FCC SAR Test Report

APPLICANT	**:**	**ZTE CORPORATION**
EQUIPMENT	**:**	**LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone**
BRAND NAME	**:**	**ZTE**
MODEL NAME	**:**	**Z999**
FCC ID	**:**	**SRQ-Z999**
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

Sporton International (Kunshan) Inc.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA760101-02	Rev. 01	Initial issue of report	Nov. 29, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION, LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone, Z999,** are as follows.

Highest 1g SAR Summary						
Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 10mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.44	1.07	0.93	1.48
		GSM1900	0.18	1.18	0.80	
	WCDMA	Band V	0.26	0.44	0.44	
		Band IV	0.21	1.15	0.64	
		Band II	0.21	1.20	0.80	
	LTE	Band 12	0.16	0.43	0.30	
		Band 5	0.22	0.36	0.36	
		Band 66/Band 4	0.26	1.18	**0.96**	
		Band 2	0.19	**1.20**	0.92	
		Band 30	**1.05**	1.04	0.35	
DTS	WLAN	2.4GHz WLAN	0.44	0.10	<0.10	1.20
NII		5GHz WLAN	0.84		<0.10	1.48

Highest 10g SAR Summary				
Equipment Class	Frequency Band		Product Specific 10g SAR (W/kg) (Separation 0mm)	Highest Simultaneous Transmission 10g SAR (W/kg)
Licensed	GSM	GSM1900	3.72	3.84
	WCDMA	Band IV	3.50	
		Band II	3.64	
	LTE	Band 66/Band 4	3.51	
		Band 2	**3.84**	
NII	WLAN	5GHz WLAN	0.52	3.84
Date of Testing:			2017/10/24 ~ 2017/11/6	

Remark: This device supports both LTE B4 and B66. Since the supported frequency span for LTE B4 falls completely within the supports frequency span for LTE B66, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B66.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; 10-gram SAR for Product Specific 10g SAR, limit: 4.0W/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	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

Manufacturer	
Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

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 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z999
FCC ID	SRQ-Z999
IMEI Code	WWAN SAR Test Sample: 865800030006586 WLAN SAR Test Sample: 865800030027970
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 30: 2307.5 MHz ~ 2312.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA HSPA+ (16QAM uplink is not supported) LTE: QPSK, 16QAM WLAN 2.4GHz : 802.11b/g/n HT20/HT40 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth v3.0+EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE NFC
HW Version	Z999HWV1.0
SW Version	Z999V1.0.0B25
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. This device does not support DTM operation and supports GRPS/EGRPS mode up to multi-slot class 10.
3. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications.
4. This device 5.2GHz WLAN/5.8GHz WLAN does not support hotspot operation and supports WiFi Direct.
5. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GSM1900, WCDMA B2 / B4 and LTE B2 / B4 / B66.
6. This device has two WWAN antennas. WWAN antenna 1 is located at the bottom side of the device and WWAN antenna 2 is located at the right side of the device which can refer to antenna location chapter. WWAN antenna 1 frequency bands include GSM850/1900, WCDMA B2 / B4 / B5, LTE B2 / B4 / B5 / B12 / B66 and WWAN antenna 2 frequency bands only include LTE B30.
7. The device is capable of switching between antenna 1 and antenna 2 based on signal strength.
8. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
9. This is a dual screens side flip smartphone. The device has two screens, mounted on the front and back face. When the device screen is closed, the back face screen can’t work; when the device screen is open, these two screens can be used as one screen or as two screens separate.

10.	This is a variant report for Z999. The product equality declaration could be referred to Appendix E. Based on the original test report, only WLAN were verified for full test, other test cases could referred to the original test report (Sporton Report Number FA760101).

4.2 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>SRQ-Z999</td></tr>
<tr><td>Equipment Name</td><td>LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850.7 MHz ~ 1909.3 MHz
LTE Band 4: 1710.7 MHz ~ 1754.3 MHz
LTE Band 5: 824.7 MHz ~ 848.3 MHz
LTE Band 12: 699.7 MHz ~ 715.3 MHz
LTE Band 30: 2307.5 MHz ~ 2312.5 MHz
LTE Band 66: 1710.7 MHz ~ 1779.3 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
LTE Band 30: 5MHz, 10MHz
LTE Band 66: 1.4MHz, 3MHz,5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE Release Version</td><td>R11, Cat11</td></tr>
<tr><td>CA Support</td><td>Yes, Downlink Only</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>Yes, when operating in hotspot mode that LTE B2 / B4 / B66 power reduction applied to satisfy SAR compliance.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Inter-Band possible combinations and the detail power verification please referred to section 12.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>This device supports maximum of 2 and 3 carriers in the downlink only. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.</td></tr>
</table>

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

LTE Band 2

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

LTE Band 4

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

LTE Band 5

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

LTE Band 12

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

LTE Band 30

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	27685	2307.5		
M	27710	2310	27710	2310
H	27735	2312.5		

LTE Band 66

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

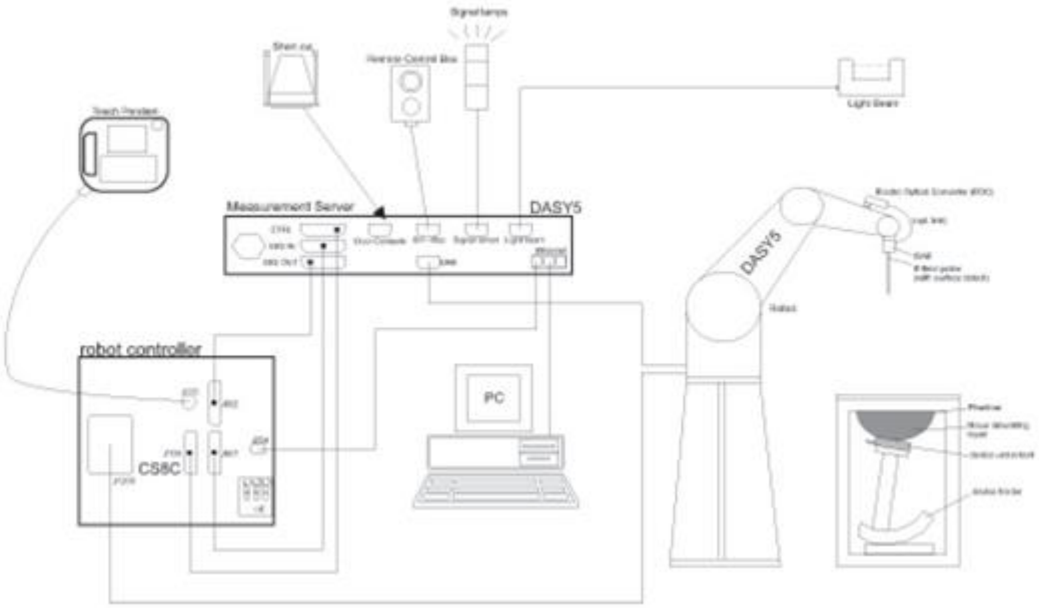
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

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

<EX3DV4 Probe>

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

7.2 Data Acquisition Electronics (DAE)

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

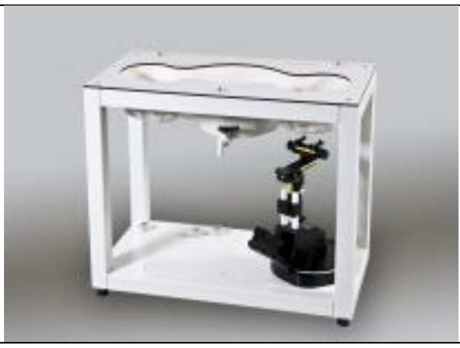
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

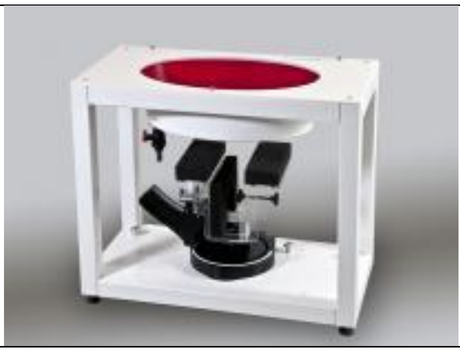
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



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

<ELI Phantom>

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



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

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

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

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

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

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

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For 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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 Power Reference Measurement

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

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit	D2450V2	840	2016/11/25	2017/11/24
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2016/12/13	2017/12/12
SPEAG	Data Acquisition Electronics	DAE4	1326	2017/9/15	2018/9/14
SPEAG	Data Acquisition Electronics	DAE4	1210	2017/5/25	2018/5/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	3954	2016/11/28	2017/11/27
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2017/5/26	2018/5/25
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1164	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1842	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1839	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2017/4/18	2018/4/17
SPEAG	DAK Kit	DAK3.5	1144	2016/11/23	2017/11/22
R&S	Signal Generator	SMR40	100455	2017/1/19	2018/1/18
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
R&S	CBT BLUETOOTH TESTER	CBT	100783	2017/8/8	2018/8/7
EXA	Spectrum Analyzer	N9010A	MY55150244	2017/4/18	2018/4/17
WISEWIND	Hygrometer	WISEWIND 0905	905	2017/4/20	2018/4/19
JM	DIGITAC THERMOMETER	JM222	AA1207166	2017/4/19	2018/4/18
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

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. 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. 10.2.

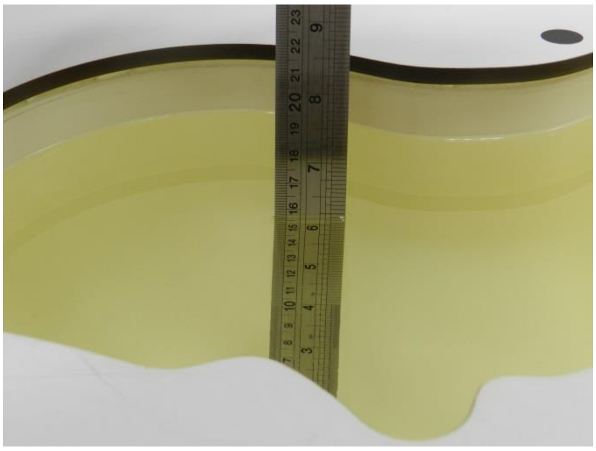


Fig 10.1Photo of Liquid Height for Head SAR

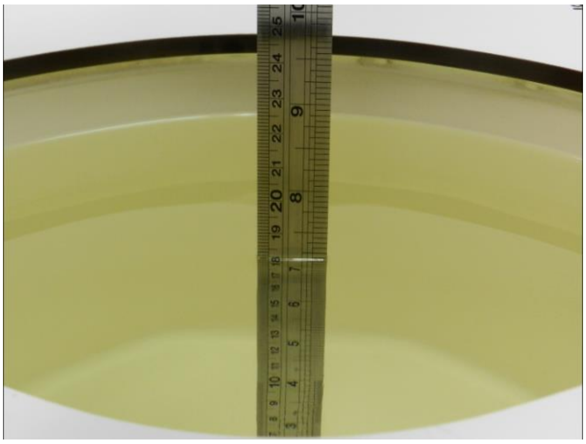


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
2450	68.6	0	0	0	0	31.4	1.95	52.7

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	Head	22.8	1.868	38.170	1.80	39.20	3.78	-2.63	±5	2017/11/6
5250	Head	22.7	4.882	37.304	4.71	35.90	3.65	3.91	±5	2017/11/5
5750	Head	22.8	5.415	36.543	5.22	35.40	3.74	3.23	±5	2017/11/5
2450	Body	22.6	2.012	54.299	1.95	52.70	3.18	3.03	±5	2017/11/5
5250	Body	22.6	5.379	49.115	5.36	48.90	0.35	0.44	±5	2017/10/24
5750	Body	22.6	6.070	47.985	5.94	48.30	2.19	-0.65	±5	2017/10/24

10.3 System Performance Check Results

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

<1g SAR>:

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 (%)
2017/11/6	2450	Head	250	840	3954	1326	13.40	54.00	53.60	-0.74
2017/11/5	5250	Head	100	1113	3954	1326	7.68	76.40	76.80	0.52
2017/11/5	5750	Head	100	1113	3954	1326	7.72	80.30	77.20	-3.86
2017/11/5	2450	Body	250	840	3857	1210	13.50	50.90	54.00	6.09
2017/10/24	5250	Body	100	1113	3857	1210	7.69	76.10	76.90	1.05
2017/10/24	5750	Body	100	1113	3857	1210	7.56	75.20	75.60	0.53

<10g SAR>:

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2017/10/24	5250	Body	100	1113	3857	1210	2.32	21.50	23.20	7.91
2017/10/24	5750	Body	100	1113	3857	1210	2.08	21.10	20.80	-1.42

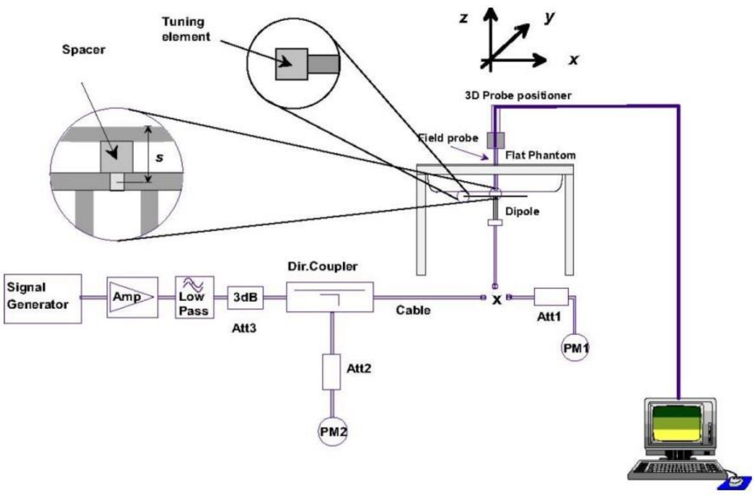


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled "M," the left ear reference point (ERP) is marked "LE," and the right ERP is marked "RE." Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

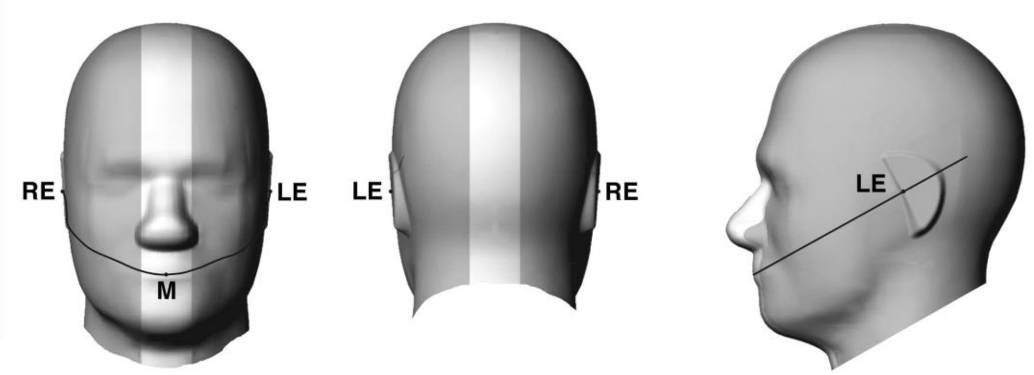


Fig 9.1.1 Front, back, and side views of SAM twin phantom

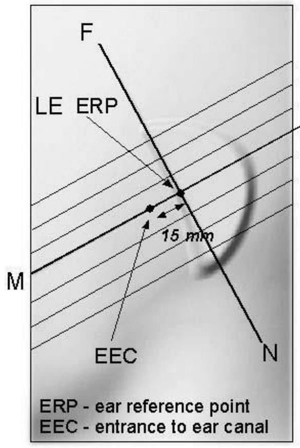


Fig 9.1.2 Close-up side view of phantom showing the ear region.

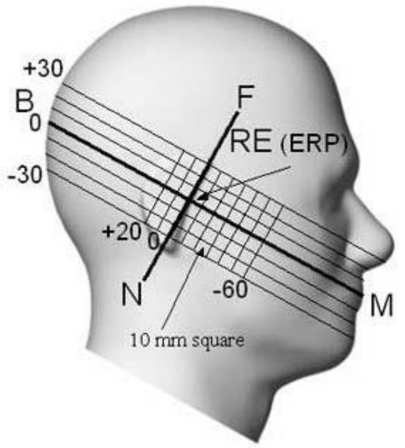


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 9.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

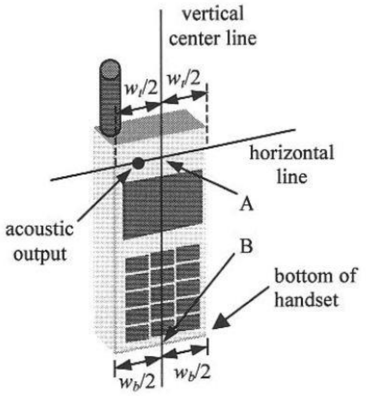


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

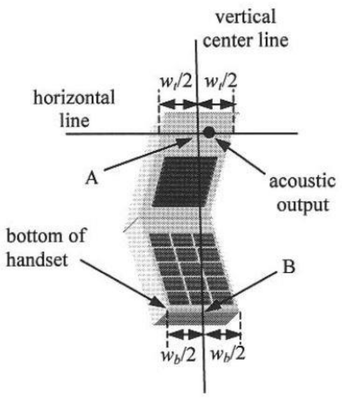


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

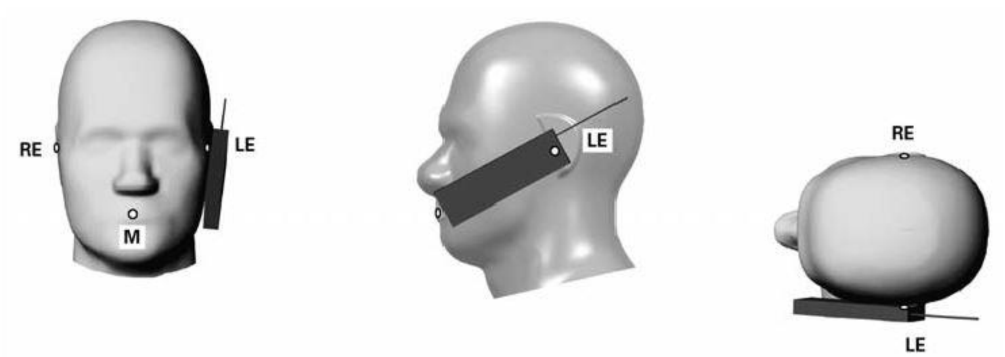


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

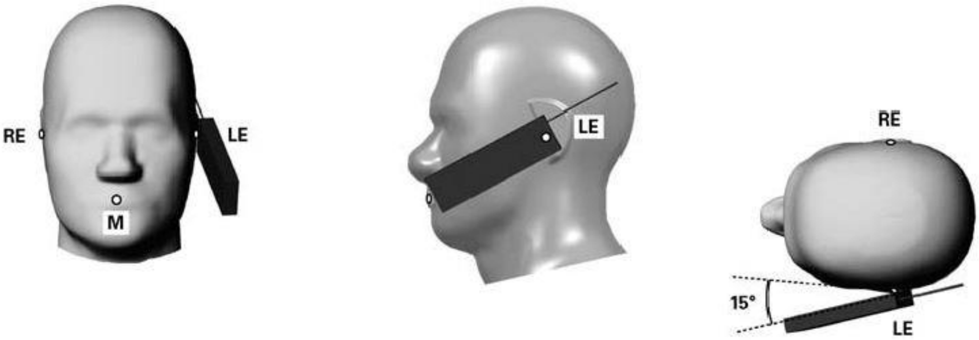


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 9.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.

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

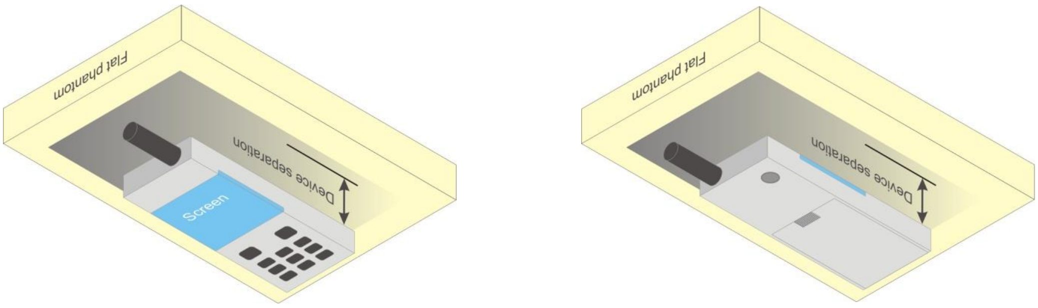


Fig 9.4 Body Worn Position

11.5 Extremity Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

11.6 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was not activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

12. Conducted RF Output Power (Unit: dBm)

<WLAN Conducted Power>

General Note:

1. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
2. 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.
3. 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).
4. 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.
5. 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.

<u><2.4GHz WLAN Ant.2></u>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	15.23	15.50	100.00
		6	2437	15.42	15.50	
		11	2462	15.45	15.50	
	802.11g 6Mbps	1	2412	13.12	14.00	94.70
		6	2437	12.78	14.00	
		11	2462	13.35	14.00	
	802.11n-HT20 MCS0	1	2412	11.07	12.00	94.35
		6	2437	11.64	12.00	
		11	2462	11.00	12.00	
	802.11n-HT40 MCS0	3	2422	11.61	12.00	89.12
		6	2437	11.39	12.00	
		9	2452	10.21	12.00	

<u><2.4GHz WLAN Ant. 1+2></u>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11n-HT20 MCS0	1	2412	14.39	15.50	94.35
		6	2437	14.83	15.50	
		11	2462	14.45	15.50	
	802.11n-HT40 MCS0	3	2422	14.64	15.00	89.12
		6	2437	14.64	15.00	
		9	2452	14.06	15.00	

<5GHz WLAN Ant.2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.50	14.00	95.32
		40	5200	13.37	14.00	
		44	5220	13.30	14.00	
		48	5240	13.53	14.00	
	802.11n-HT20 MCS0	36	5180	12.69	13.00	95.34
		40	5200	12.32	13.00	
		44	5220	12.53	13.00	
		48	5240	12.66	13.00	
	802.11n-HT40 MCS0	38	5190	12.36	13.00	90.35
		46	5230	12.27	13.00	
	802.11ac-VHT20 MCS0	36	5180	9.26	9.50	95.00
		40	5200	8.98	9.50	
		44	5220	9.01	9.50	
		48	5240	9.13	9.50	
	802.11ac-VHT40 MCS0	38	5190	9.63	10.00	90.35
		46	5230	9.79	10.00	
	802.11ac-VHT80 MCS0	42	5210	9.70	10.00	82.43

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	10.97	11.50	95.32
		157	5785	10.14	11.50	
		165	5825	11.47	13.00	
	802.11n-HT20 MCS0	149	5745	12.34	12.50	95.34
		157	5785	12.45	12.50	
		165	5825	11.66	12.00	
	802.11n-HT40 MCS0	151	5755	12.46	12.50	90.35
		159	5795	12.05	12.50	
	802.11ac-VHT20 MCS0	149	5745	8.94	9.00	95.00
		157	5785	9.21	9.50	
		165	5825	8.14	8.50	
	802.11ac-VHT40 MCS0	151	5755	9.46	9.50	90.35
		159	5795	8.56	9.00	
	802.11ac-VHT80 MCS0	155	5775	9.69	10.00	82.43

<5GHz WLAN Ant.1+2>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11n-HT20 MCS0	36	5180	16.09	16.50	95.34
		40	5200	15.90	16.50	
		44	5220	16.06	16.50	
		48	5240	16.11	16.50	
	802.11n-HT40 MCS0	38	5190	15.65	16.00	90.35
		46	5230	15.69	16.00	
	802.11ac-VHT20 MCS0	36	5180	12.74	13.50	95.00
		40	5200	12.39	13.50	
		44	5220	12.40	13.50	
		48	5240	12.53	13.50	
	802.11ac-VHT40 MCS0	38	5190	13.16	13.50	90.35
		46	5230	13.22	13.50	
	802.11ac-VHT80 MCS0	42	5210	13.06	13.50	82.43

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11n-HT20 MCS0	149	5745	14.84	15.00	95.34
		157	5785	14.50	15.00	
		165	5825	14.68	15.00	
	802.11n-HT40 MCS0	151	5755	15.09	15.50	90.35
		159	5795	15.13	15.50	
	802.11ac-VHT20 MCS0	149	5745	11.43	11.50	95.00
		157	5785	11.22	11.50	
		165	5825	11.22	11.50	
	802.11ac-VHT40 MCS0	151	5755	11.93	12.00	90.35
		159	5795	11.67	12.00	
	802.11ac-VHT80 MCS0	155	5775	11.65	12.00	82.43

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0 LE / v4.1 LE
2.4GHz Bluetooth	8.5	0.5

Note:

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

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

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

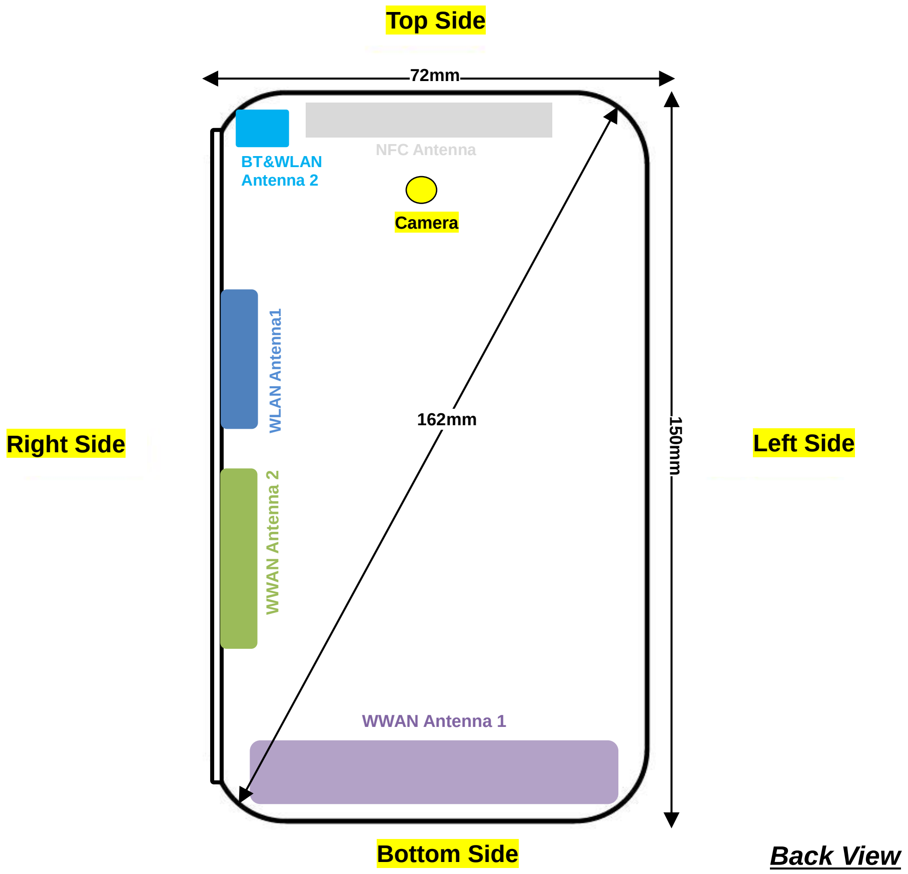
Bluetooth Max Power (dBm)	Frequency (GHz)	Separation Distance (mm)		Exclusion Thresholds	
		1-g SAR	10-g extremity SAR	1-g SAR	10-g extremity SAR
8.5	2.48	10	0	1.1	2.2

Note:

1. Per KDB 447498 D01v06, a distance of 10 mm is applied to determine 1g SAR test exclusion. The test exclusion threshold is 1.1 which is <= 3, SAR testing is not required.
2. Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR 10g SAR test exclusion. The test exclusion threshold is 2.2 which is <= 7.5, SAR testing is not required.

14. Antenna Location

<Flip Close Mode>



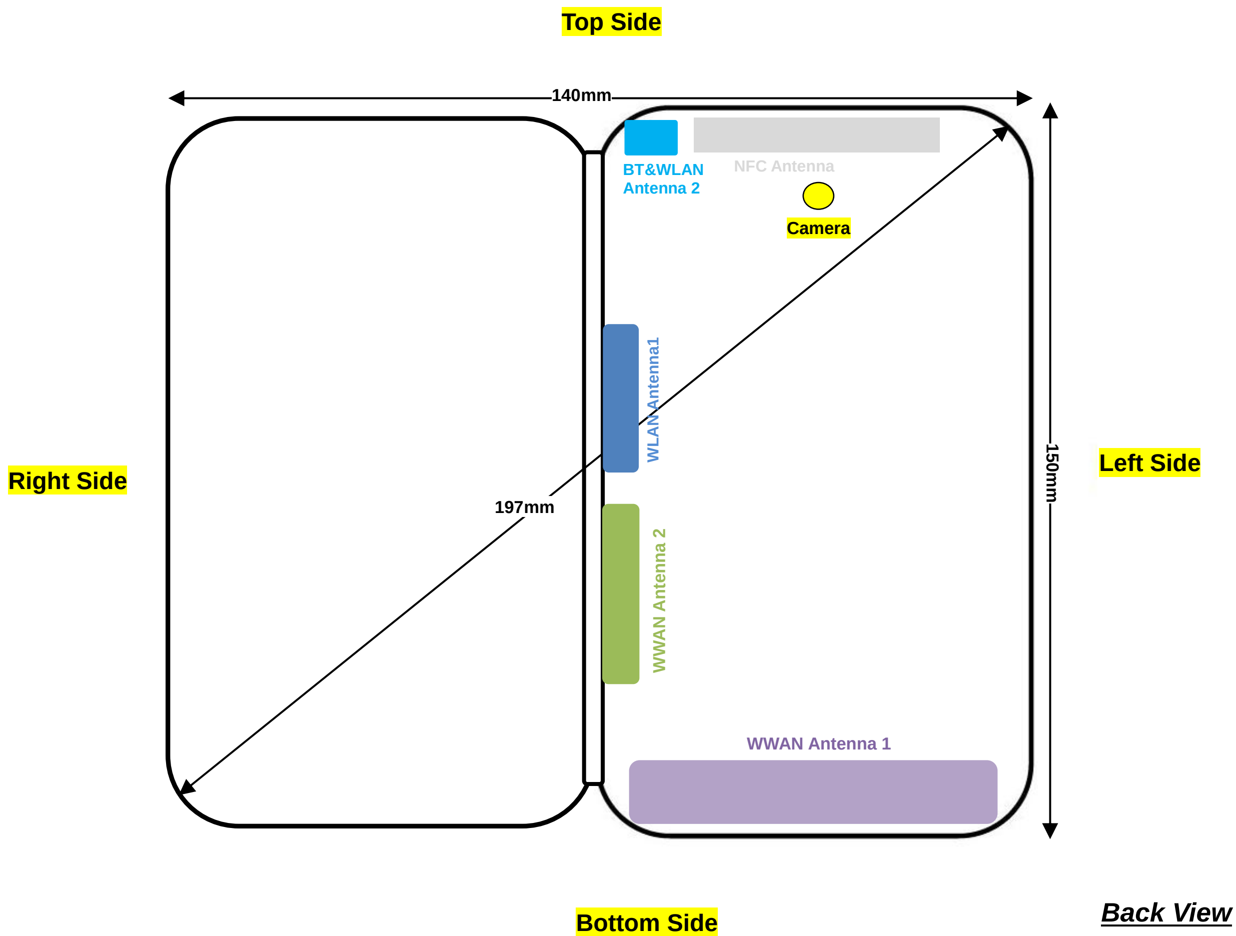
Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
WWAN Antenna 2	≤ 25mm	≤ 25mm	>25mm	>25mm	≤ 25mm	>25mm
WLAN Antenna 1	≤ 25mm	≤ 25mm	>25mm	>25mm	≤ 25mm	>25mm
BT&WLAN Antenna 2	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	Yes	Yes	No	Yes	Yes	Yes
WWAN Antenna 2	Yes	Yes	No	No	Yes	No
WLAN Antenna 1	Yes	Yes	No	No	Yes	No
BT&WLAN Antenna 2	Yes	Yes	Yes	No	Yes	No

General Note:

1. WWAN antenna 1 frequency bands include GSM850/1900, WCDMA B2 / B4 / B5, LTE B2 / B4 / B5 / B12 / B66 and WWAN antenna 2 frequency band only includes LTE B30.
2. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
3. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

<Flip Open Mode>



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm	≤ 25mm
WWAN Antenna 2	≤ 25mm	≤ 25mm	>25mm	>25mm	>25mm	>25mm
WLAN Antenna 1	≤ 25mm	≤ 25mm	>25mm	>25mm	>25mm	>25mm
BT&WLAN Antenna 2	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	>25mm	>25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	Yes	Yes	No	Yes	No	Yes
WWAN Antenna 2	Yes	Yes	No	No	No	No
WLAN Antenna 1	Yes	Yes	No	No	No	No
BT&WLAN Antenna 2	Yes	Yes	Yes	No	No	No

General Note:

1. WWAN antenna 1 frequency bands include GSM850/1900, WCDMA B2 / B4 / B5, LTE B2 / B4 / B5 / B12 / B66 and WWAN antenna 2 frequency band only includes LTE B30.
2. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
3. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

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
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 not required only when the measured SAR is ≤ 0.8W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g product specific SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
6. For 5.2GHz / 5.8GHz WLAN product specific SAR is necessary too, due to an overall diagonal dimension is > 16cm and it does not support hotspot operation.
7. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
8. This is a dual screens side flip smartphone. The device has two screens, mounted on the front and back face. When the device screen is closed, the back face screen can't work; when the device screen is open, these two screens can be used as one screen or as two screens separate.
9. In the following tables of the SAR test values, "FC" = Flip Close mode, "FO" = Flip Open mode.

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. 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.
3. 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.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

15.1 Head SAR

<WLAN 2.4GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	11	2462	15.45	15.50	1.012	100	1.000	0.01	0.0849	0.014	0.014
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	11	2462	15.45	15.50	1.012	100	1.000		0.048		
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	11	2462	15.45	15.50	1.012	100	1.000		0.0265		
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	11	2462	15.45	15.50	1.012	100	1.000		0.00436		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Right Cheek	6	2437	14.83	15.50	1.166	94.35	1.060		0.157		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Right Tilted	6	2437	14.83	15.50	1.166	94.35	1.060		0.194		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Left Cheek	6	2437	14.83	15.50	1.166	94.35	1.060	0.13	0.598	0.335	0.414
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Left Tilted	6	2437	14.83	15.50	1.166	94.35	1.060	-0.09	0.447	0.333	0.412
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	11	2462	15.45	15.50	1.012	100	1.000	0.09	0.0895	0.033	0.033
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	11	2462	15.45	15.50	1.012	100	1.000		0.00396		
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	11	2462	15.45	15.50	1.012	100	1.000		0.0341		
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	11	2462	15.45	15.50	1.012	100	1.000		0.0103		
	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Right Cheek	6	2437	14.83	15.50	1.166	94.35	1.060		0.155		
	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Right Tilted	6	2437	14.83	15.50	1.166	94.35	1.060		0.174		
	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Left Cheek	6	2437	14.83	15.50	1.166	94.35	1.060	-0.08	0.619	0.335	0.414
#01	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Left Tilted	6	2437	14.83	15.50	1.166	94.35	1.060	0.07	0.678	0.357	**0.441**

<WLAN 5GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Right Cheek	48	5240	13.53	14.00	1.115	95.32	1.049	-0.04	0.154	0.00789	0.009
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Right Tilted	48	5240	13.53	14.00	1.115	95.32	1.049		0.00186		
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Left Cheek	48	5240	13.53	14.00	1.115	95.32	1.049		0.048		
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Left Tilted	48	5240	13.53	14.00	1.115	95.32	1.049		0.0111		
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Right Cheek	48	5240	16.11	16.50	1.095	95.34	1.049	0.03	0.318	0.136	0.156
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Right Tilted	48	5240	16.11	16.50	1.095	95.34	1.049		0.49		
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Left Cheek	48	5240	16.11	16.50	1.095	95.34	1.049	-0.05	0.507	0.300	0.344
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Left Tilted	48	5240	16.11	16.50	1.095	95.34	1.049	0.03	1.03	0.446	0.512
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Right Cheek	48	5240	13.53	14.00	1.115	95.32	1.049		0.00379		
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Right Tilted	48	5240	13.53	14.00	1.115	95.32	1.049	0.05	0.0145	<0.001	<0.001
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Left Cheek	48	5240	13.53	14.00	1.115	95.32	1.049		0.00947		
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Left Tilted	48	5240	13.53	14.00	1.115	95.32	1.049		0.00387		
	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Right Cheek	48	5240	16.11	16.50	1.095	95.34	1.049		0.628		
	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Right Tilted	48	5240	16.11	16.50	1.095	95.34	1.049		0.813		
	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Left Cheek	48	5240	16.11	16.50	1.095	95.34	1.049	0.05	1.09	0.483	0.555
#02	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Left Tilted	48	5240	16.11	16.50	1.095	95.34	1.049	0.02	2.13	0.658	**0.755**
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Right Cheek	165	5825	11.47	13.00	1.423	95.32	1.049		0.00192		
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Right Tilted	165	5825	11.47	13.00	1.423	95.32	1.049		0.0205		
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	165	5825	11.47	13.00	1.423	95.32	1.049	-0.03	0.102	0.025	0.037
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Left Tilted	165	5825	11.47	13.00	1.423	95.32	1.049		0.0217		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Right Cheek	151	5755	15.27	15.50	1.055	90.35	1.107	0.01	0.918	0.368	0.430
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Right Tilted	151	5755	15.27	15.50	1.055	90.35	1.107		0.98		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Cheek	151	5755	15.27	15.50	1.055	90.35	1.107	0.15	1.14	0.521	0.609
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Tilted	151	5755	15.27	15.50	1.055	90.35	1.107	0.08	1.53	0.711	0.831
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Tilted	159	5795	15.13	15.50	1.089	90.35	1.107	0.11		0.554	0.668
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Right Cheek	165	5825	11.47	13.00	1.423	95.32	1.049	-0.01	0.0117	<0.001	<0.001
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Right Tilted	165	5825	11.47	13.00	1.423	95.32	1.049		0.00669		
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Left Cheek	165	5825	11.47	13.00	1.423	95.32	1.049		0		
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Left Tilted	165	5825	11.47	13.00	1.423	95.32	1.049		0.000136		
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Right Cheek	151	5755	15.27	15.50	1.055	90.35	1.107		0.0117		
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Right Tilted	151	5755	15.27	15.50	1.055	90.35	1.107		1.2		
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Cheek	151	5755	15.27	15.50	1.055	90.35	1.107	0.01	1.433	0.556	0.650
#03	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Tilted	151	5755	15.27	15.50	1.055	90.35	1.107	0.07	1.8	0.719	**0.840**
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Left Tilted	159	5795	15.13	15.50	1.089	90.35	1.107	0.03		0.600	0.723

15.2 Hotspot SAR

<WLAN 2.4GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Front	10	11	2462	15.45	15.50	1.012	100	1.000		0.017		
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Back	10	11	2462	15.45	15.50	1.012	100	1.000	0.01	0.028	0.003	0.003
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Right Side	10	11	2462	15.45	15.50	1.012	100	1.000	0.04	0.0395	0.016	0.016
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	11	2462	15.45	15.50	1.012	100	1.000		0.00637		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Front	10	6	2437	14.83	15.50	1.166	94.35	1.060	0.02	0.088	0.050	0.062
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Back	10	6	2437	14.83	15.50	1.166	94.35	1.060		0.063		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Right Side	10	6	2437	14.83	15.50	1.166	94.35	1.060		0.045		
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Top Side	10	6	2437	14.83	15.50	1.166	94.35	1.060	-0.03	0.111	0.071	0.088
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Front	10	11	2462	15.45	15.50	1.012	100	1.000		0.00791		
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Back	10	11	2462	15.45	15.50	1.012	100	1.000	0.05	0.0361	0.015	0.015
	FO	2	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	11	2462	15.45	15.50	1.012	100	1.000		0.00951		
	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Front	10	6	2437	14.83	15.50	1.166	94.35	1.060		0.081		
	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Back	10	6	2437	14.83	15.50	1.166	94.35	1.060		0.107		
#04	FO	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Top Side	10	6	2437	14.83	15.50	1.166	94.35	1.060	-0.11	0.117	0.077	**0.095**

15.3 Body Worn Accessory SAR

<WLAN 2.4GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Front	10	11	2462	15.45	15.50	1.012	100	1.000		0.017		
	FC	2	WLAN2.4GHz	802.11b 1Mbps	Back	10	11	2462	15.45	15.50	1.012	100	1.000	0.01	0.028	0.003	0.003
#05	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Front	10	6	2437	14.83	15.50	1.166	94.35	1.060	-0.07	0.088	0.050	0.062
	FC	1+2	WLAN2.4GHz	802.11n-HT20 MCS0	Back	10	6	2437	14.83	15.50	1.166	94.35	1.060		0.063		

<WLAN 5GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Front	10	48	5240	13.53	14.00	1.115	95.32	1.049		0.00543		
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Back	10	48	5240	13.53	14.00	1.115	95.32	1.049	0.07	0.0265	0.002	0.002
#06	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Front	10	48	5240	16.11	16.50	1.095	95.34	1.049	0.03	0.126	0.038	0.044
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Back	10	48	5240	16.11	16.50	1.095	95.34	1.049		0.0813		
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Front	10	165	5825	11.47	13.00	1.423	95.32	1.049	0.07	0.046	0.003	0.004
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Back	10	165	5825	11.47	13.00	1.423	95.32	1.049		0.018		
#07	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Front	10	151	5755	15.27	15.50	1.055	90.35	1.107	0.01	0.204	0.079	0.092
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Back	10	151	5755	15.27	15.50	1.055	90.35	1.107		0.041		

15.4 Product specific 10g SAR

<WLAN 5GHz SAR>

Plot No.	EUT Type	Ant. Port	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Front	0	48	5240	13.53	14.00	1.115	95.32	1.049		0.0716		
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Back	0	48	5240	13.53	14.00	1.115	95.32	1.049	-0.02	0.157	0.013	0.015
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Right Side	0	48	5240	13.53	14.00	1.115	95.32	1.049	0.03	1.5	0.172	0.201
	FC	2	WLAN5.2GHz	802.11a 6Mbps	Top Side	0	48	5240	13.53	14.00	1.115	95.32	1.049		0.0149		
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Front	0	48	5240	16.11	16.50	1.095	95.34	1.049	0.01	2.21	0.202	0.232
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Back	0	48	5240	16.11	16.50	1.095	95.34	1.049		0.597		
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Right Side	0	48	5240	16.11	16.50	1.095	95.34	1.049		0.863		
	FC	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Top Side	0	48	5240	16.11	16.50	1.095	95.34	1.049		1.06		
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Front	0	48	5240	13.53	14.00	1.115	95.32	1.049		0.00255		
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Back	0	48	5240	13.53	14.00	1.115	95.32	1.049	-0.01	0.64	0.076	0.089
	FO	2	WLAN5.2GHz	802.11a 6Mbps	Top Side	0	48	5240	13.53	14.00	1.115	95.32	1.049		0.0257		
	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Front	0	48	5240	16.11	16.50	1.095	95.34	1.049		3.61		
#08	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Back	0	48	5240	16.11	16.50	1.095	95.34	1.049	0.06	6.54	0.401	0.460
	FO	1+2	WLAN5.2GHz	802.11n-HT20 MCS0	Top Side	0	48	5240	16.11	16.50	1.095	95.34	1.049		3.94		
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Front	0	165	5825	11.47	13.00	1.423	95.32	1.049	0.05	0.294	0.013	0.020
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Back	0	165	5825	11.47	13.00	1.423	95.32	1.049		0.197		
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Right Side	0	165	5825	11.47	13.00	1.423	95.32	1.049	0.04	1.73	0.116	0.173
	FC	2	WLAN5.8GHz	802.11a 6Mbps	Top Side	0	165	5825	11.47	13.00	1.423	95.32	1.049		0.208		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Front	0	151	5755	15.27	15.50	1.055	90.35	1.107		3.5		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Back	0	151	5755	15.27	15.50	1.055	90.35	1.107		0.883		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Right Side	0	151	5755	15.27	15.50	1.055	90.35	1.107		0.703		
	FC	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Top Side	0	151	5755	15.27	15.50	1.055	90.35	1.107	-0.02	4.92	0.294	0.343
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Front	0	165	5825	11.47	13.00	1.423	95.32	1.049		0.0207		
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Back	0	165	5825	11.47	13.00	1.423	95.32	1.049	0.05	0.9	0.067	0.100
	FO	2	WLAN5.8GHz	802.11a 6Mbps	Top Side	0	165	5825	11.47	13.00	1.423	95.32	1.049		0.0205		
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Front	0	151	5755	15.27	15.50	1.055	90.35	1.107		2.68		
#09	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Back	0	151	5755	15.27	15.50	1.055	90.35	1.107	0.08	6.89	0.446	0.521
	FO	1+2	WLAN5.8GHz	802.11n-HT40 MCS0	Top Side	0	151	5755	15.27	15.50	1.055	90.35	1.107		5.07		

16. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Portable Handset			Note
		Head	Body-worn	Hotspot	
1.	GSM Voice + WLAN2.4GHz SISO	Yes	Yes		
2.	GPRS/EDGE + WLAN2.4GHz SISO	Yes	Yes	Yes	WLAN Hotspot
3.	WCDMA + WLAN2.4GHz SISO	Yes	Yes	Yes	WLAN Hotspot
4.	LTE + WLAN2.4GHz SISO	Yes	Yes	Yes	WLAN Hotspot
5.	GSM Voice + WLAN2.4GHz MIMO	Yes	Yes		
6.	GPRS/EDGE + WLAN2.4GHz MIMO	Yes	Yes	Yes	WLAN Hotspot
7.	WCDMA + WLAN2.4GHz MIMO	Yes	Yes	Yes	WLAN Hotspot
8.	LTE + WLAN2.4GHz MIMO	Yes	Yes	Yes	WLAN Hotspot
9.	GSM Voice + WLAN5.2/5.8GHz SISO	Yes	Yes		
10.	GPRS/EDGE + WLAN5.2/5.8GHz SISO	Yes	Yes		WLAN Direct
11.	WCDMA + WLAN5.2/5.8GHz SISO	Yes	Yes		WLAN Direct
12.	LTE + WLAN5.2/5.8GHz SISO	Yes	Yes		WLAN Direct
13.	GSM Voice + WLAN5.2/5.8GHz MIMO	Yes	Yes		
14.	GPRS/EDGE + WLAN5.2/5.8GHz MIMO	Yes	Yes		WLAN Direct
15.	WCDMA + WLAN5.2/5.8GHz MIMO	Yes	Yes		WLAN Direct
16.	LTE + WLAN5.2/5.8GHz MIMO	Yes	Yes		WLAN Direct
17.	GSM Voice + Bluetooth		Yes		
18.	GPRS/EDGE + Bluetooth		Yes	Yes	BT Tethering
19.	WCDMA + Bluetooth		Yes	Yes	BT Tethering
20.	LTE + Bluetooth		Yes	Yes	BT Tethering

General Note:

1. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications.
4. This device 5.2GHz WLAN/5.8GHz WLAN does not support hotspot operation and supports WiFi Direct.
5. Bluetooth share the same antenna with WLAN antenna 2 so can't transmit simultaneously.
6. 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 though they have independent antenna.
7. According to the EUT character, WLAN antenna 2 and Bluetooth can't transmit simultaneously.
8. Chose the worst zoom scan SAR for each EUT type of WLAN correspondingly for co-located with WWAN analysis.
9. The worst case 5 GHz WLAN reported SAR for each configuration was used for SAR summation.
10. For WLAN two transmitters, WLAN antenna 2 can transmit standalone, WLAN antenna 1 can only transmit simultaneously with WLAN antenna 2.
11. The reported SAR summation is calculated based on the same configuration and test position.
12. This device has two WWAN antennas. WWAN antenna 1 is located at the bottom side of the device and WWAN antenna 2 is located at the right side of the device which can refer to antenna location chapter. WWAN antenna 1 frequency bands include GSM850/1900, WCDMA B2 / B4 / B5, LTE B2 / B4 / B5 / B12 / B66 and WWAN antenna 2 frequency bands only include LTE B30.
13. The device is capable of switching between antenna 1 and antenna 2 based on signal strength.
14. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
    i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
    ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
    iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

<1g SAR>

Bluetooth Max Power (dBm)	Exposure Position	Hotspot & Body worn
	Test separation	10 mm
8.5	Estimated 1g SAR (W/kg)	0.147

<10g SAR>

Bluetooth Max Power (dBm)	Exposure Position	Product specific 10g SAR
	Test separation	0 mm
8.5	Estimated 10g SAR (W/kg)	0.118

16.1 Head Exposure Conditions

WWAN Band		Exposure Position		1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Flip Close	Right Cheek	0.272	0.014	0.430	0.29	0.70
			Right Tilted	0.262	0.414	0.831	0.68	1.09
			Left Cheek	0.441	0.414	0.609	0.86	1.05
			Left Tilted	0.249	0.412	0.831	0.66	1.08
		Flip Open	Right Cheek	0.158	0.033	<0.001	0.19	0.16
			Right Tilted	0.162	0.441	0.840	0.60	1.00
			Left Cheek	0.245	0.414	0.650	0.66	0.90
			Left Tilted	0.140	0.441	0.840	0.58	0.98
	GSM1900	Flip Close	Right Cheek	0.180	0.014	0.430	0.19	0.61
			Right Tilted	0.064	0.414	0.831	0.48	0.90
			Left Cheek	0.109	0.414	0.609	0.52	0.72
			Left Tilted	0.130	0.412	0.831	0.54	0.96
		Flip Open	Right Cheek	0.132	0.033	<0.001	0.17	0.13
			Right Tilted	0.049	0.441	0.840	0.49	0.89
			Left Cheek	0.098	0.414	0.650	0.51	0.75
			Left Tilted	0.076	0.441	0.840	0.52	0.92
WCDMA	Band V	Flip Close	Right Cheek	0.179	0.014	0.430	0.19	0.61
			Right Tilted	0.144	0.414	0.831	0.56	0.98
			Left Cheek	0.255	0.414	0.609	0.67	0.86
			Left Tilted	0.139	0.412	0.831	0.55	0.97
		Flip Open	Right Cheek	0.053	0.033	<0.001	0.09	0.05
			Right Tilted	0.037	0.441	0.840	0.48	0.88
			Left Cheek	0.059	0.414	0.650	0.47	0.71
			Left Tilted	0.036	0.441	0.840	0.48	0.88
	Band IV	Flip Close	Right Cheek	0.213	0.014	0.430	0.23	0.64
			Right Tilted	0.060	0.414	0.831	0.47	0.89
			Left Cheek	0.142	0.414	0.609	0.56	0.75
			Left Tilted	0.101	0.412	0.831	0.51	0.93
		Flip Open	Right Cheek	0.105	0.033	<0.001	0.14	0.11
			Right Tilted	0.032	0.441	0.840	0.47	0.87
			Left Cheek	0.074	0.414	0.650	0.49	0.72
			Left Tilted	0.036	0.441	0.840	0.48	0.88
	Band II	Flip Close	Right Cheek	0.213	0.014	0.430	0.23	0.64
			Right Tilted	0.046	0.414	0.831	0.46	0.88
			Left Cheek	0.146	0.414	0.609	0.56	0.76
			Left Tilted	0.120	0.412	0.831	0.53	0.95
		Flip Open	Right Cheek	0.176	0.033	<0.001	0.21	0.18
			Right Tilted	0.057	0.441	0.840	0.50	0.90
			Left Cheek	0.145	0.414	0.650	0.56	0.80
			Left Tilted	0.079	0.441	0.840	0.52	0.92

WWAN Band		Exposure Position		1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
LTE	Band 12	Flip Close	Right Cheek	0.127	0.014	0.430	0.14	0.56
			Right Tilted	0.105	0.414	0.831	0.52	0.94
			Left Cheek	0.158	0.414	0.609	0.57	0.77
			Left Tilted	0.105	0.412	0.831	0.52	0.94
		Flip Open	Right Cheek	0.063	0.033	<0.001	0.10	0.06
			Right Tilted	0.029	0.441	0.840	0.47	0.87
			Left Cheek	0.071	0.414	0.650	0.49	0.72
			Left Tilted	0.033	0.441	0.840	0.47	0.87
	Band 5	Flip Close	Right Cheek	0.156	0.014	0.430	0.17	0.59
			Right Tilted	0.164	0.414	0.831	0.58	1.00
			Left Cheek	0.217	0.414	0.609	0.63	0.83
			Left Tilted	0.142	0.412	0.831	0.55	0.97
		Flip Open	Right Cheek	0.057	0.033	<0.001	0.09	0.06
			Right Tilted	0.021	0.441	0.840	0.46	0.86
			Left Cheek	0.059	0.414	0.650	0.47	0.71
			Left Tilted	0.028	0.441	0.840	0.47	0.87
	Band 66	Flip Close	Right Cheek	0.263	0.014	0.430	0.28	0.69
			Right Tilted	0.090	0.414	0.831	0.50	0.92
			Left Cheek	0.158	0.414	0.609	0.57	0.77
			Left Tilted	0.130	0.412	0.831	0.54	0.96
		Flip Open	Right Cheek	0.146	0.033	<0.001	0.18	0.15
			Right Tilted	0.041	0.441	0.840	0.48	0.88
			Left Cheek	0.076	0.414	0.650	0.49	0.73
			Left Tilted	0.039	0.441	0.840	0.48	0.88
	Band 2	Flip Close	Right Cheek	0.186	0.014	0.430	0.20	0.62
			Right Tilted	0.057	0.414	0.831	0.47	0.89
			Left Cheek	0.118	0.414	0.609	0.53	0.73
			Left Tilted	0.137	0.412	0.831	0.55	0.97
		Flip Open	Right Cheek	0.155	0.033	<0.001	0.19	0.16
			Right Tilted	0.073	0.441	0.840	0.51	0.91
			Left Cheek	0.124	0.414	0.650	0.54	0.77
			Left Tilted	0.109	0.441	0.840	0.55	0.95
	Band 30	Flip Close	Right Cheek	1.047	0.014	0.430	1.06	**1.48**
			Right Tilted	0.143	0.414	0.831	0.56	0.97
			Left Cheek	0.322	0.414	0.609	0.74	0.93
			Left Tilted	0.183	0.412	0.831	0.60	1.01
		Flip Open	Right Cheek	0.278	0.033	<0.001	0.31	0.28
			Right Tilted	0.112	0.441	0.840	0.55	0.95
			Left Cheek	0.610	0.414	0.650	1.02	1.26
			Left Tilted	0.398	0.441	0.840	0.84	1.24

16.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position		1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 Bluetooth Estimated 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
GSM	GSM850	Flip Close	Front	0.934	0.062	0.147	1.00	1.08
			Back	0.640	0.003	0.147	0.64	0.79
			Left side	0.612			0.61	0.61
			Right side	0.185	0.016	0.147	0.20	0.33
			Top side		0.088	0.147	0.09	0.15
			Bottom side	0.557			0.56	0.56
		Flip Open	Front	1.069	0.095	0.147	1.16	1.22
			Back	1.053	0.015	0.147	1.07	1.20
			Left side	0.296			0.30	0.30
			Top side		0.095	0.147	0.10	0.15
			Bottom side	0.629			0.63	0.63
	GSM1900	Flip Close	Front	0.490	0.062	0.147	0.55	0.64
			Back	0.267	0.003	0.147	0.27	0.41
			Left side	0.161			0.16	0.16
			Right side	0.035	0.016	0.147	0.05	0.18
			Top side		0.088	0.147	0.09	0.15
			Bottom side	1.114			1.11	1.11
		Flip Open	Front	0.485	0.095	0.147	0.58	0.63
			Back	0.443	0.015	0.147	0.46	0.59
			Left side	0.120			0.12	0.12
			Top side		0.095	0.147	0.10	0.15
			Bottom side	1.181			1.18	1.18
WCDMA	Band V	Flip Close	Front	0.443	0.062	0.147	0.51	0.59
			Back	0.321	0.003	0.147	0.32	0.47
			Left side	0.416			0.42	0.42
			Right side	0.147	0.016	0.147	0.16	0.29
			Top side		0.088	0.147	0.09	0.15
			Bottom side	0.272			0.27	0.27
		Flip Open	Front	0.332	0.095	0.147	0.43	0.48
			Back	0.384	0.015	0.147	0.40	0.53
			Left side	0.127			0.13	0.13
			Top side		0.095	0.147	0.10	0.15
			Bottom side	0.322			0.32	0.32
	Band IV	Flip Close	Front	0.483	0.062	0.147	0.55	0.63
			Back	0.378	0.003	0.147	0.38	0.53
			Left side	0.118			0.12	0.12
			Right side	0.085	0.016	0.147	0.10	0.23
			Top side		0.088	0.147	0.09	0.15
			Bottom side	1.154			1.15	1.15
		Flip Open	Front	0.366	0.095	0.147	0.46	0.51
			Back	0.326	0.015	0.147	0.34	0.47
			Left side	0.115			0.12	0.12
			Top side		0.095	0.147	0.10	0.15
			Bottom side	0.774			0.77	0.77
	Band II	Flip Close	Front	0.518	0.062	0.147	0.58	0.67
			Back	0.311	0.003	0.147	0.31	0.46
			Left side	0.179			0.18	0.18
			Right side	0.032	0.016	0.147	0.05	0.18
			Top side		0.088	0.147	0.09	0.15
			Bottom side	1.187			1.19	1.19
		Flip Open	Front	0.548	0.095	0.147	0.64	0.70
			Back	0.545	0.015	0.147	0.56	0.69
			Left side	0.145			0.15	0.15
			Top side		0.095	0.147	0.10	0.15
			Bottom side	1.198			1.20	1.20

WWAN Band		Exposure Position		1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 Bluetooth Estimated 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
LTE	Band 12	Flip Close	Front	0.300	0.062	0.147	0.36	0.45
			Back	0.229	0.003	0.147	0.23	0.38
			Left side	0.268			0.27	0.27
			Right side	0.130	0.016	0.147	0.15	0.28
			Top side		0.088	0.147	0.09	0.15
			Bottom side	0.147			0.15	0.15
		Flip Open	Front	0.325	0.095	0.147	0.42	0.47
			Back	0.431	0.015	0.147	0.45	0.58
			Left side	0.142			0.14	0.14
			Top side		0.095	0.147	0.10	0.15
			Bottom side	0.202			0.20	0.20
	Band 5	Flip Close	Front	0.362	0.062	0.147	0.42	0.51
			Back	0.312	0.003	0.147	0.32	0.46
			Left side	0.360			0.36	0.36
			Right side	0.083	0.016	0.147	0.10	0.23
			Top side		0.088	0.147	0.09	0.15
			Bottom side	0.264			0.26	0.26
		Flip Open	Front	0.325	0.095	0.147	0.42	0.47
			Back	0.360	0.015	0.147	0.38	0.51
			Left side	0.072			0.07	0.07
			Top side		0.095	0.147	0.10	0.15
			Bottom side	0.244			0.24	0.24
	Band 66	Flip Close	Front	0.625	0.062	0.147	0.69	0.77
			Back	0.362	0.003	0.147	0.37	0.51
			Left side	0.142			0.14	0.14
			Right side	0.097	0.016	0.147	0.11	0.24
			Top side		0.088	0.147	0.09	0.15
			Bottom side	1.179			1.18	1.18
		Flip Open	Front	0.452	0.095	0.147	0.55	0.60
			Back	0.380	0.015	0.147	0.40	0.53
			Left side	0.129			0.13	0.13
			Top side		0.095	0.147	0.10	0.15
			Bottom side	1.072			1.07	1.07
	Band 2	Flip Close	Front	0.545	0.062	0.147	0.61	0.69
			Back	0.290	0.003	0.147	0.29	0.44
			Left side	0.044			0.04	0.04
			Right side	0.186	0.016	0.147	0.20	0.33
			Top side		0.088	0.147	0.09	0.15
			Bottom side	1.198			1.20	1.20
		Flip Open	Front	0.538	0.095	0.147	0.63	0.69
			Back	0.509	0.015	0.147	0.52	0.66
			Left side	0.127			0.13	0.13
			Top side		0.095	0.147	0.10	0.15
			Bottom side	1.106			1.11	1.11
	Band 30	Flip Close	Front	0.348	0.062	0.147	0.41	0.50
			Back	0.309	0.003	0.147	0.31	0.46
			Right side	1.043	0.016	0.147	1.06	1.19
			Top side		0.088	0.147	0.09	0.15
		Flip Open	Front	0.078	0.095	0.147	0.17	0.23
			Back	0.280	0.015	0.147	0.30	0.43
			Top side		0.095	0.147	0.10	0.15

16.3 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position		1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	3 5GHz WLAN 1g SAR (W/kg)	4 Bluetooth Estimated 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
GSM	GSM850	Flip Close	Front	0.934	0.062	0.092	0.147	1.00	1.03	1.08
			Back	0.640	0.003	0.002	0.147	0.64	0.64	0.79
	GSM1900	Flip Close	Front	0.796	0.062	0.092	0.147	0.86	0.89	0.94
			Back	0.469	0.003	0.002	0.147	0.47	0.47	0.62
WCDMA	Band V	Flip Close	Front	0.443	0.062	0.092	0.147	0.51	0.54	0.59
			Back	0.321	0.003	0.002	0.147	0.32	0.32	0.47
	Band IV	Flip Close	Front	0.636	0.062	0.092	0.147	0.70	0.73	0.78
			Back	0.463	0.003	0.002	0.147	0.47	0.47	0.61
	Band II	Flip Close	Front	0.801	0.062	0.092	0.147	0.86	0.89	0.95
			Back	0.490	0.003	0.002	0.147	0.49	0.49	0.64
LTE	Band 12	Flip Close	Front	0.300	0.062	0.092	0.147	0.36	0.39	0.45
			Back	0.229	0.003	0.002	0.147	0.23	0.23	0.38
	Band 5	Flip Close	Front	0.362	0.062	0.092	0.147	0.42	0.45	0.51
			Back	0.312	0.003	0.002	0.147	0.32	0.31	0.46
	Band 66	Flip Close	Front	0.958	0.062	0.092	0.147	1.02	1.05	1.11
			Back	0.595	0.003	0.002	0.147	0.60	0.60	0.74
	Band 2	Flip Close	Front	0.918	0.062	0.092	0.147	0.98	1.01	1.07
			Back	0.491	0.003	0.002	0.147	0.49	0.49	0.64
	Band 30	Flip Close	Front	0.348	0.062	0.092	0.147	0.41	0.44	0.50
			Back	0.309	0.003	0.002	0.147	0.31	0.31	0.46

16.4 Product Specific 10g SAR Exposure Conditions

WWAN Band		Exposure Position		1 WWAN 10g SAR (W/kg)	2 5GHz WLAN 10g SAR (W/kg)	3 Bluetooth Estimated 10g SAR (W/kg)	1+2 Summed 10g SAR (W/kg)	1+3 Summed 10g SAR (W/kg)
GSM	GSM1900	Flip Close	Front		0.232	0.118	0.23	0.12
			Back		0.015	0.118	0.02	0.12
			Right side		0.201	0.118	0.20	0.12
			Top side		0.343	0.118	0.34	0.12
			Bottom side	3.717			3.72	3.72
		Flip Open	Front		0.521	0.118	0.52	0.12
			Back		0.521	0.118	0.52	0.12
			Top side		0.521	0.118	0.52	0.12
			Bottom side	3.443			3.44	3.44
WCDMA	Band IV	Flip Close	Front		0.232	0.118	0.23	0.12
			Back		0.015	0.118	0.02	0.12
			Right side		0.201	0.118	0.20	0.12
			Top side		0.343	0.118	0.34	0.12
			Bottom side	2.768			2.77	2.77
		Flip Open	Front		0.521	0.118	0.52	0.12
			Back		0.521	0.118	0.52	0.12
			Top side		0.521	0.118	0.52	0.12
			Bottom side	3.502			3.50	3.50
	Band II	Flip Close	Front		0.232	0.118	0.23	0.12
			Back		0.015	0.118	0.02	0.12
			Right side		0.201	0.118	0.20	0.12
			Top side		0.343	0.118	0.34	0.12
			Bottom side	3.410			3.41	3.41
		Flip Open	Front		0.521	0.118	0.52	0.12
			Back		0.521	0.118	0.52	0.12
			Top side		0.521	0.118	0.52	0.12
			Bottom side	3.643			3.64	3.64
LTE	Band 66	Flip Close	Front		0.232	0.118	0.23	0.12
			Back		0.015	0.118	0.02	0.12
			Right side		0.201	0.118	0.20	0.12
			Top side		0.343	0.118	0.34	0.12
			Bottom side	3.512			3.51	3.51
		Flip Open	Front		0.521	0.118	0.52	0.12
			Back		0.521	0.118	0.52	0.12
			Top side		0.521	0.118	0.52	0.12
			Bottom side	3.456			3.46	3.46
	Band 2	Flip Close	Front		0.232	0.118	0.23	0.12
			Back		0.015	0.118	0.02	0.12
			Right side		0.201	0.118	0.20	0.12
			Top side		0.343	0.118	0.34	0.12
			Bottom side	3.840			**3.84**	3.84
		Flip Open	Front		0.521	0.118	0.52	0.12
			Back		0.521	0.118	0.52	0.12
			Top side		0.521	0.118	0.52	0.12
			Bottom side	3.537			3.54	3.54

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 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

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

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

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

[12] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

[13] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_2450MHz

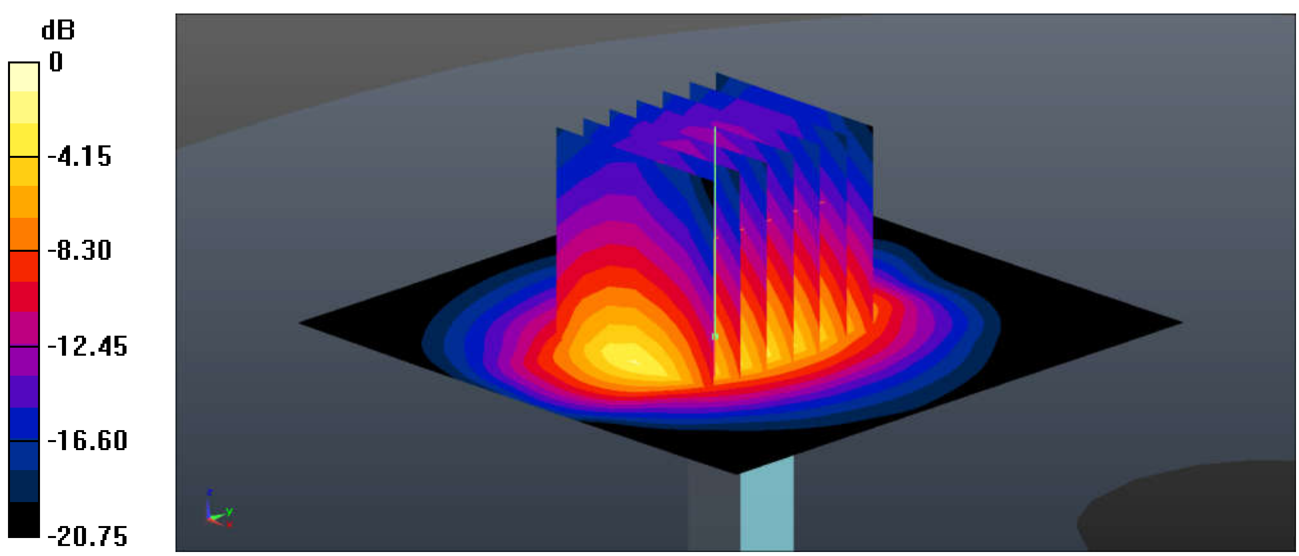
DUT: D2450V2 - SN:840

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.868 S/m; ε_r = 38.17; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 20.2 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.10 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 26.5 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.44 W/kg
Maximum value of SAR (measured) = 20.2 W/kg



0 dB = 20.2 W/kg = 13.05 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.11.5

System Check_Head_5250MHz

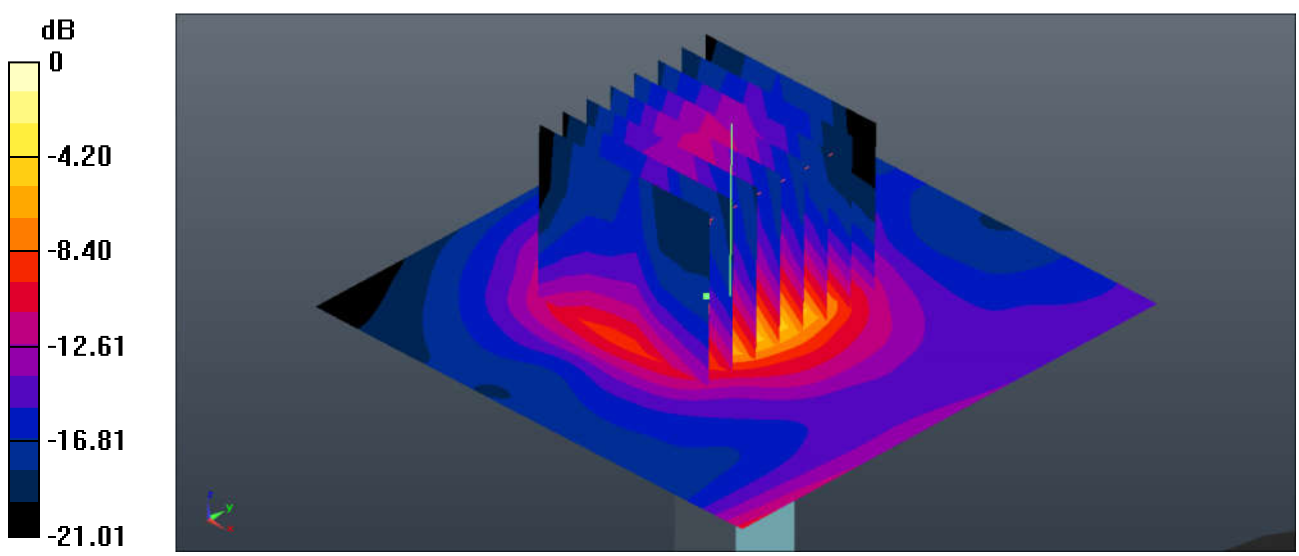
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5250 MHz; σ = 4.882 S/m; ϵ_r = 37.304; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(5.08, 5.08, 5.08); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 16.5 W/kg

CW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 34.95 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 24.3 W/kg
SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2017.11.5

System Check_Head_5750MHz

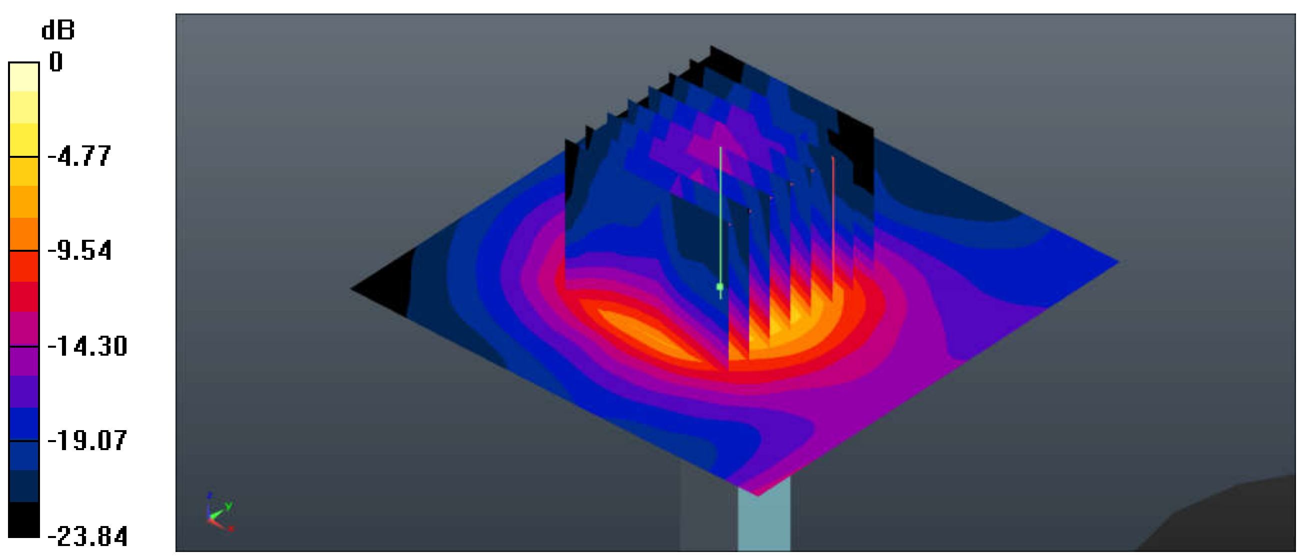
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5750 MHz; σ = 5.415 S/m; ε_r = 36.543; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.69, 4.69, 4.69); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.3 W/kg

CW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 37.65 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 28.6 W/kg
SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 17.8 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

System Check_Body_2450MHz

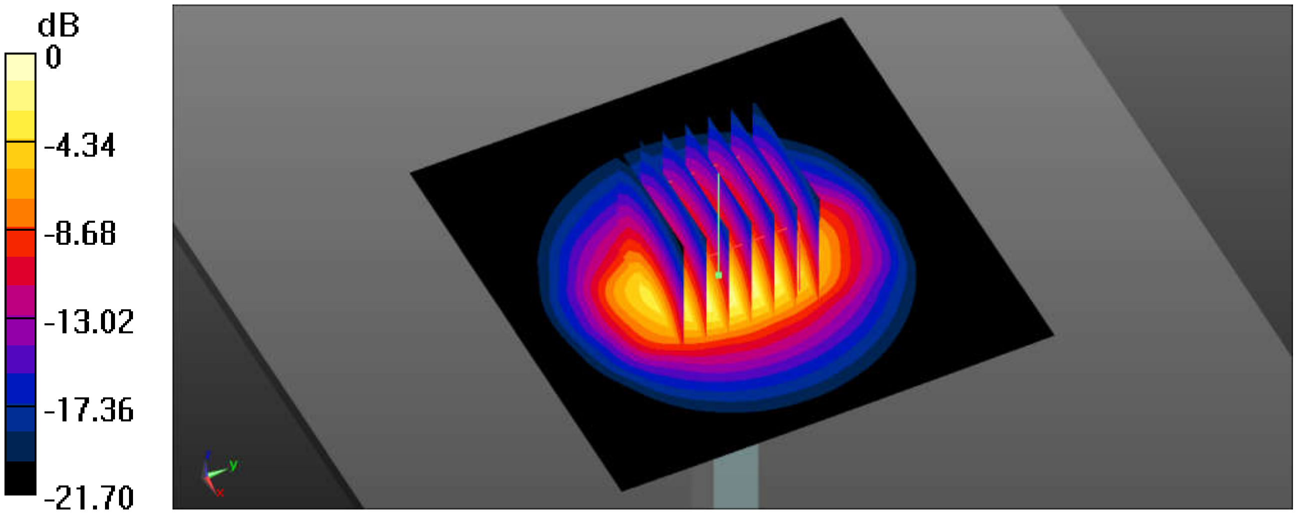
DUT: D2450V2 - SN:840

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450 Medium parameters used: f = 2450 MHz; σ = 2.012 S/m; ε_r = 54.299; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

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: SAM1; Type: SAM; Serial: TP-1164
- 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) = 20.3 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.87 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.32 W/kg
Maximum value of SAR (measured) = 20.3 W/kg



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

System Check_Body_5250MHz

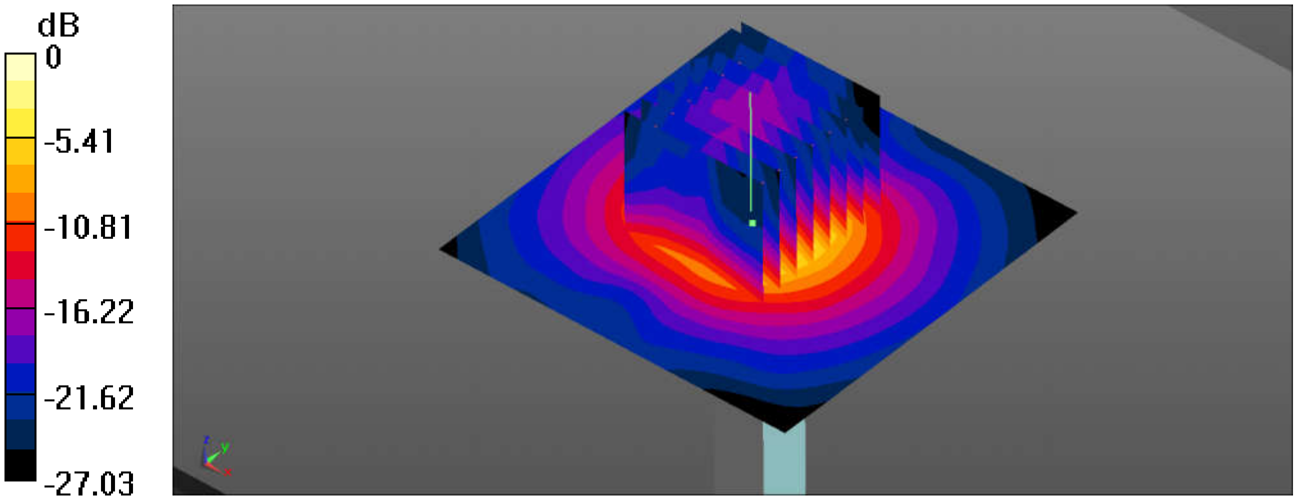
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5250 MHz; σ = 5.379 S/m; ε_r = 49.115; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; 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: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

CW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.4 W/kg

CW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 39.64 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

System Check_Body_5750MHz

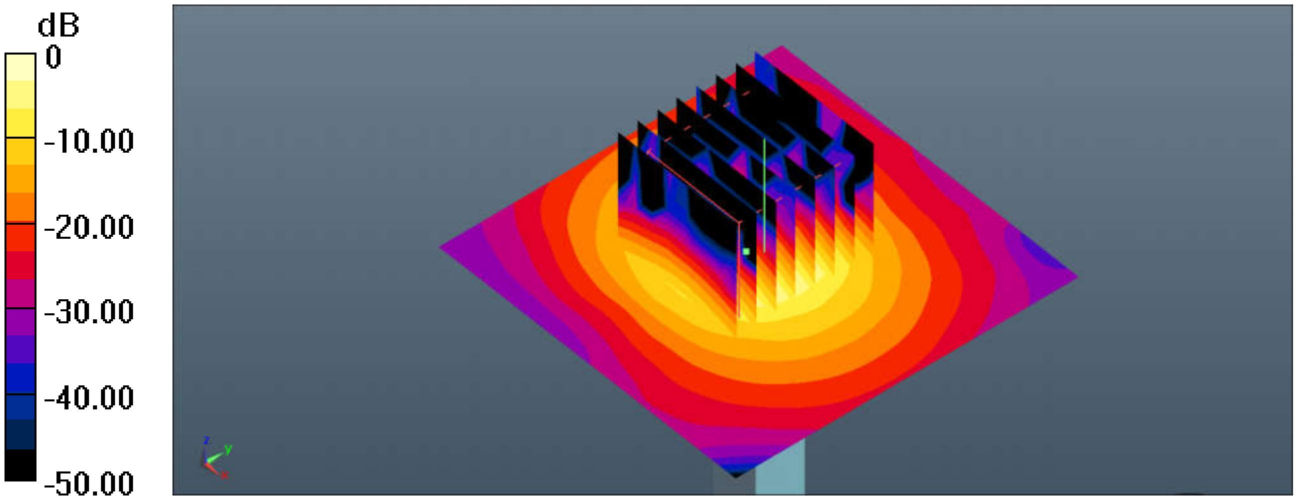
DUT: D5GHzV2-SN:1113

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: MSL_5000 Medium parameters used: f = 5750 MHz; σ = 6.07 S/m; ε_r = 47.985; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.31, 4.31, 4.31); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.1 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 34.97 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.56 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 12.28 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.11.6

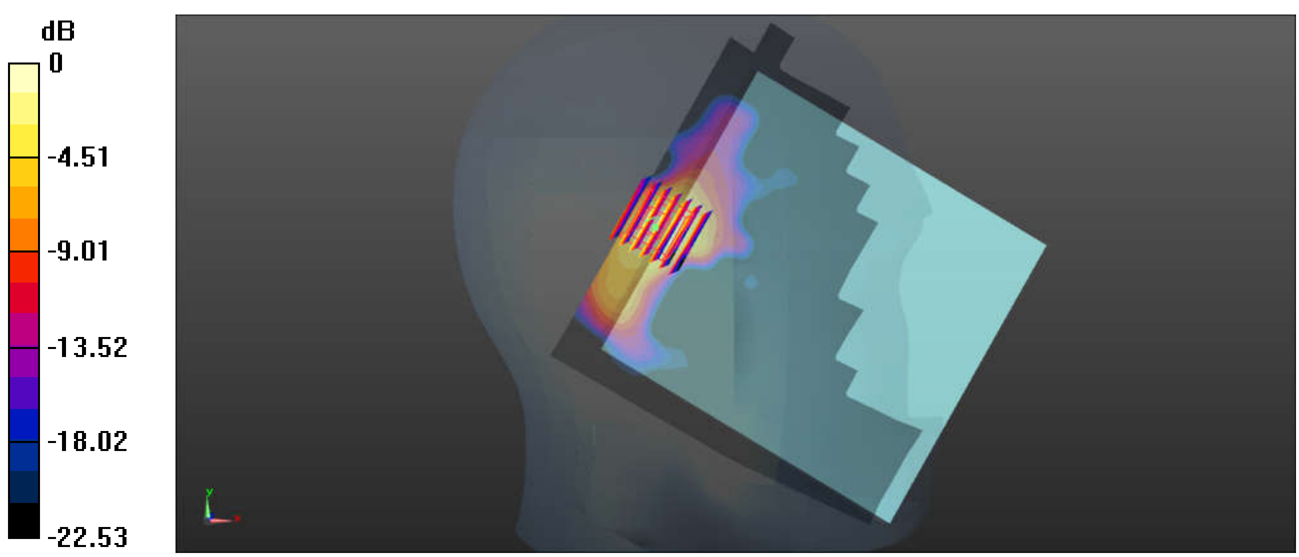
#01_WLAN2.4GHz_802.11n-HT20 MCS0_Left Tilted_0mm_Ant 1+2_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1.060
Medium: HSL_2450 Medium parameters used: f = 2437 MHz; σ = 1.855 S/m; ε_r = 38.23; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(7.44, 7.44, 7.44); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM1; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (141x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.678 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.792 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.849 W/kg
SAR(1 g) = 0.357 W/kg; SAR(10 g) = 0.148 W/kg
Maximum value of SAR (measured) = 0.552 W/kg



0 dB = 0.552 W/kg = -2.58 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.11.5

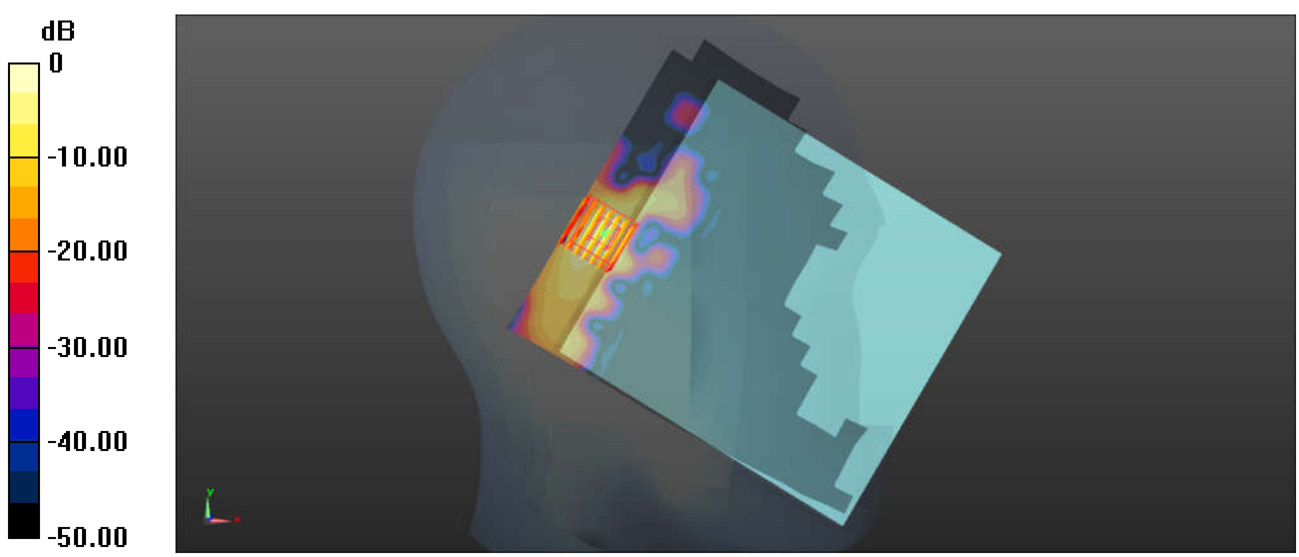
#02_WLAN5.2GHz_802.11n-HT20 MCS0_Left Tilted_0mm_Ant 1+2_Ch48

Communication System: UID 0, WIFI (0); Frequency: 5240 MHz;Duty Cycle: 1:1.049
Medium: HSL_5000 Medium parameters used: f = 5240 MHz; σ = 4.84 S/m; ε_r = 35.443; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(5.08, 5.08, 5.08); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch48/Area Scan (151x171x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.13 W/kg

Ch48/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.228 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.15 W/kg
SAR(1 g) = 0.658 W/kg; SAR(10 g) = 0.193 W/kg
Maximum value of SAR (measured) = 1.47 W/kg



0 dB = 1.47 W/kg = 1.67 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.11.5

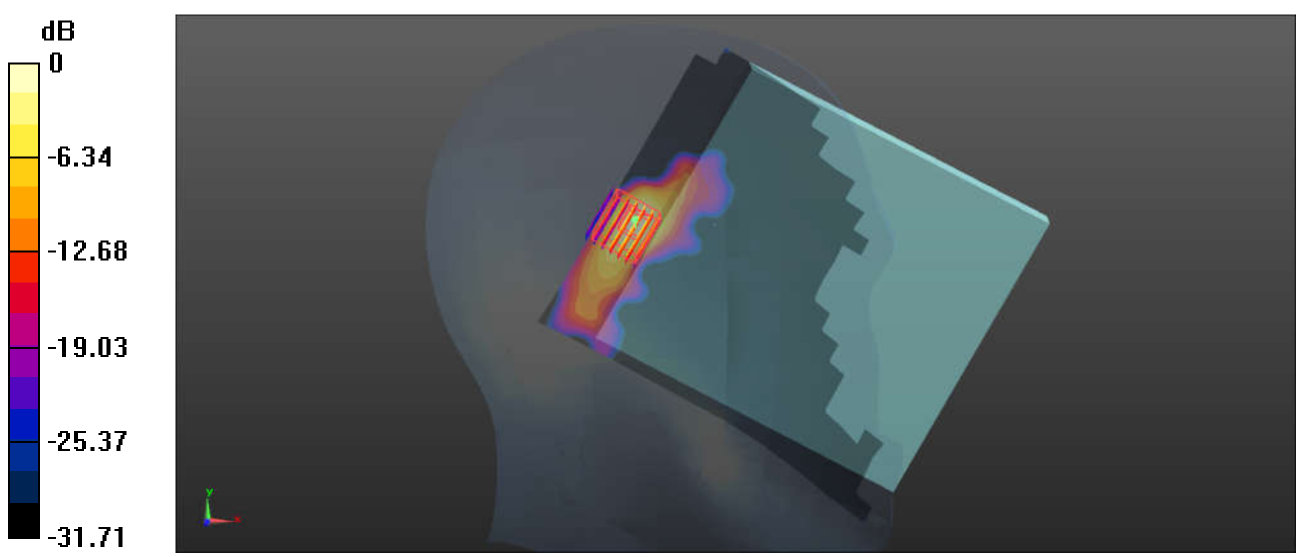
#03_WLAN5.8GHz_ 802.11n-HT40 MCS0_Left Tilted_0mm_Ant 1+2_Ch151

Communication System: UID 0, WIFI (0); Frequency: 5755 MHz;Duty Cycle: 1:1.107
Medium: HSL_5000 Medium parameters used: f = 5755 MHz; σ = 5.368 S/m; ε_r = 34.539; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(4.69, 4.69, 4.69); Calibrated: 2016.11.28;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1326; Calibrated: 2017.9.15
- Phantom: SAM3; Type: SAM; Serial: TP-1839
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch151/Area Scan (151x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.80 W/kg

Ch151/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.283 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.88 W/kg
SAR(1 g) = 0.719 W/kg; SAR(10 g) = 0.222 W/kg
Maximum value of SAR (measured) = 1.83 W/kg



0 dB = 1.83 W/kg = 2.62 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2017.11.5

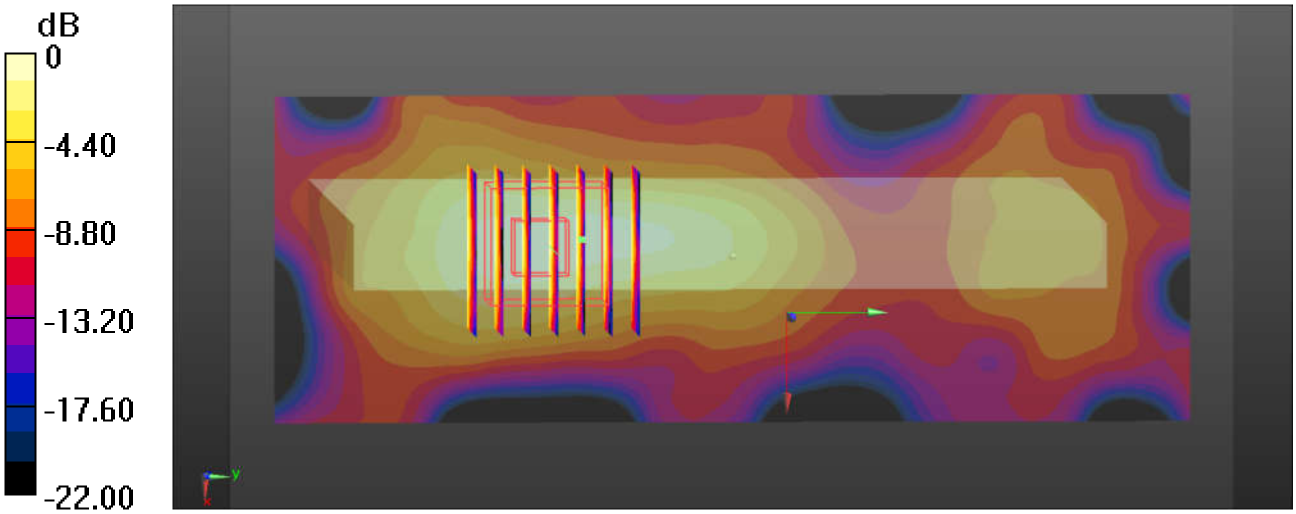
#04_WLAN2.4GHz_802.11n-HT20 MCS0_Top Side_10mm_Ant 1+2_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1.06
Medium: MSL_2450 Medium parameters used : f = 2437 MHz; σ = 1.995 S/m; ε_r = 54.357; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

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: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (51x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0970 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.348 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.137 W/kg
SAR(1 g) = 0.077 W/kg; SAR(10 g) = 0.040 W/kg
Maximum value of SAR (measured) = 0.111 W/kg



0 dB = 0.111 W/kg = -9.55 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.11.5

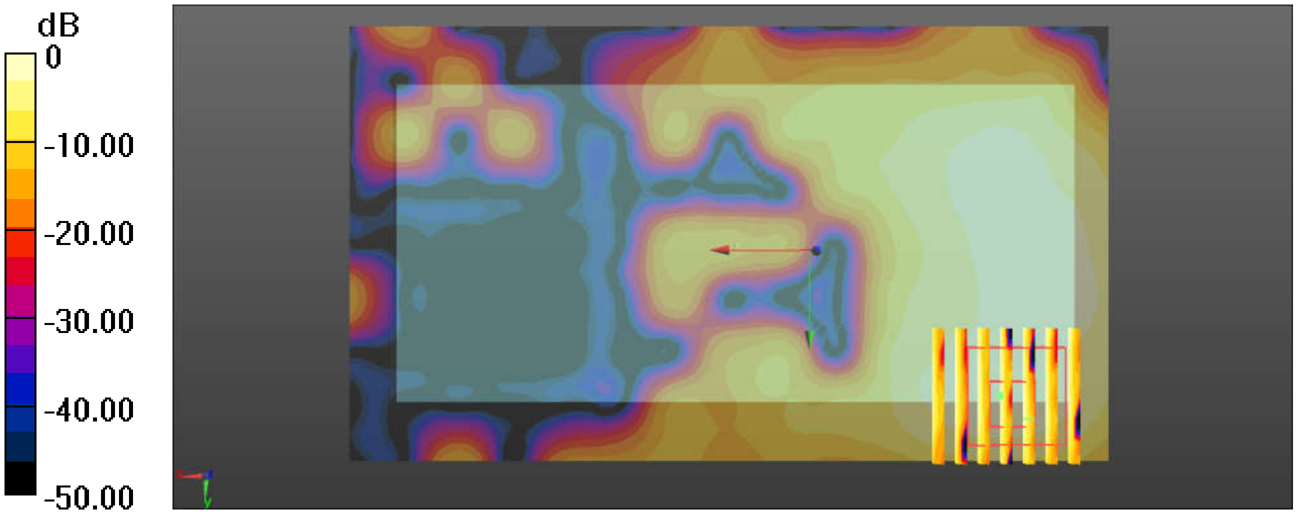
#05_WLAN2.4GHz_802.11n-HT20 MCS0_Front_10mm_Ant 1+2_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1.06
Medium: MSL_2450 Medium parameters used: f = 2437 MHz; σ = 1.995 S/m; ε_r = 54.357; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

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: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (141x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0877 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.272 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.123 W/kg
SAR(1 g) = 0.050 W/kg; SAR(10 g) = 0.023 W/kg
Maximum value of SAR (measured) = 0.0904 W/kg



0 dB = 0.0904 W/kg = -10.44 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.24

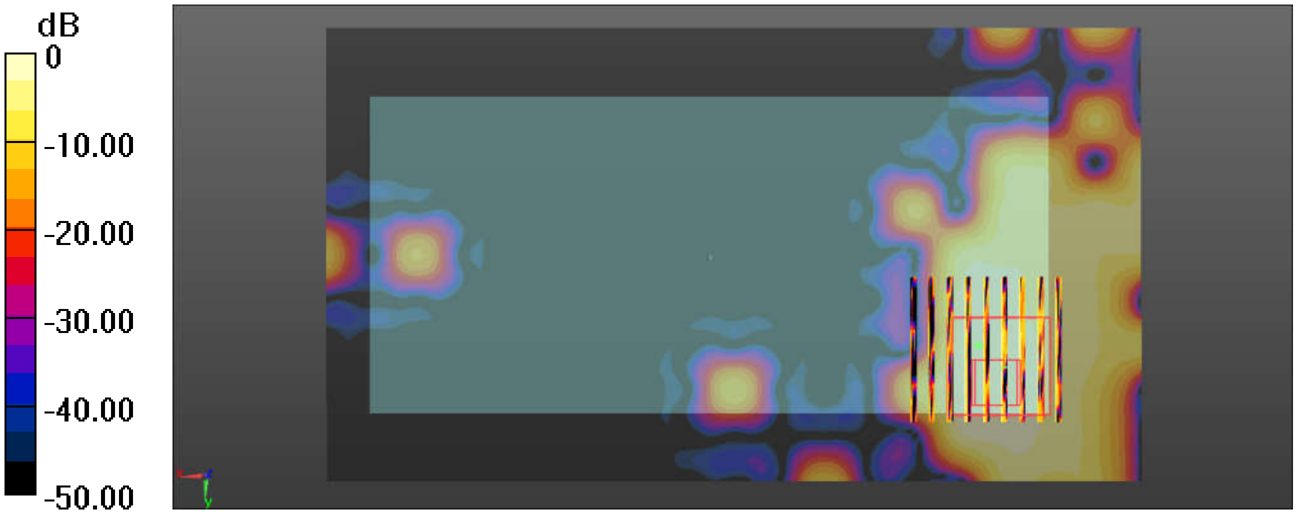
#06_WLAN5.2GHz_802.11n-HT20 MCS0_Front_10mm_Ant 1+2_Ch48

Communication System: UID 0, WIFI (0); Frequency: 5240 MHz;Duty Cycle: 1:1.049
Medium: MSL_5000 Medium parameters used: f = 5240 MHz; σ = 5.363 S/m; ε_r = 49.129; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; 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: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch48/Area Scan (181x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.126 W/kg

Ch48/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.187 W/kg
SAR(1 g) = 0.038 W/kg; SAR(10 g) = 0.013 W/kg
Maximum value of SAR (measured) = 0.101 W/kg



0 dB = 0.101 W/kg = -9.96 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.24

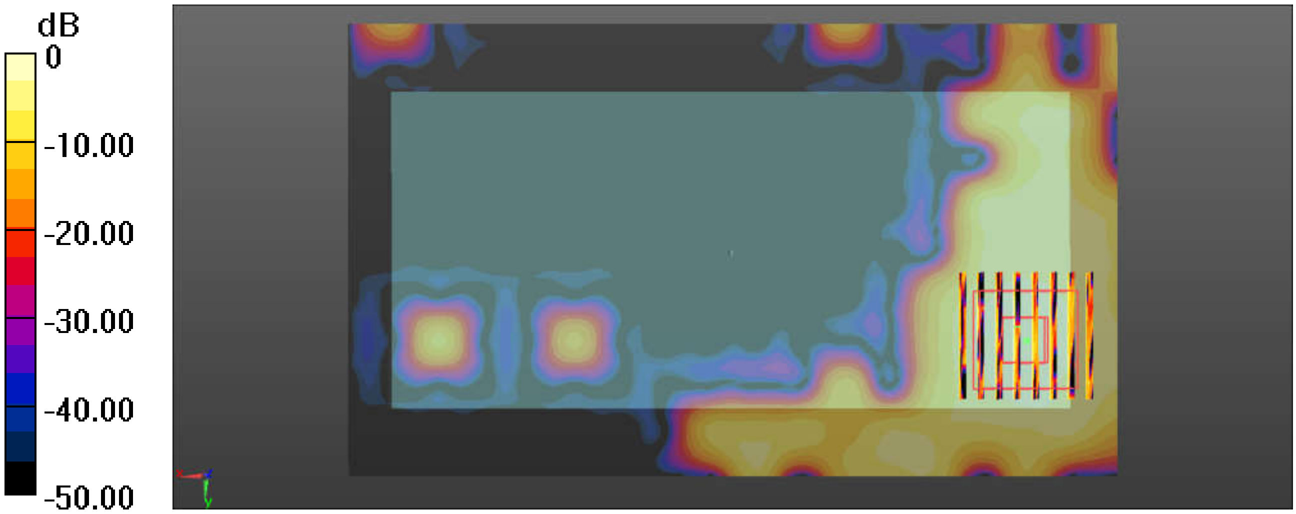
#07_WLAN5.8GHz_ 802.11n-HT40 MCS0_Front_10mm_Ant 1+2_Ch151

Communication System: UID 0, WIFI (0); Frequency: 5755 MHz;Duty Cycle: 1:1.107
Medium: MSL_5000 Medium parameters used: f = 5755 MHz; σ = 6.075 S/m; ε_r = 47.965; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.31, 4.31, 4.31); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch151/Area Scan (171x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.204 W/kg

Ch151/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 0 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.337 W/kg
SAR(1 g) = 0.079 W/kg; SAR(10 g) = 0.026 W/kg
Maximum value of SAR (measured) = 0.203 W/kg



0 dB = 0.203 W/kg = -6.93 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.10.24

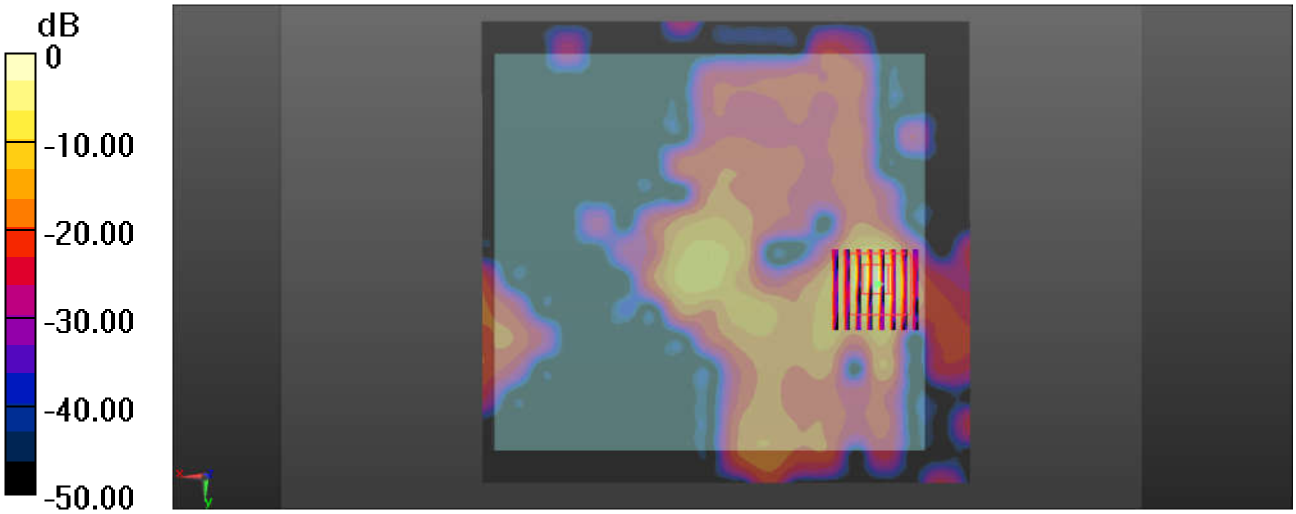
#08_WLAN5.2GHz_802.11n-HT20 MCS0_Back_0mm_Ant 1+2_Ch48

Communication System: UID 0, WIFI (0); Frequency: 5240 MHz;Duty Cycle: 1:1.049
Medium: MSL_5000 Medium parameters used: f = 5240 MHz; σ = 5.363 S/m; ε_r = 49.129; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; 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: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch48/Area Scan (171x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.54 W/kg

Ch48/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 8.176 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 0.401 W/kg
Maximum value of SAR (measured) = 7.02 W/kg



0 dB = 7.02 W/kg = 8.46 dBW/kg

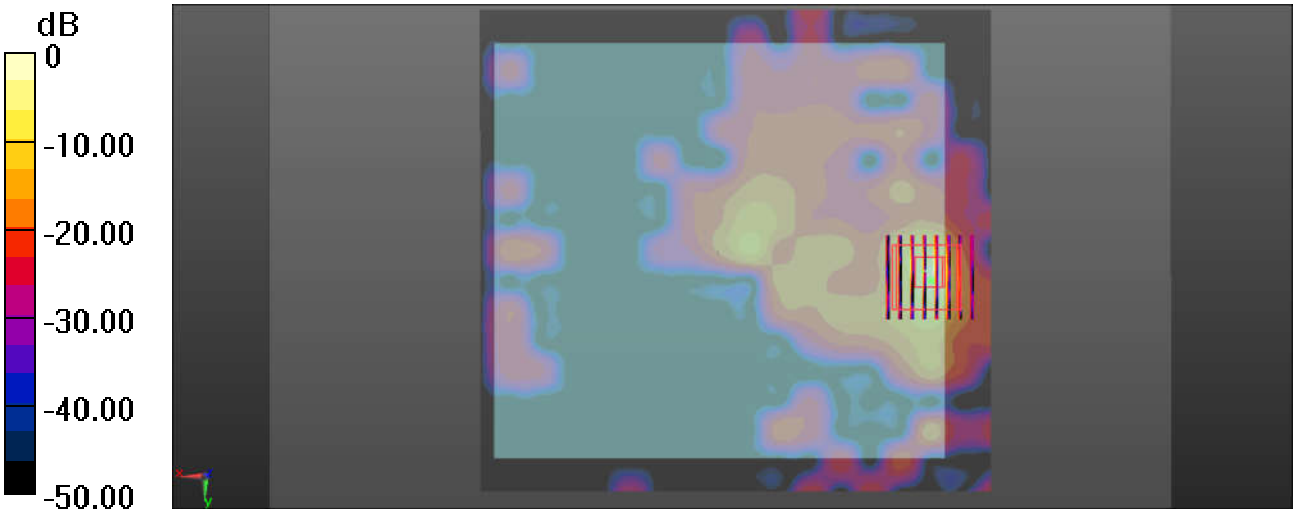
#09_WLAN5.8GHz_802.11n-HT40 MCS0_Back_0mm_Ant 1+2_Ch151

Communication System: UID 0, WIFI (0); Frequency: 5755 MHz;Duty Cycle: 1:1.107
Medium: MSL_5000 Medium parameters used: f = 5755 MHz; σ = 6.075 S/m; ε_r = 47.965; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.31, 4.31, 4.31); Calibrated: 2017.5.26;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2017.5.25
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch151/Area Scan (171x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.89 W/kg

Ch151/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.469 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 23.8 W/kg
SAR(1 g) = 2.5 W/kg; SAR(10 g) = 0.446 W/kg
Maximum value of SAR (measured) = 8.90 W/kg



0 dB = 8.90 W/kg = 9.49 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
s p e a g
CALIBRATION LABORATORY

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

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	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

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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)

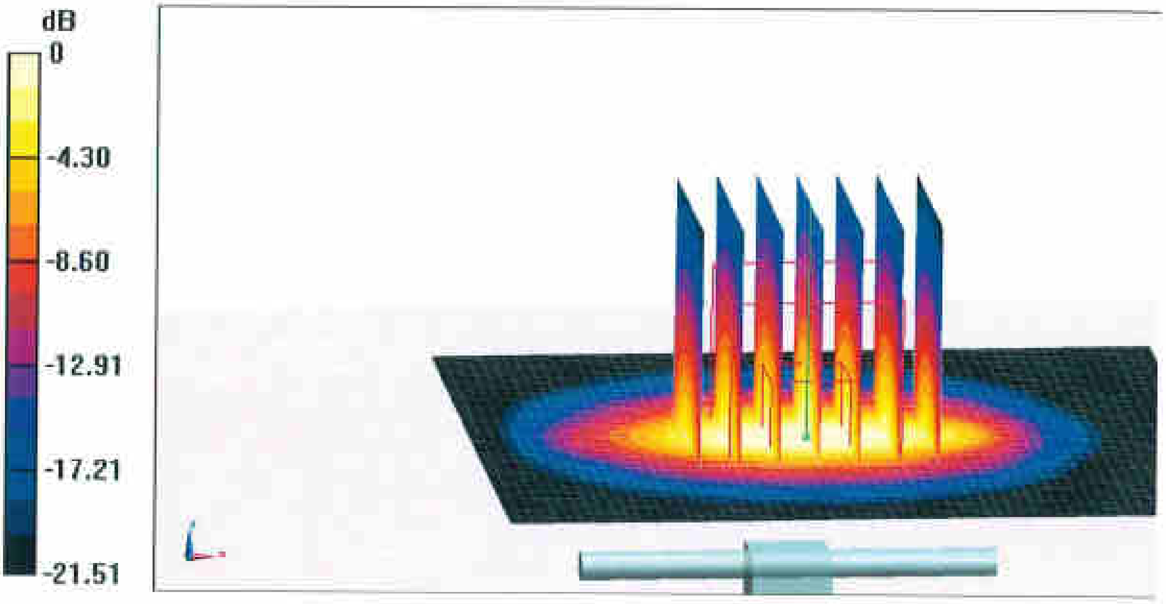
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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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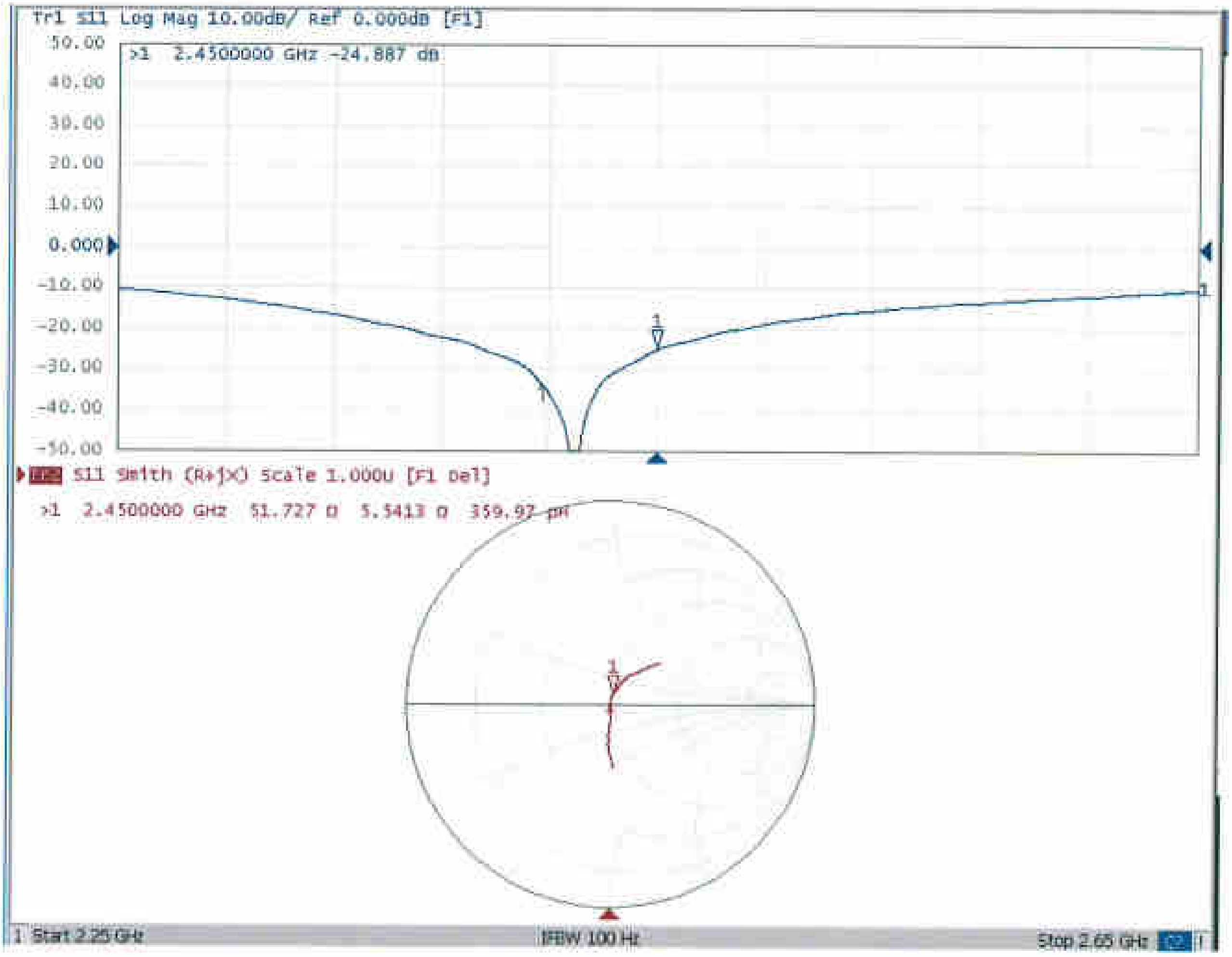
Impedance Measurement Plot for Head TSL



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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)

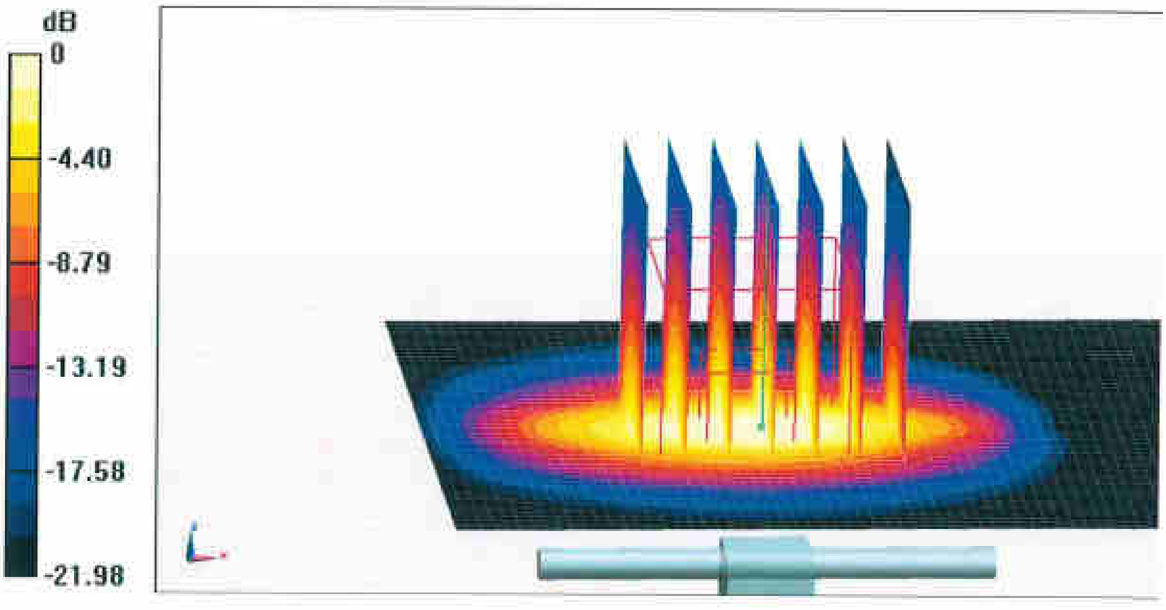
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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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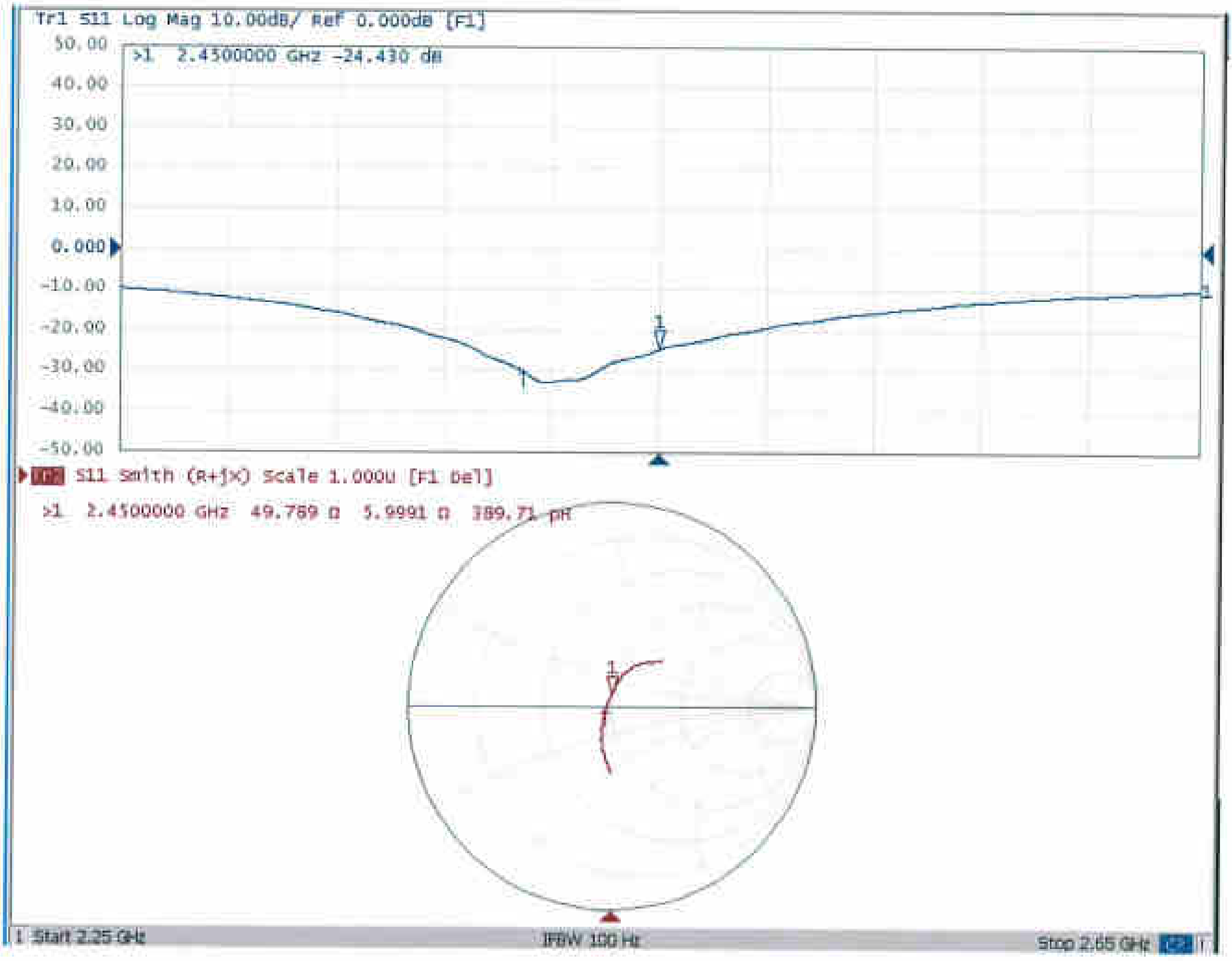
Impedance Measurement Plot for Body TSL



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

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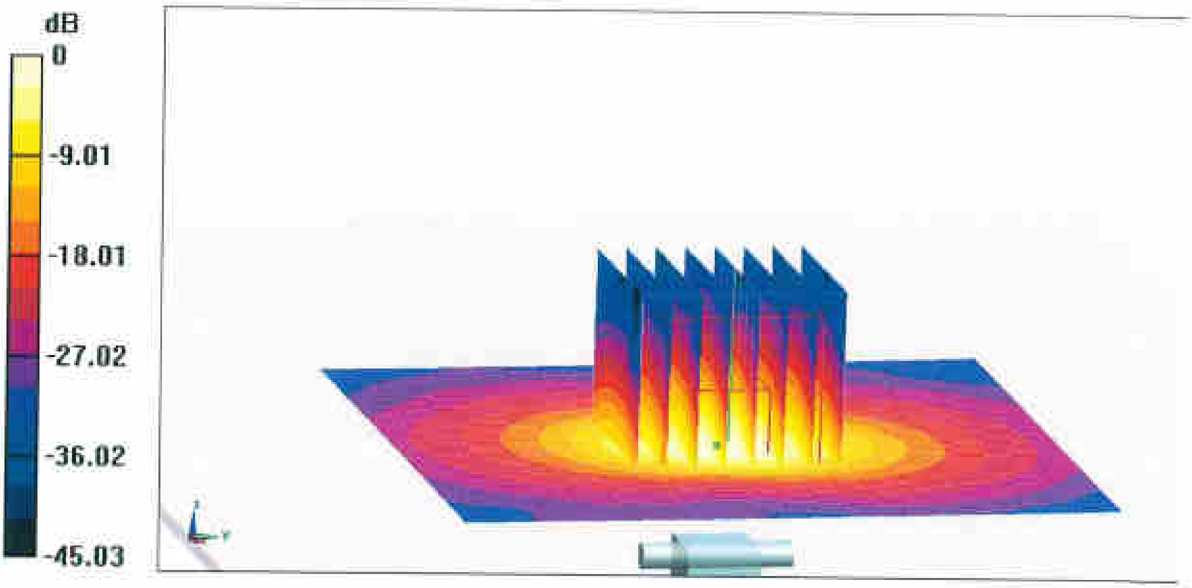
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.62 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 19.6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



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

In Collaboration with
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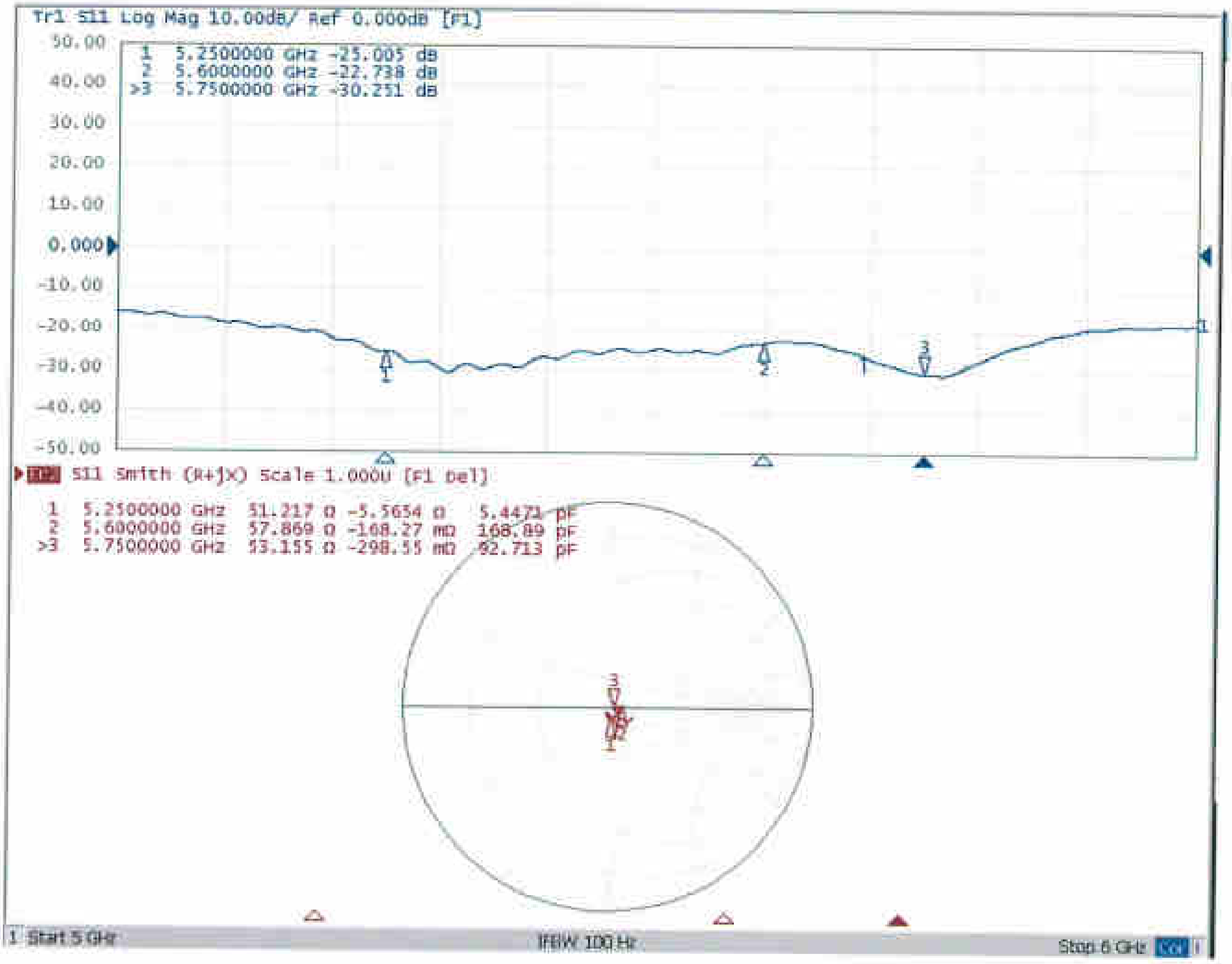
Impedance Measurement Plot for Head TSL



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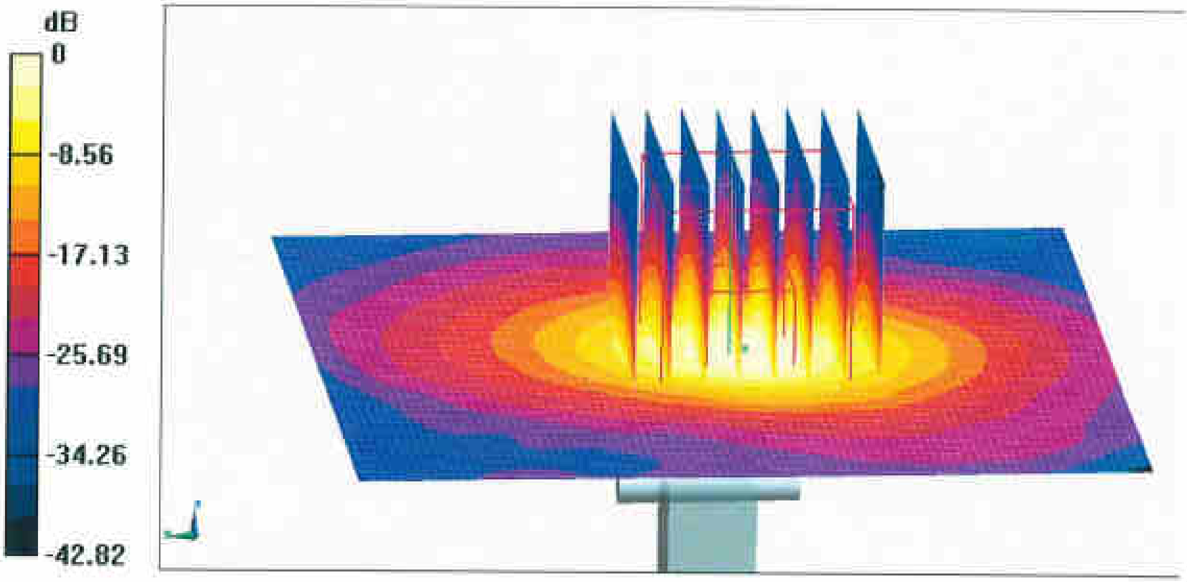
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.59 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 7.51 W/kg; SAR(10 g) = 2.11 W/kg
Maximum value of SAR (measured) = 18.5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



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

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Impedance Measurement Plot for Body TSL