SAR TEST REPORT

Applicant	ZTE Corporation
FCC ID	SRQ-MU5001
Product	UFI
Model	MU5001
Marketing	Vodafone Giga To Go
Report No.	R2106A0528-S1
Issue Date	July 14, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528- 2013, ANSI C95.1: 1992, IEEE C95.1: 1991.** The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Yurui Zhao Guangchang Fan

Prepared by: Yurui Zhao *Approved by: Guangchang Fan*

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

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

Table 1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)
	1g SAR Hotspot (Separation 10mm)
LTE FDD 7	**1.12**
LTE TDD 38	0.53
Wi-Fi (2.4G)	0.40
Wi-Fi (5G)	0.54
Date of Testing: June 23, 2021~ July 1, 2021 Date of Sample Received: June 21, 2021	
Note: 1. The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg) specified in ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013. 2.All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.	

Table 2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g SAR Hotspot (Separation 10mm)
Highest Simultaneous Transmission SAR (W/kg)	1.409
Note: The detail for simultaneous transmission consideration is described in chapter 10.3.	

3 Description of Equipment under Test

Client Information

Applicant	ZTE Corporation
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
Manufacturer	Vodafone S.à r.l.
Manufacturer address	15 rue Edward Steichen, L-2540, Luxembourg, Grand-Duché de Luxembourg

General Technologies

Application Purpose	Original Grant
EUT Stage	Identical Prototype
Model	MU5001
IMEI	868519050036374
Hardware Version	Ver.A(T1)
Software Version	BD_VDFMU5001V1.0.0B01
Antenna Type	Internal Antenna
Device Class	C
Wi-Fi Hotspot	Wi-Fi 2.4G Wi-Fi 5G U-NII-1&U-NII-3
Power Class	LTE FDD 7: 3 LTE TDD 38: 3
Power Level	LTE FDD 7: max power LTE TDD 38: max power
EUT Accessory	
Battery	Manufacturer: Zhuhai CosMX Battery Co., Ltd. Model : Li3945T44P4h815174
Note: The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.	

Wireless Technology and Frequency Range

<table>
<tr><th colspan="2">Wireless Technology</th><th>Modulation</th><th>Operating mode</th><th>Tx (MHz)</th></tr>
<tr><td rowspan="4">LTE</td><td>FDD 7</td><td rowspan="2">QPSK, 16QAM, 64QAM</td><td rowspan="2">Rel.15 /Category 13</td><td>2500 ~ 2570</td></tr>
<tr><td>TDD 38</td><td>2570 ~ 2620</td></tr>
<tr><td colspan="4">Does this device support Carrier Aggregation (CA) ☐Yes ☒No</td></tr>
<tr><td colspan="4">Does this device support SV-LTE (1xRTT-LTE)? ☐Yes ☒No</td></tr>
<tr><td rowspan="4">Wi-Fi</td><td rowspan="2">2.4G</td><td>DSSS, OFDM</td><td>802.11b/g/n HT20
802.11ax HE20</td><td>2412 ~ 2462</td></tr>
<tr><td>OFDM</td><td>802.11n HT40
802.11ax HE40</td><td>2422 ~ 2452</td></tr>
<tr><td>5G</td><td>OFDM</td><td>802.11a/n HT20/ HT40/
ac VHT20/VHT40/VHT80
802.11ax HE20/HE40/HE80</td><td>5150 ~ 5250
5725 ~ 5850</td></tr>
<tr><td colspan="4">Does this device support MIMO ☒Yes (2TX, 2RX) ☐No</td></tr>
</table>

4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992, IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

IEC 62209-1

Reference Standards

KDB 248227 D01 802.11Wi-Fi SAR v02r02
KDB 447498 D01 General RF Exposure Guidance v06
KDB 648474 D04 Handset SAR v01r03
KDB 690783 D01 SAR Listings on Grants v01r03
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02
KDB 941225 D05 SAR for LTE Devices v02r05
KDB 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
KDB 941225 D06 Hotspot Mode v02r01

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Hotspot Configuration

Hotspot operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Per FCC KDB Publication 648474 D04, Hotspot accessory exposure is typically related to voice mode operations when handsets are carried in Hotspot accessories. The Hotspot accessory procedures in FCC KDB Publication 447498 D01 should be used to test for Hotspot accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the Hotspot accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a Hotspot accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that Hotspot accessory with a headset attached to the handset.

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

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

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:
1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

5.3 Test Configuration

5.3.1 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

C) A-MPR

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

D) Largest channel bandwidth standalone SAR test requirements

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 for 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.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

5.3.2 Additional requirements for TDD LTE specification

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

TDD LTE Band supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table: Uplink-downlink configurations for uplink-downlink configurations and Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS) for Special subframe configurations.

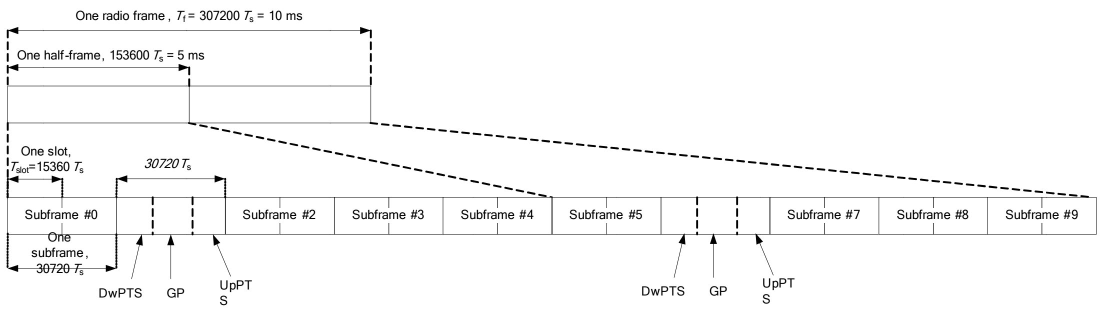


Figure 1: Frame structure type 2

Table 3: 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 4: 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

According to Figure 1, one radio frame is configured by 10 subframes, which consist of Uplink-subframe, Downlink-subframe and Special subframe. For TDD-LTE, the Duty Cycle should be calculated on Uplink-subframes and Special subframes, due to Special subframe containing both Uplink transmissions. So for one radio frame, Duty Cycle can be calculated with formula as below. The count of Uplink subframes are according to Table: Uplink-downlink configurations:

Duty cycle = (30720Ts*Ups + Uplink Component*Specials)/(307200Ts)

About the uplink component of Special subframes, we can figure out by Table: Configuration of special subframe (lengths of DwPTS/GP/UpPTS):

Uplink Component = UpPTS

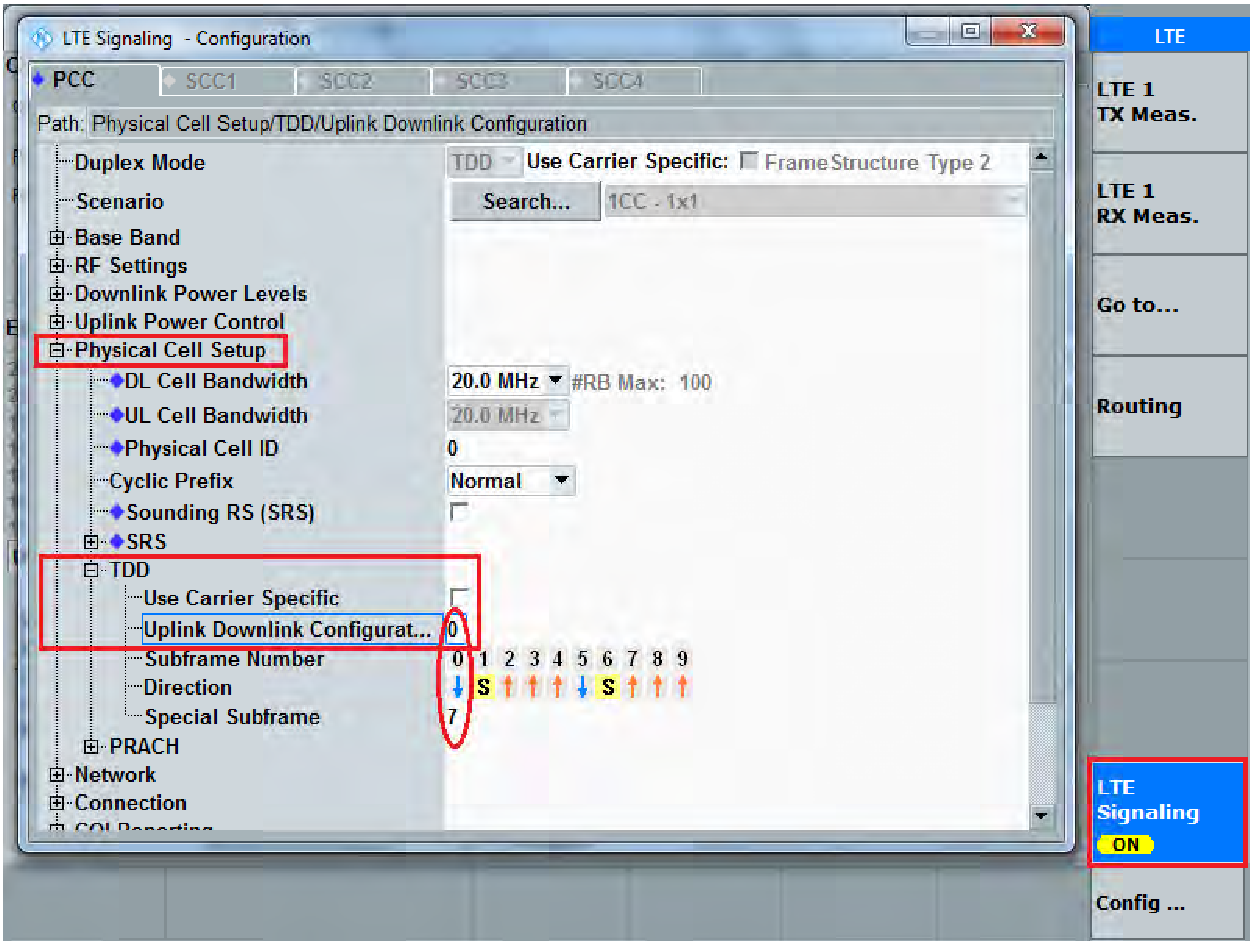
In conclusion, for the TDD LTE Band, Duty Cycle can be calculated with formula as below. All these sets are ok when we test, or we can set as below.

Duty cycle = [(30720Ts*Ups) + UpPTS *Specials]/(307200Ts)

And we can get different Duty cycles under different configurations:

Uplink-downlink configuration	Subframe number			Configuration of special subframe							
				Normal cyclic prefix in downlink				Extended cyclic prefix in downlink			
				Normal cyclic prefix in uplink		Extended cyclic prefix in uplink		Normal cyclic prefix in uplink		Extended cyclic prefix in uplink	
	D	S	U	configuration 0~4	configuration 5~9	configuration 0~4	configuration 5~9	configuration 0~3	configuration 4~7	configuration 0~3	configuration 4~7
0	2	2	6	61.43%	62.85%	61.67%	63.33%	61.43%	62.85%	61.67%	63.33%
1	4	2	4	41.43%	42.85%	41.67%	43.33%	41.43%	42.85%	41.67%	43.33%
2	6	2	2	21.43%	22.85%	21.67%	23.33%	21.43%	22.85%	21.67%	23.33%
3	6	1	3	30.71%	31.43%	30.83%	31.67%	30.71%	31.43%	30.83%	31.67%
4	7	1	2	20.71%	21.43%	20.83%	21.67%	20.71%	21.43%	20.83%	21.67%
5	8	1	1	10.71%	11.43%	10.83%	11.67%	10.71%	11.43%	10.83%	11.67%
6	3	2	5	51.43%	52.85%	51.67%	53.33%	51.43%	52.85%	51.67%	53.33%

SAR test Plan: For TDD LTE, SAR should be tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7 for Frame structure type



5.3.3 Wi-Fi Test Configuration

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

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

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

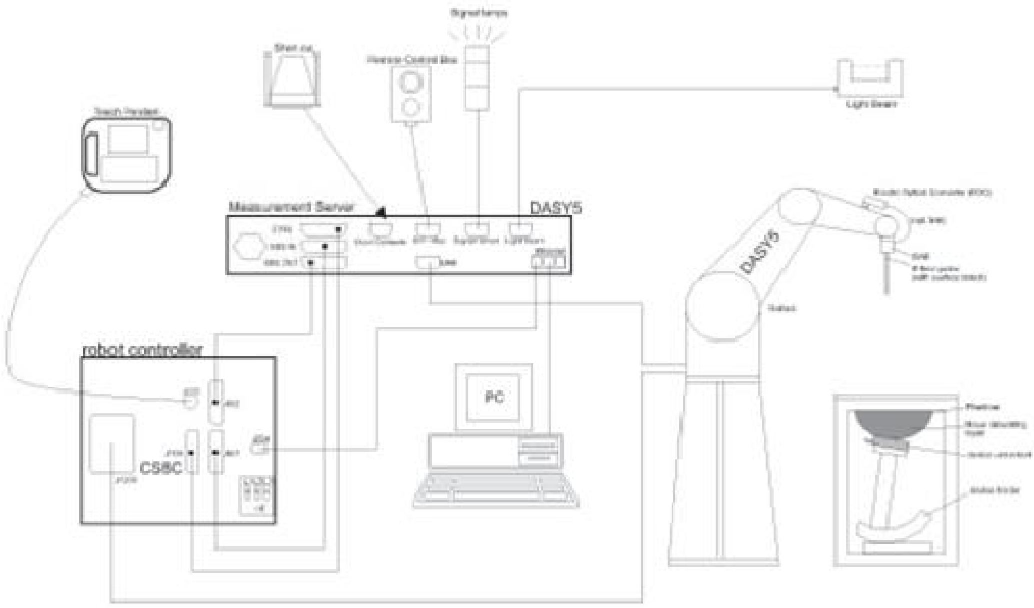
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

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



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

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide 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.

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

$$SAR = C\Delta T/\Delta t$$

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

$$SAR = |E|^2\sigma/\rho$$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

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

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><th></th><th>≤3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>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>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 rowspan="2">Maximum area scan spatial resolution: ΔxArea, ΔyArea</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
</table>

Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤3GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\triangle x_{zoom} \triangle y_{zoom}$</td><td>≤2GHz: ≤8mm
2 – 3GHz: ≤5mm*</td><td>3 – 4GHz: ≤5mm*
4 – 6GHz: ≤4mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">Uniform grid: $\triangle z_{zoom}(n)$</td><td>≤5mm</td><td>3 – 4GHz: ≤4mm
4 – 5GHz: ≤3mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td rowspan="2">Graded grid</td><td>$\triangle z_{zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤4mm</td><td>3 – 4GHz: ≤3mm
4 – 5GHz: ≤2.5mm
5 – 6GHz: ≤2mm</td></tr>
<tr><td>$\triangle z_{zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \bullet \triangle z_{zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">X, y, z</td><td>≥30mm</td><td>3 – 4GHz: ≥28mm
4 – 5GHz: ≥25mm
5 – 6GHz: ≥22mm</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.
* 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 ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</td></tr>
</table>

Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2021-05-15	2022-05-14
Dielectric Probe Kit	HP	85070E	US44020115	2021-05-15	2022-05-14
Power meter	Agilent	E4417A	GB41291714	2021-05-15	2022-05-14
Power sensor	Agilent	N8481H	MY50350004	2021-05-15	2022-05-14
Power sensor	Agilent	E9327A	US40441622	2021-05-15	2022-05-14
Dual directional coupler	Agilent	777D	50146	/	/
Dual directional coupler	UCL	UCL-DDC056G-S	20010600118	/	/
Amplifier	INDEXSAR	TPA-005060G01	13030502	2021-05-15	2022-05-14
Wireless communication tester	Anritsu	MT8820C	6201342015	2020-12-13	2021-12-12
Wireless communication tester	Key sight	E5515C	MY48360988	2020-12-13	2021-12-12
Wideband radio communication tester	R&S	CMW 500	113645	2021-05-15	2022-05-14
E-field Probe	SPEAG	EX3DV4	3677	2020-07-06	2021-07-05
DAE	SPEAG	DAE4	1317	2021-02-23	2022-02-22
Validation Kit 2450MHz	SPEAG	D2450V2	786	2020-08-27	2023-08-26
Validation Kit 2600MHz	SPEAG	D2600V2	1025	2021-04-23	2024-04-22
Validation Kit 5GHz	SPEAG	D5GHzV2	1151	2020-02-27	2023-02-26
Temperature Probe	Tianjin jinming	JM222	381	2021-05-15	2022-05-14
Hygrothermograph	Anymetr	HTC - 1	TY2020A001	2021-05-15	2022-05-14
Twin SAM Phantom	Speag	SAM1	1534	/	/
Software for Test	Speag	DASY52	/	/	/
Softwarefor Tissue	Agilent	85070	/	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 24 hours of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)	Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
2450	62.7	0.5	0	36.8	0	0	39.2	1.80
2600	55.242	0.306	0	44.452	0	0	39.0	1.96
Frequency (MHz)	**Water (%)**	**Diethylenglycol monohexylether**			**Triton X-100**		**ε_r**	**σ(s/m)**
5250	65.53	17.24			17.23		35.9	4.71
5750	65.53	17.24			17.23		35.4	5.22

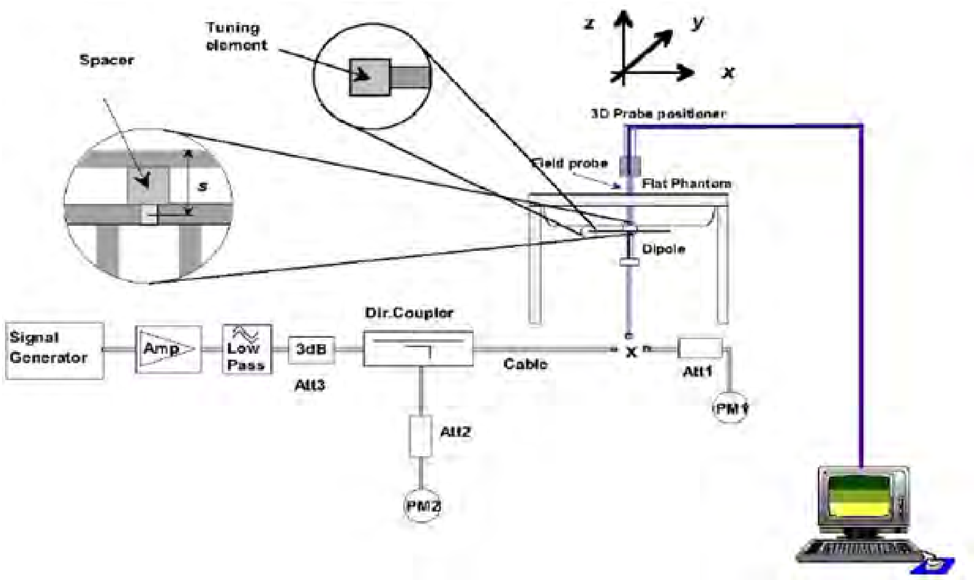
Measurements results

Frequency (MHz)	Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
			ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
2450	6/25/2021	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
2600	6/23/2021	21.5	38.2	2.01	39.0	1.96	-2.05	2.55
5250	7/1/2021	21.5	35.5	4.80	35.9	4.71	-1.11	1.91
5750	7/1/2021	21.5	34.9	5.21	35.4	5.22	-1.41	-0.19
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.								

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1System Performance Check setup

Picture 2 Setup Photo

Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

Dipole		Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
Dipole D5GHzV2 SN: 1151 (5250MHz)	Head Liquid	2/27/2020	-23.4	/	52.4	/
		2/26/2021	-23.8	-0.4	50.0	-2.4
Dipole D5GHzV2 SN: 1151 (5750MHz)	Head Liquid	2/27/2020	-25.0	/	55.9	/
		2/26/2021	-26.8	-1.8	52.5	-3.4

System Check results

Frequency (MHz)	Test Date	Temp ℃	250mW /100mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
2450	6/25/2021	21.5	13.70	54.80	52.30	4.78	1
2600	6/23/2021	21.5	13.90	55.60	56.10	-0.89	2
5250	7/1/2021	21.5	7.87	78.70	78.00	0.90	3
5750	7/1/2021	21.5	7.66	76.60	77.40	-1.03	4
Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.							

8.3 SAR System Validation

Per FCC KDB 865664 D02v01, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

Frequency [MHz]	Date	Probe SN	Probe Type	Probe Cal Point		PERM (Er)	COND (Σ)	CW Validation			Mod. Validation		
								Sensitivity	Probe Linearity	Probe Isotropy	Mod. Type	Duty Factor	PAR
750	7/6/2020	3677	EX3DV4	750	Head	42.81	0.85	PASS	PASS	PASS	FDD	PASS	N/A
835	7/6/2020	3677	EX3DV4	835	Head	42.22	0.90	PASS	PASS	PASS	GMSK	PASS	N/A
1750	7/6/2020	3677	EX3DV4	1750	Head	39.91	1.32	PASS	PASS	PASS	NA	N/A	N/A
1900	7/6/2020	3677	EX3DV4	1900	Head	39.43	1.42	PASS	PASS	PASS	GMSK	PASS	N/A
2450	7/6/2020	3677	EX3DV4	2450	Head	38.19	1.83	PASS	PASS	PASS	OFDM	PASS	PASS
2600	7/6/2020	3677	EX3DV4	2600	Head	37.60	1.99	PASS	PASS	PASS	TDD	PASS	N/A
5250	7/6/2020	3677	EX3DV4	5250	Head	35.36	4.83	PASS	PASS	PASS	OFDM	N/A	PASS
5600	7/6/2020	3677	EX3DV4	5600	Head	34.43	5.29	PASS	PASS	PASS	OFDM	N/A	PASS
5750	7/6/2020	3677	EX3DV4	5750	Head	34.07	5.47	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664D01v01 for scenarios when CW probe calibrations are used with other signal types. SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5dB), such as OFDM according to KDB 865664.

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 LTE Mode

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

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

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3

LTE FDD Band 7				Maximum Output Power (dBm)			Tune-up Limit
				Channel/Frequency (MHz)			
Bandwidth	Modulation	RB size	RB offset	20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	22.37	22.24	22.25	22.60
		1	13	22.29	22.28	22.20	22.60
		1	24	22.33	22.25	22.26	22.60
		12	0	21.29	21.37	21.31	22.00
		12	6	21.37	21.39	21.33	22.00
		12	13	21.40	21.47	21.31	22.00
		25	0	21.31	21.43	21.34	22.00
	16QAM	1	0	21.69	21.42	21.74	22.00
		1	13	21.67	21.59	21.70	22.00
		1	24	21.52	21.50	21.54	22.00
		12	0	20.61	20.53	20.63	21.00
		12	6	20.59	20.52	20.63	21.00
		12	13	20.69	20.66	20.72	21.00
		25	0	20.61	20.58	20.64	21.00
	64QAM	1	0	21.61	21.56	21.66	22.00
		1	13	21.37	21.33	21.40	22.00
		1	24	21.51	21.45	21.53	22.00
		12	0	20.65	20.57	20.71	21.00
		12	6	20.71	20.64	20.75	21.00
		12	13	20.66	20.63	20.69	21.00

Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
		25	0	20.52	20.49	20.55	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	22.39	22.25	22.28	22.60
		1	25	22.32	22.33	22.24	22.60
		1	49	22.35	22.29	22.29	22.60
		25	0	21.32	21.42	21.35	22.00
		25	13	21.40	21.44	21.37	22.00
		25	25	21.42	21.51	21.36	22.00
		50	0	21.35	21.45	21.38	22.00
	16QAM	1	0	21.71	21.45	21.76	22.00
		1	25	21.70	21.63	21.73	22.00
		1	49	21.55	21.52	21.57	22.00
		25	0	20.64	20.58	20.67	21.00
		25	13	20.61	20.56	20.66	21.00
		25	25	20.72	20.71	20.76	21.00
		50	0	20.64	20.63	20.68	21.00
	64QAM	1	0	21.63	21.55	21.68	22.00
		1	25	21.40	21.33	21.43	22.00
		1	49	21.50	21.47	21.56	22.00
		25	0	20.68	20.62	20.71	21.00
		25	13	20.73	20.68	20.78	21.00
		25	25	20.69	20.68	20.73	21.00
		50	0	20.55	20.54	20.59	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	22.38	22.21	22.26	22.60
		1	38	22.30	22.32	22.21	22.60
		1	74	22.32	22.24	22.25	22.60
		36	0	21.30	21.38	21.32	22.00
		36	18	21.37	21.39	21.33	22.00
		36	39	21.39	21.48	21.32	22.00
		75	0	21.33	21.41	21.33	22.00
	16QAM	1	0	21.66	21.43	21.74	22.00
		1	38	21.68	21.60	21.71	22.00
		1	74	21.52	21.48	21.54	22.00
		36	0	20.61	20.56	20.64	21.00
		36	18	20.58	20.51	20.62	21.00
		36	39	20.70	20.67	20.73	21.00
		75	0	20.61	20.58	20.64	21.00
	64QAM	1	0	21.58	21.53	21.66	22.00
		1	38	21.38	21.30	21.41	22.00
		1	74	21.51	21.46	21.57	22.00

		36	0	20.67	20.64	20.72	21.00
		36	18	20.71	20.65	20.77	21.00
		36	39	20.67	20.64	20.70	21.00
		75	0	20.52	20.49	20.55	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	**22.35**	22.17	**22.23**	22.60
		1	50	22.29	**22.28**	22.19	22.60
		1	99	22.30	22.23	22.22	22.60
		50	0	21.27	21.33	21.28	22.00
		50	25	21.35	21.35	**21.30**	22.00
		50	50	**21.36**	**21.43**	21.28	22.00
		100	0	21.30	**21.36**	21.29	22.00
	16QAM	1	0	21.65	21.39	21.69	22.00
		1	50	21.64	21.58	21.67	22.00
		1	99	21.50	21.45	21.52	22.00
		50	0	20.58	20.52	20.61	21.00
		50	25	20.55	20.49	20.59	21.00
		50	50	20.67	20.62	20.69	21.00
		100	0	20.59	20.54	20.61	21.00
	64QAM	1	0	21.56	21.49	21.61	22.00
		1	50	21.34	21.28	21.37	22.00
		1	99	21.45	21.40	21.51	22.00
		50	0	20.62	20.56	20.65	21.00
		50	25	20.67	20.61	20.71	21.00
		50	50	20.64	20.59	20.66	21.00
		100	0	20.50	20.45	20.52	21.00

LTE TDD Band 38				**Maximum Output Power (dBm)**			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				37775/2572.5	38000/2595	38225/2617.5	
5MHz	QPSK	1	0	21.89	21.91	21.95	23.00
		1	13	22.01	21.88	21.88	23.00
		1	24	21.93	21.93	21.96	23.00
		12	0	21.08	20.85	21.13	22.00
		12	6	21.17	21.05	21.06	22.00
		12	13	21.15	21.12	21.20	22.00
		25	0	21.19	21.17	21.11	22.00
	16QAM	1	0	21.25	21.03	21.12	22.00
		1	13	21.23	21.15	21.21	22.00
		1	24	21.21	21.08	21.12	22.00
		12	0	20.65	20.48	20.57	21.00
		12	6	20.68	20.54	20.62	21.00

Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
		12	13	20.78	20.61	20.69	21.00
		25	0	20.58	20.50	20.57	21.00
	64QAM	1	0	21.28	21.06	21.18	22.00
		1	13	21.24	21.07	21.15	22.00
		1	24	21.23	21.08	21.12	22.00
		12	0	20.65	20.46	20.60	21.00
		12	6	20.79	20.58	20.68	21.00
		12	13	20.63	20.50	20.57	21.00
		25	0	20.78	20.67	20.73	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37800/2575	38000/2595	38200/2615	
10MHz	QPSK	1	0	21.91	21.92	21.98	23.00
		1	25	22.04	21.93	21.92	23.00
		1	49	21.95	21.97	21.99	23.00
		25	0	21.11	20.90	21.17	22.00
		25	13	21.20	21.10	21.10	22.00
		25	25	21.17	21.16	21.25	22.00
		50	0	21.23	21.19	21.15	22.00
	16QAM	1	0	21.27	21.06	21.14	22.00
		1	25	21.26	21.19	21.24	22.00
		1	49	21.24	21.10	21.15	22.00
		25	0	20.68	20.53	20.61	21.00
		25	13	20.70	20.58	20.65	21.00
		25	25	20.81	20.66	20.73	21.00
		50	0	20.61	20.55	20.61	21.00
	64QAM	1	0	21.30	21.05	21.20	22.00
		1	25	21.27	21.07	21.18	22.00
		1	49	21.22	21.10	21.15	22.00
		25	0	20.68	20.51	20.60	21.00
		25	13	20.81	20.62	20.71	21.00
		25	25	20.66	20.55	20.61	21.00
		50	0	20.81	20.72	20.77	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37825/2577.5	38000/2595	38175/2612.5	
15MHz	QPSK	1	0	21.90	21.88	21.96	23.00
		1	38	22.02	21.92	21.89	23.00
		1	74	21.92	21.92	21.95	23.00
		36	0	21.09	20.86	21.14	22.00
		36	18	21.17	21.05	21.06	22.00
		36	39	21.14	21.13	21.21	22.00
		75	0	21.21	21.15	21.10	22.00
	16QAM	1	0	21.22	21.04	21.12	22.00
		1	38	21.24	21.16	21.22	22.00

		1	74	21.21	21.06	21.12	22.00
		36	0	20.65	20.51	20.58	21.00
		36	18	20.67	20.53	20.61	21.00
		36	39	20.79	20.62	20.70	21.00
		75	0	20.58	20.50	20.57	21.00
	64QAM	1	0	21.25	21.03	21.18	22.00
		1	38	21.25	21.04	21.16	22.00
		1	74	21.23	21.09	21.16	22.00
		36	0	20.67	20.53	20.61	21.00
		36	18	20.79	20.59	20.70	21.00
		36	39	20.64	20.51	20.58	21.00
		75	0	20.78	20.67	20.73	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				37850/2580	38000/2595	38150/2610	
20MHz	QPSK	1	0	21.87	21.84	**21.93**	23.00
		1	50	**22.01**	21.88	21.87	23.00
		1	99	21.90	**21.91**	21.92	23.00
		50	0	21.06	20.81	21.10	22.00
		50	25	**21.15**	21.01	21.03	22.00
		50	50	21.11	**21.08**	**21.17**	22.00
		100	0	**21.18**	21.10	21.06	22.00
	16QAM	1	0	21.14	21.00	21.07	22.00
		1	50	21.20	21.14	21.18	22.00
		1	99	21.19	21.03	21.10	22.00
		50	0	20.62	20.47	20.55	21.00
		50	25	20.64	20.51	20.58	21.00
		50	50	20.76	20.57	20.66	21.00
		100	0	20.56	20.46	20.54	21.00
	64QAM	1	0	21.23	20.99	21.13	22.00
		1	50	21.21	21.02	21.12	22.00
		1	99	21.17	21.03	21.10	22.00
		50	0	20.62	20.45	20.54	21.00
		50	25	20.75	20.55	20.64	21.00
		50	50	20.61	20.46	20.54	21.00
		100	0	20.76	20.63	20.70	21.00

9.2 WLAN Mode

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant1		Tune-up	Meas.
802.11b (1M)	1/2412	17.00	**16.34**
	6/2437	17.00	16.07
	11/2462	17.00	16.22
802.11g (6M)	1/2412	16.00	14.66
	6/2437	16.00	14.61
	11/2462	16.00	14.55
802.11n-HT20 (MCS0)	1/2412	15.00	13.57
	6/2437	15.00	13.43
	11/2462	15.00	13.28
802.11n-HT40 (MCS0)	3/2422	15.00	14.13
	6/2437	15.00	13.82
	9/2452	15.00	13.77
802.11ax HE20 (MCS0)	1/2412	13.00	11.74
	6/2437	13.00	11.68
	11/2462	13.00	11.35
802.11ax HE40 (MCS0)	3/2422	13.00	12.08
	6/2437	13.00	11.83
	9/2452	13.00	11.52
Note: Initial test configuration is 802.11b mode.			

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant2		Tune-up	Meas.
802.11b (1M)	1/2412	17.00	**15.47**
	6/2437	17.00	15.40
	11/2462	17.00	15.25
802.11g (6M)	1/2412	16.00	14.18
	6/2437	16.00	14.16
	11/2462	16.00	14.34
802.11n-HT20 (MCS0)	1/2412	15.00	13.67
	6/2437	15.00	13.43
	11/2462	15.00	13.21
802.11n-HT40 (MCS0)	3/2422	15.00	14.16
	6/2437	15.00	14.02
	9/2452	15.00	13.82
802.11ax HE20 (MCS0)	1/2412	13.00	11.13
	6/2437	13.00	11.07
	11/2462	13.00	11.12
802.11ax HE40 (MCS0)	3/2422	13.00	11.51
	6/2437	13.00	11.46
	9/2452	13.00	11.34
Note: Initial test configuration is 802.11b mode.			

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
MIMO		Tune-up	Meas.	Ant1	Ant2
802.11n-HT20 (MCS0)	1/2412	18.00	16.64	13.73	13.52
	6/2437	18.00	16.54	13.67	13.38
	11/2462	18.00	16.41	13.54	13.26
802.11n-HT40 (MCS0)	3/2422	18.00	**17.22**	14.35	14.06
	6/2437	18.00	17.03	14.11	13.93
	9/2452	18.00	16.88	13.95	13.78
802.11ax HE20 (MCS0)	1/2412	16.00	14.72	11.94	11.47
	6/2437	16.00	14.70	11.91	11.45
	11/2462	16.00	14.62	11.84	11.36
802.11ax HE40 (MCS0)	3/2422	16.00	15.13	12.37	11.86
	6/2437	16.00	14.99	12.19	11.75
	9/2452	16.00	15.01	12.28	11.71
Note: Initial test configuration is 802.11n-HT40 mode.					

Wi-Fi 5G (U-NII-1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant1		Tune-up	Meas.
802.11a (6M)	36/5180	16.00	14.76
	40/5200	16.00	**14.82**
	48/5240	16.00	14.43
802.11n-HT20 (MCS0)	36/5180	15.00	13.38
	40/5200	15.00	13.54
	48/5240	15.00	13.21
802.11n-HT40 (MCS0)	38/5190	15.00	13.87
	46/5230	15.00	14.07
802.11ac-VHT20 (MCS0)	36/5180	14.00	12.35
	40/5200	14.00	12.52
	48/5240	14.00	12.18
802.11ac-VHT40 (MCS0)	38/5190	14.00	12.80
	46/5230	14.00	12.96
802.11ac-VHT80 (MCS0)	42/5210	14.00	13.21
802.11ax-HE20 (MCS0)	36/5180	13.00	12.07
	40/5200	13.00	12.23
	48/5240	13.00	11.91
802.11ax-HE40 (MCS0)	38/5190	13.00	12.27
	46/5230	13.00	12.64
802.11ax-HE80 (MCS0)	42/5210	13.00	12.89
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.			

Wi-Fi 5G (U-NII-3) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant1		Tune-up	Meas.
802.11a (6M)	149/5745	16.00	**14.51**
	157/5785	16.00	14.18
	165/5825	16.00	14.18
802.11n-HT20 (MCS0)	149/5745	15.00	13.02
	157/5785	15.00	13.16
	165/5825	15.00	13.06
802.11n-HT40 (MCS0)	151/5755	15.00	13.14
	159/5795	15.00	13.22
802.11ac-HT20 (MCS0)	149/5745	14.00	12.03
	157/5785	14.00	12.22
	165/5825	14.00	12.08
802.11ac-HT40 (MCS0)	151/5755	14.00	12.09
	159/5795	14.00	12.48
802.11ac-HT80 (MCS0)	155/5775	14.00	12.15
802.11ax-HE20 (MCS0)	149/5745	13.00	11.29
	157/5785	13.00	11.86
	165/5825	13.00	11.35
802.11ax-HE40 (MCS0)	151/5755	13.00	11.14
	159/5795	13.00	11.87
802.11ax-HE80 (MCS0)	155/5775	13.00	11.76
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.			

Wi-Fi 5G (U-NII-1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant2		Tune-up	Meas.
802.11a (6M)	36/5180	16.00	**15.92**
	40/5200	16.00	14.65
	48/5240	16.00	14.61
802.11n-HT20 (MCS0)	36/5180	15.00	14.83
	40/5200	15.00	13.76
	48/5240	15.00	13.46
802.11n-HT40 (MCS0)	38/5190	15.00	14.53
	46/5230	15.00	14.08
802.11ac-VHT20 (MCS0)	36/5180	14.00	13.79
	40/5200	14.00	12.73
	48/5240	14.00	12.39
802.11ac-VHT40 (MCS0)	38/5190	14.00	13.46
	46/5230	14.00	13.02
802.11ac-VHT80 (MCS0)	42/5210	14.00	13.53
802.11ax-HE20 (MCS0)	36/5180	13.50	13.19
	40/5200	13.50	12.38
	48/5240	13.50	11.94
802.11ax-HE40 (MCS0)	38/5190	13.00	12.74
	46/5230	13.00	12.20
802.11ax-HE80 (MCS0)	42/5210	13.00	12.83
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.			

Wi-Fi 5G (U-NII-3) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)	
Ant2		Tune-up	Meas.
802.11a (6M)	149/5745	16.00	14.07
	157/5785	16.00	**14.63**
	165/5825	16.00	14.33
802.11n-HT20 (MCS0)	149/5745	15.00	13.09
	157/5785	15.00	13.41
	165/5825	15.00	13.17
802.11n-HT40 (MCS0)	151/5755	15.00	13.41
	159/5795	15.00	14.04
802.11ac-HT20 (MCS0)	149/5745	14.00	12.08
	157/5785	14.00	12.37
	165/5825	14.00	12.22
802.11ac-HT40 (MCS0)	151/5755	14.00	12.38
	159/5795	14.00	12.92
802.11ac-HT80 (MCS0)	155/5775	14.00	12.43
802.11ax-HE20 (MCS0)	149/5745	13.00	11.47
	157/5785	13.00	12.16
	165/5825	13.00	11.93
802.11ax-HE40 (MCS0)	151/5755	13.00	11.97
	159/5795	13.00	12.48
802.11ax-HE80 (MCS0)	155/5775	13.00	12.08
Note. Initial test configuration is 802.11a mode, since the highest maximum output power.			

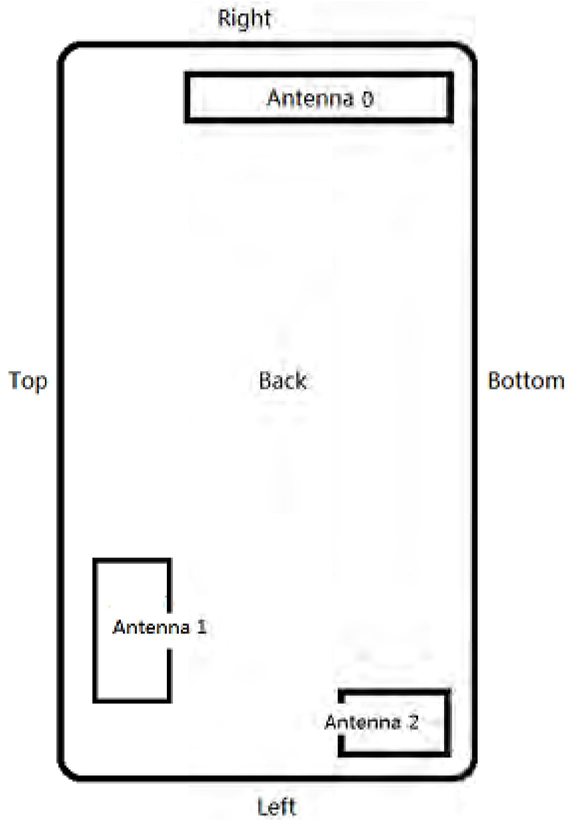
Wi-Fi 5G (U-NII-1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
MIMO		Tune-up	Meas.	Ant1	Ant2
802.11n-HT20 (MCS0)	36/5180	18.00	16.67	12.58	14.53
	40/5200	18.00	16.20	12.95	13.42
	48/5240	18.00	16.01	12.77	13.22
802.11n-HT40 (MCS0)	38/5190	18.00	**16.91**	13.46	14.29
	46/5230	18.00	16.76	13.66	13.84
802.11ac-VHT20 (MCS0)	36/5180	17.00	15.87	12.04	13.55
	40/5200	17.00	15.36	12.11	12.58
	48/5240	17.00	15.07	11.87	12.25
802.11ac-VHT40 (MCS0)	38/5190	17.00	15.84	12.41	13.22
	46/5230	17.00	15.68	12.55	12.78
802.11ac-VHT80 (MCS0)	42/5210	17.00	15.95	12.76	13.12
802.11ax-HE20 (MCS0)	36/5180	16.00	15.38	11.67	12.98
	40/5200	16.00	14.87	11.85	11.86
	48/5240	16.00	14.42	11.46	11.35
802.11ax-HE40 (MCS0)	38/5190	16.00	15.12	11.77	12.43
	46/5230	16.00	15.11	12.16	12.04
802.11ax-HE80 (MCS0)	42/5210	16.00	15.44	12.43	12.42
Note. Initial test configuration is 802.11n-HT40 mode, since the highest maximum output power.					

Wi-Fi 5G (U-NII-3) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)			
MIMO		Tune-up	Meas.	Ant1	Ant2
802.11n-HT20 (MCS0)	149/5745	18.00	15.76	12.83	12.66
	157/5785	18.00	16.04	12.97	13.08
	165/5825	18.00	15.92	12.87	12.94
802.11n-HT40 (MCS0)	151/5755	18.00	16.03	12.95	13.08
	159/5795	18.00	**16.39**	13.03	13.71
802.11ac-HT20 (MCS0)	149/5745	17.00	14.96	11.84	12.05
	157/5785	17.00	15.05	12.03	12.04
	165/5825	17.00	15.00	11.89	12.09
802.11ac-HT40 (MCS0)	151/5755	17.00	15.10	12.02	12.15
	159/5795	17.00	15.45	12.29	12.59
802.11ac-HT80 (MCS0)	155/5775	17.00	15.13	12.06	12.18
802.11ax-HE20 (MCS0)	149/5745	16.00	14.20	11.13	11.25
	157/5785	16.00	14.67	11.48	11.84
	165/5825	16.00	14.42	11.17	11.63
802.11ax-HE40 (MCS0)	151/5755	16.00	14.69	11.66	11.69
	159/5795	16.00	14.84	11.33	12.27
802.11ax-HE80 (MCS0)	155/5775	16.00	14.62	11.38	11.82
Note. Initial test configuration is 802.11n-HT40 mode, since the highest maximum output power.					

Note: Maximum Output Power for 802.11ax RU please refer to R2106A0528-R2 & R2106A0528-R3.

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Antenna 0:	LTE 7/38
Antenna 1	Wi-Fi 2.4G/ Wi-Fi 5G
Antenna 2	Wi-Fi 2.4G/ Wi-Fi 5G

Overall (Length x Width x Height): 133 mm x 73 mm x 18.5 mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Antenna 0	＜25mm	＜25mm	＞25mm	＜25mm	＞25mm	＜25mm
Antenna 1	＜25mm	＜25mm	＜25mm	＞25mm	＜25mm	＞25mm
Antenna 2	＜25mm	＜25mm	＜25mm	＞25mm	＞25mm	＜25mm
Hotspot mode, Positions for SAR tests						
Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Antenna 0	Yes	Yes	N/A	Yes	N/A	Yes
Antenna 1	Yes	Yes	Yes	N/A	Yes	N/A
Antenna 2	Yes	Yes	Yes	N/A	N/A	Yes

Note: 1. Per KDB 941225 D06, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2.Per FCC KDB 447498 D01, for each exposure position, testing of other requised channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

a) ≤0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100MHz

b) ≤0.6 W/kg or 1.5 W/kg, for1-g or 10-g respectively, when the transmission band is between 100 MHz and

200 MHz.

c) ≤ 0.4 W/kg or 1.0 Wkg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

3.When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.

4. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

10.2 Measured SAR Results

Table 5: Hotspot SAR

Band	Test Position	Dist. (mm)	Mode	RB	offset	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
LTE 7	Back Side	10	QPSK	1	0	20850/2510	22.60	22.35	0.867	0.015	1.06	0.918	/
		10	QPSK	1	50	21100/2535	22.60	22.28	0.893	0.010	1.08	0.961	/
		10	QPSK	1	0	21350/2560	22.60	22.23	0.825	0.090	1.09	0.898	/
		10	QPSK	50%	50	21100/2535	22.00	21.43	0.695	-0.020	1.14	0.792	/
	Front Side	10	QPSK	1	0	20850/2510	22.60	22.35	0.517	0.019	1.06	0.548	/
		10	QPSK	50%	50	21100/2535	22.00	21.43	0.428	-0.040	1.14	0.488	/
	Left Edge	10	QPSK	1	0	20850/2510	22.60	22.35	0.000	0.000	1.06	0.000	/
		10	QPSK	50%	50	21100/2535	22.00	21.43	0.000	0.000	1.14	0.000	/
	Right Edge	10	QPSK	1	0	20850/2510	22.60	22.35	1.030	0.120	1.06	1.091	5
	Right Edge	10	QPSK	1	50	21100/2535	22.60	22.28	0.992	0..011	1.08	1.068	/
	Right Edge	10	QPSK	1	0	21350/2560	22.60	22.23	0.975	-0.030	1.09	1.062	/
	Right Edge	10	QPSK	50%	50	20850/2510	22.00	21.36	0.936	0.130	1.16	1.085	/
	Right Edge	10	QPSK	50%	50	21100/2535	22.00	21.43	0.978	0.062	1.14	1.115	/
	Right Edge	10	QPSK	50%	0	21350/2560	22.00	21.30	0.948	0.090	1.17	1.114	/
	Right Edge Repeated	10	QPSK	50%	50	21100/2535	22.00	21.43	0.969	0.018	1.14	1.105	/
	Right Edge	10	QPSK	100%	0	20850/2510	22.00	21.30	0.925	0.032	1.17	1.087	/
	Right Edge	10	QPSK	100%	0	21100/2535	22.00	21.36	0.894	0.040	1.16	1.036	/
	Right Edge	10	QPSK	100%	0	21350/2560	22.00	21.29	0.937	-0.016	1.18	1.103	/
	Bottom Edge	10	QPSK	1	0	20850/2510	22.60	22.35	0.084	0.011	1.06	0.089	/
		10	QPSK	50%	50	21100/2535	22.00	21.43	0.076	0.038	1.14	0.087	/
LTE 38	Back Side	10	QPSK	1	50	37850/2580	23.00	22.01	0.387	-0.032	1.26	0.486	/
		10	QPSK	50%	50	38150/2610	22.00	21.17	0.314	0.011	1.21	0.380	/
	Front Side	10	QPSK	1	50	37850/2580	23.00	22.01	0.131	0.080	1.26	0.165	/
		10	QPSK	50%	50	38150/2610	22.00	21.17	0.188	0.049	1.21	0.228	/
	Left Edge	10	QPSK	1	50	37850/2580	23.00	22.01	0.000	0.000	1.26	0.000	/
		10	QPSK	50%	50	38150/2610	22.00	21.17	0.000	0.000	1.21	0.000	/
	Right Edge	10	QPSK	1	50	37850/2580	23.00	22.01	0.424	0.060	1.26	0.533	6
		10	QPSK	50%	50	38150/2610	22.00	21.17	0.344	0.024	1.21	0.416	/
	Bottom Edge	10	QPSK	1	50	37850/2580	23.00	22.01	0.000	0.000	1.26	0.000	/
		10	QPSK	50%	50	38150/2610	22.00	21.17	0.000	0.000	1.21	0.000	/
Note: 1.The value with blue color is the maximum SAR Value of each test band.													

Band	Antenna	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	Plot No.
2.4G	Ant1	Back Side	10	802.11b	98.0%	1/2412	17.00	16.34	0.106	-0.090	1.19	0.126	/
		Front Side	10	802.11b	98.0%	1/2412	17.00	16.34	0.145	0.040	1.19	0.172	/
		Left Edge	10	802.11b	98.0%	1/2412	17.00	16.34	0.045	-0.012	1.19	0.053	/
		Right Edge	10	802.11b	98.0%	1/2412	17.00	16.34	0.000	0.000	1.19	0.000	/
		Top Edge	10	802.11b	98.0%	1/2412	17.00	16.34	0.230	-0.160	1.19	0.273	/
		Bottom Edge	10	802.11b	98.0%	1/2412	17.00	16.34	0.000	0.000	1.19	0.000	/
	Ant2	Back Side	10	802.11b	98.0%	1/2412	17.00	15.47	0.111	0.024	1.45	0.161	/
		Front Side	10	802.11b	98.0%	1/2412	17.00	15.47	0.170	0.062	1.45	0.247	/
		Left Edge	10	802.11b	98.0%	1/2412	17.00	15.47	0.074	0.099	1.45	0.108	/
		Right Edge	10	802.11b	98.0%	1/2412	17.00	15.47	0.000	0.000	1.45	0.000	/
		Top Edge	10	802.11b	98.0%	1/2412	17.00	15.47	0.000	0.000	1.45	0.000	/
		Bottom Edge	10	802.11b	98.0%	1/2412	17.00	15.47	0.065	0.038	1.45	0.094	/
	MIMO	Back Side	10	11n HT40	98.0%	3/2422	18.00	17.22	0.211	-0.110	1.22	0.258	/
		Front Side	10	11n HT40	98.0%	3/2422	18.00	17.22	0.323	0.027	1.22	0.395	7
		Left Edge	10	11n HT40	98.0%	3/2422	18.00	17.22	0.142	0.058	1.22	0.173	/
		Right Edge	10	11n HT40	98.0%	3/2422	18.00	17.22	0.000	0.000	1.22	0.000	/
		Top Edge	10	11n HT40	98.0%	3/2422	18.00	17.22	0.198	-0.140	1.22	0.242	/
		Bottom Edge	10	11n HT40	98.0%	3/2422	18.00	17.22	0.127	0.021	1.22	0.155	/
U-NII-1	Ant1	Back Side	10	802.11a	100.0%	40/5200	16.00	14.82	0.145	0.060	1.31	0.190	/
		Front Side	10	802.11a	100.0%	40/5200	16.00	14.82	0.319	-0.027	1.31	0.419	/
		Left Edge	10	802.11a	100.0%	40/5200	16.00	14.82	0.107	0.135	1.31	0.140	/
		Right Edge	10	802.11a	100.0%	40/5200	16.00	14.82	0.088	0.020	1.31	0.115	/
		Top Edge	10	802.11a	100.0%	40/5200	16.00	14.82	0.361	0.067	1.31	0.474	8
		Bottom Edge	10	802.11a	100.0%	40/5200	16.00	14.82	0.102	0.100	1.31	0.134	/
	Ant2	Back Side	10	802.11a	100.0%	36/5180	16.00	15.92	0.177	0.040	1.02	0.180	/
		Front Side	10	802.11a	100.0%	36/5180	16.00	15.92	0.326	0.021	1.02	0.332	/
		Left Edge	10	802.11a	100.0%	36/5180	16.00	15.92	0.258	0.030	1.02	0.263	/
		Right Edge	10	802.11a	100.0%	36/5180	16.00	15.92	0.048	-0.094	1.02	0.049	/
		Top Edge	10	802.11a	100.0%	36/5180	16.00	15.92	0.052	0.000	1.02	0.053	/
		Bottom Edge	10	802.11a	100.0%	36/5180	16.00	15.92	0.339	0.046	1.02	0.345	/
	MIMO	Back Side	10	11n HT40	100.0%	38/5190	18.00	16.91	0.111	0.018	1.29	0.143	/
		Front Side	10	11n HT40	100.0%	38/5190	18.00	16.91	0.265	0.040	1.29	0.341	/
		Left Edge	10	11n HT40	100.0%	38/5190	18.00	16.91	0.180	-0.011	1.29	0.232	/
		Right Edge	10	11n HT40	100.0%	38/5190	18.00	16.91	0.039	-0.014	1.29	0.050	/
		Top Edge	10	11n HT40	100.0%	38/5190	18.00	16.91	0.140	0.020	1.29	0.180	/
		Bottom Edge	10	11n HT40	100.0%	38/5190	18.00	16.91	0.231	0.035	1.29	0.297	/
U-NII-3	Ant1	Back Side	10	802.11a	100.0%	149/5745	16.00	14.51	0.115	0.016	1.41	0.162	/
		Front Side	10	802.11a	100.0%	149/5745	16.00	14.51	0.222	-0.022	1.41	0.313	/
		Left Edge	10	802.11a	100.0%	149/5745	16.00	14.51	0.070	0.038	1.41	0.099	/

		Right Edge	10	802.11a	100.0%	149/5745	16.00	14.51	0.055	0.040	1.41	0.078	/
		Top Edge	10	802.11a	100.0%	149/5745	16.00	14.51	0.384	0.026	1.41	0.541	9
		Bottom Edge	10	802.11a	100.0%	149/5745	16.00	14.51	0.073	-0.019	1.41	0.103	/
	Ant2	Back Side	10	802.11a	100.0%	157/5785	16.00	14.63	0.085	-0.036	1.37	0.117	/
		Front Side	10	802.11a	100.0%	157/5785	16.00	14.63	0.147	0.100	1.37	0.202	/
		Left Edge	10	802.11a	100.0%	157/5785	16.00	14.63	0.081	0.042	1.37	0.111	/
		Right Edge	10	802.11a	100.0%	157/5785	16.00	14.63	0.056	0.080	1.37	0.077	/
		Top Edge	10	802.11a	100.0%	157/5785	16.00	14.63	0.065	0.000	1.37	0.089	/
		Bottom Edge	10	802.11a	100.0%	157/5785	16.00	14.63	0.135	0.099	1.37	0.185	/
	MIMO	Back Side	10	11n HT40	100.0%	159/5795	18.00	16.39	0.121	0.024	1.45	0.175	/
		Front Side	10	11n HT40	100.0%	159/5795	18.00	16.39	0.216	0.100	1.45	0.313	/
		Left Edge	10	11n HT40	100.0%	159/5795	18.00	16.39	0.088	-0.017	1.45	0.127	/
		Right Edge	10	11n HT40	100.0%	159/5795	18.00	16.39	0.059	-0.014	1.45	0.085	/
		Top Edge	10	11n HT40	100.0%	159/5795	18.00	16.39	0.190	0.022	1.45	0.275	/
		Bottom Edge	10	11n HT40	100.0%	159/5795	18.00	16.39	0.123	0.023	1.45	0.178	/

Note: 1.The value with blue color is the maximum SAR Value of each test band.

10.3 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Hotspot
LTE + Wi-Fi 2.4GHz	Yes
LTE + Wi-Fi 5GHz	Yes
Wi-Fi 2.4GHz + Wi-Fi 5GHz	Yes

General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

i) Scalar SAR summation < 1.6W/kg, simultaneously transmission SAR measurement is not necessary.

ii) SPLSR = (SAR1 + SAR2)^$^{1.5}$ / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.

iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

The maximum SAR_{1g} Value for LTE -Antenna

Test Position \ SAR_{1g}(W/kg)		LTE FDD 7	LTE TDD 38	MAX. SAR_{1g}
Hotspot	Back Side	0.961	0.486	0.961
	Front Side	0.548	0.228	0.548
	Left Edge	0.000	0.000	0.000
	Right Edge	1.115	0.533	1.115
	Top Edge	NA	NA	NA
	Bottom Edge	0.089	0.000	0.089

About Wi-Fi and LTE -Antenna

Test Position \ SAR_{1g}(W/kg)		LTE-Antenna	Wi-Fi 2.4G	Wi-Fi (U-NII-1)	Wi-Fi (U-NII-3)	MAX. ΣSAR_{1g}
Hotspot	Back Side	0.961	**0.258**	0.190	0.175	1.409
	Front Side	0.548	0.395	**0.419**	0.313	1.362
	Left Edge	0.000	0.173	**0.263**	0.127	0.436
	Right Edge	1.115	0.000	**0.115**	0.085	1.230
	Top Edge	NA	0.273	0.474	**0.541**	0.814
	Bottom Edge	0.089	0.155	**0.345**	0.185	0.589
Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value. 2.MAX. ΣSAR_{1g} =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}						

MAX. ΣSAR1g = 1.409W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and LTE -Antenna.

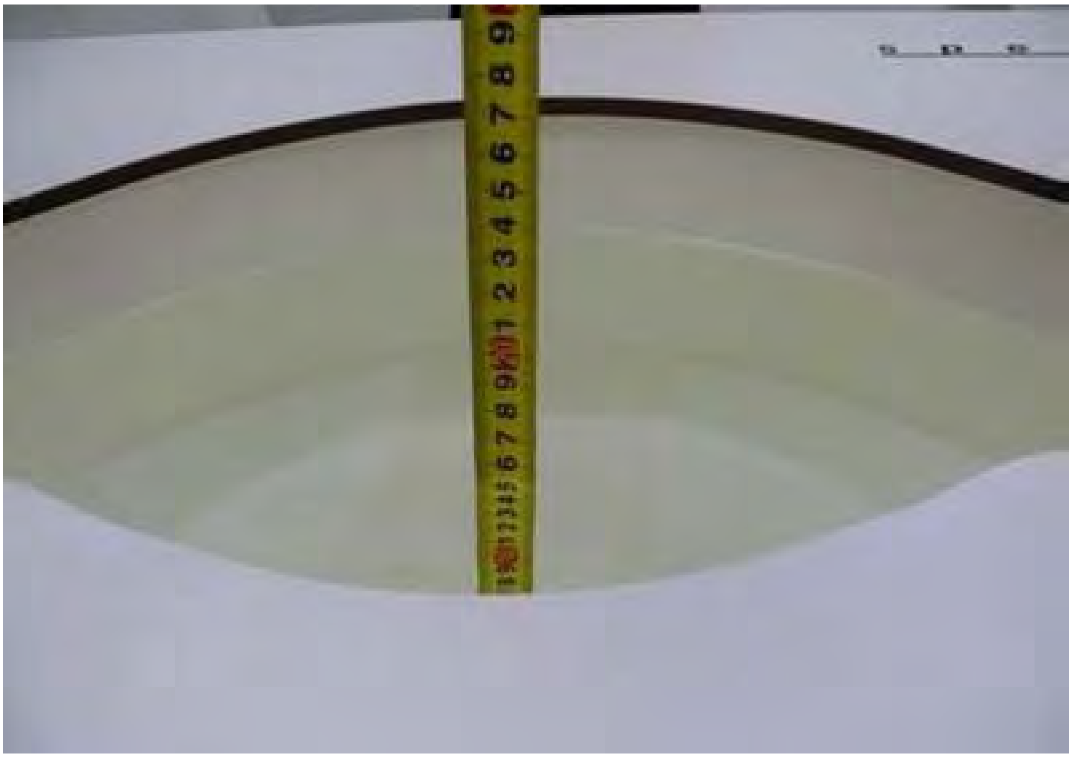
11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval. This also applies to the 10-g SAR required for phablets in KDB Publication 648474.

ANNEX A: Test Layout

Tissue Simulating Liquids

For the measurement of the field distribution inside the flat phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For Head and Body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Picture 3.



Picture 3: Liquid depth in the flat Phantom

ANNEX B: System Check Results

Plot 1 System Performance Check at 2450 MHz TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2

Date: 6/25/2021

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

Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 38.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.54, 7.54, 7.54); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 18.2 mW/g

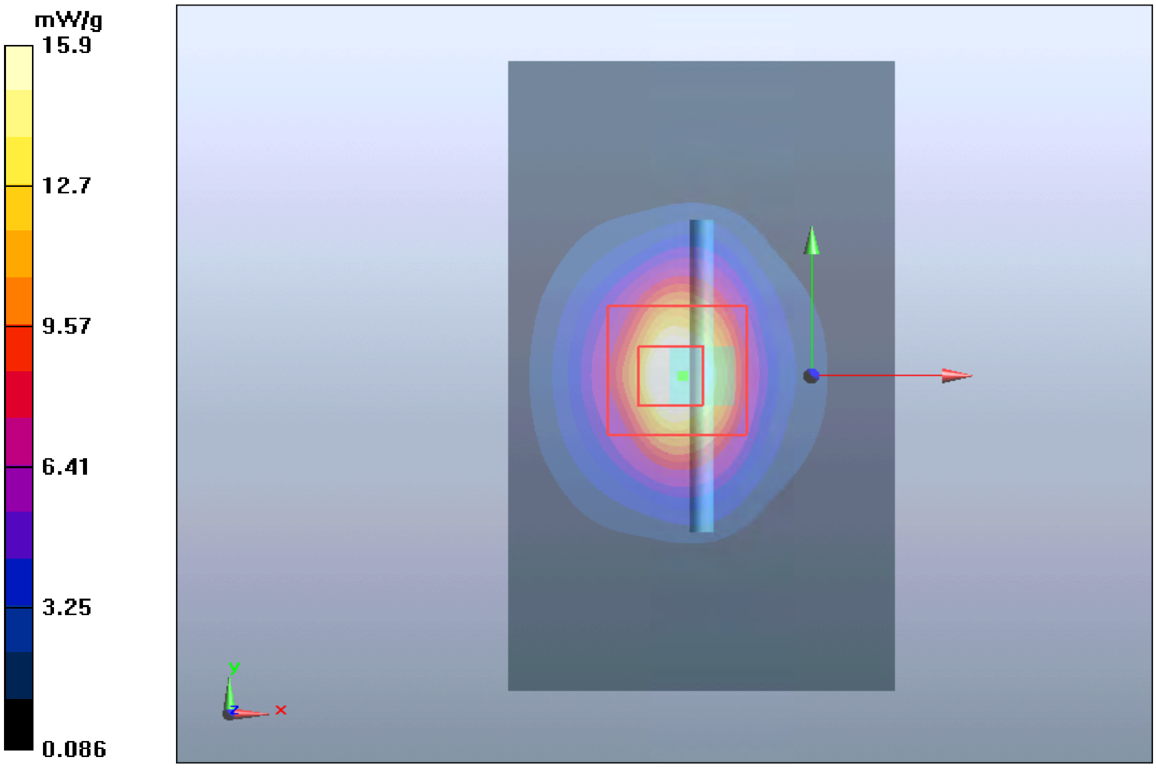
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 2 System Performance Check at 2600 MHz TSL

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2

Date: 6/23/2021

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 2.01 S/m; ε_r = 38.2; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=250mW/Area Scan (4x7x1): Measurement grid:dx=12mm, dy=12mm

Maximum value of SAR (measured) = 17.439 mW/g

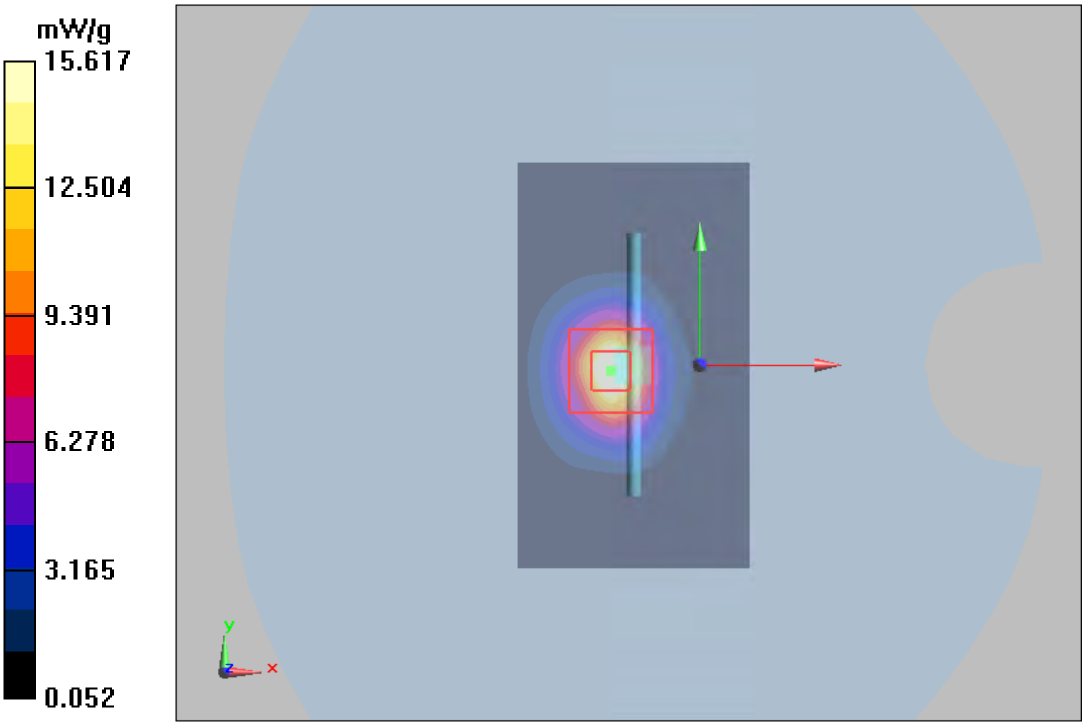
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.998 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.858 W/kg

SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.07 mW/g

Maximum value of SAR (measured) = 15.617 mW/g



Plot 3 System Performance Check at 5250 MHz TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 7/1/2021

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

Medium parameters used: f = 5250 MHz; σ = 4.80 S/m; ε_r = 35.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.55, 5.55, 5.55); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 9.14 mW/g

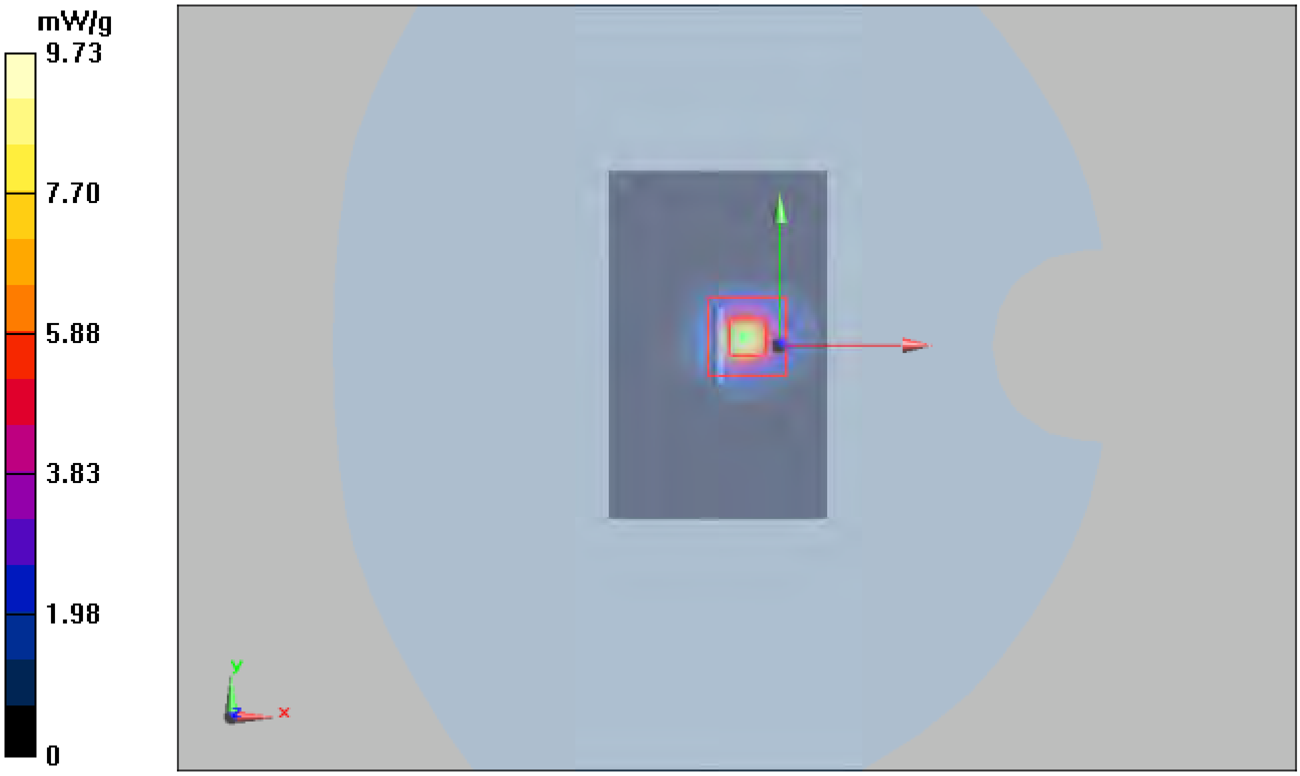
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 33.6 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 52.2 W/kg

SAR(1 g) = 7.87 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 9.73 mW/g



Plot 4 System Performance Check at 5750 MHz TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2

Date: 7/1/2021

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

Medium parameters used: f = 5750 MHz; σ = 5.21 S/m; ε_r = 34.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

d=10mm, Pin=100mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 8.31 mW/g

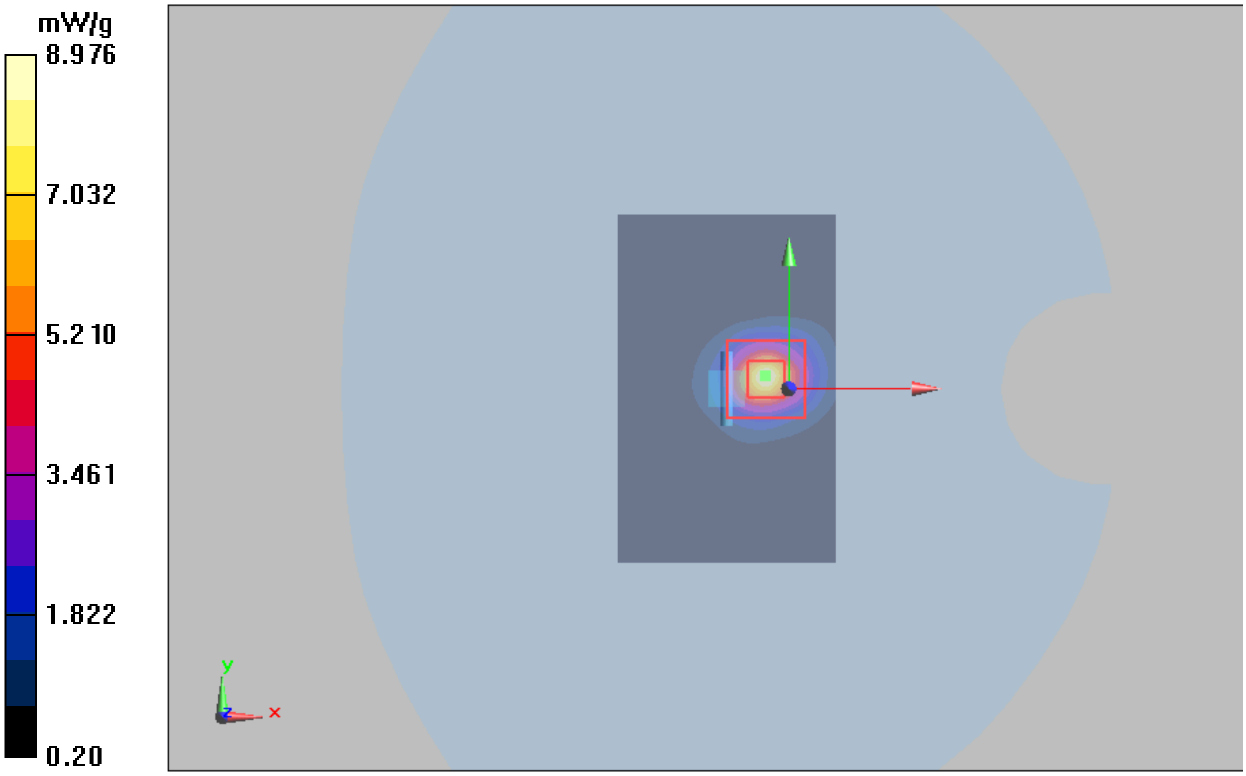
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.1 V/m; Power Drift = 0.044 dB

Peak SAR (extrapolated) = 23.4 W/kg

SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.27 mW/g

Maximum value of SAR (measured) = 8.976 mW/g



ANNEX C: Highest Graph Results

Plot 5 LTE Band 7 1RB Right Edge Low (Distance 10mm)

Date: 6/23/2021

Communication System: UID 0, LTE (0); Frequency: 2510 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2510 MHz; $\sigma = 1.91$ S/m; $\varepsilon_r = 37.398$; $\rho = 1000$ kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge Low/Area Scan (5x12x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 2.31 W/kg

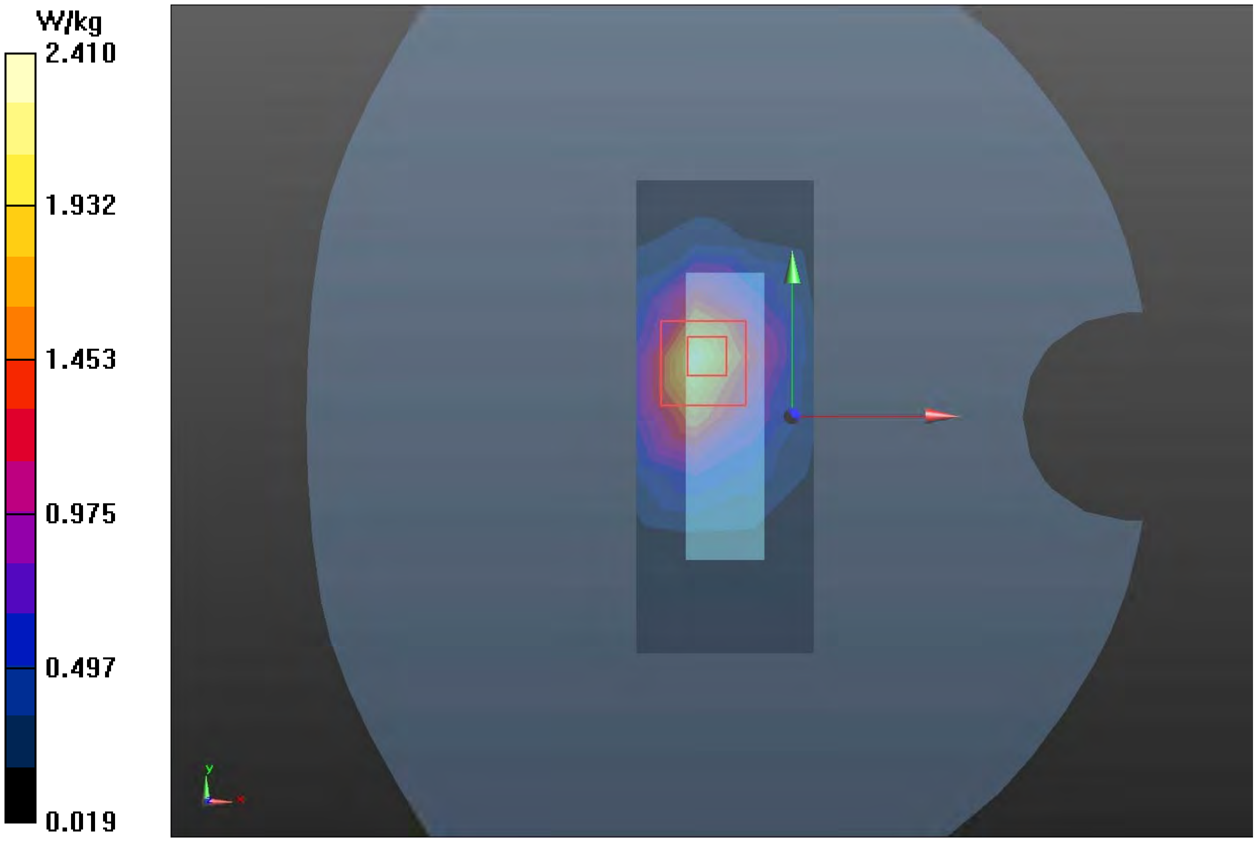
Right Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=10mm, dy=10mm, dz=10mm

Reference Value = 27.07 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 4.30 W/kg

SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.586 W/kg

Maximum value of SAR (measured) = 2.41 W/kg



Plot 6 LTE Band 38 1RB Right Edge Low (Distance 10mm)

Date: 6/23/2021

Communication System: UID 0, LTE (0); Frequency: 2580 MHz;Duty Cycle: 1:1.58

Medium parameters used: f = 2580 MHz; σ = 1.995 S/m; ε_r = 37.164; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.26, 7.26, 7.26); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Right Edge Low/Area Scan (5x12x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.46 W/kg

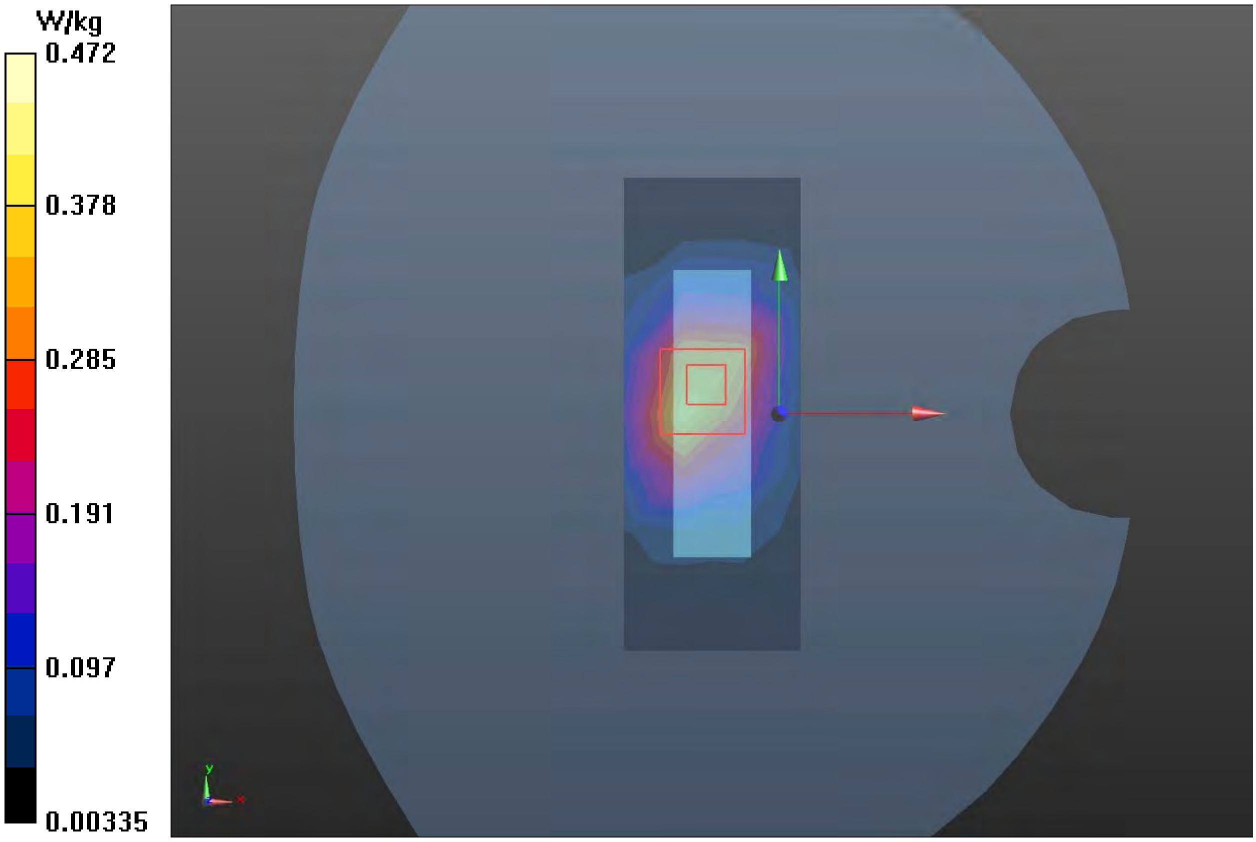
Right Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=10mm, dy=10mm, dz=10mm

Reference Value = 14.66 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.838 W/kg

SAR(1 g) = 0.424 W/kg; SAR(10 g) = 0.215 W/kg

Maximum value of SAR (measured) = 0.472 W/kg



Plot 7 802.11n Front Side Middle (Distance 10mm)

Date: 6/25/2021

Communication System: UID 0, 802.11n HT20 (0); Frequency: 2422 MHz;Duty Cycle: 1:1.02

Medium parameters used: f = 2422 MHz; σ = 1.801 S/m; ε_r = 37.737; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.54, 7.54, 7.54); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Front Side Middle/Area Scan (10x15x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.416 W/kg

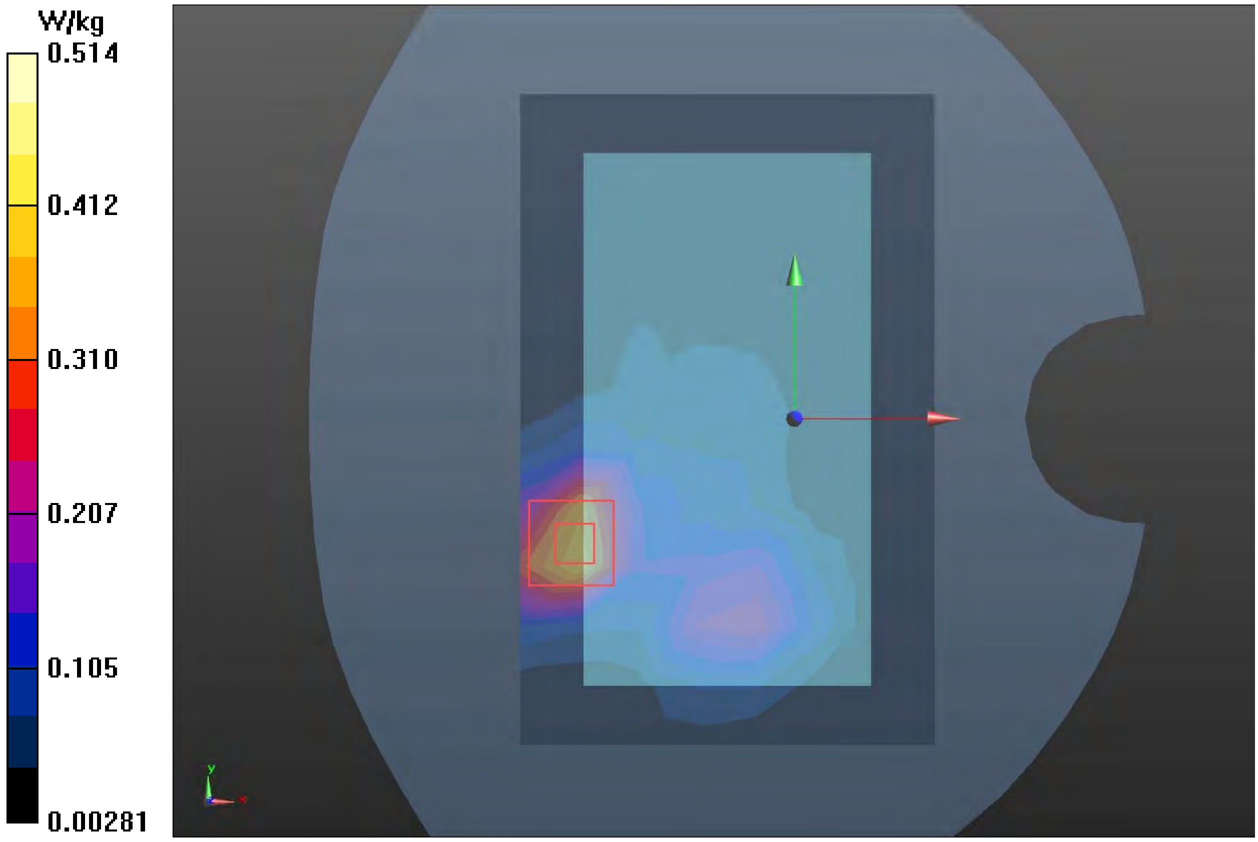
Front Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=10mm, dy=10mm, dz=10mm

Reference Value = 5.425 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 0.639 W/kg

SAR(1 g) = 0.323 W/kg; SAR(10 g) = 0.161 W/kg

Maximum value of SAR (measured) = 0.514 W/kg



Plot 8 802.11a U-NII-1 Top Edge High (Distance 10mm)

Date: 7/1/2021

Communication System: UID 0, 802.11a (0); Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; σ = 4.823 S/m; ε_r = 36.7; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.55, 5.55, 5.55); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Top Edge High/Area Scan (9x18x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.477 W/kg

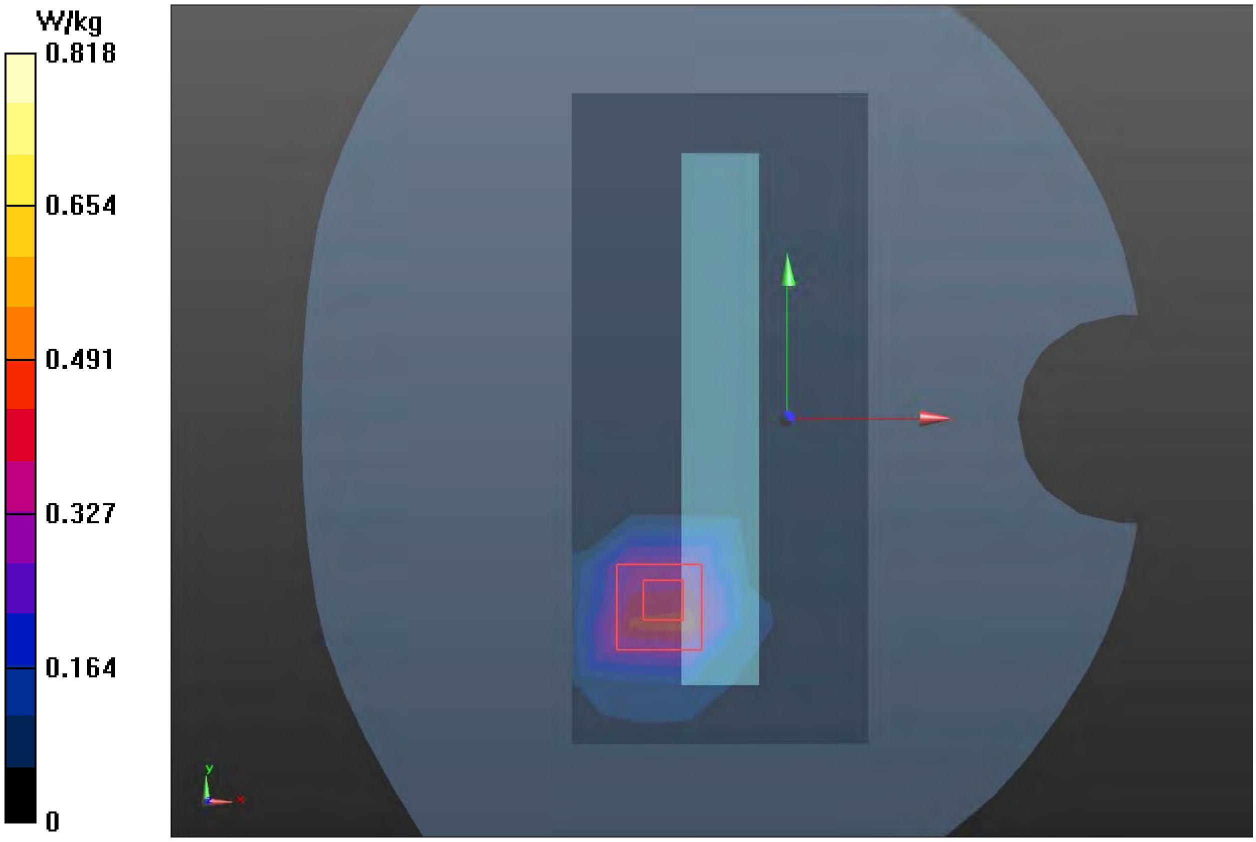
Top Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.5360 V/m; Power Drift = 0.067 dB

Peak SAR (extrapolated) = 1.39 W/kg

SAR(1 g) = 0.361 W/kg; SAR(10 g) = 0.128 W/kg

Maximum value of SAR (measured) = 0.818 W/kg



Plot 9 802.11a U-NII-3 Top Edge High (Distance 10mm)

Date: 7/1/2021

Communication System: UID 0, 802.11a (0); Frequency: 5745 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5745 MHz; σ = 5.48 S/m; ε_r = 35.27; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.00, 5.00, 5.00); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 2/23/2021

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

Top Edge High/Area Scan (9x18x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.572 W/kg

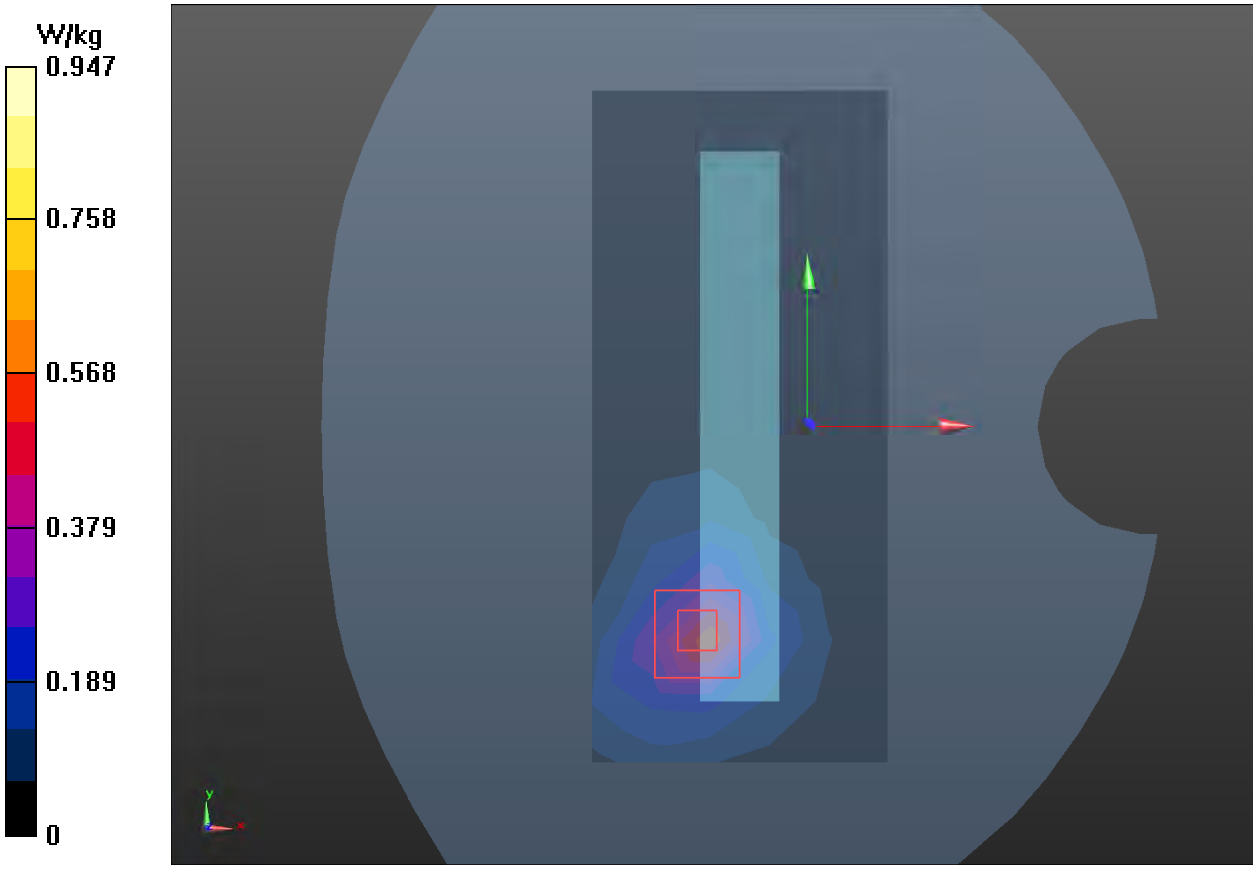
Top Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.206 V/m; Power Drift = 0.026 dB

Peak SAR (extrapolated) = 1.73 W/kg

SAR(1 g) = 0.384 W/kg; SAR(10 g) = 0.131 W/kg

Maximum value of SAR (measured) = 0.947 W/kg



ANNEX D: Probe Calibration Certificate

In Collaboration with
s p e a g
CALIBRATION LABORATORY

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Client **TA(Shanghai)** **Certificate No: Z20-60218**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN : 3677

Calibration Procedure(s): FF-Z11-004-01
Calibration Procedures for Dosimetric E-field Probes

Calibration date: July 06, 2020

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101547	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Power sensor NRP-Z91	101548	16-Jun-20(CTTL, No.J20X04344)	Jun-21
Reference 10dBAttenuator	18N50W-10dB	10-Feb-20(CTTL, No.J20X00525)	Feb-22
Reference 20dBAttenuator	18N50W-20dB	10-Feb-20(CTTL, No.J20X00526)	Feb-22
Reference Probe EX3DV4	SN 3617	30-Jan-20(SPEAG, No.EX3-3617_Jan20/2)	Jan-21
DAE4	SN 1556	4-Feb-20(SPEAG, No.DAE4-1556_Feb20)	Feb-21
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGenerator MG3700A	6201052605	23-Jun-20(CTTL, No.J20X04343)	Jun-21
Network Analyzer E5071C	MY46110673	10-Feb-20(CTTL, No.J20X00515)	Feb-21

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
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