# SAR EVALUATION REPORT

**IEEE Std 1528-2013**

*For*
**GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, ANT+**

**FCC ID: A3LSMA305G**
**Model Name: SM-A305G/DS, SM-A305G**

**Report Number: 12678287-S1V3**
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NVLAP LAB CODE 200065-0

**Revision History**

| Rev. | Date | Revisions | Revised By |
|---|---|---|---|
| V1 | 2/15/2019 | Initial Issue | -- |
| V2 | 2/26/2019 | Updated in accordance with TCB feedback | AJ Newcomer |
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| | | | |
| | | | |


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# 1. Attestation of Test Results

| | | | | | |
|---|---|---|---|---|---|
| Applicant Name | | Samsung Electronics Co. Ltd | | | |
| FCC ID | | A3LSMA305G | | | |
| Model Name | | SM-A305G/DS, SM-A305G<br>(Used model SM-A305G/DS for final testing). | | | |
| Applicable Standards | | Published RF exposure KDB procedures<br>IEEE Std 1528-2013 | | | |
| Exposure Category | | SAR Limits (W/Kg) | | | |
| | | Peak spatial-average (1g of tissue) | | Extremities (hands, wrists, ankles, etc.) (10g of tissue) | |
| General population / Uncontrolled exposure | | 1.6 | | 4 | |
| RF Exposure Conditions | | Equipment Class - Highest Reported SAR (W/kg) | | | |
| | | PCE | DTS | NII | DSS |
| Head | | 0.275 | 0.173 | 0.316 | 0.048 |
| Body-worn | | 0.404 | 0.122 | 0.146 | 0.004 |
| Hotspot | | 0.692 | 0.282 | 0.165 | 0.014 |
| Product specific 10g SAR | | N/A | N/A | 1.296 | N/A |
| Simultaneous TX | Head | 0.591 | 0.448 | 0.591 | 0.323 |
| | Body-worn | 0.550 | 0.526 | 0.550 | 0.408 |
| | Hotspot | 0.974 | 0.974 | 0.857 | 0.706 |
| Date Tested | | 1/28/2019 to 2/7/2019 | | | |
| Test Results | | Pass | | | |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.
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 the U.S. government.

| Approved & Released By: | Prepared By: |
|---|---|
| Devin Chang<br>Senior Test Engineer<br>UL Verification Services Inc. | Jason Kuo<br>Laboratory Technician<br>UL Verification Services Inc. |


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# 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 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 941225 D06 Hotspot Mode v02r01

In addition to the above, the following information was used:

- TCB workshop October 2014; RF Exposure Procedures (Other LTE Considerations)
- TCB workshop October 2015; RF Exposure Procedures (KDB 941225 D05A)
- TCB workshop April 2016; RF Exposure Procedures (LTE Carrier Aggregation for DL)
- TCB workshop October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- TCB workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB workshop May 2017; RF Exposure Procedures (Broadband Liquid Above 3 GHz)
- TCB workshop April 2018; RF Exposure Procedures (LTE DL CA SAR Test Exclusion)

# 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.


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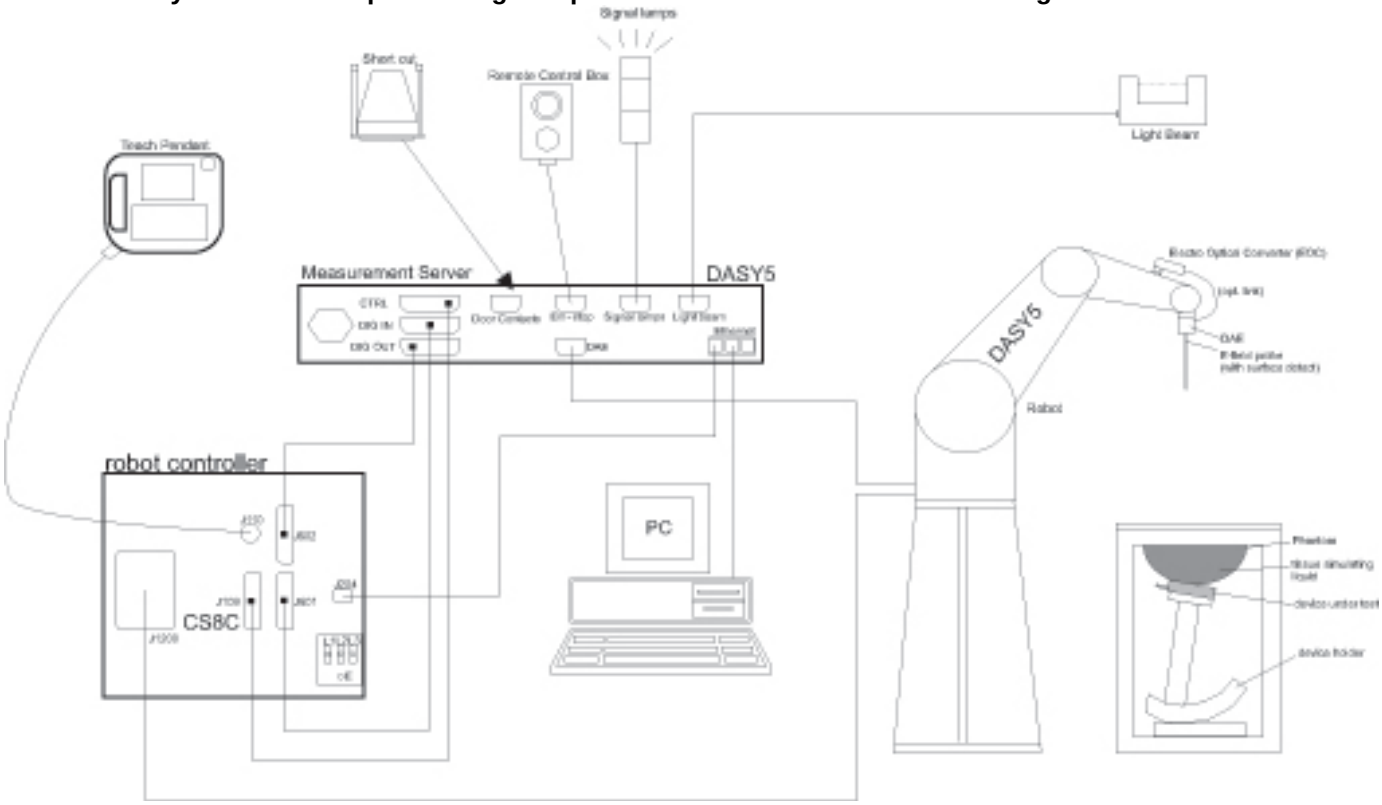
# 4. SAR Measurement System & Test Equipment

## 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.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## 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 | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |


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**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<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | $\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

**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.


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## 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 | R&S | ZNLE6 | PRE0181650 | 7/16/2019 |
| Dielectric Probe kit | SPEAG | DAK-3.5 | 1082 | 9/11/2019 |
| Shorting block | SPEAG | DAK-3.5 Short | SM DAK 200 DA | 9/11/2019 |
| Thermometer | Traceable Calibration Control Co. | 15-1078-179 | 170064398 | 3/14/2019 |
| S-Parameter Network Analyzer | R&S | ZNLE6 | PRE0181651 | 7/16/2019 |
| Dielectric Probe kit | SPEAG | DAK-3.5 | 1103 | 2/6/2019 |
| Shorting Block | SPEAG | DAK-3.5 Short | SM DAK 200 BA | 2/6/2019 |
| Thermometer | Fisher Scientific | Traceable | 150378159 | 6/6/2019 |

**System Check**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| Synthesized Signal Generator | Agilent | N5181A | MY50140610 | 6/7/2019 |
| Power Meter | Keysight | N1912A | MY55196007 | 7/23/2019 |
| Power Sensor | Agilent | N1921A | MY53020038 | 4/23/2019 |
| Power Sensor | Agilent | N1921A | MY53260010 | 10/17/2019 |
| Amplifier | MITEQ | AMF-4D-00400600-50-30P | 1795093 | N/A |
| Directional coupler | Werlatone | C8060-102 | 2148 | N/A |
| DC Power Supply | Sorensen | 1611 | 1817A2680 | N/A |
| Signal Generator | Rhode & Schwarz | SMB100A | 180969-yc | 6/27/2019 |
| Power Sensor | Rhode & Schwarz | NRP18A | 100992-iu | 6/19/2019 |
| Signal Generator | Rhode & Schwarz | SMB100A | 180969-yc | 7/4/2019 |
| Power Sensor | Rhode & Schwarz | NRP18A | 100992-iu | 6/19/2019 |

**Lab Equipment**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| E-Field Probe (SAR Lab B) | SPEAG | EX3DV4 | 3772 | 2/13/2019 |
| E-Field Probe (SAR Lab E) | SPEAG | EX3DV4 | 3990 | 8/17/2019 |
| E-Field Probe (SAR Lab G) | SPEAG | EX3DV4 | 7463 | 7/20/2019 |
| E-Field Probe (SAR Lab 2) | SPEAG | EX3DV4 | 3686 | 8/28/2019 |
| E-Field Probe (SAR Lab 4) | SPEAG | EX3DV4 | 7356 | 4/24/2019 |
| Data Acquisition Electronics (SAR Lab B) | SPEAG | DAE4 | 1377 | 9/14/2019 |
| Data Acquisition Electronics (SAR Lab E) | SPEAG | DAE4 | 1548 | 5/3/2019 |
| Data Acquisition Electronics (SAR Lab G) | SPEAG | DAE4 | 1359 | 2/9/2019 |
| Data Acquisition Electronics (SAR Lab 2) | SPEAG | DAE4 | 1545 | 4/13/2019 |
| Data Acquisition Electronics (SAR Lab 4) | SPEAG | DAE4 | 1547 | 5/3/2019 |
| System Validation Dipole | SPEAG | D750V3 | 1024 | 5/16/2019 |
| System Validation Dipole | SPEAG | D835V2 | 4d117 | 5/16/2019 |
| System Validation Dipole | SPEAG | D1750V2 | 1077 | 10/16/2019 |
| System Validation Dipole | SPEAG | D1900V2 | 5d163 | 10/16/2019 |
| System Validation Dipole | SPEAG | D2450V2 | 899 | 3/16/2019 |
| System Validation Dipole | SPEAG | D2600V2 | 1036 | 3/16/2019 |
| System Validation Dipole | SPEAG | D5GHzV2 | 1003 | 3/13/2019 |

**Other**

| Name of Equipment | Manufacturer | Type/Model | T Number | Serial No. | Cal. Due Date |
|---|---|---|---|---|---|
| Power Meter | Agilent | N1912A | T733 | MY50001018 | 10/18/2019 |
| Power Sensor | Agilent | N1921A | T748 | MY53020038 | 4/23/2019 |
| Power Sensor | Agilent | N1921A | T751 | MY53260010 | 10/17/2019 |
| Base Station Simulator | R & S | CMW500 | T959 | 135384 | 6/1/2019 |


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# 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 and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.


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# 6. Device Under Test (DUT) Information

## 6.1. DUT Description

| | |
|---|---|
| Device Dimension | Refer to Appendix A<br>This is a Phablet Device (display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm) |
| Back Cover | The Back Cover is not removable |
| Battery Options | 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.<br>☒ Mobile Hotspot (Wi-Fi 2.4 GHz)<br>☒ Mobile Hotspot (Wi-Fi 5 GHz, Ch 149 only) |
| Wi-Fi Direct | Wi-Fi Direct enabled devices transfer data directly between each other. Wi-Fi Direct is only available in hand use configuration<br>☒ Wi-Fi Direct (Wi-Fi 2.4 GHz)<br>☒ Wi-Fi Direct (Wi-Fi 5.2/5.8 GHz) |
| Bluetooth Tethering | BT Tethering mode permits the device to share its cellular data connection with other devices.<br>☒ BT Tethering (Bluetooth 2.4 GHz) |
| Test sample information | **S/N** / **IMEI** / **Notes**<br>R38KC0KSQDB / 354883100001867 / Conducted Sample<br>R38KC0K9V / 354883100001826 / Conducted Sample<br>R38KC0KSQBN / 354883100001842 / Radiated Sample<br>R38KC0KSQFR / 354883100001883 / Radiated Sample<br>R38KC0KSQGX / 354883100001891 / Radiated Sample<br>R38KC0KSQEW / 354883100001875 / Radiated Sample<br>R38KC0KSQAH / 354883100001834 / Radiated Sample |
| Hardware Version | REV 1.0 |
| Software Version | A305G.001 |


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## 6.2. Wireless Technologies

| Wireless technologies | Frequency bands | Operating mode | | Duty Cycle used for SAR testing |
|---|---|---|---|---|
| GSM | 850<br>1900 | Voice (GMSK)<br>GPRS (GMSK)<br>EDGE (8PSK) | GSM Class : B<br>Multi-Slot Class:<br>Class 33 - 4 Up, 5 Down | GSM Voice: 12.5%<br>(E)GPRS: 1 Slot: 12.5%<br>2 Slots: 25%<br>3 Slots: 37.5%<br>4 Slots: 50% |
| | Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No | | | |
| W-CDMA (UMTS) | Band II<br>Band IV<br>Band V | UMTS Rel. 99 (Voice & Data)<br>HSDPA (Category 24)<br>HSUPA (Category 6)<br>HSPA+ (Rel. 9 DL only) | | 100% |
| LTE | FDD Band 2<br>FDD Band 4<br>FDD Band 5<br>FDD Band 12<br>FDD Band 13<br>FDD Band 17<br>TDD Band 41<br>FDD Band 66 | QPSK<br>16QAM<br>64QAM (Rx only)<br>Rel. 10 Carrier Aggregation support downlink only | | 100% (FDD)<br>63.3% (TDD) Refer to §6.4 |
| | Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No | | | |
| Wi-Fi | 2.4 GHz | 802.11b<br>802.11g<br>802.11n (HT20) | | 98.84% (802.11b) [1] |
| | 5 GHz | 802.11a<br>802.11n (HT20)<br>802.11n (HT40)<br>802.11ac (VHT20)<br>802.11ac (VHT40)<br>802.11ac (VHT80) | | 94.72% (802.11a) [2]<br>74.61% (802.11ac 80MHz BW) [2] |
| | Does this device support bands 5.60 ~ 5.65 GHz? ☒ Yes ☐ No | | | |
| | Does this device support Band gap channel(s)? ☒ Yes ☐ No | | | |
| Bluetooth | 2.4 GHz | Version 5.0 LE | | 77.07% [3] |

**Notes:**

1. Refer to §9.5 for Wi-Fi DTS Duty Cycle
2. Refer to §9.6 for Wi-Fi U-NII Duty Cycle
3. Refer to §9.7 for Bluetooth GFSK Duty Cycle


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## 6.3. General LTE SAR Test and Reporting Considerations

| Item | Description | | | | | | |
|---|---|---|---|---|---|---|---|
| Frequency range, Channel Bandwidth, Numbers and Frequencies | Band 2 | Frequency range: 1850 - 1910 MHz (BW = 60 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 (BW = 45 MHz) | | | | | |
| | | Channel Bandwidth | | | | | |
| | | 20 MHz [1] | 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 (BW = 25 MHz) | | | | | |
| | | Channel Bandwidth | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz [1] | 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 12 | Frequency range: 699 – 716 MHz (BW = 17 MHz) | | | | | |
| | | Channel Bandwidth | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz [1] | 5 MHz | 3 MHz | 1.4 MHz |
| | Low | | | 23060/ 704 | 23035/ 701.5 | 23025/ 700.5 | 23017/ 699.7 |
| | Mid | | | **23095/ 707.5** | 23095/ 707.5 | 23095/ 707.5 | 23095/ 707.5 |
| | High | | | 23130/ 711 | 23155/ 713.5 | 23165/ 714.5 | 23173/ 715.3 |
| | Band 13 | Frequency range: 777 - 787 MHz (BW = 10 MHz) | | | | | |
| | | Channel Bandwidth | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz [1] | 5 MHz [1] | 3 MHz | 1.4 MHz |
| | Low | | | | 23205/ 779.5 | | |
| | Mid | | | **23230/ 782** | 23230/ 782 | | |
| | High | | | | 23255/ 784.5 | | |
| | Band 17 | Frequency range: 704 - 716 MHz (BW = 12 MHz) | | | | | |
| | | Channel Bandwidth | | | | | |
| | | 20 MHz | 15 MHz | 10 MHz [1] | 5 MHz [1] | 3 MHz | 1.4 MHz |
| | Low | | | 23780/ 709 | 23755/ 706.5 | | |
| | Mid | | | **23790/ 710** | 23790/ 710 | | |
| | High | | | 23800/ 711 | 23825/ 713.5 | | |


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## General LTE SAR Test and Reporting Considerations (Continued)

**Frequency range, Channel Bandwidth, Numbers and Frequencies**

| Band 41[2] | Frequency range: 2496 - 2690 MHz (BW = 194MHz) | | | | | |
|---|---|---|---|---|---|---|
| | Channel Bandwidth | | | | | |
| | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz |
| Low | **39750 / 2506.0** | | | | | |
| Low-Mid | **40185 / 2549.5** | | | | | |
| Mid | **40620 / 2593.0** | | | | | |
| Mid-High | **41055 / 2636.5** | | | | | |
| High | **41490 / 2680.0** | | | | | |

| Band 66 | Frequency range: 1710 - 1780 MHz (BW = 70 MHz) | | | | | |
|---|---|---|---|---|---|---|
| | Channel Bandwidth | | | | | |
| | 20 MHz | 15 MHz | 10 MHz | 5 MHz | 3 MHz | 1.4 MHz |
| Low | **132072/ 1720** | 132047/ 1717.5 | 132022/ 1715 | 131997/ 1712.5 | 131987/ 1711.5 | 131979/ 1710.7 |
| Mid | **132322/ 1745** | 132322/ 1745 | 132322/ 1745 | 132322/ 1745 | 132322/ 1745 | 132322/ 1745 |
| High | **132572/ 1770** | 132597/ 1772.5 | 132622/ 1775 | 132647/ 1777.5 | 132657/ 1778.5 | 132665/ 1779.3 |

**LTE transmitter and antenna implementation**

Refer to Appendix A.

**Maximum power reduction (MPR)**

**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | 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 |
| 64 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 |
| 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 |
| 256 QAM | ≥ 1 | | | | | | ≤ 5 |

MPR Built-in by design

The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.

A-MPR (additional MPR) was disabled during SAR testing

**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.

**Notes:**

1. Maximum bandwidth 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.
2. LTE band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths.
3. SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).


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## 6.4. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

LTE TDD Bands support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

| Special subframe configuration | Normal cyclic prefix in downlink | | | Extended cyclic prefix in downlink | | |
|---|---|---|---|---|---|---|
| | DwPTS | UpPTS | | DwPTS | UpPTS | |
| | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink |
| 0 | $6592 \cdot T_s$ | $(1+X) \cdot 2192 \cdot T_s$ | $(1+X) \cdot 2560 \cdot T_s$ | $7680 \cdot T_s$ | $(1+X) \cdot 2192 \cdot T_s$ | $(1+X) \cdot 2560 \cdot T_s$ |
| 1 | $19760 \cdot T_s$ | | | $20480 \cdot T_s$ | | |
| 2 | $21952 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 3 | $24144 \cdot T_s$ | | | $25600 \cdot T_s$ | | |
| 4 | $26336 \cdot T_s$ | | | $7680 \cdot T_s$ | $(2+X) \cdot 2192 \cdot T_s$ | $(2+X) \cdot 2560 \cdot T_s$ |
| 5 | $6592 \cdot T_s$ | $(2+X) \cdot 2192 \cdot T_s$ | $(2+X) \cdot 2560 \cdot T_s$ | $20480 \cdot T_s$ | | |
| 6 | $19760 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 7 | $21952 \cdot T_s$ | | | $12800 \cdot T_s$ | | |
| 8 | $24144 \cdot T_s$ | | | - | - | - |
| 9 | $13168 \cdot T_s$ | | | - | - | - |
| 10 | $13168 \cdot T_s$ | $13152 \cdot T_s$ | $12800 \cdot T_s$ | - | - | - |

Table 4.2-2: Uplink-downlink configurations & Calculated Duty Cycle

| Uplink-Downlink Configuration | Downlink-to-Uplink Switch-point Periodicity | Subframe Number | | | | | | | | | | Calculated Duty Cycle (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 0 | 5 ms | D | S | U | U | U | D | S | U | U | U | 63.3% |
| 1 | 5 ms | D | S | U | U | D | D | S | U | U | D | 43.3% |
| 2 | 5 ms | D | S | U | D | D | D | S | U | D | D | 23.3% |
| 3 | 10 ms | D | S | U | U | U | D | D | D | D | D | 31.7% |
| 4 | 10 ms | D | S | U | U | D | D | D | D | D | D | 21.7% |
| 5 | 10 ms | D | S | U | D | D | D | D | D | D | D | 11.7% |
| 6 | 5 ms | D | S | U | U | U | D | S | U | U | D | 53.3% |

Calculated Duty Cycle = Extended cyclic prefix in uplink * ($T_s$) * # of S + # of U / period

**Note(s):**

This device supports uplink-downlink configurations 0-6. The configuration with highest duty cycle was used for SAR Testing: configuration 0 at 63.3% duty cycle.



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# 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A 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 (Main Ant. 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 | 15 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 | |
| | Product Specifc 10g | 0 mm | Rear | Refer to note 2 | | |
| | | | Front | | | |
| | | | Edge 1 (Top) | | | |
| | | | Edge 2 (Right) | | | |
| | | | Edge 3 (Bottom) | | | |
| | | | Edge 4 (Left) | | | |
| WWAN (Main Ant. 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 | 15 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 | No | 1 |
| | Product Specifc 10g | 0 mm | Rear | Refer to note 2 | | |
| | | | Front | | | |
| | | | Edge 1 (Top) | | | |
| | | | Edge 2 (Right) | | | |
| | | | Edge 3 (Bottom) | | | |
| | | | Edge 4 (Left) | | | |

**Notes:**

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. For Phablet devices: when hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
3. WWAN Main Antenna #2 supported LTE Band 41 only


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| Wireless technologies | RF Exposure Conditions | DUT-to-User Separation | Test Position | Antenna-to-edge/surface | SAR Required | Note |
|---|---|---|---|---|---|---|
| WLAN & BT | 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 | 15 mm | Rear | N/A | Yes | |
| | | | Front | N/A | Yes | |
| | Hotspot (2.4/5.8 GHz Bands) | 10 mm | Rear | < 25 mm | Yes | |
| | | | Front | < 25 mm | Yes | |
| | | | Edge 1 (Top) | < 25 mm | Yes | |
| | | | Edge 2 (Right) | < 25 mm | Yes | |
| | | | Edge 3 (Bottom) | > 25 mm | No | 1 |
| | | | Edge 4 (Left) | > 25 mm | No | 1 |
| | Product Specifc 10g | 0 mm | Rear | Refer to notes 2 & 3 | | |
| | | | Front | | | |
| | | | Edge 1 (Top) | | | |
| | | | Edge 2 (Right) | | | |
| | | | Edge 3 (Bottom) | | | |
| | | | Edge 4 (Left) | | | |

**Notes:**

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. For Phablet devices: when hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
3. For Phablet devices: when Hotspot Mode is not supported, Product Specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
4. Wi-Fi Direct is only available in Hand use configuration.


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# 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 ± 2°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.

The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for εr and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

| Target Frequency (MHz) | Head | | Body | |
|---|---|---|---|---|
| | $\varepsilon_r$ | σ (S/m) | $\varepsilon_r$ | 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 Std 1528-2013


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**Dielectric Property Measurements Results:**

| SAR Lab | Date | Band (MHz) | Tissue Type | Frequency (MHz) | Relative Permittivity (εr) | | | Conductivity (σ) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Measured | Target | Delta (%) | Measured | Target | Delta (%) |
| B | 1/28/2019 | 2450 | Head | 2450 | 38.36 | 39.20 | -2.14 | 1.80 | 1.80 | 0.00 |
| | | | | 2400 | 38.53 | 39.30 | -1.95 | 1.80 | 1.75 | 2.82 |
| | | | | 2480 | 38.13 | 39.16 | -2.64 | 1.82 | 1.83 | -0.46 |
| B | 1/28/2019 | 2450 | Body | 2450 | 50.56 | 52.70 | -4.06 | 1.99 | 1.95 | 2.10 |
| | | | | 2400 | 50.99 | 52.77 | -3.38 | 1.97 | 1.90 | 3.90 |
| | | | | 2480 | 50.28 | 52.66 | -4.52 | 2.04 | 1.99 | 2.45 |
| B | 2/1/2019 | 2450 | Head | 2450 | 37.76 | 39.20 | -3.67 | 1.77 | 1.80 | -1.56 |
| | | | | 2400 | 37.83 | 39.30 | -3.73 | 1.74 | 1.75 | -0.95 |
| | | | | 2480 | 37.77 | 39.16 | -3.55 | 1.79 | 1.83 | -2.37 |
| B | 2/1/2019 | 2450 | Body | 2450 | 51.56 | 52.70 | -2.16 | 2.04 | 1.95 | 4.46 |
| | | | | 2400 | 51.76 | 52.77 | -1.92 | 1.97 | 1.90 | 3.84 |
| | | | | 2480 | 51.48 | 52.66 | -2.24 | 2.07 | 1.99 | 4.11 |
| E | 1/28/2019 | 5250 | Head | 5250 | 36.54 | 35.93 | 1.69 | 4.52 | 4.70 | -3.79 |
| | | | | 5150 | 36.41 | 36.05 | 1.01 | 4.40 | 4.60 | -4.32 |
| | | | | 5350 | 36.49 | 35.82 | 1.87 | 4.71 | 4.80 | -1.95 |
| E | 1/28/2019 | 5600 | Head | 5600 | 36.09 | 35.53 | 1.57 | 4.97 | 5.06 | -1.76 |
| | | | | 5500 | 36.07 | 35.65 | 1.18 | 4.76 | 4.96 | -3.93 |
| | | | | 5725 | 35.77 | 35.39 | 1.07 | 5.13 | 5.19 | -1.08 |
| E | 1/28/2019 | 5600 | Body | 5600 | 47.23 | 48.48 | -2.57 | 5.89 | 5.76 | 2.20 |
| | | | | 5500 | 47.10 | 48.61 | -3.11 | 5.64 | 5.64 | -0.15 |
| | | | | 5725 | 46.88 | 48.31 | -2.96 | 6.09 | 5.91 | 3.17 |
| E | 1/28/2019 | 5750 | Head | 5750 | 35.59 | 35.36 | 0.64 | 5.08 | 5.21 | -2.66 |
| | | | | 5700 | 35.61 | 35.42 | 0.54 | 5.16 | 5.16 | -0.07 |
| | | | | 5850 | 35.65 | 35.30 | 0.99 | 5.28 | 5.27 | 0.15 |
| G | 1/29/2019 | 5750 | Body | 5750 | 46.52 | 48.27 | -3.63 | 6.03 | 5.94 | 1.52 |
| | | | | 5700 | 46.43 | 48.34 | -3.96 | 6.13 | 5.88 | 4.26 |
| | | | | 5850 | 46.23 | 48.20 | -4.09 | 6.26 | 6.00 | 4.33 |
| G | 1/30/2019 | 5250 | Body | 5250 | 46.98 | 48.95 | -4.03 | 5.37 | 5.35 | 0.30 |
| | | | | 5150 | 47.18 | 49.09 | -3.89 | 5.23 | 5.24 | -0.05 |
| | | | | 5350 | 46.78 | 48.82 | -4.17 | 5.51 | 5.47 | 0.81 |
| 2 | 1/29/2019 | 1900 | Head | 1900 | 38.88 | 40.00 | -2.80 | 1.45 | 1.40 | 3.57 |
| | | | | 1850 | 38.91 | 40.00 | -2.73 | 1.42 | 1.40 | 1.14 |
| | | | | 1920 | 38.87 | 40.00 | -2.83 | 1.46 | 1.40 | 4.43 |
| 2 | 1/29/2019 | 1900 | Body | 1900 | 54.24 | 53.30 | 1.76 | 1.55 | 1.52 | 2.17 |
| | | | | 1850 | 54.35 | 53.30 | 1.97 | 1.50 | 1.52 | -1.32 |
| | | | | 1920 | 54.24 | 53.30 | 1.76 | 1.58 | 1.52 | 3.88 |
| 2 | 1/30/2019 | 1750 | Head | 1750 | 40.14 | 40.08 | 0.14 | 1.41 | 1.37 | 3.07 |
| | | | | 1710 | 40.49 | 40.15 | 0.86 | 1.40 | 1.35 | 3.68 |
| | | | | 1755 | 40.12 | 40.08 | 0.11 | 1.42 | 1.37 | 3.37 |
| 2 | 1/30/2019 | 1750 | Body | 1750 | 52.40 | 53.44 | -1.95 | 1.51 | 1.49 | 1.34 |
| | | | | 1710 | 52.81 | 53.54 | -1.37 | 1.46 | 1.46 | -0.04 |
| | | | | 1755 | 52.39 | 53.43 | -1.94 | 1.52 | 1.49 | 2.00 |


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**Dielectric Property Measurements Results (continued):**

| SAR Lab | Date | Band (MHz) | Tissue Type | Frequency (MHz) | Relative Permittivity (εr) | | | Conductivity (σ) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Measured | Target | Delta (%) | Measured | Target | Delta (%) |
| 4 | 1/28/2019 | 835 | Head | 835 | 40.27 | 41.50 | -2.96 | 0.94 | 0.90 | 4.30 |
| | | | | 805 | 40.34 | 41.68 | -3.21 | 0.92 | 0.90 | 3.08 |
| | | | | 850 | 40.22 | 41.50 | -3.08 | 0.94 | 0.92 | 3.13 |
| 4 | 1/28/2019 | 835 | Body | 835 | 53.32 | 55.20 | -3.41 | 1.01 | 0.97 | 3.92 |
| | | | | 805 | 53.33 | 55.33 | -3.62 | 0.99 | 0.97 | 2.57 |
| | | | | 850 | 53.27 | 55.16 | -3.42 | 1.01 | 0.99 | 2.52 |
| 4 | 1/31/2019 | 750 | Head | 750 | 40.76 | 41.96 | -2.86 | 0.90 | 0.89 | 1.12 |
| | | | | 660 | 41.19 | 42.42 | -2.91 | 0.88 | 0.89 | -0.28 |
| | | | | 800 | 40.54 | 41.71 | -2.79 | 0.93 | 0.90 | 3.24 |
| 4 | 1/31/2019 | 750 | Body | 750 | 54.22 | 55.55 | -2.39 | 0.99 | 0.96 | 2.43 |
| | | | | 660 | 54.68 | 55.89 | -2.17 | 0.95 | 0.96 | -0.84 |
| | | | | 800 | 53.98 | 55.35 | -2.48 | 1.00 | 0.97 | 3.52 |
| 4 | 2/1/2019 | 2600 | Head | 2600 | 39.60 | 39.01 | 1.51 | 1.99 | 1.96 | 1.62 |
| | | | | 2495 | 39.75 | 39.14 | 1.55 | 1.89 | 1.85 | 2.18 |
| | | | | 2690 | 39.31 | 38.90 | 1.06 | 2.07 | 2.06 | 0.46 |
| 4 | 2/1/2019 | 2600 | Body | 2600 | 50.64 | 52.51 | -3.56 | 2.19 | 2.16 | 1.17 |
| | | | | 2495 | 50.77 | 52.64 | -3.56 | 2.07 | 2.01 | 2.92 |
| | | | | 2690 | 50.40 | 52.40 | -3.81 | 2.28 | 2.29 | -0.41 |


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## 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.


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## 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. Refer to Appendix B for the SAR System Check Plots.

| SAR Lab | Date | Tissue Type | Dipole Type _Serial # | Dipole Cal. Due Data | Measured Results for 1g SAR | | | | Measured Results for 10g SAR | | | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Zoom Scan to 100 mW | Normalize to 1 W | Target (Ref. Value) | Delta ±10 % | Zoom Scan to 100 mW | Normalize to 1 W | Target (Ref. Value) | Delta ±10 % | |
| B | 1/28/2019 | Head | D2450V2 SN:899 | 3/16/2019 | 5.240 | 52.40 | 51.75 | 1.26 | 2.430 | 24.30 | 24.20 | 0.41 | |
| B | 1/28/2019 | Body | D2450V2 SN:899 | 3/16/2019 | 5.430 | 54.30 | 50.55 | **7.42** | 2.500 | 25.00 | 23.20 | 7.76 | 1,2 |
| B | 2/1/2019 | Head | D2450V2 SN:899 | 3/16/2019 | 5.280 | 52.80 | 51.75 | 2.03 | 2.450 | 24.50 | 24.20 | 1.24 | |
| B | 2/1/2019 | Body | D2450V2 SN:899 | 3/16/2019 | 5.280 | 52.80 | 50.55 | 4.45 | 2.430 | 24.30 | 23.20 | 4.74 | |
| E | 1/28/2019 | Body | D5GHzV2 SN:1003 (5.60 GHz) | 3/13/2019 | 8.170 | 81.70 | 77.70 | **5.15** | 2.300 | 23.00 | 21.70 | 5.99 | 3,4 |
| E | 1/29/2019 | Head | D5GHzV2 SN:1003 (5.25 GHz) | 3/13/2019 | 8.010 | 80.10 | 80.60 | **-0.62** | 2.310 | 23.10 | 23.20 | -0.43 | 5,6 |
| E | 1/29/2019 | Head | D5GHzV2 SN:1003 (5.60 GHz) | 3/13/2019 | 8.230 | 82.30 | 84.50 | -2.60 | 2.340 | 23.40 | 24.00 | -2.50 | |
| E | 1/29/2019 | Head | D5GHzV2 SN:1003 (5.75 GHz) | 3/13/2019 | 7.780 | 77.80 | 78.40 | **-0.77** | 2.230 | 22.30 | 22.20 | 0.45 | 7,8 |
| G | 1/29/2019 | Body | D5GHzV2 SN:1003 (5.75 GHz) | 3/13/2019 | 7.670 | 76.70 | 73.90 | **3.79** | 2.160 | 21.60 | 20.60 | 4.85 | 9,10 |
| G | 1/30/2019 | Body | D5GHzV2 SN:1003 (5.25 GHz) | 3/13/2019 | 7.410 | 74.10 | 73.60 | **0.68** | 2.130 | 21.30 | 20.50 | 3.90 | 11,12 |
| 2 | 1/29/2019 | Head | D1900V2 SN:5d163 | 10/16/2019 | 4.180 | 41.80 | 42.19 | -0.92 | 2.150 | 21.50 | 21.73 | -1.06 | |
| 2 | 1/29/2019 | Body | D1900V2 SN:5d163 | 10/16/2019 | 4.190 | 41.90 | 42.59 | **-1.62** | 2.130 | 21.30 | 22.17 | -3.92 | 13,14 |
| 2 | 1/30/2019 | Head | D1750V2 SN:1077 | 10/16/2019 | 3.880 | 38.80 | 38.69 | 0.28 | 2.050 | 20.50 | 20.46 | 0.20 | |
| 2 | 1/30/2019 | Body | D1750V2 SN:1077 | 10/16/2019 | 3.690 | 36.90 | 39.29 | **-6.08** | 1.940 | 19.40 | 21.05 | -7.84 | 15,16 |
| 4 | 1/28/2019 | Head | D835V2 SN:4d117 | 5/16/2019 | 0.989 | 9.89 | 9.87 | 0.20 | 0.640 | 6.40 | 6.40 | 0.00 | |
| 4 | 1/28/2019 | Body | D835V2 SN:4d117 | 5/16/2019 | 0.972 | 9.72 | 10.31 | **-5.72** | 0.630 | 6.30 | 6.84 | -7.89 | 17,18 |
| 4 | 1/31/2019 | Head | D750V3 SN:1024 | 5/16/2019 | 0.854 | 8.54 | 8.28 | **3.14** | 0.554 | 5.54 | 5.41 | 2.40 | 19,20 |
| 4 | 1/31/2019 | Body | D750V3 SN:1024 | 5/16/2019 | 0.921 | 9.21 | 9.03 | 1.99 | 0.600 | 6.00 | 6.05 | -0.83 | |
| 4 | 2/1/2019 | Head | D2600V2 SN:1036 | 3/16/2019 | 5.800 | 58.00 | 54.54 | **6.34** | 2.580 | 25.80 | 24.56 | 5.05 | 21,22 |
| 4 | 2/1/2019 | Body | D2600V2 SN:1036 | 3/16/2019 | 5.470 | 54.70 | 56.13 | -2.55 | 2.390 | 23.90 | 25.04 | -4.55 | |


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# 9. Conducted Output Power Measurements

## 9.1. GSM

**Per KDB 941225 D01 3G SAR Procedures:**

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

When different maximum output power applies to GSM voice or GPRS/EDGE time slots, GSM voice and GPRS/EDGE time slots should be tested separately to determine compliance by summing the corresponding reported SAR.

The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance

**Per October 2013 TCB Workshop:**

When the maximum frame-averaged powers levels are within 0.25 dB of each other, test the configuration with the most number of time slots.

**Maximum Output Power (Tune-up Limit) for GSM**

SAR is not required for EDGE (8PSK) mode because the maximum output power and tune-up limit is ≤ 1/4dB higher than GPRS/EDGE (GMSK) or the adjusted SAR of the highest reported SAR of GPRS/EDGE (GMSK) is ≤ 1.2W/kg.

**GSM850 Measured Results**

| Mode | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Maximum Average Power (dBm) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Measured | | Tune-up Limit | |
| | | | | | Burst Pwr | Frame Pwr | Burst Pwr | Frame Pwr |
| GPRS/EDGE (GMSK) | CS1 | 1 | 128 | 824.2 | 32.61 | 23.58 | 34.00 | 24.97 |
| | | | 190 | 836.6 | 32.61 | 23.58 | | |
| | | | 251 | 848.8 | 32.72 | 23.69 | | |
| | | 2 | 128 | 824.2 | 30.13 | 24.11 | 31.00 | 24.98 |
| | | | 190 | 836.6 | 29.92 | 23.90 | | |
| | | | 251 | 848.8 | 30.05 | 24.03 | | |
| | | 3 | 128 | 824.2 | 28.55 | 24.29 | 30.00 | **25.74** |
| | | | 190 | 836.6 | 28.73 | 24.47 | | |
| | | | 251 | 848.8 | 28.75 | 24.49 | | |
| | | 4 | 128 | 824.2 | 27.22 | 24.21 | 28.50 | 25.49 |
| | | | 190 | 836.6 | 27.32 | 24.31 | | |
| | | | 251 | 848.8 | 27.26 | 24.25 | | |
| EDGE (8PSK) | MCS5 | 1 | 128 | 824.2 | 26.54 | 17.51 | 27.50 | 18.47 |
| | | | 190 | 836.6 | 26.48 | 17.45 | | |
| | | | 251 | 848.8 | 26.34 | 17.31 | | |
| | | 2 | 128 | 824.2 | 24.71 | 18.69 | 25.50 | 19.48 |
| | | | 190 | 836.6 | 24.54 | 18.52 | | |
| | | | 251 | 848.8 | 24.43 | 18.41 | | |
| | | 3 | 128 | 824.2 | 23.28 | 19.02 | 24.20 | 19.94 |
| | | | 190 | 836.6 | 23.22 | 18.96 | | |
| | | | 251 | 848.8 | 23.13 | 18.87 | | |
| | | 4 | 128 | 824.2 | 21.85 | 18.84 | 22.50 | 19.49 |
| | | | 190 | 836.6 | 21.68 | 18.67 | | |
| | | | 251 | 848.8 | 21.74 | 18.73 | | |

**Notes:**

GPRS/EDGE (GMSK) mode with 3 time slots for Max power, based on the Tune-up Procedure.



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## GSM1900 Measured Results

| Mode | Coding Scheme | Time Slots | Ch No. | Freq. (MHz) | Maximum Average Power (dBm) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Measured | | Tune-up Limit | |
| | | | | | Burst Pwr | Frame Pwr | Burst Pwr | Frame Pwr |
| GPRS/EDGE (GMSK) | CS1 | 1 | 512 | 1850.2 | 29.84 | 20.81 | 31.00 | 21.97 |
| | | | 661 | 1880.0 | 29.88 | 20.85 | | |
| | | | 810 | 1909.8 | 29.63 | 20.60 | | |
| | | 2 | 512 | 1850.2 | 26.56 | 20.54 | 28.00 | 21.98 |
| | | | 661 | 1880.0 | 26.62 | 20.60 | | |
| | | | 810 | 1909.8 | 26.59 | 20.57 | | |
| | | 3 | 512 | 1850.2 | 25.20 | 20.94 | 26.60 | **22.34** |
| | | | 661 | 1880.0 | 25.11 | 20.85 | | |
| | | | 810 | 1909.8 | 25.11 | 20.85 | | |
| | | 4 | 512 | 1850.2 | 23.47 | 20.46 | 25.00 | 21.99 |
| | | | 661 | 1880.0 | 23.55 | 20.54 | | |
| | | | 810 | 1909.8 | 23.57 | 20.56 | | |
| EDGE (8PSK) | MCS5 | 1 | 512 | 1850.2 | 26.31 | 17.28 | 27.00 | 17.97 |
| | | | 661 | 1880.0 | 26.33 | 17.30 | | |
| | | | 810 | 1909.8 | 26.25 | 17.22 | | |
| | | 2 | 512 | 1850.2 | 23.84 | 17.82 | 24.20 | 18.18 |
| | | | 661 | 1880.0 | 23.79 | 17.77 | | |
| | | | 810 | 1909.8 | 23.79 | 17.77 | | |
| | | 3 | 512 | 1850.2 | 22.34 | 18.08 | 23.00 | 18.74 |
| | | | 661 | 1880.0 | 22.32 | 18.06 | | |
| | | | 810 | 1909.8 | 22.32 | 18.06 | | |
| | | 4 | 512 | 1850.2 | 21.07 | 18.06 | 21.50 | 18.49 |
| | | | 661 | 1880.0 | 21.17 | 18.16 | | |
| | | | 810 | 1909.8 | 21.19 | 18.18 | | |

**Notes:**

GPRS/EDGE (GMSK) mode with 3 time slots for Max power, based on the Tune-up Procedure.



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## 9.2. W-CDMA

**Per KDB 941225 D01 3G SAR Procedures for W-CDMA:**

Maximum output power is verified on the high, middle and low channels and using the appropriate 12.2 kbps RMC with TPC (transmit power control) set to all "1's"

**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. A summary of these settings is illustrated below:

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

**HSDPA Setup Procedures used to establish the test signals**

The following 4 Sub-tests were completed according to procedures in table C.10.1.4 of 3GPP TS 34.121-1
A summary of these settings is illustrated below:

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

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1, Note 2) | CM (dB) (Note 3) | MPR (dB) (Note 3) |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 (Note 4) | 15/15 (Note 4) | 64 | 12/15 (Note 4) | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

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

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

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

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

**HSUPA Setup Procedures used to establish the test signals**

The following 5 Sub-tests were completed according to procedures in table C.11.1.3 of 3GPP TS 34.121-1. A summary of these settings is illustrated below:

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

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1) | $\beta_{ec}$ | $\beta_{ed}$ (Note 4) (Note 5) | $\beta_{ed}$ (SF) | $\beta_{ed}$ (Codes) | CM (dB) (Note 2) | MPR (dB) (Note 2) (Note 6) | AG Index (Note 5) | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 (Note 3) | 15/15 (Note 3) | 64 | 11/15 (Note 3) | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}1$: 47/15<br>$\beta_{ed}2$: 47/15 | 4<br>4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 | 0 | - | - | 5/15 | 5/15 | 47/15 | 4 | 1 | 1.0 | 0.0 | 12 | 67 |

Note 1: For sub-test 1 to 4, $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs}$ = 30/15 * $\beta_c$. For sub-test 5, $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 5/15 with $\beta_{hs}$ = 5/15 * $\beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the $\beta_c/\beta_d$ ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 10/15 and $\beta_d$ = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: $\beta_{ed}$ can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

**HSPA+**

DUT supports HSPA+ Release 9 DL only. Therefore, conducted power measurements is not required.

SAR measurement is not required for the HSDPA, HSUPA and HSPA+. When primary mode and the adjusted SAR is ≤ 1.2 W/kg and secondary mode is ≤ ¼ dB higher than the primary mode


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**W-CDMA Band II Measured Results**

| Mode | | UL Ch No. | Freq. (MHz) | Maximum Average Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Measured Pwr | MPR | Tune-up Limit |
| Release 99 | Rel 99 (RMC, 12.2 kbps) | 9262 | 1852.4 | 25.04 | N/A | 25.50 |
| | | 9400 | 1880.0 | 25.20 | | |
| | | 9538 | 1907.6 | 25.20 | | |
| HSDPA | Subtest 1 | 9262 | 1852.4 | 24.68 | 0 | 25.50 |
| | | 9400 | 1880.0 | 24.54 | | |
| | | 9538 | 1907.6 | 24.42 | | |
| | Subtest 2 | 9262 | 1852.4 | 24.65 | 0 | 25.50 |
| | | 9400 | 1880.0 | 24.56 | | |
| | | 9538 | 1907.6 | 24.44 | | |
| | Subtest 3 | 9262 | 1852.4 | 23.66 | 0.0 | 25.50 |
| | | 9400 | 1880.0 | 23.55 | | |
| | | 9538 | 1907.6 | 23.38 | | |
| | Subtest 4 | 9262 | 1852.4 | 25.05 | 0.0 | 25.50 |
| | | 9400 | 1880.0 | 25.20 | | |
| | | 9538 | 1907.6 | 25.28 | | |
| HSUPA | Subtest 1 | 9262 | 1852.4 | 23.00 | 2 | 23.00 |
| | | 9400 | 1880.0 | 21.48 | | |
| | | 9538 | 1907.6 | 21.38 | | |
| | Subtest 2 | 9262 | 1852.4 | 21.09 | 3 | 22.00 |
| | | 9400 | 1880.0 | 20.54 | | |
| | | 9538 | 1907.6 | 20.42 | | |
| | Subtest 3 | 9262 | 1852.4 | 23.00 | 2 | 23.00 |
| | | 9400 | 1880.0 | 21.58 | | |
| | | 9538 | 1907.6 | 21.44 | | |
| | Subtest 4 | 9262 | 1852.4 | 21.65 | 3 | 22.00 |
| | | 9400 | 1880.0 | 20.55 | | |
| | | 9538 | 1907.6 | 20.39 | | |
| | Subtest 5 | 9262 | 1852.4 | 24.99 | 0 | 25.00 |
| | | 9400 | 1880.0 | 23.43 | | |
| | | 9538 | 1907.6 | 23.28 | | |


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**W-CDMA Band IV Measured Results**

| Mode | | UL Ch No. | Freq. (MHz) | Maximum Average Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Measured Pwr | MPR | Tune-up Limit |
| Release 99 | Rel 99 (RMC, 12.2 kbps) | 1312 | 1712.4 | 23.40 | N/A | 25.00 |
| | | 1413 | 1732.6 | 23.30 | | |
| | | 1513 | 1752.6 | 23.10 | | |
| HSDPA | Subtest 1 | 1312 | 1712.4 | 23.30 | 0 | 23.50 |
| | | 1413 | 1732.6 | 22.80 | | |
| | | 1513 | 1752.6 | 22.70 | | |
| | Subtest 2 | 1312 | 1712.4 | 22.90 | 0 | 23.50 |
| | | 1413 | 1732.6 | 22.30 | | |
| | | 1513 | 1752.6 | 22.20 | | |
| | Subtest 3 | 1312 | 1712.4 | 21.90 | 0.5 | 23.00 |
| | | 1413 | 1732.6 | 21.60 | | |
| | | 1513 | 1752.6 | 21.60 | | |
| | Subtest 4 | 1312 | 1712.4 | 21.90 | 0.5 | 23.00 |
| | | 1413 | 1732.6 | 21.60 | | |
| | | 1513 | 1752.6 | 21.50 | | |
| HSUPA | Subtest 1 | 1312 | 1712.4 | 20.00 | 0 | 21.00 |
| | | 1413 | 1732.6 | 20.00 | | |
| | | 1513 | 1752.6 | 20.00 | | |
| | Subtest 2 | 1312 | 1712.4 | 18.40 | 2 | 19.00 |
| | | 1413 | 1732.6 | 18.00 | | |
| | | 1513 | 1752.6 | 18.50 | | |
| | Subtest 3 | 1312 | 1712.4 | 20.00 | 1 | 20.00 |
| | | 1413 | 1732.6 | 19.50 | | |
| | | 1513 | 1752.6 | 19.30 | | |
| | Subtest 4 | 1312 | 1712.4 | 18.40 | 2 | 19.00 |
| | | 1413 | 1732.6 | 18.00 | | |
| | | 1513 | 1752.6 | 18.50 | | |
| | Subtest 5 | 1312 | 1712.4 | 20.00 | 0 | 21.00 |
| | | 1413 | 1732.6 | 20.00 | | |
| | | 1513 | 1752.6 | 20.00 | | |


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**W-CDMA Band V Measured Results**

| Mode | | UL Ch No. | Freq. (MHz) | Maximum Average Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Measured Pwr | MPR | Tune-up Limit |
| Release 99 | Rel 99 (RMC, 12.2 kbps) | 4132 | 826.4 | 24.74 | N/A | 25.50 |
| | | 4183 | 836.6 | 24.52 | | |
| | | 4233 | 846.6 | 24.27 | | |
| HSDPA | Subtest 1 | 4132 | 826.4 | 23.37 | 0 | 24.00 |
| | | 4183 | 836.6 | 23.15 | | |
| | | 4233 | 846.6 | 22.87 | | |
| | Subtest 2 | 4132 | 826.4 | 22.56 | 0 | 24.00 |
| | | 4183 | 836.6 | 22.25 | | |
| | | 4233 | 846.6 | 22.02 | | |
| | Subtest 3 | 4132 | 826.4 | 21.36 | 0.5 | 23.50 |
| | | 4183 | 836.6 | 21.41 | | |
| | | 4233 | 846.6 | 21.64 | | |
| | Subtest 4 | 4132 | 826.4 | 21.45 | 0.5 | 23.50 |
| | | 4183 | 836.6 | 21.08 | | |
| | | 4233 | 846.6 | 21.12 | | |
| HSUPA | Subtest 1 | 4132 | 826.4 | 19.89 | 2 | 21.80 |
| | | 4183 | 836.6 | 19.68 | | |
| | | 4233 | 846.6 | 19.33 | | |
| | Subtest 2 | 4132 | 826.4 | 18.91 | 3 | 20.80 |
| | | 4183 | 836.6 | 18.66 | | |
| | | 4233 | 846.6 | 18.33 | | |
| | Subtest 3 | 4132 | 826.4 | 19.93 | 2 | 21.80 |
| | | 4183 | 836.6 | 19.68 | | |
| | | 4233 | 846.6 | 19.35 | | |
| | Subtest 4 | 4132 | 826.4 | 18.87 | 3 | 20.80 |
| | | 4183 | 836.6 | 18.55 | | |
| | | 4233 | 846.6 | 18.31 | | |
| | Subtest 5 | 4132 | 826.4 | 22.76 | 0 | 23.80 |
| | | 4183 | 836.6 | 22.42 | | |
| | | 4233 | 846.6 | 22.02 | | |


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## 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 1, 2 and 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | 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 |
| 64 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 |
| 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 |
| 256 QAM | ≥ 1 | | | | | | ≤ 5 |

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 (subclause) | 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 | N/A |

According to April 2015 TCB workshop, SAR test exclusion can be applied for testing overlapping LTE bands as follows:

a) The maximum output power, including tolerance, for the smaller band must be ≤ the larger band to qualify for the SAR test exclusion.
b) The channel bandwidth and other operating parameters for the smaller band must be fully supported by the larger band.
   - LTE Band 4 (1710-1755 MHz) is covered by LTE Band 66 (1710-1780 MHz)
   - LTE Band 17 (704-716 MHz) is covered by LTE Band 12 (699-716 MHz)

LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

SAR measurement is not required for the 16QAM. When the highest maximum output power for 16QAM and is ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

Please refer to section 6.3. for LTE detail test channels.


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## LTE Band 2 Measured Results

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18700 | 18900 | 19100 | | |
| | | | | 1860 MHz | 1880 MHz | 1900 MHz | | |
| 20 MHz | QPSK | 1 | 0 | 24.02 | 24.14 | 24.24 | 0 | 24.7 |
| | | 1 | 49 | 24.04 | 24.11 | 24.07 | 0 | 24.7 |
| | | 1 | 99 | 24.06 | 24.02 | 23.95 | 0 | 24.7 |
| | | 50 | 0 | 22.00 | 22.00 | 22.08 | 1 | 23.7 |
| | | 50 | 24 | 22.00 | 22.00 | 22.01 | 1 | 23.7 |
| | | 50 | 50 | 22.01 | 21.94 | 21.93 | 1 | 23.7 |
| | | 100 | 0 | 22.00 | 21.97 | 21.99 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 23.06 | 22.99 | 22.98 | 1 | 23.7 |
| | | 1 | 49 | 23.09 | 22.96 | 22.82 | 1 | 23.7 |
| | | 1 | 99 | 23.11 | 22.90 | 22.71 | 1 | 23.7 |
| | | 50 | 0 | 22.11 | 22.09 | 22.20 | 2 | 22.7 |
| | | 50 | 24 | 22.10 | 22.07 | 22.13 | 2 | 22.7 |
| | | 50 | 50 | 22.11 | 22.04 | 22.05 | 2 | 22.7 |
| | | 100 | 0 | 22.13 | 22.10 | 22.17 | 2 | 22.7 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18675 | 18900 | 19125 | | |
| | | | | 1857.5 MHz | 1880 MHz | 1902.5 MHz | | |
| 15 MHz | QPSK | 1 | 0 | 24.14 | 24.11 | 24.30 | 0 | 24.7 |
| | | 1 | 37 | 24.15 | 24.08 | 24.16 | 0 | 24.7 |
| | | 1 | 74 | 24.15 | 24.02 | 24.07 | 0 | 24.7 |
| | | 36 | 0 | 22.06 | 22.04 | 22.04 | 1 | 23.7 |
| | | 36 | 20 | 22.07 | 22.02 | 22.00 | 1 | 23.7 |
| | | 36 | 39 | 22.09 | 22.01 | 22.00 | 1 | 23.7 |
| | | 75 | 0 | 22.07 | 22.02 | 22.00 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 23.19 | 23.05 | 23.09 | 1 | 23.7 |
| | | 1 | 37 | 23.20 | 23.03 | 22.95 | 1 | 23.7 |
| | | 1 | 74 | 23.21 | 22.96 | 22.87 | 1 | 23.7 |
| | | 36 | 0 | 22.15 | 22.14 | 22.16 | 2 | 22.7 |
| | | 36 | 20 | 22.15 | 22.13 | 22.11 | 2 | 22.7 |
| | | 36 | 39 | 22.16 | 22.10 | 22.07 | 2 | 22.7 |
| | | 75 | 0 | 22.22 | 22.12 | 22.13 | 2 | 22.7 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18650 | 18900 | 19150 | | |
| | | | | 1855 MHz | 1880 MHz | 1905 MHz | | |
| 10 MHz | QPSK | 1 | 0 | 24.21 | 24.13 | 24.19 | 0 | 24.7 |
| | | 1 | 25 | 24.21 | 24.10 | 24.13 | 0 | 24.7 |
| | | 1 | 49 | 24.25 | 24.09 | 24.11 | 0 | 24.7 |
| | | 25 | 0 | 22.05 | 22.01 | 22.01 | 1 | 23.7 |
| | | 25 | 12 | 22.07 | 22.00 | 22.00 | 1 | 23.7 |
| | | 25 | 25 | 22.07 | 22.00 | 22.00 | 1 | 23.7 |
| | | 50 | 0 | 22.06 | 22.00 | 22.00 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 23.01 | 23.24 | 23.08 | 1 | 23.7 |
| | | 1 | 25 | 23.01 | 23.22 | 23.01 | 1 | 23.7 |
| | | 1 | 49 | 23.04 | 23.20 | 23.00 | 1 | 23.7 |
| | | 25 | 0 | 22.20 | 22.18 | 22.16 | 2 | 22.7 |
| | | 25 | 12 | 22.21 | 22.16 | 22.11 | 2 | 22.7 |
| | | 25 | 25 | 22.22 | 22.15 | 22.10 | 2 | 22.7 |
| | | 50 | 0 | 22.18 | 22.11 | 22.13 | 2 | 22.7 |


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## LTE Band 2 Measured Results (continued)

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18625 | 18900 | 19175 | | |
| | | | | 1852.5 MHz | 1880 MHz | 1907.5 MHz | | |
| 5 MHz | QPSK | 1 | 0 | 24.08 | 24.12 | 24.11 | 0 | 24.7 |
| | | 1 | 12 | 24.10 | 24.12 | 24.10 | 0 | 24.7 |
| | | 1 | 24 | 24.11 | 24.09 | 24.10 | 0 | 24.7 |
| | | 12 | 0 | 22.08 | 22.00 | 22.03 | 1 | 23.7 |
| | | 12 | 7 | 22.07 | 22.00 | 22.01 | 1 | 23.7 |
| | | 12 | 13 | 22.07 | 22.00 | 22.01 | 1 | 23.7 |
| | | 25 | 0 | 22.07 | 22.00 | 22.02 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 23.05 | 23.01 | 22.88 | 1 | 23.7 |
| | | 1 | 12 | 23.06 | 23.03 | 22.88 | 1 | 23.7 |
| | | 1 | 24 | 23.07 | 22.99 | 22.88 | 1 | 23.7 |
| | | 12 | 0 | 22.14 | 22.16 | 22.20 | 2 | 22.7 |
| | | 12 | 7 | 22.17 | 22.11 | 22.16 | 2 | 22.7 |
| | | 12 | 13 | 22.19 | 22.10 | 22.14 | 2 | 22.7 |
| | | 25 | 0 | 22.19 | 22.07 | 22.20 | 2 | 22.7 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18615 | 18900 | 19185 | | |
| | | | | 1851.5 MHz | 1880 MHz | 1908.5 MHz | | |
| 3 MHz | QPSK | 1 | 0 | 24.34 | 24.07 | 24.14 | 0 | 24.7 |
| | | 1 | 8 | 24.37 | 24.07 | 24.16 | 0 | 24.7 |
| | | 1 | 14 | 24.31 | 24.08 | 24.18 | 0 | 24.7 |
| | | 8 | 0 | 22.04 | 22.00 | 22.01 | 1 | 23.7 |
| | | 8 | 4 | 22.04 | 22.00 | 22.01 | 1 | 23.7 |
| | | 8 | 7 | 22.04 | 22.00 | 22.03 | 1 | 23.7 |
| | | 15 | 0 | 22.02 | 22.00 | 22.00 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 22.86 | 23.23 | 22.96 | 1 | 23.7 |
| | | 1 | 8 | 22.94 | 23.22 | 22.94 | 1 | 23.7 |
| | | 1 | 14 | 23.02 | 23.19 | 22.84 | 1 | 23.7 |
| | | 8 | 0 | 22.20 | 22.13 | 22.15 | 2 | 22.7 |
| | | 8 | 4 | 22.21 | 22.11 | 22.16 | 2 | 22.7 |
| | | 8 | 7 | 22.19 | 22.13 | 22.16 | 2 | 22.7 |
| | | 15 | 0 | 22.15 | 22.08 | 22.11 | 2 | 22.7 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 18607 | 18900 | 19193 | | |
| | | | | 1850.7 MHz | 1880 MHz | 1909.3 MHz | | |
| 1.4 MHz | QPSK | 1 | 0 | 24.23 | 24.08 | 24.09 | 0 | 24.7 |
| | | 1 | 3 | 24.18 | 24.04 | 24.04 | 0 | 24.7 |
| | | 1 | 5 | 24.21 | 24.08 | 24.09 | 0 | 24.7 |
| | | 3 | 0 | 24.09 | 24.04 | 24.06 | 0 | 24.7 |
| | | 3 | 1 | 24.10 | 24.02 | 24.06 | 0 | 24.7 |
| | | 3 | 3 | 24.10 | 24.02 | 24.06 | 0 | 24.7 |
| | | 6 | 0 | 22.01 | 22.00 | 22.00 | 1 | 23.7 |
| | 16QAM | 1 | 0 | 23.00 | 23.04 | 22.97 | 1 | 23.7 |
| | | 1 | 3 | 22.95 | 23.09 | 23.01 | 1 | 23.7 |
| | | 1 | 5 | 23.05 | 23.04 | 22.96 | 1 | 23.7 |
| | | 3 | 0 | 23.13 | 23.03 | 23.04 | 1 | 23.7 |
| | | 3 | 1 | 23.12 | 22.99 | 23.05 | 1 | 23.7 |
| | | 3 | 3 | 23.10 | 22.96 | 23.06 | 1 | 23.7 |
| | | 6 | 0 | 22.23 | 21.93 | 22.18 | 2 | 22.7 |


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## LTE Band 5 Measured Results

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | [redacted] | 20525 | [redacted] | | |
| | | | | | 836.5 MHz | | | |
| 10 MHz | QPSK | 1 | 0 | | 24.50 | | 0 | 25 |
| | | 1 | 25 | | 24.50 | | 0 | 25 |
| | | 1 | 49 | | 24.50 | | 0 | 25 |
| | | 25 | 0 | | 23.05 | | 1 | 24 |
| | | 25 | 12 | | 23.05 | | 1 | 24 |
| | | 25 | 25 | | 23.06 | | 1 | 24 |
| | | 50 | 0 | | 23.05 | | 1 | 24 |
| | 16QAM | 1 | 0 | | 23.50 | | 1 | 24 |
| | | 1 | 25 | | 23.50 | | 1 | 24 |
| | | 1 | 49 | | 23.50 | | 1 | 24 |
| | | 25 | 0 | | 22.50 | | 2 | 23 |
| | | 25 | 12 | | 22.50 | | 2 | 23 |
| | | 25 | 25 | | 22.50 | | 2 | 23 |
| | | 50 | 0 | | 22.50 | | 2 | 23 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 20425 | 20525 | 20625 | | |
| | | | | 826.5 MHz | 836.5 MHz | 846.5 MHz | | |
| 5 MHz | QPSK | 1 | 0 | 23.72 | 23.78 | 23.55 | 0 | 25 |
| | | 1 | 12 | 23.74 | 23.75 | 23.51 | 0 | 25 |
| | | 1 | 24 | 23.68 | 23.76 | 23.47 | 0 | 25 |
| | | 12 | 0 | 22.17 | 22.25 | 22.00 | 1 | 24 |
| | | 12 | 7 | 22.16 | 22.25 | 22.00 | 1 | 24 |
| | | 12 | 13 | 22.15 | 22.27 | 22.00 | 1 | 24 |
| | | 25 | 0 | 22.18 | 22.25 | 22.02 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.67 | 22.76 | 22.51 | 1 | 24 |
| | | 1 | 12 | 22.60 | 22.71 | 22.45 | 1 | 24 |
| | | 1 | 24 | 22.60 | 22.73 | 22.44 | 1 | 24 |
| | | 12 | 0 | 21.58 | 21.59 | 21.49 | 2 | 23 |
| | | 12 | 7 | 21.61 | 21.66 | 21.42 | 2 | 23 |
| | | 12 | 13 | 21.58 | 21.61 | 21.43 | 2 | 23 |
| | | 25 | 0 | 21.71 | 21.70 | 21.42 | 2 | 23 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 20415 | 20525 | 20635 | | |
| | | | | 825.5 MHz | 836.5 MHz | 847.5 MHz | | |
| 3 MHz | QPSK | 1 | 0 | 23.79 | 23.87 | 23.65 | 0 | 25 |
| | | 1 | 8 | 23.78 | 23.84 | 23.62 | 0 | 25 |
| | | 1 | 14 | 23.74 | 23.86 | 23.54 | 0 | 25 |
| | | 8 | 0 | 22.17 | 22.26 | 22.02 | 1 | 24 |
| | | 8 | 4 | 22.15 | 22.28 | 22.00 | 1 | 24 |
| | | 8 | 7 | 22.16 | 22.28 | 22.00 | 1 | 24 |
| | | 15 | 0 | 22.17 | 22.25 | 22.00 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.91 | 22.63 | 22.42 | 1 | 24 |
| | | 1 | 8 | 22.98 | 22.49 | 22.32 | 1 | 24 |
| | | 1 | 14 | 22.87 | 22.59 | 22.45 | 1 | 24 |
| | | 8 | 0 | 21.72 | 21.72 | 21.46 | 2 | 23 |
| | | 8 | 4 | 21.71 | 21.75 | 21.45 | 2 | 23 |
| | | 8 | 7 | 21.70 | 21.75 | 21.42 | 2 | 23 |
| | | 15 | 0 | 21.62 | 21.69 | 21.41 | 2 | 23 |

**Note(s):**

10 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.


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## LTE Band 5 Measured Results (continued)

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 20407 | 20525 | 20643 | | |
| | | | | 824.7 MHz | 836.5 MHz | 848.3 MHz | | |
| 1.4 MHz | QPSK | 1 | 0 | 23.51 | 23.79 | 23.51 | 0 | 25 |
| | | 1 | 3 | 23.44 | 23.76 | 23.44 | 0 | 25 |
| | | 1 | 5 | 23.44 | 23.77 | 23.44 | 0 | 25 |
| | | 3 | 0 | 23.54 | 23.74 | 23.54 | 0 | 25 |
| | | 3 | 1 | 23.51 | 23.75 | 23.51 | 0 | 25 |
| | | 3 | 3 | 23.52 | 23.74 | 23.52 | 0 | 25 |
| | | 6 | 0 | 22.00 | 22.22 | 22.00 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.39 | 22.59 | 22.39 | 1 | 24 |
| | | 1 | 3 | 22.44 | 22.60 | 22.44 | 1 | 24 |
| | | 1 | 5 | 22.35 | 22.59 | 22.35 | 1 | 24 |
| | | 3 | 0 | 22.38 | 22.63 | 22.38 | 1 | 24 |
| | | 3 | 1 | 22.41 | 22.63 | 22.41 | 1 | 24 |
| | | 3 | 3 | 22.35 | 22.62 | 22.35 | 1 | 24 |
| | | 6 | 0 | 21.35 | 21.68 | 21.35 | 2 | 23 |


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## LTE Band 12 Measured Results

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | [redacted] | 23095 | [redacted] | | |
| | | | | | 707.5 MHz | | | |
| 10 MHz | QPSK | 1 | 0 | | 24.52 | | 0 | 24.8 |
| | | 1 | 25 | | 24.46 | | 0 | 24.8 |
| | | 1 | 49 | | 24.48 | | 0 | 24.8 |
| | | 25 | 0 | | 23.30 | | 1 | 23.8 |
| | | 25 | 12 | | 23.28 | | 1 | 23.8 |
| | | 25 | 25 | | 23.31 | | 1 | 23.8 |
| | | 50 | 0 | | 23.32 | | 1 | 23.8 |
| | 16QAM | 1 | 0 | | 23.59 | | 1 | 23.8 |
| | | 1 | 25 | | 23.55 | | 1 | 23.8 |
| | | 1 | 49 | | 23.54 | | 1 | 23.8 |
| | | 25 | 0 | | 22.27 | | 2 | 22.8 |
| | | 25 | 12 | | 22.26 | | 2 | 22.8 |
| | | 25 | 25 | | 22.25 | | 2 | 22.8 |
| | | 50 | 0 | | 22.26 | | 2 | 22.8 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 23035 | 23095 | 23155 | | |
| | | | | 701.5 MHz | 707.5 MHz | 713.5 MHz | | |
| 5 MHz | QPSK | 1 | 0 | 23.37 | 23.51 | 23.63 | 0 | 24.8 |
| | | 1 | 12 | 23.29 | 23.49 | 23.65 | 0 | 24.8 |
| | | 1 | 24 | 23.25 | 23.50 | 23.66 | 0 | 24.8 |
| | | 12 | 0 | 21.80 | 21.91 | 21.92 | 1 | 23.8 |
| | | 12 | 7 | 21.80 | 21.91 | 21.90 | 1 | 23.8 |
| | | 12 | 13 | 21.80 | 21.92 | 21.94 | 1 | 23.8 |
| | | 25 | 0 | 21.80 | 21.92 | 21.92 | 1 | 23.8 |
| | 16QAM | 1 | 0 | 22.27 | 22.33 | 22.09 | 1 | 23.8 |
| | | 1 | 12 | 22.24 | 22.31 | 22.09 | 1 | 23.8 |
| | | 1 | 24 | 22.17 | 22.30 | 22.14 | 1 | 23.8 |
| | | 12 | 0 | 21.02 | 21.31 | 21.18 | 2 | 22.8 |
| | | 12 | 7 | 21.04 | 21.30 | 21.18 | 2 | 22.8 |
| | | 12 | 13 | 21.03 | 21.30 | 21.17 | 2 | 22.8 |
| | | 25 | 0 | 21.07 | 21.26 | 21.24 | 2 | 22.8 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 23025 | 23095 | 23165 | | |
| | | | | 700.5 MHz | 707.5 MHz | 714.5 MHz | | |
| 3 MHz | QPSK | 1 | 0 | 23.53 | 23.64 | 23.69 | 0 | 24.8 |
| | | 1 | 8 | 23.48 | 23.63 | 23.71 | 0 | 24.8 |
| | | 1 | 14 | 23.46 | 23.61 | 23.70 | 0 | 24.8 |
| | | 8 | 0 | 21.83 | 22.04 | 22.00 | 1 | 23.8 |
| | | 8 | 4 | 21.81 | 22.03 | 22.00 | 1 | 23.8 |
| | | 8 | 7 | 21.80 | 22.03 | 22.01 | 1 | 23.8 |
| | | 15 | 0 | 21.80 | 21.98 | 21.96 | 1 | 23.8 |
| | 16QAM | 1 | 0 | 21.99 | 22.42 | 22.26 | 1 | 23.8 |
| | | 1 | 8 | 22.09 | 22.43 | 22.27 | 1 | 23.8 |
| | | 1 | 14 | 22.05 | 22.40 | 22.12 | 1 | 23.8 |
| | | 8 | 0 | 21.17 | 21.38 | 21.35 | 2 | 22.8 |
| | | 8 | 4 | 21.18 | 21.37 | 21.37 | 2 | 22.8 |
| | | 8 | 7 | 21.16 | 21.38 | 21.36 | 2 | 22.8 |
| | | 15 | 0 | 21.06 | 21.32 | 21.30 | 2 | 22.8 |

**Note(s):**

10 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.


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## LTE Band 12 Measured Results (continued)

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 23017 | 23095 | 23173 | | |
| | | | | 699.7 MHz | 707.5 MHz | 715.3 MHz | | |
| 1.4 MHz | QPSK | 1 | 0 | 23.41 | 23.59 | 23.60 | 0 | 24.8 |
| | | 1 | 3 | 23.37 | 23.58 | 23.56 | 0 | 24.8 |
| | | 1 | 5 | 23.39 | 23.54 | 23.60 | 0 | 24.8 |
| | | 3 | 0 | 23.36 | 23.56 | 23.57 | 0 | 24.8 |
| | | 3 | 1 | 23.37 | 23.57 | 23.58 | 0 | 24.8 |
| | | 3 | 3 | 23.45 | 23.56 | 23.59 | 0 | 24.8 |
| | | 6 | 0 | 21.80 | 21.90 | 21.86 | 1 | 23.8 |
| | 16QAM | 1 | 0 | 21.88 | 22.27 | 22.09 | 1 | 23.8 |
| | | 1 | 3 | 21.87 | 22.39 | 22.17 | 1 | 23.8 |
| | | 1 | 5 | 21.86 | 22.37 | 22.11 | 1 | 23.8 |
| | | 3 | 0 | 22.00 | 22.19 | 22.07 | 1 | 23.8 |
| | | 3 | 1 | 21.99 | 22.15 | 22.09 | 1 | 23.8 |
| | | 3 | 3 | 21.98 | 22.16 | 22.09 | 1 | 23.8 |
| | | 6 | 0 | 21.15 | 21.12 | 21.26 | 2 | 22.8 |


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## LTE Band 13 Measured Results

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | [redacted] | 23230 782 MHz | [redacted] | MPR | Tune-up Limit |
| 10 MHz | QPSK | 1 | 0 | [redacted] | 24.50 | [redacted] | 0 | 24.5 |
| | | 1 | 25 | [redacted] | 24.41 | [redacted] | 0 | 24.5 |
| | | 1 | 49 | [redacted] | 24.34 | [redacted] | 0 | 24.5 |
| | | 25 | 0 | [redacted] | 21.91 | [redacted] | 1 | 23.5 |
| | | 25 | 12 | [redacted] | 21.88 | [redacted] | 1 | 23.5 |
| | | 25 | 25 | [redacted] | 21.84 | [redacted] | 1 | 23.5 |
| | | 50 | 0 | [redacted] | 21.88 | [redacted] | 1 | 23.5 |
| | 16QAM | 1 | 0 | [redacted] | 23.32 | [redacted] | 1 | 23.5 |
| | | 1 | 25 | [redacted] | 23.19 | [redacted] | 1 | 23.5 |
| | | 1 | 49 | [redacted] | 23.20 | [redacted] | 1 | 23.5 |
| | | 25 | 0 | [redacted] | 22.43 | [redacted] | 2 | 22.5 |
| | | 25 | 12 | [redacted] | 22.38 | [redacted] | 2 | 22.5 |
| | | 25 | 25 | [redacted] | 22.34 | [redacted] | 2 | 22.5 |
| | | 50 | 0 | [redacted] | 22.41 | [redacted] | 2 | 22.5 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | [redacted] | 23230 782 MHz | [redacted] | MPR | Tune-up Limit |
| 5 MHz | QPSK | 1 | 0 | [redacted] | 24.29 | [redacted] | 0 | 24.5 |
| | | 1 | 12 | [redacted] | 24.25 | [redacted] | 0 | 24.5 |
| | | 1 | 24 | [redacted] | 24.22 | [redacted] | 0 | 24.5 |
| | | 12 | 0 | [redacted] | 21.81 | [redacted] | 1 | 23.5 |
| | | 12 | 7 | [redacted] | 21.76 | [redacted] | 1 | 23.5 |
| | | 12 | 13 | [redacted] | 21.72 | [redacted] | 1 | 23.5 |
| | | 25 | 0 | [redacted] | 21.74 | [redacted] | 1 | 23.5 |
| | 16QAM | 1 | 0 | [redacted] | 23.23 | [redacted] | 1 | 23.5 |
| | | 1 | 12 | [redacted] | 23.19 | [redacted] | 1 | 23.5 |
| | | 1 | 24 | [redacted] | 23.18 | [redacted] | 1 | 23.5 |
| | | 12 | 0 | [redacted] | 22.27 | [redacted] | 2 | 22.5 |
| | | 12 | 7 | [redacted] | 22.28 | [redacted] | 2 | 22.5 |
| | | 12 | 13 | [redacted] | 22.25 | [redacted] | 2 | 22.5 |
| | | 25 | 0 | [redacted] | 22.29 | [redacted] | 2 | 22.5 |

**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


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**LTE Band 41 Measured Results**

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 39750 | 40185 | 40620 | 41055 | 41490 | | |
| | | | | 2506 MHz | 2549.5 MHz | 2593 MHz | 2636.5 MHz | 2680 MHz | | |
| 20 MHz | QPSK | 1 | 0 | 23.37 | 23.63 | 23.31 | 23.19 | 23.36 | 0 | 25 |
| | | 1 | 49 | 23.26 | 23.55 | 23.52 | 23.13 | 23.36 | 0 | 25 |
| | | 1 | 99 | 23.28 | 23.41 | 23.53 | 23.05 | 23.37 | 0 | 25 |
| | | 50 | 0 | 22.59 | 22.88 | 22.68 | 22.40 | 22.62 | 1 | 24 |
| | | 50 | 24 | 22.57 | 22.83 | 22.72 | 22.36 | 22.61 | 1 | 24 |
| | | 50 | 50 | 22.52 | 22.77 | 22.76 | 22.33 | 22.58 | 1 | 24 |
| | | 100 | 0 | 22.56 | 22.81 | 22.74 | 22.37 | 22.62 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.70 | 22.90 | 22.52 | 22.60 | 22.89 | 1 | 24 |
| | | 1 | 49 | 22.66 | 23.00 | 22.70 | 22.52 | 22.94 | 1 | 24 |
| | | 1 | 99 | 22.36 | 22.75 | 22.64 | 22.46 | 22.91 | 1 | 24 |
| | | 50 | 0 | 21.63 | 21.90 | 21.79 | 21.43 | 21.70 | 2 | 23 |
| | | 50 | 24 | 21.59 | 21.84 | 21.81 | 21.37 | 21.65 | 2 | 23 |
| | | 50 | 50 | 21.57 | 21.80 | 21.82 | 21.34 | 21.64 | 2 | 23 |
| | | 100 | 0 | 21.61 | 21.83 | 21.78 | 21.41 | 21.64 | 2 | 23 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 39750 | 40185 | 40620 | 41055 | 41490 | | |
| | | | | 2506 MHz | 2549.5 MHz | 2593 MHz | 2636.5 MHz | 2680 MHz | | |
| 15 MHz | QPSK | 1 | 0 | 23.36 | 23.55 | 23.35 | 23.12 | 23.29 | 0 | 25 |
| | | 1 | 37 | 23.24 | 23.49 | 23.50 | 23.13 | 23.35 | 0 | 25 |
| | | 1 | 74 | 23.27 | 23.41 | 23.47 | 23.09 | 23.21 | 0 | 25 |
| | | 36 | 0 | 22.60 | 22.93 | 22.72 | 22.43 | 22.63 | 1 | 24 |
| | | 36 | 20 | 22.58 | 22.88 | 22.77 | 22.39 | 22.62 | 1 | 24 |
| | | 36 | 39 | 22.56 | 22.84 | 22.79 | 22.36 | 22.61 | 1 | 24 |
| | | 75 | 0 | 22.56 | 22.89 | 22.77 | 22.40 | 22.62 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.27 | 23.06 | 22.72 | 22.29 | 22.80 | 1 | 24 |
| | | 1 | 37 | 22.47 | 23.02 | 22.58 | 22.10 | 22.78 | 1 | 24 |
| | | 1 | 74 | 22.42 | 22.91 | 22.51 | 22.13 | 22.83 | 1 | 24 |
| | | 36 | 0 | 21.60 | 21.96 | 21.74 | 21.45 | 21.72 | 2 | 23 |
| | | 36 | 20 | 21.59 | 21.94 | 21.78 | 21.41 | 21.72 | 2 | 23 |
| | | 36 | 39 | 21.63 | 21.91 | 21.75 | 21.39 | 21.71 | 2 | 23 |
| | | 75 | 0 | 21.60 | 21.92 | 21.80 | 21.40 | 21.64 | 2 | 23 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 39750 | 40185 | 40620 | 41055 | 41490 | | |
| | | | | 2506 MHz | 2549.5 MHz | 2593 MHz | 2636.5 MHz | 2680 MHz | | |
| 10 MHz | QPSK | 1 | 0 | 23.27 | 23.49 | 23.45 | 23.17 | 23.28 | 0 | 25 |
| | | 1 | 25 | 23.26 | 23.43 | 23.49 | 23.14 | 23.27 | 0 | 25 |
| | | 1 | 49 | 23.25 | 23.41 | 23.54 | 23.11 | 23.28 | 0 | 25 |
| | | 25 | 0 | 22.55 | 22.84 | 22.75 | 22.38 | 22.60 | 1 | 24 |
| | | 25 | 12 | 22.54 | 22.81 | 22.77 | 22.36 | 22.59 | 1 | 24 |
| | | 25 | 25 | 22.53 | 22.79 | 22.80 | 22.35 | 22.59 | 1 | 24 |
| | | 50 | 0 | 22.50 | 22.79 | 22.75 | 22.35 | 22.57 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.26 | 23.05 | 22.59 | 22.34 | 22.86 | 1 | 24 |
| | | 1 | 25 | 22.23 | 23.00 | 22.61 | 22.32 | 22.84 | 1 | 24 |
| | | 1 | 49 | 22.22 | 22.98 | 22.65 | 22.29 | 22.84 | 1 | 24 |
| | | 25 | 0 | 21.60 | 21.89 | 21.77 | 21.43 | 21.67 | 2 | 23 |
| | | 25 | 12 | 21.59 | 21.85 | 21.80 | 21.41 | 21.65 | 2 | 23 |
| | | 25 | 25 | 21.58 | 21.84 | 21.81 | 21.41 | 21.65 | 2 | 23 |
| | | 50 | 0 | 21.59 | 21.83 | 21.80 | 21.41 | 21.64 | 2 | 23 |


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**LTE Band 41 Measured Results (continued)**

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 39750 | 40185 | 40620 | 41055 | 41490 | | |
| | | | | 2506 MHz | 2549.5 MHz | 2593 MHz | 2636.5 MHz | 2680 MHz | | |
| 5 MHz | QPSK | 1 | 0 | 23.31 | 23.52 | 23.42 | 23.12 | 23.31 | 0 | 25 |
| | | 1 | 12 | 23.30 | 23.50 | 23.43 | 23.09 | 23.30 | 0 | 25 |
| | | 1 | 24 | 23.27 | 23.48 | 23.46 | 23.09 | 23.34 | 0 | 25 |
| | | 12 | 0 | 22.57 | 22.83 | 22.75 | 22.36 | 22.58 | 1 | 24 |
| | | 12 | 7 | 22.56 | 22.82 | 22.74 | 22.35 | 22.57 | 1 | 24 |
| | | 12 | 13 | 22.55 | 22.81 | 22.75 | 22.33 | 22.57 | 1 | 24 |
| | | 25 | 0 | 22.55 | 22.80 | 22.74 | 22.34 | 22.57 | 1 | 24 |
| | 16QAM | 1 | 0 | 22.53 | 22.45 | 22.69 | 22.29 | 22.20 | 1 | 24 |
| | | 1 | 12 | 22.50 | 22.44 | 22.70 | 22.29 | 22.20 | 1 | 24 |
| | | 1 | 24 | 22.51 | 22.45 | 22.76 | 22.27 | 22.23 | 1 | 24 |
| | | 12 | 0 | 21.52 | 21.74 | 21.80 | 21.30 | 21.55 | 2 | 23 |
| | | 12 | 7 | 21.50 | 21.71 | 21.81 | 21.29 | 21.53 | 2 | 23 |
| | | 12 | 13 | 21.51 | 21.70 | 21.81 | 21.28 | 21.52 | 2 | 23 |
| | | 25 | 0 | 21.58 | 21.81 | 21.83 | 21.37 | 21.62 | 2 | 23 |


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## LTE Band 66 Measured Results

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 132072 | 132322 | 132572 | | |
| | | | | 1720 MHz | 1745 MHz | 1770 MHz | | |
| 20 MHz | QPSK | 1 | 0 | 23.16 | 23.52 | 23.61 | 0 | 24 |
| | | 1 | 49 | 23.08 | 23.49 | 23.58 | 0 | 24 |
| | | 1 | 99 | 23.02 | 23.43 | 23.57 | 0 | 24 |
| | | 50 | 0 | 21.50 | 21.50 | 21.65 | 1 | 23 |
| | | 50 | 24 | 21.50 | 21.51 | 21.66 | 1 | 23 |
| | | 50 | 50 | 21.50 | 21.50 | 21.66 | 1 | 23 |
| | | 100 | 0 | 21.50 | 21.51 | 21.66 | 1 | 23 |
| | 16QAM | 1 | 0 | 22.20 | 22.36 | 22.54 | 1 | 23 |
| | | 1 | 49 | 22.11 | 22.29 | 22.53 | 1 | 23 |
| | | 1 | 99 | 22.01 | 22.26 | 22.54 | 1 | 23 |
| | | 50 | 0 | 21.33 | 21.57 | 21.66 | 2 | 22 |
| | | 50 | 24 | 21.27 | 21.55 | 21.67 | 2 | 22 |
| | | 50 | 50 | 21.21 | 21.53 | 21.69 | 2 | 22 |
| | | 100 | 0 | 21.31 | 21.53 | 21.73 | 2 | 22 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 132047 | 132322 | 132597 | | |
| | | | | 1717.5 MHz | 1745 MHz | 1772.5 MHz | | |
| 15 MHz | QPSK | 1 | 0 | 23.26 | 23.51 | 23.58 | 0 | 24 |
| | | 1 | 37 | 23.20 | 23.46 | 23.53 | 0 | 24 |
| | | 1 | 74 | 23.11 | 23.42 | 23.52 | 0 | 24 |
| | | 36 | 0 | 21.50 | 21.52 | 21.63 | 1 | 23 |
| | | 36 | 20 | 21.50 | 21.52 | 21.62 | 1 | 23 |
| | | 36 | 39 | 21.50 | 21.50 | 21.64 | 1 | 23 |
| | | 75 | 0 | 21.50 | 21.53 | 21.64 | 1 | 23 |
| | 16QAM | 1 | 0 | 22.33 | 22.50 | 22.36 | 1 | 23 |
| | | 1 | 37 | 22.27 | 22.45 | 22.36 | 1 | 23 |
| | | 1 | 74 | 22.19 | 22.41 | 22.38 | 1 | 23 |
| | | 36 | 0 | 21.37 | 21.55 | 21.66 | 2 | 22 |
| | | 36 | 20 | 21.33 | 21.54 | 21.66 | 2 | 22 |
| | | 36 | 39 | 21.31 | 21.52 | 21.68 | 2 | 22 |
| | | 75 | 0 | 21.36 | 21.54 | 21.66 | 2 | 22 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 132022 | 132322 | 132622 | | |
| | | | | 1715 MHz | 1745 MHz | 1775 MHz | | |
| 10 MHz | QPSK | 1 | 0 | 23.30 | 23.44 | 23.78 | 0 | 24 |
| | | 1 | 25 | 23.25 | 23.42 | 23.81 | 0 | 24 |
| | | 1 | 49 | 23.24 | 23.42 | 23.76 | 0 | 24 |
| | | 25 | 0 | 21.50 | 21.54 | 21.71 | 1 | 23 |
| | | 25 | 12 | 21.50 | 21.54 | 21.73 | 1 | 23 |
| | | 25 | 25 | 21.50 | 21.54 | 21.73 | 1 | 23 |
| | | 50 | 0 | 21.50 | 21.53 | 21.71 | 1 | 23 |
| | 16QAM | 1 | 0 | 22.21 | 22.36 | 22.59 | 1 | 23 |
| | | 1 | 25 | 22.17 | 22.33 | 22.59 | 1 | 23 |
| | | 1 | 49 | 22.13 | 22.33 | 22.62 | 1 | 23 |
| | | 25 | 0 | 21.37 | 21.61 | 21.74 | 2 | 22 |
| | | 25 | 12 | 21.35 | 21.58 | 21.75 | 2 | 22 |
| | | 25 | 25 | 21.35 | 21.58 | 21.77 | 2 | 22 |
| | | 50 | 0 | 21.31 | 21.56 | 21.73 | 2 | 22 |


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## LTE Band 66 Measured Results (continued)

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 131997 | 132322 | 132647 | | |
| | | | | 1712.5 MHz | 1745 MHz | 1777.5 MHz | | |
| 5 MHz | QPSK | 1 | 0 | 23.03 | 23.48 | 23.62 | 0 | 24 |
| | | 1 | 12 | 23.02 | 23.49 | 23.63 | 0 | 24 |
| | | 1 | 24 | 23.02 | 23.46 | 23.66 | 0 | 24 |
| | | 12 | 0 | 21.50 | 21.51 | 21.75 | 1 | 23 |
| | | 12 | 7 | 21.50 | 21.50 | 21.74 | 1 | 23 |
| | | 12 | 13 | 21.50 | 21.51 | 21.76 | 1 | 23 |
| | | 25 | 0 | 21.50 | 21.52 | 21.76 | 1 | 23 |
| | 16QAM | 1 | 0 | 22.10 | 22.37 | 22.57 | 1 | 23 |
| | | 1 | 12 | 22.10 | 22.38 | 22.59 | 1 | 23 |
| | | 1 | 24 | 22.09 | 22.37 | 22.60 | 1 | 23 |
| | | 12 | 0 | 21.23 | 21.59 | 21.74 | 2 | 22 |
| | | 12 | 7 | 21.27 | 21.61 | 21.73 | 2 | 22 |
| | | 12 | 13 | 21.24 | 21.59 | 21.75 | 2 | 22 |
| | | 25 | 0 | 21.25 | 21.54 | 21.80 | 2 | 22 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 131987 | 132322 | 132657 | | |
| | | | | 1711.5 MHz | 1745 MHz | 1778.5 MHz | | |
| 3 MHz | QPSK | 1 | 0 | 23.29 | 23.44 | 23.78 | 0 | 24 |
| | | 1 | 8 | 23.32 | 23.47 | 23.80 | 0 | 24 |
| | | 1 | 14 | 23.30 | 23.41 | 23.76 | 0 | 24 |
| | | 8 | 0 | 21.50 | 21.51 | 21.71 | 1 | 23 |
| | | 8 | 4 | 21.50 | 21.51 | 21.72 | 1 | 23 |
| | | 8 | 7 | 21.50 | 21.51 | 21.71 | 1 | 23 |
| | | 15 | 0 | 21.50 | 21.51 | 21.71 | 1 | 23 |
| | 16QAM | 1 | 0 | 21.99 | 22.61 | 22.48 | 1 | 23 |
| | | 1 | 8 | 22.00 | 22.59 | 22.54 | 1 | 23 |
| | | 1 | 14 | 21.91 | 22.58 | 22.52 | 1 | 23 |
| | | 8 | 0 | 21.19 | 21.55 | 21.76 | 2 | 22 |
| | | 8 | 4 | 21.19 | 21.52 | 21.78 | 2 | 22 |
| | | 8 | 7 | 21.19 | 21.54 | 21.78 | 2 | 22 |
| | | 15 | 0 | 21.24 | 21.58 | 21.77 | 2 | 22 |

| BW (MHz) | Mode | RB Allocation | RB offset | Maximum Average Power (dBm) | | | MPR | Tune-up Limit |
|---|---|---|---|---|---|---|---|---|
| | | | | 131979 | 132322 | 132665 | | |
| | | | | 1710.7 MHz | 1745 MHz | 1779.3 MHz | | |
| 1.4 MHz | QPSK | 1 | 0 | 23.16 | 23.39 | 23.63 | 0 | 24 |
| | | 1 | 3 | 23.12 | 23.35 | 23.61 | 0 | 24 |
| | | 1 | 5 | 23.15 | 23.38 | 23.66 | 0 | 24 |
| | | 3 | 0 | 23.10 | 23.41 | 23.62 | 0 | 24 |
| | | 3 | 1 | 23.10 | 23.40 | 23.64 | 0 | 24 |
| | | 3 | 3 | 23.12 | 23.42 | 23.63 | 0 | 24 |
| | | 6 | 0 | 21.50 | 21.50 | 21.71 | 1 | 23 |
| | 16QAM | 1 | 0 | 22.07 | 22.49 | 22.42 | 1 | 23 |
| | | 1 | 3 | 22.04 | 22.47 | 22.43 | 1 | 23 |
| | | 1 | 5 | 22.08 | 22.47 | 22.44 | 1 | 23 |
| | | 3 | 0 | 21.99 | 22.36 | 22.70 | 1 | 23 |
| | | 3 | 1 | 21.99 | 22.35 | 22.69 | 1 | 23 |
| | | 3 | 3 | 21.96 | 22.32 | 22.72 | 1 | 23 |
| | | 6 | 0 | 21.34 | 21.39 | 21.86 | 2 | 22 |


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## 9.4. LTE Carrier Aggregation

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

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.6A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power applicable to the DUT in table below. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

| Modulation | CA bandwidth Class B and C / Smallest Component Carrier Transmission Bandwidth Configuration | | | | MPR (dB) |
|---|---|---|---|---|---|
| | 25 RB | 50 RB | 75 RB | 100 RB | |
| QPSK | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 1 |
| QPSK | > 25 | > 50 | > 75 | > 100 | ≤ 2 |
| 16 QAM | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 8 and ≤ 25 | > 12 and ≤ 50 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 2 |
| 16 QAM | > 25 | > 50 | > 75 | > 100 | ≤ 3 |
| 64 QAM | ≤ 8 and allocation wholly contained within a single CC | ≤ 12 and allocation wholly contained within a single CC | ≤ 16 and allocation wholly contained within a single CC | ≤ 18 and allocation wholly contained within a single CC | ≤ 2 |
| 64 QAM | > 8 or allocation extends across two CC's | > 12 or allocation extends across two CC's | > 16 or allocation extends across two CC's | > 18 or allocation extends across two CC's | ≤ 3 |

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH WPDK modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$MPR = CEIL\ \{\min(M_A, M_{IM5}), 0.5\}$$

Where $M_A$ is defined as follows

$$M_A = \begin{cases} 8.2 & ;0 \le A < 0.025 \\ 9.2 - 40A & ;0.025 \le A < 0.05 \\ 8 - 16A & ;0.05 \le A < 0.25 \\ 4.83 - 3.33A & ;0.25 \le A \le 0.4 \end{cases}$$


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$$3.83 - 0.83A \qquad ;0.4 \le A \le 1$$

and $M_{IM5}$ is defined as follows

$$M_{IM5} = \begin{cases} 4.5 & ; \Delta_{IM5} < 1.5 * BW_{Channel_CA} \\ 6.0 & ; 1.5 * BW_{Channel_CA} \le \Delta_{IM5} < BW_{Channel_CA}/2 + \Delta f_{ooB} \\ M_A & ; \Delta_{IM5} \ge BW_{Channel_CA}/2 + \Delta f_{ooB} \end{cases}$$

Where

$A = N_{RB_alloc} / N_{RB_agg}$

$\Delta_{IM5} = \max(\left| F_{C_agg} - (3*F_{agg_alloc_low} - 2*F_{agg_alloc_high}) \right|, \left| F_{C_agg} - (3*F_{agg_alloc_high} - 2*F_{agg_alloc_low}) \right|)$

CEIL{$M_A$, 0.5} means rounding upwards to closest 0.5dB, i.e. MPR ∈ [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5]

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in the subclause 6.2.3 apply. For intra-band non-contiguous aggregation with two uplink carriers the MPR is defined tfor those E-UTRA bands where maximum possible $W_{GAP} \le 42.2$ MHz as follows

$$MPR = CEIL\{M_A, 0.5\}$$

Where $M_N$ is defined as follows

$$M_N = \begin{cases} -0.125N + 18.25 & ; 2 \le N \le 50 \\ -0.0333\,N + 13.67 & ; 50 < N \le 200 \end{cases}$$

Where $N = N_{RB_alloc}$ is the number of allocated resource blocks.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.


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**LTE Down-Link Carrier Aggregation**

The tables below show the supported frequency bands of the device for DL Inter-band and DL Intra-band combinations.

Power measurements were performed on the channel with the highest maximum output power from Tune-up Procedure.

When carrier aggregation is limited to downlink only, uplink maximum output power (single carrier) is measured for the supported combinations of downlink carrier aggregation listed in the table below. In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the subset in each row with the largest combination of frequency bands and CCs (far right most configuration highlighted in the table below).

| Index | 2CC | Restriction | Completely Covered by Measurement Superset |
|---|---|---|---|
| **Intra-Band Contiguous** | | | |
| 2CC # 1 | CA_2C | N/A | No |
| 2CC # 2 | CA_41C | N/A | No |
| 2CC # 3 | CA_66C | N/A | No |
| **Intra-Band Non-Contiguous** | | | |
| 2CC # 4 | CA_2A-2A | N/A | No |
| 2CC # 5 | CA_4A-4A | N/A | No |
| 2CC # 6 | CA_41A-41A | N/A | No |
| 2CC # 7 | CA_66A-66A | N/A | No |
| **Inter-Band** | | | |
| 2CC # 8 | CA_2A-5A | N/A | No |
| 2CC # 9 | CA_2A-12A | N/A | No |
| 2CC # 10 | CA_2A-13A | N/A | No |
| 2CC # 11 | CA_2A-17A | N/A | No |
| 2CC # 12 | CA_4A-5A | N/A | No |
| 2CC # 13 | CA_4A-12A | N/A | No |
| 2CC # 14 | CA_4A-13A | N/A | No |
| 2CC # 15 | CA_4A-17A | N/A | No |
| 2CC # 16 | CA_5A-41A | N/A | No |
| 2CC # 17 | CA_12A-66A | N/A | No |

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the CA configuration with the largest aggregated DL CA BW in each frequency band, independently for contiguous and non-contiguous CA; however, if the same frequency band is used for both contiguous and non-contiguous CA, power measurement was performed using the configuration with the largest aggregated BW and maximum
output power among contiguous and non-contiguous CA.


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## DL Intra-Band Contiguous Measured Results

| E-UTRA CA configuration (BCS) | 3GPP Rel. # | CC1 (UL) | | | | | CC2 (DL) | | | Aggregated BW | MPR | CA Inactive (dBm) | CA Active (dBm) | Delta (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mode | BW (MHz) | Channel | Freq (MHz) | RB,Offset | BW (MHz) | Channel | Freq (MHz) | | | | | |
| CA_2C | 12 | QPSK | 20 | 18801 | 1870.1 | 1,0 | 20 | 999 | 1969.9 | 40 | 0 | 23.67 | 23.67 | 0.00 |
| CA_41C | 13 | QPSK | 20 | 40521 | 2583.1 | 1,0 | 20 | 40719 | 2602.9 | 40 | 0 | 23.20 | 23.21 | 0.01 |
| CA_66C | 14 | QPSK | 20 | 132323 | 1745.1 | 1,0 | 20 | 66985 | 2164.9 | 40 | 0 | 23.15 | 23.07 | -0.08 |

## DL Intra-Band Non-Contiguous Measured Results

| E-UTRA CA configuration | 3GPP Rel. # | CC1 (UL) | | | | | CC2 (DL) | | | Aggregated BW | MPR | CA Inactive (dBm) | CA Active (dBm) | Delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mode | BW (MHz) | Channel | Freq (MHz) | RB,Offset | BW (MHz) | Channel | Freq (MHz) | | | | | |
| CA_2A-2A | 12.4 | QPSK | 20 | 18700 | 1860 | 1,0 | 20 | 1100 | 1980 | 40 | 0 | 23.70 | 23.60 | -0.10 |
| CA_4A-4A | 13 | QPSK | 20 | 20050 | 1720 | 1,0 | 20 | 2300 | 2145 | 40 | 0 | 23.01 | 23.00 | -0.01 |
| CA_41A-41A | 12 | QPSK | 20 | 39750 | 2506 | 1,0 | 20 | 41490 | 2680 | 40 | 0 | 22.90 | 22.80 | -0.10 |
| CA_66A-66A | 13 | QPSK | 20 | 132072 | 1720 | 1,0 | 20 | 67236 | 2190 | 40 | 0 | 23.00 | 22.98 | -0.02 |

## DL Inter-Band Non-Contiguous Measured Results

| E-UTRA CA configuration | 3GPP Rel. # | CC1 (UL) | | | | | CC2 (DL) | | | Aggregated BW | MPR | CA Inactive (dBm) | CA Active (dBm) | Delta |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mode | BW (MHz) | Channel | Freq (MHz) | RB,Offset | BW (MHz) | Channel | Freq (MHz) | | | | | |
| CA_2A-5A | 12 | QPSK | 20 | 18700 | 1860 | 1,0 | 10 | 2525 | 881.5 | 30 | 0 | 23.85 | 23.78 | -0.07 |
| CA_2A-12A | 13 | QPSK | 20 | 18700 | 1860 | 1,0 | 10 | 5095 | 737.5 | 30 | 0 | 23.78 | 23.75 | -0.03 |
| CA_2A-13A | 12 | QPSK | 20 | 18700 | 1860 | 1,0 | 10 | 5230 | 751 | 30 | 0 | 23.8 | 23.80 | 0.00 |
| CA_2A-17A | 11 | QPSK | 10 | 19150 | 1905 | 1,0 | 10 | 5790 | 740 | 20 | 0 | 23.8 | 23.75 | -0.05 |
| CA_4A-5A | 12 | QPSK | 20 | 20175 | 1732.5 | 1,0 | 10 | 2525 | 881.5 | 30 | 0 | 23.37 | 23.33 | -0.04 |
| CA_4A-12A | 13 | QPSK | 20 | 20175 | 1732.5 | 1,0 | 10 | 5095 | 737.5 | 30 | 0 | 23.37 | 23.38 | 0.01 |
| CA_4A-13A | 11 | QPSK | 20 | 20175 | 1732.5 | 1,0 | 10 | 5230 | 751 | 30 | 0 | 23.37 | 23.34 | -0.03 |
| CA_4A-17A | 11 | QPSK | 10 | 20000 | 1715 | 1,0 | 10 | 5790 | 740 | 20 | 0 | 23.13 | 23.07 | -0.06 |
| CA_5A-41A | 14 | QPSK | 10 | 20525 | 836.5 | 1,0 | 20 | 41490 | 2680 | 30 | 0 | 24.7 | 24.60 | -0.10 |
| CA_12A-66A | 14 | QPSK | 10 | 23095 | 707.5 | 1,0 | 20 | 66886 | 2155 | 30 | 0 | 24.70 | 24.63 | -0.07 |


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## 9.5. Wi-Fi 2.4GHz (DTS Band)

Device is set to operate at its normal maximum output power during receiver off state. When the device is operating with a receiver on state, the maximum output power is reduced.

Refer to Operational Description for WLAN power back-off explanation.

**Wi-Fi 2.4GHz Measured Results**

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.
SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

| Band | Mode | Data Rate | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Reduced Power | | | Maximum Power | | |
| | | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| DSSS 2.4 GHz | 802.11b | 1 Mbps | 1 | 2412 | 11.50 | 12.00 | Yes | 18.30 | 19.00 | Yes |
| | | | 6 | 2437 | 11.80 | 12.00 | | 18.40 | 19.00 | |
| | | | 11 | 2462 | 11.60 | 12.00 | | 17.80 | 19.00 | |
| | | | 12 | 2467 | | 8.00 | | | 8.00 | |
| | | | 13 | 2472 | | 8.00 | | | 8.00 | |
| OFDM 2.4 GHz | 802.11g | 6 Mbps | 1 | 2412 | | 12.00 | No | | 17.00 | No |
| | | | 6 | 2437 | | 12.00 | | | 17.00 | |
| | | | 11 | 2462 | | 12.00 | | | 17.00 | |
| | | | 12 | 2467 | | 8.00 | | | 8.00 | |
| | | | 13 | 2472 | | 8.00 | | | 8.00 | |
| | 802.11n (HT20) | 6.5 Mbps | 1 | 2412 | | 12.00 | No | | 17.00 | No |
| | | | 6 | 2437 | | 12.00 | | | 17.00 | |
| | | | 11 | 2462 | | 12.00 | | | 17.00 | |
| | | | 12 | 2467 | | 6.00 | | | 6.00 | |
| | | | 13 | 2472 | | 6.00 | | | 6.00 | |

**Note(s):**

1. Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit and the measured output power for these two channels are no greater than those for the default test channels.

**Duty Factor Measured Results**

| Mode | Data Rate | T on (ms) | Period (ms) | Duty Cycle | Crest Factor (1/duty cycle) |
|---|---|---|---|---|---|
| 802.11b | 1 Mbps | 8.54 | 8.64 | 98.84% | 1.01 |

**Note(s):**

Duty Cycle = (T on / period) * 100%


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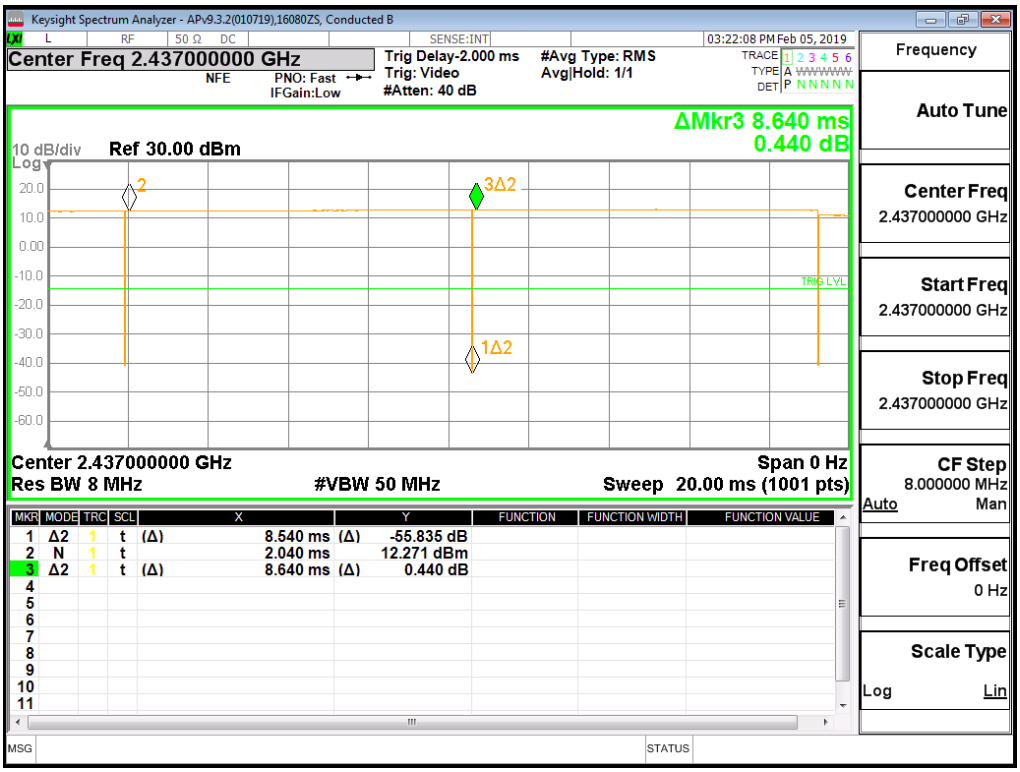
## Duty Cycle plots

802.11b




## 9.6. Wi-Fi 5GHz (U-NII Bands)

Device is set to operate at its normal maximum output power during receiver off state. When the device is operating with a receiver on state, the maximum output power is reduced.

Refer to Operational Description for WLAN power back-off explanation.

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

**Wi-Fi 5 GHz Measured Results**

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.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| Band | Mode | Data Rate | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Reduced Power | | | Maximum Power | | |
| | | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| UNII-1 5.2 GHz | 802.11a | 6 Mbps | 36 | 5180 | | 12.00 | No | 16.00 | 17.00 | No |
| | | | 40 | 5200 | | 12.00 | | 16.00 | 17.00 | |
| | | | 44 | 5220 | | 12.00 | | 16.00 | 17.00 | |
| | | | 48 | 5240 | | 12.00 | | 15.90 | 17.00 | |
| | 802.11n (HT20) | 6.5 Mbps | 36 | 5180 | | 12.00 | No | | 16.00 | No |
| | | | 40 | 5200 | | 12.00 | | | 16.00 | |
| | | | 44 | 5220 | | 12.00 | | | 16.00 | |
| | | | 48 | 5240 | | 12.00 | | | 16.00 | |
| | 802.11ac (VHT20) | 6.5 Mbps | 36 | 5180 | | 12.00 | No | | 16.00 | No |
| | | | 40 | 5200 | | 12.00 | | | 16.00 | |
| | | | 44 | 5220 | | 12.00 | | | 16.00 | |
| | | | 48 | 5240 | | 12.00 | | | 16.00 | |
| | 802.11n (HT40) | 13.5 Mbps | 38 | 5190 | | 12.00 | No | | 15.00 | No |
| | | | 46 | 5230 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT40) | 13.5 Mbps | 38 | 5190 | | 12.00 | No | | 15.00 | No |
| | | | 46 | 5230 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT80) | 29.3 Mbps | 42 | 5210 | 11.20 | 12.00 | No | | 14.00 | No |

| Band | Mode | Data Rate | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Reduced Power | | | Maximum Power | | |
| | | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| UNII-2A 5.3 GHz | 802.11a | 6 Mbps | 52 | 5260 | | 12.00 | No | 16.10 | 17.00 | Yes |
| | | | 56 | 5280 | | 12.00 | | 16.10 | 17.00 | |
| | | | 60 | 5300 | | 12.00 | | 16.10 | 17.00 | |
| | | | 64 | 5320 | | 12.00 | | 15.90 | 17.00 | |
| | 802.11n (HT20) | 6.5 Mbps | 52 | 5260 | | 12.00 | No | | 16.00 | No |
| | | | 56 | 5280 | | 12.00 | | | 16.00 | |
| | | | 60 | 5300 | | 12.00 | | | 16.00 | |
| | | | 64 | 5320 | | 12.00 | | | 16.00 | |
| | 802.11ac (VHT20) | 6.5 Mbps | 52 | 5260 | | 12.00 | No | | 16.00 | No |
| | | | 56 | 5280 | | 12.00 | | | 16.00 | |
| | | | 60 | 5300 | | 12.00 | | | 16.00 | |
| | | | 64 | 5320 | | 12.00 | | | 16.00 | |
| | 802.11n (HT40) | 13.5 Mbps | 54 | 5270 | | 12.00 | No | | 15.00 | No |
| | | | 62 | 5310 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT40) | 13.5 Mbps | 54 | 5270 | | 12.00 | No | | 15.00 | No |
| | | | 62 | 5310 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT80) | 29.3 Mbps | 58 | 5290 | 11.20 | 12.00 | Yes | | 14.00 | No |


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| Band | Mode | Data Rate | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Reduced Power | | | Maximum Power | | |
| | | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| UNII-2C 5.5 GHz | 802.11a | 6 Mbps | 100 | 5500 | | 12.00 | No | 16.20 | 17.00 | Yes |
| | | | 116 | 5580 | | 12.00 | | 16.20 | 17.00 | |
| | | | 124 | 5620 | | 12.00 | | 16.20 | 17.00 | |
| | | | 144 | 5720 | | 12.00 | | 16.10 | 17.00 | |
| | 802.11n (HT20) | 6.5 Mbps | 100 | 5500 | | 12.00 | No | | 16.00 | No |
| | | | 116 | 5580 | | 12.00 | | | 16.00 | |
| | | | 124 | 5620 | | 12.00 | | | 16.00 | |
| | | | 144 | 5720 | | 12.00 | | | 16.00 | |
| | 802.11ac (VHT20) | 6.5 Mbps | 100 | 5500 | | 12.00 | No | | 16.00 | No |
| | | | 116 | 5580 | | 12.00 | | | 16.00 | |
| | | | 124 | 5620 | | 12.00 | | | 16.00 | |
| | | | 144 | 5720 | | 12.00 | | | 16.00 | |
| | 802.11n (HT40) | 13.5 Mbps | 102 | 5510 | | 12.00 | No | | 13.00 | No |
| | | | 118 | 5590 | | 12.00 | | | 15.00 | |
| | | | 126 | 5630 | | 12.00 | | | 15.00 | |
| | | | 142 | 5710 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT40) | 13.5 Mbps | 102 | 5510 | | 12.00 | No | | 13.00 | No |
| | | | 118 | 5590 | | 12.00 | | | 15.00 | |
| | | | 126 | 5630 | | 12.00 | | | 15.00 | |
| | | | 142 | 5710 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT80) | 29.3 Mbps | 106 | 5530 | 12.00 | 12.00 | Yes | | 14.00 | No |
| | | | 122 | 5610 | 12.00 | 12.00 | | | 14.00 | |
| | | | 138 | 5690 | 11.90 | 12.00 | | | 14.00 | |

| Band | Mode | Data Rate | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Reduced Power | | | Maximum Power | | |
| | | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| UNII-3 5.8 GHz | 802.11a | 6 Mbps | 149 | 5745 | | 12.00 | No | 16.20 | 17.00 | Yes |
| | | | 157 | 5785 | | 12.00 | | 16.00 | 17.00 | |
| | | | 165 | 5825 | | 12.00 | | 16.00 | 17.00 | |
| | 802.11n (HT20) | 6.5 Mbps | 149 | 5745 | | 12.00 | No | | 16.00 | No |
| | | | 157 | 5785 | | 12.00 | | | 16.00 | |
| | | | 165 | 5825 | | 12.00 | | | 16.00 | |
| | 802.11ac (VHT20) | 6.5 Mbps | 149 | 5745 | | 12.00 | No | | 16.00 | No |
| | | | 157 | 5785 | | 12.00 | | | 16.00 | |
| | | | 165 | 5825 | | 12.00 | | | 16.00 | |
| | 802.11n (HT40) | 13.5 Mbps | 151 | 5755 | | 12.00 | No | | 15.00 | No |
| | | | 159 | 5795 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT40) | 13.5 Mbps | 151 | 5755 | | 12.00 | No | | 15.00 | No |
| | | | 159 | 5795 | | 12.00 | | | 15.00 | |
| | 802.11ac (VHT80) | 29.3 Mbps | 155 | 5775 | 10.90 | 12.00 | Yes | | 14.00 | No |

## Duty Factor Measured Results

| Mode | Data Rate | T on (ms) | Period (ms) | Duty Cycle | Crest Factor (1/duty cycle) |
|---|---|---|---|---|---|
| 802.11a | 6 Mbps | 1.435 | 1.515 | 94.72% | 1.06 |
| 802.11ac VHT80 | 29.3 Mbps | 3.333 | 4.4670 | 74.61% | 1.34 |

**Note(s):**

Duty Cycle = (T on / period) * 100%



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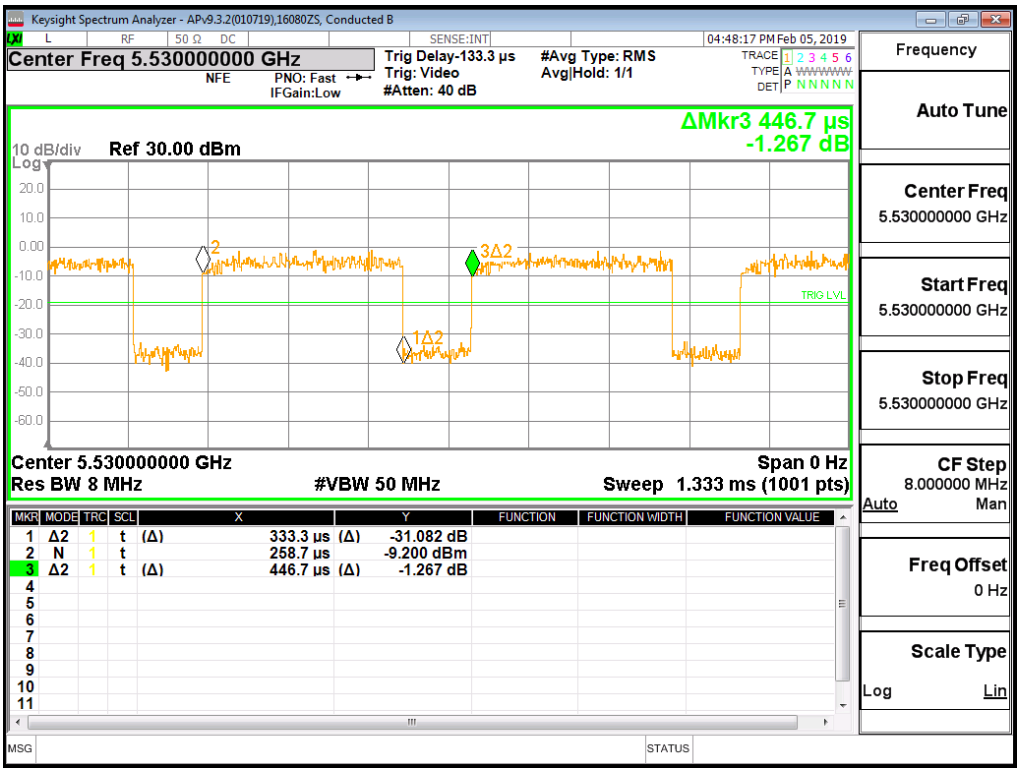
# Duty Cycle plots

802.11a

# Duty Cycle plots

802.11ac VHT80





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## 9.7. Bluetooth

### Bluetooth Measured Results

SAR measurement is not required for the QPSK, 8PSK, and BLE. When the secondary mode is ≤ ¼ dB higher than the primary mode.

| Band | Mode | Ch # | Freq. (MHz) | Maximum Average Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| 2.4 | GFSK | 0 | 2402 | 8.60 | 10.00 | Yes |
| | | 39 | 2441 | 9.60 | 10.00 | |
| | | 78 | 2480 | 8.20 | 10.00 | |
| | EDR, π/4 DQPSK | 0 | 2402 | 7.40 | 10.00 | No |
| | | 39 | 2441 | 8.40 | 10.00 | |
| | | 78 | 2480 | 7.20 | 10.00 | |
| | EDR, 8-DPSK | 0 | 2402 | 7.30 | 10.00 | No |
| | | 39 | 2441 | 8.30 | 10.00 | |
| | | 78 | 2480 | 7.10 | 10.00 | |
| | LE, GFSK | 0 | 2402 | 5.00 | 6.50 | No |
| | | 19 | 2440 | 5.86 | 6.50 | |
| | | 39 | 2480 | 5.10 | 6.50 | |

### Duty Factor Measured Results

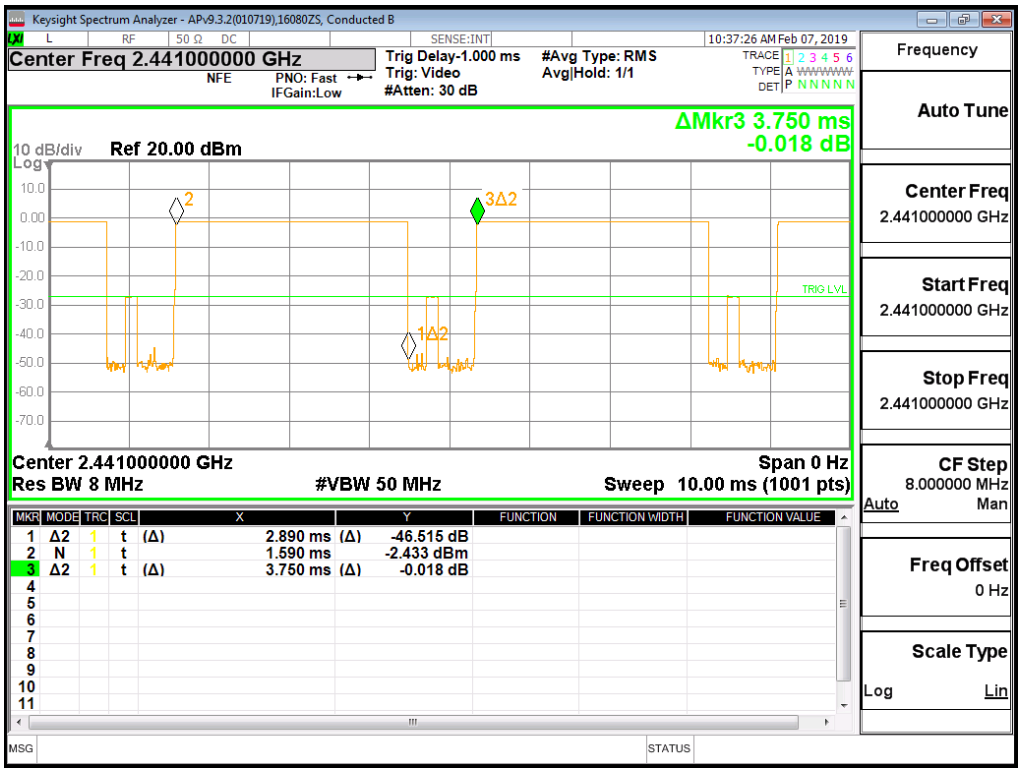
| Mode | Type | T on (ms) | Period (ms) | Duty Cycle | Crest Factor (1/duty cycle) |
|---|---|---|---|---|---|
| GFSK | DH5 | 2.89 | 3.75 | 77.07% | 1.30 |

**Note(s):**

Duty Cycle = (T on / period) * 100%

## Duty Cycle plots

GFSK





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# 10. Measured and Reported (Scaled) SAR Results

**SAR Test Reduction criteria are as follows:**

- Reported SAR(W/kg) for WWAN and Bluetooth = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

**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 648474 D04 Handset SAR (Phablet Only):**

For smart phones, with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm.
When hotspot mode does not apply, 10-g Extremity SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR < 1.2 W/kg.

**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 ≤ ¼ 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.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. 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; therefore, the requirement for H, M and L channels may not fully apply.


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**KDB 248227 D01 SAR meas for 802.11:**

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). Initial Test Position SAR Test Reduction Procedure is outlined in KDB 248227 D01 §5.1.1. 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.



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## 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 | GPRS 3 Slots | 0 | Left Touch | 190 | 836.6 | 30.0 | 28.73 | 0.009 | 0.011 | |
| | | | Left Tilt | 190 | 836.6 | 30.0 | 28.73 | 0.005 | 0.007 | |
| | | | Right Touch | 190 | 836.6 | 30.0 | 28.73 | 0.010 | **0.013** | 1 |
| | | | Right Tilt | 190 | 836.6 | 30.0 | 28.73 | 0.004 | 0.006 | |
| Body-worn | GPRS 3 Slots | 15 | Rear | 190 | 836.6 | 30.0 | 28.73 | 0.023 | **0.031** | 2 |
| | | | Front | 190 | 836.6 | 30.0 | 28.73 | 0.010 | 0.013 | |
| Hotspot | GPRS 3 Slots | 10 | Rear | 190 | 836.6 | 30.0 | 28.73 | 0.030 | **0.040** | 3 |
| | | | Front | 190 | 836.6 | 30.0 | 28.73 | 0.010 | 0.013 | |
| | | | Edge 2 | 190 | 836.6 | 30.0 | 28.73 | 0.012 | 0.016 | |
| | | | Edge 3 | 190 | 836.6 | 30.0 | 28.73 | 0.010 | 0.013 | |
| | | | Edge 4 | 190 | 836.6 | 30.0 | 28.73 | 0.005 | 0.007 | |

## 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 | GPRS 3 Slots | 0 | Left Touch | 661 | 1880.0 | 26.6 | 25.11 | 0.139 | **0.196** | 4 |
| | | | Left Tilt | 661 | 1880.0 | 26.6 | 25.11 | 0.082 | 0.116 | |
| | | | Right Touch | 661 | 1880.0 | 26.6 | 25.11 | 0.084 | 0.118 | |
| | | | Right Tilt | 661 | 1880.0 | 26.6 | 25.11 | 0.070 | 0.099 | |
| Body-worn | GPRS 3 Slots | 15 | Rear | 661 | 1880.0 | 26.6 | 25.11 | 0.150 | **0.211** | 5 |
| | | | Front | 661 | 1880.0 | 26.6 | 25.11 | 0.128 | 0.180 | |
| Hotspot | GPRS 3 Slots | 10 | Rear | 661 | 1880.0 | 26.6 | 25.11 | 0.306 | **0.431** | 6 |
| | | | Front | 661 | 1880.0 | 26.6 | 25.11 | 0.189 | 0.266 | |
| | | | Edge 2 | 661 | 1880.0 | 26.6 | 25.11 | 0.055 | 0.078 | |
| | | | Edge 3 | 661 | 1880.0 | 26.6 | 25.11 | 0.171 | 0.241 | |
| | | | Edge 4 | 661 | 1880.0 | 26.6 | 25.11 | 0.199 | 0.280 | |


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## 10.3. 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 12.2 kbps | 0 | Left Touch | 9400 | 1880.0 | 25.50 | 25.20 | 0.232 | **0.249** | 7 |
| | | | Left Tilt | 9400 | 1880.0 | 25.50 | 25.20 | 0.138 | 0.148 | |
| | | | Right Touch | 9400 | 1880.0 | 25.50 | 25.20 | 0.142 | 0.152 | |
| | | | Right Tilt | 9400 | 1880.0 | 25.50 | 25.20 | 0.091 | 0.098 | |
| Body-worn | Rel 99 RMC 12.2 kbps | 15 | Rear | 9400 | 1880.0 | 25.50 | 25.20 | 0.199 | **0.213** | 8 |
| | | | Front | 9400 | 1880.0 | 25.50 | 25.20 | 0.165 | 0.177 | |
| Hotspot | Rel 99 RMC 12.2 kbps | 10 | Rear | 9400 | 1880.0 | 25.50 | 25.20 | 0.452 | **0.484** | 9 |
| | | | Front | 9400 | 1880.0 | 25.50 | 25.20 | 0.273 | 0.293 | |
| | | | Edge 2 | 9400 | 1880.0 | 25.50 | 25.20 | 0.090 | 0.096 | |
| | | | Edge 3 | 9400 | 1880.0 | 25.50 | 25.20 | 0.254 | 0.272 | |
| | | | Edge 4 | 9400 | 1880.0 | 25.50 | 25.20 | 0.285 | 0.305 | |

## 10.4. W-CDMA Band IV

| 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 12.2 kbps | 0 | Left Touch | 1413 | 1732.6 | 25.00 | 23.30 | 0.186 | **0.275** | 10 |
| | | | Left Tilt | 1413 | 1732.6 | 25.00 | 23.30 | 0.114 | 0.169 | |
| | | | Right Touch | 1413 | 1732.6 | 25.00 | 23.30 | 0.105 | 0.155 | |
| | | | Right Tilt | 1413 | 1732.6 | 25.00 | 23.30 | 0.095 | 0.141 | |
| Body-worn | Rel. 99 RMC 12.2 kbps | 15 | Rear | 1413 | 1732.6 | 25.00 | 23.30 | 0.273 | **0.404** | 11 |
| | | | Front | 1413 | 1732.6 | 25.00 | 23.30 | 0.215 | 0.318 | |
| Hotspot | Rel. 99 RMC 12.2 kbps | 10 | Rear | 1413 | 1732.6 | 25.00 | 23.30 | 0.464 | **0.686** | 12 |
| | | | Front | 1413 | 1732.6 | 25.00 | 23.30 | 0.294 | 0.435 | |
| | | | Edge 2 | 1413 | 1732.6 | 25.00 | 23.30 | 0.077 | 0.114 | |
| | | | Edge 3 | 1413 | 1732.6 | 25.00 | 23.30 | 0.267 | 0.395 | |
| | | | Edge 4 | 1413 | 1732.6 | 25.00 | 23.30 | 0.218 | 0.322 | |


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## 10.5. 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 12.2 kbps | 0 | Left Touch | 4183 | 836.6 | 25.50 | 24.52 | 0.112 | 0.140 | |
| | | | Left Tilt | 4183 | 836.6 | 25.50 | 24.52 | 0.071 | 0.089 | |
| | | | Right Touch | 4183 | 836.6 | 25.50 | 24.52 | 0.154 | **0.193** | 13 |
| | | | Right Tilt | 4183 | 836.6 | 25.50 | 24.52 | 0.078 | 0.098 | |
| Body-worn | Rel. 99 RMC 12.2 kbps | 15 | Rear | 4183 | 836.6 | 25.50 | 24.52 | 0.237 | **0.297** | 14 |
| | | | Front | 4183 | 836.6 | 25.50 | 24.52 | 0.103 | 0.129 | |
| Hotspot | Rel. 99 RMC 12.2 kbps | 10 | Rear | 4183 | 836.6 | 25.50 | 24.52 | 0.550 | **0.689** | 15 |
| | | | Front | 4183 | 836.6 | 25.50 | 24.52 | 0.115 | 0.144 | |
| | | | Edge 2 | 4183 | 836.6 | 25.50 | 24.52 | 0.179 | 0.224 | |
| | | | Edge 3 | 4183 | 836.6 | 25.50 | 24.52 | 0.177 | 0.222 | |
| | | | Edge 4 | 4183 | 836.6 | 25.50 | 24.52 | 0.069 | 0.086 | |

## 10.6. LTE Band 2 (20MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | Power (dBm) | | 1-g SAR (W/kg) | | Plot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.239 | **0.272** | 16 |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.144 | 0.213 | |
| | | | Left Tilt (15°) | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.142 | 0.162 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.086 | 0.127 | |
| | | | Right Touch | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.173 | 0.197 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.101 | 0.149 | |
| | | | Right Tilt (15°) | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.119 | 0.135 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.071 | 0.105 | |
| Body-worn | QPSK | 15 | Rear | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.233 | **0.265** | 17 |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.142 | 0.210 | |
| | | | Front | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.179 | 0.204 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.110 | 0.163 | |
| Hotspot | QPSK | 10 | Rear | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.547 | **0.623** | 18 |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.340 | 0.503 | |
| | | | Front | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.283 | 0.322 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.176 | 0.260 | |
| | | | Edge 2 | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.092 | 0.105 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.054 | 0.080 | |
| | | | Edge 3 | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.304 | 0.346 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.187 | 0.277 | |
| | | | Edge 4 | 18900 | 1880.0 | 1 | 0 | 24.7 | 24.14 | 0.292 | 0.332 | |
| | | | | | | 50 | 24 | 23.7 | 22.00 | 0.179 | 0.265 | |


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## 10.7. LTE Band 5 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | 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 | 25.0 | 24.50 | 0.116 | 0.130 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.072 | 0.089 | |
| | | | Left Tilt (15°) | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.069 | 0.078 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.042 | 0.052 | |
| | | | Right Touch | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.145 | **0.163** | 19 |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.090 | 0.112 | |
| | | | Right Tilt (15°) | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.073 | 0.082 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.044 | 0.055 | |
| Body-worn | QPSK | 15 | Rear | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.248 | **0.278** | 20 |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.175 | 0.217 | |
| | | | Front | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.120 | 0.135 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.074 | 0.092 | |
| Hotspot | QPSK | 10 | Rear | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.546 | **0.613** | 21 |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.388 | 0.482 | |
| | | | Front | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.124 | 0.139 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.081 | 0.101 | |
| | | | Edge 2 | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.166 | 0.186 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.104 | 0.129 | |
| | | | Edge 3 | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.200 | 0.224 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.138 | 0.171 | |
| | | | Edge 4 | 20525 | 836.5 | 1 | 0 | 25.0 | 24.50 | 0.050 | 0.056 | |
| | | | | | | 25 | 25 | 24.0 | 23.06 | 0.029 | 0.036 | |


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## 10.8. LTE Band 12 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | Power (dBm) | | 1-g SAR (W/kg) | | Plot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.009 | **0.010** | 22 |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.006 | 0.007 | |
| | | | Left Tilt (15°) | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.005 | 0.006 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.004 | 0.004 | |
| | | | Right Touch | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.009 | 0.009 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.006 | 0.007 | |
| | | | Right Tilt (15°) | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.005 | 0.005 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.003 | 0.004 | |
| Body-worn | QPSK | 15 | Rear | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.036 | **0.038** | 23 |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.028 | 0.031 | |
| | | | Front | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.017 | 0.018 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.013 | 0.015 | |
| Hotspot | QPSK | 10 | Rear | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.043 | **0.046** | 24 |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.032 | 0.036 | |
| | | | Front | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.013 | 0.014 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.010 | 0.011 | |
| | | | Edge 2 | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.031 | 0.033 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.025 | 0.028 | |
| | | | Edge 3 | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.005 | 0.005 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.004 | 0.005 | |
| | | | Edge 4 | 23095 | 707.5 | 1 | 0 | 24.8 | 24.52 | 0.026 | 0.028 | |
| | | | | | | 25 | 25 | 23.8 | 23.31 | 0.019 | 0.021 | |


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## 10.9. LTE Band 13 (10MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | Power (dBm) | | 1-g SAR (W/kg) | | Plot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.043 | 0.043 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.025 | 0.036 | |
| | | | Left Tilt (15°) | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.029 | 0.029 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.019 | 0.027 | |
| | | | Right Touch | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.066 | **0.066** | 25 |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.039 | 0.056 | |
| | | | Right Tilt (15°) | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.036 | 0.036 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.021 | 0.030 | |
| Body-worn | QPSK | 15 | Rear | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.118 | **0.118** | 26 |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.069 | 0.099 | |
| | | | Front | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.063 | 0.063 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.037 | 0.053 | |
| Hotspot | QPSK | 10 | Rear | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.153 | **0.152** | 27 |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.088 | 0.127 | |
| | | | Front | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.058 | 0.058 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.034 | 0.049 | |
| | | | Edge 2 | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.076 | 0.076 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.045 | 0.065 | |
| | | | Edge 3 | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.037 | 0.037 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.023 | 0.033 | |
| | | | Edge 4 | 23230 | 782.0 | 1 | 0 | 24.5 | 24.51 | 0.039 | 0.039 | |
| | | | | | | 25 | 0 | 23.5 | 21.91 | 0.022 | 0.032 | |


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## 10.10. LTE Band 41 (20MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.113 | 0.159 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.089 | 0.118 | |
| | | | Left Tilt | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.126 | 0.177 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.100 | 0.133 | |
| | | | Right Touch | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.188 | **0.264** | 28 |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.144 | 0.191 | |
| | | | Right Tilt | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.181 | 0.254 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.145 | 0.193 | |
| Body-worn | QPSK | 15 | Rear | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.228 | **0.320** | 29 |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.182 | 0.242 | |
| | | | Front | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.210 | 0.295 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.171 | 0.227 | |
| Hotspot | QPSK | 10 | Rear | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.493 | **0.692** | 30 |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.394 | 0.524 | |
| | | | Front | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.343 | 0.482 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.274 | 0.364 | |
| | | | Edge 2 | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.276 | 0.387 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.227 | 0.302 | |
| | | | Edge 3 | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.164 | 0.230 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.132 | 0.176 | |
| | | | Egde 4 | 40620 | 2593.0 | 1 | 99 | 25.0 | 23.53 | 0.049 | 0.068 | |
| | | | | | | 50 | 50 | 24.0 | 22.76 | 0.037 | 0.049 | |


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## 10.11. LTE Band 66 (20MHz Bandwidth)

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | RB Allocation | RB offest | Power (dBm) | | 1-g SAR (W/kg) | | Plot |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | QPSK | 0 | Left Touch | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.177 | **0.198** | 31 |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.112 | 0.199 | |
| | | | Left Tilt (15°) | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.113 | 0.126 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.071 | 0.126 | |
| | | | Right Touch | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.121 | 0.135 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.074 | 0.132 | |
| | | | Right Tilt (15°) | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.097 | 0.108 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.061 | 0.108 | |
| Body-worn | QPSK | 15 | Rear | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.291 | **0.325** | 32 |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.180 | 0.320 | |
| | | | Front | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.212 | 0.237 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.132 | 0.235 | |
| Hotspot | QPSK | 10 | Rear | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.517 | **0.577** | 33 |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.323 | 0.574 | |
| | | | Front | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.298 | 0.333 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.186 | 0.331 | |
| | | | Edge 2 | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.076 | 0.085 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.045 | 0.080 | |
| | | | Edge 3 | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.331 | 0.369 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.203 | 0.361 | |
| | | | Edge 4 | 132322 | 1745.0 | 1 | 0 | 24.0 | 23.52 | 0.232 | 0.259 | |
| | | | | | | 50 | 0 | 24.0 | 21.50 | 0.146 | 0.259 | |


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## 10.12. Wi-Fi (DTS Band)

When the 802.11b reported SAR of the highest measured maximum output power channel is ≤ 0.8 W/kg, no further SAR testing is required. If SAR is > 0.8 W/kg and ≤ 1.2 W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is > 1.2 W/kg, SAR is required for the third channel.

SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

| RF Exposure Conditions | Mode | Antenna | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | 802.11b 1 Mbps | Wi-Fi Antenna #1 | ON | 0 | Left Touch | 6 | 2437 | 98.84% | **0.302** | 12.0 | 11.80 | 0.163 | **0.173** | 34 |
| | | | | | Left Tilt | 6 | 2437 | 98.84% | 0.218 | 12.0 | 11.80 | | | |
| | | | | | Right Touch | 6 | 2437 | 98.84% | 0.114 | 12.0 | 11.80 | | | |
| | | | | | Right Tilt | 6 | 2437 | 98.84% | 0.119 | 12.0 | 11.80 | | | |
| Body-worn | 802.11b 1 Mbps | Wi-Fi Antenna #1 | OFF | 15 | Rear | 6 | 2437 | 98.84% | **0.170** | 19.0 | 18.40 | 0.105 | **0.122** | 35 |
| | | | | | Front | 6 | 2437 | 98.84% | 0.114 | 19.0 | 18.40 | | | |
| Hotspot | 802.11b 1 Mbps | Wi-Fi Antenna #1 | OFF | 10 | Rear | 6 | 2437 | 98.84% | **0.425** | 19.0 | 18.40 | 0.243 | **0.282** | 36 |
| | | | | | Front | 6 | 2437 | 98.84% | 0.199 | 19.0 | 18.40 | | | |
| | | | | | Edge 1 | 6 | 2437 | 98.84% | 0.224 | 19.0 | 18.40 | | | |
| | | | | | Edge 2 | 6 | 2437 | 98.84% | 0.101 | 19.0 | 18.40 | | | |

**Note(s):**

SAR testing is not required for OFDM mode(s) because the adjusted SAR is ≤ 1.2 W/kg.



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# 10.13. Wi-Fi (U-NII Band)

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

- o ≤ 1.2 W/kg, SAR is not required for UNII band I
- o > 1.2 W/kg, both bands should be tested independently for SAR.

## UNII-2A

| RF Exposure Conditions | Mode | Antenna | Pwr Back- off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | 802.11ac VHT80 | Wi-Fi Antenna #1 | ON | 0 | Left Touch | 58 | 5290 | 74.61% | 0.336 | 12.0 | 11.20 | | | |
| | | | | | Left Tilt | 58 | 5290 | 74.61% | **0.398** | 12.0 | 11.20 | 0.196 | **0.316** | 37 |
| | | | | | Right Touch | 58 | 5290 | 74.61% | 0.270 | 12.0 | 11.20 | | | |
| | | | | | Right Tilt | 58 | 5290 | 74.61% | 0.345 | 12.0 | 11.20 | | | |
| Body-worn | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 15 | Rear | 60 | 5300 | 94.72% | **0.213** | 17.0 | 16.10 | 0.105 | **0.136** | 38 |
| | | | | | Front | 60 | 5300 | 94.72% | 0.090 | 17.0 | 16.10 | | | |
| RF Exposure Conditions | Mode | Antenna | Pwr Back- off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 10-g SAR (W/kg) | | Plot No. |
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Product Specific 10g | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 0 | Rear | 60 | 5300 | 94.72% | 5.230 | 17.0 | 16.10 | | | |
| | | | | | Front | 60 | 5300 | 94.72% | 2.320 | 17.0 | 16.10 | | | |
| | | | | | Edge 1 | 60 | 5300 | 94.72% | **16.200** | 17.0 | 16.10 | 0.998 | **1.296** | 39 |
| | | | | | Edge 2 | 60 | 5300 | 94.72% | 1.050 | 17.0 | 16.10 | | | |

**Note(s):**

Reported SAR for UNII-2A is < 1.2 W/kg and 3.0 W/kg (Product Specific 10g), therefore SAR is not required for UNII-1.

## UNII-2C

| RF Exposure Conditions | Mode | Antenna | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | 802.11ac VHT80 | Wi-Fi Antenna #1 | ON | 0 | Left Touch | 122 | 5610 | 74.61% | 0.176 | 12.0 | 12.00 | | | |
| | | | | | Left Tilt | 122 | 5610 | 74.61% | **0.191** | 12.0 | 12.00 | 0.073 | **0.098** | 40 |
| | | | | | Right Touch | 122 | 5610 | 74.61% | 0.084 | 12.0 | 12.00 | | | |
| | | | | | Right Tilt | 122 | 5610 | 74.61% | 0.106 | 12.0 | 12.00 | | | |
| Body-worn | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 15 | Rear | 124 | 5620 | 94.72% | **0.220** | 17.0 | 16.20 | 0.115 | **0.146** | 41 |
| | | | | | Front | 124 | 5620 | 94.72% | 0.111 | 17.0 | 16.20 | | | |
| RF Exposure Conditions | Mode | Antenna | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 10-g SAR (W/kg) | | Plot No. |
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Product Specific 10g | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 0 | Rear | 124 | 5620 | 94.72% | 2.360 | 17.0 | 16.20 | | | |
| | | | | | Front | 124 | 5620 | 94.72% | 0.948 | 17.0 | 16.20 | | | |
| | | | | | Edge 1 | 124 | 5620 | 94.72% | **5.750** | 17.0 | 16.20 | 0.567 | **0.720** | 42 |
| | | | | | Edge 2 | 124 | 5620 | 94.72% | 1.010 | 17.0 | 16.20 | | | |

## UNII-3

| RF Exposure Conditions | Mode | Antenna | Pwr Back-off | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Duty Cycle | Area Scan Max. SAR (W/kg) | Power (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | 802.11ac VHT80 | Wi-Fi Antenna #1 | ON | 0 | Left Touch | 155 | 5775 | 74.61% | 0.072 | 12.0 | 10.90 | | | |
| | | | | | Left Tilt | 155 | 5775 | 74.61% | **0.108** | 12.0 | 10.90 | 0.036 | **0.062** | 43 |
| | | | | | Right Touch | 155 | 5775 | 74.61% | 0.070 | 12.0 | 10.90 | | | |
| | | | | | Right Tilt | 155 | 5775 | 74.61% | 0.063 | 12.0 | 10.90 | | | |
| Body-worn | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 15 | Rear | 149 | 5745 | 94.72% | **0.117** | 17.0 | 16.20 | 0.055 | **0.070** | 44 |
| | | | | | Front | 149 | 5745 | 94.72% | 0.032 | 17.0 | 16.20 | | | |
| Hotspot | 802.11a 6 Mbps | Wi-Fi Antenna #1 | OFF | 10 | Rear | 149 | 5745 | 94.72% | 0.182 | 17.0 | 16.20 | | | |
| | | | | | Front | 149 | 5745 | 94.72% | 0.086 | 17.0 | 16.20 | | | |
| | | | | | Edge 1 | 149 | 5745 | 94.72% | **0.307** | 17.0 | 16.20 | 0.130 | **0.165** | 45 |
| | | | | | Edge 2 | 149 | 5745 | 94.72% | 0.119 | 17.0 | 16.20 | | | |


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## 10.14. Bluetooth

| RF Exposure Conditions | Mode | Antenna | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Pow er (dBm) | | 1-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | |
| Head | GFSK | Antenna #1 | 0 | Left Touch | 39 | 2441 | 10.0 | 9.60 | 0.044 | **0.048** | 46 |
| | | | | Left Tilt | 39 | 2441 | 10.0 | 9.60 | 0.043 | 0.047 | |
| | | | | Right Touch | 39 | 2441 | 10.0 | 9.60 | 0.021 | 0.023 | |
| | | | | Right Tilt | 39 | 2441 | 10.0 | 9.60 | 0.020 | 0.022 | |
| Body-w orn | GFSK | Antenna #1 | 15 | Rear | 39 | 2441 | 10.0 | 9.60 | 0.004 | **0.004** | 47 |
| | | | | Front | 39 | 2441 | 10.0 | 9.60 | 0.002 | 0.002 | |
| BT Tethering | GFSK | Antenna #1 | 10 | Rear | 39 | 2441 | 10.0 | 9.60 | 0.013 | **0.014** | 48 |
| | | | | Front | 39 | 2441 | 10.0 | 9.60 | 0.006 | 0.007 | |
| | | | | Edge 1 | 39 | 2441 | 10.0 | 9.60 | 0.006 | 0.007 | |
| | | | | Edge 2 | 39 | 2441 | 10.0 | 9.60 | 0.002 | 0.002 | |


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# 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 <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), 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 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) 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) | First Repeated | |
|---|---|---|---|---|---|---|---|
| | | | | | | Measured SAR (W/kg) | Largest to Smallest SAR Ratio |
| 700 | LTE Band 12 | Hotspot | Rear | No | 0.043 | N/A | N/A |
| | LTE Band 13 | Hotspot | Rear | No | 0.153 | N/A | N/A |
| 850 | GSM 850 | Hotspot | Rear | No | 0.030 | N/A | N/A |
| | WCDMA Band V | Hotspot | Rear | No | 0.550 | N/A | N/A |
| | LTE Band 5 | Hotspot | Rear | No | 0.546 | N/A | N/A |
| 1700 | WCDMA Band IV | Hotspot | Rear | No | 0.464 | N/A | N/A |
| | LTE Band 66 | Hotspot | Rear | No | 0.517 | N/A | N/A |
| 1900 | GSM 1900 | Hotspot | Rear | No | 0.306 | N/A | N/A |
| | WCDMA Band II | Hotspot | Rear | No | 0.452 | N/A | N/A |
| | LTE Band 2 | Hotspot | Rear | No | 0.547 | N/A | N/A |
| 2400 | Wi-Fi 802.11b | Hotspot | Rear | No | 0.243 | N/A | N/A |
| | BT | Head | Left Touch | No | 0.044 | N/A | N/A |
| 2600 | LTE Band 41 | Hotspot | Rear | No | 0.493 | N/A | N/A |
| 5300 | Wi-Fi 802.11a | Head | Left Tilt | No | 0.196 | N/A | N/A |
| 5500 | Wi-Fi 802.11a | Body | Rear | No | 0.115 | N/A | N/A |
| 5800 | Wi-Fi 802.11a | Hotspot | Edge 1 | No | 0.130 | N/A | N/A |

**Note(s):**

Repeated measurement is not required when the original highest measured SAR is < 0.8 W/kg

| Frequency Band (MHz) | Air Interface | RF Exposure Conditions | Test Position | Repeated SAR (Yes/No) | Highest Measured SAR (W/kg) | First Repeated | |
|---|---|---|---|---|---|---|---|
| | | | | | | Measured SAR (W/kg) | Largest to Smallest SAR Ratio |
| 5300 | Wi-Fi 802.11a | Product Specific 10g | Edge 1 | No | 0.998 | N/A | N/A |
| 5600 | Wi-Fi 802.11a | Product Specific 10g | Edge 1 | No | 0.567 | N/A | N/A |

**Note(s):**

Repeated measurement is not required when the original highest measured SAR is < 2.0 W/kg


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# 12. Simultaneous Transmission Conditions

| RF Exposure Condition | Item | Capable Transmit Configurations | | |
|---|---|---|---|---|
| Head<br>Body-worn<br>Hotspot | 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 |

Notes:
1. DTS & UNII (ch 149 only) supports Hotspot.
2. GPRS/EDGE, W-CDMA, and LTE support Hotspot.
3. VoIP is supported in GPRS/EDGE, W-CDMA, and LTE.
4. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
5. U-NII Radio cannot transmit simultaneously with Bluetooth Radio.

**Note(s):**

Product Specific 10g SAR does not require simultaneous transmission analysis.

## 12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

### 12.1.1. Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

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

| RF Exposure conditions | Standalone SAR (W/kg) | | | | ∑ 1-g SAR (W/kg) | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 1+2 | 1+3 | 1+4 |
| | WWAN | Wi-Fi 2.4G | Wi-Fi 5G | BT | | | |
| Head | 0.275 | 0.173 | 0.316 | 0.048 | **0.448** | **0.591** | **0.323** |
| Body-worn | 0.404 | 0.122 | 0.146 | 0.004 | **0.526** | **0.550** | **0.408** |
| Hotspot | 0.692 | 0.282 | 0.165 | 0.014 | **0.974** | **0.857** | **0.706** |

**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.


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# Appendixes

**Refer to separated files for the following appendixes.**

**Appendix A: SAR Setup Photos**

**Appendix B: SAR System Check Plots**

**Appendix C: SAR Highest Test Plots**

**Appendix D: SAR Tissue Ingredients**

**Appendix E: SAR Probe Certificates**

**Appendix F: SAR Dipole Certificates**

**END OF REPORT**


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