FCC SAR Test Report

APPLICANT	:	**Lenovo (Shanghai) Electronics Technology Co., Ltd.**
EQUIPMENT	:	**Portable Tablet Computer**
BRAND NAME	:	**Lenovo**
MODEL NAME	:	**701LV, 702LV**
FCC ID	:	**O57TAB4LV**
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

TESTING
NVLAP LAB CODE 600155-0

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Table of Contents

1. Statement of Compliance 4
2. Administration Data 5
3. Guidance Applied 5
4. Equipment Under Test (EUT) Information 6
4.1 General Information 6
4.2 Sample List 7
4.3 Specification of Accessory 7
4.4 General LTE SAR Test and Reporting Considerations 8
5. Proximity Sensor Triggering Test 9
6. RF Exposure Limits 14
6.1 Uncontrolled Environment 14
6.2 Controlled Environment 14
7. Specific Absorption Rate (SAR) 15
7.1 Introduction 15
7.2 SAR Definition 15
8. System Description and Setup 16
8.1 E-Field Probe 17
8.2 Data Acquisition Electronics (DAE) 17
8.3 Phantom 17
8.4 Device Holder 18
9. Measurement Procedures 19
9.1 Spatial Peak SAR Evaluation 19
9.2 Power Reference Measurement 20
9.3 Area Scan 20
9.4 Zoom Scan 21
9.5 Volume Scan Procedures 21
9.6 Power Drift Monitoring 21
10. Test Equipment List 22
11. System Verification 23
11.1 Tissue Simulating Liquids 23
11.2 Tissue Verification 24
11.3 System Performance Check Results 25
12. RF Exposure Positions 26
12.1 SAR Testing for Tablet 26
13. Conducted RF Output Power (Unit: dBm) 27
14. Antenna Location 42
15. SAR Test Results 44
15.1 Body SAR 46
15.2 Repeated SAR Measurement 48
16. Simultaneous Transmission Analysis 49
16.1 Body Exposure Conditions 50
16.2 SPLSR Evaluation and Analysis 51
17. Uncertainty Assessment 53
18. References 56
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA782206	Rev. 01	Initial issue of report	Nov. 07, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Lenovo (Shanghai) Electronics Technology Co., Ltd., Portable Tablet Computer, 701LV, 702LV** are as follows.

Equipment Class	Frequency Band		Highest SAR Summary Body 1g SAR (W/kg)	Highest Simultaneous Transmission SAR (W/kg)
Licensed	LTE	Band 41	1.19	1.47
DTS	WLAN	2.4GHz WLAN	**1.20**	1.20
NII		5GHz WLAN	1.10	1.19
DSS	Bluetooth	Bluetooth	0.29	1.47
Date of Testing:			2017/10/26 ~ 2017/10/29	

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	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Address	NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

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 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Portable Tablet Computer
Brand Name	Lenovo
Model Name	701LV, 702LV
FCC ID	O57TAB4LV
IMEI Code	Sample 1: 866423030007733 Sample 2: 866423030007618
Wireless Technology and Frequency Range	LTE Band 41: 2498.5 MHz ~ 2687.5 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 Bluetooth: 2402 MHz ~ 2480 MHz
Mode	LTE: QPSK, 16QAM 64QAM (Uplink is not supported) WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0+EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE, Bluetooth v4.2 LE
HW Version	LenovoPad 701LV
SW Version	TB-701LV_RF02_20170831
EUT Stage	Identical Prototype

Remark:
1. This device has no voice function.
2. This device implanted proximity sensor function at bottom face and edge 1, power reduction will be implemented immediately at LTE Band41 and WLAN 5GHz bands.

4.2 Sample List

There are two types of EUT for this project. The differences between them are summary below table. According to the difference, only sample 1 was for full test, and sample 2 verified the worst cases of sample 1.

Component	Sample 1		Sample 2	
CPU	MSM-8953-2-857NSP-TR-01-1-AB	Qualcomm	MSM-8953-2-857NSP-TR-01-1-AB	Qualcomm
Flash	KMQE10013M-B318013	Samsung	H9TQ17ABJTBCUR-KUM(A05)	Hynix
LCD	P101KDA-AF0	INX	TV101WUM-NL1	BOE
TP	MTF-101-2856IKA	O-flim	TC101GFL16V.A	GIS
Front Camera	V10835V0	C&T	B02SF0105	Broad
Rear Camera	FX219BH	QTECH	L8856A10	O-film
Battery	L16D2P31	SCUD	L16D2P31	celxpert
motor	HZF-Z04BE-RL67B25-90	HONGZHIFA	CY0408L-021HB-064	Kunwang
Speaker 1	XHB171220B08-01-B1F-RH	HAOSHENG	XHB171220B08-01-B1F-RH	HAOSHENG
Speaker 2	XHB171220B08-02-B1F-RH	HAOSHENG	XHB171220B08-02-B1F-RH	HAOSHENG

4.3 Specification of Accessory

Specification of Accessory				
Battery 1	**Brand Name**	Lenovo(SCUD)	**Model Name**	L16D2P31
	Power Rating	3.85Vdc,7000mAh	**Type**	Li-ion
Battery 2	**Brand Name**	Lenovo (Celxpert)	**Model Name**	L16D2P31
	Power Rating	3.85Vdc,7000mAh	**Type**	Li-ion

4.4 General LTE SAR Test and Reporting Considerations

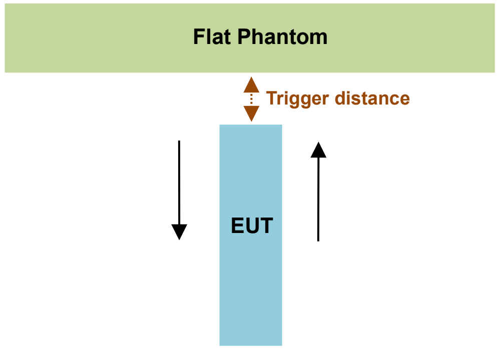
<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>O57TAB4LV</td></tr>
<tr><td>Equipment Name</td><td>Portable Tablet Computer</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 41: 2498.5 MHz ~ 2687.5 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>Uplink modulations used</td><td>QPSK, and 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE Release</td><td>R10, Cat4</td></tr>
<tr><td>CA Support</td><td>Not Supported</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>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)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>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.</td></tr>
<tr><td>Power reduction applied to satisfy SAR compliance</td><td>1. Yes, Proximity Sensor.
2. Power reduction will be active at LTE band 41.</td></tr>
</table>

LTE Band 41								
	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	39675	2498.5	39700	2501	39725	2503.5	39750	2506
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated in the exhibit "P-Sensor operational description", and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance, and the tissue-equivalent medium was used for formal proximity sensor triggering testing.



<WWAN>

Proximity Sensor Trigger Distance (mm)		
Position	Bottom Face	Edge 1
Minimum	25	22

<WLAN>

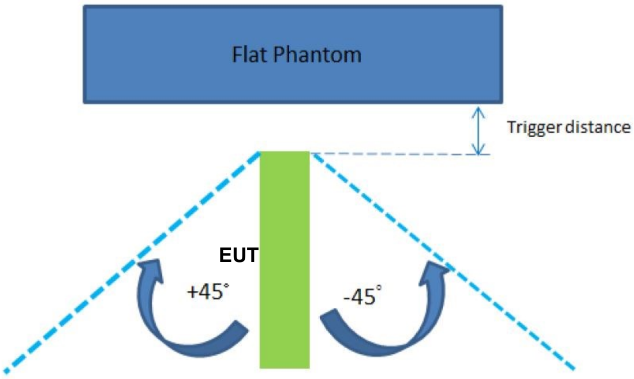
Proximity Sensor Trigger Distance (mm)		
Position	Bottom Face	Edge 1
Minimum	25	26

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and "along the direction of maximum antenna and sensor offset". Illustrated in the internal photo exhibit, although the senor is spatially offset, there is no trigger condition where the antenna is next to the user but the sensor is laterally further away, therefore proximity sensor coverage testing is not required.
This procedure is not required because antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 22 mm separation for WWAN and at 26 mm separation for WLAN. Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



<WWAN>

Proximity Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	22

<WLAN>

Proximity Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	26

Proximity sensor power reduction

Exposure Position / wireless mode	Bottom Face[(1)]	Edge 1[(1)]	Edge 2	Edge 3	Edge 4
LTE Band 41	7.0 dB	7.0 dB	0 dB	0 dB	0 dB
WLAN 5.2GHz	3.0 dB	3.0 dB	0 dB	0 dB	0 dB
WLAN 5.3GHz	3.0 dB	3.0 dB	0 dB	0 dB	0 dB
WLAN 5.5GHz	1.5 dB	1.5 dB	0 dB	0 dB	0 dB

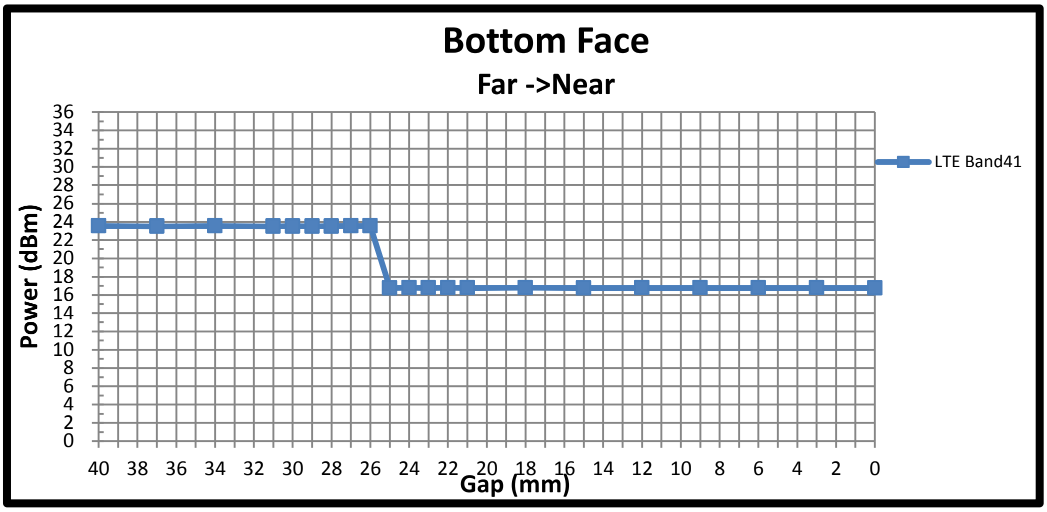
Remark:

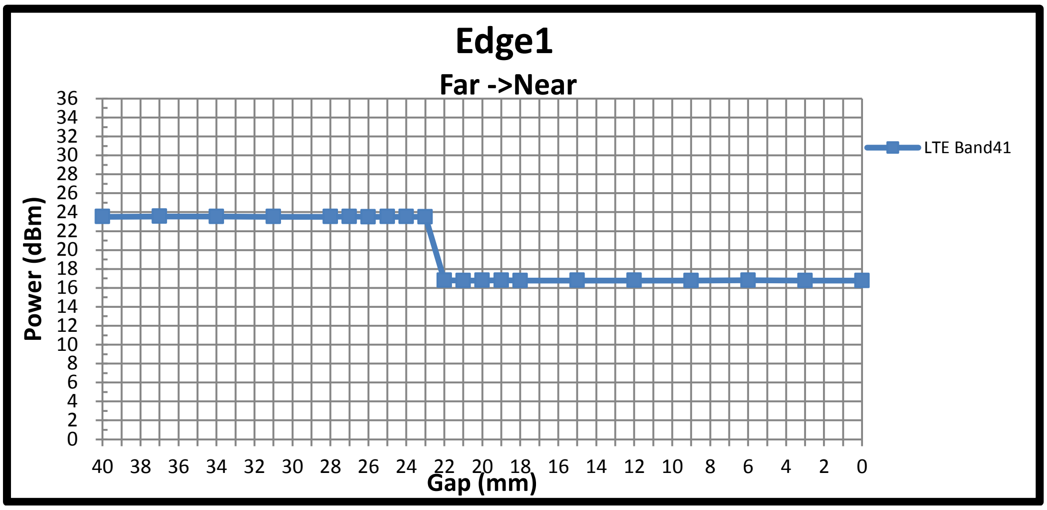
1. [(1)]: Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN 2.4GHz and Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit "P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
    - Bottom Face: 12 mm
    - Edge 1: 12 mm

Power Measurement during Sensor Trigger distance testing

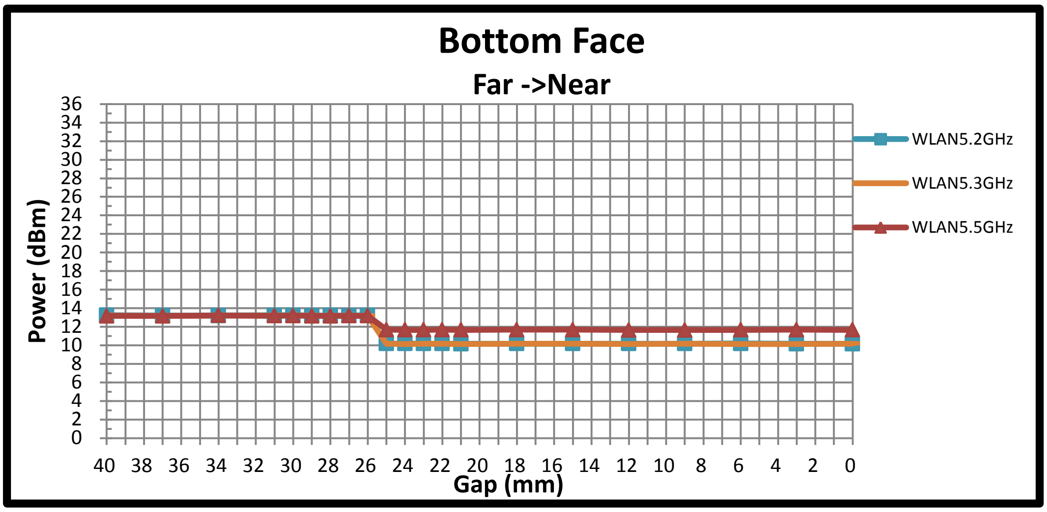
Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels (dB)
		w/o power back-off	w/ power back-off	
LTE Band 41 (20MHz 1RB 0offset)	41055	23.50	16.46	7.04
WLAN 5.2GHz 802.11n-HT40 MCS0	46	13.19	10.15	3.04
WLAN 5.3GHz 802.11n-HT40 MCS0	62	13.17	10.13	3.04
WLAN 5.5GHz 802.11n-HT40 MCS0	134	13.16	11.64	1.52

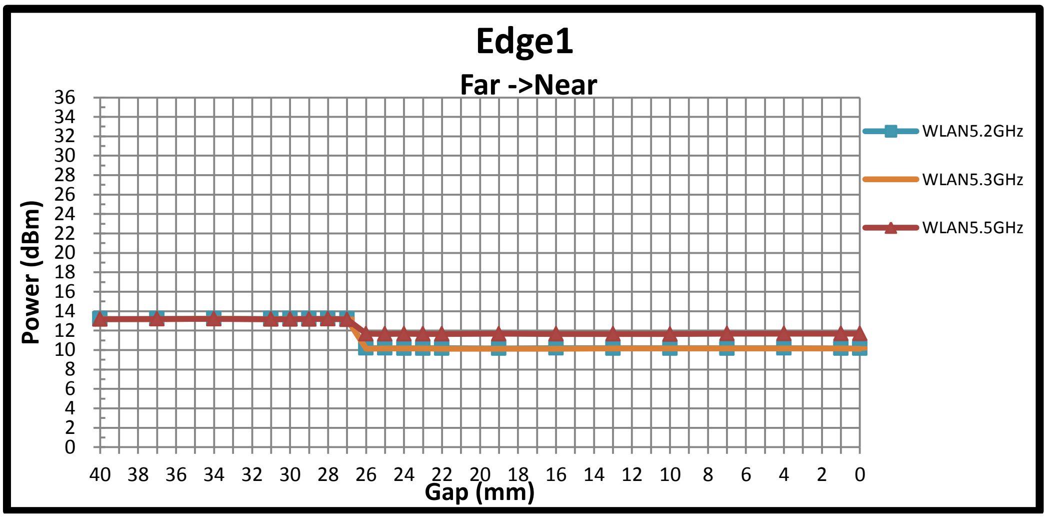
<WWAN>





<WLAN>


Bottom Face
Far ->Near
Power (dBm)
Gap (mm)
WLAN5.2GHz
WLAN5.3GHz
WLAN5.5GHz


Edge1
Far ->Near
Power (dBm)
Gap (mm)
WLAN5.2GHz
WLAN5.3GHz
WLAN5.5GHz

6. RF Exposure Limits

6.1 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.

6.2 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.

7. Specific Absorption Rate (SAR)

7.1 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.

7.2 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:

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

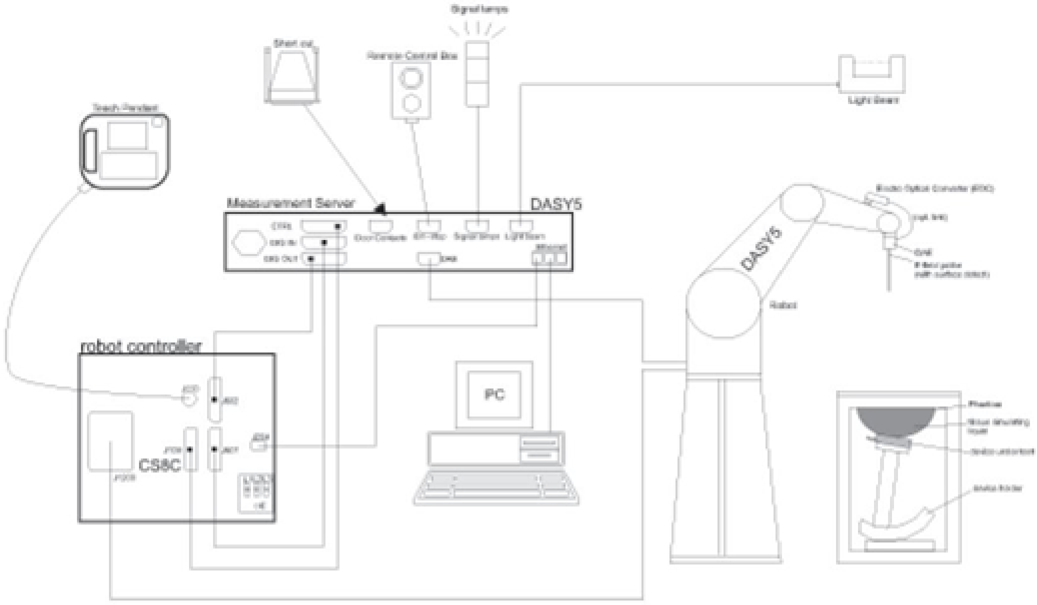
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

8. 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.

8.1 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

8.2 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

8.3 Phantom

<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.

8.4 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

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) 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
(d) 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 WWAN transmission in radiated connection, and engineering software 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

9.1 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

9.2 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.

9.3 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.	

9.4 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.

<table>
<tr><th colspan="3"></th><th>$\leq$ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

9.5 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.

9.6 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.

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
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	1210	2017/5/25	2018/5/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2017/5/26	2018/5/25
SPEAG	ELI4 Phantom	QD OVA 001 BB	TP-1079	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201563814	2017/1/19	2018/1/18
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	100783	2017/8/8	2018/8/7
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	0905	2017/4/20	2018/4/19
JM	DIGITAC THERMOMETER	JM222	AA1207166	2017/4/19	2018/4/18
EXA	Spectrum Analyzer	N9010A	MY55150244	2017/4/18	2018/4/17
ARRA	Power Divider	A3200-2	N/A	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	
AR	Amplifier	5S1G4	333096	Note	
mini-circuits	Amplifier	ZVE-3W-83+	162601250	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.

11. System Verification

11.1 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.

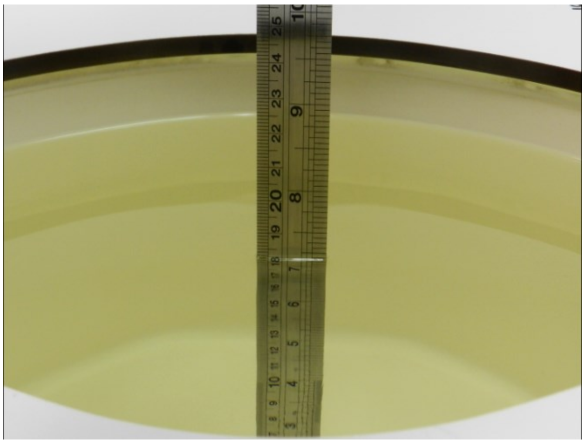


Fig 10.1 Photo of Liquid Height for Body SAR

11.2 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								
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
2450	Body	22.7	1.932	53.699	1.95	52.7	-0.92	1.90	±5	2017/10/26
2600	Body	22.5	2.139	53.172	2.16	52.5	-0.97	1.28	±5	2017/10/29
5250	Body	22.6	5.297	49.185	5.36	48.9	-1.18	0.58	±5	2017/10/27
5600	Body	22.6	5.872	48.306	5.77	48.5	1.77	-0.40	±5	2017/10/27

11.3 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 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2017/10/26	2450	Body	250	840	3857	1210	11.90	50.90	47.60	-6.48
2017/10/29	2600	Body	250	1061	3857	1210	13.40	55.40	53.60	-3.25
2017/10/27	5250	Body	100	1113	3857	1210	7.25	76.10	72.50	-4.73
2017/10/27	5600	Body	100	1113	3857	1210	7.61	79.80	76.10	-4.64

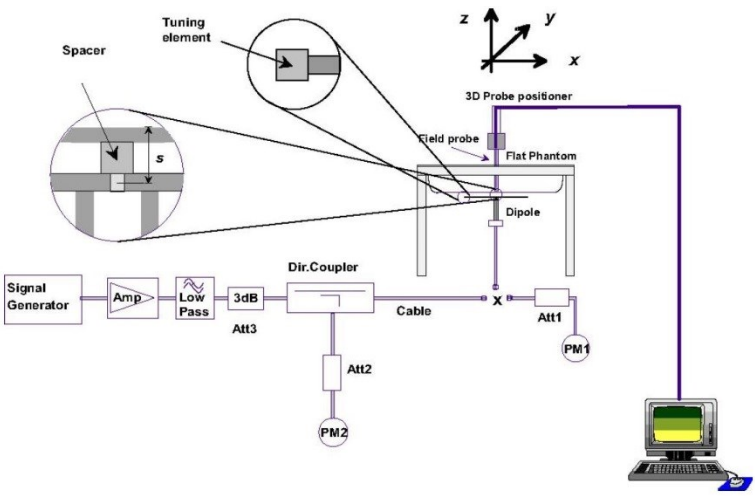


Fig 8.3.1 System Performance Check Setup

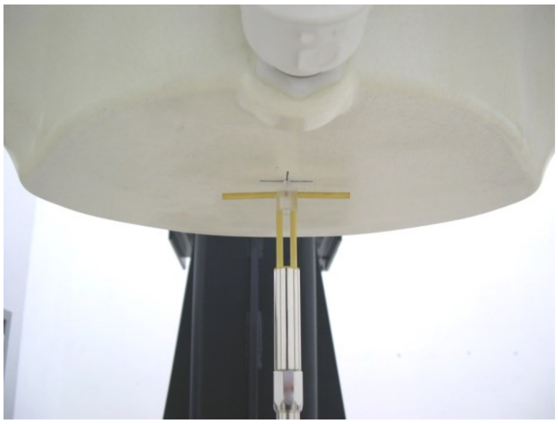


Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

This EUT was tested in three different positions. They are bottom-face, Edge1 and Edge2. EUT has proximity sensor function, it would be on bottom-face and Edge1, the distance is 12 mm for bottom-face and Edge1, EUT transmitting reduced power was performed. Additional the surface of EUT is touching with phantom 0 cm for Edge2 with full power.

13. Conducted RF Output Power (Unit: dBm)

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. “special subframe S” contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

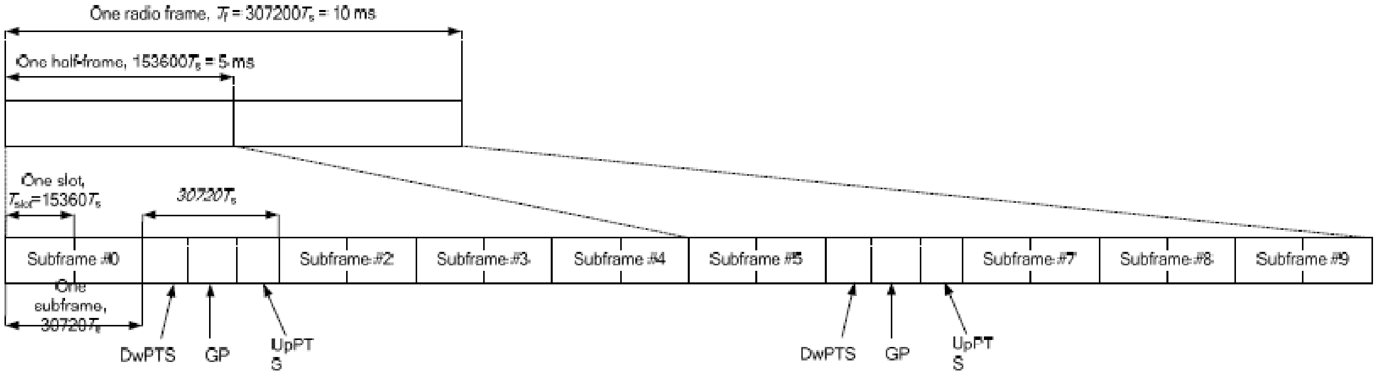


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$			$7680 \cdot T_s$		
1	$19760 \cdot T_s$			$20480 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
2	$21952 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$		
5	$6592 \cdot T_s$			$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

<Maximum Average RF Power (Proximity Sensor Inactive)>

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	23.22	23.34	23.43	23.50	23.39	24.00	0
20	QPSK	1	49	23.07	23.30	23.40	23.48	23.24		
20	QPSK	1	99	23.11	23.10	23.36	23.46	23.08		
20	QPSK	50	0	22.19	22.22	22.35	22.54	22.50	23.00	1
20	QPSK	50	24	22.12	22.20	22.35	22.47	22.46		
20	QPSK	50	50	22.06	22.09	22.34	22.48	22.48		
20	QPSK	100	0	22.02	22.25	22.40	22.50	22.47		
20	16QAM	1	0	21.72	21.66	21.92	22.02	22.20	23.00	1
20	16QAM	1	49	21.90	21.91	22.02	22.25	22.22		
20	16QAM	1	99	21.80	21.61	22.04	22.09	21.89		
20	16QAM	50	0	21.26	21.34	21.36	21.56	21.57	22.00	2
20	16QAM	50	24	21.13	21.35	21.54	21.46	21.52		
20	16QAM	50	50	21.16	21.31	21.42	21.54	21.54		
20	16QAM	100	0	21.07	21.30	21.48	21.57	21.44		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	23.26	23.07	23.29	23.48	23.21	24.00	0
15	QPSK	1	37	23.42	23.50	23.60	23.65	23.56		
15	QPSK	1	74	23.02	23.29	23.27	23.44	23.12		
15	QPSK	36	0	22.19	22.19	22.31	22.47	22.50	23.00	1
15	QPSK	36	20	22.41	22.15	22.32	22.43	22.48		
15	QPSK	36	39	22.36	22.21	22.36	22.48	22.38		
15	QPSK	75	0	22.46	22.25	22.34	22.48	22.50		
15	16QAM	1	0	21.78	22.03	21.91	22.05	22.08	23.00	1
15	16QAM	1	37	22.38	22.52	21.98	22.27	22.34		
15	16QAM	1	74	21.89	21.54	21.85	22.02	22.17		
15	16QAM	36	0	21.40	21.26	21.50	21.56	21.49	22.00	2
15	16QAM	36	20	21.25	21.60	21.52	21.50	21.79		
15	16QAM	36	39	21.33	21.34	21.58	21.89	21.40		
15	16QAM	75	0	21.56	21.29	21.45	21.55	21.44		

Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	23.25	23.17	23.41	23.48	23.46	24.00	0
10	QPSK	1	25	23.50	23.45	23.71	23.69	23.60		
10	QPSK	1	49	23.27	23.21	23.38	23.35	23.14		
10	QPSK	25	0	22.28	22.18	22.37	22.48	22.49	23.00	1
10	QPSK	25	12	22.34	22.17	22.36	22.48	22.54		
10	QPSK	25	25	22.31	22.14	22.36	22.47	22.38		
10	QPSK	50	0	22.29	22.16	22.37	22.48	22.51		
10	16QAM	1	0	21.72	21.98	22.11	22.02	22.35	23.00	1
10	16QAM	1	25	22.08	21.85	22.08	22.28	22.16		
10	16QAM	1	49	21.63	21.62	21.88	22.24	21.74		
10	16QAM	25	0	21.54	21.48	21.72	21.73	21.79	22.00	2
10	16QAM	25	12	21.60	21.49	21.71	21.72	21.78		
10	16QAM	25	25	21.55	21.54	21.79	21.87	21.62		
10	16QAM	50	0	21.38	21.65	21.39	21.52	21.57		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.3	2687.5		
5	QPSK	1	0	23.23	23.08	23.20	23.17	23.09	24.00	0
5	QPSK	1	12	23.31	23.30	23.53	23.39	23.36		
5	QPSK	1	24	23.18	23.14	23.18	23.17	23.02		
5	QPSK	12	0	22.27	22.28	22.30	22.42	22.34	23.00	1
5	QPSK	12	7	22.28	22.11	22.30	22.47	22.37		
5	QPSK	12	13	22.26	22.18	22.33	22.47	22.37		
5	QPSK	25	0	22.27	22.10	22.31	22.43	22.34		
5	16QAM	1	0	22.04	21.86	22.10	22.21	22.22	23.00	1
5	16QAM	1	12	22.10	21.92	21.92	22.36	22.61		
5	16QAM	1	24	21.77	21.91	22.07	22.24	22.16		
5	16QAM	12	0	21.28	21.18	21.35	21.48	21.44	22.00	2
5	16QAM	12	7	21.31	21.56	21.54	21.49	21.47		
5	16QAM	12	13	21.27	21.53	21.56	21.42	21.46		
5	16QAM	25	0	21.53	21.50	21.72	21.73	21.69		

<Reduced Average RF Power (Proximity Sensor Active)>

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	16.16	16.17	16.40	16.46	16.45	17.00	0
20	QPSK	1	49	16.73	16.54	16.42	16.75	16.58		
20	QPSK	1	99	16.15	16.06	16.31	16.39	16.17		
20	QPSK	50	0	16.20	16.22	16.37	16.69	16.49	17.00	0
20	QPSK	50	24	16.40	16.34	16.38	16.70	16.50		
20	QPSK	50	50	16.18	16.17	16.36	16.52	16.39		
20	QPSK	100	0	16.07	16.28	16.31	16.49	16.40		
20	16QAM	1	0	16.08	15.69	15.85	16.31	16.32	17.00	0
20	16QAM	1	49	16.69	16.34	16.45	16.35	16.02		
20	16QAM	1	99	16.16	16.01	16.10	16.12	16.08		
20	16QAM	50	0	16.38	16.20	16.14	16.73	16.42	17.00	0
20	16QAM	50	24	16.33	16.21	16.25	16.50	16.62		
20	16QAM	50	50	16.10	16.36	16.44	16.49	16.43		
20	16QAM	100	0	16.28	16.18	16.30	16.47	16.34		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	16.07	16.25	16.32	16.49	16.49	17.00	0
15	QPSK	1	37	16.46	16.46	16.66	16.66	16.68		
15	QPSK	1	74	16.09	16.17	16.25	16.54	16.18		
15	QPSK	36	0	16.16	16.20	16.36	16.71	16.46	17.00	0
15	QPSK	36	20	16.47	16.26	16.29	16.65	16.35		
15	QPSK	36	39	16.30	16.28	16.40	16.42	16.25		
15	QPSK	75	0	16.35	16.29	16.32	16.54	16.40		
15	16QAM	1	0	15.69	16.08	15.82	16.18	16.00	17.00	0
15	16QAM	1	37	16.44	16.24	15.87	16.17	16.45		
15	16QAM	1	74	16.15	15.99	15.77	16.14	15.76		
15	16QAM	36	0	16.17	16.22	16.48	16.52	16.44	17.00	0
15	16QAM	36	20	16.31	16.28	16.31	16.46	16.47		
15	16QAM	36	39	16.25	16.44	16.33	16.65	16.34		
15	16QAM	75	0	16.22	16.28	16.40	16.54	16.34		

Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	16.34	16.14	16.42	16.53	16.44	17.00	0
10	QPSK	1	25	16.46	16.84	16.32	16.41	16.85		
10	QPSK	1	49	16.22	16.19	16.51	16.50	16.26		
10	QPSK	25	0	16.30	16.27	16.52	16.68	16.59	17.00	0
10	QPSK	25	12	16.30	16.27	16.58	16.46	16.49		
10	QPSK	25	25	16.46	16.27	16.37	16.50	16.36		
10	QPSK	50	0	16.29	16.35	16.38	16.64	16.45		
10	16QAM	1	0	15.87	16.27	15.98	16.21	16.17	17.00	0
10	16QAM	1	25	16.40	16.33	16.44	16.12	16.09		
10	16QAM	1	49	15.78	16.28	15.88	16.14	15.88		
10	16QAM	25	0	16.50	16.45	16.61	16.65	16.70	17.00	0
10	16QAM	25	12	16.52	16.62	16.57	16.69	16.68		
10	16QAM	25	25	16.80	16.45	16.55	16.76	16.51		
10	16QAM	50	0	16.37	16.24	16.28	16.48	16.48		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.3	2687.5		
5	QPSK	1	0	16.21	16.03	16.20	16.35	16.18	17.00	0
5	QPSK	1	12	16.37	16.37	16.51	16.52	16.46		
5	QPSK	1	24	16.24	16.07	16.17	16.26	16.07		
5	QPSK	12	0	16.20	16.38	16.63	16.67	16.31	17.00	0
5	QPSK	12	7	16.26	16.15	16.69	16.72	16.47		
5	QPSK	12	13	16.28	16.18	16.39	16.50	16.31		
5	QPSK	25	0	16.28	16.17	16.31	16.43	16.34		
5	16QAM	1	0	15.79	16.14	16.09	16.19	16.15	17.00	0
5	16QAM	1	12	16.30	16.20	16.38	16.22	16.33		
5	16QAM	1	24	16.21	15.96	15.72	16.04	15.85		
5	16QAM	12	0	16.49	16.12	16.16	16.48	16.52	17.00	0
5	16QAM	12	7	16.30	16.31	16.43	16.63	16.45		
5	16QAM	12	13	16.31	16.32	16.41	16.49	16.29		
5	16QAM	25	0	16.80	16.69	16.59	16.70	16.56		

<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.

<Maximum Average RF Power (Proximity Sensor Inactive)>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-up limit (dBm)	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	16.12	16.50	97.59
		6	2437	15.52	16.50	
		11	2462	15.62	16.50	
	802.11g 6Mbps	1	2412	14.81	15.00	87.50
		6	2437	14.04	15.00	
		11	2462	14.16	15.00	
	802.11n-HT20 MCS0	1	2412	13.83	14.00	86.70
		6	2437	13.13	14.00	
		11	2462	13.19	14.00	
	802.11n-HT40 MCS0	3	2422	14.05	14.50	86.29
		6	2437	13.86	14.50	
		9	2452	13.60	14.50	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.16	13.50	87.11
		40	5200	13.22	13.50	
		44	5220	12.96	13.50	
		48	5240	13.26	13.50	
	802.11n-HT20 MCS0	36	5180	13.19	13.50	86.35
		40	5200	13.06	13.50	
		44	5220	13.04	13.50	
		48	5240	13.22	13.50	
	802.11n-HT40 MCS0	38	5190	13.15	13.50	86.37
		46	5230	13.19	13.50	
	802.11ac-VHT20 MCS0	36	5180	12.80	13.50	83.42
		40	5200	12.70	13.50	
		44	5220	12.68	13.50	
		48	5240	12.96	13.50	
	802.11ac-VHT40 MCS0	38	5190	13.11	13.50	70.92
		46	5230	13.15	13.50	
	802.11ac-VHT80 MCS0	42	5210	12.92	13.00	55.16

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	13.11	13.50	87.11
		56	5280	12.89	13.50	
		60	5300	13.21	13.50	
		64	5320	13.02	13.50	
	802.11n-HT20 MCS0	52	5260	13.14	13.50	86.35
		56	5280	12.90	13.50	
		60	5300	13.09	13.50	
		64	5320	13.13	13.50	
	802.11n-HT40 MCS0	54	5270	13.13	13.50	86.37
		62	5310	13.17	13.50	
	802.11ac-VHT20 MCS0	52	5260	12.82	13.50	83.42
		56	5280	12.58	13.50	
		60	5300	12.83	13.50	
		64	5320	12.65	13.50	
	802.11ac-VHT40 MCS0	54	5270	13.06	13.50	70.92
		62	5310	13.11	13.50	
	802.11ac-VHT80 MCS0	58	5290	12.90	13.00	55.16

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.11	13.50	87.11
		116	5580	12.92	13.50	
		124	5620	13.25	13.50	
		132	5660	13.12	13.50	
		140	5700	13.00	13.50	
		144	5720	12.67	13.50	
	802.11n-HT20 MCS0	100	5500	13.05	13.50	86.35
		116	5580	13.12	13.50	
		124	5620	12.91	13.50	
		132	5660	13.11	13.50	
		140	5700	12.97	13.50	
		144	5720	12.86	13.50	
	802.11n-HT40 MCS0	102	5510	13.10	13.50	86.37
		110	5550	13.01	13.50	
		126	5630	13.14	13.50	
		134	5670	13.16	13.50	
		142	5710	13.02	13.50	
	802.11ac-VHT20 MCS0	100	5500	12.56	13.50	83.42
		116	5580	12.57	13.50	
		124	5620	12.45	13.50	
		132	5660	12.72	13.50	
		140	5700	12.48	13.50	
		144	5720	12.42	13.50	
	802.11ac-VHT40 MCS0	102	5510	13.07	13.50	70.92
		110	5550	12.80	13.50	
		126	5630	12.91	13.50	
		134	5670	13.04	13.50	
		142	5710	12.97	13.50	
	802.11ac-VHT80 MCS0	106	5530	12.73	13.00	55.16
		122	5610	12.93	13.00	
		138	5690	12.87	13.00	

<Maximum Average RF Power (Proximity Sensor Active)>

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	10.03	10.50	87.11
		40	5200	9.98	10.50	
		44	5220	10.08	10.50	
		48	5240	10.11	10.50	
	802.11n-HT20 MCS0	36	5180	9.73	10.50	86.35
		40	5200	9.66	10.50	
		44	5220	9.46	10.50	
		48	5240	9.97	10.50	
	802.11n-HT40 MCS0	38	5190	10.10	10.50	86.37
		46	5230	10.15	10.50	
	802.11ac-VHT20 MCS0	36	5180	9.61	10.50	83.42
		40	5200	9.60	10.50	
		44	5220	9.44	10.50	
		48	5240	9.80	10.50	
	802.11ac-VHT40 MCS0	38	5190	9.95	10.50	70.92
		46	5230	9.74	10.50	
	802.11ac-VHT80 MCS0	42	5210	9.35	10.00	55.16

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	9.98	10.50	87.11
		56	5280	9.95	10.50	
		60	5300	10.05	10.50	
		64	5320	9.88	10.50	
	802.11n-HT20 MCS0	52	5260	9.96	10.50	86.35
		56	5280	9.61	10.50	
		60	5300	9.53	10.50	
		64	5320	9.57	10.50	
	802.11n-HT40 MCS0	54	5270	10.11	10.50	86.37
		62	5310	10.13	10.50	
	802.11ac-VHT20 MCS0	52	5260	9.77	10.50	83.42
		56	5280	9.51	10.50	
		60	5300	9.45	10.50	
		64	5320	9.47	10.50	
	802.11ac-VHT40 MCS0	54	5270	9.76	10.50	70.92
		62	5310	9.71	10.50	
	802.11ac-VHT80 MCS0	58	5290	9.27	10.00	55.16

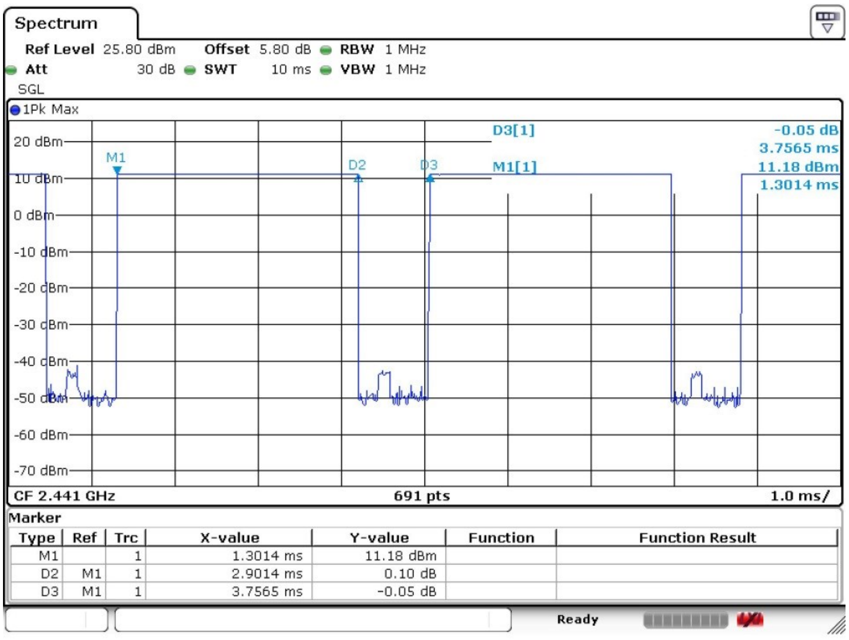
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	11.17	12.00	87.11
		116	5580	10.83	12.00	
		124	5620	11.25	12.00	
		132	5660	11.42	12.00	
		140	5700	11.14	12.00	
		144	5720	10.92	12.00	
	802.11n-HT20 MCS0	100	5500	10.93	12.00	86.35
		116	5580	10.91	12.00	
		124	5620	10.92	12.00	
		132	5660	11.13	12.00	
		140	5700	11.06	12.00	
		144	5720	10.88	12.00	
	802.11n-HT40 MCS0	102	5510	11.37	12.00	86.37
		110	5550	11.41	12.00	
		126	5630	11.55	12.00	
		134	5670	11.64	12.00	
		142	5710	11.51	12.00	
	802.11ac-VHT20 MCS0	100	5500	10.84	12.00	83.42
		116	5580	10.89	12.00	
		124	5620	10.81	12.00	
		132	5660	11.05	12.00	
		140	5700	10.95	12.00	
		144	5720	10.85	12.00	
	802.11ac-VHT40 MCS0	102	5510	11.40	12.00	70.92
		110	5550	11.16	12.00	
		126	5630	11.03	12.00	
		134	5670	11.46	12.00	
		142	5710	11.15	12.00	
	802.11ac-VHT80 MCS0	106	5530	10.66	11.00	55.16
		122	5610	10.71	11.00	
		138	5690	10.70	11.00	

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 77.24 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.

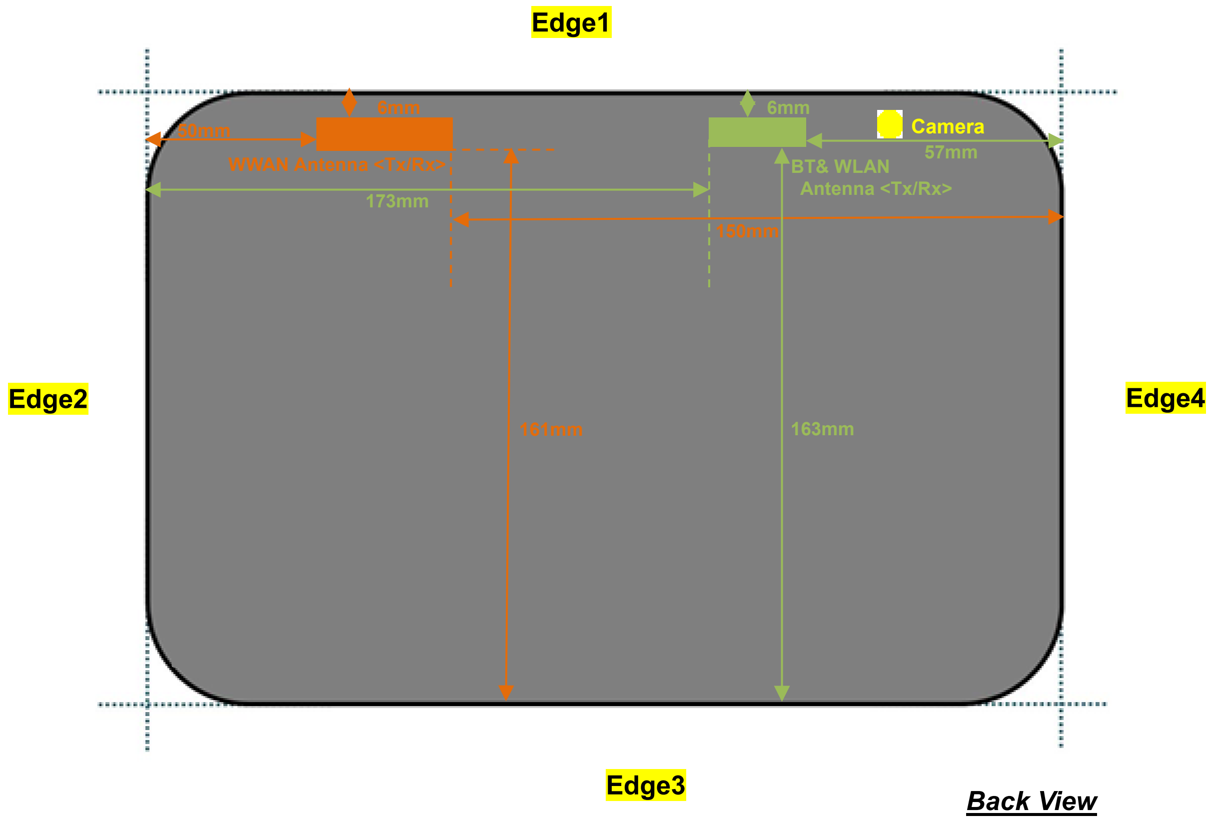
Bluetooth time-domain plot



Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
v3.0+EDR	CH 00	2402	10.97
	CH 39	2441	**11.14**
	CH 78	2480	10.78
Tune-up limit (dBm)			11.50

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0/4.1/4.2 LE	CH 00	2402	**1.43**
	CH 19	2440	1.30
	CH 39	2480	0.88
Tune-up limit (dBm)			2.00

14. Antenna Location



Diagonal Dimension: 303mm

General Note:
1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. 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
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Exposure Position	Wireless Interface	LTE Band 41	Bluetooth	2.4GHz WLAN	5GHz WLAN
	Calculated Frequency (MHz)	2687.5	2480	2462	5720
	Maximum power (dBm)	24.00	11.50	16.50	13.50
	Maximum rated power(mW)	251.0	14.0	45.0	22.0
Bottom Face	Separation distance(mm)	0	0		
	exclusion threshold	82.3	4.4	14.1	10.6
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**
Edge 1	Separation distance(mm)	6.0	6.0		
	exclusion threshold	68.6	3.7	3.4	4.0
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**
Edge 2	Separation distance(mm)	50.0	173.0		
	exclusion threshold	8.2	1325.0	1326.0	1292.0
	Testing required?	**Yes**	**No**	**No**	**No**
Edge 3	Separation distance(mm)	161.0	163.0		
	exclusion threshold	1201.0	1225.0	1226.0	1192.0
	Testing required?	**No**	**No**	**No**	**No**
Edge 4	Separation distance(mm)	150.0	57.0		
	exclusion threshold	1091.0	165.0	166.0	132.0
	Testing required?	**No**	**No**	**No**	**No**

15. 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 WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   d. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
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
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

Tablet Note:

1. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 12mm for bottom face, 12mm for edge1.
2. Per KDB 616217 D04v01r02, the additional separation introduced by the contour against a flat phantom is < 5 mm on this device and reported SAR is < 1.2 W/kg, a curved or contoured back surface or edge SAR is not required, more detail information please refer to the setup photo.

LTE Note:

1. 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. 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.
4. 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.
5. 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.

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.
6. Additional BT/WLAN 2.4GHz SAR test with 12mm separation for bottom face and edge 1 was for conservative simultaneous transmission analysis.

15.1 Body SAR

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Reduction	Sample	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	1	41055	2636.5	16.75	17.00	1.059	62.9	1.006	-0.12	0.750	0.799
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	1	39750	2506	16.73	17.00	1.064	62.9	1.006	-0.14	1.050	1.124
01	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	1	40185	2549.5	16.54	17.00	1.112	62.9	1.006	0.07	1.060	1.186
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	1	40620	2593	16.42	17.00	1.143	62.9	1.006	-0.11	0.466	0.536
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	1	41490	2680	16.58	17.00	1.102	62.9	1.006	0.18	0.797	0.883
	LTE Band 41	20M	QPSK	50	24	Bottom Face	0	ON	1	41055	2636.5	16.70	17.00	1.072	62.9	1.006	0.09	0.742	0.800
	LTE Band 41	20M	QPSK	50	24	Bottom Face	0	ON	1	39750	2506	16.40	17.00	1.148	62.9	1.006	0.17	0.968	1.118
	LTE Band 41	20M	QPSK	50	24	Bottom Face	0	ON	1	40185	2549.5	16.34	17.00	1.164	62.9	1.006	0.05	0.995	1.165
	LTE Band 41	20M	QPSK	50	24	Bottom Face	0	ON	1	40620	2593	16.38	17.00	1.153	62.9	1.006	0.14	0.749	0.869
	LTE Band 41	20M	QPSK	50	24	Bottom Face	0	ON	1	41490	2680	16.50	17.00	1.122	62.9	1.006	0.03	0.804	0.908
	LTE Band 41	20M	QPSK	100	0	Bottom Face	0	ON	1	41055	2636.5	16.49	17.00	1.125	62.9	1.006	0.01	0.750	0.849
	LTE Band 41	20M	QPSK	1	49	Edge 1	0	ON	1	41055	2636.5	16.75	17.00	1.059	62.9	1.006	0.17	0.319	0.340
	LTE Band 41	20M	QPSK	50	24	Edge 1	0	ON	1	41055	2636.5	16.70	17.00	1.072	62.9	1.006	-0.07	0.353	0.381
	LTE Band 41	20M	QPSK	1	0	Edge 2	0	OFF	1	41055	2636.5	23.50	24.00	1.122	62.9	1.006	0.13	0.006	0.007
	LTE Band 41	20M	QPSK	50	0	Edge 2	0	OFF	1	41055	2636.5	22.54	23.00	1.112	62.9	1.006	-0.02	0.003	0.003
	LTE Band 41	20M	QPSK	1	0	Bottom Face	12	OFF	1	41055	2636.5	23.50	24.00	1.122	62.9	1.006	0.01	0.503	0.568
	LTE Band 41	20M	QPSK	50	0	Bottom Face	12	OFF	1	41055	2636.5	22.54	23.00	1.112	62.9	1.006	0.15	0.406	0.454
	LTE Band 41	20M	QPSK	1	0	Edge 1	12	OFF	1	41055	2636.5	23.50	24.00	1.122	62.9	1.006	0.05	0.360	0.406
	LTE Band 41	20M	QPSK	50	0	Edge 1	12	OFF	1	41055	2636.5	22.54	23.00	1.112	62.9	1.006	0.15	0.291	0.325
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	2	40185	2549.5	16.54	17.00	1.112	62.9	1.006	-0.01	0.925	1.035
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	2	39750	2506	16.73	17.00	1.064	62.9	1.006	-0.11	0.917	0.982
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	2	40620	2593	16.42	17.00	1.143	62.9	1.006	0.03	0.561	0.645
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	2	41055	2636.5	16.75	17.00	1.059	62.9	1.006	-0.02	0.561	0.598
	LTE Band 41	20M	QPSK	1	49	Bottom Face	0	ON	2	41490	2680	16.58	17.00	1.102	62.9	1.006	-0.11	0.589	0.653

<u><WLAN SAR></u>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Sample	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
02	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	-0.05	1.070	**1.197**
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	OFF	1	11	2462	15.62	16.50	1.225	97.59	1.025	0.13	0.659	0.827
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	0	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	0.14	0.616	0.689
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	12	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	-0.08	0.125	0.140
	WLAN2.4GHz	802.11b 1Mbps	Edge 1	12	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	0.16	0.069	0.077
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	OFF	2	1	2412	16.12	16.50	1.091	97.59	1.025	-0.07	0.788	0.882
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	OFF	2	11	2462	15.62	16.50	1.225	97.59	1.025	-0.01	0.613	0.769
03	WLAN 5.3GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	1	62	5310	10.13	10.50	1.089	86.37	1.158	-0.05	0.771	**0.972**
	WLAN 5.3GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	1	54	5270	10.11	10.50	1.094	86.37	1.158	-0.03	0.717	0.908
	WLAN 5.3GHz	802.11n-HT40 MCS0	Edge 1	0	ON	1	62	5310	10.13	10.50	1.089	86.37	1.158	-0.09	0.445	0.561
	WLAN 5.3GHz	802.11n-HT40 MCS0	Bottom Face	12	OFF	1	62	5310	13.17	13.50	1.079	86.37	1.158	0.01	0.091	0.114
	WLAN 5.3GHz	802.11n-HT40 MCS0	Edge 1	12	OFF	1	62	5310	13.17	13.50	1.079	86.37	1.158	-0.18	0.077	0.096
	WLAN 5.3GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	2	62	5310	10.13	10.50	1.089	86.37	1.158	0.05	0.656	0.827
	WLAN 5.3GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	2	54	5270	10.11	10.50	1.094	86.37	1.158	0.08	0.685	0.868
	WLAN 5.5GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	1	134	5670	11.64	12.00	1.086	86.37	1.158	0.08	0.872	1.097
04	WLAN 5.5GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	1	126	5630	11.55	12.00	1.109	86.37	1.158	-0.07	0.855	**1.098**
	WLAN 5.5GHz	802.11n-HT40 MCS0	Edge 1	0	ON	1	134	5670	11.64	12.00	1.086	86.37	1.158	-0.14	0.419	0.527
	WLAN 5.5GHz	802.11n-HT40 MCS0	Bottom Face	12	OFF	1	134	5670	13.16	13.50	1.081	86.37	1.158	-0.17	0.110	0.138
	WLAN 5.5GHz	802.11n-HT40 MCS0	Edge 1	12	OFF	1	134	5670	13.16	13.50	1.081	86.37	1.158	-0.07	0.121	0.152
	WLAN 5.5GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	2	126	5630	11.55	12.00	1.109	86.37	1.158	0.06	0.729	0.936
	WLAN 5.5GHz	802.11n-HT40 MCS0	Bottom Face	0	ON	2	134	5670	11.64	12.00	1.086	86.37	1.158	0.05	0.753	0.947

<u><Bluetooth SAR></u>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Sample	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	Bluetooth	1Mbps	Bottom Face	0	OFF	1	39	2441	11.14	11.50	1.086	77.24	1.078	0.01	0.244	**0.286**
	Bluetooth	1Mbps	Edge 1	0	OFF	1	39	2441	11.14	11.50	1.086	77.24	1.078	0.19	0.207	0.242
	Bluetooth	1Mbps	Bottom Face	12	OFF	1	39	2441	11.14	11.50	1.086	77.24	1.078	-0.07	0.035	0.041
	Bluetooth	1Mbps	Edge 1	12	OFF	1	39	2441	11.14	11.50	1.086	77.24	1.078	0.14	0.022	0.026
	Bluetooth	1Mbps	Bottom Face	0	OFF	2	39	2441	11.14	11.50	1.086	77.24	1.078	0.03	0.137	0.160

15.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Mode	Test Position	Gap (mm)	Power Reduction	Sample	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	LTE Band 41	20M	QPSK	1	49	-	Bottom Face	0	ON	1	40185	2549.5	16.54	17.00	1.112	62.9	1.006	0.07	1.060	1	1.186
2nd	LTE Band 41	20M	QPSK	1	49	-	Bottom Face	0	ON	1	40185	2549.5	16.54	17.00	1.112	62.9	1.006	0.01	1.010	1.050	1.130
1st	WLAN2.4GHz	-	-	-	-	802.11b 1Mbps	Bottom Face	0	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	-0.05	1.070	1	1.197
2nd	WLAN2.4GHz	-	-	-	-	802.11b 1Mbps	Bottom Face	0	OFF	1	1	2412	16.12	16.50	1.091	97.59	1.025	0.19	1.040	1.029	1.163
1st	WLAN 5.5GHz	-	-	-	-	802.11n-HT40 MCS0	Bottom Face	0	ON	1	134	5670	11.64	12.00	1.086	86.37	1.158	0.08	0.872	1	1.097
2nd	WLAN 5.5GHz	-	-	-	-	802.11n-HT40 MCS0	Bottom Face	0	ON	1	134	5670	11.64	12.00	1.086	86.37	1.158	0.03	0.863	1.010	1.086

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.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	LTE + WLAN2.4GHz	Yes
2.	LTE + WLAN5GHz	Yes
3.	LTE + Bluetooth	Yes

General Note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. 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.
3. According to the EUT character, WLAN 5GHz and Bluetooth cannot transmit simultaneously
4. The worst case 5 GHz WLAN reported SAR for each configuration was used for SAR summation
5. The reported SAR summation is calculated based on the same configuration and test position.
6. 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 16.2.

16.1 Body Exposure Conditions

<WWAN + WLAN 2.4GHz>

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
LTE	Band 41	Bottom Face at 12mm	0.568	0.140	0.71		
		Edge 1 at 12mm	0.406	0.077	0.48		
		Bottom Face at 0mm	1.186	1.197	2.38	0.03	#1
		Edge 1 at 0mm	0.381	0.689	1.07		
		Edge 2 at 0mm	0.007		0.01		

<WWAN + WLAN 5GHz>

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
LTE	Band 41	Bottom Face at 12mm	0.568	0.138	0.71		
		Edge 1 at 12mm	0.406	0.152	0.56		
		Bottom Face at 0mm	1.186	1.098	2.28	0.03	#2
		Edge 1 at 0mm	0.381	0.561	0.94		
		Edge 2 at 0mm	0.007		0.01		

<WWAN + Bluetooth>

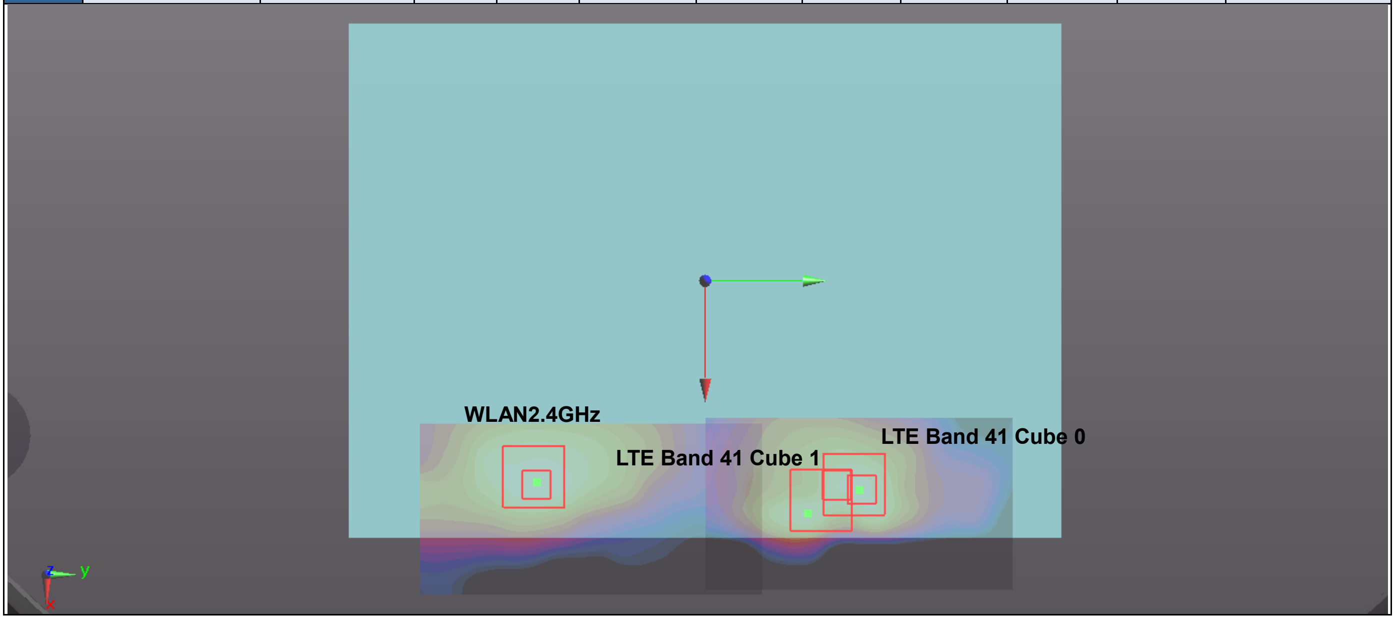
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	4 Bluetooth 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)	SPLSR	Case No
LTE	Band 41	Bottom Face at 12mm	0.568	0.041	0.61		
		Edge 1 at 12mm	0.406	0.026	0.43		
		Bottom Face at 0mm	1.186	0.286	1.47		
		Edge 1 at 0mm	0.381	0.242	0.62		
		Edge 2 at 0mm	0.007		0.01		

16.2 SPLSR Evaluation and Analysis

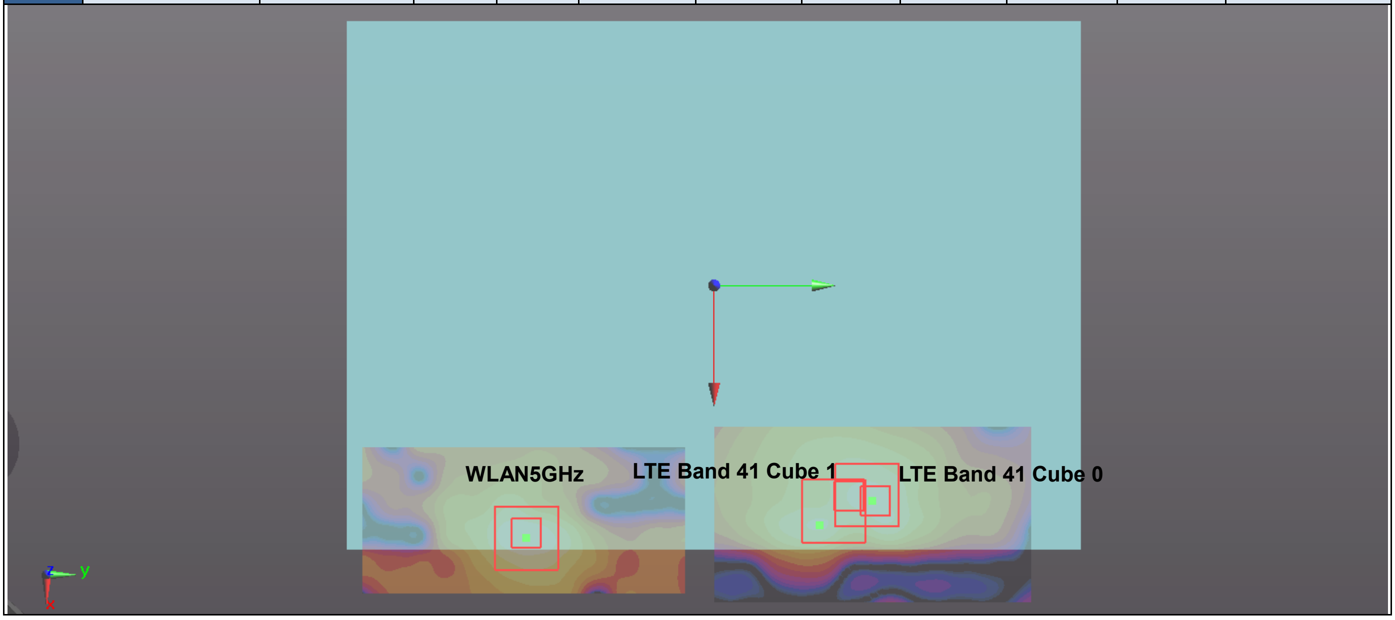
General Note:

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.

	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #1	LTE Band 41 Cube 0	Bottom Face	1.186	0	7.72	5.8	-0.22	116.39	2.383	0.03	Not required
	WLAN2.4GHz		1.197	0	7.24	-5.82	0.24				
	LTE Band 41 Cube 1		0.747	0	7.06	5.1	-0.23	109.32	1.944	0.02	Not required
	WLAN2.4GHz		1.197	0	7.24	-5.82	0.24				



	Band	Position	SAR (W/kg)	Gap	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
Case #2	LTE Band 41 Cube 0	Bottom Face	1.186	0	7.72	5.8	-0.22	121.47	2.284	0.03	Not required
	WLAN5GHz		1.098	0	8.36	-6.32	0.27				
	LTE Band 41 Cube 1		0.747	0	7.06	5.1	-0.23	115.05	1.845	0.02	Not required
	WLAN5GHz		1.098	0	8.36	-6.32	0.27				



Test Engineer : Nick Hu

17. 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 17.1. 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 17.2. 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 17.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

18. 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 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[9] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, 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: 2017.10.26

System Check_Body_2450MHz

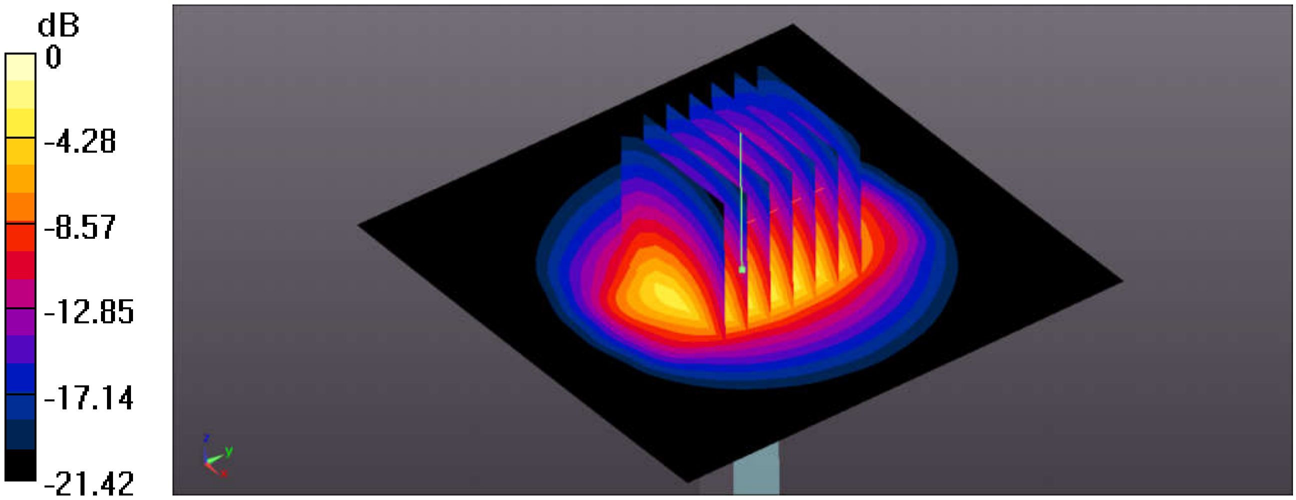
DUT: D2450V2 - SN:840

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.932 S/m; ε_r = 53.699; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.7, 7.7, 7.7); Calibrated: 2017.5.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- 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) = 17.7 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.30 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 23.7 W/kg
SAR(1 g) = 11.9 W/kg; SAR(10 g) = 5.58 W/kg
Maximum value of SAR (measured) = 17.9 W/kg



0 dB = 17.9 W/kg = 12.53 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.29

System Check_Body_2600MHz

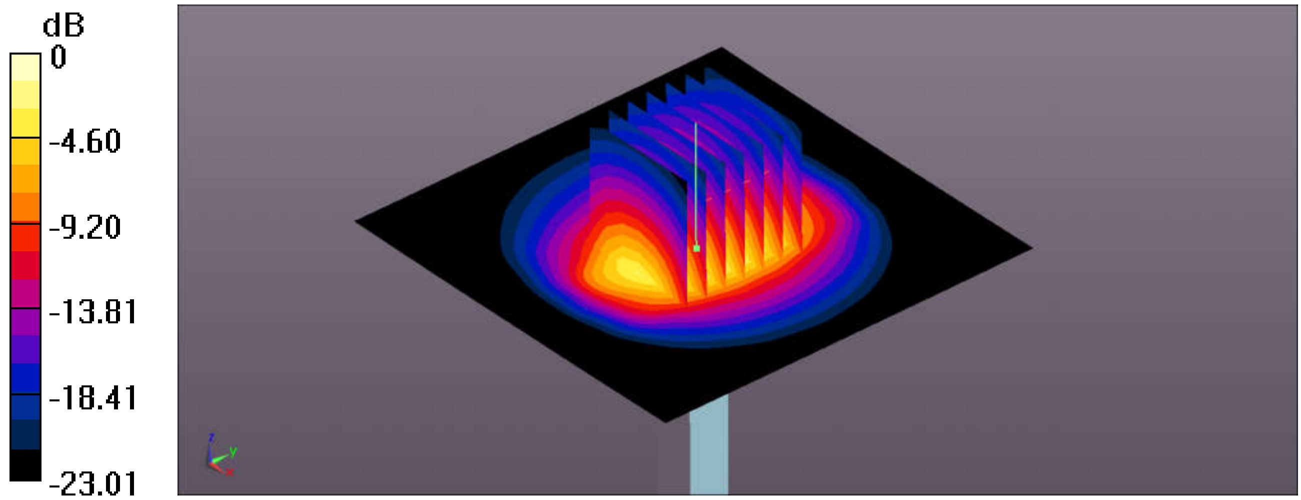
DUT: D2600V2 - SN:1061

Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL_2600 Medium parameters used: f = 2600 MHz; σ = 2.139 S/m; ε_r = 53.172; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.59, 7.59, 7.59); Calibrated: 2017.5.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- 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) = 20.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.89 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.12 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.27

System Check_Body_5250MHz

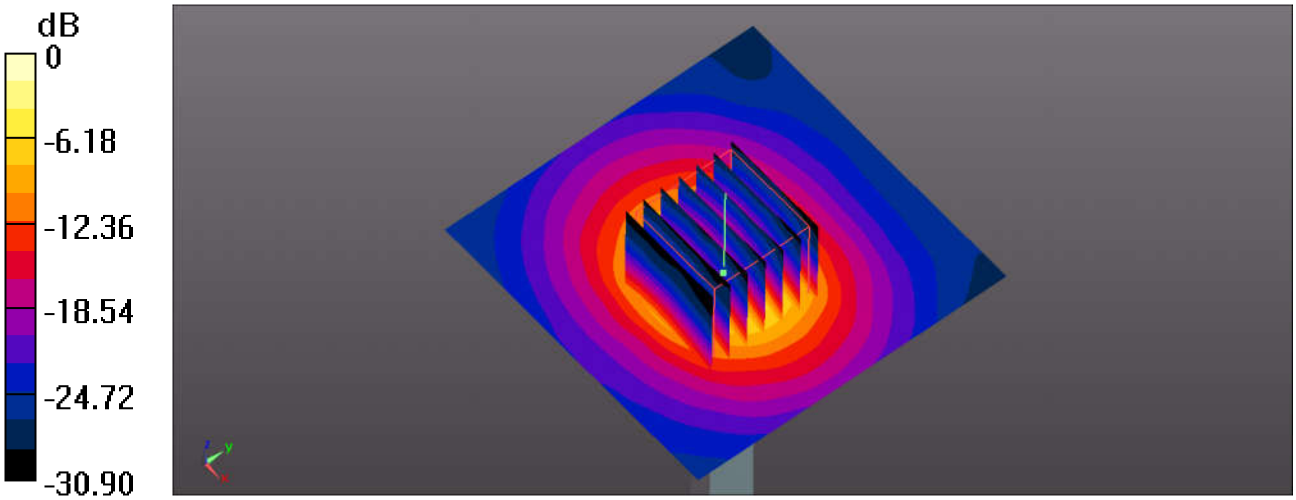
DUT: D5GHzV2-1113

Communication System: UID 0, CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5200 MHz; σ = 5.297 S/m; ε_r = 49.185; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.72, 4.72, 4.72); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- 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) = 18.5 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 37.54 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 7.25 W/kg; SAR(10 g) = 2.05 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

System Check_Body_5600MHz

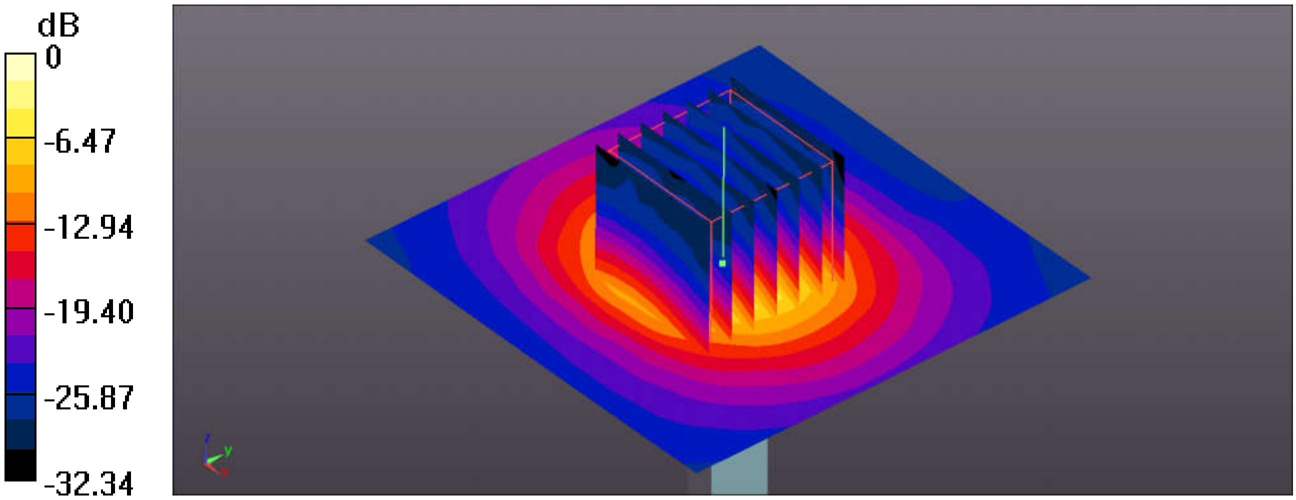
DUT: D5GHzV2-1113

Communication System: UID 0, CW; Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5600 MHz; σ = 5.872 S/m; ε_r = 48.306; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.01, 4.01, 4.01); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- 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) = 22.8 W/kg

Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 39.70 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 33.8 W/kg
SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 21.9 W/kg



0 dB = 21.9 W/kg = 13.4 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

01_LTE Band 41_20M_QPSK_1RB_49Offset_Bottom Face_0mm_Ch40185_Sensor On_Sample 1

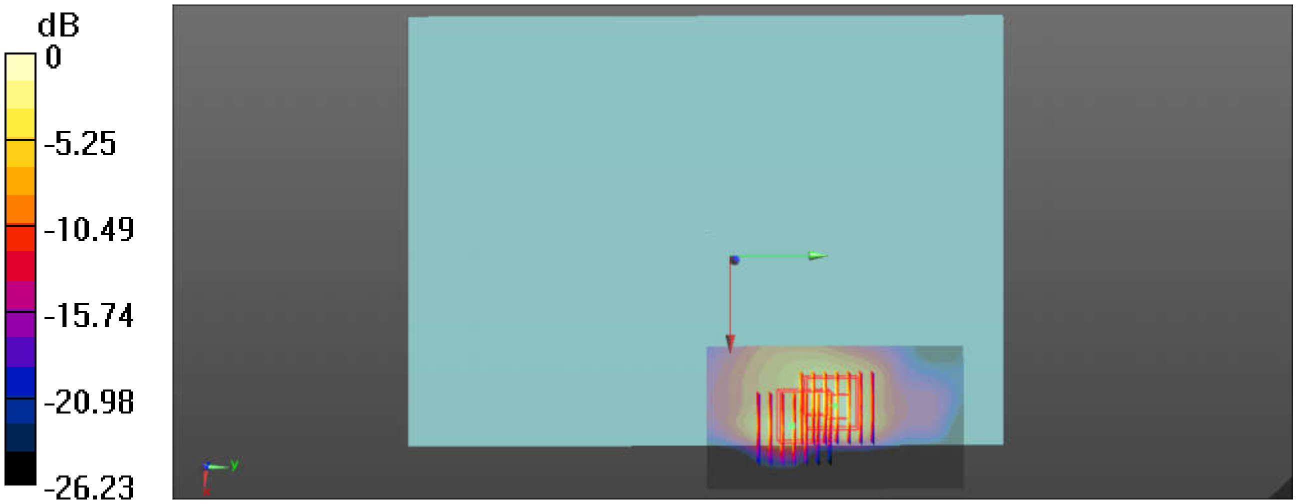
Communication System: UID 0, TDD_LTE (0); Frequency: 2549.5 MHz;Duty Cycle: 1:1.59
Medium: MSL_2600 Medium parameters used: f = 2549.5 MHz; σ = 2.069 S/m; ε_r = 53.344; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.59, 7.59, 7.59); Calibrated: 2017.5.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch40185/Area Scan (51x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.28 W/kg

Ch40185/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.226 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.79 W/kg
SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.447 W/kg
Maximum value of SAR (measured) = 1.71 W/kg

Ch40185/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.226 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 0.668 W/kg; SAR(10 g) = 0.303 W/kg
Maximum value of SAR (measured) = 1.30 W/kg



0 dB = 1.30 W/kg = 1.14 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.26

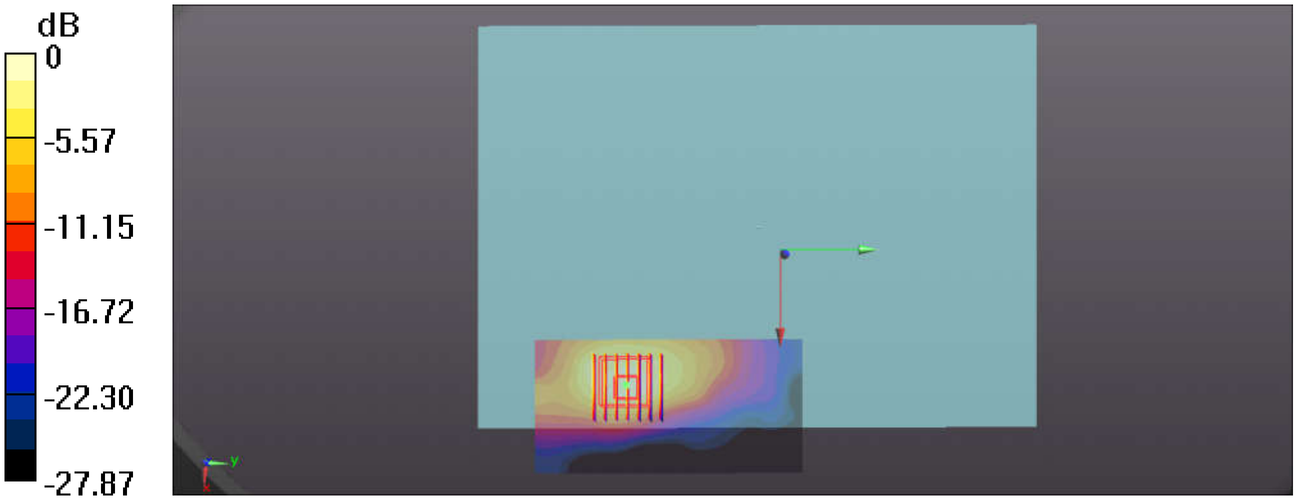
02_WLAN2.4GHz_802.11b 1Mbps_Bottom Face_0mm_Ch1_Sensor Off_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1.025
Medium: MSL_2450 Medium parameters used: f = 2412 MHz; σ = 1.881 S/m; ε_r = 53.854; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.7, 7.7, 7.7); Calibrated: 2017.5.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (51x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.83 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.9260 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.40 W/kg
SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.500 W/kg
Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

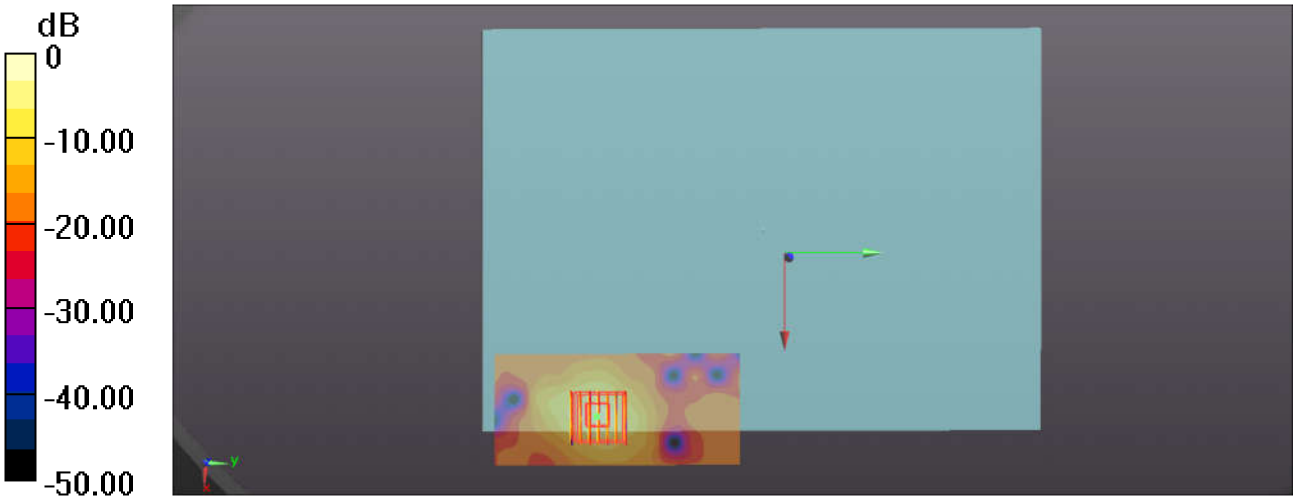
03_WLAN 5.3GHz_802.11n-HT40 MCS0_Bottom Face_0mm_Ch62_Sensor On_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 5310 MHz;Duty Cycle: 1:1.158
Medium: MSL_5000 Medium parameters used: f = 5310 MHz; σ = 5.456 S/m; ε_r=48.96; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.72, 4.72, 4.72); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch62/Area Scan (51x111x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.63 W/kg

Ch62/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.732 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.35 W/kg
SAR(1 g) = 0.771 W/kg; SAR(10 g) = 0.206 W/kg
Maximum value of SAR (measured) = 1.93 W/kg



0 dB = 1.93 W/kg = 2.86 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.27

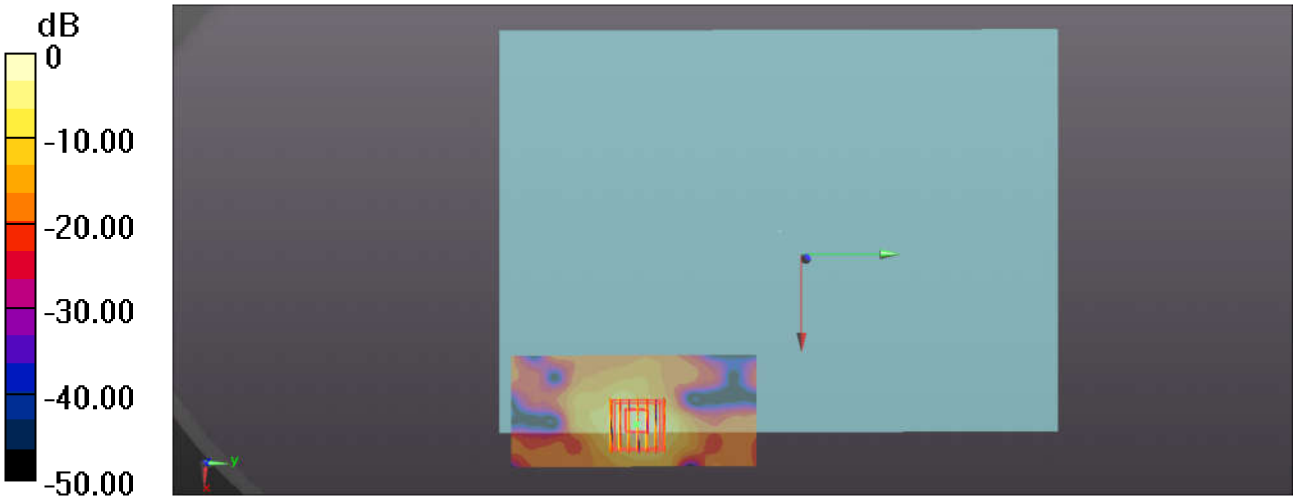
04_WLAN 5.5GHz_802.11n-HT40 MCS0_Bottom Face_0mm_Ch126_Sensor On_Sample 1

Communication System: UID 0, WIFI (0); Frequency: 5630 MHz;Duty Cycle: 1:1.158
Medium: MSL_5000 Medium parameters used: f = 5630 MHz; σ = 5.915 S/m; ε_r = 48.225; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.01, 4.01, 4.01); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch126/Area Scan (51x111x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.34 W/kg

Ch126/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.607 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.93 W/kg
SAR(1 g) = 0.855 W/kg; SAR(10 g) = 0.239 W/kg
Maximum value of SAR (measured) = 2.09 W/kg



0 dB = 2.09 W/kg = 3.20 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.26

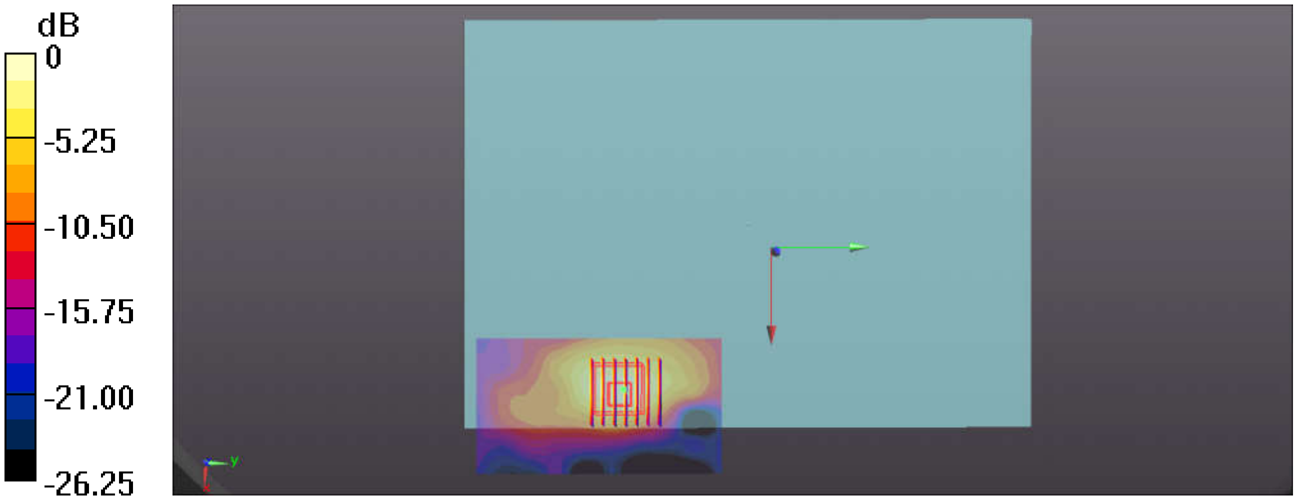
05_ Bluetooth_1Mbps_Bottom Face_0mm_Ch39_Sensor Off_Sample 1

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.295
Medium: MSL_2450 Medium parameters used: f = 2441 MHz; σ = 1.92 S/m; ε_r = 53.738; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.7, 7.7, 7.7); Calibrated: 2017.5.26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM4; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch39/Area Scan (51x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.389 W/kg

Ch39/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.7940 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.536 W/kg
SAR(1 g) = 0.244 W/kg; SAR(10 g) = 0.111 W/kg
Maximum value of SAR (measured) = 0.366 W/kg



0 dB = 0.366 W/kg = -4.37 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client: Sporton-CN

Certificate No: Z16-97231

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 840
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 25, 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 27, 2016

In Collaboration with
speag
CALIBRATION LABORATORY

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

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%.

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

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	1.79 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	13.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**54.0 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.3 ± 6 %	1.97 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	12.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.9 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.02 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7Ω+ 5.54jΩ
Return Loss	- 24.9dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.8Ω+ 6.00jΩ
Return Loss	- 24.4dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.045 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: 11.25.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 840

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.793 S/m; εr = 38.86; ρ = 1000 kg/m3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.45, 7.45, 7.45); 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)

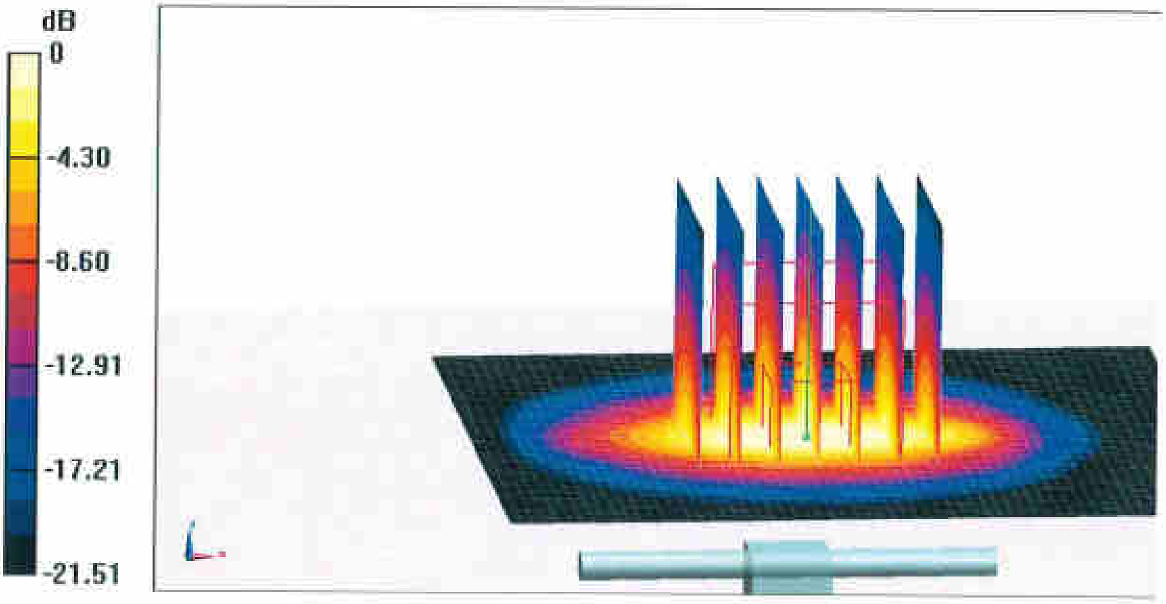
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.5 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.33 W/kg

Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.12 dBW/kg

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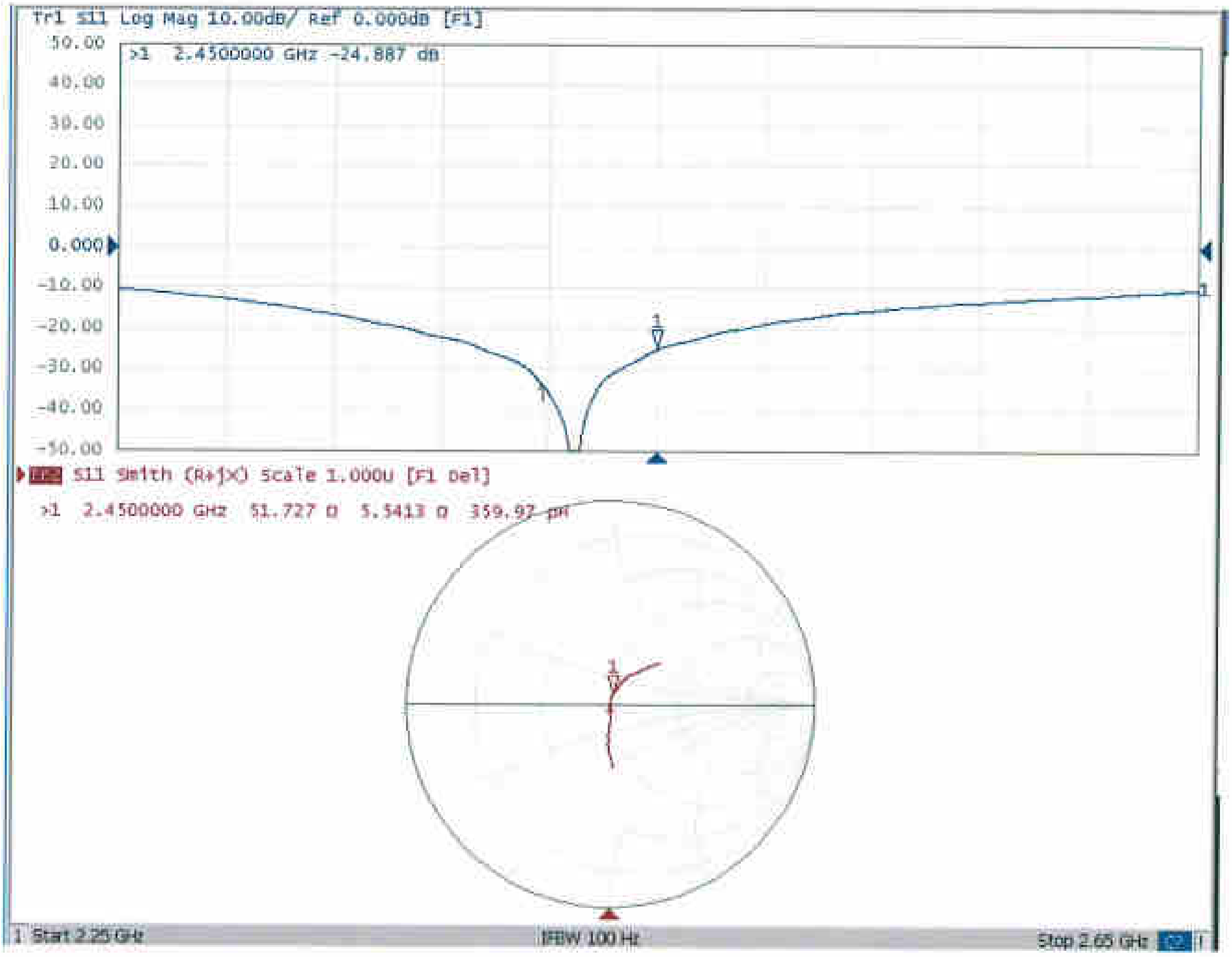
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 11.24.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 840

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2450 MHz; σ = 1.966 S/m; ε_r = 52.29; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.46, 7.46, 7.46); 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)

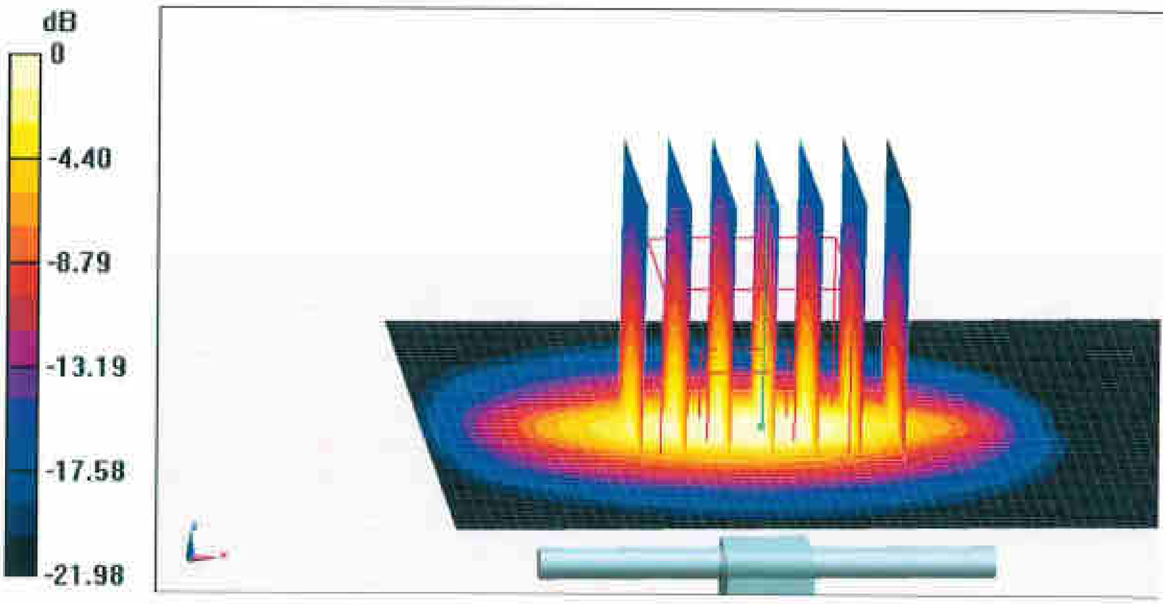
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.46 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 25.9 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 19.2 W/kg



0 dB = 19.2 W/kg = 12.83 dBW/kg

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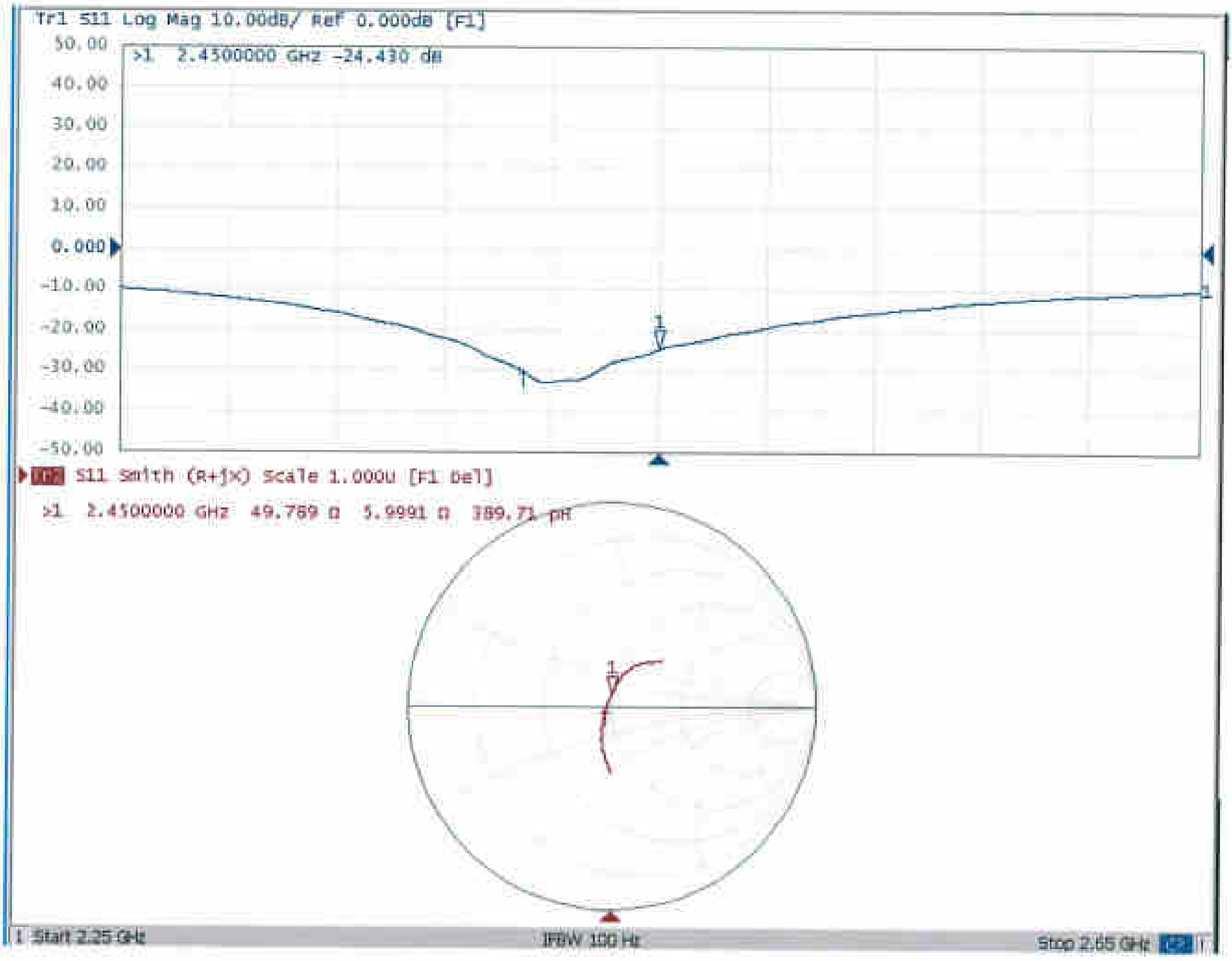
Impedance Measurement Plot for Body TSL



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Client **Sporton-CN** Certificate No: **Z16-97232**

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1061
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	November 24, 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	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
Power sensor NRP-Z91	101547	01-Jul-15 (CTTL, No.J15X04256)	Jun-16
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 27, 2016

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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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.3 ± 6 %	1.94 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	14.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**56.0 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.41 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.6 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.1 ± 6 %	2.17 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	13.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**55.4 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.37 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**25.4 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1Ω- 5.42jΩ
Return Loss	- 25.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.4Ω- 4.43jΩ
Return Loss	- 24.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.031 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: 11.24.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1061

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 1.941 S/m; εr = 38.28; ρ = 1000 kg/m3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.19, 7.19, 7.19); 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)

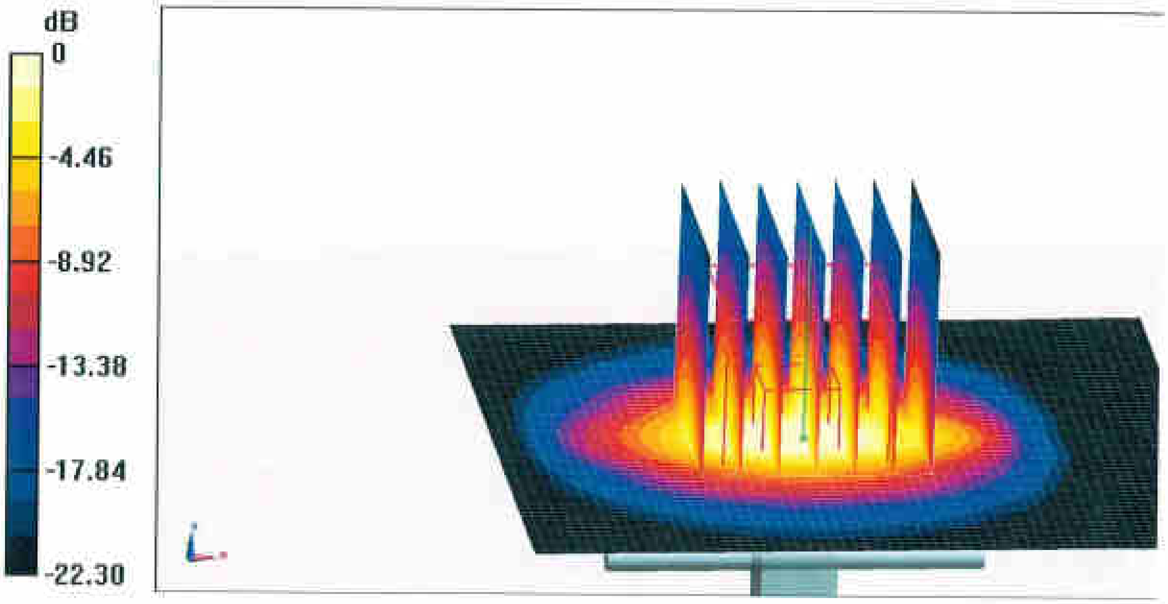
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.1 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 14 W/kg; SAR(10 g) = 6.41 W/kg

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



0 dB = 21.4 W/kg = 13.30 dBW/kg

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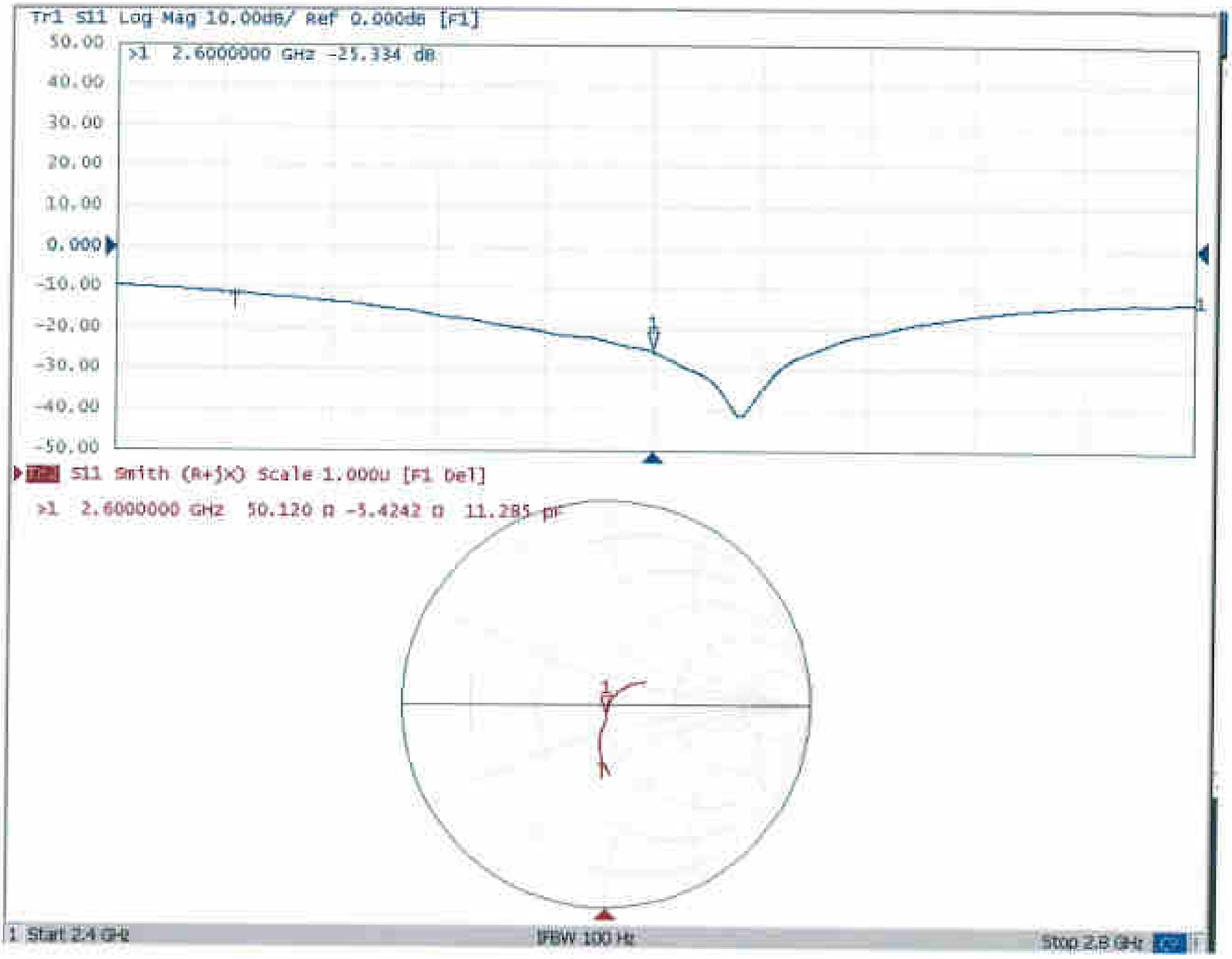
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 11.24.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1061

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2600 MHz; σ = 2.173 S/m; ε_r = 52.13; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.22, 7.22,7.22); 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)

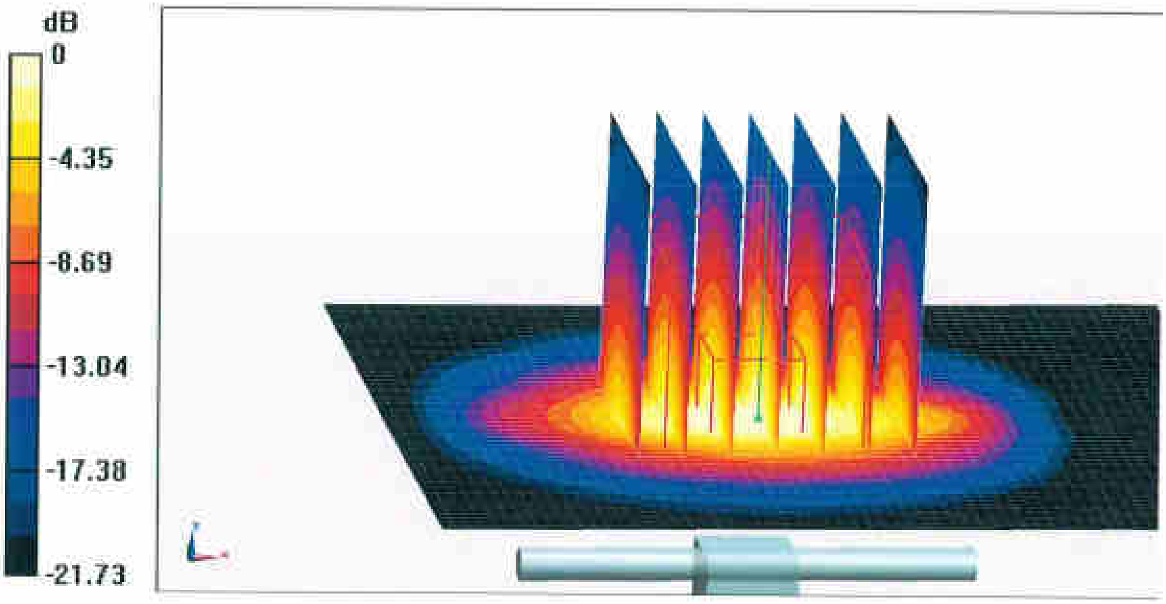
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.6 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.37 W/kg

Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

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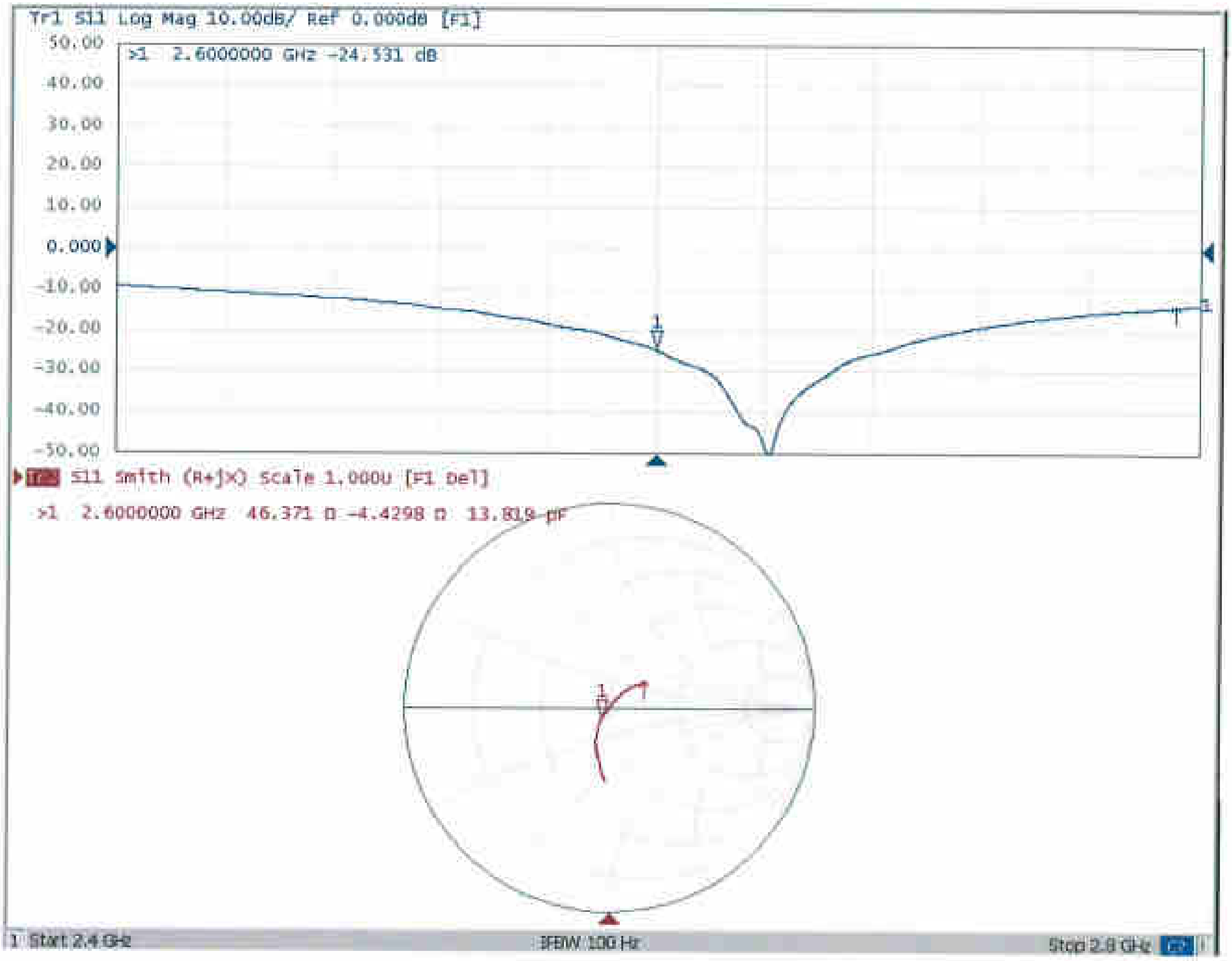
Impedance Measurement Plot for Body TSL



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Client **Sporton-CN** **Certificate No: Z16-97234**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN: 1113

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

Calibration date: December 13, 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
ReferenceProbe EX3DV4	SN 7307	19-Feb-16(SPEAG,No.EX3-7307_Feb16)	Feb-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
NetworkAnalyzer 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: December 15, 2016

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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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.3 ± 6 %	4.72 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.62 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**76.4 mW /g ± 23.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.8 mW /g ± 22.2 % (k=2)**

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Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.17 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.07 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.8 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.0 mW /g ± 22.2 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	5.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.03 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.3 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.28 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 mW /g ± 22.2 % (k=2)**

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Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.9 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.1 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 mW /g ± 22.2 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.9 ± 6 %	5.74 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.97 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**79.8 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.25 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 mW /g ± 22.2 % (k=2)**

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Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.7 ± 6 %	5.91 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.51 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**75.2 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.11 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 mW /g ± 22.2 % (k=2)**

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Appendix

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	51.2Ω - 5.57jΩ
Return Loss	- 25.0dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.9Ω - 0.17jΩ
Return Loss	- 22.7dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	53.2Ω - 0.30jΩ
Return Loss	- 30.3dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	52.0Ω - 4.21jΩ
Return Loss	- 26.8dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.3Ω + 4.48jΩ
Return Loss	- 22.8dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	53.7Ω + 2.93jΩ
Return Loss	- 26.9dB

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General Antenna Parameters and Design

Electrical Delay (one direction)	1.301 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

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DASY5 Validation Report for Head TSL Date: 12.12.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1113

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz,

Medium parameters used: f = 5250 MHz; σ = 4.724 mho/m; εr = 36.26; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 5.172 mho/m; εr = 35.54; ρ = 1000 kg/m3, Medium parameters used: f = 5750 MHz; σ = 5.371 mho/m; εr = 35.17; ρ = 1000 kg/m3,

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(5.32,5.32,5.32); Calibrated: 2016/2/19, ConvF(4.52,4.52,4.52); Calibrated: 2016/2/19, ConvF(4.45,4.45,4.45); Calibrated: 2016/2/19,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2016/2/2
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/3
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.56 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.62 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

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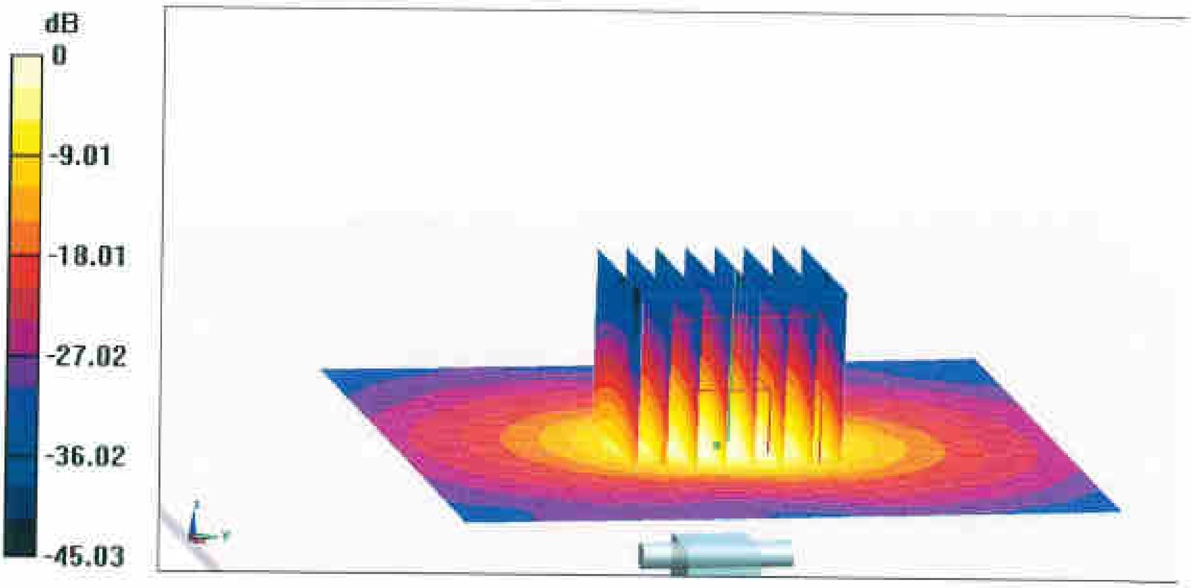
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.62 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.6 W/kg = 12.92 dBW/kg

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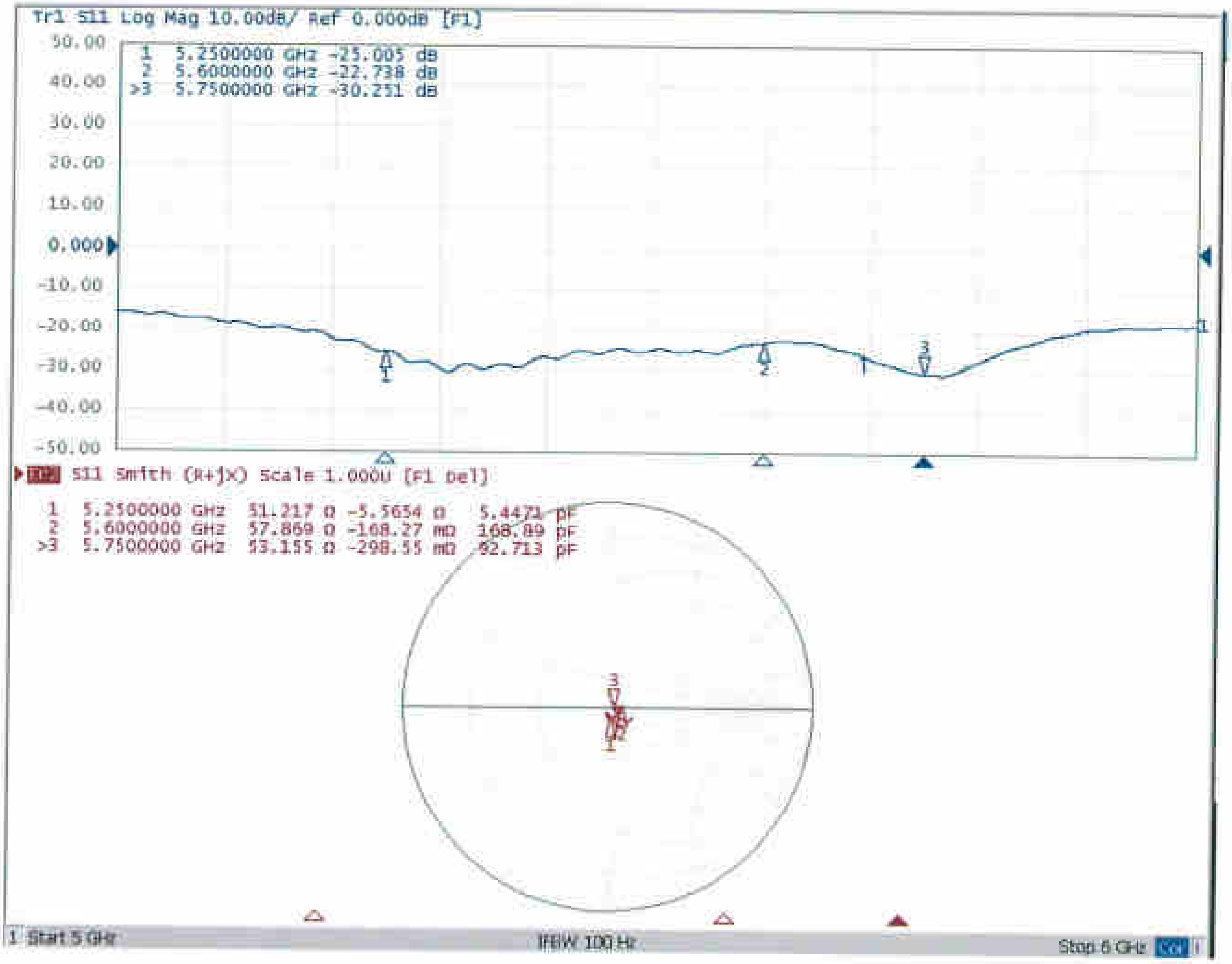
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 12.13.2016

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1113

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz,

Medium parameters used: f = 5250 MHz; σ = 5.442 mho/m; εr = 47.93; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 5.74 mho/m; εr = 48.92; ρ = 1000 kg/m3, Medium parameters used: f = 5750 MHz; σ = 5.91 mho/m; εr = 48.73; ρ = 1000 kg/m3,

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(4.48,4.48,4.48); Calibrated: 2016/2/19, ConvF(3.72,3.72,3.72); Calibrated: 2016/2/19, ConvF(3.91,3.91,3.91); Calibrated: 2016/2/19,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2016/2/2
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/3
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 50.72 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.1 W/kg
SAR(1 g) = 7.63 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.44 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

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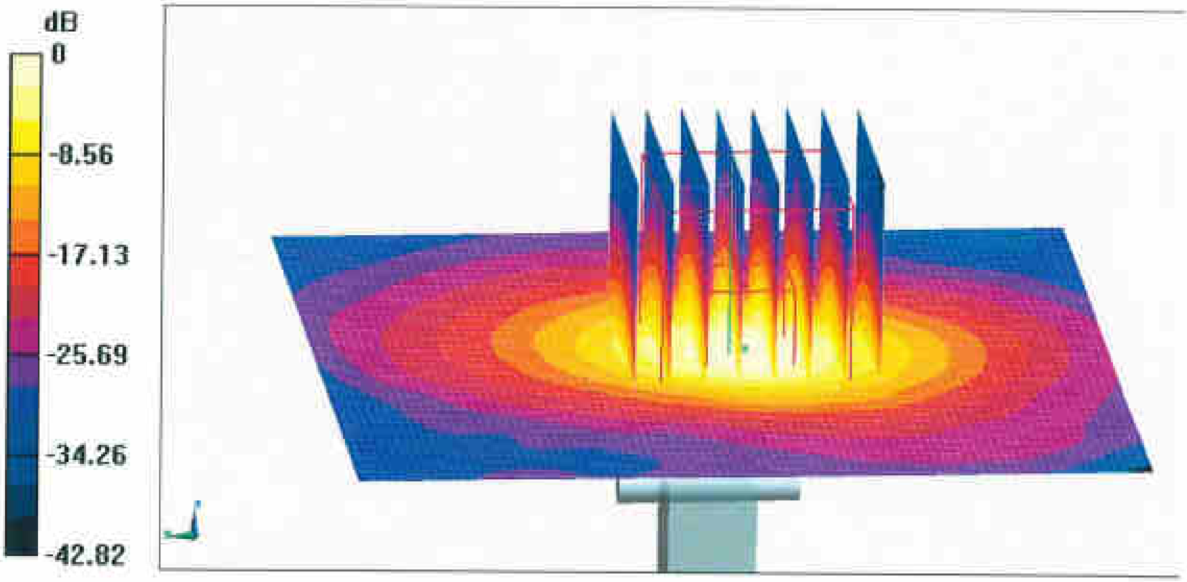
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.59 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.11 W/kg
Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 18.5 W/kg = 12.67 dBW/kg

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Impedance Measurement Plot for Body TSL