Certificate #4312.01

# FCC SAR TEST REPORT

| | |
|---|---|
| **Product Name:** | Smart Payment Terminal |
| **Trade Mark:** | PAX |
| **Model No.:** | A6630 |
| **Add. Model No.:** | N/A |
| **Report Number:** | 24071812764SAR-1 |
| **Test Standards:** | FCC 47 CFR Part 2 §2.1093<br>ANSI/IEEE C95.1-1992<br>IEEE Std 1528-2013 |
| **FCC ID:** | V5PA6630 |
| **Test Result:** | PASS |
| **Date of Issue:** | December 13, 2024 |

Prepared for:

**PAX Technology Limited**
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Prepared by:

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Date: December 13, 2024

# Version

| Version No. | Date | Description |
|---|---|---|
| V1.0 | December 13, 2024 | Original Report |

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# 1. GENERAL INFORMATION

## 1.1. STATEMENT OF COMPLIANCE

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

| Equipment Class | Mode | Highest Reported Body $SAR_{1g}$ (0.5 cm Gap) (W/kg) |
|---|---|---|
| **Limits** | | **1.6 W/kg** |
| **PCB** | **WCDMA Band II** | 0.983 |
| | **WCDMA Band IV** | 0.649 |
| | **WCDMA Band V** | 0.308 |
| | **LTE Band 2** | 0.561 |
| | **LTE Band 4** | 0.464 |
| | **LTE Band 5** | 0.498 |
| | **LTE Band 12(17)** | 0.465 |
| | **LTE Band 13** | 0.510 |
| **DTS** | **2.4G WLAN** | 0.771 |
| **DSS** | **Bluetooth** | 0.081 |
| **NII-1** | **5G WLAN** | 1.073 |
| **NII-2A** | **5G WLAN** | 0.940 |
| **NII-2C** | **5G WLAN** | 1.127 |
| **NII-3** | **5G WLAN** | **1.199** |
| **Max. SAR** | | **1.199** |

## 1.2. CLIENT INFORMATION

| | |
|---|---|
| **Applicant:** | PAX Technology Limited |
| **Address of Applicant:** | Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong |
| **Manufacturer:** | PAX Computer Technology (Shenzhen) Co., Ltd. |
| **Address of Manufacturer:** | Room 701, PAX Technology Building, Shanxia Community, Pinghu Sub-district, Longgang District, Shenzhen, China |

## 1.3. EUT INFORMATION

### 1.3.1. General Description of EUT

| | |
|---|---|
| **Product Name:** | Smart Payment Terminal |
| **Trade Mark:** | PAX |
| **Model No.:** | A6630 |
| **Add. Model No.:** | N/A |
| **FCC ID:** | V5PA6630 |
| **IMEI:** | 355910860011825 |
| **Sample Received Date:** | July 11, 2024 |
| **Sample Tested Date:** | August 5, 2024 to December 7, 2024 |

### 1.3.2. Description of Accessories

| **Adapter** | |
|---|---|
| **Model No.:** | GLH-PD18W-U |
| **Input:** | 100-240 V~50/60 Hz 0.5 A |
| **Output:** | 5.0 V ⎓ 3.0A/9.0 V ⎓ 2.0A/12.0 V ⎓ 1.5A/ |

| **Cable** | |
|---|---|
| **Connector:** | USB Cable |
| **Cable Type:** | Unshielded without ferrite |
| **Length:** | 1.0 Meter |

| **Battery** | |
|---|---|
| **Model No.:** | M0152A |
| **Battery Type:** | Rechargeable Li-ion Battery |
| **Rated Voltage:** | 3.85 Vdc |
| **Rated Capacity:** | 6000 mAh |

### 1.3.3. EUT Tx Frequency Bands

| RF Type | Band(s) | Tx Frequency Range (Unit: MHz) |
|---|---|---|
| **WCDMA** | **WCDMA Band II:** | 1852.4 - 1907.6 |
| | **WCDMA Band IV:** | 1712.4 - 1752.6 |
| | **WCDMA Band V:** | 826.4 - 846.6 |
| **LTE** | **LTE Band 2:** | 1850.7 - 1909.3 (1.4M), 1851.5 - 1908.5 (3M), 1852.5 - 1907.5 (5M), 1855 - 1905 (10M), 1857.5 - 1902.5 (15M), 1860 - 1900 (20M) |
| | **LTE Band 4:** | 1710.7 - 1754.3 (1.4M), 1711.5 - 1753.5 (3M), 1712.5 - 1752.5 (5M), 1715 - 1750 (10M), 1717.5 - 1747.5 (15M), 1720 - 1745 (20M) |
| | **LTE Band 5:** | 824.7 - 848.3 (1.4M), 825.5 - 847.5 (3M), 826.5 - 846.5 (5M), 829 - 844 (10M) |
| | **LTE Band 12:** | 699.7 - 715.3 (1.4M), 700.5 - 714.5 (3M), 701.5 - 713.5 (5M), 704 - 711 (10M) |
| | **LTE Band 13:** | 779.5 - 784.5 (5M), 782 (10M) |
| | **LTE Band 17:** | 706.5 - 713.5 (5M), 709 - 711 (10M) |
| **WLAN** | **2.4 GHz:** | 2412 - 2472 |
| | **U-NII-1:** | 5180 - 5240 |
| | **U-NII-2A:** | 5260 - 5320 |
| | **U-NII-2C:** | 5500 - 5720 |
| | **U-NII-3:** | 5745 - 5825 |
| **Bluetooth** | **2.4 GHz:** | 2402 - 2480 |
| **NFC** | **13.553 - 13.567 MHz** | 13.56 |

**Note 1:**
According to 201504 FCC TCB workshop RF exposure slides, for overlapping bands, only larger band was tested.

1. The maximum output power, including tolerance, for the smaller band is = the larger band to qualify for the SAR test exclusion.
2. The channel bandwidth and other operating parameters for the smaller band is fully supported by the larger band.
   - Band 12 (699 - 716 MHz) SAR can support band 17 (704 – 716 MHz)

### 1.3.4. Wireless Technologies

| | |
|---|---|
| **WCDMA** | RMC<br>HSDPA<br>HSUPA |
| **LTE** | QPSK<br>16QAM |
| **2.4G WLAN** | 802.11b<br>802.11g<br>802.11n (HT20/HT40) |
| **5G WLAN** | 802.11a<br>802.11n (HT20/HT40)<br>802.11ac (VHT20/VHT40/VHT80) |
| **Bluetooth** | BR+EDR<br>LE |
| **Others** | NFC |
| **Antenna Type** | WWAN/WLAN/Bluetooth: FIFA Antenna<br>NFC: Loop Antenna |
| **Power Reduction** | Not Support |
| **Dynamic Antenna** | Not Support |
| **Wireless Router (Hotspot)** | 2.4G WLAN: Not Support<br>5.2G WLAN: Not Support<br>5.3G WLAN: Not Support<br>5.6G WLAN: Not Support<br>5.8G WLAN: Not Support |
| **VOIP** | Not Support |
| **Dual SIM** | SIM 1: WCDMA + LTE<br>SIM 2: WCDMA + LTE<br>Note :<br>This device support dual SIM but they share the same antenna. Since these two SIM are used for subscriber identification only and it is not related to RF identity, only SIM1 was used for SAR testing. |

## 1.4. MAXIMUM CONDUCTED POWER

The maximum conducted average power including tune-up tolerance is shown as below.

➢ **WCDMA**

| Mode | Maximum conducted average power (dBm) | | |
|---|---|---|---|
| | WCDMA Band II | WCDMA Band V | WCDMA Band IV |
| RMC 12.2K | 23.5 | 24.0 | 23.5 |
| HSDPA Subtest-1 | 22.5 | 23.0 | 22.5 |
| HSDPA Subtest-2 | 22.0 | 22.5 | 22.0 |
| HSDPA Subtest-3 | 22.0 | 22.5 | 22.0 |
| HSDPA Subtest-4 | 22.0 | 22.5 | 22.0 |
| HSUPA Subtest-1 | 21.0 | 21.0 | 20.5 |
| HSUPA Subtest-2 | 20.5 | 21.0 | 20.5 |
| HSUPA Subtest-3 | 21.5 | 22.0 | 21.5 |
| HSUPA Subtest-4 | 20.0 | 20.5 | 20.0 |
| HSUPA Subtest-5 | 21.5 | 22.0 | 21.5 |

➢ **LTE**

| Band | Mode | Maximum conducted average power (dBm) |
|---|---|---|
| LTE Band 2 | QPSK/16QAM | 23.0 |
| LTE Band 4 | QPSK/16QAM | 22.5 |
| LTE Band 5 | QPSK/16QAM | 23.0 |
| LTE Band 12 | QPSK/16QAM | 23.0 |
| LTE Band 13 | QPSK/16QAM | 23.0 |
| LTE Band 17 | QPSK/16QAM | 22.5 |

➢ **2.4GHz WLAN**

| Mode | Maximum conducted average power (dBm) |
|---|---|
| 802.11b | 18.5 |
| 802.11g | 16.0 |
| 802.11n-HT20 | 15.0 |
| 802.11n-HT40 | 15.0 |

➢ **5GHz WLAN**

| Mode | Maximum conducted average power (dBm) | | | |
|---|---|---|---|---|
| | U-NII-1 | U-NII-2A | U-NII-2C | U-NII-3 |
| 802.11a | 12.5 | 12.5 | 14.0 | 14.0 |
| 802.11n-HT20 | 11.5 | 11.5 | 12.5 | 12.5 |
| 802.11n-HT40 | 11.5 | 11.0 | 12.5 | 12.5 |
| 802.11ac-VHT20 | 11.5 | 11.0 | 12.5 | 12.5 |
| 802.11ac-VHT40 | 11.0 | 11.0 | 12.5 | 12.5 |
| 802.11ac-VHT80 | 11.0 | 11.0 | 12.0 | 12.0 |

➢ **Bluetooth**

| Mode | Modulation | Maximum conducted average power (dBm) |
|---|---|---|
| BR + EDR | GFSK | 7.5 |
| | π/4-DQPSK | 4.5 |
| | 8-DPSK | 4.5 |
| LE | GFSK | -4.5 |

## 1.5. OTHER INFORMATION

None.

## 1.6. TEST LOCATION

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

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Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

## 1.7. TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

**CNAS-Lab Code: L9069**
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

**A2LA-Lab Certificate No.: 4312.01**
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**ISED Wireless Device Testing Laboratories**
CAB identifier: CN0032

**FCC Accredited Lab.**
Designation Number: CN1194
Test Firm Registration Number: 259480

## 1.8. GUIDANCE STANDARD

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2 §2.1093, IEEE Std 1528-2013, ANSI/IEEE C95.1-1992, the following FCC Published RF exposure KDB procedures:

| |
|---|
| KDB 865664 D01 v01r04 |
| KDB 865664 D02 v01r02 |
| KDB 248227 D01 v02r02 |
| KDB 447498 D04 v01 |
| KDB 648474 D04 v01r03 |
| KDB 941225 D01 v03r01 |
| KDB 941225 D05 v02r05 |
| KDB 941225 D05A v01r02 |
| KDB 941225 D07 v01r02 |

# 2. SPECIFIC ABSORPTION RATE (SAR)

## 2.1. INTRODUCTION

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling, by appropriate techniques, to produce specific absorption rates (SARs) as averaged over the whole-body, any 1 g or any 10 g of tissue (defined as a tissue volume in the shape of a cube). All SAR values are to be averaged over any six-minute period. When portable device was used within 20 cm of the user's body, SAR evaluation of the device will be required. The SAR limit in chapter 2.3.

## 2.2. SAR DEFINITION

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

## 2.3. SAR LIMITS

Limits for Occupational/Controlled Exposure (W/kg)

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

Limits for General Population/Uncontrolled Exposure (W/kg)

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

**Note:**

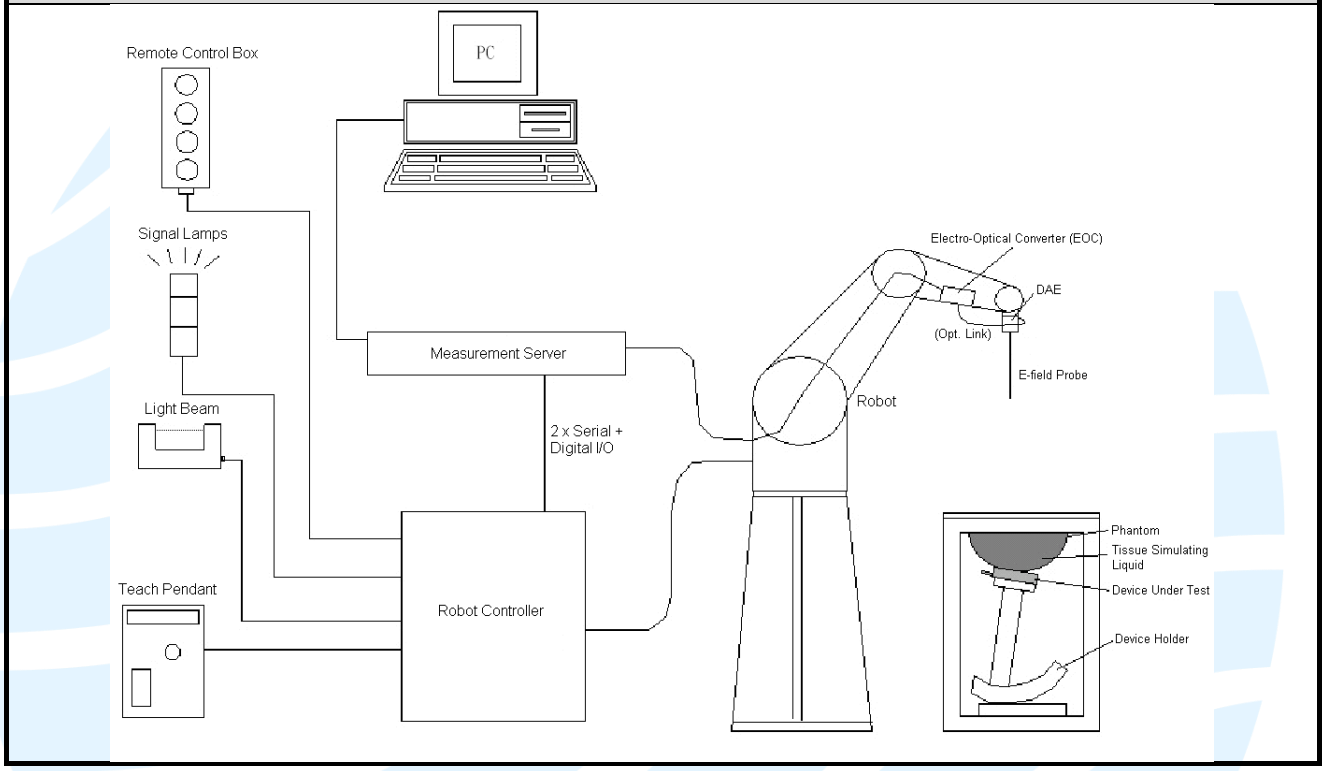
1) Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.
2) At frequencies above 6.0 GHz, SAR limits are not applicable and MPE limits for power density should be applied at 5 cm or more from the transmitting device.
3) The SAR limit is specified in FCC 47 CFR Part 2 §2.1093, ANSI/IEEE C95.1-1992.

# 3. SAR MEASUREMENT SYSTEM

## 3.1. SPEAG DASY SYSTEM

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

**DASY Measurement System**




### 3.1.1. Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

### 3.1.2. Probe

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

| | |
|---|---|
| **Model** | EX3DV4 |
| **Construction** | Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). |
| **Frequency** | 10 MHz to 6 GHz<br>Linearity: ± 0.2 dB |
| **Directivity** | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) |
| **Dynamic Range** | 10 µW/g to 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) |
| **Dimensions** | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm |

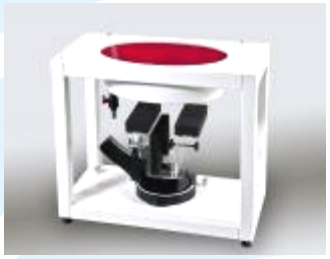
| | |
|---|---|
| **Model** | ES3DV3 |
| **Construction** | Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). |
| **Frequency** | 10 MHz to 4 GHz<br>Linearity: ± 0.2 dB |
| **Directivity** | ± 0.2 dB in HSL (rotation around probe axis)<br>± 0.3 dB in tissue material (rotation normal to probe axis) |
| **Dynamic Range** | 5 µW/g to 100 mW/g<br>Linearity: ± 0.2 dB |
| **Dimensions** | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 3.9 mm (Body: 12 mm)<br>Distance from probe tip to dipole centers: 2.0 mm |

### 3.1.3. Data Acquisition Electronics (DAE)

| | |
|---|---|
| **Model** | DAE3, DAE4 |
| **Construction** | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detectors for mechanical surface detection and emergency robot stop. |
| **Measurement Range** | -100 to +300 mV (16-bit resolution and two range settings: 4mV, 400mV) |
| **Input Offset Voltage** | < 5µV (with auto zero) |
| **Input Bias Current** | < 50 fA |
| **Dimensions** | 60 x 60 x 68 mm |

### 3.1.4. Phantom

| | | |
|---|---|---|
| **Model** | Twin SAM |  |
| **Construction** | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. | |
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Shell Thickness** | 2 ± 0.2 mm (6 ± 0.2 mm at ear point) | |
| **Dimensions** | Length: 1000 mm<br>Width: 500 mm<br>Height: adjustable feet | |
| **Filling Volume** | approx. 25 liters | |

| | | |
|---|---|---|
| **Model** | ELI |  |
| **Construction** | Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. | |
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Shell Thickness** | 2.0 ± 0.2 mm (bottom plate) | |
| **Dimensions** | Major axis: 600 mm<br>Minor axis: 400 mm | |
| **Filling Volume** | approx. 30 liters | |

### 3.1.5. Device Holder

| | | |
|---|---|---|
| **Model** | Mounting Device |  |
| **Construction** | In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). | |
| **Material** | POM | |

| | | |
|---|---|---|
| **Model** | Laptop Extensions Kit |  |
| **Construction** | Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. | |
| **Material** | POM, Acrylic glass, Foam | |

### 3.1.6. System Validation Dipoles

| | | |
|---|---|---|
| **Model** | D-Serial |  |
| **Construction** | Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions. | |
| **Frequency** | 750 MHz to 5800 MHz | |
| **Return Loss** | > 20 dB | |
| **Power Capability** | > 100 W (f < 1GHz), > 40 W (f > 1GHz) | |

## 3.2. SAR SCAN PROCEDURE

### 3.2.1. SAR Reference Measurement (drift)

Prior to the SAR test, local SAR shall be measured at a stationary reference point where the SAR exceeds the lower detection limit of the measurement system.

### 3.2.2. Area Scan

Measurement procedures for evaluating the SAR of wireless device start with a coarse measurement grid to determine the approximate location of the local peak SAR values. This is known as the area-scan procedure. All antennas and radiating structures that may contribute to the measured SAR or influence the SAR distribution must be included in the area scan. The area scan measurement resolution must enable the extrapolation algorithms of the SAR system to correctly identify the peak SAR location(s) for subsequent zoom scan measurements to correctly determine the 1-g SAR. Area scans are performed at a constant distance from the phantom surface, determined by the measurement frequencies. When a measured peak is closer than ½ the zoom scan volume dimension (x, y) from the edge of the area scan region, unless the entire peak and gram-averaging volume are both captured within the zoom scan volume, the area scan must be repeated by shifting and expanding the area scan region to ensure all peaks are away from the area scan boundary. The area scan resolutions specified in the table below must be applied to the SAR measurements.

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

### 3.2.3. Zoom Scan

To evaluate the peak spatial-average SAR values with respect to 1 g or 10 g cubes, fine resolution volume scans, called zoom scans, are performed at the peak SAR locations identified during the area scan. If the cube volume within the zoom scan chosen to calculate the peak spatial-average SAR touches any boundary of the zoom-scan volume, the zoom scan shall be repeated with the center of the zoom-scan volume shifted to the new maximum SAR location. For any secondary peaks found in the area scan that are within 2 dB of the maximum peak and are not within this zoom scan, the zoom scan shall be performed for such peaks, unless the peak spatial-average SAR at the location of the maximum peak is more than 2 dB below the applicable SAR limit (i.e., 1 W/kg for a 1.6 W/kg 1 g limit, or 1.26 W/kg for a 2 W/kg 10 g limit). The zoom scan resolutions specified in the table below must be applied to the SAR measurements.

| | | | ≤ 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 $1^{ST}$ 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 | ≤ 1.5·$\Delta Z_{Zoom}$(n-1) mm | |
| 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 IEEE Std 1528-2013 for details.

* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB Publication 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.

### 3.2.4. SAR Drift Measurement

The local SAR (or conducted power) shall be measured at exactly the same location as in 3.2.1 section. The absolute value of the measurement drift (the difference between the SAR measured in 3.2.1 and 3.2.4 section) shall be recorded. The SAR drift shall be kept within ± 5%.

## 3.3. EQUIPMENT LIST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|
| System Validation Dipole | SPEAG | D750V3 | 1066 | Jan. 02, 2024 | 3 Year |
| System Validation Dipole | SPEAG | D835V2 | 4d005 | Mar. 15, 2024 | 3 Year |
| System Validation Dipole | SPEAG | D1750V2 | 1086 | Mar. 14, 2024 | 3 Year |
| System Validation Dipole | SPEAG | D1900V2 | 509 | Mar. 14, 2024 | 3 Year |
| System Validation Dipole | SPEAG | D2450V2 | 883 | Jan. 02, 2024 | 3 Year |
| System Validation Dipole | SPEAG | D5GHzV2 | 1115 | Jan. 02, 2024 | 3 Year |
| Dosimetric E-Field Probe | SPEAG | ES3DV3 | 3090 | Mar. 26,2024 | 1 Year |
| Data Acquisition Electronics | SPEAG | DAE4 | 662 | Mar. 18,2024 | 1 Year |
| Dosimetric E-Field Probe | SPEAG | EX3DV4 | 7738 | Dec. 13, 2023 | 1 Year |
| Wideband Radio Communication Tester | R&S | CMW500 | 120932 | Mar. 29,2024 | 1 Year |
| ENA Series Network Analyzer | Agilent | 8753ES | US39170317 | Oct. 31, 2023 | 1 Year |
| Twin Phantom | SPEAG | SAM | TP-1376 | N/A | N/A |
| Twin Phantom | SPEAG | SAM | TP-1378 | N/A | N/A |
| Robot controller | STAUBLI | CS7MB | F05/511KA1/A/01 | N/A | N/A |
| Robot | STAUBLI | RX90BL | F05/511KA1/A/01 | N/A | N/A |
| Dielectric Assessment Kit | SPEAG | DAK-3.5 | 1056 | N/A | N/A |
| USB/GPIB Interface | Agilent | 82357B | N10149 | N/A | N/A |
| Signal Generator | R&S | SMB100A | 103718 | Mar. 29, 2024 | 1 Year |
| POWER METER | R&S | NRP | 101293 | Oct. 27, 2023 | 1 Year |
| Thermometer | Shanghai Gao Zhi Precision Instrument Co., Ltd. | HB6801 | 18022507 | Oct. 29, 2023 | 1 Year |
| Dual Directional Coupler | Agilent | 778D | MY52180234 | Oct. 27, 2023 | 1 Year |
| Amplifier | Mini-Circuit | ZHL42 | QA1252001 | Mar. 29, 2024 | 1 Year |
| DC Source | Agilent | 66319B | MY43000795 | Oct. 31, 2023 | 1 Year |

## 3.4. MEASUREMENT UNCERTAINTY

**TABLE 1 EXPOSURE ASSESSMENT UNCERTAINTY FOR HANDSET SAR**

| Source of Uncertainty | Tolerance (± %) | Probability Distribution | Divisor | Ci (1g) | Ci (10g) | Standard Uncertainty (1g) (± %) | Standard Uncertainty (10g) (± %) | Vi Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe Calibration (< 3 GHz) | 7.5 | N (k=2) | 2 | 1 | 1 | 3.75 | 3.75 | ∞ |
| Probe Calibration (> 3 GHz) | 6.3 | N (k=2) | 2 | 1 | 1 | 3.15 | 3.15 | ∞ |
| Axial Isotropy | 1.2 | N (k=2) | 2 | 0.7 | 0.7 | 0.42 | 0.42 | ∞ |
| Hemispherical Isotropy | 3.2 | N (k=2) | 2 | 0.7 | 0.7 | 1.12 | 1.12 | ∞ |
| Boundary Effects | 2 | Rectangular | √3 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Linearity | 0.9 | N (k=2) | 2 | 1 | 1 | 0.45 | 0.45 | ∞ |
| Detection Limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Modulation Response | 2.4 | Rectangular | √3 | 1 | 1 | 1.39 | 1.39 | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | 0.30 | 0.30 | ∞ |
| Response Time | 0 | Rectangular | √3 | 1 | 1 | 0.00 | 0.00 | ∞ |
| Integration Time | 1.7 | Rectangular | √3 | 1 | 1 | 0.98 | 0.98 | ∞ |
| RF Ambient – Noise | 3 | Rectangular | √3 | 1 | 1 | 1.73 | 1.73 | ∞ |
| RF Ambient – Reflections | 3 | Rectangular | √3 | 1 | 1 | 1.73 | 1.73 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 6.7 | Rectangular | √3 | 1 | 1 | 3.87 | 3.87 | ∞ |
| Max. SAR Evaluation | 4 | Rectangular | √3 | 1 | 1 | 2.31 | 2.31 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.3 / 2.4 | Normal | 1 | 1 | 1 | 2.30 | 2.40 | 30 |
| Device Holder | 2.8 / 2.8 | Normal | 1 | 1 | 1 | 2.80 | 2.80 | 30 |
| Power Drift | 5 | Rectangular | √3 | 1 | 1 | 2.89 | 2.89 | ∞ |
| Power Scaling | 0 | Rectangular | √3 | 1 | 1 | 0.00 | 0.00 | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | 7.9 | Rectangular | √3 | 1 | 1 | 4.56 | 4.56 | ∞ |
| SAR correction | 1.2 / 0.97 | Rectangular | √3 | 1 | 0.84 | 0.69 | 0.47 | ∞ |
| Liquid Conductivity (Meas.) | 2.5 | Rectangular | √3 | 0.78 | 0.71 | 1.13 | 1.02 | ∞ |
| Liquid Permittivity (Meas.) | 2.5 | Rectangular | √3 | 0.26 | 0.26 | 0.38 | 0.38 | ∞ |
| Temp. unc. - Conductivity | 3.4 | Rectangular | √3 | 0.78 | 0.71 | 1.53 | 1.39 | ∞ |
| Temp. unc. - Permittivity | 0.4 | Rectangular | √3 | 0.23 | 0.26 | 0.05 | 0.06 | ∞ |
| **Combined Standard Uncertainty (k = 1) (≤ 3 GHz)** | | | | | | 9.64 | 9.62 | |
| **Combined Standard Uncertainty (k = 1) (> 3 GHz)** | | | | | | 9.42 | 9.40 | |
| **Max. Expanded Uncertainty (k = 2)** | | | | | | **19.27** | **19.23** | |

**TABLE 2SYSTEM VALIDATION Measurement uncertainty**

| Source of Uncertainty | Tolerance (± %) | Probability Distribution | Divisor | Ci (1g) | Ci (10g) | Standard Uncertainty (1g) (± %) | Standard Uncertainty (10g) (± %) | Vi Veff |
|---|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | | |
| Probe Calibration (< 3 GHz) | 7.5 | N (k=2) | 2 | 1 | 1 | 3.75 | 3.75 | ∞ |
| Probe Calibration (> 3 GHz) | 6.3 | N (k=2) | 2 | 1 | 1 | 3.15 | 3.15 | ∞ |
| Axial Isotropy | 1.2 | N (k=2) | 2 | 0.7 | 0.7 | 0.42 | 0.42 | ∞ |
| Hemispherical Isotropy | 3.2 | N (k=2) | 2 | 0.7 | 0.7 | 1.12 | 1.12 | ∞ |
| Boundary Effects | 2 | Rectangular | √3 | 1 | 1 | 1.15 | 1.15 | ∞ |
| Linearity | 0.9 | N (k=2) | 2 | 1 | 1 | 0.45 | 0.45 | ∞ |
| Detection Limits | 0.25 | Rectangular | √3 | 1 | 1 | 0.14 | 0.14 | ∞ |
| Modulation Response | 2.4 | Rectangular | √3 | 1 | 1 | 1.39 | 1.39 | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | 1 | 0.30 | 0.30 | ∞ |
| Response Time | 0 | Rectangular | √3 | 1 | 1 | 0.00 | 0.00 | ∞ |
| Integration Time | 1.7 | Rectangular | √3 | 1 | 1 | 0.98 | 0.98 | ∞ |
| RF Ambient – Noise | 3 | Rectangular | √3 | 1 | 1 | 1.73 | 1.73 | ∞ |
| RF Ambient – Reflections | 3 | Rectangular | √3 | 1 | 1 | 1.73 | 1.73 | ∞ |
| Probe Positioner | 0.4 | Rectangular | √3 | 1 | 1 | 0.23 | 0.23 | ∞ |
| Probe Positioning | 6.7 | Rectangular | √3 | 1 | 1 | 3.87 | 3.87 | ∞ |
| Max. SAR Evaluation | 4 | Rectangular | √3 | 1 | 1 | 2.31 | 2.31 | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | 2.3 / 2.4 | Normal | 1 | 1 | 1 | 2.30 | 2.40 | 30 |
| Device Holder | 2.8 / 2.8 | Normal | 1 | 1 | 1 | 2.80 | 2.80 | 30 |
| Power Drift | 5 | Rectangular | √3 | 1 | 1 | 2.89 | 2.89 | ∞ |
| Power Scaling | 0 | Rectangular | √3 | 1 | 1 | 0.00 | 0.00 | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | 7.9 | Rectangular | √3 | 1 | 1 | 4.56 | 4.56 | ∞ |
| SAR correction | 1.2 / 0.97 | Rectangular | √3 | 1 | 0.84 | 0.69 | 0.47 | ∞ |
| Liquid Conductivity (Meas.) | 2.5 | Rectangular | √3 | 0.78 | 0.71 | 1.13 | 1.02 | ∞ |
| Liquid Permittivity (Meas.) | 2.5 | Rectangular | √3 | 0.26 | 0.26 | 0.38 | 0.38 | ∞ |
| Temp. unc. - Conductivity | 3.4 | Rectangular | √3 | 0.78 | 0.71 | 1.53 | 1.39 | ∞ |
| Temp. unc. - Permittivity | 0.4 | Rectangular | √3 | 0.23 | 0.26 | 0.05 | 0.06 | ∞ |
| **Combined Standard Uncertainty (k = 1) (≤ 3 GHz)** | | | | | | 9.64 | 9.62 | |
| **Combined Standard Uncertainty (k = 1) (> 3 GHz)** | | | | | | 9.42 | 9.40 | |
| **Max. Expanded Uncertainty (k = 2)** | | | | | | **19.27** | **19.23** | |

## 3.5. TISSUE DIELECTRIC PARAMETER MEASUREMENT & SYSTEM VERIFICATION

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

### 3.5.1. Tissue Simulating Liquids

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.

The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm with ≤ ± 0.5 cm variation for SAR measurements ≤ 3 GHz and ≥ 10.0 cm with ≤ ± 0.5 cm variation for measurements > 3 GHz. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.

**Photo of Liquid Height**

**Tissue Dielectric Parameters for Head and Body**

| Target Frequency | Head | | Body | |
|---|---|---|---|---|
| (MHz) | $\varepsilon_r$ | σ(S/m) | $\varepsilon_r$ | σ(S/m) |
| *750* | *41.9* | *0.89* | *55.5* | *0.96* |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| *1450* | *40.5* | *1.20* | *54.0* | *1.30* |
| *1640* | *40.3* | *1.29* | *53.8* | *1.40* |
| *1750* | *40.1* | *1.37* | *53.4* | *1.49* |
| 1800 | 40.0 | 1.40 | 53.3 | 1.52 |
| 1900 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| *2300* | *39.5* | *1.67* | *52.9* | *1.81* |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| *2600* | *39.0* | *1.96* | *52.5* | *2.16* |
| *3500* | *37.9* | *2.91* | *51.3* | *3.31* |
| *5200* | *36.0* | *4.66* | *49.0* | *5.30* |
| *5300* | *35.9* | *4.76* | *48.9* | *5.42* |
| *5500* | *35.6* | *4.96* | *48.6* | *5.65* |
| *5600* | *35.5* | *5.07* | *48.5* | *5.77* |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

( $\varepsilon_r$ = relative permittivity, σ = conductivity and ρ = 1000 kg/m$^3$)

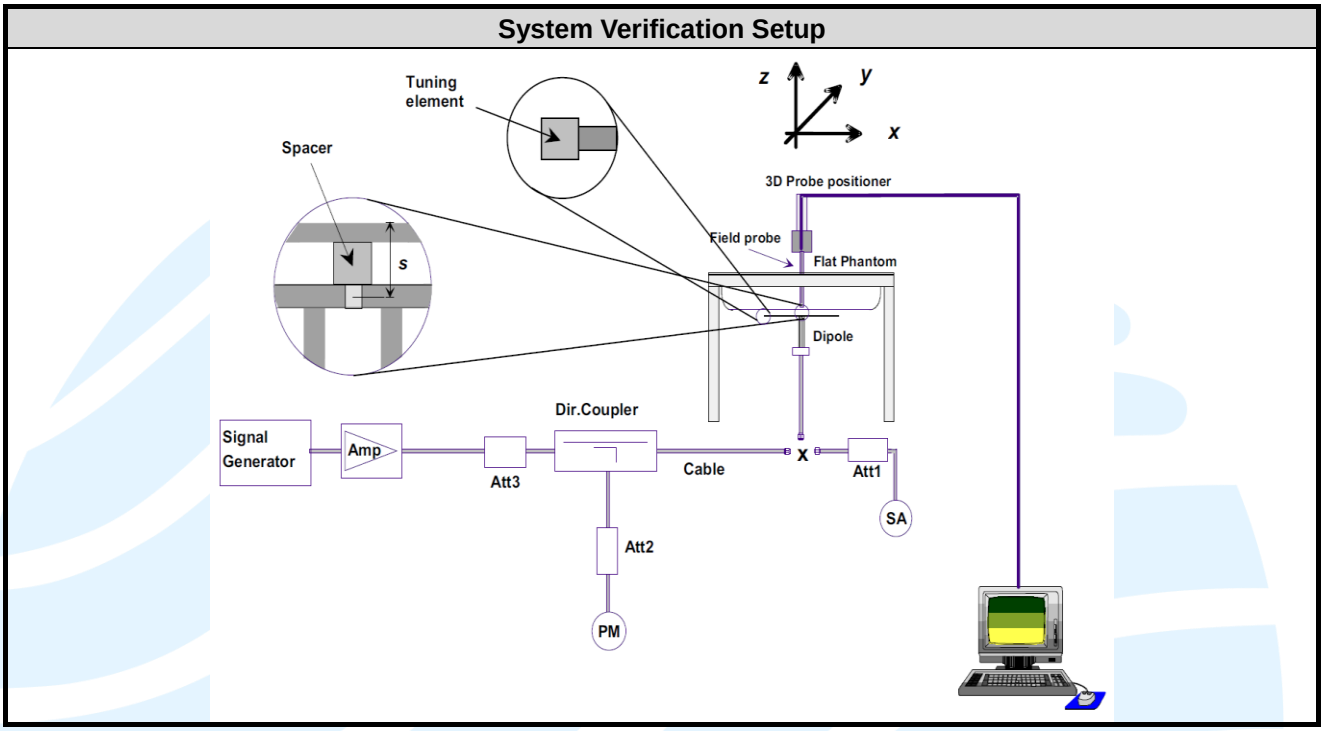
The following table gives the recipes for tissue simulating liquids.

| Recipes of Tissue Simulating Liquid | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
| H750 | 0.2 | - | 0.2 | 1.4 | 57.0 | - | 41.1 | - |
| H835 | 0.1 | - | 1.0 | 1.4 | 57.0 | - | 40.5 | - |
| H900 | 0.1 | - | 1.0 | 1.5 | 56.5 | - | 40.9 | - |
| H1450 | - | 45.5 | - | 0.7 | - | - | 53.8 | - |
| H1640 | - | 45.8 | - | 0.5 | - | - | 53.7 | - |
| H1750 | - | 44.5 | - | 0.3 | - | - | 55.2 | - |
| H1800 | - | 44.9 | - | 0.2 | - | - | 54.9 | - |
| H1900 | - | 44.9 | - | 0.2 | - | - | 54.9 | - |
| H2000 | - | 50 | - | - | - | - | 50 | - |
| H2300 | - | 44.9 | - | 0.1 | - | - | 55.0 | - |
| H2450 | - | 45.0 | - | 0.1 | - | - | 54.9 | - |
| H2600 | - | 45.1 | - | 0.1 | - | - | 54.8 | - |
| H3500 | - | 8.0 | - | 0.2 | - | 20.0 | 71.8 | - |
| H5G | - | - | - | - | - | 17.2 | 65.52 | 17.3 |
| B750 | 0.2 | - | 0.2 | 0.8 | 48.8 | - | 50.0 | - |
| B835 | 0.2 | - | 0.2 | 0.9 | 48.5 | - | 50.2 | - |
| B900 | 0.2 | - | 0.2 | 0.9 | 48.2 | - | 50.5 | - |
| B1450 | - | 34.0 | - | 0.3 | - | - | 65.7 | - |
| B1640 | - | 32.5 | - | 0.3 | - | - | 67.2 | - |
| B1750 | - | 29.4 | - | 0.4 | - | - | 70.2 | - |
| B1800 | - | 29.5 | - | 0.4 | - | - | 70.1 | - |
| B1900 | - | 29.5 | - | 0.3 | - | - | 70.2 | - |
| B2000 | - | 30.0 | - | 0.2 | - | - | 69.8 | - |
| B2300 | - | 31.0 | - | 0.1 | - | - | 68.9 | - |
| B2450 | - | 31.4 | - | 0.1 | - | - | 68.5 | - |
| B2600 | - | 31.8 | - | 0.1 | - | - | 68.1 | - |
| B3500 | - | 28.8 | - | 0.1 | - | - | 71.1 | - |
| B5G | - | - | - | - | - | 10.7 | 78.6 | 10.7 |

### 3.5.2. System Check Description

The system check procedure provides a simple, fast, and reliable test method that can be performed daily or before every SAR measurement. The objective here is to ascertain that the measurement system has acceptable accuracy and repeatability. This test requires a flat phantom and a radiating source. The system verification setup is shown as below.

**System Verification Setup**



### 3.5.3. Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

| Test Date | Tissue Type | Frequency (MHz) | Liquid Temp. (℃) | Measured Conductivity (σ) | Measured Permittivity ($\varepsilon_r$) | Target Conductivity (σ) | Target Permittivity ($\varepsilon_r$) | Conductivity Deviation (%) | Permittivity Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|
| Aug. 20, 2024 | Head | 750 | 22.1 | 0.918 | 40.521 | 0.90 | 42.00 | 2.01 | -3.52 |
| Aug. 19, 2024 | Head | 835 | 21.6 | 0.882 | 41.815 | 0.90 | 41.50 | -1.97 | 0.76 |
| Sep. 03, 2024 | Head | 835 | 22.4 | 0.890 | 42.350 | 0.90 | 41.50 | -1.07 | 2.05 |
| Aug. 05, 2024 | Head | 1750 | 21.8 | 1.365 | 39.486 | 1.37 | 40.10 | -0.36 | -1.53 |
| Sep. 04, 2024 | Head | 1900 | 21.8 | 1.436 | 40.996 | 1.40 | 40.00 | 2.57 | 2.49 |
| Aug. 06, 2024 | Head | 2450 | 21.4 | 1.827 | 37.973 | 1.80 | 39.20 | 1.50 | -3.13 |
| Oct. 22, 2024 | Head | 5250 | 22.3 | 4.816 | 36.96 | 4.71 | 35.90 | 2.25 | 2.95 |
| Oct. 24, 2024 | Head | 5250 | 22.4 | 4.673 | 36.11 | 4.71 | 35.90 | -0.79 | 0.58 |
| Dec. 07, 2024 | Head | 5600 | 22.3 | 5.121 | 34.62 | 5.07 | 35.50 | 1.01 | -2.47 |
| Oct. 24, 2024 | Head | 5800 | 22.4 | 5.183 | 34.44 | 5.27 | 35.30 | -1.65 | -2.44 |

**Note:**

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ± 5% of the target values. The variation of the liquid temperature must be within ± 2 °C during the test.

### 3.5.4. System Verification

The measuring result for system verification is tabulated as below.

| Test Date | Tissue Type | Freq. (MHz) | 1W Target SAR-1g (W/kg) | 1W Target SAR-10g (W/kg) | Measured SAR-1g (W/kg) | Measured SAR-10g (W/kg) | Normalized to 1W SAR-1g (W/kg) | Normalized to 1W SAR-10g (W/kg) | Deviation 1g(%) | Deviation 10g(%) | Dipole S/N | Probe S/N | DAE S/N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aug. 20, 2024 | Head | 750 | 8.60 | 5.64 | 2.230 | 1.470 | 8.92 | 5.88 | 3.72 | 4.26 | 1066 | 3090 | 662 |
| Aug. 19, 2024 | Head | 835 | 9.61 | 6.23 | 2.340 | 1.530 | 9.36 | 6.12 | -2.60 | -1.77 | 4d005 | 3090 | 662 |
| Sep. 03, 2024 | Head | 835 | 9.61 | 6.23 | 2.450 | 1.600 | 9.80 | 6.40 | 1.98 | 2.73 | 4d005 | 3090 | 662 |
| Aug. 05, 2024 | Head | 1750 | 36.80 | 19.50 | 8.890 | 4.650 | 35.56 | 18.60 | -3.37 | -4.62 | 1086 | 3090 | 662 |
| Sep. 04, 2024 | Head | 1900 | 40.00 | 20.90 | 9.990 | 4.980 | 39.96 | 19.92 | -0.10 | -4.69 | 509 | 3090 | 662 |
| Aug. 06, 2024 | Head | 2450 | 53.70 | 24.80 | 13.900 | 6.410 | 55.60 | 25.64 | 3.54 | 3.39 | 883 | 3090 | 662 |
| Oct. 22, 2024 | Head | 5250 | 78.60 | 22.30 | 7.980 | 2.200 | 79.80 | 22.00 | 1.53 | -1.35 | 1115 | 7738 | 662 |
| Oct. 24, 2024 | Head | 5250 | 78.60 | 22.30 | 7.740 | 2.140 | 77.40 | 21.40 | -1.53 | -4.04 | 1115 | 7738 | 662 |
| Dec. 07, 2024 | Head | 5600 | 81.90 | 23.10 | 8.030 | 2.210 | 80.30 | 22.10 | -1.95 | -4.33 | 1115 | 7738 | 662 |
| Oct. 24, 2024 | Head | 5800 | 78.60 | 22.00 | 7.780 | 2.130 | 77.80 | 21.30 | -1.02 | -3.18 | 1115 | 7738 | 662 |

**Note:**

Comparing to the reference SAR value, the validation data should be within its specification of 10%. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

# 4. SAR MEASUREMENT EVALUATION

## 4.1. EUT CONFIGURATION AND SETTING

**Connections between EUT and System Simulator**

For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

### 4.1.1. WCDMA Configuration and Testing

**WCDMA Handsets Head SAR**

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode.

**WCDMA Handsets Body-worn SAR**

SAR for body-worn configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode.

**Handsets with Release 5 HSDPA**

The 3G SAR test reduction procedure is applied to HSDPA body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices”, for the highest reported SAR body-worn exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

**Handsets with Release 6 HSUPA**

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices”, for the highest reported body-worn exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn measurements is tested for next to the ear head exposure.

**Release 5 HSDPA Data Devices**

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. HSDPA is configured according to the applicable UE category of a test device. The number of HS-DSCH / HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms and a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (βc, βd), and HS-DPCCH power offset parameters (ΔACK, ΔNACK, ΔCQI) are set according to values indicated in below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c / \beta_d$ | $\beta_{hs}$ (1) | CM (dB)(2) | MPR |
|---|---|---|---|---|---|---|---|
| 1 | 2 / 15 | 15 / 15 | 64 | 2 / 15 | 4 / 15 | 0.0 | 0 |
| 2 | 12 / 15 (3) | 15 / 15 (3) | 64 | 12 / 15 (3) | 24 / 15 | 1.0 | 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 $\Delta_{CQI}$ = 8 ⇔ $A_{hs}$ = $\beta_{hs}$ / $\beta_c$ = 30 / 15 ⇔ $\beta_{hs}$ = 30 / 15 * $\beta_c$.

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

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

**Release 6 HSUPA Data Devices**

The 3G SAR test reduction procedure is applied to body SAR with 12.2 kbps RMC as the primary mode. Otherwise, body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode. Otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing. Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in below.

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

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

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

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

Note 4: For subtest 5 the $\beta_c$ / $\beta_d$ ratio of 15 / 15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 14 / 15 and $\beta_d$ = 15 / 15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: $\beta_{ed}$ cannot be set directly; it is set by Absolute Grant Value.

**HSPA+ SAR Guidance**

The 3G SAR test reduction procedure is applied to HSPA+ (uplink) with 12.2 kbps RMC as the primary mode. Otherwise, when SAR is required for Rel. 6 HSPA, SAR is required for Rel. 7 HSPA+. Power is measured for HSPA+ that supports uplink 16QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

**DC-HSDPA SAR Guidance**

The 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Otherwise, when SAR is required for Rel. 5 HSDPA, SAR is required for Rel. 8 DC-HSDPA. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

### 4.1.2. LTE Configuration and Testing

UE power class is category 3. The LTE maximum power reduction (MPR) in accordance with 3GPP TS 36.101 is active all times during LTE operation. The allowed MPR for the maximum output power please refer to the tune up procedure.

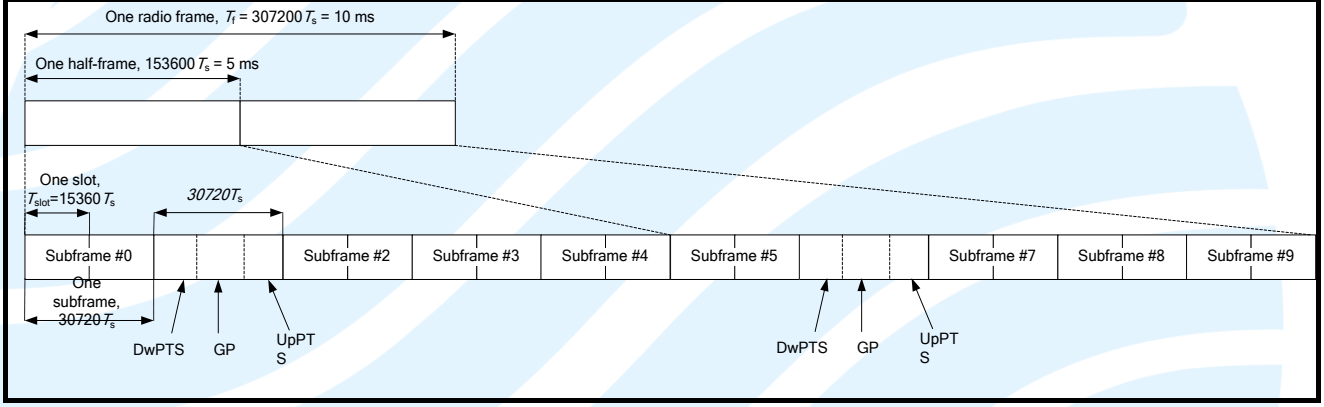
In addition, the device is compliant with additional maximum power reduction (A-MPR) requirements defined in 3GPP TS 36.101 section 6.2.4 that was disabled for all FCC compliance testing.

A properly configured base station simulator is used for the SAR and power measurements, so spectrum plots for each RB allocation and offset configuration are not included in the SAR report to demonstrate that the tested RB allocations have been correctly established at the maximum output power conditions.

**TDD-LTE Setup Configurations**

According to KDB 941225 D05, SAR testing for TDD-LTE device 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 TDD-LTE configurations. The TDD-LTE of this device supports frame structure type 2 defined in 3GPP TS 36.211 section 4.2, and the frame structure configuration can be referred to below.

**3GPP TS 36.211 Figure 4.2-1: Frame Structure Type 2**




**3GPP TS 36.211 Table 4.2-1: Configuration of Special Subframe**

| 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·Ts | 2192·Ts | 2560·Ts | 7680·Ts | 2192·Ts | 2560·Ts |
| 1 | 19760·Ts | | | 20480·Ts | | |
| 2 | 21952·Ts | | | 23040·Ts | | |
| 3 | 24144·Ts | | | 25600·Ts | | |
| 4 | 26336·Ts | | | 7680·Ts | 4384·Ts | 5120·Ts |
| 5 | 6592·Ts | 4384·Ts | 5120·Ts | 20480·Ts | | |
| 6 | 19760·Ts | | | 23040·Ts | | |
| 7 | 21952·Ts | | | 12800·Ts | | |
| 8 | 24144·Ts | | | - | - | - |
| 9 | 13168·Ts | | | - | - | - |

| Uplink-Downlink Configurations and duty cycle | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uplink-Downlink Configuration | Downlink-to-Uplink Switch-Point Periodicity | Subframe Number | | | | | | | | | | 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 | 63.33% |
| 1 | 5 ms | D | S | U | U | D | D | S | U | U | D | 43.33% |
| 2 | 5 ms | D | S | U | D | D | D | S | U | D | D | 23.33% |
| 3 | 10 ms | D | S | U | U | U | D | D | D | D | D | 31.67% |
| 4 | 10 ms | D | S | U | U | D | D | D | D | D | D | 21.67% |
| 5 | 10 ms | D | S | U | D | D | D | D | D | D | D | 11.67% |
| 6 | 5 ms | D | S | U | U | U | D | S | U | U | D | 53.33% |

Considering the highest transmission duty cycle, TDD-LTE was tested using Uplink-Downlink Configuration 0 with 6 uplink subframe and 2 special subframe. The special subframe was set to special subframe configuration 7 using extended cyclic prefix uplink. Therefore, SAR testing for TDD-LTE was performed at the maximum output power with highest transmission duty cycle of 63.33%.

### 4.1.3. WLAN Configuration and Testing

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset-based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

According to KDB 248227 D01, this device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

**Initial Test Configuration**

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.

**Subsequent Test Configuration**

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. When the highest reported SAR for the initial test configuration according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

**SAR Test Configuration and Channel Selection**

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n). After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following.

1) The channel closest to mid-band frequency is selected for SAR measurement.

2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

**Test Reduction for U-NII-1 (5.2 GHz) and U-NII-2A (5.3 GHz) Bands**

For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following.

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition).

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

## 4.2. EUT TESTING POSITION

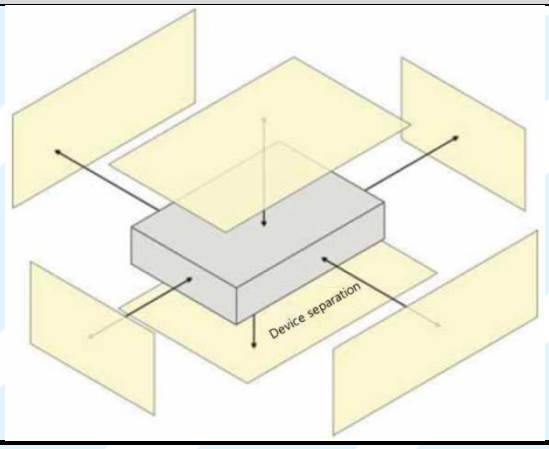
### 4.2.1. Body Exposure Conditions

| RF Exposure Conditions | Test Position | Separation Distance | SAR test exclusion |
|---|---|---|---|
| Body | Front Face | 0.5 cm | Note 2 |
| | Rear Face | | |
| | Left Side | | |
| | Right Side | | |
| | Top Side | | |
| | Bottom Side | | |

Note:

1) Voice communication for UMPC mini-tablet devices is limited to speaker mode only.
2) For mini-tablet, according to KDB 941225 D07, SAR evaluation is required on all surfaces and edges with a transmitting antenna within 25 mm from that surface or edge.

**Test Positions for mini-Tablet**



# 4.3. MEASURED CONDUCTED POWER RESULT

## 4.3.1. Conducted Power of WCDMA Bands

The measuring conducted average power (Unit: dBm) is shown as below.

| Band | WCDMA Band II | | | WCDMA Band V | | | WCDMA Band IV | | |
|---|---|---|---|---|---|---|---|---|---|
| Channel | 9262 | 9400 | 9538 | 4132 | 4182 | 4233 | 1312 | 1413 | 1513 |
| Frequency (MHz) | 1852.4 | 1880.0 | 1907.6 | 826.4 | 836.4 | 846.6 | 1712.4 | 1732.6 | 1752.6 |
| RMC 12.2K | **22.96** | 22.75 | 22.57 | **23.35** | 23.27 | 23.20 | 22.66 | 22.72 | **22.76** |
| HSDPA Subtest-1 | 21.91 | 21.72 | 21.55 | 22.36 | 22.32 | 22.34 | 21.70 | 21.75 | 21.82 |
| HSDPA Subtest-2 | 21.42 | 21.15 | 20.96 | 21.80 | 21.77 | 21.76 | 21.14 | 21.13 | 21.26 |
| HSDPA Subtest-3 | 21.47 | 21.18 | 21.00 | 21.88 | 21.77 | 21.78 | 21.20 | 21.22 | 21.34 |
| HSDPA Subtest-4 | 21.42 | 21.23 | 21.00 | 21.84 | 21.76 | 21.76 | 21.10 | 21.16 | 21.30 |
| HSUPA Subtest-1 | 20.33 | 19.48 | 19.30 | 20.73 | 20.68 | 20.67 | 20.11 | 20.09 | 20.20 |
| HSUPA Subtest-2 | 19.95 | 19.76 | 19.51 | 20.41 | 20.28 | 20.29 | 19.74 | 19.73 | 19.82 |
| HSUPA Subtest-3 | 20.92 | 20.73 | 20.51 | 21.38 | 21.32 | 21.29 | 20.74 | 20.72 | 20.78 |
| HSUPA Subtest-4 | 19.45 | 19.29 | 19.02 | 19.91 | 19.87 | 19.86 | 19.23 | 19.26 | 19.37 |
| HSUPA Subtest-5 | 20.91 | 20.68 | 20.46 | 21.37 | 21.30 | 21.27 | 20.75 | 20.71 | 20.80 |

### 4.3.2. Conducted Power of LTE Bands

The measuring conducted average power (Unit: dBm) is shown as below.

➢ **LTE Band 2**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 18607 | 18900 | 19193 | 18607 | 18900 | 19193 |
| | | | 1850.7 MHz | 1880 MHz | 1909.3 MHz | 1850.7 MHz | 1880 MHz | 1909.3 MHz |
| 2 | 1.4 | 1RB#0 | 21.73 | 21.73 | 21.53 | 20.90 | 20.95 | 20.24 |
| | | 1RB#2 | 21.82 | 21.78 | 21.66 | 20.97 | 21.14 | 20.46 |
| | | 1RB#5 | 21.79 | 21.66 | 21.48 | 20.93 | 20.98 | 20.28 |
| | | 3RB#0 | 20.84 | 20.66 | 20.56 | 21.05 | 20.75 | 20.33 |
| | | 3RB#1 | 20.78 | 20.65 | 20.55 | 21.04 | 20.51 | 20.31 |
| | | 3RB#3 | 20.80 | 20.72 | 20.51 | 21.00 | 20.58 | 20.32 |
| | | 6RB#0 | 20.80 | 20.67 | 20.54 | 20.18 | 19.91 | 19.35 |
| Band | Bandwidth (MHz) | RB | 18615 | 18900 | 19185 | 18615 | 18900 | 19185 |
| | | | 1851.5 MHz | 1880 MHz | 1908.5 MHz | 1851.5 MHz | 1880 MHz | 1908.5 MHz |
| 2 | 3 | 1RB#0 | 21.70 | 21.65 | 21.52 | 20.74 | 20.53 | 20.26 |
| | | 1RB#8 | 21.70 | 21.67 | 21.48 | 20.67 | 20.46 | 20.30 |
| | | 1RB#14 | 21.72 | 21.64 | 21.47 | 20.77 | 20.46 | 20.26 |
| | | 8RB#0 | 21.21 | 20.58 | 20.55 | 20.26 | 19.58 | 19.53 |
| | | 8RB#4 | 21.22 | 20.63 | 20.54 | 20.25 | 19.57 | 19.53 |
| | | 8RB#7 | 21.25 | 20.58 | 20.51 | 20.16 | 19.56 | 19.46 |
| | | 15RB#0 | 21.10 | 20.59 | 20.46 | 20.01 | 19.49 | 19.32 |
| Band | Bandwidth (MHz) | RB | 18625 | 18900 | 19175 | 18625 | 18900 | 19175 |
| | | | 1852.5 MHz | 1880 MHz | 1907.5 MHz | 1852.5 MHz | 1880 MHz | 1907.5 MHz |
| 2 | 5 | 1RB#0 | 21.72 | 21.57 | 21.51 | 20.63 | 20.66 | 20.44 |
| | | 1RB#12 | 21.81 | 21.66 | 21.64 | 20.81 | 20.66 | 20.48 |
| | | 1RB#24 | 21.77 | 21.61 | 21.53 | 20.69 | 20.62 | 20.37 |
| | | 12RB#0 | 20.67 | 20.64 | 20.43 | 19.64 | 19.61 | 19.43 |
| | | 12RB#6 | 20.71 | 20.60 | 20.41 | 19.64 | 20.09 | 19.40 |
| | | 12RB#13 | 20.71 | 20.60 | 20.38 | 19.66 | 19.62 | 19.34 |
| | | 25RB#0 | 20.74 | 20.67 | 20.44 | 19.73 | 19.61 | 19.47 |
| Band | Bandwidth (MHz) | RB | 18650 | 18900 | 19150 | 18650 | 18900 | 19150 |
| | | | 1855 MHz | 1880 MHz | 1905 MHz | 1855 MHz | 1880 MHz | 1905 MHz |
| 2 | 10 | 1RB#0 | 22.13 | 22.05 | 21.80 | 20.74 | 20.54 | 20.54 |
| | | 1RB#24 | 22.36 | 22.16 | 21.56 | 20.96 | 20.65 | 20.65 |
| | | 1RB#49 | 22.13 | 21.87 | 21.48 | 20.81 | 20.62 | 20.47 |
| | | 25RB#0 | 22.24 | 21.86 | 21.55 | 19.77 | 19.68 | 19.53 |
| | | 25RB#12 | 22.26 | 21.86 | 21.53 | 19.78 | 19.68 | 19.50 |
| | | 25RB#25 | 22.30 | 21.62 | 21.55 | 19.75 | 19.73 | 19.48 |
| | | 50RB#0 | 21.24 | 20.97 | 20.51 | 19.78 | 19.71 | 19.46 |
| Band | Bandwidth (MHz) | RB | 18675 | 18900 | 19125 | 18675 | 18900 | 19125 |
| | | | 1857.5 MHz | 1880 MHz | 1902.5 MHz | 1857.5 MHz | 1880 MHz | 1902.5 MHz |
| 2 | 15 | 1RB#0 | 21.68 | 21.56 | 21.52 | 20.69 | 20.67 | 20.26 |
| | | 1RB#38 | 21.82 | 21.63 | 21.59 | 20.80 | 20.74 | 20.34 |
| | | 1RB#74 | 21.66 | 21.58 | 21.38 | 20.63 | 20.68 | 20.16 |
| | | 38RB#0 | 20.82 | 20.66 | 20.60 | 20.80 | 20.66 | 20.66 |
| | | 38RB#18 | 20.74 | 20.67 | 20.63 | 20.81 | 20.70 | 20.63 |
| | | 38RB#37 | 20.80 | 20.67 | 20.60 | 20.78 | 20.67 | 20.63 |
| | | 75RB#0 | 20.80 | 20.71 | 20.63 | 19.71 | 19.68 | 19.59 |
| Band | Bandwidth (MHz) | RB | 18700 | 18900 | 19100 | 18700 | 18900 | 19100 |
| | | | 1860 MHz | 1880 MHz | 1900 MHz | 1860 MHz | 1880 MHz | 1900 MHz |
| 2 | 20 | 1RB#0 | 22.13 | 22.05 | 21.80 | 20.44 | 20.58 | 20.17 |
| | | 1RB#49 | 22.36 | 22.16 | 21.56 | 20.82 | 20.92 | 20.49 |
| | | 1RB#99 | 22.13 | 21.87 | 21.48 | 20.38 | 20.55 | 20.10 |
| | | 50RB#0 | 22.24 | 21.86 | 21.55 | 19.84 | 19.67 | 19.79 |
| | | 50RB#25 | 22.26 | 21.86 | 21.53 | 19.81 | 19.67 | 19.81 |
| | | 50RB#50 | 22.30 | 21.62 | 21.55 | 19.74 | 19.62 | 19.74 |
| | | 100RB#0 | 21.24 | 20.97 | 20.51 | 19.71 | 19.63 | 19.68 |

➢ **LTE Band 4**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 19957 | 20175 | 20393 | 19957 | 20175 | 20393 |
| | | | 1710.7 MHz | 1732.5 MHz | 1754.3 MHz | 1710.7 MHz | 1732.5 MHz | 1754.3 MHz |
| 4 | 1.4 | 1RB#0 | 21.55 | 21.69 | 21.76 | 20.46 | 20.46 | 20.48 |
| | | 1RB#2 | 21.72 | 21.80 | 21.90 | 20.60 | 20.60 | 20.69 |
| | | 1RB#5 | 21.57 | 21.70 | 21.78 | 20.47 | 20.49 | 20.48 |
| | | 3RB#0 | 21.66 | 21.69 | 21.85 | 20.43 | 20.52 | 20.59 |
| | | 3RB#1 | 21.66 | 21.67 | 21.85 | 20.43 | 20.55 | 20.59 |
| | | 3RB#3 | 21.69 | 21.68 | 21.89 | 20.41 | 20.52 | 20.60 |
| | | 6RB#0 | 20.57 | 20.68 | 20.76 | 19.62 | 19.56 | 19.74 |
| Band | Bandwidth (MHz) | RB | 19965 | 20175 | 20385 | 19965 | 20175 | 20385 |
| | | | 1711.5 MHz | 1732.5 MHz | 1753.5 MHz | 1711.5 MHz | 1732.5 MHz | 1753.5 MHz |
| 4 | 3 | 1RB#0 | 21.64 | 21.75 | 21.82 | 20.62 | 20.62 | 20.55 |
| | | 1RB#8 | 21.72 | 21.76 | 21.88 | 20.68 | 20.59 | 20.62 |
| | | 1RB#14 | 21.69 | 21.73 | 21.84 | 20.65 | 20.62 | 20.59 |
| | | 8RB#0 | 20.67 | 20.70 | 20.86 | 19.71 | 19.74 | 19.83 |
| | | 8RB#4 | 20.60 | 20.70 | 20.76 | 19.72 | 19.75 | 19.82 |
| | | 8RB#7 | 20.66 | 20.65 | 20.79 | 19.70 | 19.75 | 19.83 |
| | | 15RB#0 | 20.64 | 20.70 | 20.77 | 19.71 | 19.64 | 19.72 |
| Band | Bandwidth (MHz) | RB | 19975 | 20175 | 20375 | 19975 | 20175 | 20375 |
| | | | 1712.5 MHz | 1732.5 MHz | 1752.5 MHz | 1712.5 MHz | 1732.5 MHz | 1752.5 MHz |
| 4 | 5 | 1RB#0 | 21.55 | 21.63 | 21.76 | 20.56 | 20.74 | 20.63 |
| | | 1RB#12 | 21.76 | 21.76 | 21.86 | 20.68 | 20.88 | 20.79 |
| | | 1RB#24 | 21.68 | 21.69 | 21.75 | 20.60 | 20.76 | 20.68 |
| | | 12RB#0 | 20.60 | 20.70 | 20.74 | 19.60 | 19.81 | 19.74 |
| | | 12RB#6 | 20.62 | 20.70 | 20.72 | 19.63 | 19.80 | 19.77 |
| | | 12RB#13 | 20.63 | 20.73 | 20.67 | 19.70 | 19.79 | 19.71 |
| | | 25RB#0 | 20.61 | 20.72 | 20.75 | 19.70 | 19.72 | 19.80 |
| Band | Bandwidth (MHz) | RB | 20000 | 20175 | 20350 | 20000 | 20175 | 20350 |
| | | | 1715 MHz | 1732.5 MHz | 1750 MHz | 1715 MHz | 1732.5 MHz | 1750 MHz |
| 4 | 10 | 1RB#0 | 21.65 | 21.75 | 21.77 | 20.64 | 20.58 | 20.53 |
| | | 1RB#24 | 21.79 | 21.93 | 21.89 | 20.75 | 20.69 | 20.66 |
| | | 1RB#49 | 21.64 | 21.76 | 21.83 | 20.69 | 20.67 | 20.57 |
| | | 25RB#0 | 20.59 | 20.72 | 20.78 | 19.67 | 19.84 | 19.88 |
| | | 25RB#12 | 20.57 | 20.75 | 20.79 | 19.68 | 19.81 | 19.85 |
| | | 25RB#25 | 20.74 | 20.72 | 20.76 | 19.80 | 19.79 | 19.81 |
| | | 50RB#0 | 20.65 | 20.73 | 20.75 | 19.75 | 19.77 | 19.79 |
| Band | Bandwidth (MHz) | RB | 20025 | 20175 | 20325 | 20025 | 20175 | 20325 |
| | | | 1717.5 MHz | 1732.5 MHz | 1747.5 MHz | 1717.5 MHz | 1732.5 MHz | 1747.5 MHz |
| 4 | 15 | 1RB#0 | 21.55 | 21.58 | 21.70 | 20.54 | 20.69 | 20.45 |
| | | 1RB#38 | 21.69 | 21.65 | 21.80 | 20.66 | 20.81 | 20.55 |
| | | 1RB#74 | 21.62 | 21.57 | 21.76 | 20.58 | 20.73 | 20.48 |
| | | 38RB#0 | 20.65 | 20.74 | 20.74 | 20.66 | 20.73 | 20.71 |
| | | 38RB#18 | 20.69 | 20.69 | 20.76 | 20.70 | 20.71 | 20.77 |
| | | 38RB#37 | 20.70 | 20.71 | 20.74 | 20.73 | 20.70 | 20.72 |
| | | 75RB#0 | 20.65 | 20.71 | 20.73 | 19.66 | 19.75 | 19.82 |
| Band | Bandwidth (MHz) | RB | 20050 | 20175 | 20300 | 20050 | 20175 | 20300 |
| | | | 1720 MHz | 1732.5 MHz | 1745 MHz | 1720 MHz | 1732.5 MHz | 1745 MHz |
| 4 | 20 | 1RB#0 | 21.44 | 21.50 | 21.49 | 20.32 | 20.59 | 20.24 |
| | | 1RB#49 | 21.75 | 21.85 | 21.95 | 20.70 | 20.97 | 20.68 |
| | | 1RB#99 | 21.56 | 21.57 | 21.56 | 20.44 | 20.71 | 20.34 |
| | | 50RB#0 | 20.55 | 20.78 | 20.82 | 19.62 | 19.83 | 19.91 |
| | | 50RB#25 | 20.60 | 20.73 | 20.77 | 19.64 | 19.86 | 19.90 |
| | | 50RB#50 | 20.71 | 20.72 | 20.76 | 19.76 | 19.77 | 19.85 |
| | | 100RB#0 | 20.64 | 20.69 | 20.77 | 19.70 | 19.74 | 19.84 |

➢ **LTE Band 5**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 20407 | 20525 | 20643 | 20407 | 20525 | 20643 |
| | | | 824.7 MHz | 836.5 MHz | 848.3 MHz | 824.7 MHz | 836.5 MHz | 848.3 MHz |
| 5 | 1.4 | 1RB#0 | 22.34 | 22.35 | 22.07 | 21.22 | 21.11 | 20.93 |
| | | 1RB#2 | 22.41 | 22.36 | 22.22 | 21.39 | 21.26 | 21.22 |
| | | 1RB#5 | 22.31 | 22.27 | 22.11 | 21.18 | 21.13 | 20.90 |
| | | 3RB#0 | 22.42 | 22.25 | 22.27 | 21.18 | 21.10 | 20.99 |
| | | 3RB#1 | 22.40 | 22.24 | 22.26 | 21.18 | 21.11 | 21.00 |
| | | 3RB#3 | 22.40 | 22.31 | 22.24 | 21.17 | 21.12 | 21.11 |
| | | 6RB#0 | 21.35 | 21.33 | 21.23 | 20.36 | 20.15 | 20.17 |
| Band | Bandwidth (MHz) | RB | 20415 | 20525 | 20635 | 20415 | 20525 | 20635 |
| | | | 825.5 MHz | 836.5 MHz | 847.5 MHz | 825.5 MHz | 836.5 MHz | 847.5 MHz |
| 5 | 3 | 1RB#0 | 22.37 | 22.27 | 22.17 | 21.36 | 21.16 | 20.90 |
| | | 1RB#8 | 22.34 | 22.30 | 22.15 | 21.46 | 21.15 | 20.93 |
| | | 1RB#14 | 22.35 | 22.32 | 22.18 | 21.39 | 21.13 | 20.99 |
| | | 8RB#0 | 21.34 | 21.26 | 21.21 | 20.42 | 20.20 | 20.20 |
| | | 8RB#4 | 21.32 | 21.25 | 21.22 | 20.35 | 20.23 | 20.21 |
| | | 8RB#7 | 21.35 | 21.25 | 21.18 | 20.34 | 20.22 | 20.17 |
| | | 15RB#0 | 21.33 | 21.22 | 21.14 | 20.29 | 20.16 | 20.07 |
| Band | Bandwidth (MHz) | RB | 20425 | 20525 | 20625 | 20425 | 20525 | 20625 |
| | | | 826.5 MHz | 836.5 MHz | 846.5 MHz | 826.5 MHz | 836.5 MHz | 846.5 MHz |
| 5 | 5 | 1RB#0 | 22.35 | 22.18 | 22.15 | 21.27 | 21.33 | 21.09 |
| | | 1RB#12 | 22.49 | 22.23 | 22.16 | 21.42 | 21.36 | 21.09 |
| | | 1RB#24 | 22.32 | 22.20 | 22.15 | 21.28 | 21.24 | 21.11 |
| | | 12RB#0 | 21.34 | 21.27 | 21.26 | 20.28 | 20.28 | 20.30 |
| | | 12RB#6 | 21.32 | 21.28 | 21.27 | 20.28 | 20.32 | 20.27 |
| | | 12RB#13 | 21.34 | 21.30 | 21.15 | 20.31 | 20.28 | 20.14 |
| | | 25RB#0 | 21.34 | 21.31 | 21.23 | 20.33 | 20.26 | 20.25 |
| Band | Bandwidth (MHz) | RB | 20450 | 20525 | 20600 | 20450 | 20525 | 20600 |
| | | | 829 MHz | 836.5 MHz | 844 MHz | 829 MHz | 836.5 MHz | 844 MHz |
| 5 | 10 | 1RB#0 | 22.36 | 22.71 | 22.28 | 21.41 | 21.60 | 21.09 |
| | | 1RB#24 | 22.54 | 22.74 | 22.26 | 21.48 | 21.33 | 21.11 |
| | | 1RB#49 | 22.33 | 22.30 | 22.21 | 21.38 | 21.22 | 21.03 |
| | | 25RB#0 | 21.37 | 21.38 | 21.38 | 20.39 | 20.43 | 20.43 |
| | | 25RB#12 | 21.40 | 21.36 | 21.41 | 20.35 | 20.41 | 20.44 |
| | | 25RB#25 | 21.42 | 21.40 | 21.16 | 20.38 | 20.37 | 20.20 |
| | | 50RB#0 | 21.39 | 21.36 | 21.27 | 20.41 | 20.34 | 20.32 |

➢ **LTE Band 12**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 23017 | 23095 | 23173 | 23017 | 23095 | 23173 |
| | | | 699.7 MHz | 707.5 MHz | 715.3 MHz | 699.7 MHz | 707.5 MHz | 715.3 MHz |
| 12 | 1.4 | 1RB#0 | 21.84 | 21.87 | 21.83 | 21.15 | 20.66 | 20.82 |
| | | 1RB#2 | 22.02 | 22.09 | 22.02 | 21.37 | 20.88 | 20.96 |
| | | 1RB#5 | 21.95 | 21.89 | 21.84 | 21.23 | 20.63 | 20.85 |
| | | 3RB#0 | 22.35 | 21.98 | 21.98 | 20.70 | 20.76 | 20.83 |
| | | 3RB#1 | 21.83 | 21.94 | 22.01 | 20.69 | 20.75 | 20.85 |
| | | 3RB#3 | 21.92 | 22.02 | 21.98 | 20.67 | 20.74 | 20.80 |
| | | 6RB#0 | 20.87 | 20.88 | 20.93 | 19.72 | 19.91 | 20.03 |
| Band | Bandwidth (MHz) | RB | 23025 | 23095 | 23165 | 23025 | 23095 | 23165 |
| | | | 700.5 MHz | 707.5 MHz | 714.5 MHz | 700.5 MHz | 707.5 MHz | 714.5 MHz |
| 12 | 3 | 1RB#0 | 21.83 | 21.90 | 21.97 | 20.81 | 20.83 | 20.68 |
| | | 1RB#8 | 21.80 | 21.94 | 21.99 | 20.84 | 20.80 | 20.71 |
| | | 1RB#14 | 21.86 | 21.90 | 21.96 | 20.89 | 20.76 | 20.79 |
| | | 8RB#0 | 20.79 | 20.86 | 20.96 | 19.87 | 19.93 | 20.07 |
| | | 8RB#4 | 20.83 | 20.85 | 20.98 | 19.91 | 19.87 | 20.03 |
| | | 8RB#7 | 20.86 | 20.86 | 21.02 | 19.90 | 19.96 | 20.03 |
| | | 15RB#0 | 20.81 | 20.84 | 20.94 | 19.84 | 19.82 | 19.95 |
| Band | Bandwidth (MHz) | RB | 23035 | 23095 | 23155 | 23035 | 23095 | 23155 |
| | | | 701.5 MHz | 707.5 MHz | 713.5 MHz | 701.5 MHz | 707.5 MHz | 713.5 MHz |
| 12 | 5 | 1RB#0 | 21.74 | 21.80 | 21.80 | 20.73 | 20.92 | 20.70 |
| | | 1RB#12 | 21.98 | 22.01 | 21.95 | 20.84 | 21.03 | 20.87 |
| | | 1RB#24 | 21.89 | 21.79 | 21.93 | 20.87 | 20.94 | 20.80 |
| | | 12RB#0 | 20.92 | 20.87 | 20.99 | 19.87 | 19.92 | 20.11 |
| | | 12RB#6 | 20.89 | 20.86 | 20.99 | 19.89 | 19.97 | 20.07 |
| | | 12RB#13 | 20.80 | 21.07 | 20.92 | 19.85 | 20.05 | 19.91 |
| | | 25RB#0 | 20.89 | 20.94 | 21.02 | 19.93 | 20.00 | 20.07 |
| Band | Bandwidth (MHz) | RB | 23060 | 23095 | 23130 | 23060 | 23095 | 23130 |
| | | | 704 MHz | 707.5 MHz | 711 MHz | 704 MHz | 707.5 MHz | 711 MHz |
| 12 | 10 | 1RB#0 | 22.37 | 21.95 | 21.90 | 20.81 | 20.74 | 20.69 |
| | | 1RB#24 | 22.56 | 22.01 | 22.00 | 21.09 | 20.89 | 20.83 |
| | | 1RB#49 | 22.39 | 21.97 | 22.07 | 20.95 | 20.81 | 20.77 |
| | | 25RB#0 | 21.12 | 21.03 | 20.81 | 20.16 | 20.08 | 19.96 |
| | | 25RB#12 | 21.12 | 21.03 | 20.82 | 20.15 | 20.05 | 19.91 |
| | | 25RB#25 | 21.03 | 21.16 | 20.88 | 20.09 | 20.21 | 19.92 |
| | | 50RB#0 | 21.05 | 21.08 | 20.84 | 20.11 | 20.11 | 19.92 |

➢ **LTE Band 13**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 23205 | 23230 | 23255 | 23205 | 23230 | 23255 |
| | | | 779.5 MHz | 782 MHz | 784.5 MHz | 779.5 MHz | 782 MHz | 784.5 MHz |
| 13 | 5 | 1RB#0 | 22.29 | 22.22 | 22.21 | 21.26 | 21.40 | 21.18 |
| | | 1RB#12 | 22.39 | 22.35 | 22.36 | 21.37 | 21.46 | 21.38 |
| | | 1RB#24 | 22.37 | 22.25 | 22.25 | 21.31 | 21.39 | 21.18 |
| | | 12RB#0 | 21.23 | 21.31 | 21.37 | 20.25 | 20.33 | 20.44 |
| | | 12RB#6 | 21.30 | 21.35 | 21.35 | 20.28 | 20.39 | 20.36 |
| | | 12RB#13 | 21.30 | 21.20 | 21.32 | 20.40 | 20.34 | 20.36 |
| | | 25RB#0 | 21.31 | 21.32 | 21.35 | 20.36 | 20.30 | 20.43 |
| Band | Bandwidth (MHz) | RB | 0 | 23230 | 0 | 0 | 23230 | 0 |
| | | | 0 | 782 MHz | 0 | 0 | 782 MHz | 0 |
| 3 | 10 | 1RB#0 | / | 22.26 | / | / | 21.38 | / |
| | | 1RB#25 | / | 22.40 | / | / | 21.44 | / |
| | | 1RB#49 | / | 22.34 | / | / | 21.41 | / |
| | | 25RB#0 | / | 21.32 | / | / | 20.32 | / |
| | | 25RB#12 | / | 21.31 | / | / | 20.33 | / |
| | | 25RB#25 | / | 21.36 | / | / | 20.35 | / |
| | | 50RB#0 | / | 21.32 | / | / | 20.31 | / |

➢ **LTE Band 17**

| Conducted Power(dBm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Modulation | | | QPSK | | | 16QAM | | |
| Band | Bandwidth (MHz) | RB | 23755 706.5 MHz | 23790 710 MHz | 23825 713.5 MHz | 23755 706.5 MHz | 23790 710 MHz | 23825 713.5 MHz |
| 17 | 5 | 1RB#0 | 21.89 | 21.82 | 21.82 | 20.82 | 20.94 | 20.77 |
| | | 1RB#12 | 22.02 | 21.96 | 21.96 | 20.93 | 21.03 | 20.93 |
| | | 1RB#24 | 21.94 | 21.86 | 21.87 | 20.88 | 20.94 | 20.81 |
| | | 12RB#0 | 20.93 | 20.83 | 20.98 | 19.95 | 19.89 | 20.03 |
| | | 12RB#6 | 20.87 | 20.82 | 21.03 | 19.98 | 19.91 | 20.02 |
| | | 12RB#13 | 20.99 | 20.94 | 20.90 | 20.00 | 20.01 | 20.01 |
| | | 25RB#0 | 20.96 | 20.94 | 21.01 | 20.07 | 20.01 | 20.07 |
| Band | Bandwidth (MHz) | RB | 23780 709 MHz | 23790 710 MHz | 23800 711 MHz | 23780 709 MHz | 23790 710 MHz | 23800 711 MHz |
| 17 | 10 | 1RB#0 | 21.88 | 21.92 | 21.92 | 20.92 | 20.78 | 20.67 |
| | | 1RB#24 | 22.04 | 22.13 | 22.05 | 21.06 | 20.96 | 20.79 |
| | | 1RB#49 | 21.96 | 21.95 | 21.95 | 20.96 | 20.83 | 20.68 |
| | | 25RB#0 | 20.86 | 20.83 | 20.81 | 19.88 | 19.90 | 19.89 |
| | | 25RB#12 | 20.84 | 20.87 | 20.82 | 19.96 | 19.93 | 19.94 |
| | | 25RB#25 | 21.00 | 20.92 | 20.90 | 20.03 | 19.96 | 19.98 |
| | | 50RB#0 | 20.95 | 20.84 | 20.83 | 20.04 | 19.96 | 19.92 |

### 4.3.3. Conducted Power of WLAN

The measuring conducted average power is shown as below.

| Band | Mode | Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|---|---|
| 2.4GHz | 802.11b | 1 | 2412 | 17.04 |
| | | 6 | 2437 | 17.77 |
| | | 11 | 2462 | ***17.88*** |
| | 802.11g | 1 | 2412 | 14.86 |
| | | 6 | 2437 | 15.45 |
| | | 11 | 2462 | ***15.65*** |
| | 802.11n-HT20 | 1 | 2412 | 13.79 |
| | | 6 | 2437 | 14.50 |
| | | 11 | 2462 | ***14.53*** |
| | 802.11n-HT40 | 3 | 2422 | 14.52 |
| | | 6 | 2437 | 14.54 |
| | | 9 | 2452 | ***14.66*** |

| Mode | Band | Channel | Freq. (MHz) | Average Power (dBm) |
|---|---|---|---|---|
| IEEE 802.11a | U-NII-1 | 36 | 5180 | 11.91 |
| | | 44 | 5220 | 11.89 |
| | | 48 | 5240 | 11.97 |
| | U-NII-2A | 52 | 5260 | 11.82 |
| | | 60 | 5300 | 11.71 |
| | | 64 | 5320 | 11.67 |
| | U-NII-2C | 100 | 5500 | 12.19 |
| | | 116 | 5580 | 12.92 |
| | | 120 | 5600 | 12.97 |
| | | 140 | 5700 | 13.37 |
| | | 144 | 5720 | 13.30 |
| | U-NII-3 | 149 | 5745 | 13.27 |
| | | 157 | 5785 | 13.23 |
| | | 165 | 5825 | 13.13 |
| IEEE 802.11n-HT20 | U-NII-1 | 36 | 5180 | 10.79 |
| | | 44 | 5220 | 10.71 |
| | | 48 | 5240 | 10.68 |
| | U-NII-2A | 52 | 5260 | 10.78 |
| | | 60 | 5300 | 10.58 |
| | | 64 | 5320 | 10.44 |
| | U-NII-2C | 100 | 5500 | 11.08 |
| | | 116 | 5580 | 11.59 |
| | | 120 | 5600 | 11.78 |
| | | 140 | 5700 | 12.08 |
| | | 144 | 5720 | 12.04 |
| | U-NII-3 | 149 | 5745 | 11.97 |
| | | 157 | 5785 | 11.95 |
| | | 165 | 5825 | 11.77 |
| IEEE 802.11n-HT40 | U-NII-1 | 38 | 5190 | 10.79 |
| | | 46 | 5230 | 10.59 |
| | U-NII-2A | 54 | 5270 | 10.55 |
| | | 62 | 5310 | 10.46 |
| | U-NII-2C | 102 | 5510 | 11.05 |
| | | 110 | 5550 | 11.40 |
| | | 118 | 5590 | 11.65 |
| | | 134 | 5670 | 12.05 |
| | | 142 | 5710 | 12.01 |
| | U-NII-3 | 151 | 5755 | 11.89 |
| | | 159 | 5795 | 12.00 |
| IEEE 802.11ac-VHT20 | U-NII-1 | 36 | 5180 | 10.91 |
| | | 44 | 5220 | 10.76 |
| | | 48 | 5240 | 10.80 |
| | U-NII-2A | 52 | 5260 | 10.50 |
| | | 60 | 5300 | 10.48 |
| | | 64 | 5320 | 10.46 |
| | U-NII-2C | 100 | 5500 | 11.05 |
| | | 116 | 5580 | 11.77 |
| | | 120 | 5600 | 11.85 |
| | | 140 | 5700 | 12.00 |
| | | 144 | 5720 | 12.06 |
| | U-NII-3 | 149 | 5745 | 12.00 |
| | | 157 | 5785 | 11.93 |
| | | 165 | 5825 | 11.82 |

| Mode | Band | Channel | Freq. (MHz) | Average Power (dBm) |
|---|---|---|---|---|
| IEEE 802.11ac-VHT40 | U-NII-1 | 38 | 5190 | 10.69 |
| | | 46 | 5230 | 10.70 |
| | U-NII-2A | 54 | 5270 | 10.60 |
| | | 62 | 5310 | 10.45 |
| | U-NII-2C | 102 | 5510 | 11.13 |
| | | 110 | 5550 | 11.46 |
| | | 118 | 5590 | 11.77 |
| | | 134 | 5670 | 12.01 |
| | | 142 | 5710 | 11.99 |
| | U-NII-3 | 151 | 5755 | 11.91 |
| | | 159 | 5795 | 11.88 |
| IEEE 802.11ac-VHT80 | U-NII-1 | 42 | 5210 | 10.34 |
| | U-NII-2A | 58 | 5290 | 10.31 |
| | U-NII-2C | 106 | 5530 | 11.30 |
| | | 122 | 5610 | 11.15 |
| | | 138 | 5690 | 11.42 |
| | U-NII-3 | 155 | 5775 | 11.44 |

### 4.3.4. Conducted Power of BT

| Mode | Modulation | Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|---|---|
| BR + EDR | GFSK | 0 | 2402 | 5.69 |
| | | 39 | 2441 | 5.36 |
| | | 78 | 2480 | 6.88 |
| | π/4-DQPSK | 0 | 2402 | 2.28 |
| | | 39 | 2441 | 1.91 |
| | | 78 | 2480 | 4.06 |
| | 8-DPSK | 0 | 2402 | 2.22 |
| | | 39 | 2441 | 1.85 |
| | | 78 | 2480 | 4.01 |

| Mode | Modulation | Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|---|---|
| LE | GFSK | 0 | 2402 | -7.12 |
| | | 19 | 2440 | -4.85 |
| | | 39 | 2480 | -6.68 |

# 4.4. SAR TEST EXCLUSION EVALUATIONS

## 4.4.1. Standalone SAR Test Exclusion Considerations

According to KDB 447498 D04, SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). $P_{th}$ is given by Formula (B.2).

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad \text{(B.1)}$$

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

f is in GHz, d is the separation distance (cm), and $ERP_{20cm}$ is per Formula (B.1).

Table B.2—Example Power Thresholds (mW)

| Frequency (MHz) | Distance (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 300 | 39 | 65 | 88 | 110 | 129 | 148 | 166 | 184 | 201 | 217 |
| 450 | 22 | 44 | 67 | 89 | 112 | 135 | 158 | 180 | 203 | 226 |
| 835 | 9 | 25 | 44 | 66 | 90 | 116 | 145 | 175 | 207 | 240 |
| 1900 | 3 | 12 | 26 | 44 | 66 | 92 | 122 | 157 | 195 | 236 |
| 2450 | 3 | 10 | 22 | 38 | 59 | 83 | 111 | 143 | 179 | 219 |
| 3600 | 2 | 8 | 18 | 32 | 49 | 71 | 96 | 125 | 158 | 195 |
| 5800 | 1 | 6 | 14 | 25 | 40 | 58 | 80 | 106 | 136 | 169 |

| Mode | Max. time-averaged Power (dBm) | Gain (dBi) | ERP (dBm) | $P_{ant}$ (mW) | Left Side | | | Right Side | | | Top Side | | | Bottom Side | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ant. to Surface (cm) | $P_{th}$ (mW) | Require SAR Testing ? | Ant. to Surface (cm) | $P_{th}$ (mW) | Require SAR Testing ? | Ant. to Surface (cm) | $P_{th}$ (mW) | Require SAR Testing ? | Ant. to Surface (cm) | $P_{th}$ (mW) | Require SAR Testing ? |
| WCDMA Band II | 23.50 | -1.64 | 21.86 | 223.87 | 0.5 | 3.35 | Yes | 4.1 | 163.67 | Yes | 13.4 | 1459.96 | No | 0.5 | 3.35 | Yes |
| WCDMA Band IV | 23.50 | -1.98 | 21.52 | 223.87 | 0.5 | 3.59 | Yes | 4.1 | 168.51 | Yes | 13.4 | 1470.76 | No | 0.5 | 3.59 | Yes |
| WCDMA Band V | 24.00 | -3.09 | 18.76 | 251.19 | 0.5 | 9.07 | Yes | 4.1 | 181.11 | Yes | 13.4 | 976.82 | No | 0.5 | 9.07 | Yes |
| LTE Band 2 | 23.00 | -1.64 | 21.36 | 199.53 | 0.5 | 3.35 | Yes | 4.1 | 163.62 | Yes | 13.4 | 1459.84 | No | 0.5 | 3.35 | Yes |
| LTE Band 4 | 22.50 | -1.98 | 20.52 | 177.83 | 0.5 | 3.59 | Yes | 4.1 | 168.46 | Yes | 13.4 | 1470.63 | No | 0.5 | 3.59 | Yes |
| LTE Band 5 | 23.00 | -3.09 | 17.76 | 199.53 | 0.5 | 9.04 | Yes | 4.1 | 181.10 | Yes | 13.4 | 978.27 | No | 0.5 | 9.04 | Yes |
| LTE Band 12 | 23.00 | -8.88 | 11.97 | 199.53 | 0.5 | 11.49 | Yes | 4.1 | 182.10 | Yes | 13.4 | 862.42 | No | 0.5 | 11.49 | Yes |
| LTE Band 13 | 23.00 | -3.01 | 17.84 | 199.53 | 0.5 | 10.09 | Yes | 4.1 | 181.55 | Yes | 13.4 | 923.34 | No | 0.5 | 10.09 | Yes |
| LTE Band 17 | 22.50 | -8.88 | 11.47 | 177.83 | 0.5 | 11.53 | Yes | 4.1 | 182.11 | No | 13.4 | 860.81 | No | 0.5 | 11.53 | Yes |
| WLAN 2.4G | 18.50 | 1.22 | 19.72 | 93.76 | 6.5 | 360.00 | No | 0.5 | 2.72 | Yes | 2 | 38.16 | Yes | 11.6 | 1084.59 | No |
| WLAN 5.2G | 12.00 | 2.38 | 14.38 | 27.42 | 6.5 | 299.69 | No | 0.5 | 1.49 | Yes | 2 | 26.21 | Yes | 11.6 | 992.36 | No |
| WLAN 5.3G | 10.50 | 2.38 | 12.88 | 19.41 | 6.5 | 298.58 | No | 0.5 | 1.47 | Yes | 2 | 26.01 | No | 11.6 | 990.59 | No |
| WLAN 5.8G | 11.00 | 1.41 | 12.41 | 17.42 | 6.5 | 292.05 | No | 0.5 | 1.37 | Yes | 2 | 24.86 | No | 11.6 | 980.02 | No |
| Bluetooth | 7.50 | 1.22 | 8.72 | 7.45 | 6.5 | 359.72 | No | 0.5 | 2.72 | Yes | 2 | 38.10 | No | 11.6 | 1084.18 | No |

Note:

1) Based on the antenna location shown on appendix D of this report for SAR test exclusion.
2) The 1 mW Blanket Exemption applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

### 4.4.2. Estimated SAR Calculation

According to KDB 447498 D04, when an antenna qualifies for test exemption in single transmitter/antenna mode, its actual SAR value may not be available, because it was not required to be measured. In this case, the SAR contribution of that antenna to simultaneous transmission must be estimated relative to the SAR or MPE based exemption criteria for the applicable terms in the equation of § 1.1307(b)(3(ii)(B) (see also Appendix C), by multiplying the corresponding ratio by the SAR limit of 1.6 W/kg for 1-g SAR. This is referred to as estimated SAR.

For instance, a given antenna may qualify for a SAR-based exemption according to Section B.4, with $P_{ant} < P_{th}$, where Pant is maximum time-averaged power or effective radiated power (ERP), whichever is greater, and $P_{th}$ is defined in Formula (B.2). Then, per the preceding paragraph, the estimated SAR is computed as $SAR_{est} = 1.6 * P_{ant} / P_{th}$ [W/kg].

| Mode / Band | Frequency (GHz) | $P_{ant}$ (mW) | Ant. to Surface (cm) | $P_{th}$ (mW) | Test Position | Estimated 1g SAR (W/kg) |
|---|---|---|---|---|---|---|
| WCDMA Band II | 1907.6 | 223.87 | 13.4 | 1459.96 | Top Side | 0.245 |
| WCDMA Band IV | 1752.6 | 223.87 | 13.4 | 1470.76 | Top Side | 0.244 |
| WCDMA Band V | 846.6 | 251.19 | 13.4 | 976.82 | Top Side | 0.411 |
| LTE Band 2 | 1909.3 | 199.53 | 13.4 | 1459.84 | Top Side | 0.219 |
| LTE Band 4 | 1754.3 | 177.83 | 13.4 | 1470.63 | Top Side | 0.193 |
| LTE Band 5 | 848.3 | 199.53 | 13.4 | 978.27 | Top Side | 0.326 |
| LTE Band 12 | 715.3 | 199.53 | 13.4 | 862.42 | Top Side | 0.370 |
| LTE Band 13 | 784.5 | 199.53 | 13.4 | 923.34 | Top Side | 0.346 |
| LTE Band 17 | 713.5 | 177.83 | 13.4 | 860.81 | Top Side | 0.331 |
| WLAN 2.4G | 2472 | 93.76 | 6.5 | 360.00 | Left Side | 0.417 |
| WLAN 5.2G | 5240 | 27.42 | 6.5 | 299.69 | Left Side | 0.146 |
| WLAN 5.3G | 5320 | 19.41 | 6.5 | 298.58 | Left Side | 0.104 |
| WLAN 5.8G | 5825 | 17.42 | 6.5 | 292.05 | Left Side | 0.095 |
| Bluetooth | 2480 | 7.45 | 6.5 | 359.72 | Left Side | 0.033 |
| WLAN 2.4G | 2472 | 93.76 | 11.6 | 1084.59 | Bottom Side | 0.138 |
| WLAN 5.2G | 5240 | 27.42 | 11.6 | 992.36 | Bottom Side | 0.044 |
| WLAN 5.3G | 5320 | 19.41 | 11.6 | 990.59 | Bottom Side | 0.031 |
| WLAN 5.8G | 5825 | 17.42 | 11.6 | 980.02 | Bottom Side | 0.028 |
| Bluetooth | 2480 | 7.45 | 11.6 | 1084.18 | Bottom Side | 0.011 |

# 4.5. SAR TESTING RESULTS

## 4.5.1. SAR Test Reduction Considerations

**KDB 447498 D04 Interim General RF Exposure Guidance**

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

a) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
b) ≤ 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
c) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

**KDB 941225 D01 3G SAR Procedures**

a) GSM SAR Test Reduction

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. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

b) 3G SAR Test Reduction Procedure

The mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ 1/4 dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

**KDB 941225 D05 SAR for LTE Devices**

a) QPSK with 1 RB and 50% RB allocation

Start with the largest channel bandwidth and measure SAR, 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 of the remaining RB offset configurations and required test channels is not required; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

b) QPSK with 100% RB allocation

SAR is not required when the highest maximum output power for 100% RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

c) Higher order modulations

SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > 1/2 dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

d) Others channel bandwidth

SAR is required when the highest maximum output power of the smaller channel bandwidth is > 1/2 dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

**KDB 248227 D01 Wi-Fi SAR**

a) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is <= 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is <= 0.8 W/kg or all test positions are measured.

b) For WLAN 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is <= 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2 W/kg.

c) For WLAN 5 GHz, the initial test configuration was selected according to the transmission mode with the highest maximum output power. When the reported SAR of initial test configuration is > 0.8 W/kg, SAR is required for the subsequent highest measured output power channel until the reported SAR result is <= 1.2 W/kg or all required channels are measured. For other transmission modes, SAR is not required when the highest reported SAR for initial test configuration is adjusted by the ratio of subsequent test configuration to initial test configuration specified maximum output power and it is <= 1.2 W/kg.

d) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

## 4.5.2. SAR Results for Body Exposure Condition (Separation Distance is 0.5 cm)

| Plot No. | Band | Mode | Test Position | Channel | RB# | RB Offset | Duty Cycle | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Power Drift (dB) | Measured SAR-1g (W/kg) | Measured SAR-10g (W/kg) | Scaling Factor | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WCDMA Band II | RMC12.2K | Front Face | 9262 | - | - | - | 23.5 | 22.96 | 0.05 | 0.335 | 0.206 | 1.13 | 0.379 |
| 1 | WCDMA Band II | RMC12.2K | Rear Face | 9262 | - | - | - | 23.5 | 22.96 | -0.10 | 0.868 | 0.506 | 1.13 | **0.983** |
| * | WCDMA Band II | RMC12.2K | Rear Face | 9262 | - | - | - | 23.5 | 22.96 | -0.11 | 0.867 | 0.507 | 1.13 | 0.982 |
| | WCDMA Band II | RMC12.2K | Left Side | 9262 | - | - | - | 23.5 | 22.96 | -0.05 | 0.269 | 0.156 | 1.13 | 0.305 |
| | WCDMA Band II | RMC12.2K | Right Side | 9262 | - | - | - | 23.5 | 22.96 | -0.03 | 0.0398 | 0.0232 | 1.13 | 0.045 |
| | WCDMA Band II | RMC12.2K | Bottom Side | 9262 | - | - | - | 23.5 | 22.96 | 0.03 | 0.269 | 0.156 | 1.13 | 0.305 |
| | WCDMA Band II | RMC12.2K | Rear Face | 9400 | - | - | - | 23.5 | 22.96 | -0.03 | 0.765 | 0.435 | 1.13 | 0.866 |
| | WCDMA Band II | RMC12.2K | Rear Face | 9538 | - | - | - | 23.5 | 22.96 | -0.02 | 0.655 | 0.366 | 1.13 | 0.742 |
| | WCDMA Band IV | RMC12.2K | Front Face | 1513 | - | - | - | 23.5 | 22.76 | -0.01 | 0.174 | 0.102 | 1.19 | 0.206 |
| 2 | WCDMA Band IV | RMC12.2K | Rear Face | 1513 | - | - | - | 23.5 | 22.76 | -0.12 | 0.547 | 0.274 | 1.19 | **0.649** |
| | WCDMA Band IV | RMC12.2K | Left Side | 1513 | - | - | - | 23.5 | 22.76 | -0.17 | 0.123 | 0.0699 | 1.19 | 0.146 |
| | WCDMA Band IV | RMC12.2K | Right Side | 1513 | - | - | - | 23.5 | 22.76 | 0.05 | 0.0151 | 0.00839 | 1.19 | 0.018 |
| | WCDMA Band IV | RMC12.2K | Bottom Side | 1513 | - | - | - | 23.5 | 22.76 | 0.04 | 0.222 | 0.116 | 1.19 | 0.263 |
| | WCDMA Band V | RMC12.2K | Front Face | 4132 | - | - | - | 24.0 | 23.35 | 0.06 | 0.0492 | 0.0342 | 1.16 | 0.057 |
| 3 | WCDMA Band V | RMC12.2K | Rear Face | 4132 | - | - | - | 24.0 | 23.35 | 0.02 | 0.265 | 0.146 | 1.16 | **0.308** |
| | WCDMA Band V | RMC12.2K | Left Side | 4132 | - | - | - | 24.0 | 23.35 | -0.06 | 0.115 | 0.053 | 1.16 | 0.134 |
| | WCDMA Band V | RMC12.2K | Right Side | 4132 | - | - | - | 24.0 | 23.35 | 0.03 | 0.0318 | 0.0216 | 1.16 | 0.037 |
| | WCDMA Band V | RMC12.2K | Bottom Side | 4132 | - | - | - | 24.0 | 23.35 | 0.02 | 0.113 | 0.0659 | 1.16 | 0.131 |
| | LTE Band 2 | QPSK20M | Front Face | 18700 | 1 | 49 | - | 23.0 | 22.36 | 0.11 | 0.242 | 0.151 | 1.16 | 0.280 |
| 4 | LTE Band 2 | QPSK20M | Rear Face | 18700 | 1 | 49 | - | 23.0 | 22.36 | 0.08 | 0.484 | 0.266 | 1.16 | **0.561** |
| | LTE Band 2 | QPSK20M | Left Side | 18700 | 1 | 49 | - | 23.0 | 22.36 | -0.09 | 0.23 | 0.131 | 1.16 | 0.267 |
| | LTE Band 2 | QPSK20M | Right Side | 18700 | 1 | 49 | - | 23.0 | 22.36 | -0.10 | 0.0328 | 0.0191 | 1.16 | 0.038 |
| | LTE Band 2 | QPSK20M | Bottom Side | 18700 | 1 | 49 | - | 23.0 | 22.36 | -0.02 | 0.198 | 0.115 | 1.16 | 0.229 |
| | LTE Band 2 | QPSK20M | Front Face | 18700 | 50 | 50 | - | 23.0 | 22.30 | 0.14 | 0.185 | 0.114 | 1.17 | 0.217 |
| | LTE Band 2 | QPSK20M | Rear Face | 18700 | 50 | 50 | - | 23.0 | 22.30 | -0.08 | 0.364 | 0.199 | 1.17 | 0.428 |
| | LTE Band 2 | QPSK20M | Left Side | 18700 | 50 | 50 | - | 23.0 | 22.30 | -0.17 | 0.172 | 0.0975 | 1.17 | 0.202 |
| | LTE Band 2 | QPSK20M | Right Side | 18700 | 50 | 50 | - | 23.0 | 22.30 | -0.08 | 0.0241 | 0.014 | 1.17 | 0.028 |
| | LTE Band 2 | QPSK20M | Bottom Side | 18700 | 50 | 50 | - | 23.0 | 22.30 | -0.02 | 0.15 | 0.0861 | 1.17 | 0.176 |
| | LTE Band 4 | QPSK20M | Front Face | 20300 | 1 | 49 | - | 22.5 | 21.95 | -0.07 | 0.138 | 0.0813 | 1.14 | 0.157 |
| 5 | LTE Band 4 | QPSK20M | Rear Face | 20300 | 1 | 49 | - | 22.5 | 21.95 | -0.04 | 0.409 | 0.21 | 1.14 | **0.464** |
| | LTE Band 4 | QPSK20M | Left Side | 20300 | 1 | 49 | - | 22.5 | 21.95 | -0.02 | 0.117 | 0.066 | 1.14 | 0.133 |
| | LTE Band 4 | QPSK20M | Right Side | 20300 | 1 | 49 | - | 22.5 | 21.95 | -0.01 | 0.0143 | 0.00782 | 1.14 | 0.016 |

| Plot No. | Band | Mode | Test Position | Channel | RB# | RB Offset | Duty Cycle | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Power Drift (dB) | Measured SAR-1g (W/kg) | Measured SAR-10g (W/kg) | Scaling Factor | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LTE Band 4 | QPSK20M | Bottom Side | 20300 | 1 | 49 | - | 22.5 | 21.95 | 0.05 | 0.167 | 0.0876 | 1.14 | 0.190 |
| | LTE Band 4 | QPSK20M | Front Face | 20300 | 50 | 0 | - | 21.5 | 20.82 | 0.10 | 0.121 | 0.0703 | 1.17 | 0.142 |
| | LTE Band 4 | QPSK20M | Rear Face | 20300 | 50 | 0 | - | 21.5 | 20.82 | -0.19 | 0.381 | 0.194 | 1.17 | 0.446 |
| | LTE Band 4 | QPSK20M | Left Side | 20300 | 50 | 0 | - | 21.5 | 20.82 | 0.02 | 0.0965 | 0.0552 | 1.17 | 0.113 |
| | LTE Band 4 | QPSK20M | Right Side | 20300 | 50 | 0 | - | 21.5 | 20.82 | 0.05 | 0.014 | 0.00772 | 1.17 | 0.016 |
| | LTE Band 4 | QPSK20M | Bottom Side | 20300 | 50 | 0 | - | 21.5 | 20.82 | 0.04 | 0.141 | 0.0757 | 1.17 | 0.165 |
| | LTE Band 5 | QPSK10M | Front Face | 20525 | 1 | 25 | - | 23.0 | 22.74 | -0.03 | 0.0901 | 0.0698 | 1.06 | 0.096 |
| 6 | LTE Band 5 | QPSK10M | Rear Face | 20525 | 1 | 25 | - | 23.0 | 22.74 | -0.10 | 0.469 | 0.281 | 1.06 | **0.498** |
| | LTE Band 5 | QPSK10M | Left Side | 20525 | 1 | 25 | - | 23.0 | 22.74 | -0.15 | 0.171 | 0.0881 | 1.06 | 0.182 |
| | LTE Band 5 | QPSK10M | Right Side | 20525 | 1 | 25 | - | 23.0 | 22.74 | -0.04 | 0.0595 | 0.0452 | 1.06 | 0.063 |
| | LTE Band 5 | QPSK10M | Bottom Side | 20525 | 1 | 25 | - | 23.0 | 22.74 | 0.16 | 0.176 | 0.115 | 1.06 | 0.187 |
| | LTE Band 5 | QPSK10M | Front Face | 20450 | 25 | 25 | - | 22.0 | 21.42 | -0.19 | 0.0673 | 0.0526 | 1.14 | 0.077 |
| | LTE Band 5 | QPSK10M | Rear Face | 20450 | 25 | 25 | - | 22.0 | 21.42 | 0.17 | 0.424 | 0.25 | 1.14 | 0.485 |
| | LTE Band 5 | QPSK10M | Left Side | 20450 | 25 | 25 | - | 22.0 | 21.42 | 0.04 | 0.156 | 0.0805 | 1.14 | 0.178 |
| | LTE Band 5 | QPSK10M | Right Side | 20450 | 25 | 25 | - | 22.0 | 21.42 | 0.05 | 0.0554 | 0.0405 | 1.14 | 0.063 |
| | LTE Band 5 | QPSK10M | Bottom Side | 20450 | 25 | 25 | - | 22.0 | 21.42 | 0.08 | 0.151 | 0.0977 | 1.14 | 0.173 |
| | LTE Band 12(17) | QPSK10M | Front Face | 23060 | 1 | 25 | - | 23.0 | 22.56 | -0.04 | 0.0609 | 0.0473 | 1.11 | 0.067 |
| 7 | LTE Band 12(17) | QPSK10M | Rear Face | 23060 | 1 | 25 | - | 23.0 | 22.56 | 0.13 | 0.42 | 0.27 | 1.11 | **0.465** |
| | LTE Band 12(17) | QPSK10M | Left Side | 23060 | 1 | 25 | - | 23.0 | 22.56 | -0.06 | 0.193 | 0.121 | 1.11 | 0.214 |
| | LTE Band 12(17) | QPSK10M | Right Side | 23060 | 1 | 25 | - | 23.0 | 22.56 | -0.06 | 0.0632 | 0.0501 | 1.11 | 0.070 |
| | LTE Band 12(17) | QPSK10M | Bottom Side | 23060 | 1 | 25 | - | 23.0 | 22.56 | -0.02 | 0.0872 | 0.0596 | 1.11 | 0.096 |
| | LTE Band 12(17) | QPSK10M | Front Face | 23095 | 25 | 25 | - | 21.5 | 21.16 | -0.02 | 0.0736 | 0.0569 | 1.08 | 0.080 |
| | LTE Band 12(17) | QPSK10M | Rear Face | 23095 | 25 | 25 | - | 21.5 | 21.16 | -0.02 | 0.377 | 0.243 | 1.08 | 0.408 |
| | LTE Band 12(17) | QPSK10M | Left Side | 23095 | 25 | 25 | - | 21.5 | 21.16 | 0.05 | 0.221 | 0.166 | 1.08 | 0.239 |
| | LTE Band 12(17) | QPSK10M | Right Side | 23095 | 25 | 25 | - | 21.5 | 21.16 | 0.19 | 0.0798 | 0.0621 | 1.08 | 0.086 |
| | LTE Band 12(17) | QPSK10M | Bottom Side | 23095 | 25 | 25 | - | 21.5 | 21.16 | 0.09 | 0.104 | 0.071 | 1.08 | 0.112 |
| | LTE Band 13 | QPSK10M | Front Face | 23230 | 1 | 25 | - | 23.0 | 22.40 | 0.10 | 0.0946 | 0.0724 | 1.15 | 0.109 |
| 8 | LTE Band 13 | QPSK10M | Rear Face | 23230 | 1 | 25 | - | 23.0 | 22.40 | 0.02 | 0.444 | 0.284 | 1.15 | **0.510** |
| | LTE Band 13 | QPSK10M | Left Side | 23230 | 1 | 25 | - | 23.0 | 22.40 | -0.02 | 0.183 | 0.14 | 1.15 | 0.210 |
| | LTE Band 13 | QPSK10M | Right Side | 23230 | 1 | 25 | - | 23.0 | 22.40 | 0.09 | 0.0536 | 0.0416 | 1.15 | 0.062 |
| | LTE Band 13 | QPSK10M | Bottom Side | 23230 | 1 | 25 | - | 23.0 | 22.40 | 0.03 | 0.147 | 0.0989 | 1.15 | 0.169 |
| | LTE Band 13 | QPSK10M | Front Face | 23230 | 25 | 0 | - | 22.0 | 21.32 | 0.04 | 0.0755 | 0.0577 | 1.17 | 0.088 |
| | LTE Band 13 | QPSK10M | Rear Face | 23230 | 25 | 0 | - | 22.0 | 21.32 | -0.20 | 0.351 | 0.224 | 1.17 | 0.410 |

| Plot No. | Band | Mode | Test Position | Channel | RB# | RB Offset | Duty Cycle | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Power Drift (dB) | Measured SAR-1g (W/kg) | Measured SAR-10g (W/kg) | Scaling Factor | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LTE Band 13 | QPSK10M | Left Side | 23230 | 25 | 0 | - | 22.0 | 21.32 | 0.04 | 0.145 | 0.112 | 1.17 | 0.170 |
| | LTE Band 13 | QPSK10M | Right Side | 23230 | 25 | 0 | - | 22.0 | 21.32 | 0.04 | 0.0426 | 0.0336 | 1.17 | 0.050 |
| | LTE Band 13 | QPSK10M | Bottom Side | 23230 | 25 | 0 | - | 22.0 | 21.32 | 0.06 | 0.115 | 0.0785 | 1.17 | 0.134 |
| | 2.4GHz | IEEE 802.11b | Front Face | 11 | - | - | 99.52% | 18.5 | 17.88 | 0.02 | 0.0134 | 0.00826 | 1.15 | 0.016 |
| 9 | 2.4GHz | IEEE 802.11b | Rear Face | 11 | - | - | 99.52% | 18.5 | 17.88 | 0.08 | 0.665 | 0.265 | 1.15 | **0.771** |
| | 2.4GHz | IEEE 802.11b | Right Side | 11 | - | - | 99.52% | 18.5 | 17.88 | 0.17 | 0.112 | 0.0531 | 1.15 | 0.130 |
| | 2.4GHz | IEEE 802.11b | Top Side | 11 | - | - | 99.52% | 18.5 | 17.88 | 0.07 | 0.00701 | 0.00394 | 1.15 | 0.008 |
| | 2.4GHz | Bluetooth DH5 | Front Face | 78 | - | - | 77.20% | 7.5 | 6.88 | 0.02 | 0.00215 | 0.00181 | 1.15 | 0.003 |
| 10 | 2.4GHz | Bluetooth DH5 | Rear Face | 78 | - | - | 77.20% | 7.5 | 6.88 | 0.07 | 0.0541 | 0.0214 | 1.15 | **0.081** |
| | 2.4GHz | Bluetooth DH5 | Right Side | 78 | - | - | 77.20% | 7.5 | 6.88 | 0.13 | 0.00747 | 0.0035 | 1.15 | 0.011 |
| | 2.4GHz | Bluetooth DH5 | Top Side | 78 | - | - | 77.20% | 7.5 | 6.88 | 0.06 | <0.0001 | <0.0001 | 1.15 | <0.001 |
| | U-NII-1 | IEEE 802.11a | Front Face | 36 | - | - | 96.53% | 12.5 | 11.82 | 0.03 | 0.00554 | 0.00133 | 1.17 | 0.007 |
| 11 | U-NII-1 | IEEE 802.11a | Rear Face | 36 | - | - | 96.53% | 12.5 | 11.82 | -0.10 | 0.886 | 0.23 | 1.17 | **1.073** |
| * | U-NII-1 | IEEE 802.11a | Rear Face | 36 | - | - | 96.53% | 12.5 | 11.82 | 0.00 | 0.84 | 0.227 | 1.17 | 1.018 |
| | U-NII-1 | IEEE 802.11a | Right Side | 36 | - | - | 96.53% | 12.5 | 11.82 | -0.02 | 0.157 | 0.0555 | 1.17 | 0.190 |
| | U-NII-1 | IEEE 802.11a | Top Side | 36 | - | - | 96.53% | 12.5 | 11.82 | 0.18 | 0.0483 | 0.0155 | 1.17 | 0.059 |
| | U-NII-1 | IEEE 802.11a | Rear Face | 44 | - | - | 96.53% | 12.5 | 11.74 | -0.10 | 0.717 | 0.195 | 1.19 | 0.885 |
| | U-NII-1 | IEEE 802.11a | Rear Face | 48 | - | - | 96.53% | 12.5 | 11.76 | -0.10 | 0.739 | 0.2 | 1.19 | 0.908 |
| | U-NII-2A | IEEE 802.11a | Front Face | 52 | - | - | 96.53% | 12.0 | 11.67 | -0.13 | 0.00974 | 0.00277 | 1.08 | 0.011 |
| 12 | U-NII-2A | IEEE 802.11a | Rear Face | 52 | - | - | 96.53% | 12.0 | 11.67 | 0.00 | 0.841 | 0.219 | 1.08 | **0.940** |
| * | U-NII-2A | IEEE 802.11a | Rear Face | 52 | - | - | 96.53% | 12.0 | 11.67 | -0.10 | 0.801 | 0.21 | 1.08 | 0.895 |
| | U-NII-2A | IEEE 802.11a | Right Side | 52 | - | - | 96.53% | 12.0 | 11.67 | 0.02 | 0.148 | 0.0517 | 1.08 | 0.165 |
| | U-NII-2A | IEEE 802.11a | Top Side | 52 | - | - | 96.53% | 12.0 | 11.67 | -0.09 | 0.0434 | 0.0183 | 1.08 | 0.049 |
| | U-NII-2A | IEEE 802.11a | Rear Face | 60 | - | - | 96.53% | 12.0 | 11.56 | 0.00 | 0.696 | 0.185 | 1.11 | 0.798 |
| | U-NII-2A | IEEE 802.11a | Rear Face | 64 | - | - | 96.53% | 12.0 | 11.52 | 0.10 | 0.666 | 0.177 | 1.12 | 0.771 |
| | U-NII-2C | IEEE 802.11a | Front Face | 140 | - | - | 96.53% | 13.5 | 13.22 | 0.07 | 0.0179 | 0.00675 | 1.07 | 0.020 |
| 13 | U-NII-2C | IEEE 802.11a | Rear Face | 140 | - | - | 96.53% | 13.5 | 13.22 | 0.00 | 1.02 | 0.266 | 1.07 | **1.127** |
| * | U-NII-2C | IEEE 802.11a | Rear Face | 140 | - | - | 96.53% | 13.5 | 13.22 | -0.01 | 0.921 | 0.239 | 1.07 | 1.018 |
| | U-NII-2C | IEEE 802.11a | Right Side | 140 | - | - | 96.53% | 13.5 | 13.22 | 0.07 | 0.191 | 0.0648 | 1.07 | 0.211 |
| | U-NII-2C | IEEE 802.11a | Top Side | 140 | - | - | 96.53% | 13.5 | 13.22 | 0.05 | 0.0252 | 0.0102 | 1.07 | 0.028 |
| | U-NII-2C | IEEE 802.11a | Rear Face | 100 | - | - | 96.53% | 13.5 | 12.04 | -0.04 | 0.744 | 0.0199 | 1.40 | 1.079 |
| | U-NII-2C | IEEE 802.11a | Rear Face | 116 | - | - | 96.53% | 13.5 | 12.82 | -0.13 | 0.796 | 0.203 | 1.17 | 0.964 |
| | U-NII-3 | IEEE 802.11a | Front Face | 149 | - | - | 96.53% | 13.5 | 13.12 | 0.13 | 0.0179 | 0.00675 | 1.09 | 0.020 |

| Plot No. | Band | Mode | Test Position | Channel | RB# | RB Offset | Duty Cycle | Max. Tune-up Power (dBm) | Measured Conducted Power (dBm) | Power Drift (dB) | Measured SAR-1g (W/kg) | Measured SAR-10g (W/kg) | Scaling Factor | Scaled SAR-1g (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | U-NII-3 | IEEE 802.11a | Rear Face | 149 | - | - | 96.53% | 13.5 | 13.12 | -0.10 | 1.06 | 0.276 | 1.09 | **1.199** |
| * | U-NII-3 | IEEE 802.11a | Rear Face | 149 | - | - | 96.53% | 13.5 | 13.12 | 0.00 | 1.03 | 0.268 | 1.09 | 1.165 |
| | U-NII-3 | IEEE 802.11a | Right Side | 149 | - | - | 96.53% | 13.5 | 13.12 | 0.06 | 0.213 | 0.0724 | 1.09 | 0.241 |
| | U-NII-3 | IEEE 802.11a | Top Side | 149 | - | - | 96.53% | 13.5 | 13.12 | 0.07 | 0.0282 | 0.0115 | 1.09 | 0.032 |
| | U-NII-3 | IEEE 802.11a | Rear Face | 157 | - | - | 96.53% | 13.5 | 13.08 | 0.10 | 0.877 | 0.223 | 1.10 | 1.001 |
| | U-NII-3 | IEEE 802.11a | Rear Face | 165 | - | - | 96.53% | 13.5 | 12.98 | -0.10 | 0.89 | 0.227 | 1.13 | 1.039 |

**Note:**

1. Scaled SAR-1g (W/kg) = (Measured SAR-1g (W/kg) x Scaling Factor) / Duty Cycle.
2. "*" indicates that the data is repeated.

# 4.6. SAR MEASUREMENT VARIABILITY

## 4.6.1. Repeated Measurement

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. 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.

SAR repeated measurement procedure:

1) When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2) When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3) If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20, or when the original or repeated measurement is >= 1.45 W/kg, perform a second repeated measurement.
4) If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

| Band | Mode | Test Position | Channel | Original Measured SAR-1g (W/kg) | 1st Repeated SAR-1g (W/kg) | L/S Ratio | 2nd Repeated SAR-1g (W/kg) | L/S Ratio | 3rd Repeated SAR-1g (W/kg) | L/S Ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| Body Exposure Condition | | | | | | | | | | |
| WCDMA Band II | RMC12.2K | Rear Face | 9262 | 0.868 | 0.867 | 1.0012 | N/A | N/A | N/A | N/A |
| U-NII-1 | IEEE 802.11a | Rear Face | 36 | 0.886 | 0.84 | 1.0548 | N/A | N/A | N/A | N/A |
| U-NII-2A | IEEE 802.11a | Rear Face | 52 | 0.841 | 0.801 | 1.0499 | N/A | N/A | N/A | N/A |
| U-NII-2C | IEEE 802.11a | Rear Face | 140 | 1.02 | 0.921 | 1.1075 | N/A | N/A | N/A | N/A |
| U-NII-3 | IEEE 802.11a | Rear Face | 149 | 1.06 | 1.03 | 1.0291 | N/A | N/A | N/A | N/A |

# 4.7. SIMULTANEOUS MULTI-BAND TRANSMISSION EVALUATION

## 4.7.1. Simultaneous Transmission SAR Test Exclusion Considerations

a) Sum of SAR

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR1g 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR1g is greater than the SAR limit (SAR1g 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

b) SAR to Peak Location Separation Ratio

The simultaneous transmitting antennas in each operating mode and exposure condition combination are considered one pair at a time to determine the SPLSR.

$$SPLSR = (SAR_1 + SAR_2)^{1.5}/R_i$$

The ratio is rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10.
$SAR_1$ and $SAR_2$ are the highest reported or estimated SAR values for each antenna in the pair, and $R_i$ is the separation distance in mm between the peak SAR locations for the antenna pair

$$peak\ location\ separation\ distance = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Where $(x_1,\ y_1,\ z_1)$ and $(x_2,\ y_2,\ z_2)$ are the coordinates of the extrapolated peak SAR locations in the area or zoom scans.
When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location will be translated onto the test device to determine the peak location separation for the antenna pair.
When SAR is estimated for both antennas, the peak location separation should be determined by the closest physical separation of the antennas, according to the feed-point or geometric center of the antennas.

c) Volume Scan

When the SPLSR is <= 0.04 for 1-g SAR and <= 0.10 for 10-g SAR, the simultaneous transmission SAR is not required. Otherwise, the enlarged zoom scan and volume scan post-processing procedures will be performed.

### 4.7.2. Simultaneous Transmission Possibilities

The simultaneous transmission possibilities for this device are listed as below.

| Simultaneous Transmission Configurations | Body Exposure Condition |
|---|---|
| WCDMA (Voice / Data) + WLAN (Data) | No |
| LTE (Data) + WLAN (Data) | No |
| WCDMA (Voice / Data) + BT (Data) | No |
| LTE (Data) + BT (Data) | No |

Note:

1) The 2.4G WLAN and 5G WLAN cannot transmit simultaneously.
2) The WLAN and Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for WLAN and Bluetooth.
3) Both WCDMA and LTE can transmit through either WWAN MAIN Ant. However, only one technology (WCDMA or LTE) can transmit from an antenna at a time, and the other technology transmits through the other antenna.

*** End of Report ***

# APPENDIX A. SAR PLOTS OF SYSTEM VERIFICATION

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

# APPENDIX B. SAR PLOTS OF SAR MEASUREMENT

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

# APPENDIX C. CALIBRATION CERTIFICATE FOR PROBE AND DIPOLE

The calibration certificates are shown as follows.

# APPENDIX D. PHOTOGRAPHS OF EUT AND SETUP

The photographs of EUT and setup are shown as follows.