



SAR EVALUATION REPORT

CLASS II PERMISSIVE CHANGE

**FCC 47 CFR § 2.1093
IEEE Std 1528-2013**

For

GSM/WCDMA/LTE PHONE + BLUETOOTH, DTS/UNII a/b/g/n & NFC

FCC ID: ZNFH443

Model Name: LG-H443, H443, LGH443, LG-H445, LGH445, H445

Report Number: 15I19922-S1

Issue Date: 3/12/2015

Prepared for

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Revision History

| Rev. | Date | Revisions | Revised By |
|------|-----------|---------------|------------|
| -- | 3/12/2015 | Initial Issue | -- |
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1. Attestation of Test Results

| | | | | |
|--|---|--|--------------|-----------------|
| Applicant Name | LG ELECTRONICS MOBILECOMM U.S.A., INC. | | | |
| FCC ID | ZNFH443 | | | |
| Model Name | LG-H443, H443, LGH443, LG-H445, LGH445, H445 | | | |
| Applicable Standards | FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013 | | | |
| SAR Limits (W/Kg) | | | | |
| Exposure Category | Peak spatial-average (1g of tissue) | | | |
| General population / Uncontrolled exposure | 1.6 | | | |
| The Highest Reported SAR (W/kg) | | | | |
| RF Exposure Conditions | Equipment Class | | | |
| | Licensed | DTS | U-NII | DSS (BT) |
| Head | 0.824 | 0.370 | 0.048 | N/A |
| Body-worn | 1.229 | 0.088 | 0.111 | |
| Hotspot/Wi-Fi Direct | 1.229 | 0.088 | 0.108 | |
| Simultaneous Tx | 1.340 | 1.317 | 1.340 | |
| Date Tested | 2/2/2015 to 2/24/2015 | | | |
| Test Results | Pass | | | |
| <p>UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p> | | | | |
| Approved & Released By: | | Prepared By: | | |
|  | |  | | |
| Devin Chang Senior Engineer UL Verification Services Inc. | | Coltyce Sanders Laboratory Engineer UL Verification Services Inc. | | |

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 SAR meas for 802.11 v02
- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode v02

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

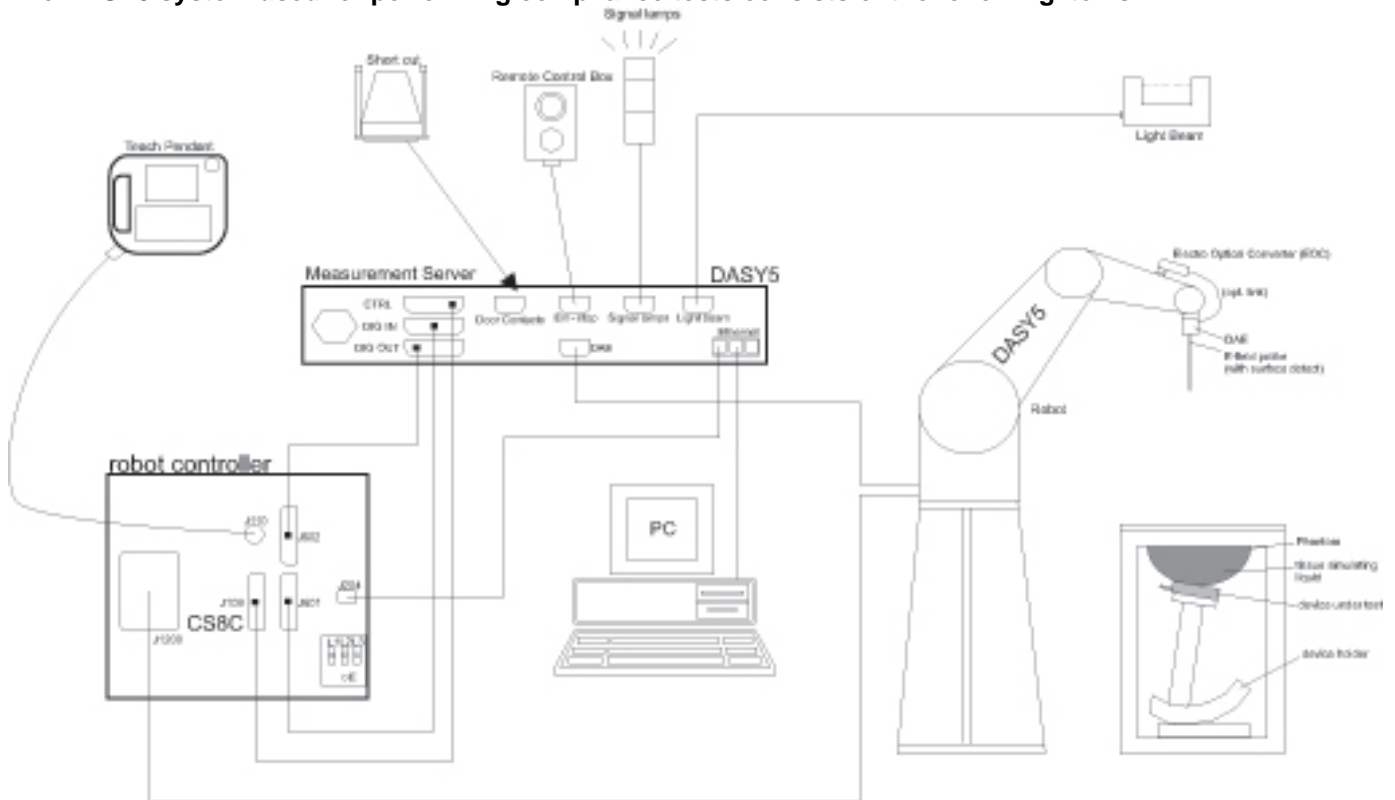
| 47173 Benicia Street | 47266 Benicia Street |
|----------------------|----------------------|
| SAR Lab A | SAR Lab 1 |
| SAR Lab B | SAR Lab 2 |
| SAR Lab C | SAR Lab 3 |
| SAR Lab D | SAR Lab 4 |
| SAR Lab E | SAR Lab 5 |
| SAR Lab F | |
| SAR Lab G | |
| SAR Lab H | |

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

Step 3: Zoom Scan

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

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|------------------------|-----------------|---------------|---------------|---------------|
| Network Analyzer | Agilent | E753ES | MY40000980 | 4/7/2015 |
| Dielectronic Probe kit | SPEAG | DAK-3.5 | 1082 | 9/16/2015 |
| Dielectronic Probe kit | SPEAG | DAK-3.5 Short | SM DAK 200 BA | N/A |
| Thermometer | Control Company | 4242 | 122529163 | 10/8/2015 |
| Thermometer | EXTECH | 445703 | CCS-200 | 3/24/2015 |

System Check

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|--------------------------------------|-----------------|------------------------|-------------|---------------|
| HP Signal Generator | HP | 8665B | 3546A00784 | 6/23/2015 |
| Power Meter | HP | 437B | 3125U09516 | 10/6/2015 |
| Power Meter | Agilent | N1911A | MY53060016 | 8/7/2015 |
| Power Sensor | Agilent | E9323A | MY53070003 | 5/1/2015 |
| Power Sensor | Agilent | 8481A | 3318A95392 | 10/6/2015 |
| Amplifier | MITEQ | AMF-4D-00400600-50-30P | 1622052 | N/A |
| Bi-directional coupler | Werlatone, Inc. | C8060-102 | 2711 | N/A |
| DC Power Supply | Sorensen Ametek | XT20-3 | 1318A00530 | N/A |
| Synthesized Signal Generator | Agilent | 8665B | 3438A00633 | 7/10/2015 |
| Power Meter | HP | 437B | 3125U11347 | 8/27/2015 |
| Power Meter | HP | 437B | 3125U16345 | 6/16/2015 |
| Power Sensor | HP | 8481A | 2702A60780 | 6/16/2015 |
| Power Sensor | HP | 8481A | 1926A16917 | 10/10/2015 |
| Amplifier | MITEQ | AMF-4D-00400600-50-30P | 1808938 | N/A |
| Bi-directional coupler | Werlatone, Inc. | C8060-102 | 2710 | N/A |
| DC Power Supply | HP | 6296A | 2841A-05955 | N/A |
| E-Field Probe (SAR 1) | SPEAG | EX3DV4 | 3902 | 5/19/2015 |
| E-Field Probe (SAR 3) | SPEAG | EX3DV4 | 3773 | 4/22/2015 |
| E-Field Probe (SAR 4) | SPEAG | EX3DV4 | 3929 | 5/9/2015 |
| E-Field Probe (SAR 5) | SPEAG | EX3DV4 | 3749 | 1/26/2016 |
| Data Acquisition Electronics (SAR 1) | SPEAG | DAE4 | 1352 | 11/7/2015 |
| Data Acquisition Electronics (SAR 3) | SPEAG | DAE4 | 1380 | 7/23/2015 |
| Data Acquisition Electronics (SAR 4) | SPEAG | DAE4 | 1377 | 8/27/2015 |
| Data Acquisition Electronics (SAR 5) | SPEAG | DAE4 | 1439 | 5/14/2015 |
| System Validation Dipole | SPEAG | D750V3 | 1019 | 3/17/2015 |
| System Validation Dipole | SPEAG | D835V2 | 4d142 | 9/9/2015 |
| System Validation Dipole | SPEAG | D1750V2 | 1050 | 4/22/2015 |
| System Validation Dipole | SPEAG | D1900V2 | 5d163 | 9/11/2015 |
| System Validation Dipole | SPEAG | D2450V2 | 748 | 2/18/2015 |
| System Validation Dipole | SPEAG | D5GHzV2 | 1138 | 9/18/2015 |
| Thermometer (SAR Lab 1) | EXTECH | 445703 | CCS-205 | 3/24/2015 |
| Thermometer (SAR Lab 3) | EXTECH | 445703 | CCS-237 | 6/3/2015 |
| Thermometer (SAR Lab 4) | EXTECH | 445703 | CCS-238 | 6/3/2015 |
| Thermometer (SAR Lab 5) | EXTECH | 445703 | CCS-239 | 6/3/2015 |

Others

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|------------------------|--------------|------------|------------|---------------|
| Power Meter | Agilent | N1912A | MY53040015 | 7/10/2015 |
| Power Sensor | Agilent | N1921A | MY52020011 | 5/6/2015 |
| Base Station Simulator | R & S | CMW500 | 135393-VQ | 7/3/2015 |

5. Measurement Uncertainty

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

6. Device Under Test (DUT) Information

6.1. DUT Description

| | |
|---------------------------|--|
| Device Dimension | Overall (Length x Width): 133.25 mm x 66.12 mm Overall Diagonal: 143 mm Display Diagonal: 120 mm |
| Battery Back Cover | <input type="checkbox"/> Normal Battery Cover <input checked="" type="checkbox"/> Normal Battery Cover with NFC <input type="checkbox"/> Wireless Charger Battery Cover <input type="checkbox"/> Wireless Charger Battery Cover with NFC <input type="checkbox"/> The rechargeable battery is not user accessible. |
| Battery Options | <input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8Vdc, 8.0Wh <input type="checkbox"/> Extended (large capacity) <input type="checkbox"/> The rechargeable battery is not user accessible. |
| Accessory | Headset |
| Wireless Router (Hotspot) | Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz) (U-NII 3 only) |
| Wi-Fi Direct | Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz) (U-NII 3 only) |

6.2. Wireless Technologies

| Wireless technologies | Frequency bands | Operating mode | Duty Cycle used for SAR testing |
|-----------------------|---|--|---|
| GSM | 850 1900 | Voice (GMSK) GPRS (GMSK) EGPRS (8PSK) | GSM Voice: 12.5%; (E)GPRS: 1 Slot: 12.5%; 2 Slots: 25%, |
| | GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - One Up <input checked="" type="checkbox"/> Class 10 - Two Up <input type="checkbox"/> Class 12 - Four Up <input type="checkbox"/> Class 33 - Four Up DTM (Dual Transfer Mode): Not supported | | |
| W-CDMA (UMTS) | Band II Band V | UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 7) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 6) | 100% |
| LTE (FDD) | Band 2 Band 4 Band 5 Band 17 | QPSK 16QAM | 100% |
| | Does this device SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | | |
| Wi-Fi | 2.4 GHz | 802.11b 802.11g 802.11n (HT20) | 100% |
| | 5 GHz | 802.11a 802.11n (HT20) 802.11n (HT40) | 100% |
| | TDWR (Terminal Doppler Weather Radar): Not supported. | | |
| Bluetooth | 2.4 GHz | Version 4.0 LE | 77.5% (DH5) |

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

| Upper limit (dB): -1.5 ~ 0.5 | | RF Output Power (dBm) | |
|------------------------------|---------------|-----------------------|------------------------------|
| RF Air interface | Mode | Target | Max. tune-up tolerance limit |
| GSM850 | Voice | 32.7 | 33.2 |
| | GPRS 1 slot | 32.7 | 33.2 |
| | GPRS 2 slots | 31.2 | 31.7 |
| | EGPRS 1 slots | 27.2 | 27.7 |
| | EGPRS 2 slots | 27.2 | 27.7 |
| GSM1900 | Voice | 29.7 | 30.2 |
| | GPRS 1 slot | 29.7 | 30.2 |
| | GPRS 2 slots | 29.2 | 29.7 |
| | EGPRS 1 slots | 26.2 | 26.7 |
| | EGPRS 2 slots | 26.2 | 26.7 |
| W-CDMA Band V | R99 | 23.7 | 24.2 |
| | HSDPA | 23.7 | 24.2 |
| | HSUPA | 23.7 | 24.2 |
| | DC-HSDPA | 23.7 | 24.2 |
| W-CDMA Band II | R99 | 23.2 | 23.7 |
| | HSDPA | 23.2 | 23.7 |
| | HSUPA | 23.2 | 23.7 |
| | DC-HSDPA | 23.2 | 23.7 |
| LTE Band 2 | QPSK | 23.2 | 23.7 |
| LTE Band 4 | QPSK | 23.2 | 23.7 |
| LTE Band 5 | QPSK | 23.2 | 23.7 |
| LTE Band 17 | QPSK | 23.2 | 23.7 |

| Upper limit (dB): ~ 1.0 | | RF Output Power (dBm) | |
|-------------------------|--------------|-----------------------|------------------------------|
| RF Air interface | Mode | Target | Max. tune-up tolerance limit |
| WiFi 2.4 GHz | 802.11b | 14.5 | 15.5 |
| | 802.11g | 11.0 | 12.0 |
| | 802.11n HT20 | 9.5 | 10.5 |
| WiFi 5 GHz | 802.11a | 10.6 | 11.6 |
| | 802.11n HT20 | 10.3 | 11.3 |
| | 802.11n HT40 | 9.0 | 10.0 |
| Bluetooth | | 7.0 | 8.0 |
| Bluetooth LE | | 0.0 | 1.0 |

6.4. General LTE SAR Test and Reporting Considerations

| Item | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----------------------------------|---|--------------|--------------|--------------|--------------|--|-------------------|---------|---------|-------|--------|--------|--------|--------|--------|-------|-------|---------|------|------------|--------------|------------|--------------|--------------|--------------|------|------------|------------|------------|------------|------------|------------|------|------------|--------------|------------|--------------|--------------|--------------|--------|----------------------------------|--|--|--|--|--|-------------------|--|--|--|--|--|--------|--------|--------|-------|-------|---------|-----|------------|--------------|------------|--------------|--------------|--------------|-----|--------------|--------------|--------------|--------------|--------------|--------------|------|------------|--------------|------------|--------------|--------------|--------------|--------|--------------------------------|--|--|--|--|--|-------------------|--|--|--|--|--|--------|--------|--------|-------|-------|---------|-----|--|--|-----------|-------------|-------------|-------------|-----|--|--|-------------|-------------|-------------|-------------|------|--|--|-----------|-------------|-------------|-------------|---------|--------------------------------|--|--|--|--|--|-------------------|--|--|--|--|--|--------|--------|--------|-------|-------|---------|-----|--|--|--|-------------|--|--|-----|--|--|-----------|-----------|--|--|------|--|--|--|-------------|--|--|
| Frequency range, Channel Bandwidth, Numbers and Frequencies | <table border="1"> <tr> <th rowspan="3">Band 2</th> <th colspan="6">Frequency range: 1850 - 1910 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td>18700/1860</td> <td>18675/1857.5</td> <td>18650/1855</td> <td>18625/1852.5</td> <td>18615/1851.5</td> <td>18607/1850.7</td> </tr> <tr> <td>Mid</td> <td>18900/1880</td> <td>18900/1880</td> <td>18900/1880</td> <td>18900/1880</td> <td>18900/1880</td> <td>18900/1880</td> </tr> <tr> <td>High</td> <td>19100/1900</td> <td>19125/1902.5</td> <td>19150/1905</td> <td>19175/1907.5</td> <td>19185/1908.5</td> <td>19193/1909.3</td> </tr> <tr> <th rowspan="3">Band 4</th> <th colspan="6">Frequency range: 1710 - 1755 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td>20050/1720</td> <td>20025/1717.5</td> <td>20000/1715</td> <td>19975/1712.5</td> <td>19965/1711.5</td> <td>19957/1710.7</td> </tr> <tr> <td>Mid</td> <td>20175/1732.5</td> <td>20175/1732.5</td> <td>20175/1732.5</td> <td>20175/1732.5</td> <td>20175/1732.5</td> <td>20175/1732.5</td> </tr> <tr> <td>High</td> <td>20300/1745</td> <td>20325/1747.5</td> <td>20350/1750</td> <td>20375/1752.5</td> <td>20385/1753.5</td> <td>20393/1754.3</td> </tr> <tr> <th rowspan="3">Band 5</th> <th colspan="6">Frequency range: 824 - 849 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td></td> <td></td> <td>20450/829</td> <td>20425/826.5</td> <td>20415/825.5</td> <td>20407/824.7</td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>20525/836.5</td> <td>20525/836.5</td> <td>20525/836.5</td> <td>20525/836.5</td> </tr> <tr> <td>High</td> <td></td> <td></td> <td>20600/844</td> <td>20625/846.5</td> <td>20635/847.5</td> <td>20643/848.3</td> </tr> <tr> <th rowspan="3">Band 17</th> <th colspan="6">Frequency range: 704 - 716 MHz</th> </tr> <tr> <th colspan="6">Channel Bandwidth</th> </tr> <tr> <th>20 MHz</th> <th>15 MHz</th> <th>10 MHz</th> <th>5 MHz</th> <th>3 MHz</th> <th>1.4 MHz</th> </tr> <tr> <td>Low</td> <td></td> <td></td> <td></td> <td>23755/706.5</td> <td></td> <td></td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>23790/710</td> <td>23790/710</td> <td></td> <td></td> </tr> <tr> <td>High</td> <td></td> <td></td> <td></td> <td>23825/713.5</td> <td></td> <td></td> </tr> </table> | Band 2 | Frequency range: 1850 - 1910 MHz | | | | | | Channel Bandwidth | | | | | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | Low | 18700/1860 | 18675/1857.5 | 18650/1855 | 18625/1852.5 | 18615/1851.5 | 18607/1850.7 | Mid | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | High | 19100/1900 | 19125/1902.5 | 19150/1905 | 19175/1907.5 | 19185/1908.5 | 19193/1909.3 | Band 4 | Frequency range: 1710 - 1755 MHz | | | | | | Channel Bandwidth | | | | | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | Low | 20050/1720 | 20025/1717.5 | 20000/1715 | 19975/1712.5 | 19965/1711.5 | 19957/1710.7 | Mid | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | High | 20300/1745 | 20325/1747.5 | 20350/1750 | 20375/1752.5 | 20385/1753.5 | 20393/1754.3 | Band 5 | Frequency range: 824 - 849 MHz | | | | | | Channel Bandwidth | | | | | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | Low | | | 20450/829 | 20425/826.5 | 20415/825.5 | 20407/824.7 | Mid | | | 20525/836.5 | 20525/836.5 | 20525/836.5 | 20525/836.5 | High | | | 20600/844 | 20625/846.5 | 20635/847.5 | 20643/848.3 | Band 17 | Frequency range: 704 - 716 MHz | | | | | | Channel Bandwidth | | | | | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | Low | | | | 23755/706.5 | | | Mid | | | 23790/710 | 23790/710 | | | High | | | | 23825/713.5 | | |
| | Band 2 | | Frequency range: 1850 - 1910 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | Channel Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Low | 18700/1860 | 18675/1857.5 | 18650/1855 | 18625/1852.5 | 18615/1851.5 | 18607/1850.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mid | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | 18900/1880 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High | 19100/1900 | 19125/1902.5 | 19150/1905 | 19175/1907.5 | 19185/1908.5 | 19193/1909.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Band 4 | Frequency range: 1710 - 1755 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Channel Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Low | 20050/1720 | 20025/1717.5 | 20000/1715 | 19975/1712.5 | 19965/1711.5 | 19957/1710.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mid | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | 20175/1732.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High | 20300/1745 | 20325/1747.5 | 20350/1750 | 20375/1752.5 | 20385/1753.5 | 20393/1754.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Band 5 | Frequency range: 824 - 849 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Channel Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Low | | | 20450/829 | 20425/826.5 | 20415/825.5 | 20407/824.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Mid | | | 20525/836.5 | 20525/836.5 | 20525/836.5 | 20525/836.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | High | | | 20600/844 | 20625/846.5 | 20635/847.5 | 20643/848.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Band 17 | Frequency range: 704 - 716 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Channel Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 MHz | | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Low | | | | 23755/706.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mid | | | 23790/710 | 23790/710 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High | | | | 23825/713.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LTE transmitter and antenna implementation | <p>LTE Band 2 has one (1) TX/RX antenna.</p> <p>LTE Bands 4 / 5 / 17 have one (1) TX/RX antenna and one (1) RX antenna</p> <p>Refer to Appendix A.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum power reduction (MPR) | <p align="center">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design</p> <p>A-MPR (additional MPR) was disabled during SAR testing</p> | Modulation | Channel bandwidth / Transmission bandwidth (RB) | | | | | | MPR (dB) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 | 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 | 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Modulation | Channel bandwidth / Transmission bandwidth (RB) | | | | | | MPR (dB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power reduction | No | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spectrum plots for RB configurations | A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

| Wireless technologies | RF Exposure Conditions | DUT-to-User Separation | Test Position | Antenna-to-edge/surface | SAR Required | Note |
|-----------------------|---------------------------|------------------------|------------------|-------------------------|--------------|------|
| WWAN (Antenna 1) | Head | 0 mm | Left Touch | N/A | Yes | |
| | | | Left Tilt (15°) | N/A | Yes | |
| | | | Right Touch | N/A | Yes | |
| | | | Right Tilt (15°) | N/A | Yes | |
| | Body | 10 mm | Rear | N/A | Yes | |
| | | | Front | N/A | Yes | |
| | Hotspot | 10 mm | Rear | < 25 mm | Yes | |
| | | | Front | < 25 mm | Yes | |
| | | | Edge 1 (Top) | > 25 mm | No | 1 |
| | | | Edge 2 (Right) | < 25 mm | Yes | |
| | | | Edge 3 (Bottom) | < 25 mm | Yes | |
| | | | Edge 4 (Left) | < 25 mm | Yes | |
| WWAN (Antenna 2) | Head | 0 mm | Left Touch | N/A | Yes | |
| | | | Left Tilt (15°) | N/A | Yes | |
| | | | Right Touch | N/A | Yes | |
| | | | Right Tilt (15°) | N/A | Yes | |
| | Body | 10 mm | Rear | N/A | Yes | |
| | | | Front | N/A | Yes | |
| | Hotspot | 10 mm | Rear | < 25 mm | Yes | |
| | | | Front | < 25 mm | Yes | |
| | | | Edge 1 (Top) | > 25 mm | No | 1 |
| | | | Edge 2 (Right) | > 25 mm | No | 1 |
| | | | Edge 3 (Bottom) | < 25 mm | Yes | |
| | | | Edge 4 (Left) | < 25 mm | Yes | |
| WLAN | Head | 0 mm | Left Touch | N/A | Yes | |
| | | | Left Tilt (15°) | N/A | Yes | |
| | | | Right Touch | N/A | Yes | |
| | | | Right Tilt (15°) | N/A | Yes | |
| | Body | 10 mm | Rear | N/A | Yes | |
| | | | Front | N/A | Yes | |
| | Hotspot / Wi-Fi Direct | 10 mm | Rear | < 25 mm | Yes | |
| | | | Front | < 25 mm | Yes | |
| | | | Edge 1 (Top) | < 25 mm | Yes | |
| | | | Edge 2 (Right) | > 25 mm | No | 1 |
| | | | Edge 3 (Bottom) | > 25 mm | No | 1 |
| | | | Edge 4 (Left) | < 25 mm | Yes | |

Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

| Target Frequency (MHz) | Head | | Body | |
|------------------------|--------------|----------------|--------------|----------------|
| | ϵ_r | σ (S/m) | ϵ_r | σ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| 1800 – 2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 |
| 5000 | 36.2 | 4.45 | 49.3 | 5.07 |
| 5100 | 36.1 | 4.55 | 49.1 | 5.18 |
| 5200 | 36.0 | 4.66 | 49.0 | 5.30 |
| 5300 | 35.9 | 4.76 | 48.9 | 5.42 |
| 5400 | 35.8 | 4.86 | 48.7 | 5.53 |
| 5500 | 35.6 | 4.96 | 48.6 | 5.65 |
| 5600 | 35.5 | 5.07 | 48.5 | 5.77 |
| 5700 | 35.4 | 5.17 | 48.3 | 5.88 |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Standard 1528-2013

Dielectric Property Measurements Results:

SAR Lab 1

| Date | Freq. (MHz) | Liquid Parameters | | Measured | Target | Delta (%) | Limit ±(%) | |
|-----------|-------------|-------------------|---------|---|--------|-----------|------------|---|
| 2/6/2015 | Head 2450 | e' | 39.4800 | Relative Permittivity (ϵ_r): | 39.48 | 39.20 | 0.71 | 5 |
| | | e" | 13.8000 | Conductivity (σ): | 1.88 | 1.80 | 4.44 | 5 |
| | Head 2410 | e' | 39.6300 | Relative Permittivity (ϵ_r): | 39.63 | 39.28 | 0.89 | 5 |
| | | e" | 13.6700 | Conductivity (σ): | 1.83 | 1.76 | 4.06 | 5 |
| | Head 2475 | e' | 39.3400 | Relative Permittivity (ϵ_r): | 39.34 | 39.17 | 0.44 | 5 |
| | | e" | 13.8500 | Conductivity (σ): | 1.91 | 1.83 | 4.32 | 5 |
| 2/6/2015 | Body 2450 | e' | 51.2100 | Relative Permittivity (ϵ_r): | 51.21 | 52.70 | -2.83 | 5 |
| | | e" | 14.8200 | Conductivity (σ): | 2.02 | 1.95 | 3.53 | 5 |
| | Body 2410 | e' | 51.3400 | Relative Permittivity (ϵ_r): | 51.34 | 52.76 | -2.69 | 5 |
| | | e" | 14.7000 | Conductivity (σ): | 1.97 | 1.91 | 3.27 | 5 |
| | Body 2475 | e' | 51.0900 | Relative Permittivity (ϵ_r): | 51.09 | 52.67 | -3.00 | 5 |
| | | e" | 14.9500 | Conductivity (σ): | 2.06 | 1.99 | 3.64 | 5 |
| 2/16/2015 | Head 5180 | e' | 36.4400 | Relative Permittivity (ϵ_r): | 36.44 | 36.01 | 1.19 | 5 |
| | | e" | 15.8300 | Conductivity (σ): | 4.56 | 4.63 | -1.54 | 5 |
| | Head 5200 | e' | 36.4000 | Relative Permittivity (ϵ_r): | 36.40 | 35.99 | 1.14 | 5 |
| | | e" | 15.8700 | Conductivity (σ): | 4.59 | 4.65 | -1.34 | 5 |
| | Head 5600 | e' | 36.0700 | Relative Permittivity (ϵ_r): | 36.07 | 35.53 | 1.51 | 5 |
| | | e" | 15.8600 | Conductivity (σ): | 4.94 | 5.06 | -2.41 | 5 |
| | Head 5800 | e' | 35.5400 | Relative Permittivity (ϵ_r): | 35.54 | 35.30 | 0.68 | 5 |
| | | e" | 16.0000 | Conductivity (σ): | 5.16 | 5.27 | -2.09 | 5 |
| | Head 5825 | e' | 35.5100 | Relative Permittivity (ϵ_r): | 35.51 | 35.30 | 0.59 | 5 |
| | | e" | 16.0900 | Conductivity (σ): | 5.21 | 5.27 | -1.11 | 5 |
| 2/16/2015 | Body 5180 | e' | 48.9400 | Relative Permittivity (ϵ_r): | 48.94 | 49.05 | -0.22 | 5 |
| | | e" | 18.5200 | Conductivity (σ): | 5.33 | 5.27 | 1.19 | 5 |
| | Body 5200 | e' | 49.1300 | Relative Permittivity (ϵ_r): | 49.13 | 49.02 | 0.23 | 5 |
| | | e" | 18.5700 | Conductivity (σ): | 5.37 | 5.29 | 1.41 | 5 |
| | Body 5600 | e' | 48.7100 | Relative Permittivity (ϵ_r): | 48.71 | 48.48 | 0.48 | 5 |
| | | e" | 18.5000 | Conductivity (σ): | 5.76 | 5.76 | -0.01 | 5 |
| | Body 5800 | e' | 48.0300 | Relative Permittivity (ϵ_r): | 48.03 | 48.20 | -0.35 | 5 |
| | | e" | 18.8600 | Conductivity (σ): | 6.08 | 6.00 | 1.37 | 5 |
| | Body 5825 | e' | 48.1600 | Relative Permittivity (ϵ_r): | 48.16 | 48.20 | -0.08 | 5 |
| | | e" | 19.0700 | Conductivity (σ): | 6.18 | 6.00 | 2.94 | 5 |
| 2/23/2015 | Body 5180 | e' | 47.1000 | Relative Permittivity (ϵ_r): | 47.10 | 49.05 | -3.97 | 5 |
| | | e" | 18.8600 | Conductivity (σ): | 5.43 | 5.27 | 3.05 | 5 |
| | Body 5200 | e' | 47.1100 | Relative Permittivity (ϵ_r): | 47.11 | 49.02 | -3.90 | 5 |
| | | e" | 18.6400 | Conductivity (σ): | 5.39 | 5.29 | 1.79 | 5 |
| | Body 5600 | e' | 46.3700 | Relative Permittivity (ϵ_r): | 46.37 | 48.48 | -4.35 | 5 |
| | | e" | 19.1500 | Conductivity (σ): | 5.96 | 5.76 | 3.50 | 5 |
| | Body 5800 | e' | 46.2100 | Relative Permittivity (ϵ_r): | 46.21 | 48.20 | -4.13 | 5 |
| | | e" | 19.2500 | Conductivity (σ): | 6.21 | 6.00 | 3.47 | 5 |
| | Body 5825 | e' | 46.0800 | Relative Permittivity (ϵ_r): | 46.08 | 48.20 | -4.40 | 5 |
| | | e" | 19.4200 | Conductivity (σ): | 6.29 | 6.00 | 4.83 | 5 |

SAR Lab 3

| Date | Freq. (MHz) | Liquid Parameters | | Measured | Target | Delta (%) | Limit ±(%) | |
|-----------|-------------|-------------------|---------|---|--------|-----------|------------|---|
| 2/22/2015 | Body 1750 | e' | 51.2100 | Relative Permittivity (ϵ_r): | 51.21 | 53.44 | -4.17 | 5 |
| | | e" | 15.3200 | Conductivity (σ): | 1.49 | 1.49 | 0.31 | 5 |
| | Body 1710 | e' | 51.2100 | Relative Permittivity (ϵ_r): | 51.21 | 53.54 | -4.36 | 5 |
| | | e" | 15.3300 | Conductivity (σ): | 1.46 | 1.46 | -0.27 | 5 |
| | Body 1755 | e' | 51.1700 | Relative Permittivity (ϵ_r): | 51.17 | 53.43 | -4.23 | 5 |
| | | e" | 15.3700 | Conductivity (σ): | 1.50 | 1.49 | 0.71 | 5 |
| 2/3/2015 | Head 1750 | e' | 38.6000 | Relative Permittivity (ϵ_r): | 38.60 | 40.08 | -3.70 | 5 |
| | | e" | 13.7500 | Conductivity (σ): | 1.34 | 1.37 | -2.27 | 5 |
| | Head 1710 | e' | 38.7600 | Relative Permittivity (ϵ_r): | 38.76 | 40.15 | -3.45 | 5 |
| | | e" | 13.6700 | Conductivity (σ): | 1.30 | 1.35 | -3.46 | 5 |
| | Head 1755 | e' | 38.6100 | Relative Permittivity (ϵ_r): | 38.61 | 40.08 | -3.66 | 5 |
| | | e" | 13.7700 | Conductivity (σ): | 1.34 | 1.37 | -2.05 | 5 |
| 2/9/2015 | Head 750 | e' | 40.5400 | Relative Permittivity (ϵ_r): | 40.54 | 41.96 | -3.39 | 5 |
| | | e" | 21.9900 | Conductivity (σ): | 0.92 | 0.89 | 2.68 | 5 |
| | Head 700 | e' | 41.5500 | Relative Permittivity (ϵ_r): | 41.55 | 42.22 | -1.58 | 5 |
| | | e" | 22.4700 | Conductivity (σ): | 0.87 | 0.89 | -1.65 | 5 |
| | Head 725 | e' | 41.0600 | Relative Permittivity (ϵ_r): | 41.06 | 42.09 | -2.45 | 5 |
| | | e" | 22.1900 | Conductivity (σ): | 0.89 | 0.89 | 0.38 | 5 |
| 2/9/2015 | Body 750 | e' | 54.3600 | Relative Permittivity (ϵ_r): | 54.36 | 55.55 | -2.14 | 5 |
| | | e" | 23.6300 | Conductivity (σ): | 0.99 | 0.96 | 2.32 | 5 |
| | Body 700 | e' | 55.4200 | Relative Permittivity (ϵ_r): | 55.42 | 55.74 | -0.57 | 5 |
| | | e" | 24.2400 | Conductivity (σ): | 0.94 | 0.96 | -1.64 | 5 |
| | Body 725 | e' | 54.9500 | Relative Permittivity (ϵ_r): | 54.95 | 55.64 | -1.24 | 5 |
| | | e" | 23.9800 | Conductivity (σ): | 0.97 | 0.96 | 0.58 | 5 |

Dielectric Property Measurements Results: (continued)

SAR Lab 4

| Date | Freq. (MHz) | Liquid Parameters | | Measured | Target | Delta (%) | Limit ±(%) | |
|----------|-------------|-------------------|---------|---|--------|-----------|------------|---|
| 2/2/2015 | Head 1900 | e' | 38.4900 | Relative Permittivity (ϵ_r): | 38.49 | 40.00 | -3.78 | 5 |
| | | e" | 13.6000 | Conductivity (σ): | 1.44 | 1.40 | 2.63 | 5 |
| | Head 1850 | e' | 38.7100 | Relative Permittivity (ϵ_r): | 38.71 | 40.00 | -3.23 | 5 |
| | | e" | 13.4300 | Conductivity (σ): | 1.38 | 1.40 | -1.32 | 5 |
| | Head 1910 | e' | 38.4400 | Relative Permittivity (ϵ_r): | 38.44 | 40.00 | -3.90 | 5 |
| | | e" | 13.6100 | Conductivity (σ): | 1.45 | 1.40 | 3.24 | 5 |
| 2/2/2015 | Body 1900 | e' | 51.9000 | Relative Permittivity (ϵ_r): | 51.90 | 53.30 | -2.63 | 5 |
| | | e" | 14.5100 | Conductivity (σ): | 1.53 | 1.52 | 0.85 | 5 |
| | Body 1850 | e' | 52.0400 | Relative Permittivity (ϵ_r): | 52.04 | 53.30 | -2.36 | 5 |
| | | e" | 14.3900 | Conductivity (σ): | 1.48 | 1.52 | -2.62 | 5 |
| | Body 1910 | e' | 51.8500 | Relative Permittivity (ϵ_r): | 51.85 | 53.30 | -2.72 | 5 |
| | | e" | 14.5700 | Conductivity (σ): | 1.55 | 1.52 | 1.80 | 5 |
| 2/9/2015 | Head 1900 | e' | 38.4600 | Relative Permittivity (ϵ_r): | 38.46 | 40.00 | -3.85 | 5 |
| | | e" | 13.1000 | Conductivity (σ): | 1.38 | 1.40 | -1.15 | 5 |
| | Head 1850 | e' | 38.7500 | Relative Permittivity (ϵ_r): | 38.75 | 40.00 | -3.13 | 5 |
| | | e" | 12.9500 | Conductivity (σ): | 1.33 | 1.40 | -4.85 | 5 |
| | Head 1910 | e' | 38.4400 | Relative Permittivity (ϵ_r): | 38.44 | 40.00 | -3.90 | 5 |
| | | e" | 13.1600 | Conductivity (σ): | 1.40 | 1.40 | -0.17 | 5 |
| 2/9/2015 | Body 1900 | e' | 51.3400 | Relative Permittivity (ϵ_r): | 51.34 | 53.30 | -3.68 | 5 |
| | | e" | 14.3800 | Conductivity (σ): | 1.52 | 1.52 | -0.05 | 5 |
| | Body 1850 | e' | 51.5600 | Relative Permittivity (ϵ_r): | 51.56 | 53.30 | -3.26 | 5 |
| | | e" | 14.2700 | Conductivity (σ): | 1.47 | 1.52 | -3.43 | 5 |
| | Body 1910 | e' | 51.3400 | Relative Permittivity (ϵ_r): | 51.34 | 53.30 | -3.68 | 5 |
| | | e" | 14.4500 | Conductivity (σ): | 1.53 | 1.52 | 0.96 | 5 |

SAR Lab 5

| Date | Freq. (MHz) | Liquid Parameters | | Measured | Target | Delta (%) | Limit ±(%) | |
|----------|-------------|-------------------|---------|---|--------|-----------|------------|---|
| 2/4/2015 | Head 835 | e' | 42.1100 | Relative Permittivity (ϵ_r): | 42.11 | 41.50 | 1.47 | 5 |
| | | e" | 19.8300 | Conductivity (σ): | 0.92 | 0.90 | 2.30 | 5 |
| | Head 820 | e' | 42.3600 | Relative Permittivity (ϵ_r): | 42.36 | 41.60 | 1.82 | 5 |
| | | e" | 19.9000 | Conductivity (σ): | 0.91 | 0.90 | 0.99 | 5 |
| | Head 850 | e' | 41.9300 | Relative Permittivity (ϵ_r): | 41.93 | 41.50 | 1.04 | 5 |
| | | e" | 19.8000 | Conductivity (σ): | 0.94 | 0.92 | 2.27 | 5 |
| 2/4/2015 | Body 835 | e' | 53.3900 | Relative Permittivity (ϵ_r): | 53.39 | 55.20 | -3.28 | 5 |
| | | e" | 21.1300 | Conductivity (σ): | 0.98 | 0.97 | 1.14 | 5 |
| | Body 820 | e' | 53.5700 | Relative Permittivity (ϵ_r): | 53.57 | 55.28 | -3.09 | 5 |
| | | e" | 21.2800 | Conductivity (σ): | 0.97 | 0.97 | 0.18 | 5 |
| | Body 850 | e' | 53.2000 | Relative Permittivity (ϵ_r): | 53.20 | 55.16 | -3.55 | 5 |
| | | e" | 21.0500 | Conductivity (σ): | 0.99 | 0.99 | 0.78 | 5 |
| 2/9/2015 | Head 835 | e' | 40.7000 | Relative Permittivity (ϵ_r): | 40.70 | 41.50 | -1.93 | 5 |
| | | e" | 19.4800 | Conductivity (σ): | 0.90 | 0.90 | 0.49 | 5 |
| | Head 820 | e' | 40.8900 | Relative Permittivity (ϵ_r): | 40.89 | 41.60 | -1.71 | 5 |
| | | e" | 19.5900 | Conductivity (σ): | 0.89 | 0.90 | -0.59 | 5 |
| | Head 850 | e' | 40.5600 | Relative Permittivity (ϵ_r): | 40.56 | 41.50 | -2.27 | 5 |
| | | e" | 19.5200 | Conductivity (σ): | 0.92 | 0.92 | 0.83 | 5 |
| 2/9/2015 | Body 835 | e' | 53.4300 | Relative Permittivity (ϵ_r): | 53.43 | 55.20 | -3.21 | 5 |
| | | e" | 21.5300 | Conductivity (σ): | 1.00 | 0.97 | 3.05 | 5 |
| | Body 820 | e' | 53.6200 | Relative Permittivity (ϵ_r): | 53.62 | 55.28 | -3.00 | 5 |
| | | e" | 21.6400 | Conductivity (σ): | 0.99 | 0.97 | 1.88 | 5 |
| | Body 850 | e' | 53.2900 | Relative Permittivity (ϵ_r): | 53.29 | 55.16 | -3.39 | 5 |
| | | e" | 21.5500 | Conductivity (σ): | 1.02 | 0.99 | 3.18 | 5 |

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

| System Dipole | Serial No. | Cal. Date | Freq. (MHz) | Target SAR Values (W/kg) | | |
|---------------|------------|-----------|-------------|--------------------------|------|------|
| | | | | 1g/10g | Head | Body |
| D750V3 | 1019 | 3/17/2014 | 750 | 1g | 8.21 | 8.64 |
| | | | | 10g | 5.38 | 5.69 |
| D835V2 | 4d142 | 9/9/2014 | 835 | 1g | 8.91 | 9.22 |
| | | | | 10g | 5.77 | 6.05 |
| D1750V2 | 1050 | 4/22/2014 | 1750 | 1g | 36.6 | 37.2 |
| | | | | 10g | 19.4 | 20.0 |
| D1900V2 | 5d163 | 9/11/2014 | 1900 | 1g | 40.8 | 40.6 |
| | | | | 10g | 21.2 | 21.4 |
| D2450V2 | 748 | 2/18/2014 | 2450 | 1g | 51.6 | 50.7 |
| | | | | 10g | 24.0 | 23.7 |
| D5GHzV2 | 1138 | 9/18/2014 | 5200 | 1g | 81.4 | 75.4 |
| | | | | 10g | 23.3 | 21 |
| | | | 5600 | 1g | 85.1 | 81.9 |
| | | | | 10g | 24.2 | 22.6 |
| | | | 5800 | 1g | 80.6 | 75.2 |
| | | | | 10g | 23 | 20.8 |

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Lab 1

| Date Tested | System Dipole | | T.S. Liquid | Measured Results | | Target (Ref. Value) | Delta $\pm 10\%$ | Plot No. | |
|-------------|-------------------|----------|-------------|---------------------|------------------|---------------------|------------------|----------|-----|
| | Type | Serial # | | Zoom Scan to 100 mW | Normalize to 1 W | | | | |
| 2/6/2015 | D2450V2 | 748 | Head | 1g | 5.26 | 52.6 | 51.6 | 1.94 | |
| | | | | 10g | 2.38 | 23.8 | 24 | -0.83 | |
| 2/6/2015 | D2450V2 | 748 | Body | 1g | 5.51 | 55.1 | 50.70 | 8.68 | 1,2 |
| | | | | 10g | 2.53 | 25.3 | 23.7 | 6.75 | |
| 2/16/2015 | D5GHzV2 (5.2 GHz) | 1138 | Head | 1g | 7.50 | 75.0 | 81.40 | -7.86 | |
| | | | | 10g | 2.15 | 21.5 | 23.30 | -7.73 | |
| 2/16/2015 | D5GHzV2 (5.6 GHz) | 1138 | Head | 1g | 7.82 | 78.2 | 85.10 | -8.11 | 3,4 |
| | | | | 10g | 2.20 | 22.0 | 24.20 | -9.09 | |
| 2/16/2015 | D5GHzV2 (5.8 GHz) | 1138 | Head | 1g | 7.42 | 74.2 | 80.60 | -7.94 | |
| | | | | 10g | 2.10 | 21.0 | 23.00 | -8.70 | |
| 2/16/2015 | D5GHzV2 (5.2 GHz) | 1138 | Body | 1g | 7.78 | 77.8 | 75.40 | 3.18 | |
| | | | | 10g | 2.23 | 22.3 | 21.00 | 6.19 | |
| 2/16/2015 | D5GHzV2 (5.6 GHz) | 1138 | Body | 1g | 7.85 | 78.5 | 81.90 | -4.15 | |
| | | | | 10g | 2.21 | 22.1 | 22.60 | -2.21 | |
| 2/16/2015 | D5GHzV2 (5.8 GHz) | 1138 | Body | 1g | 6.91 | 69.1 | 75.20 | -8.11 | |
| | | | | 10g | 1.95 | 19.5 | 20.80 | -6.25 | |
| 2/23/2015 | D5GHzV2 (5.2 GHz) | 1138 | Body | 1g | 7.72 | 77.2 | 75.4 | 2.39 | |
| | | | | 10g | 2.20 | 22.0 | 21.0 | 4.76 | |
| 2/23/2015 | D5GHzV2 (5.6 GHz) | 1138 | Body | 1g | 8.75 | 87.5 | 81.9 | 6.84 | |
| | | | | 10g | 2.46 | 24.6 | 22.6 | 8.85 | |
| 2/23/2015 | D5GHzV2 (5.8 GHz) | 1138 | Body | 1g | 7.06 | 70.6 | 75.2 | -6.12 | |
| | | | | 10g | 1.98 | 19.8 | 20.8 | -4.81 | |

SAR Lab 3

| Date Tested | System Dipole | | T.S. Liquid | Measured Results | | Target (Ref. Value) | Delta $\pm 10\%$ | Plot No. | |
|-------------|---------------|----------|-------------|---------------------|------------------|---------------------|------------------|----------|-----|
| | Type | Serial # | | Zoom Scan to 100 mW | Normalize to 1 W | | | | |
| 2/2/2015 | D1750V2 | 1050 | Body | 1g | 3.76 | 37.6 | 37.2 | 1.08 | |
| | | | | 10g | 2.01 | 20.1 | 20 | 0.50 | |
| 2/3/2015 | D1750V2 | 1050 | Head | 1g | 3.49 | 34.9 | 36.6 | -4.64 | 5,6 |
| | | | | 10g | 1.84 | 18.4 | 19.4 | -5.15 | |
| 2/9/2015 | D750V3 | 1019 | Head | 1g | 0.759 | 7.6 | 8.2 | -7.55 | 7,8 |
| | | | | 10g | 0.497 | 5.0 | 5.4 | -7.62 | |
| 2/9/2015 | D750V3 | 1019 | Body | 1g | 0.836 | 8.4 | 8.6 | -3.24 | |
| | | | | 10g | 0.556 | 5.6 | 5.7 | -2.28 | |

SAR Lab 4

| Date Tested | System Dipole | | T.S. Liquid | Measured Results | | Target (Ref. Value) | Delta ±10 % | Plot No. | |
|-------------|---------------|----------|-------------|---------------------|------------------|---------------------|-------------|----------|------|
| | Type | Serial # | | Zoom Scan to 100 mW | Normalize to 1 W | | | | |
| 2/2/2015 | 1900 | 5d163 | Head | 1g | 4.01 | 40.1 | 40.80 | -1.72 | |
| | | | | 10g | 2.07 | 20.7 | 21.20 | -2.36 | |
| 2/2/2015 | 1900 | 5d163 | Body | 1g | 3.85 | 38.5 | 40.60 | -5.17 | 9,10 |
| | | | | 10g | 1.99 | 19.9 | 21.40 | -7.01 | |
| 2/9/2015 | 1900 | 5d163 | Head | 1g | 4.20 | 42.0 | 40.80 | 2.94 | |
| | | | | 10g | 2.17 | 21.7 | 21.20 | 2.36 | |
| 2/9/2015 | 1900 | 5d163 | Body | 1g | 3.98 | 39.8 | 40.60 | -1.97 | |
| | | | | 10g | 2.06 | 20.6 | 21.40 | -3.74 | |

SAR Lab 5

| Date Tested | System Dipole | | T.S. Liquid | Measured Results | | Target (Ref. Value) | Delta ±10 % | Plot No. | |
|-------------|---------------|----------|-------------|---------------------|------------------|---------------------|-------------|----------|-------|
| | Type | Serial # | | Zoom Scan to 100 mW | Normalize to 1 W | | | | |
| 2/4/2015 | D835V2 | 4d142 | Head | 1g | 0.93 | 9.3 | 8.91 | 4.71 | |
| | | | | 10g | 0.61 | 6.1 | 5.77 | 6.41 | |
| 2/4/2015 | D835V2 | 4d142 | Body | 1g | 0.92 | 9.2 | 9.22 | 0.11 | |
| | | | | 10g | 0.61 | 6.1 | 6.05 | 0.83 | |
| 2/9/2015 | D835V2 | 4d142 | Head | 1g | 0.93 | 9.3 | 8.91 | 3.82 | |
| | | | | 10g | 0.61 | 6.1 | 5.77 | 5.37 | |
| 2/9/2015 | D835V2 | 4d142 | Body | 1g | 0.97 | 9.7 | 9.22 | 5.64 | 11,12 |
| | | | | 10g | 0.64 | 6.4 | 6.05 | 6.28 | |

9. Conducted Output Power Measurements

9.1. GSM

GSM850 Measured Results

| Band | Mode | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Burst Pwr (dBm) | Frame Pwr (dBm) | |
|------|--------------|---------------|------------|--------|-------------|-----------------|-----------------|------|
| 850 | GSM (Voice) | CS1 | 1 | 128 | 824.2 | 33.1 | 24.0 | |
| | | | | 190 | 836.6 | 33.1 | 24.1 | |
| | | | | 251 | 848.8 | 33.1 | 24.1 | |
| | GPRS (GMSK) | CS1 | 1 | 1 | 128 | 824.2 | 33.1 | 24.0 |
| | | | | | 190 | 836.6 | 33.1 | 24.1 |
| | | | | | 251 | 848.8 | 33.1 | 24.1 |
| | | | 2 | 128 | 824.2 | 31.7 | 25.7 | |
| | | | | 190 | 836.6 | 31.7 | 25.7 | |
| | | | | 251 | 848.8 | 31.7 | 25.7 | |
| | EGPRS (8PSK) | MCS5 | 1 | 1 | 128 | 824.2 | 27.7 | 18.7 |
| | | | | | 190 | 836.6 | 27.7 | 18.7 |
| | | | | | 251 | 848.8 | 27.7 | 18.7 |
| 2 | | | 128 | 824.2 | 27.7 | 21.7 | | |
| | | | 190 | 836.6 | 27.7 | 21.7 | | |
| | | | 251 | 848.8 | 27.5 | 21.5 | | |

Notes:

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

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

GSM1900 Measured Results

| Band | Mode | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Burst Pwr (dBm) | Frame Pwr (dBm) | |
|------|--------------|---------------|------------|--------|-------------|-----------------|-----------------|------|
| 1900 | GSM (Voice) | CS1 | 1 | 512 | 1850.2 | 30.0 | 21.0 | |
| | | | | 661 | 1880.0 | 30.1 | 21.1 | |
| | | | | 810 | 1909.8 | 30.2 | 21.2 | |
| | GPRS (GMSK) | CS1 | 1 | 1 | 512 | 1850.2 | 30.0 | 21.0 |
| | | | | | 661 | 1880.0 | 30.1 | 21.1 |
| | | | | | 810 | 1909.8 | 30.2 | 21.2 |
| | | | 2 | 512 | 1850.2 | 29.7 | 23.7 | |
| | | | | 661 | 1880.0 | 29.7 | 23.7 | |
| | | | | 810 | 1909.8 | 29.7 | 23.6 | |
| | EGPRS (8PSK) | MCS5 | 1 | 1 | 512 | 1850.2 | 26.7 | 17.7 |
| | | | | | 661 | 1880.0 | 26.7 | 17.7 |
| | | | | | 810 | 1909.8 | 26.7 | 17.7 |
| 2 | | | 512 | 1850.2 | 26.7 | 20.7 | | |
| | | | 661 | 1880.0 | 26.7 | 20.7 | | |
| | | | 810 | 1909.8 | 26.7 | 20.7 | | |

Notes:

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

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

9.2. W-CDMA

Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

| Mode | Subtest | Rel99 |
|------------------------|-------------------------|--------------|
| WCDMA General Settings | Loopback Mode | Test Mode 2 |
| | Rel99 RMC | 12.2kbps RMC |
| | Power Control Algorithm | Algorithm2 |
| | β_c/β_d | 8/15 |

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

| | Mode | HSDPA | | HSDPA | |
|-------------------------------|--------------------------------------|--------------|-------|-------|-------|
| | Subtest | 1 | 2 | 3 | 4 |
| W-CDMA General Settings | Loopback Mode | Test Mode 1 | | | |
| | Rel99 RMC | 12.2kbps RMC | | | |
| | HSDPA FRC | H-Set 1 | | | |
| | Power Control Algorithm | Algorithm 2 | | | |
| | β_c | 2/15 | 11/15 | 15/15 | 15/15 |
| | β_d | 15/15 | 15/15 | 8/15 | 4/15 |
| | Bd (SF) | 64 | | | |
| | β_c/β_d | 2/15 | 11/15 | 15/8 | 15/4 |
| | β_{hs} | 4/15 | 24/15 | 30/15 | 30/15 |
| MPR (dB) | 0 | 0 | 0.5 | 0.5 | |
| HSDPA Specific Settings | D_{ACK} | 8 | | | |
| | D_{NAK} | 8 | | | |
| | DCQI | 8 | | | |
| | Ack-Nack repetition factor | 3 | | | |
| | CQI Feedback (Table 5.2B.4) | 4ms | | | |
| | CQI Repetition Factor (Table 5.2B.4) | 2 | | | |
| $A_{hs}=\beta_{hs}/\beta_c$ | 30/15 | | | | |

HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

| | Mode | HSPA | | | | |
|-------------------------------|--|---------------|-------|-------|-------|-------------|
| | Subtest | 1 | 2 | 3 | 4 | 5 |
| WCDMA General Settings | Loopback Mode | Test Mode 1 | | | | |
| | Rel99 RMC | 12.2 kbps RMC | | | | |
| | HSDPA FRC | H-Set 1 | | | | |
| | HSUPA Test | HSPA | | | | |
| | Power Control Algorithm | Algorithm 2 | | | | Algorithm 1 |
| | β_c | 11/15 | 6/15 | 15/15 | 2/15 | 15/15 |
| | β_d | 15/15 | 15/15 | 9/15 | 15/15 | 0 |
| | β_{ec} | 209/225 | 12/15 | 30/15 | 2/15 | 5/15 |
| | β_c/β_d | 11/15 | 6/15 | 15/9 | 2/15 | 15/1 |
| | β_{hs} | 22/15 | 12/15 | 30/15 | 4/15 | 5/15 |
| | β_{ed} | 1309/225 | 94/75 | 47/15 | 56/75 | 47/15 |
| CM (dB) | 1 | 3 | 2 | 3 | 1 | |
| MPR (dB) | 0 | 2 | 1 | 2 | 0 | |
| HSDPA Specific Settings | DACK | 8 | | | | 0 |
| | DNAK | 8 | | | | 0 |
| | DCQI | 8 | | | | 0 |
| | Ack-Nack repetition factor | 3 | | | | |
| | CQI Feedback (Table 5.2B.4) | 4ms | | | | |
| | CQI Repetition Factor (Table 5.2B.4) | 2 | | | | |
| | A _{hs} = β_{hs}/β_c | 30/15 | | | | |
| HSUPA Specific Settings | E-DPDCCH | 6 | 8 | 8 | 5 | 7 |
| | DHARQ | 0 | 0 | 0 | 0 | 0 |
| | AG Index | 20 | 12 | 15 | 17 | 21 |
| | ETFCI (from 34.121 Table C.11.1.3) | 75 | 67 | 92 | 71 | 81 |
| | Associated Max UL Data Rate kbps | 242.1 | 174.9 | 482.8 | 205.8 | 308.9 |
| | Reference E-TFCIs | 5 | 5 | 2 | 5 | 1 |
| | Reference E-TFCI | 11 | 11 | 11 | 11 | 67 |
| | Reference E-TFCI PO | 4 | 4 | 4 | 4 | 18 |
| | Reference E-TFCI | 67 | 67 | 92 | 67 | 67 |
| | Reference E-TFCI PO | 18 | 18 | 18 | 18 | 18 |
| | Reference E-TFCI | 71 | 71 | 71 | 71 | 71 |
| | Reference E-TFCI PO | 23 | 23 | 23 | 23 | 23 |
| | Reference E-TFCI | 75 | 75 | 75 | 75 | 75 |
| | Reference E-TFCI PO | 26 | 26 | 26 | 26 | 26 |
| | Reference E-TFCI | 81 | 81 | 81 | 81 | 81 |
| Reference E-TFCI PO | 27 | 27 | 27 | 27 | 27 | |
| Maximum Channelization Codes | 2xSF2 | | | | SF4 | |

DC-HSDPA Setup Procedures used to establish the test signals

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

Table E.5.0: Levels for HSDPA connection setup

| Parameter During Connection setup | Unit | Value |
|-----------------------------------|------|-------|
| P-CPICH_Ec/Ior | dB | -10 |
| P-CCPCH and SCH_Ec/Ior | dB | -12 |
| PICH_Ec/Ior | dB | -15 |
| HS-PDSCH | dB | off |
| HS-SCCH_1 | dB | off |
| DPCH_Ec/Ior | dB | -5 |
| OCNS_Ec/Ior | dB | -3.1 |

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

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

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

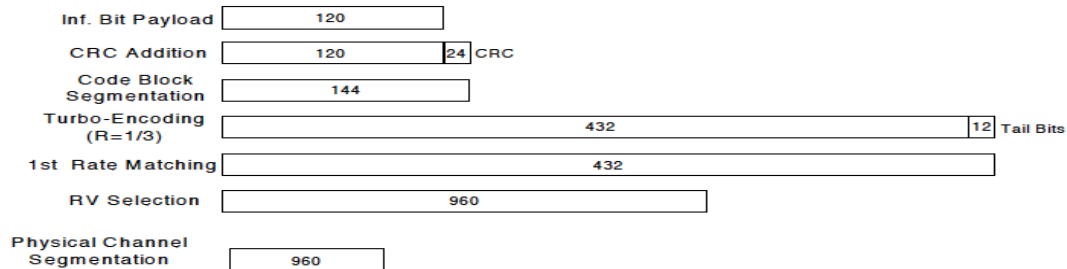


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

| Mode | HSDPA | HSDPA | HSDPA | HSDPA |
|-------------------------------|----------------------------|-------|-------|-------|
| Subtest | 1 | 2 | 3 | 4 |
| WCDMA General Settings | Loopback Mode | | | |
| | Test Mode 1 | | | |
| | Rel99 RMC | | | |
| | 12.2kbps RMC | | | |
| | HSDPA FRC | | | |
| | H-Set 1 | | | |
| | Power Control Algorithm | | | |
| | Algorithm2 | | | |
| | β_c | 2/15 | 11/15 | 15/15 |
| β_d | 15/15 | 15/15 | 8/15 | 4/15 |
| β_d (SF) | 64 | | | |
| β_c/β_d | 2/15 | 11/15 | 15/8 | 15/4 |
| β_{hs} | 4/15 | 24/15 | 30/15 | 30/15 |
| MPR (dB) | 0 | 0 | 0.5 | 0.5 |
| HSDPA Specific Settings | DACK | | | |
| | 8 | | | |
| | DNAK | | | |
| | 8 | | | |
| | DCQI | | | |
| | 8 | | | |
| | Ack-Nack Repetition factor | | | |
| 3 | | | | |
| CQI Feedback | | | | |
| 4ms | | | | |
| CQI Repetition Factor | | | | |
| 2 | | | | |
| $A_{hs} = \beta_{hs}/\beta_c$ | | | | |
| 30/15 | | | | |

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

Measured Results

| Band | Mode | | UL Ch No. | Freq. (MHz) | MPR (dB) | Avg Pwr (dBm) |
|-------------------|---------|----------------|-----------|-------------|----------|---------------|
| W-CDMA Band II | Rel 99 | RMC, 12.2 kbps | 9262 | 1852.4 | N/A | 23.2 |
| | | | 9400 | 1880.0 | N/A | 23.4 |
| | | | 9538 | 1907.6 | N/A | 23.5 |
| | HSDPA | Subtest 1 | 9262 | 1852.4 | 0 | 23.3 |
| | | | 9400 | 1880.0 | 0 | 23.5 |
| | | | 9538 | 1907.6 | 0 | 23.5 |
| | | Subtest 2 | 9262 | 1852.4 | 0 | 23.3 |
| | | | 9400 | 1880.0 | 0 | 23.5 |
| | | | 9538 | 1907.6 | 0 | 23.5 |
| | | Subtest 3 | 9262 | 1852.4 | 0.5 | 22.9 |
| | | | 9400 | 1880.0 | 0.5 | 23.1 |
| | | | 9538 | 1907.6 | 0.5 | 23.0 |
| | | | 9262 | 1852.4 | 0.5 | 22.9 |
| | | | 9400 | 1880.0 | 0.5 | 23.1 |
| | | | 9538 | 1907.6 | 0.5 | 23.0 |
| | HSUPA | Subtest 1 | 9262 | 1852.4 | 0 | 22.4 |
| | | | 9400 | 1880.0 | 0 | 22.5 |
| | | | 9538 | 1907.6 | 0 | 22.9 |
| | | Subtest 2 | 9262 | 1852.4 | 2 | 21.4 |
| | | | 9400 | 1880.0 | 2 | 21.5 |
| | | | 9538 | 1907.6 | 2 | 21.6 |
| | | Subtest 3 | 9262 | 1852.4 | 1 | 21.8 |
| | | | 9400 | 1880.0 | 1 | 21.9 |
| | | | 9538 | 1907.6 | 1 | 22.0 |
| | | Subtest 4 | 9262 | 1852.4 | 2 | 21.4 |
| | | | 9400 | 1880.0 | 2 | 21.5 |
| | | | 9538 | 1907.6 | 2 | 21.6 |
| | | Subtest 5 | 9262 | 1852.4 | 0 | 22.4 |
| | | | 9400 | 1880.0 | 0 | 22.5 |
| | | | 9538 | 1907.6 | 0 | 22.9 |
| | DC-HSPA | Subtest 1 | 9262 | 1852.4 | 0 | 22.9 |
| | | | 9400 | 1880.0 | 0 | 23.1 |
| | | | 9538 | 1907.6 | 0 | 23.0 |
| | | Subtest 2 | 9262 | 1852.4 | 0 | 22.9 |
| | | | 9400 | 1880.0 | 0 | 23.1 |
| | | | 9538 | 1907.6 | 0 | 23.0 |
| | | Subtest 3 | 9262 | 1852.4 | 0.5 | 22.9 |
| | | | 9400 | 1880.0 | 0.5 | 23.1 |
| | | | 9538 | 1907.6 | 0.5 | 23.0 |
| | | Subtest 4 | 9262 | 1852.4 | 0.5 | 22.9 |
| | | | 9400 | 1880.0 | 0.5 | 23.1 |
| | | | 9538 | 1907.6 | 0.5 | 23.0 |

| Band | Mode | | UL Ch No. | Freq. (MHz) | MPR (dB) | Avg Pwr (dBm) |
|------------------|---------|----------------|-----------|-------------|----------|---------------|
| W-CDMA Band V | Rel 99 | RMC, 12.2 kbps | 4132 | 826.4 | N/A | 23.7 |
| | | | 4183 | 836.6 | N/A | 23.7 |
| | | | 4233 | 846.6 | N/A | 23.7 |
| | HSDPA | Subtest 1 | 4132 | 826.4 | 0 | 23.7 |
| | | | 4183 | 836.6 | 0 | 23.7 |
| | | | 4233 | 846.6 | 0 | 23.7 |
| | | Subtest 2 | 4132 | 826.4 | 0 | 23.7 |
| | | | 4183 | 836.6 | 0 | 23.7 |
| | | | 4233 | 846.6 | 0 | 23.7 |
| | | Subtest 3 | 4132 | 826.4 | 0.5 | 23.2 |
| | | | 4183 | 836.6 | 0.5 | 23.1 |
| | | | 4233 | 846.6 | 0.5 | 23.1 |
| | | Subtest 4 | 4132 | 826.4 | 0.5 | 23.2 |
| | | | 4183 | 836.6 | 0.5 | 23.1 |
| | | | 4233 | 846.6 | 0.5 | 23.1 |
| | HSUPA | Subtest 1 | 4132 | 826.4 | 0 | 22.5 |
| | | | 4183 | 836.6 | 0 | 22.9 |
| | | | 4233 | 846.6 | 0 | 22.5 |
| | | Subtest 2 | 4132 | 826.4 | 2 | 21.5 |
| | | | 4183 | 836.6 | 2 | 21.7 |
| | | | 4233 | 846.6 | 2 | 21.7 |
| | | Subtest 3 | 4132 | 826.4 | 1 | 22.4 |
| | | | 4183 | 836.6 | 1 | 22.4 |
| | | | 4233 | 846.6 | 1 | 22.5 |
| | | Subtest 4 | 4132 | 826.4 | 2 | 21.5 |
| | | | 4183 | 836.6 | 2 | 21.7 |
| | | | 4233 | 846.6 | 2 | 21.7 |
| | | Subtest 5 | 4132 | 826.4 | 0 | 22.5 |
| | | | 4183 | 836.6 | 0 | 22.9 |
| | | | 4233 | 846.6 | 0 | 22.5 |
| | DC-HSPA | Subtest 1 | 4132 | 826.4 | 0 | 23.7 |
| | | | 4183 | 836.6 | 0 | 23.7 |
| | | | 4233 | 846.6 | 0 | 23.7 |
| | | Subtest 2 | 4132 | 826.4 | 0 | 23.7 |
| | | | 4183 | 836.6 | 0 | 23.7 |
| | | | 4233 | 846.6 | 0 | 23.7 |
| | | Subtest 3 | 4132 | 826.4 | 0.5 | 23.2 |
| | | | 4183 | 836.6 | 0.5 | 23.1 |
| | | | 4233 | 846.6 | 0.5 | 23.1 |
| | | Subtest 4 | 4132 | 826.4 | 0.5 | 23.2 |
| | | | 4183 | 836.6 | 0.5 | 23.1 |
| | | | 4233 | 846.6 | 0.5 | 23.1 |

9.3. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

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

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

| Modulation | Channel bandwidth / Transmission bandwidth (RB) | | | | | | MPR (dB) |
|------------|---|---------|-------|--------|--------|--------|----------|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

| Network Signalling value | Requirements (sub-clause) | E-UTRA Band | Channel bandwidth (MHz) | Resources Blocks (N_{RB}) | A-MPR (dB) |
|--------------------------|---------------------------|--------------------------|-------------------------|-------------------------------|---------------|
| NS_01 | 6.6.2.1.1 | Table 5.5-1 | 1.4, 3, 5, 10, 15, 20 | Table 5.6-1 | NA |
| NS_03 | 6.6.2.2.1 | 2, 4, 10, 23, 25, 35, 36 | 3 | >5 | ≤ 1 |
| | | | 5 | >6 | ≤ 1 |
| | | | 10 | >6 | ≤ 1 |
| | | | 15 | >8 | ≤ 1 |
| | | | 20 | >10 | ≤ 1 |
| NS_04 | 6.6.2.2.2 | 41 | 5 | >6 | ≤ 1 |
| | | | 10, 15, 20 | See Table 6.2.4-4 | |
| NS_05 | 6.6.3.3.1 | 1 | 10,15,20 | ≥ 50 | ≤ 1 |
| NS_06 | 6.6.2.2.3 | 12, 13, 14, 17 | 1.4, 3, 5, 10 | Table 5.6-1 | n/a |
| NS_07 | 6.6.2.2.3 | 13 | 10 | Table 6.2.4-2 | Table 6.2.4-2 |
| | 6.6.3.3.2 | | | | |
| NS_08 | 6.6.3.3.3 | 19 | 10, 15 | > 44 | ≤ 3 |
| NS_09 | 6.6.3.3.4 | 21 | 10, 15 | > 40 | ≤ 1 |
| | | | | > 55 | ≤ 2 |
| | | | | See Table 6.2.4-3 | |
| NS_10 | | 20 | 15, 20 | Table 6.2.4-3 | Table 6.2.4-3 |
| NS_11 | 6.6.2.2.1 | 23 ¹ | 1.4, 3, 5, 10 | Table 6.2.4-5 | Table 6.2.4-5 |
| .. | | | | | |
| NS_32 | - | - | - | - | - |

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 2 Measured Results

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|----------|------------|
| | | | | | | | 1860 MHz | 1880 MHz | 1900 MHz |
| LTE Band 2 | 20 | QPSK | 1 | 0 | 0 | 0 | 23.6 | 23.2 | 23.6 |
| | | | 1 | 49 | 0 | 0 | 23.5 | 22.9 | 23.6 |
| | | | 1 | 99 | 0 | 0 | 23.3 | 23.5 | 23.5 |
| | | | 50 | 0 | 1 | 1 | 22.3 | 22.2 | 22.3 |
| | | | 50 | 25 | 1 | 1 | 22.3 | 22.1 | 22.3 |
| | | | 50 | 49 | 1 | 1 | 22.2 | 22.2 | 22.1 |
| | | | 100 | 0 | 1 | 1 | 22.2 | 22.1 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.7 | 22.7 |
| | | | 1 | 49 | 1 | 1 | 22.7 | 22.3 | 22.7 |
| | | | 1 | 99 | 1 | 1 | 22.0 | 22.2 | 22.7 |
| | | | 50 | 0 | 2 | 2 | 21.3 | 21.2 | 21.2 |
| | | | 50 | 25 | 2 | 2 | 21.0 | 21.1 | 21.2 |
| | | | 50 | 49 | 2 | 2 | 21.0 | 21.2 | 21.1 |
| | | | 100 | 0 | 2 | 2 | 21.1 | 21.1 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1857.5 MHz | 1880 MHz | 1902.5 MHz |
| LTE Band 2 | 15 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.3 | 23.3 |
| | | | 1 | 37 | 0 | 0 | 23.2 | 23.2 | 23.2 |
| | | | 1 | 74 | 0 | 0 | 23.3 | 23.3 | 23.2 |
| | | | 36 | 0 | 1 | 1 | 22.2 | 22.3 | 22.3 |
| | | | 36 | 18 | 1 | 1 | 22.3 | 22.3 | 22.3 |
| | | | 36 | 35 | 1 | 1 | 22.2 | 22.3 | 22.1 |
| | | | 75 | 0 | 1 | 1 | 22.2 | 22.2 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.5 | 22.7 | 22.4 |
| | | | 1 | 37 | 1 | 1 | 22.7 | 22.4 | 22.5 |
| | | | 1 | 74 | 1 | 1 | 22.7 | 22.5 | 22.5 |
| | | | 36 | 0 | 2 | 2 | 21.2 | 21.4 | 21.2 |
| | | | 36 | 18 | 2 | 2 | 21.1 | 21.4 | 21.2 |
| | | | 36 | 35 | 2 | 2 | 21.1 | 21.3 | 21.1 |
| | | | 75 | 0 | 2 | 2 | 21.2 | 21.1 | 21.1 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1855 MHz | 1880 MHz | 1905 MHz |
| LTE Band 2 | 10 | QPSK | 1 | 0 | 0 | 0 | 23.4 | 23.7 | 23.4 |
| | | | 1 | 25 | 0 | 0 | 23.3 | 23.5 | 23.3 |
| | | | 1 | 49 | 0 | 0 | 23.3 | 23.4 | 23.3 |
| | | | 25 | 0 | 1 | 1 | 22.2 | 22.4 | 22.3 |
| | | | 25 | 12 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 25 | 25 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 50 | 0 | 1 | 1 | 22.2 | 22.4 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.6 | 22.3 |
| | | | 1 | 25 | 1 | 1 | 22.4 | 22.7 | 22.2 |
| | | | 1 | 49 | 1 | 1 | 22.7 | 22.7 | 22.3 |
| | | | 25 | 0 | 2 | 2 | 21.2 | 21.3 | 21.2 |
| | | | 25 | 12 | 2 | 2 | 21.2 | 21.3 | 21.3 |
| | | | 25 | 25 | 2 | 2 | 21.4 | 21.3 | 21.3 |
| | | | 50 | 0 | 2 | 2 | 21.3 | 21.3 | 21.2 |

LTE Band 2 Measured Results Cont.

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|----------|------------|
| | | | | | | | 1852.5 MHz | 1880 MHz | 1907.5 MHz |
| LTE Band 2 | 5 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.3 | 23.2 |
| | | | 1 | 12 | 0 | 0 | 23.2 | 23.6 | 23.3 |
| | | | 1 | 24 | 0 | 0 | 23.2 | 23.3 | 23.3 |
| | | | 12 | 0 | 1 | 1 | 22.1 | 22.2 | 22.2 |
| | | | 12 | 7 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 12 | 13 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 25 | 0 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.2 | 22.3 | 22.6 |
| | | | 1 | 12 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 1 | 24 | 1 | 1 | 22.1 | 22.2 | 22.1 |
| | | | 12 | 0 | 2 | 2 | 21.1 | 21.1 | 21.2 |
| | | | 12 | 7 | 2 | 2 | 21.0 | 21.1 | 21.4 |
| | | | 12 | 13 | 2 | 2 | 21.2 | 21.2 | 21.3 |
| | | | 25 | 0 | 2 | 2 | 21.3 | 21.5 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1851.5 MHz | 1880 MHz | 1908.5 MHz |
| LTE Band 2 | 3 | QPSK | 1 | 0 | 0 | 1 | 23.0 | 23.2 | 23.1 |
| | | | 1 | 7 | 0 | 0 | 23.4 | 23.7 | 23.4 |
| | | | 1 | 14 | 0 | 0 | 23.0 | 23.1 | 23.2 |
| | | | 6 | 0 | 1 | 1 | 22.0 | 22.1 | 22.2 |
| | | | 6 | 3 | 1 | 1 | 22.0 | 22.1 | 22.2 |
| | | | 6 | 5 | 1 | 1 | 22.0 | 22.2 | 22.2 |
| | | | 15 | 0 | 1 | 1 | 22.0 | 22.2 | 22.3 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.1 | 22.7 | 22.6 |
| | | | 1 | 7 | 1 | 1 | 22.4 | 22.7 | 22.7 |
| | | | 1 | 14 | 1 | 1 | 22.3 | 22.5 | 22.5 |
| | | | 6 | 0 | 2 | 2 | 21.0 | 21.0 | 21.4 |
| | | | 6 | 3 | 2 | 2 | 21.2 | 21.1 | 21.4 |
| | | | 6 | 5 | 2 | 2 | 21.1 | 21.0 | 21.4 |
| | | | 15 | 0 | 2 | 2 | 21.0 | 21.3 | 21.3 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1850.7 MHz | 1880 MHz | 1909.3 MHz |
| LTE Band 2 | 1.4 | QPSK | 1 | 0 | 0 | 0 | 23.0 | 23.2 | 23.3 |
| | | | 1 | 2 | 0 | 0 | 23.0 | 23.0 | 23.3 |
| | | | 1 | 5 | 0 | 0 | 23.1 | 23.0 | 23.3 |
| | | | 3 | 0 | 0 | 0 | 23.0 | 23.0 | 23.3 |
| | | | 3 | 1 | 0 | 0 | 23.0 | 23.1 | 23.3 |
| | | | 3 | 2 | 0 | 0 | 23.0 | 23.2 | 23.3 |
| | | | 6 | 0 | 1 | 1 | 22.0 | 22.1 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.1 | 22.2 | 22.7 |
| | | | 1 | 2 | 1 | 1 | 22.7 | 22.2 | 22.7 |
| | | | 1 | 5 | 1 | 1 | 22.7 | 22.2 | 22.7 |
| | | | 3 | 0 | 1 | 1 | 22.3 | 22.0 | 22.6 |
| | | | 3 | 1 | 1 | 1 | 22.3 | 22.0 | 22.6 |
| | | | 3 | 2 | 1 | 1 | 22.0 | 22.2 | 22.6 |
| | | | 6 | 0 | 2 | 2 | 21.6 | 21.0 | 21.5 |

LTE Band 4 Measured Results

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|------------|------------|
| | | | | | | | 1720 MHz | 1732.5 MHz | 1745 MHz |
| LTE Band 4 | 20 | QPSK | 1 | 0 | 0 | 0 | 23.5 | 23.1 | 23.2 |
| | | | 1 | 49 | 0 | 0 | 23.5 | 23.1 | 23.5 |
| | | | 1 | 99 | 0 | 0 | 23.2 | 23.1 | 23.4 |
| | | | 50 | 0 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 50 | 25 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 50 | 49 | 1 | 1 | 22.1 | 22.1 | 22.2 |
| | | | 100 | 0 | 1 | 1 | 22.2 | 22.2 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.2 | 22.4 | 22.7 |
| | | | 1 | 49 | 1 | 1 | 22.1 | 22.1 | 22.7 |
| | | | 1 | 99 | 1 | 1 | 22.0 | 22.0 | 22.7 |
| | | | 50 | 0 | 2 | 2 | 21.2 | 21.3 | 21.1 |
| | | | 50 | 25 | 2 | 2 | 21.2 | 21.1 | 20.9 |
| | | | 50 | 49 | 2 | 2 | 21.2 | 21.0 | 21.0 |
| | | | 100 | 0 | 2 | 2 | 21.1 | 21.2 | 21.3 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1717.5 MHz | 1732.5 MHz | 1747.5 MHz |
| LTE Band 4 | 15 | QPSK | 1 | 0 | 0 | 0 | 23.0 | 23.2 | 23.2 |
| | | | 1 | 37 | 0 | 0 | 23.7 | 23.1 | 23.6 |
| | | | 1 | 74 | 0 | 1 | 23.0 | 23.1 | 23.1 |
| | | | 36 | 0 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 36 | 18 | 1 | 1 | 22.1 | 22.2 | 22.2 |
| | | | 36 | 35 | 1 | 1 | 22.2 | 22.2 | 22.2 |
| | | | 75 | 0 | 1 | 1 | 22.1 | 22.2 | 22.1 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.4 | 22.6 | 22.7 |
| | | | 1 | 37 | 1 | 1 | 22.2 | 22.4 | 22.7 |
| | | | 1 | 74 | 1 | 1 | 22.1 | 22.4 | 22.7 |
| | | | 36 | 0 | 2 | 2 | 21.1 | 21.2 | 21.3 |
| | | | 36 | 18 | 2 | 2 | 21.0 | 21.3 | 21.1 |
| | | | 36 | 35 | 2 | 2 | 21.0 | 21.3 | 21.1 |
| | | | 75 | 0 | 2 | 2 | 21.0 | 21.3 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1715 MHz | 1732.5 MHz | 1750 MHz |
| LTE Band 4 | 10 | QPSK | 1 | 0 | 0 | 1 | 23.1 | 23.1 | 23.1 |
| | | | 1 | 24 | 0 | 1 | 23.1 | 23.1 | 23.1 |
| | | | 1 | 49 | 0 | 1 | 23.0 | 23.0 | 23.1 |
| | | | 25 | 0 | 1 | 1 | 22.3 | 22.2 | 22.2 |
| | | | 25 | 12 | 1 | 1 | 22.2 | 22.2 | 22.2 |
| | | | 25 | 24 | 1 | 1 | 22.1 | 22.2 | 22.2 |
| | | | 50 | 0 | 1 | 1 | 22.1 | 22.2 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.7 | 22.5 |
| | | | 1 | 24 | 1 | 1 | 22.7 | 22.7 | 22.3 |
| | | | 1 | 49 | 1 | 1 | 22.7 | 22.3 | 22.0 |
| | | | 25 | 0 | 2 | 2 | 21.2 | 21.2 | 21.3 |
| | | | 25 | 12 | 2 | 2 | 21.0 | 21.2 | 21.3 |
| | | | 25 | 24 | 2 | 2 | 21.1 | 21.2 | 21.3 |
| | | | 50 | 0 | 2 | 2 | 21.0 | 21.1 | 21.2 |

LTE Band 4 Measured Results Cont.

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|------------|------------|
| | | | | | | | 1712.5 MHz | 1732.5 MHz | 1752.5 MHz |
| LTE Band 4 | 5 | QPSK | 1 | 0 | 0 | 1 | 22.9 | 23.1 | 22.9 |
| | | | 1 | 12 | 0 | 0 | 23.1 | 23.7 | 23.5 |
| | | | 1 | 24 | 0 | 1 | 22.9 | 23.2 | 22.9 |
| | | | 12 | 0 | 1 | 2 | 22.1 | 22.1 | 22.1 |
| | | | 12 | 6 | 1 | 2 | 22.2 | 22.2 | 22.2 |
| | | | 12 | 11 | 1 | 2 | 22.2 | 22.2 | 22.1 |
| | | | 25 | 0 | 1 | 1 | 22.1 | 22.1 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.1 | 22.2 | 21.8 |
| | | | 1 | 12 | 1 | 1 | 22.3 | 22.3 | 22.6 |
| | | | 1 | 24 | 1 | 1 | 22.0 | 22.0 | 22.7 |
| | | | 12 | 0 | 2 | 2 | 21.1 | 21.2 | 21.2 |
| | | | 12 | 6 | 2 | 2 | 21.2 | 21.2 | 21.2 |
| | | | 12 | 11 | 2 | 2 | 21.1 | 21.2 | 21.3 |
| | | | 25 | 0 | 2 | 2 | 21.2 | 21.2 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1711.5 MHz | 1732.5 MHz | 1753.5 MHz |
| LTE Band 4 | 3 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.0 | 22.9 |
| | | | 1 | 37 | 0 | 0 | 23.3 | 23.5 | 23.3 |
| | | | 1 | 74 | 0 | 0 | 23.0 | 23.1 | 23.0 |
| | | | 36 | 0 | 1 | 1 | 22.1 | 22.2 | 22.1 |
| | | | 36 | 18 | 1 | 1 | 22.3 | 22.1 | 22.1 |
| | | | 36 | 35 | 1 | 1 | 22.2 | 22.1 | 22.2 |
| | | | 75 | 0 | 1 | 1 | 22.2 | 22.2 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.5 | 22.7 | 22.7 |
| | | | 1 | 37 | 1 | 1 | 22.7 | 22.7 | 21.8 |
| | | | 1 | 74 | 1 | 1 | 22.5 | 22.3 | 22.5 |
| | | | 36 | 0 | 2 | 2 | 21.2 | 21.0 | 21.3 |
| | | | 36 | 18 | 2 | 2 | 21.3 | 21.0 | 21.3 |
| | | | 36 | 35 | 2 | 2 | 21.4 | 20.9 | 21.3 |
| | | | 75 | 0 | 2 | 2 | 21.2 | 21.2 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 1710.7 MHz | 1732.5 MHz | 1754.3 MHz |
| LTE Band 4 | 1.4 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.0 | 23.1 |
| | | | 1 | 2 | 0 | 0 | 23.2 | 23.1 | 23.2 |
| | | | 1 | 5 | 0 | 0 | 23.2 | 23.1 | 23.1 |
| | | | 3 | 0 | 0 | 0 | 23.2 | 23.1 | 23.2 |
| | | | 3 | 1 | 0 | 0 | 23.2 | 23.1 | 23.2 |
| | | | 3 | 2 | 0 | 0 | 23.1 | 23.2 | 23.2 |
| | | | 6 | 0 | 1 | 1 | 22.2 | 22.2 | 22.1 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.7 | 22.3 |
| | | | 1 | 2 | 1 | 1 | 22.7 | 22.7 | 22.6 |
| | | | 1 | 5 | 1 | 1 | 22.7 | 22.4 | 22.4 |
| | | | 3 | 0 | 1 | 1 | 22.4 | 22.5 | 22.1 |
| | | | 3 | 1 | 1 | 1 | 22.5 | 22.0 | 22.3 |
| | | | 3 | 2 | 1 | 1 | 22.4 | 22.2 | 22.2 |
| | | | 6 | 0 | 2 | 2 | 21.2 | 21.3 | 21.4 |

LTE Band 5 Measured Results

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|-----------|-----------|
| | | | | | | | 829 MHz | 836.5 MHz | 844 MHz |
| LTE Band 5 | 10 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.4 | 23.1 |
| | | | 1 | 25 | 0 | 0 | 23.1 | 23.2 | 23.0 |
| | | | 1 | 49 | 0 | 0 | 23.2 | 23.0 | 23.0 |
| | | | 25 | 0 | 1 | 1 | 22.3 | 22.3 | 22.2 |
| | | | 25 | 12 | 1 | 1 | 22.4 | 22.3 | 22.3 |
| | | | 25 | 25 | 1 | 1 | 22.3 | 22.4 | 22.2 |
| | | | 50 | 0 | 1 | 1 | 22.4 | 22.3 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.5 | 22.7 | 22.2 |
| | | | 1 | 25 | 1 | 1 | 22.6 | 22.0 | 22.1 |
| | | | 1 | 49 | 1 | 1 | 22.6 | 22.4 | 22.4 |
| | | | 25 | 0 | 2 | 2 | 21.3 | 21.3 | 21.4 |
| | | | 25 | 12 | 2 | 2 | 21.4 | 21.3 | 21.3 |
| | | | 25 | 25 | 2 | 2 | 21.3 | 21.4 | 21.4 |
| | | | 50 | 0 | 2 | 2 | 21.4 | 21.3 | 21.2 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 826.5 MHz | 836.5 MHz | 846.5 MHz |
| LTE Band 5 | 5 | QPSK | 1 | 0 | 0 | 0 | 23.0 | 23.4 | 23.1 |
| | | | 1 | 12 | 0 | 0 | 23.1 | 23.7 | 23.3 |
| | | | 1 | 24 | 0 | 0 | 23.0 | 23.3 | 23.0 |
| | | | 12 | 0 | 1 | 1 | 22.2 | 22.3 | 22.2 |
| | | | 12 | 6 | 1 | 1 | 22.3 | 22.3 | 22.2 |
| | | | 12 | 11 | 1 | 1 | 22.3 | 22.3 | 22.2 |
| | | | 25 | 0 | 1 | 1 | 22.3 | 22.3 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.5 | 22.3 | 22.5 |
| | | | 1 | 12 | 1 | 1 | 22.7 | 22.4 | 22.7 |
| | | | 1 | 24 | 1 | 1 | 22.1 | 22.5 | 22.7 |
| | | | 12 | 0 | 2 | 2 | 21.2 | 21.4 | 21.3 |
| | | | 12 | 6 | 2 | 2 | 21.4 | 21.4 | 21.2 |
| | | | 12 | 11 | 2 | 2 | 21.3 | 21.4 | 21.3 |
| | | | 25 | 0 | 2 | 2 | 21.3 | 21.3 | 21.1 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
| | | | | | | | 825.5 MHz | 836.5 MHz | 847.5 MHz |
| LTE Band 5 | 3 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.3 | 23.0 |
| | | | 1 | 7 | 0 | 0 | 23.2 | 23.5 | 23.4 |
| | | | 1 | 14 | 0 | 1 | 23.0 | 23.1 | 23.1 |
| | | | 6 | 0 | 1 | 1 | 22.3 | 22.3 | 22.2 |
| | | | 6 | 3 | 1 | 1 | 22.3 | 22.4 | 22.1 |
| | | | 6 | 5 | 1 | 1 | 22.2 | 22.3 | 22.3 |
| | | | 15 | 0 | 1 | 1 | 22.3 | 22.4 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.7 | 22.7 |
| | | | 1 | 7 | 1 | 1 | 22.7 | 22.6 | 22.4 |
| | | | 1 | 14 | 1 | 1 | 22.7 | 22.7 | 22.0 |
| | | | 6 | 0 | 2 | 2 | 21.5 | 21.1 | 21.3 |
| | | | 6 | 3 | 2 | 2 | 21.1 | 21.1 | 21.4 |
| | | | 6 | 5 | 2 | 2 | 21.5 | 21.1 | 21.3 |
| | | | 15 | 0 | 2 | 2 | 21.3 | 21.3 | 21.2 |

LTE Band 5 Measured Results Cont.

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) | | |
|------------|----------|-------|---------------|-----------|------------|-----------|---------------|-----------|-----------|
| | | | | | | | 824.7 MHz | 836.5 MHz | 848.3 MHz |
| LTE Band 5 | 1.4 | QPSK | 1 | 0 | 0 | 0 | 23.1 | 23.1 | 23.0 |
| | | | 1 | 2 | 0 | 0 | 23.2 | 23.3 | 23.0 |
| | | | 1 | 5 | 0 | 0 | 23.1 | 23.2 | 23.0 |
| | | | 3 | 0 | 0 | 0 | 23.2 | 23.2 | 23.0 |
| | | | 3 | 1 | 0 | 0 | 23.2 | 23.3 | 23.2 |
| | | | 3 | 2 | 0 | 0 | 23.2 | 23.3 | 23.1 |
| | | | 6 | 0 | 1 | 1 | 22.3 | 22.3 | 22.1 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 | 22.7 | 22.5 |
| | | | 1 | 2 | 1 | 1 | 22.0 | 22.0 | 22.7 |
| | | | 1 | 5 | 1 | 1 | 22.5 | 22.2 | 22.2 |
| | | | 3 | 0 | 1 | 1 | 22.6 | 22.0 | 22.2 |
| | | | 3 | 1 | 1 | 1 | 22.6 | 22.0 | 22.5 |
| | | | 3 | 2 | 1 | 1 | 22.6 | 22.5 | 22.6 |
| | | | 6 | 0 | 2 | 2 | 21.2 | 21.1 | 21.3 |

LTE Band 17 Measured Results

| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) |
|-------------|----------|-------|---------------|-----------|------------|-----------|---------------|
| | | | | | | | 710 MHz |
| LTE Band 17 | 10 | QPSK | 1 | 0 | 0 | 0 | 23.7 |
| | | | 1 | 25 | 0 | 0 | 23.3 |
| | | | 1 | 49 | 0 | 0 | 23.4 |
| | | | 25 | 0 | 1 | 1 | 22.5 |
| | | | 25 | 12 | 1 | 1 | 22.4 |
| | | | 25 | 25 | 1 | 1 | 22.4 |
| | | | 50 | 0 | 1 | 1 | 22.5 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.7 |
| | | | 1 | 25 | 1 | 1 | 22.7 |
| | | | 1 | 49 | 1 | 1 | 22.5 |
| | | | 25 | 0 | 2 | 2 | 21.5 |
| | | | 25 | 12 | 2 | 2 | 21.5 |
| | | | 25 | 25 | 2 | 2 | 21.5 |
| | | | 50 | 0 | 2 | 2 | 21.4 |
| Band | BW (MHz) | Mode | RB Allocation | RB offset | Target MPR | Meas. MPR | Avg Pwr (dBm) |
| | | | | | | | 710 MHz |
| LTE Band 17 | 5 | QPSK | 1 | 0 | 0 | 0 | 23.2 |
| | | | 1 | 12 | 0 | 0 | 23.4 |
| | | | 1 | 24 | 0 | 0 | 23.1 |
| | | | 12 | 0 | 1 | 1 | 22.3 |
| | | | 12 | 6 | 1 | 1 | 22.3 |
| | | | 12 | 11 | 1 | 1 | 22.3 |
| | | | 25 | 0 | 1 | 1 | 22.2 |
| | | 16QAM | 1 | 0 | 1 | 1 | 22.4 |
| | | | 1 | 12 | 1 | 1 | 22.6 |
| | | | 1 | 24 | 1 | 1 | 22.1 |
| | | | 12 | 0 | 2 | 2 | 21.3 |
| | | | 12 | 6 | 2 | 2 | 21.2 |
| | | | 12 | 11 | 2 | 2 | 21.2 |
| | | | 25 | 0 | 2 | 2 | 21.3 |

Note(s):

10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. 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 per KDB 941225 D05 SAR for LTE Devices

9.4. Wi-Fi 2.4GHz

| Band (GHz) | Mode | Data Rate | Ch # | Freq. (MHz) | Avg Pwr (dBm) | Max Output Power (dBm) | SAR Test (Yes/No) | Note(s) |
|------------|----------------|-----------|------|-------------|---------------|------------------------|-------------------|---------|
| 2.4 | 802.11b | 1 Mbps | 1 | 2412 | 15.2 | 15.5 | Yes | |
| | | | 6 | 2437 | 15.0 | | | |
| | | | 11 | 2462 | 14.9 | | | |
| | 802.11g | 6 Mbps | 1 | 2412 | Not Required | 12.0 | No | 1 |
| | | | 6 | 2437 | | | | |
| | | | 11 | 2462 | | | | |
| | 802.11n (HT20) | MCS0 | 1 | 2412 | Not Required | 10.5 | No | 1 |
| | | | 6 | 2437 | | | | |
| | | | 11 | 2462 | | | | |

Note(s):

- Output Power and SAR measurement is not required for 802.11g/n HT20 channels when the specified tune-up tolerances for 802.11g/n HT20 are lower than 802.11b by more than 1/4 dB and the measured SAR is ≤ 1.2 W/Kg.

9.5. Wi-Fi 5GHz

| Band (GHz) | Mode | Data Rate | Ch # | Freq. (MHz) | Avg Pwr (dBm) | Max Output Power (dBm) | SAR Test (Yes/No) | Note(s) |
|-------------------|----------------|-----------|-------------|--------------|---------------|------------------------|-------------------|---------|
| 5.2 (U-NII 1) | 802.11a | 6 Mbps | 36 | 5180 | 10.8 | 11.6 | No | 2 |
| | | | 40 | 5200 | 10.8 | | | |
| | | | 44 | 5220 | 10.8 | | | |
| | | | 48 | 5240 | 10.8 | | | |
| | 802.11n (HT20) | 6.5 Mbps | 36-48 | 5180 - 5240 | Not Required | 11.3 | No | 1 |
| 802.11n (HT40) | 13.5 Mbps | 38-46 | 5190 - 5230 | Not Required | 10 | No | 1 | |
| 5.3 (U-NII 2A) | 802.11a | 6 Mbps | 52 | 5260 | 10.9 | 11.6 | Yes | |
| | | | 56 | 5280 | 10.9 | | | |
| | | | 60 | 5300 | 11.0 | | | |
| | | | 64 | 5320 | 11.0 | | | |
| | 802.11n (HT20) | 6.5 Mbps | 52-64 | 5260 - 5320 | Not Required | 11.3 | No | 1 |
| 802.11n (HT40) | 13.5 Mbps | 54-62 | 5270 - 5310 | Not Required | 10 | No | 1 | |
| 5.5 (U-NII 2C) | 802.11a | 6 Mbps | 100 | 5500 | 10.5 | 11.6 | Yes | |
| | | | 112 | 5560 | 10.5 | | | |
| | | | 116 | 5580 | 10.4 | | | |
| | | | 128 | 5640 | TDWR | | | |
| | 802.11n (HT20) | 6.5 Mbps | 100-140 | 5500-5700 | Not Required | 11.3 | No | 1 |
| 802.11n (HT40) | 13.5 Mbps | 102-134 | 5510-5670 | Not Required | 10 | No | 1 | |
| 5.8 (U-NII 3) | 802.11a | 6 Mbps | 132 | 5660 | 10.4 | 11.6 | Yes | |
| | | | 149 | 5745 | 10.5 | | | |
| | | | 165 | 5825 | 10.7 | | | |
| | 802.11n (HT20) | 6.5 Mbps | 149-161 | 5745-5805 | Not Required | 11.3 | No | 1 |
| | 802.11n (HT40) | 13.5 Mbps | 151-159 | 5755-5795 | Not Required | 10 | No | 1 |

Note(s):

- Output Power and SAR measurement is not required for 802.11n HT20/HT40 channels when the specified tune-up tolerances for 802.11n HT20/HT40 are lower than 802.11a by more than 1/4 dB and the measured SAR is ≤ 1.2 W/Kg.
- When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
 - ≤ 1.2 W/kg, SAR is not required for UNII band I
 - > 1.2 W/kg, both bands should be tested independently for SAR.

9.6. Bluetooth

Maximum tune-up tolerance limit is 8.00 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

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

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 648474 D04 Handset SAR:

With headset attached, when the reported SAR for 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.

KDB 941225 D01 SAR test for 3G devices:

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

KDB 941225 D05 SAR for LTE Devices:

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 1RB, 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 16-QAM 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 of 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.

KDB 248227 D01 SAR meas for 802.11 v02:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

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

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

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

10.1. GSM850

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---------------------------|--------------|------------|---------------|-------|-------------|---------------|-------|----------------|--------------|----------|
| | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | Voice | 0 | Left Touch | 190 | 836.6 | 33.2 | 33.1 | 0.382 | 0.391 | 1 |
| | | | Left Tilt | 190 | 836.6 | 33.2 | 33.1 | 0.258 | 0.264 | |
| | | | Right Touch | 190 | 836.6 | 33.2 | 33.1 | 0.458 | 0.469 | |
| | | | Right Tilt | 190 | 836.6 | 33.2 | 33.1 | 0.270 | 0.276 | |
| Head VoIP | GPRS 2 Slots | 0 | Left Touch | 190 | 836.6 | 31.7 | 31.7 | 0.569 | 0.569 | 2 |
| | | | Left Tilt | 190 | 836.6 | 31.7 | 31.7 | 0.396 | 0.396 | |
| | | | Right Touch | 190 | 836.6 | 31.7 | 31.7 | 0.681 | 0.681 | |
| | | | Right Tilt | 190 | 836.6 | 31.7 | 31.7 | 0.412 | 0.412 | |
| Body-worn | Voice | 10 | Rear | 190 | 836.6 | 33.2 | 33.1 | 0.524 | 0.536 | 3 |
| | | | Front | 190 | 836.6 | 33.2 | 33.1 | 0.473 | 0.484 | |
| Body-worn(VoIP) & Hotspot | GPRS 2 Slots | 10 | Rear | 190 | 836.6 | 31.7 | 31.7 | 0.736 | 0.736 | 4 |
| Front | | | 190 | 836.6 | 31.7 | 31.7 | 0.665 | 0.665 | | |
| Hotspot | | | Edge 2 | 190 | 836.6 | 31.7 | 31.7 | 0.414 | 0.414 | |
| | | | Edge 3 | 190 | 836.6 | 31.7 | 31.7 | 0.173 | 0.173 | |
| | | | Edge 4 | 190 | 836.6 | 31.7 | 31.7 | 0.443 | 0.443 | |

10.2. GSM1900

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---------------------------|--------------|------------|---------------|--------|-------------|---------------|-------|----------------|--------------|----------|
| | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | Voice | 0 | Left Touch | 661 | 1880.0 | 30.2 | 30.1 | 0.439 | 0.449 | 5 |
| | | | Left Tilt | 661 | 1880.0 | 30.2 | 30.1 | 0.067 | 0.069 | |
| | | | Right Touch | 661 | 1880.0 | 30.2 | 30.1 | 0.313 | 0.320 | |
| | | | Right Tilt | 661 | 1880.0 | 30.2 | 30.1 | 0.164 | 0.168 | |
| Head VoIP | GPRS 2 Slots | 0 | Left Touch | 661 | 1880.0 | 29.7 | 29.7 | 0.697 | 0.697 | 6 |
| | | | Left Tilt | 661 | 1880.0 | 29.7 | 29.7 | 0.320 | 0.320 | |
| | | | Right Touch | 661 | 1880.0 | 29.7 | 29.7 | 0.533 | 0.533 | |
| | | | Right Tilt | 661 | 1880.0 | 29.7 | 29.7 | 0.266 | 0.266 | |
| Body-worn | Voice | 10 | Rear | 661 | 1880.0 | 30.2 | 30.1 | 0.473 | 0.484 | 7 |
| | | | Front | 661 | 1880.0 | 30.2 | 30.1 | 0.439 | 0.449 | |
| Body-worn(VoIP) & Hotspot | GPRS 2 Slots | 10 | Rear | 661 | 1880.0 | 29.7 | 29.7 | 0.768 | 0.768 | 8 |
| Front | | | 661 | 1880.0 | 29.7 | 29.7 | 0.739 | 0.739 | | |
| Hotspot | | | Edge 3 | 661 | 1880.0 | 29.7 | 29.7 | 0.308 | 0.308 | |
| | | | Edge 4 | 661 | 1880.0 | 29.7 | 29.7 | 0.504 | 0.504 | |

10.3. W-CDMA Band V

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|------------|------------|---------------|-------|-------------|---------------|-------|----------------|--------------|----------|
| | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | Rel 99 RMC | 0 | Left Touch | 4183 | 836.6 | 24.2 | 23.7 | 0.430 | 0.482 | 9 |
| | | | Left Tilt | 4183 | 836.6 | 24.2 | 23.7 | 0.252 | 0.283 | |
| | | | Right Touch | 4183 | 836.6 | 24.2 | 23.7 | 0.501 | 0.562 | |
| | | | Right Tilt | 4183 | 836.6 | 24.2 | 23.7 | 0.272 | 0.305 | |
| Body-worn & Hotspot | Rel 99 RMC | 10 | Rear | 4183 | 836.6 | 24.2 | 23.7 | 0.555 | 0.623 | 10 |
| | | | Front | 4183 | 836.6 | 24.2 | 23.7 | 0.492 | 0.552 | |
| Hotspot | Rel 99 RMC | 10 | Edge 2 | 4183 | 836.6 | 24.2 | 23.7 | 0.305 | 0.342 | |
| | | | Edge 3 | 4183 | 836.6 | 24.2 | 23.7 | 0.118 | 0.132 | |
| | | | Edge 4 | 4183 | 836.6 | 24.2 | 23.7 | 0.284 | 0.319 | |

10.4. W-CDMA Band II

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|------------|------------|---------------|--------|-------------|---------------|-------|----------------|--------------|----------|
| | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | Rel 99 RMC | 0 | Left Touch | 9262 | 1852.4 | 23.7 | 23.2 | 0.721 | 0.809 | 11 |
| | | | | 9400 | 1880.0 | 23.7 | 23.4 | 0.769 | 0.824 | |
| | | | | 9538 | 1907.6 | 23.7 | 23.5 | 0.758 | 0.794 | |
| | | | Left Tilt | 9400 | 1880.0 | 23.7 | 23.4 | 0.355 | 0.380 | |
| | | | Right Touch | 9400 | 1880.0 | 23.7 | 23.4 | 0.528 | 0.566 | |
| Body-worn & Hotspot | Rel 99 RMC | 10 | Rear | 9262 | 1852.4 | 23.7 | 23.2 | 0.876 | 0.983 | 12 |
| | | | | 9400 | 1880.0 | 23.7 | 23.4 | 0.879 | 0.942 | |
| | | | | 9538 | 1907.6 | 23.7 | 23.5 | 0.739 | 0.774 | |
| | | | Front | 9262 | 1852.4 | 23.7 | 23.2 | 0.953 | 1.069 | |
| | | | 9400 | 1880.0 | 23.7 | 23.4 | 0.886 | 0.949 | | |
| Hotspot | Rel 99 RMC | 10 | Edge 3 | 9400 | 1880.0 | 23.7 | 23.4 | 0.345 | 0.370 | |
| | | | Edge 4 | 9400 | 1880.0 | 23.7 | 23.4 | 0.574 | 0.615 | |

10.5. LTE Band 2 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offset | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|------|------------|---------------|--------|-------------|---------------|-----------|---------------|-------|----------------|--------------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.648 | 0.663 | 13 |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.639 | 0.701 | |
| | | | Left Tilt | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.332 | 0.340 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.259 | 0.284 | |
| | | | Right Touch | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.676 | 0.692 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.429 | 0.470 | |
| | | | Right Tilt | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.299 | 0.306 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.222 | 0.243 | |
| Body-worn & Hotspot | QPSK | 10 | Rear | 18650 | 1855.0 | 1 | 0 | 23.7 | 23.6 | 0.986 | 1.009 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.769 | 0.843 | |
| | | | | 18900 | 1880.0 | 1 | 49 | 23.7 | 22.9 | 0.932 | 1.121 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.765 | 0.858 | |
| | | | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 1.020 | 1.044 | | |
| | | | | | 50 | 0 | 22.7 | 22.3 | 0.774 | 0.849 | | |
| | | | Front | 18650 | 1855.0 | 1 | 0 | 23.7 | 23.6 | 0.708 | 0.724 | |
| | | | | | | 18900 | 1880.0 | 1 | 49 | 23.7 | 22.9 | 0.945 |
| | | | | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.958 | 0.980 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.703 | 0.771 | |
| Hotspot | QPSK | 10 | Edge 3 | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.454 | 0.465 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.365 | 0.400 | |
| | | | Edge 4 | 19150 | 1905.0 | 1 | 0 | 23.7 | 23.6 | 0.600 | 0.614 | |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.463 | 0.508 | |

10.6. LTE Band 4 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offset | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|-------|------------|---------------|-------|-------------|---------------|-----------|---------------|-------|----------------|--------------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.642 | 0.672 | 15 |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.508 | 0.570 | |
| | | | Left Tilt | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.293 | 0.307 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.216 | 0.242 | |
| | | | Right Touch | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.582 | 0.609 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.449 | 0.504 | |
| Right Tilt | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.285 | 0.298 | | | | |
| | | | 50 | 0 | 22.7 | 22.2 | 0.193 | 0.217 | | | | |
| Body-worn & Hotspot | QPSK | 10 | Rear | 20050 | 1720.0 | 1 | 0 | 23.7 | 23.5 | 1.020 | 1.068 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.834 | 0.936 | |
| | | | | 20175 | 1732.5 | 1 | 0 | 23.7 | 23.1 | 1.070 | 1.229 | 16 |
| | | | | | | 50 | 0 | 22.7 | 22.3 | 0.846 | 0.928 | |
| | | | | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 1.150 | 1.204 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.830 | 0.931 | |
| | | | 100 | 0 | 22.7 | 22.2 | 0.824 | 0.925 | | | | |
| | | | Front | 20050 | 1720.0 | 1 | 0 | 23.7 | 23.5 | 0.886 | 0.928 | |
| | | | | 20175 | 1732.5 | 1 | 0 | 23.7 | 23.1 | 0.882 | 1.013 | |
| | | | | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.861 | 0.902 | |
| 50 | 0 | 22.7 | | | | 22.2 | 0.699 | 0.784 | | | | |
| Hotspot | QPSK | 10 | Edge 3 | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.491 | 0.514 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.322 | 0.361 | |
| | | | Edge 4 | 20300 | 1745.0 | 1 | 49 | 23.7 | 23.5 | 0.558 | 0.584 | |
| | | | | | | 50 | 0 | 22.7 | 22.2 | 0.428 | 0.480 | |

10.7. LTE Band 5 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offset | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|-------|------------|---------------|-------|-------------|---------------|-----------|---------------|-------|----------------|--------------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.397 | 0.425 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.301 | 0.323 | |
| | | | Left Tilt | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.249 | 0.267 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.195 | 0.209 | |
| | | | Right Touch | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.454 | 0.486 | 17 |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.358 | 0.384 | |
| Right Tilt | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.283 | 0.303 | | | | |
| | | | 25 | 24 | 22.7 | 22.4 | 0.221 | 0.237 | | | | |
| Body-worn & Hotspot | QPSK | 10 | Rear | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.511 | 0.548 | 18 |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.384 | 0.411 | |
| | | | Front | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.448 | 0.480 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.332 | 0.356 | |
| Hotspot | QPSK | 10 | Edge 2 | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.279 | 0.299 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.210 | 0.225 | |
| | | | Edge 3 | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.113 | 0.121 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.090 | 0.096 | |
| | | | Edge 4 | 20525 | 836.5 | 1 | 0 | 23.7 | 23.4 | 0.300 | 0.321 | |
| | | | | | | 25 | 24 | 22.7 | 22.4 | 0.230 | 0.246 | |

10.8. LTE Band 17 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offset | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|------------------------|-------|------------|---------------|-------|-------------|---------------|-----------|---------------|-------|----------------|--------------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.253 | 0.255 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.176 | 0.185 | |
| | | | Left Tilt | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.165 | 0.166 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.109 | 0.114 | |
| | | | Right Touch | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.283 | 0.285 | 19 |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.195 | 0.205 | |
| Right Tilt | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.161 | 0.162 | | | | |
| | | | 25 | 0 | 22.7 | 22.5 | 0.110 | 0.115 | | | | |
| Body-worn & Hotspot | QPSK | 10 | Rear | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.435 | 0.438 | 20 |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.308 | 0.323 | |
| | | | Front | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.362 | 0.364 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.251 | 0.263 | |
| Hotspot | QPSK | 10 | Edge 2 | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.300 | 0.302 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.216 | 0.227 | |
| | | | Edge 3 | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.085 | 0.086 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.059 | 0.062 | |
| | | | Edge 4 | 23790 | 710.0 | 1 | 0 | 23.7 | 23.7 | 0.194 | 0.195 | |
| | | | | | | 25 | 0 | 22.7 | 22.5 | 0.144 | 0.151 | |

10.9. Wi-Fi 2.4 GHz SAR

| Frequency Band | Mode | RF Exposure Conditions | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Notes | Plot No. |
|----------------|-------------------|------------------------------------|------------|---------------|-------|-------------|---------------------------|---------------|-------|----------------|--------------|-------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | | |
| 2.4GHz | 802.11b 1 Mbps | Head | 0 | Left Touch | 1 | 2412.0 | 0.158 | 15.5 | 15.2 | | | | |
| | | | | Left Tilt | 1 | 2412.0 | 0.126 | 15.5 | 15.2 | | | | |
| | | | | Right Touch | 1 | 2412.0 | 0.342 | 15.5 | 15.2 | 0.345 | 0.370 | 1 | 21 |
| | | | | Right Tilt | 1 | 2412.0 | 0.227 | 15.5 | 15.2 | | | | |
| | | Body-worn & Hotspot & Wi-Fi Direct | 10 | Rear | 1 | 2412.0 | 0.084 | 15.5 | 15.2 | 0.082 | 0.088 | 1 | 22 |
| | | | | Front | 1 | 2412.0 | 0.061 | 15.5 | 15.2 | | | | |
| | | | | Edge 1 | 1 | 2412.0 | 0.075 | 15.5 | 15.2 | | | | |
| | | | | Edge 4 | 1 | 2412.0 | 0.054 | 15.5 | 15.2 | | | | |

Note(s):

- Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.

10.10. Wi-Fi 5 GHz SAR

| Frequency Band | Mode | RF Exposure Conditions | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Notes | Plot No. |
|------------------|-------------------|------------------------------------|------------|---------------|-------|-------------|---------------------------|---------------|-------|----------------|--------------|-------|----------|
| | | | | | | | | Tune-up limit | Meas. | Meas. | Scaled | | |
| 5.3 GHz U-NII 2A | 802.11a 6 Mbps | Head | 0 | Left Touch | 60 | 5300.0 | 0.021 | 11.6 | 11.0 | 0.000 | 0.000 | | |
| | | | | Left Tilt | 60 | 5300.0 | 0.014 | 11.6 | 11.0 | | | | |
| | | | | Right Touch | 60 | 5300.0 | 0.076 | 11.6 | 11.0 | 0.042 | 0.048 | 1 | 23 |
| | | | | Right Tilt | 60 | 5300.0 | 0.071 | 11.6 | 11.0 | | | | |
| | | Body-worn | 10 | Rear | 60 | 5300.0 | 0.164 | 11.6 | 11.0 | 0.097 | 0.111 | 1 | 24 |
| | | | | Front | 60 | 5300.0 | 0.014 | 11.6 | 11.0 | | | | |
| 5.6 GHz U-NII 2C | 802.11a 6 Mbps | Head | 0 | Left Touch | 112 | 5560.0 | 0.278 | 11.6 | 10.5 | <0.001 | <0.001 | 1 | 25 |
| | | | | Left Tilt | 112 | 5560.0 | 0.038 | 11.6 | 10.5 | | | | |
| | | | | Right Touch | 112 | 5560.0 | 0.036 | 11.6 | 10.5 | | | | |
| | | | | Right Tilt | 112 | 5560.0 | 0.034 | 11.6 | 10.5 | | | | |
| | | Body-worn | 10 | Rear | 112 | 5560.0 | 0.017 | 11.6 | 10.5 | <0.001 | <0.001 | 1 | 26 |
| | | | | Front | 112 | 5560.0 | 0.025 | 11.6 | 10.5 | | | | |
| 5.8 GHz U-NII 3 | 802.11a 6 Mbps | Head | 0 | Left Touch | 165 | 5825.0 | 0.024 | 11.6 | 10.7 | | | | |
| | | | | Left Tilt | 165 | 5825.0 | 0.026 | 11.6 | 10.7 | | | | |
| | | | | Right Touch | 165 | 5825.0 | 0.040 | 11.6 | 10.7 | 0.034 | 0.042 | 1 | 27 |
| | | | | Right Tilt | 165 | 5825.0 | 0.030 | 11.6 | 10.7 | | | | |
| | | Body-worn & Hotspot & Wi-Fi Direct | 10 | Rear | 165 | 5825.0 | 0.200 | 11.6 | 10.7 | 0.088 | 0.108 | 1 | 28 |
| | | | | Front | 165 | 5825.0 | 0.041 | 11.6 | 10.7 | | | | |
| | | | | Edge 1 | 165 | 5825.0 | 0.06 | 11.6 | 10.7 | | | | |
| | | | | Edge 4 | 165 | 5825.0 | 0.078 | 11.6 | 10.7 | | | | |

Note(s):

- Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.

10.11. Bluetooth

Standalone SAR Test Exclusion Considerations & Estimated SAR

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}] \text{ W/kg}$ for test separation distances ≤ 50 mm;
where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Body-worn Accessory Exposure Conditions

| Max. tune-up tolerance limit | | Min. test separation distance (mm) | Frequency (GHz) | SAR test exclusion Result* | Test Configuration | Estimated 1-g SAR (W/kg) |
|------------------------------|------|------------------------------------|-----------------|----------------------------|--------------------|--------------------------|
| (dBm) | (mW) | | | | | |
| 8.0 | 6 | 10 | 2.480 | 0.9 | Rear/Front | 0.132 |

Conclusion:

*: The computed value is < 3 ; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

| Frequency Band (MHz) | Air Interface | RF Exposure Conditions | Test Position | Repeated SAR (Yes/No) | Highest Measured SAR (W/kg) | Repeated Measured SAR (W/kg) | Largest to Smallest SAR Ratio |
|----------------------|--------------------|------------------------|---------------|-----------------------|-----------------------------|------------------------------|-------------------------------|
| 750 | LTE Band 17 | Body & Hotspot | Rear | No | 0.435 | N/A | N/A |
| 850 | GSM 850 | Body & Hotspot | Rear | No | 0.736 | N/A | N/A |
| | WCDMA Band V | Body & Hotspot | Rear | No | 0.555 | N/A | N/A |
| | LTE Band 5 | Body & Hotspot | Rear | No | 0.511 | N/A | N/A |
| 1700 | LTE Band 4 | Body & Hotspot | Rear | Yes | 1.15 | 1.03 | 1.12 |
| 1900 | GSM 1900 | Body & Hotspot | Rear | No | 0.768 | N/A | N/A |
| | WCDMA Band II | Body & Hotspot | Front | No | 0.953 | 0.903 | 1.06 |
| | LTE Band 2 | Body & Hotspot | Rear | Yes | 1.02 | 0.945 | 1.08 |
| 2400 | Wi-Fi 802.11b/g/n | Head | Right Touch | No | 0.345 | N/A | N/A |
| 5300 | Wi-Fi 802.11a/n/ac | Body-worn | Rear | No | 0.097 | N/A | N/A |
| 5500 | Wi-Fi 802.11a/n/ac | Body-worn | Rear | No | <0.001 | N/A | N/A |
| 5800 | Wi-Fi 802.11a/n/ac | Body & Hotspot | Rear | No | 0.088 | N/A | N/A |

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

| RF Exposure Condition | Item | Capable Transmit Configurations | | |
|------------------------|------|---------------------------------|---|-------------|
| Head | 1 | GSM(Voice) | + | DTS |
| | 2 | GSM(Voice) | + | U-NII |
| | 3 | GSM(GPRS/EDGE) | + | DTS |
| | 4 | GSM(GPRS/EDGE) | + | U-NII |
| | 5 | W-CDMA | + | DTS |
| | 6 | W-CDMA | + | U-NII |
| | 9 | LTE | + | DTS |
| | 10 | LTE | + | U-NII |
| Body-worn | 1 | GSM(Voice) | + | DTS |
| | 2 | GSM(Voice) | + | U-NII |
| | 3 | GSM(Voice) | + | BT |
| | 4 | GSM(GPRS/EDGE) | + | DTS |
| | 5 | GSM(GPRS/EDGE) | + | U-NII |
| | 6 | GSM(GPRS/EDGE) | + | BT |
| | 7 | W-CDMA | + | DTS |
| | 8 | W-CDMA | + | U-NII |
| | 9 | W-CDMA | + | BT |
| | 10 | LTE | + | DTS |
| | 11 | LTE | + | U-NII |
| | 12 | LTE | + | BT |
| Hotspot & Wi-Fi Direct | 1 | GSM(GPRS/EDGE) | + | DTS |
| | 2 | GSM(GPRS/EDGE) | + | U-NII3 only |
| | 3 | W-CDMA | + | DTS |
| | 4 | W-CDMA | + | U-NII3 only |
| | 7 | LTE | + | DTS |
| | 8 | LTE | + | U-NII3 only |

Notes:

- DTS and U-NII 3 support Hotspot.
- GPRS/EDGE, W-CDMA, and LTE support Hotspot.
- VoIP is supported in GPRS/EDGE, W-CDMA, and LTE.
- DTS Radio cannot transmit simultaneously with Bluetooth Radio.
- U-NII Radio cannot transmit simultaneously with Bluetooth Radio.

12.1. Sum of the SAR for WWAN & Wi-Fi & BT

| RF Exposure conditions | ① WWAN | ② DTS | ③ U-NII | ④ BT | ①+② WWAN +DTS | | ①+③ WWAN + U-NII | | ①+④ WWAN +BT | |
|------------------------|-----------|----------|------------|---------|------------------|-----------------|---------------------|-----------------|------------------|-----------------|
| | | | | | ∑ 1-g SAR (mW/g) | SPLSR (Yes/ No) | ∑ 1-g SAR (mW/g) | SPLSR (Yes/ No) | ∑ 1-g SAR (mW/g) | SPLSR (Yes/ No) |
| Head | 0.824 | 0.370 | 0.048 | | 1.194 | No | 0.872 | No | | |
| Body-worn | 1.229 | 0.088 | 0.111 | 0.132 | 1.317 | No | 1.340 | No | 1.361 | No |
| Hotspot | 1.229 | 0.088 | 0.108 | | 1.317 | No | 1.337 | No | | |

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

A_15I19922v0 SAR Photos & Ant. Locations

B_15I19922v0 SAR Highest Test Plots

C_15I19922v0 SAR System Check Plots

D_15I19922v0 SAR Tissue Ingredients

E_15I19922v0 SAR Probe Cal. Certificates

F_15I19922v0 SAR Dipole Cal. Certificates

END OF REPORT