



## SAR TEST REPORT

**Applicant** Huawei Technologies Co., Ltd.  
**FCC ID** QISAMN-LX9  
**Product** Smart Phone  
**Model** AMN-LX9  
**Report No.** R1901H0012-S1V1  
**Issue Date** March 12, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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# 1 Test Laboratory

## 1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

## 1.2 Test facility

### **CNAS (accreditation number:L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

### **VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

### 1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.  
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### 1.4 Laboratory Environment

|                                                                                                                                                                                                 |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Temperature                                                                                                                                                                                     | Min. = 18°C, Max. = 25 °C |
| Relative humidity                                                                                                                                                                               | Min. = 30%, Max. = 70%    |
| Ground system resistance                                                                                                                                                                        | < 0.5 $\Omega$            |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. |                           |

## 2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 1: Highest Reported SAR

| Mode             | Highest Reported SAR (W/kg)          |                  |                |
|------------------|--------------------------------------|------------------|----------------|
|                  | 1g SAR Head                          | 1g SAR Body-worn | 1g SAR Hotspot |
| GSM 850          | <0.10                                | 0.53             | 0.34           |
| GSM 1900         | 0.35                                 | 0.18             | 0.21           |
| WCDMA Band V     | 0.42                                 | 0.56             | 0.38           |
| LTE FDD 5        | 0.42                                 | 0.52             | 0.64           |
| LTE FDD 7        | 0.17                                 | 0.43             | 0.60           |
| Wi-Fi (2.4G)     | 0.19                                 | 0.23             | 0.23           |
| BT               | 0.24                                 | <0.10            | <0.10          |
| Date of Testing: | February 14, 2019~ February 17, 2019 |                  |                |

Note: 1) The highest Reported SAR for head, body-worn, hotspot and simultaneous transmission exposure conditions are 0.42 W/kg, 0.56W/kg, 0.64W/kg and 0.87W/kg.

2) Sand-alone SAR evaluation is not required for BT, more details information see section 10.2

3) For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits according to the FCC rule § 2.1093, the ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

### 3 Description of Equipment under Test

#### Client Information

|                             |                                                                                                                                  |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | Huawei Technologies Co., Ltd.                                                                                                    |
| <b>Applicant address</b>    | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China. |
| <b>Manufacturer</b>         | Huawei Technologies Co., Ltd.                                                                                                    |
| <b>Manufacturer address</b> | Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China. |

#### General Technologies

|                      |                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------|
| Application Purpose: | Original Grant                                                                            |
| EUT Stage:           | Identical Prototype                                                                       |
| Model:               | AMN-LX9                                                                                   |
| IMEI:                | IMEI 1:861366040091756<br>IMEI 2:861366040095757                                          |
| Hardware Version:    | HL1AMNM                                                                                   |
| Software Version:    | 5.0.1.37(C900E20R1P2)                                                                     |
| Antenna Type:        | Internal Antenna                                                                          |
| Device Class:        | B                                                                                         |
| Wi-Fi Hotspot:       | Wi-Fi 2.4G                                                                                |
| Power Class:         | GSM 850:4<br>GSM 1900:1<br>UMTS Band V:3<br>LTE FDD 5/7:3                                 |
| Power Level:         | GSM 850:level 5<br>GSM 1900:level 0<br>UMTS Band V:all up bits<br>LTE FDD 5/7:max power   |
| EUT Accessory        |                                                                                           |
| Battery 1            | Manufacturer: Huawei Technologies Co., Ltd.<br>(Sunwoda)<br>Model: HB405979ECW            |
| Battery 2            | Manufacturer: Huawei Technologies Co., Ltd.<br>(SCUD)<br>Model: HB405979ECW               |
| Battery 3            | Manufacturer: Huawei Technologies Co., Ltd.<br>(Desay)<br>Model: HB405979ECW              |
| Earphone 1           | Manufacturer: Boluo County Quancheng Electronic Co.,ltd.<br>Model: 1293#+3283# 3.5MM-150  |
| Earphone 2           | Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD.<br>Model: MEMD1532B528000 |

# Wireless Technology and Frequency Range

| Wireless Technology |                                                                                                                        | Modulation                | Operating mode                                                                                                                                                                                                         | Tx (MHz)    |
|---------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| GSM                 | 850                                                                                                                    | Voice(GMSK)<br>GPRS(GMSK) | <input type="checkbox"/> Multi-slot Class:8-1UP<br><input type="checkbox"/> Multi-slot Class:10-2UP<br><input checked="" type="checkbox"/> Multi-slot Class:12-4UP<br><input type="checkbox"/> Multi-slot Class:33-4UP | 824 ~ 849   |
|                     | 1900                                                                                                                   | EGPRS(GMSK,8PSK)          |                                                                                                                                                                                                                        | 1850 ~ 1910 |
|                     | Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |                           |                                                                                                                                                                                                                        |             |
| UMTS                | Band V                                                                                                                 | QPSK, 16QAM               | HSDPA UE Category:14<br>HSUPA UE Category:7<br>DC-HSDPA UE Category:24<br>HSPA+ Category:7                                                                                                                             | 824 ~ 849   |
| LTE                 | FDD 5                                                                                                                  | QPSK, 16QAM               | Rel.10 /Category 4                                                                                                                                                                                                     | 824 ~ 849   |
|                     | FDD 7                                                                                                                  |                           |                                                                                                                                                                                                                        | 2500 ~ 2570 |
|                     | Does this device support Carrier Aggregation (CA) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |                           |                                                                                                                                                                                                                        |             |
|                     | Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No       |                           |                                                                                                                                                                                                                        |             |
| BT                  | 2.4G                                                                                                                   | Version 5.0 LE            |                                                                                                                                                                                                                        | 2402 ~2480  |
| Wi-Fi               | 2.4G                                                                                                                   | DSSS,OFDM                 | 802.11b/g/n HT20                                                                                                                                                                                                       | 2412 ~ 2462 |
|                     |                                                                                                                        | OFDM                      | 802.11n HT40                                                                                                                                                                                                           | 2422 ~ 2452 |
|                     | Does this device support MIMO <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                      |                           |                                                                                                                                                                                                                        |             |



## 4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

248227 D01 802.11Wi-Fi SAR v02r02  
447498 D01 General RF Exposure Guidance v06  
648474 D04 Handset SAR v01r03  
690783 D01 SAR Listings on Grants v01r03  
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04  
865664 D02 RF Exposure Reporting v01r02  
941225 D01 3G SAR Procedures v03r01  
941225 D05 SAR for LTE Devices v02r05  
941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02  
941225 D06 Hotspot Mode v02r01

## 5 Operational Conditions during Test

### 5.1 Test Positions

#### 5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 - 2013 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

#### 5.1.2 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

## 5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is  $\geq 0.80$  W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was  $> 1.20$  or when the original or repeated measurement was  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$  W/kg.
- 4) Repeated measurements are not required when the original highest measured SAR is  $< 0.80$  W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

## 5.3 Test Configuration

### 5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

**Table 2: The allowed power reduction in the multi-slot configuration**

| Number of timeslots in uplink assignment | Permissible nominal reduction of maximum output power,(dB) |
|------------------------------------------|------------------------------------------------------------|
| 1                                        | 0                                                          |
| 2                                        | 0 to 3,0                                                   |
| 3                                        | 1,8 to 4,8                                                 |
| 4                                        | 3,0 to 6,0                                                 |

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

### 5.3.2 UMTS Test Configuration

#### 5.3.2.1 3G SAR Test Reduction Procedure

The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations modes according to output power, exposure conditions and device operating capabilities. Maximum output power is verified by applying the applicable versions of 3GPP TS 34.121.

#### 5.3.2.2 Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest SAR configuration in 12.2 kbps RMC for head exposure.

#### 5.3.2.3 Body-worn accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits

configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the EUT with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the EUT, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC

#### 5.3.2.4 Release 5 HSDPA Test Configuration

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest SAR body-worn accessory exposure configuration in 12.2 kbps RMC. EUT with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device. The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors( $\beta_c$ ,  $\beta_d$ ), and HS-DPCCH power offset parameters ( $\Delta_{ACK}$ ,  $\Delta_{NACK}$ ,  $\Delta_{CQI}$ ) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

**Table 3: Subtests for UMTS Release 5 HSDPA**

| Sub-set                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | $\beta_c$         | $\beta_d$         | $\beta_d$<br>(SF) | $\beta_c/\beta_d$ | $\beta_{hs}$<br>(note 1, note 2) | CM(dB)<br>(note 3) | MPR(dB) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|----------------------------------|--------------------|---------|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2/15              | 15/15             | 64                | 2/15              | 4/15                             | 0.0                | 0.0     |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12/15<br>(note 4) | 15/15<br>(note 4) | 64                | 12/15<br>(note 4) | 24/15                            | 1.0                | 0.0     |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 15/15             | 8/15              | 64                | 15/8              | 30/15                            | 1.5                | 0.5     |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 15/15             | 4/15              | 64                | 15/4              | 30/15                            | 1.5                | 0.5     |
| <p>Note1: <math>\Delta_{ACK}</math>, <math>\Delta_{NACK}</math> and <math>\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c</math></p> <p>Note2: CM=1 for <math>\beta_c/\beta_d = 12/15</math>, <math>\beta_{hs}/\beta_c = 24/15</math>.</p> <p>Note3: For subtest 2 the <math>\beta_c/\beta_d</math> ratio of 12/15 for the TFC during the measurement period(TF1,TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1,TF1) to <math>\beta_c = 11/15</math> and <math>\beta_d = 15/15</math>.</p> |                   |                   |                   |                   |                                  |                    |         |

#### 5.3.2.5 Release 6 HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest body-worn accessory exposure SAR configuration in 12.2 kbps RMC.

When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the  $\beta$  values indicated in Table 2 and other applicable procedures described in the 'WCDMA EUT and 'Release 5 HSDPA Data Devices' sections of this document

**Table 4: Sub-Test 5 Setup for Release 6 HSUPA**

| Sub-set | $\beta_c$            | $\beta_d$            | $\beta_d$<br>(SF) | $\beta_c/\beta_d$    | $\beta_{hs}^{(1)}$ | $\beta_{ec}$ | $\beta_{ed}$                               | $\beta_{ed}$<br>(SF) | $\beta_{ed}$<br>(codes) | CM<br>(2)<br>(dB) | MPR<br>(dB) | AG <sup>(4)</sup><br>Index | E-TFCI |
|---------|----------------------|----------------------|-------------------|----------------------|--------------------|--------------|--------------------------------------------|----------------------|-------------------------|-------------------|-------------|----------------------------|--------|
| 1       | 11/15 <sup>(3)</sup> | 15/15 <sup>(3)</sup> | 64                | 11/15 <sup>(3)</sup> | 22/15              | 209/225      | 1039/225                                   | 4                    | 1                       | 1.0               | 0.0         | 20                         | 75     |
| 2       | 6/15                 | 15/15                | 64                | 6/15                 | 12/15              | 12/15        | 94/75                                      | 4                    | 1                       | 3.0               | 2.0         | 12                         | 67     |
| 3       | 15/15                | 9/15                 | 64                | 15/9                 | 30/15              | 30/15        | $\beta_{ed1}$ 47/15<br>$\beta_{ed2}$ 47/15 | 4                    | 2                       | 2.0               | 1.0         | 15                         | 92     |
| 4       | 2/15                 | 15/15                | 64                | 2/15                 | 4/15               | 2/15         | 56/75                                      | 4                    | 1                       | 3.0               | 2.0         | 17                         | 71     |
| 5       | 15/15 <sup>(4)</sup> | 15/15 <sup>(4)</sup> | 64                | 15/15 <sup>(4)</sup> | 30/15              | 24/15        | 134/15                                     | 4                    | 1                       | 1.0               | 0.0         | 21                         | 81     |

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 14/15$  and  $\beta_d = 15/15$ .

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6:  $\beta_{ed}$  can not be set directly; it is set by Absolute Grant Value.

**Table 5: HSUPA UE category**

| UE<br>E-DCH<br>Category | Maximum<br>E-DCH<br>Codes<br>Transmitted | Number<br>of HARQ<br>Processes | E-<br>DCH<br>TTI<br>(ms) | Minimum<br>Spreading<br>Factor | Maximum<br>E-DCH<br>Transport<br>Block Bits | Max<br>Rate<br>(Mbps) |
|-------------------------|------------------------------------------|--------------------------------|--------------------------|--------------------------------|---------------------------------------------|-----------------------|
| 1                       | 1                                        | 4                              | 10                       | 4                              | 7110                                        | 0.7296                |
| 2                       | 2                                        | 8                              | 2                        | 4                              | 2798                                        | 1.4592                |
|                         | 2                                        | 4                              | 10                       | 4                              | 14484                                       |                       |
| 3                       | 2                                        | 4                              | 10                       | 4                              | 14484                                       | 1.4592                |
| 4                       | 2                                        | 8                              | 2                        | 2                              | 5772                                        | 2.9185                |
|                         | 2                                        | 4                              | 10                       | 2                              | 20000                                       | 2.00                  |
| 5                       | 2                                        | 4                              | 10                       | 2                              | 20000                                       | 2.00                  |
| 6                       | 4                                        | 8                              | 2                        | 2 SE2 & 2 SE4                  | 11484                                       | 5.76                  |



|                                                                                                                                                                                                                  |   |   |    |               |       |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|----|---------------|-------|------|
| (No DPDCH)                                                                                                                                                                                                       | 4 | 4 | 10 |               | 20000 | 2.00 |
| 7                                                                                                                                                                                                                | 4 | 8 | 2  | 2 SF2 & 2 SF4 | 22996 | ?    |
| (No DPDCH)                                                                                                                                                                                                       | 4 | 4 | 10 |               | 20000 | ?    |
| NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.<br>UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM.<br>(TS25.306-7.3.0) |   |   |    |               |       |      |

### 5.3.2.6 HSPA, HSPA+ and DC-HSDPA Test Configuration

SAR test exclusion may apply to 3GPP Rel. 6 HSPA and Rel. 8 DC-HSDPA. When SAR measurement is required for HSPA or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements. Without prior KDB confirmation to determine the SAR results are acceptable, a PAG is required for equipment approval.

SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

- 1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.
- 2) SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode.<sup>36</sup> Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.
- 3) SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.
- 4) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA:
  - a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.
  - i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.
  - b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.
  - c) The UE category, operating parameters, such as the  $\beta$  and  $\Delta$  values used to configure the device for testing, power setback procedures described in 3GPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.
- 5) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

**Table 6: HS-DSCH UE category**
**Table 5.1a: FDD HS-DSCH physical layer categories**

| HS-DSCH category      | Maximum number of HS-DSCH codes received | Minimum inter-TTI interval | Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI<br>NOTE 1 | Total number of soft channel bits | Supported modulations without MIMO operation or dual cell operation | Supported modulations with MIMO operation and without dual cell operation | Supported modulations with dual cell operation     |                    |
|-----------------------|------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------|--------------------|
| Category 1            | 5                                        | 3                          | 7298                                                                                          | 19200                             | QPSK, 16QAM                                                         | Not applicable (MIMO not supported)                                       | Not applicable (dual cell operation not supported) |                    |
| Category 2            | 5                                        | 3                          | 7298                                                                                          | 28800                             |                                                                     |                                                                           |                                                    |                    |
| Category 3            | 5                                        | 2                          | 7298                                                                                          | 28800                             |                                                                     |                                                                           |                                                    |                    |
| Category 4            | 5                                        | 2                          | 7298                                                                                          | 38400                             |                                                                     |                                                                           |                                                    |                    |
| Category 5            | 5                                        | 1                          | 7298                                                                                          | 57600                             |                                                                     |                                                                           |                                                    |                    |
| Category 6            | 5                                        | 1                          | 7298                                                                                          | 67200                             |                                                                     |                                                                           |                                                    |                    |
| Category 7            | 10                                       | 1                          | 14411                                                                                         | 115200                            |                                                                     |                                                                           |                                                    |                    |
| Category 8            | 10                                       | 1                          | 14411                                                                                         | 134400                            |                                                                     |                                                                           |                                                    |                    |
| Category 9            | 15                                       | 1                          | 20251                                                                                         | 172800                            |                                                                     |                                                                           |                                                    |                    |
| Category 10           | 15                                       | 1                          | 27952                                                                                         | 172800                            |                                                                     |                                                                           |                                                    |                    |
| Category 11           | 5                                        | 2                          | 3630                                                                                          | 14400                             | QPSK                                                                |                                                                           |                                                    |                    |
| Category 12           | 5                                        | 1                          | 3630                                                                                          | 28800                             |                                                                     |                                                                           |                                                    |                    |
| Category 13           | 15                                       | 1                          | 35280                                                                                         | 259200                            | QPSK, 16QAM, 64QAM                                                  |                                                                           |                                                    |                    |
| Category 14           | 15                                       | 1                          | 42192                                                                                         | 259200                            |                                                                     |                                                                           |                                                    |                    |
| Category 15           | 15                                       | 1                          | 23370                                                                                         | 345600                            | QPSK, 16QAM                                                         |                                                                           |                                                    |                    |
| Category 16           | 15                                       | 1                          | 27952                                                                                         | 345600                            |                                                                     |                                                                           |                                                    |                    |
| Category 17<br>NOTE 2 | 15                                       | 1                          | 35280                                                                                         | 259200                            | QPSK, 16QAM, 64QAM                                                  | —                                                                         |                                                    |                    |
|                       |                                          |                            | 23370                                                                                         | 345600                            | —                                                                   | QPSK, 16QAM                                                               |                                                    |                    |
| Category 18<br>NOTE 3 | 15                                       | 1                          | 42192                                                                                         | 259200                            | QPSK, 16QAM, 64QAM                                                  | —                                                                         |                                                    |                    |
|                       |                                          |                            | 27952                                                                                         | 345600                            | —                                                                   | QPSK, 16QAM                                                               |                                                    |                    |
| Category 19           | 15                                       | 1                          | 35280                                                                                         | 518400                            | QPSK, 16QAM, 64QAM                                                  |                                                                           |                                                    |                    |
| Category 20           | 15                                       | 1                          | 42192                                                                                         | 518400                            |                                                                     |                                                                           |                                                    |                    |
| Category 21           | 15                                       | 1                          | 23370                                                                                         | 345600                            | -                                                                   | -                                                                         |                                                    | QPSK, 16QAM        |
| Category 22           | 15                                       | 1                          | 27952                                                                                         | 345600                            |                                                                     |                                                                           |                                                    | QPSK, 16QAM, 64QAM |
| Category 23           | 15                                       | 1                          | 35280                                                                                         | 518400                            |                                                                     |                                                                           |                                                    |                    |
| Category 24           | 15                                       | 1                          | 42192                                                                                         | 518400                            |                                                                     |                                                                           |                                                    |                    |

### 5.3.3 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

#### A) 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.

#### B) 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.

### **C)A-MPR**

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

### **D) Largest channel bandwidth standalone SAR test requirements**

#### **1) QPSK with 1 RB allocation**

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is  $\leq 0.8$  W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is  $> 1.45$  W/kg, SAR is required for all three RB offset configurations for that required test channel.

#### **2) QPSK with 50% RB allocation**

The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

#### **3) QPSK with 100% RB allocation**

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are  $\leq 0.8$  W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is  $> 1.45$  W/kg, the remaining required test channels must also be tested.

#### **4) Higher order modulations**

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is  $> \frac{1}{2}$  dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is  $> 1.45$  W/kg.

### **E) Other channel bandwidth standalone SAR test requirements**

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is  $> \frac{1}{2}$  dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is  $> 1.45$  W/kg.

### **5.3.4 Wi-Fi Test Configuration**

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the

measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported SAR* for the *initial test position* is:

- $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported SAR* is  $\leq 0.8$  W/kg or all required test positions are tested.
  - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported SAR* is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported SAR* is  $\leq 1.2$  W/kg or all required test channels are considered.
  - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

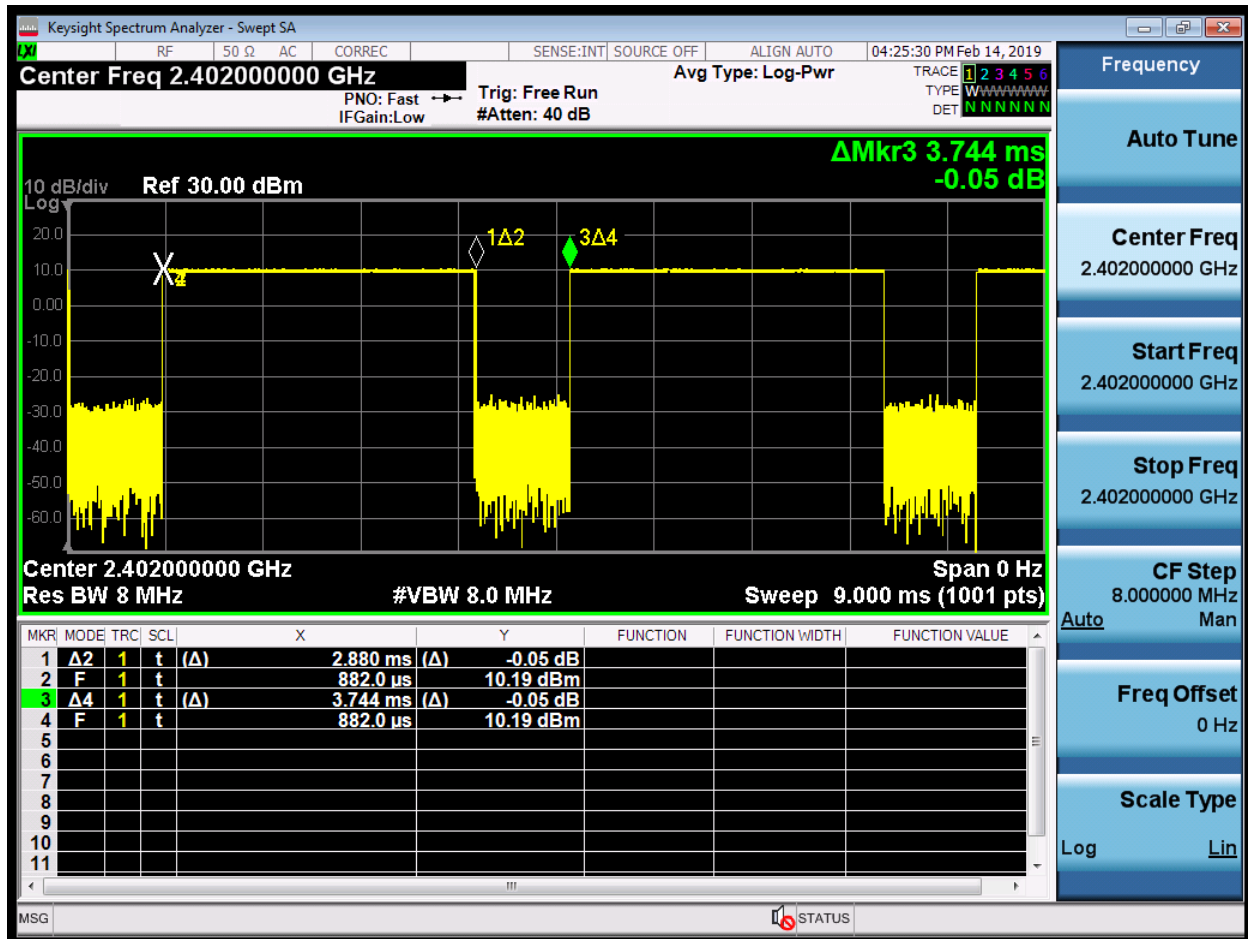
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

### 5.3.5 BT Test Configuration

For BT SAR testing, BT engineering testing software installed on the EUT can provide continuous transmitting RF signal with maximum output power. And the CBT control the EUT operating with hopping off and data rate set for DH5.

The SAR measurement takes full account of the BT duty cycle and is reflected in the report, and the duty factor of the device is as follow:



Note: Duty factor= Ton (ms)/ T(on+off) (ms)=2.880/3.744=76.9%

### 5.3.6 Proximity sensor Configuration

This device uses a proximity sensor that share the same metallic electrode as the transmitting antenna to facilitate triggering in typical user interactivity with the device.

Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the tablet is held close to a user's body exposure condition. It utilizes the proximity sensor to reduce the output power in specific wireless and operating modes to ensure SAR compliance for the following scenarios: To reduce the output power of main antennas during body operating configurations.

- 1) Antenna-to-antenna/user separation distances

#### The Detailed Antenna Locations refer to *Antenna Locations*

Note:

1. The Div Antenna and GPS Antenna does not have the transmit function.
2. The proximity sensor and main antenna use same metallic electrode, so the location is same

| Tx Antenna | Antenna/Sensor-to-DUT sides separation distances |           |           |            |          |             |
|------------|--------------------------------------------------|-----------|-----------|------------|----------|-------------|
|            | Front side                                       | Back side | Left side | Right side | Top side | Bottom side |



|                                   |                                                                          |    |        |    |         |         |
|-----------------------------------|--------------------------------------------------------------------------|----|--------|----|---------|---------|
| Main 2G&3G&4G Antenna             | NA                                                                       | NA | NA     | NA | 135.4mm | NA      |
| 2.4G WiFi Antenna                 | NA                                                                       | NA | 63.3mm | NA | NA      | 121.7mm |
| sensor                            | NA                                                                       | NA | NA     | NA | 135.4mm | NA      |
| Diversity antenna and GPS antenna | Only receive signal, so it was not figured out in the following pictures |    |        |    |         |         |

## 2) Power Reduction operation table

The EUT use MTK platform, which have some special NVs for SAR related max power back off, These NVs are used to set a new max power limit based proximity information and call configuration. When human body is in proximity and is detected by sensor, a new max power limit is set using the values stored in the NV. If Base station requests the higher output power above the limit, the power control algorithm inside modem chip will limit the power up to the preset power limit. If base station requests a lower output power less than the limit, the out power is controlled by base station.

| Band       | Sensor Trigger Distance | Capacitive sensor on+ Receiver off | Hotspot on + Capacitive sensor off | Other conditions |
|------------|-------------------------|------------------------------------|------------------------------------|------------------|
|            |                         | Power reduction(dB)                | Power reduction(dB)                |                  |
| GSM850     | Back side: 19mm         | 0                                  | 0                                  | 0                |
|            | Bottom side: 17mm       |                                    |                                    |                  |
|            | Front side:12mm         |                                    |                                    |                  |
| GSM1900    | Back side: 19mm         | 2                                  | 2                                  | 0                |
|            | Bottom side: 17mm       |                                    |                                    |                  |
|            | Front side:12mm         |                                    |                                    |                  |
| UMTS Band5 | Back side: 19mm         | 0                                  | 0                                  | 0                |
|            | Bottom side: 17mm       |                                    |                                    |                  |
|            | Front side:12mm         |                                    |                                    |                  |
| LTE Band 5 | Back side: 19mm         | 0                                  | 0                                  | 0                |
|            | Bottom side: 17mm       |                                    |                                    |                  |
|            | Front side:12mm         |                                    |                                    |                  |
| LTE Band 7 | Back side: 19mm         | 3                                  | 3                                  | 0                |
|            | Bottom side: 17mm       |                                    |                                    |                  |
|            | Front side:12mm         |                                    |                                    |                  |

### Note:

1. Since the capacitive proximity sensor triggering distance for the Back is 19mm, Bottom is 17mm, Front is 12mm, a conservative distance of Front Side 11mm were required for additional SAR test at maximum power level with sensor off. a conservative distance of Bottom Side 16mm were required for additional SAR test at maximum power level with sensor off. a conservative distance of Back Side 18mm was required for additional SAR test at maximum power level with sensor off.

2) SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

### 3) Proximity sensor coverage, distance and angle

#### 3.1) Proximity sensor triggering distances

Proximity sensor triggering distance testing was performed as the EUT moving further away from the phantom were both assessed.



Picture: Proximity sensor triggering distances assessment (Bottomside)



Picture: Proximity sensor triggering distances assessment (Back side)



Picture: Proximity sensor triggering distances assessment (Front side)

Table: Summary of Trigger Distances

| Main<br>2G&3G&4G<br>Antenna | Trigger distance-Back<br>Side |                                | Trigger distance-Bottom<br>Side |                                | Trigger<br>distance-Front Side |                                |
|-----------------------------|-------------------------------|--------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|
|                             | Moving<br>toward<br>phantom   | Moving<br>away from<br>phantom | Moving<br>toward<br>phantom     | Moving<br>away from<br>phantom | Moving<br>toward<br>phantom    | Moving<br>away from<br>phantom |
| GSM1900                     | 19 mm                         | 19 mm                          | 17 mm                           | 17 mm                          | 12 mm                          | 12 mm                          |
| LTE Band 7                  | 19 mm                         | 19 mm                          | 17 mm                           | 17 mm                          | 12 mm                          | 12 mm                          |

Table: Reduced power (Moving toward phantom)

| Main Antenna<br>2G&3G&4G | Position    | Power Reduction Status (dBm) |       |       |       |       |       |       |       |       |       |       |
|--------------------------|-------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                          |             | 25                           | 22    | 21    | 20    | 19    | 18    | 17    | 16    | 15    | 14    | 13    |
| GSM1900                  | Back side   | 30.2                         | 30.2  | 30.2  | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Back side   | 22.46                        | 22.46 | 22.46 | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |
| /                        | /           | 21                           | 20    | 19    | 18    | 17    | 16    | 15    | 14    | 13    | 12    | 11    |
| GSM1900                  | Bottom edge | 30.2                         | 30.2  | 30.2  | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Bottom edge | 22.46                        | 22.46 | 22.46 | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |
| /                        | /           | 16                           | 15    | 14    | 13    | 12    | 11    | 10    | 9     | 8     | 7     | 6     |
| GSM1900                  | Front side  | 30.2                         | 30.2  | 30.2  | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Front side  | 22.46                        | 22.46 | 22.46 | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |

Table: Full power (Moving from phantom)

| Main Antenna<br>2G&3G&4G | Position    | Power Reduction Status (dBm) |       |       |       |       |       |       |       |       |       |       |
|--------------------------|-------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                          |             | 24                           | 21    | 20    | 19    | 18    | 17    | 16    | 15    | 10    | 5     | 0     |
| GSM1900                  | Back side   | 30.2                         | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Back side   | 22.46                        | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |
| /                        | /           | 24                           | 21    | 20    | 19    | 18    | 17    | 16    | 15    | 10    | 5     | 0     |
| GSM1900                  | Bottom edge | 30.2                         | 30.2  | 30.2  | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Bottom edge | 22.46                        | 22.46 | 22.46 | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |
| /                        | /           | 22                           | 19    | 16    | 13    | 12    | 11    | 10    | 9     | 8     | 5     | 0     |
| GSM1900                  | Front side  | 30.2                         | 30.2  | 30.2  | 30.2  | 30.2  | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 | 28.01 |
| LTE Band 7               | Front side  | 22.46                        | 22.46 | 22.46 | 22.46 | 22.46 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 | 19.45 |

Note: SAR tests with proximity sensor power reduction are only required for back, front and bottom side of main antenna with GSM1900 and LTE B7. For the other sides or other frequency bands of the device, the proximity sensor is not triggered. Therefore, the proximity sensor coverage is not evaluated on these orientations. In this report, a more conservative distance of 5 mm with maximum power level with sensor off was used for front side.

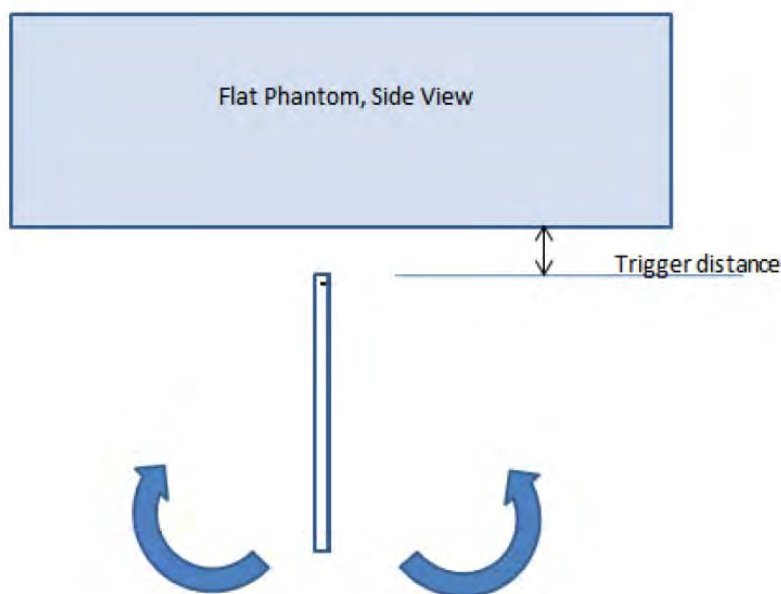
### 3.2) Procedures for determining antenna and proximity sensor coverage

The proximity sensor and main antenna use same metallic electrode, so there is no spatial offset.

### 3.3) Tilt angle influences to proximity sensor triggering

The EUT was positioned directly below the flat phantom at the minimum measured trigger distance with each applicable edge parallel to the base of the flat phantom for each band.

The EUT was rotated about each applicable edge for angles up to  $\pm 45^\circ$ . If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to  $\pm 45^\circ$ .



Picture: Proximity sensor tilt angle assessment

Table: Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering (Bottom side)

| Main Antenna<br>2G&3G&4G | Minimum trigger<br>distance at which<br>power reduction was<br>maintained over $\pm 45^\circ$ | Sensor Power Reduction Status |      |      |      |     |    |    |     |     |     |     |
|--------------------------|-----------------------------------------------------------------------------------------------|-------------------------------|------|------|------|-----|----|----|-----|-----|-----|-----|
|                          |                                                                                               | -45°                          | -35° | -25° | -15° | -5° | 0° | 5° | 15° | 25° | 35° | 45° |
| GSM 1900                 | 17 mm                                                                                         | on                            | on   | on   | on   | on  | on | on | on  | on  | on  | on  |
| LTE Band 7               | 17 mm                                                                                         | on                            | on   | on   | on   | on  | on | on | on  | on  | on  | on  |

Conclusion: As is shown from the validation data, it can be ensured that the proximity sensor can be valid triggered for the DUT tilt coverage exposure condition (GSM 1900 and LTE B7 with Main 2G&3G&4G Antenna).

### 4) Summary SAR test Plan for Proximity sensor power reduction

For Body SAR compliance, the device uses proximity sensor power reduction for some frequency bands of Main antenna and test positions.

a) To ensure all production units are compliant, the smallest separation distance determined by the sensor triggering and sensor coverage for normal and tilt positions for each applicable side triggering conditions, minus 1 mm, is used as the test separation distance for SAR testing.

b) SAR tests with proximity sensor power reduction are only required for the sides of frequency bands

in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

### 5.3.7 Receiver detection mechanism specification

This device support the receiver detection mechanism, the main purpose is to minimize triggering associated with power reduction scenarios by receiver detection mechanisms and provide enhanced user experience. It uses the receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for Wi-Fi antenna accordingly.

More details information followings:

| Wi-Fi Antenna            |          | Power Reduction Level Amount (dBm) |                    |                         |                        |
|--------------------------|----------|------------------------------------|--------------------|-------------------------|------------------------|
| Power Reduction Scenario | Receiver | 802.11b                            | 802.11g (CH2~CH10) | 802.11n HT20 (CH2~CH10) | 802.11n HT40 (CH3~CH8) |
| Full power               |          | 18.00                              | 17.50              | 17.00                   | 14.50                  |
| Standalone               | on       | 3.50                               | 3.00               | 2.50                    | 0.00                   |
|                          | off      | 0.00                               | 0.00               | 0.00                    | 0.00                   |

#### SAR test Plan

For Head SAR test, standalone SAR is evaluated with receiver on mode;

For Body SAR test, standalone SAR is evaluated with receiver off mode.

### 5.3.8 Country code detection mechanism

The device uses the mobile country code (MCC) to indicate whether the users in CE countries or FCC countries. The selection between CE countries and FCC countries power levels is based on the country code detection mechanism. It can determine the countries where users are and set the relevant power level for Wi-Fi antennas accordingly.

Table: Summary of country code detection mechanism

| Antenna    | MCC OF CE COUNTRY (CE standard) | MCC OF FCC COUNTRY (FCC standard) |
|------------|---------------------------------|-----------------------------------|
| Wi-Fi 2.4G | Power Level A3                  | Power Level B3                    |

Table: Bands supporting country code detection mechanism

| Band | Power Reduction Level Amount (dB) |                                |                                     |                                      |                                   |
|------|-----------------------------------|--------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
|      | Receiver off                      |                                |                                     |                                      | Receiver on                       |
|      | MCC of CE countries (Full power)  | MCC of FCC countries (Reduced) | MCC of CE countries (power level of | MCC of FCC countries (power level of | ALL MODE (2G&3G&4G Antenna(Voice) |



|                                          | level) | power level) | Wi-Fi and LTE IDC(In-Device Coexistence) mechanism) | Wi-Fi and LTE IDC(In-Device Coexistence) mechanism) | + Wi-Fi Antenna or Wi-Fi(Voice) only) |
|------------------------------------------|--------|--------------|-----------------------------------------------------|-----------------------------------------------------|---------------------------------------|
| Wi-Fi2.4G 802.11b (CH12&CH13)            | 0      | No Support   | 3.5                                                 | No Support                                          | 4 #                                   |
| Wi-Fi2.4G 802.11b (other channels)       | 0      | 0            | 3.5                                                 | 3                                                   | 4                                     |
| Wi-Fi2.4G 802.11g (CH12&CH13)            | 0      | No Support   | 3                                                   | No Support                                          | 3.5 #                                 |
| Wi-Fi2.4G 802.11g (CH1&CH11)             | 0      | 4            | 3                                                   | 4                                                   | 3.5                                   |
| Wi-Fi2.4G 802.11g (other channels)       | 0      | 0            | 3                                                   | 3                                                   | 3.5                                   |
| Wi-Fi2.4G 802.11n(HT20) (CH12&CH13)      | 0      | No Support   | 2                                                   | No Support                                          | 3 #                                   |
| Wi-Fi2.4G 802.11n(HT20) (CH1&CH11)       | 0      | 3.5          | 2                                                   | 3.5                                                 | 3                                     |
| Wi-Fi2.4G 802.11n(HT20) (other channels) | 0      | 0            | 2                                                   | 2                                                   | 3                                     |
| Wi-Fi2.4G 802.11n(HT40) (CH10&CH11)      | 0      | No Support   | 0                                                   | No Support                                          | 2.5 #                                 |
| Wi-Fi2.4G 802.11n(HT40) (CH3&CH9)        | 0      | 3            | 0                                                   | 1                                                   | 2.5                                   |
| Wi-Fi2.4G 802.11n(HT40) (other channels) | 0      | 0            | 0                                                   | 0                                                   | 2.5                                   |

Note: # = Only for MCC of CE countries

#### Summary test plan:

**For conducted power test,** both the full power level and reduced power level will be tested by setting different MCC to validate that the country code detection mechanism works.

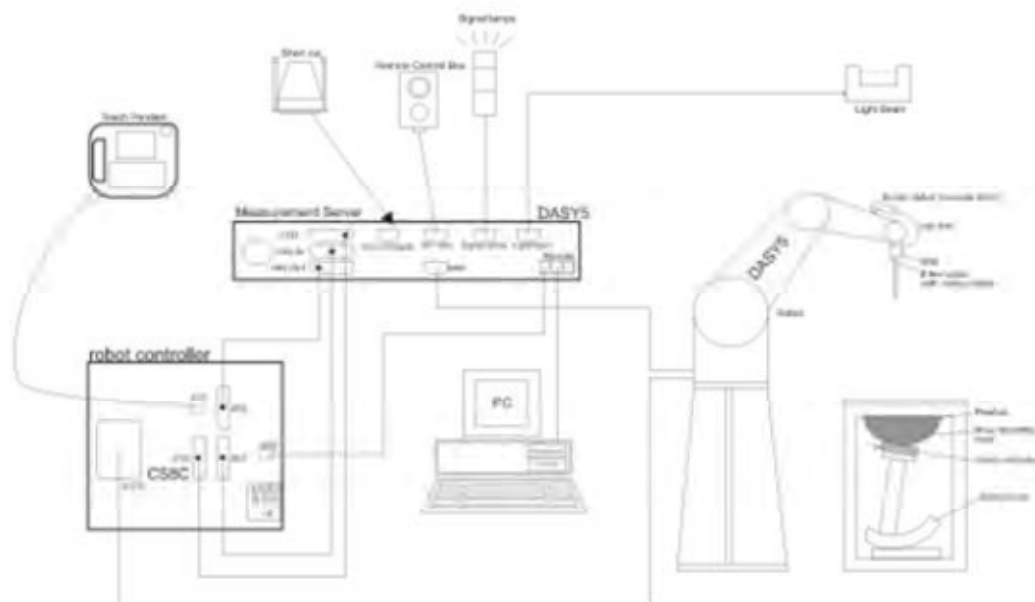
#### For FCC SAR test,

Standalone FCC SAR of Wi-Fi2.4G is evaluated at power level B3.

## 6 SAR Measurements System Configuration

## 6.1 SAR Measurement Set-up

The DASY system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4(manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

### EX3DV4 Probe Specification

|               |                                                                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE)                                                |
| Calibration   | ISO/IEC 17025 calibration<br>service available                                                                                                                                                             |
| Frequency     | 10 MHz to > 6 GHz<br>Linearity: $\pm 0.2$ dB<br>(30 MHz to 6 GHz)                                                                                                                                          |
| Directivity   | $\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)                                                                                           |
| Dynamic Range | 10 $\mu$ W/g to > 100 mW/g Linearity: $\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)                                                                                                                        |
| Dimensions    | Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                                                                          |
| Application   | High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |



### E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25$ dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C \Delta T / \Delta t$$

Where:  $\Delta t$  = Exposure time (30 seconds),  
 $C$  = Heat capacity of tissue (brain or muscle),  
 $\Delta T$  = Temperature increase due to RF exposure.

Or

$$SAR = |E|^2 \sigma / \rho$$

Where:  $\sigma$  = Simulated tissue conductivity,  
 $\rho$  = Tissue density ( $\text{kg/m}^3$ ).

## 6.3 SAR Measurement Procedure

### Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

### Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

|                                                                                                        | $\leq 3$ GHz                                                                                                                                                                                                                                                           | $> 3$ GHz                                              |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | $5 \pm 1$ mm                                                                                                                                                                                                                                                           | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm     |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | $30^\circ \pm 1^\circ$                                                                                                                                                                                                                                                 | $20^\circ \pm 1^\circ$                                 |
| Maximum area scan spatial resolution:<br>$\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$              | $\leq 2$ GHz: $\leq 15$ mm<br>$2 - 3$ GHz: $\leq 12$ mm                                                                                                                                                                                                                | $3 - 4$ GHz: $\leq 12$ mm<br>$4 - 6$ GHz: $\leq 10$ mm |
|                                                                                                        | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device. |                                                        |

## Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

|                                                                                                                                                                                                                                                                            |                                           |                                                                                             | ≤3GHz                               | > 3 GHz                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------|
| Maximum zoom scan spatial resolution: $\Delta x_{\text{zoom}} \Delta y_{\text{zoom}}$                                                                                                                                                                                      |                                           |                                                                                             | ≤2GHz: ≤8mm<br>2 – 3GHz: ≤5mm*      | 3 – 4GHz: ≤5mm*<br>4 – 6GHz: ≤4mm*                    |
| Maximum zoom scan spatial resolution, normal to phantom surface                                                                                                                                                                                                            | Uniform grid: $\Delta z_{\text{zoom}}(n)$ |                                                                                             | ≤5mm                                | 3 – 4GHz: ≤4mm<br>4 – 5GHz: ≤3mm<br>5 – 6GHz: ≤2mm    |
|                                                                                                                                                                                                                                                                            | Graded grid                               | $\Delta z_{\text{zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface | ≤4mm                                | 3 – 4GHz: ≤3mm<br>4 – 5GHz: ≤2.5mm<br>5 – 6GHz: ≤2mm  |
|                                                                                                                                                                                                                                                                            |                                           | $\Delta z_{\text{zoom}}(n>1)$ : between subsequent points                                   | ≤1.5• $\Delta z_{\text{zoom}}(n-1)$ |                                                       |
| Minimum zoom scan volume                                                                                                                                                                                                                                                   | X, y, z                                   |                                                                                             | ≥30mm                               | 3 – 4GHz: ≥28mm<br>4 – 5GHz: ≥25mm<br>5 – 6GHz: ≥22mm |
| Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.                                                                                                                          |                                           |                                                                                             |                                     |                                                       |
| * When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz. |                                           |                                                                                             |                                     |                                                       |

## Volume Scan Procedures

The volume scan is used to assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

## 7 Main Test Equipment

| Name of Equipment                   | Manufacturer    | Type/Model | Serial Number | Last Cal.  | Cal. Due Date |
|-------------------------------------|-----------------|------------|---------------|------------|---------------|
| Network analyzer                    | Agilent         | E5071B     | MY42404014    | 2018-05-20 | 2019-05-19    |
| Dielectric Probe Kit                | HP              | 85070E     | US44020115    | 2018-05-20 | 2019-05-19    |
| Power meter                         | Agilent         | E4417A     | GB41291714    | 2018-05-21 | 2019-05-20    |
| Power sensor                        | Agilent         | N8481H     | MY50350004    | 2018-05-21 | 2019-05-20    |
| Power sensor                        | Agilent         | E9327A     | US40441622    | 2018-05-20 | 2019-05-19    |
| Dual directional coupler            | Agilent         | 778D-012   | 50519         | 2018-05-21 | 2019-05-20    |
| Dual directional coupler            | Agilent         | 777D       | 50146         | 2018-05-20 | 2019-05-19    |
| Amplifier                           | INDEXSAR        | IXA-020    | 0401          | 2018-05-20 | 2019-05-19    |
| Wideband radio communication tester | R&S             | CMW 500    | 113645        | 2018-05-20 | 2019-05-19    |
| BT Base Station Simulator           | R&S             | CBT        | 100271        | 2018-05-14 | 2019-05-13    |
| E-field Probe                       | SPEAG           | EX3DV4     | 3677          | 2018-05-29 | 2019-05-28    |
| DAE                                 | SPEAG           | DAE4       | 1317          | 2018-03-23 | 2019-03-22    |
| Validation Kit 835MHz               | SPEAG           | D835V2     | 4d020         | 2017-08-28 | 2020-08-27    |
| Validation Kit 1900MHz              | SPEAG           | D1900V2    | 5d060         | 2017-08-26 | 2020-08-25    |
| Validation Kit 2450MHz              | SPEAG           | D2450V2    | 786           | 2017-08-29 | 2020-08-28    |
| Validation Kit 2600MHz              | SPEAG           | D2600V2    | 1025          | 2018-05-02 | 2021-05-01    |
| Temperature Probe                   | Tianjin jinming | JM222      | AA1009129     | 2018-05-17 | 2019-05-16    |
| Hygrothermograph                    | Anymetr         | NT-311     | 20150731      | 2018-05-17 | 2019-05-16    |
| Software for Test                   | Speag           | DASY5      | 52.8.8.1222   | /          | /             |
| Softwarefor Tissue                  | Agilent         | 85070      | E06.01.36     | /          | /             |

## 8 Tissue Dielectric Parameter Measurements & System Verification

### 8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

#### Target values

| Frequency (MHz) |      | Water (%) | Salt (%) | Sugar (%) | Glycol (%) | Preventol (%) | Cellulose (%) | $\epsilon_r$ | $\sigma(\text{s/m})$ |
|-----------------|------|-----------|----------|-----------|------------|---------------|---------------|--------------|----------------------|
| Head            | 835  | 41.45     | 1.45     | 56        | 0          | 0.1           | 1.0           | 41.5         | 0.90                 |
|                 | 1900 | 55.242    | 0.306    | 0         | 44.452     | 0             | 0             | 40.0         | 1.40                 |
|                 | 2450 | 62.7      | 0.5      | 0         | 36.8       | 0             | 0             | 39.2         | 1.80                 |
|                 | 2600 | 55.242    | 0.306    | 0         | 44.452     | 0             | 0             | 39.0         | 1.96                 |
| Body            | 835  | 52.5      | 1.4      | 45        | 0          | 0.1           | 1.0           | 55.2         | 0.97                 |
|                 | 1900 | 69.91     | 0.13     | 0         | 29.96      | 0             | 0             | 53.3         | 1.52                 |
|                 | 2450 | 73.2      | 0.1      | 0         | 26.7       | 0             | 0             | 52.7         | 1.95                 |
|                 | 2600 | 72.6      | 0.1      | 0         | 27.3       | 0             | 0             | 52.5         | 2.16                 |

#### Measurements results

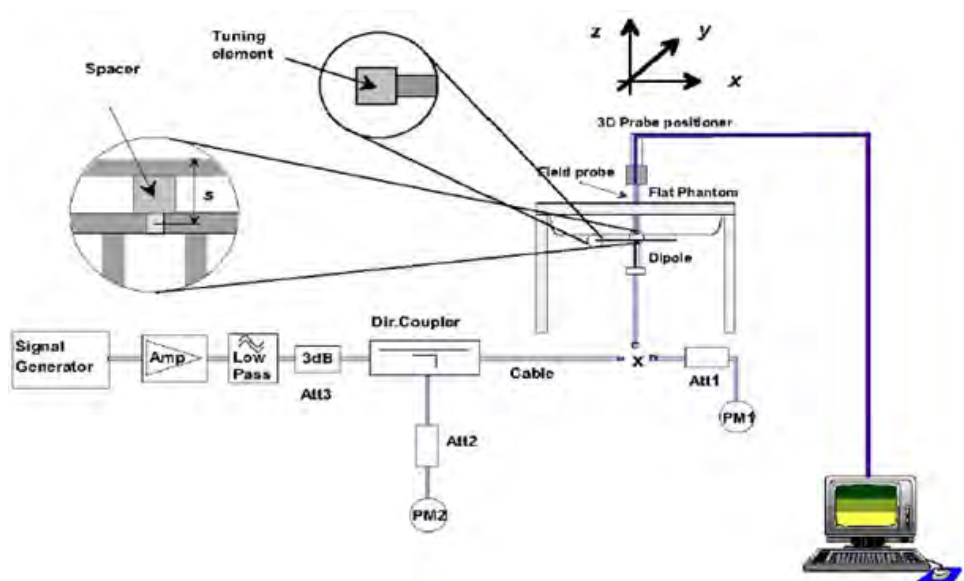
| Frequency (MHz) |      | Test Date | Temp $^\circ\text{C}$ | Measured Dielectric Parameters |                      | Target Dielectric Parameters |                      | Limit (Within $\pm 5\%$ ) |                  |
|-----------------|------|-----------|-----------------------|--------------------------------|----------------------|------------------------------|----------------------|---------------------------|------------------|
|                 |      |           |                       | $\epsilon_r$                   | $\sigma(\text{s/m})$ | $\epsilon_r$                 | $\sigma(\text{s/m})$ | Dev $\epsilon_r(\%)$      | Dev $\sigma(\%)$ |
| 835             | Head | 2/14/2019 | 21.5                  | 42.0                           | 0.91                 | 41.5                         | 0.90                 | 1.20                      | 1.11             |
|                 | Body | 2/17/2019 | 21.5                  | 53.8                           | 0.97                 | 55.2                         | 0.97                 | -2.54                     | 0.00             |
| 1900            | Head | 2/15/2019 | 21.5                  | 40.7                           | 1.39                 | 40.0                         | 1.40                 | 1.75                      | -0.71            |
|                 | Body | 2/15/2019 | 21.5                  | 52.8                           | 1.51                 | 53.3                         | 1.52                 | -0.94                     | -0.66            |
| 2450            | Head | 2/16/2019 | 21.5                  | 38.7                           | 1.86                 | 39.2                         | 1.80                 | -1.28                     | 3.33             |
|                 | Body | 2/16/2019 | 21.5                  | 51.1                           | 1.97                 | 52.7                         | 1.95                 | -3.04                     | 1.03             |
| 2600            | Head | 2/15/2019 | 21.5                  | 38.1                           | 2.02                 | 39.0                         | 1.96                 | -2.31                     | 3.06             |
|                 | Body | 2/15/2019 | 21.5                  | 50.7                           | 2.16                 | 52.5                         | 2.16                 | -3.43                     | 0.00             |

Note: The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm for measurements  $> 3$  GHz.

## 8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



**Picture 1**System Performance Check setup



### Picture 2 Setup Photo

**Justification for Extended SAR Dipole Calibrations**

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss ( $< -20$  dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

| Dipole                      |             | Date of Measurement | Return Loss(dB) | $\Delta$ % | Impedance ( $\Omega$ ) | $\Delta\Omega$ |
|-----------------------------|-------------|---------------------|-----------------|------------|------------------------|----------------|
| Dipole D835V2<br>SN: 4d020  | Head Liquid | 8/28/2017           | -31.9           | /          | 50.3                   | /              |
|                             |             | 8/27/2018           | -29.0           | 9.09       | 46.6                   | -3.7           |
|                             | Body Liquid | 8/28/2017           | -24.8           | /          | 46.8                   | /              |
|                             |             | 8/27/2018           | -27.4           | -10.48     | 48.1                   | 1.3            |
| Dipole D1900V2<br>SN: 5d060 | Head Liquid | 8/26/2017           | -23.4           | /          | 52.0                   | /              |
|                             |             | 8/25/2018           | -24.7           | -5.56      | 54.4                   | 2.4            |
|                             | Body Liquid | 8/26/2017           | -21.4           | /          | 52.7                   | /              |
|                             |             | 8/25/2018           | -24.6           | -14.95     | 55.6                   | 2.9            |
| Dipole D2450V2<br>SN: 786   | Head Liquid | 8/29/2017           | -25.5           | /          | 53.4                   | /              |
|                             |             | 8/28/2018           | -23.0           | 9.80       | 57.2                   | 3.8            |
|                             | Body Liquid | 8/29/2017           | -23.6           | /          | 51.0                   | /              |
|                             |             | 8/28/2018           | -23.7           | -0.42      | 55.2                   | 4.2            |

**System Check results**

| Frequency (MHz)                                                                               |      | Test Date | Temp $^{\circ}\text{C}$ | 250mW Measured $\text{SAR}_{1g}$ (W/kg) | 1W Normalized $\text{SAR}_{1g}$ (W/kg) | 1W Target $\text{SAR}_{1g}$ (W/kg) | $\Delta$ % (Limit $\pm 10\%$ ) | Plot No. |
|-----------------------------------------------------------------------------------------------|------|-----------|-------------------------|-----------------------------------------|----------------------------------------|------------------------------------|--------------------------------|----------|
| 835                                                                                           | Head | 2/14/2019 | 21.5                    | 2.44                                    | 9.76                                   | 9.45                               | 3.28                           | 1        |
|                                                                                               | Body | 2/17/2019 | 21.5                    | 2.41                                    | 9.64                                   | 9.75                               | -1.13                          | 2        |
| 1900                                                                                          | Head | 2/15/2019 | 21.5                    | 9.88                                    | 39.52                                  | 40.10                              | -1.45                          | 3        |
|                                                                                               | Body | 2/15/2019 | 21.5                    | 9.93                                    | 39.72                                  | 39.50                              | 0.56                           | 4        |
| 2450                                                                                          | Head | 2/16/2019 | 21.5                    | 13.70                                   | 54.80                                  | 52.60                              | 4.18                           | 5        |
|                                                                                               | Body | 2/16/2019 | 21.5                    | 12.50                                   | 50.00                                  | 50.80                              | -1.57                          | 6        |
| 2600                                                                                          | Head | 2/15/2019 | 21.5                    | 13.90                                   | 55.60                                  | 54.10                              | 2.77                           | 7        |
|                                                                                               | Body | 2/15/2019 | 21.5                    | 13.50                                   | 54.00                                  | 54.50                              | -0.92                          | 8        |
| Note: Target Values used derive from the calibration certificate Data Storage and Evaluation. |      |           |                         |                                         |                                        |                                    |                                |          |

## 9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

### 9.1 GSM Mode

| GSM 850                                                                                                       |            | Burst-Averaged output power(dBm) |                       |            |             | Division Factors | Frame-Averaged output power(dBm) |                       |              |              |
|---------------------------------------------------------------------------------------------------------------|------------|----------------------------------|-----------------------|------------|-------------|------------------|----------------------------------|-----------------------|--------------|--------------|
|                                                                                                               |            | Tune-up                          | Channel/Frenqucy(MHz) |            |             |                  | Tune-up                          | Channel/Frenqucy(MHz) |              |              |
|                                                                                                               |            | MAX                              | 128 /824.2            | 190 /836.6 | 251 /848.8  |                  | MAX                              | 128 /824.2            | 190 /836.6   | 251 /848.8   |
| GSM                                                                                                           | CS         | 34.00                            | 33.01                 | 33.04      | 33.05       | 9.03             | 24.97                            | 23.98                 | 24.01        | 24.02        |
| GPRS/<br>EGPRS<br>(GMSK)                                                                                      | 1 Tx Slot  | 34.00                            | 33.03                 | 33.06      | 33.05       | 9.03             | 24.97                            | 24.00                 | 24.03        | 24.02        |
|                                                                                                               | 2 Tx Slots | 31.00                            | 30.06                 | 30.11      | 30.14       | 6.02             | 24.98                            | 24.04                 | 24.09        | 24.12        |
|                                                                                                               | 3 Tx Slots | 29.20                            | 28.28                 | 28.30      | 28.33       | 4.26             | 24.94                            | 24.02                 | 24.04        | 24.07        |
|                                                                                                               | 4 Tx Slots | 28.00                            | 26.87                 | 26.98      | 27.04       | 3.01             | <b>24.99</b>                     | <b>23.86</b>          | <b>23.97</b> | <b>24.03</b> |
| EGPRS<br>(8PSK)                                                                                               | 1 Tx Slot  | 28.00                            | 26.99                 | 27.42      | 27.08       | 9.03             | 18.97                            | 17.96                 | 18.39        | 18.05        |
|                                                                                                               | 2 Tx Slots | 25.00                            | 24.67                 | 24.56      | 24.62       | 6.02             | 18.98                            | 18.65                 | 18.54        | 18.60        |
|                                                                                                               | 3 Tx Slots | 23.20                            | 22.61                 | 22.88      | 22.76       | 4.26             | 18.94                            | 18.35                 | 18.62        | 18.50        |
|                                                                                                               | 4 Tx Slots | 22.00                            | 21.30                 | 20.85      | 21.42       | 3.01             | 18.99                            | 18.29                 | 17.84        | 18.41        |
| GSM 1900<br>Full Power /<br>(Receiver on + SAR<br>sensor on)                                                  |            | Burst-Averaged output power(dBm) |                       |            |             | Division Factors | Frame-Averaged output power(dBm) |                       |              |              |
|                                                                                                               |            | Tune-up                          | Channel/Frenqucy(MHz) |            |             |                  | Tune-up                          | Channel/Frenqucy(MHz) |              |              |
|                                                                                                               |            | MAX                              | 512 /1850.2           | 661 /1880  | 810 /1909.8 |                  | MAX                              | 512 /1850.2           | 661 /1880    | 810 /1909.8  |
| GSM                                                                                                           | CS         | 31.00                            | 30.05                 | 30.02      | 30.19       | 9.03             | 21.97                            | 21.02                 | 20.99        | 21.16        |
| GPRS/<br>EGPRS<br>(GMSK)                                                                                      | 1 Tx Slot  | 31.00                            | 30.07                 | 30.05      | 30.20       | 9.03             | 21.97                            | 21.04                 | 21.02        | 21.17        |
|                                                                                                               | 2 Tx Slots | 28.00                            | 27.18                 | 27.16      | 27.34       | 6.02             | 21.98                            | 21.16                 | 21.14        | 21.32        |
|                                                                                                               | 3 Tx Slots | 26.20                            | 25.43                 | 25.44      | 25.66       | 4.26             | 21.94                            | 21.17                 | 21.18        | 21.40        |
|                                                                                                               | 4 Tx Slots | 25.00                            | 24.16                 | 24.16      | 24.34       | 3.01             | <b>21.99</b>                     | <b>21.15</b>          | <b>21.15</b> | <b>21.33</b> |
| EGPRS<br>(8PSK)                                                                                               | 1 Tx Slot  | 27.00                            | 26.71                 | 26.82      | 26.57       | 9.03             | 17.97                            | 17.68                 | 17.79        | 17.54        |
|                                                                                                               | 2 Tx Slots | 24.00                            | 23.82                 | 23.93      | 23.71       | 6.02             | 17.98                            | 17.80                 | 17.91        | 17.69        |
|                                                                                                               | 3 Tx Slots | 22.20                            | 22.12                 | 22.13      | 21.83       | 4.26             | 17.94                            | 17.86                 | 17.87        | 17.57        |
|                                                                                                               | 4 Tx Slots | 21.00                            | 20.80                 | 20.90      | 20.66       | 3.01             | 17.99                            | 17.79                 | 17.89        | 17.65        |
| GSM 1900<br>(Receiver off + SAR<br>sensor on) / (SAR<br>Sensor on+ hotspot)<br>/ (SAR Sensor off+<br>hotspot) |            | Burst-Averaged output power(dBm) |                       |            |             | Division Factors | Frame-Averaged output power(dBm) |                       |              |              |
|                                                                                                               |            | Tune-up                          | Channel/Frenqucy(MHz) |            |             |                  | Tune-up                          | Channel/Frenqucy(MHz) |              |              |
|                                                                                                               |            | MAX                              | 512 /1850.2           | 661 /1880  | 810 /1909.8 |                  | MAX                              | 512 /1850.2           | 661 /1880    | 810 /1909.8  |
| GSM                                                                                                           | CS         | 29.00                            | 28.06                 | 28.01      | 28.17       | 9.03             | 19.97                            | 19.03                 | 18.98        | 19.14        |
| GPRS/                                                                                                         | 1 Tx Slot  | 29.00                            | 28.08                 | 28.07      | 28.21       | 9.03             | 19.97                            | 19.05                 | 19.04        | 19.18        |



|                 |            |       |       |       |       |      |              |              |              |              |
|-----------------|------------|-------|-------|-------|-------|------|--------------|--------------|--------------|--------------|
| EGPRS<br>(GMSK) | 2 Tx Slots | 26.00 | 25.17 | 25.19 | 25.38 | 6.02 | 19.98        | 19.15        | 19.17        | 19.36        |
|                 | 3 Tx Slots | 24.20 | 23.49 | 23.48 | 23.65 | 4.26 | 19.94        | 19.23        | 19.22        | 19.39        |
|                 | 4 Tx Slots | 23.00 | 22.21 | 22.22 | 22.40 | 3.01 | <b>19.99</b> | <b>19.20</b> | <b>19.21</b> | <b>19.39</b> |
| EGPRS<br>(8PSK) | 1 Tx Slot  | 27.00 | 26.68 | 26.75 | 26.54 | 9.03 | 17.97        | 17.65        | 17.72        | 17.51        |
|                 | 2 Tx Slots | 24.00 | 23.80 | 23.91 | 23.66 | 6.02 | 17.98        | 17.78        | 17.89        | 17.64        |
|                 | 3 Tx Slots | 22.20 | 22.11 | 22.11 | 21.78 | 4.26 | 17.94        | 17.85        | 17.85        | 17.52        |
|                 | 4 Tx Slots | 21.00 | 20.62 | 20.85 | 20.48 | 3.01 | 17.99        | 17.61        | 17.84        | 17.47        |

Notes: The worst-case configuration and mode for SAR testing is determined to be as follows:

1. Standalone: GSM 850 GMSK (GPRS) mode with 4 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 4 time slots for Max power, based on the output power measurements above..

## 9.2 WCDMA Mode

The following tests were completed according to the test requirements outlined in the 3GPP TS34.121 specification.

| WCDMA          |          | Band V(dBm) |       |       |               |
|----------------|----------|-------------|-------|-------|---------------|
| Tx Channel     |          | 4132        | 4183  | 4233  | Tune-up Limit |
| Frequency(MHz) |          | 826.4       | 836.6 | 846.6 |               |
| RMC            | 12.2kbps | 24.00       | 24.02 | 24.01 | 25.00         |
| AMR            | 12.2kbps | 23.90       | 23.93 | 23.88 | 25.00         |
| HSDPA          | Sub 1    | 23.42       | 23.44 | 23.43 | 24.50         |
|                | Sub 2    | 23.41       | 23.43 | 23.42 | 24.50         |
|                | Sub 3    | 22.90       | 22.92 | 22.91 | 24.00         |
|                | Sub 4    | 22.89       | 22.91 | 22.90 | 24.00         |
| HSUPA          | Sub 1    | 22.38       | 22.40 | 22.39 | 23.00         |
|                | Sub 2    | 22.37       | 22.39 | 22.38 | 23.00         |
|                | Sub 3    | 22.85       | 22.88 | 22.87 | 24.00         |
|                | Sub 4    | 22.34       | 22.37 | 22.36 | 22.50         |
|                | Sub 5    | 23.33       | 23.36 | 23.35 | 24.00         |
| DC-HSDPA       | Sub 1    | 23.14       | 23.18 | 23.15 | 24.50         |
|                | Sub 2    | 23.13       | 23.17 | 23.14 | 24.50         |
|                | Sub 3    | 22.71       | 22.66 | 22.65 | 24.00         |
|                | Sub 4    | 22.70       | 22.65 | 22.64 | 24.00         |
| HSPA+          | 16QAM    | 22.19       | 22.23 | 22.22 | 23.00         |

Note: 1.Per KDB 941225 D01, SAR for each exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".

### 9.3 LTE Mode

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth (N <sub>RB</sub> ) |         |       |        |        |        | MPR (dB) |
|------------|---------------------------------------------------------------|---------|-------|--------|--------|--------|----------|
|            | 1.4 MHz                                                       | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |          |
| QPSK       | > 5                                                           | > 4     | > 8   | > 12   | > 16   | > 18   | ≤ 1      |
| 16 QAM     | ≤ 5                                                           | ≤ 4     | ≤ 8   | ≤ 12   | ≤ 16   | ≤ 18   | ≤ 1      |
| 16 QAM     | > 5                                                           | > 4     | > 8   | > 12   | > 16   | > 18   | ≤ 2      |

| LTE FDD Band 5 |            |         |           | Conducted Power(dBm)    |             |             | Tune-up<br>Limit |
|----------------|------------|---------|-----------|-------------------------|-------------|-------------|------------------|
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             |                  |
|                |            |         |           | 20407/824.7             | 20525/836.5 | 20643/848.3 |                  |
| 1.4MHz         | QPSK       | 1       | 0         | 24.07                   | 24.13       | 23.97       | 25.00            |
|                |            | 1       | 2         | 24.18                   | 24.20       | 24.13       | 25.00            |
|                |            | 1       | 5         | 24.04                   | 24.02       | 24.06       | 25.00            |
|                |            | 3       | 0         | 23.12                   | 23.16       | 23.17       | 24.00            |
|                |            | 3       | 2         | 23.24                   | 23.20       | 23.18       | 24.00            |
|                |            | 3       | 3         | 23.18                   | 23.14       | 23.01       | 24.00            |
|                |            | 6       | 0         | 23.22                   | 23.27       | 23.15       | 24.00            |
|                | 16QAM      | 1       | 0         | 23.54                   | 23.32       | 23.33       | 24.00            |
|                |            | 1       | 2         | 23.52                   | 23.60       | 23.49       | 24.00            |
|                |            | 1       | 5         | 23.57                   | 23.50       | 23.33       | 24.00            |
|                |            | 3       | 0         | 22.07                   | 22.11       | 22.13       | 23.00            |
|                |            | 3       | 2         | 22.19                   | 22.12       | 22.19       | 23.00            |
|                |            | 3       | 3         | 22.25                   | 22.16       | 22.06       | 23.00            |
|                |            | 6       | 0         | 22.20                   | 22.19       | 22.15       | 23.00            |
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             | Tune-up<br>Limit |
|                |            |         |           | 20415/825.5             | 20525/836.5 | 20635/847.5 |                  |
| 3MHz           | QPSK       | 1       | 0         | 24.10                   | 24.15       | 24.01       | 25.00            |
|                |            | 1       | 7         | 24.20                   | 24.24       | 24.16       | 25.00            |
|                |            | 1       | 14        | 24.07                   | 24.07       | 24.10       | 25.00            |
|                |            | 8       | 0         | 23.15                   | 23.21       | 23.21       | 24.00            |
|                |            | 8       | 4         | 23.26                   | 23.24       | 23.23       | 24.00            |
|                |            | 8       | 7         | 23.20                   | 23.16       | 23.05       | 24.00            |
|                |            | 15      | 0         | 23.22                   | 23.28       | 23.17       | 24.00            |
|                | 16QAM      | 1       | 0         | 23.57                   | 23.36       | 23.36       | 24.00            |
|                |            | 1       | 7         | 23.55                   | 23.62       | 23.52       | 24.00            |
|                |            | 1       | 14        | 23.60                   | 23.52       | 23.37       | 24.00            |
|                |            | 8       | 0         | 22.09                   | 22.15       | 22.16       | 23.00            |



|           |            | 8       | 4         | 22.22                   | 22.17       | 22.23       | 23.00         |
|-----------|------------|---------|-----------|-------------------------|-------------|-------------|---------------|
|           |            | 8       | 7         | 22.28                   | 22.21       | 22.10       | 23.00         |
|           |            | 15      | 0         | 22.22                   | 22.23       | 22.20       | 23.00         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             | Tune-up Limit |
|           |            |         |           | 20425/826.5             | 20525/836.5 | 20625/846.5 |               |
| 5MHz      | QPSK       | 1       | 0         | 24.09                   | 24.14       | 24.00       | 25.00         |
|           |            | 1       | 13        | 24.21                   | 24.25       | 24.17       | 25.00         |
|           |            | 1       | 24        | 24.06                   | 24.06       | 24.09       | 25.00         |
|           |            | 12      | 0         | 23.15                   | 23.21       | 23.21       | 24.00         |
|           |            | 12      | 6         | 23.27                   | 23.25       | 23.22       | 24.00         |
|           |            | 12      | 13        | 23.20                   | 23.18       | 23.06       | 24.00         |
|           |            | 25      | 0         | 23.26                   | 23.29       | 23.19       | 24.00         |
|           | 16QAM      | 1       | 0         | 23.56                   | 23.35       | 23.35       | 24.00         |
|           |            | 1       | 13        | 23.55                   | 23.64       | 23.52       | 24.00         |
|           |            | 1       | 24        | 23.60                   | 23.52       | 23.36       | 24.00         |
|           |            | 12      | 0         | 22.10                   | 22.16       | 22.17       | 23.00         |
|           |            | 12      | 6         | 22.21                   | 22.16       | 22.22       | 23.00         |
|           |            | 12      | 13        | 22.28                   | 22.21       | 22.10       | 23.00         |
|           |            | 25      | 0         | 22.23                   | 22.24       | 22.19       | 23.00         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             | Tune-up Limit |
|           |            |         |           | 20450/829               | 20525/836.5 | 20600/844   |               |
| 10MHz     | QPSK       | 1       | 0         | 24.05                   | 24.06       | 23.95       | 25.00         |
|           |            | 1       | 25        | 24.18                   | 24.20       | 24.12       | 25.00         |
|           |            | 1       | 49        | 24.01                   | 24.00       | 24.02       | 25.00         |
|           |            | 25      | 0         | 23.10                   | 23.12       | 23.14       | 24.00         |
|           |            | 25      | 13        | 23.22                   | 23.16       | 23.15       | 24.00         |
|           |            | 25      | 25        | 23.14                   | 23.10       | 22.98       | 24.00         |
|           |            | 50      | 0         | 23.21                   | 23.20       | 23.10       | 24.00         |
|           | 16QAM      | 1       | 0         | 23.41                   | 23.29       | 23.28       | 24.00         |
|           |            | 1       | 25        | 23.49                   | 23.59       | 23.46       | 24.00         |
|           |            | 1       | 49        | 23.55                   | 23.45       | 23.31       | 24.00         |
|           |            | 25      | 0         | 22.04                   | 22.10       | 22.11       | 23.00         |
|           |            | 25      | 13        | 22.15                   | 22.09       | 22.15       | 23.00         |
|           |            | 25      | 25        | 22.23                   | 22.12       | 22.03       | 23.00         |
|           |            | 50      | 0         | 22.18                   | 22.15       | 22.12       | 23.00         |

| LTE FDD Band 7<br>Full Power / (Receiver on + SAR sensor on) |            |         |           | Conducted Power(dBm)    |            |              | Tune-up<br>Limit |
|--------------------------------------------------------------|------------|---------|-----------|-------------------------|------------|--------------|------------------|
| Bandwidth                                                    | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              |                  |
|                                                              |            |         |           | 20775/2502.5            | 21100/2535 | 21425/2567.5 |                  |
| 5MHz                                                         | QPSK       | 1       | 0         | 21.90                   | 21.97      | 22.05        | 23.00            |
|                                                              |            | 1       | 13        | 22.39                   | 22.50      | 22.41        | 23.00            |
|                                                              |            | 1       | 24        | 22.07                   | 22.03      | 22.10        | 23.00            |



|           |            | 12      | 0         | 21.25                   | 21.37      | 21.39        | 22.00         |
|-----------|------------|---------|-----------|-------------------------|------------|--------------|---------------|
|           |            | 12      | 6         | 21.29                   | 21.37      | 21.39        | 22.00         |
|           |            | 12      | 13        | 21.36                   | 21.43      | 21.37        | 22.00         |
|           |            | 25      | 0         | 21.25                   | 21.40      | 21.30        | 22.00         |
|           | 16QAM      | 1       | 0         | 21.86                   | 21.44      | 21.46        | 22.00         |
|           |            | 1       | 13        | 21.88                   | 21.91      | 21.78        | 22.00         |
|           |            | 1       | 24        | 21.59                   | 21.58      | 21.55        | 22.00         |
|           |            | 12      | 0         | 20.24                   | 20.33      | 20.31        | 21.00         |
|           |            | 12      | 6         | 20.34                   | 20.43      | 20.35        | 21.00         |
|           |            | 12      | 13        | 20.39                   | 20.49      | 20.40        | 21.00         |
|           |            | 25      | 0         | 20.27                   | 20.34      | 20.38        | 21.00         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 20800/2505              | 21100/2535 | 21400/2565   |               |
| 10MHz     | QPSK       | 1       | 0         | 21.89                   | 22.00      | 22.04        | 23.00         |
|           |            | 1       | 25        | 22.38                   | 22.46      | 22.40        | 23.00         |
|           |            | 1       | 49        | 22.08                   | 22.04      | 22.11        | 23.00         |
|           |            | 25      | 0         | 21.24                   | 21.36      | 21.38        | 22.00         |
|           |            | 25      | 13        | 21.29                   | 21.37      | 21.39        | 22.00         |
|           |            | 25      | 25        | 21.37                   | 21.42      | 21.36        | 22.00         |
|           |            | 50      | 0         | 21.23                   | 21.42      | 21.31        | 22.00         |
|           | 16QAM      | 1       | 0         | 21.89                   | 21.43      | 21.46        | 22.00         |
|           |            | 1       | 25        | 21.87                   | 21.90      | 21.77        | 22.00         |
|           |            | 1       | 49        | 21.59                   | 21.60      | 21.55        | 22.00         |
|           |            | 25      | 0         | 20.24                   | 20.30      | 20.30        | 21.00         |
|           |            | 25      | 13        | 20.35                   | 20.44      | 20.36        | 21.00         |
|           |            | 25      | 25        | 20.38                   | 20.48      | 20.39        | 21.00         |
|           |            | 50      | 0         | 20.27                   | 20.34      | 20.38        | 21.00         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 20825/2507.5            | 21100/2535 | 21375/2562.5 |               |
| 15MHz     | QPSK       | 1       | 0         | 21.91                   | 22.01      | 22.07        | 23.00         |
|           |            | 1       | 38        | 22.41                   | 22.51      | 22.44        | 23.00         |
|           |            | 1       | 74        | 22.10                   | 22.08      | 22.14        | 23.00         |
|           |            | 36      | 0         | 21.27                   | 21.41      | 21.42        | 22.00         |
|           |            | 36      | 18        | 21.32                   | 21.42      | 21.43        | 22.00         |
|           |            | 36      | 39        | 21.39                   | 21.46      | 21.41        | 22.00         |
|           |            | 75      | 0         | 21.27                   | 21.44      | 21.35        | 22.00         |
|           | 16QAM      | 1       | 0         | 21.91                   | 21.46      | 21.48        | 22.00         |
|           |            | 1       | 38        | 21.90                   | 21.94      | 21.80        | 22.00         |
|           |            | 1       | 74        | 21.62                   | 21.62      | 21.58        | 22.00         |
|           |            | 36      | 0         | 20.27                   | 20.35      | 20.34        | 21.00         |
|           |            | 36      | 18        | 20.37                   | 20.48      | 20.39        | 21.00         |
|           |            | 36      | 39        | 20.41                   | 20.53      | 20.43        | 21.00         |
|           |            | 75      | 0         | 20.30                   | 20.39      | 20.42        | 21.00         |



| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |            | Tune-up Limit |
|-----------|------------|---------|-----------|-------------------------|------------|------------|---------------|
|           |            |         |           | 20850/2510              | 21100/2535 | 21350/2560 |               |
| 20MHz     | QPSK       | 1       | 0         | 21.87                   | 21.93      | 22.02      | 23.00         |
|           |            | 1       | 50        | 22.38                   | 22.46      | 22.39      | 23.00         |
|           |            | 1       | 99        | 22.05                   | 22.02      | 22.07      | 23.00         |
|           |            | 50      | 0         | 21.22                   | 21.32      | 21.35      | 22.00         |
|           |            | 50      | 25        | 21.27                   | 21.33      | 21.36      | 22.00         |
|           |            | 50      | 50        | 21.33                   | 21.38      | 21.33      | 22.00         |
|           |            | 100     | 0         | 21.22                   | 21.35      | 21.26      | 22.00         |
|           | 16QAM      | 1       | 0         | 21.44                   | 21.40      | 21.41      | 22.00         |
|           |            | 1       | 50        | 21.84                   | 21.89      | 21.74      | 22.00         |
|           |            | 1       | 99        | 21.57                   | 21.55      | 21.53      | 22.00         |
|           |            | 50      | 0         | 20.21                   | 20.29      | 20.28      | 21.00         |
|           |            | 50      | 25        | 20.31                   | 20.41      | 20.32      | 21.00         |
|           |            | 50      | 50        | 20.36                   | 20.44      | 20.36      | 21.00         |
|           |            | 100     | 0         | 20.25                   | 20.30      | 20.35      | 21.00         |



| LTE FDD Band 7<br>(Receiver off + SAR sensor on) /<br>(SAR Sensor on+ hotspot) /<br>(SAR Sensor off+ hotspot) |            |         |           | Conducted Power(dBm)    |            |              | Tune-up<br>Limit |
|---------------------------------------------------------------------------------------------------------------|------------|---------|-----------|-------------------------|------------|--------------|------------------|
| Bandwidth                                                                                                     | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              |                  |
|                                                                                                               |            |         |           | 20775/2502.5            | 21100/2535 | 21425/2567.5 |                  |
| 5MHz                                                                                                          | QPSK       | 1       | 0         | 18.97                   | 19.06      | 19.04        | 20.00            |
|                                                                                                               |            | 1       | 13        | 19.37                   | 19.50      | 19.47        | 20.00            |
|                                                                                                               |            | 1       | 24        | 19.07                   | 19.11      | 19.11        | 20.00            |
|                                                                                                               |            | 12      | 0         | 19.26                   | 19.32      | 19.39        | 20.00            |
|                                                                                                               |            | 12      | 6         | 19.33                   | 19.48      | 19.39        | 20.00            |
|                                                                                                               |            | 12      | 13        | 19.42                   | 19.51      | 19.47        | 20.00            |
|                                                                                                               |            | 25      | 0         | 19.34                   | 19.39      | 19.35        | 20.00            |
|                                                                                                               | 16QAM      | 1       | 0         | 19.88                   | 19.45      | 19.42        | 20.00            |
|                                                                                                               |            | 1       | 13        | 19.87                   | 19.80      | 19.78        | 20.00            |
|                                                                                                               |            | 1       | 24        | 19.51                   | 19.31      | 19.28        | 20.00            |
|                                                                                                               |            | 12      | 0         | 19.29                   | 19.34      | 19.37        | 20.00            |
|                                                                                                               |            | 12      | 6         | 19.40                   | 19.32      | 19.38        | 20.00            |
|                                                                                                               |            | 12      | 13        | 19.37                   | 19.44      | 19.45        | 20.00            |
|                                                                                                               |            | 25      | 0         | 19.27                   | 19.36      | 19.41        | 20.00            |
| Bandwidth                                                                                                     | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up<br>Limit |
|                                                                                                               |            |         |           | 20800/2505              | 21100/2535 | 21400/2565   |                  |
| 10MHz                                                                                                         | QPSK       | 1       | 0         | 18.95                   | 19.05      | 19.01        | 20.00            |
|                                                                                                               |            | 1       | 25        | 19.34                   | 19.45      | 19.43        | 20.00            |
|                                                                                                               |            | 1       | 49        | 19.05                   | 19.07      | 19.08        | 20.00            |
|                                                                                                               |            | 25      | 0         | 19.23                   | 19.27      | 19.35        | 20.00            |
|                                                                                                               |            | 25      | 13        | 19.30                   | 19.43      | 19.35        | 20.00            |
|                                                                                                               |            | 25      | 25        | 19.40                   | 19.47      | 19.42        | 20.00            |
|                                                                                                               |            | 50      | 0         | 19.30                   | 19.37      | 19.31        | 20.00            |
|                                                                                                               | 16QAM      | 1       | 0         | 19.86                   | 19.42      | 19.40        | 20.00            |
|                                                                                                               |            | 1       | 25        | 19.84                   | 19.76      | 19.75        | 20.00            |
|                                                                                                               |            | 1       | 49        | 19.48                   | 19.29      | 19.25        | 20.00            |
|                                                                                                               |            | 25      | 0         | 19.26                   | 19.29      | 19.33        | 20.00            |
|                                                                                                               |            | 25      | 13        | 19.38                   | 19.28      | 19.35        | 20.00            |
|                                                                                                               |            | 25      | 25        | 19.34                   | 19.39      | 19.41        | 20.00            |
|                                                                                                               |            | 50      | 0         | 19.24                   | 19.31      | 19.37        | 20.00            |
| Bandwidth                                                                                                     | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up<br>Limit |
|                                                                                                               |            |         |           | 20825/2507.5            | 21100/2535 | 21375/2562.5 |                  |
| 15MHz                                                                                                         | QPSK       | 1       | 0         | 18.98                   | 19.07      | 19.05        | 20.00            |
|                                                                                                               |            | 1       | 38        | 19.36                   | 19.49      | 19.46        | 20.00            |
|                                                                                                               |            | 1       | 74        | 19.08                   | 19.12      | 19.12        | 20.00            |
|                                                                                                               |            | 36      | 0         | 19.26                   | 19.32      | 19.39        | 20.00            |



|           |            | 36      | 18        | 19.32                   | 19.47      | 19.40      | 20.00         |
|-----------|------------|---------|-----------|-------------------------|------------|------------|---------------|
|           |            | 36      | 39        | 19.42                   | 19.49      | 19.46      | 20.00         |
|           |            | 75      | 0         | 19.30                   | 19.38      | 19.33      | 20.00         |
|           | 16QAM      | 1       | 0         | 19.89                   | 19.46      | 19.43      | 20.00         |
|           |            | 1       | 38        | 19.87                   | 19.78      | 19.78      | 20.00         |
|           |            | 1       | 74        | 19.51                   | 19.31      | 19.29      | 20.00         |
|           |            | 36      | 0         | 19.28                   | 19.33      | 19.36      | 20.00         |
|           |            | 36      | 18        | 19.41                   | 19.33      | 19.39      | 20.00         |
|           |            | 36      | 39        | 19.37                   | 19.44      | 19.45      | 20.00         |
|           |            | 75      | 0         | 19.26                   | 19.35      | 19.42      | 20.00         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |            | Tune-up Limit |
|           |            |         |           | 20850/2510              | 21100/2535 | 21350/2560 |               |
| 20MHz     | QPSK       | 1       | 0         | 18.93                   | 18.98      | 18.99      | 20.00         |
|           |            | 1       | 50        | 19.34                   | 19.45      | 19.42      | 20.00         |
|           |            | 1       | 99        | 19.02                   | 19.05      | 19.04      | 20.00         |
|           |            | 50      | 0         | 19.21                   | 19.23      | 19.32      | 20.00         |
|           |            | 50      | 25        | 19.28                   | 19.39      | 19.32      | 20.00         |
|           |            | 50      | 50        | 19.36                   | 19.43      | 19.39      | 20.00         |
|           |            | 100     | 0         | 19.29                   | 19.30      | 19.26      | 20.00         |
|           | 16QAM      | 1       | 0         | 19.41                   | 19.39      | 19.35      | 20.00         |
|           |            | 1       | 50        | 19.81                   | 19.75      | 19.72      | 20.00         |
|           |            | 1       | 99        | 19.46                   | 19.24      | 19.23      | 20.00         |
|           |            | 50      | 0         | 19.23                   | 19.28      | 19.31      | 20.00         |
|           |            | 50      | 25        | 19.34                   | 19.25      | 19.31      | 20.00         |
|           |            | 50      | 50        | 19.32                   | 19.35      | 19.38      | 20.00         |
|           |            | 100     | 0         | 19.22                   | 19.27      | 19.34      | 20.00         |

## 9.4 WLAN Mode

### FCC

| Wi-Fi 2.4G<br>Full Power<br>Mode | Channel<br>/Frequency(MHz) | Maximum Output Power (dBm) |       |              |
|----------------------------------|----------------------------|----------------------------|-------|--------------|
|                                  |                            | Tune-up                    | Meas. | TP Set Level |
| 802.11b<br>(1M)                  | 1/2412                     | 18.00                      | 17.45 | 18.00        |
|                                  | 6/2437                     | 18.00                      | 17.51 | 18.00        |
|                                  | 11/2462                    | 18.00                      | 17.42 | 18.00        |
| 802.11g<br>(6M)                  | 1/2412                     | 13.50                      | 12.13 | 13.00        |
|                                  | 2/2417                     | 17.50                      | 16.12 | 17.00        |
|                                  | 6/2437                     | 17.50                      | 16.13 | 17.00        |
|                                  | 10/2457                    | 17.50                      | 16.09 | 17.00        |
|                                  | 11/2462                    | 13.50                      | 12.11 | 13.00        |
| 802.11n-HT20<br>(MCS0)           | 1/2412                     | 13.50                      | 12.16 | 13.00        |
|                                  | 2/2417                     | 17.00                      | 15.69 | 16.50        |
|                                  | 6/2437                     | 17.00                      | 15.76 | 16.50        |
|                                  | 10/2457                    | 17.00                      | 15.71 | 16.50        |
|                                  | 11/2462                    | 13.50                      | 12.25 | 13.00        |
| 802.11n-HT40<br>(MCS0)           | 3/2422                     | 14.50                      | 11.27 | 14.00        |
|                                  | 5/2432                     | 14.50                      | 11.18 | 14.00        |
|                                  | 8/2447                     | 14.50                      | 10.97 | 14.00        |
|                                  | 9/2452                     | 11.50                      | 7.82  | 11.00        |

| Wi-Fi 2.4G<br>Receiver on<br>Mode | Channel<br>/Frequency(MHz) | Maximum Output Power (dBm) |       |              |
|-----------------------------------|----------------------------|----------------------------|-------|--------------|
|                                   |                            | Tune-up                    | Meas. | TP Set Level |
| 802.11b<br>(1M)                   | 1/2412                     | 14.50                      | 13.97 | 14.50        |
|                                   | 6/2437                     | 14.50                      | 14.07 | 14.50        |
|                                   | 11/2462                    | 14.50                      | 13.94 | 14.50        |
| 802.11g<br>(6M)                   | 1/2412                     | 13.50                      | 12.16 | 13.00        |
|                                   | 2/2417                     | 14.50                      | 13.09 | 14.00        |
|                                   | 6/2437                     | 14.50                      | 13.14 | 14.00        |
|                                   | 10/2457                    | 14.50                      | 13.17 | 14.00        |
|                                   | 11/2462                    | 13.50                      | 12.09 | 13.00        |
| 802.11n-HT20<br>(MCS0)            | 1/2412                     | 13.50                      | 12.19 | 13.00        |
|                                   | 2/2417                     | 14.50                      | 13.21 | 14.00        |
|                                   | 6/2437                     | 14.50                      | 13.24 | 14.00        |
|                                   | 10/2457                    | 14.50                      | 13.18 | 14.00        |



|                        |         |       |       |       |
|------------------------|---------|-------|-------|-------|
|                        | 11/2462 | 13.50 | 12.23 | 13.00 |
| 802.11n-HT40<br>(MCS0) | 3/2422  | 14.50 | 11.31 | 14.00 |
|                        | 5/2432  | 14.50 | 11.21 | 14.00 |
|                        | 8/2447  | 14.50 | 10.88 | 14.00 |
|                        | 9/2452  | 11.50 | 7.79  | 11.00 |

## CE

| Wi-Fi 2.4G<br>Full Power | Channel<br>/Frequency(MHz) | Maximum Output Power (dBm) |       |              |
|--------------------------|----------------------------|----------------------------|-------|--------------|
|                          |                            | Tune-up                    | Meas. | TP Set Level |
| Mode                     |                            |                            |       |              |
| 802.11b<br>(1M)          | 1/2412                     | 18.00                      | 17.39 | 18.00        |
|                          | 7/2442                     | 18.00                      | 17.47 | 18.00        |
|                          | 13/2472                    | 18.00                      | 17.40 | 18.00        |
| 802.11g<br>(6M)          | 1/2412                     | 17.50                      | 16.08 | 17.00        |
|                          | 7/2442                     | 17.50                      | 16.07 | 17.00        |
|                          | 13/2472                    | 17.50                      | 16.09 | 17.00        |
| 802.11n-HT20<br>(MCS0)   | 1/2412                     | 17.50                      | 16.06 | 16.50        |
|                          | 7/2442                     | 17.50                      | 16.03 | 16.50        |
|                          | 13/2472                    | 17.50                      | 16.07 | 16.50        |
| 802.11n-HT40<br>(MCS0)   | 3/2422                     | 17.00                      | 15.65 | 14.00        |
|                          | 7/2442                     | 17.00                      | 15.72 | 14.00        |
|                          | 11/2462                    | 17.00                      | 15.65 | 14.00        |

| Wi-Fi 2.4G<br>Receiver on | Channel<br>/Frequency(MHz) | Maximum Output Power (dBm) |       |              |
|---------------------------|----------------------------|----------------------------|-------|--------------|
|                           |                            | Tune-up                    | Meas. | TP Set Level |
| Mode                      |                            |                            |       |              |
| 802.11b<br>(1M)           | 1/2412                     | 14.50                      | 13.92 | 14.50        |
|                           | 7/2442                     | 14.50                      | 14.03 | 14.50        |
|                           | 13/2472                    | 14.50                      | 13.92 | 14.50        |
| 802.11g<br>(6M)           | 1/2412                     | 14.50                      | 13.06 | 14.00        |
|                           | 7/2442                     | 14.50                      | 13.04 | 14.00        |
|                           | 13/2472                    | 14.50                      | 13.10 | 14.00        |
| 802.11n-HT20<br>(MCS0)    | 1/2412                     | 14.50                      | 13.11 | 14.00        |
|                           | 7/2442                     | 14.50                      | 12.03 | 14.00        |
|                           | 13/2472                    | 14.50                      | 12.12 | 14.00        |
| 802.11n-HT40<br>(MCS0)    | 3/2422                     | 14.50                      | 13.16 | 14.00        |
|                           | 7/2442                     | 14.50                      | 13.21 | 14.00        |
|                           | 11/2462                    | 14.50                      | 13.13 | 14.00        |

## 9.5 Bluetooth Mode

| BT            | Conducted Power(dBm)   |                |                | Tune-up<br>Limit (dBm) |
|---------------|------------------------|----------------|----------------|------------------------|
|               | Channel/Frequency(MHz) |                |                |                        |
|               | Ch 0/2402 MHz          | Ch 39/2441 MHz | Ch 78/2480 MHz |                        |
| GFSK          | 10.20                  | 9.72           | 9.92           | 12.00                  |
| $\pi/4$ DQPSK | 9.45                   | 9.00           | 9.17           | 10.00                  |
| 8DPSK         | 9.46                   | 8.98           | 9.22           | 10.00                  |
| BLE           | Ch 0/2402 MHz          | Ch 19/2440 MHz | Ch 39/2480 MHz | Tune-up<br>Limit (dBm) |
| GFSK          | -4.47                  | -3.80          | -4.37          | 0.00                   |

## 10 Measured and Reported (Scaled) SAR Results

### 10.1 EUT Antenna Locations

The Detailed Antenna Locations refer to *Antenna Locations*.

| Overall (Length x Width): 147.13 mm x 70.78mm   |           |            |           |            |          |             |
|-------------------------------------------------|-----------|------------|-----------|------------|----------|-------------|
| Overall Diagonal: 155mm/Display Diagonal: 141mm |           |            |           |            |          |             |
| Distance of the Antenna to the EUT surface/edge |           |            |           |            |          |             |
| Antenna                                         | Back Side | Front side | Left Edge | Right Edge | Top Edge | Bottom Edge |
| Main-Antenna                                    | <25mm     | <25mm      | <25mm     | <25mm      | >25mm    | <25mm       |
| BT/Wi-Fi Antenna                                | <25mm     | <25mm      | >25mm     | <25mm      | <25mm    | >25mm       |
| Hotspot mode, Positions for SAR tests           |           |            |           |            |          |             |
| Mode                                            | Back Side | Front side | Left Edge | Right Edge | Top Edge | Bottom Edge |
| Main-Antenna                                    | Yes       | Yes        | Yes       | Yes        | N/A      | Yes         |
| BT/Wi-Fi Antenna                                | Yes       | Yes        | N/A       | Yes        | Yes      | N/A         |

Note: 1. Per KDB 941225 D06, when the overall device length and width are  $\geq 9\text{cm} \times 5\text{cm}$ , the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2. Per FCC KDB 447498 D01,

for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

a)  $\leq 0.8 \text{ W/kg}$  or  $2.0 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\leq 100\text{MHz}$

b)  $\leq 0.6 \text{ W/kg}$  or  $1.5 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.

c)  $\leq 0.4 \text{ W/kg}$  or  $1.0 \text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\geq 200 \text{ MHz}$ .

3. When the original highest measured SAR is  $\geq 0.80 \text{ W/kg}$ , the measurement was repeated once.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was  $\leq 1.2 \text{ W/kg}$ , no additional SAR evaluations using a headset cable were required.



## 10.2 Measured SAR Results

Table 7: GSM 850

| Test Position                                                                                                            | Cover Type | Time slot | Duty Cycle | Channel/<br>Frequency (MHz) | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|--------------------------------------------------------------------------------------------------------------------------|------------|-----------|------------|-----------------------------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|                                                                                                                          |            |           |            |                             |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| Head SAR                                                                                                                 |            |           |            |                             |               |                      |                              |                  |                |              |          |
| Left Cheek                                                                                                               | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.031                        | -0.024           | 1.25           | 0.039        | 9        |
| Left Tilt                                                                                                                | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.018                        | 0.046            | 1.25           | 0.022        | /        |
| Right Cheek                                                                                                              | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.026                        | 0.043            | 1.25           | 0.033        | /        |
| Right Tilt                                                                                                               | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.014                        | 0.036            | 1.25           | 0.018        | /        |
| Body-worn SAR (Distance 15mm)                                                                                            |            |           |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.426                        | 0.020            | 1.25           | 0.531        | 10       |
| Front Side                                                                                                               | standard   | GSM       | 1:8.3      | 190/836.6                   | 34.00         | 33.04                | 0.309                        | -0.050           | 1.25           | 0.385        | /        |
| Hotspot SAR(Distance 10mm)                                                                                               |            |           |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                | standard   | 4Txslots  | 1:2.07     | 190/836.6                   | 28.00         | 26.98                | 0.242                        | 0.070            | 1.26           | 0.306        | /        |
| Front Side                                                                                                               | standard   | 4Txslots  | 1:2.07     | 190/836.6                   | 28.00         | 26.98                | 0.122                        | -0.070           | 1.26           | 0.154        | /        |
| Left Edge                                                                                                                | standard   | 4Txslots  | 1:2.07     | 190/836.6                   | 28.00         | 26.98                | 0.227                        | -0.190           | 1.26           | 0.287        | /        |
| Right Edge                                                                                                               | standard   | 4Txslots  | 1:2.07     | 190/836.6                   | 28.00         | 26.98                | 0.270                        | -0.020           | 1.26           | 0.341        | 11       |
| Top Edge                                                                                                                 | N/A        | N/A       | N/A        | N/A                         | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                                                                                              | standard   | 4Txslots  | 1:2.07     | 190/836.6                   | 28.00         | 26.98                | 0.040                        | -0.180           | 1.26           | 0.051        | /        |
| Note: 1.The value with blue color is the maximum SAR Value of each test band.                                            |            |           |            |                             |               |                      |                              |                  |                |              |          |
| 2.When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power. |            |           |            |                             |               |                      |                              |                  |                |              |          |



Table 8: GSM 1900

| Test Position                | Cover Type | Sensor | Distance | Time slot | Duty Cycle | Channel/<br>Frequency (MHz) | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|------------------------------|------------|--------|----------|-----------|------------|-----------------------------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|                              |            |        |          |           |            |                             |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| Head SAR                     |            |        |          |           |            |                             |               |                      |                              |                  |                |              |          |
| Left Cheek                   | standard   | off    | 0mm      | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.276                        | 0.120            | 1.25           | 0.346        | 12       |
| Left Tilt                    | standard   | off    | 0mm      | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.149                        | 0.080            | 1.25           | 0.187        | /        |
| Right Cheek                  | standard   | off    | 0mm      | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.156                        | 0.097            | 1.25           | 0.195        | /        |
| Right Tilt                   | standard   | off    | 0mm      | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.126                        | 0.054            | 1.25           | 0.158        | /        |
| Body-worn SAR (Receiver off) |            |        |          |           |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                    | standard   | on     | 15mm     | GSM       | 1:8.3      | 661/1880                    | 29.00         | 28.01                | 0.144                        | -0.036           | 1.26           | 0.181        | 13       |
| Back Side                    | standard   | off    | 18mm     | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.097                        | 0.140            | 1.25           | 0.122        | /        |
| Front Side                   | standard   | off    | 15mm     | GSM       | 1:8.3      | 661/1880                    | 31.00         | 30.02                | 0.136                        | 0.120            | 1.25           | 0.170        | /        |
| Hotspot SAR                  |            |        |          |           |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                    | standard   | off    | 10mm     | 4Txslots  | 1:2.07     | 661/1880                    | 23.00         | 22.22                | 0.171                        | -0.190           | 1.20           | 0.205        | 14       |
| Front Side                   | standard   | off    | 10mm     | 4Txslots  | 1:2.07     | 661/1880                    | 23.00         | 22.22                | 0.148                        | 0.150            | 1.20           | 0.177        | /        |
| Left Edge                    | standard   | off    | 10mm     | 4Txslots  | 1:2.07     | 661/1880                    | 23.00         | 22.22                | 0.110                        | -0.040           | 1.20           | 0.132        | /        |
| Right Edge                   | standard   | off    | 10mm     | 4Txslots  | 1:2.07     | 661/1880                    | 23.00         | 22.22                | 0.098                        | 0.190            | 1.20           | 0.118        | /        |
| Top Edge                     | N/A        | N/A    | N/A      | N/A       | N/A        | N/A                         | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                  | standard   | off    | 10mm     | 4Txslots  | 1:2.07     | 661/1880                    | 23.00         | 22.22                | 0.125                        | 0.010            | 1.20           | 0.150        | /        |

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2.When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.

3. Because the power of the sensor on and sensor off is the same in the hotspot state, the SAR is tested only in the sensor off state

| MAX Adjusted SAR |            |        |                         |                  |               |                                   |                |                                            |         |
|------------------|------------|--------|-------------------------|------------------|---------------|-----------------------------------|----------------|--------------------------------------------|---------|
| Test Position    | Cover Type | Sensor | Channel/Frequency (MHz) | Full power (dBm) | Tune-up (dBm) | Reported SAR <sub>1g</sub> (W/kg) | Scaling Factor | Full power Report SAR <sub>1g</sub> (W/kg) | 0mm SAR |
| Back Side        | Standard   | off    | 661/1880                | 25.00            | 23.00         | 0.205                             | 1.58           | 0.271                                      | No      |
| Front Side       | Standard   | off    | 661/1880                | 25.00            | 23.00         | 0.177                             | 1.58           | 0.235                                      | No      |
| Left Edge        | Standard   | off    | 661/1880                | 25.00            | 23.00         | 0.132                             | 1.58           | 0.174                                      | No      |
| Right Edge       | Standard   | off    | 661/1880                | 25.00            | 23.00         | 0.118                             | 1.58           | 0.156                                      | No      |
| Top Edge         | N/A        | N/A    | N/A                     | N/A              | N/A           | N/A                               | N/A            | N/A                                        | N/A     |
| Bottom Edge      | Standard   | off    | 661/1880                | 25.00            | 23.00         | 0.150                             | 1.58           | 0.198                                      | No      |

Note: According to 648474 D04 Handset SAR v01r03. For Phablet, Since hotspot mode 1-g reported SAR < 1.2 W/kg, Product Specific 10-g SAR is not required.



Table 9: UMTS Band V

| Test Position                 | Cover Type | Channel Type | Duty Cycle | Channel/<br>Frequency (MHz) | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|-------------------------------|------------|--------------|------------|-----------------------------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|                               |            |              |            |                             |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| Head SAR                      |            |              |            |                             |               |                      |                              |                  |                |              |          |
| Left Cheek                    | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.326                        | -0.034           | 1.25           | 0.409        | /        |
| Left Tilt                     | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.171                        | 0.100            | 1.25           | 0.214        | /        |
| Right Cheek                   | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.333                        | 0.051            | 1.25           | 0.417        | 15       |
| Right Tilt                    | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.173                        | 0.100            | 1.25           | 0.217        | /        |
| Body-worn SAR (Distance 15mm) |            |              |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                     | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.444                        | -0.010           | 1.25           | 0.556        | 16       |
| Front Side                    | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.308                        | -0.040           | 1.25           | 0.386        | /        |
| Back Side                     | SIM2       | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.413                        | -0.090           | 1.25           | 0.518        | /        |
| Back Side                     | Battery 2  | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.429                        | -0.190           | 1.25           | 0.538        | /        |
| Back Side                     | Battery 3  | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.431                        | -0.110           | 1.25           | 0.540        | /        |
| Hotspot SAR(Distance 10mm)    |            |              |            |                             |               |                      |                              |                  |                |              |          |
| Back Side                     | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.300                        | 0.010            | 1.25           | 0.376        | 17       |
| Front Side                    | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.162                        | -0.060           | 1.25           | 0.203        | /        |
| Left Edge                     | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.168                        | -0.090           | 1.25           | 0.211        | /        |
| Right Edge                    | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.179                        | -0.050           | 1.25           | 0.224        | /        |
| Top Edge                      | N/A        | N/A          | N/A        | N/A                         | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                   | standard   | RMC 12.2K    | 1:1        | 4183/836.6                  | 25.00         | 24.02                | 0.038                        | -0.029           | 1.25           | 0.047        | /        |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode.

3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.



Table 10: LTE Band 5

| Test Position                                                                                                                                 | Cover Type | Duty Cycle | RB alloc ation | RB offset | Channel/ Frequency (MHz) | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|----------------|-----------|--------------------------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|                                                                                                                                               |            |            |                |           |                          |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| Head SAR (QPSK)                                                                                                                               |            |            |                |           |                          |               |                      |                              |                  |                |              |          |
| Left Cheek                                                                                                                                    | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.334                        | 0.140            | 1.20           | 0.402        | /        |
| Left Tilt                                                                                                                                     | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.179                        | -0.110           | 1.20           | 0.215        | /        |
| Right Cheek                                                                                                                                   | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.350                        | 0.061            | 1.20           | 0.421        | 18       |
| Right Tilt                                                                                                                                    | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.178                        | -0.030           | 1.20           | 0.214        | /        |
| Left Cheek                                                                                                                                    | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.104                        | 0.024            | 1.20           | 0.124        | /        |
| Left Tilt                                                                                                                                     | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.055                        | 0.036            | 1.20           | 0.066        | /        |
| Right Cheek                                                                                                                                   | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.252                        | 0.062            | 1.20           | 0.302        | /        |
| Right Tilt                                                                                                                                    | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.134                        | 0.025            | 1.20           | 0.160        | /        |
| Right Cheek                                                                                                                                   | SIM2       | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.327                        | 0.087            | 1.20           | 0.393        | /        |
| Right Cheek                                                                                                                                   | Battery 2  | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.331                        | 0.065            | 1.20           | 0.398        | /        |
| Right Cheek                                                                                                                                   | Battery 3  | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.329                        | 0.047            | 1.20           | 0.396        | /        |
| Body-worn SAR (QPSK, Distance 15mm)                                                                                                           |            |            |                |           |                          |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                                     | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.436                        | -0.042           | 1.20           | 0.524        | 19       |
| Front Side                                                                                                                                    | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.20                | 0.260                        | 0.000            | 1.20           | 0.313        | /        |
| Back Side                                                                                                                                     | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.339                        | 0.020            | 1.20           | 0.406        | /        |
| Front Side                                                                                                                                    | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.22                | 0.260                        | 0.000            | 1.20           | 0.311        | /        |
| Hotspot SAR(QPSK, Distance 10mm)                                                                                                              |            |            |                |           |                          |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                                     | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.536                        | 0.000            | 1.19           | 0.636        | 20       |
| Front Side                                                                                                                                    | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.359                        | -0.010           | 1.19           | 0.426        | /        |
| Left Edge                                                                                                                                     | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.335                        | -0.130           | 1.19           | 0.397        | /        |
| Right Edge                                                                                                                                    | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.325                        | -0.040           | 1.19           | 0.385        | /        |
| Top Edge                                                                                                                                      | N/A        | N/A        | N/A            | N/A       | N/A                      | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                                                                                                                   | standard   | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.048                        | -0.020           | 1.19           | 0.057        | /        |
| Back Side                                                                                                                                     | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.24                | 0.429                        | 0.010            | 1.19           | 0.511        | /        |
| Front Side                                                                                                                                    | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.24                | 0.123                        | 0.050            | 1.19           | 0.147        | /        |
| Left Edge                                                                                                                                     | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.24                | 0.143                        | 0.050            | 1.19           | 0.170        | /        |
| Right Edge                                                                                                                                    | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.24                | 0.111                        | 0.010            | 1.19           | 0.132        | /        |
| Top Edge                                                                                                                                      | N/A        | N/A        | N/A            | N/A       | N/A                      | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                                                                                                                   | standard   | 1:1        | 50%            | 13        | 20450/829                | 24.00         | 23.24                | 0.037                        | -0.027           | 1.19           | 0.044        | /        |
| Back Side                                                                                                                                     | SIM2       | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.511                        | 0.010            | 1.19           | 0.606        | /        |
| Back Side                                                                                                                                     | Battery 2  | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.508                        | 0.098            | 1.19           | 0.602        | /        |
| Back Side                                                                                                                                     | Battery 3  | 1:1        | 1              | 25        | 20525/836.5              | 25.00         | 24.26                | 0.511                        | 0.012            | 1.19           | 0.606        | /        |
| Note: 1. The value with blue color is the maximum SAR Value of each test band.                                                                |            |            |                |           |                          |               |                      |                              |                  |                |              |          |
| 2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are ≥ 50% limit(10g). |            |            |                |           |                          |               |                      |                              |                  |                |              |          |



3. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.



Table 11: LTE Band 7

| Test Position                                                                                                                                | Sensor | Distance | Duty Cycle | RB allocation | RB offset | Channel/<br>Frequency (MHz) | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|------------|---------------|-----------|-----------------------------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|                                                                                                                                              |        |          |            |               |           |                             |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| Head SAR (QPSK)                                                                                                                              |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |
| Left Cheek                                                                                                                                   | off    | 0mm      | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.039                        | -0.031           | 1.13           | 0.044        | /        |
| Left Tilt                                                                                                                                    | off    | 0mm      | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.032                        | 0.030            | 1.13           | 0.037        | /        |
| Right Cheek                                                                                                                                  | off    | 0mm      | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.154                        | 0.076            | 1.13           | 0.174        | 21       |
| Right Tilt                                                                                                                                   | off    | 0mm      | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.014                        | 0.164            | 1.13           | 0.016        | /        |
| Left Cheek                                                                                                                                   | off    | 0mm      | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.040                        | 0.037            | 1.15           | 0.046        | /        |
| Left Tilt                                                                                                                                    | off    | 0mm      | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.027                        | 0.057            | 1.15           | 0.031        | /        |
| Right Cheek                                                                                                                                  | off    | 0mm      | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.121                        | 0.051            | 1.15           | 0.140        | /        |
| Right Tilt                                                                                                                                   | off    | 0mm      | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.012                        | 0.066            | 1.15           | 0.013        | /        |
| Body-worn SAR (QPSK, Receiver off)                                                                                                           |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                                    | off    | 18mm     | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.379                        | 0.110            | 1.13           | 0.429        | 22       |
| Back Side                                                                                                                                    | on     | 15mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.245                        | 0.076            | 1.14           | 0.278        | /        |
| Front Side                                                                                                                                   | off    | 15mm     | 1:1        | 1             | 50        | 21100/2535                  | 23.00         | 22.46                | 0.204                        | 0.066            | 1.13           | 0.231        | /        |
| Back Side                                                                                                                                    | off    | 18mm     | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.307                        | 0.085            | 1.15           | 0.354        | /        |
| Back Side                                                                                                                                    | on     | 15mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.248                        | 0.128            | 1.14           | 0.283        | /        |
| Front Side                                                                                                                                   | off    | 15mm     | 1:1        | 50%           | 50        | 21100/2535                  | 22.00         | 21.38                | 0.202                        | 0.131            | 1.15           | 0.233        | /        |
| Hotspot SAR(QPSK)                                                                                                                            |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |
| Back Side                                                                                                                                    | off    | 10mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.526                        | 0.120            | 1.14           | 0.597        | 23       |
| Front Side                                                                                                                                   | off    | 10mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.239                        | 0.092            | 1.14           | 0.271        | /        |
| Left Edge                                                                                                                                    | off    | 10mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.032                        | 0.090            | 1.14           | 0.037        | /        |
| Right Edge                                                                                                                                   | off    | 10mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.043                        | 0.044            | 1.14           | 0.048        | /        |
| Top Edge                                                                                                                                     | N/A    | N/A      | N/A        | N/A           | N/A       | N/A                         | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                                                                                                                  | off    | 10mm     | 1:1        | 1             | 50        | 21100/2535                  | 20.00         | 19.45                | 0.502                        | 0.028            | 1.14           | 0.570        | /        |
| Back Side                                                                                                                                    | off    | 10mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.521                        | 0.030            | 1.14           | 0.594        | /        |
| Front Side                                                                                                                                   | off    | 10mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.244                        | 0.031            | 1.14           | 0.278        | /        |
| Left Edge                                                                                                                                    | off    | 10mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.032                        | 0.059            | 1.14           | 0.036        | /        |
| Right Edge                                                                                                                                   | off    | 10mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.042                        | 0.043            | 1.14           | 0.048        | /        |
| Top Edge                                                                                                                                     | N/A    | N/A      | N/A        | N/A           | N/A       | N/A                         | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                                                                                                                  | off    | 10mm     | 1:1        | 50%           | 50        | 21100/2535                  | 20.00         | 19.43                | 0.498                        | 0.025            | 1.14           | 0.568        | /        |
| Note: 1.The value with blue color is the maximum SAR Value of each test band.                                                                |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |
| 2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(10g). |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |
| 3. Because the power of the sensor on and sensor off is the same in the hotspot state, the SAR is tested only in the sensor off state        |        |          |            |               |           |                             |               |                      |                              |                  |                |              |          |

| MAX Adjusted SAR |       |        |    |          |      |         |          |         |      |     |  |
|------------------|-------|--------|----|----------|------|---------|----------|---------|------|-----|--|
| Test             | Cover | Sensor | RB | Channel/ | Full | Tune-up | Reported | Scaling | Full | 0mm |  |



| Position    | Type     |     | allocation | Frequency (MHz) | power (dBm) | (dBm) | SAR <sub>1g</sub> (W/kg) | Factor | power Report SAR <sub>1g</sub> (W/kg) | SAR |
|-------------|----------|-----|------------|-----------------|-------------|-------|--------------------------|--------|---------------------------------------|-----|
| Back Side   | Standard | off | 1          | 21100/2535      | 23.00       | 20.00 | 0.597                    | 2.00   | 1.191                                 | No  |
| Front Side  | Standard | off | 1          | 21100/2535      | 23.00       | 20.00 | 0.271                    | 2.00   | 0.541                                 | No  |
| Left Edge   | Standard | off | 1          | 21100/2535      | 23.00       | 20.00 | 0.037                    | 2.00   | 0.074                                 | No  |
| Right Edge  | Standard | off | 1          | 21100/2535      | 23.00       | 20.00 | 0.048                    | 2.00   | 0.096                                 | No  |
| Top Edge    | N/A      | N/A | N/A        | N/A             | N/A         | N/A   | N/A                      | N/A    | N/A                                   | N/A |
| Bottom Edge | Standard | off | 1          | 21100/2535      | 23.00       | 20.00 | 0.570                    | 2.00   | 1.137                                 | No  |
| Back Side   | Standard | off | 50%        | 21100/2535      | 22.00       | 20.00 | 0.594                    | 1.58   | 0.941                                 | No  |
| Front Side  | Standard | off | 50%        | 21100/2535      | 22.00       | 20.00 | 0.278                    | 1.58   | 0.441                                 | No  |
| Left Edge   | Standard | off | 50%        | 21100/2535      | 22.00       | 20.00 | 0.036                    | 1.58   | 0.057                                 | No  |
| Right Edge  | Standard | off | 50%        | 21100/2535      | 22.00       | 20.00 | 0.048                    | 1.58   | 0.076                                 | No  |
| Top Edge    | N/A      | N/A | N/A        | N/A             | N/A         | N/A   | N/A                      | N/A    | N/A                                   | N/A |
| Bottom Edge | Standard | off | 50%        | 21100/2535      | 22.00       | 20.00 | 0.568                    | 1.58   | 0.900                                 | No  |

Note: According to 648474 D04 Handset SAR v01r03, For Phablet, Since hotspot mode 1-g reported SAR < 1.2 W/kg, Product Specific 10-g SAR is not required.

Table 12: Wi-Fi (2.4G)

| Test Position                          | Cover Type | Mode 802.11b | Duty Cycle | Channel/ Frequency (MHz) | Tune-up dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                  |                |               | Plot No. |
|----------------------------------------|------------|--------------|------------|--------------------------|--------------|----------------------|------------------------------|------------------|------------------|----------------|---------------|----------|
|                                        |            |              |            |                          |              |                      | Area Scan SAR 1g             | Zoom Scan SAR 1g | Power Drift (dB) | Scaling Factor | Report SAR 1g |          |
| Head SAR                               |            |              |            |                          |              |                      |                              |                  |                  |                |               |          |
| Left Cheek                             | standard   | DSSS         | 100.0%     | 6/2437                   | 14.50        | 14.07                | 0.149                        | 0.173            | 0.026            | 1.10           | 0.191         | 24       |
| Left Tilt                              | standard   | DSSS         | 100.0%     | 6/2437                   | 14.50        | 14.07                | 0.105                        | 0.117            | 0.190            | 1.10           | 0.129         | /        |
| Right Cheek                            | standard   | DSSS         | 100.0%     | 6/2437                   | 14.50        | 14.07                | 0.069                        | 0.079            | 0.036            | 1.10           | 0.087         | /        |
| Right Tilt                             | standard   | DSSS         | 100.0%     | 6/2437                   | 14.50        | 14.07                | 0.072                        | 0.081            | 0.036            | 1.10           | 0.090         | /        |
| Body SAR(Distance 10mm) (Receiver off) |            |              |            |                          |              |                      |                              |                  |                  |                |               |          |
| Back Side                              | standard   | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.205                        | 0.206            | 0.020            | 1.12           | 0.231         | 25       |
| Front Side                             | standard   | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.155                        | 0.151            | 0.026            | 1.12           | 0.169         | /        |
| Left Edge                              | N/A        | N/A          | N/A        | N/A                      | N/A          | N/A                  | N/A                          | N/A              | N/A              | N/A            | N/A           | N/A      |
| Right Edge                             | standard   | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.110                        | 0.131            | 0.039            | 1.12           | 0.147         | /        |
| Top Edge                               | standard   | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.152                        | 0.153            | 0.030            | 1.12           | 0.171         | /        |
| Bottom Edge                            | N/A        | N/A          | N/A        | N/A                      | N/A          | N/A                  | N/A                          | N/A              | N/A              | N/A            | N/A           | N/A      |
| Back Side                              | Battery 2  | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.196                        | 0.198            | 0.090            | 1.12           | 0.222         | /        |
| Back Side                              | Battery 3  | DSSS         | 100.0%     | 6/2437                   | 18.00        | 17.51                | 0.194                        | 0.197            | 0.021            | 1.12           | 0.221         | /        |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration.

| MAX Adjusted SAR |               |                         |                                       |                             |                     |                |                                   |
|------------------|---------------|-------------------------|---------------------------------------|-----------------------------|---------------------|----------------|-----------------------------------|
| Mode             | Test Position | Channel/Frequency (MHz) | MAX Reported SAR <sub>1g</sub> (W/kg) | 802.11b Tune-up limit (dBm) | Tune-up limit (dBm) | Scaling Factor | Adjusted SAR <sub>1g</sub> (W/kg) |
| 802.11g          | Back Side     | 6/2437                  | 0.231                                 | 18.00                       | 17.00               | 0.79           | 0.182                             |
| 802.11n HT20     | Back Side     | 6/2437                  | 0.231                                 | 18.00                       | 16.50               | 0.71           | 0.164                             |
| 802.11n HT40     | Back Side     | 6/2437                  | 0.231                                 | 18.00                       | 14.00               | 0.40           | 0.092                             |

Note: SAR is not required for OFDM when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.



Table 13: BT

| Test Position                                                                                                                                                                                                                       | Cover Type | Mode | Duty Cycle | Channel/<br>Frequency (MHz) | Tune-up dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |               | Plot No. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|------------|-----------------------------|--------------|----------------------|------------------------------|------------------|----------------|---------------|----------|
|                                                                                                                                                                                                                                     |            |      |            |                             |              |                      | Measured SAR 1g              | Power Drift (dB) | Scaling Factor | Report SAR 1g |          |
| Head SAR                                                                                                                                                                                                                            |            |      |            |                             |              |                      |                              |                  |                |               |          |
| Left Cheek                                                                                                                                                                                                                          | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.115                        | 0.051            | 1.97           | 0.226         | /        |
| Left Tilt                                                                                                                                                                                                                           | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.122                        | 0.090            | 1.97           | 0.240         | 26       |
| Right Cheek                                                                                                                                                                                                                         | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.062                        | 0.028            | 1.97           | 0.123         | /        |
| Right Tilt                                                                                                                                                                                                                          | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.064                        | 0.048            | 1.97           | 0.127         | /        |
| Left Tilt                                                                                                                                                                                                                           | Battery 2  | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.119                        | 0.091            | 1.97           | 0.234         | /        |
| Left Tilt                                                                                                                                                                                                                           | Battery 3  | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.117                        | 0.010            | 1.97           | 0.230         | /        |
| Body SAR(Distance 10mm) (Receiver off)                                                                                                                                                                                              |            |      |            |                             |              |                      |                              |                  |                |               |          |
| Back Side                                                                                                                                                                                                                           | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.031                        | -0.020           | 1.97           | 0.061         | 27       |
| Front Side                                                                                                                                                                                                                          | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.021                        | 0.181            | 1.97           | 0.041         | /        |
| Left Edge                                                                                                                                                                                                                           | N/A        | N/A  | N/A        | N/A                         | N/A          | N/A                  | N/A                          | N/A              | N/A            | N/A           | N/A      |
| Right Edge                                                                                                                                                                                                                          | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.015                        | 0.132            | 1.97           | 0.029         | /        |
| Top Edge                                                                                                                                                                                                                            | standard   | DH5  | 76.9%      | 0/2402                      | 12.00        | 10.20                | 0.016                        | -0.080           | 1.97           | 0.031         | /        |
| Bottom Edge                                                                                                                                                                                                                         | N/A        | N/A  | N/A        | N/A                         | N/A          | N/A                  | N/A                          | N/A              | N/A            | N/A           | N/A      |
| Note: 1. The value with blue color is the maximum SAR Value of each test band.                                                                                                                                                      |            |      |            |                             |              |                      |                              |                  |                |               |          |
| 2. Accessories that do not contain RF transmitters and have been proven to increase the peak SAR by less than 5 %, such as hands-free kits, do not need SAR tests separate from the SAR tests attached to a main EUT configuration. |            |      |            |                             |              |                      |                              |                  |                |               |          |

### 10.3 Simultaneous Transmission Analysis

| Simultaneous Transmission Configurations | Head | Body-worn | Hotspot |
|------------------------------------------|------|-----------|---------|
| GSM Voice+ BT                            | Yes  | Yes       | N/A     |
| GSM DATA + BT                            | N/A  | Yes       | N/A     |
| GSM Voice + Wi-Fi 2.4G                   | Yes  | Yes       | N/A     |
| GSM DATA + Wi-Fi 2.4G                    | N/A  | Yes       | Yes     |
| UMTS Voice + BT                          | Yes  | Yes       | N/A     |
| UMTS Data + BT                           | yes  | Yes       | N/A     |
| UMTS Voice+ Wi-Fi 2.4G                   | Yes  | Yes       | N/A     |
| UMTS Data + Wi-Fi 2.4G                   | yes  | Yes       | Yes     |
| LTE + Wi-Fi 2.4G                         | Yes  | Yes       | Yes     |
| LTE+ BT                                  | Yes  | Yes       | N/A     |
| Wi-Fi-2.4GHz + Bluetooth                 | N/A  | N/A       | N/A     |

#### General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,
  - i) Scalar SAR summation  $< 1.6\text{W/kg}$ , simultaneously transmission SAR measurement is not necessary.
  - ii)  $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$ , and the peak separation distance is determined from the square root of  $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$ , where  $(x1, y1, z1)$  and  $(x2, y2, z2)$  are the coordinates of the extrapolated peak SAR locations in the zoom scan.
  - iii) If  $\text{SPLSR} \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.

### The maximum SAR<sub>1g</sub> Value for Main-Antenna

| TestPosition \ SAR <sub>1g</sub> (W/kg) |             | GSM<br>850 | GSM<br>1900 | WCDMA<br>Band V | LTE FDD 5 | LTE FDD 7 | MAX.<br>SAR <sub>1g</sub> |
|-----------------------------------------|-------------|------------|-------------|-----------------|-----------|-----------|---------------------------|
| Left Cheek                              |             | 0.039      | 0.346       | 0.409           | 0.402     | 0.046     | 0.409                     |
| Left Tilt                               |             | 0.022      | 0.187       | 0.214           | 0.215     | 0.037     | 0.215                     |
| Right Cheek                             |             | 0.033      | 0.195       | 0.417           | 0.421     | 0.174     | 0.421                     |
| Right Tilt                              |             | 0.018      | 0.158       | 0.217           | 0.214     | 0.016     | 0.217                     |
| Body worn                               | Back Side   | 0.531      | 0.181       | 0.556           | 0.524     | 0.429     | 0.556                     |
|                                         | Front Side  | 0.385      | 0.170       | 0.386           | 0.313     | 0.233     | 0.386                     |
| Hotspot                                 | Back Side   | 0.306      | 0.205       | 0.376           | 0.636     | 0.597     | 0.636                     |
|                                         | Front Side  | 0.154      | 0.177       | 0.203           | 0.426     | 0.278     | 0.426                     |
|                                         | Left Edge   | 0.287      | 0.132       | 0.211           | 0.397     | 0.037     | 0.397                     |
|                                         | Right Edge  | 0.341      | 0.118       | 0.224           | 0.385     | 0.048     | 0.385                     |
|                                         | Top Edge    | N/A        | N/A         | N/A             | N/A       | N/A       | N/A                       |
|                                         | Bottom Edge | 0.051      | 0.150       | 0.047           | 0.057     | 0.570     | 0.570                     |

### About BT and Main- Antenna

| Test Position \ SAR <sub>1g</sub> (W/kg) |             | Main-antenna | BT    | MAX. $\Sigma$ SAR <sub>1g</sub> |
|------------------------------------------|-------------|--------------|-------|---------------------------------|
| Left Cheek                               |             | 0.409        | 0.226 | 0.635                           |
| Left Tilt                                |             | 0.215        | 0.240 | 0.455                           |
| Right Cheek                              |             | 0.421        | 0.123 | 0.544                           |
| Right Tilt                               |             | 0.217        | 0.127 | 0.344                           |
| Body worn<br>1g                          | Back Side   | 0.556        | 0.061 | 0.617                           |
|                                          | Front Side  | 0.386        | 0.041 | 0.427                           |
| Hotspot                                  | Back Side   | 0.636        | 0.061 | 0.697                           |
|                                          | Front Side  | 0.426        | 0.041 | 0.467                           |
|                                          | Left Edge   | 0.397        | N/A   | 0.397                           |
|                                          | Right Edge  | 0.385        | 0.029 | 0.414                           |
|                                          | Top Edge    | N/A          | 0.031 | 0.031                           |
|                                          | Bottom Edge | 0.570        | N/A   | 0.570                           |

Note: 1.The value with blue color is the maximum  $\Sigma$ SAR<sub>1g</sub> Value.  
2.MAX.  $\Sigma$ SAR<sub>1g</sub> =Unlicensed SAR<sub>MAX</sub> +Licensed SAR<sub>MAX</sub>

MAX.  $\Sigma$ SAR<sub>1g</sub> =0.697W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for BT and Main-Antenna.

### About Wi-Fi and Main-Antenna

| SAR <sub>1g</sub> (W/kg)                                                                                                                                                                |             | Main-<br>antenna | Wi-Fi<br>2.4G | MAX. $\Sigma$ SAR <sub>1g</sub> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|---------------|---------------------------------|
| Test Position                                                                                                                                                                           |             |                  |               |                                 |
| Left, Cheek                                                                                                                                                                             |             | 0.409            | 0.191         | 0.600                           |
| Left, Tilt                                                                                                                                                                              |             | 0.215            | 0.129         | 0.344                           |
| Right, Cheek                                                                                                                                                                            |             | 0.421            | 0.087         | 0.508                           |
| Right, Tilt                                                                                                                                                                             |             | 0.217            | 0.090         | 0.307                           |
| Body worn<br>1g                                                                                                                                                                         | Back Side   | 0.556            | 0.231         | 0.787                           |
|                                                                                                                                                                                         | Front Side  | 0.386            | 0.169         | 0.555                           |
| Hotspot<br>1g                                                                                                                                                                           | Back Side   | 0.636            | 0.231         | 0.867                           |
|                                                                                                                                                                                         | Front Side  | 0.426            | 0.169         | 0.595                           |
|                                                                                                                                                                                         | Left Edge   | 0.397            | N/A           | 0.397                           |
|                                                                                                                                                                                         | Right Edge  | 0.385            | 0.147         | 0.532                           |
|                                                                                                                                                                                         | Top Edge    | N/A              | 0.171         | 0.171                           |
|                                                                                                                                                                                         | Bottom Edge | 0.570            | N/A           | 0.570                           |
| Note: 1. The value with blue color is the maximum $\Sigma$ SAR <sub>1g</sub> Value.<br>2. MAX. $\Sigma$ SAR <sub>1g</sub> = Unlicensed SAR <sub>MAX</sub> + Licensed SAR <sub>MAX</sub> |             |                  |               |                                 |

MAX.  $\Sigma$ SAR<sub>1g</sub> = 0.867W/kg < 1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-Antenna.

### Conclusion:

According to the KDB 690783 D01 section 1) d) i), when the sum of 1-g SAR applies for simultaneous transmission SAR test exclusion, the highest sum of 1-g SAR according to the highest reported stand-alone SAR values is used, and the highest Reported SAR for simultaneous transmission exposure conditions is 0.867 W/kg



## 11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.

## ANNEX A: Test Layout

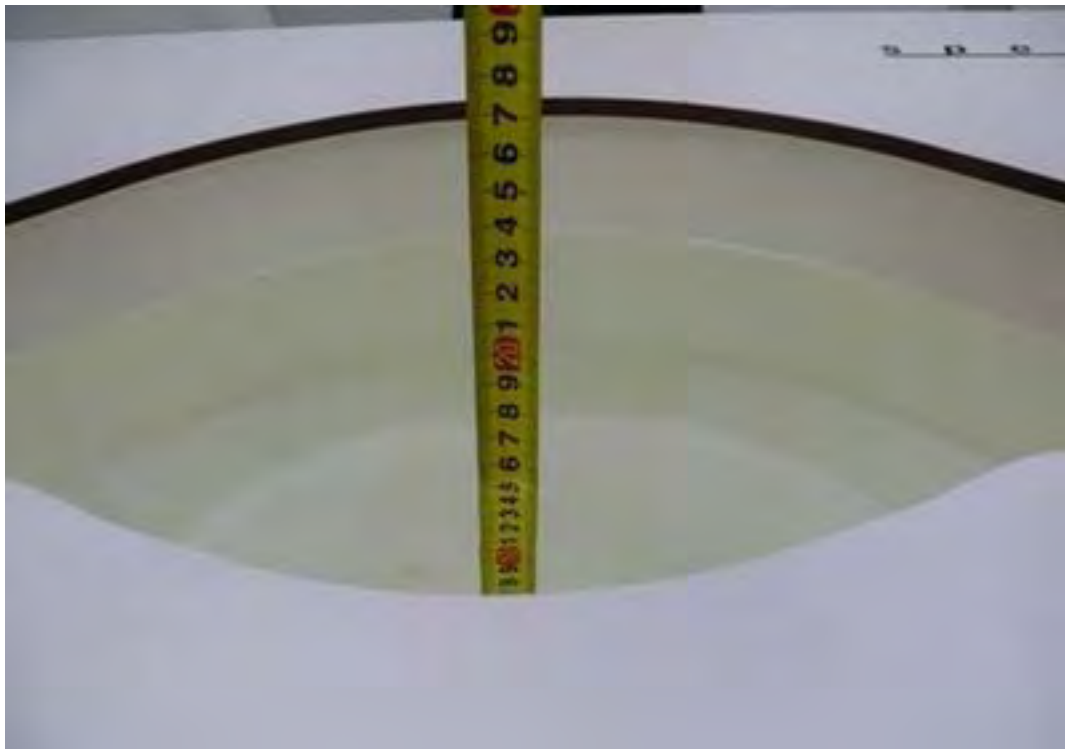


### Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and Body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Picture 3 and Picture 4.



Picture 3: liquid depth in the head Phantom



Picture 4: Liquid depth in the flat Phantom

## ANNEX B: System Check Results

### Plot 1 System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2

Date: 2/14/2019

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 42.0$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.3^\circ\text{C}$  Liquid Temperature:  $21.5^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=15mm, Pin=250mW/Area Scan (41x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.64 mW/g

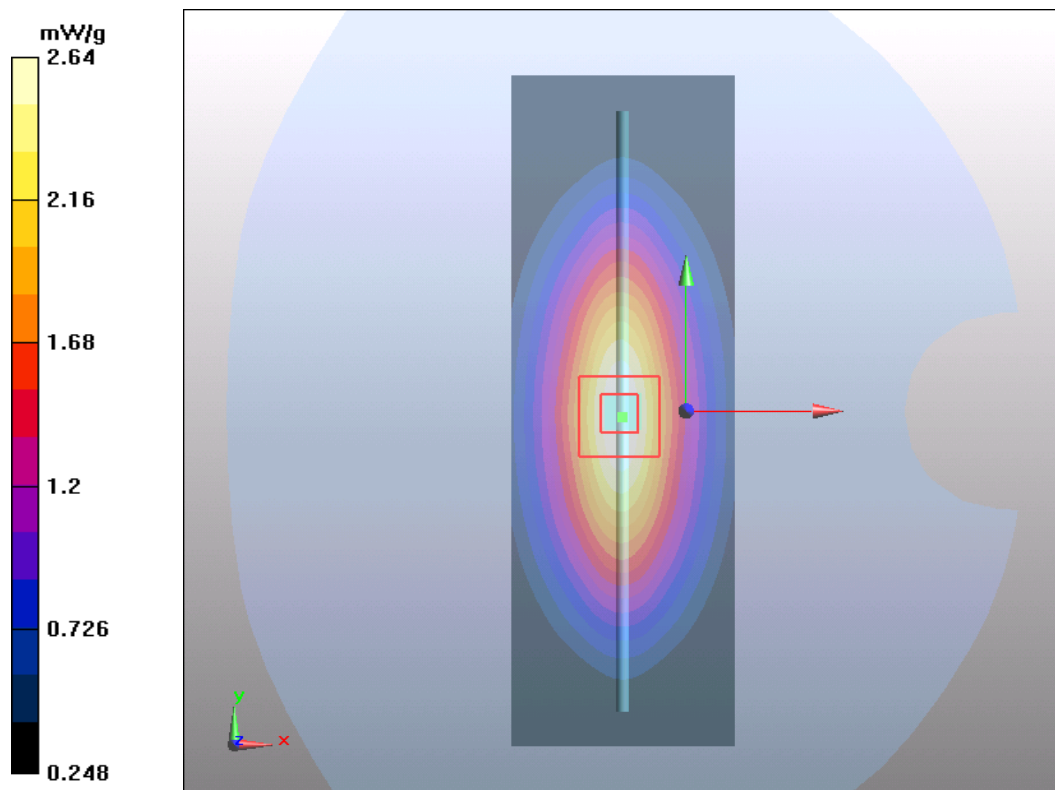
**d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

**SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g**

Maximum value of SAR (measured) = 2.64 mW/g



## Plot 2 System Performance Check at 835 MHz Body TSL

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2**

Date: 2/17/2019

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.97 \text{ mho/m}$ ;  $\epsilon_r = 53.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.3^\circ\text{C}$

Liquid Temperature:  $21.5^\circ\text{C}$

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=15mm, Pin=250mW/Area Scan (41x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.58 mW/g

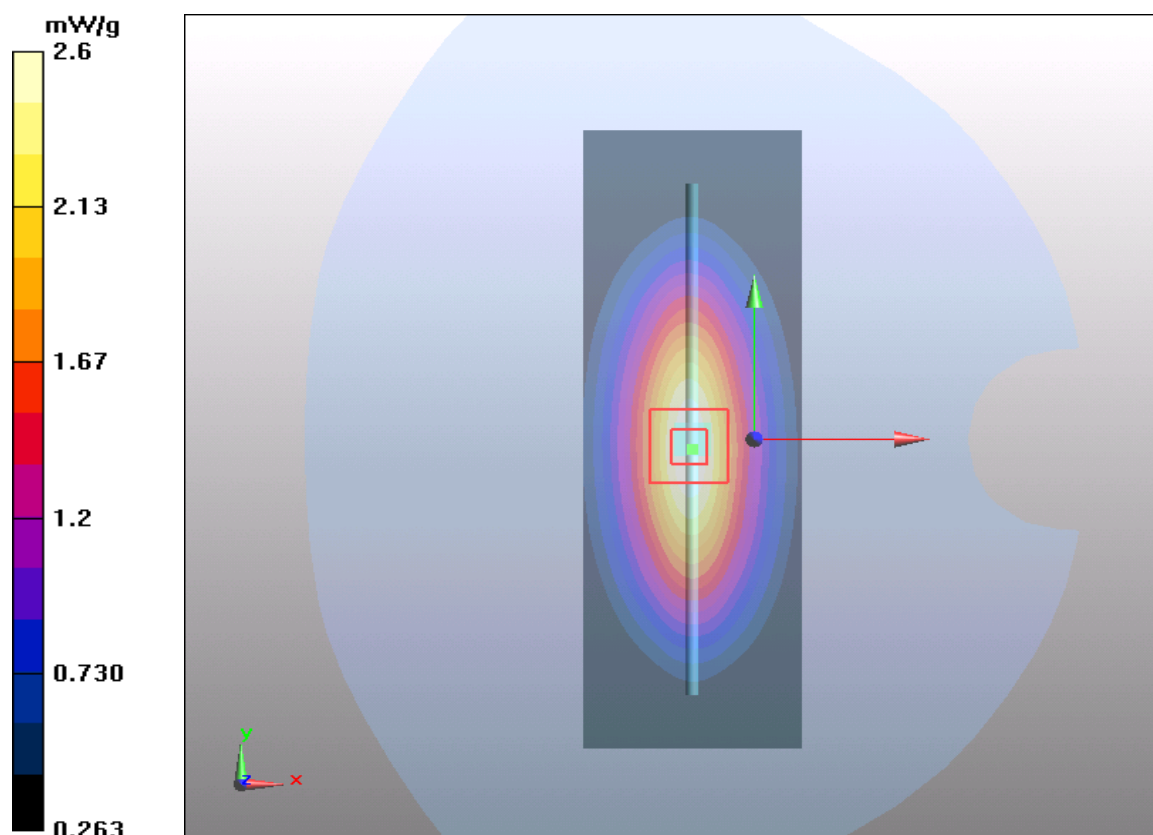
**d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 51.9 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

**SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.6 mW/g**

Maximum value of SAR (measured) = 2.6 mW/g



### Plot 3 System Performance Check at 1900 MHz Head TSL

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2**

Date: 2/15/2019

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.39$  mho/m;  $\epsilon_r = 40.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.3 mW/g

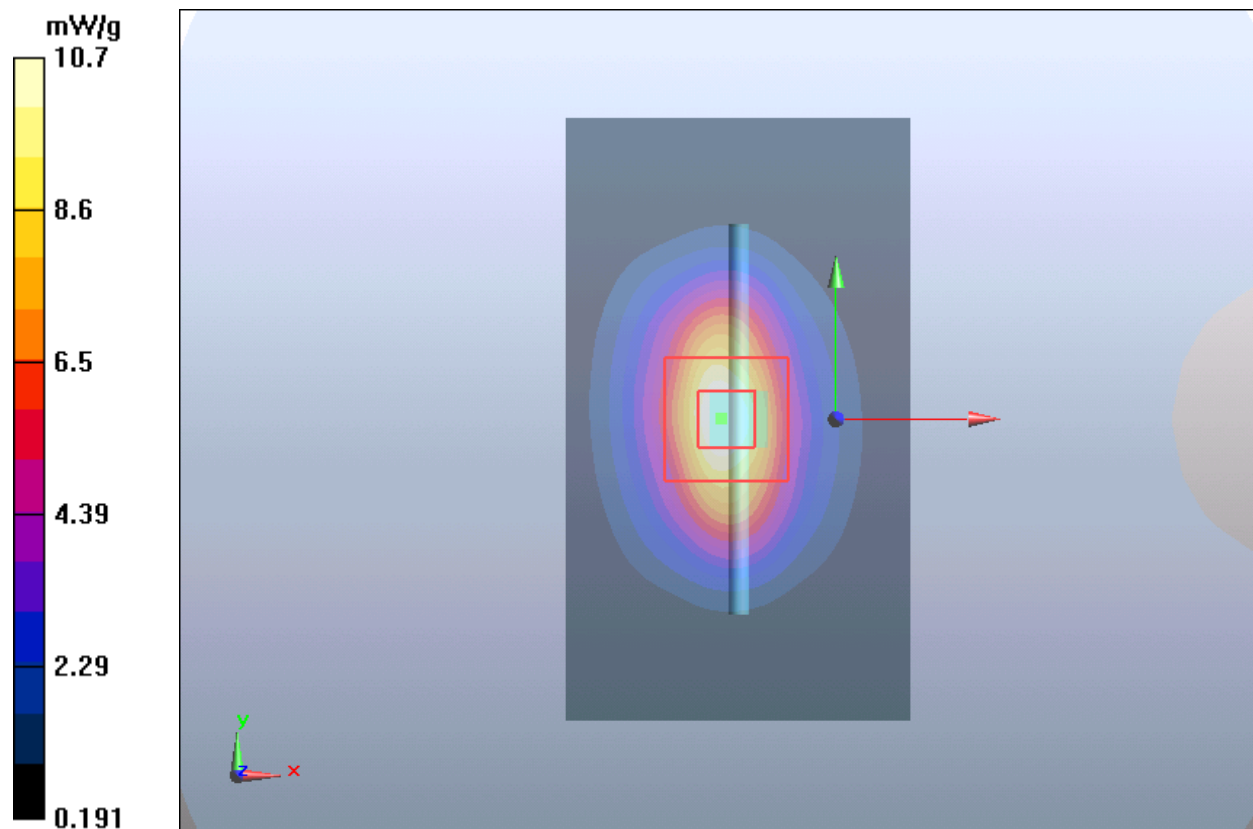
**d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

**SAR(1 g) = 9.88 mW/g; SAR(10 g) = 4.9 mW/g**

Maximum value of SAR (measured) = 10.7 mW/g



# Plot 4 System Performance Check at 1900 MHz Body TSL

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2**

Date: 2/15/2019

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 52.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.2 mW/g

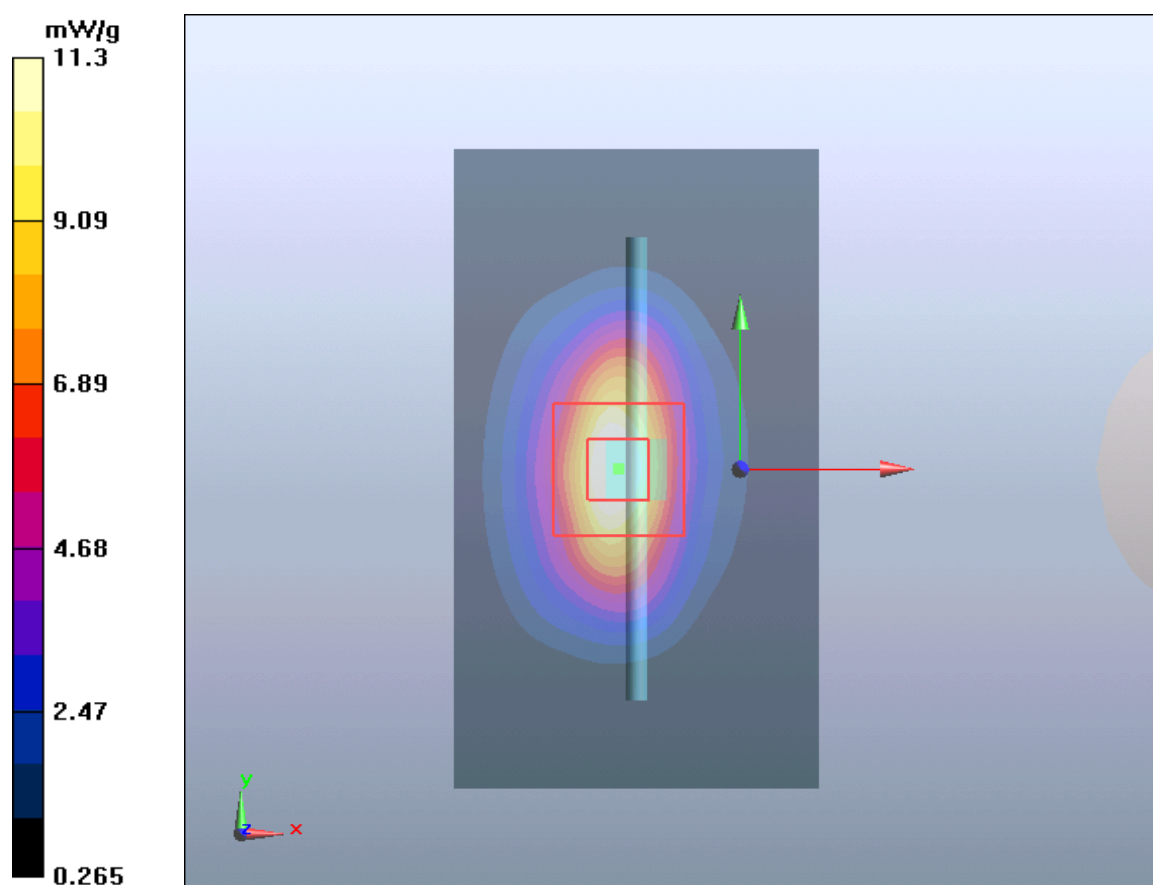
**d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

**SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g**

Maximum value of SAR (measured) = 11.3 mW/g



## Plot 5 System Performance Check at 2450 MHz Head TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2

Date: 2/16/2019

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  mho/m;  $\epsilon_r = 38.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 18.2 mW/g

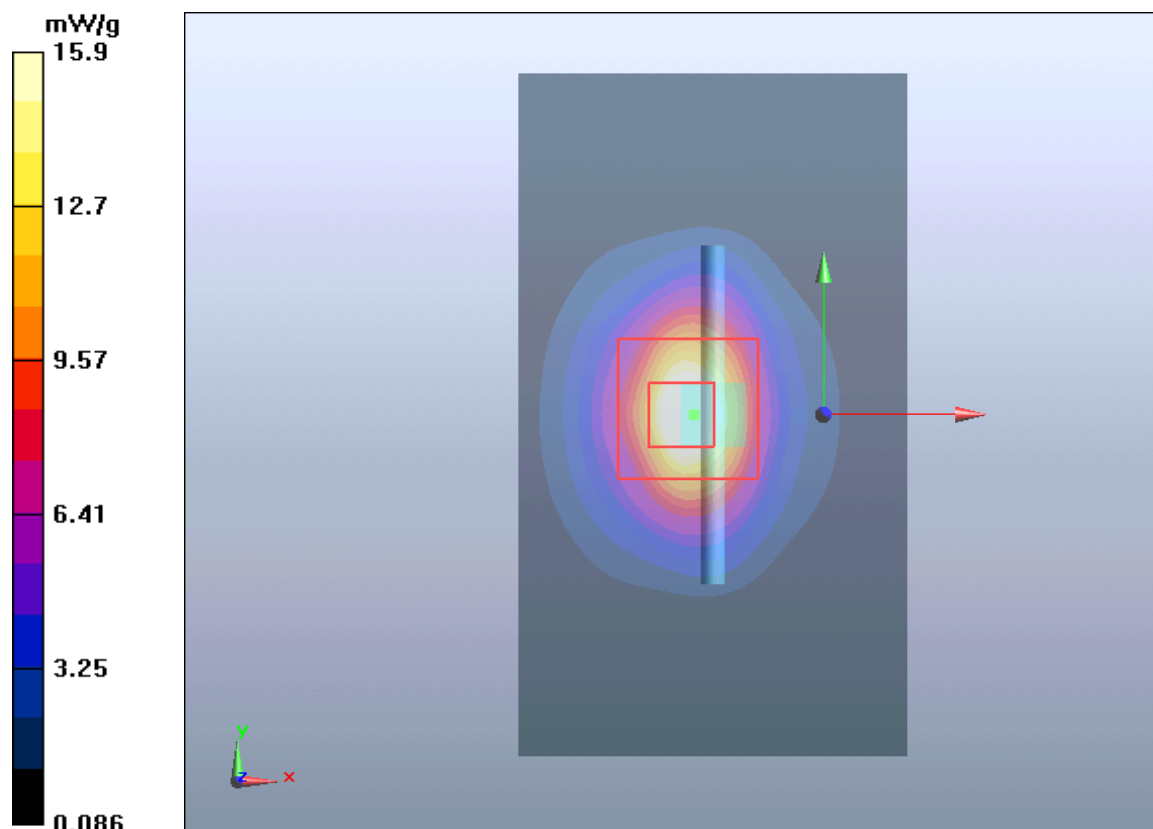
**d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

**SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g**

Maximum value of SAR (measured) = 15.9 mW/g



## Plot 6 System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2

Date: 2/16/2019

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.97$  mho/m;  $\epsilon_r = 51.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 16 mW/g

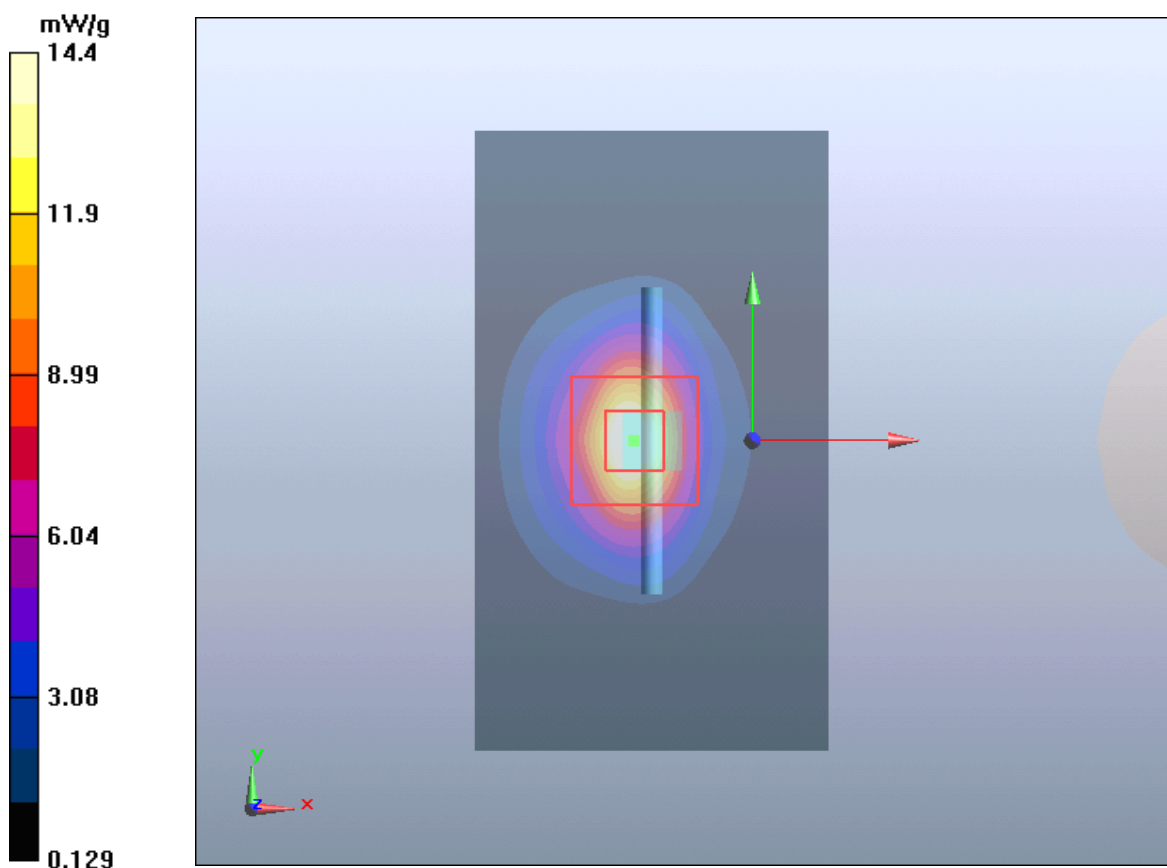
**d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

**SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g**

Maximum value of SAR (measured) = 14.4 mW/g



## Plot 7 System Performance Check at 2600 MHz Head TSL

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2**

Date: 2/15/2019

Communication System: CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.02$  mho/m;  $\epsilon_r = 38.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.28, 7.28, 7.28); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW/Area Scan (41x71x1):** Measurement grid:dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 17.439 mW/g

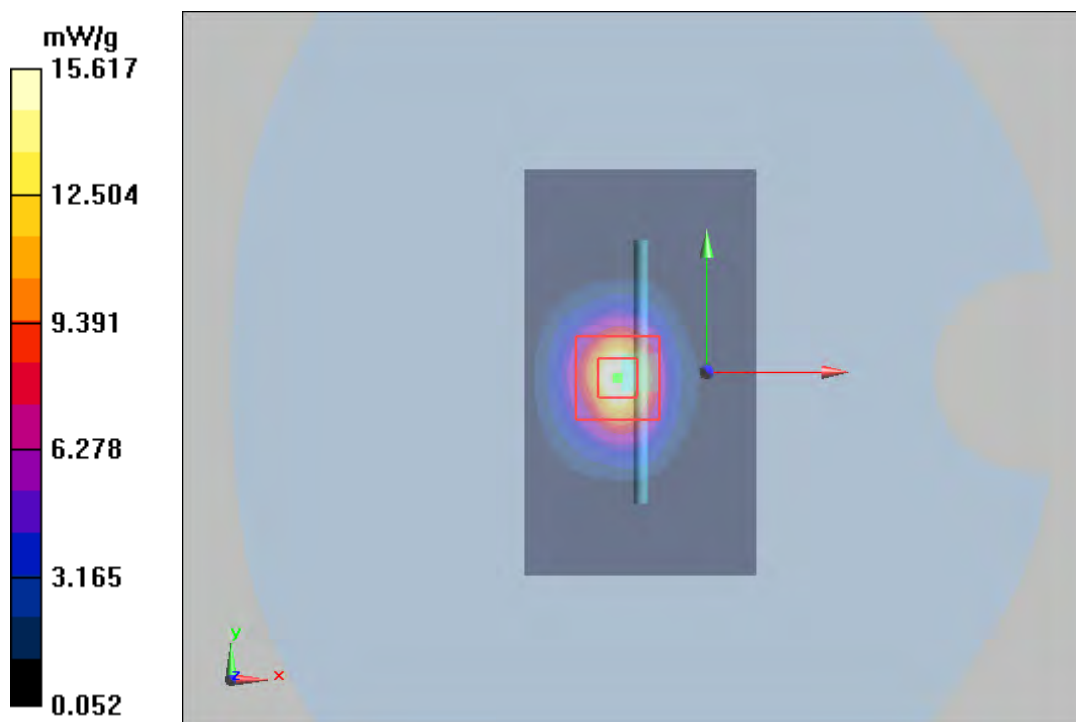
**d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.998 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.858 W/kg

**SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.07 mW/g**

Maximum value of SAR (measured) = 15.617 mW/g



## Plot 8 System Performance Check at 2600 MHz Body TSL

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2**

Date: 2/15/2019

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.16$  mho/m;  $\epsilon_r = 50.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**d=10mm, Pin=250mW /Area Scan (41x71x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 17.7 mW/g

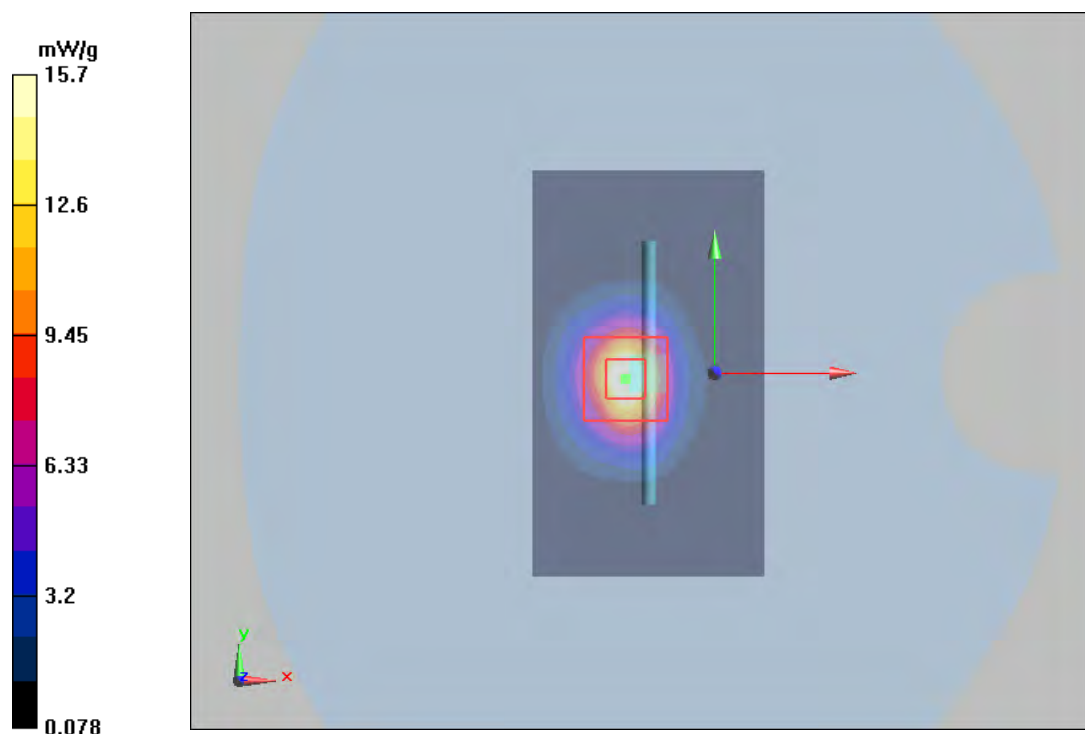
**d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 74 V/m; Power Drift = -0.0027 dB

Peak SAR (extrapolated) = 28.5 W/kg

**SAR(1 g) = 13.5 mW/g; SAR(10 g) = 5.99 mW/g**

Maximum value of SAR (measured) = 15.7 mW/g



## ANNEX C: Highest Graph Results

### Plot 9 GSM 850 Left Cheek Middle

Date: 2/14/2019

Communication System: UID 0, GSM 850 (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.916$  S/m;  $\epsilon_r = 41.951$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Left Cheek Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.0336 W/kg

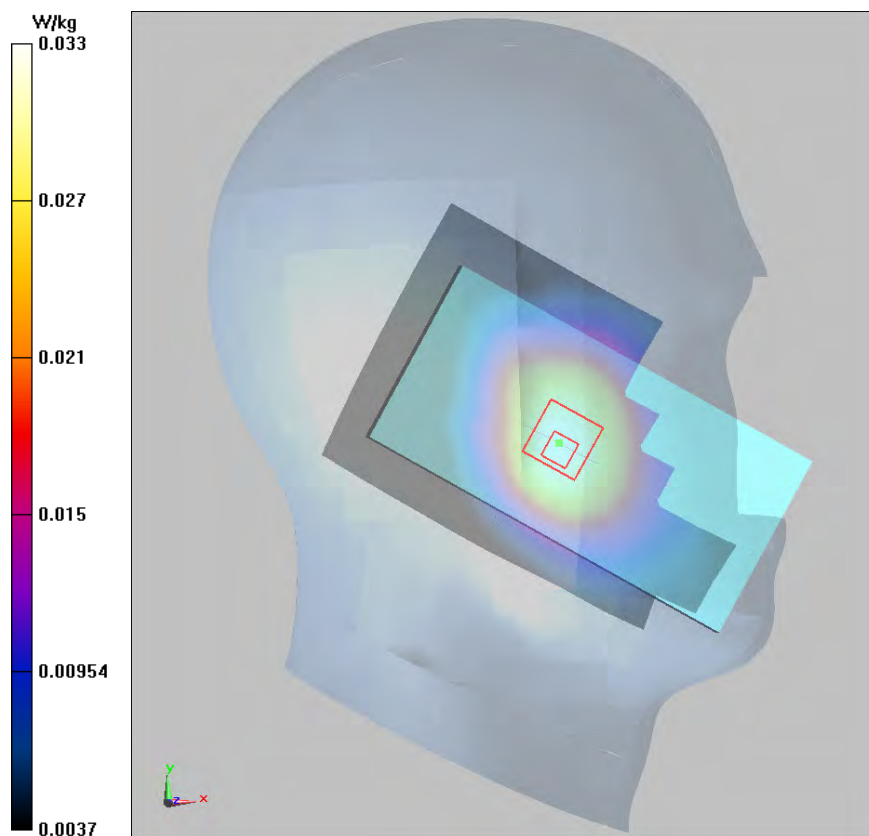
**Left Cheek Middle /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.026 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 0.0390 W/kg

**SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.024 W/kg**

Maximum value of SAR (measured) = 0.033 W/kg



## Plot 10 GSM 850 Back Side Middle (Distance 15mm)

Date: 2/17/2019

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.795$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.446 W/kg

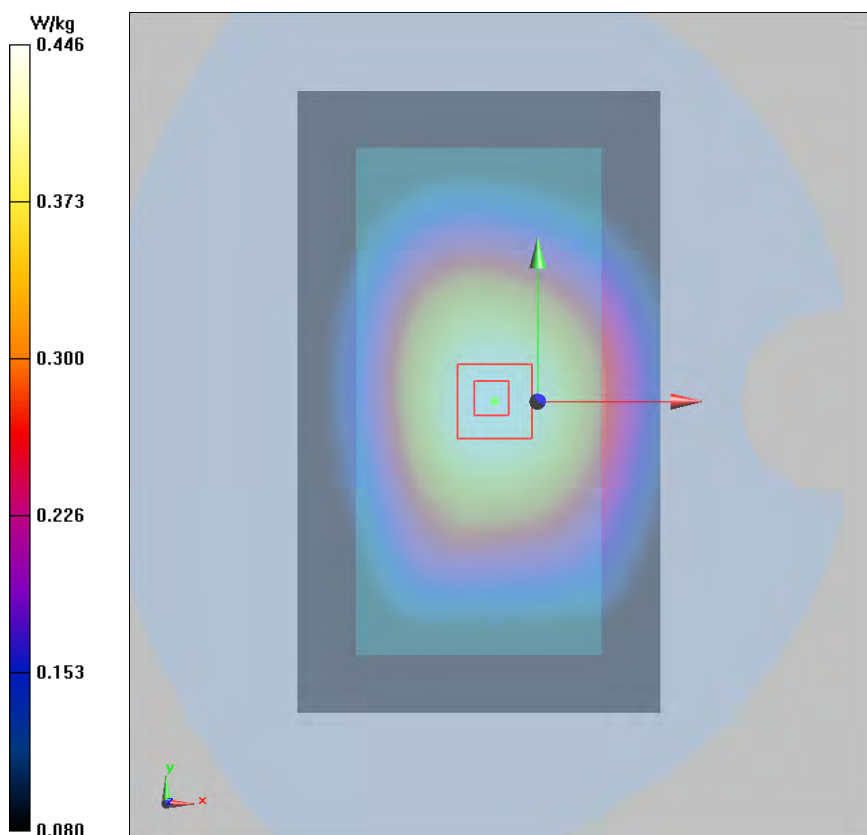
**Back Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.39 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.522 W/kg

**SAR(1 g) = 0.426 W/kg; SAR(10 g) = 0.329 W/kg**

Maximum value of SAR (measured) = 0.446 W/kg



## Plot 11 GSM 850 GPRS (4Txslots) Right Edge Middle (Distance 10mm)

Date: 2/17/2019

Communication System: UID 0, GPRS 4TX (0); Frequency: 836.6 MHz; Duty Cycle: 1:2.07491

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.795$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Right Edge Middle/Area Scan (51x171x1):** Interpolated grid: dx=10 mm, dy=10 mm

Maximum value of SAR (interpolated) = 0.285 W/kg

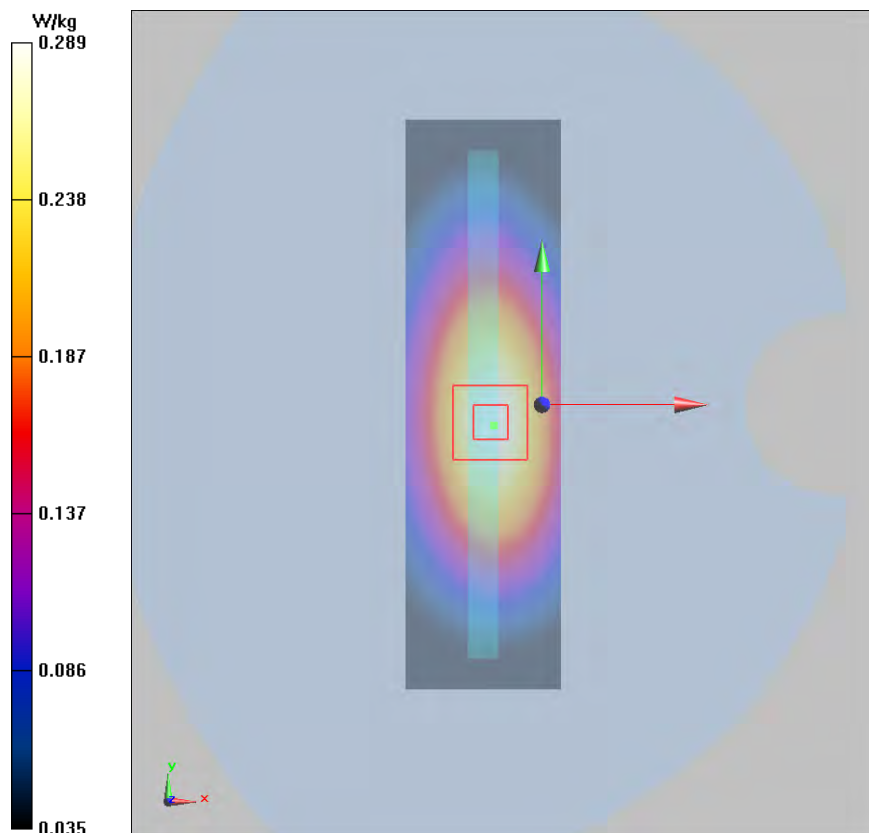
**Right Edge Middle /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.05 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.373 W/kg

**SAR(1 g) = 0.270 W/kg; SAR(10 g) = 0.187 W/kg**

Maximum value of SAR (measured) = 0.289 W/kg



## Plot 12 GSM 1900 Left Cheek Middle

Date: 2/15/2019

Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.393$  S/m;  $\epsilon_r = 38.344$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.96, 7.96, 7.96); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Left Cheek Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.317 W/kg

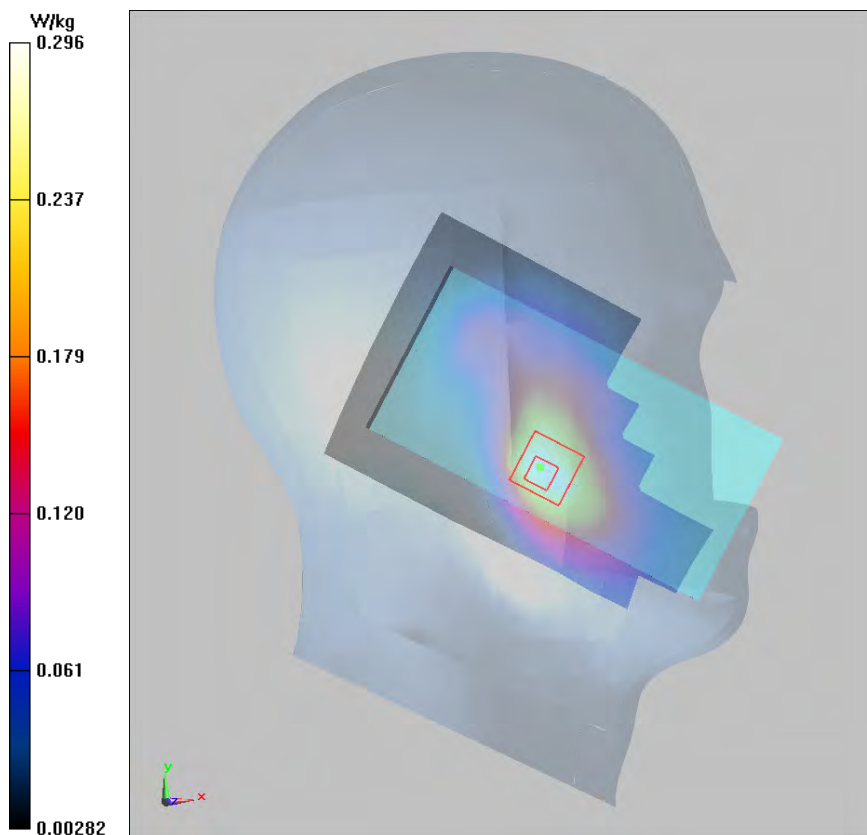
**Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.737 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.436 W/kg

**SAR(1 g) = 0.276 W/kg; SAR(10 g) = 0.169 W/kg**

Maximum value of SAR (measured) = 0.296 W/kg



# Plot 13 GSM 1900 Back Side Middle (Distance 15mm)

Date: 2/15/2019

Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.489$  S/m;  $\epsilon_r = 52.896$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.150 W/kg

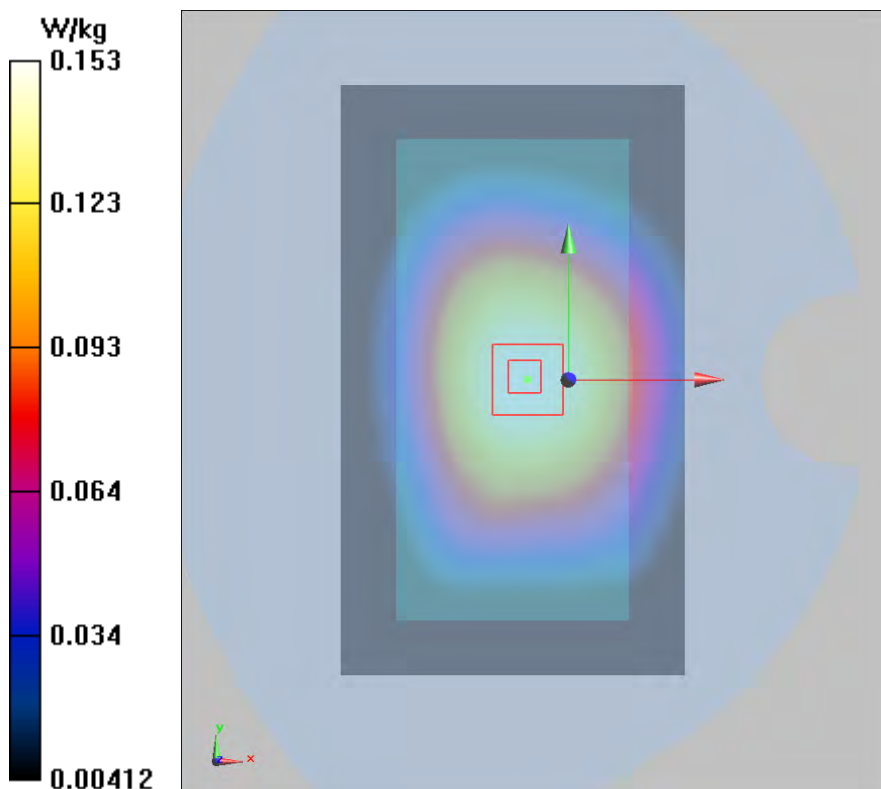
**Back Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.639 V/m; Power Drift = -0.036 dB

Peak SAR (extrapolated) = 0.222 W/kg

**SAR(1 g) = 0.144 W/kg; SAR(10 g) = 0.093 W/kg**

Maximum value of SAR (measured) = 0.153 W/kg



# **Plot 14 GSM 1900 GPRS (4Txslots) Back Side Middle (Distance 10mm)**

Date: 2/15/2019

Communication System: UID 0, GSM 1900 (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.489$  S/m;  $\epsilon_r = 52.896$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.70, 7.70, 7.70); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.190 W/kg

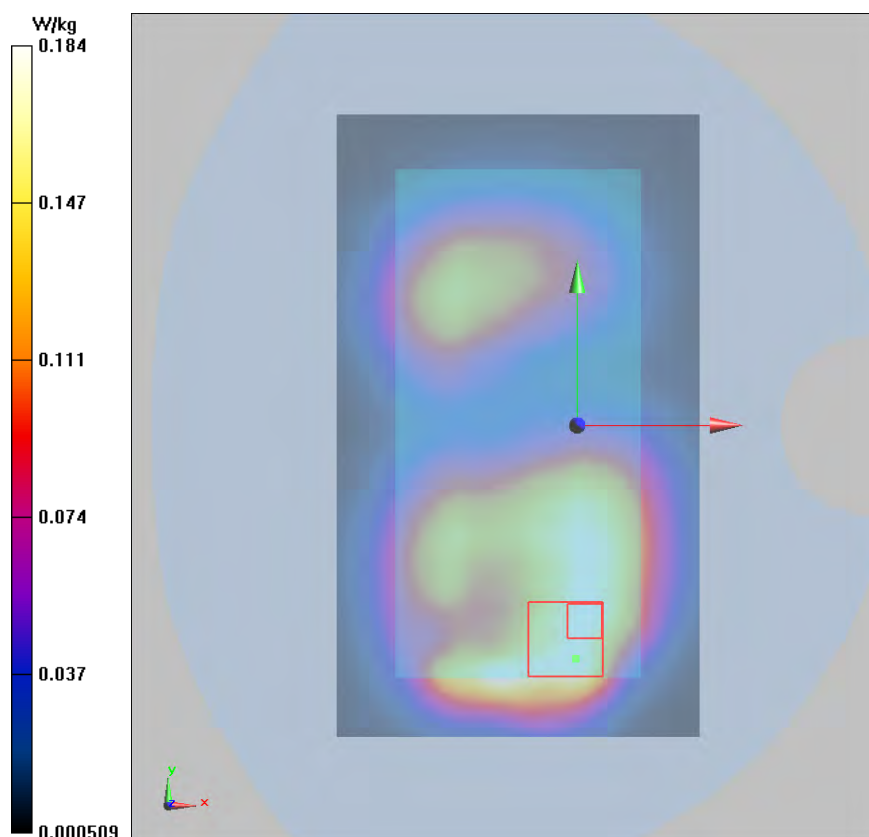
**Back Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.380 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.307 W/kg

**SAR(1 g) = 0.171 W/kg; SAR(10 g) = 0.099 W/kg**

Maximum value of SAR (measured) = 0.184 W/kg



## Plot 15 UMTS Band V Right Cheek Middle

Date: 2/14/2019

Communication System: UID 0, WCDMA V (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.916$  S/m;  $\epsilon_r = 41.951$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Right Cheek Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.353 W/kg

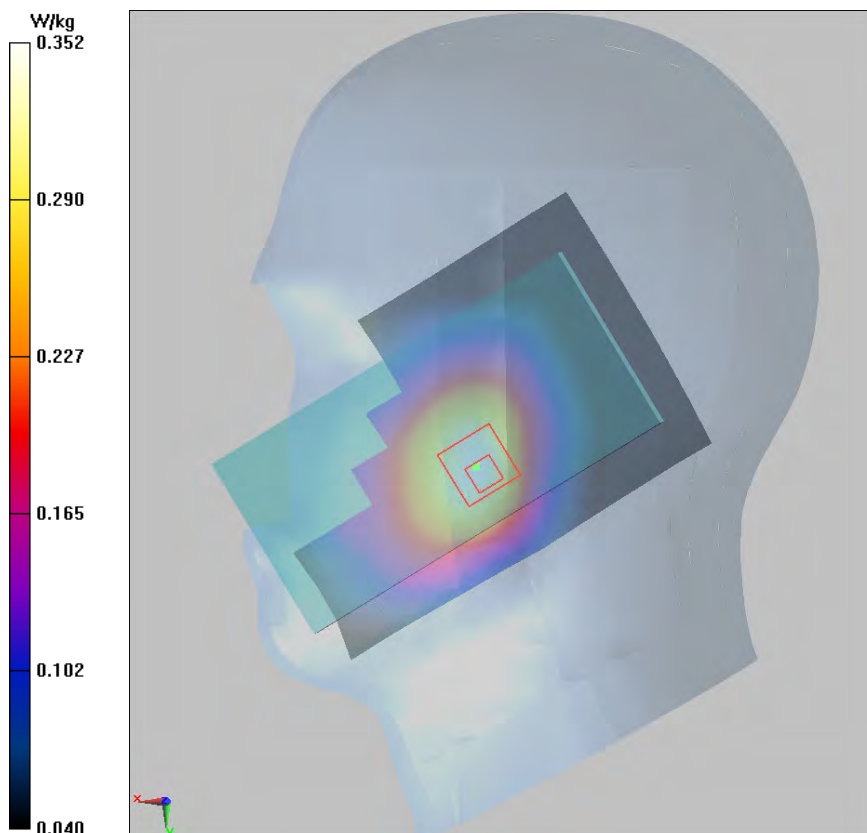
**Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.027 V/m; Power Drift = 0.051 dB

Peak SAR (extrapolated) = 0.445 W/kg

**SAR(1 g) = 0.333 W/kg; SAR(10 g) = 0.246 W/kg**

Maximum value of SAR (measured) = 0.352 W/kg



## Plot 16 UMTS Band V Front Side Middle (Distance 15mm)

Date: 2/17/2019

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.795$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Front Side Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.463 W/kg

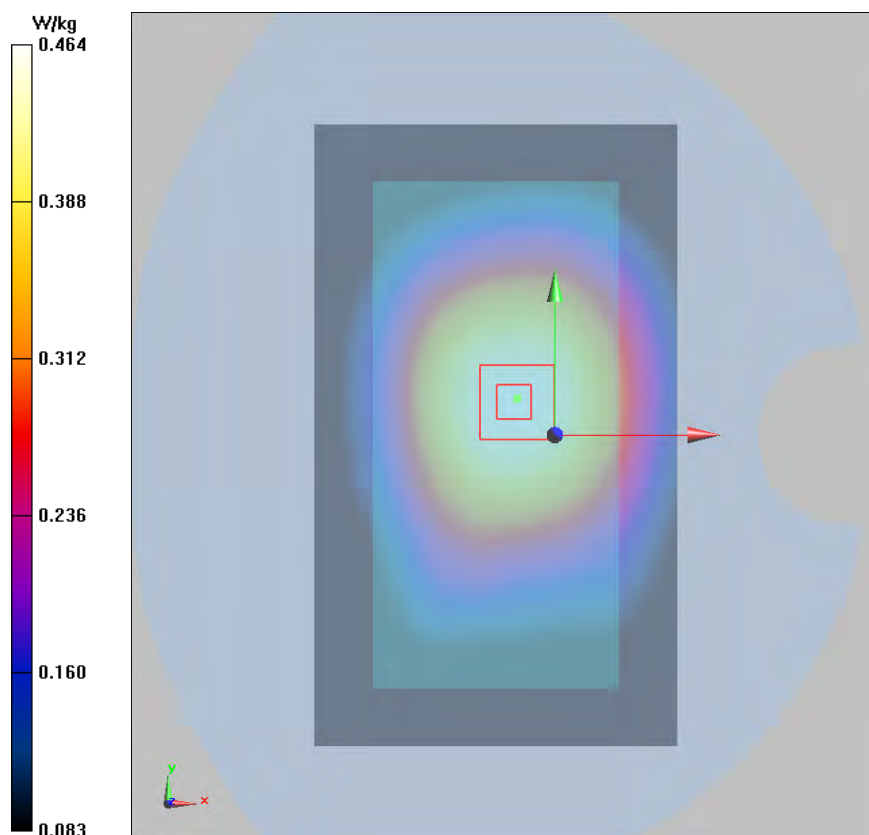
**Front Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.55 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.547 W/kg

**SAR(1 g) = 0.444 W/kg; SAR(10 g) = 0.343 W/kg**

Maximum value of SAR (measured) = 0.464 W/kg



## Plot 17 UMTS Band V Back Side Middle (Distance 10mm)

Date: 2/17/2019

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.795$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.313 W/kg

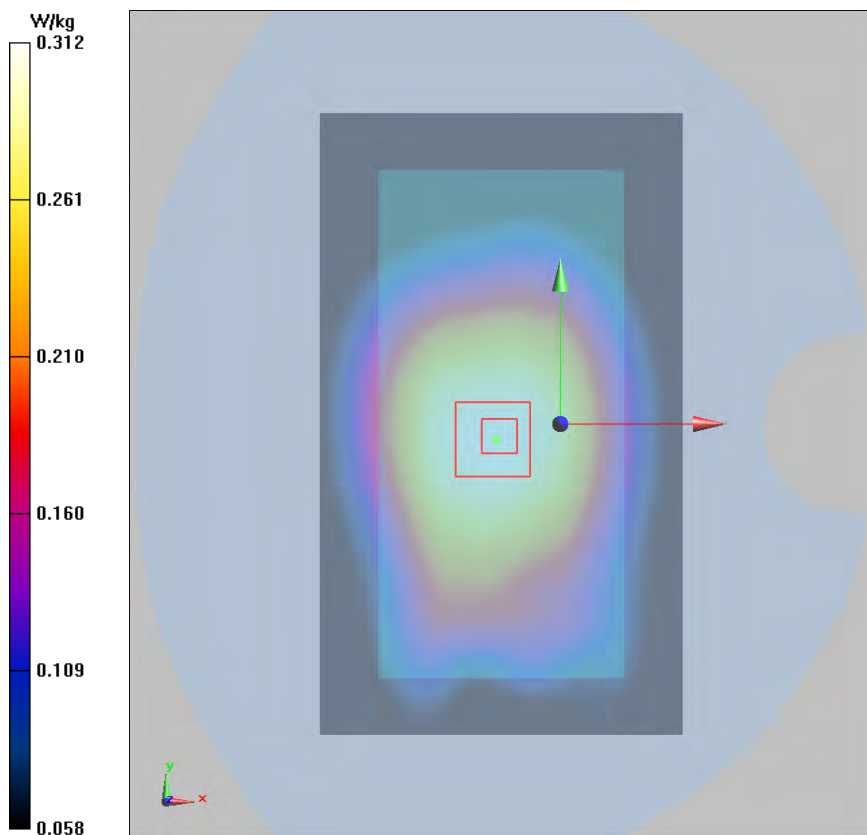
**Back Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.96 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.364 W/kg

**SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.235 W/kg**

Maximum value of SAR (measured) = 0.312 W/kg



## Plot 18 LTE Band 5 1RB Right Cheek Middle

Date: 2/14/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 836.5$  MHz;  $\sigma = 0.916$  S/m;  $\epsilon_r = 41.958$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.10, 9.10, 9.10); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Right Cheek Middle/Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.373 W/kg

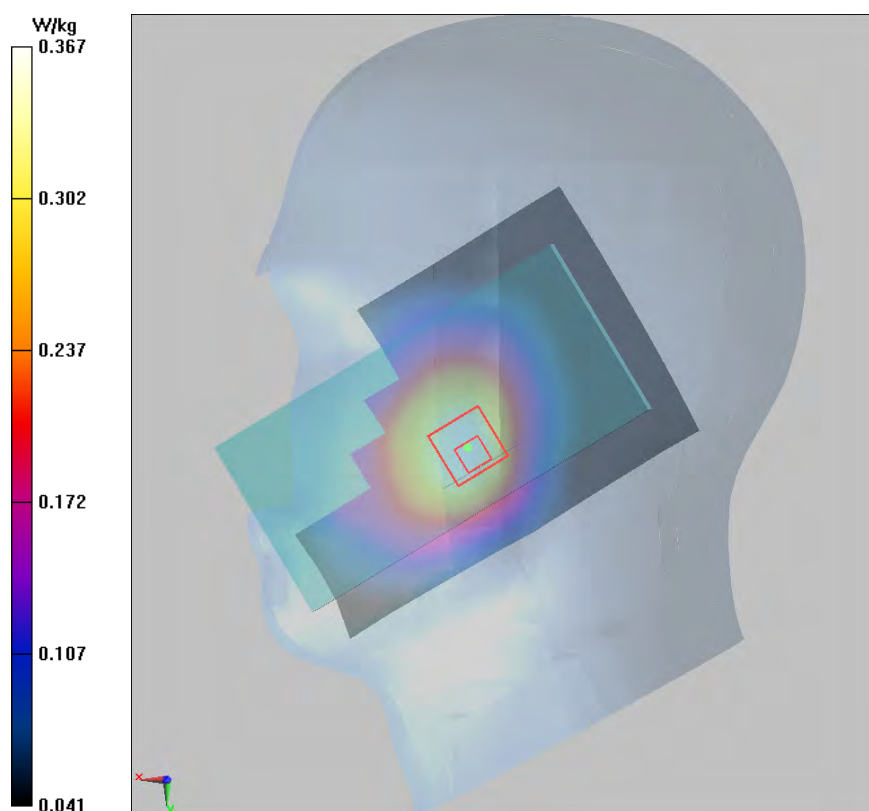
**Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.092 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 0.470 W/kg

**SAR(1 g) = 0.350 W/kg; SAR(10 g) = 0.259 W/kg**

Maximum value of SAR (measured) = 0.367 W/kg



## Plot 19 LTE Band 5 1RB Back Side Middle(Distance 15mm)

Date: 2/17/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 836.5$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.797$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle /Area Scan (71x61x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.447 W/kg

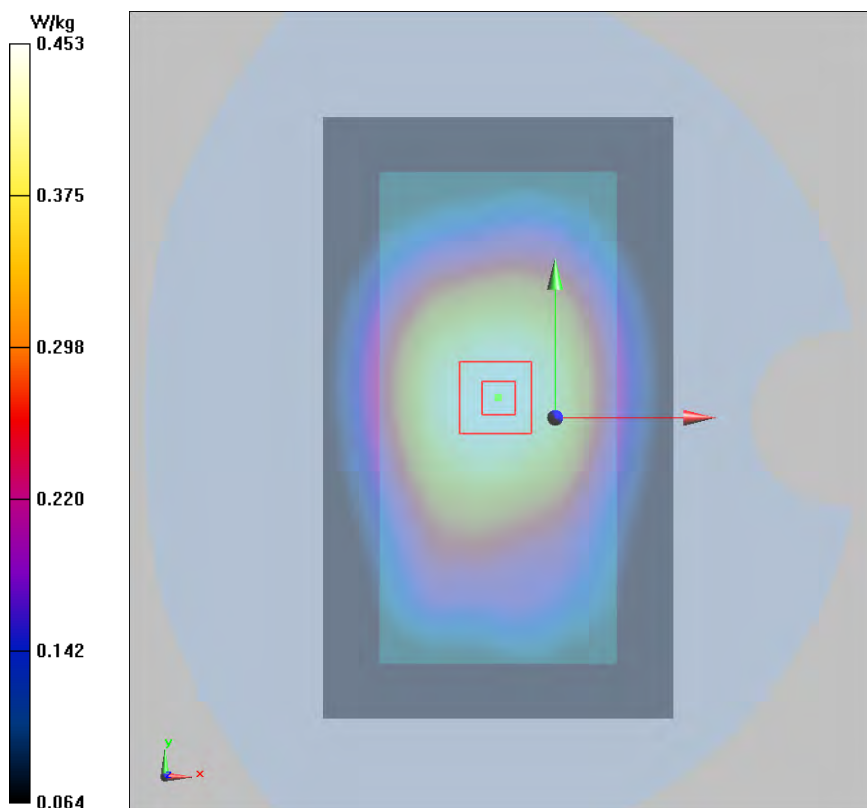
**Back Side Middle/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.32 V/m; Power Drift = -0.042 dB

Peak SAR (extrapolated) = 0.542 W/kg

**SAR(1 g) = 0.436 W/kg; SAR(10 g) = 0.332 W/kg**

Maximum value of SAR (measured) = 0.453 W/kg



## Plot 20 LTE Band 5 1RB Back Side Middle (Distance 10mm)

Date: 2/17/2019

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 836.5$  MHz;  $\sigma = 0.974$  S/m;  $\epsilon_r = 53.797$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.32, 9.32, 9.32); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle /Area Scan (71x121x1):** Interpolated grid: dx=15 mm, dy=15 mm

Maximum value of SAR (interpolated) = 0.561 W/kg

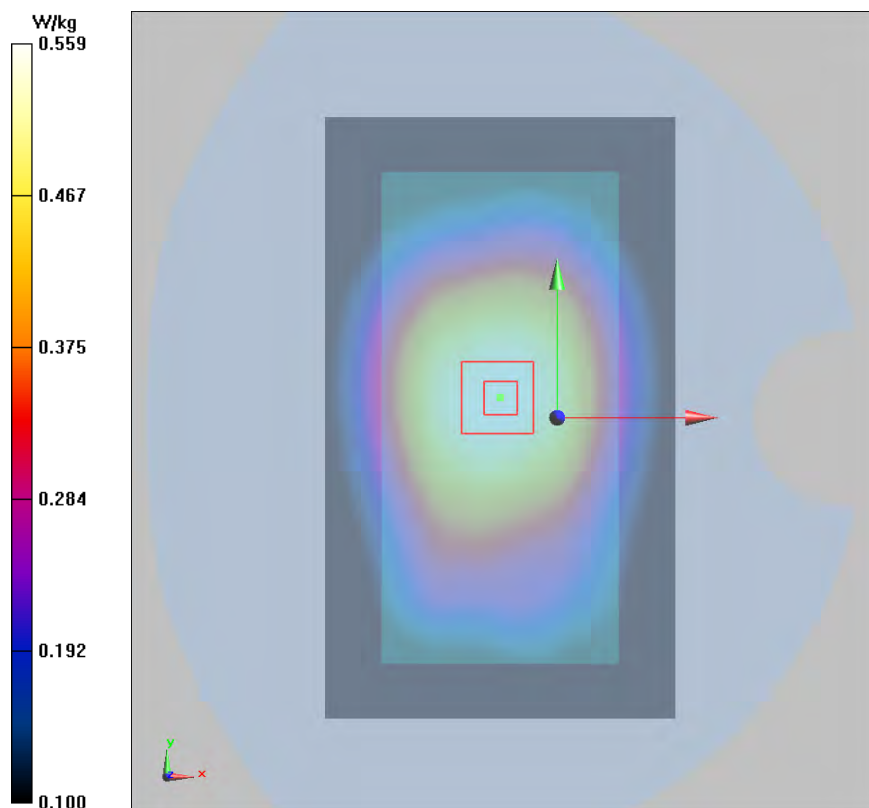
**Back Side Middle /Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.98 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.652 W/kg

**SAR(1 g) = 0.536 W/kg; SAR(10 g) = 0.418 W/kg**

Maximum value of SAR (measured) = 0.559 W/kg



## Plot 21 LTE Band 7 1RB Right Cheek Middle

Date: 2/15/2019

Communication System: UID 0, LTE (0); Frequency: 2535 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2535$  MHz;  $\sigma = 1.948$  S/m;  $\epsilon_r = 38.395$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.28, 7.28, 7.28); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Right Cheek Middle/Area Scan (91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.193 W/kg

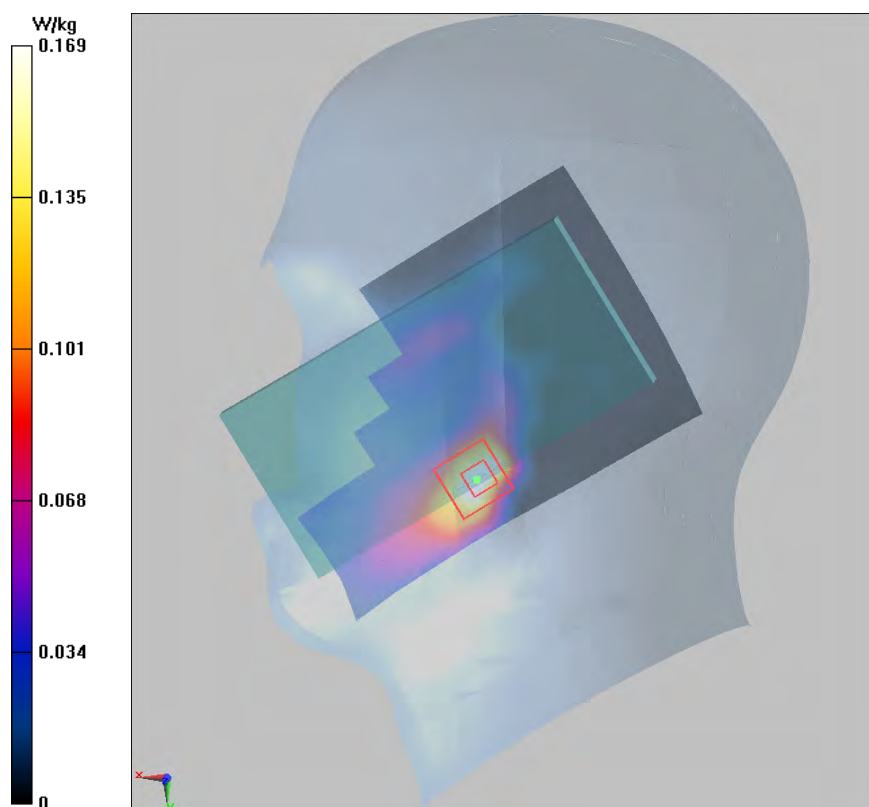
**Right Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.9720 V/m; Power Drift = 0.076 dB

Peak SAR (extrapolated) = 0.320 W/kg

**SAR(1 g) = 0.154 W/kg; SAR(10 g) = 0.077 W/kg**

Maximum value of SAR (measured) = 0.169 W/kg



## Plot 22 LTE Band 7 1RB Back Side Middle (Distance 18mm)

Date: 2/15/2019

Communication System: UID 0, LTE (0); Frequency: 2535 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2535$  MHz;  $\sigma = 2.075$  S/m;  $\epsilon_r = 50.843$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.409 W/kg

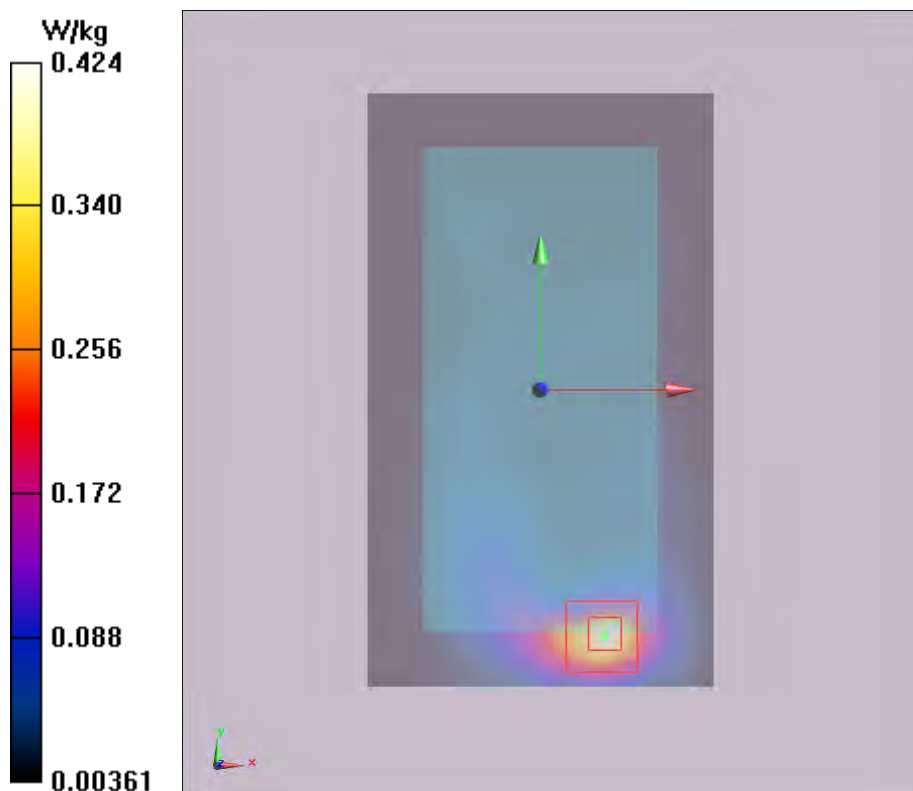
**Back Side Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.302 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.717 W/kg

**SAR(1 g) = 0.379 W/kg; SAR(10 g) = 0.193 W/kg**

Maximum value of SAR (measured) = 0.424 W/kg



# Plot 23 LTE Band 7 1RB Back Side Middle(Distance 10mm)

Date: 2/15/2019

Communication System: UID 0, LTE (0); Frequency: 2535 MHz;Duty Cycle: 1:1

Medium parameters used:  $f = 2535$  MHz;  $\sigma = 2.075$  S/m;  $\epsilon_r = 50.843$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.16, 7.16, 7.16); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan (91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.598 W/kg

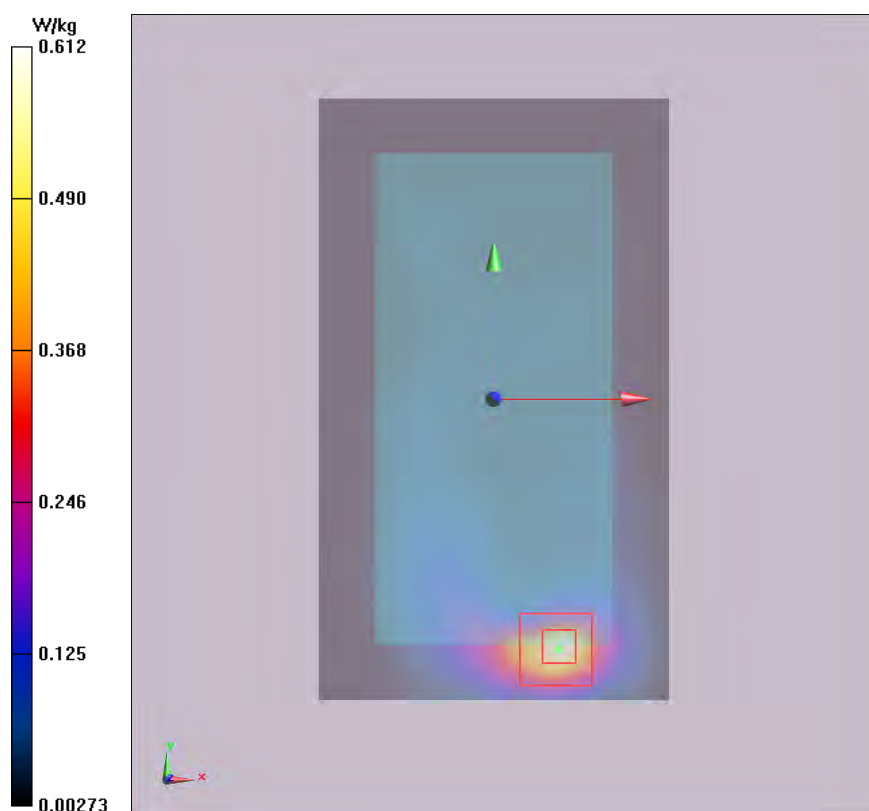
**Back Side Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.733 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.526 W/kg; SAR(10 g) = 0.225 W/kg**

Maximum value of SAR (measured) = 0.612 W/kg



## Plot 24 802.11b Left Cheek Middle

Date: 2/16/2019

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.843$  S/m;  $\epsilon_r = 38.745$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Left Cheek Middle/Area Scan (91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.198 W/kg

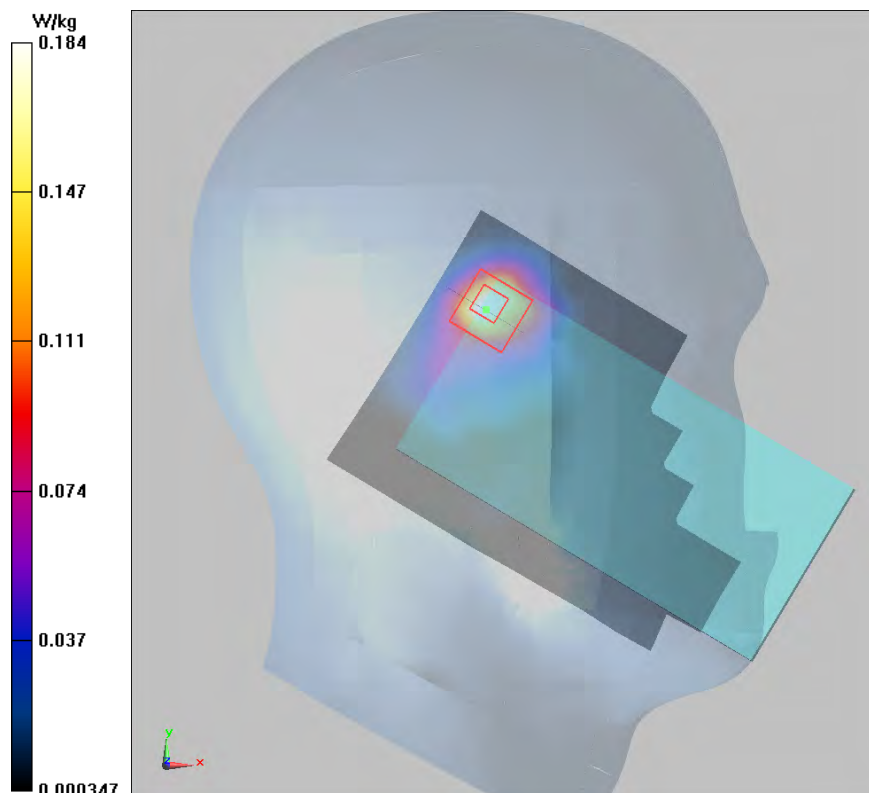
**Left Cheek Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.457 V/m; Power Drift = 0.026 dB

Peak SAR (extrapolated) = 0.446 W/kg

**SAR(1 g) = 0.173 W/kg; SAR(10 g) = 0.075 W/kg**

Maximum value of SAR (measured) = 0.184 W/kg



## Plot 25 802.11b Back Side Middle (Distance 10mm)

Date: 2/16/2019

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.959$  S/m;  $\epsilon_r = 51.134$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Middle/Area Scan(91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.234 W/kg

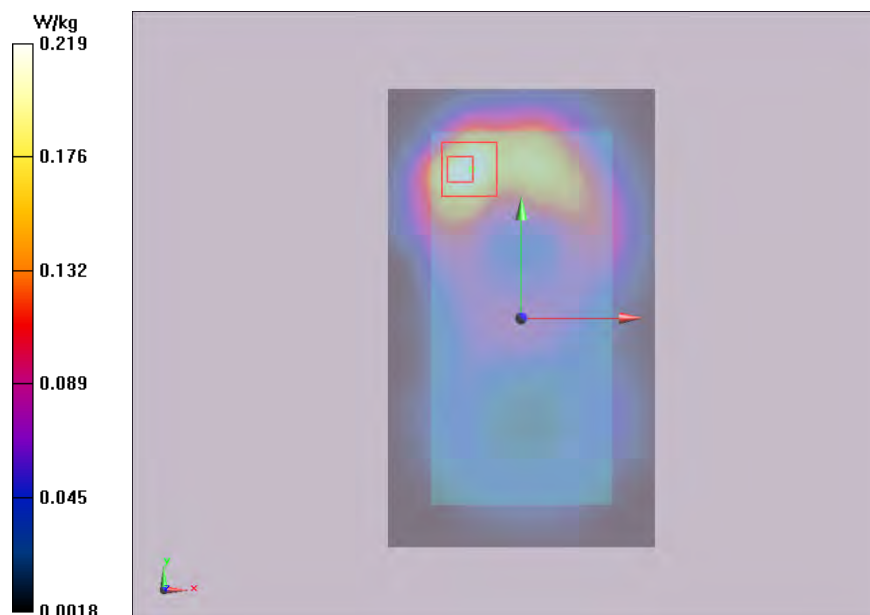
**Back Side Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.612 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 0.421 W/kg

**SAR(1 g) = 0.206 W/kg; SAR(10 g) = 0.107 W/kg**

Maximum value of SAR (measured) = 0.219 W/kg



## Plot 26 BT Left Tilt Low

Date: 2/16/2019

Communication System: UID 0, BT (0); Frequency: 2402 MHz; Duty Cycle: 1:1.30

Medium parameters used:  $f = 2402$  MHz;  $\sigma = 1.806$  S/m;  $\epsilon_r = 38.877$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.57, 7.57, 7.57); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Left Tilt Low/Area Scan (91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.129 W/kg

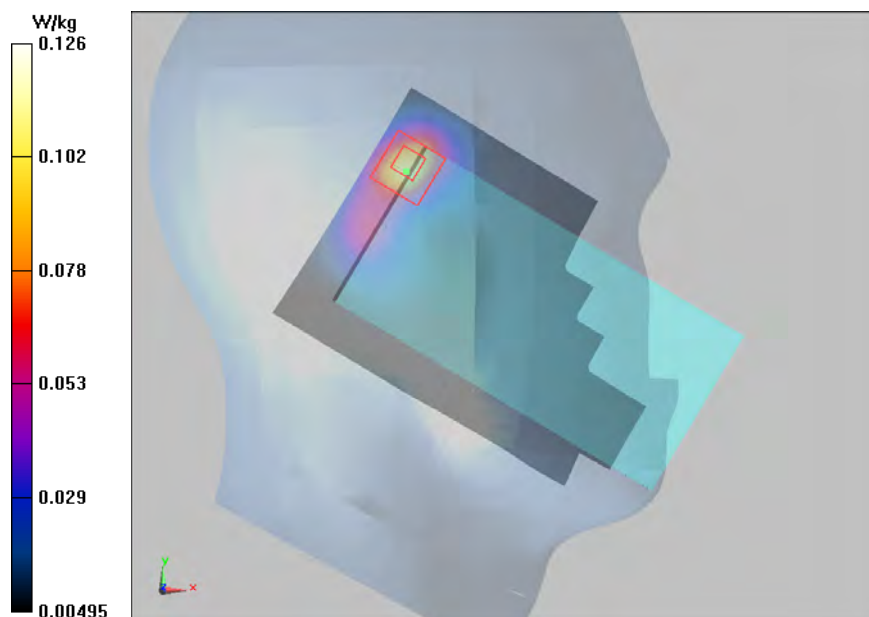
**Left Tilt Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.205 V/m; Power Drift = 0.090 dB

Peak SAR (extrapolated) = 0.315 W/kg

**SAR(1 g) = 0.122 W/kg; SAR(10 g) = 0.054 W/kg**

Maximum value of SAR (measured) = 0.126 W/kg



## Plot 27 BT Back Side Low (Distance 10mm)

Date: 2/16/2019

Communication System: UID 0, BT (0); Frequency: 2402 MHz; Duty Cycle: 1:1.30

Medium parameters used:  $f = 2402$  MHz;  $\sigma = 1.916$  S/m;  $\epsilon_r = 51.236$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.53, 7.53, 7.53); Calibrated: 5/29/2018;

Electronics: DAE4 SN1317; Calibrated: 3/23/2018

Phantom: SAM1; Type: SAM; Serial: TP-1534

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

**Back Side Low/Area Scan(91x151x1):** Interpolated grid: dx=12 mm, dy=12 mm

Maximum value of SAR (interpolated) = 0.0528 W/kg

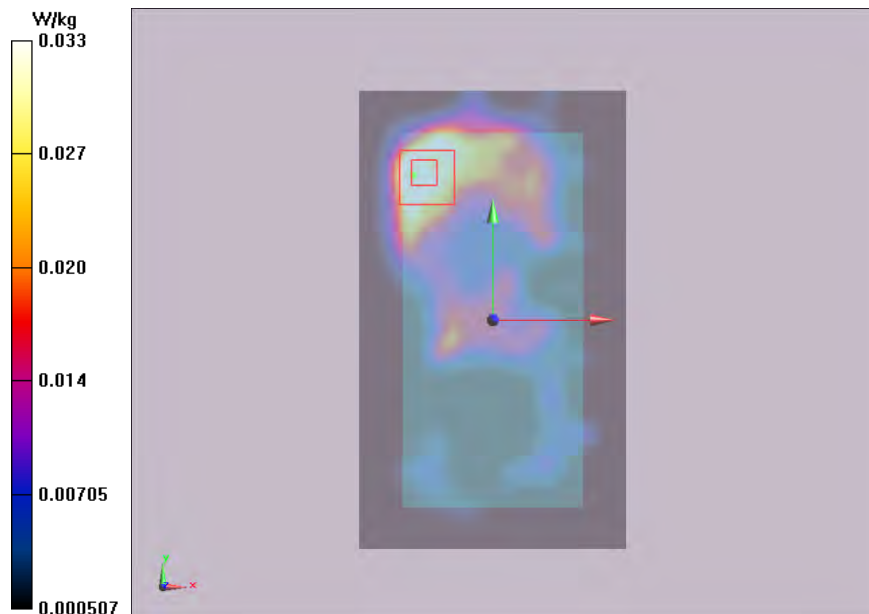
**Back Side Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.778 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.0620 W/kg

**SAR(1 g) = 0.031 W/kg; SAR(10 g) = 0.017 W/kg**

Maximum value of SAR (measured) = 0.033 W/kg





## ANNEX D: Probe Calibration Certificate



In Collaboration with  
**s p e a g**  
CALIBRATION LABORATORY

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中国认可  
国际互认  
校准  
CALIBRATION  
CNAS L0570

Client: **TA(shanghai)** Certificate No: **Z18-60093**

### CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN:3677**

Calibration Procedure(s): **FF-Z11-004-01**  
**Calibration Procedures for Dosimetric E-field Probes**

Calibration date: **May 29, 2018**

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #        | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|-------------|------------------------------------------|-----------------------|
| Power Meter NRP2        | 101919      | 27-Jun-17 (CTTL, No.J17X05857)           | Jun-18                |
| Power sensor NRP-Z91    | 101547      | 27-Jun-17 (CTTL, No.J17X05857)           | Jun-18                |
| Power sensor NRP-Z91    | 101548      | 27-Jun-17 (CTTL, No.J17X05857)           | Jun-18                |
| Reference10dBAttenuator | 18N50W-10dB | 09-Feb-18(CTTL, No.J18X01133)            | Feb-20                |
| Reference20dBAttenuator | 18N50W-20dB | 09-Feb-18(CTTL, No.J18X01132)            | Feb-20                |
| Reference Probe EX3DV4  | SN 3846     | 25-Jan-18(SPEAG, No.EX3-3846_Jan18)      | Jan-19                |
| DAE4                    | SN 777      | 15-Dec-17(SPEAG, No.DAE4-777_Dec17)      | Dec -18               |

| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|------------------------------------------|-----------------------|
| SignalGeneratorMG3700A  | 6201052605 | 27-Jun-17 (CTTL, No.J17X05858)           | Jun-18                |
| Network Analyzer E5071C | MY46110673 | 14-Jan-18 (CTTL, No.J18X00561)           | Jan -19               |

|                | Name        | Function           | Signature                                                                             |
|----------------|-------------|--------------------|---------------------------------------------------------------------------------------|
| Calibrated by: | Yu Zongying | SAR Test Engineer  |  |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |                                                                                       |
| Approved by:   | Qi Dianyuan | SAR Project Leader |                                                                                       |

Issued: May 31, 2018

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

Certificate No: Z18-60093

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### Glossary:

|                       |                                                                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| TSL                   | tissue simulating liquid                                                                                                               |
| NORM <sub>x,y,z</sub> | sensitivity in free space                                                                                                              |
| ConvF                 | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                             |
| DCP                   | diode compression point                                                                                                                |
| CF                    | crest factor (1/duty_cycle) of the RF signal                                                                                           |
| A,B,C,D               | modulation dependent linearization parameters                                                                                          |
| Polarization $\Phi$   | $\Phi$ rotation around probe axis                                                                                                      |
| Polarization $\theta$ | $\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), $\theta=0$ is normal to probe axis |

Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Methods Applied and Interpretation of Parameters:

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



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# Probe EX3DV4

## SN: 3677

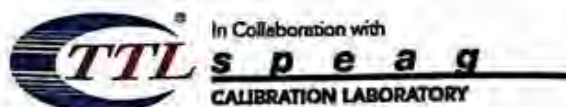
Calibrated: May 29, 2018

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: Z18-60093

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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### Basic Calibration Parameters

|                                      | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|--------------------------------------|----------|----------|----------|-----------|
| Norm( $\mu V/(V/m)^2$ ) <sup>A</sup> | 0.41     | 0.46     | 0.41     | ±10.0%    |
| DCP(mV) <sup>B</sup>                 | 99.9     | 102.7    | 102.1    |           |

### Modulation Calibration Parameters

| UID | Communication System Name |   | A dB | B dB $\cdot\mu V$ | C   | D dB | VR mV | Unc <sup>E</sup> (k=2) |
|-----|---------------------------|---|------|-------------------|-----|------|-------|------------------------|
| 0   | CW                        | X | 0.0  | 0.0               | 1.0 | 0.00 | 152.4 | ±2.4%                  |
|     |                           | Y | 0.0  | 0.0               | 1.0 |      | 161.7 |                        |
|     |                           | Z | 0.0  | 0.0               | 1.0 |      | 152.2 |                        |

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

<sup>A</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 5 and Page 6).

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

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



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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 41.9                               | 0.89                            | 9.40    | 9.40    | 9.40    | 0.40               | 0.80                    | ± 12.1%     |
| 835                  | 41.5                               | 0.90                            | 9.10    | 9.10    | 9.10    | 0.15               | 1.41                    | ± 12.1%     |
| 1750                 | 40.1                               | 1.37                            | 8.19    | 8.19    | 8.19    | 0.21               | 1.15                    | ± 12.1%     |
| 1900                 | 40.0                               | 1.40                            | 7.96    | 7.96    | 7.96    | 0.25               | 1.01                    | ± 12.1%     |
| 2300                 | 39.5                               | 1.67                            | 7.91    | 7.91    | 7.91    | 0.40               | 0.78                    | ± 12.1%     |
| 2450                 | 39.2                               | 1.80                            | 7.57    | 7.57    | 7.57    | 0.53               | 0.76                    | ± 12.1%     |
| 2600                 | 39.0                               | 1.96                            | 7.28    | 7.28    | 7.28    | 0.64               | 0.70                    | ± 12.1%     |
| 5250                 | 35.9                               | 4.71                            | 5.60    | 5.60    | 5.60    | 0.40               | 1.15                    | ± 13.3%     |
| 5600                 | 35.5                               | 5.07                            | 4.87    | 4.87    | 4.87    | 0.45               | 1.05                    | ± 13.3%     |
| 5750                 | 35.4                               | 5.22                            | 4.99    | 4.99    | 4.99    | 0.45               | 1.35                    | ± 13.3%     |

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

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

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



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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] <sup>C</sup> | Relative Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup> (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|--------------------|-------------------------|-------------|
| 750                  | 55.5                               | 0.96                            | 9.79    | 9.79    | 9.79    | 0.40               | 0.80                    | ±12.1%      |
| 835                  | 55.2                               | 0.97                            | 9.32    | 9.32    | 9.32    | 0.15               | 1.51                    | ±12.1%      |
| 1750                 | 53.4                               | 1.49                            | 7.91    | 7.91    | 7.91    | 0.23               | 1.09                    | ±12.1%      |
| 1900                 | 53.3                               | 1.52                            | 7.70    | 7.70    | 7.70    | 0.20               | 1.18                    | ±12.1%      |
| 2300                 | 52.9                               | 1.81                            | 7.65    | 7.65    | 7.65    | 0.53               | 0.82                    | ±12.1%      |
| 2450                 | 52.7                               | 1.95                            | 7.53    | 7.53    | 7.53    | 0.37               | 1.10                    | ±12.1%      |
| 2600                 | 52.5                               | 2.16                            | 7.16    | 7.16    | 7.16    | 0.55               | 0.80                    | ±12.1%      |
| 5250                 | 48.9                               | 5.36                            | 5.04    | 5.04    | 5.04    | 0.50               | 1.55                    | ±13.3%      |
| 5600                 | 48.5                               | 5.77                            | 4.27    | 4.27    | 4.27    | 0.51               | 1.66                    | ±13.3%      |
| 5750                 | 48.3                               | 5.94                            | 4.43    | 4.43    | 4.43    | 0.50               | 1.81                    | ±13.3%      |

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

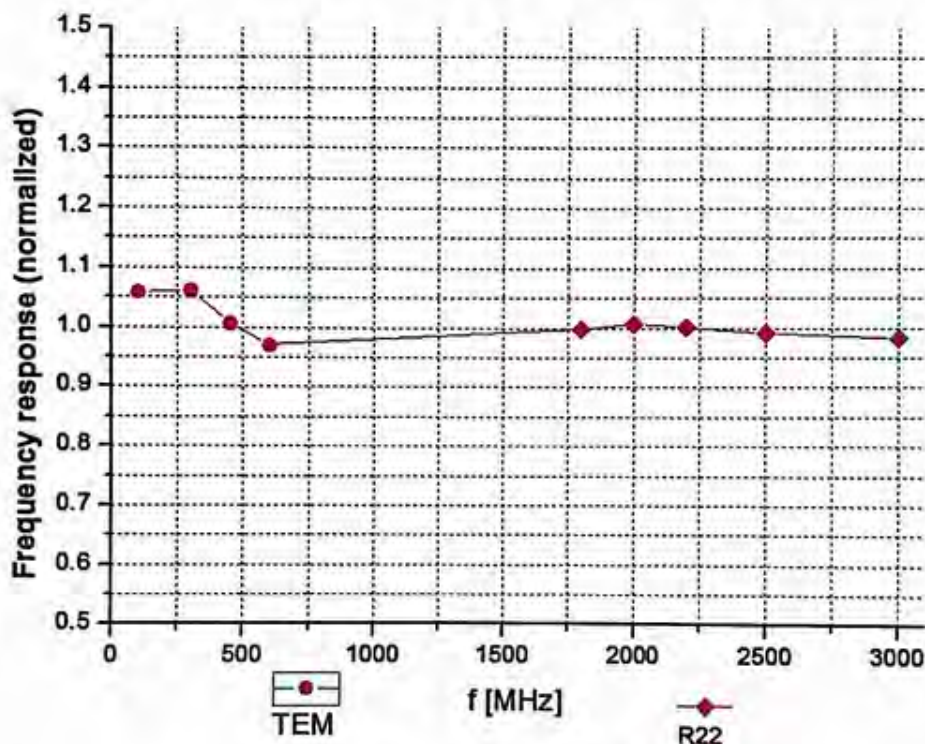
<sup>F</sup> At frequency below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to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

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



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



Uncertainty of Frequency Response of E-field:  $\pm 7.4\%$  ( $k=2$ )

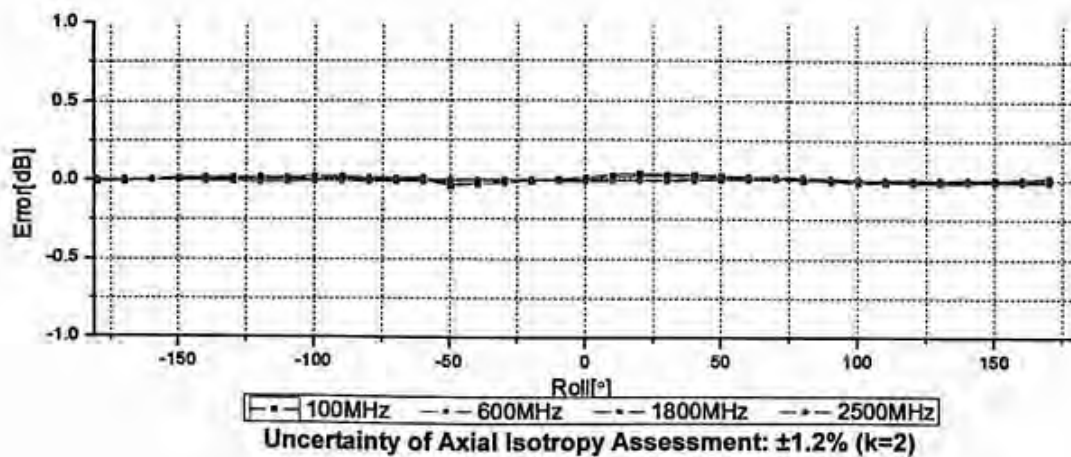
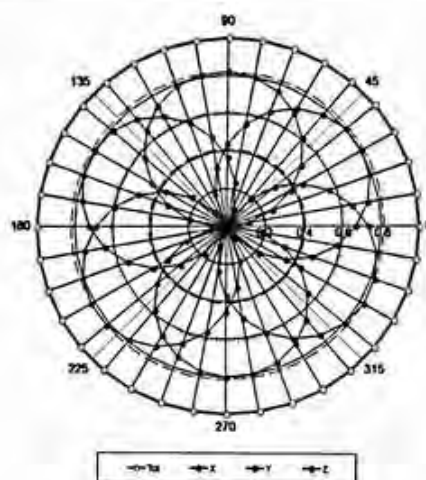
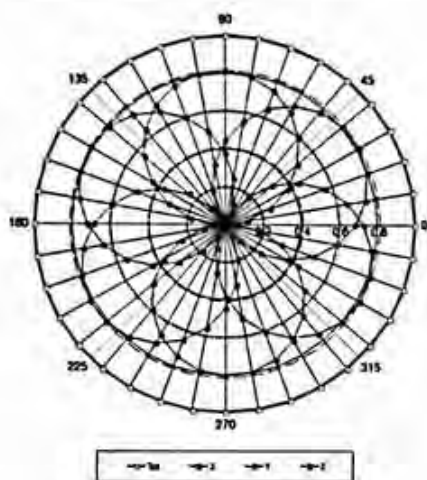


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## Receiving Pattern ( $\Phi$ ), $\theta=0^\circ$

f=600 MHz, TEM

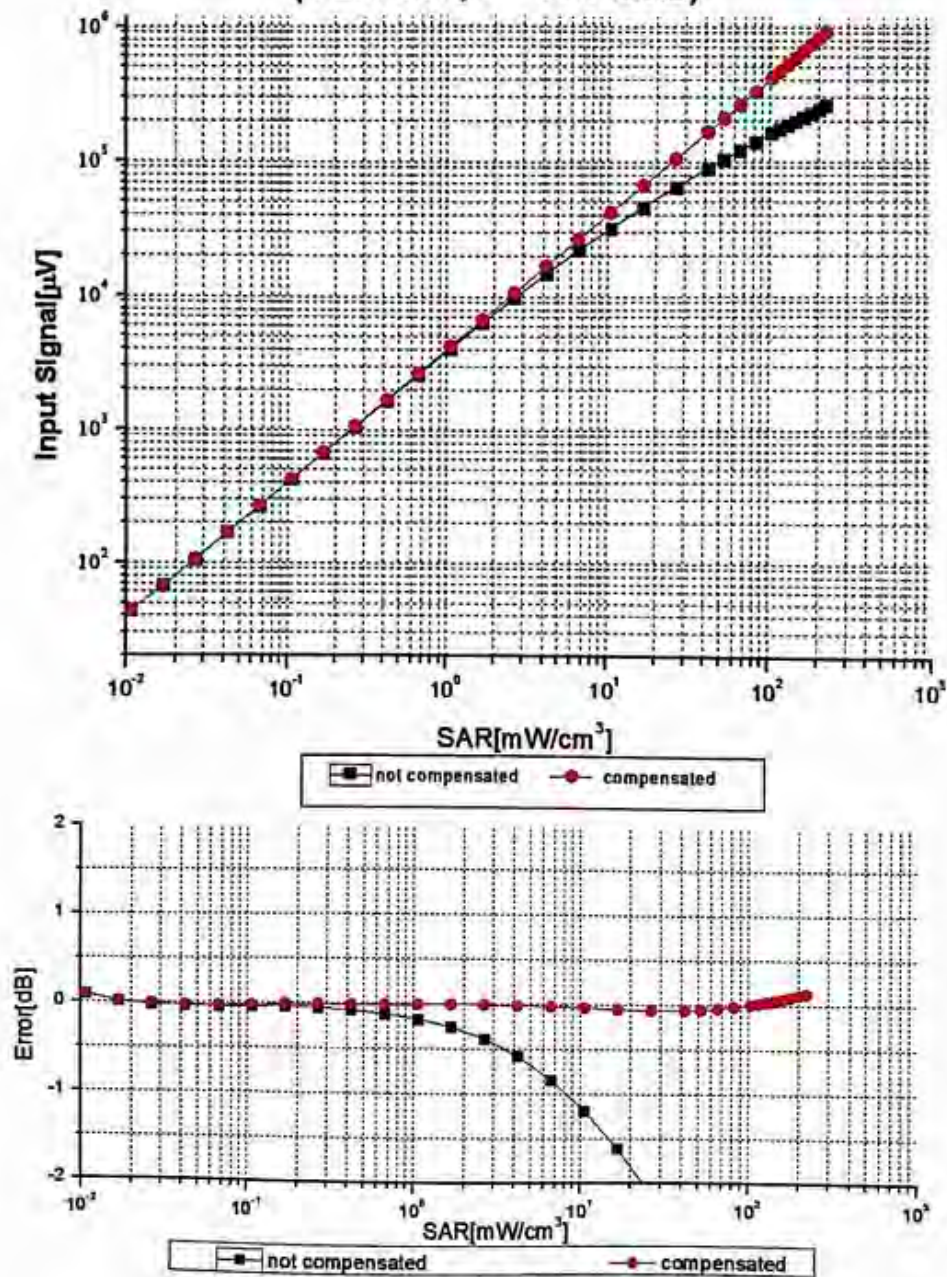
f=1800 MHz, R22





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### Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f = 900 \text{ MHz}$ )



Uncertainty of Linearity Assessment:  $\pm 0.9\%$  ( $k=2$ )

Certificate No: Z18-60093

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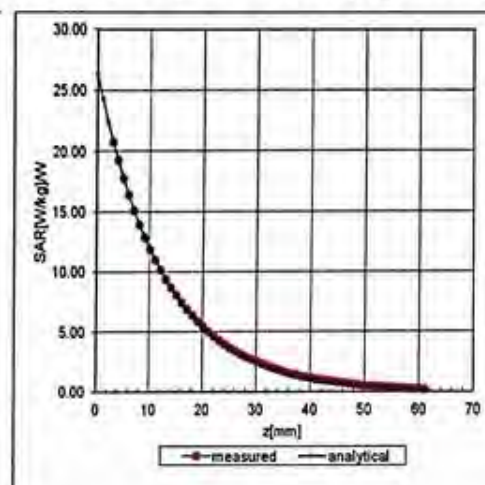
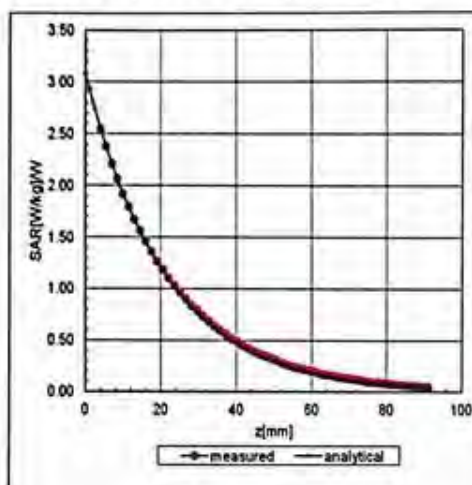


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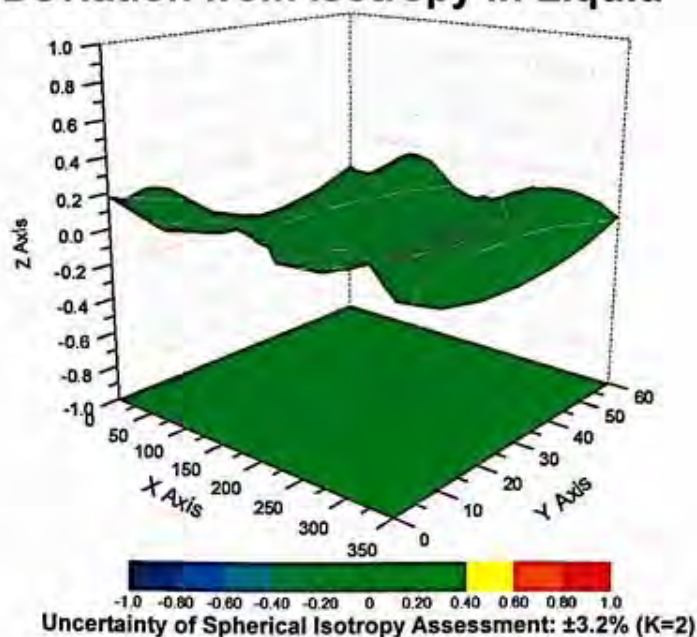
## Conversion Factor Assessment

f=750 MHz, WGLS R9(H\_convF)

f=1750 MHz, WGLS R22(H\_convF)



## Deviation from Isotropy in Liquid



Certificate No: Z18-60093

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## DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3677

### Other Probe Parameters

|                                               |            |
|-----------------------------------------------|------------|
| Sensor Arrangement                            | Triangular |
| Connector Angle (°)                           | 118.3      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disable    |
| Probe Overall Length                          | 337mm      |
| Probe Body Diameter                           | 10mm       |
| Tip Length                                    | 9mm        |
| Tip Diameter                                  | 2.5mm      |
| Probe Tip to Sensor X Calibration Point       | 1mm        |
| Probe Tip to Sensor Y Calibration Point       | 1mm        |
| Probe Tip to Sensor Z Calibration Point       | 1mm        |
| Recommended Measurement Distance from Surface | 1.4mm      |



## ANNEX E: D835V2 Dipole Calibration Certificate



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中国认可  
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CNAS L0570

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Client

TA(Shanghai)

Certificate No: Z17-97114

## CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d020

Calibration Procedure(s)  
FF-Z11-003-01  
Calibration Procedures for dipole validation kits

Calibration date: August 28, 2017

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&amp;TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|------------------------------------------|-----------------------|
| Power Meter NRVD        | 102083     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Power sensor NRV-Z5     | 100595     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Reference Probe EX3DV4  | SN 3617    | 23-Jan-17(SPEAG,No.EX3-3617_Jan17)       | Jan-18                |
| DAE4                    | SN 1331    | 19-Jan-17(CTTL-SPEAG,No.Z17-97015)       | Jan-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 13-Jan-17 (CTTL, No.J17X00286)           | Jan-18                |
| Network Analyzer E5071C | MY46110673 | 13-Jan-17 (CTTL, No.J17X00285)           | Jan-18                |

|                | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: August 31, 2017

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#### Glossary:

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

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.0.1446 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 15 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 835 MHz $\pm$ 1 MHz      |              |

### Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.5           | 0.90 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 41.2 $\pm$ 6 % | 0.89 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | <1.0 °C             | ----           | ----                 |

### SAR result with Head TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 2.34 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 9.45 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 1.51 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.09 mW / g $\pm$ 18.7 % (k=2) |

### Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 55.2           | 0.97 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 55.6 $\pm$ 6 % | 0.98 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | <1.0 °C             | ----           | ----                 |

### SAR result with Body TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 2.46 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 9.75 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 1.63 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.47 mW / g $\pm$ 18.7 % (k=2) |

Certificate No: Z17-97114

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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 50.3Ω- 2.54jΩ |
| Return Loss                          | - 31.9dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 46.8Ω- 4.57jΩ |
| Return Loss                          | - 24.8dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.495 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 |
|-----------------|-------|



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# DASY5 Validation Report for Head TSL

Date: 08.28.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.887$  S/m;  $\epsilon_r = 41.22$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.73, 9.73, 9.73); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

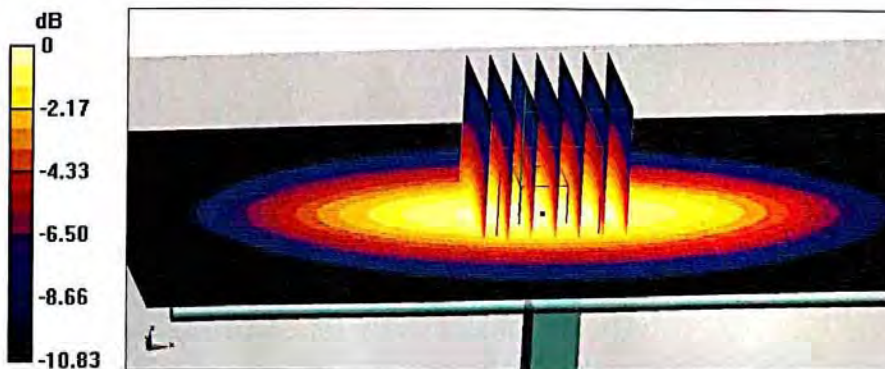
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.74V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.51 W/kg

Maximum value of SAR (measured) = 3.16 W/kg



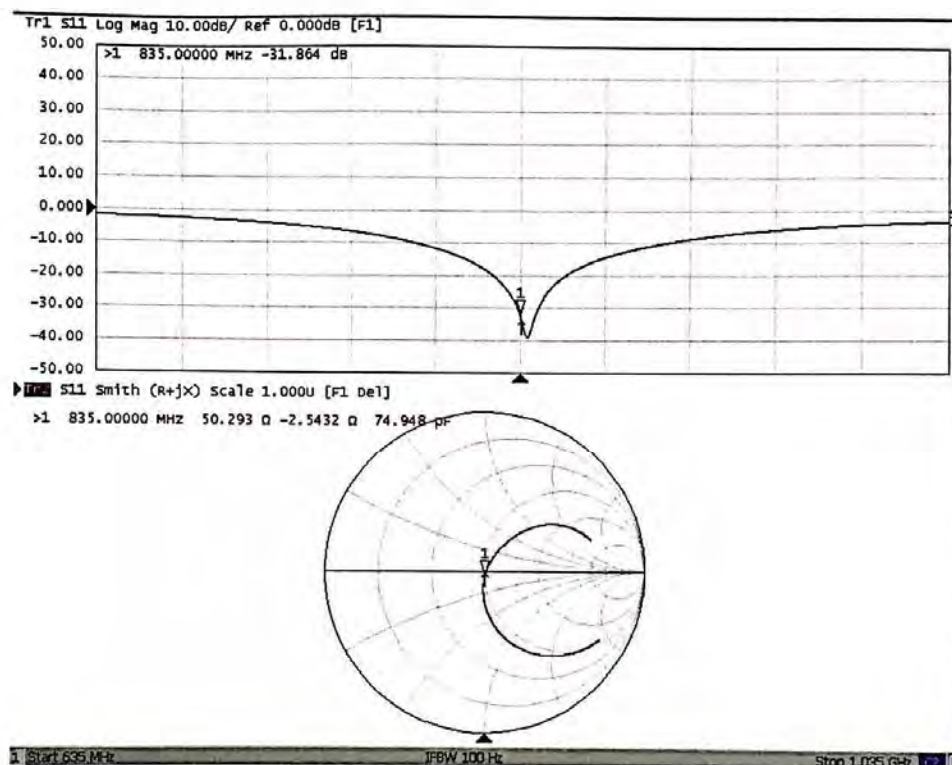
0 dB = 3.16 W/kg = 5.00 dBW/kg



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### Impedance Measurement Plot for Head TSL





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# DASY5 Validation Report for Body TSL

Date: 08.27.2017

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020**

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.984 \text{ S/m}$ ;  $\epsilon_r = 55.62$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.64,9.64, 9.64); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

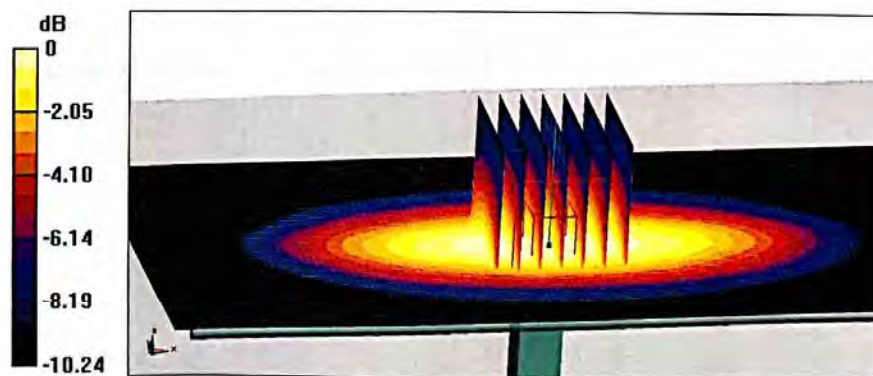
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 56.55 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.71 W/kg

**SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.63 W/kg**

Maximum value of SAR (measured) = 3.29 W/kg



0 dB = 3.29 W/kg = 5.17 dBW/kg

Certificate No: Z17-97114

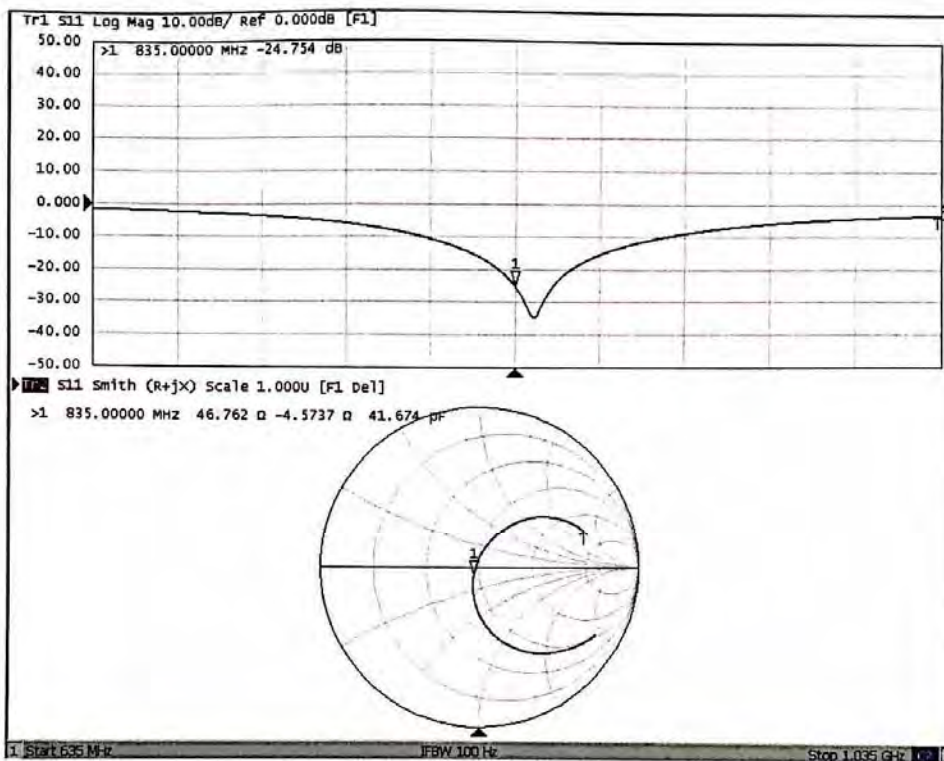
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### Impedance Measurement Plot for Body TSL





## ANNEX F: D1900V2 Dipole Calibration Certificate



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Client

TA(Shanghai)

Certificate No: Z17-97115

## CALIBRATION CERTIFICATE

Object

D1900V2 - SN: 5d060

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

August 26, 2017

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&amp;TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|------------------------------------------|-----------------------|
| Power Meter NRVD        | 102083     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Power sensor NRV-Z5     | 100595     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Reference Probe EX3DV4  | SN 3617    | 23-Jan-17(SPEAG,No.EX3-3617_Jan17)       | Jan-18                |
| DAE4                    | SN 1331    | 19-Jan-17(CTTL-SPEAG,No.Z17-97015)       | Jan-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 13-Jan-17 (CTTL, No.J17X00286)           | Jan-18                |
| Network Analyzer E5071C | MY46110673 | 13-Jan-17 (CTTL, No.J17X00285)           | Jan-18                |

|                |             |                    |           |
|----------------|-------------|--------------------|-----------|
|                | Name        | Function           | Signature |
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: August 30, 2017

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Certificate No: Z17-97115

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#### Glossary:

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

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

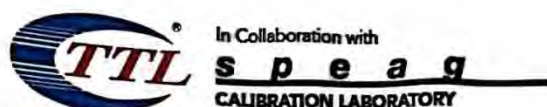
#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.0.1446 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 10 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 1900 MHz $\pm$ 1 MHz     |              |

### Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 40.0           | 1.40 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 39.9 $\pm$ 6 % | 1.41 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | <1.0 °C             | ---            | ---                  |

### SAR result with Head TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 10.1 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 40.1 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 5.19 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.7 mW / g $\pm$ 18.7 % (k=2) |

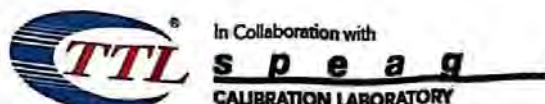
### Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 53.3           | 1.52 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 53.6 $\pm$ 6 % | 1.53 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | <1.0 °C             | ---            | ---                  |

### SAR result with Body TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 9.90 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 39.5 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 5.21 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.8 mW / g $\pm$ 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 52.0Ω+ 6.59jΩ |
| Return Loss                          | - 23.4dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 52.7Ω+ 8.35jΩ |
| Return Loss                          | - 21.4dB      |

### General Antenna Parameters and Design

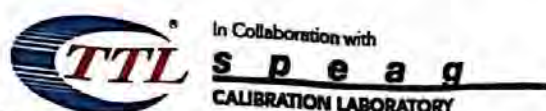
|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.302 ns |
|----------------------------------|----------|

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 |
|-----------------|-------|



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# DASY5 Validation Report for Head TSL

Date: 08.26.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.413$  S/m;  $\epsilon_r = 39.85$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.26, 8.26, 8.26); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

## System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

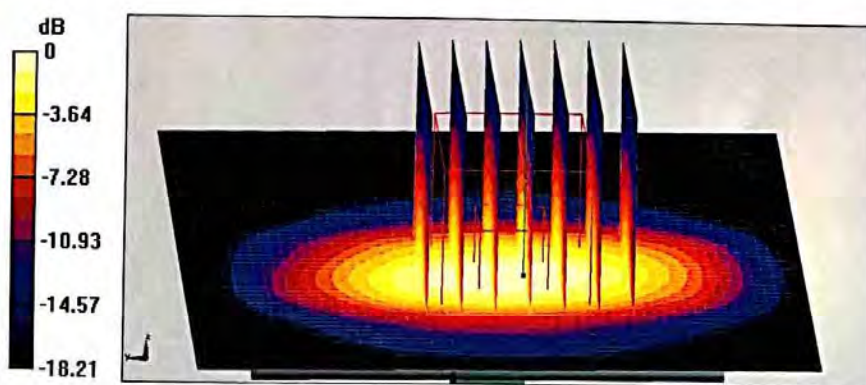
 $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 94.94 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 19.5 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.19 W/kg

Maximum value of SAR (measured) = 15.9 W/kg



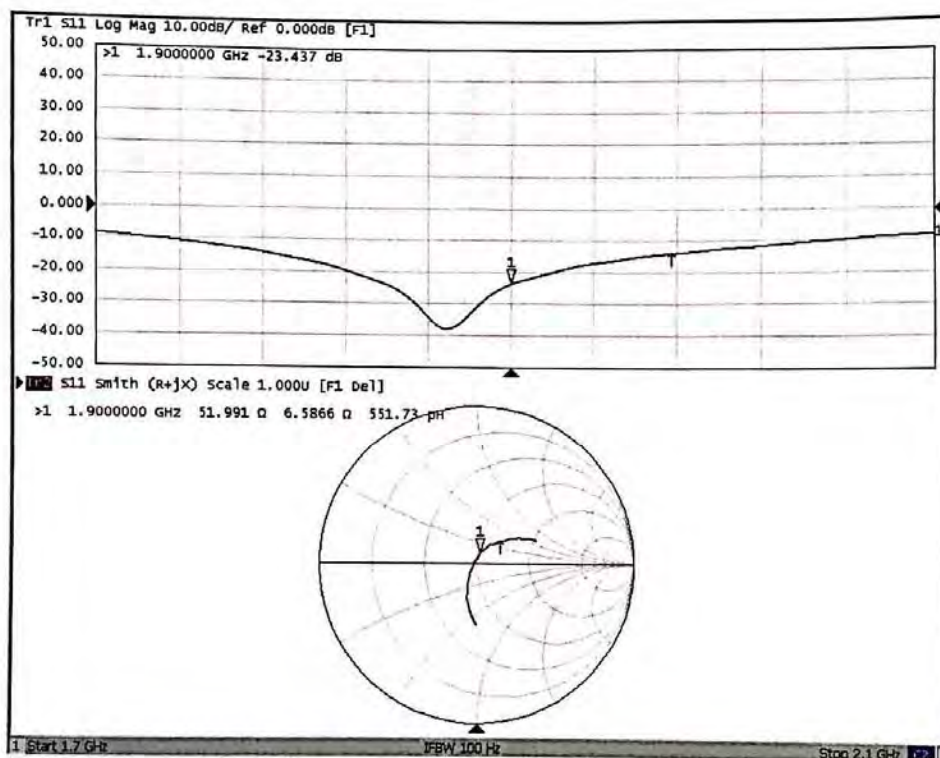
0 dB = 15.9 W/kg = 12.01 dBW/kg



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### Impedance Measurement Plot for Head TSL





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# DASY5 Validation Report for Body TSL

Date: 08.26.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.528$  S/m;  $\epsilon_r = 53.55$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.95, 7.95, 7.95); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

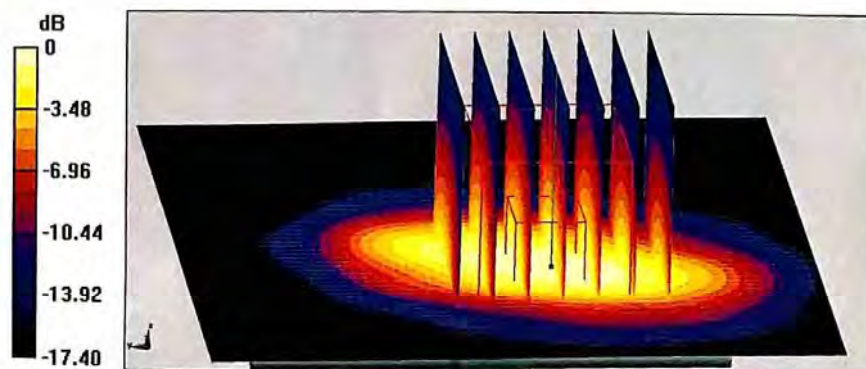
dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.19 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.21 W/kg

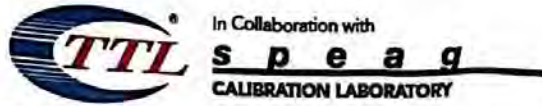
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

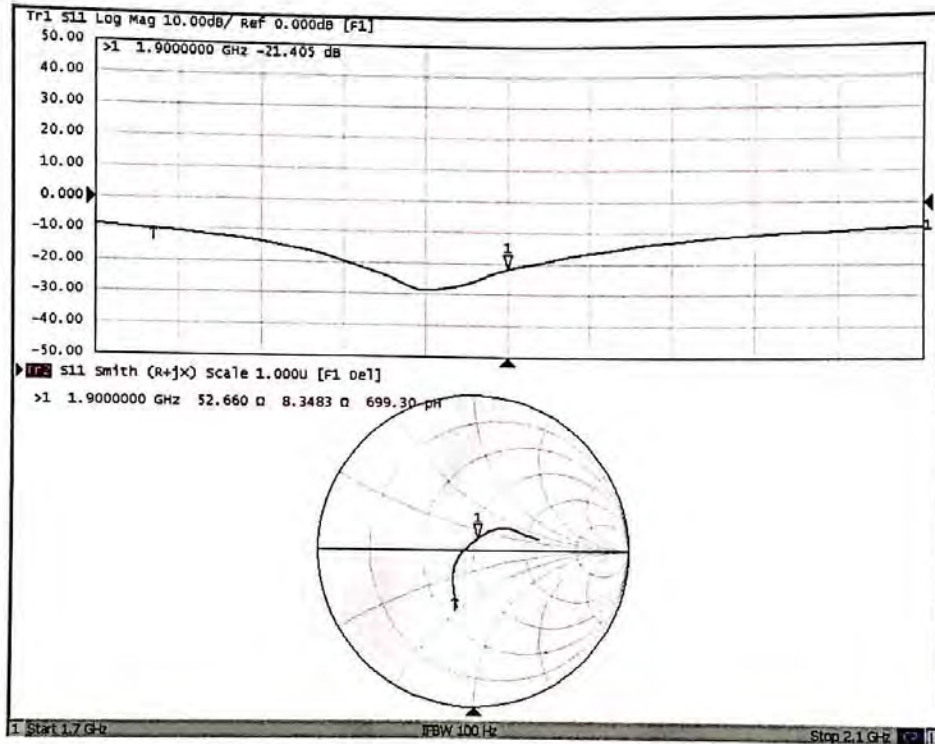
Certificate No: Z17-97115

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### Impedance Measurement Plot for Body TSL





## ANNEX G: D2450V2 Dipole Calibration Certificate



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CNAS L0570

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Client

TA(Shanghai)

Certificate No:

Z17-97116

## CALIBRATION CERTIFICATE

Object

D2450V2 - SN: 786

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

August 29, 2017

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)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|------------------------------------------|-----------------------|
| Power Meter NRVD        | 102083     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Power sensor NRV-Z5     | 100595     | 22-Sep-16 (CTTL, No.J16X06809)           | Sep-17                |
| Reference Probe EX3DV4  | SN 3617    | 23-Jan-17(SPEAG,No.EX3-3617_Jan17)       | Jan-18                |
| DAE4                    | SN 1331    | 19-Jan-17(CTTL-SPEAG,No.Z17-97015)       | Jan-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 13-Jan-17 (CTTL, No.J17X00286)           | Jan-18                |
| Network Analyzer E5071C | MY46110673 | 13-Jan-17 (CTTL, No.J17X00285)           | Jan-18                |

|                | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: September 1, 2017

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Certificate No: Z17-97116

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#### Glossary:

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

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.0.1446 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 10 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 2450 MHz $\pm$ 1 MHz     |              |

### Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 39.7 $\pm$ 6 % | 1.82 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | <1.0 °C             | ---            | ---                  |

### SAR result with Head TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 13.2 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 52.6 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 6.16 mW / g                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.6 mW / g $\pm$ 18.7 % (k=2) |

### Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.7           | 1.95 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 52.5 $\pm$ 6 % | 1.94 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | <1.0 °C             | ---            | ---                  |

### SAR result with Body TSL

|                                                         |                    |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                                |
| SAR measured                                            | 250 mW input power | 12.7 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 50.8 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                                |
| SAR measured                                            | 250 mW input power | 5.87 mW / g                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 23.5 mW / g $\pm$ 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 53.4Ω+ 4.29jΩ |
| Return Loss                          | - 25.5dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 51.0Ω+ 6.61jΩ |
| Return Loss                          | - 23.6dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.265 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 |
|-----------------|-------|



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# DASY5 Validation Report for Head TSL

Date: 08.29.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.822$  S/m;  $\epsilon_r = 39.65$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.74, 7.74, 7.74); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

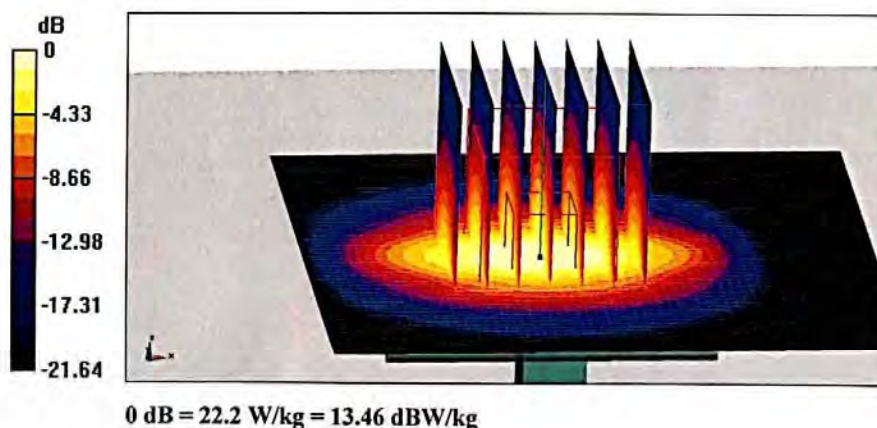
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.1 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.16 W/kg

Maximum value of SAR (measured) = 22.2 W/kg

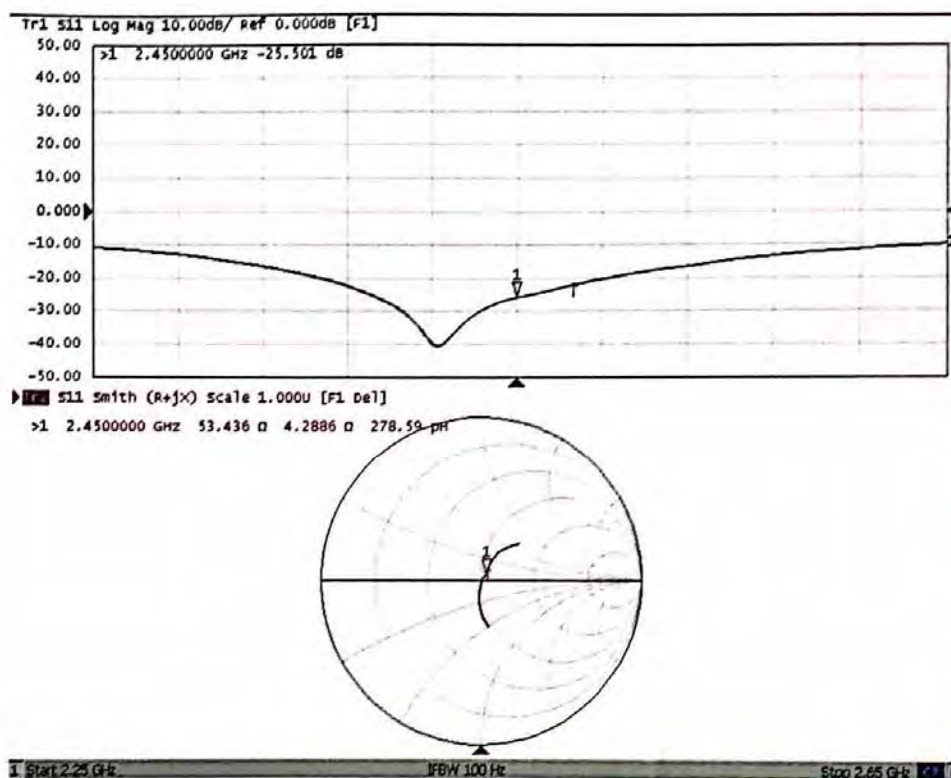




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### Impedance Measurement Plot for Head TSL





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# DASY5 Validation Report for Body TSL

Date: 08.29.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.943$  S/m;  $\epsilon_r = 52.45$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(7.8, 7.8, 7.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

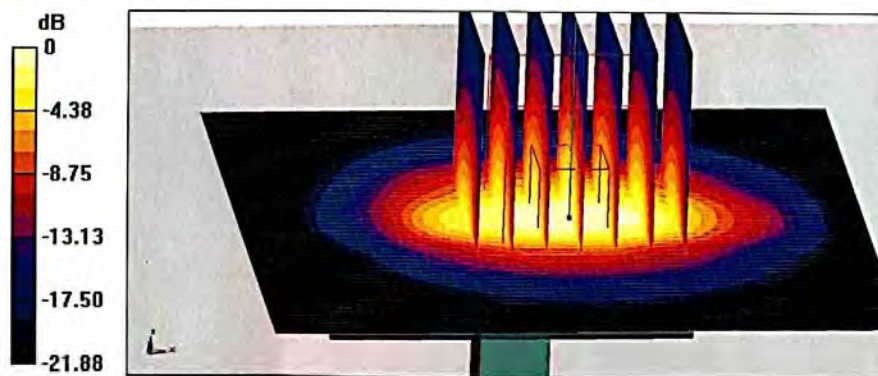
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.28 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.87 W/kg

Maximum value of SAR (measured) = 21.5 W/kg



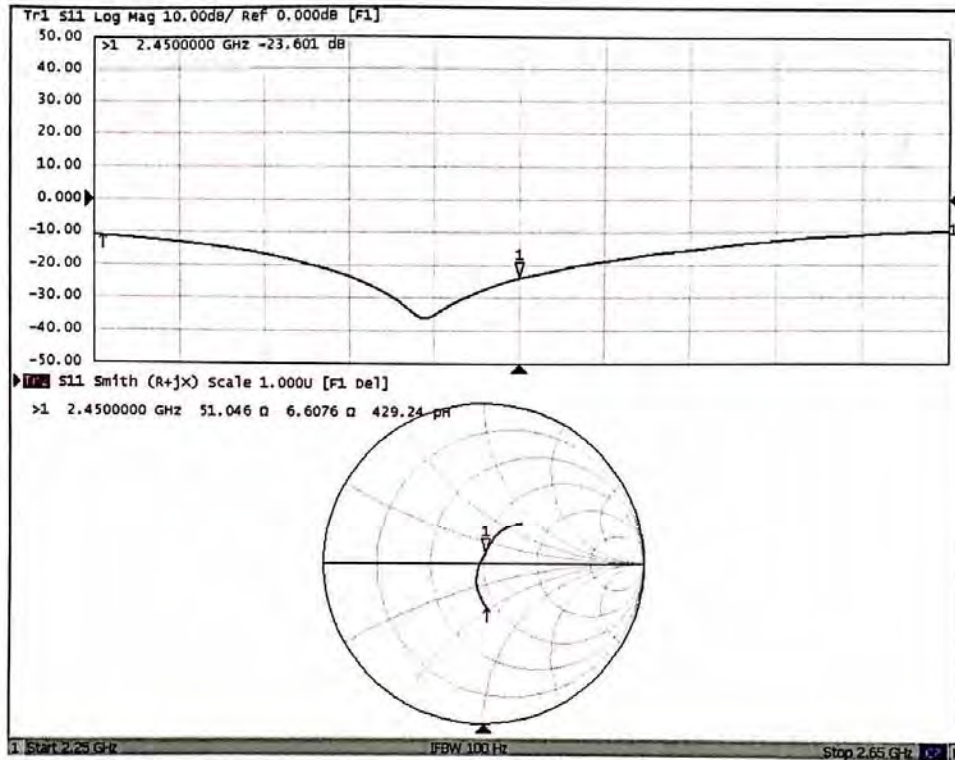
0 dB = 21.5 W/kg = 13.32 dBW/kg



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### Impedance Measurement Plot for Body TSL





## ANNEX H: D2600V2 Dipole Calibration Certificate



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Client **TA(Shanghai)**Certificate No: **Z18-60094****CALIBRATION CERTIFICATE**Object **D2600V2 - SN: 1025**

Calibration Procedure(s) **FF-Z11-003-01**  
**Calibration Procedures for dipole validation kits**

Calibration date: **May 2, 2018**

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)℃ and humidity<70%.

Calibration Equipment used (M&amp;TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|------------------------------------------|-----------------------|
| Power Meter NRVD        | 102083     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Power sensor NRV-Z5     | 100542     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Reference Probe EX3DV4  | SN 7464    | 12-Sep-17(SPEAG, No.EX3-7464_Sep17)      | Sep-18                |
| DAE4                    | SN 1525    | 02-Oct-17(SPEAG, No.DAE4-1525_Oct17)     | Oct-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| Network Analyzer E5071C | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

|                |             |                    |
|----------------|-------------|--------------------|
|                | Name        | Function           |
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |
| Approved by:   | Qi Dianyuan | SAR Project Leader |

Signature

Issued: May 5, 2018

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Certificate No: Z18-60094

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#### Glossary:

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

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

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.0.1446 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 10 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 2600 MHz $\pm$ 1 MHz     |              |

### Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.0           | 1.96 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 40.1 $\pm$ 6 % | 2.01 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | <1.0 °C             | —              | —                    |

### SAR result with Head TSL

|                                                |                    |                                |
|------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 $cm^3$ (1 g) of Head TSL   | Condition          |                                |
| SAR measured                                   | 250 mW input power | 13.6 mW / g                    |
| SAR for nominal Head TSL parameters            | normalized to 1W   | 54.1 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | Condition          |                                |
| SAR measured                                   | 250 mW input power | 6.03 mW / g                    |
| SAR for nominal Head TSL parameters            | normalized to 1W   | 24.1 mW / g $\pm$ 18.7 % (k=2) |

### Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.5           | 2.16 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 52.1 $\pm$ 6 % | 2.15 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | <1.0 °C             | —              | —                    |

### SAR result with Body TSL

|                                                |                    |                                |
|------------------------------------------------|--------------------|--------------------------------|
| SAR averaged over 1 $cm^3$ (1 g) of Body TSL   | Condition          |                                |
| SAR measured                                   | 250 mW input power | 13.6 mW / g                    |
| SAR for nominal Body TSL parameters            | normalized to 1W   | 54.5 mW / g $\pm$ 18.8 % (k=2) |
| SAR averaged over 10 $cm^3$ (10 g) of Body TSL | Condition          |                                |
| SAR measured                                   | 250 mW input power | 6.06 mW / g                    |
| SAR for nominal Body TSL parameters            | normalized to 1W   | 24.3 mW / g $\pm$ 18.7 % (k=2) |



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## Appendix(Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 48.1Ω- 7.55jΩ |
| Return Loss                          | - 22.0dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 46.6Ω- 7.06jΩ |
| Return Loss                          | - 21.9dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.014 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 |
|-----------------|-------|



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# DASY5 Validation Report for Head TSL

Date: 05.02.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1025

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.014$  S/m;  $\epsilon_r = 40.09$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(7.76, 7.76, 7.76); Calibrated: 9/12/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

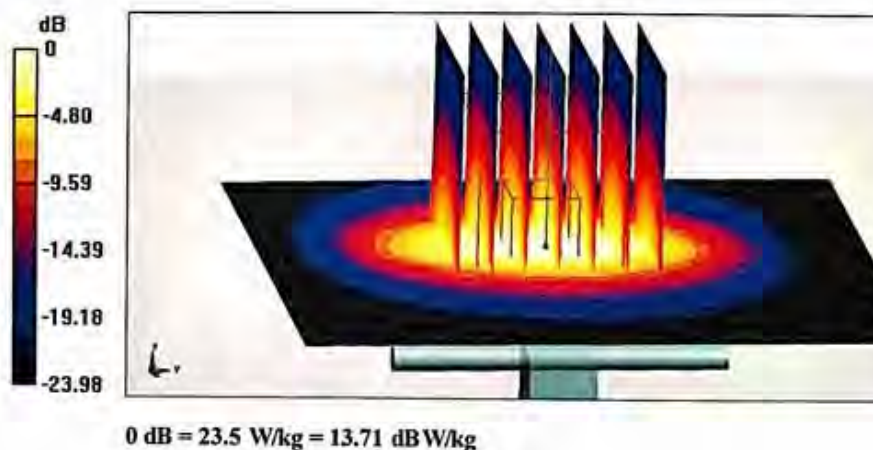
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.50 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 29.6 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.03 W/kg

Maximum value of SAR (measured) = 23.5 W/kg

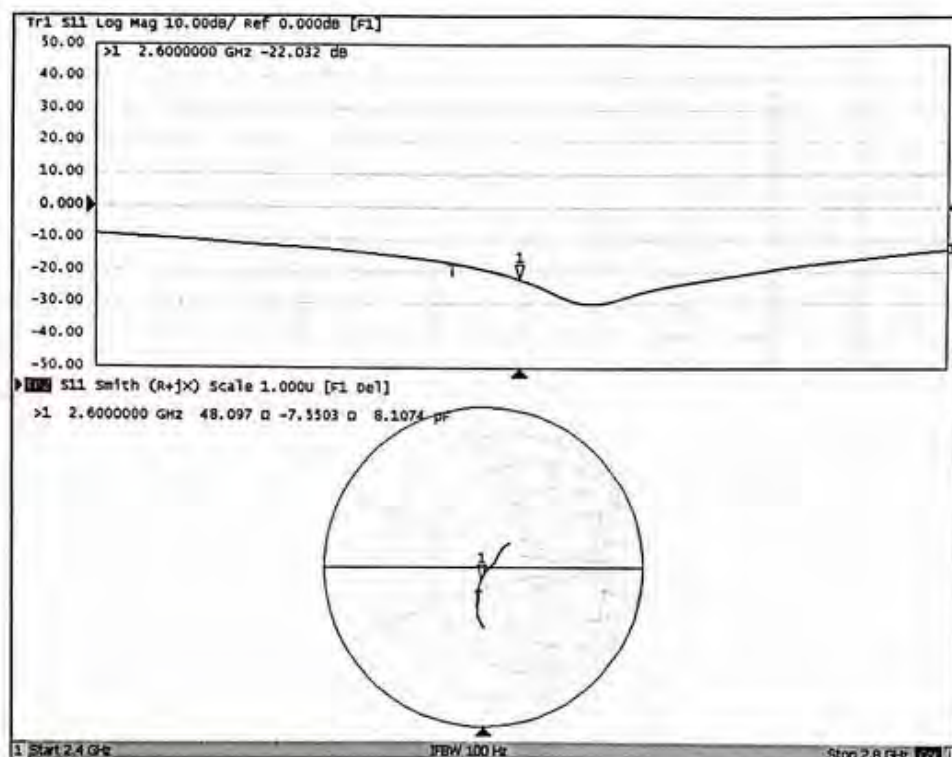




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### Impedance Measurement Plot for Head TSL





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# DASY5 Validation Report for Body TSL

Date: 05.02.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1025

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.146$  S/m;  $\epsilon_r = 52.09$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(7.84, 7.84, 7.84); Calibrated: 9/12/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 83.79 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.06 W/kg

Maximum value of SAR (measured) = 23.6 W/kg



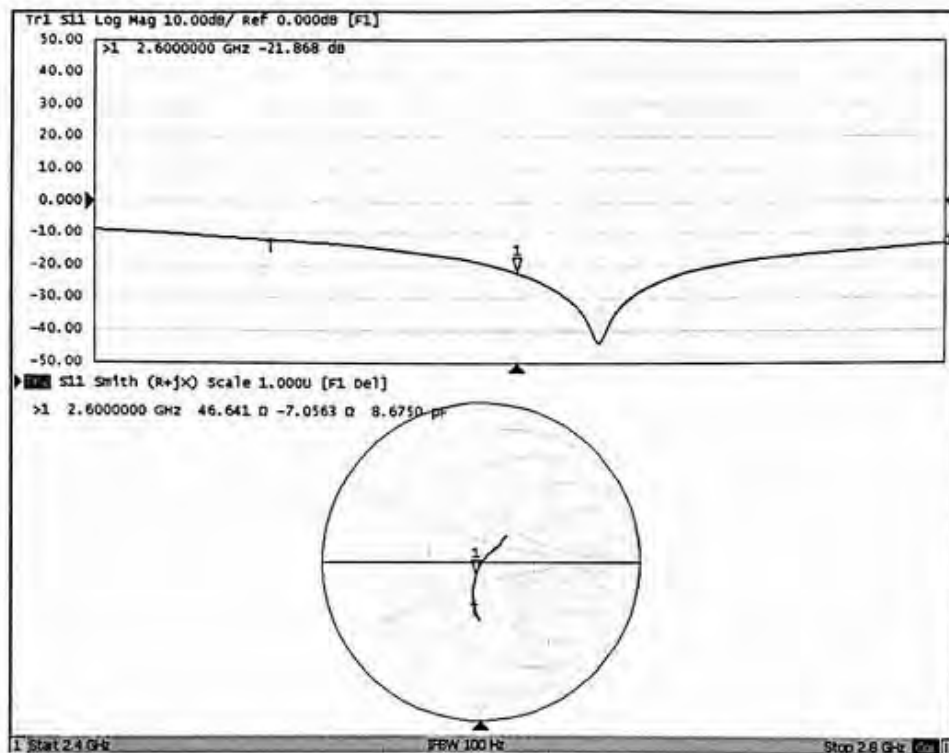
0 dB = 23.6 W/kg = 13.73 dBW/kg



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### Impedance Measurement Plot for Body TSL





## ANNEX I:DAE4 Calibration Certificate

**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 **TA-SH (Auden)**

Certificate No: **DAE4-1317\_Mar18**

### CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1317**

Calibration procedure(s) **QA CAL-06.v29**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **March 23, 2018**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards             | ID #               | Cal Date (Certificate No.) | Scheduled Calibration  |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278        | 31-Aug-17 (No:21092)       | Aug-18                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Auto DAE Calibration Unit     | SE UWS 053 AA 1001 | 04-Jan-18 (in house check) | In house check: Jan-19 |
| Calibrator Box V2.1           | SE UMS 006 AA 1002 | 04-Jan-18 (in house check) | In house check: Jan-19 |

|                |                   |                       |                  |
|----------------|-------------------|-----------------------|------------------|
|                | <b>Name</b>       | <b>Function</b>       | <b>Signature</b> |
| Calibrated by: | Dominique Steffen | Laboratory Technician |                  |
| Approved by:   | Sven Kühn         | Deputy Manager        |                  |

Issued: March 23, 2018

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

Certificate No: DAE4-1317\_Mar18

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Accreditation No.: SCS 0108

## Glossary

**DAE** data acquisition electronics  
**Connector angle** information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV  
Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X                         | Y                         | Z                         |
|---------------------|---------------------------|---------------------------|---------------------------|
| High Range          | 403.713 $\pm$ 0.02% (k=2) | 404.474 $\pm$ 0.02% (k=2) | 403.834 $\pm$ 0.02% (k=2) |
| Low Range           | 3.97916 $\pm$ 1.50% (k=2) | 3.99031 $\pm$ 1.50% (k=2) | 3.96832 $\pm$ 1.50% (k=2) |

### Connector Angle

|                                           |                                     |
|-------------------------------------------|-------------------------------------|
| Connector Angle to be used in DASY system | 332.0 $^{\circ}$ $\pm$ 1 $^{\circ}$ |
|-------------------------------------------|-------------------------------------|

## Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

| High Range |         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|------------|---------|---------------------------|------------------------------|-----------|
| Channel X  | + Input | 200033.59                 | -2.39                        | -0.00     |
| Channel X  | + Input | 20006.23                  | 0.60                         | 0.00      |
| Channel X  | - Input | -20003.30                 | 2.01                         | -0.01     |
| Channel Y  | + Input | 200032.59                 | -3.60                        | -0.00     |
| Channel Y  | + Input | 20003.70                  | -1.89                        | -0.01     |
| Channel Y  | - Input | -20004.09                 | 1.35                         | -0.01     |
| Channel Z  | + Input | 200035.04                 | -0.93                        | -0.00     |
| Channel Z  | + Input | 20005.33                  | -0.22                        | -0.00     |
| Channel Z  | - Input | -20006.76                 | -1.25                        | 0.01      |

| Low Range |         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-----------|---------|---------------------------|------------------------------|-----------|
| Channel X | + Input | 2001.75                   | 0.20                         | 0.01      |
| Channel X | + Input | 200.99                    | -0.43                        | -0.21     |
| Channel X | - Input | -197.13                   | 1.49                         | -0.75     |
| Channel Y | + Input | 2001.26                   | -0.25                        | -0.01     |
| Channel Y | + Input | 200.67                    | -0.56                        | -0.28     |
| Channel Y | - Input | -199.10                   | -0.34                        | 0.17      |
| Channel Z | + Input | 2000.98                   | -0.47                        | -0.02     |
| Channel Z | + Input | 200.06                    | -1.17                        | -0.58     |
| Channel Z | - Input | -199.95                   | -1.19                        | 0.60      |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Common mode Input Voltage (mV) | High Range Average Reading ( $\mu\text{V}$ ) | Low Range Average Reading ( $\mu\text{V}$ ) |
|-----------|--------------------------------|----------------------------------------------|---------------------------------------------|
| Channel X | 200                            | 11.88                                        | 10.25                                       |
|           | - 200                          | -8.69                                        | -10.35                                      |
| Channel Y | 200                            | 11.35                                        | 11.40                                       |
|           | - 200                          | -13.19                                       | -12.90                                      |
| Channel Z | 200                            | 1.73                                         | 1.34                                        |
|           | - 200                          | -2.98                                        | -3.58                                       |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | 2.22                        | -4.63                       |
| Channel Y | 200                | 8.79                        | -                           | 3.02                        |
| Channel Z | 200                | 10.60                       | 6.05                        | -                           |

#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15758            | 16030           |
| Channel Y | 16498            | 16052           |
| Channel Z | 16107            | 15724           |

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 1.03               | -0.09                  | 2.36                   | 0.48                      |
| Channel Y | -0.33              | -1.77                  | 1.22                   | 0.54                      |
| Channel Z | -1.81              | -3.67                  | -0.40                  | 0.67                      |

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

|           | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200            | 200              |
| Channel Y | 200            | 200              |
| Channel Z | 200            | 200              |

#### 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

#### 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |



## **ANNEX J: The EUT Appearances and Test Configuration**

The Detailed EUT Appearance and Test Configuration refer to EUT Appearance and SAR Test Setup.