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# SAR EVALUATION REPORT

**Applicant Name:**
LG Electronics U.S.A., Inc.
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

**Date of Testing:**
07/15/19 - 08/25/19
**Test Site/Location:**
PCTEST Lab, Columbia, MD, USA
**Document Serial No.:**
1M1907050112-01-R1.ZNF

**FCC ID:** **ZNFT600US**

**APPLICANT:** **LG ELECTRONICS U.S.A., INC.**

**DUT Type:** Portable Tablet
**Application Type:** Certification
**FCC Rule Part(s):** CFR §2.1093
**Model:** LM-T600US
**Additional Model(s):** LMT600US, T600US, LM-T600QS, LMT600QS, T600QS

| Equipment Class | Band & Mode | Tx Frequency | SAR |
|---|---|---|---|
| | | | 1g Body (W/kg) |
| PCB | UMTS 850 | 826.40 - 846.60 MHz | 0.73 |
| PCB | UMTS 1750 | 1712.4 - 1752.6 MHz | 0.55 |
| PCB | UMTS 1900 | 1852.4 - 1907.6 MHz | 0.89 |
| PCB | LTE Band 71 | 665.5 - 695.5 MHz | 0.55 |
| PCB | LTE Band 12 | 699.7 - 715.3 MHz | 0.64 |
| PCB | LTE Band 13 | 779.5 - 784.5 MHz | 0.66 |
| PCB | LTE Band 26 (Cell) | 814.7 - 848.3 MHz | 0.72 |
| PCB | LTE Band 5 (Cell) | 824.7 - 848.3 MHz | N/A |
| PCB | LTE Band 66 (AWS) | 1710.7 - 1779.3 MHz | 0.65 |
| PCB | LTE Band 4 (AWS) | 1710.7 - 1754.3 MHz | N/A |
| PCB | LTE Band 25 (PCS) | 1850.7 - 1914.3 MHz | 0.90 |
| PCB | LTE Band 2 (PCS) | 1850.7 - 1909.3 MHz | N/A |
| PCB | LTE Band 7 | 2502.5 - 2567.5 MHz | 1.18 |
| PCB | LTE Band 41 | 2498.5 - 2687.5 MHz | 1.22 |
| DTS | 2.4 GHz WLAN | 2412 - 2462 MHz | 0.66 |
| NII | U-NII-1 | 5180 - 5240 MHz | N/A |
| NII | U-NII-2A | 5260 - 5320 MHz | 0.43 |
| NII | U-NII-2C | 5500 - 5720 MHz | 0.54 |
| NII | U-NII-3 | 5745 - 5825 MHz | 0.40 |
| DSS/DTS | Bluetooth | 2402 - 2480 MHz | 0.23 |
| **Simultaneous SAR per KDB 690783 D01v01r03:** | | | 1.59 |

Note: This revised Test Report (S/N: 1M1907050112-01-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 of this report; for North American frequency bands only.

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

Randy Ortanez
President

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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

| Band & Mode | Operating Modes | Tx Frequency |
|---|---|---|
| UMTS 850 | Data | 826.40 - 846.60 MHz |
| UMTS 1750 | Data | 1712.4 - 1752.6 MHz |
| UMTS 1900 | Data | 1852.4 - 1907.6 MHz |
| LTE Band 71 | Data | 665.5 - 695.5 MHz |
| LTE Band 12 | Data | 699.7 - 715.3 MHz |
| LTE Band 13 | Data | 779.5 - 784.5 MHz |
| LTE Band 26 (Cell) | Data | 814.7 - 848.3 MHz |
| LTE Band 5 (Cell) | Data | 824.7 - 848.3 MHz |
| LTE Band 66 (AWS) | Data | 1710.7 - 1779.3 MHz |
| LTE Band 4 (AWS) | Data | 1710.7 - 1754.3 MHz |
| LTE Band 25 (PCS) | Data | 1850.7 - 1914.3 MHz |
| LTE Band 2 (PCS) | Data | 1850.7 - 1909.3 MHz |
| LTE Band 7 | Data | 2502.5 - 2567.5 MHz |
| LTE Band 41 | Data | 2498.5 - 2687.5 MHz |
| 2.4 GHz WLAN | Data | 2412 - 2462 MHz |
| U-NII-1 | Data | 5180 - 5240 MHz |
| U-NII-2A | Data | 5260 - 5320 MHz |
| U-NII-2C | Data | 5500 - 5720 MHz |
| U-NII-3 | Data | 5745 - 5825 MHz |
| Bluetooth | Data | 2402 - 2480 MHz |

## 1.2 Power Reduction for SAR

This device uses a power reduction mechanism for SAR compliance. The power reduction mechanism is activated when the device is used in close proximity to the user's body. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device. Detailed descriptions of the power reduction mechanism are included in the operational description.

## 1.3 Nominal and Maximum Output Power Specifications

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

### 1.3.1 Maximum Output Power

| Mode / Band | | Modulated Average (dBm) | | |
|---|---|---|---|---|
| | | *3GPP WCDMA* | *3GPP HSDPA* | *3GPP HSUPA* |
| UMTS Band 5 (850 MHz) | Maximum | **25.2** | **25.2** | **25.2** |
| | Nominal | **24.7** | **24.7** | **24.7** |
| UMTS Band 4 (1750 MHz) | Maximum | **24.7** | **24.7** | **24.7** |
| | Nominal | **24.2** | **24.2** | **24.2** |
| UMTS Band 2 (1900 MHz) | Maximum | **23.7** | **23.7** | **23.7** |
| | Nominal | **23.2** | **23.2** | **23.2** |

| Mode / Band | | Modulated Average (dBm) |
|---|---|---|
| LTE Band 71 | Maximum | **25.2** |
| | Nominal | **24.7** |
| LTE Band 12 | Maximum | **25.2** |
| | Nominal | **24.7** |
| LTE Band 13 | Maximum | **25.2** |
| | Nominal | **24.7** |
| LTE Band 26 (Cell) | Maximum | **25.2** |
| | Nominal | **24.7** |
| LTE Band 5 (Cell) | Maximum | **25.2** |
| | Nominal | **24.7** |
| LTE Band 66 (AWS) | Maximum | **24.7** |
| | Nominal | **24.2** |
| LTE Band 4 (AWS) | Maximum | **24.7** |
| | Nominal | **24.2** |
| LTE Band 25 (PCS) | Maximum | **23.7** |
| | Nominal | **23.2** |
| LTE Band 2 (PCS) | Maximum | **23.7** |
| | Nominal | **23.2** |
| LTE Band 7 | Maximum | **22.0** |
| | Nominal | **21.5** |
| LTE Band 41 | Maximum | **23.5** |
| | Nominal | **23.0** |

| Mode / Band | | Modulated Average - Single Tx Chain (dBm) |
|---|---|---|
| | Channel | 1 - 11 |
| IEEE 802.11b (2.4 GHz) | Maximum | **15.5** |
| | Nominal | **14.5** |
| IEEE 802.11g (2.4 GHz) | Maximum | **15.5** |
| | Nominal | **14.5** |
| IEEE 802.11n (2.4 GHz) | Maximum | **15.5** |
| | Nominal | **14.5** |

| Mode / Band | | Modulated Average - Single Tx Chain (dBm) | | |
|---|---|---|---|---|
| | | 20 MHz Bandwidth | 40 MHz Bandwidth | 80 MHz Bandwidth |
| | Channel | 36 - 165 | 38 - 159 | 42 - 155 |
| IEEE 802.11a (5 GHz) | Maximum | **14.5** | | |
| | Nominal | **13.5** | | |
| IEEE 802.11n (5 GHz) | Maximum | **14.5** | **14.5** | |
| | Nominal | **13.5** | **13.5** | |
| IEEE 802.11ac (5 GHz) | Maximum | **14.5** | **14.5** | **13.5** |
| | Nominal | **13.5** | **13.5** | **12.5** |

| Mode/Band | | Modulated Average (dBm) |
|---|---|---|
| Bluetooth | Maximum | **7.5** |
| | Nominal | **6.5** |
| Bluetooth LE | Maximum | **-1.0** |
| | Nominal | **-2.0** |

| Mode / Band | | Modulated Average - MIMO (dBm) |
|---|---|---|
| | | 20 MHz Bandwidth |
| | Channel | 1 - 11 |
| IEEE 802.11g (2.4 GHz) | Maximum | **18.5** |
| | Nominal | **17.5** |
| IEEE 802.11n (2.4 GHz) | Maximum | **18.5** |
| | Nominal | **17.5** |

| Mode / Band | | Modulated Average - MIMO (dBm) | | |
|---|---|---|---|---|
| | | 20 MHz Bandwidth | 40 MHz Bandwidth | 80 MHz Bandwidth |
| | Channel | 36 - 165 | 38 - 159 | 42 - 155 |
| IEEE 802.11a (5 GHz) | Maximum | **17.5** | | |
| | Nominal | **16.5** | | |
| IEEE 802.11n (5 GHz) | Maximum | **17.5** | **17.5** | |
| | Nominal | **16.5** | **16.5** | |
| IEEE 802.11ac (5 GHz) | Maximum | **17.5** | **17.5** | **16.5** |
| | Nominal | **16.5** | **16.5** | **15.5** |

### 1.3.2 Reduced Output Power

| Mode / Band | | Modulated Average (dBm) | | |
|---|---|---|---|---|
| | | *3GPP WCDMA* | *3GPP HSDPA* | *3GPP HSUPA* |
| UMTS Band 5 (850 MHz) | Maximum | **18.2** | **18.2** | **18.2** |
| | Nominal | **17.7** | **17.7** | **17.7** |
| UMTS Band 4 (1750 MHz) | Maximum | **11.7** | **11.7** | **11.7** |
| | Nominal | **11.2** | **11.2** | **11.2** |
| UMTS Band 2 (1900 MHz) | Maximum | **10.7** | **10.7** | **10.7** |
| | Nominal | **10.2** | **10.2** | **10.2** |

| Mode / Band | | Modulated Average (dBm) |
|---|---|---|
| LTE Band 71 | Maximum | **17.7** |
| | Nominal | **17.2** |
| LTE Band 12 | Maximum | **17.2** |
| | Nominal | **16.7** |
| LTE Band 13 | Maximum | **17.2** |
| | Nominal | **16.7** |
| LTE Band 26 (Cell) | Maximum | **18.2** |
| | Nominal | **17.7** |
| LTE Band 5 (Cell) | Maximum | **18.2** |
| | Nominal | **17.7** |
| LTE Band 66 (AWS) | Maximum | **11.7** |
| | Nominal | **11.2** |
| LTE Band 4 (AWS) | Maximum | **11.7** |
| | Nominal | **11.2** |
| LTE Band 25 (PCS) | Maximum | **10.7** |
| | Nominal | **10.2** |
| LTE Band 2 (PCS) | Maximum | **10.7** |
| | Nominal | **10.2** |
| LTE Band 7 | Maximum | **10.7** |
| | Nominal | **10.2** |
| LTE Band 41 | Maximum | **14.2** |
| | Nominal | **13.7** |

| Mode / Band | | Modulated Average - Single Tx Chain (dBm) |
|---|---|---|
| | Channel | 1 - 11 |
| IEEE 802.11b (2.4 GHz) | Maximum | **8.5** |
| | Nominal | **7.5** |
| IEEE 802.11g (2.4 GHz) | Maximum | **8.5** |
| | Nominal | **7.5** |
| IEEE 802.11n (2.4 GHz) | Maximum | **8.5** |
| | Nominal | **7.5** |

| Mode / Band | | Modulated Average - Single Tx Chain (dBm) | | |
|---|---|---|---|---|
| | | 20 MHz Bandwidth | 40 MHz Bandwidth | 80 MHz Bandwidth |
| | Channel | 36 - 165 | 38 - 159 | 42 - 155 |
| IEEE 802.11a (5 GHz) | Maximum | **7.5** | | |
| | Nominal | **6.5** | | |
| IEEE 802.11n (5 GHz) | Maximum | **7.5** | **7.5** | |
| | Nominal | **6.5** | **6.5** | |
| IEEE 802.11ac (5 GHz) | Maximum | **7.5** | **7.5** | **7.0** |
| | Nominal | **6.5** | **6.5** | **6.0** |

| Mode / Band | | Modulated Average - MIMO (dBm) |
|---|---|---|
| | | 20 MHz Bandwidth |
| | Channel | 1 - 11 |
| IEEE 802.11g (2.4 GHz) | Maximum | **11.5** |
| | Nominal | **10.5** |
| IEEE 802.11n (2.4 GHz) | Maximum | **11.5** |
| | Nominal | **10.5** |

| Mode / Band | | Modulated Average - MIMO (dBm) | | |
|---|---|---|---|---|
| | | 20 MHz Bandwidth | 40 MHz Bandwidth | 80 MHz Bandwidth |
| | Channel | 36 - 165 | 38 - 159 | 42 - 155 |
| IEEE 802.11a (5 GHz) | Maximum | **10.5** | | |
| | Nominal | **9.5** | | |
| IEEE 802.11n (5 GHz) | Maximum | **10.5** | **10.5** | |
| | Nominal | **9.5** | **9.5** | |
| IEEE 802.11ac (5 GHz) | Maximum | **10.5** | **10.5** | **10.0** |
| | Nominal | **9.5** | **9.5** | **9.0** |

## 1.4 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in Appendix F. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filings.

**Table 1-1**
**Device Edges/Sides for SAR Testing**

| Mode | Back | Top | Bottom | Right | Left |
|---|---|---|---|---|---|
| UMTS 850 | Yes | Yes | No | Yes | Yes |
| UMTS 1750 | Yes | Yes | No | Yes | Yes |
| UMTS 1900 | Yes | Yes | No | Yes | Yes |
| LTE Band 71 | Yes | Yes | No | Yes | Yes |
| LTE Band 12 | Yes | Yes | No | Yes | Yes |
| LTE Band 13 | Yes | Yes | No | Yes | Yes |
| LTE Band 26 (Cell) | Yes | Yes | No | Yes | Yes |
| LTE Band 66 (AWS) | Yes | Yes | No | Yes | Yes |
| LTE Band 25 (PCS) | Yes | Yes | No | Yes | Yes |
| LTE Band 7 | Yes | Yes | No | No | Yes |
| LTE Band 41 | Yes | Yes | No | No | Yes |
| 2.4 GHz WLAN Ant 1 | Yes | Yes | No | Yes | No |
| 2.4 GHz WLAN Ant 2 | Yes | Yes | No | Yes | No |
| 2.4 GHz WLAN MIMO | Yes | Yes | No | Yes | No |
| 5 GHz WLAN Ant 1 | Yes | Yes | No | Yes | No |
| 5 GHz WLAN Ant 2 | Yes | Yes | No | Yes | No |
| 5 GHz WLAN MIMO | Yes | Yes | No | Yes | No |
| Bluetooth | Yes | Yes | No | Yes | No |

Note: Per FCC KDB Publication 616217 D04v01r01, particular edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01V06. Additional edges may have been evaluated for simultaneous transmission analysis.

## 1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

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

**Table 1-2**
**Simultaneous Transmission Scenarios**

| No. | Capable Transmit Configuration | Body |
|---|---|---|
| 1 | UMTS + 2.4 GHz WI-FI | Yes |
| 2 | UMTS + 5 GHz WI-FI | Yes |
| 3 | UMTS + 2.4 GHz Bluetooth | Yes |
| 4 | UMTS + 2.4 GHz WI-FI MIMO | Yes |
| 5 | UMTS + 5 GHz WI-FI MIMO | Yes |
| 6 | UMTS + 2.4 GHz Bluetooth + 5 GHz WI-FI | Yes |
| 7 | UMTS + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO | Yes |
| 8 | LTE + 2.4 GHz WI-FI | Yes |
| 9 | LTE + 5 GHz WI-FI | Yes |
| 10 | LTE + 2.4 GHz Bluetooth | Yes |
| 11 | LTE + 2.4 GHz WI-FI MIMO | Yes |
| 12 | LTE + 5 GHz WI-FI MIMO | Yes |
| 13 | LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI | Yes |
| 14 | LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO | Yes |

1. 2.4 GHz WLAN and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. 2.4 GHz WLAN and 5 GHz WLAN cannot transmit simultaneously.
3. All licensed modes share the same antenna path and cannot transmit simultaneously.
4. This device supports 2x2 MIMO Tx for WLAN 802.11a/g/n/ac. 802.11a/g/n/ac supports CDD and STBC and 802.11n/ac additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.

## 1.6 Miscellaneous SAR Test Considerations

### (A) WIFI/BT

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02.

This device supports IEEE 802.11ac with the following features:
a) Up to 80 MHz Bandwidth only
b) No aggregate channel configurations
c) 2 Tx antenna output
d) 256 QAM is supported
e) TDWR and Band gap channels are supported

**(B) Licensed Transmitter(s)**

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.

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

This device supports LTE Carrier Aggregation (CA) in the downlink. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive. The downlink carrier aggregation exclusion analysis can be found in Appendix H.

This device supports LTE capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

This device supports 64QAM on the uplink and 256QAM on the downlink for LTE Operations. Conducted powers for 64QAM uplink configurations were measured per Section 5.1 of FCC KDB Publication 941225 D05v02r05. SAR was not required for 64QAM since the highest maximum output power for 64QAM is ≤ ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45W/kg, per Section 5.2.4 of FCC KDB Publication 941225 D05v02r05.

## 1.7 Guidance Applied

- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (3G/4G)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04v01r02 (Tablet)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)

## 1.8 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 10.

# 2 LTE INFORMATION

| LTE Information | | | | | |
|---|---|---|---|---|---|
| Form Factor | Portable Tablet | | | | |
| Frequency Range of each LTE transmission band | LTE Band 71 (665.5 - 695.5 MHz) | | | | |
| | LTE Band 12 (699.7 - 715.3 MHz) | | | | |
| | LTE Band 13 (779.5 - 784.5 MHz) | | | | |
| | LTE Band 26 (Cell) (814.7 - 848.3 MHz) | | | | |
| | LTE Band 5 (Cell) (824.7 - 848.3 MHz) | | | | |
| | LTE Band 66 (AWS) (1710.7 - 1779.3 MHz) | | | | |
| | LTE Band 4 (AWS) (1710.7 - 1754.3 MHz) | | | | |
| | LTE Band 25 (PCS) (1850.7 - 1914.3 MHz) | | | | |
| | LTE Band 2 (PCS) (1850.7 - 1909.3 MHz) | | | | |
| | LTE Band 7 (2502.5 - 2567.5 MHz) | | | | |
| | LTE Band 41 (2498.5 - 2687.5 MHz) | | | | |
| Channel Bandwidths | LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | | | |
| | LTE Band 13: 5 MHz, 10 MHz | | | | |
| | LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz | | | | |
| | LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz | | | | |
| | LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| | LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| Channel Numbers and Frequencies (MHz) | Low | Low-Mid | Mid | Mid-High | High |
| LTE Band 71: 5 MHz | 665.5 (133147) | | 680.5 (133297) | 695.5 (133447) | |
| LTE Band 71: 10 MHz | 668 (133172) | | 680.5 (133297) | 693 (133422) | |
| LTE Band 71: 15 MHz | 670.5 (133197) | | 680.5 (133297) | 690.5 (133397) | |
| LTE Band 71: 20 MHz | 673 (133222) | | 680.5 (133297) | 688 (133372) | |
| LTE Band 12: 1.4 MHz | 699.7 (23017) | | 707.5 (23095) | 715.3 (23173) | |
| LTE Band 12: 3 MHz | 700.5 (23025) | | 707.5 (23095) | 714.5 (23165) | |
| LTE Band 12: 5 MHz | 701.5 (23035) | | 707.5 (23095) | 713.5 (23155) | |
| LTE Band 12: 10 MHz | 704 (23060) | | 707.5 (23095) | 711 (23130) | |
| LTE Band 13: 5 MHz | 779.5 (23205) | | 782 (23230) | 784.5 (23255) | |
| LTE Band 13: 10 MHz | N/A | | 782 (23230) | N/A | |
| LTE Band 26 (Cell): 1.4 MHz | 814.7 (26697) | | 831.5 (26865) | 848.3 (27033) | |
| LTE Band 26 (Cell): 3 MHz | 815.5 (26705) | | 831.5 (26865) | 847.5 (27025) | |
| LTE Band 26 (Cell): 5 MHz | 816.5 (26715) | | 831.5 (26865) | 846.5 (27015) | |
| LTE Band 26 (Cell): 10 MHz | 819 (26740) | | 831.5 (26865) | 844 (26990) | |
| LTE Band 26 (Cell): 15 MHz | 821.5 (26765) | | 831.5 (26865) | 841.5 (26965) | |
| LTE Band 5 (Cell): 1.4 MHz | 824.7 (20407) | | 836.5 (20525) | 848.3 (20643) | |
| LTE Band 5 (Cell): 3 MHz | 825.5 (20415) | | 836.5 (20525) | 847.5 (20635) | |
| LTE Band 5 (Cell): 5 MHz | 826.5 (20425) | | 836.5 (20525) | 846.5 (20625) | |
| LTE Band 5 (Cell): 10 MHz | 829 (20450) | | 836.5 (20525) | 844 (20600) | |
| LTE Band 66 (AWS): 1.4 MHz | 1710.7 (131979) | | 1745 (132322) | 1779.3 (132665) | |
| LTE Band 66 (AWS): 3 MHz | 1711.5 (131987) | | 1745 (132322) | 1778.5 (132657) | |
| LTE Band 66 (AWS): 5 MHz | 1712.5 (131997) | | 1745 (132322) | 1777.5 (132647) | |
| LTE Band 66 (AWS): 10 MHz | 1715 (132022) | | 1745 (132322) | 1775 (132622) | |
| LTE Band 66 (AWS): 15 MHz | 1717.5 (132047) | | 1745 (132322) | 1772.5 (132597) | |
| LTE Band 66 (AWS): 20 MHz | 1720 (132072) | | 1745 (132322) | 1770 (132572) | |
| LTE Band 4 (AWS): 1.4 MHz | 1710.7 (19957) | | 1732.5 (20175) | 1754.3 (20393) | |
| LTE Band 4 (AWS): 3 MHz | 1711.5 (19965) | | 1732.5 (20175) | 1753.5 (20385) | |
| LTE Band 4 (AWS): 5 MHz | 1712.5 (19975) | | 1732.5 (20175) | 1752.5 (20375) | |
| LTE Band 4 (AWS): 10 MHz | 1715 (20000) | | 1732.5 (20175) | 1750 (20350) | |
| LTE Band 4 (AWS): 15 MHz | 1717.5 (20025) | | 1732.5 (20175) | 1747.5 (20325) | |
| LTE Band 4 (AWS): 20 MHz | 1720 (20050) | | 1732.5 (20175) | 1745 (20300) | |
| LTE Band 25 (PCS): 1.4 MHz | 1850.7 (26047) | | 1882.5 (26365) | 1914.3 (26683) | |
| LTE Band 25 (PCS): 3 MHz | 1851.5 (26055) | | 1882.5 (26365) | 1913.5 (26675) | |
| LTE Band 25 (PCS): 5 MHz | 1852.5 (26065) | | 1882.5 (26365) | 1912.5 (26665) | |
| LTE Band 25 (PCS): 10 MHz | 1855 (26090) | | 1882.5 (26365) | 1910 (26640) | |
| LTE Band 25 (PCS): 15 MHz | 1857.5 (26115) | | 1882.5 (26365) | 1907.5 (26615) | |
| LTE Band 25 (PCS): 20 MHz | 1860 (26140) | | 1882.5 (26365) | 1905 (26590) | |
| LTE Band 2 (PCS): 1.4 MHz | 1850.7 (18607) | | 1880 (18900) | 1909.3 (19193) | |
| LTE Band 2 (PCS): 3 MHz | 1851.5 (18615) | | 1880 (18900) | 1908.5 (19185) | |
| LTE Band 2 (PCS): 5 MHz | 1852.5 (18625) | | 1880 (18900) | 1907.5 (19175) | |
| LTE Band 2 (PCS): 10 MHz | 1855 (18650) | | 1880 (18900) | 1905 (19150) | |
| LTE Band 2 (PCS): 15 MHz | 1857.5 (18675) | | 1880 (18900) | 1902.5 (19125) | |
| LTE Band 2 (PCS): 20 MHz | 1860 (18700) | | 1880 (18900) | 1900 (19100) | |
| LTE Band 7: 5 MHz | 2502.5 (20775) | | 2535 (21100) | 2567.5 (21425) | |
| LTE Band 7: 10 MHz | 2505 (20800) | | 2535 (21100) | 2565 (21400) | |
| LTE Band 7: 15 MHz | 2507.5 (20825) | | 2535 (21100) | 2562.5 (21375) | |
| LTE Band 7: 20 MHz | 2510 (20850) | | 2535 (21100) | 2560 (21350) | |
| LTE Band 41: 5 MHz | 2506 (39750) | 2549.5 (40185) | 2593 (40620) | 2636.5 (41055) | 2680 (41490) |
| LTE Band 41: 10 MHz | 2506 (39750) | 2549.5 (40185) | 2593 (40620) | 2636.5 (41055) | 2680 (41490) |
| LTE Band 41: 15 MHz | 2506 (39750) | 2549.5 (40185) | 2593 (40620) | 2636.5 (41055) | 2680 (41490) |
| LTE Band 41: 20 MHz | 2506 (39750) | 2549.5 (40185) | 2593 (40620) | 2636.5 (41055) | 2680 (41490) |
| UE Category | DL UE Cat 13, UL UE Cat 5 | | | | |
| Modulations Supported in UL | QPSK, 16QAM, 64QAM | | | | |
| LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided) | YES | | | | |
| A-MPR (Additional MPR) disabled for SAR Testing? | YES | | | | |
| LTE Carrier Aggregation Possible Combinations | The technical description includes all the possible carrier aggregation combinations | | | | |
| LTE Additional Information | This device does not support full CA features on 3GPP Release 11. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 11 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA. | | | | |

# 3 INTRODUCTION

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

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

## 3.1 SAR Definition

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

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

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

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

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

where:

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

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

# 4 DOSIMETRIC ASSESSMENT

## 4.1 Measurement Procedure

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

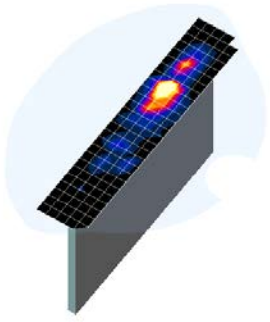

**Figure 4-1**
**Sample SAR Area Scan**

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

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

*Also compliant to IEEE 1528-2013 Table 6

# 5 TEST CONFIGURATION POSITIONS

## 5.1 Device Holder

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

## 5.2 SAR Testing for Tablet per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

## 5.3 Proximity Sensor Considerations

This device uses a power reduction mechanism to reduce output powers in certain use conditions when the device is used close the user's body.

When the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum allowed output power. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, additional evaluation is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional test positions. Sensor triggering distance summary data is included in Appendix G.

The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antennas.

# 6 RF EXPOSURE LIMITS

## 6.1 Uncontrolled Environment

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

## 6.2 Controlled Environment

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

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

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

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

# 7 FCC MEASUREMENT PROCEDURES

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

## 7.1 Measured and Reported SAR

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

## 7.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

## 7.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

## 7.4 SAR Measurement Conditions for UMTS

### 7.4.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

### 7.4.2 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s". The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or $DPDCH_n$, for the highest reported SAR configuration in 12.2 kbps RMC.

### 7.4.3 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

### 7.4.4 SAR Measurements with Rel 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

## 7.5 SAR Measurement Conditions for LTE

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

### 7.5.1 Spectrum Plots for RB Configurations

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

### 7.5.2 MPR

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

### 7.5.3 A-MPR

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

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

According to FCC KDB 941225 D05v02r04:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
    i. The required channel and offset combination with the highest maximum output power is required for SAR.
    ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
    iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

### 7.5.5 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

### 7.5.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

## 7.6 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

### 7.6.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

### 7.6.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg.

### 7.6.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

### 7.6.4 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

### 7.6.5 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

### 7.6.6 Initial Test Configuration Procedure

For OFDM, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 7.6.5).

### 7.6.7 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required.

### 7.6.8 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

# 8 RF CONDUCTED POWERS

## 8.1 UMTS Conducted Powers

**Table 8-1**
**Maximum Conducted Power**

| | Mode | 3GPP 34.121 Subtest | Cellular Band [dBm] | | | AWS Band [dBm] | | | PCS Band [dBm] | | | 3GPP MPR [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4132 | 4183 | 4233 | 1312 | 1412 | 1513 | 9262 | 9400 | 9538 | |
| 99 | WCDMA | 12.2 kbps RMC | 24.90 | 25.16 | 25.20 | 24.69 | 24.66 | 24.63 | 23.70 | 23.60 | 23.62 | - |
| 6 | HSDPA | Subtest 1 | 24.17 | 24.13 | 24.16 | 23.68 | 23.55 | 23.56 | 22.55 | 22.38 | 22.37 | 0 |
| 6 | | Subtest 2 | 24.13 | 24.15 | 24.22 | 23.79 | 23.62 | 23.58 | 22.57 | 22.36 | 22.46 | 0 |
| 6 | | Subtest 3 | 23.71 | 23.58 | 23.78 | 23.32 | 23.11 | 23.09 | 21.98 | 21.82 | 21.80 | 0.5 |
| 6 | | Subtest 4 | 23.65 | 23.61 | 23.71 | 23.30 | 23.13 | 23.08 | 22.01 | 21.78 | 21.76 | 0.5 |
| 6 | HSUPA | Subtest 1 | 24.16 | 24.19 | 24.29 | 23.79 | 23.81 | 23.80 | 22.59 | 22.37 | 22.37 | 0 |
| 6 | | Subtest 2 | 22.21 | 22.25 | 22.34 | 21.74 | 21.78 | 21.83 | 20.60 | 20.40 | 20.42 | 2 |
| 6 | | Subtest 3 | 23.18 | 23.24 | 23.35 | 22.70 | 22.74 | 22.85 | 21.58 | 21.41 | 21.37 | 1 |
| 6 | | Subtest 4 | 22.23 | 22.27 | 22.36 | 21.73 | 21.76 | 21.84 | 20.59 | 20.41 | 20.41 | 2 |
| 6 | | Subtest 5 | 24.21 | 24.26 | 24.35 | 23.73 | 23.87 | 23.85 | 22.61 | 22.41 | 22.40 | 0 |

**Table 8-2**
**Reduced Conducted Power**

| 3GPP Release Version | Mode | 3GPP 34.121 Subtest | Cellular Band [dBm] | | | AWS Band [dBm] | | | PCS Band [dBm] | | | 3GPP MPR [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 4132 | 4183 | 4233 | 1312 | 1412 | 1513 | 9262 | 9400 | 9538 | |
| 99 | WCDMA | 12.2 kbps RMC | 17.98 | 18.04 | 18.12 | 11.70 | 11.58 | 11.66 | 10.70 | 10.69 | 10.65 | - |
| 6 | HSDPA | Subtest 1 | 18.02 | 18.06 | 18.12 | 11.63 | 11.62 | 11.54 | 10.60 | 10.51 | 10.37 | 0 |
| 6 | | Subtest 2 | 18.12 | 18.09 | 18.10 | 11.70 | 11.61 | 11.69 | 10.69 | 10.44 | 10.36 | 0 |
| 6 | | Subtest 3 | 16.52 | 16.24 | 16.35 | 10.08 | 10.02 | 10.00 | 8.98 | 8.78 | 8.72 | 0.5 |
| 6 | | Subtest 4 | 16.54 | 16.42 | 16.54 | 10.02 | 10.00 | 10.23 | 8.96 | 8.81 | 8.70 | 0.5 |
| 6 | HSUPA | Subtest 1 | 17.01 | 17.01 | 17.12 | 11.00 | 10.60 | 10.70 | 10.01 | 9.39 | 9.35 | 0 |
| 6 | | Subtest 2 | 15.04 | 15.09 | 15.16 | 8.61 | 8.62 | 8.73 | 7.60 | 7.48 | 7.36 | 2 |
| 6 | | Subtest 3 | 16.02 | 16.08 | 16.13 | 10.02 | 9.85 | 9.90 | 8.55 | 8.39 | 8.30 | 1 |
| 6 | | Subtest 4 | 15.03 | 15.08 | 15.14 | 8.60 | 8.62 | 8.81 | 7.61 | 7.41 | 7.36 | 2 |
| 6 | | Subtest 5 | 17.03 | 17.08 | 17.15 | 10.62 | 10.65 | 10.75 | 9.59 | 9.30 | 9.35 | 0 |

This device does not support DC-HSDPA.


**Figure 8-1**
**Power Measurement Setup**

## 8.2 LTE Conducted Powers

### 8.2.1 LTE Band 71

**Table 8-3**
**LTE Band 71 Maximum Conducted Powers - 20 MHz Bandwidth**

| LTE Band 71 20 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 24.55 | 0 | 0 |
| | 1 | 50 | 24.82 | | 0 |
| | 1 | 99 | **24.99** | | 0 |
| | 50 | 0 | **23.85** | 0-1 | 1 |
| | 50 | 25 | 23.72 | | 1 |
| | 50 | 50 | 23.72 | | 1 |
| | 100 | 0 | 23.69 | | 1 |
| 16QAM | 1 | 0 | 24.19 | 0-1 | 1 |
| | 1 | 50 | 23.84 | | 1 |
| | 1 | 99 | 23.97 | | 1 |
| | 50 | 0 | 22.84 | 0-2 | 2 |
| | 50 | 25 | 22.71 | | 2 |
| | 50 | 50 | 22.72 | | 2 |
| | 100 | 0 | 22.83 | | 2 |
| 64QAM | 1 | 0 | 23.07 | 0-2 | 2 |
| | 1 | 50 | 22.64 | | 2 |
| | 1 | 99 | 23.00 | | 2 |
| | 50 | 0 | 21.72 | 0-3 | 3 |
| | 50 | 25 | 21.56 | | 3 |
| | 50 | 50 | 21.71 | | 3 |
| | 100 | 0 | 21.70 | | 3 |

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-4**
**LTE Band 71 Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 71<br>15 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**133297 (680.5 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 24.92 | 0 | 0 |
| | 1 | 36 | 24.65 | | 0 |
| | 1 | 74 | 24.82 | | 0 |
| | 36 | 0 | 23.60 | 0-1 | 1 |
| | 36 | 18 | 23.53 | | 1 |
| | 36 | 37 | 23.50 | | 1 |
| | 75 | 0 | 23.55 | | 1 |
| 16QAM | 1 | 0 | 23.72 | 0-1 | 1 |
| | 1 | 36 | 23.49 | | 1 |
| | 1 | 74 | 23.62 | | 1 |
| | 36 | 0 | 22.63 | 0-2 | 2 |
| | 36 | 18 | 22.52 | | 2 |
| | 36 | 37 | 22.48 | | 2 |
| | 75 | 0 | 22.58 | | 2 |
| 64QAM | 1 | 0 | 23.08 | 0-2 | 2 |
| | 1 | 36 | 23.11 | | 2 |
| | 1 | 74 | 22.98 | | 2 |
| | 36 | 0 | 21.61 | 0-3 | 3 |
| | 36 | 18 | 21.53 | | 3 |
| | 36 | 37 | 21.57 | | 3 |
| | 75 | 0 | 21.48 | | 3 |

Note: LTE Band 71 at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-5
## LTE Band 71 Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 71 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 133172 (668.0 MHz) | Mid Channel 133297 (680.5 MHz) | High Channel 133422 (693.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.92 | 24.87 | 24.87 | 0 | 0 |
| | 1 | 25 | 25.11 | 25.05 | 24.92 | | 0 |
| | 1 | 49 | 24.72 | 24.91 | 24.77 | | 0 |
| | 25 | 0 | 23.83 | 23.87 | 23.80 | 0-1 | 1 |
| | 25 | 12 | 23.89 | 23.83 | 23.79 | | 1 |
| | 25 | 25 | 23.86 | 23.78 | 23.70 | | 1 |
| | 50 | 0 | 23.90 | 23.80 | 23.75 | | 1 |
| 16QAM | 1 | 0 | 23.69 | 23.77 | 23.64 | 0-1 | 1 |
| | 1 | 25 | 23.65 | 23.71 | 23.81 | | 1 |
| | 1 | 49 | 23.38 | 23.88 | 23.56 | | 1 |
| | 25 | 0 | 22.81 | 22.86 | 22.79 | 0-2 | 2 |
| | 25 | 12 | 22.88 | 22.86 | 22.78 | | 2 |
| | 25 | 25 | 22.81 | 22.74 | 22.73 | | 2 |
| | 50 | 0 | 22.88 | 22.76 | 22.73 | | 2 |
| 64QAM | 1 | 0 | 22.83 | 22.89 | 22.84 | 0-2 | 2 |
| | 1 | 25 | 23.10 | 22.84 | 22.72 | | 2 |
| | 1 | 49 | 22.73 | 22.73 | 22.81 | | 2 |
| | 25 | 0 | 21.93 | 21.96 | 21.81 | 0-3 | 3 |
| | 25 | 12 | 21.93 | 21.92 | 21.77 | | 3 |
| | 25 | 25 | 21.94 | 21.82 | 21.69 | | 3 |
| | 50 | 0 | 21.89 | 21.81 | 21.74 | | 3 |

## Table 8-6
## LTE Band 71 Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 71 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 133147 (665.5 MHz) | Mid Channel 133297 (680.5 MHz) | High Channel 133447 (695.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.96 | 24.98 | 24.58 | 0 | 0 |
| | 1 | 12 | 25.07 | 24.92 | 24.66 | | 0 |
| | 1 | 24 | 25.08 | 24.89 | 24.65 | | 0 |
| | 12 | 0 | 23.73 | 23.68 | 23.67 | 0-1 | 1 |
| | 12 | 6 | 23.74 | 23.79 | 23.66 | | 1 |
| | 12 | 13 | 23.71 | 23.75 | 23.71 | | 1 |
| | 25 | 0 | 23.68 | 23.66 | 23.62 | | 1 |
| 16QAM | 1 | 0 | 23.27 | 23.62 | 23.18 | 0-1 | 1 |
| | 1 | 12 | 23.42 | 23.66 | 23.35 | | 1 |
| | 1 | 24 | 23.37 | 23.59 | 23.24 | | 1 |
| | 12 | 0 | 22.73 | 22.74 | 22.62 | 0-2 | 2 |
| | 12 | 6 | 22.85 | 22.81 | 22.70 | | 2 |
| | 12 | 13 | 22.71 | 22.80 | 22.71 | | 2 |
| | 25 | 0 | 22.71 | 22.69 | 22.63 | | 2 |
| 64QAM | 1 | 0 | 23.17 | 23.00 | 22.76 | 0-2 | 2 |
| | 1 | 12 | 23.17 | 23.09 | 22.91 | | 2 |
| | 1 | 24 | 23.19 | 22.88 | 22.86 | | 2 |
| | 12 | 0 | 21.74 | 21.66 | 21.60 | 0-3 | 3 |
| | 12 | 6 | 21.75 | 21.86 | 21.65 | | 3 |
| | 12 | 13 | 21.77 | 21.81 | 21.65 | | 3 |
| | 25 | 0 | 21.63 | 21.72 | 21.57 | | 3 |

**Table 8-7**
**LTE Band 71 Reduced Conducted Powers - 20 MHz Bandwidth**

| LTE Band 71<br>20 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Mid Channel<br>133297<br>(680.5 MHz)<br>Conducted Power [dBm] | MPR Allowed per 3GPP [dB] | MPR [dB] |
| QPSK | 1 | 0 | **17.52** | 0 | 0 |
| | 1 | 50 | 17.00 | | 0 |
| | 1 | 99 | 17.32 | | 0 |
| | 50 | 0 | **17.25** | 0-1 | 0 |
| | 50 | 25 | 17.05 | | 0 |
| | 50 | 50 | 17.16 | | 0 |
| | 100 | 0 | 17.22 | | 0 |
| 16QAM | 1 | 0 | 17.70 | 0-1 | 0 |
| | 1 | 50 | 17.19 | | 0 |
| | 1 | 99 | 17.44 | | 0 |
| | 50 | 0 | 17.18 | 0-2 | 0 |
| | 50 | 25 | 17.04 | | 0 |
| | 50 | 50 | 17.07 | | 0 |
| | 100 | 0 | 17.18 | | 0 |
| 64QAM | 1 | 0 | 17.70 | 0-2 | 0 |
| | 1 | 50 | 17.45 | | 0 |
| | 1 | 99 | 17.68 | | 0 |
| | 50 | 0 | 17.22 | 0-3 | 0 |
| | 50 | 25 | 17.13 | | 0 |
| | 50 | 50 | 17.21 | | 0 |
| | 100 | 0 | 17.28 | | 0 |

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

**Table 8-8**
**LTE Band 71 Reduced Conducted Powers - 15 MHz Bandwidth**

| LTE Band 71<br>15 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**133297 (680.5 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 17.28 | 0 | 0 |
| | 1 | 36 | 17.07 | | 0 |
| | 1 | 74 | 17.12 | | 0 |
| | 36 | 0 | 17.34 | 0-1 | 0 |
| | 36 | 18 | 17.22 | | 0 |
| | 36 | 37 | 17.25 | | 0 |
| | 75 | 0 | 17.23 | | 0 |
| 16QAM | 1 | 0 | 17.63 | 0-1 | 0 |
| | 1 | 36 | 17.41 | | 0 |
| | 1 | 74 | 17.41 | | 0 |
| | 36 | 0 | 17.31 | 0-2 | 0 |
| | 36 | 18 | 17.18 | | 0 |
| | 36 | 37 | 17.31 | | 0 |
| | 75 | 0 | 17.21 | | 0 |
| 64QAM | 1 | 0 | 17.65 | 0-2 | 0 |
| | 1 | 36 | 17.64 | | 0 |
| | 1 | 74 | 17.50 | | 0 |
| | 36 | 0 | 17.30 | 0-3 | 0 |
| | 36 | 18 | 17.23 | | 0 |
| | 36 | 37 | 17.22 | | 0 |
| | 75 | 0 | 17.12 | | 0 |

Note: LTE Band 71 at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-9
## LTE Band 71 Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 71<br>10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>133172<br>(668.0 MHz) | Mid Channel<br>133297<br>(680.5 MHz) | High Channel<br>133422<br>(693.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.23 | 17.27 | 17.29 | 0 | 0 |
| | 1 | 25 | 17.36 | 17.32 | 17.25 | | 0 |
| | 1 | 49 | 17.13 | 17.19 | 17.10 | | 0 |
| | 25 | 0 | 17.51 | 17.55 | 17.51 | 0-1 | 0 |
| | 25 | 12 | 17.48 | 17.41 | 17.40 | | 0 |
| | 25 | 25 | 17.48 | 17.37 | 17.31 | | 0 |
| | 50 | 0 | 17.56 | 17.43 | 17.33 | | 0 |
| 16QAM | 1 | 0 | 17.39 | 17.45 | 17.66 | 0-1 | 0 |
| | 1 | 25 | 17.54 | 17.27 | 17.69 | | 0 |
| | 1 | 49 | 17.32 | 17.57 | 17.46 | | 0 |
| | 25 | 0 | 17.50 | 17.56 | 17.48 | 0-2 | 0 |
| | 25 | 12 | 17.50 | 17.45 | 17.40 | | 0 |
| | 25 | 25 | 17.46 | 17.36 | 17.36 | | 0 |
| | 50 | 0 | 17.52 | 17.36 | 17.37 | | 0 |
| 64QAM | 1 | 0 | 17.28 | 17.20 | 17.68 | 0-2 | 0 |
| | 1 | 25 | 17.41 | 17.27 | 17.55 | | 0 |
| | 1 | 49 | 17.29 | 17.24 | 17.48 | | 0 |
| | 25 | 0 | 17.63 | 17.62 | 17.46 | 0-3 | 0 |
| | 25 | 12 | 17.60 | 17.48 | 17.40 | | 0 |
| | 25 | 25 | 17.55 | 17.44 | 17.35 | | 0 |
| | 50 | 0 | 17.55 | 17.41 | 17.32 | | 0 |

## Table 8-10
## LTE Band 71 Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 71<br>5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>133147<br>(665.5 MHz) | Mid Channel<br>133297<br>(680.5 MHz) | High Channel<br>133447<br>(695.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.33 | 17.59 | 17.19 | 0 | 0 |
| | 1 | 12 | 17.44 | 17.42 | 17.28 | | 0 |
| | 1 | 24 | 17.39 | 17.40 | 17.19 | | 0 |
| | 12 | 0 | 17.39 | 17.36 | 17.39 | 0-1 | 0 |
| | 12 | 6 | 17.50 | 17.47 | 17.38 | | 0 |
| | 12 | 13 | 17.39 | 17.48 | 17.44 | | 0 |
| | 25 | 0 | 17.41 | 17.36 | 17.34 | | 0 |
| 16QAM | 1 | 0 | 17.46 | 17.67 | 17.38 | 0-1 | 0 |
| | 1 | 12 | 17.47 | 17.59 | 17.49 | | 0 |
| | 1 | 24 | 17.43 | 17.59 | 17.39 | | 0 |
| | 12 | 0 | 17.49 | 17.43 | 17.39 | 0-2 | 0 |
| | 12 | 6 | 17.53 | 17.55 | 17.39 | | 0 |
| | 12 | 13 | 17.47 | 17.54 | 17.39 | | 0 |
| | 25 | 0 | 17.45 | 17.41 | 17.35 | | 0 |
| 64QAM | 1 | 0 | 17.48 | 17.58 | 17.31 | 0-2 | 0 |
| | 1 | 12 | 17.65 | 17.61 | 17.42 | | 0 |
| | 1 | 24 | 17.59 | 17.47 | 17.35 | | 0 |
| | 12 | 0 | 17.46 | 17.38 | 17.35 | 0-3 | 0 |
| | 12 | 6 | 17.51 | 17.51 | 17.40 | | 0 |
| | 12 | 13 | 17.44 | 17.54 | 17.34 | | 0 |
| | 25 | 0 | 17.40 | 17.42 | 17.31 | | 0 |

### 8.2.2 LTE Band 12

**Table 8-11**
**LTE Band 12 Maximum Conducted Powers - 10 MHz Bandwidth**

| LTE Band 12<br>10 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**23095**<br>**(707.5 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | **25.01** | 0 | 0 |
| | 1 | 25 | 24.87 | | 0 |
| | 1 | 49 | 24.97 | | 0 |
| | 25 | 0 | **23.90** | 0-1 | 1 |
| | 25 | 12 | 23.73 | | 1 |
| | 25 | 25 | 23.84 | | 1 |
| | 50 | 0 | 23.89 | | 1 |
| 16QAM | 1 | 0 | 24.00 | 0-1 | 1 |
| | 1 | 25 | 23.88 | | 1 |
| | 1 | 49 | 23.92 | | 1 |
| | 25 | 0 | 22.80 | 0-2 | 2 |
| | 25 | 12 | 22.64 | | 2 |
| | 25 | 25 | 22.77 | | 2 |
| | 50 | 0 | 22.75 | | 2 |
| 64QAM | 1 | 0 | 23.20 | 0-2 | 2 |
| | 1 | 25 | 23.18 | | 2 |
| | 1 | 49 | 23.19 | | 2 |
| | 25 | 0 | 21.81 | 0-3 | 3 |
| | 25 | 12 | 21.70 | | 3 |
| | 25 | 25 | 21.85 | | 3 |
| | 50 | 0 | 21.76 | | 3 |

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-12
## LTE Band 12 Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 12 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 23035 (701.5 MHz) | Mid Channel 23095 (707.5 MHz) | High Channel 23155 (713.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.79 | 24.86 | 24.89 | 0 | 0 |
| | 1 | 12 | 24.77 | 25.03 | 24.95 | | 0 |
| | 1 | 24 | 24.75 | 24.95 | 24.84 | | 0 |
| | 12 | 0 | 23.68 | 23.67 | 23.74 | 0-1 | 1 |
| | 12 | 6 | 23.83 | 23.74 | 23.77 | | 1 |
| | 12 | 13 | 23.76 | 23.83 | 23.75 | | 1 |
| | 25 | 0 | 23.77 | 23.74 | 23.74 | | 1 |
| 16QAM | 1 | 0 | 23.74 | 23.46 | 23.77 | 0-1 | 1 |
| | 1 | 12 | 23.83 | 23.69 | 23.89 | | 1 |
| | 1 | 24 | 23.71 | 23.60 | 23.75 | | 1 |
| | 12 | 0 | 22.73 | 22.72 | 22.75 | 0-2 | 2 |
| | 12 | 6 | 22.83 | 22.79 | 22.81 | | 2 |
| | 12 | 13 | 22.73 | 22.84 | 22.77 | | 2 |
| | 25 | 0 | 22.74 | 22.79 | 22.75 | | 2 |
| 64QAM | 1 | 0 | 22.98 | 23.11 | 22.98 | 0-2 | 2 |
| | 1 | 12 | 22.97 | 22.75 | 23.11 | | 2 |
| | 1 | 24 | 23.12 | 23.19 | 22.97 | | 2 |
| | 12 | 0 | 21.66 | 21.64 | 21.74 | 0-3 | 3 |
| | 12 | 6 | 21.82 | 21.68 | 21.77 | | 3 |
| | 12 | 13 | 21.65 | 21.83 | 21.76 | | 3 |
| | 25 | 0 | 21.70 | 21.78 | 21.81 | | 3 |

## Table 8-13
## LTE Band 12 Maximum Conducted Powers - 3 MHz Bandwidth

| LTE Band 12 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 23025 (700.5 MHz) | Mid Channel 23095 (707.5 MHz) | High Channel 23165 (714.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.80 | 24.77 | 24.83 | 0 | 0 |
| | 1 | 7 | 24.93 | 25.07 | 25.10 | | 0 |
| | 1 | 14 | 24.80 | 24.97 | 24.88 | | 0 |
| | 8 | 0 | 23.81 | 23.68 | 23.75 | 0-1 | 1 |
| | 8 | 4 | 23.76 | 23.80 | 23.82 | | 1 |
| | 8 | 7 | 23.68 | 23.75 | 23.77 | | 1 |
| | 15 | 0 | 23.77 | 23.80 | 23.77 | | 1 |
| 16QAM | 1 | 0 | 23.64 | 23.28 | 23.76 | 0-1 | 1 |
| | 1 | 7 | 23.91 | 23.58 | 24.13 | | 1 |
| | 1 | 14 | 23.69 | 23.37 | 23.76 | | 1 |
| | 8 | 0 | 22.67 | 22.53 | 22.82 | 0-2 | 2 |
| | 8 | 4 | 22.66 | 22.63 | 22.85 | | 2 |
| | 8 | 7 | 22.58 | 22.58 | 22.85 | | 2 |
| | 15 | 0 | 22.77 | 22.75 | 22.93 | | 2 |
| 64QAM | 1 | 0 | 23.01 | 22.62 | 22.67 | 0-2 | 2 |
| | 1 | 7 | 22.98 | 22.97 | 22.83 | | 2 |
| | 1 | 14 | 22.81 | 22.69 | 22.65 | | 2 |
| | 8 | 0 | 21.79 | 21.76 | 21.90 | 0-3 | 3 |
| | 8 | 4 | 21.77 | 21.98 | 22.02 | | 3 |
| | 8 | 7 | 21.63 | 21.87 | 21.96 | | 3 |
| | 15 | 0 | 21.86 | 21.86 | 21.72 | | 3 |

## Table 8-14
## LTE Band 12 Maximum Conducted Powers -1.4 MHz Bandwidth

| LTE Band 12<br>1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>23017<br>(699.7 MHz) | Mid Channel<br>23095<br>(707.5 MHz) | High Channel<br>23173<br>(715.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.87 | 24.73 | 24.96 | 0 | 0 |
| | 1 | 2 | 24.69 | 24.78 | 25.03 | | 0 |
| | 1 | 5 | 24.67 | 24.87 | 25.06 | | 0 |
| | 3 | 0 | 25.07 | 24.76 | 25.02 | | 0 |
| | 3 | 2 | 24.96 | 24.90 | 25.02 | | 0 |
| | 3 | 3 | 24.84 | 24.84 | 24.90 | | 0 |
| | 6 | 0 | 23.85 | 23.57 | 23.62 | 0-1 | 1 |
| 16QAM | 1 | 0 | 23.77 | 23.24 | 23.70 | 0-1 | 1 |
| | 1 | 2 | 23.70 | 23.31 | 23.78 | | 1 |
| | 1 | 5 | 23.67 | 23.33 | 23.82 | | 1 |
| | 3 | 0 | 24.00 | 23.67 | 23.81 | | 1 |
| | 3 | 2 | 23.84 | 23.85 | 23.89 | | 1 |
| | 3 | 3 | 23.71 | 23.83 | 23.84 | | 1 |
| | 6 | 0 | 22.80 | 22.53 | 22.57 | 0-2 | 2 |
| 64QAM | 1 | 0 | 22.74 | 22.65 | 22.52 | 0-2 | 2 |
| | 1 | 2 | 22.79 | 22.69 | 22.49 | | 2 |
| | 1 | 5 | 22.85 | 22.68 | 22.50 | | 2 |
| | 3 | 0 | 22.90 | 22.98 | 23.00 | | 2 |
| | 3 | 2 | 23.04 | 23.12 | 23.04 | | 2 |
| | 3 | 3 | 22.80 | 23.07 | 22.99 | | 2 |
| | 6 | 0 | 21.78 | 21.55 | 21.68 | 0-3 | 3 |

**Table 8-15**
**LTE Band 12 Reduced Conducted Powers - 10 MHz Bandwidth**

| LTE Band 12<br>10 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**23095**<br>**(707.5 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | **16.99** | 0 | 0 |
| | 1 | 25 | 16.81 | | 0 |
| | 1 | 49 | 16.89 | | 0 |
| | 25 | 0 | **17.00** | 0-1 | 0 |
| | 25 | 12 | 16.80 | | 0 |
| | 25 | 25 | 16.93 | | 0 |
| | 50 | 0 | 16.94 | | 0 |
| 16QAM | 1 | 0 | 17.18 | 0-1 | 0 |
| | 1 | 25 | 17.20 | | 0 |
| | 1 | 49 | 17.12 | | 0 |
| | 25 | 0 | 16.90 | 0-2 | 0 |
| | 25 | 12 | 16.76 | | 0 |
| | 25 | 25 | 16.88 | | 0 |
| | 50 | 0 | 16.90 | | 0 |
| 64QAM | 1 | 0 | 17.06 | 0-2 | 0 |
| | 1 | 25 | 16.88 | | 0 |
| | 1 | 49 | 17.00 | | 0 |
| | 25 | 0 | 16.93 | 0-3 | 0 |
| | 25 | 12 | 16.80 | | 0 |
| | 25 | 25 | 16.94 | | 0 |
| | 50 | 0 | 16.94 | | 0 |

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-16
## LTE Band 12 Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 12<br>5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>23035<br>(701.5 MHz) | Mid Channel<br>23095<br>(707.5 MHz) | High Channel<br>23155<br>(713.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 16.95 | 16.90 | 16.90 | 0 | 0 |
| | 1 | 12 | 16.83 | 16.91 | 16.92 | | 0 |
| | 1 | 24 | 16.85 | 16.76 | 16.76 | | 0 |
| | 12 | 0 | 16.79 | 16.76 | 16.88 | 0-1 | 0 |
| | 12 | 6 | 17.00 | 16.82 | 16.86 | | 0 |
| | 12 | 13 | 16.83 | 16.90 | 16.90 | | 0 |
| | 25 | 0 | 16.83 | 16.82 | 16.83 | | 0 |
| 16QAM | 1 | 0 | 17.15 | 17.00 | 17.15 | 0-1 | 0 |
| | 1 | 12 | 17.05 | 17.17 | 17.19 | | 0 |
| | 1 | 24 | 17.00 | 17.00 | 17.07 | | 0 |
| | 12 | 0 | 16.93 | 16.88 | 17.00 | 0-2 | 0 |
| | 12 | 6 | 17.06 | 16.98 | 17.01 | | 0 |
| | 12 | 13 | 16.98 | 17.03 | 16.99 | | 0 |
| | 25 | 0 | 16.88 | 16.94 | 16.94 | | 0 |
| 64QAM | 1 | 0 | 17.17 | 17.03 | 17.16 | 0-2 | 0 |
| | 1 | 12 | 17.09 | 17.13 | 17.13 | | 0 |
| | 1 | 24 | 17.15 | 17.05 | 17.08 | | 0 |
| | 12 | 0 | 16.88 | 16.86 | 16.96 | 0-3 | 0 |
| | 12 | 6 | 17.05 | 16.96 | 17.03 | | 0 |
| | 12 | 13 | 16.91 | 16.99 | 16.97 | | 0 |
| | 25 | 0 | 16.91 | 16.98 | 16.97 | | 0 |

## Table 8-17
## LTE Band 12 Reduced Conducted Powers - 3 MHz Bandwidth

| LTE Band 12<br>3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>23025<br>(700.5 MHz) | Mid Channel<br>23095<br>(707.5 MHz) | High Channel<br>23165<br>(714.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 16.88 | 16.77 | 16.89 | 0 | 0 |
| | 1 | 7 | 16.89 | 16.88 | 17.02 | | 0 |
| | 1 | 14 | 16.91 | 16.80 | 16.86 | | 0 |
| | 8 | 0 | 16.93 | 16.78 | 16.93 | 0-1 | 0 |
| | 8 | 4 | 16.86 | 16.92 | 16.92 | | 0 |
| | 8 | 7 | 16.85 | 16.82 | 16.87 | | 0 |
| | 15 | 0 | 16.96 | 16.88 | 16.85 | | 0 |
| 16QAM | 1 | 0 | 17.09 | 16.86 | 16.93 | 0-1 | 0 |
| | 1 | 7 | 17.20 | 17.20 | 17.19 | | 0 |
| | 1 | 14 | 17.06 | 17.13 | 17.18 | | 0 |
| | 8 | 0 | 16.93 | 16.95 | 16.96 | 0-2 | 0 |
| | 8 | 4 | 16.86 | 17.03 | 17.05 | | 0 |
| | 8 | 7 | 16.83 | 16.95 | 16.97 | | 0 |
| | 15 | 0 | 16.92 | 16.98 | 16.96 | | 0 |
| 64QAM | 1 | 0 | 17.10 | 16.96 | 17.10 | 0-2 | 0 |
| | 1 | 7 | 17.20 | 17.19 | 17.18 | | 0 |
| | 1 | 14 | 17.11 | 17.13 | 17.20 | | 0 |
| | 8 | 0 | 17.00 | 16.92 | 16.99 | 0-3 | 0 |
| | 8 | 4 | 16.93 | 17.05 | 17.10 | | 0 |
| | 8 | 7 | 16.90 | 16.97 | 17.05 | | 0 |
| | 15 | 0 | 16.88 | 16.97 | 16.96 | | 0 |

## Table 8-18
## LTE Band 12 Reduced Conducted Powers -1.4 MHz Bandwidth

| LTE Band 12<br>1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>23017<br>(699.7 MHz) | Mid Channel<br>23095<br>(707.5 MHz) | High Channel<br>23173<br>(715.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 16.94 | 16.68 | 16.80 | 0 | 0 |
| | 1 | 2 | 17.16 | 16.69 | 16.81 | | 0 |
| | 1 | 5 | 16.82 | 16.69 | 16.88 | | 0 |
| | 3 | 0 | 16.94 | 16.69 | 16.84 | | 0 |
| | 3 | 2 | 16.89 | 16.81 | 16.90 | | 0 |
| | 3 | 3 | 16.73 | 16.75 | 16.80 | | 0 |
| | 6 | 0 | 16.94 | 16.71 | 16.82 | 0-1 | 0 |
| 16QAM | 1 | 0 | 17.12 | 16.95 | 17.05 | 0-1 | 0 |
| | 1 | 2 | 17.18 | 16.94 | 17.10 | | 0 |
| | 1 | 5 | 17.03 | 16.98 | 17.13 | | 0 |
| | 3 | 0 | 17.08 | 16.83 | 16.96 | | 0 |
| | 3 | 2 | 17.06 | 17.00 | 17.06 | | 0 |
| | 3 | 3 | 16.95 | 16.93 | 17.00 | | 0 |
| | 6 | 0 | 16.96 | 16.79 | 16.87 | 0-2 | 0 |
| 64QAM | 1 | 0 | 17.11 | 16.96 | 17.11 | 0-2 | 0 |
| | 1 | 2 | 17.11 | 17.05 | 17.16 | | 0 |
| | 1 | 5 | 17.05 | 17.00 | 17.18 | | 0 |
| | 3 | 0 | 17.14 | 16.84 | 17.10 | | 0 |
| | 3 | 2 | 17.05 | 17.00 | 17.19 | | 0 |
| | 3 | 3 | 16.95 | 16.95 | 17.20 | | 0 |
| | 6 | 0 | 16.94 | 16.79 | 16.92 | 0-3 | 0 |

### 8.2.3 LTE Band 13

**Table 8-19**
**LTE Band 13 Maximum Conducted Powers - 10 MHz Bandwidth**

| LTE Band 13<br>10 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**23230**<br>**(782.0 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | **25.10** | 0 | 0 |
| | 1 | 25 | 24.92 | | 0 |
| | 1 | 49 | 24.87 | | 0 |
| | 25 | 0 | **23.90** | 0-1 | 1 |
| | 25 | 12 | 23.86 | | 1 |
| | 25 | 25 | 23.84 | | 1 |
| | 50 | 0 | 23.88 | | 1 |
| 16QAM | 1 | 0 | 23.41 | 0-1 | 1 |
| | 1 | 25 | 24.10 | | 1 |
| | 1 | 49 | 24.16 | | 1 |
| | 25 | 0 | 22.82 | 0-2 | 2 |
| | 25 | 12 | 22.81 | | 2 |
| | 25 | 25 | 22.78 | | 2 |
| | 50 | 0 | 22.98 | | 2 |
| 64QAM | 1 | 0 | 23.11 | 0-2 | 2 |
| | 1 | 25 | 22.85 | | 2 |
| | 1 | 49 | 22.95 | | 2 |
| | 25 | 0 | 21.98 | 0-3 | 3 |
| | 25 | 12 | 21.90 | | 3 |
| | 25 | 25 | 21.87 | | 3 |
| | 50 | 0 | 21.88 | | 3 |

**Table 8-20**
**LTE Band 13 Maximum Conducted Powers - 5 MHz Bandwidth**

| LTE Band 13<br>5 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**23230 (782.0 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 24.77 | 0 | 0 |
| | 1 | 12 | 24.75 | | 0 |
| | 1 | 24 | 24.72 | | 0 |
| | 12 | 0 | 23.79 | 0-1 | 1 |
| | 12 | 6 | 23.74 | | 1 |
| | 12 | 13 | 23.78 | | 1 |
| | 25 | 0 | 23.84 | | 1 |
| 16QAM | 1 | 0 | 23.73 | 0-1 | 1 |
| | 1 | 12 | 23.73 | | 1 |
| | 1 | 24 | 23.67 | | 1 |
| | 12 | 0 | 22.79 | 0-2 | 2 |
| | 12 | 6 | 22.83 | | 2 |
| | 12 | 13 | 22.80 | | 2 |
| | 25 | 0 | 22.80 | | 2 |
| 64QAM | 1 | 0 | 23.01 | 0-2 | 2 |
| | 1 | 12 | 23.11 | | 2 |
| | 1 | 24 | 22.98 | | 2 |
| | 12 | 0 | 21.78 | 0-3 | 3 |
| | 12 | 6 | 21.78 | | 3 |
| | 12 | 13 | 21.78 | | 3 |
| | 25 | 0 | 21.82 | | 3 |

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

**Table 8-21**
**LTE Band 13 Reduced Conducted Powers - 10 MHz Bandwidth**

| LTE Band 13<br>10 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Mid Channel<br>23230<br>(782.0 MHz)<br>Conducted Power [dBm] | MPR Allowed per 3GPP [dB] | MPR [dB] |
| QPSK | 1 | 0 | **17.20** | 0 | 0 |
| | 1 | 25 | 16.95 | | 0 |
| | 1 | 49 | 17.00 | | 0 |
| | 25 | 0 | **17.18** | 0-1 | 0 |
| | 25 | 12 | 17.09 | | 0 |
| | 25 | 25 | 17.00 | | 0 |
| | 50 | 0 | 17.17 | | 0 |
| 16QAM | 1 | 0 | 17.19 | 0-1 | 0 |
| | 1 | 25 | 17.13 | | 0 |
| | 1 | 49 | 17.20 | | 0 |
| | 25 | 0 | 17.10 | 0-2 | 0 |
| | 25 | 12 | 17.04 | | 0 |
| | 25 | 25 | 16.97 | | 0 |
| | 50 | 0 | 17.20 | | 0 |
| 64QAM | 1 | 0 | 17.16 | 0-2 | 0 |
| | 1 | 25 | 17.10 | | 0 |
| | 1 | 49 | 17.06 | | 0 |
| | 25 | 0 | 17.04 | 0-3 | 0 |
| | 25 | 12 | 16.92 | | 0 |
| | 25 | 25 | 16.83 | | 0 |
| | 50 | 0 | 17.04 | | 0 |

**Table 8-22**
**LTE Band 13 Reduced Conducted Powers - 5 MHz Bandwidth**

| LTE Band 13<br>5 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel**<br>**23230 (782.0 MHz)**<br>**Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 16.82 | 0 | 0 |
| | 1 | 12 | 16.83 | | 0 |
| | 1 | 24 | 16.69 | | 0 |
| | 12 | 0 | 16.91 | 0-1 | 0 |
| | 12 | 6 | 16.86 | | 0 |
| | 12 | 13 | 16.88 | | 0 |
| | 25 | 0 | 16.88 | | 0 |
| 16QAM | 1 | 0 | 17.12 | 0-1 | 0 |
| | 1 | 12 | 17.06 | | 0 |
| | 1 | 24 | 16.90 | | 0 |
| | 12 | 0 | 16.90 | 0-2 | 0 |
| | 12 | 6 | 16.91 | | 0 |
| | 12 | 13 | 16.89 | | 0 |
| | 25 | 0 | 16.92 | | 0 |
| 64QAM | 1 | 0 | 17.05 | 0-2 | 0 |
| | 1 | 12 | 17.07 | | 0 |
| | 1 | 24 | 17.00 | | 0 |
| | 12 | 0 | 16.92 | 0-3 | 0 |
| | 12 | 6 | 16.90 | | 0 |
| | 12 | 13 | 16.90 | | 0 |
| | 25 | 0 | 16.88 | | 0 |

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

### 8.2.4 LTE Band 26 (Cell)

**Table 8-23**
**LTE Band 26 (Cell) Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 26 (Cell) 15 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Mid Channel 26865 (831.5 MHz) Conducted Power [dBm] | MPR Allowed per 3GPP [dB] | MPR [dB] |
| QPSK | 1 | 0 | 24.99 | 0 | 0 |
| | 1 | 36 | 25.14 | | 0 |
| | 1 | 74 | **25.20** | | 0 |
| | 36 | 0 | **24.17** | 0-1 | 1 |
| | 36 | 18 | 24.07 | | 1 |
| | 36 | 37 | 24.02 | | 1 |
| | 75 | 0 | 23.96 | | 1 |
| 16QAM | 1 | 0 | 23.99 | 0-1 | 1 |
| | 1 | 36 | 24.17 | | 1 |
| | 1 | 74 | 24.19 | | 1 |
| | 36 | 0 | 23.20 | 0-2 | 2 |
| | 36 | 18 | 23.10 | | 2 |
| | 36 | 37 | 23.07 | | 2 |
| | 75 | 0 | 23.02 | | 2 |
| 64QAM | 1 | 0 | 23.02 | 0-2 | 2 |
| | 1 | 36 | 23.00 | | 2 |
| | 1 | 74 | 23.20 | | 2 |
| | 36 | 0 | 21.90 | 0-3 | 3 |
| | 36 | 18 | 21.91 | | 3 |
| | 36 | 37 | 21.90 | | 3 |
| | 75 | 0 | 21.82 | | 3 |

Note: LTE Band 26 (Cell) at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-24
## LTE Band 26 (Cell) Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 26 (Cell) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26740 (819.0 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 26990 (844.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.97 | 25.03 | 25.05 | 0 | 0 |
| | 1 | 25 | 24.78 | 24.75 | 24.82 | | 0 |
| | 1 | 49 | 25.01 | 25.00 | 25.02 | | 0 |
| | 25 | 0 | 23.85 | 23.85 | 23.88 | 0-1 | 1 |
| | 25 | 12 | 23.70 | 23.75 | 23.84 | | 1 |
| | 25 | 25 | 23.70 | 23.78 | 23.78 | | 1 |
| | 50 | 0 | 23.75 | 23.80 | 23.90 | | 1 |
| 16QAM | 1 | 0 | 23.85 | 23.98 | 23.99 | 0-1 | 1 |
| | 1 | 25 | 23.76 | 23.67 | 23.69 | | 1 |
| | 1 | 49 | 23.95 | 23.93 | 23.88 | | 1 |
| | 25 | 0 | 22.75 | 22.85 | 22.81 | 0-2 | 2 |
| | 25 | 12 | 22.70 | 22.70 | 22.82 | | 2 |
| | 25 | 25 | 22.70 | 22.75 | 22.82 | | 2 |
| | 50 | 0 | 22.75 | 22.80 | 22.84 | | 2 |
| 64QAM | 1 | 0 | 23.17 | 23.12 | 23.20 | 0-2 | 2 |
| | 1 | 25 | 23.10 | 23.03 | 23.05 | | 2 |
| | 1 | 49 | 23.12 | 23.20 | 23.18 | | 2 |
| | 25 | 0 | 21.81 | 21.88 | 21.90 | 0-3 | 3 |
| | 25 | 12 | 21.76 | 21.75 | 21.88 | | 3 |
| | 25 | 25 | 21.75 | 21.82 | 21.85 | | 3 |
| | 50 | 0 | 21.75 | 21.84 | 21.86 | | 3 |

## Table 8-25
## LTE Band 26 (Cell) Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 26 (Cell) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26715 (816.5 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27015 (846.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 25.00 | 24.95 | 25.00 | 0 | 0 |
| | 1 | 12 | 24.95 | 24.80 | 24.99 | | 0 |
| | 1 | 24 | 24.95 | 24.80 | 25.00 | | 0 |
| | 12 | 0 | 23.91 | 23.65 | 23.88 | 0-1 | 1 |
| | 12 | 6 | 23.91 | 23.73 | 23.88 | | 1 |
| | 12 | 13 | 23.83 | 23.71 | 23.79 | | 1 |
| | 25 | 0 | 23.85 | 23.70 | 23.82 | | 1 |
| 16QAM | 1 | 0 | 23.65 | 23.85 | 23.91 | 0-1 | 1 |
| | 1 | 12 | 23.65 | 23.80 | 24.00 | | 1 |
| | 1 | 24 | 23.65 | 23.75 | 23.80 | | 1 |
| | 12 | 0 | 22.69 | 22.73 | 22.91 | 0-2 | 2 |
| | 12 | 6 | 22.75 | 22.86 | 22.91 | | 2 |
| | 12 | 13 | 22.85 | 22.77 | 22.85 | | 2 |
| | 25 | 0 | 22.86 | 22.73 | 22.89 | | 2 |
| 64QAM | 1 | 0 | 22.92 | 23.15 | 23.19 | 0-2 | 2 |
| | 1 | 12 | 22.94 | 23.07 | 23.20 | | 2 |
| | 1 | 24 | 22.95 | 23.10 | 23.14 | | 2 |
| | 12 | 0 | 21.71 | 21.67 | 21.95 | 0-3 | 3 |
| | 12 | 6 | 21.70 | 21.80 | 21.98 | | 3 |
| | 12 | 13 | 21.65 | 21.76 | 21.86 | | 3 |
| | 25 | 0 | 21.58 | 21.75 | 21.94 | | 3 |

## Table 8-26
## LTE Band 26 (Cell) Maximum Conducted Powers - 3 MHz Bandwidth

| LTE Band 26 (Cell) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26705 (815.5 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27025 (847.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.98 | 24.92 | 24.96 | 0 | 0 |
| | 1 | 7 | 24.98 | 24.90 | 25.11 | | 0 |
| | 1 | 14 | 25.00 | 24.93 | 25.07 | | 0 |
| | 8 | 0 | 23.88 | 23.71 | 23.90 | 0-1 | 1 |
| | 8 | 4 | 23.91 | 23.76 | 23.91 | | 1 |
| | 8 | 7 | 23.87 | 23.76 | 23.88 | | 1 |
| | 15 | 0 | 23.88 | 23.70 | 23.86 | | 1 |
| 16QAM | 1 | 0 | 23.66 | 23.85 | 24.00 | 0-1 | 1 |
| | 1 | 7 | 23.75 | 23.95 | 24.00 | | 1 |
| | 1 | 14 | 23.70 | 23.75 | 23.91 | | 1 |
| | 8 | 0 | 22.73 | 22.75 | 22.92 | 0-2 | 2 |
| | 8 | 4 | 22.78 | 22.73 | 22.83 | | 2 |
| | 8 | 7 | 22.65 | 22.76 | 22.83 | | 2 |
| | 15 | 0 | 22.68 | 22.73 | 22.78 | | 2 |
| 64QAM | 1 | 0 | 22.95 | 23.13 | 23.11 | 0-2 | 2 |
| | 1 | 7 | 23.00 | 23.20 | 23.20 | | 2 |
| | 1 | 14 | 22.95 | 23.18 | 23.08 | | 2 |
| | 8 | 0 | 21.71 | 21.82 | 21.84 | 0-3 | 3 |
| | 8 | 4 | 21.80 | 21.84 | 21.88 | | 3 |
| | 8 | 7 | 21.71 | 21.85 | 21.83 | | 3 |
| | 15 | 0 | 21.66 | 21.75 | 21.80 | | 3 |

## Table 8-27
## LTE Band 26 (Cell) Maximum Conducted Powers -1.4 MHz Bandwidth

| LTE Band 26 (Cell) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26697 (814.7 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27033 (848.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.87 | 25.00 | 24.97 | 0 | 0 |
| | 1 | 2 | 24.90 | 24.96 | 24.94 | | 0 |
| | 1 | 5 | 24.88 | 24.90 | 24.99 | | 0 |
| | 3 | 0 | 24.90 | 24.90 | 24.92 | | 0 |
| | 3 | 2 | 25.00 | 24.95 | 24.97 | | 0 |
| | 3 | 3 | 24.88 | 24.88 | 24.94 | | 0 |
| | 6 | 0 | 23.75 | 23.70 | 23.82 | 0-1 | 1 |
| 16QAM | 1 | 0 | 23.83 | 23.95 | 23.89 | 0-1 | 1 |
| | 1 | 2 | 23.87 | 23.96 | 23.95 | | 1 |
| | 1 | 5 | 23.76 | 23.88 | 23.87 | | 1 |
| | 3 | 0 | 23.72 | 23.76 | 23.88 | | 1 |
| | 3 | 2 | 23.88 | 23.80 | 23.87 | | 1 |
| | 3 | 3 | 23.74 | 23.75 | 23.88 | | 1 |
| | 6 | 0 | 22.81 | 22.79 | 22.90 | 0-2 | 2 |
| 64QAM | 1 | 0 | 23.10 | 23.10 | 23.15 | 0-2 | 2 |
| | 1 | 2 | 23.16 | 23.20 | 23.12 | | 2 |
| | 1 | 5 | 23.10 | 23.20 | 23.16 | | 2 |
| | 3 | 0 | 23.17 | 23.09 | 23.19 | | 2 |
| | 3 | 2 | 23.20 | 23.10 | 23.19 | | 2 |
| | 3 | 3 | 23.15 | 23.07 | 23.15 | | 2 |
| | 6 | 0 | 21.76 | 21.70 | 21.80 | 0-3 | 3 |

**Table 8-28**
**LTE Band 26 (Cell) Reduced Conducted Powers - 15 MHz Bandwidth**

| LTE Band 26 (Cell) 15 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Modulation** | **RB Size** | **RB Offset** | **Mid Channel 26865 (831.5 MHz) Conducted Power [dBm]** | **MPR Allowed per 3GPP [dB]** | **MPR [dB]** |
| QPSK | 1 | 0 | 18.12 | 0 | 0 |
| | 1 | 36 | 17.96 | | 0 |
| | 1 | 74 | **18.13** | | 0 |
| | 36 | 0 | **18.12** | 0-1 | 0 |
| | 36 | 18 | 18.01 | | 0 |
| | 36 | 37 | 18.08 | | 0 |
| | 75 | 0 | 18.04 | | 0 |
| 16QAM | 1 | 0 | 18.17 | 0-1 | 0 |
| | 1 | 36 | 18.19 | | 0 |
| | 1 | 74 | 18.20 | | 0 |
| | 36 | 0 | 18.08 | 0-2 | 0 |
| | 36 | 18 | 18.01 | | 0 |
| | 36 | 37 | 18.02 | | 0 |
| | 75 | 0 | 18.00 | | 0 |
| 64QAM | 1 | 0 | 17.98 | 0-2 | 0 |
| | 1 | 36 | 17.81 | | 0 |
| | 1 | 74 | 18.10 | | 0 |
| | 36 | 0 | 17.94 | 0-3 | 0 |
| | 36 | 18 | 17.91 | | 0 |
| | 36 | 37 | 17.92 | | 0 |
| | 75 | 0 | 17.87 | | 0 |

Note: LTE Band 26 (Cell) at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

## Table 8-29
## LTE Band 26 (Cell) Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 26 (Cell) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26740 (819.0 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 26990 (844.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.89 | 17.90 | 18.00 | 0 | 0 |
| | 1 | 25 | 17.70 | 17.63 | 17.75 | | 0 |
| | 1 | 49 | 17.90 | 17.94 | 17.86 | | 0 |
| | 25 | 0 | 17.90 | 17.94 | 18.05 | 0-1 | 0 |
| | 25 | 12 | 17.88 | 17.85 | 17.98 | | 0 |
| | 25 | 25 | 17.91 | 17.88 | 17.92 | | 0 |
| | 50 | 0 | 17.90 | 17.93 | 18.01 | | 0 |
| 16QAM | 1 | 0 | 18.10 | 18.10 | 18.20 | 0-1 | 0 |
| | 1 | 25 | 17.90 | 17.85 | 18.04 | | 0 |
| | 1 | 49 | 18.17 | 17.90 | 18.10 | | 0 |
| | 25 | 0 | 17.90 | 18.17 | 17.97 | 0-2 | 0 |
| | 25 | 12 | 17.82 | 17.90 | 17.95 | | 0 |
| | 25 | 25 | 17.86 | 17.83 | 17.96 | | 0 |
| | 50 | 0 | 17.85 | 17.86 | 18.01 | | 0 |
| 64QAM | 1 | 0 | 18.10 | 17.90 | 18.20 | 0-2 | 0 |
| | 1 | 25 | 18.00 | 17.91 | 18.04 | | 0 |
| | 1 | 49 | 18.20 | 18.17 | 18.10 | | 0 |
| | 25 | 0 | 17.96 | 17.94 | 18.01 | 0-3 | 0 |
| | 25 | 12 | 17.88 | 17.86 | 17.99 | | 0 |
| | 25 | 25 | 17.88 | 17.92 | 17.97 | | 0 |
| | 50 | 0 | 17.88 | 17.92 | 17.99 | | 0 |

## Table 8-30
## LTE Band 26 (Cell) Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 26 (Cell) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26715 (816.5 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27015 (846.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.78 | 18.05 | 18.17 | 0 | 0 |
| | 1 | 12 | 17.80 | 18.00 | 18.10 | | 0 |
| | 1 | 24 | 17.78 | 17.95 | 17.98 | | 0 |
| | 12 | 0 | 17.88 | 18.00 | 18.16 | 0-1 | 0 |
| | 12 | 6 | 17.86 | 18.05 | 18.15 | | 0 |
| | 12 | 13 | 17.86 | 18.05 | 18.08 | | 0 |
| | 25 | 0 | 17.80 | 18.05 | 18.14 | | 0 |
| 16QAM | 1 | 0 | 18.00 | 18.18 | 18.20 | 0-1 | 0 |
| | 1 | 12 | 18.03 | 18.20 | 18.17 | | 0 |
| | 1 | 24 | 18.06 | 18.18 | 18.17 | | 0 |
| | 12 | 0 | 17.96 | 18.02 | 18.20 | 0-2 | 0 |
| | 12 | 6 | 17.93 | 18.14 | 18.19 | | 0 |
| | 12 | 13 | 17.93 | 18.07 | 18.11 | | 0 |
| | 25 | 0 | 17.80 | 18.00 | 18.20 | | 0 |
| 64QAM | 1 | 0 | 17.94 | 18.20 | 18.19 | 0-2 | 0 |
| | 1 | 12 | 18.02 | 18.18 | 18.20 | | 0 |
| | 1 | 24 | 17.95 | 18.15 | 18.20 | | 0 |
| | 12 | 0 | 17.86 | 18.00 | 18.16 | 0-3 | 0 |
| | 12 | 6 | 17.86 | 18.11 | 18.12 | | 0 |
| | 12 | 13 | 17.85 | 18.10 | 18.13 | | 0 |
| | 25 | 0 | 17.83 | 18.06 | 18.16 | | 0 |

## Table 8-31
## LTE Band 26 (Cell) Reduced Conducted Powers - 3 MHz Bandwidth

| LTE Band 26 (Cell) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26705 (815.5 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27025 (847.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.89 | 17.92 | 18.08 | 0 | 0 |
| | 1 | 7 | 17.97 | 17.95 | 18.11 | | 0 |
| | 1 | 14 | 17.91 | 17.90 | 18.00 | | 0 |
| | 8 | 0 | 17.97 | 18.00 | 18.08 | 0-1 | 0 |
| | 8 | 4 | 18.04 | 17.96 | 18.11 | | 0 |
| | 8 | 7 | 17.91 | 18.00 | 18.03 | | 0 |
| | 15 | 0 | 17.92 | 17.95 | 18.06 | | 0 |
| 16QAM | 1 | 0 | 18.01 | 18.15 | 18.20 | 0-1 | 0 |
| | 1 | 7 | 18.17 | 18.20 | 18.20 | | 0 |
| | 1 | 14 | 18.11 | 18.11 | 18.19 | | 0 |
| | 8 | 0 | 18.00 | 18.00 | 18.15 | 0-2 | 0 |
| | 8 | 4 | 18.08 | 17.97 | 18.12 | | 0 |
| | 8 | 7 | 18.00 | 18.01 | 18.16 | | 0 |
| | 15 | 0 | 17.97 | 17.95 | 18.10 | | 0 |
| 64QAM | 1 | 0 | 18.05 | 18.10 | 18.20 | 0-2 | 0 |
| | 1 | 7 | 18.18 | 18.20 | 18.20 | | 0 |
| | 1 | 14 | 18.05 | 18.05 | 18.19 | | 0 |
| | 8 | 0 | 17.96 | 18.00 | 18.12 | 0-3 | 0 |
| | 8 | 4 | 18.07 | 18.00 | 18.18 | | 0 |
| | 8 | 7 | 17.98 | 18.01 | 18.10 | | 0 |
| | 15 | 0 | 17.97 | 17.94 | 18.17 | | 0 |

## Table 8-32
## LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

| LTE Band 26 (Cell) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26697 (814.7 MHz) | Mid Channel 26865 (831.5 MHz) | High Channel 27033 (848.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 17.80 | 17.88 | 18.02 | 0 | 0 |
| | 1 | 2 | 17.79 | 17.92 | 18.03 | | 0 |
| | 1 | 5 | 17.80 | 17.95 | 17.99 | | 0 |
| | 3 | 0 | 17.75 | 17.87 | 18.00 | | 0 |
| | 3 | 2 | 17.85 | 17.92 | 18.08 | | 0 |
| | 3 | 3 | 17.75 | 17.86 | 18.01 | | 0 |
| | 6 | 0 | 17.77 | 17.90 | 18.03 | 0-1 | 0 |
| 16QAM | 1 | 0 | 18.00 | 18.10 | 18.20 | 0-1 | 0 |
| | 1 | 2 | 18.04 | 18.15 | 18.20 | | 0 |
| | 1 | 5 | 17.99 | 18.14 | 18.18 | | 0 |
| | 3 | 0 | 17.90 | 18.01 | 18.18 | | 0 |
| | 3 | 2 | 18.02 | 18.08 | 18.16 | | 0 |
| | 3 | 3 | 17.94 | 18.00 | 18.14 | | 0 |
| | 6 | 0 | 17.85 | 17.93 | 18.15 | 0-2 | 0 |
| 64QAM | 1 | 0 | 17.94 | 18.08 | 18.16 | 0-2 | 0 |
| | 1 | 2 | 17.93 | 18.06 | 18.18 | | 0 |
| | 1 | 5 | 17.94 | 18.13 | 18.16 | | 0 |
| | 3 | 0 | 17.81 | 17.98 | 18.15 | | 0 |
| | 3 | 2 | 17.96 | 18.03 | 18.20 | | 0 |
| | 3 | 3 | 17.85 | 17.96 | 18.11 | | 0 |
| | 6 | 0 | 17.81 | 17.93 | 18.04 | 0-3 | 0 |

## 8.2.5 LTE Band 66 (AWS)

**Table 8-33**
**LTE Band 66 (AWS) Maximum Conducted Powers - 20 MHz Bandwidth**

| LTE Band 66 (AWS) 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132072 (1720.0 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132572 (1770.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.92 | 24.35 | 24.28 | 0 | 0 |
| | 1 | 50 | 23.91 | 24.24 | 24.00 | | 0 |
| | 1 | 99 | 24.09 | **24.42** | 24.01 | | 0 |
| | 50 | 0 | 22.97 | **23.12** | 23.11 | 0-1 | 1 |
| | 50 | 25 | 23.02 | 22.92 | 23.03 | | 1 |
| | 50 | 50 | 23.00 | 22.97 | 22.90 | | 1 |
| | 100 | 0 | 22.99 | 22.99 | 22.96 | | 1 |
| 16QAM | 1 | 0 | 23.69 | 23.69 | 23.70 | 0-1 | 1 |
| | 1 | 50 | 23.69 | 23.41 | 23.42 | | 1 |
| | 1 | 99 | 23.70 | 23.63 | 23.38 | | 1 |
| | 50 | 0 | 22.24 | 22.03 | 22.12 | 0-2 | 2 |
| | 50 | 25 | 22.01 | 21.87 | 22.06 | | 2 |
| | 50 | 50 | 22.01 | 21.87 | 22.11 | | 2 |
| | 100 | 0 | 21.91 | 21.96 | 22.01 | | 2 |
| 64QAM | 1 | 0 | 22.21 | 22.00 | 22.70 | 0-2 | 2 |
| | 1 | 50 | 22.09 | 21.84 | 22.61 | | 2 |
| | 1 | 99 | 22.40 | 22.08 | 22.64 | | 2 |
| | 50 | 0 | 21.04 | 21.15 | 21.15 | 0-3 | 3 |
| | 50 | 25 | 21.05 | 21.06 | 21.09 | | 3 |
| | 50 | 50 | 21.10 | 21.14 | 21.15 | | 3 |
| | 100 | 0 | 21.13 | 21.07 | 21.10 | | 3 |

**Table 8-34**
**LTE Band 66 (AWS) Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 66 (AWS) 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132047 (1717.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132597 (1772.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.09 | 24.28 | 24.27 | 0 | 0 |
| | 1 | 36 | 23.94 | 23.96 | 24.05 | | 0 |
| | 1 | 74 | 24.15 | 24.14 | 24.07 | | 0 |
| | 36 | 0 | 23.15 | 23.15 | 23.23 | 0-1 | 1 |
| | 36 | 18 | 23.16 | 23.10 | 23.18 | | 1 |
| | 36 | 37 | 23.20 | 23.22 | 23.12 | | 1 |
| | 75 | 0 | 23.13 | 23.03 | 23.16 | | 1 |
| 16QAM | 1 | 0 | 23.35 | 23.12 | 23.66 | 0-1 | 1 |
| | 1 | 36 | 23.19 | 23.13 | 23.48 | | 1 |
| | 1 | 74 | 23.46 | 23.49 | 23.61 | | 1 |
| | 36 | 0 | 22.20 | 22.15 | 22.18 | 0-2 | 2 |
| | 36 | 18 | 22.22 | 22.13 | 22.20 | | 2 |
| | 36 | 37 | 22.22 | 22.13 | 22.10 | | 2 |
| | 75 | 0 | 22.08 | 22.09 | 22.25 | | 2 |
| 64QAM | 1 | 0 | 22.36 | 22.07 | 22.45 | 0-2 | 2 |
| | 1 | 36 | 22.12 | 22.37 | 22.67 | | 2 |
| | 1 | 74 | 22.44 | 22.15 | 22.22 | | 2 |
| | 36 | 0 | 21.18 | 21.10 | 21.19 | 0-3 | 3 |
| | 36 | 18 | 21.21 | 21.15 | 21.10 | | 3 |
| | 36 | 37 | 21.23 | 21.09 | 21.20 | | 3 |
| | 75 | 0 | 21.11 | 21.09 | 21.17 | | 3 |

## Table 8-35
## LTE Band 66 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 66 (AWS) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132022 (1715.0 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132622 (1775.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.17 | 24.32 | 23.96 | 0 | 0 |
| | 1 | 25 | 24.14 | 24.12 | 24.01 | | 0 |
| | 1 | 49 | 24.28 | 23.86 | 23.90 | | 0 |
| | 25 | 0 | 23.30 | 23.34 | 23.21 | 0-1 | 1 |
| | 25 | 12 | 23.24 | 23.22 | 23.04 | | 1 |
| | 25 | 25 | 23.30 | 23.20 | 23.25 | | 1 |
| | 50 | 0 | 23.35 | 23.18 | 23.22 | | 1 |
| 16QAM | 1 | 0 | 23.55 | 23.21 | 23.19 | 0-1 | 1 |
| | 1 | 25 | 23.51 | 23.16 | 23.45 | | 1 |
| | 1 | 49 | 23.67 | 23.36 | 23.63 | | 1 |
| | 25 | 0 | 22.29 | 22.25 | 22.23 | 0-2 | 2 |
| | 25 | 12 | 22.23 | 22.21 | 22.19 | | 2 |
| | 25 | 25 | 22.31 | 22.25 | 22.27 | | 2 |
| | 50 | 0 | 22.28 | 22.17 | 22.25 | | 2 |
| 64QAM | 1 | 0 | 22.27 | 22.31 | 22.55 | 0-2 | 2 |
| | 1 | 25 | 22.45 | 22.16 | 22.41 | | 2 |
| | 1 | 49 | 22.60 | 22.47 | 22.14 | | 2 |
| | 25 | 0 | 21.19 | 21.14 | 21.25 | 0-3 | 3 |
| | 25 | 12 | 21.24 | 21.19 | 21.20 | | 3 |
| | 25 | 25 | 21.30 | 21.16 | 21.26 | | 3 |
| | 50 | 0 | 21.26 | 21.21 | 21.27 | | 3 |

## Table 8-36
## LTE Band 66 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 66 (AWS) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131997 (1712.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132647 (1777.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.16 | 24.22 | 24.31 | 0 | 0 |
| | 1 | 12 | 24.26 | 24.33 | 24.22 | | 0 |
| | 1 | 24 | 24.05 | 24.31 | 24.19 | | 0 |
| | 12 | 0 | 23.15 | 23.12 | 23.06 | 0-1 | 1 |
| | 12 | 6 | 23.22 | 23.19 | 23.03 | | 1 |
| | 12 | 13 | 23.15 | 23.05 | 23.03 | | 1 |
| | 25 | 0 | 23.16 | 23.12 | 23.05 | | 1 |
| 16QAM | 1 | 0 | 23.35 | 23.69 | 23.55 | 0-1 | 1 |
| | 1 | 12 | 23.41 | 23.64 | 23.40 | | 1 |
| | 1 | 24 | 23.38 | 23.41 | 23.32 | | 1 |
| | 12 | 0 | 22.27 | 22.18 | 22.09 | 0-2 | 2 |
| | 12 | 6 | 22.26 | 22.21 | 22.12 | | 2 |
| | 12 | 13 | 22.20 | 22.09 | 22.03 | | 2 |
| | 25 | 0 | 22.21 | 22.14 | 22.06 | | 2 |
| 64QAM | 1 | 0 | 22.39 | 22.59 | 22.55 | 0-2 | 2 |
| | 1 | 12 | 22.29 | 22.46 | 22.27 | | 2 |
| | 1 | 24 | 22.36 | 22.40 | 22.22 | | 2 |
| | 12 | 0 | 21.29 | 21.15 | 21.11 | 0-3 | 3 |
| | 12 | 6 | 21.25 | 21.23 | 21.09 | | 3 |
| | 12 | 13 | 21.19 | 21.16 | 21.01 | | 3 |
| | 25 | 0 | 21.19 | 21.13 | 21.07 | | 3 |

## Table 8-37
## LTE Band 66 (AWS) Maximum Conducted Powers - 3 MHz Bandwidth

| LTE Band 66 (AWS) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131987 (1711.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132657 (1778.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.16 | 24.37 | 24.24 | 0 | 0 |
| | 1 | 7 | 24.29 | 24.38 | 24.28 | | 0 |
| | 1 | 14 | 24.17 | 24.28 | 23.99 | | 0 |
| | 8 | 0 | 23.18 | 23.16 | 23.06 | 0-1 | 1 |
| | 8 | 4 | 23.18 | 23.16 | 23.10 | | 1 |
| | 8 | 7 | 23.10 | 23.12 | 23.00 | | 1 |
| | 15 | 0 | 23.21 | 23.14 | 23.05 | | 1 |
| 16QAM | 1 | 0 | 23.42 | 23.12 | 23.36 | 0-1 | 1 |
| | 1 | 7 | 23.65 | 23.21 | 23.66 | | 1 |
| | 1 | 14 | 23.39 | 23.02 | 23.24 | | 1 |
| | 8 | 0 | 21.93 | 22.02 | 22.15 | 0-2 | 2 |
| | 8 | 4 | 22.01 | 22.01 | 22.13 | | 2 |
| | 8 | 7 | 22.00 | 21.95 | 22.12 | | 2 |
| | 15 | 0 | 22.17 | 22.09 | 22.19 | | 2 |
| 64QAM | 1 | 0 | 22.49 | 22.19 | 22.62 | 0-2 | 2 |
| | 1 | 7 | 22.53 | 22.21 | 22.61 | | 2 |
| | 1 | 14 | 22.53 | 21.97 | 22.30 | | 2 |
| | 8 | 0 | 20.91 | 21.04 | 21.14 | 0-3 | 3 |
| | 8 | 4 | 21.06 | 21.03 | 21.15 | | 3 |
| | 8 | 7 | 21.01 | 20.98 | 21.12 | | 3 |
| | 15 | 0 | 21.22 | 21.07 | 21.19 | | 3 |

## Table 8-38
## LTE Band 66 (AWS) Maximum Conducted Powers -1.4 MHz Bandwidth

| LTE Band 66 (AWS) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131979 (1710.7 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132665 (1779.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 24.33 | 24.63 | 24.27 | 0 | 0 |
| | 1 | 2 | 24.42 | 24.59 | 24.23 | | 0 |
| | 1 | 5 | 24.30 | 24.51 | 24.15 | | 0 |
| | 3 | 0 | 24.34 | 24.16 | 24.04 | | 0 |
| | 3 | 2 | 24.36 | 24.33 | 24.19 | | 0 |
| | 3 | 3 | 24.33 | 24.17 | 24.17 | | 0 |
| | 6 | 0 | 23.07 | 23.00 | 22.92 | 0-1 | 1 |
| 16QAM | 1 | 0 | 23.36 | 23.27 | 22.91 | 0-1 | 1 |
| | 1 | 2 | 23.34 | 23.25 | 23.06 | | 1 |
| | 1 | 5 | 23.37 | 23.05 | 23.08 | | 1 |
| | 3 | 0 | 23.35 | 23.22 | 23.36 | | 1 |
| | 3 | 2 | 23.27 | 23.27 | 23.49 | | 1 |
| | 3 | 3 | 23.29 | 23.33 | 23.38 | | 1 |
| | 6 | 0 | 22.25 | 22.11 | 22.27 | 0-2 | 2 |
| 64QAM | 1 | 0 | 22.40 | 22.21 | 22.55 | 0-2 | 2 |
| | 1 | 2 | 22.41 | 22.34 | 22.65 | | 2 |
| | 1 | 5 | 22.50 | 22.26 | 22.64 | | 2 |
| | 3 | 0 | 22.28 | 22.29 | 22.56 | | 2 |
| | 3 | 2 | 22.33 | 22.25 | 22.60 | | 2 |
| | 3 | 3 | 22.26 | 22.44 | 22.35 | | 2 |
| | 6 | 0 | 21.30 | 21.50 | 21.45 | 0-3 | 3 |

## Table 8-39
## LTE Band 66 (AWS) Reduced Conducted Powers - 20 MHz Bandwidth

| LTE Band 66 (AWS) 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132072 (1720.0 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132572 (1770.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.40 | 11.33 | 11.42 | 0 | 0 |
| | 1 | 50 | 11.17 | 11.20 | 11.31 | | 0 |
| | 1 | 99 | 11.45 | 11.38 | **11.48** | | 0 |
| | 50 | 0 | 11.27 | 11.27 | **11.37** | 0-1 | 0 |
| | 50 | 25 | 11.16 | 11.13 | 11.31 | | 0 |
| | 50 | 50 | 11.25 | 11.25 | 11.36 | | 0 |
| | 100 | 0 | 11.26 | 11.26 | 11.36 | | 0 |
| 16QAM | 1 | 0 | 11.57 | 11.56 | 11.56 | 0-1 | 0 |
| | 1 | 50 | 11.40 | 11.42 | 11.50 | | 0 |
| | 1 | 99 | 11.56 | 11.67 | 11.64 | | 0 |
| | 50 | 0 | 11.20 | 11.25 | 11.36 | 0-2 | 0 |
| | 50 | 25 | 11.16 | 11.16 | 11.31 | | 0 |
| | 50 | 50 | 11.17 | 11.22 | 11.38 | | 0 |
| | 100 | 0 | 11.22 | 11.22 | 11.29 | | 0 |
| 64QAM | 1 | 0 | 11.60 | 11.60 | 11.65 | 0-2 | 0 |
| | 1 | 50 | 11.65 | 11.50 | 11.55 | | 0 |
| | 1 | 99 | 11.70 | 11.70 | 11.70 | | 0 |
| | 50 | 0 | 11.14 | 11.55 | 11.35 | 0-3 | 0 |
| | 50 | 25 | 11.23 | 11.46 | 11.32 | | 0 |
| | 50 | 50 | 11.26 | 11.57 | 11.40 | | 0 |
| | 100 | 0 | 11.32 | 11.51 | 11.35 | | 0 |

## Table 8-40
## LTE Band 66 (AWS) Reduced Conducted Powers - 15 MHz Bandwidth

| LTE Band 66 (AWS) 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132047 (1717.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132597 (1772.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.30 | 11.29 | 11.36 | 0 | 0 |
| | 1 | 36 | 11.26 | 11.24 | 11.26 | | 0 |
| | 1 | 74 | 11.39 | 11.35 | 11.35 | | 0 |
| | 36 | 0 | 11.34 | 11.41 | 11.56 | 0-1 | 0 |
| | 36 | 18 | 11.30 | 11.41 | 11.50 | | 0 |
| | 36 | 37 | 11.30 | 11.41 | 11.39 | | 0 |
| | 75 | 0 | 11.28 | 11.32 | 11.48 | | 0 |
| 16QAM | 1 | 0 | 11.40 | 11.26 | 11.36 | 0-1 | 0 |
| | 1 | 36 | 11.49 | 11.22 | 11.67 | | 0 |
| | 1 | 74 | 11.44 | 11.23 | 11.69 | | 0 |
| | 36 | 0 | 11.41 | 11.42 | 11.57 | 0-2 | 0 |
| | 36 | 18 | 11.42 | 11.43 | 11.52 | | 0 |
| | 36 | 37 | 11.33 | 11.42 | 11.41 | | 0 |
| | 75 | 0 | 11.30 | 11.34 | 11.54 | | 0 |
| 64QAM | 1 | 0 | 11.68 | 11.25 | 11.60 | 0-2 | 0 |
| | 1 | 36 | 11.52 | 11.21 | 11.55 | | 0 |
| | 1 | 74 | 11.56 | 11.25 | 11.57 | | 0 |
| | 36 | 0 | 11.35 | 11.54 | 11.63 | 0-3 | 0 |
| | 36 | 18 | 11.42 | 11.52 | 11.62 | | 0 |
| | 36 | 37 | 11.37 | 11.55 | 11.52 | | 0 |
| | 75 | 0 | 11.33 | 11.39 | 11.49 | | 0 |

## Table 8-41
## LTE Band 66 (AWS) Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 66 (AWS) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 132022 (1715.0 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132622 (1775.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.41 | 11.52 | 11.58 | 0 | 0 |
| | 1 | 25 | 11.24 | 11.44 | 11.27 | | 0 |
| | 1 | 49 | 11.34 | 11.51 | 11.50 | | 0 |
| | 25 | 0 | 11.49 | 11.59 | 11.47 | 0-1 | 0 |
| | 25 | 12 | 11.43 | 11.51 | 11.46 | | 0 |
| | 25 | 25 | 11.47 | 11.49 | 11.44 | | 0 |
| | 50 | 0 | 11.44 | 11.48 | 11.52 | | 0 |
| 16QAM | 1 | 0 | 11.62 | 11.28 | 11.59 | 0-1 | 0 |
| | 1 | 25 | 11.43 | 11.18 | 11.57 | | 0 |
| | 1 | 49 | 11.54 | 11.28 | 11.61 | | 0 |
| | 25 | 0 | 11.36 | 11.52 | 11.48 | 0-2 | 0 |
| | 25 | 12 | 11.41 | 11.42 | 11.51 | | 0 |
| | 25 | 25 | 11.37 | 11.44 | 11.45 | | 0 |
| | 50 | 0 | 11.35 | 11.39 | 11.48 | | 0 |
| 64QAM | 1 | 0 | 11.58 | 11.48 | 11.39 | 0-2 | 0 |
| | 1 | 25 | 11.32 | 11.38 | 11.29 | | 0 |
| | 1 | 49 | 11.44 | 11.46 | 11.23 | | 0 |
| | 25 | 0 | 11.44 | 11.67 | 11.64 | 0-3 | 0 |
| | 25 | 12 | 11.47 | 11.49 | 11.65 | | 0 |
| | 25 | 25 | 11.57 | 11.60 | 11.63 | | 0 |
| | 50 | 0 | 11.63 | 11.69 | 11.61 | | 0 |

## Table 8-42
## LTE Band 66 (AWS) Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 66 (AWS) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131997 (1712.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132647 (1777.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.31 | 11.56 | 11.30 | 0 | 0 |
| | 1 | 12 | 11.27 | 11.46 | 11.27 | | 0 |
| | 1 | 24 | 11.22 | 11.40 | 11.25 | | 0 |
| | 12 | 0 | 11.42 | 11.42 | 11.44 | 0-1 | 0 |
| | 12 | 6 | 11.41 | 11.46 | 11.41 | | 0 |
| | 12 | 13 | 11.35 | 11.33 | 11.38 | | 0 |
| | 25 | 0 | 11.38 | 11.38 | 11.42 | | 0 |
| 16QAM | 1 | 0 | 11.52 | 11.63 | 11.68 | 0-1 | 0 |
| | 1 | 12 | 11.35 | 11.62 | 11.55 | | 0 |
| | 1 | 24 | 11.51 | 11.68 | 11.52 | | 0 |
| | 12 | 0 | 11.49 | 11.47 | 11.41 | 0-2 | 0 |
| | 12 | 6 | 11.48 | 11.44 | 11.46 | | 0 |
| | 12 | 13 | 11.40 | 11.48 | 11.35 | | 0 |
| | 25 | 0 | 11.39 | 11.38 | 11.39 | | 0 |
| 64QAM | 1 | 0 | 11.52 | 11.70 | 11.62 | 0-2 | 0 |
| | 1 | 12 | 11.65 | 11.64 | 11.51 | | 0 |
| | 1 | 24 | 11.68 | 11.51 | 11.51 | | 0 |
| | 12 | 0 | 11.69 | 11.47 | 11.48 | 0-3 | 0 |
| | 12 | 6 | 11.64 | 11.52 | 11.55 | | 0 |
| | 12 | 13 | 11.62 | 11.51 | 11.44 | | 0 |
| | 25 | 0 | 11.50 | 11.63 | 11.53 | | 0 |

## Table 8-43
## LTE Band 66 (AWS) Reduced Conducted Powers - 3 MHz Bandwidth

| LTE Band 66 (AWS) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131987 (1711.5 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132657 (1778.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.31 | 11.34 | 11.28 | 0 | 0 |
| | 1 | 7 | 11.28 | 11.38 | 11.32 | | 0 |
| | 1 | 14 | 11.24 | 11.26 | 11.18 | | 0 |
| | 8 | 0 | 11.41 | 11.49 | 11.42 | 0-1 | 0 |
| | 8 | 4 | 11.41 | 11.41 | 11.47 | | 0 |
| | 8 | 7 | 11.33 | 11.43 | 11.37 | | 0 |
| | 15 | 0 | 11.35 | 11.44 | 11.41 | | 0 |
| 16QAM | 1 | 0 | 11.62 | 11.25 | 11.60 | 0-1 | 0 |
| | 1 | 7 | 11.64 | 11.25 | 11.69 | | 0 |
| | 1 | 14 | 11.48 | 11.08 | 11.49 | | 0 |
| | 8 | 0 | 11.38 | 11.47 | 11.54 | 0-2 | 0 |
| | 8 | 4 | 11.32 | 11.38 | 11.51 | | 0 |
| | 8 | 7 | 11.33 | 11.29 | 11.36 | | 0 |
| | 15 | 0 | 11.49 | 11.39 | 11.40 | | 0 |
| 64QAM | 1 | 0 | 11.33 | 11.23 | 11.30 | 0-2 | 0 |
| | 1 | 7 | 11.34 | 11.38 | 11.47 | | 0 |
| | 1 | 14 | 11.25 | 11.09 | 11.51 | | 0 |
| | 8 | 0 | 11.39 | 11.52 | 11.36 | 0-3 | 0 |
| | 8 | 4 | 11.69 | 11.61 | 11.41 | | 0 |
| | 8 | 7 | 11.54 | 11.49 | 11.52 | | 0 |
| | 15 | 0 | 11.56 | 11.44 | 11.66 | | 0 |

## Table 8-44
## LTE Band 66 (AWS) Reduced Conducted Powers -1.4 MHz Bandwidth

| LTE Band 66 (AWS) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 131979 (1710.7 MHz) | Mid Channel 132322 (1745.0 MHz) | High Channel 132665 (1779.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 11.38 | 11.30 | 11.39 | 0 | 0 |
| | 1 | 2 | 11.36 | 11.33 | 11.41 | | 0 |
| | 1 | 5 | 11.36 | 11.18 | 11.38 | | 0 |
| | 3 | 0 | 11.37 | 11.42 | 11.45 | | 0 |
| | 3 | 2 | 11.38 | 11.47 | 11.46 | | 0 |
| | 3 | 3 | 11.33 | 11.44 | 11.39 | | 0 |
| | 6 | 0 | 11.24 | 11.32 | 11.28 | 0-1 | 0 |
| 16QAM | 1 | 0 | 11.48 | 11.48 | 11.47 | 0-1 | 0 |
| | 1 | 2 | 11.48 | 11.47 | 11.48 | | 0 |
| | 1 | 5 | 11.45 | 11.46 | 11.47 | | 0 |
| | 3 | 0 | 11.50 | 11.50 | 11.48 | | 0 |
| | 3 | 2 | 11.52 | 11.52 | 11.59 | | 0 |
| | 3 | 3 | 11.50 | 11.47 | 11.49 | | 0 |
| | 6 | 0 | 11.25 | 11.47 | 11.26 | 0-2 | 0 |
| 64QAM | 1 | 0 | 11.55 | 11.41 | 11.68 | 0-2 | 0 |
| | 1 | 2 | 11.61 | 11.37 | 11.55 | | 0 |
| | 1 | 5 | 11.43 | 11.34 | 11.54 | | 0 |
| | 3 | 0 | 11.49 | 11.44 | 11.47 | | 0 |
| | 3 | 2 | 11.40 | 11.42 | 11.48 | | 0 |
| | 3 | 3 | 11.35 | 11.41 | 11.47 | | 0 |
| | 6 | 0 | 11.44 | 11.39 | 11.44 | 0-3 | 0 |

## 8.2.6 LTE Band 25 (PCS)

**Table 8-45**
**LTE Band 25 (PCS) Maximum Conducted Powers - 20 MHz Bandwidth**

| LTE Band 25 (PCS) 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26140 (1860.0 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26590 (1905.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.27 | 23.32 | **23.66** | 0 | 0 |
| | 1 | 50 | 23.25 | 23.17 | 23.53 | | 0 |
| | 1 | 99 | 23.27 | 23.40 | 23.56 | | 0 |
| | 50 | 0 | 22.26 | 22.30 | **22.31** | 0-1 | 1 |
| | 50 | 25 | 22.18 | 22.15 | 22.29 | | 1 |
| | 50 | 50 | 22.21 | 22.17 | 22.19 | | 1 |
| | 100 | 0 | 22.17 | 22.13 | 22.22 | | 1 |
| 16QAM | 1 | 0 | 22.70 | 22.40 | 22.58 | 0-1 | 1 |
| | 1 | 50 | 22.67 | 22.24 | 22.47 | | 1 |
| | 1 | 99 | 22.68 | 22.47 | 22.70 | | 1 |
| | 50 | 0 | 21.24 | 21.23 | 21.20 | 0-2 | 2 |
| | 50 | 25 | 21.21 | 21.21 | 21.28 | | 2 |
| | 50 | 50 | 21.25 | 21.23 | 21.26 | | 2 |
| | 100 | 0 | 21.16 | 21.12 | 21.26 | | 2 |
| 64QAM | 1 | 0 | 21.22 | 21.65 | 21.50 | 0-2 | 2 |
| | 1 | 50 | 21.04 | 21.57 | 21.34 | | 2 |
| | 1 | 99 | 21.17 | 21.70 | 21.52 | | 2 |
| | 50 | 0 | 20.19 | 20.17 | 20.20 | 0-3 | 3 |
| | 50 | 25 | 20.22 | 20.12 | 20.26 | | 3 |
| | 50 | 50 | 20.27 | 20.21 | 20.33 | | 3 |
| | 100 | 0 | 20.18 | 20.12 | 20.25 | | 3 |

**Table 8-46**
**LTE Band 25 (PCS) Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 25 (PCS) 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26115 (1857.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26615 (1907.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.57 | 23.25 | 23.41 | 0 | 0 |
| | 1 | 36 | 23.42 | 23.19 | 23.38 | | 0 |
| | 1 | 74 | 23.55 | 23.20 | 23.65 | | 0 |
| | 36 | 0 | 22.32 | 22.14 | 22.40 | 0-1 | 1 |
| | 36 | 18 | 22.27 | 22.15 | 22.45 | | 1 |
| | 36 | 37 | 22.34 | 22.15 | 22.38 | | 1 |
| | 75 | 0 | 22.30 | 22.11 | 22.35 | | 1 |
| 16QAM | 1 | 0 | 22.22 | 21.96 | 22.46 | 0-1 | 1 |
| | 1 | 36 | 22.17 | 21.83 | 22.37 | | 1 |
| | 1 | 74 | 22.39 | 21.89 | 22.51 | | 1 |
| | 36 | 0 | 21.29 | 21.12 | 21.40 | 0-2 | 2 |
| | 36 | 18 | 21.32 | 21.18 | 21.42 | | 2 |
| | 36 | 37 | 21.40 | 21.15 | 21.37 | | 2 |
| | 75 | 0 | 21.29 | 21.18 | 21.44 | | 2 |
| 64QAM | 1 | 0 | 21.21 | 20.97 | 21.47 | 0-2 | 2 |
| | 1 | 36 | 21.15 | 20.82 | 21.38 | | 2 |
| | 1 | 74 | 21.41 | 20.87 | 21.44 | | 2 |
| | 36 | 0 | 20.29 | 20.31 | 20.39 | 0-3 | 3 |
| | 36 | 18 | 20.33 | 20.20 | 20.44 | | 3 |
| | 36 | 37 | 20.35 | 20.15 | 20.37 | | 3 |
| | 75 | 0 | 20.29 | 20.11 | 20.44 | | 3 |

## Table 8-47
## LTE Band 25 (PCS) Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 25 (PCS) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26090 (1855.0 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26640 (1910.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.39 | 23.40 | 23.42 | 0 | 0 |
| | 1 | 25 | 23.26 | 23.18 | 23.34 | | 0 |
| | 1 | 49 | 23.45 | 23.39 | 23.68 | | 0 |
| | 25 | 0 | 22.20 | 22.27 | 22.30 | 0-1 | 1 |
| | 25 | 12 | 22.26 | 22.27 | 22.30 | | 1 |
| | 25 | 25 | 22.20 | 22.23 | 22.32 | | 1 |
| | 50 | 0 | 22.23 | 22.30 | 22.30 | | 1 |
| 16QAM | 1 | 0 | 22.26 | 22.31 | 22.05 | 0-1 | 1 |
| | 1 | 25 | 22.14 | 22.11 | 21.85 | | 1 |
| | 1 | 49 | 22.32 | 22.29 | 22.13 | | 1 |
| | 25 | 0 | 21.25 | 21.26 | 21.36 | 0-2 | 2 |
| | 25 | 12 | 21.33 | 21.23 | 21.31 | | 2 |
| | 25 | 25 | 21.25 | 21.22 | 21.34 | | 2 |
| | 50 | 0 | 21.27 | 21.27 | 21.30 | | 2 |
| 64QAM | 1 | 0 | 21.28 | 21.34 | 21.04 | 0-2 | 2 |
| | 1 | 25 | 21.15 | 21.11 | 20.91 | | 2 |
| | 1 | 49 | 21.36 | 21.30 | 21.16 | | 2 |
| | 25 | 0 | 20.24 | 20.25 | 20.36 | 0-3 | 3 |
| | 25 | 12 | 20.32 | 20.25 | 20.31 | | 3 |
| | 25 | 25 | 20.26 | 20.22 | 20.35 | | 3 |
| | 50 | 0 | 20.24 | 20.26 | 20.31 | | 3 |

## Table 8-48
## LTE Band 25 (PCS) Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 25 (PCS) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26065 (1852.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26665 (1912.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.40 | 23.40 | 23.38 | 0 | 0 |
| | 1 | 12 | 23.41 | 23.38 | 23.45 | | 0 |
| | 1 | 24 | 23.38 | 23.31 | 23.32 | | 0 |
| | 12 | 0 | 22.33 | 22.22 | 22.34 | 0-1 | 1 |
| | 12 | 6 | 22.31 | 22.20 | 22.38 | | 1 |
| | 12 | 13 | 22.26 | 22.12 | 22.29 | | 1 |
| | 25 | 0 | 22.27 | 22.16 | 22.34 | | 1 |
| 16QAM | 1 | 0 | 22.16 | 22.27 | 22.22 | 0-1 | 1 |
| | 1 | 12 | 22.09 | 22.29 | 22.33 | | 1 |
| | 1 | 24 | 22.06 | 22.19 | 22.24 | | 1 |
| | 12 | 0 | 21.38 | 21.27 | 21.39 | 0-2 | 2 |
| | 12 | 6 | 21.34 | 21.30 | 21.38 | | 2 |
| | 12 | 13 | 21.33 | 21.18 | 21.31 | | 2 |
| | 25 | 0 | 21.28 | 21.18 | 21.34 | | 2 |
| 64QAM | 1 | 0 | 21.19 | 21.31 | 21.21 | 0-2 | 2 |
| | 1 | 12 | 21.10 | 21.29 | 21.28 | | 2 |
| | 1 | 24 | 21.05 | 21.20 | 21.21 | | 2 |
| | 12 | 0 | 20.37 | 20.29 | 20.36 | 0-3 | 3 |
| | 12 | 6 | 20.33 | 20.28 | 20.39 | | 3 |
| | 12 | 13 | 20.35 | 20.19 | 20.35 | | 3 |
| | 25 | 0 | 20.31 | 20.19 | 20.34 | | 3 |

## Table 8-49
## LTE Band 25 (PCS) Maximum Conducted Powers - 3 MHz Bandwidth

| LTE Band 25 (PCS) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26055 (1851.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26675 (1913.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.21 | 23.28 | 23.35 | 0 | 0 |
| | 1 | 7 | 23.40 | 23.44 | 23.54 | | 0 |
| | 1 | 14 | 23.14 | 23.32 | 23.46 | | 0 |
| | 8 | 0 | 22.27 | 22.33 | 22.36 | 0-1 | 1 |
| | 8 | 4 | 22.29 | 22.27 | 22.38 | | 1 |
| | 8 | 7 | 22.20 | 22.28 | 22.29 | | 1 |
| | 15 | 0 | 22.26 | 22.26 | 22.33 | | 1 |
| 16QAM | 1 | 0 | 22.27 | 22.08 | 22.32 | 0-1 | 1 |
| | 1 | 7 | 22.37 | 22.20 | 22.45 | | 1 |
| | 1 | 14 | 22.14 | 21.90 | 22.15 | | 1 |
| | 8 | 0 | 21.16 | 21.42 | 21.46 | 0-2 | 2 |
| | 8 | 4 | 21.20 | 21.35 | 21.43 | | 2 |
| | 8 | 7 | 21.14 | 21.36 | 21.41 | | 2 |
| | 15 | 0 | 21.30 | 21.45 | 21.47 | | 2 |
| 64QAM | 1 | 0 | 21.27 | 21.10 | 21.30 | 0-2 | 2 |
| | 1 | 7 | 21.33 | 21.21 | 21.44 | | 2 |
| | 1 | 14 | 21.14 | 20.91 | 21.17 | | 2 |
| | 8 | 0 | 20.19 | 20.22 | 20.22 | 0-3 | 3 |
| | 8 | 4 | 20.19 | 20.16 | 20.22 | | 3 |
| | 8 | 7 | 20.13 | 20.16 | 20.20 | | 3 |
| | 15 | 0 | 20.29 | 20.27 | 20.26 | | 3 |

## Table 8-50
## LTE Band 25 (PCS) Maximum Conducted Powers - 1.4 MHz Bandwidth

| LTE Band 25 (PCS) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26047 (1850.7 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26683 (1914.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 23.23 | 23.26 | 23.49 | 0 | 0 |
| | 1 | 2 | 23.31 | 23.35 | 23.52 | | 0 |
| | 1 | 5 | 23.17 | 23.20 | 23.57 | | 0 |
| | 3 | 0 | 23.36 | 23.35 | 23.47 | | 0 |
| | 3 | 2 | 23.44 | 23.41 | 23.42 | | 0 |
| | 3 | 3 | 23.38 | 23.29 | 23.31 | | 0 |
| | 6 | 0 | 22.20 | 22.09 | 22.18 | 0-1 | 1 |
| 16QAM | 1 | 0 | 22.33 | 21.86 | 22.19 | 0-1 | 1 |
| | 1 | 2 | 22.37 | 21.88 | 22.23 | | 1 |
| | 1 | 5 | 22.31 | 21.81 | 22.18 | | 1 |
| | 3 | 0 | 22.30 | 22.33 | 22.22 | | 1 |
| | 3 | 2 | 22.33 | 22.32 | 22.25 | | 1 |
| | 3 | 3 | 22.27 | 22.28 | 22.27 | | 1 |
| | 6 | 0 | 21.37 | 21.16 | 21.18 | 0-2 | 2 |
| 64QAM | 1 | 0 | 21.35 | 20.83 | 21.20 | 0-2 | 2 |
| | 1 | 2 | 21.38 | 20.87 | 21.22 | | 2 |
| | 1 | 5 | 21.32 | 20.81 | 21.19 | | 2 |
| | 3 | 0 | 21.31 | 21.28 | 21.19 | | 2 |
| | 3 | 2 | 21.33 | 21.32 | 21.27 | | 2 |
| | 3 | 3 | 21.31 | 21.29 | 21.29 | | 2 |
| | 6 | 0 | 20.40 | 20.13 | 20.19 | 0-3 | 3 |

## Table 8-51
## LTE Band 25 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth

| LTE Band 25 (PCS) 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26140 (1860.0 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26590 (1905.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.47 | 10.46 | 10.48 | 0 | 0 |
| | 1 | 50 | 10.37 | 10.26 | 10.31 | | 0 |
| | 1 | 99 | **10.54** | 10.45 | 10.47 | | 0 |
| | 50 | 0 | 10.45 | 10.48 | 10.41 | 0-1 | 0 |
| | 50 | 25 | 10.44 | 10.37 | 10.39 | | 0 |
| | 50 | 50 | **10.59** | 10.45 | 10.43 | | 0 |
| | 100 | 0 | 10.50 | 10.43 | 10.44 | | 0 |
| 16QAM | 1 | 0 | 10.45 | 10.69 | 10.67 | 0-1 | 0 |
| | 1 | 50 | 10.69 | 10.50 | 10.55 | | 0 |
| | 1 | 99 | 10.63 | 10.70 | 10.70 | | 0 |
| | 50 | 0 | 10.41 | 10.43 | 10.36 | 0-2 | 0 |
| | 50 | 25 | 10.47 | 10.38 | 10.38 | | 0 |
| | 50 | 50 | 10.56 | 10.43 | 10.39 | | 0 |
| | 100 | 0 | 10.42 | 10.41 | 10.40 | | 0 |
| 64QAM | 1 | 0 | 10.66 | 10.57 | 10.40 | 0-2 | 0 |
| | 1 | 50 | 10.60 | 10.40 | 10.26 | | 0 |
| | 1 | 99 | 10.70 | 10.61 | 10.46 | | 0 |
| | 50 | 0 | 10.32 | 10.38 | 10.35 | 0-3 | 0 |
| | 50 | 25 | 10.27 | 10.34 | 10.38 | | 0 |
| | 50 | 50 | 10.36 | 10.40 | 10.45 | | 0 |
| | 100 | 0 | 10.34 | 10.35 | 10.41 | | 0 |

## Table 8-52
## LTE Band 25 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth

| LTE Band 25 (PCS) 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26115 (1857.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26615 (1907.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.50 | 10.50 | 10.42 | 0 | 0 |
| | 1 | 36 | 10.41 | 10.43 | 10.36 | | 0 |
| | 1 | 74 | 10.48 | 10.40 | 10.49 | | 0 |
| | 36 | 0 | 10.46 | 10.54 | 10.59 | 0-1 | 0 |
| | 36 | 18 | 10.44 | 10.61 | 10.62 | | 0 |
| | 36 | 37 | 10.46 | 10.58 | 10.55 | | 0 |
| | 75 | 0 | 10.46 | 10.50 | 10.53 | | 0 |
| 16QAM | 1 | 0 | 10.47 | 10.44 | 10.70 | 0-1 | 0 |
| | 1 | 36 | 10.43 | 10.35 | 10.64 | | 0 |
| | 1 | 74 | 10.50 | 10.37 | 10.67 | | 0 |
| | 36 | 0 | 10.49 | 10.53 | 10.56 | 0-2 | 0 |
| | 36 | 18 | 10.49 | 10.62 | 10.61 | | 0 |
| | 36 | 37 | 10.53 | 10.53 | 10.53 | | 0 |
| | 75 | 0 | 10.44 | 10.53 | 10.55 | | 0 |
| 64QAM | 1 | 0 | 10.40 | 10.43 | 10.20 | 0-2 | 0 |
| | 1 | 36 | 10.48 | 10.37 | 10.41 | | 0 |
| | 1 | 74 | 10.36 | 10.34 | 10.22 | | 0 |
| | 36 | 0 | 10.45 | 10.62 | 10.63 | 0-3 | 0 |
| | 36 | 18 | 10.45 | 10.66 | 10.45 | | 0 |
| | 36 | 37 | 10.45 | 10.64 | 10.63 | | 0 |
| | 75 | 0 | 10.49 | 10.55 | 10.50 | | 0 |

## Table 8-53
## LTE Band 25 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 25 (PCS) 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26090 (1855.0 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26640 (1910.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.44 | 10.41 | 10.22 | 0 | 0 |
| | 1 | 25 | 10.28 | 10.24 | 10.32 | | 0 |
| | 1 | 49 | 10.43 | 10.39 | 10.28 | | 0 |
| | 25 | 0 | 10.51 | 10.37 | 10.30 | 0-1 | 0 |
| | 25 | 12 | 10.54 | 10.38 | 10.28 | | 0 |
| | 25 | 25 | 10.53 | 10.34 | 10.28 | | 0 |
| | 50 | 0 | 10.51 | 10.37 | 10.33 | | 0 |
| 16QAM | 1 | 0 | 10.65 | 10.34 | 10.52 | 0-1 | 0 |
| | 1 | 25 | 10.52 | 10.55 | 10.28 | | 0 |
| | 1 | 49 | 10.67 | 10.28 | 10.49 | | 0 |
| | 25 | 0 | 10.50 | 10.42 | 10.29 | 0-2 | 0 |
| | 25 | 12 | 10.57 | 10.37 | 10.34 | | 0 |
| | 25 | 25 | 10.51 | 10.38 | 10.37 | | 0 |
| | 50 | 0 | 10.50 | 10.35 | 10.37 | | 0 |
| 64QAM | 1 | 0 | 10.49 | 10.33 | 10.55 | 0-2 | 0 |
| | 1 | 25 | 10.40 | 10.32 | 10.48 | | 0 |
| | 1 | 49 | 10.58 | 10.29 | 10.39 | | 0 |
| | 25 | 0 | 10.62 | 10.47 | 10.28 | 0-3 | 0 |
| | 25 | 12 | 10.68 | 10.46 | 10.29 | | 0 |
| | 25 | 25 | 10.62 | 10.44 | 10.33 | | 0 |
| | 50 | 0 | 10.55 | 10.45 | 10.32 | | 0 |

## Table 8-54
## LTE Band 25 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 25 (PCS) 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26065 (1852.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26665 (1912.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.43 | 10.36 | 10.22 | 0 | 0 |
| | 1 | 12 | 10.39 | 10.28 | 10.27 | | 0 |
| | 1 | 24 | 10.28 | 10.20 | 10.41 | | 0 |
| | 12 | 0 | 10.50 | 10.33 | 10.22 | 0-1 | 0 |
| | 12 | 6 | 10.44 | 10.30 | 10.26 | | 0 |
| | 12 | 13 | 10.44 | 10.21 | 10.25 | | 0 |
| | 25 | 0 | 10.41 | 10.25 | 10.28 | | 0 |
| 16QAM | 1 | 0 | 10.40 | 10.51 | 10.26 | 0-1 | 0 |
| | 1 | 12 | 10.36 | 10.48 | 10.29 | | 0 |
| | 1 | 24 | 10.28 | 10.41 | 10.24 | | 0 |
| | 12 | 0 | 10.53 | 10.38 | 10.23 | 0-2 | 0 |
| | 12 | 6 | 10.49 | 10.37 | 10.25 | | 0 |
| | 12 | 13 | 10.47 | 10.30 | 10.21 | | 0 |
| | 25 | 0 | 10.44 | 10.31 | 10.19 | | 0 |
| 64QAM | 1 | 0 | 10.61 | 10.42 | 10.35 | 0-2 | 0 |
| | 1 | 12 | 10.55 | 10.38 | 10.31 | | 0 |
| | 1 | 24 | 10.64 | 10.28 | 10.22 | | 0 |
| | 12 | 0 | 10.51 | 10.37 | 10.18 | 0-3 | 0 |
| | 12 | 6 | 10.50 | 10.36 | 10.20 | | 0 |
| | 12 | 13 | 10.49 | 10.29 | 10.25 | | 0 |
| | 25 | 0 | 10.41 | 10.34 | 10.21 | | 0 |

## Table 8-55
## LTE Band 25 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth

| LTE Band 25 (PCS) 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26055 (1851.5 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26675 (1913.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.27 | 10.21 | 10.31 | 0 | 0 |
| | 1 | 7 | 10.39 | 10.24 | 10.23 | | 0 |
| | 1 | 14 | 10.25 | 10.22 | 10.33 | | 0 |
| | 8 | 0 | 10.43 | 10.34 | 10.21 | 0-1 | 0 |
| | 8 | 4 | 10.46 | 10.25 | 10.21 | | 0 |
| | 8 | 7 | 10.38 | 10.25 | 10.25 | | 0 |
| | 15 | 0 | 10.44 | 10.28 | 10.26 | | 0 |
| 16QAM | 1 | 0 | 10.46 | 10.44 | 10.27 | 0-1 | 0 |
| | 1 | 7 | 10.62 | 10.35 | 10.38 | | 0 |
| | 1 | 14 | 10.35 | 10.52 | 10.24 | | 0 |
| | 8 | 0 | 10.32 | 10.22 | 10.30 | 0-2 | 0 |
| | 8 | 4 | 10.38 | 10.27 | 10.28 | | 0 |
| | 8 | 7 | 10.27 | 10.23 | 10.26 | | 0 |
| | 15 | 0 | 10.48 | 10.28 | 10.31 | | 0 |
| 64QAM | 1 | 0 | 10.37 | 10.42 | 10.37 | 0-2 | 0 |
| | 1 | 7 | 10.53 | 10.22 | 10.40 | | 0 |
| | 1 | 14 | 10.26 | 10.34 | 10.63 | | 0 |
| | 8 | 0 | 10.47 | 10.43 | 10.35 | 0-3 | 0 |
| | 8 | 4 | 10.49 | 10.40 | 10.37 | | 0 |
| | 8 | 7 | 10.43 | 10.39 | 10.29 | | 0 |
| | 15 | 0 | 10.51 | 10.37 | 10.21 | | 0 |

## Table 8-56
## LTE Band 25 (PCS) Reduced Conducted Powers – 1.4 MHz Bandwidth

| LTE Band 25 (PCS) 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 26047 (1850.7 MHz) | Mid Channel 26365 (1882.5 MHz) | High Channel 26683 (1914.3 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.49 | 10.46 | 10.46 | 0 | 0 |
| | 1 | 2 | 10.53 | 10.46 | 10.54 | | 0 |
| | 1 | 5 | 10.47 | 10.36 | 10.50 | | 0 |
| | 3 | 0 | 10.65 | 10.52 | 10.49 | | 0 |
| | 3 | 2 | 10.60 | 10.54 | 10.58 | | 0 |
| | 3 | 3 | 10.69 | 10.48 | 10.46 | | 0 |
| | 6 | 0 | 10.67 | 10.47 | 10.44 | 0-1 | 0 |
| 16QAM | 1 | 0 | 10.70 | 10.38 | 10.53 | 0-1 | 0 |
| | 1 | 2 | 10.66 | 10.44 | 10.59 | | 0 |
| | 1 | 5 | 10.68 | 10.33 | 10.53 | | 0 |
| | 3 | 0 | 10.56 | 10.68 | 10.56 | | 0 |
| | 3 | 2 | 10.61 | 10.67 | 10.66 | | 0 |
| | 3 | 3 | 10.62 | 10.61 | 10.63 | | 0 |
| | 6 | 0 | 10.47 | 10.43 | 10.41 | 0-2 | 0 |
| 64QAM | 1 | 0 | 10.63 | 10.38 | 10.55 | 0-2 | 0 |
| | 1 | 2 | 10.69 | 10.43 | 10.58 | | 0 |
| | 1 | 5 | 10.63 | 10.26 | 10.47 | | 0 |
| | 3 | 0 | 10.68 | 10.66 | 10.56 | | 0 |
| | 3 | 2 | 10.68 | 10.52 | 10.61 | | 0 |
| | 3 | 3 | 10.69 | 10.61 | 10.55 | | 0 |
| | 6 | 0 | 10.69 | 10.48 | 10.46 | 0-3 | 0 |

## 8.2.1 LTE Band 7

**Table 8-57**
**LTE Band 7 Maximum Conducted Powers - 20 MHz Bandwidth**

| LTE Band 7 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20850 (2510.0 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21350 (2560.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 21.92 | 21.85 | 21.87 | 0 | 0 |
| | 1 | 50 | 21.73 | 21.71 | 21.68 | | 0 |
| | 1 | 99 | **21.96** | 21.93 | 21.95 | | 0 |
| | 50 | 0 | 20.64 | 20.45 | 20.48 | 0-1 | 1 |
| | 50 | 25 | **20.65** | 20.43 | 20.50 | | 1 |
| | 50 | 50 | 20.63 | 20.50 | 20.48 | | 1 |
| | 100 | 0 | 20.64 | 20.49 | 20.53 | | 1 |
| 16QAM | 1 | 0 | 20.95 | 20.86 | 21.00 | 0-1 | 1 |
| | 1 | 50 | 20.66 | 20.74 | 20.78 | | 1 |
| | 1 | 99 | 20.95 | 20.91 | 21.00 | | 1 |
| | 50 | 0 | 19.43 | 19.15 | 19.22 | 0-2 | 2 |
| | 50 | 25 | 19.43 | 19.13 | 19.22 | | 2 |
| | 50 | 50 | 19.37 | 19.19 | 19.18 | | 2 |
| | 100 | 0 | 19.45 | 19.22 | 19.24 | | 2 |
| 64QAM | 1 | 0 | 19.97 | 19.85 | 19.86 | 0-2 | 2 |
| | 1 | 50 | 19.92 | 19.78 | 19.62 | | 2 |
| | 1 | 99 | 19.98 | 20.00 | 19.88 | | 2 |
| | 50 | 0 | 18.93 | 18.67 | 18.79 | 0-3 | 3 |
| | 50 | 25 | 18.94 | 18.64 | 18.75 | | 3 |
| | 50 | 50 | 18.88 | 18.69 | 18.76 | | 3 |
| | 100 | 0 | 19.00 | 18.77 | 18.75 | | 3 |

**Table 8-58**
**LTE Band 7 Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 7 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20825 (2507.5 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21375 (2562.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 21.76 | 21.59 | 21.78 | 0 | 0 |
| | 1 | 36 | 21.72 | 21.71 | 21.76 | | 0 |
| | 1 | 74 | 21.80 | 21.70 | 21.97 | | 0 |
| | 36 | 0 | 20.50 | 20.50 | 20.54 | 0-1 | 1 |
| | 36 | 18 | 20.53 | 20.48 | 20.50 | | 1 |
| | 36 | 37 | 20.48 | 20.40 | 20.44 | | 1 |
| | 75 | 0 | 20.42 | 20.38 | 20.45 | | 1 |
| 16QAM | 1 | 0 | 20.69 | 20.67 | 20.61 | 0-1 | 1 |
| | 1 | 36 | 20.66 | 20.61 | 20.49 | | 1 |
| | 1 | 74 | 20.85 | 20.75 | 20.75 | | 1 |
| | 36 | 0 | 19.50 | 19.36 | 19.52 | 0-2 | 2 |
| | 36 | 18 | 19.52 | 19.42 | 19.55 | | 2 |
| | 36 | 37 | 19.45 | 19.44 | 19.43 | | 2 |
| | 75 | 0 | 19.47 | 19.45 | 19.45 | | 2 |
| 64QAM | 1 | 0 | 19.77 | 19.89 | 19.81 | 0-2 | 2 |
| | 1 | 36 | 19.67 | 19.82 | 19.96 | | 2 |
| | 1 | 74 | 19.80 | 19.88 | 19.96 | | 2 |
| | 36 | 0 | 18.99 | 18.86 | 18.65 | 0-3 | 3 |
| | 36 | 18 | 18.70 | 18.93 | 18.99 | | 3 |
| | 36 | 37 | 18.94 | 18.96 | 18.93 | | 3 |
| | 75 | 0 | 18.95 | 18.96 | 18.93 | | 3 |

## Table 8-59
## LTE Band 7 Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 7 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20800 (2505.0 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21400 (2565.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 21.95 | 21.67 | 21.91 | 0 | 0 |
| | 1 | 25 | 21.80 | 21.50 | 21.64 | | 0 |
| | 1 | 49 | 21.98 | 21.71 | 21.92 | | 0 |
| | 25 | 0 | 20.69 | 20.49 | 20.58 | 0-1 | 1 |
| | 25 | 12 | 20.68 | 20.46 | 20.51 | | 1 |
| | 25 | 25 | 20.64 | 20.49 | 20.68 | | 1 |
| | 50 | 0 | 20.73 | 20.45 | 20.65 | | 1 |
| 16QAM | 1 | 0 | 20.86 | 20.59 | 20.85 | 0-1 | 1 |
| | 1 | 25 | 20.68 | 20.55 | 20.71 | | 1 |
| | 1 | 49 | 20.93 | 20.88 | 20.94 | | 1 |
| | 25 | 0 | 19.64 | 19.49 | 19.60 | 0-2 | 2 |
| | 25 | 12 | 19.69 | 19.50 | 19.58 | | 2 |
| | 25 | 25 | 19.65 | 19.55 | 19.72 | | 2 |
| | 50 | 0 | 19.70 | 19.45 | 19.69 | | 2 |
| 64QAM | 1 | 0 | 19.79 | 19.62 | 19.79 | 0-2 | 2 |
| | 1 | 25 | 19.83 | 19.41 | 19.68 | | 2 |
| | 1 | 49 | 19.84 | 19.63 | 19.73 | | 2 |
| | 25 | 0 | 18.72 | 18.88 | 18.87 | 0-3 | 3 |
| | 25 | 12 | 18.92 | 18.89 | 18.99 | | 3 |
| | 25 | 25 | 18.84 | 18.96 | 18.72 | | 3 |
| | 50 | 0 | 18.91 | 18.84 | 18.71 | | 3 |

## Table 8-60
## LTE Band 7 Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 7 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20775 (2502.5 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21425 (2567.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 22.00 | 21.82 | 21.74 | 0 | 0 |
| | 1 | 12 | 21.95 | 21.78 | 21.78 | | 0 |
| | 1 | 24 | 21.77 | 21.70 | 21.79 | | 0 |
| | 12 | 0 | 20.62 | 20.72 | 20.62 | 0-1 | 1 |
| | 12 | 6 | 20.71 | 20.40 | 20.60 | | 1 |
| | 12 | 13 | 20.59 | 20.43 | 20.58 | | 1 |
| | 25 | 0 | 20.62 | 20.39 | 20.68 | | 1 |
| 16QAM | 1 | 0 | 20.71 | 20.66 | 20.63 | 0-1 | 1 |
| | 1 | 12 | 20.69 | 20.54 | 20.67 | | 1 |
| | 1 | 24 | 20.56 | 20.57 | 20.61 | | 1 |
| | 12 | 0 | 19.69 | 19.43 | 19.66 | 0-2 | 2 |
| | 12 | 6 | 19.76 | 19.48 | 19.66 | | 2 |
| | 12 | 13 | 19.68 | 19.50 | 19.63 | | 2 |
| | 25 | 0 | 19.70 | 19.42 | 19.68 | | 2 |
| 64QAM | 1 | 0 | 19.65 | 19.60 | 19.65 | 0-2 | 2 |
| | 1 | 12 | 19.70 | 19.55 | 19.68 | | 2 |
| | 1 | 24 | 19.58 | 19.54 | 19.61 | | 2 |
| | 12 | 0 | 18.70 | 18.44 | 18.66 | 0-3 | 3 |
| | 12 | 6 | 18.70 | 18.48 | 18.65 | | 3 |
| | 12 | 13 | 18.65 | 18.50 | 18.63 | | 3 |
| | 25 | 0 | 18.66 | 18.55 | 18.69 | | 3 |

## Table 8-61
## LTE Band 7 Reduced Conducted Powers - 20 MHz Bandwidth

| LTE Band 7 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20850 (2510.0 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21350 (2560.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | **10.52** | 10.39 | 10.34 | 0 | 0 |
| | 1 | 50 | 10.29 | 10.14 | 10.05 | | 0 |
| | 1 | 99 | 10.47 | 10.37 | 10.11 | | 0 |
| | 50 | 0 | **10.47** | 10.28 | 10.17 | 0-1 | 0 |
| | 50 | 25 | 10.39 | 10.19 | 10.11 | | 0 |
| | 50 | 50 | 10.33 | 10.24 | 10.08 | | 0 |
| | 100 | 0 | 10.41 | 10.27 | 10.13 | | 0 |
| 16QAM | 1 | 0 | 10.68 | 10.18 | 10.61 | 0-1 | 0 |
| | 1 | 50 | 10.45 | 10.38 | 10.27 | | 0 |
| | 1 | 99 | 10.67 | 10.51 | 10.46 | | 0 |
| | 50 | 0 | 10.40 | 10.26 | 10.17 | 0-2 | 0 |
| | 50 | 25 | 10.40 | 10.18 | 10.09 | | 0 |
| | 50 | 50 | 10.30 | 10.22 | 10.07 | | 0 |
| | 100 | 0 | 10.39 | 10.28 | 10.14 | | 0 |
| 64QAM | 1 | 0 | 10.55 | 10.70 | 10.65 | 0-2 | 0 |
| | 1 | 50 | 10.52 | 10.55 | 10.43 | | 0 |
| | 1 | 99 | 10.70 | 10.70 | 10.60 | | 0 |
| | 50 | 0 | 10.37 | 10.29 | 10.38 | 0-3 | 0 |
| | 50 | 25 | 10.28 | 10.30 | 10.33 | | 0 |
| | 50 | 50 | 10.34 | 10.34 | 10.38 | | 0 |
| | 100 | 0 | 10.51 | 10.34 | 10.42 | | 0 |

## Table 8-62
## LTE Band 7 Reduced Conducted Powers - 15 MHz Bandwidth

| LTE Band 7 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel 20825 (2507.5 MHz) | Mid Channel 21100 (2535.0 MHz) | High Channel 21375 (2562.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.28 | 10.26 | 10.46 | 0 | 0 |
| | 1 | 36 | 10.25 | 10.13 | 10.35 | | 0 |
| | 1 | 74 | 10.40 | 10.32 | 10.27 | | 0 |
| | 36 | 0 | 10.25 | 10.18 | 10.44 | 0-1 | 0 |
| | 36 | 18 | 10.27 | 10.23 | 10.27 | | 0 |
| | 36 | 37 | 10.25 | 10.25 | 10.15 | | 0 |
| | 75 | 0 | 10.21 | 10.18 | 10.27 | | 0 |
| 16QAM | 1 | 0 | 10.56 | 10.45 | 10.70 | 0-1 | 0 |
| | 1 | 36 | 10.46 | 10.37 | 10.68 | | 0 |
| | 1 | 74 | 10.65 | 10.54 | 10.49 | | 0 |
| | 36 | 0 | 10.22 | 10.14 | 10.39 | 0-2 | 0 |
| | 36 | 18 | 10.31 | 10.20 | 10.30 | | 0 |
| | 36 | 37 | 10.27 | 10.25 | 10.16 | | 0 |
| | 75 | 0 | 10.24 | 10.21 | 10.23 | | 0 |
| 64QAM | 1 | 0 | 10.48 | 10.38 | 10.66 | 0-2 | 0 |
| | 1 | 36 | 10.50 | 10.35 | 10.39 | | 0 |
| | 1 | 74 | 10.51 | 10.55 | 10.55 | | 0 |
| | 36 | 0 | 10.28 | 10.18 | 10.43 | 0-3 | 0 |
| | 36 | 18 | 10.32 | 10.27 | 10.40 | | 0 |
| | 36 | 37 | 10.32 | 10.33 | 10.23 | | 0 |
| | 75 | 0 | 10.23 | 10.21 | 10.25 | | 0 |

## Table 8-63
## LTE Band 7 Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 7<br>10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>20800<br>(2505.0 MHz) | Mid Channel<br>21100<br>(2535.0 MHz) | High Channel<br>21400<br>(2565.0 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.50 | 10.42 | 10.67 | 0 | 0 |
| | 1 | 25 | 10.35 | 10.33 | 10.40 | | 0 |
| | 1 | 49 | 10.58 | 10.52 | 10.59 | | 0 |
| | 25 | 0 | 10.28 | 10.30 | 10.48 | 0-1 | 0 |
| | 25 | 12 | 10.31 | 10.31 | 10.45 | | 0 |
| | 25 | 25 | 10.34 | 10.35 | 10.53 | | 0 |
| | 50 | 0 | 10.39 | 10.32 | 10.54 | | 0 |
| 16QAM | 1 | 0 | 10.68 | 10.61 | 10.47 | 0-1 | 0 |
| | 1 | 25 | 10.47 | 10.43 | 10.59 | | 0 |
| | 1 | 49 | 10.70 | 10.57 | 10.70 | | 0 |
| | 25 | 0 | 10.30 | 10.33 | 10.55 | 0-2 | 0 |
| | 25 | 12 | 10.30 | 10.27 | 10.42 | | 0 |
| | 25 | 25 | 10.33 | 10.36 | 10.52 | | 0 |
| | 50 | 0 | 10.35 | 10.29 | 10.53 | | 0 |
| 64QAM | 1 | 0 | 10.56 | 10.55 | 10.66 | 0-2 | 0 |
| | 1 | 25 | 10.50 | 10.44 | 10.59 | | 0 |
| | 1 | 49 | 10.70 | 10.41 | 10.70 | | 0 |
| | 25 | 0 | 10.31 | 10.32 | 10.50 | 0-3 | 0 |
| | 25 | 12 | 10.34 | 10.33 | 10.43 | | 0 |
| | 25 | 25 | 10.32 | 10.41 | 10.56 | | 0 |
| | 50 | 0 | 10.38 | 10.30 | 10.54 | | 0 |

## Table 8-64
## LTE Band 7 Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 7<br>5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>20775<br>(2502.5 MHz) | Mid Channel<br>21100<br>(2535.0 MHz) | High Channel<br>21425<br>(2567.5 MHz) | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | Conducted Power [dBm] | | | | |
| QPSK | 1 | 0 | 10.50 | 10.31 | 10.46 | 0 | 0 |
| | 1 | 12 | 10.44 | 10.15 | 10.39 | | 0 |
| | 1 | 24 | 10.31 | 10.22 | 10.38 | | 0 |
| | 12 | 0 | 10.36 | 10.23 | 10.48 | 0-1 | 0 |
| | 12 | 6 | 10.47 | 10.25 | 10.41 | | 0 |
| | 12 | 13 | 10.40 | 10.25 | 10.39 | | 0 |
| | 25 | 0 | 10.45 | 10.18 | 10.44 | | 0 |
| 16QAM | 1 | 0 | 10.67 | 10.48 | 10.61 | 0-1 | 0 |
| | 1 | 12 | 10.67 | 10.36 | 10.46 | | 0 |
| | 1 | 24 | 10.44 | 10.41 | 10.56 | | 0 |
| | 12 | 0 | 10.42 | 10.23 | 10.44 | 0-2 | 0 |
| | 12 | 6 | 10.51 | 10.32 | 10.45 | | 0 |
| | 12 | 13 | 10.42 | 10.30 | 10.29 | | 0 |
| | 25 | 0 | 10.45 | 10.22 | 10.42 | | 0 |
| 64QAM | 1 | 0 | 10.61 | 10.44 | 10.51 | 0-2 | 0 |
| | 1 | 12 | 10.56 | 10.27 | 10.42 | | 0 |
| | 1 | 24 | 10.51 | 10.36 | 10.47 | | 0 |
| | 12 | 0 | 10.45 | 10.30 | 10.51 | 0-3 | 0 |
| | 12 | 6 | 10.57 | 10.34 | 10.48 | | 0 |
| | 12 | 13 | 10.45 | 10.32 | 10.45 | | 0 |
| | 25 | 0 | 10.45 | 10.23 | 10.51 | | 0 |

## 8.2.2 LTE Band 41

**Table 8-65**
**LTE Band 41 Maximum Conducted Powers - 20 MHz Bandwidth**

| LTE Band 41 20 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | **23.50** | 23.30 | 23.04 | 22.95 | 23.37 | 0 | 0 |
| | 1 | 50 | 23.28 | 23.07 | 23.42 | 23.25 | 23.48 | | 0 |
| | 1 | 99 | 23.49 | 23.40 | 23.26 | 23.01 | 23.23 | | 0 |
| | 50 | 0 | **22.50** | 22.36 | 22.45 | 22.39 | 22.49 | 0-1 | 1 |
| | 50 | 25 | 22.48 | 22.33 | 22.49 | 22.48 | 22.48 | | 1 |
| | 50 | 50 | 22.49 | 22.34 | 22.49 | 22.45 | 22.45 | | 1 |
| | 100 | 0 | 22.49 | 22.40 | 22.46 | 22.47 | 22.49 | | 1 |
| 16QAM | 1 | 0 | 22.50 | 22.26 | 22.02 | 22.48 | 22.19 | 0-1 | 1 |
| | 1 | 50 | 22.46 | 22.06 | 22.38 | 21.81 | 22.46 | | 1 |
| | 1 | 99 | 22.49 | 22.32 | 22.14 | 22.20 | 22.35 | | 1 |
| | 50 | 0 | 21.50 | 21.33 | 21.39 | 21.50 | 21.22 | 0-2 | 2 |
| | 50 | 25 | 21.46 | 21.32 | 21.50 | 21.33 | 21.48 | | 2 |
| | 50 | 50 | 21.49 | 21.37 | 21.45 | 21.50 | 21.45 | | 2 |
| | 100 | 0 | 21.47 | 21.45 | 21.42 | 21.38 | 21.35 | | 2 |
| 64QAM | 1 | 0 | 21.50 | 21.18 | 21.00 | 21.45 | 21.16 | 0-2 | 2 |
| | 1 | 50 | 21.45 | 21.03 | 21.47 | 20.83 | 21.39 | | 2 |
| | 1 | 99 | 21.50 | 21.22 | 21.23 | 21.27 | 21.22 | | 2 |
| | 50 | 0 | 20.50 | 20.50 | 20.45 | 20.38 | 20.46 | 0-3 | 3 |
| | 50 | 25 | 20.40 | 20.41 | 20.50 | 20.49 | 20.48 | | 3 |
| | 50 | 50 | 20.45 | 20.49 | 20.48 | 20.50 | 20.50 | | 3 |
| | 100 | 0 | 20.49 | 20.43 | 20.47 | 20.47 | 20.43 | | 3 |

**Table 8-66**
**LTE Band 41 Maximum Conducted Powers - 15 MHz Bandwidth**

| LTE Band 41 15 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 23.35 | 23.08 | 22.94 | 22.80 | 23.26 | 0 | 0 |
| | 1 | 36 | 23.25 | 22.97 | 23.20 | 22.97 | 23.24 | | 0 |
| | 1 | 74 | 23.32 | 23.07 | 23.06 | 22.92 | 23.16 | | 0 |
| | 36 | 0 | 22.39 | 22.13 | 22.15 | 21.97 | 22.34 | 0-1 | 1 |
| | 36 | 18 | 22.41 | 22.13 | 22.29 | 22.10 | 22.44 | | 1 |
| | 36 | 37 | 22.28 | 22.11 | 22.27 | 22.03 | 22.37 | | 1 |
| | 75 | 0 | 22.32 | 22.07 | 22.23 | 22.03 | 22.34 | | 1 |
| 16QAM | 1 | 0 | 22.41 | 22.18 | 22.04 | 21.78 | 22.25 | 0-1 | 1 |
| | 1 | 36 | 22.36 | 22.06 | 22.23 | 22.00 | 22.27 | | 1 |
| | 1 | 74 | 22.39 | 22.12 | 22.01 | 22.00 | 22.21 | | 1 |
| | 36 | 0 | 21.47 | 21.14 | 21.27 | 21.06 | 21.44 | 0-2 | 2 |
| | 36 | 18 | 21.47 | 21.20 | 21.37 | 21.16 | 21.50 | | 2 |
| | 36 | 37 | 21.43 | 21.14 | 21.36 | 21.14 | 21.41 | | 2 |
| | 75 | 0 | 21.30 | 21.11 | 21.25 | 21.04 | 21.36 | | 2 |
| 64QAM | 1 | 0 | 21.32 | 20.99 | 20.86 | 20.76 | 21.16 | 0-2 | 2 |
| | 1 | 36 | 21.30 | 20.92 | 21.12 | 20.97 | 21.23 | | 2 |
| | 1 | 74 | 21.29 | 20.98 | 21.04 | 20.93 | 21.11 | | 2 |
| | 36 | 0 | 20.43 | 20.20 | 20.26 | 19.96 | 20.38 | 0-3 | 3 |
| | 36 | 18 | 20.48 | 20.23 | 20.46 | 20.18 | 20.45 | | 3 |
| | 36 | 37 | 20.35 | 20.18 | 20.33 | 20.10 | 20.44 | | 3 |
| | 75 | 0 | 20.34 | 20.17 | 20.27 | 20.07 | 20.40 | | 3 |

## Table 8-67
## LTE Band 41 Maximum Conducted Powers - 10 MHz Bandwidth

| LTE Band 41<br>10 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 23.49 | 23.35 | 23.14 | 23.39 | 23.40 | 0 | 0 |
| | 1 | 25 | 23.23 | 23.08 | 23.20 | 22.94 | 23.30 | | 0 |
| | 1 | 49 | 23.35 | 23.31 | 23.42 | 23.39 | 23.41 | | 0 |
| | 25 | 0 | 22.44 | 22.32 | 22.46 | 22.21 | 22.34 | 0-1 | 1 |
| | 25 | 12 | 22.38 | 22.31 | 22.40 | 22.16 | 22.46 | | 1 |
| | 25 | 25 | 22.41 | 22.37 | 22.46 | 22.30 | 22.43 | | 1 |
| | 50 | 0 | 22.49 | 22.38 | 22.45 | 22.27 | 22.46 | | 1 |
| 16QAM | 1 | 0 | 22.46 | 22.42 | 22.37 | 22.40 | 22.47 | 0-1 | 1 |
| | 1 | 25 | 22.24 | 22.21 | 22.28 | 22.09 | 22.30 | | 1 |
| | 1 | 49 | 22.40 | 22.38 | 22.37 | 22.35 | 22.48 | | 1 |
| | 25 | 0 | 21.47 | 21.39 | 21.41 | 21.17 | 21.40 | 0-2 | 2 |
| | 25 | 12 | 21.35 | 21.36 | 21.41 | 21.17 | 21.46 | | 2 |
| | 25 | 25 | 21.41 | 21.39 | 21.37 | 21.26 | 21.35 | | 2 |
| | 50 | 0 | 21.46 | 21.37 | 21.41 | 21.25 | 21.37 | | 2 |
| 64QAM | 1 | 0 | 21.40 | 21.31 | 21.37 | 21.26 | 21.44 | 0-2 | 2 |
| | 1 | 25 | 21.19 | 21.13 | 21.16 | 21.00 | 21.20 | | 2 |
| | 1 | 49 | 21.29 | 21.24 | 21.35 | 21.34 | 21.44 | | 2 |
| | 25 | 0 | 20.45 | 20.42 | 20.36 | 20.24 | 20.47 | 0-3 | 3 |
| | 25 | 12 | 20.39 | 20.43 | 20.27 | 20.22 | 20.35 | | 3 |
| | 25 | 25 | 20.48 | 20.41 | 20.49 | 20.36 | 20.31 | | 3 |
| | 50 | 0 | 20.43 | 20.46 | 20.40 | 20.26 | 20.45 | | 3 |

## Table 8-68
## LTE Band 41 Maximum Conducted Powers - 5 MHz Bandwidth

| LTE Band 41<br>5 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 23.29 | 23.12 | 23.28 | 23.14 | 23.49 | 0 | 0 |
| | 1 | 12 | 23.19 | 23.10 | 23.18 | 23.02 | 23.31 | | 0 |
| | 1 | 24 | 23.16 | 23.05 | 23.15 | 22.96 | 23.25 | | 0 |
| | 12 | 0 | 22.38 | 22.26 | 22.37 | 22.02 | 22.48 | 0-1 | 1 |
| | 12 | 6 | 22.31 | 22.27 | 22.30 | 22.01 | 22.46 | | 1 |
| | 12 | 13 | 22.22 | 22.21 | 22.32 | 21.98 | 22.43 | | 1 |
| | 25 | 0 | 22.35 | 22.27 | 22.32 | 22.04 | 22.42 | | 1 |
| 16QAM | 1 | 0 | 22.10 | 22.05 | 22.02 | 21.71 | 22.23 | 0-1 | 1 |
| | 1 | 12 | 21.96 | 21.96 | 21.92 | 21.59 | 22.04 | | 1 |
| | 1 | 24 | 21.99 | 21.91 | 21.94 | 21.65 | 22.06 | | 1 |
| | 12 | 0 | 21.50 | 21.38 | 21.44 | 21.09 | 21.34 | 0-2 | 2 |
| | 12 | 6 | 21.45 | 21.40 | 21.46 | 21.08 | 21.45 | | 2 |
| | 12 | 13 | 21.34 | 21.31 | 21.33 | 21.04 | 21.45 | | 2 |
| | 25 | 0 | 21.36 | 21.30 | 21.33 | 21.00 | 21.46 | | 2 |
| 64QAM | 1 | 0 | 21.40 | 21.33 | 21.28 | 20.94 | 21.47 | 0-2 | 2 |
| | 1 | 12 | 21.30 | 21.20 | 21.25 | 20.99 | 21.41 | | 2 |
| | 1 | 24 | 21.21 | 21.20 | 21.18 | 20.98 | 21.37 | | 2 |
| | 12 | 0 | 20.49 | 20.42 | 20.43 | 20.12 | 20.41 | 0-3 | 3 |
| | 12 | 6 | 20.33 | 20.43 | 20.35 | 20.23 | 20.36 | | 3 |
| | 12 | 13 | 20.41 | 20.35 | 20.45 | 20.19 | 20.25 | | 3 |
| | 25 | 0 | 20.36 | 20.28 | 20.31 | 20.04 | 20.46 | | 3 |

## Table 8-69
## LTE Band 41 Reduced Conducted Powers - 20 MHz Bandwidth

| LTE Band 41 20 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 13.73 | 13.47 | 13.07 | 12.92 | 13.50 | 0 | 0 |
| | 1 | 50 | 13.45 | 13.31 | 13.45 | 13.22 | **13.82** | | 0 |
| | 1 | 99 | 13.68 | 13.32 | 13.15 | 13.01 | 13.72 | | 0 |
| | 50 | 0 | 13.84 | 13.49 | 13.33 | 13.33 | 13.97 | 0-1 | 0 |
| | 50 | 25 | 13.78 | 13.52 | 13.62 | 13.43 | **14.07** | | 0 |
| | 50 | 50 | 13.87 | 13.51 | 13.58 | 13.53 | 14.05 | | 0 |
| | 100 | 0 | 13.67 | 13.50 | 13.39 | 13.47 | 13.80 | | 0 |
| 16QAM | 1 | 0 | 13.95 | 13.65 | 13.24 | 13.01 | 13.30 | 0-1 | 0 |
| | 1 | 50 | 13.75 | 13.59 | 13.30 | 13.52 | 13.57 | | 0 |
| | 1 | 99 | 13.85 | 13.60 | 13.43 | 13.31 | 13.38 | | 0 |
| | 50 | 0 | 13.90 | 13.62 | 13.23 | 13.39 | 14.02 | 0-2 | 0 |
| | 50 | 25 | 13.86 | 13.60 | 13.46 | 13.61 | 14.00 | | 0 |
| | 50 | 50 | 13.87 | 13.58 | 13.60 | 13.59 | 13.99 | | 0 |
| | 100 | 0 | 13.82 | 13.58 | 13.33 | 13.54 | 13.97 | | 0 |
| 64QAM | 1 | 0 | 13.45 | 13.52 | 13.35 | 13.25 | 13.65 | 0-2 | 0 |
| | 1 | 50 | 13.15 | 13.30 | 13.74 | 13.72 | 13.91 | | 0 |
| | 1 | 99 | 13.40 | 13.58 | 13.55 | 13.51 | 13.57 | | 0 |
| | 50 | 0 | 13.74 | 13.53 | 13.52 | 13.51 | 13.98 | 0-3 | 0 |
| | 50 | 25 | 13.68 | 13.54 | 13.75 | 13.73 | 14.08 | | 0 |
| | 50 | 50 | 13.80 | 13.55 | 13.70 | 13.68 | 14.04 | | 0 |
| | 100 | 0 | 13.65 | 13.52 | 13.68 | 13.68 | 14.00 | | 0 |

## Table 8-70
## LTE Band 41 Reduced Conducted Powers - 15 MHz Bandwidth

| LTE Band 41 15 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 13.57 | 13.56 | 13.25 | 13.04 | 13.55 | 0 | 0 |
| | 1 | 36 | 13.58 | 13.40 | 13.37 | 13.08 | 13.51 | | 0 |
| | 1 | 74 | 13.74 | 13.55 | 13.22 | 13.07 | 13.49 | | 0 |
| | 36 | 0 | 13.78 | 13.72 | 13.55 | 13.33 | 13.80 | 0-1 | 0 |
| | 36 | 18 | 13.86 | 13.74 | 13.70 | 13.45 | 13.84 | | 0 |
| | 36 | 37 | 13.81 | 13.73 | 13.63 | 13.42 | 13.82 | | 0 |
| | 75 | 0 | 13.75 | 13.76 | 13.61 | 13.37 | 13.79 | | 0 |
| 16QAM | 1 | 0 | 13.89 | 13.87 | 13.60 | 13.41 | 13.90 | 0-1 | 0 |
| | 1 | 36 | 13.77 | 13.68 | 13.69 | 13.38 | 13.79 | | 0 |
| | 1 | 74 | 13.98 | 13.86 | 13.60 | 13.45 | 13.85 | | 0 |
| | 36 | 0 | 13.84 | 13.75 | 13.61 | 13.37 | 13.77 | 0-2 | 0 |
| | 36 | 18 | 13.90 | 13.76 | 13.73 | 13.48 | 13.87 | | 0 |
| | 36 | 37 | 13.83 | 13.75 | 13.67 | 13.44 | 13.87 | | 0 |
| | 75 | 0 | 13.84 | 13.78 | 13.65 | 13.43 | 13.89 | | 0 |
| 64QAM | 1 | 0 | 13.45 | 13.44 | 13.32 | 13.07 | 13.50 | 0-2 | 0 |
| | 1 | 36 | 13.49 | 13.34 | 13.38 | 13.09 | 13.48 | | 0 |
| | 1 | 74 | 13.75 | 13.46 | 13.28 | 13.13 | 13.44 | | 0 |
| | 36 | 0 | 13.89 | 13.83 | 13.55 | 13.33 | 13.88 | 0-3 | 0 |
| | 36 | 18 | 13.94 | 13.83 | 13.72 | 13.45 | 13.94 | | 0 |
| | 36 | 37 | 13.86 | 13.80 | 13.64 | 13.44 | 13.91 | | 0 |
| | 75 | 0 | 13.86 | 13.83 | 13.61 | 13.37 | 13.90 | | 0 |

## Table 8-71
## LTE Band 41 Reduced Conducted Powers - 10 MHz Bandwidth

| LTE Band 41<br>10 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 13.68 | 13.65 | 13.47 | 13.32 | 13.63 | 0 | 0 |
| | 1 | 25 | 13.46 | 13.54 | 13.08 | 12.88 | 13.50 | | 0 |
| | 1 | 49 | 13.68 | 13.75 | 13.57 | 13.30 | 13.60 | | 0 |
| | 25 | 0 | 13.80 | 13.92 | 13.48 | 13.28 | 13.58 | 0-1 | 0 |
| | 25 | 12 | 13.80 | 13.86 | 13.46 | 13.30 | 13.46 | | 0 |
| | 25 | 25 | 13.81 | 13.88 | 13.43 | 13.18 | 13.56 | | 0 |
| | 50 | 0 | 13.84 | 13.92 | 13.53 | 13.30 | 13.59 | | 0 |
| 16QAM | 1 | 0 | 13.90 | 13.95 | 13.66 | 13.42 | 13.73 | 0-1 | 0 |
| | 1 | 25 | 13.69 | 13.77 | 13.31 | 13.07 | 13.39 | | 0 |
| | 1 | 49 | 13.87 | 13.92 | 13.70 | 13.48 | 13.75 | | 0 |
| | 25 | 0 | 13.78 | 13.88 | 13.47 | 13.26 | 13.57 | 0-2 | 0 |
| | 25 | 12 | 13.78 | 13.89 | 13.42 | 13.20 | 13.52 | | 0 |
| | 25 | 25 | 13.81 | 13.85 | 13.44 | 13.26 | 13.53 | | 0 |
| | 50 | 0 | 13.88 | 13.96 | 13.57 | 13.35 | 13.68 | | 0 |
| 64QAM | 1 | 0 | 13.66 | 13.68 | 13.40 | 13.26 | 13.52 | 0-2 | 0 |
| | 1 | 25 | 13.46 | 13.52 | 13.00 | 13.10 | 13.43 | | 0 |
| | 1 | 49 | 13.63 | 13.67 | 13.44 | 13.20 | 13.50 | | 0 |
| | 25 | 0 | 13.91 | 14.03 | 13.59 | 13.39 | 13.69 | 0-3 | 0 |
| | 25 | 12 | 13.89 | 13.55 | 13.57 | 13.28 | 13.62 | | 0 |
| | 25 | 25 | 13.95 | 14.00 | 13.57 | 13.44 | 13.66 | | 0 |
| | 50 | 0 | 13.92 | 14.01 | 13.59 | 13.37 | 13.67 | | 0 |

## Table 8-72
## LTE Band 41 Reduced Conducted Powers - 5 MHz Bandwidth

| LTE Band 41<br>5 MHz Bandwidth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Low-Mid Channel | Mid Channel | Mid-High Channel | High Channel | MPR Allowed per 3GPP [dB] | MPR [dB] |
| | | | 39750 (2506.0 MHz) | 40185 (2549.5 MHz) | 40620 (2593.0 MHz) | 41055 (2636.5 MHz) | 41490 (2680.0 MHz) | | |
| | | | Conducted Power [dBm] | | | | | | |
| QPSK | 1 | 0 | 13.65 | 13.62 | 13.46 | 13.20 | 13.62 | 0 | 0 |
| | 1 | 12 | 13.53 | 13.58 | 13.46 | 13.24 | 13.60 | | 0 |
| | 1 | 24 | 13.47 | 13.51 | 13.32 | 13.14 | 13.51 | | 0 |
| | 12 | 0 | 13.79 | 13.85 | 13.70 | 13.50 | 13.86 | 0-1 | 0 |
| | 12 | 6 | 13.75 | 13.85 | 13.67 | 13.49 | 13.86 | | 0 |
| | 12 | 13 | 13.69 | 13.83 | 13.62 | 13.43 | 13.81 | | 0 |
| | 25 | 0 | 13.70 | 13.80 | 13.64 | 13.46 | 13.85 | | 0 |
| 16QAM | 1 | 0 | 13.75 | 13.88 | 13.66 | 13.49 | 13.88 | 0-1 | 0 |
| | 1 | 12 | 13.76 | 13.83 | 13.65 | 13.46 | 13.80 | | 0 |
| | 1 | 24 | 13.68 | 13.76 | 13.53 | 13.40 | 13.75 | | 0 |
| | 12 | 0 | 13.89 | 13.95 | 13.62 | 13.50 | 13.81 | 0-2 | 0 |
| | 12 | 6 | 13.83 | 13.93 | 13.75 | 13.52 | 13.94 | | 0 |
| | 12 | 13 | 13.76 | 13.87 | 13.66 | 13.52 | 13.88 | | 0 |
| | 25 | 0 | 13.72 | 13.80 | 13.60 | 13.37 | 13.82 | | 0 |
| 64QAM | 1 | 0 | 13.49 | 13.57 | 13.36 | 13.19 | 13.61 | 0-2 | 0 |
| | 1 | 12 | 13.40 | 13.40 | 13.24 | 13.31 | 13.56 | | 0 |
| | 1 | 24 | 13.40 | 13.44 | 13.24 | 13.09 | 13.45 | | 0 |
| | 12 | 0 | 13.93 | 14.00 | 13.88 | 13.60 | 13.78 | 0-3 | 0 |
| | 12 | 6 | 13.88 | 14.00 | 13.85 | 13.61 | 13.88 | | 0 |
| | 12 | 13 | 13.75 | 13.95 | 13.73 | 13.58 | 13.95 | | 0 |
| | 25 | 0 | 13.74 | 13.92 | 13.80 | 13.54 | 13.98 | | 0 |

## 8.3 WLAN Conducted Powers

**Table 8-73**
**2.4 GHz WLAN Maximum Average RF Power – Ant 1**

| 2.4GHz Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | | |
| | | 802.11b | 802.11g | 802.11n |
| | | Average | Average | Average |
| 2412 | 1 | 15.02 | 15.26 | 15.04 |
| 2437 | 6 | 15.13 | 15.41 | 15.21 |
| 2462 | 11 | 15.16 | 15.35 | 15.13 |

**Table 8-74**
**2.4 GHz WLAN Maximum Average RF Power – Ant 2**

| 2.4GHz Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | | |
| | | 802.11b | 802.11g | 802.11n |
| | | Average | Average | Average |
| 2412 | 1 | 15.01 | 15.32 | 15.08 |
| 2437 | 6 | 15.19 | 15.45 | 15.24 |
| 2462 | 11 | 15.27 | 15.48 | 15.31 |

**Table 8-75**
**2.4 GHz WLAN Maximum Average RF Power – MIMO**

| 2.4GHz 802.11n Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | ANT1 | ANT2 | MIMO |
| 2412 | 1 | 15.04 | 15.08 | 18.07 |
| 2437 | 6 | 15.21 | 15.24 | 18.24 |
| 2462 | 11 | 15.13 | 15.31 | 18.23 |

**Table 8-76**
**5 GHz WLAN Maximum Average RF Power – Ant 1**

| 5GHz (40MHz) Conducted Power [dBm] | | | |
|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | |
| | | 802.11n | 802.11ac |
| | | Average | Average |
| 5190 | 38 | 14.48 | 14.45 |
| 5230 | 46 | 14.46 | 14.49 |
| 5270 | 54 | 14.27 | 14.19 |
| 5310 | 62 | 14.21 | 14.21 |
| 5510 | 102 | 14.24 | 14.18 |
| 5590 | 118 | 13.87 | 13.84 |
| 5630 | 126 | 13.79 | 13.81 |
| 5710 | 142 | 13.97 | 14.02 |
| 5755 | 151 | 14.08 | 14.08 |
| 5795 | 159 | 14.19 | 14.21 |

**Table 8-77**
**5 GHz WLAN Maximum Average RF Power – Ant 2**

| 5GHz (40MHz) Conducted Power [dBm] | | | |
|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | |
| | | 802.11n | 802.11ac |
| | | Average | Average |
| 5190 | 38 | 14.25 | 14.26 |
| 5230 | 46 | 14.33 | 14.33 |
| 5270 | 54 | 14.15 | 14.17 |
| 5310 | 62 | 14.12 | 14.12 |
| 5510 | 102 | 14.42 | 14.37 |
| 5590 | 118 | 14.19 | 14.16 |
| 5630 | 126 | 14.26 | 14.28 |
| 5710 | 142 | 14.48 | 14.49 |
| 5755 | 151 | 14.49 | 14.47 |
| 5795 | 159 | 14.36 | 14.34 |

**Table 8-78**
**5 GHz WLAN Maximum Average RF Power – MIMO**

| 5GHz (40MHz) 802.11n Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | ANT1 | ANT2 | MIMO |
| 5190 | 38 | 14.48 | 14.25 | 17.38 |
| 5230 | 46 | 14.46 | 14.33 | 17.41 |
| 5270 | 54 | 14.27 | 14.15 | 17.22 |
| 5310 | 62 | 14.21 | 14.12 | 17.18 |
| 5510 | 102 | 14.24 | 14.42 | 17.34 |
| 5590 | 118 | 13.87 | 14.19 | 17.04 |
| 5630 | 126 | 13.79 | 14.26 | 17.04 |
| 5710 | 142 | 13.97 | 14.48 | 17.24 |
| 5755 | 151 | 14.08 | 14.49 | 17.30 |
| 5795 | 159 | 14.19 | 14.36 | 17.29 |

**Table 8-79**
**2.4 GHz WLAN Reduced Average RF Power – Ant 1**

| 2.4GHz Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | | |
| | | 802.11b | 802.11g | 802.11n |
| | | Average | Average | Average |
| 2412 | 1 | 8.12 | 8.10 | 8.10 |
| 2437 | 6 | 8.26 | 7.94 | 7.96 |
| 2462 | 11 | 8.18 | 8.18 | 8.15 |

**Table 8-80**
**2.4 GHz WLAN Reduced Average RF Power – Ant 2**

| 2.4GHz Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | | |
| | | 802.11b | 802.11g | 802.11n |
| | | Average | Average | Average |
| 2412 | 1 | 7.81 | 7.75 | 7.76 |
| 2437 | 6 | 8.06 | 7.90 | 7.95 |
| 2462 | 11 | 8.34 | 8.06 | 7.94 |

**Table 8-81**
**2.4 GHz WLAN Reduced Average RF Power – MIMO**

| 2.4GHz 802.11n Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| Freq [MHz] | Channel | ANT1 | ANT2 | MIMO |
| 2412 | 1 | 8.10 | 7.76 | 10.94 |
| 2437 | 6 | 7.96 | 7.95 | 10.97 |
| 2462 | 11 | 8.15 | 7.94 | 11.06 |

**Table 8-82**
**5 GHz WLAN Reduced Average RF Power – Ant 1**

| 5GHz (40MHz) Conducted Power [dBm] | | | |
|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | |
| | | 802.11n | 802.11ac |
| | | Average | Average |
| 5190 | 38 | 7.24 | 7.40 |
| 5230 | 46 | 7.33 | 7.23 |
| 5270 | 54 | 7.07 | 7.16 |
| 5310 | 62 | 7.05 | 7.21 |
| 5510 | 102 | 6.95 | 6.80 |
| 5590 | 118 | 6.62 | 6.55 |
| 5630 | 126 | 6.91 | 6.91 |
| 5710 | 142 | 6.73 | 6.81 |
| 5755 | 151 | 6.97 | 6.82 |
| 5795 | 159 | 6.89 | 6.90 |

**Table 8-83**
**5 GHz WLAN Reduced Average RF Power – Ant 2**

| 5GHz (40MHz) Conducted Power [dBm] | | | |
|---|---|---|---|
| Freq [MHz] | Channel | IEEE Transmission Mode | |
| | | 802.11n | 802.11ac |
| | | Average | Average |
| 5190 | 38 | 7.42 | 7.41 |
| 5230 | 46 | 7.40 | 7.01 |
| 5270 | 54 | 7.29 | 7.43 |
| 5310 | 62 | 6.92 | 7.16 |
| 5510 | 102 | 6.90 | 6.77 |
| 5590 | 118 | 6.62 | 6.51 |
| 5630 | 126 | 6.79 | 7.09 |
| 5710 | 142 | 6.83 | 6.72 |
| 5755 | 151 | 6.91 | 7.00 |
| 5795 | 159 | 7.12 | 6.85 |

**Table 8-84**
**5 GHz WLAN Reduced Average RF Power – MIMO**

| 5GHz (40MHz) 802.11n Conducted Power [dBm] | | | | |
|---|---|---|---|---|
| **Freq [MHz]** | **Channel** | **ANT1** | **ANT2** | **MIMO** |
| 5190 | 38 | 7.24 | 7.42 | 10.34 |
| 5230 | 46 | 7.33 | 7.40 | 10.38 |
| 5270 | 54 | 7.07 | 7.29 | 10.19 |
| 5310 | 62 | 7.05 | 6.92 | 10.00 |
| 5510 | 102 | 6.95 | 6.90 | 9.94 |
| 5590 | 118 | 6.62 | 6.62 | 9.63 |
| 5630 | 126 | 6.91 | 6.79 | 9.86 |
| 5710 | 142 | 6.73 | 6.83 | 9.79 |
| 5755 | 151 | 6.97 | 6.91 | 9.95 |
| 5795 | 159 | 6.89 | 7.12 | 10.02 |

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.
- The bolded data rate and channel above were tested for SAR.

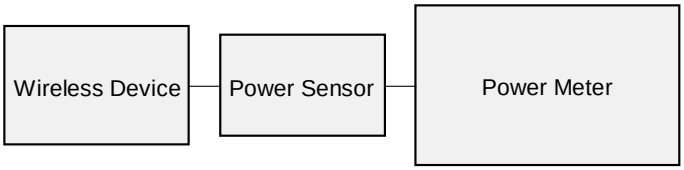


**Figure 8-2**
**Power Measurement Setup**

## 8.4 Bluetooth Conducted Powers

**Table 8-85**
**Bluetooth Average RF Power**

| Frequency [MHz] | Data Rate [Mbps] | Channel No. | Avg Conducted Power | |
|---|---|---|---|---|
| | | | [dBm] | [mW] |
| 2402 | 1.0 | 0 | 5.71 | 3.727 |
| 2441 | 1.0 | 39 | 7.19 | 5.236 |
| 2480 | 1.0 | 78 | 5.81 | 3.811 |
| 2402 | 2.0 | 0 | 5.12 | 3.250 |
| 2441 | 2.0 | 39 | 6.56 | 4.525 |
| 2480 | 2.0 | 78 | 5.22 | 3.328 |
| 2402 | 3.0 | 0 | 5.14 | 3.267 |
| 2441 | 3.0 | 39 | 6.60 | 4.569 |
| 2480 | 3.0 | 78 | 5.23 | 3.334 |

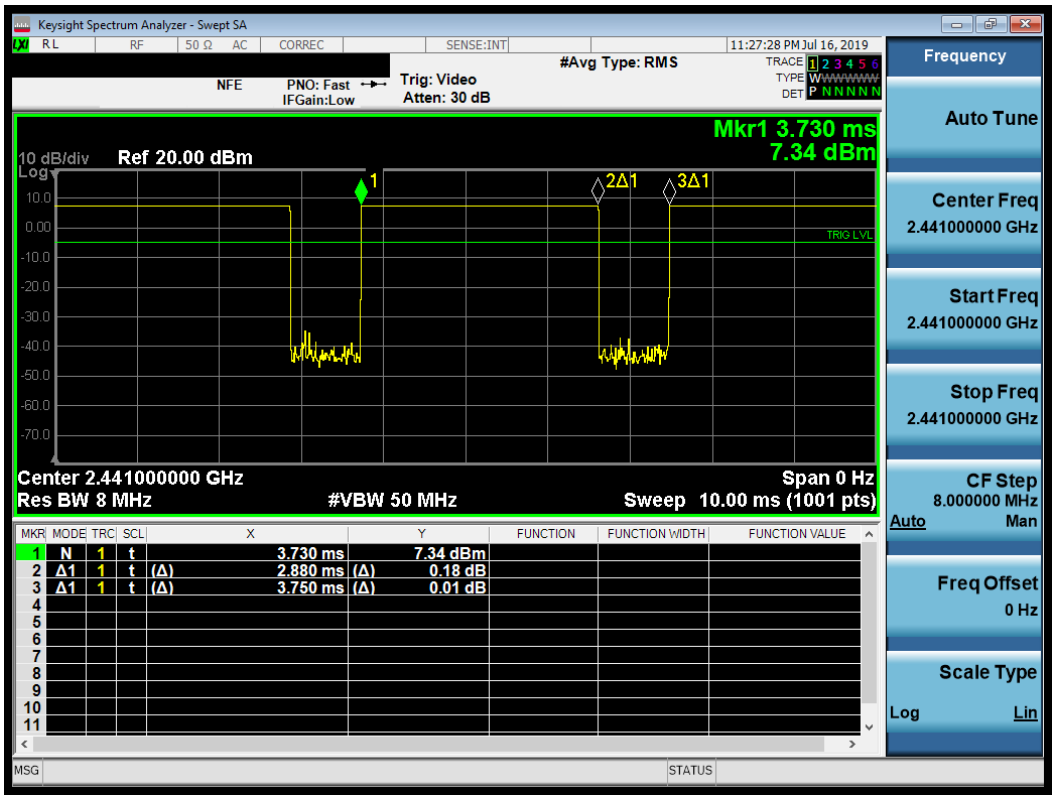


**Figure 8-3**
**Bluetooth Transmission Plot**

**Equation 8-1**
**Bluetooth Duty Cycle Calculation**

$$\textbf{Duty Cycle} = \frac{\textbf{Pulse Width}}{\textbf{Period}} * 100\% = \frac{2.88ms}{3.75ms} * 100\% = 76.8\%$$

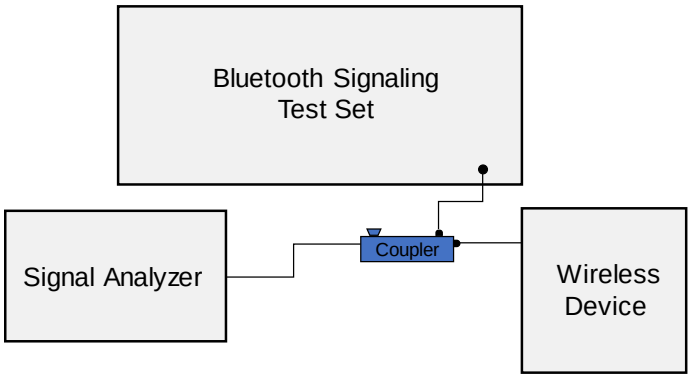


**Figure 8-4**
**Power Measurement Setup**

# 9 SYSTEM VERIFICATION

## 9.1 Tissue Verification

**Table 9-1**
**Measured Tissue Properties**

| Calibrated for Tests Performed on: | Tissue Type | Tissue Temp During Calibration (°C) | Measured Frequency (MHz) | Measured Conductivity, σ (S/m) | Measured Dielectric Constant, ε | TARGET Conductivity, σ (S/m) | TARGET Dielectric Constant, ε | % dev σ | % dev ε |
|---|---|---|---|---|---|---|---|---|---|
| 7/15/2019 | 750B | 23.8 | 680 | 0.919 | 57.445 | 0.958 | 55.804 | -4.07% | 2.94% |
| | | | 695 | 0.923 | 57.410 | 0.959 | 55.745 | -3.75% | 2.99% |
| | | | 700 | 0.925 | 57.398 | 0.959 | 55.726 | -3.55% | 3.00% |
| | | | 710 | 0.929 | 57.376 | 0.960 | 55.687 | -3.23% | 3.03% |
| | | | 740 | 0.939 | 57.327 | 0.963 | 55.570 | -2.49% | 3.16% |
| | | | 755 | 0.944 | 57.299 | 0.964 | 55.512 | -2.07% | 3.22% |
| | | | 770 | 0.949 | 57.264 | 0.965 | 55.453 | -1.66% | 3.27% |
| | | | 785 | 0.954 | 57.219 | 0.966 | 55.395 | -1.24% | 3.29% |
| 8/20/2019 | 750B | 22.8 | 740 | 0.948 | 56.679 | 0.963 | 55.570 | -1.56% | 2.00% |
| | | | 755 | 0.954 | 56.666 | 0.964 | 55.512 | -1.04% | 2.08% |
| | | | 770 | 0.959 | 56.606 | 0.965 | 55.453 | -0.62% | 2.08% |
| | | | 785 | 0.963 | 56.580 | 0.966 | 55.395 | -0.31% | 2.14% |
| 8/19/2019 | 835B | 21.9 | 820 | 0.940 | 57.123 | 0.969 | 55.258 | -2.99% | 3.38% |
| | | | 835 | 0.945 | 57.098 | 0.970 | 55.200 | -2.58% | 3.44% |
| | | | 850 | 0.951 | 57.065 | 0.988 | 55.154 | -3.74% | 3.46% |
| 7/17/2019 | 1750B | 21.9 | 1710 | 1.436 | 54.029 | 1.463 | 53.537 | -1.85% | 0.92% |
| | | | 1750 | 1.464 | 53.969 | 1.488 | 53.432 | -1.61% | 1.01% |
| | | | 1790 | 1.491 | 53.914 | 1.514 | 53.326 | -1.52% | 1.10% |
| 8/19/2019 | 1750B | 21.4 | 1710 | 1.413 | 51.869 | 1.463 | 53.537 | -3.42% | -3.12% |
| | | | 1750 | 1.437 | 51.764 | 1.488 | 53.432 | -3.43% | -3.12% |
| | | | 1790 | 1.466 | 51.703 | 1.514 | 53.326 | -3.17% | -3.04% |
| 8/20/2019 | 1900B | 24.6 | 1850 | 1.488 | 53.785 | 1.520 | 53.300 | -2.11% | 0.91% |
| | | | 1880 | 1.521 | 53.677 | 1.520 | 53.300 | 0.07% | 0.71% |
| | | | 1910 | 1.554 | 53.583 | 1.520 | 53.300 | 2.24% | 0.53% |
| 8/25/2019 | 1900B | 21.6 | 1850 | 1.523 | 54.770 | 1.520 | 53.300 | 0.20% | 2.76% |
| | | | 1880 | 1.558 | 54.661 | 1.520 | 53.300 | 2.50% | 2.55% |
| | | | 1910 | 1.592 | 54.547 | 1.520 | 53.300 | 4.74% | 2.34% |
| 7/31/2019 | 2450B | 22.1 | 2400 | 1.854 | 51.645 | 1.902 | 52.767 | -2.52% | -2.13% |
| | | | 2450 | 1.917 | 51.463 | 1.950 | 52.700 | -1.69% | -2.35% |
| | | | 2500 | 1.983 | 51.300 | 2.021 | 52.636 | -1.88% | -2.54% |
| 8/1/2019 | 2450B | 23.3 | 2450 | 2.013 | 50.759 | 1.950 | 52.700 | 3.23% | -3.68% |
| | | | 2500 | 2.071 | 50.620 | 2.021 | 52.636 | 2.47% | -3.83% |
| | | | 2550 | 2.131 | 50.472 | 2.092 | 52.573 | 1.86% | -4.00% |
| | | | 2600 | 2.189 | 50.331 | 2.163 | 52.509 | 1.20% | -4.15% |
| | | | 2650 | 2.247 | 50.170 | 2.234 | 52.445 | 0.58% | -4.34% |
| | | | 2700 | 2.306 | 50.016 | 2.305 | 52.382 | 0.04% | -4.52% |
| 8/4/2019 | 2450B | 22.5 | 2400 | 1.983 | 51.695 | 1.902 | 52.767 | 4.26% | -2.03% |
| | | | 2450 | 2.042 | 51.536 | 1.950 | 52.700 | 4.72% | -2.21% |
| | | | 2500 | 2.102 | 51.400 | 2.021 | 52.636 | 4.01% | -2.35% |
| 07/31/2019 | 5200B-5800B | 21.4 | 5240 | 5.150 | 47.084 | 5.346 | 48.960 | -3.67% | -3.83% |
| | | | 5260 | 5.180 | 47.051 | 5.369 | 48.933 | -3.52% | -3.85% |
| | | | 5280 | 5.202 | 47.019 | 5.393 | 48.906 | -3.54% | -3.86% |
| | | | 5320 | 5.253 | 46.964 | 5.439 | 48.851 | -3.42% | -3.86% |
| | | | 5500 | 5.489 | 46.656 | 5.650 | 48.607 | -2.85% | -4.01% |
| | | | 5520 | 5.515 | 46.615 | 5.673 | 48.580 | -2.79% | -4.04% |
| | | | 5600 | 5.629 | 46.485 | 5.766 | 48.471 | -2.38% | -4.10% |
| | | | 5620 | 5.655 | 46.425 | 5.790 | 48.444 | -2.33% | -4.17% |
| | | | 5640 | 5.691 | 46.405 | 5.813 | 48.417 | -2.10% | -4.16% |
| | | | 5700 | 5.772 | 46.321 | 5.883 | 48.336 | -1.89% | -4.17% |
| | | | 5745 | 5.834 | 46.233 | 5.936 | 48.275 | -1.72% | -4.23% |
| | | | 5765 | 5.864 | 46.188 | 5.959 | 48.248 | -1.59% | -4.27% |
| | | | 5785 | 5.895 | 46.146 | 5.982 | 48.220 | -1.45% | -4.30% |
| | | | 5800 | 5.914 | 46.136 | 6.000 | 48.200 | -1.43% | -4.28% |

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

## 9.2 Test System Verification

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

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

| System Verification TARGET & MEASURED | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAR System # | Tissue Frequency (MHz) | Tissue Type | Date | Amb. Temp (°C) | Liquid Temp (°C) | Input Power (W) | Source SN | Probe SN | Measured $SAR_{1g}$ (W/kg) | 1 W Target $SAR_{1g}$ (W/kg) | 1 W Normalized $SAR_{1g}$ (W/kg) | $Deviation_{1g}$ (%) |
| D | 750 | BODY | 07/15/2019 | 22.8 | 22.6 | 0.200 | 1003 | 3914 | 1.700 | 8.580 | 8.500 | -0.93% |
| H | 750 | BODY | 08/20/2019 | 23.5 | 21.5 | 0.200 | 1054 | 7406 | 1.790 | 8.550 | 8.950 | 4.68% |
| H | 835 | BODY | 08/19/2019 | 21.0 | 20.9 | 0.200 | 4d132 | 7406 | 2.010 | 9.670 | 10.050 | 3.93% |
| G | 1750 | BODY | 07/17/2019 | 22.6 | 21.9 | 0.100 | 1150 | 7409 | 3.880 | 36.600 | 38.800 | 6.01% |
| G | 1750 | BODY | 08/19/2019 | 22.4 | 21.4 | 0.100 | 1150 | 7409 | 3.630 | 36.600 | 36.300 | -0.82% |
| J | 1900 | BODY | 08/20/2019 | 20.9 | 23.0 | 0.100 | 5d148 | 7488 | 4.100 | 39.100 | 41.000 | 4.86% |
| J | 1900 | BODY | 08/25/2019 | 20.0 | 20.1 | 0.100 | 5d148 | 7488 | 4.160 | 39.100 | 41.600 | 6.39% |
| I | 2450 | BODY | 07/31/2019 | 22.6 | 21.2 | 0.100 | 797 | 7357 | 4.950 | 51.100 | 49.500 | -3.13% |
| K | 2450 | BODY | 08/01/2019 | 22.5 | 22.0 | 0.100 | 719 | 7417 | 5.210 | 50.100 | 52.100 | 3.99% |
| K | 2450 | BODY | 08/04/2019 | 22.2 | 21.2 | 0.100 | 719 | 7417 | 5.310 | 50.100 | 53.100 | 5.99% |
| K | 2600 | BODY | 08/01/2019 | 22.5 | 22.0 | 0.100 | 1004 | 7417 | 5.600 | 54.800 | 56.000 | 2.19% |
| L | 5250 | BODY | 07/31/2019 | 21.5 | 20.4 | 0.050 | 1057 | 7410 | 3.470 | 75.900 | 69.400 | -8.56% |
| L | 5600 | BODY | 07/31/2019 | 21.5 | 20.4 | 0.050 | 1057 | 7410 | 3.740 | 79.900 | 74.800 | -6.38% |
| L | 5750 | BODY | 07/31/2019 | 21.5 | 20.4 | 0.050 | 1057 | 7410 | 3.570 | 76.700 | 71.400 | -6.91% |

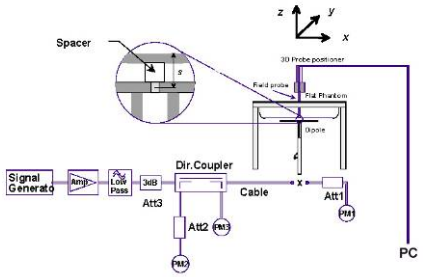


**Figure 9-1**
**System Verification Setup Diagram**

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

# 10 SAR DATA SUMMARY

## 10.1 Standalone Body SAR Data

**Table 10-1**
**UMTS Body SAR Data**

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing | Device Serial Number | Duty Cycle | Side | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | (W/kg) | | (W/kg) | |
| 836.60 | 4183 | UMTS 850 | RMC | 25.2 | 25.16 | 0.01 | 15 mm | 00657 | 1:1 | back | 0.504 | 1.009 | 0.509 | |
| 826.40 | 4132 | UMTS 850 | RMC | 25.2 | 24.90 | -0.04 | 15 mm | 00657 | 1:1 | top | 0.624 | 1.072 | 0.669 | |
| 836.60 | 4183 | UMTS 850 | RMC | 25.2 | 25.16 | -0.02 | 15 mm | 00657 | 1:1 | top | 0.701 | 1.009 | 0.707 | |
| 846.60 | 4233 | UMTS 850 | RMC | 25.2 | 25.20 | -0.01 | 15 mm | 00657 | 1:1 | top | 0.732 | 1.000 | 0.732 | A1 |
| 836.60 | 4183 | UMTS 850 | RMC | 25.2 | 25.16 | 0.01 | 0 mm | 00640 | 1:1 | right | 0.103 | 1.009 | 0.104 | |
| 836.60 | 4183 | UMTS 850 | RMC | 25.2 | 25.16 | 0.05 | 0 mm | 00640 | 1:1 | left | 0.207 | 1.009 | 0.209 | |
| 836.60 | 4183 | UMTS 850 | RMC | 18.2 | 18.04 | 0.03 | 0 mm | 00640 | 1:1 | back | 0.582 | 1.038 | 0.604 | |
| 826.40 | 4132 | UMTS 850 | RMC | 18.2 | 17.98 | -0.03 | 0 mm | 00640 | 1:1 | top | 0.616 | 1.052 | 0.648 | |
| 836.60 | 4183 | UMTS 850 | RMC | 18.2 | 18.04 | 0.01 | 0 mm | 00640 | 1:1 | top | 0.597 | 1.038 | 0.620 | |
| 846.60 | 4233 | UMTS 850 | RMC | 18.2 | 18.12 | 0.00 | 0 mm | 00640 | 1:1 | top | 0.591 | 1.019 | 0.602 | |
| 1732.40 | 1412 | UMTS 1750 | RMC | 24.7 | 24.66 | -0.02 | 15 mm | 00640 | 1:1 | back | 0.542 | 1.009 | 0.547 | A2 |
| 1732.40 | 1412 | UMTS 1750 | RMC | 24.7 | 24.66 | -0.06 | 15 mm | 00640 | 1:1 | top | 0.520 | 1.009 | 0.525 | |
| 1732.40 | 1412 | UMTS 1750 | RMC | 24.7 | 24.66 | -0.19 | 0 mm | 00657 | 1:1 | right | 0.211 | 1.009 | 0.213 | |
| 1732.40 | 1412 | UMTS 1750 | RMC | 24.7 | 24.66 | 0.06 | 0 mm | 00657 | 1:1 | left | 0.502 | 1.009 | 0.507 | |
| 1732.40 | 1412 | UMTS 1750 | RMC | 11.7 | 11.58 | -0.01 | 0 mm | 00657 | 1:1 | back | 0.452 | 1.028 | 0.465 | |
| 1732.40 | 1412 | UMTS 1750 | RMC | 11.7 | 11.58 | 0.02 | 0 mm | 00657 | 1:1 | top | 0.455 | 1.028 | 0.468 | |
| 1852.40 | 9262 | UMTS 1900 | RMC | 23.7 | 23.70 | -0.01 | 15 mm | 00657 | 1:1 | back | 0.616 | 1.000 | 0.616 | |
| 1880.00 | 9400 | UMTS 1900 | RMC | 23.7 | 23.60 | -0.01 | 15 mm | 00657 | 1:1 | back | 0.650 | 1.023 | 0.665 | |
| 1907.60 | 9538 | UMTS 1900 | RMC | 23.7 | 23.62 | 0.01 | 15 mm | 00657 | 1:1 | back | 0.734 | 1.019 | 0.748 | |
| 1852.40 | 9262 | UMTS 1900 | RMC | 23.7 | 23.70 | -0.02 | 15 mm | 00657 | 1:1 | top | 0.700 | 1.000 | 0.700 | |
| 1880.00 | 9400 | UMTS 1900 | RMC | 23.7 | 23.60 | -0.02 | 15 mm | 00657 | 1:1 | top | 0.759 | 1.023 | 0.776 | |
| 1907.60 | 9538 | UMTS 1900 | RMC | 23.7 | 23.62 | 0.00 | 15 mm | 00657 | 1:1 | top | 0.877 | 1.019 | 0.894 | A3 |
| 1880.00 | 9400 | UMTS 1900 | RMC | 23.7 | 23.60 | 0.00 | 0 mm | 00640 | 1:1 | right | 0.177 | 1.023 | 0.181 | |
| 1880.00 | 9400 | UMTS 1900 | RMC | 23.7 | 23.60 | 0.10 | 0 mm | 00640 | 1:1 | left | 0.467 | 1.023 | 0.478 | |
| 1880.00 | 9400 | UMTS 1900 | RMC | 10.7 | 10.69 | -0.11 | 0 mm | 00640 | 1:1 | back | 0.567 | 1.002 | 0.568 | |
| 1880.00 | 9400 | UMTS 1900 | RMC | 10.7 | 10.69 | 0.02 | 0 mm | 00640 | 1:1 | top | 0.281 | 1.002 | 0.282 | |
| 1907.60 | 9538 | UMTS 1900 | RMC | 23.7 | 23.62 | -0.03 | 15 mm | 00657 | 1:1 | top | 0.871 | 1.019 | 0.888 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | |

Note: Blue entry represents variability measurement.

## Table 10-2
## LTE Band 71 Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 25.2 | 24.99 | -0.01 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | back | 1:1 | 0.388 | 1.050 | 0.407 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 24.2 | 23.85 | -0.02 | 1 | 00657 | QPSK | 50 | 0 | 15 mm | back | 1:1 | 0.310 | 1.084 | 0.336 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 25.2 | 24.99 | -0.08 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | top | 1:1 | 0.307 | 1.050 | 0.322 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 24.2 | 23.85 | -0.05 | 1 | 00657 | QPSK | 50 | 0 | 15 mm | top | 1:1 | 0.217 | 1.084 | 0.235 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 25.2 | 24.99 | -0.06 | 0 | 00665 | QPSK | 1 | 99 | 0 mm | right | 1:1 | 0.094 | 1.050 | 0.099 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 24.2 | 23.85 | -0.02 | 1 | 00665 | QPSK | 50 | 0 | 0 mm | right | 1:1 | 0.056 | 1.084 | 0.061 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 25.2 | 24.99 | 0.07 | 0 | 00665 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 0.125 | 1.050 | 0.131 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 24.2 | 23.85 | -0.01 | 1 | 00665 | QPSK | 50 | 0 | 0 mm | left | 1:1 | 0.115 | 1.084 | 0.125 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 17.7 | 17.52 | -0.01 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1 | 0.502 | 1.042 | 0.523 | A4 |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 17.7 | 17.25 | 0.00 | 0 | 00665 | QPSK | 50 | 0 | 0 mm | back | 1:1 | 0.496 | 1.109 | 0.550 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 17.7 | 17.52 | 0.05 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | top | 1:1 | 0.382 | 1.042 | 0.398 | |
| 680.50 | 133297 | Mid | LTE Band 71 | 20 | 17.7 | 17.25 | 0.05 | 0 | 00665 | QPSK | 50 | 0 | 0 mm | top | 1:1 | 0.375 | 1.109 | 0.416 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | |

## Table 10-3
## LTE Band 12 Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 25.2 | 25.01 | 0.01 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | back | 1:1 | 0.474 | 1.045 | 0.495 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 24.2 | 23.90 | -0.11 | 1 | 00657 | QPSK | 25 | 0 | 15 mm | back | 1:1 | 0.375 | 1.072 | 0.402 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 25.2 | 25.01 | -0.03 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | top | 1:1 | 0.374 | 1.045 | 0.391 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 24.2 | 23.90 | -0.03 | 1 | 00657 | QPSK | 25 | 0 | 15 mm | top | 1:1 | 0.302 | 1.072 | 0.324 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 25.2 | 25.01 | 0.02 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | right | 1:1 | 0.089 | 1.045 | 0.093 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 24.2 | 23.90 | -0.04 | 1 | 00665 | QPSK | 25 | 0 | 0 mm | right | 1:1 | 0.061 | 1.072 | 0.065 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 25.2 | 25.01 | -0.07 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | left | 1:1 | 0.183 | 1.045 | 0.191 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 24.2 | 23.90 | 0.05 | 1 | 00665 | QPSK | 25 | 0 | 0 mm | left | 1:1 | 0.143 | 1.072 | 0.153 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 17.2 | 16.99 | 0.00 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1 | 0.607 | 1.050 | 0.637 | A5 |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 17.2 | 17.00 | 0.01 | 0 | 00665 | QPSK | 25 | 0 | 0 mm | back | 1:1 | 0.599 | 1.047 | 0.627 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 17.2 | 16.99 | 0.03 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | top | 1:1 | 0.452 | 1.050 | 0.475 | |
| 707.50 | 23095 | Mid | LTE Band 12 | 10 | 17.2 | 17.00 | 0.02 | 0 | 00665 | QPSK | 25 | 0 | 0 mm | top | 1:1 | 0.455 | 1.047 | 0.476 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | |

## Table 10-4
## LTE Band 13 Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 25.2 | 25.10 | -0.01 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | back | 1:1 | 0.649 | 1.023 | 0.664 | A6 |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 24.2 | 23.90 | -0.11 | 1 | 00657 | QPSK | 25 | 0 | 15 mm | back | 1:1 | 0.413 | 1.072 | 0.443 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 25.2 | 25.10 | -0.13 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | top | 1:1 | 0.516 | 1.023 | 0.528 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 24.2 | 23.90 | -0.12 | 1 | 00657 | QPSK | 25 | 0 | 15 mm | top | 1:1 | 0.342 | 1.072 | 0.367 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 25.2 | 25.10 | -0.11 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | right | 1:1 | 0.099 | 1.023 | 0.101 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 24.2 | 23.90 | -0.07 | 1 | 00665 | QPSK | 25 | 0 | 0 mm | right | 1:1 | 0.063 | 1.072 | 0.068 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 25.2 | 25.10 | 0.00 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | left | 1:1 | 0.264 | 1.023 | 0.270 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 24.2 | 23.90 | -0.06 | 1 | 00665 | QPSK | 25 | 0 | 0 mm | left | 1:1 | 0.173 | 1.072 | 0.185 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 17.2 | 17.20 | -0.01 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1 | 0.591 | 1.000 | 0.591 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 17.2 | 17.18 | 0.01 | 0 | 00665 | QPSK | 25 | 0 | 0 mm | back | 1:1 | 0.602 | 1.005 | 0.605 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 17.2 | 17.20 | -0.04 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | top | 1:1 | 0.430 | 1.000 | 0.430 | |
| 782.00 | 23230 | Mid | LTE Band 13 | 10 | 17.2 | 17.18 | 0.02 | 0 | 00665 | QPSK | 25 | 0 | 0 mm | top | 1:1 | 0.443 | 1.005 | 0.445 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | | | | | |

## Table 10-5
## LTE Band 26 (Cell) Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 25.2 | 25.20 | -0.04 | 0 | 00657 | QPSK | 1 | 74 | 15 mm | back | 1:1 | 0.473 | 1.000 | 0.473 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 24.2 | 24.17 | -0.05 | 1 | 00657 | QPSK | 36 | 0 | 15 mm | back | 1:1 | 0.356 | 1.007 | 0.358 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 25.2 | 25.20 | -0.05 | 0 | 00657 | QPSK | 1 | 74 | 15 mm | top | 1:1 | 0.724 | 1.000 | 0.724 | A7 |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 24.2 | 24.17 | -0.01 | 1 | 00657 | QPSK | 36 | 0 | 15 mm | top | 1:1 | 0.491 | 1.007 | 0.494 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 25.2 | 25.20 | 0.13 | 0 | 00640 | QPSK | 1 | 74 | 0 mm | right | 1:1 | 0.118 | 1.000 | 0.118 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 24.2 | 24.17 | 0.06 | 1 | 00640 | QPSK | 36 | 0 | 0 mm | right | 1:1 | 0.085 | 1.007 | 0.086 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 25.2 | 25.20 | -0.04 | 0 | 00640 | QPSK | 1 | 74 | 0 mm | left | 1:1 | 0.209 | 1.000 | 0.209 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 24.2 | 24.17 | -0.02 | 1 | 00640 | QPSK | 36 | 0 | 0 mm | left | 1:1 | 0.142 | 1.007 | 0.143 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 18.2 | 18.13 | -0.02 | 0 | 00640 | QPSK | 1 | 74 | 0 mm | back | 1:1 | 0.638 | 1.016 | 0.648 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 18.2 | 18.12 | -0.03 | 0 | 00640 | QPSK | 36 | 0 | 0 mm | back | 1:1 | 0.667 | 1.019 | 0.680 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 18.2 | 18.13 | 0.00 | 0 | 00640 | QPSK | 1 | 74 | 0 mm | top | 1:1 | 0.617 | 1.016 | 0.627 | |
| 831.50 | 26865 | Mid | LTE Band 26 (Cell) | 15 | 18.2 | 18.12 | 0.01 | 0 | 00640 | QPSK | 36 | 0 | 0 mm | top | 1:1 | 0.649 | 1.019 | 0.661 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | | | | | |

## Table 10-6
## LTE Band 66 (AWS) Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 24.7 | 24.42 | -0.01 | 0 | 00640 | QPSK | 1 | 99 | 15 mm | back | 1:1 | 0.501 | 1.067 | 0.535 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 23.7 | 23.12 | 0.01 | 1 | 00640 | QPSK | 50 | 0 | 15 mm | back | 1:1 | 0.378 | 1.143 | 0.432 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 24.7 | 24.42 | -0.01 | 0 | 00640 | QPSK | 1 | 99 | 15 mm | top | 1:1 | 0.484 | 1.067 | 0.516 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 23.7 | 23.12 | -0.02 | 1 | 00640 | QPSK | 50 | 0 | 15 mm | top | 1:1 | 0.364 | 1.143 | 0.416 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 24.7 | 24.42 | 0.06 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | right | 1:1 | 0.242 | 1.067 | 0.258 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 23.7 | 23.12 | 0.03 | 1 | 00657 | QPSK | 50 | 0 | 0 mm | right | 1:1 | 0.161 | 1.143 | 0.184 | |
| 1720.00 | 132072 | Low | LTE Band 66 (AWS) | 20 | 24.7 | 24.09 | 0.15 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 0.469 | 1.151 | 0.540 | |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 24.7 | 24.42 | 0.08 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 0.564 | 1.067 | 0.602 | |
| 1770.00 | 132572 | High | LTE Band 66 (AWS) | 20 | 24.7 | 24.28 | 0.11 | 0 | 00657 | QPSK | 1 | 0 | 0 mm | left | 1:1 | 0.586 | 1.102 | 0.646 | A8 |
| 1745.00 | 132322 | Mid | LTE Band 66 (AWS) | 20 | 23.7 | 23.12 | 0.11 | 1 | 00657 | QPSK | 50 | 0 | 0 mm | left | 1:1 | 0.443 | 1.143 | 0.506 | |
| 1770.00 | 132572 | High | LTE Band 66 (AWS) | 20 | 11.7 | 11.48 | -0.04 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | back | 1:1 | 0.372 | 1.052 | 0.391 | |
| 1770.00 | 132572 | High | LTE Band 66 (AWS) | 20 | 11.7 | 11.37 | -0.01 | 0 | 00657 | QPSK | 50 | 0 | 0 mm | back | 1:1 | 0.384 | 1.079 | 0.414 | |
| 1770.00 | 132572 | High | LTE Band 66 (AWS) | 20 | 11.7 | 11.48 | 0.01 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | top | 1:1 | 0.463 | 1.052 | 0.487 | |
| 1770.00 | 132572 | High | LTE Band 66 (AWS) | 20 | 11.7 | 11.37 | -0.01 | 0 | 00657 | QPSK | 50 | 0 | 0 mm | top | 1:1 | 0.468 | 1.079 | 0.505 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | |

## Table 10-7
## LTE Band 25 (PCS) Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 23.7 | 23.27 | 0.02 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | back | 1:1 | 0.750 | 1.104 | 0.828 | |
| 1882.50 | 26365 | Mid | LTE Band 25 (PCS) | 20 | 23.7 | 23.40 | -0.03 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | back | 1:1 | 0.815 | 1.072 | 0.874 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 23.7 | 23.66 | 0.02 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | back | 1:1 | 0.821 | 1.009 | 0.828 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.31 | -0.02 | 1 | 00657 | QPSK | 50 | 0 | 15 mm | back | 1:1 | 0.651 | 1.094 | 0.712 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.22 | -0.01 | 1 | 00657 | QPSK | 100 | 0 | 15 mm | back | 1:1 | 0.668 | 1.117 | 0.746 | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 23.7 | 23.27 | -0.01 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | top | 1:1 | 0.751 | 1.104 | 0.829 | |
| 1882.50 | 26365 | Mid | LTE Band 25 (PCS) | 20 | 23.7 | 23.40 | 0.00 | 0 | 00657 | QPSK | 1 | 99 | 15 mm | top | 1:1 | 0.835 | 1.072 | 0.895 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 23.7 | 23.66 | 0.00 | 0 | 00657 | QPSK | 1 | 0 | 15 mm | top | 1:1 | 0.863 | 1.009 | 0.871 | A9 |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.31 | -0.01 | 1 | 00657 | QPSK | 50 | 0 | 15 mm | top | 1:1 | 0.668 | 1.094 | 0.731 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.22 | 0.00 | 1 | 00657 | QPSK | 100 | 0 | 15 mm | top | 1:1 | 0.684 | 1.117 | 0.764 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 23.7 | 23.66 | -0.08 | 0 | 00640 | QPSK | 1 | 0 | 0 mm | right | 1:1 | 0.178 | 1.009 | 0.180 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.31 | 0.02 | 1 | 00640 | QPSK | 50 | 0 | 0 mm | right | 1:1 | 0.146 | 1.094 | 0.160 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 23.7 | 23.66 | 0.06 | 0 | 00640 | QPSK | 1 | 0 | 0 mm | left | 1:1 | 0.543 | 1.009 | 0.548 | |
| 1905.00 | 26590 | High | LTE Band 25 (PCS) | 20 | 22.7 | 22.31 | 0.03 | 1 | 00640 | QPSK | 50 | 0 | 0 mm | left | 1:1 | 0.437 | 1.094 | 0.478 | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 10.7 | 10.54 | -0.03 | 0 | 00640 | QPSK | 1 | 99 | 0 mm | back | 1:1 | 0.434 | 1.038 | 0.450 | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 10.7 | 10.59 | -0.07 | 0 | 00640 | QPSK | 50 | 50 | 0 mm | back | 1:1 | 0.437 | 1.026 | 0.448 | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 10.7 | 10.54 | 0.03 | 0 | 00640 | QPSK | 1 | 99 | 0 mm | top | 1:1 | 0.304 | 1.038 | 0.316 | |
| 1860.00 | 26140 | Low | LTE Band 25 (PCS) | 20 | 10.7 | 10.59 | 0.00 | 0 | 00640 | QPSK | 50 | 50 | 0 mm | top | 1:1 | 0.312 | 1.026 | 0.320 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | |

## Table 10-8
## LTE Band 7 Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 22.0 | 21.96 | 0.02 | 0 | 00665 | QPSK | 1 | 99 | 15 mm | back | 1:1 | 0.264 | 1.009 | 0.266 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 21.0 | 20.65 | 0.02 | 1 | 00665 | QPSK | 50 | 25 | 15 mm | back | 1:1 | 0.227 | 1.084 | 0.246 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 22.0 | 21.96 | 0.02 | 0 | 00665 | QPSK | 1 | 99 | 15 mm | top | 1:1 | 0.339 | 1.009 | 0.342 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 21.0 | 20.65 | -0.02 | 1 | 00665 | QPSK | 50 | 25 | 15 mm | top | 1:1 | 0.304 | 1.084 | 0.330 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 22.0 | 21.96 | -0.03 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 1.170 | 1.009 | 1.181 | A10 |
| 2535.00 | 21100 | Mid | LTE Band 7 | 20 | 22.0 | 21.93 | 0.00 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 1.060 | 1.016 | 1.077 | |
| 2560.00 | 21350 | High | LTE Band 7 | 20 | 22.0 | 21.95 | -0.09 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 1.150 | 1.012 | 1.164 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 21.0 | 20.65 | 0.01 | 1 | 00657 | QPSK | 50 | 25 | 0 mm | left | 1:1 | 0.981 | 1.084 | 1.063 | |
| 2535.00 | 21100 | Mid | LTE Band 7 | 20 | 21.0 | 20.50 | -0.02 | 1 | 00657 | QPSK | 50 | 50 | 0 mm | left | 1:1 | 0.923 | 1.122 | 1.036 | |
| 2560.00 | 21350 | High | LTE Band 7 | 20 | 21.0 | 20.50 | -0.02 | 1 | 00657 | QPSK | 50 | 25 | 0 mm | left | 1:1 | 0.974 | 1.122 | 1.093 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 21.0 | 20.64 | 0.00 | 1 | 00657 | QPSK | 100 | 0 | 0 mm | left | 1:1 | 0.961 | 1.086 | 1.044 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 10.7 | 10.52 | -0.18 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1 | 0.498 | 1.042 | 0.519 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 10.7 | 10.47 | -0.19 | 0 | 00665 | QPSK | 50 | 0 | 0 mm | back | 1:1 | 0.488 | 1.054 | 0.514 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 10.7 | 10.52 | -0.15 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | top | 1:1 | 0.204 | 1.042 | 0.213 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 10.7 | 10.47 | -0.15 | 0 | 00665 | QPSK | 50 | 0 | 0 mm | top | 1:1 | 0.216 | 1.054 | 0.228 | |
| 2510.00 | 20850 | Low | LTE Band 7 | 20 | 22.0 | 21.96 | 0.05 | 0 | 00657 | QPSK | 1 | 99 | 0 mm | left | 1:1 | 1.120 | 1.009 | 1.130 | |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | | |

Note: Blue entry represents variability measurement.

# Table 10-9
# LTE Band 41 Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | | Mode | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | MPR [dB] | Device Serial Number | Modulation | RB Size | RB Offset | Spacing | Side | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | (W/kg) | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 23.5 | 23.50 | 0.05 | 0 | 00665 | QPSK | 1 | 0 | 15 mm | back | 1:1.58 | 0.224 | 1.000 | 0.224 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 22.5 | 22.50 | -0.03 | 1 | 00665 | QPSK | 50 | 0 | 15 mm | back | 1:1.58 | 0.186 | 1.000 | 0.186 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 23.5 | 23.50 | 0.00 | 0 | 00665 | QPSK | 1 | 0 | 15 mm | top | 1:1.58 | 0.296 | 1.000 | 0.296 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 22.5 | 22.50 | 0.12 | 1 | 00665 | QPSK | 50 | 0 | 15 mm | top | 1:1.58 | 0.252 | 1.000 | 0.252 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 23.5 | 23.50 | 0.01 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | left | 1:1.58 | 1.020 | 1.000 | 1.020 | |
| 2549.50 | 40185 | Low-Mid | LTE Band 41 | 20 | 23.5 | 23.40 | 0.05 | 0 | 00665 | QPSK | 1 | 99 | 0 mm | left | 1:1.58 | 1.110 | 1.023 | 1.136 | |
| 2593.00 | 40620 | Mid | LTE Band 41 | 20 | 23.5 | 23.42 | 0.01 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | left | 1:1.58 | 1.080 | 1.019 | 1.101 | |
| 2636.50 | 41055 | Mid-High | LTE Band 41 | 20 | 23.5 | 23.25 | 0.02 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | left | 1:1.58 | 0.949 | 1.059 | 1.005 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 23.5 | 23.48 | 0.04 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | left | 1:1.58 | 1.210 | 1.005 | **1.216** | A11 |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 22.5 | 22.50 | 0.05 | 1 | 00665 | QPSK | 50 | 0 | 0 mm | left | 1:1.58 | 0.841 | 1.000 | 0.841 | |
| 2549.50 | 40185 | Low-Mid | LTE Band 41 | 20 | 22.5 | 22.36 | 0.04 | 1 | 00665 | QPSK | 50 | 0 | 0 mm | left | 1:1.58 | 0.867 | 1.033 | 0.896 | |
| 2593.00 | 40620 | Mid | LTE Band 41 | 20 | 22.5 | 22.49 | 0.00 | 1 | 00665 | QPSK | 50 | 25 | 0 mm | left | 1:1.58 | 0.892 | 1.002 | 0.894 | |
| 2636.50 | 41055 | Mid-High | LTE Band 41 | 20 | 22.5 | 22.48 | 0.01 | 1 | 00665 | QPSK | 50 | 25 | 0 mm | left | 1:1.58 | 0.820 | 1.005 | 0.824 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 22.5 | 22.49 | 0.01 | 1 | 00665 | QPSK | 50 | 0 | 0 mm | left | 1:1.58 | 1.040 | 1.002 | 1.042 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 22.5 | 22.49 | 0.07 | 1 | 00665 | QPSK | 100 | 0 | 0 mm | left | 1:1.58 | 1.020 | 1.002 | 1.022 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 14.2 | 13.73 | -0.14 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1.58 | 0.732 | 1.114 | 0.815 | |
| 2549.50 | 40185 | Low-Mid | LTE Band 41 | 20 | 14.2 | 13.47 | -0.17 | 0 | 00665 | QPSK | 1 | 0 | 0 mm | back | 1:1.58 | 0.745 | 1.183 | 0.881 | |
| 2593.00 | 40620 | Mid | LTE Band 41 | 20 | 14.2 | 13.45 | -0.17 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | back | 1:1.58 | 0.767 | 1.189 | 0.912 | |
| 2636.50 | 41055 | Mid-High | LTE Band 41 | 20 | 14.2 | 13.22 | -0.12 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | back | 1:1.58 | 0.702 | 1.253 | 0.880 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 14.2 | 13.82 | -0.11 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | back | 1:1.58 | 0.822 | 1.091 | 0.897 | |
| 2506.00 | 39750 | Low | LTE Band 41 | 20 | 14.2 | 13.87 | -0.07 | 0 | 00665 | QPSK | 50 | 50 | 0 mm | back | 1:1.58 | 0.784 | 1.079 | 0.846 | |
| 2549.50 | 40185 | Low-Mid | LTE Band 41 | 20 | 14.2 | 13.52 | -0.14 | 0 | 00665 | QPSK | 50 | 25 | 0 mm | back | 1:1.58 | 0.783 | 1.169 | 0.915 | |
| 2593.00 | 40620 | Mid | LTE Band 41 | 20 | 14.2 | 13.62 | -0.17 | 0 | 00665 | QPSK | 50 | 25 | 0 mm | back | 1:1.58 | 0.797 | 1.143 | 0.911 | |
| 2636.50 | 41055 | Mid-High | LTE Band 41 | 20 | 14.2 | 13.53 | -0.21 | 0 | 00665 | QPSK | 50 | 50 | 0 mm | back | 1:1.58 | 0.726 | 1.167 | 0.847 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 14.2 | 14.07 | -0.12 | 0 | 00665 | QPSK | 50 | 25 | 0 mm | back | 1:1.58 | 0.893 | 1.030 | 0.920 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 14.2 | 13.80 | -0.19 | 0 | 00665 | QPSK | 100 | 0 | 0 mm | back | 1:1.58 | 0.870 | 1.096 | 0.954 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 14.2 | 13.82 | 0.01 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | top | 1:1.58 | 0.370 | 1.091 | 0.404 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 14.2 | 14.07 | -0.18 | 0 | 00665 | QPSK | 50 | 25 | 0 mm | top | 1:1.58 | 0.407 | 1.030 | 0.419 | |
| 2680.00 | 41490 | High | LTE Band 41 | 20 | 23.5 | 23.48 | -0.01 | 0 | 00665 | QPSK | 1 | 50 | 0 mm | left | 1:1.58 | 1.200 | 1.005 | 1.206 | |
| **ANSI / IEEE C95.1 1992 - SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population** | | | | | | | | | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | |

Note: Blue entry represents variability measurement.

## Table 10-10
## DTS SISO Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing | Antenna Config. | Device Serial Number | Data Rate (Mbps) | Side | Duty Cycle (%) | SAR (1g) | Scaling Factor (Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | (W/kg) | | | (W/kg) | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.16 | 0.10 | 15 mm | 1 | 00665 | 1 | back | 99.1 | 0.077 | 1.081 | 1.009 | 0.084 | |
| 2437 | 6 | 802.11b | DSSS | 22 | 8.5 | 8.26 | -0.05 | 0 mm | 1 | 00640 | 1 | back | 99.1 | 0.411 | 1.057 | 1.009 | 0.438 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.16 | 0.04 | 15 mm | 1 | 00665 | 1 | top | 99.1 | 0.100 | 1.081 | 1.009 | 0.109 | |
| 2437 | 6 | 802.11b | DSSS | 22 | 8.5 | 8.26 | 0.17 | 0 mm | 1 | 00640 | 1 | top | 99.1 | 0.232 | 1.057 | 1.009 | 0.247 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.16 | -0.09 | 0 mm | 1 | 00665 | 1 | right | 99.1 | 0.164 | 1.081 | 1.009 | 0.179 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.16 | -0.19 | 0 mm | 1 | 00640 | 1 | left | 99.1 | 0.002 | 1.081 | 1.009 | 0.002 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.27 | 0.14 | 15 mm | 2 | 00665 | 1 | back | 99.1 | 0.060 | 1.054 | 1.009 | 0.064 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 8.5 | 8.34 | -0.04 | 0 mm | 2 | 00640 | 1 | back | 99.1 | 0.325 | 1.038 | 1.009 | 0.340 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.27 | 0.05 | 15 mm | 2 | 00665 | 1 | top | 99.1 | 0.079 | 1.054 | 1.009 | 0.084 | |
| 2412 | 1 | 802.11b | DSSS | 22 | 8.5 | 7.81 | -0.19 | 0 mm | 2 | 00640 | 1 | top | 99.1 | 0.484 | 1.172 | 1.009 | 0.572 | |
| 2437 | 6 | 802.11b | DSSS | 22 | 8.5 | 8.06 | -0.03 | 0 mm | 2 | 00640 | 1 | top | 99.1 | 0.590 | 1.107 | 1.009 | **0.659** | A12 |
| 2462 | 11 | 802.11b | DSSS | 22 | 8.5 | 8.34 | -0.06 | 0 mm | 2 | 00640 | 1 | top | 99.1 | 0.573 | 1.038 | 1.009 | 0.600 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.27 | 0.14 | 0 mm | 2 | 00665 | 1 | right | 99.1 | 0.162 | 1.054 | 1.009 | 0.172 | |
| 2462 | 11 | 802.11b | DSSS | 22 | 15.5 | 15.27 | -0.17 | 0 mm | 2 | 00640 | 1 | left | 99.1 | 0.023 | 1.054 | 1.009 | 0.024 | |

| ANSI / IEEE C95.1 1992 - SAFETY LIMIT | Body |
|---|---|
| Spatial Peak | 1.6 W/kg (mW/g) |
| Uncontrolled Exposure/General Population | averaged over 1 gram |

## Table 10-11
## DTS MIMO Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Bandwidth [MHz] | Maximum Allowed Power (Ant 1) [dBm] | Conducted Power (Ant 1) [dBm] | Maximum Allowed Power (Ant 2) [dBm] | Conducted Power (Ant 2) [dBm] | Power Drift [dB] | Spacing | Antenna Config. | Device Serial Number | Data Rate (Mbps) | Side | Duty Cycle (%) | SAR (1g) | Scaling Factor (Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | (W/kg) | | | (W/kg) | |
| 2437 | 6 | 802.11n | OFDM | 20 | 15.5 | 15.21 | 15.5 | 15.24 | -0.13 | 15 mm | MIMO | 00640 | 13 | back | 94.5 | 0.108 | 1.069 | 1.058 | 0.122 | |
| 2437 | 6 | 802.11n | OFDM | 20 | 15.5 | 15.21 | 15.5 | 15.24 | 0.16 | 15 mm | MIMO | 00640 | 13 | top | 94.5 | 0.135 | 1.069 | 1.058 | 0.153 | |
| 2437 | 6 | 802.11n | OFDM | 20 | 15.5 | 15.21 | 15.5 | 15.24 | 0.14 | 0 mm | MIMO | 00640 | 13 | right | 94.5 | 0.220 | 1.069 | 1.058 | 0.249 | |
| 2437 | 6 | 802.11n | OFDM | 20 | 15.5 | 15.21 | 15.5 | 15.24 | 0.11 | 0 mm | MIMO | 00640 | 13 | left | 94.5 | 0.018 | 1.069 | 1.058 | 0.020 | |
| 2462 | 11 | 802.11n | OFDM | 20 | 8.5 | 8.15 | 8.5 | 7.94 | 0.10 | 0 mm | MIMO | 00640 | 13 | back | 94.5 | 0.319 | 1.138 | 1.058 | 0.384 | |
| 2412 | 1 | 802.11n | OFDM | 20 | 8.5 | 8.10 | 8.5 | 7.76 | 0.20 | 0 mm | MIMO | 00640 | 13 | top | 94.5 | 0.533 | 1.186 | 1.058 | 0.669 | |
| 2437 | 6 | 802.11n | OFDM | 20 | 8.5 | 7.96 | 8.5 | 7.95 | 0.13 | 0 mm | MIMO | 00640 | 13 | top | 94.5 | 0.581 | 1.135 | 1.058 | 0.698 | |
| 2462 | 11 | 802.11n | OFDM | 20 | 8.5 | 8.15 | 8.5 | 7.94 | 0.18 | 0 mm | MIMO | 00640 | 13 | top | 94.5 | 0.563 | 1.138 | 1.058 | 0.678 | |

| ANSI / IEEE C95.1 1992 - SAFETY LIMIT | Body |
|---|---|
| Spatial Peak | 1.6 W/kg (mW/g) |
| Uncontrolled Exposure/General Population | averaged over 1 gram |

For channels 1, 6, and 11, to achieve the 18.5/11.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 15.5/8.5 dBm.

# Table 10-12
# U-NII SISO Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Bandwidth [MHz] | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing | Antenna Config. | Device Serial Number | Data Rate (Mbps) | Side | Duty Cycle (%) | SAR (1g) | Scaling Factor (Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | (W/kg) | | | (W/kg) | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 0.13 | 15 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.029 | 1.054 | 1.075 | 0.033 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.07 | -0.19 | 0 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.289 | 1.104 | 1.075 | 0.343 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | -0.13 | 15 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.053 | 1.054 | 1.075 | 0.060 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.07 | -0.09 | 0 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.168 | 1.104 | 1.075 | 0.199 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | -0.12 | 0 mm | 1 | 00665 | 13.5 | right | 93.0 | 0.017 | 1.054 | 1.075 | 0.019 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 0.14 | 0 mm | 1 | 00665 | 13.5 | left | 93.0 | 0.026 | 1.054 | 1.075 | 0.029 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.15 | 0.18 | 15 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.086 | 1.084 | 1.082 | 0.101 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.29 | -0.01 | 0 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.193 | 1.050 | 1.082 | 0.219 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.15 | 0.12 | 15 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.153 | 1.084 | 1.082 | 0.179 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.29 | -0.19 | 0 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.374 | 1.050 | 1.082 | 0.425 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.15 | -0.18 | 0 mm | 2 | 00665 | 13.5 | right | 92.4 | 0.291 | 1.084 | 1.082 | 0.341 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.15 | -0.19 | 0 mm | 2 | 00665 | 13.5 | left | 92.4 | 0.015 | 1.084 | 1.082 | 0.018 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 0.13 | 15 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.037 | 1.062 | 1.075 | 0.042 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.95 | 0.02 | 0 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.333 | 1.135 | 1.075 | 0.406 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 0.14 | 15 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.053 | 1.062 | 1.075 | 0.061 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.95 | -0.08 | 0 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.121 | 1.135 | 1.075 | 0.148 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | -0.16 | 0 mm | 1 | 00665 | 13.5 | right | 93.0 | 0.031 | 1.062 | 1.075 | 0.035 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 0.07 | 0 mm | 1 | 00665 | 13.5 | left | 93.0 | 0.015 | 1.062 | 1.075 | 0.017 | |
| 5710 | 142 | 802.11n | OFDM | 40 | 14.5 | 14.48 | 0.11 | 15 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.102 | 1.005 | 1.082 | 0.111 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.90 | -0.04 | 0 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.277 | 1.148 | 1.082 | 0.344 | |
| 5710 | 142 | 802.11n | OFDM | 40 | 14.5 | 14.48 | 0.19 | 15 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.158 | 1.005 | 1.082 | 0.172 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.90 | -0.17 | 0 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.432 | 1.148 | 1.082 | **0.537** | A13 |
| 5710 | 142 | 802.11n | OFDM | 40 | 14.5 | 14.48 | -0.07 | 0 mm | 2 | 00665 | 13.5 | right | 92.4 | 0.208 | 1.005 | 1.082 | 0.226 | |
| 5710 | 142 | 802.11n | OFDM | 40 | 14.5 | 14.48 | -0.14 | 0 mm | 2 | 00665 | 13.5 | left | 92.4 | 0.045 | 1.005 | 1.082 | 0.049 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 14.5 | 14.19 | -0.14 | 15 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.041 | 1.074 | 1.075 | 0.047 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 7.5 | 6.97 | -0.16 | 0 mm | 1 | 00665 | 13.5 | back | 93.0 | 0.328 | 1.130 | 1.075 | 0.398 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 14.5 | 14.19 | 0.03 | 15 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.043 | 1.074 | 1.075 | 0.050 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 7.5 | 6.97 | -0.11 | 0 mm | 1 | 00665 | 13.5 | top | 93.0 | 0.118 | 1.130 | 1.075 | 0.143 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 14.5 | 14.19 | -0.19 | 0 mm | 1 | 00665 | 13.5 | right | 93.0 | 0.033 | 1.074 | 1.075 | 0.038 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 14.5 | 14.19 | -0.21 | 0 mm | 1 | 00665 | 13.5 | left | 93.0 | 0.011 | 1.074 | 1.075 | 0.013 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.49 | 0.15 | 15 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.061 | 1.002 | 1.082 | 0.066 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 7.5 | 7.12 | -0.18 | 0 mm | 2 | 00665 | 13.5 | back | 92.4 | 0.174 | 1.091 | 1.082 | 0.205 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.49 | 0.17 | 15 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.097 | 1.002 | 1.082 | 0.105 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 7.5 | 7.12 | 0.15 | 0 mm | 2 | 00665 | 13.5 | top | 92.4 | 0.263 | 1.091 | 1.082 | 0.310 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.49 | 0.04 | 0 mm | 2 | 00665 | 13.5 | right | 92.4 | 0.117 | 1.002 | 1.082 | 0.127 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.49 | -0.14 | 0 mm | 2 | 00665 | 13.5 | left | 92.4 | 0.025 | 1.002 | 1.082 | 0.027 | |

| ANSI / IEEE C95.1 1992 - SAFETY LIMIT | Body |
|---|---|
| Spatial Peak | 1.6 W/kg (mW/g) |
| Uncontrolled Exposure/General Population | averaged over 1 gram |

## Table 10-13
## U-NII MIMO Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Bandwidth [MHz] | Maximum Allowed Power (Ant 1) [dBm] | Conducted Power (Ant 1) [dBm] | Maximum Allowed Power (Ant 2) [dBm] | Conducted Power (Ant 2) [dBm] | Power Drift [dB] | Spacing | Antenna Config. | Device Serial Number | Data Rate (Mbps) | Side | Duty Cycle (%) | SAR (1g) (W/kg) | Scaling Factor (Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) (W/kg) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | | | | | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 14.5 | 14.15 | 0.07 | 15 mm | MIMO | 00665 | 27 | back | 92.9 | 0.078 | 1.084 | 1.076 | 0.091 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 14.5 | 14.15 | 0.01 | 15 mm | MIMO | 00665 | 27 | top | 92.9 | 0.162 | 1.084 | 1.076 | 0.189 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 14.5 | 14.15 | -0.11 | 0 mm | MIMO | 00665 | 27 | right | 92.9 | 0.164 | 1.084 | 1.076 | 0.191 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 14.5 | 14.27 | 14.5 | 14.15 | 0.13 | 0 mm | MIMO | 00665 | 27 | left | 92.9 | 0.039 | 1.084 | 1.076 | 0.045 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.07 | 7.5 | 7.29 | -0.01 | 0 mm | MIMO | 00665 | 27 | back | 92.9 | 0.304 | 1.104 | 1.076 | 0.361 | |
| 5270 | 54 | 802.11n | OFDM | 40 | 7.5 | 7.07 | 7.5 | 7.29 | -0.13 | 0 mm | MIMO | 00665 | 27 | top | 92.9 | 0.379 | 1.104 | 1.076 | 0.450 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 14.5 | 14.42 | 0.16 | 15 mm | MIMO | 00665 | 27 | back | 92.9 | 0.110 | 1.062 | 1.076 | 0.126 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 14.5 | 14.42 | 0.07 | 15 mm | MIMO | 00665 | 27 | top | 92.9 | 0.129 | 1.062 | 1.076 | 0.147 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 14.5 | 14.42 | 0.15 | 0 mm | MIMO | 00665 | 27 | right | 92.9 | 0.142 | 1.062 | 1.076 | 0.162 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 14.5 | 14.24 | 14.5 | 14.42 | 0.14 | 0 mm | MIMO | 00665 | 27 | left | 92.9 | 0.043 | 1.062 | 1.076 | 0.049 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.95 | 7.5 | 6.90 | -0.20 | 0 mm | MIMO | 00665 | 27 | back | 92.9 | 0.332 | 1.148 | 1.076 | 0.410 | |
| 5510 | 102 | 802.11n | OFDM | 40 | 7.5 | 6.95 | 7.5 | 6.90 | 0.08 | 0 mm | MIMO | 00665 | 27 | top | 92.9 | 0.388 | 1.148 | 1.076 | 0.479 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.08 | 14.5 | 14.49 | -0.14 | 15 mm | MIMO | 00665 | 27 | back | 92.9 | 0.083 | 1.102 | 1.076 | 0.098 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.08 | 14.5 | 14.49 | 0.05 | 15 mm | MIMO | 00665 | 27 | top | 92.9 | 0.147 | 1.102 | 1.076 | 0.174 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.08 | 14.5 | 14.49 | 0.15 | 0 mm | MIMO | 00665 | 27 | right | 92.9 | 0.078 | 1.102 | 1.076 | 0.092 | |
| 5755 | 151 | 802.11n | OFDM | 40 | 14.5 | 14.08 | 14.5 | 14.49 | 0.07 | 0 mm | MIMO | 00665 | 27 | left | 92.9 | 0.042 | 1.102 | 1.076 | 0.050 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 7.5 | 6.89 | 7.5 | 7.12 | -0.01 | 0 mm | MIMO | 00665 | 27 | back | 92.9 | 0.331 | 1.151 | 1.076 | 0.410 | |
| 5795 | 159 | 802.11n | OFDM | 40 | 7.5 | 6.89 | 7.5 | 7.12 | 0.17 | 0 mm | MIMO | 00665 | 27 | top | 92.9 | 0.378 | 1.151 | 1.076 | 0.468 | |

| ANSI / IEEE C95.1 1992 - SAFETY LIMIT | Body |
|---|---|
| Spatial Peak | 1.6 W/kg (mW/g) |
| Uncontrolled Exposure/General Population | averaged over 1 gram |

For channels 54, 102, 151, and 159, to achieve the 17.5/10.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 14.5/7.5 dBm.

## Table 10-14
## DSS Body SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Power Drift [dB] | Spacing | Device Serial Number | Data Rate (Mbps) | Side | Duty Cycle (%) | SAR (1g) (W/kg) | Scaling Factor (Cond Power) | Scaling Factor (Duty Cycle) | Reported SAR (1g) (W/kg) | Plot # |
| MHz | Ch. | | | | | | | | | | | | | | | |
| 2441 | 39 | Bluetooth | FHSS | 7.5 | 7.19 | 0.08 | 0 mm | 00657 | 1 | back | 76.8 | 0.164 | 1.074 | 1.302 | **0.229** | A14 |
| 2441 | 39 | Bluetooth | FHSS | 7.5 | 7.19 | 0.15 | 0 mm | 00657 | 1 | top | 76.8 | 0.116 | 1.074 | 1.302 | 0.162 | |
| 2441 | 39 | Bluetooth | FHSS | 7.5 | 7.19 | 0.16 | 0 mm | 00665 | 1 | right | 76.8 | 0.020 | 1.074 | 1.302 | 0.028 | |
| 2441 | 39 | Bluetooth | FHSS | 7.5 | 7.19 | 0.19 | 0 mm | 00665 | 1 | left | 76.8 | 0.002 | 1.074 | 1.302 | 0.003 | |

| ANSI / IEEE C95.1 1992 - SAFETY LIMIT | Body |
|---|---|
| Spatial Peak | 1.6 W/kg (mW/g) |
| Uncontrolled Exposure/General Population | averaged over 1 gram |

## 10.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02 and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.

5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 12 for variability analysis.
7. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v06 was applied to determine SAR test exclusion for adjacent edge configurations.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
2. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 7.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.
6. Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

WLAN Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.6.4 for more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not

investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 7.6.5 for more information.

3. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see Section 11 for complete analysis.
4. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
5. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 100% transmission duty factor to determine compliance. See Section 8.4 for the time domain plot and calculation for the duty factor of the device.

# 11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

## 11.1 Introduction

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

## 11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g SAR.

Notes:

1. For SAR summation, the highest reported SAR across all test distances was used as the most conservative evaluation for simultaneous transmission analysis for each device edge.
2. When the antenna separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine the simultaneous transmission SAR exclusion for test positions excluded per FCC KDB Publication 447498 D01v06.

**Table 11-1**
**Simultaneous Transmission Scenario with 2.4 GHz WLAN**

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 2.4 GHz WLAN Ant 1 SAR (W/kg) | 2.4 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| Body SAR | UMTS 850 | 0.732 | 0.438 | 0.659 | 1.170 | 1.391 |
| | UMTS 1750 | 0.547 | 0.438 | 0.659 | 0.985 | 1.206 |
| | UMTS 1900 | 0.894 | 0.438 | 0.659 | 1.332 | 1.553 |
| | LTE Band 71 | 0.550 | 0.438 | 0.659 | 0.988 | 1.209 |
| | LTE Band 12 | 0.637 | 0.438 | 0.659 | 1.075 | 1.296 |
| | LTE Band 13 | 0.664 | 0.438 | 0.659 | 1.102 | 1.323 |
| | LTE Band 26 (Cell) | 0.724 | 0.438 | 0.659 | 1.162 | 1.383 |
| | LTE Band 66 (AWS) | 0.646 | 0.438 | 0.659 | 1.084 | 1.305 |
| | LTE Band 25 (PCS) | 0.895 | 0.438 | 0.659 | 1.333 | **1.554** |
| | LTE Band 7 | 1.181 | 0.438 | 0.659 | See Table Below | See Table Below |
| | LTE Band 41 | 1.216 | 0.438 | 0.659 | See Table Below | See Table Below |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 2.4 GHz WLAN Ant 1 SAR (W/kg) | 2.4 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| Body SAR | Back | 0.519 | 0.438 | 0.340 | 0.957 | 0.859 |
| | Top | 0.342 | 0.247 | 0.659 | 0.589 | 1.001 |
| | Bottom | 0.400 | 0.400 | 0.400 | 0.800 | 0.800 |
| | Right | 0.400 | 0.179 | 0.172 | 0.579 | 0.572 |
| | Left | 1.181 | 0.002 | 0.024 | 1.183 | **1.205** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 2.4 GHz WLAN Ant 1 SAR (W/kg) | 2.4 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| Body SAR | Back | 0.954 | 0.438 | 0.340 | **1.392** | 1.294 |
| | Top | 0.419 | 0.247 | 0.659 | 0.666 | 1.078 |
| | Bottom | 0.400 | 0.400 | 0.400 | 0.800 | 0.800 |
| | Right | 0.400 | 0.179 | 0.172 | 0.579 | 0.572 |
| | Left | 1.216 | 0.002 | 0.024 | 1.218 | 1.240 |

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 2.4 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | UMTS 850 | 0.732 | 0.698 | 1.430 |
| | UMTS 1750 | 0.547 | 0.698 | 1.245 |
| | UMTS 1900 | 0.894 | 0.698 | 1.592 |
| | LTE Band 71 | 0.550 | 0.698 | 1.248 |
| | LTE Band 12 | 0.637 | 0.698 | 1.335 |
| | LTE Band 13 | 0.664 | 0.698 | 1.362 |
| | LTE Band 26 (Cell) | 0.724 | 0.698 | 1.422 |
| | LTE Band 66 (AWS) | 0.646 | 0.698 | 1.344 |
| | LTE Band 25 (PCS) | 0.895 | 0.698 | **1.593** |
| | LTE Band 7 | 1.181 | 0.698 | See Table Below |
| | LTE Band 41 | 1.216 | 0.698 | See Table Below |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 2.4 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | Back | 0.519 | 0.384 | 0.903 |
| | Top | 0.342 | 0.698 | 1.040 |
| | Bottom | 0.400 | 0.400 | 0.800 |
| | Right | 0.400 | 0.249 | 0.649 |
| | Left | 1.181 | 0.020 | **1.201** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 2.4 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | Back | 0.954 | 0.384 | **1.338** |
| | Top | 0.419 | 0.698 | 1.117 |
| | Bottom | 0.400 | 0.400 | 0.800 |
| | Right | 0.400 | 0.249 | 0.649 |
| | Left | 1.216 | 0.020 | 1.236 |

**Table 11-2**
**Simultaneous Transmission Scenario with 5 GHz WLAN**

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 5 GHz WLAN Ant 1 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| Body SAR | UMTS 850 | 0.732 | 0.406 | 0.537 | 1.138 | 1.269 |
| | UMTS 1750 | 0.547 | 0.406 | 0.537 | 0.953 | 1.084 |
| | UMTS 1900 | 0.894 | 0.406 | 0.537 | 1.300 | 1.431 |
| | LTE Band 71 | 0.550 | 0.406 | 0.537 | 0.956 | 1.087 |
| | LTE Band 12 | 0.637 | 0.406 | 0.537 | 1.043 | 1.174 |
| | LTE Band 13 | 0.664 | 0.406 | 0.537 | 1.070 | 1.201 |
| | LTE Band 26 (Cell) | 0.724 | 0.406 | 0.537 | 1.130 | 1.261 |
| | LTE Band 66 (AWS) | 0.646 | 0.406 | 0.537 | 1.052 | 1.183 |
| | LTE Band 25 (PCS) | 0.895 | 0.406 | 0.537 | 1.301 | 1.432 |
| | LTE Band 7 | 1.181 | 0.406 | 0.537 | **1.587** | See Table Below |
| | LTE Band 41 | 1.216 | 0.406 | 0.537 | See Table Below | See Table Below |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | Back | 0.519 | 0.344 | 0.863 |
| | Top | 0.342 | 0.537 | 0.879 |
| | Bottom | 0.400 | 0.400 | 0.800 |
| | Right | 0.400 | 0.341 | 0.741 |
| | Left | 1.181 | 0.049 | **1.230** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 5 GHz WLAN Ant 1 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Σ SAR (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| Body SAR | Back | 0.954 | 0.406 | 0.344 | **1.360** | 1.298 |
| | Top | 0.419 | 0.199 | 0.537 | 0.618 | 0.956 |
| | Bottom | 0.400 | 0.400 | 0.400 | 0.800 | 0.800 |
| | Right | 0.400 | 0.038 | 0.341 | 0.438 | 0.741 |
| | Left | 1.216 | 0.029 | 0.049 | 1.245 | 1.265 |

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | UMTS 850 | 0.732 | 0.479 | 1.211 |
| | UMTS 1750 | 0.547 | 0.479 | 1.026 |
| | UMTS 1900 | 0.894 | 0.479 | 1.373 |
| | LTE Band 71 | 0.550 | 0.479 | 1.029 |
| | LTE Band 12 | 0.637 | 0.479 | 1.116 |
| | LTE Band 13 | 0.664 | 0.479 | 1.143 |
| | LTE Band 26 (Cell) | 0.724 | 0.479 | 1.203 |
| | LTE Band 66 (AWS) | 0.646 | 0.479 | 1.125 |
| | LTE Band 25 (PCS) | 0.895 | 0.479 | **1.374** |
| | LTE Band 7 | 1.181 | 0.479 | See Table Below |
| | LTE Band 41 | 1.216 | 0.479 | See Table Below |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | Back | 0.519 | 0.410 | 0.929 |
| | Top | 0.342 | 0.479 | 0.821 |
| | Bottom | 0.400 | 0.400 | 0.800 |
| | Right | 0.400 | 0.191 | 0.591 |
| | Left | 1.181 | 0.050 | **1.231** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | Back | 0.954 | 0.410 | **1.364** |
| | Top | 0.419 | 0.479 | 0.898 |
| | Bottom | 0.400 | 0.400 | 0.800 |
| | Right | 0.400 | 0.191 | 0.591 |
| | Left | 1.216 | 0.050 | 1.266 |

**Table 11-3**
**Simultaneous Transmission Scenario with Bluetooth**

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|
| | | 1 | 2 | 1+2 |
| Body SAR | UMTS 850 | 0.732 | 0.229 | 0.961 |
| | UMTS 1750 | 0.547 | 0.229 | 0.776 |
| | UMTS 1900 | 0.894 | 0.229 | 1.123 |
| | LTE Band 71 | 0.550 | 0.229 | 0.779 |
| | LTE Band 12 | 0.637 | 0.229 | 0.866 |
| | LTE Band 13 | 0.664 | 0.229 | 0.893 |
| | LTE Band 26 (Cell) | 0.724 | 0.229 | 0.953 |
| | LTE Band 66 (AWS) | 0.646 | 0.229 | 0.875 |
| | LTE Band 25 (PCS) | 0.895 | 0.229 | 1.124 |
| | LTE Band 7 | 1.181 | 0.229 | 1.410 |
| | LTE Band 41 | 1.216 | 0.229 | **1.445** |

**Table 11-4**
**Simultaneous Transmission Scenario with 5GHz WLAN and Bluetooth**

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 5 GHz WLAN Ant 1 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | UMTS 850 | 0.732 | 0.406 | 0.229 | 1.367 |
| | UMTS 1750 | 0.547 | 0.406 | 0.229 | 1.182 |
| | UMTS 1900 | 0.894 | 0.406 | 0.229 | 1.529 |
| | LTE Band 71 | 0.550 | 0.406 | 0.229 | 1.185 |
| | LTE Band 12 | 0.637 | 0.406 | 0.229 | 1.272 |
| | LTE Band 13 | 0.664 | 0.406 | 0.229 | 1.299 |
| | LTE Band 26 (Cell) | 0.724 | 0.406 | 0.229 | 1.359 |
| | LTE Band 66 (AWS) | 0.646 | 0.406 | 0.229 | 1.281 |
| | LTE Band 25 (PCS) | 0.895 | 0.406 | 0.229 | **1.530** |
| | LTE Band 7 | 1.181 | 0.406 | 0.229 | See Table Below |
| | LTE Band 41 | 1.216 | 0.406 | 0.229 | See Table Below |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 5 GHz WLAN Ant 1 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.519 | 0.406 | 0.229 | 1.154 |
| | Top | 0.342 | 0.199 | 0.162 | 0.703 |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.400 | 0.038 | 0.028 | 0.466 |
| | Left | 1.181 | 0.029 | 0.003 | **1.213** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 5 GHz WLAN Ant 1 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.954 | 0.406 | 0.229 | **1.589** |
| | Top | 0.419 | 0.199 | 0.162 | 0.780 |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.400 | 0.038 | 0.028 | 0.466 |
| | Left | 1.216 | 0.029 | 0.003 | 1.248 |

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | UMTS 850 | 0.732 | 0.537 | 0.229 | **1.498** |
| | UMTS 1750 | 0.547 | 0.537 | 0.229 | 1.313 |
| | UMTS 1900 | 0.894 | 0.537 | 0.229 | See Table Below |
| | LTE Band 71 | 0.550 | 0.537 | 0.229 | 1.316 |
| | LTE Band 12 | 0.637 | 0.537 | 0.229 | 1.403 |
| | LTE Band 13 | 0.664 | 0.537 | 0.229 | 1.430 |
| | LTE Band 26 (Cell) | 0.724 | 0.537 | 0.229 | 1.490 |
| | LTE Band 66 (AWS) | 0.646 | 0.537 | 0.229 | 1.412 |
| | LTE Band 25 (PCS) | 0.895 | 0.537 | 0.229 | See Table Below |
| | LTE Band 7 | 1.181 | 0.537 | 0.229 | See Table Below |
| | LTE Band 41 | 1.216 | 0.537 | 0.229 | See Table Below |

| Simult Tx | Configuration | UMTS 1900 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.748 | 0.344 | 0.229 | 1.321 |
| | Top | 0.894 | 0.537 | 0.162 | **1.593** |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.181 | 0.341 | 0.028 | 0.550 |
| | Left | 0.478 | 0.049 | 0.003 | 0.530 |

| Simult Tx | Configuration | LTE Band 25 (PCS) SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.874 | 0.344 | 0.229 | 1.447 |
| | Top | 0.895 | 0.537 | 0.162 | **1.594** |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.180 | 0.341 | 0.028 | 0.549 |
| | Left | 0.548 | 0.049 | 0.003 | 0.600 |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.519 | 0.344 | 0.229 | 1.092 |
| | Top | 0.342 | 0.537 | 0.162 | 1.041 |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.400 | 0.341 | 0.028 | 0.769 |
| | Left | 1.181 | 0.049 | 0.003 | **1.233** |

| Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 5 GHz WLAN Ant 2 SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.954 | 0.344 | 0.229 | **1.527** |
| | Top | 0.419 | 0.537 | 0.162 | 1.118 |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.400 | 0.341 | 0.028 | 0.769 |
| | Left | 1.216 | 0.049 | 0.003 | 1.268 |

| Exposure Condition | Mode | 3G/4G SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | UMTS 850 | 0.732 | 0.479 | 0.229 | **1.440** |
| | UMTS 1750 | 0.547 | 0.479 | 0.229 | 1.255 |
| | UMTS 1900 | 0.894 | 0.479 | 0.229 | See Table Below |
| | LTE Band 71 | 0.550 | 0.479 | 0.229 | 1.258 |
| | LTE Band 12 | 0.637 | 0.479 | 0.229 | 1.345 |
| | LTE Band 13 | 0.664 | 0.479 | 0.229 | 1.372 |
| | LTE Band 26 (Cell) | 0.724 | 0.479 | 0.229 | 1.432 |
| | LTE Band 66 (AWS) | 0.646 | 0.479 | 0.229 | 1.354 |
| | LTE Band 25 (PCS) | 0.895 | 0.479 | 0.229 | See Table Below |
| | LTE Band 7 | 1.181 | 0.479 | 0.229 | See Table Below |
| | LTE Band 41 | 1.216 | 0.479 | 0.229 | See Table Below |

| Simult Tx | Configuration | UMTS 1900 SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) | Simult Tx | Configuration | LTE Band 25 (PCS) SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 | | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.748 | 0.410 | 0.229 | 1.387 | Body SAR | Back | 0.874 | 0.410 | 0.229 | 1.513 |
| | Top | 0.894 | 0.479 | 0.162 | **1.535** | | Top | 0.895 | 0.479 | 0.162 | **1.536** |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 | | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.181 | 0.191 | 0.028 | 0.400 | | Right | 0.180 | 0.191 | 0.028 | 0.399 |
| | Left | 0.478 | 0.050 | 0.003 | 0.531 | | Left | 0.548 | 0.050 | 0.003 | 0.601 |

| Simult Tx | Configuration | LTE Band 7 SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) | Simult Tx | Configuration | LTE Band 41 SAR (W/kg) | 5 GHz WLAN MIMO SAR (W/kg) | Bluetooth SAR (W/kg) | Σ SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2+3 | | | 1 | 2 | 3 | 1+2+3 |
| Body SAR | Back | 0.519 | 0.410 | 0.229 | 1.158 | Body SAR | Back | 0.954 | 0.410 | 0.229 | **1.593** |
| | Top | 0.342 | 0.479 | 0.162 | 0.983 | | Top | 0.419 | 0.479 | 0.162 | 1.060 |
| | Bottom | 0.400 | 0.400 | 0.400 | 1.200 | | Bottom | 0.400 | 0.400 | 0.400 | 1.200 |
| | Right | 0.400 | 0.191 | 0.028 | 0.619 | | Right | 0.400 | 0.191 | 0.028 | 0.619 |
| | Left | 1.181 | 0.050 | 0.003 | **1.234** | | Left | 1.216 | 0.050 | 0.003 | 1.269 |

## 11.3 Simultaneous Transmission Conclusion

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

# 12 SAR MEASUREMENT VARIABILITY

## 12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

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

**Table 12-1**
**Body SAR Measurement Variability Results**

| BODY VARIABILITY RESULTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Band | FREQUENCY | | Mode | Service | Side | Spacing | Measured SAR (1g) | 1st Repeated SAR (1g) | Ratio | 2nd Repeated SAR (1g) | Ratio | 3rd Repeated SAR (1g) | Ratio |
| | MHz | Ch. | | | | | (W/kg) | (W/kg) | | (W/kg) | | (W/kg) | |
| 1900 | 1907.60 | 9538 | UMTS 1900 | RMC | top | 15 mm | 0.877 | 0.871 | 1.01 | N/A | N/A | N/A | N/A |
| 2450 | 2510.00 | 20850 | LTE Band 7, 20 MHz Bandwidth | QPSK, 1 RB, 99 RB Offset | left | 0 mm | 1.170 | 1.120 | 1.04 | N/A | N/A | N/A | N/A |
| 2600 | 2680.00 | 41490 | LTE Band 41, 20 MHz Bandwidth | QPSK, 1 RB, 50 RB Offset | left | 0 mm | 1.210 | 1.200 | 1.01 | N/A | N/A | N/A | N/A |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | | | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram | | | | | | |

## 12.2 Measurement Uncertainty

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

# 13 EQUIPMENT LIST

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| Agilent | 8753ES | S-Parameter Network Analyzer | 10/2/2018 | Annual | 10/2/2019 | US39170118 |
| Agilent | 8753ES | Network Analyzer | 3/19/2018 | Annual | 3/19/2020 | MY40001472 |
| Agilent | E4438C | ESG Vector Signal Generator | 5/23/2019 | Annual | 5/23/2020 | MY47270002 |
| Agilent | E4440A | PSA Series Spectrum Analyzer | 11/14/2018 | Annual | 11/14/2019 | MY46186272 |
| Agilent | E5515C | Wireless Communications Test Set | 2/28/2018 | Biennial | 2/28/2020 | GB41450275 |
| Agilent | N5182A | MXG Vector Signal Generator | 6/27/2019 | Annual | 6/27/2020 | US46240505 |
| Amplifier Research | 150A100C | Amplifier | CBT | N/A | CBT | 350132 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 343972 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 343971 |
| Anritsu | MA24106A | USB Power Sensor | 5/6/2019 | Annual | 5/6/2020 | 1231538 |
| Anritsu | MA24106A | USB Power Sensor | 5/22/2019 | Annual | 5/22/2020 | 1231535 |
| Anritsu | MA2411B | Pulse Power Sensor | 10/30/2018 | Annual | 10/30/2019 | 1207470 |
| Anritsu | MA2411B | Pulse Power Sensor | 11/20/2018 | Annual | 11/20/2019 | 1339007 |
| Anritsu | ML2495A | Power Meter | 10/21/2018 | Annual | 10/21/2019 | 941001 |
| Anritsu | ML2496A | Power Meter | 10/21/2018 | Annual | 10/21/2019 | 1138001 |
| Anritsu | MT8820C | Radio Communication Analyzer | 3/29/2019 | Annual | 3/29/2020 | 6201300731 |
| Anritsu | MT8821C | Radio Communication Analyzer | 1/25/2019 | Annual | 1/25/2020 | 6261895213 |
| Control Company | 4040 | Digital Thermometer | 2/28/2018 | Biennial | 2/28/2020 | 130448366 |
| Control Company | 4040 | Temperature / Humidity Monitor | 2/28/2018 | Biennial | 2/28/2020 | 150761911 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 6/6/2018 | Biennial | 6/6/2020 | 181334694 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 5/21/2018 | Biennial | 5/21/2020 | 181292000 |
| MCL | BW-N6W5+ | 6dB Attenuator | CBT | N/A | CBT | 1139 |
| Mini-Circuits | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT | N/A | CBT | N/A |
| Mini-Circuits | NLP-1200+ | Low Pass Filter DC to 1000 MHz | CBT | N/A | CBT | N/A |
| Mini-Circuits | NLP-2950+ | Low Pass Filter DC to 2700 MHz | CBT | N/A | CBT | N/A |
| Mini-Circuits | VLF-6000+ | Low Pass Filter | CBT | N/A | CBT | N/A |
| Mitutoyo | CD-6"CSX | Digital Caliper | 4/18/2018 | Biennial | 4/18/2020 | 13264165 |
| Narda | 4772-3 | Attenuator (3dB) | CBT | N/A | CBT | 9406 |
| Narda | BW-S3W2 | Attenuator (3dB) | CBT | N/A | CBT | 120 |
| Narda | 4014C-6 | 4 - 8 GHz SMA 6 dB Directional Coupler | CBT | N/A | CBT | N/A |
| Pasternack | PE2208-6 | Bidirectional Coupler | CBT | N/A | CBT | N/A |
| Pasternack | PE2209-10 | Bidirectional Coupler | CBT | N/A | CBT | N/A |
| Pasternack | NC-100 | Torque Wrench | 11/7/2017 | Biennial | 11/7/2019 | N/A |
| Rohde & Schwarz | CMW500 | Radio Communication Tester | 6/8/2018 | Biennial | 6/8/2020 | 101767 |
| Rohde & Schwarz | CMW500 | Radio Communication Tester | 9/25/2018 | Annual | 9/25/2019 | 102060 |
| Rohde & Schwarz | CMW500 | Wideband Radio Communication Tester | 6/7/2019 | Annual | 6/7/2020 | 155397 |
| SPEAG | DAK-3.5 | Dielectric Assessment Kit | 9/11/2018 | Annual | 9/11/2019 | 1091 |
| SPEAG | D750V3 | 750 MHz SAR Dipole | 1/15/2018 | Biennial | 1/15/2020 | 1003 |
| SPEAG | D750V3 | 750 MHz Dipole | 3/18/2019 | Annual | 3/18/2020 | 1054 |
| SPEAG | D835V2 | 835 MHz SAR Dipole | 1/22/2019 | Annual | 1/22/2020 | 4d132 |
| SPEAG | D1750V2 | 1750 MHz SAR Dipole | 10/22/2018 | Annual | 10/22/2019 | 1150 |
| SPEAG | D1900V2 | 1900 MHz SAR Dipole | 2/21/2019 | Annual | 2/21/2020 | 5d148 |
| SPEAG | D2450V2 | 2450 MHz SAR Dipole | 9/11/2017 | Biennial | 9/11/2019 | 797 |
| SPEAG | D2450V2 | 2450 MHz SAR Dipole | 8/17/2017 | Biennial | 8/17/2019 | 719 |
| SPEAG | D2600V2 | 2600 MHz SAR Dipole | 4/11/2018 | Biennial | 4/11/2020 | 1004 |
| SPEAG | D5GHzV2 | 5 GHz SAR Dipole | 1/16/2018 | Biennial | 1/16/2020 | 1057 |
| SPEAG | EX3DV4 | SAR Probe | 2/19/2019 | Annual | 2/19/2020 | 3914 |
| SPEAG | EX3DV4 | SAR Probe | 5/16/2019 | Annual | 5/16/2020 | 7406 |
| SPEAG | EX3DV4 | SAR Probe | 6/19/2019 | Annual | 6/19/2020 | 7409 |
| SPEAG | EX3DV4 | SAR Probe | 1/24/2019 | Annual | 1/24/2020 | 7488 |
| SPEAG | EX3DV4 | SAR Probe | 4/24/2019 | Annual | 4/24/2020 | 7357 |
| SPEAG | EX3DV4 | SAR Probe | 2/19/2019 | Annual | 2/19/2020 | 7417 |
| SPEAG | EX3DV4 | SAR Probe | 7/16/2019 | Annual | 7/16/2020 | 7410 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 2/14/2019 | Annual | 2/14/2020 | 1272 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 5/8/2019 | Annual | 5/8/2020 | 859 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 6/20/2019 | Annual | 6/20/2020 | 1334 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 1/15/2019 | Annual | 1/15/2020 | 1530 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 4/18/2019 | Annual | 4/18/2020 | 1407 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 2/13/2019 | Annual | 2/13/2020 | 665 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 7/11/2019 | Annual | 7/11/2020 | 1322 |

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

# 14 MEASUREMENT UNCERTAINTIES

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

# 15 CONCLUSION

## 15.1 Measurement Conclusion

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

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

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# APPENDIX A: SAR TEST DATA

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

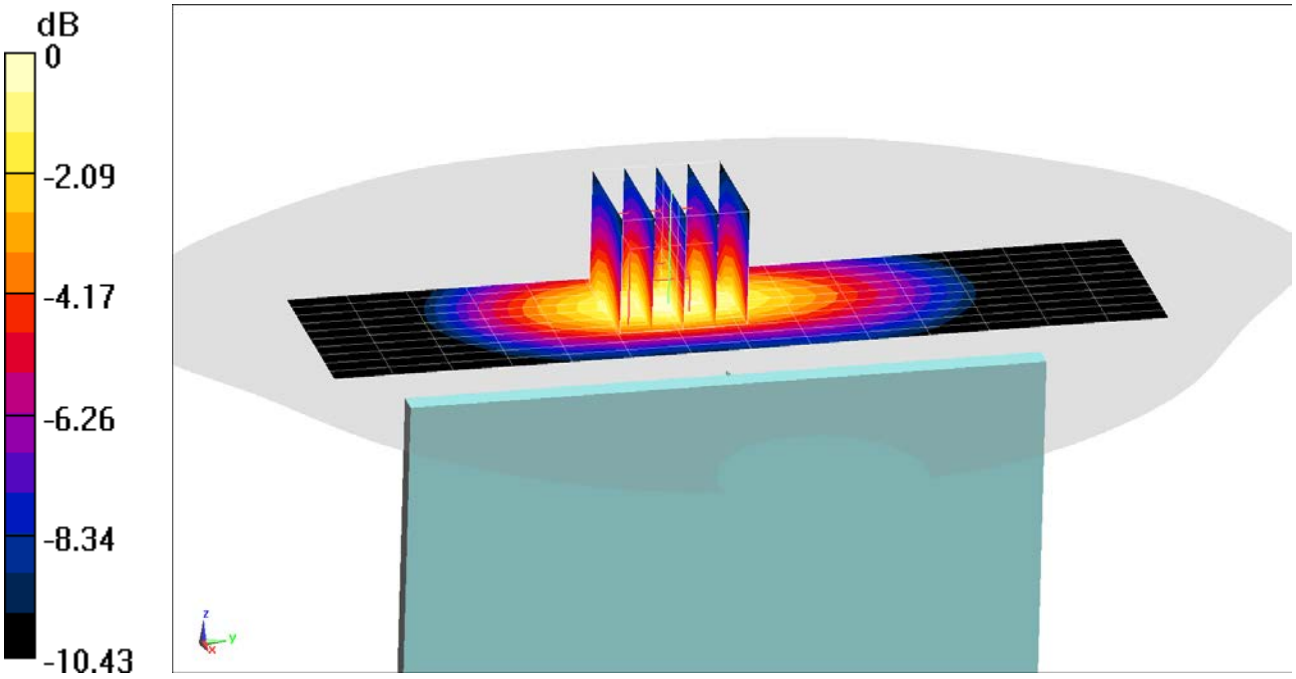
Communication System: UID 0, UMTS; Frequency: 846.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 846.6 MHz; $\sigma$ = 0.95 S/m; $\varepsilon_r$ = 57.072; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 846.6 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

## Mode: UMTS 850, Body SAR, Top Edge, High.ch

**Area Scan (11x15x1):** Measurement grid: dx=5mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.58 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.10 W/kg
**SAR(1 g) = 0.732 W/kg**




0 dB = 0.977 W/kg = -0.10 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00640**

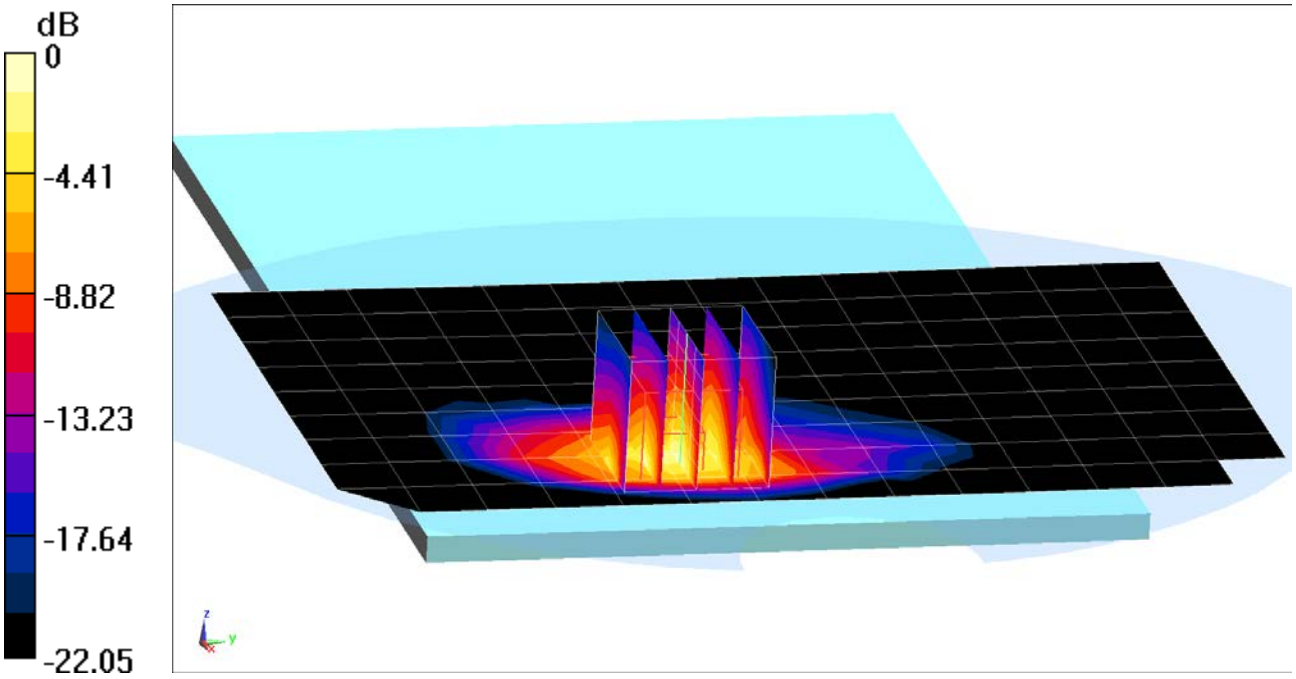
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.4 MHz; $\sigma$ = 1.426 S/m; $\varepsilon_r$ = 51.81; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1732.4 MHz; Calibrated: 6/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/20/2019
Phantom: Front; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

## Mode: UMTS 1750, Body SAR, Back side, Mid.ch

**Area Scan (10x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.36 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.888 W/kg
**SAR(1 g) = 0.542 W/kg**




0 dB = 0.764 W/kg = -1.17 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

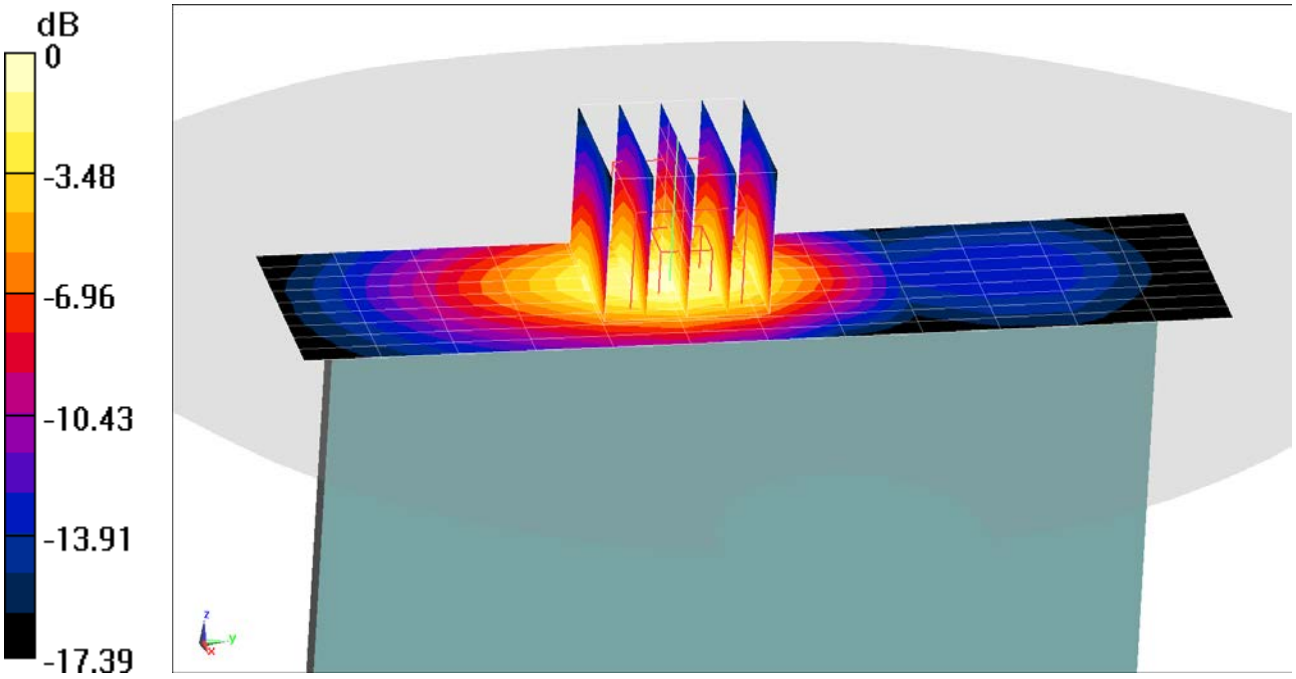
Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1907.6 MHz; $\sigma$ = 1.589 S/m; $\varepsilon_r$ = 54.556; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-25-2019; Ambient Temp: 20.0°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1907.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

## Mode: UMTS 1900, Body SAR, Top Edge, High.ch

**Area Scan (10x13x1):** Measurement grid: dx=5mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.49 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.50 W/kg
**SAR(1 g) = 0.877 W/kg**




0 dB = 1.27 W/kg = 1.04 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665**

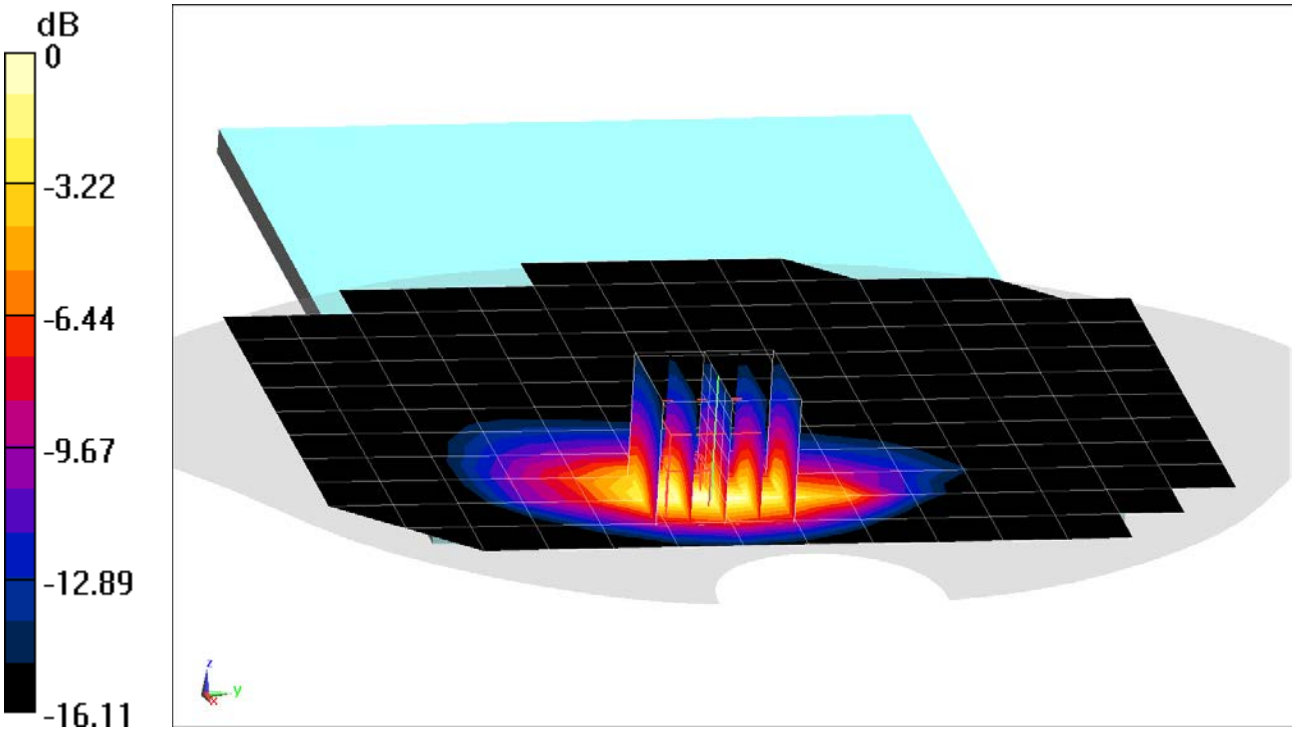
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 680.5 MHz; $\sigma$ = 0.919 S/m; $\varepsilon_r$ = 57.444; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 680.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 71, Body SAR, Back side, Mid.ch,**
**20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (13x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.51 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.21 W/kg
**SAR(1 g) = 0.502 W/kg**




0 dB = 0.920 W/kg = -0.36 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665**

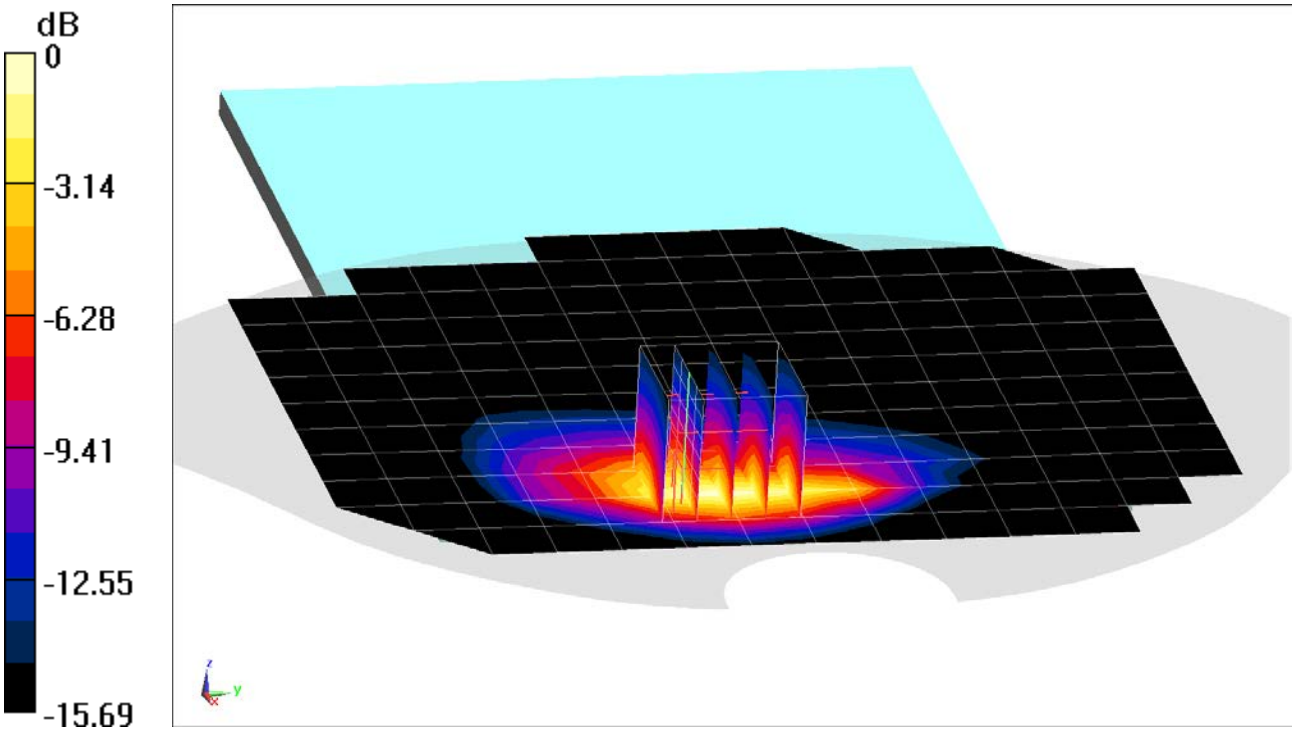
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; $\sigma$ = 0.928 S/m; $\varepsilon_r$ = 57.382; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 707.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 12, Body SAR, Back side, Mid.ch,**
**10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (13x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.96 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.47 W/kg
**SAR(1 g) = 0.607 W/kg**




0 dB = 1.10 W/kg = 0.41 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

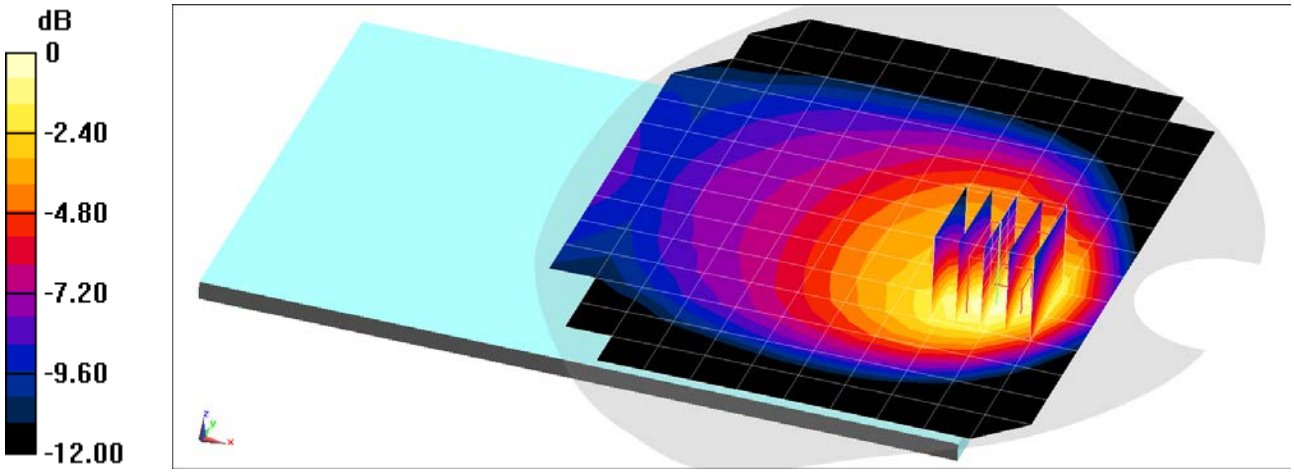
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; $\sigma$ = 0.962 S/m; $\varepsilon_r$ = 56.585; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 23.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.05, 10.05, 10.05) @ 782 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 13, Body SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (15x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.60 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.01 W/kg
**SAR(1 g) = 0.649 W/kg**




0 dB = 0.869 W/kg = -0.61 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

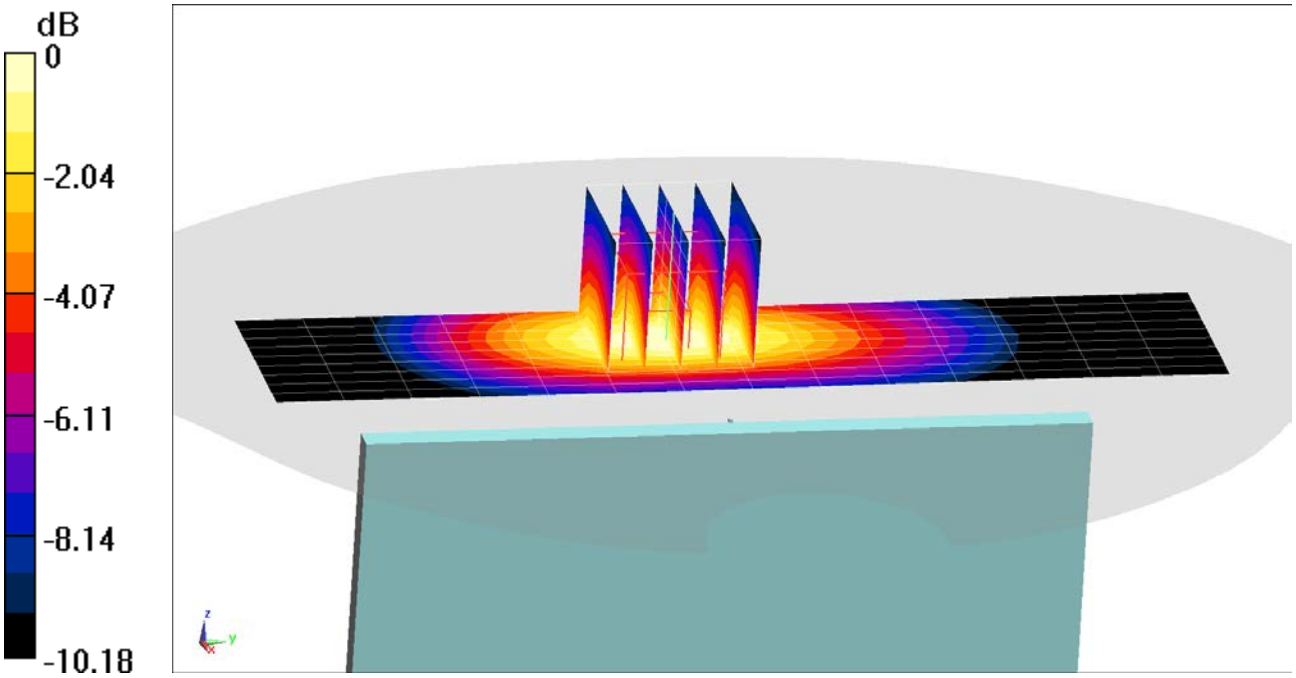
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; $\sigma$ = 0.944 S/m; $\varepsilon_r$ = 57.104; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 831.5 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 26 (Cell.), Body SAR, Top Edge, Mid.ch, 15 MHz Bandwidth, QPSK, 1 RB, 74 RB Offset**

**Area Scan (10x15x1):** Measurement grid: dx=5mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.65 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.07 W/kg
**SAR(1 g) = 0.724 W/kg**




0 dB = 0.947 W/kg = -0.24 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

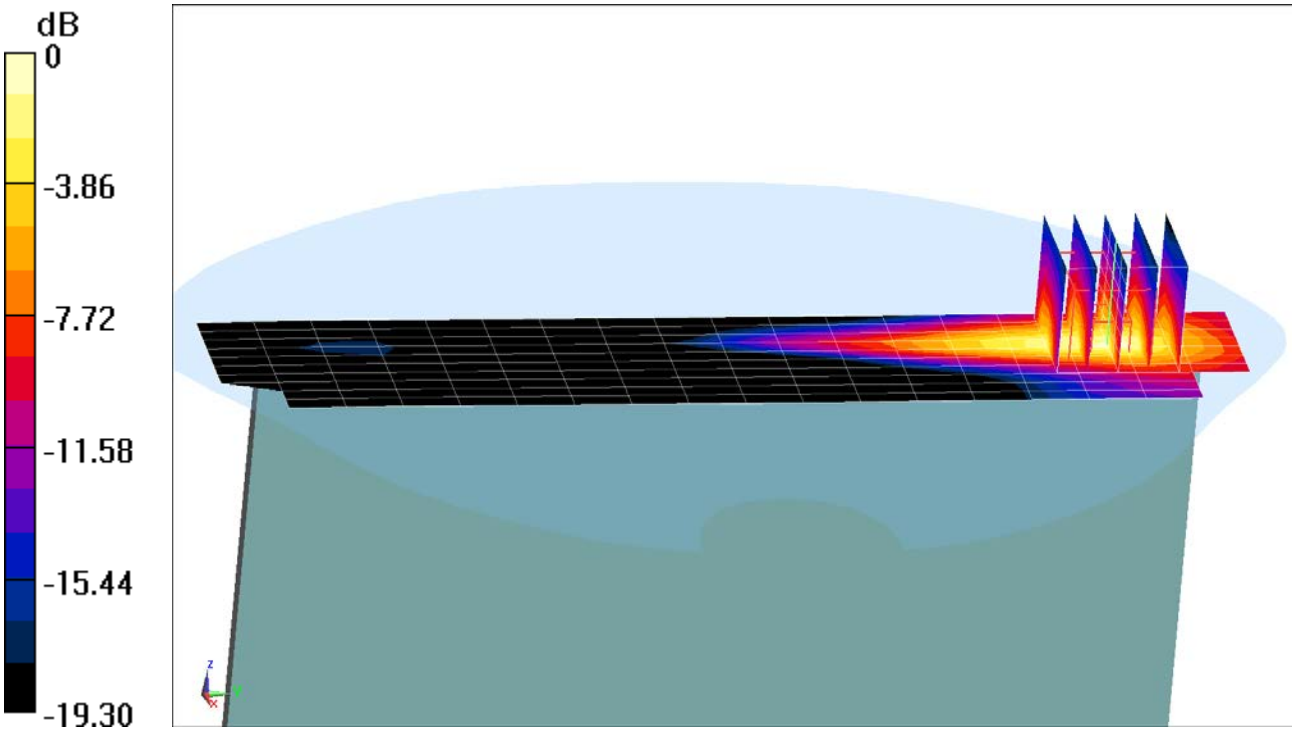
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1770$ MHz; $\sigma = 1.478$ S/m; $\varepsilon_r = 53.941$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-17-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1770 MHz; Calibrated: 6/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/20/2019
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 66 (AWS), Body SAR, Left Edge, High.ch,**
**20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (11x21x1):** Measurement grid: dx=5mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.69 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.45 W/kg
**SAR(1 g) = 0.586 W/kg**




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

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

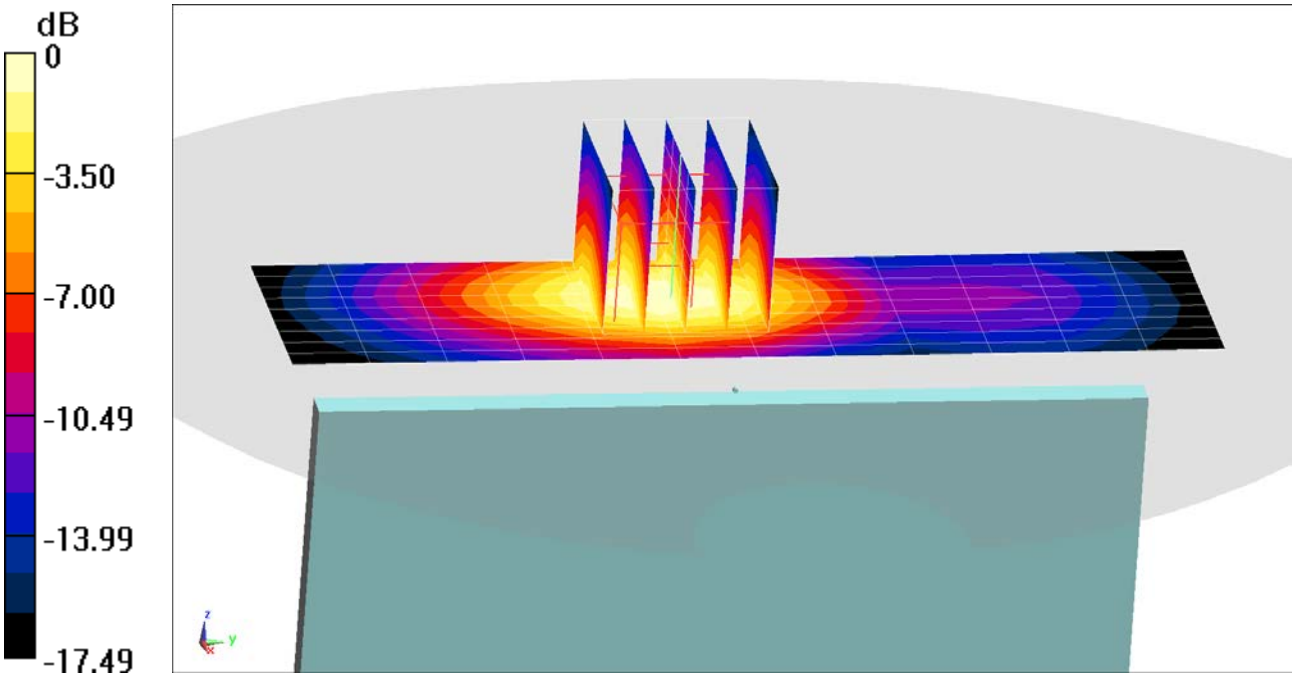
Communication System: UID 0, _LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1905 MHz; $\sigma$ = 1.548 S/m; $\varepsilon_r$ = 53.599; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 20.9°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1905 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 25 (PCS), Body SAR, Top Edge, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (10x13x1):** Measurement grid: dx=5mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.62 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.47 W/kg
**SAR(1 g) = 0.863 W/kg**




0 dB = 1.25 W/kg = 0.97 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

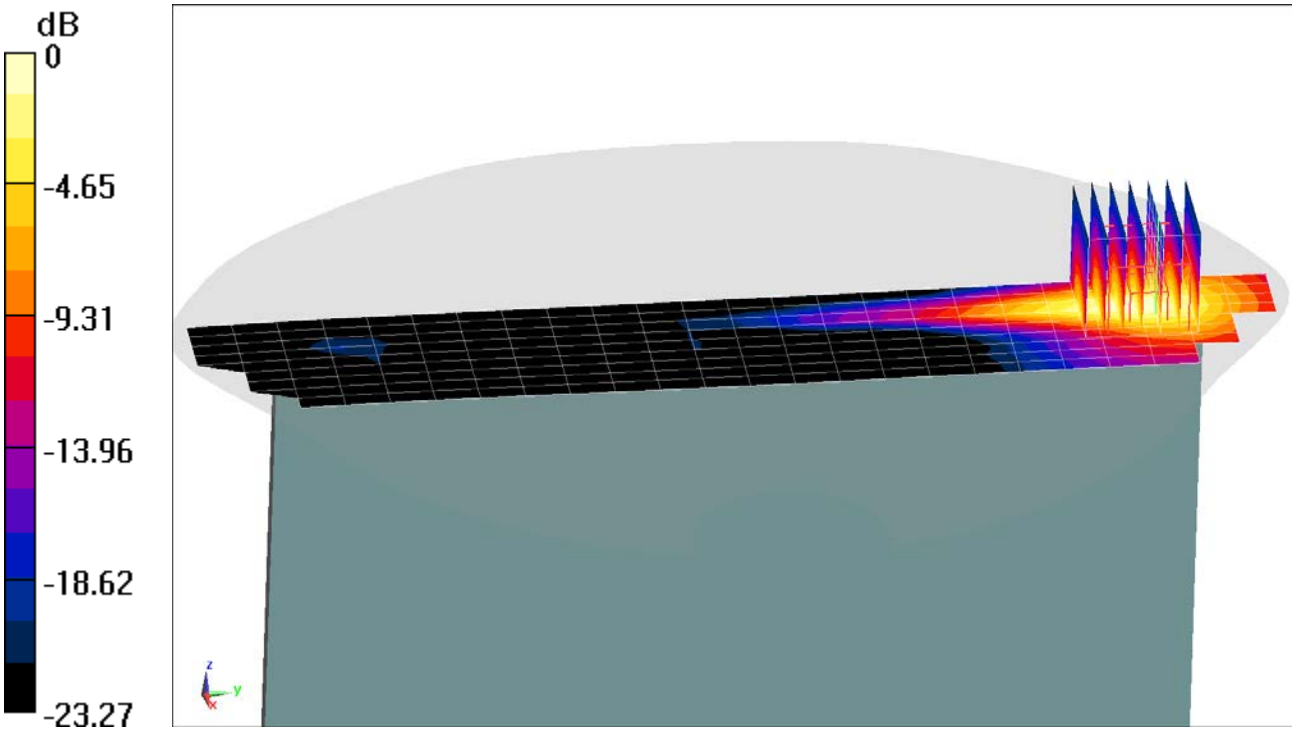
Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2510 MHz; $\sigma$ = 2.083 S/m; $\varepsilon_r$ = 50.59; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2510 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 7, Body SAR, Left Edge, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

**Area Scan (10x25x1):** Measurement grid: dx=5mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 25.13 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.26 W/kg
**SAR(1 g) = 1.17 W/kg**




0 dB = 2.18 W/kg = 3.38 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665**

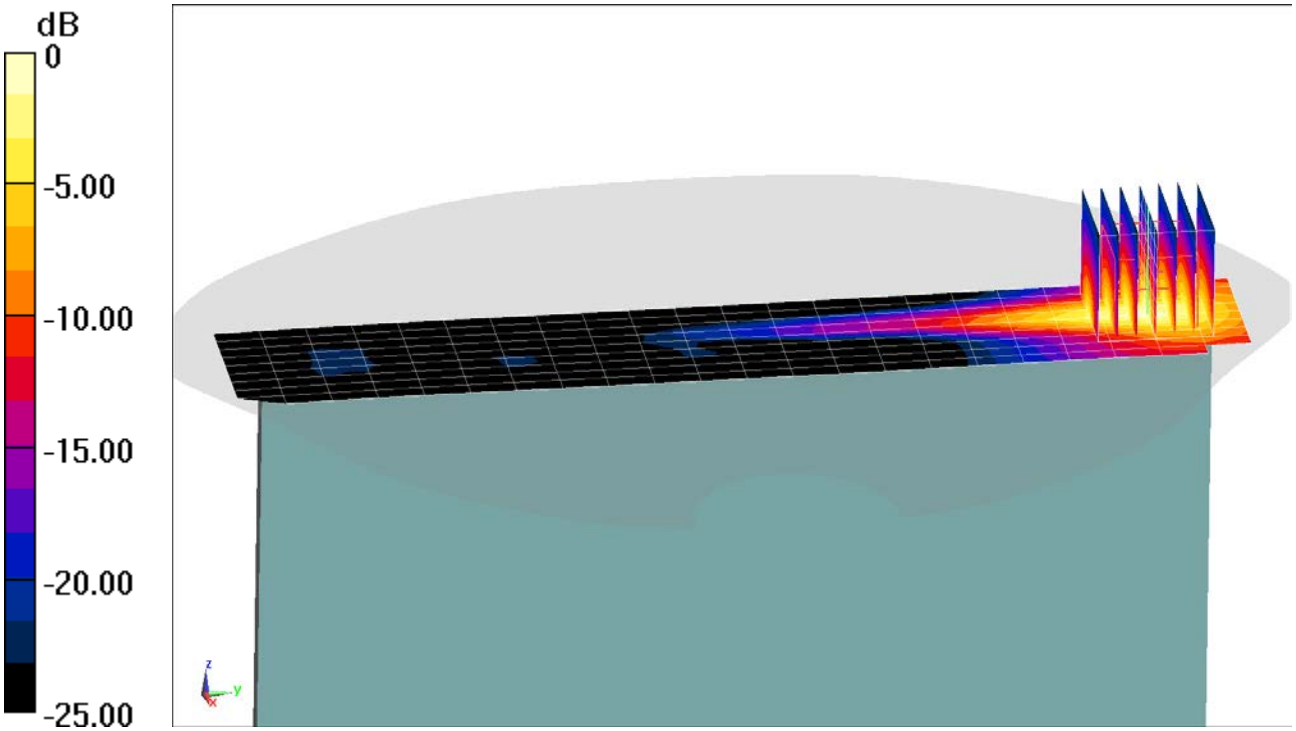
Communication System: UID 0, _LTE Band 41; Frequency: 2680 MHz; Duty Cycle: 1:1.58
Medium: 2450 Body Medium parameters used (interpolated):
f = 2680 MHz; $\sigma$ = 2.282 S/m; $\varepsilon_r$ = 50.078; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2680 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 41, Body SAR, Left Edge, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

**Area Scan (10x19x1):** Measurement grid: dx=5mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.72 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.81 W/kg
**SAR(1 g) = 1.21 W/kg**




0 dB = 2.83 W/kg = 4.52 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00640**

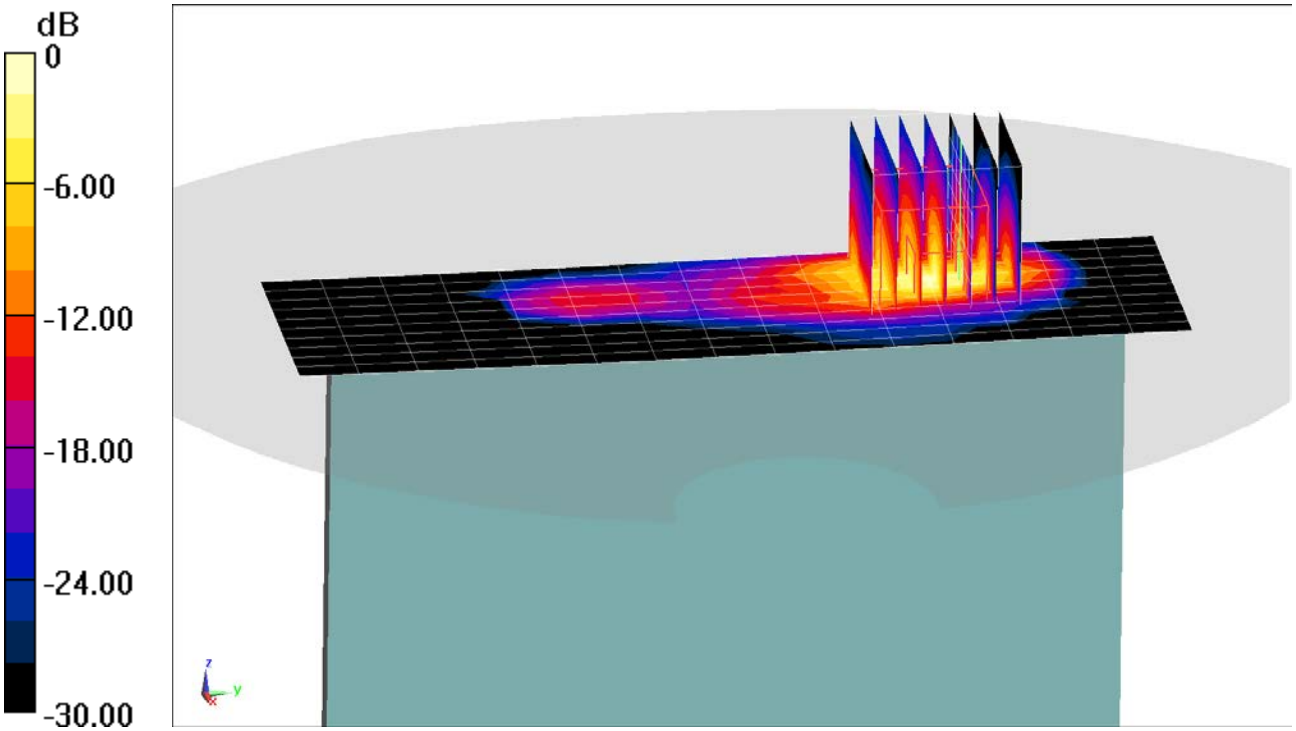
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
$f = 2437$ MHz; $\sigma = 1.901$ S/m; $\varepsilon_r = 51.51$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-31-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7357; ConvF(7.59, 7.59, 7.59) @ 2437 MHz; Calibrated: 4/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/18/2019
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: IEEE 802.11b, 22 MHz Bandwidth, Antenna 2, Body SAR,**
**Ch 6, 1 Mbps, Top Edge**

**Area Scan (11x16x1):** Measurement grid: dx=5mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.32 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.22 W/kg
**SAR(1 g) = 0.590 W/kg**




0 dB = 1.50 W/kg = 1.76 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665**

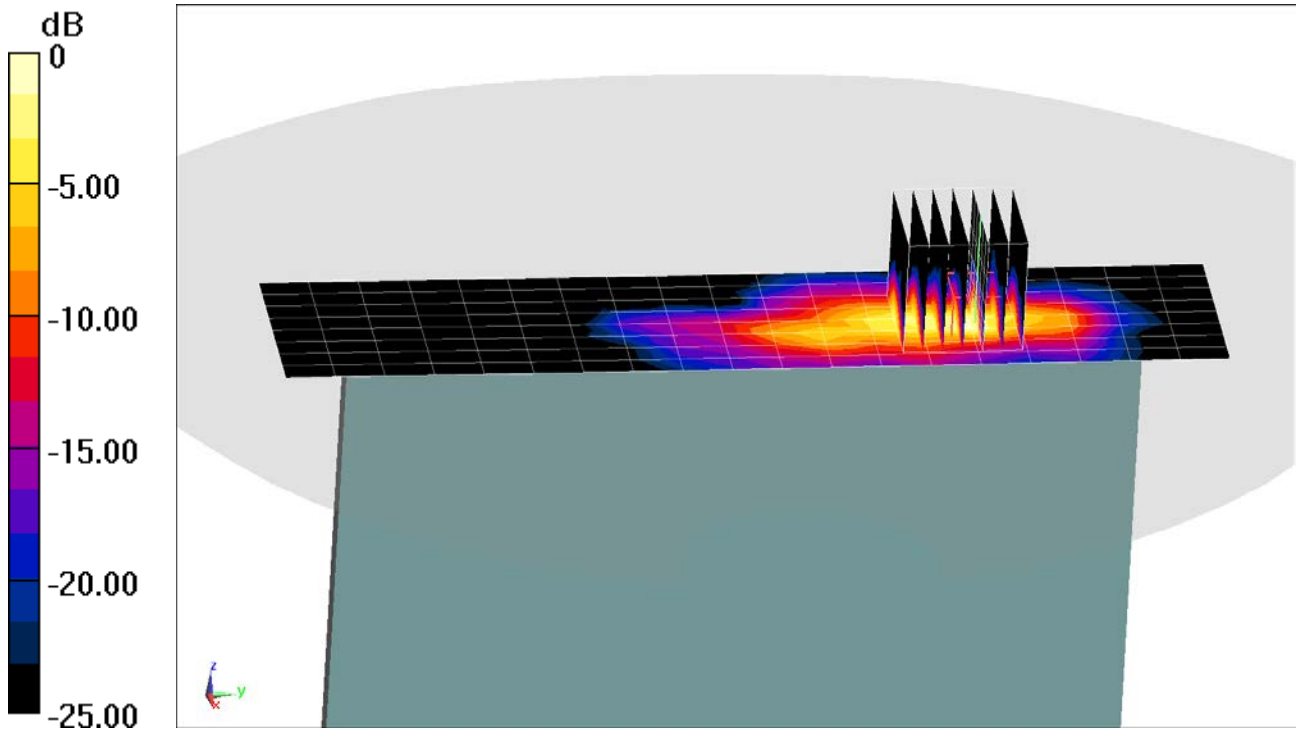
Communication System: UID 0, _IEEE 802.11n; Frequency: 5510 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
f = 5510 MHz; $\sigma$ = 5.502 S/m; $\varepsilon_r$ = 46.636; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5510 MHz; Calibrated: 7/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: IEEE 802.11n, Antenna 2, U-NII-2C, 40 MHz Bandwidth, Body SAR, Ch 102, 13.5 Mbps, Top Edge**

**Area Scan (9x8x1):** Measurement grid: dx=5mm, dy=10mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 10.44 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 2.82 W/kg
**SAR(1 g) = 0.432 W/kg**




0 dB = 1.42 W/kg = 1.52 dBW/kg

**DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657**

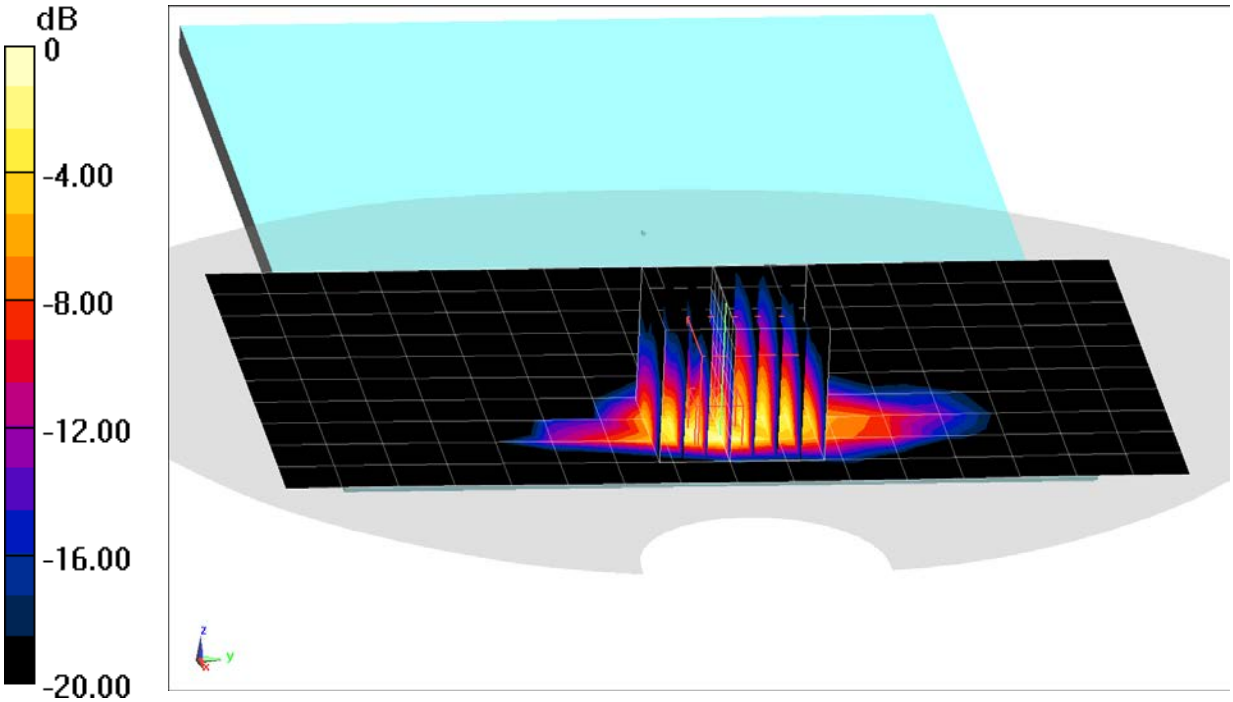
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.302
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; $\sigma$ = 2.031 S/m; $\varepsilon_r$ = 51.565; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 08-04-2019; Ambient Temp: 22.2°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2441 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

## Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

**Area Scan (9x19x1):** Measurement grid: dx=12mm, dy=12mm
**Zoom Scan (7x9x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.206 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.416 W/kg
**SAR(1 g) = 0.164 W/kg**




0 dB = 0.479 W/kg = -3.20 dBW/kg

# APPENDIX B: SYSTEM VERIFICATION

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1003**

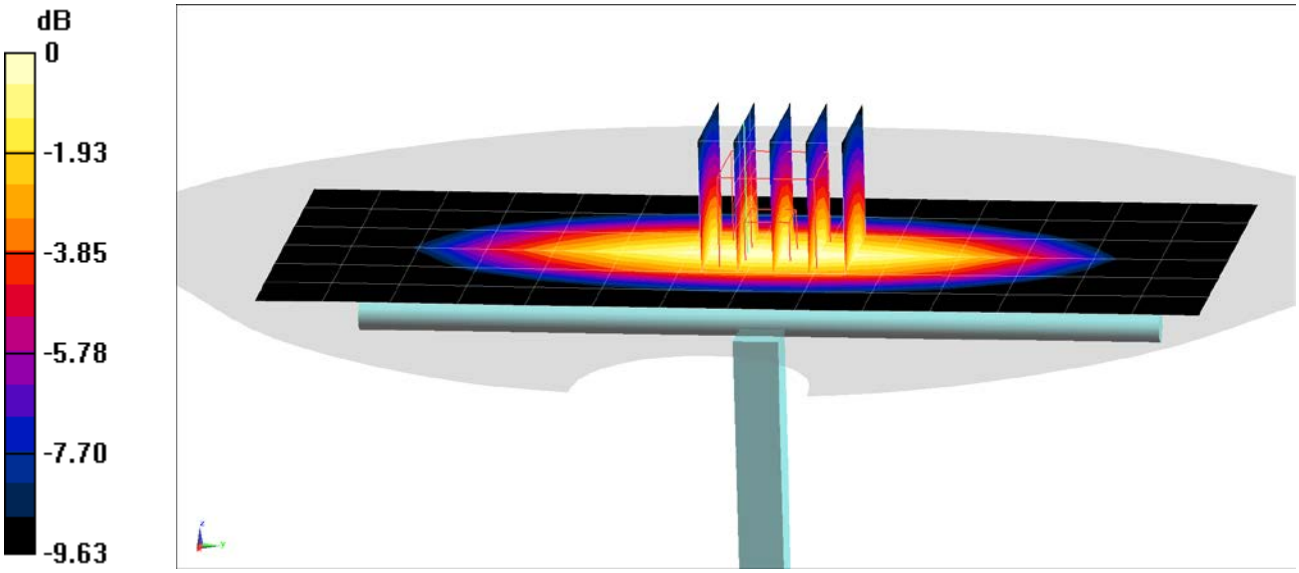
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; $\sigma$ = 0.942 S/m; $\varepsilon_r$ = 57.308; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 750 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.49 W/kg
**SAR(1 g) = 1.7 W/kg**
Deviation(1 g) = -0.93%




0 dB = 2.22 W/kg = 3.46 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1054**

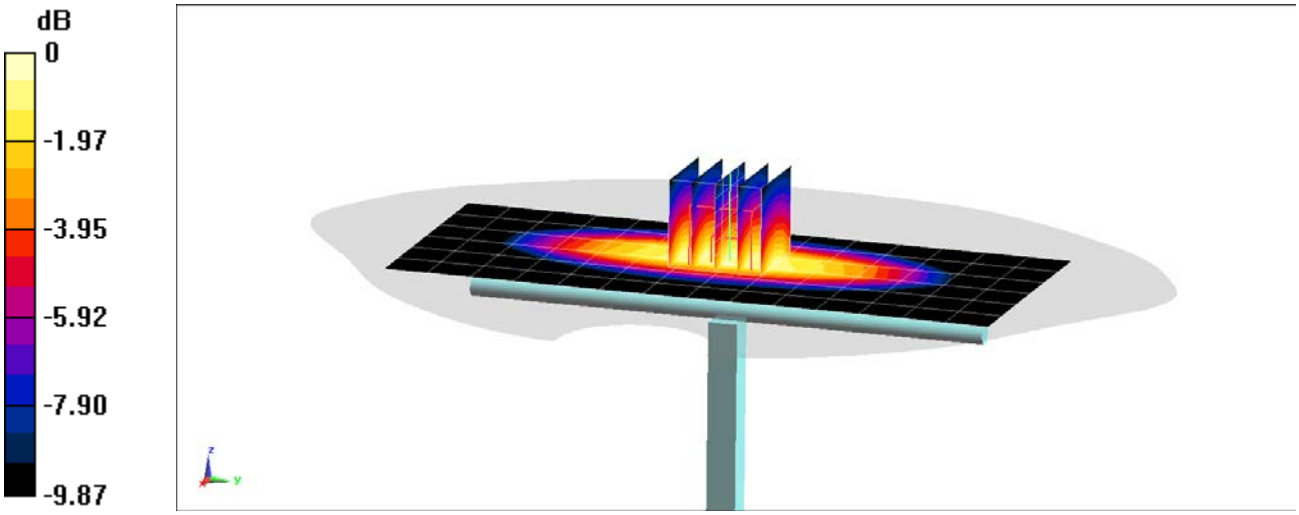
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body; Medium parameters used (interpolated):
f = 750 MHz; $\sigma$ = 0.952 S/m; $\varepsilon_r$ = 56.67; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 23.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.05, 10.05, 10.05) @ 750 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.66 W/kg
**SAR(1 g) = 1.79 W/kg**
Deviation(1 g) = 4.68%




0 dB = 2.37 W/kg = 3.75 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d132**

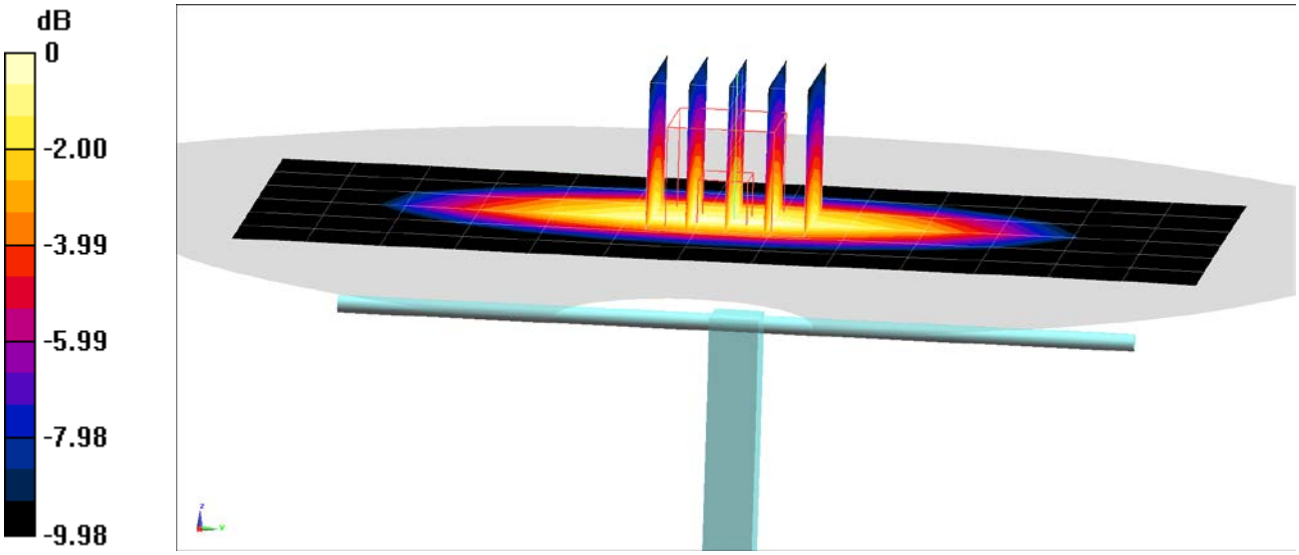
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used:
f = 835 MHz; $\sigma$ = 0.945 S/m; $\varepsilon_r$ = 57.098; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 835 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.00 W/kg
**SAR(1 g) = 2.01 W/kg**
Deviation(1 g) = 3.93%




0 dB = 2.67 W/kg = 4.27 dBW/kg

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1150**

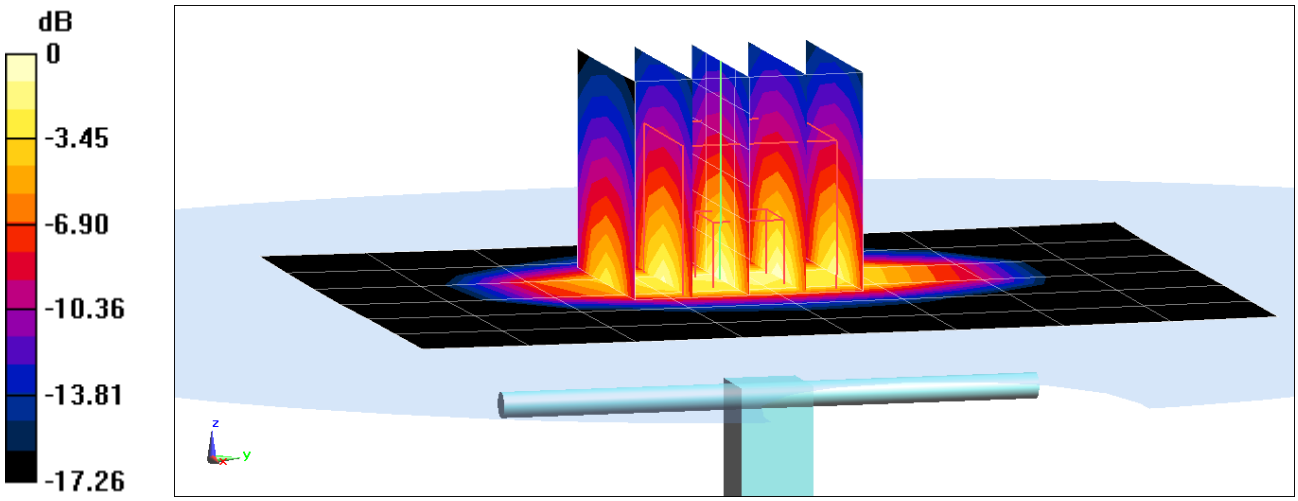
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; $\sigma$ = 1.464 S/m; $\varepsilon_r$ = 53.969; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-17-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1750 MHz; Calibrated: 6/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/20/2019
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5m
Peak SAR (extrapolated) = 7.12 W/kg
**SAR(1 g) = 3.88 W/kg**
Deviation(1 g) = 6.01%




0 dB = 5.92 W/kg = 7.72 dBW/kg

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1150**

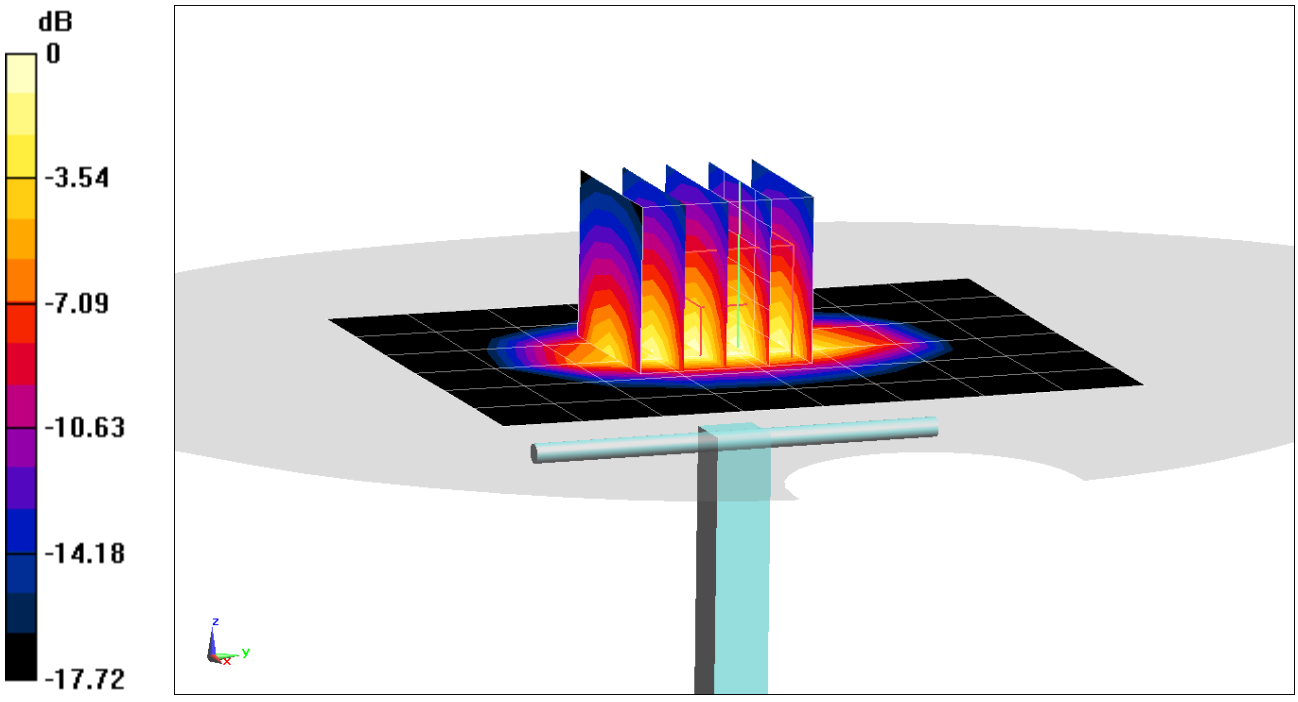
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; $\sigma$ = 1.437 S/m; $\varepsilon_r$ = 51.764; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-19-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1750 MHz; Calibrated: 6/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/20/2019
Phantom: Front; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.73 W/kg
**SAR(1 g) = 3.63 W/kg**
Deviation(1 g) = -0.82%




0 dB = 5.54 W/kg = 7.44 dBW/kg

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d148**

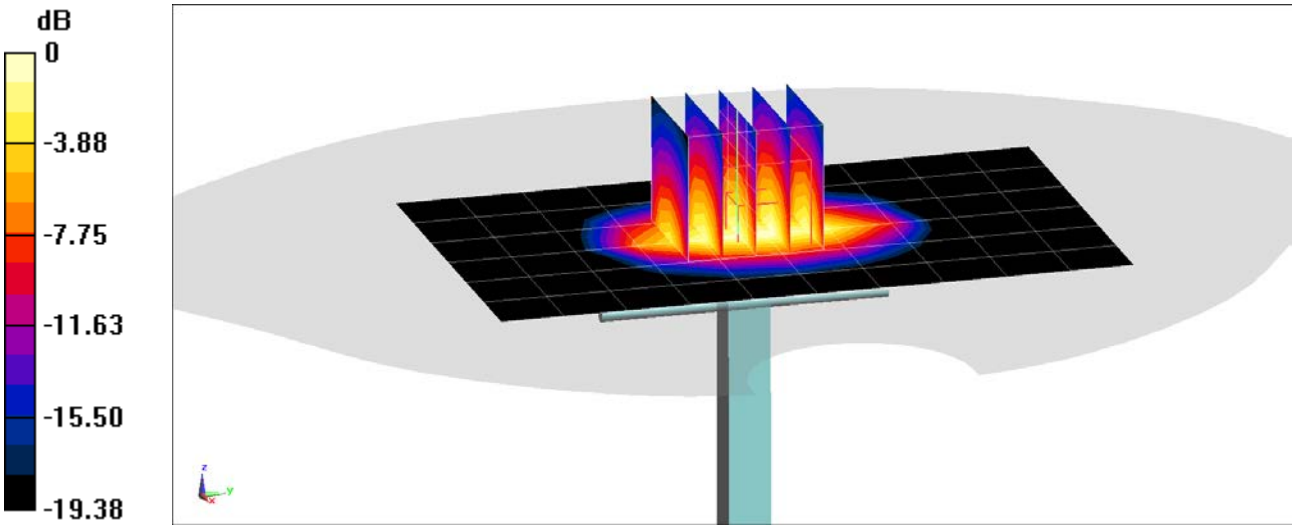
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; $\sigma$ = 1.581 S/m; $\varepsilon_r$ = 54.585; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-25-2019; Ambient Temp: 20.0°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1900 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**1900 MHz System Verification at 20.0 dBm (100 mW)**

**Area Scan (7x11x1):** Measurement grid: dx=15mm, dy=15mm
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.76 W/kg
**SAR(1 g) = 4.16 W/kg**
Deviation(1 g) = 6.39%




0 dB = 6.39 W/kg = 8.06 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 797**

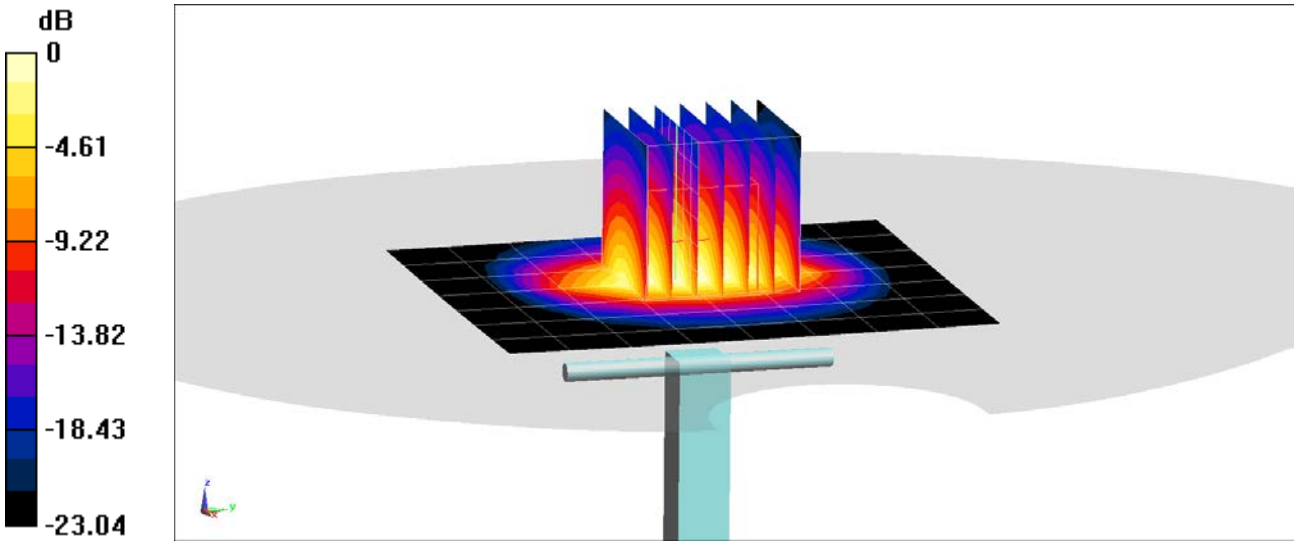
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; $\sigma$ = 1.917 S/m; $\varepsilon_r$ = 51.463; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7357; ConvF(7.59, 7.59, 7.59) @ 2450 MHz; Calibrated: 4/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/18/2019
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**2450 MHz System Verification at 20.0 dBm (100 mW)**

**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.5 W/kg
**SAR(1 g) = 4.95 W/kg**
Deviation(1 g) = -3.13%




0 dB = 8.32 W/kg = 9.20 dBW/kg

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719**

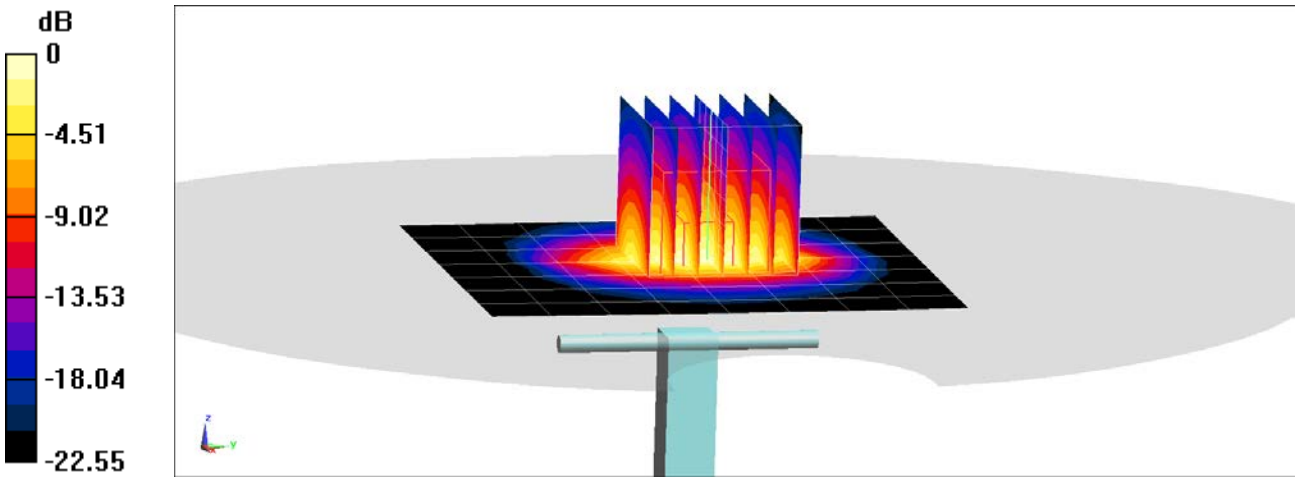
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; $\sigma$ = 2.042 S/m; $\varepsilon_r$ = 51.536; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2019; Ambient Temp: 22.2°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2450 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**2450 MHz System Verification at 20.0 dBm (100 mW)**

**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.0 W/kg
**SAR(1 g) = 5.31 W/kg**
Deviation(1 g) = 5.99%




0 dB = 8.92 W/kg = 9.50 dBW/kg

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004**

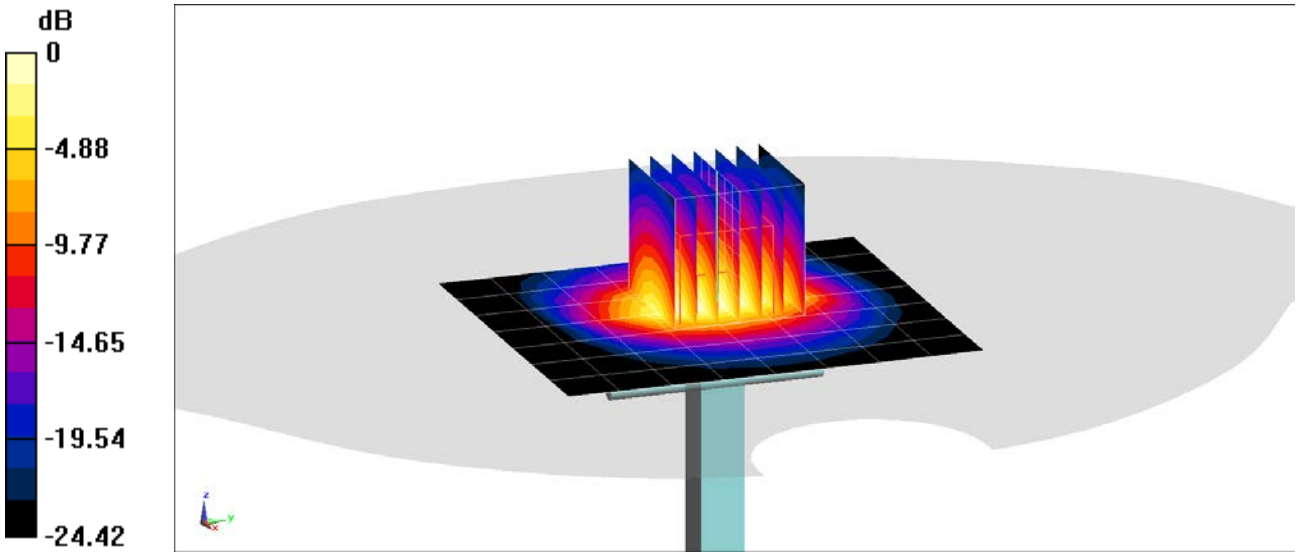
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2600 MHz; $\sigma$ = 2.189 S/m; $\varepsilon_r$ = 50.331; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2600 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**2600 MHz System Verification at 20.0 dBm (100 mW)**

**Area Scan (8x9x1):** Measurement grid: dx=12mm, dy=12mm
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 12.2 W/kg
**SAR(1 g) = 5.6 W/kg**
Deviation(1 g) = 2.19%




0 dB = 9.60 W/kg = 9.82 dBW/kg

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057**

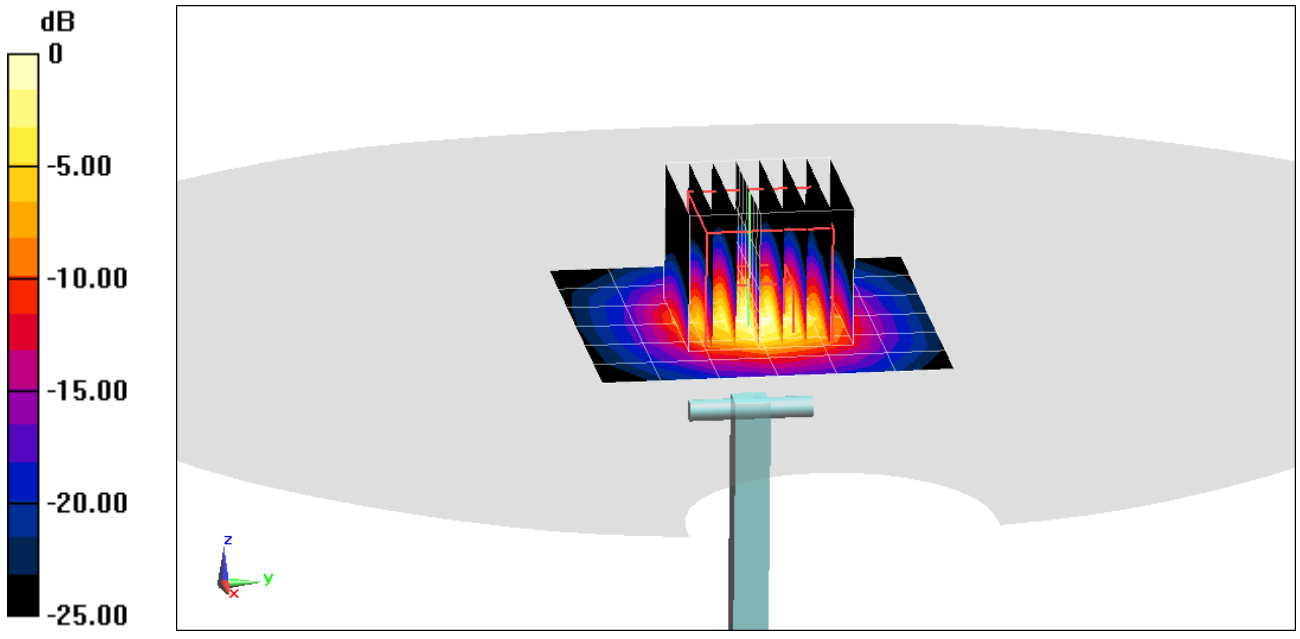
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
f = 5250 MHz; $\sigma$ = 5.165 S/m; $\varepsilon_r$ = 47.068; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(4.95, 4.95, 4.95) @ 5250 MHz; Calibrated: 7/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

**5250 MHz System Verification at 17.0 dBm (50 mW)**

**Area Scan (7x7x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 13.5 W/kg
**SAR(1 g) = 3.47 W/kg**
Deviation(1 g) = -8.56%




0 dB = 8.16 W/kg = 9.12 dBW/kg

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057**

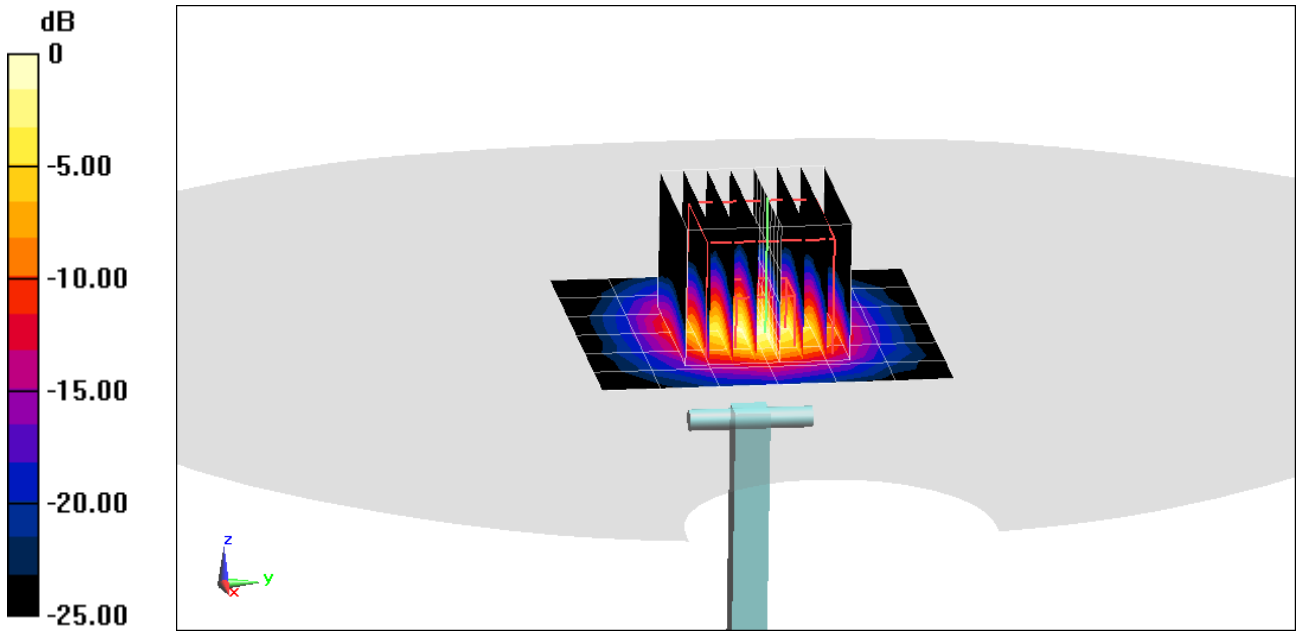
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5600 MHz; $\sigma$ = 5.629 S/m; $\varepsilon_r$ = 46.485; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5600 MHz; Calibrated: 7/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

**5600 MHz System Verification at 17.0 dBm (50 mW)**

**Area Scan (7x7x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (9x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 16.4 W/kg
**SAR(1 g) = 3.74 W/kg**
Deviation(1 g) = -6.38%




0 dB = 9.37 W/kg = 9.72 dBW/kg

**DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057**

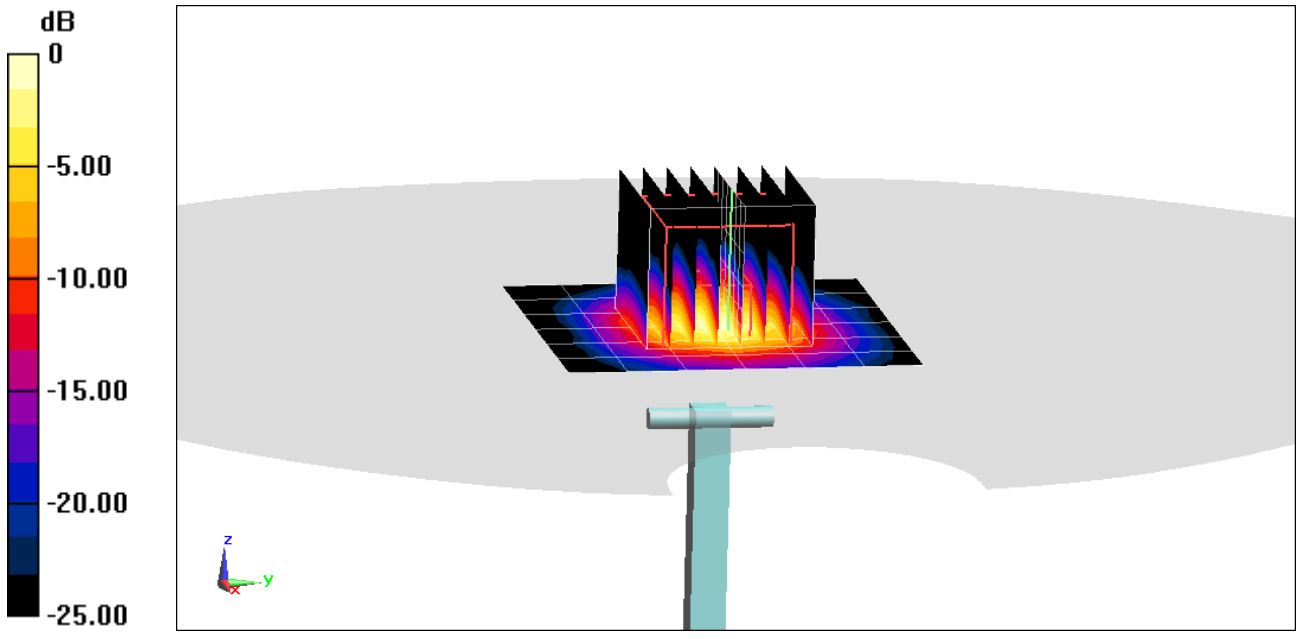
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
$f = 5750$ MHz; $\sigma = 5.842$ S/m; $\varepsilon_r = 46.222$; $\rho = 1000$ kg/m$^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(4.6, 4.6, 4.6) @ 5750 MHz; Calibrated: 7/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2019
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**5750 MHz System Verification at 17.0 dBm (50 mW)**

**Area Scan (7x7x1):** Measurement grid: dx=10mm, dy=10mm
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 16.0 W/kg
**SAR(1 g) = 3.57 W/kg**
Deviation(1 g) = -6.91%




0 dB = 8.98 W/kg = 9.53 dBW/kg

# APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan18**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D750V3 - SN:1003 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | January 15, 2018 |

BN ✓
01-25-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. BN ✓
02/06/2019

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-17 (No. 217-02521) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02522) | Apr-18 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 07-Apr-17 (No. 217-02529) | Apr-18 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-17 (No. EX3-7349_Dec17) | Dec-18 |
| DAE4 | SN: 601 | 26-Oct-17 (No. DAE4-601_Oct17) | Oct-18 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

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

Issued: January 15, 2018

## 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| DASY Version | DASY5 | V52.10.0 |
|---|---|---|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5.0 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 | 40.9 ± 6 % | 0.90 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.10 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.28 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.42 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| Nominal Body TSL parameters | 22.0 °C | 55.5 | 0.96 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 55.0 ± 6 % | 0.96 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| SAR averaged over 1 cm³ (1 g) of Body TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.15 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **8.58 W/kg ± 17.0 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Body TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.43 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **5.71 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 | 53.8 Ω - 2.1 jΩ |
| Return Loss | - 27.6 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.2 Ω - 6.2 jΩ |
| Return Loss | - 24.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.043 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 | January 21, 2009 |

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

### Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

| Phantom | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---|---|---|

### SAR result with SAM Head (Top)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.98 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **7.94 W/kg ± 17.5 % (k=2)** |

| SAR averaged over 10 cm³ (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 | **5.32 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Mouth)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.05 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.22 W/kg ± 17.5 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.52 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Neck)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.01 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.06 W/kg ± 17.5 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.52 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Ear)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.67 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.70 W/kg ± 17.5 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.15 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **4.60 W/kg ± 16.9 % (k=2)** |

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003**

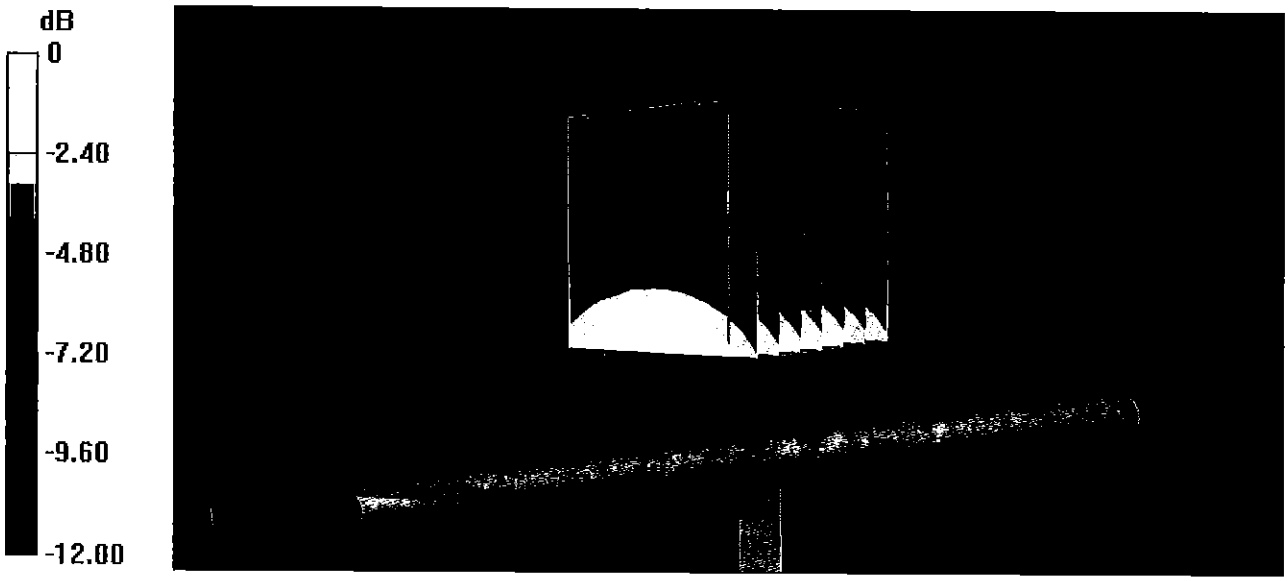
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.9 S/m; $\varepsilon_r$ = 40.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

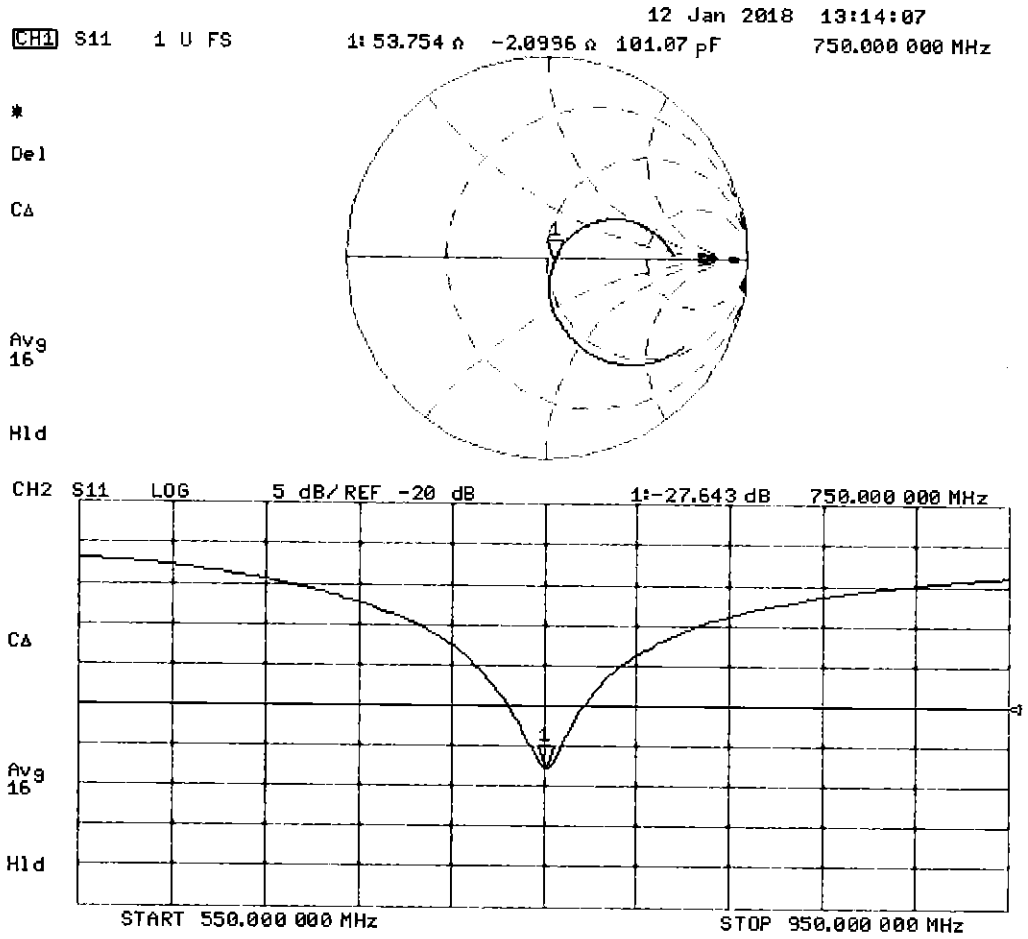
## Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.11 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.15 W/kg
**SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg**
Maximum value of SAR (measured) = 2.80 W/kg




0 dB = 2.80 W/kg = 4.47 dBW/kg

## Impedance Measurement Plot for Head TSL



Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003**

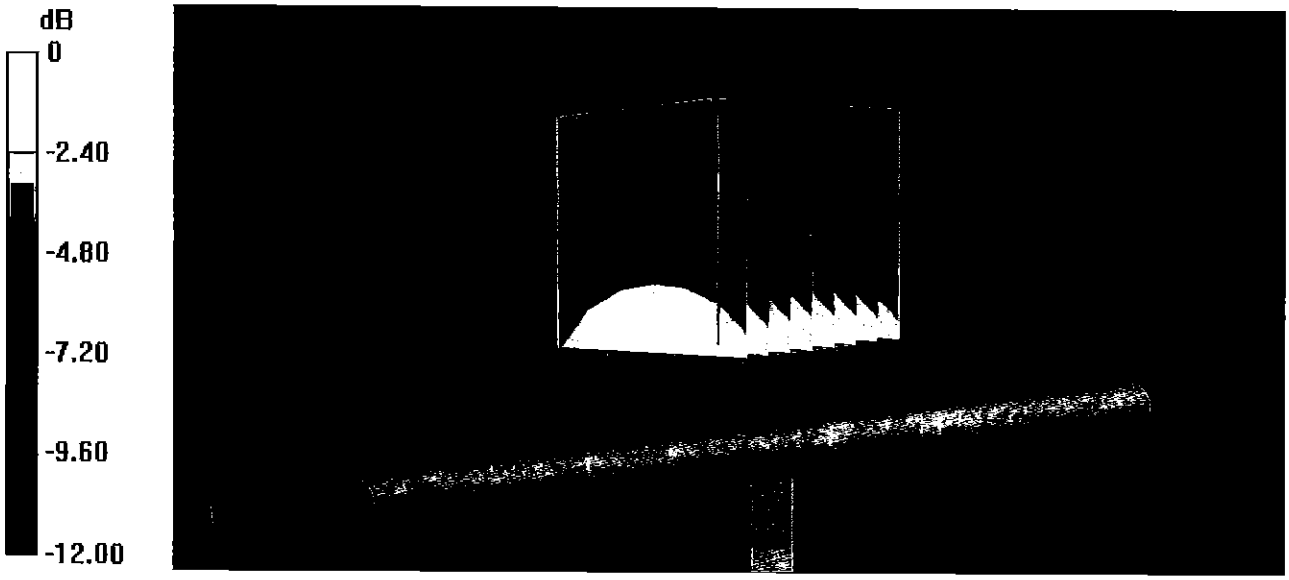
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.96 S/m; $\varepsilon_r$ = 55; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

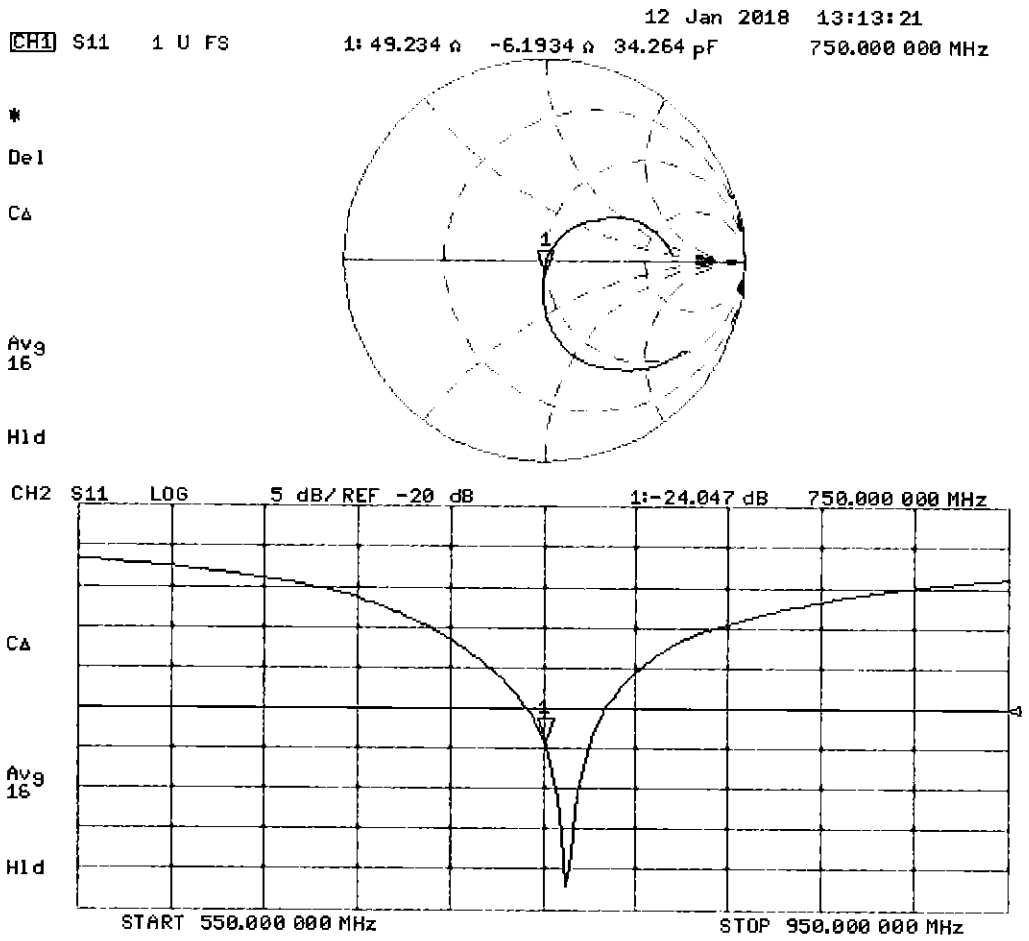
## Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.31 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.17 W/kg
**SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg**
Maximum value of SAR (measured) = 2.83 W/kg




0 dB = 2.83 W/kg = 4.52 dBW/kg

## Impedance Measurement Plot for Body TSL



Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1003**

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.9 S/m; $\varepsilon_r$ = 44.2; $\rho$ = 1000 kg/m$^3$
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

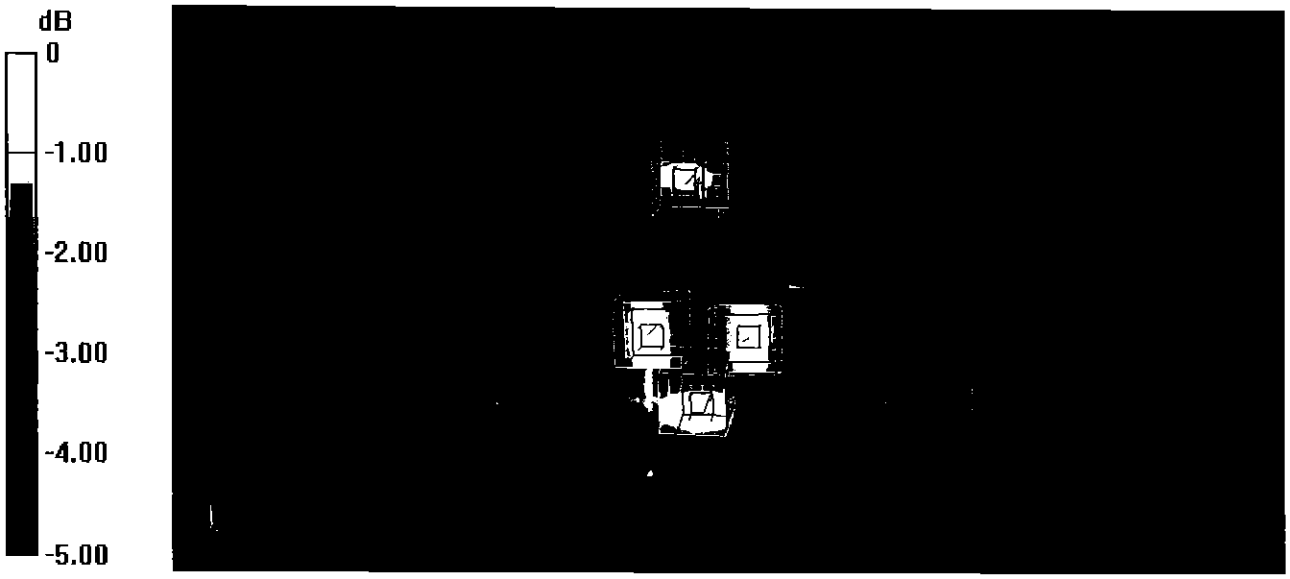
- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

**SAM Head/Top/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.79 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.89 W/kg
**SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg**
Maximum value of SAR (measured) = 2.58 W/kg

**SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.85 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.94 W/kg
**SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg**
Maximum value of SAR (measured) = 2.62 W/kg

**SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.29 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.78 W/kg
**SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg**
Maximum value of SAR (measured) = 2.56 W/kg

**SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.01 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.31 W/kg
**SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg**
Maximum value of SAR (measured) = 2.11 W/kg




0 dB = 2.58 W/kg = 4.12 dBW/kg

# Certification of Calibration

| | |
|---|---|
| Object | D750V3 – SN: 1003 |
| Calibration procedure(s) | Procedure for Calibration Extension for SAR Dipoles. |
| Extension Calibration date: | 1/15/2019 |
| Description: | SAR Validation Dipole at 750 MHz. |

Calibration Equipment used:

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| Agilent | 8753ES | S-Parameter Network Analyzer | 2/8/2018 | Annual | 2/8/2019 | US39170122 |
| Agilent | N5182A | MXG Vector Signal Generator | 4/18/2018 | Annual | 4/18/2019 | MY47420800 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 433971 |
| Anritsu | MA2411B | Pulse Power Sensor | 3/2/2018 | Annual | 3/2/2019 | 1207364 |
| Anritsu | MA2411B | Pulse Power Sensor | 3/2/2018 | Annual | 3/2/2019 | 1339018 |
| Anritsu | ML2495A | Power Meter | 10/21/2018 | Annual | 10/21/2019 | 941001 |
| Control Company | 4040 | Therm./Clock/Humidity Monitor | 3/31/2017 | Biennial | 3/31/2019 | 170232394 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 5/2/2017 | Biennial | 5/2/2019 | 170330156 |
| Keysight | 772D | Dual Directional Coupler | CBT | N/A | CBT | MY52180215 |
| Keysight Technologies | 85033E | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018 | Annual | 6/4/2019 | MY53401181 |
| MiniCircuits | VLF-6000+ | Low Pass Filter | CBT | N/A | CBT | N/A |
| Mini-Circuits | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT | N/A | CBT | N/A |
| Narda | 4772-3 | Attenuator (3dB) | CBT | N/A | CBT | 9406 |
| Pasternack | PE2208-6 | Bidirectional Coupler | CBT | N/A | CBT | N/A |
| Seekonk | NC-100 | Torque Wrench | 7/11/2018 | Annual | 7/11/2019 | N/A |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 10/3/2018 | Annual | 10/3/2019 | 1558 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 6/18/2018 | Annual | 6/18/2019 | 1334 |
| SPEAG | DAK-3.5 | Dielectric Assessment Kit | 9/11/2018 | Annual | 9/11/2019 | 1091 |
| SPEAG | EX3DV4 | SAR Probe | 8/23/2018 | Annual | 8/23/2019 | 7308 |
| SPEAG | EX3DV4 | SAR Probe | 6/25/2018 | Annual | 6/25/2019 | 7409 |

Measurement Uncertainty = ±23% (k=2)

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated By: | Brodie Halbfoster | Test Engineer | BRODIE HALBFOSTER |
| Approved By: | Kaitlin O'Keefe | Senior Technical Manager | |

# DIPOLE CALIBRATION EXTENSION

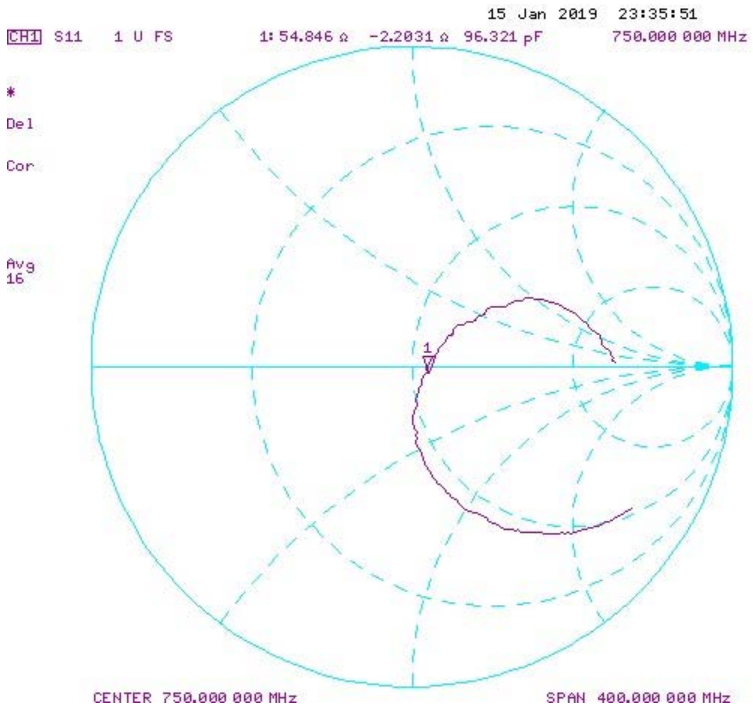
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

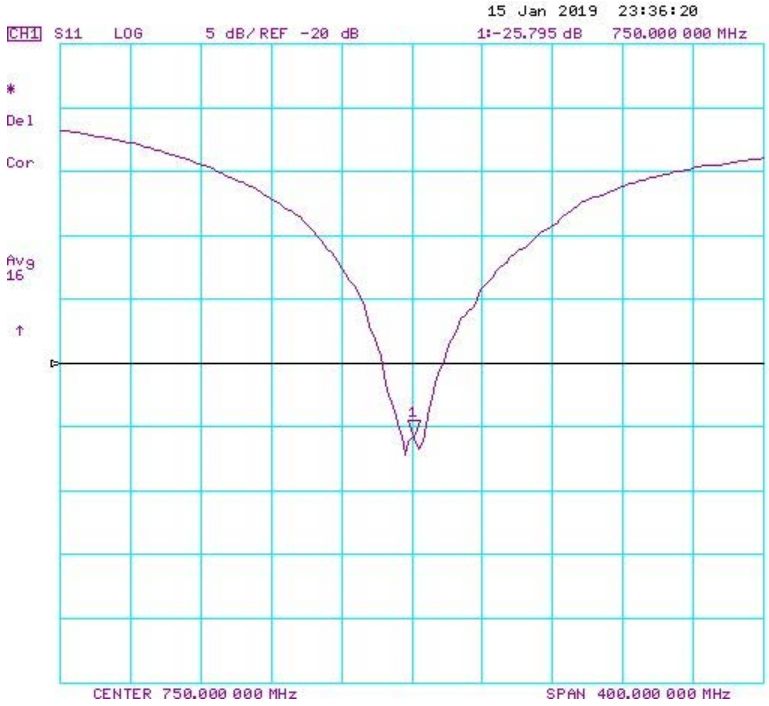
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

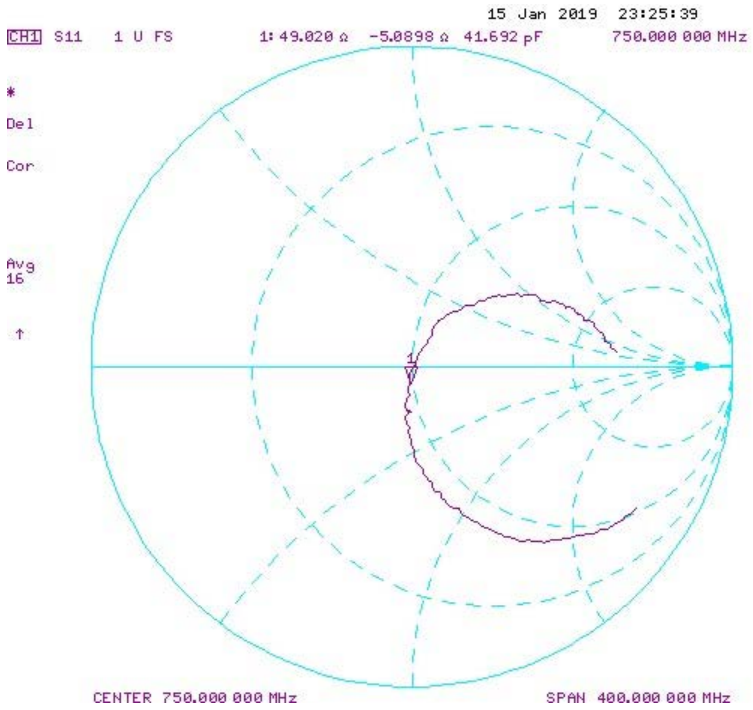
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 23.0 dBm | Measured Head SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 23.0 dBm | Measured Head SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/15/2018 | 1/15/2019 | 1.043 | 1.656 | 1.75 | 5.68% | 1.08 | 1.15 | 6.09% | 53.8 | 54.8 | 1 | -2.1 | -2.2 | 0.1 | -27.6 | -25.8 | 6.50% | PASS |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 23.0 dBm | Measured Body SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 23.0 dBm | Measured Body SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 1/15/2018 | 1/15/2019 | 1.043 | 1.716 | 1.84 | 7.23% | 1.14 | 1.23 | 7.71% | 49.2 | 49 | 0.2 | -6.2 | -5.1 | 1.1 | -24 | -25.6 | -6.80% | PASS |

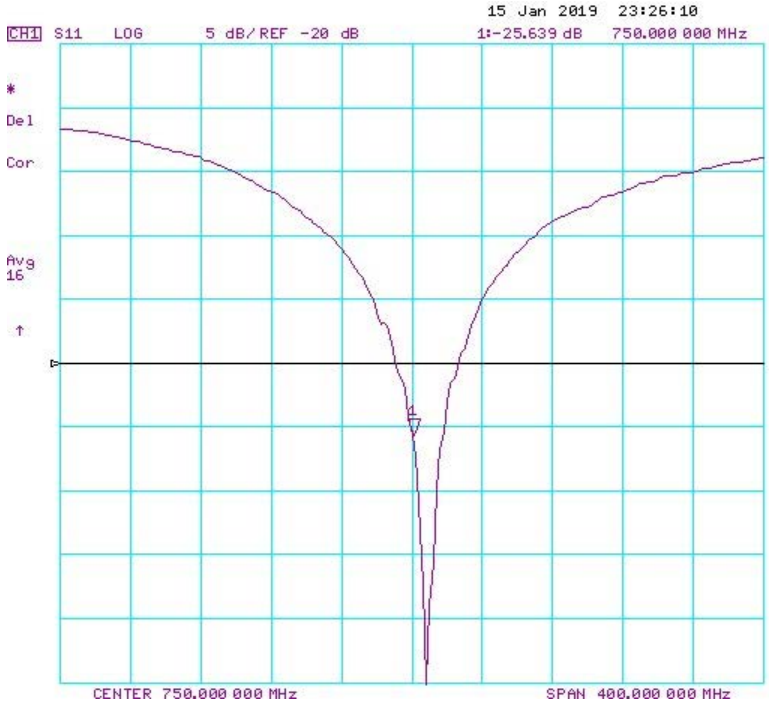
Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



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

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

**Accreditation No.: SCS 0108**

**Client** **PC Test**

**Certificate No: D750V3-1054_Mar19/2**

# CALIBRATION CERTIFICATE (Replacement of No:D750V3-1154_Mar19)

Object: D750V3 - SN:1054

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

BN ✓ 4-29-2019

Calibration date: March 18, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-18 (No. 217-02672/02673) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-18 (No. 217-02672) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-18 (No. 217-02673) | Apr-19 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-18 (No. 217-02682) | Apr-19 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683) | Apr-19 |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-18 (No. EX3-7349_Dec18) | Dec-19 |
| DAE4 | SN: 601 | 04-Oct-18 (No. DAE4-601_Oct18) | Oct-19 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 07-Oct-15 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Manu Seitz | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: April 12, 2019

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

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

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

**Accreditation No.: SCS 0108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5.0 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 | 42.1 ± 6 % | 0.89 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.07 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.29 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.48 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 | 54.5 ± 6 % | 0.98 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.18 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **8.55 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (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 | **5.67 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 | 54.5 Ω - 0.3 jΩ |
| Return Loss | - 27.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.2 Ω - 3.0 jΩ |
| Return Loss | - 30.3 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.035 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 |

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

### Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

| **Phantom** | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---|---|---|

### SAR result with SAM Head (Top)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.93 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **7.72 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.31 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.23 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Mouth)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.05 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.20 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.39 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.55 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Neck)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.00 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.00 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.51 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Ear)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.66 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.64 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **4.55 W/kg ± 16.9 % (k=2)** |

## DASY5 Validation Report for Head TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054**

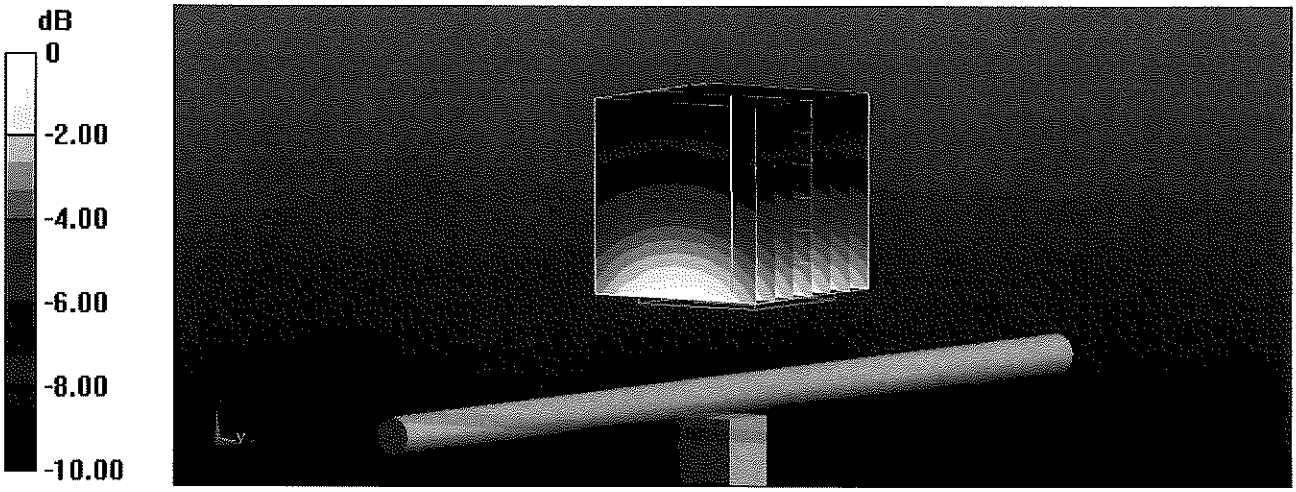
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.89 S/m; $\varepsilon_r$ = 42.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.32, 10.32, 10.32) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

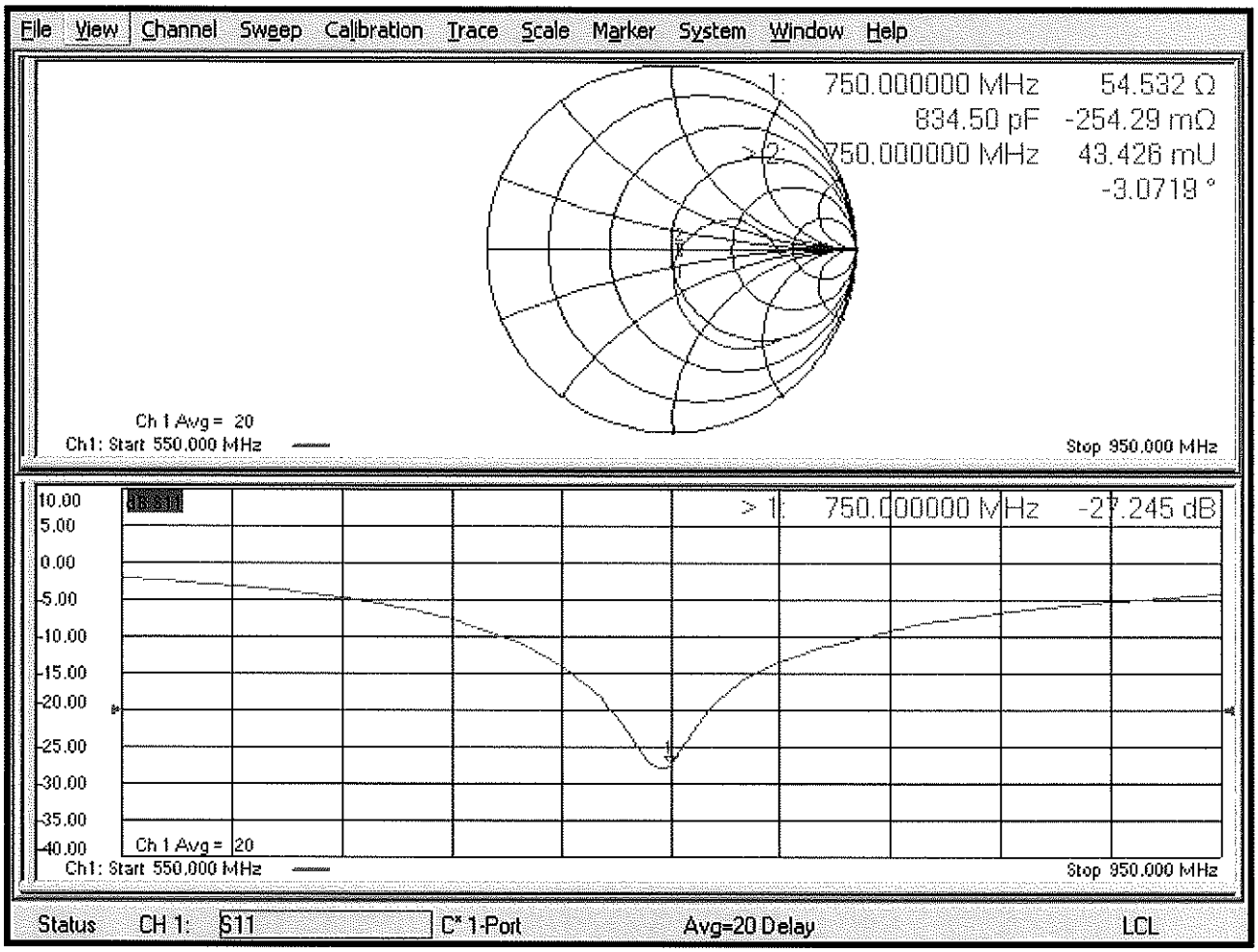
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.96 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.06 W/kg
**SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.37 W/kg**
Maximum value of SAR (measured) = 2.73 W/kg




0 dB = 2.73 W/kg = 4.36 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054**

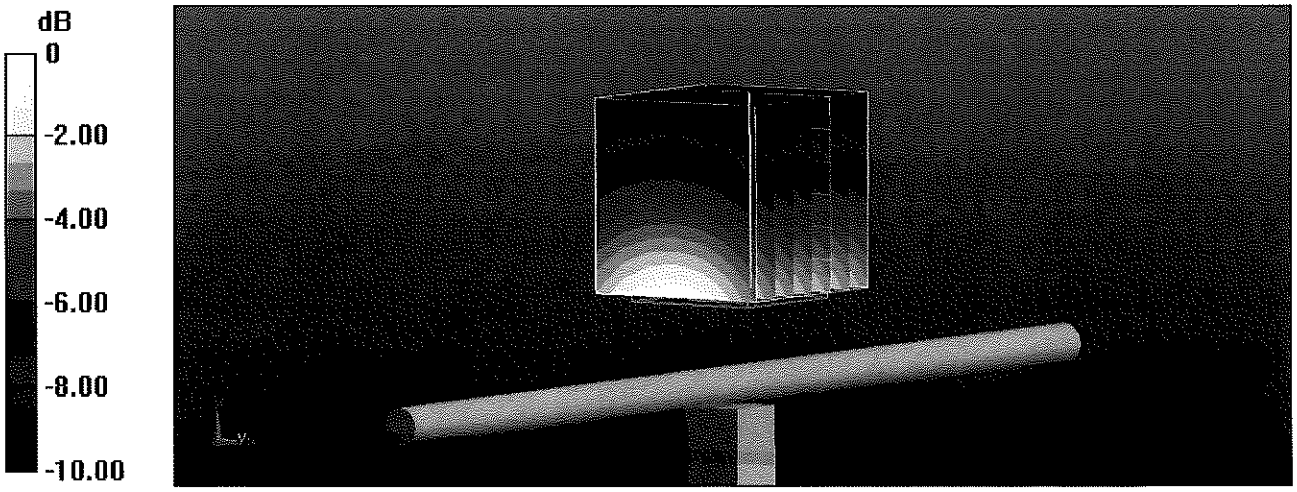
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.98 S/m; $\varepsilon_r$ = 54.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.29, 10.29, 10.29) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

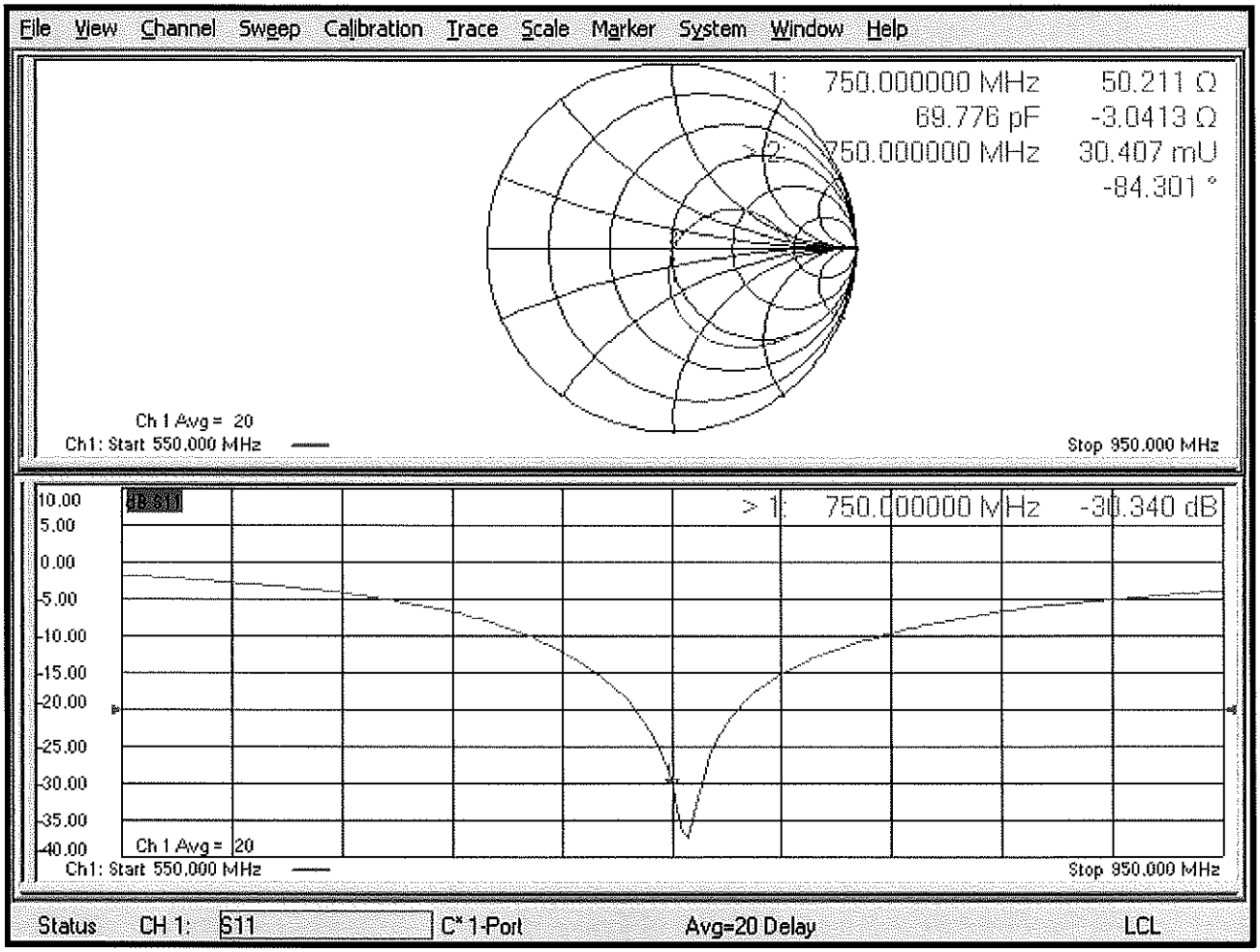
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.37 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.19 W/kg
**SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg**
Maximum value of SAR (measured) = 2.87 W/kg




0 dB = 2.87 W/kg = 4.58 dBW/kg

## Impedance Measurement Plot for Body TSL



## DASY5 Validation Report for SAM Head

Date: 18.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma$ = 0.904 S/m; $\varepsilon_r$ = 44.22; $\rho$ = 1000 kg/m$^3$
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

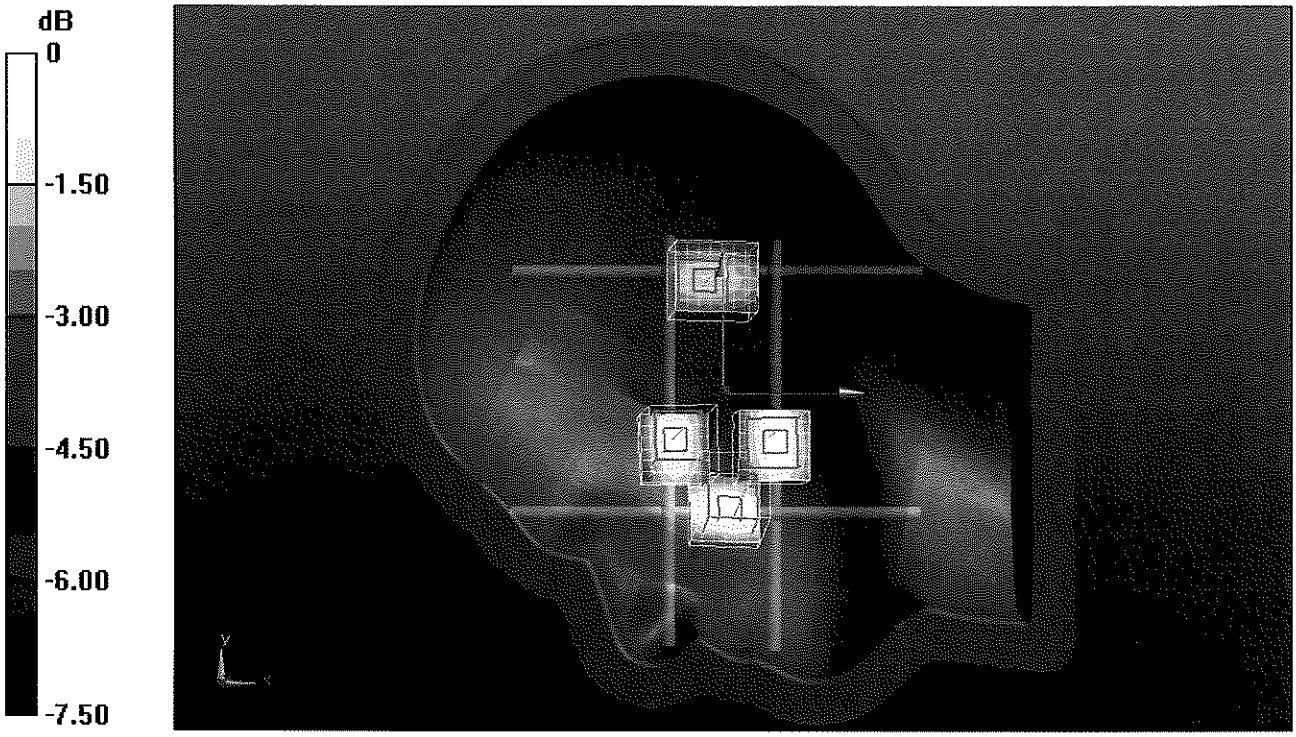
- Probe: EX3DV4 - SN7349; ConvF(10.32, 10.32, 10.32) @ 750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

**SAM Right/Head/Top/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.66 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.80 W/kg
**SAR(1 g) = 1.93 W/kg; SAR(10 g) = 1.31 W/kg**
Maximum value of SAR (measured) = 2.52 W/kg

**SAM Right/Head/Mouth/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.68 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.98 W/kg
**SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.39 W/kg**
Maximum value of SAR (measured) = 2.68 W/kg

**SAM Right/Head/Neck/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.23 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 2.82 W/kg
**SAR(1 g) = 2 W/kg; SAR(10 g) = 1.38 W/kg**
Maximum value of SAR (measured) = 2.56 W/kg

**SAM Right/Head/Ear/Zoom Scan (8x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.76 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.32 W/kg
**SAR(1 g) = 1.66 W/kg; SAR(10 g) = 1.14 W/kg**
Maximum value of SAR (measured) = 2.11 W/kg




0 dB = 2.11 W/kg = 3.24 dBW/kg

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

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

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

**Accreditation No.: SCS 0108**

**Client** **PC Test** **Certificate No: D835V2-4d132_Jan19**

# CALIBRATION CERTIFICATE

Object D835V2 - SN:4d132

Calibration procedure(s) QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

BN ✓ 02/06/2019

Calibration date: January 22, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-18 (No. 217-02672/02673) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-18 (No. 217-02672) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-18 (No. 217-02673) | Apr-19 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-18 (No. 217-02682) | Apr-19 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683) | Apr-19 |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-18 (No. EX3-7349_Dec18) | Dec-19 |
| DAE4 | SN: 601 | 04-Oct-18 (No. DAE4-601_Oct18) | Oct-19 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

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

Issued: January 22, 2019

## 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5.0 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 | 41.3 ± 6 % | 0.92 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.44 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.59 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.58 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.23 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 % | 0.99 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.46 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.67 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.61 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.35 W/kg ± 16.5 % (k=2)** |

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

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.6 Ω - 3.6 jΩ |
| Return Loss | - 28.7 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.4 Ω - 6.2 jΩ |
| Return Loss | - 23.2 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.387 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 |

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

### Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

| **Phantom** | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---|---|---|

### SAR result with SAM Head (Top)

| **SAR averaged over 1 cm³ (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 | **9.38 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.57 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.26 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Mouth)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.47 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.86 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.65 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.58 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Neck)

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.36 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.42 W/kg ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.60 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.38 W/kg ± 16.9 % (k=2)** |

### SAR result with SAM Head (Ear)

| **SAR averaged over 1 cm³ (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 ± 17.5 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.36 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.42 W/kg ± 16.9 % (k=2)** |

## DASY5 Validation Report for Head TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132**

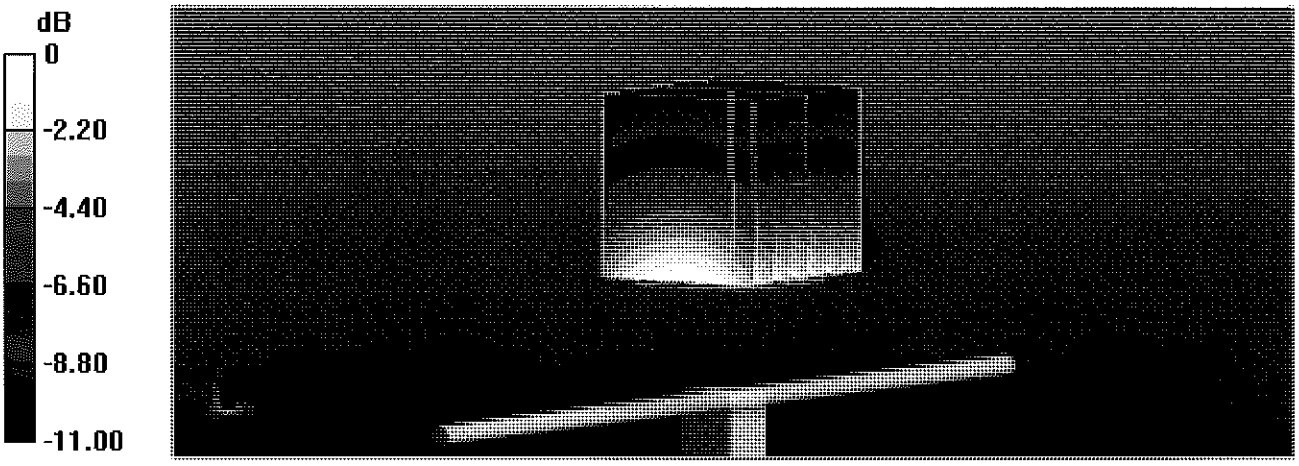
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.92 S/m; $\varepsilon_r$ = 41.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

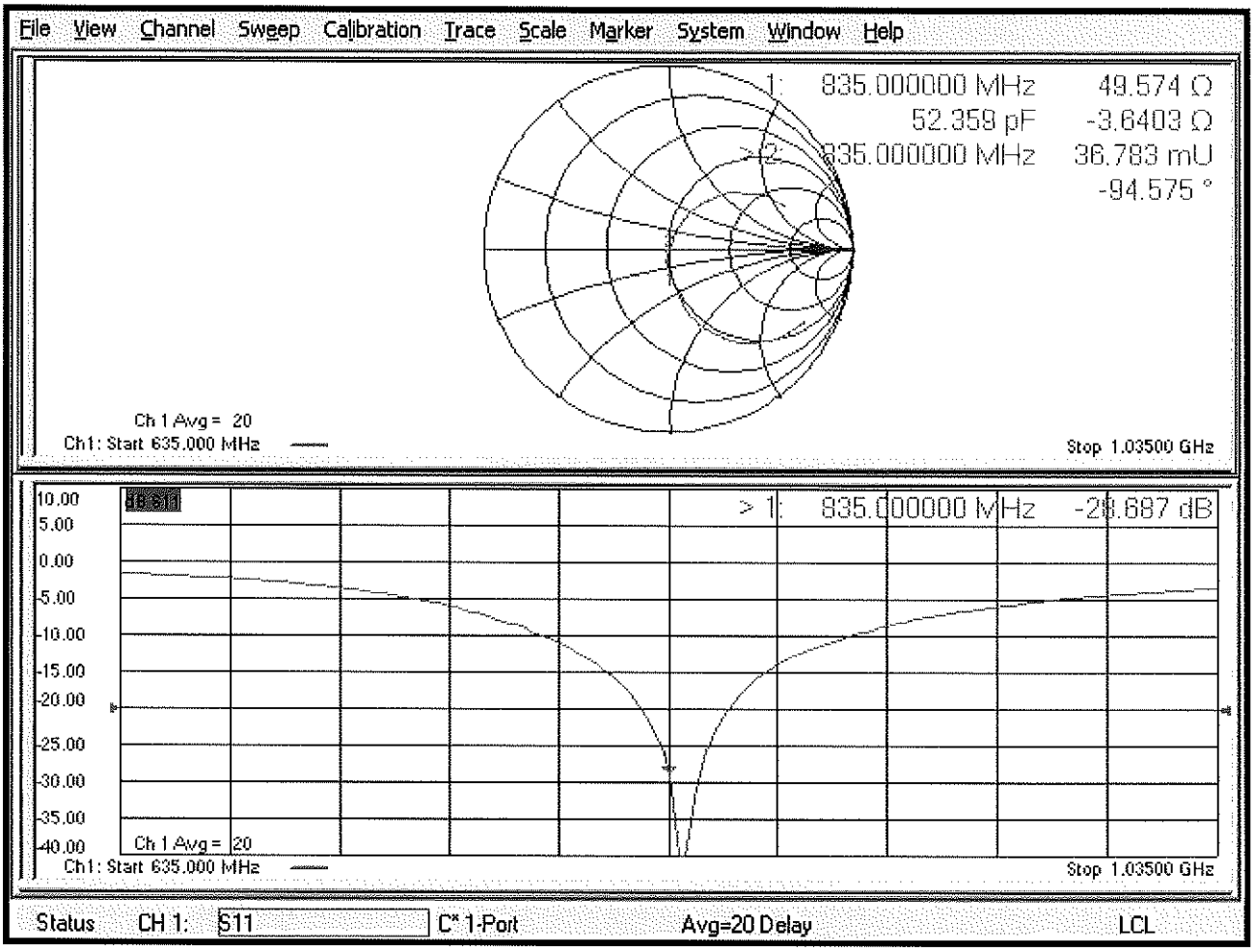
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.24 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.73 W/kg
**SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg**
Maximum value of SAR (measured) = 3.28 W/kg




0 dB = 3.28 W/kg = 5.16 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132**

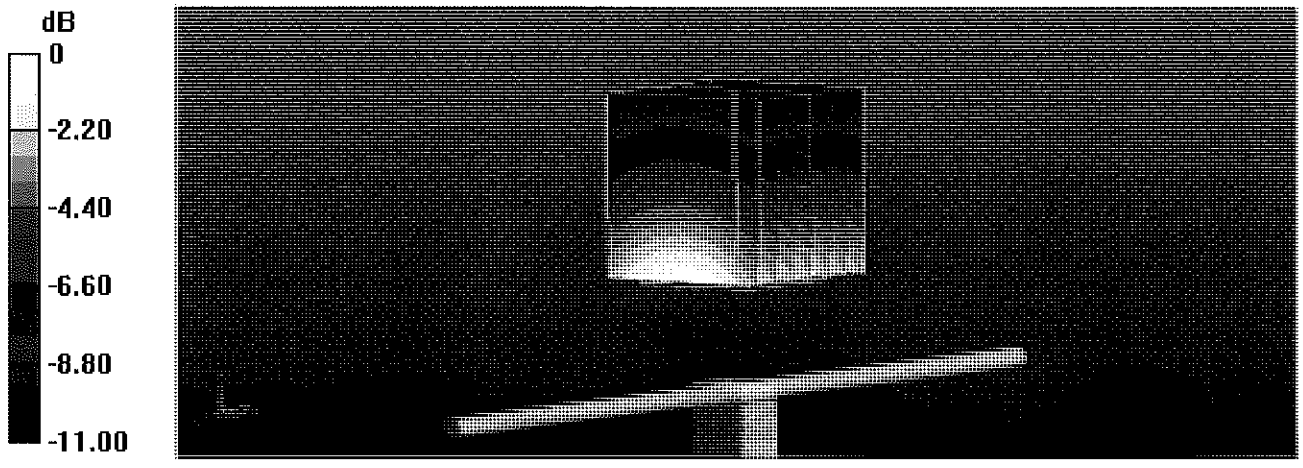
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.99 S/m; $\varepsilon_r$ = 54.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

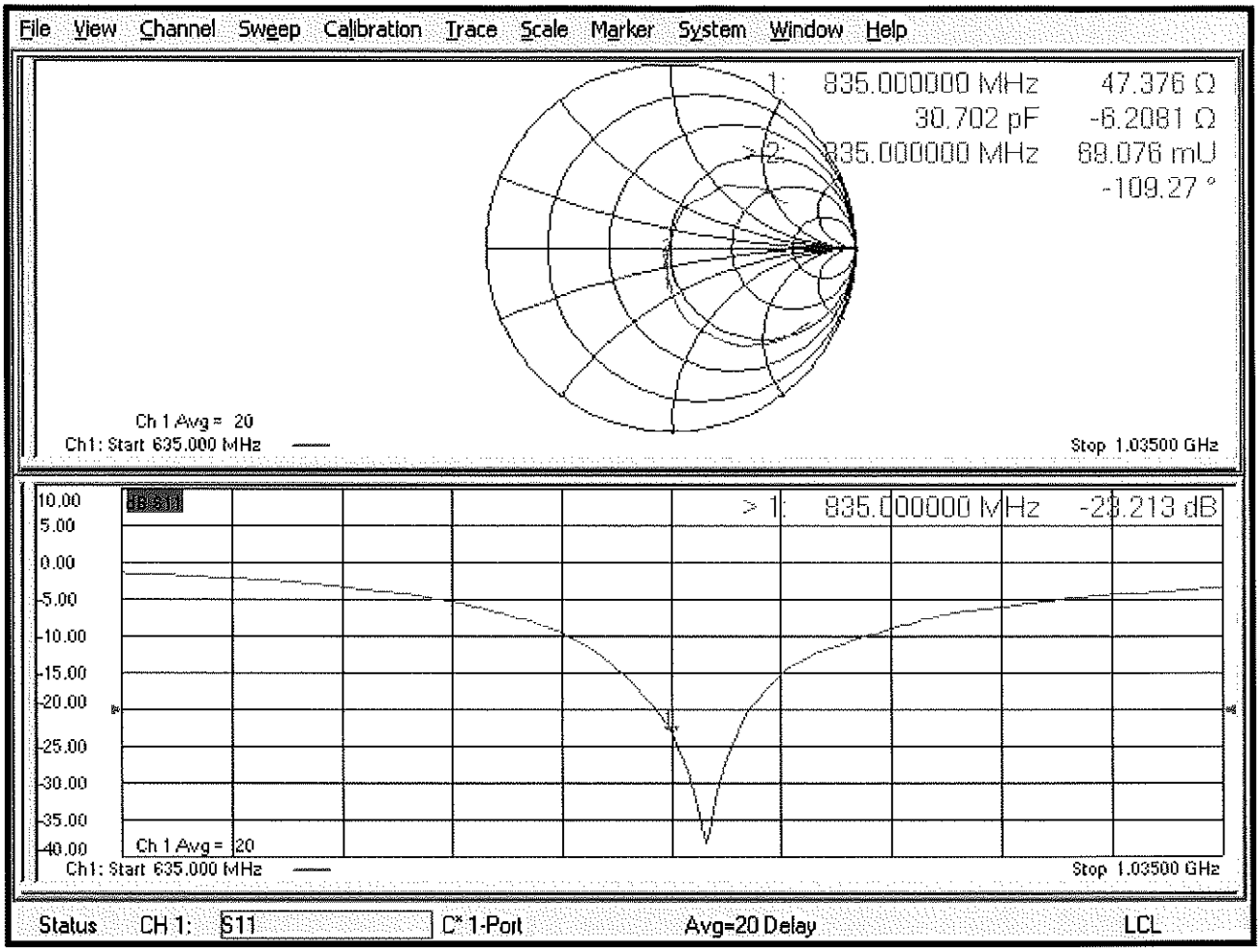
### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.32 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.64 W/kg
**SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg**
Maximum value of SAR (measured) = 3.26 W/kg




0 dB = 3.26 W/kg = 5.13 dBW/kg

## Impedance Measurement Plot for Body TSL



## DASY5 Validation Report for SAM Head

Date: 22.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d132**

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.92 S/m; $\varepsilon_r$ = 44.4; $\rho$ = 1000 kg/m$^3$
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

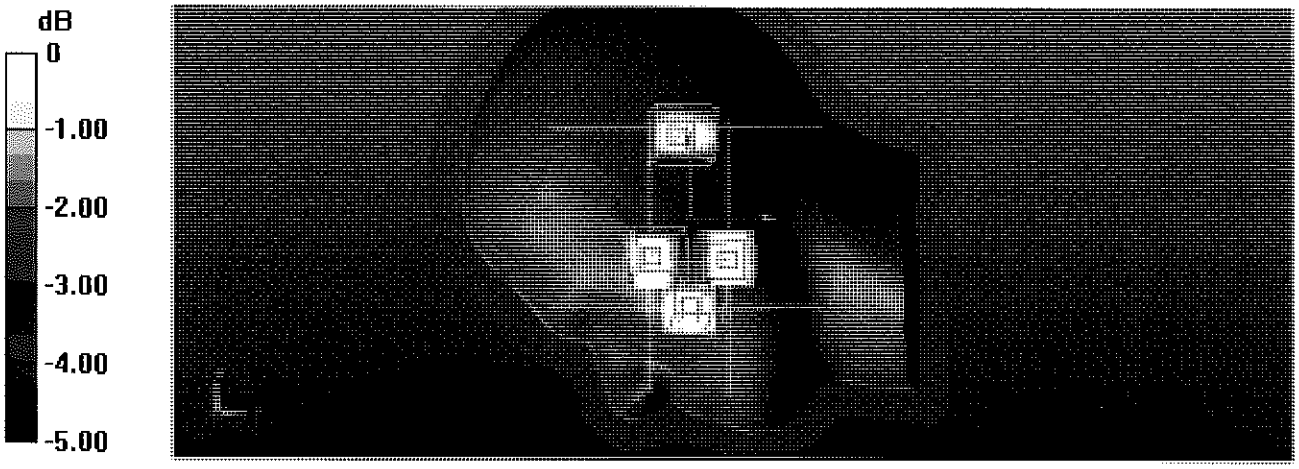
- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

**SAM/Head/Top/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.32 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.51 W/kg
**SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.57 W/kg**
Maximum value of SAR (measured) = 3.12 W/kg

**SAM/Head/Mouth/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.25 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.67 W/kg
**SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.65 W/kg**
Maximum value of SAR (measured) = 3.24 W/kg

**SAM/Head/Neck/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.69 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.43 W/kg
**SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.6 W/kg**
Maximum value of SAR (measured) = 3.08 W/kg

**SAM/Head/Ear/Zoom Scan (8x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.79 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.94 W/kg
**SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.36 W/kg**
Maximum value of SAR (measured) = 2.62 W/kg




0 dB = 2.62 W/kg = 4.18 dBW/kg

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**Zeughausstrasse 43, 8004 Zurich, Switzerland**

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**C** Service suisse d'étalonnage
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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 0108**

**Client** PC Test

**Certificate No: D1750V2-1150_Oct18**

# CALIBRATION CERTIFICATE

Object D1750V2 - SN:1150

Calibration procedure(s) QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

BN✓
10/30/2018

Calibration date: October 22, 2018

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-18 (No. 217-02672/02673) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-18 (No. 217-02672) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-18 (No. 217-02673) | Apr-19 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-18 (No. 217-02682) | Apr-19 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683) | Apr-19 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-17 (No. EX3-7349_Dec17) | Dec-18 |
| DAE4 | SN: 601 | 04-Oct-18 (No. DAE4-601_Oct18) | Oct-19 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

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

Issued: October 22, 2018

**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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

e) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.2 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 38.8 ± 6 % | 1.33 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.02 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **36.5 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.76 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **19.2 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.4 | 1.49 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.5 ± 6 % | 1.46 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.04 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **36.6 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.82 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **19.4 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 | 50.9 Ω - 0.4 jΩ |
| Return Loss | - 40.1 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.6 Ω - 0.1 jΩ |
| Return Loss | - 29.2 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.217 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 | April 10, 2015 |

## DASY5 Validation Report for Head TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150**

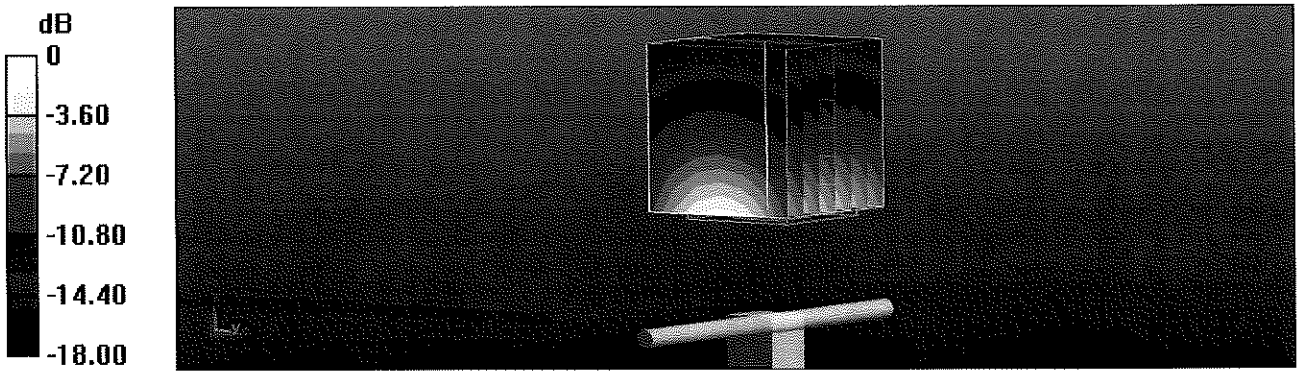
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.33 S/m; $\varepsilon_r$ = 38.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

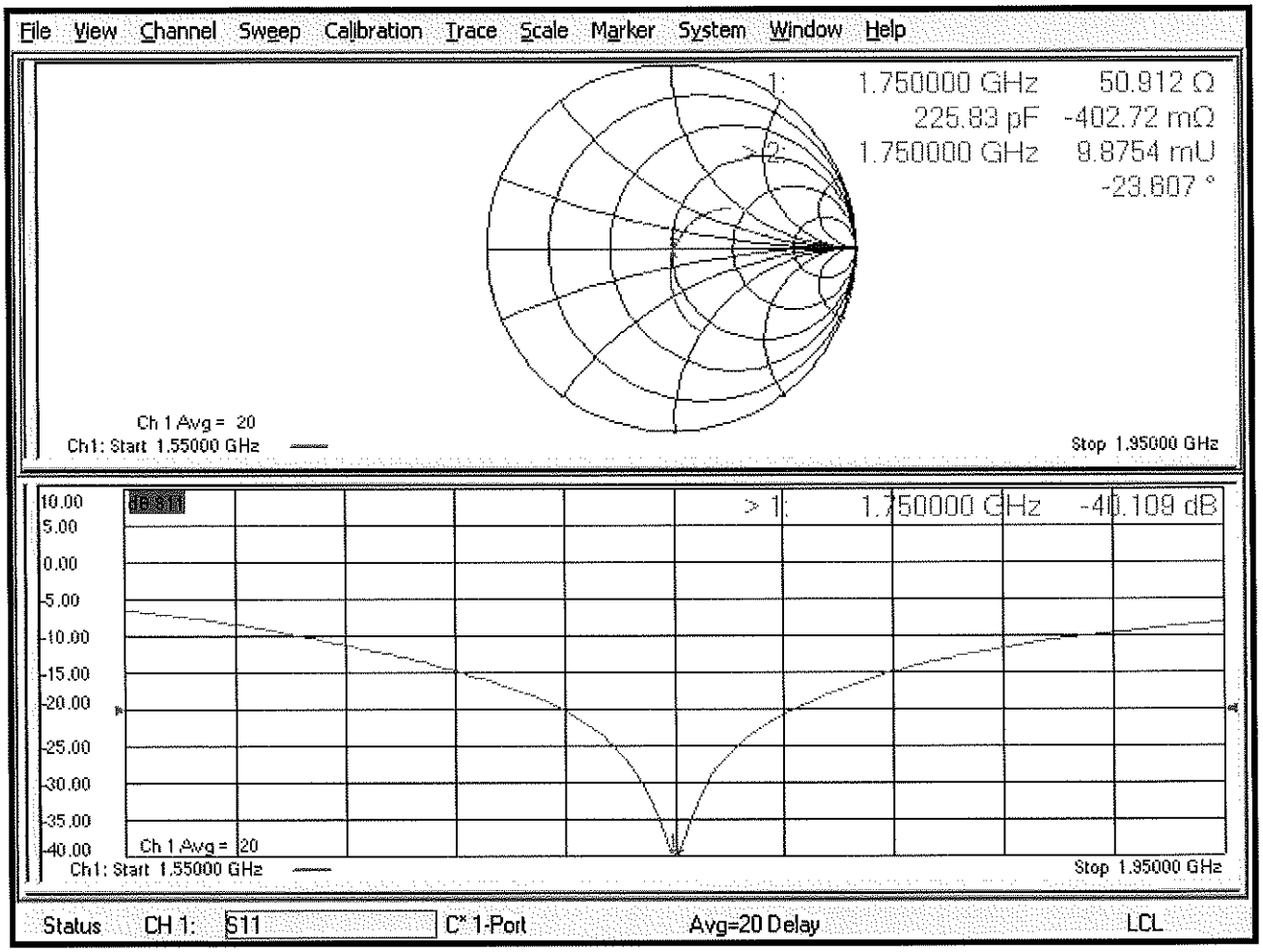
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.1 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.7 W/kg
**SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg**
Maximum value of SAR (measured) = 14.0 W/kg




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

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150**

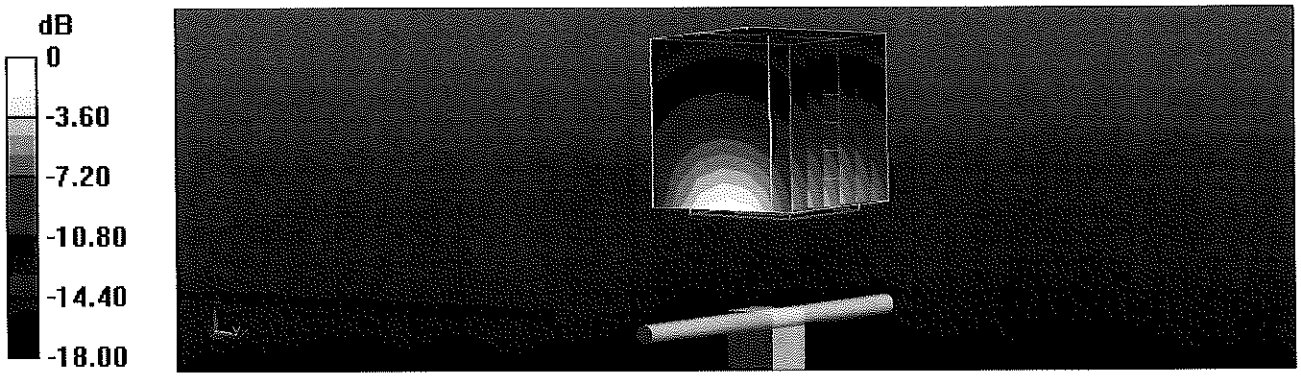
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.46 S/m; $\varepsilon_r$ = 53.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

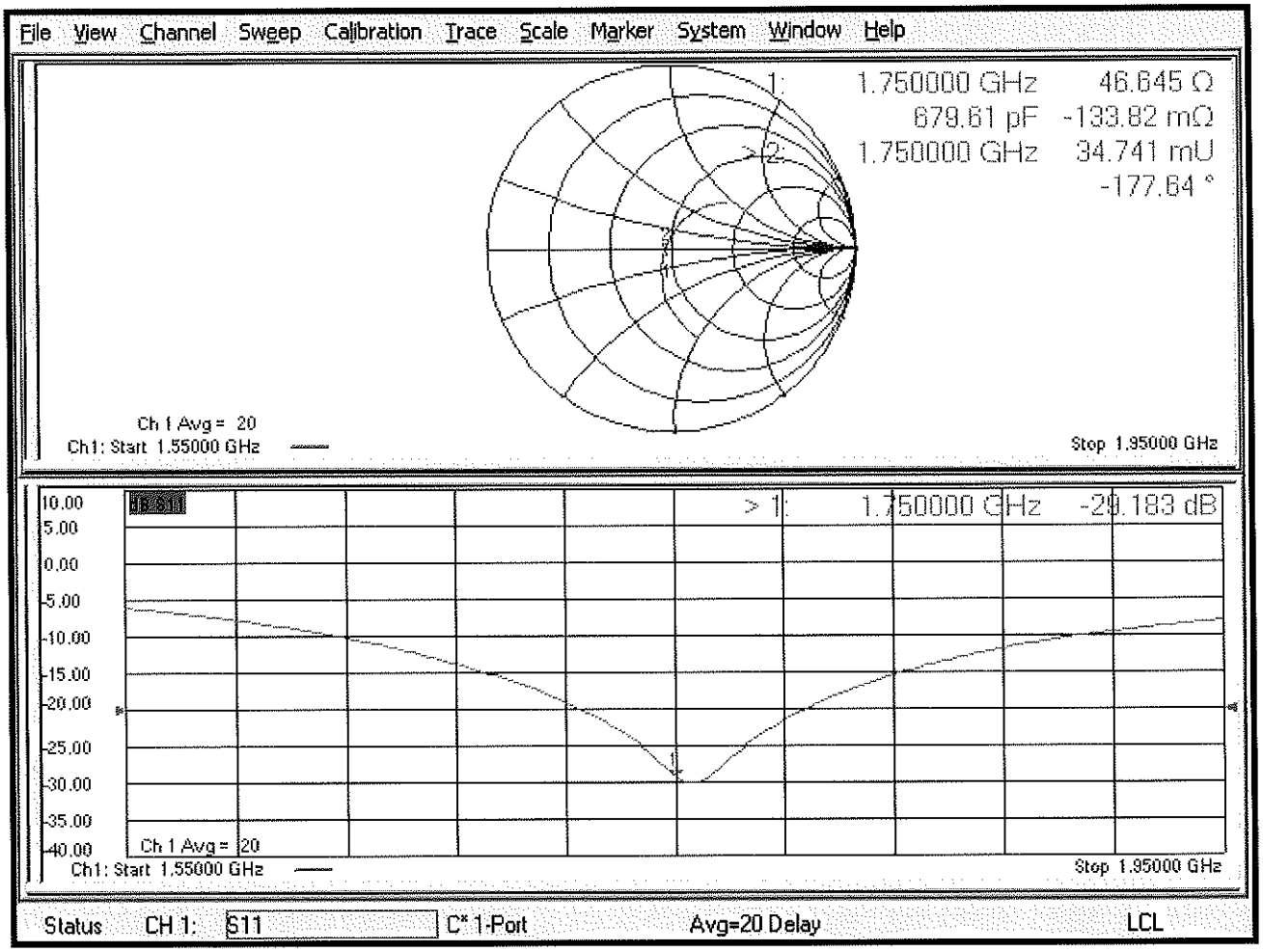
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.0 W/kg
**SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.82 W/kg**
Maximum value of SAR (measured) = 13.6 W/kg




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

## Impedance Measurement Plot for Body TSL



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**Accreditation No.: SCS 0108**

**Client** PC Test

**Certificate No: D1900V2-5d148_Feb19**

# CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d148

Calibration procedure(s): QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

BN ✓
05-01-19

Calibration date: February 21, 2019

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-18 (No. 217-02672/02673) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-18 (No. 217-02672) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-18 (No. 217-02673) | Apr-19 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-18 (No. 217-02682) | Apr-19 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683) | Apr-19 |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-18 (No. EX3-7349_Dec18) | Dec-19 |
| DAE4 | SN: 601 | 04-Oct-18 (No. DAE4-601_Oct18) | Oct-19 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 07-Oct-15 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Manu Seitz | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: February 21, 2019

**Calibration Laboratory of**
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**Zeughausstrasse 43, 8004 Zurich, Switzerland**

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**C** Service suisse d'étalonnage
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**S** Swiss Calibration Service

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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 0108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.2 |
| **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 | 40.9 ± 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 | 9.65 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.1 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.05 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.4 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 | 53.6 ± 6 % | 1.47 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 | 9.56 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **39.1 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm$^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.05 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.5 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 | 51.8 Ω + 6.8 jΩ |
| Return Loss | - 23.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.4 Ω + 7.8 jΩ |
| Return Loss | - 21.9 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.170 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 |

## DASY5 Validation Report for Head TSL

Date: 21.02.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148**

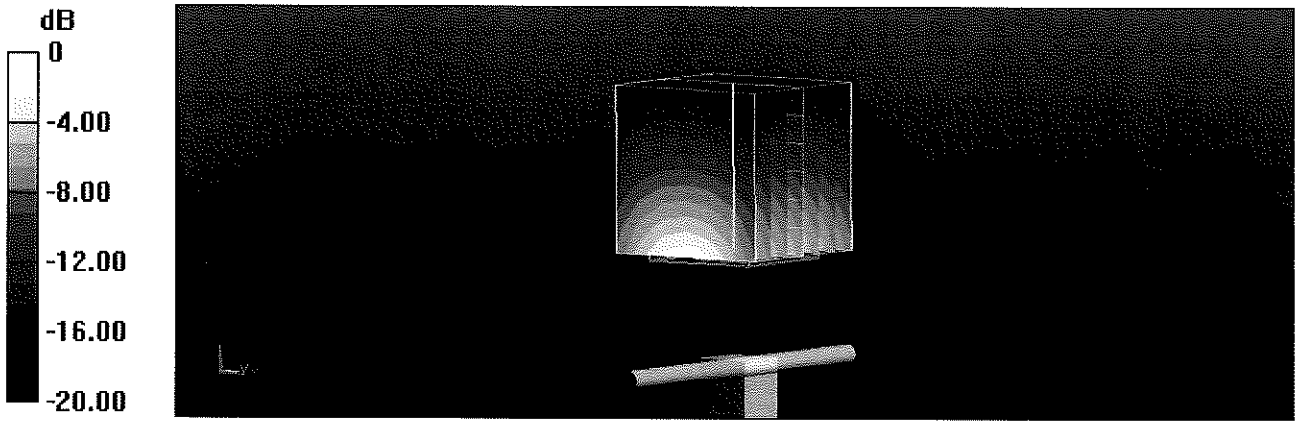
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.38 S/m; $\varepsilon_r$ = 40.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.26, 8.26, 8.26) @ 1900 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

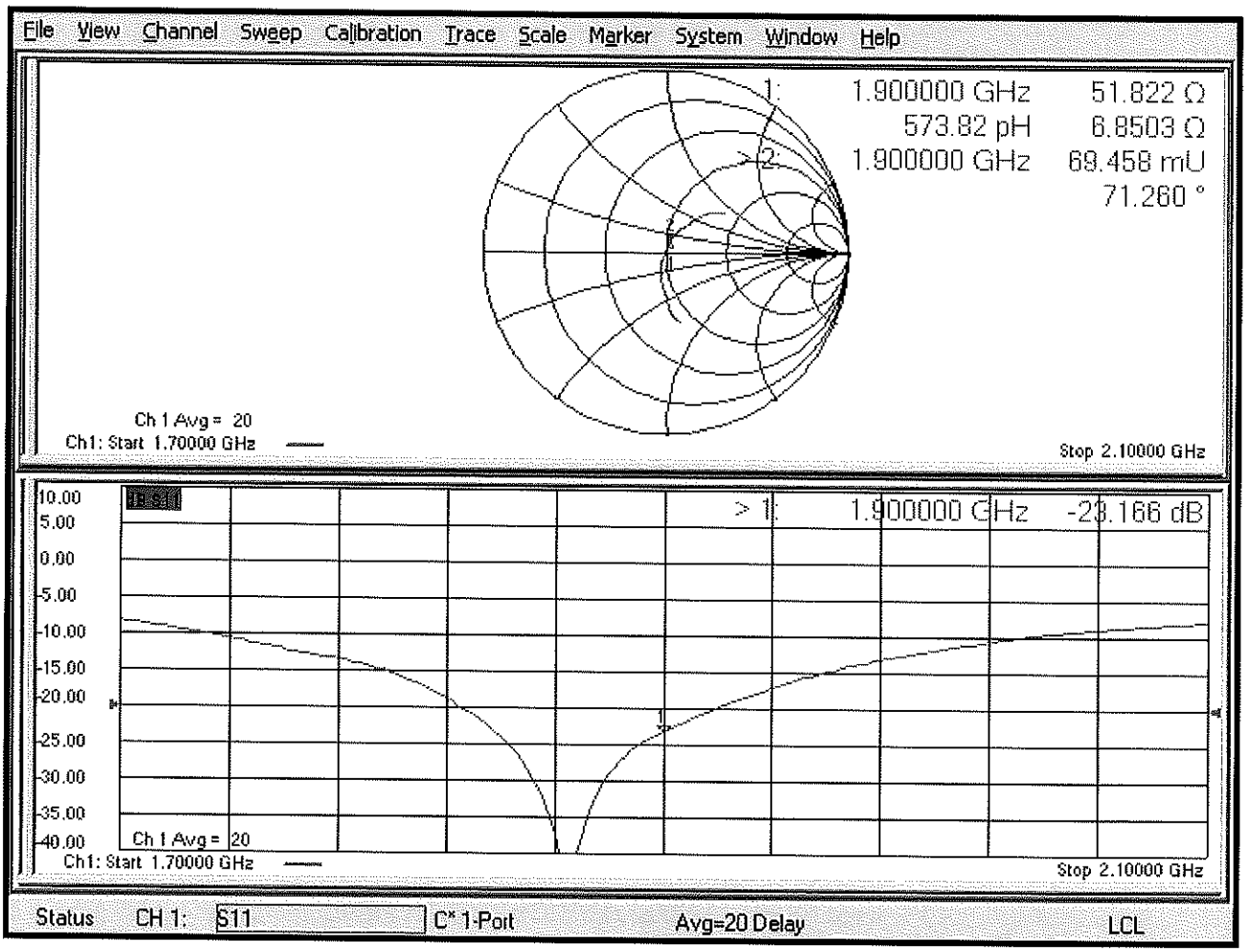
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.4 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.8 W/kg
**SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.05 W/kg**
Maximum value of SAR (measured) = 15.0 W/kg




0 dB = 15.0 W/kg = 11.76 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 21.02.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148**

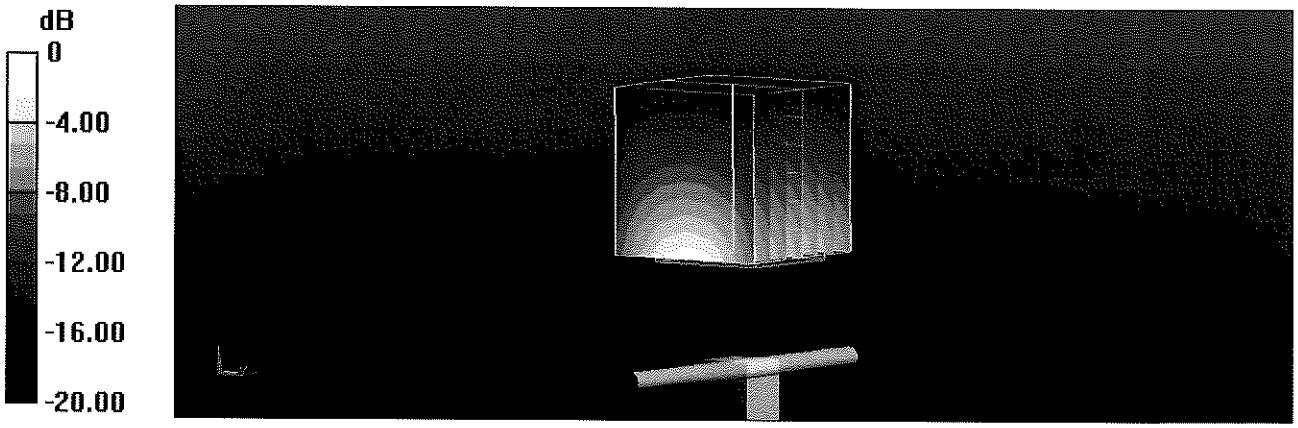
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.47 S/m; $\varepsilon_r$ = 53.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.23, 8.23, 8.23) @ 1900 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

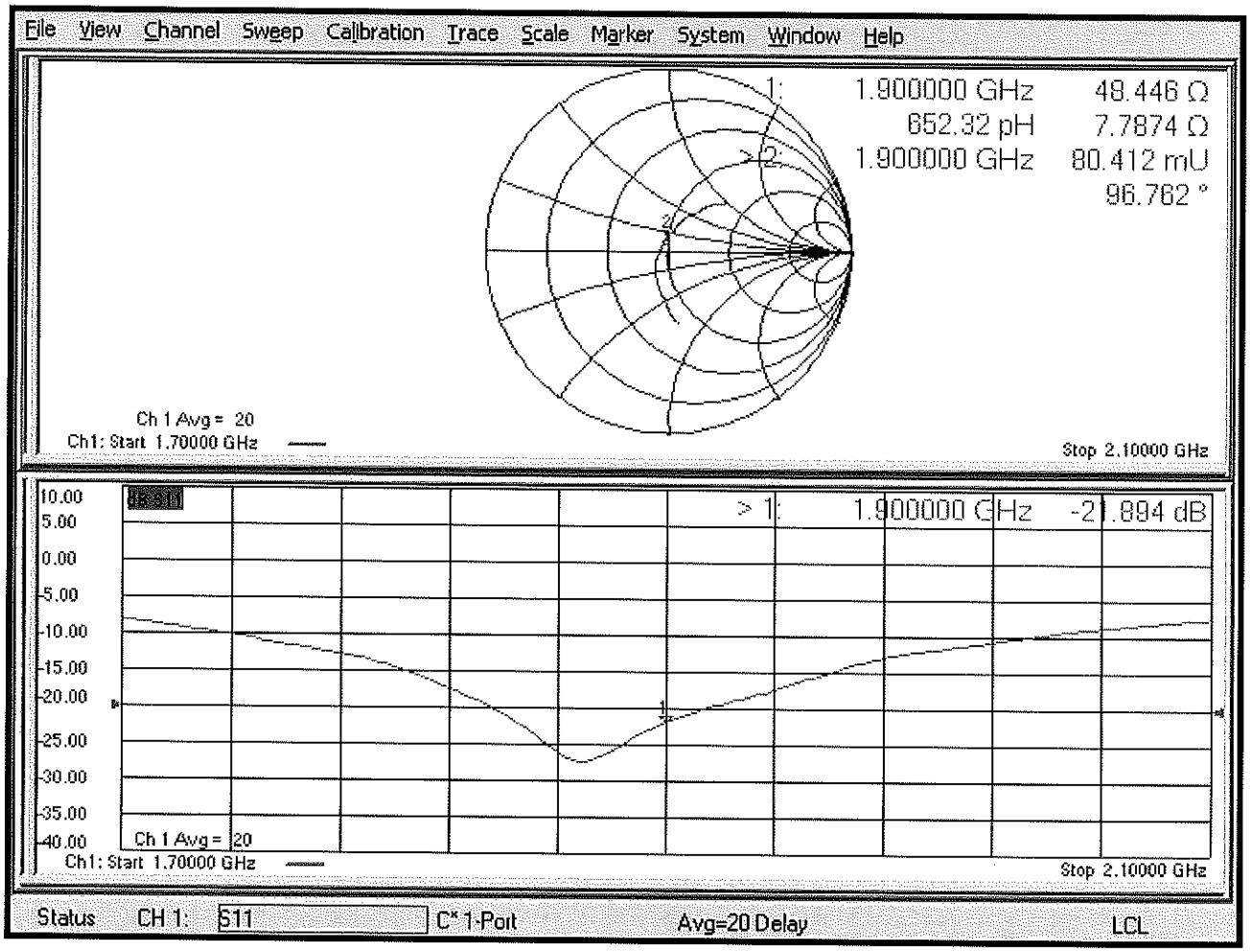
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 17.0 W/kg
**SAR(1 g) = 9.56 W/kg; SAR(10 g) = 5.05 W/kg**
Maximum value of SAR (measured) = 14.4 W/kg




0 dB = 14.4 W/kg = 11.58 dBW/kg

## Impedance Measurement Plot for Body TSL



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**Accreditation No.: SCS 0108**

**Client** **PC Test**

**Certificate No: D2450V2-797_Sep17**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN:797 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | September 11, 2017 |

SCV 10/03/2017

Extended PMV 9/20/2018

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-17 (No. 217-02521) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02522) | Apr-18 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Type-N mismatch combination | SN: 5047.2 / 08327 | 07-Apr-17 (No. 217-02529) | Apr-18 |
| Reference Probe EX3DV4 | SN: 7349 | 31-May-17 (No. EX3-7349_May17) | May-18 |
| DAE4 | SN: 601 | 28-Mar-17 (No. DAE4-601_Mar17) | Mar-18 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-08 | SN: 100972 | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-16) | In house check: Oct-17 |

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

Issued: September 11, 2017

## 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.0 |
| **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 | 37.8 ± 6 % | 1.86 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.5 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **52.7 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.28 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.8 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 | 51.9 ± 6 % | 2.04 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.1 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **51.1 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.14 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **24.2 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 | 53.8 Ω + 7.4 jΩ |
| Return Loss | - 21.9 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.7 Ω + 9.1 jΩ |
| Return Loss | - 20.9 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.152 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 | January 24, 2006 |

## DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797**

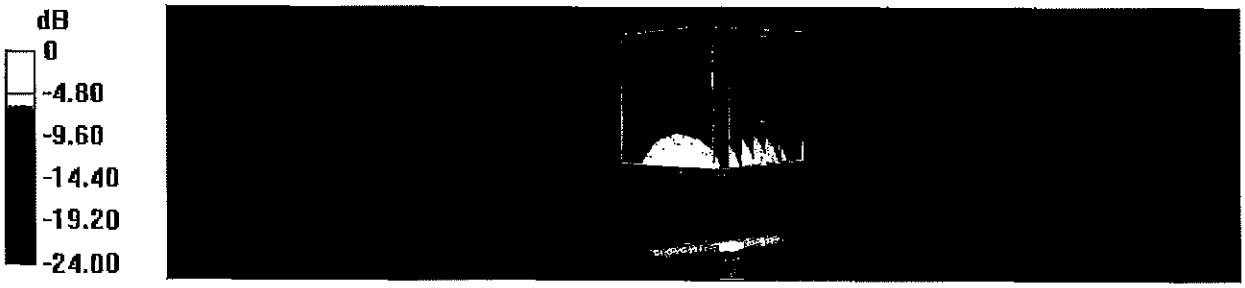
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.86 S/m; $\varepsilon_r$ = 37.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

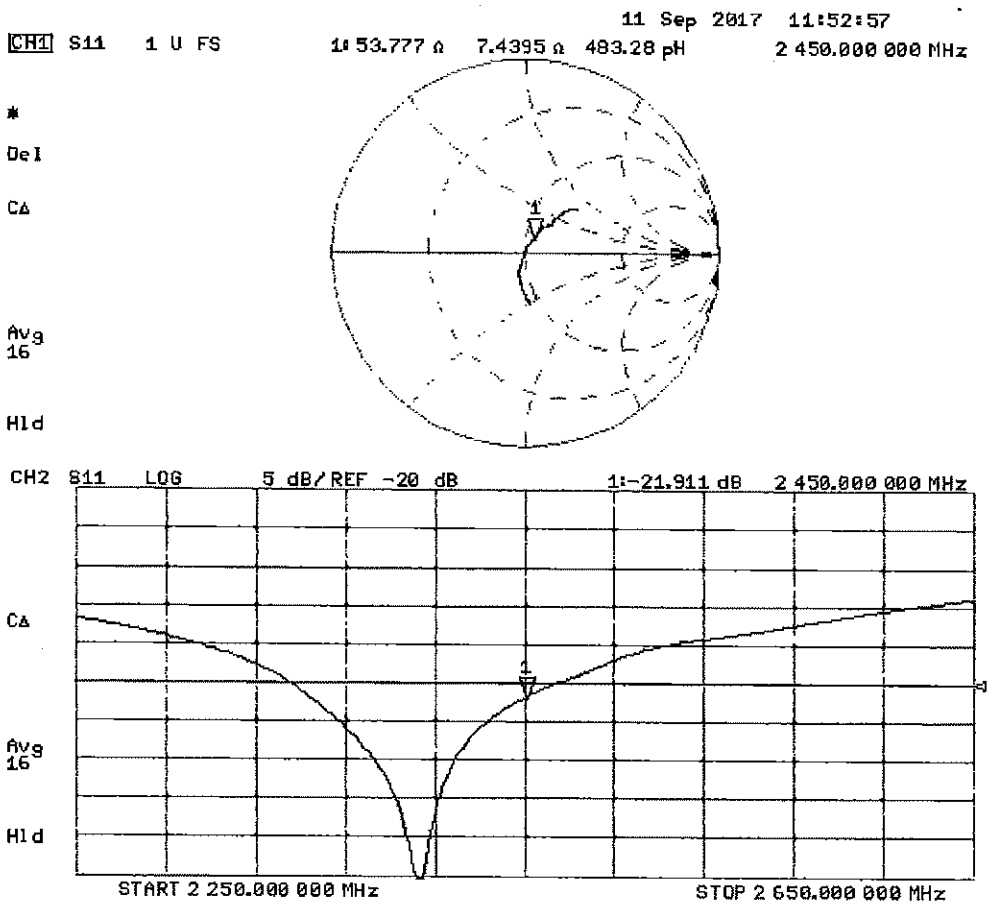
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.5 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 26.9 W/kg
**SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg**
Maximum value of SAR (measured) = 21.6 W/kg




0 dB = 21.6 W/kg = 13.34 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797**

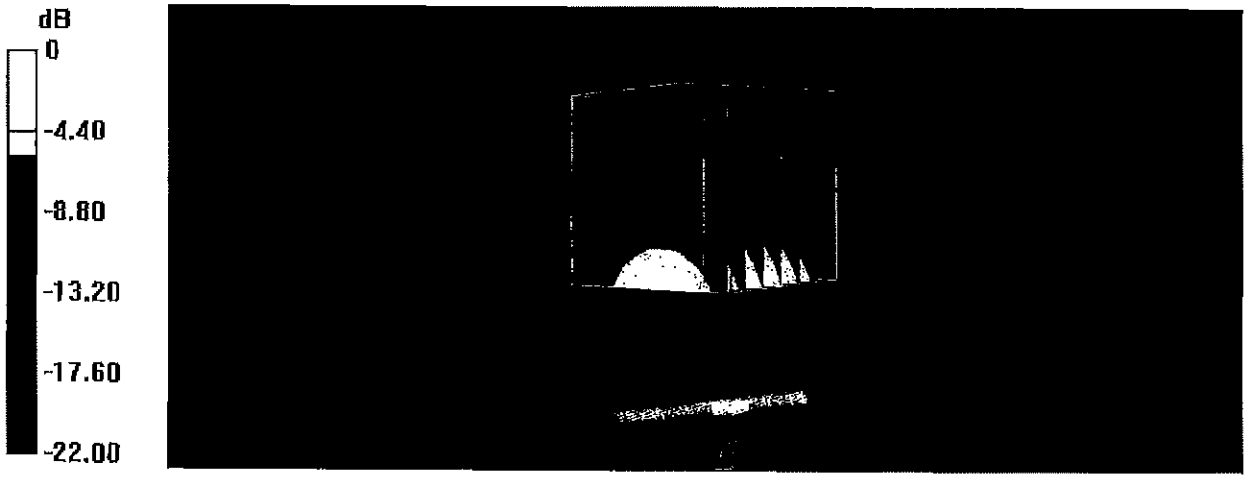
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.04 S/m; $\varepsilon_r$ = 51.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

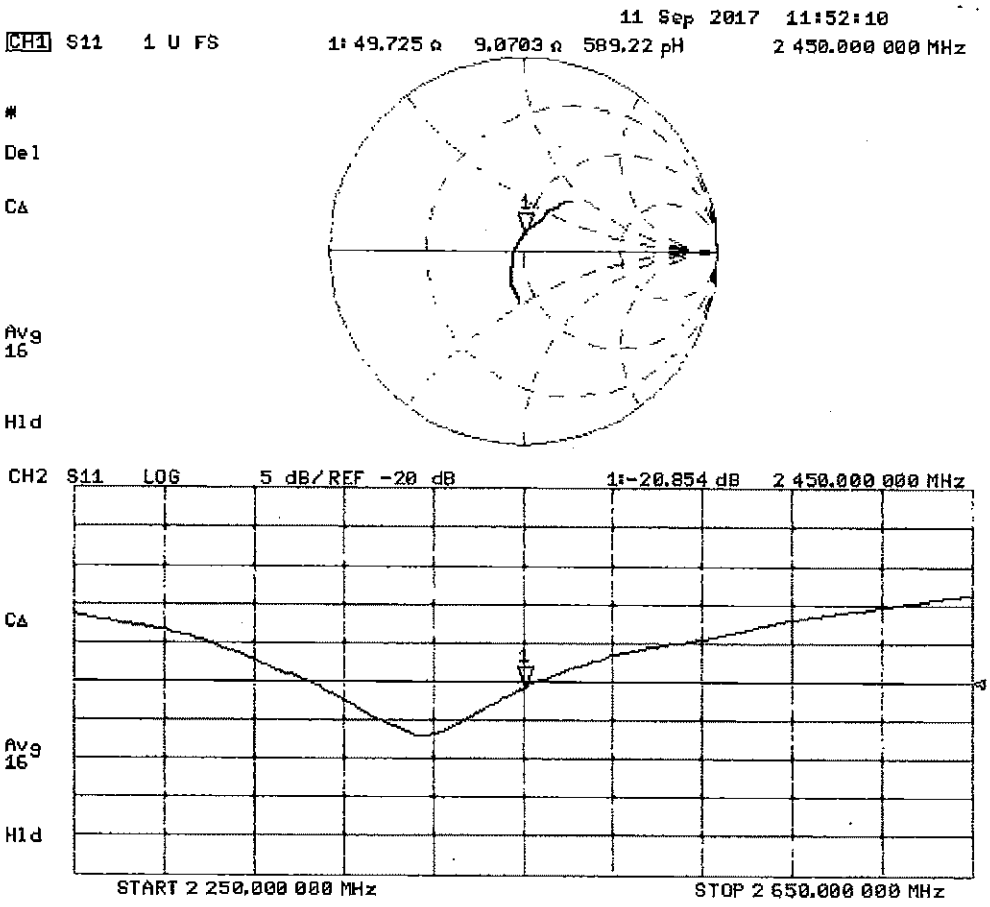
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 25.6 W/kg
**SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg**
Maximum value of SAR (measured) = 20.3 W/kg




0 dB = 20.3 W/kg = 13.07 dBW/kg

## Impedance Measurement Plot for Body TSL



PCTEST ENGINEERING LABORATORY, INC.
18855 Adams Ct, Morgan Hill, CA 95037 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctest.com

# Certification of Calibration

| | |
|---|---|
| Object | D2450V2 – SN: 797 |
| Calibration procedure(s) | Procedure for Calibration Extension for SAR Dipoles. |
| Extended Calibration date: | September 11, 2018 |
| Description: | SAR Validation Dipole at 2450 MHz. |

Calibration Equipment used:

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| Control Company | 4040 | Therm./Clock/Humidity Monitor | 3/31/2017 | Biennial | 3/31/2019 | 170232394 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 5/2/2017 | Biennial | 5/2/2019 | 170330156 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 433971 |
| Narda | 4772-3 | Attenuator (3dB) | CBT | N/A | CBT | 9406 |
| Keysight | 772D | Dual Directional Coupler | CBT | N/A | CBT | MY52180215 |
| Keysight Technologies | 85033E | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018 | Annual | 6/4/2019 | MY53401181 |
| Agilent | 8753ES | S-Parameter Vector Network Analyzer | 8/30/2018 | Annual | 8/30/2019 | MY40003841 |
| Mini-Circuits | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT | N/A | CBT | N/A |
| SPEAG | DAK-3.5 | Dielectric Assessment Kit | 5/15/2018 | Annual | 5/15/2019 | 1070 |
| SPEAG | EX3DV4 | SAR Probe | 7/20/2018 | Annual | 7/20/2019 | 7410 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 7/11/2018 | Annual | 7/11/2019 | 1322 |
| SPEAG | ES3DV3 | SAR Probe | 3/13/2018 | Annual | 3/13/2019 | 3319 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 3/7/2018 | Annual | 3/7/2019 | 1368 |
| Anritsu | MA2411B | Pulse Power Sensor | 3/2/2018 | Annual | 3/2/2019 | 1207364 |
| Anritsu | MA2411B | Pulse Power Sensor | 3/2/2018 | Annual | 3/2/2019 | 1339018 |
| Anritsu | ML2495A | Power Meter | 10/22/2017 | Annual | 10/22/2018 | 1328004 |
| Agilent | N5182A | MXG Vector Signal Generator | 4/18/2018 | Annual | 4/18/2019 | MY47420800 |
| Seekonk | NC-100 | Torque Wrench | 7/11/2018 | Annual | 7/11/2019 | N/A |
| MiniCircuits | VLF-6000+ | Low Pass Filter | CBT | N/A | CBT | N/A |
| Narda | 4014C-6 | 4 - 8 GHz SMA 6 dB Directional Coupler | CBT | N/A | CBT | N/A |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = ±23% (k=2)

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer | BRODIE HALBFOSTER |
| Approved By: | Kaitlin O'Keefe | Senior Technical Manager | KOK |

# DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

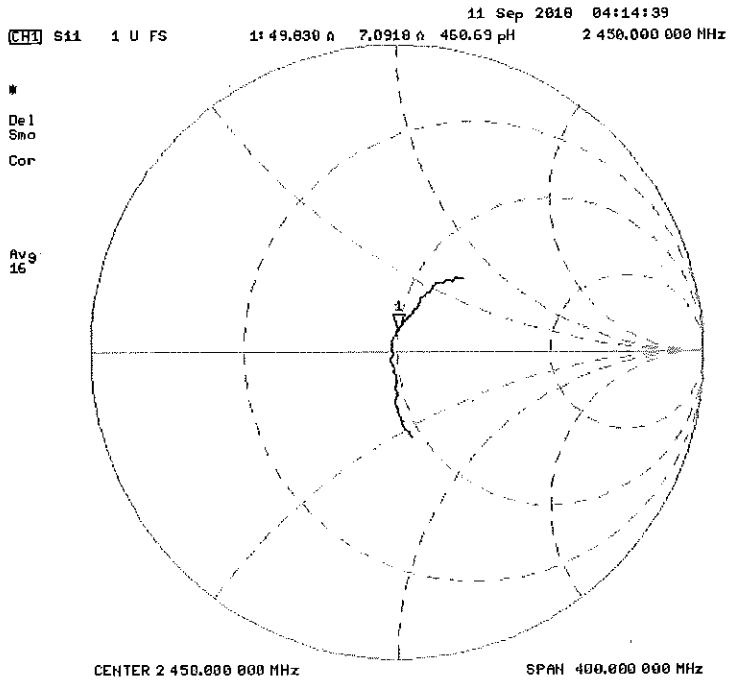
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

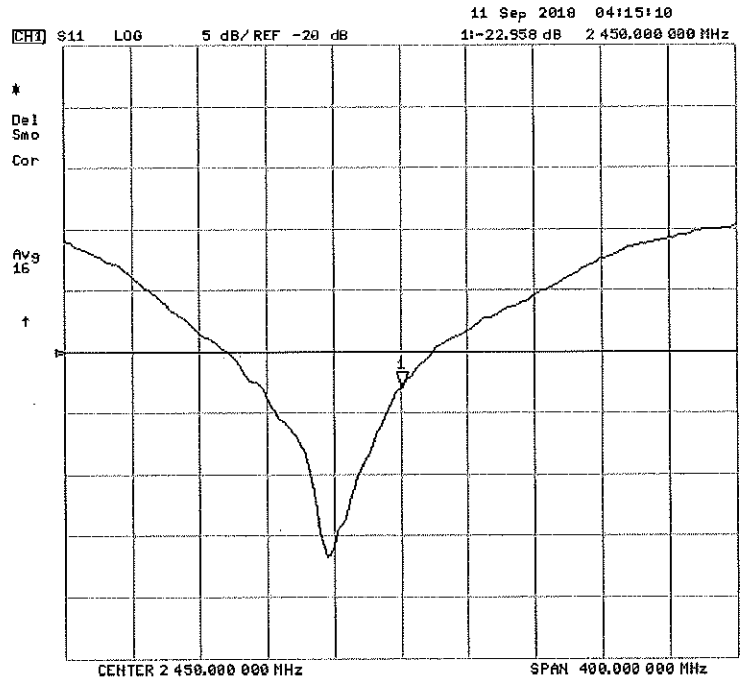
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 20.0 dBm | Measured Head SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/11/2017 | 9/11/2018 | 1.152 | 5.27 | 5.52 | 4.74% | 2.48 | 2.54 | 2.42% | 53.8 | 49.8 | 4 | 7.4 | 7.1 | 0.3 | -21.9 | -23 | -4.80% | PASS |

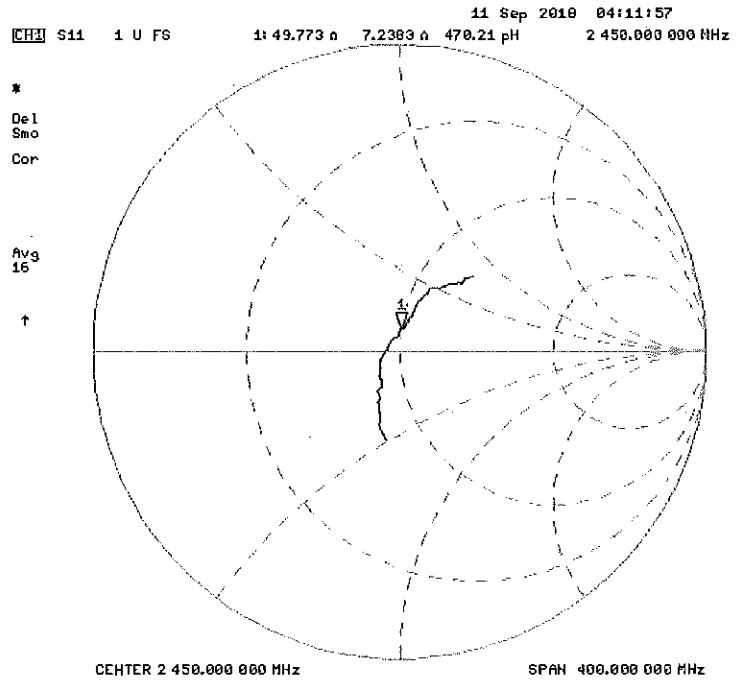
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/11/2017 | 9/11/2018 | 1.152 | 5.11 | 5.17 | 1.17% | 2.42 | 2.37 | -2.07% | 49.7 | 49.8 | 0.1 | 9.1 | 7.2 | 1.9 | -20.9 | -22.6 | -8.20% | PASS |

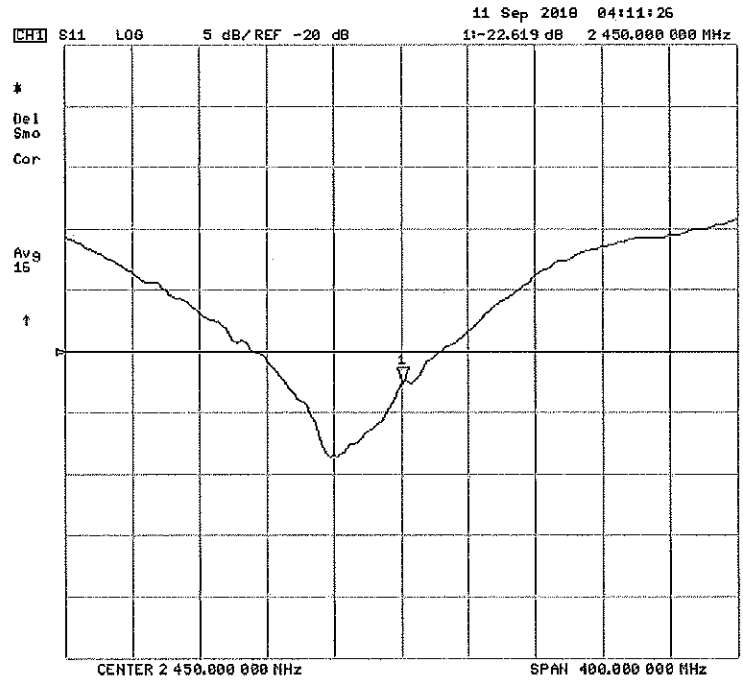
Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



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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 0108**

Client **PC Test**

Certificate No: **D2450V2-719_Aug17**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN:719 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | August 17, 2017 |

PMV 8/27/17
Extended BN 8/19/2018

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-17 (No. 217-02521) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02522) | Apr-18 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 07-Apr-17 (No. 217-02529) | Apr-18 |
| Reference Probe EX3DV4 | SN: 7349 | 31-May-17 (No. EX3-7349_May17) | May-18 |
| DAE4 | SN: 601 | 28-Mar-17 (No. DAE4-601_Mar17) | Mar-18 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-16) | In house check: Oct-17 |

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

Issued: August 17, 2017

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

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

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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 0108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.0 |
| **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 | 37.8 ± 6 % | 1.86 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.3 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **51.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.15 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 | 51.9 ± 6 % | 2.03 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 12.8 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **50.1 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.00 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **23.7 W/kg ± 16.5 % (k=2)** |

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

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 55.7 Ω + 7.0 jΩ |
| Return Loss | - 21.4 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.4 Ω + 8.1 jΩ |
| Return Loss | - 21.8 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.150 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 10, 2002 |

## DASY5 Validation Report for Head TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 719**

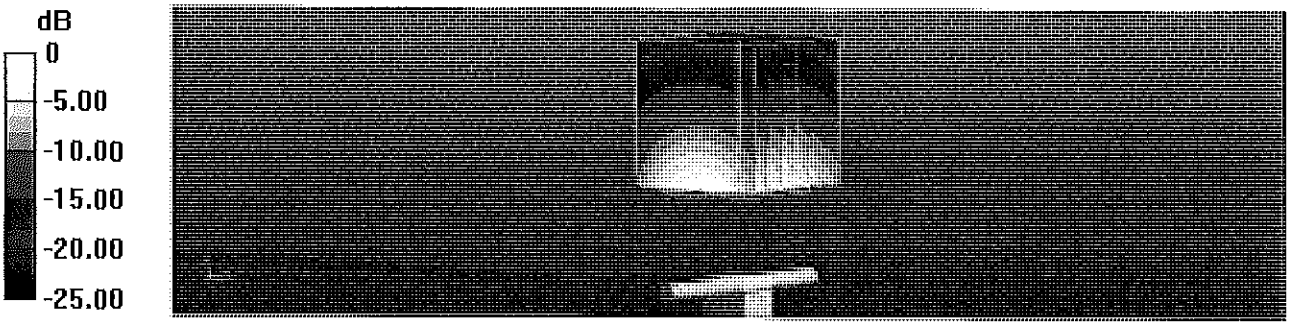
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.86 S/m; $\varepsilon_r$ = 37.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

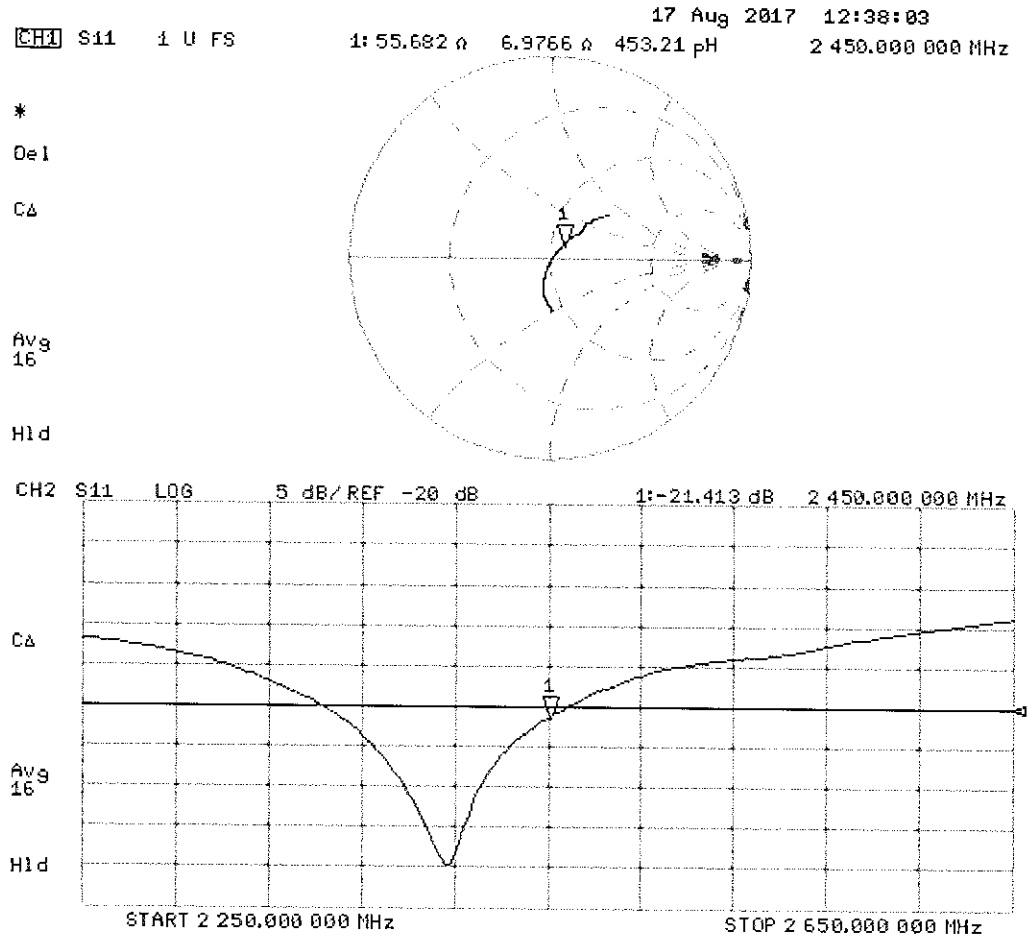
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 112.8 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 26.9 W/kg
**SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg**
Maximum value of SAR (measured) = 21.6 W/kg




0 dB = 21.6 W/kg = 13.34 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 719**

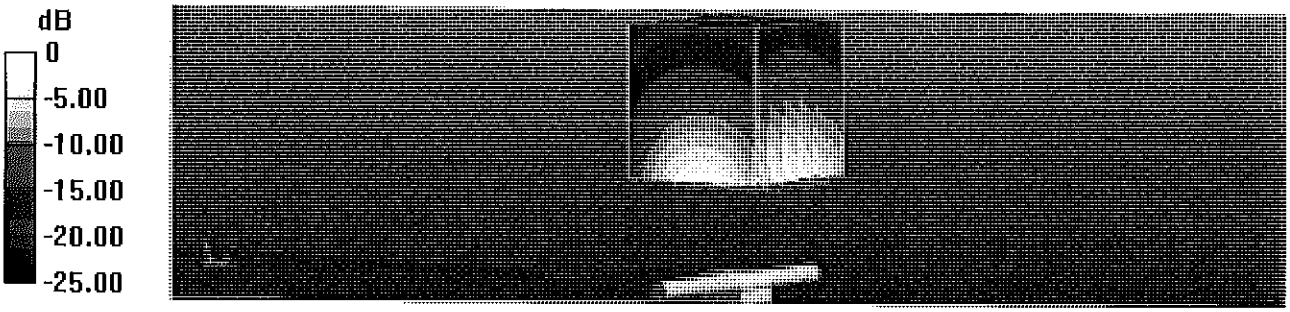
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.03 S/m; $\varepsilon_r$ = 51.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

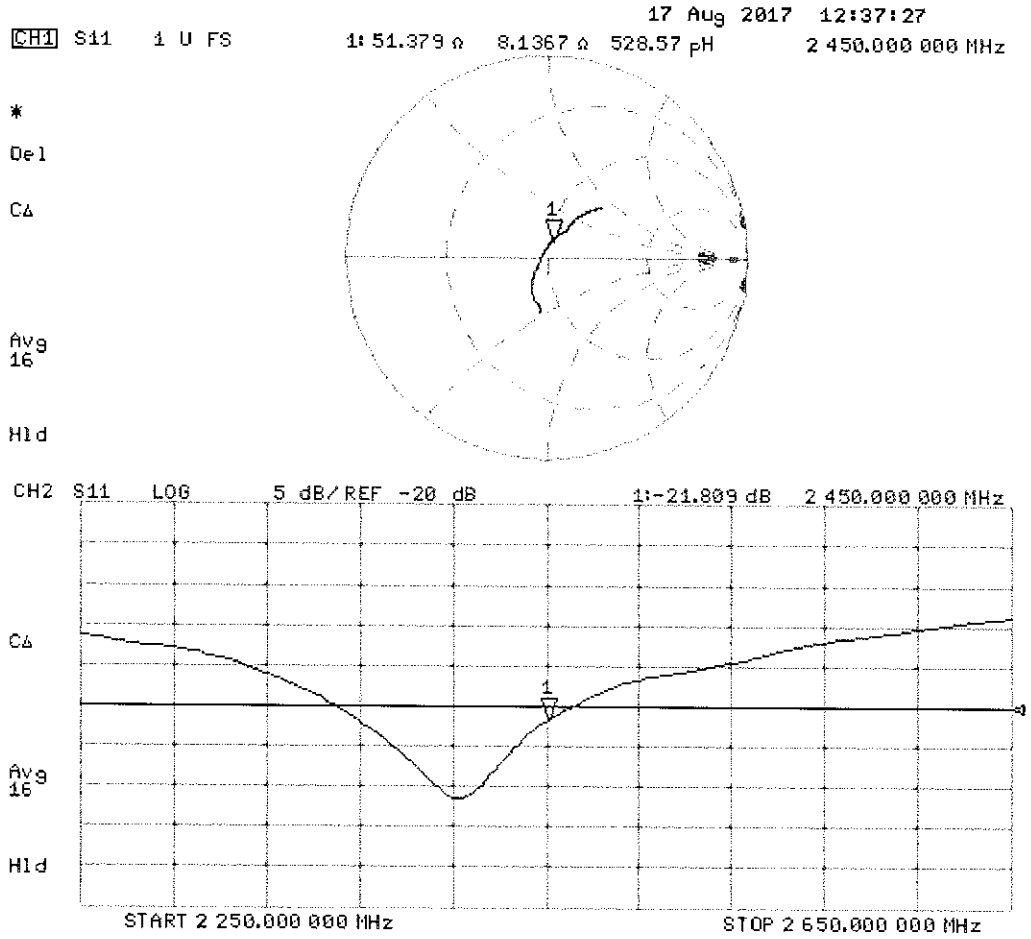
### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.0 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 25.2 W/kg
**SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6 W/kg**
Maximum value of SAR (measured) = 19.8 W/kg




0 dB = 19.8 W/kg = 12.97 dBW/kg

## Impedance Measurement Plot for Body TSL



# Certification of Calibration

| | |
|---|---|
| Object | D2450V2 – SN: 719 |
| Calibration procedure(s) | Procedure for Calibration Extension for SAR Dipoles. |
| Extended Calibration date: | 08/09/2018 |
| Description: | SAR Validation Dipole at 2450 MHz. |

Calibration Equipment used:

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| Agilent | E4438C | ESG Vector Signal Generator | 3/24/2017 | Biennial | 3/24/2019 | MY42082385 |
| Agilent | 8753ES | S-Parameter Network Analyzer | 9/14/2017 | Annual | 9/14/2018 | US39170118 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 433971 |
| Anritsu | ML2495A | Power Meter | 11/28/2017 | Annual | 11/28/2018 | 1039008 |
| Anritsu | MA2411B | Pulse Power Sensor | 3/2/2018 | Annual | 3/2/2019 | 1207364 |
| Anritsu | MA2411B | Pulse Power Sensor | 11/15/2017 | Annual | 11/15/2018 | 1339007 |
| Control Company | 4040 | Therm./Clock/Humidity Monitor | 3/31/2017 | Biennial | 3/31/2019 | 170232394 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 5/2/2017 | Biennial | 5/2/2019 | 170330156 |
| Keysight | 772D | Dual Directional Coupler | CBT | N/A | CBT | MY52180215 |
| Keysight Technologies | 85033E | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018 | Annual | 6/4/2019 | MY53401181 |
| Mini-Circuits | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT | N/A | CBT | N/A |
| Mini-Circuits | NLP-2950+ | Low Pass Filter DC to 2700 MHz | CBT | N/A | CBT | N/A |
| Narda | 4772-3 | Attenuator (3dB) | CBT | N/A | CBT | 9406 |
| Pasternack | PE2209-10 | Bidirectional Coupler | CBT | N/A | CBT | N/A |
| Pasternack | PE5011-1 | Torque Wrench | 7/19/2017 | Biennial | 7/19/2019 | N/A |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 3/7/2018 | Annual | 3/7/2019 | 1368 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 8/9/2017 | Annual | 8/9/2018 | 1323 |
| SPEAG | DAK-3.5 | Dielectric Assessment Kit | 9/12/2017 | Annual | 9/12/2018 | 1091 |
| SPEAG | ES3DV3 | SAR Probe | 3/13/2018 | Annual | 3/13/2019 | 3319 |
| SPEAG | ES3DV3 | SAR Probe | 8/14/2017 | Annual | 8/14/2018 | 3332 |

Measurement Uncertainty = ±23% (k=2)

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated By: | Brodie Halbfoster | Test Engineer | BRODIE HALBFOSTER |
| Approved By: | Kaitlin O'Keefe | Senior Technical Manager | |

# DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

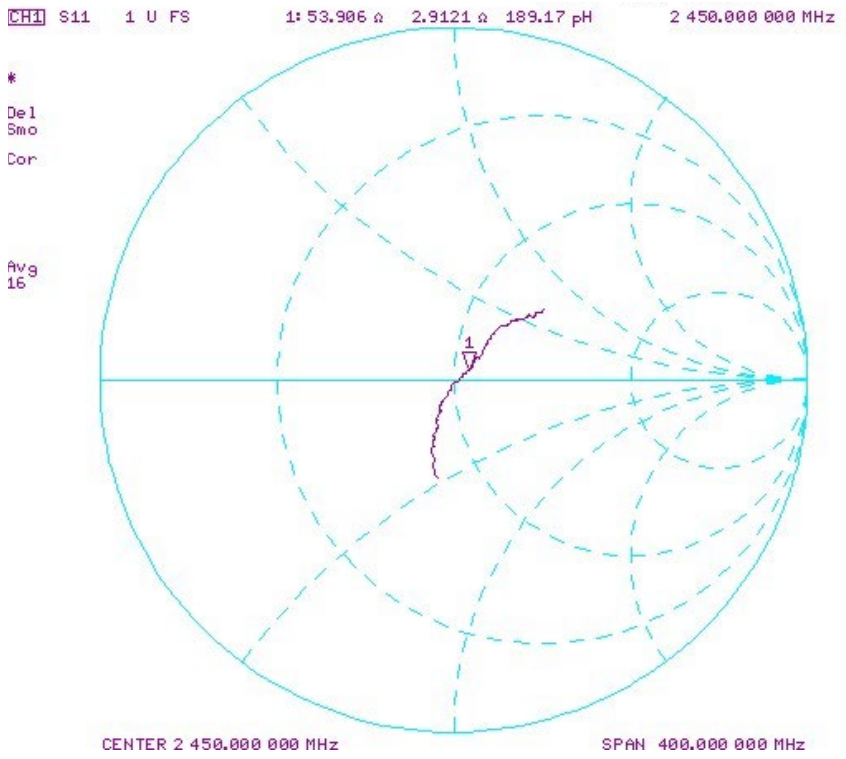
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

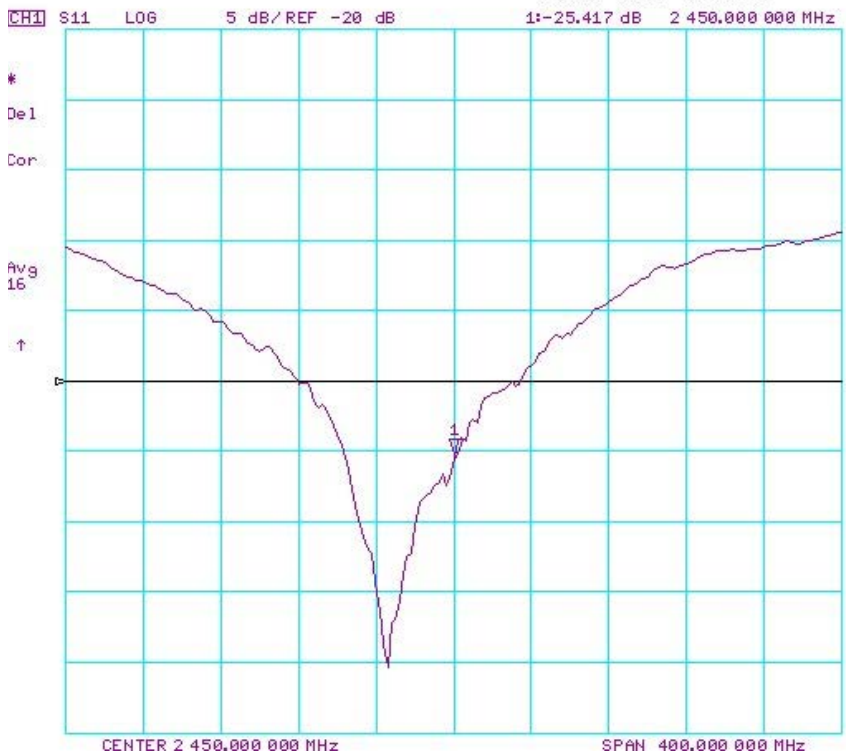
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 20.0 dBm | Measured Head SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/17/2017 | 8/9/2018 | 1.150 | 5.19 | 5.46 | 5.20% | 2.43 | 2.51 | 3.29% | 55.7 | 53.9 | 1.8 | 7.0 | 2.9 | 4.1 | -21.4 | -25.4 | -18.70% | PASS |

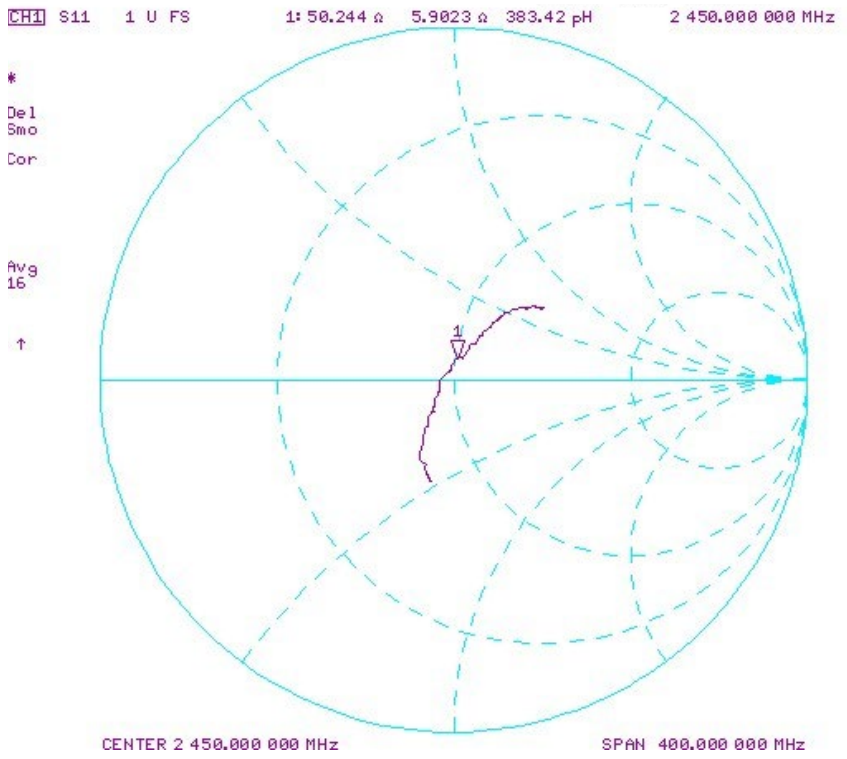
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/17/2017 | 8/9/2018 | 1.150 | 5.01 | 5.19 | 3.59% | 2.37 | 2.38 | 0.42% | 51.4 | 50.2 | 1.2 | 8.1 | 5.9 | 2.2 | -21.8 | -24.6 | -12.80% | PASS |

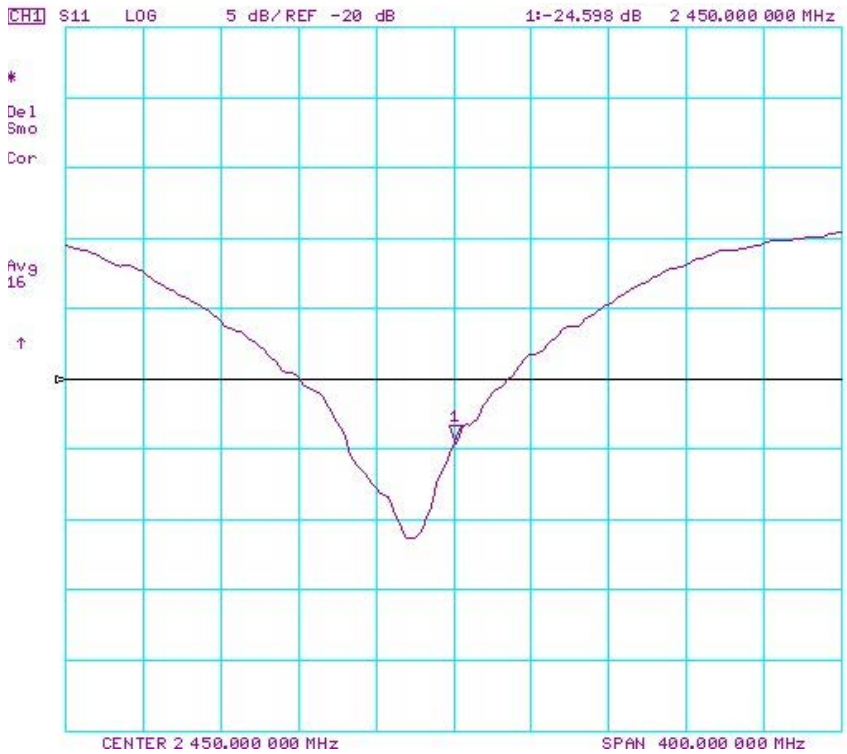
Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss 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
**S** Swiss Calibration Service

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

**Accreditation No.: SCS 0108**

**Client** PC Test

**Certificate No: D2600V2-1004_Apr18**

# CALIBRATION CERTIFICATE

Object: D2600V2 - SN:1004

Calibration procedure(s): QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz

BN ✓ 05-01-2018

Calibration date: April 11, 2018

BN ✓ Extended 04-20-2019

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-18 (No. 217-02672/02673) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-18 (No. 217-02672) | Apr-19 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-18 (No. 217-02673) | Apr-19 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-18 (No. 217-02682) | Apr-19 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683) | Apr-19 |
| Reference Probe EX3DV4 | SN: 7349 | 30-Dec-17 (No. EX3-7349_Dec17) | Dec-18 |
| DAE4 | SN: 601 | 26-Oct-17 (No. DAE4-601_Oct17) | Oct-18 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

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

Issued: April 12, 2018

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

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

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

**Accreditation No.: SCS 0108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.0 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2600 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.0 | 1.96 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 37.8 ± 6 % | 2.03 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 14.3 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **55.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.35 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **25.1 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.5 | 2.16 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.1 ± 6 % | 2.19 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.8 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **54.8 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.20 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **24.7 W/kg ± 16.5 % (k=2)** |

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

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.7 Ω - 5.7 jΩ |
| Return Loss | - 24.1 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.0 Ω - 3.8 jΩ |
| Return Loss | - 24.9 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.149 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 | December 23, 2006 |

## DASY5 Validation Report for Head TSL

Date: 11.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1004**

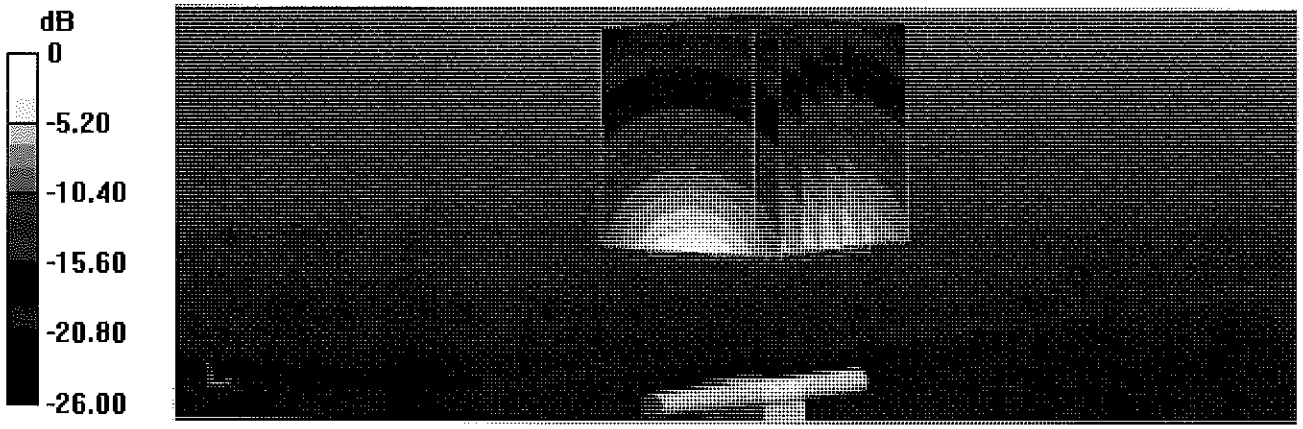
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.03 S/m; $\varepsilon_r$ = 37.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

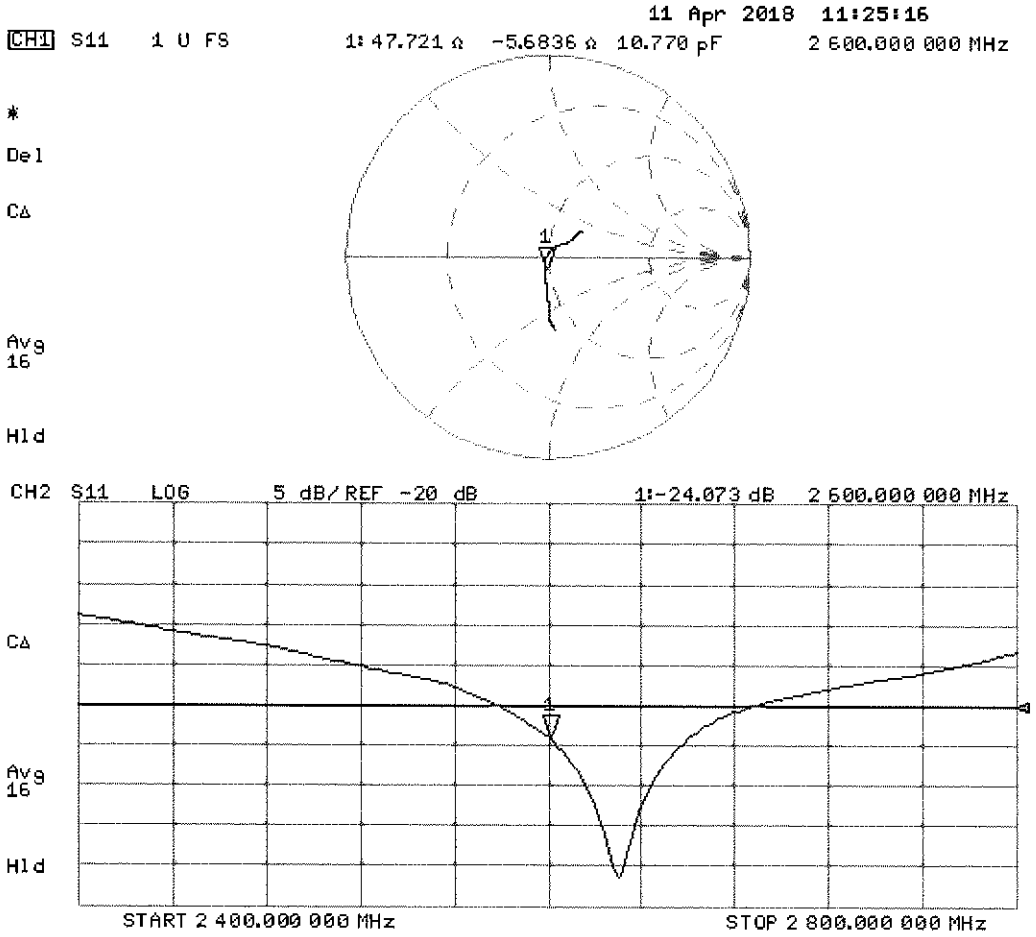
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 118.5 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 28.6 W/kg
**SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.35 W/kg**
Maximum value of SAR (measured) = 23.9 W/kg




0 dB = 23.9 W/kg = 13.78 dBW/kg

## Impedance Measurement Plot for Head TSL



Date: 11.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1004**

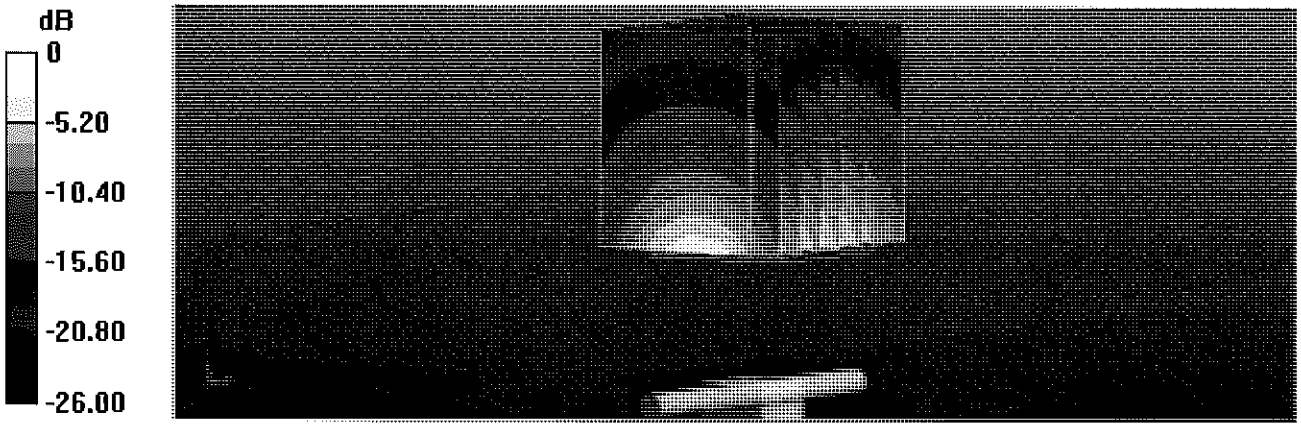
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma$ = 2.19 S/m; $\varepsilon_r$ = 52.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

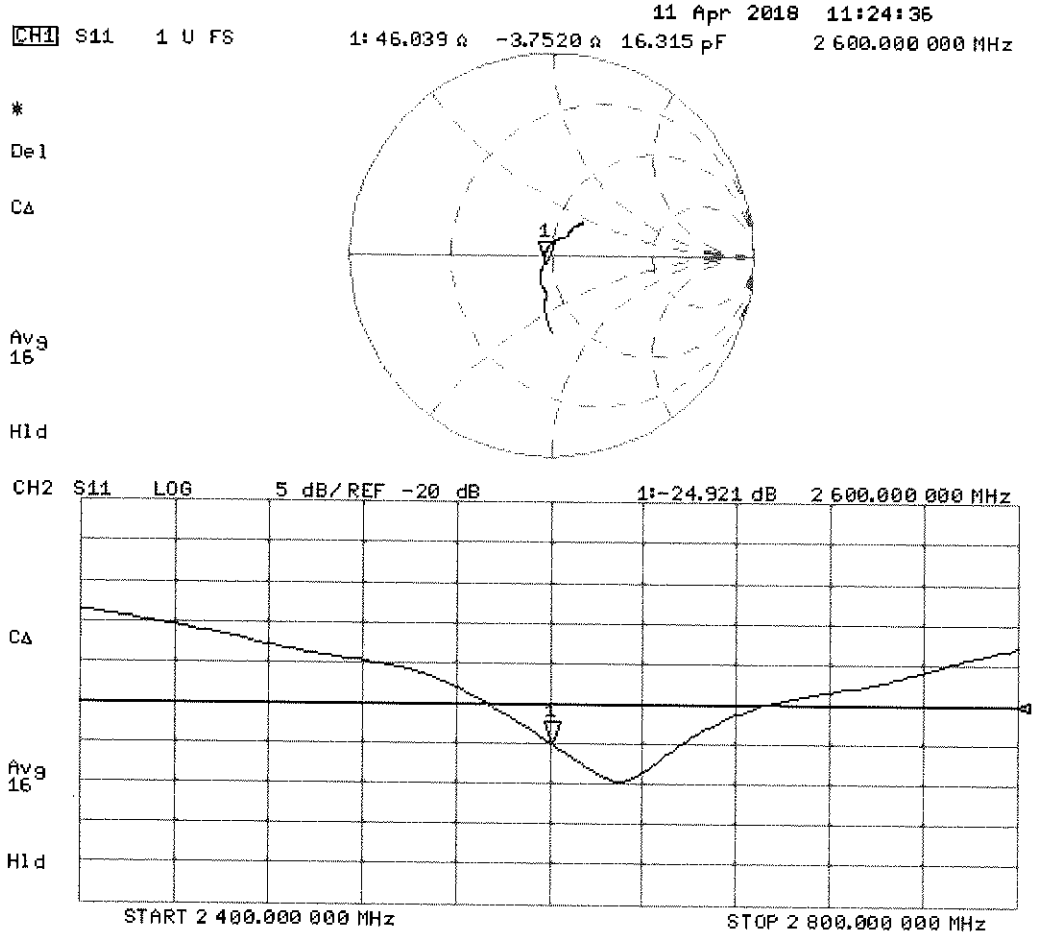
## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.5 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 28.3 W/kg
**SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.2 W/kg**
Maximum value of SAR (measured) = 22.9 W/kg




0 dB = 22.9 W/kg = 13.60 dBW/kg

## Impedance Measurement Plot for Body TSL



# Certification of Calibration

Object D2600V2 – SN: 1004

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extension Calibration date: 4/11/2019

Description: SAR Validation Dipole at 2600 MHz.

Calibration Equipment used:

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| Agilent | 8753ES | S-Parameter Network Analyzer | 3/11/2019 | Annual | 3/11/2020 | US39170122 |
| Agilent | N5182A | MXG Vector Signal Generator | 4/18/2018 | Annual | 4/18/2019 | MY47420800 |
| Amplifier Research | 15S1G6 | Amplifier | CBT | N/A | CBT | 433971 |
| Anritsu | MA2411B | Pulse Power Sensor | 11/20/2018 | Annual | 11/20/2019 | 1027293 |
| Anritsu | MA2411B | Pulse Power Sensor | 10/30/2018 | Annual | 10/30/2019 | 1126066 |
| Anritsu | ML2495A | Power Meter | 10/21/2018 | Annual | 10/21/2019 | 941001 |
| Control Company | 4040 | Therm./ Clock/ Humidity Monitor | 10/9/2018 | Biennial | 10/9/2020 | 181647811 |
| Control Company | 4352 | Ultra Long Stem Thermometer | 5/2/2017 | Biennial | 5/2/2019 | 170330156 |
| Keysight | 772D | Dual Directional Coupler | CBT | N/A | CBT | MY52180215 |
| Keysight Technologies | 85033E | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018 | Annual | 6/4/2019 | MY53401181 |
| MiniCircuits | VLF-6000+ | Low Pass Filter | CBT | N/A | CBT | N/A |
| Mini-Circuits | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT | N/A | CBT | N/A |
| Narda | 4772-3 | Attenuator (3dB) | CBT | N/A | CBT | 9406 |
| Pasternack | PE2209-10 | Bidirectional Coupler | CBT | N/A | CBT | N/A |
| Seekonk | NC-100 | Torque Wrench | 7/11/2018 | Annual | 7/11/2019 | N/A |
| SPEAG | EX3DV4 | SAR Probe | 6/25/2018 | Annual | 6/25/2019 | 7409 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 6/18/2018 | Annual | 6/18/2019 | 1334 |
| SPEAG | DAE4 | Dasy Data Acquisition Electronics | 2/13/2019 | Annual | 2/13/2020 | 665 |
| SPEAG | EX3DV4 | SAR Probe | 2/19/2019 | Annual | 2/19/2020 | 7417 |
| SPEAG | DAK-3.5 | Dielectric Assessment Kit | 9/11/2018 | Annual | 9/11/2019 | 1091 |

Measurement Uncertainty = ±23% (k=2)

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated By: | Brodie Halbfoster | Test Engineer | BRODIE HALBFOSTER |
| Approved By: | Kaitlin O'Keefe | Senior Technical Manager | |

# DIPOLE CALIBRATION EXTENSION

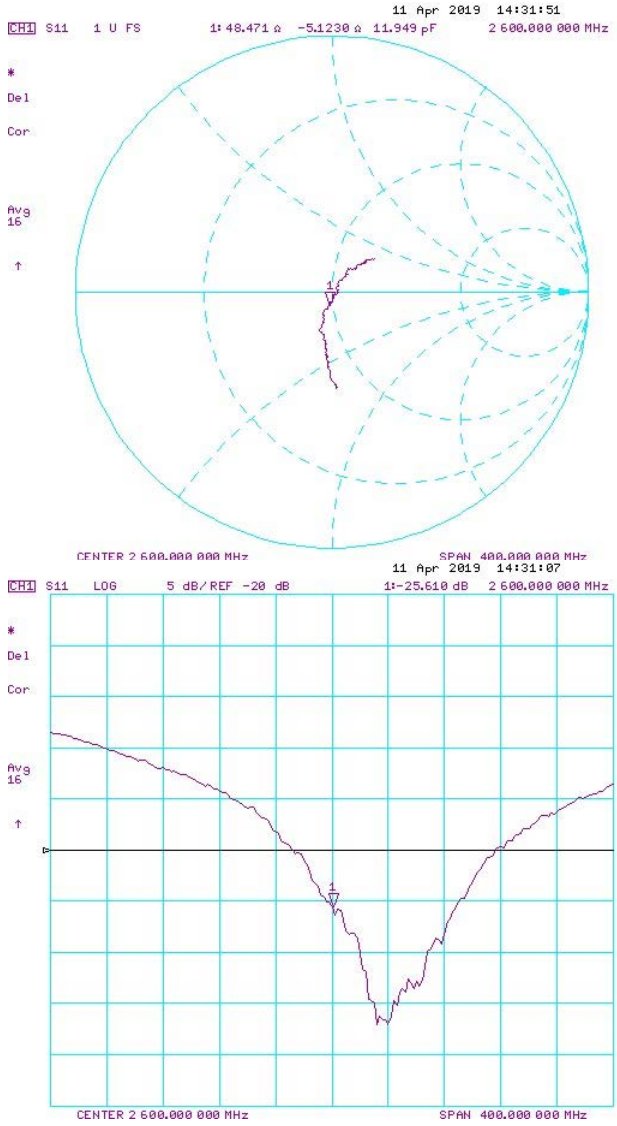
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

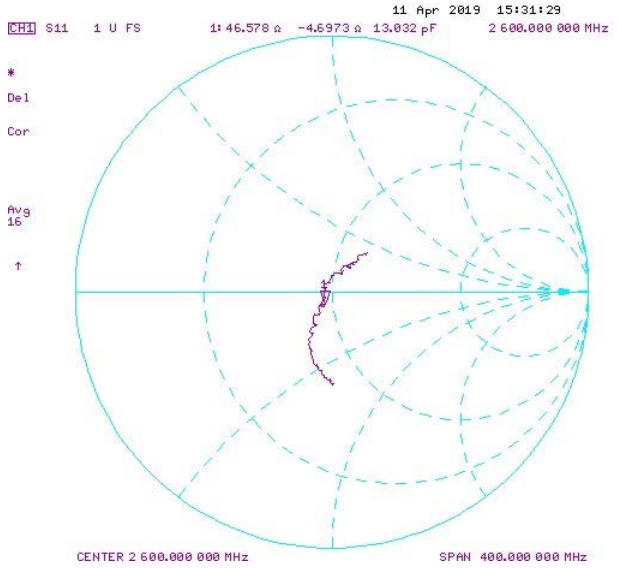
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 20.0 dBm | Measured Head SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/11/2018 | 4/11/2019 | 1.149 | 5.59 | 5.51 | -1.43% | 2.51 | 2.47 | -1.59% | 47.7 | 48.5 | 0.8 | -5.7 | -5.1 | 0.6 | -24.1 | -25.6 | -6.30% | PASS |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 4/11/2018 | 4/11/2019 | 1.149 | 5.48 | 5.65 | 3.10% | 2.47 | 2.48 | 0.40% | 46 | 46.6 | 0.6 | -3.8 | -4.7 | 0.9 | -24.9 | -24.5 | 1.80% | PASS |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss 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
**S** Swiss Calibration Service

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

**Accreditation No.: SCS 0108**

**Client** PC Test

**Certificate No: D5GHzV2-1057_Jan18**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D5GHzV2 - SN:1057 |
| Calibration procedure(s) | QA CAL-22.v2<br>Calibration procedure for dipole validation kits between 3-6 GHz |
| Calibration date: | January 16, 2018 |

BN ✓
01-25-2018

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

BN ✓
02/06/2019

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-17 (No. 217-02521/02522) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-17 (No. 217-02521) | Apr-18 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-17 (No. 217-02522) | Apr-18 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 07-Apr-17 (No. 217-02528) | Apr-18 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 07-Apr-17 (No. 217-02529) | Apr-18 |
| Reference Probe EX3DV4 | SN: 3503 | 30-Dec-17 (No. EX3-3503_Dec17) | Dec-18 |
| DAE4 | SN: 601 | 26-Oct-17 (No. DAE4-601_Oct17) | Oct-18 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter EPM-442A | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

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

Issued: January 18, 2018

## 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.10.0 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| **Frequency** | 5200 MHz ± 1 MHz<br>5250 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5750 MHz ± 1 MHz<br>5800 MHz ± 1 MHz | |

## Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.9 | 4.71 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.2 ± 6 % | 4.55 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5250 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.91 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **79.2 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.28 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.8 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.5 | 5.07 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 35.8 ± 6 % | 4.90 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5600 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.41 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **84.1 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.40 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.0 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.4 | 5.22 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 35.5 ± 6 % | 5.06 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5750 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.06 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **80.5 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.30 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.0 W/kg ± 19.5 % (k=2)** |

## Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 49.0 | 5.30 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 47.3 ± 6 % | 5.41 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL at 5200 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.36 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **73.1 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.06 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.4 W/kg ± 19.5 % (k=2)** |

## Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 48.9 | 5.36 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 47.2 ± 6 % | 5.48 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL at 5250 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.64 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **75.9 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.13 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.1 W/kg ± 19.5 % (k=2)** |

## Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 48.5 | 5.77 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 46.6 ± 6 % | 5.94 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL at 5600 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.05 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **79.9 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.25 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **22.3 W/kg ± 19.5 % (k=2)** |

## Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 48.3 | 5.94 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 46.3 ± 6 % | 6.15 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL at 5750 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.72 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **76.7 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.14 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.2 W/kg ± 19.5 % (k=2)** |

## Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 48.2 | 6.00 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 46.2 ± 6 % | 6.22 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL at 5800 MHz

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.68 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **76.3 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.13 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.1 W/kg ± 19.5 % (k=2)** |

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

### Antenna Parameters with Head TSL at 5250 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 50.0 Ω - 5.5 jΩ |
| Return Loss | - 25.2 dB |

### Antenna Parameters with Head TSL at 5600 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 54.7 Ω - 2.1 jΩ |
| Return Loss | - 26.2 dB |

### Antenna Parameters with Head TSL at 5750 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 52.7 Ω + 0.0 jΩ |
| Return Loss | - 31.5 dB |

### Antenna Parameters with Body TSL at 5200 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 49.3 Ω - 6.7 jΩ |
| Return Loss | - 23.4 dB |

### Antenna Parameters with Body TSL at 5250 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 48.4 Ω - 3.9 jΩ |
| Return Loss | - 27.4 dB |

### Antenna Parameters with Body TSL at 5600 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 55.3 Ω - 1.6 jΩ |
| Return Loss | - 25.6 dB |

### Antenna Parameters with Body TSL at 5750 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 52.6 Ω + 1.1 jΩ |
| Return Loss | - 31.2 dB |

### Antenna Parameters with Body TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.8 Ω - 0.4 jΩ |
| Return Loss | - 34.9 dB |

## General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.203 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 | November 27, 2006 |

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

### Measurement Conditions (f=5200 MHz)

DASY system configuration, as far as not given on page 1 and 3.

| Phantom | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---|---|---|

### SAR result with SAM Head (Top)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.24 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **82.6 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.35 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.6 W/kg ± 19.9 % (k=2)** |

### SAR result with SAM Head (Mouth)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.54 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **85.6 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.7 W/kg ± 19.9 % (k=2)** |

### SAR result with SAM Head (Neck)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **81.6 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.7 W/kg ± 19.9 % (k=2)** |

### SAR result with SAM Head (Ear)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 5.16 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **51.7 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 1.76 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **17.7 W/kg ± 19.9 % (k=2)** |

## Measurement Conditions (f=5800 MHz)

DASY system configuration, as far as not given on page 1 and 3.

| Phantom | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---|---|---|

## SAR result with SAM Head (Top)

| SAR averaged over 1 $cm^3$ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.62 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **86.3 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.41 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.1 W/kg ± 19.9 % (k=2)** |

## SAR result with SAM Head (Mouth)

| SAR averaged over 1 $cm^3$ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.88 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **88.9 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.44 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.4 W/kg ± 19.9 % (k=2)** |

## SAR result with SAM Head (Neck)

| SAR averaged over 1 $cm^3$ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.33 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **83.4 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.35 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.5 W/kg ± 19.9 % (k=2)** |

## SAR result with SAM Head (Ear)

| SAR averaged over 1 $cm^3$ (1 g) of Head TSL | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 5.68 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **56.8 W/kg ± 20.3 % (k=2)** |

| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 1.89 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **18.9 W/kg ± 19.9 % (k=2)** |

## DASY5 Validation Report for Head TSL

Date: 11.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057**

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; $\sigma$ = 4.55 S/m; $\varepsilon_r$ = 36.2; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5600 MHz; $\sigma$ = 4.9 S/m; $\varepsilon_r$ = 35.8; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5750 MHz; $\sigma$ = 5.06 S/m; $\varepsilon_r$ = 35.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017, ConvF(4.98, 4.98, 4.98); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 - modified; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

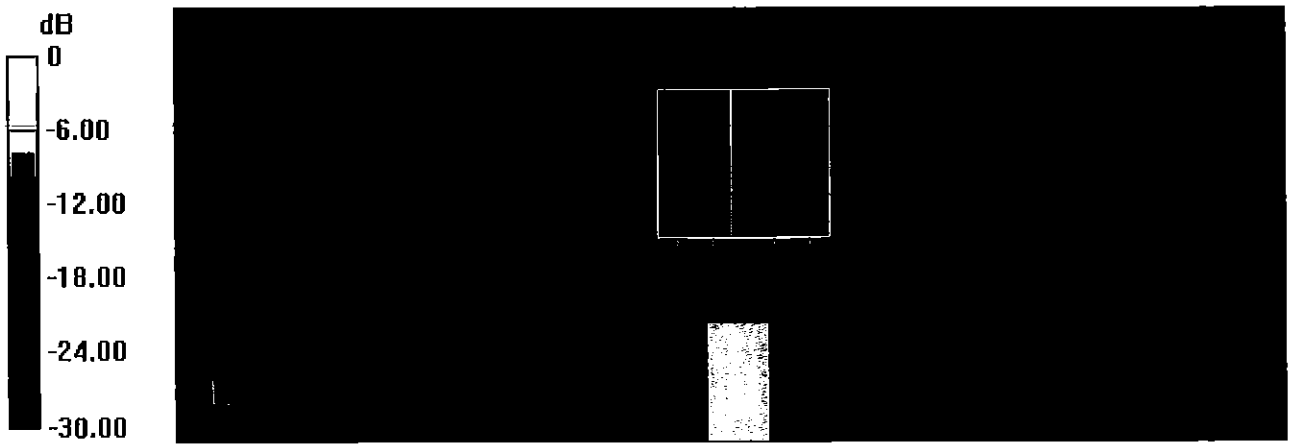
Reference Value = 72.54 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.5 W/kg
**SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.28 W/kg**
Maximum value of SAR (measured) = 17.7 W/kg

### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.77 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 32.2 W/kg
**SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.4 W/kg**
Maximum value of SAR (measured) = 19.7 W/kg

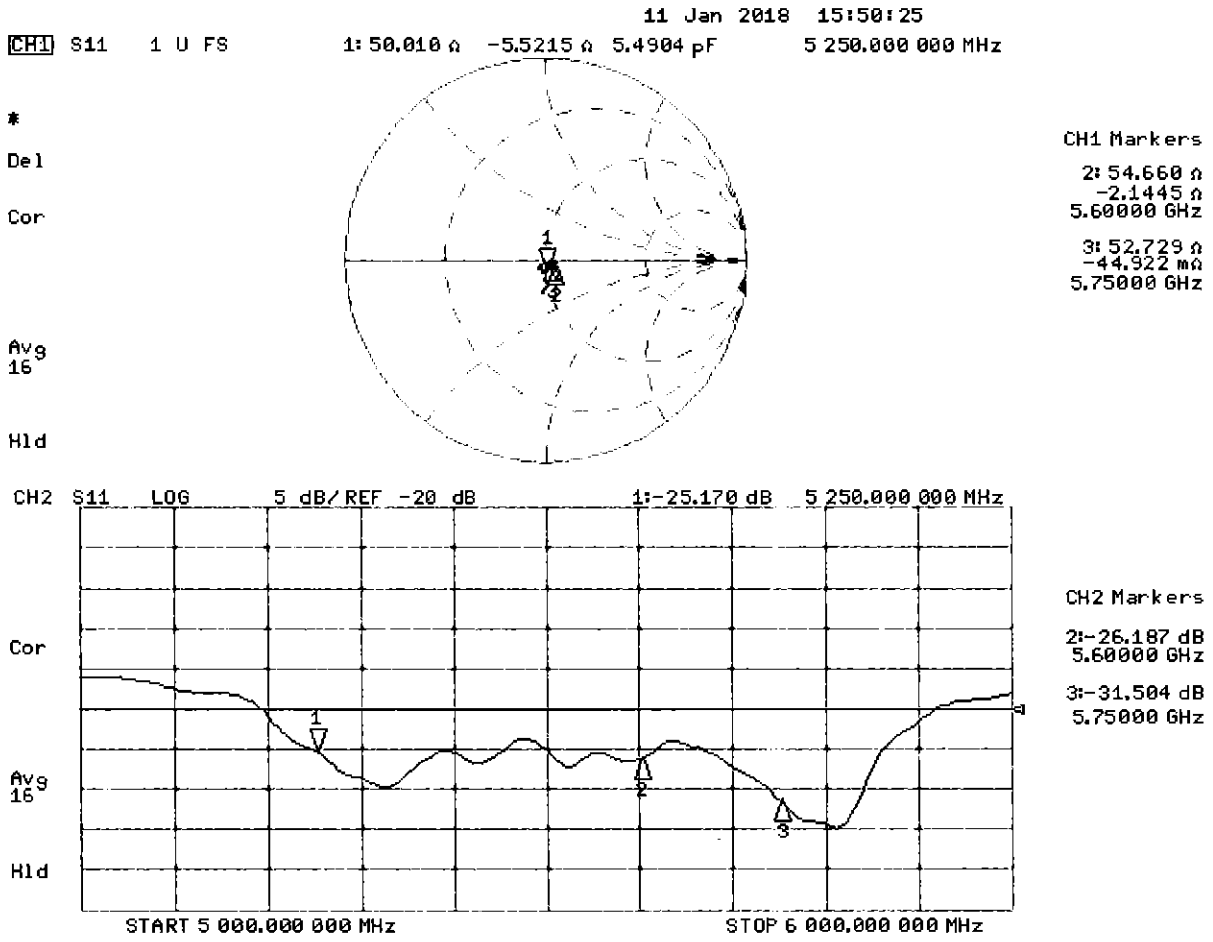
### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.93 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 31.4 W/kg
**SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.3 W/kg**
Maximum value of SAR (measured) = 18.9 W/kg




0 dB = 18.9 W/kg = 12.76 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 10.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz
Medium parameters used:f = 5200 MHz; $\sigma$ = 5.41 S/m; $\varepsilon_r$ = 47.3; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5250 MHz; $\sigma$ = 5.48 S/m; $\varepsilon_r$ = 47.2; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5600 MHz; $\sigma$ = 5.94 S/m; $\varepsilon_r$ = 46.6; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5750 MHz; $\sigma$ = 6.15 S/m; $\varepsilon_r$ = 46.3; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5800 MHz; $\sigma$ = 6.22 S/m; $\varepsilon_r$ = 46.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.35, 5.35, 5.35); Calibrated: 30.12.2017, ConvF(5.26, 5.26, 5.26); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.57, 4.57, 4.57); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

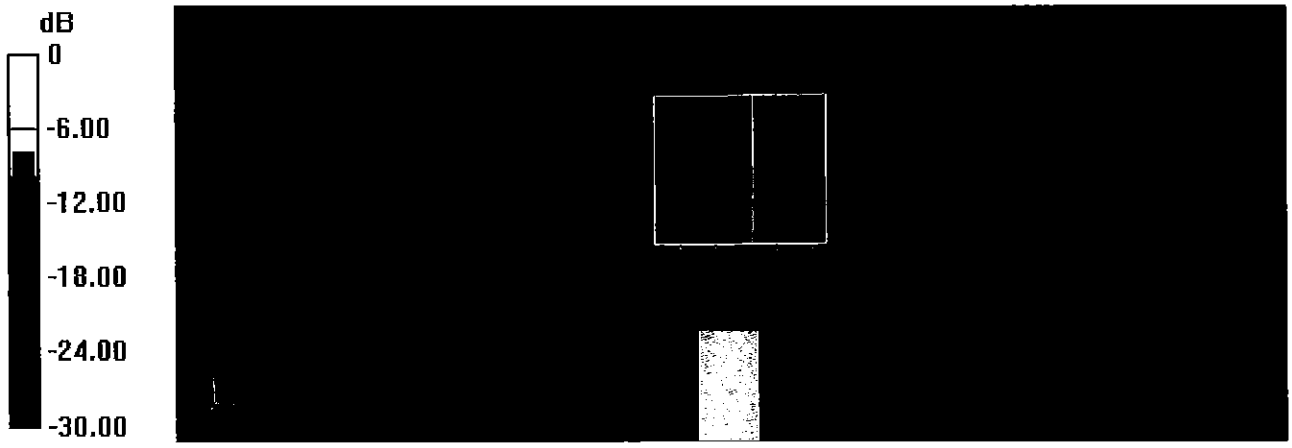
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.05 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 27.6 W/kg
**SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.06 W/kg**
Maximum value of SAR (measured) = 17.1 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.53 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 29.4 W/kg
**SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg**
Maximum value of SAR (measured) = 17.9 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.09 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.0 W/kg
**SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.25 W/kg**
Maximum value of SAR (measured) = 19.5 W/kg

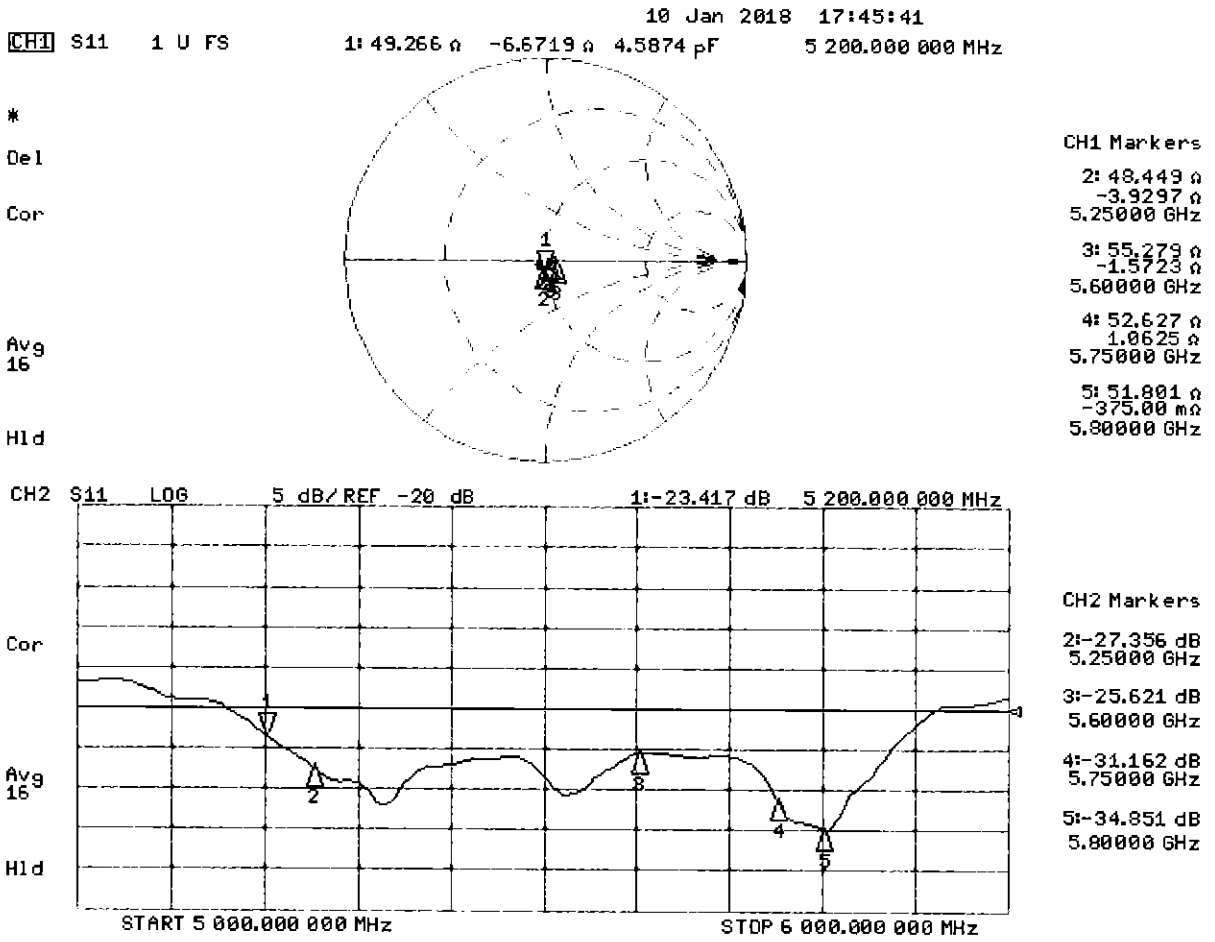
**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.45 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 32.9 W/kg
**SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg**
Maximum value of SAR (measured) = 18.9 W/kg

**Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.14 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.3 W/kg
**SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.13 W/kg**



0 dB = 18.9 W/kg = 12.76 dBW/kg

## Impedance Measurement Plot for Body TSL



## DASY5 Validation Report for SAM Head

Date: 16.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 4.59 S/m; $\varepsilon r$ = 36.5; $\rho$ = 1000 kg/m3 ,
Medium parameters used: f = 5800 MHz; $\sigma$ = 5.28 S/m; $\varepsilon r$ = 35.4; $\rho$ = 1000 kg/m3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12.2017, ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

**SAM Head/Top - 5200/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.99 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 30.6 W/kg
**SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.35 W/kg**
Maximum value of SAR (measured) = 19.7 W/kg

**SAM Head/Top - 5800/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.00 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 36.5 W/kg
**SAR(1 g) = 8.62 W/kg; SAR(10 g) = 2.41 W/kg**
Maximum value of SAR (measured) = 21.9 W/kg

**SAM Head/Mouth - 5200/Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.79 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 29.5 W/kg
**SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.37 W/kg**
Maximum value of SAR (measured) = 20.7 W/kg