FCC SAR Test Report

APPLICANT	:	Acer Incorporated
EQUIPMENT	:	Smart Camera
BRAND NAME	:	acer
MODEL NAME	:	C01
MARKETING NAME	:	Holo360
FCC ID	:	HLZC01
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Mark Qu

Approved by: Mark Qu / Manager

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA751212	Rev. 01	Initial issue of report	Sep. 05, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Acer Incorporated, Smart Camera, C01**, are as follows.

Equipment Class		Frequency Band	Highest SAR Summary Body 1g SAR (W/kg) (5mm Gap)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	WCDMA	Band V	**1.20**	1.49
		Band IV	1.18	
		Band II	1.14	
	LTE	Band 12/Band 17	1.14	
		Band 5	1.04	
		Band 4	1.19	
		Band 2	1.19	
		Band 7	1.19	
DTS	WLAN	WLAN 2.4GHz Band	0.30	1.49
NII	WLAN	WLAN 5GHz Band	0.73	1.36
DSS	Bluetooth	Bluetooth		1.37
Date of Testing:			2017/8/2 ~ 2017/8/18	
Remark: This device supports both LTE B12 and LTE B17. Since the supported frequency span for LTE B17 falls completely within the supports frequency span for LTE B12, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B12.				

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Testing Laboratory	
Test Site	Sporton International (Kunshan) Inc.
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958

Applicant	
Company Name	Acer Incorporated
Address	8F, 88, Sec.1 Xintai 5th Rd., Xizhi, New Taipei City 221, Taiwan, R.O.C

Manufacturer	
Company Name	Acer Incorporated
Address	8F, 88, Sec.1 Xintai 5th Rd., Xizhi, New Taipei City 221, Taiwan, R.O.C

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Smart Camera
Brand Name	acer
Model Name	C01
Marketing Name	Holo360
FCC ID	HLZC01
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink is not supported) LTE: QPSK, 16QAM 802.11b/g/n HT20/HT40 802.11a/n HT20/HT40 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE
HW	V1.03
SW	Acer_AV0N0_C01_0.000.08_EMEA_GEN1
EUT Stage	Pre-Production
Remark: This product has voice function, but limit to speakerphone mode.	

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	HLZC01
Equipment Name	Smart Camera
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz
Uplink modulations used	QPSK / 16QAM
LTE Voice / Data requirements	Data Only
LTE Release Version	R9, Cat4
CA Support	Not Supported
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (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 A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

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

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

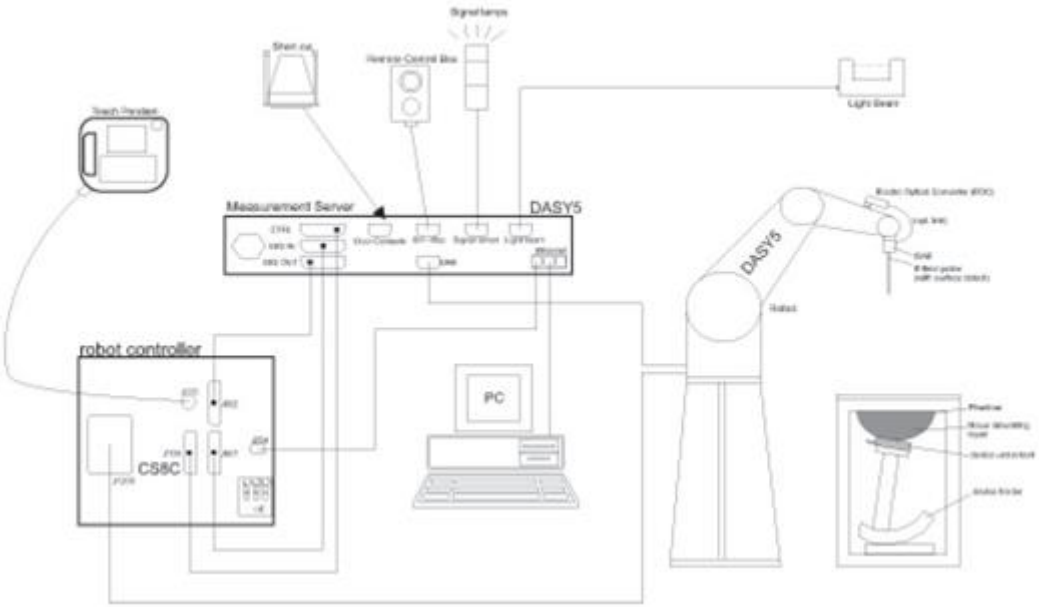
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

The DASY system used 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 DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 Data Acquisition Electronics (DAE)

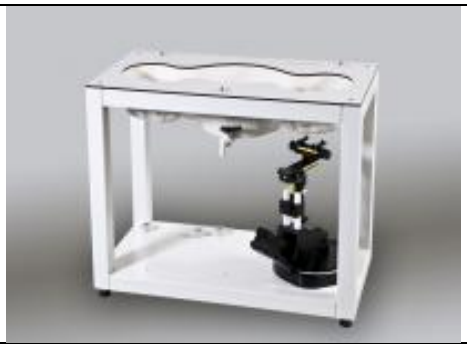
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

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

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

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

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(b) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 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.

8.3 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 dB0 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 D01v01r04 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: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 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 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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 ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 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.

8.6 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.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1065	2016/11/21	2017/11/20
SPEAG	835MHz System Validation Kit	D835V2	4d091	2016/11/22	2017/11/21
SPEAG	1750MHz System Validation Kit	D1750V2	1069	2016/11/23	2017/11/22
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	2016/11/24	2017/11/23
SPEAG	2450MHz System Validation Kit	D2450V2	840	2016/11/25	2017/11/24
SPEAG	2600MHz System Validation Kit	D2600V2	1061	2016/11/24	2017/11/23
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2016/12/13	2017/12/12
SPEAG	Data Acquisition Electronics	DAE4	1279	2017/5/2	2018/5/1
SPEAG	Dosimetric E-Field Probe	EX3DV4	3954	2016/11/28	2017/11/27
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1842	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1839	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2017/4/18	2018/4/17
SPEAG	DAK Kit	DAK3.5	1144	2016/11/23	2017/11/22
R&S	Signal Generator	SMR40	100455	2017/1/19	2018/1/18
R&S	CBT BLUETOOTH TESTER	CBT	100963	2017/1/3	2018/1/2
Anritsu	Power Senor	MA2411B	1644003	2016/12/23	2017/12/22
Anritsu	Power Meter	ML2495A	1531197	2016/12/23	2017/12/22
Anritsu	Power Senor	MA2411B	1644004	2016/12/23	2017/12/22
Anritsu	Power Meter	ML2495A	1531198	2016/12/23	2017/12/22
WISEWIND	Hygrometer	WISEWIND 0905	905	2017/4/20	2018/4/19
JM	DIGITAC THERMOMETER	JM222	AA1207166	2017/4/19	2018/4/18
R&S	Spectrum Analyzer	FSV7	103712	2016/11/17	2017/11/16
ARRA	Power Divider	A3200-2	NA	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
AR	Amplifier	5S1G4	333096	Note	
mini-circuits	Amplifier	ZVE-3W-83+	162601250	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	

Note:
Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1.

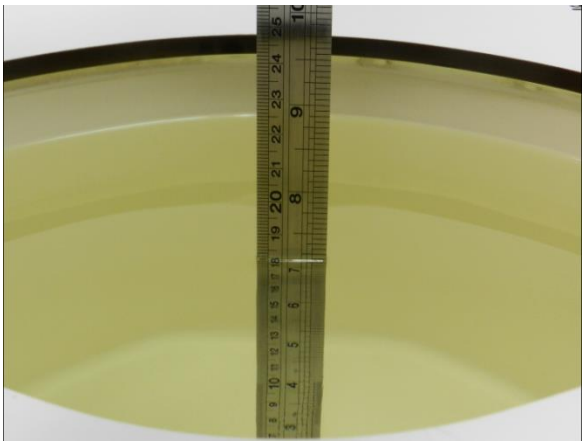


Fig 10.1 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Body	22.6	0.964	55.673	0.96	55.50	0.42	0.31	±5	2017/8/2
835	Body	22.7	0.970	54.490	0.97	55.20	0.00	-1.29	±5	2017/8/10
1750	Body	22.6	1.460	53.208	1.49	53.40	-2.01	-0.36	±5	2017/8/14
1900	Body	22.6	1.537	51.866	1.52	53.30	1.12	-2.69	±5	2017/8/17
2450	Body	22.6	2.028	52.259	1.95	52.70	4.00	-0.84	±5	2017/8/17
2600	Body	22.6	2.200	51.176	2.16	52.50	1.85	-2.52	±5	2017/8/18
5250	Body	22.5	5.490	47.921	5.36	48.90	2.43	-2.00	±5	2017/8/18
5600	Body	22.5	5.851	47.711	5.77	48.50	1.40	-1.63	±5	2017/8/18
5750	Body	22.5	6.160	47.074	5.94	48.30	3.70	-2.54	±5	2017/8/18

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2017/8/2	750	Body	250	1065	3954	1279	2.35	8.71	9.40	7.92
2017/8/10	835	Body	250	4d091	3954	1279	2.54	9.68	10.16	4.96
2017/8/14	1750	Body	250	1069	3954	1279	9.07	37.70	36.28	-3.77
2017/8/17	1900	Body	250	5d118	3954	1279	10.60	40.80	42.40	3.92
2017/8/17	2450	Body	250	840	3954	1279	12.60	50.90	50.40	-0.98
2017/8/18	2600	Body	250	1061	3954	1279	14.50	55.40	58.00	4.69
2017/8/18	5250	Body	100	1113	3954	1279	7.48	76.10	74.80	-1.71
2017/8/18	5600	Body	100	1113	3954	1279	8.39	79.80	83.90	5.14
2017/8/18	5750	Body	100	1113	3954	1279	7.00	75.20	70.00	-6.91

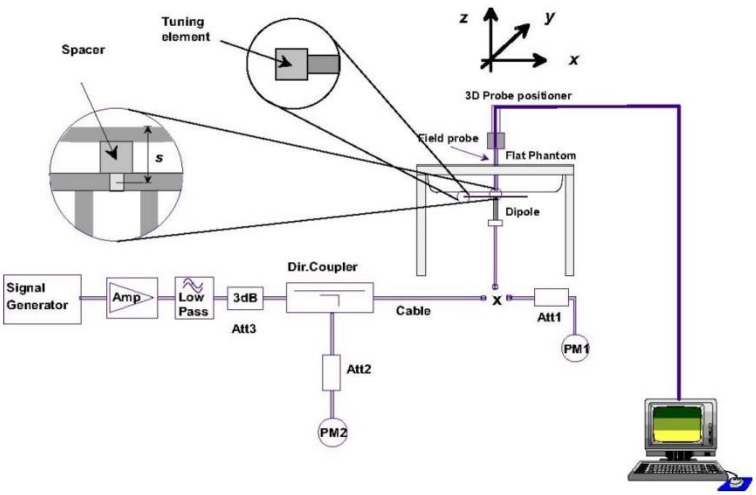


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. Conducted RF Output Power (Unit: dBm)

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .

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

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

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

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_d=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

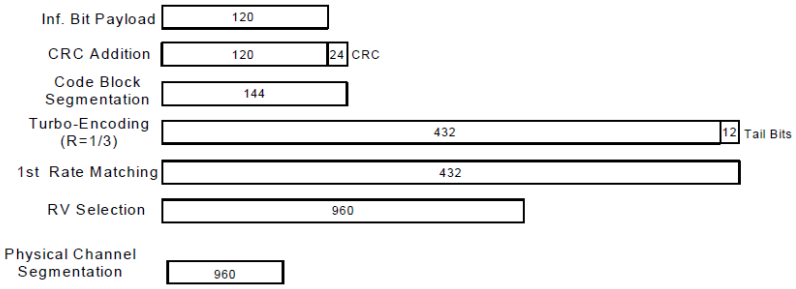


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSUPA.

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band IV			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	19.96	20.14	20.29	20.50	20.95	20.72	20.74	21.50	21.93	21.84	21.80	22.50
3GPP Rel 99	RMC 12.2Kbps	19.98	20.15	**20.30**	20.50	**20.96**	20.73	20.75	21.50	**21.94**	21.93	21.81	22.50
3GPP Rel 6	HSDPA Subtest-1	18.23	18.55	18.69	19.00	20.22	20.15	20.22	20.50	20.24	20.15	20.15	20.50
3GPP Rel 6	HSDPA Subtest-2	18.36	18.72	18.79	19.00	20.20	20.05	20.20	20.50	20.26	20.21	20.22	20.50
3GPP Rel 6	HSDPA Subtest-3	17.86	18.23	18.31	18.50	19.72	19.73	19.74	20.00	19.80	19.74	19.76	20.00
3GPP Rel 6	HSDPA Subtest-4	17.84	18.25	18.32	18.50	19.71	19.72	19.73	20.00	19.78	19.74	19.75	20.00
3GPP Rel 8	DC-HSDPA Subtest-1	18.11	18.43	18.56	19.00	18.85	20.10	20.03	20.50	20.12	20.01	20.03	20.50
3GPP Rel 8	DC-HSDPA Subtest-2	18.21	18.63	18.67	19.00	18.83	20.01	19.93	20.50	20.14	20.02	20.10	20.50
3GPP Rel 8	DC-HSDPA Subtest-3	17.74	18.11	18.19	18.50	18.38	19.60	19.62	20.00	19.67	19.62	19.63	20.00
3GPP Rel 8	DC-HSDPA Subtest-4	17.72	18.13	18.21	18.50	18.38	19.57	19.60	20.00	19.66	19.62	19.62	20.00
3GPP Rel 6	HSUPA Subtest-1	18.28	18.59	18.85	19.00	19.29	20.00	19.47	20.50	20.30	20.29	20.29	20.50
3GPP Rel 6	HSUPA Subtest-2	16.34	16.65	16.82	17.00	18.19	18.14	18.24	18.50	18.27	18.22	18.27	18.50
3GPP Rel 6	HSUPA Subtest-3	17.30	17.59	17.88	18.00	19.21	19.14	19.26	19.50	19.33	19.34	19.23	19.50
3GPP Rel 6	HSUPA Subtest-4	16.34	16.59	16.79	17.00	18.19	18.14	18.24	18.50	18.37	18.22	18.27	18.50
3GPP Rel 6	HSUPA Subtest-5	18.20	18.62	18.91	19.00	20.10	20.00	20.20	20.50	20.19	20.20	20.20	20.50

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, 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 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.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 17 SAR test was covered by Band 12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
    a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
    b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	20.18	20.3	20.3	21	0
20	QPSK	1	49	20.61	20.72	20.68		
20	QPSK	1	99	20.42	20.53	20.52		
20	QPSK	50	0	19.4	19.63	19.6	20	1
20	QPSK	50	24	19.4	19.55	19.54		
20	QPSK	50	50	19.21	19.62	19.56		
20	QPSK	100	0	19.28	19.56	19.52		
20	16QAM	1	0	19.12	19.09	19.24	20	1
20	16QAM	1	49	19.17	19.68	19.8		
20	16QAM	1	99	18.91	18.95	19.24		
20	16QAM	50	0	18.53	18.61	18.58	19	2
20	16QAM	50	24	18.51	18.3	18.56		
20	16QAM	50	50	18.4	18.49	18.66		
20	16QAM	100	0	18.29	18.25	18.64		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	20.63	20.39	20.5	21	0
15	QPSK	1	37	20.61	20.7	20.85		
15	QPSK	1	74	20.31	20.39	20.68		
15	QPSK	36	0	19.44	19.35	19.6	20	1
15	QPSK	36	20	19.44	19.49	19.72		
15	QPSK	36	39	19.4	19.48	19.6		
15	QPSK	75	0	19.42	19.35	19.57		
15	16QAM	1	0	19.28	19.21	19.21	20	1
15	16QAM	1	37	18.92	19.46	19.32		
15	16QAM	1	74	19.02	19.19	19.23		
15	16QAM	36	0	18.47	18.45	18.53	19	2
15	16QAM	36	20	18.52	18.53	18.66		
15	16QAM	36	39	18.45	18.53	18.64		
15	16QAM	75	0	18.56	18.38	18.69		

Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	20.38	20.17	20.47	21	0
10	QPSK	1	25	20.79	20.81	20.88		
10	QPSK	1	49	20.25	20.29	20.3		
10	QPSK	25	0	19.59	19.4	19.69	20	1
10	QPSK	25	12	19.55	19.52	19.62		
10	QPSK	25	25	19.37	19.48	19.52		
10	QPSK	50	0	19.46	19.38	19.58		
10	16QAM	1	0	19.22	19.2	19.27	20	1
10	16QAM	1	25	19.13	19.9	19.44		
10	16QAM	1	49	19.25	18.92	19.43		
10	16QAM	25	0	18.58	18.35	19	19	2
10	16QAM	25	12	18.62	18.68	18.78		
10	16QAM	25	25	18.55	18.61	18.66		
10	16QAM	50	0	18.6	18.53	18.64		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	20.38	20.28	20.16	21	0
5	QPSK	1	12	20.59	20.5	20.81		
5	QPSK	1	24	20.16	20.1	20.22		
5	QPSK	12	0	19.59	19.49	19.5	20	1
5	QPSK	12	7	19.52	19.5	19.58		
5	QPSK	12	13	19.42	19.42	19.53		
5	QPSK	25	0	19.43	19.56	19.54		
5	16QAM	1	0	19.05	19.1	19.31	20	1
5	16QAM	1	12	19.23	19.44	19.64		
5	16QAM	1	24	19.12	19.02	19.25		
5	16QAM	12	0	18.55	18.73	18.55	19	2
5	16QAM	12	7	18.49	18.72	18.55		
5	16QAM	12	13	18.49	18.68	18.49		
5	16QAM	25	0	18.39	18.4	18.69		

Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	20.44	20.15	20.59	21	0
3	QPSK	1	8	20.59	20.56	20.41		
3	QPSK	1	14	20.5	20.12	20.21		
3	QPSK	8	0	19.6	19.65	19.64	20	1
3	QPSK	8	4	19.47	19.52	19.62		
3	QPSK	8	7	19.5	19.47	19.59		
3	QPSK	15	0	19.41	19.5	19.51		
3	16QAM	1	0	19.23	19.76	19.35	20	1
3	16QAM	1	8	19.51	19.71	19.23		
3	16QAM	1	14	19.3	19.26	19.3		
3	16QAM	8	0	18.58	18.26	18.56	19	2
3	16QAM	8	4	18.53	18.34	18.79		
3	16QAM	8	7	18.51	18.47	18.62		
3	16QAM	15	0	18.51	18.58	18.32		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	20.39	20.41	20.61	21	0
1.4	QPSK	1	3	20.57	20.46	20.58		
1.4	QPSK	1	5	20.59	20.53	20.56		
1.4	QPSK	3	0	20.75	20.52	20.81		
1.4	QPSK	3	1	20.83	20.64	20.86		
1.4	QPSK	3	3	20.71	20.66	20.74		
1.4	QPSK	6	0	19.58	19.53	19.63	20	1
1.4	16QAM	1	0	19.22	19.61	19.46	20	1
1.4	16QAM	1	3	19.22	19.71	19.36		
1.4	16QAM	1	5	19.07	19.75	19.48		
1.4	16QAM	3	0	19.64	19.53	19.72		
1.4	16QAM	3	1	19.8	19.57	19.73		
1.4	16QAM	3	3	19.96	19.76	19.78		
1.4	16QAM	6	0	18.55	18.67	18.49	19	2

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	20.63	20.62	20.58	21.5	0
20	QPSK	1	49	21.34	21.21	21.2		
20	QPSK	1	99	20.92	20.57	20.91		
20	QPSK	50	0	19.83	19.79	19.82	20.5	1
20	QPSK	50	24	19.9	19.78	19.77		
20	QPSK	50	50	19.8	19.78	19.79		
20	QPSK	100	0	19.99	19.78	19.98		
20	16QAM	1	0	19.37	19.71	19.73	20.5	1
20	16QAM	1	49	19.73	19.4	19.59		
20	16QAM	1	99	19.39	19.37	19.59		
20	16QAM	50	0	18.91	18.78	19.03	19.5	2
20	16QAM	50	24	18.96	18.89	18.91		
20	16QAM	50	50	18.85	18.92	18.84		
20	16QAM	100	0	18.83	18.81	18.82		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	20.75	20.89	20.9	21.5	0
15	QPSK	1	37	21.17	20.87	20.78		
15	QPSK	1	74	20.83	20.62	20.76		
15	QPSK	36	0	19.79	19.84	19.72	20.5	1
15	QPSK	36	20	19.89	19.72	19.84		
15	QPSK	36	39	19.93	19.77	19.91		
15	QPSK	75	0	19.88	19.77	19.91		
15	16QAM	1	0	19.53	19.61	19.61	20.5	1
15	16QAM	1	37	19.54	19.43	19.58		
15	16QAM	1	74	19.65	19.35	19.66		
15	16QAM	36	0	18.81	18.85	18.8	19.5	2
15	16QAM	36	20	18.95	18.74	18.94		
15	16QAM	36	39	19.01	18.89	18.9		
15	16QAM	75	0	18.95	18.89	18.86		

Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	20.56	20.62	20.81	21.5	0
10	QPSK	1	25	21.12	21.24	21.17		
10	QPSK	1	49	20.75	20.69	20.62		
10	QPSK	25	0	19.7	19.83	19.78	20.5	1
10	QPSK	25	12	19.93	19.79	19.88		
10	QPSK	25	25	19.82	19.77	19.85		
10	QPSK	50	0	19.92	19.74	19.91		
10	16QAM	1	0	19.54	19.52	19.51	20.5	1
10	16QAM	1	25	19.61	19.46	19.53		
10	16QAM	1	49	19.64	19.3	19.75		
10	16QAM	25	0	19.03	18.86	19.07	19.5	2
10	16QAM	25	12	18.89	18.82	18.96		
10	16QAM	25	25	18.87	18.78	18.87		
10	16QAM	50	0	18.92	18.76	18.88		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	20.42	20.78	20.76	21.5	0
5	QPSK	1	12	20.91	21.03	20.88		
5	QPSK	1	24	20.38	20.67	20.77		
5	QPSK	12	0	19.69	19.83	19.82	20.5	1
5	QPSK	12	7	19.85	19.74	19.78		
5	QPSK	12	13	19.68	19.73	19.91		
5	QPSK	25	0	19.73	19.74	19.83		
5	16QAM	1	0	19.31	19.55	19.46	20.5	1
5	16QAM	1	12	19.74	19.72	19.39		
5	16QAM	1	24	19.46	19.43	19.59		
5	16QAM	12	0	18.53	18.56	18.75	19.5	2
5	16QAM	12	7	18.78	18.76	18.96		
5	16QAM	12	13	18.8	18.95	18.99		
5	16QAM	25	0	18.85	18.82	19.03		

Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	20.78	20.68	20.58	21.5	0
3	QPSK	1	8	20.92	20.99	20.83		
3	QPSK	1	14	20.67	20.69	20.81		
3	QPSK	8	0	19.83	19.83	19.81	20.5	1
3	QPSK	8	4	19.73	19.84	19.85		
3	QPSK	8	7	19.7	19.8	19.73		
3	QPSK	15	0	19.71	19.79	19.85		
3	16QAM	1	0	19.6	19.58	19.4	20.5	1
3	16QAM	1	8	19.37	19.4	19.26		
3	16QAM	1	14	19.51	19.56	19.65		
3	16QAM	8	0	18.75	18.92	19.17	19.5	2
3	16QAM	8	4	18.79	18.91	18.87		
3	16QAM	8	7	18.79	18.94	18.82		
3	16QAM	15	0	18.84	18.84	18.52		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	20.91	20.81	20.91	21.5	0
1.4	QPSK	1	3	20.94	20.83	21.03		
1.4	QPSK	1	5	20.81	20.83	20.97		
1.4	QPSK	3	0	20.86	20.92	20.91		
1.4	QPSK	3	1	20.88	21	21.16		
1.4	QPSK	3	3	20.89	20.84	20.95		
1.4	QPSK	6	0	19.78	19.7	19.96	20.5	1
1.4	16QAM	1	0	19.47	19.54	19.57	20.5	1
1.4	16QAM	1	3	19.54	19.5	19.63		
1.4	16QAM	1	5	19.42	19.53	19.75		
1.4	16QAM	3	0	19.68	19.8	20.12		
1.4	16QAM	3	1	19.47	19.75	20.13		
1.4	16QAM	3	3	19.58	19.9	20.22		
1.4	16QAM	6	0	18.49	18.68	18.88	19.5	2

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	21.31	21.32	21.31	22.5	0
10	QPSK	1	25	21.58	21.94	21.47		
10	QPSK	1	49	21.13	21.5	20.98		
10	QPSK	25	0	20.6	20.64	20.5	21.5	1
10	QPSK	25	12	20.61	20.63	20.49		
10	QPSK	25	25	20.48	20.49	20.42		
10	QPSK	50	0	20.52	20.56	20.51		
10	16QAM	1	0	20.72	20.34	20.28	21.5	1
10	16QAM	1	25	20.29	20.34	20.37		
10	16QAM	1	49	20.29	20.04	20.12		
10	16QAM	25	0	19.58	19.56	19.58	20.5	2
10	16QAM	25	12	19.63	19.69	19.48		
10	16QAM	25	25	19.54	19.71	19.45		
10	16QAM	50	0	19.53	19.39	19.46		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	21.38	21.33	21.3	22.5	0
5	QPSK	1	12	22.03	21.61	21.77		
5	QPSK	1	24	21.41	21.39	21.09		
5	QPSK	12	0	20.66	20.44	20.42	21.5	1
5	QPSK	12	7	20.61	20.41	20.44		
5	QPSK	12	13	20.63	20.42	20.33		
5	QPSK	25	0	20.55	20.41	20.28		
5	16QAM	1	0	20.58	20.26	20.29	21.5	1
5	16QAM	1	12	20.36	20.19	20.56		
5	16QAM	1	24	20.3	20.35	20.15		
5	16QAM	12	0	19.86	19.3	19.45	20.5	2
5	16QAM	12	7	19.84	19.39	19.41		
5	16QAM	12	13	19.81	19.29	19.17		
5	16QAM	25	0	19.68	19.21	19.21		

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	21.5	21.45	21.28	22.5	0
3	QPSK	1	8	21.67	21.6	21.32		
3	QPSK	1	14	21.53	21.53	21.23		
3	QPSK	8	0	20.69	20.46	20.58	21.5	1
3	QPSK	8	4	20.73	20.56	20.34		
3	QPSK	8	7	20.78	20.49	20.35		
3	QPSK	15	0	20.72	20.46	20.36		
3	16QAM	1	0	20.49	20.45	20.34	21.5	1
3	16QAM	1	8	20.45	20.26	20.64		
3	16QAM	1	14	20.8	20.41	20.68		
3	16QAM	8	0	20.06	19.52	19.55	20.5	2
3	16QAM	8	4	20.13	19.54	19.4		
3	16QAM	8	7	19.83	19.53	19.42		
3	16QAM	15	0	19.4	19.54	19.45		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	21.69	21.44	21.37	22.5	0
1.4	QPSK	1	3	21.69	21.41	21.13		
1.4	QPSK	1	5	21.86	21.47	21.33		
1.4	QPSK	3	0	21.76	21.58	21.35		
1.4	QPSK	3	1	21.79	21.56	21.39		
1.4	QPSK	3	3	20.7	20.63	20.67		
1.4	QPSK	6	0	20.48	20.21	20.25	21.5	1
1.4	16QAM	1	0	20.51	20.25	20.18	21.5	1
1.4	16QAM	1	3	20.84	20.17	20.02		
1.4	16QAM	1	5	20.84	20.71	20.21		
1.4	16QAM	3	0	20.81	20.65	20.34		
1.4	16QAM	3	1	20.83	20.7	20.51		
1.4	16QAM	3	3	19.56	19.52	19.66		
1.4	16QAM	6	0	20.21	20.16	19.79	20.5	2

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	20.6	20.99	21.13	22	0
20	QPSK	1	49	21.41	21.49	21.8		
20	QPSK	1	99	21.1	21.12	21.13		
20	QPSK	50	0	20.1	20.39	20.42	21	1
20	QPSK	50	24	20.15	20.38	20.43		
20	QPSK	50	50	20.16	20.4	20.56		
20	QPSK	100	0	20.17	20.47	20.48		
20	16QAM	1	0	19.82	20.17	20.26	21	1
20	16QAM	1	49	19.83	20.23	20.2		
20	16QAM	1	99	19.9	20.19	20.08		
20	16QAM	50	0	19.3	19.6	19.66	20	2
20	16QAM	50	24	19.22	19.63	19.49		
20	16QAM	50	50	19.33	19.6	19.5		
20	16QAM	100	0	19.19	19.55	19.44		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	21.02	21.3	21.38	22	0
15	QPSK	1	37	21.3	21.59	21.43		
15	QPSK	1	74	21.25	21.29	21.35		
15	QPSK	36	0	20.08	20.43	20.41	21	1
15	QPSK	36	20	20.05	20.39	20.42		
15	QPSK	36	39	20.22	20.46	20.38		
15	QPSK	75	0	20.11	20.39	20.43		
15	16QAM	1	0	19.88	20.25	20.16	21	1
15	16QAM	1	37	19.81	20.31	20.08		
15	16QAM	1	74	20.01	20.16	20.12		
15	16QAM	36	0	19.24	19.6	19.58	20	2
15	16QAM	36	20	19.2	19.67	19.61		
15	16QAM	36	39	19.26	19.52	19.47		
15	16QAM	75	0	19.28	19.57	19.57		

Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	20.9	21.4	21.17	22	0
10	QPSK	1	25	21.39	21.6	21.63		
10	QPSK	1	49	20.99	21.06	21.05		
10	QPSK	25	0	20.05	20.41	20.4	21	1
10	QPSK	25	12	20.03	20.47	20.33		
10	QPSK	25	25	20.1	20.42	20.36		
10	QPSK	50	0	20.08	20.36	20.41		
10	16QAM	1	0	19.72	20.24	20.16	21	1
10	16QAM	1	25	19.83	20.18	20.05		
10	16QAM	1	49	19.82	20.01	20.08		
10	16QAM	25	0	19.23	19.39	19.57	20	2
10	16QAM	25	12	19.2	19.55	19.42		
10	16QAM	25	25	19.24	19.65	19.51		
10	16QAM	50	0	19.18	19.64	19.49		
Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	20.84	21.02	21.08	22	0
5	QPSK	1	12	21.08	21.56	21.32		
5	QPSK	1	24	20.83	21.02	20.93		
5	QPSK	12	0	20.05	20.43	20.31	21	1
5	QPSK	12	7	19.98	20.5	20.33		
5	QPSK	12	13	20.06	20.41	20.29		
5	QPSK	25	0	20.03	20.37	20.26		
5	16QAM	1	0	19.75	20.16	19.97	21	1
5	16QAM	1	12	19.72	20.04	20.25		
5	16QAM	1	24	19.7	20.16	19.81		
5	16QAM	12	0	19.09	19.42	19.16	20	2
5	16QAM	12	7	19.26	19.48	19.18		
5	16QAM	12	13	19.35	19.49	19.2		
5	16QAM	25	0	19.15	19.58	19.17		

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	22.78	22.94	23.01	24	0
10	QPSK	1	25	23.05	23.24	23.3		
10	QPSK	1	49	23.15	23.41	23.42		
10	QPSK	25	0	22.31	22.36	22.37	23	1
10	QPSK	25	12	22.16	22.35	22.36		
10	QPSK	25	25	22.25	22.34	22.35		
10	QPSK	50	0	22.31	22.32	22.31		
10	16QAM	1	0	21.82	21.94	22.11	23	1
10	16QAM	1	25	22.17	22.19	22.08		
10	16QAM	1	49	22.14	22.09	22.09		
10	16QAM	25	0	21.25	21.27	21.53	22	2
10	16QAM	25	12	21.41	21.56	21.42		
10	16QAM	25	25	21.43	21.34	21.4		
10	16QAM	50	0	21.32	21.41	21.49		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	22.7	22.93	22.92	24	0
5	QPSK	1	12	23.46	23.51	23.2		
5	QPSK	1	24	23.16	23.13	22.77		
5	QPSK	12	0	22.15	22.3	22.24	23	1
5	QPSK	12	7	22.22	22.45	22.22		
5	QPSK	12	13	22.22	22.36	22.18		
5	QPSK	25	0	22.24	22.36	22.22		
5	16QAM	1	0	21.87	22.1	22.42	23	1
5	16QAM	1	12	21.81	22.08	22.53		
5	16QAM	1	24	22.1	22.1	21.96		
5	16QAM	12	0	21.16	21.26	21.41	22	2
5	16QAM	12	7	21.21	21.49	21.32		
5	16QAM	12	13	21.29	21.57	21.2		
5	16QAM	25	0	21.29	21.39	21.23		

Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.95	23.14	23.33	24	0
3	QPSK	1	8	23.35	23.5	23.19		
3	QPSK	1	14	23.07	23.33	22.94		
3	QPSK	8	0	22.19	22.4	22.38	23	1
3	QPSK	8	4	22.36	22.43	22.26		
3	QPSK	8	7	22.31	22.43	22.26		
3	QPSK	15	0	22.4	22.34	22.23		
3	16QAM	1	0	21.86	22.15	22.1	23	1
3	16QAM	1	8	21.88	22.15	21.96		
3	16QAM	1	14	22.01	22.23	21.49		
3	16QAM	8	0	21.22	21.42	21	22	2
3	16QAM	8	4	21.53	21.36	20.98		
3	16QAM	8	7	21.52	21.42	21.16		
3	16QAM	15	0	21.37	21.38	21.16		
Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	22.98	23.31	23.2	24	0
1.4	QPSK	1	3	23.19	23.34	23.22		
1.4	QPSK	1	5	23.19	23.36	23.26		
1.4	QPSK	3	0	23.08	23.3	23.22		
1.4	QPSK	3	1	23.27	23.53	23.24		
1.4	QPSK	3	3	23.13	23.38	23.2		
1.4	QPSK	6	0	22.14	22.35	22.25	23	1
1.4	16QAM	1	0	22.02	22.23	22.43	23	1
1.4	16QAM	1	3	21.94	22.16	22.15		
1.4	16QAM	1	5	22.07	22.23	22.12		
1.4	16QAM	3	0	22.08	22.38	22.22		
1.4	16QAM	3	1	22.2	22.37	22.23		
1.4	16QAM	3	3	22.34	22.51	22.32		
1.4	16QAM	6	0	21.2	21.35	21.3	22	2

<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	23.74	23.02	22.94	24	0
10	QPSK	1	25	23.79	23.78	23.49		
10	QPSK	1	49	23.57	23.1	23.21		
10	QPSK	25	0	22.45	22.25	22.23	23	1
10	QPSK	25	12	22.44	22.18	22.21		
10	QPSK	25	25	22.43	22.25	22.23		
10	QPSK	50	0	22.39	22.25	22.29		
10	16QAM	1	0	22.22	22.03	21.91	23	1
10	16QAM	1	25	22.12	21.93	21.92		
10	16QAM	1	49	22.09	21.94	21.95		
10	16QAM	25	0	21.62	21.27	21.25	22	2
10	16QAM	25	12	21.6	21.33	21.27		
10	16QAM	25	25	21.39	21.33	21.15		
10	16QAM	50	0	21.53	21.34	21.39		
Channel				23755	23790	23825	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	23.22	23.11	22.76	24	0
5	QPSK	1	12	23.44	23.65	23.37		
5	QPSK	1	24	22.91	23.08	22.95		
5	QPSK	12	0	22.14	22.19	21.98	23	1
5	QPSK	12	7	22.24	22.21	22.1		
5	QPSK	12	13	22.25	22.18	22.1		
5	QPSK	25	0	22.19	22.21	22.13		
5	16QAM	1	0	21.98	21.75	21.96	23	1
5	16QAM	1	12	22.26	21.91	21.77		
5	16QAM	1	24	21.98	21.83	21.88		
5	16QAM	12	0	21.17	21.11	21.26	22	2
5	16QAM	12	7	21.21	21.4	21.25		
5	16QAM	12	13	21.47	21.35	21.11		
5	16QAM	25	0	21.49	21.44	21.15		

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of 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 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode 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 report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b	CH 1	2412	1Mbps	15.39	16.00	97.43
		CH 6	2437		**15.50**	16.00	
		CH 11	2462		15.20	16.00	
	802.11g	CH 1	2412	6Mbps	13.70	14.00	87.62
		CH 6	2437		13.44	14.00	
		CH 11	2462		13.71	14.00	
	802.11n-HT20	CH 1	2412	MCS0	12.45	13.00	86.70
		CH 6	2437		12.13	13.00	
		CH 11	2462		12.39	13.00	
	802.11n-HT40	CH 3	2422	MCS0	12.85	13.00	75.66
		CH 6	2437		12.58	13.00	
		CH 9	2452		12.36	13.00	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a	CH 36	5180	6Mbps	12.14	13.00	86.88
		CH 40	5200		12.07	13.00	
		CH 44	5220		**12.33**	13.00	
		CH 48	5240		12.20	13.00	
	802.11n-HT20	CH 36	5180	MCS0	11.22	11.50	86.44
		CH 40	5200		11.34	11.50	
		CH 44	5220		11.18	11.50	
		CH 48	5240		11.41	11.50	
	802.11n-HT40	CH 38	5190	MCS0	12.13	12.50	76.12
		CH 46	5230		12.00	12.50	
	802.11ac-VHT20	CH 36	5180	MCS0	11.12	11.50	83.25
		CH 40	5200		11.22	11.50	
		CH 44	5220		11.11	11.50	
		CH 48	5240		11.36	11.50	
	802.11ac-VHT40	CH 38	5190	MCS0	12.06	12.50	71.13
		CH 46	5230		11.98	12.50	
	802.11ac-VHT80	CH 42	5210	MCS0	12.05	12.50	55.48

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a	CH 52	5260	6Mbps	12.26	13.00	86.88
		CH 56	5280		12.28	13.00	
		CH 60	5300		**12.35**	13.00	
		CH 64	5320		12.34	13.00	
	802.11n-HT20	CH 52	5260	MCS0	11.34	11.50	86.44
		CH 56	5280		11.27	11.50	
		CH 60	5300		11.31	11.50	
		CH 64	5320		11.49	11.50	
	802.11n-HT40	CH 54	5270	MCS0	12.21	12.50	76.12
		CH 62	5310		12.06	12.50	
	802.11ac-VHT20	CH 52	5260	MCS0	11.27	11.50	83.25
		CH 56	5280		11.25	11.50	
		CH 60	5300		11.28	11.50	
		CH 64	5320		11.29	11.50	
	802.11ac-VHT40	CH 54	5270	MCS0	12.13	12.50	71.13
		CH 62	5310		12.02	12.50	
	802.11ac-VHT80	CH 58	5290	MCS0	12.04	12.50	55.48

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a	CH 100	5500	6Mbps	12.82	13.50	86.88
		CH 116	5580		**12.94**	13.50	
		CH 124	5620		12.81	13.50	
		CH 132	5660		12.77	13.50	
		CH 140	5700		12.71	13.50	
		CH 144	5720		12.64	13.50	
	802.11n-HT20	CH 100	5500	MCS0	12.08	12.50	86.44
		CH 116	5580		12.04	12.50	
		CH 124	5620		11.81	12.50	
		CH 132	5660		11.77	12.50	
		CH 140	5700		11.76	12.50	
		CH 144	5720		11.79	12.50	
	802.11n-HT40	CH 102	5510	MCS0	12.61	13.00	76.12
		CH 110	5550		12.79	13.00	
		CH 126	5630		12.23	13.00	
		CH 134	5670		12.41	13.00	
		CH 142	5710		12.34	13.00	
	802.11ac-VHT20	CH 100	5500	MCS0	11.17	12.50	83.25
		CH 116	5580		12.02	12.50	
		CH 124	5620		11.67	12.50	
		CH 132	5660		11.65	12.50	
		CH 140	5700		11.72	12.50	
		CH 144	5720		11.74	12.50	
	802.11ac-VHT40	CH 102	5510	MCS0	11.96	12.00	71.13
		CH 110	5550		11.70	12.00	
		CH 126	5630		11.58	12.00	
		CH 134	5670		11.55	12.00	
		CH 142	5710		11.28	12.00	
	802.11ac-VHT80	CH 106	5530	MCS0	11.82	12.00	55.48
		CH 122	5610		11.81	12.00	
		CH 138	5690		11.50	12.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a	CH 149	5745	6Mbps	**12.66**	13.00	86.88
		CH 157	5785		12.60	13.00	
		CH 165	5825		12.51	13.00	
	802.11n-HT20	CH 149	5745	MCS0	11.78	12.00	86.44
		CH 157	5785		11.83	12.00	
		CH 165	5825		11.54	12.00	
	802.11n-HT40	CH 151	5755	MCS0	12.31	12.50	76.12
		CH 159	5795		12.22	12.50	
	802.11ac-VHT20	CH 149	5745	MCS0	11.75	12.00	83.25
		CH 157	5785		11.74	12.00	
		CH 165	5825		11.47	12.00	
	802.11ac-VHT40	CH 151	5755	MCS0	12.23	12.50	71.13
		CH 159	5795		12.18	12.50	
	802.11ac-VHT80	CH 155	5775	MCS0	12.07	12.50	55.48

12. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0 + EDR	Bluetooth v4.0/4.1 LE
2.4GHz Bluetooth	6.00	1.50

Note:
Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

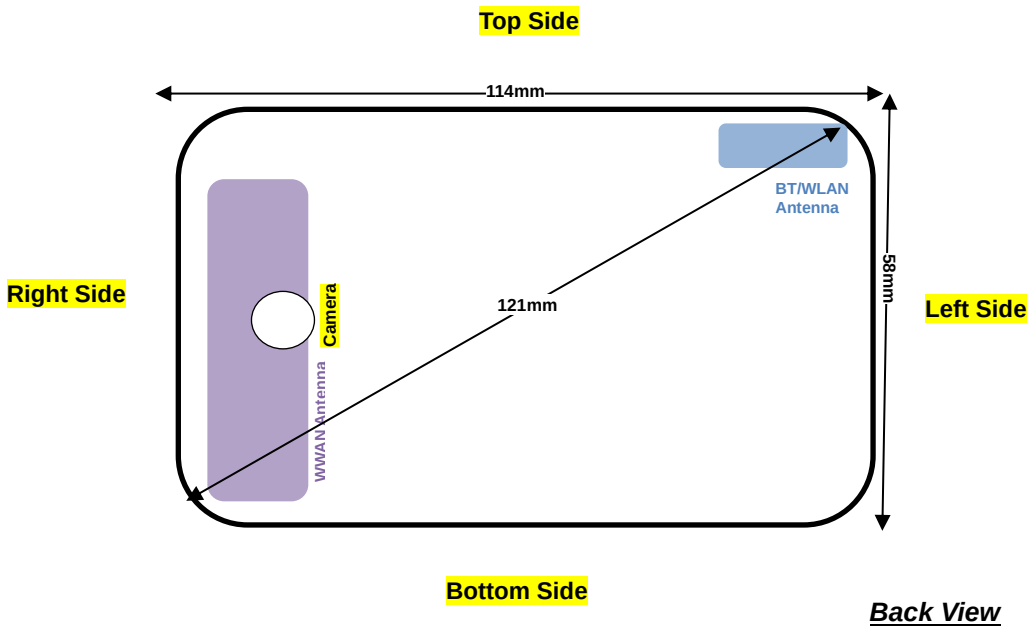
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

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

Bluetooth Max Power (dBm)	Frequency (GHz)	Separation Distance (mm)	Exclusion Thresholds
6.00	2.48	5	1.3

Note:
Per KDB 447498 D01v06, a distance of 5 mm is applied to determine 1g SAR test exclusion. The test exclusion threshold is 1.3 which is <= 3, SAR testing is not required.

13. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm	≤ 25mm	>25mm
BT&WLAN Antenna	≤ 25mm	≤ 25mm	≤ 25m	>25mm	>25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna	Yes	Yes	Yes	Yes	Yes	No
BT&WLAN Antenna	Yes	Yes	Yes	No	No	Yes

General Note:
Referring to 447498 D01 v06, SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
3. ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
4. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 0.8W/kg.

WCDMA Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, 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 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.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 17 SAR test was covered by Band 12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   c. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   d. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required 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.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode 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 report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Body SAR

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band V	RMC 12.2Kbps	Front	5	4132	826.4	21.94	22.50	1.138	-0.16	0.680	0.774
	WCDMA Band V	RMC 12.2Kbps	Back	5	4132	826.4	21.94	22.50	1.138	-0.02	0.882	1.003
01	WCDMA Band V	RMC 12.2Kbps	Back	5	4182	836.4	21.93	22.50	1.140	0.05	1.050	**1.197**
	WCDMA Band V	RMC 12.2Kbps	Back	5	4233	846.6	21.81	22.50	1.172	-0.02	0.892	1.046
	WCDMA Band V	RMC 12.2Kbps	Right Side	5	4132	826.4	21.94	22.50	1.138	-0.06	0.227	0.258
	WCDMA Band V	RMC 12.2Kbps	Top Side	5	4132	826.4	21.94	22.50	1.138	-0.11	0.509	0.579
	WCDMA Band V	RMC 12.2Kbps	Bottom Side	5	4132	826.4	21.94	22.50	1.138	-0.14	0.499	0.568
	WCDMA Band IV	RMC 12.2Kbps	Front	5	1312	1712.4	20.96	21.50	1.132	-0.11	0.672	0.761
	WCDMA Band IV	RMC 12.2Kbps	Back	5	1312	1712.4	20.96	21.50	1.132	-0.07	0.819	0.927
	WCDMA Band IV	RMC 12.2Kbps	Back	5	1413	1732.6	20.73	21.50	1.194	-0.08	0.862	1.029
02	WCDMA Band IV	RMC 12.2Kbps	Back	5	1513	1752.6	20.75	21.50	1.189	-0.17	0.994	**1.181**
	WCDMA Band IV	RMC 12.2Kbps	Right Side	5	1312	1712.4	20.96	21.50	1.132	-0.12	0.156	0.177
	WCDMA Band IV	RMC 12.2Kbps	Top Side	5	1312	1712.4	20.96	21.50	1.132	-0.19	0.116	0.131
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	5	1312	1712.4	20.96	21.50	1.132	-0.06	0.725	0.821
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	5	1413	1732.6	20.73	21.50	1.194	-0.04	0.698	0.833
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	5	1513	1752.6	20.75	21.50	1.189	-0.13	0.892	1.060
	WCDMA Band II	RMC 12.2Kbps	Front	5	9538	1907.6	20.30	20.50	1.047	0.04	0.984	1.030
03	WCDMA Band II	RMC 12.2Kbps	Front	5	9262	1852.4	19.98	20.50	1.127	-0.12	1.010	**1.138**
	WCDMA Band II	RMC 12.2Kbps	Front	5	9400	1880	20.15	20.50	1.084	-0.15	1.010	1.095
	WCDMA Band II	RMC 12.2Kbps	Back	5	9538	1907.6	20.30	20.50	1.047	-0.03	0.980	1.026
	WCDMA Band II	RMC 12.2Kbps	Back	5	9262	1852.4	19.98	20.50	1.127	-0.02	0.907	1.022
	WCDMA Band II	RMC 12.2Kbps	Back	5	9400	1880	20.15	20.50	1.084	-0.05	0.891	0.966
	WCDMA Band II	RMC 12.2Kbps	Right Side	5	9538	1907.6	20.30	20.50	1.047	0.08	0.412	0.431
	WCDMA Band II	RMC 12.2Kbps	Top Side	5	9538	1907.6	20.30	20.50	1.047	-0.06	0.244	0.255
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	5	9538	1907.6	20.30	20.50	1.047	-0.17	0.810	0.848
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	5	9262	1852.4	19.98	20.50	1.127	-0.14	0.794	0.895
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	5	9400	1880	20.15	20.50	1.084	-0.08	0.773	0.838

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 12	10M	QPSK	1	49	Front	5	23095	707.5	23.41	24.00	1.146	-0.18	0.838	0.960
	LTE Band 12	10M	QPSK	25	0	Front	5	23095	707.5	22.36	23.00	1.159	-0.05	0.618	0.716
	LTE Band 12	10M	QPSK	50	0	Front	5	23095	707.5	22.32	23.00	1.169	-0.15	0.644	0.753
04	LTE Band 12	10M	QPSK	1	49	Back	5	23095	707.5	23.41	24.00	1.146	-0.16	0.999	**1.144**
	LTE Band 12	10M	QPSK	25	0	Back	5	23095	707.5	22.36	23.00	1.159	-0.02	0.686	0.795
	LTE Band 12	10M	QPSK	50	0	Back	5	23095	707.5	22.32	23.00	1.169	-0.05	0.752	0.879
	LTE Band 12	10M	QPSK	1	49	Right Side	5	23095	707.5	23.41	24.00	1.146	-0.07	0.286	0.328
	LTE Band 12	10M	QPSK	25	0	Right Side	5	23095	707.5	22.36	23.00	1.159	-0.09	0.196	0.227
	LTE Band 12	10M	QPSK	1	49	Top Side	5	23095	707.5	23.41	24.00	1.146	-0.11	0.374	0.428
	LTE Band 12	10M	QPSK	25	0	Top Side	5	23095	707.5	22.36	23.00	1.159	-0.04	0.238	0.276
	LTE Band 12	10M	QPSK	1	49	Bottom Side	5	23095	707.5	23.41	24.00	1.146	-0.12	0.743	0.851
	LTE Band 12	10M	QPSK	25	0	Bottom Side	5	23095	707.5	22.36	23.00	1.159	-0.03	0.506	0.586
	LTE Band 12	10M	QPSK	50	0	Bottom Side	5	23095	707.5	22.32	23.00	1.169	-0.14	0.505	0.591
	LTE Band 5	10M	QPSK	1	25	Front	5	20525	836.5	21.94	22.50	1.138	-0.15	0.757	0.861
	LTE Band 5	10M	QPSK	25	0	Front	5	20525	836.5	20.64	21.50	1.219	-0.06	0.606	0.739
	LTE Band 5	10M	QPSK	50	0	Front	5	20525	836.5	20.56	21.50	1.242	-0.15	0.602	0.747
05	LTE Band 5	10M	QPSK	1	25	Back	5	20525	836.5	21.94	22.50	1.138	-0.15	0.915	**1.041**
	LTE Band 5	10M	QPSK	25	0	Back	5	20525	836.5	20.64	21.50	1.219	-0.03	0.750	0.914
	LTE Band 5	10M	QPSK	50	0	Back	5	20525	836.5	20.56	21.50	1.242	-0.04	0.750	0.931
	LTE Band 5	10M	QPSK	1	25	Right Side	5	20525	836.5	21.94	22.50	1.138	-0.08	0.242	0.275
	LTE Band 5	10M	QPSK	25	0	Right Side	5	20525	836.5	20.64	21.50	1.219	-0.13	0.191	0.233
	LTE Band 5	10M	QPSK	1	25	Top Side	5	20525	836.5	21.94	22.50	1.138	-0.06	0.636	0.724
	LTE Band 5	10M	QPSK	25	0	Top Side	5	20525	836.5	20.64	21.50	1.219	-0.07	0.464	0.566
	LTE Band 5	10M	QPSK	1	25	Bottom Side	5	20525	836.5	21.94	22.50	1.138	-0.14	0.559	0.636
	LTE Band 5	10M	QPSK	25	0	Bottom Side	5	20525	836.5	20.64	21.50	1.219	-0.17	0.427	0.521
	LTE Band 4	20M	QPSK	1	49	Front	5	20175	1732.5	21.21	21.50	1.069	-0.16	0.963	1.029
	LTE Band 4	20M	QPSK	50	24	Front	5	20175	1732.5	19.78	20.50	1.180	-0.17	0.734	0.866
	LTE Band 4	20M	QPSK	100	0	Front	5	20175	1732.5	19.78	20.50	1.180	-0.04	0.805	0.950
06	LTE Band 4	20M	QPSK	1	49	Back	5	20175	1732.5	21.21	21.50	1.069	-0.06	1.110	**1.187**
	LTE Band 4	20M	QPSK	50	24	Back	5	20175	1732.5	19.78	20.50	1.180	-0.09	0.861	1.016
	LTE Band 4	20M	QPSK	100	0	Back	5	20175	1732.5	19.78	20.50	1.180	-0.09	0.886	1.046
	LTE Band 4	20M	QPSK	1	49	Right Side	5	20175	1732.5	21.21	21.50	1.069	-0.03	0.284	0.304
	LTE Band 4	20M	QPSK	50	24	Right Side	5	20175	1732.5	19.78	20.50	1.180	-0.03	0.226	0.267
	LTE Band 4	20M	QPSK	1	49	Top Side	5	20175	1732.5	21.21	21.50	1.069	-0.11	0.155	0.166
	LTE Band 4	20M	QPSK	50	24	Top Side	5	20175	1732.5	19.78	20.50	1.180	-0.09	0.120	0.142
	LTE Band 4	20M	QPSK	1	49	Bottom Side	5	20175	1732.5	21.21	21.50	1.069	-0.12	0.847	0.905
	LTE Band 4	20M	QPSK	50	24	Bottom Side	5	20175	1732.5	19.78	20.50	1.180	-0.05	0.685	0.809
	LTE Band 4	20M	QPSK	100	0	Bottom Side	5	20175	1732.5	19.78	20.50	1.180	-0.15	0.725	0.856

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Front	5	18900	1880	20.72	21.00	1.067	-0.16	1.050	1.120
07	LTE Band 2	20M	QPSK	1	49	Front	5	18700	1860	20.61	21.00	1.094	-0.11	1.090	**1.192**
	LTE Band 2	20M	QPSK	1	49	Front	5	19100	1900	20.68	21.00	1.076	-0.1	1.100	1.184
	LTE Band 2	20M	QPSK	50	0	Front	5	18900	1880	19.63	20.00	1.089	-0.09	0.859	0.935
	LTE Band 2	20M	QPSK	50	0	Front	5	18700	1860	19.40	20.00	1.148	-0.03	0.910	1.045
	LTE Band 2	20M	QPSK	50	0	Front	5	19100	1900	19.60	20.00	1.096	-0.02	0.886	0.971
	LTE Band 2	20M	QPSK	100	0	Front	5	18900	1880	19.56	20.00	1.107	-0.13	0.789	0.873
	LTE Band 2	20M	QPSK	1	49	Back	5	18900	1880	20.72	21.00	1.067	-0.06	1.000	1.067
	LTE Band 2	20M	QPSK	1	49	Back	5	18700	1860	20.61	21.00	1.094	-0.01	0.926	1.013
	LTE Band 2	20M	QPSK	1	49	Back	5	19100	1900	20.68	21.00	1.076	-0.02	1.070	1.152
	LTE Band 2	20M	QPSK	50	0	Back	5	18900	1880	19.63	20.00	1.089	-0.06	0.736	0.801
	LTE Band 2	20M	QPSK	50	0	Back	5	18700	1860	19.40	20.00	1.148	0.17	0.757	0.869
	LTE Band 2	20M	QPSK	50	0	Back	5	19100	1900	19.60	20.00	1.096	-0.15	0.765	0.839
	LTE Band 2	20M	QPSK	100	0	Back	5	18900	1880	19.56	20.00	1.107	-0.08	0.736	0.814
	LTE Band 2	20M	QPSK	1	49	Right Side	5	18900	1880	20.72	21.00	1.067	-0.05	0.414	0.442
	LTE Band 2	20M	QPSK	50	0	Right Side	5	18900	1880	19.63	20.00	1.089	-0.11	0.316	0.344
	LTE Band 2	20M	QPSK	1	49	Top Side	5	18900	1880	20.72	21.00	1.067	-0.08	0.275	0.293
	LTE Band 2	20M	QPSK	50	0	Top Side	5	18900	1880	19.63	20.00	1.089	-0.05	0.209	0.228
	LTE Band 2	20M	QPSK	1	49	Bottom Side	5	18900	1880	20.72	21.00	1.067	-0.19	0.745	0.795
	LTE Band 2	20M	QPSK	50	0	Bottom Side	5	18900	1880	19.63	20.00	1.089	-0.1	0.574	0.625
	LTE Band 7	20M	QPSK	1	49	Front	5	21350	2560	21.80	22.00	1.047	-0.05	0.735	0.770
	LTE Band 7	20M	QPSK	50	50	Front	5	21350	2560	20.56	21.00	1.107	-0.09	0.575	0.636
	LTE Band 7	20M	QPSK	1	49	Back	5	21350	2560	21.80	22.00	1.047	-0.03	1.010	1.058
	LTE Band 7	20M	QPSK	1	49	Back	5	20850	2510	21.41	22.00	1.146	-0.01	0.838	0.960
	LTE Band 7	20M	QPSK	1	49	Back	5	21100	2535	21.49	22.00	1.125	-0.08	0.924	1.039
	LTE Band 7	20M	QPSK	50	50	Back	5	21350	2560	20.56	21.00	1.107	-0.06	0.812	0.899
	LTE Band 7	20M	QPSK	50	50	Back	5	20850	2510	20.16	21.00	1.213	-0.01	0.644	0.781
	LTE Band 7	20M	QPSK	50	50	Back	5	21100	2535	20.40	21.00	1.148	-0.16	0.710	0.815
	LTE Band 7	20M	QPSK	100	0	Back	5	21350	2560	20.48	21.00	1.127	-0.11	0.794	0.895
	LTE Band 7	20M	QPSK	1	49	Right Side	5	21350	2560	21.80	22.00	1.047	-0.09	0.956	1.001
	LTE Band 7	20M	QPSK	1	49	Right Side	5	20850	2510	21.41	22.00	1.146	-0.05	0.698	0.800
	LTE Band 7	20M	QPSK	1	49	Right Side	5	21100	2535	21.49	22.00	1.125	-0.19	0.845	0.950
	LTE Band 7	20M	QPSK	50	50	Right Side	5	21350	2560	20.56	21.00	1.107	-0.04	0.700	0.775
	LTE Band 7	20M	QPSK	100	0	Right Side	5	21350	2560	20.48	21.00	1.127	-0.16	0.705	0.795
	LTE Band 7	20M	QPSK	1	49	Top Side	5	21350	2560	21.80	22.00	1.047	-0.07	0.193	0.202
	LTE Band 7	20M	QPSK	50	50	Top Side	5	21350	2560	20.56	21.00	1.107	-0.05	0.148	0.164
08	LTE Band 7	20M	QPSK	1	49	Bottom Side	5	21350	2560	21.80	22.00	1.047	-0.02	1.140	**1.194**
	LTE Band 7	20M	QPSK	1	49	Bottom Side	5	20850	2510	21.41	22.00	1.146	-0.11	0.924	1.058
	LTE Band 7	20M	QPSK	1	49	Bottom Side	5	21100	2535	21.49	22.00	1.125	-0.02	1.010	1.136
	LTE Band 7	20M	QPSK	50	50	Bottom Side	5	21350	2560	20.56	21.00	1.107	-0.03	0.997	1.103
	LTE Band 7	20M	QPSK	50	50	Bottom Side	5	20850	2510	20.16	21.00	1.213	-0.07	0.752	0.912
	LTE Band 7	20M	QPSK	50	50	Bottom Side	5	21100	2535	20.40	21.00	1.148	0.02	0.858	0.985
	LTE Band 7	20M	QPSK	100	0	Bottom Side	5	21350	2560	20.48	21.00	1.127	-0.05	0.879	0.991

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front	5	6	2437	15.50	16.00	1.122	97.43	1.026		0.0917		
	WLAN2.4GHz	802.11b 1Mbps	Back	5	6	2437	15.50	16.00	1.122	97.43	1.026	-0.02	0.201	0.108	0.124
	WLAN2.4GHz	802.11b 1Mbps	Left Side	5	6	2437	15.50	16.00	1.122	97.43	1.026		0.0836		
	WLAN2.4GHz	802.11b 1Mbps	Top Side	5	6	2437	15.50	16.00	1.122	97.43	1.026		0.199		
	WLAN2.4GHz	802.11b 1Mbps	Back	5	1	2412	15.39	16.00	1.151	97.43	1.026	-0.02		0.184	0.217
09	WLAN2.4GHz	802.11b 1Mbps	Back	5	11	2462	15.20	16.00	1.202	97.43	1.026	-0.03		0.240	**0.296**
	WLAN 5.3GHz	802.11a 6Mbps	Front	5	60	5300	12.35	13.00	1.161	86.88	1.151	0.01	0.284	0.128	0.171
	WLAN 5.3GHz	802.11a 6Mbps	Back	5	60	5300	12.35	13.00	1.161	86.88	1.151		0.302		
	WLAN 5.3GHz	802.11a 6Mbps	Left Side	5	60	5300	12.35	13.00	1.161	86.88	1.151	0.08	0.563	0.275	0.368
	WLAN 5.3GHz	802.11a 6Mbps	Top Side	5	60	5300	12.35	13.00	1.161	86.88	1.151	0.06	0.663	0.300	0.401
	WLAN 5.3GHz	802.11a 6Mbps	Top Side	5	52	5260	12.26	13.00	1.186	86.88	1.151	0.07		0.256	0.349
10	WLAN 5.3GHz	802.11a 6Mbps	Top Side	5	64	5320	12.34	13.00	1.164	86.88	1.151	0.02		0.311	**0.417**
	WLAN 5.5GHz	802.11a 6Mbps	Front	5	116	5580	12.94	13.50	1.138	86.88	1.151	0.05	0.250	0.110	0.144
	WLAN 5.5GHz	802.11a 6Mbps	Back	5	116	5580	12.94	13.50	1.138	86.88	1.151	0.09	1.187	0.486	0.636
	WLAN 5.5GHz	802.11a 6Mbps	Left Side	5	116	5580	12.94	13.50	1.138	86.88	1.151		0.559		
	WLAN 5.5GHz	802.11a 6Mbps	Top Side	5	116	5580	12.94	13.50	1.138	86.88	1.151	0.09	0.839	0.364	0.477
	WLAN 5.5GHz	802.11a 6Mbps	Back	5	100	5500	12.82	13.50	1.169	86.88	1.151	-0.02		0.461	0.621
11	WLAN 5.5GHz	802.11a 6Mbps	Back	5	144	5720	12.64	13.50	1.219	86.88	1.151	-0.14		0.521	**0.731**
	WLAN 5.8GHz	802.11a 6Mbps	Front	5	149	5745	12.66	13.00	1.081	86.88	1.151	0.03	0.218	0.0744	0.093
	WLAN 5.8GHz	802.11a 6Mbps	Back	5	149	5745	12.66	13.00	1.081	86.88	1.151	0.03	1.015	0.440	0.548
	WLAN 5.8GHz	802.11a 6Mbps	Left Side	5	149	5745	12.66	13.00	1.081	86.88	1.151		0.381		
	WLAN 5.8GHz	802.11a 6Mbps	Top Side	5	149	5745	12.66	13.00	1.081	86.88	1.151	0.06	0.672	0.294	0.366
12	WLAN 5.8GHz	802.11a 6Mbps	Back	5	157	5785	12.60	13.00	1.096	86.88	1.151	0.04		0.500	**0.631**
	WLAN 5.8GHz	802.11a 6Mbps	Back	5	165	5825	12.51	13.00	1.119	86.88	1.151	-0.06		0.488	0.629

14.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA Band V	-	-	-	-	RMC 12.2Kbps	Back	5	4182	836.4	21.93	22.50	1.140	0.05	1.050	1	1.197
2nd	WCDMA Band V	-	-	-	-	RMC 12.2Kbps	Back	5	4182	836.4	21.93	22.50	1.140	0.07	1.010	1.040	1.152
1st	LTE Band 2	20M	QPSK		1	49	Front	5	19100	1900	20.68	21.00	1.076	-0.1	1.100	1	1.184
2nd	LTE Band 2	20M	QPSK		1	49	Front	5	19100	1900	20.68	21.00	1.076	-0.03	1.080	1.019	1.163
1st	LTE Band 4	20M	QPSK		1	49	Back	5	20175	1732.5	21.21	21.50	1.069	-0.06	1.110	1	1.187
2nd	LTE Band 4	20M	QPSK		1	49	Back	5	20175	1732.5	21.21	21.50	1.069	-0.06	1.110	1.000	1.187
1st	LTE Band 7	20M	QPSK		1	49	Bottom Side	5	21350	2560	21.80	22.00	1.047	-0.02	1.140	1	1.194
2nd	LTE Band 7	20M	QPSK		1	49	Bottom Side	5	21350	2560	21.80	22.00	1.047	-0.09	1.110	1.027	1.162
1st	LTE Band 12	10M	QPSK		1	49	Back	5	23095	707.5	23.41	24.00	1.146	-0.16	0.999	1	1.144
2nd	LTE Band 12	10M	QPSK		1	49	Back	5	23095	707.5	23.41	24.00	1.146	-0.03	0.960	1.041	1.100

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WCDMA + 2.4GHz WLAN	Yes
2.	LTE + 2.4GHz WLAN	Yes
3.	WCDMA + Bluetooth	Yes
4.	LTE + Bluetooth	Yes
5.	WCDMA + 5GHz WLAN	Yes
6.	LTE + 5GHz WLAN	Yes

General Note:

1. EUT will choose either WCDMA or LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. Bluetooth and WLAN share the same antenna so can't transmit simultaneously.
3. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
4. According to the EUT character, WLAN 5GHz and Bluetooth can't transmit simultaneously.
5. Chose the worst zoom scan SAR for each EUT type of WLAN correspondingly for co-located with WWAN analysis.
6. The reported SAR summation is calculated based on the same configuration and test position.
7. The worst case 5 GHz WLAN reported SAR for each configuration was used for SAR summation.
8. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   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.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 15.2.
9. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power (dBm)	Exposure Position	Body
	Test separation	5 mm
6.00	Estimated 1g SAR (W/kg)	0.168

15.1 Body Exposure Conditions

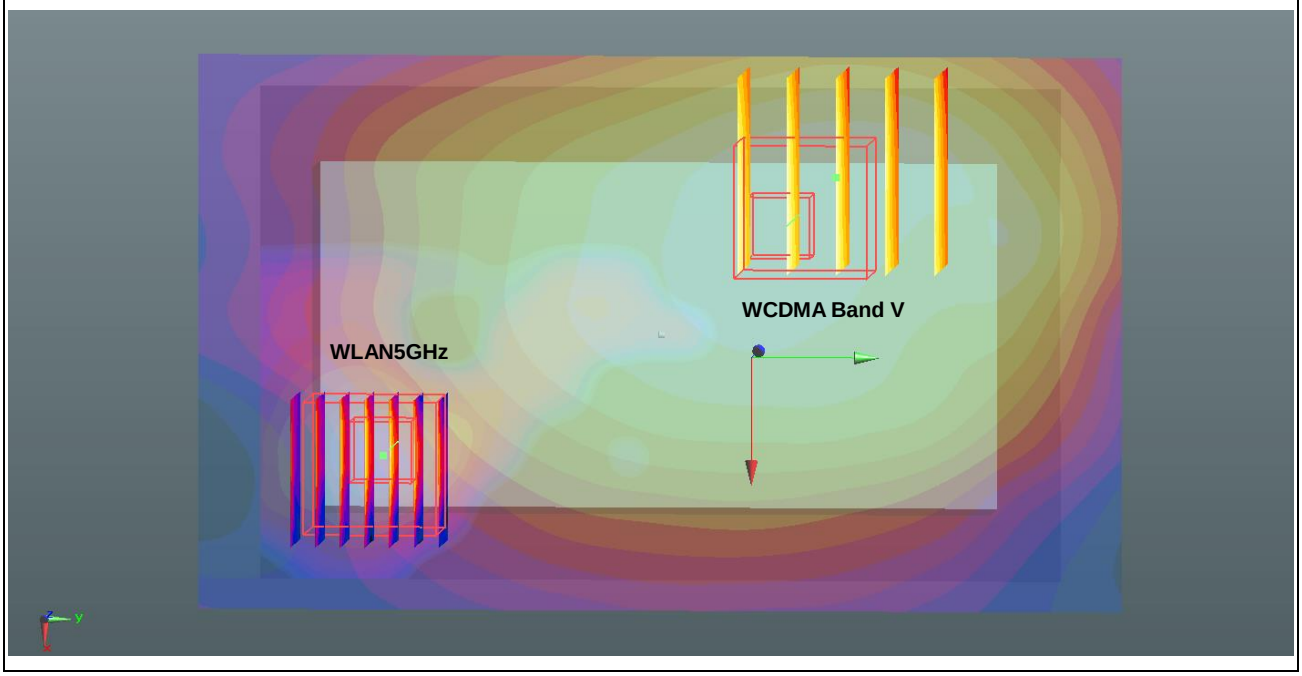
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	4 Bluetooth Estimated 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+3 SPLSR	1+3 Case No	1+4 Summed 1g SAR (W/kg)
WCDMA	Band V	Front	0.774	0.296	0.171	0.168	1.07	0.95			0.94
		Back	1.197	0.296	0.731	0.168	**1.49**	**1.93**	**0.04**	**#1**	**1.37**
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.258				0.26	0.26			0.26
		Top side	0.579	0.296	0.477	0.168	0.88	1.06			0.75
		Bottom side	0.568				0.57	0.57			0.57
	Band IV	Front	0.761	0.296	0.171	0.168	1.06	0.93			0.93
		Back	1.181	0.296	0.731	0.168	1.48	**1.91**	**0.03**	**#2**	1.35
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.177				0.18	0.18			0.18
		Top side	0.131	0.296	0.477	0.168	0.43	0.61			0.30
		Bottom side	1.060				1.06	1.06			1.06
	Band II	Front	1.138	0.296	0.171	0.168	1.43	1.31			1.31
		Back	1.026	0.296	0.731	0.168	1.32	**1.76**	**0.02**	**#3**	1.19
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.431				0.43	0.43			0.43
		Top side	0.255	0.296	0.477	0.168	0.55	0.73			0.42
		Bottom side	0.895				0.90	0.90			0.90
LTE	Band 12	Front	0.960	0.296	0.171	0.168	1.26	1.13			1.13
		Back	1.144	0.296	0.731	0.168	1.44	**1.88**	**0.03**	**#4**	1.31
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.328				0.33	0.33			0.33
		Top side	0.428	0.296	0.477	0.168	0.72	0.91			0.60
		Bottom side	0.851				0.85	0.85			0.85
	Band 5	Front	0.861	0.296	0.171	0.168	1.16	1.03			1.03
		Back	1.041	0.296	0.731	0.168	1.34	**1.77**	**0.03**	**#5**	1.21
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.275				0.28	0.28			0.28
		Top side	0.724	0.296	0.477	0.168	1.02	1.20			0.89
		Bottom side	0.636				0.64	0.64			0.64
	Band 4	Front	1.029	0.296	0.171	0.168	1.33	1.20			1.20
		Back	1.187	0.296	0.731	0.168	1.48	**1.92**	**0.03**	**#6**	1.36
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.304				0.30	0.30			0.30
		Top side	0.166	0.296	0.477	0.168	0.46	0.64			0.33
		Bottom side	0.905				0.91	0.91			0.91
	Band 2	Front	1.192	0.296	0.171	0.168	**1.49**	**1.36**			1.36
		Back	1.152	0.296	0.731	0.168	1.45	**1.88**	**0.03**	**#7**	1.32
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	0.442				0.44	0.44			0.44
		Top side	0.293	0.296	0.477	0.168	0.59	0.77			0.46
		Bottom side	0.795				0.80	0.80			0.80
	Band 7	Front	0.770	0.296	0.171	0.168	1.07	0.94			0.94
		Back	1.058	0.296	0.731	0.168	1.35	**1.79**	**0.02**	**#8**	1.23
		Left side		0.296	0.368	0.168	0.30	0.37			0.17
		Right side	1.001				1.00	1.00			1.00
		Top side	0.202	0.296	0.477	0.168	0.50	0.68			0.37
		Bottom side	1.194				1.19	1.19			1.19

15.2 SPLSR Evaluation and Analysis

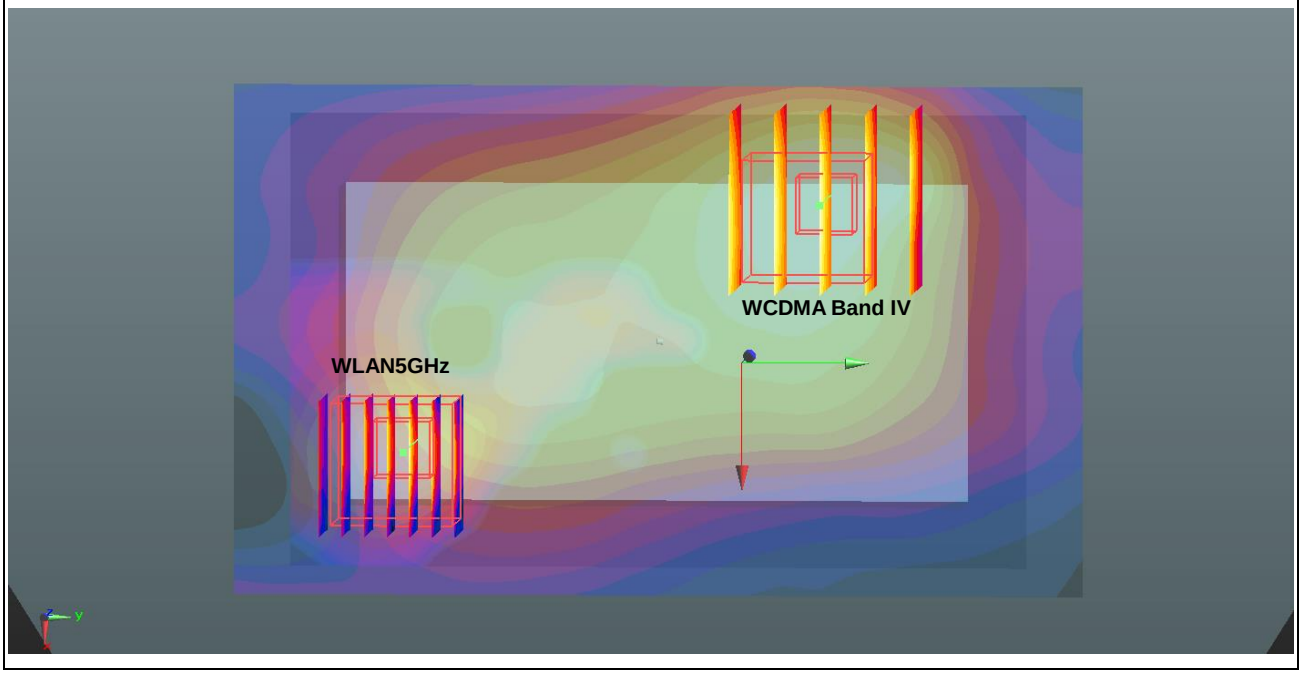
General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of [(x1−x2)2 + (y1−y2)2 + (z1−z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

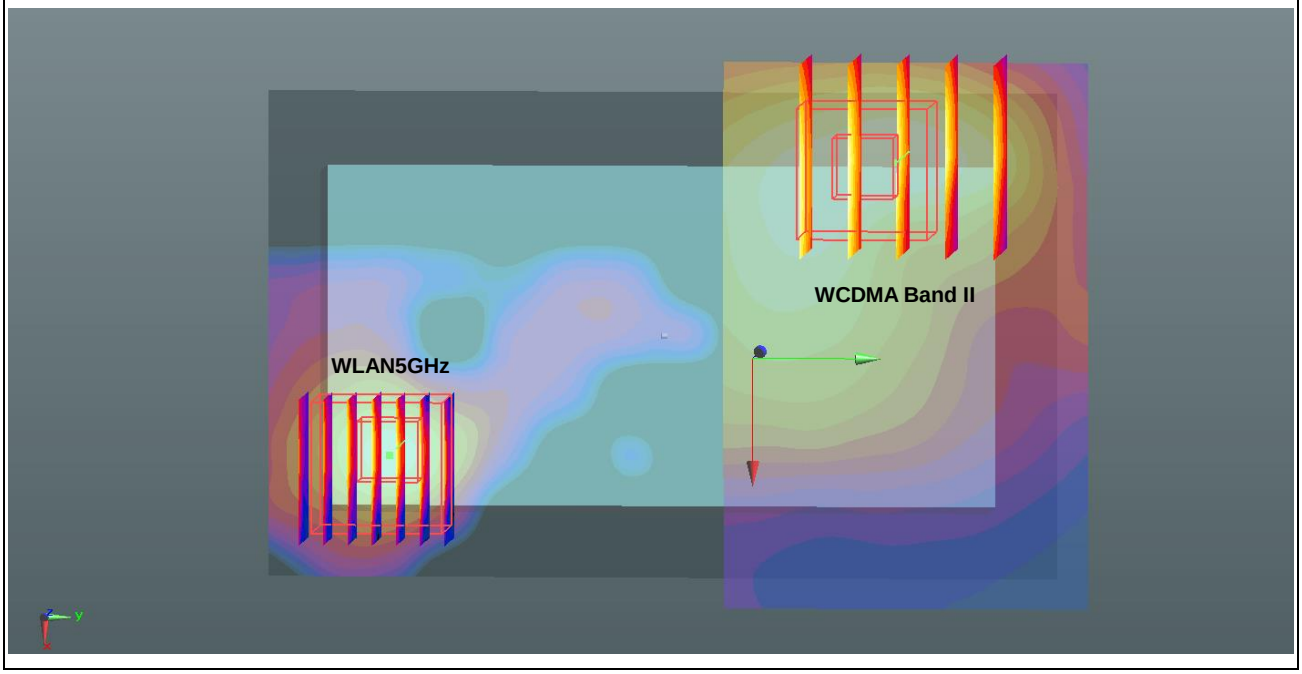
Case #1	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
	WCDMA Band V	Back	1.197	5	-0.0345	0.0205	-0.206	74.1	1.93	0.04	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



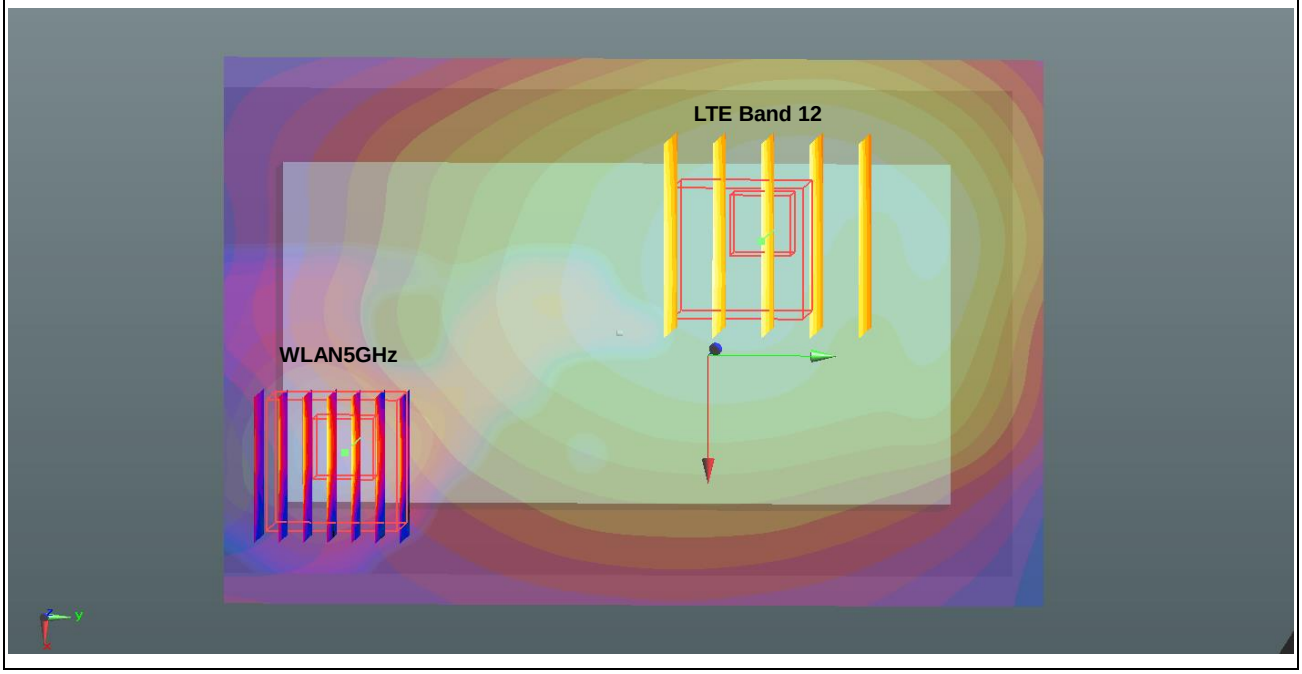
Case #2	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band IV	Back	1.181	5	-0.041	0.0285	-0.206	84.3	1.91	0.03	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



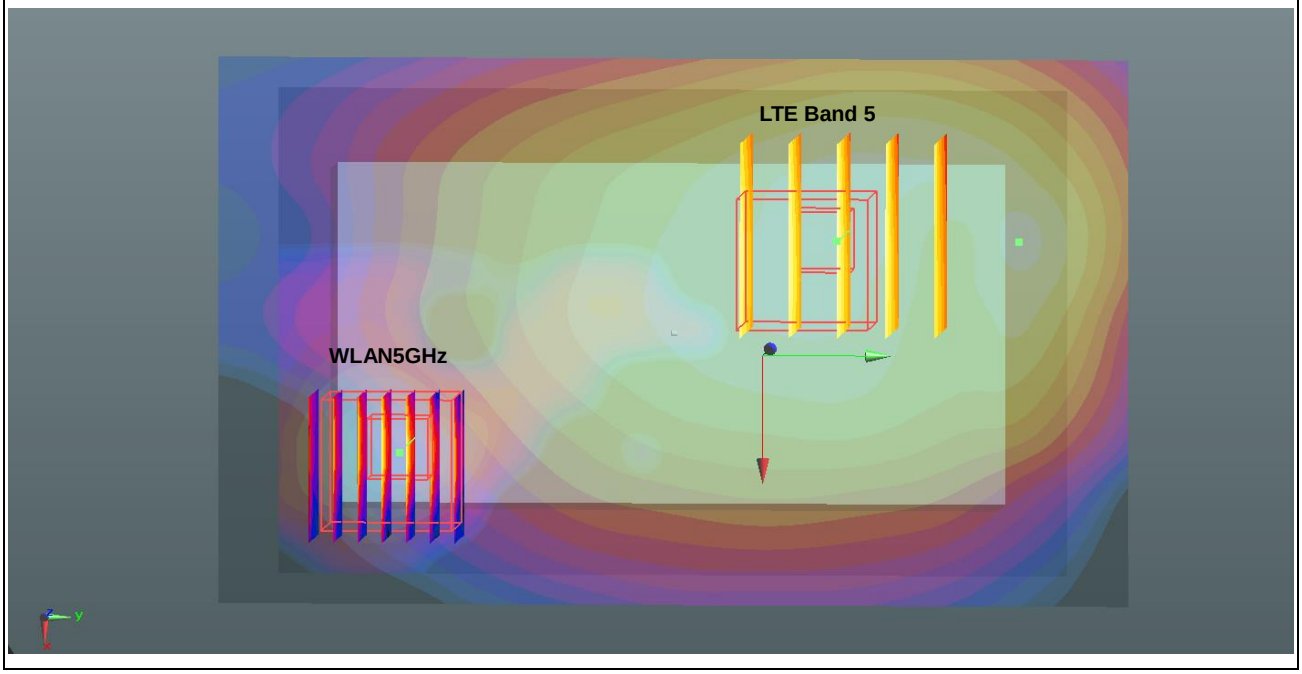
Case #3	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA Band II	Back	1.026	5	-0.0455	0.0385	-0.206	95.2	1.76	0.02	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



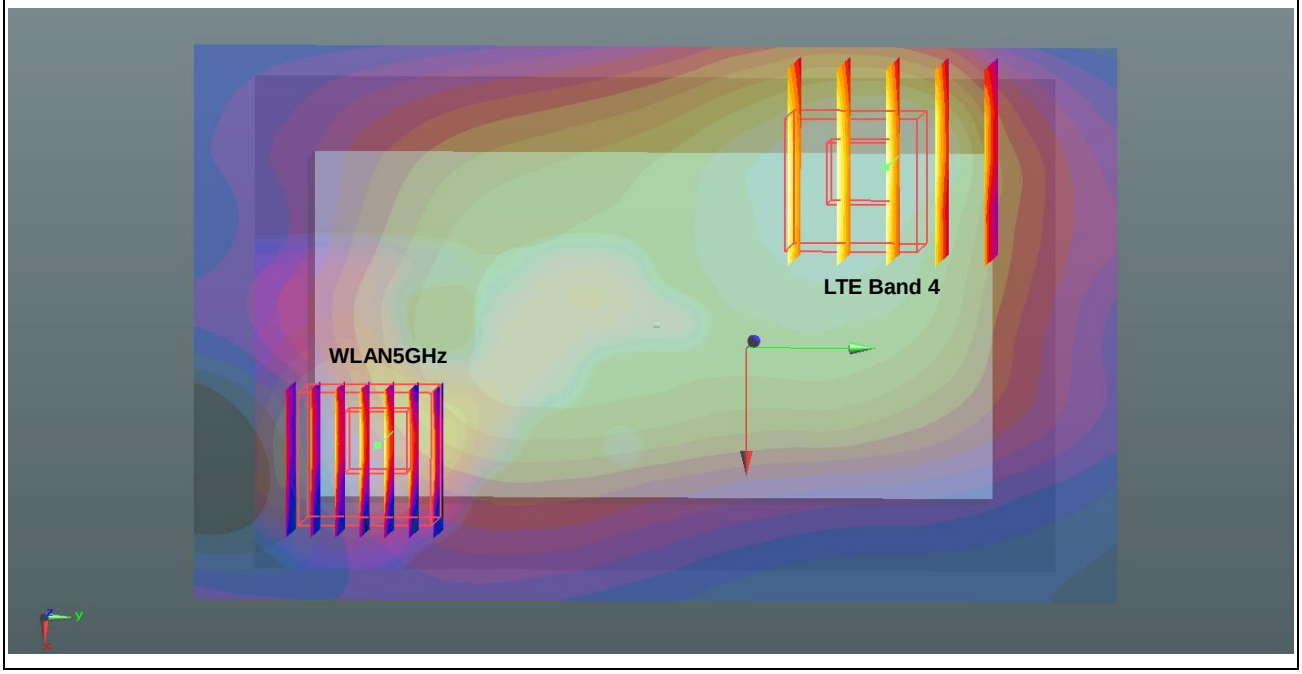
Case #4	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 12	Back	1.144	5	-0.032	0.0235	-0.206	75.6	1.88	0.03	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



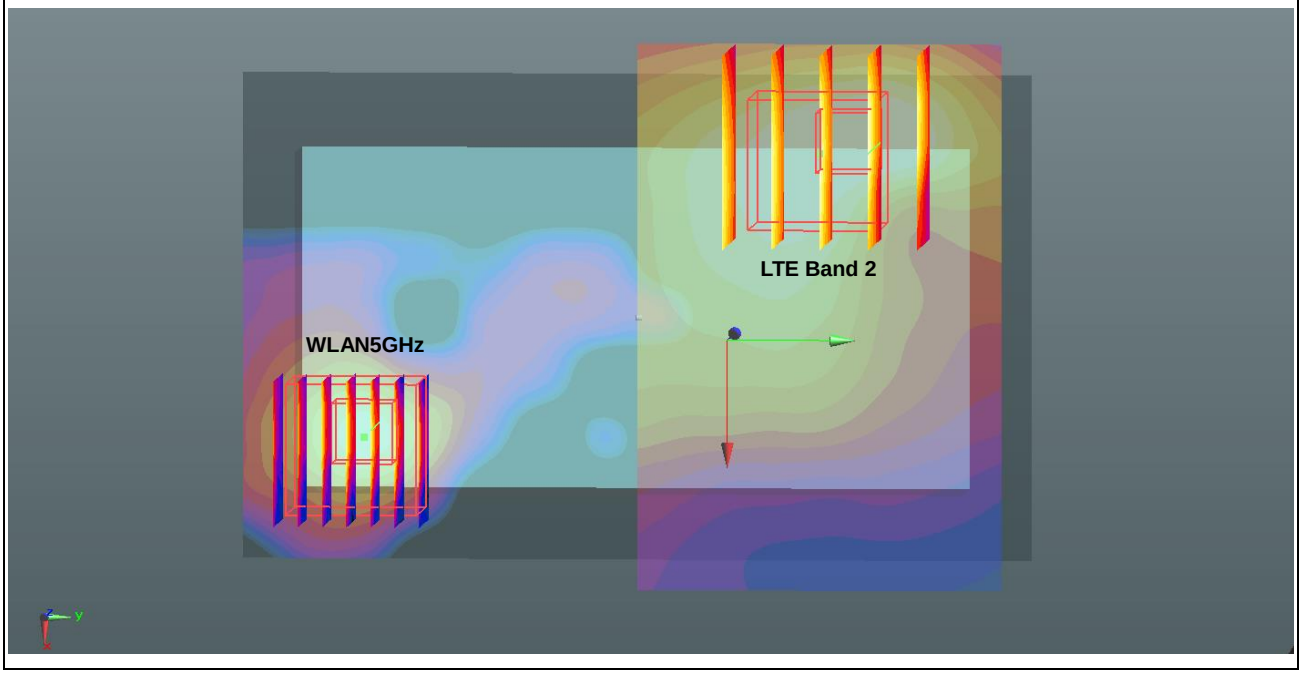
Case #5	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 5	Back	1.041	5	-0.032	0.027	-0.206	78.7	1.77	0.03	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



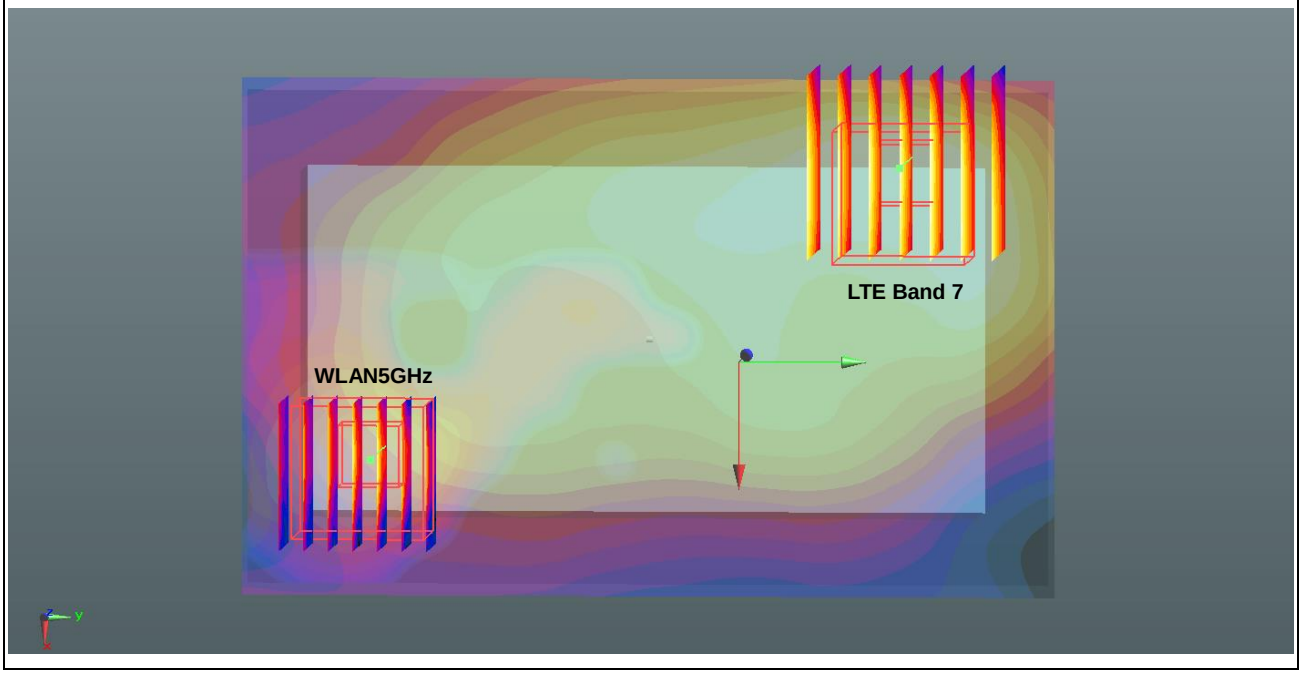
Case #6	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 4	Back	1.187	5	-0.0425	0.0375	-0.206	92.9	1.92	0.03	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



Case #7	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Back	1.152	5	-0.044	0.038	-0.206	94.0	1.88	0.03	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



Case #8	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 7	Back	1.058	5	-0.0446	0.0408	-0.206	96.8	1.79	0.02	Not required
	WLAN5GHz		0.731	5	0.002	-0.044	-0.206				



Test Engineer： Nick Hu

16. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 16.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 16.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.5%	12.5%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.1%	25.0%

Table 16.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

17. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015

[6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015

[7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[8] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[9] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[10] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.2

System Check_Body_750MHz

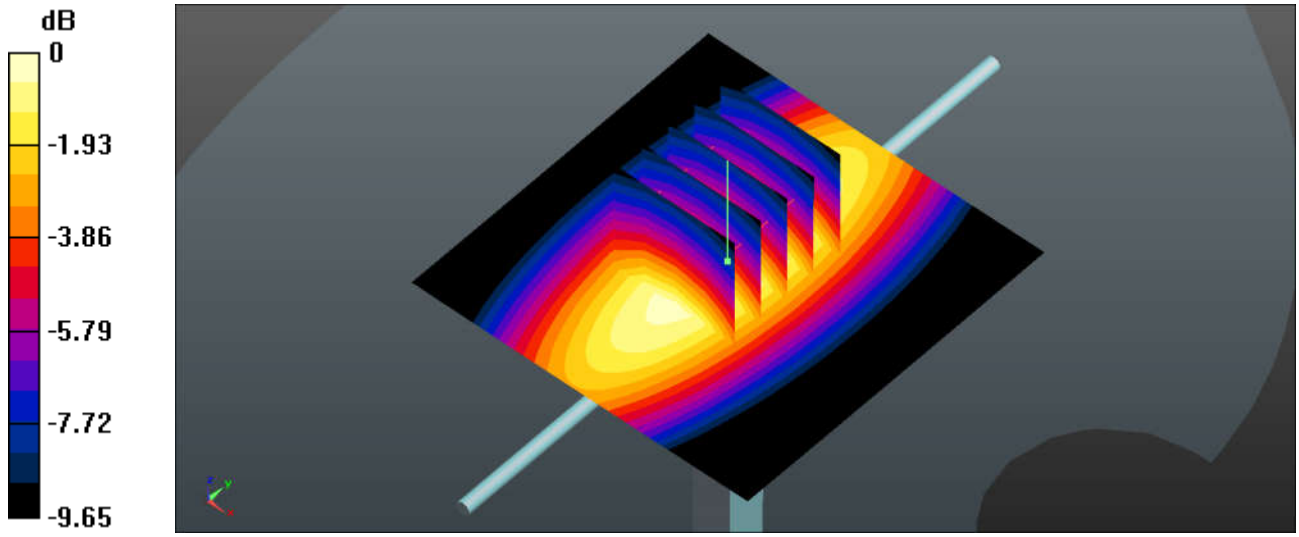
DUT: D750V3 - SN:1065

Communication System: UID 0, CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: MSL_750 Medium parameters used: f = 750 MHz; σ = 0.964 S/m; ε_r = 55.673; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.54, 10.54, 10.54); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.93 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.97 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.41 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.10

System Check_Body_835MHz

DUT: D835V2 - SN:4d091

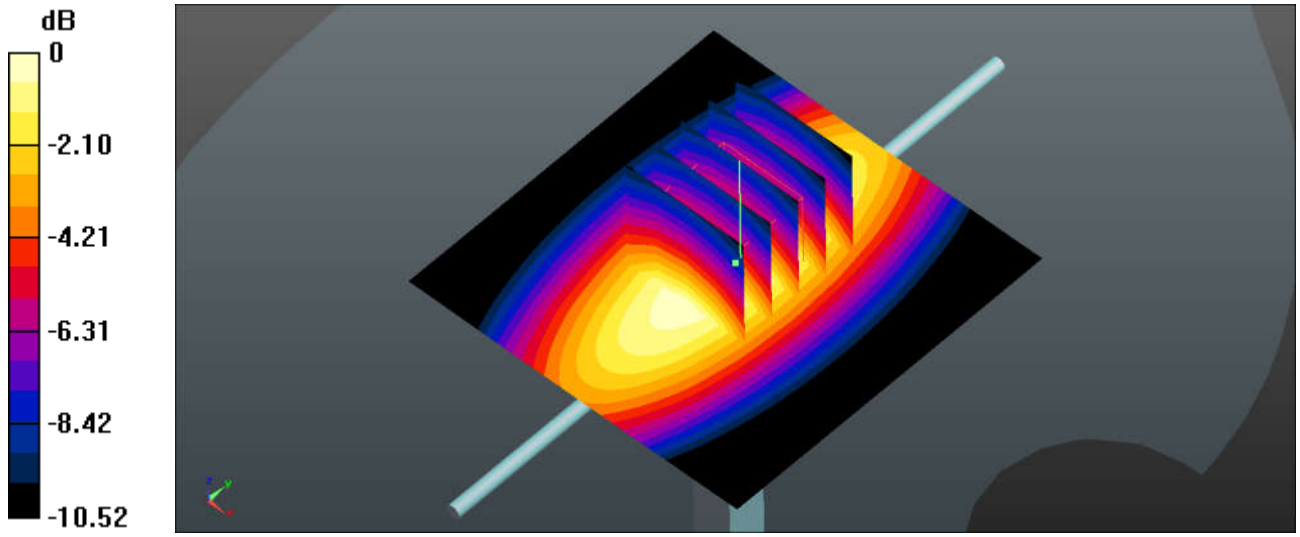
Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 835 MHz; σ = 0.97 S/m; ε_r = 54.49; ρ = 1000 kg/m^3

Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.20 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.87 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.73 W/kg
SAR(1 g) = 2.54 W/kg; SAR(10 g) = 1.68 W/kg
Maximum value of SAR (measured) = 3.19 W/kg



0 dB = 3.19 W/kg = 5.04 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.14

System Check_Body_1750MHz

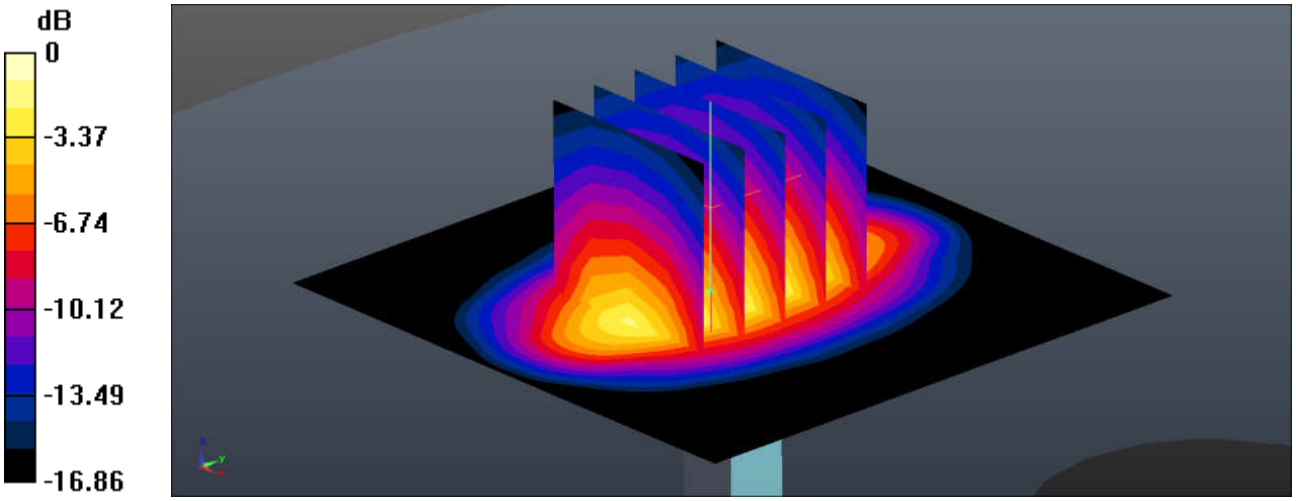
DUT: D1900V2 - SN:1069

Communication System: UID 0, CW (0); Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750 Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.208; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.32, 8.32, 8.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 12.9 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 82.40 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.2 W/kg
SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.81 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.17

System Check_Body_1900MHz

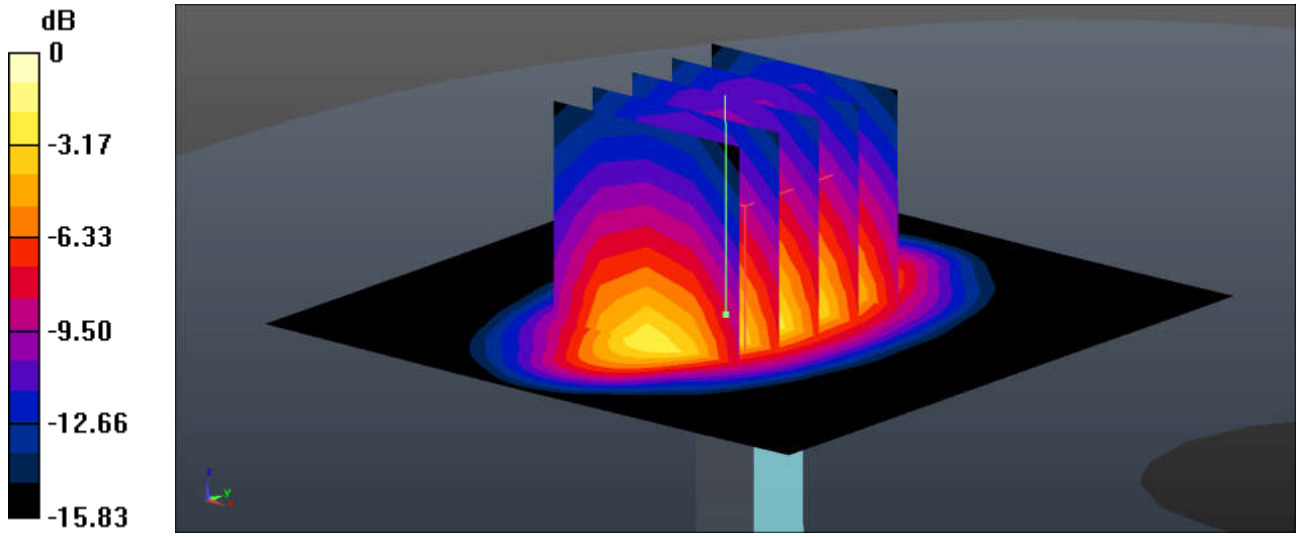
DUT: D1900V2 - SN:5d118

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.537 S/m; ε_r = 51.866; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.01, 8.01, 8.01); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.48 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 10.6 W/kg; SAR(10 g) = 5.78 W/kg
Maximum value of SAR (measured) = 14.5 W/kg



0 dB = 14.5 W/kg = 11.61 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.17

System Check_Body_2450MHz

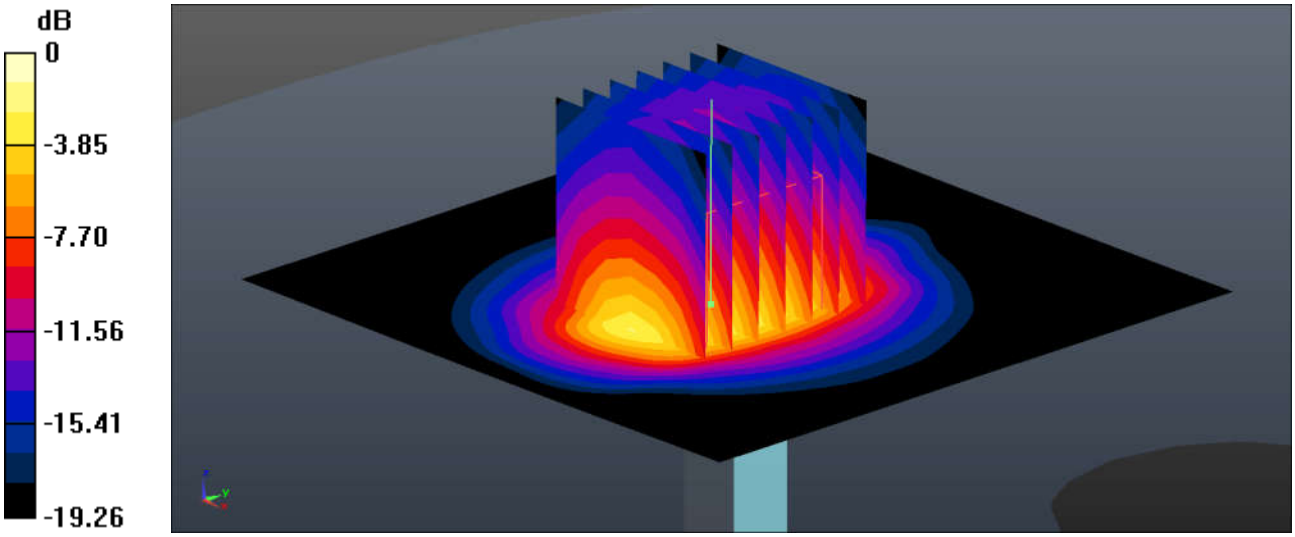
DUT: D2450V2 - SN:840

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450 Medium parameters used: f = 2450 MHz; σ = 2.028 S/m; ε_r = 52.259; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 19.0 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 81.89 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 24.1 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 6.12 W/kg
Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 18.7 W/kg = 12.72 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

System Check_Body_2600MHz

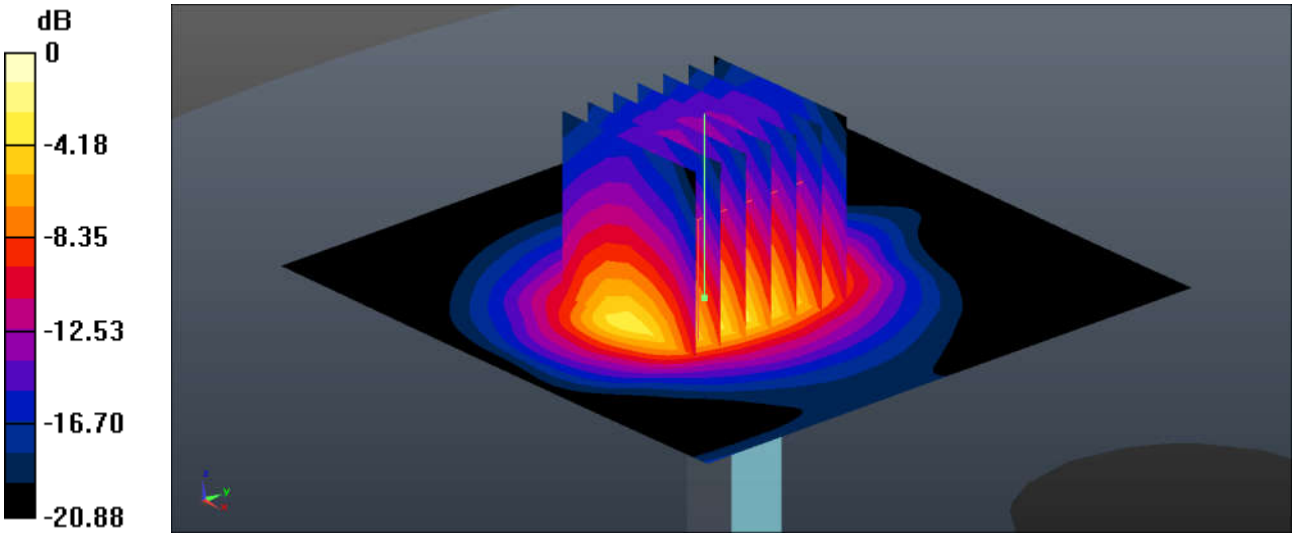
DUT: D2600V2 - SN:1061

Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL_2600 Medium parameters used: f = 2600 MHz; σ = 2.2 S/m; ε_r = 51.176; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.05, 7.05, 7.05); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 22.2 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 83.34 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.71 W/kg
Maximum value of SAR (measured) = 22.0 W/kg



0 dB = 22.0 W/kg = 13.42 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

System Check_Body_5250MHz

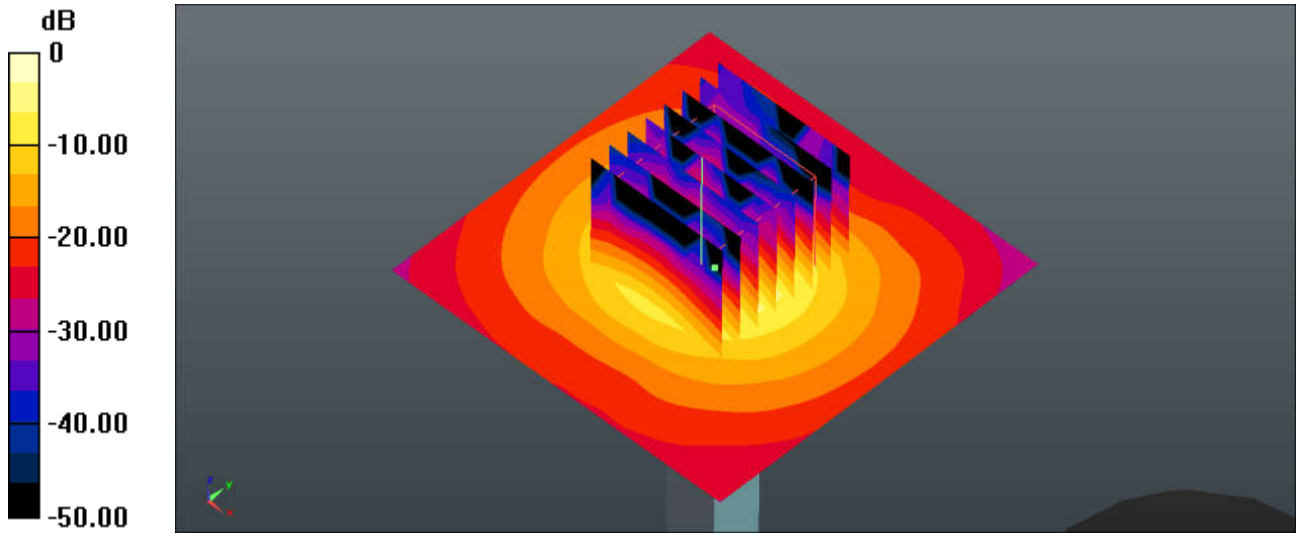
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5250 MHz; σ = 5.49 S/m; ε_r = 47.921; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.5, 4.5, 4.5); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.0 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 41.08 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.5 W/kg



0 dB = 17.5 W/kg = 12.43 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

System Check_Body_5600MHz

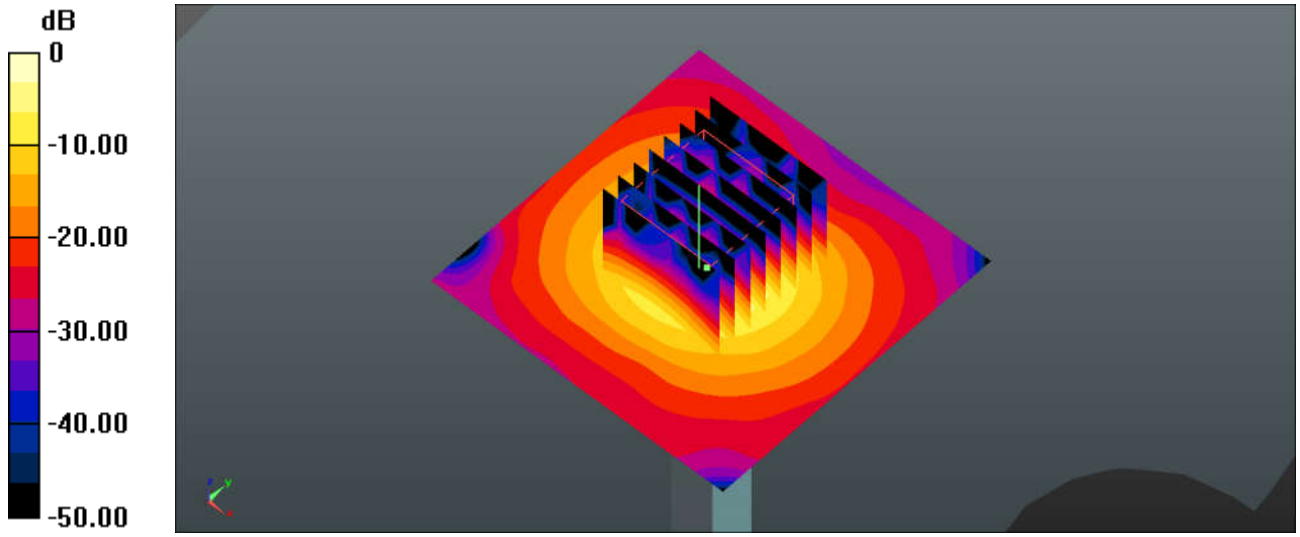
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5600 MHz; σ = 5.851 S/m; ε_r = 47.711; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(3.92, 3.92, 3.92); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.0 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 41.57 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 8.39 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 20.3 W/kg



0 dB = 20.3 W/kg = 13.07 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

System Check_Body_5750MHz

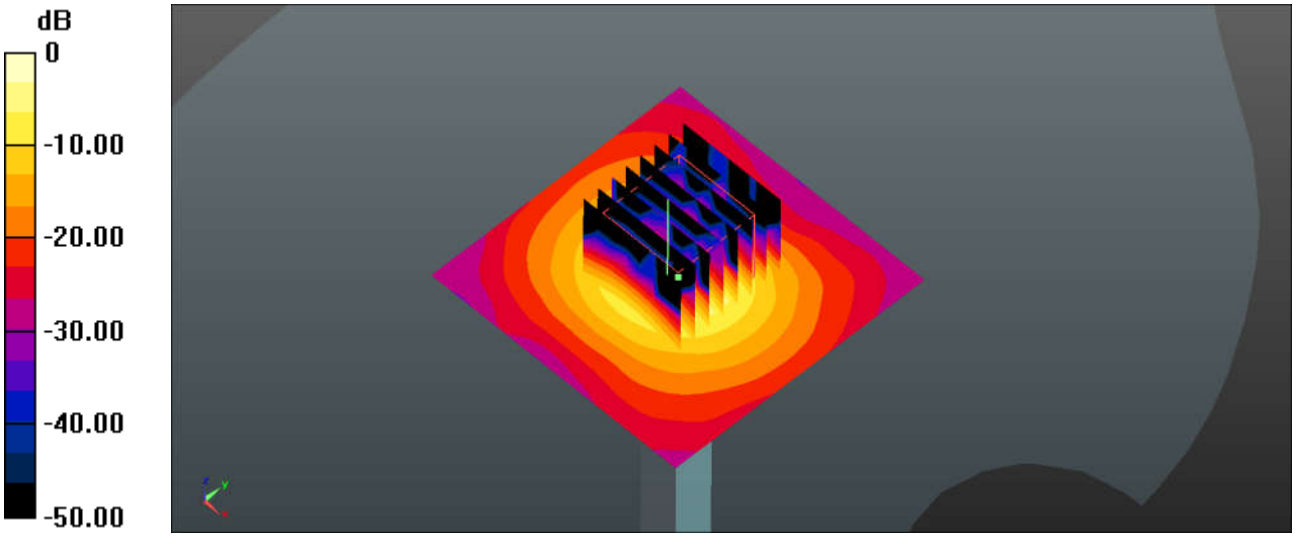
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5750 MHz; σ = 6.16 S/m; ε_r = 47.074; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.05, 4.05, 4.05); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.2 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 37.52 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 7 W/kg; SAR(10 g) = 1.95 W/kg
Maximum value of SAR (measured) = 16.7 W/kg



0 dB = 16.7 W/kg = 12.23 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.10

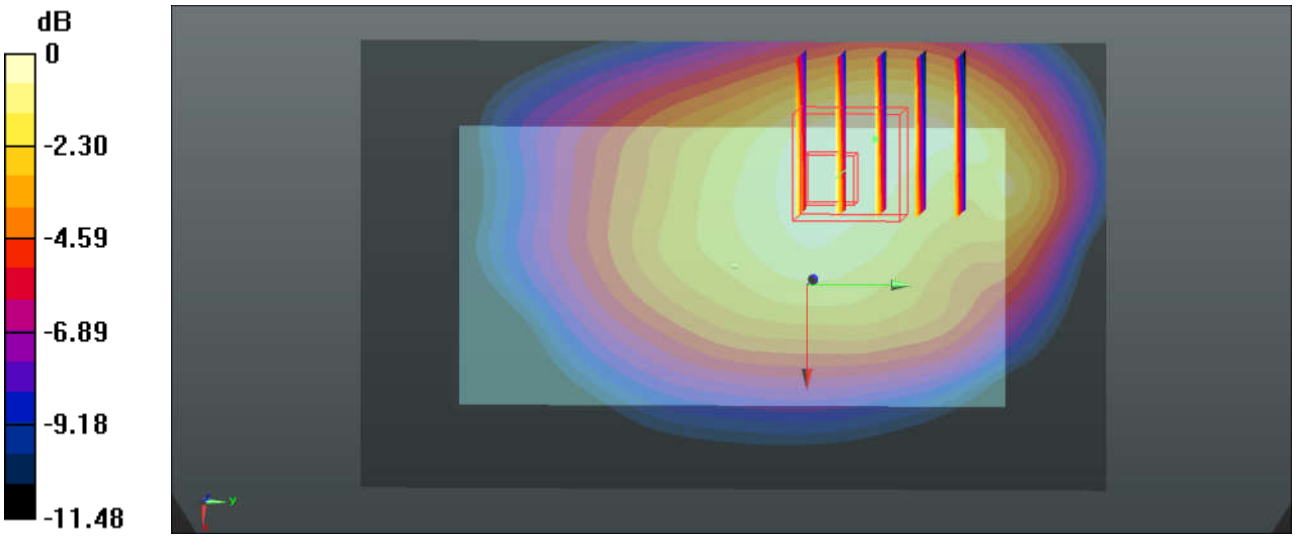
01_WCDMA Band V_RMC 12.2Kbps_Back_5mm_Ch4182

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 836.4 MHz; σ = 0.971 S/m; ε_r = 54.478; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4182/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.24 W/kg

Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.06 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 1.05 W/kg; SAR(10 g) = 0.721 W/kg
Maximum value of SAR (measured) = 1.24 W/kg



0 dB = 1.24 W/kg = 0.93 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.14

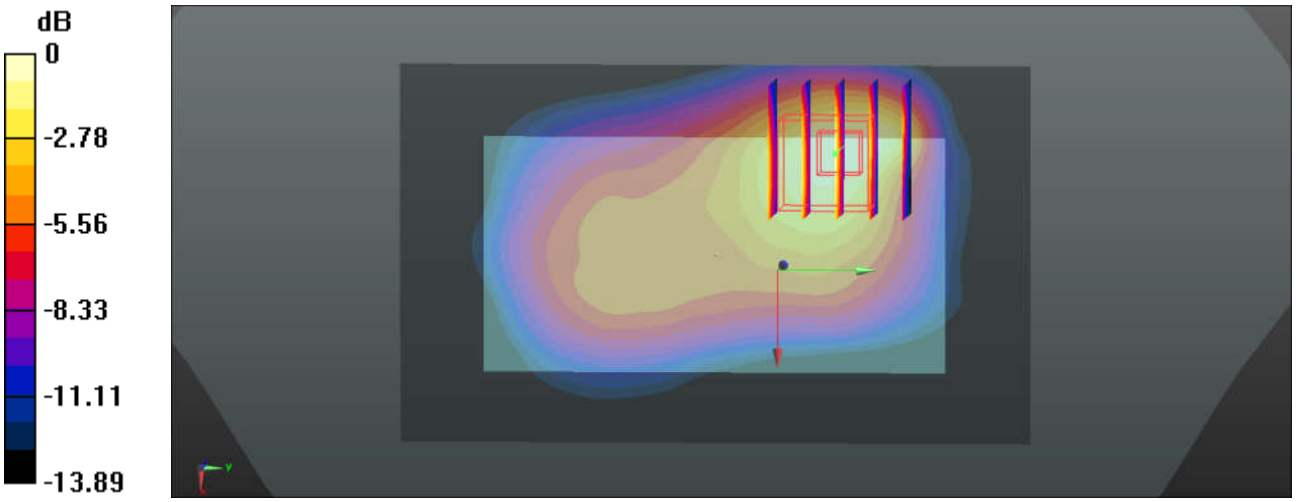
02_WCDMA Band IV_RMC 12.2Kbps_Back_5mm_Ch1513

Communication System: UID 0, UMTS (0); Frequency: 1752.6 MHz;Duty Cycle: 1:1
Medium: MSL_1750 Medium parameters used: f = 1752.6 MHz; σ = 1.463 S/m; ε_r = 53.197; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.32, 8.32, 8.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1513/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.44 W/kg

Ch1513/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.37 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.994 W/kg; SAR(10 g) = 0.590 W/kg
Maximum value of SAR (measured) = 1.38 W/kg



0 dB = 1.38 W/kg = 1.40 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.17

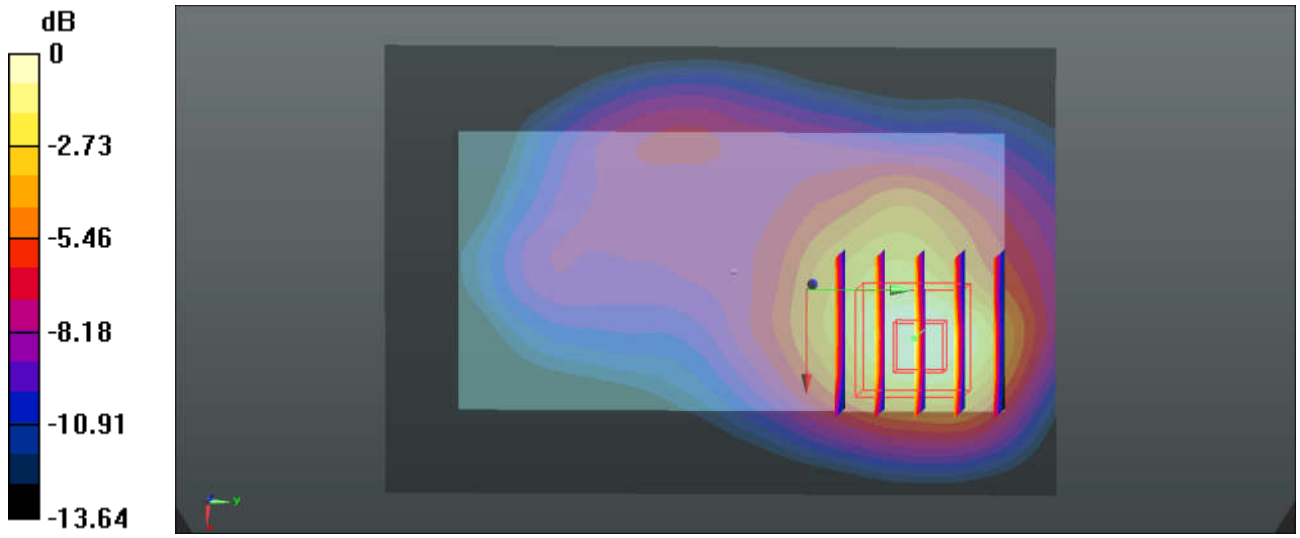
03_WCDMA Band II_RMC 12.2Kbps_Front_5mm_Ch9262

Communication System: UID 0, UMTS (0); Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: f = 1852.4 MHz; σ = 1.489 S/m; ε_r = 52.018; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.01, 8.01, 8.01); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9262/Area Scan (61x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.43 W/kg

Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.42 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.576 W/kg
Maximum value of SAR (measured) = 1.35 W/kg



0 dB = 1.35 W/kg = 1.30 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.2

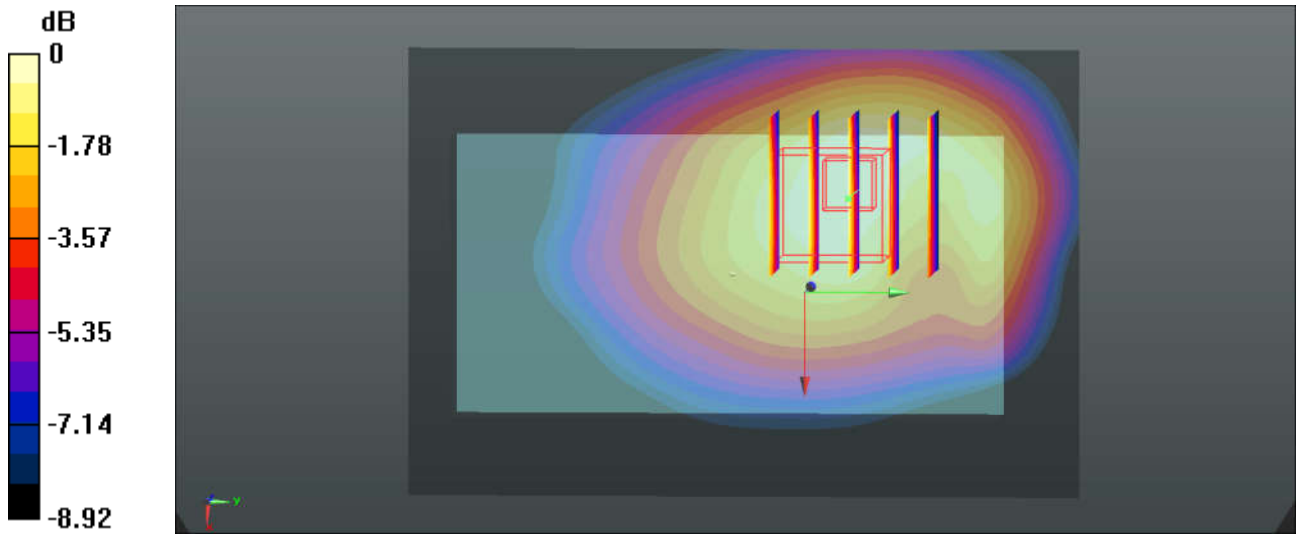
04_LTE Band 12_10M_QPSK_1RB_49Offset_Back_5mm_Ch23095

Communication System: UID 0, FDD_LTE (0); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: MSL_750 Medium parameters used: f = 707.5 MHz; σ = 0.92 S/m; ε_r = 55.977; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.54, 10.54, 10.54); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23095/Area Scan (61x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.20 W/kg

Ch23095/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.69 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 1.38 W/kg
SAR(1 g) = 0.999 W/kg; SAR(10 g) = 0.727 W/kg
Maximum value of SAR (measured) = 1.18 W/kg



0 dB = 1.18 W/kg = 0.72 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.10

05_LTE Band 5_10M_QPSK_1RB_25Offset_Back_5mm_Ch20525

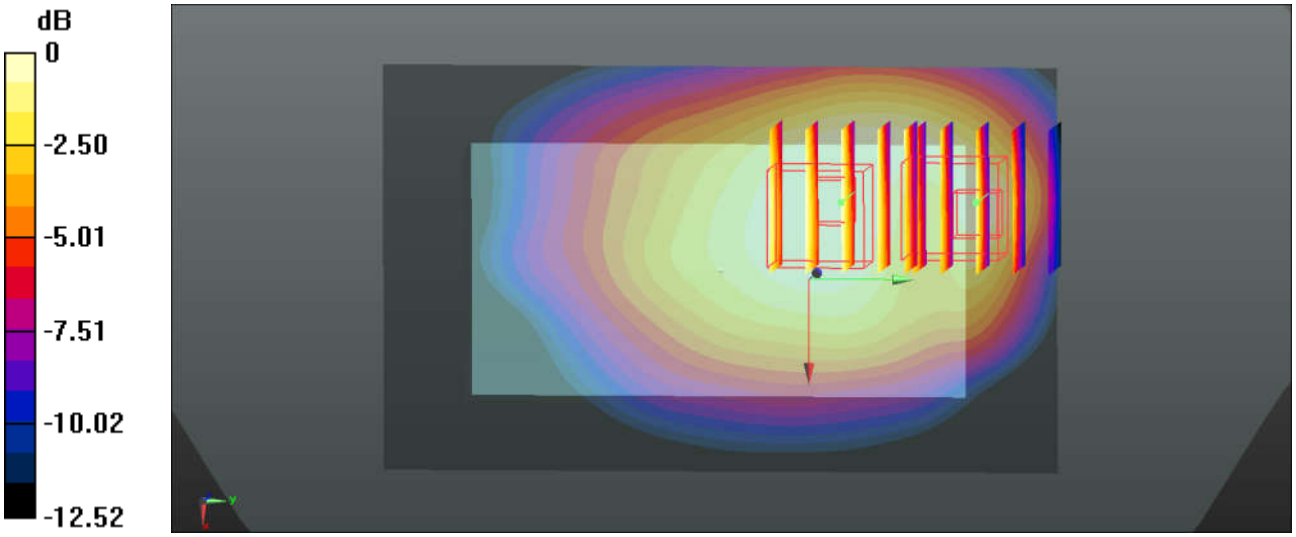
Communication System: UID 0, FDD_LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.971 S/m; ε_r = 54.477; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20525/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.11 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.92 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.915 W/kg; SAR(10 g) = 0.663 W/kg
Maximum value of SAR (measured) = 1.10 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.92 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.697 W/kg; SAR(10 g) = 0.453 W/kg
Maximum value of SAR (measured) = 0.947 W/kg



0 dB = 0.947 W/kg = -0.24 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.14

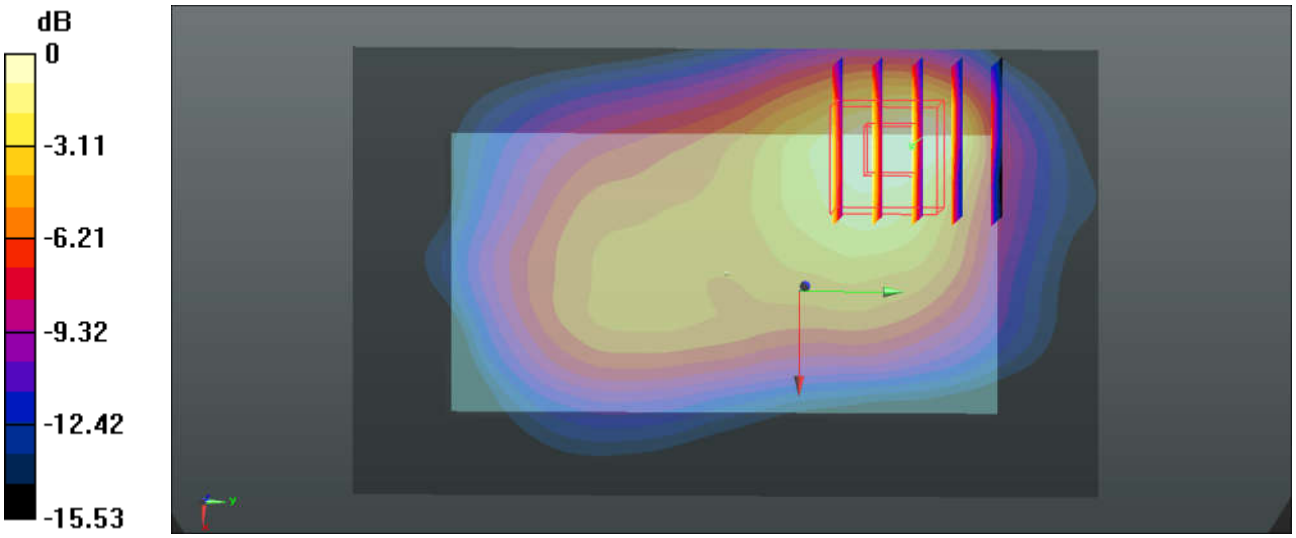
06_LTE Band 4_20M_QPSK_1RB_49Offset_Back_5mm_Ch20175

Communication System: UID 0, FDD_LTE (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: MSL_1750 Medium parameters used: f = 1732.5 MHz; σ = 1.44 S/m; ε_r = 53.268; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.32, 8.32, 8.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20175/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.65 W/kg

Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.41 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 1.11 W/kg; SAR(10 g) = 0.658 W/kg
Maximum value of SAR (measured) = 1.53 W/kg



0 dB = 1.53 W/kg = 1.85 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.17

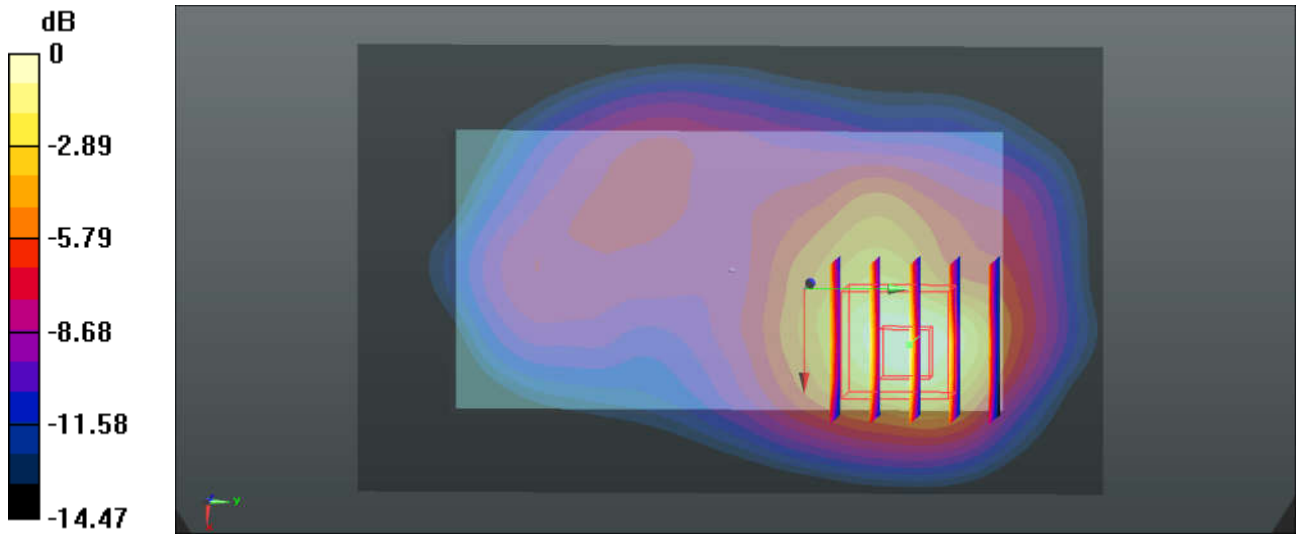
07_LTE Band 2_20M_QPSK_1RB_49Offset_Front_5mm_Ch18700

Communication System: UID 0, FDD_LTE (0); Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: f = 1860 MHz; σ = 1.497 S/m; ε_r = 51.999; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(8.01, 8.01, 8.01); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch18700/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.42 W/kg

Ch18700/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.70 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.623 W/kg
Maximum value of SAR (measured) = 1.49 W/kg



0 dB = 1.49 W/kg = 1.73 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

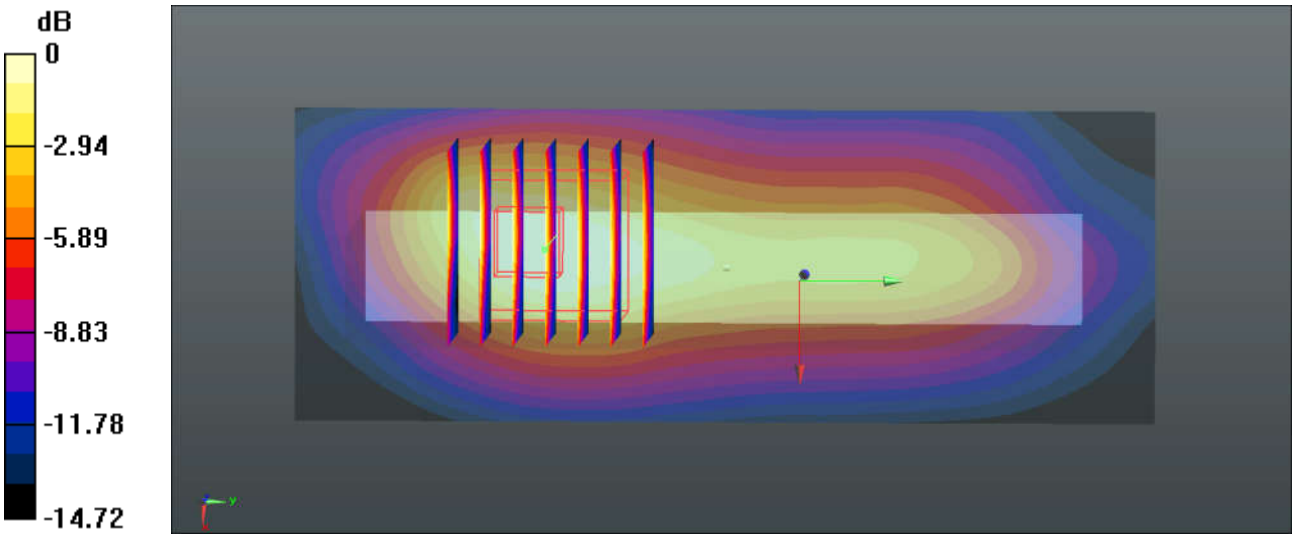
08_LTE Band 7_20M_QPSK_1RB_49Offset_Bottom Side_5mm_Ch21350

Communication System: UID 0, FDD_LTE (0); Frequency: 2560 MHz;Duty Cycle: 1:1
Medium: MSL_2600 Medium parameters used: f = 2560 MHz; σ = 2.143 S/m; ε_r = 51.319; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.05, 7.05, 7.05); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch21350/Area Scan (41x111x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.70 W/kg

Ch21350/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.93 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.616 W/kg
Maximum value of SAR (measured) = 1.57 W/kg



0 dB = 1.57 W/kg = 1.96 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.17

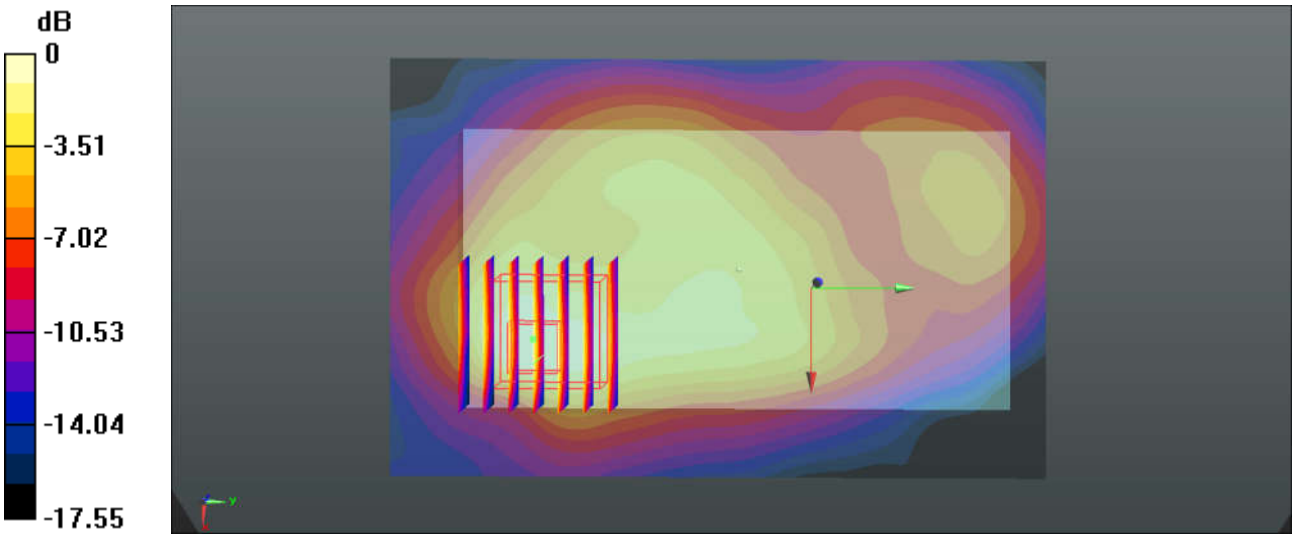
09_WLAN2.4GHz_802.11b 1Mbps_Back_5mm_Ch11

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1.026
Medium: MSL_2450 Medium parameters used: f = 2462 MHz; σ = 2.045 S/m; ε_r = 52.209; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch11/Area Scan (71x111x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.420 W/kg

Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.524 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.444 W/kg
SAR(1 g) = 0.240 W/kg; SAR(10 g) = 0.127 W/kg
Maximum value of SAR (measured) = 0.358 W/kg



0 dB = 0.358 W/kg = -4.46 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

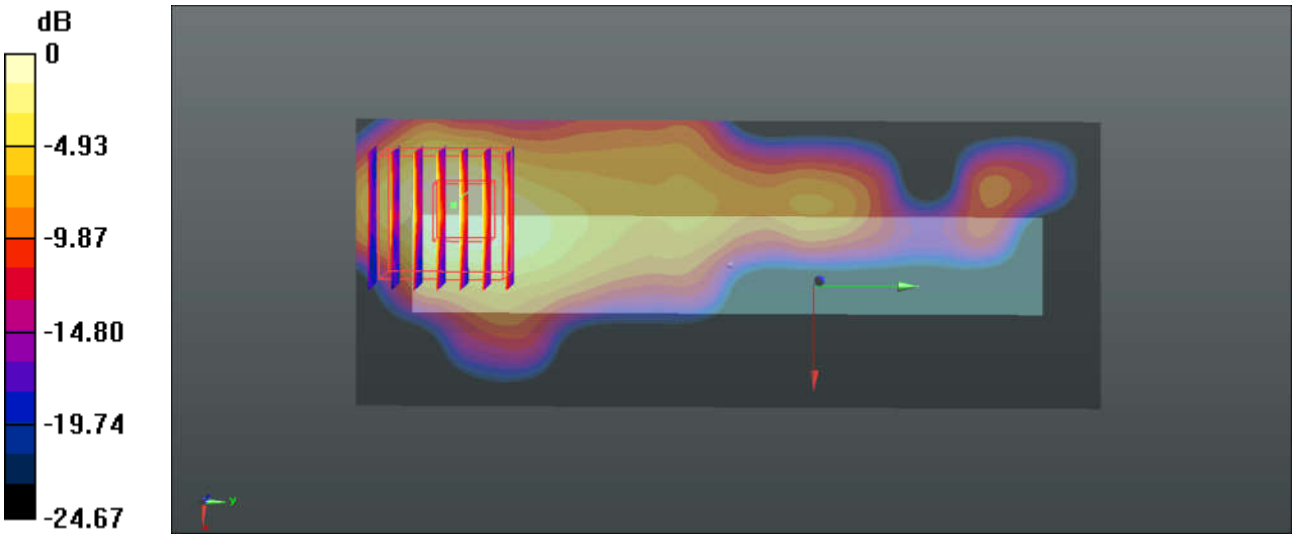
10_WLAN 5.3GHz_802.11a 6Mbps_Top Side_5mm_Ch64

Communication System: UID 0, WIFI (0); Frequency: 5320 MHz;Duty Cycle: 1:1.151
Medium: MSL_5000 Medium parameters used: f = 5320 MHz; σ = 5.582 S/m; ε_r = 47.783; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.5, 4.5, 4.5); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch64/Area Scan (51x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.663 W/kg

Ch64/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.976 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.311 W/kg; SAR(10 g) = 0.096 W/kg
Maximum value of SAR (measured) = 0.641 W/kg



0 dB = 0.641 W/kg = -1.93 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

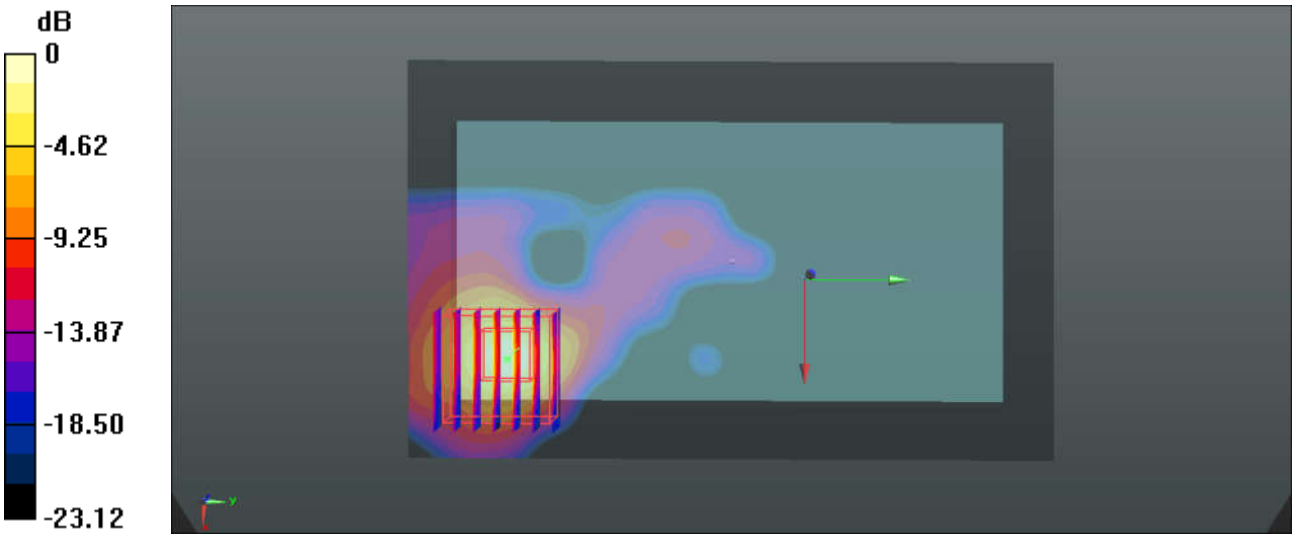
11_WLAN 5.5GHz_802.11a 6Mbps_Back_5mm_Ch144

Communication System: UID 0, WIFI (0); Frequency: 5720 MHz;Duty Cycle: 1:1.151
Medium: MSL_5000 Medium parameters used: f = 5720 MHz; σ = 6.001 S/m; ε_r = 47.423; ρ = $1000_{kg/m^3}$
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(3.92, 3.92, 3.92); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch144/Area Scan (81x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.24 W/kg

Ch144/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.851 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 0.521 W/kg; SAR(10 g) = 0.157 W/kg
Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.25 W/kg = 0.97 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.8.18

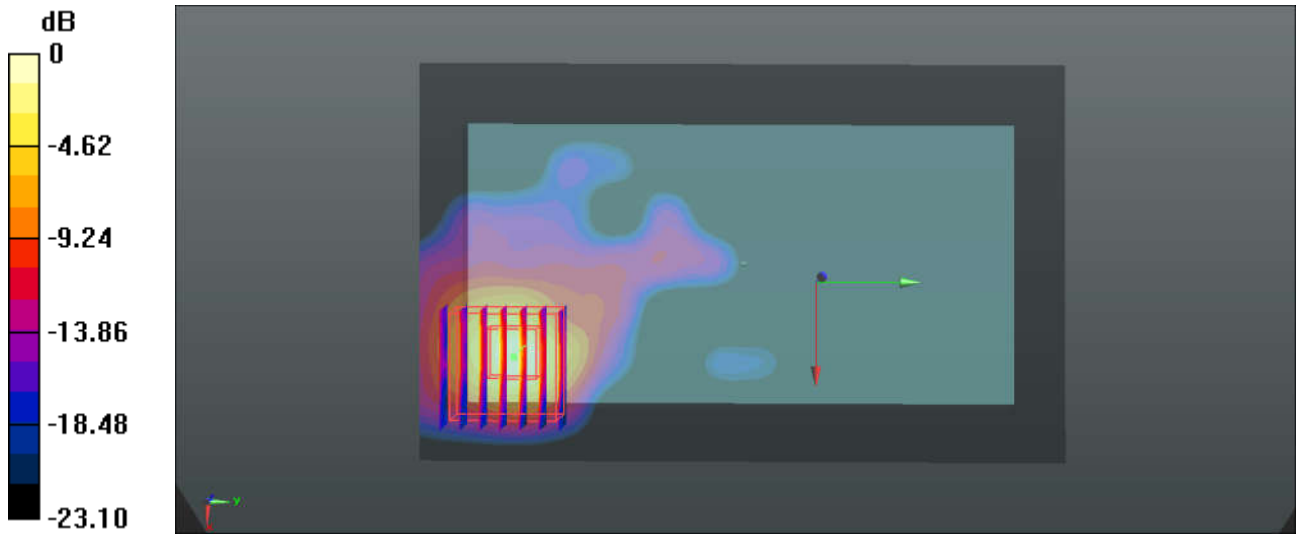
12_WLAN 5.8GHz_802.11a 6Mbps_Back_5mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.151
Medium: MSL_5000 Medium parameters used: f = 5785 MHz; σ = 6.211 S/m; ε_r = 47.031; ρ = 1000$_{kg/m^3}$
Ambient Temperature：23.3 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.05, 4.05, 4.05); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1279; Calibrated: 2017.5.2
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch157/Area Scan (81x131x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.19 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.404 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.59 W/kg
SAR(1 g) = 0.500 W/kg; SAR(10 g) = 0.148 W/kg
Maximum value of SAR (measured) = 1.16 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client **Sporton-CN** **Certificate No: Z16-97221**

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1065
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 21, 2016

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.J16X04771)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04771)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: November 26, 2016

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

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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, "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 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%.

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
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	41.8 ± 6 %	0.91 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	2.11 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**8.32 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.41 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**5.58 mW /g ± 20.4 % (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	54.5 ± 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	2.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**8.71 mW /g ± 20.8 % (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	**5.88 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7Ω- 3.08jΩ
Return Loss	- 29.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.9Ω- 2.07jΩ
Return Loss	- 32.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.021 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

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DASY5 Validation Report for Head TSL Date: 11.21.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1065

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

Medium parameters used: f = 750 MHz; σ = 0.906 S/m; ε_r = 41.82; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(10.01, 10.01, 10.01); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

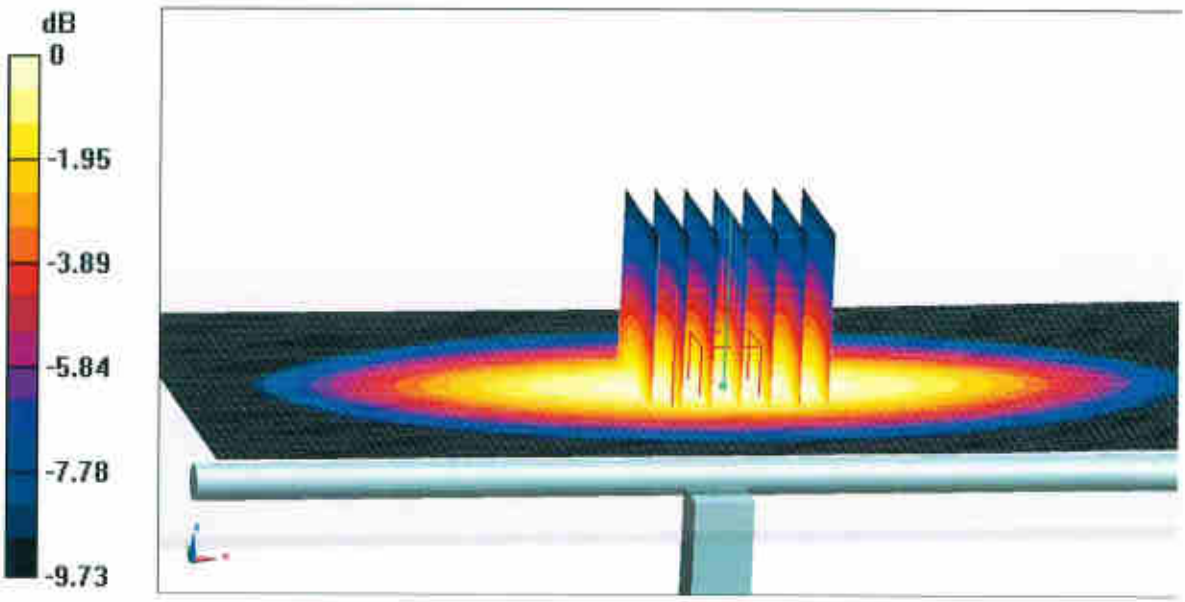
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.09 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.09 W/kg

SAR(1 g) = 2.11 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.65 W/kg



0 dB = 2.65 W/kg = 4.23 dBW/kg

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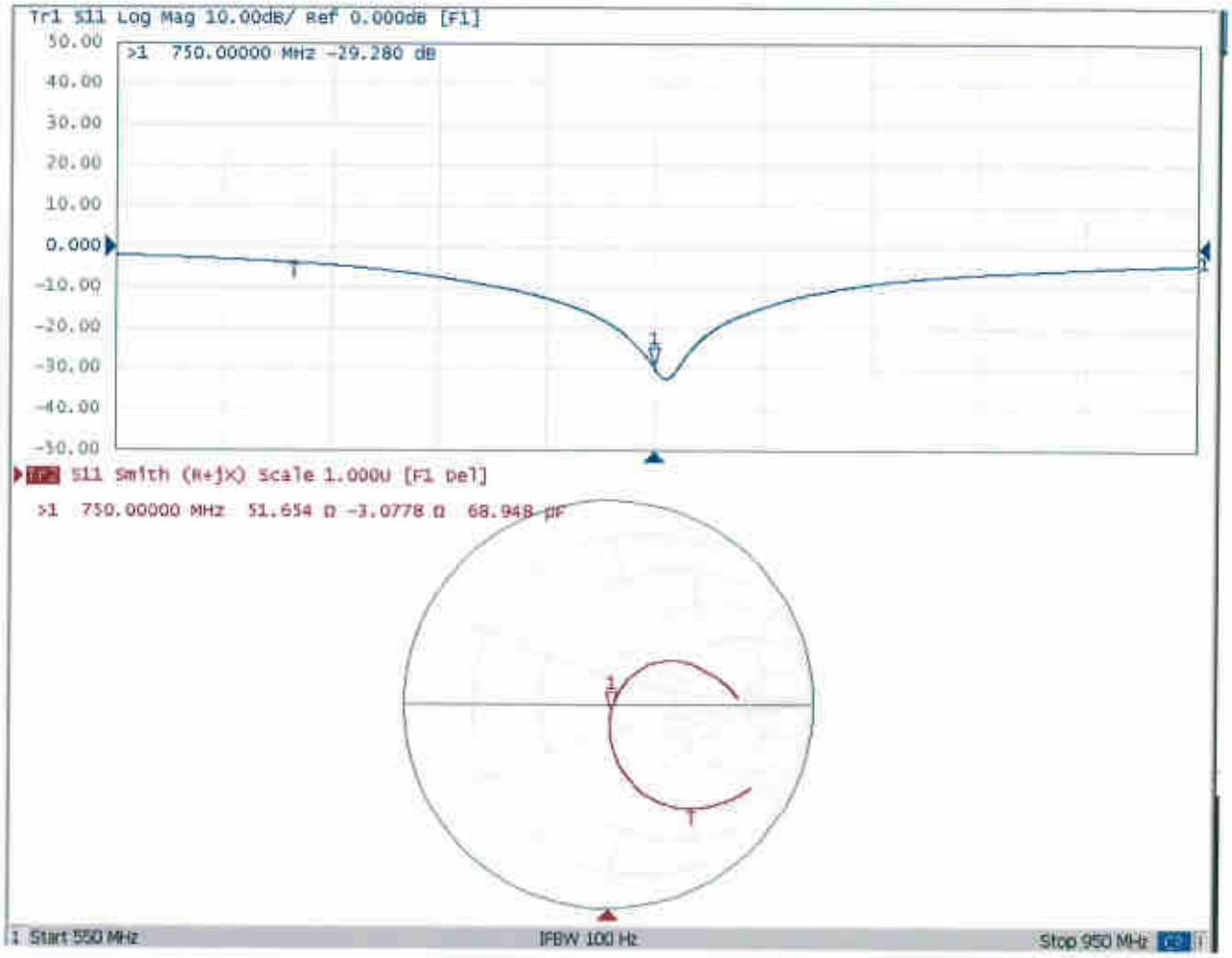
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 11.21.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1065

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

Medium parameters used: f = 750 MHz; σ = 0.945 S/m; ε_r = 54.47; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.83, 9.83, 9.83); Calibrated: 9/26/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2/2/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

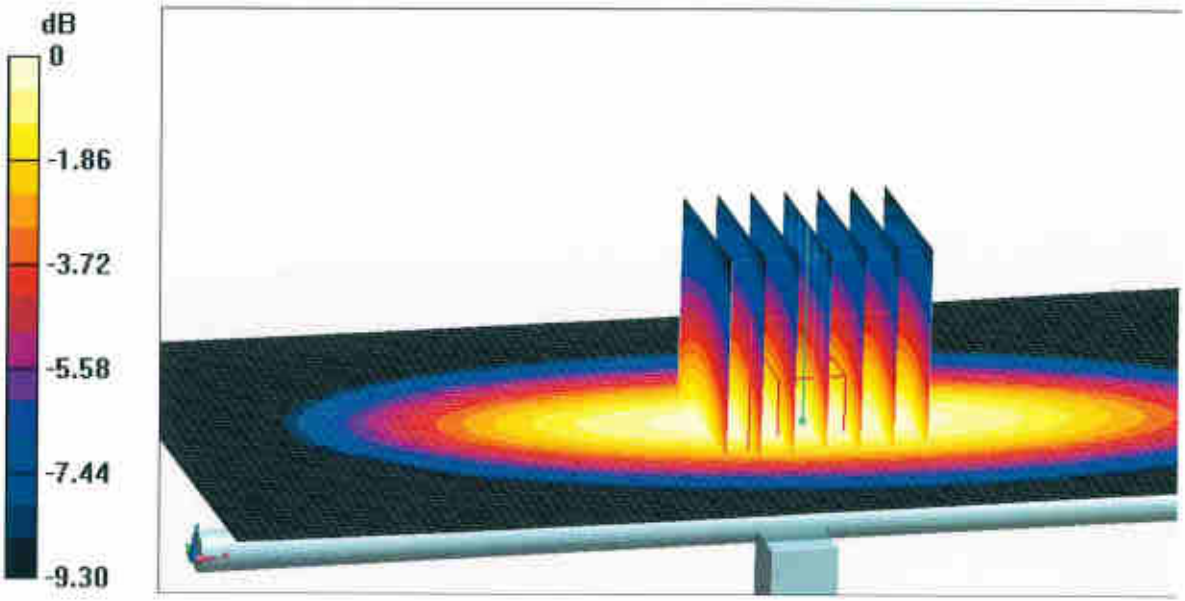
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.84 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.09 W/kg

SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.46 W/kg

Maximum value of SAR (measured) = 2.68 W/kg



0 dB = 2.68 W/kg = 4.28 dBW/kg

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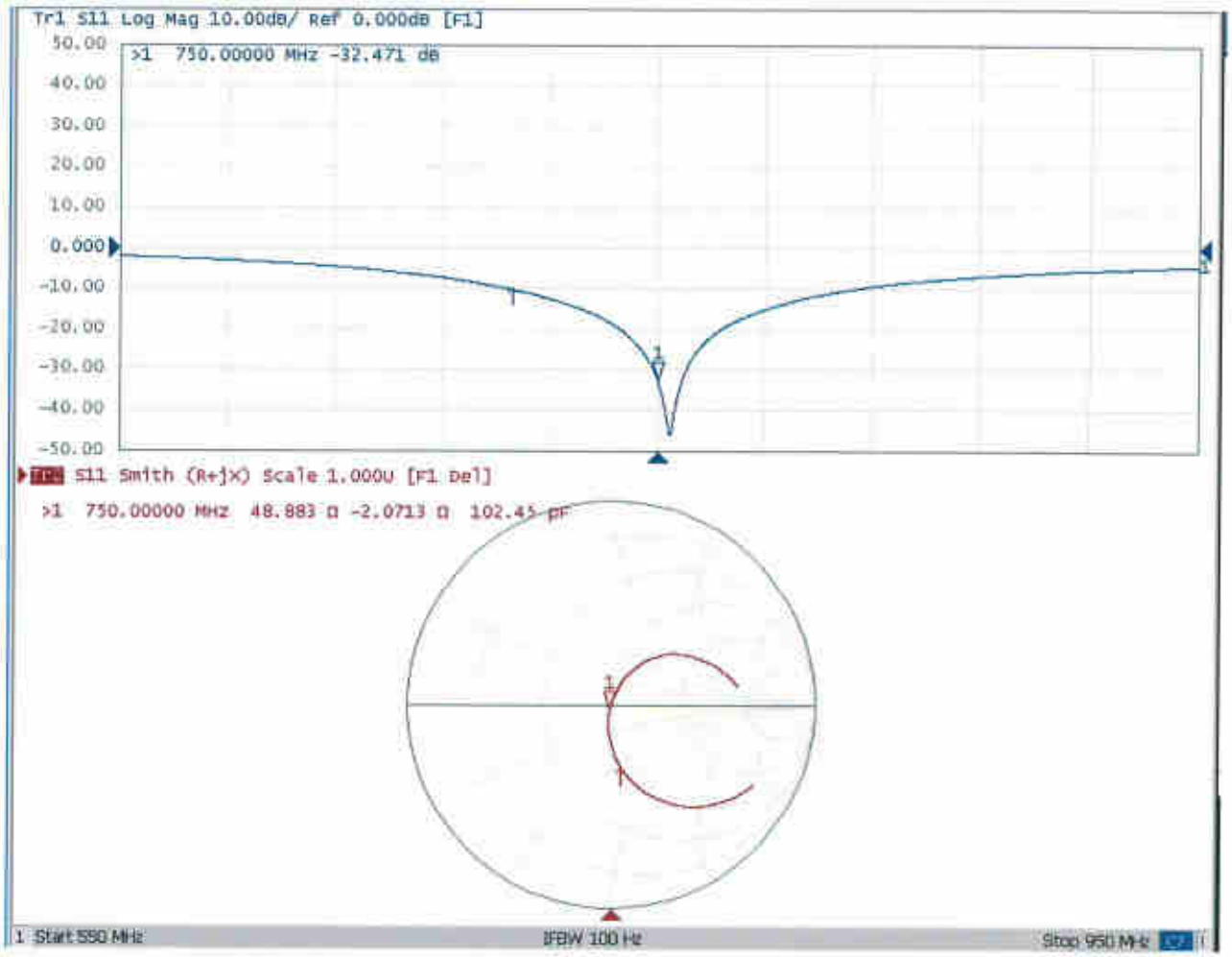
Impedance Measurement Plot for Body TSL



In Collaboration with
s p e a g
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CALIBRATION
CNAS L0570

Client **Sporton-CN** **Certificate No: Z16-97223**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d091
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 22, 2016

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
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: November 26, 2016

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