# TEST REPORT

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Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRRFCC2109-0087
2. Customer
   - Name : Kyocera Corporation
   - Address : Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku Yokohama-shi, Kanagawa, Japan
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : Mobile Phone / EB1083

   FCC ID : JOYEB1083
5. FCC Regulation(s) : CFR 47 Part 2 subpart 2.1093

   Test Method Used : IEEE 1528-2013, IEC/IEEE 62209-1528

   FCC SAR KDB Publications (Details in test report)
6. Date of Test : 2021.09.06 ~ 2021.09.27
7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
8. Testing Environment : Refer to appended test report.
9. Test Result : Refer to attached test report.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

| | | |
|---|---|---|
| Affirmation | Tested by<br>Name : YeJin Seo (Signature) | Reviewed by<br>Name : HakMin Kim (Signature) |

**2021 . 09 . 30 .**

**DT&C Co., Ltd.**

**If this report is required to confirmation of authenticity, please contact to report@dtnc.net**

# Test Report Version

| Test Report No. | Date | Description | Tested by | Reviewed by |
|---|---|---|---|---|
| DRRFCC2109-0087 | Sep. 30, 2021 | Initial issue | YeJin Seo | HakMin Kim |
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# 1. DESCRIPTION OF DEVICE

## 1.1 General Information

| | |
|---|---|
| EUT type | Mobile Phone |
| FCC ID | JOYEB1083 |
| Equipment model name | EB1083 |
| Equipment add model name | N/A |
| Equipment serial no. | Identical prototype |
| FCC & ISED MRA Designation No. | KR0034 |
| ISED# | 5740A |
| Mode(s) of Operation | GSM 1900, WCDMA 1700, WCDMA 1900, LTE Band 4, 2, 2.4 G W-LAN (802.11b/g/n-HT20),<br>5 G W-LAN (802.11a/n-HT20/n-HT40/ac-VHT20/ac-VHT40/ac-VHT80), Bluetooth |

| | Band | Mode | Operating Modes | Bandwidth | Frequency |
|---|---|---|---|---|---|
| TX Frequency Range | GSM 1900 | GSM/GPRS | Voice/Data | - | 1 850.2 ~ 1 909.8 MHz |
| | WCDMA 1700 | WCDMA | Voice/Data | - | 1 712.4 ~ 1 752.6 MHz |
| | WCDMA 1900 | WCDMA | Voice/Data | - | 1 852.4 ~ 1 907.6 MHz |
| | LTE Band 4 | LTE | Voice/Data | 1.4/3/5/10/15/20MHz | 1 710.7 ~ 1 754.3 MHz |
| | LTE Band 2 | LTE | Voice/Data | 1.4/3/5/10/15/20MHz | 1 850.7 ~ 1 909.3 MHz |
| | 2.4 GHz W-LAN | 802.11b/g/n | Voice/Data | HT20 | 2 412 ~ 2 462 MHz |
| | 5.2 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 180 ~ 5 240 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 190 ~ 5 230 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 210 MHz |
| | 5.3 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 260 ~ 5 320 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 270 ~ 5 310 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 290 MHz |
| | 5.6 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 500 ~ 5 700 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 510 ~ 5 670 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 530 MHz |
| | 5.8 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 745 ~ 5 825 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 755 ~ 5 795 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 775 MHz |
| | Bluetooth | - | Data | - | 2 402 ~ 2 480 MHz |
| RX Frequency Range | GSM 1900 | GSM/GPRS | Voice/Data | - | 1 930.2 ~ 1 989.8 MHz |
| | WCDMA 1700 | WCDMA | Voice/Data | - | 2 112.4 ~ 2 152.6 MHz |
| | WCDMA 1900 | WCDMA | Voice/Data | - | 1 932.4 ~ 1 987.6 MHz |
| | LTE Band 4 | LTE | Voice/Data | 1.4/3/5/10/15/20MHz | 2 110.7 ~ 2 154.3 MHz |
| | LTE Band 2 | LTE | Voice/Data | 1.4/3/5/10/15/20MHz | 1 930.7 ~ 1 989.3 MHz |
| | 2.4 GHz W-LAN | 802.11b/g/n | Voice/Data | HT20 | 2 412 ~ 2 462 MHz |
| | 5.2 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 180 ~ 5 240 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 190 ~ 5 230 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 210 MHz |
| | 5.3 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT200 | 5 260 ~ 5 320 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 270 ~ 5 310 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 290 MHz |
| | 5.6 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 500 ~ 5 700 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 510 ~ 5 670 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 530 MHz |
| | 5.8 GHz W-LAN | 802.11a/n/ac | Voice/Data | HT20/VHT20 | 5 745 ~ 5 825 MHz |
| | | 802.11n/ac | Voice/Data | HT40/VHT40 | 5 755 ~ 5 795 MHz |
| | | 802.11ac | Voice/Data | VHT80 | 5 775 MHz |
| | Bluetooth | - | Data | - | 2 402 ~ 2 480 MHz |

| Equipment Class | Band | Reported SAR | | | |
|---|---|---|---|---|---|
| | | 1g SAR (W/kg) | | | 10g SAR (W/kg) |
| | | Head | Body-Worn | Hotspot | Phablet |
| PCE | GSM 1900 | 0.17 | 0.37 | - | - |
| PCE | GPRS 1900 | 0.24 | 0.55 | 0.55 | - |
| PCE | WCDMA 1700 | 0.36 | 0.79 | 0.79 | - |
| PCE | WCDMA 1900 | 0.56 | 0.79 | 0.85 | - |
| PCE | LTE Band 4 | 0.28 | 0.71 | 0.71 | - |
| PCE | LTE Band 2 | 0.35 | 0.80 | 0.80 | - |
| DTS | 2.4 GHz W-LAN | 0.13 | 0.18 | 0.18 | - |
| U-NII-1 | 5.2 GHz W-LAN | - | - | - | - |
| U-NII-2A | 5.3 GHz W-LAN | 0.17 | 0.69 | - | 0.72 |
| U-NII-2C | 5.6 GHz W-LAN | 0.14 | 0.63 | - | 0.99 |
| U-NII-3 | 5.8 GHz W-LAN | 0.22 | 0.60 | | 1.08 |
| DSS | Bluetooth | < 0.1 | 0.11 | 0.11 | - |
| Simultaneous SAR per KDB 690783 D01v01r03 | | **0.87** | **1.59** | **0.98** | - |

| | |
|---|---|
| FCC Equipment Class | Licensed Portable Transmitter Held to Ear (PCE)<br>Part 15 Spread Spectrum Transmitter(DSS)<br>Digital Transmission System(DTS)<br>Unlicensed National Information Infrastructure (UNII) |
| Date(s) of Tests | 2021.09.06 ~ 2021.09.27 |
| Antenna Type | Internal Antenna |
| Functions | ● GSM/GPRS (GPRS Class: 12) supported.<br>* DTM not supported.<br>● No simultaneous transmission between BT & 2.4GHz WLAN<br>● Simultaneous transmission between [GSM, WCDMA voice & WLAN], [GPRS, WCDMA & WLAN], [LTE & WLAN].<br>● VoIP is supported.<br>● W-LAN 2.4GHz is supported Hotspot.<br>● W-LAN 5 GHz is not supported Hotspot. |

## 1.2 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

## 1.3 Nominal and Maximum Output Power Specifications

The Nominal and Maximum Output Power Specifications are in section 9 of this test report.

## 1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device of the device antenna can be found in JOYEB1083_Antenna Location. Since the diagonal dimension of this device is > 160 mm and < 200 mm. it is considered a “phablet”.

| Mode | Device Sides for SAR Testing | | | | | |
|---|---|---|---|---|---|---|
| | Top | Bottom | Front | Rear | Right | Left |
| GSM/GPRS 1900 | X | O | O | O | X | O |
| WCDMA 1700 | X | O | O | O | X | O |
| WCDMA 1900 | X | O | O | O | X | O |
| LTE Band 4 | X | O | O | O | X | O |
| LTE Band 2 | X | O | O | O | X | O |
| 2.4G W-LAN | O | X | O | O | X | O |
| 5G W-LAN | X | X | O | O | X | X |

Note 1: Particular DUT edges were not required to be evaluated for Hotspot SAR or Phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 648474 D04v01r03.The antenna document shows the distances between the transmit antennas and the edges of the device.

Note 2: O - Test / X - Not test.

## 1.5 Simultaneous Transmission Capabilities

The Simultaneous Transmission Capabilities are in section 12 of this test report.

## 1.6 Miscellaneous SAR Test Considerations

**(A) WIFI**

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.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a “phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Phablet SAR tests were not required when wireless router 1g SAR < 1.2 W/kg.

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

GSM/GPRS DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS Data.

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.

Per FCC KDB Publication 648474 D04 v01r03, this device is considered a “phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

### 1.7 Guidance Applied

- IEEE 1528-2013
- IEC/IEEE 62209-1528
- FCC KDB Publication 941225 D01v03r01 (3G SAR Procedures)
- FCC KDB Publication 941225 D05v02r05 (SAR for LTE Devices)
- FCC KDB Publication 941225 D05Av01r02 (LTE Rel.10 KDB Inquiry Sheet)
- FCC KDB Publication 941225 D06v02r01(Hotspot Mode)
- FCC KDB Publication 248227 D01v02r02 (802.11 Wi-Fi SAR)
- FCC KDB Publication 447498 D01v06 (General RF Exposure Guidance)
- FCC KDB Publication 648474 D04v01r03 (Handset SAR)
- FCC KDB Publication 690783 D01v01r03 (SAR Listings on Grants)
- FCC KDB Publication 865664 D01v01r04 (SAR Measurement 100 MHz to 6 GHz)
- FCC KDB Publication 865664 D02v01r02 (RF Exposure Reporting)
- October 2013 TCB Workshop Notes (GPRS testing criteria)
- April 2015 TCB Workshop Notes (Simultaneous transmission summation clarified)
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)
- April 2019 TCB Workshop Notes (Tissue Simulating Liquids)

### 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 11.

### 1.9 FCC & ISED MRA test lab designation no. : KR0034

# 2. LTE INFORMATION

| LTE Information | | | | | |
|---|---|---|---|---|---|
| **FCC ID** | **JOYEB1083** | | | | |
| Form Factor | Mobile Phone | | | | |
| Frequency Range of each LTE transmission Band | LTE Band 4 (AWS) (1 710.7 ~ 1 754.3 MHz)<br>LTE Band 2 (PCS) (1 850.7 ~ 1 909.3 MHz) | | | | |
| Channel Bandwidths | LTE Band 4 : 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 2 : 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz | | | | |
| Channel Number and Frequencies(MHz) | Low | Low-Mid | Mid | Mid-High | High |
| LTE Band 4 (AWS): 1.4 MHz | 1 710.7 (19957) | N/A | 1 732.5 (20175) | N/A | 1 754.3 (20393) |
| LTE Band 4 (AWS): 3 MHz | 1 711.5 (19965) | N/A | 1 732.5 (20175) | N/A | 1 753.5 (20385) |
| LTE Band 4 (AWS): 5 MHz | 1 712.5 (19975) | N/A | 1 732.5 (20175) | N/A | 1 752.5 (20375) |
| LTE Band 4 (AWS): 10 MHz | 1 715.0 (20000) | N/A | 1 732.5 (20175) | N/A | 1 750.0 (20350) |
| LTE Band 4 (AWS): 15 MHz | 1 717.5 (20025) | N/A | 1 732.5 (20175) | N/A | 1 747.5 (20325) |
| LTE Band 4 (AWS): 20 MHz | 1 720.0 (20050) | N/A | **1 732.5 (20175)** Note1 | N/A | 1 745.0 (20300) |
| LTE Band 2 (PCS): 1.4 MHz | 1 850.7 (18607) | N/A | 1 880.0 (18900) | N/A | 1 909.3 (19193) |
| LTE Band 2 (PCS): 3 MHz | 1 851.5 (18615) | N/A | 1 880.0 (18900) | N/A | 1 908.5 (19185) |
| LTE Band 2 (PCS): 5 MHz | 1 852.5 (18625) | N/A | 1 880.0 (18900) | N/A | 1 907.5 (19175) |
| LTE Band 2 (PCS): 10 MHz | 1 855.0 (18650) | N/A | 1 880.0 (18900) | N/A | 1 905.0 (19150) |
| LTE Band 2 (PCS): 15 MHz | 1 857.5 (18675) | N/A | 1 880.0 (18900) | N/A | 1 902.5 (19125) |
| LTE Band 2 (PCS): 20 MHz | **1 860.0 (18700)** | N/A | **1 880.0 (18900)** | N/A | **1 900.0 (19100)** |
| UE Category | UE Cat 4 | | | | |
| 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 | This device does not support both UL and DL carrier aggregation. | | | | |

Note(s)
1. LTE B4 (AWS) can not contain three non-overlapping channels of 20 MHz bandwidth.
Per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

# 3. INTROCUCTION

The FCC and Industry 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.

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. 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. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring 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 National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. 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.

## SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ) It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 3.1)

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

Fig. 3.1 SAR Mathematical Equation

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

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

where:

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

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations 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.

# 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:

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 IEEE1528-2013.

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.

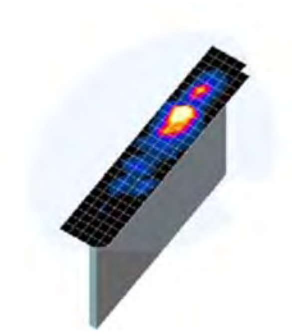

**Figure 4.1**
**Sample SAR Area Scan**

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>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 mm ± 1 mm</td><td>½·$\delta$·ln(2) mm ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$</td><td>$\leq$ 2 GHz: $\leq$ 15 mm<br>2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm<br>4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$</td><td>$\leq$ 2 GHz: $\leq$ 8 mm<br>2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*<br>4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm<br>4 – 5 GHz: $\leq$ 3 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm<br>4 – 5 GHz: $\leq$ 2.5 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ mm</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm<br>4 – 5 GHz: $\geq$ 25 mm<br>5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.<br>* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

**Table 4.1 Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04***

# 5. DEFINITION OF REFERENCE POINTS

## 5.1 Ear Reference Point

Figure 5.1 shows the front, back and side views of the SAM Twin Phantom. The point"M" is the reference point for the center of the mouth, "LE" is the left ear reference point(ERP), and "RE" is the right ERP. The ERPs are 15 mm posterior to the entrance to the Ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5.1. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck- Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 5.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning.

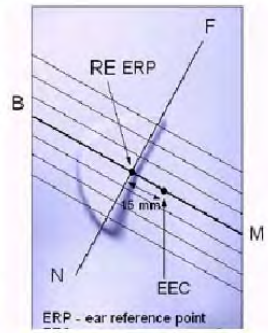


**Figure 5.1 Close-up side view of ERP**

## 5.2 Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 5.3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.


**Figure 5.2 Front, back and side view SAM Twin Phantom**

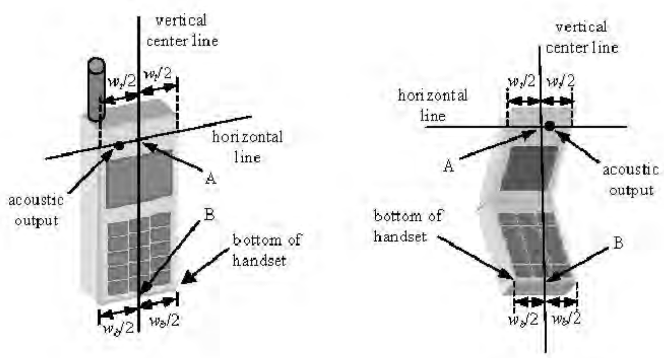


**Figure 5.3 Handset Vertical Center & Horizontal Line Reference Points**

# 6. TEST CONFIGURATION POSITIONS FOR HANDSETS

## 6.1 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.

## 6.2 Positioning for Cheek/Touch

1. The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.


**Figure 6.1 Front, Side and Top View of Cheek/Touch Position**

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).
4. The phone was hen rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek). (See Figure 6.2)

## 6.3 Positioning for Ear / 15 ° Tilt

With the test device aligned in the "Cheek/Touch Position":

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6.3).

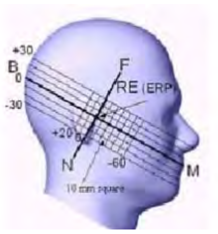


**Figure 6.2 Side view w/relevant markings**


**Figure 6.3 Front, Side and Top View of Ear/15º Position**

## 6.4 Body-Worn Accessory Configurations

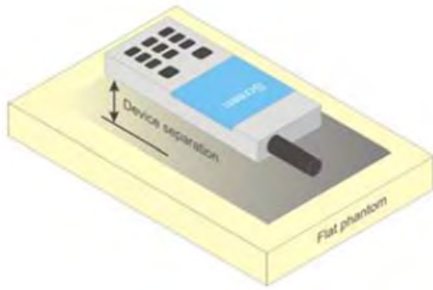


**Figure 6.4 Sample Body-Worn Diagram**

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6.4). Per FCC KDB Publication 648474 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

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

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

## 6.5 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

### 6.6 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front the front, rear and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. When the same wireless transmission configuration is used for testing body-worn accessory and hotspot mode SAR, respectively, in voice and data mode, SAR results for the most conservative test separation distance configuration may be used to support both SAR conditions.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitter often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each KDB Publication 447498 D01v06 procedures. The “Portable Hotspot” feature on the handset was not activated during SAR assessment, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

### 6.7 Phablet Configurations

For smart phones with a display diagonal > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna ≤ 25mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

# 7. RF EXPOSURE LIMITS

**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.

**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 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 7.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-1992**

| | **HUMAN EXPOSURE LIMITS** | |
|---|---|---|
| | General Public Exposure (W/kg) or (mW/g) | Occupational Exposure (W/kg) or (mW/g) |
| SPATIAL PEAK SAR * (Brain) | 1.60 | 8.00 |
| SPATIAL AVERAGE SAR ** (Whole Body) | 0.08 | 0.40 |
| SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist) | 4.00 | 20.0 |

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.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

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).

# 8. FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

## 8.1 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.

## 8.2 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01.

The device was 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 were 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 was 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 deviated by more than 5%, the SAR test and drift measurements were repeated.

## 8.3 SAR Measurement Conditions for WCDMA (UMTS)

### 8.3.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1s”.

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 (release 5), 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.

### 8.3.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

### 8.3.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all“1s”.

### 8.3.4 Release 5 HSDPA Data Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with WCDMA and requires an active DPCCH. The default test configuration is to measure SAR in WCDMA with HSDPA remain inactive, to establish a radio link between the test device and a communication test set using a 12.2 kbps RMC configured in Test Loop Mode 1. SAR for HSDPA is selectively measured using the highest reported SAR configuration in WCDMA, with an FRC in H-set 1 and a 12.2 kbps RMC. SAR is selectively confirmed for other physical channel configurations (DPCCH & DPDCHn) according to exposure conditions, device operating capabilities and maximum output power specified for production units, including tune-up tolerance by applying the 3G SAR test reduction procedures. Maximum output power is verified according to the applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | CM (dB) (2) |
|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 |
| 2 | 12/15 (3) | 15/15 (3) | 64 | 12/15 (3) | 24/15 | 1.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 |

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

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.

Note 3: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

**Figure 8.1 Table 1**

### 8.3.5 Release 6 HSUPA Data Devices

The following procedures are applicable to HSPA (HSUPA/HSDPA) data devices operating under 3GPP Release 6. SAR is required for devices in body-worn accessory and other body exposure conditions, including handsets and data modems operating in various electronic devices. HSUPA operates in conjunction with WCDMA and HSDPA. SAR is initially measured in WCDMA test configurations with HSPA remain inactive. The default test configuration is to establish a radio link between the test device and a communication test set to configure a 12.2 kbps RMC in Test Loop Mode 1. SAR for HSPA is selectively measured with HS-DPCCH, E-DPCCH and E-DPDCH, all enabled, along with a 12.2 kbps RMC using the highest reported SAR configuration in WCDMA with 12.2 kbps RMC only.
An FRC is configured according to HS-DPCCH Sub-test 1 using H-set 1 and QPSK. HSPA is configured according to E-DCH Sub-test 5 requirements. SAR for other HSPA sub-test configurations is confirmed selectively according to exposure conditions, E-DCH UE Category and maximum output power of production units, including tune-up tolerance by applying the 3G SAR test reduction procedure. Maximum output power is verified according to procedures in applicable versions of 3GPP TS 34.121. SAR must be measured based on these maximum output conditions and requirements in KDB Publication 447498, with respect to the UE Categories for HS-DPCCH and HSPA, and explained in the SAR report. When Maximum Power Reduction (MPR) applies, the implementations must be clearly identified in the SAR report to support test results according to Cubic Metric (CM) and, as appropriate, Enhanced MPR (E-MPR) requirements.

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

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c = 30/15$ ⇔ $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the $\beta_c/\beta_d$ ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 10/15 and $\beta_d$ = 15/15.
Note 4: For subtest 5 the $\beta_c/\beta_d$ ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 14/15 and $\beta_d$ = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: $\beta_{ed}$ cannot be set directly; it is set by Absolute Grant Value.

**Figure 8.2 Table 2**

## 8.4 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02r05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The call simulator was used for LTE output power measurement 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).

### 8.4.1 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.

### 8.4.2 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.

### 8.4.3 A-MPR

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

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

According to FCC KDB 941225 D05v02r05:

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 channel 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. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
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 0.5 dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.

### 8.4.5 64QAM uplink

(1) Per KDB 941225 D05 V02r05, we'll measure conducted powers per Section 5.1 for all uplink modulations (QPSK, 16QAM, 64QAM) and include in the test report.

(2) From these power measurements, we will apply the procedures in Section 5.2.4 ("Higher Order Modulations") to determine SAR test reduction for 16QAM and 64QAM test cases.

## 8.5 SAR Testing with 802.11 Transmitters

The normal network operating configurations are not suitable for measuring the SAR of 802.11 b/g/n transmitters. 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 248227D01v02r02 for more details.

### 8.5.1 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. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the 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.

### 8.5.2 U-NII and U-NII-2A

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following, with respect to the highest reported SAR and maximum output power specified for production units. The procedures are applied independently to each exposure configuration; for example, head, body, hotspot mode etc.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, each band is tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, each band is tested independently for SAR.

### 8.5.3 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 Rader (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. When band gap channels are disabled, each band is tested independently according to the normally required OFDM SAR measurements and probe calibration frequency points requirements.

### 8.5.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test position are measured.

### 8.5.5 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a 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 exposure configuration 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.

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

For the 2.4 GHz and 5 GHz bands, 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 and 802.11n 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 80211n or 802.11g then 802.11n is used for SAR measurement. When the maximum output power ware 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.

### 8.5.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, 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 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, and lowest data rate. 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.

### 8.5.8 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 applicable. When the highest reported SAR for the initial test configuration, adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power is ≤ 1.2 W/kg, no additional SAR testing for the subsequent test configurations is required.

# 9. RF CONDUCTED POWERS

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

## 9.1 GSM Nominal and Maximum Output Power Spec and Conducted Powers

| Band & Mode | | Voice[dBm] | Burst Average GMSK [dBm] | | | |
|---|---|---|---|---|---|---|
| | | 1 TX Slot | 1 TX Slot | 2 TX Slot | 3 TX Slot | 4 TX Slot |
| GSM/GPRS 1900 | Maximum | **30.4** | 30.4 | 27.4 | 25.6 | **24.4** |
| | Nominal | **29.0** | 29.0 | 26.0 | 24.2 | **23.0** |

**Table 9.1.1 GSM Nominal and Maximum Output Power Spec**

| Band | Channel | Maximum Burst-Averaged Output Power(dBm) | | | | |
|---|---|---|---|---|---|---|
| | | Voice | GPRS Data (GMSK) | | | |
| | | GSM CS 1 Slot | GPRS 1 TX Slot | GPRS 2 TX Slot | GPRS 3 TX Slot | GPRS 4 TX Slot |
| PCS 1900 | 512 | 29.85 | 29.85 | 26.86 | 25.04 | 23.87 |
| | 661 | **29.56** | 29.56 | 26.73 | 24.78 | **23.75** |
| | 810 | 29.33 | 29.33 | 26.60 | 24.69 | 23.66 |
| **Band** | **Channel** | **Calculated Maximum Frame-Averaged Output Power(dBm)** | | | | |
| | | **Voice** | **GPRS Data (GMSK)** | | | |
| | | **GSM CS 1 Slot** | **GPRS 1 TX Slot** | **GPRS 2 TX Slot** | **GPRS 3 TX Slot** | **GPRS 4 TX Slot** |
| PCS 1900 | 512 | 20.82 | 20.82 | 20.84 | 20.78 | 20.86 |
| | 661 | **20.53** | 20.53 | 20.71 | 20.52 | **20.74** |
| | 810 | 20.30 | 20.30 | 20.58 | 20.43 | 20.65 |
| **PCS 1900** | **Frame Avg. Targets:** | **19.97** | 19.97 | 19.98 | 19.94 | **19.99** |

**Table 9.1.2 GSM Conducted Power**

Note:

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. GPRS (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.

GPRS Multislot class: 12 (max 4 TX Uplink slots)
DTM Multislot Class: N/A


**Figure 9.1 Power Measurement Setup**

## 9.2 WCDMA Nominal and Maximum Output Power Spec and Conducted Powers

| 3GPP Release Version | Mode | | | AWS Band (dBm) | PCS Band (dBm) | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|
| 99 | WCDMA | Voice | Maximum | 24.5 | 24.5 | - |
| | | | Nominal | 24.0 | 24.0 | |
| 5 | HSDPA | Subtest 1 | Maximum | 23.5 | 23.5 | 0 |
| | | | Nominal | 23.0 | 23.0 | |
| 5 | | Subtest 2 | Maximum | 23.5 | 23.5 | 0 |
| | | | Nominal | 23.0 | 23.0 | |
| 5 | | Subtest 3 | Maximum | 23.0 | 23.0 | 0.5 |
| | | | Nominal | 22.5 | 22.5 | |
| 5 | | Subtest 4 | Maximum | 23.0 | 23.0 | 0.5 |
| | | | Nominal | 22.5 | 22.5 | |
| 6 | HSUPA | Subtest 1 | Maximum | 23.5 | 23.5 | 0 |
| | | | Nominal | 23.0 | 23.0 | |
| 6 | | Subtest 2 | Maximum | 21.5 | 21.5 | 2 |
| | | | Nominal | 21.0 | 21.0 | |
| 6 | | Subtest 3 | Maximum | 22.5 | 22.5 | 1 |
| | | | Nominal | 22.0 | 22.0 | |
| 6 | | Subtest 4 | Maximum | 21.5 | 21.5 | 2 |
| | | | Nominal | 21.0 | 21.0 | |
| 6 | | Subtest 5 | Maximum | 23.5 | 23.5 | 0 |
| | | | Nominal | 23.0 | 23.0 | |

**Table 9.2.1 WCDMA Nominal and Maximum Output Power Spec**

| 3GPP Release Version | Mode | 3GPP 34.121 Subtest | AWS Band (dBm) | | | PCS Band (dBm) | | | 3GPP MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1312 | 1412 | 1513 | 9262 | 9400 | 9538 | |
| 99 | WCDMA | 12.2 kbps RMC | 23.44 | 23.33 | 23.23 | 23.19 | 23.07 | 23.14 | - |
| 99 | | 12.2 kbps AMR | 23.42 | 23.33 | 23.22 | 23.18 | 23.06 | 23.13 | - |
| 5 | HSDPA | Subtest 1 | 22.49 | 22.42 | 22.15 | 22.21 | 22.06 | 22.11 | 0 |
| 5 | | Subtest 2 | 22.42 | 22.23 | 22.25 | 22.18 | 22.08 | 22.11 | 0 |
| 5 | | Subtest 3 | 22.01 | 21.75 | 21.80 | 21.71 | 21.58 | 21.62 | 0.5 |
| 5 | | Subtest 4 | 22.01 | 21.89 | 21.77 | 21.68 | 21.56 | 21.62 | 0.5 |
| 6 | HSUPA | Subtest 1 | 22.38 | 22.25 | 22.23 | 22.19 | 22.05 | 22.12 | 0 |
| 6 | | Subtest 2 | 20.35 | 20.38 | 20.32 | 20.14 | 20.05 | 20.10 | 2 |
| 6 | | Subtest 3 | 21.43 | 21.41 | 21.27 | 21.15 | 21.02 | 21.10 | 1 |
| 6 | | Subtest 4 | 20.35 | 20.39 | 20.18 | 20.18 | 20.05 | 20.10 | 2 |
| 6 | | Subtest 5 | 22.41 | 22.24 | 22.15 | 22.17 | 22.07 | 22.13 | 0 |

**Table 9.2.2 WCDMA Conducted Power**

WCDMA SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

The manufacturer declares that the HSDPA and HSUPA transmitter's power will not exceed the R99 maximum transmit power in devices based on Qualcomm's HSPA chipset solutions.


**Figure 9.2 Power Measurement Setup**

## 9.3 LTE Nominal and Maximum Output Power Spec and Conducted Powers

| Band & Mode | | Modulated Average[dBm] |
|---|---|---|
| LTE Band 4 | Maximum | 24.5 |
| | Nominal | 23.0 |

Table 9.3.2.1 Nominal and Maximum Output Power Spec

### 1) LTE Band 4

| LTE Band 4 (AWS) Conducted Power– 20 MHz Bandwidth | | | | | |
|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Mid Channel<br>20175 (1 732.5 MHz)<br>Conducted Power (dBm) | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| QPSK | **1** | **0** | **23.20** | | |
| | 1 | 50 | 23.14 | | 0 |
| | 1 | 99 | 23.09 | | |
| | 50 | 0 | 22.02 | ≤ 1 | |
| | **50** | **25** | **22.08** | | 1 |
| | 50 | 50 | 21.97 | | |
| | 100 | 0 | 21.98 | | 1 |
| 16QAM | 1 | 0 | 22.32 | | |
| | 1 | 50 | 22.27 | ≤ 1 | 1 |
| | 1 | 99 | 22.25 | | |
| | 50 | 0 | 21.00 | | |
| | 50 | 25 | 21.03 | ≤ 2 | 2 |
| | 50 | 50 | 20.92 | | |
| | 100 | 0 | 21.00 | | 2 |
| 64QAM | 1 | 0 | 21.34 | | |
| | 1 | 50 | 21.27 | ≤ 2 | 2 |
| | 1 | 99 | 21.06 | | |
| | 50 | 0 | 20.04 | | |
| | 50 | 25 | 20.15 | ≤ 3 | 3 |
| | 50 | 50 | 20.00 | | |
| | 100 | 0 | 20.03 | | 3 |

Table 9.3.1.2 LTE Conducted Power

Note: LTE B4 (AWS) can not contain three non-overlapping channels of 20 MHz bandwidth.
Per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

| LTE Band 4 (AWS) Conducted Power– 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>20025 (1 717.5 MHz) | Mid Channel<br>20175 (1 732.5 MHz) | High Channel<br>20325 (1 747.5 MHz) | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.28 | 23.09 | 23.18 | | |
| | 1 | 36 | 23.23 | 23.04 | 23.13 | | 0 |
| | 1 | 74 | 23.18 | 23.02 | 23.09 | | |
| | 36 | 0 | 22.13 | 22.03 | 22.08 | ≤ 1 | |
| | 36 | 18 | 22.17 | 22.07 | 22.09 | | 1 |
| | 36 | 37 | 22.07 | 21.99 | 22.05 | | |
| | 75 | 0 | 22.10 | 22.05 | 22.07 | | 1 |
| 16QAM | 1 | 0 | 22.35 | 22.22 | 22.35 | | |
| | 1 | 36 | 22.32 | 22.19 | 22.27 | ≤ 1 | 1 |
| | 1 | 74 | 22.28 | 22.15 | 22.21 | | |
| | 36 | 0 | 21.19 | 21.09 | 21.11 | | |
| | 36 | 18 | 21.20 | 21.15 | 21.16 | ≤ 2 | 2 |
| | 36 | 37 | 21.10 | 21.05 | 21.06 | | |
| | 75 | 0 | 21.12 | 21.03 | 21.04 | | 2 |
| 64QAM | 1 | 0 | 21.46 | 21.23 | 21.33 | | |
| | 1 | 36 | 21.32 | 21.18 | 21.27 | ≤ 2 | 2 |
| | 1 | 74 | 21.23 | 21.05 | 21.23 | | |
| | 36 | 0 | 20.21 | 20.09 | 20.13 | | |
| | 36 | 18 | 20.26 | 20.13 | 20.18 | ≤ 3 | 3 |
| | 36 | 37 | 20.19 | 19.97 | 20.09 | | |
| | 75 | 0 | 20.16 | 20.10 | 20.12 | | 3 |

Table 9.3.1.3 LTE Conducted Power

| LTE Band 4 (AWS) Conducted Power– 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel<br>20000 (1 715.0 MHz) | Mid Channel<br>20175 (1 732.5 MHz) | High Channel<br>20350 (1 750.0 MHz) | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.28 | 23.18 | 23.09 | | |
| | 1 | 25 | 23.23 | 23.13 | 23.04 | | 0 |
| | 1 | 49 | 23.18 | 23.09 | 23.02 | | |
| | 25 | 0 | 22.13 | 22.07 | 22.08 | ≤ 1 | |
| | 25 | 12 | 22.17 | 22.09 | 22.09 | | 1 |
| | 25 | 25 | 22.07 | 21.99 | 22.05 | | |
| | 50 | 0 | 22.10 | 22.05 | 22.07 | | 1 |
| 16QAM | 1 | 0 | 22.35 | 22.35 | 22.22 | | |
| | 1 | 25 | 22.32 | 22.27 | 22.19 | ≤ 1 | 1 |
| | 1 | 49 | 22.28 | 22.21 | 22.15 | | |
| | 25 | 0 | 21.19 | 21.09 | 21.11 | | |
| | 25 | 12 | 21.20 | 21.16 | 21.16 | ≤ 2 | 2 |
| | 25 | 25 | 21.10 | 21.06 | 21.06 | | |
| | 50 | 0 | 21.12 | 21.07 | 21.04 | | 2 |
| 64QAM | 1 | 0 | 21.46 | 21.33 | 21.23 | | |
| | 1 | 25 | 21.32 | 21.27 | 21.18 | ≤ 2 | 2 |
| | 1 | 49 | 21.23 | 21.23 | 21.05 | | |
| | 25 | 0 | 20.21 | 20.09 | 20.13 | | |
| | 25 | 12 | 20.26 | 20.13 | 20.18 | ≤ 3 | 3 |
| | 25 | 25 | 20.19 | 19.97 | 20.09 | | |
| | 50 | 0 | 20.16 | 20.12 | 20.12 | | 3 |

Table 9.3.1.4 LTE Conducted Power

| LTE Band 4 (AWS) Conducted Power– 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 19975 (1 712.5 MHz) | 20175 (1 732.5 MHz) | 20375 (1 752.5 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.18 | 23.15 | 23.16 | ≤ 1 | 0 |
| | 1 | 12 | 23.15 | 23.02 | 23.11 | | |
| | 1 | 24 | 23.10 | 22.99 | 23.03 | | |
| | 12 | 0 | 21.92 | 21.90 | 21.91 | | 1 |
| | 12 | 6 | 22.06 | 21.96 | 22.01 | | |
| | 12 | 13 | 21.89 | 21.83 | 21.87 | | |
| | 25 | 0 | 21.92 | 21.90 | 21.91 | | 1 |
| 16QAM | 1 | 0 | 22.31 | 22.26 | 22.29 | ≤ 1 | 1 |
| | 1 | 12 | 22.29 | 22.18 | 22.27 | | |
| | 1 | 24 | 22.21 | 22.15 | 22.15 | | |
| | 12 | 0 | 20.94 | 20.91 | 20.92 | ≤ 2 | 2 |
| | 12 | 6 | 20.98 | 20.94 | 20.95 | | |
| | 12 | 13 | 20.83 | 20.78 | 20.79 | | |
| | 25 | 0 | 20.90 | 20.85 | 20.88 | | 2 |
| 64QAM | 1 | 0 | 21.24 | 21.20 | 21.23 | ≤ 2 | 2 |
| | 1 | 12 | 21.23 | 21.14 | 21.15 | | |
| | 1 | 24 | 21.08 | 21.00 | 21.06 | | |
| | 12 | 0 | 19.96 | 19.94 | 19.95 | ≤ 3 | 3 |
| | 12 | 6 | 20.01 | 19.95 | 19.96 | | |
| | 12 | 13 | 19.86 | 19.82 | 19.83 | | |
| | 25 | 0 | 19.95 | 19.92 | 19.93 | | 3 |

**Table 9.3.1.5 LTE Conducted Power**

| LTE Band 4 (AWS) Conducted Power– 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 19965 (1 711.5 MHz) | 20175 (1 732.5 MHz) | 20385 (1 753.5 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.27 | 23.13 | 23.14 | ≤ 1 | 0 |
| | 1 | 7 | 23.21 | 23.06 | 23.09 | | |
| | 1 | 14 | 23.17 | 23.01 | 23.03 | | |
| | 8 | 0 | 22.16 | 22.02 | 22.03 | | 1 |
| | 8 | 4 | 22.18 | 22.06 | 22.07 | | |
| | 8 | 7 | 22.13 | 21.96 | 22.00 | | |
| | 15 | 0 | 22.11 | 22.02 | 22.04 | | 1 |
| 16QAM | 1 | 0 | 22.42 | 22.25 | 22.30 | ≤ 1 | 1 |
| | 1 | 7 | 22.35 | 22.14 | 22.18 | | |
| | 1 | 14 | 22.27 | 21.91 | 22.13 | | |
| | 8 | 0 | 21.25 | 21.09 | 21.10 | ≤ 2 | 2 |
| | 8 | 4 | 21.28 | 21.12 | 21.15 | | |
| | 8 | 7 | 21.13 | 21.00 | 21.09 | | |
| | 15 | 0 | 21.25 | 21.04 | 21.07 | | 2 |
| 64QAM | 1 | 0 | 21.33 | 21.20 | 21.26 | ≤ 2 | 2 |
| | 1 | 7 | 21.27 | 21.03 | 21.17 | | |
| | 1 | 14 | 21.24 | 20.82 | 20.98 | | |
| | 8 | 0 | 20.35 | 20.13 | 20.14 | ≤ 3 | 3 |
| | 8 | 4 | 20.36 | 20.15 | 20.25 | | |
| | 8 | 7 | 20.30 | 19.97 | 20.04 | | |
| | 15 | 0 | 20.24 | 20.08 | 20.11 | | 3 |

**Table 9.3.1.6 LTE Conducted Power**

| TE Band 4 (AWS) Conducted Power– 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 19957 (1 710.7 MHz) | 20175 (1 732.5 MHz) | 20393 (1 754.3 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.10 | 23.05 | 23.09 | ≤ 1 | 0 |
| | 1 | 2 | 23.08 | 23.04 | 23.07 | | |
| | 1 | 5 | 23.05 | 22.95 | 23.01 | | |
| | 3 | 0 | 23.00 | 22.90 | 22.92 | | 0 |
| | 3 | 2 | 23.05 | 22.94 | 22.96 | | |
| | 3 | 3 | 22.96 | 22.87 | 22.89 | | |
| | 6 | 0 | 22.11 | 21.91 | 21.97 | | 1 |
| 16QAM | 1 | 0 | 22.27 | 22.22 | 22.26 | ≤ 1 | 1 |
| | 1 | 2 | 22.25 | 22.15 | 22.22 | | |
| | 1 | 5 | 22.24 | 22.11 | 22.19 | | |
| | 3 | 0 | 22.15 | 22.01 | 22.02 | | 1 |
| | 3 | 2 | 22.18 | 22.07 | 22.09 | | |
| | 3 | 3 | 22.13 | 21.97 | 21.99 | | |
| | 6 | 0 | 21.26 | 21.02 | 21.09 | ≤ 2 | 2 |
| 64QAM | 1 | 0 | 21.20 | 21.15 | 21.18 | ≤ 2 | 2 |
| | 1 | 2 | 21.11 | 20.98 | 21.02 | | |
| | 1 | 5 | 21.10 | 20.90 | 20.96 | | |
| | 3 | 0 | 21.10 | 20.95 | 21.03 | | 2 |
| | 3 | 2 | 21.13 | 20.99 | 21.06 | | |
| | 3 | 3 | 21.03 | 20.88 | 20.93 | | |
| | 6 | 0 | 20.08 | 20.02 | 20.03 | ≤ 3 | 3 |

**Table 9.3.1.7 LTE Conducted Power**

| Band & Mode | | Modulated Average[dBm] |
|---|---|---|
| LTE Band 2(PCS) | Maximum | 24.5 |
| | Nominal | 23.0 |

**Table 9.3.2.1 Nominal and Maximum Output Power Spec**

## 2) LTE Band 2 (PCS)

| LTE Band 2 (PCS) Conducted Power– 20 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18700 (1 860.0 MHz) | 18900 (1 880.0 MHz) | 19100 (1 900.0 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | **1** | **0** | **23.29** | 23.09 | 23.16 | ≤ 1 | 0 |
| | 1 | 50 | 23.27 | 22.95 | 22.99 | | |
| | 1 | 99 | 23.20 | 22.85 | 22.97 | | |
| | **50** | **0** | **22.10** | 21.98 | 22.07 | | 1 |
| | 50 | 25 | 22.09 | 21.95 | 21.96 | | |
| | 50 | 50 | 21.96 | 21.82 | 21.94 | | |
| | 100 | 0 | 22.04 | 21.94 | 21.96 | | 1 |
| 16QAM | 1 | 0 | 22.40 | 22.28 | 22.32 | ≤ 1 | 1 |
| | 1 | 50 | 22.39 | 22.05 | 22.17 | | |
| | 1 | 99 | 22.34 | 22.03 | 22.13 | | |
| | 50 | 0 | 21.14 | 20.95 | 20.97 | ≤ 2 | 2 |
| | 50 | 25 | 21.03 | 20.94 | 20.95 | | |
| | 50 | 50 | 20.98 | 20.82 | 20.92 | | |
| | 100 | 0 | 21.01 | 20.90 | 20.96 | | 2 |
| 64QAM | 1 | 0 | 21.19 | 20.91 | 20.98 | ≤ 2 | 2 |
| | 1 | 50 | 21.14 | 20.85 | 20.90 | | |
| | 1 | 99 | 21.02 | 20.83 | 20.88 | | |
| | 50 | 0 | 20.16 | 20.00 | 20.03 | ≤ 3 | 3 |
| | 50 | 25 | 20.06 | 19.97 | 19.98 | | |
| | 50 | 50 | 19.99 | 19.85 | 19.92 | | |
| | 100 | 0 | 20.04 | 19.94 | 19.96 | | 3 |

**Table 9.3.2.2 LTE Conducted Power**

| LTE Band 2 (PCS) Conducted Power– 15 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18675 (1 857.5 MHz) | 18900 (1 880.0 MHz) | 19125 (1 902.5 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.11 | 23.05 | 23.09 | ≤ 1 | 0 |
| | 1 | 36 | 23.07 | 22.97 | 23.03 | | |
| | 1 | 74 | 23.06 | 22.95 | 22.99 | | |
| | 36 | 0 | 21.93 | 21.83 | 21.88 | | 1 |
| | 36 | 18 | 21.88 | 21.80 | 21.81 | | |
| | 36 | 37 | 21.87 | 21.74 | 21.77 | | |
| | 75 | 0 | 21.87 | 21.79 | 21.86 | | 1 |
| 16QAM | 1 | 0 | 22.29 | 22.20 | 22.21 | ≤ 1 | 1 |
| | 1 | 36 | 22.22 | 22.17 | 22.19 | | |
| | 1 | 74 | 22.17 | 21.98 | 22.15 | | |
| | 36 | 0 | 21.01 | 20.89 | 20.90 | ≤ 2 | 2 |
| | 36 | 18 | 20.90 | 20.86 | 20.87 | | |
| | 36 | 37 | 20.88 | 20.72 | 20.77 | | |
| | 75 | 0 | 20.93 | 20.82 | 20.83 | | 2 |
| 64QAM | 1 | 0 | 21.21 | 21.03 | 21.16 | ≤ 2 | 2 |
| | 1 | 36 | 21.11 | 21.01 | 21.06 | | |
| | 1 | 74 | 21.09 | 20.92 | 20.98 | | |
| | 36 | 0 | 19.99 | 19.83 | 19.84 | ≤ 3 | 3 |
| | 36 | 18 | 19.96 | 19.80 | 19.81 | | |
| | 36 | 37 | 19.95 | 19.72 | 19.74 | | |
| | 75 | 0 | 19.92 | 19.81 | 19.82 | | 3 |

**Table 9.3.2.3 LTE Conducted Power**

| LTE Band 2 (PCS) Conducted Power– 10 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18650 (1 855.0 MHz) | 18900 (1 880.0 MHz) | 19150 (1 905.0 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.14 | 23.06 | 23.10 | ≤ 1 | 0 |
| | 1 | 25 | 23.05 | 22.94 | 22.95 | | |
| | 1 | 49 | 23.00 | 22.89 | 22.93 | | |
| | 25 | 0 | 22.04 | 21.83 | 21.88 | | 1 |
| | 25 | 12 | 21.93 | 21.79 | 21.81 | | |
| | 25 | 25 | 21.86 | 21.74 | 21.77 | | |
| | 50 | 0 | 21.91 | 21.79 | 21.86 | | 1 |
| 16QAM | 1 | 0 | 22.32 | 22.16 | 22.20 | ≤ 1 | 1 |
| | 1 | 25 | 22.24 | 22.05 | 22.09 | | |
| | 1 | 49 | 22.11 | 22.04 | 22.05 | | |
| | 25 | 0 | 21.03 | 20.89 | 20.90 | ≤ 2 | 2 |
| | 25 | 12 | 20.93 | 20.85 | 20.86 | | |
| | 25 | 25 | 20.91 | 20.72 | 20.77 | | |
| | 50 | 0 | 20.86 | 20.82 | 20.83 | | 2 |
| 64QAM | 1 | 0 | 21.25 | 21.05 | 21.12 | ≤ 2 | 2 |
| | 1 | 25 | 21.17 | 21.01 | 21.02 | | |
| | 1 | 49 | 21.10 | 20.94 | 21.06 | | |
| | 25 | 0 | 19.99 | 19.83 | 19.84 | ≤ 3 | 3 |
| | 25 | 12 | 19.91 | 19.80 | 19.81 | | |
| | 25 | 25 | 19.87 | 19.71 | 19.74 | | |
| | 50 | 0 | 19.89 | 19.81 | 19.82 | | 3 |

**Table 9.3.2.4 LTE Conducted Power**

| LTE Band 2 (PCS) Conducted Power– 5 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18625 (1 852.5 MHz) | 18900 (1 880.0 MHz) | 19175 (1 907.5 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.13 | 23.10 | 23.11 | ≤ 1 | 0 |
| | 1 | 12 | 23.09 | 22.99 | 23.06 | | |
| | 1 | 24 | 23.04 | 22.94 | 23.02 | | |
| | 12 | 0 | 22.09 | 21.94 | 21.97 | | 1 |
| | 12 | 6 | 22.06 | 21.88 | 21.93 | | |
| | 12 | 13 | 21.91 | 21.79 | 21.90 | | |
| | 25 | 0 | 22.01 | 21.84 | 21.93 | | 1 |
| 16QAM | 1 | 0 | 22.27 | 22.20 | 22.24 | ≤ 1 | 1 |
| | 1 | 12 | 22.17 | 22.15 | 22.16 | | |
| | 1 | 24 | 22.15 | 22.06 | 22.13 | | |
| | 12 | 0 | 21.11 | 20.96 | 20.98 | ≤ 2 | 2 |
| | 12 | 6 | 21.09 | 20.90 | 20.97 | | |
| | 12 | 13 | 21.02 | 20.81 | 20.87 | | |
| | 25 | 0 | 21.07 | 20.89 | 20.90 | | 2 |
| 64QAM | 1 | 0 | 21.30 | 21.15 | 21.19 | ≤ 2 | 2 |
| | 1 | 12 | 21.22 | 21.14 | 21.15 | | |
| | 1 | 24 | 21.21 | 21.11 | 21.09 | | |
| | 12 | 0 | 20.10 | 20.05 | 20.07 | ≤ 3 | 3 |
| | 12 | 6 | 20.04 | 19.99 | 20.03 | | |
| | 12 | 13 | 19.95 | 19.85 | 19.88 | | |
| | 25 | 0 | 19.98 | 19.94 | 19.95 | | 3 |

**Table 9.3.2.5 LTE Conducted Power**

| LTE Band 2 (PCS) Conducted Power– 3 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18615 (1 851.5 MHz) | 18900 (1 880.0 MHz) | 19185 (1 908.5 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.24 | 23.08 | 23.12 | ≤ 1 | 0 |
| | 1 | 7 | 23.20 | 23.05 | 23.11 | | |
| | 1 | 14 | 23.09 | 22.91 | 22.92 | | |
| | 8 | 0 | 22.06 | 21.89 | 21.93 | | 1 |
| | 8 | 4 | 22.03 | 21.88 | 21.91 | | |
| | 8 | 7 | 21.97 | 21.77 | 21.83 | | |
| | 15 | 0 | 21.99 | 21.86 | 21.87 | | 1 |
| 16QAM | 1 | 0 | 22.41 | 22.23 | 22.24 | ≤ 1 | 1 |
| | 1 | 7 | 22.30 | 22.21 | 22.22 | | |
| | 1 | 14 | 22.23 | 21.99 | 22.08 | | |
| | 8 | 0 | 21.13 | 20.96 | 21.01 | ≤ 2 | 2 |
| | 8 | 4 | 21.12 | 20.91 | 20.95 | | |
| | 8 | 7 | 21.01 | 20.87 | 20.92 | | |
| | 15 | 0 | 21.02 | 20.90 | 20.92 | | 2 |
| 64QAM | 1 | 0 | 21.29 | 21.16 | 21.21 | ≤ 2 | 2 |
| | 1 | 7 | 21.26 | 21.14 | 21.19 | | |
| | 1 | 14 | 21.15 | 20.99 | 21.00 | | |
| | 8 | 0 | 20.19 | 20.04 | 20.06 | ≤ 3 | 3 |
| | 8 | 4 | 20.13 | 19.99 | 20.01 | | |
| | 8 | 7 | 20.06 | 19.93 | 19.97 | | |
| | 15 | 0 | 20.10 | 19.91 | 19.98 | | 3 |

**Table 9.3.2.6 LTE Conducted Power**

| LTE Band 2 (PCS) Conducted Power– 1.4 MHz Bandwidth | | | | | | | |
|---|---|---|---|---|---|---|---|
| Modulation | RB Size | RB Offset | Low Channel | Mid Channel | High Channel | MPR Allowed Per 3GPP(dB) | MPR (dB) |
| | | | 18607 (1 850.7 MHz) | 18900 (1 880.0 MHz) | 19193 (1 909.3 MHz) | | |
| | | | Conducted Power (dBm) | | | | |
| QPSK | 1 | 0 | 23.26 | 23.11 | 23.17 | ≤ 1 | 0 |
| | 1 | 2 | 23.13 | 22.95 | 23.12 | | |
| | 1 | 5 | 23.06 | 22.92 | 23.01 | | |
| | 3 | 0 | 22.96 | 22.84 | 22.89 | | 0 |
| | 3 | 2 | 22.95 | 22.81 | 22.84 | | |
| | 3 | 3 | 22.94 | 22.79 | 22.80 | | |
| | 6 | 0 | 22.01 | 21.82 | 21.85 | | 1 |
| 16QAM | 1 | 0 | 22.42 | 22.30 | 22.35 | ≤ 1 | 1 |
| | 1 | 2 | 22.31 | 22.11 | 22.27 | | |
| | 1 | 5 | 22.25 | 22.08 | 22.20 | | |
| | 3 | 0 | 22.16 | 21.96 | 21.98 | | 1 |
| | 3 | 2 | 22.06 | 21.92 | 21.94 | | |
| | 3 | 3 | 22.05 | 21.87 | 21.91 | | |
| | 6 | 0 | 20.98 | 20.73 | 20.92 | ≤ 2 | 2 |
| 64QAM | 1 | 0 | 21.40 | 21.28 | 21.33 | ≤ 2 | 2 |
| | 1 | 2 | 21.30 | 21.14 | 21.24 | | |
| | 1 | 5 | 21.21 | 21.04 | 21.19 | | |
| | 3 | 0 | 21.09 | 21.03 | 21.03 | | 2 |
| | 3 | 2 | 21.05 | 20.96 | 21.00 | | |
| | 3 | 3 | 21.02 | 20.90 | 20.91 | | |
| | 6 | 0 | 20.09 | 19.85 | 19.87 | ≤ 3 | 3 |

**Table 9.3.2.7 LTE Conducted Power**

## 9.4 WLAN Nominal and Maximum Output Power Spec and Conducted Powers

| Band (GHz) | Mode | Modulated Average[dBm] | |
|---|---|---|---|
| | | Maximum | Nominal |
| 2.4 | 802.11b | 15.0 | 12.0 |
| | 802.11g | 15.0 | 12.0 |
| | 802.11n | 15.0 | 12.0 |

**Table 9.4.1 Nominal and Maximum Output Power Spec**

| Mode | Freq. (MHz) | Channel | IEEE 802.11 (2.4 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11b | 2 412 | 1 | 11.59 |
| | **2 437** | **6** | 12.27 |
| | 2 462 | 11 | 12.14 |
| 802.11g | 2 412 | 1 | 11.43 |
| | 2 437 | 6 | 11.94 |
| | 2 462 | 11 | 11.84 |
| 802.11n (HT-20) | 2 412 | 1 | 11.35 |
| | 2 437 | 6 | 11.88 |
| | 2 462 | 11 | 11.68 |

**Table 9.4.2 IEEE 802.11 Average RF Power**

Justification for reduced test configurations for WIFI channels 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, duo to an even number of channels, both channels were measured.
- Output Power and SAR is not required for 802.11 g/n HT20/ac VHT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjust SAR is ≤ 1.2 W/kg.
- The underlined data rate and channel above were tested for SAR.

The average output powers of this device were tested by below configuration.

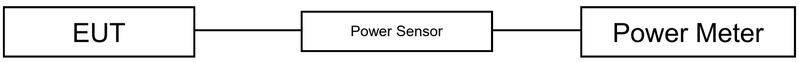


**Figure 9.4.1 Power Measurement Setup**

| Band (GHz) | Mode | Modulated Average[dBm] | |
|---|---|---|---|
| | | Maximum | Nominal |
| 5 (UNII) | 802.11a | 14.5 | 11.5 |
| | 802.11n/ac (20MHz) | 14.5 | 11.5 |
| | 802.11n/ac (40MHz) | 14.5 | 11.5 |
| | 802.11ac (80MHz) | 14.5 | 11.5 |

**Table 9.4.3 Nominal and Maximum Output Power Spec**

| Mode | Freq. (MHz) | Channel | IEEE 802.11a (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11a | 5 180 | 36 | 10.80 |
| | 5 200 | 40 | 10.57 |
| | 5 220 | 44 | 10.94 |
| | 5 240 | 48 | 11.05 |
| | 5 260 | 52 | 11.12 |
| | 5 280 | 56 | 11.31 |
| | 5 300 | 60 | 11.26 |
| | 5 320 | 64 | 11.33 |
| | 5 500 | 100 | 10.96 |
| | 5 600 | 120 | 10.93 |
| | 5 660 | 132 | 11.02 |
| | 5 700 | 140 | 10.98 |
| | 5 745 | 149 | 10.00 |
| | 5 785 | 157 | 9.82 |
| | 5 825 | 165 | 10.02 |

**Table 9.4.4 IEEE 802.11a Average RF Power**

| Mode | Freq. (MHz) | Channel | IEEE 802.11n HT20 (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11n (HT-20) | 5 180 | 36 | 10.82 |
| | 5 200 | 40 | 10.43 |
| | 5 220 | 44 | 10.83 |
| | 5 240 | 48 | 10.97 |
| | 5 260 | 52 | 10.95 |
| | 5 280 | 56 | 11.08 |
| | 5 300 | 60 | 11.11 |
| | 5 320 | 64 | 11.04 |
| | 5 500 | 100 | 10.69 |
| | 5 600 | 120 | 10.76 |
| | 5 660 | 132 | 10.63 |
| | 5 700 | 140 | 10.62 |
| | 5 745 | 149 | 9.81 |
| | 5 785 | 157 | 9.63 |
| | 5 825 | 165 | 9.91 |

**Table 9.4.5 IEEE 802.11n HT20 Average RF Power**

| Mode | Freq. (MHz) | Channel | IEEE 802.11ac VHT20 (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11ac (VHT-20) | 5 180 | 36 | 10.74 |
| | 5 200 | 40 | 10.41 |
| | 5 220 | 44 | 10.78 |
| | 5 240 | 48 | 10.91 |
| | 5 260 | 52 | 10.93 |
| | 5 280 | 56 | 11.10 |
| | 5 300 | 60 | 11.15 |
| | 5 320 | 64 | 11.12 |
| | 5 500 | 100 | 10.70 |
| | 5 600 | 120 | 10.75 |
| | 5 660 | 132 | 10.70 |
| | 5 700 | 140 | 10.68 |
| | 5 745 | 149 | 10.00 |
| | 5 785 | 157 | 9.83 |
| | 5 825 | 165 | 9.94 |

**Table 9.4.6 IEEE 802.11ac VHT20 Average RF Power**

| Mode | Freq. (MHz) | Channel | IEEE 802.11n HT40 (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11n (HT-40) | 5 190 | 38 | 11.64 |
| | 5 230 | 46 | 11.55 |
| | 5 270 | 54 | 11.65 |
| | 5 310 | 62 | 11.90 |
| | 5 510 | 102 | 11.40 |
| | 5 590 | 118 | 11.24 |
| | 5 670 | 134 | 11.32 |
| | 5 755 | 151 | 11.46 |
| | 5 795 | 159 | 10.31 |

**Table 9.4.7 IEEE 802.11n HT40 Average RF Power**

| Mode | Freq. (MHz) | Channel | IEEE 802.11ac VHT40 (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11ac (VHT-40) | 5 190 | 38 | 11.63 |
| | 5 230 | 46 | 11.52 |
| | 5 270 | 54 | 11.61 |
| | 5 310 | 62 | 11.89 |
| | 5 510 | 102 | 11.49 |
| | 5 590 | 118 | 11.26 |
| | 5 670 | 134 | 11.41 |
| | 5 755 | 151 | 10.54 |
| | 5 795 | 159 | 10.33 |

**Table 9.4.8 IEEE 802.11ac VHT40 Average RF Power**

| Mode | Freq. (MHz) | Channel | IEEE 802.11ac VHT80 (5 GHz) Conducted Power [dBm] |
|---|---|---|---|
| 802.11ac (VHT-80) | 5 210 | 42 | 11.63 |
| | **5 290** | **58** | **11.84** |
| | 5 530 | 106 | 11.05 |
| | **5 610** | **122** | **11.14** |
| | 5 690 | 138 | 11.03 |
| | **5 775** | **155** | **10.58** |

**Table 9.4.9 IEEE 802.11ac VHT80 Average RF Power**

Justification for reduced test configurations for WIFI channels 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, duo to an even number of channels, both channels were measured.
- Output Power and SAR is not required for 802.11 g/n HT20/ac VHT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjust SAR is ≤ 1.2 W/kg.
- The underlined data rate and channel above were tested for SAR.

The average output powers of this device were tested by below configuration.

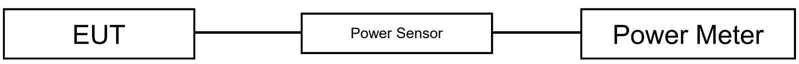


**Figure 9.4.2 Power Measurement Setup**

## 9.5 Bluetooth Conducted Powers

| Frame Modulated Average[dBm] | | |
|---|---|---|
| Bluetooth 1 Mbps | Maximum | 16.0 |
| | Nominal | 12.3 |
| Bluetooth 2 Mbps | Maximum | 13.0 |
| | Nominal | 9.3 |
| Bluetooth 3 Mbps | Maximum | 13.0 |
| | Nominal | 9.3 |
| Bluetooth (LE) | Maximum | 9.8 |
| | Nominal | 6.1 |

**Table 9.5.1 Nominal and Maximum Output Power Spec (Frame)**

| Channel | Frequency | Frame AVG Output Power (1Mbps)) | Frame AVG Output Power (2Mbps) | Frame AVG Output Power (3Mbps) |
|---|---|---|---|---|
| | (MHz) | (dBm) | (dBm) | (dBm) |
| Low | 2 402 | 12.67 | 9.90 | 9.82 |
| Mid | 2 441 | 12.65 | 10.10 | 10.91 |
| High | 2 480 | 12.59 | 9.97 | 9.96 |

**Table 9.5.2 Bluetooth Frame Average RF Power**

| Channel | Frequency | Frame AVG Output Power(LE / 1Mbps) | Frame AVG Output Power(LE / 2Mbps) |
|---|---|---|---|
| | (MHz) | (dBm) | (dBm) |
| Low | 2 402 | 7.39 | 7.39 |
| Mid | 2 440 | 7.45 | 7.45 |
| High | 2 480 | 6.34 | 6.32 |

**Table 9.5.3 Bluetooth LE Frame Average RF Power**

- **Bluetooth Conducted Powers procedures**

1. Bluetooth (BDR, EDR)
   1) Enter DUT mode in EUT and operate it.
      When it operating, The EUT is transmitting at maximum power level and duty cycle fixed.
   2) Instruments and EUT were connected like Figure 9.5.1.
   3) The maximum output powers of BDR(1 Mbps), EDR(2, 3 Mbps) and each frequency were set by a Bluetooth Tester.
   4) Power levels were measured by a Power Meter.

2. Bluetooth (LE)
   1) Enter LE mode in EUT and operate it.
      When it operating, The EUT is transmitting at maximum power level and duty cycle fixed.
   2) Instruments and EUT were connected like Figure 9.5.1.
   3) The average conducted output powers of LE and each frequency can measurement according to setting program in EUT.
   4) Power levels were measured by a Power Meter.

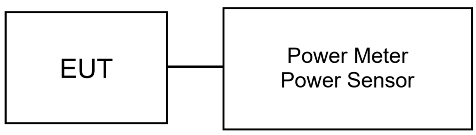


**Figure 9.5.1 Average Power Measurement Setup**

- **Bluetooth Transmission Plot**

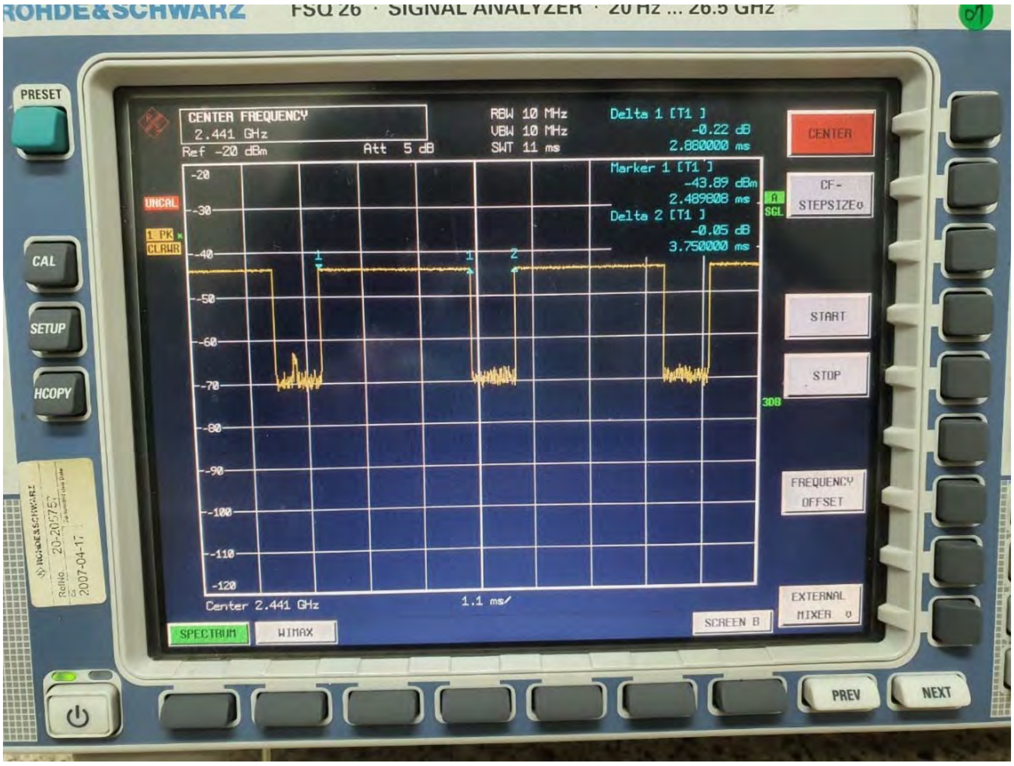

Figure 9.5.2 Bluetooth Transmission Plot

- **Bluetooth Duty Cycle Calculation**

**Duty Cycle = Pulse/Period * 100% = (2.880/3.750) * 100 = 76.8%**

# 10. SYSTEM VERIFICATION

## 10.1 Tissue Verification

| MEASURED TISSUE PARAMETERS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date(s) | Tissue Type | Ambient Temp.[°C] | Liquid Temp.[°C] | Measured Frequency [MHz] | Target Dielectric Constant, εr | Target Conductivity, σ (S/m) | Measured Dielectric Constant, εr | Measured Conductivity, σ (S/m) | Er Deviation [%] | σ Deviation [%] |
| Sep. 7. 2021 | 1800 Head | 20.7 | 20.5 | 1 712.4 | 40.126 | 1.350 | 41.495 | 1.334 | 3.41 | -1.19 |
| | | | | 1 720.0 | 40.114 | 1.354 | 41.472 | 1.341 | 3.39 | -0.96 |
| | | | | 1 732.4 | 40.097 | 1.361 | 41.427 | 1.352 | 3.32 | -0.66 |
| | | | | 1 732.5 | 40.097 | 1.361 | 41.427 | 1.352 | 3.32 | -0.66 |
| | | | | 1 745.0 | 40.079 | 1.369 | 41.375 | 1.364 | 3.23 | -0.37 |
| | | | | 1 752.6 | 40.069 | 1.373 | 41.342 | 1.371 | 3.18 | -0.15 |
| | | | | 1 770.0 | 40.043 | 1.383 | 41.267 | 1.387 | 3.06 | 0.29 |
| | | | | 1 800.0 | 40.000 | 1.400 | 41.144 | 1.416 | 2.86 | 1.14 |
| Sep. 6. 2021 | 1900 Head | 20.2 | 20.0 | 1 850.2 | 40.000 | 1.400 | 38.835 | 1.382 | -2.91 | -1.29 |
| | | | | 1 852.4 | 40.000 | 1.400 | 38.828 | 1.384 | -2.93 | -1.14 |
| | | | | 1 860.0 | 40.000 | 1.400 | 38.812 | 1.391 | -2.97 | -0.64 |
| | | | | 1 880.0 | 40.000 | 1.400 | 38.784 | 1.412 | -3.04 | 0.86 |
| | | | | 1 900.0 | 40.000 | 1.400 | 38.731 | 1.430 | -3.17 | 2.14 |
| | | | | 1 907.6 | 40.000 | 1.400 | 38.708 | 1.436 | -3.23 | 2.57 |
| | | | | 1 909.8 | 40.000 | 1.400 | 38.703 | 1.438 | -3.24 | 2.71 |
| Sep. 17. 2021 | 2450 Head | 21.2 | 21.1 | 2 402.0 | 39.282 | 1.757 | 39.272 | 1.730 | -0.03 | -1.54 |
| | | | | 2 412.0 | 39.265 | 1.766 | 39.235 | 1.740 | -0.08 | -1.47 |
| | | | | 2 437.0 | 39.222 | 1.788 | 39.149 | 1.768 | -0.19 | -1.12 |
| | | | | 2 441.0 | 39.215 | 1.792 | 39.136 | 1.773 | -0.20 | -1.06 |
| | | | | 2 450.0 | 39.200 | 1.800 | 39.107 | 1.783 | -0.24 | -0.94 |
| | | | | 2 462.0 | 39.184 | 1.813 | 39.075 | 1.795 | -0.28 | -0.99 |
| | | | | 2 480.0 | 39.160 | 1.832 | 39.014 | 1.814 | -0.37 | -0.98 |
| Sep. 23. 2021 | 5300 Head | 20.8 | 20.7 | 5 260.0 | 35.940 | 4.720 | 35.838 | 4.834 | -0.28 | 2.42 |
| | | | | 5 270.0 | 35.930 | 4.730 | 35.826 | 4.845 | -0.29 | 2.43 |
| | | | | 5 280.0 | 35.920 | 4.740 | 35.816 | 4.854 | -0.29 | 2.41 |
| | | | | 5 290.0 | 35.910 | 4.750 | 35.799 | 4.863 | -0.31 | 2.38 |
| | | | | 5 300.0 | 35.900 | 4.760 | 35.778 | 4.872 | -0.34 | 2.35 |
| | | | | 5 310.0 | 35.890 | 4.770 | 35.757 | 4.885 | -0.37 | 2.41 |
| | | | | 5 320.0 | 35.880 | 4.780 | 35.741 | 4.897 | -0.39 | 2.45 |
| Sep. 26. 2021 | 5600 Head | 20.8 | 20.9 | 5 500.0 | 35.650 | 4.965 | 34.789 | 4.940 | -2.42 | -0.50 |
| | | | | 5 510.0 | 35.635 | 4.976 | 34.786 | 4.951 | -2.38 | -0.50 |
| | | | | 5 530.0 | 35.605 | 4.997 | 34.776 | 4.979 | -2.33 | -0.36 |
| | | | | 5 550.0 | 35.575 | 5.018 | 34.775 | 5.002 | -2.25 | -0.32 |
| | | | | 5 580.0 | 35.530 | 5.049 | 34.749 | 5.040 | -2.20 | -0.18 |
| | | | | 5 600.0 | 35.500 | 5.070 | 34.746 | 5.066 | -2.12 | -0.08 |
| | | | | 5 610.0 | 35.490 | 5.080 | 34.745 | 5.073 | -2.10 | -0.14 |
| | | | | 5 660.0 | 35.440 | 5.130 | 34.697 | 5.129 | -2.10 | -0.02 |
| | | | | 5 670.0 | 35.430 | 5.140 | 34.683 | 5.139 | -2.11 | -0.02 |
| | | | | 5 690.0 | 35.410 | 5.160 | 34.660 | 5.166 | -2.12 | 0.12 |
| | | | | 5 710.0 | 35.390 | 5.180 | 34.651 | 5.189 | -2.09 | 0.17 |
| | | | | 5 720.0 | 35.380 | 5.190 | 34.645 | 5.197 | -2.08 | 0.13 |
| | | | | 5 800.0 | 35.300 | 5.270 | 34.541 | 5.286 | -2.15 | 0.30 |
| Sep. 27. 2021 | 5800 Head | 20.7 | 20.4 | 5 745.0 | 35.355 | 5.215 | 34.469 | 5.202 | -2.51 | -0.25 |
| | | | | 5 755.0 | 35.345 | 5.225 | 34.459 | 5.213 | -2.51 | -0.23 |
| | | | | 5 775.0 | 35.325 | 5.245 | 34.437 | 5.232 | -2.51 | -0.25 |
| | | | | 5 785.0 | 35.315 | 5.255 | 34.419 | 5.244 | -2.54 | -0.21 |
| | | | | 5 795.0 | 35.305 | 5.265 | 34.405 | 5.257 | -2.55 | -0.15 |
| | | | | 5 800.0 | 35.300 | 5.270 | 34.399 | 5.264 | -2.55 | -0.11 |
| | | | | 5 825.0 | 35.275 | 5.296 | 34.387 | 5.289 | -2.52 | -0.13 |

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 865664 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.

**Measurement Procedure for Tissue verification:**

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

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

where $Y$ is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$ , $\omega$ is the angular frequency, and $j = \sqrt{-1}$ .

## 10.2 Test System Verification

Prior to assessment, the system is verified to the ± 10 % of the specifications at using the SAR Dipole kit(s). (Graphic Plots Attached)

### Table 10.2.1 System Verification Results (1g)

| SYSTEM DIPOLE VERIFICATION TARGET & MEASURED | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAR System # | Freq. [MHz] | SAR Dipole kits | Date(s) | Tissue Type | Ambient Temp. [°C] | Liquid Temp. [°C] | Probe S/N | Input Power (mW) | 1 W Target $SAR_{1g}$ (W/kg) | Measured $SAR_{1g}$ (W/kg) | 1 W Normalized $SAR_{1g}$ (W/kg) | Deviation [%] |
| D | 1 800 | D1800V2, SN:2d047 | Sep. 7. 2021 | Head | 20.7 | 20.5 | 3327 | 100 | 39.3 | 4.12 | 41.20 | 4.83 |
| D | 1 900 | D1900V2, SN:5d029 | Sep. 6. 2021 | Head | 20.2 | 20.0 | 3327 | 100 | 40.5 | 4.18 | 41.80 | 3.21 |
| A | 2 450 | D2450V2, SN: 716 | Sep. 17. 2021 | Head | 21.2 | 21.1 | 3916 | 100 | 54.1 | 5.62 | 56.20 | 3.88 |
| C | 5 300 | D5GHzV2, SN:1103 | Sep. 23. 2021 | Head | 20.8 | 20.7 | 7368 | 100 | 84.7 | 7.98 | 79.80 | -5.79 |
| C | 5 600 | D5GHzV2, SN:1103 | Sep. 26. 2021 | Head | 20.8 | 20.9 | 7368 | 100 | 86.4 | 8.39 | 83.90 | -2.89 |
| C | 5 800 | D5GHzV2, SN:1103 | Sep. 27. 2021 | Head | 20.7 | 20.4 | 7368 | 100 | 83.5 | 7.87 | 78.70 | -5.75 |

### Table 10.2.2 System Verification Results (10g)

| SYSTEM DIPOLE VERIFICATION TARGET & MEASURED | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAR System # | Freq. [MHz] | SAR Dipole kits | Date(s) | Tissue Type | Ambient Temp. [°C] | Liquid Temp. [°C] | Probe S/N | Input Power (mW) | 1 W Target $SAR_{10g}$ (W/kg) | Measured $SAR_{10g}$ (W/kg) | 1 W Normalized $SAR_{10g}$ (W/kg) | Deviation [%] |
| C | 5 300 | D5GHzV2, SN:1103 | Sep. 23. 2021 | Head | 20.8 | 20.7 | 7368 | 100 | 24.1 | 2.30 | 23.00 | -4.56 |
| C | 5 600 | D5GHzV2, SN:1103 | Sep. 26. 2021 | Head | 20.8 | 20.9 | 7368 | 100 | 24.5 | 2.32 | 23.20 | -5.31 |
| C | 5 800 | D5GHzV2, SN:1103 | Sep. 27. 2021 | Head | 20.7 | 20.4 | 7368 | 100 | 23.5 | 2.19 | 21.90 | -6.81 |

Note(s) :
1. System Verification was measured with input 100 mW and normalized to 1W.
2. Full system validation status and results can be found in Attachment D.

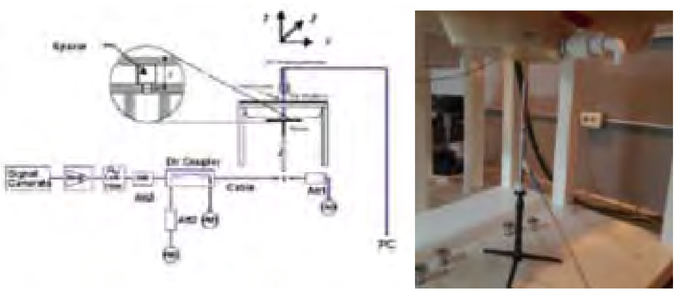

**Figure 10.1 Dipole Verification Test Setup Diagram & Photo**

# 11. SAR TEST RESULTS

## 11.1 Head SAR Results

### Table 11.1.1 PCS/GPRS 1900 Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | # of Time Slots | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | -0.110 | Left Touch | FCC #1 | 1 | 1:8.3 | 0.140 | 1.213 | **0.170** | A1 |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | 0.020 | Right Touch | FCC #1 | 1 | 1:8.3 | 0.089 | 1.213 | 0.108 | |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | -0.100 | Left Tilt | FCC #1 | 1 | 1:8.3 | 0.065 | 1.213 | 0.079 | |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | -0.170 | Right Tilt | FCC #1 | 1 | 1:8.3 | 0.053 | 1.213 | 0.064 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | -0.140 | Left Touch | FCC #1 | 4 | 1:2.075 | 0.210 | 1.161 | **0.244** | A2 |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | -0.160 | Right Touch | FCC #1 | 4 | 1:2.075 | 0.131 | 1.161 | 0.152 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.170 | Left Tilt | FCC #1 | 4 | 1:2.075 | 0.092 | 1.161 | 0.107 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | -0.090 | Right Tilt | FCC #1 | 4 | 1:2.075 | 0.081 | 1.161 | 0.094 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

### Table 11.1.2 WCDMA 1700 Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | -0.140 | Left Touch | FCC #1 | 1:1 | 0.272 | 1.309 | **0.356** | A3 |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.040 | Right Touch | FCC #1 | 1:1 | 0.117 | 1.309 | 0.153 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.180 | Left Tilt | FCC #1 | 1:1 | 0.173 | 1.309 | 0.226 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.070 | Right Tilt | FCC #1 | 1:1 | 0.101 | 1.309 | 0.132 | |
| **ANSI / IEEE C95.1-2005– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | |

### Table 11.1.3 WCDMA 1900 Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.160 | Left Touch | FCC #1 | 1:1 | 0.348 | 1.390 | 0.484 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.110 | Right Touch | FCC #1 | 1:1 | 0.400 | 1.390 | **0.556** | A4 |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | 0.140 | Left Tilt | FCC #1 | 1:1 | 0.190 | 1.390 | 0.264 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | 0.140 | Right Tilt | FCC #1 | 1:1 | 0.300 | 1.390 | 0.417 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | |

### Table 11.1.4 LTE Band 4 (AWS) Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | BW [MHz] | Max Allowed Power [dBm] | Cond. PWR [dBm] | Drift Power [dB] | MPR | Position | Device Serial Number | Mod. | RB Size | RB Offs. | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | | | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.020 | 0 | Left Touch | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.210 | 1.349 | **0.283** | A5 |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.130 | 1 | Left Touch | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.178 | 1.387 | 0.247 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.130 | 0 | Right Touch | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.108 | 1.349 | 0.146 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.040 | 1 | Right Touch | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.091 | 1.387 | 0.126 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | -0.190 | 0 | Left Tilt | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.109 | 1.349 | 0.147 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | -0.030 | 1 | Left Tilt | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.095 | 1.387 | 0.132 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.180 | 0 | Right Tilt | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.095 | 1.349 | 0.128 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | -0.030 | 1 | Right Tilt | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.075 | 1.387 | 0.104 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | | |

### Table 11.1.5 LTE Band 2 (PCS) Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | BW [MHz] | Max Allowed Power [dBm] | Cond. PWR [dBm] | Drift Power [dB] | MPR | Position | Device Serial Number | Mod. | RB Size | RB Offs. | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | | | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | 0.020 | 0 | Left Touch | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.264 | 1.321 | **0.349** | A6 |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.000 | 1 | Left Touch | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.185 | 1.380 | 0.255 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.190 | 0 | Right Touch | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.155 | 1.321 | 0.205 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.090 | 1 | Right Touch | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.131 | 1.380 | 0.181 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.090 | 0 | Left Tilt | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.167 | 1.321 | 0.221 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | 0.090 | 1 | Left Tilt | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.136 | 1.380 | 0.188 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.180 | 0 | Right Tilt | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.133 | 1.321 | 0.176 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | 0.060 | 1 | Right Tilt | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.104 | 1.380 | 0.144 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | | |

## Table 11.1.6 DTS Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode (Antenna) | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.000 | Left Touch | FCC #2 | 0.021 | 1 | 91.5 | 0.018 | 1.875 | 1.093 | 0.037 | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.000 | Right Touch | FCC #2 | 0.056 | 1 | 91.5 | 0.062 | 1.875 | 1.093 | **0.127** | A7 |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.000 | Left Tilt | FCC #2 | 0.007 | 1 | 91.5 | 0.004 | 1.875 | 1.093 | 0.008 | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.000 | Right Tilt | FCC #2 | 0.015 | 1 | 91.5 | 0.013 | 1.875 | 1.093 | 0.027 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | | |

| Adjusted SAR results for OFDM SAR | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Antenna | Service | Maximum Allowed Power [dBm] | 1g Scaled SAR (W/kg) | FREQUENCY [MHz] | Mode | Service | Maximum Allowed Power [dBm | Ratio of OFDM to DSSS | 1g Adjusted SAR (W/kg) | Determine OFDM SAR |
| MHz | Ch | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.127 | 2 437.0 | 802.11g | OFDM | 15.0 | 1.000 | **0.127** | X |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.127 | 2 437.0 | 802.11n | OFDM | 15.0 | 1.000 | **0.127** | X |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | |

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

## Table 11.1.7 UNII Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode (Antenna) | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.000 | Left Touch | FCC #2 | 0.047 | MCS0 | 89.2 | 0.027 | 1.845 | 1.121 | 0.056 | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.000 | Right Touch | FCC #2 | 0.098 | MCS0 | 89.2 | 0.080 | 1.845 | 1.121 | **0.165** | A8 |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.000 | Left Tilt | FCC #2 | 0.006 | MCS0 | 89.2 | 0.009 | 1.845 | 1.121 | 0.019 | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.000 | Right Tilt | FCC #2 | 0.035 | MCS0 | 89.2 | 0.020 | 1.845 | 1.121 | 0.041 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | | |

| Adjusted SAR results for UNII-1 and UNII-2A SAR | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Antenna | Service | Maximum Allowed Power [dBm] | 1g Scaled SAR (W/kg) | FREQUENCY [MHz] | Mode | Service | Maximum Allowed Power [dBm | Adjusted Factor | 1g Adjusted SAR (W/kg) | **SAR for** the band with lower maximum output power |
| MHz | Ch | | | | | | | | | | | |
| 5 290.0 | 58 | 802.11ac | OFDM | 14.5 | 0.165 | 5 210.0 | 802.11ac | OFDM | 14.5 | 1.000 | **0.165** | X |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | |

Note: U-NII-1 and U-NII-2A Bands: When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

## Table 11.1.8 UNII Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode (Antenna) | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.000 | Left Touch | FCC #2 | 0.002 | MCS0 | 89.2 | 0.006 | 2.168 | 1.121 | 0.015 | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.000 | Right Touch | FCC #2 | 0.079 | MCS0 | 89.2 | 0.059 | 2.168 | 1.121 | **0.143** | A9 |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.000 | Left Tilt | FCC #2 | 0.015 | MCS0 | 89.2 | 0.013 | 2.168 | 1.121 | 0.032 | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.000 | Right Tilt | FCC #2 | 0.025 | MCS0 | 89.2 | 0.017 | 2.168 | 1.121 | 0.041 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | | |

## Table 11.1.9 UNII Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode (Antenna) | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.000 | Left Touch | FCC #2 | 0.063 | MCS0 | 89.2 | 0.031 | 2.466 | 1.121 | 0.086 | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.000 | Right Touch | FCC #2 | 0.106 | MCS0 | 89.2 | 0.079 | 2.466 | 1.121 | **0.218** | A10 |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.000 | Left Tilt | FCC #2 | 0.017 | MCS0 | 89.2 | 0.012 | 2.466 | 1.121 | 0.033 | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.000 | Right Tilt | FCC #2 | 0.042 | MCS0 | 89.2 | 0.024 | 2.466 | 1.121 | 0.066 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | | |

## Table 11.1.10 Bluetooth Head SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Rate [Mbps] | Duty Cycle (%) | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | Left Touch | FCC #2 | 1 | 76.8 | 0.008 | 2.163 | 1.302 | 0.023 | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | Right Touch | FCC #2 | 1 | 76.8 | 0.033 | 2.163 | 1.302 | **0.093** | A11 |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | Left Tilt | FCC #2 | 1 | 76.8 | 0.003 | 2.163 | 1.302 | 0.008 | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | Right Tilt | FCC #2 | 1 | 76.8 | 0.008 | 2.163 | 1.302 | 0.023 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Head 1.6 W/kg (mW/g)** averaged over 1 gram | | | | | | |

## 11.2 Standalone Body-Worn SAR Worn SAR Results

### Table 11.2.1 PCS/GPRS/WCDMA Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Spacing [Side] | Device Serial Number | # of Time Slots | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | 0.020 | 10 mm [Front] | FCC #1 | 1 | 1:8.3 | 0.089 | 1.213 | 0.108 | |
| 1 880.0 | 661 | PCS1900 | PCS | 30.40 | 29.56 | 0.130 | 10 mm [Rear] | FCC #1 | 1 | 1:8.3 | 0.308 | 1.213 | **0.374** | A12 |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.160 | 10 mm [Front] | FCC #1 | 4 | 1:2.075 | 0.134 | 1.161 | 0.156 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.010 | 10 mm [Rear] | FCC #1 | 4 | 1:2.075 | 0.469 | 1.161 | **0.545** | A13 |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | -0.140 | 10 mm [Front] | FCC #1 | N/A | 1:1 | 0.473 | 1.309 | 0.619 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.000 | 10 mm [Rear] | FCC #1 | N/A | 1:1 | 0.606 | 1.309 | **0.793** | A14 |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.150 | 10 mm [Front] | FCC #1 | N/A | 1:1 | 0.486 | 1.390 | 0.676 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | 0.050 | 10 mm [Rear] | FCC #1 | N/A | 1:1 | 0.571 | 1.390 | **0.794** | A15 |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

Note: Yellow entries represent variability measurements

### Table 11.2.2 LTE B4, B2 Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | BW [MHz] | Max Allowed Power [dBm] | Cond. PWR [dBm] | Drift Power [dB] | MPR | Position | Device Serial Number | Mod. | RB Size | RB Offs. | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | | | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.050 | 0 | 10 mm [Front] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.299 | 1.349 | 0.403 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.050 | 1 | 10 mm [Front] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.242 | 1.387 | 0.336 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | -0.040 | 0 | 10 mm [Rear] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.525 | 1.349 | **0.708** | A16 |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | -0.050 | 1 | 10 mm [Rear] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.425 | 1.387 | 0.589 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.130 | 0 | 10 mm [Front] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.284 | 1.321 | 0.375 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.070 | 1 | 10 mm [Front] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.234 | 1.380 | 0.323 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.080 | 0 | 10 mm [Rear] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.605 | 1.321 | **0.799** | A17 |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.050 | 1 | 10 mm [Rear] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.557 | 1.380 | 0.769 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Body<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

### Table 11.2.3 DTS Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.090 | 10 mm [Front] | FCC #2 | 0.017 | 1 | 91.5 | 0.014 | 1.875 | 1.093 | 0.029 | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | -0.140 | 10 mm [Rear] | FCC #2 | 0.101 | 1 | 91.5 | 0.089 | 1.875 | 1.093 | **0.182** | A18 |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

| Adjusted SAR results for OFDM SAR | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Antenna | Service | Maximum Allowed Power [dBm] | 1g Scaled SAR (W/kg) | FREQUENCY [MHz] | Mode | Service | Maximum Allowed Power [dBm | Ratio of OFDM to DSSS | 1g Adjusted SAR (W/kg) | Determine OFDM SAR |
| MHz | Ch | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.182 | 2 437.0 | 802.11g | OFDM | 15.0 | 1.000 | **0.182** | X |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.182 | 2 437.0 | 802.11n | OFDM | 15.0 | 1.000 | **0.182** | X |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | **Body<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

### Table 11.2.4 UNII Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | -0.020 | 10 mm [Front] | FCC #2 | 0.027 | MCS0 | 89.2 | 0.015 | 1.845 | 1.121 | 0.031 | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | -0.070 | 10 mm [Rear] | FCC #2 | 0.318 | MCS0 | 89.2 | 0.331 | 1.845 | 1.121 | **0.685** | A19 |
| **ANSI / IEEE C95.1-2005– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

| Adjusted SAR results for UNII-1 and UNII-2A SAR | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Antenna | Service | Maximum Allowed Power [dBm] | 1g Scaled SAR (W/kg) | FREQUENCY [MHz] | Mode | Service | Maximum Allowed Power [dBm | Adjusted Factor | 1g Adjusted SAR (W/kg) | SAR for the band with lower maximum output power |
| MHz | Ch | | | | | | | | | | | |
| 5 290.0 | 58 | 802.11ac | OFDM | 14.5 | 0.685 | 5 210.0 | 802.11ac | OFDM | 14.5 | 1.000 | **0.685** | X |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure** | | | | | | **Head<br>1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

Note: U-NII-1 and U-NII-2A Bands: When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

## Table 11.2.5 UNII Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | -0.080 | 10 mm [Front] | FCC #2 | 0.042 | MCS0 | 89.2 | 0.027 | 2.168 | 1.121 | 0.066 | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | -0.170 | 10 mm [Rear] | FCC #2 | 0.262 | MCS0 | 89.2 | 0.257 | 2.168 | 1.121 | **0.625** | A20 |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

## Table 11.2.6 UNII Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | -0.170 | 10 mm [Front] | FCC #2 | 0.034 | MCS0 | 89.2 | 0.022 | 2.466 | 1.121 | 0.061 | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | -0.160 | 10 mm [Rear] | FCC #2 | 0.209 | MCS0 | 89.2 | 0.216 | 2.466 | 1.121 | **0.597** | A21 |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

## Table 11.2.7 Bluetooth Body-Worn SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Rate [Mbps] | Duty Cycle (%) | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | 10 mm [Front] | FCC #2 | 1 | 76.8 | 0.005 | 2.163 | 1.302 | 0.014 | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | -0.120 | 10 mm [Rear] | FCC #2 | 1 | 76.8 | 0.039 | 2.163 | 1.302 | **0.110** | A22 |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

## 11.3 Standalone Hotspot SAR Results

### Table 11.3.1 GPRS/WCDMA Hotspot SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | Service | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Spacing [Side] | Device Serial Number | # of Time Slots | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.090 | 10 mm [Bottom] | FCC #1 | 4 | 1:2.075 | 0.199 | 1.161 | 0.231 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.160 | 10 mm [Front] | FCC #1 | 4 | 1:2.075 | 0.134 | 1.161 | 0.156 | |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | 0.010 | 10 mm [Rear] | FCC #1 | 4 | 1:2.075 | 0.469 | 1.161 | **0.545** | A13 |
| 1 880.0 | 661 | PCS1900 | GPRS | 24.40 | 23.75 | -0.050 | 10 mm [Left] | FCC #1 | 4 | 1:2.075 | 0.283 | 1.161 | 0.329 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.010 | 10 mm [Bottom] | FCC #1 | N/A | 1:1 | 0.176 | 1.309 | 0.230 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | -0.140 | 10 mm [Front] | FCC #1 | N/A | 1:1 | 0.473 | 1.309 | 0.619 | |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | 0.000 | 10 mm [Rear] | FCC #1 | N/A | 1:1 | 0.606 | 1.309 | **0.793** | A15 |
| 1 732.4 | 1412 | WCDMA 1700 | RMC | 24.50 | 23.33 | -0.050 | 10 mm [Left] | FCC #1 | N/A | 1:1 | 0.333 | 1.309 | 0.436 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.020 | 10 mm [Bottom] | FCC #1 | N/A | 1:1 | 0.200 | 1.390 | 0.278 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.150 | 10 mm [Front] | FCC #1 | N/A | 1:1 | 0.486 | 1.390 | 0.676 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | 0.050 | 10 mm [Rear] | FCC #1 | N/A | 1:1 | 0.571 | 1.390 | 0.794 | |
| 1 852.4 | 9262 | WCDMA 1900 | RMC | 24.50 | 23.19 | -0.030 | 10 mm [Left] | FCC #1 | N/A | 1:1 | 0.613 | 1.352 | 0.829 | |
| 1 880.0 | 9400 | WCDMA 1900 | RMC | 24.50 | 23.07 | -0.050 | 10 mm [Left] | FCC #1 | N/A | 1:1 | 0.608 | 1.390 | **0.845** | A23 |
| 1 907.6 | 9538 | WCDMA 1900 | RMC | 24.50 | 23.14 | -0.030 | 10 mm [Left] | FCC #1 | N/A | 1:1 | 0.541 | 1.368 | 0.740 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

Note: Yellow entries represent variability measurements

### Table 11.3.2 LTE B4 Hotspot SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | BW [MHz] | Max Allowed Power [dBm] | Cond. PWR [dBm] | Drift Power [dB] | MPR | Position | Device Serial Number | Mod. | RB Size | RB Offs. | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | | | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.140 | 0 | 10 mm [Bottom] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.169 | 1.349 | 0.228 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.170 | 1 | 10 mm [Bottom] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.146 | 1.387 | 0.203 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.050 | 0 | 10 mm [Front] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.299 | 1.349 | 0.403 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.050 | 1 | 10 mm [Front] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.242 | 1.387 | 0.336 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | -0.040 | 0 | 10 mm [Rear] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.525 | 1.349 | **0.708** | A16 |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | -0.050 | 1 | 10 mm [Rear] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.425 | 1.387 | 0.589 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 24.50 | 23.20 | 0.100 | 0 | 10 mm [Left] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.275 | 1.349 | 0.371 | |
| 1 732.5 | 20175 | LTE B4 | 20 | 23.50 | 22.08 | 0.100 | 1 | 10 mm [Left] | FCC #1 | QPSK | 50 | 25 | 1:1 | 0.228 | 1.387 | 0.316 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | | |

### Table 11.3.3 LTE B2 Hotspot SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Band | BW [MHz] | Max Allowed Power [dBm] | Cond. PWR [dBm] | Drift Power [dB] | MPR | Position | Device Serial Number | Mod. | RB Size | RB Offs. | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | | | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.050 | 0 | 10 mm [Bottom] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.148 | 1.321 | 0.196 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.00 | 22.10 | -0.140 | 1 | 10 mm [Bottom] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.121 | 1.549 | 0.187 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.130 | 0 | 10 mm [Front] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.284 | 1.321 | 0.375 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.070 | 1 | 10 mm [Front] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.234 | 1.380 | 0.323 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.080 | 0 | 10 mm [Rear] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.605 | 1.321 | **0.799** | A17 |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.050 | 1 | 10 mm [Rear] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.557 | 1.380 | 0.769 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 24.50 | 23.29 | -0.070 | 0 | 10 mm [Left] | FCC #1 | QPSK | 1 | 0 | 1:1 | 0.363 | 1.321 | 0.480 | |
| 1 860.0 | 18700 | LTE B2 | 20 | 23.50 | 22.10 | -0.050 | 1 | 10 mm [Left] | FCC #1 | QPSK | 50 | 0 | 1:1 | 0.309 | 1.380 | 0.426 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | | |

### Table 11.3.4 DTS Hotspot SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | -0.140 | 10 mm [Top] | FCC #2 | 0.005 | 1 | 91.5 | 0.003 | 1.875 | 1.093 | 0.006 | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.090 | 10 mm [Front] | FCC #2 | 0.017 | 1 | 91.5 | 0.014 | 1.875 | 1.093 | 0.029 | |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | -0.140 | 10 mm [Rear] | FCC #2 | 0.101 | 1 | 91.5 | 0.089 | 1.875 | 1.093 | **0.182** | A18 |
| 2 437.0 | 6 | 802.11b | 15.00 | 12.27 | 0.040 | 10 mm [Left] | FCC #2 | 0.055 | 1 | 91.5 | 0.048 | 1.875 | 1.093 | 0.098 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | | |

| Adjusted SAR results for OFDM SAR | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode/ Antenna | Service | Maximum Allowed Power [dBm] | 1g Scaled SAR (W/kg) | FREQUENCY [MHz] | Mode | Service | Maximum Allowed Power [dBm | Ratio of OFDM to DSSS | 1g Adjusted SAR (W/kg) | Determine OFDM SAR |
| MHz | Ch | | | | | | | | | | | |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.182 | 2 437.0 | 802.11g | OFDM | 15.0 | 1.000 | **0.182** | X |
| 2 437.0 | 6 | 802.11b | DSSS | 15.0 | 0.182 | 2 437.0 | 802.11n | OFDM | 15.0 | 1.000 | **0.182** | X |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

Note: SAR is not required for the following 2.4 GHz OFDM conditions. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

### Table 11.3.5 Bluetooth Hotspot SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Rate [Mbps] | Duty Cycle (%) | 1g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 1g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | 10 mm [Top] | FCC #2 | 1 | 76.8 | < 0.001 | 2.163 | 1.302 | < 0.001 | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | 0.000 | 10 mm [Front] | FCC #2 | 1 | 76.8 | 0.005 | 2.163 | 1.302 | 0.014 | |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | -0.120 | 10 mm [Rear] | FCC #2 | 1 | 76.8 | 0.039 | 2.163 | 1.302 | **0.110** | A22 |
| 2 441.0 | 39 | Bluetooth | 16.00 | 12.65 | -0.020 | 10 mm [Left] | FCC #2 | 1 | 76.8 | 0.035 | 2.163 | 1.302 | 0.099 | |
| **ANSI / IEEE C95.1-1992– SAFETY LIMIT**<br>**Spatial Peak**<br>**Uncontrolled Exposure/General Population Exposure** | | | | | | | | **Body**<br>**1.6 W/kg (mW/g)**<br>averaged over 1 gram | | | | | | |

## 11.4 Standalone Phablet SAR Results

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required when Hotspot 1g SAR (scaled to maximum output power including tolerance) < 1.2 W/kg.

### Table 11.4.1 UNII Phablet SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 10g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 10g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | -0.020 | 0 mm [Top] | FCC #2 | 0.007 | MCS0 | 89.2 | 0.006 | 1.845 | 1.121 | 0.012 | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.090 | 0 mm [Front] | FCC #2 | 0.046 | MCS0 | 89.2 | 0.032 | 1.845 | 1.121 | 0.066 | |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | 0.110 | 0 mm [Rear] | FCC #2 | 0.354 | MCS0 | 89.2 | 0.348 | 1.845 | 1.121 | **0.720** | A24 |
| 5 290.0 | 58 | 802.11ac | 14.50 | 11.84 | -0.160 | 0 mm [Left] | FCC #2 | 0.210 | MCS0 | 89.2 | 0.234 | 1.845 | 1.121 | 0.484 | |
| ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure | | | | | | | | Phablet<br>4.0 W/kg (mW/g)<br>averaged over 10 gram | | | | | | | |

### Table 11.4.2 UNII Phablet SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 10g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 10g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | -0.070 | 0 mm [Top] | FCC #2 | 0.015 | MCS0 | 89.2 | 0.013 | 2.168 | 1.019 | 0.029 | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.030 | 0 mm [Front] | FCC #2 | 0.052 | MCS0 | 89.2 | 0.039 | 2.168 | 1.019 | 0.086 | |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.120 | 0 mm [Rear] | FCC #2 | 0.416 | MCS0 | 89.2 | 0.447 | 2.168 | 1.019 | **0.988** | A25 |
| 5 610.0 | 122 | 802.11ac | 14.50 | 11.14 | 0.160 | 0 mm [Left] | FCC #2 | 0.234 | MCS0 | 89.2 | 0.272 | 2.168 | 1.019 | 0.601 | |
| ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure | | | | | | | | Phablet<br>4.0 W/kg (mW/g)<br>averaged over 10 gram | | | | | | | |

### Table 11.4.3 UNII Phablet SAR

| MEASUREMENT RESULTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQUENCY | | Mode | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Drift Power [dB] | Phantom Position | Device Serial Number | Peak SAR of Area Scan | Data Rate [Mbps] | Duty Cycle | 10g SAR (W/kg) | Scaling Factor | Scaling Factor (Duty Cycle) | 10g Scaled SAR (W/kg) | Plots # |
| MHz | Ch | | | | | | | | | | | | | | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.030 | 0 mm [Top] | FCC #2 | 0.016 | MCS0 | 89.2 | 0.014 | 2.466 | 1.121 | 0.039 | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | -0.070 | 0 mm [Front] | FCC #2 | 0.041 | MCS0 | 89.2 | 0.030 | 2.466 | 1.121 | 0.083 | |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | 0.160 | 0 mm [Rear] | FCC #2 | 0.341 | MCS0 | 89.2 | 0.392 | 2.466 | 1.121 | **1.084** | A26 |
| 5 775.0 | 155 | 802.11ac | 14.50 | 10.58 | -0.140 | 0 mm [Left] | FCC #2 | 0.182 | MCS0 | 89.2 | 0.202 | 2.466 | 1.121 | 0.558 | |
| ANSI / IEEE C95.1-1992– SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population Exposure | | | | | | | | Phablet<br>4.0 W/kg (mW/g)<br>averaged over 10 gram | | | | | | | |

## 11.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all 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. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated with a headset connected to the device. Since the standalone reported boy-worn SAR was > 1.2 W/kg, additional body-worn SAR evaluations using a headset cable were performed.
8. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated.
9. SAR measurements were performed using the DASY5 automated system. The procedure for spatial peak SAR evaluation has been implemented according to the IEEE 1528 standard. During a maximum search, global and local maxima searches are automatically performed in 2-D after each area scan measurement. The algorithm will find the global maximum and all local maxima within 2 dB of the global maxima for all SAR distributions. All local maxima within 2 dB of the global maximum were searched and passed for the Zoom Scan measurement.

GSM Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. This device supports GSM VOIP in the head and body-worn configurations; therefore GPRS was additionally evaluated for head and body-worn compliance.
3. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR.
4. 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 then testing at the other channels is not required for such test configuration(s). Since the maximum output power variation across the required test channels is not > ½ dB, the middle channel was used for testing.

WCDMA (UMTS) Notes:

1. WCDMA (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 since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
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 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 D05v02r05. The general test procedures used for testing can be found in Section 8.4.4.
2. According to FCC KDB 941225 D05v02r05, when the reported SAR is ≤ 0.8 W/kg, testing of the 100% RB allocation and required test channels is not required.
   Otherwise, SAR is required for the remaining required test channels using the 1 RB, 50% RB and 100% RB allocation with highest output power for that channel.
   Only one channel, and as reported SAR values for 1 RB allocation and 50% RB allocation were less than 1.45 W/kg only the highest power RB offset for each allocation was required.
3. 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.
4. A-MPR was disabled for all SAR tests by setting NS=1 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).
5. SAR test reduction is applied using the following criteria:
   Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is > 0.8 W/kg, testing for other channels is performed at the highest output power level for 1 RB, and 50% RB configuration for that channel. Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg, Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg. Testing for 16QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/kg and its output power is not more than 0.5 dB higher than that a QPSK. Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

WLAN Notes:

1. The initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. 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 duo to the maximum allowed powers and the highest reported DSSS SAR when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output and the adjust SAR is ≤ 1.2 W/kg.
3. 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.
4. When the maximum reported 1g averaged SAR ≤ 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 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 to determine compliance.

# 12. FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

## 12.1 Introduction

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

## 12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 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 sum 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is $\leq$ 1.6 W/kg. The different test positon in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

## 12.3 Simultaneous Transmission Capabilities

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

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

## Table 12.3.1 Simultaneous SAR Cases

| No. | Capable Transmit Configuration | Head SAR | Body-Worn SAR | Hotspot SAR | Phablet SAR | Note |
|---|---|---|---|---|---|---|
| 1 | GSM Voice + Wi-Fi 2.4 GHz | Yes | Yes | N/A | Yes | |
| 2 | GSM Voice + Wi-Fi 5 GHz | Yes | Yes | N/A | Yes | |
| 3 | GSM Voice + Bluetooth 2.4 GHz | Yes | Yes | N/A | Yes | |
| 4 | GSM Voice + Bluetooth 2.4 GHz + Wi-Fi 5GHz | Yes | Yes | N/A | Yes | |
| 5 | WCDMA + Wi-Fi 2.4 GHz | Yes | Yes | Yes | Yes | |
| 6 | WCDMA + Wi-Fi 5 GHz | Yes | Yes | N/A | Yes | |
| 7 | WCDMA + Bluetooth 2.4 GHz | Yes | Yes | Yes | Yes | |
| 8 | WCMDA + Bluetooth 2.4 GHz + Wi-Fi 5GHz | Yes | Yes | N/A | Yes | |
| 9 | LTE + Wi-Fi 2.4 GHz | Yes | Yes | Yes | Yes | |
| 10 | LTE + Wi-Fi 5 GHz | Yes | Yes | N/A | Yes | |
| 11 | LTE + Bluetooth 2.4 GHz | Yes | Yes | Yes | Yes | |
| 12 | LTE + Bluetooth 2.4 GHz + Wi-Fi 5GHz | Yes | Yes | N/A | Yes | |
| 13 | GPRS + Wi-Fi 2.4 GHz | Yes | Yes | Yes | Yes | |
| 14 | GPRS + Wi-Fi 5 GHz | Yes | Yes | N/A | Yes | |
| 15 | GPRS + Bluetooth 2.4 GHz | Yes | Yes | Yes | Yes | |
| 16 | GPRS + Bluetooth 2.4 GHz + Wi-Fi 5GHz | Yes | Yes | N/A | Yes | |

Notes:
1. WiFi 2.4GHz is supported Hotspot.
2. WiFi 5GHz is not supported Hotspot.
3. LTE, WCDMA, GPRS is supported Hotspot.
4. VoIP is supported in LTE, WCDMA, GSM
5. GSM, WCDMA and LTE can not transmit simultaneously since they share the same chip.

## 12.4 Head SAR Simultaneous Transmission Analysis

### Table 12.4.1 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.3 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.3G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.023 | 0.056 | 0.193 | 0.226 | 0.249 |
| | | Right Touch | 0.108 | 0.093 | 0.165 | 0.201 | 0.273 | **0.366** |
| | | Left Tilt | 0.079 | 0.008 | 0.019 | 0.087 | 0.098 | 0.106 |
| | | Right Tilt | 0.064 | 0.023 | 0.041 | 0.087 | 0.105 | 0.128 |
| | GPRS 1900 | Left Touch | 0.244 | 0.023 | 0.056 | 0.267 | 0.300 | 0.323 |
| | | Right Touch | 0.152 | 0.093 | 0.165 | 0.245 | 0.317 | **0.410** |
| | | Left Tilt | 0.107 | 0.008 | 0.019 | 0.115 | 0.126 | 0.134 |
| | | Right Tilt | 0.094 | 0.023 | 0.041 | 0.117 | 0.135 | 0.158 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.023 | 0.056 | 0.379 | 0.412 | **0.435** |
| | | Right Touch | 0.153 | 0.093 | 0.165 | 0.246 | 0.318 | 0.411 |
| | | Left Tilt | 0.226 | 0.008 | 0.019 | 0.234 | 0.245 | 0.253 |
| | | Right Tilt | 0.132 | 0.023 | 0.041 | 0.155 | 0.173 | 0.196 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.023 | 0.056 | 0.507 | 0.540 | 0.563 |
| | | Right Touch | 0.556 | 0.093 | 0.165 | 0.649 | 0.721 | **0.814** |
| | | Left Tilt | 0.264 | 0.008 | 0.019 | 0.272 | 0.283 | 0.291 |
| | | Right Tilt | 0.417 | 0.023 | 0.041 | 0.440 | 0.458 | 0.481 |
| | LTE Band 4 | Left Touch | 0.283 | 0.023 | 0.056 | 0.306 | 0.339 | 0.362 |
| | | Right Touch | 0.146 | 0.093 | 0.165 | 0.239 | 0.311 | **0.404** |
| | | Left Tilt | 0.147 | 0.008 | 0.019 | 0.155 | 0.166 | 0.174 |
| | | Right Tilt | 0.128 | 0.023 | 0.041 | 0.151 | 0.169 | 0.192 |
| | LTE Band 2 | Left Touch | 0.349 | 0.023 | 0.056 | 0.372 | 0.405 | 0.428 |
| | | Right Touch | 0.205 | 0.093 | 0.165 | 0.298 | 0.370 | **0.463** |
| | | Left Tilt | 0.221 | 0.008 | 0.019 | 0.229 | 0.240 | 0.248 |
| | | Right Tilt | 0.176 | 0.023 | 0.041 | 0.199 | 0.217 | 0.240 |

### Table 12.4.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.6 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.6G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.023 | 0.015 | 0.193 | 0.185 | 0.208 |
| | | Right Touch | 0.108 | 0.093 | 0.143 | 0.201 | 0.251 | **0.344** |
| | | Left Tilt | 0.079 | 0.008 | 0.032 | 0.087 | 0.111 | 0.119 |
| | | Right Tilt | 0.064 | 0.023 | 0.041 | 0.087 | 0.105 | 0.128 |
| | GPRS 1900 | Left Touch | 0.244 | 0.023 | 0.015 | 0.267 | 0.259 | 0.282 |
| | | Right Touch | 0.152 | 0.093 | 0.143 | 0.245 | 0.295 | **0.388** |
| | | Left Tilt | 0.107 | 0.008 | 0.032 | 0.115 | 0.139 | 0.147 |
| | | Right Tilt | 0.094 | 0.023 | 0.041 | 0.117 | 0.135 | 0.158 |
| | WCDMA 1700 | **Left Touch** | 0.356 | 0.023 | 0.015 | 0.379 | 0.371 | **0.394** |
| | | Right Touch | 0.153 | 0.093 | 0.143 | 0.246 | 0.296 | 0.389 |
| | | Left Tilt | 0.226 | 0.008 | 0.032 | 0.234 | 0.258 | 0.266 |
| | | Right Tilt | 0.132 | 0.023 | 0.041 | 0.155 | 0.173 | 0.196 |
| | WCDMA 1900 | **Left Touch** | 0.484 | 0.023 | 0.015 | 0.507 | 0.499 | 0.522 |
| | | Right Touch | 0.556 | 0.093 | 0.143 | 0.649 | 0.699 | **0.792** |
| | | Left Tilt | 0.264 | 0.008 | 0.032 | 0.272 | 0.296 | 0.304 |
| | | Right Tilt | 0.417 | 0.023 | 0.041 | 0.440 | 0.458 | 0.481 |
| | LTE Band 4 | Left Touch | 0.283 | 0.023 | 0.015 | 0.306 | 0.298 | 0.321 |
| | | Right Touch | 0.146 | 0.093 | 0.143 | 0.239 | 0.289 | **0.382** |
| | | Left Tilt | 0.147 | 0.008 | 0.032 | 0.155 | 0.179 | 0.187 |
| | | Right Tilt | 0.128 | 0.023 | 0.041 | 0.151 | 0.169 | 0.192 |
| | LTE Band 2 | Left Touch | 0.349 | 0.023 | 0.015 | 0.372 | 0.364 | 0.387 |
| | | Right Touch | 0.205 | 0.093 | 0.143 | 0.298 | 0.348 | **0.441** |
| | | Left Tilt | 0.221 | 0.008 | 0.032 | 0.229 | 0.253 | 0.261 |
| | | Right Tilt | 0.176 | 0.023 | 0.041 | 0.199 | 0.217 | 0.240 |

### Table 12.4.3 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.8 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.8G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.023 | 0.086 | 0.193 | 0.256 | 0.279 |
| | | Right Touch | 0.108 | 0.093 | 0.218 | 0.201 | 0.326 | **0.419** |
| | | Left Tilt | 0.079 | 0.008 | 0.033 | 0.087 | 0.112 | 0.120 |
| | | Right Tilt | 0.064 | 0.023 | 0.066 | 0.087 | 0.130 | 0.153 |
| | GPRS 1900 | Left Touch | 0.244 | 0.023 | 0.086 | 0.267 | 0.330 | 0.353 |
| | | Right Touch | 0.152 | 0.093 | 0.218 | 0.245 | 0.370 | **0.463** |
| | | Left Tilt | 0.107 | 0.008 | 0.033 | 0.115 | 0.140 | 0.148 |
| | | Right Tilt | 0.094 | 0.023 | 0.066 | 0.117 | 0.160 | 0.183 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.023 | 0.086 | 0.379 | 0.442 | **0.465** |
| | | Right Touch | 0.153 | 0.093 | 0.218 | 0.246 | 0.371 | 0.464 |
| | | Left Tilt | 0.226 | 0.008 | 0.033 | 0.234 | 0.259 | 0.267 |
| | | Right Tilt | 0.132 | 0.023 | 0.066 | 0.155 | 0.198 | 0.221 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.023 | 0.086 | 0.507 | 0.570 | 0.593 |
| | | **Right Touch** | **0.556** | **0.093** | **0.218** | **0.649** | **0.774** | **0.867** |
| | | Left Tilt | 0.264 | 0.008 | 0.033 | 0.272 | 0.297 | 0.305 |
| | | Right Tilt | 0.417 | 0.023 | 0.066 | 0.440 | 0.483 | 0.506 |
| | LTE Band 4 | Left Touch | 0.283 | 0.023 | 0.086 | 0.306 | 0.369 | 0.392 |
| | | Right Touch | 0.146 | 0.093 | 0.218 | 0.239 | 0.364 | **0.457** |
| | | Left Tilt | 0.147 | 0.008 | 0.033 | 0.155 | 0.180 | 0.188 |
| | | Right Tilt | 0.128 | 0.023 | 0.066 | 0.151 | 0.194 | 0.217 |
| | LTE Band 2 | Left Touch | 0.349 | 0.023 | 0.086 | 0.372 | 0.435 | 0.458 |
| | | Right Touch | 0.205 | 0.093 | 0.218 | 0.298 | 0.423 | **0.516** |
| | | Left Tilt | 0.221 | 0.008 | 0.033 | 0.229 | 0.254 | 0.262 |
| | | Right Tilt | 0.176 | 0.023 | 0.066 | 0.199 | 0.242 | 0.265 |

### Table 12.4.4 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 2.4G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.037 | 0.207 |
| | | Right Touch | 0.108 | 0.127 | **0.235** |
| | | Left Tilt | 0.079 | 0.008 | 0.087 |
| | | Right Tilt | 0.064 | 0.027 | 0.091 |
| | GPRS 1900 | Left Touch | 0.244 | 0.037 | **0.281** |
| | | Right Touch | 0.152 | 0.127 | 0.279 |
| | | Left Tilt | 0.107 | 0.008 | 0.115 |
| | | Right Tilt | 0.094 | 0.027 | 0.121 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.037 | **0.393** |
| | | Right Touch | 0.153 | 0.127 | 0.280 |
| | | Left Tilt | 0.226 | 0.008 | 0.234 |
| | | Right Tilt | 0.132 | 0.027 | 0.159 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.037 | 0.521 |
| | | Right Touch | 0.556 | 0.127 | **0.683** |
| | | Left Tilt | 0.264 | 0.008 | 0.272 |
| | | Right Tilt | 0.417 | 0.027 | 0.444 |
| | LTE Band 4 | Left Touch | 0.283 | 0.037 | **0.320** |
| | | Right Touch | 0.146 | 0.127 | 0.273 |
| | | Left Tilt | 0.147 | 0.008 | 0.155 |
| | | Right Tilt | 0.128 | 0.027 | 0.155 |
| | LTE Band 2 | Left Touch | 0.349 | 0.037 | **0.386** |
| | | Right Touch | 0.205 | 0.127 | 0.332 |
| | | Left Tilt | 0.221 | 0.008 | 0.229 |
| | | Right Tilt | 0.176 | 0.027 | 0.203 |

## Table 12.4.5 Simultaneous Transmission Scenario : 2G/3G/4G + 5.3 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.3G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.056 | 0.226 |
| | | Right Touch | 0.108 | 0.165 | **0.273** |
| | | Left Tilt | 0.079 | 0.019 | 0.098 |
| | | Right Tilt | 0.064 | 0.041 | 0.105 |
| | GPRS 1900 | Left Touch | 0.244 | 0.056 | 0.300 |
| | | Right Touch | 0.152 | 0.165 | **0.317** |
| | | Left Tilt | 0.107 | 0.019 | 0.126 |
| | | Right Tilt | 0.094 | 0.041 | 0.135 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.056 | **0.412** |
| | | Right Touch | 0.153 | 0.165 | 0.318 |
| | | Left Tilt | 0.226 | 0.019 | 0.245 |
| | | Right Tilt | 0.132 | 0.041 | 0.173 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.056 | 0.540 |
| | | Right Touch | 0.556 | 0.165 | **0.721** |
| | | Left Tilt | 0.264 | 0.019 | 0.283 |
| | | Right Tilt | 0.417 | 0.041 | 0.458 |
| | LTE Band 4 | Left Touch | 0.283 | 0.056 | **0.339** |
| | | Right Touch | 0.146 | 0.165 | 0.311 |
| | | Left Tilt | 0.147 | 0.019 | 0.166 |
| | | Right Tilt | 0.128 | 0.041 | 0.169 |
| | LTE Band 2 | Left Touch | 0.349 | 0.056 | **0.405** |
| | | Right Touch | 0.205 | 0.165 | 0.370 |
| | | Left Tilt | 0.221 | 0.019 | 0.240 |
| | | Right Tilt | 0.176 | 0.041 | 0.217 |

## Table 12.4.6 Simultaneous Transmission Scenario : 2G/3G/4G + 5.6 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.6G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.015 | 0.185 |
| | | Right Touch | 0.108 | 0.143 | **0.251** |
| | | Left Tilt | 0.079 | 0.032 | 0.111 |
| | | Right Tilt | 0.064 | 0.041 | 0.105 |
| | GPRS 1900 | Left Touch | 0.244 | 0.015 | 0.259 |
| | | Right Touch | 0.152 | 0.143 | **0.295** |
| | | Left Tilt | 0.107 | 0.032 | 0.139 |
| | | Right Tilt | 0.094 | 0.041 | 0.135 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.015 | **0.371** |
| | | Right Touch | 0.153 | 0.143 | 0.296 |
| | | Left Tilt | 0.226 | 0.032 | 0.258 |
| | | Right Tilt | 0.132 | 0.041 | 0.173 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.015 | 0.499 |
| | | Right Touch | 0.556 | 0.143 | **0.699** |
| | | Left Tilt | 0.264 | 0.032 | 0.296 |
| | | Right Tilt | 0.417 | 0.041 | 0.458 |
| | LTE Band 4 | Left Touch | 0.283 | 0.015 | **0.298** |
| | | Right Touch | 0.146 | 0.143 | 0.289 |
| | | Left Tilt | 0.147 | 0.032 | 0.179 |
| | | Right Tilt | 0.128 | 0.041 | 0.169 |
| | LTE Band 2 | Left Touch | 0.349 | 0.015 | **0.364** |
| | | Right Touch | 0.205 | 0.143 | 0.348 |
| | | Left Tilt | 0.221 | 0.032 | 0.253 |
| | | Right Tilt | 0.176 | 0.041 | 0.217 |

## Table 12.4.7 Simultaneous Transmission Scenario : 2G/3G/4G + 5.8 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.8G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.086 | 0.256 |
| | | Right Touch | 0.108 | 0.218 | **0.326** |
| | | Left Tilt | 0.079 | 0.033 | 0.112 |
| | | Right Tilt | 0.064 | 0.066 | 0.130 |
| | GPRS 1900 | Left Touch | 0.244 | 0.086 | 0.330 |
| | | Right Touch | 0.152 | 0.218 | **0.370** |
| | | Left Tilt | 0.107 | 0.033 | 0.140 |
| | | Right Tilt | 0.094 | 0.066 | 0.160 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.086 | **0.442** |
| | | Right Touch | 0.153 | 0.218 | 0.371 |
| | | Left Tilt | 0.226 | 0.033 | 0.259 |
| | | Right Tilt | 0.132 | 0.066 | 0.198 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.086 | 0.570 |
| | | Right Touch | 0.556 | 0.218 | **0.774** |
| | | Left Tilt | 0.264 | 0.033 | 0.297 |
| | | Right Tilt | 0.417 | 0.066 | 0.483 |
| | LTE Band 4 | Left Touch | 0.283 | 0.086 | **0.369** |
| | | Right Touch | 0.146 | 0.218 | 0.364 |
| | | Left Tilt | 0.147 | 0.033 | 0.180 |
| | | Right Tilt | 0.128 | 0.066 | 0.194 |
| | LTE Band 2 | Left Touch | 0.349 | 0.086 | **0.435** |
| | | Right Touch | 0.205 | 0.218 | 0.423 |
| | | Left Tilt | 0.221 | 0.033 | 0.254 |
| | | Right Tilt | 0.176 | 0.066 | 0.242 |

## Table 12.4.8 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Held to Ear)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | GSM 1900 | Left Touch | 0.170 | 0.023 | 0.193 |
| | | Right Touch | 0.108 | 0.093 | **0.201** |
| | | Left Tilt | 0.079 | 0.008 | 0.087 |
| | | Right Tilt | 0.064 | 0.023 | 0.087 |
| | GPRS 1900 | Left Touch | 0.244 | 0.023 | **0.267** |
| | | Right Touch | 0.152 | 0.093 | 0.245 |
| | | Left Tilt | 0.107 | 0.008 | 0.115 |
| | | Right Tilt | 0.094 | 0.023 | 0.117 |
| | WCDMA 1700 | Left Touch | 0.356 | 0.023 | **0.379** |
| | | Right Touch | 0.153 | 0.093 | 0.246 |
| | | Left Tilt | 0.226 | 0.008 | 0.234 |
| | | Right Tilt | 0.132 | 0.023 | 0.155 |
| | WCDMA 1900 | Left Touch | 0.484 | 0.023 | 0.507 |
| | | Right Touch | 0.556 | 0.093 | **0.649** |
| | | Left Tilt | 0.264 | 0.008 | 0.272 |
| | | Right Tilt | 0.417 | 0.023 | 0.440 |
| | LTE Band 4 | Left Touch | 0.283 | 0.023 | **0.306** |
| | | Right Touch | 0.146 | 0.093 | 0.239 |
| | | Left Tilt | 0.147 | 0.008 | 0.155 |
| | | Right Tilt | 0.128 | 0.023 | 0.151 |
| | LTE Band 2 | Left Touch | 0.349 | 0.023 | **0.372** |
| | | Right Touch | 0.205 | 0.093 | 0.298 |
| | | Left Tilt | 0.221 | 0.008 | 0.229 |
| | | Right Tilt | 0.176 | 0.023 | 0.199 |

## Table 12.4.9 Simultaneous Transmission Scenario : Bluetooth + 5 GHz W-LAN (Held to Ear)

| Exposure Condition | Mode | Configuration | Bluetooth SAR (W/kg) | 5G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Head SAR | 5.3G W-LAN | Left Touch | 0.023 | 0.056 | 0.079 |
| | | Right Touch | 0.093 | 0.165 | **0.258** |
| | | Left Tilt | 0.008 | 0.019 | 0.027 |
| | | Right Tilt | 0.023 | 0.041 | 0.064 |
| | 5.6G W-LAN | Left Touch | 0.023 | 0.015 | 0.038 |
| | | Right Touch | 0.093 | 0.143 | **0.236** |
| | | Left Tilt | 0.008 | 0.032 | 0.040 |
| | | Right Tilt | 0.023 | 0.041 | 0.064 |
| | 5.8G W-LAN | Left Touch | 0.023 | 0.086 | 0.109 |
| | | Right Touch | 0.093 | 0.218 | **0.311** |
| | | Left Tilt | 0.008 | 0.033 | 0.041 |
| | | Right Tilt | 0.023 | 0.066 | 0.089 |

## 12.5 Body-Worn Simultaneous Transmission Analysis

### Table 12.5.1 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.3 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.3G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.014 | 0.031 | 0.122 | 0.139 | 0.153 |
| | | Rear | 0.374 | 0.110 | 0.685 | 0.484 | 1.059 | **1.169** |
| | GPRS 1900 | Front | 0.156 | 0.014 | 0.031 | 0.170 | 0.187 | 0.201 |
| | | Rear | 0.545 | 0.110 | 0.685 | 0.655 | 1.230 | 1.340 |
| | WCDMA 1700 | Front | 0.619 | 0.014 | 0.031 | 0.633 | 0.650 | 0.664 |
| | | Rear | 0.793 | 0.110 | 0.685 | 0.903 | 1.478 | **1.588** |
| | WCDMA 1900 | Front | 0.676 | 0.014 | 0.031 | 0.690 | 0.707 | 0.721 |
| | | Rear | 0.794 | 0.110 | 0.685 | 0.904 | 1.479 | **1.589** |
| | LTE Band 4 | Front | 0.403 | 0.014 | 0.031 | 0.417 | 0.434 | 0.448 |
| | | Rear | 0.708 | 0.110 | 0.685 | 0.818 | 1.393 | 1.503 |
| | LTE Band 2 | Front | 0.375 | 0.014 | 0.031 | 0.389 | 0.406 | 0.420 |
| | | **Rear** | **0.799** | **0.110** | **0.685** | **0.909** | **1.484** | **1.594** |

### Table 12.5.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.6 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.6G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.014 | 0.066 | 0.122 | 0.174 | 0.188 |
| | | Rear | 0.374 | 0.110 | 0.625 | 0.484 | 0.999 | **1.109** |
| | GPRS 1900 | Front | 0.156 | 0.014 | 0.066 | 0.170 | 0.222 | 0.236 |
| | | Rear | 0.545 | 0.110 | 0.625 | 0.655 | 1.170 | 1.280 |
| | WCDMA 1700 | Front | 0.619 | 0.014 | 0.066 | 0.633 | 0.685 | 0.699 |
| | | Rear | 0.793 | 0.110 | 0.625 | 0.903 | 1.418 | **1.528** |
| | WCDMA 1900 | Front | 0.676 | 0.014 | 0.066 | 0.690 | 0.742 | 0.756 |
| | | **Rear** | 0.794 | 0.110 | 0.625 | 0.904 | 1.419 | **1.529** |
| | LTE Band 4 | Front | 0.403 | 0.014 | 0.066 | 0.417 | 0.469 | 0.483 |
| | | Rear | 0.708 | 0.110 | 0.625 | 0.818 | 1.333 | 1.443 |
| | LTE Band 2 | Front | 0.375 | 0.014 | 0.066 | 0.389 | 0.441 | 0.455 |
| | | Rear | 0.799 | 0.110 | 0.625 | 0.909 | 1.424 | **1.534** |

### Table 12.5.3 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth + 5.8 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | 5.8G W-LAN SAR (W/kg) | ΣSAR (W/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 1+2 | 1+3 | 1+2+3 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.014 | 0.061 | 0.122 | 0.169 | 0.183 |
| | | Rear | 0.374 | 0.110 | 0.597 | 0.484 | 0.971 | **1.081** |
| | GPRS 1900 | Front | 0.156 | 0.014 | 0.061 | 0.170 | 0.217 | 0.231 |
| | | Rear | 0.545 | 0.110 | 0.597 | 0.655 | 1.142 | 1.252 |
| | WCDMA 1700 | Front | 0.619 | 0.014 | 0.061 | 0.633 | 0.680 | 0.694 |
| | | Rear | 0.793 | 0.110 | 0.597 | 0.903 | 1.390 | **1.500** |
| | WCDMA 1900 | Front | 0.676 | 0.014 | 0.061 | 0.690 | 0.737 | 0.751 |
| | | **Rear** | 0.794 | 0.110 | 0.597 | 0.904 | 1.391 | **1.501** |
| | LTE Band 4 | Front | 0.403 | 0.014 | 0.061 | 0.417 | 0.464 | 0.478 |
| | | Rear | 0.708 | 0.110 | 0.597 | 0.818 | 1.305 | 1.415 |
| | LTE Band 2 | Front | 0.375 | 0.014 | 0.061 | 0.389 | 0.436 | 0.450 |
| | | Rear | 0.799 | 0.110 | 0.597 | 0.909 | 1.396 | **1.506** |

### Table 12.5.4 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 2.4G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.029 | 0.137 |
| | | Rear | 0.374 | 0.182 | **0.556** |
| | GPRS 1900 | Front | 0.156 | 0.029 | 0.185 |
| | | Rear | 0.545 | 0.182 | 0.727 |
| | WCDMA 1700 | Front | 0.619 | 0.029 | 0.648 |
| | | Rear | 0.793 | 0.182 | **0.975** |
| | WCDMA 1900 | Front | 0.676 | 0.029 | 0.705 |
| | | Rear | 0.794 | 0.182 | **0.976** |
| | LTE Band 4 | Front | 0.403 | 0.029 | 0.432 |
| | | Rear | 0.708 | 0.182 | 0.890 |
| | LTE Band 2 | Front | 0.375 | 0.029 | 0.404 |
| | | Rear | 0.799 | 0.182 | **0.981** |

### Table 12.5.5 Simultaneous Transmission Scenario : 2G/3G/4G + 5.3 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.3G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.031 | 0.139 |
| | | Rear | 0.374 | 0.685 | **1.059** |
| | GPRS 1900 | Front | 0.156 | 0.031 | 0.187 |
| | | Rear | 0.545 | 0.685 | 1.230 |
| | WCDMA 1700 | Front | 0.619 | 0.031 | 0.650 |
| | | Rear | 0.793 | 0.685 | **1.478** |
| | WCDMA 1900 | Front | 0.676 | 0.031 | 0.707 |
| | | Rear | 0.794 | 0.685 | **1.479** |
| | LTE Band 4 | Front | 0.403 | 0.031 | 0.434 |
| | | Rear | 0.708 | 0.685 | 1.393 |
| | LTE Band 2 | Front | 0.375 | 0.031 | 0.406 |
| | | Rear | 0.799 | 0.685 | **1.484** |

### Table 12.5.6 Simultaneous Transmission Scenario : 2G/3G/4G + 5.6 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.6G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.066 | 0.174 |
| | | Rear | 0.374 | 0.625 | **0.999** |
| | GPRS 1900 | Front | 0.156 | 0.066 | 0.222 |
| | | Rear | 0.545 | 0.625 | 1.170 |
| | WCDMA 1700 | Front | 0.619 | 0.066 | 0.685 |
| | | Rear | 0.793 | 0.625 | **1.418** |
| | WCDMA 1900 | Front | 0.676 | 0.066 | 0.742 |
| | | Rear | 0.794 | 0.625 | **1.419** |
| | LTE Band 4 | Front | 0.403 | 0.066 | 0.469 |
| | | Rear | 0.708 | 0.625 | 1.333 |
| | LTE Band 2 | Front | 0.375 | 0.066 | 0.441 |
| | | Rear | 0.799 | 0.625 | **1.424** |

### Table 12.5.7 Simultaneous Transmission Scenario : 2G/3G/4G + 5.8 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 5.8G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.061 | 0.169 |
| | | Rear | 0.374 | 0.597 | **0.971** |
| | GPRS 1900 | Front | 0.156 | 0.061 | 0.217 |
| | | Rear | 0.545 | 0.597 | 1.142 |
| | WCDMA 1700 | Front | 0.619 | 0.061 | 0.680 |
| | | Rear | 0.793 | 0.597 | **1.390** |
| | WCDMA 1900 | Front | 0.676 | 0.061 | 0.737 |
| | | Rear | 0.794 | 0.597 | **1.391** |
| | LTE Band 4 | Front | 0.403 | 0.061 | 0.464 |
| | | Rear | 0.708 | 0.597 | 1.305 |
| | LTE Band 2 | Front | 0.375 | 0.061 | 0.436 |
| | | Rear | 0.799 | 0.597 | **1.396** |

### Table 12.5.8 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | GSM 1900 | Front | 0.108 | 0.014 | 0.122 |
| | | Rear | 0.374 | 0.110 | **0.484** |
| | GPRS 1900 | Front | 0.156 | 0.014 | 0.170 |
| | | Rear | 0.545 | 0.110 | 0.655 |
| | WCDMA 1700 | Front | 0.619 | 0.014 | 0.633 |
| | | Rear | 0.793 | 0.110 | **0.903** |
| | WCDMA 1900 | Front | 0.676 | 0.014 | 0.690 |
| | | Rear | 0.794 | 0.110 | **0.904** |
| | LTE Band 4 | Front | 0.403 | 0.014 | 0.417 |
| | | Rear | 0.708 | 0.110 | 0.818 |
| | LTE Band 2 | Front | 0.375 | 0.014 | 0.389 |
| | | Rear | 0.799 | 0.110 | **0.909** |

### Table 12.5.9 Simultaneous Transmission Scenario : Bluetooth + 5 GHz W-LAN (Body-Worn at 10 mm)

| Exposure Condition | Mode | Configuration | Bluetooth SAR (W/kg) | 5G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Body-Worn SAR | 5.3G W-LAN | Front | 0.014 | 0.031 | 0.045 |
| | | Rear | 0.110 | 0.685 | **0.795** |
| | 5.6G W-LAN | Front | 0.014 | 0.066 | 0.080 |
| | | Rear | 0.110 | 0.625 | **0.735** |
| | 5.8G W-LAN | Front | 0.014 | 0.061 | 0.075 |
| | | Rear | 0.110 | 0.597 | **0.707** |

## 12.6 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v02r01, the device edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

**Table 12.6.1 Simultaneous Transmission Scenario : 2G/3G/4G + 2.4 GHz W-LAN (Hotspot at 10 mm)**

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | 2.4G W-LAN SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Hotspot SAR | GPRS 1900 | Top | - | 0.006 | 0.006 |
| | | Bottom | 0.231 | - | 0.231 |
| | | Front | 0.156 | 0.029 | 0.185 |
| | | Rear | 0.545 | 0.182 | **0.727** |
| | | Right | - | - | - |
| | | Left | 0.329 | 0.098 | 0.427 |
| | WCDMA 1700 | Top | - | 0.006 | 0.006 |
| | | Bottom | 0.230 | - | 0.230 |
| | | Front | 0.619 | 0.029 | 0.648 |
| | | Rear | 0.793 | 0.182 | **0.975** |
| | | Right | - | - | - |
| | | Left | 0.436 | 0.098 | 0.534 |
| | WCDMA 1900 | Top | - | 0.006 | 0.006 |
| | | Bottom | 0.278 | - | 0.278 |
| | | Front | 0.676 | 0.029 | **0.705** |
| | | Rear | 0.794 | 0.182 | **0.976** |
| | | Right | - | - | - |
| | | Left | 0.845 | 0.098 | 0.943 |
| | LTE Band 4 | Top | - | 0.006 | 0.006 |
| | | Bottom | 0.228 | - | 0.228 |
| | | Front | 0.403 | 0.029 | 0.432 |
| | | Rear | 0.708 | 0.182 | **0.890** |
| | | Right | - | - | - |
| | | Left | 0.371 | 0.098 | **0.469** |
| | LTE Band 2 | Top | - | 0.006 | 0.006 |
| | | Bottom | 0.196 | - | 0.196 |
| | | Front | 0.375 | 0.029 | 0.404 |
| | | **Rear** | **0.799** | **0.182** | **0.981** |
| | | Right | - | - | - |
| | | Left | 0.480 | 0.098 | 0.578 |

**Table 12.6.2 Simultaneous Transmission Scenario : 2G/3G/4G + Bluetooth (Hotspot at 10 mm)**

| Exposure Condition | Mode | Configuration | 2G/3G/4G SAR (W/kg) | Bluetooth SAR (W/kg) | ΣSAR (W/kg) |
|---|---|---|---|---|---|
| | | | 1 | 2 | 1+2 |
| Hotspot SAR | GPRS 1900 | Top | - | < 0.001 | < 0.001 |
| | | Bottom | 0.231 | - | 0.231 |
| | | Front | 0.156 | 0.014 | 0.170 |
| | | Rear | 0.545 | 0.110 | **0.655** |
| | | Right | - | - | - |
| | | Left | 0.329 | 0.099 | 0.428 |
| | WCDMA 1700 | Top | - | < 0.001 | < 0.001 |
| | | Bottom | 0.230 | - | 0.230 |
| | | Front | 0.619 | 0.014 | 0.633 |
| | | Rear | 0.793 | 0.110 | **0.903** |
| | | Right | - | - | - |
| | | Left | 0.436 | 0.099 | 0.535 |
| | WCDMA 1900 | Top | - | < 0.001 | < 0.001 |
| | | Bottom | 0.278 | - | 0.278 |
| | | Front | 0.676 | 0.014 | **0.690** |
| | | Rear | 0.794 | 0.110 | 0.904 |
| | | Right | - | - | - |
| | | Left | 0.845 | 0.099 | **0.944** |
| | LTE Band 4 | Top | - | < 0.001 | < 0.001 |
| | | Bottom | 0.228 | - | 0.228 |
| | | Front | 0.403 | 0.014 | 0.417 |
| | | Rear | 0.708 | 0.110 | **0.818** |
| | | Right | - | - | - |
| | | Left | 0.371 | 0.099 | **0.470** |
| | LTE Band 2 | Top | - | < 0.001 | < 0.001 |
| | | Bottom | 0.196 | - | 0.196 |
| | | Front | 0.375 | 0.014 | 0.389 |
| | | Rear | 0.799 | 0.110 | **0.909** |
| | | Right | - | - | - |
| | | Left | 0.480 | 0.099 | 0.579 |

### 12.7 Phablet SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required of Hotspot 1g SAR (scaled to maximum output power, including tolerance) < 1.2 W/kg. Therefore no further analysis was required to for Phablet Simultaneous Transmission Analysis.

### 12.8 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.

# 13. SAR MEASUREMENT VARIABILITY

## 13.1 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 1-g 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
5. The same procedures should be adapted for measurements according to extremity exposure limits by applying a factor of 2.5 for extremity exposure to the corresponding SAR thresholds.

## 13.2 Measurement Uncertainty

The measured SAR was < 1.5 W/kg for 1g and < 3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

# 14. EQUIPMENT LIST

**Table 14.1.1 Test Equipment Calibration**

| | Type | Manufacturer | Model | Cal.Date | Next.Cal.Date | S/N |
|---|---|---|---|---|---|---|
| ☒ | SEMITEC Engineering | SEMITEC | N/A | N/A | N/A | Shield Room |
| ☒ | SEMITEC Engineering | SEMITEC | N/A | N/A | N/A | Shield Room |
| ☒ | SEMITEC Engineering | SEMITEC | N/A | N/A | N/A | Shield Room |
| ☒ | Robot | SPEAG | TX90XL | N/A | N/A | F13/5P9GA1/A/01 |
| ☒ | Robot | SPEAG | TX90XL | N/A | N/A | F13/5RR2A1/A/01 |
| ☒ | Robot | SPEAG | TX60L | N/A | N/A | F12/5LP5A1/A/01 |
| ☒ | Robot Controller | SPEAG | CS8C | N/A | N/A | F13/5P9GA1/C/01 |
| ☒ | Robot Controller | SPEAG | CS8C | N/A | N/A | F13/5RR2A1/C/01 |
| ☒ | Robot Controller | SPEAG | CS8C | N/A | N/A | F12/5LP5A1/C/01 |
| ☒ | Joystick | SPEAG | N/A | N/A | N/A | S-12450905 |
| ☒ | Joystick | SPEAG | N/A | N/A | N/A | S-13200990 |
| ☒ | Joystick | SPEAG | N/A | N/A | N/A | S-12030401 |
| ☒ | Intel Core i7-3 770 3.40 GHz Windows 7 Professional | N/A | N/A | N/A | N/A | N/A |
| ☒ | Intel Core i7-3 770 3.40 GHz Windows 7 Professional | N/A | N/A | N/A | N/A | N/A |
| ☒ | Intel Core i7-2 600 3.40 GHz Window 7 Professional | N/A | N/A | N/A | N/A | N/A |
| ☒ | Probe Alignment Unit LB | N/A | N/A | N/A | N/A | SE UKS 030 AA |
| ☒ | Probe Alignment Unit LB | N/A | N/A | N/A | N/A | SE UKS 030 AA |
| ☒ | Probe Alignment Unit LB | N/A | N/A | N/A | N/A | SE UKS 030 AA |
| ☒ | Device Holder | SPEAG | SD000H01HA | N/A | N/A | N/A |
| ☒ | Device Holder | SPEAG | SD000H01HA | N/A | N/A | N/A |
| ☒ | Device Holder | SPEAG | SD000H01HA | N/A | N/A | N/A |
| ☒ | Twin SAM Phantom | SPEAG | QD000P40CD | N/A | N/A | 1782 |
| ☒ | Twin SAM Phantom | SPEAG | QD000P40CD | N/A | N/A | 1785 |
| ☒ | Twin SAM Phantom | SPEAG | QD000P40CD | N/A | N/A | 1679 |
| ☒ | Data Acquisition Electronics | SPEAG | DAE4V1 | 2021-04-26 | 2022-04-26 | 1485 |
| ☒ | Data Acquisition Electronics | SPEAG | DAE3V1 | 2020-11-24 | 2021-11-24 | 520 |
| ☒ | Data Acquisition Electronics | SPEAG | DAE4V1 | 2021-08-23 | 2022-08-23 | 1396 |
| ☒ | Dosimetric E-Field Probe | SPEAG | EX3DV4 | 2020-11-27 | 2021-11-27 | 7368 |
| ☒ | Dosimetric E-Field Probe | SPEAG | ES3DV3 | 2021-01-27 | 2022-01-27 | 3327 |
| ☒ | Dosimetric E-Field Probe | SPEAG | EX3DV4 | 2021-04-30 | 2022-04-30 | 3916 |
| ☒ | 1 800MHz SAR Dipole | SPEAG | D1800V2 | 2021-04-23 | 2023-04-23 | 2d047 |
| ☒ | 1 900MHz SAR Dipole | SPEAG | D1900V2 | 2021-07-23 | 2023-07-23 | 5d029 |
| ☒ | 2 450MHz SAR Dipole | SPEAG | D2450V2 | 2021-05-27 | 2023-05-27 | 716 |
| ☒ | 5GHz SAR Dipole | SPEAG | D5GHzV2 | 2021-02-23 | 2023-02-23 | 1103 |
| ☒ | Network Analyzer | Agilent | E5071C | 2021-06-24 | 2022-06-24 | MY46106970 |
| ☒ | Signal Generator | Agilent | E4438C | 2021-06-24 | 2022-06-24 | US41461520 |
| ☒ | Amplifier | EMPOWER | BBS3Q7ELU | 2021-06-24 | 2022-06-24 | 1020 |
| ☒ | High Power RF Amplifier | EMPOWER | BBS3Q8CCJ | 2021-06-24 | 2022-06-24 | 1005 |
| ☒ | Power Meter | HP | EPM-442A | 2020-12-16 | 2021-12-16 | GB37170267 |
| ☒ | Power Meter | HP | EPM-442A | 2020-12-16 | 2021-12-16 | GB37170413 |
| ☒ | Power Sensor | HP | 8481A | 2020-12-16 | 2021-12-16 | US37294267 |
| ☒ | Power Sensor | HP | 8481A | 2020-12-16 | 2021-12-16 | 2702A61707 |
| ☒ | Power Sensor | HP | 8481A | 2020-12-16 | 2021-12-16 | 2702A65976 |
| ☒ | Dual Directional Coupler | Agilent | 778D-012 | 2020-12-16 | 2021-12-16 | 50228 |
| ☒ | Directional Coupler | HP | 772D | 2021-06-24 | 2022-06-24 | 2889A01064 |
| ☒ | Low Pass Filter 3.0GHz | Micro LAB | LA-30N | 2021-06-24 | 2022-06-24 | 2 |
| ☒ | Low Pass Filter 6.0GHz | Micro LAB | LA-60N | 2020-12-16 | 2021-12-16 | 03942 |
| ☒ | Attenuators(10 dB) | WEINSCHEL | 23-10-34 | 2020-12-16 | 2021-12-16 | BP4387 |
| ☒ | Step Attenuator | H/P | 8494A | 2021-06-24 | 2022-06-24 | 3308A33341 |
| ☒ | Dielectric Probe kit | SPEAG | DAK-3.5 | 2020-11-25 | 2021-11-25 | 1092 |
| ☒ | 8960 Series 10 Wireless Comms. Test Set | Agilent | E5515C | 2021-06-24 | 2022-06-24 | GB41321164 |
| ☒ | Wideband Radio Communication Tester | Rohde Schwarz | CMW500 | 2020-12-16 | 2021-12-16 | 101414 |
| ☒ | Wideband Radio Communication Tester | Rohde Schwarz | CMW500 | 2021-04-23 | 2022-04-23 | 166448 |
| ☒ | Power Splitter | Anritsu | K241B | 2020-12-16 | 2021-12-16 | 1301183 |
| ☒ | Bluetooth Tester | TESCOM | TC-3000C | 2021-06-24 | 2022-06-24 | 3000C000563 |

**NOTE(S):**
1. The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Verification measurement is performed by DT&C before each test. The brain and muscle simulating material are calibrated by DT&C using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain and muscle-equivalent material. Each equipment item was used solely within its respective 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. 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.

# 15. MEASUREMENT UNCERTAINTIES

## 1 800 MHz Head (SN: 3327)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.0 | Normal | 1 | 1 | 1 | 6.0 | 6.0 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 3.9 | Normal | 1 | 0.78 | 0.71 | 3.0 | 2.8 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 4.0 | Normal | 1 | 0.23 | 0.26 | 0.92 | 1.0 | 10 |
| Temp. unc. - Conductivity | 1.9 | Rectangular | √3 | 0.78 | 0.71 | 0.86 | 0.78 | ∞ |
| Temp. unc. - Permittivity | 1.8 | Rectangular | √3 | 0.23 | 0.26 | 0.24 | 0.27 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

$U(1\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)
$U(10\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)

## 1 900 MHz Head (SN: 3327)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.0 | Normal | 1 | 1 | 1 | 6.0 | 6.0 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 4.0 | Normal | 1 | 0.78 | 0.71 | 3.1 | 2.8 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 3.8 | Normal | 1 | 0.23 | 0.26 | 0.87 | 1.0 | 10 |
| Temp. unc. - Conductivity | 1.9 | Rectangular | √3 | 0.78 | 0.71 | 0.86 | 0.78 | ∞ |
| Temp. unc. - Permittivity | 2.0 | Rectangular | √3 | 0.23 | 0.26 | 0.27 | 0.30 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

*U(1 g)* = $k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % *k* = 2)
*U(10 g)* = $k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % *k* = 2)

## 2 450 ~ 2 600 MHz Head (SN: 3916)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.0 | Normal | 1 | 1 | 1 | 6.0 | 6.0 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 0.0 | Rectangular | √3 | 1 | 1 | 0.0 | 0.0 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 4.1 | Normal | 1 | 0.78 | 0.71 | 3.2 | 2.9 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 4.2 | Normal | 1 | 0.23 | 0.26 | 0.97 | 1.1 | 10 |
| Temp. unc. - Conductivity | 2.0 | Rectangular | √3 | 0.78 | 0.71 | 0.90 | 0.82 | ∞ |
| Temp. unc. - Permittivity | 2.0 | Rectangular | √3 | 0.23 | 0.26 | 0.27 | 0.30 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

$U(1\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)
$U(10\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)

## 5 300 MHz Head (SN: 7368)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.5 | Normal | 1 | 1 | 1 | 6.5 | 6.5 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 4.0 | Normal | 1 | 0.78 | 0.71 | 3.1 | 2.8 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 4.0 | Normal | 1 | 0.23 | 0.26 | 0.92 | 1.0 | 10 |
| Temp. unc. - Conductivity | 1.9 | Rectangular | √3 | 0.78 | 0.71 | 0.86 | 0.78 | ∞ |
| Temp. unc. - Permittivity | 2.0 | Rectangular | √3 | 0.23 | 0.26 | 0.27 | 0.30 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

$U(1\ g) = k \cdot u_c$
= 2 . 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)
$U(10\ g) = k \cdot u_c$
= 2 . 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)

## 5 600 MHz Head (SN: 7368)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.5 | Normal | 1 | 1 | 1 | 6.5 | 6.5 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 4.0 | Normal | 1 | 0.78 | 0.71 | 3.1 | 2.8 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 4.0 | Normal | 1 | 0.23 | 0.26 | 0.92 | 1.0 | 10 |
| Temp. unc. - Conductivity | 1.9 | Rectangular | √3 | 0.78 | 0.71 | 0.86 | 0.78 | ∞ |
| Temp. unc. - Permittivity | 2.0 | Rectangular | √3 | 0.23 | 0.26 | 0.27 | 0.30 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

$U(1\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)
$U(10\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)

## 5 800 MHz Head (SN: 7368)

| Error Description | Uncertainty value ±% | Probability Distribution | Divisor | (Ci) 1 g | (Ci) 10 g | Standard 1 g (± %) | Standard 10 g (± %) | vi 2 or Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe calibration | 6.5 | Normal | 1 | 1 | 1 | 6.5 | 6.5 | ∞ |
| Axial isotropy | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Hemispherical isotropy | 9.6 | Rectangular | √3 | 1 | 1 | 5.5 | 5.5 | ∞ |
| Boundary Effects | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Probe Linearity | 4.7 | Rectangular | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Probe modulation response | 2.4 | Rectangular | √3 | 1 | 1 | 1.4 | 1.4 | ∞ |
| Detection limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Readout Electronics | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response time | 0.8 | Rectangular | √3 | 1 | 1 | 0.46 | 0.46 | ∞ |
| Integration time | 2.6 | Rectangular | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| RF Ambient Conditions – Noise | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| RF Ambient Conditions – Reflections | 3.0 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Algorithms for Max. SAR Eval. | 1.0 | Rectangular | √3 | 1 | 1 | 0.58 | 0.58 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | 1 | 2.9 | 2.9 | 145 |
| Device Holder | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | 5 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | 1 | 2.9 | 2.9 | ∞ |
| SAR Scaling | 2.0 | Rectangular | √3 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Physical Parameters** | | | | | | | | |
| Phantom Shell | 7.6 | Rectangular | √3 | 1 | 1 | 4.4 | 4.4 | ∞ |
| Liquid conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| Liquid conductivity (Meas.) | 4.0 | Normal | 1 | 0.78 | 0.71 | 3.1 | 2.8 | 10 |
| Liquid permittivity (Target) | 5.0 | Rectangular | √3 | 0.60 | 0.49 | 1.7 | 1.4 | ∞ |
| Liquid permittivity (Meas.) | 4.1 | Normal | 1 | 0.23 | 0.26 | 0.94 | 1.1 | 10 |
| Temp. unc. - Conductivity | 1.9 | Rectangular | √3 | 0.78 | 0.71 | 0.86 | 0.78 | ∞ |
| Temp. unc. - Permittivity | 1.9 | Rectangular | √3 | 0.23 | 0.26 | 0.25 | 0.29 | ∞ |
| **Combined Standard Uncertainty** | | | | | | **13** | **13** | 330 |
| **Expanded Uncertainty (k=2)** | | | | | | **26** | **26** | |

$U(1\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)
$U(10\ g) = k \cdot u_c$
= 2 · 13 %
= 26 % (The confidence level is about 95 % $k$ = 2)

# 16. CONCLUSION

**Measurement Conclusion**

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under the worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are every 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 impossible biological effect 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 innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

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# APPENDIX A. – Probe Calibration Data

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

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

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

Accreditation No.: **SCS 0108**

Client **DT&C (Dymstec)**

Certificate No: **ES3-3327_Jan21**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ES3DV3 - SN:3327 |
| Calibration procedure(s) | QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | January 27, 2021 |

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 | 01-Apr-20 (No. 217-03100/03101) | Apr-21 |
| Power sensor NRP-Z91 | SN: 103244 | 01-Apr-20 (No. 217-03100) | Apr-21 |
| Power sensor NRP-Z91 | SN: 103245 | 01-Apr-20 (No. 217-03101) | Apr-21 |
| Reference 20 dB Attenuator | SN: CC2552 (20x) | 31-Mar-20 (No. 217-03106) | Apr-21 |
| DAE4 | SN: 660 | 23-Dec-20 (No. DAE4-660_Dec20) | Dec-21 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-20 (No. ES3-3013_Dec20) | Dec-21 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| Power meter E4419B | SN: GB41293874 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| Power sensor E4412A | SN: MY41498087 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| Power sensor E4412A | SN: 000110210 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| RF generator HP 8648C | SN: US3642U01700 | 04-Aug-99 (in house check Jun-20) | In house check: Jun-22 |
| Network Analyzer E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-21 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeffrey Katzman | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: January 28, 2021

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

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

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

Accreditation No.: **SCS 0108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "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"

## Methods Applied and Interpretation of Parameters:

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

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm (μV/(V/m)²)[A] | 1.15 | 1.09 | 1.03 | ± 10.1 % |
| DCP (mV)[B] | 103.6 | 106.2 | 107.2 | |

## Calibration Results for Modulation Response

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Max dev. | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 193.6 | ± 2.5 % | ± 4.7 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 202.9 | | |
| | | Z | 0.0 | 0.0 | 1.0 | | 195.9 | | |

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

[A] The uncertainties of Norm X,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | -125.9 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 10 mm |
| Tip Diameter | 4 mm |
| Probe Tip to Sensor X Calibration Point | 2 mm |
| Probe Tip to Sensor Y Calibration Point | 2 mm |
| Probe Tip to Sensor Z Calibration Point | 2 mm |
| Recommended Measurement Distance from Surface | 3 mm |

**Note**: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 6.49 | 6.49 | 6.49 | 0.80 | 1.26 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 6.26 | 6.26 | 6.26 | 0.77 | 1.23 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 6.08 | 6.08 | 6.08 | 0.40 | 1.75 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 5.41 | 5.41 | 5.41 | 0.73 | 1.31 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 5.13 | 5.13 | 5.13 | 0.68 | 1.32 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 4.68 | 4.68 | 4.68 | 0.80 | 1.40 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 4.47 | 4.47 | 4.47 | 0.80 | 1.37 | ± 12.0 % |
| 3500 | 37.9 | 2.91 | 4.23 | 4.23 | 4.23 | 0.90 | 1.40 | ± 13.1 % |
| 3700 | 37.7 | 3.12 | 4.13 | 4.13 | 4.13 | 0.90 | 1.40 | ± 13.1 % |

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

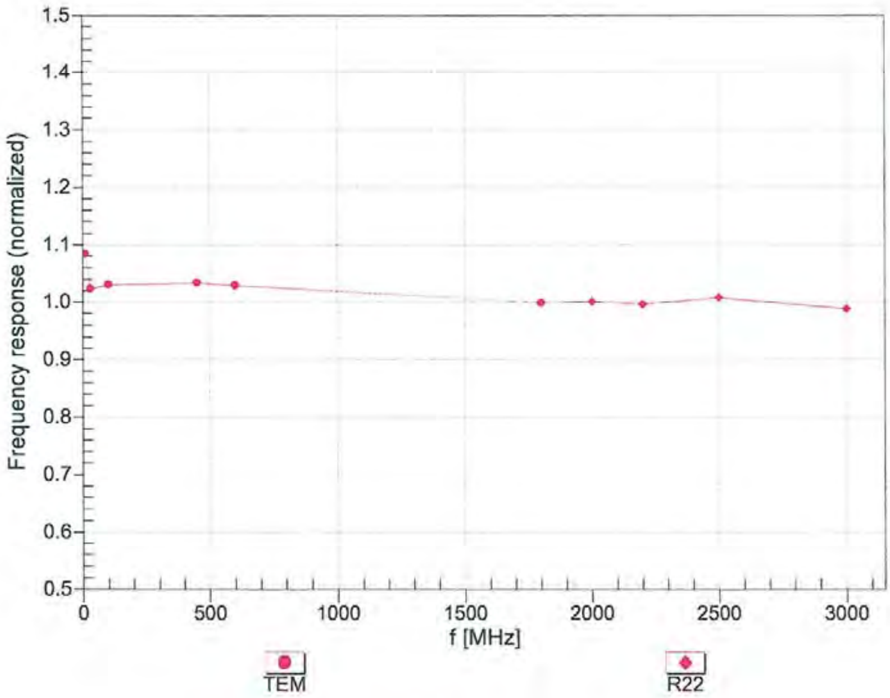
## Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) C | Relative Permittivity F | Conductivity (S/m) F | ConvF X | ConvF Y | ConvF Z | Alpha G | Depth G (mm) | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 55.5 | 0.96 | 6.51 | 6.51 | 6.51 | 0.43 | 1.58 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 6.34 | 6.34 | 6.34 | 0.80 | 1.18 | ± 12.0 % |
| 900 | 55.0 | 1.05 | 6.23 | 6.23 | 6.23 | 0.57 | 1.39 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 5.26 | 5.26 | 5.26 | 0.48 | 1.59 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 5.01 | 5.01 | 5.01 | 0.48 | 1.64 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 4.49 | 4.49 | 4.49 | 0.80 | 1.28 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 4.34 | 4.34 | 4.34 | 0.80 | 1.25 | ± 12.0 % |
| 3500 | 51.3 | 3.31 | 3.81 | 3.81 | 3.81 | 0.80 | 1.60 | ± 13.1 % |
| 3700 | 51.0 | 3.55 | 3.71 | 3.71 | 3.71 | 0.80 | 1.60 | ± 13.1 % |

C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# Frequency Response of E-Field

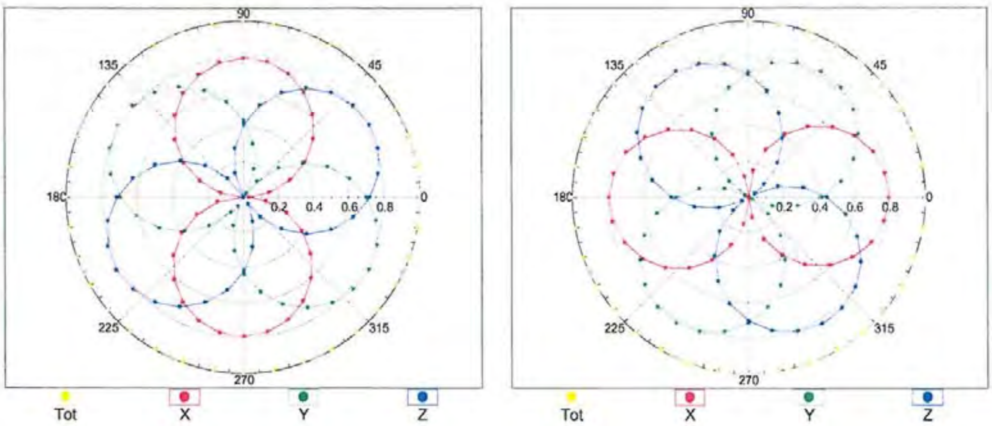
**(TEM-Cell:ifi110 EXX, Waveguide: R22)**

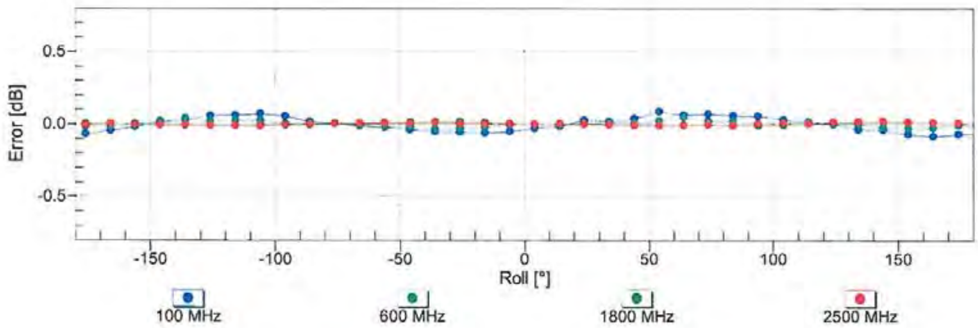



**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

# Receiving Pattern (φ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22

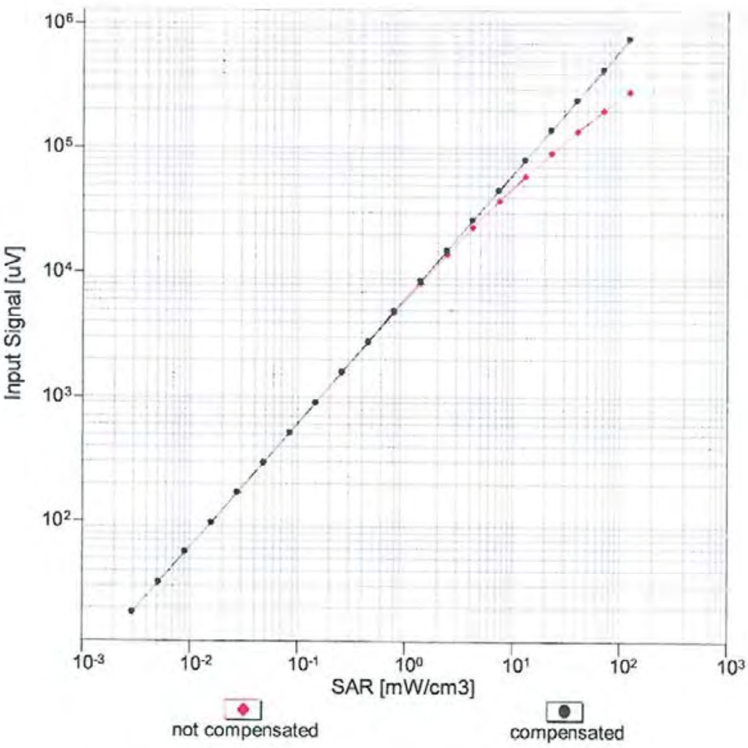


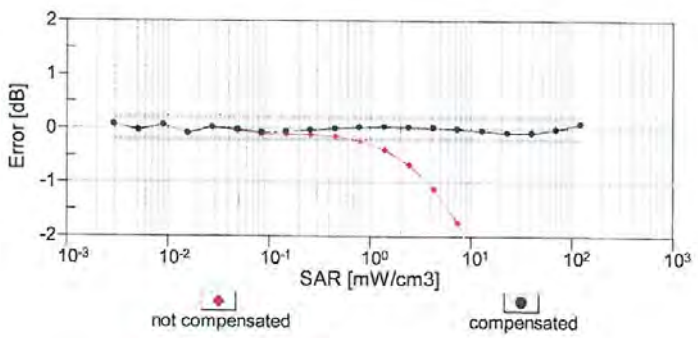




**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

ES3DV3– SN:3327 January 27, 2021

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

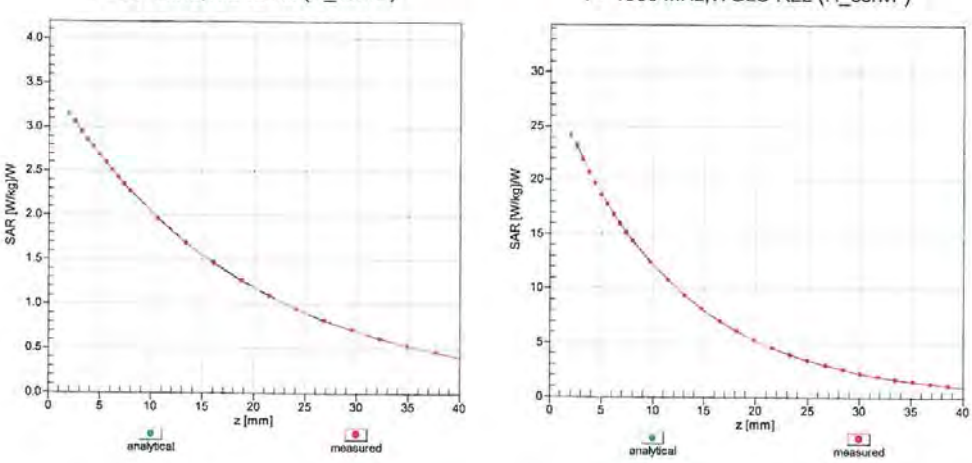



**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

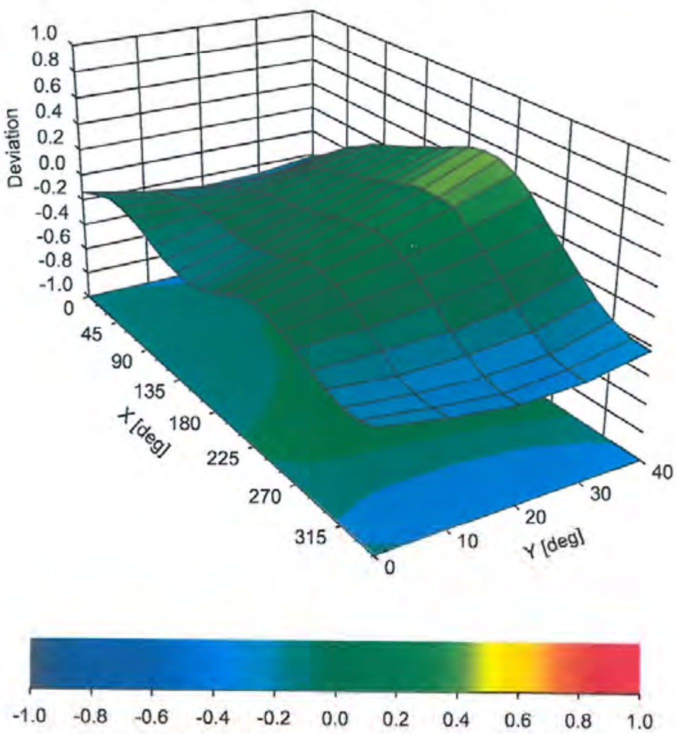
ES3DV3– SN:3327 January 27, 2021

# Conversion Factor Assessment




# Deviation from Isotropy in Liquid

**Error (ϕ, ϑ), f = 900 MHz**




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

Certificate No: ES3-3327_Jan21 Page 10 of 10

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

**S** Schweizerischer Kalibrierdienst
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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 **DT&C (Dymstec)**

Certificate No: **EX3-7368_Nov20**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:7368 |
| Calibration procedure(s) | QA CAL-01.v9, QA CAL-14.v6, QA CAL-23.v5, QA CAL-25.v7<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | November 27, 2020 |

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 | 01-Apr-20 (No. 217-03100/03101) | Apr-21 |
| Power sensor NRP-Z91 | SN: 103244 | 01-Apr-20 (No. 217-03100) | Apr-21 |
| Power sensor NRP-Z91 | SN: 103245 | 01-Apr-20 (No. 217-03101) | Apr-21 |
| Reference 20 dB Attenuator | SN: CC2552 (20x) | 31-Mar-20 (No. 217-03106) | Apr-21 |
| DAE4 | SN: 660 | 27-Dec-19 (No. DAE4-660_Dec19) | Dec-20 |
| Reference Probe ES3DV2 | SN: 3013 | 31-Dec-19 (No. ES3-3013_Dec19) | Dec-20 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| Power meter E4419B | SN: GB41293874 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| Power sensor E4412A | SN: MY41498087 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| Power sensor E4412A | SN: 000110210 | 06-Apr-16 (in house check Jun-20) | In house check: Jun-22 |
| RF generator HP 8648C | SN: US3642U01700 | 04-Aug-99 (in house check Jun-20) | In house check: Jun-22 |
| Network Analyzer E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-21 |

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

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

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, ", "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"

## Methods Applied and Interpretation of Parameters:

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7368

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm (µV/(V/m)$^2$)[A] | 0.48 | 0.56 | 0.42 | ± 10.1 % |
| DCP (mV)[B] | 100.7 | 97.7 | 102.2 | |

## Calibration Results for Modulation Response

| UID | Communication System Name | | A dB | B dB√µV | C | D dB | VR mV | Max dev. | Max Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.00 | 0.00 | 1.00 | 0.00 | 160.3 | ± 3.0 % | ± 4.7 % |
| | | Y | 0.00 | 0.00 | 1.00 | | 150.0 | | |
| | | Z | 0.00 | 0.00 | 1.00 | | 153.7 | | |
| 10352-AAA | Pulse Waveform (200Hz, 10%) | X | 3.59 | 70.12 | 12.21 | 10.00 | 60.0 | ± 3.6 % | ± 9.6 % |
| | | Y | 7.31 | 77.83 | 15.34 | | 60.0 | | |
| | | Z | 2.34 | 65.07 | 9.45 | | 60.0 | | |
| 10353-AAA | Pulse Waveform (200Hz, 20%) | X | 8.27 | 79.42 | 14.40 | 6.99 | 80.0 | ± 2.5 % | ± 9.6 % |
| | | Y | 20.00 | 89.19 | 17.66 | | 80.0 | | |
| | | Z | 1.05 | 62.05 | 7.32 | | 80.0 | | |
| 10354-AAA | Pulse Waveform (200Hz, 40%) | X | 20.00 | 90.35 | 16.92 | 3.98 | 95.0 | ± 1.6 % | ± 9.6 % |
| | | Y | 20.00 | 92.58 | 17.99 | | 95.0 | | |
| | | Z | 1.31 | 67.09 | 8.70 | | 95.0 | | |
| 10355-AAA | Pulse Waveform (200Hz, 60%) | X | 20.00 | 100.56 | 20.68 | 2.22 | 120.0 | ± 0.9 % | ± 9.6 % |
| | | Y | 20.00 | 98.82 | 19.84 | | 120.0 | | |
| | | Z | 20.00 | 90.18 | 15.38 | | 120.0 | | |
| 10387-AAA | QPSK Waveform, 1 MHz | X | 1.76 | 66.72 | 15.53 | 1.00 | 150.0 | ± 1.7 % | ± 9.6 % |
| | | Y | 1.70 | 65.34 | 14.63 | | 150.0 | | |
| | | Z | 1.89 | 69.82 | 16.78 | | 150.0 | | |
| 10388-AAA | QPSK Waveform, 10 MHz | X | 2.32 | 68.49 | 16.16 | 0.00 | 150.0 | ± 1.1 % | ± 9.6 % |
| | | Y | 2.23 | 67.27 | 15.31 | | 150.0 | | |
| | | Z | 2.39 | 70.02 | 17.05 | | 150.0 | | |
| 10396-AAA | 64-QAM Waveform, 100 kHz | X | 2.94 | 71.30 | 19.25 | 3.01 | 150.0 | ± 0.9 % | ± 9.6 % |
| | | Y | 2.70 | 69.06 | 18.13 | | 150.0 | | |
| | | Z | 2.46 | 69.81 | 18.76 | | 150.0 | | |
| 10399-AAA | 64-QAM Waveform, 40 MHz | X | 3.59 | 67.39 | 16.00 | 0.00 | 150.0 | ± 0.8 % | ± 9.6 % |
| | | Y | 3.40 | 66.17 | 15.27 | | 150.0 | | |
| | | Z | 3.50 | 67.50 | 16.15 | | 150.0 | | |
| 10414-AAA | WLAN CCDF, 64-QAM, 40MHz | X | 4.93 | 65.84 | 15.67 | 0.00 | 150.0 | ± 1.3 % | ± 9.6 % |
| | | Y | 4.80 | 65.05 | 15.20 | | 150.0 | | |
| | | Z | 4.73 | 65.78 | 15.70 | | 150.0 | | |

Note: For details on UID parameters see Appendix

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

[A] The uncertainties of Norm X,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7368

## Sensor Model Parameters

| | C1 fF | C2 fF | α $V^{-1}$ | T1 $ms.V^{-2}$ | T2 $ms.V^{-1}$ | T3 ms | T4 $V^{-2}$ | T5 $V^{-1}$ | T6 |
|---|---|---|---|---|---|---|---|---|---|
| X | 45.0 | 330.78 | 34.68 | 8.53 | 0.00 | 4.98 | 1.90 | 0.05 | 1.01 |
| Y | 48.5 | 362.65 | 35.59 | 7.00 | 0.00 | 5.00 | 1.12 | 0.18 | 1.01 |
| Z | 35.0 | 255.74 | 34.42 | 6.18 | 0.00 | 4.95 | 1.32 | 0.00 | 1.00 |

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 155.8 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 1.4 mm |

**Note**: Measurement distance from surface can be increased to 3-4 mm for an *Area Scan* job.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7368

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 9.90 | 9.90 | 9.90 | 0.51 | 0.80 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 9.68 | 9.68 | 9.68 | 0.43 | 0.80 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 9.59 | 9.59 | 9.59 | 0.46 | 0.80 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.52 | 8.52 | 8.52 | 0.41 | 0.80 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.27 | 8.27 | 8.27 | 0.29 | 0.80 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.89 | 7.89 | 7.89 | 0.36 | 0.80 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 7.53 | 7.53 | 7.53 | 0.37 | 0.80 | ± 12.0 % |
| 3500 | 37.9 | 2.91 | 7.03 | 7.03 | 7.03 | 0.35 | 1.30 | ± 13.1 % |
| 3700 | 37.7 | 3.12 | 6.92 | 6.92 | 6.92 | 0.35 | 1.30 | ± 13.1 % |
| 5200 | 36.0 | 4.66 | 5.65 | 5.65 | 5.65 | 0.40 | 1.80 | ± 13.1 % |
| 5300 | 35.9 | 4.76 | 5.39 | 5.39 | 5.39 | 0.40 | 1.80 | ± 13.1 % |
| 5500 | 35.6 | 4.96 | 5.04 | 5.04 | 5.04 | 0.40 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.84 | 4.84 | 4.84 | 0.40 | 1.80 | ± 13.1 % |
| 5800 | 35.3 | 5.27 | 5.03 | 5.03 | 5.03 | 0.40 | 1.80 | ± 13.1 % |

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7368

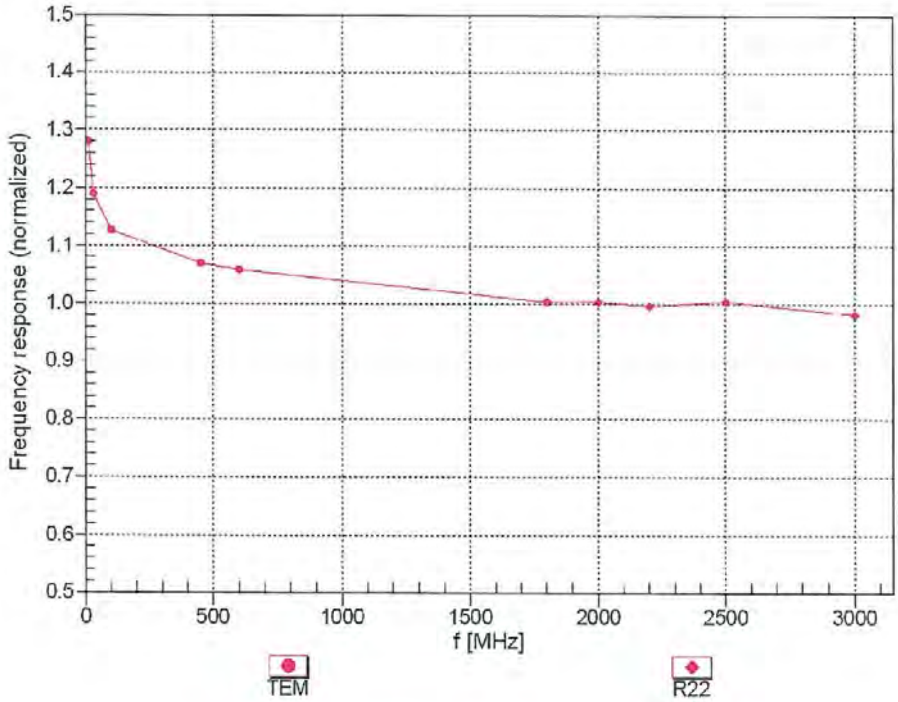
## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unc (k=2) |
|---|---|---|---|---|---|---|---|---|
| 6500 | 34.5 | 6.07 | 5.50 | 5.50 | 5.50 | 0.20 | 2.50 | ± 18.6 % |

[C] Frequency validity above 6GHz is ± 700 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies 6-10 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz; below ± 2% for frequencies between 3-6 GHz; and below ± 4% for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.

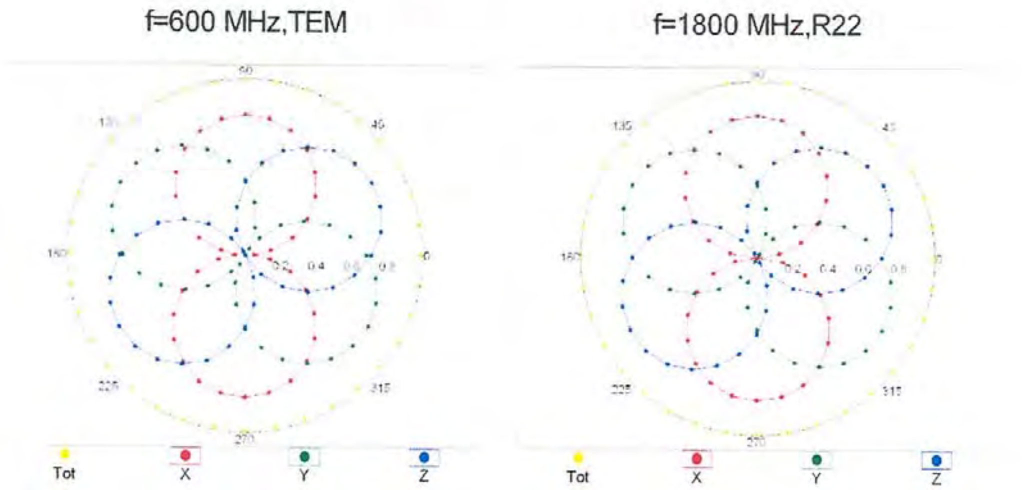
# Frequency Response of E-Field

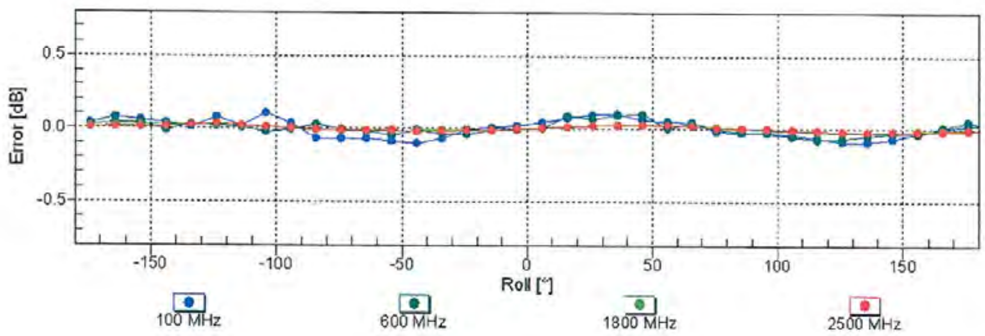
**(TEM-Cell:ifi110 EXX, Waveguide: R22)**




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

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

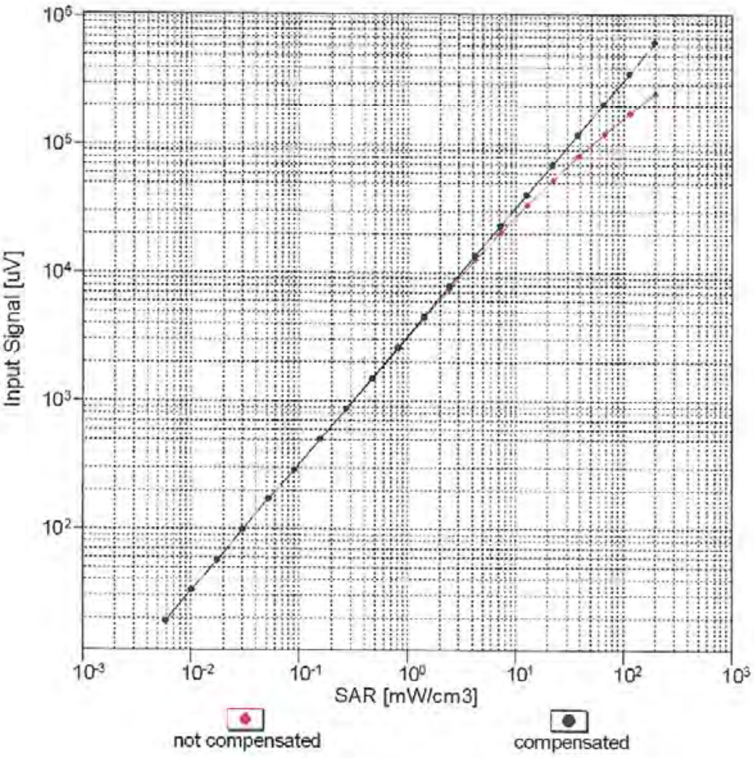


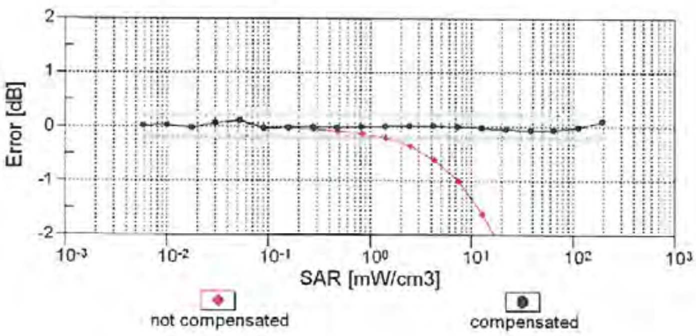




**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

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

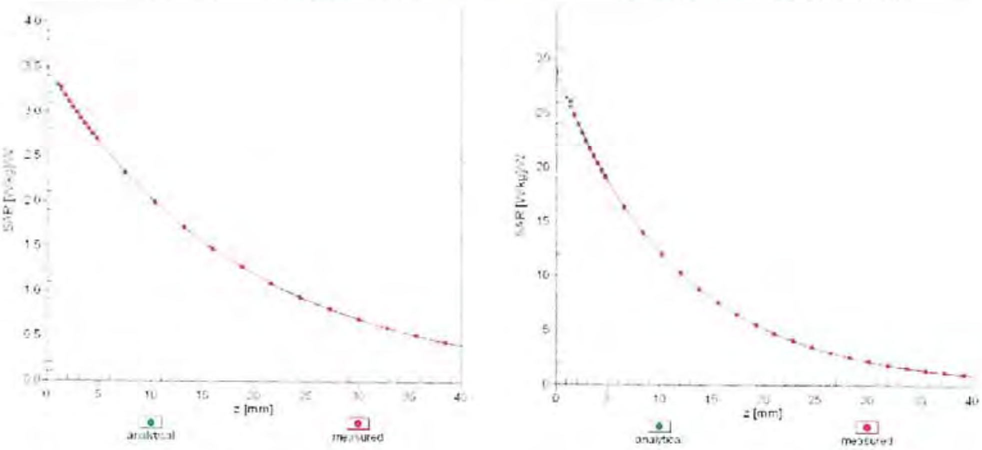
**(TEM cell , $f_{eval}$= 1900 MHz)**



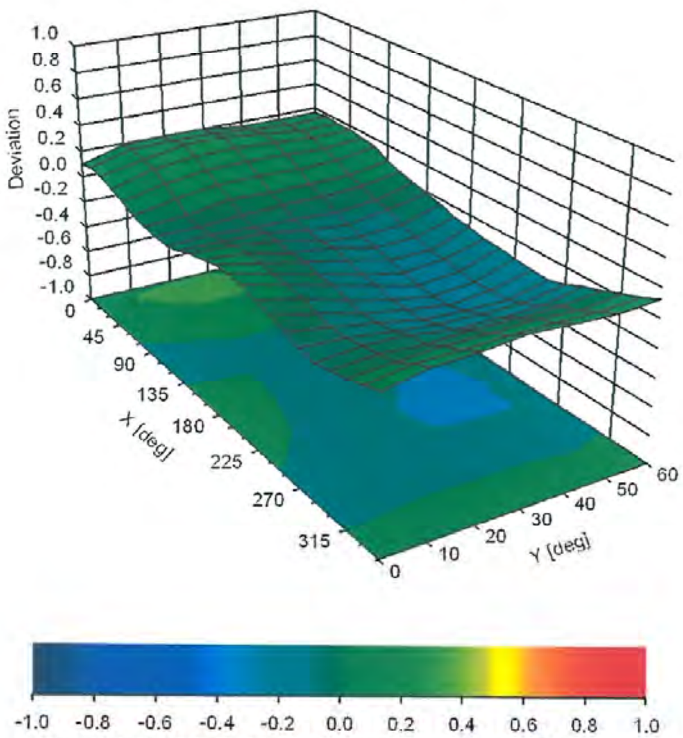

**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

## Conversion Factor Assessment




## Deviation from Isotropy in Liquid

**Error (ϕ, ϑ), f = 900 MHz**




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

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## Appendix: Modulation Calibration Parameters

| UID | Rev | Communication System Name | Group | PAR (dB) | Unc[E] (k=2) |
|---|---|---|---|---|---|
| 0 | | CW | CW | 0.00 | ± 4.7 % |
| 10010 | CAA | SAR Validation (Square, 100ms, 10ms) | Test | 10.00 | ± 9.6 % |
| 10011 | CAB | UMTS-FDD (WCDMA) | WCDMA | 2.91 | ± 9.6 % |
| 10012 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps) | WLAN | 1.87 | ± 9.6 % |
| 10013 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps) | WLAN | 9.46 | ± 9.6 % |
| 10021 | DAC | GSM-FDD (TDMA, GMSK) | GSM | 9.39 | ± 9.6 % |
| 10023 | DAC | GPRS-FDD (TDMA, GMSK, TN 0) | GSM | 9.57 | ± 9.6 % |
| 10024 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1) | GSM | 6.56 | ± 9.6 % |
| 10025 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0) | GSM | 12.62 | ± 9.6 % |
| 10026 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1) | GSM | 9.55 | ± 9.6 % |
| 10027 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2) | GSM | 4.80 | ± 9.6 % |
| 10028 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3) | GSM | 3.55 | ± 9.6 % |
| 10029 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2) | GSM | 7.78 | ± 9.6 % |
| 10030 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1) | Bluetooth | 5.30 | ± 9.6 % |
| 10031 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3) | Bluetooth | 1.87 | ± 9.6 % |
| 10032 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5) | Bluetooth | 1.16 | ± 9.6 % |
| 10033 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1) | Bluetooth | 7.74 | ± 9.6 % |
| 10034 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3) | Bluetooth | 4.53 | ± 9.6 % |
| 10035 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5) | Bluetooth | 3.83 | ± 9.6 % |
| 10036 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1) | Bluetooth | 8.01 | ± 9.6 % |
| 10037 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3) | Bluetooth | 4.77 | ± 9.6 % |
| 10038 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5) | Bluetooth | 4.10 | ± 9.6 % |
| 10039 | CAB | CDMA2000 (1xRTT, RC1) | CDMA2000 | 4.57 | ± 9.6 % |
| 10042 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate) | AMPS | 7.78 | ± 9.6 % |
| 10044 | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM) | AMPS | 0.00 | ± 9.6 % |
| 10048 | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24) | DECT | 13.80 | ± 9.6 % |
| 10049 | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12) | DECT | 10.79 | ± 9.6 % |
| 10056 | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps) | TD-SCDMA | 11.01 | ± 9.6 % |
| 10058 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3) | GSM | 6.52 | ± 9.6 % |
| 10059 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps) | WLAN | 2.12 | ± 9.6 % |
| 10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps) | WLAN | 2.83 | ± 9.6 % |
| 10061 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps) | WLAN | 3.60 | ± 9.6 % |
| 10062 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps) | WLAN | 8.68 | ± 9.6 % |
| 10063 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps) | WLAN | 8.63 | ± 9.6 % |
| 10064 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps) | WLAN | 9.09 | ± 9.6 % |
| 10065 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps) | WLAN | 9.00 | ± 9.6 % |
| 10066 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps) | WLAN | 9.38 | ± 9.6 % |
| 10067 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps) | WLAN | 10.12 | ± 9.6 % |
| 10068 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps) | WLAN | 10.24 | ± 9.6 % |
| 10069 | CAD | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps) | WLAN | 10.56 | ± 9.6 % |
| 10071 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps) | WLAN | 9.83 | ± 9.6 % |
| 10072 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps) | WLAN | 9.62 | ± 9.6 % |
| 10073 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps) | WLAN | 9.94 | ± 9.6 % |
| 10074 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps) | WLAN | 10.30 | ± 9.6 % |
| 10075 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps) | WLAN | 10.77 | ± 9.6 % |
| 10076 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps) | WLAN | 10.94 | ± 9.6 % |
| 10077 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps) | WLAN | 11.00 | ± 9.6 % |
| 10081 | CAB | CDMA2000 (1xRTT, RC3) | CDMA2000 | 3.97 | ± 9.6 % |
| 10082 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate) | AMPS | 4.77 | ± 9.6 % |
| 10090 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4) | GSM | 6.56 | ± 9.6 % |
| 10097 | CAC | UMTS-FDD (HSDPA) | WCDMA | 3.98 | ± 9.6 % |
| 10098 | DAC | UMTS-FDD (HSUPA, Subtest 2) | WCDMA | 3.98 | ± 9.6 % |

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| | | | | | |
|---|---|---|---|---|---|
| 10099 | CAC | EDGE-FDD (TDMA, 8PSK, TN 0-4) | GSM | 9.55 | ± 9.6 % |
| 10100 | CAC | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-FDD | 5.67 | ± 9.6 % |
| 10101 | CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ± 9.6 % |
| 10102 | CAB | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.60 | ± 9.6 % |
| 10103 | DAC | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK) | LTE-TDD | 9.29 | ± 9.6 % |
| 10104 | CAE | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.97 | ± 9.6 % |
| 10105 | CAE | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.01 | ± 9.6 % |
| 10108 | CAE | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK) | LTE-FDD | 5.80 | ± 9.6 % |
| 10109 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.43 | ± 9.6 % |
| 10110 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK) | LTE-FDD | 5.75 | ± 9.6 % |
| 10111 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.44 | ± 9.6 % |
| 10112 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.59 | ± 9.6 % |
| 10113 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.62 | ± 9.6 % |
| 10114 | CAG | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK) | WLAN | 8.10 | ± 9.6 % |
| 10115 | CAG | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM) | WLAN | 8.46 | ± 9.6 % |
| 10116 | CAG | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN | 8.15 | ± 9.6 % |
| 10117 | CAG | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK) | WLAN | 8.07 | ± 9.6 % |
| 10118 | CAD | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM) | WLAN | 8.59 | ± 9.6 % |
| 10119 | CAD | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM) | WLAN | 8.13 | ± 9.6 % |
| 10140 | CAD | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.49 | ± 9.6 % |
| 10141 | CAD | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.53 | ± 9.6 % |
| 10142 | CAD | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK) | LTE-FDD | 5.73 | ± 9.6 % |
| 10143 | CAD | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM) | LTE-FDD | 6.35 | ± 9.6 % |
| 10144 | CAC | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM) | LTE-FDD | 6.65 | ± 9.6 % |
| 10145 | CAC | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK) | LTE-FDD | 5.76 | ± 9.6 % |
| 10146 | CAC | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-FDD | 6.41 | ± 9.6 % |
| 10147 | CAC | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.72 | ± 9.6 % |
| 10149 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-FDD | 6.42 | ± 9.6 % |
| 10150 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-FDD | 6.60 | ± 9.6 % |
| 10151 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK) | LTE-TDD | 9.28 | ± 9.6 % |
| 10152 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM) | LTE-TDD | 9.92 | ± 9.6 % |
| 10153 | CAE | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-TDD | 10.05 | ± 9.6 % |
| 10154 | CAF | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK) | LTE-FDD | 5.75 | ± 9.6 % |
| 10155 | CAF | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM) | LTE-FDD | 6.43 | ± 9.6 % |
| 10156 | CAF | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK) | LTE-FDD | 5.79 | ± 9.6 % |
| 10157 | CAE | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM) | LTE-FDD | 6.49 | ± 9.6 % |
| 10158 | CAE | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM) | LTE-FDD | 6.62 | ± 9.6 % |
| 10159 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM) | LTE-FDD | 6.56 | ± 9.6 % |
| 10160 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK) | LTE-FDD | 5.82 | ± 9.6 % |
| 10161 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM) | LTE-FDD | 6.43 | ± 9.6 % |
| 10162 | CAG | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM) | LTE-FDD | 6.58 | ± 9.6 % |
| 10166 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK) | LTE-FDD | 5.46 | ± 9.6 % |
| 10167 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM) | LTE-FDD | 6.21 | ± 9.6 % |
| 10168 | CAG | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM) | LTE-FDD | 6.79 | ± 9.6 % |
| 10169 | CAG | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-FDD | 5.73 | ± 9.6 % |
| 10170 | CAG | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-FDD | 6.52 | ± 9.6 % |
| 10171 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-FDD | 6.49 | ± 9.6 % |
| 10172 | CAE | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK) | LTE-TDD | 9.21 | ± 9.6 % |
| 10173 | CAE | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM) | LTE-TDD | 9.48 | ± 9.6 % |
| 10174 | CAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM) | LTE-TDD | 10.25 | ± 9.6 % |
| 10175 | CAF | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK) | LTE-FDD | 5.72 | ± 9.6 % |
| 10176 | CAF | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM) | LTE-FDD | 6.52 | ± 9.6 % |
| 10177 | CAE | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK) | LTE-FDD | 5.73 | ± 9.6 % |
| 10178 | CAE | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM) | LTE-FDD | 6.52 | ± 9.6 % |
| 10179 | AAE | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM) | LTE-FDD | 6.50 | ± 9.6 % |
| 10180 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM) | LTE-FDD | 6.50 | ± 9.6 % |