SAR TEST REPORT

Applicant	ZTE Corporation
FCC ID	SRQ-MF985U
Product	LTE UFI
Model	MF985U
Report No.	RXA1712-0441SAR
Issue Date	January 25, 2018

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

Jiangpeng Lan Kai Xu

Performed by: Jiangpeng Lan *Approved by: Kai Xu*

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

Table of Contents

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

CNAS (accreditation number:L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

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.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

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.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

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 2.1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)
	1g Body SAR (Separation 10mm)
LTE FDD 2	1.109
LTE FDD 4	1.231
LTE FDD 5	0.655
LTE FDD 12	0.578
LTE FDD 13	1.033
LTE FDD 25	0.758
Wi-Fi (2.4G)	0.128
Wi-Fi (5G)	0.962
Date of Testing:	December 27, 2017 ~ December 29, 2017
Note: The device is in compliance with SAR for Uncontrolled Environment /General Population exposure limits (1.6 W/kg and 4.0 W/kg) specified in ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.	

Table 2.2: Highest Simultaneous Transmission SAR

Exposure Configuration	1g Body SAR (Separation 10mm)
Highest Simultaneous Transmission SAR (W/kg)	1.576
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 Gran
EUT Stage	Identical Prototype
Model:	MF985U
IMEI:	99000897000163
Hardware Version:	MF985UHW1.0
Software Version:	USCC_US_MF985UV1.0.0B02
Antenna Type:	Internal Antenna
Wi-Fi Hotspot	Wi-Fi 2.4G Wi-Fi 5G U-NII-1&U-NII-3
Power Class:	LTE FDD 2/4/5/12/13/25:3
Power Level	LTE FDD 2/4/5/12/13/25:max power
EUT Accessory	
Adapter 1	Manufacturer: SHENZHEN RUIJING INDUSTRIAL CO LTD Model: STC-A515A-Z
Adapter 2	Manufacturer: Jiangsu Chenyang Electron Co., Ltd. Model: STC-A515A-Z
Adapter 3	Manufacturer: Shenzhen Dokocom Energy Technology Co., Ltd. Model: STC-A515A-Z
Battery	Manufacturer: ARBIN COSLIGHT POWER CO LTD Model: Li3930T44P4h794659
USB Cable 1	Manufacturer: LUXSHARE-ICT 100cm Cable, Shielded
USB Cable 2	Manufacturer: kingpower-tech 100cm Cable, Shielded

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
LTE	FDD 2	QPSK, 16QAM	Rel.11 /Category 9	1850 ~ 1910
	FDD 4			1710 ~ 1755
	FDD 5			824 ~ 849
	FDD 12			699 ~ 716
	FDD 13			777~787
	FDD 25			1850 ~ 1915
	Does this device support Carrier Aggregation (CA) ☒Yes downlink only☐No			
	Does this device support SV-LTE (1xRTT-LTE)? ☐Yes ☒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 20M/40M/ ac 20M/40M/80M	5150 ~ 5240 5720 ~ 5825
	Does this device support MIMO ☒Yes ☐ 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/IEEE C95.1-1992, the following FCC Published RF exposure KDB procedures:

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

5 Operational Conditions during Test

5.1 Measurement Variability

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

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

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

5.2 Test Configuration

5.2.1 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 > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

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

5.2.2 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. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

5.2.3 Downlink LTE CA specification

The device supports downlink Release 11 LTE Carrier Aggregation (CA) only. It supports a maximum of 2 carriers in the downlink. Other Release 11 features are not supported, including Uplink Carrier Aggregation, Enhanced SC-FDMA and Uplink MIMO or other antenna diversity configurations etc. All uplink communications are identical to the Release 8 Specifications.

Table 4.3.1.1.2A-1: Test frequencies for CA_2A-2A

Test Frequency ID	CC-Combo / NRB_agg [RB]	CC1 Note1					Wgap [MHz]	CC2 Note1				
		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]		BW [RB]	N_{UL}	f_{UL} [MHz]	N_{DL}	f_{DL} [MHz]
Max WGap	25+25	25	18625	1852.5	625	1932.5	50	25	19175	1907.5	1175	1987.5
	25+50	25	18625	1852.5	625	1932.5	45	50	19150	1905	1150	1985
		50	18650	1855	650	1935	45	25	19175	1907.5	1175	1987.5
	25+75	25	18625	1852.5	625	1932.5	40	75	19125	1902.5	1125	1982.5
		75	18675	1857.5	675	1937.5	40	25	19175	1907.5	1175	1987.5
	50+50	50	18650	1855	650	1935	40	50	19150	1905	1150	1985
	25+100	25	18625	1852.5	625	1932.5	35	100	19100	1900	1100	1980
		100	18700	1860	700	1940	35	25	19175	1907.5	1175	1987.5
	50+75	50	18650	1855	650	1935	35	75	19125	1902.5	1125	1982.5
		75	18675	1857.5	675	1937.5	35	50	19150	1905	1150	1985
	50+100	50	18650	1855	650	1935	30	100	19100	1900	1100	1980
		100	18700	1860	700	1940	30	50	19150	1905	1150	1985
	75+75	75	18675	1857.5	675	1937.5	30	75	19125	1902.5	1125	1982.5
	75+100	75	18675	1857.5	675	1937.5	25	100	19100	1900	1100	1980
		100	18700	1860	700	1940	25	75	19125	1902.5	1125	1982.5
	100+100	100	18700	1860	700	1940	20	100	19100	1900	1100	1980
Note 1: Carriers in increasing frequency order.												

inter-band CA (per 3GPP TS 36.101 Table 5.6A.1-2)

E-UTRA CA configuration / Bandwidth combination set									
E-UTRA CA Configuration	E-UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
CA_2A-4A	2	Yes	Yes	Yes	Yes	Yes	Yes	40	0
	4			Yes	Yes	Yes	Yes		
	2			Yes	Yes			20	1
	4			Yes	Yes				
	2			Yes	Yes	Yes	Yes	40	2
	4			Yes	Yes	Yes	Yes		
CA_2A-5A	2			Yes	Yes	Yes	Yes	30	0

	5			Yes	Yes				
	2			Yes	Yes			20	1
	5			Yes	Yes				
CA_2A-12A	2			Yes	Yes	Yes	Yes	30	0
	12			Yes	Yes				
	2			Yes	Yes	Yes	Yes	30	1
	12		Yes	Yes	Yes				
	2			Yes	Yes			20	2
	12			Yes	Yes				
CA_4A-5A	4			Yes	Yes	Yes	Yes	20	0
	5			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	1
	5			Yes	Yes				
CA_4A-12A	4	Yes	Yes	Yes	Yes			20	0
	12			Yes	Yes				
	4	Yes	Yes	Yes	Yes	Yes	Yes	30	1
	12			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	2
	12		Yes	Yes	Yes				
	4			Yes	Yes			20	3
	12			Yes	Yes				
	4			Yes	Yes	Yes	Yes	30	4
	12			Yes	Yes				
	4			Yes	Yes	Yes		20	5
	12			Yes	Yes				
CA_2A-2A-12A	2			Yes	Yes			50	0
	12			Yes	Yes				
CA_2A-4A-5A	2			Yes	Yes	Yes	Yes	50	0
	4			Yes	Yes				
	5			Yes	Yes				
CA_2A-2A-5A	2			Yes	Yes			50	0
	5			Yes	Yes				

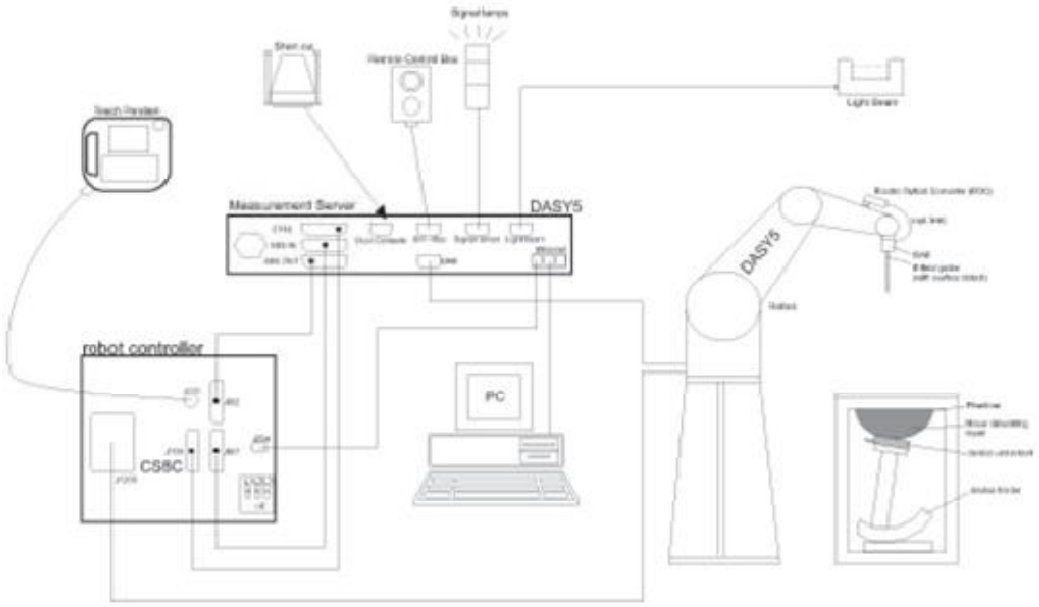
NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

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



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

6.2 DASY5 E-field Probe System

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

EX3DV4 Probe Specification

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

E-field Probe Calibration

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

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

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

temperature probe is used in conjunction with the E-field probe.

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

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

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.
Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

	≤3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: ΔxArea, ΔyArea	≤ 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 ≤ 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 assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

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

			≤3GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\triangle x_{zoom}$ $\triangle y_{zoom}$			≤2GHz: ≤8mm 2 – 3GHz: ≤5mm*	3 – 4GHz: ≤5mm* 4 – 6GHz: ≤4mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: $\triangle z_{zoom}(n)$		≤5mm	3 – 4GHz: ≤4mm 4 – 5GHz: ≤3mm 5 – 6GHz: ≤2mm
	Graded grid	$\triangle z_{zoom}(1)$: between 1st two points closest to phantom surface	≤4mm	3 – 4GHz: ≤3mm 4 – 5GHz: ≤2.5mm 5 – 6GHz: ≤2mm
		$\triangle z_{zoom}(n>1)$: between subsequent points	≤1.5•$\triangle z_{zoom}(n-1)$	
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 *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.				

Volume Scan Procedures

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

Power Drift Monitoring

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

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2017-05-20	2018-05-19
Dielectric Probe Kit	HP	85070E	US44020115	2017-05-20	2018-05-19
Power meter	Agilent	E4417A	GB41291714	2017-05-21	2018-05-20
Power sensor	Agilent	N8481H	MY50350004	2017-05-21	2018-05-20
Power sensor	Agilent	E9327A	US40441622	2017-05-20	2018-05-19
Dual directional coupler	Agilent	778D-012	50519	2017-05-21	2018-05-20
Dual directional coupler	Agilent	777D	50146	2017-05-20	2018-05-19
Amplifier	INDEXSAR	IXA-020	0401	2017-05-20	2018-05-19
Wideband radio communication tester	R&S	CMW 500	113645	2017-05-20	2018-05-19
BT Base Station Simulator	R&S	CBT	100271	2017-05-14	2018-05-13
E-field Probe	SPEAG	EX3DV4	3677	2017-01-23	2018-01-22
DAE	SPEAG	DAE4	1291	2017-01-19	2018-01-18
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	2017-01-10	2020-01-09
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	2017-01-05	2020-01-04
Temperature Probe	Tianjin jinming	JM222	AA1009129	2017-05-17	2018-05-16
Hygrothermograph	Anymetr	NT-311	20150731	2017-05-17	2018-05-16
Software for Test	Speag	DASY5	52.8.8.1222	/	/
Software for Tissue	Agilent	85070	E06.01.36	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)		Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ε_r	σ(s/m)
Body	750	52.49	1.41	45	0	0.1	1.0	55.5	0.96
	835	52.5	1.4	45	0	0.1	1.0	55.2	0.97
	1750	69.91	0.12	0	29.97	0	0	53.4	1.49
	1900	69.91	0.13	0	29.96	0	0	53.3	1.52
	2450	73.2	0.1	0	26.7	0	0	52.7	1.95
Frequency (MHz)		**Water (%)**	**Diethylenglycol monohexylether**			**Triton X-100**		**ε_r**	**σ(s/m)**
Body	5250	72.52	13.74			13.74		48.9	5.36
	5750	72.52	13.74			13.74		48.3	5.94

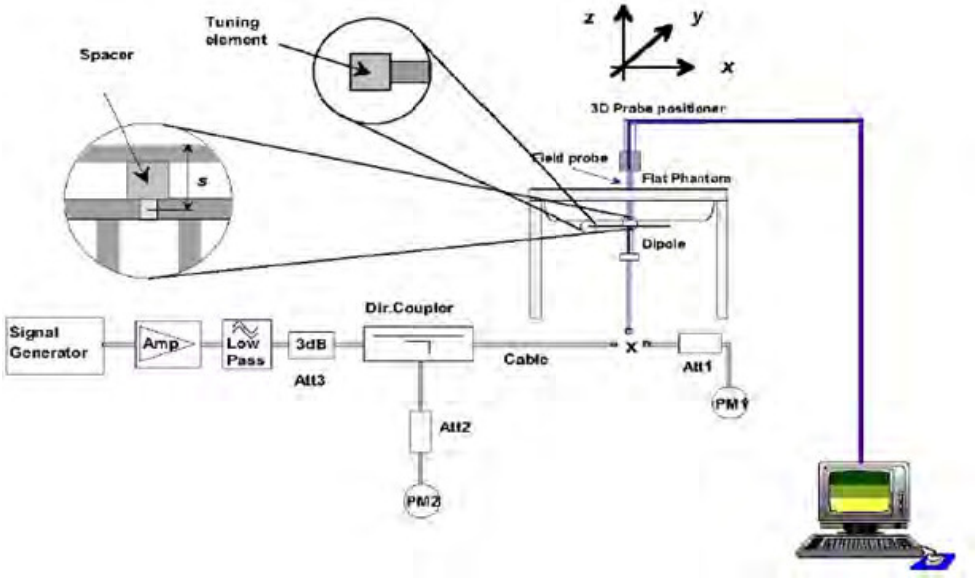
Measurements results

Frequency (MHz)		Test Date	Temp ℃	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within ±5%)	
				ε_r	σ(s/m)	ε_r	σ(s/m)	Dev ε_r(%)	Dev σ(%)
750	Body	12/28/2017	21.5	56.9	0.95	55.5	0.96	2.52	-1.04
835	Body	12/27/2017	21.5	54.2	0.96	55.2	0.97	-1.81	-1.03
1750	Body	12/28/2017	21.5	51.9	1.46	53.4	1.49	-2.81	-2.01
1900	Body	12/27/2017	21.5	52.6	1.51	53.3	1.52	-1.31	-0.66
2450	Body	12/29/2017	21.5	52.5	1.98	52.7	1.95	-0.38	1.54
5250	Body	12/29/2017	21.5	48.1	5.32	48.9	5.36	-1.64	-0.75
5750	Body	12/29/2017	21.5	47.6	6.14	48.3	5.94	-1.45	3.37
Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.									

8.2 System Performance Check

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

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



Picture 1 System Performance Check setup

Picture 2 Setup Photo

System Check results

Frequency (MHz)		Test Date	Temp ℃	250mW Measured SAR_{1g} (W/kg)	1W Normalized SAR_{1g} (W/kg)	1W Target SAR_{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
750	Body	12/28/2017	21.5	2.22	8.88	8.78	1.14	1
835	Body	12/27/2017	21.5	2.41	9.64	9.75	-1.13	2
1750	Body	12/28/2017	21.5	9.24	36.96	37.60	-1.70	3
1900	Body	12/27/2017	21.5	9.93	39.72	39.50	0.56	4
2450	Body	12/29/2017	21.5	12.50	50.00	50.80	-1.57	5
5250	Body	12/29/2017	21.5	7.46	74.60	75.60	-1.32	6
5750	Body	12/29/2017	21.5	7.15	71.50	74.60	-4.16	7
Note：Target Values used derive from the calibration certificate Data Storage and Evaluation.								

9 Normal and Maximum Output Power

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

9.1 LTE Mode

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

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

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

LTE FDD Band 2				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				18607/1850.7	18900/1880	19193/1909.3	
1.4MHz	QPSK	1	0	22.68	22.75	22.94	23.50
		1	2	22.74	22.79	22.92	23.50
		1	5	22.47	22.67	23.07	23.50
		3	0	22.70	22.71	23.05	23.50
		3	2	22.77	22.74	23.06	23.50
		3	3	22.67	22.68	23.01	23.50
		6	0	21.74	21.79	22.01	22.50
	16QAM	1	0	21.81	21.82	22.13	22.50
		1	2	21.89	21.86	22.39	22.50
		1	5	21.89	21.97	22.14	22.50
		3	0	21.75	21.79	22.13	22.50
		3	2	21.84	21.77	22.15	22.50
		3	3	21.73	21.81	22.04	22.50
		6	0	20.84	20.91	21.16	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				18615/1851.5	18900/1880	19185/1908.5	
3MHz	QPSK	1	0	22.87	22.90	22.96	23.50
		1	7	22.65	22.72	22.86	23.50
		1	14	22.92	23.02	23.01	23.50
		8	0	21.74	21.73	21.94	22.50
		8	4	21.67	21.75	21.87	22.50

		8	7	21.76	21.75	21.97	22.50
		15	0	21.84	21.78	21.98	22.50
		1	0	21.87	21.93	21.91	22.50
		1	7	21.89	21.93	22.02	22.50
		1	14	21.82	21.87	22.04	22.50
	16QAM	8	0	20.73	20.69	20.90	21.50
		8	4	20.81	20.78	21.01	21.50
		8	7	20.80	20.70	20.93	21.50
		15	0	20.72	20.73	20.98	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				18625/1852.5	18900/1880	19175/1907.5	
5MHz	QPSK	1	0	22.84	22.88	22.92	23.50
		1	13	22.63	22.68	22.83	23.50
		1	24	22.89	22.97	22.97	23.50
		12	0	21.71	21.68	21.90	22.50
		12	6	21.65	21.71	21.82	22.50
		12	13	21.74	21.73	21.93	22.50
		25	0	21.82	21.77	21.96	22.50
	16QAM	1	0	21.84	21.89	21.88	22.50
		1	13	21.86	21.91	21.99	22.50
		1	24	21.79	21.85	22.00	22.50
		12	0	20.71	20.65	20.87	21.50
		12	6	20.78	20.73	20.97	21.50
		12	13	20.77	20.65	20.89	21.50
		25	0	20.70	20.69	20.93	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				18650/1855	18900/1880	19150/1905	
10MHz	QPSK	1	0	22.86	22.89	22.95	23.50
		1	25	22.66	22.73	22.87	23.50
		1	49	22.91	23.01	23.00	23.50
		25	0	21.74	21.73	21.94	22.50
		25	13	21.68	21.76	21.86	22.50
		25	25	21.76	21.77	21.98	22.50
		50	0	21.90	21.79	22.00	22.50
	16QAM	1	0	21.86	21.92	21.90	22.50
		1	25	21.89	21.95	22.02	22.50
		1	49	21.82	21.87	22.03	22.50
		25	0	20.74	20.70	20.91	21.50
		25	13	20.80	20.77	21.00	21.50
		25	25	20.80	20.70	20.93	21.50
		50	0	20.73	20.74	20.97	21.50

Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				18675/1857.5	18900/1880	19125/1902.5	
15MHz	QPSK	1	0	22.85	22.85	22.93	23.50
		1	38	22.64	22.72	22.84	23.50
		1	74	22.88	22.96	22.96	23.50
		36	0	21.72	21.69	21.91	22.50
		36	18	21.65	21.71	21.82	22.50
		36	39	21.73	21.74	21.94	22.50
		75	0	21.88	21.75	21.95	22.50
	16QAM	1	0	21.81	21.90	21.88	22.50
		1	38	21.87	21.92	22.00	22.50
		1	74	21.79	21.83	22.00	22.50
		36	0	20.71	20.68	20.88	21.50
		36	18	20.77	20.72	20.96	21.50
		36	39	20.78	20.66	20.90	21.50
		75	0	20.70	20.69	20.93	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				18700/1860	18900/1880	19100/1900	
20MHz	QPSK	1	0	22.82	22.81	22.90	23.50
		1	50	22.63	22.68	22.82	23.50
		1	99	22.86	22.95	22.93	23.50
		50	0	21.69	21.64	21.87	22.50
		50	25	21.63	21.67	21.79	22.50
		50	50	21.70	21.69	21.90	22.50
		100	0	21.85	21.70	21.91	22.50
	16QAM	1	0	21.79	21.86	21.83	22.50
		1	50	21.83	21.90	21.96	22.50
		1	99	21.77	21.80	21.98	22.50
		50	0	20.68	20.64	20.85	21.50
		50	25	20.74	20.70	20.93	21.50
		50	50	20.75	20.61	20.86	21.50
		100	0	20.68	20.65	20.90	21.50

LTE FDD Band 4				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				19957/1710.7	20175/1732.5	20393/1754.3	
1.4MHz	QPSK	1	0	22.35	22.38	22.26	23.00
		1	2	22.44	22.43	22.29	23.00
		1	5	22.36	22.41	22.30	23.00
		3	0	22.39	22.44	22.35	23.00

		3	2	22.40	22.46	22.37	23.00
		3	3	22.35	22.41	22.43	23.00
		6	0	21.56	21.43	21.48	22.00
	16QAM	1	0	21.73	21.89	21.72	22.00
		1	2	21.81	21.64	21.75	22.00
		1	5	21.67	21.83	21.65	22.00
		3	0	21.51	21.43	21.41	22.00
		3	2	21.46	21.49	21.45	22.00
		3	3	21.53	21.47	21.44	22.00
		6	0	20.68	20.51	20.64	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				19965/1711.5	20175/1732.5	20385/1753.5	
3MHz	QPSK	1	0	22.18	22.17	22.15	23.00
		1	7	22.38	22.18	22.45	23.00
		1	14	22.14	22.00	22.02	23.00
		8	0	21.33	21.33	21.32	22.00
		8	4	21.45	21.46	21.45	22.00
		8	7	21.34	21.25	21.09	22.00
		15	0	21.25	21.32	21.16	22.00
	16QAM	1	0	21.51	21.57	21.54	22.00
		1	7	21.55	21.51	21.44	22.00
		1	14	21.44	21.48	21.45	22.00
		8	0	20.46	20.37	20.41	21.00
		8	4	20.54	20.52	20.43	21.00
		8	7	20.31	20.29	20.20	21.00
		15	0	20.35	20.36	20.26	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				19975/1712.5	20175/1732.5	20375/1752.5	
5MHz	QPSK	1	0	22.15	22.15	22.11	23.00
		1	13	22.36	22.14	22.42	23.00
		1	24	22.11	21.95	21.98	23.00
		12	0	21.30	21.28	21.28	22.00
		12	6	21.43	21.42	21.40	22.00
		12	13	21.32	21.23	21.05	22.00
		25	0	21.23	21.31	21.14	22.00
	16QAM	1	0	21.48	21.53	21.51	22.00
		1	13	21.52	21.49	21.41	22.00
		1	24	21.41	21.46	21.41	22.00
		12	0	20.44	20.33	20.38	21.00
		12	6	20.51	20.47	20.39	21.00
		12	13	20.28	20.24	20.16	21.00

		25	0	20.33	20.32	20.21	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20000/1715	20175/1732.5	20350/1750	
10MHz	QPSK	1	0	22.17	22.16	22.14	23.00
		1	25	22.39	22.19	22.46	23.00
		1	49	22.13	21.99	22.01	23.00
		25	0	21.33	21.33	21.32	22.00
		25	13	21.46	21.47	21.44	22.00
		25	25	21.34	21.27	21.10	22.00
		50	0	21.31	21.33	21.18	22.00
	16QAM	1	0	21.50	21.56	21.53	22.00
		1	25	21.55	21.53	21.44	22.00
		1	49	21.44	21.48	21.44	22.00
		25	0	20.47	20.38	20.42	21.00
		25	13	20.53	20.51	20.42	21.00
		25	25	20.31	20.29	20.20	21.00
		50	0	20.36	20.37	20.25	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20025/1717.5	20175/1732.5	20325/1747.5	
15MHz	QPSK	1	0	22.16	22.12	22.12	23.00
		1	38	22.37	22.18	22.43	23.00
		1	74	22.10	21.94	21.97	23.00
		36	0	21.31	21.29	21.29	22.00
		36	18	21.43	21.42	21.40	22.00
		36	39	21.31	21.24	21.06	22.00
		75	0	21.29	21.29	21.13	22.00
	16QAM	1	0	21.45	21.54	21.51	22.00
		1	38	21.53	21.50	21.42	22.00
		1	74	21.41	21.44	21.41	22.00
		36	0	20.44	20.36	20.39	21.00
		36	18	20.50	20.46	20.38	21.00
		36	39	20.29	20.25	20.17	21.00
		75	0	20.33	20.32	20.21	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20050/1720	20175/1732.5	20300/1745	
20MHz	QPSK	1	0	22.13	22.08	22.09	23.00
		1	50	22.36	22.14	22.41	23.00
		1	99	22.08	21.93	21.94	23.00
		50	0	21.28	21.24	21.25	22.00
		50	25	21.41	21.38	21.37	22.00

		50	50	21.28	21.19	21.02	22.00
		100	0	21.26	21.24	21.09	22.00
	16QAM	1	0	21.43	21.50	21.46	22.00
		1	50	21.49	21.48	21.38	22.00
		1	99	21.39	21.41	21.39	22.00
		50	0	20.41	20.32	20.36	21.00
		50	25	20.47	20.44	20.35	21.00
		50	50	20.26	20.20	20.13	21.00
		100	0	20.31	20.28	20.18	21.00

LTE FDD Band 5				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20407/824.7	20525/836.5	20643/848.3	
1.4MHz	QPSK	1	0	23.15	23.37	23.18	24.00
		1	2	23.13	23.36	23.40	24.00
		1	5	23.29	23.33	23.22	24.00
		3	0	23.18	23.37	23.20	24.00
		3	2	23.25	23.41	23.39	24.00
		3	3	23.19	23.32	23.23	24.00
		6	0	22.25	22.40	22.48	23.00
	16QAM	1	0	22.51	22.57	22.53	23.00
		1	2	22.48	22.46	22.59	23.00
		1	5	22.53	22.59	22.66	23.00
		3	0	22.34	22.35	22.38	23.00
		3	2	22.28	22.48	22.53	23.00
		3	3	22.24	22.39	22.31	23.00
		6	0	21.28	21.45	21.41	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20415/825.5	20525/836.5	20635/847.5	
3MHz	QPSK	1	0	23.31	23.33	23.32	24.00
		1	7	23.34	23.39	23.36	24.00
		1	14	23.35	23.31	23.53	24.00
		8	0	22.37	22.56	22.40	23.00
		8	4	22.33	22.42	22.44	23.00
		8	7	22.41	22.45	22.18	23.00
		15	0	22.30	22.37	22.24	23.00
	16QAM	1	0	22.50	22.48	22.67	23.00
		1	7	22.34	22.38	22.51	23.00
		1	14	22.52	22.57	22.24	23.00
		8	0	21.39	21.39	21.42	22.00
		8	4	21.46	21.51	21.42	22.00

		8	7	21.49	21.57	21.30	22.00
		15	0	21.32	21.31	21.46	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20425/826.5	20525/836.5	20625/846.5	
5MHz	QPSK	1	0	23.28	23.31	23.28	24.00
		1	13	23.32	23.35	23.33	24.00
		1	24	23.32	23.26	23.49	24.00
		12	0	22.34	22.51	22.36	23.00
		12	6	22.31	22.38	22.39	23.00
		12	13	22.39	22.43	22.14	23.00
		25	0	22.28	22.36	22.22	23.00
	16QAM	1	0	22.47	22.44	22.64	23.00
		1	13	22.31	22.36	22.48	23.00
		1	24	22.49	22.55	22.20	23.00
		12	0	21.37	21.35	21.39	22.00
		12	6	21.43	21.46	21.38	22.00
		12	13	21.46	21.52	21.26	22.00
		25	0	21.30	21.27	21.41	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20450/829	20525/836.5	20600/844	
10MHz	QPSK	1	0	23.26	23.24	23.26	24.00
		1	25	23.32	23.35	23.32	24.00
		1	49	23.29	23.24	23.45	24.00
		25	0	22.32	22.47	22.33	23.00
		25	13	22.29	22.34	22.36	23.00
		25	25	22.35	22.39	22.11	23.00
		50	0	22.31	22.29	22.17	23.00
	16QAM	1	0	22.42	22.41	22.59	23.00
		1	25	22.28	22.35	22.45	23.00
		1	49	22.47	22.50	22.18	23.00
		25	0	21.34	21.34	21.37	22.00
		25	13	21.39	21.43	21.34	22.00
		25	25	21.44	21.48	21.23	22.00
		50	0	21.28	21.23	21.38	22.00

LTE FDD Band 12				**Conducted Power(dBm)**			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				23017/699.7	23095/707.5	23173/715.3	
1.4MHz	QPSK	1	0	23.29	23.37	23.44	24.00

		1	2	23.26	23.47	23.51	24.00
		1	5	23.38	23.35	23.65	24.00
		3	0	23.22	23.32	23.49	24.00
		3	2	23.24	23.40	23.42	24.00
		3	3	23.35	23.34	23.41	24.00
		6	0	22.25	22.45	22.52	23.00
	16QAM	1	0	22.61	22.59	22.46	23.00
		1	2	22.55	22.61	22.49	23.00
		1	5	22.49	22.74	22.59	23.00
		3	0	22.38	22.40	22.37	23.00
		3	2	22.39	22.46	22.44	23.00
		3	3	22.44	22.61	22.67	23.00
		6	0	21.43	21.51	21.55	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				23025/700.5	23095/707.5	23165/714.5	
3MHz	QPSK	1	0	23.42	23.35	23.37	24.00
		1	7	23.34	23.48	23.25	24.00
		1	14	23.59	23.58	23.63	24.00
		8	0	22.37	22.65	22.36	23.00
		8	4	22.32	22.49	22.40	23.00
		8	7	22.51	22.52	22.41	23.00
		15	0	22.50	22.40	22.40	23.00
	16QAM	1	0	22.64	22.62	22.26	23.00
		1	7	22.57	22.68	22.56	23.00
		1	14	22.57	22.68	22.46	23.00
		8	0	21.42	21.28	21.32	22.00
		8	4	21.48	21.48	21.42	22.00
		8	7	21.56	21.51	21.46	22.00
		15	0	21.42	21.39	21.44	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				23035/701.5	23095/707.5	23155/713.5	
5MHz	QPSK	1	0	23.39	23.33	23.33	24.00
		1	13	23.32	23.44	23.22	24.00
		1	24	23.56	23.53	23.59	24.00
		12	0	22.34	22.60	22.32	23.00
		12	6	22.30	22.45	22.35	23.00
		12	13	22.49	22.50	22.37	23.00
		25	0	22.48	22.39	22.38	23.00
	16QAM	1	0	22.61	22.58	22.23	23.00
		1	13	22.54	22.66	22.53	23.00
		1	24	22.54	22.66	22.42	23.00

		12	0	21.40	21.24	21.29	22.00
		12	6	21.45	21.43	21.38	22.00
		12	13	21.53	21.46	21.42	22.00
		25	0	21.40	21.35	21.39	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				23060/704	23095/707.5	23130/711	
10MHz	QPSK	1	0	23.37	23.26	23.31	24.00
		1	25	23.32	23.44	23.21	24.00
		1	49	23.53	23.51	23.55	24.00
		25	0	22.32	22.56	22.29	23.00
		25	13	22.28	22.41	22.32	23.00
		25	25	22.45	22.46	22.34	23.00
		50	0	22.51	22.32	22.33	23.00
	16QAM	1	0	22.56	22.55	22.18	23.00
		1	25	22.51	22.65	22.50	23.00
		1	49	22.52	22.61	22.40	23.00
		25	0	21.37	21.23	21.27	22.00
		25	13	21.41	21.40	21.34	22.00
		25	25	21.51	21.42	21.39	22.00
		50	0	21.38	21.31	21.36	22.00

LTE FDD Band 13				**Conducted Power(dBm)**			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				23205/779.5	23230/782	23255/784.5	
5MHz	QPSK	1	0	23.56	23.45	23.45	24.00
		1	13	23.45	23.61	23.49	24.00
		1	24	23.31	23.54	23.33	24.00
		12	0	22.19	22.34	22.32	23.00
		12	6	22.37	22.45	22.38	23.00
		12	13	22.28	22.39	22.29	23.00
		25	0	22.28	22.38	22.37	23.00
	16QAM	1	0	22.64	22.90	22.40	23.00
		1	13	22.54	22.79	22.51	23.00
		1	24	22.57	22.69	22.61	23.00
		12	0	21.17	21.32	21.26	22.00
		12	6	21.39	21.40	21.40	22.00
		12	13	21.34	21.41	21.32	22.00
		25	0	21.32	21.39	21.47	22.00
Bandwidth	Modulation	RB size	RB offset	Channel	Channel	Channel	Tune-up

				/	23230/782	/	Limit (dBm)
10MHz	QPSK	1	0	/	23.16	/	24.00
		1	25	/	23.29	/	24.00
		1	49	/	23.25	/	24.00
		25	0	/	22.36	/	23.00
		25	13	/	22.42	/	23.00
		25	25	/	22.29	/	23.00
		50	0	/	22.38	/	23.00
	16QAM	1	0	/	22.22	/	23.00
		1	25	/	22.33	/	23.00
		1	49	/	22.25	/	23.00
		25	0	/	21.33	/	22.00
		25	13	/	21.36	/	22.00
		25	25	/	21.27	/	22.00
		50	0	/	21.37	/	22.00

LTE FDD Band 25				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				26047/1850.7	26365/1882.5	26683/1914.3	
1.4MHz	QPSK	1	0	22.64	22.53	22.34	23.50
		1	2	22.58	22.72	22.65	23.50
		1	5	22.45	22.59	22.51	23.50
		3	0	22.75	22.57	22.73	23.50
		3	2	22.69	22.62	22.64	23.50
		3	3	22.70	22.70	22.69	23.50
		6	0	21.79	21.75	21.80	22.50
	16QAM	1	0	21.92	21.83	21.83	22.50
		1	2	22.11	21.86	21.91	22.50
		1	5	21.91	21.91	21.69	22.50
		3	0	21.80	21.68	21.76	22.50
		3	2	21.92	21.81	21.84	22.50
		3	3	21.86	21.73	21.72	22.50
		6	0	21.02	20.66	20.85	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				26055/1851.5	26365/1882.5	26675/1913.5	
3MHz	QPSK	1	0	22.27	22.26	22.08	23.00
		1	7	21.44	21.43	22.05	23.00

		1	14	22.01	21.63	22.22	23.00
		8	0	21.06	20.97	21.27	22.00
		8	4	20.53	20.60	21.16	22.00
		8	7	20.78	20.55	20.89	22.00
		15	0	20.82	20.80	21.06	22.00
	16QAM	1	0	21.76	21.76	21.72	22.00
		1	7	20.84	20.82	20.77	22.00
		1	14	21.06	20.90	20.98	22.00
		8	0	19.97	19.86	19.90	21.00
		8	4	19.42	19.46	19.49	21.00
		8	7	19.67	19.53	19.64	21.00
		15	0	19.72	19.65	19.86	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				26065/1852.5	26365/1882.5	26665/1912.5	
5MHz	QPSK	1	0	22.24	22.24	22.04	23.00
		1	13	21.42	21.39	22.02	23.00
		1	24	21.98	21.58	22.18	23.00
		12	0	21.03	20.92	21.23	22.00
		12	6	20.51	20.56	21.11	22.00
		12	13	20.76	20.53	20.85	22.00
		25	0	20.80	20.79	21.04	22.00
	16QAM	1	0	21.73	21.72	21.69	22.00
		1	13	20.81	20.80	20.74	22.00
		1	24	21.03	20.88	20.94	22.00
		12	0	19.95	19.82	19.87	21.00
		12	6	19.39	19.41	19.45	21.00
		12	13	19.64	19.48	19.60	21.00
		25	0	19.70	19.61	19.81	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				26090/1855	26365/1882.5	26640/1910	
10MHz	QPSK	1	0	22.26	22.25	22.07	23.00
		1	25	21.45	21.44	22.06	23.00
		1	49	22.00	21.62	22.21	23.00
		25	0	21.06	20.97	21.27	22.00
		25	13	20.54	20.61	21.15	22.00
		25	25	20.78	20.57	20.90	22.00
		50	0	20.88	20.81	21.08	22.00
	16QAM	1	0	21.75	21.75	21.71	22.00
		1	25	20.84	20.84	20.77	22.00
		1	49	21.06	20.90	20.97	22.00
		25	0	19.98	19.87	19.91	21.00

		25	13	19.41	19.45	19.48	21.00
		25	25	19.67	19.53	19.64	21.00
		50	0	19.73	19.66	19.85	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				26115/1857.5	26365/1882.5	26615/1907.5	
15MHz	QPSK	1	0	22.25	22.21	22.05	23.00
		1	38	21.43	21.43	22.03	23.00
		1	74	21.97	21.57	22.17	23.00
		36	0	21.04	20.93	21.24	22.00
		36	18	20.51	20.56	21.11	22.00
		36	39	20.75	20.54	20.86	22.00
		75	0	20.86	20.77	21.03	22.00
	16QAM	1	0	21.70	21.73	21.69	22.00
		1	38	20.82	20.81	20.75	22.00
		1	74	21.03	20.86	20.94	22.00
		36	0	19.95	19.85	19.88	21.00
		36	18	19.38	19.40	19.44	21.00
		36	39	19.65	19.49	19.61	21.00
		75	0	19.70	19.61	19.81	21.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				26140/1860	26365/1882.5	26590/1905	
20MHz	QPSK	1	0	22.22	22.17	22.02	23.00
		1	50	21.42	21.39	22.01	23.00
		1	99	21.95	21.56	22.14	23.00
		50	0	21.01	20.88	21.20	22.00
		50	25	20.49	20.52	21.08	22.00
		50	50	20.72	20.49	20.82	22.00
		100	0	20.83	20.72	20.99	22.00
	16QAM	1	0	21.68	21.69	21.64	22.00
		1	50	20.78	20.79	20.71	22.00
		1	99	21.01	20.83	20.92	22.00
		50	0	19.92	19.81	19.85	21.00
		50	25	19.35	19.38	19.41	21.00
		50	50	19.62	19.44	19.57	21.00
		100	0	19.68	19.57	19.78	21.00

DL LTE CA Class	PCC						SCC			Power(dBm)			Tune-up Limit (dBm)
	PCC Band	PCC Bandwidth (MHz)	PCC UL RB size	PCC UL RB offset	PCC UL Channel	PCC DL Channel	SCC Band	SCC Bandwidth (MHz)	SCC DL Channel	Standalone	CA active	Delta	
CA_2A-2A	2	5	1	24	18625	625	2	20	1100	22.42	22.37	-0.05	23.50
	2	10	1	49	18650	650	2	20	1100	22.33	22.41	0.08	23.50
	2	15	1	74	18675	675	2	20	1100	22.41	22.50	0.09	23.50
	2	20	1	99	18700	700	2	20	1100	22.43	22.40	-0.03	23.50
CA_2A-4A	2	5	1	24	18900	900	4	20	2300	22.97	23.10	0.13	23.50
	2	10	1	49	18900	900	4	20	2300	23.01	23.12	0.11	23.50
	2	15	1	74	18900	900	4	20	2300	22.96	23.09	0.13	23.50
	2	20	1	99	18900	900	4	20	2300	22.95	23.09	0.14	23.50
	4	5	1	13	20375	2375	2	20	900	22.42	22.56	0.14	23.00
	4	10	1	25	20350	2350	2	20	900	22.46	22.58	0.12	23.00
	4	15	1	38	20325	2325	2	20	900	22.43	22.59	0.16	23.00
	4	20	1	50	20300	2300	2	20	900	22.41	22.63	0.22	23.00
CA_2A-5A	2	5	1	24	18900	900	5	10	2600	22.97	23.12	0.15	23.50
	2	10	1	49	18900	900	5	10	2600	23.01	23.18	0.17	23.50
	2	15	1	74	18900	900	5	10	2600	22.96	23.09	0.13	23.50
	2	20	1	99	18900	900	5	10	2600	22.95	23.11	0.16	23.50
	5	5	1	24	20625	2625	2	20	900	23.49	23.56	0.07	24.00
	5	10	1	49	20600	2600	2	20	900	23.45	23.63	0.18	24.00
CA_2A-12A	2	5	1	24	18900	900	12	10	5130	22.97	22.98	0.01	23.50
	2	10	1	49	18900	900	12	10	5130	23.01	23.09	0.08	23.50
	2	15	1	74	18900	900	12	10	5130	22.96	23.11	0.15	23.50
	2	20	1	99	18900	900	12	10	5130	22.95	23.10	0.15	23.50
	12	3	1	14	23165	5165	2	20	900	23.63	23.70	0.07	24.00
	12	5	1	24	23155	5155	2	20	900	23.59	23.65	0.06	24.00
	12	10	1	49	23130	5130	2	20	900	23.55	23.54	-0.01	24.00
CA_4A-5A	4	5	1	13	20375	2375	5	10	2600	22.42	22.53	0.11	23.00
	4	10	1	25	20350	2350	5	10	2600	22.46	22.59	0.13	23.00
	4	15	1	38	20325	2325	5	10	2600	22.43	22.44	0.01	23.00
	4	20	1	50	20300	2300	5	10	2600	22.41	22.57	0.16	23.00
	5	5	1	24	20625	2625	4	20	2300	23.49	23.59	0.10	24.00
	5	10	1	49	20600	2600	4	20	2300	23.45	23.48	0.03	24.00
CA_4A-12A	4	1.4	1	2	20393	2393	12	10	5130	22.41	22.56	0.15	23.00
	4	3	1	7	20385	2385	12	10	5130	22.45	22.52	0.07	23.00
	4	5	1	13	20375	2375	12	10	5130	22.42	22.48	0.06	23.00
	4	10	1	25	20350	2350	12	10	5130	22.46	22.44	-0.02	23.00
	4	15	1	38	20325	2325	12	10	5130	22.43	22.53	0.10	23.00
	4	20	1	50	20300	2300	12	10	5130	22.41	22.56	0.15	23.00

DL LTE CA Class	PCC						SCC1			SCC2			Power(dBm)			Tune-up Limit (dBm)
	PCC Band	PCC Bandwidth (MHz)	PCC UL RB size	PCC UL RB offset	PCC UL Channel	PCC DL Channel	SCC1 Band	SCC1 Bandwidth (MHz)	SCC1 DL Channel	SCC2 Band	SCC2 Bandwidth (MHz)	SCC2 DL Channel	Standalone	CA active	Delta	
CA_2A-2A-12A	2	5	1	24	18900	900	2	20	900	12	10	5130	22.43	22.34	-0.09	23.50
	2	10	1	49	18900	900	2	20	900	12	10	5130	22.35	22.40	0.05	23.50
	2	15	1	74	18900	900	2	20	900	12	10	5130	22.44	22.48	0.04	23.50
	2	20	1	99	18900	900	2	20	900	12	10	5130	22.44	22.37	-0.07	23.50
	12	10	1	24	23130	5130	2	20	900	2	20	900	23.61	23.64	0.03	24.00
	12	10	1	49	23130	5130	2	20	900	2	20	900	23.58	23.52	-0.06	24.00
CA_2A-4A-5A	2	5	1	24	18900	900	4	20	2300	5	10	2600	22.43	22.34	-0.09	23.50
	2	10	1	49	18900	900	4	20	2300	5	10	2600	22.35	22.40	0.05	23.50
	2	15	1	74	18900	900	4	20	2300	5	10	2600	22.44	22.48	0.04	23.50
	2	20	1	99	18900	900	4	20	2300	5	10	2600	22.44	22.37	-0.07	23.50
	4	5	1	13	20375	2375	2	20	900	5	10	2600	22.44	22.55	0.11	23.00
	4	10	1	25	20350	2350	2	20	900	5	10	2600	22.49	22.56	0.07	23.00
	4	15	1	38	20325	2325	2	20	900	5	10	2600	22.44	22.56	0.12	23.00
	4	20	1	50	20300	2300	2	20	900	5	10	2600	22.43	22.62	0.19	23.00
	5	5	1	24	20625	2625	2	20	900	4	20	2300	23.52	23.54	0.02	24.00
	5	10	1	49	20600	2600	2	20	900	4	20	2300	23.47	23.60	0.13	24.00
CA_2A-2A-5A	2	5	1	24	18900	900	2	20	900	5	10	2600	22.45	22.36	-0.09	23.50
	2	10	1	49	18900	900	2	20	900	5	10	2600	22.34	22.39	0.05	23.50
	2	15	1	74	18900	900	2	20	900	5	10	2600	22.43	22.47	0.04	23.50
	2	20	1	99	18900	900	2	20	900	5	10	2600	22.46	22.38	-0.08	23.50
	5	5	1	24	20625	2625	2	20	900	2	20	900	23.50	23.53	0.03	24.00
	5	10	1	49	20600	2600	2	20	900	2	20	900	23.47	23.62	0.15	24.00

9.2 WLAN Mode

2.4GHz	Antenna	Channel	Frequency (MHz)	Average Conducted Power (dBm)	Tune-up Limit(dBm)	TX Power Setting Level
				1M		
802.11b	Antenna 1	1	2412	14.85	15.50	14
		6	2437	14.25	15.50	14
		11	2462	14.72	15.50	15
	Antenna 2	1	2412	14.00	15.50	13
		6	2437	14.35	15.50	14
		11	2462	14.81	15.50	15
Mode	Antenna	Channel	Frequency (MHz)	Average Conducted Power (dBm)	Tune-up Limit(dBm)	TX Power Setting Level
				6M		
802.11g	Antenna 1	1	2412	12.65	13.50	12
		6	2437	12.62	13.50	13
		11	2462	12.41	13.50	13
	Antenna 2	1	2412	12.41	13.50	12
		6	2437	11.80	13.50	12
		11	2462	11.29	13.50	12
Mode	Antenna	Channel	Frequency (MHz)	Average Conducted Power (dBm)	Tune-up Limit(dBm)	TX Power Setting Level
				6.5M		
802.11n HT20	Antenna 1	1	2412	11.39	/	10
		6	2437	11.57	/	11
		11	2462	11.62	/	11
	Antenna 2	1	2412	10.50	/	10
		6	2437	9.83	/	10
		11	2462	10.21	/	11
	Sum	1	2412	14.19	15.00	/
		6	2437	14.01	15.00	/
		11	2462	14.19	15.00	/
Mode	Ant	Channel	Frequency (MHz)	Average Conducted Power (dBm)	Tune-up Limit(dBm)	TX Power Setting Level
				13.5M		
802.11n HT40	Antenna 1	3	2422	10.62	/	10
		6	2437	10.59	/	10
		9	2452	11.04	/	11
	Antenna 2	3	2422	10.64	/	10
		6	2437	10.93	/	11
		9	2452	10.49	/	11

	Sum	3	2422	14.09	15.00	/
		6	2437	14.23	15.00	/
		9	2452	14.24	15.00	/

5GHz Wi-Fi	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					6M		
802.11a	Antenna 1	U-NII-1	36	5180	11.06	11.50	13
			40	5200	11.17	11.50	13
			44	5220	10.52	11.50	13
			48	5240	11.00	11.50	13
		U-NII-3	149	5745	11.07	11.50	13
			157	5785	11.11	11.50	13
			165	5825	10.51	11.50	13
	Antenna 2	U-NII-1	36	5180	10.95	11.50	14
			40	5200	10.67	11.50	14
			44	5220	11.01	11.50	14
			48	5240	10.48	11.50	14
		U-NII-3	149	5745	10.89	12.00	14
			157	5785	11.30	12.00	14
			165	5825	11.22	12.00	14
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0		
802.11n HT20	Antenna 1	U-NII-1	36	5180	11.50	12.00	15
			40	5200	11.43	12.00	15
			44	5220	11.64	12.00	15
			48	5240	11.61	12.00	15
		U-NII-3	149	5745	11.72	12.00	14
			157	5785	11.59	12.00	14
			165	5825	10.88	12.00	14
	Antenna 2	U-NII-1	36	5180	11.64	12.00	15
			40	5200	11.35	12.00	15
			44	5220	11.84	12.00	15
			48	5240	11.34	12.00	15
		U-NII-3	149	5745	10.86	11.50	14
			157	5785	10.98	11.50	14
			165	5825	10.94	11.50	14
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0		
802.11n HT40	Antenna 1	U-NII-1	38	5190	10.81	11.50	14
			46	5230	11.08	11.50	14

		U-NII-3	151	5755	11.21	11.50	14
			159	5795	10.49	11.50	14
	Antenna 2	U-NII-1	38	5190	10.86	11.50	14
			46	5230	10.77	11.50	14
		U-NII-3	151	5755	11.24	11.50	14
			159	5795	11.21	11.50	14
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm) MCS0	Tune-up Limit(dBm)	TX Power Setting Level
802.11ac HT20	Antenna 1	U-NII-1	36	5180	10.52	11.50	14
			40	5200	10.51	11.50	14
			44	5220	10.67	11.50	14
			48	5240	10.69	11.50	14
		U-NII-3	149	5745	10.70	11.50	13
			157	5785	10.60	11.50	13
			165	5825	10.22	11.50	13
	Antenna 2	U-NII-1	36	5180	10.71	12.00	14
			40	5200	10.46	12.00	14
			44	5220	11.85	12.00	14
			48	5240	10.37	12.00	14
		U-NII-3	149	5745	10.02	11.50	13
			157	5785	10.02	11.50	13
			165	5825	10.08	11.50	13
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm) MCS0	Tune-up Limit(dBm)	TX Power Setting Level
802.11ac HT40	Antenna 1	U-NII-1	38	5190	9.84	11.50	13
			46	5230	10.13	11.50	13
		U-NII-3	151	5755	10.21	11.50	12
			159	5795	9.44	11.50	12
	Antenna 2	U-NII-1	38	5190	10.03	11.50	13
			46	5230	9.94	11.50	13
		U-NII-3	151	5755	10.33	11.50	12
			159	5795	10.42	11.50	12
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm) MCS0	Tune-up Limit(dBm)	TX Power Setting Level
802.11ac HT80	Antenna 1	U-NII-1	42	5210	9.51	11.50	13
		U-NII-3	155	5775	8.97	11.50	12
	Antenna 2	U-NII-1	42	5210	9.28	11.50	13
		U-NII-3	155	5775	9.80	11.50	12
Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting

					MCS0/6		Level
802.11n HT20	Antenna 1	U-NII-1	36	5180	11.50	/	15
			40	5200	11.43	/	15
			44	5220	11.64	/	15
			48	5240	11.61	/	15
		U-NII-3	149	5745	11.72	/	14
			157	5785	11.59	/	14
			165	5825	10.88	/	14
	Antenna 2	U-NII-1	36	5180	11.64	/	15
			40	5200	11.35	/	15
			44	5220	11.84	/	15
			48	5240	11.34	/	15
		U-NII-3	149	5745	10.86	/	14
			157	5785	10.98	/	14
			165	5825	10.94	/	14
	Sum	U-NII-1	36	5180	14.58	15.00	/
			40	5200	14.40	15.00	/
			44	5220	14.75	15.00	/
			48	5240	14.49	15.00	/
		U-NII-3	149	5745	14.32	15.00	/
			157	5785	14.31	15.00	/
			165	5825	13.92	15.00	/

Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0/6		
802.11n HT40	Antenna 1	U-NII-1	38	5190	10.81	/	14
			46	5230	11.08	/	14
		U-NII-3	151	5755	11.21	/	14
			159	5795	10.49	/	14
	Antenna 2	U-NII-1	38	5190	10.86	/	14
			46	5230	10.77	/	14
		U-NII-3	151	5755	11.24	/	14
			159	5795	11.21	/	14
	Sum	U-NII-1	38	5190	13.85	14.50	/
			46	5230	13.94	14.50	/
		U-NII-3	151	5755	14.24	14.50	/
			159	5795	13.88	14.50	/

Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0/6		
802.11ac HT20	Antenna 1	U-NII-1	36	5180	10.52	/	14
			40	5200	10.51	/	14
			44	5220	10.67	/	14

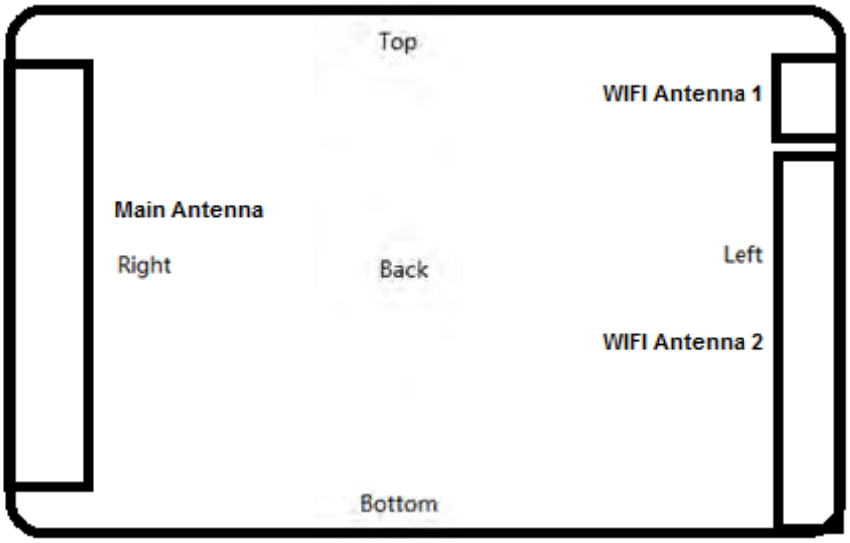
			48	5240	10.69	/	14
		U-NII-3	149	5745	10.70	/	13
			157	5785	10.60	/	13
			165	5825	10.22	/	13
	Antenna 2	U-NII-1	36	5180	10.71	/	14
			40	5200	10.46	/	14
			44	5220	11.85	/	14
			48	5240	10.37	/	14
		U-NII-3	149	5745	10.02	/	13
			157	5785	10.02	/	13
			165	5825	10.08	/	13
	Sum	U-NII-1	36	5180	13.63	14.50	/
			40	5200	13.50	14.50	/
			44	5220	14.31	14.50	/
			48	5240	13.54	14.50	/
		U-NII-3	149	5745	13.38	14.50	/
			157	5785	13.33	14.50	/
			165	5825	13.16	14.50	/

Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0		
802.11ac HT40	Antenna 1	U-NII-1	38	5190	9.84	/	13
			46	5230	10.13	/	13
		U-NII-3	151	5755	10.21	/	12
			159	5795	9.44	/	12
	Antenna 2	U-NII-1	38	5190	10.03	/	13
			46	5230	9.94	/	13
		U-NII-3	151	5755	10.33	/	12
			159	5795	10.42	/	12
	Sum	U-NII-1	38	5190	12.95	14.50	/
			46	5230	13.05	14.50	/
		U-NII-3	151	5755	13.28	14.50	/
			159	5795	12.97	14.50	/

Mode	Antenna	Band	Channel	Frequency (MHz)	Average Conducted Power(dBm)	Tune-up Limit(dBm)	TX Power Setting Level
					MCS0		
802.11ac HT80	Antenna 1	U-NII-1	42	5210	9.51	/	13
		U-NII-3	155	5775	8.97	/	12
	Antenna 2	U-NII-1	42	5210	9.28	/	13
		U-NII-3	155	5775	9.80	/	12
	Sum	U-NII-1	42	5210	12.41	14.50	/
		U-NII-3	155	5775	12.42	14.50	/

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 112mm x 64mm						
Distance of the Antenna to the EUT surface/edge						
Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	0	0	>25mm	0	<25mm	<25mm
Wi-Fi Antenna 1	0	0	0	>25mm	<25mm	<25mm
Wi-Fi Antenna 2	0	0	0	>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	N/A	Yes	Yes	Yes
Wi-Fi Antenna 1	Yes	Yes	Yes	N/A	Yes	Yes
Wi-Fi Antenna 2	Yes	Yes	Yes	N/A	Yes	Yes

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

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg (for 1g SAR) or ≤ 2 W/kg (for 10g SAR) then testing at the other channels is not required for such test configuration(s).

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

10.2 Measured SAR Results

Table 1: LTE Band 2

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power(dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	99	19100/1900	23.50	22.93	0.100	0.894	1.14	1.019	/
	Standard	1RB	99	18900/1880	23.50	22.95	-0.080	0.869	1.14	0.986	/
	Standard	1RB	99	18700/1860	23.50	22.86	0.020	0.862	1.16	0.999	/
Front Side	Standard	1RB	99	19100/1900	23.50	22.93	0.050	0.945	1.14	1.078	/
	Standard	1RB	99	18900/1880	23.50	22.95	-0.040	0.951	1.14	1.079	/
	Standard	1RB	99	18700/1860	23.50	22.86	0.010	0.957	1.16	1.109	8
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	99	18900/1880	23.50	22.95	0.100	0.660	1.14	0.749	/
Top Edge	Standard	1RB	99	18900/1880	23.50	22.95	0.022	0.331	1.14	0.376	/
Bottom Edge	Standard	1RB	99	18900/1880	23.50	22.95	0.180	0.204	1.14	0.232	/
Back Side	Standard	50%RB	50	19100/1900	22.50	21.90	0.040	0.694	1.15	0.797	/
Front Side	Standard	50%RB	50	19100/1900	22.50	21.90	0.000	0.745	1.15	0.855	/
	Standard	50%RB	50	18900/1880	22.50	21.69	0.050	0.747	1.21	0.900	/
	Standard	50%RB	50	18700/1860	22.50	21.70	0.020	0.759	1.20	0.913	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	50	19100/1900	22.50	21.90	0.170	0.555	1.15	0.637	/
Top Edge	Standard	50%RB	50	19100/1900	22.50	21.90	0.033	0.273	1.15	0.313	/
Bottom Edge	Standard	50%RB	50	19100/1900	22.50	21.90	0.028	0.158	1.15	0.181	/
Back Side	Standard	100%RB	0	19100/1900	22.50	21.91	0.000	0.697	1.15	0.798	/
Front Side	Standard	100%RB	0	19100/1900	22.50	21.91	0.000	0.758	1.15	0.868	/
	Standard	100%RB	0	18900/1880	22.50	21.70	0.060	0.742	1.20	0.892	/
	Standard	100%RB	0	18700/1860	22.50	21.85	-0.020	0.753	1.16	0.875	/
Front Side	Repeated	1RB	99	18700/1860	23.50	22.86	0.020	0.951	1.16	1.102	/
Note: 1.The value with blue color is the maximum SAR Value of each test band.											

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{10g} (W/kg)	1st Repeated SAR_{10g} (W/kg)	Ratio
Front side	18700/1860	0.957	0.951	1.01
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). 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 2: LTE Band 4

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power(dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	50	20300/1745	23.00	22.41	-0.020	0.937	1.15	1.073	/
	Standard	1RB	50	20175/1732.5	23.00	22.14	-0.090	0.930	1.22	1.134	/
	Standard	1RB	50	20050/1720	23.00	22.36	-0.030	0.923	1.16	1.070	/
Front Side	Standard	1RB	50	20300/1745	23.00	22.41	-0.020	1.010	1.15	1.157	/
	Standard	1RB	50	20175/1732.5	23.00	22.14	0.010	1.010	1.22	1.231	/
	Standard	1RB	50	20050/1720	23.00	22.36	0.050	1.010	1.16	1.170	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	50	20300/1745	23.00	22.41	-0.025	0.413	1.15	0.473	/
Top Edge	Standard	1RB	50	20300/1745	23.00	22.41	-0.050	0.313	1.15	0.359	/
Bottom Edge	Standard	1RB	50	20300/1745	23.00	22.41	0.100	0.228	1.15	0.261	/
Back Side	Standard	50%RB	25	20050/1720	22.00	21.41	-0.140	0.649	1.15	0.743	/
Front Side	Standard	50%RB	25	20300/1745	22.00	21.37	0.030	0.807	1.16	0.933	/
	Standard	50%RB	25	20175/1732.5	22.00	21.38	0.010	0.815	1.15	0.940	/
	Standard	50%RB	25	20050/1720	22.00	21.41	0.010	0.816	1.15	0.935	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	25	20050/1720	22.00	21.41	0.010	0.306	1.15	0.351	/
Top Edge	Standard	50%RB	25	20050/1720	22.00	21.41	-0.030	0.266	1.15	0.305	/
Bottom Edge	Standard	50%RB	25	20050/1720	22.00	21.41	0.040	0.170	1.15	0.195	/
Back side	Standard	100%RB	0	20050/1720	22.00	21.26	0.010	0.654	1.19	0.775	/
Front side	Standard	100%RB	0	20300/1745	22.00	21.09	0.120	0.687	1.23	0.847	/
	Standard	100%RB	0	20175/1732.5	22.00	21.24	0.040	0.676	1.19	0.805	/
	Standard	100%RB	0	20050/1720	22.00	21.26	-0.130	0.678	1.19	0.804	/
Front side	Repeated	1RB	50	20175/1732.5	23.00	22.14	0.030	1.010	1.22	1.231	9
Note: 1.The value with blue color is the maximum SAR Value of each test band.											

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Front side	20175/1732.5	1.010	1.010	1.00
Note: 1) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). 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 3: LTE Band 5

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	49	20600/844	24.00	23.45	-0.020	0.533	1.14	0.605	/
Front Side	Standard	1RB	49	20600/844	24.00	23.45	-0.137	0.491	1.14	0.557	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	49	20600/844	24.00	23.45	0.170	0.089	1.14	0.101	/
Top Edge	Standard	1RB	49	20600/844	24.00	23.45	-0.150	0.241	1.14	0.274	/
Bottom Edge	Standard	1RB	49	20600/844	24.00	23.45	-0.010	0.308	1.14	0.350	/
Back Side	Standard	50%RB	0	20525/836.5	23.00	22.47	0.010	0.580	1.13	0.655	10
Front Side	Standard	50%RB	0	20525/836.5	23.00	22.47	-0.010	0.562	1.13	0.635	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	0	20525/836.5	23.00	22.47	0.150	0.085	1.13	0.096	/
Top Edge	Standard	50%RB	0	20525/836.5	23.00	22.47	-0.030	0.263	1.13	0.297	/
Bottom Edge	Standard	50%RB	0	20525/836.5	23.00	22.47	-0.060	0.302	1.13	0.341	/

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 ≥ 0.8 W/kg.

Table 4: LTE Band 12

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	49	23130/711	24.00	23.55	0.050	0.484	1.11	0.537	/
Front Side	Standard	1RB	49	23130/711	24.00	23.55	0.010	0.480	1.11	0.532	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	49	23130/711	24.00	23.55	-0.028	0.130	1.11	0.144	/
Top Edge	Standard	1RB	49	23130/711	24.00	23.55	-0.010	0.179	1.11	0.199	/
Bottom Edge	Standard	1RB	49	23130/711	24.00	23.55	-0.160	0.347	1.11	0.385	/
Back Side	Standard	50%RB	0	23095/707.5	23.00	22.56	-0.020	0.522	1.11	0.578	11
Front Side	Standard	50%RB	0	23095/707.5	23.00	22.56	0.030	0.516	1.11	0.571	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	0	23095/707.5	23.00	22.56	0.100	0.073	1.11	0.081	/
Top Edge	Standard	50%RB	0	23095/707.5	23.00	22.56	-0.040	0.195	1.11	0.216	/
Bottom Edge	Standard	50%RB	0	23095/707.5	23.00	22.56	-0.020	0.340	1.11	0.376	/

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 ≥ 0.8 W/kg.

Table 5: LTE Band 13

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	25	23230/785	24.00	23.29	-0.050	0.756	1.18	0.890	/
Front Side	Standard	1RB	25	23230/785	24.00	23.29	-0.066	0.877	1.18	1.033	12
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	25	23230/785	24.00	23.29	0.070	0.143	1.18	0.168	/
Top Edge	Standard	1RB	25	23230/785	24.00	23.29	0.010	0.332	1.18	0.391	/
Bottom Edge	Standard	1RB	25	23230/785	24.00	23.29	0.050	0.348	1.18	0.410	/
Back Side	Standard	50%RB	13	23230/785	23.00	22.42	-0.030	0.685	1.14	0.783	/
Front Side	Standard	50%RB	13	23230/785	23.00	22.42	0.130	0.622	1.14	0.711	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	13	23230/785	23.00	22.42	0.110	0.111	1.14	0.127	/
Top Edge	Standard	50%RB	13	23230/785	23.00	22.42	0.010	0.260	1.14	0.297	/
Bottom Edge	Standard	50%RB	13	23230/785	23.00	22.42	0.040	0.269	1.14	0.307	/
Back Side	Standard	100%RB	0	23230/785	23.00	22.38	-0.010	0.518	1.15	0.597	/
Front Side	Standard	100%RB	0	23230/785	23.00	22.38	-0.020	0.696	1.15	0.803	/
Front Side	Repeated	1RB	25	23230/785	24.00	23.29	0.040	0.854	1.18	1.006	/

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 ≥ 0.8 W/kg.

Measurement Variability				
Test Position	Channel/ Frequency(MHz)	MAX Measured SAR_{1g} (W/kg)	1st Repeated SAR_{1g} (W/kg)	Ratio
Front side	23230/785	0.877	0.854	1.03

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

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 25

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)											
Back Side	Standard	1RB	0	26140/1860	23.00	22.22	0.060	0.570	1.20	0.682	/
Front Side	Standard	1RB	0	26140/1860	23.00	22.22	-0.080	0.633	1.20	0.758	13
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	1RB	0	26140/1860	23.00	22.22	0.150	0.447	1.20	0.535	/
Top Edge	Standard	1RB	0	26140/1860	23.00	22.22	0.022	0.272	1.20	0.326	/
Bottom Edge	Standard	1RB	0	26140/1860	23.00	22.22	0.028	0.152	1.20	0.182	/
Back Side	Standard	50%RB	0	26590/1905	22.00	21.20	0.130	0.493	1.20	0.593	/
Front Side	Standard	50%RB	0	26590/1905	22.00	21.20	0.140	0.553	1.20	0.665	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	Standard	50%RB	0	26590/1905	22.00	21.20	-0.024	0.424	1.20	0.510	/
Top Edge	Standard	50%RB	0	26590/1905	22.00	21.20	0.021	0.208	1.20	0.250	/
Bottom Edge	Standard	50%RB	0	26590/1905	22.00	21.20	0.030	0.117	1.20	0.141	/

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 ≥ 0.8 W/kg.

Table 7: Wi-Fi (2.4G)

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11b	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm) ANT1												
Back Side	Standard	1/2412	DSSS	1:1	15.50	14.85	0.100	0.112	0.110	1.16	0.128	14
Front Side	Standard	1/2412	DSSS	1:1	15.50	14.85	-0.038	0.060	0.062	1.16	0.071	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	Standard	1/2412	DSSS	1:1	15.50	14.85	0.170	0.077	0.081	1.16	0.094	/
Body SAR (Distance 10mm) ANT2												
Back Side	Standard	11/2462	DSSS	1:1	15.50	14.81	0.040	0.089	0.091	1.17	0.107	/
Front Side	Standard	11/2462	DSSS	1:1	15.50	14.81	0.028	0.098	0.096	1.17	0.112	15
Left Edge	Standard	11/2462	DSSS	1:1	15.50	14.81	0.070	0.023	0.020	1.17	0.024	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	Standard	11/2462	DSSS	1:1	15.50	14.81	0.030	0.070	0.062	1.17	0.073	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

2. Initial test configuration is 802.11b mode, since the highest maximum output power.

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	Back Side	1/2412	0.128	15.50	13.50	0.66	0.085
802.11n HT20	Back Side	1/2412	0.128	15.50	15.00	0.94	0.120
802.11n HT40	Back Side	1/2412	0.128	15.50	15.00	0.94	0.120
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 8: Wi-Fi 5G

Antenna 1

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT20	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)												
Back Side	Standard	44/5220	OFDM	95.24%	12.00	11.64	0.000	0.003	0.060	1.14	0.069	/
Front Side	Standard	44/5220	OFDM	95.24%	12.00	11.64	0.000	0.086	0.108	1.14	0.123	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	Standard	44/5220	OFDM	95.24%	12.00	11.64	-0.140	0.606	0.558	1.14	0.637	16
Body SAR (Distance 10mm)												
Back Side	Standard	149/5745	OFDM	95.24%	12.00	11.72	0.000	0.019	0.089	1.12	0.100	/
Front Side	Standard	149/5745	OFDM	95.24%	12.00	11.72	0.100	0.143	0.175	1.12	0.196	/
Left Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	Standard	149/5745	OFDM	95.24%	12.00	11.72	0.110	0.707	0.454	1.12	0.508	17

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

2. Initial test configuration is 802.11n HT20 mode, since the highest maximum output power.

Antenna 2

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT20	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm) (U-NII-1)												
Back Side	Standard	44/5220	OFDM	95.24%	12.00	11.84	0.100	0.138	0.097	1.09	0.105	/
Front Side	Standard	44/5220	OFDM	95.24%	12.00	11.84	0.100	0.060	0.076	1.09	0.083	/
Left Edge	Standard	44/5220	OFDM	95.24%	12.00	11.84	0.088	0.233	0.165	1.09	0.180	18
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	Standard	44/5220	OFDM	95.24%	12.00	11.84	0.160	0.117	0.124	1.09	0.135	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Test Position	**Cover Type**	**Channel/ Frequency (MHz)**	**Mode 802.11a**	**Duty Cycle**	**Tune-up limit (dBm)**	**Conducted Power (dBm)**	**Drift (dB)**	**Area Scan Max.SAR (W/Kg)**	**Measured SAR_{1g} (W/kg)**	**Scaling Factor**	**Reported SAR_{1g} (W/kg)**	**Plot No.**
Body SAR (Distance 10mm) (U-NII-3)												
Back Side	Standard	157/5785	OFDM	95.56%	12.00	11.30	0.183	0.215	0.222	1.23	0.273	19
Front Side	Standard	157/5785	OFDM	95.56%	12.00	11.30	0.000	0.089	0.137	1.23	0.168	/
Left Edge	Standard	157/5785	OFDM	95.56%	12.00	11.30	0.026	0.126	0.128	1.23	0.157	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	Standard	157/5785	OFDM	95.56%	12.00	11.30	0.000	0.140	0.128	1.23	0.157	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

2. Initial test configuration is 802.11n HT20 mode for U-NII-1, 802.11a mode for U-NII-3, since the highest maximum output power.

MIMO

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT20	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR_{1g} (W/kg)	Scaling Factor	Reported SAR_{1g} (W/kg)	Plot No.
Body SAR (Distance 10mm)												
Back side	Standard	44/5220	OFDM	95.24%	15.00	14.75	0.093	0.160	0.129	1.11	0.143	/
Front side	Standard	44/5220	OFDM	95.24%	15.00	14.75	-0.108	0.090	0.108	1.11	0.120	/
Left Edge	Standard	44/5220	OFDM	95.24%	15.00	14.75	0.127	0.218	0.198	1.11	0.220	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	Standard	44/5220	OFDM	95.24%	15.00	14.75	0.186	0.130	0.138	1.11	0.153	/
Bottom Edge	Standard	48/5240	OFDM	95.24%	15.00	14.49	0.012	0.753	0.789	1.18	0.932	/
	Standard	44/5220	OFDM	95.24%	15.00	14.75	0.047	0.741	0.779	1.11	0.866	/
	Standard	36/5180	OFDM	95.24%	15.00	14.58	0.038	0.731	0.832	1.16	0.962	20
Bottom Edge	Repeated	36/5180	OFDM	95.24%	15.00	14.58	0.012	0.715	0.810	1.16	0.937	/
Test Position	**Cover Type**	**Channel/ Frequency (MHz)**	**Mode 802.11n HT20**	**Duty Cycle**	**Tune-up limit (dBm)**	**Conducted Power (dBm)**	**Drift (dB)**	**Area Scan Max.SAR (W/Kg)**	**Measured SAR_{1g} (W/kg)**	**Scaling Factor**	**Reported SAR_{1g} (W/kg)**	**Plot No.**
Body SAR (Distance 10mm) (U-NII-3)												
Back side	Standard	149/5745	OFDM	95.24%	15.00	14.32	0.081	0.161	0.137	1.23	0.168	/
Front side	Standard	149/5745	OFDM	95.24%	15.00	14.32	0.100	0.149	0.132	1.23	0.162	/
Left Edge	Standard	149/5745	OFDM	95.24%	15.00	14.32	0.098	0.102	0.121	1.23	0.149	/
Right Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Top Edge	Standard	149/5745	OFDM	95.24%	15.00	14.32	-0.057	0.101	0.105	1.23	0.129	/
Bottom Edge	Standard	149/5745	OFDM	95.24%	15.00	14.32	0.020	0.743	0.447	1.23	0.549	21

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

2. Initial test configuration is 802.11n HT20 mode, since the highest maximum output power.

Measurement Variability				
Test Position	**Channel/ Frequency(MHz)**	**MAX Measured SAR_{1g} (W/kg)**	**1st Repeated SAR_{1g} (W/kg)**	**Ratio**
Bottom Edge	36/5180	0.832	0.810	1.03

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

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.

10.3 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Body
LTE(Data) + Wi-Fi Antenna 1	Yes
LTE(Data) + Wi-Fi Antenna 2	Yes
Wi-Fi Antenna 1+ Wi-Fi Antenna 2	Yes
Wi-Fi 2.4G + Wi-Fi 5G	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 < 1.6W/kg, simultaneously transmission SAR measurement is not necessary.

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

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

The maximum SAR_{1g} Value for LTE Antenna

Test Position \ SAR_{1g}(W/kg)		LTE FDD 2	LTE FDD 4	LTE FDD 5	LTE FDD 12	LTE FDD 13	LTE FDD 25	MAX. SAR_{1g}
Body SAR	Back Side	1.019	1.134	0.655	0.578	0.890	0.682	1.134
	Front Side	1.109	1.231	0.635	0.571	1.033	0.758	1.231
	Left Edge	0	0	0	0	0	0	0
	Right Edge	0.749	0.473	0.101	0.144	0.168	0.535	0.749
	Top Edge	0.376	0.359	0.297	0.216	0.391	0.326	0.391
	Bottom Edge	0.232	0.261	0.350	0.385	0.410	0.182	0.410

About Wi-Fi Antenna 1 and Wi-Fi Antenna 2 and LTE Antenna

Test Position \ $SAR_{1g/10g}$(W/kg)		LTE Antenna	Wi-Fi 2.4G			Wi-Fi 5G		MAX. ΣSAR_{1g}
			Ant 1	Ant 2	ANT1+ANT2	Wi-Fi MIMO (U-NII-1)	Wi-Fi MIMO (U-NII-3)	
Body SAR	Back Side	**1.134**	0.128	0.107	**0.235**	0.143	**0.168**	1.537
	Front Side	**1.231**	0.071	0.112	**0.183**	0.120	**0.162**	1.576
	Left Edge	**0**	0	0.024	**0.024**	**0.220**	0.149	0.244
	Right Edge	**0.749**	0	0	**0**	0	0	0.749
	Top Edge	**0.391**	0	0.073	**0.073**	**0.153**	0.129	0.617
	Bottom Edge	**0.410**	0.094	0	**0.094**	**0.962**	0.549	1.466

Note: 1.The value with blue color is the maximum ΣSAR_{1g} Value.

2. MAX. $\Sigma SAR_{1g/10g}$ =Unlicensed SAR_{MAX} +Licensed SAR_{MAX}

3. For Wi-Fi 2.4G uses ANT1+ANT2 as a more conservative assessment

MAX. ΣSAR_{1g} =1.576 <1.6 W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi Antenna 1 and Wi-Fi Antenna 2 and LTE Antenna.

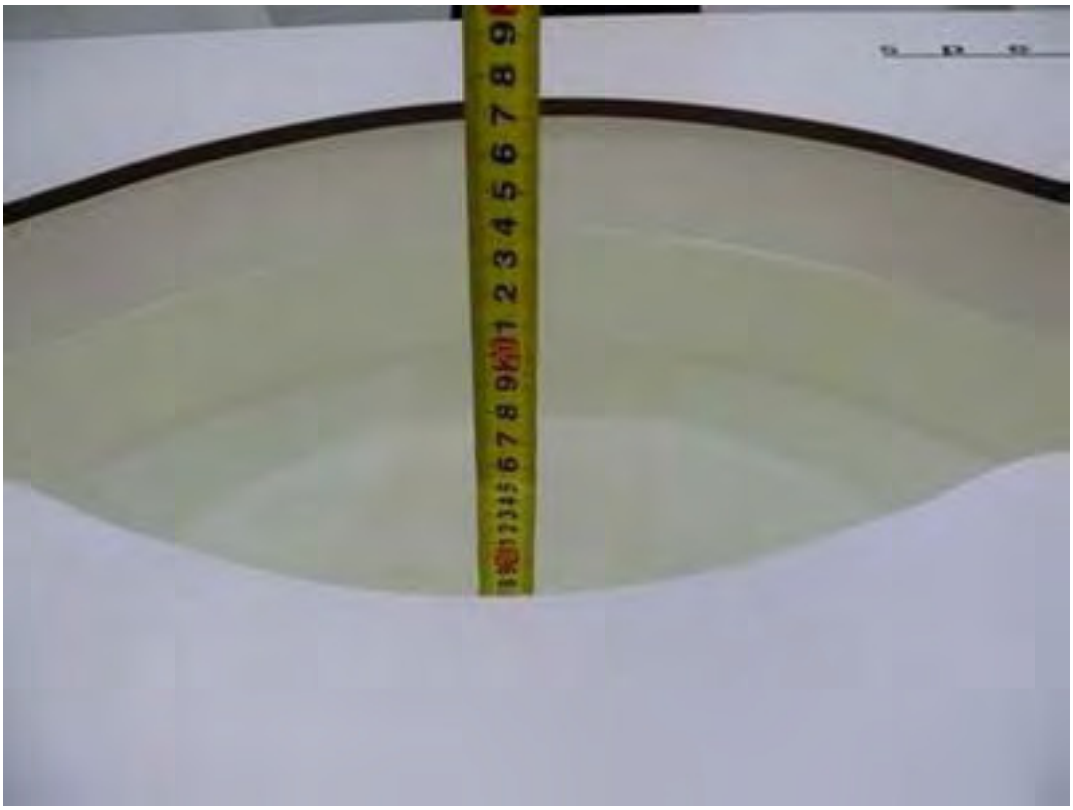
11 Measurement Uncertainty

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

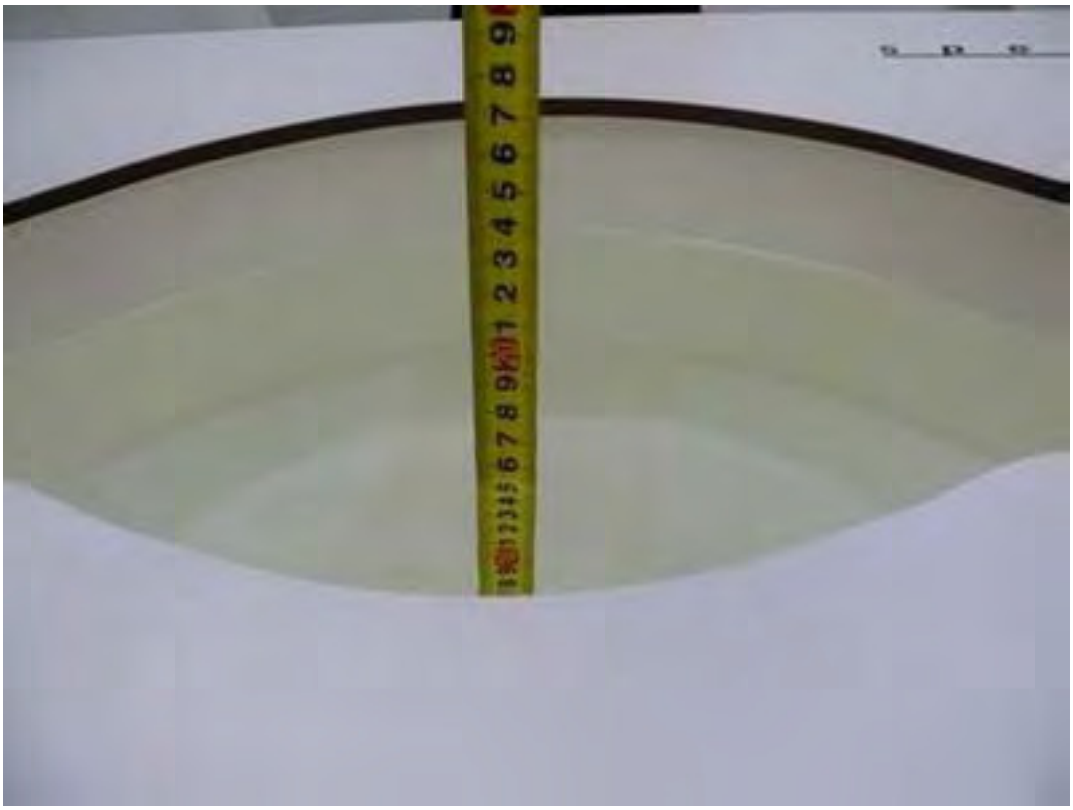
ANNEX A: Test Layout

Picture 3: Liquid depth in the flat Phantom (750MHz, 15.4cm depth)

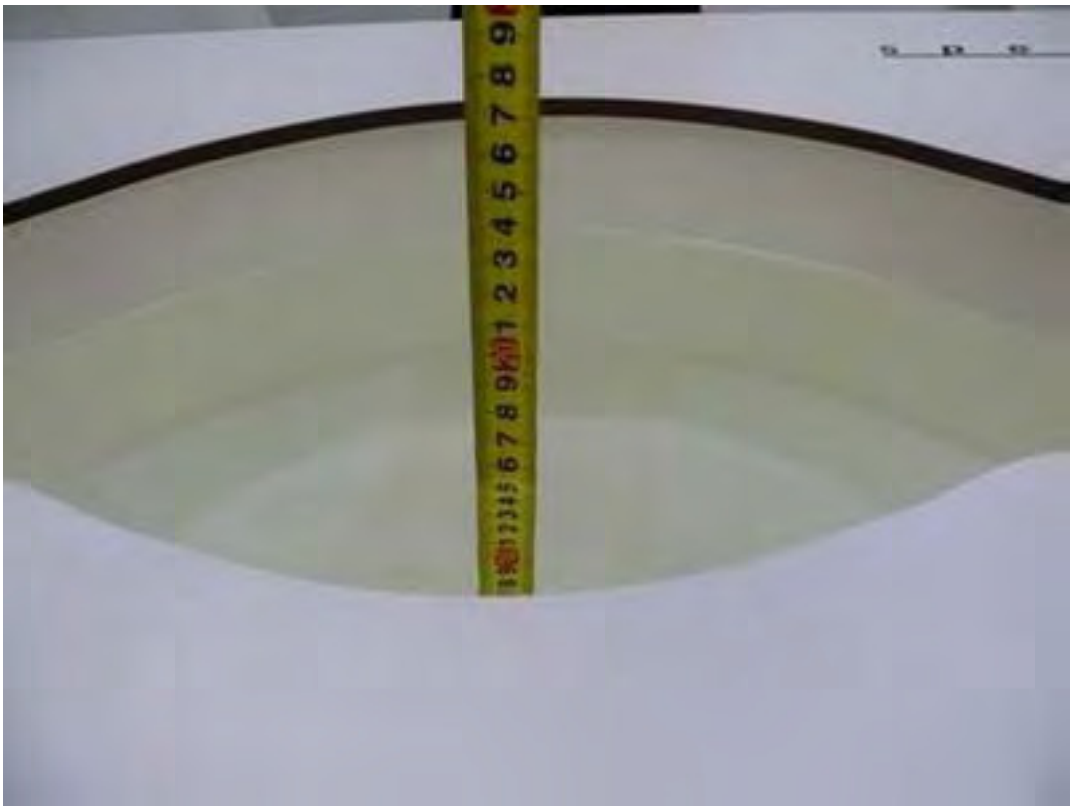
Picture 4: Liquid depth in the flat Phantom (835MHz, 15.4cm depth)



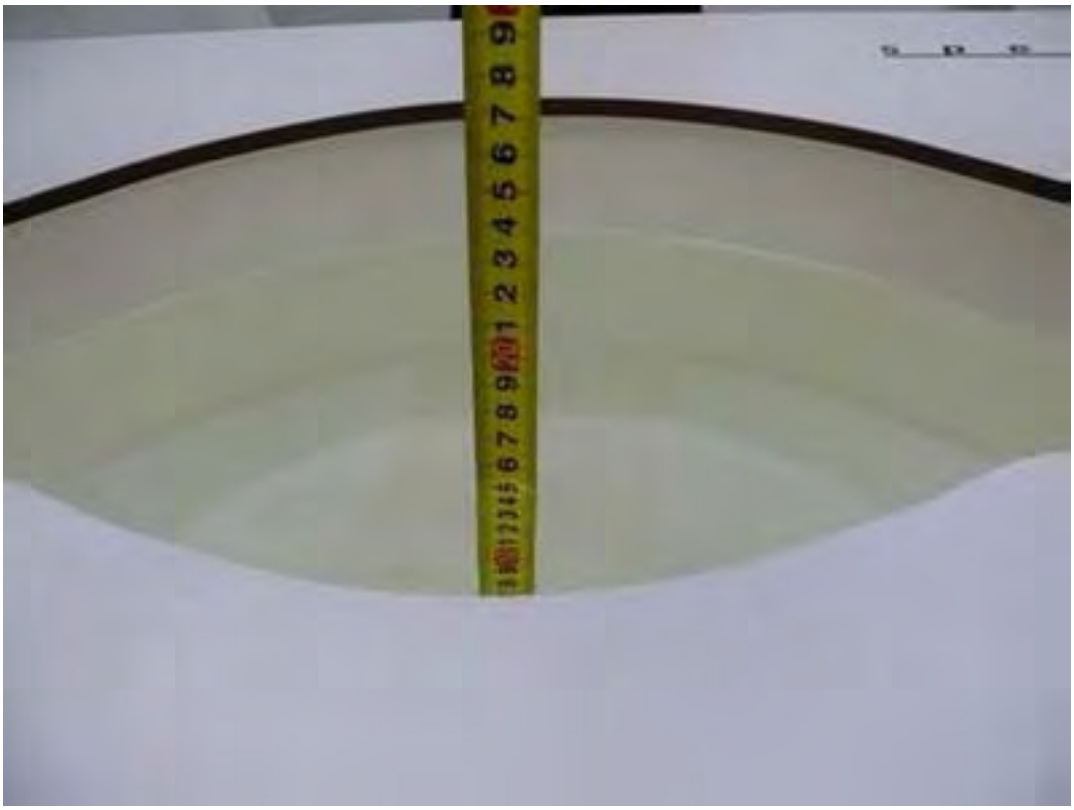
Picture 5: Liquid depth in the flat Phantom (1750 MHz, 15.2cm depth)



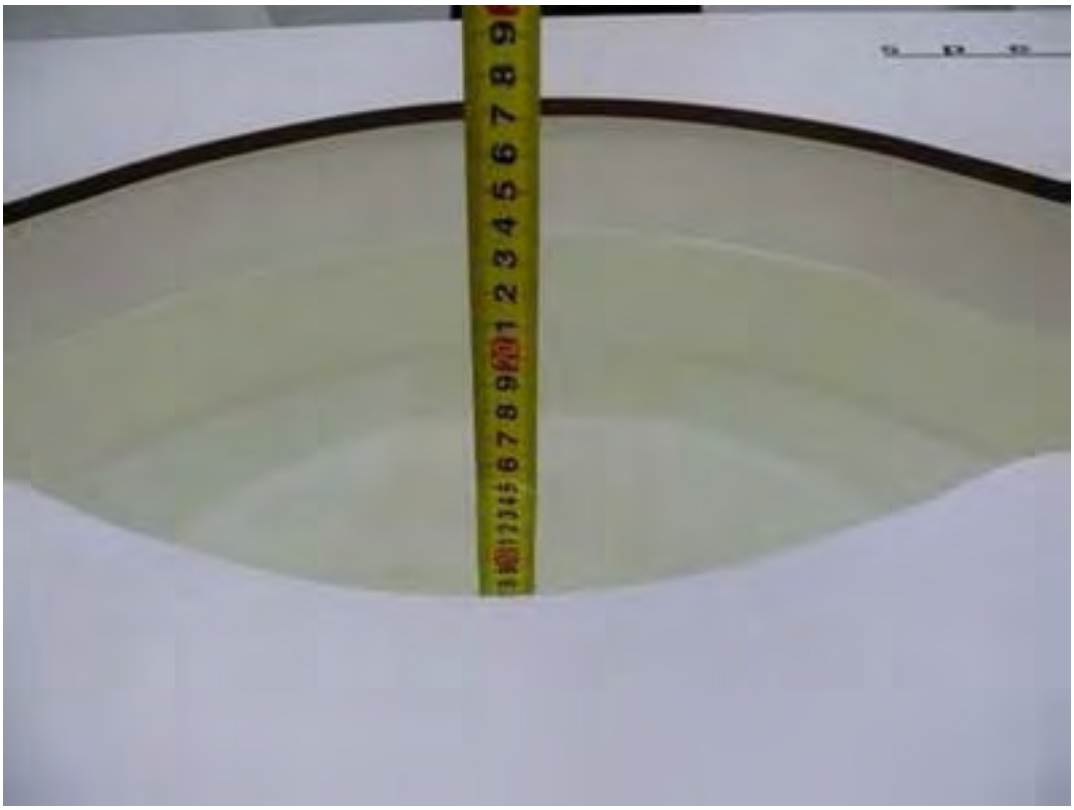
Picture 6: Liquid depth in the flat Phantom (1900 MHz, 15.2cm depth)



Picture 7: Liquid depth in the flat Phantom (2450 MHz, 15.3cm depth)



Picture 8: Liquid depth in the flat Phantom (5250 MHz, 15.3cm depth)



Picture 9: Liquid depth in the flat Phantom (5750 MHz, 15.0cm depth)

ANNEX B: System Check Results

Plot 1 System Performance Check at 750 MHz Body TSL

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

Date: 12/28/2017

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

Medium parameters used: f = 750 MHz; σ = 0.95 S/m; ε_r = 56.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.99, 9.99, 9.99); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.36 W/kg

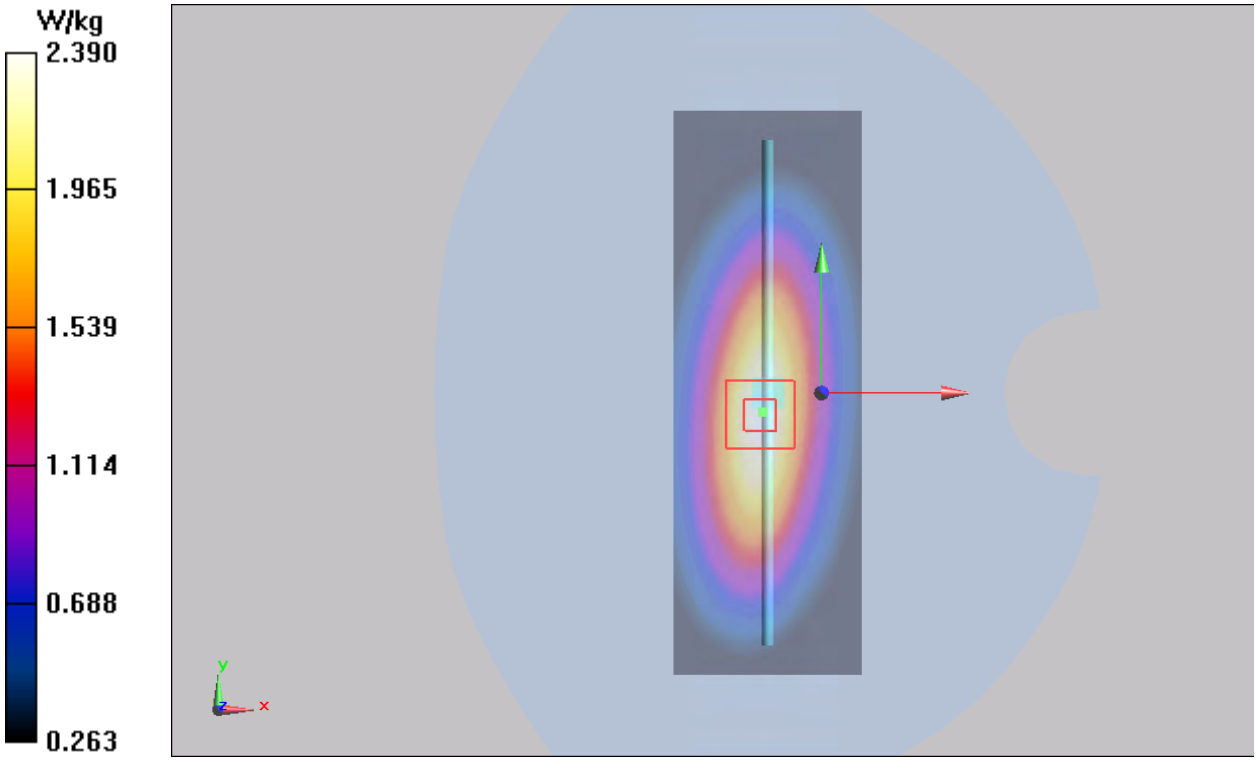
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 48.998 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.24 W/kg

SAR(1 g) = 2.22 W/kg; SAR(10 g) = 1.49 W/kg

Maximum value of SAR (measured) = 2.39 W/kg



Plot 2 System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 12/27/2017

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

Medium parameters used: f = 835 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.74, 9.74, 9.74); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 2.58 mW/g

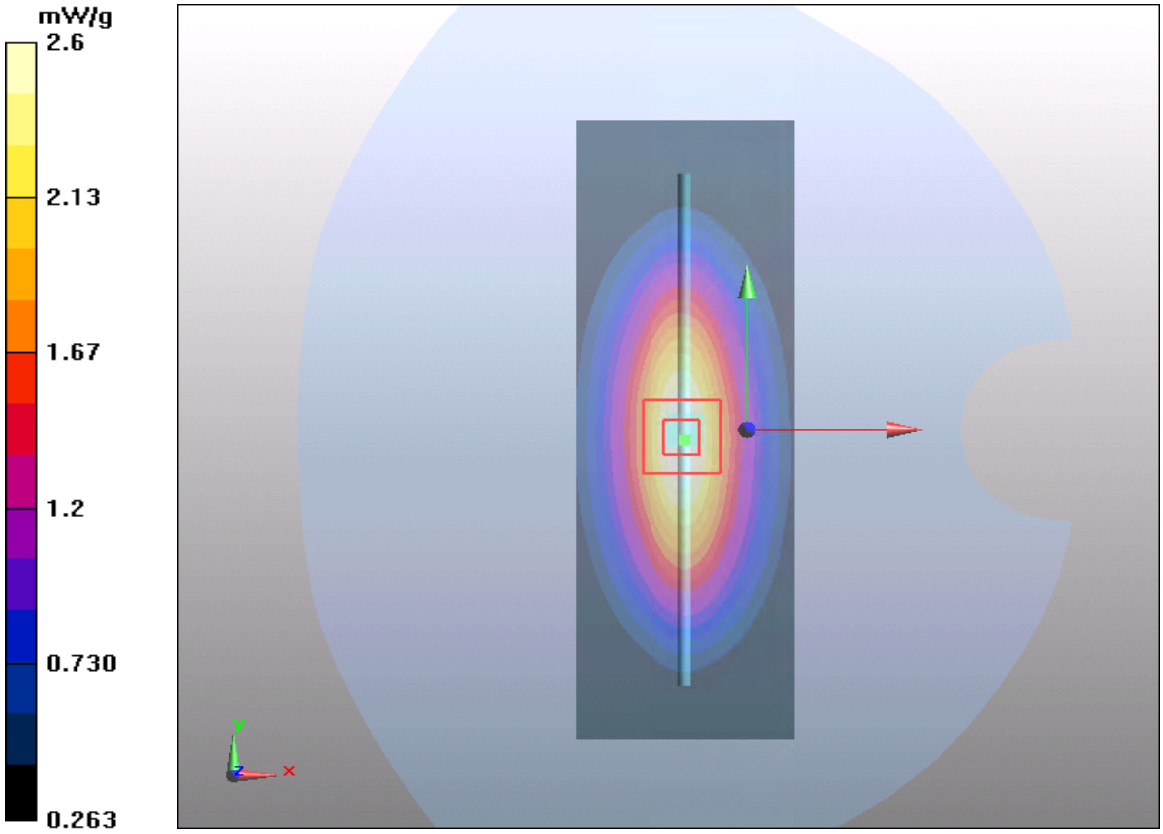
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 51.9 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.6 mW/g



Plot 3 System Performance Check at 1750 MHz Body TSL

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1033

Date: 12/28/2017

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

Medium parameters used: f = 1750 MHz; σ = 1.46 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.7℃

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(8.39, 8.39, 8.39); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (51x81x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 10.6 mW/g

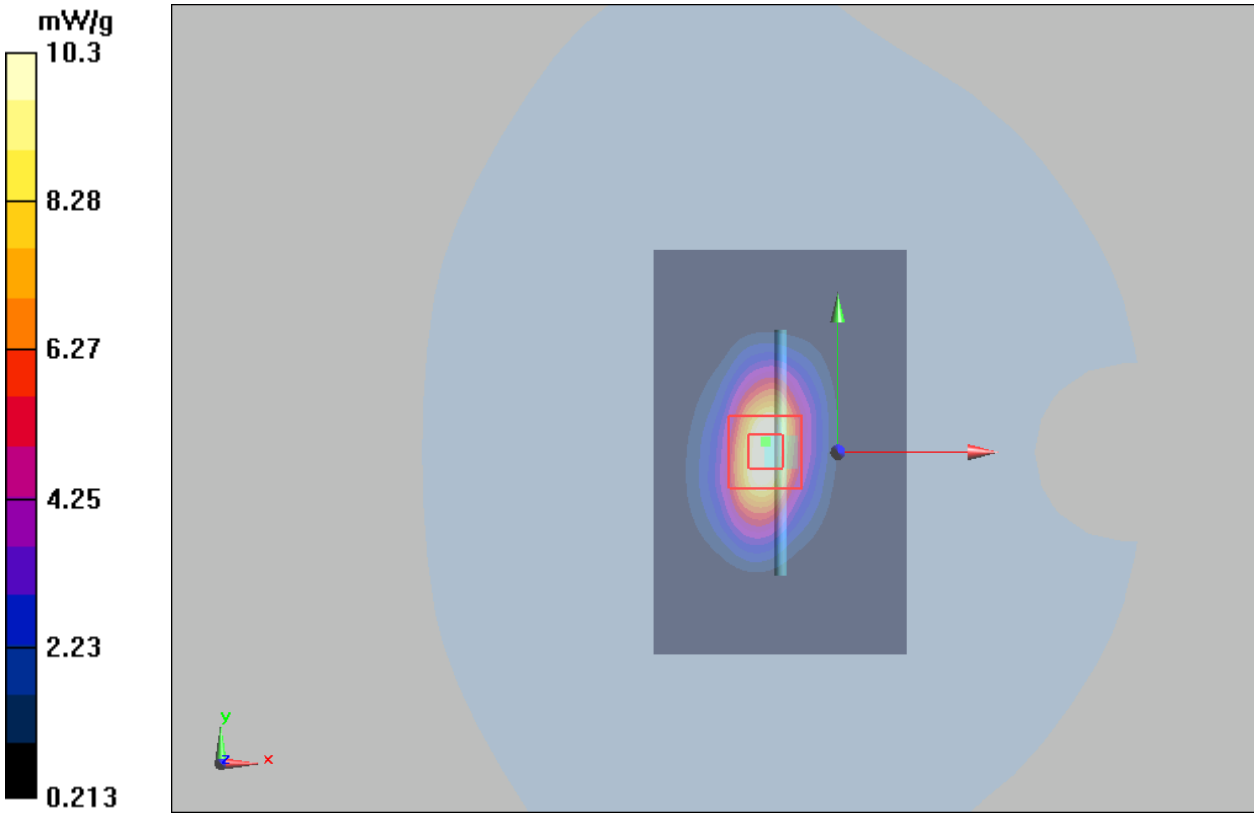
d=10mm, Pin=250mW/Area Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 77.7 V/m; Power Drift = 0.097 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.24 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.3 mW/g



Plot 4 System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 12/27/2017

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

Medium parameters used: f = 1900 MHz; σ = 1.51 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.98, 7.98, 7.98); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.2 mW/g

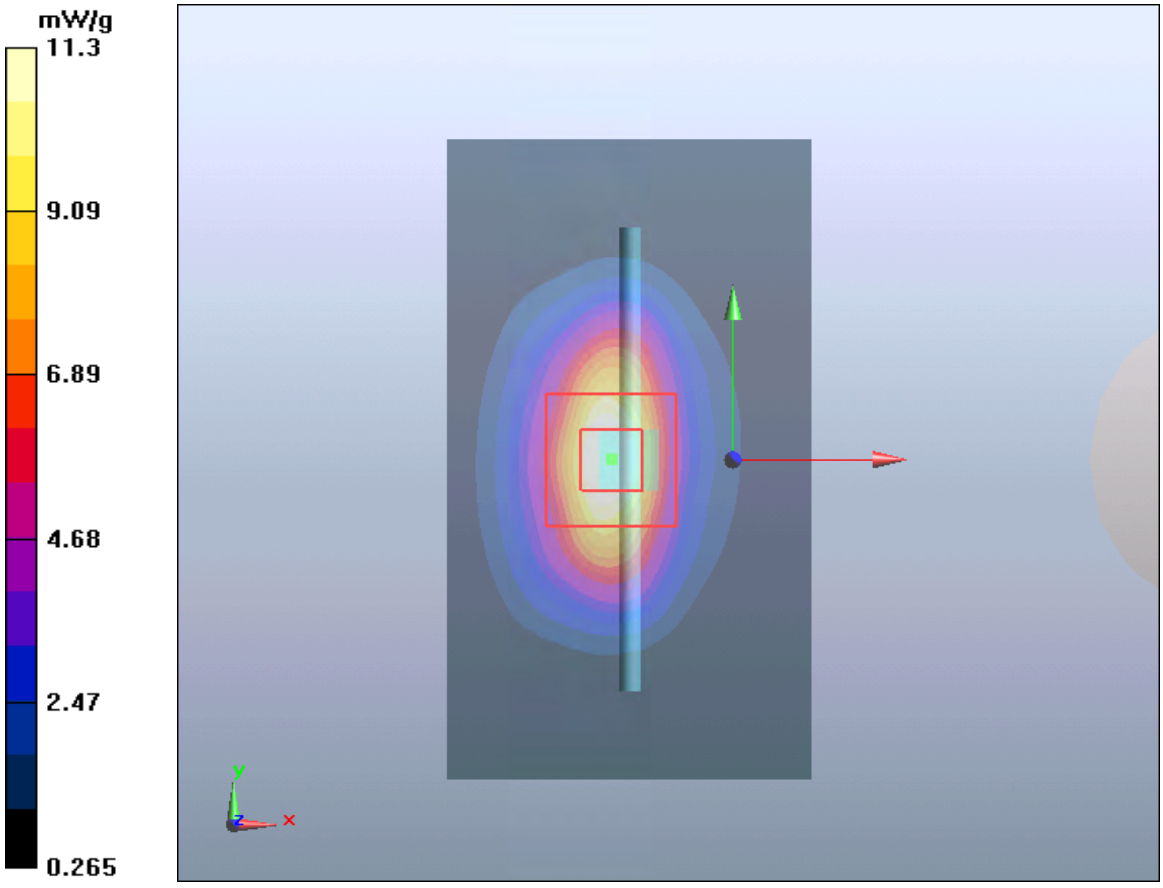
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g

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



Plot 5 System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 12/29/2017

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

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.85, 7.85, 7.85); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 16 mW/g

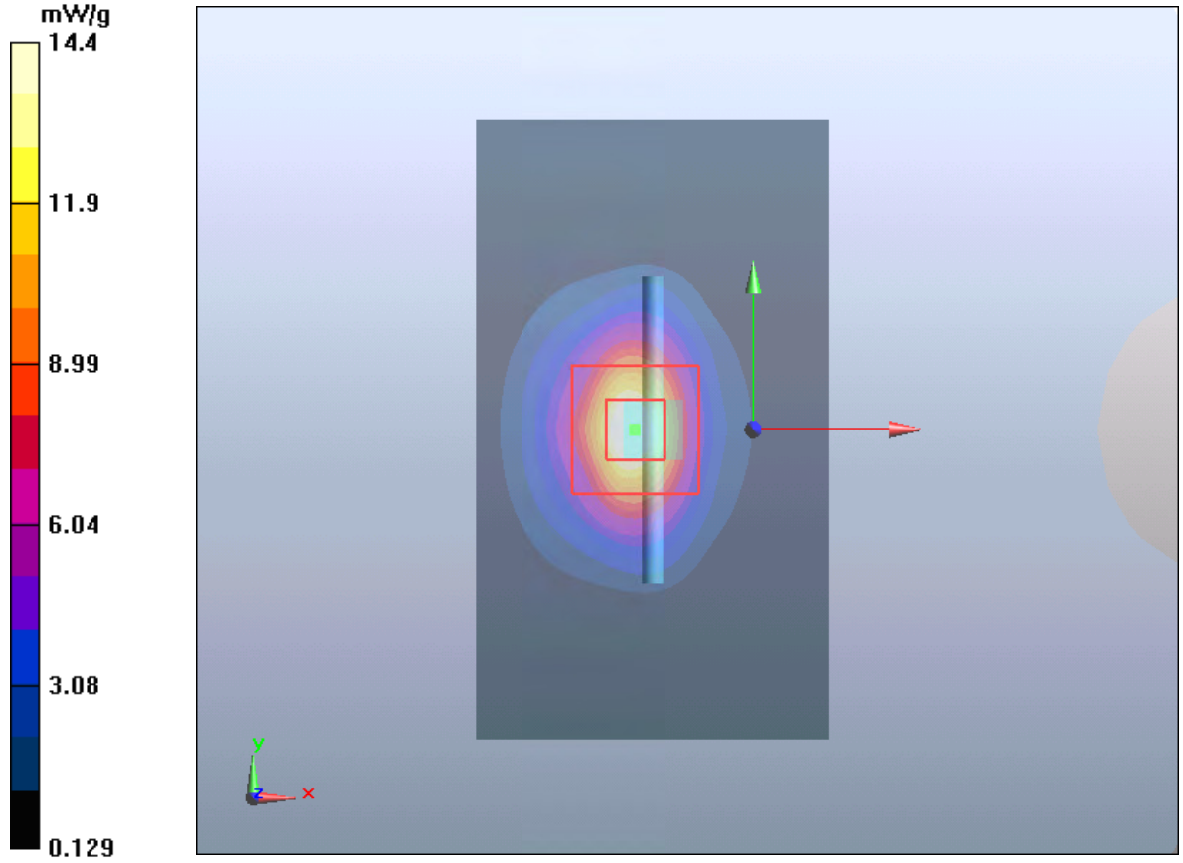
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



Plot 6 System Performance Check at 5250 MHz Body TSL

DUT: Dipole 5250 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 12/29/2017

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1.05

Medium parameters used: f = 5250 MHz; σ = 5.32 mho/m; ε_r = 48.1; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 7.69 mW/g

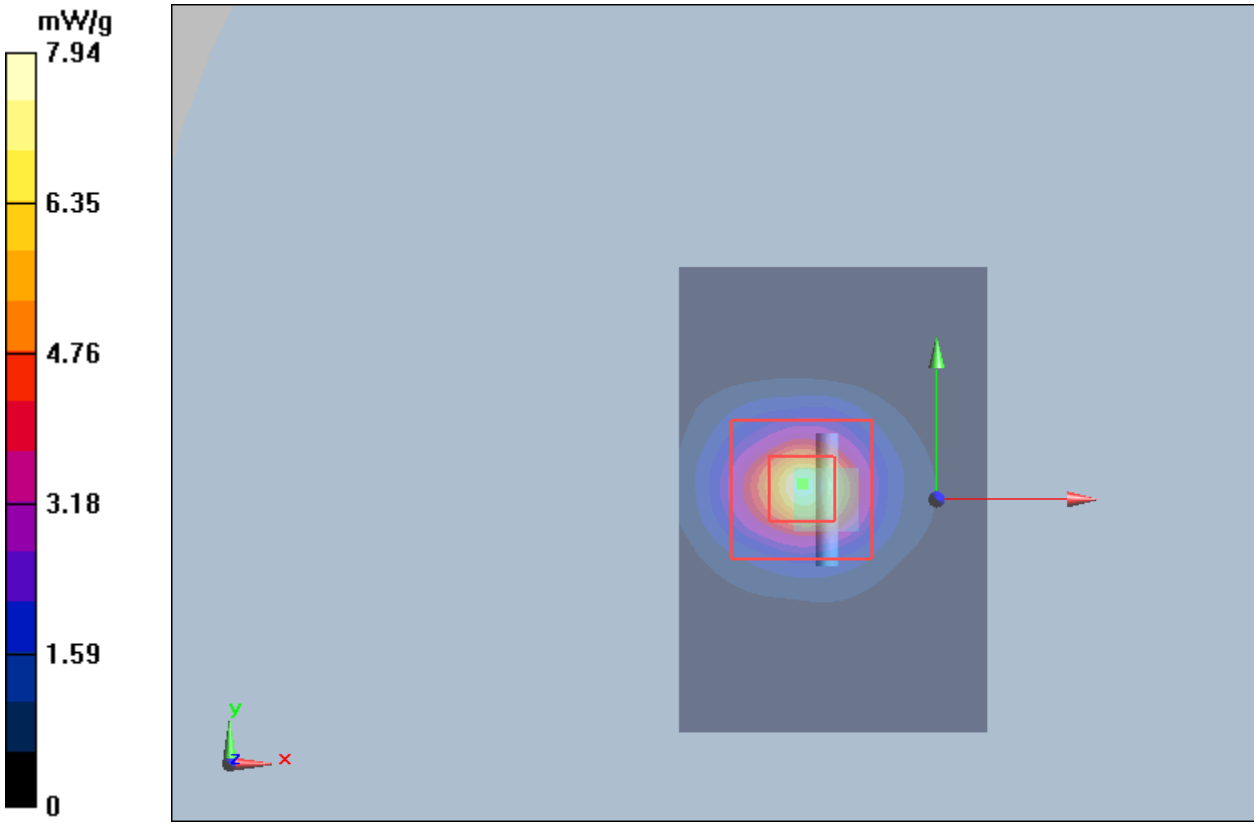
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 36.3 V/m; Power Drift = 0.0277 dB

Peak SAR (extrapolated) = 47.7 W/kg

SAR(1 g) = 7.46 mW/g; SAR(10 g) = 2.26 mW/g

Maximum value of SAR (measured) = 7.94 mW/g



Plot 7 System Performance Check at 5750 MHz Body TSL

DUT: Dipole 5750 MHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1151

Date: 12/29/2017

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1.05

Medium parameters used: f = 5750 MHz; σ = 6.14 mho/m; ε_r = 47.6; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.52, 4.52, 4.52); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=1.000mm, dy=1.000mm

Maximum value of SAR (interpolated) = 7.84 mW/g

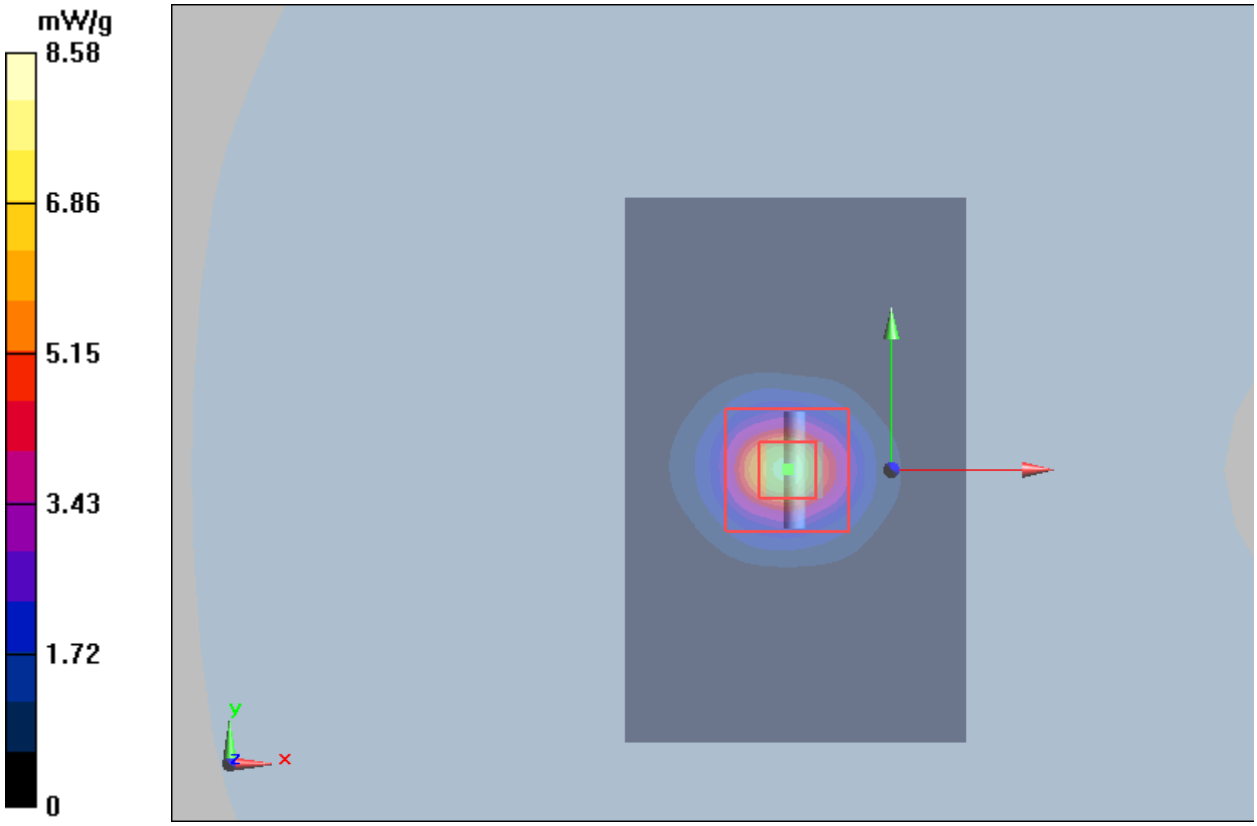
d=10mm, Pin=250mW/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 38 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 22.6 W/kg

SAR(1 g) = 7.15 mW/g; SAR(10 g) = 1.99 mW/g

Maximum value of SAR (measured) = 8.58 mW/g



ANNEX C: Highest Graph Results

Plot 8 LTE Band 2 1RB Front Side Low (Distance 10mm)

Date: 12/27/2017

Communication System: UID 0, LTE_FDD (0); Frequency: 1860 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1860 MHz; σ = 1.457 S/m; ε_r = 51.898; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.98, 7.98, 7.98); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Low/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

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

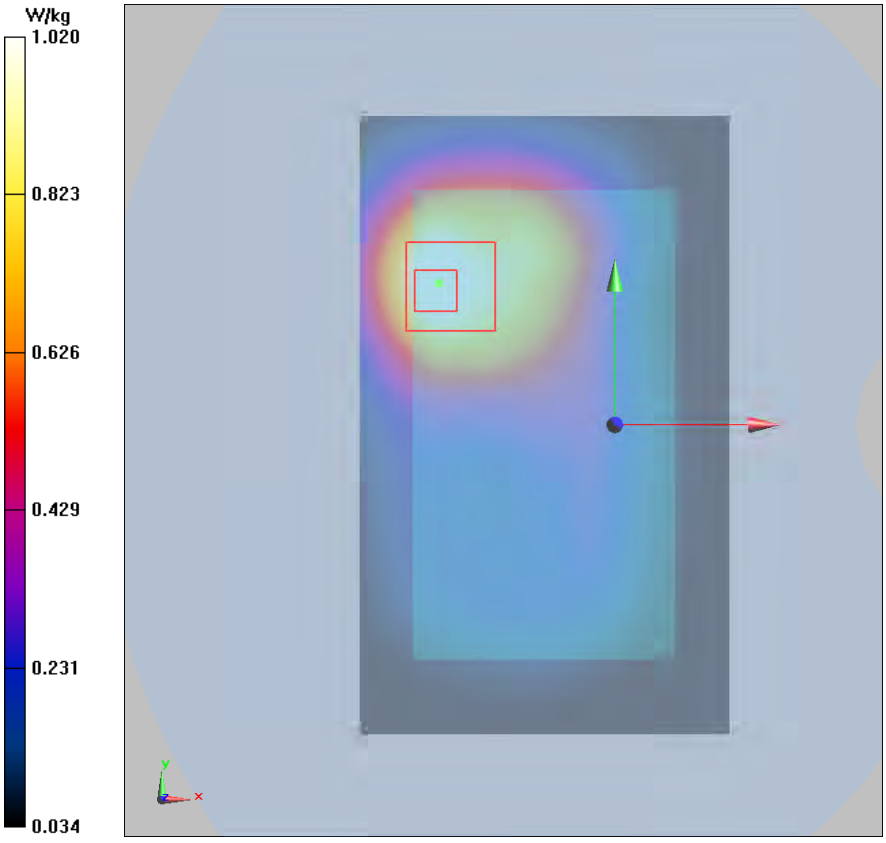
Front Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.27 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.55 W/kg

SAR(1 g) = 0.957 W/kg; SAR(10 g) = 0.594 W/kg

Maximum value of SAR (measured) = 1.02 W/kg



Plot 9 LTE Band 4 1RB Front side Middle Repeat (Distance 10mm)

Date: 12/28/2017

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

Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.417 S/m; ε_r = 51.918; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(8.39, 8.39, 8.39); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

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

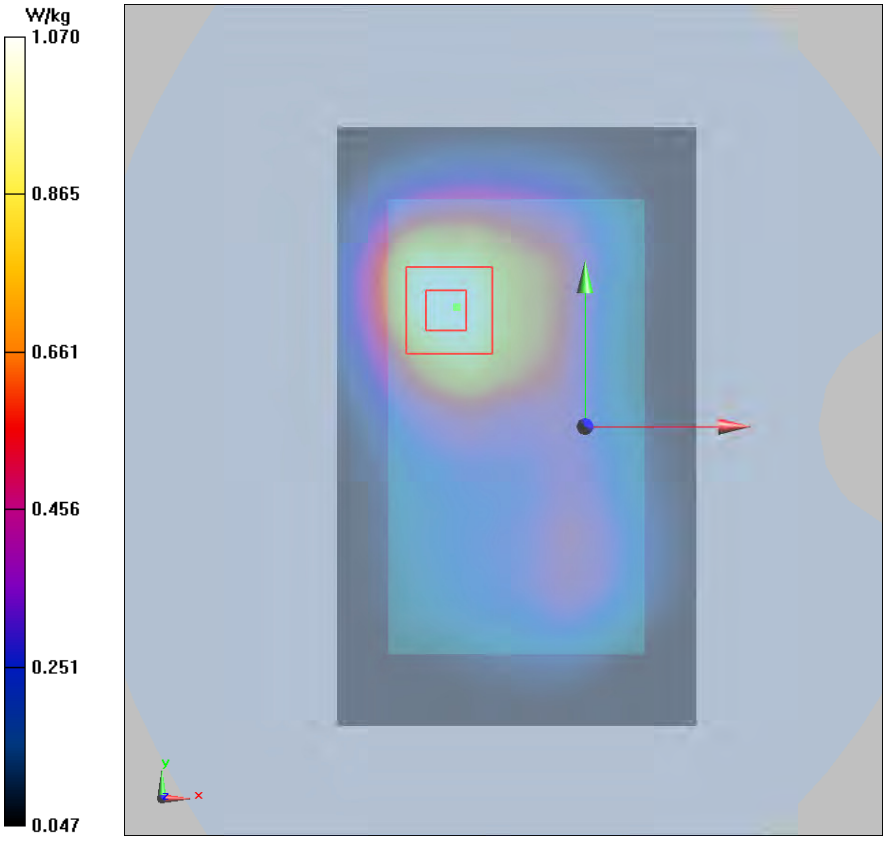
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.10 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.62 W/kg

SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.619 W/kg

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



Plot 10 LTE Band 5 50%RB Back Side Middle (Distance 10mm)

Date: 12/27/2017

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 836.5 MHz; σ = 0.989 S/m; ε_r = 54.023; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.74, 9.74, 9.74); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.613 W/kg

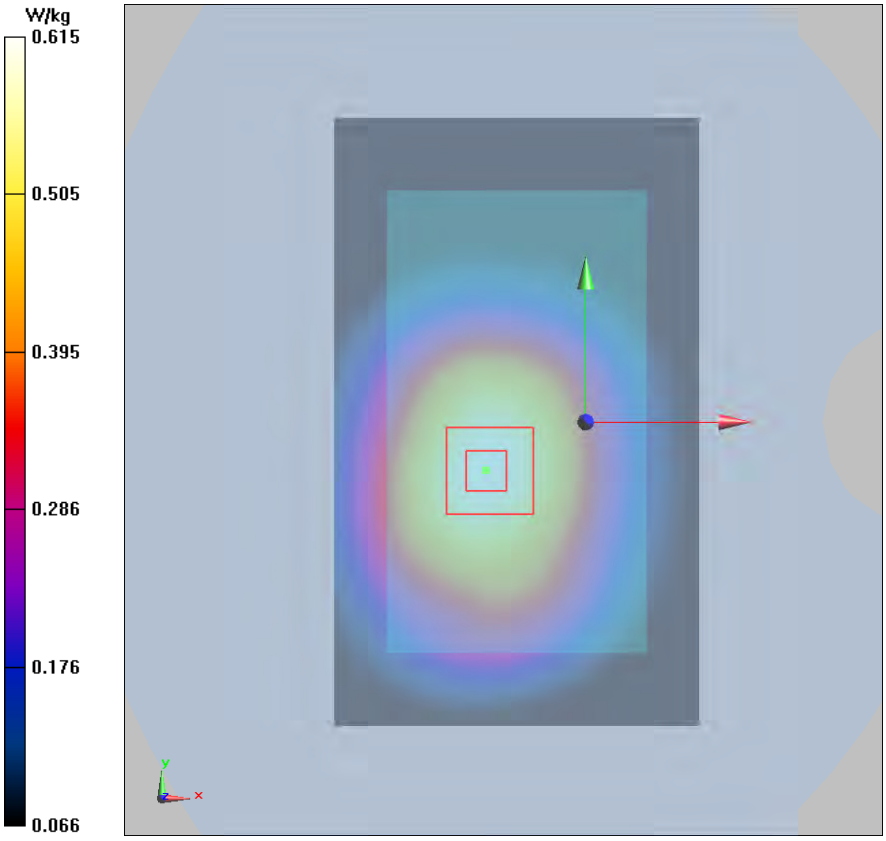
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.61 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.738 W/kg

SAR(1 g) = 0.580 W/kg; SAR(10 g) = 0.426 W/kg

Maximum value of SAR (measured) = 0.615 W/kg



Plot 11 LTE Band 12 50%RB Back Side Middle (Distance 10mm)

Date: 12/28/2017

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

Medium parameters used (interpolated): f = 707.5 MHz; σ = 0.924 S/m; ε_r = 55.408; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.99, 9.99, 9.99); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.551 W/kg

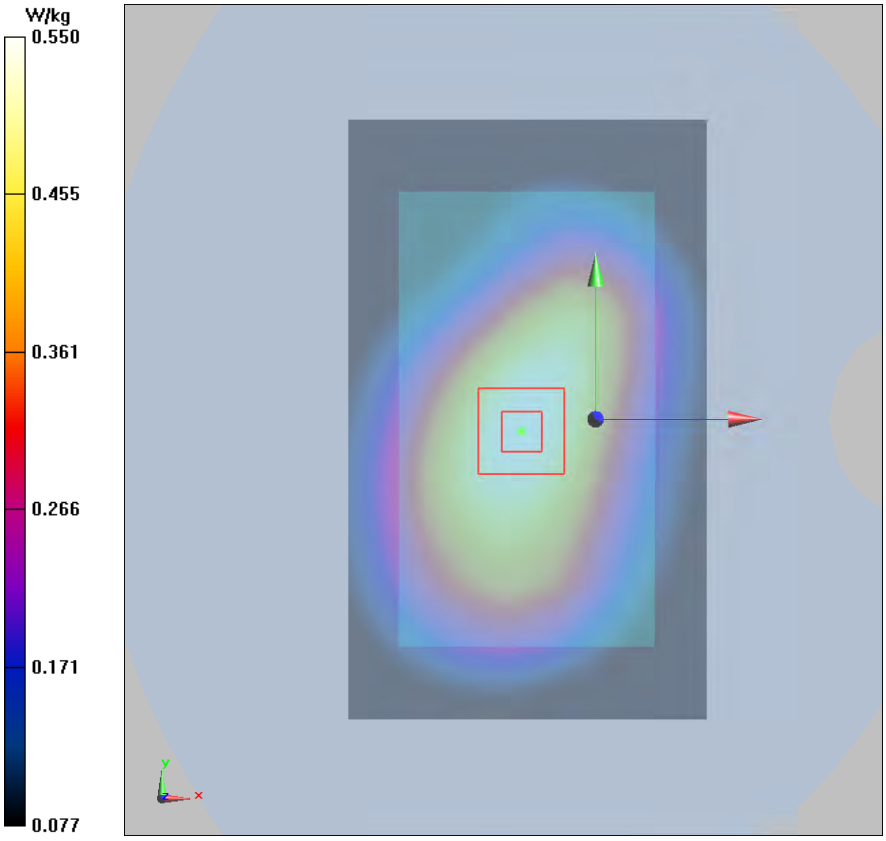
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.44 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.663 W/kg

SAR(1 g) = 0.522 W/kg; SAR(10 g) = 0.391 W/kg

Maximum value of SAR (measured) = 0.550 W/kg



Plot 12 LTE Band 13 1RB Front Side Middle (Distance 10mm)

Date: 12/28/2017

Communication System: UID 0, LTE (0); Frequency: 782 MHz;Duty Cycle: 1:1

Medium parameters used: f = 782 MHz; σ = 0.992 S/m; ε_r = 54.593; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(9.99, 9.99, 9.99); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.883 W/kg

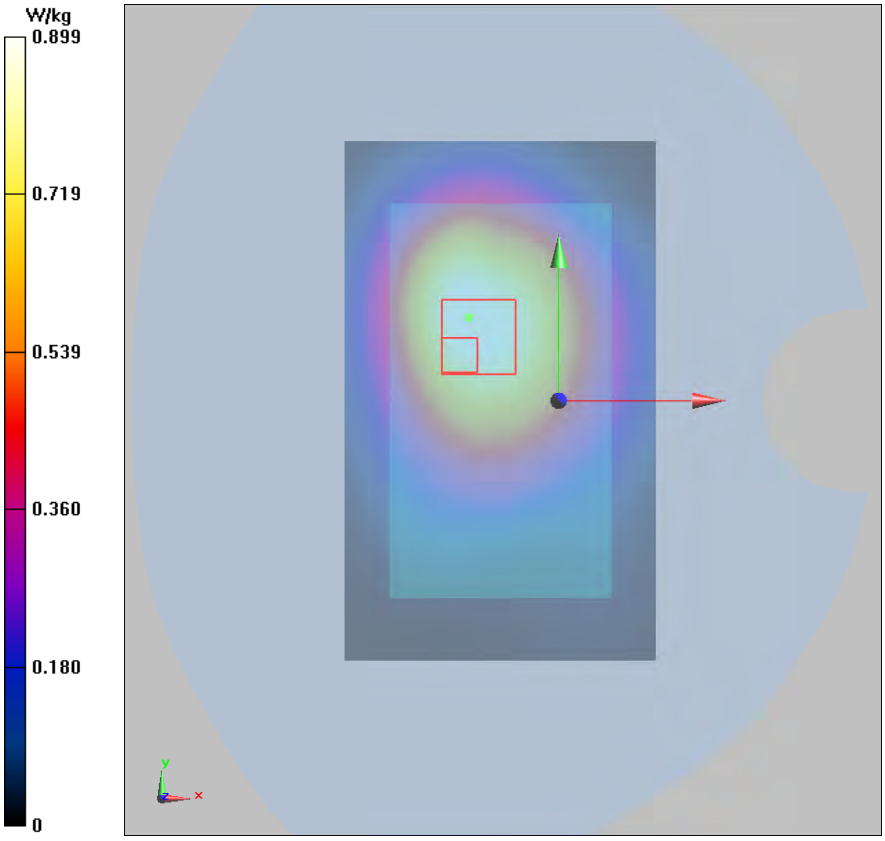
Front Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.17 V/m; Power Drift = -0.066 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.877 W/kg; SAR(10 g) = 0.583 W/kg

Maximum value of SAR (measured) = 0.899 W/kg



Plot 13 LTE Band 25 1RB Front Side Low (Distance 10mm)

Date: 12/27/2017

Communication System: UID 0, LTE_FDD (0); Frequency: 1857.5 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1857.5 MHz; σ = 1.453 S/m; ε_r = 51.863; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.98, 7.98, 7.98); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side Low/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.744 W/kg

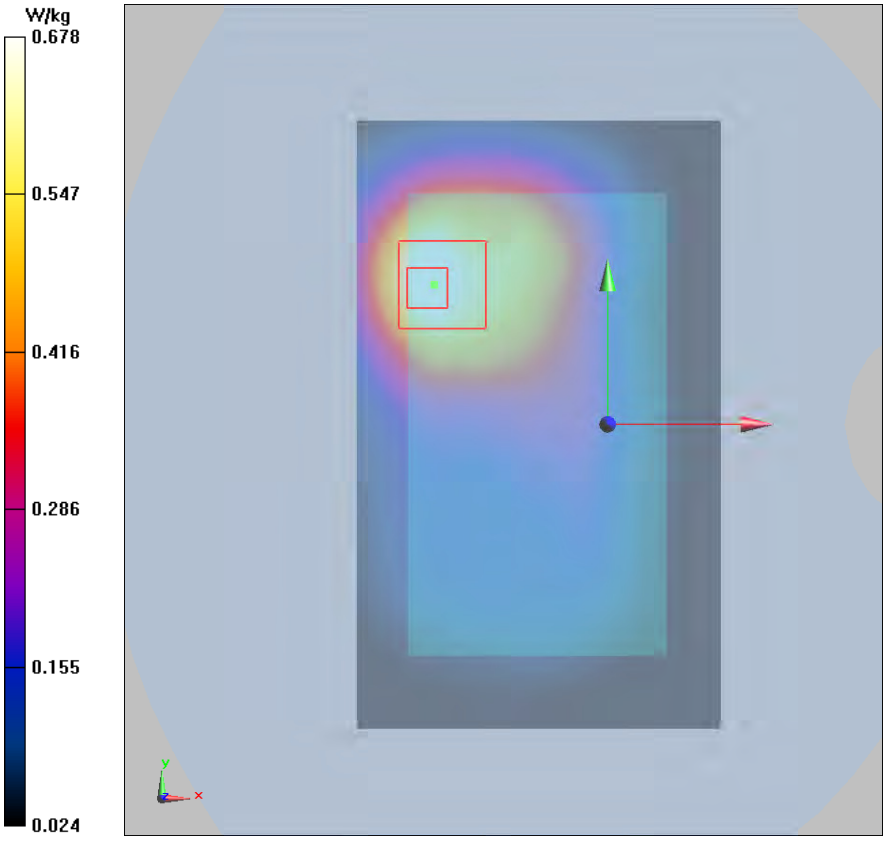
Front Side Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.19 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.633 W/kg; SAR(10 g) = 0.392 W/kg

Maximum value of SAR (measured) = 0.678 W/kg



Plot 14 802.11b Back Side Low (ANT1, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.902 S/m; ε_r = 51.597; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.85, 7.85, 7.85); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Low/Area Scan (81x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.128 W/kg

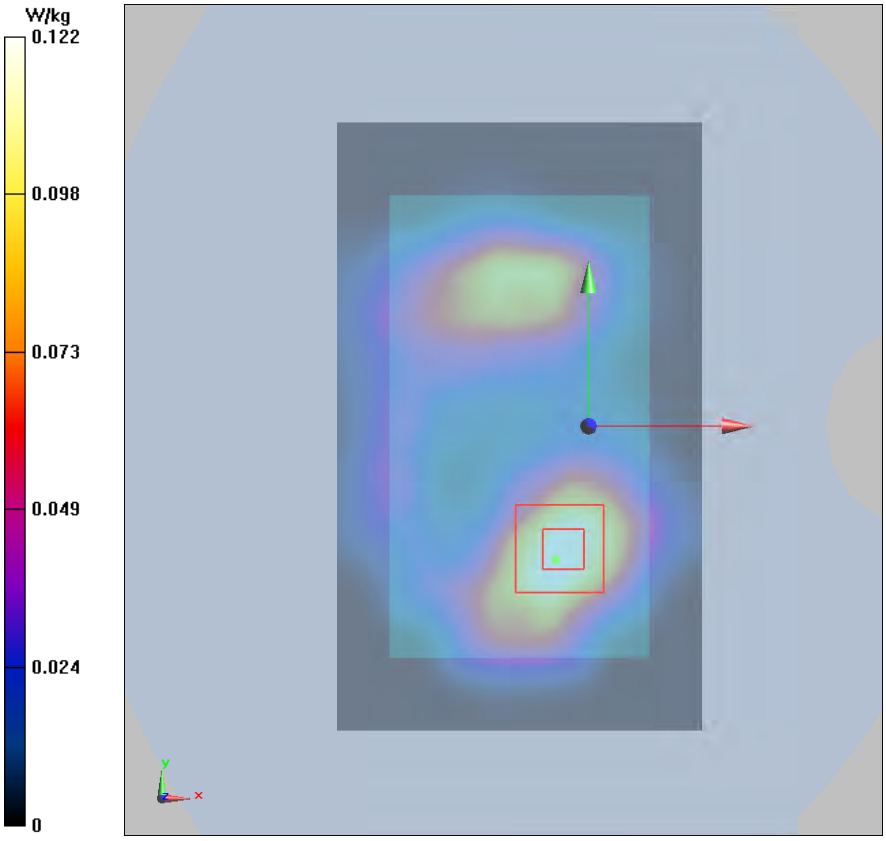
Back Side Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.600 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.060 W/kg

Maximum value of SAR (measured) = 0.122 W/kg



Plot 15 802.11b Front Side High (ANT2, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11b (0); Frequency: 2462 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; σ = 1.959 S/m; ε_r = 51.465; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(7.85, 7.85, 7.85); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Front Side High/Area Scan (81x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.114 W/kg

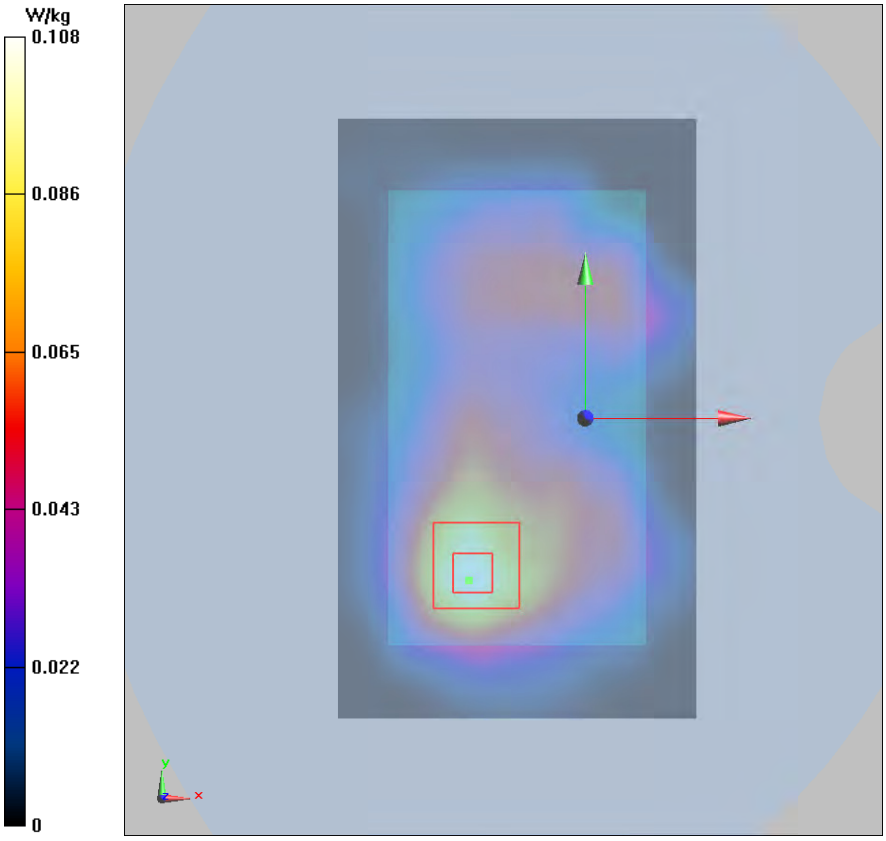
Front Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.786 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 0.183 W/kg

SAR(1 g) = 0.096 W/kg; SAR(10 g) = 0.050 W/kg

Maximum value of SAR (measured) = 0.108 W/kg



Plot 16 802.11a U-NII-1 Bottom Edge Middle (ANT1, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11n(20M) (0); Frequency: 5220 MHz;Duty Cycle: 1:1.050

Medium parameters used: f = 5220 MHz; σ = 5.368 S/m; ε_r = 46.801; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Middle/Area Scan (51x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.716 W/kg

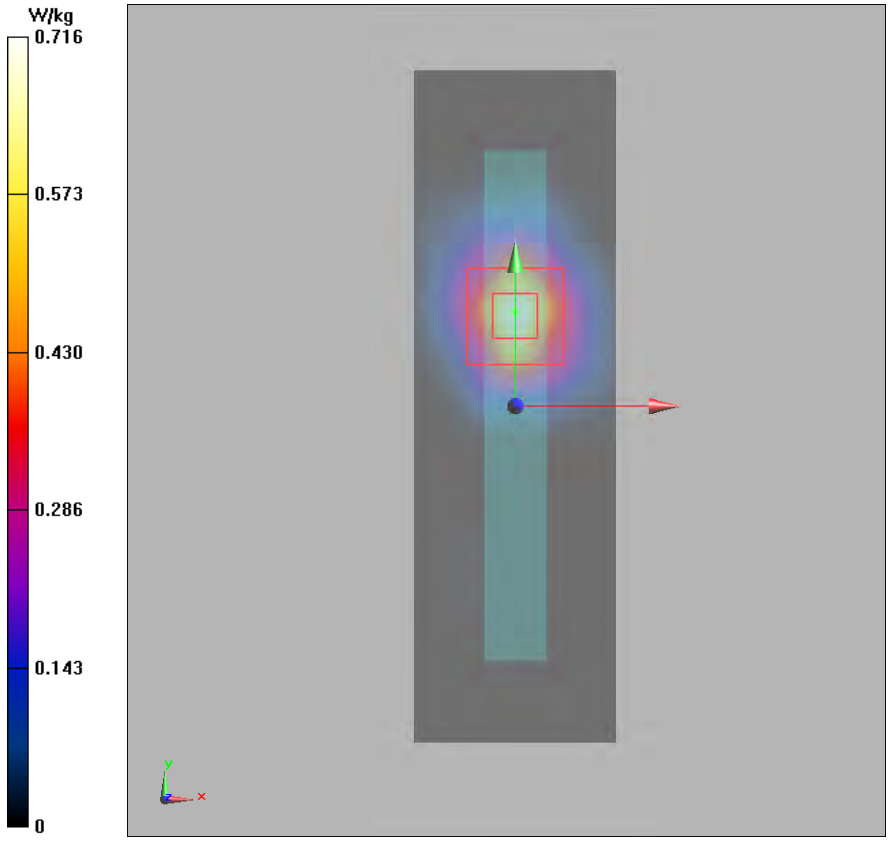
Bottom Edge Middle/Zoom Scan(7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 5.562 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.52 W/kg

SAR(1 g) = 0.558 W/kg; SAR(10 g) = 0.193 W/kg

Maximum value of SAR (measured) = 0.716 W/kg

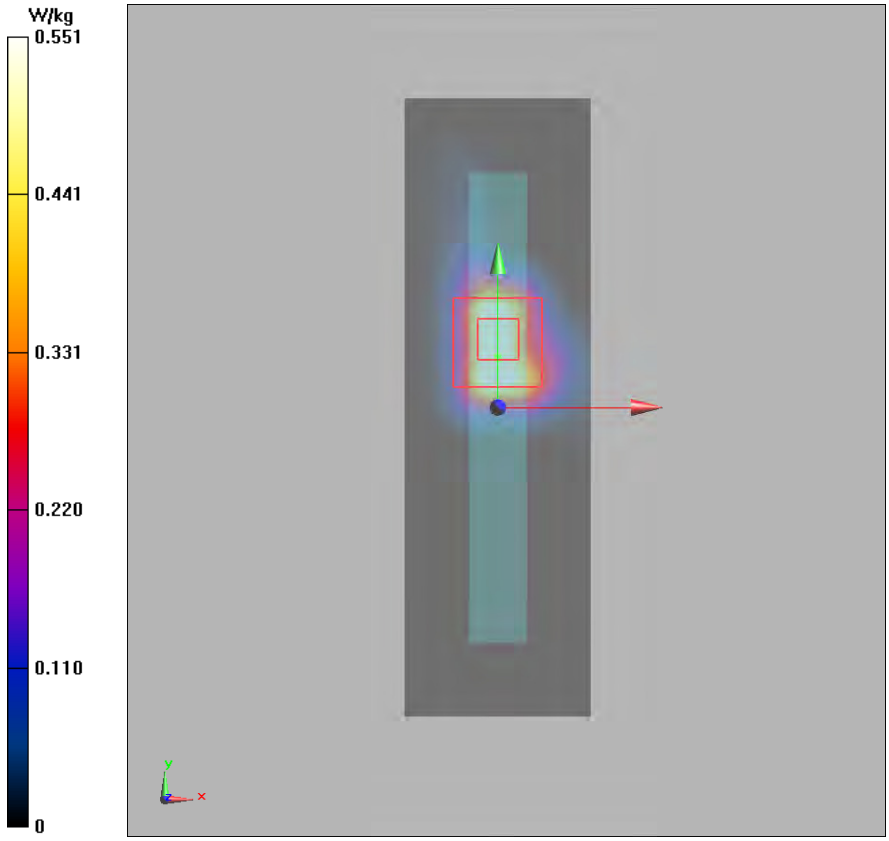


Plot 17 802.11a U-NII-3 Bottom Edge Low (ANT1, Distance 10mm)

Date: 12/29/2017
Communication System: UID 0, 802.11n(20M) (0); Frequency: 5745 MHz;Duty Cycle: 1:1.050
Medium parameters used: f = 5745 MHz; σ = 6.06 S/m; ε_r = 47.742; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃
Phantom section: Flat Section
DASY5 Configuration:
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Probe: EX3DV4 - SN3677; ConvF(4.52, 4.52, 4.52); Calibrated: 1/23/2017;
Electronics: DAE4 Sn1291; Calibrated: 1/19/2017
Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Side Low/Area Scan (51x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.845 W/kg

Bottom Side Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.435 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.454 W/kg; SAR(10 g) = 0.158 W/kg
Maximum value of SAR (measured) = 0.551 W/kg



Plot 18 802.11a U-NII-1 Left Edge Middle (ANT2, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11n(20M) (0); Frequency: 5220 MHz;Duty Cycle: 1:1.050

Medium parameters used: f = 5220 MHz; σ = 5.368 S/m; ε_r = 46.801; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Edge Middle/Area Scan (51x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.268 W/kg

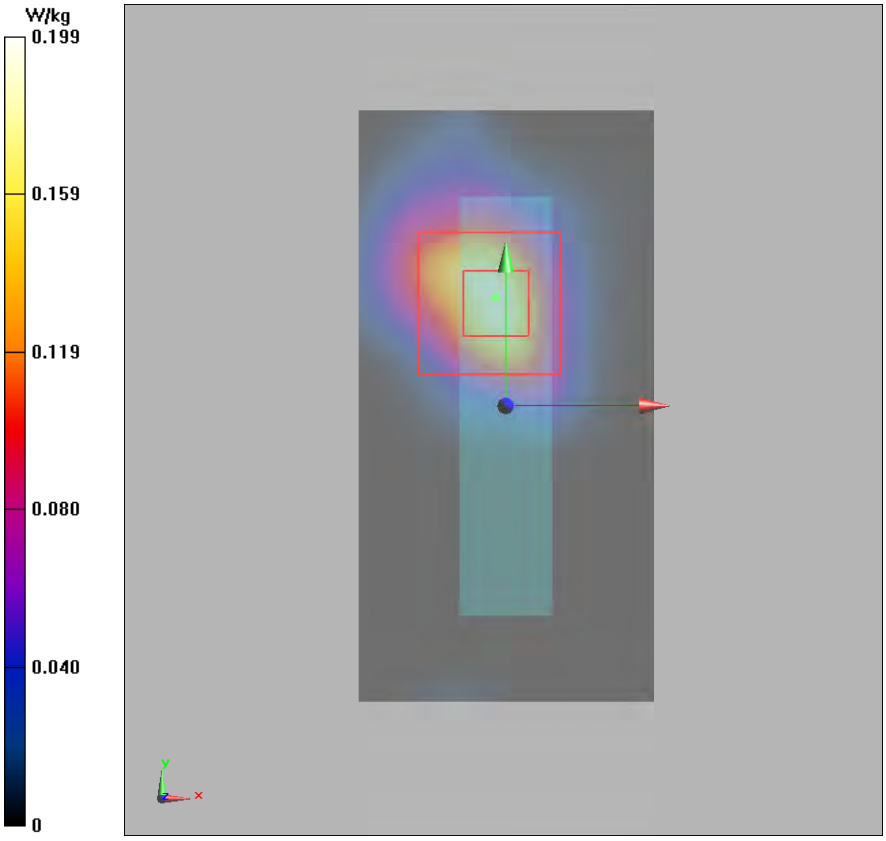
Left Edge Middle/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.391 V/m; Power Drift = 0.088 dB

Peak SAR (extrapolated) = 0.486 W/kg

SAR(1 g) = 0.165 W/kg; SAR(10 g) = 0.058 W/kg

Maximum value of SAR (measured) = 0.199 W/kg



Plot 19 802.11a U-NII-3 Back Side Middle (ANT2, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11a (0); Frequency: 5785 MHz;Duty Cycle: 1:1.046

Medium parameters used: f = 5785 MHz; σ = 6.114 S/m; ε_r = 47.638; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.52, 4.52, 4.52); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (91x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.287 W/kg

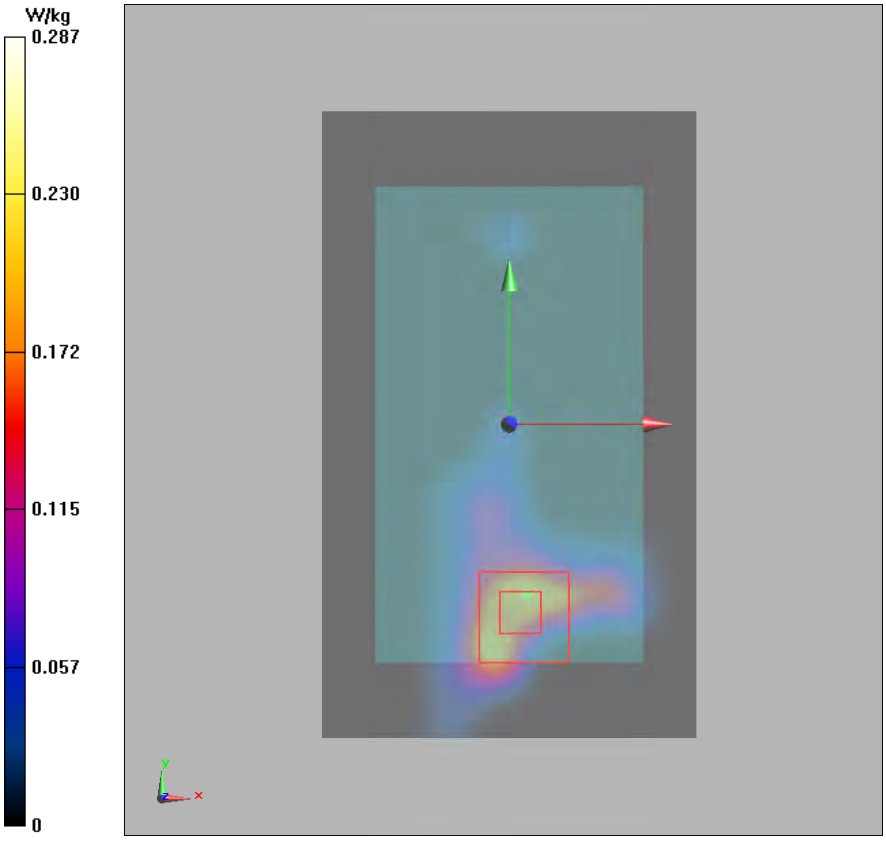
Back Side Middle/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.333 V/m; Power Drift = 0.183 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.222 W/kg; SAR(10 g) = 0.084 W/kg

Maximum value of SAR (measured) = 0.287 W/kg



Plot 20 802.11a U-NII-1 Bottom Edge Low (MIMO, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11n(20M) (0); Frequency: 5180 MHz;Duty Cycle: 1:1.050

Medium parameters used (extrapolated): f = 5180 MHz; σ = 5.305 S/m; ε_r = 46.924; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(5.03, 5.03, 5.03); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Low/Area Scan (51x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.894 W/kg

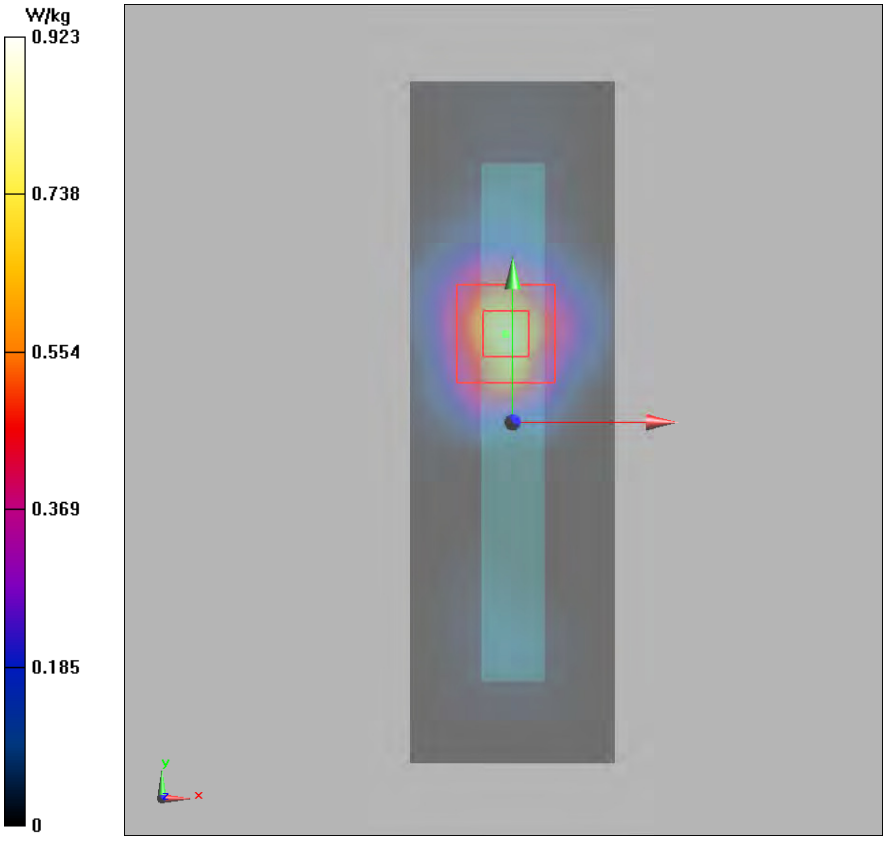
Bottom Edge Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 6.983 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 3.13 W/kg

SAR(1 g) = 0.832 W/kg; SAR(10 g) = 0.291 W/kg

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



Plot 21 802.11a U-NII-3 Bottom Edge Low (MIMO, Distance 10mm)

Date: 12/29/2017

Communication System: UID 0, 802.11n(20M) (0); Frequency: 5745 MHz;Duty Cycle: 1:1.050

Medium parameters used: f = 5745 MHz; σ = 6.06 S/m; ε_r = 47.742; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liquid Temperature: 21.5℃

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3677; ConvF(4.52, 4.52, 4.52); Calibrated: 1/23/2017;

Electronics: DAE4 Sn1291; Calibrated: 1/19/2017

Phantom: SAM 1; Type: QD000P40CD; Serial: TP:1666

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Low/Area Scan (51x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.996 W/kg

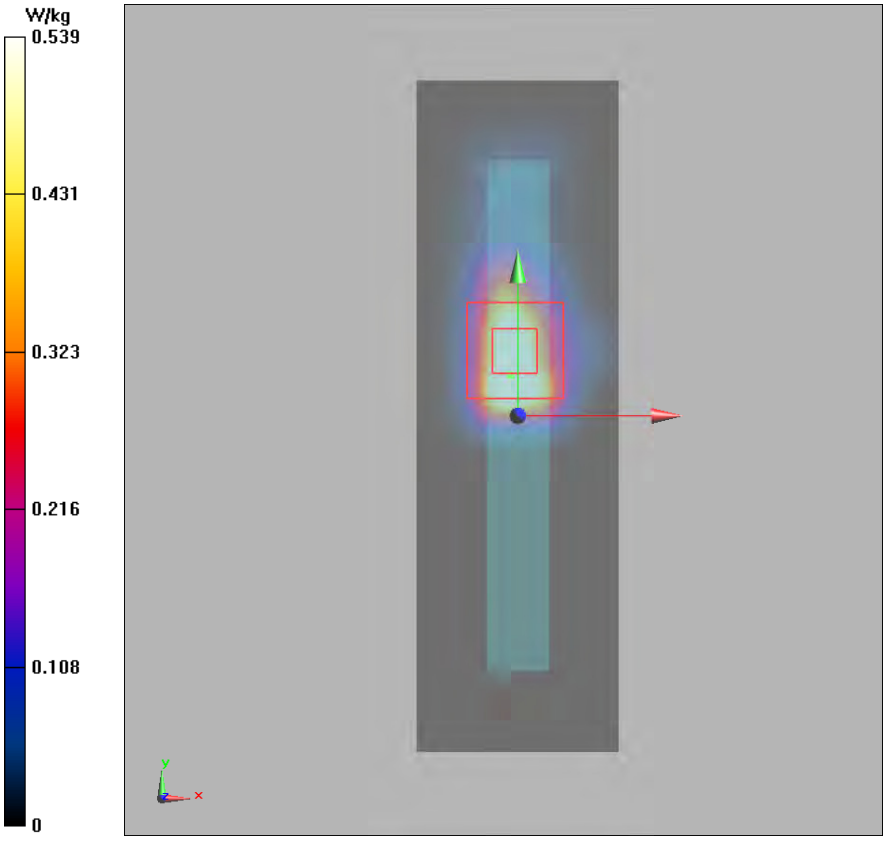
Bottom Edge Low/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 8.006 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.447 W/kg; SAR(10 g) = 0.154 W/kg

Maximum value of SAR (measured) = 0.539 W/kg



ANNEX D: Probe Calibration Certificate

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client TA(Shanghai) Certificate No: Z17-97012

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3677

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

Calibration date: January 23, 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)℃ 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	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101548	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference10dBAttenuator	18N50W-10dB	13-Mar-16(CTTL,No.J16X01547)	Mar-18
Reference20dBAttenuator	18N50W-20dB	13-Mar-16(CTTL, No.J16X01548)	Mar-18
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 549	13-Dec-16(SPEAG, No.DAE4-549_Dec16)	Dec -17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGeneratorMG3700A	6201052605	27-Jun-16 (CTTL, No.J16X04776)	Jun-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan -17

	Name	Function	Signature
Calibrated by:	Yu Zongying	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: January 24, 2017

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

Certificate No: Z17-97012 Page 1 of 11

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,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 θ=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:

a) 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

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

c) 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

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,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.
- *DCPx,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.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,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≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. 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 NORMx,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±50MHz to±100MHz.
- *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 *NORMx* (no uncertainty required).

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3677

Calibrated: January 23, 2017

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)^A	0.39	0.44	0.38	±10.8%
DCP(mV)^B	97.3	102.2	101.1	

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	180.5	±2.0%
		Y	0.0	0.0	1.0		195.3	
		Z	0.0	0.0	1.0		177.9	

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 E^2-field uncertainty inside TSL (see Page 5 and Page 6).
^{B} Numerical linearization parameter: uncertainty not required.
^{E} Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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)	Unct. (k=2)
750	41.9	0.89	9.58	9.58	9.58	0.30	0.75	±12%
835	41.5	0.90	9.31	9.31	9.31	0.11	1.55	±12%
1750	40.1	1.37	8.60	8.60	8.60	0.24	1.07	±12%
1900	40.0	1.40	8.39	8.39	8.39	0.23	1.10	±12%
2300	39.5	1.67	8.13	8.13	8.13	0.53	0.74	±12%
2450	39.2	1.80	7.90	7.90	7.90	0.61	0.71	±12%
2600	39.0	1.96	7.64	7.64	7.64	0.68	0.68	±12%
5250	35.9	4.71	5.66	5.66	5.66	0.40	1.20	±13%
5600	35.5	5.07	4.99	4.99	4.99	0.40	1.40	±13%
5750	35.4	5.22	5.00	5.00	5.00	0.40	1.40	±13%

[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.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	9.99	9.99	9.99	0.30	0.95	±12%
835	55.2	0.97	9.74	9.74	9.74	0.14	1.66	±12%
1750	53.4	1.49	8.39	8.39	8.39	0.21	1.16	±12%
1900	53.3	1.52	7.98	7.98	7.98	0.22	1.24	±12%
2300	52.9	1.81	7.97	7.97	7.97	0.55	0.80	±12%
2450	52.7	1.95	7.85	7.85	7.85	0.50	0.86	±12%
2600	52.5	2.16	7.63	7.63	7.63	0.44	0.91	±12%
5250	48.9	5.36	5.03	5.03	5.03	0.50	1.60	±13%
5600	48.5	5.77	4.34	4.34	4.34	0.54	1.66	±13%
5750	48.3	5.94	4.52	4.52	4.52	0.57	1.95	±13%

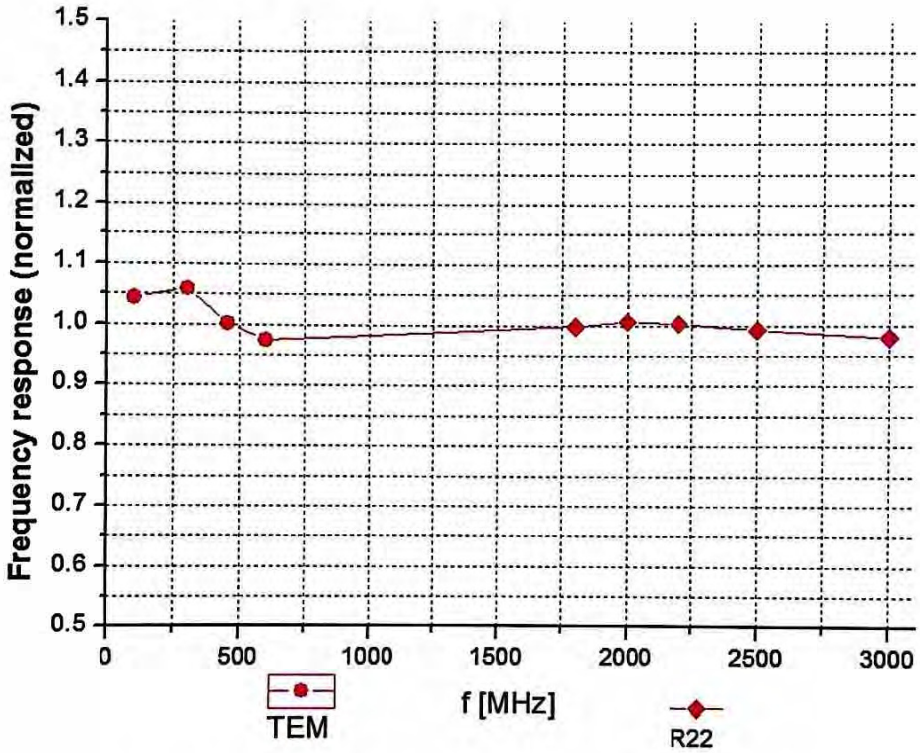
[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 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.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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



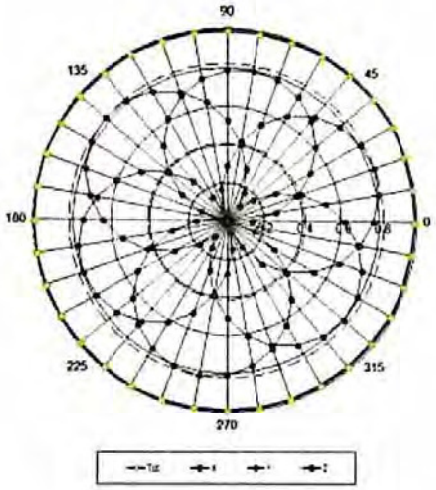
Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

Certificate No: Z17-97012 Page 7 of 11

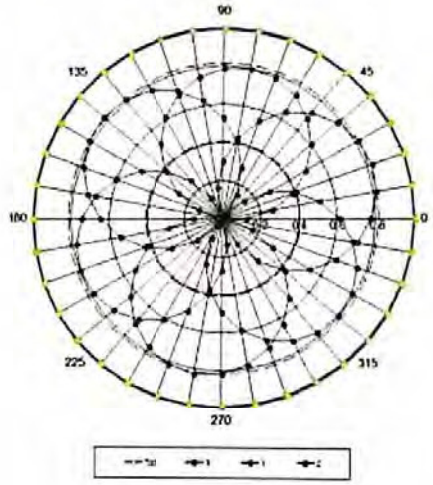
In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

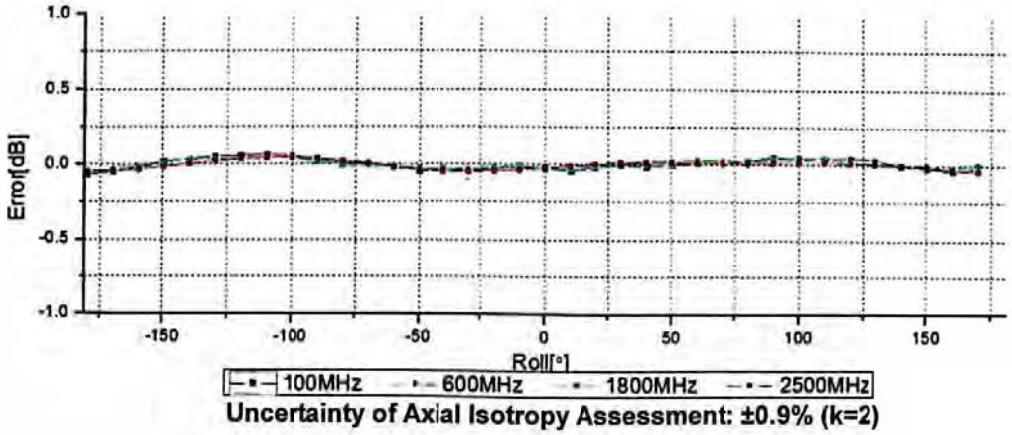
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



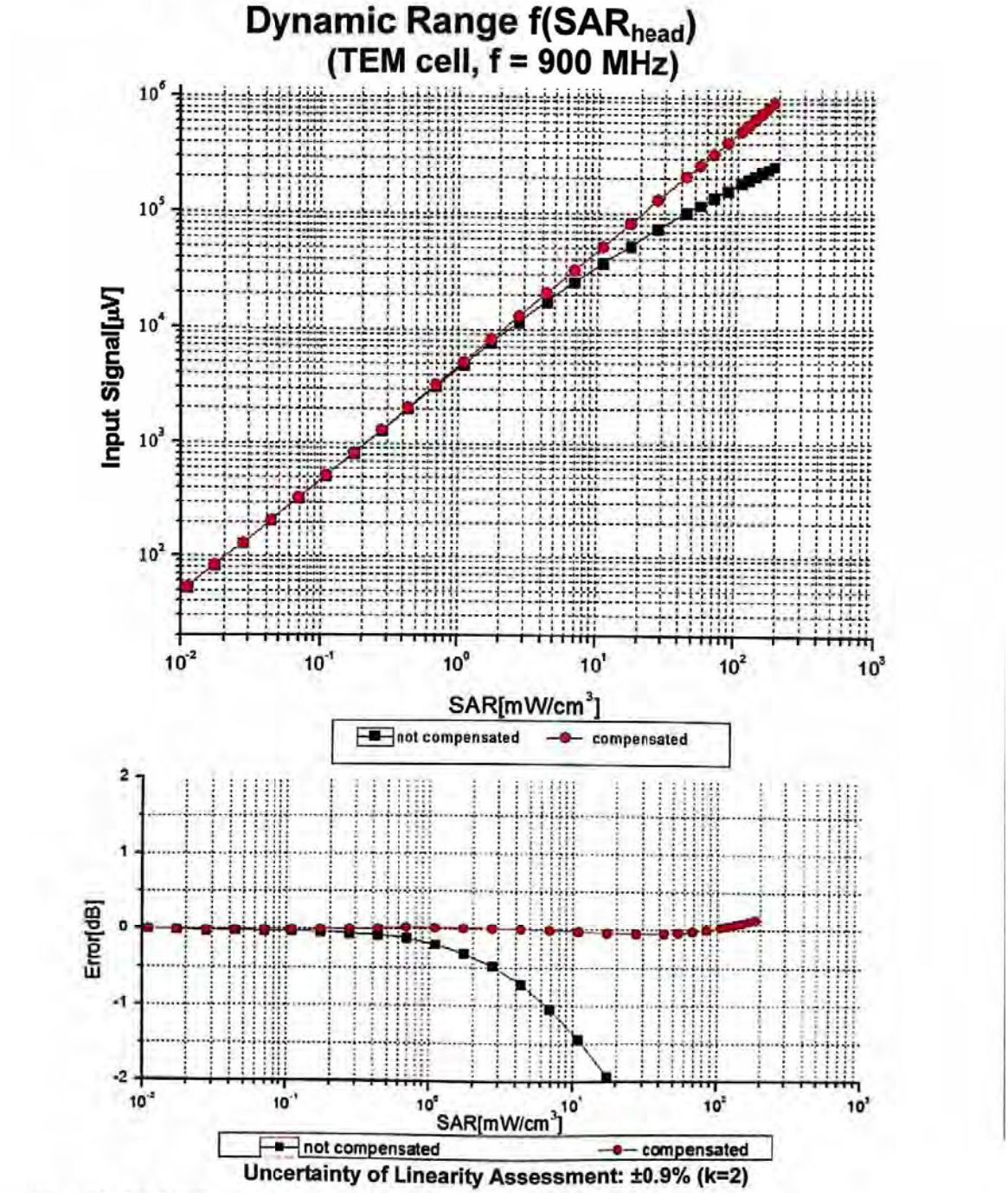
f=1800 MHz, R22





Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

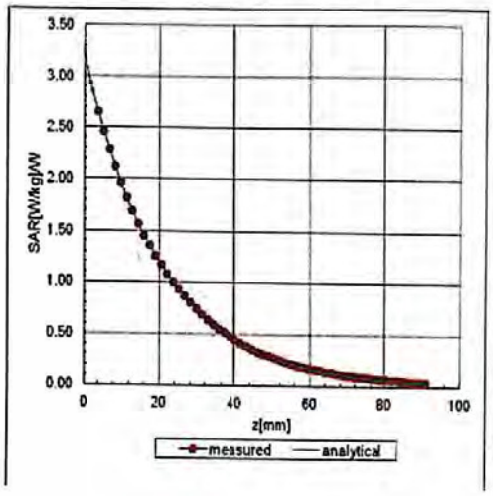


Certificate No: Z17-97012 Page 9 of 11

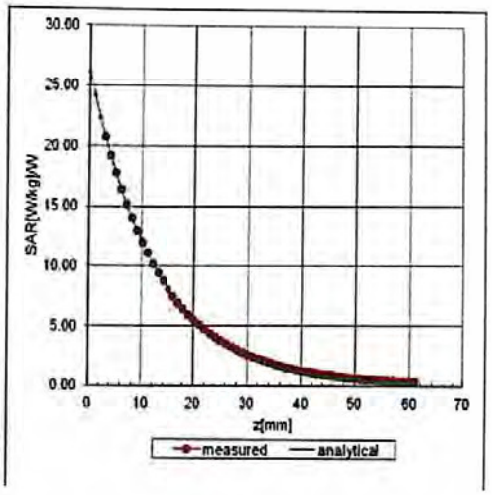
In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Conversion Factor Assessment

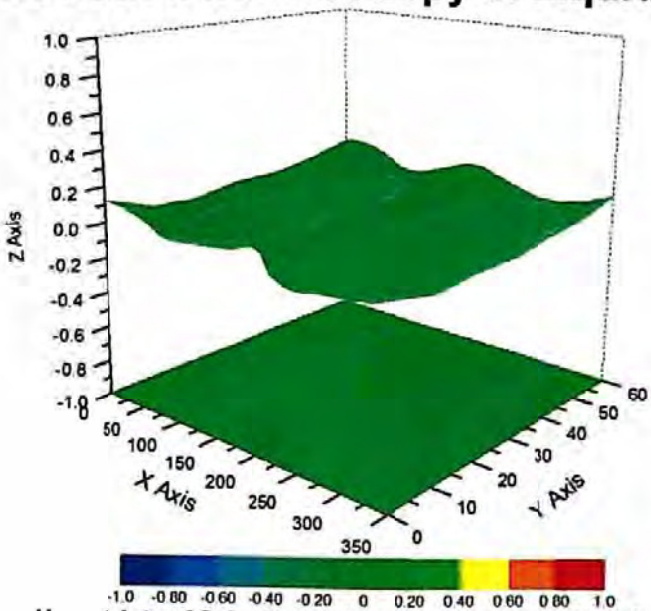
f=835 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2218 Fax: +86-10-62304633-2209
E-mail: cttl@chinattl.com Http://www.chinattl.cn

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	117.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
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

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn
中国认可 国际互认 校准 CALIBRATION CNAS L0570

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)℃ 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 30, 2017

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) 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
b) 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
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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%.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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 ± 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 ± 0.2) °C	41.7 ± 6 %	0.89 mho/m ± 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 ± 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 ± 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 ± 0.2) °C	55.7 ± 6 %	0.95 mho/m ± 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 ± 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 ±18.7 % (k=2)**

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ctl@chinattl.com http://www.chinattl.cn

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

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

Manufactured by	SPEAG

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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 MHz; σ = 0.886 S/m; ε_r = 41.66; ρ = 1000 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)

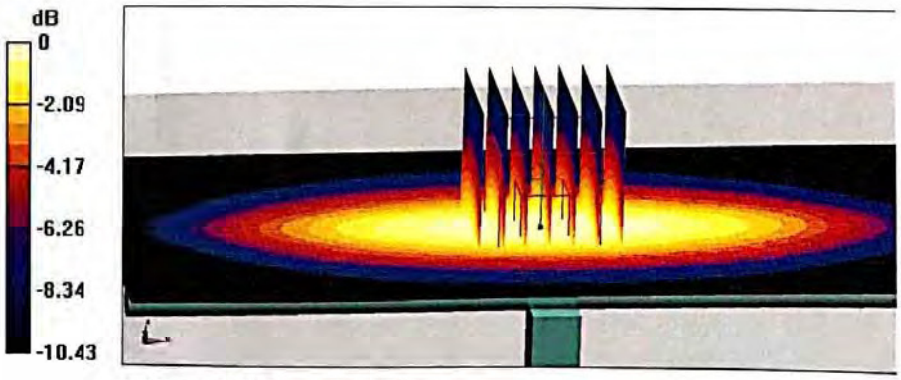
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



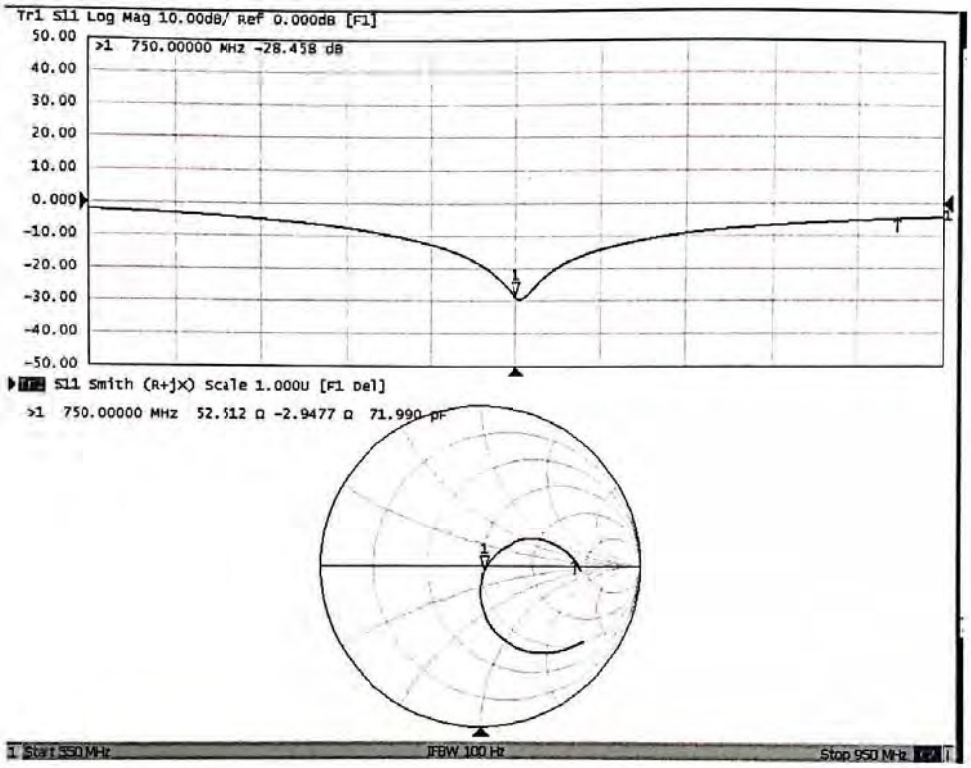
0 dB = 2.80 W/kg = 4.47 dBW/kg

Certificate No: Z17-97113 Page 5 of 8

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



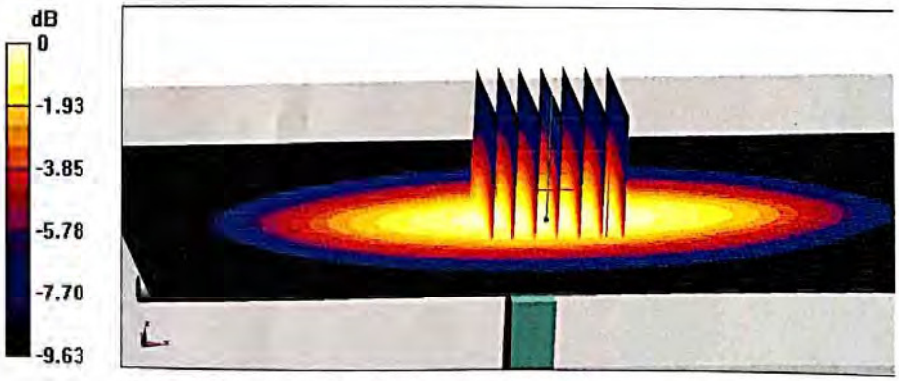
Certificate No: Z17-97113 Page 6 of 8

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ctl@chinattl.com http://www.chinattl.cn

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 MHz; σ = 0.952 S/m; ε_r = 55.68; ρ = 1000 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=5mm, dy=5mm, dz=5mm
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

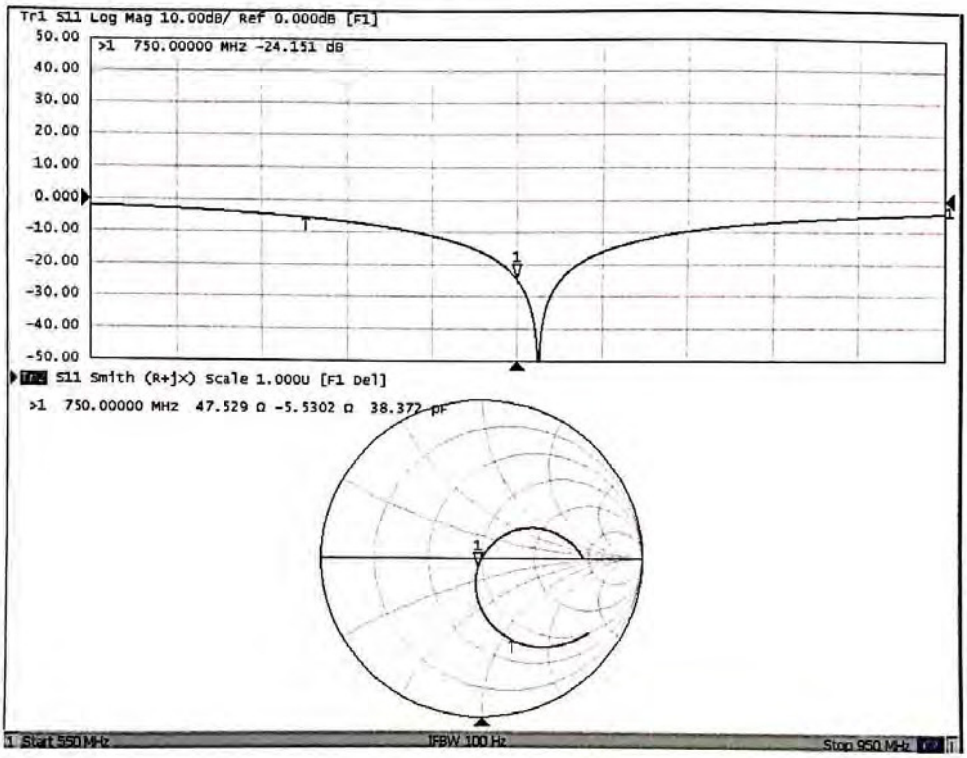


0 dB = 2.88 W/kg = 4.59 dBW/kg

Certificate No: Z17-97113 Page 7 of 8

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



Certificate No: Z17-97113 Page 8 of 8

ANNEX F: D835V2 Dipole Calibration Certificate

In Collaboration with speag CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

中国认可 国际互认 校准 CALIBRATION CNAS L0570

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)℃ 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

Certificate No: Z17-97114 Page 1 of 8

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) 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
b) 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
c) 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
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) 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%.

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

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	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.2 ± 6 %	0.89 mho/m ± 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	2.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.45 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.09 mW /g ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.98 mho/m ± 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	2.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.75 mW /g ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.47 mW /g ± 18.7 % (k=2)**

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: ctl@chinattl.com http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.3Ω- 2.54jΩ
Return Loss	- 31.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8Ω- 4.57jΩ
Return Loss	- 24.8dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.495 ns

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

Manufactured by	SPEAG

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 08.28.2017

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: f = 835 MHz; σ = 0.887 S/m; ε_r = 41.22; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.73, 9.73, 9.73); 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)

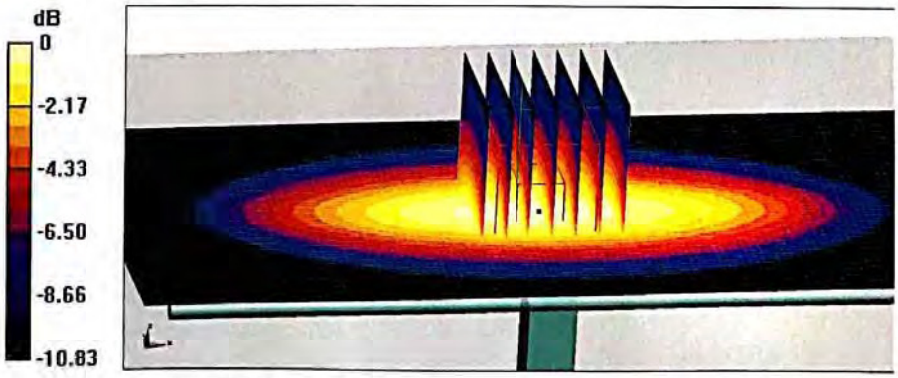
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.51 W/kg

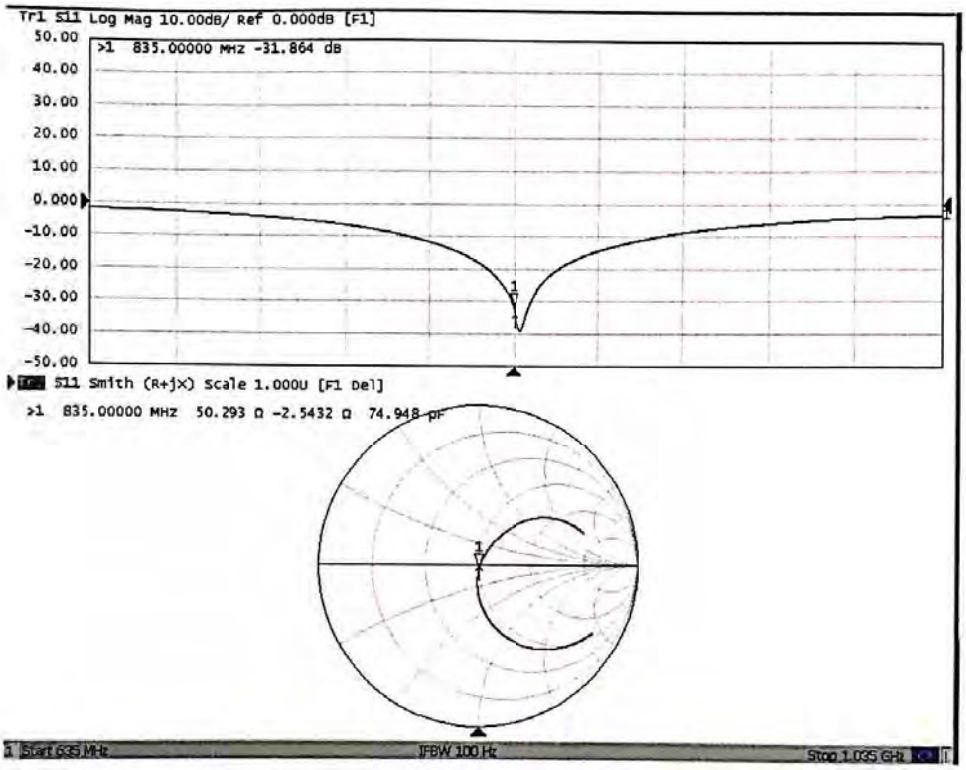
Maximum value of SAR (measured) = 3.16 W/kg



0 dB = 3.16 W/kg = 5.00 dBW/kg

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Head TSL



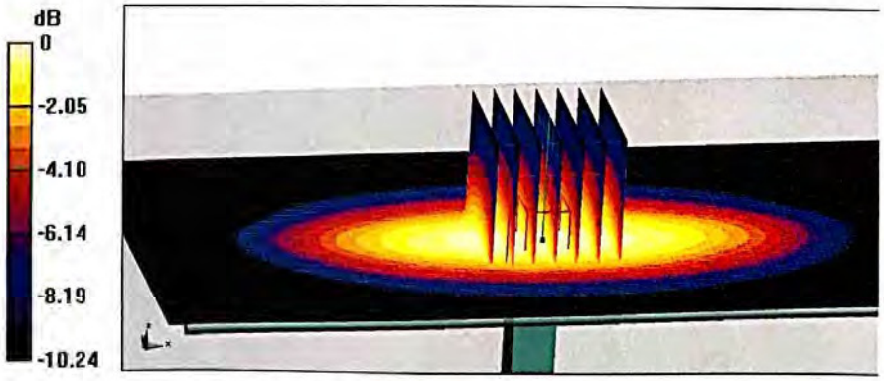
Certificate No: Z17-97114 Page 6 of 8

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Body TSL Date: 08.27.2017
Test Laboratory: CTTL, Beijing, China
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.984 S/m; ε_r = 55.62; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.64,9.64, 9.64); 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)

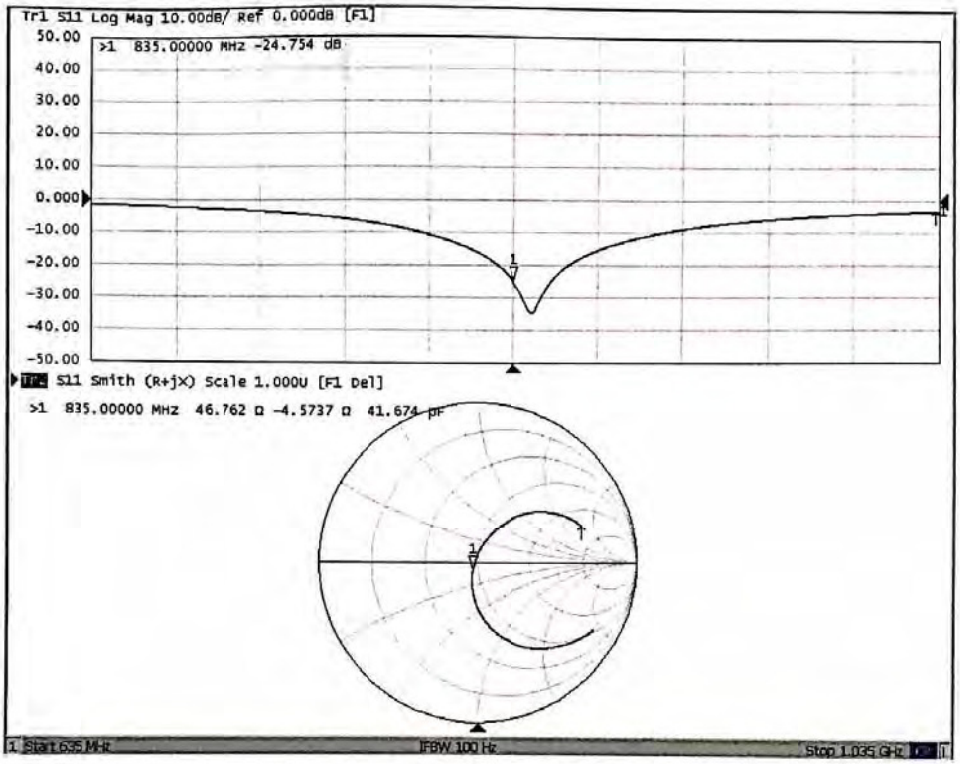
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.55 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.63 W/kg
Maximum value of SAR (measured) = 3.29 W/kg



0 dB = 3.29 W/kg = 5.17 dBW/kg

In Collaboration with
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

Impedance Measurement Plot for Body TSL



Certificate No: Z17-97114 Page 8 of 8