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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.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
Simultaneous SAR per KDB 690783 D01v01r03:			2.25	5.93

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for controlled environment/occupational 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 Ortanez
President

The SAR Tick is an initiative of the Mobile Manufacturers Forum (MMF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MMF. Further details can be obtained by emailing: sartick@mmfai.info.

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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	**24.5**
	Nominal	**24.0**
LTE Band 14	Maximum	**24.5**
	Nominal	**24.0**
LTE Band 4 (AWS)	Maximum	**25.5**
	Nominal	**25.0**

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.

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.

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
		Antennas
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,
		Batteries
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
		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
	12082-0681-01	Speaker Microphone, Wireless, Bluetooth
IV	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
		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
		Miscellaneous
	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

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 < 4.0 W/kg, no additional evaluations for Body-worn Accessory Grouping 2 and 3 were required.

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
	12082-0681-01	Speaker Microphone, Wireless, Bluetooth
IV	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 < 4.0 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)

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		

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 (ρ). 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:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
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]

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:

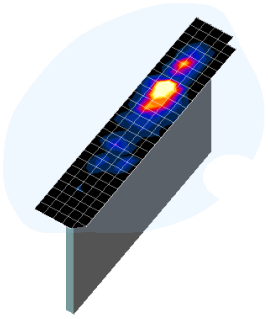

Figure 4-1
Sample SAR Area Scan

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.

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

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

*Also compliant to IEEE 1528-2013 Table 6

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 ε = 3 and loss tangent δ = 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.

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 *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR 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.

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 ≤ 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.

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.

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 10 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	23.06	0	0
	1	25	**23.11**		0
	1	49	22.90		0
	25	0	22.08	0-1	1
	25	12	**22.12**		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

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

LTE Band 13 5 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
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 10 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23330 (793.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	23.85	0	0
	1	25	**24.30**		0
	1	49	23.90		0
	25	0	**23.27**	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

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

LTE Band 14 5 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23330 (793.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
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) 20 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
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.

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

LTE Band 4 (AWS) 15 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 20025 (1717.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20325 (1747.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			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) 10 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 20000 (1715.0 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20350 (1750.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			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

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

LTE Band 4 (AWS) 5 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 19975 (1712.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20375 (1752.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			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

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, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	%dev σ	%dev ε
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.

9.2 Test System Verification

Prior to SAR assessment, the system is verified to ±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 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_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
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%

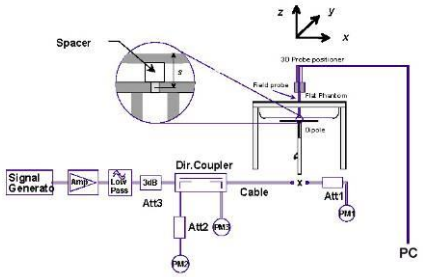

Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

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 Spatial Peak Controlled Environment / Occupational											Head 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational											Head 8.0 W/kg (mW/g) averaged over 1 gram										

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	
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	A3
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 Spatial Peak Controlled Environment / Occupational											Head 8.0 W/kg (mW/g) 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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	QPSK	25	12	A40302000148	1:1	0.128	1.374	0.176	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Environment / Occupational											Body-Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational											Body-Worn 8.0 W/kg (mW/g) averaged over 1 gram											

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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) averaged over 1 gram										

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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) 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	
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	A6
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 Spatial Peak Controlled Environment / Occupational													Body-Worn 8.0 W/kg (mW/g) averaged over 1 gram									

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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) averaged over 1 gram									

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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational														Body- Worn 8.0 W/kg (mW/g) averaged over 1 gram									

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	KRE1011506/1	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	KRE1011506/1	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 Spatial Peak Controlled Environment / Occupational															Body- Worn 8.0 W/kg (mW/g) 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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	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	KRE1011506/1	QPSK	50	0	A40302000148	1:1	0.389	1.365	0.531	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Environment / Occupational														Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational														Body- Worn 8.0 W/kg (mW/g) averaged over 1 gram								

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 Spatial Peak Controlled Environment / Occupational												Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational												Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational												Body- Worn 8.0 W/kg (mW/g) averaged over 1 gram										

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 Spatial Peak Controlled Environment / Occupational													Body- Worn 8.0 W/kg (mW/g) 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	
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	A11
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 Spatial Peak Controlled Environment / Occupational														Body- Worn 8.0 W/kg (mW/g) 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 Spatial Peak Controlled Environment / Occupational														Body- Worn 8.0 W/kg (mW/g) averaged over 1 gram									

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 < 4.0 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.

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 KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤ 8.0 W/kg. The different test positions, antennas and accessories within an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

Note:
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 and 031315OWD-1302-S).

11.3 Head SAR Simultaneous Transmission Analysis

Table 11-1
Simultaneous Transmission Scenario with VHF

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.500	**1.859**
	LTE Band 14	0.290	1.500	1.790
	LTE Band 4 (AWS)	0.080	1.500	1.580

Table 11-2
Simultaneous Transmission Scenario with UHF

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.875	**2.234**
	LTE Band 14	0.290	1.875	2.165
	LTE Band 4 (AWS)	0.080	1.875	1.955

Table 11-3
Simultaneous Transmission Scenario with 700 MHz

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 4 (AWS)	0.080	1.365	**1.445**

Table 11-4
Simultaneous Transmission Scenario with 800 MHz

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.940	**1.299**
	LTE Band 14	0.290	0.940	1.230
	LTE Band 4 (AWS)	0.080	0.940	1.020

Table 11-5
Simultaneous Transmission Scenario with Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.003	**0.362**
	LTE Band 14	0.290	0.003	0.293
	LTE Band 4 (AWS)	0.080	0.003	0.083

Table 11-6
Simultaneous Transmission Scenario with 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.004	**0.363**
	LTE Band 14	0.290	0.004	0.294
	LTE Band 4 (AWS)	0.080	0.004	0.084

Table 11-7
Simultaneous Transmission Scenario with 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.020	**0.379**
	LTE Band 14	0.290	0.020	0.310
	LTE Band 4 (AWS)	0.080	0.020	0.100

Table 11-8
Simultaneous Transmission Scenario with VHF and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.500	0.003	**1.862**
	LTE Band 14	0.290	1.500	0.003	1.793
	LTE Band 4 (AWS)	0.080	1.500	0.003	1.583

Table 11-9
Simultaneous Transmission Scenario with UHF and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.875	0.003	**2.237**
	LTE Band 14	0.290	1.875	0.003	2.168
	LTE Band 4 (AWS)	0.080	1.875	0.003	1.958

Table 11-10
Simultaneous Transmission Scenario with 700 MHz and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 4 (AWS)	0.080	1.365	0.003	**1.448**

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

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.940	0.003	**1.302**
	LTE Band 14	0.290	0.940	0.003	1.233
	LTE Band 4 (AWS)	0.080	0.940	0.003	1.023

Table 11-12
Simultaneous Transmission Scenario with VHF and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.500	0.004	**1.863**
	LTE Band 14	0.290	1.500	0.004	1.794
	LTE Band 4 (AWS)	0.080	1.500	0.004	1.584

Table 11-13
Simultaneous Transmission Scenario with UHF and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.875	0.004	**2.238**
	LTE Band 14	0.290	1.875	0.004	2.169
	LTE Band 4 (AWS)	0.080	1.875	0.004	1.959

Table 11-14
Simultaneous Transmission Scenario with 700 MHz and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 4 (AWS)	0.080	1.365	0.004	**1.449**

Table 11-15
Simultaneous Transmission Scenario with 800 MHz and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.940	0.004	**1.303**
	LTE Band 14	0.290	0.940	0.004	1.234
	LTE Band 4 (AWS)	0.080	0.940	0.004	1.024

Table 11-16
Simultaneous Transmission Scenario with VHF and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.500	0.020	**1.879**
	LTE Band 14	0.290	1.500	0.020	1.810
	LTE Band 4 (AWS)	0.080	1.500	0.020	1.600

Table 11-17
Simultaneous Transmission Scenario with UHF and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	1.875	0.020	**2.254**
	LTE Band 14	0.290	1.875	0.020	2.185
	LTE Band 4 (AWS)	0.080	1.875	0.020	1.975

Table 11-18
Simultaneous Transmission Scenario with 700 MHz and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 4 (AWS)	0.080	1.365	0.020	**1.465**

Table 11-19
Simultaneous Transmission Scenario with 800 MHz and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	LTE Band 13	0.359	0.940	0.020	**1.319**
	LTE Band 14	0.290	0.940	0.020	1.250
	LTE Band 4 (AWS)	0.080	0.940	0.020	1.040

11.4 Body-Worn Simultaneous Transmission Analysis

Table 11-20
Simultaneous Transmission Scenario with VHF

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	5.200	5.451
	LTE Band 14	0.147	5.200	5.347
	LTE Band 4 (AWS)	0.700	5.200	**5.900**

Table 11-21
Simultaneous Transmission Scenario with UHF

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	4.670	4.921
	LTE Band 14	0.147	4.670	4.817
	LTE Band 4 (AWS)	0.700	4.670	**5.370**

Table 11-22
Simultaneous Transmission Scenario with 700 MHz

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 4 (AWS)	0.700	2.445	**3.145**

Table 11-23
Simultaneous Transmission Scenario with 800 MHz

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	3.345	3.596
	LTE Band 14	0.147	3.345	3.492
	LTE Band 4 (AWS)	0.700	3.345	**4.045**

Table 11-24
Simultaneous Transmission Scenario with Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	0.006	0.257
	LTE Band 14	0.147	0.006	0.153
	LTE Band 4 (AWS)	0.700	0.006	**0.706**

Table 11-25
Simultaneous Transmission Scenario with 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	0.005	0.256
	LTE Band 14	0.147	0.005	0.152
	LTE Band 4 (AWS)	0.700	0.005	**0.705**

Table 11-26
Simultaneous Transmission Scenario with 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	0.031	0.282
	LTE Band 14	0.147	0.031	0.178
	LTE Band 4 (AWS)	0.700	0.031	**0.731**

Table 11-27
Simultaneous Transmission Scenario with VHF and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	5.200	0.006	5.457
	LTE Band 14	0.147	5.200	0.006	5.353
	LTE Band 4 (AWS)	0.700	5.200	0.006	**5.906**

Table 11-28
Simultaneous Transmission Scenario with UHF and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	4.670	0.006	4.927
	LTE Band 14	0.147	4.670	0.006	4.823
	LTE Band 4 (AWS)	0.700	4.670	0.006	**5.376**

Table 11-29
Simultaneous Transmission Scenario with 700 MHz and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 4 (AWS)	0.700	2.445	0.006	**3.151**

Table 11-30
Simultaneous Transmission Scenario with 800 MHz and Bluetooth

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	3.345	0.006	3.602
	LTE Band 14	0.147	3.345	0.006	3.498
	LTE Band 4 (AWS)	0.700	3.345	0.006	**4.051**

Table 11-31
Simultaneous Transmission Scenario with VHF and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	5.200	0.005	5.456
	LTE Band 14	0.147	5.200	0.005	5.352
	LTE Band 4 (AWS)	0.700	5.200	0.005	**5.905**

Table 11-32
Simultaneous Transmission Scenario with UHF and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	4.670	0.005	4.926
	LTE Band 14	0.147	4.670	0.005	4.822
	LTE Band 4 (AWS)	0.700	4.670	0.005	**5.375**

Table 11-33
Simultaneous Transmission Scenario with 700 MHz and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 4 (AWS)	0.700	2.445	0.005	**3.150**

Table 11-34
Simultaneous Transmission Scenario with 800 MHz and 2.4 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	3.345	0.005	3.601
	LTE Band 14	0.147	3.345	0.005	3.497
	LTE Band 4 (AWS)	0.700	3.345	0.005	**4.050**

Table 11-35
Simultaneous Transmission Scenario with VHF and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	VHF SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	5.200	0.031	5.482
	LTE Band 14	0.147	5.200	0.031	5.378
	LTE Band 4 (AWS)	0.700	5.200	0.031	**5.931**

Table 11-36
Simultaneous Transmission Scenario with UHF and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	UHF SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	4.670	0.031	4.952
	LTE Band 14	0.147	4.670	0.031	4.848
	LTE Band 4 (AWS)	0.700	4.670	0.031	**5.401**

Table 11-37
Simultaneous Transmission Scenario with 700 MHz and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	700 MHz SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 4 (AWS)	0.700	2.445	0.031	**3.176**

Table 11-38
Simultaneous Transmission Scenario with 800 MHz and 5 GHz WLAN

Exposure Condition	Mode	LTE SAR (W/kg)	800 MHz SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	LTE Band 13	0.251	3.345	0.031	3.627
	LTE Band 14	0.147	3.345	0.031	3.523
	LTE Band 4 (AWS)	0.700	3.345	0.031	**4.076**

11.5 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

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.

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	M1S5A00-009
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.

14 MEASUREMENT UNCERTAINTIES

a	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System								
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	∞
Test Sample Related								
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	∞
Phantom & Tissue Parameters								
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 Unceritainty	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	∞
Combined Standard Uncertainty (k=1)		RSS				11.5	11.3	60
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				23.0	22.6	

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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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

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

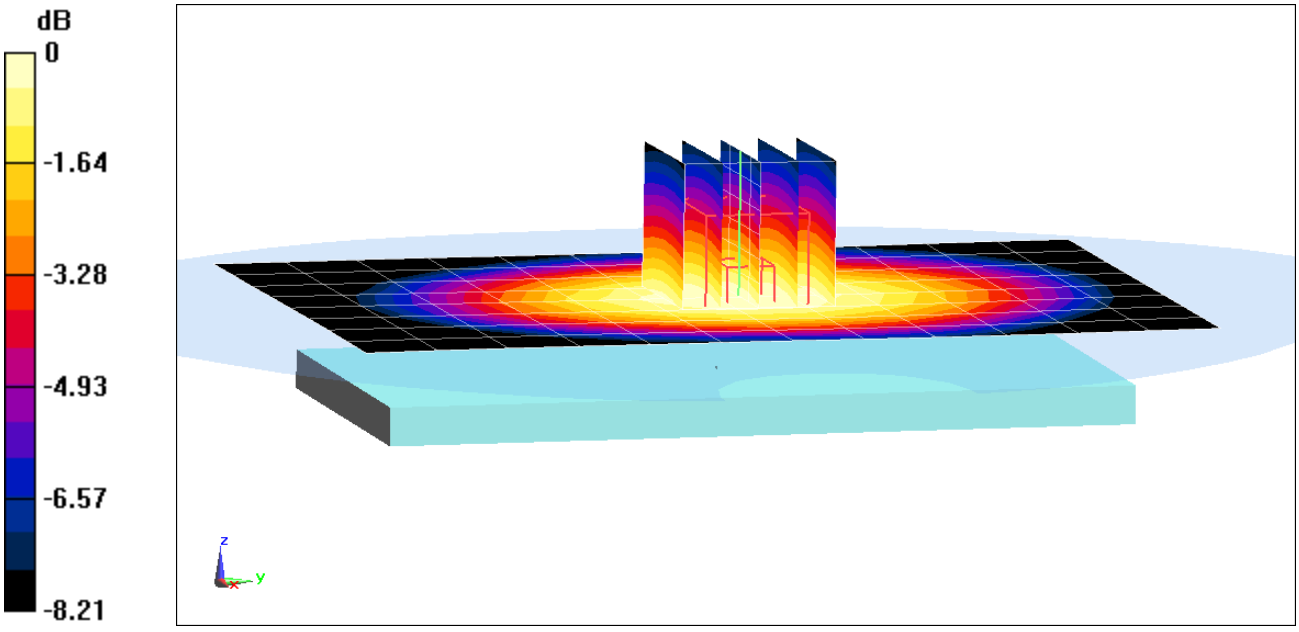
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Head, Medium parameters used (interpolated):
f = 782 MHz; σ = 0.923 S/m; ε_r = 42.161; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 2.5 cm

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

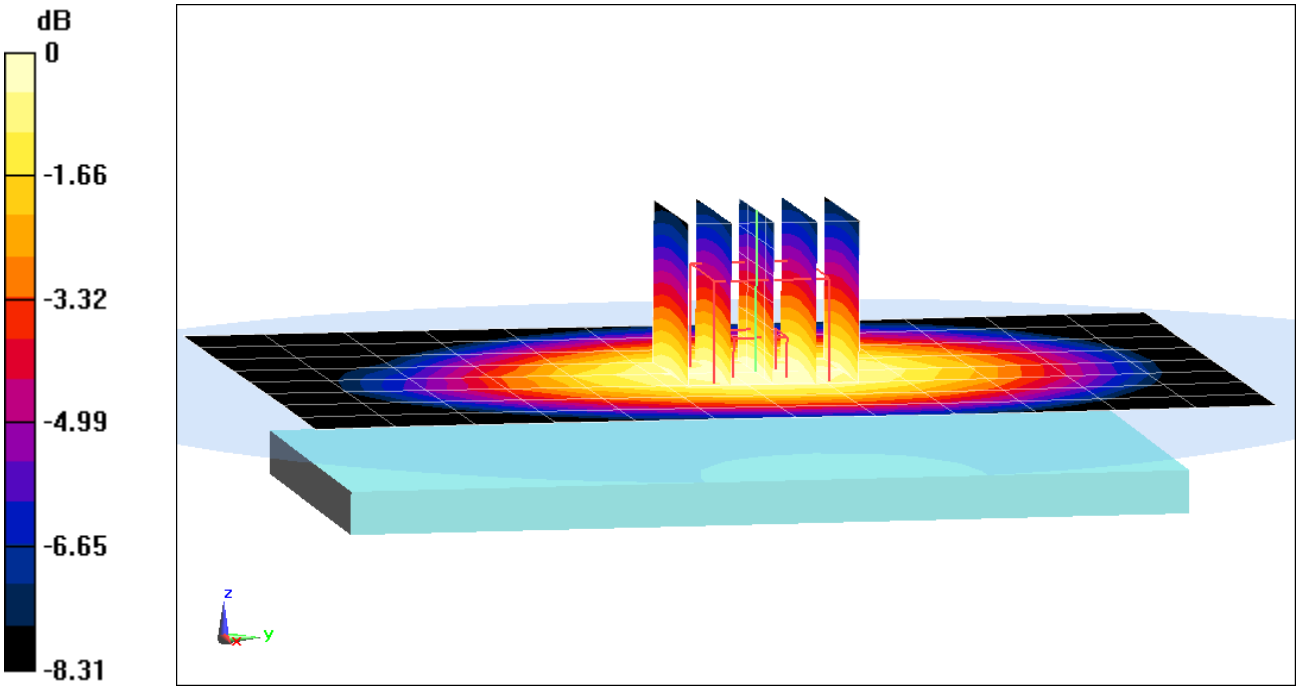
Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1
Medium: 750 Head, Medium parameters used (interpolated):
f = 793 MHz; σ = 0.932 S/m; ε_r = 42.082; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 2.5 cm

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

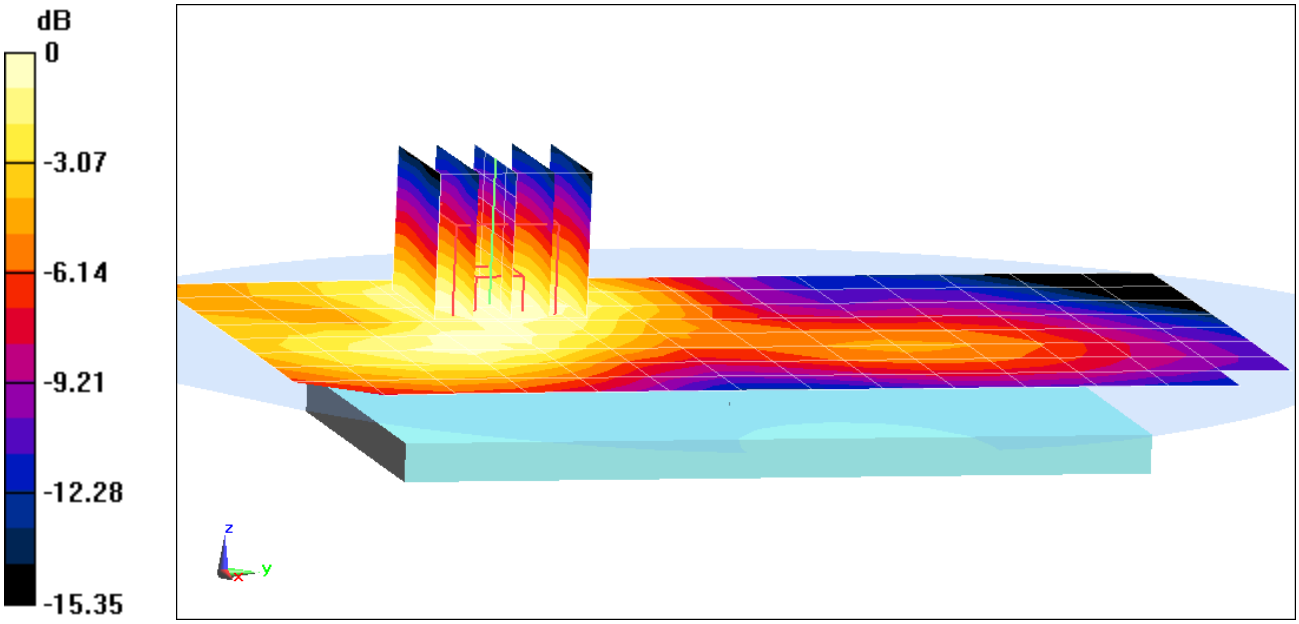
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.322$ S/m; $\varepsilon_r = 38.449$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 2.5 cm

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

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

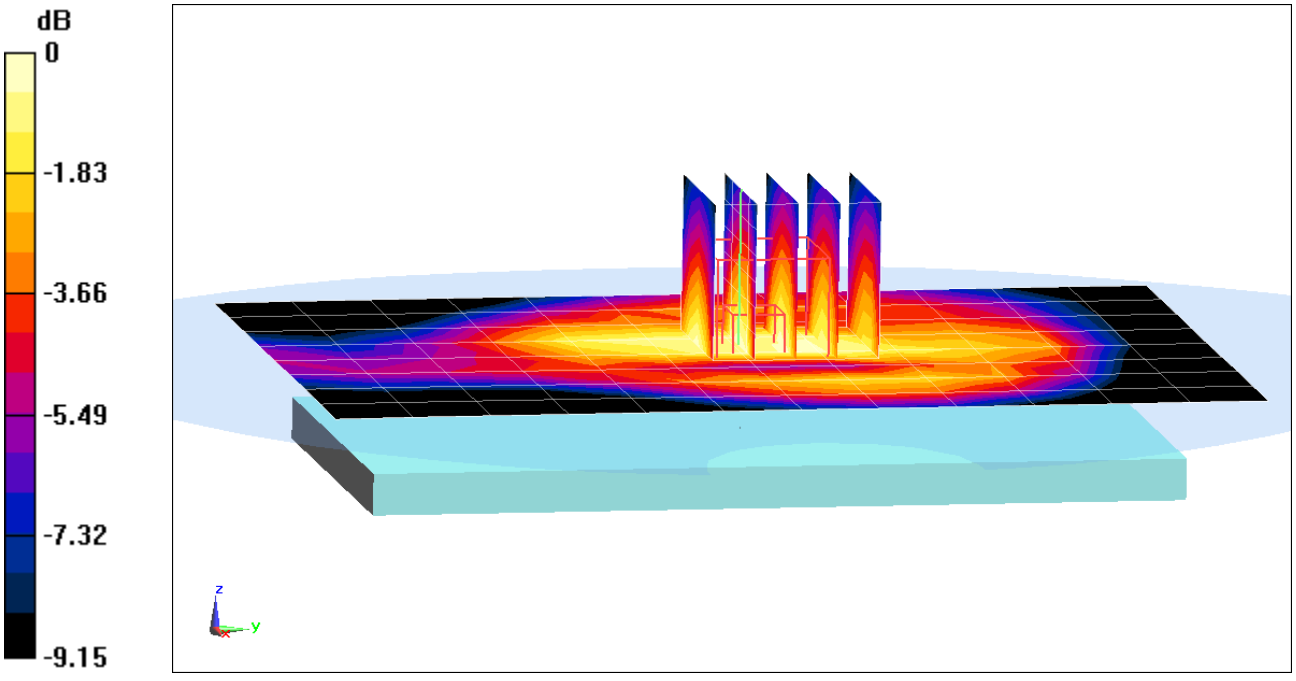
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.992 S/m; ε_r = 53.576; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 1; Space: 0.0 cm

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

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

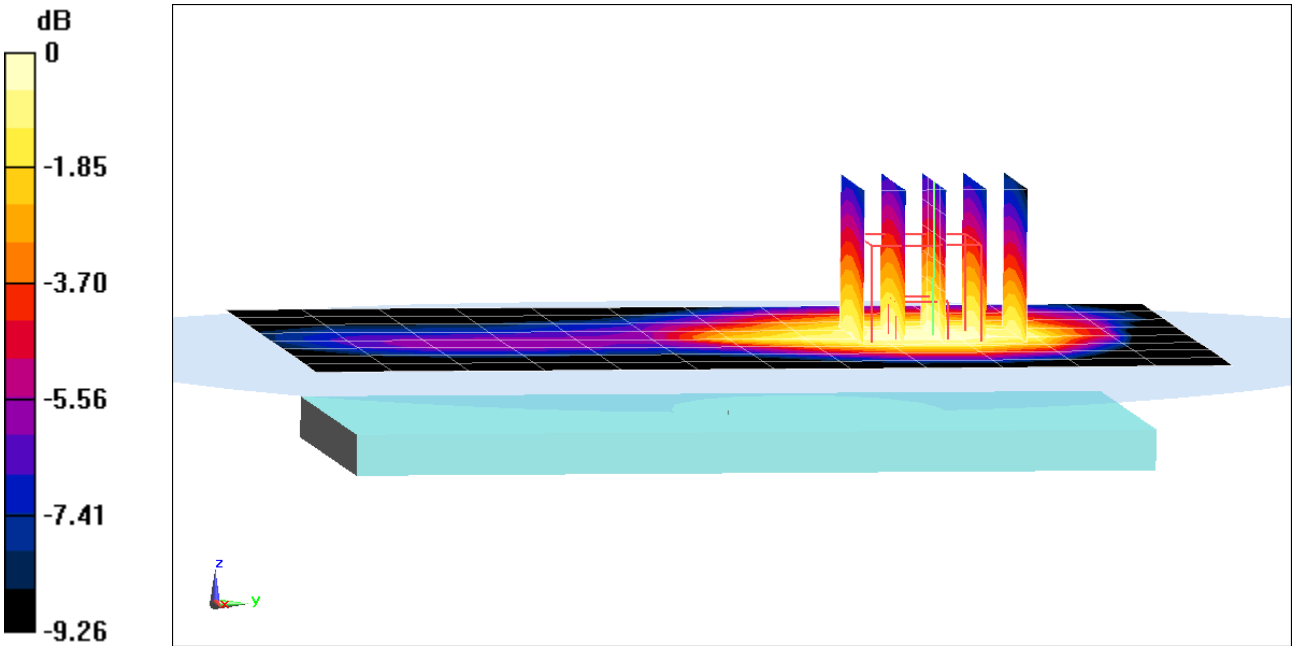
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.992 S/m; ε_r = 53.576; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

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=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
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

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

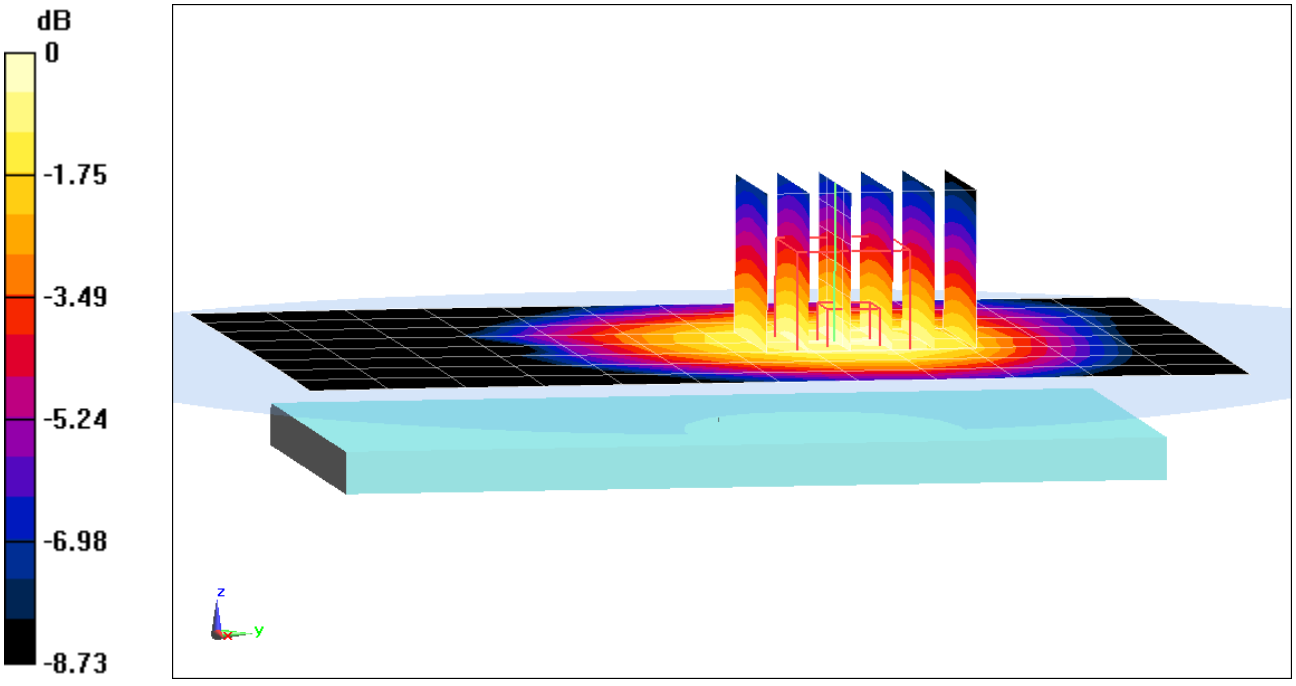
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.996 S/m; ε_r = 53.973; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

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=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
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

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

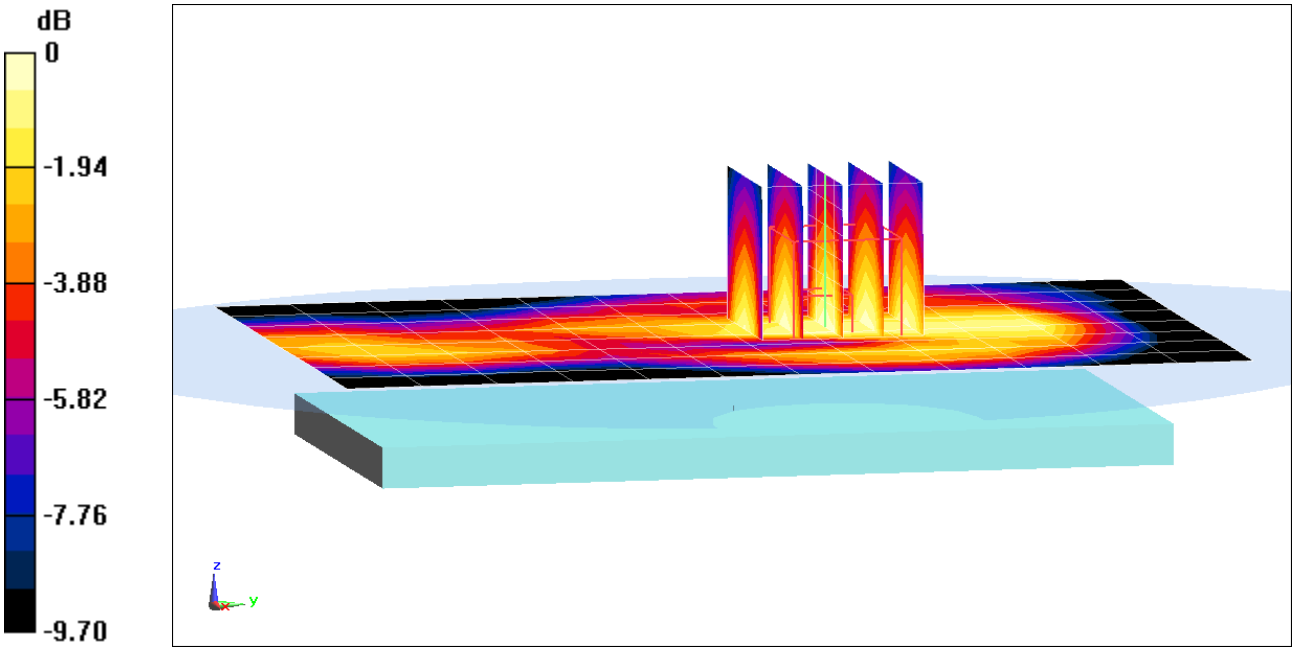
Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 793 MHz; σ = 1.002 S/m; ε_r = 53.459; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory 1; Space: 0.0 cm

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

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

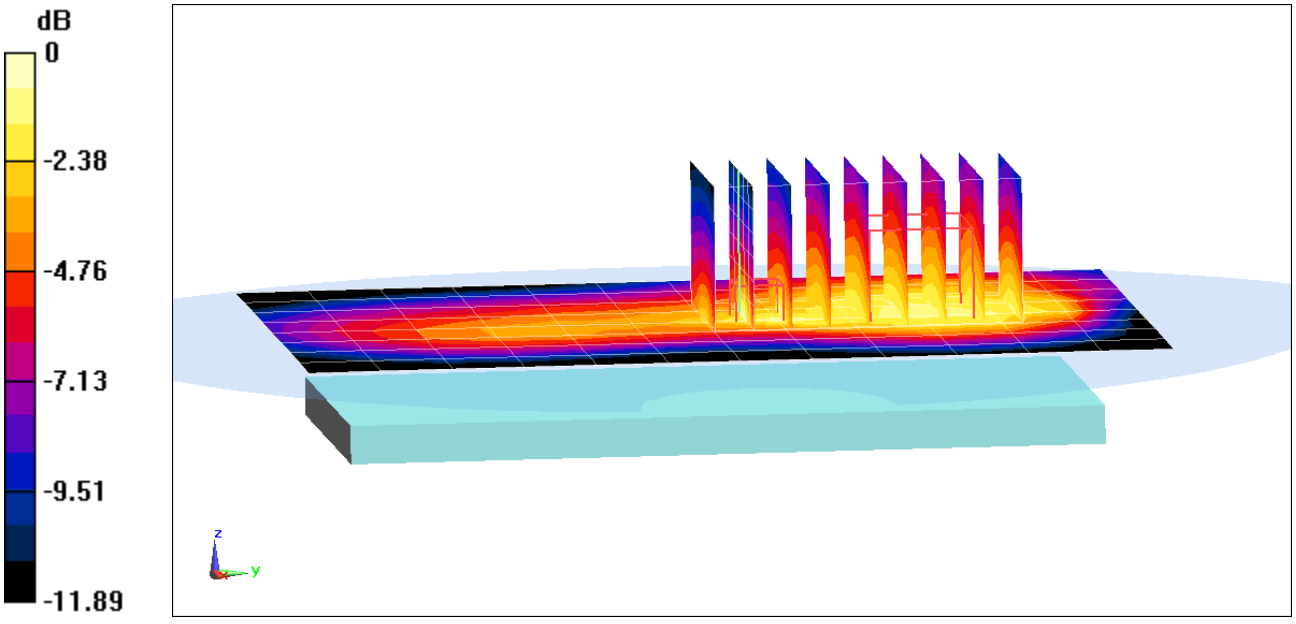
Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 793 MHz; σ = 1.002 S/m; ε_r = 53.459; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

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=15mm, dy=15mm
Zoom Scan (6x9x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
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

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

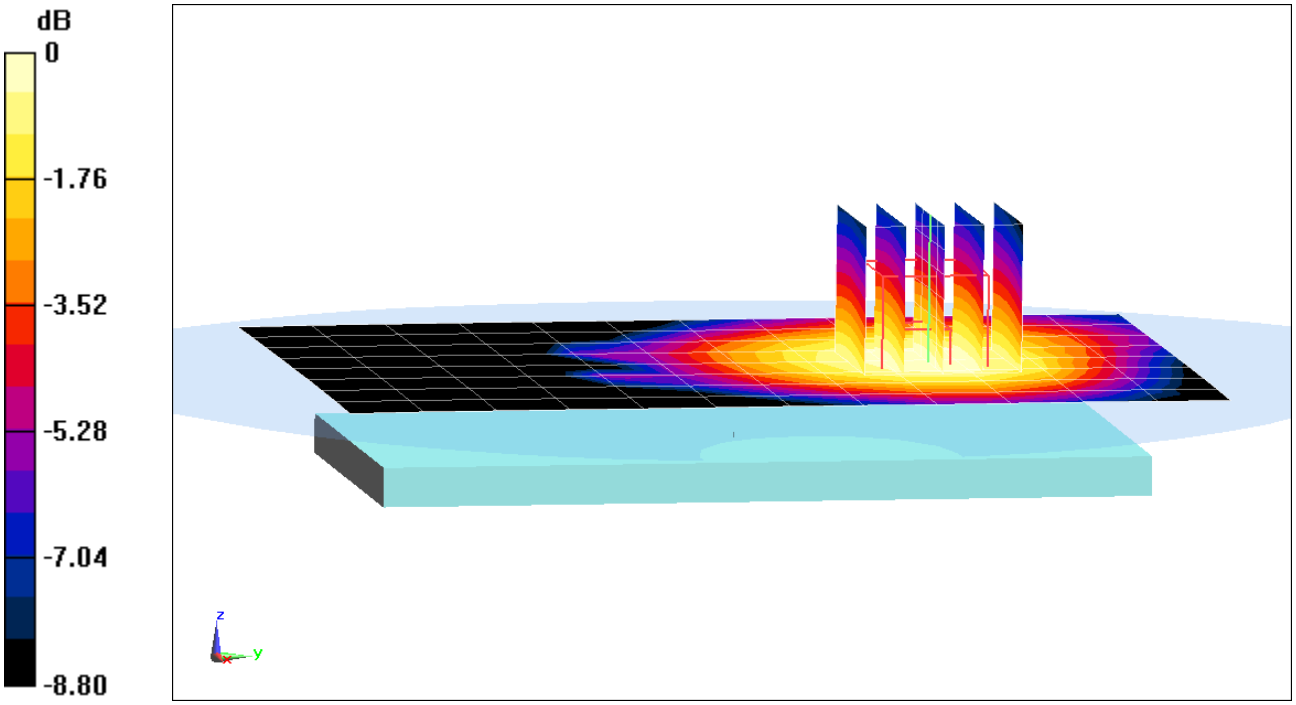
Communication System: UID 0, LTE Band 14 (0); Frequency: 793 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 793 MHz; σ = 1.006 S/m; ε_r = 53.848; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

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

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

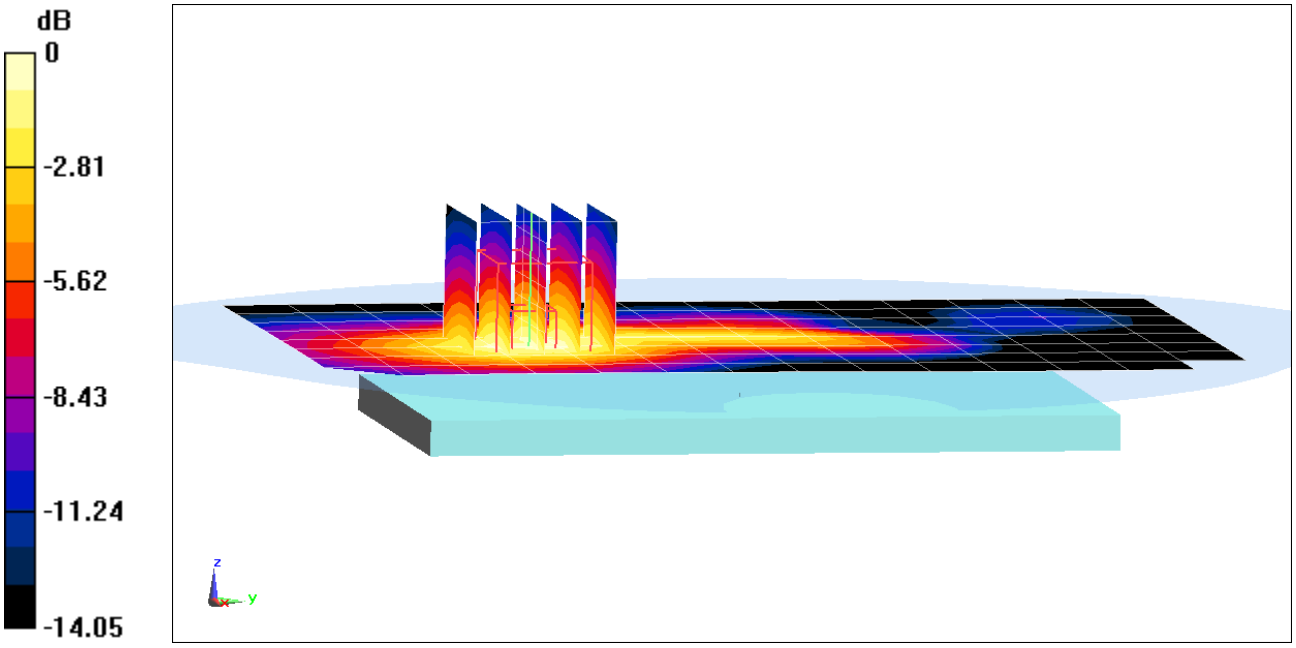
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.474$ S/m; $\varepsilon_r = 52.062$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; BW Accessory 1; Space: 0.0 cm

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

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

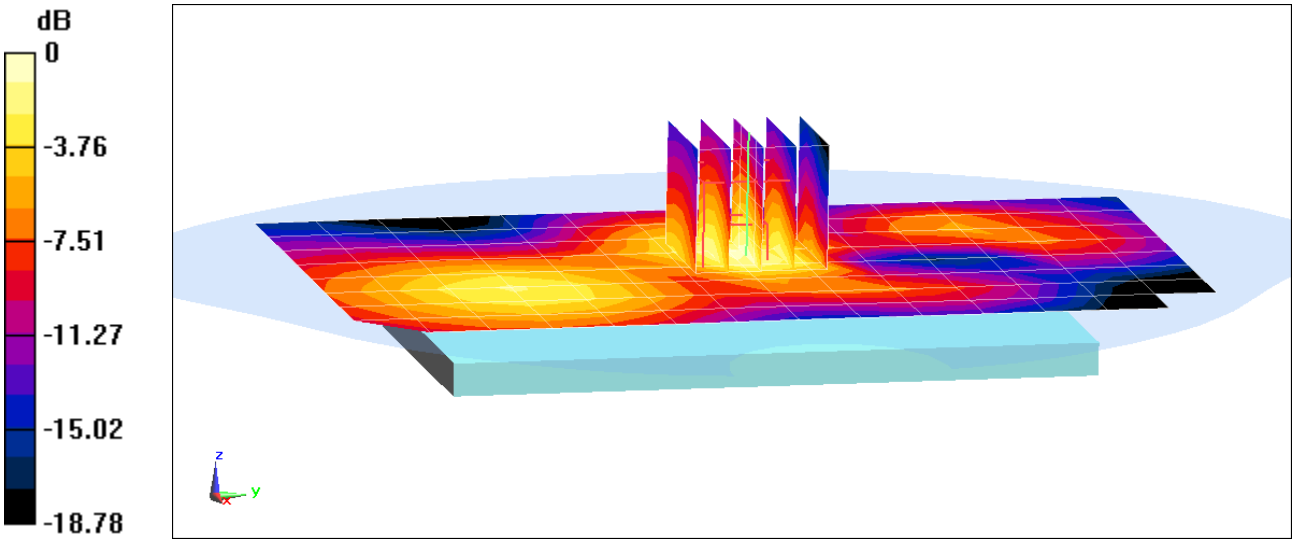
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.482 S/m; ε_r = 52.216; ρ = 1000 kg/m^3
Phantom section: Flat Section; BW Accessory: 2; Space: 0.0 cm

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

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

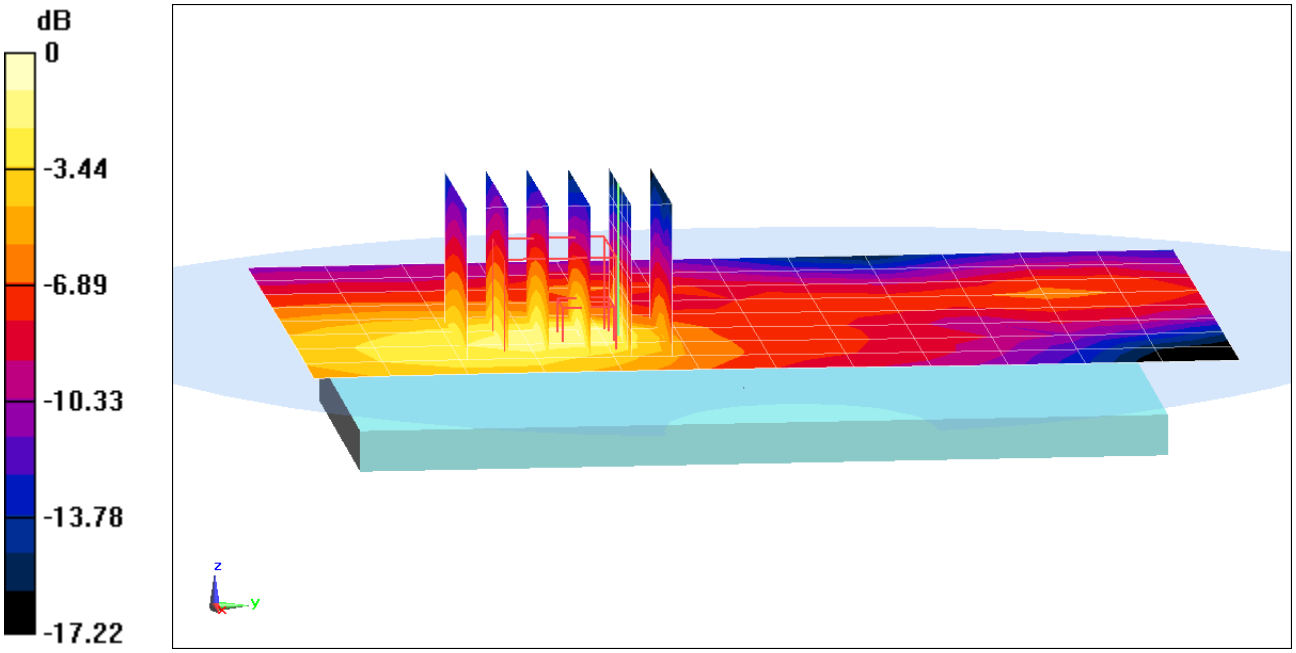
Communication System: UID 0, LTE Band 4 (AWS) (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.43$ S/m; $\varepsilon_r = 51.446$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; BW Accessory: 3; Space: 0.0 cm

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

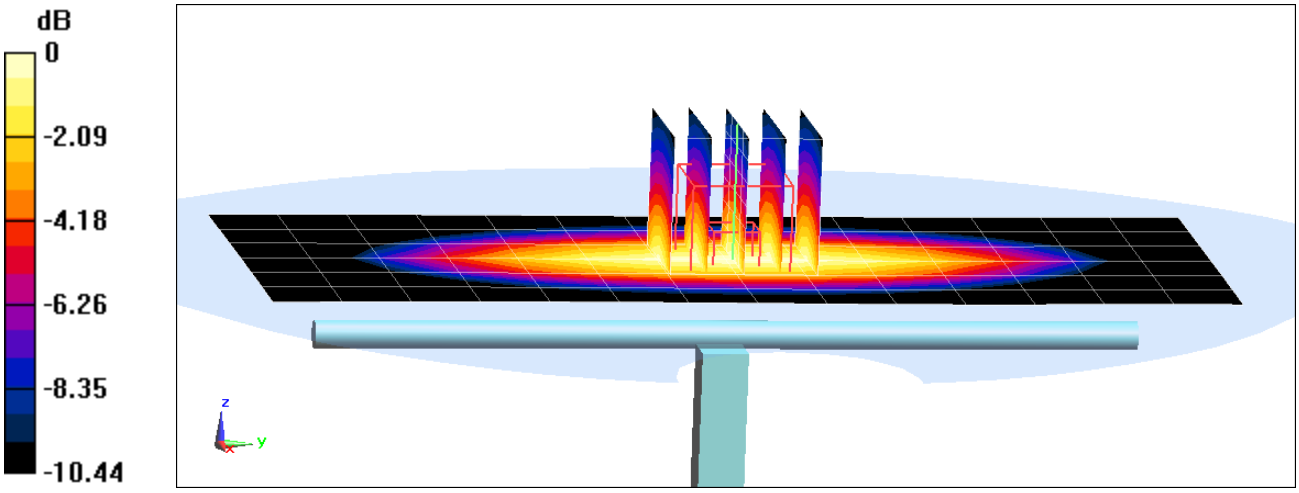
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.893$ S/m; $\varepsilon_r = 42.621$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
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

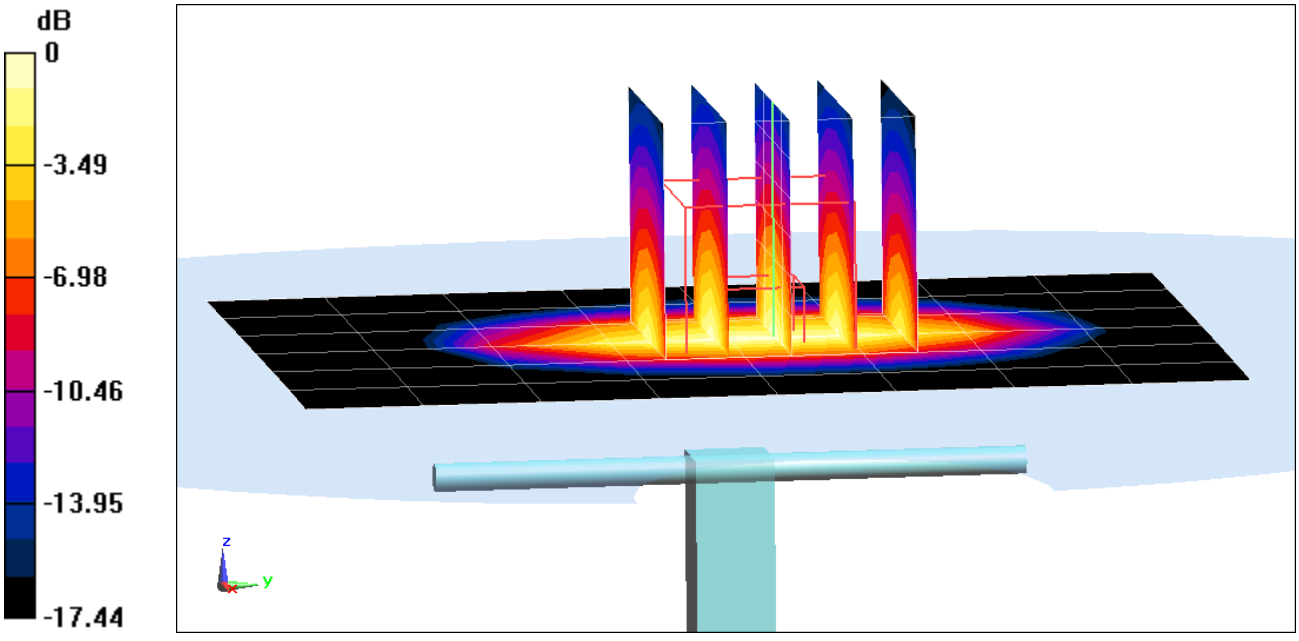
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.338 S/m; ε_r = 38.375; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

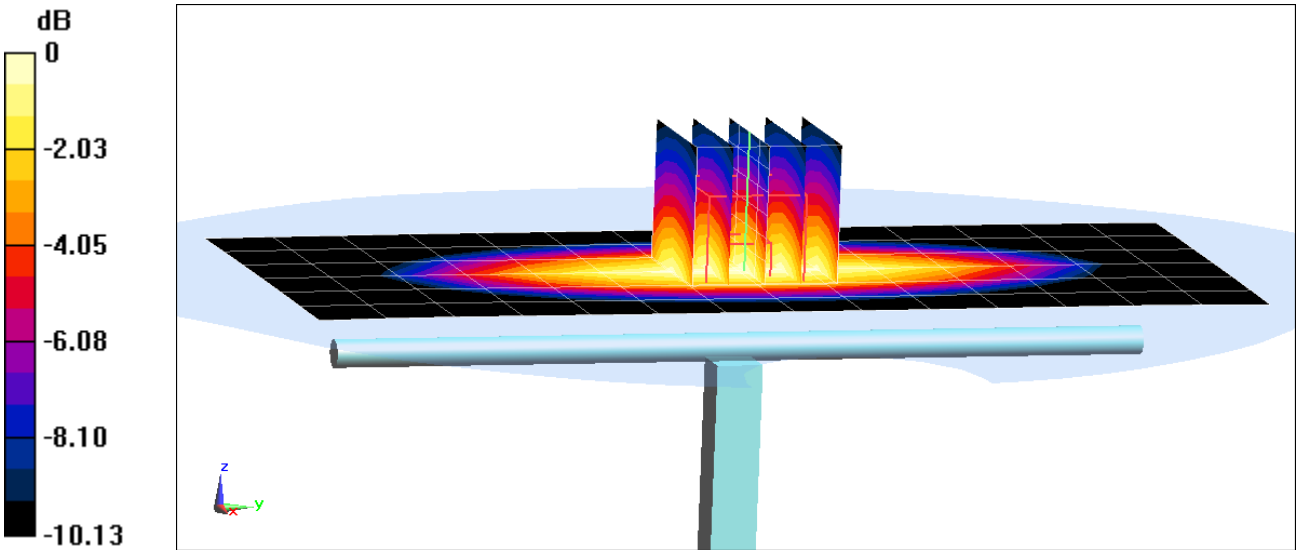
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.964$ S/m; $\varepsilon_r = 54.338$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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%



0 dB = 2.09 W/kg = 3.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

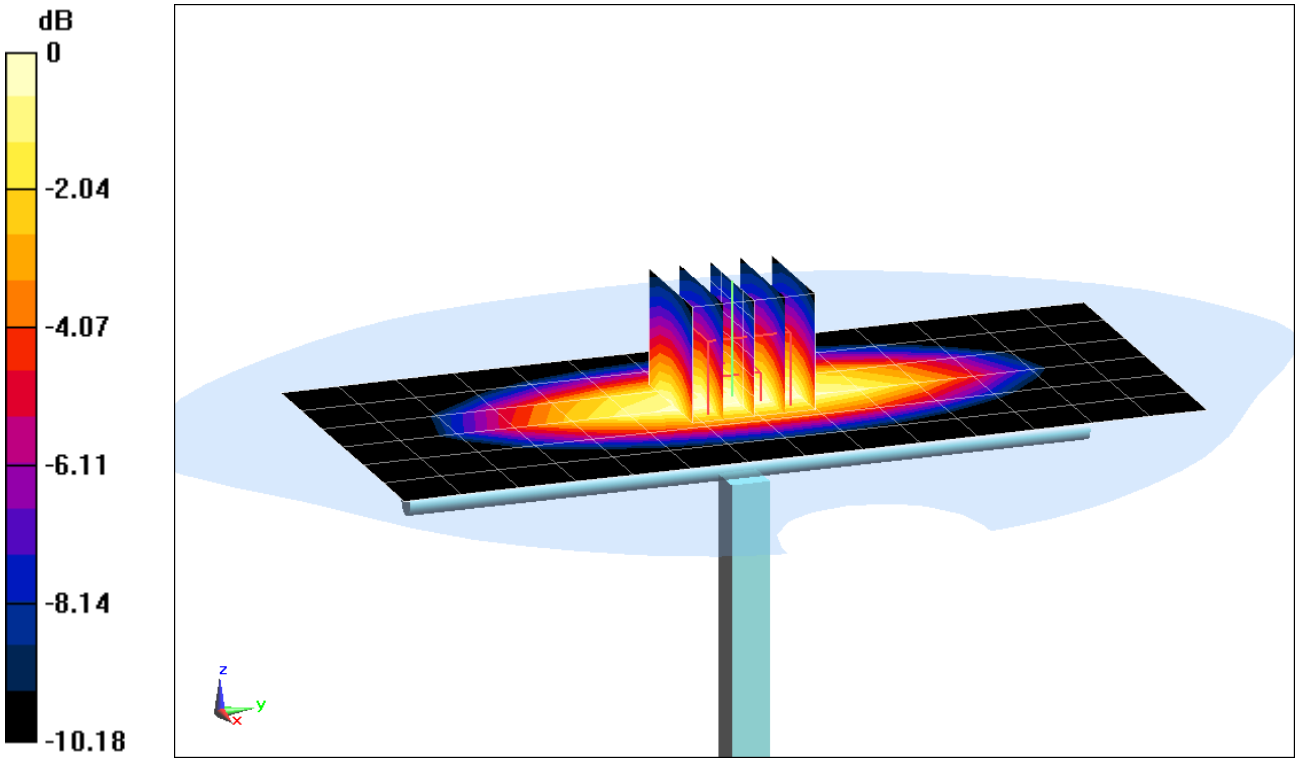
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.961 S/m; ε_r = 53.958; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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

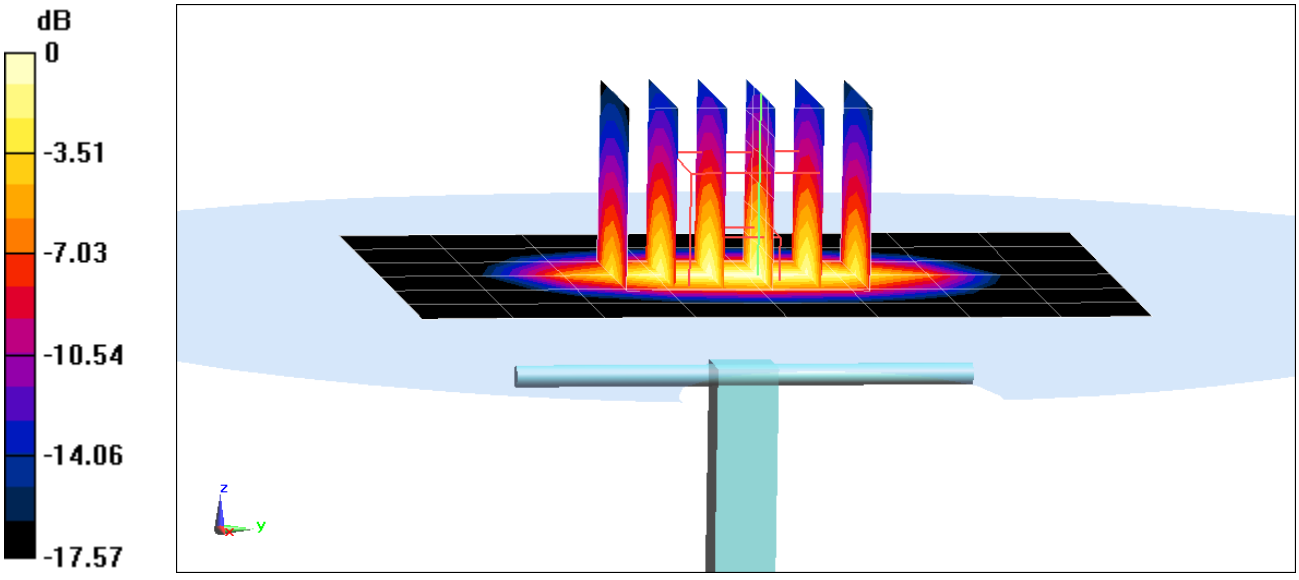
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.446 S/m; ε_r = 51.388; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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%



0 dB = 4.63 W/kg = 6.66 dBW/kg

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

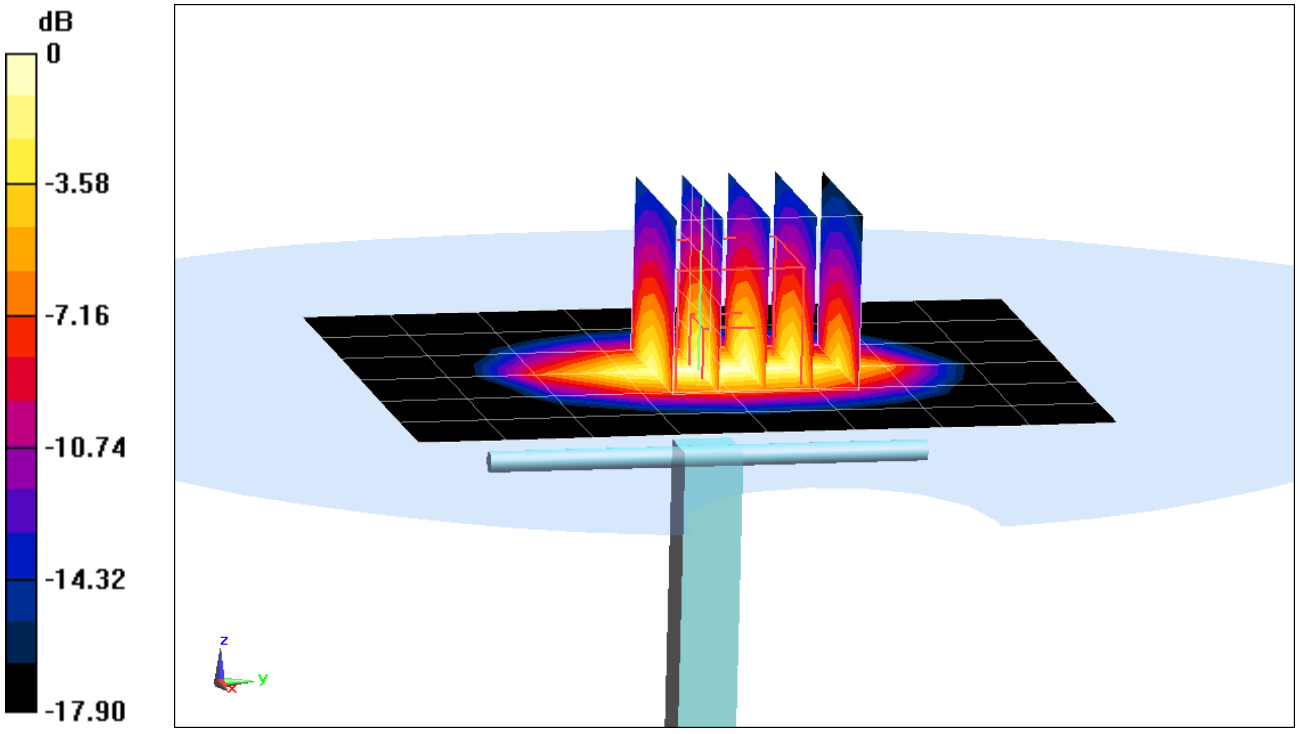
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.501 S/m; ε_r = 52.164; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
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

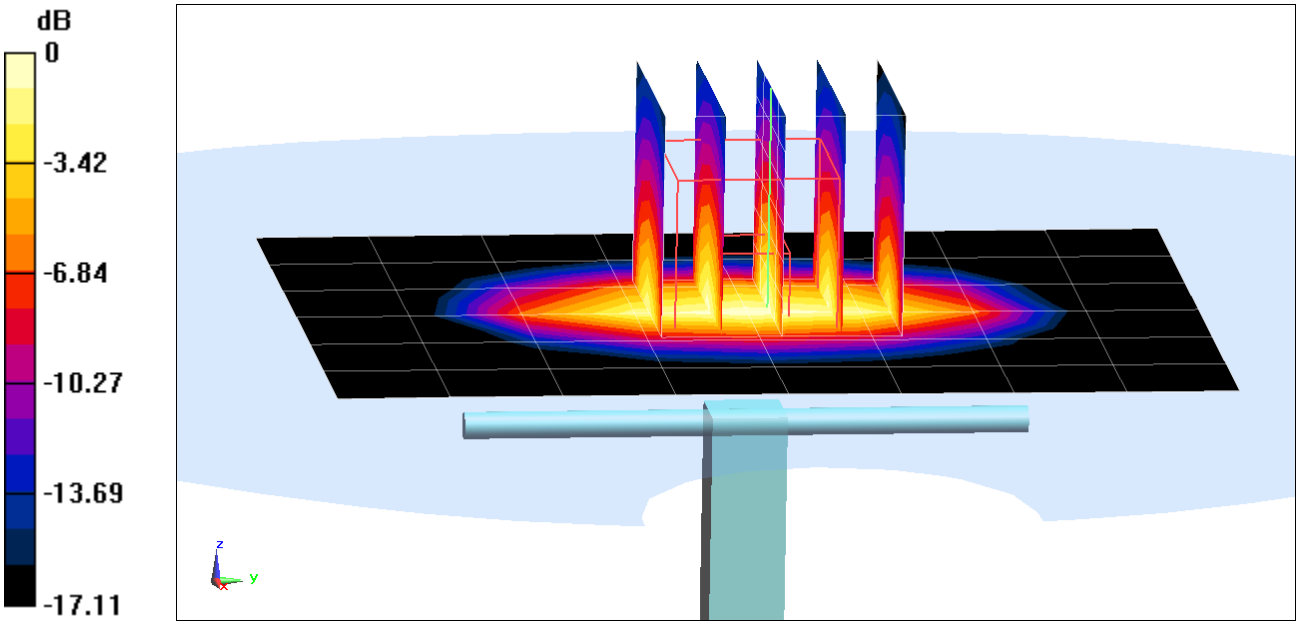
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.493 S/m; ε_r = 51.993; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 17, 2016

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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

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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 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 ± 0.2) °C	41.8 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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 ± 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 ± 0.2) °C	55.1 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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 ± 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 Ω + 2.3 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.7 Ω - 0.8 jΩ
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

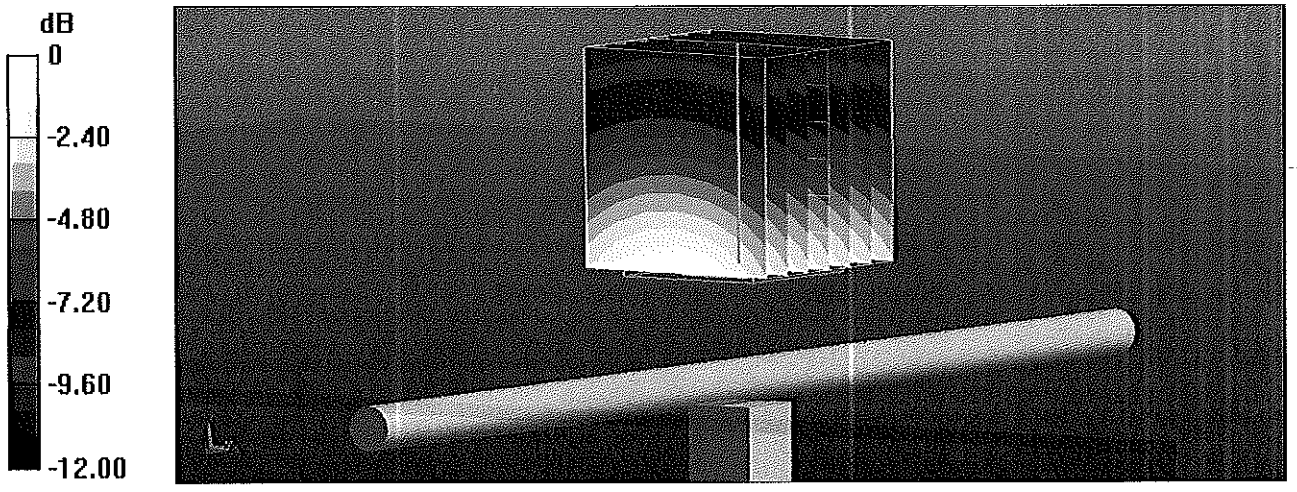
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 41.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

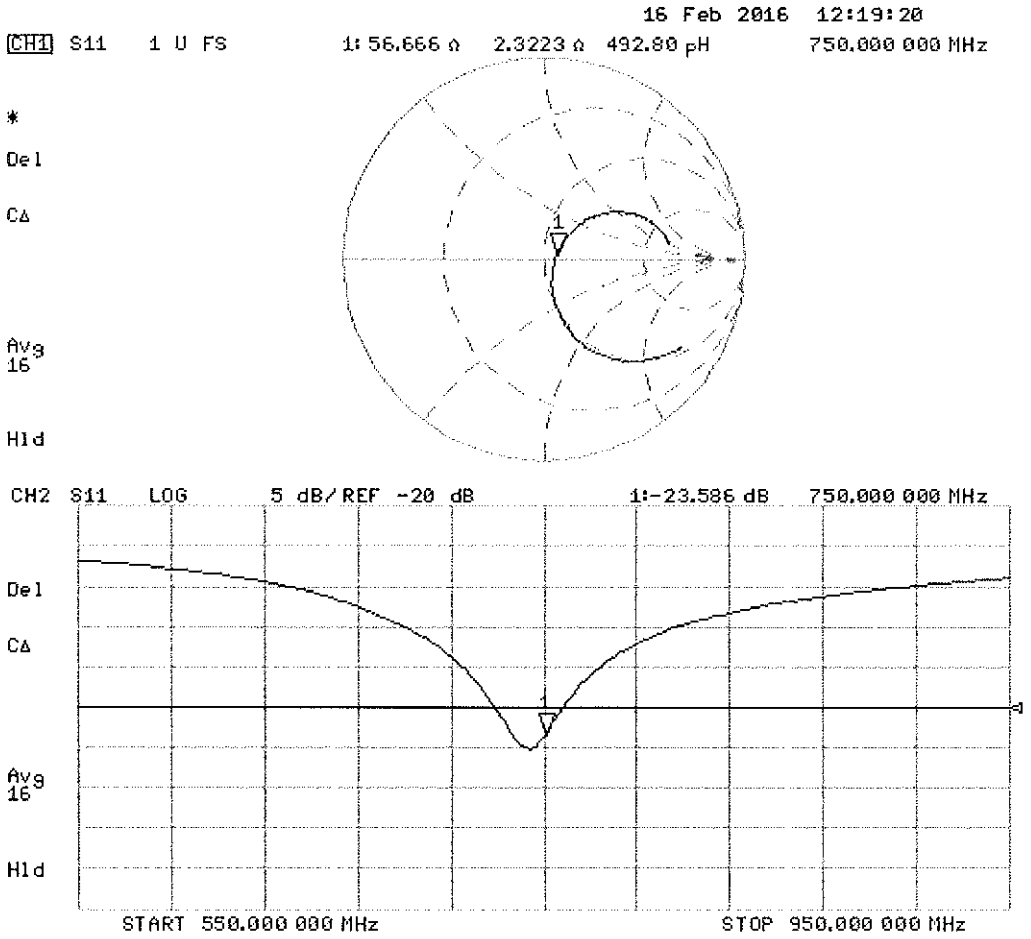
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



0 dB = 2.75 W/kg = 4.39 dBW/kg

Impedance Measurement Plot for Head TSL



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

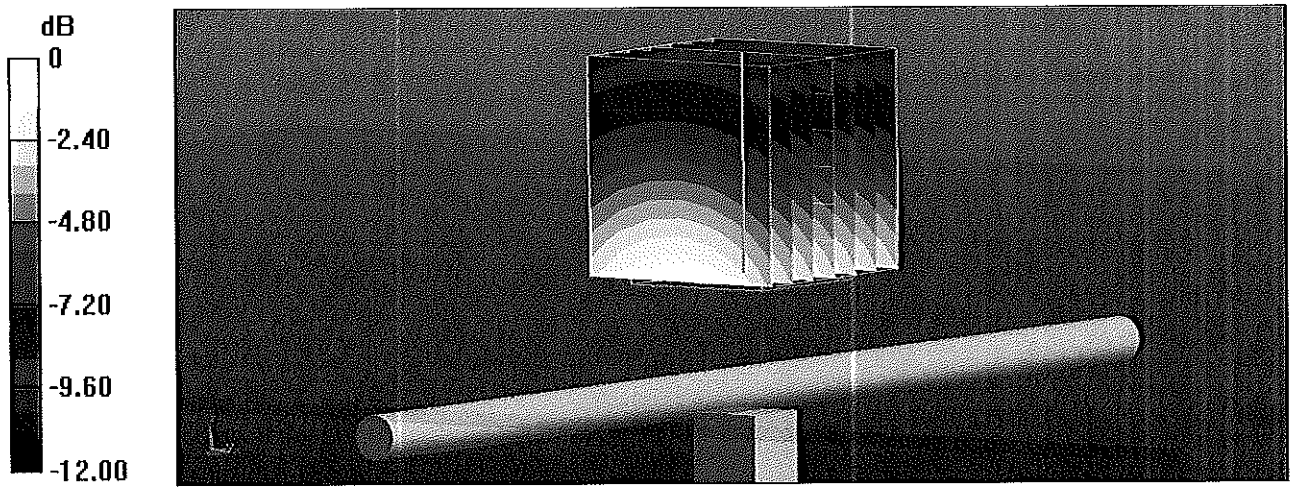
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.98 S/m; ε_r = 55.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

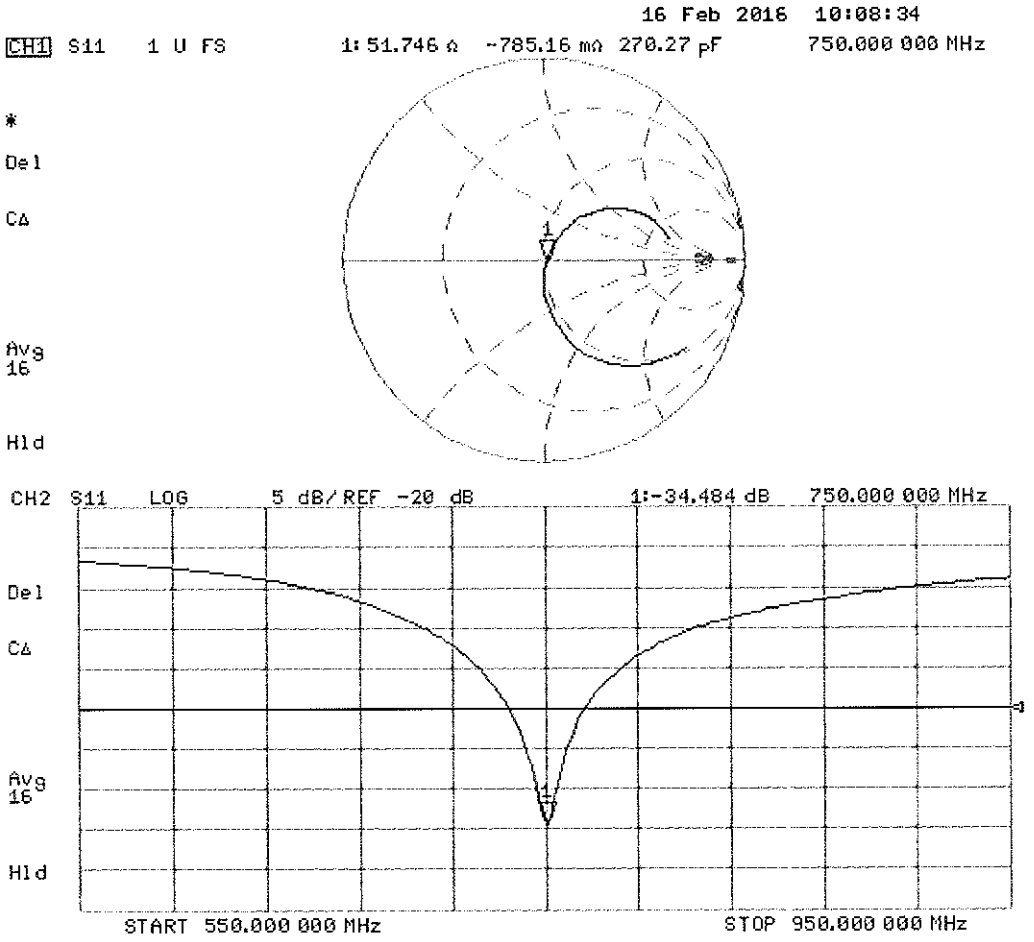
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



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Accreditation No.: SCS 0108

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 ± 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-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

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 15, 2015

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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:

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) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) 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 ± 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 ± 0.2) °C	38.9 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (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 ± 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 ± 0.2) °C	51.5 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (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 ± 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 Ω - 0.2 jΩ
Return Loss	- 37.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9 Ω + 0.3 jΩ
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

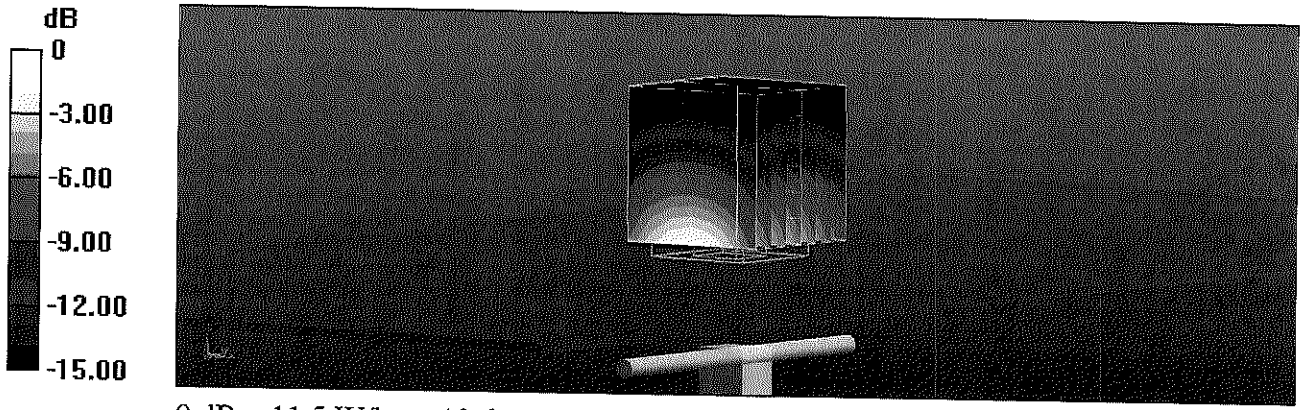
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.35 S/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

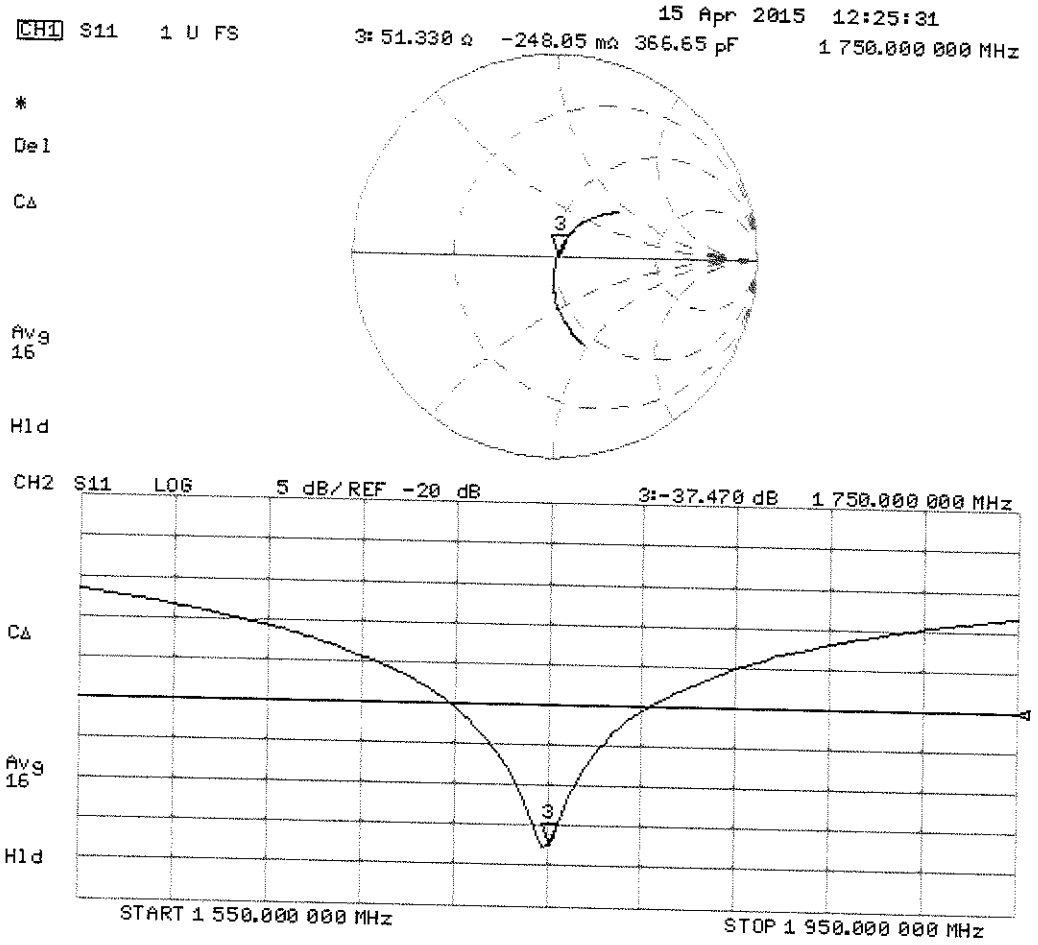
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

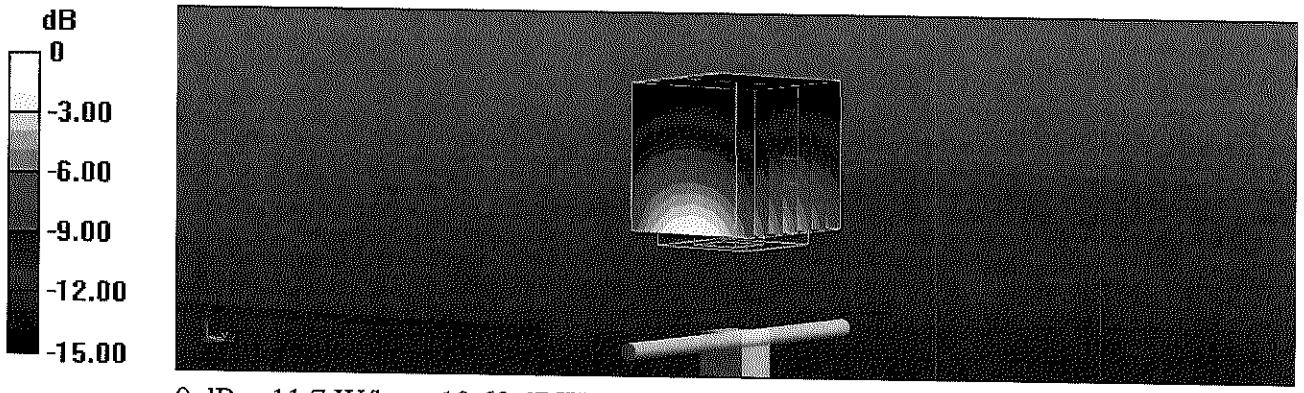
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.48 S/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

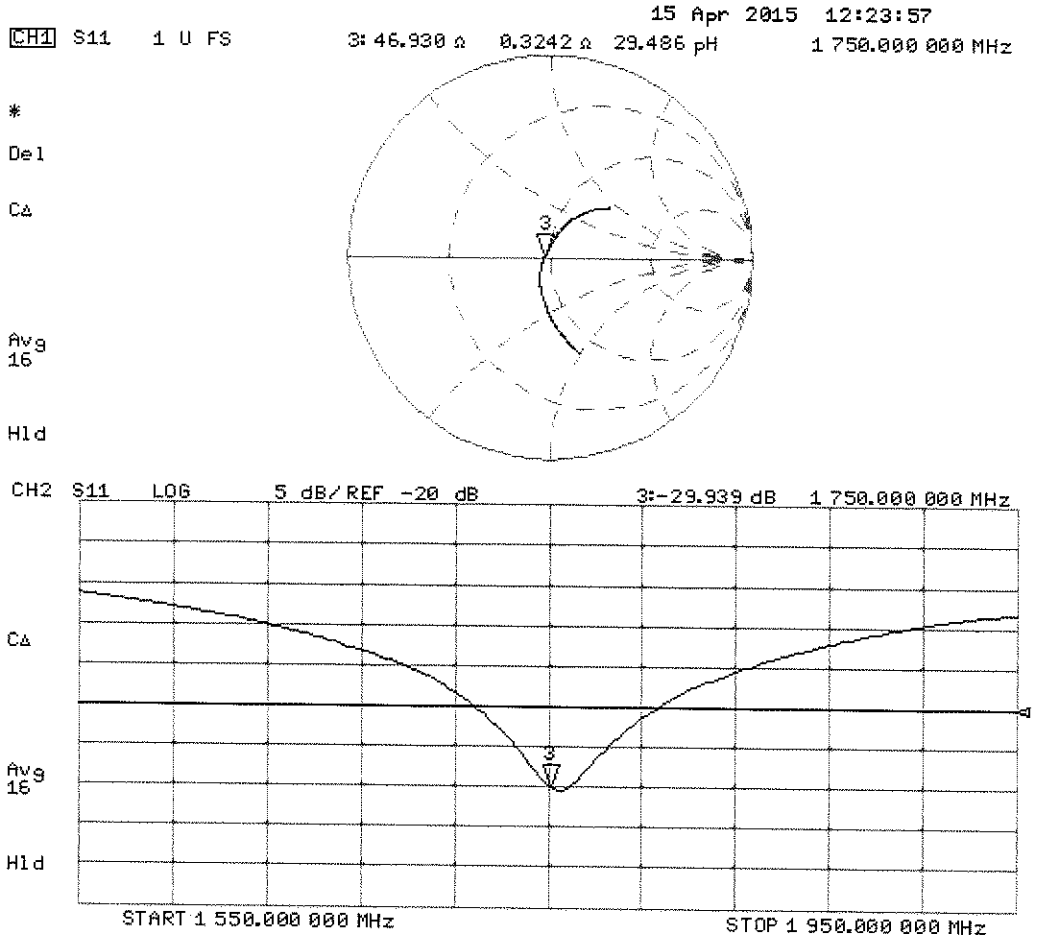
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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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
Calibration date:	May 11, 2016

BNV 05/23/16

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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 17, 2016

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 ± 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 ± 0.2) °C	39.8 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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 ± 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 ± 0.2) °C	53.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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 ± 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 Ω - 6.0 jΩ
Return Loss	- 24.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8 Ω - 6.8 jΩ
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

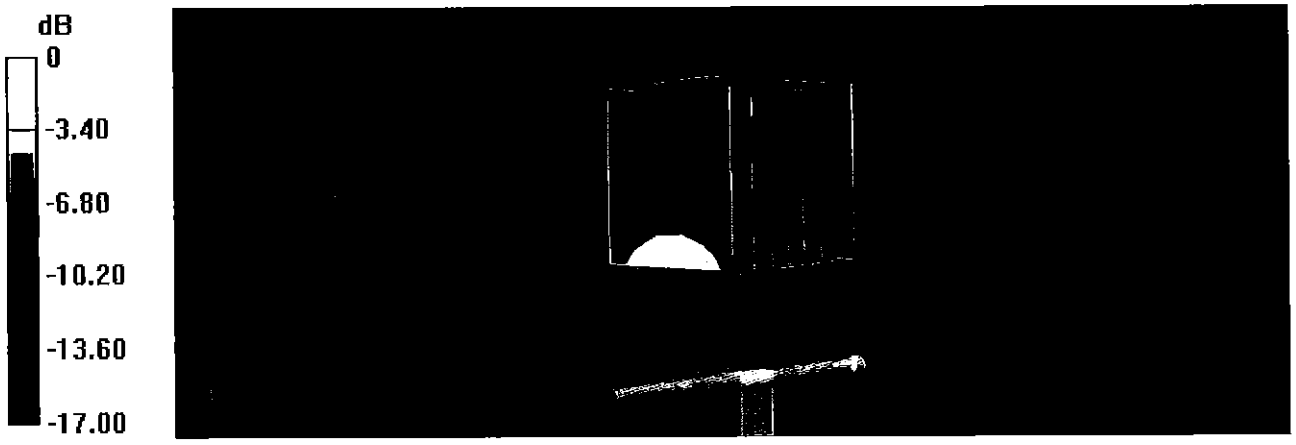
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

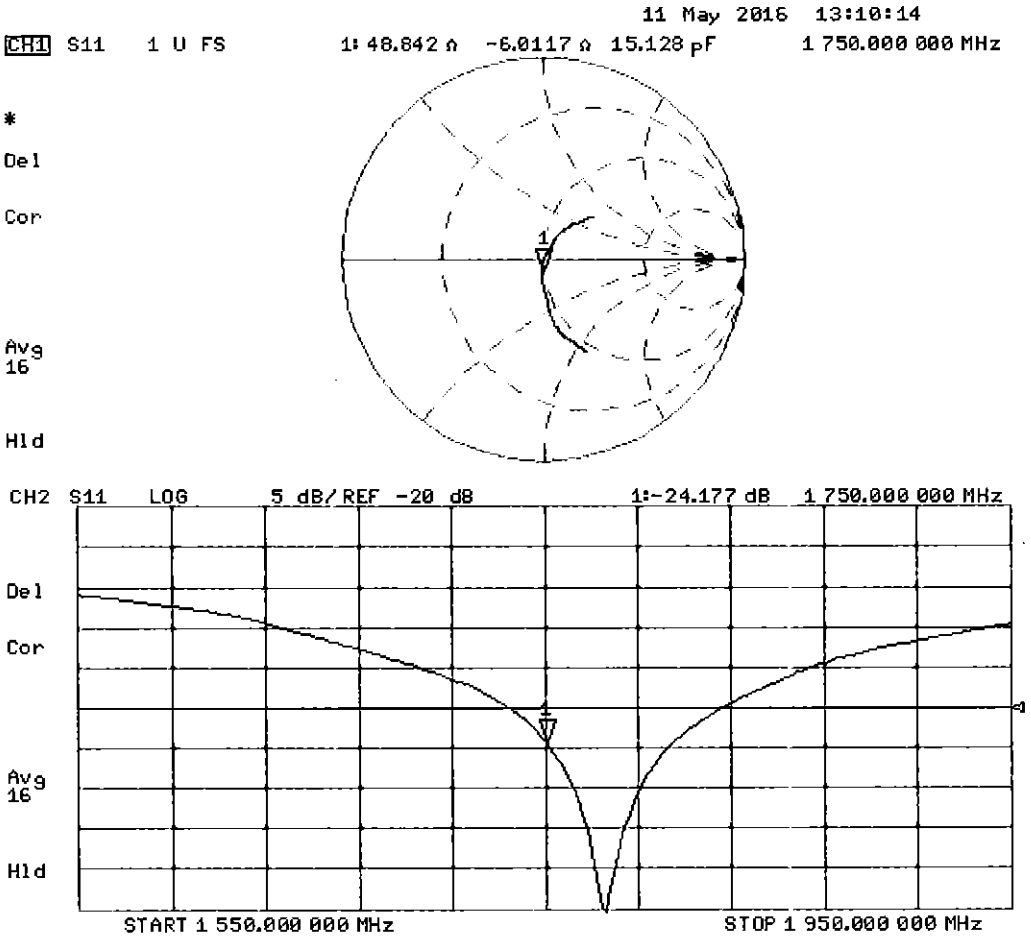
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

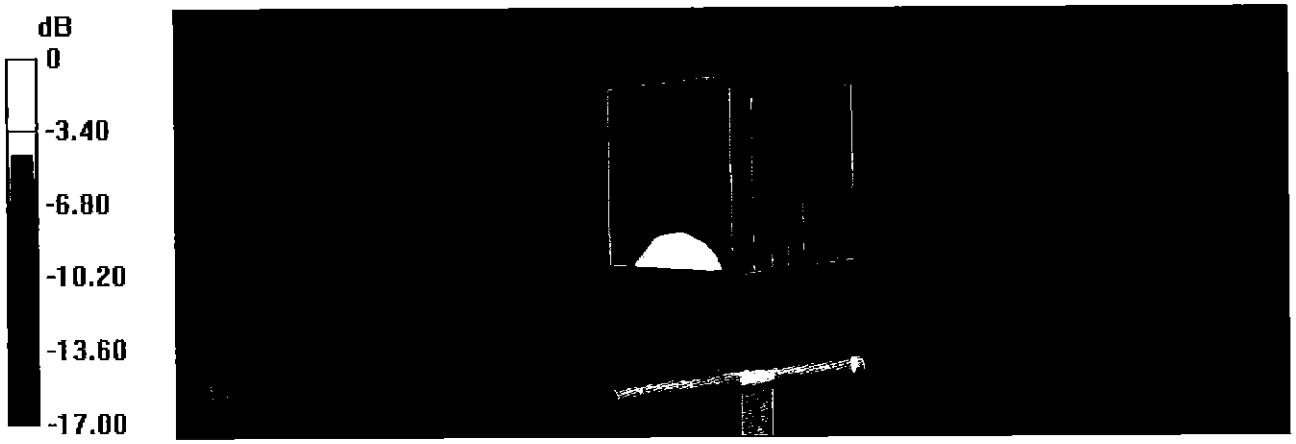
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.5 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

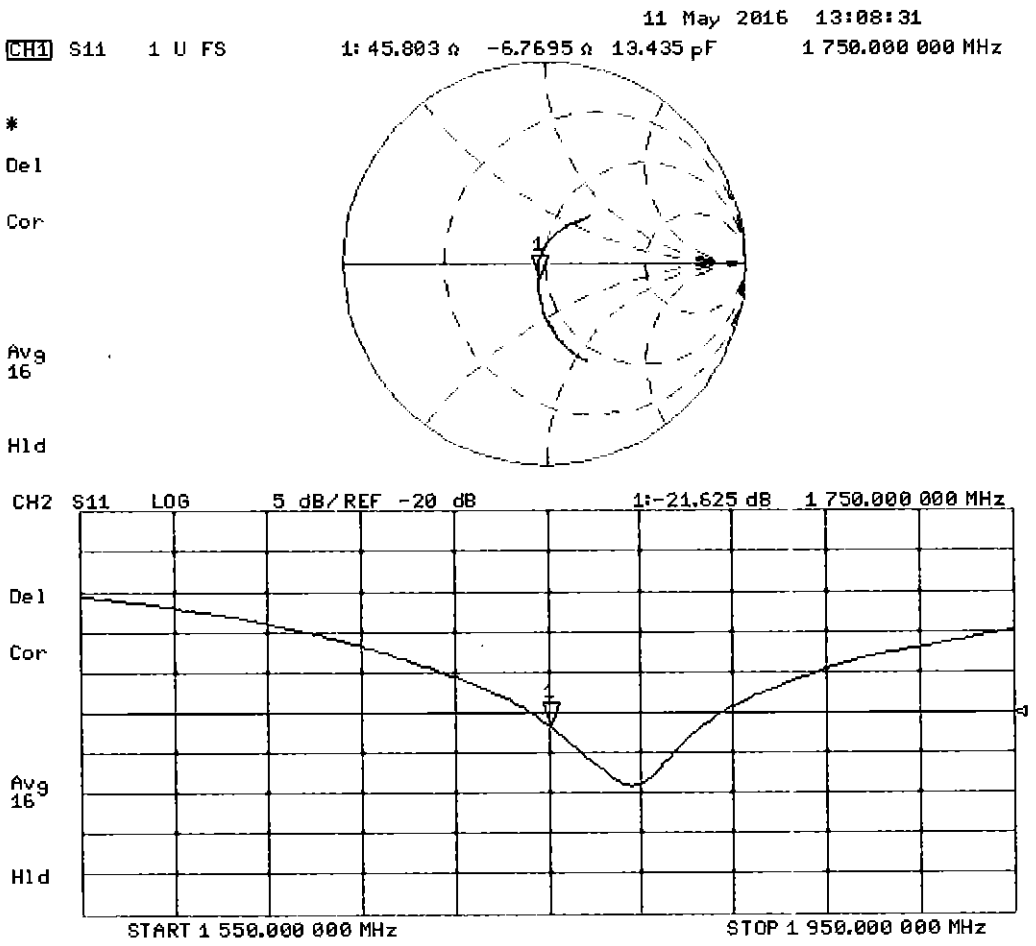
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



0 dB = 14.0 W/kg = 11.46 dBW/kg

Impedance Measurement Plot for Body TSL



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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

BN ✓
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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M. Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 11, 2016

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 ± 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 ± 0.2) °C	39.7 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (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 ± 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 ± 0.2) °C	53.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (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 ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (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 ± 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 Ω - 0.7 jΩ
Return Loss	- 43.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω - 1.4 jΩ
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

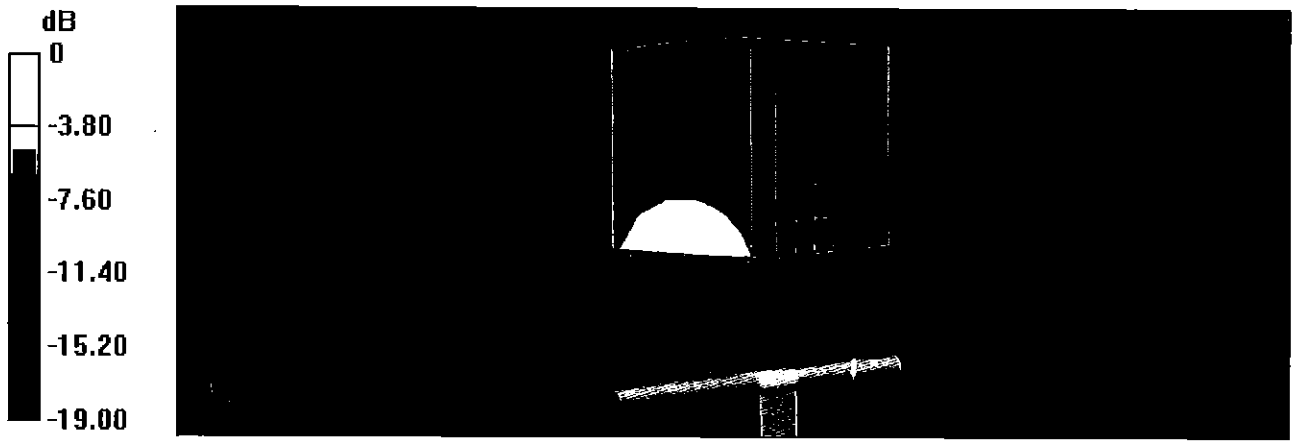
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

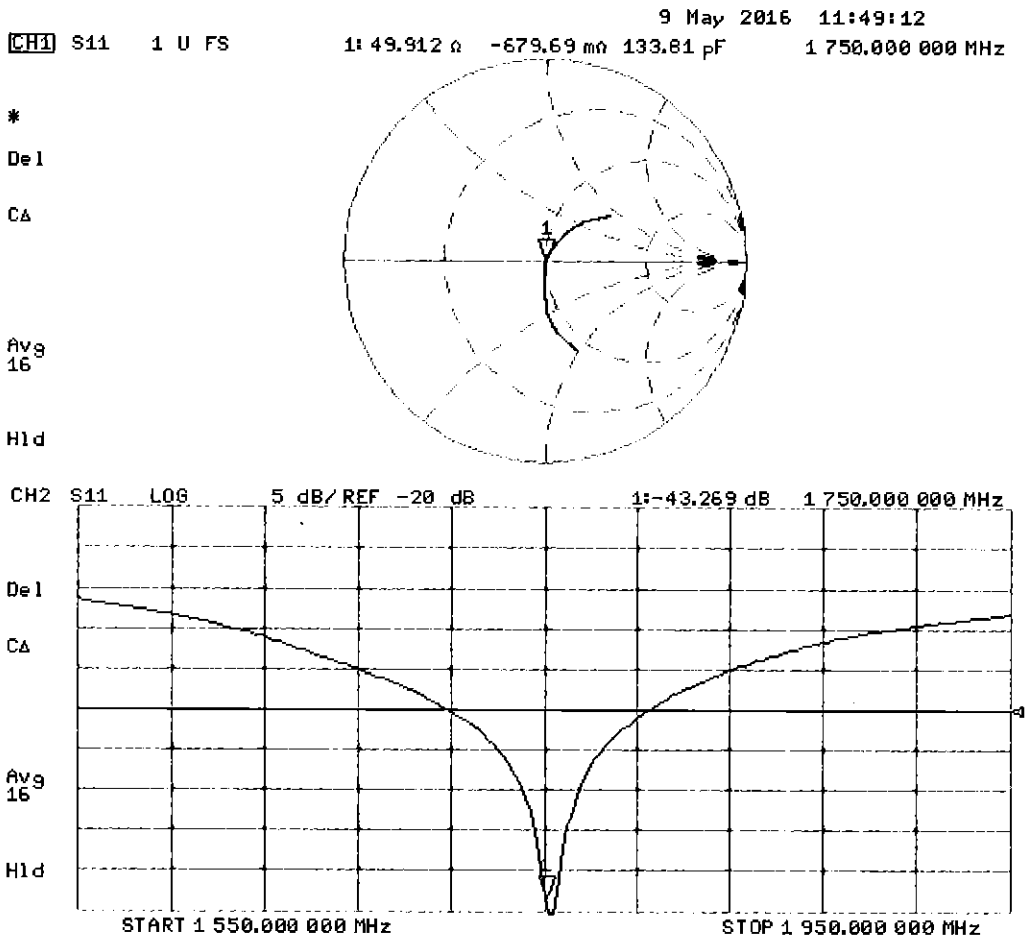
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

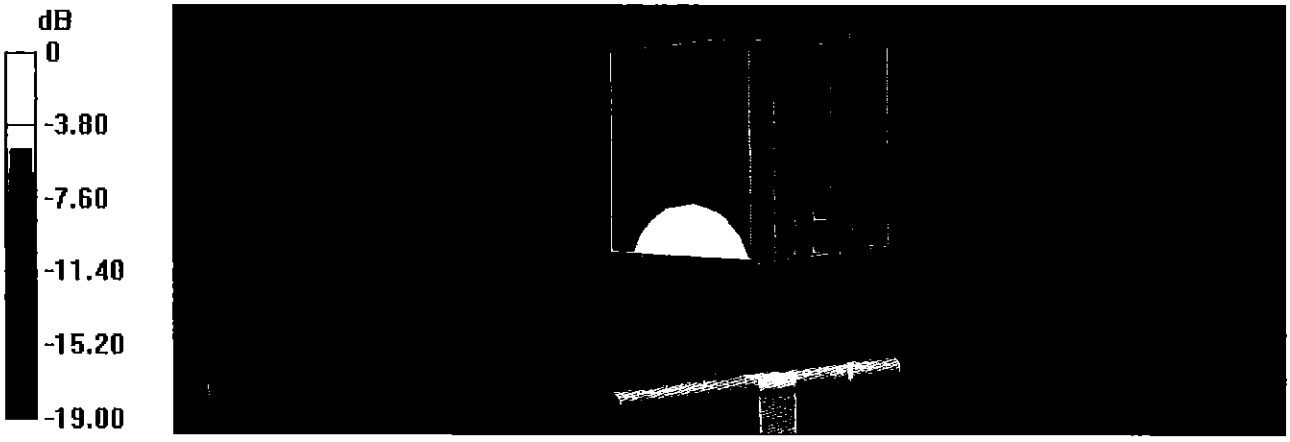
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.5 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

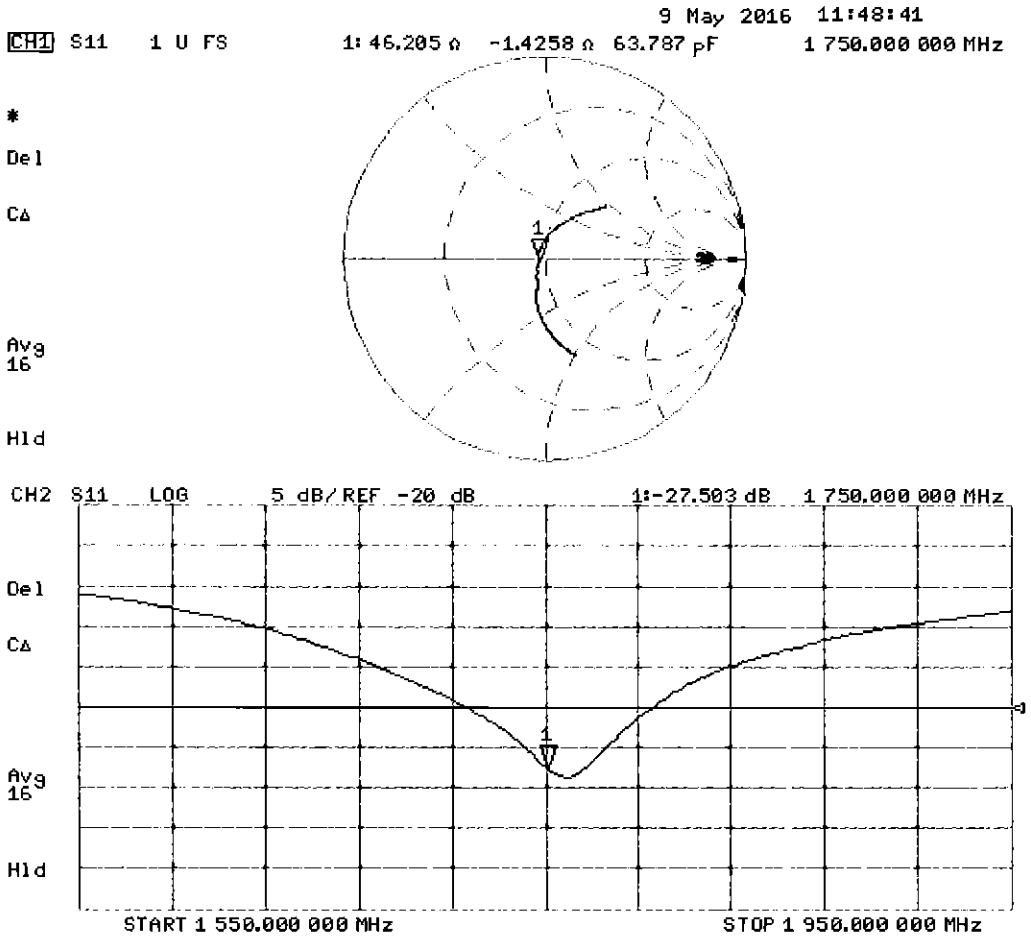
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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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

BN ✓
9/3/2015

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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 27, 2015

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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:

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"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,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 ≤ 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 *NORMx,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 ± 50 MHz to ± 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 *NORMx* (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 ($\mu V/(V/m)^2$)[A]	1.00	1.03	0.95	± 10.1 %
DCP (mV)[B]	99.9	99.7	100.9	

Modulation Calibration Parameters

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

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (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 %

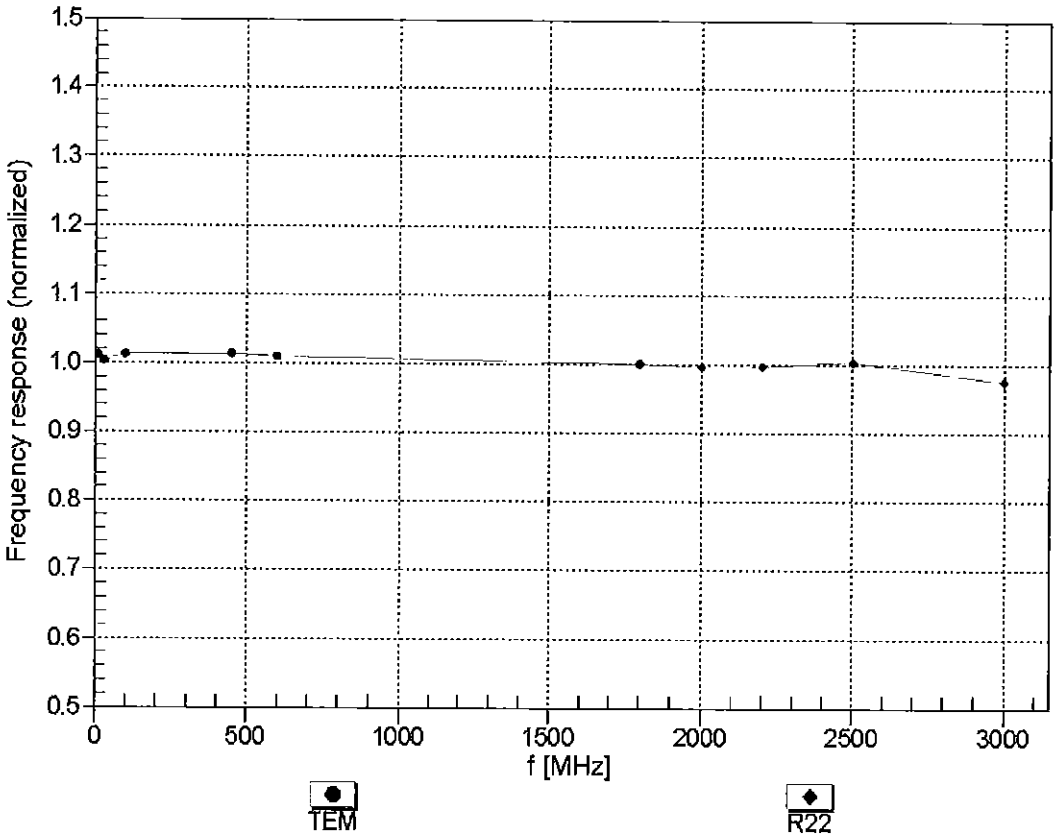
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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

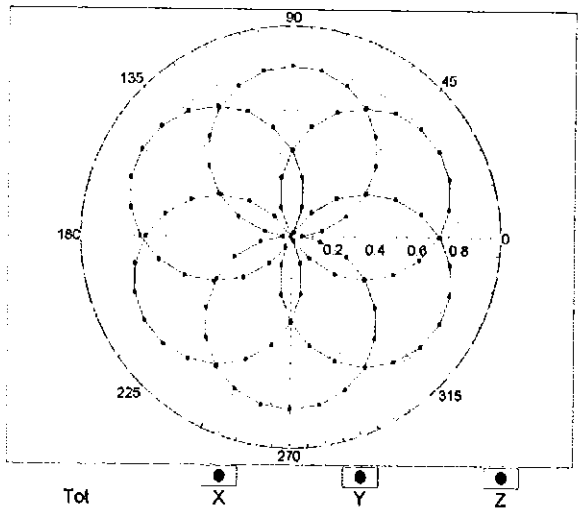
(TEM-Cell:ifi110 EXX, Waveguide: R22)



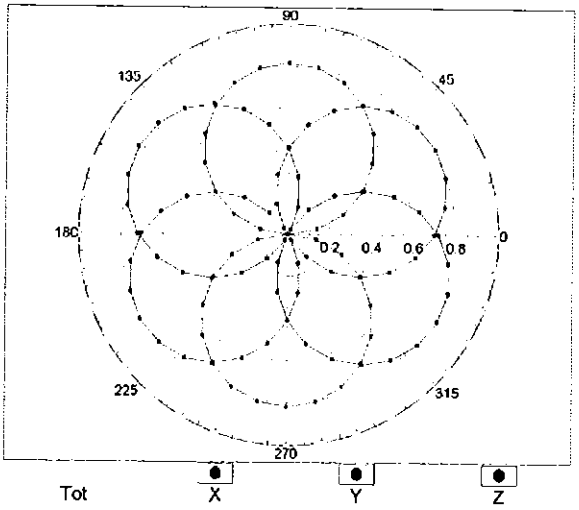
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

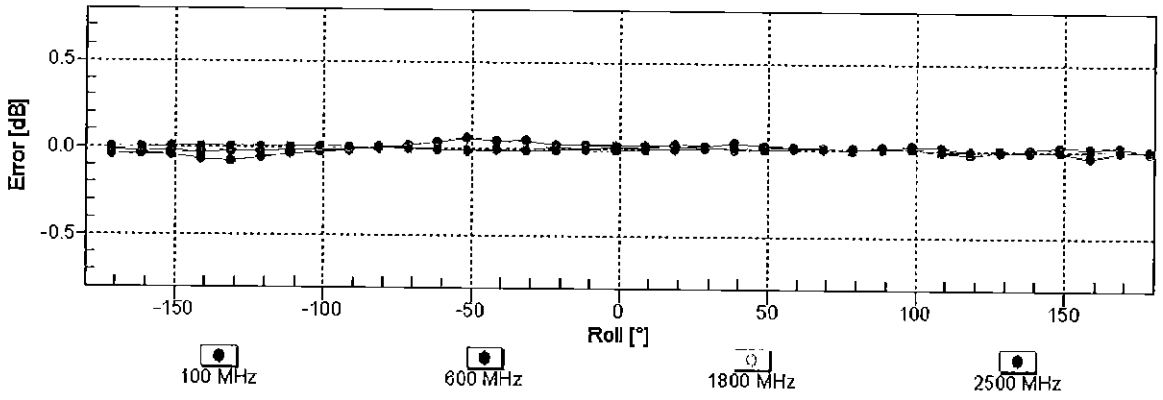
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

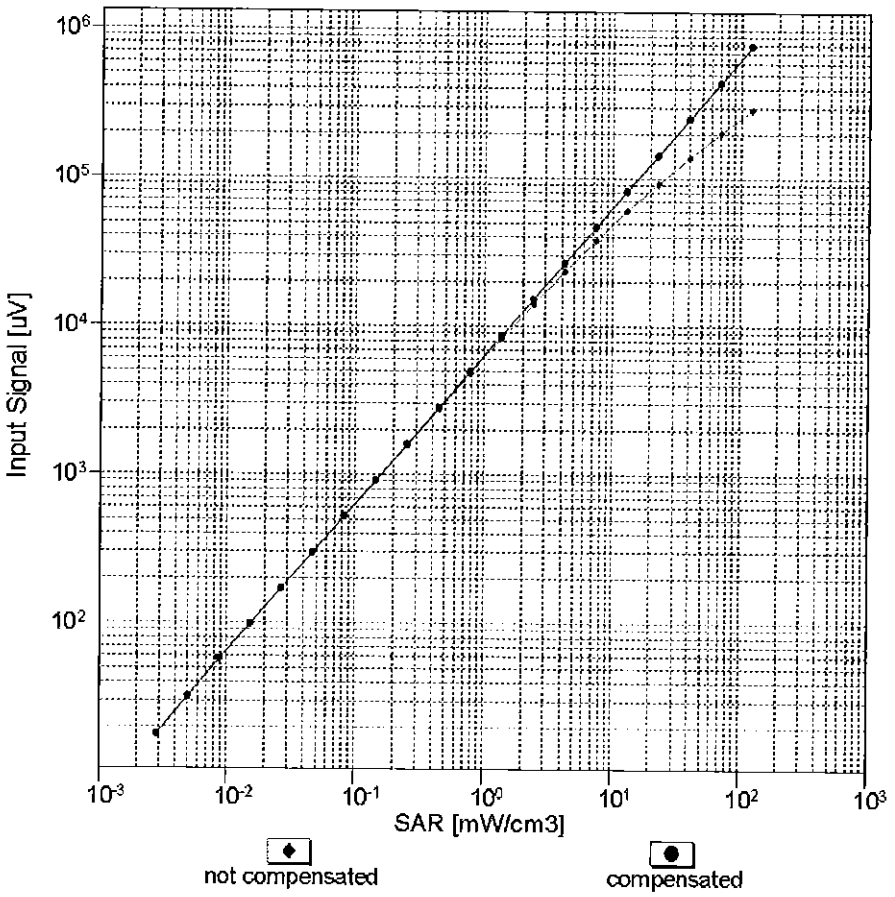


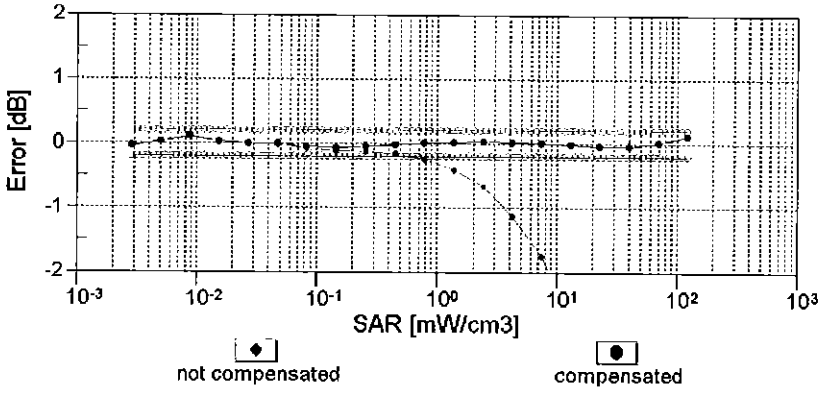


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)

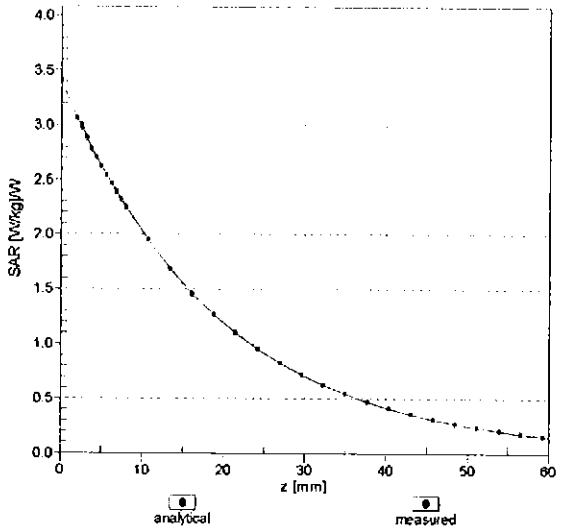




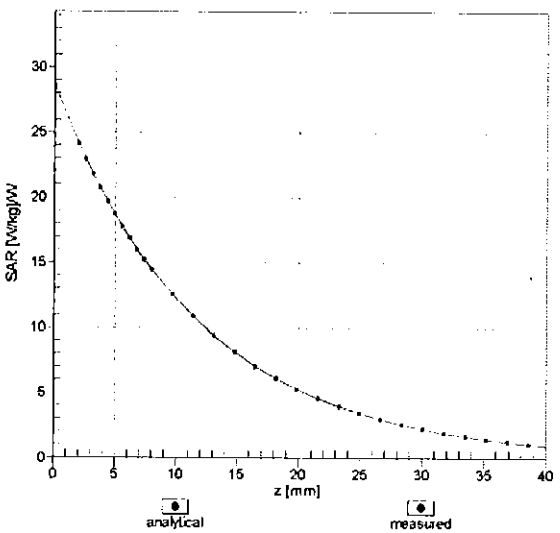
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

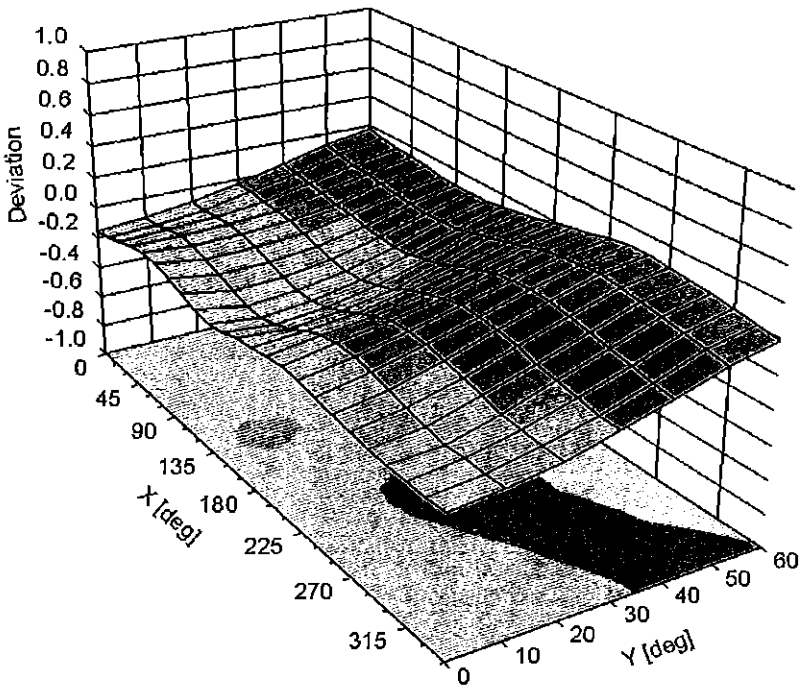


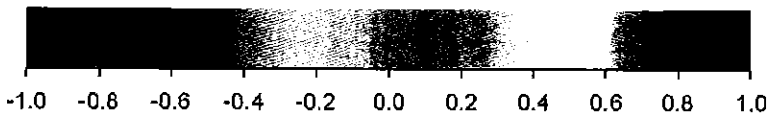
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 ± 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-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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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:

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"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,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 ≤ 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 *NORMx,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 ± 50 MHz to ± 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 *NORMx* (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 ($\mu V/(V/m)^2$)[A]	1.03	1.03	0.99	± 10.1 %
DCP (mV)[B]	107.6	105.3	107.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	192.1	±2.7 %
		Y	0.0	0.0	1.0		183.6	
		Z	0.0	0.0	1.0		183.3	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.27	60.1	10.2	10.00	38.6	±1.4 %
		Y	1.99	59.3	10.2		38.4	
		Z	5.38	67.8	12.9		37.2	
10011-CAB	UMTS-FDD (WCDMA)	X	3.40	68.0	18.9	2.91	131.7	±0.5 %
		Y	3.27	67.0	18.2		130.2	
		Z	3.41	68.3	19.1		148.5	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.93	68.9	18.7	1.87	132.9	±0.7 %
		Y	3.12	69.6	18.8		130.2	
		Z	3.24	71.1	19.7		128.2	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.90	70.3	23.0	9.46	133.5	±3.3 %
		Y	10.53	69.0	22.1		124.6	
		Z	11.14	71.2	23.6		147.1	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	15.05	91.0	24.4	9.39	139.5	±1.9 %
		Y	10.11	85.5	23.3		131.9	
		Z	11.84	87.6	23.4		130.0	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	10.42	84.9	22.6	9.57	131.5	±3.0 %
		Y	13.29	89.7	24.6		141.1	
		Z	14.17	90.2	24.2		148.7	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	11.26	83.1	19.4	6.56	140.7	±1.9 %
		Y	26.29	95.5	23.8		134.7	
		Z	16.82	88.9	21.3		131.6	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	64.74	99.9	22.2	4.80	131.5	±2.2 %
		Y	56.71	99.8	22.7		124.7	
		Z	63.10	99.9	22.2		124.1	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	62.11	99.6	21.6	3.55	146.1	±1.9 %
		Y	77.61	99.8	21.2		132.0	
		Z	72.33	99.7	21.2		133.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	96.24	92.7	15.9	1.16	137.2	±1.7 %
		Y	95.69	93.1	16.2		129.5	
		Z	98.67	94.1	16.4		149.7	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.14	66.8	19.2	5.67	126.2	±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	9.64	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, SO55, 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, SO32, 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		136.8	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.86	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%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (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 %

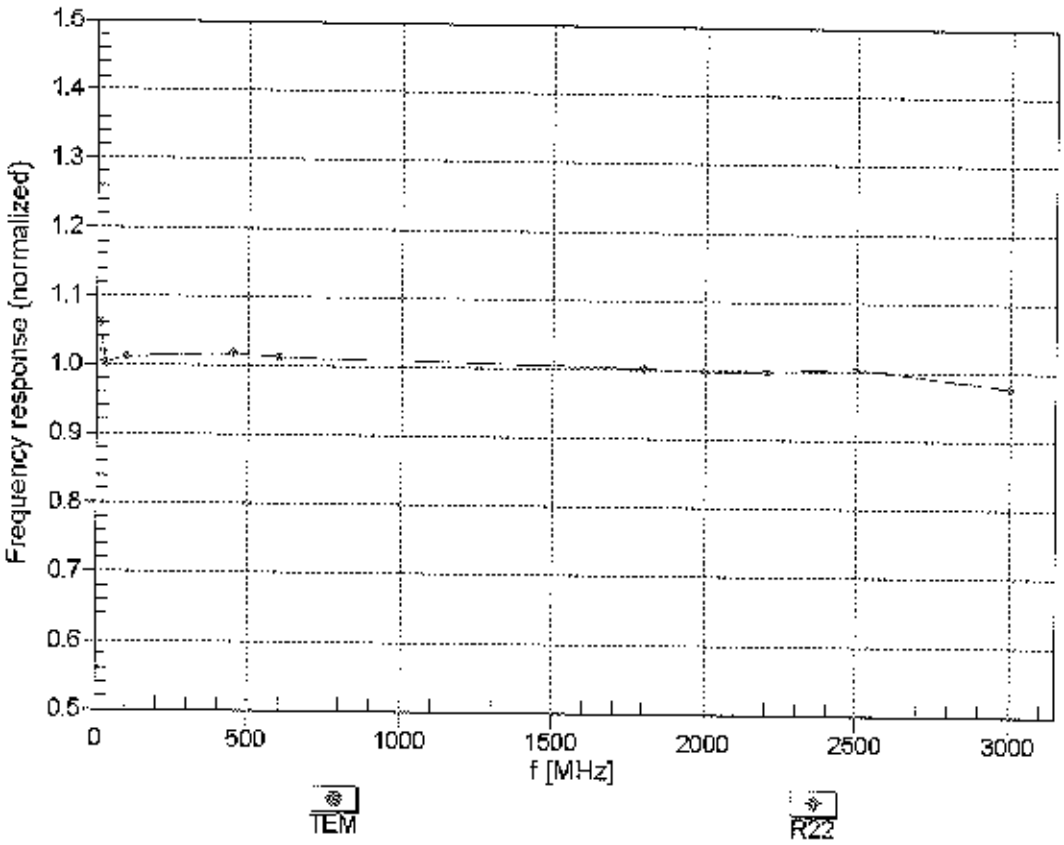
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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

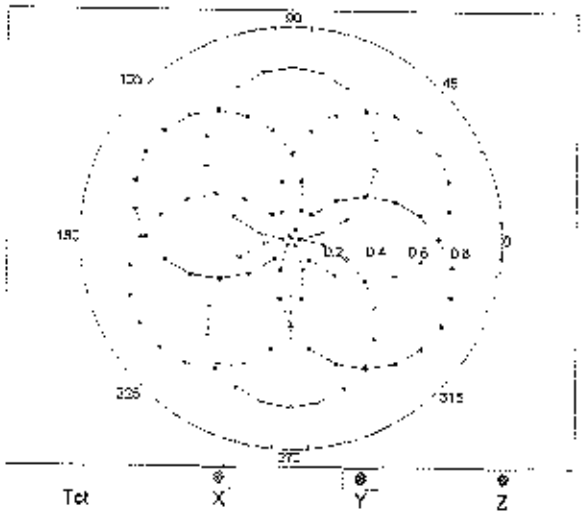
(TEM-Cell:ifi110 EXX, Waveguide: R22)



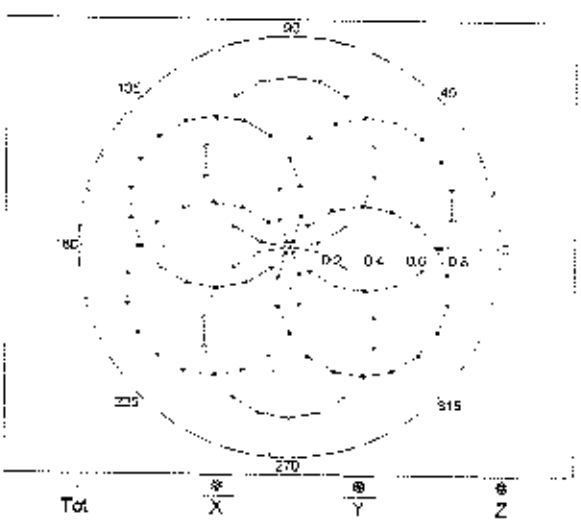
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

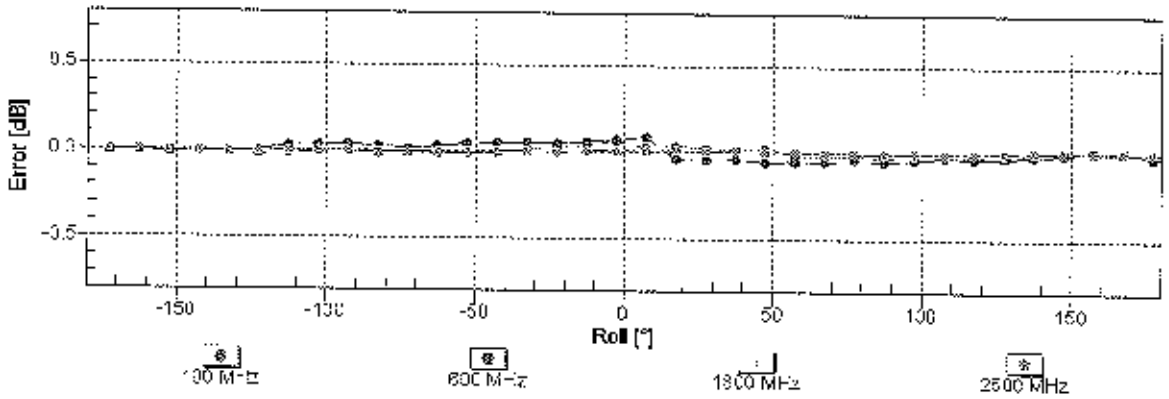
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

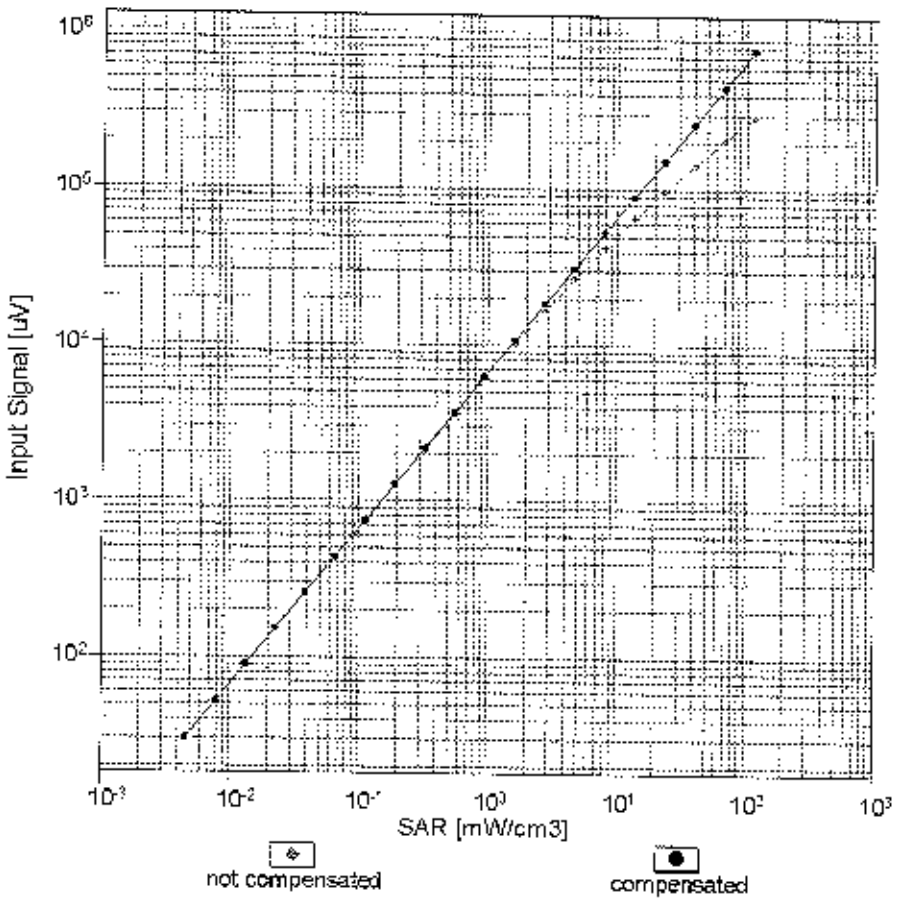


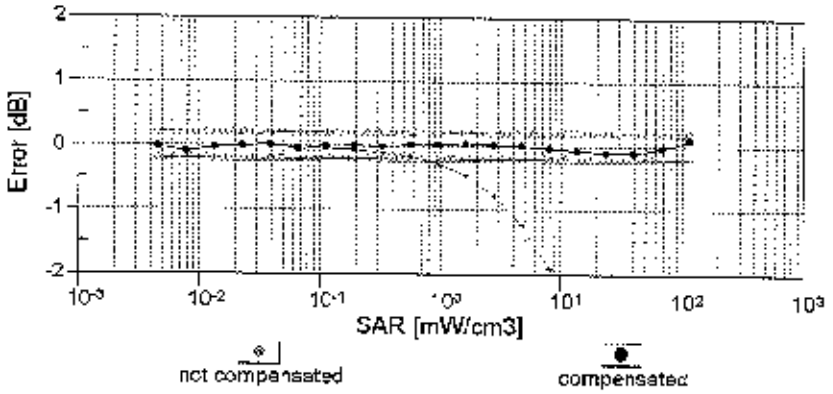


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

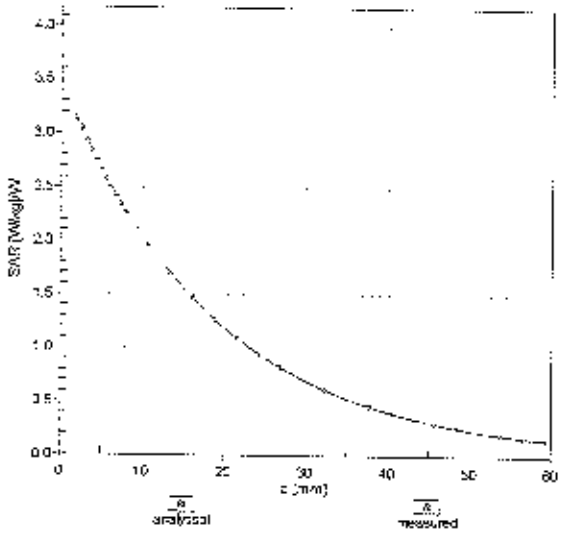




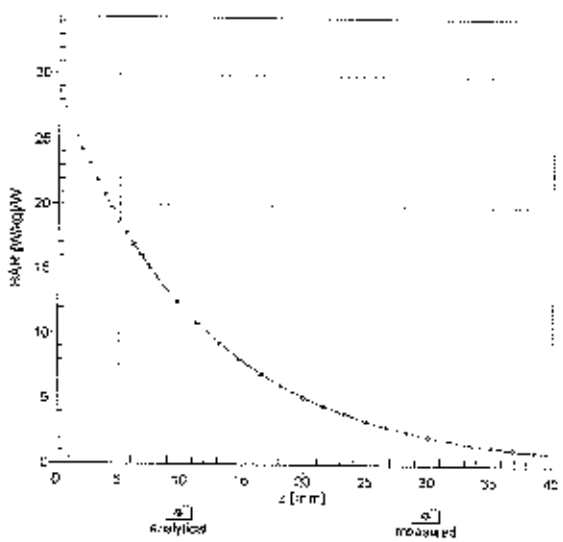
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

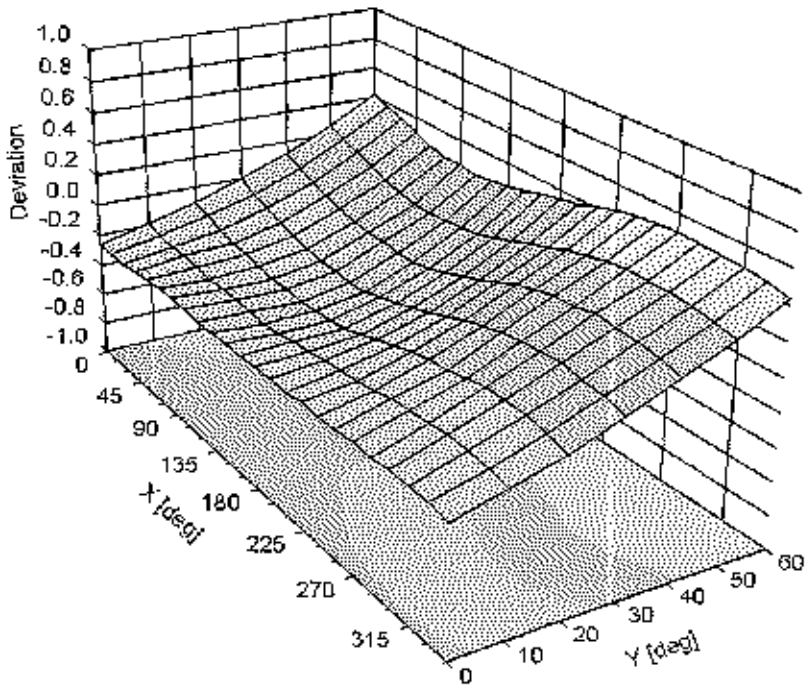


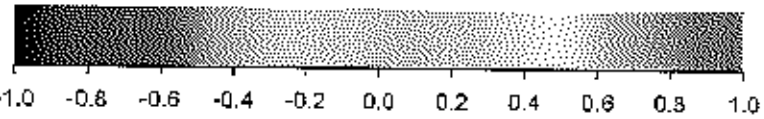
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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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
Calibration date:	April 19, 2016

BN 04/26/2016

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 ± 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

	Name	Function	Signature
Calibrated by:	**Jeton Kastrati**	**Laboratory Technician**	
Approved by:	**Katja Pokovic**	**Technical Manager**	

Issued: April 20, 2016

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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:

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"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,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 ≤ 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 *NORMx,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 ± 50 MHz to ± 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 *NORMx* (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 ($\mu V/(V/m)^2$)[A]	0.48	0.44	0.47	± 10.1 %
DCP (mV)[B]	100.7	97.9	98.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	120.4	±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	±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	±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	±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	±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	±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	±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	±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	±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	±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	±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	±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%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 6 and 7).
[B] Numerical linearization parameter: uncertainty not required.
[E] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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

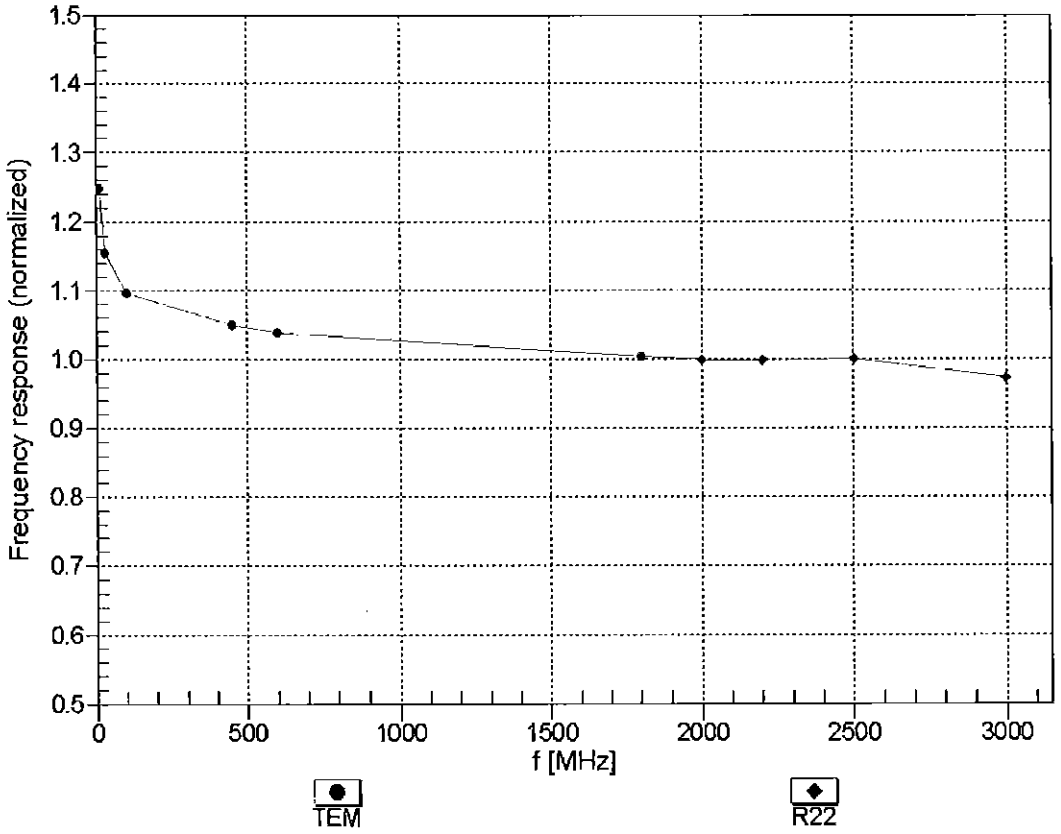
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	9.54	9.54	9.54	0.46	0.80	± 12.0 %
835	55.2	0.97	9.35	9.35	9.35	0.45	0.84	± 12.0 %
1750	53.4	1.49	7.78	7.78	7.78	0.37	0.85	± 12.0 %
1900	53.3	1.52	7.49	7.49	7.49	0.33	0.91	± 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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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.

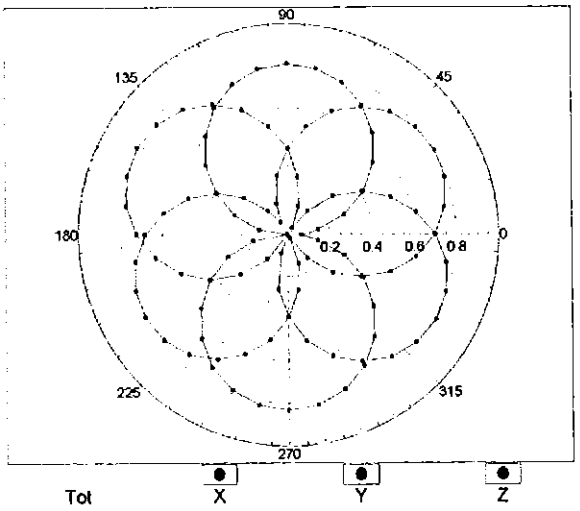
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



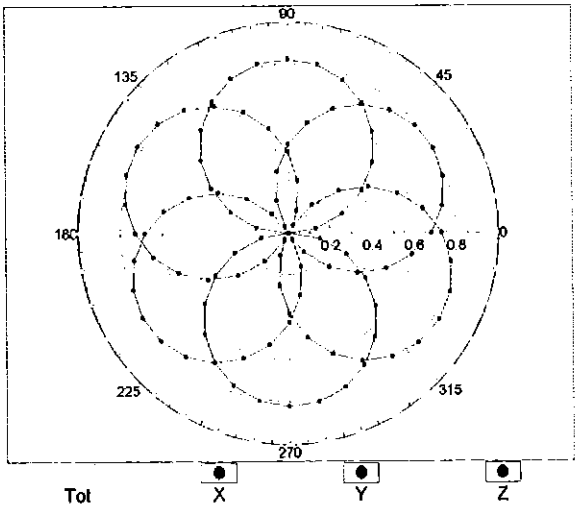
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

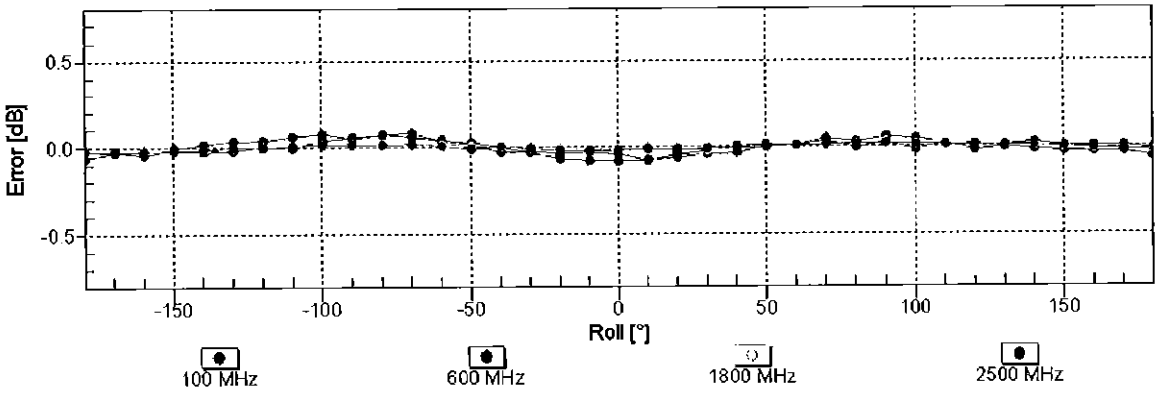
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

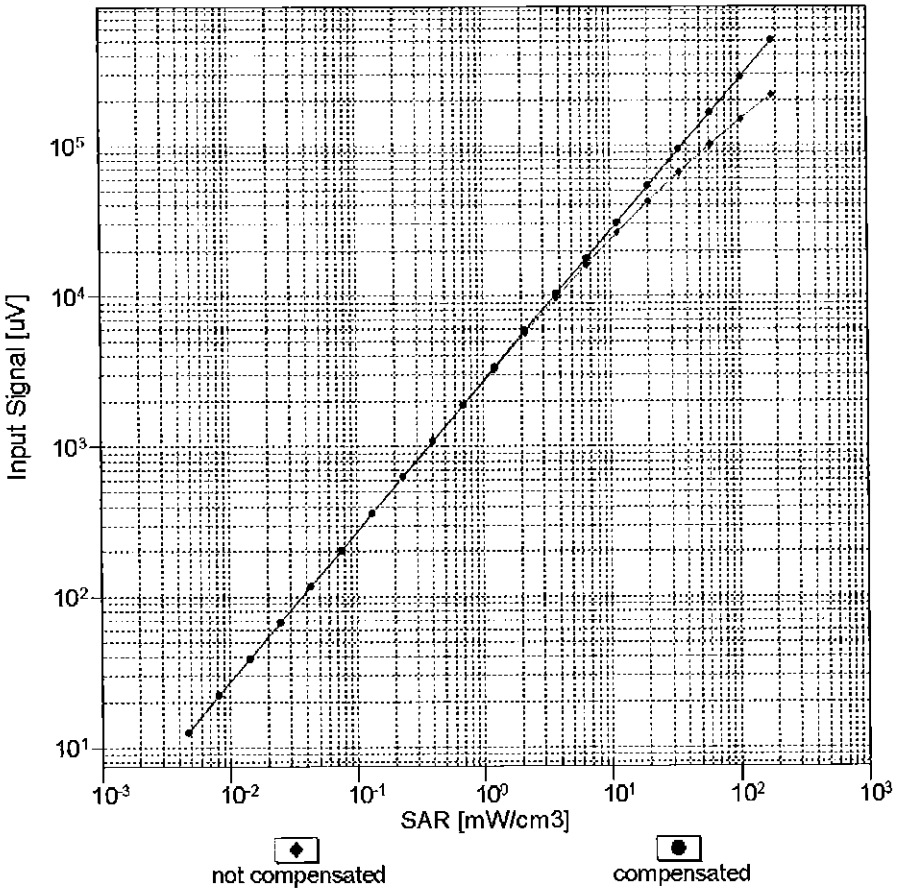


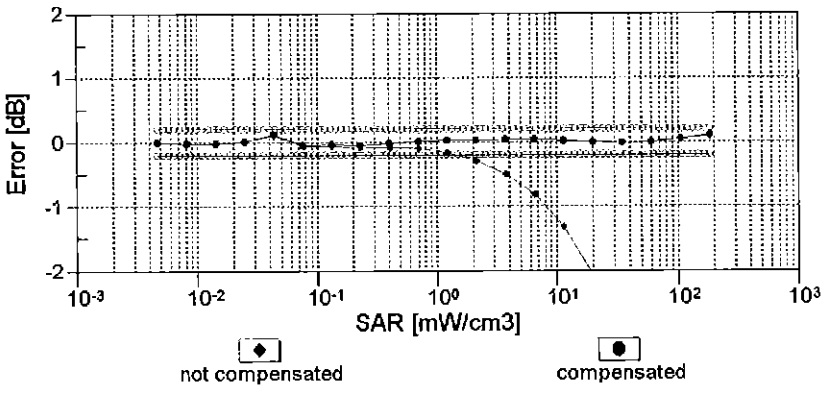


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

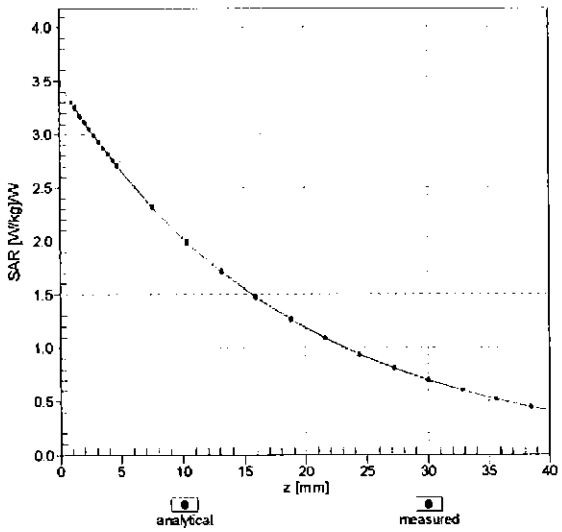




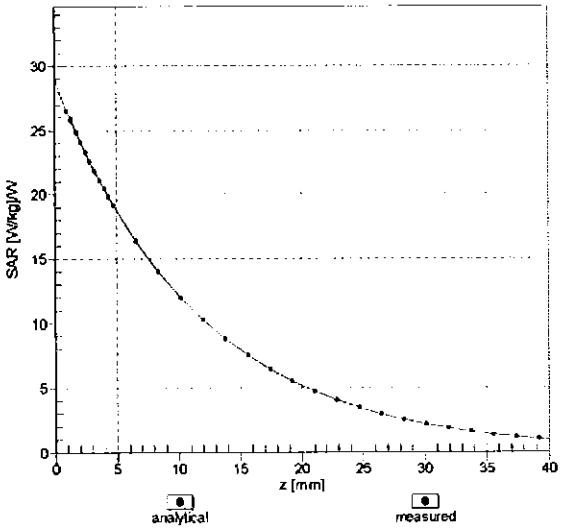
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

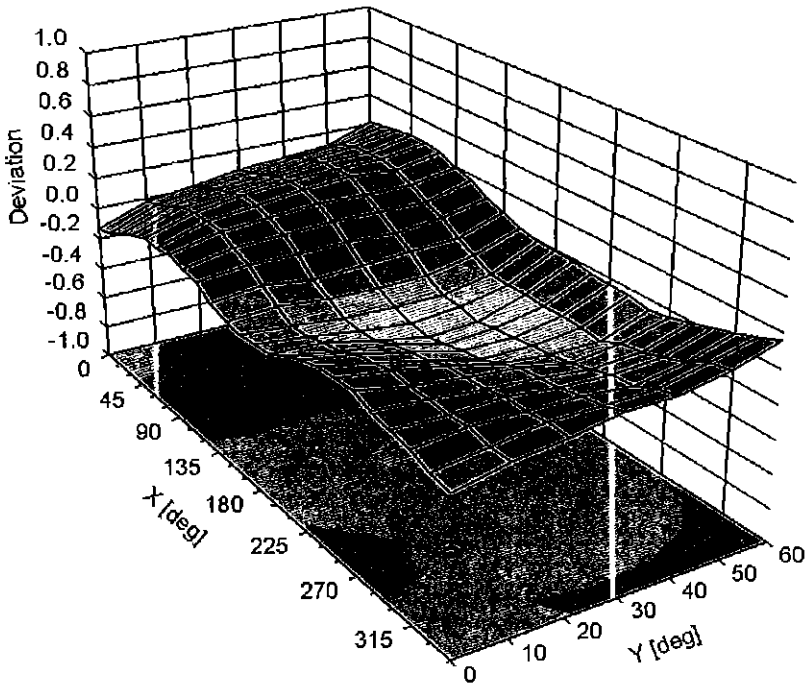


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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

BN ✓ 05/23/16

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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 18, 2016

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 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:

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"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,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*.
- *DCPx,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
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,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 ≤ 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 *NORMx,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 ± 50 MHz to ± 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 *NORMx* (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 ($\mu V/(V/m)^2$)[A]	0.39	0.34	0.39	± 10.1 %
DCP (mV)[B]	106.3	102.2	99.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (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%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 6 and 7).
[B] Numerical linearization parameter: uncertainty not required.
[E] 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) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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

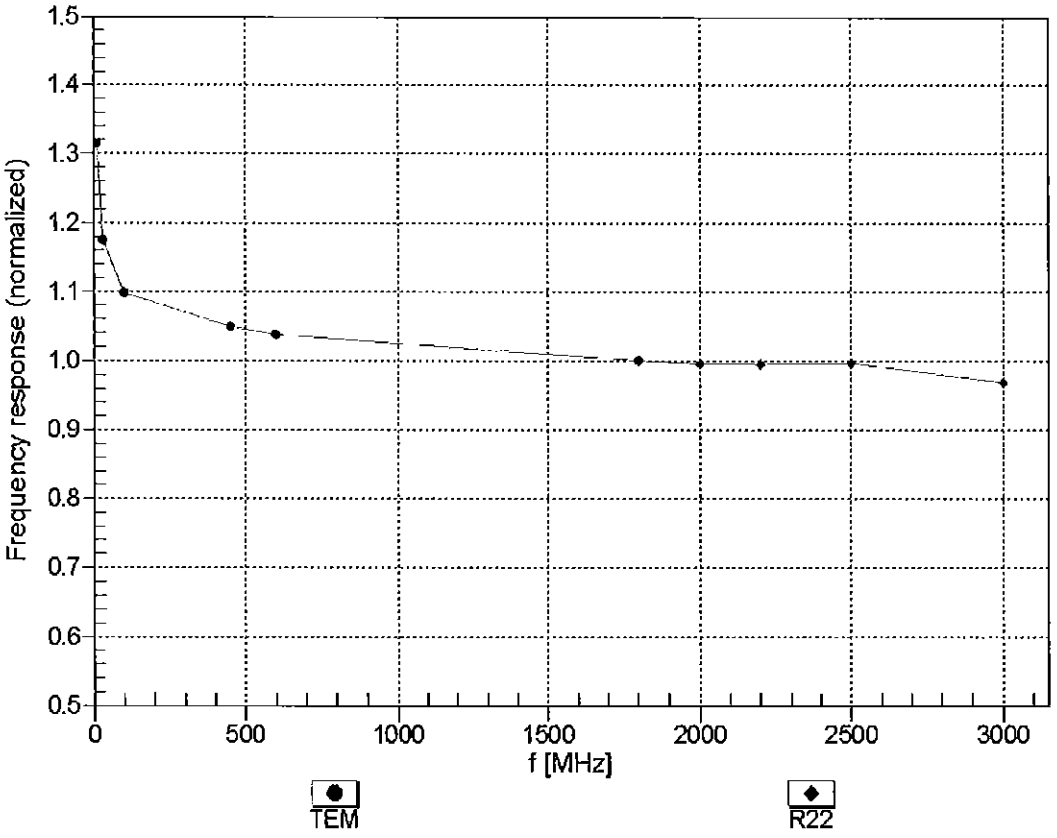
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	9.46	9.46	9.46	0.52	0.80	± 12.0 %
835	55.2	0.97	9.33	9.33	9.33	0.34	1.04	± 12.0 %
1750	53.4	1.49	7.72	7.72	7.72	0.44	0.80	± 12.0 %
1900	53.3	1.52	7.47	7.47	7.47	0.43	0.80	± 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 %

[C] 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.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) 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 (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] 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.

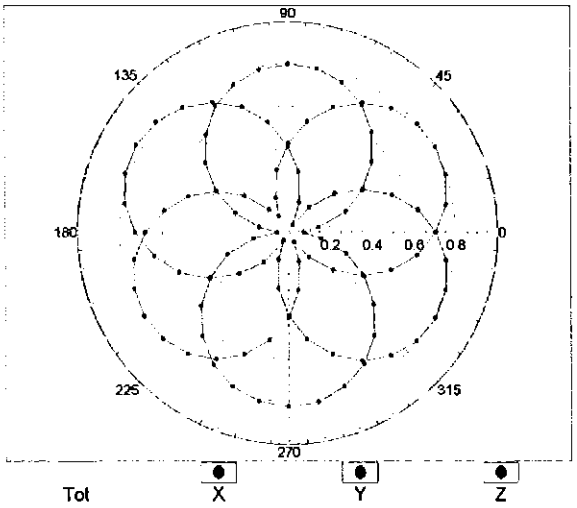
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



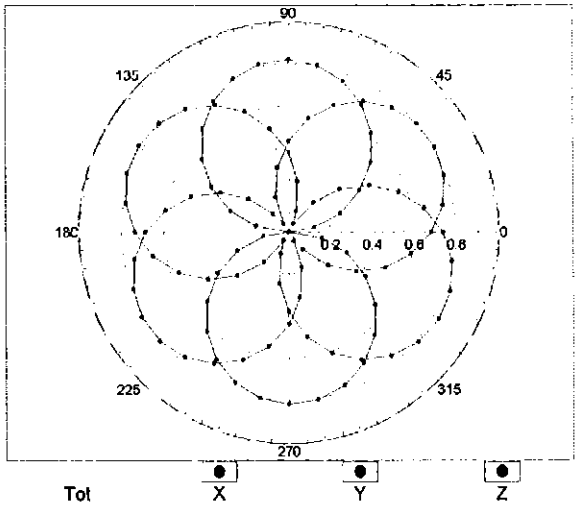
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

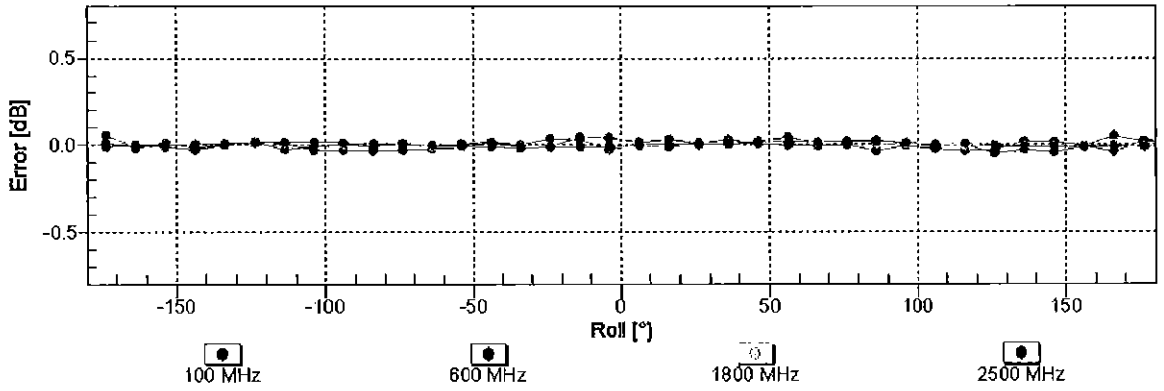
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



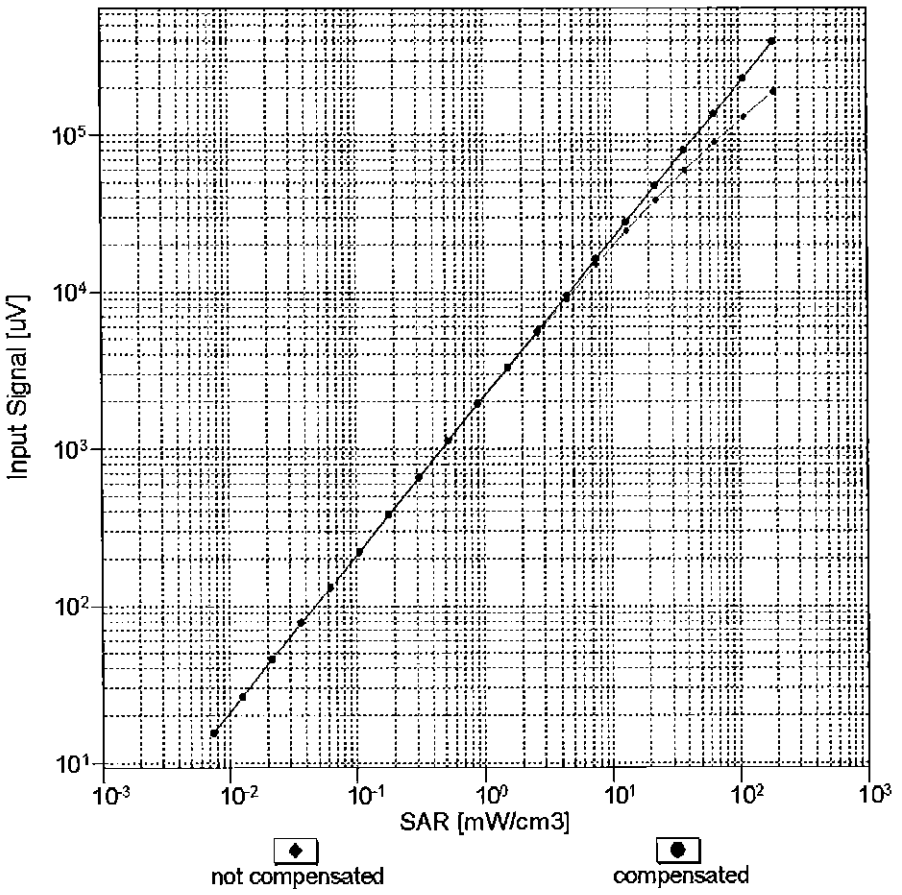
f=1800 MHz,R22

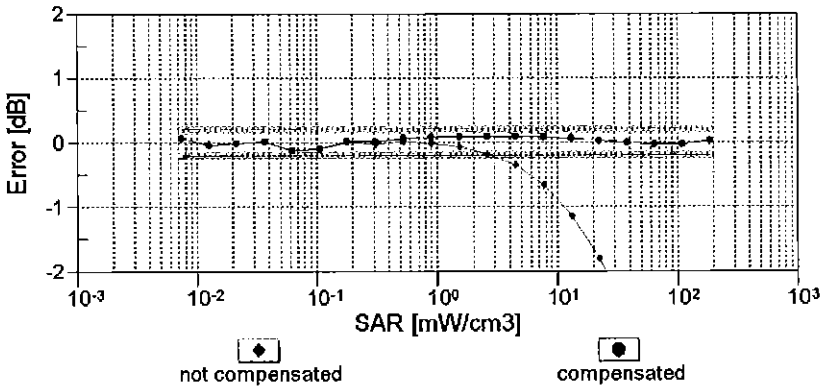




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

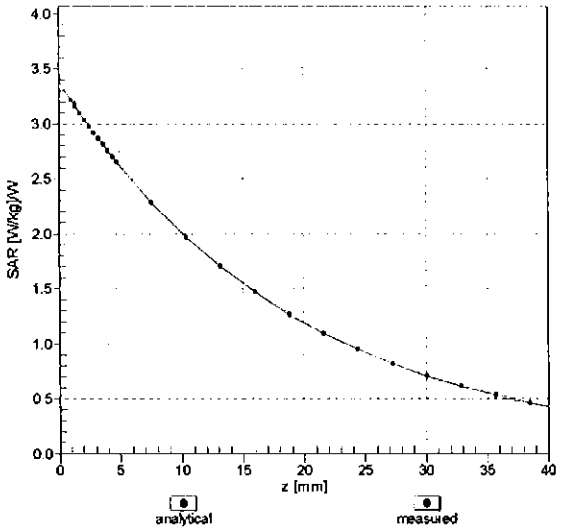




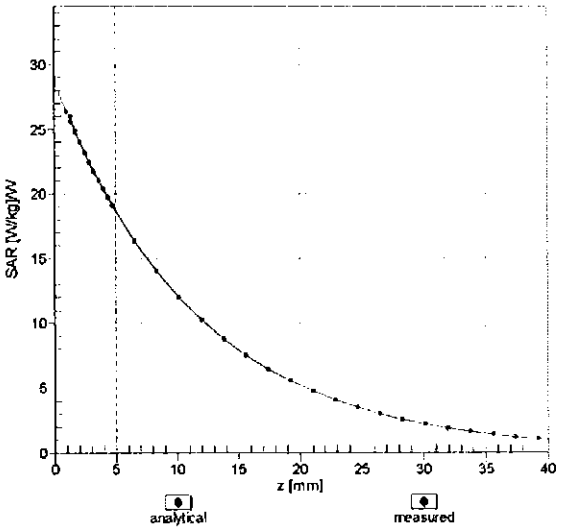
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

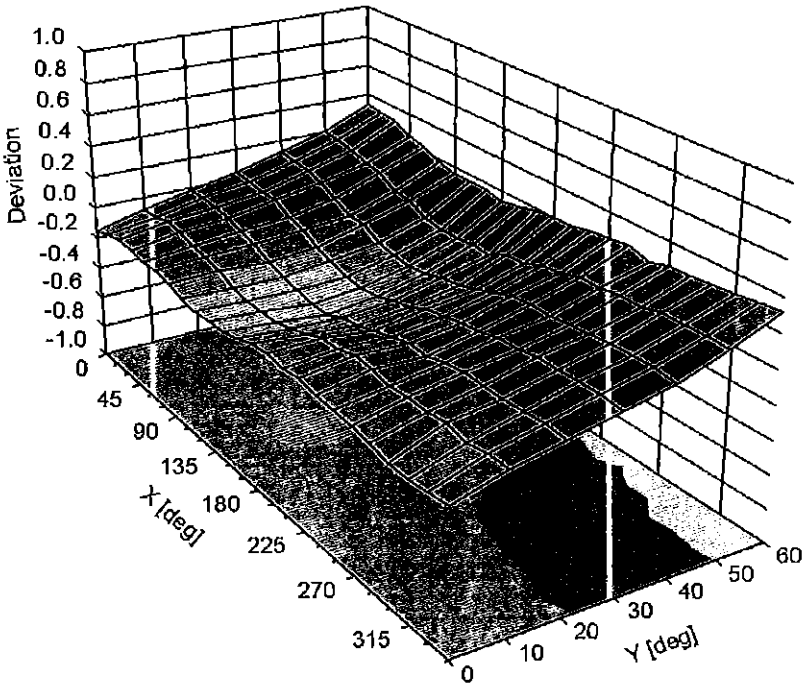


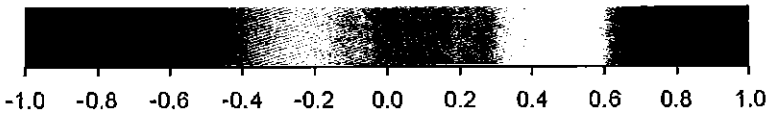
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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 ε' can be calculated from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{\left[\ln(b/a)\right]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r'\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

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, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω 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 2 - 3	See Page 2	47	31
NaCl			0.4	0.2
Water			52.6	68.8

2 Composition / Information on ingredients

The Item is composed of the following ingredients:

H_2O	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-methyyl-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 ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

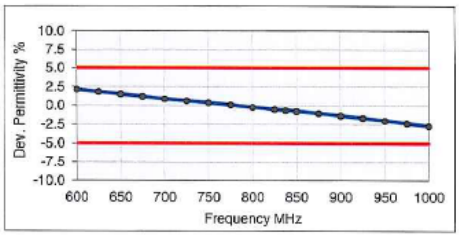
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	25-Feb-15
Operator	IEN

Additional Information

TSL Density	1.212 g/cm^3
TSL Heat-capacity	3.006 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	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



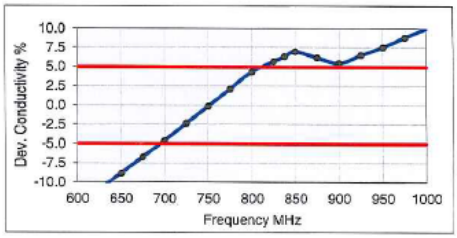


Figure D-2
750MHz Body Tissue Equivalent Matter

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 ± 2.5% towards the target values of Methanol.

Target Parameters

Target parameters as defined in the IEEE 1528 and IEC 62209 compliance standards.

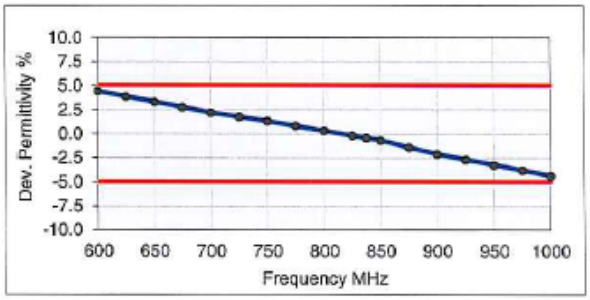
Test Condition

Ambient	Environment temperatur (22 ± 3)°C and humidity < 70%.
TSL Temperature	22°C
Test Date	18-Feb-15
Operator	IEN

Additional Information

TSL Density	1.284 g/cm^3
TSL Heat-capacity	2.701 kJ/(kg*K)

	Measured			Target		Diff.to Target [%]	
f [MHz]	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



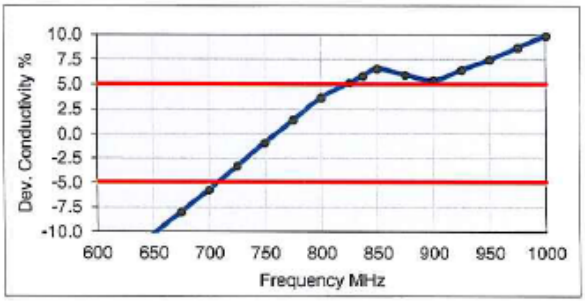


Figure D-3
750MHz Head Tissue Equivalent Matter

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. (σ)	PERM. (εr)	CW VALIDATION			MOD. VALIDATION		
									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.