# FCC SAR Test Report

| | | |
|---|---|---|
| **APPLICANT** | : | **TCL Communication Ltd.** |
| **EQUIPMENT** | : | **Tablet PC** |
| **BRAND NAME** | : | **ALCATEL ONETOUCH** |
| **MODEL NAME** | : | **9006W** |
| **MARKETING NAME** | : | **ONETOUCH PIXI 2 (7)** |
| **FCC ID** | : | **2ACCJB014** |
| **STANDARD** | : | **FCC 47 CFR Part 2 (2.1093)**<br>**ANSI/IEEE C95.1-1992**<br>**IEEE 1528-2003** |

**We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.**

Eric Huang

**Reviewed by: Eric Huang / Deputy Manager**

Jones Tsai

**Approved by: Jones Tsai / Manager**

TAF
Testing Laboratory
1190

## *SPORTON INTERNATIONAL INC.*

***No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)***

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# Revision History

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FA542101 | Rev. 01 | Initial issue of report | May. 11, 2015 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **TCL Communication Ltd., Tablet PC, 9006W** are as follows.

| Equipment Class | Frequency Band | Highest SAR Summary | |
|---|---|---|---|
| | | Body 1g SAR (W/kg) | Simultaneous Transmission 1g SAR (W/kg) |
| PCB | GSM850 | 0.22 | 1.49 |
| | GSM1900 | 1.11 | |
| | WCDMA Band V | 0.25 | |
| | WCDMA Band IV | 1.03 | |
| | WCDMA Band II | 1.40 | |
| | LTE Band 12 | 0.32 | |
| | LTE Band 4 | 1.01 | |
| | LTE Band 2 | **1.44** | |
| DTS | WLAN 2.4GHz Band | 1.39 | 1.44 |
| Date of Testing: | | 2015/5/5~ 2015/5/9 | |

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 1528-2003.

# 2. Administration Data

| **Testing Laboratory** | |
|---|---|
| **Test Site** | SPORTON INTERNATIONAL INC. |
| **Test Site Location** | No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |

| **Applicant** | |
|---|---|
| **Company Name** | TCL Communication Ltd. |
| **Address** | 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203 |

| **Manufacturer** | |
|---|---|
| **Company Name** | TCL Communication Ltd. |
| **Address** | 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203 |

# 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 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r01
- FCC KDB 941225 D01 3G SAR Procedures v03
- FCC KDB 941225 D05 SAR for LTE Devices v02r03

# 4. Equipment Under Test (EUT)

## 4.1 General Information

| **Product Feature & Specification** | |
|---|---|
| **Equipment Name** | Tablet PC |
| **Brand Name** | ALCATEL ONETOUCH |
| **Model Name** | 9006W |
| **Marketing Name** | ONETOUCH PIXI 2 (7) |
| **FCC ID** | 2ACCJB014 |
| **IMEI Code** | 014399000023051 |
| **Wireless Technology and Frequency Range** | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8 MHz<br>WCDMA Band V: 826.4 MHz ~ 846.6 MHz<br>WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz<br>WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz<br>LTE Band 12: 699.7 MHz ~ 715.3 MHz<br>LTE Band 4: 1710.7 MHz ~ 1754.3 MHz<br>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| **Mode** | · GSM/GPRS/EGPRS<br>· RMC/AMR 12.2Kbps<br>· HSDPA<br>· HSUPA<br>· DC-HSDPA<br>· LTE: QPSK, 16QAM<br>· 802.11a/b/g/n HT20/HT40<br>· Bluetooth v3.0+EDR, Bluetooth v4.1-LE |
| **HW Version** | V03 |
| **SW Version** | B2E |
| **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** | Production Unit |
| **Remark:**<br>1. This device supported VoIP in EGPRS, WCDMA, LTE (e.g. 3rd party VoIP). | |

## 4.2 Maximum Tune-up Limit

| Mode / Band | Burst Average Power (dBm) | | | |
|---|---|---|---|---|
| | GSM 850 | | GSM 1900 | |
| Output Power Status | Full Power Mode | Reduce Power Mode | Full Power Mode | Reduce Power Mode |
| GPRS (GMSK, 1 Tx slot) | 34.50 | 24.50 | 31.00 | 20.00 |
| GPRS (GMSK, 2 Tx slots) | 31.00 | 22.50 | 29.00 | 18.00 |
| GPRS (GMSK, 3 Tx slots) | 29.00 | 20.50 | 26.00 | 16.00 |
| GPRS (GMSK, 4 Tx slots) | 27.00 | 19.00 | 25.00 | 14.50 |
| EDGE (8PSK, 1 Tx slot) | 27.00 | 19.00 | 26.00 | 16.00 |
| EDGE (8PSK, 2 Tx slots) | 27.00 | 17.50 | 26.00 | 15.00 |
| EDGE (8PSK, 3 Tx slot) | 26.00 | 16.50 | 24.00 | 15.00 |
| EDGE (8PSK, 4 Tx slots) | 25.00 | 16.00 | 24.00 | 14.00 |

| Mode / Band | Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | WCDMA Band V | | WCDMA Band II | | WCDMA Band IV | |
| Output Power Status | Full Power Mode | Reduce Power Mode | Full Power Mode | Reduce Power Mode | Full Power Mode | Reduce Power Mode |
| RMC 12.2Kbps | 24.50 | 16.50 | 24.50 | 13.50 | 24.50 | 13.50 |
| HSDPA Subtest-1 | 23.50 | 14.50 | 23.50 | 13.50 | 23.50 | 13.50 |
| DC-HSDPA Subtest-1 | 23.50 | 14.50 | 23.50 | 13.50 | 23.50 | 13.50 |
| HSUPA Subtest-5 | 23.50 | 14.50 | 23.50 | 13.50 | 23.50 | 13.50 |

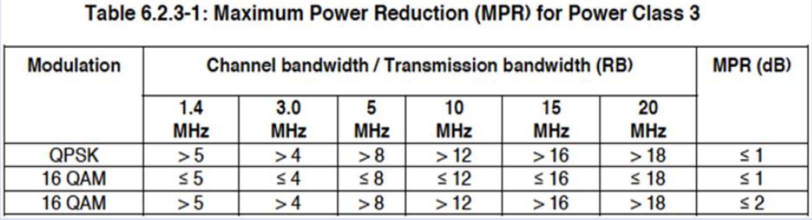
| LTE Band 12 | | | | | | |
|---|---|---|---|---|---|---|
| Modulation | BW (MHz) | RB size | Full Power Mode | | Reduce Power Mode | |
| | | | MPR | Average Power (dBm) | MPR | Average Power (dBm) |
| QPSK | 10 | ≤ 12 | 0 | 24.50 | 0 | 15.50 |
| QPSK | 10 | > 12 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 10 | ≤ 12 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 10 | > 12 | 2 | 22.50 | 0 | 15.50 |
| QPSK | 5 | ≤ 8 | 0 | 24.50 | 0 | 15.50 |
| QPSK | 5 | > 8 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 5 | ≤ 8 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 5 | > 8 | 2 | 22.50 | 0 | 15.50 |
| QPSK | 3 | ≤ 4 | 0 | 24.50 | 0 | 15.50 |
| QPSK | 3 | > 4 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 3 | ≤ 4 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 3 | > 4 | 2 | 22.50 | 0 | 15.50 |
| QPSK | 1.4 | ≤ 5 | 0 | 24.50 | 0 | 15.50 |
| QPSK | 1.4 | > 5 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 1.4 | ≤ 5 | 1 | 23.50 | 0 | 15.50 |
| 16QAM | 1.4 | > 5 | 2 | 22.50 | 0 | 15.50 |

| LTE Band 4 | | | | | | |
|---|---|---|---|---|---|---|
| Modulation | BW (MHz) | RB size | Full Power Mode | | Reduce Power Mode | |
| | | | MPR | Average Power (dBm) | MPR | Average Power (dBm) |
| QPSK | 20 | ≤ 18 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 20 | > 18 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 20 | ≤ 18 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 20 | > 18 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 15 | ≤ 16 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 15 | > 16 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 15 | ≤ 16 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 15 | > 16 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 10 | ≤ 12 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 10 | > 12 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 10 | ≤ 12 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 10 | > 12 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 5 | ≤ 8 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 5 | > 8 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 5 | ≤ 8 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 5 | > 8 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 3 | ≤ 4 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 3 | > 4 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 3 | ≤ 4 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 3 | > 4 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 1.4 | ≤ 5 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 1.4 | > 5 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 1.4 | ≤ 5 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 1.4 | > 5 | 2 | 22.50 | 0 | 13.50 |

| LTE Band 2 | | | | | | |
|---|---|---|---|---|---|---|
| Modulation | BW (MHz) | RB size | Full Power Mode | | Reduce Power Mode | |
| | | | MPR | Average Power (dBm) | MPR | Average Power (dBm) |
| QPSK | 20 | ≤ 18 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 20 | > 18 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 20 | ≤ 18 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 20 | > 18 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 15 | ≤ 16 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 15 | > 16 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 15 | ≤ 16 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 15 | > 16 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 10 | ≤ 12 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 10 | > 12 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 10 | ≤ 12 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 10 | > 12 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 5 | ≤ 8 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 5 | > 8 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 5 | ≤ 8 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 5 | > 8 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 3 | ≤ 4 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 3 | > 4 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 3 | ≤ 4 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 3 | > 4 | 2 | 22.50 | 0 | 13.50 |
| QPSK | 1.4 | ≤ 5 | 0 | 24.50 | 0 | 13.50 |
| QPSK | 1.4 | > 5 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 1.4 | ≤ 5 | 1 | 23.50 | 0 | 13.50 |
| 16QAM | 1.4 | > 5 | 2 | 22.50 | 0 | 13.50 |

| Mode | | Average Power (dBm) |
|---|---|---|
| 2.4GHz | 802.11b | 12.90 |
| | 802.11g | 12.50 |
| | 802.11n-HT20 | 12.50 |
| 5GHz | 802.11a | 8.00 |
| | 802.11n-HT20 | 8.00 |
| | 802.11n-HT40 | 8.00 |
| Bluetooth v3.0-EDR | | 7.0 |
| Bluetooth v4.1-LE | | 3.0 |

## 4.3 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r03</th></tr>
<tr><td>FCC ID</td><td>2ACCJB014</td></tr>
<tr><td>Equipment Name</td><td>Tablet PC</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 12: 699.7 MHz ~ 715.3 MHz<br>LTE Band 4: 1710.7 MHz ~ 1754.3 MHz<br>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 12: 1.4MHz, 3MHz, 5MHz, 10MHz<br>LTE Band 04: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 02: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>UE Category</td><td>Cat4</td></tr>
<tr><td>uplink modulations used</td><td>QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>1. Data only</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>Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th>MPR (dB)</th></tr>
<tr><th></th><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><th></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.</td></tr>
</table>

**Transmission (H, M, L) channel numbers and frequencies in each LTE band**

LTE Band 12

| | 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 | 23017 | 699.7 | 23025 | 700.5 | 23035 | 701.5 | 23060 | 704 |
| M | 23095 | 707.5 | 23095 | 707.5 | 23095 | 707.5 | 23095 | 707.5 |
| H | 23173 | 715.3 | 23165 | 714.5 | 23155 | 713.5 | 23130 | 711 |

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 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 |

# 5. Proximity Sensor Triggering Test

**Proximity sensor power reduction**

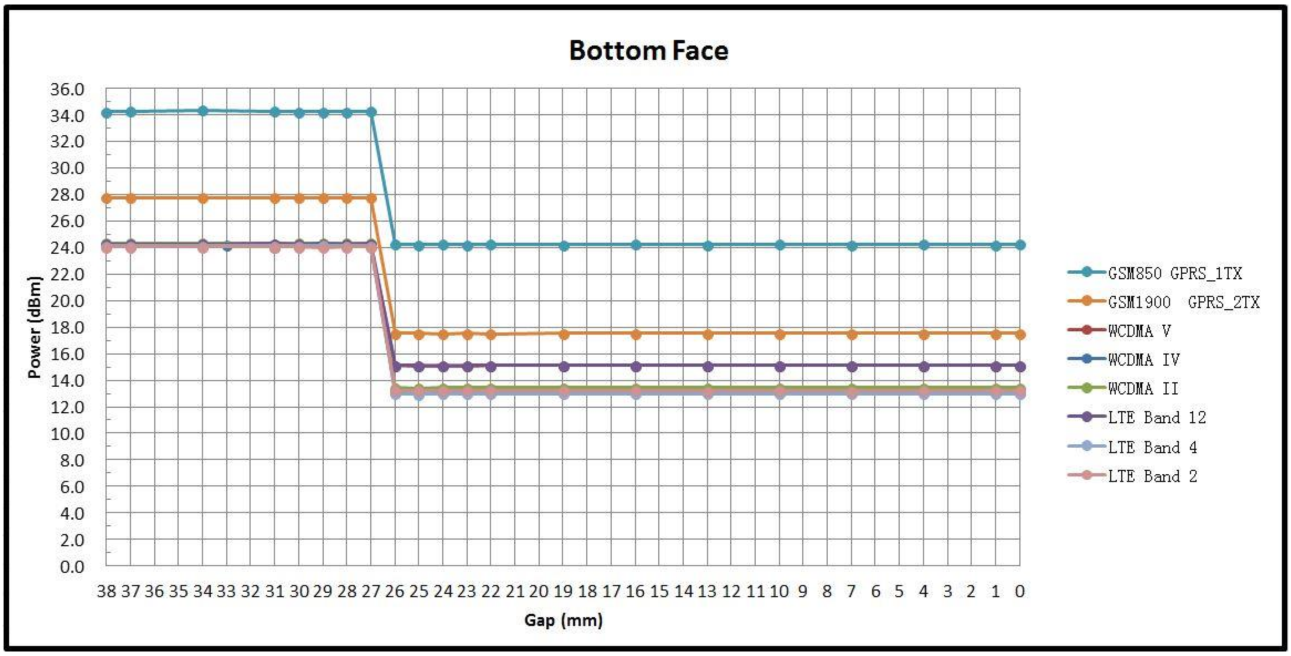
| Exposure Position / wireless mode | Bottom Face(1) | Edge 1(1) | Curved surface of Edge 1(1) | Edge 2 | Edge 3 | Edge 4 |
|---|---|---|---|---|---|---|
| GSM850 GPRS (GMSK 1 Tx slot) - CS1 | 10.0 | 10.0 | 10.0 | 0 dB | 0 dB | 0 dB |
| GSM850 GPRS (GMSK 2 Tx slot) - CS1 | 8.5 | 8.5 | 8.5 | | | |
| GSM850 GPRS (GMSK 3 Tx slot) - CS1 | 8.5 | 8.5 | 8.5 | | | |
| GSM850 GPRS (GMSK 4 Tx slot) - CS1 | 8.0 | 8.0 | 8.0 | | | |
| GSM850 EDGE (8PSK 1 Tx slot) - MCS5 | 8.0 | 8.0 | 8.0 | | | |
| GSM850 EDGE (8PSK 2 Tx slot) - MCS5 | 9.5 | 9.5 | 9.5 | | | |
| GSM850 EDGE (8PSK 3 Tx slot) - MCS5 | 9.5 | 9.5 | 9.5 | | | |
| GSM850 EDGE (8PSK 4 Tx slot) - MCS5 | 9.0 | 9.0 | 9.0 | | | |
| GSM1900 GPRS (GMSK 1 Tx slot) - CS1 | 11.0 | 11.0 | 11.0 | | | |
| GSM1900 GPRS (GMSK 2 Tx slot) - CS1 | 11.0 | 11.0 | 11.0 | | | |
| GSM1900 GPRS (GMSK 3 Tx slot) - CS1 | 10.0 | 10.0 | 10.0 | | | |
| GSM1900 GPRS (GMSK 4 Tx slot) - CS1 | 10.5 | 10.5 | 10.5 | | | |
| GSM1900 EDGE (8PSK 1 Tx slot) - MCS5 | 10.0 | 10.0 | 10.0 | | | |
| GSM1900 EDGE (8PSK 2 Tx slot) - MCS5 | 11.0 | 11.0 | 11.0 | | | |
| GSM1900 EDGE (8PSK 3 Tx slot) - MCS5 | 9.0 | 9.0 | 9.0 | | | |
| GSM1900 EDGE (8PSK 4 Tx slot) - MCS5 | 10.0 | 10.0 | 10.0 | | | |
| WCDMA Band V | 8.0 | 8.0 | 8.0 | | | |
| WCDMA Band II | 11.0 | 11.0 | 11.0 | | | |
| WCDMA Band IV | 11.0 | 11.0 | 11.0 | | | |
| LTE Band 12 | 9.0 | 9.0 | 9.0 | | | |
| LTE Band 4 | 11.0 | 11.0 | 11.0 | | | |
| LTE Band 2 | 11.0 | 11.0 | 11.0 | | | |

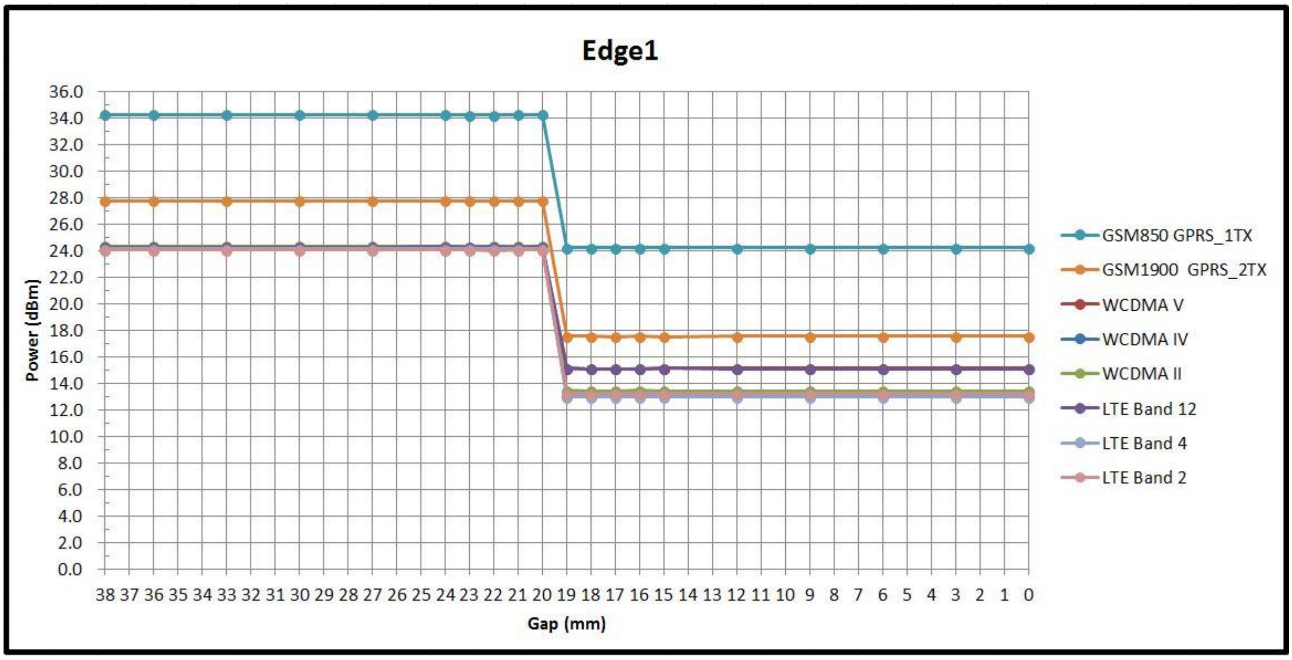
**Remark:**

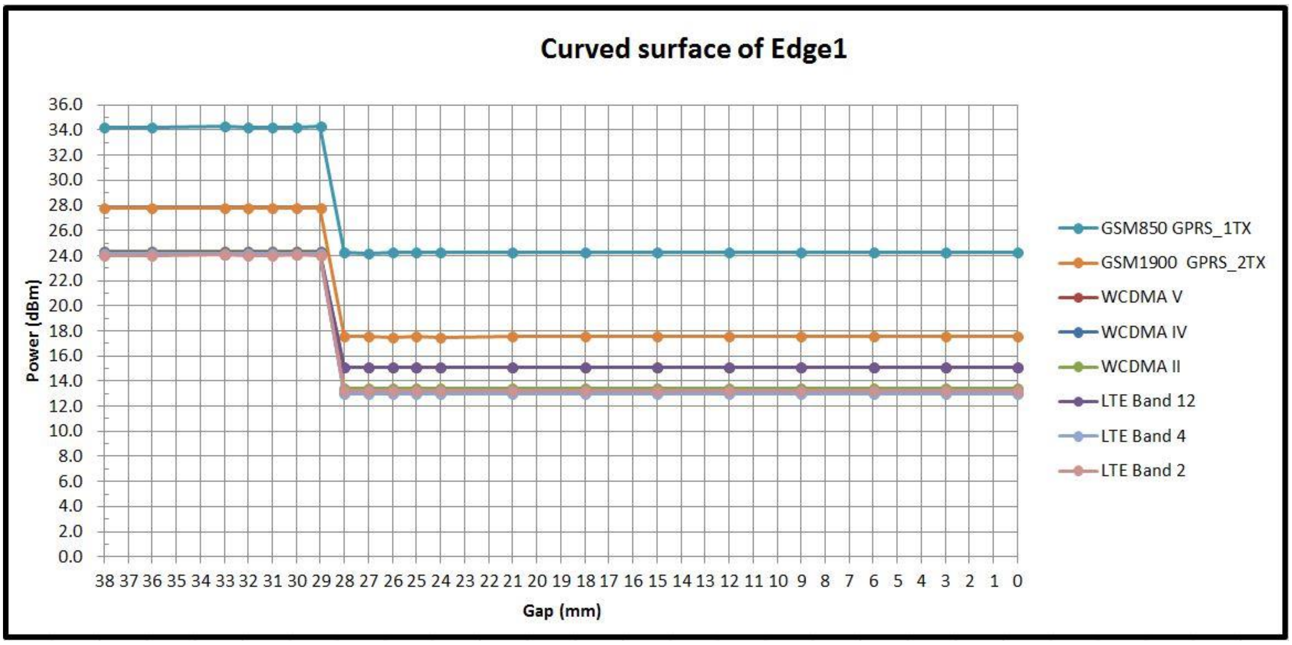
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN and Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational 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: 15 mm
   - Edge1: 15 mm
   - Curved surface of dge1: 15 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 | 189 | 34.27 | 24.23 | 10.04 |
| GSM1900 | 661 | 30.67 | 19.38 | 11.29 |
| WCDMA Band V | 4182 | 24.03 | 15.02 | 9.01 |
| WCDMA Band IV | 1413 | 24.01 | 13.10 | 10.91 |
| WCDMA Band II | 9400 | 24.13 | 13.39 | 10.74 |
| LTE Band 12 | 23095 | 24.28 | 15.11 | 9.17 |
| LTE Band 4 | 20175 | 24.15 | 12.97 | 11.18 |
| LTE Band 2 | 18900 | 24.04 | 13.22 | 10.82 |




Edge1
Power (dBm)
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Gap (mm)
GSM850 GPRS_1TX
GSM1900 GPRS_2TX
WCDMA V
WCDMA IV
WCDMA II
LTE Band 12
LTE Band 4
LTE Band 2


Curved surface of Edge1
Power (dBm)
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Gap (mm)
GSM850 GPRS_1TX
GSM1900 GPRS_2TX
WCDMA V
WCDMA IV
WCDMA II
LTE Band 12
LTE Band 4
LTE Band 2

# 6. RF Exposure Limits

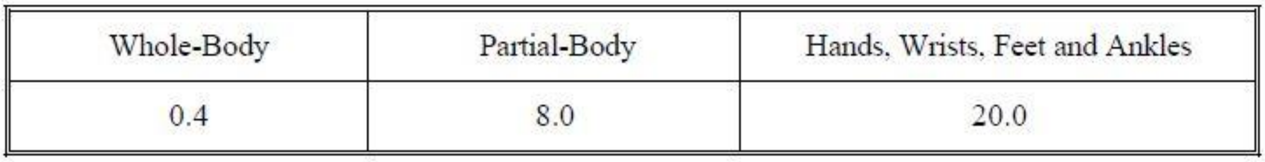
## 6.1 Uncontrolled Environment

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

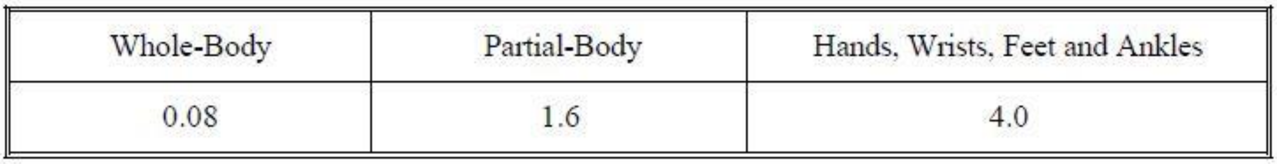
Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed 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:

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

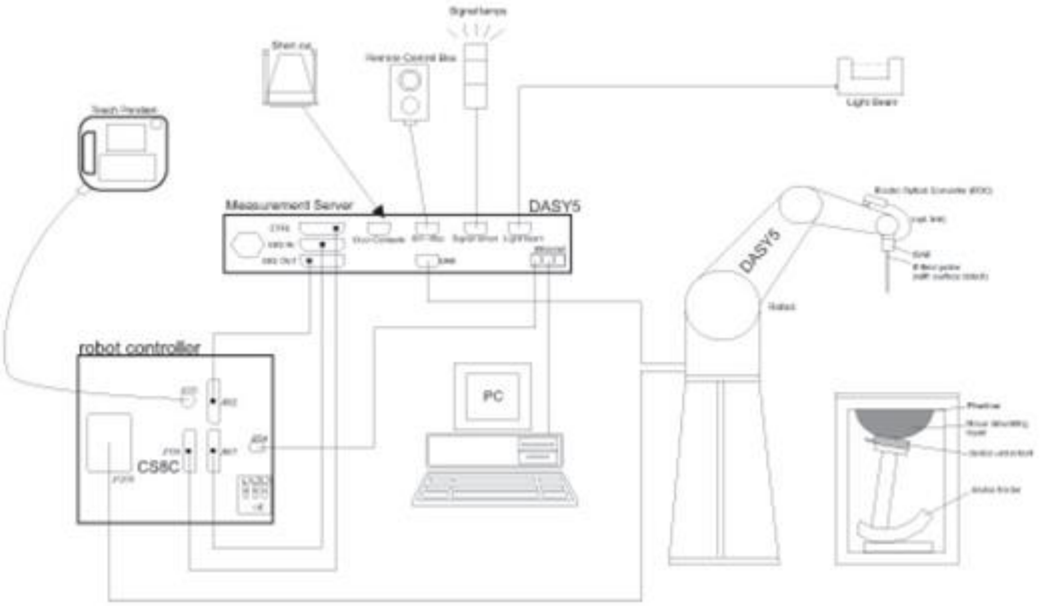
SAR is expressed in units of Watts per kilogram (W/kg)

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

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.

# 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

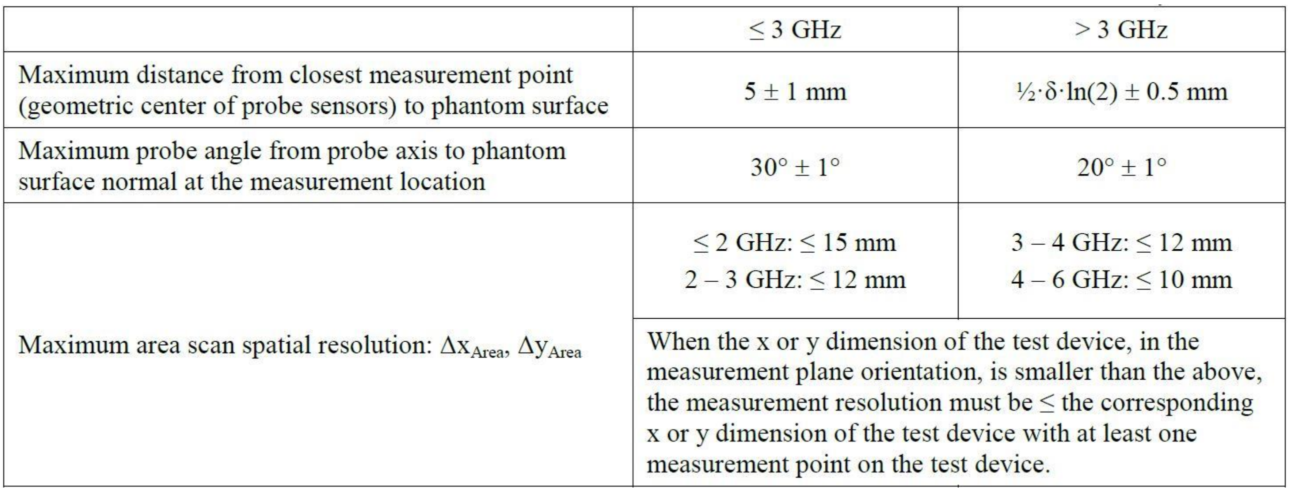
## 9.2 Power Reference Measurement

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 D01v01r03 SAR measurement 100 MHz to 6 GHz.

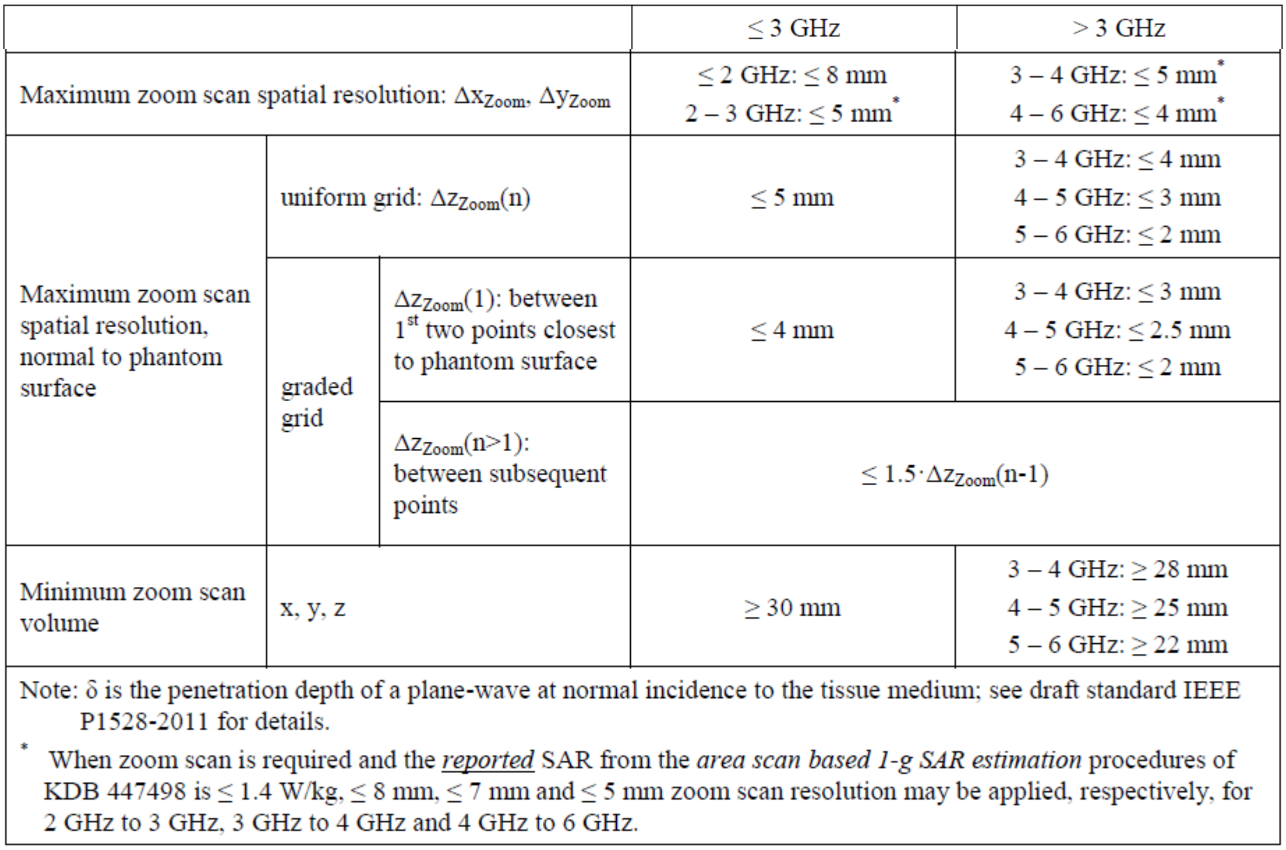


| | ≤ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum 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 D01v01r03 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.

* 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 | 750MHz System Validation Kit | D750V3 | 1099 | Nov. 19, 2014 | Nov. 18, 2015 |
| SPEAG | 835MHz System Validation Kit | D835V2 | 499 | Mar. 20, 2015 | Mar. 19, 2016 |
| SPEAG | 1750MHz System Validation Kit | D1750V2 | 1068 | Nov. 14, 2014 | Nov. 13, 2015 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d041 | Mar. 24, 2015 | Mar. 23, 2016 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 924 | Nov. 19, 2014 | Nov. 18, 2015 |
| SPEAG | Data Acquisition Electronics | DAE3 | 577 | Oct. 06, 2014 | Oct. 05, 2015 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3931 | Sep. 25, 2014 | Sep. 24, 2015 |
| Wisewind | Thermometer | ETP-101 | TM560 | Oct. 21, 2014 | Oct. 20, 2015 |
| Anritsu | Radio Communication Analyzer | MT8820C | 6201074414 | Feb. 06, 2015 | Feb. 05, 2016 |
| Agilent | Wireless Communication Test Set | E5515C | MY50266977 | May. 27, 2014 | May. 26, 2015 |
| SPEAG | Device Holder | N/A | N/A | N/A | N/A |
| Agilent | Signal Generator | N5181A | MY50145381 | Dec. 11, 2014 | Dec. 10, 2015 |
| Agilent | ENA Network Analyzer | E5071C | MY46316648 | Feb. 11, 2015 | Feb. 10, 2016 |
| SPEAG | Dielectric Probe Kit | DAK-3.5 | 1138 | Nov. 18, 2014 | Nov. 17, 2015 |
| Anritsu | Power Meter | ML2495A | 1349001 | Dec. 03, 2014 | Dec. 02, 2015 |
| Anritsu | Power Sensor | MA2411B | 1306099 | Dec. 03, 2014 | Dec. 02, 2015 |
| R&S | Spectrum Analyzer | FSP 7 | 101131 | Jul. 10, 2014 | Jul. 09, 2015 |
| Agilent | Dual Directional Coupler | 778D | 50422 | Note 1 | |
| Woken | Attenuator 1 | WK0602-XX | N/A | Note 1 | |
| PE | Attenuator 2 | PE7005-10 | N/A | Note 1 | |
| PE | Attenuator 3 | PE7005- 3 | N/A | Note 1 | |
| AR | Power Amplifier | 5S1G4M2 | 0328767 | Note 1 | |
| Mini-Circuits | Power Amplifier | ZVE-3W | 162601250 | 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 | | | | | | | | |
| 750 | 41.1 | 57.0 | 0.2 | 1.4 | 0.2 | 0 | 0.89 | 41.9 |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 900 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.97 | 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 | | | | | | | | |
| 750 | 51.7 | 47.2 | 0 | 0.9 | 0.1 | 0 | 0.96 | 55.5 |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 900 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 1.05 | 55.0 |
| 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 |

Simulating Liquid for 5GHz, Manufactured by SPEAG

| Ingredients | (% by weight) |
|---|---|
| Water | 64~78% |
| Mineral oil | 11~18% |
| Emulsifiers | 9~15% |
| Additives and Salt | 2~3% |

**<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 |
|---|---|---|---|---|---|---|---|---|---|---|
| 750 | MSL | 22.5 | 0.961 | 53.914 | 0.96 | 55.50 | 0.10 | -2.86 | ±5 | 2015/5/6 |
| 835 | MSL | 22.5 | 0.996 | 55.380 | 0.97 | 55.20 | 2.68 | 0.33 | ±5 | 2015/5/6 |
| 1750 | MSL | 22.4 | 1.459 | 52.753 | 1.49 | 53.40 | -2.08 | -1.21 | ±5 | 2015/5/5 |
| 1750 | MSL | 22.4 | 1.473 | 52.385 | 1.49 | 53.40 | -1.14 | -1.90 | ±5 | 2015/5/7 |
| 1900 | MSL | 22.4 | 1.541 | 53.910 | 1.52 | 53.30 | 1.38 | 1.14 | ±5 | 2015/5/5 |
| 1900 | MSL | 22.3 | 1.569 | 51.584 | 1.52 | 53.30 | 3.22 | -3.22 | ±5 | 2015/5/8 |
| 2450 | MSL | 22.2 | 2.026 | 52.618 | 1.95 | 52.70 | 3.90 | -0.16 | ±5 | 2015/5/9 |

## 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 (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015/5/6 | 750 | MSL | 250 | D750V3-1099 | EX3DV4 - SN3931 | DAE3 Sn577 | 2.00 | 8.56 | 8.00 | -6.54 |
| 2015/5/6 | 835 | MSL | 250 | D835V2-499 | EX3DV4 - SN3931 | DAE3 Sn577 | 2.51 | 9.30 | 10.04 | 7.96 |
| 2015/5/5 | 1750 | MSL | 250 | D1750V2-1068 | EX3DV4 - SN3931 | DAE3 Sn577 | 8.90 | 38.00 | 35.60 | -6.32 |
| 2015/5/7 | 1750 | MSL | 250 | D1750V2-1068 | EX3DV4 - SN3931 | DAE3 Sn577 | 8.84 | 38.00 | 35.36 | -6.95 |
| 2015/5/5 | 1900 | MSL | 250 | D1900V2-5d041 | EX3DV4 - SN3931 | DAE3 Sn577 | 9.45 | 39.80 | 37.80 | -5.03 |
| 2015/5/8 | 1900 | MSL | 250 | D1900V2-5d041 | EX3DV4 - SN3931 | DAE3 Sn577 | 10.10 | 39.80 | 40.40 | 1.51 |
| 2015/5/9 | 2450 | MSL | 250 | D2450V2-924 | EX3DV4 - SN3931 | DAE3 Sn577 | 13.70 | 51.40 | 54.80 | 6.61 |

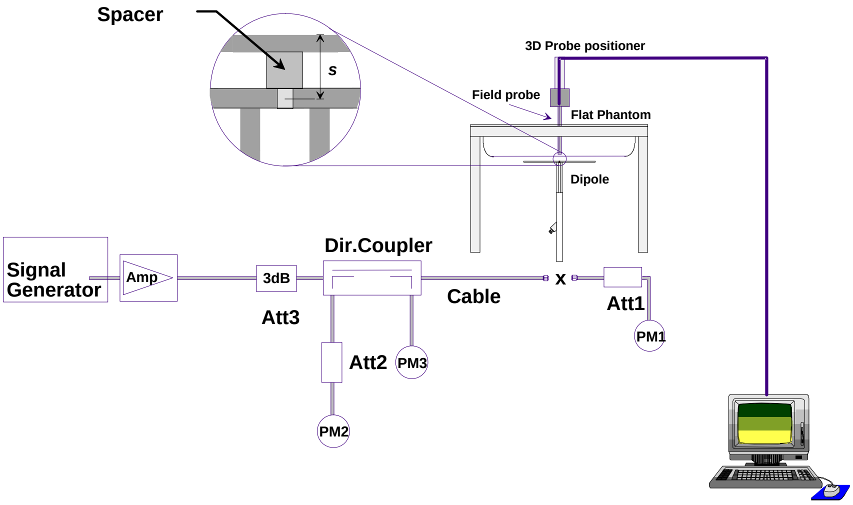


Fig 8.3.1 System Performance Check Setup

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 D01v05r02 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>

**General Note:**

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03, for Body SAR test reduction for GPRS and EDGE 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, for GSM850 the GPRS 1Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power, and for GSM1900 the GPRS 2Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected 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 | |
| GPRS (GMSK, 1 Tx slot) | 33.89 | 34.27 | 34.22 | 34.50 | 24.89 | 25.27 | 25.22 | 25.50 |
| GPRS (GMSK, 2 Tx slots) | 30.62 | 30.67 | 30.73 | 31.00 | 24.62 | 24.67 | 24.73 | 25.00 |
| GPRS (GMSK, 3 Tx slots) | 28.54 | 28.55 | 28.62 | 29.00 | 24.28 | 24.29 | 24.36 | 24.74 |
| GPRS (GMSK, 4 Tx slots) | 26.78 | 26.78 | 26.85 | 27.00 | 23.78 | 23.78 | 23.85 | 24.00 |
| EDGE (8PSK, 1 Tx slot) | 26.70 | 26.69 | 26.77 | 27.00 | 17.70 | 17.69 | 17.77 | 18.00 |
| EDGE (8PSK, 2 Tx slots) | 26.13 | 26.14 | 26.19 | 27.00 | 20.13 | 20.14 | 20.19 | 21.00 |
| EDGE (8PSK, 3 Tx slots) | 25.06 | 25.05 | 25.11 | 26.00 | 20.80 | 20.79 | 20.85 | 21.74 |
| EDGE (8PSK, 4 Tx slots) | 23.99 | 23.98 | 24.05 | 25.00 | 20.99 | 20.98 | 21.05 | 22.00 |

| 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 | |
| GPRS (GMSK, 1 Tx slot) | 30.68 | 30.67 | 30.88 | 31.00 | 21.68 | 21.67 | 21.88 | 22.00 |
| GPRS (GMSK, 2 Tx slots) | 27.65 | 27.52 | 27.77 | 29.00 | 21.65 | 21.52 | 21.77 | 23.00 |
| GPRS (GMSK, 3 Tx slots) | 25.25 | 25.38 | 25.30 | 26.00 | 20.99 | 21.12 | 21.04 | 21.74 |
| GPRS (GMSK, 4 Tx slots) | 23.77 | 23.64 | 23.81 | 25.00 | 20.77 | 20.64 | 20.81 | 22.00 |
| EDGE (8PSK, 1 Tx slot) | 25.55 | 25.57 | 25.67 | 26.00 | 16.55 | 16.57 | 16.67 | 17.00 |
| EDGE (8PSK, 2 Tx slots) | 24.91 | 24.88 | 24.94 | 26.00 | 18.91 | 18.88 | 18.94 | 20.00 |
| EDGE (8PSK, 3 Tx slots) | 23.77 | 23.74 | 23.81 | 24.00 | 19.51 | 19.48 | 19.55 | 19.74 |
| EDGE (8PSK, 4 Tx slots) | 22.70 | 22.64 | 22.71 | 24.00 | 19.70 | 19.64 | 19.71 | 21.00 |

**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 | |
| GPRS (GMSK, 1 Tx slot) | 24.14 | 24.23 | 24.22 | 24.50 | 15.14 | 15.23 | 15.22 | 15.50 |
| GPRS (GMSK, 2 Tx slots) | 22.35 | 22.40 | 22.37 | 22.50 | 16.35 | 16.40 | 16.37 | 16.50 |
| GPRS (GMSK, 3 Tx slots) | 20.36 | 20.45 | 20.38 | 20.50 | 16.10 | 16.19 | 16.12 | 16.24 |
| GPRS (GMSK, 4 Tx slots) | 18.71 | 18.88 | 18.75 | 19.00 | 15.71 | 15.88 | 15.75 | 16.00 |
| EDGE (8PSK, 1 Tx slot) | 18.48 | 18.54 | 18.51 | 19.00 | 9.48 | 9.54 | 9.51 | 10.00 |
| EDGE (8PSK, 2 Tx slots) | 17.37 | 17.49 | 17.40 | 17.50 | 11.37 | 11.49 | 11.40 | 11.50 |
| EDGE (8PSK, 3 Tx slots) | 16.32 | 16.46 | 16.44 | 16.50 | 12.06 | 12.20 | 12.18 | 12.24 |
| EDGE (8PSK, 4 Tx slots) | 15.48 | 15.57 | 15.49 | 16.00 | 12.48 | 12.57 | 12.49 | 13.00 |

| 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 | |
| GPRS (GMSK, 1 Tx slot) | 19.44 | 19.38 | 19.49 | 20.00 | 10.44 | 10.38 | 10.49 | 11.00 |
| GPRS (GMSK, 2 Tx slots) | 17.38 | 17.27 | 17.54 | 18.00 | 11.38 | 11.27 | 11.54 | 12.00 |
| GPRS (GMSK, 3 Tx slots) | 15.39 | 15.36 | 15.48 | 16.00 | 11.13 | 11.10 | 11.22 | 11.74 |
| GPRS (GMSK, 4 Tx slots) | 14.26 | 14.17 | 14.33 | 14.50 | 11.26 | 11.17 | 11.33 | 11.50 |
| EDGE (8PSK, 1 Tx slot) | 15.53 | 15.50 | 15.62 | 16.00 | 6.53 | 6.50 | 6.62 | 7.00 |
| EDGE (8PSK, 2 Tx slots) | 14.58 | 14.57 | 14.66 | 15.00 | 8.58 | 8.57 | 8.66 | 9.00 |
| EDGE (8PSK, 3 Tx slots) | 14.05 | 14.01 | 14.11 | 15.00 | 9.79 | 9.75 | 9.85 | 10.74 |
| EDGE (8PSK, 4 Tx slots) | 13.26 | 13.20 | 13.32 | 14.00 | 10.26 | 10.20 | 10.32 | 11.00 |

## <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 D01 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 HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. 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.

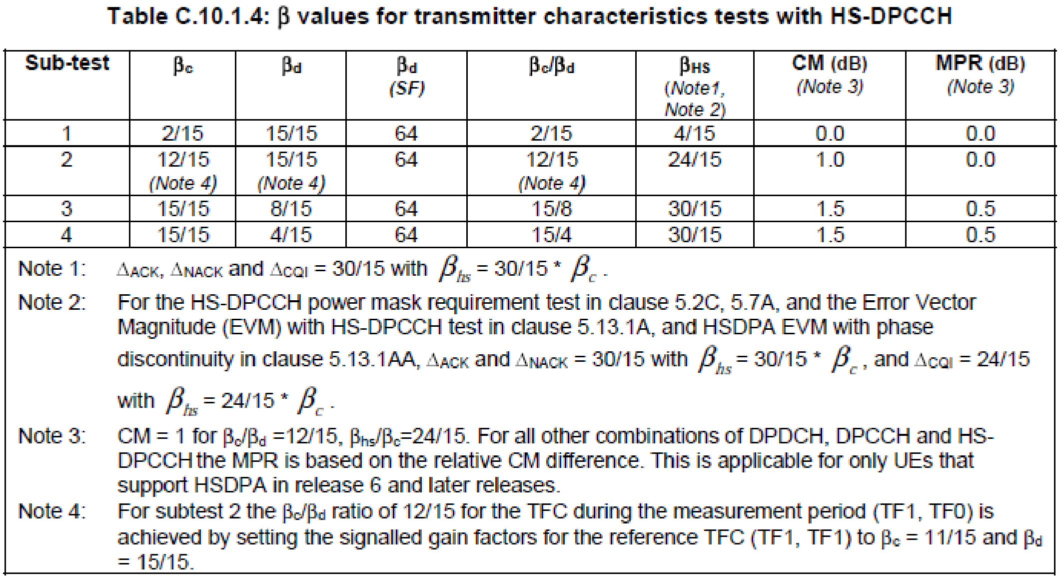


**Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH**

| 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<br>*(Note 4)* | 15/15<br>*(Note 4)* | 64 | 12/15<br>*(Note 4)* | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

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.

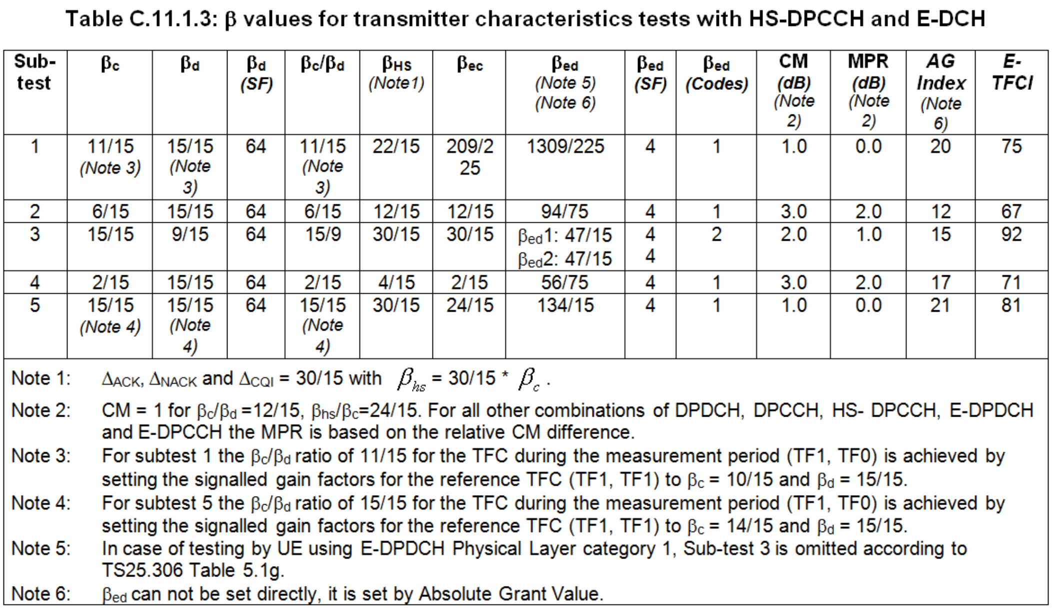


**Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH**

| 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.

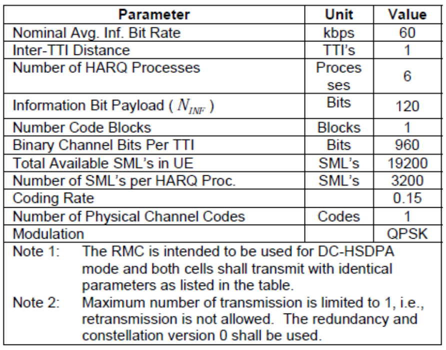
c. A call was established between EUT and Base Station with following setting:
   - i. Set RMC 12.2Kbps + HSDPA mode.
   - ii. Set Cell Power = -25 dBm
   - iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   - iv. Select HSDPA Uplink Parameters
   - v. Set Gain Factors ($\beta_c$ and $\beta_d$) 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.

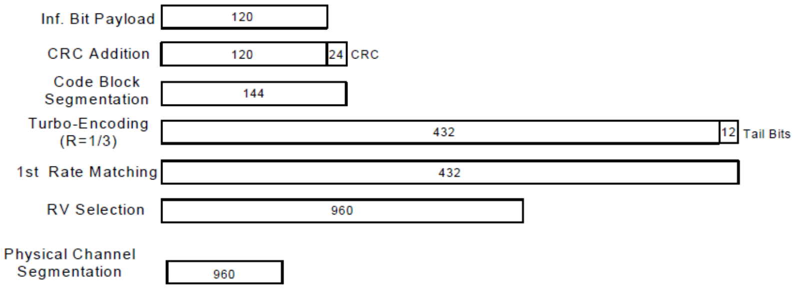


**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**

**Setup Configuration**

## <WCDMA Conducted Power>

**General Note:**

1. Per KDB 941225 D01v03, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03, 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 V | | | WCDMA II | | | WCDMA IV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | | 4132 | 4182 | 4233 | 9262 | 9400 | 9538 | 1312 | 1413 | 1513 |
| Rx Channel | | | 4357 | 4407 | 4458 | 9662 | 9800 | 9938 | 1537 | 1638 | 1738 |
| Frequency (MHz) | | | 826.4 | 836.4 | 846.6 | 1852.4 | 1880 | 1907.6 | 1712.4 | 1732.6 | 1752.6 |
| MPR (dB) | 3GPP Rel 99 | RMC 12.2Kbps | 24.10 | 24.03 | 24.08 | 24.07 | 24.13 | 24.39 | 24.15 | 24.01 | 24.34 |
| 0 | 3GPP Rel 6 | HSDPA Subtest-1 | 23.09 | 22.95 | 23.01 | 23.19 | 23.29 | 23.39 | 23.48 | 23.17 | 23.47 |
| 0 | 3GPP Rel 6 | HSDPA Subtest-2 | 23.05 | 22.98 | 23.00 | 23.21 | 23.30 | 23.34 | 23.49 | 23.19 | 23.50 |
| 0.5 | 3GPP Rel 6 | HSDPA Subtest-3 | 22.64 | 22.53 | 22.63 | 22.69 | 22.79 | 22.90 | 22.50 | 22.55 | 22.98 |
| 0.5 | 3GPP Rel 6 | HSDPA Subtest-4 | 22.63 | 22.55 | 22.62 | 22.70 | 22.81 | 22.91 | 22.51 | 22.57 | 22.99 |
| 0 | 3GPP Rel 8 | DC-HSDPA Subtest-1 | 23.07 | 22.90 | 23.00 | 23.17 | 23.24 | 23.35 | 23.45 | 23.15 | 23.47 |
| 0 | 3GPP Rel 8 | DC-HSDPA Subtest-2 | 23.01 | 22.93 | 23.00 | 23.20 | 23.27 | 23.32 | 23.48 | 23.18 | 23.48 |
| 0.5 | 3GPP Rel 8 | DC-HSDPA Subtest-3 | 22.65 | 22.52 | 22.61 | 22.62 | 22.78 | 22.88 | 22.43 | 22.53 | 22.95 |
| 0.5 | 3GPP Rel 8 | DC-HSDPA Subtest-4 | 22.63 | 22.50 | 22.64 | 22.65 | 22.80 | 22.88 | 22.50 | 22.57 | 22.99 |
| 0 | 3GPP Rel 6 | HSUPA Subtest-1 | 23.09 | 21.98 | 22.19 | 22.46 | 22.74 | 22.08 | 23.46 | 23.14 | 23.50 |
| 2 | 3GPP Rel 6 | HSUPA Subtest-2 | 20.85 | 21.08 | 20.68 | 21.76 | 21.46 | 21.04 | 21.90 | 21.82 | 21.86 |
| 1 | 3GPP Rel 6 | HSUPA Subtest-3 | 21.18 | 21.63 | 21.33 | 21.37 | 21.18 | 21.31 | 21.52 | 21.54 | 21.94 |
| 2 | 3GPP Rel 6 | HSUPA Subtest-4 | 21.11 | 21.62 | 21.03 | 22.15 | 21.76 | 21.29 | 22.48 | 22.12 | 22.45 |
| 0 | 3GPP Rel 6 | HSUPA Subtest-5 | 22.13 | 22.65 | 22.12 | 22.09 | 22.42 | 22.00 | 23.48 | 23.14 | 23.43 |

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

| Band | | | WCDMA V | | | WCDMA II | | | WCDMA IV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | | 4132 | 4182 | 4233 | 9262 | 9400 | 9538 | 1312 | 1413 | 1513 |
| Rx Channel | | | 4357 | 4407 | 4458 | 9662 | 9800 | 9938 | 1537 | 1638 | 1738 |
| Frequency (MHz) | | | 826.4 | 836.4 | 846.6 | 1852.4 | 1880 | 1907.6 | 1712.4 | 1732.6 | 1752.6 |
| MPR (dB) | 3GPP Rel 99 | RMC 12.2Kbps | 15.11 | 15.02 | 15.10 | 13.38 | 13.39 | 13.45 | 13.09 | 13.10 | 13.11 |
| 0 | 3GPP Rel 6 | HSDPA Subtest-1 | 13.95 | 13.90 | 13.92 | 12.20 | 12.24 | 12.39 | 12.33 | 12.34 | 12.39 |
| 0 | 3GPP Rel 6 | HSDPA Subtest-2 | 14.15 | 14.09 | 14.11 | 12.25 | 12.30 | 12.39 | 12.33 | 12.37 | 12.45 |
| 0.5 | 3GPP Rel 6 | HSDPA Subtest-3 | 13.67 | 13.56 | 13.60 | 11.77 | 11.79 | 11.89 | 11.80 | 11.81 | 11.89 |
| 0.5 | 3GPP Rel 6 | HSDPA Subtest-4 | 13.50 | 13.40 | 13.45 | 11.79 | 11.80 | 11.99 | 11.79 | 11.82 | 11.89 |
| 0 | 3GPP Rel 8 | DC-HSDPA Subtest-1 | 13.90 | 13.85 | 13.87 | 12.15 | 12.19 | 12.34 | 12.28 | 12.29 | 12.34 |
| 0 | 3GPP Rel 8 | DC-HSDPA Subtest-2 | 14.10 | 14.04 | 14.06 | 12.20 | 12.25 | 12.34 | 12.28 | 12.32 | 12.40 |
| 0.5 | 3GPP Rel 8 | DC-HSDPA Subtest-3 | 13.62 | 13.51 | 13.55 | 11.72 | 11.74 | 11.84 | 11.75 | 11.76 | 11.84 |
| 0.5 | 3GPP Rel 8 | DC-HSDPA Subtest-4 | 13.45 | 13.35 | 13.40 | 11.74 | 11.75 | 11.94 | 11.74 | 11.77 | 11.84 |
| 0 | 3GPP Rel 6 | HSUPA Subtest-1 | 13.58 | 13.49 | 13.51 | 11.52 | 11.41 | 11.10 | 11.15 | 11.33 | 11.39 |
| 2 | 3GPP Rel 6 | HSUPA Subtest-2 | 13.03 | 13.18 | 12.65 | 10.84 | 10.44 | 10.11 | 10.39 | 10.29 | 10.43 |
| 1 | 3GPP Rel 6 | HSUPA Subtest-3 | 13.37 | 13.50 | 13.39 | 10.43 | 10.23 | 10.21 | 10.56 | 10.46 | 10.60 |
| 2 | 3GPP Rel 6 | HSUPA Subtest-4 | 13.33 | 13.31 | 13.17 | 11.20 | 10.82 | 10.26 | 11.11 | 11.05 | 11.26 |
| 0 | 3GPP Rel 6 | HSUPA Subtest-5 | 14.25 | 14.34 | 14.22 | 11.08 | 11.32 | 10.91 | 12.10 | 12.05 | 12.41 |

## <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 D05v02r03, 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 D05v02r03, 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 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, 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 D05v02r03, 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 D05v02r03, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r03, 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 D05v02r03, smaller bandwidth SAR testing is not required.

## Maximum Average RF Power (Proximity Sensor Inactive)

**<LTE Band 12>**

| 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 | | | | 23060 | 23095 | 23130 | | |
| Frequency (MHz) | | | | 704 | 707.5 | 711 | | |
| 10 | QPSK | 1 | 0 | 24.06 | 24.28 | 24.15 | 24.5 | 0 |
| 10 | QPSK | 1 | 24 | 24.04 | 24.10 | 24.13 | | |
| 10 | QPSK | 1 | 49 | 24.04 | 23.87 | 24.15 | | |
| 10 | QPSK | 25 | 0 | 23.00 | 23.01 | 22.97 | 23.5 | 1 |
| 10 | QPSK | 25 | 12 | 22.99 | 22.88 | 22.92 | | |
| 10 | QPSK | 25 | 24 | 22.91 | 23.00 | 22.88 | | |
| 10 | QPSK | 50 | 0 | 22.93 | 22.95 | 22.91 | | |
| 10 | 16QAM | 1 | 0 | 22.77 | 23.06 | 23.01 | 23.5 | 1 |
| 10 | 16QAM | 1 | 24 | 22.99 | 23.40 | 23.15 | | |
| 10 | 16QAM | 1 | 49 | 23.44 | 23.20 | 23.42 | | |
| 10 | 16QAM | 25 | 0 | 21.80 | 21.92 | 21.96 | 22.5 | 2 |
| 10 | 16QAM | 25 | 12 | 21.96 | 21.96 | 21.97 | | |
| 10 | 16QAM | 25 | 24 | 22.07 | 21.99 | 21.97 | | |
| 10 | 16QAM | 50 | 0 | 22.00 | 22.03 | 21.99 | | |
| Channel | | | | 23035 | 23095 | 23155 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 701.5 | 707.5 | 713.5 | | |
| 5 | QPSK | 1 | 0 | 24.06 | 24.03 | 24.00 | 24.5 | 0 |
| 5 | QPSK | 1 | 12 | 23.98 | 24.02 | 24.04 | | |
| 5 | QPSK | 1 | 24 | 24.05 | 23.81 | 23.88 | | |
| 5 | QPSK | 12 | 0 | 22.83 | 22.84 | 22.86 | 23.5 | 1 |
| 5 | QPSK | 12 | 6 | 22.90 | 23.00 | 22.89 | | |
| 5 | QPSK | 12 | 11 | 22.83 | 22.92 | 22.92 | | |
| 5 | QPSK | 25 | 0 | 22.79 | 22.90 | 22.90 | | |
| 5 | 16QAM | 1 | 0 | 22.96 | 23.25 | 22.80 | 23.5 | 1 |
| 5 | 16QAM | 1 | 12 | 23.47 | 23.11 | 23.48 | | |
| 5 | 16QAM | 1 | 24 | 23.47 | 22.87 | 23.42 | | |
| 5 | 16QAM | 12 | 0 | 21.86 | 21.90 | 21.89 | 22.5 | 2 |
| 5 | 16QAM | 12 | 6 | 21.82 | 22.02 | 21.90 | | |
| 5 | 16QAM | 12 | 11 | 21.78 | 21.92 | 21.82 | | |
| 5 | 16QAM | 25 | 0 | 22.16 | 22.09 | 21.89 | | |
| Channel | | | | 23025 | 23095 | 23165 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 700.5 | 707.5 | 714.5 | | |
| 3 | QPSK | 1 | 0 | 24.04 | 24.12 | 23.81 | 24.5 | 0 |
| 3 | QPSK | 1 | 7 | 24.01 | 24.11 | 24.05 | | |
| 3 | QPSK | 1 | 14 | 23.72 | 23.76 | 23.93 | | |
| 3 | QPSK | 8 | 0 | 22.96 | 22.91 | 22.86 | 23.5 | 1 |
| 3 | QPSK | 8 | 4 | 22.91 | 23.02 | 22.99 | | |
| 3 | QPSK | 8 | 7 | 22.93 | 22.98 | 22.99 | | |
| 3 | QPSK | 15 | 0 | 22.83 | 22.98 | 22.83 | | |
| 3 | 16QAM | 1 | 0 | 23.10 | 23.24 | 22.80 | 23.5 | 1 |
| 3 | 16QAM | 1 | 7 | 23.46 | 23.25 | 23.19 | | |
| 3 | 16QAM | 1 | 14 | 23.48 | 23.29 | 23.02 | | |
| 3 | 16QAM | 8 | 0 | 22.09 | 21.82 | 21.80 | 22.5 | 2 |
| 3 | 16QAM | 8 | 4 | 21.99 | 22.14 | 21.81 | | |
| 3 | 16QAM | 8 | 7 | 21.99 | 22.20 | 21.84 | | |
| 3 | 16QAM | 15 | 0 | 22.11 | 22.17 | 21.75 | | |

| Channel | | | | 23017 | 23095 | 23173 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 699.7 | 707.5 | 715.3 | | |
| 1.4 | QPSK | 1 | 0 | 24.18 | 24.27 | 23.61 | 24.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 23.99 | 23.80 | 23.74 | | |
| 1.4 | QPSK | 1 | 5 | 23.87 | 23.92 | 23.83 | | |
| 1.4 | QPSK | 3 | 0 | 23.99 | 24.02 | 23.98 | | |
| 1.4 | QPSK | 3 | 1 | 24.11 | 24.26 | 24.12 | | |
| 1.4 | QPSK | 3 | 2 | 24.17 | 24.18 | 24.23 | | |
| 1.4 | QPSK | 6 | 0 | 22.86 | 23.01 | 22.95 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.49 | 22.62 | 22.54 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 2 | 22.58 | 22.58 | 22.62 | | |
| 1.4 | 16QAM | 1 | 5 | 22.51 | 22.72 | 22.53 | | |
| 1.4 | 16QAM | 3 | 0 | 22.48 | 22.66 | 22.56 | | |
| 1.4 | 16QAM | 3 | 1 | 22.48 | 22.62 | 23.01 | | |
| 1.4 | 16QAM | 3 | 2 | 22.70 | 22.82 | 23.11 | | |
| 1.4 | 16QAM | 6 | 0 | 21.50 | 21.66 | 22.04 | 22.5 | 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 | 23.86 | 24.15 | 23.96 | 24.5 | 0 |
| 20 | QPSK | 1 | 49 | 23.79 | 24.14 | 23.85 | | |
| 20 | QPSK | 1 | 99 | 23.70 | 23.78 | 23.70 | | |
| 20 | QPSK | 50 | 0 | 22.72 | 22.85 | 22.84 | 23.5 | 1 |
| 20 | QPSK | 50 | 24 | 22.62 | 22.60 | 22.65 | | |
| 20 | QPSK | 50 | 49 | 22.60 | 22.61 | 22.64 | | |
| 20 | QPSK | 100 | 0 | 22.67 | 22.68 | 22.62 | | |
| 20 | 16QAM | 1 | 0 | 23.12 | 22.61 | 22.66 | 23.5 | 1 |
| 20 | 16QAM | 1 | 49 | 22.80 | 22.48 | 22.50 | | |
| 20 | 16QAM | 1 | 99 | 22.78 | 22.49 | 22.41 | | |
| 20 | 16QAM | 50 | 0 | 21.68 | 21.66 | 21.67 | 22.5 | 2 |
| 20 | 16QAM | 50 | 24 | 21.53 | 21.64 | 21.62 | | |
| 20 | 16QAM | 50 | 49 | 21.52 | 21.47 | 21.58 | | |
| 20 | 16QAM | 100 | 0 | 21.70 | 21.67 | 21.56 | | |
| Channel | | | | 20025 | 20175 | 20325 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1732.5 | 1747.5 | | |
| 15 | QPSK | 1 | 0 | 23.95 | 23.87 | 23.74 | 24.5 | 0 |
| 15 | QPSK | 1 | 37 | 23.69 | 23.74 | 23.73 | | |
| 15 | QPSK | 1 | 74 | 23.62 | 23.56 | 23.52 | | |
| 15 | QPSK | 36 | 0 | 22.64 | 22.73 | 22.74 | 23.5 | 1 |
| 15 | QPSK | 36 | 18 | 22.60 | 22.66 | 22.73 | | |
| 15 | QPSK | 36 | 37 | 22.57 | 22.56 | 22.67 | | |
| 15 | QPSK | 75 | 0 | 22.65 | 22.64 | 22.76 | | |
| 15 | 16QAM | 1 | 0 | 23.13 | 23.06 | 23.45 | 23.5 | 1 |
| 15 | 16QAM | 1 | 37 | 22.87 | 22.81 | 23.49 | | |
| 15 | 16QAM | 1 | 74 | 22.82 | 22.77 | 23.37 | | |
| 15 | 16QAM | 36 | 0 | 21.56 | 21.49 | 21.64 | 22.5 | 2 |
| 15 | 16QAM | 36 | 18 | 21.46 | 21.50 | 21.57 | | |
| 15 | 16QAM | 36 | 37 | 21.45 | 21.42 | 21.56 | | |
| 15 | 16QAM | 75 | 0 | 21.66 | 21.66 | 21.82 | | |
| Channel | | | | 20000 | 20175 | 20350 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1715 | 1732.5 | 1750 | | |
| 10 | QPSK | 1 | 0 | 23.80 | 24.04 | 24.03 | 24.5 | 0 |
| 10 | QPSK | 1 | 24 | 23.55 | 23.89 | 23.95 | | |
| 10 | QPSK | 1 | 49 | 23.56 | 23.71 | 23.78 | | |
| 10 | QPSK | 25 | 0 | 22.64 | 22.75 | 22.75 | 23.5 | 1 |
| 10 | QPSK | 25 | 12 | 22.65 | 22.67 | 22.79 | | |
| 10 | QPSK | 25 | 24 | 22.56 | 22.58 | 22.64 | | |
| 10 | QPSK | 50 | 0 | 22.60 | 22.72 | 22.71 | | |
| 10 | 16QAM | 1 | 0 | 23.44 | 22.54 | 23.10 | 23.5 | 1 |
| 10 | 16QAM | 1 | 24 | 23.42 | 22.78 | 23.19 | | |
| 10 | 16QAM | 1 | 49 | 23.19 | 22.84 | 22.95 | | |
| 10 | 16QAM | 25 | 0 | 21.67 | 21.67 | 21.62 | 22.5 | 2 |
| 10 | 16QAM | 25 | 12 | 21.69 | 21.60 | 21.61 | | |
| 10 | 16QAM | 25 | 24 | 21.68 | 21.58 | 21.66 | | |
| 10 | 16QAM | 50 | 0 | 21.59 | 21.78 | 21.74 | | |

| Channel | | | | 19975 | 20175 | 20375 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1712.5 | 1732.5 | 1752.5 | | |
| 5 | QPSK | 1 | 0 | 23.41 | 23.74 | 23.64 | 24.5 | 0 |
| 5 | QPSK | 1 | 12 | 23.40 | 23.56 | 23.63 | | |
| 5 | QPSK | 1 | 24 | 23.40 | 23.59 | 23.40 | | |
| 5 | QPSK | 12 | 0 | 22.57 | 22.63 | 22.74 | 23.5 | 1 |
| 5 | QPSK | 12 | 6 | 22.55 | 22.68 | 22.83 | | |
| 5 | QPSK | 12 | 11 | 22.52 | 22.63 | 22.69 | | |
| 5 | QPSK | 25 | 0 | 22.52 | 22.63 | 22.69 | | |
| 5 | 16QAM | 1 | 0 | 22.83 | 22.80 | 22.86 | 23.5 | 1 |
| 5 | 16QAM | 1 | 12 | 22.90 | 22.84 | 22.92 | | |
| 5 | 16QAM | 1 | 24 | 22.27 | 22.80 | 22.78 | | |
| 5 | 16QAM | 12 | 0 | 21.61 | 21.49 | 21.55 | 22.5 | 2 |
| 5 | 16QAM | 12 | 6 | 21.58 | 21.47 | 21.56 | | |
| 5 | 16QAM | 12 | 11 | 21.65 | 21.53 | 21.53 | | |
| 5 | 16QAM | 25 | 0 | 21.74 | 21.51 | 21.64 | | |
| Channel | | | | 19965 | 20175 | 20385 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1711.5 | 1732.5 | 1753.5 | | |
| 3 | QPSK | 1 | 0 | 23.72 | 23.65 | 23.89 | 24.5 | 0 |
| 3 | QPSK | 1 | 7 | 23.46 | 23.64 | 23.68 | | |
| 3 | QPSK | 1 | 14 | 23.37 | 23.51 | 23.55 | | |
| 3 | QPSK | 8 | 0 | 22.63 | 22.69 | 22.69 | 23.5 | 1 |
| 3 | QPSK | 8 | 4 | 22.61 | 22.62 | 22.59 | | |
| 3 | QPSK | 8 | 7 | 22.56 | 22.64 | 22.65 | | |
| 3 | QPSK | 15 | 0 | 22.53 | 22.63 | 22.61 | | |
| 3 | 16QAM | 1 | 0 | 22.82 | 22.80 | 22.97 | 23.5 | 1 |
| 3 | 16QAM | 1 | 7 | 22.81 | 22.83 | 22.82 | | |
| 3 | 16QAM | 1 | 14 | 22.73 | 22.79 | 22.81 | | |
| 3 | 16QAM | 8 | 0 | 21.63 | 21.60 | 21.59 | 22.5 | 2 |
| 3 | 16QAM | 8 | 4 | 21.44 | 21.52 | 21.41 | | |
| 3 | 16QAM | 8 | 7 | 21.55 | 21.63 | 21.52 | | |
| 3 | 16QAM | 15 | 0 | 21.55 | 21.28 | 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 | 23.83 | 23.84 | 23.74 | 24.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 23.82 | 23.83 | 23.61 | | |
| 1.4 | QPSK | 1 | 5 | 23.69 | 23.54 | 23.53 | | |
| 1.4 | QPSK | 3 | 0 | 23.79 | 23.70 | 23.56 | | |
| 1.4 | QPSK | 3 | 1 | 23.73 | 23.56 | 23.68 | | |
| 1.4 | QPSK | 3 | 2 | 23.81 | 23.56 | 23.73 | | |
| 1.4 | QPSK | 6 | 0 | 22.53 | 22.59 | 22.60 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.99 | 22.78 | 23.02 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 2 | 22.96 | 23.05 | 22.89 | | |
| 1.4 | 16QAM | 1 | 5 | 23.04 | 22.79 | 22.50 | | |
| 1.4 | 16QAM | 3 | 0 | 22.51 | 22.62 | 22.38 | | |
| 1.4 | 16QAM | 3 | 1 | 22.73 | 22.65 | 22.73 | | |
| 1.4 | 16QAM | 3 | 2 | 22.56 | 22.72 | 22.49 | | |
| 1.4 | 16QAM | 6 | 0 | 21.34 | 21.72 | 22.01 | 22.5 | 2 |

**<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 | 24.01 | 24.04 | 23.88 | 24.5 | 0 |
| 20 | QPSK | 1 | 49 | 23.96 | 23.73 | 23.67 | | |
| 20 | QPSK | 1 | 99 | 23.80 | 23.71 | 23.71 | | |
| 20 | QPSK | 50 | 0 | 22.87 | 22.88 | 22.83 | 23.5 | 1 |
| 20 | QPSK | 50 | 24 | 22.79 | 22.80 | 22.79 | | |
| 20 | QPSK | 50 | 49 | 22.76 | 22.67 | 22.82 | | |
| 20 | QPSK | 100 | 0 | 22.79 | 22.87 | 22.84 | | |
| 20 | 16QAM | 1 | 0 | 23.13 | 23.24 | 23.21 | 23.5 | 1 |
| 20 | 16QAM | 1 | 49 | 23.02 | 23.24 | 23.10 | | |
| 20 | 16QAM | 1 | 99 | 22.92 | 23.03 | 23.04 | | |
| 20 | 16QAM | 50 | 0 | 21.77 | 21.97 | 21.90 | 22.5 | 2 |
| 20 | 16QAM | 50 | 24 | 21.73 | 21.84 | 21.83 | | |
| 20 | 16QAM | 50 | 49 | 21.75 | 21.80 | 21.87 | | |
| 20 | 16QAM | 100 | 0 | 21.93 | 21.83 | 21.88 | | |
| Channel | | | | 18675 | 18900 | 19125 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1857.5 | 1880 | 1902.5 | | |
| 15 | QPSK | 1 | 0 | 24.00 | 23.91 | 24.02 | 24.5 | 0 |
| 15 | QPSK | 1 | 37 | 23.99 | 23.84 | 23.79 | | |
| 15 | QPSK | 1 | 74 | 23.89 | 23.72 | 23.80 | | |
| 15 | QPSK | 36 | 0 | 22.78 | 22.85 | 22.81 | 23.5 | 1 |
| 15 | QPSK | 36 | 18 | 22.76 | 22.78 | 22.81 | | |
| 15 | QPSK | 36 | 37 | 22.71 | 22.65 | 22.80 | | |
| 15 | QPSK | 75 | 0 | 22.74 | 22.89 | 22.77 | | |
| 15 | 16QAM | 1 | 0 | 23.12 | 23.41 | 23.18 | 23.5 | 1 |
| 15 | 16QAM | 1 | 37 | 22.97 | 23.46 | 23.00 | | |
| 15 | 16QAM | 1 | 74 | 23.01 | 23.27 | 23.03 | | |
| 15 | 16QAM | 36 | 0 | 21.80 | 21.98 | 21.83 | 22.5 | 2 |
| 15 | 16QAM | 36 | 18 | 21.79 | 21.92 | 21.80 | | |
| 15 | 16QAM | 36 | 37 | 21.74 | 21.88 | 21.76 | | |
| 15 | 16QAM | 75 | 0 | 21.77 | 21.92 | 21.87 | | |
| Channel | | | | 18650 | 18900 | 19150 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1855 | 1880 | 1905 | | |
| 10 | QPSK | 1 | 0 | 24.02 | 23.77 | 23.99 | 24.5 | 0 |
| 10 | QPSK | 1 | 24 | 24.01 | 23.65 | 23.88 | | |
| 10 | QPSK | 1 | 49 | 23.68 | 23.70 | 23.98 | | |
| 10 | QPSK | 25 | 0 | 22.66 | 22.88 | 22.88 | 23.5 | 1 |
| 10 | QPSK | 25 | 12 | 22.69 | 22.86 | 22.83 | | |
| 10 | QPSK | 25 | 24 | 22.69 | 22.84 | 22.78 | | |
| 10 | QPSK | 50 | 0 | 22.72 | 22.81 | 22.78 | | |
| 10 | 16QAM | 1 | 0 | 23.44 | 23.23 | 23.22 | 23.5 | 1 |
| 10 | 16QAM | 1 | 24 | 23.49 | 23.26 | 23.22 | | |
| 10 | 16QAM | 1 | 49 | 23.19 | 23.05 | 23.11 | | |
| 10 | 16QAM | 25 | 0 | 21.89 | 21.91 | 21.93 | 22.5 | 2 |
| 10 | 16QAM | 25 | 12 | 21.80 | 21.89 | 21.85 | | |
| 10 | 16QAM | 25 | 24 | 21.83 | 21.97 | 21.84 | | |
| 10 | 16QAM | 50 | 0 | 21.72 | 21.95 | 21.84 | | |

| Channel | | | | 18625 | 18900 | 19175 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1852.5 | 1880 | 1907.5 | | |
| 5 | QPSK | 1 | 0 | 23.98 | 23.98 | 23.93 | 24.5 | 0 |
| 5 | QPSK | 1 | 12 | 23.91 | 23.89 | 23.92 | | |
| 5 | QPSK | 1 | 24 | 23.60 | 23.55 | 23.87 | | |
| 5 | QPSK | 12 | 0 | 22.65 | 22.79 | 22.81 | 23.5 | 1 |
| 5 | QPSK | 12 | 6 | 22.65 | 22.86 | 22.81 | | |
| 5 | QPSK | 12 | 11 | 22.66 | 22.81 | 22.83 | | |
| 5 | QPSK | 25 | 0 | 22.62 | 22.81 | 22.76 | | |
| 5 | 16QAM | 1 | 0 | 23.45 | 23.46 | 23.45 | 23.5 | 1 |
| 5 | 16QAM | 1 | 12 | 23.44 | 23.43 | 23.22 | | |
| 5 | 16QAM | 1 | 24 | 23.06 | 23.42 | 22.44 | | |
| 5 | 16QAM | 12 | 0 | 21.67 | 22.12 | 21.68 | 22.5 | 2 |
| 5 | 16QAM | 12 | 6 | 21.68 | 22.20 | 21.60 | | |
| 5 | 16QAM | 12 | 11 | 21.78 | 22.14 | 21.74 | | |
| 5 | 16QAM | 25 | 0 | 21.87 | 21.74 | 21.83 | | |
| Channel | | | | 18615 | 18900 | 19185 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1851.5 | 1880 | 1908.5 | | |
| 3 | QPSK | 1 | 0 | 23.83 | 23.82 | 23.74 | 24.5 | 0 |
| 3 | QPSK | 1 | 7 | 23.81 | 23.81 | 23.73 | | |
| 3 | QPSK | 1 | 14 | 23.55 | 23.70 | 23.73 | | |
| 3 | QPSK | 8 | 0 | 22.78 | 22.85 | 22.99 | 23.5 | 1 |
| 3 | QPSK | 8 | 4 | 22.68 | 22.90 | 22.82 | | |
| 3 | QPSK | 8 | 7 | 22.72 | 22.82 | 22.82 | | |
| 3 | QPSK | 15 | 0 | 22.67 | 22.81 | 22.78 | | |
| 3 | 16QAM | 1 | 0 | 22.99 | 23.14 | 22.63 | 23.5 | 1 |
| 3 | 16QAM | 1 | 7 | 22.68 | 22.65 | 23.07 | | |
| 3 | 16QAM | 1 | 14 | 22.71 | 23.06 | 22.77 | | |
| 3 | 16QAM | 8 | 0 | 21.93 | 21.95 | 21.73 | 22.5 | 2 |
| 3 | 16QAM | 8 | 4 | 21.79 | 21.96 | 21.96 | | |
| 3 | 16QAM | 8 | 7 | 21.92 | 22.00 | 21.96 | | |
| 3 | 16QAM | 15 | 0 | 21.87 | 21.89 | 21.98 | | |
| Channel | | | | 18607 | 18900 | 19193 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1850.7 | 1880 | 1909.3 | | |
| 1.4 | QPSK | 1 | 0 | 23.94 | 23.93 | 23.87 | 24.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 23.93 | 23.82 | 23.83 | | |
| 1.4 | QPSK | 1 | 5 | 23.79 | 23.78 | 23.73 | | |
| 1.4 | QPSK | 3 | 0 | 23.72 | 23.87 | 23.76 | | |
| 1.4 | QPSK | 3 | 1 | 23.70 | 23.81 | 23.85 | | |
| 1.4 | QPSK | 3 | 2 | 23.72 | 23.92 | 23.86 | | |
| 1.4 | QPSK | 6 | 0 | 22.77 | 22.87 | 22.95 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.80 | 22.58 | 23.46 | 23.5 | 1 |
| 1.4 | 16QAM | 1 | 2 | 22.86 | 22.88 | 23.25 | | |
| 1.4 | 16QAM | 1 | 5 | 22.89 | 23.49 | 23.17 | | |
| 1.4 | 16QAM | 3 | 0 | 22.78 | 22.84 | 22.74 | | |
| 1.4 | 16QAM | 3 | 1 | 22.84 | 22.83 | 22.77 | | |
| 1.4 | 16QAM | 3 | 2 | 22.85 | 22.97 | 22.62 | | |
| 1.4 | 16QAM | 6 | 0 | 21.38 | 21.87 | 21.57 | 22.5 | 2 |

## Reduced Average RF Power (Proximity Sensor active)

**<LTE Band 12>**

| 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 | | | | 23060 | 23095 | 23130 | | |
| Frequency (MHz) | | | | 704 | 707.5 | 711 | | |
| 10 | QPSK | 1 | 0 | 15.02 | 15.11 | 15.00 | 15.5 | 0 |
| 10 | QPSK | 1 | 24 | 14.70 | 15.04 | 14.99 | | |
| 10 | QPSK | 1 | 49 | 14.65 | 14.87 | 14.98 | | |
| 10 | QPSK | 25 | 0 | 14.74 | 14.84 | 14.79 | 15.5 | 0 |
| 10 | QPSK | 25 | 12 | 14.73 | 14.68 | 14.70 | | |
| 10 | QPSK | 25 | 24 | 14.68 | 14.77 | 14.70 | | |
| 10 | QPSK | 50 | 0 | 14.73 | 14.79 | 14.76 | | |
| 10 | 16QAM | 1 | 0 | 14.95 | 14.86 | 14.91 | 15.5 | 0 |
| 10 | 16QAM | 1 | 24 | 14.87 | 14.75 | 14.90 | | |
| 10 | 16QAM | 1 | 49 | 14.79 | 14.58 | 14.85 | | |
| 10 | 16QAM | 25 | 0 | 14.77 | 14.57 | 14.66 | 15.5 | 0 |
| 10 | 16QAM | 25 | 12 | 14.72 | 14.67 | 14.69 | | |
| 10 | 16QAM | 25 | 24 | 14.63 | 14.67 | 14.56 | | |
| 10 | 16QAM | 50 | 0 | 14.74 | 14.67 | 14.73 | | |
| Channel | | | | 23035 | 23095 | 23155 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 701.5 | 707.5 | 713.5 | | |
| 5 | QPSK | 1 | 0 | 14.97 | 15.03 | 14.97 | 15.5 | 0 |
| 5 | QPSK | 1 | 12 | 14.63 | 14.98 | 14.89 | | |
| 5 | QPSK | 1 | 24 | 14.55 | 14.85 | 14.95 | | |
| 5 | QPSK | 12 | 0 | 14.64 | 14.81 | 14.77 | 15.5 | 0 |
| 5 | QPSK | 12 | 6 | 14.70 | 14.65 | 14.64 | | |
| 5 | QPSK | 12 | 11 | 14.61 | 14.75 | 14.68 | | |
| 5 | QPSK | 25 | 0 | 14.63 | 14.75 | 14.66 | | |
| 5 | 16QAM | 1 | 0 | 14.95 | 14.85 | 14.84 | 15.5 | 0 |
| 5 | 16QAM | 1 | 12 | 14.83 | 14.74 | 14.90 | | |
| 5 | 16QAM | 1 | 24 | 14.77 | 14.57 | 14.76 | | |
| 5 | 16QAM | 12 | 0 | 14.77 | 14.54 | 14.66 | 15.5 | 0 |
| 5 | 16QAM | 12 | 6 | 14.64 | 14.59 | 14.65 | | |
| 5 | 16QAM | 12 | 11 | 14.56 | 14.60 | 14.49 | | |
| 5 | 16QAM | 25 | 0 | 14.74 | 14.64 | 14.70 | | |
| Channel | | | | 23025 | 23095 | 23165 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 700.5 | 707.5 | 714.5 | | |
| 3 | QPSK | 1 | 0 | 14.89 | 14.93 | 14.93 | 15.5 | 0 |
| 3 | QPSK | 1 | 7 | 14.54 | 14.90 | 14.83 | | |
| 3 | QPSK | 1 | 14 | 14.50 | 14.85 | 14.88 | | |
| 3 | QPSK | 8 | 0 | 14.64 | 14.72 | 14.77 | 15.5 | 0 |
| 3 | QPSK | 8 | 4 | 14.68 | 14.61 | 14.54 | | |
| 3 | QPSK | 8 | 7 | 14.54 | 14.67 | 14.64 | | |
| 3 | QPSK | 15 | 0 | 14.60 | 14.69 | 14.65 | | |
| 3 | 16QAM | 1 | 0 | 14.88 | 14.76 | 14.78 | 15.5 | 0 |
| 3 | 16QAM | 1 | 7 | 14.78 | 14.65 | 14.81 | | |
| 3 | 16QAM | 1 | 14 | 14.72 | 14.48 | 14.68 | | |
| 3 | 16QAM | 8 | 0 | 14.77 | 14.45 | 14.56 | 15.5 | 0 |
| 3 | 16QAM | 8 | 4 | 14.55 | 14.54 | 14.57 | | |
| 3 | 16QAM | 8 | 7 | 14.51 | 14.54 | 14.44 | | |
| 3 | 16QAM | 15 | 0 | 14.70 | 14.57 | 14.68 | | |

| Channel | | | | 23017 | 23095 | 23173 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 699.7 | 707.5 | 715.3 | | |
| 1.4 | QPSK | 1 | 0 | 14.85 | 14.89 | 14.85 | 15.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 14.53 | 14.84 | 14.80 | | |
| 1.4 | QPSK | 1 | 5 | 14.45 | 14.81 | 14.82 | | |
| 1.4 | QPSK | 3 | 0 | 14.63 | 14.71 | 14.77 | | |
| 1.4 | QPSK | 3 | 1 | 14.63 | 14.61 | 14.46 | | |
| 1.4 | QPSK | 3 | 2 | 14.49 | 14.62 | 14.63 | | |
| 1.4 | QPSK | 6 | 0 | 14.56 | 14.61 | 14.63 | 15.5 | 0 |
| 1.4 | 16QAM | 1 | 0 | 14.81 | 14.69 | 14.74 | 15.5 | 0 |
| 1.4 | 16QAM | 1 | 2 | 14.74 | 14.60 | 14.72 | | |
| 1.4 | 16QAM | 1 | 5 | 14.71 | 14.43 | 14.66 | | |
| 1.4 | 16QAM | 3 | 0 | 14.70 | 14.41 | 14.54 | | |
| 1.4 | 16QAM | 3 | 1 | 14.55 | 14.52 | 14.51 | | |
| 1.4 | 16QAM | 3 | 2 | 14.45 | 14.52 | 14.41 | | |
| 1.4 | 16QAM | 6 | 0 | 14.64 | 14.53 | 14.66 | 15.5 | 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 | 12.69 | 12.97 | 12.75 | 13.5 | 0 |
| 20 | QPSK | 1 | 49 | 12.58 | 12.45 | 12.58 | | |
| 20 | QPSK | 1 | 99 | 12.32 | 12.46 | 12.24 | | |
| 20 | QPSK | 50 | 0 | 12.49 | 12.84 | 12.71 | 13.5 | 0 |
| 20 | QPSK | 50 | 24 | 12.48 | 12.51 | 12.53 | | |
| 20 | QPSK | 50 | 49 | 12.35 | 12.47 | 12.52 | | |
| 20 | QPSK | 100 | 0 | 12.48 | 12.76 | 12.57 | | |
| 20 | 16QAM | 1 | 0 | 12.67 | 12.68 | 12.73 | 13.5 | 0 |
| 20 | 16QAM | 1 | 49 | 12.53 | 12.79 | 12.69 | | |
| 20 | 16QAM | 1 | 99 | 12.27 | 12.57 | 12.51 | | |
| 20 | 16QAM | 50 | 0 | 12.25 | 12.71 | 12.66 | 13.5 | 0 |
| 20 | 16QAM | 50 | 24 | 12.23 | 12.56 | 12.58 | | |
| 20 | 16QAM | 50 | 49 | 12.11 | 12.50 | 12.49 | | |
| 20 | 16QAM | 100 | 0 | 12.31 | 12.57 | 12.54 | | |
| Channel | | | | 20025 | 20175 | 20325 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1732.5 | 1747.5 | | |
| 15 | QPSK | 1 | 0 | 12.44 | 12.72 | 12.73 | 13.5 | 0 |
| 15 | QPSK | 1 | 37 | 12.30 | 12.20 | 12.51 | | |
| 15 | QPSK | 1 | 74 | 12.22 | 12.27 | 12.07 | | |
| 15 | QPSK | 36 | 0 | 12.32 | 12.72 | 12.56 | 13.5 | 0 |
| 15 | QPSK | 36 | 18 | 12.24 | 12.21 | 12.35 | | |
| 15 | QPSK | 36 | 37 | 12.23 | 12.33 | 12.50 | | |
| 15 | QPSK | 75 | 0 | 12.31 | 12.63 | 12.53 | | |
| 15 | 16QAM | 1 | 0 | 12.39 | 12.46 | 12.57 | 13.5 | 0 |
| 15 | 16QAM | 1 | 37 | 12.33 | 12.59 | 12.46 | | |
| 15 | 16QAM | 1 | 74 | 12.09 | 12.40 | 12.21 | | |
| 15 | 16QAM | 36 | 0 | 12.10 | 12.45 | 12.40 | 13.5 | 0 |
| 15 | 16QAM | 36 | 18 | 12.08 | 12.36 | 12.33 | | |
| 15 | 16QAM | 36 | 37 | 11.98 | 12.26 | 12.36 | | |
| 15 | 16QAM | 75 | 0 | 12.09 | 12.42 | 12.39 | | |
| Channel | | | | 20000 | 20175 | 20350 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1715 | 1732.5 | 1750 | | |
| 10 | QPSK | 1 | 0 | 12.49 | 12.73 | 12.66 | 13.5 | 0 |
| 10 | QPSK | 1 | 24 | 12.45 | 12.30 | 12.49 | | |
| 10 | QPSK | 1 | 49 | 12.22 | 12.28 | 12.21 | | |
| 10 | QPSK | 25 | 0 | 12.20 | 12.64 | 12.54 | 13.5 | 0 |
| 10 | QPSK | 25 | 12 | 12.20 | 12.37 | 12.45 | | |
| 10 | QPSK | 25 | 24 | 12.17 | 12.29 | 12.52 | | |
| 10 | QPSK | 50 | 0 | 12.19 | 12.58 | 12.56 | | |
| 10 | 16QAM | 1 | 0 | 12.48 | 12.41 | 12.50 | 13.5 | 0 |
| 10 | 16QAM | 1 | 24 | 12.39 | 12.49 | 12.53 | | |
| 10 | 16QAM | 1 | 49 | 12.05 | 12.26 | 12.38 | | |
| 10 | 16QAM | 25 | 0 | 11.96 | 12.49 | 12.39 | 13.5 | 0 |
| 10 | 16QAM | 25 | 12 | 11.96 | 12.40 | 12.48 | | |
| 10 | 16QAM | 25 | 24 | 11.83 | 12.15 | 12.21 | | |
| 10 | 16QAM | 50 | 0 | 12.08 | 12.31 | 12.27 | | |

| Channel | | | | 19975 | 20175 | 20375 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1712.5 | 1732.5 | 1752.5 | | |
| 5 | QPSK | 1 | 0 | 12.51 | 12.83 | 12.65 | 13.5 | 0 |
| 5 | QPSK | 1 | 12 | 12.46 | 12.29 | 12.55 | | |
| 5 | QPSK | 1 | 24 | 12.11 | 12.17 | 12.24 | | |
| 5 | QPSK | 12 | 0 | 12.19 | 12.59 | 12.61 | 13.5 | 0 |
| 5 | QPSK | 12 | 6 | 12.33 | 12.28 | 12.40 | | |
| 5 | QPSK | 12 | 11 | 12.22 | 12.24 | 12.33 | | |
| 5 | QPSK | 25 | 0 | 12.35 | 12.47 | 12.55 | | |
| 5 | 16QAM | 1 | 0 | 12.46 | 12.45 | 12.60 | 13.5 | 0 |
| 5 | 16QAM | 1 | 12 | 12.33 | 12.54 | 12.57 | | |
| 5 | 16QAM | 1 | 24 | 12.04 | 12.42 | 12.29 | | |
| 5 | 16QAM | 12 | 0 | 11.98 | 12.38 | 12.51 | 13.5 | 0 |
| 5 | 16QAM | 12 | 6 | 12.01 | 12.21 | 12.45 | | |
| 5 | 16QAM | 12 | 11 | 11.89 | 12.21 | 12.39 | | |
| 5 | 16QAM | 25 | 0 | 12.14 | 12.29 | 12.26 | | |
| Channel | | | | 19965 | 20175 | 20385 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1711.5 | 1732.5 | 1753.5 | | |
| 3 | QPSK | 1 | 0 | 12.55 | 12.84 | 12.64 | 13.5 | 0 |
| 3 | QPSK | 1 | 7 | 12.37 | 12.22 | 12.51 | | |
| 3 | QPSK | 1 | 14 | 12.20 | 12.21 | 12.14 | | |
| 3 | QPSK | 8 | 0 | 12.34 | 12.56 | 12.54 | 13.5 | 0 |
| 3 | QPSK | 8 | 4 | 12.20 | 12.23 | 12.46 | | |
| 3 | QPSK | 8 | 7 | 12.18 | 12.36 | 12.37 | | |
| 3 | QPSK | 15 | 0 | 12.22 | 12.62 | 12.41 | | |
| 3 | 16QAM | 1 | 0 | 12.43 | 12.43 | 12.48 | 13.5 | 0 |
| 3 | 16QAM | 1 | 7 | 12.27 | 12.53 | 12.48 | | |
| 3 | 16QAM | 1 | 14 | 12.02 | 12.36 | 12.22 | | |
| 3 | 16QAM | 8 | 0 | 11.95 | 12.44 | 12.36 | 13.5 | 0 |
| 3 | 16QAM | 8 | 4 | 12.05 | 12.38 | 12.46 | | |
| 3 | 16QAM | 8 | 7 | 11.92 | 12.30 | 12.35 | | |
| 3 | 16QAM | 15 | 0 | 12.10 | 12.41 | 12.28 | | |
| Channel | | | | 19957 | 20175 | 20393 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1710.7 | 1732.5 | 1754.3 | | |
| 1.4 | QPSK | 1 | 0 | 12.59 | 12.87 | 12.69 | 13.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 12.36 | 12.20 | 12.57 | | |
| 1.4 | QPSK | 1 | 5 | 12.20 | 12.19 | 12.20 | | |
| 1.4 | QPSK | 3 | 0 | 12.27 | 12.63 | 12.61 | | |
| 1.4 | QPSK | 3 | 1 | 12.20 | 12.25 | 12.39 | | |
| 1.4 | QPSK | 3 | 2 | 12.15 | 12.20 | 12.34 | | |
| 1.4 | QPSK | 6 | 0 | 12.37 | 12.53 | 12.44 | 13.5 | 0 |
| 1.4 | 16QAM | 1 | 0 | 12.52 | 12.45 | 12.60 | 13.5 | 0 |
| 1.4 | 16QAM | 1 | 2 | 12.36 | 12.60 | 12.58 | | |
| 1.4 | 16QAM | 1 | 5 | 12.12 | 12.42 | 12.38 | | |
| 1.4 | 16QAM | 3 | 0 | 11.98 | 12.36 | 12.54 | | |
| 1.4 | 16QAM | 3 | 1 | 12.04 | 12.32 | 12.36 | | |
| 1.4 | 16QAM | 3 | 2 | 11.94 | 12.21 | 12.33 | | |
| 1.4 | 16QAM | 6 | 0 | 12.06 | 12.31 | 12.25 | 13.5 | 0 |

**<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 | 13.19 | 13.22 | 13.20 | 13.5 | 0 |
| 20 | QPSK | 1 | 49 | 13.01 | 12.95 | 13.00 | | |
| 20 | QPSK | 1 | 99 | 12.75 | 12.80 | 12.83 | | |
| 20 | QPSK | 50 | 0 | 12.85 | 12.86 | 12.83 | 13.5 | 0 |
| 20 | QPSK | 50 | 24 | 12.65 | 12.75 | 12.76 | | |
| 20 | QPSK | 50 | 49 | 12.61 | 12.62 | 12.75 | | |
| 20 | QPSK | 100 | 0 | 12.78 | 12.79 | 12.75 | | |
| 20 | 16QAM | 1 | 0 | 12.95 | 12.72 | 12.70 | 13.5 | 0 |
| 20 | 16QAM | 1 | 49 | 12.91 | 12.58 | 12.56 | | |
| 20 | 16QAM | 1 | 99 | 12.85 | 13.00 | 12.53 | | |
| 20 | 16QAM | 50 | 0 | 12.72 | 12.68 | 12.64 | 13.5 | 0 |
| 20 | 16QAM | 50 | 24 | 12.60 | 12.64 | 12.59 | | |
| 20 | 16QAM | 50 | 49 | 12.56 | 12.80 | 12.68 | | |
| 20 | 16QAM | 100 | 0 | 12.69 | 12.77 | 12.65 | | |
| Channel | | | | 18675 | 18900 | 19125 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1857.5 | 1880 | 1902.5 | | |
| 15 | QPSK | 1 | 0 | 13.01 | 13.01 | 13.04 | 13.5 | 0 |
| 15 | QPSK | 1 | 37 | 12.99 | 12.85 | 12.92 | | |
| 15 | QPSK | 1 | 74 | 12.73 | 12.74 | 12.74 | | |
| 15 | QPSK | 36 | 0 | 12.75 | 12.81 | 12.79 | 13.5 | 0 |
| 15 | QPSK | 36 | 18 | 12.60 | 12.68 | 12.73 | | |
| 15 | QPSK | 36 | 37 | 12.56 | 12.53 | 12.65 | | |
| 15 | QPSK | 75 | 0 | 12.57 | 12.76 | 12.67 | | |
| 15 | 16QAM | 1 | 0 | 12.86 | 12.70 | 12.68 | 13.5 | 0 |
| 15 | 16QAM | 1 | 37 | 12.85 | 12.52 | 12.49 | | |
| 15 | 16QAM | 1 | 74 | 12.78 | 12.35 | 12.45 | | |
| 15 | 16QAM | 36 | 0 | 12.66 | 12.58 | 12.62 | 13.5 | 0 |
| 15 | 16QAM | 36 | 18 | 12.54 | 12.58 | 12.55 | | |
| 15 | 16QAM | 36 | 37 | 12.51 | 12.50 | 12.62 | | |
| 15 | 16QAM | 75 | 0 | 12.64 | 12.42 | 12.64 | | |
| Channel | | | | 18650 | 18900 | 19150 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1855 | 1880 | 1905 | | |
| 10 | QPSK | 1 | 0 | 12.91 | 12.92 | 12.98 | 13.5 | 0 |
| 10 | QPSK | 1 | 24 | 12.93 | 12.81 | 12.86 | | |
| 10 | QPSK | 1 | 49 | 12.71 | 12.69 | 12.66 | | |
| 10 | QPSK | 25 | 0 | 12.70 | 12.76 | 12.71 | 13.5 | 0 |
| 10 | QPSK | 25 | 12 | 12.55 | 12.61 | 12.63 | | |
| 10 | QPSK | 25 | 24 | 12.51 | 12.51 | 12.59 | | |
| 10 | QPSK | 50 | 0 | 12.48 | 12.76 | 12.60 | | |
| 10 | 16QAM | 1 | 0 | 12.84 | 12.62 | 12.62 | 13.5 | 0 |
| 10 | 16QAM | 1 | 24 | 12.82 | 12.48 | 12.49 | | |
| 10 | 16QAM | 1 | 49 | 12.68 | 12.34 | 12.38 | | |
| 10 | 16QAM | 25 | 0 | 12.59 | 12.53 | 12.58 | 13.5 | 0 |
| 10 | 16QAM | 25 | 12 | 12.52 | 12.49 | 12.52 | | |
| 10 | 16QAM | 25 | 24 | 12.47 | 12.48 | 12.57 | | |
| 10 | 16QAM | 50 | 0 | 12.57 | 12.36 | 12.61 | | |

| Channel | | | | 18625 | 18900 | 19175 | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | | | | 1852.5 | 1880 | 1907.5 | | |
| 5 | QPSK | 1 | 0 | 12.91 | 12.84 | 12.96 | 13.5 | 0 |
| 5 | QPSK | 1 | 12 | 12.84 | 12.71 | 12.82 | | |
| 5 | QPSK | 1 | 24 | 12.65 | 12.61 | 12.63 | | |
| 5 | QPSK | 12 | 0 | 12.68 | 12.69 | 12.69 | 13.5 | 0 |
| 5 | QPSK | 12 | 6 | 12.48 | 12.60 | 12.59 | | |
| 5 | QPSK | 12 | 11 | 12.49 | 12.45 | 12.52 | | |
| 5 | QPSK | 25 | 0 | 12.41 | 12.74 | 12.53 | | |
| 5 | 16QAM | 1 | 0 | 12.77 | 12.59 | 12.52 | 13.5 | 0 |
| 5 | 16QAM | 1 | 12 | 12.77 | 12.44 | 12.43 | | |
| 5 | 16QAM | 1 | 24 | 12.66 | 12.24 | 12.37 | | |
| 5 | 16QAM | 12 | 0 | 12.51 | 12.50 | 12.51 | 13.5 | 0 |
| 5 | 16QAM | 12 | 6 | 12.50 | 12.41 | 12.50 | | |
| 5 | 16QAM | 12 | 11 | 12.40 | 12.40 | 12.56 | | |
| 5 | 16QAM | 25 | 0 | 12.50 | 12.36 | 12.56 | | |
| Channel | | | | 18615 | 18900 | 19185 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1851.5 | 1880 | 1908.5 | | |
| 3 | QPSK | 1 | 0 | 12.89 | 12.80 | 12.89 | 13.5 | 0 |
| 3 | QPSK | 1 | 7 | 12.79 | 12.62 | 12.80 | | |
| 3 | QPSK | 1 | 14 | 12.61 | 12.52 | 12.59 | | |
| 3 | QPSK | 8 | 0 | 12.58 | 12.60 | 12.64 | 13.5 | 0 |
| 3 | QPSK | 8 | 4 | 12.47 | 12.58 | 12.56 | | |
| 3 | QPSK | 8 | 7 | 12.46 | 12.42 | 12.43 | | |
| 3 | QPSK | 15 | 0 | 12.38 | 12.67 | 12.50 | | |
| 3 | 16QAM | 1 | 0 | 12.75 | 12.53 | 12.49 | 13.5 | 0 |
| 3 | 16QAM | 1 | 7 | 12.67 | 12.39 | 12.37 | | |
| 3 | 16QAM | 1 | 14 | 12.60 | 12.21 | 12.37 | | |
| 3 | 16QAM | 8 | 0 | 12.49 | 12.40 | 12.45 | 13.5 | 0 |
| 3 | 16QAM | 8 | 4 | 12.45 | 12.35 | 12.41 | | |
| 3 | 16QAM | 8 | 7 | 12.38 | 12.40 | 12.52 | | |
| 3 | 16QAM | 15 | 0 | 12.42 | 12.31 | 12.50 | | |
| Channel | | | | 18607 | 18900 | 19193 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1850.7 | 1880 | 1909.3 | | |
| 1.4 | QPSK | 1 | 0 | 12.88 | 12.79 | 12.82 | 13.5 | 0 |
| 1.4 | QPSK | 1 | 2 | 12.74 | 12.55 | 12.71 | | |
| 1.4 | QPSK | 1 | 5 | 12.57 | 12.43 | 12.52 | | |
| 1.4 | QPSK | 3 | 0 | 12.58 | 12.53 | 12.62 | | |
| 1.4 | QPSK | 3 | 1 | 12.39 | 12.58 | 12.50 | | |
| 1.4 | QPSK | 3 | 2 | 12.37 | 12.41 | 12.38 | | |
| 1.4 | QPSK | 6 | 0 | 12.38 | 12.66 | 12.41 | 13.5 | 0 |
| 1.4 | 16QAM | 1 | 0 | 12.70 | 12.50 | 12.40 | 13.5 | 0 |
| 1.4 | 16QAM | 1 | 2 | 12.60 | 12.32 | 12.32 | | |
| 1.4 | 16QAM | 1 | 5 | 12.59 | 12.20 | 12.29 | | |
| 1.4 | 16QAM | 3 | 0 | 12.39 | 12.37 | 12.35 | | |
| 1.4 | 16QAM | 3 | 1 | 12.44 | 12.32 | 12.32 | | |
| 1.4 | 16QAM | 3 | 2 | 12.30 | 12.38 | 12.49 | | |
| 1.4 | 16QAM | 6 | 0 | 12.37 | 12.29 | 12.50 | 13.5 | 0 |

## <WLAN Conducted Power>

**General Note:**

1. Per KDB 248227 D01v02, 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 The initial test position procedure is described in the following:
    a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
    b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
    c. 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.

## <2.4GHz WLAN>

| | Mode | Channel | Frequency (MHz) | Data Rate | Average power (dBm) | Duty Cycle % |
|---|---|---|---|---|---|---|
| 2.4GHz WLAN Antenna A | 802.11b | CH 1 | 2412 | 1Mbps | 11.57 | 97.79 |
| | | CH 6 | 2437 | | 11.64 | |
| | | CH 11 | 2462 | | 12.52 | |
| | 802.11g | CH 1 | 2412 | 6Mbps | 10.84 | 86.97 |
| | | CH 6 | 2437 | | 11.08 | |
| | | CH 11 | 2462 | | 11.79 | |
| | 802.11n-HT20 | CH 1 | 2412 | MCS0 | 10.76 | 86.42 |
| | | CH 6 | 2437 | | 11.06 | |
| | | CH 11 | 2462 | | 11.71 | |

# 14. RF Exposure Exclusions Applied

## <Bluetooth Maximum Power>

| Mode Band | Average power(dBm) | |
|---|---|---|
| | Bluetooth v3.0-EDR | Bluetooth v4.1-LE |
| 2.4GHz Bluetooth | 7.0 | 3.0 |

## <5GHz WLAN Maximum Power>

| Mode | | Average Power (dBm) |
|---|---|---|
| 5GHz | 802.11a | 8.00 |
| | 802.11n-HT20 | 8.00 |
| | 802.11n-HT40 | 8.00 |

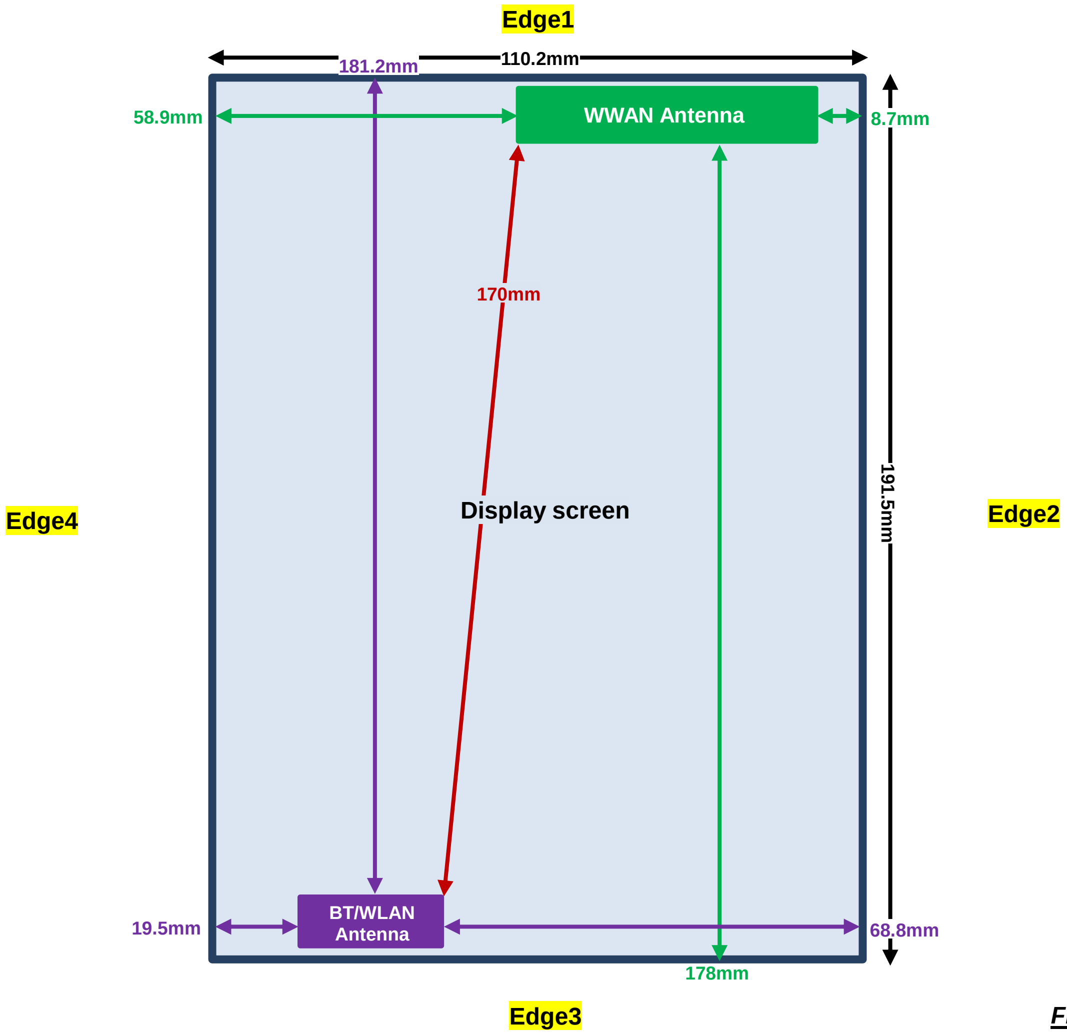
## <Exclusion Applied>

**General Note:**

1. Per KDB 447498 D01v05r02, 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
2. Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold both are <= 3, SAR testing is not required.

| Function | Max Power (dBm) | Distance (mm) | Frequency (GHz) | exclusion threshold | Limit |
|---|---|---|---|---|---|
| Bluetooth | 7.0 | 5 | 2.480 | 1.57 | 3.0 |
| 5GHz WLAN | 8.0 | 5 | 5.825 | 2.9 | 3.0 |

## 15. Antenna Location



*Front View*

## <SAR test exclusion table>

**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 D01v05r02, 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 D01v05r02, 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 D01v05r02, 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 D01v05r02, 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 8 | GPRS 1900 Class 10 | WCDMA Band V | WCDMA Band IV | WCDMA Band II | LTE Band 12 | LTE Band 4 | LTE Band 2 | 802.11b |
|---|---|---|---|---|---|---|---|---|---|---|
| | Calculated Frequency | 848MHz | 1909MHz | 846MHz | 1750MHz | 1907MHz | 715MHz | 1754MHz | 1909MHz | 2462MHz |
| | Maximum power (dBm) | 25.5 | 23 | 24.50 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 12.9 |
| | Maximum rated power(mW) | 355.0 | 200.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 282.0 | 19.0 |
| Bottom Face | Separation distance(mm) | 5.0 | | | | | | | | 5.0 |
| | exclusion threshold | 65.4 | 55.3 | 51.9 | 74.6 | 77.9 | 47.7 | 74.7 | 77.9 | 6.0 |
| | Testing required? | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| Edge 1 | Separation distance(mm) | 5.0 | | | | | | | | 181.2 |
| | exclusion threshold | 65.4 | 55.3 | 51.9 | 74.6 | 77.9 | 47.7 | 74.7 | 77.9 | 1408.0 |
| | Testing required? | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **No** |
| Edge 2 | Separation distance(mm) | 8.7 | | | | | | | | 68.8 |
| | exclusion threshold | 37.6 | 31.8 | 29.8 | 42.9 | 44.8 | 27.4 | 42.9 | 44.8 | 283.0 |
| | Testing required? | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **No** |
| Edge 3 | Separation distance(mm) | 178.0 | | | | | | | | 5.0 |
| | exclusion threshold | 886.0 | 1388.0 | 885.0 | 1393.0 | 1388.0 | 787.0 | 1393.0 | 1388.0 | 6.0 |
| | Testing required? | **No** | **No** | **No** | **No** | **No** | **No** | **No** | **No** | **Yes** |
| Edge 4 | Separation distance(mm) | 58.9 | | | | | | | | 19.5 |
| | exclusion threshold | 213.0 | 197.0 | 213.0 | 202.0 | 197.0 | 220.0 | 202.0 | 197.0 | 1.5 |
| | Testing required? | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **No** |

# 16. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v05r02, 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 D01v05r02, 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; 15mm for bottom face, 15mm for edge1, 15mm for curved surface of edge1.
2. When the minimum distance between antenna and device edge along the curve is less than bottom face and surface edge, the curved SAR is necessary, more detail information which can be referred to setup photo.
3. For SAR testing of the curved region of the device, the device was placed directly against the phantom at the point where the distance between the antenna and device exterior is a minimum.

**GSM Note:**

1. Per KDB 941225 D01v03, for Body SAR test reduction for GPRS and EDGE 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, for GSM850 the GPRS 1Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power, and for GSM1900 the GPRS 2Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

**UMTS Note:**

1. Per KDB 941225 D01v03, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03, 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 D05v02r03, 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 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r03, 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 D05v02r03, 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 D05v02r03, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r03, 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 D05v02r03, smaller bandwidth SAR testing is not required.

**WLAN Note:**

1. Per KDB 248227 D01v02, for all positions/configurations tested using the initial test position and subsequent test positions, 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.
2. Per KDB 248227 D01v02, for 802.11g/n SAR testing is 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.
3. Per KDB 248227 D01v02, for OFDM transmission configurations in the 2.4 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 802.11g/n mode is used for SAR measurement, on the highest measured output power channel for each frequency band.

## *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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GSM850 | GPRS (2 Tx slots) | Bottom Face | 0mm | ON | 189 | 836.4 | 22.40 | 22.50 | 1.023 | -0.01 | 0.154 | 0.158 |
| | GSM850 | GPRS (2 Tx slots) | Edge 1 | 0mm | ON | 189 | 836.4 | 22.40 | 22.50 | 1.023 | -0.01 | 0.147 | 0.150 |
| | GSM850 | GPRS (2 Tx slots) | Curved surface of Edge 1 | 0mm | ON | 189 | 836.4 | 22.40 | 22.50 | 1.023 | -0.12 | 0.143 | 0.146 |
| | GSM850 | GPRS (1 Tx slots) | Bottom Face | 15mm | OFF | 189 | 836.4 | 34.27 | 34.50 | 1.054 | -0.05 | 0.154 | 0.162 |
| | GSM850 | GPRS (1 Tx slots) | Edge 1 | 15mm | OFF | 189 | 836.4 | 34.27 | 34.50 | 1.054 | -0.05 | 0.101 | 0.106 |
| 01 | GSM850 | GPRS (1 Tx slots) | Edge 2 | 0mm | OFF | 189 | 836.4 | 34.27 | 34.50 | 1.054 | -0.07 | 0.206 | 0.217 |
| | GSM850 | GPRS (1 Tx slots) | Edge 4 | 0mm | OFF | 189 | 836.4 | 34.27 | 34.50 | 1.054 | 0.01 | 0.095 | 0.100 |
| | GSM850 | GPRS (1 Tx slots) | Curved surface of Edge 1 | 15mm | OFF | 189 | 836.4 | 34.27 | 34.50 | 1.054 | -0.05 | 0.131 | 0.138 |
| | GSM1900 | GPRS (2 Tx slots) | Bottom Face | 0mm | ON | 810 | 1909.8 | 17.54 | 18.00 | 1.112 | -0.07 | 0.623 | 0.693 |
| | GSM1900 | GPRS (2 Tx slots) | Edge 1 | 0mm | ON | 810 | 1909.8 | 17.54 | 18.00 | 1.112 | 0.02 | 0.560 | 0.623 |
| 02 | GSM1900 | GPRS (2 Tx slots) | Curved surface of Edge 1 | 0mm | ON | 810 | 1909.8 | 17.54 | 18.00 | 1.112 | -0.08 | 0.996 | 1.107 |
| | GSM1900 | GPRS (2 Tx slots) | Curved surface of Edge 1 | 0mm | ON | 512 | 1850.2 | 17.38 | 18.00 | 1.153 | -0.06 | 0.847 | 0.977 |
| | GSM1900 | GPRS (2 Tx slots) | Curved surface of Edge 1 | 0mm | ON | 661 | 1880 | 17.27 | 18.00 | 1.183 | -0.08 | 0.914 | 1.081 |
| | GSM1900 | GPRS (2 Tx slots) | Bottom Face | 15mm | OFF | 810 | 1909.8 | 27.77 | 29.00 | 1.327 | 0.03 | 0.249 | 0.331 |
| | GSM1900 | GPRS (2 Tx slots) | Edge 1 | 15mm | OFF | 810 | 1909.8 | 27.77 | 29.00 | 1.327 | 0.02 | 0.348 | 0.462 |
| | GSM1900 | GPRS (2 Tx slots) | Edge 2 | 0mm | OFF | 810 | 1909.8 | 27.77 | 29.00 | 1.327 | -0.03 | 0.183 | 0.243 |
| | GSM1900 | GPRS (2 Tx slots) | Edge 4 | 0mm | OFF | 810 | 1909.8 | 27.77 | 29.00 | 1.327 | 0.15 | 0.029 | 0.038 |
| | GSM1900 | GPRS (2 Tx slots) | Curved surface of Edge 1 | 15mm | OFF | 810 | 1909.8 | 27.77 | 29.00 | 1.327 | -0.06 | 0.517 | 0.686 |

## <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 V | RMC 12.2Kbps | Bottom Face | 0mm | ON | 4132 | 826.4 | 15.11 | 16.50 | 1.377 | -0.09 | 0.111 | 0.153 |
|  | WCDMA V | RMC 12.2Kbps | Edge 1 | 0mm | ON | 4132 | 826.4 | 15.11 | 16.50 | 1.377 | -0.03 | 0.117 | 0.161 |
|  | WCDMA V | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 4132 | 826.4 | 15.11 | 16.50 | 1.377 | -0.05 | 0.134 | 0.185 |
|  | WCDMA V | RMC 12.2Kbps | Bottom Face | 15mm | OFF | 4132 | 826.4 | 24.10 | 24.50 | 1.096 | 0.01 | 0.137 | 0.150 |
|  | WCDMA V | RMC 12.2Kbps | Edge 1 | 15mm | OFF | 4132 | 826.4 | 24.10 | 24.50 | 1.096 | -0.08 | 0.125 | 0.137 |
| 03 | WCDMA V | RMC 12.2Kbps | Edge 2 | 0mm | OFF | 4132 | 826.4 | 24.10 | 24.50 | 1.096 | 0.02 | 0.228 | 0.250 |
|  | WCDMA V | RMC 12.2Kbps | Edge 4 | 0mm | OFF | 4132 | 826.4 | 24.10 | 24.50 | 1.096 | -0.04 | 0.112 | 0.123 |
|  | WCDMA V | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 4132 | 826.4 | 24.10 | 24.50 | 1.096 | -0.01 | 0.156 | 0.171 |
|  | WCDMA IV | RMC 12.2Kbps | Bottom Face | 0mm | ON | 1513 | 1752.6 | 13.11 | 13.50 | 1.094 | -0.02 | 0.558 | 0.610 |
|  | WCDMA IV | RMC 12.2Kbps | Edge 1 | 0mm | ON | 1513 | 1752.6 | 13.11 | 13.50 | 1.094 | -0.06 | 0.576 | 0.630 |
|  | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 1513 | 1752.6 | 13.11 | 13.50 | 1.094 | -0.04 | 0.754 | 0.825 |
|  | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 1312 | 1712.4 | 13.09 | 13.50 | 1.099 | -0.04 | 0.646 | 0.710 |
| 04 | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 1413 | 1732.6 | 13.10 | 13.50 | 1.096 | -0.07 | 0.938 | 1.028 |
|  | WCDMA IV | RMC 12.2Kbps | Bottom Face | 15mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | -0.04 | 0.572 | 0.593 |
|  | WCDMA IV | RMC 12.2Kbps | Edge 1 | 15mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | -0.03 | 0.535 | 0.555 |
|  | WCDMA IV | RMC 12.2Kbps | Edge 2 | 0mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | -0.03 | 0.430 | 0.446 |
|  | WCDMA IV | RMC 12.2Kbps | Edge 4 | 0mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | 0.01 | 0.379 | 0.393 |
|  | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | -0.09 | 0.943 | 0.978 |
|  | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 1312 | 1712.4 | 24.15 | 24.50 | 1.084 | 0 | 0.806 | 0.874 |
|  | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 1413 | 1732.6 | 24.01 | 24.50 | 1.119 | -0.04 | 0.851 | 0.953 |
|  | WCDMA II | RMC 12.2Kbps | Bottom Face | 0mm | ON | 9538 | 1907.6 | 13.45 | 13.50 | 1.012 | -0.07 | 0.737 | 0.746 |
|  | WCDMA II | RMC 12.2Kbps | Edge 1 | 0mm | ON | 9538 | 1907.6 | 13.45 | 13.50 | 1.012 | -0.04 | 0.840 | 0.850 |
|  | WCDMA II | RMC 12.2Kbps | Edge 1 | 0mm | ON | 9262 | 1852.4 | 13.38 | 13.50 | 1.028 | -0.02 | 0.604 | 0.621 |
|  | WCDMA II | RMC 12.2Kbps | Edge 1 | 0mm | ON | 9400 | 1880 | 13.39 | 13.50 | 1.026 | 0 | 0.732 | 0.751 |
| 05 | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 9538 | 1907.6 | 13.45 | 13.50 | 1.012 | -0.05 | 1.380 | 1.396 |
|  | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 9262 | 1852.4 | 13.38 | 13.50 | 1.028 | -0.06 | 0.963 | 0.990 |
|  | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 9400 | 1880 | 13.39 | 13.50 | 1.026 | -0.04 | 1.200 | 1.231 |
|  | WCDMA II | RMC 12.2Kbps | Bottom Face | 15mm | OFF | 9538 | 1907.6 | 24.39 | 24.50 | 1.026 | -0.03 | 0.451 | 0.463 |
|  | WCDMA II | RMC 12.2Kbps | Edge 1 | 15mm | OFF | 9538 | 1907.6 | 24.39 | 24.50 | 1.026 | 0 | 0.640 | 0.656 |
|  | WCDMA II | RMC 12.2Kbps | Edge 2 | 0mm | OFF | 9538 | 1907.6 | 24.39 | 24.50 | 1.026 | -0.04 | 0.374 | 0.384 |
|  | WCDMA II | RMC 12.2Kbps | Edge 4 | 0mm | OFF | 9538 | 1907.6 | 24.39 | 24.50 | 1.026 | -0.06 | 0.067 | 0.069 |
|  | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 9538 | 1907.6 | 24.39 | 24.50 | 1.026 | -0.05 | 0.875 | 0.897 |
|  | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 9262 | 1852.4 | 24.07 | 24.50 | 1.104 | -0.1 | 0.618 | 0.682 |
|  | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 9400 | 1880 | 24.13 | 24.50 | 1.089 | -0.01 | 0.681 | 0.742 |

## <LTE SAR>

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Bottom Face | 0mm | ON | 23095 | 707.5 | 15.11 | 15.50 | 1.094 | 0.11 | 0.210 | 0.230 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Bottom Face | 0mm | ON | 23095 | 707.5 | 14.84 | 15.50 | 1.164 | -0.01 | 0.217 | 0.253 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Edge 1 | 0mm | ON | 23095 | 707.5 | 15.11 | 15.50 | 1.094 | -0.1 | 0.168 | 0.184 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Edge 1 | 0mm | ON | 23095 | 707.5 | 14.84 | 15.50 | 1.164 | -0.11 | 0.166 | 0.193 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 23095 | 707.5 | 15.11 | 15.50 | 1.094 | -0.13 | 0.175 | 0.191 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 23095 | 707.5 | 14.84 | 15.50 | 1.164 | -0.08 | 0.176 | 0.205 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Bottom Face | 15mm | OFF | 23095 | 707.5 | 24.28 | 24.50 | 1.052 | -0.1 | 0.253 | 0.266 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Bottom Face | 15mm | OFF | 23095 | 707.5 | 23.01 | 23.50 | 1.119 | -0.04 | 0.209 | 0.234 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Edge 1 | 15mm | OFF | 23095 | 707.5 | 24.28 | 24.50 | 1.052 | 0.02 | 0.157 | 0.165 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Edge 1 | 15mm | OFF | 23095 | 707.5 | 23.01 | 23.50 | 1.119 | -0.03 | 0.131 | 0.147 |
| 06 | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Edge 2 | 0mm | OFF | 23095 | 707.5 | 24.28 | 24.50 | 1.052 | 0.08 | 0.300 | 0.316 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Edge 2 | 0mm | OFF | 23095 | 707.5 | 23.01 | 23.50 | 1.119 | -0.03 | 0.251 | 0.281 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Edge 4 | 0mm | OFF | 23095 | 707.5 | 24.28 | 24.50 | 1.052 | 0.17 | 0.239 | 0.251 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Edge 4 | 0mm | OFF | 23095 | 707.5 | 23.01 | 23.50 | 1.119 | 0 | 0.197 | 0.221 |
|  | LTE Band 12 | 10M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 23095 | 707.5 | 24.28 | 24.50 | 1.052 | -0.04 | 0.253 | 0.266 |
|  | LTE Band 12 | 10M | QPSK | 25RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 23095 | 707.5 | 23.01 | 23.50 | 1.119 | -0.07 | 0.236 | 0.264 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Bottom Face | 0mm | ON | 20175 | 1732.5 | 12.97 | 13.50 | 1.130 | -0.04 | 0.534 | 0.603 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Bottom Face | 0mm | ON | 20175 | 1732.5 | 12.84 | 13.50 | 1.164 | -0.07 | 0.636 | 0.740 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Edge 1 | 0mm | ON | 20175 | 1732.5 | 12.97 | 13.50 | 1.130 | -0.05 | 0.360 | 0.407 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Edge 1 | 0mm | ON | 20175 | 1732.5 | 12.84 | 13.50 | 1.164 | -0.04 | 0.381 | 0.444 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20175 | 1732.5 | 12.97 | 13.50 | 1.130 | -0.07 | 0.775 | 0.876 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20050 | 1720 | 12.69 | 13.50 | 1.205 | -0.16 | 0.699 | 0.842 |
| 07 | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20300 | 1745 | 12.75 | 13.50 | 1.189 | -0.06 | 0.852 | 1.013 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20175 | 1732.5 | 12.84 | 13.50 | 1.164 | -0.05 | 0.754 | 0.878 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20050 | 1720 | 12.49 | 13.50 | 1.262 | -0.17 | 0.724 | 0.914 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20300 | 1745 | 12.71 | 13.50 | 1.199 | -0.11 | 0.814 | 0.976 |
|  | LTE Band 4 | 20M | QPSK | 100RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 20175 | 1732.5 | 12.76 | 13.50 | 1.186 | -0.04 | 0.792 | 0.939 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Bottom Face | 15mm | OFF | 20175 | 1732.5 | 24.15 | 24.50 | 1.084 | 0.01 | 0.543 | 0.589 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Bottom Face | 15mm | OFF | 20175 | 1732.5 | 22.85 | 23.50 | 1.161 | 0.09 | 0.420 | 0.488 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Edge 1 | 15mm | OFF | 20175 | 1732.5 | 24.15 | 24.50 | 1.084 | -0.03 | 0.519 | 0.563 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Edge 1 | 15mm | OFF | 20175 | 1732.5 | 22.85 | 23.50 | 1.161 | -0.05 | 0.405 | 0.470 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Edge 2 | 0mm | OFF | 20175 | 1732.5 | 24.15 | 24.50 | 1.084 | 0.11 | 0.339 | 0.367 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Edge 2 | 0mm | OFF | 20175 | 1732.5 | 22.85 | 23.50 | 1.161 | 0 | 0.279 | 0.324 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Edge 4 | 0mm | OFF | 20175 | 1732.5 | 24.15 | 24.50 | 1.084 | 0.04 | 0.401 | 0.435 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Edge 4 | 0mm | OFF | 20175 | 1732.5 | 22.85 | 23.50 | 1.161 | 0.03 | 0.304 | 0.353 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 20175 | 1732.5 | 24.15 | 24.50 | 1.084 | 0.06 | 0.813 | 0.881 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 20050 | 1720 | 23.86 | 24.50 | 1.159 | -0.07 | 0.743 | 0.861 |
|  | LTE Band 4 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 20300 | 1745 | 23.96 | 24.50 | 1.132 | 0.01 | 0.852 | 0.965 |
|  | LTE Band 4 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 20175 | 1732.5 | 22.85 | 23.50 | 1.161 | -0.01 | 0.651 | 0.756 |
|  | LTE Band 4 | 20M | QPSK | 100RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 20175 | 1732.5 | 22.68 | 23.50 | 1.208 | -0.05 | 0.626 | 0.756 |

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Bottom Face | 0mm | ON | 18900 | 1880 | 13.22 | 13.50 | 1.067 | -0.06 | 0.894 | 0.954 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Bottom Face | 0mm | ON | 18700 | 1860 | 13.19 | 13.50 | 1.074 | -0.03 | 0.887 | 0.953 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Bottom Face | 0mm | ON | 19100 | 1900 | 13.20 | 13.50 | 1.072 | -0.05 | 0.872 | 0.934 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Bottom Face | 0mm | ON | 18900 | 1880 | 12.86 | 13.50 | 1.159 | -0.05 | 0.897 | 1.039 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Bottom Face | 0mm | ON | 18700 | 1860 | 12.85 | 13.50 | 1.161 | -0.05 | 0.856 | 0.994 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Bottom Face | 0mm | ON | 19100 | 1900 | 12.83 | 13.50 | 1.167 | 0.02 | 0.864 | 1.008 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0offset | Bottom Face | 0mm | ON | 18900 | 1880 | 12.79 | 13.50 | 1.178 | -0.03 | 0.875 | 1.030 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Edge 1 | 0mm | ON | 18900 | 1880 | 13.22 | 13.50 | 1.067 | -0.08 | 0.725 | 0.773 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 1 | 0mm | ON | 18900 | 1880 | 12.86 | 13.50 | 1.159 | -0.06 | 0.720 | 0.834 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 1 | 0mm | ON | 18700 | 1860 | 12.85 | 13.50 | 1.161 | -0.03 | 0.669 | 0.777 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 1 | 0mm | ON | 19100 | 1900 | 12.83 | 13.50 | 1.167 | -0.02 | 0.767 | 0.895 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0offset | Edge 1 | 0mm | ON | 18900 | 1880 | 12.79 | 13.50 | 1.178 | -0.04 | 0.722 | 0.850 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 18900 | 1880 | 13.22 | 13.50 | 1.067 | -0.15 | 1.180 | 1.259 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 18700 | 1860 | 13.19 | 13.50 | 1.074 | -0.05 | 1.120 | 1.203 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 19100 | 1900 | 13.20 | 13.50 | 1.072 | -0.07 | 1.260 | 1.350 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 18900 | 1880 | 12.86 | 13.50 | 1.159 | -0.08 | 1.170 | 1.356 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 18700 | 1860 | 12.85 | 13.50 | 1.161 | -0.01 | 1.090 | 1.266 |
| 08 | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 19100 | 1900 | 12.83 | 13.50 | 1.167 | -0.02 | 1.230 | 1.435 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0offset | Curved surface of Edge 1 | 0mm | ON | 18900 | 1880 | 12.79 | 13.50 | 1.178 | -0.06 | 1.190 | 1.401 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Bottom Face | 15mm | OFF | 18900 | 1880 | 24.04 | 24.50 | 1.112 | 0.08 | 0.490 | 0.545 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Bottom Face | 15mm | OFF | 18900 | 1880 | 22.88 | 23.50 | 1.153 | 0.02 | 0.374 | 0.431 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Edge 1 | 15mm | OFF | 18900 | 1880 | 24.04 | 24.50 | 1.112 | 0.11 | 0.550 | 0.611 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 1 | 15mm | OFF | 18900 | 1880 | 22.88 | 23.50 | 1.153 | -0.01 | 0.440 | 0.508 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Edge 2 | 0mm | OFF | 18900 | 1880 | 24.04 | 24.50 | 1.112 | -0.02 | 0.391 | 0.435 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 2 | 0mm | OFF | 18900 | 1880 | 22.88 | 23.50 | 1.153 | -0.01 | 0.298 | 0.344 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Edge 4 | 0mm | OFF | 18900 | 1880 | 24.04 | 24.50 | 1.112 | 0.07 | 0.063 | 0.070 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Edge 4 | 0mm | OFF | 18900 | 1880 | 22.88 | 23.50 | 1.153 | 0.02 | 0.044 | 0.051 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 18900 | 1880 | 24.04 | 24.50 | 1.112 | -0.02 | 0.821 | 0.913 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 18700 | 1860 | 24.01 | 24.50 | 1.119 | 0 | 0.815 | 0.912 |
| | LTE Band 2 | 20M | QPSK | 1RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 19100 | 1900 | 23.88 | 24.50 | 1.153 | -0.06 | 0.870 | 1.004 |
| | LTE Band 2 | 20M | QPSK | 50RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 18900 | 1880 | 22.88 | 23.50 | 1.153 | 0 | 0.691 | 0.797 |
| | LTE Band 2 | 20M | QPSK | 100RB | 0offset | Curved surface of Edge 1 | 15mm | OFF | 18900 | 1880 | 22.87 | 23.50 | 1.156 | -0.16 | 0.661 | 0.764 |

### <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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | 11 | 2462 | 12.52 | 12.90 | 1.091 | 97.79 | 1.023 | -0.1 | 1.010 | 1.128 |
| | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | 6 | 2437 | 11.64 | 12.90 | 1.337 | 97.79 | 1.023 | -0.15 | 0.852 | 1.165 |
| | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | 1 | 2412 | 11.57 | 12.90 | 1.358 | 97.79 | 1.023 | 0.06 | 0.841 | 1.169 |
| | WLAN2.4GHz | 802.11b 1Mbps | Edge 3 | 0mm | 11 | 2462 | 12.52 | 12.90 | 1.091 | 97.79 | 1.023 | -0.1 | 0.697 | 0.778 |
| | WLAN2.4GHz | 802.11b 1Mbps | Curved surface of Edge 3 | 0mm | 11 | 2462 | 12.52 | 12.90 | 1.091 | 97.79 | 1.023 | -0.08 | 1.100 | 1.228 |
| | WLAN2.4GHz | 802.11b 1Mbps | Curved surface of Edge 3 | 0mm | 6 | 2437 | 11.64 | 12.90 | 1.337 | 97.79 | 1.023 | -0.01 | 1.010 | 1.381 |
| 09 | WLAN2.4GHz | 802.11b 1Mbps | Curved surface of Edge 3 | 0mm | 1 | 2412 | 11.57 | 12.90 | 1.358 | 97.79 | 1.023 | -0.09 | 1.000 | 1.390 |
| | WLAN2.4GHz | 802.11g 6Mbps | Bottom Face | 0mm | 11 | 2462 | 11.79 | 12.50 | 1.178 | 86.97 | 1.150 | -0.01 | 0.816 | 1.105 |
| | WLAN2.4GHz | 802.11g 6Mbps | Bottom Face | 0mm | 6 | 2437 | 11.08 | 12.50 | 1.387 | 86.97 | 1.150 | -0.14 | 0.726 | 1.158 |
| | WLAN2.4GHz | 802.11g 6Mbps | Bottom Face | 0mm | 1 | 2412 | 10.84 | 12.50 | 1.466 | 86.97 | 1.150 | -0.02 | 0.688 | 1.160 |
| | WLAN2.4GHz | 802.11g 6Mbps | Edge 3 | 0mm | 11 | 2462 | 11.79 | 12.50 | 1.178 | 86.97 | 1.150 | 0.02 | 0.541 | 0.733 |
| | WLAN2.4GHz | 802.11g 6Mbps | Curved surface of Edge 3 | 0mm | 11 | 2462 | 11.79 | 12.50 | 1.178 | 86.97 | 1.150 | -0.05 | 0.924 | 1.251 |
| | WLAN2.4GHz | 802.11g 6Mbps | Curved surface of Edge 3 | 0mm | 6 | 2437 | 11.08 | 12.50 | 1.387 | 86.97 | 1.150 | -0.12 | 0.806 | 1.285 |
| | WLAN2.4GHz | 802.11g 6Mbps | Curved surface of Edge 3 | 0mm | 1 | 2412 | 10.84 | 12.50 | 1.466 | 86.97 | 1.150 | -0.1 | 0.817 | 1.377 |

## 16.2 Repeated SAR Measurement

| No. | Band | Mode | Test Position | Gap (mm) | Power Reduction | 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) | Ratio | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | - | - | -0.09 | 0.943 | - | 0.978 |
| 2nd | WCDMA IV | RMC 12.2Kbps | Curved surface of Edge 1 | 15mm | OFF | 1513 | 1752.6 | 24.34 | 24.50 | 1.038 | - | - | -0.04 | 0.867 | 1.09 | 0.900 |
| 1st | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 9538 | 1907.6 | 13.45 | 13.50 | 1.012 | - | - | -0.05 | 1.380 | - | 1.396 |
| 2nd | WCDMA II | RMC 12.2Kbps | Curved surface of Edge 1 | 0mm | ON | 9538 | 1907.6 | 13.45 | 13.50 | 1.012 | - |  | -0.01 | 1.360 | 1.01 | 1.376 |
| 1st | WLAN2.4GHz | 802.11b 1Mbps | Curved surface of Edge 3 | 0mm | - | 11 | 2462 | 12.52 | 12.90 | 1.091 | 97.79 | 1.023 | -0.08 | 1.100 | - | 1.228 |
| 2nd | WLAN2.4GHz | 802.11b 1Mbps | Curved surface of Edge 3 | 0cm | - | 11 | 2462 | 12.52 | 12.90 | 1.091 | 97.79 | 1.023 | -0.19 | 1.060 | 1.04 | 1.184 |

**General Note:**

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r03, 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 | Note |
|---|---|---|---|
| | | Body | |
| 1. | GPRS/EDGE(Data) + WLAN2.4GHz(data) | Yes | Hotspot |
| 2. | WCDMA(Data) + WLAN2.4GHz(data) | Yes | Hotspot |
| 3. | LTE(Data) + WLAN2.4GHz(data) | Yes | Hotspot |
| 4. | GPRS/EDGE(Data) + Bluetooth(data) | Yes | Bluetooth Tethering |
| 5. | WCDMA(Data) + Bluetooth(data) | Yes | Bluetooth Tethering |
| 6. | LTE(Data) + Bluetooth(data) | Yes | Bluetooth Tethering |
| 7. | GPRS/EDGE(data) + WLAN5.2GHz / 5.8GHz(data) | Yes | Hotspot |
| 8. | WCDMA(data) + WLAN5.2GHz / 5.8GHz(data) | Yes | Hotspot |
| 9. | LTE(data) + WLAN5.2GHz / 5.8GHz(data) | Yes | Hotspot |

**General Note:**

1. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation, and 5.3GHz WLAN supports WiFi Direct (Group Client).
2. For simultaneous transmission analysis for exposure position of edge 15mm and bottom face15mm, WLAN SAR tested at 0mm separation is worse and the test data is used for conservative SAR summation.
3. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v05r02, 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.
   - v) The SPLSR calculated results please refer to section 17.2.
7. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 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.

| Function | Max Power | Estimated 1g SAR W/kg |
|---|---|---|
| Bluetooth | 7.0 | 0.210 W/kg |
| 5GHz WLAN | 8.0 | 0.386 W/kg |

## 17.1 Body Exposure Conditions

| WWAN Band | | Exposure Position | 1 | 2 | **1+2 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| | | | WWAN | 2.4GHz WLAN | | | |
| | | | 1g SAR (W/kg) | 1g SAR (W/kg) | | | |
| GSM | GSM850 | Bottom Face at 0mm | 0.158 | 1.165 | **1.32** | | |
| | | Edge 1 at 0mm | 0.150 | | **0.15** | | |
| | | Curved surface of Edge 1 at 0mm | 0.146 | | **0.15** | | |
| | | Bottom Face at 15mm | 0.162 | | **0.16** | | |
| | | Edge 1 at 15mm | 0.106 | | **0.11** | | |
| | | Edge 2 at 0mm | 0.217 | | **0.22** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.100 | | **0.10** | | |
| | | Curved surface of Edge 1 at 15mm | 0.138 | | **0.14** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| | GSM1900 | Bottom Face at 0mm | 0.693 | 1.165 | **1.86** | 0.01 | Case 1 |
| | | Edge 1 at 0mm | 0.623 | | **0.62** | | |
| | | Curved surface of Edge 1 at 0mm | 1.107 | | **1.11** | | |
| | | Bottom Face at 15mm | 0.331 | | **0.33** | | |
| | | Edge 1 at 15mm | 0.462 | | **0.46** | | |
| | | Edge 2 at 0mm | 0.243 | | **0.24** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.038 | | **0.04** | | |
| | | Curved surface of Edge 1 at 15mm | 0.686 | | **0.69** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| WCDMA | WCDMA V | Bottom Face at 0mm | 0.153 | 1.165 | **1.32** | | |
| | | Edge 1 at 0mm | 0.161 | | **0.16** | | |
| | | Curved surface of Edge 1 at 0mm | 0.185 | | **0.19** | | |
| | | Bottom Face at 15mm | 0.150 | | **0.15** | | |
| | | Edge 1 at 15mm | 0.137 | | **0.14** | | |
| | | Edge 2 at 0mm | 0.250 | | **0.25** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.123 | | **0.12** | | |
| | | Curved surface of Edge 1 at 15mm | 0.171 | | **0.17** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| | WCDMA IV | Bottom Face at 0mm | 0.610 | 1.165 | **1.78** | 0.01 | Case 2 |
| | | Edge 1 at 0mm | 0.630 | | **0.63** | | |
| | | Curved surface of Edge 1 at 0mm | 1.028 | | **1.03** | | |
| | | Bottom Face at 15mm | 0.593 | | **0.59** | | |
| | | Edge 1 at 15mm | 0.555 | | **0.56** | | |
| | | Edge 2 at 0mm | 0.446 | | **0.45** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.393 | | **0.39** | | |
| | | Curved surface of Edge 1 at 15mm | 0.978 | | **0.98** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| | WCDMA II | Bottom Face at 0mm | 0.746 | 1.165 | **1.91** | 0.01 | Case 3 |
| | | Edge 1 at 0mm | 0.850 | | **0.85** | | |
| | | Curved surface of Edge 1 at 0mm | 1.396 | | **1.40** | | |
| | | Bottom Face at 15mm | 0.463 | | **0.46** | | |
| | | Edge 1 at 15mm | 0.656 | | **0.66** | | |
| | | Edge 2 at 0mm | 0.384 | | **0.38** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.069 | | **0.07** | | |
| | | Curved surface of Edge 1 at 15mm | 0.897 | | **0.90** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |

| WWAN Band | | Exposure Position | 1 | 2 | **1+2 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| | | | WWAN | 2.4GHz WLAN | | | |
| | | | 1g SAR (W/kg) | 1g SAR (W/kg) | | | |
| | | Edge 1 at 0mm | 0.193 | | **0.19** | | |
| | | Curved surface of Edge 1 at 0mm | 0.205 | | **0.21** | | |
| | | Bottom Face at 15mm | 0.266 | | **0.27** | | |
| | | Edge 1 at 15mm | 0.165 | | **0.17** | | |
| | | Edge 2 at 0mm | 0.316 | | **0.32** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.251 | | **0.25** | | |
| | | Curved surface of Edge 1 at 15mm | 0.266 | | **0.27** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| | LTE Band 4 | Bottom Face at 0mm | 0.740 | 1.165 | **1.91** | 0.01 | Case 4 |
| | | Edge 1 at 0mm | 0.444 | | **0.44** | | |
| | | Curved surface of Edge 1 at 0mm | 1.013 | | **1.01** | | |
| | | Bottom Face at 15mm | 0.589 | | **0.59** | | |
| | | Edge 1 at 15mm | 0.563 | | **0.56** | | |
| | | Edge 2 at 0mm | 0.367 | | **0.37** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.435 | | **0.44** | | |
| | | Curved surface of Edge 1 at 15mm | 0.965 | | **0.97** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |
| | LTE Band 2 | Bottom Face at 0mm | 1.039 | 1.165 | **2.20** | 0.02 | Case 5 |
| | | Edge 1 at 0mm | 0.895 | | **0.90** | | |
| | | Curved surface of Edge 1 at 0mm | 1.435 | | **1.44** | | |
| | | Bottom Face at 15mm | 0.545 | | **0.55** | | |
| | | Edge 1 at 15mm | 0.611 | | **0.61** | | |
| | | Edge 2 at 0mm | 0.435 | | **0.44** | | |
| | | Edge 3 at 0mm | | 0.778 | **0.78** | | |
| | | Edge 4 at 0mm | 0.070 | | **0.07** | | |
| | | Curved surface of Edge 1 at 15mm | 1.004 | | **1.00** | | |
| | | Curved surface of Edge 3 at 0mm | | 1.390 | **1.39** | | |

| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 3 2.4GHz Bluetooth Estimated 1g SAR (W/kg) | **1+3 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| GSM | GSM850 | Bottom Face at 0mm | 0.158 | 0.210 | **0.37** | | |
| | | Edge 1 at 0mm | 0.150 | 0.210 | **0.36** | | |
| | | Curved surface of Edge 1 at 0mm | 0.146 | 0.210 | **0.36** | | |
| | | Bottom Face at 15mm | 0.162 | 0.210 | **0.37** | | |
| | | Edge 1 at 15mm | 0.106 | 0.210 | **0.32** | | |
| | | Edge 2 at 0mm | 0.217 | 0.210 | **0.43** | | |
| | | Edge 4 at 0mm | 0.100 | 0.210 | **0.31** | | |
| | | Curved surface of Edge 1 at 15mm | 0.138 | 0.210 | **0.35** | | |
| | GSM1900 | Bottom Face at 0mm | 0.693 | 0.210 | **0.90** | | |
| | | Edge 1 at 0mm | 0.623 | 0.210 | **0.83** | | |
| | | Curved surface of Edge 1 at 0mm | 1.107 | 0.210 | **1.32** | | |
| | | Bottom Face at 15mm | 0.331 | 0.210 | **0.54** | | |
| | | Edge 1 at 15mm | 0.462 | 0.210 | **0.67** | | |
| | | Edge 2 at 0mm | 0.243 | 0.210 | **0.45** | | |
| | | Edge 4 at 0mm | 0.038 | 0.210 | **0.25** | | |
| | | Curved surface of Edge 1 at 15mm | 0.686 | 0.210 | **0.90** | | |
| WCDMA | WCDMA V | Bottom Face at 0mm | 0.153 | 0.210 | **0.36** | | |
| | | Edge 1 at 0mm | 0.161 | 0.210 | **0.37** | | |
| | | Curved surface of Edge 1 at 0mm | 0.185 | 0.210 | **0.40** | | |
| | | Bottom Face at 15mm | 0.150 | 0.210 | **0.36** | | |
| | | Edge 1 at 15mm | 0.137 | 0.210 | **0.35** | | |
| | | Edge 2 at 0mm | 0.250 | 0.210 | **0.46** | | |
| | | Edge 4 at 0mm | 0.123 | 0.210 | **0.33** | | |
| | | Curved surface of Edge 1 at 15mm | 0.171 | 0.210 | **0.38** | | |
| | WCDMA IV | Bottom Face at 0mm | 0.610 | 0.210 | **0.82** | | |
| | | Edge 1 at 0mm | 0.630 | 0.210 | **0.84** | | |
| | | Curved surface of Edge 1 at 0mm | 1.028 | 0.210 | **1.24** | | |
| | | Bottom Face at 15mm | 0.593 | 0.210 | **0.80** | | |
| | | Edge 1 at 15mm | 0.555 | 0.210 | **0.77** | | |
| | | Edge 2 at 0mm | 0.446 | 0.210 | **0.66** | | |
| | | Edge 4 at 0mm | 0.393 | 0.210 | **0.60** | | |
| | | Curved surface of Edge 1 at 15mm | 0.978 | 0.210 | **1.19** | | |
| | WCDMA II | Bottom Face at 0mm | 0.746 | 0.210 | **0.96** | | |
| | | Edge 1 at 0mm | 0.850 | 0.210 | **1.06** | | |
| | | Curved surface of Edge 1 at 0mm | 1.396 | 0.210 | **1.61** | 0.01 | Case 6 |
| | | Bottom Face at 15mm | 0.463 | 0.210 | **0.67** | | |
| | | Edge 1 at 15mm | 0.656 | 0.210 | **0.87** | | |
| | | Edge 2 at 0mm | 0.384 | 0.210 | **0.59** | | |
| | | Edge 4 at 0mm | 0.069 | 0.210 | **0.28** | | |
| | | Curved surface of Edge 1 at 15mm | 0.897 | 0.210 | **1.11** | | |

| WWAN Band | | Exposure Position | 1 | 3 | **1+3 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| | | | WWAN | 2.4GHz Bluetooth | | | |
| | | | 1g SAR (W/kg) | Estimated 1g SAR (W/kg) | | | |
| LTE | LTE Band 12 | Bottom Face at 0mm | 0.253 | 0.210 | **0.46** | | |
| | | Edge 1 at 0mm | 0.193 | 0.210 | **0.40** | | |
| | | Curved surface of Edge 1 at 0mm | 0.205 | 0.210 | **0.42** | | |
| | | Bottom Face at 15mm | 0.266 | 0.210 | **0.48** | | |
| | | Edge 1 at 15mm | 0.165 | 0.210 | **0.38** | | |
| | | Edge 2 at 0mm | 0.316 | 0.210 | **0.53** | | |
| | | Edge 4 at 0mm | 0.251 | 0.210 | **0.46** | | |
| | | Curved surface of Edge 1 at 15mm | 0.266 | 0.210 | **0.48** | | |
| | LTE Band 4 | Bottom Face at 0mm | 0.740 | 0.210 | **0.95** | | |
| | | Edge 1 at 0mm | 0.444 | 0.210 | **0.65** | | |
| | | Curved surface of Edge 1 at 0mm | 1.013 | 0.210 | **1.22** | | |
| | | Bottom Face at 15mm | 0.589 | 0.210 | **0.80** | | |
| | | Edge 1 at 15mm | 0.563 | 0.210 | **0.77** | | |
| | | Edge 2 at 0mm | 0.367 | 0.210 | **0.58** | | |
| | | Edge 4 at 0mm | 0.435 | 0.210 | **0.65** | | |
| | | Curved surface of Edge 1 at 15mm | 0.965 | 0.210 | **1.18** | | |
| | LTE Band 2 | Bottom Face at 0mm | 1.039 | 0.210 | **1.25** | | |
| | | Edge 1 at 0mm | 0.895 | 0.210 | **1.11** | | |
| | | Curved surface of Edge 1 at 0mm | 1.435 | 0.210 | **1.65** | 0.01 | Case 7 |
| | | Bottom Face at 15mm | 0.545 | 0.210 | **0.76** | | |
| | | Edge 1 at 15mm | 0.611 | 0.210 | **0.82** | | |
| | | Edge 2 at 0mm | 0.435 | 0.210 | **0.65** | | |
| | | Edge 4 at 0mm | 0.070 | 0.210 | **0.28** | | |
| | | Curved surface of Edge 1 at 15mm | 1.004 | 0.210 | **1.21** | | |

| WWAN Band | | Exposure Position | 1 | 4 | **1+4 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| | | | WWAN | 5GHz WLAN | | | |
| | | | 1g SAR (W/kg) | Estimated 1g SAR (W/kg) | | | |
| GSM | GSM850 | Bottom Face at 0mm | 0.158 | 0.386 | **0.54** | | |
| | | Edge 1 at 0mm | 0.150 | 0.386 | **0.54** | | |
| | | Curved surface of Edge 1 at 0mm | 0.146 | 0.386 | **0.53** | | |
| | | Bottom Face at 15mm | 0.162 | 0.386 | **0.55** | | |
| | | Edge 1 at 15mm | 0.106 | 0.386 | **0.49** | | |
| | | Edge 2 at 0mm | 0.217 | 0.386 | **0.60** | | |
| | | Edge 4 at 0mm | 0.100 | 0.386 | **0.49** | | |
| | | Curved surface of Edge 1 at 15mm | 0.138 | 0.386 | **0.52** | | |
| | GSM1900 | Bottom Face at 0mm | 0.693 | 0.386 | **1.08** | | |
| | | Edge 1 at 0mm | 0.623 | 0.386 | **1.01** | | |
| | | Curved surface of Edge 1 at 0mm | 1.107 | 0.386 | **1.49** | | |
| | | Bottom Face at 15mm | 0.331 | 0.386 | **0.72** | | |
| | | Edge 1 at 15mm | 0.462 | 0.386 | **0.85** | | |
| | | Edge 2 at 0mm | 0.243 | 0.386 | **0.63** | | |
| | | Edge 4 at 0mm | 0.038 | 0.386 | **0.42** | | |
| | | Curved surface of Edge 1 at 15mm | 0.686 | 0.386 | **1.07** | | |
| WCDMA | WCDMA V | Bottom Face at 0mm | 0.153 | 0.386 | **0.54** | | |
| | | Edge 1 at 0mm | 0.161 | 0.386 | **0.55** | | |
| | | Curved surface of Edge 1 at 0mm | 0.185 | 0.386 | **0.57** | | |
| | | Bottom Face at 15mm | 0.150 | 0.386 | **0.54** | | |
| | | Edge 1 at 15mm | 0.137 | 0.386 | **0.52** | | |
| | | Edge 2 at 0mm | 0.250 | 0.386 | **0.64** | | |
| | | Edge 4 at 0mm | 0.123 | 0.386 | **0.51** | | |
| | | Curved surface of Edge 1 at 15mm | 0.171 | 0.386 | **0.56** | | |
| | WCDMA IV | Bottom Face at 0mm | 0.610 | 0.386 | **1.00** | | |
| | | Edge 1 at 0mm | 0.630 | 0.386 | **1.02** | | |
| | | Curved surface of Edge 1 at 0mm | 1.028 | 0.386 | **1.41** | | |
| | | Bottom Face at 15mm | 0.593 | 0.386 | **0.98** | | |
| | | Edge 1 at 15mm | 0.555 | 0.386 | **0.94** | | |
| | | Edge 2 at 0mm | 0.446 | 0.386 | **0.83** | | |
| | | Edge 4 at 0mm | 0.393 | 0.386 | **0.78** | | |
| | | Curved surface of Edge 1 at 15mm | 0.978 | 0.386 | **1.36** | | |
| | WCDMA II | Bottom Face at 0mm | 0.746 | 0.386 | **1.13** | | |
| | | Edge 1 at 0mm | 0.850 | 0.386 | **1.24** | | |
| | | Curved surface of Edge 1 at 0mm | 1.396 | 0.386 | **1.78** | 0.01 | Case 8 |
| | | Bottom Face at 15mm | 0.463 | 0.386 | **0.85** | | |
| | | Edge 1 at 15mm | 0.656 | 0.386 | **1.04** | | |
| | | Edge 2 at 0mm | 0.384 | 0.386 | **0.77** | | |
| | | Edge 4 at 0mm | 0.069 | 0.386 | **0.46** | | |
| | | Curved surface of Edge 1 at 15mm | 0.897 | 0.386 | **1.28** | | |

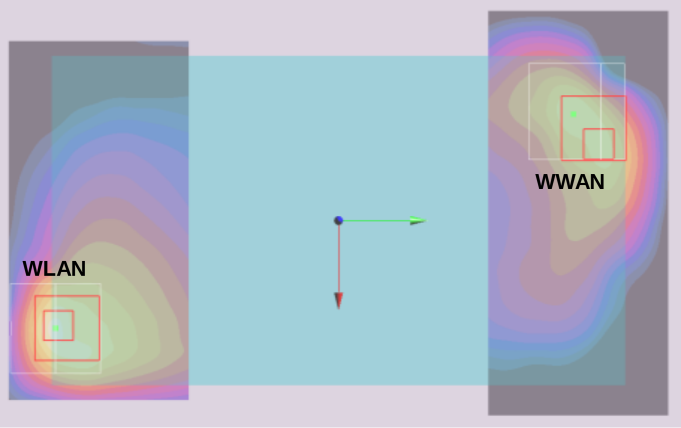
| WWAN Band | | Exposure Position | 1 | 4 | **1+4 Summed 1g SAR (W/kg)** | SPLSR | Case No |
|---|---|---|---|---|---|---|---|
| | | | WWAN | 5GHz WLAN | | | |
| | | | 1g SAR (W/kg) | Estimated 1g SAR (W/kg) | | | |
| LTE | LTE Band 12 | Bottom Face at 0mm | 0.253 | 0.386 | **0.64** | | |
| | | Edge 1 at 0mm | 0.193 | 0.386 | **0.58** | | |
| | | Curved surface of Edge 1 at 0mm | 0.205 | 0.386 | **0.59** | | |
| | | Bottom Face at 15mm | 0.266 | 0.386 | **0.65** | | |
| | | Edge 1 at 15mm | 0.165 | 0.386 | **0.55** | | |
| | | Edge 2 at 0mm | 0.316 | 0.386 | **0.70** | | |
| | | Edge 4 at 0mm | 0.251 | 0.386 | **0.64** | | |
| | | Curved surface of Edge 1 at 15mm | 0.266 | 0.386 | **0.65** | | |
| | LTE Band 4 | Bottom Face at 0mm | 0.740 | 0.386 | **1.13** | | |
| | | Edge 1 at 0mm | 0.444 | 0.386 | **0.83** | | |
| | | Curved surface of Edge 1 at 0mm | 1.013 | 0.386 | **1.40** | | |
| | | Bottom Face at 15mm | 0.589 | 0.386 | **0.98** | | |
| | | Edge 1 at 15mm | 0.563 | 0.386 | **0.95** | | |
| | | Edge 2 at 0mm | 0.367 | 0.386 | **0.75** | | |
| | | Edge 4 at 0mm | 0.435 | 0.386 | **0.82** | | |
| | | Curved surface of Edge 1 at 15mm | 0.965 | 0.386 | **1.35** | | |
| | LTE Band 2 | Bottom Face at 0mm | 1.039 | 0.386 | **1.43** | | |
| | | Edge 1 at 0mm | 0.895 | 0.386 | **1.28** | | |
| | | Curved surface of Edge 1 at 0mm | 1.435 | 0.386 | **1.82** | 0.01 | Case 9 |
| | | Bottom Face at 15mm | 0.545 | 0.386 | **0.93** | | |
| | | Edge 1 at 15mm | 0.611 | 0.386 | **1.00** | | |
| | | Edge 2 at 0mm | 0.435 | 0.386 | **0.82** | | |
| | | Edge 4 at 0mm | 0.070 | 0.386 | **0.46** | | |
| | | Curved surface of Edge 1 at 15mm | 1.004 | 0.386 | **1.39** | | |

## 17.2 SPLSR Evaluation and Analysis

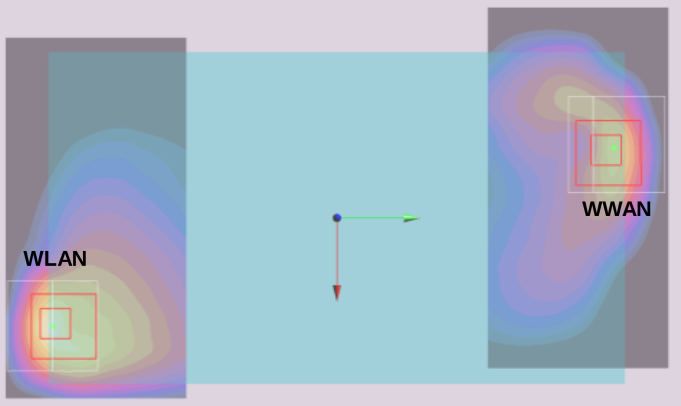
**General Note:**

1. According to section15, the minimum distances between each antenna pair was used for conservative SPLSR calculation. This is justified to compare the SAR peak separation in SPLSR analysis case 1 ~ 5 with SPLSR analysis case 6 ~ 9.
2. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

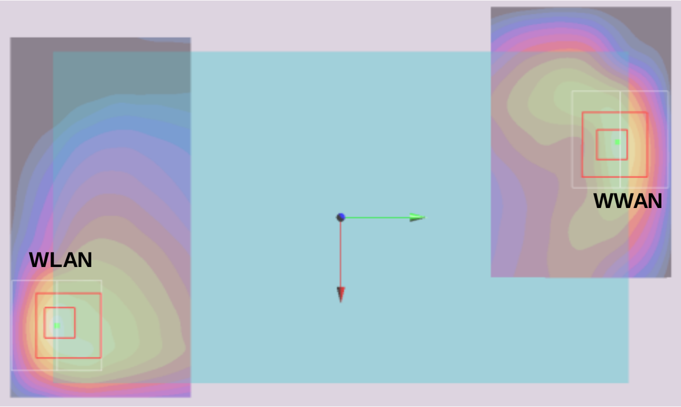
| Case 1 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | X | Y | Z | | | | |
| | GSM1900 | Bottom Face | 0.693 | 0mm | -0.0204 | 0.0875 | -0.177 | 190.4 | 1.86 | 0.01 | Not required |
| | 2.4GHz WLAN | | 1.165 | 0mm | 0.036 | -0.0944 | -0.177 | | | | |



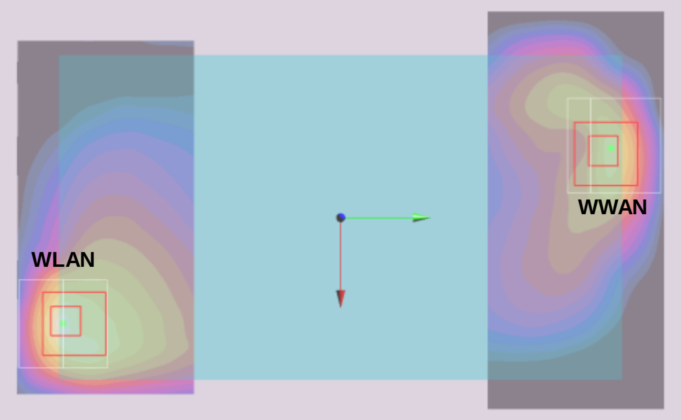
| Case 2 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | X | Y | Z | | | | |
| | WCDMA IV | Bottom Face | 0.610 | 0mm | -0.0244 | 0.085 | -0.177 | 189.3 | 1.78 | 0.01 | Not required |
| | 2.4GHz WLAN | | 1.165 | 0mm | 0.036 | -0.0944 | -0.177 | | | | |



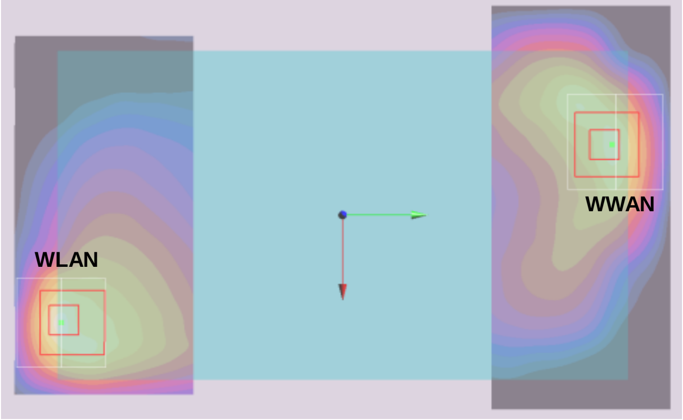
| Case 3 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | X | Y | Z | | | | |
| | WCDMA II | Bottom Face | 0.746 | 0mm | -0.026 | 0.093 | -0.178 | 197.4 | 1.91 | 0.01 | Not required |
| | 2.4GHz WLAN | | 1.165 | 0mm | 0.036 | -0.0944 | -0.177 | | | | |



| Case 4 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | X | Y | Z | | | | |
| | LTE Band 4 | Bottom Face | 0.740 | 0mm | -0.0245 | 0.085 | -0.177 | 189.3 | 1.91 | 0.01 | Not required |
| | 2.4GHz WLAN | | 1.165 | 0mm | 0.036 | -0.0944 | -0.177 | | | | |



| Case 5 | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | X | Y | Z | | | | |
| | LTE Band 2 | Bottom Face | 1.039 | 0mm | -0.0245 | 0.0915 | -0.177 | 195.5 | 2.20 | 0.02 | Not required |
| | 2.4GHz WLAN | | 1.165 | 0mm | 0.036 | -0.0944 | -0.177 | | | | |



| Case 6 | Band | Position | SAR (W/kg) | Gap | Minimum Distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | | | | |
| | WCDMA II | Curved surface of Edge 1 | 1.396 | 0mm | 170.0 | 1.61 | 0.01 | Not required |
| | Bluetooth | | 0.210 | 0mm | | | | |

| Case 7 | Band | Position | SAR (W/kg) | Gap | Minimum Distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | | | | |
| | LTE Band 2 | Curved surface of Edge 1 | 1.435 | 0mm | 170.0 | 1.65 | 0.01 | Not required |
| | Bluetooth | | 0.210 | 0mm | | | | |

| Case 8 | Band | Position | SAR (W/kg) | Gap | Minimum Distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | | | | |
| | WCDMA II | Curved surface of Edge 1 | 1.396 | 0mm | 170.0 | 1.78 | 0.01 | Not required |
| | 5GHz WLAN | | 0.386 | 0mm | | | | |

| Case 9 | Band | Position | SAR (W/kg) | Gap | Minimum Distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|
| | | | | (cm) | | | | |
| | LTE Band 2 | Curved surface of Edge 1 | 1.435 | 0mm | 170.0 | 1.82 | 0.01 | Not required |
| | 5GHz WLAN | | 0.386 | 0mm | | | | |

**Test Engineer：** Angelo Chang, Frank Wu, Tom Jiang and Tommy Chen

# 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 16.1. 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 Distribution | Divisor | Ci (1g) | Ci (10g) | Standard Uncertainty (1g) | Standard Uncertainty (10g) |
|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | |
| Probe Calibration | 6.0 | Normal | 1 | 1 | 1 | ± 6.0 % | ± 6.0 % |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | 0.7 | ± 1.9 % | ± 1.9 % |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | 0.7 | ± 3.9 % | ± 3.9 % |
| Boundary Effects | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| Linearity | 4.7 | Rectangular | √3 | 1 | 1 | ± 2.7 % | ± 2.7 % |
| System Detection Limits | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | ± 0.3 % | ± 0.3 % |
| Response Time | 0.8 | Rectangular | √3 | 1 | 1 | ± 0.5 % | ± 0.5 % |
| Integration Time | 2.6 | Rectangular | √3 | 1 | 1 | ± 1.5 % | ± 1.5 % |
| RF Ambient Noise | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| RF Ambient Reflections | 3.0 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | ± 0.2 % | ± 0.2 % |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | ± 1.7 % | ± 1.7 % |
| Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | ± 0.6 % | ± 0.6 % |
| **Test Sample Related** | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | ± 3.6 % | ± 3.6 % |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | ± 2.9 % | ± 2.9 % |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | √3 | 1 | 1 | ± 2.3 % | ± 2.3 % |
| Liquid Conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | ± 1.8 % | ± 1.2 % |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.64 | 0.43 | ± 1.6 % | ± 1.1 % |
| Liquid Permittivity (Target) | 5.0 | Rectangular | √3 | 0.6 | 0.49 | ± 1.7 % | ± 1.4 % |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.6 | 0.49 | ± 1.5 % | ± 1.2 % |
| **Combined Standard Uncertainty** | | | | | | ± 11.0 % | ± 10.8 % |
| **Coverage Factor for 95 %** | | | | | | K=2 | |
| **Expanded Uncertainty** | | | | | | **± 22.0 %** | **± 21.5 %** |

**Table 16.2. 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. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v2, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Mar 2015.

[6] FCC KDB 447498 D01 v05r02, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Feb 2014

[7] FCC KDB 941225 D01 v03, “3G SAR MEAUREMENT PROCEDURES”, Oct 2014

[8] FCC KDB 941225 D05 v02r03, “SAR Evaluation Considerations for LTE Devices”, Dec 2013

[9] FCC KDB 616217 D04 v01r01, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, May 2013

[10] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014.

[11] FCC KDB 865664 D02 v01r01, “RF Exposure Compliance Reporting and Documentation Considerations” May 2013.

# *Appendix A. Plots of System Performance Check*

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab          Date: 2015/5/6

# System Check_Body_750MHz_150506

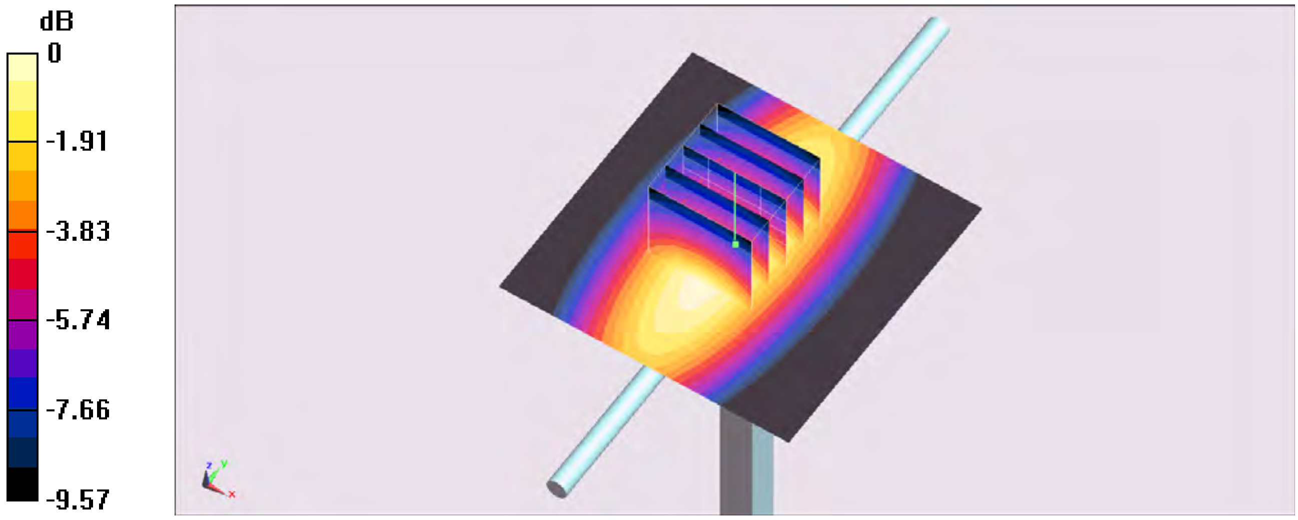
## DUT: D750V3-1099

Communication System: CW ; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: MSL_750_150506 Medium parameters used: f = 750 MHz; $\sigma$ = 0.961 S/m; $\varepsilon_r$ = 53.914; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.1, 10.1, 10.1); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.47 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.70 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.85 W/kg
**SAR(1 g) = 2 W/kg; SAR(10 g) = 1.35 W/kg**
Maximum value of SAR (measured) = 2.48 W/kg



0 dB = 2.48 W/kg = 3.94 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/5/6

# System Check_Body_835MHz_150506

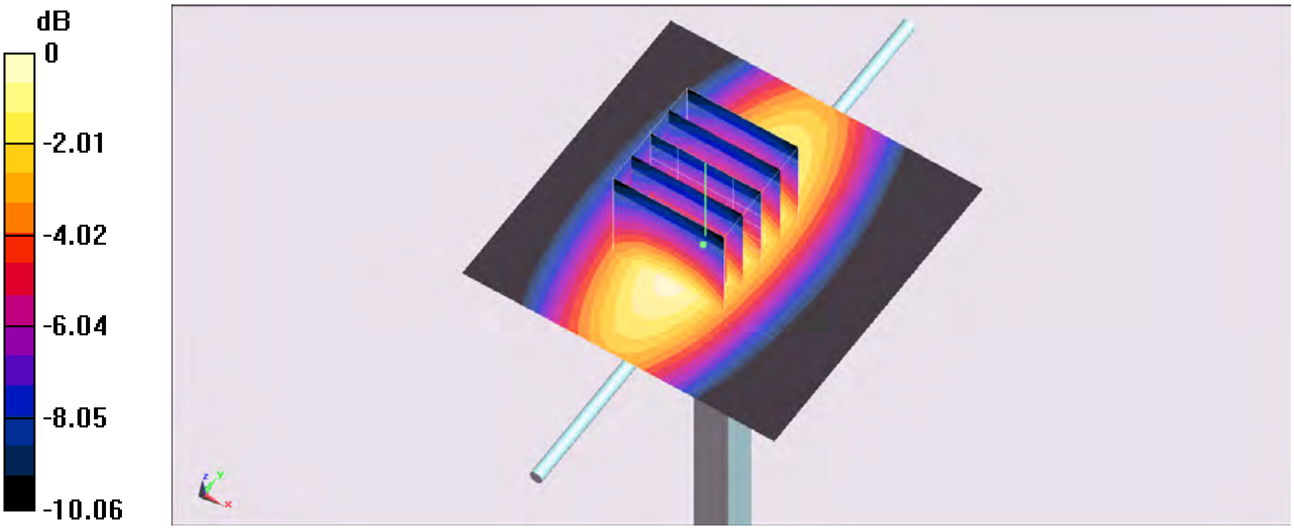
## DUT: D835V2-499

Communication System: CW ; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_850_150506 Medium parameters used: f = 835 MHz; $\sigma$ = 0.996 S/m; $\varepsilon_r$ = 55.38; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.12 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.07 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.64 W/kg
**SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.67 W/kg**
Maximum value of SAR (measured) = 3.13 W/kg



0 dB = 3.13 W/kg = 4.96 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/5/5

# System Check_Body_1750MHz_150505

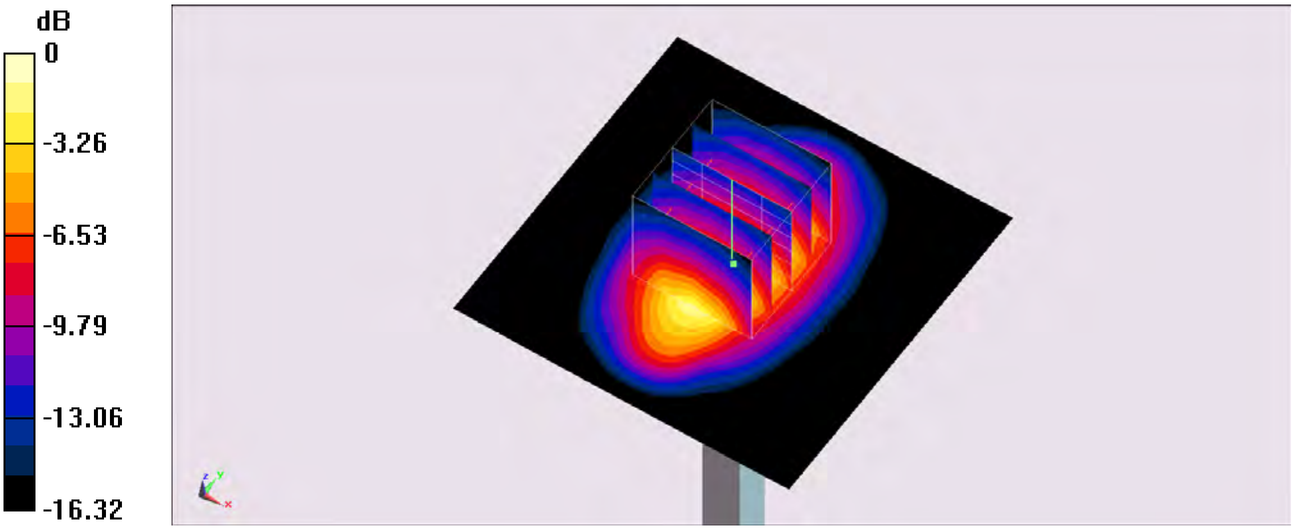
## DUT: D1750V2-1068

Communication System: CW ; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150505 Medium parameters used: f = 1750 MHz; $\sigma$ = 1.459 S/m; $\varepsilon_r$ = 52.753; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.4 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 100.2 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 15.5 W/kg
**SAR(1 g) = 8.9 W/kg; SAR(10 g) = 4.78 W/kg**
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/5/7

# System Check_Body_1750MHz_150507

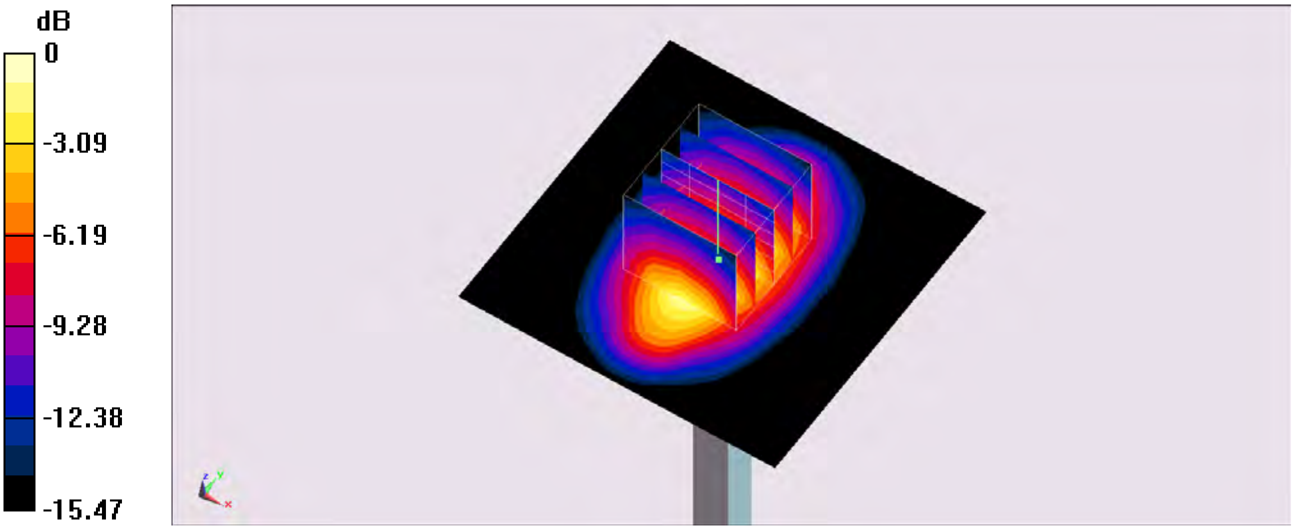
## DUT: D1750V2-1068

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1750 MHz; $\sigma$ = 1.473 S/m; $\varepsilon_r$ = 52.385; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 12.0 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 91.42 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 14.2 W/kg
**SAR(1 g) = 8.84 W/kg; SAR(10 g) = 4.91 W/kg**
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

## System Check_Body_1900MHz_150505

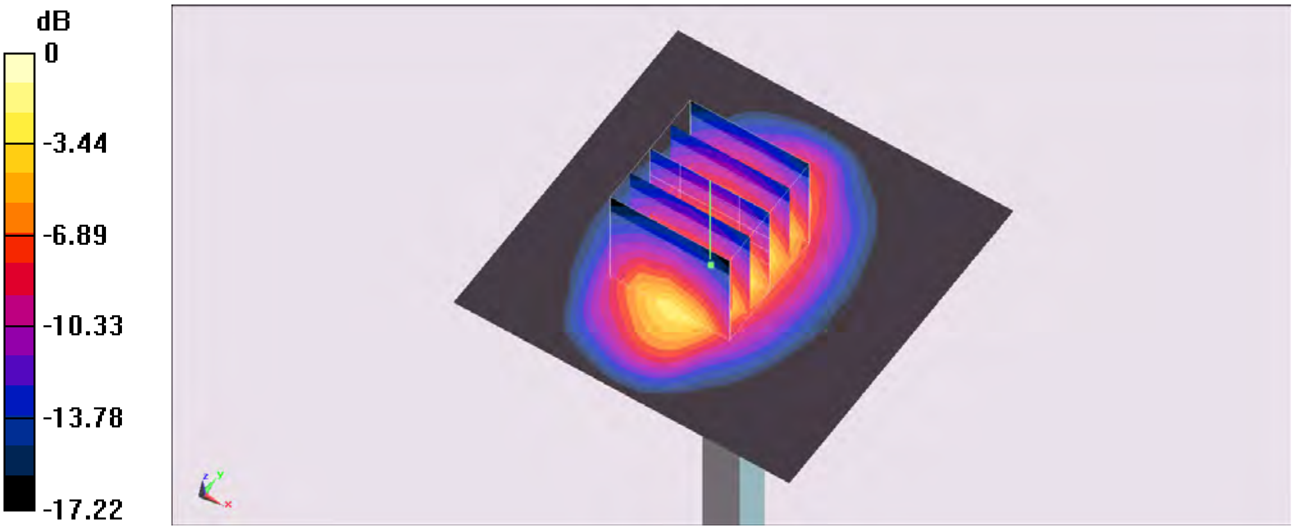
### DUT: D1900V2-5d041

Communication System: CW ; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150505 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.541 S/m; $\varepsilon_r$ = 53.91; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.3 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 91.48 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 15.9 W/kg
**SAR(1 g) = 9.45 W/kg; SAR(10 g) = 5.03 W/kg**
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

# System Check_Body_1900MHz_150508

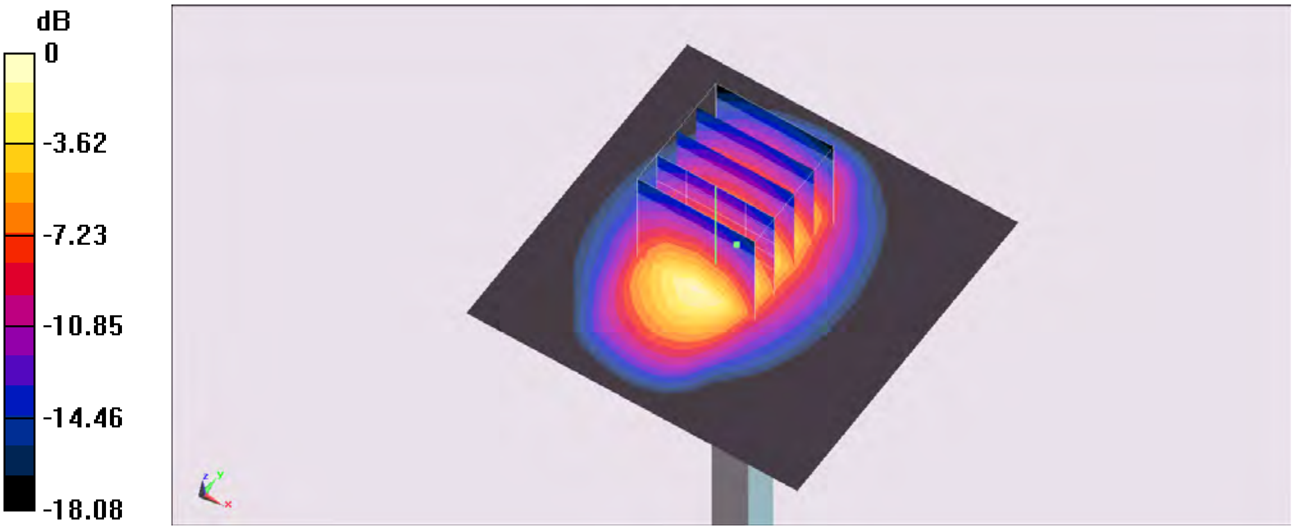
## DUT: D1900V2-5d041

Communication System: CW ; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150508 Medium parameters used: f = 1900 MHz; $\sigma = 1.569$ S/m; $\varepsilon_r = 51.584$; $\rho = 1000$ kg/m$^3$
Ambient Temperature：23.3 ℃; Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.1 W/kg

**Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.72 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.3 W/kg
**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.29 W/kg**
Maximum value of SAR (measured) = 13.9 W/kg



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

# System Check_Body_2450MHz_150509

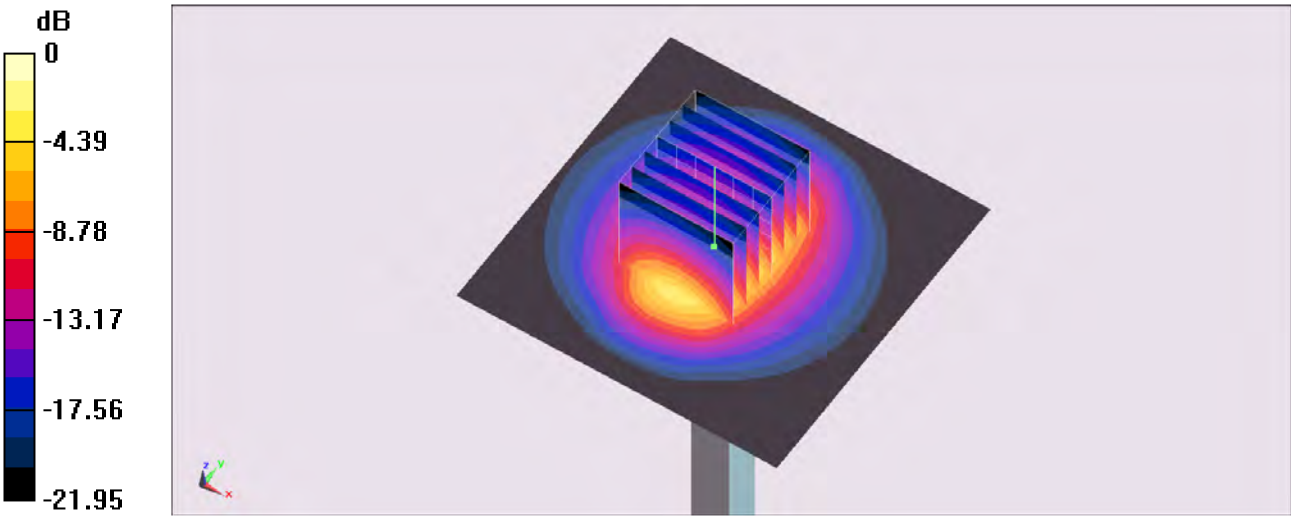
## DUT: D2450V2-924

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_150509 Medium parameters used: f = 2450 MHz; σ = 2.026 S/m; $\varepsilon_r$ = 52.618; ρ = 1000 kg/$m^3$
Ambient Temperature：23.2 ℃; Liquid Temperature：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Pin=250mW/Area Scan (71x71x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 20.9 W/kg

**Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.77 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.3 W/kg
**SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.25 W/kg**
Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

# Appendix B. Plots of SAR Measurement

The plots are shown as follows.

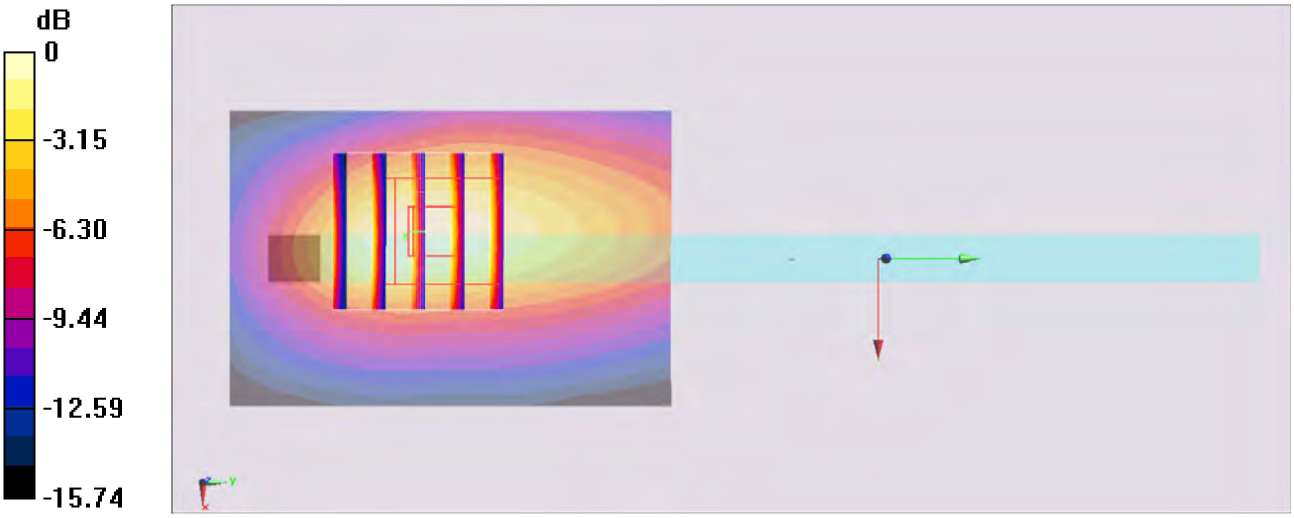
# #01_GSM850_GPRS (1 Tx slots)_Edge 2_0mm_Ch189

Communication System: GSM850 ; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: MSL_850_150506 Medium parameters used : f = 836.4 MHz; $\sigma = 0.998$ S/m; $\varepsilon_r = 55.382$; $\rho = 1000$ kg/m$^3$
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch189/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.326 W/kg

**Configuration/Ch189/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.55 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.382 W/kg
**SAR(1 g) = 0.206 W/kg; SAR(10 g) = 0.119 W/kg**
Maximum value of SAR (measured) = 0.305 W/kg



0 dB = 0.305 W/kg = -5.16 dBW/kg

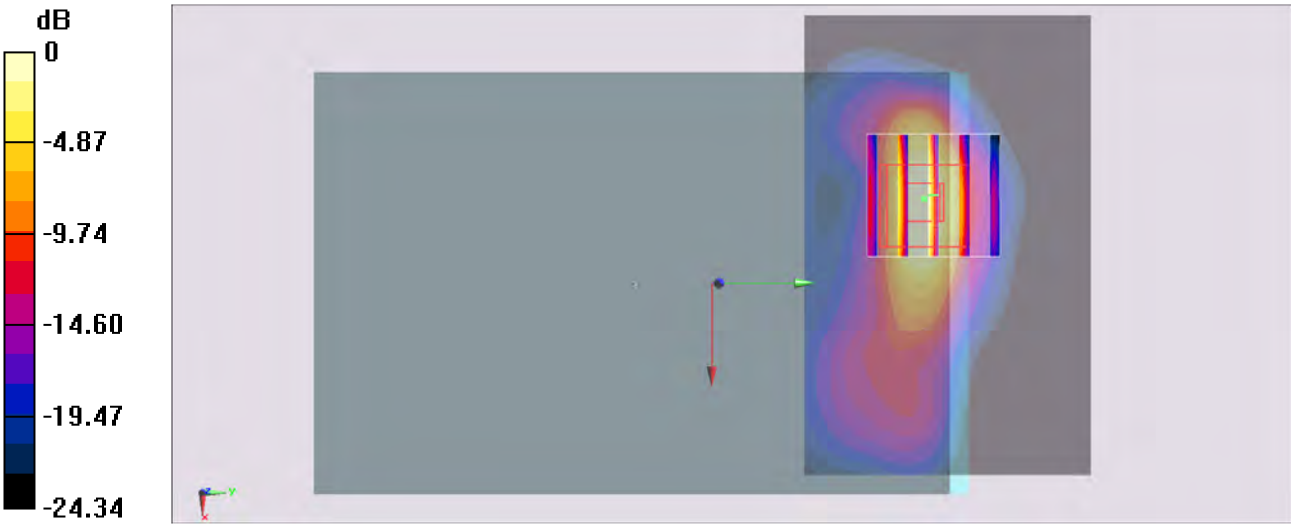
# #02_GSM1900_GPRS (2 Tx slots)_Curved surface of Edge 1_0mm_Ch810

Communication System: PCS; Frequency: 1909.8 MHz;Duty Cycle: 1:4.15
Medium: MSL_1900_150508 Medium parameters used: f = 1910 MHz; $\sigma = 1.581$ S/m; $\varepsilon_r = 51.566$; $\rho = 1000$ kg/m$^3$
Ambient Temperature：23.3 ℃; Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch810/Area Scan (81x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.90 W/kg

**Configuration/Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.42 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.14 W/kg
**SAR(1 g) = 0.996 W/kg; SAR(10 g) = 0.412 W/kg**
Maximum value of SAR (measured) = 1.54 W/kg



0 dB = 1.54 W/kg = 1.88 dBW/kg

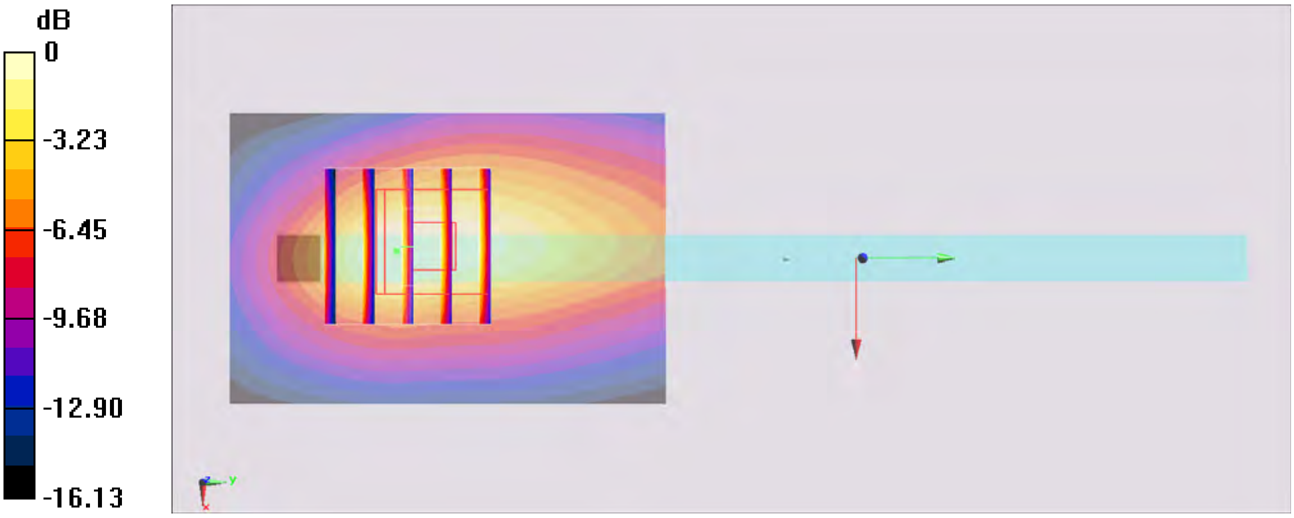
# #03_WCDMA V_RMC 12.2Kbps_Edge 2_0mm_Ch4132

Communication System: WCDMA ; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: MSL_850_150506 Medium parameters used : f = 826.4 MHz; σ = 0.988 S/m; $\varepsilon_r$ = 55.443; ρ = 1000 kg/$m^3$
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch4132/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.393 W/kg

**Configuration/Ch4132/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.80 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.407 W/kg
**SAR(1 g) = 0.228 W/kg; SAR(10 g) = 0.130 W/kg**
Maximum value of SAR (measured) = 0.341 W/kg



0 dB = 0.341 W/kg = -4.67 dBW/kg

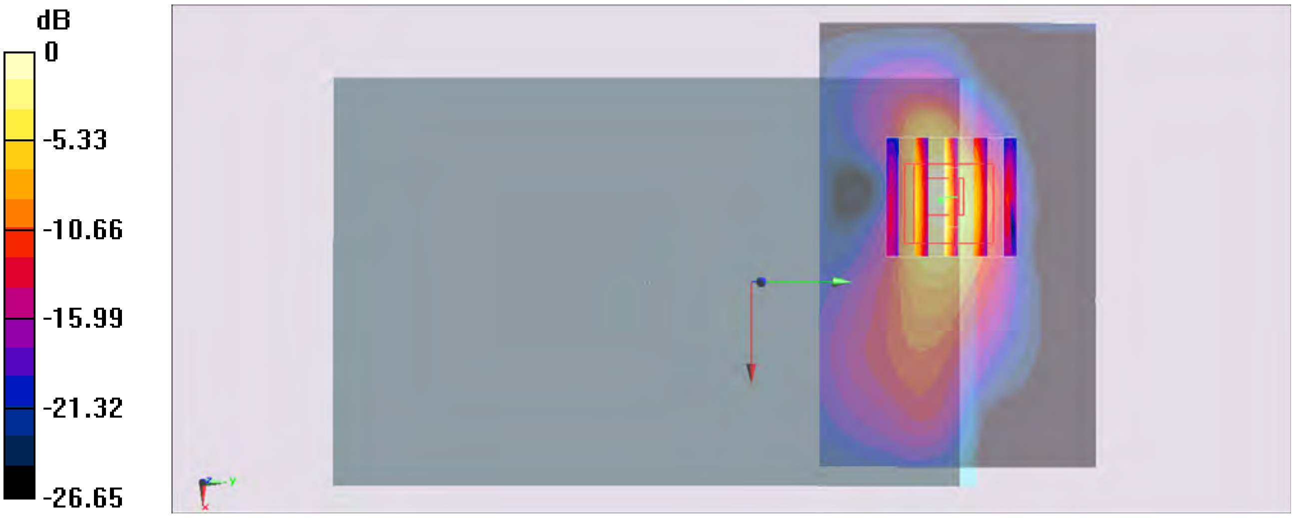
# #04_WCDMA IV_RMC 12.2Kbps_Curved surface of Edge 1_0mm_Ch1413

Communication System: WCDMA ; Frequency: 1732.6 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1733 MHz; σ = 1.458 S/m; $\varepsilon_r$ = 52.44; ρ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch1413/Area Scan (81x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.69 W/kg

**Configuration/Ch1413/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 36.87 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.04 W/kg
**SAR(1 g) = 0.938 W/kg; SAR(10 g) = 0.396 W/kg**
Maximum value of SAR (measured) = 1.70 W/kg



0 dB = 1.70 W/kg = 2.30 dBW/kg

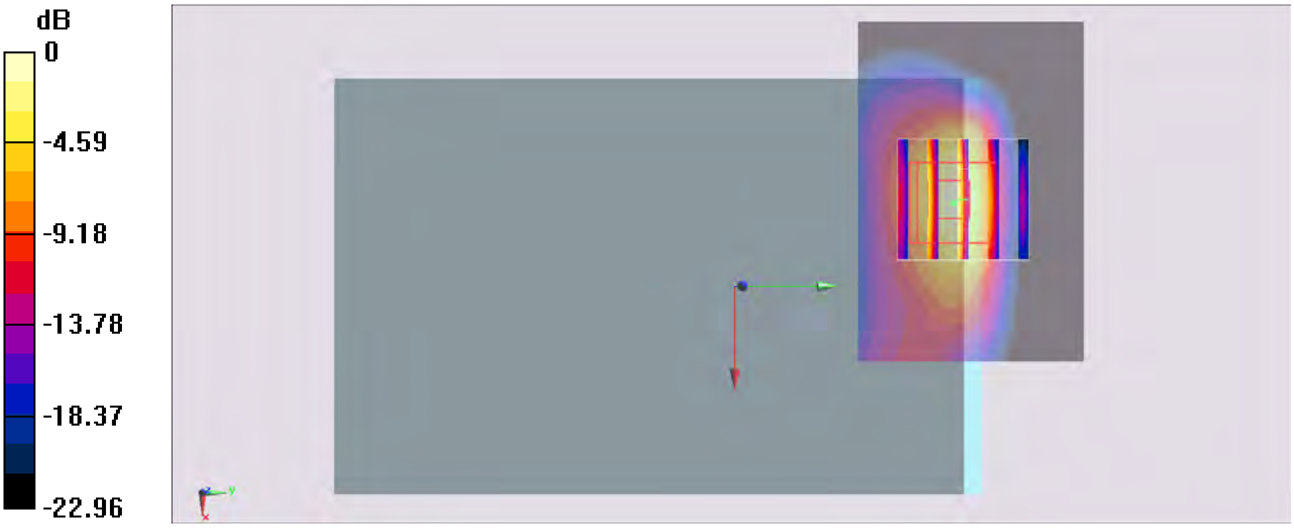
# #05_WCDMA II_RMC 12.2Kbps_Curved surface of Edge 1_0mm_Ch9538

Communication System: WCDMA ; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150505 Medium parameters used: f = 1908 MHz; $\sigma$ = 1.55 S/m; $\varepsilon_r$ = 53.86; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch9538/Area Scan (61x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.82 W/kg

**Configuration/Ch9538/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 40.45 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.97 W/kg
**SAR(1 g) = 1.38 W/kg; SAR(10 g) = 0.572 W/kg**
Maximum value of SAR (measured) = 2.09 W/kg



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

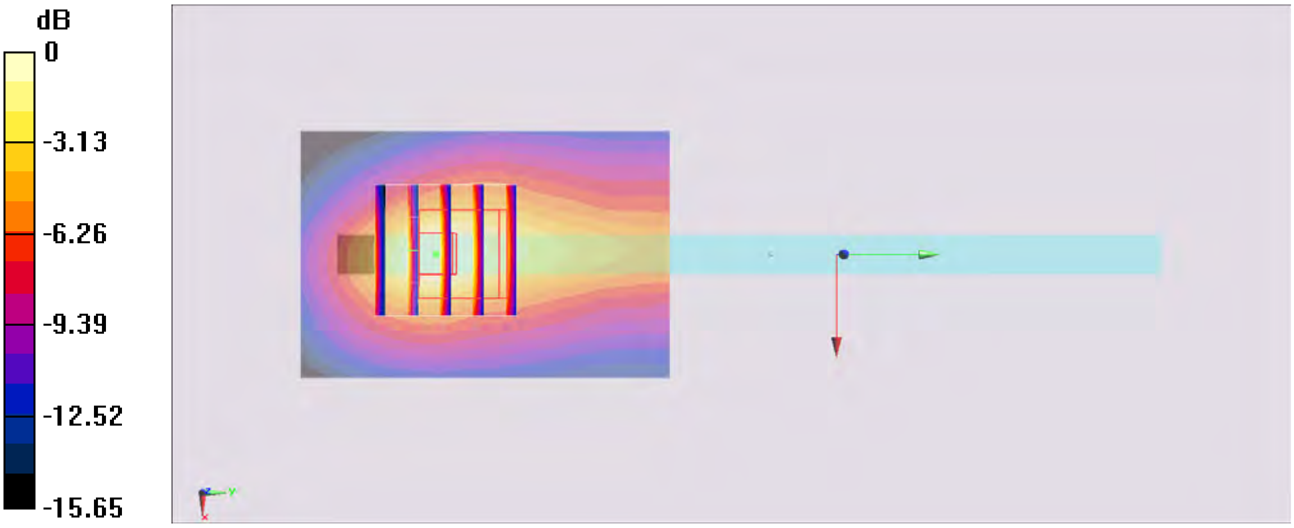
# #06_LTE Band 12_10M_QPSK_1RB_0offset_Edge 2_0mm_Ch23095

Communication System: LTE; Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: MSL_750_150506 Medium parameters used: f = 707.5 MHz; σ = 0.931 S/m; $\varepsilon_r$ = 54.88; ρ = 1000 kg/$m^3$
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.1, 10.1, 10.1); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch23095/Area Scan (41x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.588 W/kg

**Configuration/Ch23095/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.00 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.658 W/kg
**SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.168 W/kg**
Maximum value of SAR (measured) = 0.501 W/kg



0 dB = 0.501 W/kg = -3.00 dBW/kg

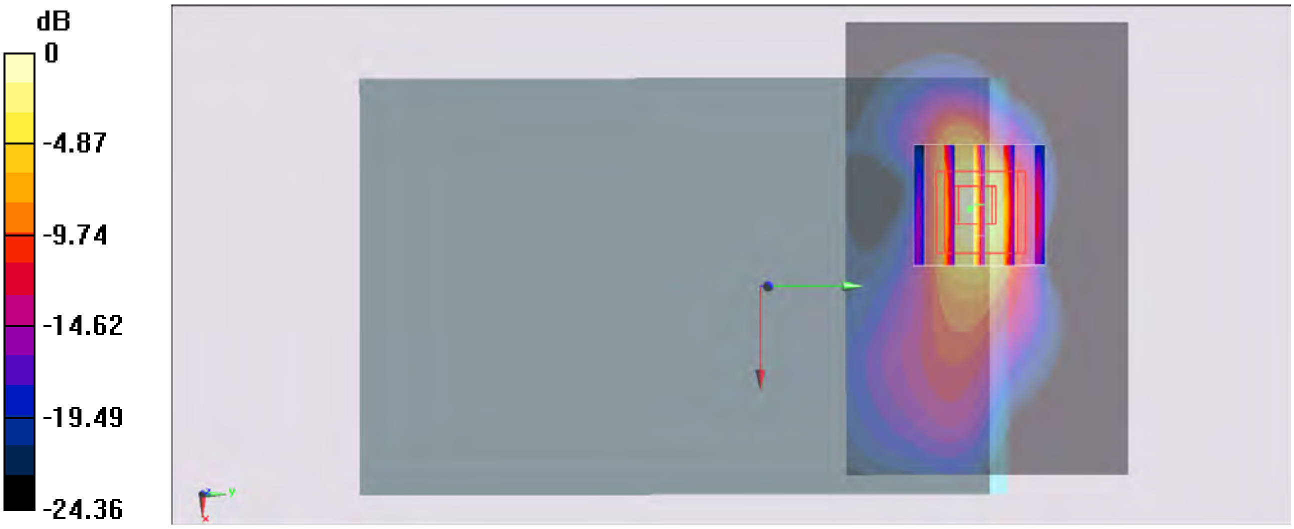
# #07_LTE Band 4_20M_QPSK_1RB_0offset_Curved surface of Edge 1_0mm_Ch20300

Communication System: LTE ; Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1745 MHz; σ = 1.468 S/m; $\varepsilon_r$ = 52.402; ρ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch20300/Area Scan (81x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.38 W/kg

**Configuration/Ch20300/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.45 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.98 W/kg
**SAR(1 g) = 0.852 W/kg; SAR(10 g) = 0.354 W/kg**
Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

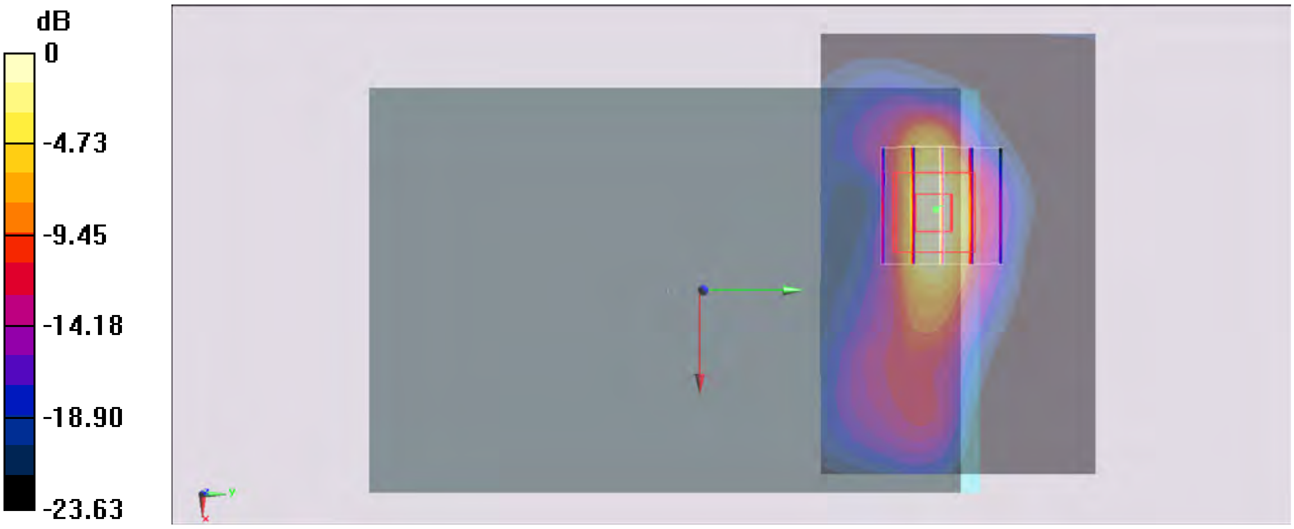
# #08_LTE Band 2_20M_QPSK_50RB_0offset_Curved surface of Edge 1_0mm_Ch19100

Communication System: LTE; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150508 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.569 S/m; $\varepsilon_r$ = 51.584; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.3 ℃; Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch19100/Area Scan (81x51x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.44 W/kg

**Configuration/Ch19100/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 39.60 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.71 W/kg
**SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.506 W/kg**
Maximum value of SAR (measured) = 1.95 W/kg



0 dB = 1.95 W/kg = 2.90 dBW/kg

# #09_WLAN2.4GHz_802.11b 1Mbps_Curved surface of Edge 3_0mm_Ch1

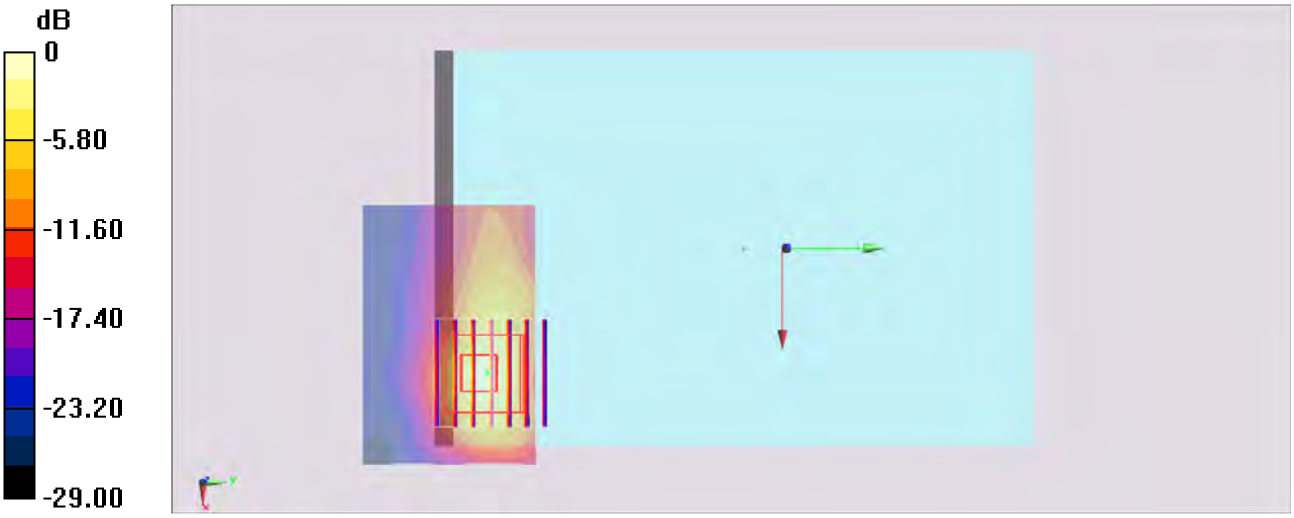
Communication System: 802.11b; Frequency: 2412 MHz;Duty Cycle: 1:1.023
Medium: MSL_2450_150509 Medium parameters used: f = 2412 MHz; σ = 1.972 S/m; $\varepsilon_r$ = 52.788; ρ = 1000 kg/m$^3$
Ambient Temperature：23.2 ℃; Liquid Temperature：22.2 ℃

DASY5 Configuration:

- Probe: EX3DV4 - SN3931; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Configuration/Ch1/Area Scan (61x41x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.55 W/kg

**Configuration/Ch1/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.62 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 2.77 W/kg
**SAR(1 g) = 1 W/kg; SAR(10 g) = 0.342 W/kg**
Maximum value of SAR (measured) = 1.81 W/kg



0 dB = 1.81 W/kg = 2.58 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 108**

**Client** **Sporton-TW (Auden)**

**Certificate No: D750V3-1099_Nov14**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D750V3 - SN: 1099 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 19, 2014 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

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

Issued: November 20, 2014

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

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

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

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.9 | 0.89 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 41.4 ± 6 % | 0.89 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 | 2.02 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.06 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.33 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.31 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.5 | 0.96 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 54.7 ± 6 % | 0.98 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 | 2.18 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **8.56 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.44 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **5.68 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 55.2 Ω + 0.1 jΩ |
| Return Loss | - 26.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.7 Ω - 2.2 jΩ |
| Return Loss | - 33.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.034 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 | July 05, 2013 |

## DASY5 Validation Report for Head TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099**

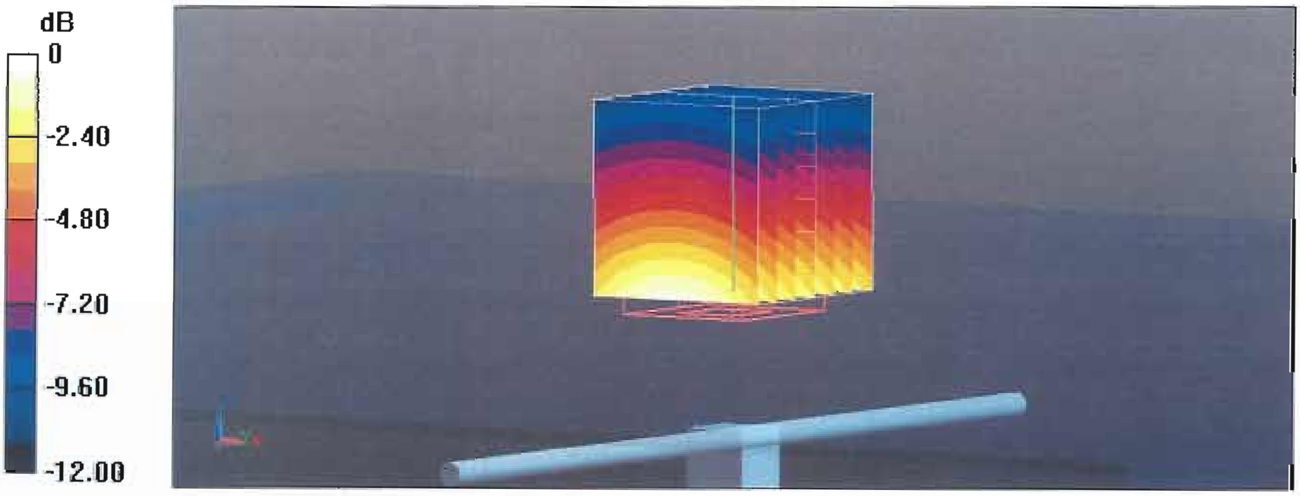
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.89$ S/m; $\varepsilon_r = 41.4$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

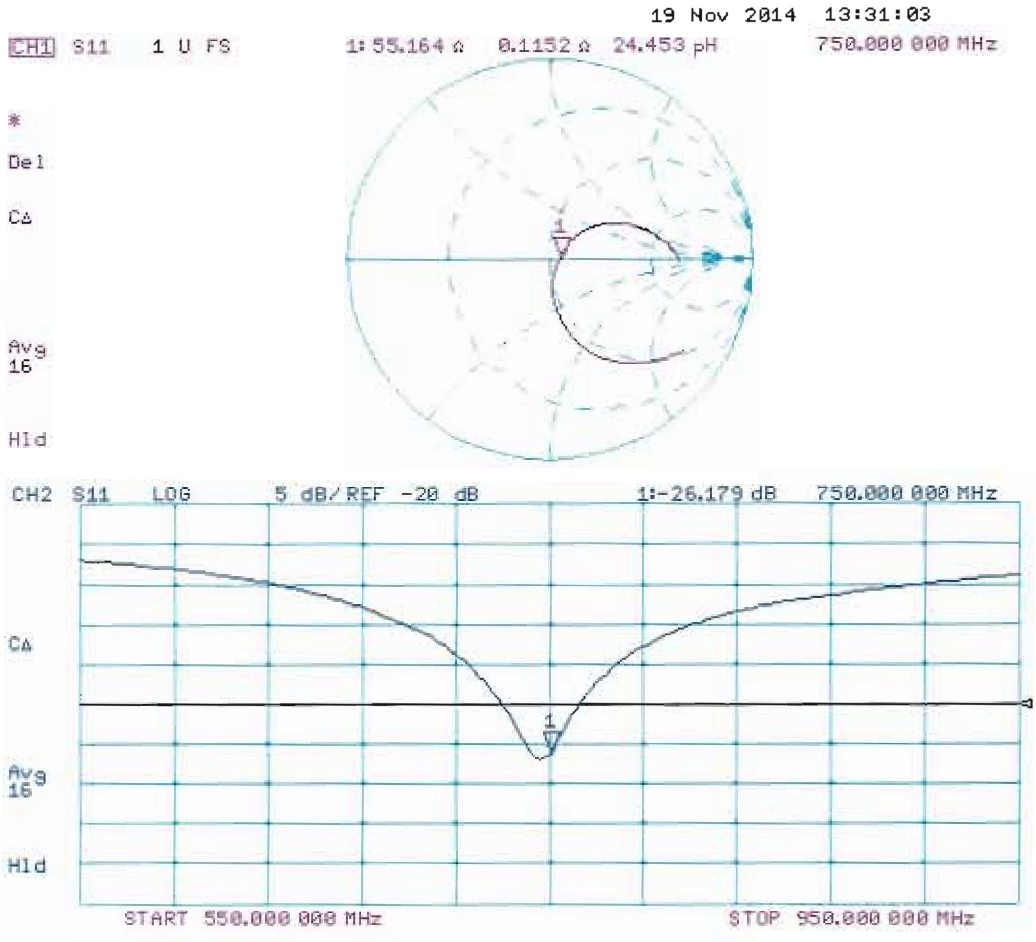
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.19 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.00 W/kg
**SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.33 W/kg**
Maximum value of SAR (measured) = 2.36 W/kg



0 dB = 2.36 W/kg = 3.73 dBW/kg

# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 18.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099**

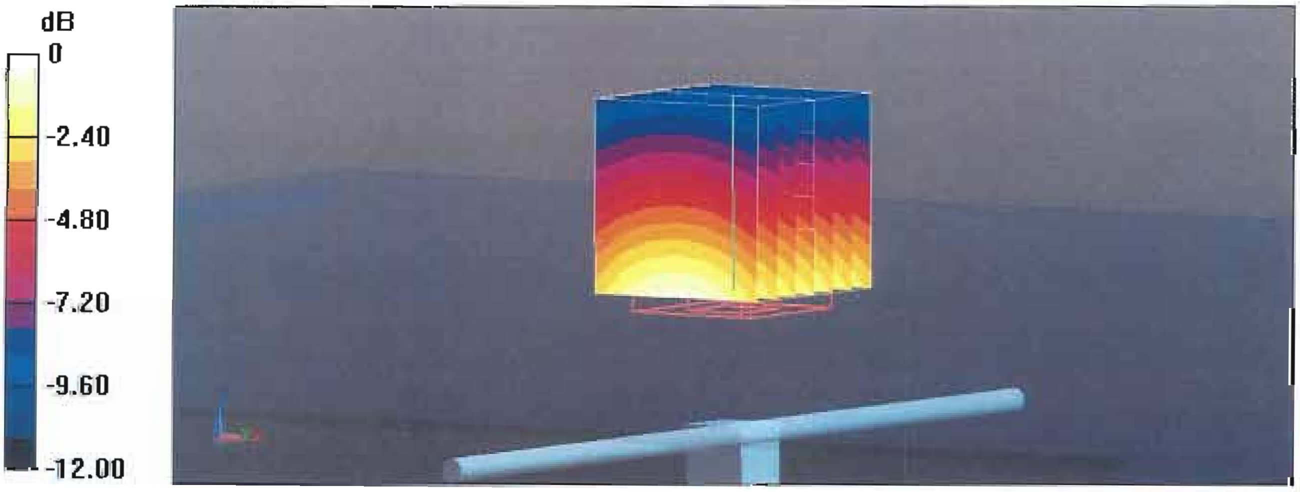
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.98$ S/m; $\varepsilon_r = 54.7$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

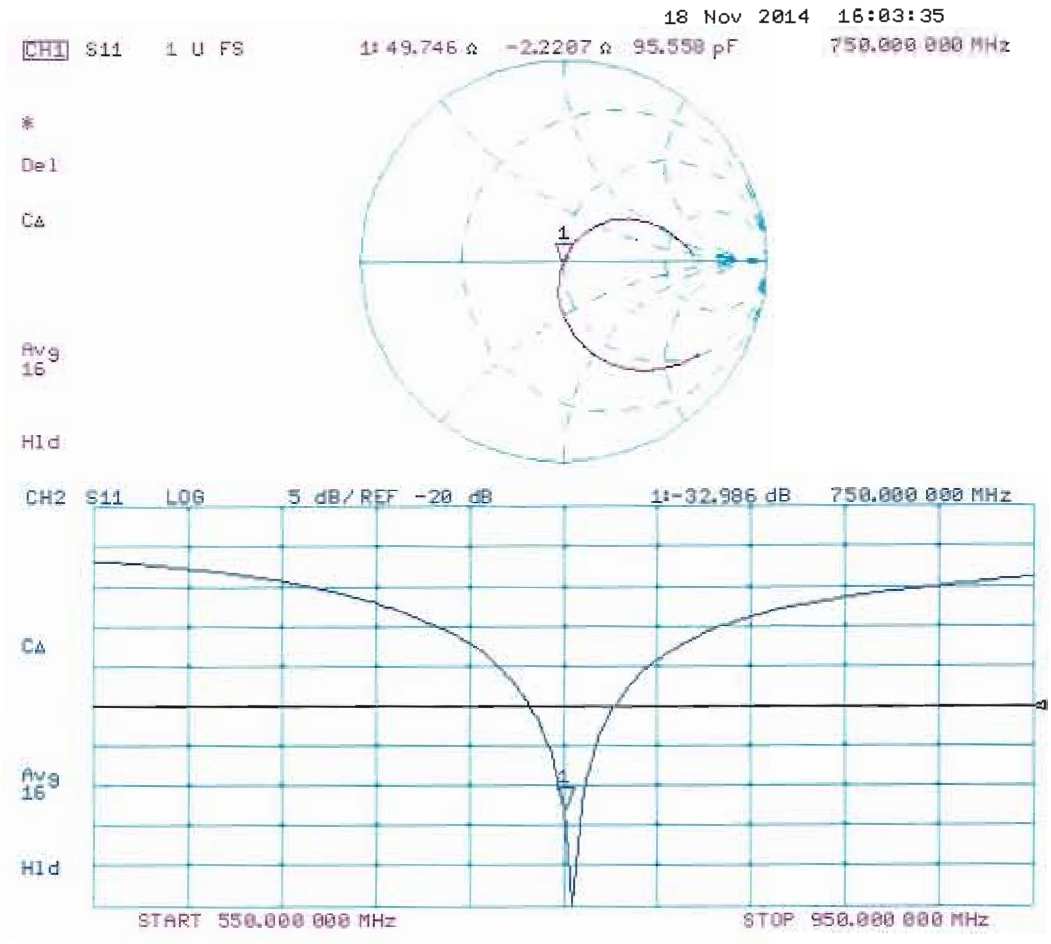
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.95 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.16 W/kg
**SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg**
Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.55 W/kg = 4.07 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-TW (Auden)**

**Certificate No: D835V2-499_Mar15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D835V2 - SN:499 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | March 20, 2015 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-14 (No. ES3-3205_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Israe Elnaouq | Laboratory Technician | Israe Elnaouq |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: March 20, 2015

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

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 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 | 40.6 ± 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 | 2.35 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.20 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.53 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.02 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 | 54.6 ± 6 % | 1.02 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 | **9.30 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.58 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.12 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 - 3.2 jΩ |
| Return Loss | - 29.4 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.6 Ω - 5.2 jΩ |
| Return Loss | - 24.7 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.390 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 | July 10, 2003 |

## DASY5 Validation Report for Head TSL

Date: 19.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499**

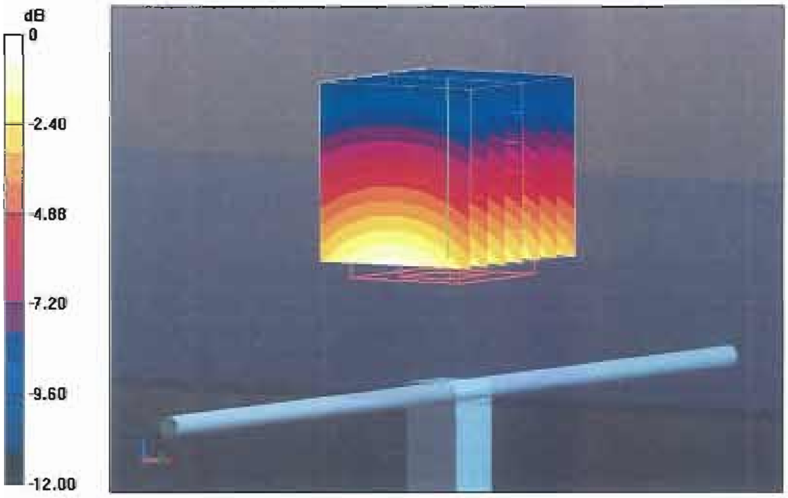
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.92$ S/m; $\varepsilon_r = 40.6$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

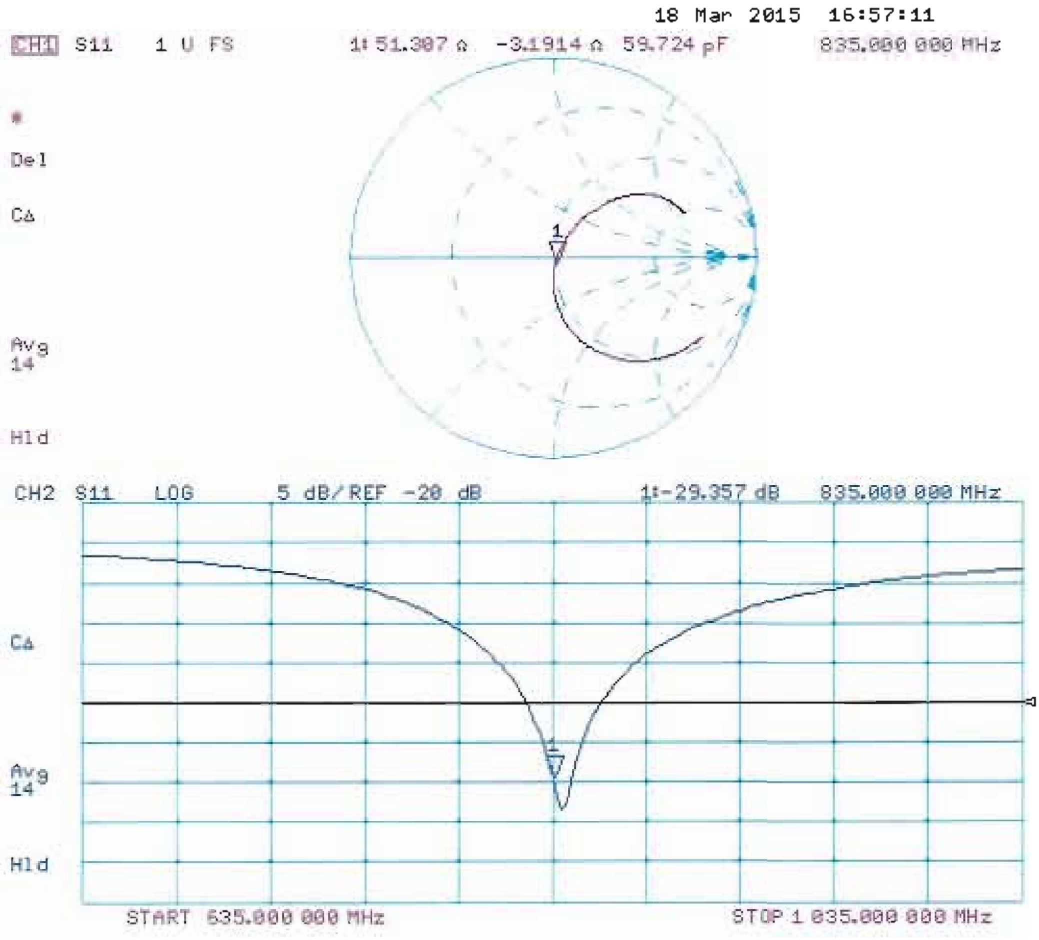
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.43 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.52 W/kg
**SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg**
Maximum value of SAR (measured) = 2.75 W/kg



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

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 20.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499**

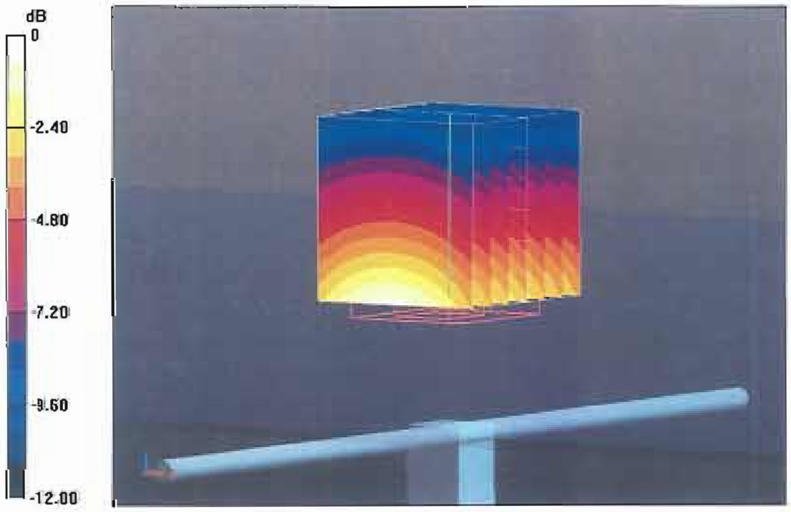
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 1.02 S/m; $\varepsilon_r$ = 54.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

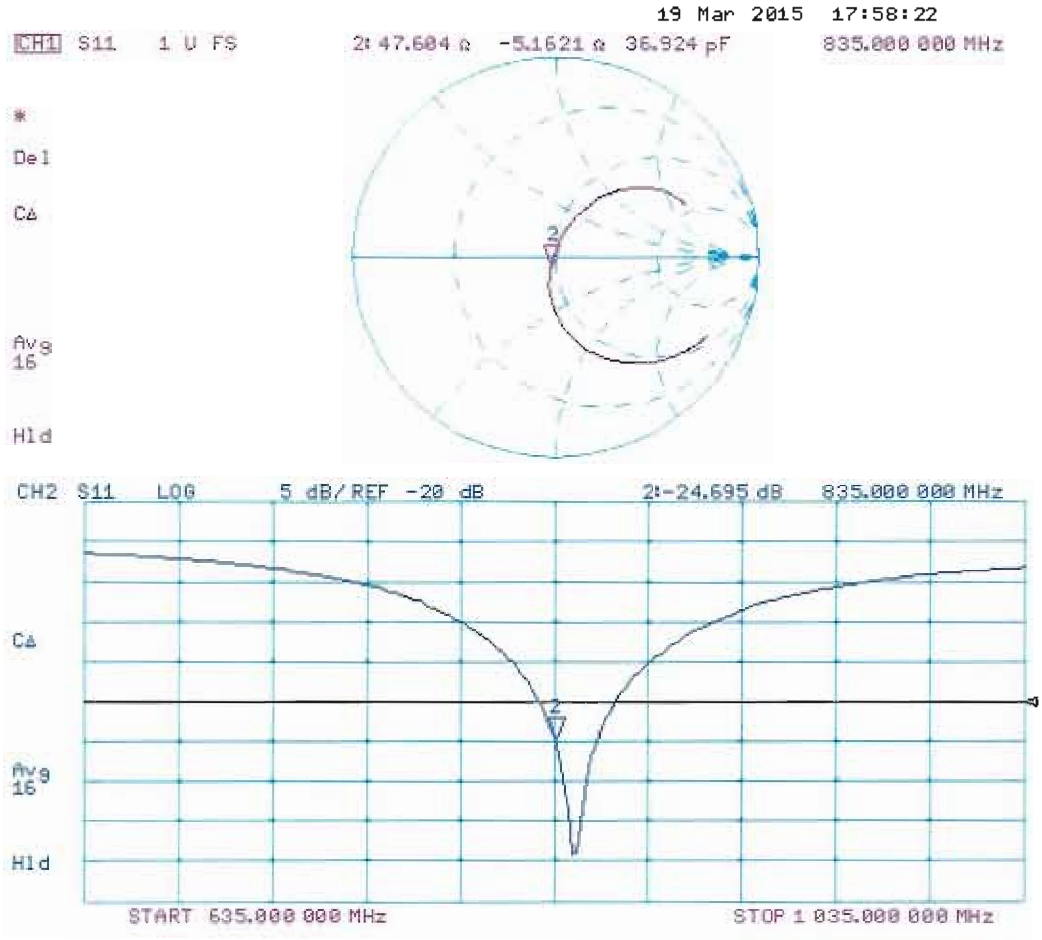
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.57 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.57 W/kg
**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.58 W/kg**
Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 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**
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**The Swiss Accreditation Service is one of the signatories to the EA**
**Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** **Sporton-TW (Auden)**

**Certificate No: D1750V2-1068_Nov14**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1750V2 - SN: 1068 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 14, 2014 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

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

Issued: November 14, 2014

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

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

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

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.4 ± 6 % | 1.38 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 | 9.27 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **36.8 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.90 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 | 52.2 ± 6 % | 1.50 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm$^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.59 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **38.0 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.14 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.4 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.8 Ω - 0.9 jΩ |
| Return Loss | - 41.0 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 45.7 Ω - 0.7 jΩ |
| Return Loss | - 26.9 dB |

### General Antenna Parameters and Design

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

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

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

### Additional EUT Data

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

## DASY5 Validation Report for Head TSL

Date: 14.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1068**

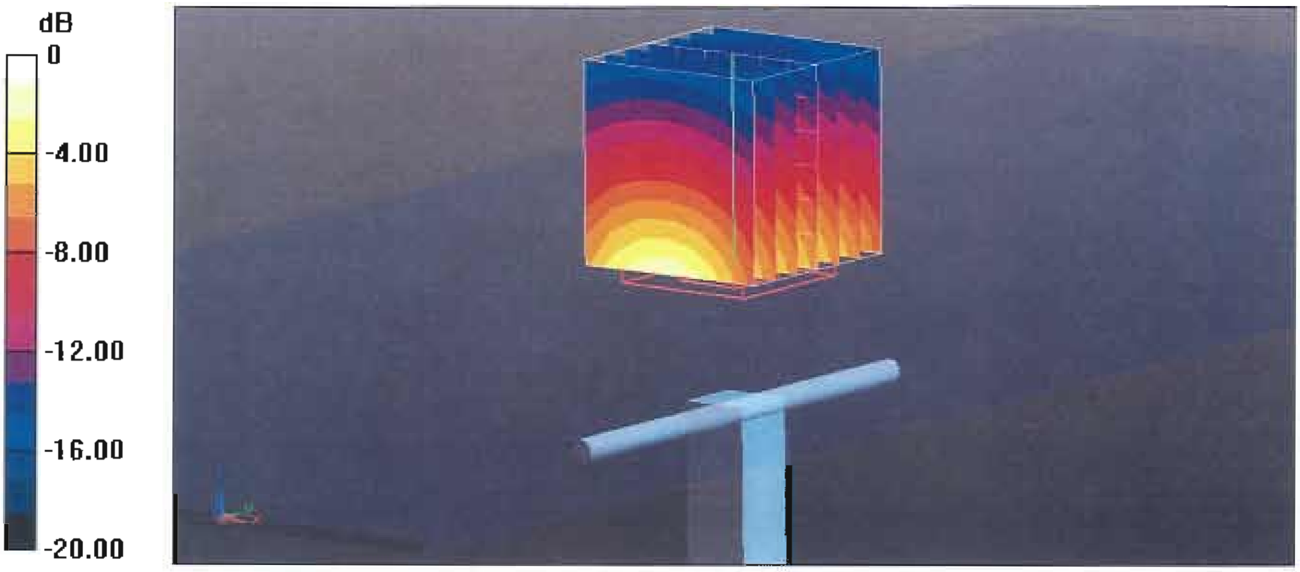
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.38 S/m; $\varepsilon_r$ = 39.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

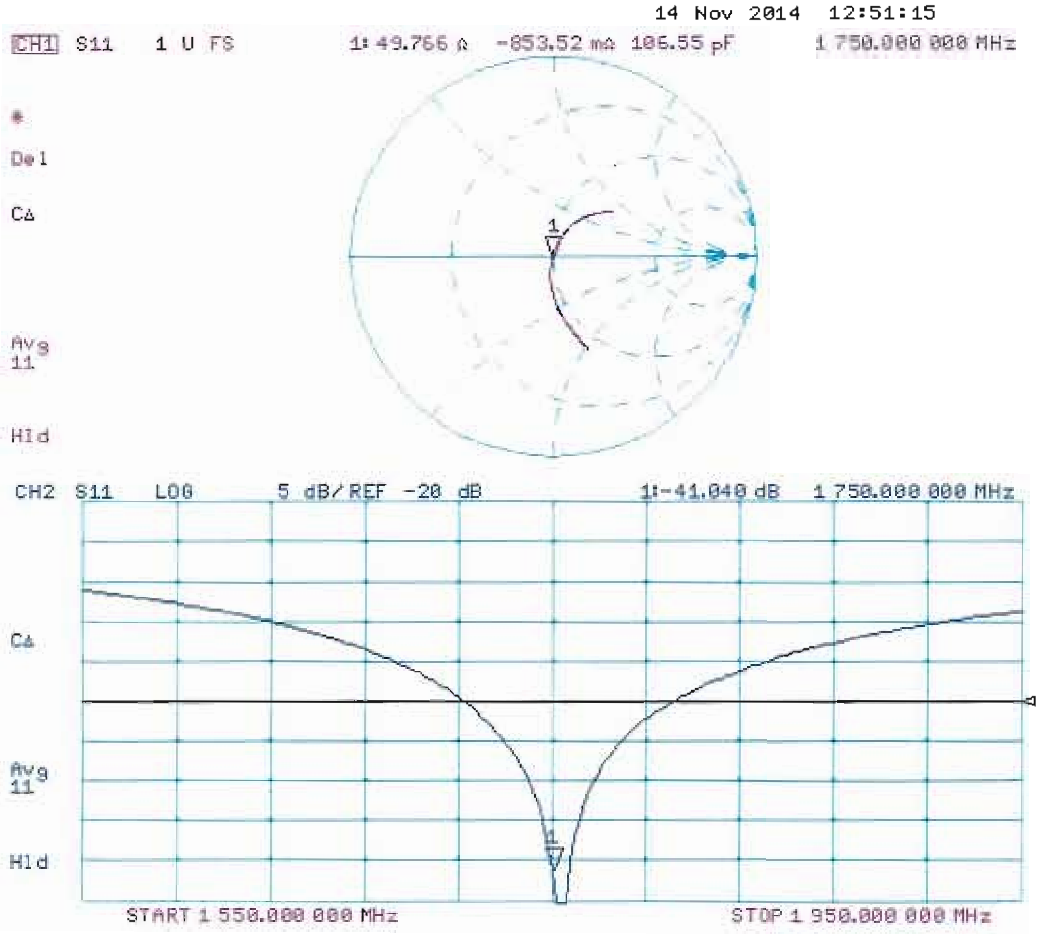
## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.05 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 16.8 W/kg
**SAR(1 g) = 9.27 W/kg; SAR(10 g) = 4.9 W/kg**
Maximum value of SAR (measured) = 11.7 W/kg



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

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 14.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1068**

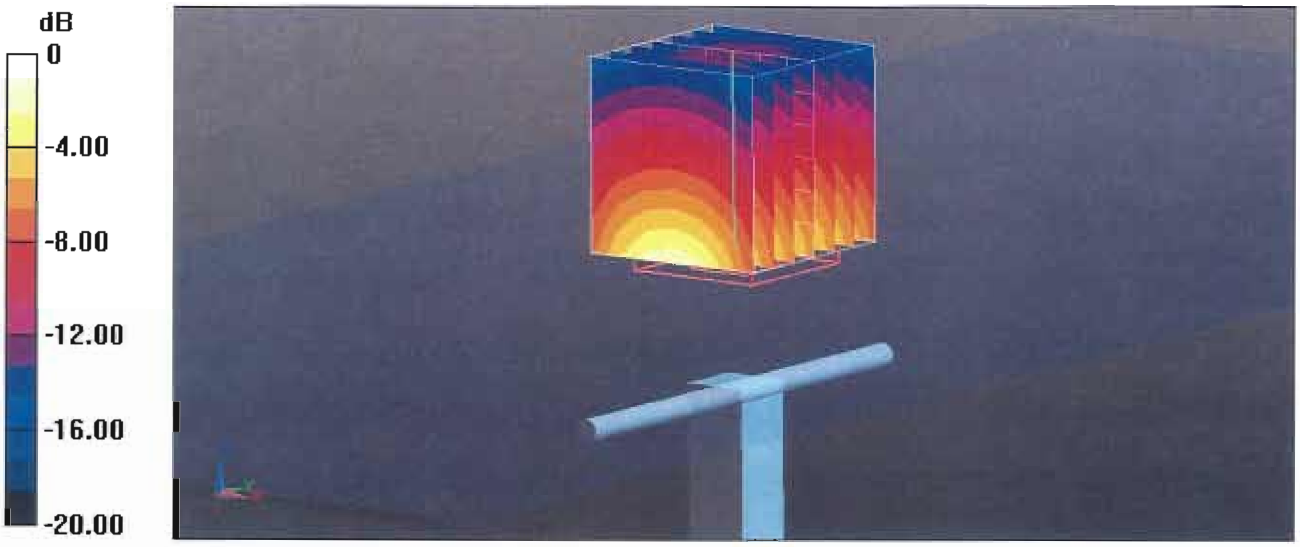
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma = 1.5$ S/m; $\varepsilon_r = 52.2$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

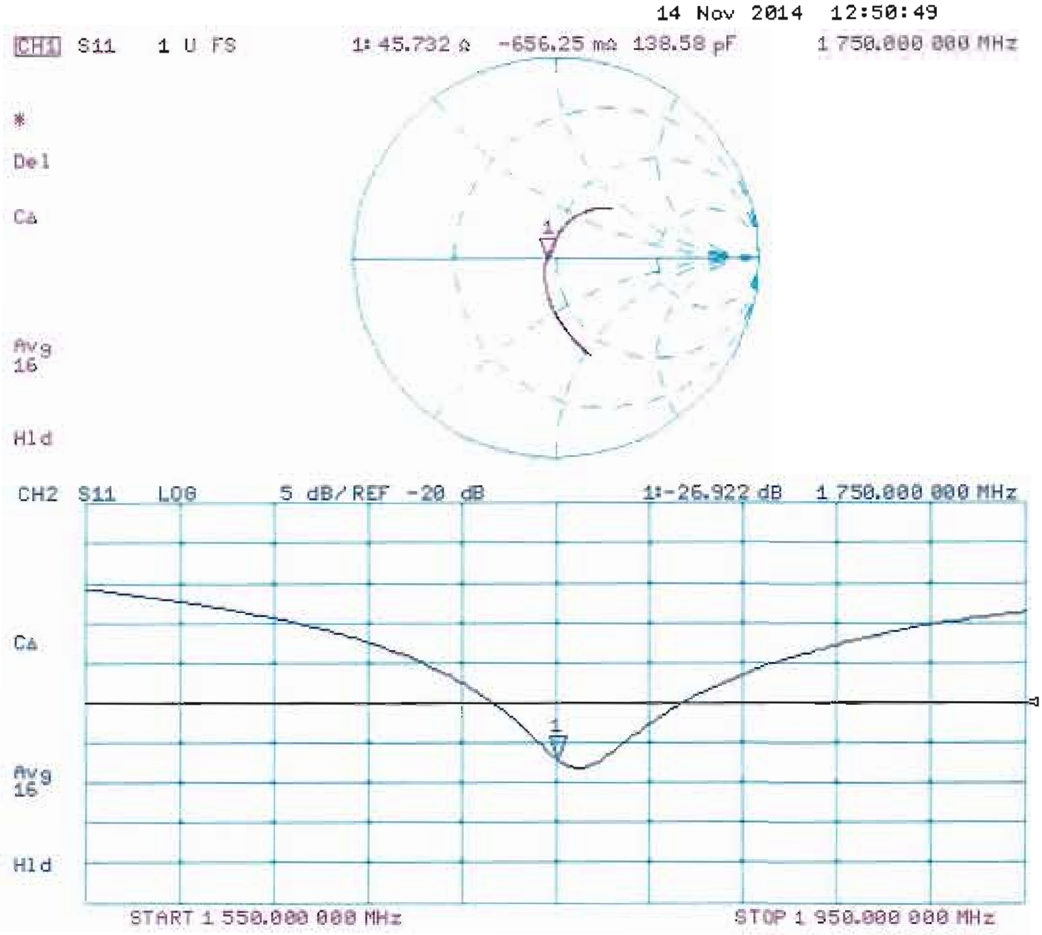
## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.73 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.6 W/kg
**SAR(1 g) = 9.59 W/kg; SAR(10 g) = 5.14 W/kg**
Maximum value of SAR (measured) = 12.1 W/kg



0 dB = 12.1 W/kg = 10.83 dBW/kg

## Impedance Measurement Plot for Body TSL



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Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

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

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**Accreditation No.: SCS 0108**

**Client** **Sporton-TW (Auden)**

**Certificate No: D1900V2-5d041_Mar15**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN:5d041 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | March 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-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-14 (No. ES3-3205_Dec14) | Dec-15 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Leif Klysner | Laboratory Technician | Leif Klysner |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: March 25, 2015

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

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.0 ± 6 % | 1.38 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 | 9.98 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **40.0 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.22 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.9 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 | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.8 ± 6 % | 1.50 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.90 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **39.8 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.28 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.2 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 | 53.2 Ω + 6.4 jΩ |
| Return Loss | - 23.3 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.7 Ω + 7.4 jΩ |
| Return Loss | - 22.4 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.201 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 | July 04, 2003 |

## DASY5 Validation Report for Head TSL

Date: 24.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041**

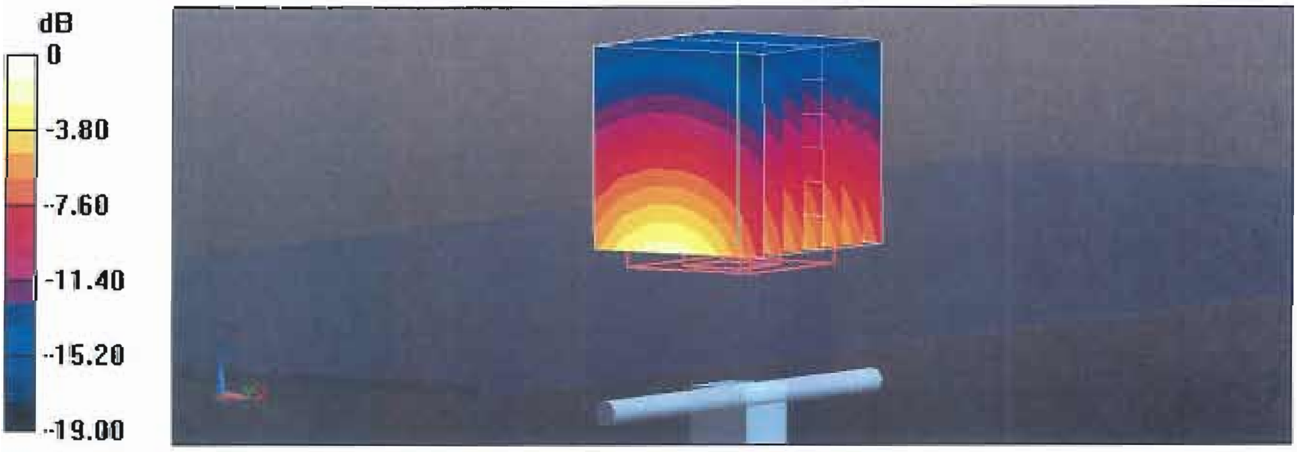
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.38 S/m; $\varepsilon_r$ = 39; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

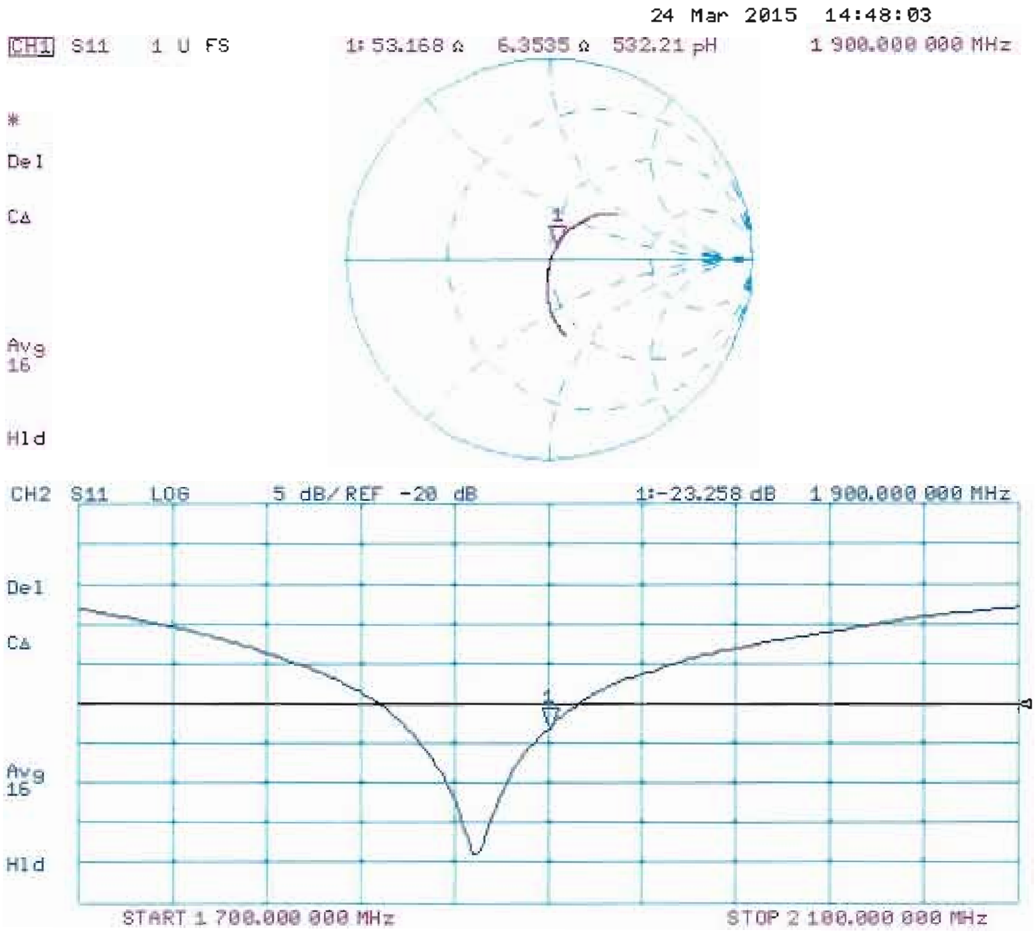
## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.15 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.4 W/kg
**SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.22 W/kg**
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 24.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041**

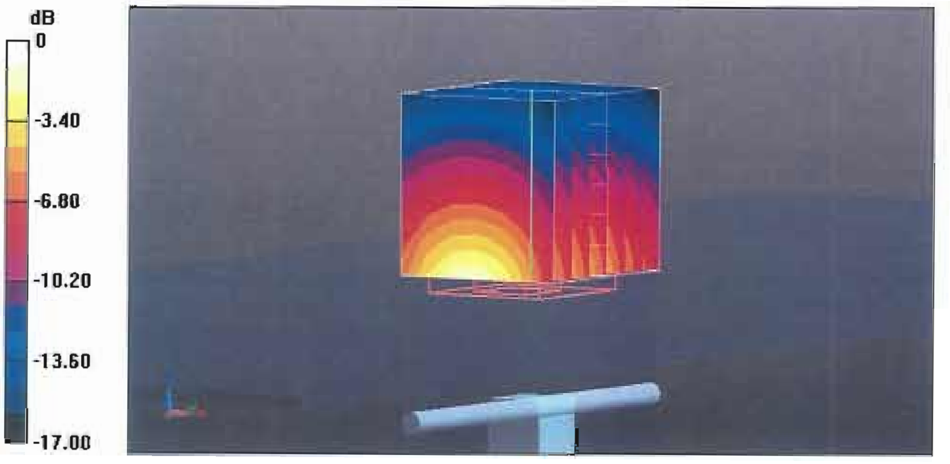
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.5 S/m; $\varepsilon_r$ = 52.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

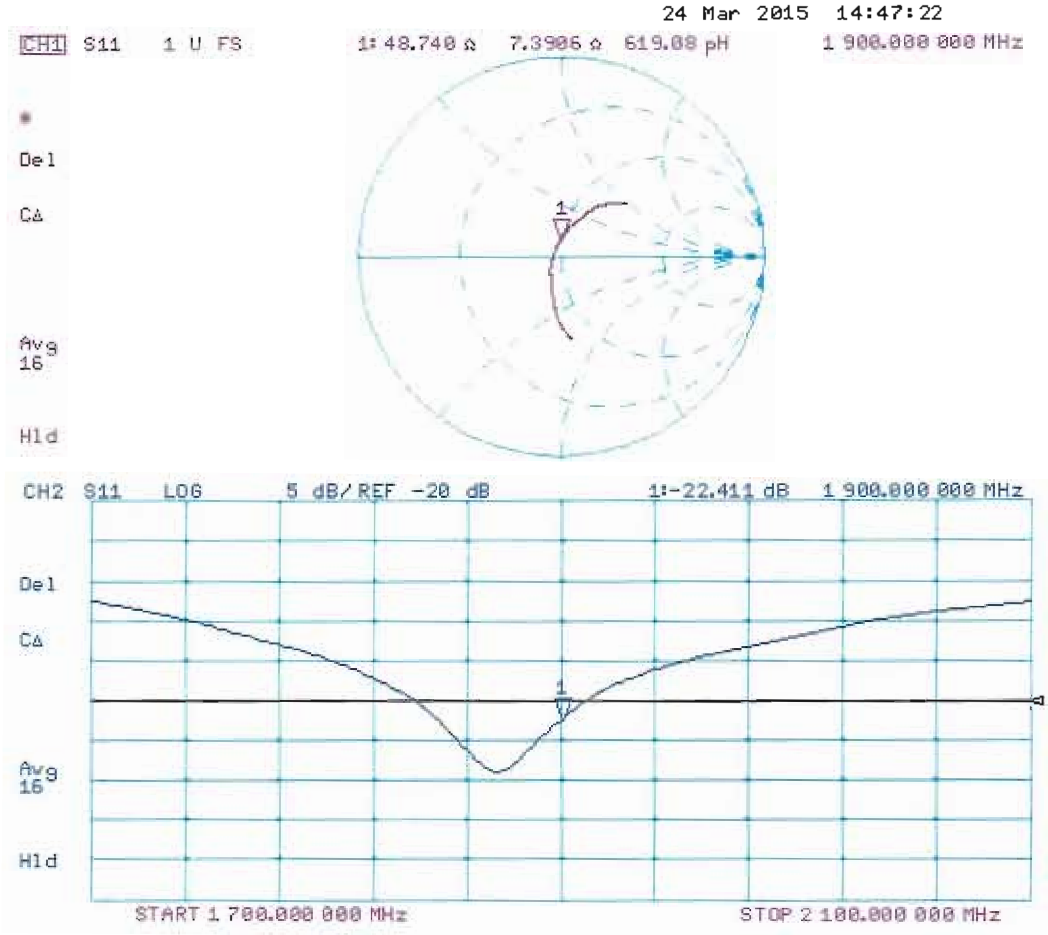
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.15 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 16.8 W/kg
**SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.28 W/kg**
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

## Impedance Measurement Plot for Body TSL



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**Zeughausstrasse 43, 8004 Zurich, Switzerland**

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**C** **Service suisse d'étalonnage**
**S** **Servizio svizzero di taratura**
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**Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** **Sporton-TW (Auden)**

**Certificate No: D2450V2-924_Nov14**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN: 924 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | November 19, 2014 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | US37292783 | 07-Oct-14 (No. 217-02020) | Oct-15 |
| Power sensor HP 8481A | MY41092317 | 07-Oct-14 (No. 217-02021) | Oct-15 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 03-Apr-14 (No. 217-01918) | Apr-15 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 03-Apr-14 (No. 217-01921) | Apr-15 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-13 (No. ES3-3205_Dec13) | Dec-14 |
| DAE4 | SN: 601 | 18-Aug-14 (No. DAE4-601_Aug14) | Aug-15 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-13) | In house check: Oct-16 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-14) | In house check: Oct-15 |

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

Issued: November 20, 2014

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

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.8 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.2 | 1.80 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.0 ± 6 % | 1.86 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 | 13.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **51.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.3 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.7 | 1.95 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 50.9 ± 6 % | 2.03 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 | 13.2 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **51.4 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.05 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **23.8 W/kg ± 16.5 % (k=2)** |

## Appendix (Additional assessments outside the scope of SCS108)

## Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 54.8 Ω + 3.2 jΩ |
| Return Loss | - 25.3 dB |

## Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.3 Ω + 4.6 jΩ |
| Return Loss | - 26.8 dB |

## General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.153 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 26, 2013 |

## DASY5 Validation Report for Head TSL

Date: 18.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924**

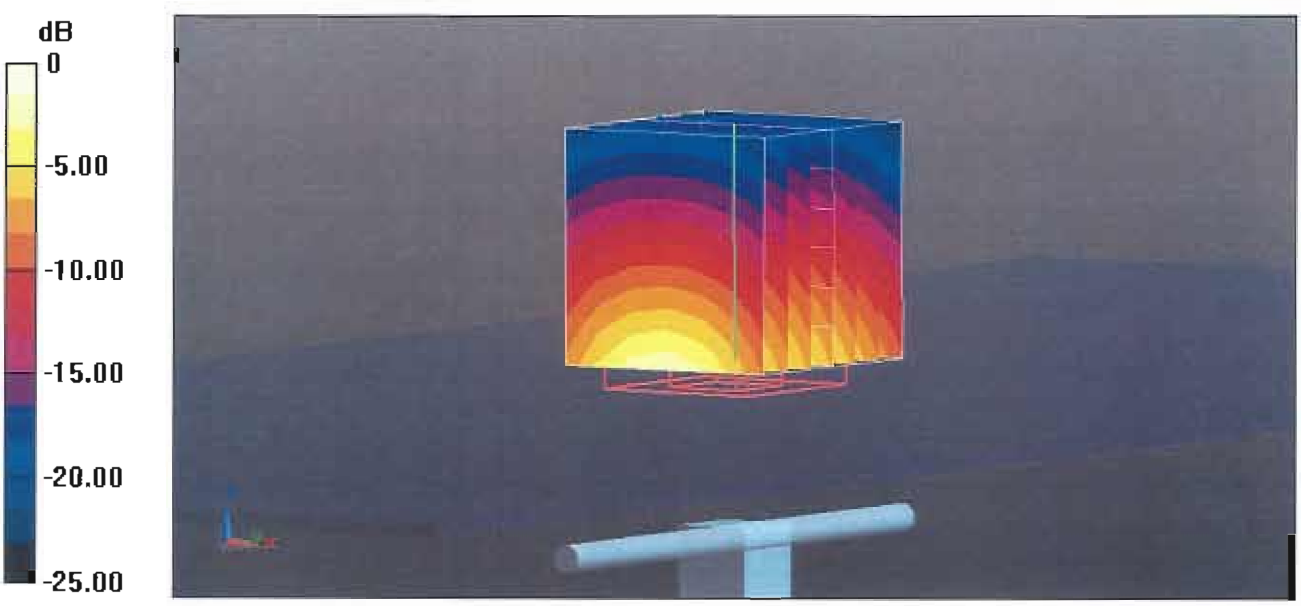
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma = 1.86$ S/m; $\varepsilon_r = 39$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

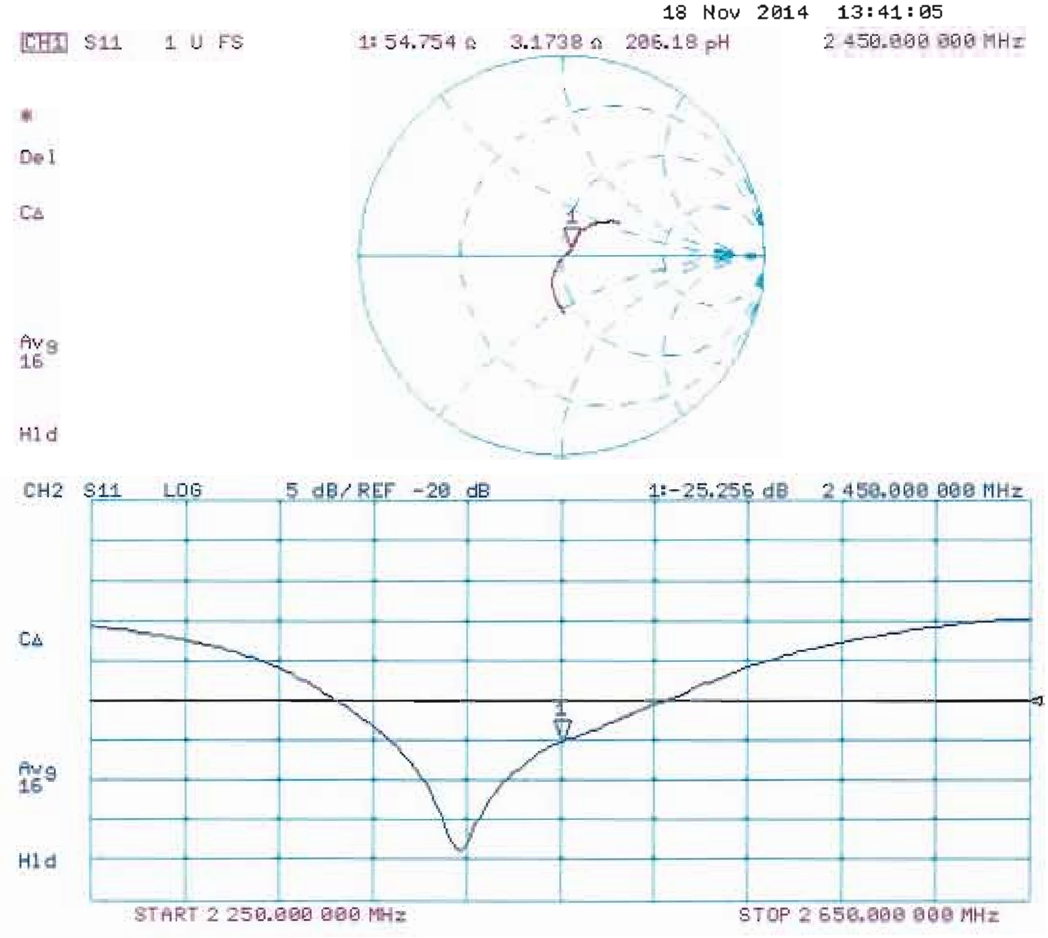
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.6 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.1 W/kg
**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.14 W/kg**
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924**

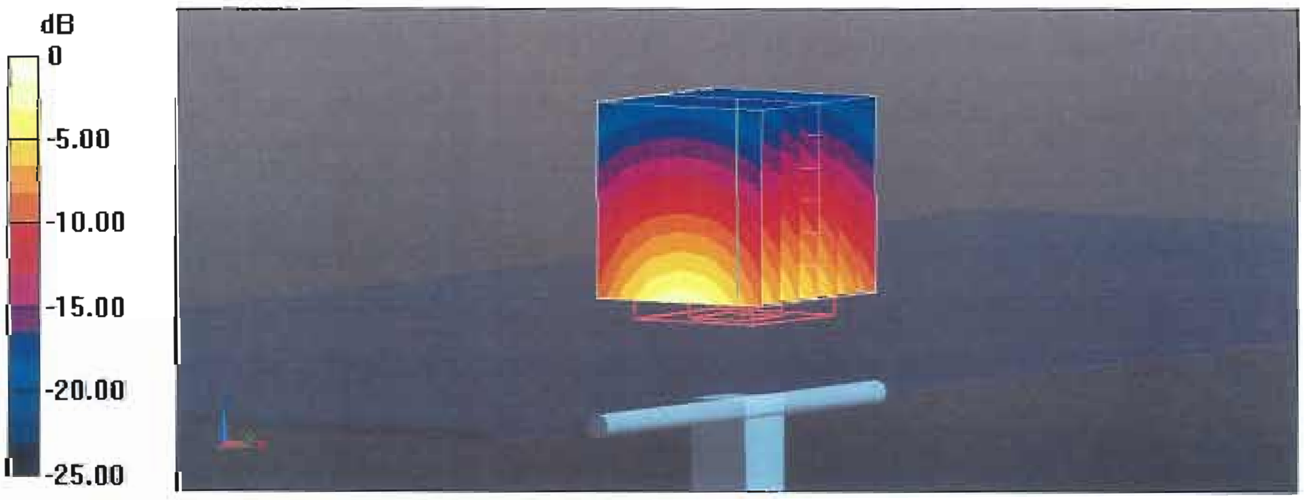
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma = 2.03$ S/m; $\varepsilon_r = 50.9$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

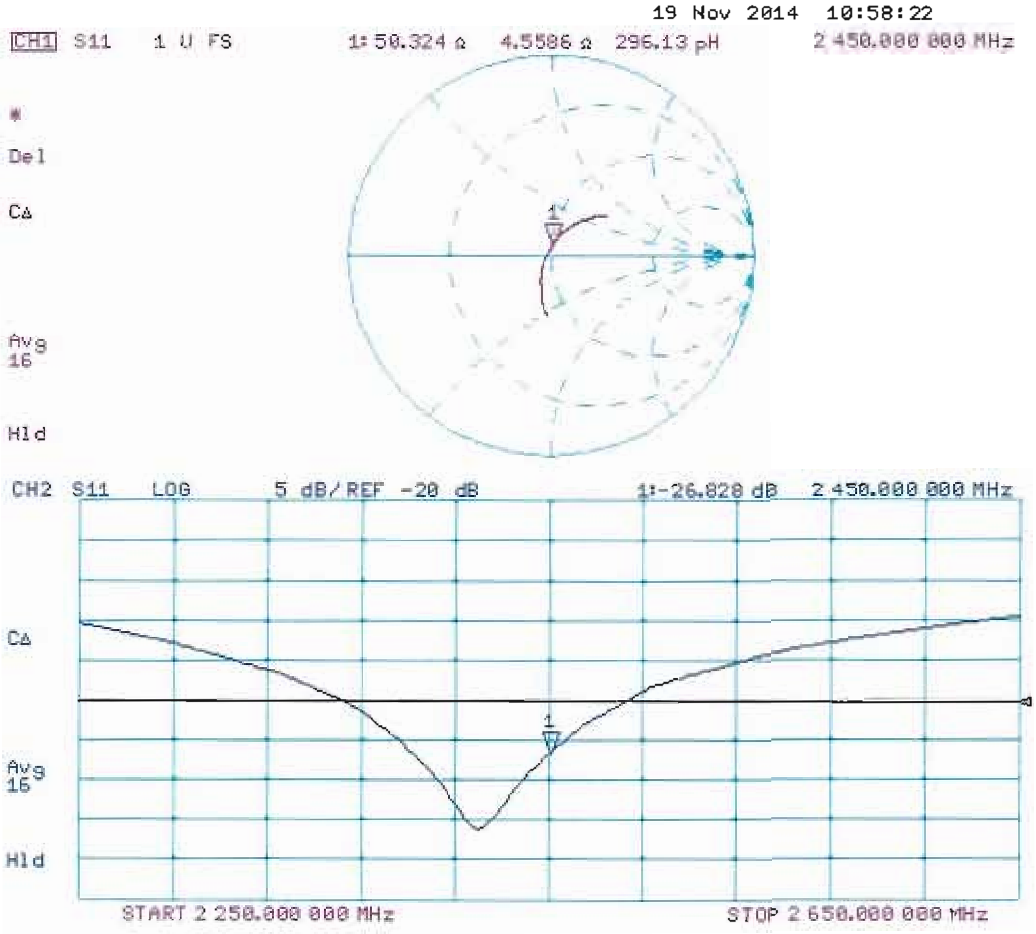
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.44 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 27.9 W/kg
**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.05 W/kg**
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

## Impedance Measurement Plot for Body TSL



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**Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** **Sporton-TW (Auden)**

**Certificate No: DAE3-577_Oct14**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | DAE3 - SD 000 D03 AA - SN: 577 |
| Calibration procedure(s) | QA CAL-06.v28<br>Calibration procedure for the data acquisition electronics (DAE) |
| Calibration date: | October 06, 2014 |

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 |
|---|---|---|---|
| Keithley Multimeter Type 2001 | SN: 0810278 | 03-Oct-14 (No:15573) | Oct-15 |
| **Secondary Standards** | **ID #** | **Check Date (in house)** | **Scheduled Check** |
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 07-Jan-14 (in house check) | In house check: Jan-15 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 07-Jan-14 (in house check) | In house check: Jan-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dominique Steffen | Technician | |
| Approved by: | Fin Bomholt | Deputy Technical Manager | i.V. |

Issued: October 6, 2014

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

## Glossary

| | |
|---|---|
| DAE | data acquisition electronics |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

## Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

| | | | | |
|---|---|---|---|---|
| High Range: | 1LSB = | 6.1μV , | full range = | -100...+300 mV |
| Low Range: | 1LSB = | 61nV , | full range = | -1.......+3mV |

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| **Calibration Factors** | **X** | **Y** | **Z** |
|---|---|---|---|
| **High Range** | 403.482 ± 0.02% (k=2) | 403.471 ± 0.02% (k=2) | 403.779 ± 0.02% (k=2) |
| **Low Range** | 3.91221 ± 1.50% (k=2) | 3.94944 ± 1.50% (k=2) | 3.96413 ± 1.50% (k=2) |

## Connector Angle

| | |
|---|---|
| **Connector Angle** to be used in DASY system | 190.0 ° ± 1 ° |

## Appendix (Additional assessments outside the scope of SCS108)

### 1. DC Voltage Linearity

| High Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| **Channel X** | **+ Input** | 200032.88 | -1.99 | -0.00 |
| **Channel X** | **+ Input** | 20008.32 | 4.67 | 0.02 |
| **Channel X** | **- Input** | -20001.95 | 3.91 | -0.02 |
| **Channel Y** | **+ Input** | 200034.36 | -0.48 | -0.00 |
| **Channel Y** | **+ Input** | 20004.96 | 1.49 | 0.01 |
| **Channel Y** | **- Input** | -20005.18 | 0.80 | -0.00 |
| **Channel Z** | **+ Input** | 200033.48 | -1.14 | -0.00 |
| **Channel Z** | **+ Input** | 20005.14 | 1.72 | 0.01 |
| **Channel Z** | **- Input** | -20006.62 | -0.60 | 0.00 |

| Low Range | | Reading (μV) | Difference (μV) | Error (%) |
|---|---|---|---|---|
| **Channel X** | **+ Input** | 2000.31 | 0.11 | 0.01 |
| **Channel X** | **+ Input** | 200.48 | 0.24 | 0.12 |
| **Channel X** | **- Input** | -199.49 | 0.14 | -0.07 |
| **Channel Y** | **+ Input** | 1999.98 | -0.10 | -0.01 |
| **Channel Y** | **+ Input** | 199.48 | -0.67 | -0.34 |
| **Channel Y** | **- Input** | -200.14 | -0.32 | 0.16 |
| **Channel Z** | **+ Input** | 1999.95 | -0.08 | -0.00 |
| **Channel Z** | **+ Input** | 199.09 | -0.96 | -0.48 |
| **Channel Z** | **- Input** | -201.17 | -1.27 | 0.64 |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (μV) | Low Range Average Reading (μV) |
|---|---|---|---|
| **Channel X** | 200 | -1.95 | -3.98 |
| | - 200 | 5.57 | 3.77 |
| **Channel Y** | 200 | -13.96 | -14.08 |
| | - 200 | 13.30 | 13.19 |
| **Channel Z** | 200 | 2.29 | 2.64 |
| | - 200 | -5.81 | -5.27 |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (μV) | Channel Y (μV) | Channel Z (μV) |
|---|---|---|---|---|
| **Channel X** | 200 | - | 0.37 | -3.20 |
| **Channel Y** | 200 | 9.80 | - | 0.72 |
| **Channel Z** | 200 | 6.30 | 6.84 | - |

## 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|---|---|---|
| **Channel X** | 16130 | 15294 |
| **Channel Y** | 16097 | 15352 |
| **Channel Z** | 16126 | 12399 |

## 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (μV) |
|---|---|---|---|---|
| **Channel X** | 0.41 | -0.20 | 1.04 | 0.30 |
| **Channel Y** | -0.55 | -1.63 | 1.48 | 0.44 |
| **Channel Z** | -0.30 | -1.93 | 0.42 | 0.40 |

## 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

## 7. Input Resistance (Typical values for information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|---|---|---|
| **Channel X** | 200 | 200 |
| **Channel Y** | 200 | 200 |
| **Channel Z** | 200 | 200 |

## 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|---|---|
| **Supply (+ Vcc)** | +7.9 |
| **Supply (- Vcc)** | -7.6 |

## 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|---|---|---|---|
| **Supply (+ Vcc)** | +0.01 | +6 | +14 |
| **Supply (- Vcc)** | –0.01 | -8 | -9 |

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**Accreditation No.: SCS 108**

**Client** **Sporton-TW (Auden)**

**Certificate No: EX3-3931_Sep14**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:3931 |
| Calibration procedure(s) | QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | September 25, 2014 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Power sensor E4412A | MY41498087 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 03-Apr-14 (No. 217-01915) | Apr-15 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919) | Apr-15 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920) | Apr-15 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-13 (No. ES3-3013_Dec13) | Dec-14 |
| DAE4 | SN: 660 | 13-Dec-13 (No. DAE4-660_Dec13) | Dec-14 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-13) | In house check: Apr-16 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

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

Issued: September 25, 2014

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## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Methods Applied and Interpretation of Parameters:

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

# Probe EX3DV4

## SN:3931

Manufactured: July 24, 2013
Calibrated: September 25, 2014

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$)[A] | 0.42 | 0.58 | 0.49 | ± 10.1 % |
| DCP (mV)[B] | 99.9 | 96.9 | 99.9 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A<br>dB | B<br>dB$\sqrt{\mu V}$ | C | D<br>dB | VR<br>mV | Unc[E]<br>(k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 149.1 | ±3.8 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 132.9 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 145.1 | |

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

---

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 10.75 | 10.75 | 10.75 | 0.41 | 0.79 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 10.32 | 10.32 | 10.32 | 0.20 | 1.13 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 10.07 | 10.07 | 10.07 | 0.52 | 0.72 | ± 12.0 % |
| 1450 | 40.5 | 1.20 | 8.74 | 8.74 | 8.74 | 0.20 | 1.48 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.48 | 8.48 | 8.48 | 0.57 | 0.69 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.17 | 8.17 | 8.17 | 0.31 | 0.96 | ± 12.0 % |
| 2000 | 40.0 | 1.40 | 8.10 | 8.10 | 8.10 | 0.43 | 0.77 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.29 | 7.29 | 7.29 | 0.33 | 0.88 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 7.09 | 7.09 | 7.09 | 0.37 | 0.86 | ± 12.0 % |

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

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

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

## Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 55.5 | 0.96 | 10.10 | 10.10 | 10.10 | 0.27 | 1.14 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 10.13 | 10.13 | 10.13 | 0.40 | 0.93 | ± 12.0 % |
| 1450 | 54.0 | 1.30 | 8.72 | 8.72 | 8.72 | 0.24 | 1.22 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 8.26 | 8.26 | 8.26 | 0.48 | 0.80 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 7.80 | 7.80 | 7.80 | 0.38 | 0.89 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 7.36 | 7.36 | 7.36 | 0.80 | 0.56 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 7.20 | 7.20 | 7.20 | 0.76 | 0.58 | ± 12.0 % |

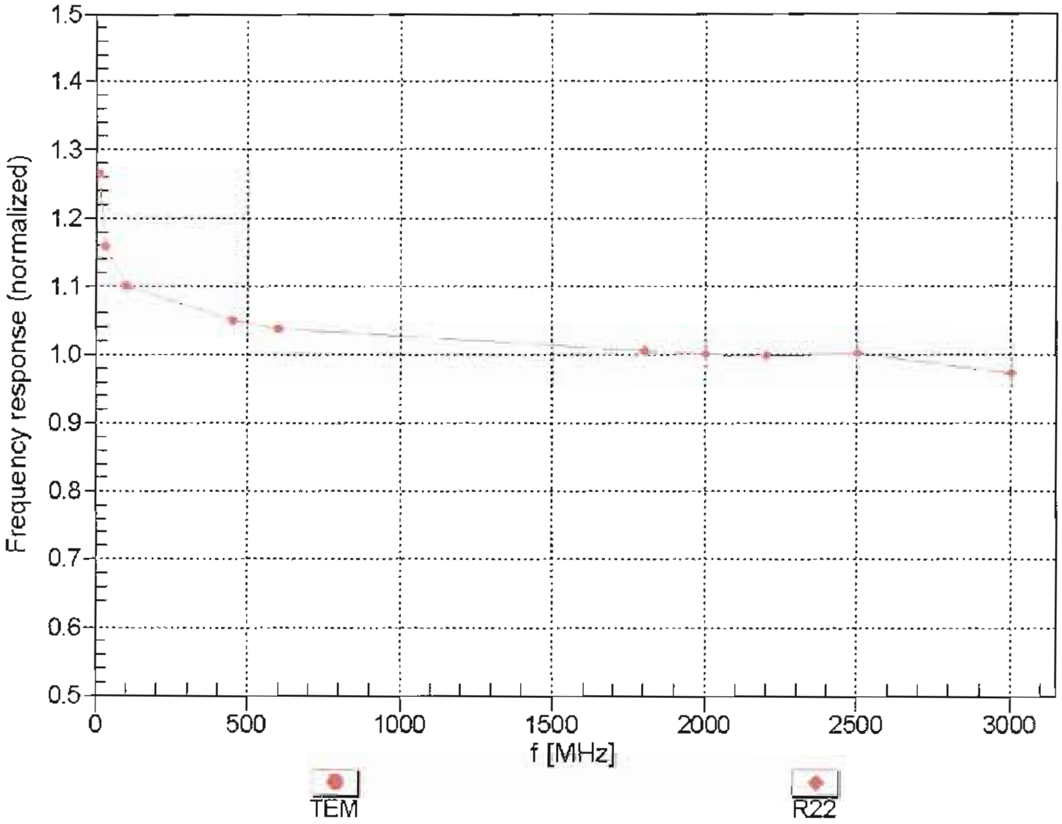
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz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

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

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

# Frequency Response of E-Field

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

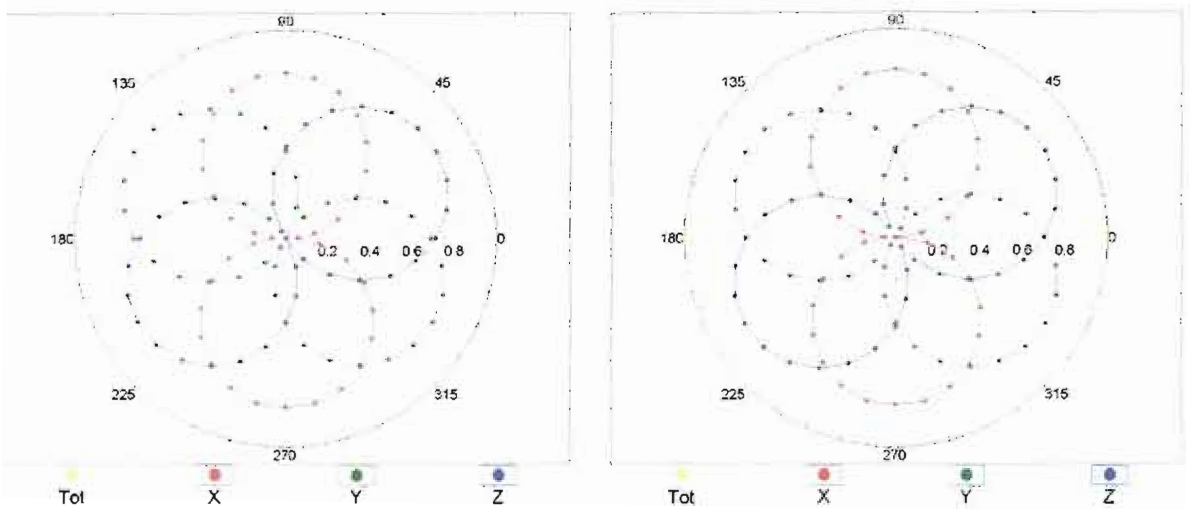


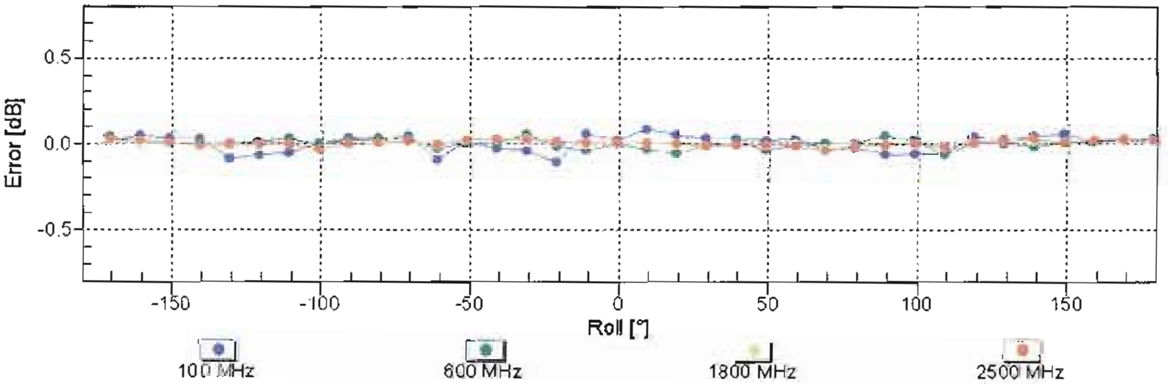
**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

# Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM

f=1800 MHz,R22

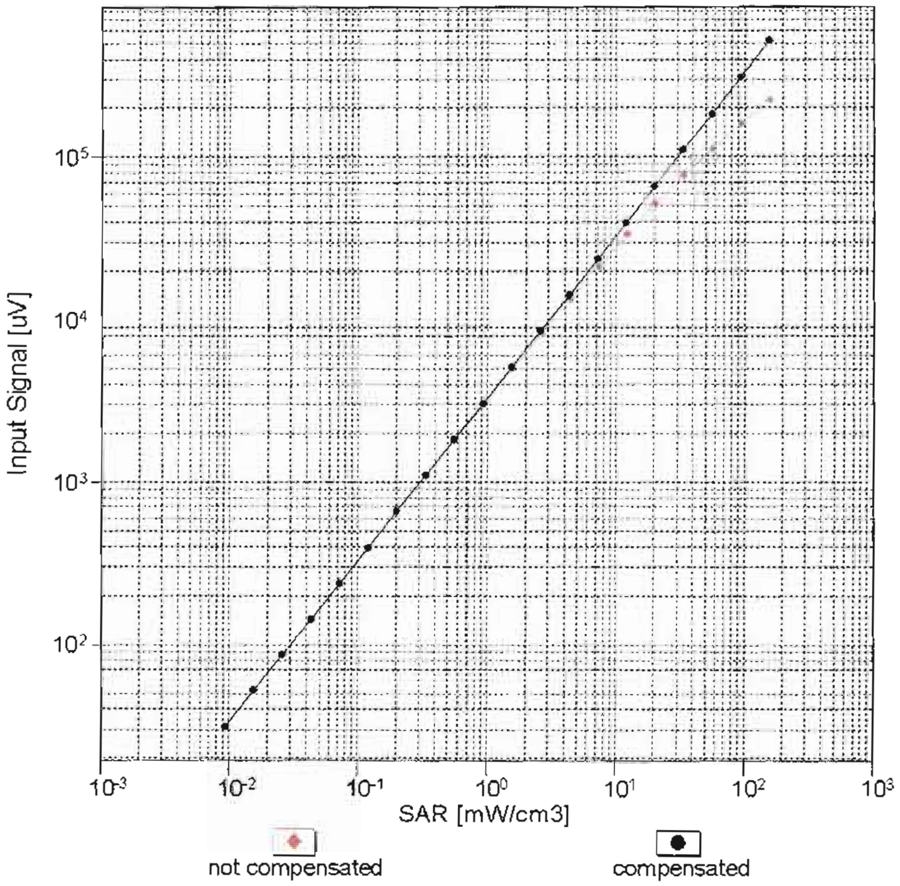


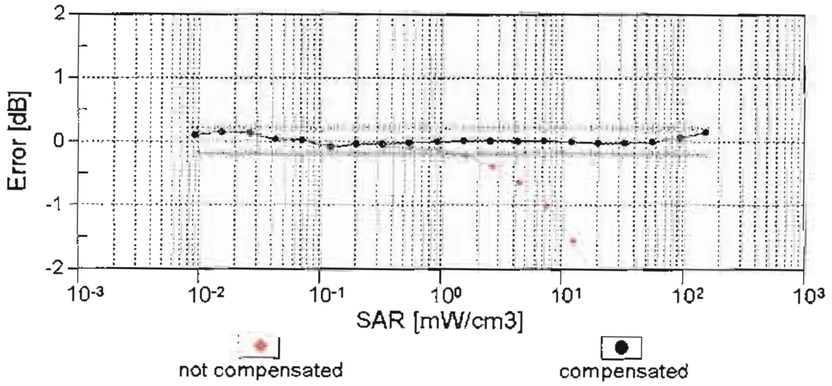


**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

# Dynamic Range f($SAR_{head}$)

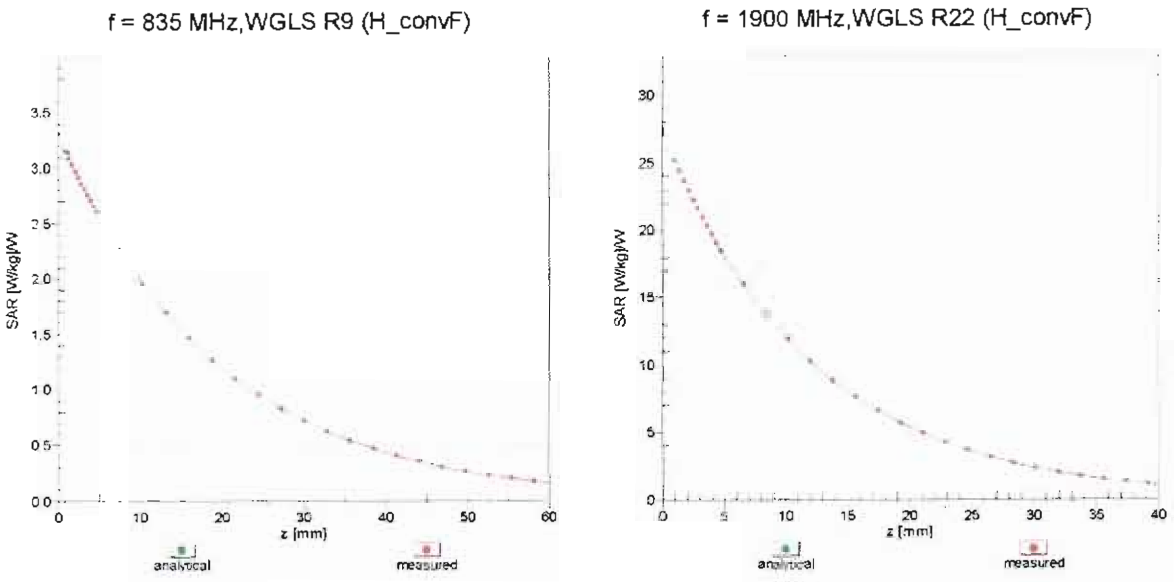
## (TEM cell , $f_{eval}$= 1900 MHz)





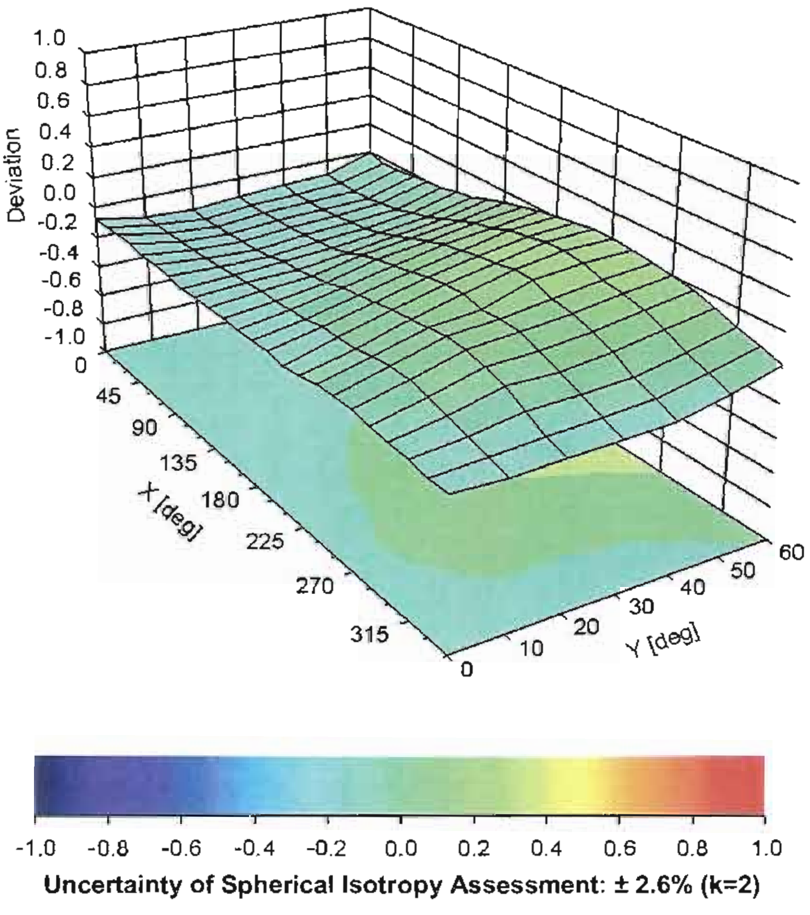
**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

# Conversion Factor Assessment



# Deviation from Isotropy in Liquid

### Error (ϕ, ϑ), f = 900 MHz



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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | -11.5 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 1.4 mm |