



## SAR EVALUATION REPORT

**Applicant Name:**

Harris Corporation  
221 Jefferson Ridge Parkway  
Lynchburg, VA 24501  
United States

**Date of Testing:**

03/14/2016 – 07/25/2016

**Test Site/Location:**

PCTEST Lab, Columbia, MD, USA

**Document Serial No.:**

0Y1603030467-R1.BV8

**FCC ID:**

**BV8BBPBM214**

**APPLICANT:**

**HARRIS CORPORATION**

**DUT Type:**

Module Integrated to PTT Device

**Application Type:**

Class II Permissive Change

**FCC Rule Part(s):**

CFR §2.1093

**Model(s):**

XL-200P

**Test Device Serial No.:**

Pre-Production Sample [S/N: A40302000148]

**Permissive Change(s):**

Module Integrate into XL-200P, PTT Device

**Date of Original Certification:**

09-10-2015

| Equipment Class | Band & Mode      | Tx Frequency        | SAR              |                       |
|-----------------|------------------|---------------------|------------------|-----------------------|
|                 |                  |                     | 1 gm Head (W/kg) | 1 gm Body-Worn (W/kg) |
| TNB             | LTE Band 13      | 779.5 - 784.5 MHz   | 0.36             | 0.25                  |
| TNB             | LTE Band 14      | 790.5 - 795.5 MHz   | 0.29             | 0.15                  |
| TNB             | LTE Band 4 (AWS) | 1712.5 - 1752.5 MHz | < 0.1            | 0.70                  |

Note: This revised Test Report (S/N: 0Y1603030467-R1.BV8) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.11 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

  
Randy Orlanez  
President



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|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | SAR EVALUATION REPORT                        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 1 of 44                    |

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|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

| Band & Mode      | Operating Modes | Tx Frequency        |
|------------------|-----------------|---------------------|
| LTE Band 13      | Data            | 779.5 - 784.5 MHz   |
| LTE Band 14      | Data            | 790.5 - 795.5 MHz   |
| LTE Band 4 (AWS) | Data            | 1712.5 - 1752.5 MHz |

## 1.2 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

## 1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

| Mode / Band      |         | Modulated Average (dBm) |
|------------------|---------|-------------------------|
| LTE Band 13      | Maximum | <b>24.5</b>             |
|                  | Nominal | <b>24.0</b>             |
| LTE Band 14      | Maximum | <b>24.5</b>             |
|                  | Nominal | <b>24.0</b>             |
| LTE Band 4 (AWS) | Maximum | <b>25.5</b>             |
|                  | Nominal | <b>25.0</b>             |

## 1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. The overall diagonal dimension of the device is ≤160 mm and the diagonal display is ≤150 mm. A diagram showing the location of the device antennas can be found in Appendix F.

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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## 1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Modes which share the same transmission path cannot transmit simultaneously with one another.



**Figure 1-1**  
**Simultaneous Transmission Paths**

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

This module is integrated into host model XL-200P with FCC ID: OWDTR-0133-E and can transmit simultaneously.

**Table 1-1**  
**Simultaneous Transmission Scenarios**

| No. | Capable Transmit Configuration     | Head | Body-Worn Accessory |
|-----|------------------------------------|------|---------------------|
| 1   | LTE B13/14/4 + VHF                 | Yes  | Yes                 |
| 2   | LTE B13/14/4 + UHF                 | Yes  | Yes                 |
| 3   | LTE B4 + 700 MHz                   | Yes  | Yes                 |
| 4   | LTE B13/14/4 + 800 MHz             | Yes  | Yes                 |
| 5   | LTE B13/14/4 + Bluetooth           | Yes  | Yes                 |
| 6   | LTE B13/14/4 + 2.4 GHz WLAN        | Yes  | Yes                 |
| 7   | LTE B13/14/4 + 5 GHz WLAN          | Yes  | Yes                 |
| 8   | LTE B13/14/4 + VHF + Bluetooth     | Yes  | Yes                 |
| 9   | LTE B13/14/4 + UHF + Bluetooth     | Yes  | Yes                 |
| 10  | LTE B4 + 700 MHz + Bluetooth       | Yes  | Yes                 |
| 11  | LTE B13/14/4 + 800 MHz + Bluetooth | Yes  | Yes                 |
| 12  | LTE B13/14/4 + VHF + WLAN          | Yes  | Yes                 |
| 13  | LTE B13/14/4 + UHF + WLAN          | Yes  | Yes                 |
| 14  | LTE B4 + 700 MHz + WLAN            | Yes  | Yes                 |
| 15  | LTE B13/14/4 + 800 MHz + WLAN      | Yes  | Yes                 |

Note:

1. LTE B13/14 + 700 MHz combination is not supported by this device.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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## 1.6 Manufacturer's Accessory List

PTT radios intended for occupational use typically have multiple options for antennas, batteries, body-worn and audio accessories. The following accessories were provided by the manufacturer and have been tested for SAR compliance as outlined by KDB Publication 643646 D01v01r03.

**Table 1-2  
Manufacturer's Accessory List**

| SAR Test Report Reference    | Manufacturer's Part Number | Part Description                                                            |
|------------------------------|----------------------------|-----------------------------------------------------------------------------|
| <b>Antennas</b>              |                            |                                                                             |
| A                            | KRE1011506/1               | 1/2 Wave Whip Antenna, (764-870 MHz)                                        |
| B                            | KRE1011506/2               | 1/2 Wave Stub Antenna, (764-870 MHz)                                        |
| C                            | 14035-4000-01              | Antenna, Full Spectrum                                                      |
| D                            | 14035-4420-01              | Antenna, Whip Wideband 378-520 MHz, 762-870 MHz                             |
| E                            | 14035-4440-01              | Antenna, Whip, 1/2 Wave, 762-870 MHz                                        |
| F                            | 14035-4440-02              | Antenna, Whip, 1/4 Wave, 762-870 MHz                                        |
| <b>Batteries</b>             |                            |                                                                             |
| a                            | 14035-4010-04              | BATTERY, LI-ION, 3100 MAH                                                   |
| b                            | 14035-4010-05              | BATTERY, LI-ION, 3100 MAH, UL                                               |
| c                            | 14035-4010-01              | Battery, Lithium, Standard Capacity                                         |
| <b>Audio Accessories</b>     |                            |                                                                             |
| I                            | 12082-0650-13              | Headset, Heavy Duty, Behind-the-Head, w/PTT                                 |
|                              | 12082-0650-14              | Headset, Heavy Duty, Over-the-Head, w/PTT                                   |
|                              | 12082-0650-15              | Headset, BTH Boom Mic, Earpiece, w/PTT                                      |
|                              | 12082-0650-16              | Headset, Tactical, Boom Mic, Earpiece, w/PTT                                |
| II                           | 12082-0650-17              | Skull Mic, w/Body PTT, Earcup                                               |
|                              | 14002-0197-01              | Adapter, 6-Pin Hirose                                                       |
|                              | 12082-0650-18              | Throat Mic, w/Acoustic Tube, Body PTT                                       |
|                              | 12082-0650-19              | Throat Mic, w/Acoustic Tube, body and Ring PTT                              |
| III                          | 12150-1000-01              | Speaker Microphone, Premium, Fire, Noise Cancelling                         |
|                              | 12082-0600-01              | Speaker Microphone                                                          |
|                              | 12082-0600-02              | Speaker Microphone, Emergency Button                                        |
|                              | 12150-1000-05              | Speaker Microphone, Premium, Fire, Noise Cancelling, High Visibility Yellow |
| IV                           | 12082-0681-01              | Speaker Microphone, Wireless, Bluetooth                                     |
|                              | 12082-0650-10              | Headset, Light Weight, Behind-the-Head, Dual Ear, Pig Tail PTT              |
|                              | 12082-0650-01              | Microphone, Palm, 2-Wire, Black                                             |
|                              | 12082-0650-02              | Microphone, Palm, 2-Wire, Beige                                             |
|                              | 12082-0650-03              | Microphone, Mini-Lapel, 3-Wire, Black                                       |
|                              | 12082-0650-04              | Microphone, Mini-Lapel, 3-Wire, Beige                                       |
|                              | 12082-0650-07              | Headset, In-Ear, Boom Mic, In-Line PTT                                      |
|                              | 12082-0650-08              | Headset, Light Weight, Over-the-Head, Single Ear, In-Line PTT               |
|                              | 12082-0650-09              | Headset, Light Weight, Behind-the-Head, Dual Ear, In-Line PTT               |
|                              | 12082-0650-11              | Headset, Light Weight, Behind-the-Head, Dual In-Ear, In-Line PTT            |
|                              | 12082-0650-12              | Headset, Light Weight, Behind-the-Head, Dual In-Ear, Pig Tail PTT           |
|                              | 12082-0684-01              | Bluetooth, Covert, Earpiece/MIC/PTT, Radios                                 |
|                              | LS103239V1                 | Earphone, Lapel Microphone                                                  |
|                              | LS103239V2                 | Earphone, Speaker Mic, Right Angle, 2.5 MM                                  |
| <b>Body-Worn Accessories</b> |                            |                                                                             |
| 1                            | 12082-1290-01              | Metal Belt Clip                                                             |
| 2                            | 14035-4200-02              | HOLSTER, LEATHER W/RINGS, RADIO, PREMIUM                                    |
|                              | CC103333V1                 | Strap, Shoulder                                                             |
|                              | 14035-4202-02              | HOLSTER, LEATHER W/RINGS, RADIO, STANDARD                                   |
|                              | 14035-4202-04              | HOLSTER, RING, LEATHER, RADIO, STANDARD                                     |
|                              | 14035-4200-04              | HOLSTER, RING, LEATHER, RADIO, PREMIUM                                      |
|                              | 14036-4000-02              | HOLSTER, LEATHER W/RINGS, LOTUS, PREMIUM                                    |
|                              | 14035-4201-02              | Case, Leather, Premium, Shoulder Strap                                      |
|                              | 14035-4201-02              | CASE, LEATHER, PREMIUM, SHOULDER STRAP                                      |
|                              | 14035-4202-01              | CASE, LEATHER, PREMIUM, SHOULDER STRAP                                      |
|                              | 14002-0218-01              | Belt Loop, Leather, Premium                                                 |
| 3                            | 14035-4200-01              | Holster, Leather, Radio, Premium                                            |
|                              | KRY1011609/1               | Belt Loop, Leather                                                          |
|                              | 14036-4000-01              | HOLSTER, LEATHER, LOTUS, PREMIUM                                            |
|                              | 14035-4201-01              | CASE, LEATHER, PREMIUM, BELT LOOP, D-SWIVEL                                 |
|                              | 12082-3230-01              | D-Swivel                                                                    |
|                              | 14035-4200-03              | HOLSTER, NYLON, BLACK, RADIO, PREMIUM                                       |
|                              | 14035-4202-03              | HOLSTER, NYLON, BLACK, RADIO, STANDARD                                      |
| <b>Miscellaneous</b>         |                            |                                                                             |
|                              | 14035-1800-01              | Charger, Single Bay                                                         |
|                              | 14035-1800-02              | Charger, Multi Bay                                                          |
|                              | 14035-4100-01              | Charger, Vehicular                                                          |
|                              | 12082-0445-A1              | Cable, Data Interface                                                       |
|                              | 12082-0435-A1              | Cable, MATQ-03424, Test                                                     |
|                              | 12082-0410-A1              | Cable, USB, Key Loading/Programming                                         |
|                              | 12082-0400-A1              | Cable, KVL, Key Loading                                                     |
|                              | 12082-0650-05              | Earphone Kit, Black                                                         |
|                              | 12082-0650-06              | Earphone Kit, Beige                                                         |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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## 1.7 Additional Battery

Battery 'a' is the default battery provided by the manufacturer. Batteries 'a' and 'b' are identical in construction and differ only in label. Batteries 'a' and 'c' are nearly identical in construction and capacity. Therefore, SAR testing was only performed with battery 'a'.

## 1.8 Body-Worn Accessories

This DUT may be used with the body-worn accessories outlined below. Body-worn accessories similar in construction and test separation distance were grouped. The highlighted body-worn accessories within each group were selected for SAR testing and are expected to result in the highest SAR based on test distance and metallic components.

**Table 1-3**  
**Body-Worn Accessory Groups**

| Group: | Part Number:  | Body-Worn Accessories:                      |
|--------|---------------|---------------------------------------------|
| 1      | 12082-1290-01 | Metal Belt Clip                             |
| 2      | 14035-4200-02 | HOLSTER, LEATHER W/RINGS, RADIO, PREMIUM    |
|        | CC103333V1    | Strap, Shoulder                             |
|        | 14035-4202-02 | HOLSTER, LEATHER W/RINGS, RADIO, STANDARD   |
|        | 14035-4202-04 | HOLSTER, RING, LEATHER, RADIO, STANDARD     |
|        | 14035-4200-04 | HOLSTER, RING, LEATHER, RADIO, PREMIUM      |
|        | 14036-4000-02 | HOLSTER, LEATHER W/RINGS, LOTUS, PREMIUM    |
|        | 14035-4201-02 | Case, Leather, Premium, Shoulder Strap      |
|        | 14035-4201-02 | CASE, LEATHER, PREMIUM, SHOULDER STRAP      |
|        | 14035-4202-01 | CASE, LEATHER, PREMIUM, SHOULDER STRAP      |
| 3      | 14002-0218-01 | Belt Loop, Leather, Premium                 |
|        | 14035-4200-01 | Holster, Leather, Radio, Premium            |
|        | KRY1011609/1  | Belt Loop, Leather                          |
|        | 14036-4000-01 | HOLSTER, LEATHER, LOTUS, PREMIUM            |
|        | 14035-4201-01 | CASE, LEATHER, PREMIUM, BELT LOOP, D-SWIVEL |
|        | 12082-3230-01 | D-Swivel                                    |
|        | 14035-4200-03 | HOLSTER, NYLON, BLACK, RADIO, PREMIUM       |
|        | 14035-4202-03 | HOLSTER, NYLON, BLACK, RADIO, STANDARD      |

Per FCC KDB Publication 643646 D01v01r03, the accessories were tested in conjunction with the host device to demonstrate compliance. Grouping '1' was selected as the standard body-worn accessory as it is expected to result in the highest SAR based on its construction and separation distance between the user and the device. Back side was evaluated for 1 g body-worn SAR for each mode and frequency band with the body-worn accessory combination positioned at 0.0 mm from the phantom. Highlighted body-worn accessories combinations in grouping 2 and 3 are selected for additional body-worn testing as they provide smallest antenna separation distance among the groups. Worst case configurations for each LTE Band were retested using Groupings '2' and '3' to ensure the highest SAR is reported.

Since the reported SAR was < 0.8 W/kg, no additional evaluations for Body-worn Accessory Grouping 2 and 3 were required.

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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## 1.9 Audio Accessories

This DUT may be used with the audio accessories outlined below. Audio accessories with similar construction and operating requirements were grouped. The highlighted audio accessories within each group were selected for SAR testing and are expected to result in the highest SAR based on metallic components and power usage.

**Table 1-4**  
**Audio Accessory Groups**

| Group: | Part Number:  | Audio Accessories:                                                          |
|--------|---------------|-----------------------------------------------------------------------------|
| I      | 12082-0650-13 | Headset, Heavy Duty, Behind-the-Head, w/PTT                                 |
|        | 12082-0650-14 | Headset, Heavy Duty, Over-the-Head, w/PTT                                   |
|        | 12082-0650-15 | Headset, BTH Boom Mic, Earpiece, w/PTT                                      |
|        | 12082-0650-16 | Headset, Tactical, Boom Mic, Earpiece, w/PTT                                |
| II     | 12082-0650-17 | Skull Mic, w/Body PTT, Earcup                                               |
|        | 14002-0197-01 | Adapter, 6-Pin Hirose                                                       |
|        | 12082-0650-18 | Throat Mic, w/Acoustic Tube, Body PTT                                       |
|        | 12082-0650-19 | Throat Mic, w/Acoustic Tube, body and Ring PTT                              |
| III    | 12150-1000-01 | Speaker Microphone, Premium, Fire, Noise Cancelling                         |
|        | 12082-0600-01 | Speaker Microphone                                                          |
|        | 12082-0600-02 | Speaker Microphone, Emergency Button                                        |
|        | 12150-1000-05 | Speaker Microphone, Premium, Fire, Noise Cancelling, High Visibility Yellow |
| IV     | 12082-0681-01 | Speaker Microphone, Wireless, Bluetooth                                     |
|        | 12082-0650-10 | Headset, Light Weight, Behind-the-Head, Dual Ear, Pig Tail PTT              |
|        | 12082-0650-01 | Microphone, Palm, 2-Wire, Black                                             |
|        | 12082-0650-02 | Microphone, Palm, 2-Wire, Beige                                             |
|        | 12082-0650-03 | Microphone, Mini-Lapel, 3-Wire, Black                                       |
|        | 12082-0650-04 | Microphone, Mini-Lapel, 3-Wire, Beige                                       |
|        | 12082-0650-07 | Headset, In-Ear, Boom Mic, In-Line PTT                                      |
|        | 12082-0650-08 | Headset, Light Weight, Over-the-Head, Single Ear, In-Line PTT               |
|        | 12082-0650-09 | Headset, Light Weight, Behind-the-Head, Dual Ear, In-Line PTT               |
|        | 12082-0650-11 | Headset, Light Weight, Behind-the-Head, Dual In-Ear, In-Line PTT            |
|        | 12082-0650-12 | Headset, Light Weight, Behind-the-Head, Dual In-Ear, Pig Tail PTT           |
|        | 12082-0684-01 | Bluetooth, Covert, Earpiece/MIC/PTT, Radios                                 |
|        | LS103239V1    | Earphone, Lapel Microphone                                                  |
|        | LS103239V2    | Earphone, Speaker Mic, Right Angle, 2.5 MM                                  |

All audio accessories are without a built-in radiating element. All combinations of antennas, body-worn accessories and audio accessories can be used together. Per FCC KDB Publication 643646 D01v01r03, the accessories were tested in conjunction with the hose device to demonstrate compliance. Since the reported SAR was < 0.8 W/kg no additional evaluations with additional audio accessories for Body-worn Accessory Grouping 2 and 3 were required.

## 1.10 Miscellaneous SAR Test Considerations

### (A) Licensed Transmitter(s)

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r04.

## 1.11 Guidance Applied

- FCC KDB Publication 941225 D05v02r04
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 643646 D01v01r03 (SAR Test for PTT Radios)

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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## 2 LTE INFORMATION

| LTE Information                                                                                                   |                                                 |                |                |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------|----------------|
| FCC ID                                                                                                            | BV8BBPBM214                                     |                |                |
| Form Factor                                                                                                       | Module Integrated to PTT Device                 |                |                |
| Frequency Range of each LTE transmission band                                                                     | LTE Band 13 (779.5 - 784.5 MHz)                 |                |                |
|                                                                                                                   | LTE Band 14 (790.5 - 795.5 MHz)                 |                |                |
|                                                                                                                   | LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)          |                |                |
| Channel Bandwidths                                                                                                | LTE Band 13: 5 MHz, 10 MHz                      |                |                |
|                                                                                                                   | LTE Band 14: 5 MHz, 10 MHz                      |                |                |
|                                                                                                                   | LTE Band 4 (AWS): 5 MHz, 10 MHz, 15 MHz, 20 MHz |                |                |
| Channel Numbers and Frequencies (MHz)                                                                             | Low                                             | Mid            | High           |
| LTE Band 13: 5 MHz                                                                                                | 779.5 (23205)                                   | 782 (23230)    | 784.5 (23255)  |
| LTE Band 13: 10 MHz                                                                                               | N/A                                             | 782 (23230)    | N/A            |
| LTE Band 14: 5 MHz                                                                                                | 790.5 (23755)                                   | 793 (23780)    | 795.5 (23805)  |
| LTE Band 14: 10 MHz                                                                                               | 793 (23330)                                     | 793 (23330)    | 793 (23330)    |
| LTE Band 4 (AWS): 5 MHz                                                                                           | 1712.5 (19975)                                  | 1732.5 (20175) | 1752.5 (20375) |
| LTE Band 4 (AWS): 10 MHz                                                                                          | 1715 (20000)                                    | 1732.5 (20175) | 1750 (20350)   |
| LTE Band 4 (AWS): 15 MHz                                                                                          | 1717.5 (20025)                                  | 1732.5 (20175) | 1747.5 (20325) |
| LTE Band 4 (AWS): 20 MHz                                                                                          | 1720 (20050)                                    | 1732.5 (20175) | 1745 (20300)   |
| UE Category                                                                                                       | 4                                               |                |                |
| Modulations Supported in UL                                                                                       | QPSK, 16QAM                                     |                |                |
| LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3–6.2.5? (manufacturer attestation to be provided) | YES                                             |                |                |
| A-MPR (Additional MPR) disabled for SAR Testing?                                                                  | YES                                             |                |                |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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### 3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

#### 3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

**Equation 3-1**  
**SAR Mathematical Equation**

$$SAR = \frac{d}{dt} \left( \frac{dU}{dm} \right) = \frac{d}{dt} \left( \frac{dU}{\rho dv} \right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

- $\sigma$  = conductivity of the tissue-simulating material (S/m)
- $\rho$  = mass density of the tissue-simulating material (kg/m<sup>3</sup>)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

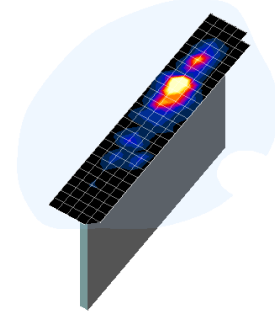
|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 4 DOSIMETRIC ASSESSMENT

### 4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
  - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
  - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.



**Figure 4-1**  
Sample SAR Area Scan

**Table 4-1**  
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04\*

| Frequency | Maximum Area Scan Resolution (mm)<br>( $\Delta x_{\text{area}}, \Delta y_{\text{area}}$ ) | Maximum Zoom Scan Resolution (mm)<br>( $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$ ) | Maximum Zoom Scan Spatial Resolution (mm) |                             |                                     | Minimum Zoom Scan Volume (mm)<br>(x,y,z) |
|-----------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------|-------------------------------------|------------------------------------------|
|           |                                                                                           |                                                                                           | Uniform Grid                              | Graded Grid                 |                                     |                                          |
|           |                                                                                           |                                                                                           |                                           | $\Delta z_{\text{zoom}}(n)$ | $\Delta z_{\text{zoom}}(1)^*$       |                                          |
| ≤2 GHz    | ≤15                                                                                       | ≤8                                                                                        | ≤5                                        | ≤4                          | ≤1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥30                                      |
| 2-3 GHz   | ≤12                                                                                       | ≤5                                                                                        | ≤5                                        | ≤4                          | ≤1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥30                                      |
| 3-4 GHz   | ≤12                                                                                       | ≤5                                                                                        | ≤4                                        | ≤3                          | ≤1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥28                                      |
| 4-5 GHz   | ≤10                                                                                       | ≤4                                                                                        | ≤3                                        | ≤2.5                        | ≤1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥25                                      |
| 5-6 GHz   | ≤10                                                                                       | ≤4                                                                                        | ≤2                                        | ≤2                          | ≤1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥22                                      |

\*Also compliant to IEEE 1528-2013 Table 6

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 5 TEST CONFIGURATION POSITIONS

### 5.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity  $\epsilon = 3$  and loss tangent  $\delta = 0.02$ .

### 5.2 Positioning for Head Testing

Per FCC KDB Publication 643646 D01v01r03, head SAR was measured with the front surface of the DUT positioned 2.5 cm below a flat phantom filled with head simulating liquid. In the case where the front surface is not flat, with a variation of 1.0 cm or more, the average distance of contour is used to establish the 2.5 cm test distance. No body-worn or audio accessories apply to this use condition and thus were not included in head SAR testing.

### 5.3 Body-Worn Accessory Configurations

Body SAR is measured with the radio placed in a body-worn accessory, positioned against a flat phantom under normal operating conditions expected by users and typically with a standard default audio accessory supplied with the radio per FCC KDB Publication 643646 D01v01r03. Body-worn testing is performed with the default battery and a standard body-worn accessory, and if applicable, a default audio accessory, to measure the body SAR of each antenna.

When multiple default body-worn accessories are supplied with a radio, the standard body-worn accessory expected to result in highest SAR based on its construction and exposure conditions is considered the default body-worn accessory for making body-worn SAR measurements.

Body-worn test is repeated for additional body-worn accessories. For body-worn accessories with similar construction and operating configurations, test only the body-worn accessory within the group that is expected to result in the highest SAR determined by the smallest antenna separation distance provided by the body-worn accessory, between the radio and the user, with the applicable side(s) of the radio facing the user.

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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## 6 RF EXPOSURE LIMITS

### 6.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### 6.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 6-1**  
**SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

| HUMAN EXPOSURE LIMITS                                               |                                                                           |                                                                   |
|---------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|
|                                                                     | UNCONTROLLED ENVIRONMENT<br><i>General Population</i><br>(W/kg) or (mW/g) | CONTROLLED ENVIRONMENT<br><i>Occupational</i><br>(W/kg) or (mW/g) |
| <b>Peak Spatial Average SAR</b><br>Head                             | 1.6                                                                       | 8.0                                                               |
| <b>Whole Body SAR</b>                                               | 0.08                                                                      | 0.4                                                               |
| <b>Peak Spatial Average SAR</b><br>Hands, Feet, Ankle, Wrists, etc. | 4.0                                                                       | 20                                                                |

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 7 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

### 7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

### 7.2 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

#### 7.2.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

#### 7.2.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

#### 7.2.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

#### 7.2.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
  - i. The required channel and offset combination with the highest maximum output power is required for SAR.
  - ii. When the reported SAR is  $\leq 0.8$  W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
  - iii. When the reported SAR for a required test channel is  $> 1.45$  W/kg, SAR is required for all RB offset configurations for that channel.

|                                      |                                                                                                                                                                                                        |                                              |
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- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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## 8 RF CONDUCTED POWERS

### 8.1 LTE Conducted Powers

#### 8.1.1 LTE Band 13

Table 8-1  
LTE Band 13 Conducted Powers – 10 MHz Bandwidth

| LTE Band 13<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 23230<br>(782.0 MHz)     |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 23.06                    | 0                            | 0        |
|                                 | 1       | 25        | <b>23.11</b>             |                              | 0        |
|                                 | 1       | 49        | 22.90                    |                              | 0        |
|                                 | 25      | 0         | 22.08                    | 0-1                          | 1        |
|                                 | 25      | 12        | <b>22.12</b>             |                              | 1        |
|                                 | 25      | 25        | 21.71                    |                              | 1        |
|                                 | 50      | 0         | 22.03                    |                              | 1        |
| 16QAM                           | 1       | 0         | 22.42                    | 0-1                          | 1        |
|                                 | 1       | 25        | 22.32                    |                              | 1        |
|                                 | 1       | 49        | 22.00                    |                              | 1        |
|                                 | 25      | 0         | 21.09                    | 0-2                          | 2        |
|                                 | 25      | 12        | 21.01                    |                              | 2        |
|                                 | 25      | 25        | 20.69                    |                              | 2        |
|                                 | 50      | 0         | 21.00                    |                              | 2        |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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**Table 8-2**  
**LTE Band 13 Conducted Powers – 5 MHz Bandwidth**

| LTE Band 13<br>5 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23230<br>(782.0 MHz)     |                              |          |
|                                |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 23.13                    | 0                            | 0        |
|                                | 1       | 12        | 23.26                    |                              | 0        |
|                                | 1       | 24        | 23.09                    |                              | 0        |
|                                | 12      | 0         | 22.27                    | 0-1                          | 1        |
|                                | 12      | 6         | 22.29                    |                              | 1        |
|                                | 12      | 13        | 21.90                    |                              | 1        |
|                                | 25      | 0         | 22.16                    |                              | 1        |
| 16QAM                          | 1       | 0         | 22.22                    | 0-1                          | 1        |
|                                | 1       | 12        | 22.30                    |                              | 1        |
|                                | 1       | 24        | 21.78                    |                              | 1        |
|                                | 12      | 0         | 21.16                    | 0-2                          | 2        |
|                                | 12      | 6         | 21.22                    |                              | 2        |
|                                | 12      | 13        | 20.91                    |                              | 2        |
|                                | 25      | 0         | 21.14                    |                              | 2        |

Note: LTE Band 13 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## 8.1.2 LTE Band 14

**Table 8-3**  
**LTE Band 14 Conducted Powers – 10 MHz Bandwidth**

| LTE Band 14<br>10 MHz Bandwidth |         |           |                          |                              |          |
|---------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                      | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                 |         |           | 23330<br>(793.0 MHz)     |                              |          |
|                                 |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                            | 1       | 0         | 23.85                    | 0                            | 0        |
|                                 | 1       | 25        | <b>24.30</b>             |                              | 0        |
|                                 | 1       | 49        | 23.90                    |                              | 0        |
|                                 | 25      | 0         | <b>23.27</b>             | 0-1                          | 1        |
|                                 | 25      | 12        | 23.20                    |                              | 1        |
|                                 | 25      | 25        | 22.91                    |                              | 1        |
|                                 | 50      | 0         | 23.20                    |                              | 1        |
| 16QAM                           | 1       | 0         | 23.04                    | 0-1                          | 1        |
|                                 | 1       | 25        | 23.38                    |                              | 1        |
|                                 | 1       | 49        | 23.12                    |                              | 1        |
|                                 | 25      | 0         | 22.12                    | 0-2                          | 2        |
|                                 | 25      | 12        | 22.03                    |                              | 2        |
|                                 | 25      | 25        | 21.91                    |                              | 2        |
|                                 | 50      | 0         | 22.19                    |                              | 2        |

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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**Table 8-4**  
**LTE Band 14 Conducted Powers – 5 MHz Bandwidth**

| LTE Band 14<br>5 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                     | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                |         |           | 23330<br>(793.0 MHz)     |                              |          |
|                                |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                           | 1       | 0         | 24.30                    | 0                            | 0        |
|                                | 1       | 12        | 24.50                    |                              | 0        |
|                                | 1       | 24        | 24.23                    |                              | 0        |
|                                | 12      | 0         | 23.48                    | 0-1                          | 1        |
|                                | 12      | 6         | 23.39                    |                              | 1        |
|                                | 12      | 13        | 23.19                    |                              | 1        |
|                                | 25      | 0         | 23.28                    |                              | 1        |
| 16QAM                          | 1       | 0         | 23.32                    | 0-1                          | 1        |
|                                | 1       | 12        | 23.30                    |                              | 1        |
|                                | 1       | 24        | 23.27                    |                              | 1        |
|                                | 12      | 0         | 22.18                    | 0-2                          | 2        |
|                                | 12      | 6         | 22.18                    |                              | 2        |
|                                | 12      | 13        | 21.98                    |                              | 2        |
|                                | 25      | 0         | 22.12                    |                              | 2        |

Note: LTE Band 14 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

### 8.1.3 LTE Band 4

**Table 8-5**  
**LTE Band 4 Conducted Powers – 20 MHz Bandwidth**

| LTE Band 4 (AWS)<br>20 MHz Bandwidth |         |           |                          |                              |          |
|--------------------------------------|---------|-----------|--------------------------|------------------------------|----------|
| Modulation                           | RB Size | RB Offset | Mid Channel              | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                      |         |           | 20175<br>(1732.5 MHz)    |                              |          |
|                                      |         |           | Conducted Power<br>[dBm] |                              |          |
| QPSK                                 | 1       | 0         | 24.31                    | 0                            | 0        |
|                                      | 1       | 50        | 24.28                    |                              | 0        |
|                                      | 1       | 99        | 24.20                    |                              | 0        |
|                                      | 50      | 0         | 24.15                    | 0-1                          | 0        |
|                                      | 50      | 25        | 23.81                    |                              | 0        |
|                                      | 50      | 50        | 23.84                    |                              | 0        |
|                                      | 100     | 0         | 24.11                    |                              | 0        |
| 16QAM                                | 1       | 0         | 24.19                    | 0-1                          | 0        |
|                                      | 1       | 50        | 24.14                    |                              | 0        |
|                                      | 1       | 99        | 24.10                    |                              | 0        |
|                                      | 50      | 0         | 23.13                    | 0-2                          | 1        |
|                                      | 50      | 25        | 22.84                    |                              | 1        |
|                                      | 50      | 50        | 22.79                    |                              | 1        |
|                                      | 100     | 0         | 23.16                    |                              | 1        |

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 17 of 44                   |

**Table 8-6**  
**LTE Band 4 Conducted Powers – 15 MHz Bandwidth**

| LTE Band 4 (AWS)<br>15 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20025<br>(1717.5 MHz) | 20175<br>(1732.5 MHz) | 20325<br>(1747.5 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.03                 | 24.47                 | 24.22                 | 0                            | 0        |
|                                     | 1       | 36        | 24.41                 | 24.24                 | 24.27                 |                              | 0        |
|                                     | 1       | 74        | 24.52                 | 24.34                 | 24.52                 |                              | 0        |
|                                     | 36      | 0         | 24.03                 | 24.53                 | 24.16                 | 0-1                          | 0        |
|                                     | 36      | 18        | 24.36                 | 24.12                 | 24.14                 |                              | 0        |
|                                     | 36      | 37        | 24.36                 | 24.17                 | 24.52                 |                              | 0        |
|                                     | 75      | 0         | 24.31                 | 24.51                 | 24.26                 |                              | 0        |
| 16QAM                               | 1       | 0         | 24.53                 | 24.63                 | 24.60                 | 0-1                          | 0        |
|                                     | 1       | 36        | 24.69                 | 24.60                 | 24.65                 |                              | 0        |
|                                     | 1       | 74        | 24.71                 | 24.53                 | 24.63                 |                              | 0        |
|                                     | 36      | 0         | 23.09                 | 23.49                 | 23.19                 | 0-2                          | 1        |
|                                     | 36      | 18        | 23.29                 | 23.14                 | 23.40                 |                              | 1        |
|                                     | 36      | 37        | 23.35                 | 23.13                 | 23.47                 |                              | 1        |
|                                     | 75      | 0         | 23.14                 | 23.50                 | 23.19                 |                              | 1        |

**Table 8-7**  
**LTE Band 4 Conducted Powers – 10 MHz Bandwidth**

| LTE Band 4 (AWS)<br>10 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|-------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                          | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                     |         |           | 20000<br>(1715.0 MHz) | 20175<br>(1732.5 MHz) | 20350<br>(1750.0 MHz) |                              |          |
|                                     |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                                | 1       | 0         | 24.03                 | 24.41                 | 24.28                 | 0                            | 0        |
|                                     | 1       | 25        | 24.33                 | 24.17                 | 24.29                 |                              | 0        |
|                                     | 1       | 49        | 24.43                 | 24.23                 | 24.34                 |                              | 0        |
|                                     | 25      | 0         | 24.02                 | 24.44                 | 24.22                 | 0-1                          | 0        |
|                                     | 25      | 12        | 24.31                 | 24.10                 | 24.37                 |                              | 0        |
|                                     | 25      | 25        | 24.37                 | 24.06                 | 24.51                 |                              | 0        |
|                                     | 50      | 0         | 24.25                 | 24.43                 | 24.35                 |                              | 0        |
| 16QAM                               | 1       | 0         | 24.41                 | 24.70                 | 24.71                 | 0-1                          | 0        |
|                                     | 1       | 25        | 24.52                 | 24.49                 | 24.70                 |                              | 0        |
|                                     | 1       | 49        | 24.69                 | 24.55                 | 24.66                 |                              | 0        |
|                                     | 25      | 0         | 23.14                 | 23.33                 | 23.44                 | 0-2                          | 1        |
|                                     | 25      | 12        | 23.31                 | 23.13                 | 23.30                 |                              | 1        |
|                                     | 25      | 25        | 23.36                 | 23.06                 | 23.48                 |                              | 1        |
|                                     | 50      | 0         | 23.09                 | 23.48                 | 23.40                 |                              | 1        |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 18 of 44                   |

**Table 8-8**  
**LTE Band 4 Conducted Powers – 5 MHz Bandwidth**

| LTE Band 4 (AWS)<br>5 MHzBandwidth |         |           |                       |                       |                       |                              |          |
|------------------------------------|---------|-----------|-----------------------|-----------------------|-----------------------|------------------------------|----------|
| Modulation                         | RB Size | RB Offset | Low Channel           | Mid Channel           | High Channel          | MPR Allowed per<br>3GPP [dB] | MPR [dB] |
|                                    |         |           | 19975<br>(1712.5 MHz) | 20175<br>(1732.5 MHz) | 20375<br>(1752.5 MHz) |                              |          |
|                                    |         |           | Conducted Power [dBm] |                       |                       |                              |          |
| QPSK                               | 1       | 0         | 24.07                 | 24.32                 | 24.43                 | 0                            | 0        |
|                                    | 1       | 12        | 24.12                 | 24.33                 | 24.48                 |                              | 0        |
|                                    | 1       | 24        | 24.11                 | 24.29                 | 24.49                 |                              | 0        |
|                                    | 12      | 0         | 24.00                 | 24.51                 | 24.38                 | 0-1                          | 0        |
|                                    | 12      | 6         | 24.16                 | 24.20                 | 24.49                 |                              | 0        |
|                                    | 12      | 13        | 24.19                 | 24.12                 | 24.51                 |                              | 0        |
|                                    | 25      | 0         | 24.18                 | 24.43                 | 24.49                 |                              | 0        |
| 16QAM                              | 1       | 0         | 24.07                 | 24.36                 | 24.51                 | 0-1                          | 0        |
|                                    | 1       | 12        | 24.23                 | 24.00                 | 24.62                 |                              | 0        |
|                                    | 1       | 24        | 24.19                 | 23.97                 | 24.49                 |                              | 0        |
|                                    | 12      | 0         | 22.88                 | 23.45                 | 23.31                 | 0-2                          | 1        |
|                                    | 12      | 6         | 23.02                 | 23.26                 | 23.33                 |                              | 1        |
|                                    | 12      | 13        | 23.11                 | 23.09                 | 23.41                 |                              | 1        |
|                                    | 25      | 0         | 22.94                 | 23.41                 | 23.45                 |                              | 1        |

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 19 of 44                   |

## 9 SYSTEM VERIFICATION

### 9.1 Tissue Verification

Table 9-1  
Measured Tissue Properties

| Calibrated for Tests Performed on: | Tissue Type | Tissue Temp During Calibration (°C) | Measured Frequency (MHz) | Measured Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon$ | TARGET Conductivity, $\sigma$ (S/m) | TARGET Dielectric Constant, $\epsilon$ | % dev $\sigma$ | % dev $\epsilon$ |
|------------------------------------|-------------|-------------------------------------|--------------------------|---------------------------------------|------------------------------------------|-------------------------------------|----------------------------------------|----------------|------------------|
| 3/15/2016                          | 750H        | 22.0                                | 740                      | 0.883                                 | 42.792                                   | 0.893                               | 41.994                                 | -1.12%         | 1.90%            |
|                                    |             |                                     | 755                      | 0.898                                 | 42.536                                   | 0.894                               | 41.916                                 | 0.45%          | 1.48%            |
|                                    |             |                                     | 770                      | 0.913                                 | 42.370                                   | 0.895                               | 41.838                                 | 2.01%          | 1.27%            |
|                                    |             |                                     | 785                      | 0.925                                 | 42.109                                   | 0.896                               | 41.760                                 | 3.24%          | 0.84%            |
|                                    |             |                                     | 800                      | 0.938                                 | 42.059                                   | 0.897                               | 41.682                                 | 4.57%          | 0.90%            |
| 3/14/2016                          | 1750H       | 22.6                                | 1710                     | 1.301                                 | 38.544                                   | 1.348                               | 40.142                                 | -3.49%         | -3.98%           |
|                                    |             |                                     | 1750                     | 1.338                                 | 38.375                                   | 1.371                               | 40.079                                 | -2.41%         | -4.25%           |
|                                    |             |                                     | 1790                     | 1.383                                 | 38.166                                   | 1.394                               | 40.016                                 | -0.79%         | -4.62%           |
| 3/28/2016                          | 750B        | 22.4                                | 740                      | 0.955                                 | 54.441                                   | 0.963                               | 55.570                                 | -0.83%         | -2.03%           |
|                                    |             |                                     | 755                      | 0.969                                 | 54.287                                   | 0.964                               | 55.512                                 | 0.52%          | -2.21%           |
|                                    |             |                                     | 770                      | 0.984                                 | 54.113                                   | 0.965                               | 55.453                                 | 1.97%          | -2.42%           |
|                                    |             |                                     | 785                      | 0.999                                 | 53.938                                   | 0.966                               | 55.395                                 | 3.42%          | -2.63%           |
|                                    |             |                                     | 800                      | 1.013                                 | 53.770                                   | 0.967                               | 55.336                                 | 4.76%          | -2.83%           |
| 7/25/2016                          | 750B        | 22.0                                | 740                      | 0.951                                 | 54.083                                   | 0.963                               | 55.570                                 | -1.25%         | -2.68%           |
|                                    |             |                                     | 755                      | 0.966                                 | 53.896                                   | 0.964                               | 55.512                                 | 0.21%          | -2.91%           |
|                                    |             |                                     | 770                      | 0.981                                 | 53.719                                   | 0.965                               | 55.453                                 | 1.66%          | -3.13%           |
|                                    |             |                                     | 785                      | 0.995                                 | 53.540                                   | 0.966                               | 55.395                                 | 3.00%          | -3.35%           |
|                                    |             |                                     | 800                      | 1.009                                 | 53.389                                   | 0.967                               | 55.336                                 | 4.34%          | -3.52%           |
| 4/1/2016                           | 1750B       | 22.1                                | 1710                     | 1.409                                 | 51.520                                   | 1.463                               | 53.537                                 | -3.69%         | -3.77%           |
|                                    |             |                                     | 1750                     | 1.446                                 | 51.388                                   | 1.488                               | 53.432                                 | -2.82%         | -3.83%           |
|                                    |             |                                     | 1790                     | 1.491                                 | 51.199                                   | 1.514                               | 53.326                                 | -1.52%         | -3.99%           |
| 7/18/2016                          | 1750B       | 21.6                                | 1710                     | 1.457                                 | 52.284                                   | 1.463                               | 53.537                                 | -0.41%         | -2.34%           |
|                                    |             |                                     | 1750                     | 1.501                                 | 52.164                                   | 1.488                               | 53.432                                 | 0.87%          | -2.37%           |
|                                    |             |                                     | 1790                     | 1.550                                 | 51.992                                   | 1.514                               | 53.326                                 | 2.38%          | -2.50%           |
| 7/25/2016                          | 1750B       | 21.7                                | 1710                     | 1.449                                 | 52.150                                   | 1.463                               | 53.537                                 | -0.96%         | -2.59%           |
|                                    |             |                                     | 1750                     | 1.493                                 | 51.993                                   | 1.488                               | 53.432                                 | 0.34%          | -2.69%           |
|                                    |             |                                     | 1790                     | 1.537                                 | 51.862                                   | 1.514                               | 53.326                                 | 1.52%          | -2.75%           |

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

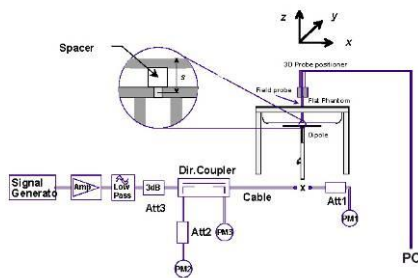
|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | SAR EVALUATION REPORT                        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 20 of 44                   |

## 9.2 Test System Verification

Prior to SAR assessment, the system is verified to  $\pm 10\%$  of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix E.

**Table 9-2**  
**System Verification Results**

| System Verification<br>TARGET & MEASURED |                        |             |            |                |                  |                 |           |          |                                   |                                     |                                         |                             |
|------------------------------------------|------------------------|-------------|------------|----------------|------------------|-----------------|-----------|----------|-----------------------------------|-------------------------------------|-----------------------------------------|-----------------------------|
| SAR System #                             | Tissue Frequency (MHz) | Tissue Type | Date:      | Amb. Temp (°C) | Liquid Temp (°C) | Input Power (W) | Dipole SN | Probe SN | Measured SAR <sub>1g</sub> (W/kg) | 1 W Target SAR <sub>1g</sub> (W/kg) | 1 W Normalized SAR <sub>1g</sub> (W/kg) | Deviation <sub>1g</sub> (%) |
| K                                        | 750                    | HEAD        | 03/15/2016 | 22.4           | 22.0             | 0.200           | 1046      | 3022     | 1.510                             | 8.200                               | 7.550                                   | -7.93%                      |
| K                                        | 1750                   | HEAD        | 03/14/2016 | 24.0           | 22.6             | 0.100           | 1051      | 3022     | 3.350                             | 36.200                              | 33.500                                  | -7.46%                      |
| K                                        | 750                    | BODY        | 03/28/2016 | 23.5           | 22.8             | 0.200           | 1046      | 3022     | 1.790                             | 8.770                               | 8.950                                   | 2.05%                       |
| G                                        | 750                    | BODY        | 07/25/2016 | 23.0           | 21.6             | 0.200           | 1046      | 3334     | 1.750                             | 8.770                               | 8.750                                   | -0.23%                      |
| K                                        | 1750                   | BODY        | 04/01/2016 | 23.5           | 22.4             | 0.100           | 1051      | 3022     | 3.700                             | 37.100                              | 37.000                                  | -0.27%                      |
| E                                        | 1750                   | BODY        | 07/18/2016 | 21.1           | 21.6             | 0.100           | 1008      | 7406     | 3.780                             | 37.300                              | 37.800                                  | 1.34%                       |
| K                                        | 1750                   | BODY        | 07/25/2016 | 22.3           | 21.7             | 0.100           | 1148      | 7409     | 3.670                             | 37.100                              | 36.700                                  | -1.08%                      |



**Figure 9-1**  
**System Verification Setup Diagram**



**Figure 9-2**  
**System Verification Setup Photo**

|                                      |                                                                                                                                   |                                              |                                                                                                     |                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | SAR EVALUATION REPORT                        |  <b>HARRIS</b> | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                                     | Page 21 of 44                   |

# 10 SAR DATA SUMMARY

## 10.1 Standalone Head SAR Data

**Table 10-1**  
**LTE Band 13 Head SAR**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |                             |                       |                  |          |      |            |                                                 |                     |               |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|-----------------------------|-----------------------|------------------|----------|------|------------|-------------------------------------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Reference                               | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |                             |                       |                  |          |      |            |                                                 |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | 0.15     | 0    | Front      | 25 mm                                           | A                   | KRE1011506/1  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.234          | 1.377             | 0.322  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | -0.02    | 1    | Front      | 25 mm                                           | A                   | KRE1011506/1  | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.181          | 1.374             | 0.249  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | 0.11     | 0    | Front      | 25 mm                                           | B                   | KRE1011506/2  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.228          | 1.377             | 0.314  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | -0.12    | 1    | Front      | 25 mm                                           | B                   | KRE1011506/2  | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.179          | 1.374             | 0.246  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | 0.08     | 0    | Front      | 25 mm                                           | C                   | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.133          | 1.377             | 0.183  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | 0.10     | 1    | Front      | 25 mm                                           | C                   | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.111          | 1.374             | 0.153  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | 0.00     | 0    | Front      | 25 mm                                           | D                   | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.261          | 1.377             | 0.359  | A1 |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | 0.00     | 1    | Front      | 25 mm                                           | D                   | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.208          | 1.374             | 0.286  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | -0.02    | 0    | Front      | 25 mm                                           | E                   | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.247          | 1.377             | 0.340  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | 0.02     | 1    | Front      | 25 mm                                           | E                   | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.199          | 1.374             | 0.273  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 24.5                  | 23.11            | -0.03    | 0    | Front      | 25 mm                                           | F                   | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.238          | 1.377             | 0.328  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10                          | 23.5                  | 22.12            | 0.02     | 1    | Front      | 25 mm                                           | F                   | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.195          | 1.374             | 0.268  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |                             |                       |                  |          |      |            | Head<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |    |

**Table 10-2**  
**LTE Band 14 Head SAR**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |                             |                       |                  |          |      |            |                                                 |                     |               |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|-----------------------------|-----------------------|------------------|----------|------|------------|-------------------------------------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Reference                               | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |                             |                       |                  |          |      |            |                                                 |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | -0.01    | 0    | Front      | 25 mm                                           | A                   | KRE1011506/1  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.242          | 1.047             | 0.253  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | -0.02    | 1    | Front      | 25 mm                                           | A                   | KRE1011506/1  | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.198          | 1.054             | 0.209  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | 0.07     | 0    | Front      | 25 mm                                           | B                   | KRE1011506/2  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.256          | 1.047             | 0.268  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | 0.03     | 1    | Front      | 25 mm                                           | B                   | KRE1011506/2  | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.206          | 1.054             | 0.217  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | 0.01     | 0    | Front      | 25 mm                                           | C                   | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.135          | 1.047             | 0.141  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | -0.04    | 1    | Front      | 25 mm                                           | C                   | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.115          | 1.054             | 0.121  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | 0.05     | 0    | Front      | 25 mm                                           | D                   | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.261          | 1.047             | 0.273  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | -0.01    | 1    | Front      | 25 mm                                           | D                   | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.209          | 1.054             | 0.220  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | 0.10     | 0    | Front      | 25 mm                                           | E                   | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.277          | 1.047             | 0.290  | A2 |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | -0.02    | 1    | Front      | 25 mm                                           | E                   | 14035-4440-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.214          | 1.054             | 0.226  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 24.5                  | 24.30            | 0.03     | 0    | Front      | 25 mm                                           | F                   | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.270          | 1.047             | 0.283  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10                          | 23.5                  | 23.27            | 0.00     | 1    | Front      | 25 mm                                           | F                   | 14035-4440-02 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.203          | 1.054             | 0.214  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |                             |                       |                  |          |      |            | Head<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |    |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | SAR EVALUATION REPORT                        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 22 of 44                   |

**Table 10-3**  
**LTE Band 4 Head SAR**

| MEASUREMENT RESULTS                                                                                 |       |     |                  |                 |                             |                       |                  |          |                                                 |            |                   |                     |            |         |           |                      |            |          |                |                   |        |
|-----------------------------------------------------------------------------------------------------|-------|-----|------------------|-----------------|-----------------------------|-----------------------|------------------|----------|-------------------------------------------------|------------|-------------------|---------------------|------------|---------|-----------|----------------------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                           |       |     | Mode             | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Side                                            | Test Space | Antenna Reference | Antenna Part Number | Modulation | RB Size | RB Offset | Device Serial Number | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                                 | Ch.   |     |                  |                 |                             |                       |                  |          |                                                 |            |                   |                     |            |         |           |                      |            | (W/kg)   |                | (W/kg)            |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | -0.06            | 0        | Front                                           | 25 mm      | A                 | KRE1011506/1        | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.052    | 1.315          | 0.068             | A3     |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | 0.16             | 0        | Front                                           | 25 mm      | A                 | KRE1011506/1        | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.052    | 1.365          | 0.071             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | 0.04             | 0        | Front                                           | 25 mm      | B                 | KRE1011506/2        | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.061    | 1.315          | 0.080             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | 0.02             | 0        | Front                                           | 25 mm      | B                 | KRE1011506/2        | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.052    | 1.365          | 0.071             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | 0.06             | 0        | Front                                           | 25 mm      | C                 | 14035-4000-01       | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.053    | 1.315          | 0.070             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | 0.03             | 0        | Front                                           | 25 mm      | C                 | 14035-4000-01       | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.046    | 1.365          | 0.063             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | -0.12            | 0        | Front                                           | 25 mm      | D                 | 14035-4420-01       | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.061    | 1.315          | 0.080             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | -0.03            | 0        | Front                                           | 25 mm      | D                 | 14035-4420-01       | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.056    | 1.365          | 0.076             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | 0.07             | 0        | Front                                           | 25 mm      | E                 | 14035-4440-01       | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.048    | 1.315          | 0.063             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | 0.16             | 0        | Front                                           | 25 mm      | E                 | 14035-4440-01       | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.042    | 1.365          | 0.057             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.31                 | 0.11             | 0        | Front                                           | 25 mm      | F                 | 14035-4440-02       | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.050    | 1.315          | 0.066             |        |
| 1732.50                                                                                             | 20175 | Mid | LTE Band 4 (AWS) | 20              | 25.5                        | 24.15                 | 0.04             | 0        | Front                                           | 25 mm      | F                 | 14035-4440-02       | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.042    | 1.365          | 0.057             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |     |                  |                 |                             |                       |                  |          | Head<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |            |                   |                     |            |         |           |                      |            |          |                |                   |        |

## 10.2 Standalone Body-Worn SAR Data

**Table 10-4**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna A**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | 0.09     | 0    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.156          | 1.377             | 0.215  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | -0.03    | 1    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.128          | 1.374             | 0.176  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | 0.05     | 0    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.166          | 1.377             | 0.229  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | -0.01    | 1    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.127          | 1.374             | 0.174  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | 0.11     | 0    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.168          | 1.377             | 0.231  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | -0.02    | 1    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.129          | 1.374             | 0.177  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | 0.03     | 0    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.168          | 1.377             | 0.231  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | -0.05    | 1    | Back       | 0 mm                                                 | KRE1011506/I | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.128          | 1.374             | 0.176  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |  |

**Table 10-5**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna B**

| MEASUREMENT RESULTS                                   |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |
|-------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                             |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                   | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | 0.00     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.150          | 1.377             | 0.207  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | 0.07     | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.119          | 1.374             | 0.164  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | 0.02     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.164          | 1.377             | 0.226  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | 0.01     | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.119          | 1.374             | 0.164  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | 0.10     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.160          | 1.377             | 0.220  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | -0.05    | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.120          | 1.374             | 0.165  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | 0.07     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.167          | 1.377             | 0.230  |  |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | -0.03    | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.121          | 1.374             | 0.166  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |  |
| Uncontrolled Exposure / General Population            |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 23 of 44                   |

**Table 10-6**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna C**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|---------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR[dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | 0.03    | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.141          | 1.377             | 0.194  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | 0.09    | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.108          | 1.374             | 0.148  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | 0.02    | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.138          | 1.377             | 0.190  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | 0.05    | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.104          | 1.374             | 0.143  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | -0.03   | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.145          | 1.377             | 0.200  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | -0.05   | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.107          | 1.374             | 0.147  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | -0.05   | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.144          | 1.377             | 0.198  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | 0.06    | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.104          | 1.374             | 0.143  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |         |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-7**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna D**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|---------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR[dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | 0.16    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.163          | 1.377             | 0.224  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | 0.04    | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.126          | 1.374             | 0.173  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | 0.14    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.156          | 1.377             | 0.215  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | 0.01    | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.124          | 1.374             | 0.170  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | 0.07    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.170          | 1.377             | 0.234  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | 0.03    | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.132          | 1.374             | 0.181  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | 0.01    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.165          | 1.377             | 0.227  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | -0.04   | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.126          | 1.374             | 0.173  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |         |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-8**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna E**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|---------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR[dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |         |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | 0.10    | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.173          | 1.377             | 0.238  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | -0.05   | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.131          | 1.374             | 0.180  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | -0.01   | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.174          | 1.377             | 0.240  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | 0.03    | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.130          | 1.374             | 0.179  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | 0.00    | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.172          | 1.377             | 0.237  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | -0.04   | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.129          | 1.374             | 0.177  |    |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | -0.04   | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.182          | 1.377             | 0.251  | A4 |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | 0.10    | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.132          | 1.374             | 0.181  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |         |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |    |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 24 of 44                   |

**Table 10-9**  
**LTE Band 13 Body-Worn Group 1 SAR Data – Antenna F**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | I                | -0.10    | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.160          | 1.377             | 0.220  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | I                | -0.02    | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.123          | 1.374             | 0.169  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | II               | -0.03    | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.156          | 1.377             | 0.215  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | II               | 0.05     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.123          | 1.374             | 0.169  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | III              | -0.03    | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.168          | 1.377             | 0.231  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | III              | -0.03    | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.125          | 1.374             | 0.172  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 24.5                  | 23.11           | IV               | 0.01     | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.174          | 1.377             | 0.240  |  |
| 782.00                                                                                              | 23230 | Mid  | LTE Band 13     | 10           | 1                           | 23.5                  | 22.12           | IV               | 0.09     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.123          | 1.374             | 0.169  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-10**  
**LTE Band 13 Body-Worn SAR Data- BW Group '2'**

| MEASUREMENT RESULTS                        |       |      |                 |              |                             |                       |                 |                  |          |      |                      |                   |                     |               |         |           |                      |              |          |                |                   |        |    |
|--------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|----------------------|-------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                  |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space           | Antenna Reference | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                        | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |                      |                   |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.07     | 0    | Back                 | 0 mm              | A                   | KRE1011506/1  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.156          | 1.377             | 0.214  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | -0.05    | 1    | Back                 | 0 mm              | A                   | KRE1011506/1  | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.119          | 1.374             | 0.163  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.04     | 0    | Back                 | 0 mm              | B                   | KRE1011506/2  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.155          | 1.377             | 0.214  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | 0.14     | 1    | Back                 | 0 mm              | B                   | KRE1011506/2  | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.112          | 1.374             | 0.154  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.05     | 0    | Back                 | 0 mm              | C                   | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.133          | 1.377             | 0.184  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | 0.09     | 1    | Back                 | 0 mm              | C                   | 14035-4000-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.096          | 1.374             | 0.132  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.14     | 0    | Back                 | 0 mm              | D                   | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.153          | 1.377             | 0.211  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | -0.07    | 1    | Back                 | 0 mm              | D                   | 14035-4420-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.117          | 1.374             | 0.161  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.02     | 0    | Back                 | 0 mm              | E                   | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.169          | 1.377             | 0.233  | A5 |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | -0.13    | 1    | Back                 | 0 mm              | E                   | 14035-4440-01 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.122          | 1.374             | 0.168  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 24.5                  | 23.11           | IV               | 0.14     | 0    | Back                 | 0 mm              | F                   | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.161          | 1.377             | 0.222  |    |
| 782.00                                     | 23230 | Mid  | LTE Band 13     | 10           | 2                           | 23.5                  | 22.12           | IV               | 0.11     | 1    | Back                 | 0 mm              | F                   | 14035-4440-02 | QPSK    | 25        | 12                   | A40302000148 | 1:1      | 0.114          | 1.374             | 0.156  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT      |       |      |                 |              |                             |                       |                 |                  |          |      | Body-Worn            |                   |                     |               |         |           |                      |              |          |                |                   |        |    |
| Spatial Peak                               |       |      |                 |              |                             |                       |                 |                  |          |      | 1.6 W/kg (mW/g)      |                   |                     |               |         |           |                      |              |          |                |                   |        |    |
| Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      | averaged over 1 gram |                   |                     |               |         |           |                      |              |          |                |                   |        |    |

**Table 10-11**  
**LTE Band 13 Body-Worn SAR Data- BW Group '3'**

| MEASUREMENT RESULTS                                   |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |               |                                                      |           |                      |              |          |                |                   |        |    |
|-------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|-------------------|---------------------|---------------|------------------------------------------------------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                             |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Reference | Antenna Part Number | Modulation    | RB Size                                              | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                   | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |               |                                                      |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | 0.13     | 0    | Back       | 0 mm              | A                   | KRE1011506/1  | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.089          | 1.377             | 0.123  | A6 |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | 0.02     | 1    | Back       | 0 mm              | A                   | KRE1011506/1  | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.068          | 1.374             | 0.094  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | -0.07    | 0    | Back       | 0 mm              | B                   | KRE1011506/2  | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.089          | 1.377             | 0.123  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | 0.04     | 1    | Back       | 0 mm              | B                   | KRE1011506/2  | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.065          | 1.374             | 0.089  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | -0.02    | 0    | Back       | 0 mm              | C                   | 14035-4000-01 | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.077          | 1.377             | 0.105  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | -0.08    | 1    | Back       | 0 mm              | C                   | 14035-4000-01 | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.055          | 1.374             | 0.076  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | 0.11     | 0    | Back       | 0 mm              | D                   | 14035-4420-01 | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.088          | 1.377             | 0.121  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | -0.12    | 1    | Back       | 0 mm              | D                   | 14035-4420-01 | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.067          | 1.374             | 0.093  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | 0.04     | 0    | Back       | 0 mm              | E                   | 14035-4440-01 | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.097          | 1.377             | 0.134  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | 0.09     | 1    | Back       | 0 mm              | E                   | 14035-4440-01 | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.070          | 1.374             | 0.096  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 24.5                  | 23.11           | IV               | 0.15     | 0    | Back       | 0 mm              | F                   | 14035-4440-02 | QPSK                                                 | 1         | 25                   | A40302000148 | 1:1      | 0.093          | 1.377             | 0.128  |    |
| 782.00                                                | 23230 | Mid  | LTE Band 13     | 10           | 3                           | 23.5                  | 22.12           | IV               | -0.09    | 1    | Back       | 0 mm              | F                   | 14035-4440-02 | QPSK                                                 | 25        | 12                   | A40302000148 | 1:1      | 0.065          | 1.374             | 0.090  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |               | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |           |                      |              |          |                |                   |        |    |
| Uncontrolled Exposure / General Population            |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |               |                                                      |           |                      |              |          |                |                   |        |    |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8B8PBM214                  |  | SAR EVALUATION REPORT                        |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 25 of 44                   |

**Table 10-12**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna A**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.02     | 0    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.124          | 1.047             | 0.130  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | -0.02    | 1    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.113          | 1.054             | 0.119  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | 0.00     | 0    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.141          | 1.047             | 0.147  | A7 |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | 0.03     | 1    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.131          | 1.054             | 0.138  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | -0.03    | 0    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.108          | 1.047             | 0.113  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | -0.15    | 1    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.098          | 1.054             | 0.103  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | -0.07    | 0    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.124          | 1.047             | 0.129  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.02     | 1    | Back       | 0 mm                                                 | KRE1011506/1 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.105          | 1.054             | 0.111  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |    |

**Table 10-13**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna B**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.04     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.103          | 1.047             | 0.108  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | -0.13    | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.101          | 1.054             | 0.107  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | 0.00     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.113          | 1.047             | 0.118  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | -0.02    | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.101          | 1.054             | 0.107  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | -0.11    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.091          | 1.047             | 0.096  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | 0.00     | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.083          | 1.054             | 0.088  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | -0.03    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.103          | 1.047             | 0.108  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.11     | 1    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.090          | 1.054             | 0.095  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |  |

**Table 10-14**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna C**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.05     | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.101          | 1.047             | 0.106  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | -0.04    | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.090          | 1.054             | 0.095  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | -0.03    | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.118          | 1.047             | 0.124  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | -0.08    | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.101          | 1.054             | 0.106  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | 0.06     | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.102          | 1.047             | 0.107  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | 0.02     | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.086          | 1.054             | 0.090  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | 0.05     | 0    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.099          | 1.047             | 0.104  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.07     | 1    | Back       | 0 mm                                                 | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.085          | 1.054             | 0.090  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-15**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna D**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.19     | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.108          | 1.047             | 0.113  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | -0.04    | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.097          | 1.054             | 0.103  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | -0.09    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.127          | 1.047             | 0.133  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | 0.03     | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.110          | 1.054             | 0.116  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | -0.15    | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.104          | 1.047             | 0.109  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | -0.12    | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.092          | 1.054             | 0.097  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | 0.15     | 0    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.105          | 1.047             | 0.109  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.04     | 1    | Back       | 0 mm                                                 | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.094          | 1.054             | 0.099  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 26 of 44                   |

**Table 10-16**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna E**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.03     | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.131          | 1.047             | 0.137  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | -0.06    | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.115          | 1.054             | 0.121  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | -0.04    | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.134          | 1.047             | 0.140  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | -0.03    | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.117          | 1.054             | 0.123  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | -0.12    | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.106          | 1.047             | 0.111  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | -0.14    | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.096          | 1.054             | 0.101  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | 0.05     | 0    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.122          | 1.047             | 0.128  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.03     | 1    | Back       | 0 mm                                                 | 14035-4440-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.107          | 1.054             | 0.112  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-17**  
**LTE Band 14 Body-Worn Group 1 SAR Data- Antenna F**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | I                | 0.00     | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.100          | 1.047             | 0.105  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | I                | 0.04     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.092          | 1.054             | 0.097  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | II               | 0.01     | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.108          | 1.047             | 0.113  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | II               | 0.09     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.098          | 1.054             | 0.104  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | III              | 0.10     | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.087          | 1.047             | 0.091  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | III              | 0.04     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.080          | 1.054             | 0.085  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 24.5                  | 24.30           | IV               | 0.01     | 0    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.094          | 1.047             | 0.098  |  |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 1                           | 23.5                  | 23.27           | IV               | 0.07     | 1    | Back       | 0 mm                                                 | 14035-4440-02 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.086          | 1.054             | 0.091  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-18**  
**LTE Band 14 Body-Worn SAR Data- BW Group '2'**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |                                                      |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|-------------------|---------------------|------------------------------------------------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Reference | Antenna Part Number | Modulation                                           | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     |                                                      |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | 0.11     | 0    | Back       | 0 mm              | A                   | KRE1011506/1                                         | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.128          | 1.047             | 0.134  | A8 |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | -0.05    | 1    | Back       | 0 mm              | A                   | KRE1011506/1                                         | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.119          | 1.054             | 0.125  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | 0.05     | 0    | Back       | 0 mm              | B                   | KRE1011506/2                                         | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.102          | 1.047             | 0.107  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | 0.00     | 1    | Back       | 0 mm              | B                   | KRE1011506/2                                         | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.092          | 1.054             | 0.097  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | -0.04    | 0    | Back       | 0 mm              | C                   | 14035-4000-01                                        | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.107          | 1.047             | 0.112  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | 0.14     | 1    | Back       | 0 mm              | C                   | 14035-4000-01                                        | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.091          | 1.054             | 0.096  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | 0.07     | 0    | Back       | 0 mm              | D                   | 14035-4420-01                                        | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.115          | 1.047             | 0.121  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | -0.03    | 1    | Back       | 0 mm              | D                   | 14035-4420-01                                        | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.100          | 1.054             | 0.105  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | 0.11     | 0    | Back       | 0 mm              | E                   | 14035-4440-01                                        | QPSK    | 1         | 25                   | A40303000015 | 1:1      | 0.122          | 1.047             | 0.127  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | -0.06    | 1    | Back       | 0 mm              | E                   | 14035-4440-01                                        | QPSK    | 25        | 0                    | A40303000015 | 1:1      | 0.106          | 1.054             | 0.112  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 24.5                  | 24.30           | II               | 0.03     | 0    | Back       | 0 mm              | F                   | 14035-4440-02                                        | QPSK    | 1         | 25                   | A40303000015 | 1:1      | 0.099          | 1.047             | 0.103  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 2                           | 23.5                  | 23.27           | II               | -0.01    | 1    | Back       | 0 mm              | F                   | 14035-4440-02                                        | QPSK    | 25        | 0                    | A40303000015 | 1:1      | 0.089          | 1.054             | 0.094  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                     | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |         |           |                      |              |          |                |                   |        |    |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8B8PBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 27 of 44                   |

**Table 10-19**  
**LTE Band 14 Body-Worn SAR Data- BW Group '3'**

| MEASUREMENT RESULTS                                                                                 |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                                                      |               |         |           |                      |              |          |                |                   |        |    |
|-----------------------------------------------------------------------------------------------------|-------|------|-----------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|-------------------|------------------------------------------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz] | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Reference | Antenna Part Number                                  | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                                 | Ch.   |      |                 |              |                             |                       |                 |                  |          |      |            |                   |                                                      |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | 0.07     | 0    | Back       | 0 mm              | A                                                    | KRE1011506/L  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.078          | 1.047             | 0.081  | A9 |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | -0.14    | 1    | Back       | 0 mm              | A                                                    | KRE1011506/L  | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.072          | 1.054             | 0.076  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | -0.03    | 0    | Back       | 0 mm              | B                                                    | KRE1011506/2  | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.062          | 1.047             | 0.065  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | -0.08    | 1    | Back       | 0 mm              | B                                                    | KRE1011506/2  | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.056          | 1.054             | 0.059  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | 0.02     | 0    | Back       | 0 mm              | C                                                    | 14035-4000-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.065          | 1.047             | 0.068  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | 0.15     | 1    | Back       | 0 mm              | C                                                    | 14035-4000-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.055          | 1.054             | 0.058  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | 0.13     | 0    | Back       | 0 mm              | D                                                    | 14035-4420-01 | QPSK    | 1         | 25                   | A40302000148 | 1:1      | 0.070          | 1.047             | 0.073  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | -0.02    | 1    | Back       | 0 mm              | D                                                    | 14035-4420-01 | QPSK    | 25        | 0                    | A40302000148 | 1:1      | 0.061          | 1.054             | 0.064  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | 0.04     | 0    | Back       | 0 mm              | E                                                    | 14035-4440-01 | QPSK    | 1         | 25                   | A40303000015 | 1:1      | 0.074          | 1.047             | 0.077  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | 0.01     | 1    | Back       | 0 mm              | E                                                    | 14035-4440-01 | QPSK    | 25        | 0                    | A40303000015 | 1:1      | 0.064          | 1.054             | 0.068  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 24.5                  | 24.30           | II               | -0.01    | 0    | Back       | 0 mm              | F                                                    | 14035-4440-02 | QPSK    | 1         | 25                   | A40303000015 | 1:1      | 0.060          | 1.047             | 0.063  |    |
| 793.00                                                                                              | 23330 | Mid  | LTE Band 14     | 10           | 3                           | 23.5                  | 23.27           | II               | 0.03     | 1    | Back       | 0 mm              | F                                                    | 14035-4440-02 | QPSK    | 25        | 0                    | A40303000015 | 1:1      | 0.054          | 1.054             | 0.057  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                 |              |                             |                       |                 |                  |          |      |            |                   | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |               |         |           |                      |              |          |                |                   |        |    |

**Table 10-20**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna A**

| MEASUREMENT RESULTS                                                                                 |       |      |                  |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.06    | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.496          | 1.315             | 0.652  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | -0.09    | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.401          | 1.365             | 0.547  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | 0.13     | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.453          | 1.315             | 0.596  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | -0.09    | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.361          | 1.365             | 0.493  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | 0.09     | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.453          | 1.315             | 0.596  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | -0.05    | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.380          | 1.365             | 0.519  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | 0.04     | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.468          | 1.315             | 0.615  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | 0.06     | 0    | Back       | 0 mm                                                 | KRE1011506/L | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.389          | 1.365             | 0.531  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |  |

**Table 10-21**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna B**

| MEASUREMENT RESULTS                                                                                 |       |      |                  |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------|------------------------------------------------------|--------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space | Antenna Part Number                                  | Modulation   | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |            |                                                      |              |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.05    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.425          | 1.315             | 0.559  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | -0.04    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.341          | 1.365             | 0.465  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | -0.10    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.425          | 1.315             | 0.559  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | 0.03     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.341          | 1.365             | 0.465  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | -0.14    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.441          | 1.315             | 0.580  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | 0.04     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.355          | 1.365             | 0.485  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | 0.10     | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.445          | 1.315             | 0.585  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | -0.05    | 0    | Back       | 0 mm                                                 | KRE1011506/2 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.356          | 1.365             | 0.486  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      |            | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |              |         |           |                      |              |          |                |                   |        |  |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 28 of 44                   |

**Table 10-22**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna C**

| MEASUREMENT RESULTS                        |       |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              |          |                |                   |        |     |
|--------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|----------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|-----|
| FREQUENCY                                  |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space           | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |     |
| MHz                                        | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.07    | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.532          | 1.315             | 0.700  | A10 |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | -0.06    | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.405          | 1.365             | 0.553  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | 0.01     | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.480          | 1.315             | 0.631  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | 0.05     | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.376          | 1.365             | 0.513  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | -0.04    | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.488          | 1.315             | 0.642  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | 0.07     | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.401          | 1.365             | 0.547  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | 0.03     | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.492          | 1.315             | 0.647  |     |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | -0.08    | 0    | Back                 | 0 mm                | 14035-4000-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.359          | 1.365             | 0.490  |     |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT      |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn            |                     |               |         |           |                      |              |          |                |                   |        |     |
| Spatial Peak                               |       |      |                  |              |                             |                       |                 |                  |          |      | 1.6 W/kg (mW/g)      |                     |               |         |           |                      |              |          |                |                   |        |     |
| Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |     |

**Table 10-23**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna D**

| MEASUREMENT RESULTS                        |       |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              |          |                |                   |        |  |
|--------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|----------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                  |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space           | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                        | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.12    | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.484          | 1.315             | 0.636  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | -0.20    | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.377          | 1.365             | 0.515  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | 0.02     | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.464          | 1.315             | 0.610  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | -0.01    | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.362          | 1.365             | 0.494  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | 0.14     | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.464          | 1.315             | 0.610  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | 0.04     | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.378          | 1.365             | 0.516  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | -0.13    | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.441          | 1.315             | 0.580  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | 0.01     | 0    | Back                 | 0 mm                | 14035-4420-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.355          | 1.365             | 0.485  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT      |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn            |                     |               |         |           |                      |              |          |                |                   |        |  |
| Spatial Peak                               |       |      |                  |              |                             |                       |                 |                  |          |      | 1.6 W/kg (mW/g)      |                     |               |         |           |                      |              |          |                |                   |        |  |
| Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-24**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna E**

| MEASUREMENT RESULTS                        |       |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              |          |                |                   |        |  |
|--------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|----------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                  |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space           | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                        | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                      |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.01    | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.528          | 1.315             | 0.694  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | 0.06     | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.425          | 1.365             | 0.580  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | -0.08    | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.492          | 1.315             | 0.647  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | -0.14    | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.387          | 1.365             | 0.528  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | 0.02     | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.500          | 1.315             | 0.658  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | 0.01     | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.405          | 1.365             | 0.553  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | -0.02    | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.500          | 1.315             | 0.658  |  |
| 1732.50                                    | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | 0.18     | 0    | Back                 | 0 mm                | 14035-4440-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.378          | 1.365             | 0.516  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT      |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn            |                     |               |         |           |                      |              |          |                |                   |        |  |
| Spatial Peak                               |       |      |                  |              |                             |                       |                 |                  |          |      | 1.6 W/kg (mW/g)      |                     |               |         |           |                      |              |          |                |                   |        |  |
| Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |  |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 29 of 44                   |

**Table 10-25**  
**LTE Band 4 Body-Worn Group 1 SAR Data- Antenna F**

| MEASUREMENT RESULTS                                                                                 |       |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                     |               |         |           |                      |              |          |                |                   |        |  |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------------------------------------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|--|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space                                           | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |  |
| MHz                                                                                                 | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | I                | -0.03    | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.472          | 1.315             | 0.621  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | I                | -0.09    | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.375          | 1.365             | 0.512  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | II               | 0.04     | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.461          | 1.315             | 0.606  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | II               | -0.11    | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.351          | 1.365             | 0.479  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | III              | 0.02     | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.464          | 1.315             | 0.610  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | III              | 0.10     | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.385          | 1.365             | 0.526  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.31           | IV               | 0.08     | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.433          | 1.315             | 0.569  |  |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 1                           | 25.5                  | 24.15           | IV               | 0.07     | 0    | Back                                                 | 0 mm                | 14035-4440-02 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.337          | 1.365             | 0.460  |  |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                     |               |         |           |                      |              |          |                |                   |        |  |

**Table 10-26**  
**LTE Band 4 Body-Worn SAR Data- BW Group '2'**

| MEASUREMENT RESULTS                                                                                 |       |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                   |                     |               |         |           |                      |              |          |                |                   |        |     |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------------------------------------------------|-------------------|---------------------|---------------|---------|-----------|----------------------|--------------|----------|----------------|-------------------|--------|-----|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space                                           | Antenna Reference | Antenna Part Number | Modulation    | RB Size | RB Offset | Device Serial Number | Duty Cycle   | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |     |
| MHz                                                                                                 | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                   |                     |               |         |           |                      |              | (W/kg)   |                | (W/kg)            |        |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | -0.02    | 0    | Back                                                 | 0 mm              | A                   | KRE1011506/1  | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.211          | 1.315             | 0.278  | A11 |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | 0.15     | 0    | Back                                                 | 0 mm              | A                   | KRE1011506/1  | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.171          | 1.365             | 0.233  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | 0.09     | 0    | Back                                                 | 0 mm              | B                   | KRE1011506/2  | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.181          | 1.315             | 0.238  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | 0.11     | 0    | Back                                                 | 0 mm              | B                   | KRE1011506/2  | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.145          | 1.365             | 0.198  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | -0.04    | 0    | Back                                                 | 0 mm              | C                   | 14035-4000-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.226          | 1.315             | 0.298  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | 0.02     | 0    | Back                                                 | 0 mm              | C                   | 14035-4000-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.172          | 1.365             | 0.235  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | 0.06     | 0    | Back                                                 | 0 mm              | D                   | 14035-4420-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.206          | 1.315             | 0.271  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | 0.14     | 0    | Back                                                 | 0 mm              | D                   | 14035-4420-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.160          | 1.365             | 0.219  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | -0.11    | 0    | Back                                                 | 0 mm              | E                   | 14035-4440-01 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.225          | 1.172             | 0.263  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | -0.02    | 0    | Back                                                 | 0 mm              | E                   | 14035-4440-01 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.181          | 1.216             | 0.220  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.31           | I                | 0.00     | 0    | Back                                                 | 0 mm              | F                   | 14035-4440-02 | QPSK    | 1         | 0                    | A40302000148 | 1:1      | 0.201          | 1.172             | 0.236  |     |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 2                           | 25.50                 | 24.15           | I                | 0.04     | 0    | Back                                                 | 0 mm              | F                   | 14035-4440-02 | QPSK    | 50        | 0                    | A40302000148 | 1:1      | 0.160          | 1.216             | 0.194  |     |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                   |                     |               |         |           |                      |              |          |                |                   |        |     |

**Table 10-27**  
**LTE Band 4 Body-Worn SAR Data- BW Group '3'**

| MEASUREMENT RESULTS                                                                                 |       |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                   |                     |            |         |           |                      |            |          |                |                   |        |
|-----------------------------------------------------------------------------------------------------|-------|------|------------------|--------------|-----------------------------|-----------------------|-----------------|------------------|----------|------|------------------------------------------------------|-------------------|---------------------|------------|---------|-----------|----------------------|------------|----------|----------------|-------------------|--------|
| FREQUENCY                                                                                           |       | Mode | Bandwidth [MHz]  | BW Accessory | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Audio Accessory | Power Drift [dB] | MPR [dB] | Side | Test Space                                           | Antenna Reference | Antenna Part Number | Modulation | RB Size | RB Offset | Device Serial Number | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz                                                                                                 | Ch.   |      |                  |              |                             |                       |                 |                  |          |      |                                                      |                   |                     |            |         |           |                      |            | (W/kg)   |                | (W/kg)            |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | 0.00     | 0    | Back                                                 | 0 mm              | A KRE1011506/1      | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.125    | 1.315          | 0.164             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | 0.06     | 0    | Back                                                 | 0 mm              | A KRE1011506/1      | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.101    | 1.365          | 0.138             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | -0.09    | 0    | Back                                                 | 0 mm              | B KRE1011506/2      | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.107    | 1.315          | 0.141             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | 0.11     | 0    | Back                                                 | 0 mm              | B KRE1011506/2      | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.086    | 1.365          | 0.117             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | -0.14    | 0    | Back                                                 | 0 mm              | C 14035-4000-01     | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.134    | 1.315          | 0.176             | A12    |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | 0.00     | 0    | Back                                                 | 0 mm              | C 14035-4000-01     | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.102    | 1.365          | 0.139             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | 0.01     | 0    | Back                                                 | 0 mm              | D 14035-4420-01     | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.122    | 1.315          | 0.160             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | -0.07    | 0    | Back                                                 | 0 mm              | D 14035-4420-01     | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.095    | 1.365          | 0.130             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | 0.11     | 0    | Back                                                 | 0 mm              | E 14035-4440-01     | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.133    | 1.172          | 0.156             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | 0.16     | 0    | Back                                                 | 0 mm              | E 14035-4440-01     | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.107    | 1.216          | 0.130             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.31           | I                | -0.01    | 0    | Back                                                 | 0 mm              | F 14035-4440-02     | QPSK       | 1       | 0         | A40302000148         | 1:1        | 0.119    | 1.172          | 0.139             |        |
| 1732.50                                                                                             | 20175 | Mid  | LTE Band 4 (AWS) | 20           | 3                           | 25.50                 | 24.15           | I                | 0.05     | 0    | Back                                                 | 0 mm              | F 14035-4440-02     | QPSK       | 50      | 0         | A40302000148         | 1:1        | 0.095    | 1.216          | 0.115             |        |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure / General Population |       |      |                  |              |                             |                       |                 |                  |          |      | Body-Worn<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                   |                     |            |         |           |                      |            |          |                |                   |        |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | <b>SAR EVALUATION REPORT</b>                 |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 30 of 44                   |

### 10.3 SAR Test Notes

#### General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publications 447498 D01v06 and 643646 D01v01r03
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg. Please see Section 12 for variability analysis.
7. Since the other batteries available with this device are similar in construction and capacity, no additional SAR tests with the other batteries were required.
8. Body-worn groupings were established based on test distance and metallic components. The combinations reported are the most conservative and provide the worst-case SAR values. Since the reported SAR was < 0.8 W/kg, no additional evaluations for body-worn accessory groupings 2 and 3 were required.
9. Audio accessories with similar construction and operating requirements were grouped. Audio accessories were selected for testing based on metallic components and power usage and provide the worst-case SAR values.
10. The device tested operated within expected parameters and was not overdriven throughout the test.

#### LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 7.2.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. LTE SAR was evaluated at 100% duty cycle.

|                                      |                                                                                                                                                                                                        |                                              |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| FCC ID: BV8BBPBM214                  |  <b>SAR EVALUATION REPORT</b>  | Reviewed by:<br>Quality Manager              |
| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                                                                                     | DUT Type:<br>Module Integrated to PTT Device |
|                                      |                                                                                                                                                                                                        | Page 31 of 44                                |

# 11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

## 11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

## 11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC Guidance, simultaneous transmission SAR test exclusion may be applied when the sum of the ratios of SAR to the applicable limit for each transmit mode is  $\leq 1.0$ . The different test positions, antennas and accessories within an exposure condition were considered collectively to determine SAR test exclusion according to the sum of the ratios of the 1-g SAR to the applicable SAR limit.

Notes:

1. This module is integrated into host model XL-200P with FCC ID: OWDTR-0133-E with and can transmit simultaneously. LMR and BT/WLAN 1g SAR data was referenced from OWDTR-0133-E report (Test Report Serial No. 121814OWD-1302-S, 031315OWD-1302-S, and 060515OWD-1328-S).
2. LTE and WIFI/BT SAR are subject to uncontrolled exposure/ general population SAR limits. LMR SAR is subject to controlled exposure/occupational SAR limits.
3. Total ratio summation ( $\Sigma$  Ratios) is calculated using summed values of the (unrounded) individual ratio values of the maximum SAR to the applicable SAR limit. The ratio values reported below are rounded to the third significant digit.
4. The evaluations below represent the worst case simultaneous transmission cases with all three transmitters active and cover any lesser combination with only two transmitters.

## 11.3 Head SAR Simultaneous Transmission Analysis

**Table 11-1**  
**Simultaneous Transmission Scenario with VHF and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | $\Sigma$ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|----------------------|----------------|-----------------|
|                    |                  | 1              | 2              | 3              | 4              | 5                    | 6              | 2+4+6           |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.500          | 0.188          | 0.003                | 0.002          | 0.414           |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.500          | 0.188          | 0.003                | 0.002          | 0.371           |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.500          | 0.188          | 0.003                | 0.002          | 0.239           |

**Table 11-2**  
**Simultaneous Transmission Scenario with UHF and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | $\Sigma$ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|----------------------|----------------|-----------------|
|                    |                  | 1              | 2              | 3              | 4              | 5                    | 6              | 2+4+6           |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.875          | 0.234          | 0.003                | 0.002          | 0.461           |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.875          | 0.234          | 0.003                | 0.002          | 0.418           |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.875          | 0.234          | 0.003                | 0.002          | 0.286           |

|                                      |                                                                                     |                                              |  |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|--|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                  |  | SAR EVALUATION REPORT                        |  |  | Reviewed by:<br>Quality Manager |
| Document S/N:<br>0Y1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |  | Page 32 of 44                                                                         |                                 |

**Table 11-3**  
**Simultaneous Transmission Scenario with 700 MHz and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                    | 6              | 2+4+6    |
| Head SAR           | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.365              | 0.171          | 0.003                | 0.002          | 0.223    |

**Table 11-4**  
**Simultaneous Transmission Scenario with 800 MHz and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                    | 6              | 2+4+6    |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 0.940              | 0.118          | 0.003                | 0.002          | 0.344    |
|                    | LTE Band 14      | 0.290          | 0.181          | 0.940              | 0.118          | 0.003                | 0.002          | 0.301    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 0.940              | 0.118          | 0.003                | 0.002          | 0.169    |

**Table 11-5**  
**Simultaneous Transmission Scenario with VHF and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                       | 6              | 2+4+6    |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.500          | 0.188          | 0.004                   | 0.003          | 0.414    |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.500          | 0.188          | 0.004                   | 0.003          | 0.371    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.500          | 0.188          | 0.004                   | 0.003          | 0.240    |

**Table 11-6**  
**Simultaneous Transmission Scenario with UHF and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                       | 6              | 2+4+6    |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.875          | 0.234          | 0.004                   | 0.003          | 0.461    |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.875          | 0.234          | 0.004                   | 0.003          | 0.418    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.875          | 0.234          | 0.004                   | 0.003          | 0.287    |

**Table 11-7**  
**Simultaneous Transmission Scenario with 700 MHz and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                       | 6              | 2+4+6    |
| Head SAR           | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.365              | 0.171          | 0.004                   | 0.003          | 0.223    |

**Table 11-8**  
**Simultaneous Transmission Scenario with 800 MHz and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                       | 6              | 2+4+6    |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 0.940              | 0.118          | 0.004                   | 0.003          | 0.344    |
|                    | LTE Band 14      | 0.290          | 0.181          | 0.940              | 0.118          | 0.004                   | 0.003          | 0.301    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 0.940              | 0.118          | 0.004                   | 0.003          | 0.170    |

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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| Document S/N:<br>0Y1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 33 of 44                   |

**Table 11-9**  
**Simultaneous Transmission Scenario with VHF and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                     | 6              |          |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.500          | 0.188          | 0.020                 | 0.013          | 0.424    |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.500          | 0.188          | 0.020                 | 0.013          | 0.381    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.500          | 0.188          | 0.020                 | 0.013          | 0.250    |

**Table 11-10**  
**Simultaneous Transmission Scenario with UHF and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                     | 6              |          |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 1.875          | 0.234          | 0.020                 | 0.013          | 0.471    |
|                    | LTE Band 14      | 0.290          | 0.181          | 1.875          | 0.234          | 0.020                 | 0.013          | 0.428    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.875          | 0.234          | 0.020                 | 0.013          | 0.297    |

**Table 11-11**  
**Simultaneous Transmission Scenario with 700 MHz and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                     | 6              |          |
| Head SAR           | LTE Band 4 (AWS) | 0.080          | 0.050          | 1.365              | 0.171          | 0.020                 | 0.013          | 0.233    |

**Table 11-12**  
**Simultaneous Transmission Scenario with 800 MHz and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                     | 6              |          |
| Head SAR           | LTE Band 13      | 0.359          | 0.224          | 0.940              | 0.118          | 0.020                 | 0.013          | 0.354    |
|                    | LTE Band 14      | 0.290          | 0.181          | 0.940              | 0.118          | 0.020                 | 0.013          | 0.311    |
|                    | LTE Band 4 (AWS) | 0.080          | 0.050          | 0.940              | 0.118          | 0.020                 | 0.013          | 0.180    |

## 11.4 Body-Worn Simultaneous Transmission Analysis

**Table 11-13**  
**Simultaneous Transmission Scenario with VHF and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                    | 6              |          |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 5.200          | 0.650          | 0.006                | 0.004          | 0.811    |
|                    | LTE Band 14      | 0.147          | 0.092          | 5.200          | 0.650          | 0.006                | 0.004          | 0.746    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 5.200          | 0.650          | 0.006                | 0.004          | 1.091    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0.

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
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| Document S/N:<br>0Y1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 34 of 44                   |

**Table 11-14**  
**Simultaneous Transmission Scenario with UHF and Bluetooth**

| Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|------------------|----------------|----------------|----------------|----------------|----------------------|----------------|----------|
|                  | 1              | 2              | 3              | 4              | 5                    | 6              | 2+4+6    |
| LTE Band 13      | 0.251          | 0.157          | 4.670          | 0.584          | 0.006                | 0.004          | 0.744    |
| LTE Band 14      | 0.147          | 0.092          | 4.670          | 0.584          | 0.006                | 0.004          | 0.679    |
| LTE Band 4 (AWS) | 0.700          | 0.438          | 4.670          | 0.584          | 0.006                | 0.004          | 1.025    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0

**Table 11-15**  
**Simultaneous Transmission Scenario with 700 MHz and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                    | 6              | 2+4+6    |
| Body-Worn          | LTE Band 4 (AWS) | 0.700          | 0.438          | 2.645              | 0.331          | 0.006                | 0.004          | 0.772    |

**Table 11-16**  
**Simultaneous Transmission Scenario with 800 MHz and Bluetooth**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | Bluetooth SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                    | 6              | 2+4+6    |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 3.365              | 0.421          | 0.006                | 0.004          | 0.581    |
|                    | LTE Band 14      | 0.147          | 0.092          | 3.365              | 0.421          | 0.006                | 0.004          | 0.516    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 3.365              | 0.421          | 0.006                | 0.004          | 0.862    |

**Table 11-17**  
**Simultaneous Transmission Scenario with VHF and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                       | 6              | 2+4+6    |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 5.200          | 0.650          | 0.005                   | 0.003          | 0.810    |
|                    | LTE Band 14      | 0.147          | 0.092          | 5.200          | 0.650          | 0.005                   | 0.003          | 0.745    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 5.200          | 0.650          | 0.005                   | 0.003          | 1.091    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0

**Table 11-18**  
**Simultaneous Transmission Scenario with UHF and 2.4 GHz WLAN**

| Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|------------------|----------------|----------------|----------------|----------------|-------------------------|----------------|----------|
|                  | 1              | 2              | 3              | 4              | 5                       | 6              | 2+4+6    |
| LTE Band 13      | 0.251          | 0.157          | 4.670          | 0.584          | 0.005                   | 0.003          | 0.744    |
| LTE Band 14      | 0.147          | 0.092          | 4.670          | 0.584          | 0.005                   | 0.003          | 0.679    |
| LTE Band 4 (AWS) | 0.700          | 0.438          | 4.670          | 0.584          | 0.005                   | 0.003          | 1.024    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 35 of 44                   |

**Table 11-19**  
**Simultaneous Transmission Scenario with 700 MHz and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                       | 6              | 2+4+6    |
| Body-Worn          | LTE Band 4 (AWS) | 0.700          | 0.438          | 2.645              | 0.331          | 0.005                   | 0.003          | 0.771    |

**Table 11-20**  
**Simultaneous Transmission Scenario with 800 MHz and 2.4 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | 2.4 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-------------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                       | 6              | 2+4+6    |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 3.365              | 0.421          | 0.005                   | 0.003          | 0.581    |
|                    | LTE Band 14      | 0.147          | 0.092          | 3.365              | 0.421          | 0.005                   | 0.003          | 0.516    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 3.365              | 0.421          | 0.005                   | 0.003          | 0.861    |

**Table 11-21**  
**Simultaneous Transmission Scenario with VHF and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | VHF SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3              | 4              | 5                     | 6              | 2+4+6    |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 5.200          | 0.650          | 0.031                 | 0.019          | 0.826    |
|                    | LTE Band 14      | 0.147          | 0.092          | 5.200          | 0.650          | 0.031                 | 0.019          | 0.761    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 5.200          | 0.650          | 0.031                 | 0.019          | 1.107    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0

**Table 11-22**  
**Simultaneous Transmission Scenario with UHF and 5 GHz WLAN**

| Mode             | LTE SAR (W/kg) | Ratio to limit | UHF SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|------------------|----------------|----------------|----------------|----------------|-----------------------|----------------|----------|
|                  | 1              | 2              | 3              | 4              | 5                     | 6              | 2+4+6    |
| LTE Band 13      | 0.251          | 0.157          | 4.670          | 0.584          | 0.031                 | 0.019          | 0.760    |
| LTE Band 14      | 0.147          | 0.092          | 4.670          | 0.584          | 0.031                 | 0.019          | 0.695    |
| LTE Band 4 (AWS) | 0.700          | 0.438          | 4.670          | 0.584          | 0.031                 | 0.019          | 1.041    |

\*Note: See Section 11.5 for spatial analysis of hotspots with summed ratios greater than 1.0

**Table 11-23**  
**Simultaneous Transmission Scenario with 700 MHz and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 700 MHz SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                     | 6              | 2+4+6    |
| Body-Worn          | LTE Band 4 (AWS) | 0.700          | 0.438          | 2.645              | 0.331          | 0.031                 | 0.019          | 0.788    |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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**Table 11-24**  
**Simultaneous Transmission Scenario with 800 MHz and 5 GHz WLAN**

| Exposure Condition | Mode             | LTE SAR (W/kg) | Ratio to limit | 800 MHz SAR (W/kg) | Ratio to limit | 5 GHz WLAN SAR (W/kg) | Ratio to limit | Σ Ratios |
|--------------------|------------------|----------------|----------------|--------------------|----------------|-----------------------|----------------|----------|
|                    |                  | 1              | 2              | 3                  | 4              | 5                     | 6              | 2+4+6    |
| Body-Worn          | LTE Band 13      | 0.251          | 0.157          | 3.365              | 0.421          | 0.031                 | 0.019          | 0.597    |
|                    | LTE Band 14      | 0.147          | 0.092          | 3.365              | 0.421          | 0.031                 | 0.019          | 0.532    |
|                    | LTE Band 4 (AWS) | 0.700          | 0.438          | 3.365              | 0.421          | 0.031                 | 0.019          | 0.878    |

### 11.5 Spatial Analysis for Summed SAR to Limit Ratios Over 1.0

Since the SAR levels were very low (noise floor) for 2.4 GHz BT/WLAN and 5 GHz WLAN operations, no additional analysis was performed with respect to this transmitter for simultaneous transmission purposes.

The hotspots for VHF/UHF and LTE Band 4 were analyzed to compare SAR distributions and peak locations. Due to the antenna locations at opposite sides of the device, the separation distance between the transmitter was greater than 10 cm. The overlap between the distributions is minimal as the hotspots are spatially separated.

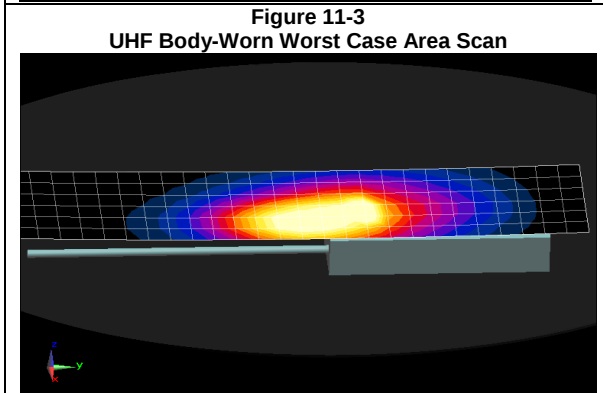
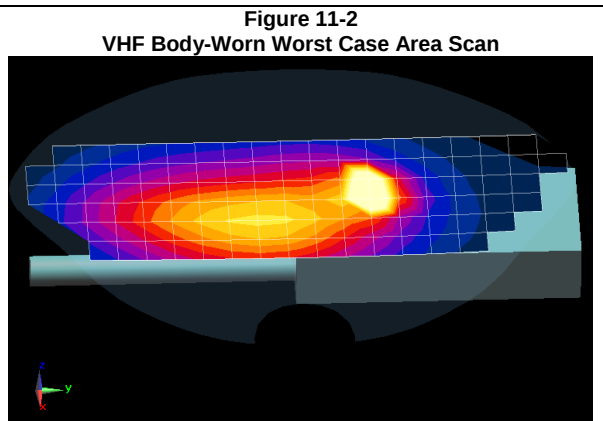
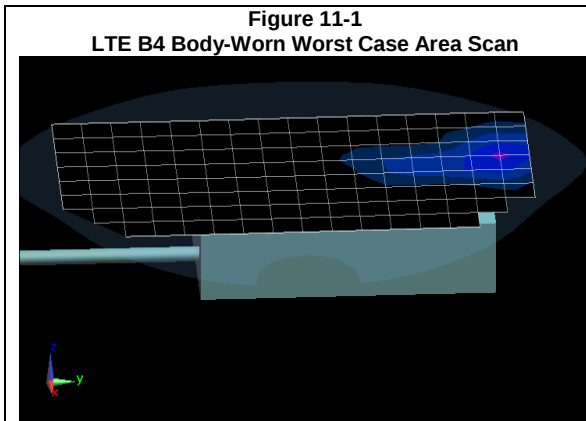
**Table 11-25**  
**Peak SAR Locations for Body Back Side**

| Mode/Band        | x (mm) | y (mm) | Reported SAR (W/kg) | Applicable SAR Limit (W/kg) |
|------------------|--------|--------|---------------------|-----------------------------|
| LTE Band 4 (AWS) | -30.50 | 150.00 | 0.7                 | 1.6                         |
| VHF              | -16.99 | 40.00  | 5.2                 | 8                           |
| UHF              | -11.01 | 22.01  | 4.67                | 8                           |

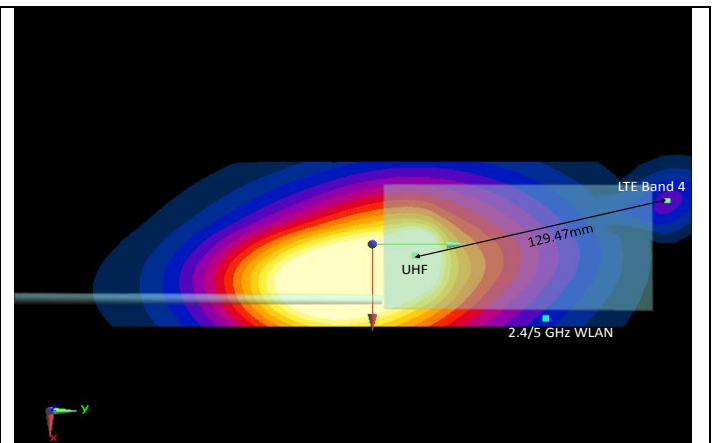
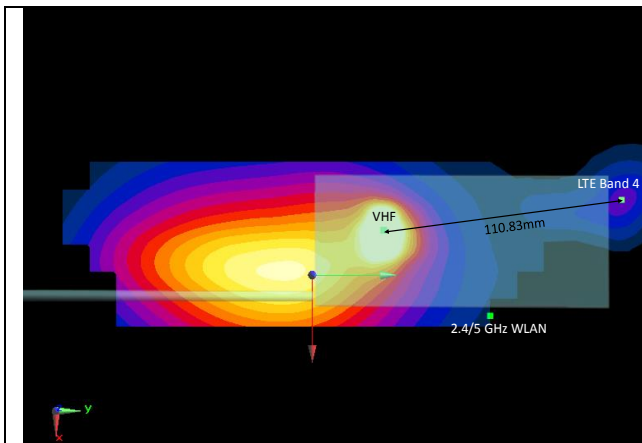
**Table 11-26**  
**Back Side SAR to Peak Location Separation Ratio Calculations**

| Antenna Pair     |         | Standalone 1g SAR/Limit Ratio |       | Sum of SAR / Limit Ratios | Peak SAR Separation Distance (mm) |
|------------------|---------|-------------------------------|-------|---------------------------|-----------------------------------|
| Ant "a"          | Ant "b" | a                             | b     | a+b                       | D <sub>a-b</sub>                  |
| LTE Band 4 (AWS) | VHF     | 0.438                         | 0.65  | 1.088                     | 110.83                            |
| LTE Band 4 (AWS) | UHF     | 0.438                         | 0.584 | 1.022                     | 129.47                            |

|                                      |                                                                                                                                   |                                              |                                                                                       |                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                                                                | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 37 of 44                   |



**Figure 11-4**  
**Back Side SAR to Peak Location Separation Ratio Plots**



|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 12 SAR MEASUREMENT VARIABILITY

### 12.1 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was not assessed for any frequency band since all measured SAR values were less than 0.80 W/kg.

### 12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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# 13 EQUIPMENT LIST

| Manufacturer       | Model       | Description                                   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|--------------------|-------------|-----------------------------------------------|------------|--------------|------------|---------------|
| Agilent            | 8594A       | (9kHz-2.9GHz) Spectrum Analyzer               | CBT        | N/A          | CBT        | 3051A00187    |
| Agilent            | 8753ES      | S-Parameter Network Analyzer                  | 3/3/2016   | Annual       | 3/3/2017   | US39170122    |
| Agilent            | E4432B      | ESG-D Series Signal Generator                 | 3/5/2016   | Annual       | 3/5/2017   | US40053896    |
| Agilent            | E4438C      | ESG Vector Signal Generator                   | 3/13/2015  | Biennial     | 3/13/2017  | MY42082385    |
| Agilent            | E8257D      | (250kHz-20GHz) Signal Generator               | 3/2/2016   | Annual       | 3/2/2017   | MY45470194    |
| Agilent            | N5182A      | MXG Vector Signal Generator                   | 3/5/2016   | Annual       | 3/5/2017   | MY47420800    |
| Amplifier Research | 15S1G6      | Amplifier                                     | CBT        | N/A          | CBT        | 433971        |
| Amplifier Research | 15S1G6      | Amplifier                                     | CBT        | N/A          | CBT        | 433972        |
| Anritsu            | MA24106A    | USB Power Sensor                              | 3/28/2016  | Annual       | 3/28/2017  | 1344554       |
| Anritsu            | MA24106A    | USB Power Sensor                              | 3/4/2016   | Annual       | 3/4/2017   | 1349514       |
| Anritsu            | MA2411B     | Pulse Power Sensor                            | 2/28/2016  | Annual       | 2/28/2017  | 1207470       |
| Anritsu            | MA2481A     | Power Sensor                                  | 3/3/2016   | Annual       | 3/3/2017   | 5318          |
| Anritsu            | ML2438A     | Power Meter                                   | 3/3/2016   | Annual       | 3/3/2017   | 1070030       |
| Anritsu            | ML2495A     | Power Meter                                   | 10/16/2015 | Biennial     | 10/16/2017 | 941001        |
| Anritsu            | MT8820C     | Radio Communication Analyzer                  | 12/4/2015  | Annual       | 12/4/2016  | 6201300731    |
| Anritsu            | MT8820C     | Radio Communication Analyzer                  | 11/12/2015 | Annual       | 11/12/2016 | 6201144418    |
| COMTech            | AR85729-5   | Solid State Amplifier                         | CBT        | N/A          | CBT        | M155A00-009   |
| Control Company    | 4040        | Digital Thermometer                           | 3/18/2015  | Biennial     | 3/18/2017  | 150194987     |
| Control Company    | 4353        | Long Stem Thermometer                         | 3/5/2015   | Biennial     | 3/5/2017   | 150149534     |
| Keysight           | 772D        | Dual Directional Coupler                      | CBT        | N/A          | CBT        | MY52180215    |
| MCL                | BW-N6W5+    | 6dB Attenuator                                | CBT        | N/A          | CBT        | 1139          |
| MiniCircuits       | SLP-2400+   | Low Pass Filter                               | CBT        | N/A          | CBT        | R8979500903   |
| Mini-Circuits      | BW-N20W5    | Power Attenuator                              | CBT        | N/A          | CBT        | 1226          |
| Mini-Circuits      | BW-N20W5+   | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | NLP-1200+   | Low Pass Filter DC to 1000 MHz                | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | NLP-2950+   | Low Pass Filter DC to 2700 MHz                | CBT        | N/A          | CBT        | N/A           |
| Mitutoyo           | CD-6"CSX    | Digital Caliper                               | 3/2/2016   | Biennial     | 3/2/2018   | 13264165      |
| Narda              | 4014C-6     | 4 - 8 GHz SMA 6 dB Directional Coupler        | CBT        | N/A          | CBT        | N/A           |
| Narda              | 4772-3      | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 9406          |
| Pasternack         | NC-100      | Torque Wrench                                 | 11/6/2015  | Biennial     | 11/6/2017  | N/A           |
| Pasternack         | NC-100      | Torque Wrench                                 | 11/6/2015  | Biennial     | 11/6/2017  | N/A           |
| Pasternack         | PE2208-6    | Bidirectional Coupler                         | CBT        | N/A          | CBT        | N/A           |
| Rohde & Schwarz    | CMW500      | Radio Communication Tester                    | 8/19/2015  | Biennial     | 8/19/2017  | 101767        |
| Seekonk            | NC-100      | Torque Wrench 5/16", 8" lbs                   | 3/2/2016   | Biennial     | 3/2/2018   | N/A           |
| Seekonk            | NC-100      | Torque Wrench                                 | 11/6/2015  | Biennial     | 11/6/2017  | N/A           |
| SPEAG              | D1750V2     | 1750 MHz SAR Dipole                           | 4/15/2015  | Annual       | 4/15/2016  | 1051          |
| SPEAG              | D750V3      | 750 MHz SAR Dipole                            | 2/16/2016  | Annual       | 2/16/2017  | 1046          |
| SPEAG              | D1765V2     | 1765 MHz SAR Dipole                           | 5/11/2016  | Annual       | 5/11/2017  | 1008          |
| SPEAG              | D1750V2     | SAR Dipole                                    | 5/9/2016   | Annual       | 5/9/2017   | 1148          |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics             | 9/16/2015  | Annual       | 9/16/2016  | 1323          |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics             | 11/11/2015 | Annual       | 11/11/2016 | 1415          |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics             | 4/14/2016  | Annual       | 4/14/2017  | 1407          |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics             | 5/11/2016  | Annual       | 5/11/2017  | 859           |
| SPEAG              | ES3DV2      | SAR Probe                                     | 8/26/2015  | Annual       | 8/26/2016  | 3022          |
| SPEAG              | ES3DV3      | SAR Probe                                     | 11/17/2015 | Annual       | 11/17/2016 | 3334          |
| SPEAG              | EX3DV4      | SAR Probe                                     | 4/19/2016  | Annual       | 4/19/2017  | 7406          |
| SPEAG              | EX3DV4      | SAR Probe                                     | 5/17/2016  | Annual       | 5/17/2017  | 7409          |
| SPEAG              | Planar R140 | Reflectometer                                 | 8/2/2015   | Annual       | 8/2/2016   | 50513         |
| SPEAG              | DAK-3.5     | Dielectric Assessment Kit                     | 10/20/2015 | Annual       | 10/20/2016 | 1091          |

## Note:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
2. All equipment was used during its calibration period.

|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>OY1603030467-R1.BV8 | Test Dates:<br>03/14/16 – 07/25/16                                                  | DUT Type:<br>Module Integrated to PTT Device |                                                                                       | Page 40 of 44                   |

# 14 MEASUREMENT UNCERTAINTIES

| a                                                                             | c             | d              | e=<br>f(d,k) | f                     | g                        | h =<br>c x f/e                 | i =<br>c x g/e                   | k              |
|-------------------------------------------------------------------------------|---------------|----------------|--------------|-----------------------|--------------------------|--------------------------------|----------------------------------|----------------|
| Uncertainty Component                                                         | Tol.<br>(± %) | Prob.<br>Dist. | Div.         | c <sub>i</sub><br>1gm | c <sub>i</sub><br>10 gms | 1gm<br>u <sub>i</sub><br>(± %) | 10gms<br>u <sub>i</sub><br>(± %) | v <sub>i</sub> |
| <b>Measurement System</b>                                                     |               |                |              |                       |                          |                                |                                  |                |
| Probe Calibration                                                             | 6.55          | N              | 1            | 1.0                   | 1.0                      | 6.6                            | 6.6                              | ∞              |
| Axial Isotropy                                                                | 0.25          | N              | 1            | 0.7                   | 0.7                      | 0.2                            | 0.2                              | ∞              |
| Hemishperical Isotropy                                                        | 1.3           | N              | 1            | 0.7                   | 0.7                      | 0.9                            | 0.9                              | ∞              |
| Boundary Effect                                                               | 2.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.2                            | 1.2                              | ∞              |
| Linearity                                                                     | 0.3           | N              | 1            | 1.0                   | 1.0                      | 0.3                            | 0.3                              | ∞              |
| System Detection Limits                                                       | 0.25          | R              | 1.73         | 1.0                   | 1.0                      | 0.1                            | 0.1                              | ∞              |
| Readout Electronics                                                           | 0.3           | N              | 1            | 1.0                   | 1.0                      | 0.3                            | 0.3                              | ∞              |
| Response Time                                                                 | 0.8           | R              | 1.73         | 1.0                   | 1.0                      | 0.5                            | 0.5                              | ∞              |
| Integration Time                                                              | 2.6           | R              | 1.73         | 1.0                   | 1.0                      | 1.5                            | 1.5                              | ∞              |
| RF Ambient Conditions - Noise                                                 | 3.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| RF Ambient Conditions - Reflections                                           | 3.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| Probe Positioner Mechanical Tolerance                                         | 0.4           | R              | 1.73         | 1.0                   | 1.0                      | 0.2                            | 0.2                              | ∞              |
| Probe Positioning w/ respect to Phantom                                       | 6.7           | R              | 1.73         | 1.0                   | 1.0                      | 3.9                            | 3.9                              | ∞              |
| Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation | 4.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.3                            | 2.3                              | ∞              |
| <b>Test Sample Related</b>                                                    |               |                |              |                       |                          |                                |                                  |                |
| Test Sample Positioning                                                       | 2.7           | N              | 1            | 1.0                   | 1.0                      | 2.7                            | 2.7                              | 35             |
| Device Holder Uncertainty                                                     | 1.67          | N              | 1            | 1.0                   | 1.0                      | 1.7                            | 1.7                              | 5              |
| Output Power Variation - SAR drift measurement                                | 5.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.9                            | 2.9                              | ∞              |
| SAR Scaling                                                                   | 0.0           | R              | 1.73         | 1.0                   | 1.0                      | 0.0                            | 0.0                              | ∞              |
| <b>Phantom &amp; Tissue Parameters</b>                                        |               |                |              |                       |                          |                                |                                  |                |
| Phantom Uncertainty (Shape & Thickness tolerances)                            | 7.6           | R              | 1.73         | 1.0                   | 1.0                      | 4.4                            | 4.4                              | ∞              |
| Liquid Conductivity - measurement uncertainty                                 | 4.2           | N              | 1            | 0.78                  | 0.71                     | 3.3                            | 3.0                              | 10             |
| Liquid Permittivity - measurement uncertainty                                 | 4.1           | N              | 1            | 0.23                  | 0.26                     | 1.0                            | 1.1                              | 10             |
| Liquid Conductivity - Temperature Uncertainty                                 | 3.4           | R              | 1.73         | 0.78                  | 0.71                     | 1.5                            | 1.4                              | ∞              |
| Liquid Permittivity - Temperature Uncertainty                                 | 0.6           | R              | 1.73         | 0.23                  | 0.26                     | 0.1                            | 0.1                              | ∞              |
| Liquid Conductivity - deviation from target values                            | 5.0           | R              | 1.73         | 0.64                  | 0.43                     | 1.8                            | 1.2                              | ∞              |
| Liquid Permittivity - deviation from target values                            | 5.0           | R              | 1.73         | 0.60                  | 0.49                     | 1.7                            | 1.4                              | ∞              |
| <b>Combined Standard Uncertainty (k=1)</b>                                    | RSS           |                |              |                       |                          | 11.5                           | 11.3                             | 60             |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                         | k=2           |                |              |                       |                          | 23.0                           | 22.6                             |                |

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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## 15 CONCLUSION

### 15.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

|                                      |                                                                                     |                                              |                                                                                       |                                 |
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|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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|                                      |                                                                                     |                                              |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## APPENDIX A: SAR TEST DATA

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Head, Medium parameters used (interpolated):

$f = 782 \text{ MHz}$ ;  $\sigma = 0.923 \text{ S/m}$ ;  $\epsilon_r = 42.161$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 2.5 cm

Test Date: 03-15-2016; Ambient Temp: 22.4°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 13, Head SAR, Front Side, Mid.ch,  
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset, Antenna D**

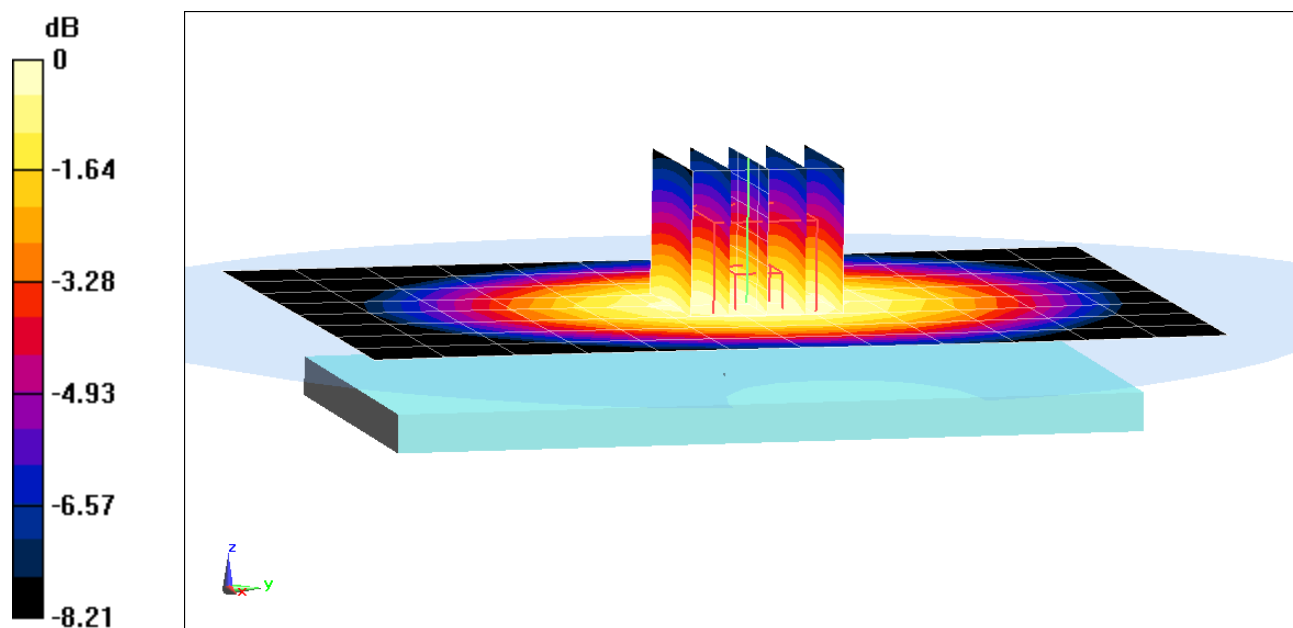
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.49 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.339 W/kg

**SAR(1 g) = 0.261 W/kg**



0 dB = 0.289 W/kg = -5.39 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1

Medium: 750 Head, Medium parameters used (interpolated):

$f = 793 \text{ MHz}$ ;  $\sigma = 0.932 \text{ S/m}$ ;  $\epsilon_r = 42.082$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 2.5 cm

Test Date: 03-15-2016; Ambient Temp: 22.4°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 14, Head SAR, Front Side, Mid.ch,  
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset, Antenna E**

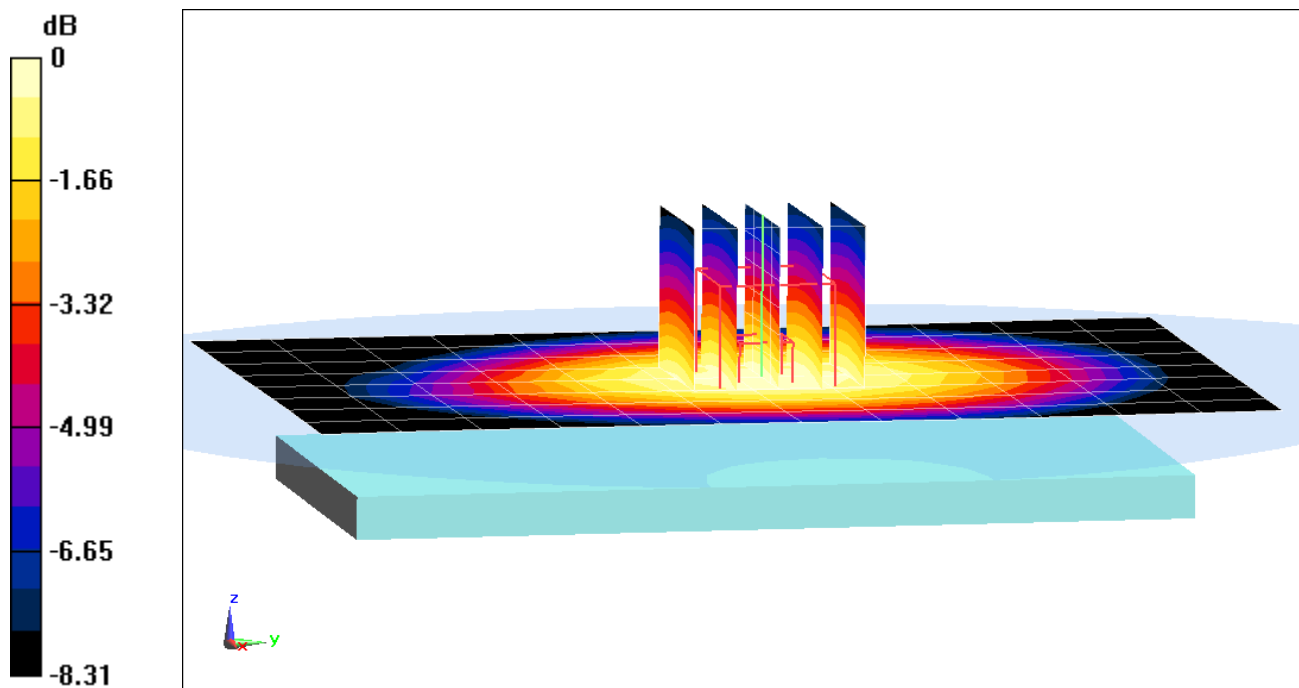
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.83 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.360 W/kg

**SAR(1 g) = 0.277 W/kg**



0 dB = 0.309 W/kg = -5.10 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.322 \text{ S/m}$ ;  $\epsilon_r = 38.449$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 2.5 cm

Test Date: 03-14-2016; Ambient Temp: 24.0°C; Tissue Temp: 22.6°C

Probe: ES3DV2 - SN3022; ConvF(5.08, 5.08, 5.08); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Head SAR, Front side, Mid.ch,  
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Antenna B**

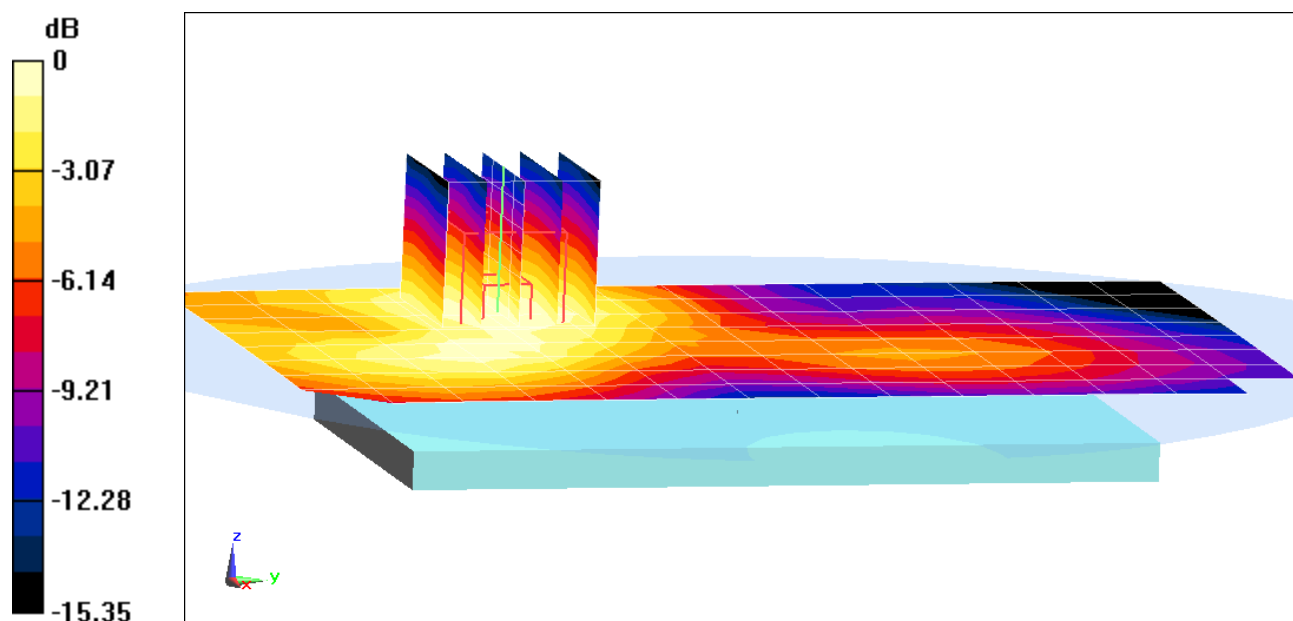
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.155 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.0970 W/kg

**SAR(1 g) = 0.061 W/kg**



0 dB = 0.101 W/kg = -9.96 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$ ;  $\sigma = 0.992 \text{ S/m}$ ;  $\epsilon_r = 53.576$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 1; Space: 0.0 cm

Test Date: 07-25-2016; Ambient Temp: 23.00°C; Tissue Temp: 21.60°C

Probe: ES3DV3 - SN3334; ConvF(6.37, 6.37, 6.37); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Moe: LTE Band 13, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 25 RB Offset, Antenna E, Audio Accessory IV, BW Group 1**

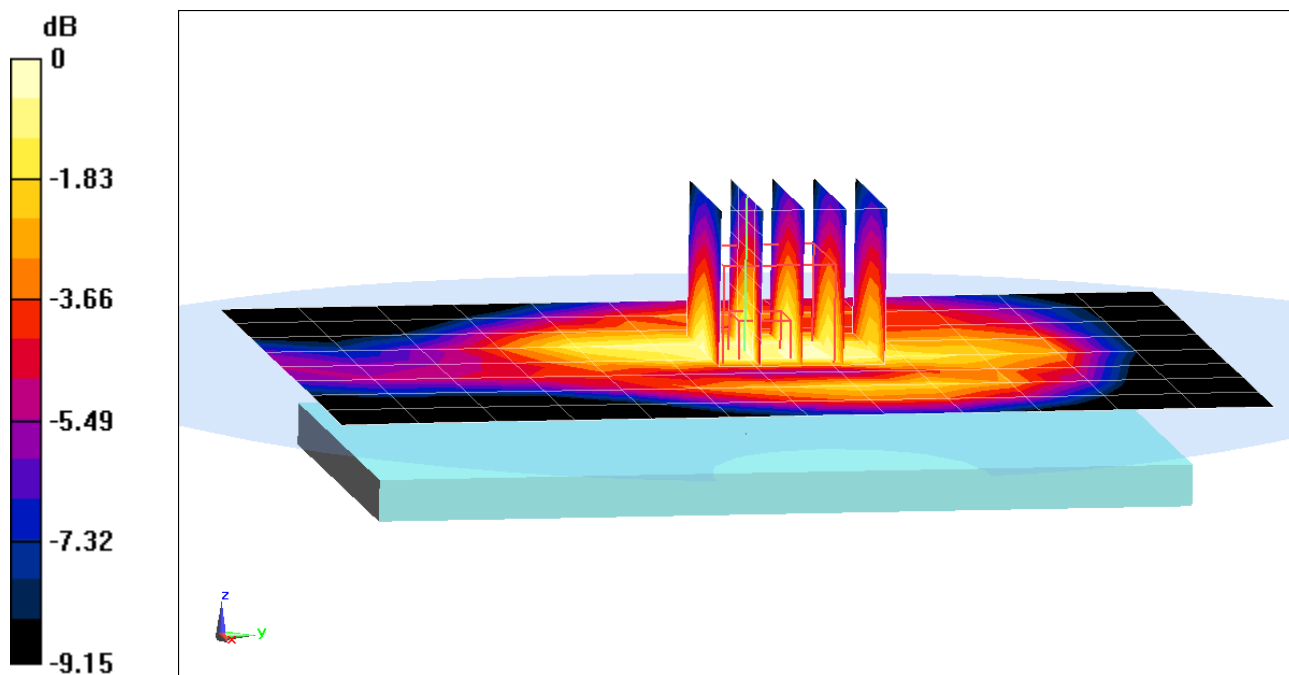
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.61 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.237 W/kg

**SAR(1 g) = 0.182 W/kg**



0 dB = 0.197 W/kg = -7.06 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$ ;  $\sigma = 0.992 \text{ S/m}$ ;  $\epsilon_r = 53.576$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

Test Date: 07-25-2016; Ambient Temp: 23.00°C; Tissue Temp: 21.60°C

Probe: ES3DV3 - SN3334; ConvF(6.37, 6.37, 6.37); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 13, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 25 RB Offset, Antenna E, Audio Accessory IV, BW Group 2**

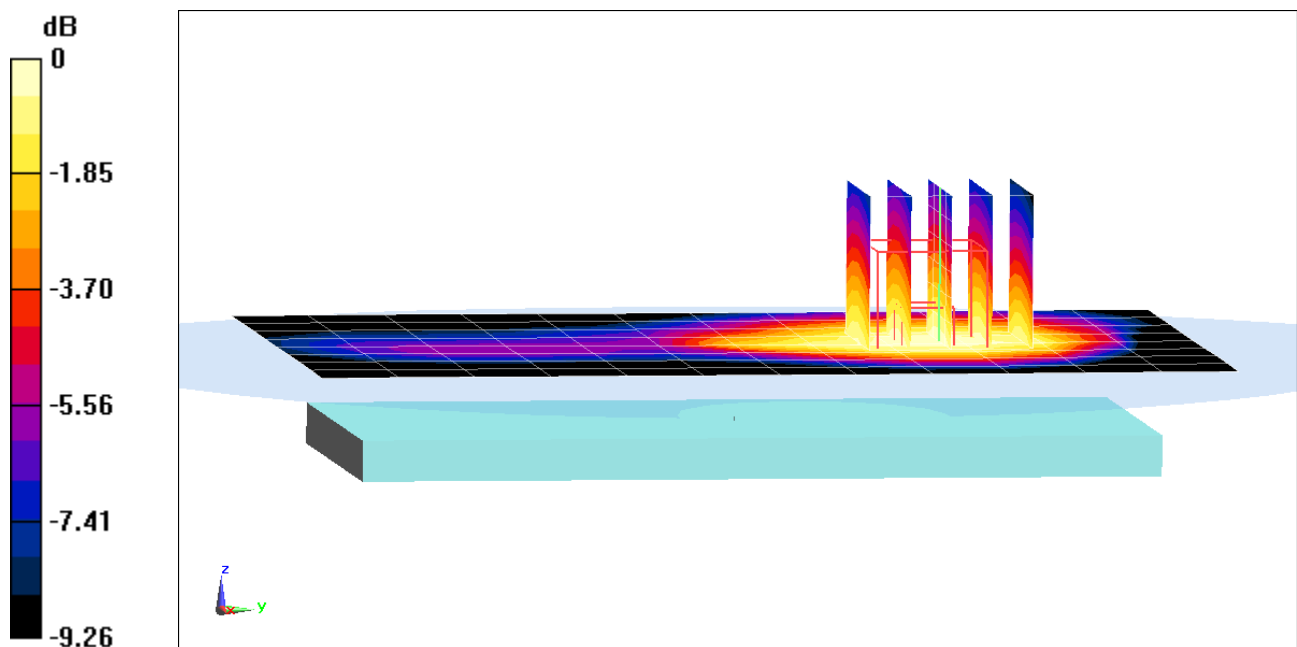
**Area Scan (9x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 13.59 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.215 W/kg

**SAR(1 g) = 0.169 W/kg**



0 dB = 0.186 W/kg = -7.30 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$ ;  $\sigma = 0.996 \text{ S/m}$ ;  $\epsilon_r = 53.973$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

Test Date: 03-28-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.8°C

Probe: ES3DV2 - SN3022; ConvF(6.16, 6.16, 6.16); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 13, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 25 RB Offset, Antenna E, Audio Accessory IV, BW Group 3**

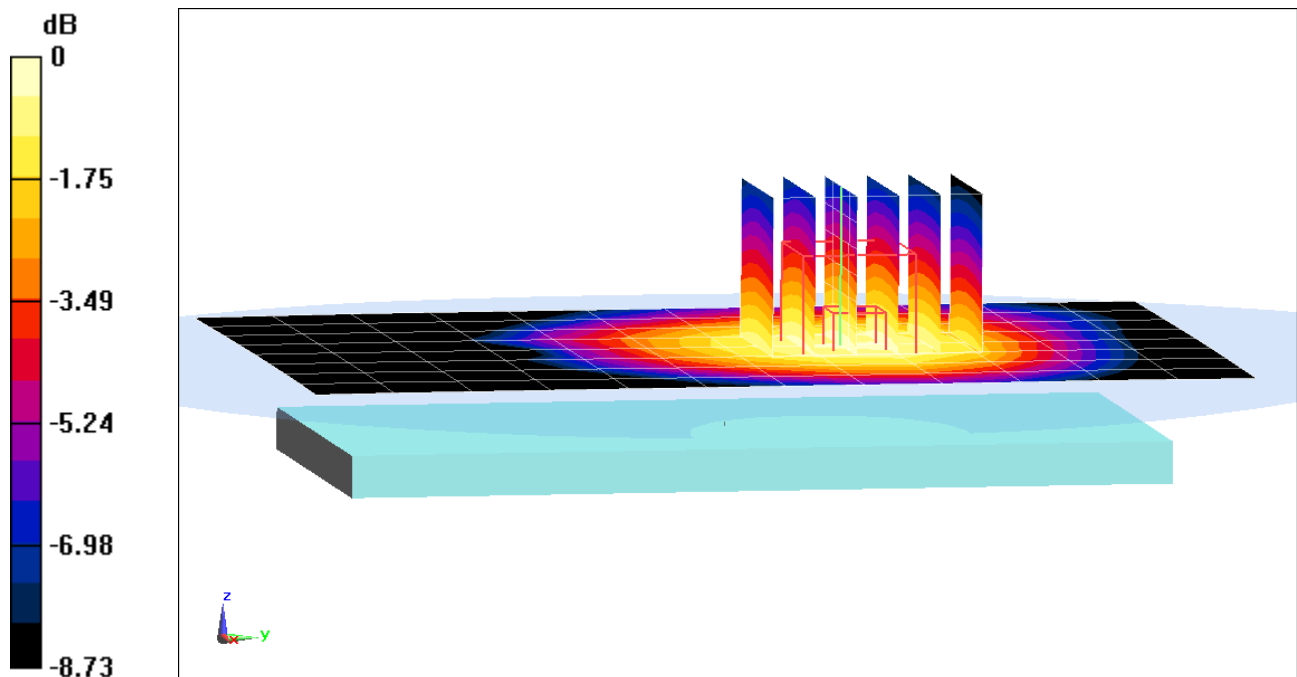
**Area Scan (9x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.13 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.125 W/kg

**SAR(1 g) = 0.097 W/kg**



0 dB = 0.107 W/kg = -9.71 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 793 \text{ MHz}$ ;  $\sigma = 1.002 \text{ S/m}$ ;  $\epsilon_r = 53.459$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory 1; Space: 0.0 cm

Test Date: 07-25-2016; Ambient Temp: 23.00°C; Tissue Temp: 21.60°C

Probe: ES3DV3 - SN3334; ConvF(6.37, 6.37, 6.37); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 14, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 25 RB Offset, Antenna A, Audio Accessory II, BW Group 1**

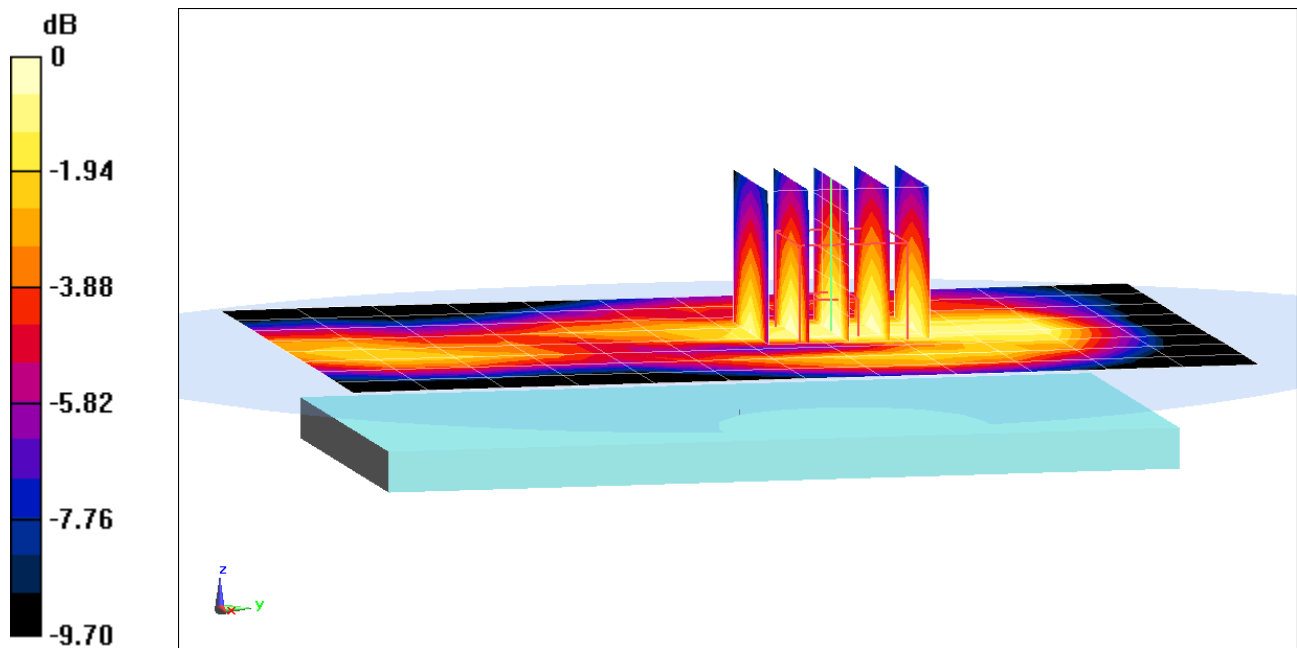
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.19 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.176 W/kg

**SAR(1 g) = 0.141 W/kg**



0 dB = 0.150 W/kg = -8.24 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 793 \text{ MHz}$ ;  $\sigma = 1.002 \text{ S/m}$ ;  $\epsilon_r = 53.459$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

Test Date: 07-25-2016; Ambient Temp: 23.00°C; Tissue Temp: 21.60°C

Probe: ES3DV3 - SN3334; ConvF(6.37, 6.37, 6.37); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 14, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset, Antenna A, Audio Accessory II, BW Group 2**

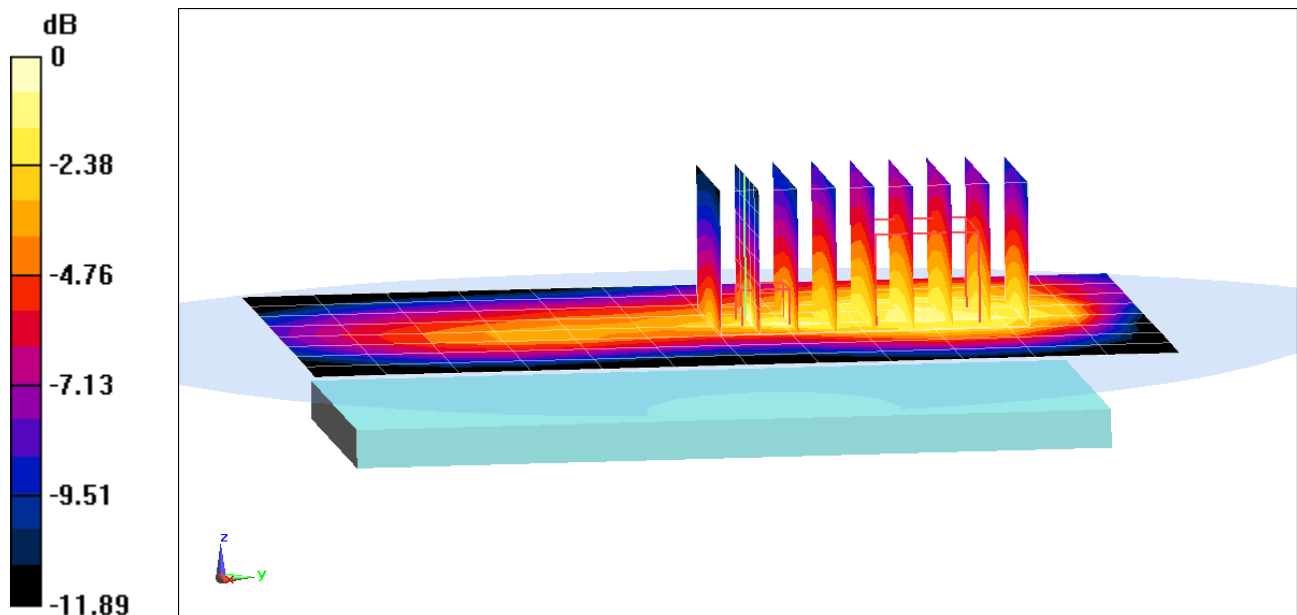
**Area Scan (9x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (6x9x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.97 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.279 W/kg

**SAR(1 g) = 0.128 W/kg**



0 dB = 0.163 W/kg = -7.88 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 793 \text{ MHz}$ ;  $\sigma = 1.006 \text{ S/m}$ ;  $\epsilon_r = 53.848$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

Test Date: 03-28-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.8°C

Probe: ES3DV2 - SN3022; ConvF(6.16, 6.16, 6.16); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 14, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 25 RB Offset, Antenna A, Audio Accessory II, BW Group 3**

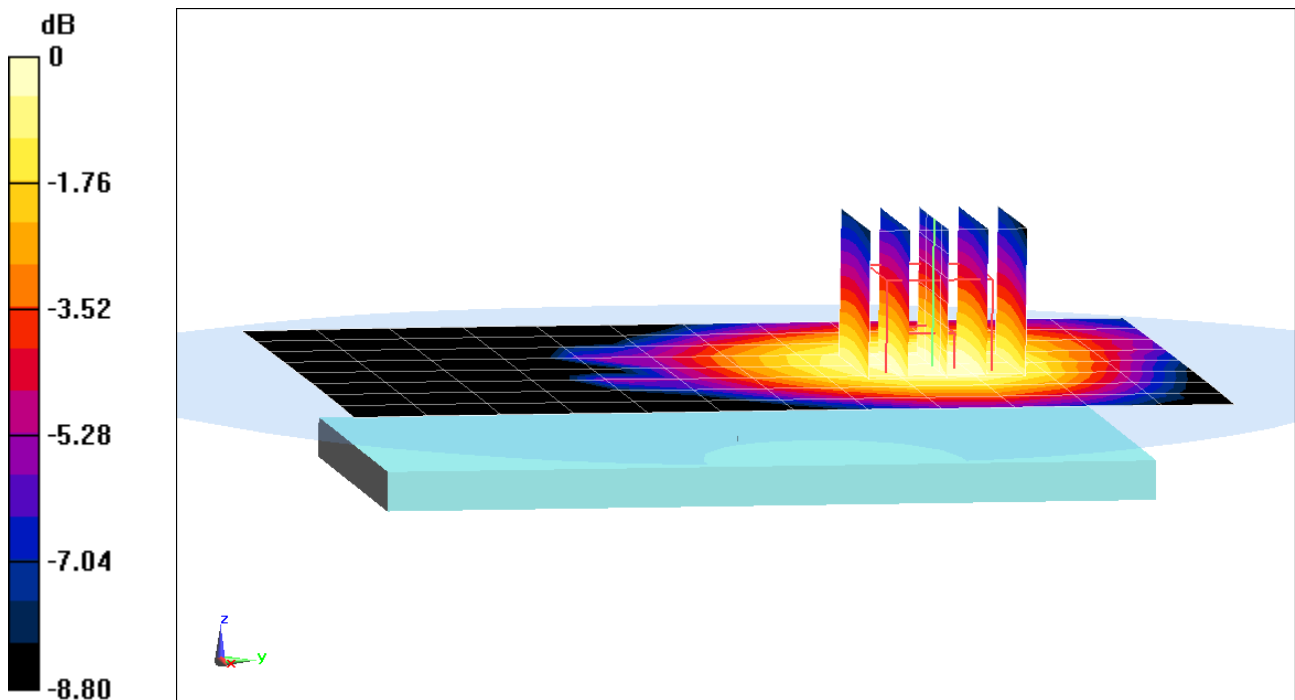
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.016 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.101 W/kg

**SAR(1 g) = 0.078 W/kg**



0 dB = 0.0858 W/kg = -10.67 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.474 \text{ S/m}$ ;  $\epsilon_r = 52.062$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory 1; Space: 0.0 cm

Test Date: 07-25-2016; Ambient Temp: 22.30°C; Tissue Temp: 21.70°C

Probe: EX3DV4 - SN7409; ConvF(7.72, 7.72, 7.72); Calibrated: 5/17/2016;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/11/2016

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch, 20 MHz Bandwidth,  
QPSK, 1 RB, 0 RB Offset, Antenna C, Audio Accessory I, BW Group 1**

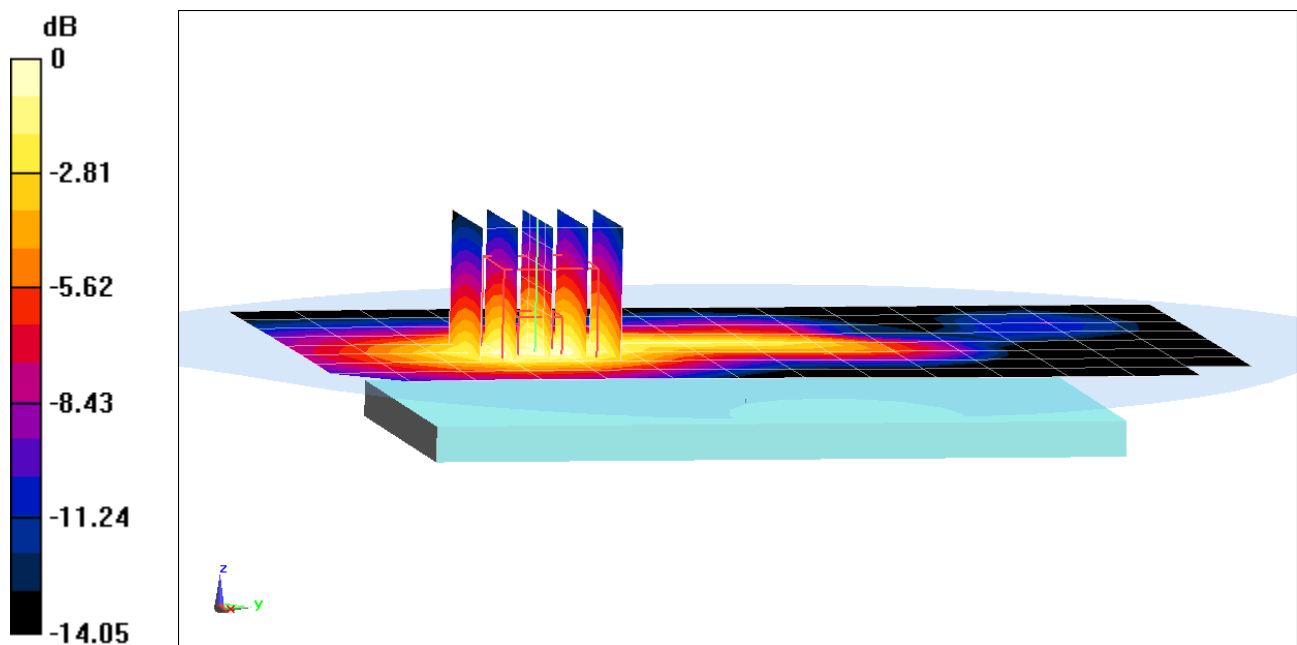
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.84 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.871 W/kg

**SAR(1 g) = 0.532 W/kg**



0 dB = 0.751 W/kg = -1.24 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.482 \text{ S/m}$ ;  $\epsilon_r = 52.216$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

Test Date: 07-18-2016; Ambient Temp: 21.10°C; Tissue Temp: 21.60°C

Probe: EX3DV4 - SN7406; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2016;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/14/2016

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Antenna C, Audio Accessory I, BW Group 2**

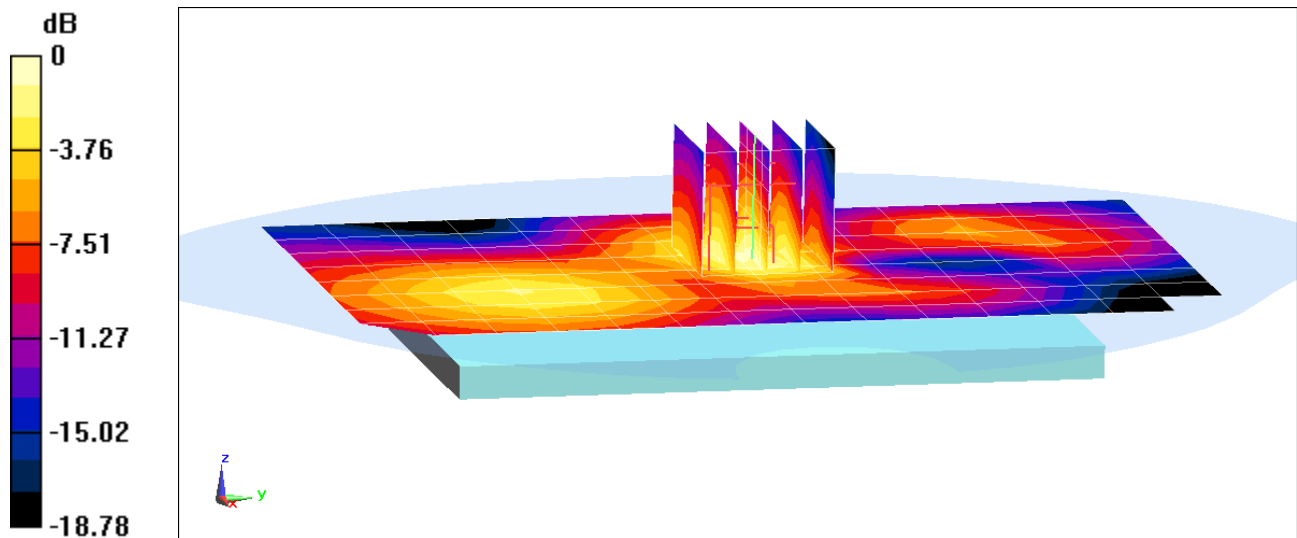
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.91 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.382 W/kg

**SAR(1 g) = 0.226 W/kg**



0 dB = 0.328 W/kg = -4.84 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BV8BBPBM214; Type: Module Integrated to PTT Device; Serial: A40302000148**

Communication System: UID 0, LTE Band 4 (AWS) (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.43 \text{ S/m}$ ;  $\epsilon_r = 51.446$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

Test Date: 04-01-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(4.79, 4.79, 4.79); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth,  
QPSK, 1 RB, 0 RB Offset, Antenna C, Audio Accessory I, BW Group 3**

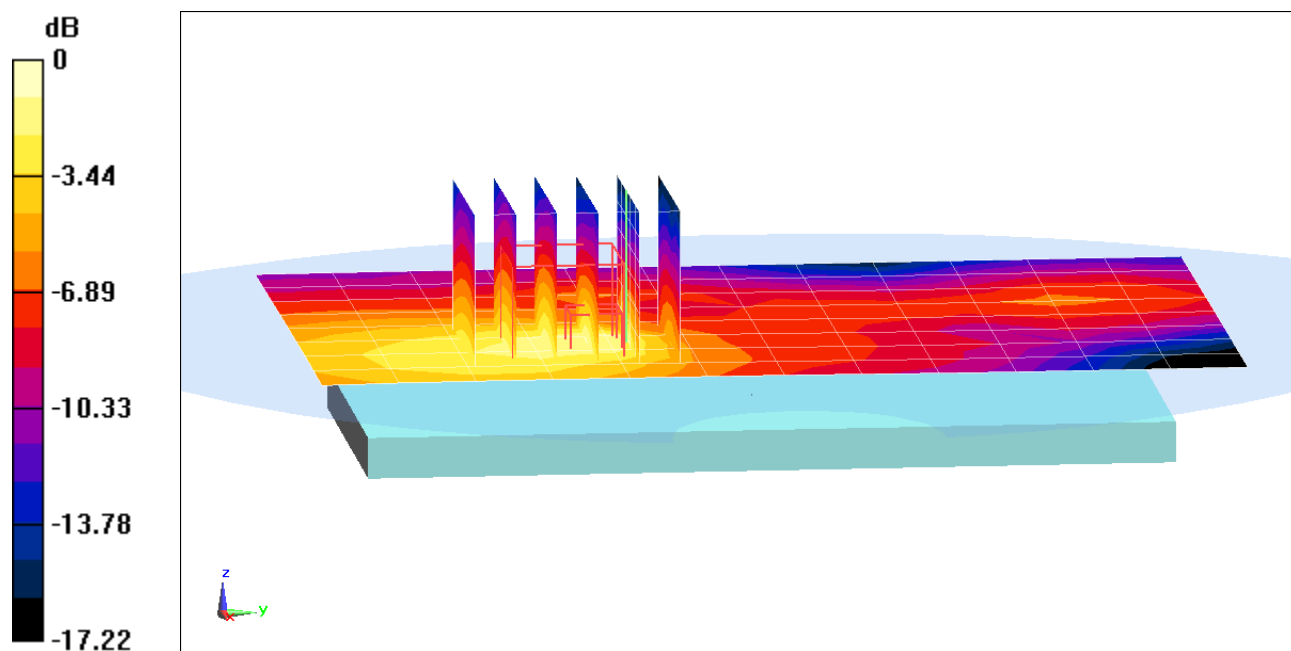
**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.477 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.276 W/kg

**SAR(1 g) = 0.134 W/kg**



0 dB = 0.178 W/kg = -7.50 dBW/kg

## APPENDIX B: SYSTEM VERIFICATION

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1046**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.893 \text{ S/m}$ ;  $\epsilon_r = 42.621$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-15-2016; Ambient Temp: 22.4°C; Tissue Temp: 22.0°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification at 23.0 dBm (200 mW)

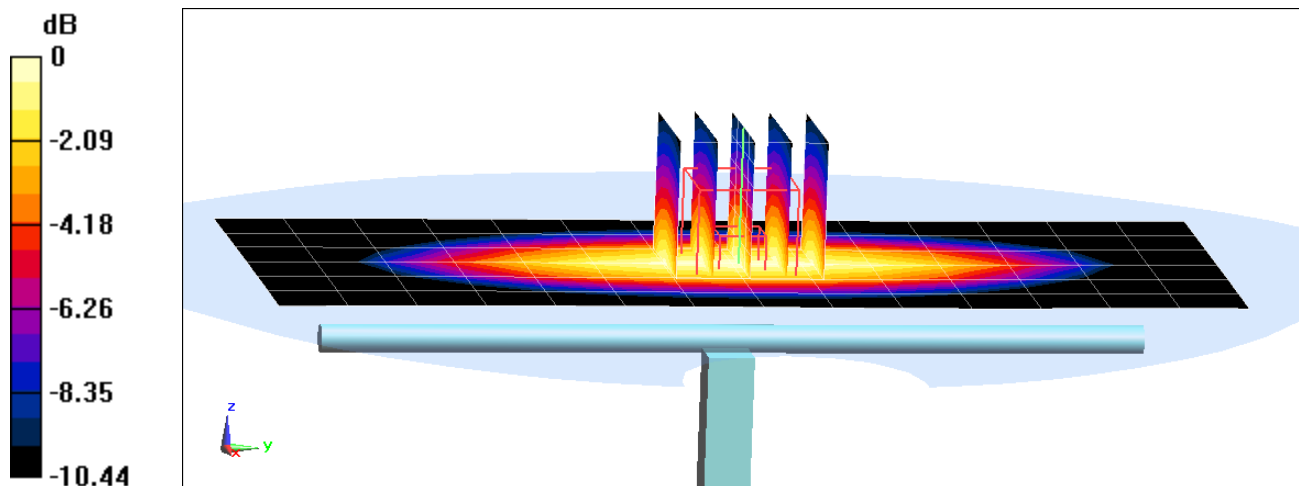
**Area Scan (7x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Peak SAR (extrapolated) = 2.24 W/kg

**SAR(1 g) = 1.51 W/kg**

Deviation(1 g) = -7.93%



0 dB = 1.77 W/kg = 2.48 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.338 \text{ S/m}$ ;  $\epsilon_r = 38.375$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-14-2016; Ambient Temp: 24.0°C; Tissue Temp: 22.6°C

Probe: ES3DV2 - SN3022; ConvF(5.08, 5.08, 5.08); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification at 20.0 dBm (100 mW)

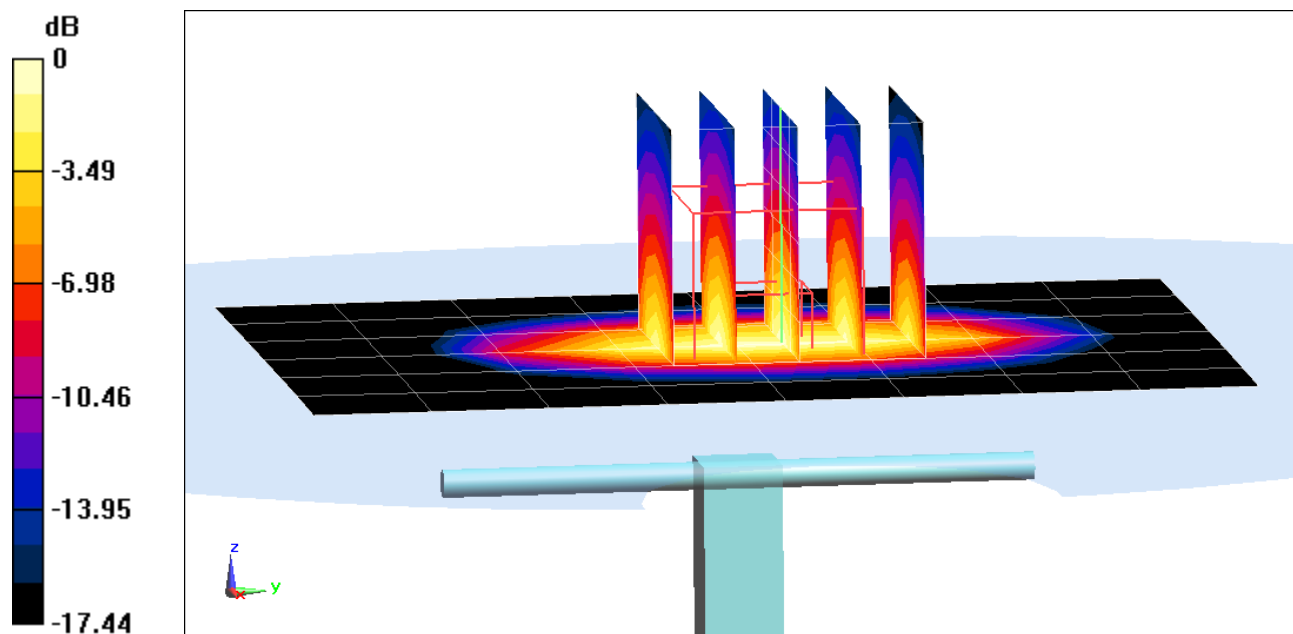
**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 6.06 W/kg

**SAR(1 g) = 3.35 W/kg**

Deviation(1 g) = -7.46%



0 dB = 4.25 W/kg = 6.28 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1046**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.964 \text{ S/m}$ ;  $\epsilon_r = 54.338$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-28-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.8°C

Probe: ES3DV2 - SN3022; ConvF(6.16, 6.16, 6.16); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification at 23.0 dBm (200 mW)

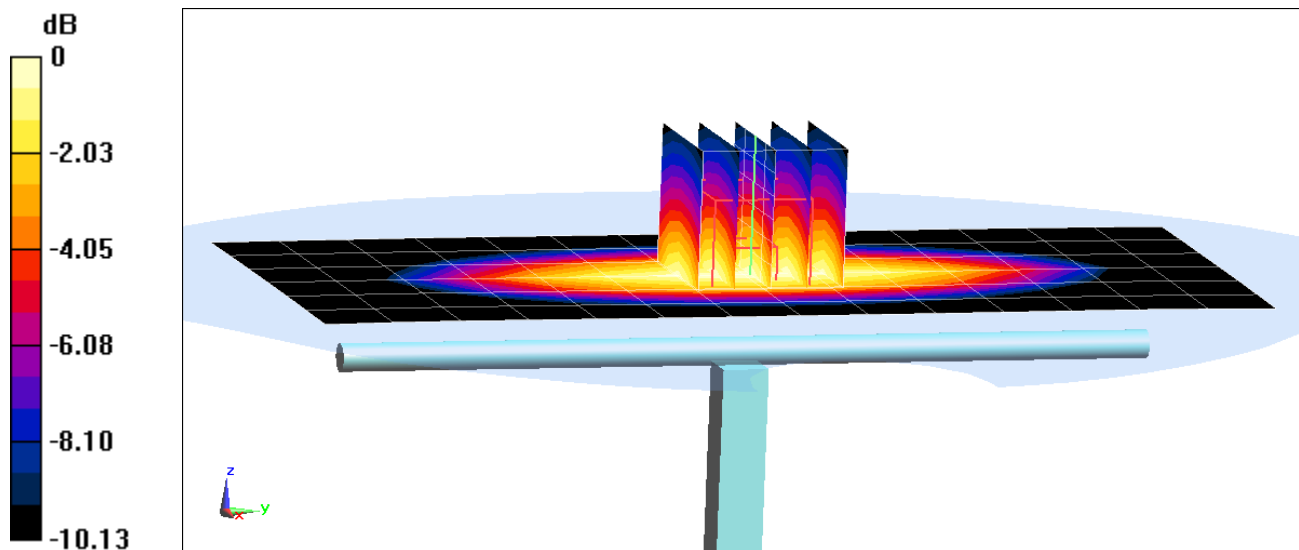
**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 2.64 W/kg

**SAR(1 g) = 1.79 W/kg**

Deviation(1 g) = 2.05%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1046**

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.961 \text{ S/m}$ ;  $\epsilon_r = 53.958$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-25-2016; Ambient Temp: 23.00°C; Tissue Temp: 21.60°C

Probe: ES3DV3 - SN3334; ConvF(6.37, 6.37, 6.37); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification at 23.0 dBm (200 mW)

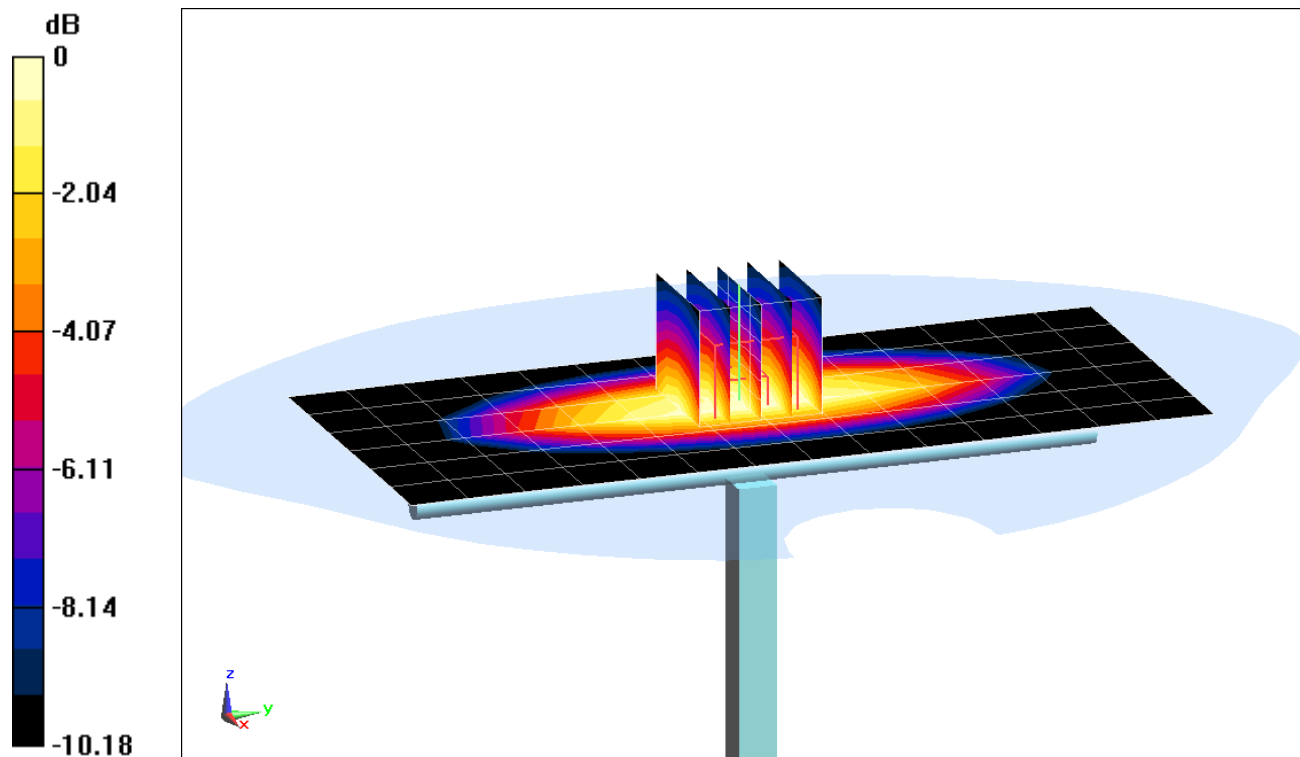
**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 2.57 W/kg

**SAR(1 g) = 1.75 W/kg**

Deviation(1 g) = -0.23%



0 dB = 2.04 W/kg = 3.10 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.446 \text{ S/m}$ ;  $\epsilon_r = 51.388$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-01-2016; Ambient Temp: 23.5°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(4.79, 4.79, 4.79); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/16/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification at 20.0 dBm (100 mW)

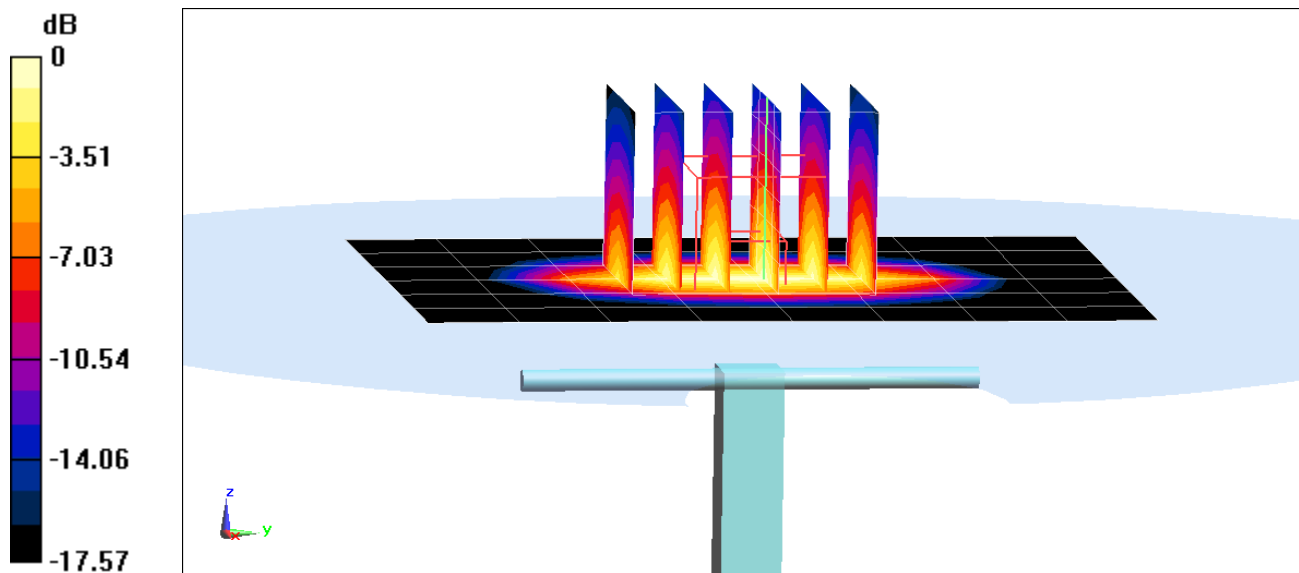
**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 6.45 W/kg

**SAR(1 g) = 3.70 W/kg**

Deviation(1 g) = -0.27%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.501 \text{ S/m}$ ;  $\epsilon_r = 52.164$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-18-2016; Ambient Temp: 21.10°C; Tissue Temp: 21.60°C

Probe: EX3DV4 - SN7406; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2016;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/14/2016

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification at 20.0 dBm (100 mW)

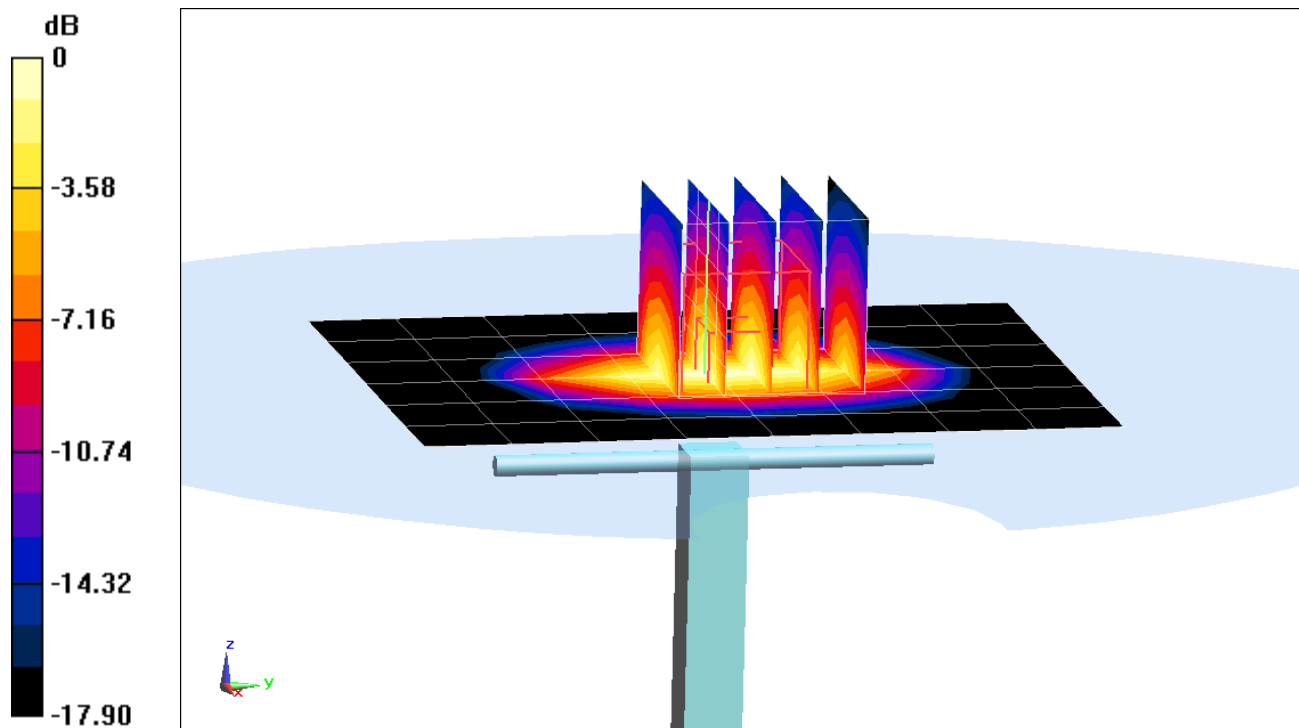
**Area Scan (7x9x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Peak SAR (extrapolated) = 6.80 W/kg

**SAR(1 g) = 3.78 W/kg**

Deviation(1 g) = 1.34%



0 dB = 5.65 W/kg = 7.52 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.493 \text{ S/m}$ ;  $\epsilon_r = 51.993$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-25-2016; Ambient Temp: 22.30°C; Tissue Temp: 21.70°C

Probe: EX3DV4 - SN7409; ConvF(7.72, 7.72, 7.72); Calibrated: 5/17/2016;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/11/2016

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification at 20.0 dBm (100 mW)

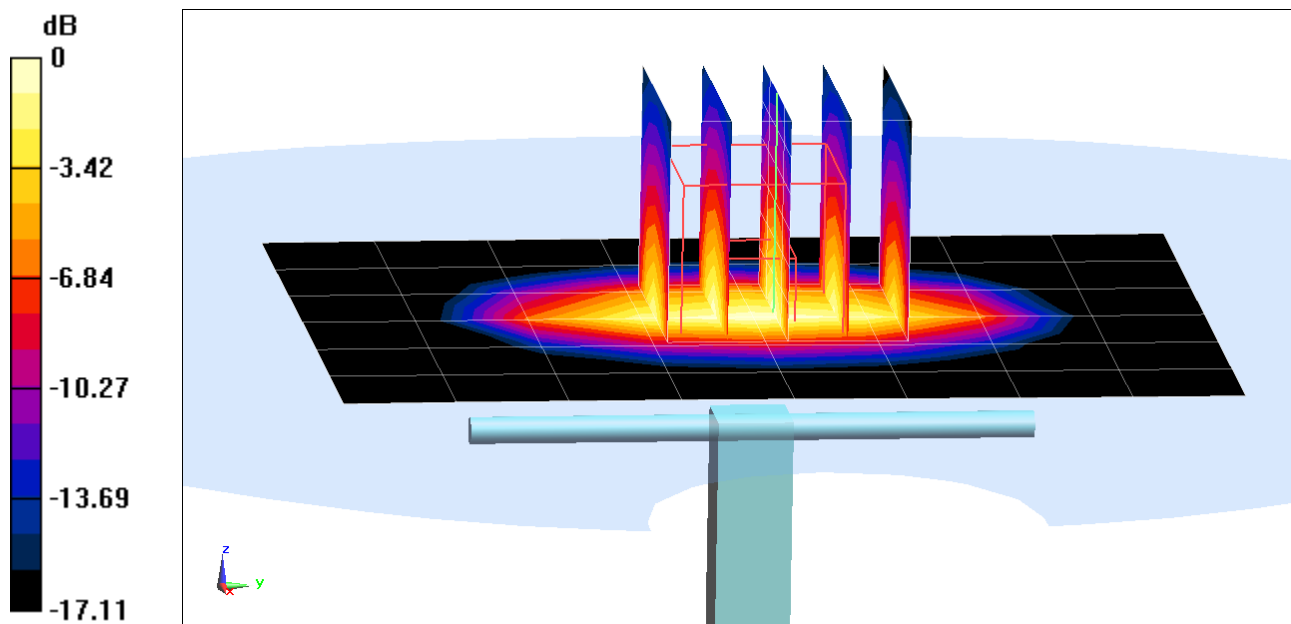
**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 6.66 W/kg

**SAR(1 g) = 3.67 W/kg**

Deviation(1 g) = -1.08%



0 dB = 5.61 W/kg = 7.49 dBW/kg

## APPENDIX C: PROBE CALIBRATION



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1046\_Feb16**

## CALIBRATION CERTIFICATE

Object **D750V3 - SN:1046**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **February 16, 2016**

BN ✓  
3/1/2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 07-Oct-15 (No. 217-02222)         | Oct-16                 |
| Power sensor HP 8481A       | US37292783         | 07-Oct-15 (No. 217-02222)         | Oct-16                 |
| Power sensor HP 8481A       | MY41092317         | 07-Oct-15 (No. 217-02223)         | Oct-16                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 01-Apr-15 (No. 217-02131)         | Mar-16                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134)         | Mar-16                 |
| Reference Probe EX3DV4      | SN: 7349           | 31-Dec-15 (No. EX3-7349_Dec15)    | Dec-16                 |
| DAE4                        | SN: 601            | 30-Dec-15 (No. DAE4-601_Dec15)    | Dec-16                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| RF generator R&S SMT-06     | 100972             | 15-Jun-15 (in house check Jun-15) | In house check: Jun-18 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

Calibrated by: **Name** Michael Weber **Function** Laboratory Technician

Signature

Approved by: **Name** Katja Pokovic **Technical Manager**

Issued: February 17, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.8     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 750 MHz $\pm$ 1 MHz    |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.9           | 0.89 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 41.8 $\pm$ 6 % | 0.90 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 2.07 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 8.20 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 1.35 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 5.36 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 55.5           | 0.96 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 55.1 $\pm$ 6 % | 0.98 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 2.23 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 8.77 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 1.47 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 5.80 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 56.7 $\Omega$ + 2.3 j $\Omega$ |
| Return Loss                          | - 23.6 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.7 $\Omega$ - 0.8 j $\Omega$ |
| Return Loss                          | - 34.5 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.037 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                    |
|-----------------|--------------------|
| Manufactured by | SPEAG              |
| Manufactured on | September 02, 2011 |

## DASY5 Validation Report for Head TSL

Date: 16.02.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1046**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750 \text{ MHz}$ ;  $\sigma = 0.9 \text{ S/m}$ ;  $\epsilon_r = 41.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.28, 10.28, 10.28); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

**Dipole Calibration for Head Tissue/Pin=250 mW,  $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:**

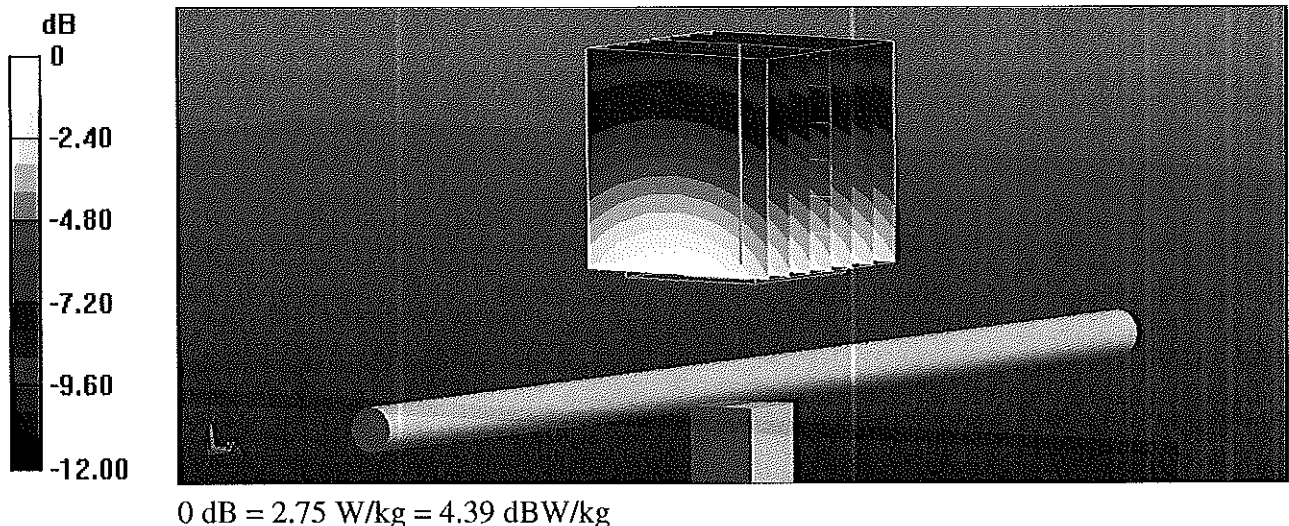
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 58.40 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.11 W/kg

**SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.35 W/kg**

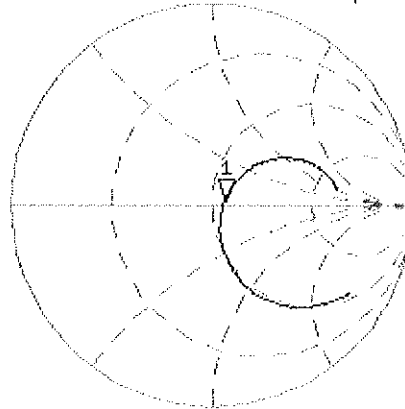
Maximum value of SAR (measured) = 2.75 W/kg



# Impedance Measurement Plot for Head TSL

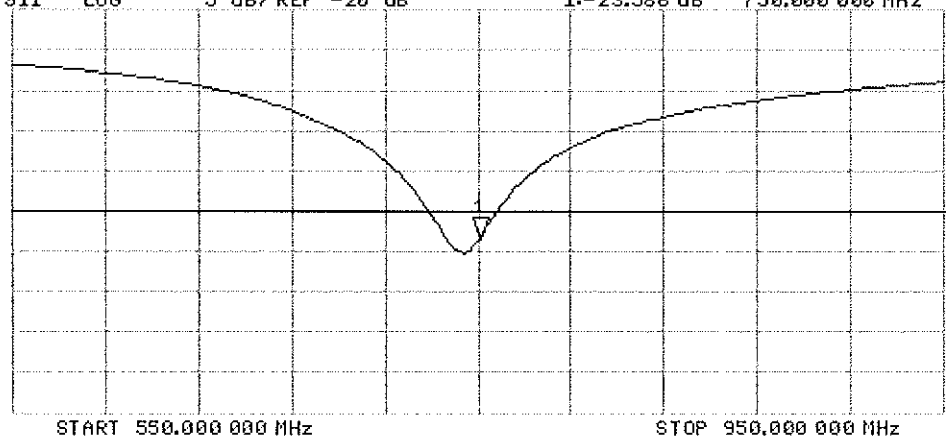
16 Feb 2016 12:19:20  
 [CH1] S11 1 U FS 1: 56.666  $\Omega$  2.3223  $\Omega$  492.80 pF 750.000 000 MHz

\*  
 Del  
 CA  
 Avg  
 16  
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1: -23.586 dB 750.000 000 MHz

Del  
 CA  
 Avg  
 16  
 H1d



## DASY5 Validation Report for Body TSL

Date: 16.02.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1046**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.98$  S/m;  $\epsilon_r = 55.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

### Dipole Calibration for Body Tissue/ $P_{in}=250$ mW, $d=15$ mm/Zoom Scan (7x7x7)/Cube 0:

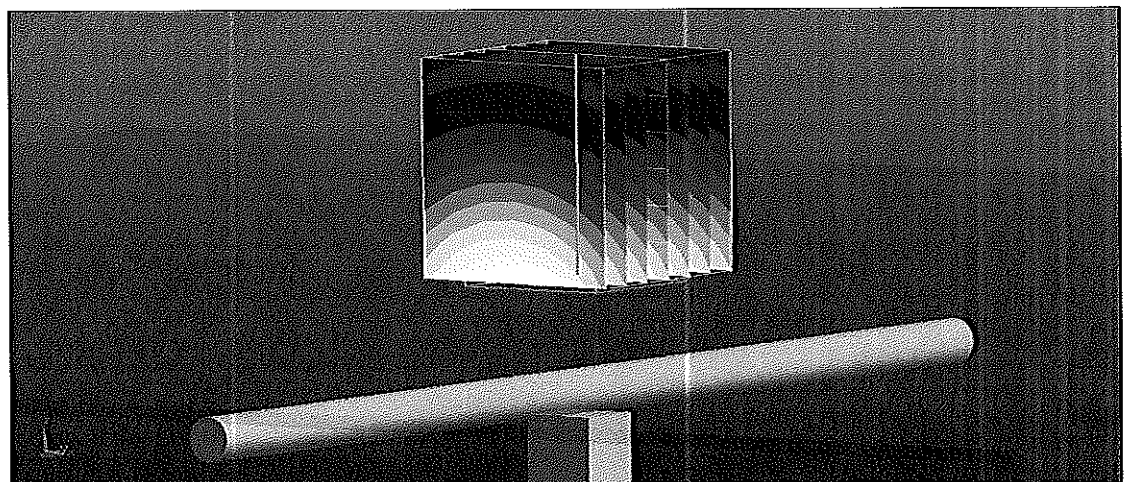
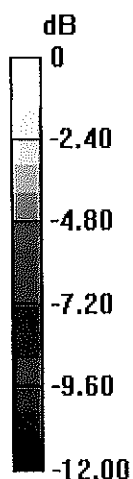
Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 57.48 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.31 W/kg

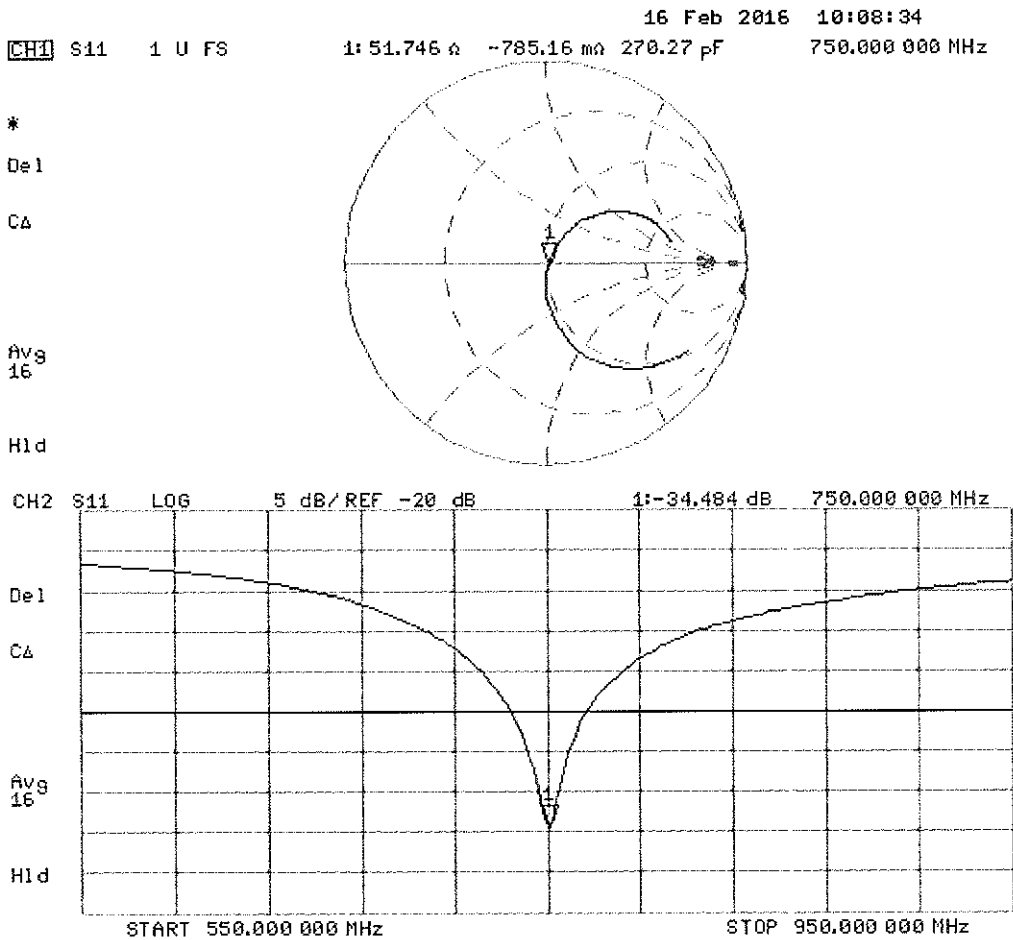
**SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.47 W/kg**

Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Impedance Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D1750V2-1051\_Apr15**

## CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1051**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

PM ✓  
 4/29/15

Calibration date: **April 15, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 07-Oct-14 (No. 217-02020)         | Oct-15                 |
| Power sensor HP 8481A       | US37292783         | 07-Oct-14 (No. 217-02020)         | Oct-15                 |
| Power sensor HP 8481A       | MY41092317         | 07-Oct-14 (No. 217-02021)         | Oct-15                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 01-Apr-15 (No. 217-02131)         | Mar-16                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134)         | Mar-16                 |
| Reference Probe ES3DV3      | SN: 3205           | 30-Dec-14 (No. ES3-3205_Dec14)    | Dec-15                 |
| DAE4                        | SN: 601            | 18-Aug-14 (No. DAE4-601_Aug14)    | Aug-15                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| RF generator R&S SMT-06     | 100005             | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: April 15, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.8     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1750 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 40.1           | 1.37 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 38.9 $\pm$ 6 % | 1.35 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                          | 250 mW input power | 9.04 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.2 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 4.80 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.2 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 53.4           | 1.49 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 51.5 $\pm$ 6 % | 1.48 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                          | 250 mW input power | 9.32 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 37.1 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 5.01 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.0 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.3 $\Omega$ - 0.2 j $\Omega$ |
| Return Loss                          | - 37.5 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.9 $\Omega$ + 0.3 j $\Omega$ |
| Return Loss                          | - 29.9 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.221 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                   |
|-----------------|-------------------|
| Manufactured by | SPEAG             |
| Manufactured on | February 19, 2010 |

## DASY5 Validation Report for Head TSL

Date: 15.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1051**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.35$  S/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

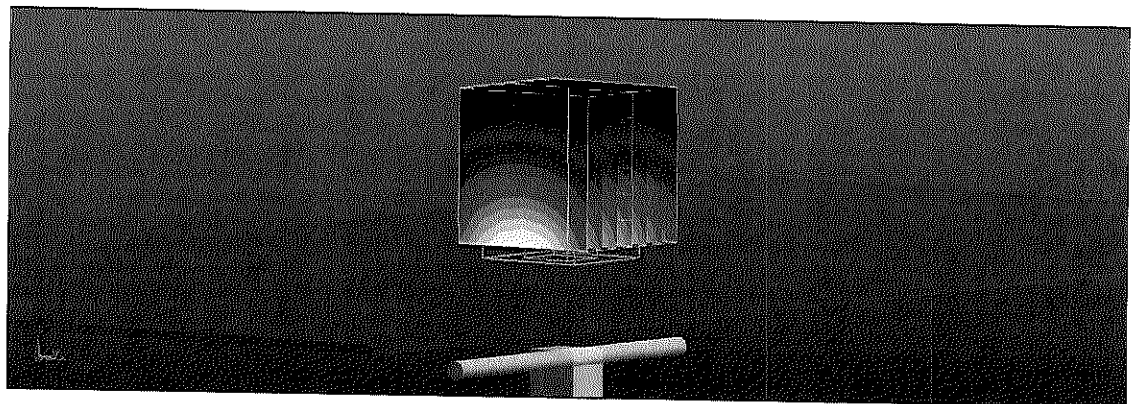
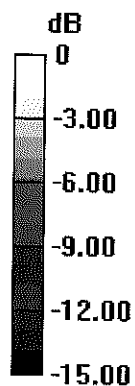
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.99 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 16.3 W/kg

**SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.8 W/kg**

Maximum value of SAR (measured) = 11.5 W/kg



0 dB = 11.5 W/kg = 10.61 dBW/kg

# Impedance Measurement Plot for Head TSL

CH1

S11

1 U FS

3: 51.330  $\Omega$

-248.05 m $\Omega$

366.65 pF

1 750.000 000 MHz

\*

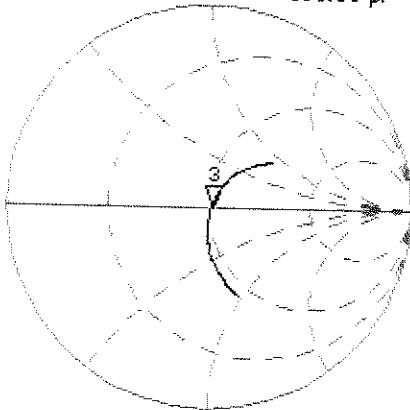
De1

C $\Delta$

Avg

16

H1d



CH2

S11

LOG

5 dB/REF -20 dB

3:-37.470 dB

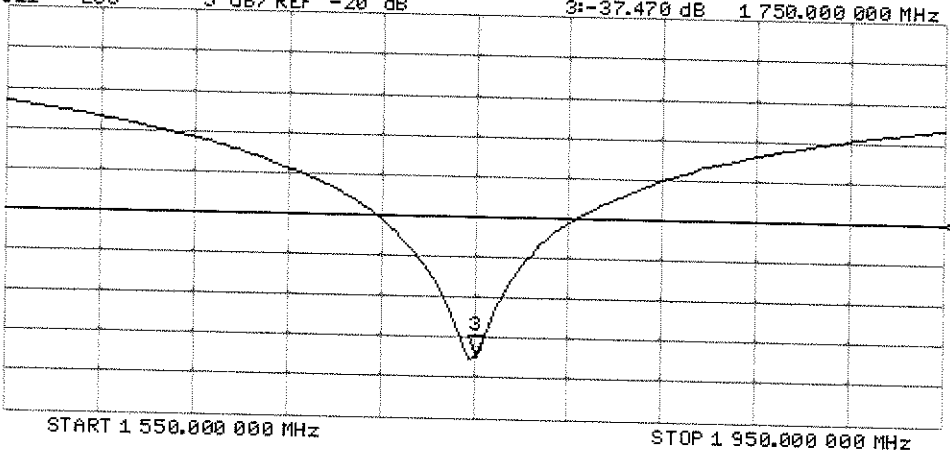
1 750.000 000 MHz

C $\Delta$

Avg

16

H1d



## DASY5 Validation Report for Body TSL

Date: 15.04.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1051**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.48$  S/m;  $\epsilon_r = 51.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.88, 4.88, 4.88); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### **Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

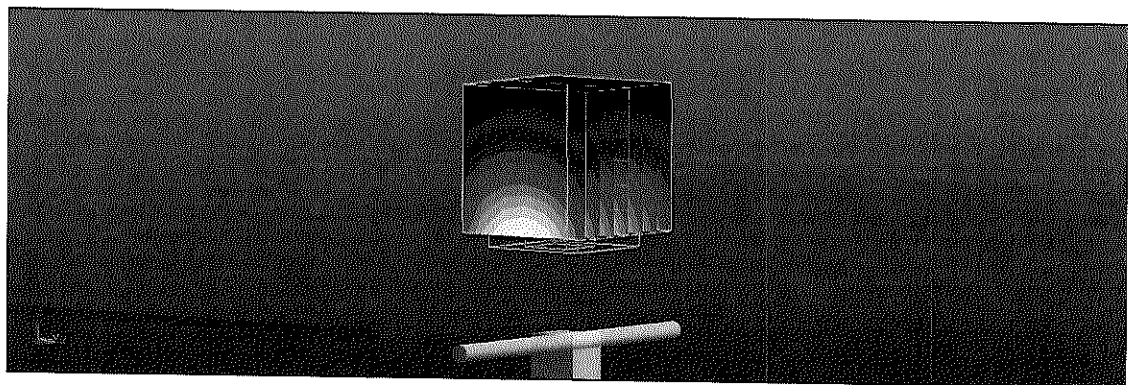
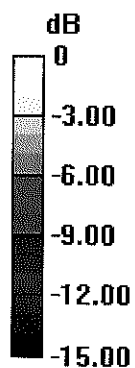
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.87 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.0 W/kg

**SAR(1 g) = 9.32 W/kg; SAR(10 g) = 5.01 W/kg**

Maximum value of SAR (measured) = 11.7 W/kg

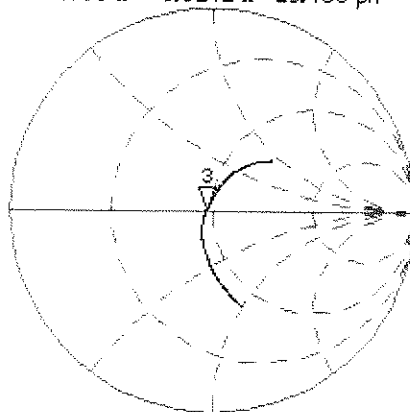


0 dB = 11.7 W/kg = 10.68 dBW/kg

# Impedance Measurement Plot for Body TSL

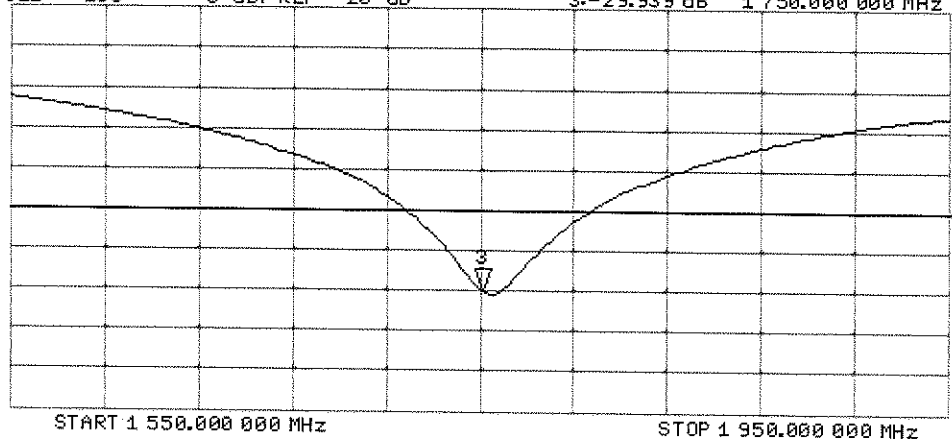
15 Apr 2015 12:23:57  
 [CH1] S11 1 U FS 3: 46.930  $\Omega$  0.3242  $\Omega$  29.486 pH 1 750.000 000 MHz

\*  
 Del  
 Ca  
 Avg  
 16  
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 3:-29.939 dB 1 750.000 000 MHz

Ca  
 Avg  
 16  
 H1d





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1765V2-1008\_May16**

## CALIBRATION CERTIFICATE

Object **D1765V2 - SN:1008**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

*BNV  
05/23/16*

Calibration date: **May 11, 2016**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP             | SN: 104778         | 06-Apr-16 (No. 217-02288/02289)   | Apr-17                 |
| Power sensor NRP-Z91        | SN: 103244         | 06-Apr-16 (No. 217-02288)         | Apr-17                 |
| Power sensor NRP-Z91        | SN: 103245         | 06-Apr-16 (No. 217-02289)         | Apr-17                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 05-Apr-16 (No. 217-02292)         | Apr-17                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 05-Apr-16 (No. 217-02295)         | Apr-17                 |
| Reference Probe EX3DV4      | SN: 7349           | 31-Dec-15 (No. EX3-7349_Dec15)    | Dec-16                 |
| DAE4                        | SN: 601            | 30-Dec-15 (No. DAE4-601_Dec15)    | Dec-16                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A        | SN: GB37480704     | 07-Oct-15 (No. 217-02222)         | In house check: Oct-16 |
| Power sensor HP 8481A       | SN: US37292783     | 07-Oct-15 (No. 217-02222)         | In house check: Oct-16 |
| Power sensor HP 8481A       | SN: MY41092317     | 07-Oct-15 (No. 217-02223)         | In house check: Oct-16 |
| RF generator R&S SMT-06     | SN: 100972         | 15-Jun-15 (in house check Jun-15) | In house check: Oct-16 |
| Network Analyzer HP 8753E   | SN: US37390585     | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

Calibrated by: **Michael Weber**      Name: **Michael Weber**      Function: **Laboratory Technician**

Approved by: **Katja Pokovic**      Technical Manager

Signature

*M. Weber*

*Katja Pokovic*

Issued: May 17, 2016

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- e) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.8     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1750 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 40.1           | 1.37 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 39.8 $\pm$ 6 % | 1.36 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.10 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.7 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 4.81 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.3 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 53.4           | 1.50 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 53.8 $\pm$ 6 % | 1.50 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.30 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 37.3 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 4.94 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 19.8 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 48.8 $\Omega$ - 6.0 j $\Omega$ |
| Return Loss                          | - 24.2 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 45.8 $\Omega$ - 6.8 j $\Omega$ |
| Return Loss                          | - 21.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.211 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                  |
|-----------------|------------------|
| Manufactured by | SPEAG            |
| Manufactured on | October 06, 2005 |

## DASY5 Validation Report for Head TSL

Date: 11.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.36$  S/m;  $\epsilon_r = 39.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.54, 8.54, 8.54); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

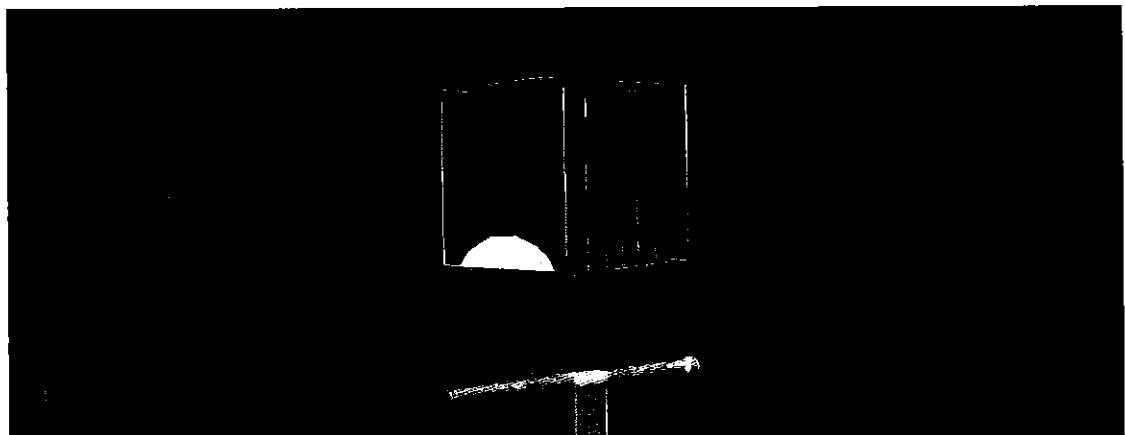
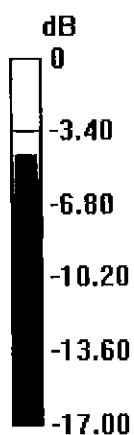
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.4 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 16.7 W/kg

**SAR(1 g) = 9.1 W/kg; SAR(10 g) = 4.81 W/kg**

Maximum value of SAR (measured) = 13.7 W/kg

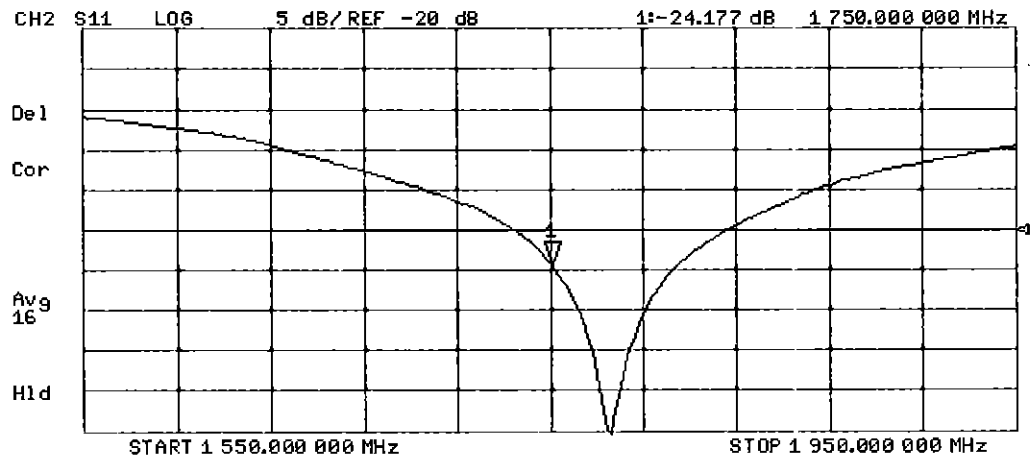
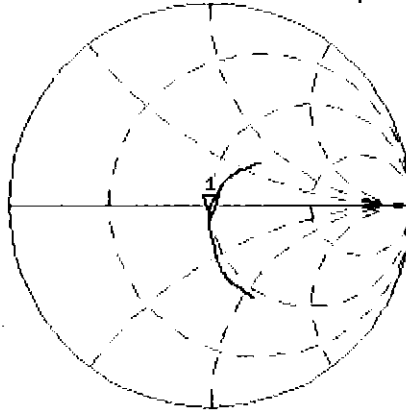


0 dB = 13.7 W/kg = 11.37 dBW/kg

# Impedance Measurement Plot for Head TSL

11 May 2016 13:10:14  
 [CH1] S11 1 U FS 1: 48.842  $\Omega$  -6.0117  $\Omega$  15.128 pF 1 750.000 000 MHz

\*  
 Del  
 Cor  
 Avg  
 16  
 H1d



## DASY5 Validation Report for Body TSL

Date: 11.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.5$  S/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

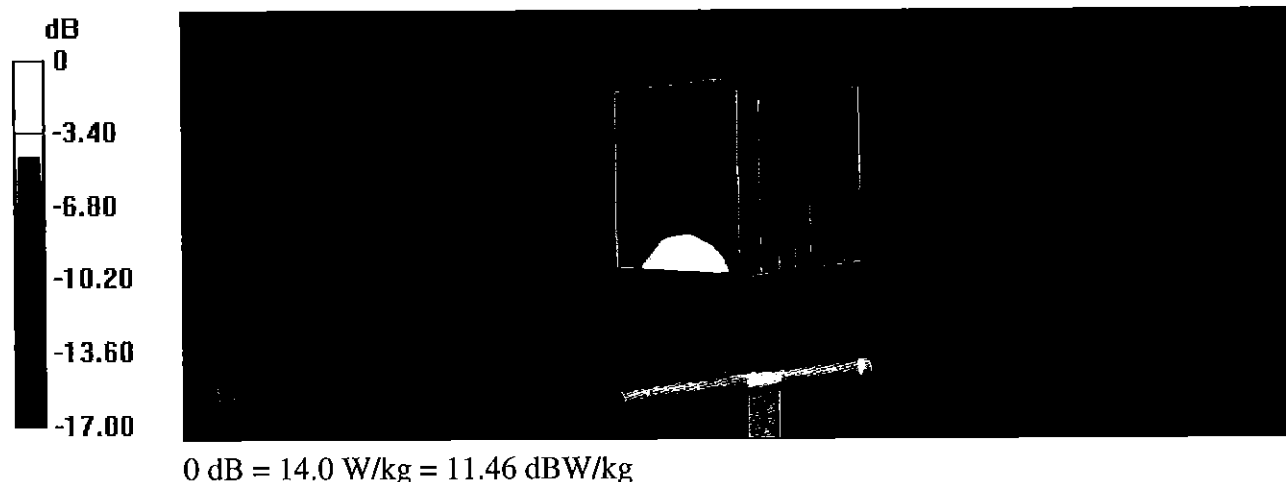
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.9 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.4 W/kg

**SAR(1 g) = 9.3 W/kg; SAR(10 g) = 4.94 W/kg**

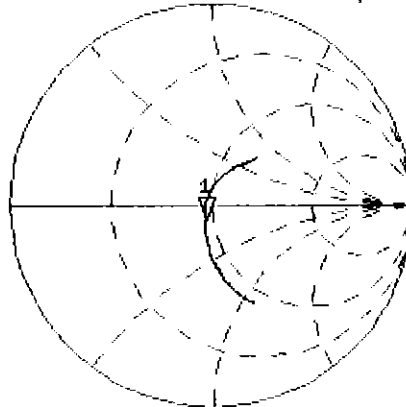
Maximum value of SAR (measured) = 14.0 W/kg



# Impedance Measurement Plot for Body TSL

11 May 2016 13:08:31  
 [CH1] S11 1 U FS 1: 45.803  $\Omega$  -6.7695  $\Omega$  13.435 pF 1 750.000 000 MHz

\*  
 Del  
 Cor



Avg  
 16

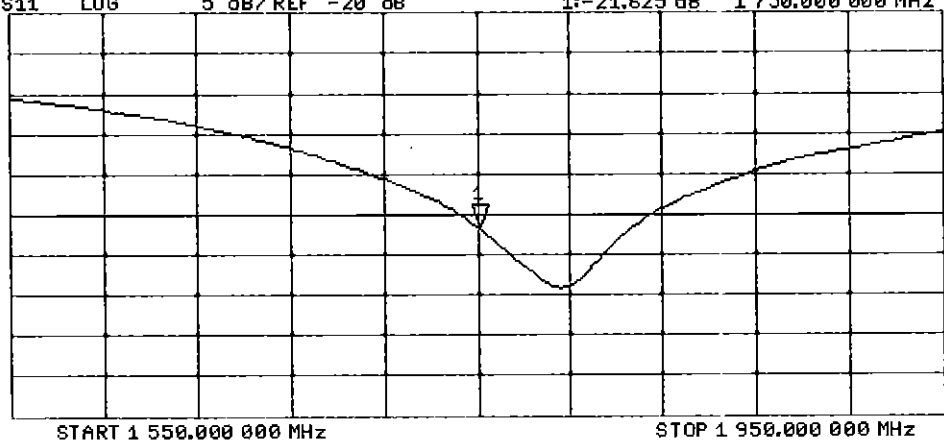
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-21.625 dB 1 750.000 000 MHz

Del  
 Cor

Avg  
 16

H1d





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1148\_May16**

## CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1148**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **May 09, 2016**

BNV  
 5/17/2016

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP             | SN: 104778         | 06-Apr-16 (No. 217-02288/02289)   | Apr-17                 |
| Power sensor NRP-Z91        | SN: 103244         | 06-Apr-16 (No. 217-02288)         | Apr-17                 |
| Power sensor NRP-Z91        | SN: 103245         | 06-Apr-16 (No. 217-02289)         | Apr-17                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 05-Apr-16 (No. 217-02292)         | Apr-17                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 05-Apr-16 (No. 217-02295)         | Apr-17                 |
| Reference Probe EX3DV4      | SN: 7349           | 31-Dec-15 (No. EX3-7349_Dec15)    | Dec-16                 |
| DAE4                        | SN: 601            | 30-Dec-15 (No. DAE4-601_Dec15)    | Dec-16                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A        | SN: GB37480704     | 07-Oct-15 (No. 217-02222)         | In house check: Oct-16 |
| Power sensor HP 8481A       | SN: US37292783     | 07-Oct-15 (No. 217-02222)         | In house check: Oct-16 |
| Power sensor HP 8481A       | SN: MY41092317     | 07-Oct-15 (No. 217-02223)         | In house check: Oct-16 |
| RF generator R&S SMT-06     | SN: 100972         | 15-Jun-15 (in house check Jun-15) | In house check: Oct-16 |
| Network Analyzer HP 8753E   | SN: US37390585     | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

Calibrated by: **Michael Weber** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: May 11, 2016

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.8.8     |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1750 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 40.1           | 1.37 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 39.7 $\pm$ 6 % | 1.36 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.03 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.2 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 4.78 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.1 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 53.4           | 1.49 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 53.8 $\pm$ 6 % | 1.50 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.30 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 37.1 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 4.93 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 19.7 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.9 $\Omega$ - 0.7 j $\Omega$ |
| Return Loss                          | - 43.3 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.2 $\Omega$ - 1.4 j $\Omega$ |
| Return Loss                          | - 27.5 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.221 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                    |
|-----------------|--------------------|
| Manufactured by | SPEAG              |
| Manufactured on | September 30, 2014 |

## DASY5 Validation Report for Head TSL

Date: 09.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1148**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.36$  S/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.54, 8.54, 8.54); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

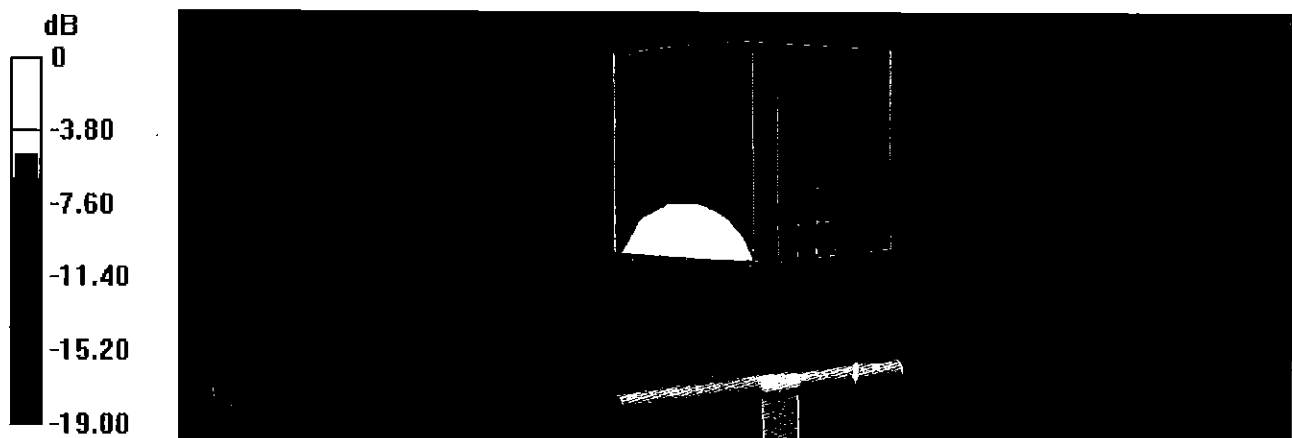
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.5 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 16.7 W/kg

**SAR(1 g) = 9.03 W/kg; SAR(10 g) = 4.78 W/kg**

Maximum value of SAR (measured) = 13.6 W/kg

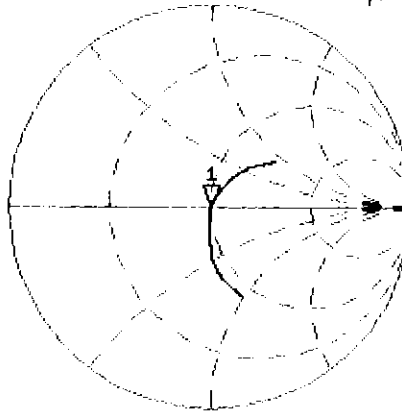


0 dB = 13.6 W/kg = 11.34 dBW/kg

# Impedance Measurement Plot for Head TSL

9 May 2016 11:49:12  
 [CH1] S11 1 U FS 1: 49.912  $\Omega$  -679.69 m $\Omega$  133.81 pF 1 750.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

H1d

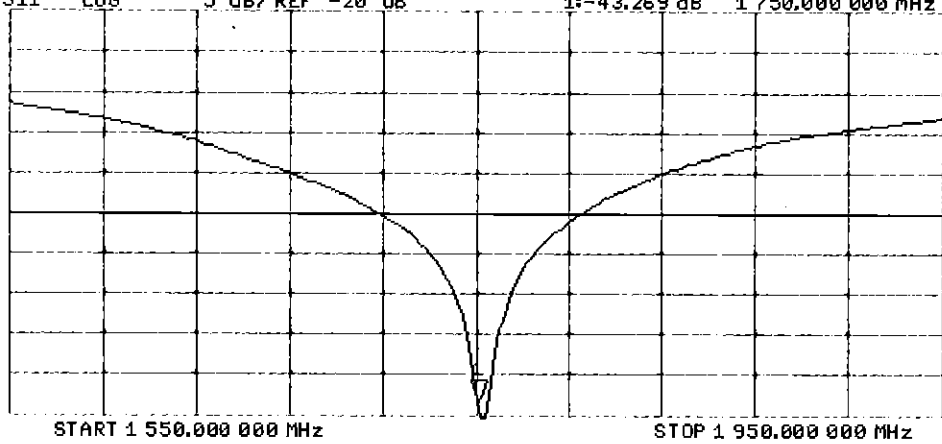
CH2 S11 LOG 5 dB/REF -20 dB 1: -43.269 dB 1 750.000 000 MHz

Del

CA

Avg  
 16

H1d



## DASY5 Validation Report for Body TSL

Date: 09.05.2016

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1148**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.5$  S/m;  $\epsilon_r = 53.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 31.12.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

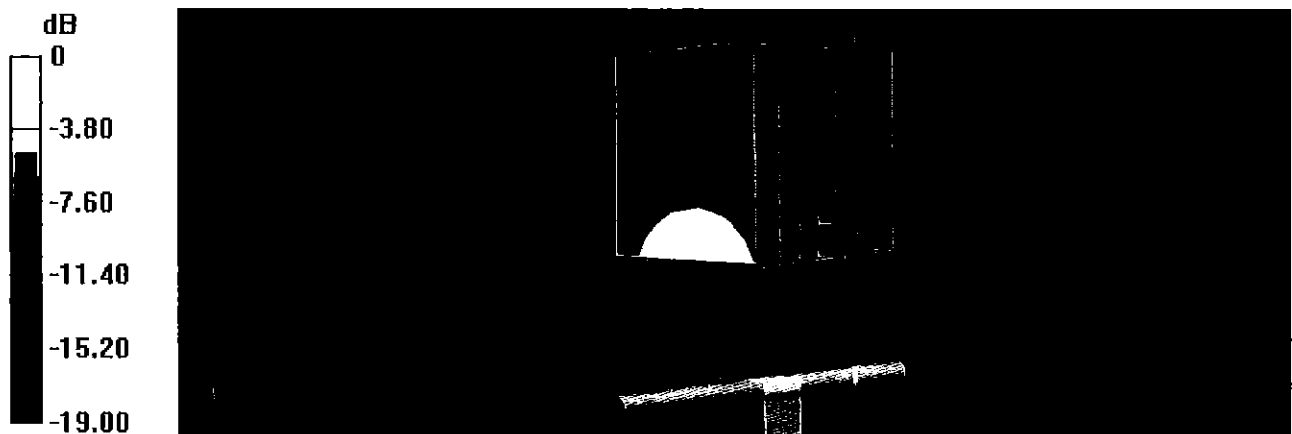
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.0 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 16.6 W/kg

**SAR(1 g) = 9.3 W/kg; SAR(10 g) = 4.93 W/kg**

Maximum value of SAR (measured) = 14.1 W/kg

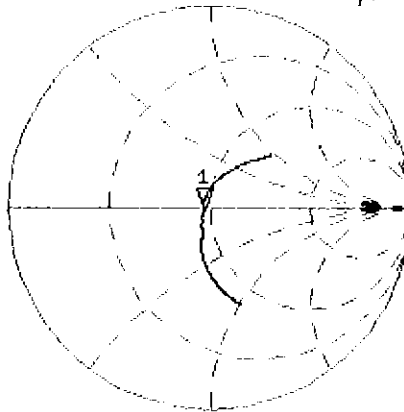


0 dB = 14.1 W/kg = 11.49 dBW/kg

## Impedance Measurement Plot for Body TSL

9 May 2016 11:48:41  
[CH1] S11 1 U FS 1: 46.205  $\Omega$  -1.4258  $\Omega$  63.787 pF 1 750.000 000 MHz

\*  
De1  
CA



Avg  
16

H1d

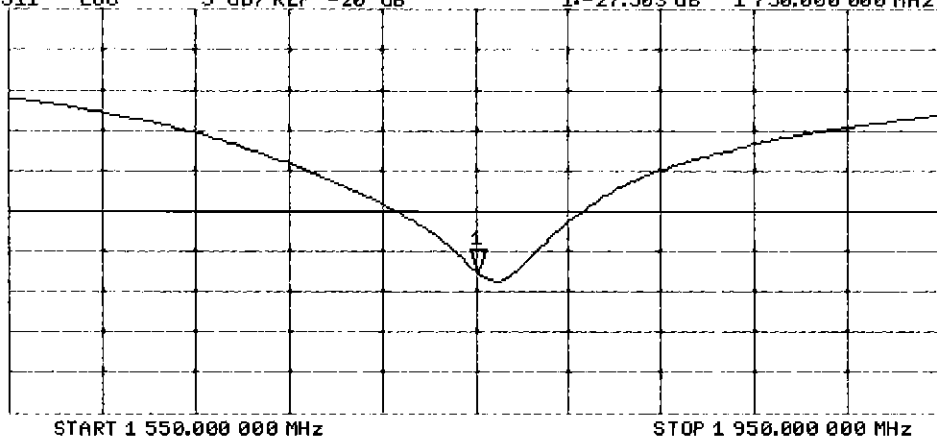
CH2 S11 LOG 5 dB/REF -20 dB 1: -27.503 dB 1 750.000 000 MHz

De1

CA

Avg  
16

H1d





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3022\_Aug15**

## CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **August 26, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
|                            |                 |                                   |                        |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

|                                                                                                                                                       |                              |                                          |                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------|
| Calibrated by:                                                                                                                                        | Name<br><b>Michael Weber</b> | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:                                                                                                                                          | <b>Katja Pokovic</b>         | <b>Technical Manager</b>                 |               |
| <p>Issued: August 27, 2015</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> |                              |                                          |                                                                                                    |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the  $E^2$ -field uncertainty inside TSL (see below **ConvF**).
- NORM( $f$ )<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of **ConvF**.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for **ConvF**. A frequency dependent **ConvF** is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV2

## SN:3022

Manufactured: April 15, 2003  
Calibrated: August 26, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.00     | 1.03     | 0.95     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 99.9     | 99.7     | 100.9    |               |

### Modulation Calibration Parameters

| UID           | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0             | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 179.6    | $\pm 3.3 \%$              |
|               |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 183.9    |                           |
|               |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 179.0    |                           |
| 10010-<br>CAA | SAR Validation (Square, 100ms, 10ms)          | X | 3.60    | 65.9                         | 14.2 | 10.00   | 43.5     | $\pm 2.2 \%$              |
|               |                                               | Y | 2.84    | 63.5                         | 13.0 |         | 43.3     |                           |
|               |                                               | Z | 2.76    | 63.7                         | 12.7 |         | 41.7     |                           |
| 10011-<br>CAB | UMTS-FDD (WCDMA)                              | X | 3.32    | 67.0                         | 18.7 | 2.91    | 144.4    | $\pm 0.7 \%$              |
|               |                                               | Y | 3.24    | 66.3                         | 18.0 |         | 147.3    |                           |
|               |                                               | Z | 3.19    | 66.3                         | 18.0 |         | 143.5    |                           |
| 10012-<br>CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 3.15    | 69.9                         | 19.5 | 1.87    | 146.1    | $\pm 0.7 \%$              |
|               |                                               | Y | 2.88    | 67.7                         | 18.0 |         | 147.9    |                           |
|               |                                               | Z | 2.78    | 67.4                         | 17.8 |         | 145.6    |                           |
| 10013-<br>CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 11.40   | 71.3                         | 23.8 | 9.46    | 144.9    | $\pm 3.3 \%$              |
|               |                                               | Y | 11.15   | 70.5                         | 23.1 |         | 146.9    |                           |
|               |                                               | Z | 10.95   | 70.5                         | 23.3 |         | 140.3    |                           |
| 10021-<br>DAB | GSM-FDD (TDMA, GMSK)                          | X | 20.66   | 99.8                         | 29.2 | 9.39    | 132.6    | $\pm 2.2 \%$              |
|               |                                               | Y | 14.36   | 93.3                         | 26.6 |         | 145.3    |                           |
|               |                                               | Z | 17.17   | 97.2                         | 27.8 |         | 145.4    |                           |
| 10023-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 17.22   | 96.5                         | 28.2 | 9.57    | 125.4    | $\pm 1.9 \%$              |
|               |                                               | Y | 11.06   | 88.6                         | 25.0 |         | 136.0    |                           |
|               |                                               | Z | 8.71    | 84.6                         | 23.4 |         | 130.7    |                           |
| 10024-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 31.05   | 99.5                         | 25.9 | 6.56    | 135.2    | $\pm 2.2 \%$              |
|               |                                               | Y | 25.28   | 97.4                         | 25.0 |         | 132.5    |                           |
|               |                                               | Z | 21.58   | 95.7                         | 24.5 |         | 144.4    |                           |
| 10027-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 42.88   | 99.9                         | 24.0 | 4.80    | 129.5    | $\pm 1.9 \%$              |
|               |                                               | Y | 40.80   | 99.6                         | 23.7 |         | 124.9    |                           |
|               |                                               | Z | 38.42   | 99.7                         | 23.7 |         | 137.8    |                           |
| 10028-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 44.48   | 100.0                        | 23.2 | 3.55    | 138.2    | $\pm 1.9 \%$              |
|               |                                               | Y | 44.03   | 99.7                         | 22.8 |         | 133.0    |                           |
|               |                                               | Z | 41.36   | 99.8                         | 22.8 |         | 147.5    |                           |
| 10032-<br>CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 16.08   | 99.5                         | 23.3 | 1.16    | 127.5    | $\pm 1.4 \%$              |
|               |                                               | Y | 79.69   | 99.6                         | 19.3 |         | 146.2    |                           |
|               |                                               | Z | 45.81   | 99.9                         | 20.4 |         | 138.2    |                           |
| 10100-<br>CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.43    | 67.4                         | 19.8 | 5.67    | 138.7    | $\pm 1.4 \%$              |
|               |                                               | Y | 6.27    | 66.8                         | 19.2 |         | 134.9    |                           |
|               |                                               | Z | 6.16    | 66.6                         | 19.2 |         | 127.6    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.13 | 75.0 | 25.9 | 9.29 | 129.4 | ±3.3 % |
|           |                                          | Y | 9.46  | 73.0 | 24.5 |      | 131.8 |        |
|           |                                          | Z | 9.52  | 74.0 | 25.4 |      | 137.0 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.27  | 66.9 | 19.7 | 5.80 | 137.0 | ±1.7 % |
|           |                                          | Y | 6.24  | 66.7 | 19.3 |      | 140.0 |        |
|           |                                          | Z | 6.06  | 66.3 | 19.2 |      | 127.1 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.16 | 68.7 | 21.3 | 8.07 | 127.7 | ±2.2 % |
|           |                                          | Y | 9.99  | 68.2 | 20.9 |      | 131.5 |        |
|           |                                          | Z | 10.22 | 69.1 | 21.4 |      | 141.6 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 9.34  | 73.4 | 25.2 | 9.28 | 125.0 | ±3.3 % |
|           |                                          | Y | 8.92  | 72.2 | 24.3 |      | 127.2 |        |
|           |                                          | Z | 8.95  | 73.1 | 25.1 |      | 131.9 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.95  | 66.4 | 19.4 | 5.75 | 134.4 | ±1.4 % |
|           |                                          | Y | 5.92  | 66.2 | 19.1 |      | 137.0 |        |
|           |                                          | Z | 5.98  | 66.7 | 19.5 |      | 146.8 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.39  | 66.9 | 19.6 | 5.82 | 139.9 | ±1.7 % |
|           |                                          | Y | 6.35  | 66.7 | 19.3 |      | 141.9 |        |
|           |                                          | Z | 6.15  | 66.2 | 19.2 |      | 128.4 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.96  | 66.6 | 19.8 | 5.73 | 137.3 | ±1.4 % |
|           |                                          | Y | 4.85  | 66.1 | 19.3 |      | 139.8 |        |
|           |                                          | Z | 4.85  | 66.6 | 19.7 |      | 146.7 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 8.75  | 78.7 | 28.3 | 9.21 | 138.9 | ±3.0 % |
|           |                                          | Y | 7.69  | 75.1 | 26.1 |      | 140.1 |        |
|           |                                          | Z | 7.80  | 76.6 | 27.2 |      | 144.0 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.88  | 66.2 | 19.6 | 5.72 | 132.0 | ±1.4 % |
|           |                                          | Y | 4.77  | 65.8 | 19.1 |      | 132.6 |        |
|           |                                          | Z | 4.83  | 66.5 | 19.6 |      | 146.0 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.91  | 66.3 | 19.7 | 5.72 | 131.7 | ±1.4 % |
|           |                                          | Y | 4.82  | 66.0 | 19.2 |      | 138.4 |        |
|           |                                          | Z | 4.86  | 66.7 | 19.7 |      | 145.7 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 10.04 | 69.1 | 21.7 | 8.10 | 140.9 | ±2.2 % |
|           |                                          | Y | 9.62  | 67.9 | 20.8 |      | 125.2 |        |
|           |                                          | Z | 9.74  | 68.6 | 21.3 |      | 133.3 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 7.01  | 67.1 | 19.6 | 5.97 | 143.7 | ±1.4 % |
|           |                                          | Y | 6.78  | 66.2 | 19.0 |      | 129.3 |        |
|           |                                          | Z | 6.80  | 66.7 | 19.3 |      | 136.5 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 8.55  | 78.0 | 27.9 | 9.21 | 134.6 | ±3.0 % |
|           |                                          | Y | 7.79  | 75.6 | 26.3 |      | 141.6 |        |
|           |                                          | Z | 7.89  | 76.9 | 27.4 |      | 145.2 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 9.30  | 74.8 | 26.1 | 9.24 | 134.8 | ±3.3 % |
|           |                                          | Y | 8.65  | 72.5 | 24.5 |      | 136.4 |        |
|           |                                          | Z | 8.33  | 72.3 | 24.8 |      | 126.6 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 10.20 | 76.2 | 26.8 | 9.30 | 144.8 | ±3.3 % |
|           |                                          | Y | 9.41  | 73.7 | 25.1 |      | 145.9 |        |
|           |                                          | Z | 9.18  | 73.9 | 25.6 |      | 138.6 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.45  | 66.7 | 18.9 | 3.96 | 147.0 | ±0.9 % |
|           |                                                               | Y | 4.21  | 65.5 | 17.9 |      | 126.5 |        |
|           |                                                               | Z | 4.36  | 66.5 | 18.5 |      | 148.0 |        |
| 10291-AAB | CDMA2000, RC3, SO55, Full Rate                                | X | 3.57  | 66.3 | 18.5 | 3.46 | 134.3 | ±0.7 % |
|           |                                                               | Y | 3.48  | 65.6 | 17.8 |      | 136.8 |        |
|           |                                                               | Z | 3.51  | 66.2 | 18.3 |      | 136.4 |        |
| 10292-AAB | CDMA2000, RC3, SO32, Full Rate                                | X | 3.53  | 66.4 | 18.6 | 3.39 | 135.8 | ±0.7 % |
|           |                                                               | Y | 3.45  | 65.8 | 17.9 |      | 140.4 |        |
|           |                                                               | Z | 3.50  | 66.5 | 18.5 |      | 137.0 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.18  | 66.5 | 19.5 | 5.81 | 129.4 | ±1.4 % |
|           |                                                               | Y | 6.15  | 66.3 | 19.1 |      | 133.6 |        |
|           |                                                               | Z | 6.13  | 66.5 | 19.3 |      | 131.2 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.77  | 67.2 | 19.9 | 6.06 | 134.8 | ±1.7 % |
|           |                                                               | Y | 6.81  | 67.3 | 19.7 |      | 144.8 |        |
|           |                                                               | Z | 6.68  | 67.1 | 19.7 |      | 136.7 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 10.30 | 69.4 | 22.0 | 8.37 | 142.0 | ±2.5 % |
|           |                                                               | Y | 9.90  | 68.2 | 21.1 |      | 126.8 |        |
|           |                                                               | Z | 10.15 | 69.3 | 21.9 |      | 142.6 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.72  | 68.1 | 18.9 | 3.76 | 147.8 | ±0.7 % |
|           |                                                               | Y | 4.56  | 67.5 | 18.2 |      | 133.6 |        |
|           |                                                               | Z | 4.61  | 68.2 | 18.7 |      | 147.4 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.57  | 67.8 | 18.8 | 3.77 | 144.3 | ±0.7 % |
|           |                                                               | Y | 4.43  | 67.3 | 18.1 |      | 131.3 |        |
|           |                                                               | Z | 4.57  | 68.3 | 18.8 |      | 145.0 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.64  | 67.9 | 18.7 | 1.54 | 142.1 | ±0.5 % |
|           |                                                               | Y | 2.36  | 65.4 | 16.8 |      | 130.3 |        |
|           |                                                               | Z | 2.50  | 66.7 | 17.7 |      | 145.0 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 10.04 | 69.0 | 21.7 | 8.23 | 138.8 | ±2.2 % |
|           |                                                               | Y | 9.71  | 68.0 | 20.9 |      | 125.6 |        |
|           |                                                               | Z | 9.94  | 69.0 | 21.6 |      | 140.4 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 6.33    | 6.33    | 6.33    | 0.46               | 1.43                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 6.11    | 6.11    | 6.11    | 0.24               | 2.08                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 5.08    | 5.08    | 5.08    | 0.45               | 1.47                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 4.93    | 4.93    | 4.93    | 0.59               | 1.25                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 4.63    | 4.63    | 4.63    | 0.55               | 1.39                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 4.30    | 4.30    | 4.30    | 0.51               | 1.47                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 4.12    | 4.12    | 4.12    | 0.57               | 1.46                    | ± 12.0 %  |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 6.16    | 6.16    | 6.16    | 0.50               | 1.34                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 6.13    | 6.13    | 6.13    | 0.25               | 2.16                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 4.79    | 4.79    | 4.79    | 0.61               | 1.33                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 4.56    | 4.56    | 4.56    | 0.31               | 2.02                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 4.32    | 4.32    | 4.32    | 0.79               | 1.19                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 4.08    | 4.08    | 4.08    | 0.80               | 1.12                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 3.96    | 3.96    | 3.96    | 0.80               | 1.10                    | ± 12.0 %  |

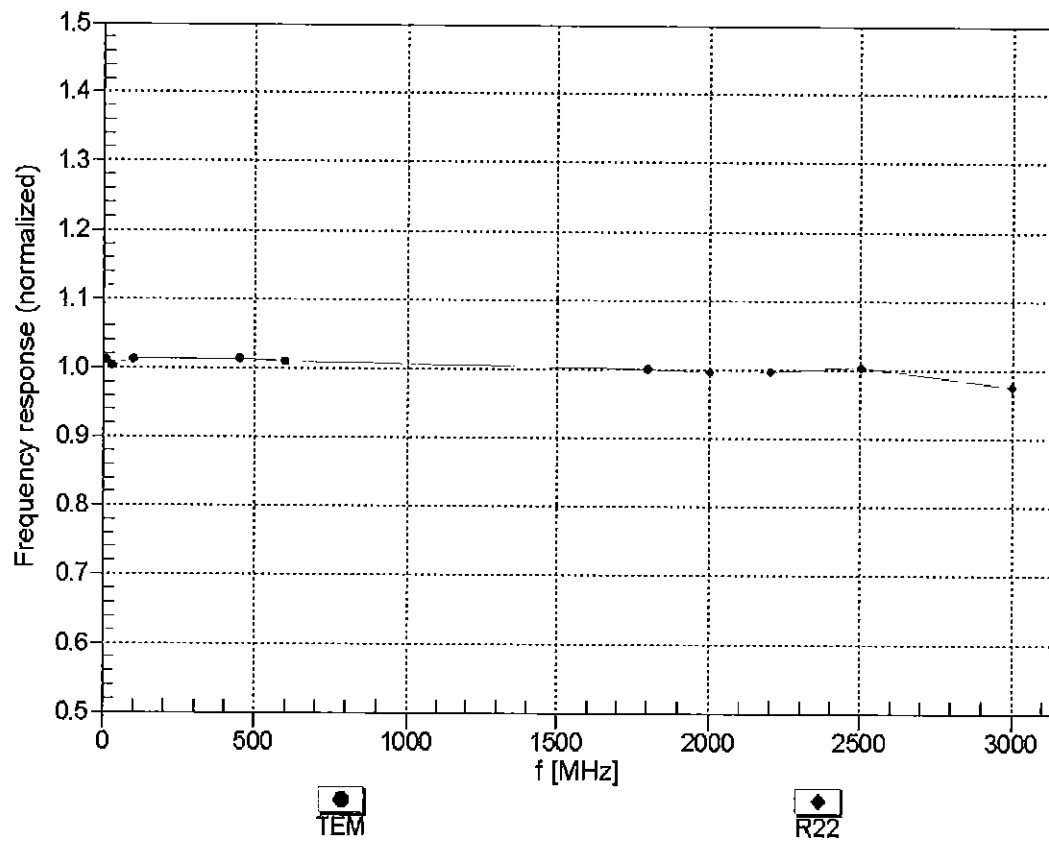
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

(TEM-Cell: ifi110 EXX, Waveguide: R22)

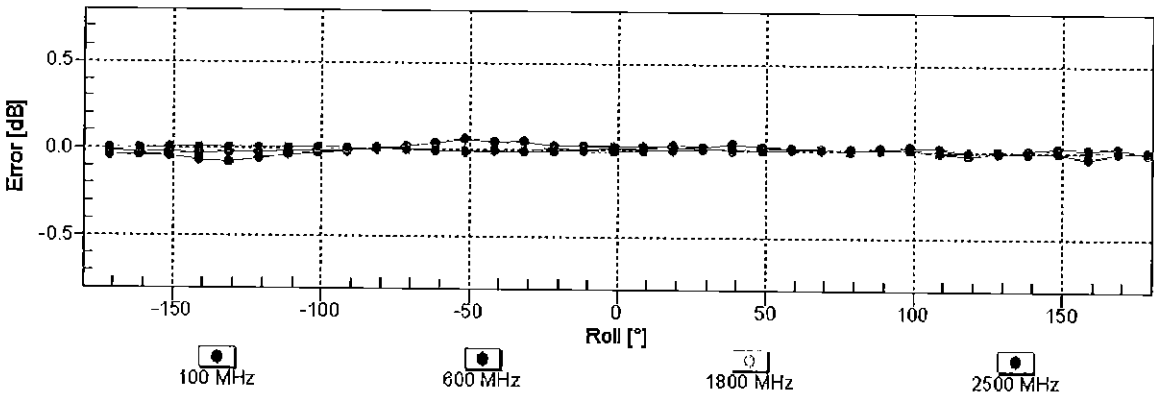
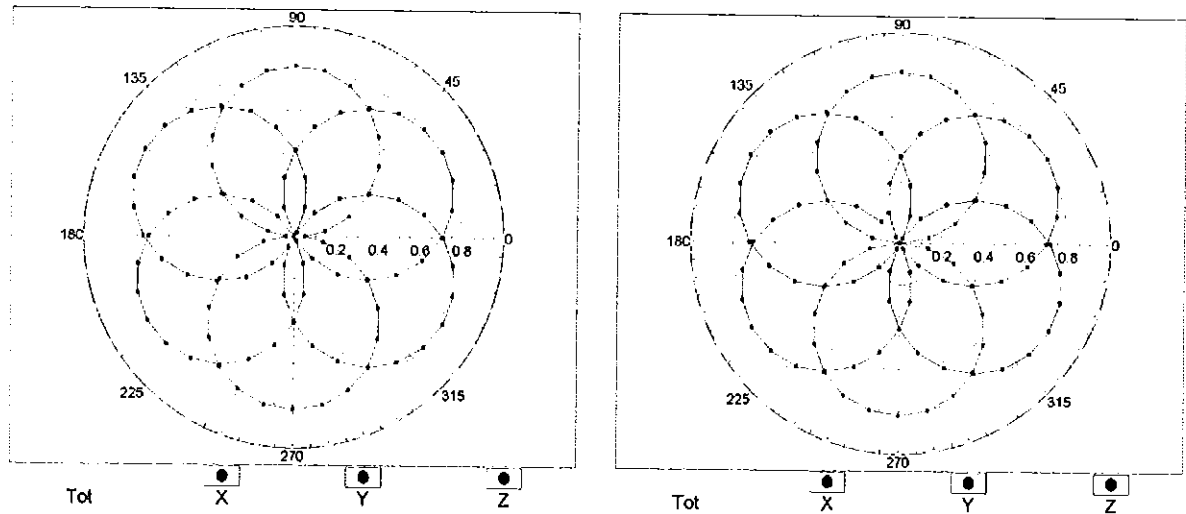


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

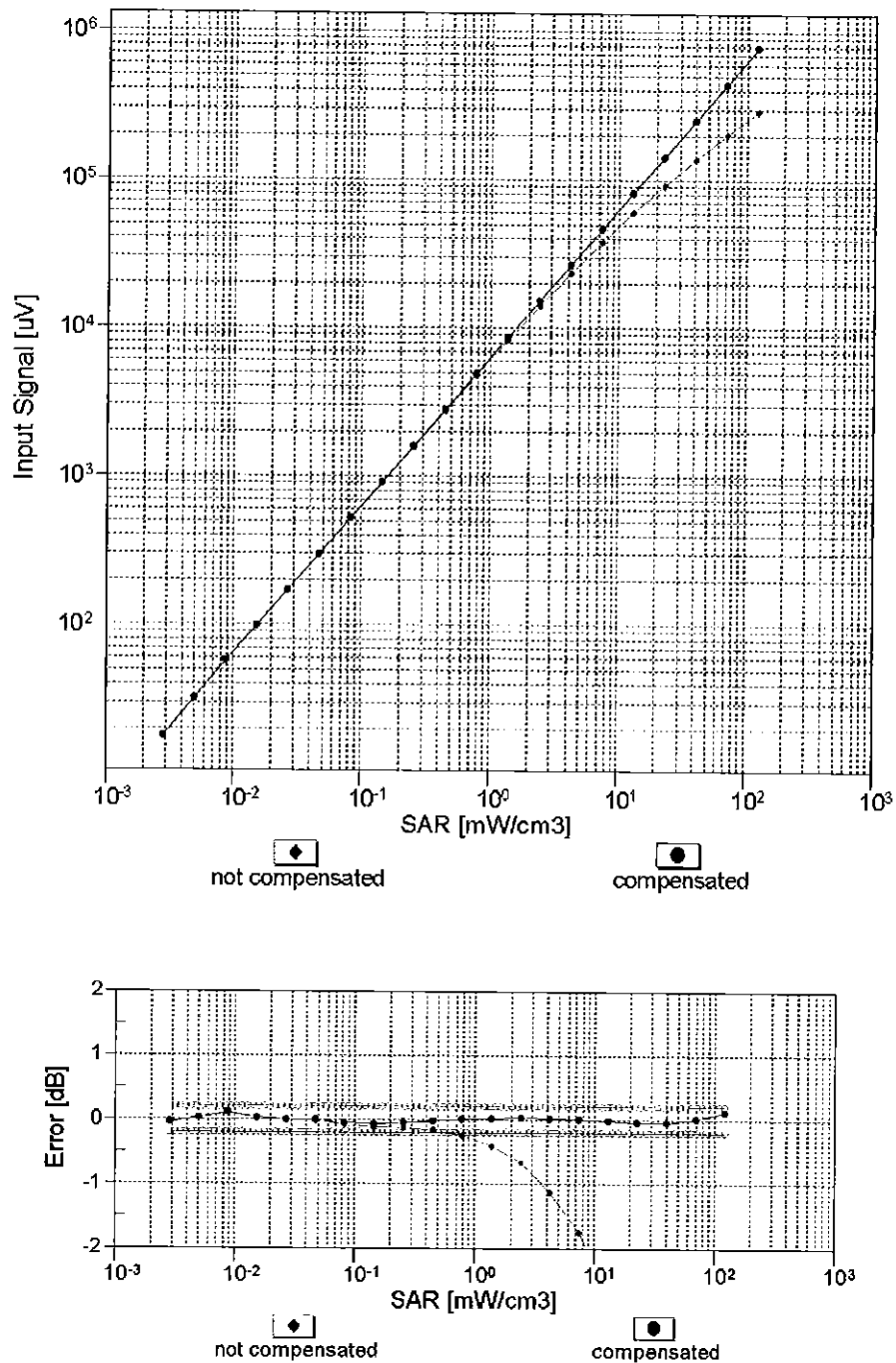
f=600 MHz,TEM

f=1800 MHz,R22



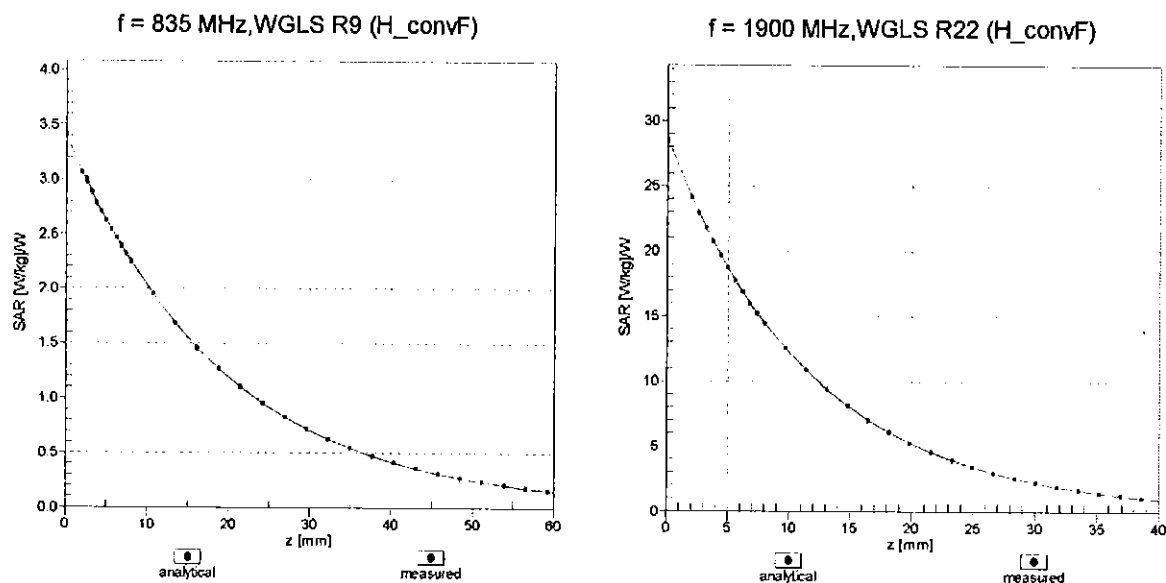
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

Dynamic Range f(SAR<sub>head</sub>)  
(TEM cell , f<sub>eval</sub>= 1900 MHz)



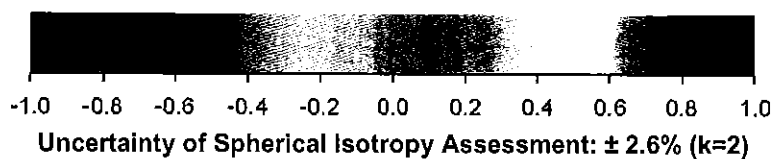
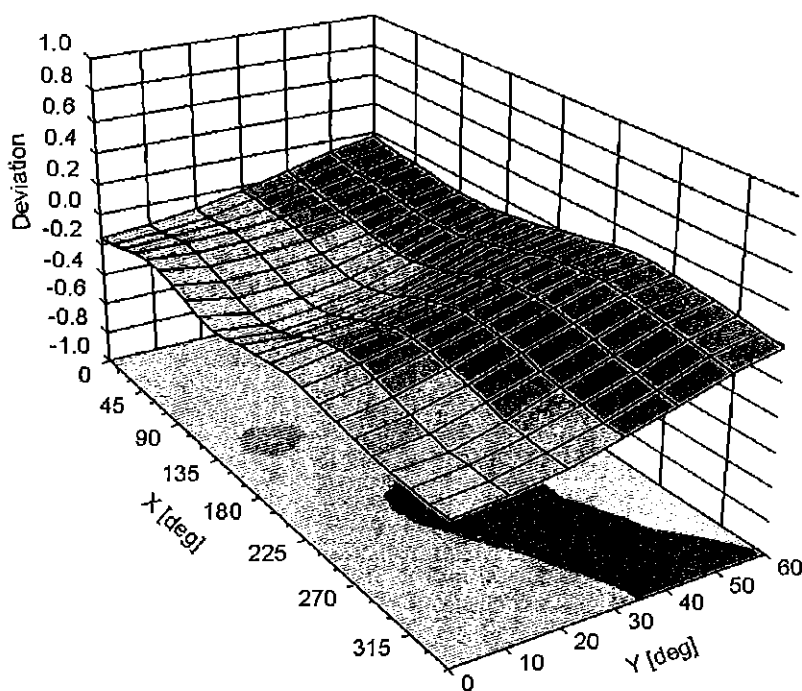
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



**DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 98.5       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3334\_Nov15**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3334**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

BN ✓  
 11/24/15

Calibration date: **November 17, 2015**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID              | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Power sensor E4412A        | MY41498087      | 01-Apr-15 (No. 217-02128)         | Mar-16                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 01-Apr-15 (No. 217-02129)         | Mar-16                 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 01-Apr-15 (No. 217-02132)         | Mar-16                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 01-Apr-15 (No. 217-02133)         | Mar-16                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-14 (No. ES3-3013_Dec14)    | Dec-15                 |
| DAE4                       | SN: 660         | 14-Jan-15 (No. DAE4-660_Jan15)    | Jan-16                 |
| Secondary Standards        | ID              | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Apr-13)  | In house check: Apr-16 |
| Network Analyzer HP 8753E  | US3739J585      | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

|                                                                                                                 | Name           | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|----------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Jeton Kastrati | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic  | Technical Manager     |           |
| Issued: November 17, 2015                                                                                       |                |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                |                       |           |



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Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| $NORM_{x,y,z}$           | sensitivity in free space                                                                                                                               |
| $ConvF$                  | sensitivity in TSL / $NORM_{x,y,z}$                                                                                                                     |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Methods Applied and Interpretation of Parameters:

- $NORM_{x,y,z}$ : Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide).  $NORM_{x,y,z}$  are only intermediate values, i.e., the uncertainties of  $NORM_{x,y,z}$  does not affect the  $E^2$ -field uncertainty inside TSL (see below  $ConvF$ ).
- $NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency\_response$  (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of  $ConvF$ .
- $DCP_{x,y,z}$ : DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- $A_{x,y,z}$ ;  $B_{x,y,z}$ ;  $C_{x,y,z}$ ;  $D_{x,y,z}$ ;  $VR_{x,y,z}$ ; A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- $ConvF$  and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to  $NORM_{x,y,z} * ConvF$  whereby the uncertainty corresponds to that given for  $ConvF$ . A frequency dependent  $ConvF$  is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the  $NORM_x$  (no uncertainty required).

# Probe ES3DV3

## SN:3334

Manufactured: January 24, 2012  
Calibrated: November 17, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.03     | 1.03     | 0.99     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 107.6    | 105.3    | 107.9    |               |

## Modulation Calibration Parameters

| UID           | Communication System Name                     |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0             | CW                                            | X | 0.0     | 0.0                          | 1.0  | 0.00    | 192.1    | $\pm 2.7 \%$              |
|               |                                               | Y | 0.0     | 0.0                          | 1.0  |         | 183.6    |                           |
|               |                                               | Z | 0.0     | 0.0                          | 1.0  |         | 183.3    |                           |
| 10010-<br>CAA | SAR Validation (Square, 100ms, 10ms)          | X | 2.27    | 60.1                         | 10.2 | 10.00   | 38.6     | $\pm 1.4 \%$              |
|               |                                               | Y | 1.99    | 59.3                         | 10.2 |         | 38.4     |                           |
|               |                                               | Z | 5.38    | 67.8                         | 12.9 |         | 37.2     |                           |
| 10011-<br>CAB | UMTS-FDD (WCDMA)                              | X | 3.40    | 68.0                         | 18.9 | 2.91    | 131.7    | $\pm 0.5 \%$              |
|               |                                               | Y | 3.27    | 67.0                         | 18.2 |         | 130.2    |                           |
|               |                                               | Z | 3.41    | 68.3                         | 19.1 |         | 148.5    |                           |
| 10012-<br>CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)      | X | 2.93    | 68.9                         | 18.7 | 1.87    | 132.9    | $\pm 0.7 \%$              |
|               |                                               | Y | 3.12    | 69.6                         | 18.8 |         | 130.2    |                           |
|               |                                               | Z | 3.24    | 71.1                         | 19.7 |         | 128.2    |                           |
| 10013-<br>CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | X | 10.90   | 70.3                         | 23.0 | 9.46    | 133.5    | $\pm 3.3 \%$              |
|               |                                               | Y | 10.53   | 69.0                         | 22.1 |         | 124.6    |                           |
|               |                                               | Z | 11.14   | 71.2                         | 23.6 |         | 147.1    |                           |
| 10021-<br>DAB | GSM-FDD (TDMA, GMSK)                          | X | 15.05   | 91.0                         | 24.4 | 9.39    | 139.5    | $\pm 1.9 \%$              |
|               |                                               | Y | 10.11   | 85.5                         | 23.3 |         | 131.9    |                           |
|               |                                               | Z | 11.84   | 87.6                         | 23.4 |         | 130.0    |                           |
| 10023-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0)                   | X | 10.42   | 84.9                         | 22.6 | 9.57    | 131.5    | $\pm 3.0 \%$              |
|               |                                               | Y | 13.29   | 89.7                         | 24.6 |         | 141.1    |                           |
|               |                                               | Z | 14.17   | 90.2                         | 24.2 |         | 148.7    |                           |
| 10024-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1)                 | X | 11.26   | 83.1                         | 19.4 | 6.56    | 140.7    | $\pm 1.9 \%$              |
|               |                                               | Y | 26.29   | 95.5                         | 23.8 |         | 134.7    |                           |
|               |                                               | Z | 16.82   | 88.9                         | 21.3 |         | 131.6    |                           |
| 10027-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2)               | X | 64.74   | 99.9                         | 22.2 | 4.80    | 131.5    | $\pm 2.2 \%$              |
|               |                                               | Y | 56.71   | 99.8                         | 22.7 |         | 124.7    |                           |
|               |                                               | Z | 63.10   | 99.9                         | 22.2 |         | 124.1    |                           |
| 10028-<br>DAB | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)             | X | 62.11   | 99.6                         | 21.6 | 3.55    | 146.1    | $\pm 1.9 \%$              |
|               |                                               | Y | 77.61   | 99.8                         | 21.2 |         | 132.0    |                           |
|               |                                               | Z | 72.33   | 99.7                         | 21.2 |         | 133.3    |                           |
| 10032-<br>CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)           | X | 96.24   | 92.7                         | 15.9 | 1.16    | 137.2    | $\pm 1.7 \%$              |
|               |                                               | Y | 95.69   | 93.1                         | 16.2 |         | 129.5    |                           |
|               |                                               | Z | 98.67   | 94.1                         | 16.4 |         | 149.7    |                           |
| 10100-<br>CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)      | X | 6.14    | 66.8                         | 19.2 | 5.67    | 126.2    | $\pm 1.7 \%$              |
|               |                                               | Y | 6.21    | 66.8                         | 19.1 |         | 139.9    |                           |
|               |                                               | Z | 6.41    | 67.9                         | 19.9 |         | 145.9    |                           |

|           |                                          |   |       |      |      |      |       |        |
|-----------|------------------------------------------|---|-------|------|------|------|-------|--------|
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 10.07 | 75.4 | 25.8 | 9.29 | 138.2 | ±2.5 % |
|           |                                          | Y | 9.54  | 73.3 | 24.5 |      | 130.5 |        |
|           |                                          | Z | 9.84  | 75.1 | 25.8 |      | 130.6 |        |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.34  | 67.6 | 19.8 | 5.80 | 149.5 | ±1.4 % |
|           |                                          | Y | 6.13  | 66.6 | 19.1 |      | 132.1 |        |
|           |                                          | Z | 6.19  | 67.2 | 19.7 |      | 137.8 |        |
| 10117-CAB | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | X | 10.13 | 68.9 | 21.2 | 8.07 | 138.8 | ±2.7 % |
|           |                                          | Y | 10.16 | 68.9 | 21.1 |      | 149.6 |        |
|           |                                          | Z | 9.96  | 68.7 | 21.1 |      | 127.1 |        |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 9.42  | 74.4 | 25.5 | 9.28 | 132.9 | ±3.0 % |
|           |                                          | Y | 9.50  | 74.0 | 25.0 |      | 143.7 |        |
|           |                                          | Z | 9.01  | 73.4 | 25.0 |      | 126.5 |        |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 6.03  | 67.1 | 19.6 | 5.75 | 145.5 | ±1.4 % |
|           |                                          | Y | 5.81  | 66.0 | 18.9 |      | 128.9 |        |
|           |                                          | Z | 5.91  | 66.8 | 19.5 |      | 135.1 |        |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.19  | 66.5 | 19.2 | 5.82 | 126.7 | ±1.4 % |
|           |                                          | Y | 6.20  | 66.4 | 19.0 |      | 132.8 |        |
|           |                                          | Z | 6.39  | 67.5 | 19.8 |      | 141.1 |        |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 5.05  | 67.6 | 20.0 | 5.73 | 146.8 | ±1.4 % |
|           |                                          | Y | 4.82  | 66.2 | 19.2 |      | 132.2 |        |
|           |                                          | Z | 4.96  | 67.4 | 20.0 |      | 143.8 |        |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 8.88  | 79.7 | 28.3 | 9.21 | 147.9 | ±3.0 % |
|           |                                          | Y | 8.00  | 76.1 | 26.2 |      | 138.9 |        |
|           |                                          | Z | 8.39  | 78.5 | 27.8 |      | 141.5 |        |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.99  | 67.3 | 19.9 | 5.72 | 140.7 | ±1.2 % |
|           |                                          | Y | 4.80  | 66.2 | 19.1 |      | 131.3 |        |
|           |                                          | Z | 4.90  | 67.1 | 19.8 |      | 136.1 |        |
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.99  | 67.3 | 19.9 | 5.72 | 145.4 | ±1.4 % |
|           |                                          | Y | 4.81  | 66.2 | 19.2 |      | 130.9 |        |
|           |                                          | Z | 4.89  | 67.1 | 19.8 |      | 136.0 |        |
| 10196-CAB | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | X | 9.78  | 68.8 | 21.3 | 8.10 | 131.0 | ±2.5 % |
|           |                                          | Y | 9.73  | 68.4 | 21.0 |      | 140.7 |        |
|           |                                          | Z | 9.94  | 69.4 | 21.6 |      | 146.6 |        |
| 10225-CAB | UMTS-FDD (HSPA+)                         | X | 6.88  | 66.9 | 19.3 | 5.97 | 133.9 | ±1.7 % |
|           |                                          | Y | 6.96  | 67.1 | 19.3 |      | 144.8 |        |
|           |                                          | Z | 6.71  | 66.6 | 19.2 |      | 125.7 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 9.00  | 80.2 | 28.5 | 9.21 | 148.2 | ±3.0 % |
|           |                                          | Y | 7.73  | 75.1 | 25.7 |      | 131.6 |        |
|           |                                          | Z | 8.27  | 78.2 | 27.7 |      | 136.1 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 9.59  | 76.3 | 26.7 | 9.24 | 144.1 | ±2.7 % |
|           |                                          | Y | 8.74  | 72.9 | 24.5 |      | 133.4 |        |
|           |                                          | Z | 9.14  | 75.2 | 26.1 |      | 136.9 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 9.25  | 73.9 | 25.3 | 9.30 | 124.8 | ±3.0 % |
|           |                                          | Y | 9.40  | 73.7 | 24.9 |      | 142.1 |        |
|           |                                          | Z | 9.86  | 76.1 | 26.5 |      | 145.3 |        |

|           |                                                               |   |       |      |      |      |       |        |
|-----------|---------------------------------------------------------------|---|-------|------|------|------|-------|--------|
| 10275-CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)                      | X | 4.38  | 66.9 | 18.7 | 3.96 | 133.3 | ±0.9 % |
|           |                                                               | Y | 4.44  | 66.9 | 18.6 |      | 148.2 |        |
|           |                                                               | Z | 4.30  | 66.7 | 18.6 |      | 128.9 |        |
| 10291-AAB | CDMA2000, RC3, SQ55, Full Rate                                | X | 3.68  | 67.3 | 18.7 | 3.46 | 145.8 | ±0.7 % |
|           |                                                               | Y | 3.58  | 66.6 | 18.2 |      | 136.3 |        |
|           |                                                               | Z | 3.62  | 67.3 | 18.8 |      | 139.4 |        |
| 10292-AAB | CDMA2000, RC3, SQ32, Full Rate                                | X | 3.73  | 68.0 | 19.1 | 3.39 | 147.5 | ±0.7 % |
|           |                                                               | Y | 3.55  | 66.7 | 18.3 |      | 138.5 |        |
|           |                                                               | Z | 3.60  | 67.6 | 18.9 |      | 143.0 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)                       | X | 6.30  | 67.4 | 19.7 | 5.81 | 141.4 | ±1.2 % |
|           |                                                               | Y | 6.11  | 66.5 | 19.1 |      | 130.3 |        |
|           |                                                               | Z | 6.17  | 67.0 | 19.5 |      | 138.8 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                      | X | 6.88  | 68.0 | 20.1 | 6.06 | 147.0 | ±1.7 % |
|           |                                                               | Y | 6.68  | 67.1 | 19.5 |      | 136.0 |        |
|           |                                                               | Z | 6.75  | 67.7 | 20.0 |      | 141.6 |        |
| 10400-AAC | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)           | X | 9.97  | 68.8 | 21.4 | 8.37 | 126.9 | ±2.7 % |
|           |                                                               | Y | 10.07 | 68.9 | 21.4 |      | 143.6 |        |
|           |                                                               | Z | 10.21 | 69.7 | 22.0 |      | 147.4 |        |
| 10403-AAB | CDMA2000 (1xEV-DO, Rev. 0)                                    | X | 4.77  | 68.5 | 18.8 | 3.76 | 134.9 | ±0.5 % |
|           |                                                               | Y | 4.69  | 68.1 | 18.5 |      | 126.7 |        |
|           |                                                               | Z | 4.74  | 68.8 | 18.9 |      | 129.4 |        |
| 10404-AAB | CDMA2000 (1xEV-DO, Rev. A)                                    | X | 4.72  | 68.7 | 18.8 | 3.77 | 132.9 | ±0.7 % |
|           |                                                               | Y | 4.78  | 68.9 | 18.9 |      | 147.4 |        |
|           |                                                               | Z | 4.63  | 68.7 | 18.9 |      | 127.1 |        |
| 10415-AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)     | X | 2.72  | 68.9 | 18.8 | 1.54 | 131.9 | ±0.5 % |
|           |                                                               | Y | 2.65  | 68.0 | 18.1 |      | 145.9 |        |
|           |                                                               | Z | 2.72  | 69.3 | 19.0 |      | 127.3 |        |
| 10416-AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle) | X | 9.81  | 68.6 | 21.2 | 8.23 | 131.6 | ±2.7 % |
|           |                                                               | Y | 9.90  | 68.7 | 21.2 |      | 144.1 |        |
|           |                                                               | Z | 9.97  | 69.3 | 21.7 |      | 146.0 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>C</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>e</sup> | Conductivity (S/m) <sup>e</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>g</sup> | Depth (mm) <sup>c</sup> | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 6                    | 55.5                               | 0.75                            | 6.13    | 6.13    | 6.13    | 0.00               | 1.00                    | ± 13.3 %  |
| 13                   | 55.5                               | 0.75                            | 5.76    | 5.76    | 5.76    | 0.00               | 1.00                    | ± 13.3 %  |
| 750                  | 41.9                               | 0.89                            | 6.56    | 6.56    | 6.56    | 0.24               | 2.36                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 6.37    | 6.37    | 6.37    | 0.37               | 1.70                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 5.39    | 5.39    | 5.39    | 0.58               | 1.32                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 5.18    | 5.18    | 5.18    | 0.77               | 1.20                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 4.85    | 4.85    | 4.85    | 0.71               | 1.28                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 4.58    | 4.58    | 4.58    | 0.79               | 1.17                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 4.46    | 4.46    | 4.46    | 0.80               | 1.26                    | ± 12.0 %  |

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>e</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>c</sup> | Relative Permittivity <sup>f</sup> | Conductivity (S/m) <sup>f</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>g</sup> | Depth <sup>g</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 6.37    | 6.37    | 6.37    | 0.74               | 1.22                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 6.24    | 6.24    | 6.24    | 0.31               | 1.94                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 5.03    | 5.03    | 5.03    | 0.50               | 1.57                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 4.84    | 4.84    | 4.84    | 0.50               | 1.58                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 4.61    | 4.61    | 4.61    | 0.74               | 1.23                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 4.45    | 4.45    | 4.45    | 0.74               | 1.20                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 4.29    | 4.29    | 4.29    | 0.80               | 1.20                    | ± 12.0 %  |

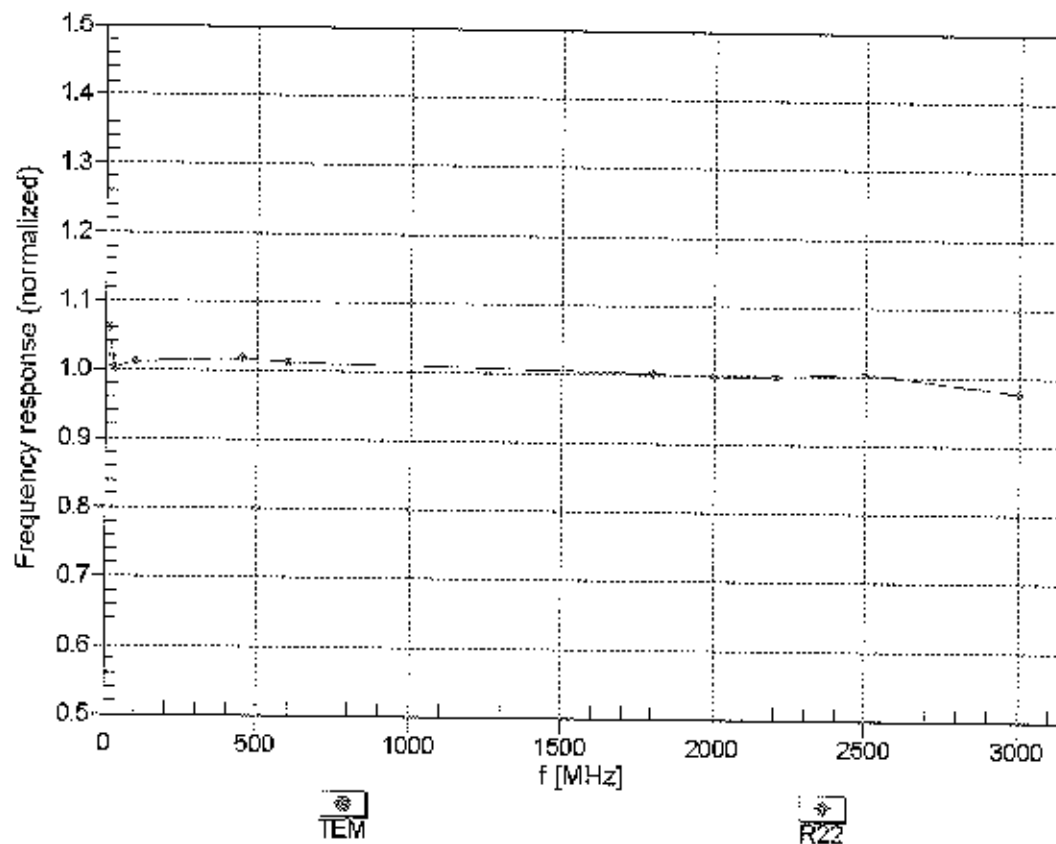
<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>f</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

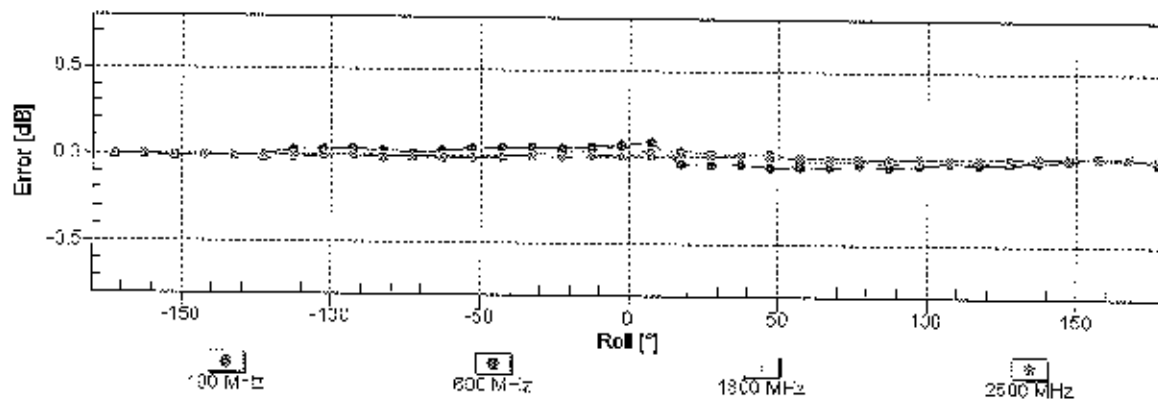
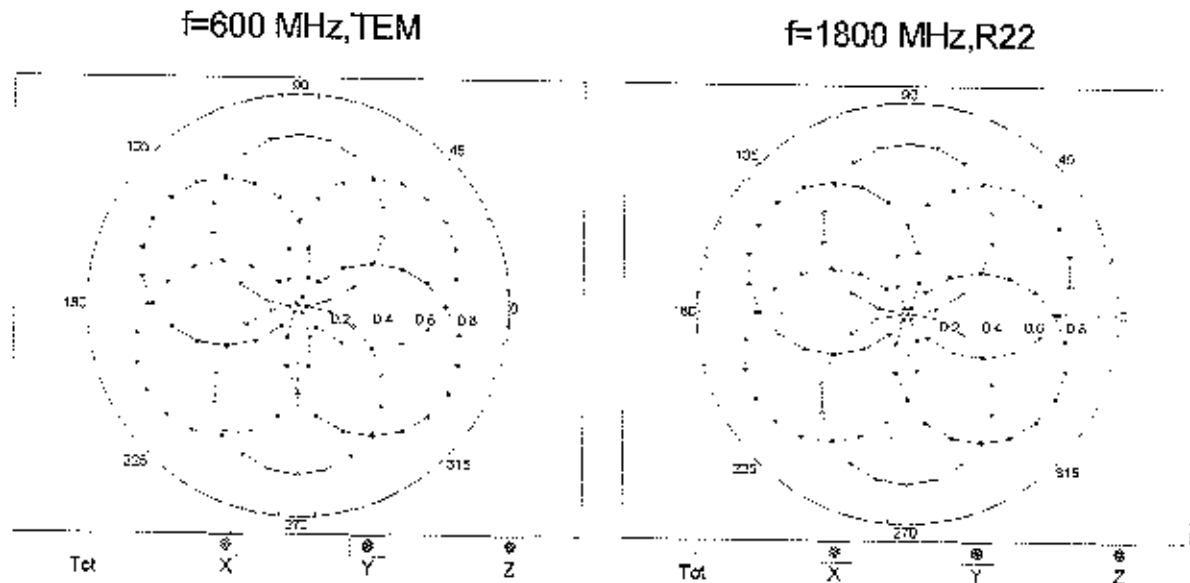
## Frequency Response of E-Field

(TEM-Cell: ifi110 EXX, Waveguide: R22)



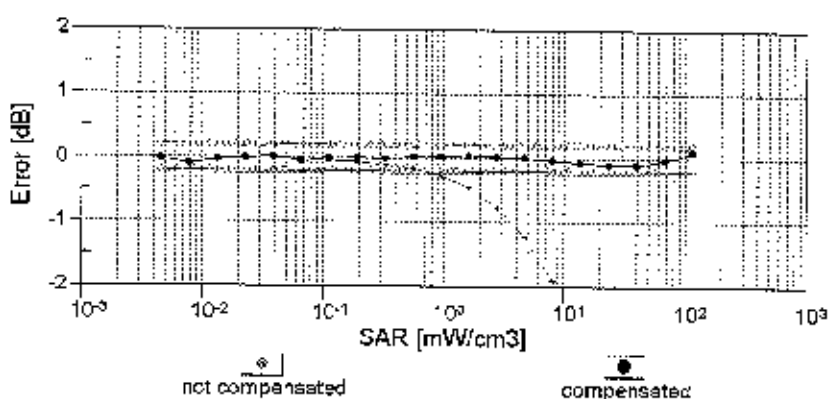
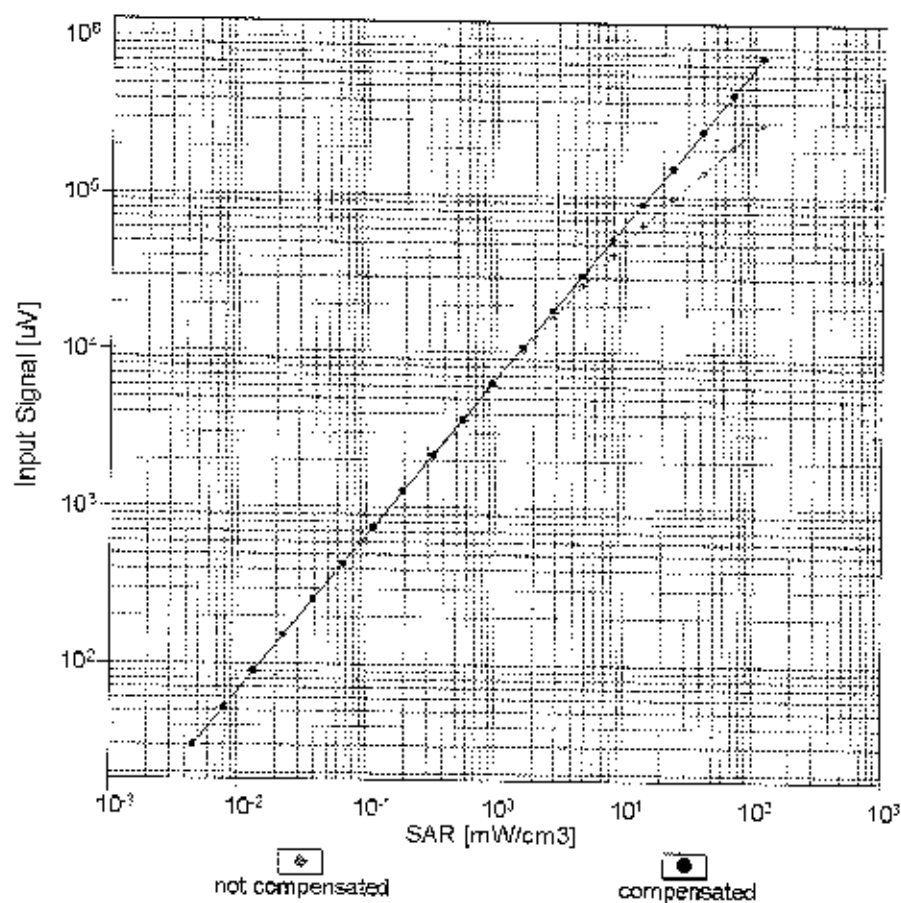
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

# Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



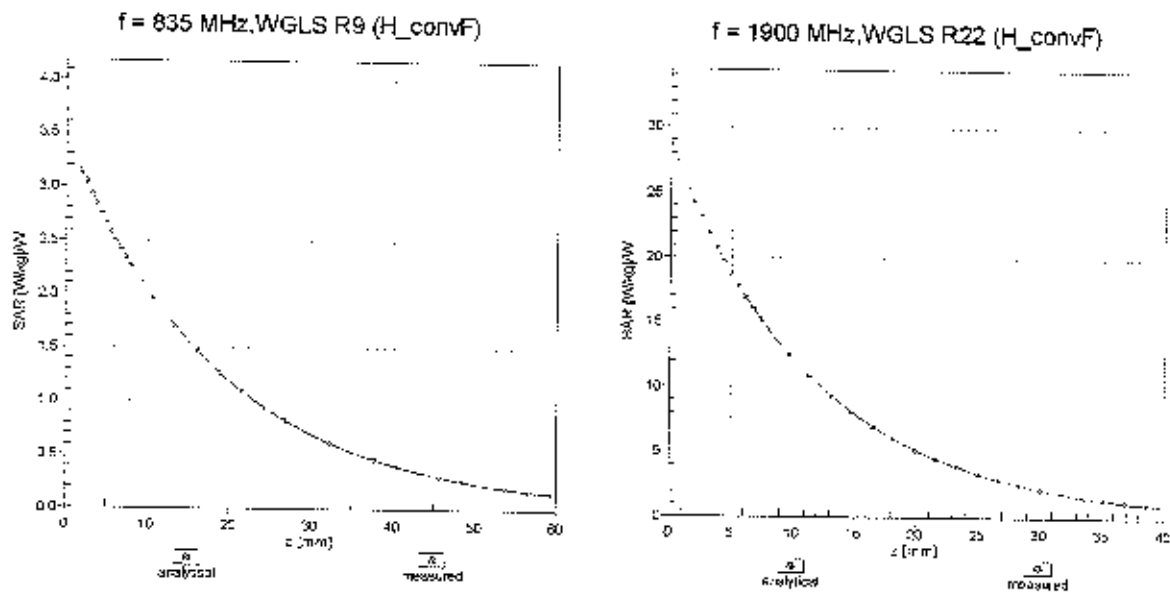
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$ )



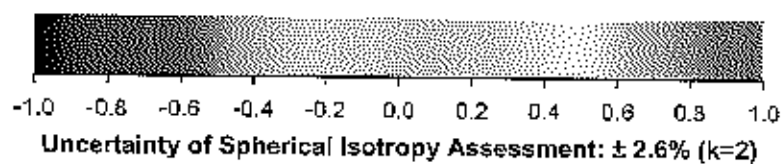
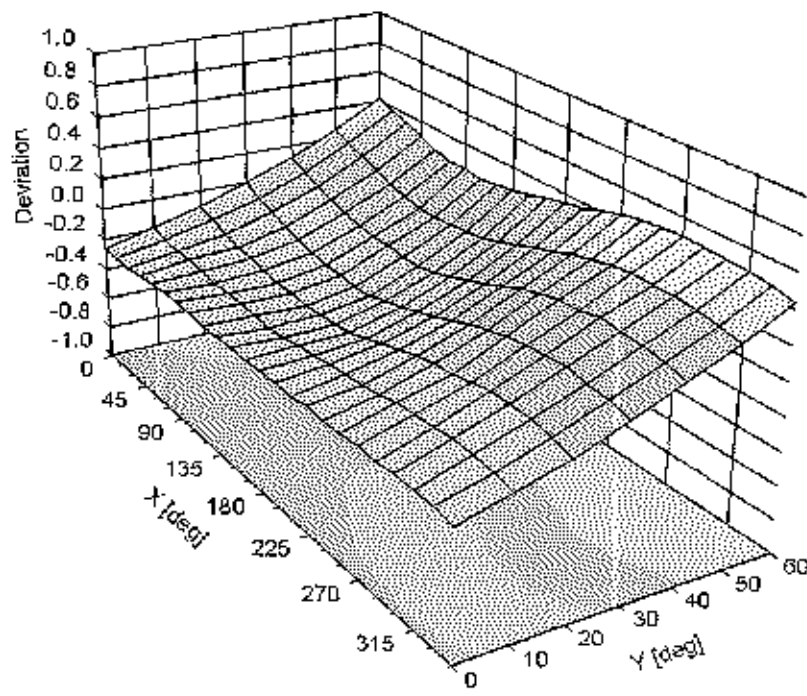
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi$ ,  $\theta$ ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  (k=2)

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3334

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 17.4       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 10 mm      |
| Tip Diameter                                  | 4 mm       |
| Probe Tip to Sensor X Calibration Point       | 2 mm       |
| Probe Tip to Sensor Y Calibration Point       | 2 mm       |
| Probe Tip to Sensor Z Calibration Point       | 2 mm       |
| Recommended Measurement Distance from Surface | 3 mm       |



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **EX3-7406\_Apr16**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7406**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

BN 04/26/2d6

Calibration date: **April 19, 2016**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 06-Apr-16 (No. 217-02288/02289)   | Apr-17                 |
| Power sensor NRP-Z91       | SN: 103244       | 06-Apr-16 (No. 217-02288)         | Apr-17                 |
| Power sensor NRP-Z91       | SN: 103245       | 06-Apr-16 (No. 217-02289)         | Apr-17                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 05-Apr-16 (No. 217-02293)         | Apr-17                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-15 (No. ES3-3013_Dec15)    | Dec-16                 |
| DAE4                       | SN: 660          | 23-Dec-15 (No. DAE4-660_Dec15)    | Dec-16                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (No. 217-02285/02284)   | In house check: Jun-16 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (No. 217-02285)         | In house check: Jun-16 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (No. 217-02284)         | In house check: Jun-16 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Apr-13) | In house check: Jun-16 |
| Network Analyzer HP 8753E  | SN: US37390585   | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

|                |                               |                                          |                        |
|----------------|-------------------------------|------------------------------------------|------------------------|
| Calibrated by: | Name<br><b>Jeton Kastrati</b> | Function<br><b>Laboratory Technician</b> | Signature<br>          |
| Approved by:   | <b>Katja Pokovic</b>          | <b>Technical Manager</b>                 |                        |
|                |                               |                                          | Issued: April 20, 2016 |

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### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(*f*)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe EX3DV4

## SN:7406

Manufactured: November 24, 2015  
Calibrated: April 19, 2016

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

## Basic Calibration Parameters

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)     |
|-----------------------------------------------------------|----------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.48     | 0.44     | 0.47     | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                                     | 100.7    | 97.9     | 98.6     |               |

## Modulation Calibration Parameters

| UID       | Communication System Name                |   | A<br>dB | B<br>dB $\sqrt{\mu\text{V}}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|------------------------------------------|---|---------|------------------------------|------|---------|----------|---------------------------|
| 0         | CW                                       | X | 0.0     | 0.0                          | 1.0  | 0.00    | 120.4    | $\pm 3.3 \%$              |
|           |                                          | Y | 0.0     | 0.0                          | 1.0  |         | 148.3    |                           |
|           |                                          | Z | 0.0     | 0.0                          | 1.0  |         | 146.7    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)     | X | 0.81    | 54.6                         | 7.4  | 10.00   | 50.3     | $\pm 2.2 \%$              |
|           |                                          | Y | 0.68    | 55.1                         | 7.9  |         | 47.9     |                           |
|           |                                          | Z | 1.34    | 61.0                         | 11.0 |         | 46.8     |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) | X | 2.83    | 68.0                         | 18.3 | 1.87    | 127.8    | $\pm 0.5 \%$              |
|           |                                          | Y | 2.82    | 68.4                         | 18.4 |         | 117.8    |                           |
|           |                                          | Z | 3.00    | 69.2                         | 19.0 |         | 115.9    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 6.54    | 67.4                         | 19.5 | 5.67    | 142.1    | $\pm 1.2 \%$              |
|           |                                          | Y | 6.19    | 66.7                         | 19.3 |         | 127.6    |                           |
|           |                                          | Z | 6.37    | 66.7                         | 19.2 |         | 125.7    |                           |
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 7.58    | 67.9                         | 21.8 | 9.29    | 114.4    | $\pm 1.7 \%$              |
|           |                                          | Y | 7.34    | 68.3                         | 22.5 |         | 144.3    |                           |
|           |                                          | Z | 7.53    | 67.7                         | 21.8 |         | 139.5    |                           |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.34    | 66.9                         | 19.4 | 5.80    | 137.5    | $\pm 1.2 \%$              |
|           |                                          | Y | 5.90    | 65.9                         | 19.0 |         | 123.8    |                           |
|           |                                          | Z | 6.24    | 66.4                         | 19.2 |         | 123.7    |                           |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 7.17    | 67.2                         | 21.5 | 9.28    | 109.5    | $\pm 1.7 \%$              |
|           |                                          | Y | 6.83    | 67.6                         | 22.3 |         | 137.0    |                           |
|           |                                          | Z | 7.23    | 67.4                         | 21.7 |         | 135.1    |                           |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.99    | 66.4                         | 19.2 | 5.75    | 132.4    | $\pm 0.9 \%$              |
|           |                                          | Y | 5.61    | 65.8                         | 19.1 |         | 119.4    |                           |
|           |                                          | Z | 5.91    | 65.9                         | 19.0 |         | 120.1    |                           |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 6.47    | 67.0                         | 19.5 | 5.82    | 137.0    | $\pm 1.2 \%$              |
|           |                                          | Y | 5.96    | 66.0                         | 19.1 |         | 123.9    |                           |
|           |                                          | Z | 6.33    | 66.3                         | 19.1 |         | 124.2    |                           |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.71    | 65.5                         | 18.9 | 5.73    | 113.2    | $\pm 1.2 \%$              |
|           |                                          | Y | 4.60    | 66.2                         | 19.6 |         | 144.2    |                           |
|           |                                          | Z | 4.93    | 66.5                         | 19.5 |         | 143.2    |                           |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 5.68    | 68.2                         | 22.4 | 9.21    | 117.6    | $\pm 1.7 \%$              |
|           |                                          | Y | 5.56    | 70.1                         | 24.1 |         | 146.1    |                           |
|           |                                          | Z | 5.87    | 69.4                         | 23.2 |         | 143.7    |                           |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.75    | 65.7                         | 19.1 | 5.72    | 112.3    | $\pm 0.9 \%$              |
|           |                                          | Y | 4.58    | 66.1                         | 19.5 |         | 143.2    |                           |
|           |                                          | Z | 4.95    | 66.7                         | 19.6 |         | 142.0    |                           |

|           |                                          |   |      |      |      |      |       |        |
|-----------|------------------------------------------|---|------|------|------|------|-------|--------|
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.71 | 65.5 | 18.9 | 5.72 | 110.2 | ±0.9 % |
|           |                                          | Y | 4.53 | 65.8 | 19.4 |      | 141.4 |        |
|           |                                          | Z | 4.90 | 66.5 | 19.5 |      | 138.1 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 5.69 | 68.3 | 22.5 | 9.21 | 117.3 | ±1.7 % |
|           |                                          | Y | 5.47 | 69.5 | 23.8 |      | 145.1 |        |
|           |                                          | Z | 5.85 | 69.3 | 23.1 |      | 142.0 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 7.04 | 68.1 | 22.2 | 9.24 | 141.2 | ±1.9 % |
|           |                                          | Y | 6.35 | 67.2 | 22.2 |      | 125.4 |        |
|           |                                          | Z | 6.82 | 67.1 | 21.7 |      | 127.5 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 7.45 | 68.3 | 22.2 | 9.30 | 148.0 | ±1.9 % |
|           |                                          | Y | 6.84 | 67.5 | 22.3 |      | 132.0 |        |
|           |                                          | Z | 7.24 | 67.4 | 21.8 |      | 134.6 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 6.35 | 66.9 | 19.4 | 5.81 | 135.3 | ±1.2 % |
|           |                                          | Y | 5.92 | 65.9 | 19.0 |      | 122.9 |        |
|           |                                          | Z | 6.26 | 66.4 | 19.2 |      | 122.1 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK) | X | 6.92 | 67.4 | 19.7 | 6.06 | 139.3 | ±1.2 % |
|           |                                          | Y | 6.52 | 66.6 | 19.5 |      | 127.9 |        |
|           |                                          | Z | 6.82 | 66.9 | 19.5 |      | 126.8 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 6 and 7).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 10.52   | 10.52   | 10.52   | 0.52               | 0.89                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 9.83    | 9.83    | 9.83    | 0.54               | 0.80                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 8.85    | 8.85    | 8.85    | 0.49               | 0.85                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 8.22    | 8.22    | 8.22    | 0.40               | 0.88                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 7.67    | 7.67    | 7.67    | 0.36               | 0.89                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 7.29    | 7.29    | 7.29    | 0.40               | 0.80                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 7.08    | 7.08    | 7.08    | 0.37               | 0.95                    | ± 12.0 %  |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 9.54    | 9.54    | 9.54    | 0.46               | 0.80                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 9.35    | 9.35    | 9.35    | 0.45               | 0.84                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 7.78    | 7.78    | 7.78    | 0.37               | 0.85                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 7.49    | 7.49    | 7.49    | 0.33               | 0.91                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 7.37    | 7.37    | 7.37    | 0.42               | 0.80                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 7.24    | 7.24    | 7.24    | 0.37               | 0.88                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 6.94    | 6.94    | 6.94    | 0.27               | 0.99                    | ± 12.0 %  |

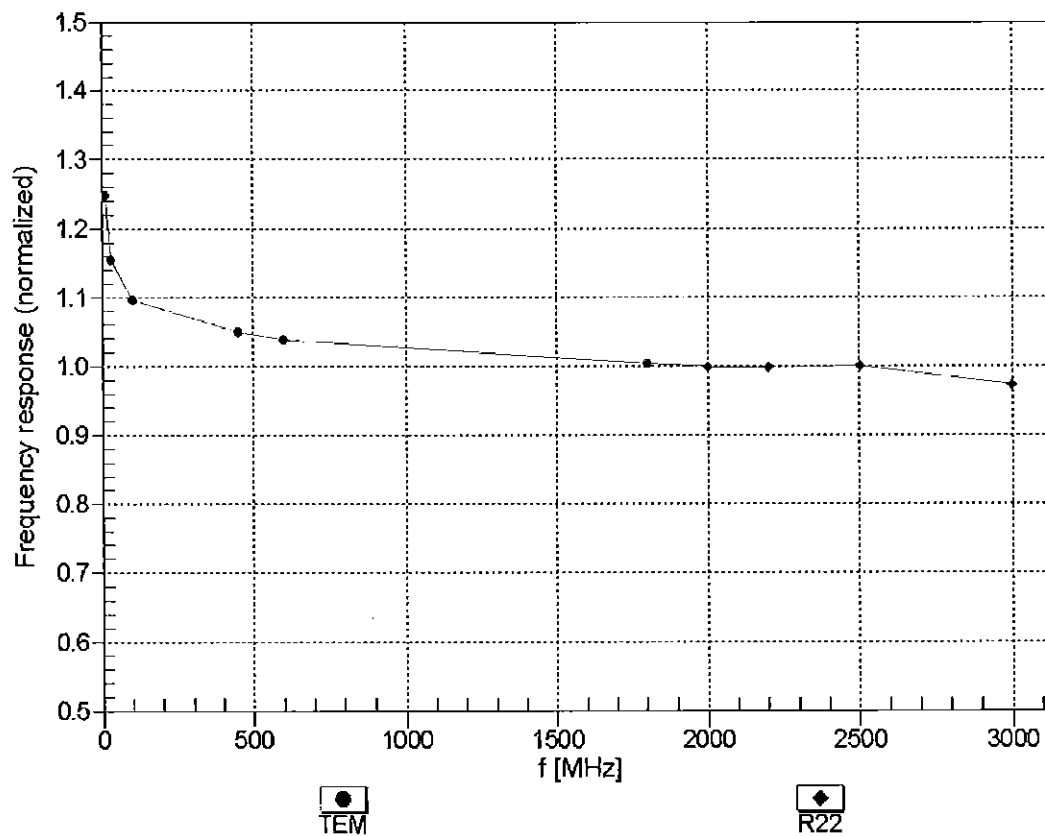
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

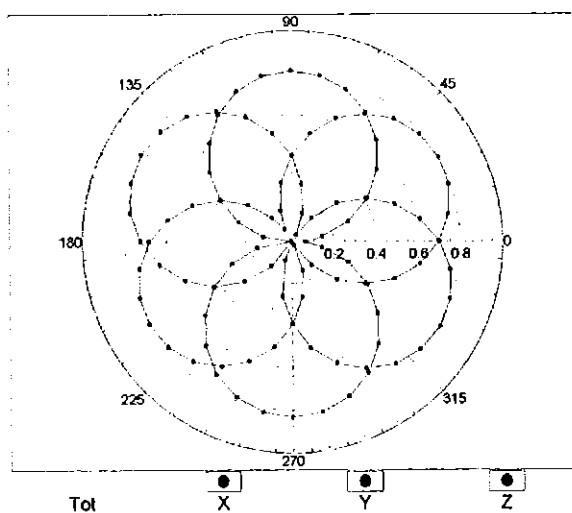
(TEM-Cell:ifi110 EXX, Waveguide: R22)



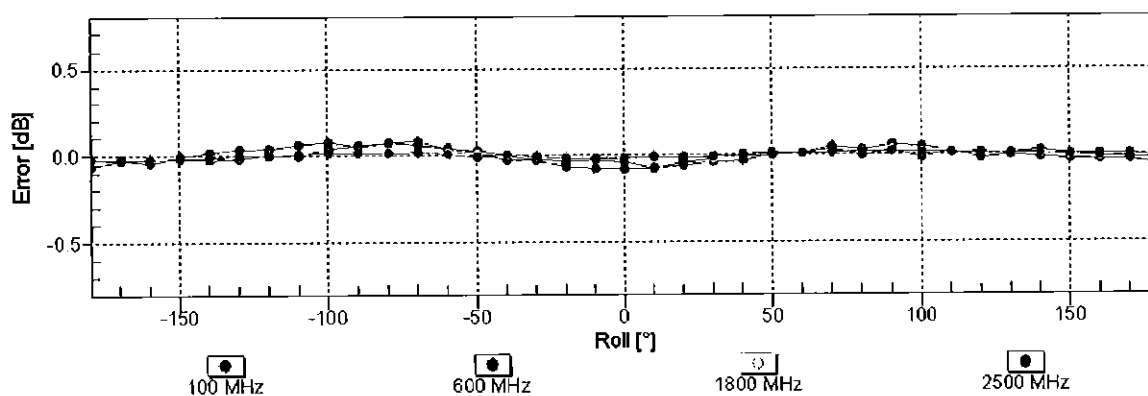
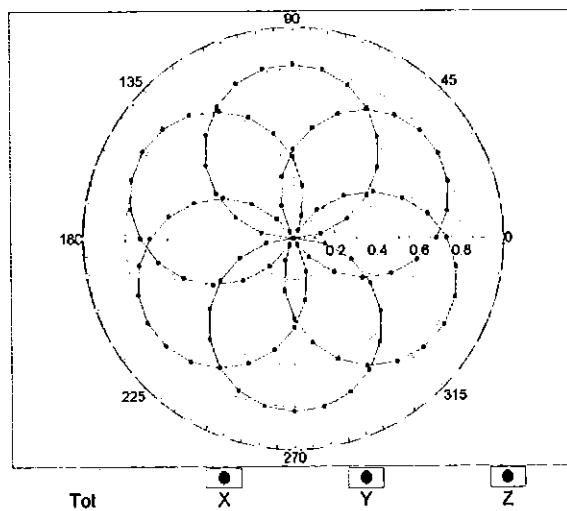
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM



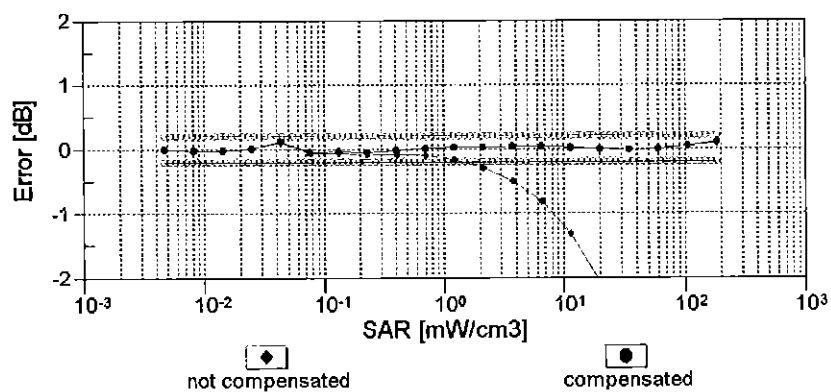
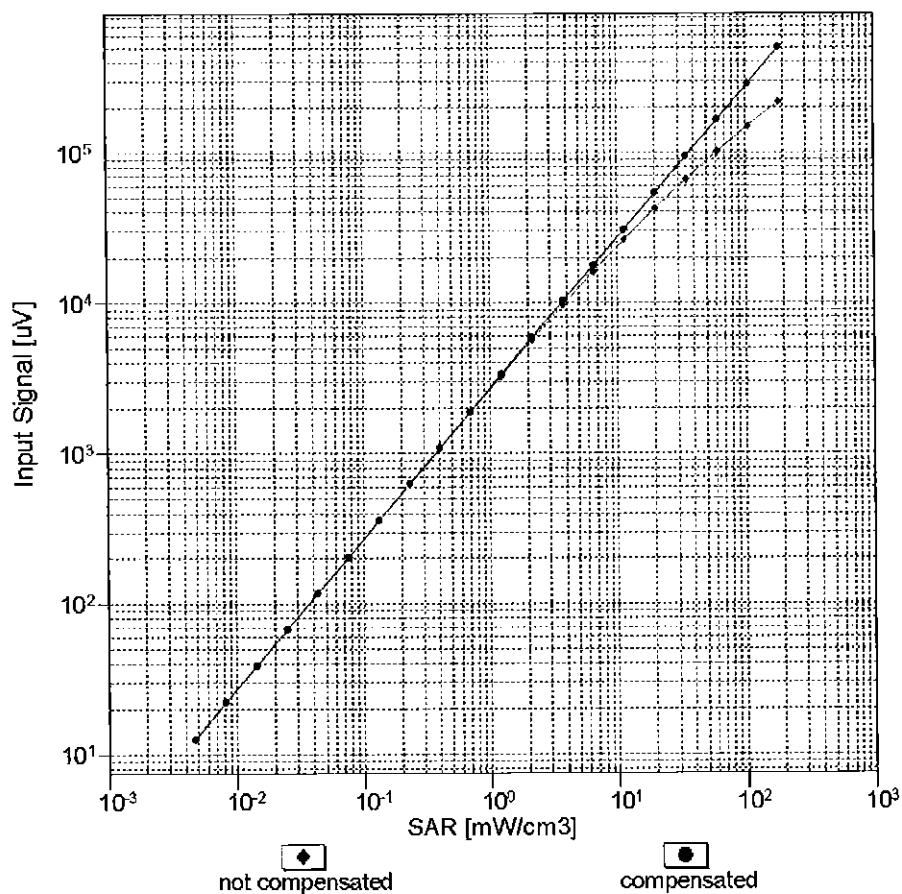
f=1800 MHz,R22



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

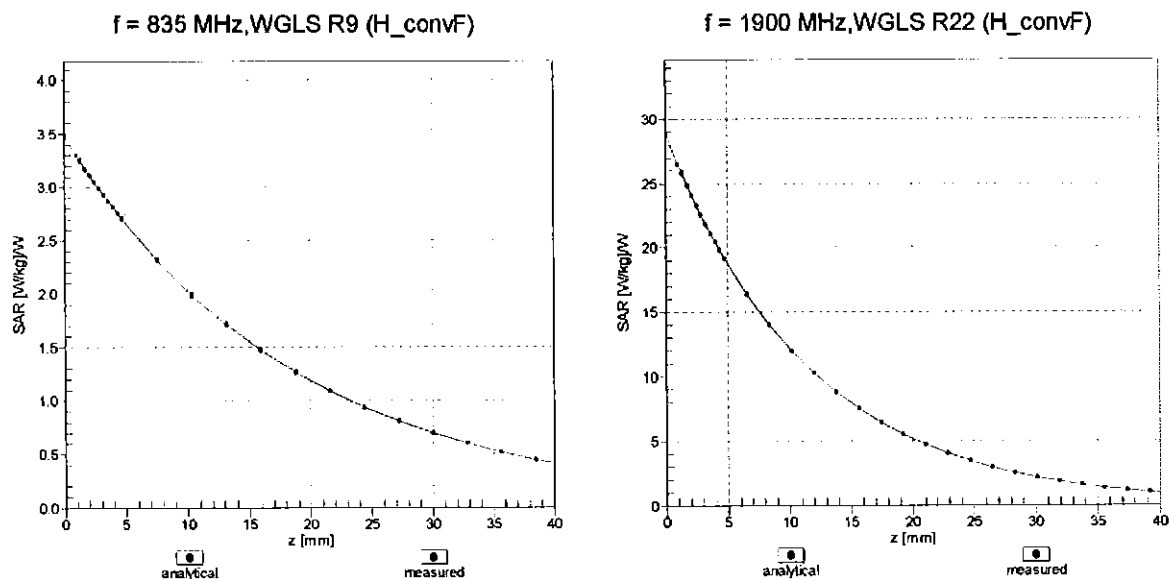
# Dynamic Range f(SAR<sub>head</sub>)

(TEM cell , f<sub>eval</sub>= 1900 MHz)



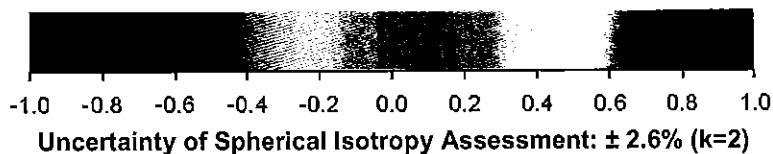
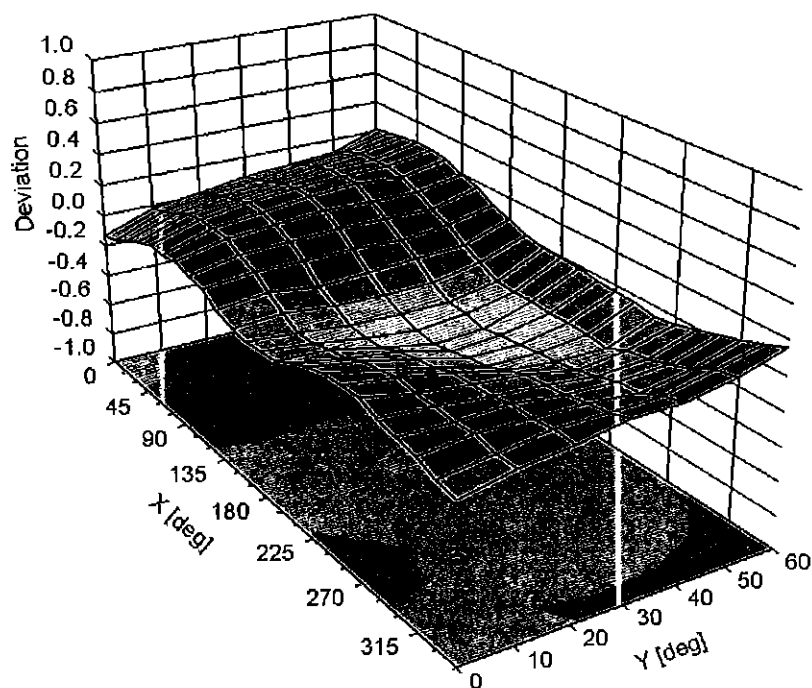
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

## Conversion Factor Assessment



## Deviation from Isotropy in Liquid

Error ( $\phi, \theta$ ),  $f = 900 \text{ MHz}$



**DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 0.4        |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **EX3-7409\_May16**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7409**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **May 17, 2016**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 06-Apr-16 (No. 217-02288/02289)   | Apr-17                 |
| Power sensor NRP-Z91       | SN: 103244       | 06-Apr-16 (No. 217-02288)         | Apr-17                 |
| Power sensor NRP-Z91       | SN: 103245       | 06-Apr-16 (No. 217-02289)         | Apr-17                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 05-Apr-16 (No. 217-02293)         | Apr-17                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-15 (No. ES3-3013_Dec15)    | Dec-16                 |
| DAE4                       | SN: 660          | 23-Dec-15 (No. DAE4-660_Dec15)    | Dec-16                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (No. 217-02285/02284)   | In house check: Jun-16 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (No. 217-02285)         | In house check: Jun-16 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (No. 217-02284)         | In house check: Jun-16 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Apr-13) | In house check: Jun-16 |
| Network Analyzer HP 8753E  | SN: US37390585   | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

|                                                                                                                 |                              |                                          |                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------|
| Calibrated by:                                                                                                  | Name<br><b>Michael Weber</b> | Function<br><b>Laboratory Technician</b> | Signature<br> |
| Approved by:                                                                                                    | <b>Katja Pokovic</b>         | <b>Technical Manager</b>                 |               |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                              |                                          | Issued: May 18, 2016                                                                               |



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Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\varphi$   | $\varphi$ rotation around probe axis                                                                                                                    |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe EX3DV4

## SN:7409

Manufactured: November 24, 2015  
Calibrated: May 17, 2016

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7409

## Basic Calibration Parameters

|                                       | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup> | 0.39     | 0.34     | 0.39     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>                 | 106.3    | 102.2    | 99.4     |           |

## Modulation Calibration Parameters

| UID       | Communication System Name                |   | A<br>dB | B<br>dB $\sqrt{\mu V}$ | C    | D<br>dB | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-----------|------------------------------------------|---|---------|------------------------|------|---------|----------|---------------------------|
| 0         | CW                                       | X | 0.0     | 0.0                    | 1.0  | 0.00    | 141.2    | ±3.3 %                    |
|           |                                          | Y | 0.0     | 0.0                    | 1.0  |         | 127.3    |                           |
|           |                                          | Z | 0.0     | 0.0                    | 1.0  |         | 131.8    |                           |
| 10010-CAA | SAR Validation (Square, 100ms, 10ms)     | X | 0.39    | 53.8                   | 5.5  | 10.00   | 42.5     | ±1.2 %                    |
|           |                                          | Y | 0.55    | 54.7                   | 5.9  |         | 41.8     |                           |
|           |                                          | Z | 0.85    | 58.7                   | 9.1  |         | 41.6     |                           |
| 10012-CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) | X | 3.55    | 75.3                   | 22.2 | 1.87    | 149.7    | ±0.7 %                    |
|           |                                          | Y | 3.32    | 72.6                   | 21.0 |         | 139.7    |                           |
|           |                                          | Z | 2.84    | 68.8                   | 19.0 |         | 144.7    |                           |
| 10100-CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 5.98    | 66.6                   | 19.3 | 5.67    | 113.6    | ±0.9 %                    |
|           |                                          | Y | 6.17    | 66.7                   | 19.4 |         | 107.1    |                           |
|           |                                          | Z | 6.13    | 66.1                   | 18.8 |         | 110.9    |                           |
| 10103-CAB | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | X | 6.59    | 66.2                   | 21.1 | 9.29    | 123.5    | ±1.4 %                    |
|           |                                          | Y | 7.27    | 67.9                   | 22.1 |         | 121.1    |                           |
|           |                                          | Z | 7.01    | 66.4                   | 21.1 |         | 119.9    |                           |
| 10108-CAC | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 5.72    | 66.1                   | 19.2 | 5.80    | 111.4    | ±1.2 %                    |
|           |                                          | Y | 6.34    | 67.6                   | 20.0 |         | 149.2    |                           |
|           |                                          | Z | 6.02    | 65.9                   | 19.0 |         | 109.0    |                           |
| 10151-CAB | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 6.27    | 66.1                   | 21.2 | 9.28    | 116.8    | ±1.4 %                    |
|           |                                          | Y | 6.89    | 67.6                   | 22.1 |         | 114.7    |                           |
|           |                                          | Z | 6.69    | 66.0                   | 21.0 |         | 116.4    |                           |
| 10154-CAC | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 5.37    | 65.9                   | 19.1 | 5.75    | 107.3    | ±1.2 %                    |
|           |                                          | Y | 5.98    | 67.2                   | 19.9 |         | 143.3    |                           |
|           |                                          | Z | 6.01    | 66.7                   | 19.4 |         | 149.2    |                           |
| 10160-CAB | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | X | 5.76    | 66.2                   | 19.2 | 5.82    | 109.5    | ±1.2 %                    |
|           |                                          | Y | 6.43    | 67.6                   | 20.0 |         | 148.3    |                           |
|           |                                          | Z | 6.05    | 65.6                   | 18.7 |         | 107.5    |                           |
| 10169-CAB | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.24    | 65.6                   | 19.3 | 5.73    | 127.4    | ±0.9 %                    |
|           |                                          | Y | 4.54    | 66.4                   | 19.8 |         | 120.4    |                           |
|           |                                          | Z | 4.62    | 65.9                   | 19.3 |         | 123.8    |                           |
| 10172-CAB | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)    | X | 4.91    | 68.0                   | 22.7 | 9.21    | 126.7    | ±1.4 %                    |
|           |                                          | Y | 5.24    | 68.8                   | 23.3 |         | 124.0    |                           |
|           |                                          | Z | 5.35    | 68.1                   | 22.5 |         | 125.0    |                           |
| 10175-CAC | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.27    | 65.8                   | 19.4 | 5.72    | 128.9    | ±0.9 %                    |
|           |                                          | Y | 4.52    | 66.2                   | 19.7 |         | 121.2    |                           |
|           |                                          | Z | 4.63    | 65.9                   | 19.3 |         | 125.2    |                           |

|           |                                          |   |      |      |      |      |       |        |
|-----------|------------------------------------------|---|------|------|------|------|-------|--------|
| 10181-CAB | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)    | X | 4.26 | 65.7 | 19.4 | 5.72 | 125.9 | ±0.9 % |
|           |                                          | Y | 4.47 | 66.0 | 19.5 |      | 120.6 |        |
|           |                                          | Z | 4.60 | 65.7 | 19.2 |      | 123.0 |        |
| 10237-CAB | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)    | X | 4.89 | 67.9 | 22.6 | 9.21 | 125.9 | ±1.7 % |
|           |                                          | Y | 5.26 | 69.0 | 23.4 |      | 123.8 |        |
|           |                                          | Z | 5.32 | 67.8 | 22.3 |      | 124.3 |        |
| 10252-CAB | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | X | 6.04 | 66.8 | 21.7 | 9.24 | 149.2 | ±1.4 % |
|           |                                          | Y | 6.64 | 68.1 | 22.6 |      | 148.9 |        |
|           |                                          | Z | 6.48 | 66.5 | 21.4 |      | 147.5 |        |
| 10267-CAB | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | X | 6.27 | 66.1 | 21.2 | 9.30 | 119.1 | ±1.4 % |
|           |                                          | Y | 6.88 | 67.4 | 22.0 |      | 115.9 |        |
|           |                                          | Z | 6.73 | 66.1 | 21.1 |      | 117.6 |        |
| 10297-AAA | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | X | 5.71 | 66.0 | 19.2 | 5.81 | 110.7 | ±0.9 % |
|           |                                          | Y | 6.41 | 67.8 | 20.2 |      | 149.8 |        |
|           |                                          | Z | 5.98 | 65.7 | 18.9 |      | 107.9 |        |
| 10311-AAA | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK) | X | 6.23 | 66.3 | 19.4 | 6.06 | 112.8 | ±0.9 % |
|           |                                          | Y | 6.51 | 66.6 | 19.5 |      | 107.4 |        |
|           |                                          | Z | 6.49 | 66.1 | 19.0 |      | 109.4 |        |

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of Norm X,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 6 and 7).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:7409

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 41.9                               | 0.89                            | 10.73   | 10.73   | 10.73   | 0.62               | 0.83                    | ± 12.0 %  |
| 835                  | 41.5                               | 0.90                            | 10.04   | 10.04   | 10.04   | 0.45               | 0.93                    | ± 12.0 %  |
| 1750                 | 40.1                               | 1.37                            | 8.05    | 8.05    | 8.05    | 0.38               | 0.80                    | ± 12.0 %  |
| 1900                 | 40.0                               | 1.40                            | 7.69    | 7.69    | 7.69    | 0.41               | 0.80                    | ± 12.0 %  |
| 2300                 | 39.5                               | 1.67                            | 7.22    | 7.22    | 7.22    | 0.25               | 0.92                    | ± 12.0 %  |
| 2450                 | 39.2                               | 1.80                            | 6.90    | 6.90    | 6.90    | 0.30               | 0.93                    | ± 12.0 %  |
| 2600                 | 39.0                               | 1.96                            | 6.77    | 6.77    | 6.77    | 0.32               | 0.83                    | ± 12.0 %  |

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:7409

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unc (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-----------|
| 750                  | 55.5                               | 0.96                            | 9.46    | 9.46    | 9.46    | 0.52               | 0.80                    | ± 12.0 %  |
| 835                  | 55.2                               | 0.97                            | 9.33    | 9.33    | 9.33    | 0.34               | 1.04                    | ± 12.0 %  |
| 1750                 | 53.4                               | 1.49                            | 7.72    | 7.72    | 7.72    | 0.44               | 0.80                    | ± 12.0 %  |
| 1900                 | 53.3                               | 1.52                            | 7.47    | 7.47    | 7.47    | 0.43               | 0.80                    | ± 12.0 %  |
| 2300                 | 52.9                               | 1.81                            | 7.22    | 7.22    | 7.22    | 0.36               | 0.85                    | ± 12.0 %  |
| 2450                 | 52.7                               | 1.95                            | 7.10    | 7.10    | 7.10    | 0.39               | 0.80                    | ± 12.0 %  |
| 2600                 | 52.5                               | 2.16                            | 6.83    | 6.83    | 6.83    | 0.39               | 0.86                    | ± 12.0 %  |

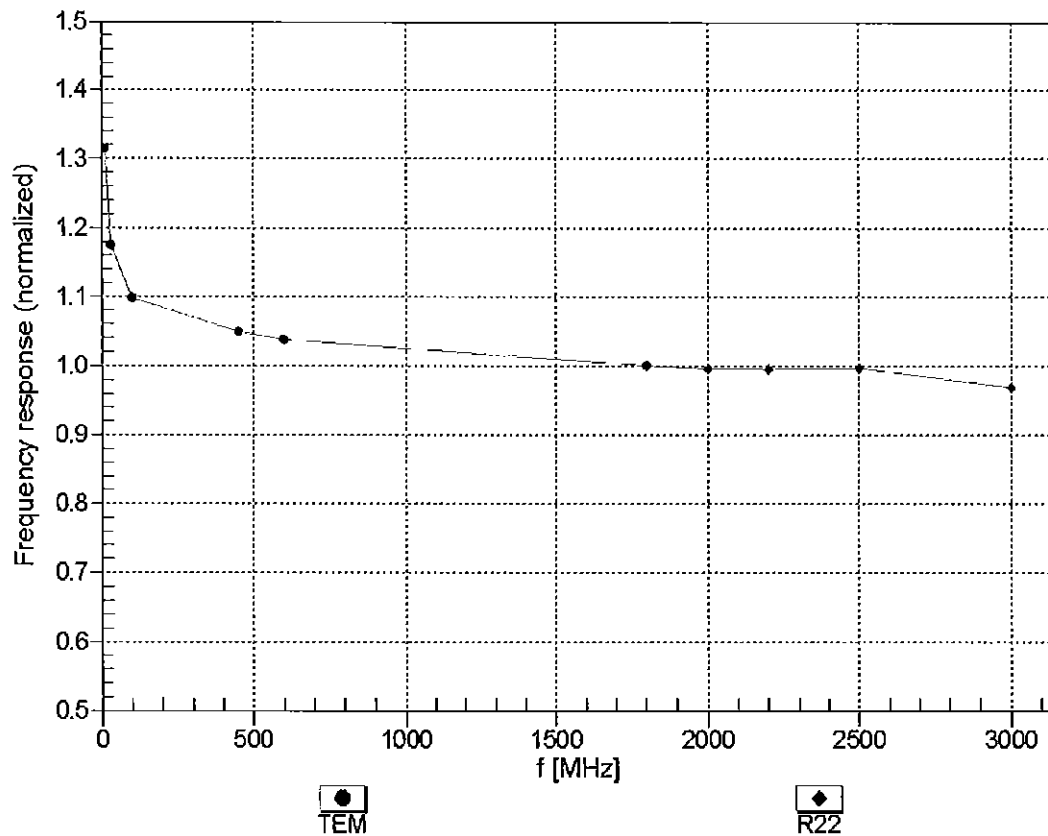
<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Frequency Response of E-Field

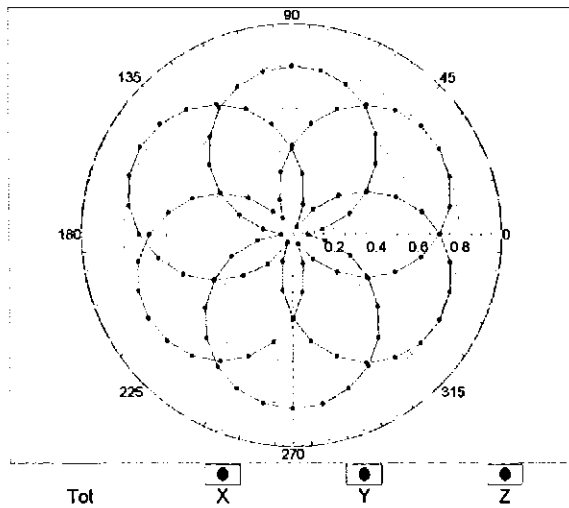
(TEM-Cell:ifi110 EXX, Waveguide: R22)



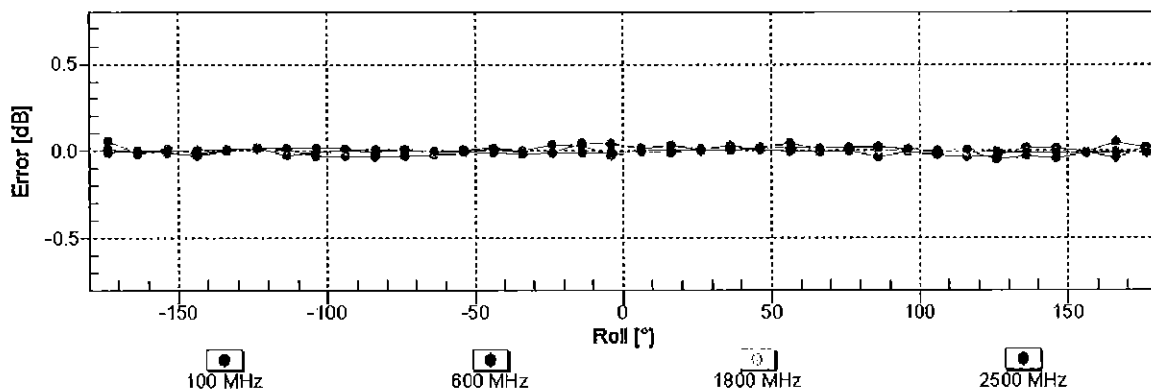
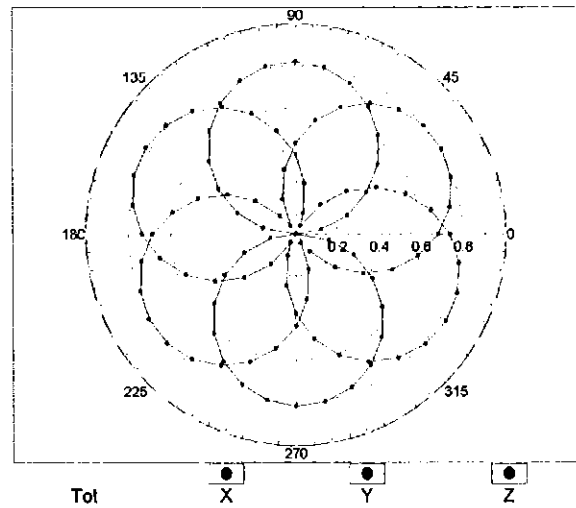
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

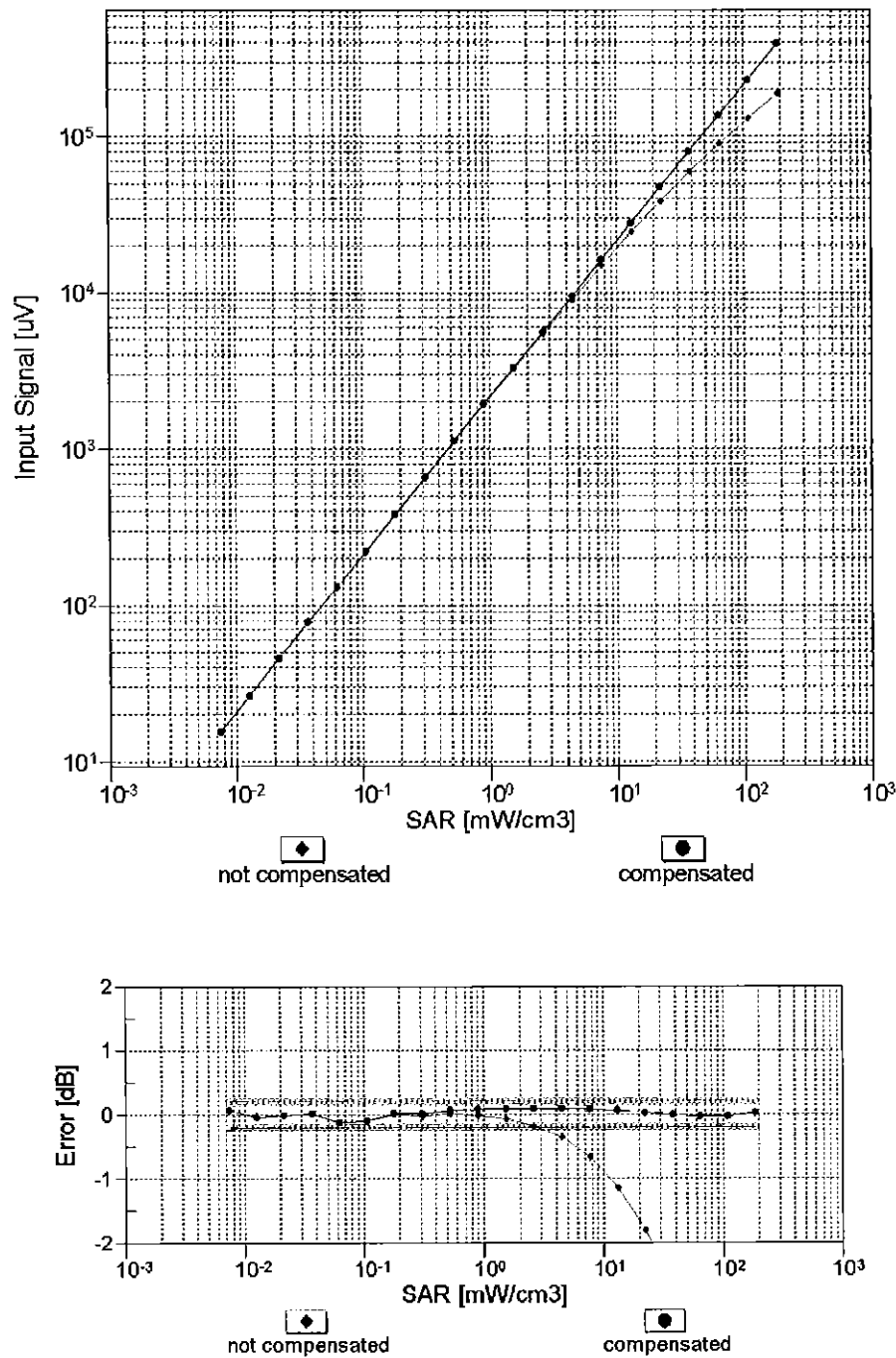


f=1800 MHz,R22



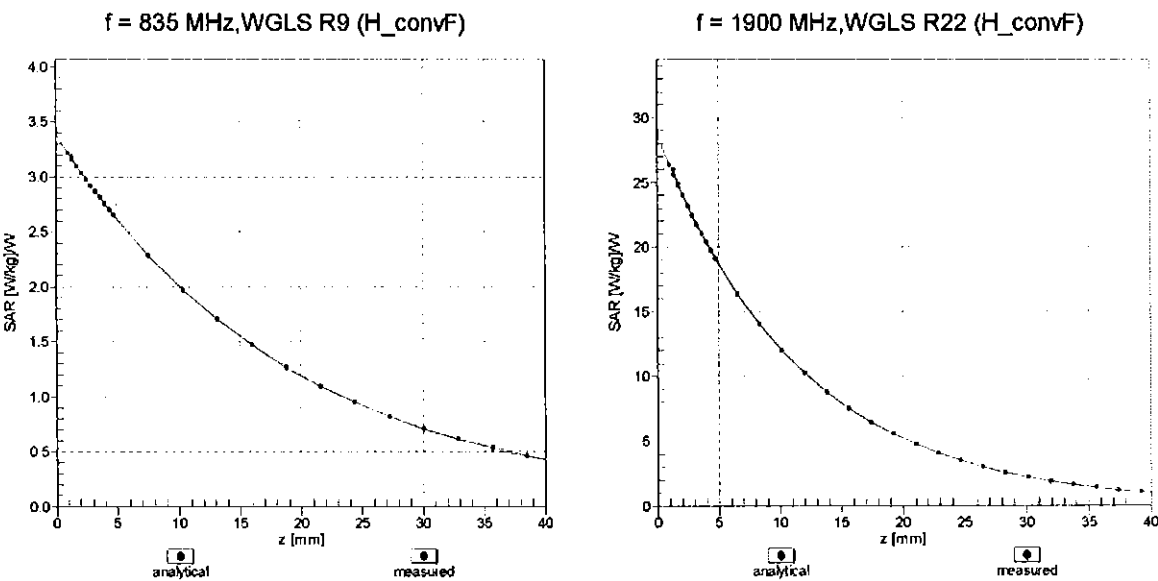
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

Dynamic Range f(SAR<sub>head</sub>)  
(TEM cell , f<sub>eval</sub>= 1900 MHz)

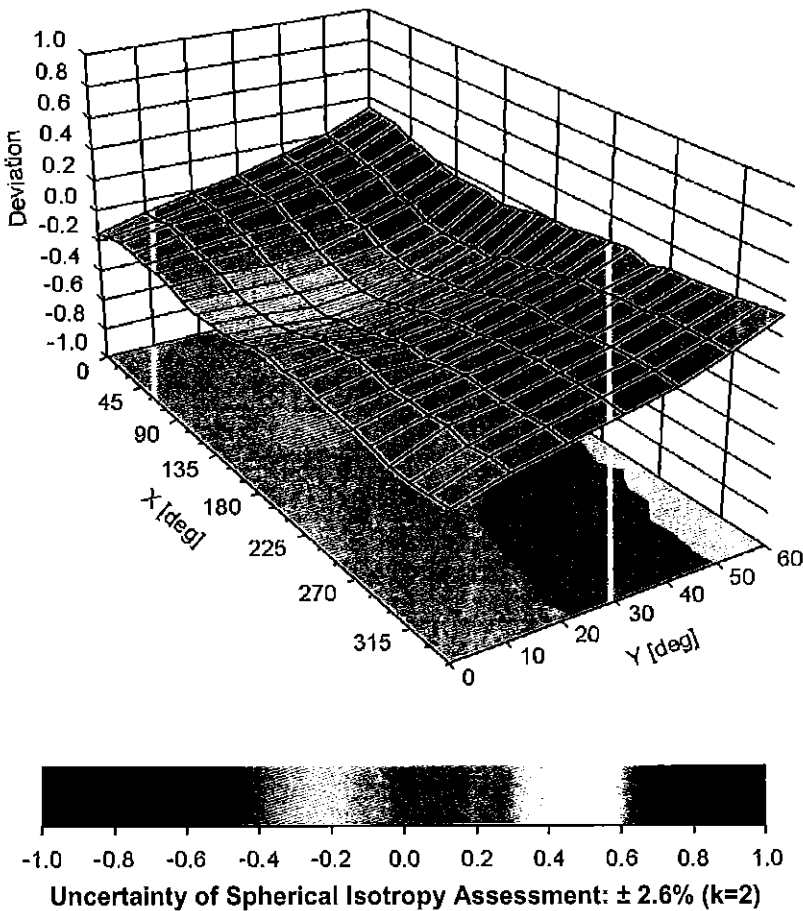


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid  
Error ( $\phi, \vartheta$ ), f = 900 MHz



**DASY/EASY - Parameters of Probe: EX3DV4 - SN:7409****Other Probe Parameters**

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 36.2       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

## APPENDIX D: SAR TISSUE SPECIFICATIONS

Measurement Procedure for Tissue verification:

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the tissue. The tissue was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity  $\epsilon'$  can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where  $Y$  is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively,  $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$ ,  $\omega$  is the angular frequency, and  $j = \sqrt{-1}$ .

**Table D-I**  
**Composition of the Tissue Equivalent Matter**

| Frequency (MHz)           | 750               | 750           | 1750 | 1750 |
|---------------------------|-------------------|---------------|------|------|
| Tissue                    | Head              | Body          | Head | Body |
| Ingredients (% by weight) |                   |               |      |      |
| DGBE                      | See Page<br>2 - 3 | See Page<br>2 | 47   | 31   |
| NaCl                      |                   |               | 0.4  | 0.2  |
| Water                     |                   |               | 52.6 | 68.8 |

|                                    |                                                                                                                                   |                       |                                                                                       |                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | SAR EVALUATION REPORT |  | Reviewed by:<br>Quality Manager |
| Test Dates:<br>03/14/16 – 07/25/16 | DUT Type:<br>Module Integrated to PTT Device                                                                                      |                       |                                                                                       | APPENDIX D:<br>Page 1 of 3      |

## 2 Composition / Information on ingredients

The Item is composed of the following ingredients:

|                                                                  |                                                                                                                                                     |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| H <sub>2</sub> O                                                 | Water, 35 – 58%                                                                                                                                     |
| Sucrose                                                          | Sugar, white, refined, 40 – 60%                                                                                                                     |
| NaCl                                                             | Sodium Chloride, 0 – 6%                                                                                                                             |
| Hydroxyethyl-cellulose                                           | Medium Viscosity (CAS# 9004-62-0), <0.3%                                                                                                            |
| Preventol-D7                                                     | Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1 – 0.7% |
| Relevant for safety; Refer to the respective Safety Data Sheet*. |                                                                                                                                                     |

**Figure D-1**

### Composition of 750 MHz Head and Body Tissue Equivalent Matter

**Note:** 750MHz liquid recipes are proprietary SPEAG. Since the composition is approximate to the actual liquids utilized, the manufacturer tissue-equivalent liquid data sheets are provided below.

#### Measurement Certificate / Material Test

|              |                                          |
|--------------|------------------------------------------|
| Item Name    | Body Tissue Simulating Liquid (MSL750V2) |
| Product No.  | SL AAM 075 AA (Charge: 150223-3)         |
| Manufacturer | SPEAG                                    |

#### Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

#### Setup Validation

Validation results were within  $\pm 2.5\%$  towards the target values of Methanol.

#### Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

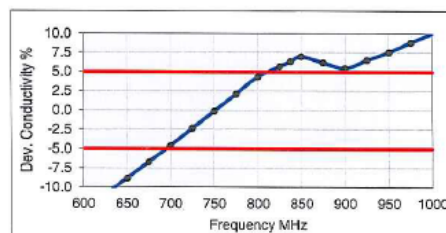
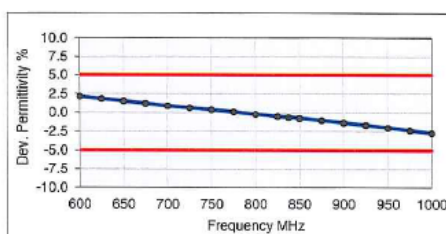
#### Test Condition

|                 |                                                             |
|-----------------|-------------------------------------------------------------|
| Ambient         | Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%. |
| TSL Temperature | 22°C                                                        |
| Test Date       | 25-Feb-15                                                   |
| Operator        | IEN                                                         |

#### Additional Information

|                   |                         |
|-------------------|-------------------------|
| TSL Density       | 1.212 g/cm <sup>3</sup> |
| TSL Heat-capacity | 3.006 kJ/(kg*K)         |

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-e'    | HP-e'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 600     | 57.3     | 24.76  | 0.83  | 56.1   | 0.95  | 2.2                | -13.2   |
| 625     | 57.1     | 24.43  | 0.85  | 56.0   | 0.95  | 1.8                | -11.0   |
| 650     | 56.8     | 24.09  | 0.87  | 55.9   | 0.96  | 1.5                | -8.8    |
| 675     | 56.5     | 23.80  | 0.89  | 55.8   | 0.96  | 1.2                | -6.7    |
| 700     | 56.2     | 23.51  | 0.92  | 55.7   | 0.96  | 0.9                | -4.6    |
| 725     | 56.0     | 23.28  | 0.94  | 55.6   | 0.96  | 0.6                | -2.4    |
| 750     | 55.7     | 23.06  | 0.96  | 55.5   | 0.96  | 0.4                | -0.1    |
| 775     | 55.5     | 22.87  | 0.99  | 55.4   | 0.97  | 0.1                | 2.1     |
| 800     | 55.2     | 22.68  | 1.01  | 55.3   | 0.97  | -0.2               | 4.4     |
| 825     | 55.0     | 22.52  | 1.03  | 55.2   | 0.98  | -0.5               | 5.7     |
| 838     | 54.9     | 22.44  | 1.05  | 55.2   | 0.98  | -0.6               | 6.3     |
| 850     | 54.8     | 22.36  | 1.06  | 55.2   | 0.99  | -0.7               | 7.0     |
| 875     | 54.5     | 22.24  | 1.08  | 55.1   | 1.02  | -1.0               | 6.2     |
| 900     | 54.3     | 22.12  | 1.11  | 55.0   | 1.05  | -1.3               | 5.5     |
| 925     | 54.1     | 22.01  | 1.13  | 55.0   | 1.06  | -1.6               | 6.5     |
| 950     | 53.9     | 21.89  | 1.16  | 54.9   | 1.08  | -2.0               | 7.6     |
| 975     | 53.6     | 21.81  | 1.18  | 54.9   | 1.09  | -2.3               | 8.8     |
| 1000    | 53.4     | 21.73  | 1.21  | 54.8   | 1.10  | -2.7               | 10.1    |



**Figure D-2**

### 750MHz Body Tissue Equivalent Matter

|                                    |                                                                                     |                       |                                                                                       |                                 |
|------------------------------------|-------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                |  | SAR EVALUATION REPORT |  | Reviewed by:<br>Quality Manager |
| Test Dates:<br>03/14/16 – 07/25/16 | DUT Type:<br>Module Integrated to PTT Device                                        |                       |                                                                                       | APPENDIX D:<br>Page 2 of 3      |

## Measurement Certificate / Material Test

Item Name **Head Tissue Simulating Liquid (HSL750V2)**  
 Product No. SL AAH 075 AA (Charge: 150213-1)  
 Manufacturer SPEAG

### Measurement Method

TSL dielectric parameters measured using calibrated OCP probe.

### Setup Validation

Validation results were within  $\pm 2.5\%$  towards the target values of Methanol.

### Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

### Test Condition

Ambient Environment temperatur ( $22 \pm 3$ )°C and humidity < 70%.  
 TSL Temperature 22°C  
 Test Date 18-Feb-15  
 Operator IEN

### Additional Information

TSL Density 1.284 g/cm<sup>3</sup>  
 TSL Heat-capacity 2.701 kJ/(kg\*K)

| f [MHz] | Measured |        |       | Target |       | Diff.to Target [%] |         |
|---------|----------|--------|-------|--------|-------|--------------------|---------|
|         | HP-e'    | HP-e'' | sigma | eps    | sigma | Δ-eps              | Δ-sigma |
| 600     | 44.6     | 22.42  | 0.75  | 42.7   | 0.88  | 4.5                | -15.1   |
| 625     | 44.3     | 22.20  | 0.77  | 42.6   | 0.88  | 3.9                | -12.7   |
| 650     | 43.9     | 21.98  | 0.79  | 42.5   | 0.89  | 3.3                | -10.3   |
| 675     | 43.5     | 21.75  | 0.82  | 42.3   | 0.89  | 2.8                | -8.0    |
| 700     | 43.1     | 21.53  | 0.84  | 42.2   | 0.89  | 2.2                | -5.7    |
| 725     | 42.8     | 21.36  | 0.86  | 42.1   | 0.89  | 1.8                | -3.3    |
| 750     | 42.5     | 21.22  | 0.89  | 41.9   | 0.89  | 1.3                | -0.9    |
| 775     | 42.2     | 21.06  | 0.91  | 41.8   | 0.90  | 0.8                | 1.4     |
| 800     | 41.8     | 20.90  | 0.93  | 41.7   | 0.90  | 0.3                | 3.7     |
| 825     | 41.5     | 20.77  | 0.95  | 41.6   | 0.91  | -0.2               | 5.1     |
| 838     | 41.4     | 20.71  | 0.96  | 41.5   | 0.91  | -0.4               | 5.8     |
| 850     | 41.2     | 20.65  | 0.98  | 41.5   | 0.92  | -0.7               | 6.6     |
| 875     | 40.9     | 20.53  | 1.00  | 41.5   | 0.94  | -1.4               | 6.0     |
| 900     | 40.6     | 20.42  | 1.02  | 41.5   | 0.97  | -2.1               | 5.4     |
| 925     | 40.4     | 20.32  | 1.05  | 41.5   | 0.98  | -2.6               | 6.5     |
| 950     | 40.1     | 20.22  | 1.07  | 41.4   | 0.99  | -3.2               | 7.5     |
| 975     | 39.8     | 20.14  | 1.09  | 41.4   | 1.00  | -3.8               | 8.7     |
| 1000    | 39.5     | 20.05  | 1.12  | 41.3   | 1.01  | -4.3               | 9.9     |

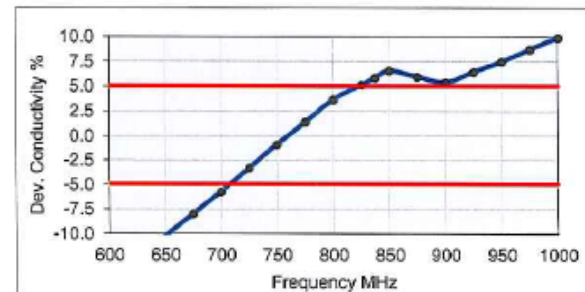
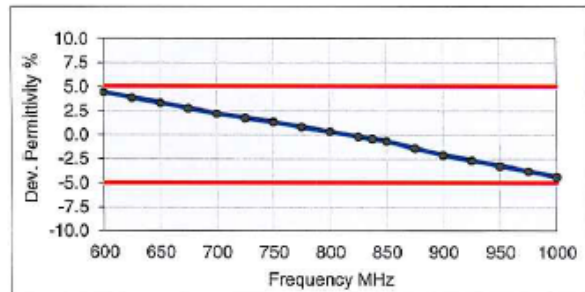


Figure D-3  
 750MHz Head Tissue Equivalent Matter

FCC ID: BV8BBPBM214



SAR EVALUATION REPORT



Reviewed by:  
 Quality Manager

Test Dates:  
 03/14/16 – 07/25/16

DUT Type:  
 Module Integrated to PTT Device

APPENDIX D:  
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## APPENDIX E: SAR SYSTEM VALIDATION

Per FCC KDB Publication 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

**Table E-I**  
**SAR System Validation Summary**

| SAR SYSTEM # | FREQ. [MHz] | DATE      | PROBE SN | PROBE TYPE | PROBE CAL. POINT |      | COND.        | PERM.            | CW VALIDATION |                 |                | MOD. VALIDATION |             |     |
|--------------|-------------|-----------|----------|------------|------------------|------|--------------|------------------|---------------|-----------------|----------------|-----------------|-------------|-----|
|              |             |           |          |            |                  |      | ( $\sigma$ ) | ( $\epsilon_r$ ) | SENSITIVITY   | PROBE LINEARITY | PROBE ISOTROPY | MOD. TYPE       | DUTY FACTOR | PAR |
| K            | 750         | 2/16/2016 | 3022     | ES3DV2     | 750              | Head | 0.905        | 42.793           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| K            | 1750        | 2/9/2016  | 3022     | ES3DV2     | 1750             | Head | 1.385        | 38.918           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| G            | 750         | 12/3/2015 | 3334     | ES3DV3     | 750              | Body | 0.994        | 55.948           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| K            | 750         | 2/15/2016 | 3022     | ES3DV2     | 750              | Body | 0.967        | 56.814           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| E            | 1750        | 4/25/2016 | 7406     | EX3DV4     | 1750             | Body | 1.490        | 53.432           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| K            | 1750        | 2/10/2016 | 3022     | ES3DV2     | 1750             | Body | 1.484        | 51.369           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |
| K            | 1750        | 5/23/2016 | 7409     | EX3DV4     | 1750             | Body | 1.511        | 52.333           | PASS          | PASS            | PASS           | N/A             | N/A         | N/A |

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to FCC KDB Publication 865664 D01v01r04.

|                                    |                                                                                                                                   |                            |                                                                                       |                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BV8BBPBM214                |  <b>PCTEST</b><br>ENGINEERING LABORATORY, INC. | SAR EVALUATION REPORT      |  | Reviewed by:<br>Quality Manager |
| Test Dates:<br>03/14/16 – 07/25/16 | DUT Type:<br>Module Integrated to PTT Device                                                                                      | APPENDIX E:<br>Page 1 of 1 |                                                                                       |                                 |