



SAR TEST REPORT

Applicant ZTE Corporation
FCC ID SRQ-MF928
Product LTE ufi Hotspot
Model MF928
Report No. R2006A0416-S1
Issue Date July 17, 2020

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.

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Table of Contents

1	Test Laboratory.....	3
1.1	Notes of the Test Report	3
1.2.	Test facility	3
1.3	Testing Location.....	3
1.4	Laboratory Environment.....	4
2	Statement of Compliance	5
3	Description of Equipment under Test.....	6
4	Test Specification, Methods and Procedures	8
5	Operational Conditions during Test	9
5.3	Test Positions.....	9
5.3.1	Body Worn Configuration.....	9
5.4	Measurement Variability	10
5.5	Test Configuration	11
5.5.1	LTE Test Configuration	11
5.5.2	Wi-Fi Test Configuration.....	13
6	SAR Measurements System Configuration	14
6.3	SAR Measurement Set-up	14
6.4	DASY5 E-field Probe System.....	15
6.5	SAR Measurement Procedure	16
7	Main Test Equipment.....	18
8	Tissue Dielectric Parameter Measurements & System Verification	19
8.3	Tissue Verification.....	19
8.4	System Performance Check.....	20
8.5	SAR System Validation	22
9	Normal and Maximum Output Power	23
9.3	LTE Mode.....	23
9.4	WLAN Mode.....	35
10	Measured and Reported (Scaled) SAR Results	37
10.1	EUT Antenna Locations	37
10.2	Measured SAR Results.....	38
10.3	Simultaneous Transmission Analysis.....	47
11	Measurement Uncertainty	49
ANNEX A:	Test Layout.....	50
ANNEX B:	System Check Results.....	52
ANNEX C:	Highest Graph Results.....	59
ANNEX D:	Probe Calibration Certificate.....	68
ANNEX E:	D750V3 Dipole Calibration Certificate.....	77
ANNEX F:	D835V2 Dipole Calibration Certificate.....	85
ANNEX G:	D1750V2 Dipole Calibration Certificate	93
ANNEX H:	D1900V2 Dipole Calibration Certificate	101
ANNEX I:	D2450V2 Dipole Calibration Certificate	109
ANNEX J:	D5GHzV2 Dipole Calibration Certificate	117
ANNEX K:	DAE4 Calibration Certificate	131

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 electromagnetic emissions measurements.

A2LA (Certificate Number: 3857.01)

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

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
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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 2	1.251
LTE FDD 4	0.937
LTE FDD 5	0.980
LTE FDD 12	0.989
LTE FDD 66	1.217
LTE FDD 71	0.418
Wi-Fi (2.4G)	0.480
Wi-Fi (5G)	0.542
Date of Testing:	June 23, 2020 ~ July 14, 2020
Note: 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)	1.589
Note: 1. 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	ZTE Corporation
Manufacturer address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

General Technologies

Application Purpose:	Original Grant
EUT Stage:	Identical Prototype
Model:	MF928
IMEI:	866987050000372
Hardware Version:	MF928-1.0.0
Software Version:	BD_RWMF928V0.0.0B02
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 2/4/5/12/66/71:3
Power Level:	LTE FDD 2/4/5/12/66/71:max power
EUT Accessory	
Adapter 1	Manufacturer: DONGGUAN AOHAI POWER TECHNOLOGY CO., LTD. Model: STC-A51D-Z
Adapter 2	Manufacturer: SHENZHEN RUIJING INDUSTRIAL CO LTD Model: STC-A51D-Z
Battery	Manufacturer: HARBIN COSLIGHT POWER CO LTD Model: Li3820T43P3h715345
USB Cable 1	Manufacturer: LUXSHARE-ICT 100cm Cable, Shielded
USB Cable 2	Manufacturer: kingpower-tech 100cm Cable, Shielded
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

Wireless Technology		Modulation	Operating mode	Tx (MHz)
LTE	FDD 2	QPSK, 16QAM	Category 4	1850 ~ 1910
	FDD 4			1710 ~ 1755
	FDD 5			824 ~ 849
	FDD 12			699 ~ 716
	FDD 66			1710 ~ 1780
	FDD 71			663 ~ 698
	Does this device support Carrier Aggregation (CA) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Wi-Fi	2.4G	DSSS,OFDM	802.11b/g/n HT20	2412 ~ 2462
		OFDM	802.11n HT40	2422 ~ 2452
	5G	OFDM	802.11a/n HT20/ HT40/ ac VHT20/ VHT40/ VHT80	5150 ~ 5250 5725 ~ 5850
	Does this device support MIMO <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

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

5.3 Test Positions

5.3.1 Body Worn Configuration

Body-worn 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, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn 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 body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is $> 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn 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.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn 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.

5.4 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 performed 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 ($\sim 10\%$ 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.

5.5 Test Configuration

5.5.1 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 [4]. 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 $> \frac{1}{2}$ 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 $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

5.5.2 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.

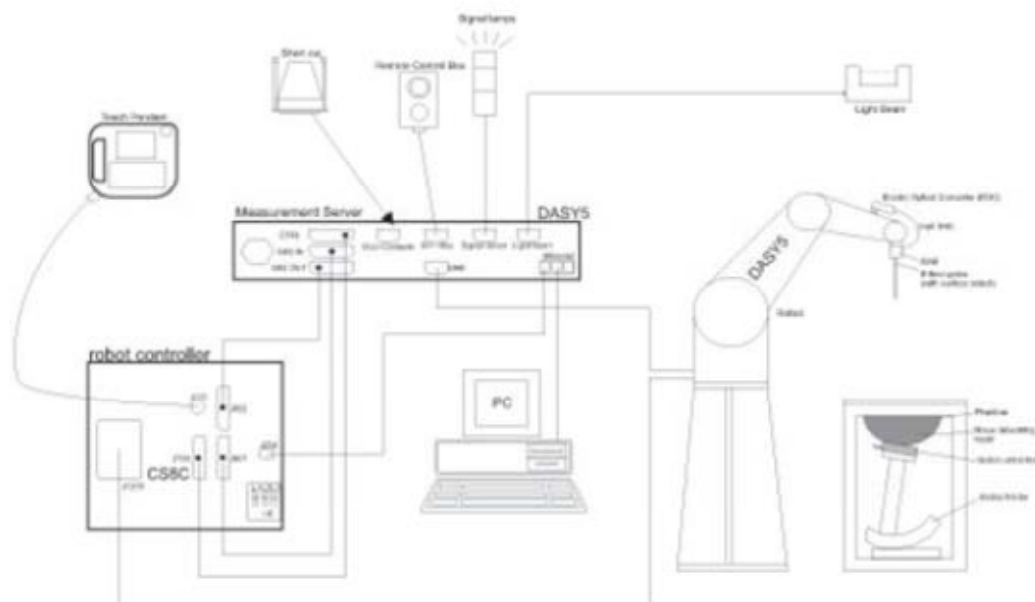
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

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

6.3 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.

6.4 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 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/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 $\pm 10\%$. The spherical isotropy was evaluated and found to be better than ± 0.25 dB. 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 below 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).

6.5 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.

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

Zoom Scan

Zoom scans are used to 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 whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 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.

			≤3GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{zoom}} \Delta y_{\text{zoom}}$			≤2GHz: ≤8mm 2 – 3GHz: ≤5mm*	3 – 4GHz: ≤5mm* 4 – 6GHz: ≤4mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: $\Delta z_{\text{zoom}}(n)$		≤5mm	3 – 4GHz: ≤4mm 4 – 5GHz: ≤3mm 5 – 6GHz: ≤2mm
	Graded grid	$\Delta z_{\text{zoom}}(1)$: between 1 st two points closest to phantom surface	≤4mm	3 – 4GHz: ≤3mm 4 – 5GHz: ≤2.5mm 5 – 6GHz: ≤2mm
		$\Delta z_{\text{zoom}}(n>1)$: between subsequent points	≤1.5• $\Delta z_{\text{zoom}}(n-1)$	
Minimum zoom scan volume	X, y, z		≥30mm	3 – 4GHz: ≥28mm 4 – 5GHz: ≥25mm 5 – 6GHz: ≥22mm
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 <i>area scan based 1-g SAR estimation</i> 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.				

Volume Scan Procedures

The volume scan is used to 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	2020-05-17	2021-05-16
Dielectric Probe Kit	HP	85070E	US44020115	2020-05-17	2021-05-16
Power meter	Agilent	E4417A	GB41291714	2020-05-17	2021-05-16
Power sensor	Agilent	N8481H	MY50350004	2020-05-17	2021-05-16
Power sensor	Agilent	E9327A	US40441622	2020-05-17	2021-05-16
Dual directional coupler	Agilent	778D-012	50519	/	/
Dual directional coupler	Agilent	777D	50146	/	/
Amplifier	INDEXSAR	IXA-020	0401	2020-05-17	2021-05-16
Wireless communication tester	Anritsu	MT8820C	6201342015	2020-05-17	2021-05-16
Wireless communication tester	Key sight	E5515C	MY48360988	2019-12-15	2020-12-14
Wideband radio communication tester	R&S	CMW 500	113645	2020-05-17	2021-05-16
E-field Probe	SPEAG	EX3DV4	3677	2020-07-06	2021-07-05
DAE	SPEAG	DAE4	1317	2019-10-23	2020-10-22
Validation Kit 750MHz	SPEAG	D750V3	1045	2017-08-27	2020-08-26
Validation Kit 835MHz	SPEAG	D835V2	4d020	2017-08-28	2020-08-27
Validation Kit 1750MHz	SPEAG	D1750V2	1033	2020-02-25	2023-02-24
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2017-08-26	2020-08-25
Validation Kit 2450MHz	SPEAG	D2450V2	786	2017-08-29	2020-08-28
Validation Kit 5GHz	SPEAG	D5GHzV2	1151	2020-02-27	2023-02-26
Temperature Probe	Tianjin jinming	JM222	381	2020-05-25	2021-05-24
Hygrothermograph	Anymetr	NT-311	20150731	2020-05-17	2021-05-16
Twin SAM Phantom	Speag	SAM1	1534	/	/
Software for Test	Speag	DASY52	/	/	/
Softwarefor Tissue	Agilent	85070	/	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.3 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 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	$\sigma(\text{s/m})$
750	41.448	1.452	56	0	0.1	1.0	41.9	0.89
835	41.45	1.45	56	0	0.1	1.0	41.5	0.90
1750	55.24	0.31	0	44.45	0	0	40.1	1.37
1900	55.242	0.306	0	44.452	0	0	40.0	1.40
2450	62.7	0.5	0	36.8	0	0	39.2	1.80
Frequency (MHz)	Water (%)	Diethylenglycol monohexylether			Triton X-100		ϵ_r	$\sigma(\text{s/m})$
5250	65.53	17.24			17.23		35.9	4.71
5600	65.53	17.24			17.23		35.5	5.07
5750	65.53	17.24			17.23		35.4	5.22

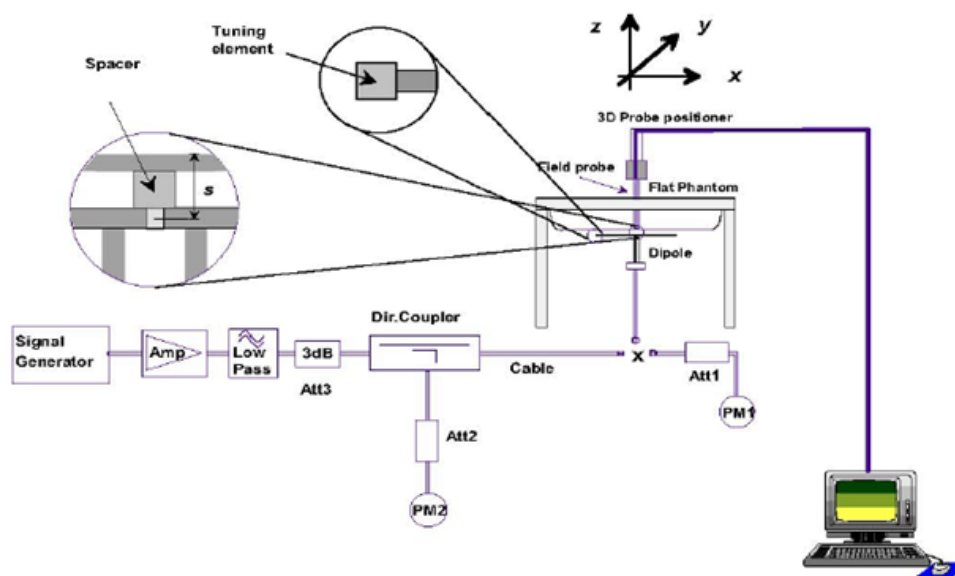
Measurements results

Frequency (MHz)	Test Date	Temp $^\circ\text{C}$	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within $\pm 5\%$)	
			ϵ_r	$\sigma(\text{s/m})$	ϵ_r	$\sigma(\text{s/m})$	Dev $\epsilon_r(\%)$	Dev $\sigma(\%)$
750	7/13/2020	21.5	42.3	0.88	41.9	0.89	0.95	-1.12
835	7/9/2020	21.5	41.4	0.88	41.5	0.90	-0.24	-2.22
1750	7/10/2020	21.5	40.2	1.34	40.1	1.37	0.25	-2.19
1900	7/7/2020	21.5	40.1	1.41	40.0	1.40	0.25	0.71
2450	7/12/2020	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
5250	7/11/2020	21.5	35.5	4.80	35.9	4.71	-1.11	1.91
5750	7/11/2020	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.								

8.4 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 1 System 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)	$\Delta\Omega$
Dipole D750V3 SN: 1045	Head Liquid	8/27/2017	-28.5	/	52.5	/
		8/26/2018	-27.6	3.3	53.2	-0.7
		8/25/2019	-27.5	0.4	54.1	-0.9
Dipole D835V2 SN: 4d020	Head Liquid	8/28/2017	-31.9	/	50.3	/
		8/27/2018	-29.0	10.0	46.6	3.7
		8/26/2019	-29.4	-1.4	45.9	0.7
Dipole D1900V2 SN: 5d060	Head Liquid	8/26/2017	-23.4	/	52.0	/
		8/25/2018	-24.7	-5.3	54.4	-2.4
		8/24/2019	-24.9	-0.8	56.2	-1.8
Dipole D2450V2 SN: 786	Head Liquid	8/29/2017	-25.5	/	53.4	/
		8/28/2018	-23.0	10.9	57.2	-3.8
		8/27/2019	-22.2	3.6	56.4	0.8

System Check results

Frequency (MHz)	Test Date	Temp $^{\circ}\text{C}$	250mW /100mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit $\pm 10\%$)	Plot No.
750	7/13/2020	21.5	2.13	8.52	8.34	2.16	1
835	7/9/2020	21.5	2.44	9.76	9.45	3.28	2
1750	7/10/2020	21.5	8.95	35.80	35.90	-0.28	3
1900	7/7/2020	21.5	9.88	39.52	40.10	-1.45	4
2450	7/12/2020	21.5	13.70	54.80	52.60	4.18	5
5250	7/11/2020	21.5	7.87	78.70	78.00	0.90	6
5750	7/11/2020	21.5	7.66	76.60	77.40	-1.03	7

Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.

8.5 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
750	7/6/2020	3677	EX3DV4	750	Body	55.35	0.99	PASS	PASS	PASS	FDD	PASS	N/A
835	7/6/2020	3677	EX3DV4	835	Body	54.88	0.98	PASS	PASS	PASS	GMSK	PASS	N/A
1750	7/6/2020	3677	EX3DV4	1750	Body	51.24	1.44	PASS	PASS	PASS	NA	N/A	N/A
1900	7/6/2020	3677	EX3DV4	1900	Body	50.98	1.56	PASS	PASS	PASS	GMSK	PASS	N/A
2450	7/6/2020	3677	EX3DV4	2450	Body	50.59	1.95	PASS	PASS	PASS	OFDM	PASS	PASS
2600	7/6/2020	3677	EX3DV4	2600	Body	50.14	2.13	PASS	PASS	PASS	TDD	PASS	N/A
5250	7/6/2020	3677	EX3DV4	5250	Body	47.37	5.44	PASS	PASS	PASS	OFDM	N/A	PASS
5600	7/6/2020	3677	EX3DV4	5600	Body	46.42	5.99	PASS	PASS	PASS	OFDM	N/A	PASS
5750	7/6/2020	3677	EX3DV4	5750	Body	46.02	6.23	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.

9.3 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

LTE FDD Band 2				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				18607/1850.7	18900/1880	19193/1909.3	
1.4MHz	QPSK	1	0	23.30	22.90	23.42	24.00
		1	2	23.29	23.07	23.26	24.00
		1	5	23.22	22.96	23.19	24.00
		3	0	23.12	23.35	23.30	24.00
		3	2	23.11	23.34	23.30	24.00
		3	3	23.13	23.30	23.05	24.00
		6	0	22.05	22.10	22.16	23.00
	16QAM	1	0	22.33	22.72	22.33	23.00
		1	2	22.44	22.65	22.07	23.00
		1	5	22.18	22.51	21.97	23.00
		3	0	22.27	21.89	22.34	23.00
		3	2	22.27	21.97	22.34	23.00
		3	3	22.30	21.99	22.14	23.00
		6	0	20.98	20.96	21.19	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18615/1851.5	18900/1880	19185/1908.5	
3MHz	QPSK	1	0	23.25	23.32	23.18	24.00
		1	7	23.16	23.34	23.25	24.00
		1	14	23.19	23.34	23.31	24.00
		8	0	22.07	22.13	22.26	23.00
		8	4	22.07	22.13	22.26	23.00
		8	7	22.09	22.09	22.42	23.00
		15	0	22.06	22.09	22.16	23.00



	16QAM	1	0	22.40	22.52	22.00	23.00
		1	7	22.43	22.81	21.65	23.00
		1	14	22.46	22.78	21.59	23.00
		8	0	20.87	21.42	21.20	22.00
		8	4	20.88	21.42	21.17	22.00
		8	7	20.81	21.38	21.05	22.00
		15	0	20.96	21.27	21.23	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18625/1852.5	18900/1880	19175/1907.5	
5MHz	QPSK	1	0	23.00	23.10	23.21	24.00
		1	13	23.04	23.22	23.10	24.00
		1	24	22.92	23.13	23.07	24.00
		12	0	21.99	22.05	22.11	23.00
		12	6	22.09	22.15	22.11	23.00
		12	13	21.99	22.11	22.08	23.00
		25	0	22.03	22.11	22.16	23.00
	16QAM	1	0	22.43	22.34	22.13	23.00
		1	13	22.41	22.41	21.84	23.00
		1	24	22.40	22.33	21.80	23.00
		12	0	20.97	20.82	21.27	22.00
		12	6	20.97	20.77	21.17	22.00
		12	13	20.95	20.58	21.04	22.00
		25	0	21.16	20.92	21.20	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18650/1855	18900/1880	19150/1905	
10MHz	QPSK	1	0	23.04	23.17	23.02	24.00
		1	25	23.03	23.45	23.43	24.00
		1	49	23.04	23.10	23.27	24.00
		25	0	21.98	22.09	22.12	23.00
		25	13	21.97	22.10	22.12	23.00
		25	25	22.01	22.05	22.19	23.00
		50	0	21.89	22.09	22.26	23.00
	16QAM	1	0	21.88	22.14	21.72	23.00
		1	25	22.50	22.95	21.98	23.00
		1	49	21.64	22.66	21.64	23.00
		25	0	21.01	21.24	21.29	22.00
		25	13	21.02	21.03	21.29	22.00
		25	25	21.08	21.19	21.22	22.00
		50	0	20.92	21.08	21.27	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18675/1857.5	18900/1880	19125/1902.5	
15MHz	QPSK	1	0	23.12	22.79	23.03	24.00
		1	38	23.18	23.23	23.05	24.00



		1	74	23.05	23.00	22.88	24.00
		36	0	21.91	22.04	22.07	23.00
		36	18	21.92	22.04	21.97	23.00
		36	39	22.04	21.96	22.08	23.00
		75	0	21.91	21.91	21.98	23.00
	16QAM	1	0	22.09	22.35	21.54	23.00
		1	38	22.16	22.63	21.72	23.00
		1	74	21.33	22.38	21.66	23.00
		36	0	20.81	20.96	21.04	22.00
		36	18	20.81	21.06	21.03	22.00
		36	39	20.89	21.02	21.11	22.00
		75	0	20.96	20.95	21.03	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				18700/1860	18900/1880	19100/1900	
20MHz	QPSK	1	0	22.92	23.05	23.40	24.00
		1	50	23.45	23.50	23.06	24.00
		1	99	22.73	23.03	23.09	24.00
		50	0	21.89	21.91	22.01	23.00
		50	25	21.88	21.92	21.97	23.00
		50	50	21.96	21.98	22.14	23.00
		100	0	21.87	21.97	22.03	23.00
	16QAM	1	0	22.22	21.41	22.16	23.00
		1	50	22.34	21.77	22.42	23.00
		1	99	22.16	21.48	21.93	23.00
		50	0	20.92	20.85	21.12	22.00
		50	25	20.91	20.91	21.12	22.00
		50	50	20.99	21.02	21.01	22.00
		100	0	21.02	21.03	21.19	22.00

LTE FDD Band 4				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				19957/1710.7	20175/1732.5	20393/1754.3	
1.4MHz	QPSK	1	0	23.18	23.72	23.57	24.00
		1	2	23.82	23.71	23.72	24.00
		1	5	23.36	23.51	23.54	24.00
		3	0	23.42	23.43	23.65	24.00
		3	2	23.39	23.45	23.66	24.00
		3	3	23.60	23.51	23.59	24.00
		6	0	22.66	22.61	22.70	23.00
	16QAM	1	0	22.83	22.31	22.50	23.00
		1	2	22.81	22.32	22.90	23.00
		1	5	22.82	22.34	22.89	23.00
		3	0	22.63	22.29	22.50	23.00



		3	2	22.68	22.32	22.53	23.00
		3	3	22.62	22.52	22.43	23.00
		6	0	21.50	21.56	21.56	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				19965/1711.5	20175/1732.5	20385/1753.5	
3MHz	QPSK	1	0	23.20	23.76	23.60	24.00
		1	7	23.80	23.74	23.76	24.00
		1	14	23.39	23.56	23.58	24.00
		8	0	22.52	22.55	22.78	23.00
		8	4	22.51	22.55	22.78	23.00
		8	7	22.70	22.62	22.69	23.00
		15	0	22.66	22.65	22.73	23.00
	16QAM	1	0	22.86	22.33	22.53	23.00
		1	7	22.84	22.32	22.94	23.00
		1	14	22.84	22.38	22.92	23.00
		8	0	21.74	21.42	21.62	22.00
		8	4	21.79	21.45	21.65	22.00
		8	7	21.72	21.64	21.56	22.00
		15	0	21.53	21.60	21.59	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				19975/1712.5	20175/1732.5	20375/1752.5	
5MHz	QPSK	1	0	23.17	23.74	23.56	24.00
		1	13	23.78	23.70	23.73	24.00
		1	24	23.36	23.51	23.54	24.00
		12	0	22.49	22.50	22.74	23.00
		12	6	22.49	22.51	22.73	23.00
		12	13	22.68	22.60	22.65	23.00
		25	0	22.66	22.64	22.71	23.00
	16QAM	1	0	22.83	22.29	22.50	23.00
		1	13	22.81	22.30	22.91	23.00
		1	24	22.81	22.36	22.88	23.00
		12	0	21.72	21.38	21.59	22.00
		12	6	21.76	21.40	21.61	22.00
		12	13	21.69	21.59	21.52	22.00
		25	0	21.51	21.56	21.54	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20000/1715	20175/1732.5	20350/1750	
10MHz	QPSK	1	0	23.19	23.75	23.59	24.00
		1	25	23.81	23.75	23.77	24.00
		1	49	23.38	23.55	23.57	24.00
		25	0	22.52	22.55	22.78	23.00
		25	13	22.52	22.56	22.77	23.00
		25	25	22.70	22.64	22.70	23.00



	16QAM	50	0	22.70	22.66	22.75	23.00
		1	0	22.85	22.32	22.52	23.00
		1	25	22.84	22.34	22.94	23.00
		1	49	22.84	22.38	22.91	23.00
		25	0	21.75	21.43	21.63	22.00
		25	13	21.78	21.44	21.64	22.00
		25	25	21.72	21.64	21.56	22.00
		50	0	21.54	21.61	21.58	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20025/1717.5	20175/1732.5	20325/1747.5	
15MHz	QPSK	1	0	23.18	23.71	23.57	24.00
		1	38	23.79	23.74	23.74	24.00
		1	74	23.35	23.50	23.53	24.00
		36	0	22.50	22.51	22.75	23.00
		36	18	22.49	22.51	22.73	23.00
		36	39	22.67	22.61	22.66	23.00
		75	0	22.68	22.62	22.70	23.00
	16QAM	1	0	22.80	22.30	22.50	23.00
		1	38	22.82	22.31	22.92	23.00
		1	74	22.81	22.34	22.88	23.00
		36	0	21.72	21.41	21.60	22.00
		36	18	21.75	21.39	21.60	22.00
		36	39	21.70	21.60	21.53	22.00
		75	0	21.51	21.56	21.54	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20050/1720	20175/1732.5	20300/1745	
20MHz	QPSK	1	0	23.15	23.67	23.54	24.00
		1	50	23.78	23.70	23.72	24.00
		1	99	23.33	23.49	23.50	24.00
		50	0	22.47	22.46	22.71	23.00
		50	25	22.47	22.47	22.70	23.00
		50	50	22.64	22.56	22.62	23.00
		100	0	22.65	22.57	22.66	23.00
	16QAM	1	0	22.30	22.26	22.45	23.00
		1	50	22.78	22.29	22.88	23.00
		1	99	22.79	22.31	22.86	23.00
		50	0	21.69	21.37	21.57	22.00
		50	25	21.72	21.37	21.57	22.00
		50	50	21.67	21.55	21.49	22.00
		100	0	21.49	21.52	21.51	22.00



LTE FDD Band 5				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20407/824.7	20525/836.5	20643/848.3	
1.4MHz	QPSK	1	0	24.04	23.75	23.79	24.50
		1	2	24.24	23.79	23.94	24.50
		1	5	24.10	23.67	23.77	24.50
		3	0	24.03	23.72	23.76	24.50
		3	2	24.02	23.72	23.76	24.50
		3	3	24.03	23.66	23.77	24.50
		6	0	22.85	22.75	22.93	23.50
	16QAM	1	0	23.11	22.97	22.42	24.00
		1	2	23.22	23.17	22.54	24.00
		1	5	23.04	23.03	22.44	24.00
		3	0	23.02	22.81	22.80	24.00
		3	2	23.02	22.75	22.81	24.00
		3	3	23.05	22.78	22.68	24.00
		6	0	21.75	21.80	21.98	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20415/825.5	20525/836.5	20635/847.5	
3MHz	QPSK	1	0	23.64	23.81	23.75	24.50
		1	7	23.65	23.71	23.81	24.50
		1	14	23.56	23.56	23.81	24.50
		8	0	22.96	22.90	22.83	23.50
		8	4	22.96	22.91	22.83	23.50
		8	7	22.95	22.79	22.88	23.50
		15	0	22.92	22.90	22.91	23.50
	16QAM	1	0	22.85	23.29	22.63	24.00
		1	7	22.86	23.35	22.62	24.00
		1	14	22.69	23.44	22.66	24.00
		8	0	21.71	22.00	21.64	23.00
		8	4	22.10	22.01	21.64	23.00
		8	7	22.09	21.76	21.65	23.00
		15	0	21.92	21.65	21.81	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20425/826.5	20525/836.5	20625/846.5	
5MHz	QPSK	1	0	23.76	23.76	23.56	24.50
		1	13	23.81	23.80	23.96	24.50
		1	24	23.85	23.70	23.98	24.50
		12	0	22.94	22.90	22.90	23.50
		12	6	22.95	22.91	22.90	23.50
		12	13	22.90	22.82	22.82	23.50
		25	0	22.89	22.85	22.81	23.50



	16QAM	1	0	22.84	22.93	22.76	24.00
		1	13	22.76	23.10	22.75	24.00
		1	24	22.57	23.03	22.61	24.00
		12	0	21.75	21.68	21.63	23.00
		12	6	21.76	21.64	21.63	23.00
		12	13	21.61	21.48	21.55	23.00
		25	0	21.83	21.70	21.72	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				20450/829	20525/836.5	20600/844	
10MHz	QPSK	1	0	23.67	23.71	23.80	24.50
		1	25	23.96	24.09	24.28	24.50
		1	49	23.67	23.73	24.01	24.50
		25	0	22.98	22.93	22.89	23.50
		25	13	22.97	22.92	22.90	23.50
		25	25	22.96	22.85	22.96	23.50
		50	0	22.91	22.95	22.94	23.50
	16QAM	1	0	22.93	23.49	22.67	24.00
		1	25	23.61	23.88	23.52	24.00
		1	49	22.75	23.58	22.33	24.00
		25	0	22.04	22.05	21.82	23.00
		25	13	22.04	21.97	21.83	23.00
		25	25	22.03	21.88	21.87	23.00
		50	0	21.81	21.83	21.91	23.00

LTE FDD Band 12				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				23017/699.7	23095/707.5	23173/715.3	
1.4MHz	QPSK	1	0	23.55	23.94	23.83	24.50
		1	2	23.67	24.08	23.74	24.50
		1	5	23.39	24.06	23.53	24.50
		3	0	23.46	23.64	23.73	24.50
		3	2	23.55	23.64	23.72	24.50
		3	3	23.44	23.71	23.61	24.50
		6	0	22.59	22.82	22.90	23.50
	16QAM	1	0	22.57	22.96	23.34	24.00
		1	2	22.88	23.31	23.32	24.00
		1	5	22.55	23.01	23.23	24.00
		3	0	22.73	22.95	22.93	24.00
		3	2	22.71	22.90	22.94	24.00
		3	3	22.40	22.79	22.96	24.00
		6	0	21.60	21.99	21.95	23.00



Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				23025/700.5	23095/707.5	23165/714.5	
3MHz	QPSK	1	0	23.51	23.75	23.74	24.50
		1	7	23.55	23.76	23.79	24.50
		1	14	23.53	23.70	23.73	24.50
		8	0	22.68	22.85	23.06	23.50
		8	4	22.67	22.93	23.06	23.50
		8	7	22.76	22.96	22.89	23.50
		15	0	22.74	22.94	23.03	23.50
	16QAM	1	0	22.52	23.65	22.54	24.00
		1	7	22.55	23.34	22.45	24.00
		1	14	22.63	23.24	22.33	24.00
		8	0	21.47	21.72	21.89	23.00
		8	4	21.56	21.73	21.89	23.00
		8	7	21.67	21.85	21.73	23.00
		15	0	21.60	21.69	21.97	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				23035/701.5	23095/707.5	23155/713.5	
5MHz	QPSK	1	0	23.40	23.71	23.88	24.50
		1	13	23.74	23.83	23.84	24.50
		1	24	23.59	23.70	23.64	24.50
		12	0	22.66	22.90	22.92	23.50
		12	6	22.55	22.91	22.92	23.50
		12	13	22.74	23.01	22.88	23.50
		25	0	22.67	22.95	22.97	23.50
	16QAM	1	0	22.55	23.22	22.86	24.00
		1	13	22.78	23.01	22.97	24.00
		1	24	22.37	22.96	22.68	24.00
		12	0	21.51	21.64	21.88	23.00
		12	6	21.51	21.67	21.88	23.00
		12	13	21.59	21.79	21.77	23.00
		25	0	21.83	21.72	21.91	23.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				23060/704	23095/707.5	23130/711	
10MHz	QPSK	1	0	23.45	23.83	23.66	24.50
		1	25	23.71	24.01	24.22	24.50
		1	49	23.78	23.97	23.72	24.50
		25	0	22.74	22.93	22.95	23.50
		25	13	22.74	22.95	22.96	23.50
		25	25	22.91	22.98	23.05	23.50
		50	0	22.81	22.88	23.04	23.50
	16QAM	1	0	22.57	23.38	22.37	24.00
		1	25	22.83	23.60	22.67	24.00



		1	49	22.41	23.58	22.42	24.00
		25	0	21.86	21.85	21.95	23.00
		25	13	21.80	21.87	21.96	23.00
		25	25	21.96	22.13	21.98	23.00
		50	0	21.73	21.96	21.93	23.00

LTE FDD Band 66				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				131979/1710.7	132322/1745	132665/1779.3	
1.4MHz	QPSK	1	0	23.22	23.61	23.43	24.00
		1	2	23.34	23.38	23.57	24.00
		1	5	23.07	23.38	23.23	24.00
		3	0	23.02	23.21	23.07	24.00
		3	2	22.96	23.04	23.02	24.00
		3	3	23.09	23.06	23.06	24.00
		6	0	22.11	22.13	22.50	23.00
	16QAM	1	0	22.09	22.26	22.63	23.00
		1	2	22.07	22.36	22.49	23.00
		1	5	22.01	22.19	22.37	23.00
		3	0	22.08	22.25	22.42	23.00
		3	2	22.02	22.09	22.24	23.00
		3	3	22.08	22.05	22.07	23.00
		6	0	21.10	21.17	21.25	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				131987/1711.5	132322/1745	132657/1778.5	
3MHz	QPSK	1	0	23.24	23.65	23.46	24.00
		1	7	23.32	23.41	23.61	24.00
		1	14	23.10	23.43	23.27	24.00
		8	0	22.12	22.33	22.20	23.00
		8	4	22.08	22.14	22.14	23.00
		8	7	22.19	22.17	22.16	23.00
		15	0	22.11	22.17	22.53	23.00
	16QAM	1	0	22.12	22.28	22.66	23.00
		1	7	22.10	22.36	22.53	23.00
		1	14	22.03	22.23	22.40	23.00
		8	0	21.19	21.38	21.54	22.00
		8	4	21.13	21.22	21.36	22.00
		8	7	21.18	21.17	21.20	22.00
		15	0	21.13	21.21	21.28	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				131997/1712.5	132322/1745	132647/1777.5	
5MHz	QPSK	1	0	23.21	23.63	23.42	24.00
		1	13	23.30	23.37	23.58	24.00



		1	24	23.07	23.38	23.23	24.00
		12	0	22.09	22.28	22.16	23.00
		12	6	22.06	22.10	22.09	23.00
		12	13	22.17	22.15	22.12	23.00
		25	0	22.11	22.16	22.51	23.00
	16QAM	1	0	22.09	22.24	22.63	23.00
		1	13	22.07	22.34	22.50	23.00
		1	24	22.00	22.21	22.36	23.00
		12	0	21.17	21.34	21.51	22.00
		12	6	21.10	21.17	21.32	22.00
		12	13	21.15	21.12	21.16	22.00
		25	0	21.11	21.17	21.23	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				132022/1715	132322/1745	132622/1775	
10MHz	QPSK	1	0	23.23	23.64	23.45	24.00
		1	25	23.33	23.42	23.62	24.00
		1	49	23.09	23.42	23.26	24.00
		25	0	22.12	22.33	22.20	23.00
		25	13	22.09	22.15	22.13	23.00
		25	25	22.19	22.19	22.17	23.00
		50	0	22.15	22.18	22.55	23.00
	16QAM	1	0	22.11	22.27	22.65	23.00
		1	25	22.10	22.38	22.53	23.00
		1	49	22.03	22.23	22.39	23.00
		25	0	21.20	21.39	21.55	22.00
		25	13	21.12	21.21	21.35	22.00
		25	25	21.18	21.17	21.20	22.00
		50	0	21.14	21.22	21.27	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				132047/1717.5	132322/1745	132597/1772.5	
15MHz	QPSK	1	0	23.22	23.60	23.43	24.00
		1	38	23.31	23.41	23.59	24.00
		1	74	23.06	23.37	23.22	24.00
		36	0	22.10	22.29	22.17	23.00
		36	18	22.06	22.10	22.09	23.00
		36	39	22.16	22.16	22.13	23.00
		75	0	22.13	22.14	22.50	23.00
	16QAM	1	0	22.06	22.25	22.63	23.00
		1	38	22.08	22.35	22.51	23.00
		1	74	22.00	22.19	22.36	23.00
		36	0	21.17	21.37	21.52	22.00
		36	18	21.09	21.16	21.31	22.00
		36	39	21.16	21.13	21.17	22.00



		75	0	21.11	21.17	21.23	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				132072/1720	132322/1745	132572/1770	
20MHz	QPSK	1	0	23.19	23.56	23.40	24.00
		1	50	23.30	23.37	23.57	24.00
		1	99	23.04	23.36	23.19	24.00
		50	0	22.07	22.24	22.13	23.00
		50	25	22.04	22.06	22.06	23.00
		50	50	22.13	22.11	22.09	23.00
		100	0	22.10	22.09	22.46	23.00
	16QAM	1	0	21.93	22.21	22.58	23.00
		1	50	22.04	22.33	22.47	23.00
		1	99	21.98	22.16	22.34	23.00
		50	0	21.14	21.33	21.49	22.00
		50	25	21.06	21.14	21.28	22.00
		50	50	21.13	21.08	21.13	22.00
		100	0	21.09	21.13	21.20	22.00

LTE FDD Band 71				Conducted Power(dBm)			Tune-up Limit
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				133147/665.5	133297/680.5	133447/695.5	
5MHz	QPSK	1	0	23.39	23.77	23.04	24.50
		1	13	24.02	23.23	23.25	24.50
		1	24	23.08	23.42	24.19	24.50
		12	0	22.69	22.56	22.51	23.50
		12	6	22.75	22.52	22.09	23.50
		12	13	22.75	22.43	22.49	23.50
		25	0	22.79	22.47	22.48	23.50
	16QAM	1	0	22.94	22.55	22.82	23.50
		1	13	22.92	22.42	22.88	23.50
		1	24	22.49	22.47	22.71	23.50
		12	0	21.85	21.46	21.54	22.50
		12	6	21.74	21.41	21.63	22.50
		12	13	21.75	21.35	21.55	22.50
		25	0	21.83	21.40	21.45	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				133172/668	133297/680.5	133422/693	
10MHz	QPSK	1	0	23.41	23.78	23.07	24.50
		1	25	24.05	23.28	23.29	24.50
		1	49	23.10	23.46	24.22	24.50
		25	0	22.72	22.61	22.55	23.50
		25	13	22.78	22.57	22.13	23.50
		25	25	22.77	22.47	22.54	23.50



	16QAM	50	0	22.83	22.49	22.52	23.50
		1	0	22.96	22.58	22.84	23.50
		1	25	22.95	22.46	22.91	23.50
		1	49	22.52	22.49	22.74	23.50
		25	0	21.88	21.51	21.58	22.50
		25	13	21.76	21.45	21.66	22.50
		25	25	21.78	21.40	21.59	22.50
		50	0	21.86	21.45	21.49	22.50
		50	0	21.86	21.45	21.49	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				133197/670.5	133297/680.5	133397/690.5	
15MHz	QPSK	1	0	23.40	23.74	23.05	24.50
		1	38	24.03	23.27	23.26	24.50
		1	74	23.07	23.41	24.18	24.50
		36	0	22.70	22.57	22.52	23.50
		36	18	22.75	22.52	22.09	23.50
		36	39	22.74	22.44	22.50	23.50
		75	0	22.81	22.45	22.47	23.50
	16QAM	1	0	22.91	22.56	22.82	23.50
		1	38	22.93	22.43	22.89	23.50
		1	74	22.49	22.45	22.71	23.50
		36	0	21.85	21.49	21.55	22.50
		36	18	21.73	21.40	21.62	22.50
		36	39	21.76	21.36	21.56	22.50
		75	0	21.83	21.40	21.45	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit
				133222/673	133322/683	133372/688	
20MHz	QPSK	1	0	23.37	23.70	23.02	24.50
		1	50	24.02	23.23	23.24	24.50
		1	99	23.05	23.40	24.15	24.50
		50	0	22.67	22.52	22.48	23.50
		50	25	22.73	22.48	22.06	23.50
		50	50	22.71	22.39	22.46	23.50
		100	0	22.78	22.40	22.43	23.50
	16QAM	1	0	22.57	22.52	22.77	23.50
		1	50	22.89	22.41	22.85	23.50
		1	99	22.47	22.42	22.69	23.50
		50	0	21.82	21.45	21.52	22.50
		50	25	21.70	21.38	21.59	22.50
		50	50	21.73	21.31	21.52	22.50
		100	0	21.81	21.36	21.42	22.50

9.4 WLAN Mode

Wi-Fi 2.4G Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
		Tune-up	Meas.	TP Set Level
802.11b (1M)	1/2412	18.50	18.19	18
	6/2437	18.50	18.37	19
	11/2462	18.50	17.63	18
802.11g (6M)	1/2412	18.00	17.68	18
	6/2437	18.00	17.05	18
	11/2462	18.00	17.12	18
802.11n-HT20 (MCS0)	1/2412	18.00	17.31	18
	6/2437	18.00	17.51	19
	11/2462	18.00	16.78	18
802.11n-HT40 (MCS0)	3/2422	18.50	17.96	19
	6/2437	18.50	17.94	19
	9/2452	18.50	17.26	18

Note: Initial test configuration is 802.11b mode.

Wi-Fi 5G (U-NII-1) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
		Tune-up	Meas.	TP Set Level
802.11a (6M)	36/5180	16.00	15.43	17
	40/5200	16.00	15.38	17
	48/5240	16.00	14.75	17
802.11n-HT20 (MCS0)	36/5180	16.00	15.18	17
	40/5200	16.00	15.34	17
	48/5240	16.00	14.63	17
802.11n-HT40 (MCS0)	38/5190	15.50	14.96	16
	46/5230	15.50	14.88	16
802.11ac-VHT20 (MCS0)	36/5180	14.50	13.94	15
	40/5200	14.50	13.85	15
	48/5240	14.50	13.81	15
802.11ac-VHT40 (MCS0)	38/5190	13.50	13.13	14
	46/5230	13.50	13.16	14
802.11ac-VHT80 (MCS0)	42/5210	13.50	12.02	14

Note: Initial test configuration is 802.11a mode, since the highest maximum output power.

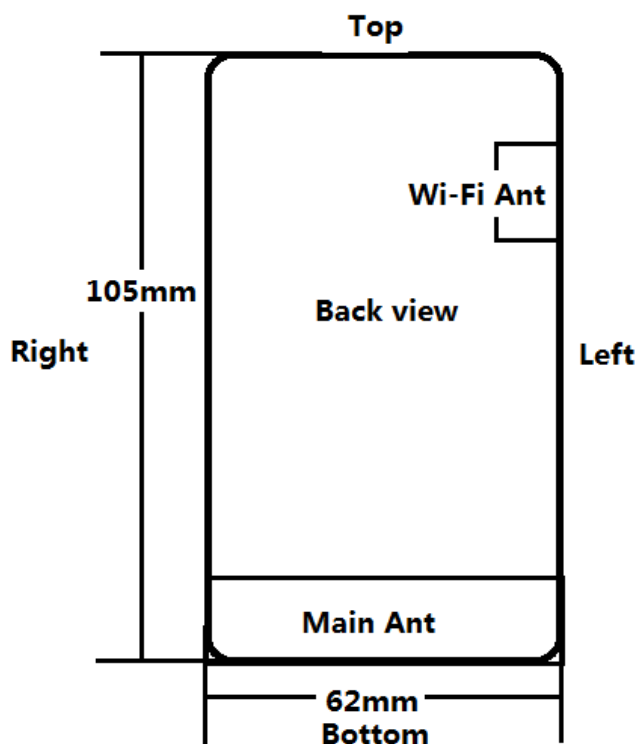


Wi-Fi 5G (U-NII-3) Mode	Channel /Frequency(MHz)	Maximum Output Power (dBm)		
		Tune-up	Meas.	TP Set Level
802.11a (6M)	149/5745	16.00	14.96	19
	157/5785	16.00	15.61	19
	165/5825	16.00	15.43	19
802.11n-HT20 (MCS0)	149/5745	16.50	14.92	19
	157/5785	16.50	15.53	19
	165/5825	16.50	15.62	19
802.11n-HT40 (MCS0)	151/5755	16.00	15.09	19
	159/5795	16.00	15.23	18
802.11ac-HT20 (MCS0)	149/5745	15.00	14.12	18
	157/5785	15.00	14.73	18
	165/5825	15.00	14.56	18
802.11ac-HT40 (MCS0)	151/5755	14.00	13.31	17
	159/5795	14.00	13.43	16
802.11ac-HT80 (MCS0)	155/5775	14.00	12.55	16

Note. Initial test configuration is 802.11n HT20 mode, since the highest maximum output power, the largest channel bandwidth, and lowest order.

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 105 mm x 62 mm

Distance of the Antenna to the EUT surface/edge

Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	<25mm	<25mm	<25mm	<25mm	>25mm	<25mm
BT/Wi-Fi Antenna	<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
Main-Antenna	Yes	Yes	Yes	Yes	NA	Yes
BT/Wi-Fi Antenna	Yes	Yes	Yes	NA	Yes	NA

Note: 1. Per KDB 941225 D06, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, 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 required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- $\leq 0.8 \text{ W/kg}$ or 2.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\leq 100\text{MHz}$
- $\leq 0.6 \text{ W/kg}$ or 1.5 W/kg , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- $\leq 0.4 \text{ W/kg}$ or 1.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\geq 200 \text{ MHz}$.

3. When the original highest measured SAR is $\geq 0.80 \text{ W/kg}$, the measurement was repeated once.

10.2 Measured SAR Results

Table 3: LTE Band 2 (20MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB alloc ation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	50	18700/1860	24.00	23.45	1.060	-0.030	1.14	1.203	/
	Standard	1:1	1	50	18900/1880	24.00	23.50	1.080	0.080	1.12	1.212	/
	Standard	1:1	1	0	19100/1900	24.00	23.40	1.090	0.180	1.15	1.251	8
Front Side	Standard	1:1	1	50	18700/1860	24.00	23.45	0.862	0.035	1.14	0.978	/
	Standard	1:1	1	50	18900/1880	24.00	23.50	0.930	-0.045	1.12	1.043	/
	Standard	1:1	1	0	19100/1900	24.00	23.40	0.917	-0.028	1.15	1.053	/
Left Edge	Standard	1:1	1	50	18900/1880	24.00	23.50	0.035	0.020	1.12	0.039	/
Right Edge	Standard	1:1	1	50	18900/1880	24.00	23.50	0.384	0.013	1.12	0.431	/
Top Edge	Standard	1:1	1	50	18900/1880	24.00	23.50	0.351	0.010	1.12	0.394	/
Bottom Edge	Standard	1:1	1	50	18900/1880	24.00	23.50	0.643	-0.030	1.12	0.721	/
Back Side	Standard	1:1	50%	50	18700/1860	23.00	21.96	0.721	0.102	1.27	0.916	/
	Standard	1:1	50%	50	18900/1880	23.00	21.98	0.694	0.064	1.26	0.878	/
	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.682	0.012	1.22	0.831	/
Front Side	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.549	-0.038	1.22	0.669	/
Left Edge	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.014	0.026	1.22	0.017	/
Right Edge	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.352	0.031	1.22	0.429	/
Top Edge	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.261	0.055	1.22	0.318	/
Bottom Edge	Standard	1:1	50%	50	19100/1900	23.00	22.14	0.432	0.104	1.22	0.527	/
Back Side	Standard	1:1	100%	0	18700/1860	23.00	21.87	0.735	-0.090	1.30	0.953	/
	Standard	1:1	100%	0	18900/1880	23.00	21.97	0.814	0.029	1.27	1.032	/
	Standard	1:1	100%	0	19100/1900	23.00	22.03	0.785	0.036	1.25	0.981	/
Back Side	Repeated	1:1	1	0	19100/1900	24.00	23.40	1.050	0.020	1.15	1.206	/
Note: 1.The value with blue color is the maximum SAR Value of each test band. 2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).												

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR _{1g} (W/kg)	1 st Repeated SAR _{1g} (W/kg)	Ratio
Back Side	19100/1900	1.090	1.050	1.038
Note: 1) A second repeated measurement was performed 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). 2) 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 .				



Table 4: LTE Band 4 (20MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB alloc ation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	50	20050/1720	24.00	23.78	0.673	0.024	1.05	0.708	/
Front Side	Standard	1:1	1	50	20050/1720	24.00	23.78	0.869	-0.062	1.05	0.914	/
	Standard	1:1	1	50	20175/1732.5	24.00	23.70	0.874	0.020	1.07	0.937	9
	Standard	1:1	1	50	20300/1745	24.00	23.72	0.852	0.014	1.07	0.909	/
Left Edge	Standard	1:1	1	50	20050/1720	24.00	23.78	0.072	0.085	1.05	0.076	/
Right Edge	Standard	1:1	1	50	20050/1720	24.00	23.78	0.282	0.015	1.05	0.297	/
Top Edge	Standard	1:1	1	50	20050/1720	24.00	23.78	0.355	0.021	1.05	0.373	/
Bottom Edge	Standard	1:1	1	50	20050/1720	24.00	23.78	0.478	0.031	1.05	0.503	/
Back Side	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.603	0.050	1.07	0.645	/
Front Side	Standard	1:1	50%	50	20050/1720	23.00	22.64	0.745	-0.083	1.09	0.809	/
	Standard	1:1	50%	50	20175/1732.5	23.00	22.56	0.773	0.019	1.11	0.855	/
	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.782	-0.099	1.07	0.836	/
Left Edge	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.051	0.010	1.07	0.055	/
Right Edge	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.286	0.035	1.07	0.306	/
Top Edge	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.259	0.037	1.07	0.277	/
Bottom Edge	Standard	1:1	50%	0	20300/1745	23.00	22.71	0.264	0.011	1.07	0.282	/
Front Side	Standard	1:1	100%	0	20300/1745	23.00	22.66	0.727	0.052	1.08	0.786	/
Front Side	Repeated	1:1	1	50	20175/1732.5	24.00	23.70	0.865	-0.031	1.07	0.927	/

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

2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are \geq 50% limit(1g).

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR _{1g} (W/kg)	1 st Repeated SAR _{1g} (W/kg)	Ratio
Front Side	20175/1732.5	0.874	0.865	1.010

Note: 1) A second repeated measurement was performed 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 ($\sim 10\%$ from the 1-g SAR limit).

2) 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 .



Table 5: LTE Band 5 (10MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB alloc ation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	25	20450/829	24.50	23.96	0.853	0.028	1.13	0.966	/
	Standard	1:1	1	25	20525/836.5	24.50	24.09	0.885	0.023	1.10	0.973	/
	Standard	1:1	1	25	20600/844	24.50	24.28	0.932	0.140	1.05	0.980	10
Front Side	Standard	1:1	1	25	20600/844	24.50	24.28	0.738	0.015	1.05	0.776	/
Left Edge	Standard	1:1	1	25	20600/844	24.50	24.28	0.010	0.099	1.05	0.011	/
Right Edge	Standard	1:1	1	25	20600/844	24.50	24.28	0.181	-0.030	1.05	0.190	/
Top Edge	Standard	1:1	1	25	20600/844	24.50	24.28	0.368	0.021	1.05	0.387	/
Bottom Edge	Standard	1:1	1	25	20600/844	24.50	24.28	0.340	0.019	1.05	0.358	/
Back Side	Standard	1:1	50%	0	20450/829	23.50	22.98	0.672	0.020	1.13	0.757	/
Front Side	Standard	1:1	50%	0	20450/829	23.50	22.98	0.672	0.034	1.13	0.757	/
Left Edge	Standard	1:1	50%	0	20450/829	23.50	22.98	0.009	0.028	1.13	0.010	/
Right Edge	Standard	1:1	50%	0	20450/829	23.50	22.98	0.148	-0.010	1.13	0.167	/
Top Edge	Standard	1:1	50%	0	20450/829	23.50	22.98	0.302	0.033	1.13	0.340	/
Bottom Edge	Standard	1:1	50%	0	20450/829	23.50	22.98	0.270	0.016	1.13	0.304	/
Back Side	Standard	1:1	100%	0	20525/836.5	23.50	22.95	0.702	-0.035	1.14	0.797	/
Back Side	Repeated	1:1	1	25	20600/844	24.50	24.28	0.930	0.108	1.05	0.978	/
Note: 1.The value with blue color is the maximum SAR Value of each test band. 2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are ≥ 50% limit(1g).												

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR _{1g} (W/kg)	1 st Repeated SAR _{1g} (W/kg)	Ratio
Back Side	20600/844	0.932	0.930	1.002
Note: 1) A second repeated measurement was performed 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 ($\sim 10\%$ from the 1-g SAR limit). 2) 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 .				



Table 6: LTE Band 12 (10MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB alloc ation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	49	23060/704	24.50	23.78	0.838	0.020	1.18	0.989	/
	Standard	1:1	1	25	23095/707.5	24.50	24.01	0.855	-0.061	1.12	0.957	11
	Standard	1:1	1	25	23130/711	24.50	24.22	0.701	0.130	1.07	0.748	/
Front Side	Standard	1:1	1	49	23060/704	24.50	23.78	0.765	-0.010	1.18	0.903	/
	Standard	1:1	1	25	23095/707.5	24.50	24.01	0.742	0.026	1.12	0.831	/
	Standard	1:1	1	25	23130/711	24.50	24.22	0.844	0.011	1.07	0.900	/
Left Edge	Standard	1:1	1	25	23130/711	24.50	24.22	0.069	0.105	1.07	0.074	/
Right Edge	Standard	1:1	1	25	23130/711	24.50	24.22	0.124	0.028	1.07	0.132	/
Top Edge	Standard	1:1	1	25	23130/711	24.50	24.22	0.231	0.033	1.07	0.246	/
Bottom Edge	Standard	1:1	1	25	23130/711	24.50	24.22	0.193	0.015	1.07	0.206	/
Back Side	Standard	1:1	50%	25	23130/711	23.50	23.05	0.687	0.027	1.11	0.762	/
Front Side	Standard	1:1	50%	25	23130/711	23.50	23.05	0.671	0.034	1.11	0.744	/
Left Edge	Standard	1:1	50%	25	23130/711	23.50	23.05	0.013	0.022	1.11	0.014	/
Right Edge	Standard	1:1	50%	25	23130/711	23.50	23.05	0.081	-0.010	1.11	0.090	/
Top Edge	Standard	1:1	50%	25	23130/711	23.50	23.05	0.217	0.024	1.11	0.241	/
Bottom Edge	Standard	1:1	50%	25	23130/711	23.50	23.05	0.167	0.085	1.11	0.185	/
Back Side	Standard	1:1	100%	0	23130/711	23.50	23.04	0.715	0.038	1.11	0.795	/
Back Side	Repeated	1:1	1	49	23060/704	24.50	23.78	0.829	0.023	1.18	0.978	/

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

2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are \geq 50% limit(1g).

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR _{1g} (W/kg)	1 st Repeated SAR _{1g} (W/kg)	Ratio
Back Side	23060/704	0.855	0.829	1.031

Note: 1) A second repeated measurement was performed 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 ($\sim 10\%$ from the 1-g SAR limit).

2) 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 .



Table 7: LTE Band 66 (20MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB allocation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	50	132072/1720	24.00	23.30	0.812	0.030	1.17	0.954	/
	Standard	1:1	1	0	132322/1745	24.00	23.56	0.783	0.024	1.11	0.866	/
	Standard	1:1	1	50	132572/1770	24.00	23.57	0.804	0.099	1.10	0.888	/
Front Side	Standard	1:1	1	50	132072/1720	24.00	23.30	0.972	-0.022	1.17	1.142	/
	Standard	1:1	1	0	132322/1745	24.00	23.56	1.100	-0.030	1.11	1.217	12
	Standard	1:1	1	50	132572/1770	24.00	23.57	0.970	-0.090	1.10	1.071	/
Left Edge	Standard	1:1	1	50	132572/1770	24.00	23.57	0.105	0.032	1.10	0.116	/
Right Edge	Standard	1:1	1	50	132572/1770	24.00	23.57	0.428	0.060	1.10	0.473	/
Top Edge	Standard	1:1	1	50	132572/1770	24.00	23.57	0.395	0.014	1.10	0.436	/
Bottom Edge	Standard	1:1	1	50	132572/1770	24.00	23.57	0.492	-0.080	1.10	0.543	/
Back Side	Standard	1:1	50%	50	132072/1720	23.00	22.13	0.752	0.110	1.22	0.919	/
	Standard	1:1	50%	0	132322/1745	23.00	22.24	0.786	0.032	1.19	0.936	/
	Standard	1:1	50%	0	132572/1770	23.00	22.13	0.789	-0.064	1.22	0.964	/
Front Side	Standard	1:1	50%	50	132072/1720	23.00	22.13	0.775	-0.062	1.22	0.947	/
	Standard	1:1	50%	0	132322/1745	23.00	22.24	0.793	0.051	1.19	0.945	/
	Standard	1:1	50%	0	132572/1770	23.00	22.13	0.762	0.013	1.22	0.931	/
Left Edge	Standard	1:1	50%	0	132572/1770	23.00	22.24	0.045	0.017	1.19	0.054	/
Right Edge	Standard	1:1	50%	0	132572/1770	23.00	22.24	0.389	0.024	1.19	0.463	/
Top Edge	Standard	1:1	50%	0	132572/1770	23.00	22.24	0.314	-0.022	1.19	0.374	/
Bottom Edge	Standard	1:1	50%	0	132572/1770	23.00	22.24	0.428	0.037	1.19	0.510	/
Front Side	Standard	1:1	100%	0	132072/1720	23.00	22.10	0.724	0.065	1.23	0.891	/
	Standard	1:1	100%	0	132322/1745	23.00	22.09	0.695	0.082	1.23	0.857	/
	Standard	1:1	100%	0	132572/1770	23.00	22.46	0.782	0.012	1.13	0.886	/
Front Side	Repeated	1:1	1	0	132322/1745	24.00	23.56	1.060	0.035	1.11	1.173	/

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

2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are \geq 50% limit(1g).

Measurement Variability

Test Position	Channel/ Frequency(MHz)	MAX Measured SAR _{1g} (W/kg)	1 st Repeated SAR _{1g} (W/kg)	Ratio
Front Side	132322/1745	1.100	1.060	1.038

Note: 1) A second repeated measurement was performed 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 ($\sim 10\%$ from the 1-g SAR limit).

2) 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 .

Table 8: LTE Band 71 (20MHz, Main-antenna)

Test Position	Cover Type	Duty Cycle	RB alloc ation	RB offset	Channel/ Frequency (MHz)	Tune-up (dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
								Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR1g	
Hotspot SAR(QPSK, Distance 10mm)												
Back Side	Standard	1:1	1	50	133222/673	24.50	24.02	0.287	-0.170	1.12	0.321	/
	Standard	1:1	1	0	133322/683	24.50	23.70	0.295	-0.036	1.20	0.355	/
	Standard	1:1	1	99	133372/688	24.50	24.15	0.386	-0.150	1.08	0.418	13
Front Side	Standard	1:1	1	99	133372/688	24.50	24.15	0.272	0.160	1.08	0.295	/
Left Edge	Standard	1:1	1	50	133372/688	24.50	24.15	0.005	0.021	1.08	0.005	/
Right Edge	Standard	1:1	1	99	133372/688	24.50	24.15	0.095	0.039	1.08	0.103	/
Top Edge	Standard	1:1	1	99	133372/688	24.50	24.15	0.193	0.011	1.08	0.209	/
Bottom Edge	Standard	1:1	1	99	133372/688	24.50	24.15	0.204	-0.040	1.08	0.221	/
Back Side	Standard	1:1	50%	25	133222/673	23.50	22.73	0.250	0.100	1.19	0.298	/
Front Side	Standard	1:1	50%	25	133222/673	23.50	22.73	0.249	0.023	1.19	0.297	/
Left Edge	Standard	1:1	50%	25	133222/673	23.50	22.73	0.008	0.018	1.19	0.010	/
Right Edge	Standard	1:1	50%	25	133222/673	23.50	22.73	0.077	0.035	1.19	0.092	/
Top Edge	Standard	1:1	50%	25	133222/673	23.50	22.73	0.132	0.010	1.19	0.158	/
Bottom Edge	Standard	1:1	50%	25	133222/673	23.50	22.73	0.139	0.069	1.19	0.166	/
Note: 1.The value with blue color is the maximum SAR Value of each test band. 2.For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are≥ 50% limit(1g).												



Table 9: Wi-Fi (2.4G)

Test Position	Cover Type	Mode 802.11b	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Hotspot SAR(Distance 10mm)											
Back Side	standard	DSSS	99.0%	6/2437	18.50	18.37	0.320	-0.021	1.04	0.333	/
Front Side	standard	DSSS	99.0%	6/2437	18.50	18.37	0.331	-0.030	1.04	0.345	/
Left Edge	standard	DSSS	99.0%	6/2437	18.50	18.37	0.184	0.160	1.04	0.192	/
Right Edge	standard	DSSS	99.0%	6/2437	18.50	18.37	0.058	-0.140	1.04	0.060	/
Top Edge	standard	DSSS	99.0%	6/2437	18.50	18.37	0.461	-0.100	1.04	0.480	14
Bottom Edge	standard	DSSS	99.0%	6/2437	18.50	18.37	0.017	0.090	1.04	0.017	/

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

MAX Adjusted SAR							
Mode	Test Position	Channel/Frequency (MHz)	MAX Reported SAR _{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR _{1g} (W/kg)
802.11g	Top Edge	6/2437	0.480	18.50	18.00	0.89	0.428
802.11n HT20	Top Edge	6/2437	0.480	18.50	18.00	0.89	0.428
802.11n HT40	Top Edge	6/2437	0.480	18.50	18.50	1.00	0.480

Note: SAR is not required for OFDM when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

**Table 10: Wi-Fi (5G,U-NII-1)**

Test Position	Cover Type	Mode 802.11a	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Hotspot SAR(Distance 10mm)											
Back Side	standard	OFDM	92.0%	36/5180	16.00	15.43	0.162	-0.099	1.24	0.201	/
Front Side	standard	OFDM	92.0%	36/5180	16.00	15.43	0.300	0.170	1.24	0.372	/
Left Edge	standard	OFDM	92.0%	36/5180	16.00	15.43	0.046	0.022	1.24	0.057	/
Right Edge	standard	OFDM	92.0%	36/5180	16.00	15.43	0.012	0.019	1.24	0.015	/
Top Edge	standard	OFDM	92.0%	36/5180	16.00	15.43	0.437	-0.121	1.24	0.542	15
Bottom Edge	standard	OFDM	92.0%	36/5180	16.00	15.43	0.016	0.040	1.24	0.020	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											



Table 11: Wi-Fi (5G,U-NII-3)

Test Position	Cover Type	Mode 802.11n HT20	Duty Cycle	Channel/ Frequency (MHz)	Tune-up dBm)	Measured power (dBm)	Limit of SAR 1.6 W/kg (mW/g)				Plot No.
							Measured SAR1g	Power Drift (dB)	Scaling Factor	Report SAR 1g	
Hotspot SAR(Distance 10mm)											
Back Side	standard	OFDM	95.0%	165/5825	16.50	15.62	0.158	0.099	1.29	0.204	/
Front Side	standard	OFDM	95.0%	165/5825	16.50	15.62	0.163	0.038	1.29	0.210	/
Left Edge	standard	OFDM	95.0%	165/5825	16.50	15.62	0.032	0.010	1.29	0.041	/
Right Edge	standard	OFDM	95.0%	165/5825	16.50	15.62	0.009	0.099	1.29	0.012	/
Top Edge	standard	OFDM	95.0%	165/5825	16.50	15.62	0.395	-0.142	1.29	0.509	16
Bottom Edge	standard	OFDM	95.0%	165/5825	16.50	15.62	0.005	0.027	1.29	0.006	/
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	N/A

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 $< 1.6\text{W/kg}$, simultaneously transmission SAR measurement is not necessary.
 - ii) $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$, 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 $\text{SPLSR} \leq 0.04$, simultaneously transmission SAR measurement is not necessary.

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

SAR _{1g} (W/kg)		LTE FDD	LTE FDD	LTE FDD	LTE FDD	LTE FDD	LTE FDD	MAX.
Test Position		2	4	5	12	66	71	SAR _{1g}
Hotspot	Back Side	1.251	0.708	0.980	0.989	0.964	0.418	1.251
	Front Side	1.053	0.937	0.776	0.903	1.217	0.297	1.217
	Left Edge	0.039	0.076	0.011	0.074	0.116	0.010	0.116
	Right Edge	0.431	0.306	0.190	0.132	0.473	0.103	0.473
	Top Edge	0.394	0.373	0.387	0.246	0.436	0.209	0.436
	Bottom Edge	0.721	0.503	0.358	0.206	0.543	0.221	0.721

About Wi-Fi and Main-Antenna

SAR _{1g} (W/kg)		Main- antenna	Wi-Fi 2.4G	Wi-Fi (U-NII-1)	Wi-Fi (U-NII-3)	MAX. ΣSAR _{1g}
Test Position						
Hotspot	Back Side	1.251	0.333	0.201	0.204	1.584
	Front Side	1.217	0.345	0.372	0.210	1.589
	Left Edge	0.116	0.192	0.057	0.041	0.308
	Right Edge	0.473	0.060	0.015	0.012	0.533
	Top Edge	0.436	0.480	0.542	0.509	0.978
	Bottom Edge	0.721	0.017	0.020	0.006	0.741

Note: 1. The value with blue color is the maximum ΣSAR_{1g} Value.
2. MAX. ΣSAR_{1g} = Unlicensed SAR_{MAX} + Licensed SAR_{MAX}

MAX. ΣSAR_{1g} = 1.589W/kg < 1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-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 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 750 MHz TSL

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3

Date: 7/13/2020

Communication System: CW (0); Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.88 \text{ S/m}$; $\epsilon_r = 42.3$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.78, 9.78, 9.78); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

d=15mm, Pin=250mW/Area Scan (4x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.29 W/kg

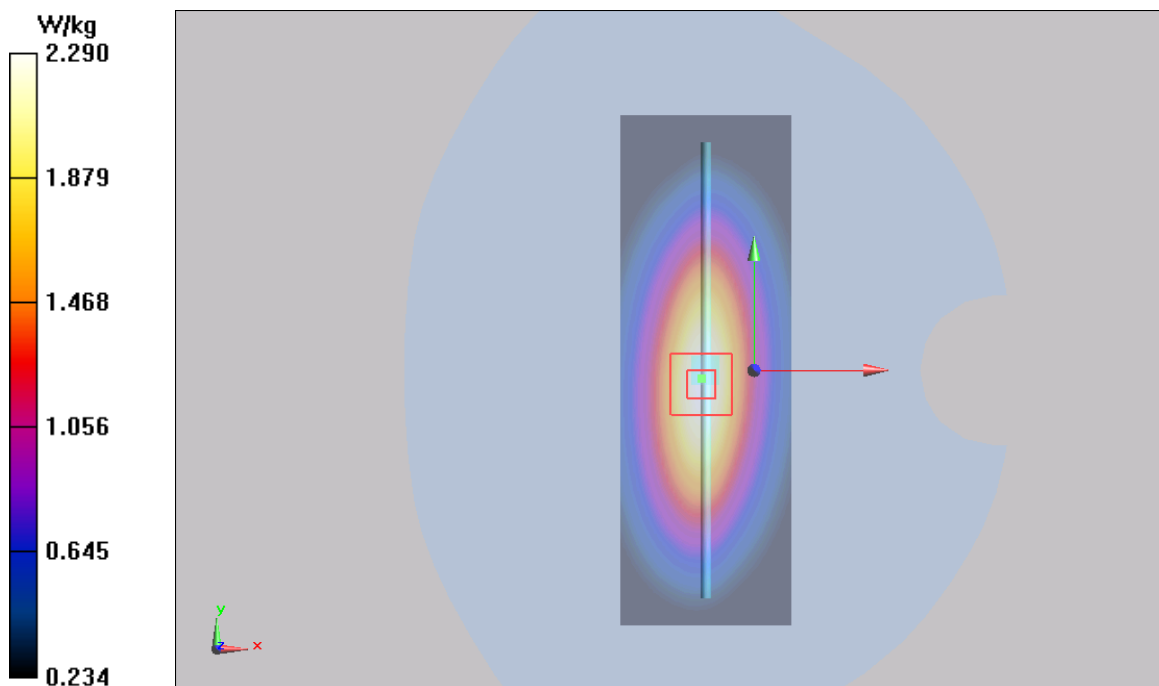
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 50.653 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.16 W/kg

SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.29 W/kg



Plot 2 System Performance Check at 835 MHz TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2

Date: 7/9/2020

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

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.88 \text{ S/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.38, 9.38, 9.38); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

d=15mm, Pin=250mW/Area Scan (4x12x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 2.64 mW/g

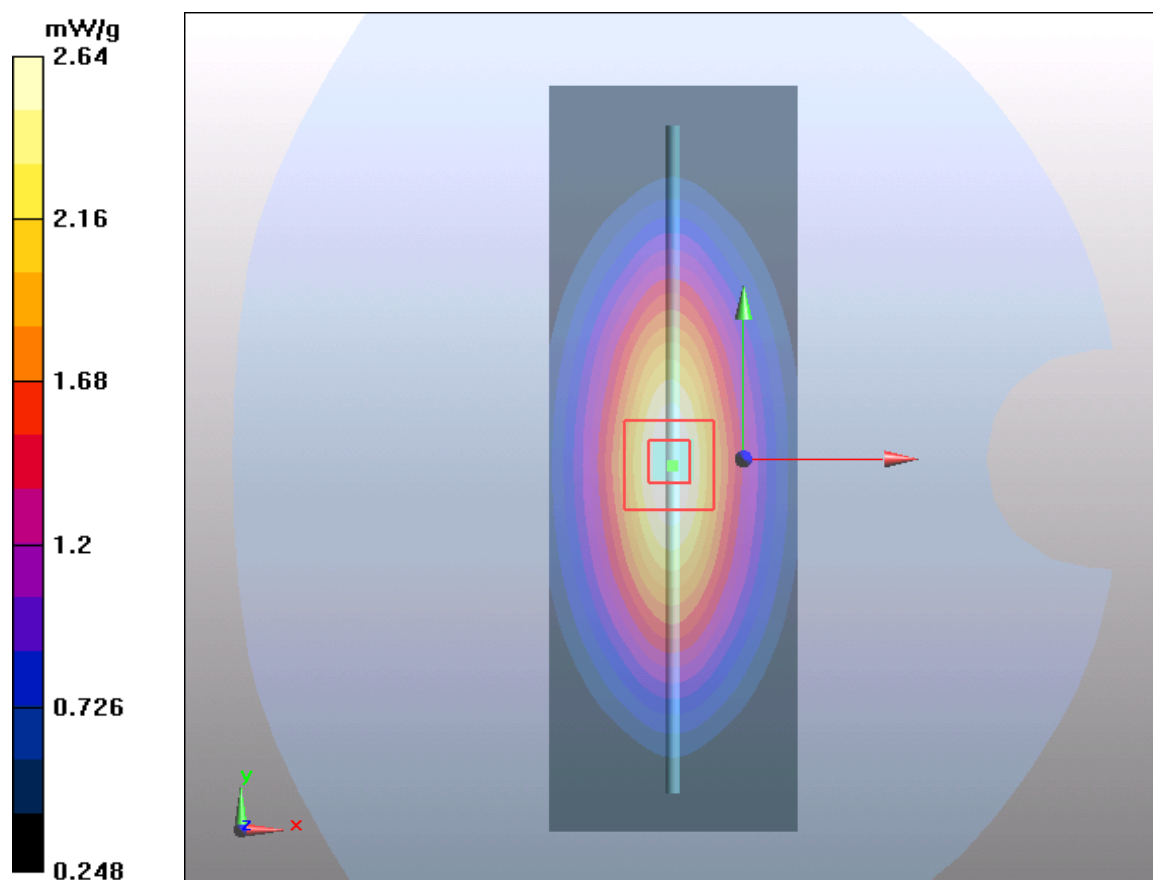
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.4 V/m ; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.44 mW/g ; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.64 mW/g



Plot 3 System Performance Check at 1750 MHz TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2

Date: 7/10/2020

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

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 40.2$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(8.25, 8.25, 8.25); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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 (5x8x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 9.78 mW/g

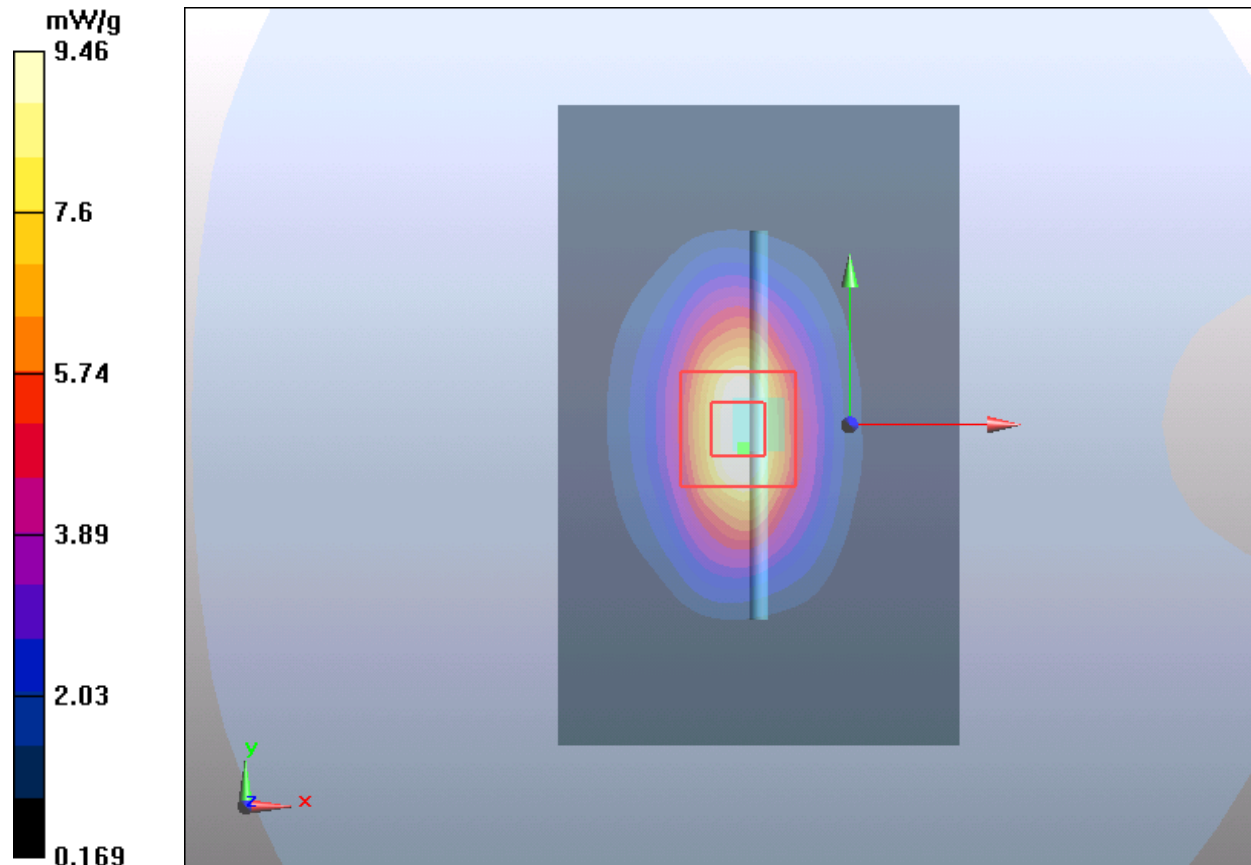
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 80 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 8.95 mW/g; SAR(10 g) = 4.5 mW/g

Maximum value of SAR (measured) = 9.46 mW/g



Plot 4 System Performance Check at 1900 MHz TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2

Date: 7/7/2020

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.41$ S/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.90, 7.90, 7.90); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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=15mm, dy=15mm

Maximum value of SAR (measured) = 11.3 mW/g

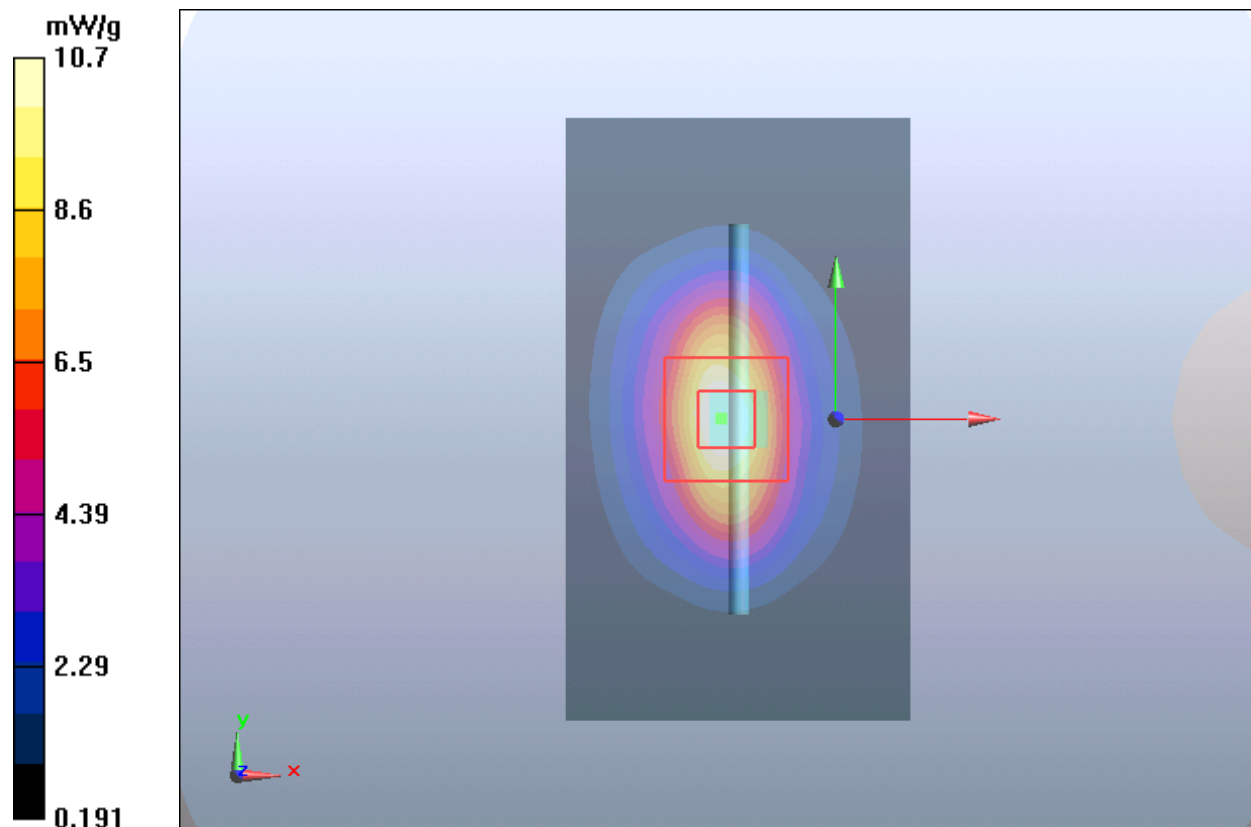
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.88 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



Plot 5 System Performance Check at 2450 MHz TSL

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

Date: 7/12/2020

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.81$ S/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C

Liquid Temperature: 21.5 °C

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: 10/23/2019

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

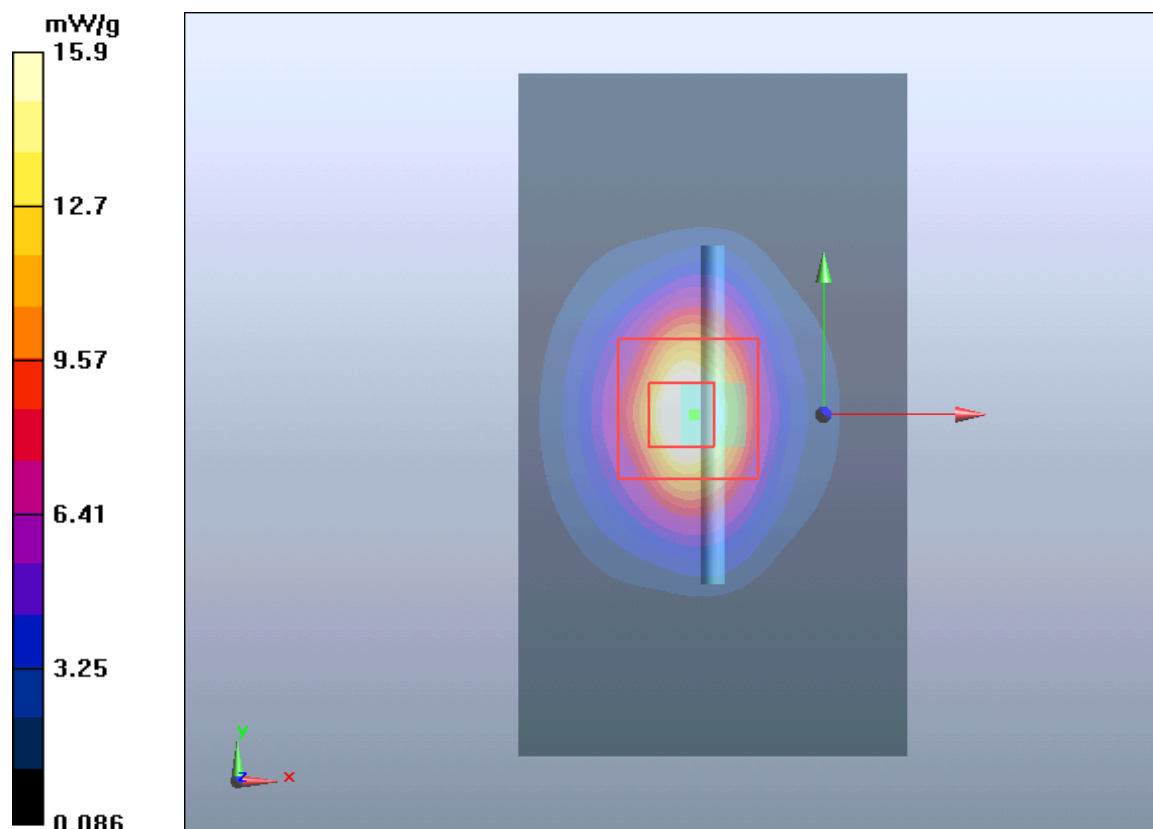
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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 6 System Performance Check at 5250 MHz TSL

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

Date: 7/11/2020

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

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.80$ S/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

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: 10/23/2019

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

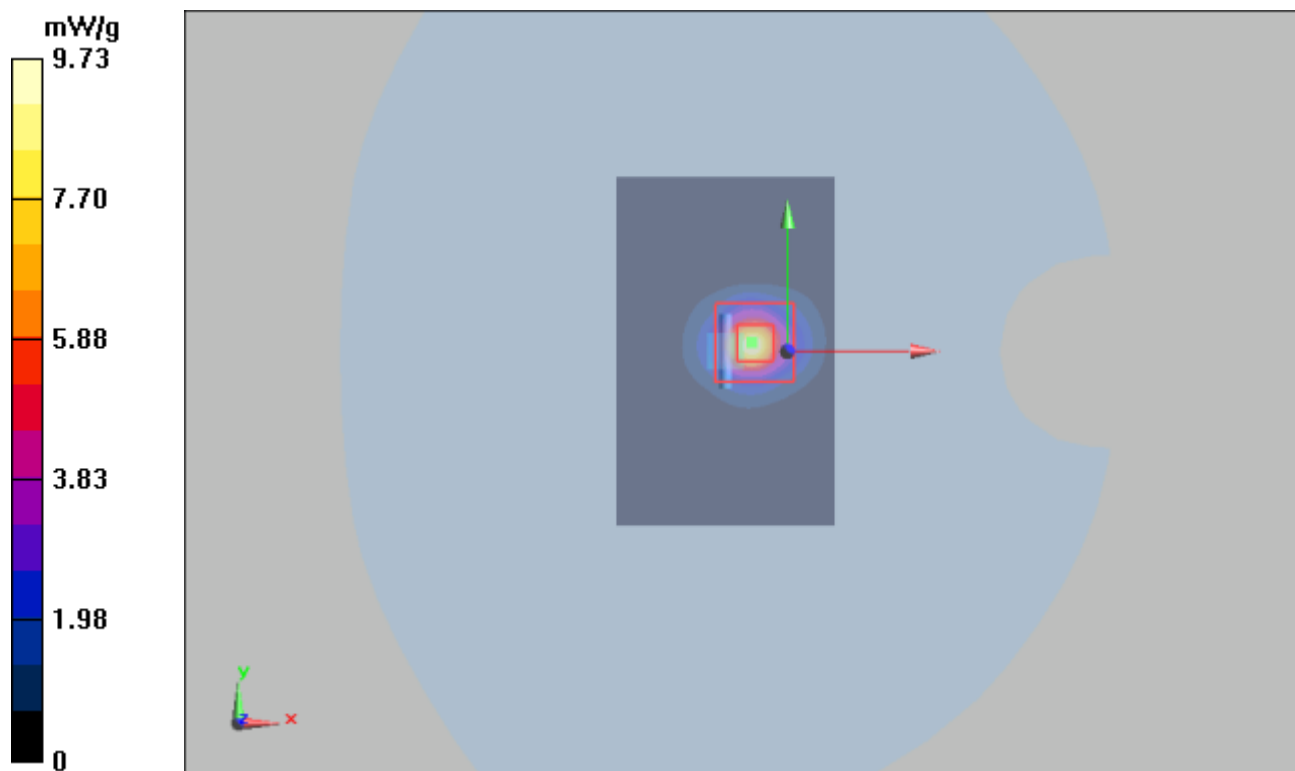
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

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 7 System Performance Check at 5750 MHz TSL

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

Date: 7/11/2020

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

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.21$ S/m; $\epsilon_r = 34.9$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

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: 10/23/2019

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

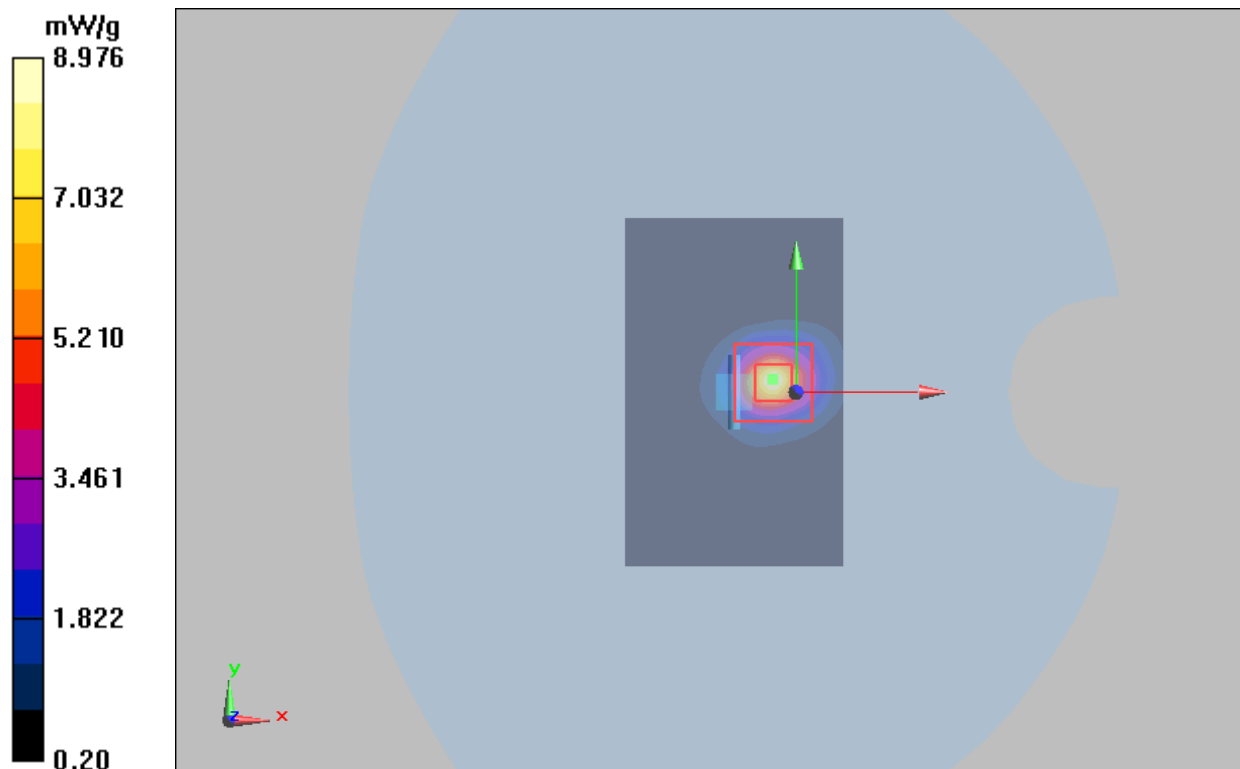
d=10mm, Pin=100mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

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 8 LTE B2 1RB Back Side High(Distance 10mm)

Date: 7/7/2020

Communication System: UID 0, LTE (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.434$ S/m; $\epsilon_r = 38.861$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.90, 7.90, 7.90); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Back Side High/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.13 W/kg

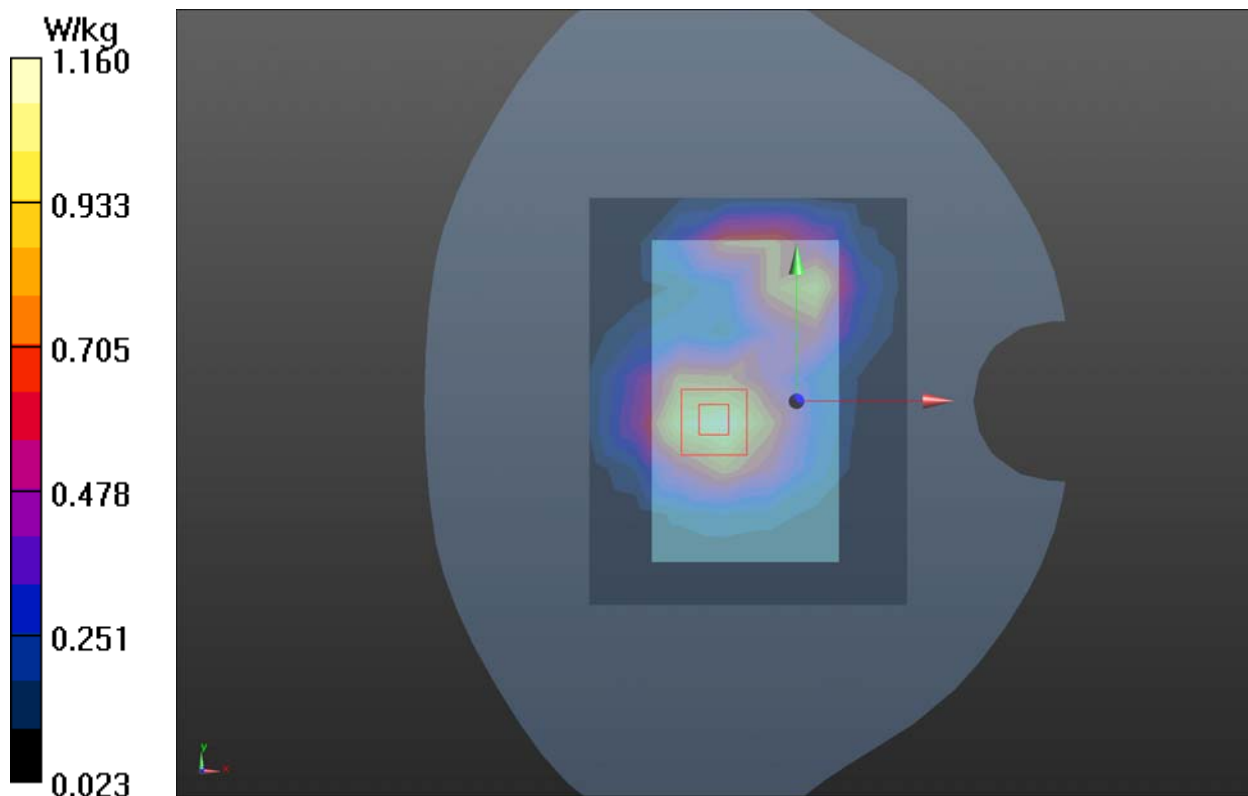
Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.00 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1g) = 1.09 W/kg; SAR(10g) = 0.676 W/kg

Maximum value of SAR (measured) = 1.16 W/kg



Plot 9 LTE B4 1RB Front Side Middle (Distance 10mm)

Date: 7/10/2020

Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.313$ S/m; $\epsilon_r = 39.384$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(8.25, 8.25, 8.25); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Front Side Middle/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.915 W/kg

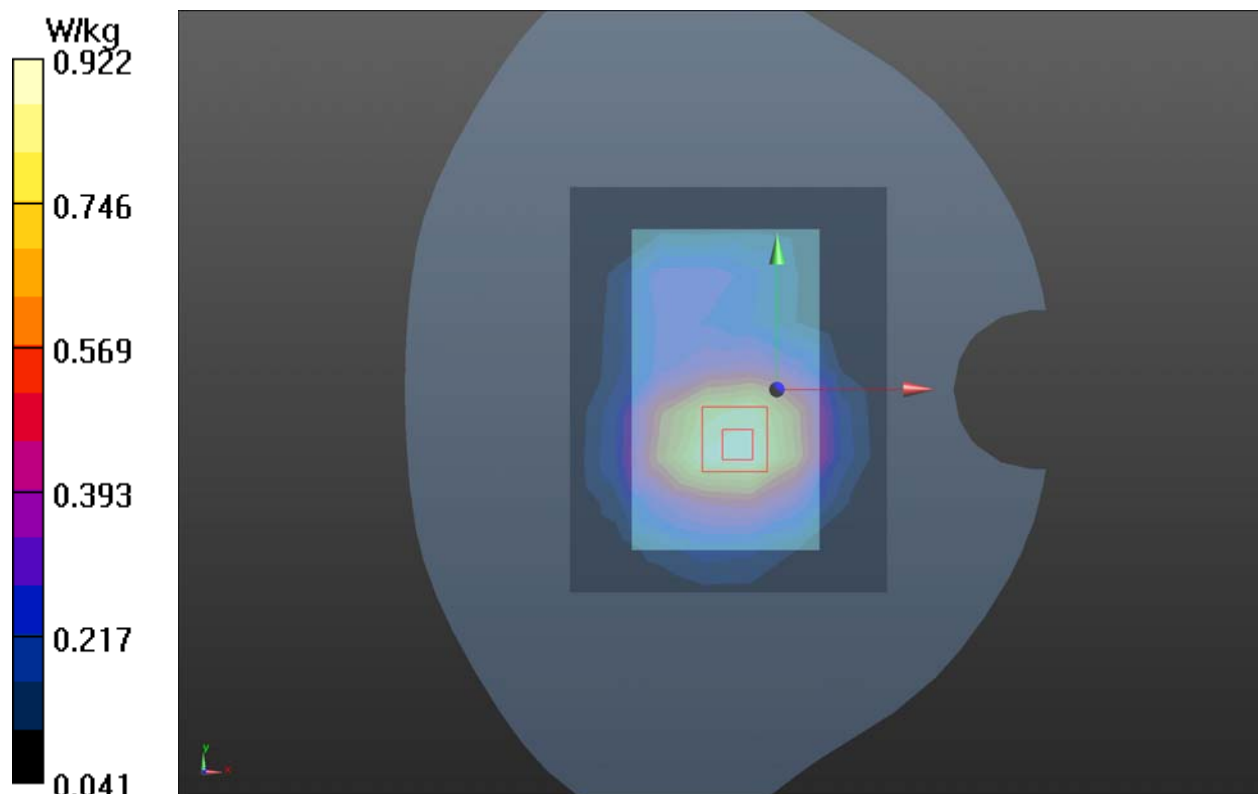
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.28 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1g) = 0.874 W/kg; SAR(10g) = 0.588 W/kg

Maximum value of SAR (measured) = 0.922 W/kg



Plot 10 LTE B5 1RB Back Side High (Distance 10mm)

Date: 7/9/2020

Communication System: UID 0, LTE (0); Frequency: 844 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 844 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 42.206$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.38, 9.38, 9.38); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Back Side High/Area Scan (8x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.933 W/kg

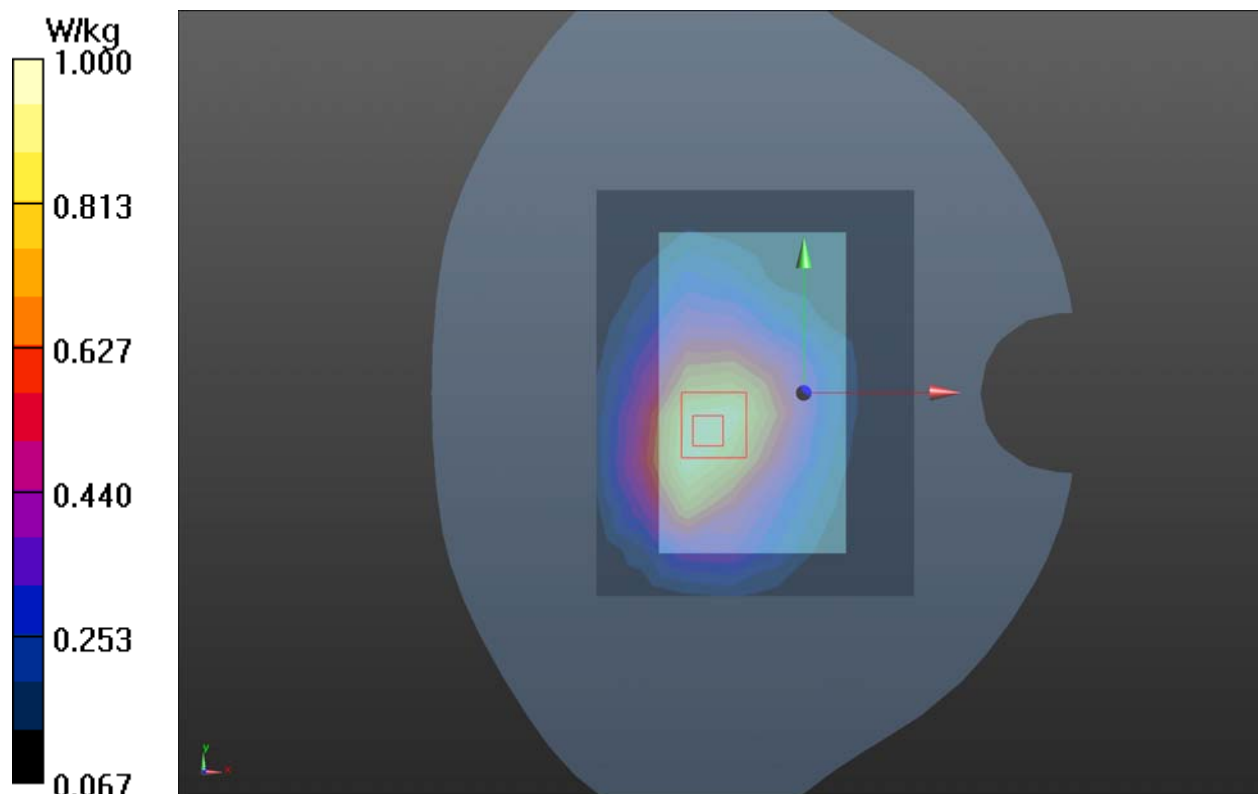
Back Side High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 28.67 V/m ; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1g) = 0.932 W/kg ; SAR(10g) = 0.636 W/kg

Maximum value of SAR (measured) = 1.00 W/kg



Plot 11 LTE Band 12 1RB Back Side Middle (Distance 10mm)

Date: 7/13/2020

Communication System: UID 0, LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 707.5$ MHz; $\sigma = 0.848$ S/m; $\epsilon_r = 42.763$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.78, 9.78, 9.78); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Back Side Middle/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.985 W/kg

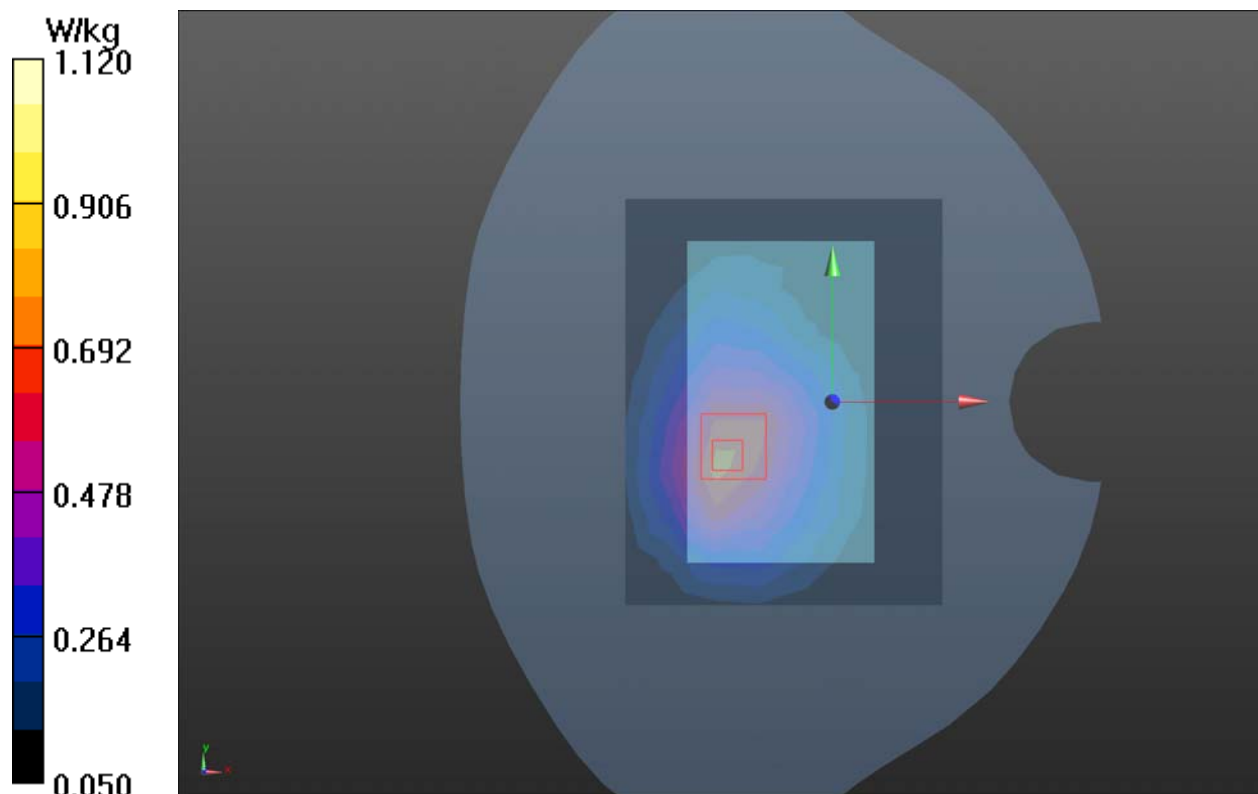
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.21 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 1.57 W/kg

SAR(1g) = 0.855 W/kg; SAR(10g) = 0.659 W/kg

Maximum value of SAR (measured) = 1.12 W/kg



Plot 12 LTE Band 66 1RB Front Side Middle(Distance 10mm)

Date: 7/10/2020

Communication System: UID 0, LTE (0); Frequency: 1745 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1745$ MHz; $\sigma = 1.323$ S/m; $\epsilon_r = 39.378$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(8.25, 8.25, 8.25); Calibrated: 7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Front Side Middle/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.11 W/kg

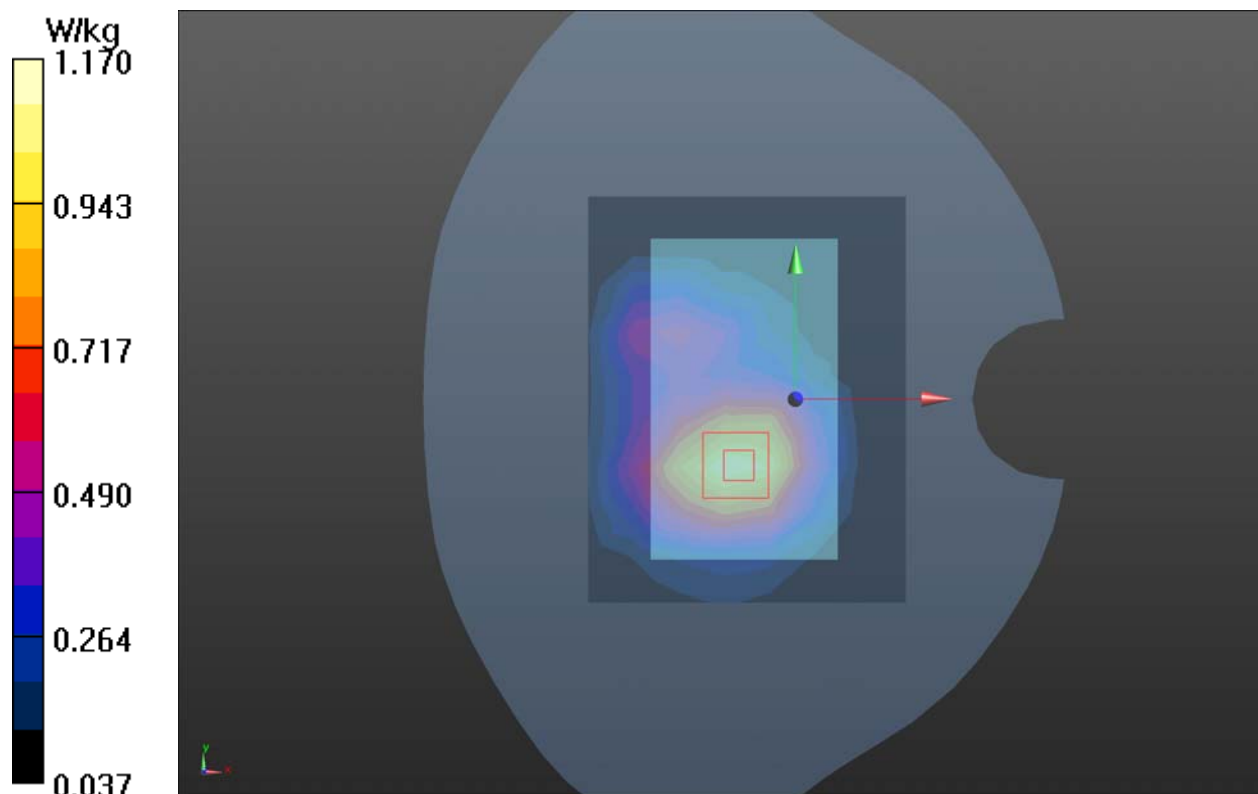
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.59 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1g) = 1.1 W/kg; SAR(10g) = 0.718 W/kg

Maximum value of SAR (measured) = 1.17 W/kg



Plot 13 LTE Band 71 1RB Front Side Low(Distance 10mm)

Date: 7/13/2020

Communication System: UID 0, LTE (0); Frequency: 688 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 688 \text{ MHz}$; $\sigma = 0.836 \text{ S/m}$; $\epsilon_r = 42.863$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.78, 9.78, 9.78); Calibrated:7/6/2020;

Electronics: DAE4 SN1317; Calibrated: 10/23/2019

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

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

Front Side Low/Area Scan (8x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.400 W/kg

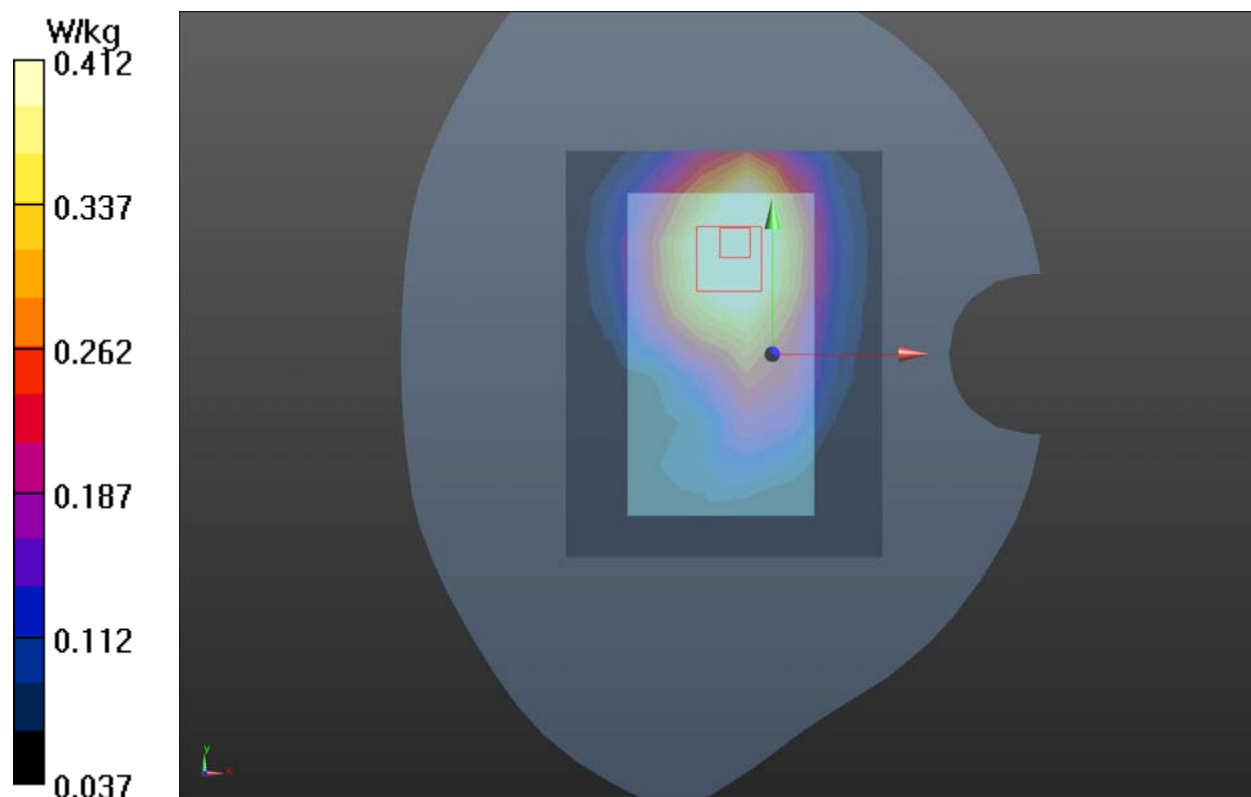
Front Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.25 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.649 W/kg

SAR(1 g) = 0.386 W/kg; SAR(10 g) = 0.168 W/kg

Maximum value of SAR (measured) = 0.412 W/kg



Plot 14 802.11b Top Edge Middle (Distance 10mm)

Date: 7/12/2020

Communication System: UID 0, 802.11b (0); Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.791$ S/m; $\epsilon_r = 39.401$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

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: 10/23/2019

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

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

Top Edge Middle/Area Scan (5x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.281 W/kg

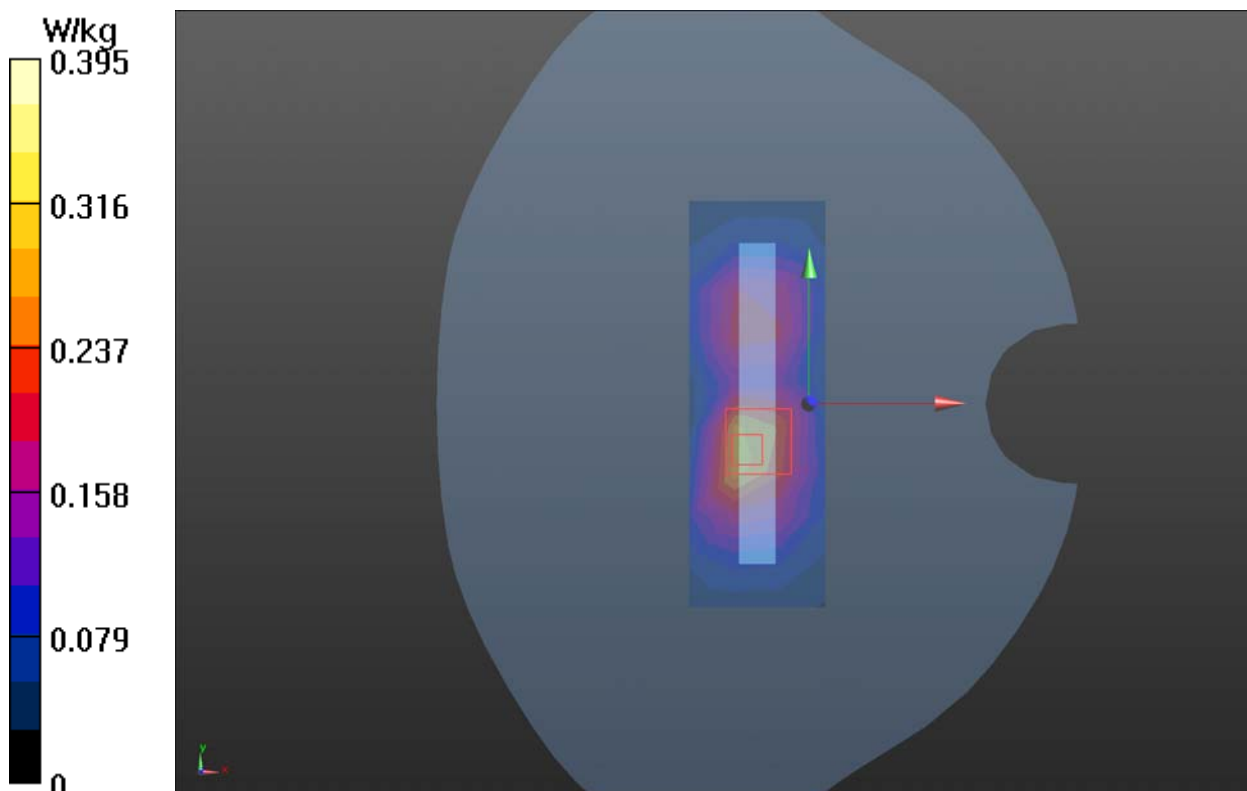
Top Edge Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 11.45 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.461 W/kg; SAR(10 g) = 0.184 W/kg

Maximum value of SAR (measured) = 0.395 W/kg



Plot 15 802.11a U-NII-1 Top Edge Low (Distance 10mm)

Date: 7/11/2020

Communication System: UID 0, 802.11a (0); Frequency: 5180 MHz;Duty Cycle: 1:1

Medium parameters used: $f = 5180$ MHz; $\sigma = 4.75$ S/m; $\epsilon_r = 36.766$; $\rho = 1000$ kg/m³

Ambient Temperature:22.3 °C Liquid Temperature: 21.5°C

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: 10/23/2019

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

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

Top Edge Low/Area Scan (6x15x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.353 W/kg

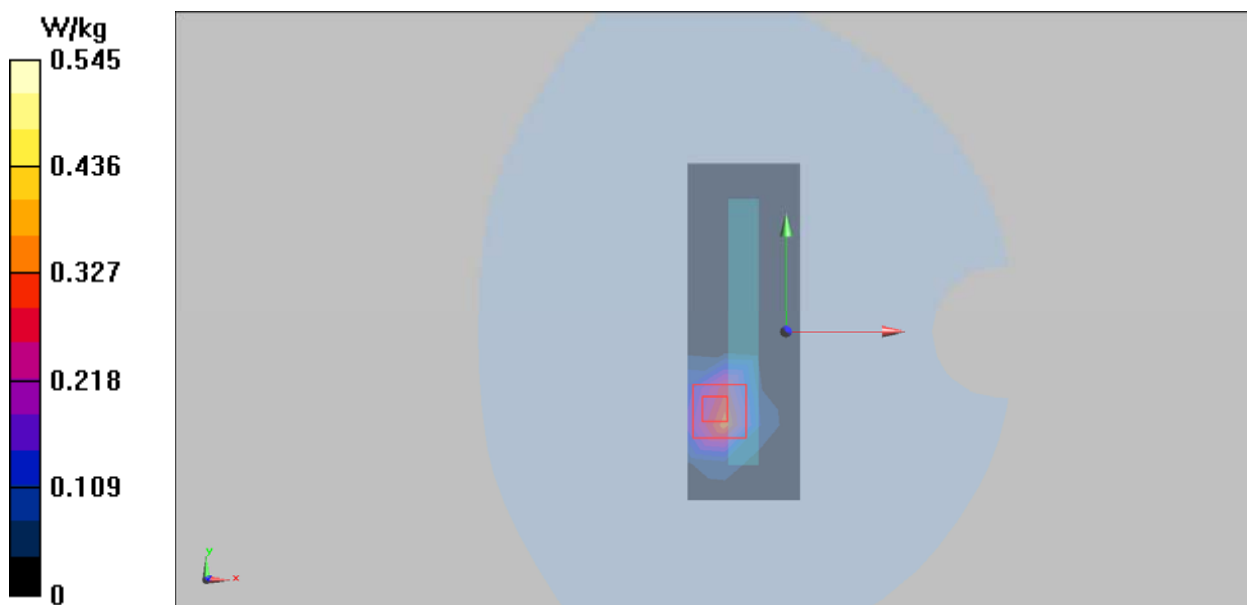
Top Edge Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.623 V/m; Power Drift = -0.121 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.437 W/kg; SAR(10 g) = 0.144 W/kg

Maximum value of SAR (measured) = 0.545 W/kg



Plot 16 802.11nHT20 U-NII-3 Top Edge High (Distance 10mm)

Date: 7/11/2020

Communication System: UID 0, 802.11a (0); Frequency: 5825 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 5180$ MHz; $\sigma = 4.75$ S/m; $\epsilon_r = 36.766$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

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: 10/23/2019

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

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

Top Edge High/Area Scan (6x15x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.466 W/kg

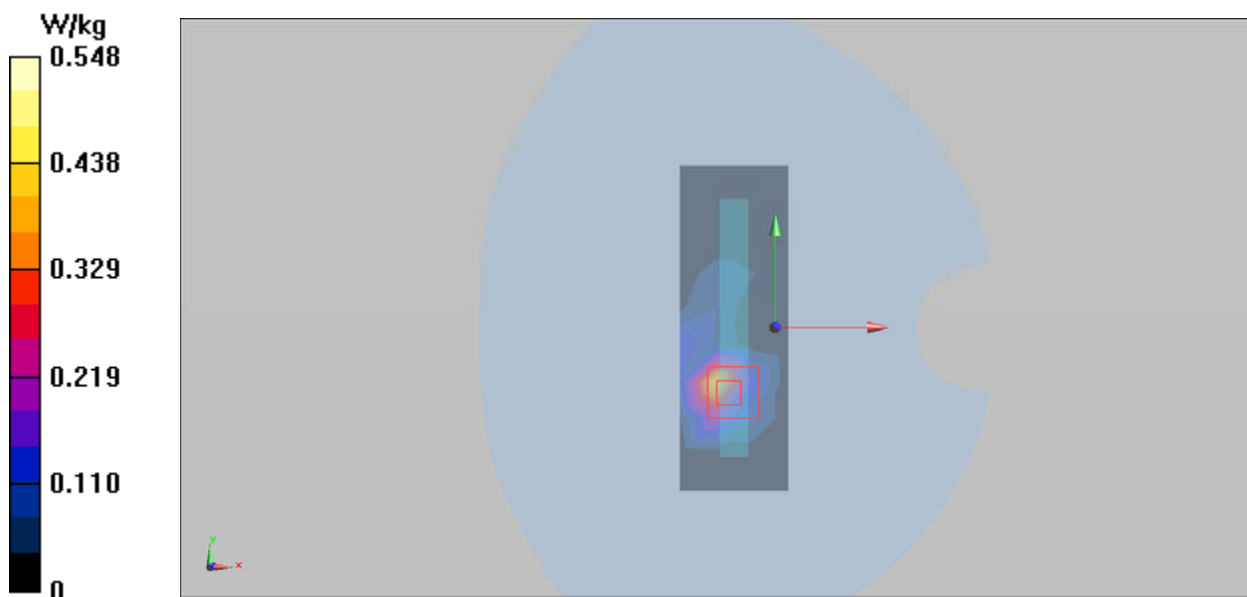
Top Edge High/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.221 V/m; Power Drift = -0.142 dB

Peak SAR (extrapolated) = 1.24 W/kg

SAR(1 g) = 0.395 W/kg; SAR(10 g) = 0.111 W/kg

Maximum value of SAR (measured) = 0.548 W/kg





ANNEX D: Probe Calibration Certificate



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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)°C 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	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: July 08, 2020

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: Z20-60218

Page 1 of 9



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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i $\theta=0$ is normal to probe axis

Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

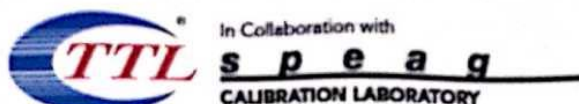
- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta=0$ ($f \leq 900\text{MHz}$ in TEM-cell; $f > 1800\text{MHz}$: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}; A,B,C** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\text{MHz}$. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from $\pm 50\text{MHz}$ to $\pm 100\text{MHz}$.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Certificate No: Z20-60218

Page 2 of 9



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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$) ^A	0.41	0.46	0.40	±10.0%
DCP(mV) ^B	100.7	102.6	102.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB· μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	174.8	±2.0%
		Y	0.0	0.0	1.0		186.9	
		Z	0.0	0.0	1.0		173.5	

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.



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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Uct. (k=2)
750	41.9	0.89	9.78	9.78	9.78	0.40	0.75	±12.1%
835	41.5	0.90	9.38	9.38	9.38	0.21	1.11	±12.1%
1750	40.1	1.37	8.25	8.25	8.25	0.26	1.05	±12.1%
1900	40.0	1.40	7.90	7.90	7.90	0.28	1.06	±12.1%
2000	40.0	1.40	7.97	7.97	7.97	0.23	1.17	±12.1%
2300	39.5	1.67	7.69	7.69	7.69	0.66	0.68	±12.1%
2450	39.2	1.80	7.54	7.54	7.54	0.66	0.70	±12.1%
2600	39.0	1.96	7.26	7.26	7.26	0.74	0.67	±12.1%
3300	38.2	2.71	7.07	7.07	7.07	0.48	0.97	±13.3%
3500	37.9	2.91	7.03	7.03	7.03	0.49	0.93	±13.3%
3700	37.7	3.12	6.83	6.83	6.83	0.49	0.97	±13.3%
3900	37.5	3.32	6.76	6.76	6.76	0.40	1.20	±13.3%
4100	37.2	3.53	6.78	6.78	6.78	0.40	1.15	±13.3%
4400	36.9	3.84	6.47	6.47	6.47	0.40	1.20	±13.3%
4600	36.7	4.04	6.42	6.42	6.42	0.50	1.13	±13.3%
4800	36.4	4.25	6.35	6.35	6.35	0.45	1.25	±13.3%
4950	36.3	4.40	6.22	6.22	6.22	0.45	1.25	±13.3%
5250	35.9	4.71	5.55	5.55	5.55	0.50	1.15	±13.3%
5600	35.5	5.07	4.97	4.97	4.97	0.55	1.22	±13.3%
5750	35.4	5.22	5.00	5.00	5.00	0.55	1.27	

^c Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

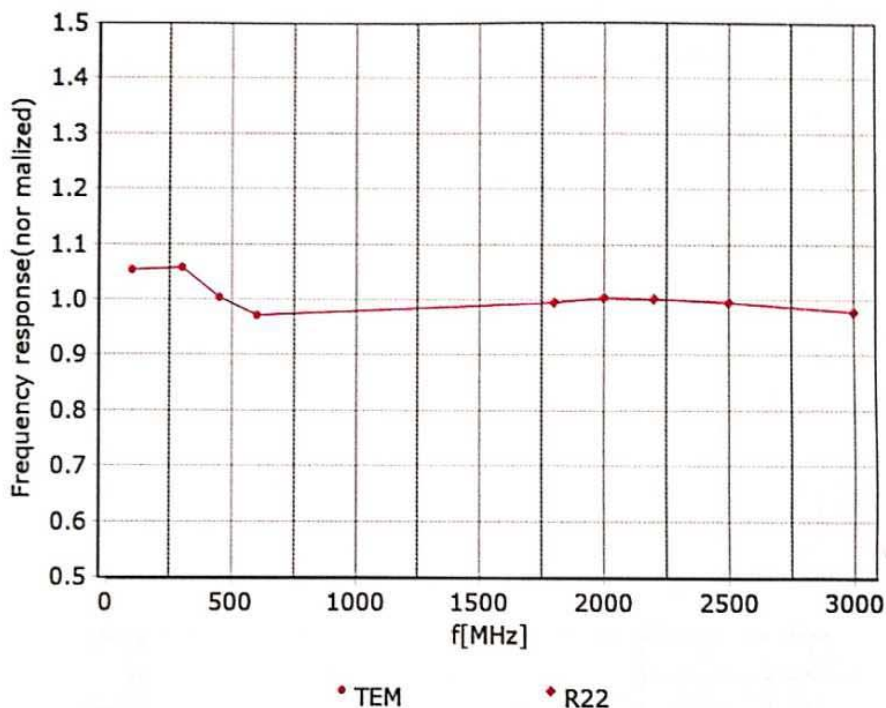
^f At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ ($k=2$)



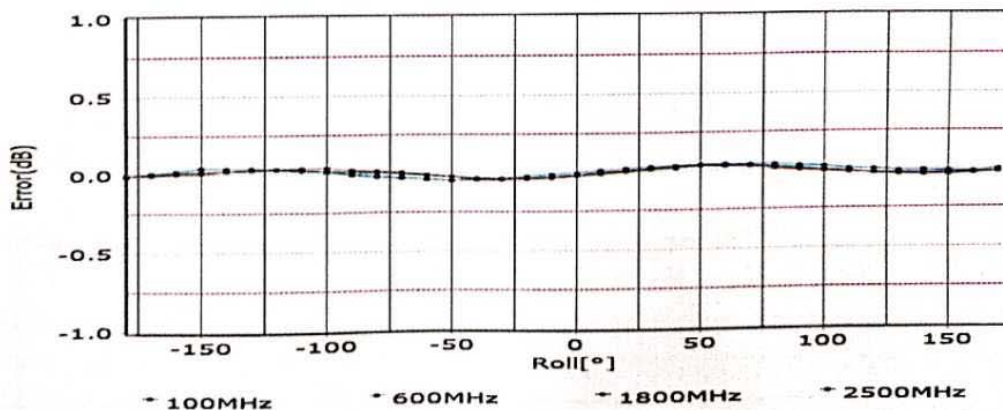
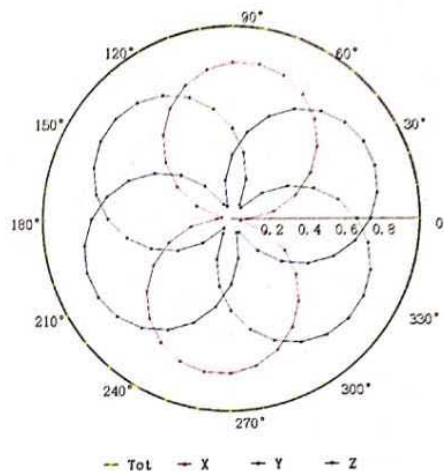
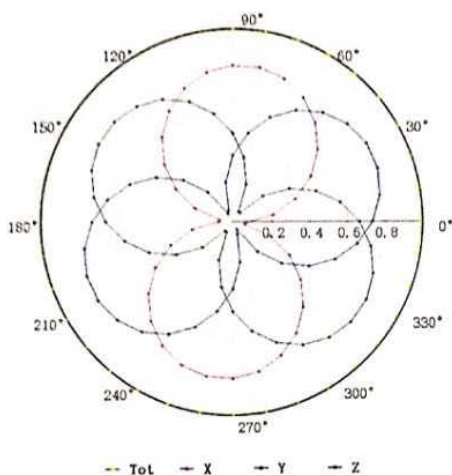
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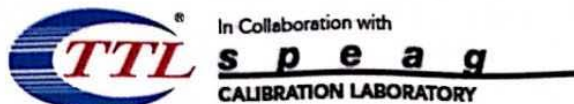
Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22

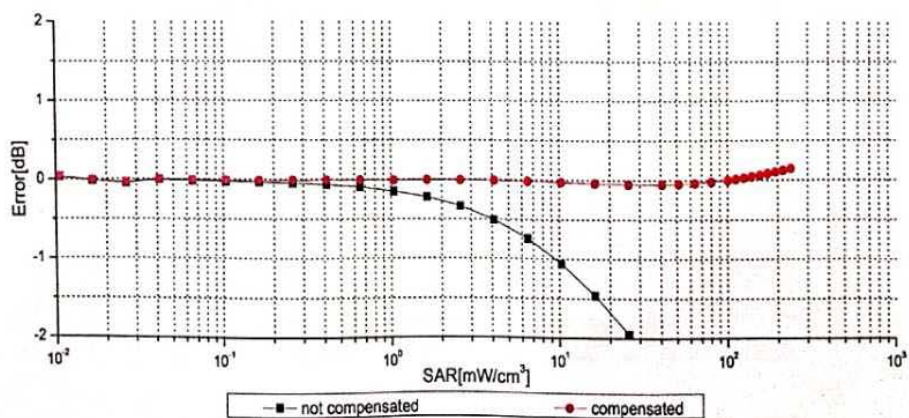
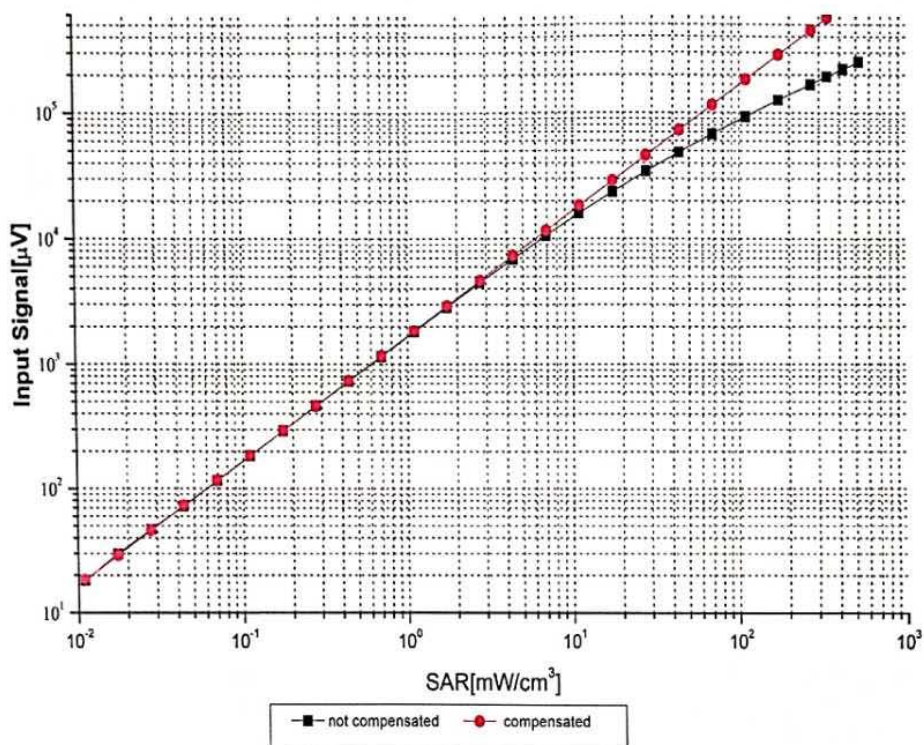


Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)



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Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f = 900 \text{ MHz}$)



Uncertainty of Linearity Assessment: $\pm 0.9\%$ ($k=2$)



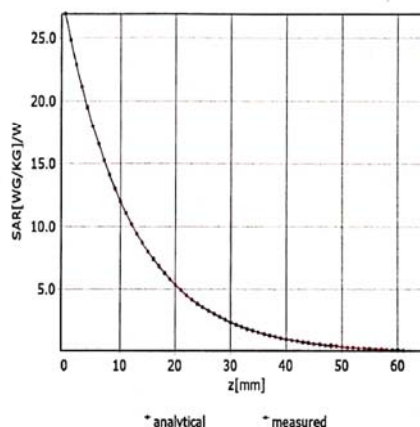
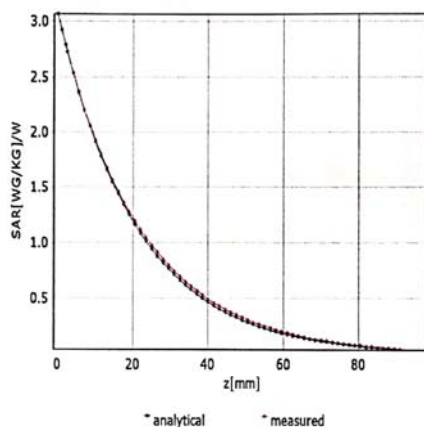
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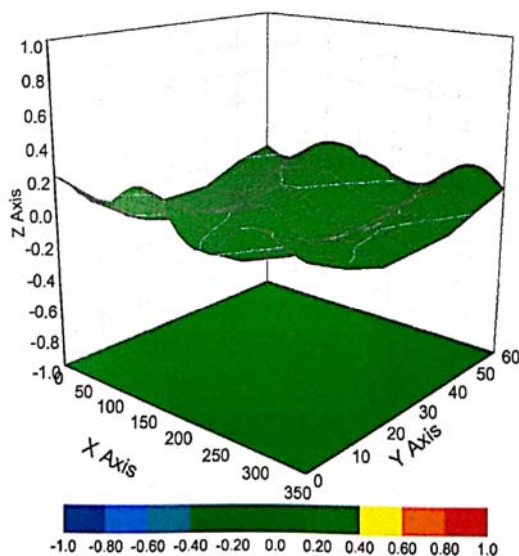
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

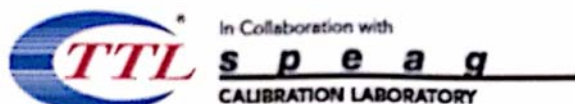
f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 3.2\%$ ($k=2$)



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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3677

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	115.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

**ANNEX E: D750V3 Dipole Calibration Certificate**

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Client

TA(Shanghai)

Certificate No: Z17-97113

CALIBRATION CERTIFICATE

Object

D750V3 - SN: 1045

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

August 27, 2017

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)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	Name	Function
Calibrated by:	Zhao Jing	SAR Test Engineer
Reviewed by:	Lin Hao	SAR Test Engineer
Approved by:	Qi Dianyuan	SAR Project Leader

Signature

Issued: August 30, 2017

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Certificate No: Z17-97113

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM _{x,y,z}
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor $k=2$, which for a normal distribution Corresponds to a coverage probability of approximately 95%.



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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	41.7 \pm 6 %	0.89 mho/m \pm 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.08 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	8.34 mW / g \pm 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	5.45 mW / g \pm 18.7 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	55.7 \pm 6 %	0.95 mho/m \pm 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	8.78 mW / g \pm 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	5.87 mW / g \pm 18.7 % (k=2)



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5Ω- 2.95jΩ
Return Loss	- 28.5dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5Ω- 5.53jΩ
Return Loss	- 24.2dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.140 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL

Date: 08.27.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1045

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.886 \text{ S/m}$; $\epsilon_r = 41.66$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.05, 10.05, 10.05); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

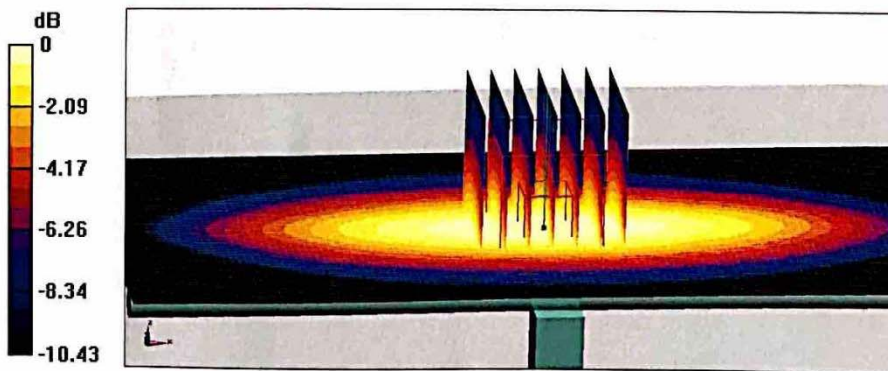
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.59 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.20 W/kg

SAR(1 g) = 2.08 W/kg; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.80 W/kg



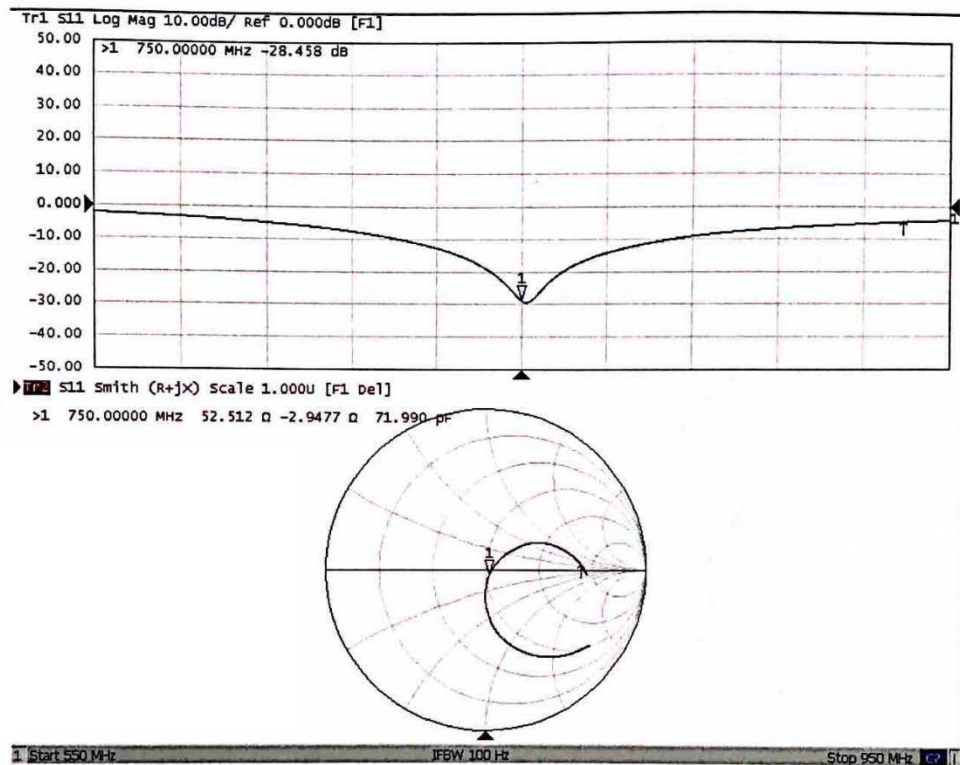
0 dB = 2.80 W/kg = 4.47 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 08.27.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1045

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.952 \text{ S/m}$; $\epsilon_r = 55.68$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.8, 9.8, 9.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

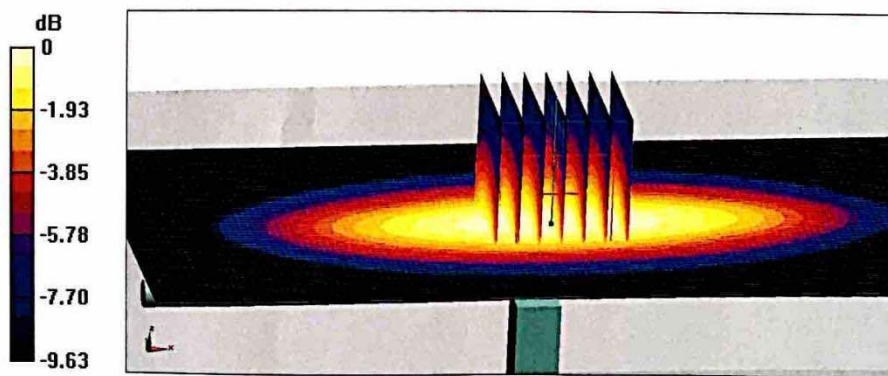
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$,
 $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.33 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.23 W/kg

SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.46 W/kg

Maximum value of SAR (measured) = 2.88 W/kg



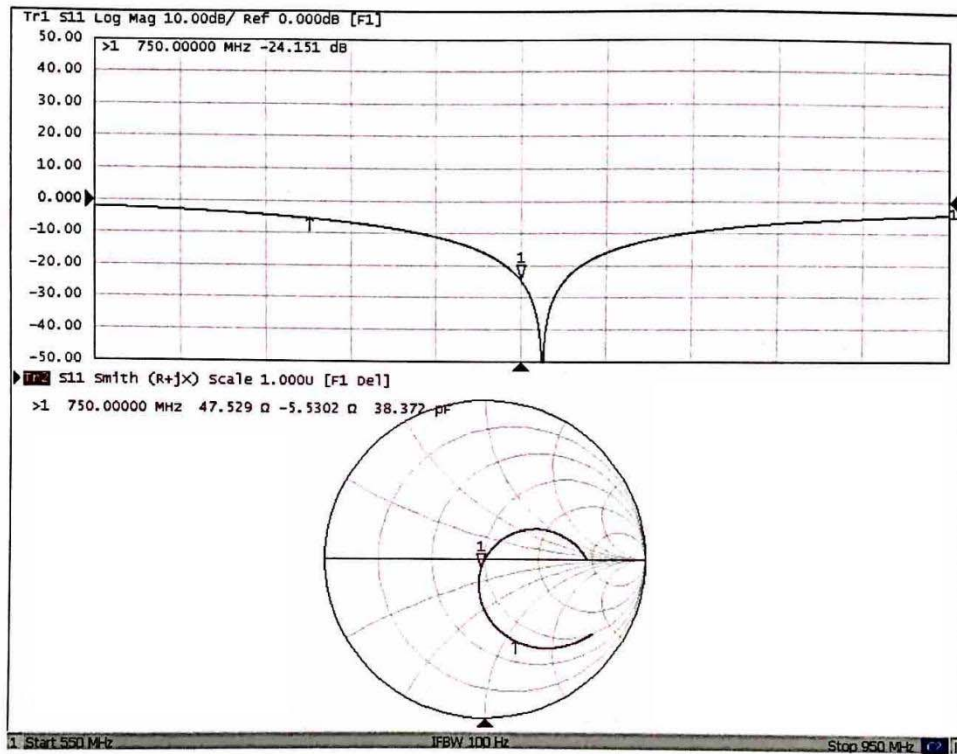
0 dB = 2.88 W/kg = 4.59 dBW/kg



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Impedance Measurement Plot for Body TSL





ANNEX F: D835V2 Dipole Calibration Certificate



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国际互认
校准
CALIBRATION
CNAS L0570

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Client

TA(Shanghai)

Certificate No: Z17-97114

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d020

Calibration Procedure(s) FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: August 28, 2017

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)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Power sensor NRV-Z5	100595	22-Sep-16 (CTTL, No.J16X06809)	Sep-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG,No.Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 31, 2017

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