TESTING
NVLAP LAB CODE 600118-0

# SAR TEST REPORT

## No. I21Z60407-SEM01

**For**

**Shenzhen Tinno Mobile Technology Corp.**

**4G MIFI**

**Model Name: UM200AA**

**with**

**Hardware Version: V1.2**

**Software Version: UM200AA V01.64.10**

**FCC ID: XD6UM200AA**

**Issued Date: 2021-4-15**

**Note:**

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## REPORT HISTORY

| Report Number | Revision | Issue Date | Description |
|---|---|---|---|
| I21Z60407-SEM01 | Rev.0 | 2021-3-3 | Initial creation of test report |
| I21Z60407-SEM01 | Rev.1 | 2021-4-6 | Update ANNEX G Sensor Triggering Data Summary. |
| I21Z60407-SEM01 | Rev.2 | 2021-4-15 | Add the spot check values on the bottom side of two band on ANNEX J |

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# 1 Test Laboratory

## 1.1 Testing Location

| | |
|---|---|
| Company Name: | CTTL |
| Address: | No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191. |

## 1.2 Testing Environment

| | |
|---|---|
| Temperature: | 18°C~25°C, |
| Relative humidity: | 30%~ 70% |
| Ground system resistance: | < 0.5 Ω |
| Ambient noise & Reflection: | < 0.012 W/kg |

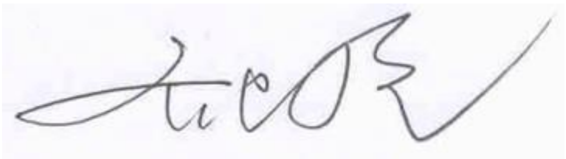
## 1.3 Project Data

| | |
|---|---|
| Project Leader: | Qi Dianyuan |
| Test Engineer: | Lin Xiaojun |
| Testing Start Date: | February 27, 2021 |
| Testing End Date: | February 28, 2021 |

## 1.4 Signature

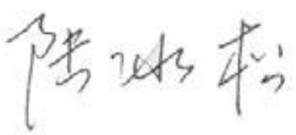
**Lin Xiaojun**

**(Prepared this test report)**



**Qi Dianyuan**

**(Reviewed this test report)**



**Lu Bingsong**

**Deputy Director of the laboratory**

**(Approved this test report)**

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## 2 Statement of Compliance

**This EUT is a variant product and the report of original sample is No.I21Z60214-SEM01. We do the spot check on highest value point in each band of the original report for body and spot check of bottom side for LTE band 2 and band5. The results of spot check are presented in the annex J.**

The maximum results of Specific Absorption Rate (SAR) found during testing for Shenzhen Tinno Mobile Technology Corp.4G MIFI UM200AA is as follows:

**Table 2.1: Highest Reported SAR (1g)**

| Exposure Configuration | Technology Band | Highest Reported SAR 1g(W/kg) | Equipment Class |
|---|---|---|---|
| Body | LTE Band2 | **0.91** | PCE |
| | LTE Band5 | **0.97** | |
| | LTE Band12 | **0.73** | |
| | LTE Band14 | **0.72** | |
| | LTE Band30 | **0.96** | |
| | LTE Band66 | **0.75** | |
| | WLAN 2.4 GHz | **0.54** | DTS |
| | WLAN 5 GHz | **0.53** | NII |

The SAR values found for the MIFI are below the maximum recommended levels of 1.6 W/kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report. The highest reported SAR value is obtained at the case of **(Table 2.1),** and the values are**: 0.97W/kg(1g).**

Remark:

This device supports both LTE B4 and LTE B66.Since the supported frequency span for LTE B4 falls completely within the supports frequency span for B66, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B66.

**Table 2.2: The sum of SAR values for Main antenna + WiFi-2.4G**

| | Position | Main antenna | WiFi-2.4G | Sum |
|---|---|---|---|---|
| **Highest SAR value for Body** | Top 5mm (LTE Band2) | 0.89 | 0.54 | **1.43** |

**Table 2.3: The sum of SAR values for Main antenna + WiFi-5G**

| | Position | Main antenna | WiFi-5G | Sum |
|---|---|---|---|---|
| **Highest SAR value for Body** | Front 5mm (LTE Band30) | 0.96 | 0.53 | **1.49** |

According to the above tables, the highest sum of reported SAR values is **1.49 W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

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# 3 Client Information

## 3.1 Applicant Information

| | |
|---|---|
| Company Name: | Shenzhen Tinno Mobile Technology Corp. |
| Address/Post: | 4/F, H-3 Building,OCT Eastern Industrial Park. NO.1 XiangShan East Road, Nan Shan District,Shenzhen, P.R.China |
| Contact Person: | xiaoping.li |
| Contact Email: | xiaoping.li@tinno.com |
| Telephone: | 0755-86095550 |

## 3.2 Manufacturer Information

| | |
|---|---|
| Company Name: | Shenzhen Tinno Mobile Technology Corp. |
| Address/Post: | 4/F, H-3 Building,OCT Eastern Industrial Park. NO.1 XiangShan East Road, Nan Shan District,Shenzhen, P.R.China |
| Contact Person: | xiaoping.li |
| Contact Email: | xiaoping.li@tinno.com |
| Telephone: | 0755-86095550 |

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# 4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

## 4.1 About EUT

| | |
|---|---|
| Description: | Shenzhen Tinno Mobile Technology Corp. |
| Model name: | UM200AA |
| Operating mode(s): | LTEBand2/4/5/12/14/30/66,<br>Wi-Fi2.4G, Wi-Fi5G |
| Tested Tx Frequency: | 1850 – 1910 MHz (LTE Band 2) |
| | 824 – 849 MHz (LTE Band 5) |
| | 699 – 716 MHz (LTE Band 12) |
| | 788 –798 MHz (LTE Band 14) |
| | 2305 –2315 MHz (LTE Band 30) |
| | 1710 –1780 MHz (LTE Band 66) |
| | 2412 – 2462 MHz (Wi-Fi 2.4G) |
| | 5180 – 5240 MHz (Wi-Fi 5.2G) |
| | 5260 – 5320 MHz (Wi-Fi 5.3G) |
| | 5500 – 5720 MHz (Wi-Fi 5.5G) |
| | 5745 – 5825 MHz (Wi-Fi 5.8G) |
| Test device Production information: | Production unit |
| Device type: | MiFi |
| Antenna type: | Integrated antenna |
| Hotspot mode: | Support |

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### 4.2 Internal Identification of EUT used during the test

| EUT ID* | IMEI | HW Version | SW Version |
|---|---|---|---|
| EUT1 | 865770050011909 | V1.2 | UM200AA V01.64.10 |
| EUT2 | 865770050010158 | V1.2 | UM200AA V01.64.10 |
| EUT3 | 865770050012014 | V1.2 | UM200AA V01.64.10 |
| EUT4 | 865770050009879 | V1.2 | UM200AA V01.64.10 |
| EUT5 | 865770050011669 | V1.2 | UM200AA V01.64.10 |

*EUT ID: is used to identify the test sample in the lab internally.

**Note:** It is performed to do SAR with the EUT1~3 and conducted power with the EUT4~5.

### 4.3 Internal Identification of AE used during the test

| AE ID* | Description | Model | SN | Manufacturer |
|---|---|---|---|---|
| AE1 | Battery | LT25H436270J | / | Ningbo Veken Battery Co., Ltd. |

*AE ID: is used to identify the test sample in the lab internally.

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# 5 TEST METHODOLOGY

## 5.1 Applicable Limit Regulations

**ANSI C95.1–1992:**IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

## 5.2 Applicable Measurement Standards

**IEEE 1528–2013:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

**KDB447498 D01: General RF Exposure Guidance v06:** Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

**KDB447498 D02**: SAR Procedures for Dongle Xmtr v02r01: SAR Measurement Procedures for USB Dongle Transmitters

**KDB648474 D04 Handset SAR v01r03:** SAR Evaluation Considerations for Wireless Handsets.

**KDB941225 D05 SAR for LTE Devices v02r05:** SAR Evaluation Considerations for LTE Devices

**KDB941225 D06 Hotspot Mode SAR v02r01:** SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

**KDB248227 D01 802.11 Wi-Fi SAR v02r02:** SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

**KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04:** SAR Measurement Requirements for 100 MHz to 6 GHz.

**KDB865664 D02RF Exposure Reporting v01r02:** RF Exposure Compliance Reporting and Documentation Considerations

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# 6 Specific Absorption Rate (SAR)

## 6.1 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. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

## 6.2 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 ( $\rho$ ) . 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 either related to the temperature elevation in tissue by

$$SAR = c\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, $\delta T$ is the temperature rise and $\delta t$ is the exposure duration, or related to the electrical field in the tissue by

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

Where: $\sigma$ is the conductivity of the tissue, $\rho$ is the mass density of tissue and $E$ is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

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# 7 Tissue Simulating Liquids

## 7.1 Targets for tissue simulating liquid

**Table 7.1: Targets for tissue simulating liquid**

| Frequency(MHz) | Liquid Type | Conductivity(σ) | ± 5% Range | Permittivity(ε) | ± 5% Range |
|---|---|---|---|---|---|
| 750 | Head | 0.89 | 0.85～0.93 | 41.94 | 39.8～44.0 |
| 835 | Head | 0.90 | 0.86～0.95 | 41.5 | 39.4～43.6 |
| 1750 | Head | 1.37 | 1.30～1.44 | 40.08 | 38.1～42.1 |
| 1900 | Head | 1.40 | 1.33～1.47 | 40.0 | 38.0～42.0 |
| 2300 | Head | 1.67 | 1.59～1.75 | 39.47 | 37.50～41.44 |
| 2450 | Head | 1.67 | 1.59～1.75 | 39.47 | 37.5～41.4 |
| 5250 | Head | 4.66 | 4.43～4.89 | 35.99 | 34.19～37.79 |
| 5600 | Head | 5.07 | 4.82～5.32 | 35.53 | 33.75～37.31 |
| 5750 | Head | 5.27 | 5.01～5.53 | 35.3 | 33.5～37.1 |

## 7.2 Dielectric Performance

**Table 7.2: Dielectric Performance of Tissue Simulating Liquid**

| Measurement Date yyyy/mm/dd | Frequency | Type | Permittivity ε | Drift (%) | Conductivity σ (S/m) | Drift (%) |
|---|---|---|---|---|---|---|
| 2021/2/13 | 750 MHz | Head | 42.5 | 1.34 | 0.89 | 0.00 |
| 2021/2/14 | 835 MHz | Head | 40.69 | -1.95 | 0.888 | -1.33 |
| 2021/2/15 | 1750 MHz | Head | 40.2 | 0.30 | 1.354 | -1.17 |
| 2021/2/16 | 1900 MHz | Head | 39.38 | -1.55 | 1.411 | 0.79 |
| 2021/2/17 | 2300 MHz | Head | 40.14 | 1.62 | 1.687 | 1.02 |
| 2021/2/18 | 2450 MHz | Head | 39.2 | 0.00 | 1.796 | -0.22 |
| 2021/2/19 | 5250 MHz | Head | 36.07 | 0.39 | 4.729 | 0.40 |
| 2021/2/20 | 5600 MHz | Head | 35.75 | 0.62 | 5.153 | 1.64 |
| 2021/2/21 | 5750 MHz | Head | 35.73 | 1.05 | 5.201 | -0.36 |

Note: The liquid temperature is 22.0℃

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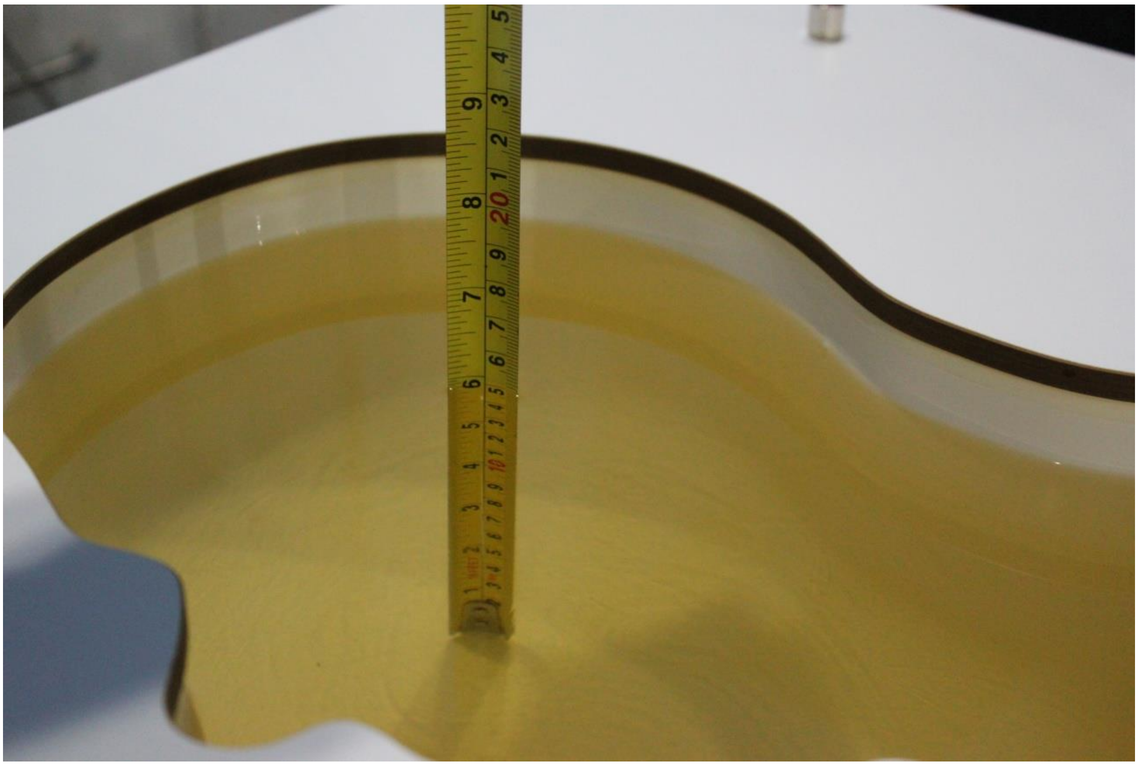
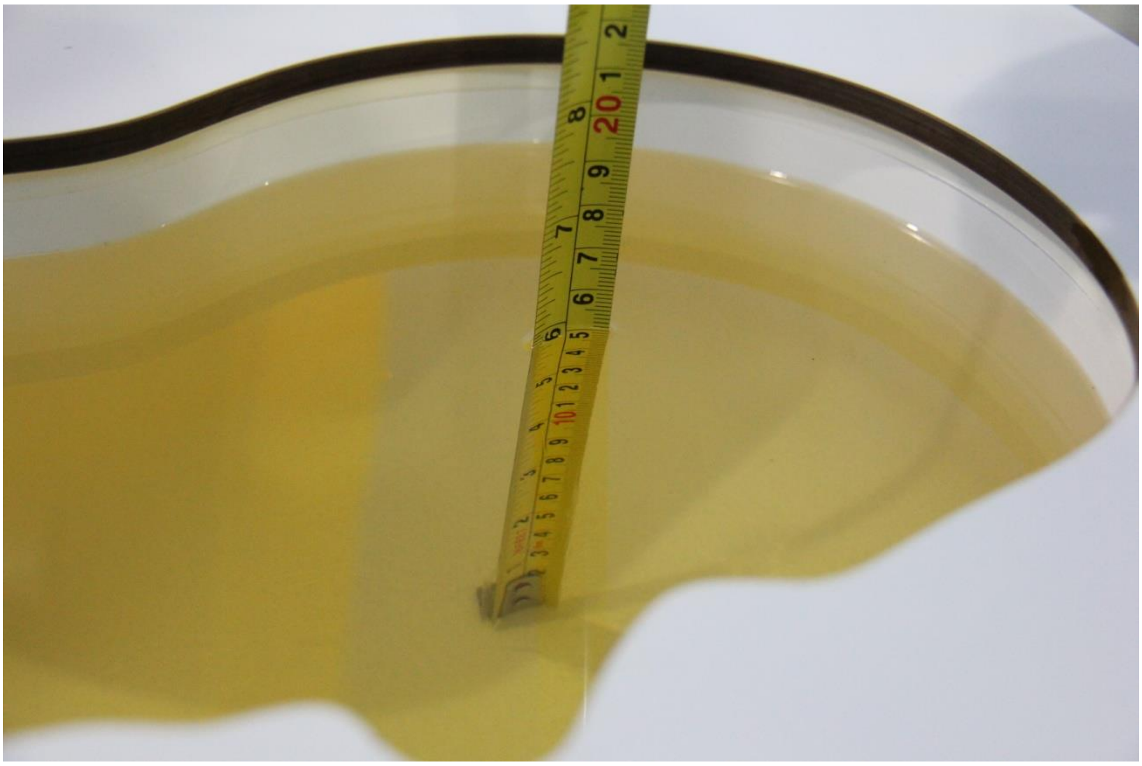


**Picture 7-1 Liquid depth in the Head Phantom (750MHz)**



**Picture 7-2 Liquid depth in the Head Phantom (835 MHz)**

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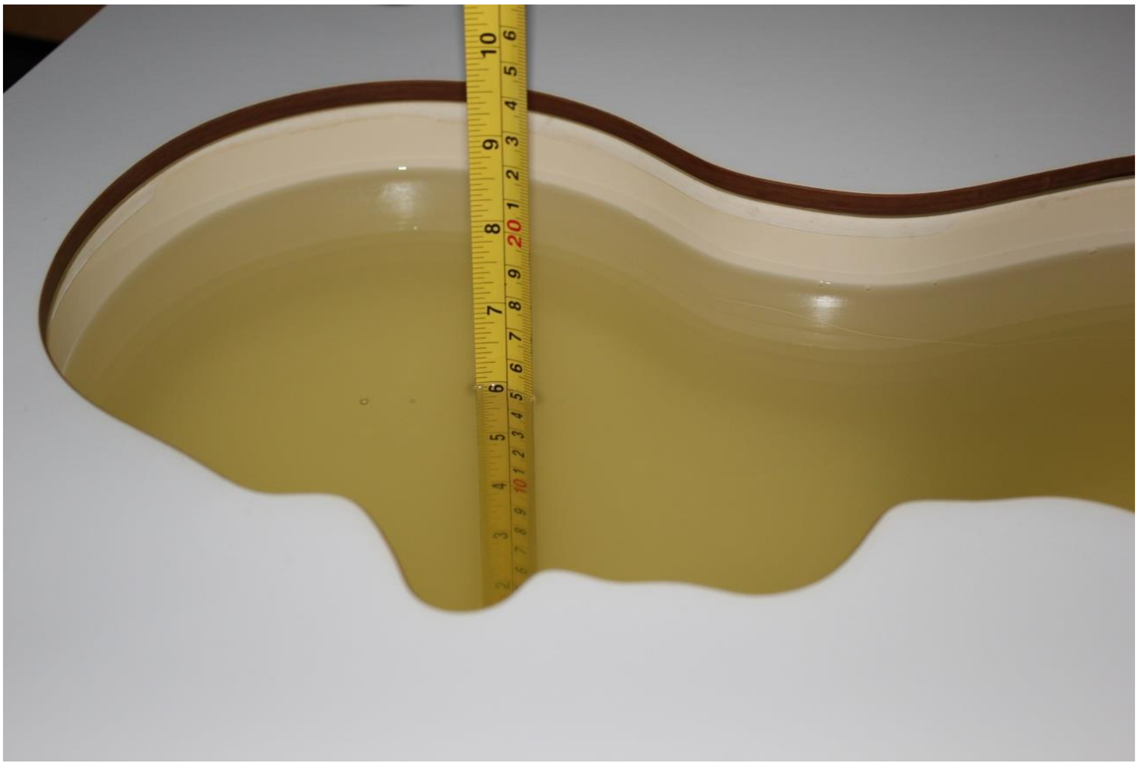
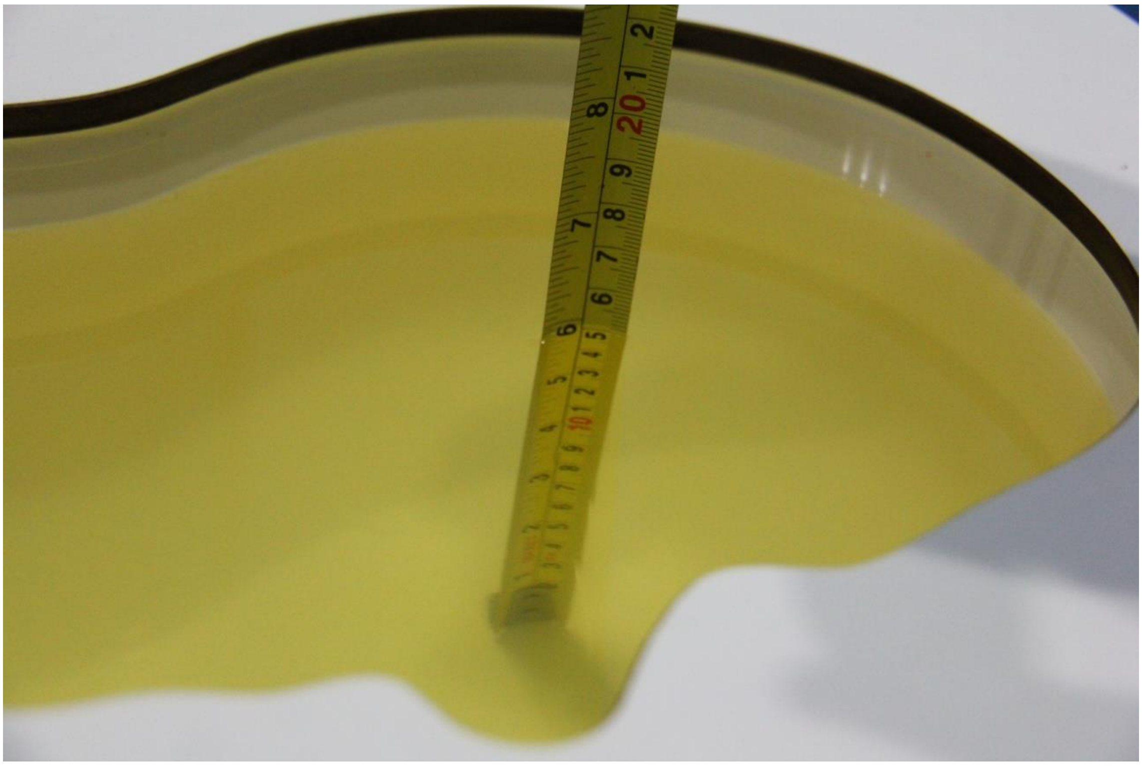


Picture 7-3 Liquid depth in the Head Phantom (1750 MHz)



Picture 7-4 Liquid depth in the Head Phantom (1900 MHz)

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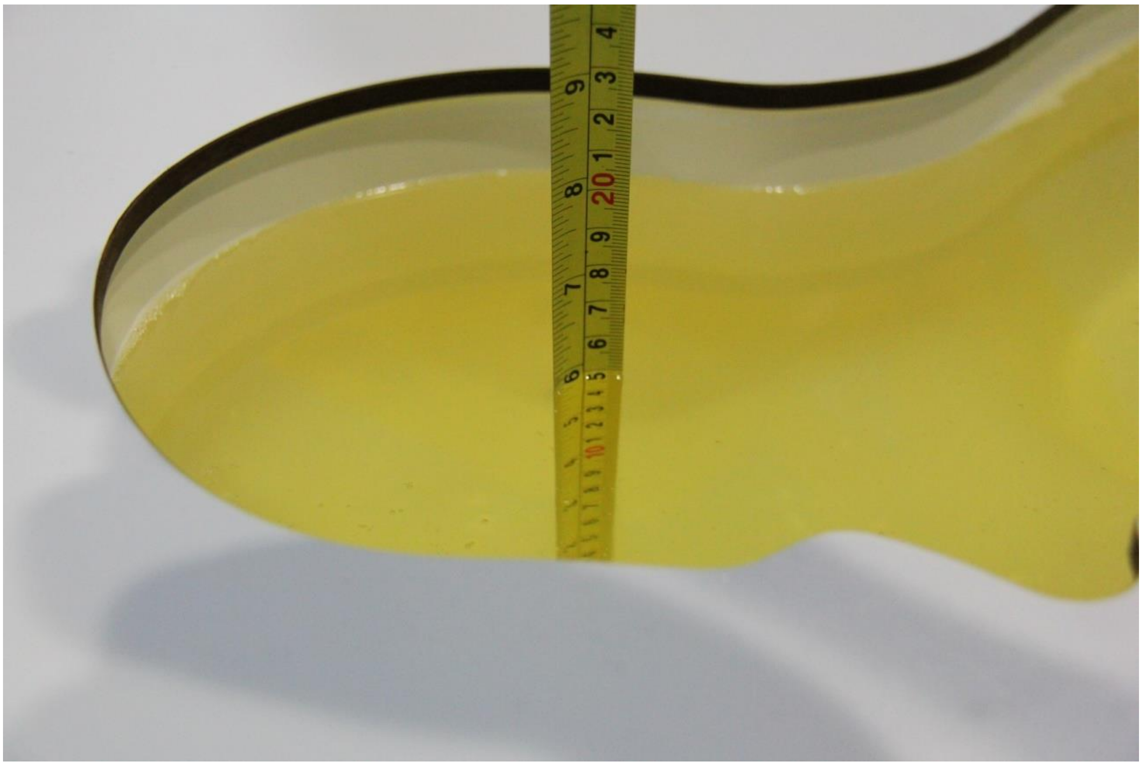
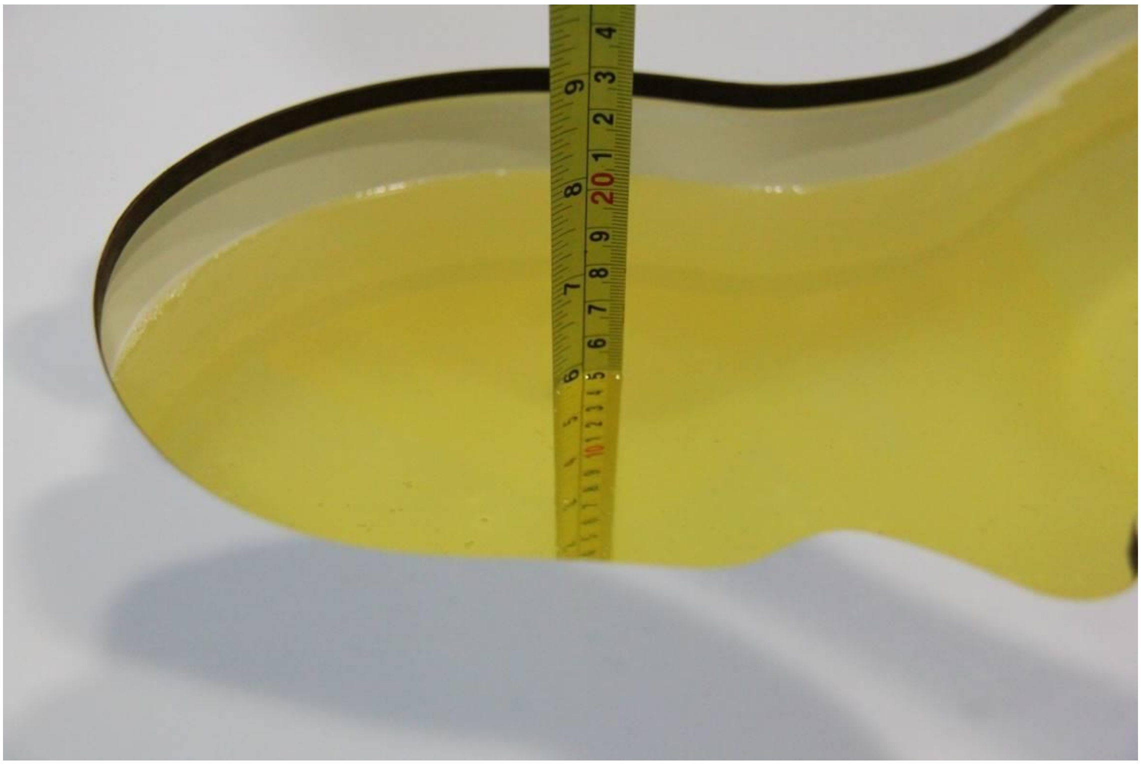


Picture 7-5 Liquid depth in the Head Phantom (2450MHz)



Picture 7-6 Liquid depth in the Head Phantom (2300 MHz)

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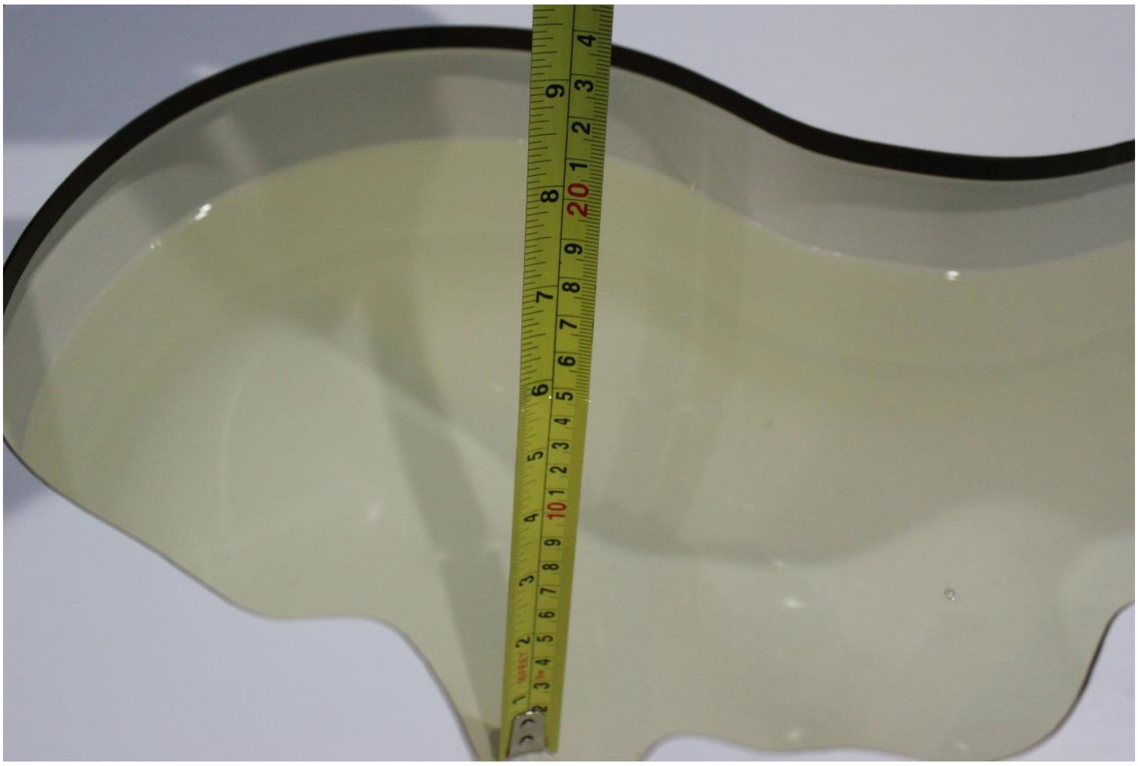

**Picture 7-7 Liquid depth in the Head Phantom (5GHz)**

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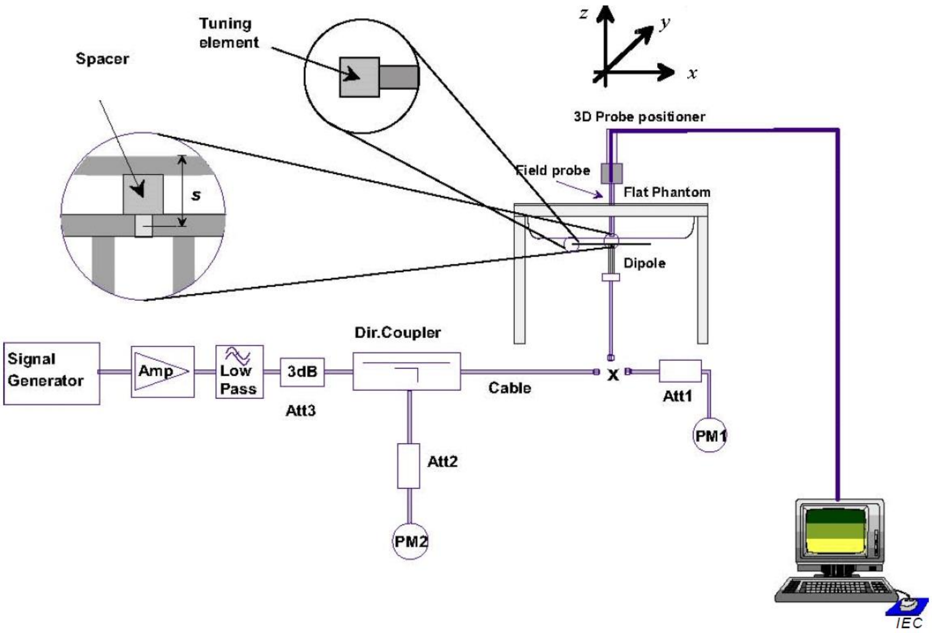
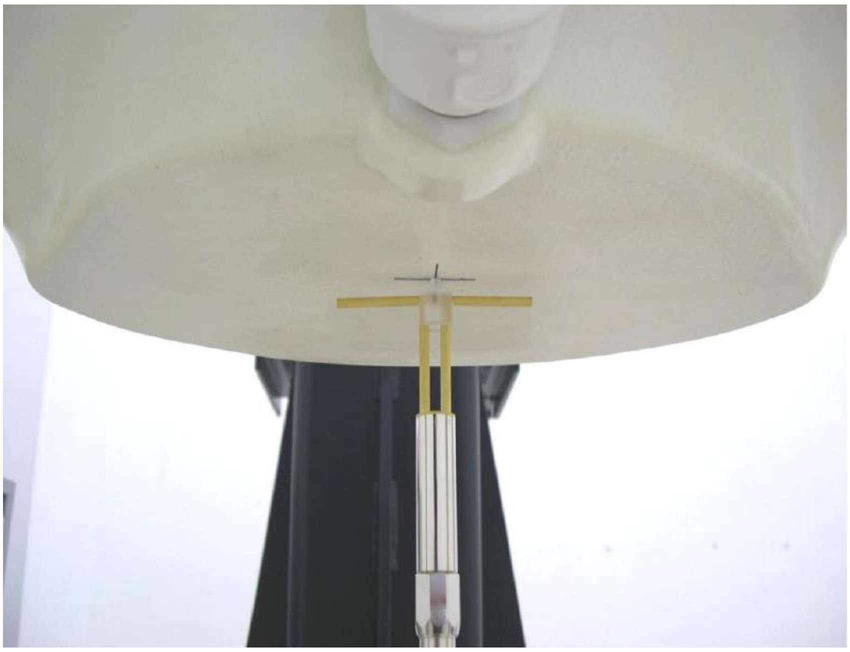
# 8 System verification

## 8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:




**Picture 8.1 System Setup for System Evaluation**



**Picture 8.2 Photo of Dipole Setup**

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## 8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

**Table 8.1: System Verification of Head**

| Measurement Date (yyyy-mm-dd) | Frequency | Target value (W/kg) | | Measured value (W/kg) | | Deviation | |
|---|---|---|---|---|---|---|---|
| | | 10 g Average | 1 g Average | 10 g Average | 1 g Average | 10 g Average | 1 g Average |
| 2021/2/13 | 750 MHz | 5.53 | 8.47 | 5.44 | 8.64 | -1.63% | 2.01% |
| 2021/2/14 | 835 MHz | 6.25 | 9.60 | 6.2 | 9.72 | -0.80% | 1.25% |
| 2021/2/15 | 1750 MHz | 19.1 | 36.5 | 19.48 | 36.36 | 1.99% | -0.38% |
| 2021/2/16 | 1900 MHz | 20.6 | 39.6 | 20.52 | 39.96 | -0.39% | 0.91% |
| 2021/2/17 | 2300 MHz | 23.8 | 49.7 | 24.08 | 49.24 | 1.18% | -0.93% |
| 2021/2/18 | 2450 MHz | 24.5 | 52.5 | 24.56 | 52.32 | 0.24% | -0.34% |
| 2021/2/19 | 5250 MHz | 22.9 | 80.5 | 23.2 | 80.0 | 1.14% | -0.62% |
| 2021/2/20 | 5600 MHz | 23.6 | 83.3 | 23.5 | 83.5 | -0.34% | 0.26% |
| 2021/2/21 | 5750 MHz | 22.7 | 80.4 | 23.0 | 79.6 | 1.32% | -1.00% |

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# 9 Measurement Procedures

## 9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

**Step 1**: The tests described in 9.2 shall be performed at the channel that is closest to the centre of the transmit frequency band ( $f_c$ ) for:

a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
b) all configurations for each device position in a), e.g., antenna extended and retracted, and
c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e., $N_c > 3$), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

**Step 2**: For the condition providing highest peak spatial-average SAR determined in Step 1,perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

**Step 3**: Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.

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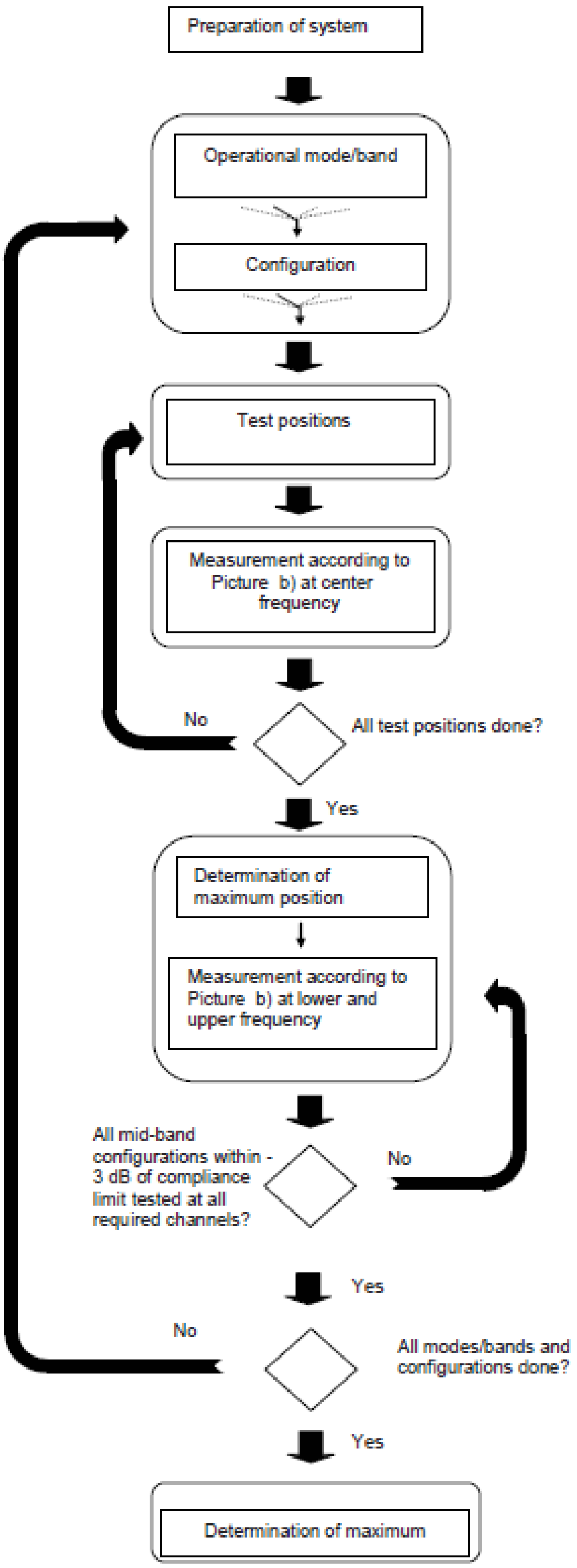
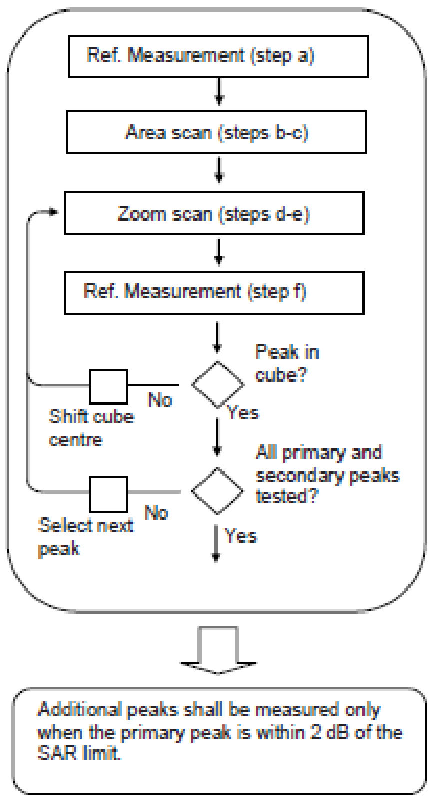



Picture a – Tests to be performed




Picture b – General procedure

**Picture 9.1Block diagram of the tests to be performed**

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## 9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results when all the measurement parameters in the following table are not satisfied.

<table>
<tr><td colspan="3"></td><td>$\leq$ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$</td><td>$\leq$ 2 GHz: $\leq$ 15 mm<br>2 – 3 GHz: $\leq$ 12 mm</td><td>3 – 4 GHz: $\leq$ 12 mm<br>4 – 6 GHz: $\leq$ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$</td><td>$\leq$ 2 GHz: $\leq$ 8 mm<br>2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*<br>4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm<br>4 – 5 GHz: $\leq$ 3 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm<br>4 – 5 GHz: $\leq$ 2.5 mm<br>5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm<br>4 – 5 GHz: $\geq$ 25 mm<br>5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.<br>* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

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## 9.3 SAR Measurement for LTE

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. All powers were measured with the CMW 500.

It is performed for conducted power and SAR based on the KDB941225 D05.

SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation

   Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; 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.

2) QPSK with 50% RB allocation

   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

   For 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 in 1) and 2) 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.

### TDD test:

TDD testing is performed using guidance from FCC KDB 941225 D05 and the SAR test guidance provided in April 2013 TCB works hop notes. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211.

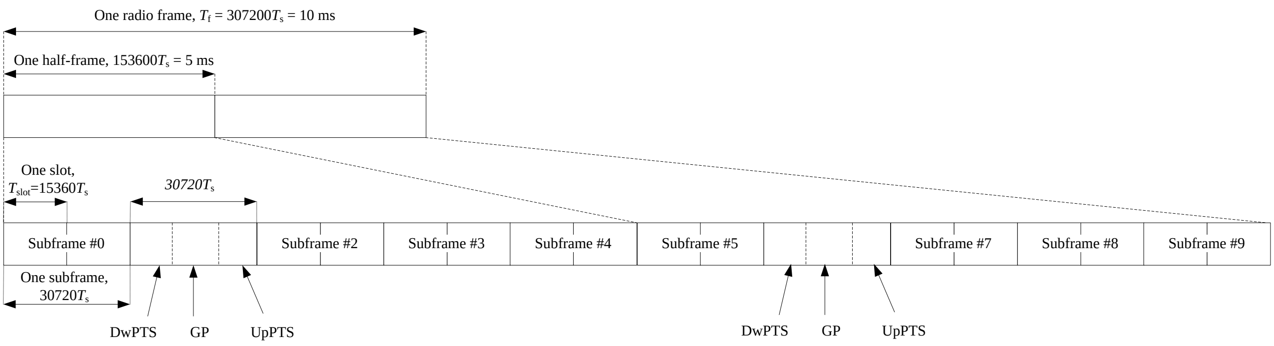


**Figure 9.2: Frame structure type 2 (for 5 ms switch-point periodicity)**

**Table 9.1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)**

<table>
<tr><th rowspan="3">Special subframe configuration</th><th colspan="3">Normal cyclic prefix in downlink</th><th colspan="3">Extended cyclic prefix in downlink</th></tr>
<tr><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th><th rowspan="2">DwPTS</th><th colspan="2">UpPTS</th></tr>
<tr><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th></tr>
<tr><td>0</td><td>$6592 \cdot T_s$</td><td rowspan="5">$2192 \cdot T_s$</td><td rowspan="5">$2560 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$2192 \cdot T_s$</td><td rowspan="4">$2560 \cdot T_s$</td></tr>
<tr><td>1</td><td>$19760 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>2</td><td>$21952 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>3</td><td>$24144 \cdot T_s$</td><td>$25600 \cdot T_s$</td></tr>
<tr><td>4</td><td>$26336 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$4384 \cdot T_s$</td><td rowspan="4">$5120 \cdot T_s$</td></tr>
<tr><td>5</td><td>$6592 \cdot T_s$</td><td rowspan="5">$4384 \cdot T_s$</td><td rowspan="5">$5120 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>6</td><td>$19760 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>7</td><td>$21952 \cdot T_s$</td><td>$12800 \cdot T_s$</td></tr>
<tr><td>8</td><td>$24144 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>$13168 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
</table>

**Table 9.2: Uplink-downlink configurations**

| Uplink-downlink configuration | Downlink-to-Uplink Switch-point periodicity | Subframe number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 5 ms | D | S | U | U | U | D | S | U | U | U |
| 1 | 5 ms | D | S | U | U | D | D | S | U | U | D |
| 2 | 5 ms | D | S | U | D | D | D | S | U | D | D |
| 3 | 10 ms | D | S | U | U | U | D | D | D | D | D |
| 4 | 10 ms | D | S | U | U | D | D | D | D | D | D |
| 5 | 10 ms | D | S | U | D | D | D | D | D | D | D |
| 6 | 5 ms | D | S | U | U | U | D | S | U | U | D |

Duty factor is calculated by:

Duty factor = uplink frame*6+UpPTS*2/one frame length

= $(30720.T_s * 6+5120. T_s*2)/307200.T_s$

= 0.633

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## 9.4 Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

## 9.5 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in section14 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

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# 10 Area Scan Based 1-g SAR

## 10.1 Requirement of KDB

According to the KDB447498 D01, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-gSAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

## 10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz)and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm mare 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

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# 11 Conducted Output Power

There are two sets of tune-up power, Normal power and Low power. Low power for body test by proximity sensor in all bands. The detail of proximity sensor is presented in annex G.

## 11.1 LTE Measurement result

**Maximum Target Power for Production Unit**

| Band | Tune up (dBm) | |
|---|---|---|
| | Normal Power | Low power |
| Band 2 | 23 | 19 |
| Band 5 | 24 | 22 |
| Band 12 | 23.5 | 22 |
| Band 14 | 23.5 | 21.5 |
| Band 30 | 22.5 | 18.5 |
| Band 66 | 23 | 18 |

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**Normal Power:**

| LTEB2 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 1909.3 (19193) | 22.01 | 21.08 |
| | | 1880 (18900) | 22.11 | 21.13 |
| | | 1850.7 (18607) | 21.97 | 20.82 |
| | 1RB-Middle (3) | 1909.3 (19193) | 22.22 | 21.13 |
| | | 1880 (18900) | 22.00 | 21.06 |
| | | 1850.7 (18607) | 21.99 | 20.55 |
| | 1RB-Low (0) | 1909.3 (19193) | 22.11 | 21.10 |
| | | 1880 (18900) | 21.93 | 21.06 |
| | | 1850.7 (18607) | 21.90 | 20.67 |
| | 3RB-High (3) | 1909.3 (19193) | 21.97 | 21.03 |
| | | 1880 (18900) | 22.02 | 20.91 |
| | | 1850.7 (18607) | 22.03 | 20.92 |
| | 3RB-Middle (1) | 1909.3 (19193) | 21.98 | 20.98 |
| | | 1880 (18900) | 22.07 | 20.97 |
| | | 1850.7 (18607) | 22.13 | 20.89 |
| | 3RB-Low (0) | 1909.3 (19193) | 22.02 | 21.03 |
| | | 1880 (18900) | 21.90 | 20.83 |
| | | 1850.7 (18607) | 21.98 | 20.83 |
| | 6RB (0) | 1909.3 (19193) | 21.16 | 20.43 |
| | | 1880 (18900) | 21.02 | 19.84 |
| | | 1850.7 (18607) | 21.13 | 20.19 |
| 3MHz | 1RB-High (14) | 1908.5 (19185) | 22.19 | 21.20 |
| | | 1880 (18900) | 21.95 | 21.11 |
| | | 1851.5 (18615) | 22.05 | 21.13 |
| | 1RB-Middle (7) | 1908.5 (19185) | 22.25 | 21.44 |
| | | 1880 (18900) | 22.22 | 21.17 |
| | | 1851.5 (18615) | 22.09 | 21.44 |
| | 1RB-Low (0) | 1908.5 (19185) | 22.26 | 21.20 |
| | | 1880 (18900) | 21.99 | 21.07 |
| | | 1851.5 (18615) | 22.09 | 21.18 |
| | 8RB-High (7) | 1908.5 (19185) | 21.04 | 20.50 |
| | | 1880 (18900) | 21.07 | 20.08 |
| | | 1851.5 (18615) | 21.18 | 20.29 |
| | 8RB-Middle (4) | 1908.5 (19185) | 20.98 | 20.54 |
| | | 1880 (18900) | 21.09 | 20.11 |
| | | 1851.5 (18615) | 21.10 | 20.31 |
| | 8RB-Low (0) | 1908.5 (19185) | 20.95 | 20.53 |

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| | | | | |
|---|---|---|---|---|
| | | 1880 (18900) | 21.05 | 20.07 |
| | | 1851.5 (18615) | 21.05 | 20.26 |
| | 15RB (0) | 1908.5 (19185) | 21.12 | 20.16 |
| | | 1880 (18900) | 21.05 | 20.06 |
| | | 1851.5 (18615) | 21.08 | 20.30 |
| 5MHz | 1RB-High (24) | 1907.5 (19175) | 22.16 | 21.16 |
| | | 1880 (18900) | 22.24 | 20.83 |
| | | 1852.5 (18625) | 21.78 | 20.91 |
| | 1RB-Middle (12) | 1907.5 (19175) | 22.33 | 21.34 |
| | | 1880 (18900) | 22.35 | 20.96 |
| | | 1852.5 (18625) | 22.05 | 21.14 |
| | 1RB-Low (0) | 1907.5 (19175) | 22.27 | 21.23 |
| | | 1880 (18900) | 22.21 | 20.93 |
| | | 1852.5 (18625) | 21.83 | 21.02 |
| | 12RB-High (13) | 1907.5 (19175) | 21.13 | 20.22 |
| | | 1880 (18900) | 21.08 | 20.12 |
| | | 1852.5 (18625) | 21.01 | 19.90 |
| | 12RB-Middle (6) | 1907.5 (19175) | 21.24 | 20.18 |
| | | 1880 (18900) | 21.11 | 20.15 |
| | | 1852.5 (18625) | 21.16 | 19.95 |
| | 12RB-Low (0) | 1907.5 (19175) | 21.17 | 20.16 |
| | | 1880 (18900) | 21.13 | 20.18 |
| | | 1852.5 (18625) | 21.10 | 19.98 |
| | 25RB (0) | 1907.5 (19175) | 21.12 | 20.06 |
| | | 1880 (18900) | 21.09 | 20.36 |
| | | 1852.5 (18625) | 21.11 | 20.03 |
| 10MHz | 1RB-High (49) | 1905 (19150) | 22.25 | 20.68 |
| | | 1880 (18900) | 22.35 | 21.24 |
| | | 1855 (18650) | 22.18 | 21.16 |
| | 1RB-Middle (24) | 1905 (19150) | 22.70 | 21.42 |
| | | 1880 (18900) | 22.54 | 21.72 |
| | | 1855 (18650) | 22.26 | 21.08 |
| | 1RB-Low (0) | 1905 (19150) | 22.33 | 20.86 |
| | | 1880 (18900) | 22.36 | 21.16 |
| | | 1855 (18650) | 21.83 | 20.98 |
| | 25RB-High (25) | 1905 (19150) | 21.24 | 20.23 |
| | | 1880 (18900) | 21.16 | 20.28 |
| | | 1855 (18650) | 21.17 | 20.26 |
| | 25RB-Middle (12) | 1905 (19150) | 21.29 | 20.28 |
| | | 1880 (18900) | 21.22 | 20.27 |
| | | 1855 (18650) | 21.17 | 20.32 |
| | 25RB-Low (0) | 1905 (19150) | 21.14 | 20.20 |

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| | | | | |
|---|---|---|---|---|
| | | 1880 (18900) | 21.07 | 20.25 |
| | | 1855 (18650) | 21.22 | 20.19 |
| | 50RB (0) | 1905 (19150) | 21.16 | 20.22 |
| | | 1880 (18900) | 21.12 | 20.30 |
| | | 1855 (18650) | 21.06 | 20.02 |
| 15MHz | 1RB-High (74) | 1902.5 (19125) | 21.82 | 21.01 |
| | | 1880 (18900) | 22.05 | 21.32 |
| | | 1857.5 (18675) | 22.01 | 20.90 |
| | 1RB-Middle (37) | 1902.5 (19125) | 22.19 | 21.29 |
| | | 1880 (18900) | 22.09 | 21.82 |
| | | 1857.5 (18675) | 22.35 | 21.61 |
| | 1RB-Low (0) | 1902.5 (19125) | 22.14 | 20.97 |
| | | 1880 (18900) | 22.00 | 21.14 |
| | | 1857.5 (18675) | 21.97 | 20.92 |
| | 36RB-High (38) | 1902.5 (19125) | 21.18 | 20.31 |
| | | 1880 (18900) | 21.10 | 20.29 |
| | | 1857.5 (18675) | 21.16 | 20.27 |
| | 36RB-Middle (19) | 1902.5 (19125) | 21.22 | 20.45 |
| | | 1880 (18900) | 21.11 | 20.19 |
| | | 1857.5 (18675) | 21.10 | 20.20 |
| | 36RB-Low (0) | 1902.5 (19125) | 21.08 | 20.42 |
| | | 1880 (18900) | 20.98 | 20.06 |
| | | 1857.5 (18675) | 20.92 | 20.02 |
| | 75RB (0) | 1902.5 (19125) | 21.10 | 20.22 |
| | | 1880 (18900) | 21.08 | 20.18 |
| | | 1857.5 (18675) | 21.00 | 20.09 |
| 20MHz | 1RB-High (99) | 1900 (19100) | 22.23 | 21.02 |
| | | 1880 (18900) | 22.19 | 21.02 |
| | | 1860 (18700) | 22.01 | 21.01 |
| | 1RB-Middle (50) | 1900 (19100) | **22.43** | 21.22 |
| | | 1880 (18900) | 22.39 | 21.17 |
| | | 1860 (18700) | 22.25 | 21.23 |
| | 1RB-Low (0) | 1900 (19100) | 22.18 | 21.01 |
| | | 1880 (18900) | 22.02 | 21.03 |
| | | 1860 (18700) | 22.03 | 21.01 |
| | 50RB-High (50) | 1900 (19100) | 21.39 | 20.18 |
| | | 1880 (18900) | 21.14 | 20.28 |
| | | 1860 (18700) | 21.31 | 20.16 |
| | 50RB-Middle (25) | 1900 (19100) | **21.41** | 20.42 |
| | | 1880 (18900) | 21.25 | 20.17 |
| | | 1860 (18700) | 21.35 | 20.31 |
| | 50RB-Low (0) | 1900 (19100) | 21.17 | 20.27 |

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| | | | | |
|---|---|---|---|---|
| | | 1880 (18900) | 21.15 | 20.16 |
| | | 1860 (18700) | 21.13 | 20.10 |
| | 100RB (0) | 1900 (19100) | 21.23 | 20.22 |
| | | 1880 (18900) | 21.20 | 20.04 |
| | | 1860 (18700) | 21.11 | 20.10 |

| LTEB5 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 848.3 (20643) | 22.52 | 21.74 |
| | | 836.5 (20525) | 22.86 | 22.13 |
| | | 824.7 (20407) | 22.58 | 21.81 |
| | 1RB-Middle (3) | 848.3 (20643) | 22.65 | 21.78 |
| | | 836.5 (20525) | 22.93 | 22.10 |
| | | 824.7 (20407) | 22.72 | 21.83 |
| | 1RB-Low (0) | 848.3 (20643) | 22.71 | 21.69 |
| | | 836.5 (20525) | 22.79 | 22.19 |
| | | 824.7 (20407) | 22.69 | 21.75 |
| | 3RB-High (3) | 848.3 (20643) | 22.58 | 21.76 |
| | | 836.5 (20525) | 22.83 | 21.94 |
| | | 824.7 (20407) | 22.65 | 21.50 |
| | 3RB-Middle (1) | 848.3 (20643) | 22.81 | 21.79 |
| | | 836.5 (20525) | 22.69 | 21.92 |
| | | 824.7 (20407) | 22.76 | 21.54 |
| | 3RB-Low (0) | 848.3 (20643) | 22.67 | 21.90 |
| | | 836.5 (20525) | 22.60 | 22.15 |
| | | 824.7 (20407) | 22.71 | 21.50 |
| | 6RB (0) | 848.3 (20643) | 21.62 | 20.65 |
| | | 836.5 (20525) | 21.86 | 21.17 |
| | | 824.7 (20407) | 21.80 | 20.37 |
| 3MHz | 1RB-High (14) | 847.5 (20635) | 22.71 | 21.80 |
| | | 836.5 (20525) | 22.60 | 21.89 |
| | | 825.5 (20415) | 22.69 | 21.81 |
| | 1RB-Middle (7) | 847.5 (20635) | 22.88 | 21.82 |
| | | 836.5 (20525) | 22.94 | 21.94 |
| | | 825.5 (20415) | 22.89 | 22.10 |
| | 1RB-Low (0) | 847.5 (20635) | 22.83 | 21.98 |
| | | 836.5 (20525) | 22.90 | 21.85 |
| | | 825.5 (20415) | 22.61 | 21.82 |
| | 8RB-High (7) | 847.5 (20635) | 21.92 | 20.86 |
| | | 836.5 (20525) | 21.90 | 21.23 |

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| | | | | |
|---|---|---|---|---|
| | | 825.5 (20415) | 21.79 | 20.82 |
| | 8RB-Middle (4) | 847.5 (20635) | 21.89 | 20.94 |
| | | 836.5 (20525) | 21.90 | 21.13 |
| | | 825.5 (20415) | 21.82 | 20.86 |
| | 8RB-Low (0) | 847.5 (20635) | 21.87 | 20.92 |
| | | 836.5 (20525) | 21.97 | 21.21 |
| | | 825.5 (20415) | 21.87 | 20.82 |
| | 15RB (0) | 847.5 (20635) | 21.84 | 20.81 |
| | | 836.5 (20525) | 21.90 | 21.16 |
| | | 825.5 (20415) | 21.88 | 20.86 |
| 5MHz | 1RB-High (24) | 846.5 (20625) | 22.26 | 21.73 |
| | | 836.5 (20525) | 22.50 | 21.85 |
| | | 826.5 (20425) | 22.67 | 21.60 |
| | 1RB-Middle (12) | 846.5 (20625) | 22.50 | 21.37 |
| | | 836.5 (20525) | 22.71 | 21.96 |
| | | 826.5 (20425) | 22.93 | 21.87 |
| | 1RB-Low (0) | 846.5 (20625) | 22.27 | 21.01 |
| | | 836.5 (20525) | 22.51 | 21.76 |
| | | 826.5 (20425) | 22.75 | 21.69 |
| | 12RB-High (13) | 846.5 (20625) | 21.85 | 20.88 |
| | | 836.5 (20525) | 21.95 | 20.91 |
| | | 826.5 (20425) | 21.89 | 21.00 |
| | 12RB-Middle (6) | 846.5 (20625) | 21.79 | 20.84 |
| | | 836.5 (20525) | 21.88 | 20.93 |
| | | 826.5 (20425) | 21.95 | 21.06 |
| | 12RB-Low (0) | 846.5 (20625) | 21.80 | 20.86 |
| | | 836.5 (20525) | 21.96 | 20.94 |
| | | 826.5 (20425) | 21.86 | 20.98 |
| | 25RB (0) | 846.5 (20625) | 21.82 | 20.98 |
| | | 836.5 (20525) | 21.90 | 20.78 |
| | | 826.5 (20425) | 21.85 | 21.00 |
| 10MHz | 1RB-High (49) | 844 (20600) | 22.70 | 21.75 |
| | | 836.5 (20525) | 22.66 | 21.51 |
| | | 829 (20450) | 22.58 | 21.77 |
| | 1RB-Middle (24) | 844 (20600) | 23.05 | 22.11 |
| | | 836.5 (20525) | **23.18** | 21.98 |
| | | 829 (20450) | 22.77 | 22.04 |
| | 1RB-Low (0) | 844 (20600) | 22.89 | 21.52 |
| | | 836.5 (20525) | 22.68 | 21.76 |
| | | 829 (20450) | 22.51 | 21.51 |
| | 25RB-High (25) | 844 (20600) | 21.79 | 20.91 |
| | | 836.5 (20525) | 21.89 | 20.86 |

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| | | | | |
|---|---|---|---|---|
| | | 829 (20450) | 21.85 | 20.76 |
| | 25RB-Middle (12) | 844 (20600) | 21.97 | 20.92 |
| | | 836.5 (20525) | **21.99** | 20.93 |
| | | 829 (20450) | 21.94 | 21.07 |
| | 25RB-Low (0) | 844 (20600) | 21.78 | 20.81 |
| | | 836.5 (20525) | 21.83 | 20.76 |
| | | 829 (20450) | 21.87 | 20.95 |
| | 50RB (0) | 844 (20600) | 21.77 | 20.76 |
| | | 836.5 (20525) | 21.89 | 20.92 |
| | | 829 (20450) | 21.82 | 20.89 |

| LTEB12 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 715.3 (23173) | 21.98 | 20.97 |
| | | 707.5 (23095) | 21.98 | 20.71 |
| | | 699.7 (23017) | 21.94 | 20.87 |
| | 1RB-Middle (3) | 715.3 (23173) | 21.96 | 21.02 |
| | | 707.5 (23095) | 21.93 | 20.70 |
| | | 699.7 (23017) | 21.82 | 20.76 |
| | 1RB-Low (0) | 715.3 (23173) | 21.94 | 20.91 |
| | | 707.5 (23095) | 22.00 | 20.60 |
| | | 699.7 (23017) | 21.74 | 20.90 |
| | 3RB-High (3) | 715.3 (23173) | 22.04 | 20.97 |
| | | 707.5 (23095) | 22.03 | 20.56 |
| | | 699.7 (23017) | 21.79 | 20.67 |
| | 3RB-Middle (1) | 715.3 (23173) | 22.05 | 21.03 |
| | | 707.5 (23095) | 22.03 | 20.55 |
| | | 699.7 (23017) | 21.97 | 20.59 |
| | 3RB-Low (0) | 715.3 (23173) | 22.01 | 20.97 |
| | | 707.5 (23095) | 21.99 | 20.50 |
| | | 699.7 (23017) | 22.02 | 20.66 |
| | 6RB (0) | 715.3 (23173) | 20.94 | 19.94 |
| | | 707.5 (23095) | 20.92 | 19.82 |
| | | 699.7 (23017) | 20.88 | 19.59 |
| 3MHz | 1RB-High (14) | 714.5 (23165) | 22.14 | 20.95 |
| | | 707.5 (23095) | 21.93 | 20.53 |
| | | 700.5 (23025) | 22.10 | 20.75 |
| | 1RB-Middle (7) | 714.5 (23165) | 22.14 | 20.95 |
| | | 707.5 (23095) | 21.95 | 20.64 |
| | | 700.5 (23025) | 21.88 | 20.61 |

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| | | | | |
|---|---|---|---|---|
| | 1RB-Low (0) | 714.5 (23165) | 21.92 | 21.09 |
| | | 707.5 (23095) | 21.98 | 20.58 |
| | | 700.5 (23025) | 22.08 | 20.81 |
| | 8RB-High (7) | 714.5 (23165) | 20.98 | 19.96 |
| | | 707.5 (23095) | 21.01 | 19.78 |
| | | 700.5 (23025) | 20.97 | 20.40 |
| | 8RB-Middle (4) | 714.5 (23165) | 20.97 | 20.05 |
| | | 707.5 (23095) | 20.99 | 19.79 |
| | | 700.5 (23025) | 20.95 | 20.23 |
| | 8RB-Low (0) | 714.5 (23165) | 20.89 | 20.04 |
| | | 707.5 (23095) | 20.94 | 19.69 |
| | | 700.5 (23025) | 20.88 | 20.17 |
| | 15RB (0) | 714.5 (23165) | 20.97 | 20.13 |
| | | 707.5 (23095) | 21.01 | 19.73 |
| | | 700.5 (23025) | 20.96 | 19.99 |
| 5MHz | 1RB-High (24) | 713.5 (23155) | 21.62 | 20.51 |
| | | 707.5 (23095) | 21.77 | 20.81 |
| | | 701.5 (23035) | 21.77 | 20.83 |
| | 1RB-Middle (12) | 713.5 (23155) | 22.21 | 20.71 |
| | | 707.5 (23095) | 21.85 | 20.57 |
| | | 701.5 (23035) | 22.09 | 21.42 |
| | 1RB-Low (0) | 713.5 (23155) | 21.66 | 20.56 |
| | | 707.5 (23095) | 21.83 | 20.50 |
| | | 701.5 (23035) | 21.62 | 20.70 |
| | 12RB-High (13) | 713.5 (23155) | 20.96 | 19.79 |
| | | 707.5 (23095) | 20.87 | 19.97 |
| | | 701.5 (23035) | 20.86 | 19.88 |
| | 12RB-Middle (6) | 713.5 (23155) | 21.05 | 19.90 |
| | | 707.5 (23095) | 20.88 | 19.90 |
| | | 701.5 (23035) | 20.99 | 19.97 |
| | 12RB-Low (0) | 713.5 (23155) | 21.04 | 19.94 |
| | | 707.5 (23095) | 20.84 | 19.70 |
| | | 701.5 (23035) | 20.81 | 19.82 |
| | 25RB (0) | 713.5 (23155) | 20.94 | 19.82 |
| | | 707.5 (23095) | 20.89 | 19.73 |
| | | 701.5 (23035) | 20.84 | 19.97 |
| 10MHz | 1RB-High (49) | 711 (23130) | 21.63 | 20.85 |
| | | 707.5 (23095) | 21.76 | 20.50 |
| | | 704 (23060) | 21.84 | 20.82 |
| | 1RB-Middle (24) | 711 (23130) | 21.90 | 21.05 |
| | | 707.5 (23095) | 22.13 | 20.86 |
| | | 704 (23060) | **22.43** | 21.49 |

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| | | | | |
|---|---|---|---|---|
| | 1RB-Low (0) | 711 (23130) | 21.79 | 20.50 |
| | | 707.5 (23095) | 21.71 | 20.91 |
| | | 704 (23060) | 21.78 | 21.37 |
| | 25RB-High (25) | 711 (23130) | 20.94 | 19.96 |
| | | 707.5 (23095) | 20.90 | 19.97 |
| | | 704 (23060) | **20.95** | 19.78 |
| | 25RB-Middle (12) | 711 (23130) | 20.89 | 20.00 |
| | | 707.5 (23095) | 20.90 | 19.99 |
| | | 704 (23060) | 20.93 | 19.90 |
| | 25RB-Low (0) | 711 (23130) | 20.77 | 19.79 |
| | | 707.5 (23095) | 20.85 | 19.84 |
| | | 704 (23060) | 20.91 | 19.85 |
| | 50RB (0) | 711 (23130) | 20.94 | 20.05 |
| | | 707.5 (23095) | 20.88 | 19.90 |
| | | 704 (23060) | 20.80 | 19.79 |

| LTEB14 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 5MHz | 1RB-High (24) | 795.5 (23355) | 23.08 | 22.03 |
| | | 793 (23330) | 22.73 | 21.55 |
| | | 790.5 (23305) | 22.69 | 21.63 |
| | 1RB-Middle (12) | 795.5 (23355) | 23.43 | 22.07 |
| | | 793 (23330) | 23.37 | 21.61 |
| | | 790.5 (23305) | 23.24 | 22.37 |
| | 1RB-Low (0) | 795.5 (23355) | 22.81 | 21.60 |
| | | 793 (23330) | 23.03 | 21.54 |
| | | 790.5 (23305) | 22.81 | 21.96 |
| | 12RB-High (13) | 795.5 (23355) | 22.05 | 21.12 |
| | | 793 (23330) | 22.02 | 20.79 |
| | | 790.5 (23305) | 22.11 | 20.89 |
| | 12RB-Middle (6) | 795.5 (23355) | 22.05 | 21.12 |
| | | 793 (23330) | 22.11 | 21.07 |
| | | 790.5 (23305) | 22.19 | 20.92 |
| | 12RB-Low (0) | 795.5 (23355) | 22.00 | 21.01 |
| | | 793 (23330) | 22.14 | 21.09 |
| | | 790.5 (23305) | 22.13 | 21.14 |
| | 25RB (0) | 795.5 (23355) | 22.05 | 21.05 |
| | | 793 (23330) | 22.04 | 21.06 |
| | | 790.5 (23305) | 22.09 | 20.94 |
| 10MHz | 1RB-High (49) | 793 (23330) | 23.13 | 22.19 |
| | 1RB-Middle (24) | 793 (23330) | **23.35** | 22.26 |

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| | | | | |
|---|---|---|---|---|
| | 1RB-Low (0) | 793 (23330) | 23.29 | 22.10 |
| | 25RB-High (25) | 793 (23330) | 22.16 | 21.16 |
| | 25RB-Middle (12) | 793 (23330) | 22.13 | 21.23 |
| | 25RB-Low (0) | 793 (23330) | **22.19** | 21.17 |
| | 50RB (0) | 793 (23330) | 22.08 | 21.06 |

| LTE B30 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number LTEf RBs** | **Frequency** | **QPSK** | **16QAM** |
| 5MHz | 1RB-High (24) | 2312.5 (27735) | 21.00 | 19.82 |
| | | 2310 (27710) | 21.13 | 19.63 |
| | | 2307.5 (27685) | 21.00 | 20.22 |
| | 1RB-Middle (12) | 2312.5 (27735) | 21.34 | 20.11 |
| | | 2310 (27710) | 21.51 | 20.13 |
| | | 2307.5 (27685) | 21.33 | 20.53 |
| | 1RB-LLTEw (0) | 2312.5 (27735) | 21.30 | 19.96 |
| | | 2310 (27710) | 21.31 | 19.87 |
| | | 2307.5 (27685) | 20.98 | 20.37 |
| | 12RB-High (13) | 2312.5 (27735) | 20.18 | 19.12 |
| | | 2310 (27710) | 20.27 | 19.15 |
| | | 2307.5 (27685) | 20.27 | 19.28 |
| | 12RB-Middle (6) | 2312.5 (27735) | 20.33 | 19.19 |
| | | 2310 (27710) | 20.31 | 19.29 |
| | | 2307.5 (27685) | 20.33 | 19.34 |
| | 12RB-LLTEw (0) | 2312.5 (27735) | 20.38 | 19.13 |
| | | 2310 (27710) | 20.31 | 19.26 |
| | | 2307.5 (27685) | 20.29 | 19.25 |
| | 25RB (0) | 2312.5 (27735) | 20.28 | 19.15 |
| | | 2310 (27710) | 20.32 | 19.29 |
| | | 2307.5 (27685) | 20.33 | 19.46 |
| 10MHz | 1RB-High (49) | 2310 (27710) | 21.00 | 19.94 |
| | 1RB-Middle (24) | 2310 (27710) | **21.57** | 20.42 |
| | 1RB-LLTEw (0) | 2310 (27710) | 21.26 | 19.94 |
| | 25RB-High (25) | 2310 (27710) | 20.33 | 19.30 |
| | 25RB-Middle (12) | 2310 (27710) | **20.36** | 19.56 |
| | 25RB-LLTEw (0) | 2310 (27710) | 20.25 | 19.54 |
| | 50RB (0) | 2310 (27710) | 20.22 | 19.24 |

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| LTEB66 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 1779.3 (132665) | 21.24 | 20.29 |
| | | 1745 (132322) | 21.12 | 20.01 |
| | | 1710.7 (131979) | 21.01 | 20.27 |
| | 1RB-Middle (3) | 1779.3 (132665) | 21.33 | 20.07 |
| | | 1745 (132322) | 21.22 | 20.02 |
| | | 1710.7 (131979) | 21.01 | 20.15 |
| | 1RB-Low (0) | 1779.3 (132665) | 21.27 | 20.04 |
| | | 1745 (132322) | 21.17 | 20.02 |
| | | 1710.7 (131979) | 21.09 | 20.14 |
| | 3RB-High (3) | 1779.3 (132665) | 21.16 | 20.01 |
| | | 1745 (132322) | 21.13 | 20.05 |
| | | 1710.7 (131979) | 21.09 | 20.30 |
| | 3RB-Middle (1) | 1779.3 (132665) | 21.27 | 20.07 |
| | | 1745 (132322) | 21.16 | 20.03 |
| | | 1710.7 (131979) | 21.11 | 20.43 |
| | 3RB-Low (0) | 1779.3 (132665) | 21.21 | 20.04 |
| | | 1745 (132322) | 21.11 | 20.02 |
| | | 1710.7 (131979) | 21.05 | 20.40 |
| | 6RB (0) | 1779.3 (132665) | 20.21 | 19.15 |
| | | 1745 (132322) | 20.19 | 19.30 |
| | | 1710.7 (131979) | 20.32 | 19.50 |
| 3MHz | 1RB-High (14) | 1778.5 (132657) | 21.23 | 20.49 |
| | | 1745 (132322) | 21.15 | 20.16 |
| | | 1711.5 (131987) | 21.03 | 20.19 |
| | 1RB-Middle (7) | 1778.5 (132657) | 21.63 | 20.30 |
| | | 1745 (132322) | 21.20 | 20.68 |
| | | 1711.5 (131987) | 21.08 | 20.23 |
| | 1RB-Low (0) | 1778.5 (132657) | 21.23 | 20.21 |
| | | 1745 (132322) | 21.52 | 20.48 |
| | | 1711.5 (131987) | 21.24 | 20.16 |
| | 8RB-High (7) | 1778.5 (132657) | 20.30 | 19.20 |
| | | 1745 (132322) | 20.28 | 19.43 |
| | | 1711.5 (131987) | 20.22 | 19.63 |
| | 8RB-Middle (4) | 1778.5 (132657) | 20.29 | 19.19 |
| | | 1745 (132322) | 20.28 | 19.45 |
| | | 1711.5 (131987) | 20.24 | 19.23 |
| | 8RB-Low (0) | 1778.5 (132657) | 20.22 | 19.28 |
| | | 1745 (132322) | 20.26 | 19.44 |
| | | 1711.5 (131987) | 20.23 | 19.22 |

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| | | | | |
|---|---|---|---|---|
| | 15RB (0) | 1778.5 (132657) | 20.32 | 19.25 |
| | | 1745 (132322) | 20.23 | 19.34 |
| | | 1711.5 (131987) | 20.23 | 19.11 |
| 5MHz | 1RB-High (24) | 1777.5 (132647) | 21.02 | 20.23 |
| | | 1745 (132322) | 21.07 | 20.01 |
| | | 1712.5 (131997) | 21.27 | 20.02 |
| | 1RB-Middle (12) | 1777.5 (132647) | 21.01 | 20.35 |
| | | 1745 (132322) | 21.10 | 20.02 |
| | | 1712.5 (131997) | 21.26 | 20.03 |
| | 1RB-Low (0) | 1777.5 (132647) | 21.02 | 20.15 |
| | | 1745 (132322) | 21.03 | 20.01 |
| | | 1712.5 (131997) | 21.15 | 20.01 |
| | 12RB-High (13) | 1777.5 (132647) | 20.21 | 19.33 |
| | | 1745 (132322) | 20.13 | 19.03 |
| | | 1712.5 (131997) | 20.30 | 19.04 |
| | 12RB-Middle (6) | 1777.5 (132647) | 20.20 | 19.33 |
| | | 1745 (132322) | 20.17 | 19.07 |
| | | 1712.5 (131997) | 20.19 | 19.00 |
| | 12RB-Low (0) | 1777.5 (132647) | 20.22 | 19.25 |
| | | 1745 (132322) | 20.16 | 19.07 |
| | | 1712.5 (131997) | 20.15 | 19.01 |
| | 25RB (0) | 1777.5 (132647) | 20.26 | 19.21 |
| | | 1745 (132322) | 20.25 | 19.13 |
| | | 1712.5 (131997) | 20.28 | 19.34 |
| 10MHz | 1RB-High (49) | 1775 (132622) | 21.27 | 20.30 |
| | | 1745 (132322) | 21.11 | 20.47 |
| | | 1715 (132022) | 21.11 | 20.34 |
| | 1RB-Middle (24) | 1775 (132622) | 21.14 | 20.33 |
| | | 1745 (132322) | 21.31 | 20.46 |
| | | 1715 (132022) | 21.40 | 20.89 |
| | 1RB-Low (0) | 1775 (132622) | 21.08 | 20.01 |
| | | 1745 (132322) | 21.20 | 20.20 |
| | | 1715 (132022) | 21.12 | 20.15 |
| | 25RB-High (25) | 1775 (132622) | 20.30 | 19.34 |
| | | 1745 (132322) | 20.34 | 19.48 |
| | | 1715 (132022) | 20.40 | 19.31 |
| | 25RB-Middle (12) | 1775 (132622) | 20.32 | 19.37 |
| | | 1745 (132322) | 20.40 | 19.39 |
| | | 1715 (132022) | 20.40 | 19.29 |
| | 25RB-Low (0) | 1775 (132622) | 20.22 | 19.31 |
| | | 1745 (132322) | 20.39 | 19.22 |
| | | 1715 (132022) | 20.23 | 19.14 |

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|---|---|---|---|---|
| | 50RB (0) | 1775 (132622) | 20.33 | 19.35 |
| | | 1745 (132322) | 20.30 | 19.13 |
| | | 1715 (132022) | 20.32 | 19.23 |
| 15MHz | 1RB-High (74) | 1772.5 (132597) | 21.14 | 20.06 |
| | | 1745 (132322) | 21.25 | 20.91 |
| | | 1717.5 (132047) | 21.37 | 20.46 |
| | 1RB-Middle (37) | 1772.5 (132597) | 21.50 | 20.33 |
| | | 1745 (132322) | 21.51 | 21.09 |
| | | 1717.5 (132047) | 21.39 | 20.84 |
| | 1RB-Low (0) | 1772.5 (132597) | 21.25 | 20.02 |
| | | 1745 (132322) | 21.17 | 20.97 |
| | | 1717.5 (132047) | 21.25 | 20.18 |
| | 36RB-High (38) | 1772.5 (132597) | 20.32 | 19.21 |
| | | 1745 (132322) | 20.32 | 19.37 |
| | | 1717.5 (132047) | 20.28 | 19.27 |
| | 36RB-Middle (19) | 1772.5 (132597) | 20.33 | 19.24 |
| | | 1745 (132322) | 20.31 | 19.34 |
| | | 1717.5 (132047) | 20.37 | 19.26 |
| | 36RB-Low (0) | 1772.5 (132597) | 20.27 | 19.40 |
| | | 1745 (132322) | 20.45 | 19.30 |
| | | 1717.5 (132047) | 20.21 | 19.11 |
| | 75RB (0) | 1772.5 (132597) | 20.26 | 19.27 |
| | | 1745 (132322) | 20.41 | 19.29 |
| | | 1717.5 (132047) | 20.28 | 19.20 |
| 20MHz | 1RB-High (99) | 1770 (132572) | 21.15 | 20.28 |
| | | 1745 (132322) | 21.07 | 20.10 |
| | | 1720 (132072) | 21.06 | 20.42 |
| | 1RB-Middle (50) | 1770 (132572) | **21.47** | 20.36 |
| | | 1745 (132322) | 21.38 | 20.21 |
| | | 1720 (132072) | 21.22 | 20.69 |
| | 1RB-Low (0) | 1770 (132572) | 21.19 | 20.02 |
| | | 1745 (132322) | 21.05 | 20.18 |
| | | 1720 (132072) | 21.02 | 20.01 |
| | 50RB-High (50) | 1770 (132572) | 20.33 | 19.33 |
| | | 1745 (132322) | **20.47** | 19.48 |
| | | 1720 (132072) | 20.37 | 19.49 |
| | 50RB-Middle (25) | 1770 (132572) | 20.31 | 19.30 |
| | | 1745 (132322) | 20.41 | 19.35 |
| | | 1720 (132072) | 20.34 | 19.44 |
| | 50RB-Low (0) | 1770 (132572) | 20.27 | 19.17 |
| | | 1745 (132322) | 20.46 | 19.38 |
| | | 1720 (132072) | 20.31 | 19.23 |

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|---|---|---|---|---|
| | 100RB (0) | 1770 (132572) | 20.24 | 19.25 |
| | | 1745 (132322) | 20.40 | 19.45 |
| | | 1720 (132072) | 20.35 | 19.39 |

**Low power：**

| LTEB2 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 1909.3 (19193) | 18.00 | 17.20 |
| | | 1880 (18900) | 18.22 | 17.43 |
| | | 1850.7 (18607) | 18.23 | 17.29 |
| | 1RB-Middle (3) | 1909.3 (19193) | 18.31 | 17.23 |
| | | 1880 (18900) | 18.26 | 17.38 |
| | | 1850.7 (18607) | 18.27 | 17.31 |
| | 1RB-Low (0) | 1909.3 (19193) | 18.26 | 17.20 |
| | | 1880 (18900) | 18.24 | 17.43 |
| | | 1850.7 (18607) | 18.20 | 17.26 |
| | 3RB-High (3) | 1909.3 (19193) | 18.21 | 17.42 |
| | | 1880 (18900) | 18.17 | 17.39 |
| | | 1850.7 (18607) | 18.21 | 17.01 |
| | 3RB-Middle (1) | 1909.3 (19193) | 18.46 | 17.39 |
| | | 1880 (18900) | 18.33 | 17.51 |
| | | 1850.7 (18607) | 18.25 | 17.06 |
| | 3RB-Low (0) | 1909.3 (19193) | 18.32 | 17.44 |
| | | 1880 (18900) | 18.29 | 17.57 |
| | | 1850.7 (18607) | 18.21 | 17.02 |
| | 6RB (0) | 1909.3 (19193) | 17.26 | 16.18 |
| | | 1880 (18900) | 17.32 | 16.47 |
| | | 1850.7 (18607) | 17.28 | 15.90 |
| 3MHz | 1RB-High (14) | 1908.5 (19185) | 18.01 | 17.10 |
| | | 1880 (18900) | 18.29 | 17.16 |
| | | 1851.5 (18615) | 18.19 | 17.34 |
| | 1RB-Middle (7) | 1908.5 (19185) | 18.28 | 17.66 |
| | | 1880 (18900) | 18.33 | 17.32 |
| | | 1851.5 (18615) | 18.22 | 17.37 |
| | 1RB-Low (0) | 1908.5 (19185) | 18.15 | 17.29 |
| | | 1880 (18900) | 18.25 | 17.25 |
| | | 1851.5 (18615) | 18.12 | 17.27 |
| | 8RB-High (7) | 1908.5 (19185) | 17.24 | 16.28 |
| | | 1880 (18900) | 17.24 | 16.57 |
| | | 1851.5 (18615) | 17.19 | 16.10 |

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|---|---|---|---|---|
| | 8RB-Middle (4) | 1908.5 (19185) | 17.28 | 16.34 |
| | | 1880 (18900) | 17.28 | 16.60 |
| | | 1851.5 (18615) | 17.19 | 16.04 |
| | 8RB-Low (0) | 1908.5 (19185) | 17.16 | 16.32 |
| | | 1880 (18900) | 17.26 | 16.48 |
| | | 1851.5 (18615) | 17.25 | 16.08 |
| | 15RB (0) | 1908.5 (19185) | 17.16 | 15.99 |
| | | 1880 (18900) | 17.27 | 16.23 |
| | | 1851.5 (18615) | 17.27 | 16.27 |
| 5MHz | 1RB-High (24) | 1907.5 (19175) | 18.00 | 17.21 |
| | | 1880 (18900) | 18.12 | 16.91 |
| | | 1852.5 (18625) | 18.09 | 17.12 |
| | 1RB-Middle (12) | 1907.5 (19175) | 18.09 | 17.29 |
| | | 1880 (18900) | 18.32 | 16.81 |
| | | 1852.5 (18625) | 18.20 | 17.15 |
| | 1RB-Low (0) | 1907.5 (19175) | 17.99 | 17.14 |
| | | 1880 (18900) | 18.23 | 16.64 |
| | | 1852.5 (18625) | 18.00 | 16.87 |
| | 12RB-High (13) | 1907.5 (19175) | 17.19 | 16.18 |
| | | 1880 (18900) | 17.21 | 16.14 |
| | | 1852.5 (18625) | 17.16 | 16.14 |
| | 12RB-Middle (6) | 1907.5 (19175) | 17.25 | 16.23 |
| | | 1880 (18900) | 17.13 | 16.16 |
| | | 1852.5 (18625) | 17.18 | 16.16 |
| | 12RB-Low (0) | 1907.5 (19175) | 17.16 | 16.14 |
| | | 1880 (18900) | 17.19 | 16.01 |
| | | 1852.5 (18625) | 17.13 | 16.10 |
| | 25RB (0) | 1907.5 (19175) | 17.21 | 16.03 |
| | | 1880 (18900) | 17.30 | 16.25 |
| | | 1852.5 (18625) | 17.22 | 16.13 |
| 10MHz | 1RB-High (49) | 1905 (19150) | 18.21 | 17.25 |
| | | 1880 (18900) | 18.20 | 17.40 |
| | | 1855 (18650) | 18.58 | 17.29 |
| | 1RB-Middle (24) | 1905 (19150) | 18.51 | 17.30 |
| | | 1880 (18900) | 18.35 | 17.73 |
| | | 1855 (18650) | 18.80 | 17.90 |
| | 1RB-Low (0) | 1905 (19150) | 18.04 | 16.76 |
| | | 1880 (18900) | 17.95 | 17.17 |
| | | 1855 (18650) | 18.44 | 17.08 |
| | 25RB-High (25) | 1905 (19150) | 17.22 | 15.96 |
| | | 1880 (18900) | 17.31 | 16.32 |
| | | 1855 (18650) | 17.30 | 16.33 |

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| | | | | |
|---|---|---|---|---|
| | 25RB-Middle (12) | 1905 (19150) | 17.25 | 16.06 |
| | | 1880 (18900) | 17.27 | 16.38 |
| | | 1855 (18650) | 17.33 | 16.34 |
| | 25RB-Low (0) | 1905 (19150) | 17.18 | 16.00 |
| | | 1880 (18900) | 17.12 | 16.22 |
| | | 1855 (18650) | 17.19 | 16.13 |
| | 50RB (0) | 1905 (19150) | 17.25 | 15.96 |
| | | 1880 (18900) | 17.25 | 16.14 |
| | | 1855 (18650) | 17.19 | 16.11 |
| 15MHz | 1RB-High (74) | 1902.5 (19125) | 18.21 | 17.41 |
| | | 1880 (18900) | 18.24 | 17.21 |
| | | 1857.5 (18675) | 18.25 | 17.14 |
| | 1RB-Middle (37) | 1902.5 (19125) | 18.46 | 17.87 |
| | | 1880 (18900) | 18.61 | 17.75 |
| | | 1857.5 (18675) | 18.44 | 17.27 |
| | 1RB-Low (0) | 1902.5 (19125) | 18.29 | 17.72 |
| | | 1880 (18900) | 18.40 | 16.96 |
| | | 1857.5 (18675) | 18.29 | 16.67 |
| | 36RB-High (38) | 1902.5 (19125) | 17.20 | 16.02 |
| | | 1880 (18900) | 17.25 | 16.13 |
| | | 1857.5 (18675) | 17.24 | 16.35 |
| | 36RB-Middle (19) | 1902.5 (19125) | 17.24 | 16.05 |
| | | 1880 (18900) | 17.23 | 16.17 |
| | | 1857.5 (18675) | 17.27 | 16.40 |
| | 36RB-Low (0) | 1902.5 (19125) | 17.21 | 16.01 |
| | | 1880 (18900) | 17.22 | 16.03 |
| | | 1857.5 (18675) | 17.20 | 16.19 |
| | 75RB (0) | 1902.5 (19125) | 17.11 | 16.01 |
| | | 1880 (18900) | 17.25 | 16.13 |
| | | 1857.5 (18675) | 17.26 | 16.27 |
| 20MHz | 1RB-High (99) | 1900 (19100) | 18.34 | 17.10 |
| | | 1880 (18900) | 18.19 | 17.16 |
| | | 1860 (18700) | 17.91 | 16.98 |
| | 1RB-Middle (50) | 1900 (19100) | 18.64 | 17.25 |
| | | 1880 (18900) | 18.52 | 17.21 |
| | | 1860 (18700) | 18.45 | 17.44 |
| | 1RB-Low (0) | 1900 (19100) | 18.40 | 17.04 |
| | | 1880 (18900) | 18.12 | 17.08 |
| | | 1860 (18700) | 17.80 | 16.91 |
| | 50RB-High (50) | 1900 (19100) | 17.30 | 16.28 |
| | | 1880 (18900) | 17.40 | 16.27 |
| | | 1860 (18700) | 17.21 | 16.10 |

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| | | | | |
|---|---|---|---|---|
| | 50RB-Middle (25) | 1900 (19100) | 17.36 | 16.27 |
| | | 1880 (18900) | 17.41 | 16.24 |
| | | 1860 (18700) | 17.38 | 16.38 |
| | 50RB-Low (0) | 1900 (19100) | 17.36 | 16.29 |
| | | 1880 (18900) | 17.25 | 16.20 |
| | | 1860 (18700) | 17.29 | 16.27 |
| | 100RB (0) | 1900 (19100) | 17.32 | 16.13 |
| | | 1880 (18900) | 17.37 | 16.26 |
| | | 1860 (18700) | 17.33 | 16.26 |

| LTEB5 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 848.3 (20643) | 20.75 | 20.02 |
| | | 836.5 (20525) | 20.73 | 19.88 |
| | | 824.7 (20407) | 20.68 | 19.78 |
| | 1RB-Middle (3) | 848.3 (20643) | 20.97 | 20.03 |
| | | 836.5 (20525) | 20.81 | 19.79 |
| | | 824.7 (20407) | 20.89 | 19.65 |
| | 1RB-Low (0) | 848.3 (20643) | 20.90 | 19.97 |
| | | 836.5 (20525) | 20.82 | 19.87 |
| | | 824.7 (20407) | 20.60 | 19.60 |
| | 3RB-High (3) | 848.3 (20643) | 20.71 | 20.02 |
| | | 836.5 (20525) | 20.93 | 19.75 |
| | | 824.7 (20407) | 20.75 | 19.47 |
| | 3RB-Middle (1) | 848.3 (20643) | 20.73 | 19.96 |
| | | 836.5 (20525) | 20.89 | 19.65 |
| | | 824.7 (20407) | 20.85 | 19.50 |
| | 3RB-Low (0) | 848.3 (20643) | 20.68 | 20.02 |
| | | 836.5 (20525) | 20.79 | 19.66 |
| | | 824.7 (20407) | 20.79 | 19.45 |
| | 6RB (0) | 848.3 (20643) | 19.87 | 18.97 |
| | | 836.5 (20525) | 19.87 | 19.17 |
| | | 824.7 (20407) | 19.82 | 18.51 |
| 3MHz | 1RB-High (14) | 847.5 (20635) | 20.73 | 19.85 |
| | | 836.5 (20525) | 21.05 | 19.94 |
| | | 825.5 (20415) | 20.94 | 19.75 |
| | 1RB-Middle (7) | 847.5 (20635) | 20.90 | 19.88 |
| | | 836.5 (20525) | 21.13 | 19.92 |
| | | 825.5 (20415) | 21.13 | 19.73 |
| | 1RB-Low (0) | 847.5 (20635) | 20.79 | 20.05 |
| | | 836.5 (20525) | 21.04 | 19.85 |

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| | | | | |
|---|---|---|---|---|
| | | 825.5 (20415) | 20.99 | 19.60 |
| | 8RB-High (7) | 847.5 (20635) | 19.88 | 19.03 |
| | | 836.5 (20525) | 19.85 | 18.92 |
| | | 825.5 (20415) | 19.82 | 19.18 |
| | 8RB-Middle (4) | 847.5 (20635) | 19.91 | 19.19 |
| | | 836.5 (20525) | 19.88 | 18.79 |
| | | 825.5 (20415) | 19.78 | 19.10 |
| | 8RB-Low (0) | 847.5 (20635) | 19.89 | 18.90 |
| | | 836.5 (20525) | 19.86 | 18.86 |
| | | 825.5 (20415) | 19.79 | 19.15 |
| | 15RB (0) | 847.5 (20635) | 19.80 | 19.01 |
| | | 836.5 (20525) | 19.78 | 18.68 |
| | | 825.5 (20415) | 19.73 | 18.79 |
| 5MHz | 1RB-High (24) | 846.5 (20625) | 20.63 | 19.95 |
| | | 836.5 (20525) | 20.65 | 19.67 |
| | | 826.5 (20425) | 20.46 | 19.69 |
| | 1RB-Middle (12) | 846.5 (20625) | 20.66 | 19.80 |
| | | 836.5 (20525) | 20.94 | 19.85 |
| | | 826.5 (20425) | 20.74 | 19.72 |
| | 1RB-Low (0) | 846.5 (20625) | 20.48 | 19.55 |
| | | 836.5 (20525) | 20.49 | 19.59 |
| | | 826.5 (20425) | 20.79 | 19.43 |
| | 12RB-High (13) | 846.5 (20625) | 19.94 | 18.77 |
| | | 836.5 (20525) | 19.85 | 18.96 |
| | | 826.5 (20425) | 19.75 | 18.71 |
| | 12RB-Middle (6) | 846.5 (20625) | 19.90 | 18.81 |
| | | 836.5 (20525) | 19.87 | 18.97 |
| | | 826.5 (20425) | 19.82 | 18.77 |
| | 12RB-Low (0) | 846.5 (20625) | 19.84 | 18.77 |
| | | 836.5 (20525) | 19.76 | 18.78 |
| | | 826.5 (20425) | 19.65 | 18.78 |
| | 25RB (0) | 846.5 (20625) | 19.94 | 18.89 |
| | | 836.5 (20525) | 19.80 | 18.81 |
| | | 826.5 (20425) | 19.63 | 18.88 |
| 10MHz | 1RB-High (49) | 844 (20600) | 20.69 | 19.82 |
| | | 836.5 (20525) | 20.56 | 19.69 |
| | | 829 (20450) | 20.57 | 19.14 |
| | 1RB-Middle (24) | 844 (20600) | 21.11 | 20.25 |
| | | 836.5 (20525) | 21.03 | 19.88 |
| | | 829 (20450) | 20.88 | 19.87 |
| | 1RB-Low (0) | 844 (20600) | 20.56 | 19.43 |
| | | 836.5 (20525) | 20.38 | 19.22 |

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|---|---|---|---|---|
| | | 829 (20450) | 20.52 | 19.35 |
| | 25RB-High (25) | 844 (20600) | 19.77 | 18.88 |
| | | 836.5 (20525) | 19.93 | 19.04 |
| | | 829 (20450) | 19.73 | 18.70 |
| | 25RB-Middle (12) | 844 (20600) | 19.80 | 18.91 |
| | | 836.5 (20525) | 19.91 | 19.13 |
| | | 829 (20450) | 19.80 | 18.86 |
| | 25RB-Low (0) | 844 (20600) | 19.74 | 18.75 |
| | | 836.5 (20525) | 19.75 | 18.96 |
| | | 829 (20450) | 19.61 | 18.76 |
| | 50RB (0) | 844 (20600) | 19.74 | 18.72 |
| | | 836.5 (20525) | 19.81 | 18.74 |
| | | 829 (20450) | 19.73 | 18.66 |

| LTEB12 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 715.3 (23173) | 20.80 | 19.76 |
| | | 707.5 (23095) | 20.48 | 19.71 |
| | | 699.7 (23017) | 20.66 | 19.68 |
| | 1RB-Middle (3) | 715.3 (23173) | 20.88 | 19.86 |
| | | 707.5 (23095) | 20.57 | 19.59 |
| | | 699.7 (23017) | 20.74 | 19.79 |
| | 1RB-Low (0) | 715.3 (23173) | 20.88 | 19.88 |
| | | 707.5 (23095) | 20.53 | 19.72 |
| | | 699.7 (23017) | 20.70 | 19.88 |
| | 3RB-High (3) | 715.3 (23173) | 20.65 | 19.88 |
| | | 707.5 (23095) | 20.82 | 19.54 |
| | | 699.7 (23017) | 20.79 | 19.94 |
| | 3RB-Middle (1) | 715.3 (23173) | 20.75 | 20.02 |
| | | 707.5 (23095) | 20.79 | 19.53 |
| | | 699.7 (23017) | 20.82 | 19.87 |
| | 3RB-Low (0) | 715.3 (23173) | 20.72 | 19.92 |
| | | 707.5 (23095) | 20.62 | 19.39 |
| | | 699.7 (23017) | 20.89 | 19.86 |
| | 6RB (0) | 715.3 (23173) | 20.03 | 18.91 |
| | | 707.5 (23095) | 19.89 | 18.75 |
| | | 699.7 (23017) | 19.95 | 18.66 |
| 3MHz | 1RB-High (14) | 714.5 (23165) | 20.82 | 19.73 |
| | | 707.5 (23095) | 21.05 | 19.46 |
| | | 700.5 (23025) | 20.74 | 19.87 |
| | 1RB-Middle (7) | 714.5 (23165) | 20.96 | 19.94 |

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|---|---|---|---|---|
| | | 707.5 (23095) | 21.08 | 19.53 |
| | | 700.5 (23025) | 20.79 | 20.19 |
| | 1RB-Low (0) | 714.5 (23165) | 20.89 | 20.01 |
| | | 707.5 (23095) | 20.85 | 19.71 |
| | | 700.5 (23025) | 20.81 | 19.91 |
| | 8RB-High (7) | 714.5 (23165) | 19.90 | 18.67 |
| | | 707.5 (23095) | 20.00 | 19.16 |
| | | 700.5 (23025) | 19.94 | 18.88 |
| | 8RB-Middle (4) | 714.5 (23165) | 19.95 | 18.74 |
| | | 707.5 (23095) | 20.00 | 18.79 |
| | | 700.5 (23025) | 20.00 | 18.86 |
| | 8RB-Low (0) | 714.5 (23165) | 19.99 | 18.69 |
| | | 707.5 (23095) | 20.00 | 18.71 |
| | | 700.5 (23025) | 19.89 | 18.84 |
| | 15RB (0) | 714.5 (23165) | 19.99 | 18.71 |
| | | 707.5 (23095) | 20.02 | 18.82 |
| | | 700.5 (23025) | 19.92 | 18.92 |
| 5MHz | 1RB-High (24) | 713.5 (23155) | 20.73 | 19.38 |
| | | 707.5 (23095) | 20.51 | 19.80 |
| | | 701.5 (23035) | 20.74 | 19.46 |
| | 1RB-Middle (12) | 713.5 (23155) | 21.01 | 19.89 |
| | | 707.5 (23095) | 20.57 | 20.09 |
| | | 701.5 (23035) | 20.85 | 19.97 |
| | 1RB-Low (0) | 713.5 (23155) | 20.79 | 19.67 |
| | | 707.5 (23095) | 20.50 | 19.80 |
| | | 701.5 (23035) | 20.55 | 19.50 |
| | 12RB-High (13) | 713.5 (23155) | 19.72 | 18.69 |
| | | 707.5 (23095) | 19.76 | 18.80 |
| | | 701.5 (23035) | 19.72 | 18.85 |
| | 12RB-Middle (6) | 713.5 (23155) | 19.88 | 18.84 |
| | | 707.5 (23095) | 19.82 | 18.78 |
| | | 701.5 (23035) | 19.97 | 19.08 |
| | 12RB-Low (0) | 713.5 (23155) | 19.85 | 18.90 |
| | | 707.5 (23095) | 19.78 | 18.74 |
| | | 701.5 (23035) | 19.83 | 18.94 |
| | 25RB (0) | 713.5 (23155) | 19.77 | 18.68 |
| | | 707.5 (23095) | 19.89 | 18.82 |
| | | 701.5 (23035) | 19.78 | 18.82 |
| 10MHz | 1RB-High (49) | 711 (23130) | 20.94 | 19.72 |
| | | 707.5 (23095) | 20.64 | 19.75 |
| | | 704 (23060) | 20.77 | 19.92 |
| | 1RB-Middle (24) | 711 (23130) | 20.95 | 20.46 |

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|---|---|---|---|---|
| | | 707.5 (23095) | 20.93 | 19.92 |
| | | 704 (23060) | 20.96 | 20.09 |
| | 1RB-Low (0) | 711 (23130) | 20.87 | 19.74 |
| | | 707.5 (23095) | 20.64 | 19.36 |
| | | 704 (23060) | 20.71 | 19.43 |
| | 25RB-High (25) | 711 (23130) | 19.87 | 18.93 |
| | | 707.5 (23095) | 19.94 | 18.91 |
| | | 704 (23060) | 19.83 | 18.94 |
| | 25RB-Middle (12) | 711 (23130) | 19.93 | 19.11 |
| | | 707.5 (23095) | 19.87 | 18.80 |
| | | 704 (23060) | 19.83 | 18.91 |
| | 25RB-Low (0) | 711 (23130) | 19.85 | 18.86 |
| | | 707.5 (23095) | 19.77 | 18.88 |
| | | 704 (23060) | 19.68 | 18.85 |
| | 50RB (0) | 711 (23130) | 19.90 | 18.93 |
| | | 707.5 (23095) | 19.80 | 18.82 |
| | | 704 (23060) | 19.88 | 18.88 |

| LTEB14 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 5MHz | 1RB-High (24) | 795.5 (23355) | 19.82 | 18.82 |
| | | 793 (23330) | 19.74 | 18.86 |
| | | 790.5 (23305) | 19.86 | 18.50 |
| | 1RB-Middle (12) | 795.5 (23355) | 19.93 | 18.51 |
| | | 793 (23330) | 20.01 | 19.11 |
| | | 790.5 (23305) | 20.11 | 18.59 |
| | 1RB-Low (0) | 795.5 (23355) | 19.73 | 18.51 |
| | | 793 (23330) | 19.98 | 19.03 |
| | | 790.5 (23305) | 19.97 | 18.52 |
| | 12RB-High (13) | 795.5 (23355) | 19.06 | 17.92 |
| | | 793 (23330) | 18.93 | 17.77 |
| | | 790.5 (23305) | 18.95 | 17.72 |
| | 12RB-Middle (6) | 795.5 (23355) | 18.94 | 17.80 |
| | | 793 (23330) | 18.97 | 17.81 |
| | | 790.5 (23305) | 19.06 | 17.99 |
| | 12RB-Low (0) | 795.5 (23355) | 18.88 | 17.66 |
| | | 793 (23330) | 18.89 | 17.84 |
| | | 790.5 (23305) | 18.99 | 18.02 |
| | 25RB (0) | 795.5 (23355) | 19.01 | 17.92 |
| | | 793 (23330) | 18.88 | 17.83 |

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|---|---|---|---|---|
| | | 790.5 (23305) | 18.98 | 17.84 |
| 10MHz | 1RB-High (49) | 793 (23330) | 20.05 | 18.68 |
| | 1RB-Middle (24) | 793 (23330) | 20.33 | 19.25 |
| | 1RB-Low (0) | 793 (23330) | 20.26 | 19.16 |
| | 25RB-High (25) | 793 (23330) | 19.04 | 18.03 |
| | 25RB-Middle (12) | 793 (23330) | 19.04 | 18.02 |
| | 25RB-Low (0) | 793 (23330) | 19.02 | 18.10 |
| | 50RB (0) | 793 (23330) | 18.96 | 17.97 |

| LTEB30 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 5MHz | 1RB-High (24) | 2312.5 (27735) | 16.51 | 16.15 |
| | | 2310 (27710) | 16.96 | 16.09 |
| | | 2307.5 (27685) | 17.05 | 15.86 |
| | 1RB-Middle (12) | 2312.5 (27735) | 17.16 | 16.41 |
| | | 2310 (27710) | 17.21 | 16.22 |
| | | 2307.5 (27685) | 17.20 | 16.05 |
| | 1RB-Low (0) | 2312.5 (27735) | 16.88 | 16.06 |
| | | 2310 (27710) | 16.78 | 16.00 |
| | | 2307.5 (27685) | 17.04 | 15.67 |
| | 12RB-High (13) | 2312.5 (27735) | 16.02 | 14.90 |
| | | 2310 (27710) | 16.12 | 15.13 |
| | | 2307.5 (27685) | 15.92 | 14.94 |
| | 12RB-Middle (6) | 2312.5 (27735) | 16.02 | 15.01 |
| | | 2310 (27710) | 16.12 | 15.12 |
| | | 2307.5 (27685) | 16.06 | 15.12 |
| | 12RB-Low (0) | 2312.5 (27735) | 15.96 | 14.96 |
| | | 2310 (27710) | 16.06 | 15.11 |
| | | 2307.5 (27685) | 16.00 | 15.15 |
| | 25RB (0) | 2312.5 (27735) | 16.10 | 15.25 |
| | | 2310 (27710) | 16.03 | 14.96 |
| | | 2307.5 (27685) | 15.99 | 15.14 |
| 10MHz | 1RB-High (49) | 2310 (27710) | 17.04 | 16.14 |
| | 1RB-Middle (24) | 2310 (27710) | 17.33 | 16.28 |
| | 1RB-Low (0) | 2310 (27710) | 17.03 | 16.01 |
| | 25RB-High (25) | 2310 (27710) | 16.11 | 15.01 |
| | 25RB-Middle (12) | 2310 (27710) | 16.07 | 15.12 |
| | 25RB-Low (0) | 2310 (27710) | 16.09 | 15.09 |
| | 50RB (0) | 2310 (27710) | 16.06 | 15.10 |

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| LTEB66 | | | | |
|---|---|---|---|---|
| **BANDWIDTH** | **Number of RBs** | **Frequency** | **QPSK** | **16QAM** |
| 1.4MHz | 1RB-High (5) | 1779.3 (132665) | 17.16 | 15.92 |
| | | 1745 (132322) | 17.07 | 15.95 |
| | | 1710.7 (131979) | 16.98 | 16.01 |
| | 1RB-Middle (3) | 1779.3 (132665) | 17.16 | 15.87 |
| | | 1745 (132322) | 17.10 | 15.91 |
| | | 1710.7 (131979) | 17.00 | 16.07 |
| | 1RB-Low (0) | 1779.3 (132665) | 17.18 | 15.83 |
| | | 1745 (132322) | 17.17 | 16.06 |
| | | 1710.7 (131979) | 16.86 | 15.98 |
| | 3RB-High (3) | 1779.3 (132665) | 17.10 | 15.96 |
| | | 1745 (132322) | 17.15 | 15.81 |
| | | 1710.7 (131979) | 17.16 | 15.65 |
| | 3RB-Middle (1) | 1779.3 (132665) | 17.10 | 16.02 |
| | | 1745 (132322) | 17.16 | 15.75 |
| | | 1710.7 (131979) | 17.23 | 15.55 |
| | 3RB-Low (0) | 1779.3 (132665) | 17.15 | 15.98 |
| | | 1745 (132322) | 17.11 | 15.71 |
| | | 1710.7 (131979) | 17.11 | 15.64 |
| | 6RB (0) | 1779.3 (132665) | 16.08 | 15.25 |
| | | 1745 (132322) | 16.14 | 14.89 |
| | | 1710.7 (131979) | 16.00 | 14.87 |
| 3MHz | 1RB-High (14) | 1778.5 (132657) | 17.30 | 16.24 |
| | | 1745 (132322) | 17.38 | 16.00 |
| | | 1711.5 (131987) | 16.97 | 16.11 |
| | 1RB-Middle (7) | 1778.5 (132657) | 17.43 | 16.15 |
| | | 1745 (132322) | 17.41 | 16.06 |
| | | 1711.5 (131987) | 17.00 | 16.20 |
| | 1RB-Low (0) | 1778.5 (132657) | 17.36 | 16.05 |
| | | 1745 (132322) | 17.36 | 16.19 |
| | | 1711.5 (131987) | 16.95 | 15.96 |
| | 8RB-High (7) | 1778.5 (132657) | 16.14 | 15.24 |
| | | 1745 (132322) | 16.14 | 15.50 |
| | | 1711.5 (131987) | 16.02 | 15.07 |
| | 8RB-Middle (4) | 1778.5 (132657) | 16.10 | 15.20 |
| | | 1745 (132322) | 16.18 | 15.44 |
| | | 1711.5 (131987) | 16.06 | 15.22 |
| | 8RB-Low (0) | 1778.5 (132657) | 16.16 | 15.17 |
| | | 1745 (132322) | 16.15 | 15.51 |

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| | | | | |
|---|---|---|---|---|
| | | 1711.5 (131987) | 16.00 | 15.23 |
| | 15RB (0) | 1778.5 (132657) | 16.09 | 15.19 |
| | | 1745 (132322) | 16.16 | 15.27 |
| | | 1711.5 (131987) | 16.06 | 15.26 |
| 5MHz | 1RB-High (24) | 1777.5 (132647) | 17.16 | 15.83 |
| | | 1745 (132322) | 16.92 | 15.88 |
| | | 1712.5 (131997) | 16.88 | 16.20 |
| | 1RB-Middle (12) | 1777.5 (132647) | 17.28 | 15.77 |
| | | 1745 (132322) | 17.21 | 15.90 |
| | | 1712.5 (131997) | 16.99 | 16.26 |
| | 1RB-Low (0) | 1777.5 (132647) | 17.26 | 15.72 |
| | | 1745 (132322) | 17.11 | 15.80 |
| | | 1712.5 (131997) | 16.79 | 16.04 |
| | 12RB-High (13) | 1777.5 (132647) | 16.13 | 15.16 |
| | | 1745 (132322) | 16.16 | 15.09 |
| | | 1712.5 (131997) | 16.07 | 15.11 |
| | 12RB-Middle (6) | 1777.5 (132647) | 16.04 | 15.27 |
| | | 1745 (132322) | 16.19 | 15.12 |
| | | 1712.5 (131997) | 16.04 | 15.03 |
| | 12RB-Low (0) | 1777.5 (132647) | 16.01 | 15.31 |
| | | 1745 (132322) | 16.08 | 15.10 |
| | | 1712.5 (131997) | 15.95 | 14.97 |
| | 25RB (0) | 1777.5 (132647) | 16.01 | 15.14 |
| | | 1745 (132322) | 16.09 | 15.16 |
| | | 1712.5 (131997) | 16.03 | 15.14 |
| 10MHz | 1RB-High (49) | 1775 (132622) | 17.43 | 16.24 |
| | | 1745 (132322) | 17.27 | 16.24 |
| | | 1715 (132022) | 17.08 | 15.65 |
| | 1RB-Middle (24) | 1775 (132622) | 17.65 | 16.47 |
| | | 1745 (132322) | 17.67 | 16.84 |
| | | 1715 (132022) | 17.46 | 16.19 |
| | 1RB-Low (0) | 1775 (132622) | 17.36 | 15.90 |
| | | 1745 (132322) | 17.31 | 16.21 |
| | | 1715 (132022) | 16.90 | 15.38 |
| | 25RB-High (25) | 1775 (132622) | 16.11 | 15.52 |
| | | 1745 (132322) | 16.17 | 15.30 |
| | | 1715 (132022) | 16.18 | 15.11 |
| | 25RB-Middle (12) | 1775 (132622) | 16.16 | 15.44 |
| | | 1745 (132322) | 16.12 | 15.17 |
| | | 1715 (132022) | 16.12 | 15.14 |
| | 25RB-Low (0) | 1775 (132622) | 16.15 | 15.22 |
| | | 1745 (132322) | 16.11 | 15.18 |

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| | | | | |
|---|---|---|---|---|
| | | 1715 (132022) | 16.00 | 15.19 |
| | 50RB (0) | 1775 (132622) | 16.12 | 15.19 |
| | | 1745 (132322) | 16.09 | 15.15 |
| | | 1715 (132022) | 16.14 | 15.22 |
| 15MHz | 1RB-High (74) | 1772.5 (132597) | 16.19 | 16.12 |
| | | 1745 (132322) | 16.11 | 16.08 |
| | | 1717.5 (132047) | 16.06 | 16.72 |
| | 1RB-Middle (37) | 1772.5 (132597) | 16.40 | 16.39 |
| | | 1745 (132322) | 16.16 | 16.14 |
| | | 1717.5 (132047) | 16.10 | 16.95 |
| | 1RB-Low (0) | 1772.5 (132597) | 16.14 | 16.06 |
| | | 1745 (132322) | 16.20 | 15.75 |
| | | 1717.5 (132047) | 16.01 | 16.64 |
| | 36RB-High (38) | 1772.5 (132597) | 16.21 | 15.26 |
| | | 1745 (132322) | 16.22 | 15.40 |
| | | 1717.5 (132047) | 16.25 | 15.36 |
| | 36RB-Middle (19) | 1772.5 (132597) | 16.26 | 15.31 |
| | | 1745 (132322) | 16.21 | 15.31 |
| | | 1717.5 (132047) | 16.18 | 15.30 |
| | 36RB-Low (0) | 1772.5 (132597) | 16.14 | 15.27 |
| | | 1745 (132322) | 16.23 | 15.34 |
| | | 1717.5 (132047) | 16.08 | 15.03 |
| | 75RB (0) | 1772.5 (132597) | 16.20 | 15.26 |
| | | 1745 (132322) | 16.20 | 15.33 |
| | | 1717.5 (132047) | 16.21 | 15.17 |
| 20MHz | 1RB-High (99) | 1770 (132572) | 17.18 | 15.91 |
| | | 1745 (132322) | 16.93 | 15.85 |
| | | 1720 (132072) | 16.94 | 15.80 |
| | 1RB-Middle (50) | 1770 (132572) | 17.52 | 16.18 |
| | | 1745 (132322) | 17.31 | 15.84 |
| | | 1720 (132072) | 17.31 | 16.33 |
| | 1RB-Low (0) | 1770 (132572) | 17.11 | 15.85 |
| | | 1745 (132322) | 17.12 | 15.89 |
| | | 1720 (132072) | 16.69 | 15.59 |
| | 50RB-High (50) | 1770 (132572) | 16.14 | 15.10 |
| | | 1745 (132322) | 16.22 | 15.27 |
| | | 1720 (132072) | 16.08 | 15.25 |
| | 50RB-Middle (25) | 1770 (132572) | 16.17 | 15.32 |
| | | 1745 (132322) | 16.13 | 15.18 |
| | | 1720 (132072) | 16.14 | 15.31 |
| | 50RB-Low (0) | 1770 (132572) | 16.06 | 15.13 |
| | | 1745 (132322) | 16.22 | 15.17 |

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| | | | | |
|---|---|---|---|---|
| | | 1720 (132072) | 16.11 | 15.03 |
| | 100RB (0) | 1770 (132572) | 16.05 | 15.11 |
| | | 1745 (132322) | 16.21 | 15.20 |
| | | 1720 (132072) | 16.19 | 15.21 |

## 11.2 Wi-Fi Measurement result

The average conducted power for Wi-Fi 2.4G is as following-Normal Power:

| 802.11b | |
|---|---|
| Channel\data rate | 1Mbps |
| 11(2462MHz) | 16.28 |
| 6(2437(MHz) | 16.63 |
| 1(2412MHz) | 16.94 |
| Tune up | 17.00 |
| 802.11g | |
| Channel\data rate | 6Mbps |
| 11(2462MHz) | 14.91 |
| 6(2437(MHz) | 14.71 |
| 1(2412MHz) | 14.98 |
| Tune up | 15.50 |
| 802.11n-20MHz | |
| Channel\data rate | MCS0 |
| 11(2462MHz) | 14.62 |
| 6(2437(MHz) | 14.70 |
| 1(2412MHz) | 15.25 |
| Tune up | 15.50 |

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The average conducted power for Wi-Fi 5G is as following-Normal Power:

| **802.11a(dBm)** | |
|---|---|
| Channel\data rate | 6Mbps |
| 36(5180 MHz) | 11.62 |
| 40(5200 MHz) | 11.91 |
| 44(5220 MHz) | 11.88 |
| 48(5240 MHz) | 11.95 |
| 52(5260 MHz) | 11.81 |
| 56(5280 MHz) | 11.55 |
| 60(5300 MHz) | 11.25 |
| 64(5320 MHz) | 11.12 |
| 100(5500 MHz) | 11.36 |
| 104(5520 MHz) | 11.35 |
| 108(5540 MHz) | 11.37 |
| 112(5560 MHz) | 11.86 |
| 116(5580 MHz) | 11.91 |
| 120(5600 MHz) | 12.03 |
| 124(5620 MHz) | 11.87 |
| 128(5640 MHz) | 11.57 |
| 132(5660 MHz) | 11.54 |
| 136(5680 MHz) | 11.58 |
| 140(5700 MHz) | 12.10 |
| 144(5720 MHz) | 12.39 |
| 149(5745 MHz) | 12.41 |
| 153(5765 MHz) | 12.69 |
| 157(5785 MHz) | 12.55 |
| 161(5805 MHz) | 12.15 |
| 165(5825 MHz) | 11.92 |
| Tune up | 13.00 |

The average conducted power for Wi-Fi 2.4G is as following-Low Power:

| 802.11b | |
|---|---|
| Channel\data rate | 1Mbps |
| 11(2462MHz) | 14.38 |
| 6(2437(MHz) | 14.08 |
| 1(2412MHz) | 14.59 |
| Tune up | 15.00 |
| 802.11g | |
| Channel\data rate | 6Mbps |
| 11(2462MHz) | 13.77 |
| 6(2437(MHz) | 13.52 |

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| | |
|---|---|
| 1(2412MHz) | 13.98 |
| Tune up | 14.50 |
| 802.11n-20MHz | |
| Channel\data rate | MCS0 |
| 11(2462MHz) | 13.44 |
| 6(2437(MHz) | 13.32 |
| 1(2412MHz) | 13.71 |
| Tune up | 14.50 |

The average conducted power for Wi-Fi 5G is as following-Low Power:

| **802.11a(dBm)** | |
|---|---|
| Channel\data rate | 6Mbps |
| 36(5180 MHz) | 10.20 |
| 40(5200 MHz) | 10.43 |
| 44(5220 MHz) | 10.39 |
| 48(5240 MHz) | 10.41 |
| 52(5260 MHz) | 10.46 |
| 56(5280 MHz) | 10.18 |
| 60(5300 MHz) | 10.03 |
| 64(5320 MHz) | 10.01 |
| 100(5500 MHz) | 10.04 |
| 104(5520 MHz) | 10.03 |
| 108(5540 MHz) | 10.02 |
| 112(5560 MHz) | 10.04 |
| 116(5580 MHz) | 10.20 |
| 120(5600 MHz) | 10.19 |
| 124(5620 MHz) | 10.18 |
| 128(5640 MHz) | 10.01 |
| 132(5660 MHz) | 10.02 |
| 136(5680 MHz) | 10.11 |
| 140(5700 MHz) | 10.68 |
| 144(5720 MHz) | 11.01 |
| 149(5745 MHz) | 10.99 |
| 153(5765 MHz) | 11.36 |
| 157(5785 MHz) | 11.27 |
| 161(5805 MHz) | 10.89 |
| 165(5825 MHz) | 10.66 |
| Tune up | 12.00 |

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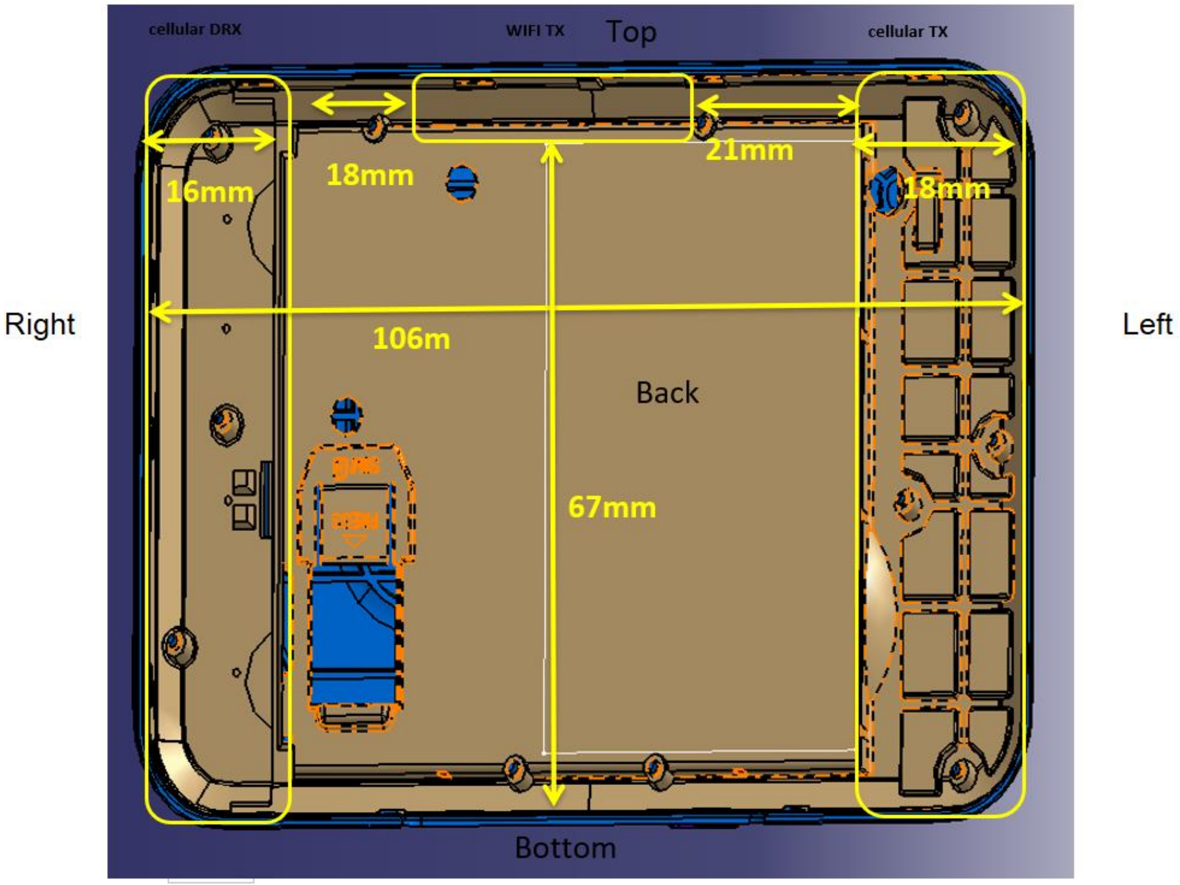
# 12 Simultaneous TX SAR Considerations

## 12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g devices which may simultaneously transmit with the licensed transmitter.

For this device, Wi-Fi can transmit simultaneous with other transmitters.

## 12.2 Transmit Antenna Separation Distances




**Picture 12.1 Antenna Locations**

## 12.3 SAR Measurement Positions

According to the KDB941225 D06 Hot Spot SAR, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

| SAR measurement positions | | | | | | |
|---|---|---|---|---|---|---|
| Mode | Front | Rear | Left edge | Right edge | Top edge | Bottom edge |
| Main Antenna | Yes | Yes | Yes | No | Yes | Yes |
| WiFi Antenna-ANT2 | Yes | Yes | No | No | Yes | No |

## 12.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

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

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, where

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

**Table 12.1: Standalone SAR test exclusion considerations**

| **Band/Mode** | **F(GHz)** | **Position** | **SAR test exclusion threshold(mW)** | **RF output power** | | **SAR test exclusion** |
|---|---|---|---|---|---|---|
| | | | | **dBm** | **mW** | |
| 2.4GHz WLAN | 2.45 | Body | 19.17 | 17 | 50.12 | No |
| 5GHz WLAN | 5.2 | Body | 13.16 | 13 | 20 | No |
| | 5.3 | Body | 13.03 | 13 | 20 | No |
| | 5.6 | Body | 12.68 | 13 | 20 | No |
| | 5.8 | Body | 12.46 | 13 | 20 | No |

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# 13 Evaluation of Simultaneous

**Table 13.1: The sum of SAR values for Main antenna + WiFi-2.4G**

| | Position | Main antenna | WiFi-2.4G | Sum |
|---|---|---|---|---|
| **Highest SAR value for Body** | Top 5mm (LTE Band2) | 0.89 | 0.54 | **1.43** |

**Table 13.2: The sum of SAR values for Main antenna + WiFi-5G**

| | Position | Main antenna | WiFi-5G | Sum |
|---|---|---|---|---|
| **Highest SAR value for Body** | Front 5mm (LTE Band30) | 0.96 | 0.53 | **1.49** |

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

**Conclusion:**
According to the above tables, the sum of reported SAR values is<1.6W/kg. So the simultaneous transmission SAR with volume scans is not required.

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# 14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.
It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or more than 1.2W/kg.

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{\text{Target}} - P_{\text{Measured}})/10}$$

Where $P_{Target}$ is the power of manufacturing upper limit;
$P_{Measured}$ is the measured power in chapter 11.

**Table 14.1: Duty Cycle**

| Mode | Duty Cycle |
|---|---|
| LTE FDD | 1:1 |

## 14.1 SAR results for Fast SAR

**Table 14.1-1: SAR Values (LTE Band 2-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 19100 | 1900 | 1RB-Mid Front 17mm | / | 22.43 | 23 | 0.357 | **0.41** | 0.562 | **0.64** | 0.1 |
| 19100 | 1900 | 1RB-Mid Rear 17mm | / | 22.43 | 23 | 0.305 | **0.35** | 0.466 | **0.53** | -0.06 |
| 19100 | 1900 | 1RB-Mid Left 19mm | / | 22.43 | 23 | 0.198 | **0.23** | 0.313 | **0.36** | -0.12 |
| 19100 | 1900 | 1RB-Mid Bottom 5mm | / | 22.43 | 23 | 0.263 | **0.30** | 0.461 | **0.53** | -0.09 |
| 19100 | 1900 | 1RB-Mid Top 5mm | / | 22.43 | 23 | 0.45 | **0.51** | 0.783 | **0.89** | 0.00 |
| 18900 | 1880 | 1RB-Mid Top 5mm | / | 22.39 | 23 | 0.429 | **0.49** | 0.746 | **0.86** | 0.08 |
| 18700 | 1860 | 1RB-Mid Top 5mm | / | 22.25 | 23 | 0.412 | **0.49** | 0.722 | **0.86** | 0.04 |
| 19100 | 1900 | 50RB-Mid Front 17mm | / | 21.41 | 22 | 0.277 | **0.32** | 0.436 | **0.50** | -0.08 |
| 19100 | 1900 | 50RB-Mid Rear 17mm | / | 21.41 | 22 | 0.248 | **0.28** | 0.378 | **0.43** | 0.02 |
| 19100 | 1900 | 50RB-Mid Left 19mm | / | 21.41 | 22 | 0.154 | **0.18** | 0.243 | **0.28** | 0.01 |
| 19100 | 1900 | 50RB-Mid Bottom 5mm | / | 21.41 | 22 | 0.204 | **0.23** | 0.357 | **0.41** | 0.18 |
| 19100 | 1900 | 50RB-Mid Top 5mm | / | 21.41 | 22 | 0.368 | **0.42** | 0.641 | **0.73** | -0.07 |
| 19100 | 1900 | 100RB | / | 21.23 | 22 | 0.354 | **0.42** | 0.628 | **0.75** | 0.12 |
| 19100 | 1900 | 1RB-Middle Front5mm | Fig.1 | 18.64 | 19 | 0.479 | **0.52** | 0.835 | **0.91** | -0.02 |
| 19100 | 1900 | 1RB-Mid Rear 5mm | / | 18.64 | 19 | 0.452 | **0.49** | 0.774 | **0.84** | 0.1 |
| 19100 | 1900 | 1RB-Mid Left 5mm | / | 18.64 | 19 | 0.136 | **0.15** | 0.259 | **0.28** | 0.14 |
| 18900 | 1880 | 50RB-Mid Front 5mm | / | 17.41 | 18 | 0.369 | **0.42** | 0.644 | **0.74** | -0.09 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18900 | 1880 | 50RB-Mid Rear 5mm | / | 17.41 | 18 | 0.342 | **0.39** | 0.585 | **0.67** | -0.01 |
| 18900 | 1880 | 50RB-Mid Left 5mm | / | 17.41 | 18 | 0.128 | **0.15** | 0.244 | **0.28** | -0.07 |

Note4: The LTE mode is QPSK_20MHz.

**Table 14.1-2: SAR Values (LTE Band 5-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 20525 | 836.5 | 1RB-Mid Front17mm | / | 23.18 | 24 | 0.301 | **0.36** | 0.421 | **0.51** | 0.08 |
| 20525 | 836.5 | 1RB-Mid Rear17mm | / | 23.18 | 24 | 0.382 | **0.46** | 0.56 | **0.68** | -0.17 |
| 20525 | 836.5 | 1RB-Mid Left19mm | / | 23.18 | 24 | 0.026 | **0.03** | 0.041 | **0.05** | -0.02 |
| 20525 | 836.5 | 1RB-Mid Bottom5mm | / | 23.18 | 24 | 0.279 | **0.34** | 0.416 | **0.50** | 0.05 |
| 20525 | 836.5 | 1RB-Mid Top5mm | / | 23.18 | 24 | 0.281 | **0.34** | 0.413 | **0.50** | -0.07 |
| 20525 | 836.5 | 25RB-Mid Front17mm | / | 21.99 | 23 | 0.248 | **0.31** | 0.347 | **0.44** | -0.01 |
| 20525 | 836.5 | 25RB-Mid Rear17mm | / | 21.99 | 23 | 0.304 | **0.38** | 0.446 | **0.56** | 0.14 |
| 20525 | 836.5 | 25RB-Mid Left19mm | / | 21.99 | 23 | 0.022 | **0.03** | 0.034 | **0.04** | -0.16 |
| 20525 | 836.5 | 25RB-Mid Bottom5mm | / | 21.99 | 23 | 0.231 | **0.29** | 0.344 | **0.43** | -0.18 |
| 20525 | 836.5 | 25RB-Mid Top5mm | / | 21.99 | 23 | 0.235 | **0.30** | 0.301 | **0.38** | 0.09 |
| 20600 | 844 | 1RB-Mid Front5mm | / | 21.11 | 22 | 0.327 | **0.40** | 0.517 | **0.63** | 0.08 |
| 20600 | 844 | 1RB-Mid Rear5mm | Fig.2 | 21.11 | 22 | 0.456 | **0.56** | 0.793 | **0.97** | 0.04 |
| 20525 | 836.5 | 1RB-Mid Rear5mm | / | 21.03 | 22 | 0.437 | **0.55** | 0.768 | **0.96** | 0.08 |
| 20450 | 829 | 1RB-Mid Rear5mm | / | 20.88 | 22 | 0.417 | **0.54** | 0.743 | **0.96** | -0.03 |
| 20600 | 844 | 1RB-Mid Left 5mm | / | 21.11 | 22 | 0.099 | **0.12** | 0.173 | **0.21** | 0.08 |
| 20525 | 836.5 | 25RB-High Front5mm | / | 19.93 | 21 | 0.266 | **0.34** | 0.421 | **0.54** | -0.13 |
| 20525 | 836.5 | 25RB-High Rear5mm | / | 19.93 | 21 | 0.376 | **0.48** | 0.653 | **0.84** | 0.13 |
| 20525 | 836.5 | 25RB-High Left5mm | / | 19.93 | 21 | 0.081 | **0.10** | 0.141 | **0.18** | 0.18 |
| 20525 | 836.5 | 50RB Rear 5mm | / | 19.81 | 21 | 0.359 | **0.47** | 0.635 | **0.84** | 0.09 |

Note4: The LTE mode is QPSK_10MHz.

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**Table 14.1-3: SAR Values (LTE Band 12-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 23060 | 704 | 1RB-Mid Front 17mm | / | 22.43 | 23.5 | 0.197 | **0.25** | 0.277 | **0.35** | -0.14 |
| 23060 | 704 | 1RB-Mid Rear 17mm | / | 22.43 | 23.5 | 0.23 | **0.29** | 0.323 | **0.41** | 0.15 |
| 23060 | 704 | 1RB-Mid Left 19mm | / | 22.43 | 23.5 | <0.01 | <0.01 | <0.01 | <0.01 | / |
| 23060 | 704 | 1RB-Mid Bottom 5mm | / | 22.43 | 23.5 | 0.246 | **0.31** | 0.364 | **0.47** | 0.05 |
| 23060 | 704 | 1RB-Mid Top 5mm | / | 22.43 | 23.5 | 0.172 | **0.22** | 0.261 | **0.33** | -0.07 |
| 23060 | 704 | 25RB-High Front 17mm | / | 20.95 | 22.5 | 0.146 | **0.21** | 0.206 | **0.29** | -0.17 |
| 23060 | 704 | 25RB-High Rear 17mm | / | 20.95 | 22.5 | 0.182 | **0.26** | 0.253 | **0.36** | 0.18 |
| 23060 | 704 | 25RB-High Left 19mm | / | 20.95 | 22.5 | <0.01 | <0.01 | <0.01 | <0.01 | / |
| 23060 | 704 | 25RB-High Bottom 5mm | / | 20.95 | 22.5 | 0.191 | **0.27** | 0.284 | **0.41** | -0.04 |
| 23060 | 704 | 25RB-High Top 5mm | / | 20.95 | 22.5 | 0.128 | **0.18** | 0.194 | **0.28** | -0.06 |
| 23060 | 704 | 1RB-Mid Front 5mm | Fig.3 | 20.96 | 22 | 0.402 | **0.51** | 0.571 | **0.73** | 0.04 |
| 23060 | 704 | 1RB-Mid Rear 5mm | / | 20.96 | 22 | 0.389 | **0.49** | 0.531 | **0.67** | 0.08 |
| 23060 | 704 | 1RB-Mid Left 5mm | / | 20.96 | 22 | 0.075 | **0.10** | 0.128 | **0.16** | -0.15 |
| 23095 | 707.5 | 25RB-High Front 5mm | / | 19.94 | 21 | 0.317 | **0.40** | 0.451 | **0.58** | 0.17 |
| 23095 | 707.5 | 25RB-High Rear 5mm | / | 19.94 | 21 | 0.314 | **0.40** | 0.426 | **0.54** | 0.01 |
| 23095 | 707.5 | 25RB-High Left 5mm | / | 19.94 | 21 | 0.059 | **0.08** | 0.103 | **0.13** | 0.06 |

Note4: The LTE mode is QPSK_10MHz.

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**Table 14.1-4: SAR Values (LTE Band 14-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 23330 | 793 | 1RB-Mid Front 17mm | / | 23.35 | 23.5 | 0.279 | **0.29** | 0.38 | **0.39** | 0.13 |
| 23330 | 793 | 1RB-Mid Rear 17mm | / | 23.35 | 23.5 | 0.354 | **0.37** | 0.485 | **0.50** | 0.13 |
| 23330 | 793 | 1RB-Mid Left 19mm | / | 23.35 | 23.5 | 0.024 | **0.02** | 0.035 | **0.04** | -0.14 |
| 23330 | 793 | 1RB-Mid Bottom 5mm | / | 23.35 | 23.5 | 0.288 | **0.30** | 0.42 | **0.43** | -0.04 |
| 23330 | 793 | 1RB-Mid Top 5mm | / | 23.35 | 23.5 | 0.331 | **0.34** | 0.493 | **0.51** | -0.04 |
| 23330 | 793 | 25RB-Low Front 17mm | / | 22.19 | 22.5 | 0.233 | **0.25** | 0.318 | **0.34** | 0.06 |
| 23330 | 793 | 25RB-Low Rear 17mm | / | 22.19 | 22.5 | 0.265 | **0.28** | 0.364 | **0.39** | -0.15 |
| 23330 | 793 | 25RB-Low Left 19mm | / | 22.19 | 22.5 | 0.02 | **0.02** | 0.028 | **0.03** | 0.16 |
| 23330 | 793 | 25RB-Low Bottom 5mm | / | 22.19 | 22.5 | 0.246 | **0.26** | 0.359 | **0.39** | -0.11 |
| 23330 | 793 | 25RB-Low Top 5mm | / | 22.19 | 22.5 | 0.267 | **0.29** | 0.397 | **0.43** | 0.06 |
| 23330 | 793 | 1RB-Mid Front 5mm | / | 20.33 | 21.5 | 0.359 | **0.47** | 0.473 | **0.62** | 0.07 |
| 23330 | 793 | 1RB-Mid Rear 5mm | Fig.4 | 20.33 | 21.5 | 0.407 | **0.53** | 0.547 | **0.72** | -0.03 |
| 23330 | 793 | 1RB-Mid Left 5mm | / | 20.33 | 21.5 | 0.069 | **0.09** | 0.111 | **0.15** | 0.07 |
| 23330 | 793 | 25RB-High Front 5mm | / | 19.04 | 20.5 | 0.289 | **0.40** | 0.381 | **0.53** | -0.16 |
| 23330 | 793 | 25RB-High Rear 5mm | / | 19.04 | 20.5 | 0.311 | **0.44** | 0.419 | **0.59** | 0.16 |
| 23330 | 793 | 25RB-High Left 5mm | / | 19.04 | 20.5 | 0.052 | **0.07** | 0.083 | **0.12** | 0.05 |

Note4: The LTE mode is QPSK_10MHz.

**Table 14.1-5: SAR Values (LTE Band 30-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 27710 | 2310 | 1RB-Mid Front 17mm | / | 21.57 | 22.5 | 0.216 | **0.27** | 0.384 | **0.48** | -0.17 |
| 27710 | 2310 | 1RB-Mid Rear 17mm | / | 21.57 | 22.5 | 0.192 | **0.24** | 0.335 | **0.41** | 0.17 |
| 27710 | 2310 | 1RB-Mid Left 19mm | / | 21.57 | 22.5 | 0.172 | **0.21** | 0.293 | **0.36** | -0.07 |
| 27710 | 2310 | 1RB-Mid Bottom 5mm | / | 21.57 | 22.5 | 0.136 | **0.17** | 0.243 | **0.30** | -0.09 |
| 27710 | 2310 | 1RB-Mid Top 5mm | / | 21.57 | 22.5 | 0.241 | **0.30** | 0.431 | **0.53** | 0.09 |
| 27710 | 2310 | 25RB-Mid Front 17mm | / | 20.36 | 21.5 | 0.172 | **0.22** | 0.307 | **0.40** | -0.02 |
| 27710 | 2310 | 25RB-Mid Rear 17mm | / | 20.36 | 21.5 | 0.151 | **0.20** | 0.264 | **0.34** | -0.18 |
| 27710 | 2310 | 25RB-Mid Left 19mm | / | 20.36 | 21.5 | 0.139 | **0.18** | 0.236 | **0.31** | -0.17 |
| 27710 | 2310 | 25RB-Mid Bottom 5mm | / | 20.36 | 21.5 | 0.11 | **0.14** | 0.194 | **0.25** | 0.14 |
| 27710 | 2310 | 25RB-Mid Top 5mm | / | 20.36 | 21.5 | 0.183 | **0.24** | 0.326 | **0.42** | -0.02 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 27710 | 2310 | 1RB-Mid Front 5mm | Fig.5 | 17.33 | 18.5 | 0.357 | **0.47** | 0.736 | **0.96** | 0.06 |
| 27710 | 2310 | 1RB-Mid Rear 5mm | / | 17.33 | 18.5 | 0.298 | **0.39** | 0.573 | **0.75** | 0.00 |
| 27710 | 2310 | 1RB-Mid Left 5mm | / | 17.33 | 18.5 | 0.22 | **0.29** | 0.444 | **0.58** | -0.16 |
| 27710 | 2310 | 25RB-High Front 5mm | / | 16.11 | 17.5 | 0.253 | **0.35** | 0.521 | **0.72** | 0.17 |
| 27710 | 2310 | 25RB-High Rear 5mm | / | 16.11 | 17.5 | 0.209 | **0.29** | 0.401 | **0.55** | 0.12 |
| 27710 | 2310 | 25RB-High Left 5mm | / | 16.11 | 17.5 | 0.161 | **0.22** | 0.325 | **0.45** | -0.16 |
| 27710 | 2310 | 50RB Front 5mm | / | 16.06 | 17.5 | 0.237 | **0.33** | 0.512 | **0.71** | 0.07 |
| 27710 | 2310 | 1RB-Mid Front 5mm USB | / | 17.33 | 18.5 | 0.352 | **0.46** | 0.716 | **0.94** | -0.13 |

Note4: The LTE mode is QPSK_10MHz.

**Table 14.1-6: SAR Values (LTE Band66 –Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode | Figure No. | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 132572 | 1770 | 1RB-Mid Front 17mm | / | 21.47 | 23 | 0.246 | **0.35** | 0.386 | **0.55** | -0.15 |
| 132572 | 1770 | 1RB-Mid Rear 17mm | / | 21.47 | 23 | 0.189 | **0.27** | 0.306 | **0.44** | 0.09 |
| 132572 | 1770 | 1RB-Mid Left 19mm | / | 21.47 | 23 | 0.123 | **0.17** | 0.196 | **0.28** | 0 |
| 132572 | 1770 | 1RB-Mid Bottom 5mm | / | 21.47 | 23 | 0.205 | **0.29** | 0.356 | **0.51** | 0.03 |
| 132572 | 1770 | 1RB-Mid Top 5mm | / | 21.47 | 23 | 0.133 | **0.19** | 0.231 | **0.33** | 0.18 |
| 132322 | 1745 | 50RB-High Front 17mm | / | 20.47 | 22 | 0.179 | **0.25** | 0.28 | **0.40** | 0.05 |
| 132322 | 1745 | 50RB-High Rear 17mm | / | 20.47 | 22 | 0.153 | **0.22** | 0.233 | **0.33** | -0.12 |
| 132322 | 1745 | 50RB-High Left 19mm | / | 20.47 | 22 | 0.105 | **0.15** | 0.168 | **0.24** | -0.08 |
| 132322 | 1745 | 50RB-High Bottom 5mm | / | 20.47 | 22 | 0.185 | **0.26** | 0.319 | **0.45** | 0.08 |
| 132322 | 1745 | 50RB-High Top 5mm | / | 20.47 | 22 | 0.1 | **0.14** | 0.169 | **0.24** | -0.01 |
| 132572 | 1770 | 1RB-Mid Front 5mm | Fig.6 | 17.52 | 18 | 0.404 | **0.45** | 0.676 | **0.75** | 0.03 |
| 132572 | 1770 | 1RB-Mid Rear 5mm | / | 17.52 | 18 | 0.272 | **0.30** | 0.497 | **0.56** | 0.12 |
| 132572 | 1770 | 1RB-Mid Left 5mm | / | 17.52 | 18 | 0.167 | **0.19** | 0.322 | **0.36** | -0.05 |
| 132322 | 1745 | 50RB-High Front 5mm | / | 16.22 | 17 | 0.325 | **0.39** | 0.556 | **0.67** | -0.15 |
| 132322 | 1745 | 50RB-High Rear 5mm | / | 16.22 | 17 | 0.262 | **0.31** | 0.488 | **0.58** | 0.03 |

Note: The distance between the EUT and the phantom bottom is 10mm. The LTE mode is QPSK_20MHz.

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## 14.2 SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

**Table 14.2-1: SAR Values (LTE Band 2-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 19100 | 1900 | 1RB-Middle Front5mm | Fig.1 | 18.64 | 19 | 0.479 | **0.52** | 0.835 | **0.91** | -0.02 |

Note4: The LTE mode is QPSK_20MHz.

**Table 14.2-2: SAR Values (LTE Band 5-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 20600 | 844 | 1RB-Mid Rear5mm | Fig.2 | 21.11 | 22 | 0.456 | **0.56** | 0.793 | **0.97** | 0.04 |

Note4: The LTE mode is QPSK_10MHz.

**Table 14.2-3: SAR Values (LTE Band 12-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 23060 | 704 | 1RB-Mid Front 5mm | Fig.3 | 20.96 | 22 | 0.402 | **0.51** | 0.571 | **0.73** | 0.04 |

Note4: The LTE mode is QPSK_10MHz.

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**Table 14.2-4: SAR Values (LTE Band 14-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 23330 | 793 | 1RB-Mid Rear 5mm | Fig.4 | 20.33 | 21.5 | 0.407 | **0.53** | 0.547 | **0.72** | -0.03 |

Note4: The LTE mode is QPSK_10MHz.

**Table 14.2-5: SAR Values (LTE Band 30-Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test setup | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 27710 | 2310 | 1RB-Mid Front 5mm | Fig.5 | 17.33 | 18.5 | 0.357 | **0.47** | 0.736 | **0.96** | 0.06 |

Note4: The LTE mode is QPSK_10MHz.

**Table 14.2-6: SAR Values (LTE Band66 –Body)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Mode | Figure No. | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g) (W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 132572 | 1770 | 1RB-Mid Front 5mm | Fig.6 | 17.52 | 18 | 0.404 | **0.45** | 0.676 | **0.75** | 0.03 |

Note: The distance between the EUT and the phantom bottom is 10mm. The LTE mode is QPSK_20MHz.

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## 14.3 WLAN Evaluation for 2.4G

According to the KDB248227 D01, SAR is measured for 2.4GHz 802.11b DSSS using the initial test position procedure.

**Body Evaluation**

**Table 14.3-1: SAR Values (WLAN - Body)– 802.11b (Fast SAR)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency** | | **Test Position** | **Figure No./ Note** | **Conducted Power (dBm)** | **Max. tune-up Power (dBm)** | **Measured SAR(10g) (W/kg)** | **Reported SAR(10g)(W/kg)** | **Measured SAR(1g) (W/kg)** | **Reported SAR(1g)(W/kg)** | **Power Drift (dB)** |
| Ch. | MHz | | | | | | | | | |
| 1 | 2412 | Front 17mm 14dB | / | 16.94 | 17 | 0.066 | **0.07** | 0.125 | **0.13** | -0.05 |
| 1 | 2412 | Rear 17mm 14dB | / | 16.94 | 17 | 0.027 | **0.03** | 0.046 | **0.05** | -0.11 |
| 1 | 2412 | Top 5mm 14dB | / | 16.94 | 17 | 0.245 | **0.25** | 0.538 | **0.55** | -0.07 |
| 1 | 2412 | Front 5mm 12dB | / | 14.59 | 15 | 0.188 | **0.21** | 0.435 | **0.48** | 0.16 |
| 1 | 2412 | Rear 5mm 12dB | / | 14.59 | 15 | 0.062 | **0.07** | 0.128 | **0.14** | -0.13 |

As shown above table, the initial test position for body is “Rear 17mm”. So the body SAR of WLAN is presented as below:

**Table 14.3-2: SAR Values (WLAN - Body)– 802.11b (Full SAR)**

| Ambient Temperature: 22.9 °C Liquid Temperature: 22.5°C | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | | Test Position | Figure No./ Note | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g)(W/kg) | Power Drift (dB) |
| Ch. | MHz | | | | | | | | | |
| 1 | 2412 | Top 5 mm 14dB | Fig.7 | 16.94 | 17 | 0.238 | 0.24 | 0.530 | **0.54** | -0.07 |
| 1 | 2412 | Front 5mm12dB | / | 14.59 | 15 | 0.180 | 0.20 | 0.412 | **0.45** | 0.16 |

Note1: When the reported SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest estimated 1-g SAR conditions determined by area scans, on the highest maximum output power channel, until the reported SAR is ⩽ 0.8 W/kg.

Note2: For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel until the reported SAR is ⩽ 1.2 W/kg or all required channels are tested.

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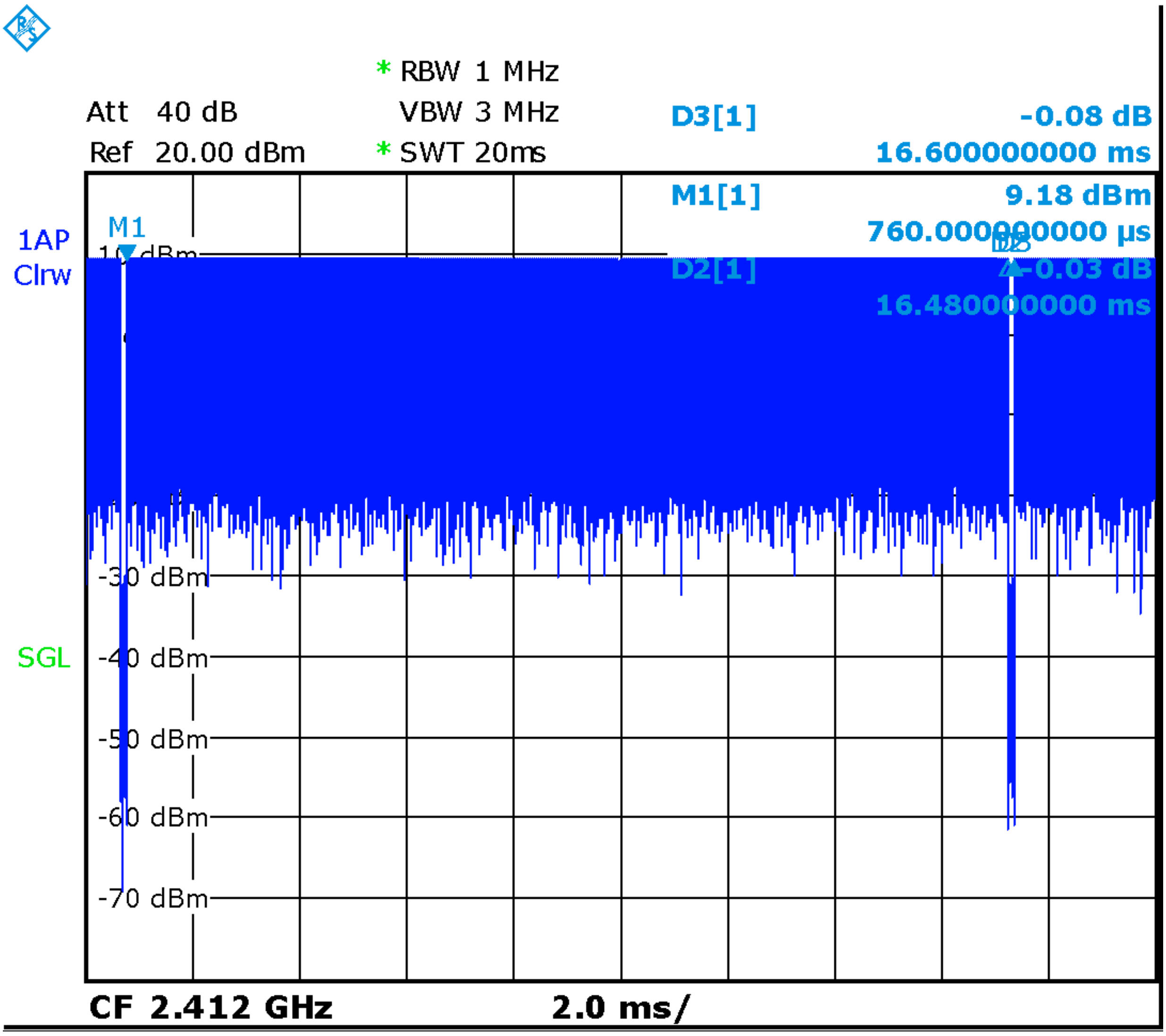
According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below.

**Table 14.3-3: SAR Values (WLAN - Body) – 802.11b (Scaled Reported SAR)**

| Ambient Temperature: 22.9 ℃ | | Liquid Temperature: 22.5℃ | | | | |
|---|---|---|---|---|---|---|
| Frequency | | Test Position | Actual duty factor | maximum duty factor | Reported SAR (1g)(W/kg) | Scaled reported SAR (1g)(W/kg) |
| Ch. | MHz | | | | | |
| 1 | 2412 | Top 5 mm 14dB | 98.92% | 100% | **0.54** | **0.54** |

SAR is not required for OFDM because the 802.11b adjusted SAR ≤ 1.2 W/kg.




**Picture 14.2 Duty factor plot**

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## 14.4 WLAN Evaluation For 5G

**Table 14.4-1: Maximum output power specified of WLAN antenna – Body-Normal Power**

| 802.11 mode | a | g | n | | ac | | | |
|---|---|---|---|---|---|---|---|---|
| Ch. BW(MHz) | 20 | 20 | 20 | 40 | 20 | 40 | 80 | 160 |
| U-NII-1 | 20 | | 18 | 18 | 16 | 16 | 16 | |
| U-NII-2A | 20 | | 18 | 18 | 16 | 16 | 16 | |
| U-NII-2C | 20 | | 18 | 18 | 16 | 16 | 16 | |
| U-NII-3 | 20 | | 18 | 18 | 16 | 16 | 16 | |
| § 15.247 (5.8 GHz) | | | | | | | | |

- The maximum output power specified for production units is the same for all channels, modulations and data rates in each channel bandwidth configuration of the 802.11a/g/n/ac modes.
- The blue highlighted cells represent highest output configurations in each standalone or aggregated frequency band, with tune-up tolerance included.

**Table 14.4-2: Maximum output power specified of WLAN antenna – Body-Low Power**

| 802.11 mode | a | g | n | | ac | | | |
|---|---|---|---|---|---|---|---|---|
| Ch. BW(MHz) | 20 | 20 | 20 | 40 | 20 | 40 | 80 | 160 |
| U-NII-1 | 16 | | 14 | 14 | 13 | 13 | 13 | |
| U-NII-2A | 16 | | 14 | 14 | 13 | 13 | 13 | |
| U-NII-2C | 16 | | 14 | 14 | 13 | 13 | 13 | |
| U-NII-3 | 16 | | 14 | 14 | 13 | 13 | 13 | |
| § 15.247 (5.8 GHz) | | | | | | | | |

- The maximum output power specified for production units is the same for all channels, modulations and data rates in each channel bandwidth configuration of the 802.11a/g/n/ac modes.
- The blue highlighted cells represent highest output configurations in each standalone or aggregated frequency band, with tune-up tolerance included.

**Table 14.4-3: Maximum output power measured of WLAN antenna, for the applicable OFDM configurations according to the default power measurement procedures for selection initial test configurations –Body-Normal Power**

| 802.11 mode | a | n | | ac | | |
|---|---|---|---|---|---|---|
| BW(MHz) | 20 | 20 | 40 | 20 | 40 | 80 |
| U-NII-1 | 36/40/44/48<br>15/16/15/16 | 36/40/44/48<br>Lower power | 38/46<br>Lower power | 36/40/44/48<br>Lower power | 38/46<br>Lower power | 42<br>Lower power |
| U-NII-2A | 52/56/60/64<br>15/14/13/13 | 52/56/60/64<br>Lower power | 54/62<br>Lower power | 52/56/60/64<br>Lower power | 54/62<br>Lower power | 58<br>Lower power |
| U-NII-2C | 100/104/108/112<br>116/120/124/128/<br>132/136/140/144<br>14/14/14/15 | 100/104/108/112<br>116/120/124/128<br>/132/136/140/144 | 102/110/118/<br>126/134/142<br>Lower power | 100/104/108/112<br>116/132/136/140 | 102/110/134<br>Lower power | 106<br>Lower power |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | 16/16/15/14<br>14/14/16/17 | Lower power | | Lower power | | |
| **U-NII-3** | 149/153/157/161/165<br>17/19/18/16/16 | 149/153/157/161/165<br>Lower power | 151/159<br>Lower power | 149/153/157/161/165<br>Lower power | 151/159<br>Lower power | 155<br>Lower power |

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

**Table 14.4-4: Maximum output power measured of WLAN antenna, for the applicable OFDM configurations according to the default power measurement procedures for selection initial test configurations**

**–Body-Low Power**

| **802.11 mode** | **a** | **n** | | **ac** | | |
|---|---|---|---|---|---|---|
| **BW(MHz)** | **20** | **20** | **40** | **20** | **40** | **80** |
| **U-NII-1** | 36/40/44/48<br>10/11/11/11 | 36/40/44/48<br>Lower power | 38/46<br>Lower power | 36/40/44/48<br>Lower power | 38/46<br>Lower power | 42<br>Lower power |
| **U-NII-2A** | 52/56/60/64<br>11/10/10/10 | 52/56/60/64<br>Lower power | 54/62<br>Lower power | 52/56/60/64<br>Lower power | 54/62<br>Lower power | 58<br>Lower power |
| **U-NII-2C** | 100/104/108/112<br>116/120/124/128/<br>132/136/140/144<br>10/10/10/1010/10<br>/10/10/10/10/12/13 | 100/104/108/112<br>116/120/124/128<br>/132/136/140/144<br>Lower power | 102/110/118/<br>126/134/142<br>Lower power | 100/104/108/112<br>116/132/136/140<br>Lower power | 102/110/134<br>Lower power | 106<br>Lower power |
| **U-NII-3** | 149/153/157/161/165<br>13/14/13/12/12 | 149/153/157/161<br>/165<br>Lower power | 151/159<br>Lower power | 149/153/157/161/165<br>Lower power | 151/159<br>Lower power | 155<br>Lower power |

- The **bold numbers** is the maximum output measured power (mW).
- Channels with measured maximum power within 0.25dB are considered to have the same measured output. Channels selected for initial test configuration are highlighted in yellow.

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**Table 14.4-5: Reported SAR of initial test configuration for Body -WiFi antenna-Normal Power**

| 802.11 mode | a | n | | ac | | |
|---|---|---|---|---|---|---|
| BW(MHz) | 20 | 20 | 40 | 20 | 40 | 80 |
| U-NII-1 | 36/40/44/48 | 36/40/44/48 | 38/46 | 36/40/44/48 | 38/46 | 42 |
| U-NII-2A | 52/56/60/64<br>0.39 | 52/56/60/64 | 54/62 | 52/56/60/64 | 54/62 | 58 |
| U-NII-2C | 100/104/108/112/116/120/124/128/132/136/140/144<br>0.37 | 100/104/108/112/116/120/124/128/132/136/140/144 | 102/110/118/126/134/142 | 100/104/108/112 116/132/136/140 | 102/110/134 | 106 |
| U-NII-3 | 149/153/157/161/165<br>0.15 | 149/153/157/161/165 | 151/159 | 149/153/157/161/165 | 151/159 | 155 |

Initial test configuration SAR for U-NII-2A band is > 0.8 W/kg, SAR is required for next highest output channel in initial test configuration. The next highest output channel SAR is ≤ 1.2 W/kg, SAR is not required for subsequent next highest output channel. Similar circumstances apply to U-NII-1, U-NII-2C band and U-NII-3 band.
The green highlighted channels are next highest measured output channel in the initial test configuration. Highest measured output power channel tested initially are in yellow highlight.

**Table 14.4-6: Reported SAR of initial test configuration for Body -WiFi antenna-Low Power**

| 802.11 mode | a | n | | ac | | |
|---|---|---|---|---|---|---|
| BW(MHz) | 20 | 20 | 40 | 20 | 40 | 80 |
| U-NII-1 | 36/40/44/48 | 36/40/44/48 | 38/46 | 36/40/44/48 | 38/46 | 42 |
| U-NII-2A | 52/56/60/64<br>0.32 | 52/56/60/64 | 54/62 | 52/56/60/64 | 54/62 | 58 |
| U-NII-2C | 100/104/108/112/116/120/124/128/132/136/140/144<br>0.53 | 100/104/108/112/116/120/124/128/132/136/140/144 | 102/110/118/126/134/142 | 100/104/108/112 116/132/136/140 | 102/110/134 | 106 |
| U-NII-3 | 149/153/157/161/165<br>0.47 | 149/153/157/161/165 | 151/159 | 149/153/157/161/165 | 151/159 | 155 |

Initial test configuration SAR for U-NII-2A band is > 0.8 W/kg, SAR is required for next highest output channel in initial test configuration. The next highest output channel SAR is ≤ 1.2 W/kg, SAR is not required for subsequent next highest output channel. Similar circumstances apply to U-NII-1, U-NII-2C band and U-NII-3 band.
The green highlighted channels are next highest measured output channel in the initial test configuration. Highest measured output power channel tested initially are in yellow highlight.

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**Table 14.4-7: SAR Values (WLAN 5G – Body)**

| Frequency | | Test Position | Figure No. | Conducted Power (dBm) | Max. tune-up Power (dBm) | Measured SAR(10g) (W/kg) | Reported SAR(10g)(W/kg) | Measured SAR(1g) (W/kg) | Reported SAR(1g) (W/kg) | Power Drift (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| Ch. | MHz | | | | | | | | | |
| 52 | 5260 | 11a-6M Front 17mm | / | 11.81 | 13 | 0.035 | **0.05** | 0.095 | **0.12** | -0.17 |
| 52 | 5260 | 11a-6M Rear 17mm | / | 11.81 | 13 | 0.01 | **0.01** | 0.052 | **0.07** | 0.04 |
| 52 | 5260 | 11a-6M Top 5mm | / | 11.81 | 13 | 0.081 | **0.11** | 0.289 | **0.38** | -0.03 |
| 52 | 5260 | 11a-6M Front 5mm | / | 10.46 | 12 | 0.073 | **0.10** | 0.223 | **0.32** | 0.09 |
| 52 | 5260 | 11a-6M Rear 5mm | / | 10.46 | 12 | 0.028 | **0.04** | 0.074 | **0.11** | -0.1 |
| 144 | 5720 | 11a-6M Front 17mm | / | 12.39 | 13 | 0.057 | **0.07** | 0.176 | **0.20** | 0.01 |
| 144 | 5720 | 11a-6M Rear 17mm | / | 12.39 | 13 | 0.01 | **0.01** | 0.062 | **0.07** | 0.05 |
| 144 | 5720 | 11a-6M Top 5mm | / | 12.39 | 13 | 0.09 | **0.10** | 0.317 | **0.36** | -0.14 |
| 144 | 5720 | 11a-6M Front 5mm | Fig.8 | 11.01 | 12 | 0.118 | **0.15** | 0.416 | **0.52** | -0.03 |
| 144 | 5720 | 11a-6M Rear 5mm | / | 11.01 | 12 | 0.011 | **0.01** | 0.057 | **0.07** | 0.15 |
| 153 | 5765 | 11a-6M Front 17mm | / | 12.69 | 13 | 0.049 | **0.05** | 0.141 | **0.15** | 0.08 |
| 153 | 5765 | 11a-6M Rear 17mm | / | 12.69 | 13 | 0.007 | **0.01** | 0.038 | **0.04** | 0.09 |
| 153 | 5765 | 11a-6M Top 5mm | / | 12.69 | 13 | 0.081 | **0.09** | 0.297 | **0.32** | 0.14 |
| 153 | 5765 | 11a-6M Front 5mm | / | 11.36 | 12 | 0.111 | **0.13** | 0.402 | **0.47** | 0.05 |
| 153 | 5765 | 11a-6M Rear 5mm | / | 11.36 | 12 | 0.01 | **0.01** | 0.049 | **0.06** | -0.17 |

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. The scaled reported SAR is presented as below.

**Table 14.4-8 SAR Values (WLAN 5G – Body) (Scaled Reported SAR)**

| Frequency | | Test Position | D (mm) | Actual duty factor | maximum duty factor | Reported SAR (1g) (W/kg) | Scaled reported SAR (1g) (W/kg) |
|---|---|---|---|---|---|---|---|
| Ch. | MHz | | | | | | |
| 144 | 5720 | Front | 5 | 98.89% | 100% | **0.52** | **0.53** |

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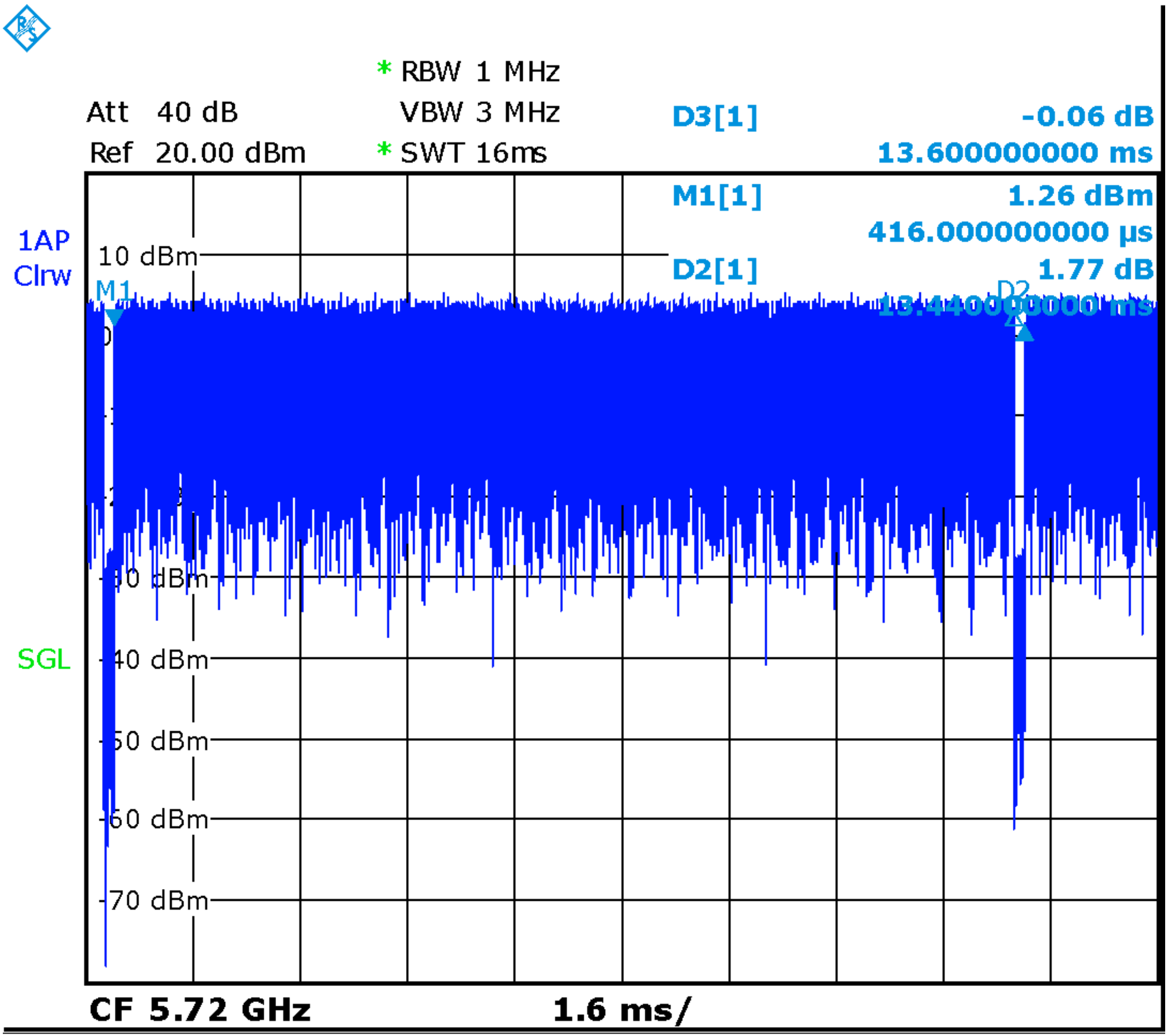


**Picture 14.4-2 The plot of duty factor for Body**

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## 15 SAR Measurement Variability

SAR measurement variability must be 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.

The following procedures are applied to determine if repeated measurements are required.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20

**Table 15.1: SAR Measurement Variability for Body LTE Band2(1g)**

| Frequency | | Test Position | Spacing (mm) | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|
| Ch. | MHz | | | | | | |
| 1900 | 19100 | Front | 5 | 0.835 | 0.827 | 1.01 | / |

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# 16 Measurement Uncertainty

## 16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.0 | N | 1 | 1 | 1 | 6.0 | 6.0 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | N | 1 | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. restrictions | B | 0.4 | R | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 2.9 | R | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 14 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 15 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 16 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 17 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 18 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 19 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 20 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 21 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$ | | | | | | 9.55 | 9.43 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 19.1 | 18.9 | |

## 16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.55 | N | 1 | 1 | 1 | 6.55 | 6.55 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.2 | 1.2 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. restrictions | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 6.7 | R | $\sqrt{3}$ | 1 | 1 | 3.9 | 3.9 | ∞ |
| 13 | Post-processing | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 14 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 15 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 16 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 17 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 18 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 19 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 20 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c^{'}=\sqrt{\sum_{i=1}^{21}c_i^2u_i^2}$ | | | | | | 10.7 | 10.6 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e=2u_c$ | | | | | | 21.4 | 21.1 | |

## 16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.0 | N | 1 | 1 | 1 | 6.0 | 6.0 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. Restrictions | B | 0.4 | R | $\sqrt{3}$ | 1 | 1 | 0.2 | 0.2 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 2.9 | R | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 14 | Fast SAR z-Approximation | B | 7.0 | R | $\sqrt{3}$ | 1 | 1 | 4.0 | 4.0 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 15 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 16 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |
| 17 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 18 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 19 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 21 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 22 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$ | | | | | | 10.4 | 10.3 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 20.8 | 20.6 | |

## 16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

| No. | Error Description | Type | Uncertainty value | Probably Distribution | Div. | (Ci) 1g | (Ci) 10g | Std. Unc. (1g) | Std. Unc. (10g) | Degree of freedom |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | | | | |
| 1 | Probe calibration | B | 6.55 | N | 1 | 1 | 1 | 6.55 | 6.55 | ∞ |
| 2 | Isotropy | B | 4.7 | R | $\sqrt{3}$ | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 3 | Boundary effect | B | 2.0 | R | $\sqrt{3}$ | 1 | 1 | 1.2 | 1.2 | ∞ |
| 4 | Linearity | B | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 | ∞ |
| 5 | Detection limit | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Readout electronics | B | 0.3 | R | $\sqrt{3}$ | 1 | 1 | 0.3 | 0.3 | ∞ |
| 7 | Response time | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 8 | Integration time | B | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 | ∞ |
| 9 | RF ambient conditions-noise | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 10 | RFambient conditions-reflection | B | 0 | R | $\sqrt{3}$ | 1 | 1 | 0 | 0 | ∞ |
| 11 | Probe positioned mech. Restrictions | B | 0.8 | R | $\sqrt{3}$ | 1 | 1 | 0.5 | 0.5 | ∞ |
| 12 | Probe positioning with respect to phantom shell | B | 6.7 | R | $\sqrt{3}$ | 1 | 1 | 3.9 | 3.9 | ∞ |
| 13 | Post-processing | B | 1.0 | R | $\sqrt{3}$ | 1 | 1 | 0.6 | 0.6 | ∞ |
| 14 | Fast SAR z-Approximation | B | 14.0 | R | $\sqrt{3}$ | 1 | 1 | 8.1 | 8.1 | ∞ |
| **Test sample related** | | | | | | | | | | |
| 15 | Test sample positioning | A | 3.3 | N | 1 | 1 | 1 | 3.3 | 3.3 | 71 |
| 16 | Device holder uncertainty | A | 3.4 | N | 1 | 1 | 1 | 3.4 | 3.4 | 5 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Drift of output power | B | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | | |
| 18 | Phantom uncertainty | B | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 19 | Liquid conductivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 20 | Liquid conductivity (meas.) | A | 2.06 | N | 1 | 0.64 | 0.43 | 1.32 | 0.89 | 43 |
| 21 | Liquid permittivity (target) | B | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.4 | ∞ |
| 22 | Liquid permittivity (meas.) | A | 1.6 | N | 1 | 0.6 | 0.49 | 1.0 | 0.8 | 521 |
| Combined standard uncertainty | | $u_c^{'} = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$ | | | | | | 13.5 | 13.4 | 257 |
| Expanded uncertainty (confidence interval of 95 %) | | $u_e = 2u_c$ | | | | | | 27.0 | 26.8 | |

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# 17 MAIN TEST INSTRUMENTS

**Table 17.1: List of Main Instruments**

| No. | Name | Type | Serial Number | Calibration Date | Valid Period |
|---|---|---|---|---|---|
| 01 | Network analyzer | E5071C | MY46110673 | January 14, 2021 | One year |
| 02 | Power meter | NRP2 | 101919 | May 12, 2020 | One year |
| 03 | Power sensor | NRP-Z91 | 101547 | | |
| 04 | Signal Generator | E4438C | MY49071430 | February 25, 2020 | One Year |
| 05 | Amplifier | 60S1G4 | 0331848 | No Calibration Requested | |
| 06 | BTS | CMW500 | 159889 | January 13, 2021 | One year |
| 07 | E-field Probe | SPEAG EX3DV4 | 7307 | May 29, 2020 | One year |
| 08 | DAE | SPEAG DAE4 | 536 | November 6, 2020 | One year |
| 09 | Dipole Validation Kit | SPEAG D750V3 | 1017 | July 24,2020 | One year |
| 10 | Dipole Validation Kit | SPEAG D835V2 | 4d069 | July 24,,2020 | One year |
| 11 | Dipole Validation Kit | SPEAG D1750V2 | 1003 | July 24, 2020 | One year |
| 12 | Dipole Validation Kit | SPEAG D1900V2 | 5d101 | July 28,2020 | One year |
| 13 | Dipole Validation Kit | SPEAG D2450V2 | 853 | July 21,2020 | One year |
| 14 | Dipole Validation Kit | SPEAG D2300V2 | 1018 | July 21,2020 | One year |
| 15 | Dipole Validation Kit | SPEAG D5GHzV2 | 1060 | July 27,2020 | One year |

***END OF REPORT BODY***

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# ANNEX A Graph Results

**LTE1900-FDD2_CH19100 1RB-Middle Front5mm**

Date: 2/16/2021

Electronics: DAE4 Sn536

Medium: head 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.411 mho/m; εr = 39.38; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: LTE1900-FDD2 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.33,8.33,8.33)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.27 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.907 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.48 W/kg

**SAR(1 g) = 0.835 W/kg; SAR(10 g) = 0.479 W/kg**

Maximum value of SAR (measured) = 1.21W/kg

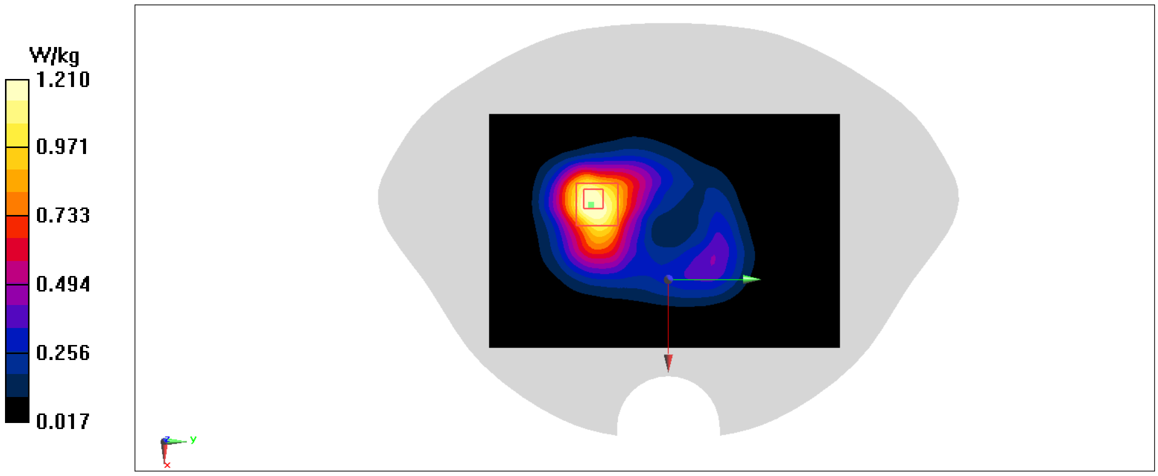


**Fig A.1**

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**LTE850-FDD5_CH20600 1RB-Mid Rear 5mm**

Date: 2/14/2021

Electronics: DAE4 Sn536

Medium: head 835 MHz

Medium parameters used: f = 844 MHz; σ = 0.895 mho/m; εr = 40.91; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5$^o$C, Liquid Temperature: 22.3$^o$C

Communication System: LTE850-FDD5 844 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(10.2,10.2,10.2)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.23 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.78 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.47 W/kg

**SAR(1 g) = 0.793 W/kg; SAR(10 g) = 0.456 W/kg**

Maximum value of SAR (measured) = 1.19 W/kg

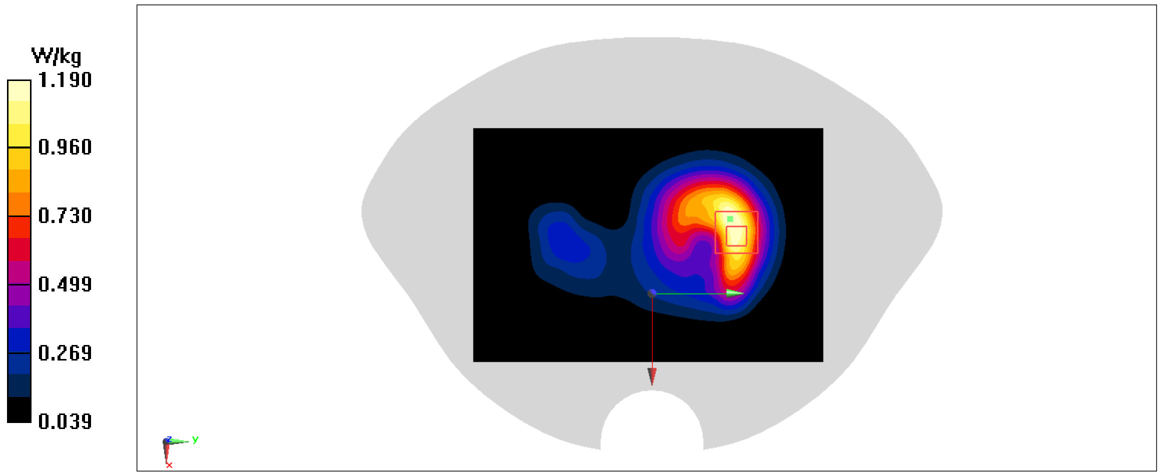


**Fig A.2**

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**LTE700-FDD12_CH23060 1RB-MID Front 5mm**

Date: 2/13/2021

Electronics: DAE4 Sn536

Medium: head 750 MHz

Medium parameters used: f = 704 MHz; σ = 0.856 mho/m; εr = 41.8; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: LTE700-FDD12 704 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(10.41,10.41,10.41)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.750 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.73 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.886 W/kg

**SAR(1 g) = 0.571 W/kg; SAR(10 g) = 0.402 W/kg**

Maximum value of SAR (measured) = 0.758W/kg

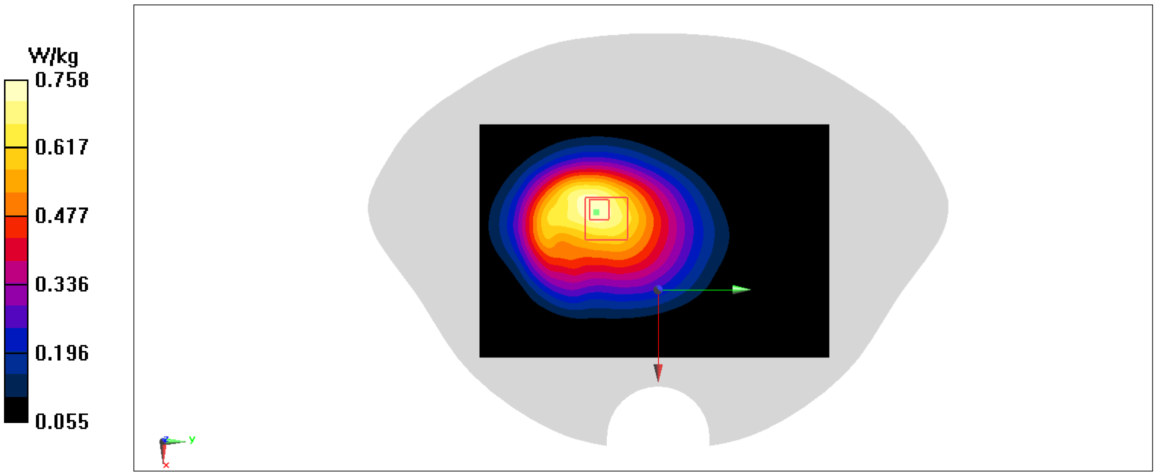


**Fig A.3**

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**LTE700-FDD14_CH23330 1RB-Mid Rear 5mm**

Date: 2/13/2021

Electronics: DAE4 Sn536

Medium: head 750 MHz

Medium parameters used: f = 793 MHz; σ = 0.941 mho/m; εr = 41.69; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: LTE700-FDD14 793 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(10.41,10.41,10.41)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.674 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.49 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.756 W/kg

**SAR(1 g) = 0.547 W/kg; SAR(10 g) = 0.407 W/kg**

Maximum value of SAR (measured) = 0.682 W/kg

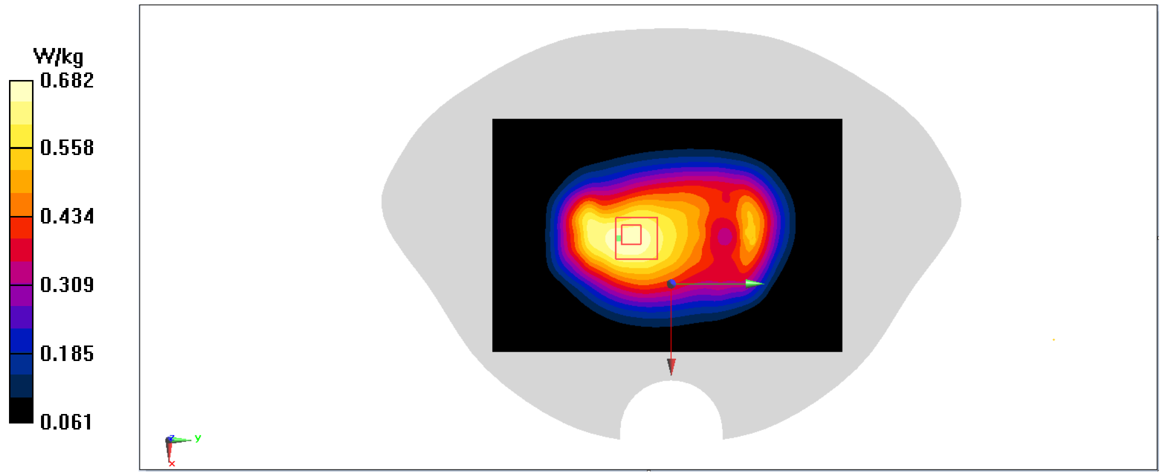


**Fig A.4**

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**LTE2300-FDD30_CH27710 1RB-Mid Front 5mm**

Date: 2/17/2021

Electronics: DAE4 Sn536

Medium: head 2300 MHz

Medium parameters used: f = 2310 MHz; σ = 1.676 mho/m; εr = 39.15; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: LTE2300-FDD30 2310 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.15,8.15,8.15)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.14 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.396 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.45 W/kg
**SAR(1 g) = 0.736 W/kg; SAR(10 g) = 0.357 W/kg**
Maximum value of SAR (measured) = 1.18W/kg

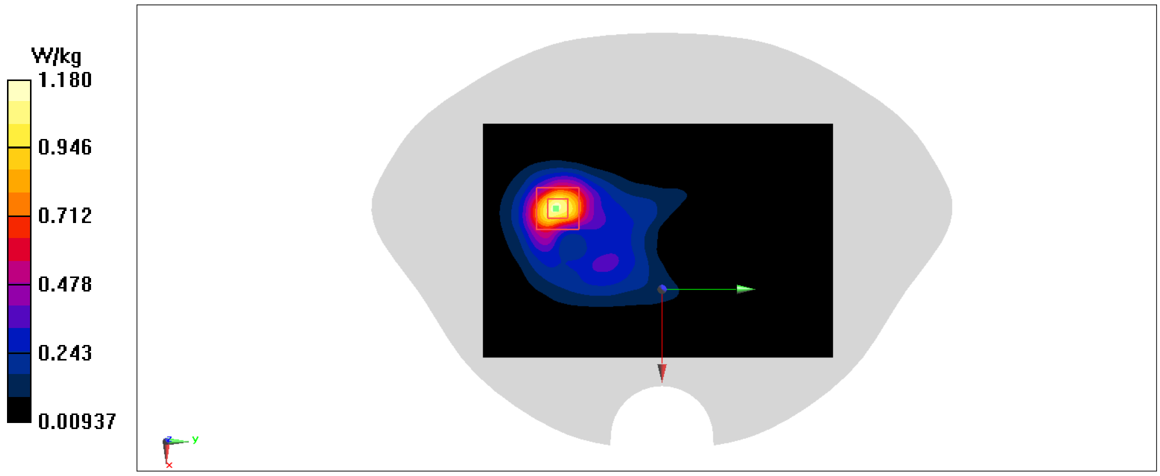


**Fig A.5**

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**LTE1700-FDD66_CH132572 1RB-Mid Front 5mm**

Date: 2/15/2021

Electronics: DAE4 Sn536

Medium: head 1750 MHz

Medium parameters used: f =1770 MHz; σ = 1.356 mho/m; εr = 40.18; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5$^o$C, Liquid Temperature: 22.3$^o$C

Communication System: LTE1700-FDD66 2310 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.64,8.64,8.64)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 1.07 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.996 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.13 W/kg

**SAR(1 g) = 0.676 W/kg; SAR(10 g) = 0.404 W/kg**

Maximum value of SAR (measured) = 0.958 W/kg

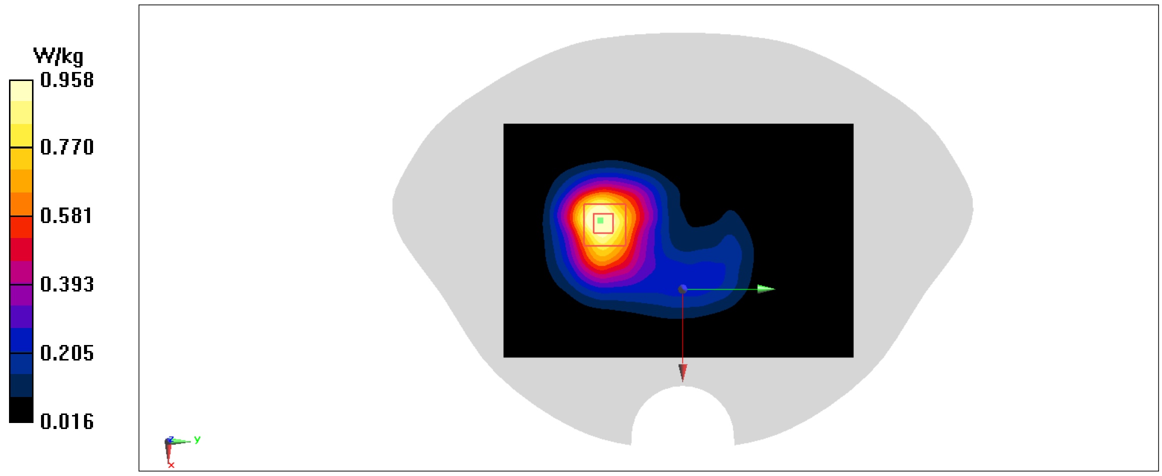


**Fig A.6**

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**WLAN2450_CH1 Top Edge 5mm 14dB 2000**

Date: 2/18/2021

Electronics: DAE4 Sn536

Medium: head 2450 MHz

Medium parameters used: f = 2412; σ = 1.778 mho/m; εr = 39.1; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C

Communication System: WLAN2450 2412 Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(7.77,7.77,7.77)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.923 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.87 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.20 W/kg

**SAR(1 g) = 0.53 W/kg; SAR(10 g) = 0.238 W/kg**

Maximum value of SAR (measured) = 0.932 W/kg

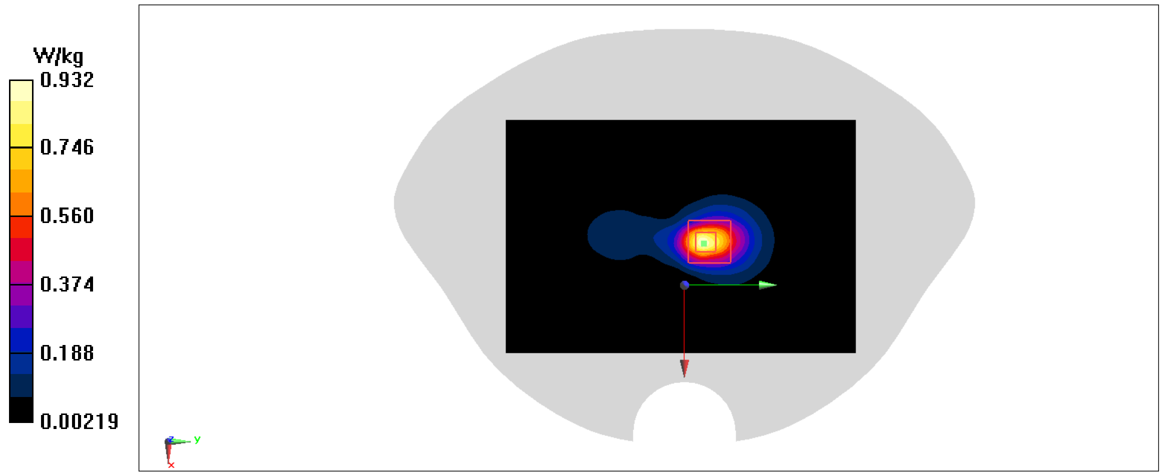


**Fig A.7**

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**WLAN5G_CH144 11a-6M 10.5dB 10000 Front 5mm**
Date: 2/18/2021
Electronics: DAE4 Sn536
Medium: head 2450 MHz
Medium parameters used: f = 5720; σ = 4.921 mho/m; εr = 35.13; ρ = 1000 kg/$m^3$
Ambient Temperature: 22.5°C, Liquid Temperature: 22.3°C
Communication System: WLAN2450 5720 Duty Cycle: 1:1
Probe: EX3DV4 – SN7307 ConvF(7.77,7.77,7.77)

**Area Scan (71x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.21 W/kg

**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.968 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.79 W/kg
**SAR(1 g) = 0.5225084649 W/kg; SAR(10 g) = 0.118 W/kg**
Maximum value of SAR (measured) = 1.11W/kg

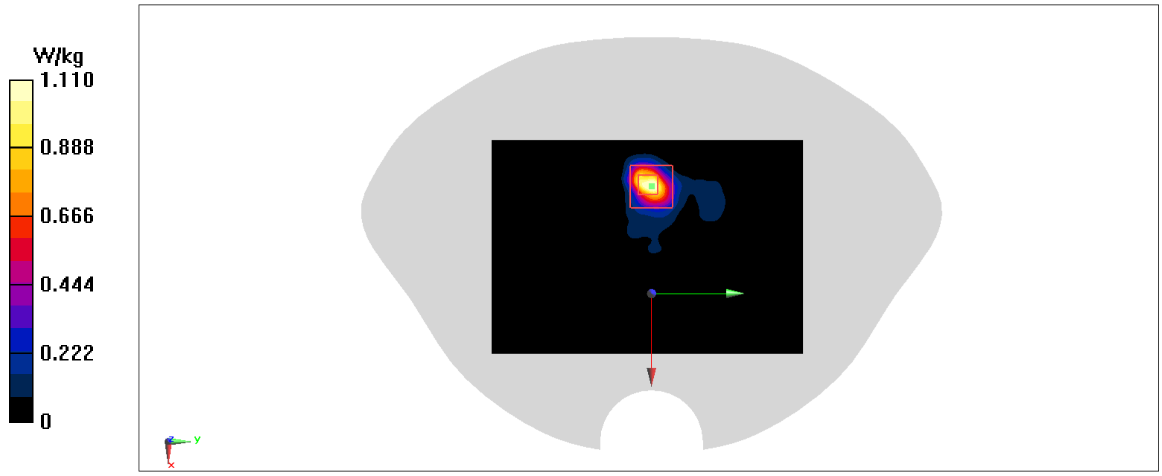


**Fig A.8**

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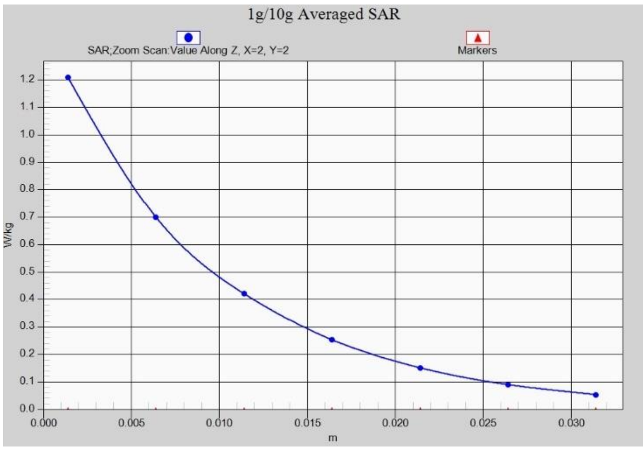
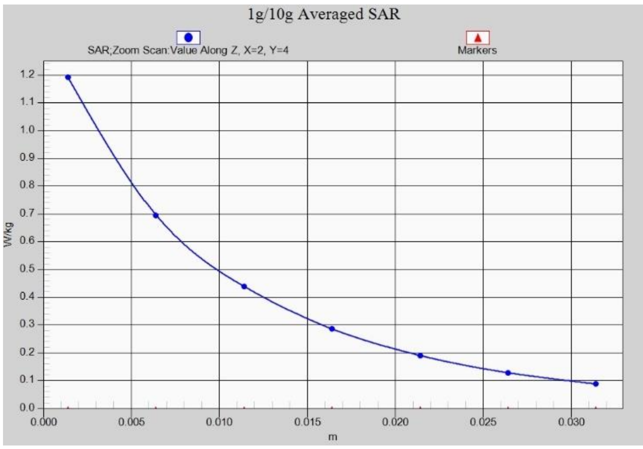
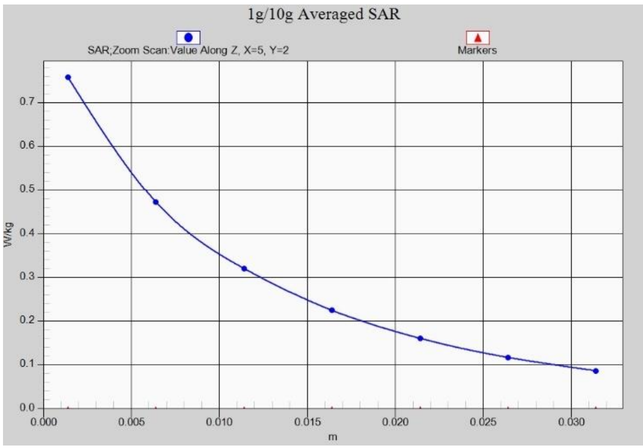



**Z-Scan at power reference point (LTEB2)**




**Z-Scan at power reference point (LTEB5)**




**Z-Scan at power reference point (LTEB12)**

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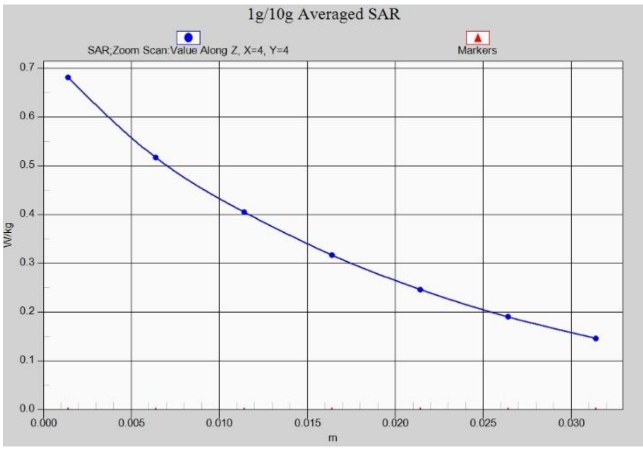
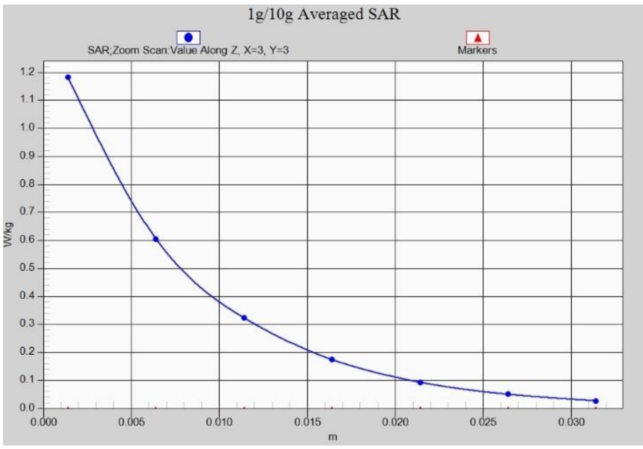
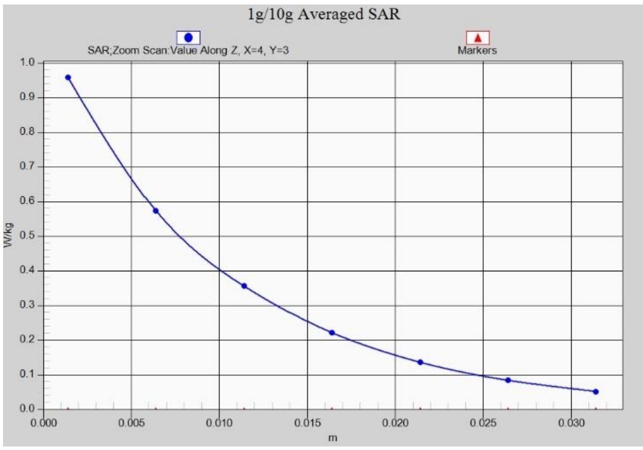



**Z-Scan at power reference point (LTEB14)**




**Z-Scan at power reference point (LTEB30)**




**Z-Scan at power reference point (LTEB66)**

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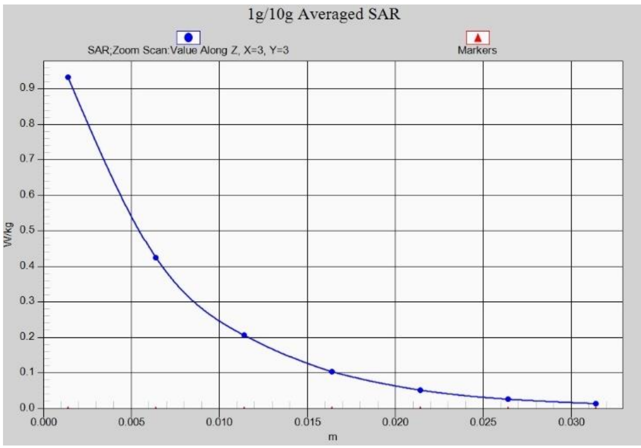
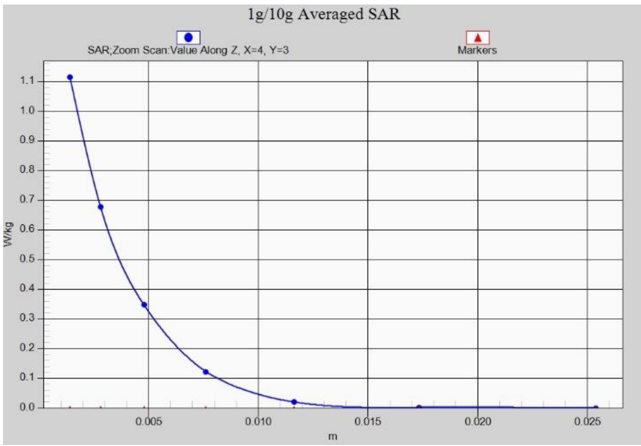



**Z-Scan at power reference point (WIFI2.4G)**




**Z-Scan at power reference point (WIFI5G)**

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# ANNEX B System Verification Results

**750 MHz**

Date: 2/13/2021

Electronics: DAE4 Sn536

Medium: Head 750 MHz

Medium parameters used: f = 750 MHz; σ =0.89 mho/m; $\varepsilon_r$ = 42.5; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(10.41,10.41,10.41)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 58.74 V/m; Power Drift = -0.02

**Fast SAR: SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.38 W/kg**

Maximum value of SAR (interpolated) = 2.85 W/kg

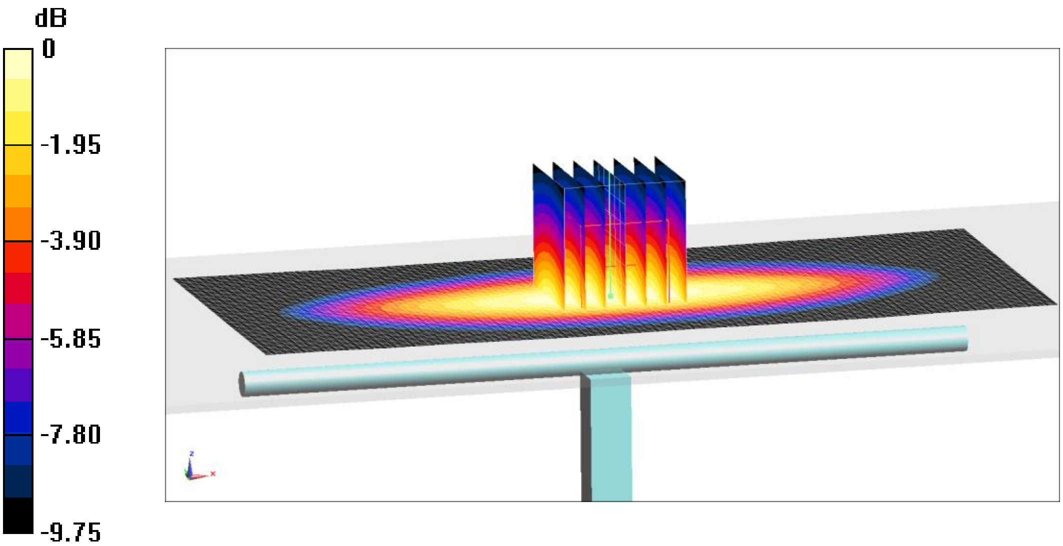
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =58.74 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.28 W/kg

**SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.36 W/kg**

Maximum value of SAR (measured) = 2.85 W/kg




0 dB = 2.85 W/kg = 4.55 dB W/kg

**Fig.B.1 validation 750 MHz 250mW**

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**835 MHz**

Date: 2/14/2021

Electronics: DAE4 Sn536

Medium: Head 835 MHz

Medium parameters used: f = 835 MHz; σ =0.888 mho/m; $\varepsilon_r$ = 40.69; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(10.2,10.2,10.2)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 62.83 V/m; Power Drift = 0.1

**Fast SAR: SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.53 W/kg**

Maximum value of SAR (interpolated) = 3.19 W/kg

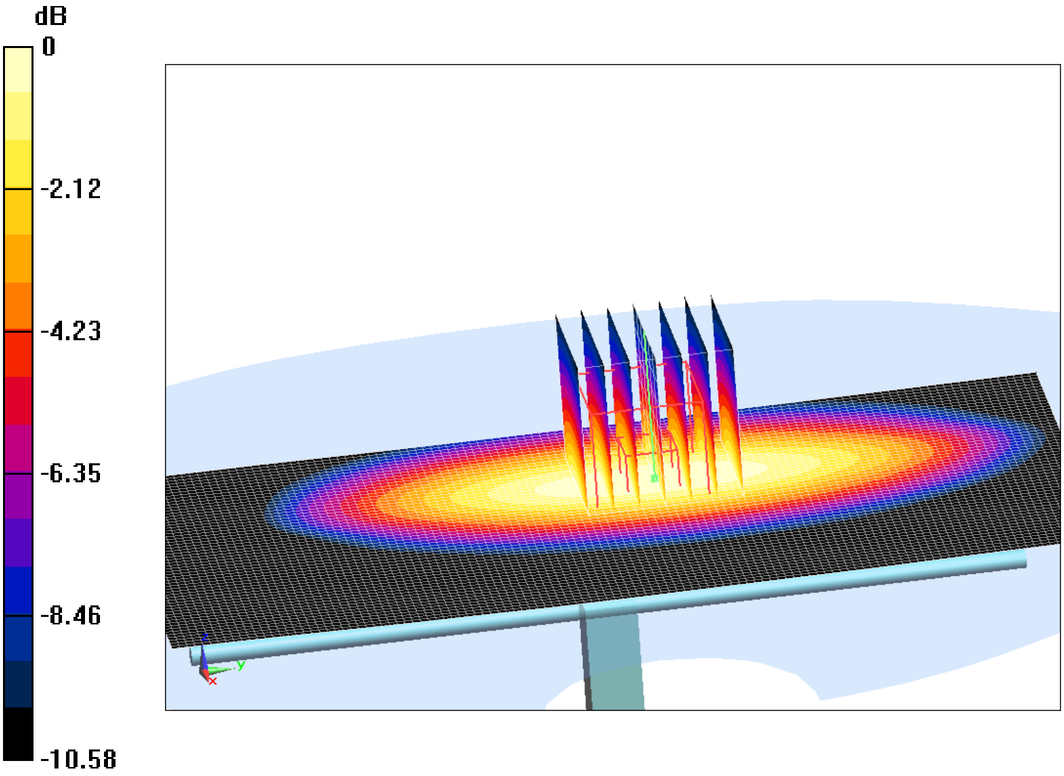
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =62.83 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 3.66 W/kg

**SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.55 W/kg**

Maximum value of SAR (measured) = 3.27 W/kg




0 dB = 3.27 W/kg = 5.15 dB W/kg

**Fig.B.2 validation 835 MHz 250mW**

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**1750 MHz**

Date: 2/15/2021

Electronics: DAE4 Sn536

Medium: Head 1750 MHz

Medium parameters used: f = 1750 MHz; σ =1.354 mho/m; $\varepsilon_r$ = 40.2; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 1750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.64,8.64,8.64)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 106.22 V/m; Power Drift = 0.01

**Fast SAR: SAR(1 g) = 9.29 W/kg; SAR(10 g) = 4.87 W/kg**

Maximum value of SAR (interpolated) = 13.78 W/kg

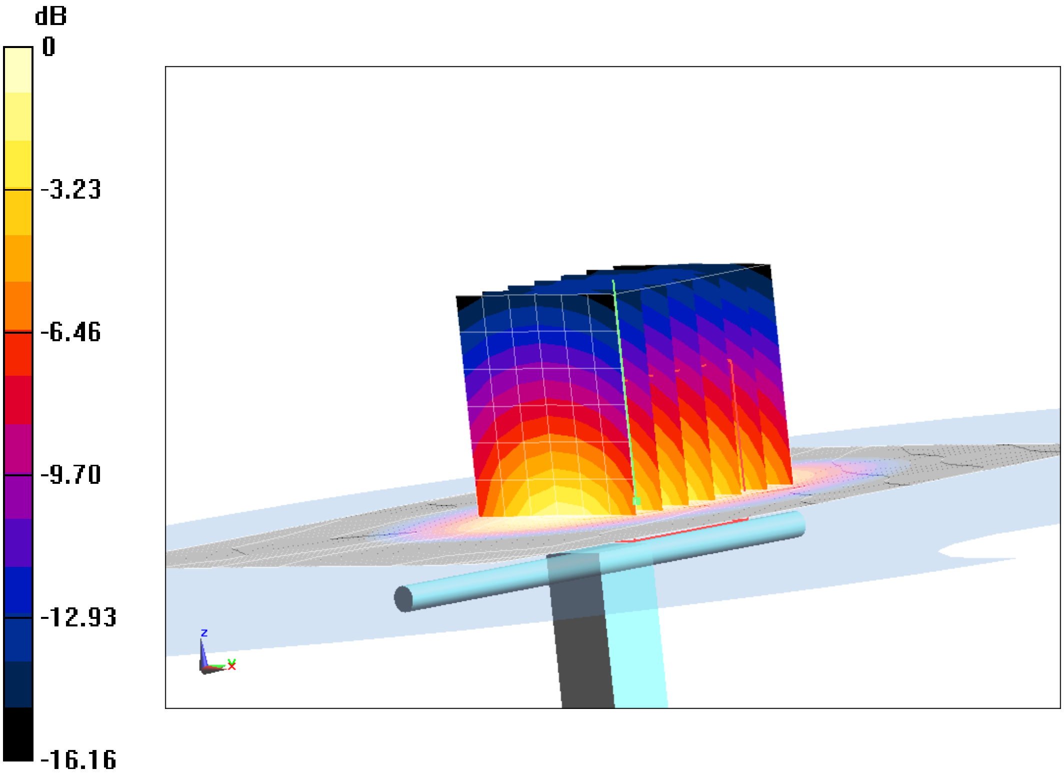
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =106.22 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.83 W/kg

**SAR(1 g) = 9.09 W/kg; SAR(10 g) = 4.87 W/kg**

Maximum value of SAR (measured) = 13.92 W/kg




0 dB = 13.92 W/kg = 11.44 dB W/kg

**Fig.B.3 validation 1750 MHz 250mW**

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**1900 MHz**

Date: 2/16/2021

Electronics: DAE4 Sn536

Medium: Body 1900 MHz

Medium parameters used: f = 1900 MHz; σ =1.411 mho/m; $\varepsilon_r$ = 39.38; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.33,8.33,8.33)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 103.64 V/m; Power Drift = -0.04

**Fast SAR: SAR(1 g) = 9.84 W/kg; SAR(10 g) = 5.18 W/kg**

Maximum value of SAR (interpolated) = 14.05 W/kg

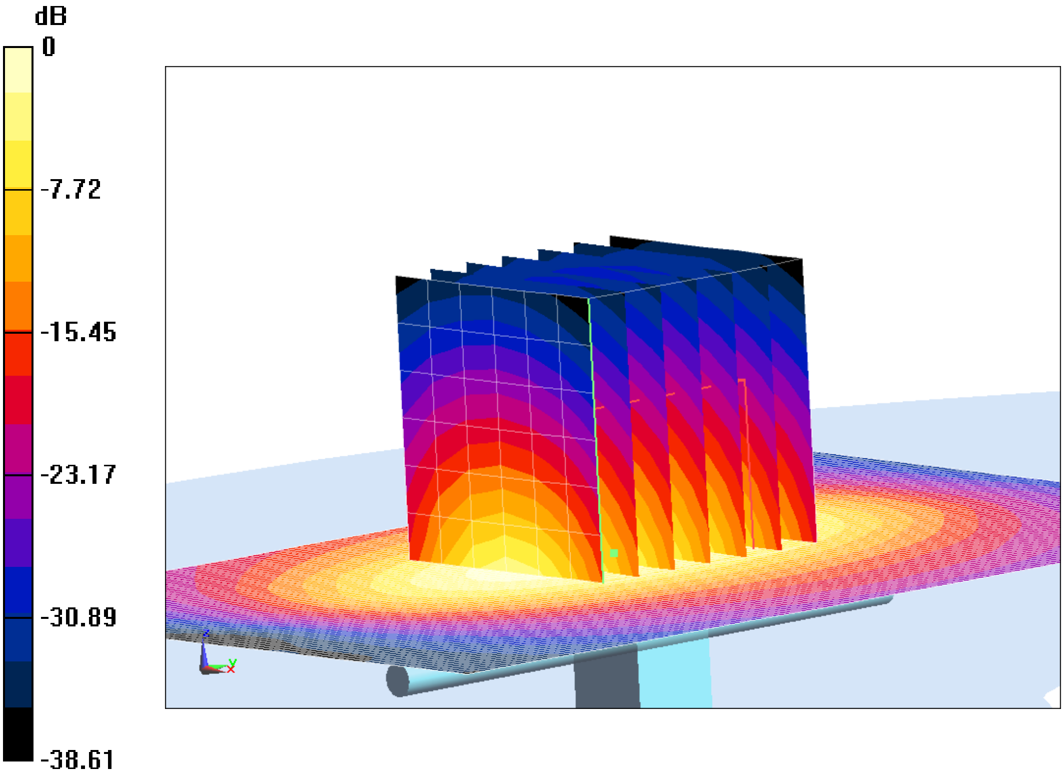
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =103.64 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 16.67 W/kg

**SAR(1 g) = 9.94 W/kg; SAR(10 g) = 5.29 W/kg**

Maximum value of SAR (measured) = 14.21 W/kg




0 dB = 14.21 W/kg = 11.53 dB W/kg

**Fig.B.4 validation 1900 MHz 250mW**

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**2300 MHz**

Date: 2/17/2021

Electronics: DAE4 Sn536

Medium: Head 2300 MHz

Medium parameters used: f = 2300 MHz; σ =1.687 mho/m; $\varepsilon_r$ = 40.14; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 2300 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(8.15,8.15,8.15)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 118.49 V/m; Power Drift = -0.04

**Fast SAR: SAR(1 g) = 12.57 W/kg; SAR(10 g) = 5.97 W/kg**

Maximum value of SAR (interpolated) = 19.94 W/kg

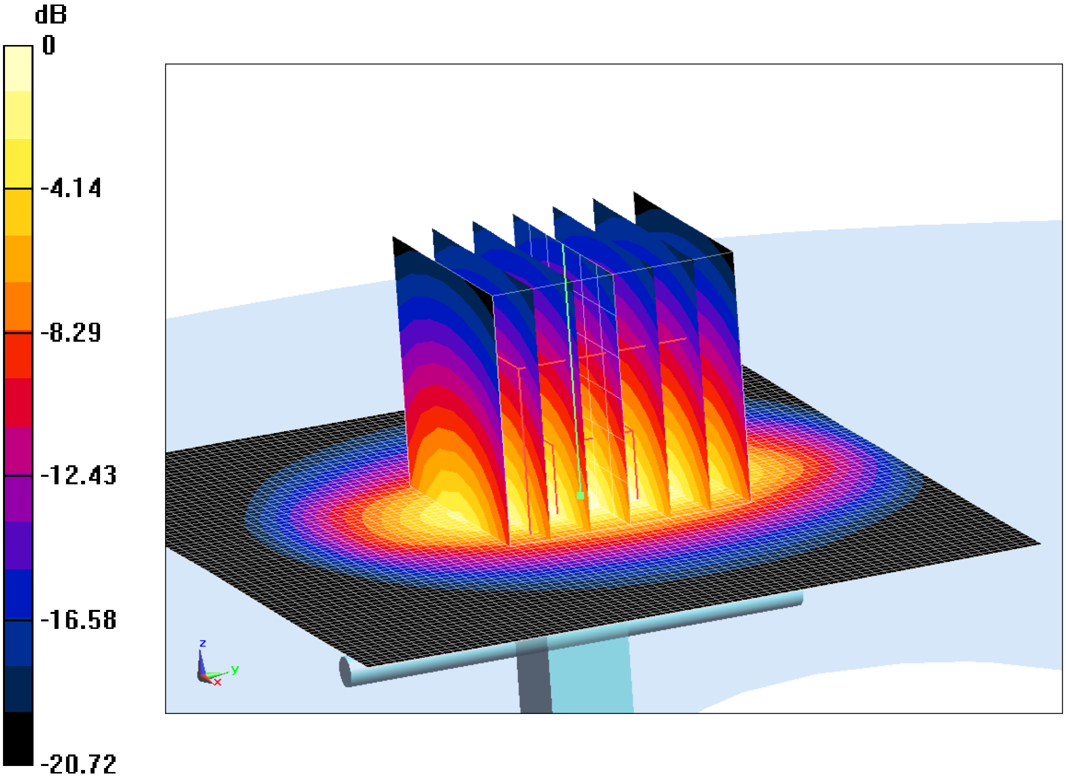
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =118.49 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 23.34 W/kg

**SAR(1 g) = 12.31 W/kg; SAR(10 g) = 6.02 W/kg**

Maximum value of SAR (measured) = 19.67 W/kg




0 dB = 19.67 W/kg = 12.94 dB W/kg

**Fig.B.5 validation 2300 MHz 250mW**

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**2450 MHz**

Date: 2/18/2021

Electronics: DAE4 Sn536

Medium: Head 2450 MHz

Medium parameters used: f = 2450 MHz; σ =1.796 mho/m; $\varepsilon_r$ = 39.2; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(7.77,7.77,7.77)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 120.3 V/m; Power Drift = 0.02

**Fast SAR: SAR(1 g) = 12.96 W/kg; SAR(10 g) = 6.01 W/kg**

Maximum value of SAR (interpolated) = 21.33 W/kg

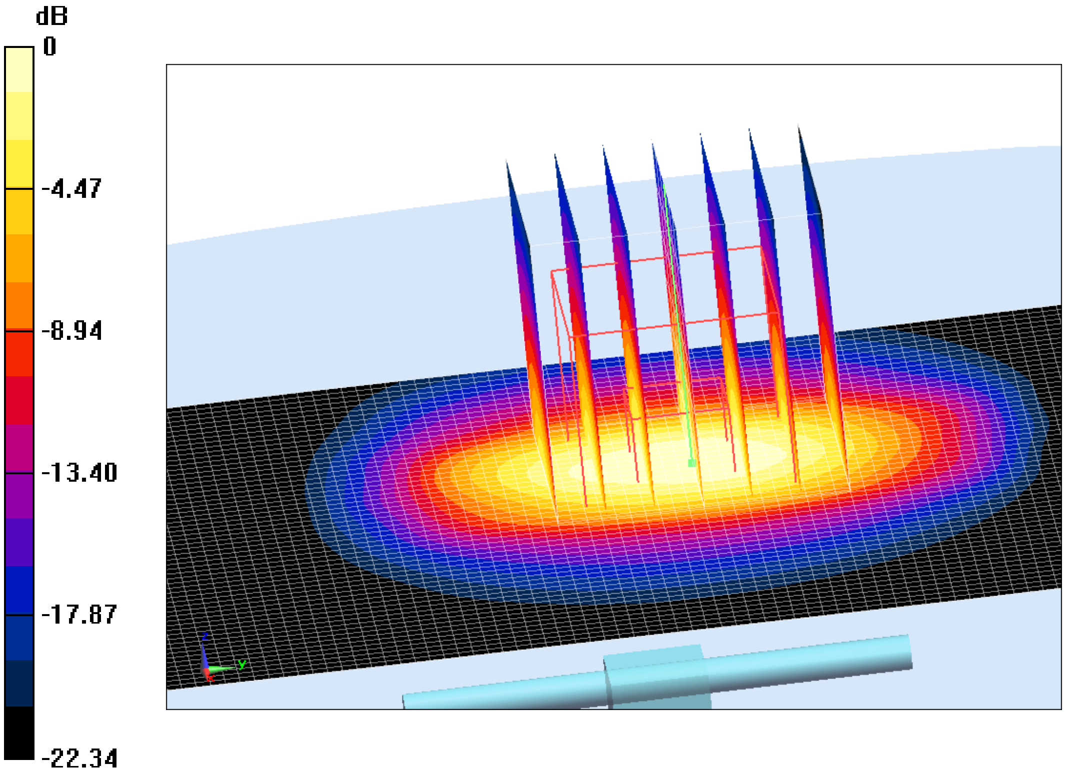
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =120.3 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 26.32 W/kg

**SAR(1 g) = 13.08 W/kg; SAR(10 g) = 6.14 W/kg**

Maximum value of SAR (measured) = 21.4 W/kg




0 dB = 21.4 W/kg = 13.3 dB W/kg

**Fig.B.6 validation 2450 MHz 250mW**

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**5250 MHz**

Date: 2/19/2021

Electronics: DAE4 Sn536

Medium: Head 5250 MHz

Medium parameters used: f = 5250 MHz; $\sigma$ =4.729 mho/m; $\varepsilon_r$ = 36.07; $\rho$ = 1000 kg/m$^3$

Ambient Temperature: 22.5$^o$C Liquid Temperature: 22.3$^o$C

Communication System: CW Frequency: 5250 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(5.61,5.61,5.61)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 80.36 V/m; Power Drift = 0.02

**Fast SAR: SAR(1 g) = 19.77 W/kg; SAR(10 g) = 5.78 W/kg**

Maximum value of SAR (interpolated) = 18.06 W/kg

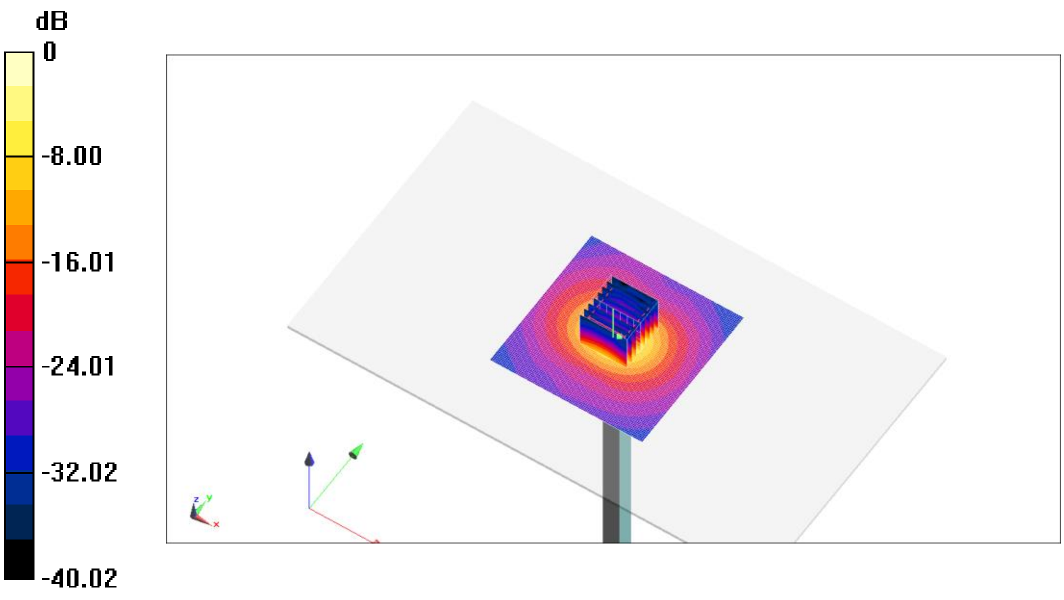
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =80.36 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 28.46 W/kg

**SAR(1 g) = 20 W/kg; SAR(10 g) = 5.79 W/kg**

Maximum value of SAR (measured) = 18.62 W/kg




0 dB = 18.62 W/kg = 12.7 dB W/kg

**Fig.B.7validation 5250 MHz 250mW**

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**5600 MHz**

Date: 2/20/2021

Electronics: DAE4 Sn536

Medium: Head 5600 MHz

Medium parameters used: f = 5600 MHz; σ =5.153 mho/m; $\varepsilon_r$ = 35.75; ρ = 1000 kg/m$^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 5600 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(5.1,5.1,5.1)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 79.4 V/m; Power Drift = -0.1

**Fast SAR: SAR(1 g) = 20.89 W/kg; SAR(10 g) = 5.79 W/kg**

Maximum value of SAR (interpolated) = 19.84 W/kg

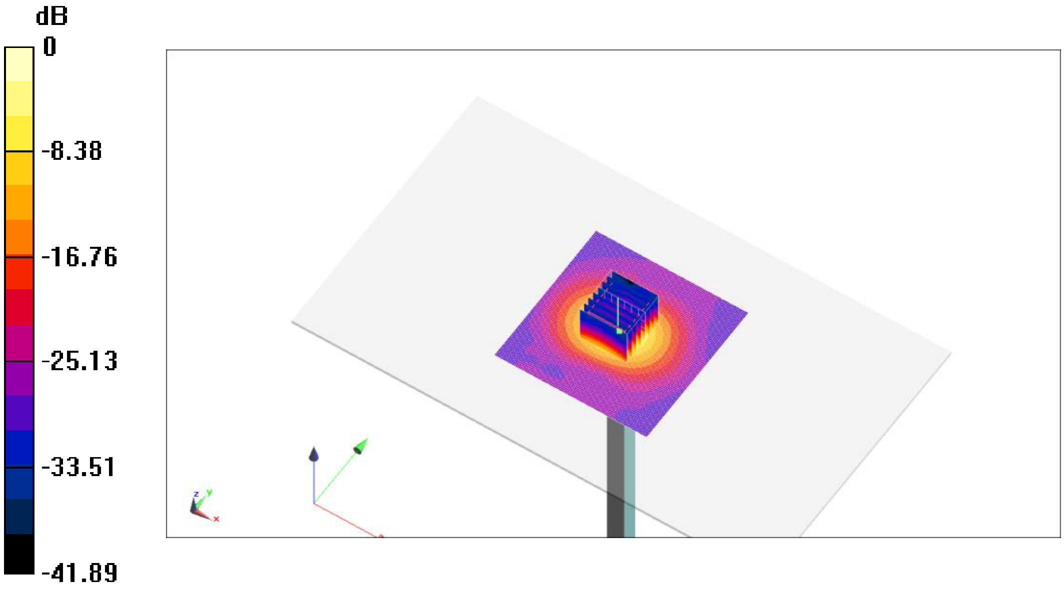
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =79.4 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 31.06 W/kg

**SAR(1 g) = 20.88 W/kg; SAR(10 g) = 5.88 W/kg**

Maximum value of SAR (measured) = 20.39 W/kg




0 dB = 20.39 W/kg = 13.09 dB W/kg

**Fig.B.8 validation 5600 MHz 250mW**

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**5750 MHz**

Date: 2/21/2021

Electronics: DAE4 Sn536

Medium: Head 5750 MHz

Medium parameters used: f = 5750 MHz; σ =5.201 mho/m; $\varepsilon_r$ = 35.73; ρ = 1000 kg/$m^3$

Ambient Temperature: 22.5°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 5750 MHz Duty Cycle: 1:1

Probe: EX3DV4 – SN7307 ConvF(5.05,5.05,5.05)

**System Validation /Area Scan (81x191x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Reference Value = 76.15 V/m; Power Drift = -0.02

**Fast SAR: SAR(1 g) = 20.29 W/kg; SAR(10 g) = 5.74 W/kg**

Maximum value of SAR (interpolated) = 20.16 W/kg

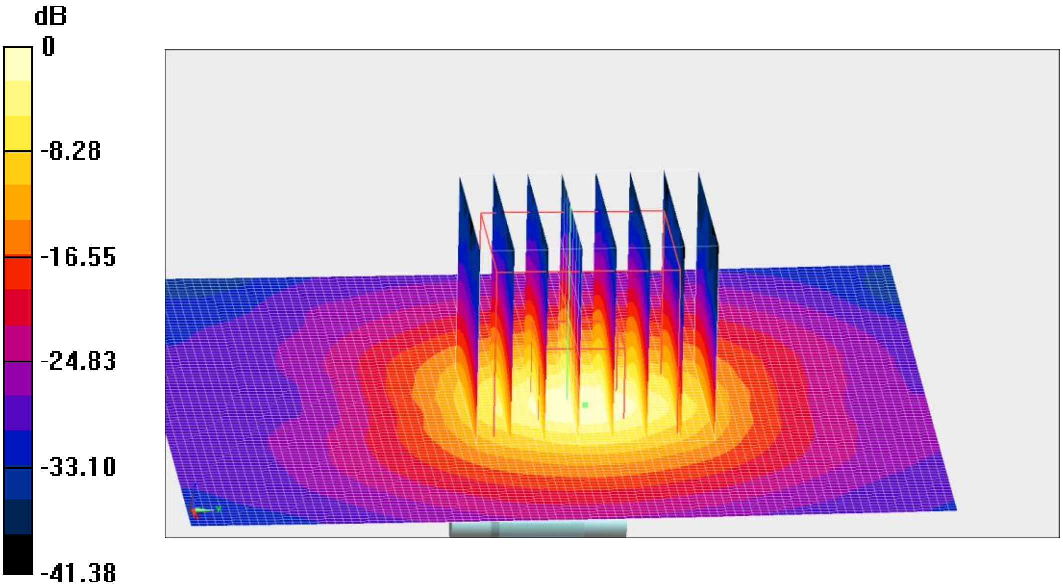
**System Validation /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =76.15 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 32.38 W/kg

**SAR(1 g) = 19.9 W/kg; SAR(10 g) = 5.75 W/kg**

Maximum value of SAR (measured) = 19.65 W/kg




0 dB = 19.65 W/kg = 12.93 dB W/kg

**Fig.B.9 validation 5750 MHz 250mW**

The SAR system verification must be required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR.

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**Table B.1 Comparison between area scan and zoom scan for system verification**

| Date | Band | Position | Area scan (1g) | Zoom scan (1g) | Drift (%) |
|---|---|---|---|---|---|
| 2021/2/13 | 750 MHz | Head | 2.19 | 2.16 | 1.39% |
| 2021/2/14 | 835 MHz | Head | 2.37 | 2.43 | -2.47% |
| 2021/2/15 | 1750 MHz | Head | 9.29 | 9.09 | 2.20% |
| 2021/2/16 | 1900 MHz | Head | 9.84 | 9.94 | -1.01% |
| 2021/2/17 | 2300 MHz | Head | 12.57 | 12.31 | 2.11% |
| 2021/2/18 | 2450 MHz | Head | 12.96 | 13.08 | -0.92% |

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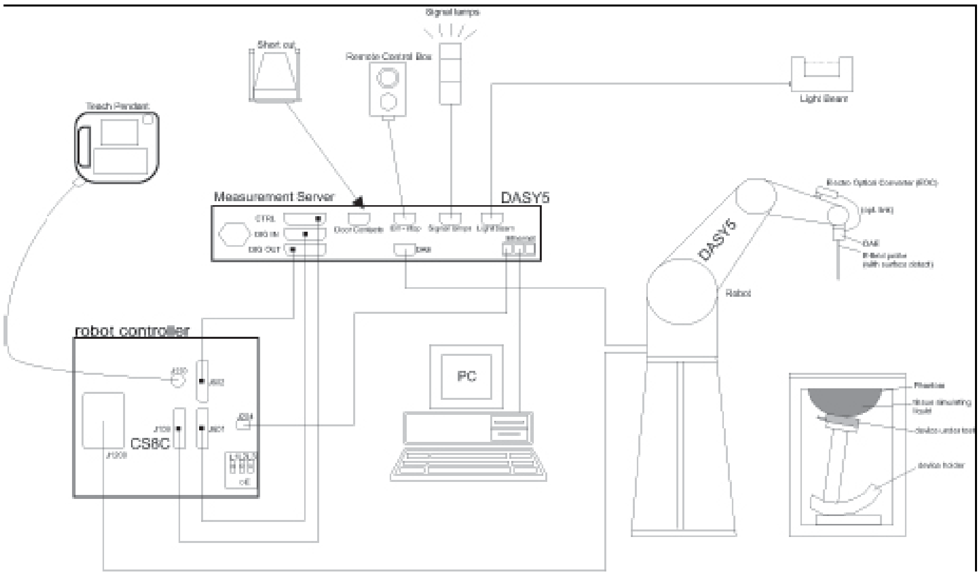
# ANNEX C SAR Measurement Setup

## C.1 Measurement Set-up

The Dasy4 or DASY5 system for performing compliance tests is illustrated above graphically. This system consists of the following items:




**Picture C.1SAR Lab Test Measurement Set-up**

- A standard high precision 6-axis robot (StäubliTX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY4 or DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as
- warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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## C.2 Dasy4 or DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 or DASY5 software reads the reflection durning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Picture C.2Near-field Probe

**Probe Specifications:**

**Model:** ES3DV3, EX3DV4

**Frequency Range:** 10MHz — 6.0GHz(EX3DV4)
10MHz — 4GHz(ES3DV3)

**Calibration:** In head and body simulating tissue at Frequencies from 835 up to 5800MHz

**Linearity:** ± 0.2 dB(30 MHz to 6 GHz) for EX3DV4
± 0.2 dB(30 MHz to 4 GHz) for ES3DV3

**DynamicRange:** 10 mW/kg — 100W/kg

**Probe Length:** 330 mm

**Probe Tip Length:** 20 mm

**Body Diameter:** 12 mm

**Tip Diameter:** 2.5 mm (3.9 mm for ES3DV3)

**Tip-Center:** 1 mm (2.0mm for ES3DV3)

**Application:** SAR Dosimetry Testing
Compliance tests ofmobile phones
Dosimetry in strong gradient fields

**Picture C.3E-field Probe**

## C.3 E-field Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm$^2$) using an RF Signal generator, TEM cell, and RF Power Meter.

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or

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other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 $mW/cm^2$.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

$\Delta t$ = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

$\Delta T$ = Temperature increase due to RF exposure.

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

Where:

$\sigma$ = Simulated tissue conductivity,

$\rho$ = Tissue density ($kg/m^3$).

## C.4 Other Test Equipment

### C.4.1 Data Acquisition Electronics(DAE)

The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**PictureC.4: DAE**

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### C.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90XL; DASY5: RX160L) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)


**Picture C.5DASY 4**


**Picture C.6DASY 5**

### C.4.3 Measurement Server

The Measurement server is based on a PC/104 CPU broad with CPU (dasy4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128MB), RAM (DASY4: 64 MB, DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O broad, which is directly connected to the PC/104 bus of the CPU broad.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

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**Picture C.7 Server for DASY 4**

**Picture C.8 Server for DASY 5**

### C.4.4 Device Holder for Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

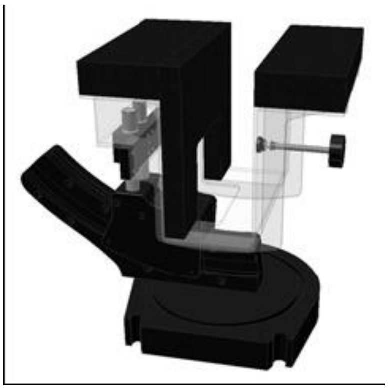
The DASY device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon$=3 and loss tangent $\delta$=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin-SAM and ELI phantoms.

**Picture C.9-1: Device Holder**



**Picture C.9-2: Laptop Extension Kit**

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### C.4.5 Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to

Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

Shell Thickness: 2±0. 2 mm

Filling Volume: Approx. 25 liters

Dimensions: 810 x l000 x 500 mm (H x L x W)

Available: Special

**Picture C.10: SAM Twin Phantom**

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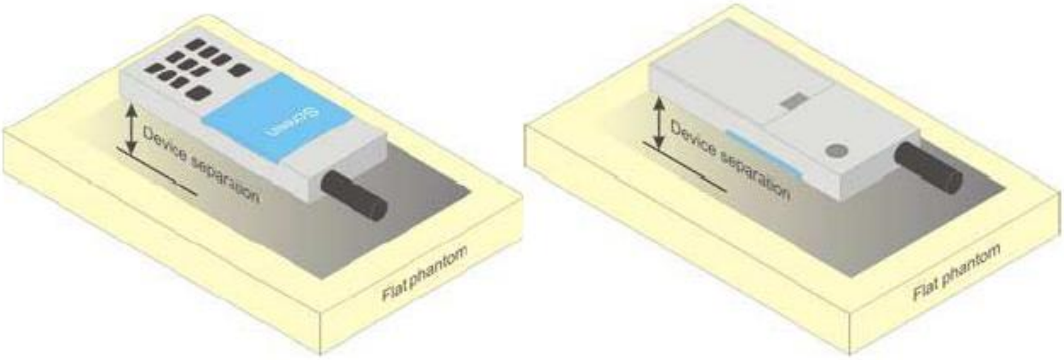
# ANNEX D Position of the wireless device in relation to the phantom

## D.1 Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer.




**Picture D.4Test positions for body-worn devices**

## D.2 Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.
The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture8.5 show positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.

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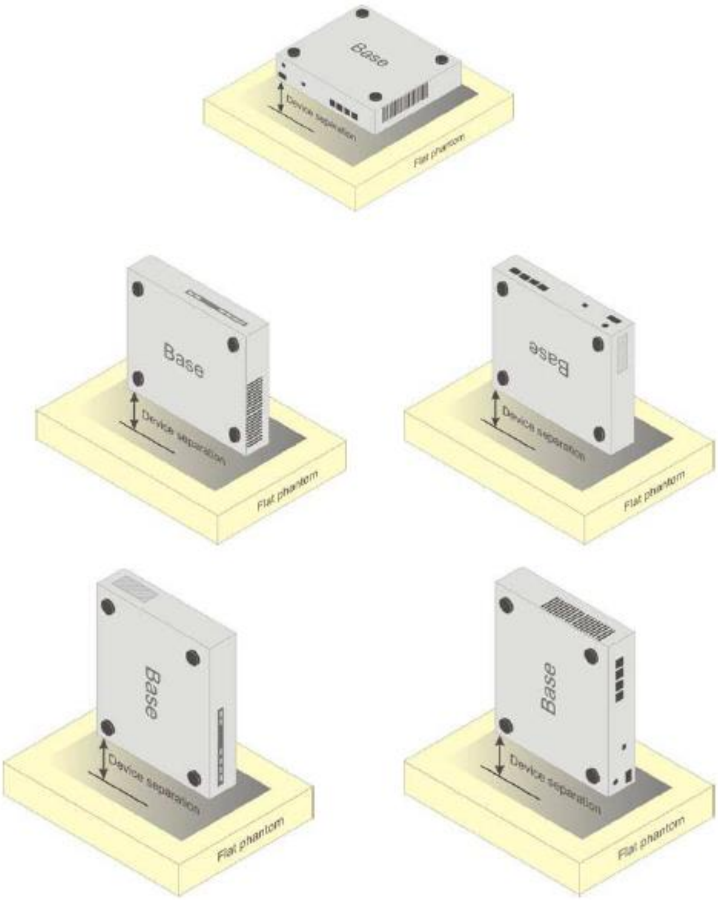


**Picture D.5 Test positions for desktop devices**

## D.3 DUT Setup Photos


**Picture D.6**

## ANNEX E Equivalent Media Recipes

The liquid used for the frequency range of 800-3000 MHz consisted of water, sugar, salt, preventol, glycol monobutyl and Cellulose. The liquid has been previously proven to be suited for worst-case. The Table E.1 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209.

**TableE.1: Composition of the Tissue Equivalent Matter**

| Frequency (MHz) | 835Head | 835Body | 1900 Head | 1900 Body | 2450 Head | 2450 Body | 5800 Head | 5800 Body |
|---|---|---|---|---|---|---|---|---|
| Ingredients (% by weight) | | | | | | | | |
| Water | 41.45 | 52.5 | 55.242 | 69.91 | 58.79 | 72.60 | 65.53 | 65.53 |
| Sugar | 56.0 | 45.0 | \ | \ | \ | \ | \ | \ |
| Salt | 1.45 | 1.4 | 0.306 | 0.13 | 0.06 | 0.18 | \ | \ |
| Preventol | 0.1 | 0.1 | \ | \ | \ | \ | \ | \ |
| Cellulose | 1.0 | 1.0 | \ | \ | \ | \ | \ | \ |
| Glycol Monobutyl | \ | \ | 44.452 | 29.96 | 41.15 | 27.22 | \ | \ |
| Diethylenglycol monohexylether | \ | \ | \ | \ | \ | \ | 17.24 | 17.24 |
| Triton X-100 | \ | \ | \ | \ | \ | \ | 17.24 | 17.24 |
| Dielectric Parameters Target Value | ε=41.5 σ=0.90 | ε=55.2 σ=0.97 | ε=40.0 σ=1.40 | ε=53.3 σ=1.52 | ε=39.2 σ=1.80 | ε=52.7 σ=1.95 | ε=35.3 σ=5.27 | ε=48.2 σ=6.00 |

**Note: There are a little adjustment respectively for 750, 1750, 2600, 5200, 5300 and 5600 based on the recipe of closest frequency in table E.1.**

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# ANNEX F System Validation

The SAR system must be validated against its performance specifications before it is deployed. When SAR probes, system components or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such components.

**Table F.1: System Validation for 7307**

| Probe SN. | Liquid name | Validation date | Frequency point | Status (OK or Not) |
|---|---|---|---|---|
| 7307 | Head 750MHz | June.15,2020 | 750 MHz | OK |
| 7307 | Head 850MHz | June.15,2020 | 835 MHz | OK |
| 7307 | Head 900MHz | June.15,2020 | 900 MHz | OK |
| 7307 | Head 1750MHz | June.15,2020 | 1750 MHz | OK |
| 7307 | Head 1810MHz | June.15,2020 | 1810 MHz | OK |
| 7307 | Head 1900MHz | June.16,2020 | 1900 MHz | OK |
| 7307 | Head 2000MHz | June.16,2020 | 2000 MHz | OK |
| 7307 | Head 2100MHz | June.16,2020 | 2100 MHz | OK |
| 7307 | Head 2300MHz | June.16,2020 | 2300 MHz | OK |
| 7307 | Head 2450MHz | June.16,2020 | 2450 MHz | OK |
| 7307 | Head 2600MHz | June.17,2020 | 2600 MHz | OK |
| 7307 | Head 3500MHz | June.17,2020 | 3500 MHz | OK |
| 7307 | Head 3700MHz | June.17,2020 | 3700 MHz | OK |
| 7307 | Head 5200MHz | June.17,2020 | 5250 MHz | OK |
| 7307 | Head 5500MHz | June.17,2020 | 5600 MHz | OK |
| 7307 | Head 5800MHz | June.17,2020 | 5800 MHz | OK |
| 7307 | Body 750MHz | June.17,2020 | 750 MHz | OK |
| 7307 | Body 850MHz | June.18,2020 | 835 MHz | OK |
| 7307 | Body 900MHz | June.18,2020 | 900 MHz | OK |
| 7307 | Body 1750MHz | June.18,2020 | 1750 MHz | OK |
| 7307 | Body 1810MHz | June.18,2020 | 1810 MHz | OK |
| 7307 | Body 1900MHz | June.18,2020 | 1900 MHz | OK |
| 7307 | Body 2000MHz | June.19,2020 | 2000 MHz | OK |
| 7307 | Body 2100MHz | June.19,2020 | 2100 MHz | OK |
| 7307 | Body 2300MHz | June.19,2020 | 2300 MHz | OK |
| 7307 | Body 2450MHz | June.19,2020 | 2450 MHz | OK |
| 7307 | Body 2600MHz | June.19,2020 | 2600 MHz | OK |
| 7307 | Body 3500MHz | June.20,2020 | 3500 MHz | OK |
| 7307 | Body 3700MHz | June.20,2020 | 3700 MHz | OK |
| 7307 | Body 5200MHz | June.20,2020 | 5250 MHz | OK |
| 7307 | Body 5500MHz | June.20,2020 | 5600 MHz | OK |
| 7307 | Body 5800MHz | June.20,2020 | 5800 MHz | OK |

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## ANNEX G Sensor Triggering Data Summary

**Main and Wifi Antenna**

| | | |
|---|---|---|
| SAR Sensor | Left(mm) | 20(mm) |
| SAR Sensor | Front(mm) | 18(mm) |
| SAR Sensor | Back(mm) | 18(mm) |

According to the above description, this device was tested by the manufacturer to determine the SAR sensor triggering distances for the front, rear, and left edge both for main and WIFI antenna The measured power state within ±5mm of the triggering points (or until touching the phantom) is included for front, rear and Left edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom with the device at maximum output power without power reduction.

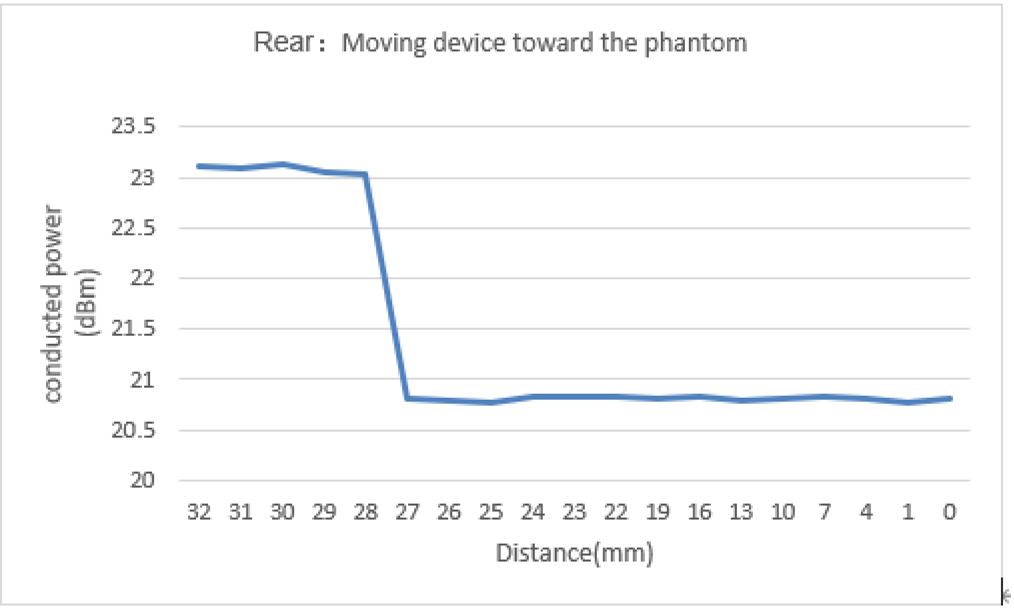
We tested the power and got the different proximity sensor triggering distances for front, rear and left edge. But the manufacturer has declared 18mm (rear) / 18mm (front) /20mm (left) are the most conservative triggering distance for wifi and main antenna. Therefore base on the most conservative triggering distances as above, additional SAR measurements were required at 17mm (rear) / 17mm (front) /19mm (left) for main antenna and wifi antenna.

**WWAN Antenna:**

**Rear**

Moving device toward the phantom:

| | The power state | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **32** | **31** | **30** | **29** | **28** | **27** | **26** | **25** | **24** | **23** | **22** | **19** | **16** | **13** | **10** | **7** | **4** | **1** | **0** |
| **Conducted power(dBm)** | 23.1 | 23.09 | 23.13 | 23.05 | 23.04 | 20.81 | 20.79 | 20.76 | 20.83 | 20.82 | 20.82 | 20.8 | 20.82 | 20.78 | 20.8 | 20.82 | 20.81 | 20.76 | 20.8 |

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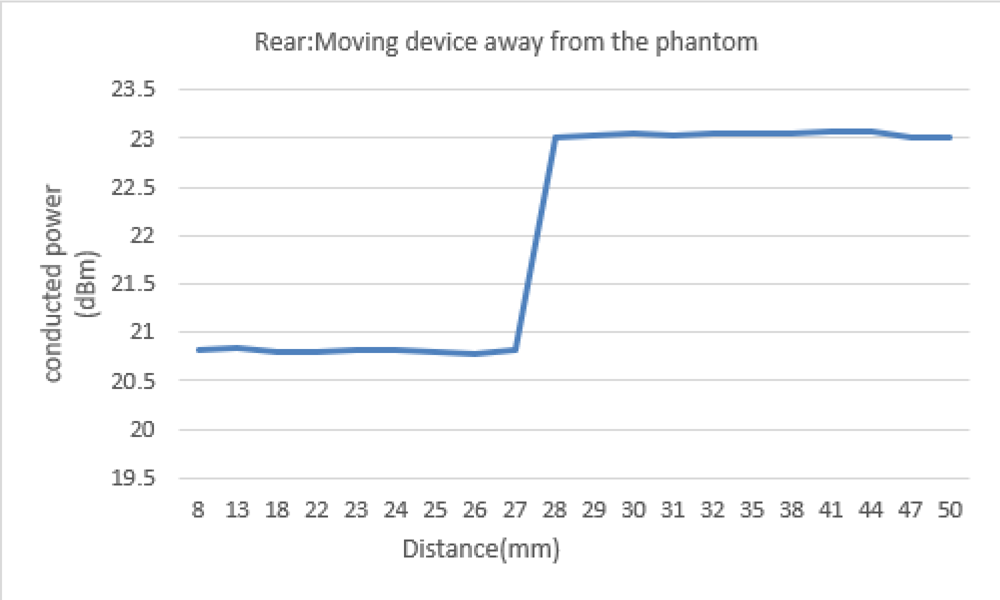
Moving device away from the phantom:

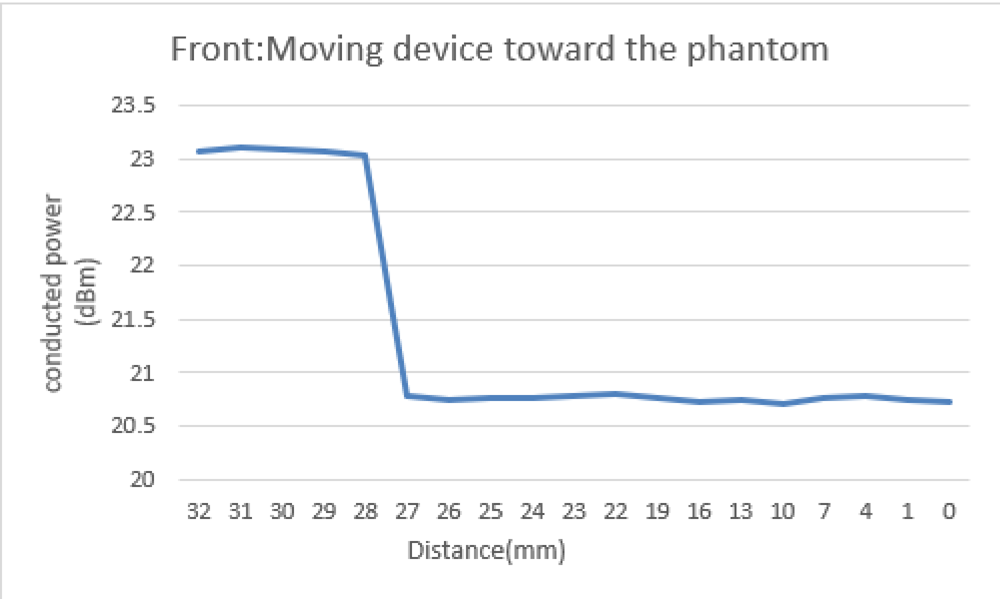
| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 8 | 13 | 18 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 35 | 38 | 41 | 44 | 47 | 50 |
| Conducted power(dBm) | 20.81 | 20.83 | 20.79 | 20.79 | 20.81 | 20.82 | 20.8 | 20.78 | 20.81 | 23.01 | 23.02 | 23.06 | 23.02 | 23.05 | 23.04 | 23.06 | 23.07 | 23.08 | 23.01 | 23.01 |




**Front**

Moving device toward the phantom:

| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 19 | 16 | 13 | 10 | 7 | 4 | 1 | 0 |
| Conducted power(dBm) | 23.06 | 23.11 | 23.08 | 23.07 | 23.04 | 20.79 | 20.75 | 20.76 | 20.77 | 20.78 | 20.81 | 20.76 | 20.73 | 20.75 | 20.71 | 20.77 | 20.79 | 20.74 | 20.73 |

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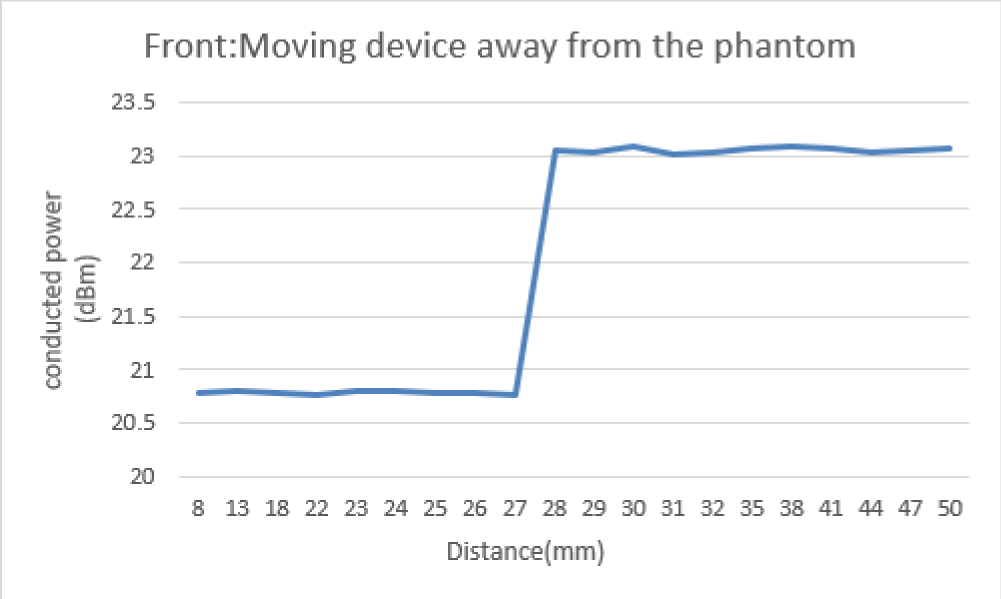
Moving device away from the phantom:

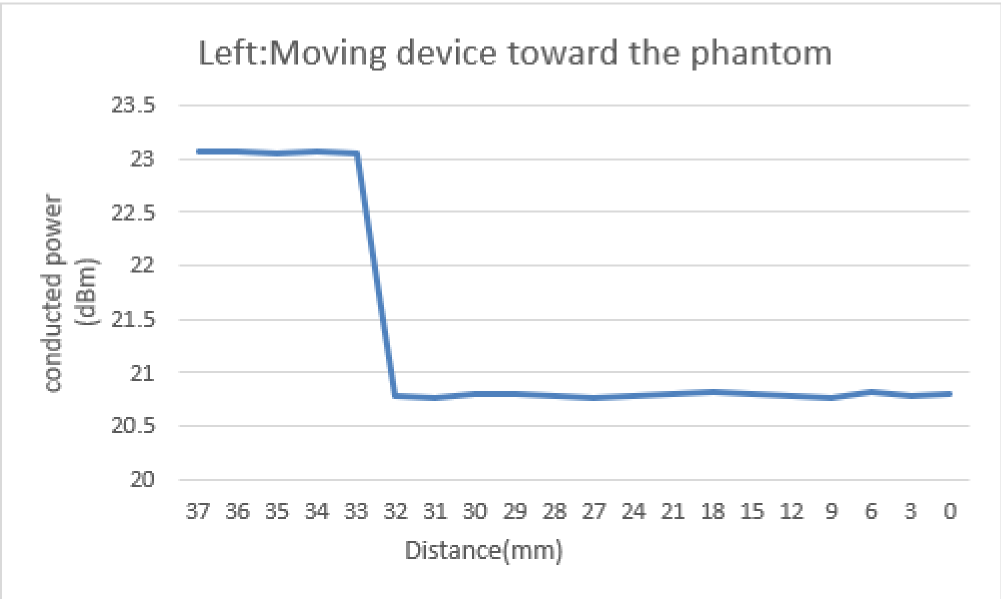
| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **8** | **13** | **18** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** | **31** | **32** | **35** | **38** | **41** | **44** | **47** | **50** |
| **Conducted power(dBm)** | 20.79 | 20.81 | 20.78 | 20.76 | 20.8 | 20.81 | 20.79 | 20.78 | 20.77 | 23.05 | 23.03 | 23.08 | 23.01 | 23.03 | 23.07 | 23.09 | 23.06 | 23.03 | 23.05 | 23.06 |




**Left Edge**

Moving device toward the phantom:

| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **37** | **36** | **35** | **34** | **33** | **32** | **31** | **30** | **29** | **28** | **27** | **24** | **21** | **18** | **15** | **12** | **9** | **6** | **3** | **0** |
| Conducted power(dBm) | 23.07 | 23.06 | 23.05 | 23.07 | 23.05 | 20.79 | 20.76 | 20.81 | 20.81 | 20.79 | 20.76 | 20.79 | 20.81 | 20.82 | 20.81 | 20.78 | 20.76 | 20.82 | 20.78 | 20.8 |

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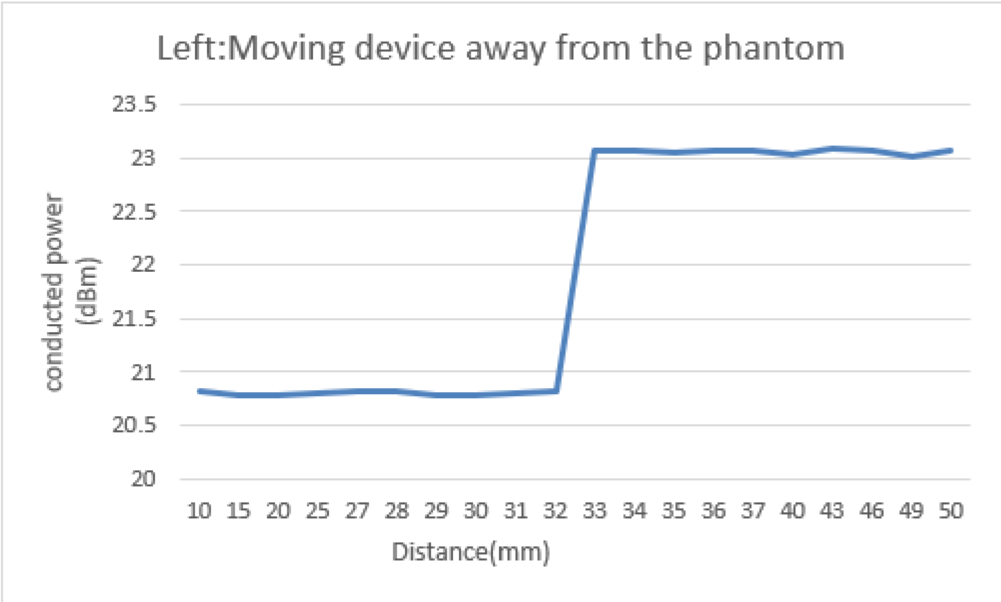
Moving device away from the phantom:

| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 10 | 15 | 20 | 25 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 40 | 43 | 46 | 49 | 50 |
| Conducted power(dBm) | 20.83 | 20.79 | 20.78 | 20.81 | 20.82 | 20.82 | 20.79 | 20.78 | 20.81 | 20.82 | 23.06 | 23.07 | 23.05 | 23.07 | 23.06 | 23.03 | 23.08 | 23.06 | 23.01 | 23.06 |

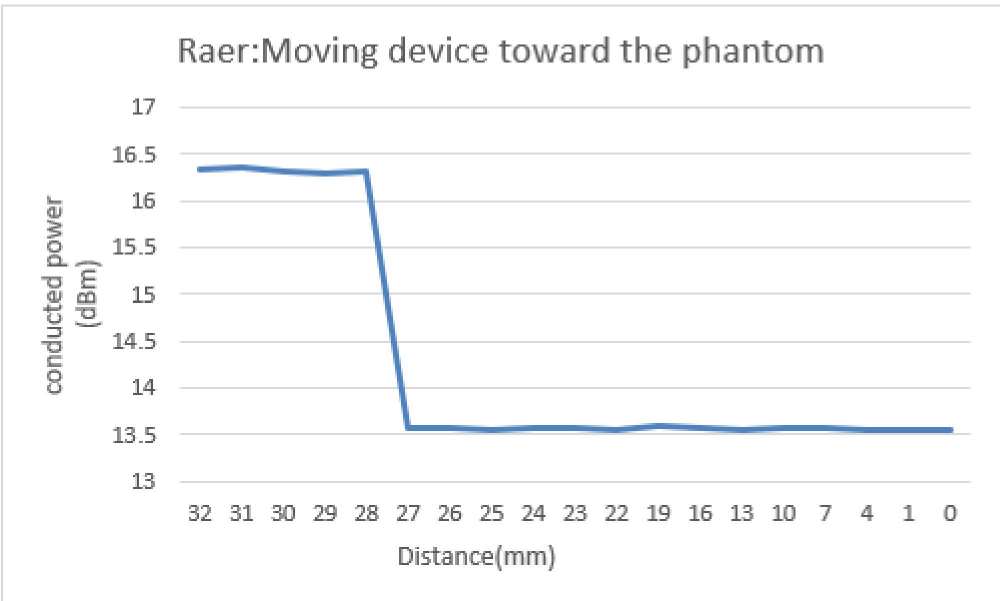



## WLAN Antenna:

### Rear

Moving device toward the phantom:

| The power state | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 19 | 16 | 13 | 10 | 7 | 4 | 1 | 0 |
| Conducted power(dBm) | 16.34 | 16.35 | 16.32 | 16.29 | 16.31 | 13.57 | 13.58 | 13.56 | 13.57 | 13.58 | 13.56 | 13.59 | 13.57 | 13.56 | 13.57 | 13.58 | 13.55 | 13.56 | 13.55 |

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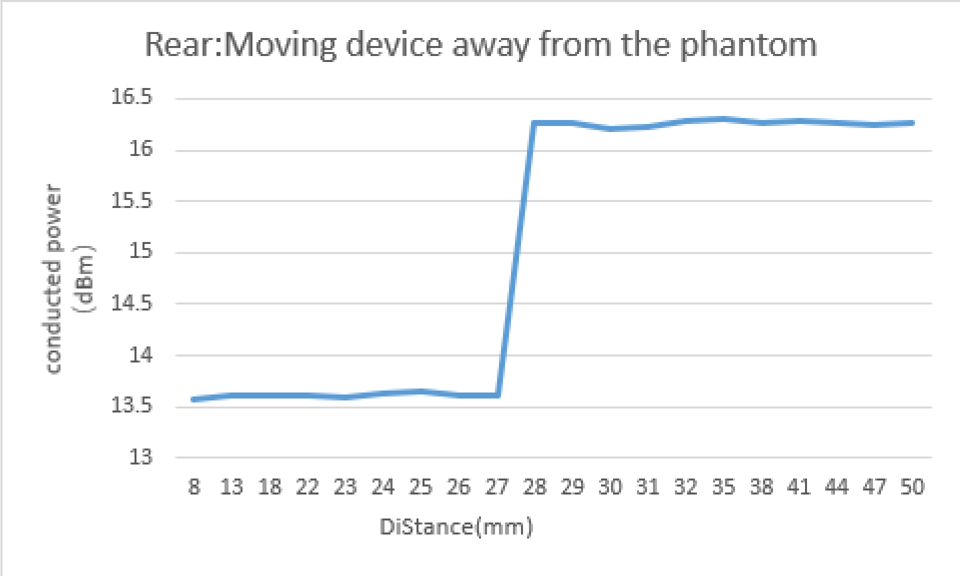
Moving device away from the phantom:

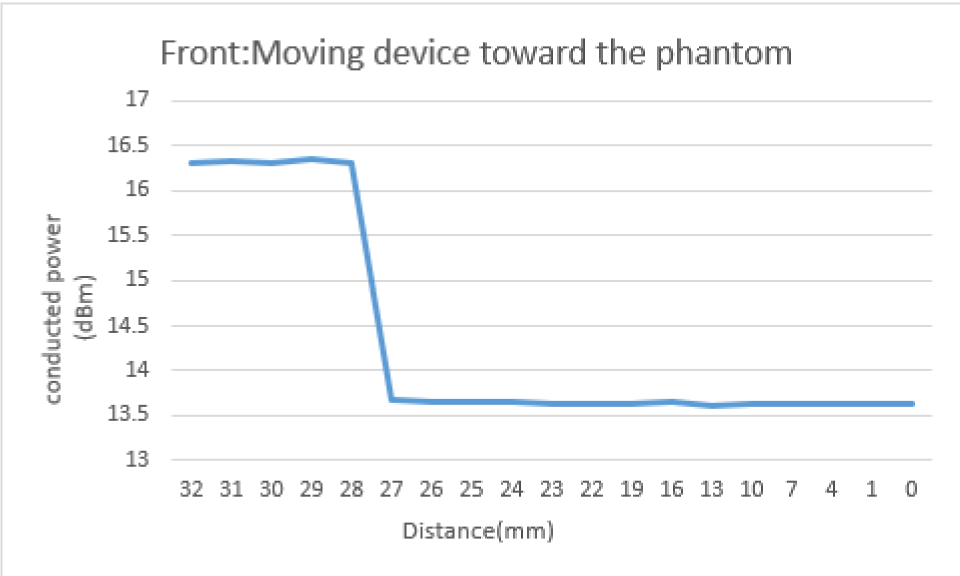
| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 8 | 13 | 18 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 35 | 38 | 41 | 44 | 47 | 50 |
| Conducted power(dBm) | 13.58 | 13.61 | 13.62 | 13.61 | 13.59 | 13.63 | 13.65 | 13.61 | 13.62 | 16.27 | 16.26 | 16.21 | 16.23 | 16.28 | 16.3 | 16.26 | 16.28 | 16.26 | 16.25 | 16.27 |




**Front**

Moving device toward the phantom:

| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 19 | 16 | 13 | 10 | 7 | 4 | 1 | 0 |
| Conducted power(dBm) | 16.3 | 16.32 | 16.31 | 16.35 | 16.31 | 13.68 | 13.66 | 13.66 | 13.65 | 13.63 | 13.62 | 13.63 | 13.65 | 13.61 | 13.62 | 13.63 | 13.64 | 13.62 | 13.63 |

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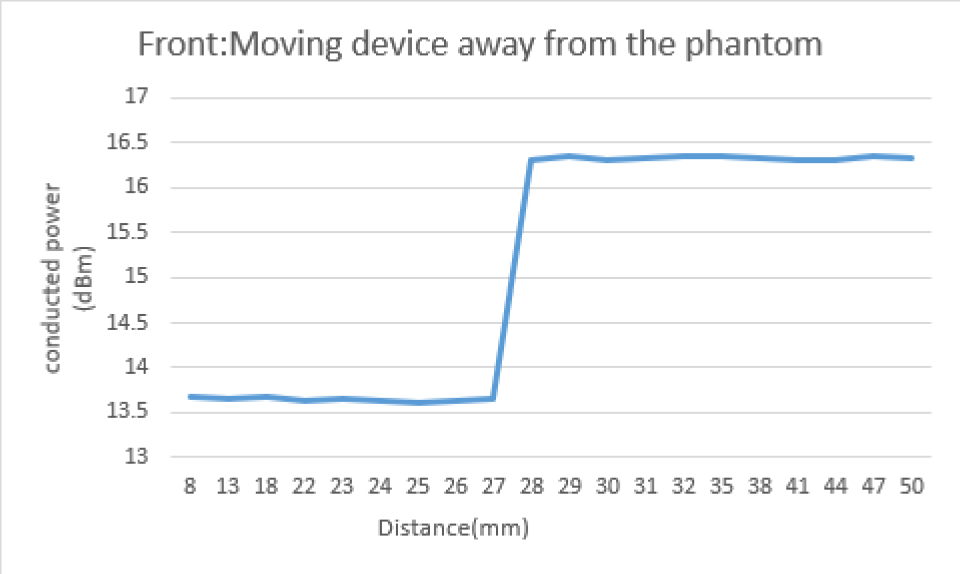
Moving device away from the phantom:

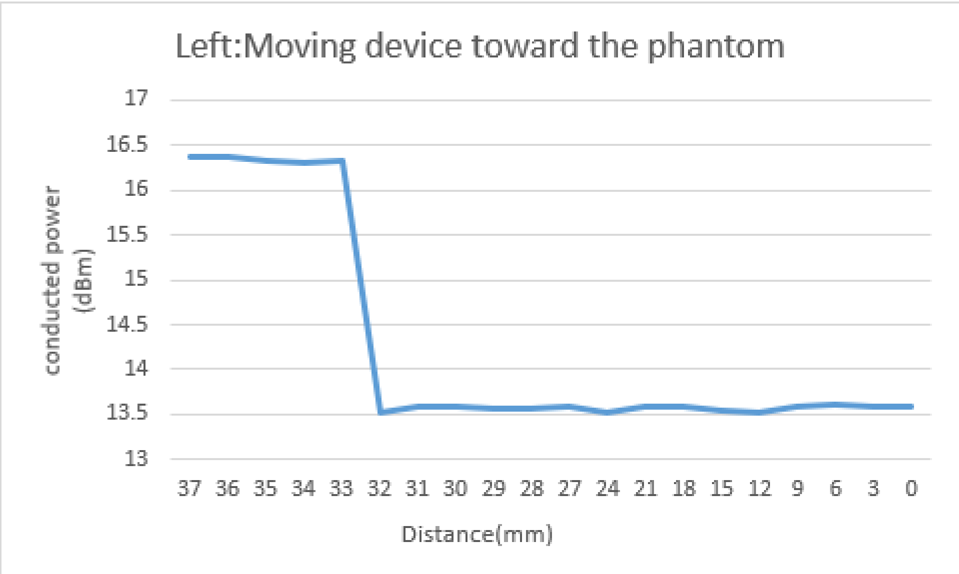
| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 8 | 13 | 18 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 35 | 38 | 41 | 44 | 47 | 50 |
| Conducted power(dBm) | 13.68 | 13.66 | 13.68 | 13.62 | 13.66 | 13.63 | 13.61 | 13.63 | 13.65 | 16.3 | 16.35 | 16.31 | 16.32 | 16.36 | 16.35 | 16.34 | 16.31 | 16.31 | 16.35 | 16.33 |




**Left:**

Moving device toward the phantom:

| The power state | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 37 | 36 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 24 | 21 | 18 | 15 | 12 | 9 | 6 | 3 | 0 |
| Conducted power(dBm) | 16.37 | 16.38 | 16.33 | 16.31 | 16.33 | 13.53 | 13.58 | 13.59 | 13.56 | 13.56 | 13.58 | 13.53 | 13.59 | 13.58 | 13.55 | 13.53 | 13.59 | 13.6 | 13.58 | 13.59 |

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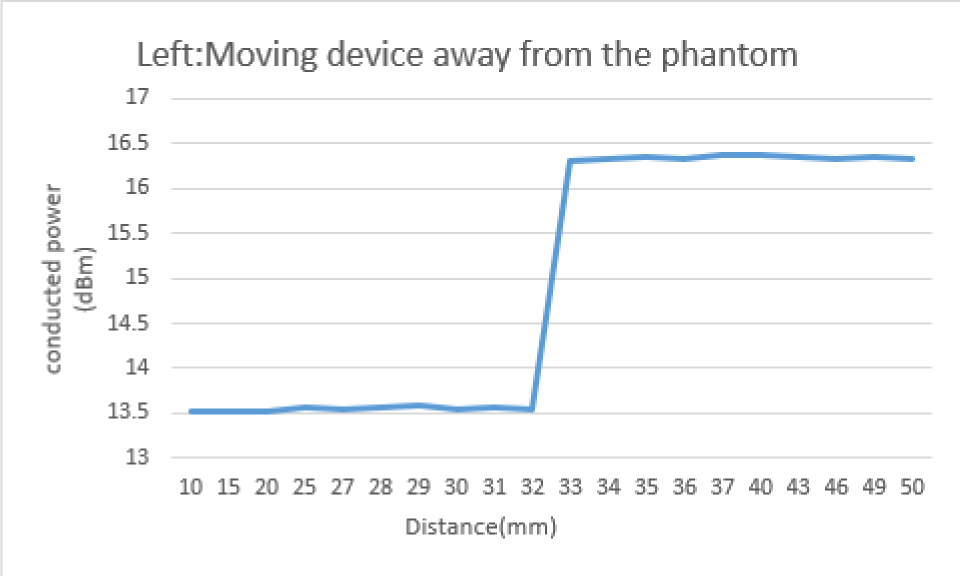
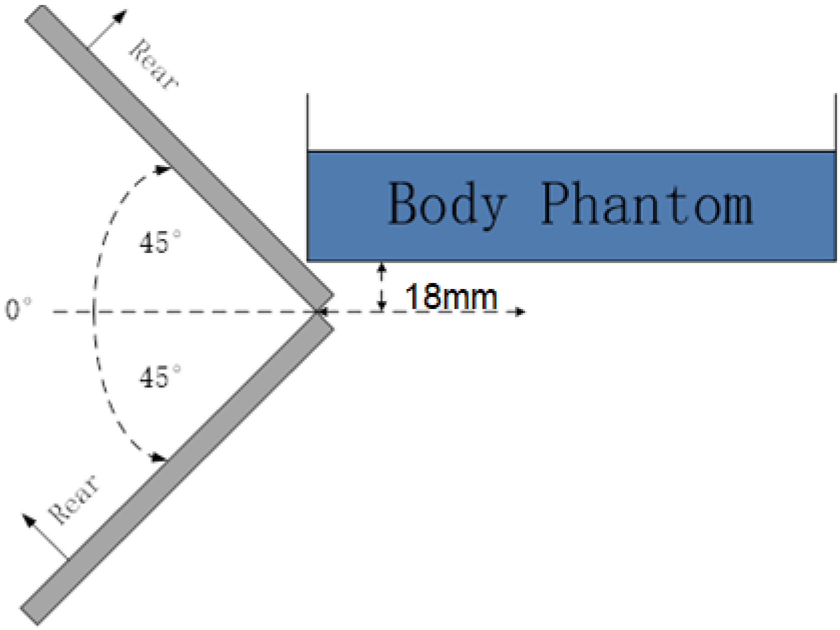
Moving device away from the phantom:

| | The power state | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance [mm] | 10 | 15 | 20 | 25 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 40 | 43 | 46 | 49 | 50 |
| Conducted power(dBm) | 13.51 | 13.53 | 13.53 | 13.56 | 13.54 | 13.57 | 13.58 | 13.54 | 13.56 | 13.55 | 16.31 | 16.32 | 16.36 | 16.32 | 16.37 | 16.38 | 16.36 | 16.32 | 16.36 | 16.33 |




Note: The trigger distance declared by the customer is smaller than the corresponding actual trigger distance, so the distance for SAR test is conservative.

The influence of table tilt angles to proximity sensor triggering is determined by positioning each edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance by rotating the device around the edge next to the phantom in ≤ 10° increments until the tablet is ±45° or more from the vertical position at 0°.

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