# FCC SAR Test Report

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|---|---|
| **APPLICANT** | **: SAFRAN Identity&Security** |
| **EQUIPMENT** | **: MorphoTablet 2** |
| **BRAND NAME** | **: SAFRAN MORPHO** |
| **MODEL NAME** | **: MPH-MB001A** |
| **FCC ID** | **: ZBW-MPHMB001A** |
| **STANDARD** | **: FCC 47 CFR Part 2 (2.1093)<br>ANSI/IEEE C95.1-1992<br>IEEE 1528-2013** |

**We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.**

Mark Qu

**Prepared by: Mark Qu / Manager**

Jones Tsai

**Approved by: Jones Tsai / Manager**

Testing Laboratory
2627

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***No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China***

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# Revision History

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FA640601 | Rev. 01 | Initial issue of report | Jun. 28, 2016 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **SAFRAN Identity&Security, MorphoTablet 2, MPH-MB001A** are as follows.

| Equipment Class | Frequency Band | | Highest SAR Summary Body 1g SAR (W/kg) | Highest Simultaneous Transmission 1g SAR (W/kg) |
|---|---|---|---|---|
| Licensed | GSM | GSM850 | 1.08 | 1.53 |
| | | GSM1900 | **1.19** | |
| | WCDMA | WCDMA V | 0.92 | |
| | | WCDMA II | 1.16 | |
| | LTE | Band 5 | 1.16 | |
| | | Band 2 | 1.15 | |
| | | Band 4 | 1.05 | |
| | | Band 7 | 1.17 | |
| DTS | WLAN | 2.4GHz WLAN | 0.58 | 1.50 |
| DSS | 2.4GHz Band | Bluetooth | | 1.53 |
| Date of Testing: | | | 2016/05/27 ~ 2016/06/08 | |

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications

## 2. Administration Data

| Testing Laboratory | |
|---|---|
| Test Site | SPORTON INTERNATIONAL (KUNSHAN) INC. |
| Test Site Location | No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.<br>TEL: +86-0512-5790-0158<br>FAX: +86-0512-5790-0958 |

| Applicant | |
|---|---|
| Company Name | SAFRAN Identity&Security |
| Address | 11, boulevard Galliéni 92130 - Issy-les-Moulineaux France |

| Manufacturer | |
|---|---|
| Company Name | SAFRAN Identity&Security |
| Address | 11, boulevard Galliéni 92130 - Issy-les-Moulineaux France |

## 3. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

# 4. Equipment Under Test (EUT) Information

## 4.1 General Information

| Product Feature & Specification | |
|---|---|
| **Equipment Name** | MorphoTablet 2 |
| **Brand Name** | SAFRAN MORPHO |
| **Model Name** | MPH-MB001A |
| **FCC ID** | ZBW-MPHMB001A |
| **IMEI Code** | 357079070000057 |
| **Wireless Technology and Frequency Range** | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8 MHz<br>WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz<br>WCDMA Band V: 826.4 MHz ~ 846.6 MHz<br>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>NFC : 13.56 MHz |
| **Mode** | · GSM/GPRS/EGPRS(Downlink Only)<br>· RMC/AMR 12.2Kbps<br>· HSDPA<br>· HSUPA<br>· DC-HSDPA<br>· HSPA+ (16QAM uplink is not supported)<br>· LTE: QPSK, 16QAM<br>· 802.11b/g/n HT20<br>· Bluetooth v3.0+EDR,Bluetooth v4.0 LE<br>· NFC:ASK |
| **GSM / (E)GPRS Transfer mode** | Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network. |
| **EUT Stage** | Identical Prototype |

**Remark:**
1. This device has voice function but limit to speakerphone mode.
2. 802.11n-HT40 is not supported in 2.4GHz WLAN.
3. This device does not support DTM operation.
4. This device supports GRPS/EGPRS mode up to multi-slot class12 and EGPRS downlink only.
5. This device implanted proximity sensor function for WWAN(GSM850/GSM1900/WCDMA Band V/Band II/LTE Band 2/4/7 and power reduction are applicable at Bottom face/Edge 2.

## 4.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>ZBW-MPHMB001A</td></tr>
<tr><td>Equipment Name</td><td>WCDMA/GSM/LTE/WIFI/BT/NFC Tablet</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz<br>LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table></td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>Yes, Proximity Sensor.<br>Power reduction for GSM850/GSM1900/WCDMA Band V/Band II/LTE Band 2/4/7</td></tr>
<tr><td>LTE Release</td><td>R8, Cat 4</td></tr>
<tr><td>CA Support</td><td>NO</td></tr>
</table>

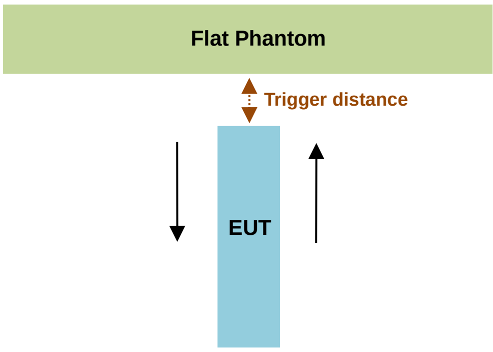
| Transmission (H, M, L) channel numbers and frequencies in each LTE band | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTE Band 2 | | | | | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 18607 | 1850.7 | 18615 | 1851.5 | 18625 | 1852.5 | 18650 | 1855 | 18675 | 1857.5 | 18700 | 1860 |
| M | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 |
| H | 19193 | 1909.3 | 19185 | 1908.5 | 19175 | 1907.5 | 19150 | 1905 | 19125 | 1902.5 | 19100 | 1900 |
| LTE Band 4 | | | | | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 19957 | 1710.7 | 19965 | 1711.5 | 19975 | 1712.5 | 20000 | 1715 | 20025 | 1717.5 | 20050 | 1720 |
| M | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 |
| H | 20393 | 1754.3 | 20385 | 1753.5 | 20375 | 1752.5 | 20350 | 1750 | 20325 | 1747.5 | 20300 | 1745 |

| LTE Band 5 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 20407 | 824.7 | 20415 | 825.5 | 20425 | 826.5 | 20450 | 829 |
| M | 20525 | 836.5 | 20525 | 836.5 | 20525 | 836.5 | 20525 | 836.5 |
| H | 20643 | 848.3 | 20635 | 847.5 | 20625 | 846.5 | 20600 | 844 |
| LTE Band 7 | | | | | | | | |
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 20775 | 2502.5 | 20800 | 2505 | 20825 | 2507.5 | 20850 | 2510 |
| M | 21100 | 2535 | 21100 | 2535 | 21100 | 2535 | 21100 | 2535 |
| H | 21425 | 2567.5 | 21400 | 2565 | 21375 | 2562.5 | 21350 | 2560 |

# 5. Proximity Sensor Triggering Test

**<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:**

Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated in the exhibit "P-Sensor operational description", and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



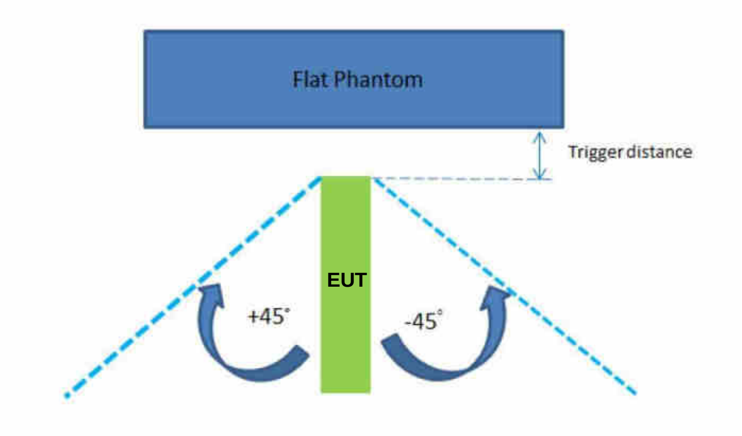

| Proximity Sensor Trigger Distance (mm) | | |
|---|---|---|
| Position | Bottom Face | Edge 2 |
| Minimum | 20 | 14 |

**<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:**

If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and "along the direction of maximum antenna and sensor offset".
Illustrated in the internal photo exhibit, although the senor is spatially offset, there is no trigger condition where the antenna is next to the user but the sensor is laterally further away, therefore proximity sensor coverage testing is not required.
This procedure is not required because antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

**<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:**

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 14 mm separation.
Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.




| The Sensor Trigger Distance (mm) | |
|---|---|
| Position | Edge 2 |
| Minimum | 14 |

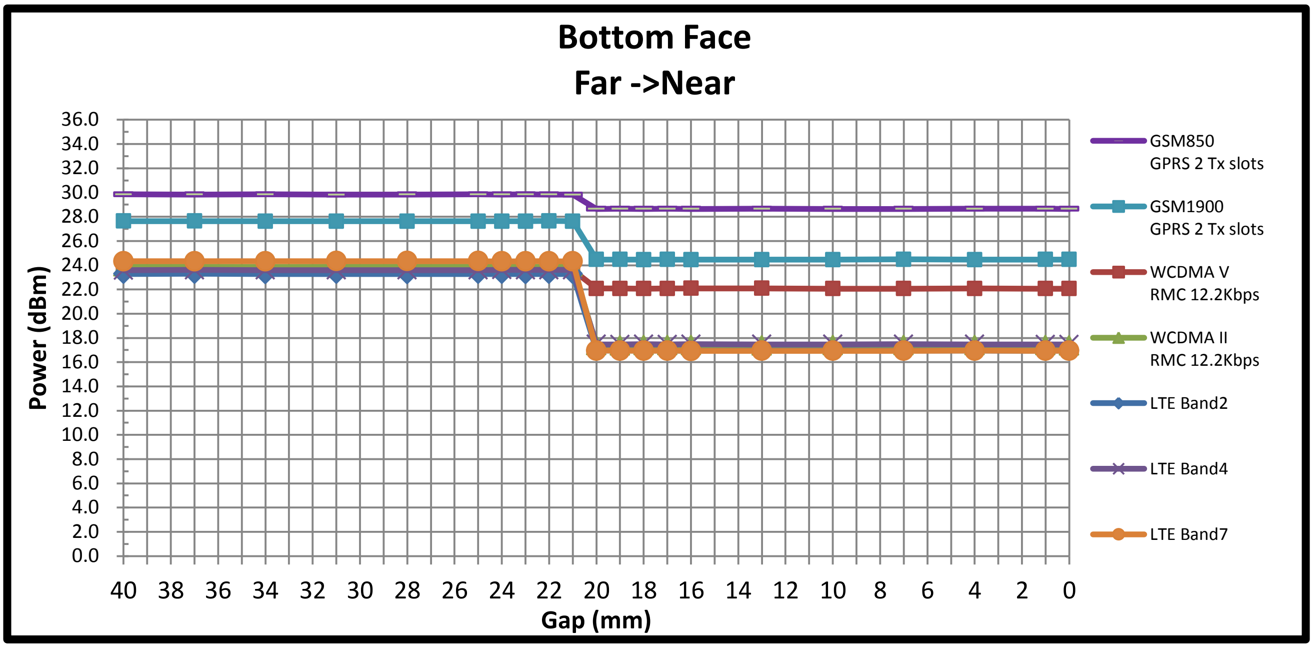
## Proximity sensor power reduction

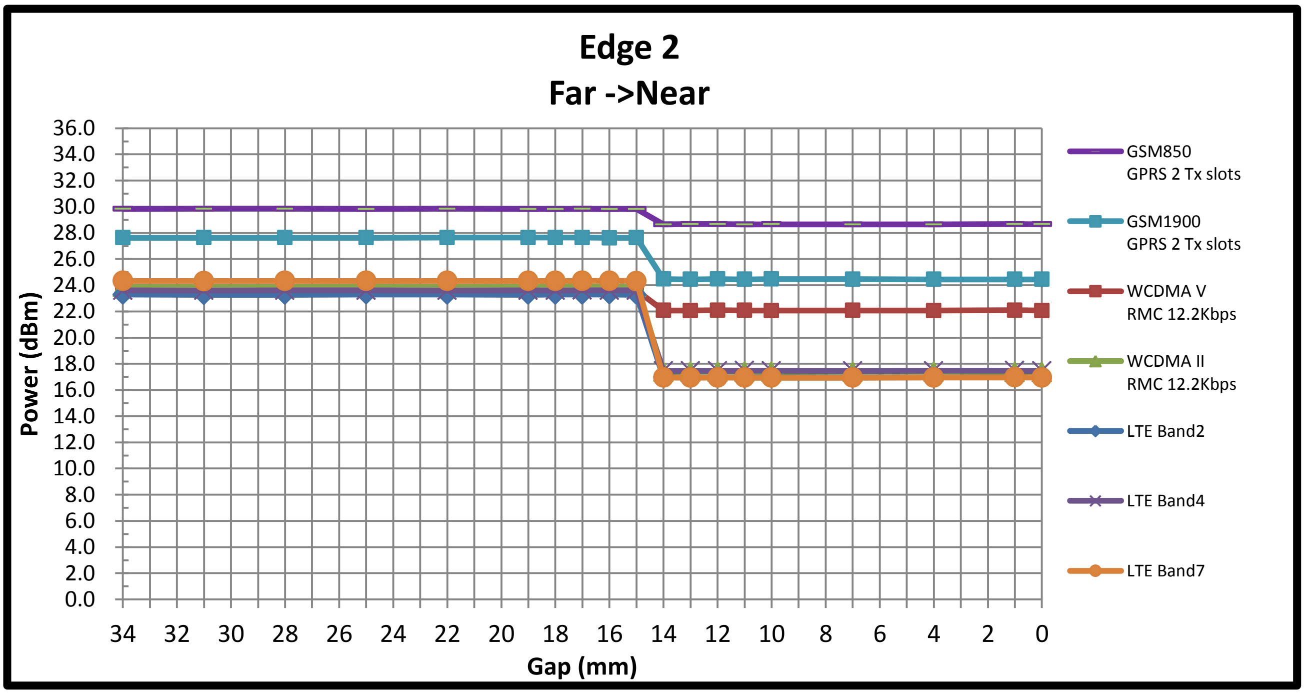
| Exposure Position / wireless mode | Bottom Face[1] | Edge 1 | Edge 2[1] | Edge 3 | Edge 4 |
|---|---|---|---|---|---|
| GSM850 GSM (GMSK 1 Tx slot) - CS1 | 3.0 dB | 0 dB | 3.0 dB | 0 dB | 0 dB |
| GSM850 GPRS (GMSK 1 Tx slot) - CS1 | 3.0 dB | 0 dB | 3.0 dB | 0 dB | 0 dB |
| GSM850 GPRS (GMSK 2 Tx slot) - CS1 | 2.0 dB | 0 dB | 2.0 dB | 0 dB | 0 dB |
| GSM850 GPRS (GMSK 3 Tx slot) - CS1 | 1.5 dB | 0 dB | 1.5 dB | 0 dB | 0 dB |
| GSM850 GPRS (GMSK 4 Tx slot) - CS1 | 1.5 dB | 0 dB | 1.5 dB | 0 dB | 0 dB |
| GSM1900 GSM (GMSK 1 Tx slot) - CS1 | 3.0 dB | 0 dB | 3.0 dB | 0 dB | 0 dB |
| GSM1900 GPRS (GMSK 1 Tx slot) - CS1 | 3.0 dB | 0 dB | 3.0 dB | 0 dB | 0 dB |
| GSM1900 GPRS (GMSK 2 Tx slot) - CS1 | 3.5 dB | 0 dB | 3.5 dB | 0 dB | 0 dB |
| GSM1900 GPRS (GMSK 3 Tx slot) - CS1 | 3.5 dB | 0 dB | 3.5 dB | 0 dB | 0 dB |
| GSM1900 GPRS (GMSK 4 Tx slot) - CS1 | 4.0 dB | 0 dB | 4.0 dB | 0 dB | 0 dB |
| WCDMA Band V RMC 12.2kbps | 3.0 dB | 0 dB | 3.0 dB | 0 dB | 0 dB |
| WCDMA Band II RMC 12.2kbps | 7.0 dB | 0 dB | 7.0 dB | 0 dB | 0 dB |
| LTE Band 2 | 6.5 dB | 0 dB | 6.5 dB | 0 dB | 0 dB |
| LTE Band 4 | 6.5 dB | 0 dB | 6.5 dB | 0 dB | 0 dB |
| LTE Band 7 | 7.5 dB | 0 dB | 7.5 dB | 0 dB | 0 dB |

**Remark:**
1. [1]: Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN /Bluetooth and LTE Band 5.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   - Bottom Face: 10 mm
   - Edge2: 10 mm

## Power Measurement during Sensor Trigger distance testing

| Band/Mode | Ch # | Measured power reduction (dBm) | | Reduction Levels |
|---|---|---|---|---|
| | | w/o power back-off | w/ power back-off | (dB) |
| GSM850 GPRS (GMSK 2 Tx slot) | 189 | 29.64 | 28.62 | 1.02 |
| GSM1900 GPRS (GMSK 2 Tx slot) | 661 | 27.62 | 24.45 | 3.17 |
| WCDMA Band V (RMC 12.2Kbps) | 4182 | 23.58 | 22.01 | 1.57 |
| WCDMA Band II (RMC 12.2Kbps) | 9400 | 23.86 | 17.37 | 6.49 |
| LTE Band 2 20MHz 1RB 49offset | 18900 | 23.27 | 16.90 | 6.37 |
| LTE Band 4 20MHz 1RB 0offset | 20175 | 23.59 | 17.45 | 6.14 |
| LTE Band 7 20MHz 1RB 0offset | 21100 | 24.05 | 16.89 | 7.16 |



# 6. RF Exposure Limits

## 6.1 Uncontrolled Environment

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

## 6.2 Controlled Environment

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

**Limits for Occupational/Controlled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

# 7. Specific Absorption Rate (SAR)

## 7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

## 7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

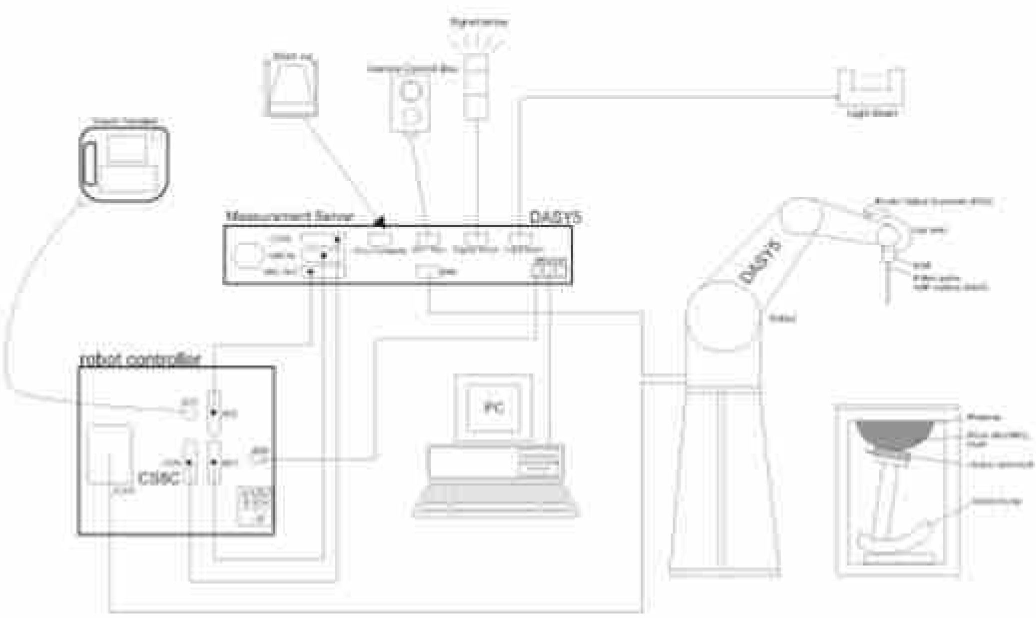
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^{2}}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

# 8. System Description and Setup

**The DASY system used 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 DASY5 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.

## 8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

**<EX3DV4 Probe>**

| | |
|---|---|
| **Construction** | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| **Frequency** | 10 MHz – >6 GHz<br>Linearity: ±0.2 dB (30 MHz – 6 GHz) |
| **Directivity** | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis) |
| **Dynamic Range** | 10 µW/g – >100 mW/g<br>Linearity: ±0.2 dB (noise: typically <1 µW/g) |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 2.5 mm (body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm |

## 8.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Fig 5.1 Photo of DAE**

## 8.3 Phantom

**<SAM Twin Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume** | Approx. 25 liters |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |
| **Measurement Areas** | Left Hand, Right Hand, Flat Phantom |

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

**<ELI Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%) |
| **Filling Volume** | Approx. 30 liters |
| **Dimensions** | Major ellipse axis: 600 mm<br>Minor axis: 400 mm |

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

## 8.4 Device Holder

**<Mounting Device for Hand-Held Transmitter>**

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

**<Mounting Device for Laptops and other Body-Worn Transmitters>**

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

# 9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

## 9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

## 9.2 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.

## 9.3 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 dB0 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 D01v01r04 SAR measurement 100 MHz to 6 GHz.

| | ≤ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |

## 9.4 Zoom Scan

Zoom scans are used 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 shoes 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 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

## 9.5 Volume Scan Procedures

The volume scan is used for 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.

## 9.6 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.

# 10. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 835MHz System Validation Kit | D835V2 | 4d091 | 2015/11/24 | 2016/11/23 |
| SPEAG | 1750MHz System Validation Kit | D1750V2 | 1069 | 2015/11/23 | 2016/11/22 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d118 | 2015/11/23 | 2016/11/22 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 840 | 2015/11/25 | 2016/11/24 |
| SPEAG | 2600MHz System Validation Kit | D2600V2 | 1061 | 2015/11/25 | 2016/11/24 |
| SPEAG | Data Acquisition Electronics | DAE4 | 917 | 2015/12/14 | 2016/12/13 |
| SPEAG | Data Acquisition Electronics | DAE4 | 905 | 2015/7/16 | 2016/7/15 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3661 | 2016/5/11 | 2017/5/10 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3954 | 2015/11/27 | 2016/11/26 |
| SPEAG | ELI4 Phantom | QD OVA 001 BB | TP-1079 | NCR | NCR |
| SPEAG | ELI4 Phantom | QD OVA 001 BB | TP-1127 | NCR | NCR |
| SPEAG | Phone Positioner | N/A | N/A | NCR | NCR |
| Anritsu | Radio communication analyzer | MT8820C | 6201300654 | 2015/8/10 | 2016/8/9 |
| Agilent | Wireless Communication Test Set | E5515C | MY52102706 | 2016/4/22 | 2017/4/21 |
| Agilent | ENA Series Network Analyzer | E5071C | MY46111157 | 2016/4/22 | 2017/4/21 |
| Agilent | Dielectric Probe Kit | 85070E | MY44300475 | NCR | NCR |
| R&S | Signal Generator | SMBV100A | 258305 | 2016/1/20 | 2017/1/19 |
| Anritsu | Power Senor | MA2411B | 0917070 | 2016/1/20 | 2017/1/19 |
| Anritsu | Power Meter | ML2495A | 1005002 | 2016/1/20 | 2017/1/19 |
| Anritsu | Power Senor | MA2411B | 1339163 | 2016/1/20 | 2017/1/19 |
| Anritsu | Power Meter | ML2495A | 1435004 | 2016/1/20 | 2017/1/19 |
| R&S | Spectrum Analyzer | FSP40 | 100319 | 2015/8/10 | 2016/8/9 |
| ARRA | Power Divider | A3200-2 | N/A | Note 1 | |
| Agilent | Dual Directional Coupler | 778D | 50422 | Note 1 | |
| PASTERNACK | Dual Directional Coupler | PE2214-10 | N/A | Note 1 | |
| AR | Amplifier | 5S1G4 | 333096 | Note 1 | |
| MCL | Attenuation1 | BW-S10W5+ | N/A | Note 1 | |
| MCL | Attenuation2 | BW-S10W5+ | N/A | Note 1 | |
| MCL | Attenuation3 | BW-S10W5+ | N/A | Note 1 | |

**General Note:**

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

# 11. System Verification

## 11.1 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| For Head | | | | | | | | |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 1800, 1900, 2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| 2600 | 54.8 | 0 | 0 | 0.1 | 0 | 45.1 | 1.96 | 39.0 |
| For Body | | | | | | | | |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 1800, 1900, 2000 | 70.2 | 0 | 0 | 0.4 | 0 | 29.4 | 1.52 | 53.3 |
| 2450 | 68.6 | 0 | 0 | 0 | 0 | 31.4 | 1.95 | 52.7 |
| 2600 | 68.1 | 0 | 0 | 0.1 | 0 | 31.8 | 2.16 | 52.5 |

**<Tissue Dielectric Parameter Check Results>**

| Frequency (MHz) | Tissue Type | Liquid Temp. (℃) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|---|
| 835 | Body | 22.7 | 0.966 | 57.085 | 0.97 | 55.2 | -0.41 | 3.41 | ±5 | 2016.5.29 |
| 1750 | Body | 22.8 | 1.528 | 53.219 | 1.49 | 53.4 | 2.55 | -0.34 | ±5 | 2016.5.27 |
| 1900 | Body | 22.8 | 1.551 | 54.638 | 1.52 | 53.3 | 2.04 | 2.51 | ±5 | 2016.5.27 |
| 2450 | Body | 22.9 | 1.989 | 51.422 | 1.95 | 52.7 | 2.00 | -2.43 | ±5 | 2016.6.8 |
| 2600 | Body | 22.9 | 2.165 | 53.823 | 2.16 | 52.5 | 0.23 | 2.52 | ±5 | 2016.5.28 |

## 11.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Date | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2016.5.29 | 835 | Body | 250 | 4d091 | 3954 | 905 | 2.26 | 9.55 | 9.04 | -5.34 |
| 2016.5.27 | 1750 | Body | 250 | 1069 | 3661 | 917 | 9.55 | 35.9 | 38.2 | 6.41 |
| 2016.5.27 | 1900 | Body | 250 | 5d118 | 3661 | 917 | 10.1 | 40.6 | 40.4 | -0.49 |
| 2016.6.8 | 2450 | Body | 250 | 840 | 3661 | 917 | 12.3 | 51.1 | 49.2 | -3.72 |
| 2016.5.28 | 2600 | Body | 250 | 1061 | 3661 | 917 | 13.9 | 54.6 | 55.6 | 1.83 |

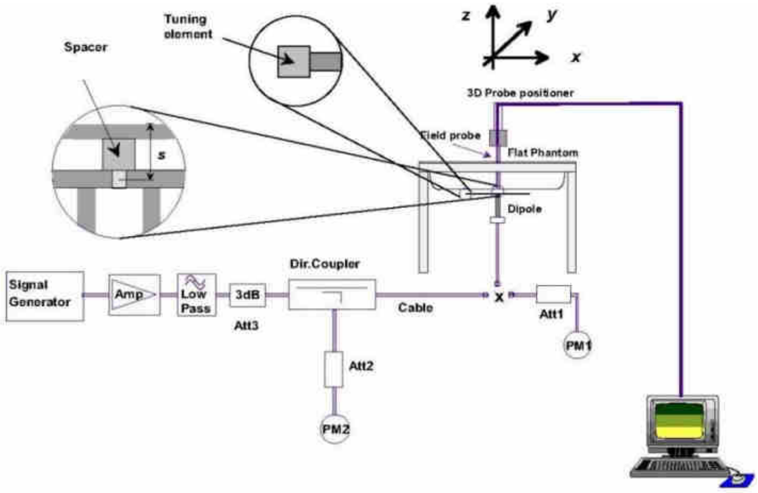



Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

# 12. RF Exposure Positions

## 12.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

# 13. Conducted RF Output Power (Unit: dBm)

## <GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, the GPRS 2Tx slots modes was selected for GSM850 / GSM1900, when EUT operating without power back-off, the GPRS 2Tx slots modes was selected for GSM850 / GSM1900 when EUT operating with power back-off, according to the highest source-based time-averaged output power.

**Maximum Average RF Power (Proximity Sensor Inactive)**

| Band GSM850 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 128 | 189 | 251 | | 128 | 189 | 251 | |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 | | 824.2 | 836.4 | 848.8 | |
| GSM 1 Tx slot | **31.71** | 31.62 | 31.69 | 33.50 | 22.71 | 22.62 | 22.69 | 24.50 |
| GPRS 1 Tx slot | 31.68 | 31.58 | 31.62 | 33.50 | 22.68 | 22.58 | 22.62 | 24.50 |
| GPRS 2 Tx slots | 29.82 | 29.64 | 29.73 | 30.50 | 23.82 | 23.64 | 23.73 | 24.50 |
| GPRS 3 Tx slots | 27.85 | 27.61 | 27.64 | 28.00 | 23.59 | 23.35 | 23.38 | 23.74 |
| GPRS 4 Tx slots | 25.98 | 26.01 | 26.07 | 26.50 | 22.98 | 23.01 | 23.07 | 23.50 |

**Remark:** The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

| Band GSM1900 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 512 | 661 | 810 | | 512 | 661 | 810 | |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 | | 1850.2 | 1880 | 1909.8 | |
| GSM 1 Tx slot | 29.24 | 29.30 | **29.36** | 30.50 | 20.24 | 20.30 | 20.36 | 21.50 |
| GPRS 1 Tx slot | 29.23 | 29.24 | 29.32 | 30.50 | 20.23 | 20.24 | 20.32 | 21.50 |
| GPRS 2 Tx slots | 27.56 | 27.62 | 27.58 | 28.00 | 21.56 | 21.62 | 21.58 | 22.00 |
| GPRS 3 Tx slots | 25.52 | 25.45 | 25.22 | 26.00 | 21.26 | 21.19 | 20.96 | 21.74 |
| GPRS 4 Tx slots | 23.94 | 23.99 | 23.79 | 24.50 | 20.94 | 20.99 | 20.79 | 21.50 |

**Remark:** The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

**Reduced Average RF Power (Proximity Sensor active)**

| Band GSM850 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 128 | 189 | 251 | | 128 | 189 | 251 | |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 | | 824.2 | 836.4 | 848.8 | |
| GSM 1 Tx slot | 30.93 | **30.96** | 30.77 | 31.00 | 21.93 | 21.96 | 21.77 | 22.00 |
| GPRS 1 Tx slot | 30.91 | 30.94 | 30.75 | 31.00 | 21.91 | 21.94 | 21.75 | 22.00 |
| GPRS 2 Tx slots | 28.64 | 28.62 | 28.68 | 29.00 | 22.64 | 22.62 | 22.68 | 23.00 |
| GPRS 3 Tx slots | 26.71 | 26.44 | 26.47 | 27.00 | 22.45 | 22.18 | 22.21 | 22.74 |
| GPRS 4 Tx slots | 24.88 | 24.83 | 24.95 | 25.50 | 21.88 | 21.83 | 21.95 | 22.50 |

**Remark:** The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

| Band GSM1900 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 512 | 661 | 810 | | 512 | 661 | 810 | |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 | | 1850.2 | 1880 | 1909.8 | |
| GSM 1 Tx slot | 27.56 | **27.89** | 27.69 | 28.00 | 18.56 | 18.89 | 18.69 | 19.00 |
| GPRS 1 Tx slot | 27.52 | 27.88 | 27.63 | 28.00 | 18.52 | 18.88 | 18.63 | 19.00 |
| GPRS 2 Tx slots | 24.41 | 24.45 | 24.50 | 25.00 | 18.41 | 18.45 | 18.50 | 19.00 |
| GPRS 3 Tx slots | 22.37 | 22.18 | 22.25 | 23.00 | 18.11 | 17.92 | 17.99 | 18.74 |
| GPRS 4 Tx slots | 20.83 | 20.86 | 20.69 | 21.00 | 17.83 | 17.86 | 17.69 | 18.00 |

**Remark:** The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

## <WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

**HSDPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

**Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1, Note 2) | CM (dB) (Note 3) | MPR (dB) (Note 3) |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 (Note 4) | 15/15 (Note 4) | 64 | 12/15 (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 |

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

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, $\Delta_{ACK}$ and $\Delta_{NACK}$ = 30/15 with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI}$ = 24/15 with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 11/15 and $\beta_d$ = 15/15.

**Setup Configuration**

**HSUPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors ($\beta_c$ and $\beta_d$) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

**Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1) | $\beta_{ec}$ | $\beta_{ed}$ (Note 5) (Note 6) | $\beta_{ed}$ (SF) | $\beta_{ed}$ (Codes) | CM (dB) (Note 2) | MPR (dB) (Note 2) | AG Index (Note 6) | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 (Note 3) | 15/15 (Note 3) | 64 | 11/15 (Note 3) | 22/15 | 209/225 | 1309/225 | 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_{ed}$1: 47/15<br>$\beta_{ed}$2: 47/15 | 4<br>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 (Note 4) | 15/15 (Note 4) | 64 | 15/15 (Note 4) | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs}$ = 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 signalled 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 signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 14/15 and $\beta_d$ = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: $\beta_{ed}$ can not be set directly, it is set by Absolute Grant Value.

**Setup Configuration**

**DC-HSDPA 3GPP release 8 Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: $\beta_c/\beta_d$=2/15
      b). Subtest 2: $\beta_c/\beta_d$=12/15
      c). Subtest 3: $\beta_c/\beta_d$=15/8
      d). Subtest 4: $\beta_c/\beta_d$=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

**Table C.8.1.12: Fixed Reference Channel H-Set 12**

| Parameter | Unit | Value |
|---|---|---|
| Nominal Avg. Inf. Bit Rate | kbps | 60 |
| Inter-TTI Distance | TTI's | 1 |
| Number of HARQ Processes | Processes | 6 |
| Information Bit Payload ( $N_{INF}$ ) | Bits | 120 |
| Number Code Blocks | Blocks | 1 |
| Binary Channel Bits Per TTI | Bits | 960 |
| Total Available SML's in UE | SML's | 19200 |
| Number of SML's per HARQ Proc. | SML's | 3200 |
| Coding Rate | | 0.15 |
| Number of Physical Channel Codes | Codes | 1 |
| Modulation | | QPSK |
| Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used. | | |

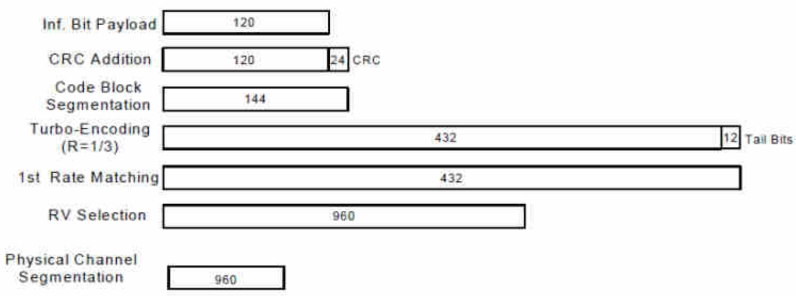



**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**

**Setup Configuration**

## <WCDMA Conducted Power>

**General Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

**Maximum Average RF Power (Proximity Sensor Inactive)**

| Band | | WCDMA Band V | | | Tune-up Limit (dBm) | WCDMA Band II | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | 4132 | 4182 | 4233 | | 9262 | 9400 | 9538 | |
| Rx Channel | | 4357 | 4407 | 4458 | | 9662 | 9800 | 9938 | |
| Frequency (MHz) | | 826.4 | 836.4 | 846.6 | | 1852.4 | 1880 | 1907.6 | |
| 3GPP Rel 99 | AMR 12.2Kbps | 23.54 | 23.57 | 23.57 | 25.00 | 23.71 | 23.84 | 23.81 | 24.50 |
| 3GPP Rel 99 | RMC 12.2Kbps | 23.56 | 23.58 | **23.59** | 25.00 | 23.73 | **23.86** | 23.82 | 24.50 |
| 3GPP Rel 6 | HSDPA Subtest-1 | 22.31 | 22.45 | 22.52 | 23.00 | 22.59 | 22.71 | 22.72 | 23.00 |
| 3GPP Rel 6 | HSDPA Subtest-2 | 22.52 | 22.53 | 22.51 | 23.00 | 22.62 | 22.71 | 22.74 | 23.00 |
| 3GPP Rel 6 | HSDPA Subtest-3 | 22.06 | 22.07 | 22.07 | 22.50 | 22.16 | 22.25 | 22.28 | 22.50 |
| 3GPP Rel 6 | HSDPA Subtest-4 | 22.03 | 22.04 | 22.05 | 22.50 | 22.15 | 22.24 | 22.26 | 22.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-1 | 22.16 | 22.05 | 22.06 | 22.50 | 22.26 | 22.36 | 22.32 | 22.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-2 | 22.16 | 22.12 | 22.06 | 22.50 | 22.20 | 22.33 | 22.45 | 22.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-3 | 22.13 | 22.19 | 22.17 | 22.50 | 22.21 | 22.36 | 22.39 | 22.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-4 | 22.16 | 22.15 | 22.17 | 22.50 | 22.24 | 22.34 | 22.36 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-1 | 21.93 | 21.48 | 22.16 | 22.50 | 22.36 | 22.44 | 22.44 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-2 | 20.65 | 20.81 | 20.97 | 21.50 | 21.05 | 21.02 | 22.03 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-3 | 20.34 | 21.15 | 21.15 | 21.50 | 21.55 | 20.72 | 21.68 | 22.00 |
| 3GPP Rel 6 | HSUPA Subtest-4 | 21.69 | 21.10 | 21.34 | 22.00 | 22.14 | 22.17 | 22.25 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-5 | 21.56 | 21.64 | 21.82 | 22.00 | 22.08 | 22.14 | 22.46 | 22.50 |

**Reduced Average RF Power (Proximity Sensor active)**

| Band | | WCDMA Band V | | | Tune-up Limit (dBm) | WCDMA Band II | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | 4132 | 4182 | 4233 | | 9262 | 9400 | 9538 | |
| Rx Channel | | 4357 | 4407 | 4458 | | 9662 | 9800 | 9938 | |
| Frequency (MHz) | | 826.4 | 836.4 | 846.6 | | 1852.4 | 1880 | 1907.6 | |
| 3GPP Rel 99 | AMR 12.2Kbps | 22.01 | 21.98 | 22.04 | 22.50 | 17.22 | 17.35 | 17.36 | 17.50 |
| 3GPP Rel 99 | RMC 12.2Kbps | 22.04 | 22.01 | **22.06** | 22.50 | 17.24 | 17.37 | **17.39** | 17.50 |
| 3GPP Rel 6 | HSDPA Subtest-1 | 20.91 | 20.79 | 20.93 | 21.50 | 16.18 | 16.16 | 16.21 | 16.50 |
| 3GPP Rel 6 | HSDPA Subtest-2 | 20.95 | 20.85 | 20.89 | 21.50 | 16.25 | 16.29 | 16.34 | 16.50 |
| 3GPP Rel 6 | HSDPA Subtest-3 | 20.44 | 20.51 | 20.50 | 21.00 | 15.67 | 15.78 | 15.74 | 16.00 |
| 3GPP Rel 6 | HSDPA Subtest-4 | 20.50 | 20.47 | 20.48 | 21.00 | 15.64 | 15.77 | 15.82 | 16.00 |
| 3GPP Rel 8 | DC-HSDPA Subtest-1 | 20.63 | 20.53 | 20.61 | 21.00 | 16.04 | 16.07 | 16.07 | 16.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-2 | 20.59 | 20.55 | 20.67 | 21.00 | 16.01 | 16.09 | 16.06 | 16.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-3 | 20.44 | 20.48 | 20.41 | 21.00 | 15.57 | 15.71 | 15.67 | 16.00 |
| 3GPP Rel 8 | DC-HSDPA Subtest-4 | 20.45 | 20.50 | 20.64 | 21.00 | 15.56 | 15.71 | 15.72 | 16.00 |
| 3GPP Rel 6 | HSUPA Subtest-1 | 19.95 | 19.91 | 19.93 | 20.50 | 15.84 | 15.94 | 16.02 | 16.50 |
| 3GPP Rel 6 | HSUPA Subtest-2 | 19.42 | 19.49 | 19.52 | 20.00 | 15.26 | 15.42 | 15.54 | 16.00 |
| 3GPP Rel 6 | HSUPA Subtest-3 | 19.03 | 19.08 | 19.12 | 19.50 | 14.87 | 15.11 | 15.23 | 16.00 |
| 3GPP Rel 6 | HSUPA Subtest-4 | 19.62 | 19.73 | 19.80 | 20.00 | 15.48 | 15.68 | 15.89 | 16.00 |
| 3GPP Rel 6 | HSUPA Subtest-5 | 19.97 | 20.13 | 20.21 | 20.50 | 15.79 | 16.92 | 16.25 | 17.00 |

## <LTE Conducted Power>

**General Note:**

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, 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 are ≤ 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.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B5 / B4 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Maximum Average RF Power (Proximity Sensor Inactive)

**<LTE Band 2>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 18700 | 18900 | 19100 | | |
| Frequency (MHz) | | | | 1860 | 1880 | 1900 | | |
| 20 | QPSK | 1 | 0 | 23.18 | 23.21 | 22.95 | 24.00 | 0 |
| 20 | QPSK | 1 | 49 | 23.24 | 23.27 | 23.16 | | |
| 20 | QPSK | 1 | 99 | 22.81 | 23.09 | 23.06 | | |
| 20 | QPSK | 50 | 0 | 21.93 | 22.03 | 21.94 | 23.00 | 1 |
| 20 | QPSK | 50 | 24 | 21.83 | 21.88 | 21.86 | | |
| 20 | QPSK | 50 | 50 | 21.75 | 22.01 | 21.89 | | |
| 20 | QPSK | 100 | 0 | 21.86 | 21.88 | 21.83 | | |
| 20 | 16QAM | 1 | 0 | 21.80 | 21.72 | 21.55 | 23.00 | 1 |
| 20 | 16QAM | 1 | 49 | 21.71 | 21.61 | 21.65 | | |
| 20 | 16QAM | 1 | 99 | 21.45 | 21.64 | 21.52 | | |
| 20 | 16QAM | 50 | 0 | 20.72 | 20.69 | 20.96 | 22.00 | 2 |
| 20 | 16QAM | 50 | 24 | 20.63 | 20.67 | 20.90 | | |
| 20 | 16QAM | 50 | 50 | 20.64 | 20.70 | 20.90 | | |
| 20 | 16QAM | 100 | 0 | 20.74 | 20.64 | 20.85 | | |
| Channel | | | | 18675 | 18900 | 19125 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1857.5 | 1880 | 1902.5 | | |
| 15 | QPSK | 1 | 0 | 23.04 | 22.95 | 23.01 | 24.00 | 0 |
| 15 | QPSK | 1 | 37 | 22.81 | 22.77 | 22.86 | | |
| 15 | QPSK | 1 | 74 | 22.76 | 22.82 | 22.80 | | |
| 15 | QPSK | 36 | 0 | 21.97 | 21.89 | 21.87 | 23.00 | 1 |
| 15 | QPSK | 36 | 20 | 21.83 | 21.88 | 21.86 | | |
| 15 | QPSK | 36 | 39 | 21.80 | 21.83 | 21.89 | | |
| 15 | QPSK | 75 | 0 | 21.82 | 21.83 | 21.99 | | |
| 15 | 16QAM | 1 | 0 | 22.30 | 22.32 | 22.37 | 23.00 | 1 |
| 15 | 16QAM | 1 | 37 | 22.08 | 22.16 | 22.14 | | |
| 15 | 16QAM | 1 | 74 | 22.04 | 22.08 | 22.10 | | |
| 15 | 16QAM | 36 | 0 | 20.77 | 20.78 | 20.70 | 22.00 | 2 |
| 15 | 16QAM | 36 | 20 | 20.74 | 20.79 | 20.61 | | |
| 15 | 16QAM | 36 | 39 | 20.72 | 20.83 | 20.70 | | |
| 15 | 16QAM | 75 | 0 | 20.75 | 20.74 | 20.81 | | |

| Channel | | | | 18650 | 18900 | 19150 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1855 | 1880 | 1905 | | |
| 10 | QPSK | 1 | 0 | 22.95 | 22.86 | 22.88 | 24.00 | 0 |
| 10 | QPSK | 1 | 25 | 22.74 | 22.75 | 23.17 | | |
| 10 | QPSK | 1 | 49 | 22.76 | 22.79 | 22.87 | | |
| 10 | QPSK | 25 | 0 | 21.87 | 21.78 | 21.86 | 23.00 | 1 |
| 10 | QPSK | 25 | 12 | 21.92 | 21.88 | 21.97 | | |
| 10 | QPSK | 25 | 25 | 21.78 | 21.87 | 21.87 | | |
| 10 | QPSK | 50 | 0 | 21.87 | 21.84 | 21.96 | | |
| 10 | 16QAM | 1 | 0 | 22.31 | 22.29 | 21.85 | 23.00 | 1 |
| 10 | 16QAM | 1 | 25 | 22.28 | 22.10 | 21.83 | | |
| 10 | 16QAM | 1 | 49 | 22.12 | 22.24 | 21.87 | | |
| 10 | 16QAM | 25 | 0 | 20.76 | 20.80 | 20.98 | 22.00 | 2 |
| 10 | 16QAM | 25 | 12 | 20.85 | 21.07 | 20.82 | | |
| 10 | 16QAM | 25 | 25 | 20.70 | 21.08 | 20.77 | | |
| 10 | 16QAM | 50 | 0 | 20.78 | 20.85 | 20.79 | | |
| Channel | | | | 18625 | 18900 | 19175 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1852.5 | 1880 | 1907.5 | | |
| 5 | QPSK | 1 | 0 | 22.84 | 22.89 | 22.72 | 24.00 | 0 |
| 5 | QPSK | 1 | 12 | 23.20 | 22.82 | 22.88 | | |
| 5 | QPSK | 1 | 24 | 22.91 | 22.76 | 22.76 | | |
| 5 | QPSK | 12 | 0 | 21.79 | 21.67 | 21.75 | 23.00 | 1 |
| 5 | QPSK | 12 | 7 | 21.75 | 21.85 | 21.82 | | |
| 5 | QPSK | 12 | 13 | 21.73 | 21.86 | 21.81 | | |
| 5 | QPSK | 25 | 0 | 21.79 | 21.73 | 21.85 | | |
| 5 | 16QAM | 1 | 0 | 21.94 | 22.18 | 22.13 | 23.00 | 1 |
| 5 | 16QAM | 1 | 12 | 22.06 | 22.19 | 22.05 | | |
| 5 | 16QAM | 1 | 24 | 21.90 | 22.14 | 22.16 | | |
| 5 | 16QAM | 12 | 0 | 20.70 | 20.78 | 20.77 | 22.00 | 2 |
| 5 | 16QAM | 12 | 7 | 20.68 | 20.78 | 20.71 | | |
| 5 | 16QAM | 12 | 13 | 20.75 | 20.78 | 20.76 | | |
| 5 | 16QAM | 25 | 0 | 20.61 | 20.74 | 20.75 | | |

| Channel | | | | 18615 | 18900 | 19185 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1851.5 | 1880 | 1908.5 | | |
| 3 | QPSK | 1 | 0 | 22.80 | 22.69 | 22.81 | 24.00 | 0 |
| 3 | QPSK | 1 | 8 | 22.87 | 22.53 | 22.94 | | |
| 3 | QPSK | 1 | 14 | 22.85 | 22.70 | 22.90 | | |
| 3 | QPSK | 8 | 0 | 21.77 | 21.79 | 21.77 | 23.00 | 1 |
| 3 | QPSK | 8 | 4 | 21.75 | 21.82 | 21.82 | | |
| 3 | QPSK | 8 | 7 | 21.81 | 21.86 | 21.82 | | |
| 3 | QPSK | 15 | 0 | 21.73 | 21.72 | 21.78 | | |
| 3 | 16QAM | 1 | 0 | 21.51 | 21.59 | 21.51 | 23.00 | 1 |
| 3 | 16QAM | 1 | 8 | 21.50 | 21.97 | 21.66 | | |
| 3 | 16QAM | 1 | 14 | 21.50 | 22.06 | 21.54 | | |
| 3 | 16QAM | 8 | 0 | 20.60 | 20.62 | 20.75 | 22.00 | 2 |
| 3 | 16QAM | 8 | 4 | 20.55 | 20.65 | 20.67 | | |
| 3 | 16QAM | 8 | 7 | 20.53 | 20.69 | 20.70 | | |
| 3 | 16QAM | 15 | 0 | 20.62 | 20.42 | 20.74 | | |
| Channel | | | | 18607 | 18900 | 19193 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1850.7 | 1880 | 1909.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.73 | 22.81 | 22.76 | 24.00 | 0 |
| 1.4 | QPSK | 1 | 3 | 22.86 | 22.77 | 22.68 | | |
| 1.4 | QPSK | 1 | 5 | 22.80 | 22.76 | 22.65 | | |
| 1.4 | QPSK | 3 | 0 | 22.73 | 22.82 | 22.82 | | |
| 1.4 | QPSK | 3 | 1 | 22.69 | 22.87 | 22.93 | | |
| 1.4 | QPSK | 3 | 3 | 22.76 | 22.88 | 22.82 | | |
| 1.4 | QPSK | 6 | 0 | 21.72 | 21.70 | 21.84 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.10 | 22.07 | 22.02 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 3 | 22.15 | 21.96 | 22.31 | | |
| 1.4 | 16QAM | 1 | 5 | 21.99 | 21.83 | 21.97 | | |
| 1.4 | 16QAM | 3 | 0 | 22.24 | 21.69 | 22.22 | | |
| 1.4 | 16QAM | 3 | 1 | 22.18 | 21.92 | 22.20 | | |
| 1.4 | 16QAM | 3 | 3 | 22.42 | 21.93 | 22.51 | | |
| 1.4 | 16QAM | 6 | 0 | 20.71 | 20.40 | 20.71 | 22.00 | 2 |

**<LTE Band 4>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20050 | 20175 | 20300 | | |
| Frequency (MHz) | | | | 1720 | 1732.5 | 1745 | | |
| 20 | QPSK | 1 | 0 | 23.51 | 23.59 | 23.57 | 24.00 | 0 |
| 20 | QPSK | 1 | 49 | 23.29 | 23.57 | 23.56 | | |
| 20 | QPSK | 1 | 99 | 23.00 | 23.47 | 23.32 | | |
| 20 | QPSK | 50 | 0 | 22.43 | 22.99 | 22.41 | 23.00 | 1 |
| 20 | QPSK | 50 | 24 | 22.30 | 22.39 | 22.35 | | |
| 20 | QPSK | 50 | 50 | 22.14 | 22.19 | 22.15 | | |
| 20 | QPSK | 100 | 0 | 22.22 | 22.25 | 22.21 | | |
| 20 | 16QAM | 1 | 0 | 22.82 | 22.25 | 22.34 | 23.00 | 1 |
| 20 | 16QAM | 1 | 49 | 22.79 | 22.07 | 22.10 | | |
| 20 | 16QAM | 1 | 99 | 22.39 | 22.01 | 21.76 | | |
| 20 | 16QAM | 50 | 0 | 21.37 | 21.17 | 21.26 | 22.00 | 2 |
| 20 | 16QAM | 50 | 24 | 21.24 | 21.11 | 21.21 | | |
| 20 | 16QAM | 50 | 50 | 21.15 | 21.04 | 21.12 | | |
| 20 | 16QAM | 100 | 0 | 21.24 | 21.19 | 21.15 | | |
| Channel | | | | 20025 | 20175 | 20325 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1732.5 | 1747.5 | | |
| 15 | QPSK | 1 | 0 | 23.12 | 23.01 | 23.11 | 24.00 | 0 |
| 15 | QPSK | 1 | 37 | 23.32 | 23.22 | 23.27 | | |
| 15 | QPSK | 1 | 74 | 23.01 | 23.33 | 22.97 | | |
| 15 | QPSK | 36 | 0 | 22.39 | 22.34 | 22.40 | 23.00 | 1 |
| 15 | QPSK | 36 | 20 | 22.30 | 22.28 | 22.33 | | |
| 15 | QPSK | 36 | 39 | 22.33 | 22.23 | 22.15 | | |
| 15 | QPSK | 75 | 0 | 22.31 | 22.27 | 22.23 | | |
| 15 | 16QAM | 1 | 0 | 22.85 | 22.69 | 22.87 | 23.00 | 1 |
| 15 | 16QAM | 1 | 37 | 22.70 | 22.42 | 22.67 | | |
| 15 | 16QAM | 1 | 74 | 22.42 | 22.54 | 22.46 | | |
| 15 | 16QAM | 36 | 0 | 21.31 | 21.17 | 21.35 | 22.00 | 2 |
| 15 | 16QAM | 36 | 20 | 21.24 | 21.02 | 21.36 | | |
| 15 | 16QAM | 36 | 39 | 21.35 | 21.00 | 21.18 | | |
| 15 | 16QAM | 75 | 0 | 21.24 | 21.21 | 21.26 | | |

| Channel | | | | 20000 | 20175 | 20350 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1715 | 1732.5 | 1750 | | |
| 10 | QPSK | 1 | 0 | 23.37 | 23.01 | 23.31 | 24.00 | 0 |
| 10 | QPSK | 1 | 25 | 23.31 | 23.35 | 23.11 | | |
| 10 | QPSK | 1 | 49 | 23.25 | 23.01 | 23.26 | | |
| 10 | QPSK | 25 | 0 | 22.29 | 22.30 | 22.37 | 23.00 | 1 |
| 10 | QPSK | 25 | 12 | 22.27 | 22.17 | 22.31 | | |
| 10 | QPSK | 25 | 25 | 22.27 | 22.23 | 22.09 | | |
| 10 | QPSK | 50 | 0 | 22.35 | 22.22 | 22.23 | | |
| 10 | 16QAM | 1 | 0 | 22.11 | 22.70 | 22.75 | 23.00 | 1 |
| 10 | 16QAM | 1 | 25 | 22.06 | 22.64 | 22.69 | | |
| 10 | 16QAM | 1 | 49 | 22.01 | 22.64 | 22.45 | | |
| 10 | 16QAM | 25 | 0 | 21.43 | 21.15 | 21.13 | 22.00 | 2 |
| 10 | 16QAM | 25 | 12 | 21.23 | 21.13 | 21.16 | | |
| 10 | 16QAM | 25 | 25 | 21.13 | 21.11 | 21.14 | | |
| 10 | 16QAM | 50 | 0 | 21.28 | 21.18 | 21.27 | | |
| Channel | | | | 19975 | 20175 | 20375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1712.5 | 1732.5 | 1752.5 | | |
| 5 | QPSK | 1 | 0 | 23.18 | 23.29 | 23.23 | 24.00 | 0 |
| 5 | QPSK | 1 | 12 | 23.13 | 23.22 | 23.32 | | |
| 5 | QPSK | 1 | 24 | 23.18 | 23.26 | 23.08 | | |
| 5 | QPSK | 12 | 0 | 22.19 | 22.23 | 22.29 | 23.00 | 1 |
| 5 | QPSK | 12 | 7 | 22.24 | 22.17 | 22.12 | | |
| 5 | QPSK | 12 | 13 | 22.30 | 22.22 | 22.14 | | |
| 5 | QPSK | 25 | 0 | 22.31 | 22.22 | 22.18 | | |
| 5 | 16QAM | 1 | 0 | 22.62 | 22.44 | 22.51 | 23.00 | 1 |
| 5 | 16QAM | 1 | 12 | 22.69 | 22.64 | 22.31 | | |
| 5 | 16QAM | 1 | 24 | 22.41 | 21.94 | 22.28 | | |
| 5 | 16QAM | 12 | 0 | 21.24 | 21.15 | 21.03 | 22.00 | 2 |
| 5 | 16QAM | 12 | 7 | 21.19 | 21.12 | 20.95 | | |
| 5 | 16QAM | 12 | 13 | 21.25 | 21.18 | 21.08 | | |
| 5 | 16QAM | 25 | 0 | 21.26 | 21.18 | 21.21 | | |

| Channel | | | | 19965 | 20175 | 20385 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1711.5 | 1732.5 | 1753.5 | | |
| 3 | QPSK | 1 | 0 | 23.30 | 23.25 | 23.19 | 24.00 | 0 |
| 3 | QPSK | 1 | 8 | 23.13 | 23.27 | 23.10 | | |
| 3 | QPSK | 1 | 14 | 23.15 | 23.33 | 22.98 | | |
| 3 | QPSK | 8 | 0 | 22.47 | 22.19 | 22.28 | 23.00 | 1 |
| 3 | QPSK | 8 | 4 | 22.29 | 22.22 | 22.20 | | |
| 3 | QPSK | 8 | 7 | 22.31 | 22.18 | 22.28 | | |
| 3 | QPSK | 15 | 0 | 22.17 | 22.14 | 22.10 | | |
| 3 | 16QAM | 1 | 0 | 22.72 | 21.95 | 22.38 | 23.00 | 1 |
| 3 | 16QAM | 1 | 8 | 23.00 | 22.63 | 22.87 | | |
| 3 | 16QAM | 1 | 14 | 22.63 | 22.43 | 22.41 | | |
| 3 | 16QAM | 8 | 0 | 21.58 | 21.08 | 21.30 | 22.00 | 2 |
| 3 | 16QAM | 8 | 4 | 21.25 | 21.02 | 21.29 | | |
| 3 | 16QAM | 8 | 7 | 21.17 | 21.12 | 21.29 | | |
| 3 | 16QAM | 15 | 0 | 21.02 | 20.91 | 21.27 | | |
| Channel | | | | 19957 | 20175 | 20393 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1710.7 | 1732.5 | 1754.3 | | |
| 1.4 | QPSK | 1 | 0 | 23.14 | 23.26 | 23.18 | 24.00 | 0 |
| 1.4 | QPSK | 1 | 3 | 23.03 | 23.19 | 23.21 | | |
| 1.4 | QPSK | 1 | 5 | 23.29 | 23.17 | 23.05 | | |
| 1.4 | QPSK | 3 | 0 | 23.11 | 23.24 | 23.18 | | |
| 1.4 | QPSK | 3 | 1 | 23.01 | 23.35 | 23.21 | | |
| 1.4 | QPSK | 3 | 3 | 23.02 | 23.34 | 23.21 | | |
| 1.4 | QPSK | 6 | 0 | 22.37 | 22.15 | 22.23 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.02 | 21.94 | 22.36 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 3 | 22.04 | 21.95 | 22.68 | | |
| 1.4 | 16QAM | 1 | 5 | 21.94 | 21.87 | 22.32 | | |
| 1.4 | 16QAM | 3 | 0 | 22.00 | 21.93 | 22.62 | | |
| 1.4 | 16QAM | 3 | 1 | 21.95 | 21.83 | 22.55 | | |
| 1.4 | 16QAM | 3 | 3 | 22.14 | 21.94 | 22.55 | | |
| 1.4 | 16QAM | 6 | 0 | 21.06 | 20.95 | 21.25 | 22.00 | 2 |

**<LTE Band 5>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20450 | 20525 | 20600 | | |
| Frequency (MHz) | | | | 829 | 836.5 | 844 | | |
| 10 | QPSK | 1 | 0 | 23.16 | 23.06 | 23.19 | 24.00 | 0 |
| 10 | QPSK | 1 | 25 | 23.19 | 23.18 | 23.40 | | |
| 10 | QPSK | 1 | 49 | 23.17 | 23.17 | 23.18 | | |
| 10 | QPSK | 25 | 0 | 22.12 | 22.11 | 22.17 | 23.00 | 1 |
| 10 | QPSK | 25 | 12 | 22.12 | 22.10 | 22.15 | | |
| 10 | QPSK | 25 | 25 | 22.05 | 22.06 | 22.10 | | |
| 10 | QPSK | 50 | 0 | 22.15 | 22.06 | 22.17 | | |
| 10 | 16QAM | 1 | 0 | 21.71 | 21.78 | 22.61 | 23.00 | 1 |
| 10 | 16QAM | 1 | 25 | 21.69 | 21.70 | 22.34 | | |
| 10 | 16QAM | 1 | 49 | 21.67 | 21.70 | 22.22 | | |
| 10 | 16QAM | 25 | 0 | 21.33 | 21.22 | 21.14 | 22.00 | 2 |
| 10 | 16QAM | 25 | 12 | 21.13 | 21.12 | 21.14 | | |
| 10 | 16QAM | 25 | 25 | 21.16 | 20.92 | 21.13 | | |
| 10 | 16QAM | 50 | 0 | 21.17 | 21.04 | 20.96 | | |
| Channel | | | | 20425 | 20525 | 20625 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 826.5 | 836.5 | 846.5 | | |
| 5 | QPSK | 1 | 0 | 22.85 | 22.83 | 22.97 | 24.00 | 0 |
| 5 | QPSK | 1 | 12 | 23.08 | 22.93 | 23.19 | | |
| 5 | QPSK | 1 | 24 | 22.81 | 23.02 | 22.91 | | |
| 5 | QPSK | 12 | 0 | 22.11 | 22.02 | 22.17 | 23.00 | 1 |
| 5 | QPSK | 12 | 7 | 22.12 | 21.94 | 22.11 | | |
| 5 | QPSK | 12 | 13 | 22.13 | 21.93 | 21.93 | | |
| 5 | QPSK | 25 | 0 | 22.08 | 22.03 | 22.13 | | |
| 5 | 16QAM | 1 | 0 | 22.60 | 22.29 | 22.43 | 23.00 | 1 |
| 5 | 16QAM | 1 | 12 | 22.85 | 22.17 | 22.30 | | |
| 5 | 16QAM | 1 | 24 | 22.69 | 22.33 | 22.13 | | |
| 5 | 16QAM | 12 | 0 | 21.01 | 20.94 | 21.06 | 22.00 | 2 |
| 5 | 16QAM | 12 | 7 | 21.06 | 20.96 | 21.04 | | |
| 5 | 16QAM | 12 | 13 | 21.07 | 20.91 | 20.96 | | |
| 5 | 16QAM | 25 | 0 | 21.10 | 20.91 | 21.06 | | |

| Channel | | | | 20415 | 20525 | 20635 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 825.5 | 836.5 | 847.5 | | |
| 3 | QPSK | 1 | 0 | 23.15 | 22.86 | 23.07 | 24.00 | 0 |
| 3 | QPSK | 1 | 8 | 23.07 | 23.01 | 23.03 | | |
| 3 | QPSK | 1 | 14 | 23.21 | 22.79 | 22.97 | | |
| 3 | QPSK | 8 | 0 | 22.09 | 21.98 | 22.06 | 23.00 | 1 |
| 3 | QPSK | 8 | 4 | 22.03 | 21.93 | 21.98 | | |
| 3 | QPSK | 8 | 7 | 22.13 | 21.95 | 21.99 | | |
| 3 | QPSK | 15 | 0 | 22.02 | 21.96 | 22.01 | | |
| 3 | 16QAM | 1 | 0 | 21.71 | 22.69 | 21.80 | 23.00 | 1 |
| 3 | 16QAM | 1 | 8 | 21.85 | 22.81 | 21.83 | | |
| 3 | 16QAM | 1 | 14 | 21.71 | 22.65 | 21.67 | | |
| 3 | 16QAM | 8 | 0 | 20.80 | 20.95 | 20.84 | 22.00 | 2 |
| 3 | 16QAM | 8 | 4 | 20.84 | 20.96 | 20.77 | | |
| 3 | 16QAM | 8 | 7 | 20.89 | 20.91 | 20.82 | | |
| 3 | 16QAM | 15 | 0 | 20.85 | 20.74 | 20.86 | | |
| Channel | | | | 20407 | 20525 | 20643 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 824.7 | 836.5 | 848.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.85 | 22.81 | 22.95 | 24.00 | 0 |
| 1.4 | QPSK | 1 | 3 | 23.09 | 22.92 | 22.93 | | |
| 1.4 | QPSK | 1 | 5 | 22.94 | 22.85 | 22.81 | | |
| 1.4 | QPSK | 3 | 0 | 22.98 | 22.91 | 23.01 | | |
| 1.4 | QPSK | 3 | 1 | 23.13 | 22.97 | 22.93 | | |
| 1.4 | QPSK | 3 | 3 | 23.05 | 22.93 | 22.79 | | |
| 1.4 | QPSK | 6 | 0 | 22.04 | 21.87 | 21.90 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.13 | 22.22 | 22.62 | 23.00 | 1 |
| 1.4 | 16QAM | 1 | 3 | 22.22 | 22.23 | 22.68 | | |
| 1.4 | 16QAM | 1 | 5 | 22.12 | 22.15 | 22.47 | | |
| 1.4 | 16QAM | 3 | 0 | 22.12 | 21.82 | 22.14 | | |
| 1.4 | 16QAM | 3 | 1 | 22.08 | 22.11 | 22.05 | | |
| 1.4 | 16QAM | 3 | 3 | 21.82 | 21.96 | 21.84 | | |
| 1.4 | 16QAM | 6 | 0 | 20.69 | 20.72 | 20.68 | 22.00 | 2 |

**<LTE Band 7>**

| BW [MHz] | Modulation | RB Size | RB Offset | Measured Power | | | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20850 | 21100 | 21350 | | |
| Frequency (MHz) | | | | 2510 | 2535 | 2560 | | |
| 20 | QPSK | 1 | 0 | 23.99 | 24.05 | 24.31 | 24.50 | 0 |
| 20 | QPSK | 1 | 49 | 23.97 | 23.96 | 23.99 | | |
| 20 | QPSK | 1 | 99 | 23.91 | 23.74 | 24.06 | | |
| 20 | QPSK | 50 | 0 | 23.01 | 23.08 | 23.17 | 23.50 | 1 |
| 20 | QPSK | 50 | 24 | 22.91 | 23.04 | 23.11 | | |
| 20 | QPSK | 50 | 50 | 22.99 | 23.06 | 23.09 | | |
| 20 | QPSK | 100 | 0 | 23.00 | 23.11 | 23.13 | | |
| 20 | 16QAM | 1 | 0 | 23.26 | 23.33 | 23.03 | 23.50 | 1 |
| 20 | 16QAM | 1 | 49 | 23.14 | 23.46 | 22.99 | | |
| 20 | 16QAM | 1 | 99 | 23.10 | 23.10 | 22.77 | | |
| 20 | 16QAM | 50 | 0 | 21.92 | 21.95 | 22.04 | 22.50 | 2 |
| 20 | 16QAM | 50 | 24 | 21.88 | 21.96 | 22.03 | | |
| 20 | 16QAM | 50 | 50 | 21.95 | 21.99 | 21.99 | | |
| 20 | 16QAM | 100 | 0 | 22.05 | 22.01 | 22.05 | | |
| Channel | | | | 20825 | 21100 | 21375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2507.5 | 2535 | 2562.5 | | |
| 15 | QPSK | 1 | 0 | 24.24 | 24.15 | 24.06 | 24.50 | 0 |
| 15 | QPSK | 1 | 37 | 23.92 | 24.09 | 24.04 | | |
| 15 | QPSK | 1 | 74 | 23.96 | 23.83 | 24.08 | | |
| 15 | QPSK | 36 | 0 | 23.00 | 23.10 | 23.19 | 23.50 | 1 |
| 15 | QPSK | 36 | 20 | 23.00 | 23.03 | 23.15 | | |
| 15 | QPSK | 36 | 39 | 23.08 | 23.05 | 23.09 | | |
| 15 | QPSK | 75 | 0 | 22.99 | 23.03 | 23.13 | | |
| 15 | 16QAM | 1 | 0 | 23.06 | 23.42 | 23.47 | 23.50 | 1 |
| 15 | 16QAM | 1 | 37 | 22.78 | 23.32 | 23.33 | | |
| 15 | 16QAM | 1 | 74 | 22.73 | 23.22 | 23.37 | | |
| 15 | 16QAM | 36 | 0 | 21.96 | 21.84 | 21.99 | 22.50 | 2 |
| 15 | 16QAM | 36 | 20 | 21.98 | 21.85 | 21.90 | | |
| 15 | 16QAM | 36 | 39 | 22.02 | 21.90 | 21.90 | | |
| 15 | 16QAM | 75 | 0 | 21.87 | 21.99 | 22.09 | | |

| Channel | | | | 20800 | 21100 | 21400 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 2505 | 2535 | 2565 | | |
| 10 | QPSK | 1 | 0 | 24.08 | 24.00 | 24.16 | 24.50 | 0 |
| 10 | QPSK | 1 | 25 | 23.87 | 24.00 | 24.17 | | |
| 10 | QPSK | 1 | 49 | 23.88 | 23.91 | 24.08 | | |
| 10 | QPSK | 25 | 0 | 22.91 | 23.06 | 23.14 | 23.50 | 1 |
| 10 | QPSK | 25 | 12 | 22.93 | 23.01 | 23.08 | | |
| 10 | QPSK | 25 | 25 | 22.90 | 23.07 | 23.08 | | |
| 10 | QPSK | 50 | 0 | 22.97 | 23.00 | 23.12 | | |
| 10 | 16QAM | 1 | 0 | 23.41 | 23.35 | 23.27 | 23.50 | 1 |
| 10 | 16QAM | 1 | 25 | 23.48 | 23.25 | 23.21 | | |
| 10 | 16QAM | 1 | 49 | 23.47 | 23.28 | 22.83 | | |
| 10 | 16QAM | 25 | 0 | 22.21 | 22.10 | 22.37 | 22.50 | 2 |
| 10 | 16QAM | 25 | 12 | 22.25 | 22.15 | 22.30 | | |
| 10 | 16QAM | 25 | 25 | 22.07 | 22.19 | 22.29 | | |
| 10 | 16QAM | 50 | 0 | 21.84 | 21.85 | 22.12 | | |
| Channel | | | | 20775 | 21100 | 21425 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2502.5 | 2535 | 2567.5 | | |
| 5 | QPSK | 1 | 0 | 24.12 | 23.81 | 23.73 | 24.50 | 0 |
| 5 | QPSK | 1 | 12 | 24.25 | 24.33 | 23.90 | | |
| 5 | QPSK | 1 | 24 | 23.71 | 23.84 | 23.75 | | |
| 5 | QPSK | 12 | 0 | 23.01 | 23.05 | 22.98 | 23.50 | 1 |
| 5 | QPSK | 12 | 7 | 22.96 | 23.09 | 23.09 | | |
| 5 | QPSK | 12 | 13 | 22.82 | 23.02 | 22.98 | | |
| 5 | QPSK | 25 | 0 | 22.93 | 23.05 | 23.04 | | |
| 5 | 16QAM | 1 | 0 | 22.99 | 23.01 | 23.02 | 23.50 | 1 |
| 5 | 16QAM | 1 | 12 | 22.71 | 23.01 | 23.01 | | |
| 5 | 16QAM | 1 | 24 | 22.58 | 23.03 | 23.01 | | |
| 5 | 16QAM | 12 | 0 | 21.98 | 22.01 | 22.04 | 22.50 | 2 |
| 5 | 16QAM | 12 | 7 | 22.21 | 21.98 | 22.04 | | |
| 5 | 16QAM | 12 | 13 | 22.12 | 21.98 | 21.84 | | |
| 5 | 16QAM | 25 | 0 | 21.80 | 22.18 | 21.97 | | |

## Reduced Average RF Power (Proximity Sensor active)

### <LTE Band 2>

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 18700 | 18900 | 19100 | | |
| Frequency (MHz) | | | | 1860 | 1880 | 1900 | | |
| 20 | QPSK | 1 | 0 | 17.35 | 16.94 | 17.04 | 18.00 | 0 |
| 20 | QPSK | 1 | 49 | 17.16 | 16.90 | 17.01 | | |
| 20 | QPSK | 1 | 99 | 16.89 | 16.82 | 16.91 | | |
| 20 | QPSK | 50 | 0 | 16.93 | 16.92 | 16.81 | 18.00 | 0 |
| 20 | QPSK | 50 | 24 | 16.80 | 16.87 | 16.74 | | |
| 20 | QPSK | 50 | 50 | 16.65 | 16.90 | 16.74 | | |
| 20 | QPSK | 100 | 0 | 16.83 | 16.80 | 16.80 | | |
| 20 | 16QAM | 1 | 0 | 16.75 | 17.14 | 16.67 | 18.00 | 0 |
| 20 | 16QAM | 1 | 49 | 16.56 | 17.07 | 16.65 | | |
| 20 | 16QAM | 1 | 99 | 16.25 | 17.04 | 16.59 | | |
| 20 | 16QAM | 50 | 0 | 16.88 | 16.95 | 16.82 | 18.00 | 0 |
| 20 | 16QAM | 50 | 24 | 16.84 | 16.90 | 16.73 | | |
| 20 | 16QAM | 50 | 50 | 16.79 | 16.93 | 16.71 | | |
| 20 | 16QAM | 100 | 0 | 16.85 | 16.80 | 16.77 | | |
| Channel | | | | 18675 | 18900 | 19125 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1857.5 | 1880 | 1902.5 | | |
| 15 | QPSK | 1 | 0 | 17.16 | 17.05 | 17.07 | 18.00 | 0 |
| 15 | QPSK | 1 | 37 | 17.02 | 16.90 | 16.94 | | |
| 15 | QPSK | 1 | 74 | 16.77 | 16.92 | 16.97 | | |
| 15 | QPSK | 36 | 0 | 16.94 | 16.92 | 16.85 | 18.00 | 0 |
| 15 | QPSK | 36 | 20 | 16.85 | 16.89 | 16.90 | | |
| 15 | QPSK | 36 | 39 | 16.77 | 16.91 | 16.92 | | |
| 15 | QPSK | 75 | 0 | 16.85 | 16.87 | 16.87 | | |
| 15 | 16QAM | 1 | 0 | 17.34 | 17.16 | 17.33 | 18.00 | 0 |
| 15 | 16QAM | 1 | 37 | 17.16 | 17.11 | 17.01 | | |
| 15 | 16QAM | 1 | 74 | 17.02 | 17.09 | 17.16 | | |
| 15 | 16QAM | 36 | 0 | 16.96 | 16.83 | 16.83 | 18.00 | 0 |
| 15 | 16QAM | 36 | 20 | 16.88 | 16.83 | 16.80 | | |
| 15 | 16QAM | 36 | 39 | 16.80 | 16.84 | 16.89 | | |
| 15 | 16QAM | 75 | 0 | 16.86 | 16.90 | 16.84 | | |

| Channel | | | | 18650 | 18900 | 19150 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1855 | 1880 | 1905 | | |
| 10 | QPSK | 1 | 0 | 17.09 | 16.86 | 16.89 | 18.00 | 0 |
| 10 | QPSK | 1 | 25 | 17.12 | 17.01 | 16.79 | | |
| 10 | QPSK | 1 | 49 | 17.09 | 16.84 | 16.77 | | |
| 10 | QPSK | 25 | 0 | 16.87 | 16.85 | 16.79 | 18.00 | 0 |
| 10 | QPSK | 25 | 12 | 16.89 | 16.91 | 16.90 | | |
| 10 | QPSK | 25 | 25 | 16.82 | 16.86 | 16.91 | | |
| 10 | QPSK | 50 | 0 | 16.84 | 16.86 | 16.92 | | |
| 10 | 16QAM | 1 | 0 | 16.64 | 17.31 | 17.15 | 18.00 | 0 |
| 10 | 16QAM | 1 | 25 | 16.43 | 17.07 | 17.07 | | |
| 10 | 16QAM | 1 | 49 | 16.38 | 17.11 | 17.32 | | |
| 10 | 16QAM | 25 | 0 | 17.03 | 16.99 | 16.88 | 18.00 | 0 |
| 10 | 16QAM | 25 | 12 | 16.82 | 16.85 | 16.88 | | |
| 10 | 16QAM | 25 | 25 | 16.64 | 16.86 | 16.86 | | |
| 10 | 16QAM | 50 | 0 | 16.90 | 16.78 | 16.90 | | |
| Channel | | | | 18625 | 18900 | 19175 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1852.5 | 1880 | 1907.5 | | |
| 5 | QPSK | 1 | 0 | 16.55 | 16.76 | 16.94 | 18.00 | 0 |
| 5 | QPSK | 1 | 12 | 16.76 | 17.10 | 16.92 | | |
| 5 | QPSK | 1 | 24 | 16.51 | 16.64 | 16.96 | | |
| 5 | QPSK | 12 | 0 | 16.80 | 16.85 | 16.88 | 18.00 | 0 |
| 5 | QPSK | 12 | 7 | 16.80 | 16.85 | 16.84 | | |
| 5 | QPSK | 12 | 13 | 16.76 | 16.84 | 16.91 | | |
| 5 | QPSK | 25 | 0 | 16.85 | 16.81 | 16.90 | | |
| 5 | 16QAM | 1 | 0 | 16.88 | 17.43 | 17.46 | 18.00 | 0 |
| 5 | 16QAM | 1 | 12 | 17.02 | 17.37 | 17.51 | | |
| 5 | 16QAM | 1 | 24 | 16.82 | 16.81 | 17.10 | | |
| 5 | 16QAM | 12 | 0 | 16.85 | 16.85 | 16.77 | 18.00 | 0 |
| 5 | 16QAM | 12 | 7 | 16.83 | 16.74 | 16.87 | | |
| 5 | 16QAM | 12 | 13 | 16.82 | 16.81 | 16.83 | | |
| 5 | 16QAM | 25 | 0 | 16.91 | 16.72 | 16.93 | | |

| Channel | | | | 18615 | 18900 | 19185 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1851.5 | 1880 | 1908.5 | | |
| 3 | QPSK | 1 | 0 | 16.73 | 16.69 | 16.73 | 18.00 | 0 |
| 3 | QPSK | 1 | 8 | 16.78 | 16.93 | 17.11 | | |
| 3 | QPSK | 1 | 14 | 16.69 | 16.83 | 16.84 | | |
| 3 | QPSK | 8 | 0 | 16.87 | 16.79 | 16.87 | 18.00 | 0 |
| 3 | QPSK | 8 | 4 | 16.87 | 16.84 | 16.95 | | |
| 3 | QPSK | 8 | 7 | 16.83 | 16.88 | 16.90 | | |
| 3 | QPSK | 15 | 0 | 16.83 | 16.85 | 16.84 | | |
| 3 | 16QAM | 1 | 0 | 16.99 | 17.45 | 17.04 | 18.00 | 0 |
| 3 | 16QAM | 1 | 8 | 17.59 | 17.55 | 17.04 | | |
| 3 | 16QAM | 1 | 14 | 17.46 | 17.49 | 17.04 | | |
| 3 | 16QAM | 8 | 0 | 16.75 | 17.06 | 16.73 | 18.00 | 0 |
| 3 | 16QAM | 8 | 4 | 17.14 | 16.97 | 16.70 | | |
| 3 | 16QAM | 8 | 7 | 17.11 | 17.02 | 16.75 | | |
| 3 | 16QAM | 15 | 0 | 16.99 | 16.63 | 16.46 | | |
| Channel | | | | 18607 | 18900 | 19193 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1850.7 | 1880 | 1909.3 | | |
| 1.4 | QPSK | 1 | 0 | 16.55 | 16.58 | 16.71 | 18.00 | 0 |
| 1.4 | QPSK | 1 | 3 | 16.64 | 16.72 | 16.72 | | |
| 1.4 | QPSK | 1 | 5 | 16.64 | 16.63 | 16.68 | | |
| 1.4 | QPSK | 3 | 0 | 16.81 | 16.68 | 16.77 | | |
| 1.4 | QPSK | 3 | 1 | 16.86 | 16.72 | 16.82 | | |
| 1.4 | QPSK | 3 | 3 | 16.84 | 16.73 | 16.83 | | |
| 1.4 | QPSK | 6 | 0 | 16.81 | 16.69 | 16.79 | 18.00 | 0 |
| 1.4 | 16QAM | 1 | 0 | 17.44 | 17.07 | 17.16 | 18.00 | 0 |
| 1.4 | 16QAM | 1 | 3 | 16.42 | 17.13 | 17.16 | | |
| 1.4 | 16QAM | 1 | 5 | 16.35 | 17.03 | 17.09 | | |
| 1.4 | 16QAM | 3 | 0 | 16.47 | 17.09 | 17.10 | | |
| 1.4 | 16QAM | 3 | 1 | 16.39 | 17.09 | 17.13 | | |
| 1.4 | 16QAM | 3 | 3 | 16.59 | 17.08 | 17.16 | | |
| 1.4 | 16QAM | 6 | 0 | 16.49 | 16.89 | 16.96 | 18.00 | 0 |

**<LTE Band 4>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20050 | 20175 | 20300 | | |
| Frequency (MHz) | | | | 1720 | 1732.5 | 1745 | | |
| 20 | QPSK | 1 | 0 | 17.63 | 17.45 | 17.86 | 18.00 | 0 |
| 20 | QPSK | 1 | 49 | 17.24 | 17.23 | 17.65 | | |
| 20 | QPSK | 1 | 99 | 16.97 | 17.20 | 17.26 | | |
| 20 | QPSK | 50 | 0 | 17.35 | 17.33 | 17.41 | 18.00 | 0 |
| 20 | QPSK | 50 | 24 | 17.32 | 17.28 | 17.30 | | |
| 20 | QPSK | 50 | 50 | 17.24 | 17.23 | 17.24 | | |
| 20 | QPSK | 100 | 0 | 17.33 | 17.33 | 17.35 | | |
| 20 | 16QAM | 1 | 0 | 17.81 | 17.66 | 17.12 | 18.00 | 0 |
| 20 | 16QAM | 1 | 49 | 17.70 | 17.58 | 17.04 | | |
| 20 | 16QAM | 1 | 99 | 17.42 | 17.41 | 16.86 | | |
| 20 | 16QAM | 50 | 0 | 17.44 | 17.35 | 17.45 | 18.00 | 0 |
| 20 | 16QAM | 50 | 24 | 17.31 | 17.31 | 17.45 | | |
| 20 | 16QAM | 50 | 50 | 17.24 | 17.27 | 17.32 | | |
| 20 | 16QAM | 100 | 0 | 17.26 | 17.26 | 17.39 | | |
| Channel | | | | 20025 | 20175 | 20325 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1732.5 | 1747.5 | | |
| 15 | QPSK | 1 | 0 | 17.57 | 17.57 | 17.61 | 18.00 | 0 |
| 15 | QPSK | 1 | 37 | 17.43 | 17.57 | 17.42 | | |
| 15 | QPSK | 1 | 74 | 17.18 | 17.49 | 17.29 | | |
| 15 | QPSK | 36 | 0 | 17.35 | 17.38 | 17.34 | 18.00 | 0 |
| 15 | QPSK | 36 | 20 | 17.32 | 17.30 | 17.31 | | |
| 15 | QPSK | 36 | 39 | 17.35 | 17.27 | 17.15 | | |
| 15 | QPSK | 75 | 0 | 17.31 | 17.30 | 17.30 | | |
| 15 | 16QAM | 1 | 0 | 17.79 | 17.93 | 17.81 | 18.00 | 0 |
| 15 | 16QAM | 1 | 37 | 17.64 | 17.80 | 17.60 | | |
| 15 | 16QAM | 1 | 74 | 17.46 | 17.81 | 17.38 | | |
| 15 | 16QAM | 36 | 0 | 17.37 | 17.47 | 17.38 | 18.00 | 0 |
| 15 | 16QAM | 36 | 20 | 17.26 | 17.36 | 17.32 | | |
| 15 | 16QAM | 36 | 39 | 17.25 | 17.30 | 17.25 | | |
| 15 | 16QAM | 75 | 0 | 17.25 | 17.33 | 17.20 | | |

| Channel | | | | 20000 | 20175 | 20350 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1715 | 1732.5 | 1750 | | |
| 10 | QPSK | 1 | 0 | 17.43 | 17.43 | 17.48 | 18.00 | 0 |
| 10 | QPSK | 1 | 25 | 17.18 | 17.12 | 17.36 | | |
| 10 | QPSK | 1 | 49 | 17.26 | 17.08 | 17.16 | | |
| 10 | QPSK | 25 | 0 | 17.33 | 17.33 | 17.26 | 18.00 | 0 |
| 10 | QPSK | 25 | 12 | 17.33 | 17.26 | 17.20 | | |
| 10 | QPSK | 25 | 25 | 17.27 | 17.25 | 17.17 | | |
| 10 | QPSK | 50 | 0 | 17.30 | 17.23 | 17.22 | | |
| 10 | 16QAM | 1 | 0 | 17.73 | 17.82 | 17.69 | 18.00 | 0 |
| 10 | 16QAM | 1 | 25 | 17.58 | 17.63 | 17.87 | | |
| 10 | 16QAM | 1 | 49 | 17.63 | 17.59 | 17.53 | | |
| 10 | 16QAM | 25 | 0 | 17.25 | 17.14 | 17.17 | 18.00 | 0 |
| 10 | 16QAM | 25 | 12 | 17.27 | 17.17 | 17.20 | | |
| 10 | 16QAM | 25 | 25 | 17.43 | 17.17 | 17.09 | | |
| 10 | 16QAM | 50 | 0 | 17.15 | 17.23 | 17.23 | | |
| Channel | | | | 19975 | 20175 | 20375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1712.5 | 1732.5 | 1752.5 | | |
| 5 | QPSK | 1 | 0 | 17.31 | 17.08 | 17.11 | 18.00 | 0 |
| 5 | QPSK | 1 | 12 | 17.69 | 17.08 | 17.09 | | |
| 5 | QPSK | 1 | 24 | 17.37 | 17.08 | 17.04 | | |
| 5 | QPSK | 12 | 0 | 17.19 | 17.25 | 17.28 | 18.00 | 0 |
| 5 | QPSK | 12 | 7 | 17.26 | 17.26 | 17.19 | | |
| 5 | QPSK | 12 | 13 | 17.32 | 17.21 | 17.20 | | |
| 5 | QPSK | 25 | 0 | 17.33 | 17.31 | 17.16 | | |
| 5 | 16QAM | 1 | 0 | 17.14 | 17.57 | 17.98 | 18.00 | 0 |
| 5 | 16QAM | 1 | 12 | 17.32 | 17.89 | 17.92 | | |
| 5 | 16QAM | 1 | 24 | 17.21 | 17.79 | 17.80 | | |
| 5 | 16QAM | 12 | 0 | 17.24 | 17.27 | 17.20 | 18.00 | 0 |
| 5 | 16QAM | 12 | 7 | 17.21 | 17.18 | 17.19 | | |
| 5 | 16QAM | 12 | 13 | 17.28 | 17.15 | 17.13 | | |
| 5 | 16QAM | 25 | 0 | 17.17 | 17.23 | 17.54 | | |

| Channel | | | | 19965 | 20175 | 20385 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1711.5 | 1732.5 | 1753.5 | | |
| 3 | QPSK | 1 | 0 | 17.21 | 17.16 | 17.35 | 18.00 | 0 |
| 3 | QPSK | 1 | 8 | 17.25 | 17.42 | 17.25 | | |
| 3 | QPSK | 1 | 14 | 17.13 | 17.17 | 17.11 | | |
| 3 | QPSK | 8 | 0 | 17.36 | 17.20 | 17.29 | 18.00 | 0 |
| 3 | QPSK | 8 | 4 | 17.28 | 17.22 | 17.36 | | |
| 3 | QPSK | 8 | 7 | 17.30 | 17.30 | 17.27 | | |
| 3 | QPSK | 15 | 0 | 17.28 | 17.35 | 17.29 | | |
| 3 | 16QAM | 1 | 0 | 17.23 | 17.83 | 17.83 | 18.00 | 0 |
| 3 | 16QAM | 1 | 8 | 17.43 | 17.85 | 17.96 | | |
| 3 | 16QAM | 1 | 14 | 17.30 | 17.66 | 17.86 | | |
| 3 | 16QAM | 8 | 0 | 17.56 | 17.37 | 17.45 | 18.00 | 0 |
| 3 | 16QAM | 8 | 4 | 17.47 | 17.34 | 17.43 | | |
| 3 | 16QAM | 8 | 7 | 17.49 | 17.38 | 17.42 | | |
| 3 | 16QAM | 15 | 0 | 17.43 | 17.41 | 17.38 | | |
| Channel | | | | 19957 | 20175 | 20393 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1710.7 | 1732.5 | 1754.3 | | |
| 1.4 | QPSK | 1 | 0 | 17.30 | 17.11 | 17.12 | 18.00 | 0 |
| 1.4 | QPSK | 1 | 3 | 17.50 | 17.12 | 17.35 | | |
| 1.4 | QPSK | 1 | 5 | 17.35 | 17.11 | 17.11 | | |
| 1.4 | QPSK | 3 | 0 | 17.32 | 17.11 | 17.23 | | |
| 1.4 | QPSK | 3 | 1 | 17.49 | 17.22 | 17.26 | | |
| 1.4 | QPSK | 3 | 3 | 17.38 | 17.20 | 17.26 | | |
| 1.4 | QPSK | 6 | 0 | 17.34 | 17.17 | 17.32 | 18.00 | 0 |
| 1.4 | 16QAM | 1 | 0 | 17.52 | 17.51 | 17.80 | 18.00 | 0 |
| 1.4 | 16QAM | 1 | 3 | 17.84 | 17.53 | 17.88 | | |
| 1.4 | 16QAM | 1 | 5 | 17.55 | 17.39 | 17.79 | | |
| 1.4 | 16QAM | 3 | 0 | 17.29 | 17.57 | 17.45 | | |
| 1.4 | 16QAM | 3 | 1 | 17.34 | 17.59 | 17.38 | | |
| 1.4 | 16QAM | 3 | 3 | 17.47 | 17.58 | 17.27 | | |
| 1.4 | 16QAM | 6 | 0 | 17.27 | 17.40 | 16.82 | 18.00 | 0 |

<u><LTE Band 7></u>

| BW [MHz] | Modulation | RB Size | RB Offset | Measured Power | | | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20850 | 21100 | 21350 | | |
| Frequency (MHz) | | | | 2510 | 2535 | 2560 | | |
| 20 | QPSK | 1 | 0 | 16.88 | 16.89 | 16.93 | 17.50 | 0 |
| 20 | QPSK | 1 | 49 | 16.84 | 16.68 | 16.88 | | |
| 20 | QPSK | 1 | 99 | 16.74 | 16.58 | 16.65 | | |
| 20 | QPSK | 50 | 0 | 16.88 | 16.91 | 16.92 | 17.50 | 0 |
| 20 | QPSK | 50 | 24 | 16.73 | 16.85 | 16.88 | | |
| 20 | QPSK | 50 | 50 | 16.80 | 16.85 | 16.80 | | |
| 20 | QPSK | 100 | 0 | 16.86 | 16.93 | 16.98 | | |
| 20 | 16QAM | 1 | 0 | 17.11 | 17.25 | 16.91 | 17.50 | 0 |
| 20 | 16QAM | 1 | 49 | 16.89 | 17.30 | 16.99 | | |
| 20 | 16QAM | 1 | 99 | 16.83 | 17.02 | 16.50 | | |
| 20 | 16QAM | 50 | 0 | 16.73 | 16.87 | 16.93 | 17.50 | 0 |
| 20 | 16QAM | 50 | 24 | 16.68 | 16.87 | 16.94 | | |
| 20 | 16QAM | 50 | 50 | 16.73 | 16.90 | 16.86 | | |
| 20 | 16QAM | 100 | 0 | 16.81 | 16.86 | 16.92 | | |
| Channel | | | | 20825 | 21100 | 21375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2507.5 | 2535 | 2562.5 | | |
| 15 | QPSK | 1 | 0 | 17.10 | 17.02 | 16.89 | 17.50 | 0 |
| 15 | QPSK | 1 | 37 | 16.77 | 16.84 | 16.88 | | |
| 15 | QPSK | 1 | 74 | 16.84 | 16.89 | 16.82 | | |
| 15 | QPSK | 36 | 0 | 16.75 | 16.88 | 16.99 | 17.50 | 0 |
| 15 | QPSK | 36 | 20 | 16.77 | 16.79 | 17.01 | | |
| 15 | QPSK | 36 | 39 | 16.79 | 16.88 | 16.86 | | |
| 15 | QPSK | 75 | 0 | 16.85 | 16.87 | 16.93 | | |
| 15 | 16QAM | 1 | 0 | 16.88 | 17.21 | 17.26 | 17.50 | 0 |
| 15 | 16QAM | 1 | 37 | 16.61 | 16.99 | 17.17 | | |
| 15 | 16QAM | 1 | 74 | 16.56 | 17.00 | 16.87 | | |
| 15 | 16QAM | 36 | 0 | 16.73 | 16.79 | 16.93 | 17.50 | 0 |
| 15 | 16QAM | 36 | 20 | 16.74 | 16.74 | 16.94 | | |
| 15 | 16QAM | 36 | 39 | 16.85 | 16.84 | 16.90 | | |
| 15 | 16QAM | 75 | 0 | 16.63 | 16.82 | 16.97 | | |

| Channel | | | | 20800 | 21100 | 21400 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 2505 | 2535 | 2565 | | |
| 10 | QPSK | 1 | 0 | 17.06 | 16.79 | 16.95 | 17.50 | 0 |
| 10 | QPSK | 1 | 25 | 17.08 | 16.80 | 16.95 | | |
| 10 | QPSK | 1 | 49 | 16.74 | 16.64 | 16.86 | | |
| 10 | QPSK | 25 | 0 | 16.73 | 16.85 | 16.89 | 17.50 | 0 |
| 10 | QPSK | 25 | 12 | 16.69 | 16.89 | 16.81 | | |
| 10 | QPSK | 25 | 25 | 16.68 | 16.84 | 16.82 | | |
| 10 | QPSK | 50 | 0 | 16.74 | 16.86 | 16.87 | | |
| 10 | 16QAM | 1 | 0 | 17.13 | 17.18 | 17.12 | 17.50 | 0 |
| 10 | 16QAM | 1 | 25 | 17.11 | 17.04 | 16.51 | | |
| 10 | 16QAM | 1 | 49 | 17.05 | 17.04 | 16.48 | | |
| 10 | 16QAM | 25 | 0 | 16.76 | 16.98 | 17.08 | 17.50 | 0 |
| 10 | 16QAM | 25 | 12 | 16.68 | 16.83 | 16.81 | | |
| 10 | 16QAM | 25 | 25 | 16.73 | 16.77 | 16.80 | | |
| 10 | 16QAM | 50 | 0 | 16.71 | 16.76 | 16.86 | | |
| Channel | | | | 20775 | 21100 | 21425 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2502.5 | 2535 | 2567.5 | | |
| 5 | QPSK | 1 | 0 | 16.85 | 16.49 | 16.59 | 17.50 | 0 |
| 5 | QPSK | 1 | 12 | 16.75 | 16.77 | 16.83 | | |
| 5 | QPSK | 1 | 24 | 16.64 | 16.44 | 16.56 | | |
| 5 | QPSK | 12 | 0 | 16.68 | 16.77 | 16.75 | 17.50 | 0 |
| 5 | QPSK | 12 | 7 | 16.76 | 16.79 | 16.76 | | |
| 5 | QPSK | 12 | 13 | 16.59 | 16.77 | 16.63 | | |
| 5 | QPSK | 25 | 0 | 16.59 | 16.74 | 16.82 | | |
| 5 | 16QAM | 1 | 0 | 16.20 | 17.06 | 17.17 | 17.50 | 0 |
| 5 | 16QAM | 1 | 12 | 16.34 | 17.25 | 17.23 | | |
| 5 | 16QAM | 1 | 24 | 16.13 | 16.75 | 17.10 | | |
| 5 | 16QAM | 12 | 0 | 16.57 | 16.64 | 17.04 | 17.50 | 0 |
| 5 | 16QAM | 12 | 7 | 16.64 | 16.74 | 16.70 | | |
| 5 | 16QAM | 12 | 13 | 16.58 | 16.75 | 16.67 | | |
| 5 | 16QAM | 25 | 0 | 16.58 | 16.60 | 16.92 | | |

## <WLAN Conducted Power>

**General Note:**

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18
5. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

**<u><2.4GHz WLAN></u>**

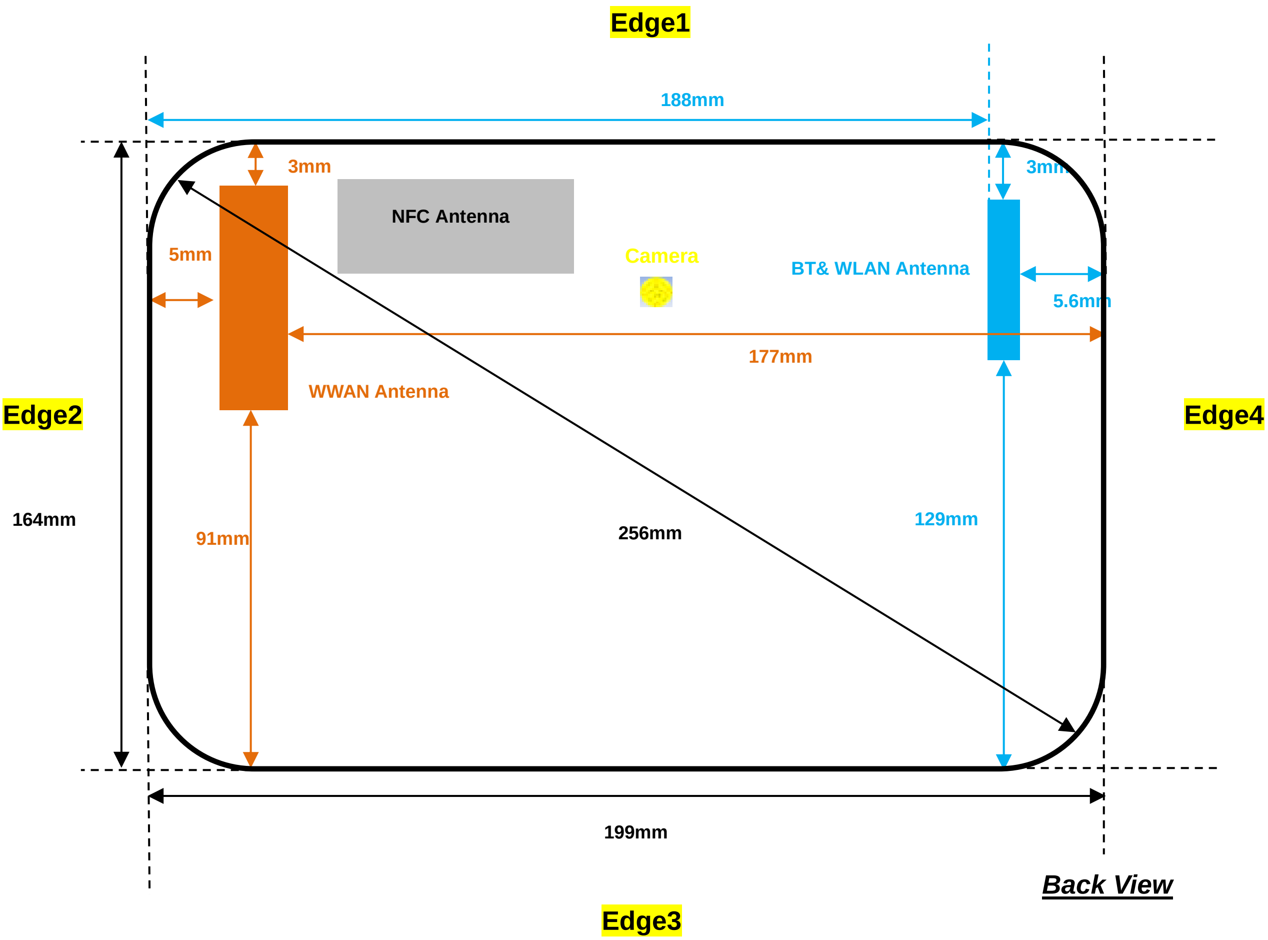
| | Mode | Channel | Frequency (MHz) | Data Rate | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
|---|---|---|---|---|---|---|---|
| 2.4GHz WLAN | 802.11b | CH 1 | 2412 | 1Mbps | 13.57 | 14.00 | 97.59 |
| | | CH 6 | 2437 | | 14.87 | 15.00 | |
| | | CH 11 | 2462 | | **16.04** | 16.50 | |
| | 802.11g | CH 1 | 2412 | 6Mbps | 7.95 | 8.50 | 87.04 |
| | | CH 6 | 2437 | | 9.58 | 10.00 | |
| | | CH 11 | 2462 | | 12.09 | 12.50 | |
| | 802.11n-HT20 | CH 1 | 2412 | MCS0 | 11.16 | 11.50 | 86.09 |
| | | CH 6 | 2437 | | 10.90 | 11.50 | |
| | | CH 11 | 2462 | | 11.08 | 11.50 | |

**<2.4GHz Bluetooth>**.

| Mode | Channel | Frequency (MHz) | Average power (dBm) | | |
|---|---|---|---|---|---|
| | | | 1Mbps | 2Mbps | 3Mbps |
| v3.0 with EDR | CH 00 | 2402 | 7.56 | 5.35 | 5.16 |
| | CH 39 | 2441 | **8.63** | 6.19 | 6.09 |
| | CH 78 | 2480 | 7.91 | 5.82 | 5.81 |
| Tune-up Limit | | | 9 | 7 | 7 |

| Mode | Channel | Frequency (MHz) | Average power (dBm) |
|---|---|---|---|
| | | | GFSK |
| v4.0 with LE | CH 00 | 2402 | -1.54 |
| | CH 19 | 2440 | **-0.34** |
| | CH 39 | 2480 | -0.88 |
| Tune-up Limit | | | 1.00 |

# 15. Antenna Location



**General Note:**

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·( f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

| Exposure Position | Wireless Interface | GPRS 850 Class 10 | GPRS 1900 Class 10 | WCDMA Band V | WCDMA Band II | LTE Band 5 | LTE Band 4 | LTE Band 2 | LTE Band 7 | BT | 2.4GHz WLAN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exposure Position | Calculated Frequency | 848MHz | 1909MHz | 846MHz | 1907MHz | 848MHz | 1754MHz | 1909MHz | 2570MHz | 2480MHz | 2462MHz |
| | Maximum power (dBm) | 24.5 | 22 | 25.00 | 24.5 | 24 | 24 | 24 | 24.5 | 9 | 16.5 |
| | Maximum rated power(mW) | 282.0 | 158.0 | 316.0 | 282.0 | 251.0 | 251.0 | 251.0 | 282.0 | 8.0 | 45.0 |
| Bottom Face | Separation distance(mm) | 5.0 | | | | | | | | 5.0 | 5.0 |
| | exclusion threshold | 51.9 | 43.7 | 58.1 | 77.9 | 46.2 | 66.5 | 69.4 | 90.4 | 2.5 | 14.1 |
| | Testing required? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Edge 1 | Separation distance(mm) | 3.0 | | | | | | | | 3.0 | 3.0 |
| | exclusion threshold | 51.9 | 43.7 | 58.1 | 77.9 | 46.2 | 66.5 | 69.4 | 90.4 | 2.5 | 14.1 |
| | Testing required? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Edge 2 | Separation distance(mm) | 5.0 | | | | | | | | 188.0 | 188.0 |
| | exclusion threshold | 51.9 | 43.7 | 58.1 | 77.9 | 46.2 | 66.5 | 69.4 | 90.4 | 1475.0 | 1476.0 |
| | Testing required? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Edge 3 | Separation distance(mm) | 91.0 | | | | | | | | 129.0 | 129.0 |
| | exclusion threshold | 395.0 | 519.0 | 394.0 | 519.0 | 395.0 | 523.0 | 519.0 | 504.0 | 885.0 | 886.0 |
| | Testing required? | No | No | No | No | No | No | No | No | No | No |
| Edge 4 | Separation distance(mm) | 177.0 | | | | | | | | 5.6 | 5.6 |
| | exclusion threshold | 881.0 | 1379.0 | 879.0 | 1379.0 | 881.0 | 1383.0 | 1379.0 | 1364.0 | 2.3 | 12.7 |
| | Testing required? | No | No | No | No | No | No | No | No | No | Yes |

# 16. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, 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:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

**Tablet Note:**

1. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 10mm for bottom face, 10mm for edge2
2. Per KDB 616217 D04v01r02, the additional separation introduced by the contour against a flat phantom is < 5 mm on this device and reported SAR is < 1.2 W/kg, a curved or contoured back surface or edge SAR is not required, more detail information please refer to the setup photo.
3. For LTE Band 5 Bottom face and Edge 2 10mm full power SAR tested for co-locate with WLAN analysis.

**GSM Note:**

1. Per KDB 941225 D01v03r01, for SAR test reduction for GPRS a modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, the GPRS 2Tx slots modes was selected for GSM850 / GSM1900, when EUT operating without power back-off, the GPRS 2Tx slots modes was selected for GSM850 / GSM1900 when EUT operating with power back-off, according to the highest source-based time-averaged output power.

**UMTS Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

**LTE Note:**

1. Per KDB 941225 D05v02r05, 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, 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 are ≤ 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. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B5 / B4 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**WLAN Note:**

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required 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 ≤ 1.2 W/kg.
2. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
3. During SAR testing the WLAN transmission was verified using a spectrum analyzer.
4. WLAN Bottom Face 10mm SAR tested for co-locate with WWAN analysis.

## 16.1 Body SAR

<GSM SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | GSM850 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 251 | 848.8 | 28.68 | 29 | 1.076 | -0.1 | 1.000 | 1.076 |
| | GSM850 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 128 | 824.2 | 28.64 | 29 | 1.086 | -0.05 | 0.837 | 0.909 |
| | GSM850 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 189 | 836.4 | 28.62 | 29 | 1.091 | -0.09 | 0.926 | 1.011 |
| | GSM850 | GPRS 2 Tx slots | Edge 2 | 0mm | Sensor On | 251 | 848.8 | 28.68 | 29 | 1.076 | -0.16 | 0.420 | 0.452 |
| | GSM850 | GPRS 2 Tx slots | Bottom Face | 10mm | Sensor Off | 128 | 824.2 | 29.82 | 30.5 | 1.169 | 0.06 | 0.368 | 0.430 |
| | GSM850 | GPRS 2 Tx slots | Edge 2 | 10mm | Sensor Off | 128 | 824.2 | 29.82 | 30.5 | 1.169 | -0.02 | 0.212 | 0.248 |
| | GSM850 | GPRS 2 Tx slots | Edge 1 | 0mm | Sensor Off | 128 | 824.2 | 29.82 | 30.5 | 1.169 | -0.14 | 0.561 | 0.656 |
| | GSM1900 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 810 | 1909.8 | 24.50 | 25 | 1.122 | -0.11 | 0.983 | 1.103 |
| 02 | GSM1900 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 512 | 1850.2 | 24.41 | 25 | 1.146 | 0.03 | 1.040 | 1.191 |
| | GSM1900 | GPRS 2 Tx slots | Bottom Face | 0mm | Sensor On | 661 | 1880 | 24.45 | 25 | 1.135 | -0.02 | 1.030 | 1.169 |
| | GSM1900 | GPRS 2 Tx slots | Edge 2 | 0mm | Sensor On | 810 | 1909.8 | 24.50 | 25 | 1.122 | -0.14 | 0.622 | 0.698 |
| | GSM1900 | GPRS 2 Tx slots | Bottom Face | 10mm | Sensor Off | 661 | 1880 | 27.62 | 28 | 1.091 | 0.1 | 0.534 | 0.583 |
| | GSM1900 | GPRS 2 Tx slots | Edge 2 | 10mm | Sensor Off | 661 | 1880 | 27.62 | 28 | 1.091 | -0.15 | 0.399 | 0.435 |
| | GSM1900 | GPRS 2 Tx slots | Edge 1 | 0mm | Sensor Off | 661 | 1880 | 27.62 | 28 | 1.091 | -0.09 | 0.264 | 0.288 |

## <WCDMA SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 4233 | 846.6 | 22.06 | 22.5 | 1.107 | 0.13 | 0.829 | 0.917 |
| 03 | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 4132 | 826.4 | 22.04 | 22.5 | 1.112 | 0.05 | 0.831 | **0.924** |
| | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 4182 | 836.4 | 22.01 | 22.5 | 1.119 | 0.17 | 0.825 | 0.924 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 2 | 0mm | Sensor On | 4233 | 846.6 | 22.06 | 22.5 | 1.107 | -0.16 | 0.436 | 0.482 |
| | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 10mm | Sensor Off | 4233 | 846.6 | 23.59 | 25 | 1.384 | 0.1 | 0.392 | 0.542 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 2 | 10mm | Sensor Off | 4233 | 846.6 | 23.59 | 25 | 1.384 | -0.02 | 0.225 | 0.311 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 1 | 0mm | Sensor Off | 4233 | 846.6 | 23.59 | 25 | 1.384 | -0.13 | 0.642 | 0.888 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 1 | 0mm | Sensor Off | 4132 | 826.4 | 23.56 | 25 | 1.393 | 0.1 | 0.448 | 0.624 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 1 | 0mm | Sensor Off | 4182 | 836.4 | 23.58 | 25 | 1.387 | -0.13 | 0.448 | 0.621 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 9538 | 1907.6 | 17.39 | 17.5 | 1.026 | -0.1 | 0.829 | 0.850 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 9262 | 1852.4 | 17.24 | 17.5 | 1.062 | 0.06 | 0.870 | 0.924 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0mm | Sensor On | 9400 | 1880 | 17.37 | 17.5 | 1.030 | 0.11 | 0.845 | 0.871 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 2 | 0mm | Sensor On | 9538 | 1907.6 | 17.39 | 17.5 | 1.026 | 0.07 | 0.528 | 0.542 |
| 04 | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 10mm | Sensor Off | 9400 | 1880 | 23.86 | 24.5 | 1.159 | 0.03 | 1.000 | **1.159** |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 10mm | Sensor Off | 9262 | 1852.4 | 23.73 | 24.5 | 1.194 | 0.11 | 0.900 | 1.075 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 10mm | Sensor Off | 9538 | 1907.6 | 23.82 | 24.5 | 1.169 | 0.07 | 0.830 | 0.971 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 2 | 10mm | Sensor Off | 9400 | 1880 | 23.86 | 24.5 | 1.159 | -0.15 | 0.788 | 0.913 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 2 | 10mm | Sensor Off | 9262 | 1852.4 | 23.73 | 24.5 | 1.194 | -0.15 | 0.785 | 0.937 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 2 | 10mm | Sensor Off | 9538 | 1907.6 | 23.82 | 24.5 | 1.169 | -0.15 | 0.625 | 0.731 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 1 | 0mm | Sensor Off | 9400 | 1880 | 23.86 | 24.5 | 1.159 | -0.08 | 0.509 | 0.590 |

## <u><LTE SAR></u>

| Plot No. | Band | BW (MHz) | Modulation | RB Size | RB offset | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05 | LTE Band 5 | 10M | QPSK | 1RB | 25Offset | Bottom Face | 0mm | Sensor Off | 20525 | 836.5 | 23.18 | 24 | 1.208 | -0.08 | 0.956 | 1.155 |
| | LTE Band 5 | 10M | QPSK | 25RB | 0Offset | Bottom Face | 0mm | Sensor Off | 20525 | 836.5 | 22.11 | 23 | 1.227 | -0.13 | 0.759 | 0.932 |
| | LTE Band 5 | 10M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor Off | 20525 | 836.5 | 22.06 | 23 | 1.242 | -0.04 | 0.759 | 0.942 |
| | LTE Band 5 | 10M | QPSK | 1RB | 25Offset | Bottom Face | 10mm | Sensor Off | 20525 | 836.5 | 23.18 | 24 | 1.208 | -0.17 | 0.360 | 0.435 |
| | LTE Band 5 | 10M | QPSK | 25RB | 0Offset | Bottom Face | 10mm | Sensor Off | 20525 | 836.5 | 22.11 | 23 | 1.227 | -0.09 | 0.290 | 0.356 |
| | LTE Band 5 | 10M | QPSK | 1RB | 25Offset | Edge 2 | 0mm | Sensor Off | 20525 | 836.5 | 23.18 | 24 | 1.208 | 0.08 | 0.653 | 0.789 |
| | LTE Band 5 | 10M | QPSK | 25RB | 0Offset | Edge 2 | 0mm | Sensor Off | 20525 | 836.5 | 22.11 | 23 | 1.227 | -0.06 | 0.526 | 0.646 |
| | LTE Band 5 | 10M | QPSK | 1RB | 25Offset | Edge 2 | 10mm | Sensor Off | 20525 | 836.5 | 23.18 | 24 | 1.208 | -0.06 | 0.260 | 0.314 |
| | LTE Band 5 | 10M | QPSK | 25RB | 0Offset | Edge 2 | 10mm | Sensor Off | 20525 | 836.5 | 22.11 | 23 | 1.227 | -0.06 | 0.215 | 0.264 |
| | LTE Band 5 | 10M | QPSK | 1RB | 25Offset | Edge 1 | 0mm | Sensor Off | 20525 | 836.5 | 23.18 | 24 | 1.208 | -0.17 | 0.563 | 0.680 |
| | LTE Band 5 | 10M | QPSK | 25RB | 0Offset | Edge 1 | 0mm | Sensor Off | 20525 | 836.5 | 22.11 | 23 | 1.227 | -0.09 | 0.431 | 0.529 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 18700 | 1860 | 17.35 | 18 | 1.161 | 0.07 | 0.893 | 1.037 |
| 06 | LTE Band 2 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 18900 | 1880 | 16.94 | 18 | 1.276 | -0.03 | 0.903 | 1.153 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 19100 | 1900 | 17.04 | 18 | 1.247 | -0.15 | 0.873 | 1.089 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 18700 | 1860 | 16.93 | 18 | 1.279 | -0.04 | 0.809 | 1.035 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 18900 | 1880 | 16.92 | 18 | 1.282 | -0.17 | 0.827 | 1.060 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 19100 | 1900 | 16.81 | 18 | 1.315 | -0.09 | 0.866 | 1.139 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0Offset | Bottom Face | 0mm | Sensor On | 18700 | 1860 | 16.83 | 18 | 1.309 | 0.07 | 0.834 | 1.092 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0Offset | Edge 2 | 0mm | Sensor On | 18700 | 1860 | 17.35 | 18 | 1.161 | -0.08 | 0.566 | 0.657 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 0mm | Sensor On | 18700 | 1860 | 16.93 | 18 | 1.279 | 0.1 | 0.565 | 0.723 |
| | LTE Band 2 | 20M | QPSK | 1RB | 49Offset | Bottom Face | 10mm | Sensor Off | 18900 | 1880 | 23.27 | 24 | 1.183 | 0.1 | 0.915 | 1.082 |
| | LTE Band 2 | 20M | QPSK | 1RB | 49Offset | Bottom Face | 10mm | Sensor Off | 18700 | 1860 | 23.24 | 24 | 1.191 | -0.13 | 0.891 | 1.061 |
| | LTE Band 2 | 20M | QPSK | 1RB | 49Offset | Bottom Face | 10mm | Sensor Off | 19100 | 1900 | 23.16 | 24 | 1.213 | 0.01 | 0.882 | 1.070 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 18900 | 1880 | 22.03 | 23 | 1.250 | 0.002 | 0.764 | 0.955 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 18700 | 1860 | 21.93 | 23 | 1.279 | 0.03 | 0.737 | 0.943 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 19100 | 1900 | 21.94 | 23 | 1.276 | 0.03 | 0.752 | 0.960 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0Offset | Bottom Face | 10mm | Sensor Off | 18900 | 1880 | 21.88 | 23 | 1.294 | -0.03 | 0.743 | 0.962 |
| | LTE Band 2 | 20M | QPSK | 1RB | 49Offset | Edge 2 | 10mm | Sensor Off | 18900 | 1880 | 23.27 | 24 | 1.183 | -0.17 | 0.657 | 0.777 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 10mm | Sensor Off | 18900 | 1880 | 22.03 | 23 | 1.250 | -0.14 | 0.530 | 0.663 |
| | LTE Band 2 | 20M | QPSK | 1RB | 49Offset | Edge 1 | 0mm | Sensor Off | 18900 | 1880 | 23.27 | 24 | 1.183 | -0.09 | 0.432 | 0.511 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0Offset | Edge 1 | 0mm | Sensor Off | 18900 | 1880 | 22.03 | 23 | 1.250 | -0.1 | 0.352 | 0.440 |

| Plot No. | Band | BW (MHz) | Modulation | RB Size | RB offset | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07 | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 20175 | 1732.5 | 17.45 | 18 | 1.135 | 0.09 | 0.929 | 1.054 |
| | LTE Band 4 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 20175 | 1732.5 | 17.33 | 18 | 1.167 | 0.03 | 0.880 | 1.027 |
| | LTE Band 4 | 20M | QPSK | 100RB | 0Offset | Bottom Face | 0mm | Sensor On | 20175 | 1732.5 | 17.33 | 18 | 1.167 | 0.01 | 0.793 | 0.925 |
| | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Edge 2 | 0mm | Sensor On | 20175 | 1732.5 | 17.45 | 18 | 1.135 | -0.03 | 0.253 | 0.287 |
| | LTE Band 4 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 0mm | Sensor On | 20175 | 1732.5 | 17.33 | 18 | 1.167 | -0.09 | 0.268 | 0.313 |
| | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm | Sensor Off | 20175 | 1732.5 | 23.59 | 24 | 1.099 | -0.1 | 0.269 | 0.296 |
| | LTE Band 4 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 20175 | 1732.5 | 22.99 | 23 | 1.002 | 0.1 | 0.271 | 0.272 |
| | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Edge 2 | 10mm | Sensor Off | 20175 | 1732.5 | 23.59 | 24 | 1.099 | -0.06 | 0.190 | 0.209 |
| | LTE Band 4 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 10mm | Sensor Off | 20175 | 1732.5 | 22.99 | 23 | 1.002 | -0.14 | 0.133 | 0.133 |
| | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Edge 1 | 0mm | Sensor Off | 20175 | 1732.5 | 23.59 | 24 | 1.099 | 0.06 | 0.308 | 0.338 |
| | LTE Band 4 | 20M | QPSK | 50RB | 0Offset | Edge 1 | 0mm | Sensor Off | 20175 | 1732.5 | 22.99 | 23 | 1.002 | -0.09 | 0.259 | 0.260 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 21350 | 2560 | 16.93 | 17.5 | 1.140 | 0.08 | 0.770 | 0.878 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 20850 | 2510 | 16.88 | 17.5 | 1.153 | 0.02 | 0.982 | 1.133 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 21100 | 2535 | 16.89 | 17.5 | 1.151 | 0.01 | 1.000 | 1.151 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 21350 | 2560 | 16.92 | 17.5 | 1.143 | 0.12 | 0.741 | 0.847 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 20850 | 2510 | 16.88 | 17.5 | 1.153 | 0.15 | 0.982 | 1.133 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 0mm | Sensor On | 21100 | 2535 | 16.91 | 17.5 | 1.146 | 0.13 | 0.981 | 1.124 |
| | LTE Band 7 | 20M | QPSK | 100RB | 0Offset | Bottom Face | 0mm | Sensor On | 21350 | 2560 | 16.98 | 17.5 | 1.127 | 0.11 | 1.010 | 1.138 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Edge 2 | 0mm | Sensor On | 21350 | 2560 | 16.93 | 17.5 | 1.140 | -0.19 | 0.445 | 0.507 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 0mm | Sensor On | 21350 | 2560 | 16.92 | 17.5 | 1.143 | -0.19 | 0.449 | 0.513 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm | Sensor Off | 21350 | 2560 | 24.31 | 24.5 | 1.045 | -0.03 | 0.959 | 1.002 |
| 08 | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm | Sensor Off | 20850 | 2510 | 23.99 | 24.5 | 1.125 | -0.02 | 1.040 | 1.170 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm | Sensor Off | 21100 | 2535 | 24.05 | 24.5 | 1.109 | -0.1 | 0.922 | 1.023 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 21350 | 2560 | 23.17 | 23.5 | 1.079 | 0.08 | 0.781 | 0.843 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 20850 | 2510 | 23.01 | 23.5 | 1.119 | -0.03 | 0.777 | 0.870 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Bottom Face | 10mm | Sensor Off | 21100 | 2535 | 23.08 | 23.5 | 1.102 | -0.07 | 0.873 | 0.962 |
| | LTE Band 7 | 20M | QPSK | 100RB | 0Offset | Bottom Face | 10mm | Sensor Off | 21350 | 2560 | 23.13 | 23.5 | 1.089 | 0.11 | 0.876 | 0.954 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Edge 2 | 10mm | Sensor Off | 21350 | 2560 | 24.31 | 24.5 | 1.045 | -0.19 | 0.139 | 0.145 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Edge 2 | 10mm | Sensor Off | 21350 | 2560 | 23.17 | 23.5 | 1.079 | -0.1 | 0.134 | 0.145 |
| | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Edge 1 | 0mm | Sensor Off | 21350 | 2560 | 24.31 | 24.5 | 1.045 | -0.19 | 0.670 | 0.700 |
| | LTE Band 7 | 20M | QPSK | 50RB | 0Offset | Edge 1 | 0mm | Sensor Off | 21350 | 2560 | 23.17 | 23.5 | 1.079 | 0.03 | 0.526 | 0.568 |

<WLAN SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 09 | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | 11 | 2462 | 16.04 | 16.5 | 1.112 | 97.59 | 1.025 | 0.01 | 0.506 | 0.577 |
| | WLAN2.4GHz | 802.11b 1Mbps | Edge 1 | 0mm | 11 | 2462 | 16.04 | 16.5 | 1.112 | 97.59 | 1.025 | 0.01 | 0.390 | 0.444 |
| | WLAN2.4GHz | 802.11b 1Mbps | Edge 4 | 0mm | 11 | 2462 | 16.04 | 16.5 | 1.112 | 97.59 | 1.025 | 0.02 | 0.456 | 0.520 |
| | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 10mm- | 11 | 2462 | 16.04 | 16.5 | 1.112 | 97.59 | 1.025 | 0.003 | 0.099 | 0.113 |

## 16.2 Repeated SAR Measurement

| No. | Band | BW (MHz) | Mode | RB Size | RB offset | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Ratio | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st | GSM850 | - | GPRS 2 Tx slots | - | - | Bottom Face | 0mm | Sensor On | 251 | 848.8 | 28.68 | 29 | 1.076 | -0.1 | 1.000 | 1 | 1.076 |
| 2nd | GSM850 | - | GPRS 2 Tx slots | - | - | Bottom Face | 0mm | Sensor On | 251 | 848.8 | 28.68 | 29 | 1.076 | -0.1 | 0.993 | 1.007 | 1.069 |
| 1st | GSM1900 | - | GPRS 2 Tx slots | - | - | Bottom Face | 0mm | Sensor On | 512 | 1850.2 | 24.41 | 25 | 1.146 | 0.03 | 1.040 | 1 | 1.191 |
| 2nd | GSM1900 | - | GPRS 2 Tx slots | - | - | Bottom Face | 0mm | Sensor On | 512 | 1850.2 | 24.41 | 25 | 1.146 | 0.01 | 1.010 | 1.030 | 1.157 |
| 1st | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 20175 | 1732.5 | 17.45 | 18 | 1.135 | 0.09 | 0.929 | 1 | 1.054 |
| 2nd | LTE Band 4 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 0mm | Sensor On | 20175 | 1732.5 | 17.45 | 18 | 1.135 | 0.07 | 0.927 | 1.002 | 1.052 |
| 1st | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm- | Sensor Off | 20850 | 2510 | 23.99 | 24.5 | 1.125 | -0.02 | 1.040 | 1 | 1.170 |
| 2nd | LTE Band 7 | 20M | QPSK | 1RB | 0Offset | Bottom Face | 10mm- | Sensor Off | 20850 | 2510 | 23.99 | 24.5 | 1.125 | -0.02 | 1.030 | 1.010 | 1.158 |

**General Note:**

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

# 17. Simultaneous Transmission Analysis

| NO. | Simultaneous Transmission Configurations | Tablet |
|---|---|---|
| | | Body |
| 1. | GSM Voice + WLAN2.4GHz | Yes |
| 2. | GPRS/EDGE + WLAN2.4GHz | Yes |
| 3. | WCDMA + WLAN2.4GHz | Yes |
| 4. | LTE + WLAN2.4GHz | Yes |
| 5. | GSM Voice + Bluetooth | Yes |
| 6. | GPRS/EDGE + Bluetooth | Yes |
| 7. | WCDMA+ Bluetooth | Yes |
| 8. | LTE + Bluetooth | Yes |

**General Note:**

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose each GSM, WCDMA, LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (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 SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
5. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

| Bluetooth Max Power | Exposure Position | Body |
|---|---|---|
| | Test separation | 0 mm |
| 9.0 dBm | Estimated SAR (W/kg) | 0.336 W/kg |

## 17.1 Body Exposure Conditions

| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 2 2.4GHz WLAN 1g SAR (W/kg) | 1+2 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| GSM | GSM850 | Bottom Face at 0mm | 1.076 | 0.577 | **1.65** | **0.01** | **#1** |
| | | Edge 1 at 0mm | 0.656 | 0.444 | 1.10 | | |
| | | Edge 2 at 0mm | 0.452 | | 0.45 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 0.430 | 0.113 | 0.54 | | |
| | | Edge 2 at 10mm | 0.248 | | 0.25 | | |
| | GSM1900 | Bottom Face at 0mm | 1.191 | 0.577 | **1.77** | **0.01** | **#2** |
| | | Edge 1 at 0mm | 0.288 | 0.444 | 0.73 | | |
| | | Edge 2 at 0mm | 0.698 | | 0.70 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 0.583 | 0.113 | 0.70 | | |
| | | Edge 2 at 10mm | 0.435 | | 0.44 | | |
| WCDMA | Band V | Bottom Face at 0mm | 0.924 | 0.577 | **1.50** | | |
| | | Edge 1 at 0mm | 0.888 | 0.444 | 1.33 | | |
| | | Edge 2 at 0mm | 0.482 | | 0.48 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 0.542 | 0.113 | 0.66 | | |
| | | Edge 2 at 10mm | 0.311 | | 0.31 | | |
| | Band II | Bottom Face at 0mm | 0.924 | 0.577 | 1.50 | | |
| | | Edge 1 at 0mm | 0.590 | 0.444 | 1.03 | | |
| | | Edge 2 at 0mm | 0.542 | | 0.54 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 1.159 | 0.113 | 1.27 | | |
| | | Edge 2 at 10mm | 0.937 | | 0.94 | | |

| WWAN Band | | Exposure Position | 1<br>WWAN<br>1g SAR (W/kg) | 2<br>2.4GHz WLAN<br>1g SAR (W/kg) | 1+2 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| LTE | Band 5 | Bottom Face at 0mm | 1.155 | 0.577 | **1.73** | **0.01** | **#3** |
| | | Edge 1 at 0mm | 0.680 | 0.444 | 1.12 | | |
| | | Edge 2 at 0mm | 0.789 | | 0.79 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 0.435 | 0.113 | 0.55 | | |
| | | Edge 2 at 10mm | 0.314 | | 0.31 | | |
| | Band 2 | Bottom Face at 0mm | 1.153 | 0.577 | **1.73** | **0.01** | **#4** |
| | | Edge 1 at 0mm | 0.511 | 0.444 | 0.96 | | |
| | | Edge 2 at 0mm | 0.723 | | 0.72 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 1.082 | 0.113 | 1.20 | | |
| | | Edge 2 at 10mm | 0.777 | | 0.78 | | |
| | Band 4 | Bottom Face at 0mm | 1.054 | 0.577 | **1.63** | **0.01** | **#5** |
| | | Edge 1 at 0mm | 0.338 | 0.444 | 0.78 | | |
| | | Edge 2 at 0mm | 0.313 | | 0.31 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 0.296 | 0.113 | 0.41 | | |
| | | Edge 2 at 10mm | 0.209 | | 0.21 | | |
| | Band 7 | Bottom Face at 0mm | 1.151 | 0.577 | **1.73** | **0.01** | **#6** |
| | | Edge 1 at 0mm | 0.700 | 0.444 | 1.14 | | |
| | | Edge 2 at 0mm | 0.513 | | 0.51 | | |
| | | Edge 4 at 0mm | | 0.520 | 0.52 | | |
| | | Bottom Face at 10mm | 1.170 | 0.113 | 1.28 | | |
| | | Edge 2 at 10mm | 0.145 | | 0.15 | | |

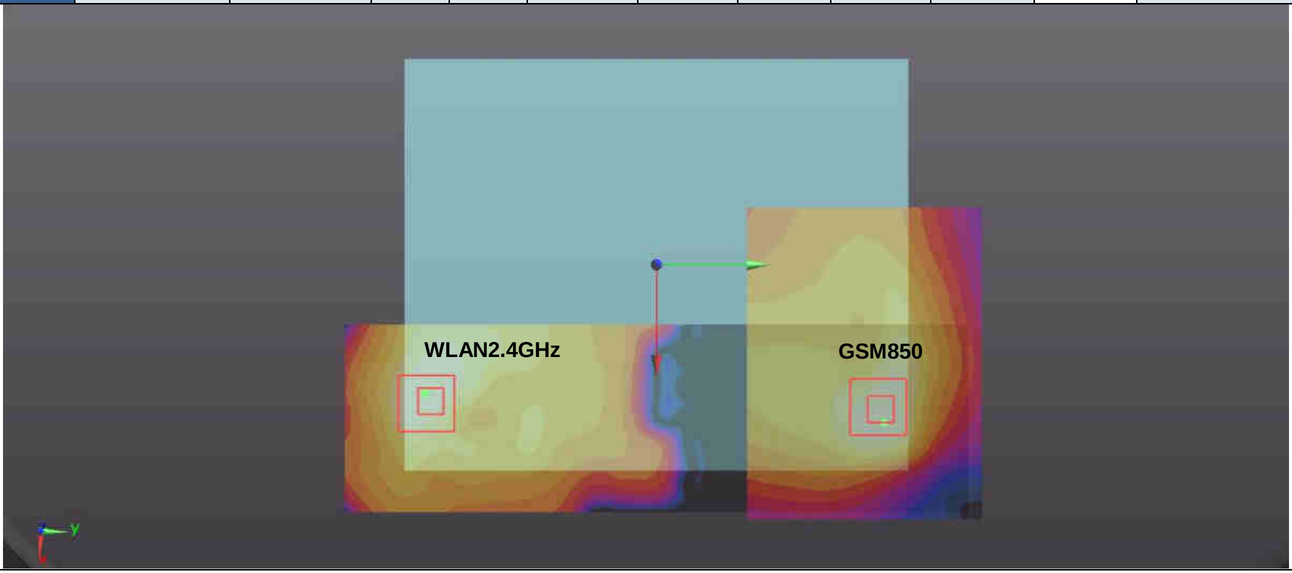
| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 3 Bluetooth Estimated 1g SAR (W/kg) | 1+3 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| GSM | GSM850 | Bottom Face at 0mm | 1.076 | 0.336 | 1.41 | | |
| | | Edge 1 at 0mm | 0.656 | 0.336 | 0.99 | | |
| | | Edge 2 at 0mm | 0.452 | 0.336 | 0.79 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 0.430 | 0.336 | 0.77 | | |
| | | Edge 2 at 10mm | 0.248 | 0.336 | 0.58 | | |
| | GSM1900 | Bottom Face at 0mm | 1.191 | 0.336 | 1.53 | | |
| | | Edge 1 at 0mm | 0.288 | 0.336 | 0.62 | | |
| | | Edge 2 at 0mm | 0.698 | 0.336 | 1.03 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 0.583 | 0.336 | 0.92 | | |
| | | Edge 2 at 10mm | 0.435 | 0.336 | 0.77 | | |
| WCDMA | Band V | Bottom Face at 0mm | 0.924 | 0.336 | 1.26 | | |
| | | Edge 1 at 0mm | 0.888 | 0.336 | 1.22 | | |
| | | Edge 2 at 0mm | 0.482 | 0.336 | 0.82 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 0.542 | 0.336 | 0.88 | | |
| | | Edge 2 at 10mm | 0.311 | 0.336 | 0.65 | | |
| | Band II | Bottom Face at 0mm | 0.924 | 0.336 | 1.26 | | |
| | | Edge 1 at 0mm | 0.590 | 0.336 | 0.93 | | |
| | | Edge 2 at 0mm | 0.542 | 0.336 | 0.88 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 1.159 | 0.336 | 1.50 | | |
| | | Edge 2 at 10mm | 0.937 | 0.336 | 1.27 | | |

| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 3 Bluetooth Estimated 1g SAR (W/kg) | 1+3 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| LTE | Band 5 | Bottom Face at 0mm | 1.155 | 0.336 | 1.49 | | |
| | | Edge 1 at 0mm | 0.680 | 0.336 | 1.02 | | |
| | | Edge 2 at 0mm | 0.789 | 0.336 | 1.13 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 0.435 | 0.336 | 0.77 | | |
| | | Edge 2 at 10mm | 0.314 | 0.336 | 0.65 | | |
| | Band 2 | Bottom Face at 0mm | 1.153 | 0.336 | 1.49 | | |
| | | Edge 1 at 0mm | 0.511 | 0.336 | 0.85 | | |
| | | Edge 2 at 0mm | 0.723 | 0.336 | 1.06 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 1.082 | 0.336 | 1.42 | | |
| | | Edge 2 at 10mm | 0.777 | 0.336 | 1.11 | | |
| | Band 4 | Bottom Face at 0mm | 1.054 | 0.336 | 1.39 | | |
| | | Edge 1 at 0mm | 0.338 | 0.336 | 0.67 | | |
| | | Edge 2 at 0mm | 0.313 | 0.336 | 0.65 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 0.296 | 0.336 | 0.63 | | |
| | | Edge 2 at 10mm | 0.209 | 0.336 | 0.55 | | |
| | Band 7 | Bottom Face at 0mm | 1.151 | 0.336 | 1.49 | | |
| | | Edge 1 at 0mm | 0.700 | 0.336 | 1.04 | | |
| | | Edge 2 at 0mm | 0.513 | 0.336 | 0.85 | | |
| | | Edge 4 at 0mm | | 0.336 | 0.34 | | |
| | | Bottom Face at 10mm | 1.170 | 0.336 | 1.51 | | |
| | | Edge 2 at 10mm | 0.145 | 0.336 | 0.48 | | |

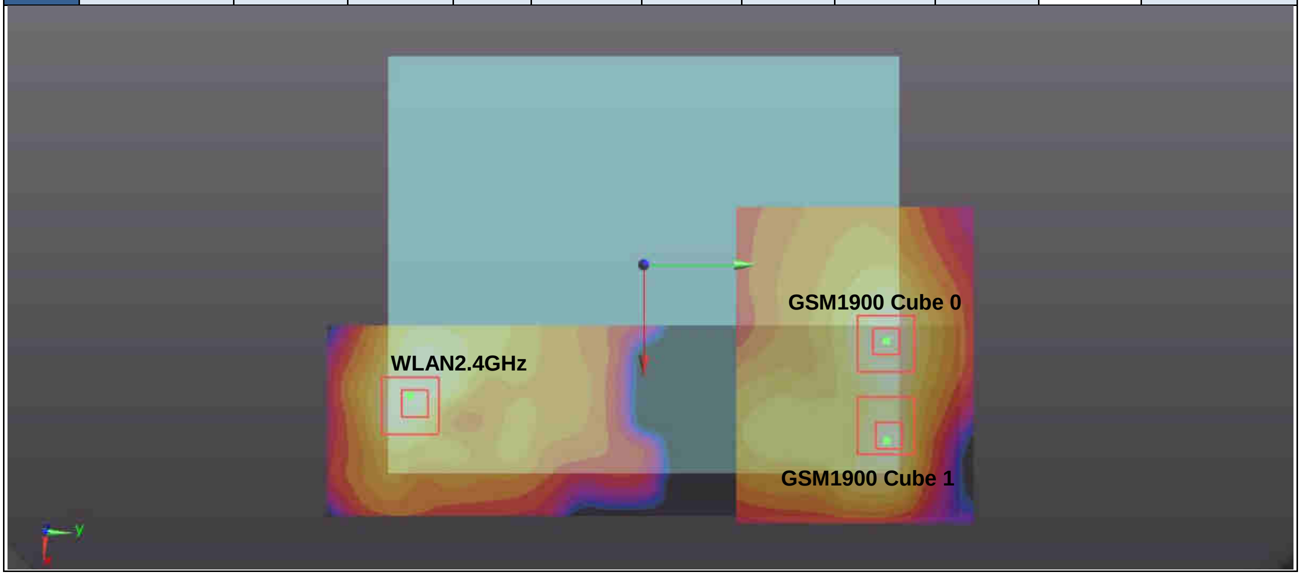
## 17.2 SPLSR Evaluation and Analysis

**General Note:**
SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

| Case 1 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| | GSM850 | Bottom Face | 1.076 | 0 | 0.0525 | 0.0875 | -0.18 | 172.9 | 1.65 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |

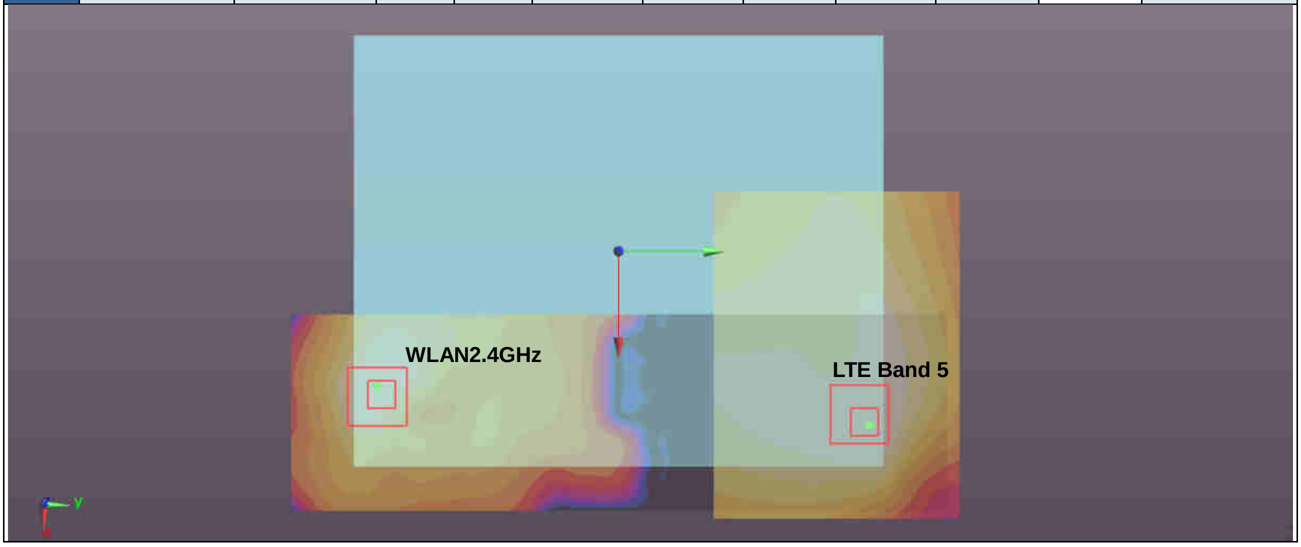



| Case 2 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| | GSM1900 | Bottom Face | 1.191 (Cube 0) | 0 | 0.029 | 0.092 | -0.177 | 179.0 | 1.77 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |

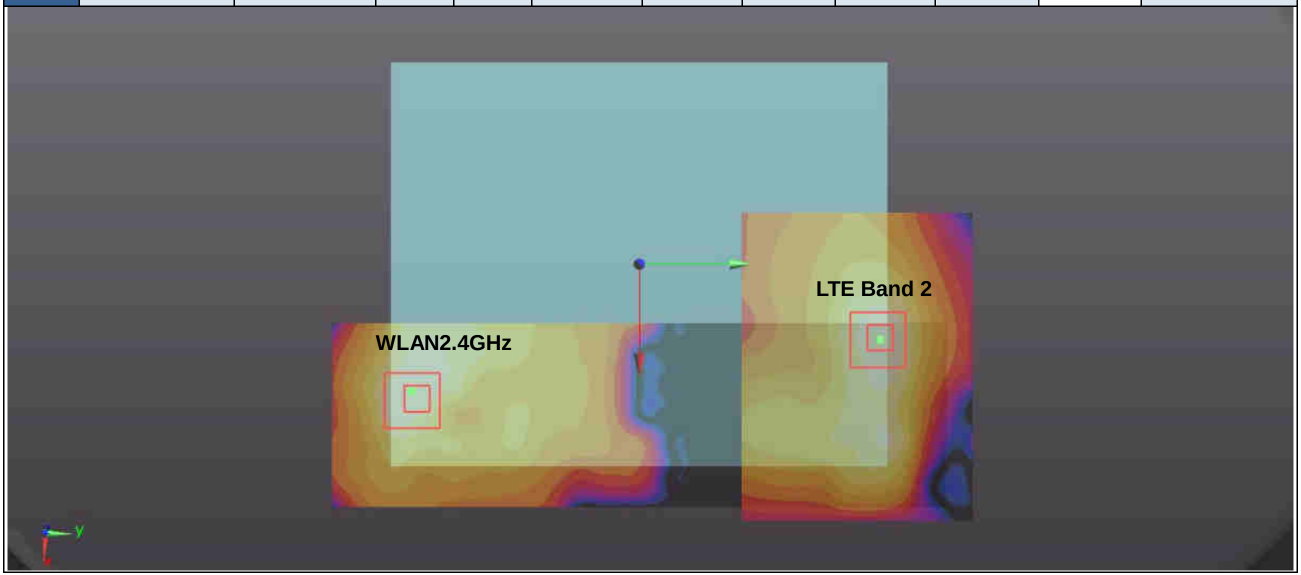



Note：For GSM1900 , compared with cube 1, cube 0 with higher SAR value and the shortest distance with WLAN 2.4GHz. So chose cube 0 for SPLSR analysis.

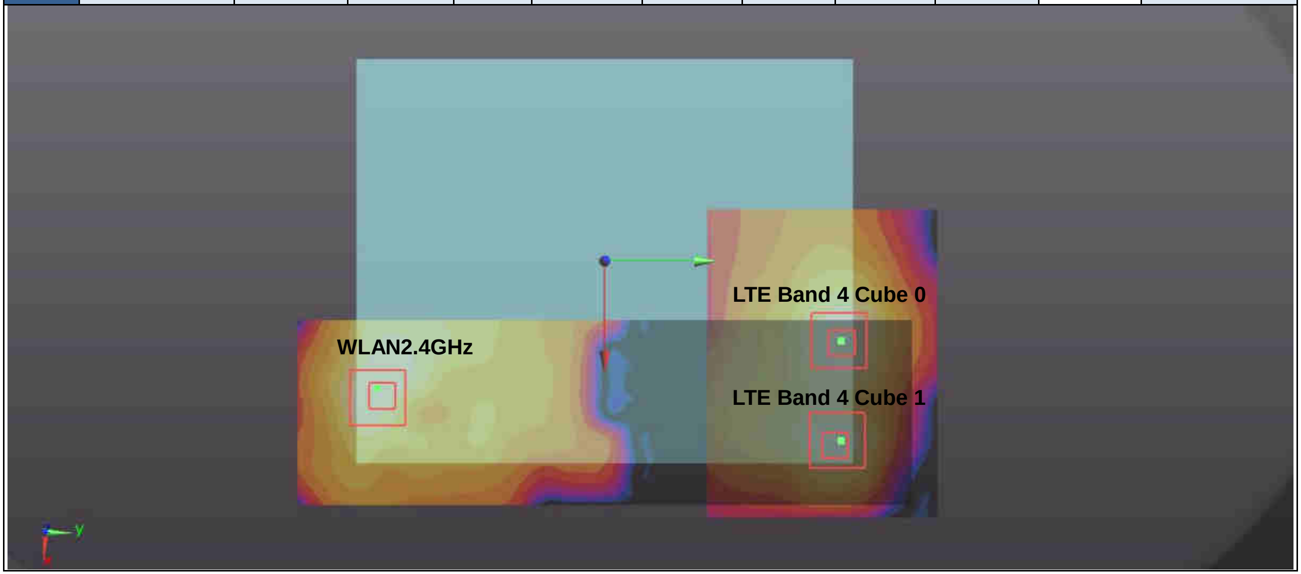
| Case | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (m) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 3 | LTE Band 5 | Bottom Face | 1.155 | 0 | 0.0635 | 0.092 | -0.177 | 177.7 | 1.73 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |




| Case | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (m) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 4 | LTE Band 2 | Bottom Face | 1.153 | 0 | 0.0295 | 0.094 | -0.177 | 180.9 | 1.73 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |

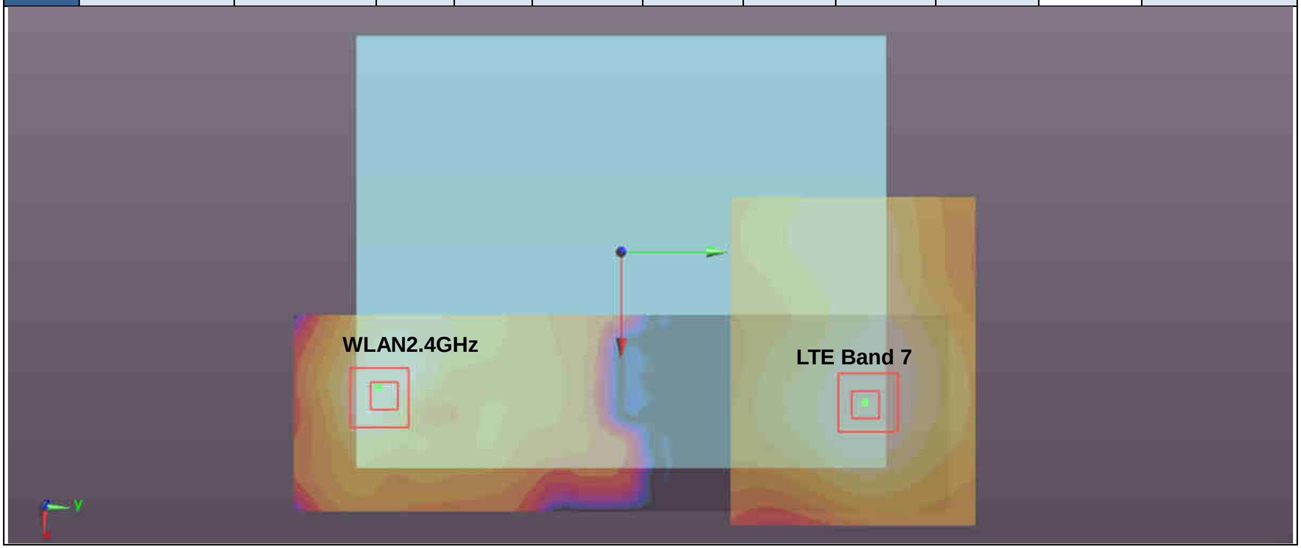


| Case | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (m) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 5 | LTE Band 4 | Bottom Face | 1.054 (Cube 0) | 0 | 0.031 | 0.0925 | -0.178 | 179.3 | 1.63 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |




Note：For LTE Band 4, compared with cube 1, cube 0 with higher SAR value and the shortest distance.
So chose cube 0 for SPLSR analysis.

| Case | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (m) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 6 | LTE Band 7 | Bottom Face | 1.151 | 0 | 0.0616 | 0.0928 | -0.178 | 178.4 | 1.73 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.577 | 0 | 0.053 | -0.0854 | -0.177 | | | | |




**Test Engineer：** Frank Qiao

# 18. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-Shape |
|---|---|---|---|---|
| Multi-plying Factor(a) | 1/k(b) | $1/\sqrt{3}$ | $1/\sqrt{6}$ | $1/\sqrt{2}$ |

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) $\kappa$ is the coverage factor

**Table 18.1. Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

| Error Description | Uncertainty Value (±%) | Probability | Divisor | (Ci) 1g | (Ci) 10g | Standard Uncertainty (1g) (±%) | Standard Uncertainty (10g) (±%) |
|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | |
| Probe Calibration | 6.0 | N | 1 | 1 | 1 | 6.0 | 6.0 |
| Axial Isotropy | 4.7 | R | 1.732 | 0.7 | 0.7 | 1.9 | 1.9 |
| Hemispherical Isotropy | 9.6 | R | 1.732 | 0.7 | 0.7 | 3.9 | 3.9 |
| Boundary Effects | 1.0 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| System Detection Limits | 1.0 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Modulation Response | 3.2 | R | 1.732 | 1 | 1 | 1.8 | 1.8 |
| Readout Electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response Time | 0.0 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| Integration Time | 2.6 | R | 1.732 | 1 | 1 | 1.5 | 1.5 |
| RF Ambient Noise | 3.0 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| RF Ambient Reflections | 3.0 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner | 0.4 | R | 1.732 | 1 | 1 | 0.2 | 0.2 |
| Probe Positioning | 2.9 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| Max. SAR Eval. | 2.0 | R | 1.732 | 1 | 1 | 1.2 | 1.2 |
| **Test Sample Related** | | | | | | | |
| Device Positioning | 3.0 | N | 1 | 1 | 1 | 3.0 | 3.0 |
| Device Holder | 3.6 | N | 1 | 1 | 1 | 3.6 | 3.6 |
| Power Drift | 5.0 | R | 1.732 | 1 | 1 | 2.9 | 2.9 |
| Power Scaling | 0.0 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 6.1 | R | 1.732 | 1 | 1 | 3.5 | 3.5 |
| SAR correction | 0.0 | R | 1.732 | 1 | 0.84 | 0.0 | 0.0 |
| Liquid Conductivity Repeatability | 0.2 | N | 1 | 0.78 | 0.71 | 0.1 | 0.1 |
| Liquid Conductivity (target) | 5.0 | R | 1.732 | 0.78 | 0.71 | 2.3 | 2.0 |
| Liquid Conductivity (mea.) | 2.5 | R | 1.732 | 0.78 | 0.71 | 1.1 | 1.0 |
| Temp. unc. - Conductivity | 3.4 | R | 1.732 | 0.78 | 0.71 | 1.5 | 1.4 |
| Liquid Permittivity Repeatability | 0.15 | N | 1 | 0.23 | 0.26 | 0.0 | 0.0 |
| Liquid Permittivity (target) | 5.0 | R | 1.732 | 0.23 | 0.26 | 0.7 | 0.8 |
| Liquid Permittivity (mea.) | 2.5 | R | 1.732 | 0.23 | 0.26 | 0.3 | 0.4 |
| Temp. unc. - Permittivity | 0.83 | R | 1.732 | 0.23 | 0.26 | 0.1 | 0.1 |
| **Combined Std. Uncertainty** | | | | | | 11.4% | 11.4% |
| **Coverage Factor for 95 %** | | | | | | K=2 | K=2 |
| **Expanded STD Uncertainty** | | | | | | 22.9% | 22.7% |

**Table 18.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz**

# 19. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 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”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[10] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[11] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

# Appendix A. Plots of System Performance Check

The plots are shown as follows.

**System Check_Body_835MHz_160529**

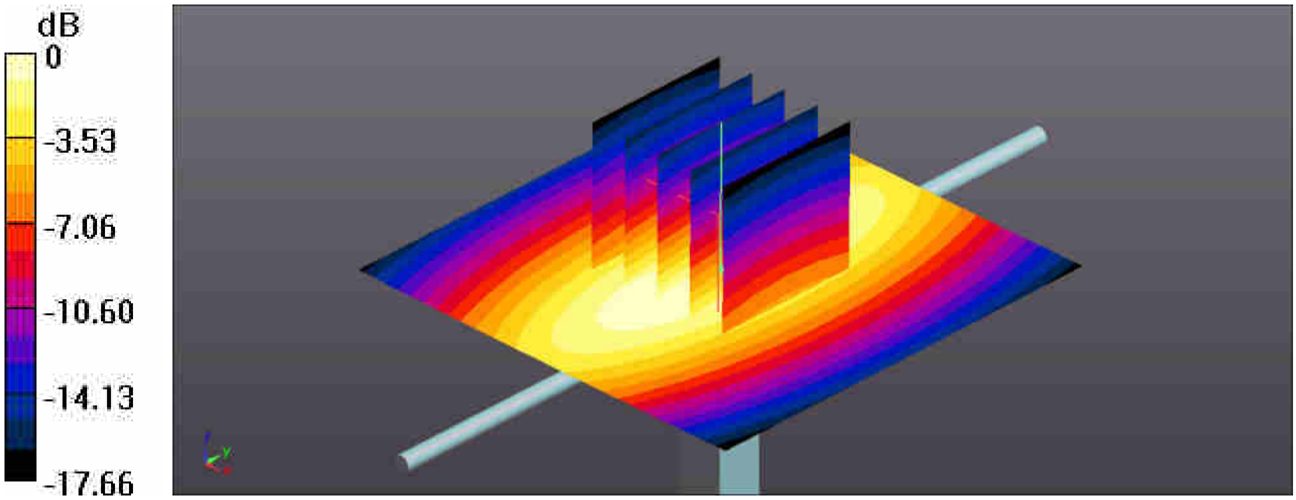
**DUT: D835V2 - SN:4d091**

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_835_160529 Medium parameters used: f = 835 MHz; σ = 0.966 S/m; $\varepsilon_r$ = 57.085; ρ = 1000 kg/$m^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.17, 10.17, 10.17); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2015.7.16
- Phantom: SAM3; Type: SAM; Serial: TP-1127
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.82 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.08 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.29 W/kg
**SAR(1 g) = 2.26 W/kg; SAR(10 g) = 1.5 W/kg**
Maximum value of SAR (measured) = 2.84 W/kg




0 dB = 2.82 W/kg = 4.50 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.5.27

**System Check_Body_1750MHz_160527**

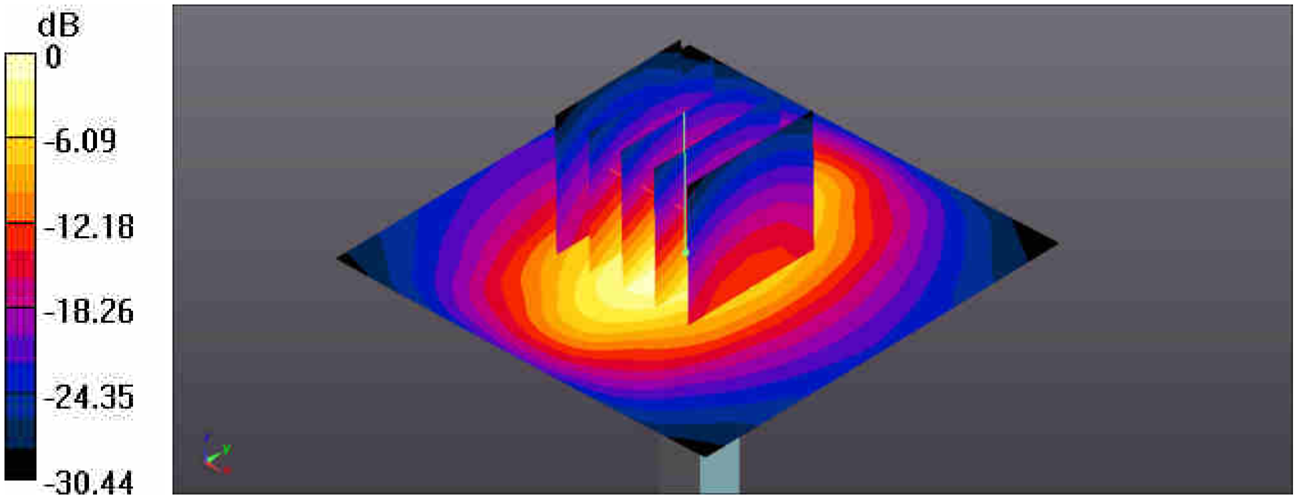
**DUT: D1750V2 - SN:1069**

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_160527 Medium parameters used: f = 1750 MHz; $\sigma$ = 1.528 S/m; $\varepsilon_r$ = 53.219; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(8.11, 8.11, 8.11); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.3 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.30 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 17.7 W/kg
**SAR(1 g) = 9.55 W/kg; SAR(10 g) = 4.72 W/kg**
Maximum value of SAR (measured) = 14.3 W/kg




0 dB = 14.3 W/kg = 11.55 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.5.27

**System Check_Body_1900MHz_160527**

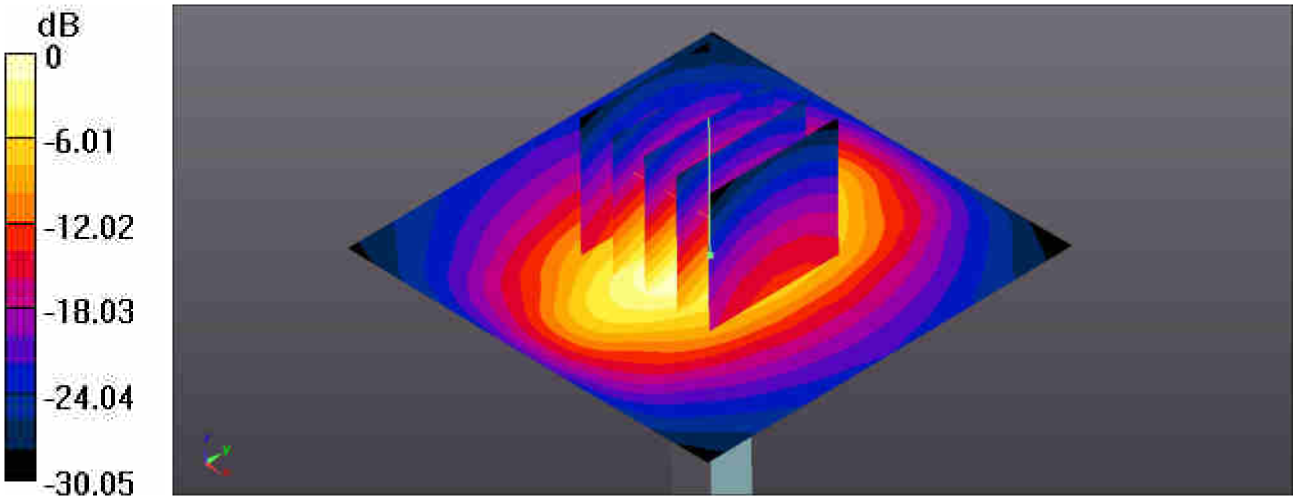
**DUT: D1900V2 - SN:5d118**

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_160527 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.551 S/m; $\varepsilon_r$ = 54.638; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.79, 7.79, 7.79); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.9 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 87.24 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 18.6 W/kg
**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.15 W/kg**
Maximum value of SAR (measured) = 14.9 W/kg




0 dB = 14.9 W/kg = 11.73 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.6.8

**System Check_Body_2450MHz_160608**

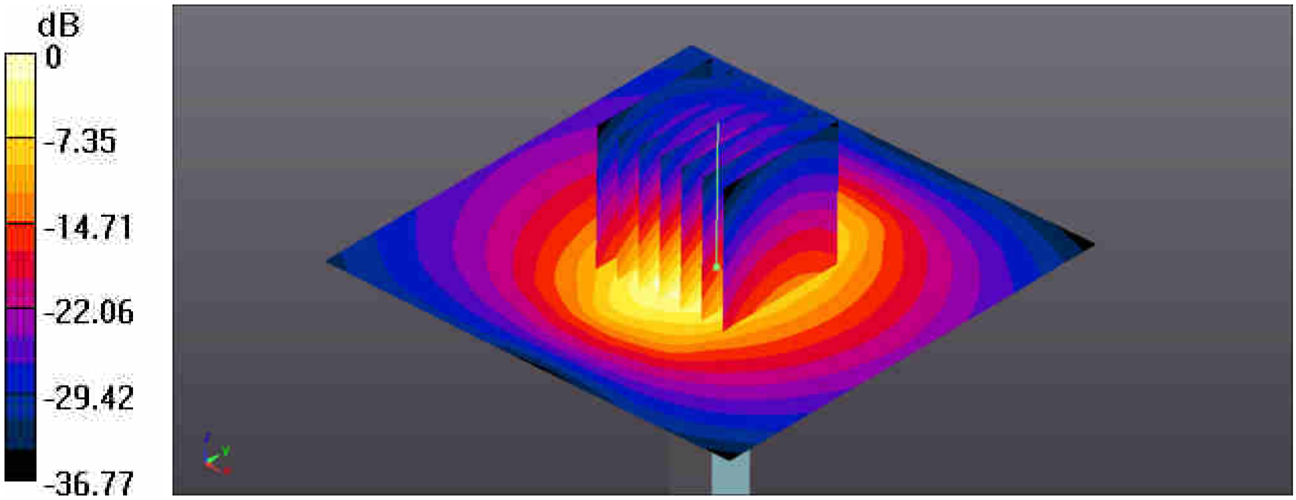
**DUT: D2450V2 - SN:840**

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160608 Medium parameters used: f = 2450 MHz; $\sigma$ = 1.989 S/m; $\varepsilon_r$ = 51.422; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 18.4 W/kg

**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.58 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 24.7 W/kg
**SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.79 W/kg**
Maximum value of SAR (measured) = 18.6 W/kg




0 dB = 18.4 W/kg = 12.65 dBW/kg

**System Check_Body_2600MHz_160528**

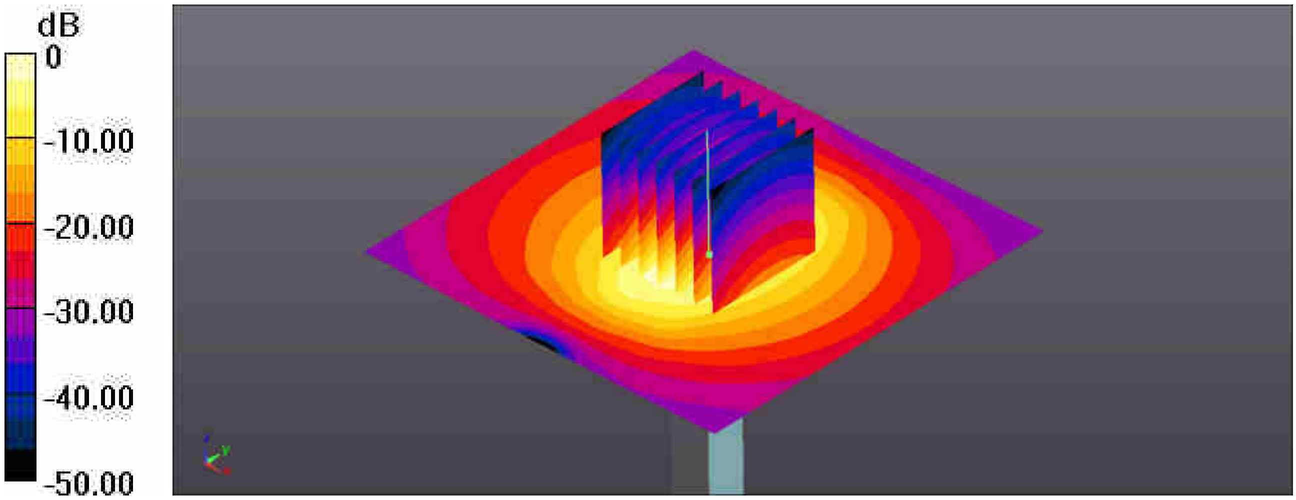
**DUT: D2600V2 - SN:1061**

Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL_2600_160528 Medium parameters used: f = 2600 MHz; $\sigma$ = 2.165 S/m; $\varepsilon_r$ = 53.823; $\rho$ = 1000 $kg/m^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 21.0 W/kg

**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.27 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 29.5 W/kg
**SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.35 W/kg**
Maximum value of SAR (measured) = 21.4 W/kg




0 dB = 21.0 W/kg = 13.22 dBW/kg

# Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.5.29

**01_GSM850_GPRS 2 Tx slots_Bottom Face_0mm_Sensor On_Ch251**

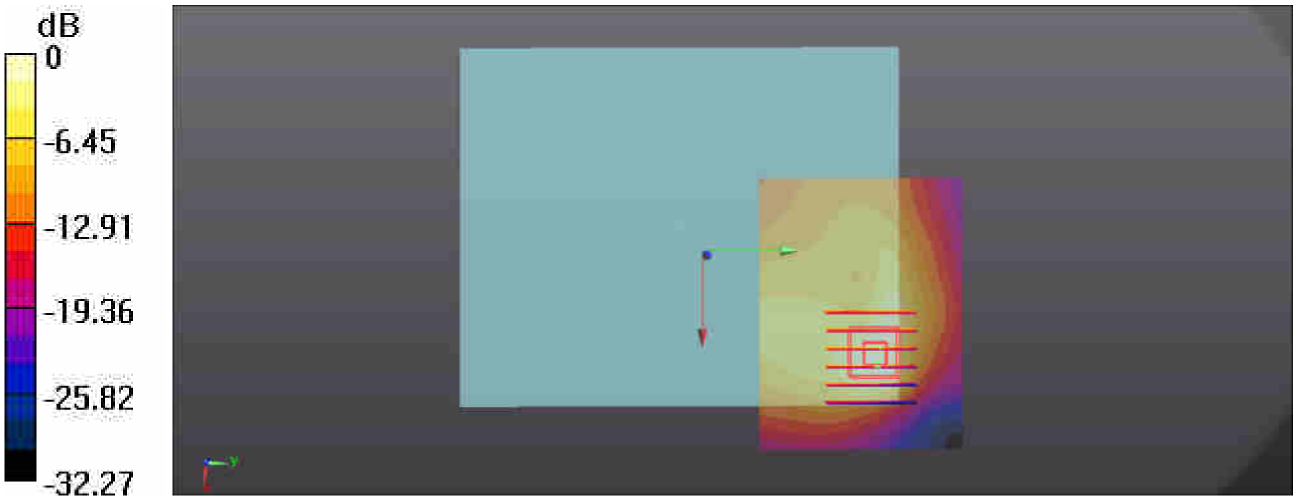
Communication System: UID 0, GPRS/EDGE (2 Tx slots) (0); Frequency: 848.8 MHz;Duty Cycle: 1:4.15
Medium: MSL_835_160529 Medium parameters used: f = 848.8 MHz; $\sigma$ = 0.981 S/m; $\varepsilon_r$ = 56.957; $\rho$ =1000 kg/m3

Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.17, 10.17, 10.17); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2015.7.16
- Phantom: SAM3; Type: SAM; Serial: TP-1127
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch251/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.40 W/kg

**Ch251/Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.218 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 2.15 W/kg
**SAR(1 g) = 1 W/kg; SAR(10 g) = 0.495 W/kg**
Maximum value of SAR (measured) = 1.61 W/kg




0 dB = 1.40 W/kg = 1.46 dBW/kg

**02_GSM1900_GPRS 2 Tx slots_Bottom Face_0mm_Sensor On_Ch512**

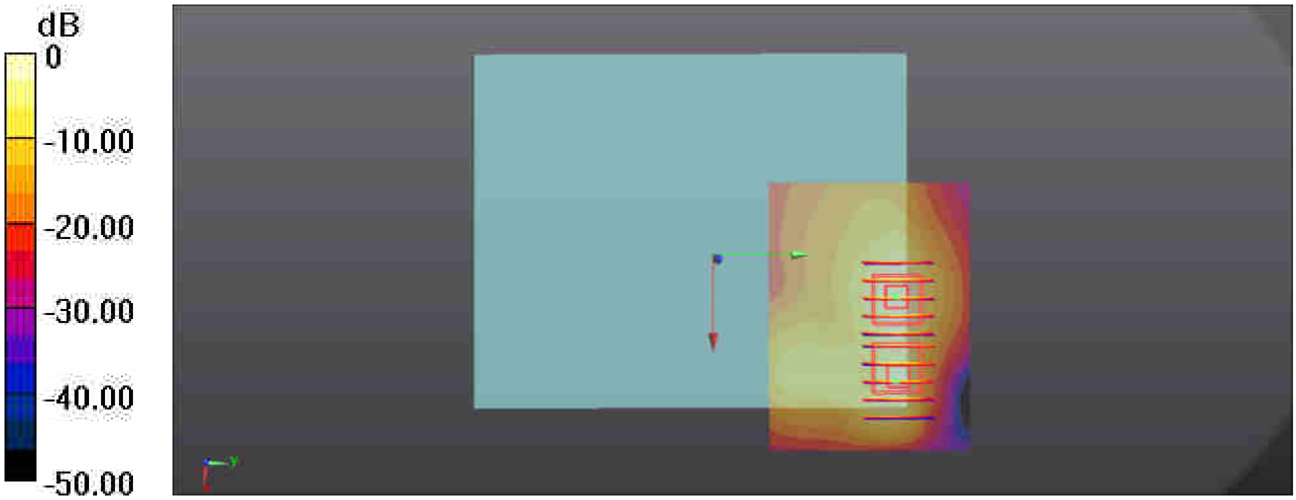
Communication System: UID 0, GPRS/EDGE (2 Tx slots) (0); Frequency: 1850.2 MHz;Duty Cycle: 1:4.15
Medium: MSL_1900_160527 Medium parameters used: f = 1850.2 MHz; $\sigma$ = 1.49 S/m; $\varepsilon_r$ = 54.784; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.79, 7.79, 7.79); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch512/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.64 W/kg

**Ch512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.647 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.75 W/kg
**SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.531 W/kg**
Maximum value of SAR (measured) = 1.44 W/kg

**Ch512/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.647 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.68 W/kg
**SAR(1 g) = 0.681 W/kg; SAR(10 g) = 0.299 W/kg**
Maximum value of SAR (measured) = 1.27 W/kg




0 dB = 1.64 W/kg = 2.15 dBW/kg

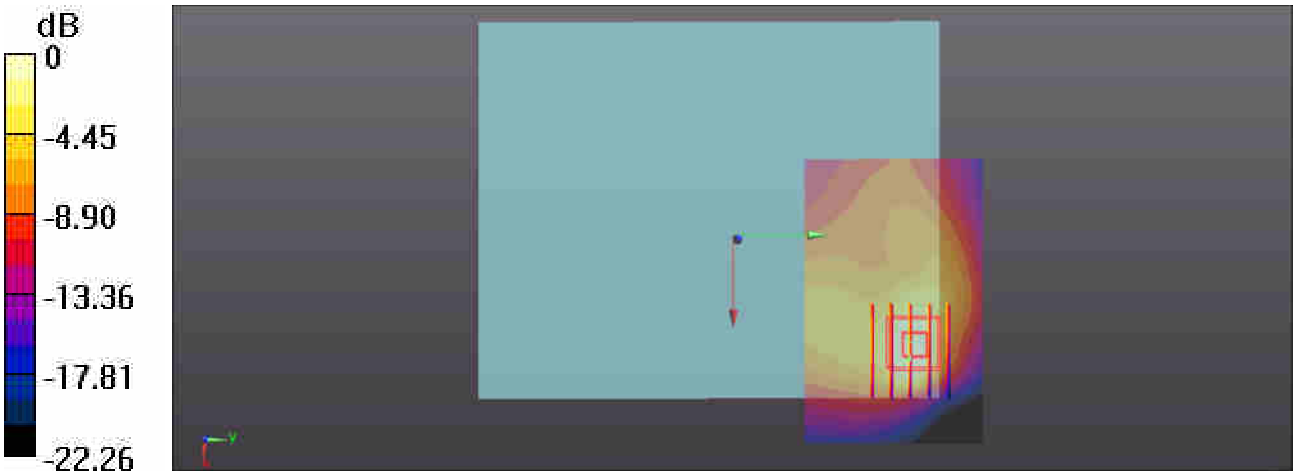
**03_WCDMA Band V_RMC 12.2Kbps_Bottom Face_0mm_Sensor On_Ch4132**

Communication System: UID 0, UMTS (0); Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: MSL_835_160529 Medium parameters used: f = 826.4 MHz; $\sigma$ = 0.957 S/m; $\varepsilon_r$ = 57.166; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.17, 10.17, 10.17); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2015.7.16
- Phantom: SAM3; Type: SAM; Serial: TP-1127
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch4132/Area Scan (81x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.46 W/kg

**Ch4132/Zoom Scan (6x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.744 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.81 W/kg
**SAR(1 g) = 0.831 W/kg; SAR(10 g) = 0.404 W/kg**
Maximum value of SAR (measured) = 1.15 W/kg




0 dB = 1.15 W/kg = 0.61 dBW/kg

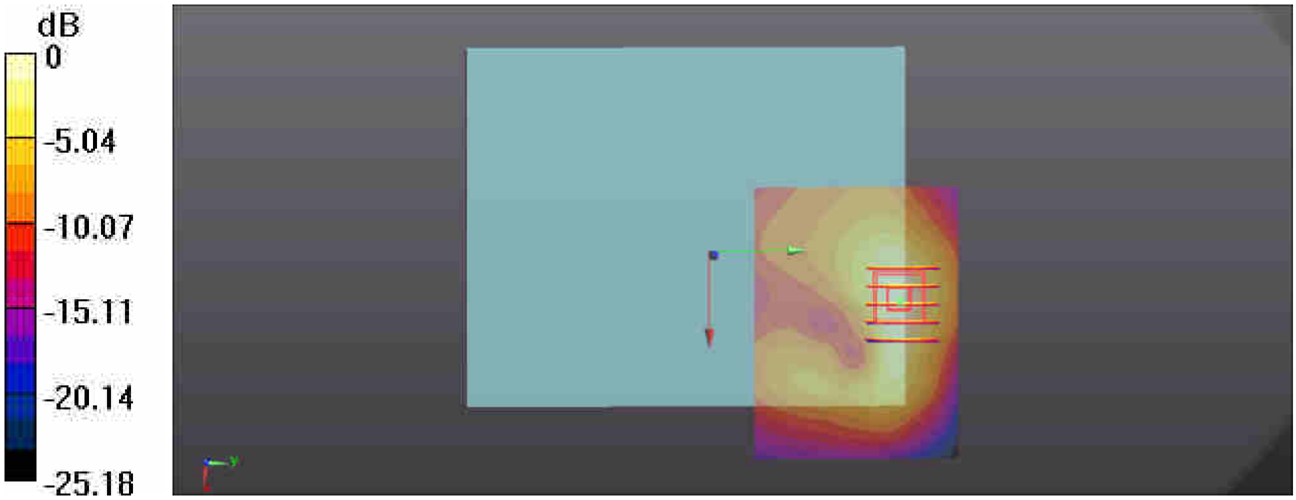
**04_WCDMA Band II_RMC 12.2Kbps_Bottom Face_10mm_Sensor Off_Ch9400**

Communication System: UID 0, UMTS (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_160527 Medium parameters used: f = 1880 MHz; $\sigma$ = 1.529 S/m; $\varepsilon_r$ = 54.69; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.79, 7.79, 7.79); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch9400/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.38 W/kg

**Ch9400/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.151 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.56 W/kg
**SAR(1 g) = 1 W/kg; SAR(10 g) = 0.588 W/kg**
Maximum value of SAR (measured) = 1.31 W/kg




0 dB = 1.38 W/kg = 1.40 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.5.29

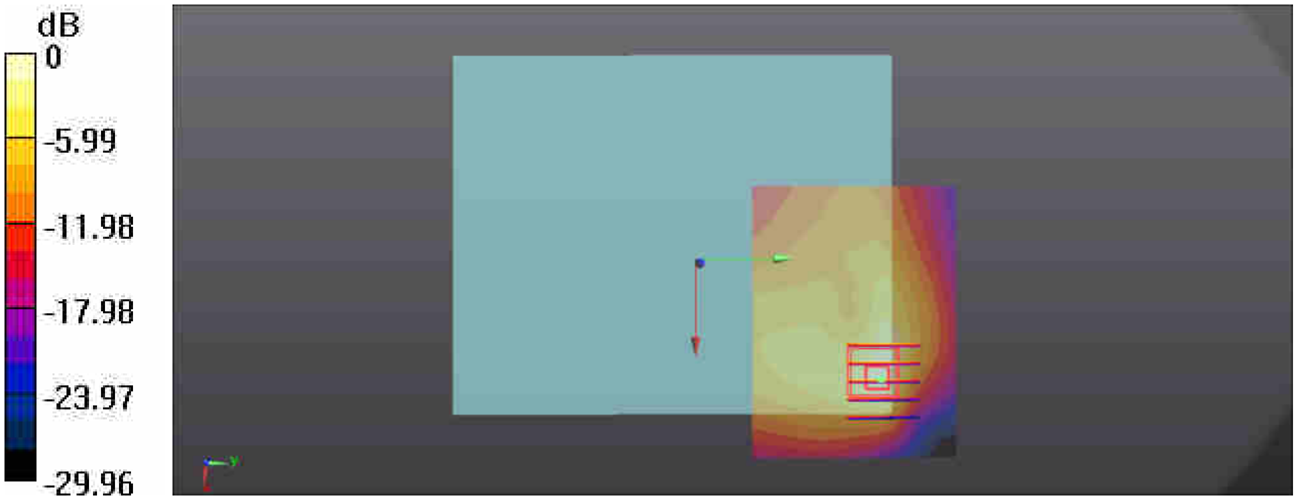
**05_LTE Band 5_10M_QPSK_1RB_25Offset_Bottom Face_0mm_Sensor Off_Ch20525**

Communication System: UID 0, FDD_LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: MSL_835_160529 Medium parameters used: f = 836.5 MHz; $\sigma$ = 0.968 S/m; $\varepsilon_r$ = 57.072; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.17, 10.17, 10.17); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 2015.7.16
- Phantom: SAM3; Type: SAM; Serial: TP-1127
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20525/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.49 W/kg

**Ch20525/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.102 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.35 W/kg
**SAR(1 g) = 0.956 W/kg; SAR(10 g) = 0.456 W/kg**
Maximum value of SAR (measured) = 1.56 W/kg




0 dB = 1.49 W/kg = 1.73 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.5.27

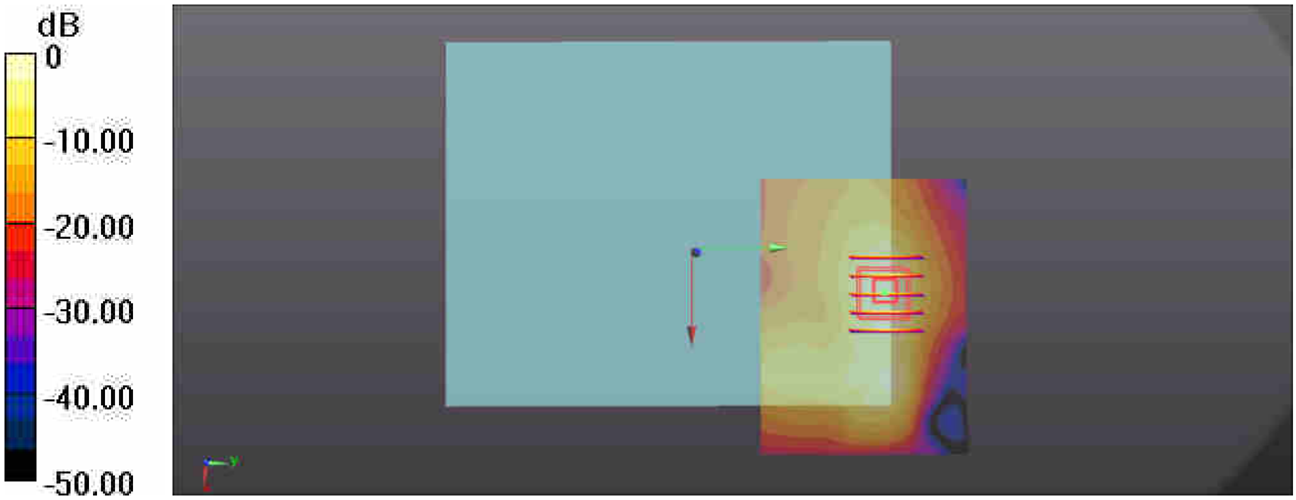
**06_LTE Band 2_20M_QPSK_1RB_0Offset_Bottom Face_0mm_Sensor On_Ch18900**

Communication System: UID 0, FDD_LTE (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: MSL_1900_160527 Medium parameters used: f = 1880 MHz; $\sigma$ = 1.529 S/m; $\varepsilon_r$ = 54.69; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.79, 7.79, 7.79); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch18900/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.43 W/kg

**Ch18900/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.422 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.52 W/kg
**SAR(1 g) = 0.903 W/kg; SAR(10 g) = 0.460 W/kg**
Maximum value of SAR (measured) = 1.25 W/kg




0 dB = 1.43 W/kg = 1.55 dBW/kg

**07_LTE Band 4_20M_QPSK_1RB_0Offset_Bottom Face_0mm_Sensor On_Ch20175**

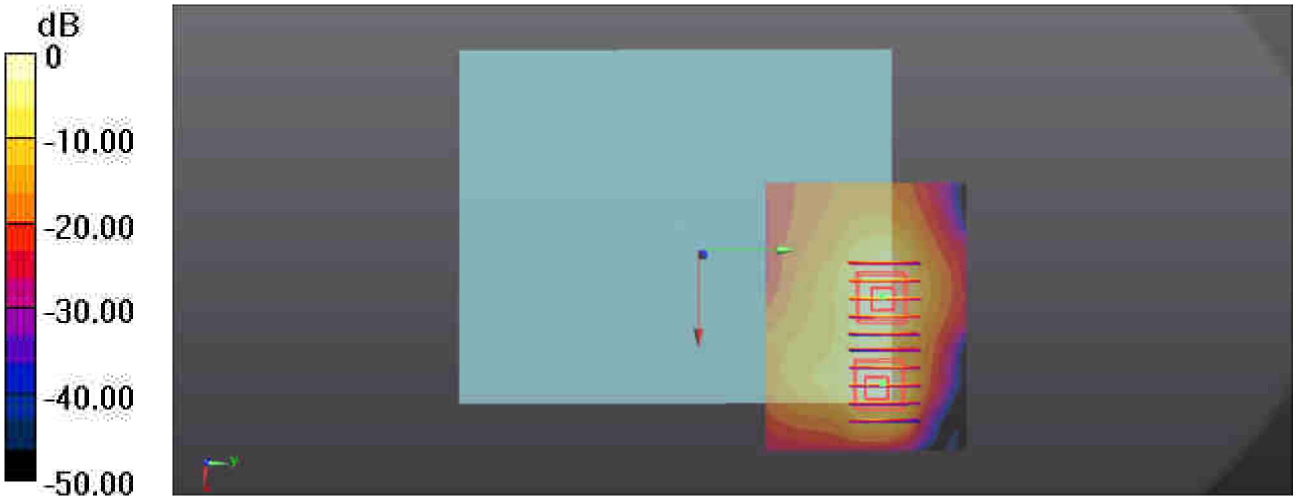
Communication System: UID 0, FDD_LTE (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: MSL_1750_160527 Medium parameters used: f = 1732.5 MHz; $\sigma$ = 1.509 S/m; $\varepsilon_r$ = 53.281; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(8.11, 8.11, 8.11); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20175/Area Scan (81x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.43 W/kg

**Ch20175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.9850 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.52 W/kg
**SAR(1 g) = 0.929 W/kg; SAR(10 g) = 0.480 W/kg**
Maximum value of SAR (measured) = 1.25 W/kg

**Configuration/Ch20175/Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.9850 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.85 W/kg
**SAR(1 g) = 0.615 W/kg; SAR(10 g) = 0.268 W/kg**
Maximum value of SAR (measured) = 0.954 W/kg




0 dB = 1.43 W/kg = 1.55 dBW/kg

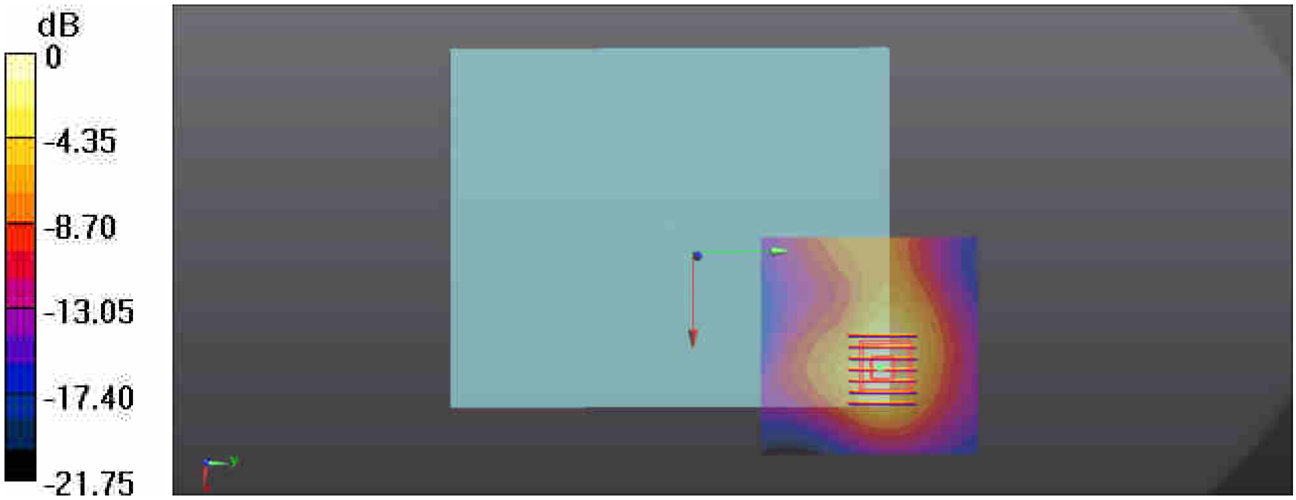
**08_LTE Band 7_20M_QPSK_1RB_0Offset_Bottom Face_10mm_Sensor Off_Ch20850**

Communication System: UID 0, FDD_LTE (0); Frequency: 2510 MHz;Duty Cycle: 1:1
Medium: MSL_2600_160528 Medium parameters used: f = 2510 MHz; $\sigma$ = 2.071 S/m; $\varepsilon_r$ = 53.993; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.5.11;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20850/Area Scan (81x81x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.73 W/kg

**Ch20850/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.217 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.93 W/kg
**SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.539 W/kg**
Maximum value of SAR (measured) = 1.60 W/kg




0 dB = 1.73 W/kg = 2.38 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2016.6.8

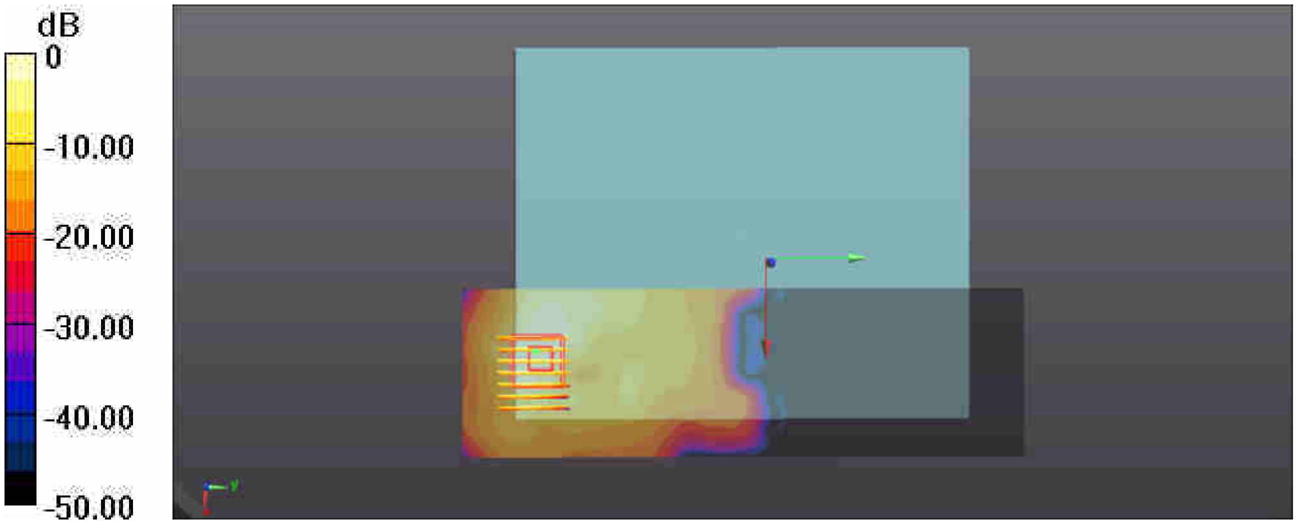
**09_WLAN2.4GHz_802.11b 1Mbps_Bottom Face_0mm_Sensor Off_Ch11**

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1.025
Medium: MSL_2450_160608 Medium parameters used: f = 2462 MHz; $\sigma$ = 2.006 S/m; $\varepsilon_r$ = 51.382; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.7 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3661; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.5.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn917; Calibrated: 2015.12.14
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (61x201x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.718 W/kg

**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.519 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.967 W/kg
**SAR(1 g) = 0.506 W/kg; SAR(10 g) = 0.245 W/kg**
Maximum value of SAR (measured) = 0.739 W/kg




0 dB = 0.718 W/kg = -1.44 dBW/kg

## Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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

**S** **Schweizerischer Kalibrierdienst**
**C** **Service suisse d'étalonnage**
**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** **Sporton-KS (Auden)**

**Certificate No: D835V2-4d091_Nov15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D835V2 - SN: 4d091 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 24, 2015 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | US37292783 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-15 (No. 217-02223) | Oct-16 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 01-Apr-15 (No. 217-02131) | Mar-16 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134) | Mar-16 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-14 (No. EX3-7349_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 17-Aug-15 (No. DAE4-601_Aug15) | Aug-16 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| RF generator R&S SMT-06 | 100972 | 15-Jun-15 (in house check Jun-15) | In house check: Jun-18 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: November 24, 2015

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 835 MHz ± 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 ± 0.2) °C | 42.6 ± 6 % | 0.92 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.31 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.14 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.50 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.94 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.2 | 0.97 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 55.6 ± 6 % | 0.99 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.42 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.55 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.59 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.29 W/kg ± 16.5 % (k=2)** |

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

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.3 Ω - 4.3 jΩ |
| Return Loss | - 27.0 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.3 Ω - 6.3 jΩ |
| Return Loss | - 23.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.395 ns |

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | September 15, 2009 |

## DASY5 Validation Report for Head TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d091**

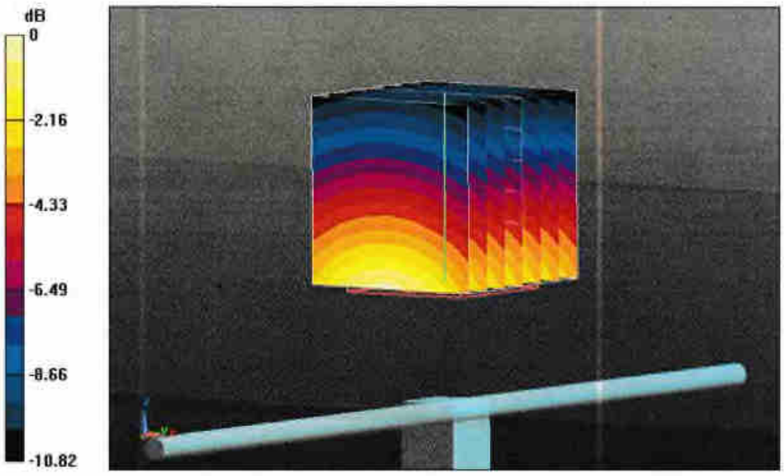
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.92 S/m; $\varepsilon_r$ = 42.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.77, 9.77, 9.77); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

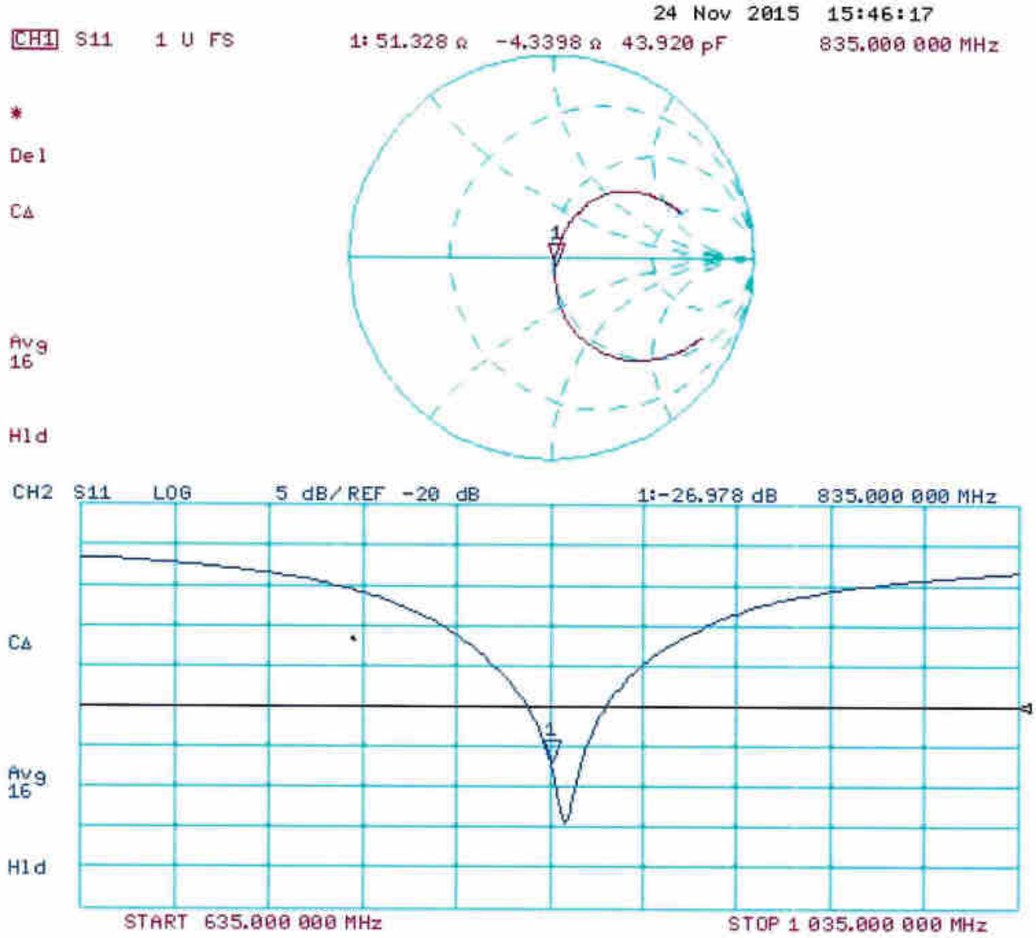
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.87 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.43 W/kg
**SAR(1 g) = 2.31 W/kg; SAR(10 g) = 1.5 W/kg**
Maximum value of SAR (measured) = 3.05 W/kg




0 dB = 3.05 W/kg = 4.84 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

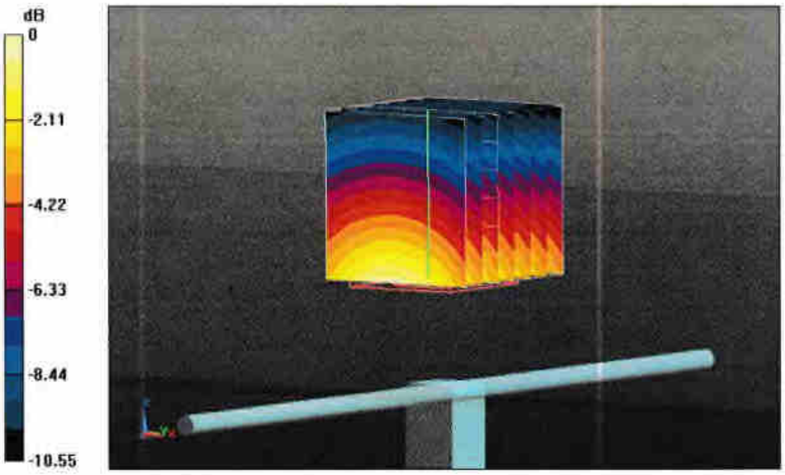
**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d091**

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.99$ S/m; $\varepsilon_r = 55.6$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

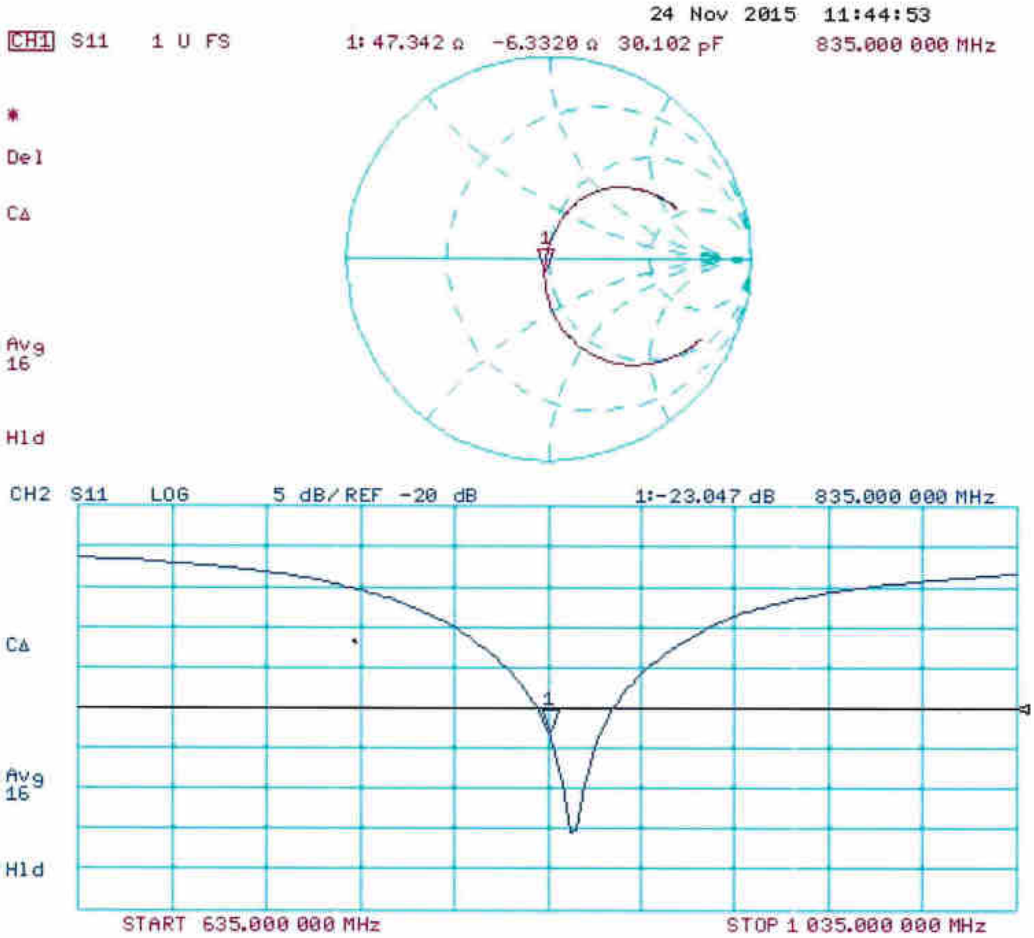
- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.69 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.58 W/kg
**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.59 W/kg**
Maximum value of SAR (measured) = 3.19 W/kg




0 dB = 3.19 W/kg = 5.04 dBW/kg

## Impedance Measurement Plot for Body TSL



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

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

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

**Accreditation No.: SCS 0108**

**Client** **Sporton-KS (Auden)**

**Certificate No: D1750V2-1069_Nov15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1750V2 - SN: 1069 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 23, 2015 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | US37292783 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-15 (No. 217-02223) | Oct-16 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 01-Apr-15 (No. 217-02131) | Mar-16 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134) | Mar-16 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-14 (No. EX3-7349_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 17-Aug-15 (No. DAE4-601_Aug15) | Aug-16 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| RF generator R&S SMT-06 | 100972 | 15-Jun-15 (in house check Jun-15) | In house check: Jun-18 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

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

Issued: November 24, 2015

**Glossary:**

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

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

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

**Additional Documentation:**

e) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

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

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 40.8 ± 6 % | 1.35 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm$^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.12 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **37.0 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.83 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **19.5 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.4 | 1.49 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 54.2 ± 6 % | 1.48 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm$^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 8.92 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **35.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.76 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **19.1 W/kg ± 16.5 % (k=2)** |

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

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.5 Ω - 0.4 jΩ |
| Return Loss | - 44.1 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.6 Ω - 0.4 jΩ |
| Return Loss | - 29.1 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.218 ns |

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | June 15, 2010 |

## DASY5 Validation Report for Head TSL

Date: 23.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

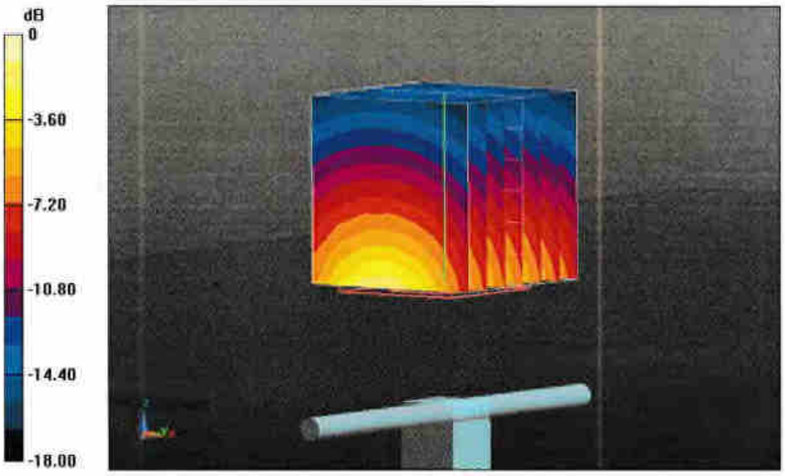
**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1069**

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.35 S/m; $\varepsilon_r$ = 40.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

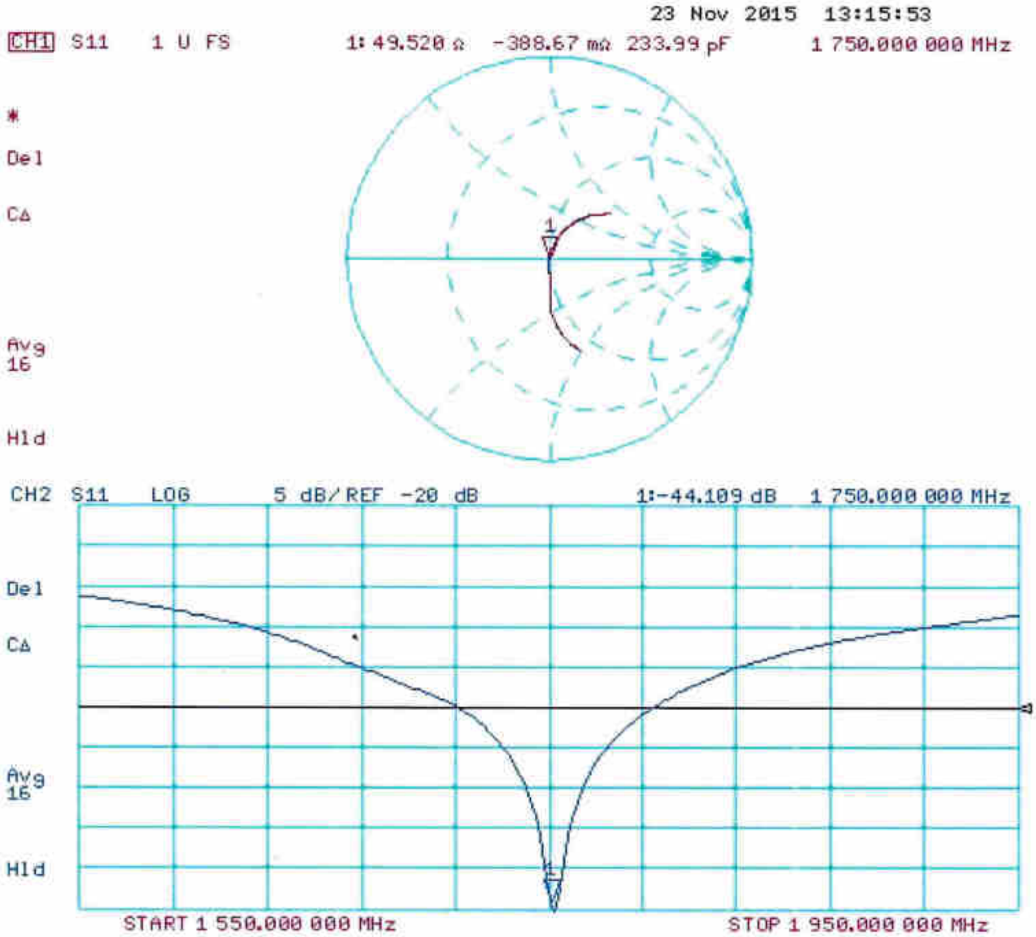
- Probe: EX3DV4 - SN7349; ConvF(8.38, 8.38, 8.38); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.2 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 16.9 W/kg
**SAR(1 g) = 9.12 W/kg; SAR(10 g) = 4.83 W/kg**
Maximum value of SAR (measured) = 13.9 W/kg




0 dB = 13.9 W/kg = 11.43 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 23.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

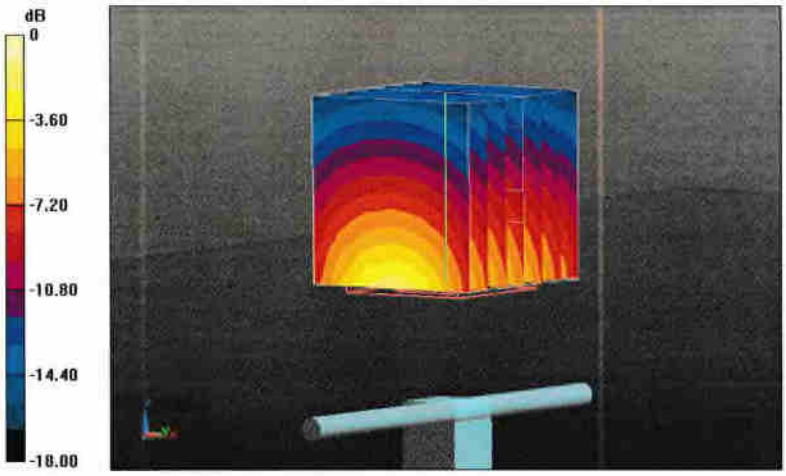
**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1069**

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.48 S/m; $\varepsilon_r$ = 54.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

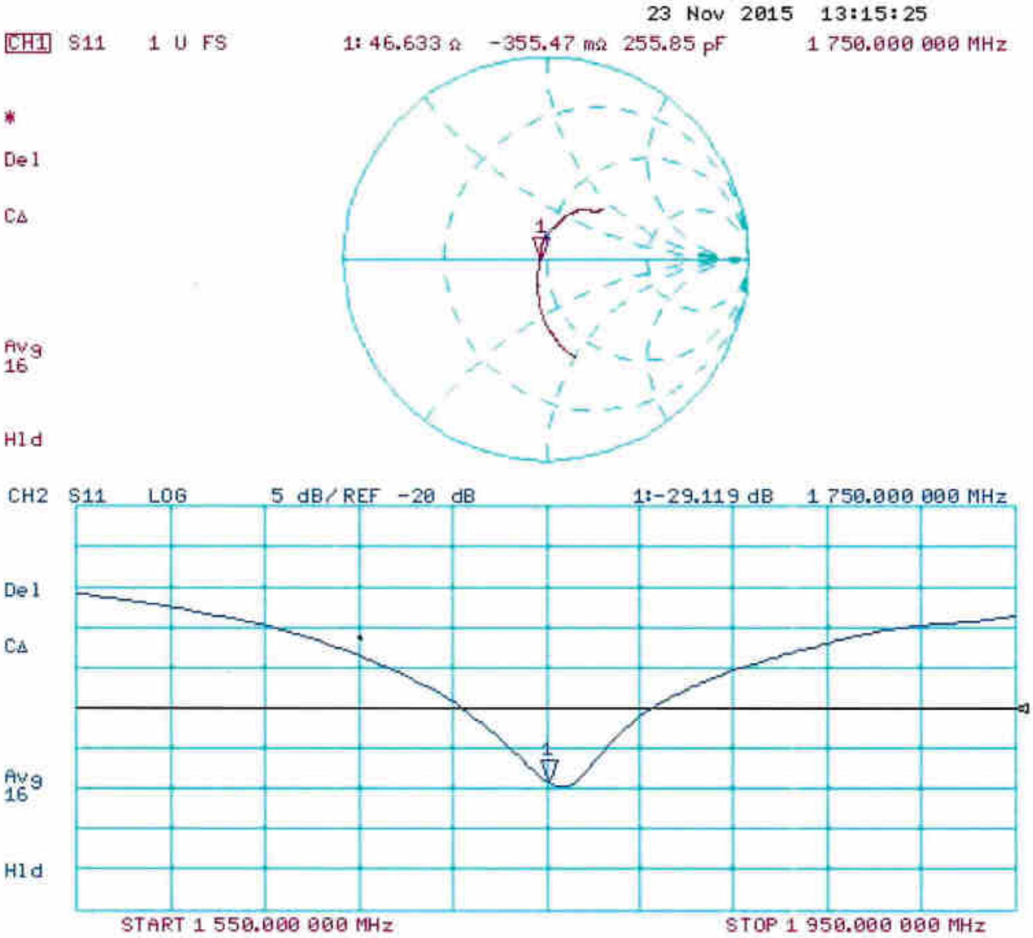
- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 15.8 W/kg
**SAR(1 g) = 8.92 W/kg; SAR(10 g) = 4.76 W/kg**
Maximum value of SAR (measured) = 13.5 W/kg




0 dB = 13.5 W/kg = 11.30 dBW/kg

## Impedance Measurement Plot for Body TSL



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

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

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

**Accreditation No.: SCS 0108**

Client **Sporton-KS (Auden)**

Certificate No: **D1900V2-5d118_Nov15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d118 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 23, 2015 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | US37292783 | 07-Oct-15 (No. 217-02222) | Oct-16 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-15 (No. 217-02223) | Oct-16 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 01-Apr-15 (No. 217-02131) | Mar-16 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 01-Apr-15 (No. 217-02134) | Mar-16 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-14 (No. EX3-7349_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 17-Aug-15 (No. DAE4-601_Aug15) | Aug-16 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| RF generator R&S SMT-06 | 100972 | 15-Jun-15 (in house check Jun-15) | In house check: Jun-18 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-15) | In house check: Oct-16 |

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

Issued: November 26, 2015