FCC SAR Test Report

APPLICANT	**:**	**ZTE CORPORATION**
EQUIPMENT	**:**	**LTE Digital Mobile Phone**
BRAND NAME	**:**	**ZTE**
MODEL NAME	**:**	**Z6530V**
FCC ID	**:**	**SRQ-Z6530V**
STANDARD	**:**	**FCC 47 CFR PART 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Jul. 09, 2019 and testing was started from Jul. 09, 2019 and completed on Aug. 06, 2019. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has 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.

Rose Wang

Reviewed by: Rose Wang / Supervisor

Kat Yin

Approved by: Kat Yin / Manager

ilac-MRA ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA970903	Rev. 01	Initial issue of report	Aug. 09, 2019

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION, LTE Digital Mobile Phone, Z6530V,** 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	LTE	Band 5	0.24	0.57	0.57	1.46
		Band 13	0.17	0.37	0.37	
		Band 2	0.15	0.63	0.60	
		Band 66 / 4	0.30	**0.66**	**0.64**	
DTS	WLAN	2.4GHz WLAN	0.27	0.12	0.12	0.77
NII		5GHz WLAN	**1.19**	0.66	0.48	1.46
DSS	Bluetooth	2.4GHz Bluetooth	<0.10			1.46
Date of Testing:			2019/7/9~ 2019/8/6			
Remark: This device supports 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 (1.6 W/kg for Partial-Body 1g SAR) 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

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR 01	CN1257	314309

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 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 Digital Mobile Phone
Brand Name	ZTE
Model Name	Z6530V
FCC ID	SRQ-Z6530V
IMEI Code	861884040004306
Wireless Technology and Frequency Range	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 13: 779.5 MHz ~ 784.5 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	LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz : 802.11b/g/n HT20/HT40 WLAN 5GHz : 802.11n HT20/HT40 WLAN 5GHz : 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
HW Version	Z6530VHW1.0
SW Version	Z6530VV1.0.0B01
EUT Stage	Identical Prototype

Remark:
1. This device supports VoIP in LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications.
3. This device 2.4GHz WLAN/5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WiFi Direct (GC/GO).

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-Z6530V</td></tr>
<tr><td>Equipment Name</td><td>LTE 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 13: 779.5 MHz ~ 784.5 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 13: 5MHz, 10MHz
LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>Uplink Modulations used</td><td>QPSK / 16QAM / 64QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Voice and Data</td></tr>
<tr><td>LTE Release Version</td><td>R11, Cat 13</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 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{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>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</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>LTE Carrier Aggregation Combinations</td><td>Intra-Band and 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 carriers in the downlink. Additional 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 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5		
M	23230	782	23230	782
H	23255	784.5		

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:

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

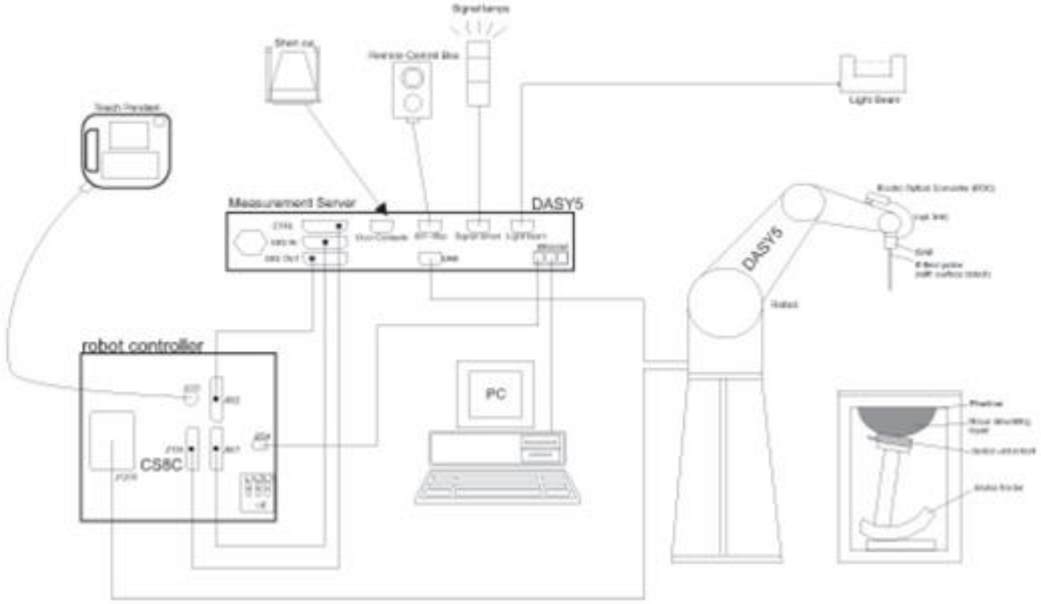
SAR is expressed in units of Watts per kilogram (W/kg)

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

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.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm

<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.

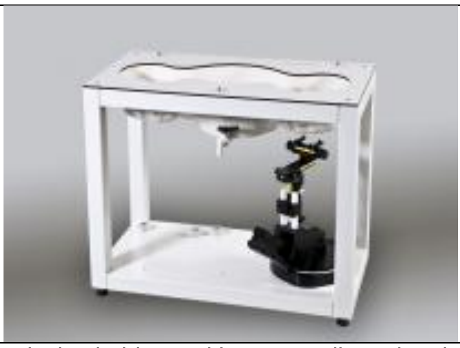
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

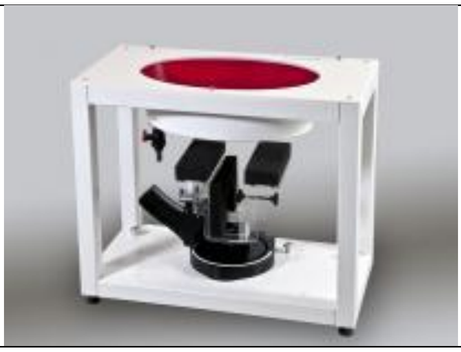
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



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	$\frac{1}{2}\cdot\delta\cdot\ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 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.

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

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	2019/3/27	2020/3/26
SPEAG	835MHz System Validation Kit	D835V2	4d151	2019/3/27	2020/3/26
SPEAG	1750MHz System Validation Kit	D1750V2	1090	2019/3/27	2020/3/26
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	2019/3/26	2020/3/25
SPEAG	2450MHz System Validation Kit	D2450V2	908	2019/3/25	2020/3/24
SPEAG	5000MHz System Validation Kit	D5GHzV2	1006	2018/9/27	2019/9/26
SPEAG	Data Acquisition Electronics	DAE4	690	2019/1/23	2020/1/22
SPEAG	Data Acquisition Electronics	DAE4	1338	2018/12/3	2019/12/2
SPEAG	Dosimetric E-Field Probe	ES3DV3	3293	2018/10/25	2019/10/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2019/5/27	2020/5/26
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1542	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1842	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8821C	6201432831	2019/4/17	2020/4/16
Agilent	Wireless Communication Test Set	E5515C	MY52102706	2019/4/18	2020/4/17
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2019/4/18	2020/4/17
SPEAG	Dielectric Probe Kit	DAK-3.5	1138	2018/11/20	2019/11/19
Anritsu	Vector Signal Generator	MG3710A	6201682672	2019/1/14	2020/1/13
Rohde & Schwarz	Power Meter	NRVD	102081	2018/8/20	2019/8/19
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2018/8/20	2019/8/19
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2018/8/20	2019/8/19
R&S	CBT BLUETOOTH TESTER	CBT	101641	2019/1/14	2020/1/13
EXA	Spectrum Analyzer	FSV7	101631	2019/1/14	2020/1/13
Testo	Hygrometer	608-H1	1241332126	2018/8/21	2019/8/20
FLUKE	DIGITAC THERMOMETER	51II	97240029	2018/8/8	2019/8/7
ARRA	Power Divider	A3200-2	N/A	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note	
Agilent	Dual Directional Coupler	778D	20500	Note	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note	

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

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For 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.

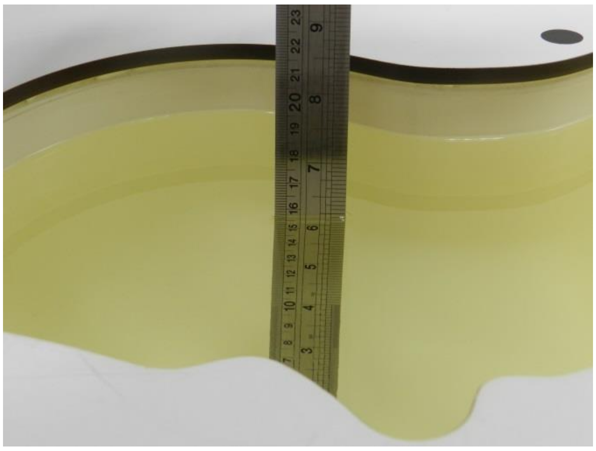


Fig 10.1Photo of Liquid Height for Head SAR

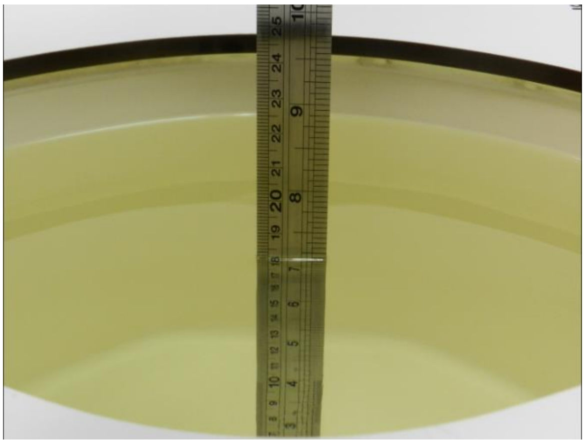


Fig 10.2 Photo of Liquid Height for Body SAR

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)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.8	0.900	41.707	0.89	41.90	1.12	-0.46	±5	2019/7/9
835	Head	22.9	0.921	42.546	0.90	41.50	2.33	2.52	±5	2019/7/9
1750	Head	22.8	1.346	40.242	1.37	40.10	-1.75	0.35	±5	2019/7/10
1900	Head	22.7	1.431	39.108	1.40	40.00	2.21	-2.23	±5	2019/7/11
2450	Head	22.8	1.860	40.275	1.80	39.20	3.33	2.74	±5	2019/7/12
5250	Head	22.7	4.842	36.481	4.71	35.90	2.80	1.62	±5	2019/8/6
5750	Head	22.9	5.375	35.709	5.22	35.40	2.97	0.87	±5	2019/8/6

10.3 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2019/7/9	750	Head	250	1087	3293	690	1.95	8.36	7.8	-6.70
2019/7/9	835	Head	250	4d151	3293	690	2.40	9.30	9.6	3.23
2019/7/10	1750	Head	250	1090	3293	690	8.84	36.40	35.36	-2.86
2019/7/11	1900	Head	250	5d170	3293	690	10.40	39.00	41.6	6.67
2019/7/12	2450	Head	250	908	3857	1338	13.30	52.80	53.2	0.76
2019/8/6	5250	Head	100	1006	3857	1338	7.68	80.70	76.8	-4.83
2019/8/6	5750	Head	100	1006	3857	1338	7.54	80.40	75.4	-6.22

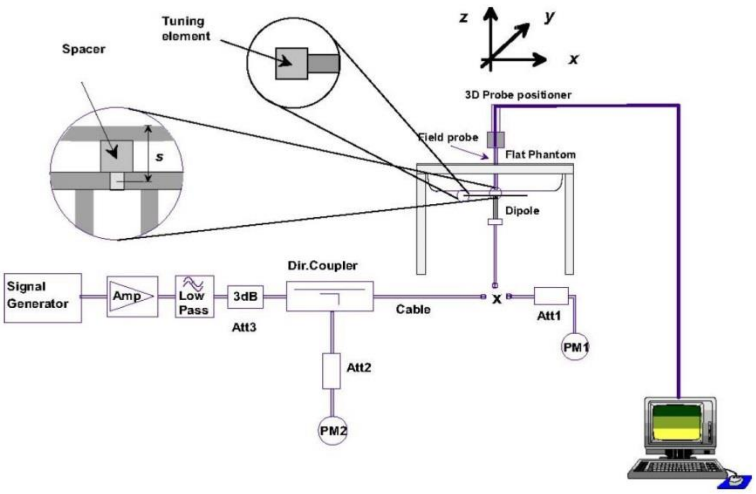


Fig 10.3.1 System Performance Check Setup

Fig 10.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 11.1.1 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 11.1.2 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 11.1.3). 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 11.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

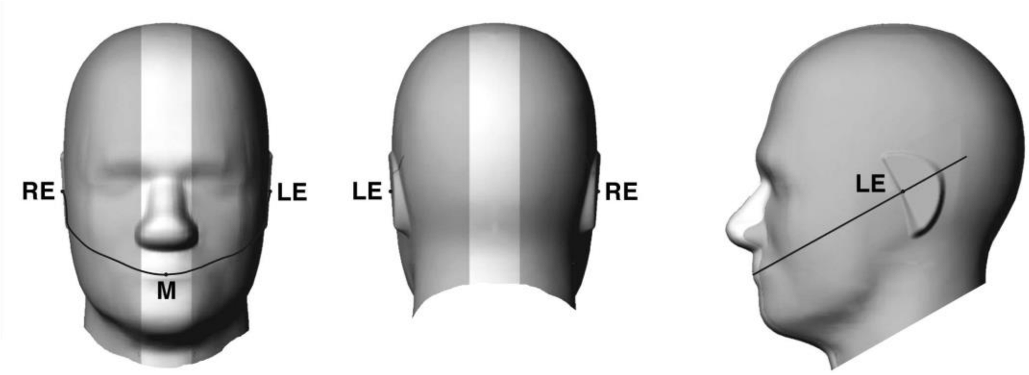


Fig 11.1.1 Front, back, and side views of SAM twin phantom

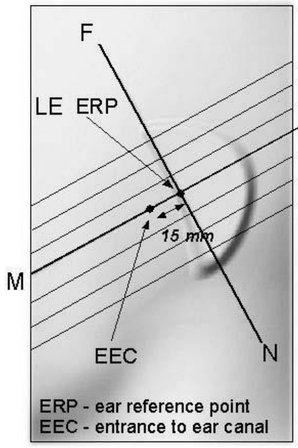


Fig 11.1.2 Close-up side view of phantom showing the ear region.

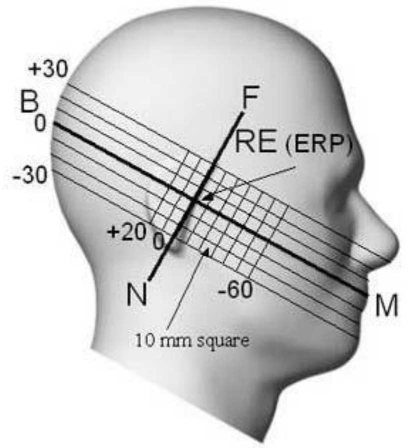


Fig 11.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

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 11.2.1 and Figure 11.2.2), 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 11.2.1). 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 11.2.2), 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 11.2.3), 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 11.2.3. The actual rotation angles should be documented in the test report.

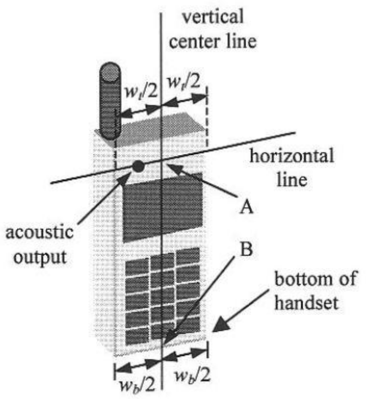


Fig 11.2.1 Handset vertical and horizontal reference lines—"fixed case

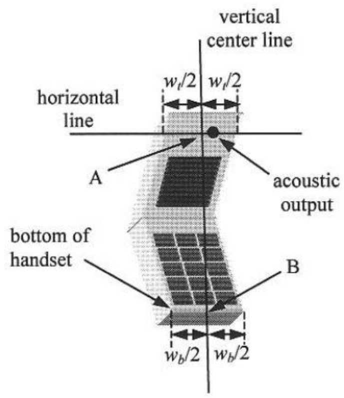


Fig 11.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

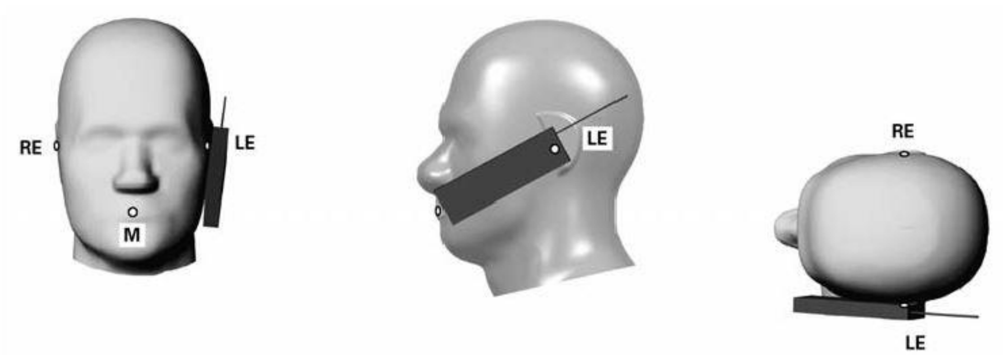


Fig 11.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

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 11.3.1. 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

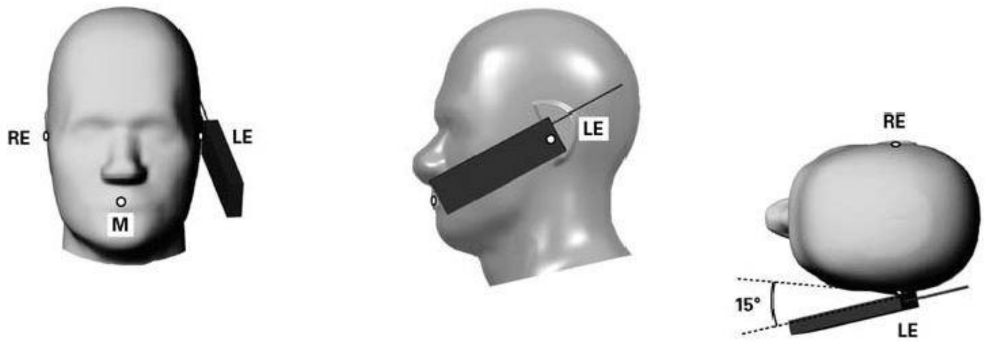


Fig 11.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

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 11.4). 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.

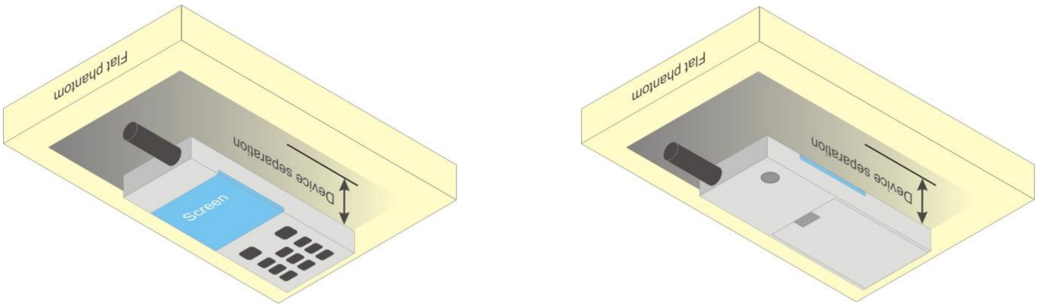


Fig 11.4 Body Worn Position

11.5 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.

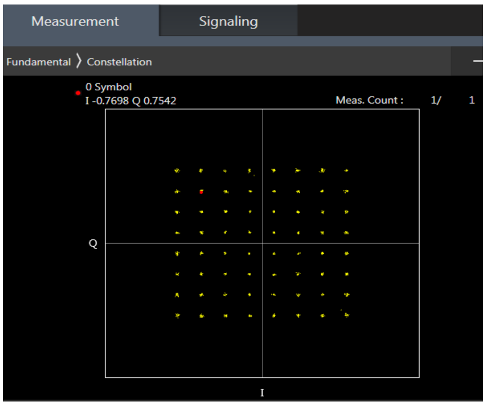
When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for 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)

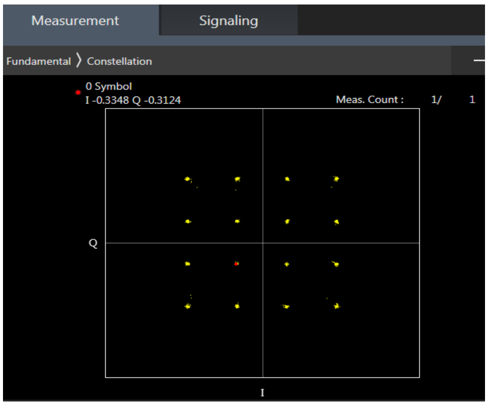
<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 4 SAR test was covered by Band 66; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
    a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
    b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to 2017 TCB workshop, for 64 QAM and 16 QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 64QAM and 16QAM signal modulation are correct.



64QAM



16QAM

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	22.42	22.69	22.31	24	0
20	QPSK	1	49	22.57	22.57	22.55		
20	QPSK	1	99	22.30	22.28	22.31		
20	QPSK	50	0	21.53	21.56	21.48	23	1
20	QPSK	50	24	21.55	21.56	21.52		
20	QPSK	50	50	21.55	21.40	21.41		
20	QPSK	100	0	21.52	21.49	21.44		
20	16QAM	1	0	21.61	21.56	21.67	23	1
20	16QAM	1	49	21.96	21.87	21.94		
20	16QAM	1	99	21.61	21.68	21.62		
20	16QAM	50	0	20.54	20.54	20.51	22	2
20	16QAM	50	24	20.57	20.55	20.54		
20	16QAM	50	50	20.57	20.39	20.44		
20	16QAM	100	0	20.52	20.45	20.44		
20	64QAM	1	0	20.60	20.59	20.64	22	2
20	64QAM	1	49	20.83	20.69	20.82		
20	64QAM	1	99	20.52	20.46	20.60		
20	64QAM	50	0	19.49	19.53	19.45	21	3
20	64QAM	50	24	19.56	19.52	19.52		
20	64QAM	50	50	19.55	19.35	19.42		
20	64QAM	100	0	19.52	19.45	19.42		

Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.50	22.37	22.35		
15	QPSK	1	37	22.66	22.59	22.56	24	0
15	QPSK	1	74	22.38	22.34	22.39		
15	QPSK	36	0	21.62	21.58	21.55		
15	QPSK	36	20	21.61	21.56	21.55	23	1
15	QPSK	36	39	21.59	21.48	21.52		
15	QPSK	75	0	21.58	21.54	21.51		
15	16QAM	1	0	21.74	21.69	21.78		
15	16QAM	1	37	21.97	21.83	21.97	23	1
15	16QAM	1	74	21.74	21.71	21.60		
15	16QAM	36	0	20.57	20.52	20.52		
15	16QAM	36	20	20.55	20.50	20.54	22	2
15	16QAM	36	39	20.55	20.44	20.50		
15	16QAM	75	0	20.55	20.51	20.51		
15	64QAM	1	0	20.65	20.57	20.66		
15	64QAM	1	37	20.83	20.77	20.88	22	2
15	64QAM	1	74	20.69	20.61	20.65		
15	64QAM	36	0	19.56	19.54	19.54		
15	64QAM	36	20	19.53	19.49	19.56	21	3
15	64QAM	36	39	19.53	19.43	19.48		
15	64QAM	75	0	19.53	19.46	19.49		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.55	22.48	22.45		
10	QPSK	1	25	22.63	22.63	22.62	24	0
10	QPSK	1	49	22.47	22.45	22.44		
10	QPSK	25	0	21.66	21.63	21.61		
10	QPSK	25	12	21.63	21.60	21.63	23	1
10	QPSK	25	25	21.60	21.52	21.54		
10	QPSK	50	0	21.62	21.58	21.59		
10	16QAM	1	0	21.70	21.74	21.81		
10	16QAM	1	25	21.88	21.98	21.96	23	1
10	16QAM	1	49	21.89	21.76	21.76		
10	16QAM	25	0	20.61	20.62	20.65		
10	16QAM	25	12	20.62	20.59	20.63	22	2
10	16QAM	25	25	20.61	20.52	20.57		
10	16QAM	50	0	20.60	20.56	20.58		
10	64QAM	1	0	20.79	20.65	20.72		
10	64QAM	1	25	20.74	20.87	20.92	22	2
10	64QAM	1	49	20.63	20.60	20.65		
10	64QAM	25	0	19.60	19.59	19.61		
10	64QAM	25	12	19.60	19.55	19.63	21	3
10	64QAM	25	25	19.60	19.51	19.52		
10	64QAM	50	0	19.59	19.51	19.53		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.46	22.36	22.37	24	0
5	QPSK	1	12	22.67	22.64	22.66		
5	QPSK	1	24	22.38	22.34	22.36		
5	QPSK	12	0	21.62	21.52	21.57	23	1
5	QPSK	12	7	21.63	21.56	21.59		
5	QPSK	12	13	21.61	21.54	21.54		
5	QPSK	25	0	21.60	21.49	21.52		
5	16QAM	1	0	21.76	21.59	21.57	23	1
5	16QAM	1	12	21.92	21.98	21.86		
5	16QAM	1	24	21.72	21.59	21.70		
5	16QAM	12	0	20.59	20.48	20.56	22	2
5	16QAM	12	7	20.61	20.54	20.61		
5	16QAM	12	13	20.59	20.51	20.51		
5	16QAM	25	0	20.56	20.51	20.53		
5	64QAM	1	0	20.57	20.48	20.68	22	2
5	64QAM	1	12	20.89	20.73	20.84		
5	64QAM	1	24	20.56	20.52	20.57		
5	64QAM	12	0	19.60	19.49	19.56	21	3
5	64QAM	12	7	19.64	19.52	19.59		
5	64QAM	12	13	19.59	19.49	19.56		
5	64QAM	25	0	19.55	19.46	19.51		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.58	22.48	22.44	24	0
3	QPSK	1	8	22.57	22.48	22.47		
3	QPSK	1	14	22.51	22.43	22.47		
3	QPSK	8	0	21.62	21.53	21.55	23	1
3	QPSK	8	4	21.68	21.55	21.56		
3	QPSK	8	7	21.58	21.50	21.52		
3	QPSK	15	0	21.61	21.51	21.53		
3	16QAM	1	0	21.86	21.74	21.72	23	1
3	16QAM	1	8	21.84	21.72	21.78		
3	16QAM	1	14	21.73	21.74	21.74		
3	16QAM	8	0	20.64	20.55	20.63	22	2
3	16QAM	8	4	20.68	20.58	20.64		
3	16QAM	8	7	20.64	20.55	20.62		
3	16QAM	15	0	20.62	20.50	20.53		
3	64QAM	1	0	20.68	20.71	20.68	22	2
3	64QAM	1	8	20.72	20.72	20.65		
3	64QAM	1	14	20.65	20.71	20.73		
3	64QAM	8	0	19.60	19.52	19.60	21	3
3	64QAM	8	4	19.65	19.56	19.57		
3	64QAM	8	7	19.59	19.50	19.53		
3	64QAM	15	0	19.56	19.46	19.52		

Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.52	22.39	22.40	24	0
1.4	QPSK	1	3	22.61	22.54	22.53		
1.4	QPSK	1	5	22.51	22.40	22.39		
1.4	QPSK	3	0	22.61	22.50	22.51		
1.4	QPSK	3	1	22.66	22.58	22.56		
1.4	QPSK	3	3	22.63	22.50	22.51		
1.4	QPSK	6	0	21.64	21.51	21.54	23	1
1.4	16QAM	1	0	21.76	21.74	21.61	23	1
1.4	16QAM	1	3	21.82	21.71	21.77		
1.4	16QAM	1	5	21.70	21.66	21.76		
1.4	16QAM	3	0	21.58	21.53	21.55		
1.4	16QAM	3	1	21.68	21.59	21.60		
1.4	16QAM	3	3	21.61	21.53	21.47		
1.4	16QAM	6	0	20.67	20.58	20.62	22	2
1.4	64QAM	1	0	20.71	20.56	20.60	22	2
1.4	64QAM	1	3	20.79	20.73	20.76		
1.4	64QAM	1	5	20.63	20.60	20.61		
1.4	64QAM	3	0	20.70	20.58	20.60		
1.4	64QAM	3	1	20.71	20.65	20.67		
1.4	64QAM	3	3	20.67	20.59	20.70		
1.4	64QAM	6	0	19.59	19.50	19.51	21	3

<u><LTE Band 4></u>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.72	22.65	22.66	24	0
20	QPSK	1	49	22.70	22.61	22.58		
20	QPSK	1	99	22.27	22.32	22.32		
20	QPSK	50	0	21.60	21.56	21.54	23	1
20	QPSK	50	24	21.56	21.55	21.52		
20	QPSK	50	50	21.52	21.51	21.60		
20	QPSK	100	0	21.51	21.50	21.55		
20	16QAM	1	0	21.72	21.61	21.78	23	1
20	16QAM	1	49	21.97	22.04	21.97		
20	16QAM	1	99	21.69	21.65	21.60		
20	16QAM	50	0	20.48	20.53	20.54	22	2
20	16QAM	50	24	20.58	20.52	20.55		
20	16QAM	50	50	20.55	20.53	20.60		
20	16QAM	100	0	20.49	20.52	20.58		
20	64QAM	1	0	20.67	20.58	20.63	22	2
20	64QAM	1	49	20.76	20.77	20.83		
20	64QAM	1	99	20.44	20.58	20.54		
20	64QAM	50	0	19.47	19.52	19.54	21	3
20	64QAM	50	24	19.54	19.52	19.53		
20	64QAM	50	50	19.53	19.50	19.58		
20	64QAM	100	0	19.50	19.47	19.56		

Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.44	22.45	22.42	24	0
15	QPSK	1	37	22.64	22.69	22.68		
15	QPSK	1	74	22.36	22.40	22.41		
15	QPSK	36	0	21.54	21.58	21.52	23	1
15	QPSK	36	20	21.59	21.57	21.57		
15	QPSK	36	39	21.56	21.57	21.59		
15	QPSK	75	0	21.54	21.58	21.58		
15	16QAM	1	0	21.82	21.86	21.85	23	1
15	16QAM	1	37	22.05	22.08	22.07		
15	16QAM	1	74	21.71	21.73	21.69		
15	16QAM	36	0	20.51	20.54	20.51	22	2
15	16QAM	36	20	20.55	20.57	20.55		
15	16QAM	36	39	20.55	20.54	20.56		
15	16QAM	75	0	20.57	20.58	20.57		
15	64QAM	1	0	20.61	20.58	20.70	22	2
15	64QAM	1	37	20.97	20.91	20.88		
15	64QAM	1	74	20.62	20.58	20.57		
15	64QAM	36	0	19.53	19.55	19.52	21	3
15	64QAM	36	20	19.56	19.57	19.56		
15	64QAM	36	39	19.56	19.56	19.58		
15	64QAM	75	0	19.54	19.54	19.54		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.49	22.43	22.41	24	0
10	QPSK	1	25	22.61	22.59	22.62		
10	QPSK	1	49	22.40	22.43	22.44		
10	QPSK	25	0	21.57	21.55	21.48	23	1
10	QPSK	25	12	21.55	21.55	21.57		
10	QPSK	25	25	21.59	21.55	21.61		
10	QPSK	50	0	21.59	21.54	21.56		
10	16QAM	1	0	21.77	21.70	21.81	23	1
10	16QAM	1	25	22.01	21.87	22.03		
10	16QAM	1	49	21.67	21.76	21.78		
10	16QAM	25	0	20.61	20.56	20.51	22	2
10	16QAM	25	12	20.59	20.56	20.58		
10	16QAM	25	25	20.60	20.56	20.63		
10	16QAM	50	0	20.58	20.54	20.59		
10	64QAM	1	0	20.70	20.58	20.73	22	2
10	64QAM	1	25	20.83	20.85	20.84		
10	64QAM	1	49	20.57	20.75	20.72		
10	64QAM	25	0	19.55	19.54	19.46	21	3
10	64QAM	25	12	19.57	19.54	19.56		
10	64QAM	25	25	19.59	19.56	19.61		
10	64QAM	50	0	19.56	19.53	19.56		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.42	22.34	22.37	24	0
5	QPSK	1	12	22.71	22.69	22.68		
5	QPSK	1	24	22.35	22.35	22.39		
5	QPSK	12	0	21.54	21.51	21.52	23	1
5	QPSK	12	7	21.62	21.58	21.60		
5	QPSK	12	13	21.61	21.57	21.59		
5	QPSK	25	0	21.58	21.51	21.56		
5	16QAM	1	0	21.77	21.74	21.71	23	1
5	16QAM	1	12	21.94	21.99	22.05		
5	16QAM	1	24	21.63	21.66	21.68		
5	16QAM	12	0	20.56	20.49	20.53	22	2
5	16QAM	12	7	20.65	20.59	20.63		
5	16QAM	12	13	20.62	20.57	20.60		
5	16QAM	25	0	20.59	20.51	20.56		
5	64QAM	1	0	20.63	20.61	20.62	22	2
5	64QAM	1	12	20.93	20.92	20.88		
5	64QAM	1	24	20.61	20.53	20.62		
5	64QAM	12	0	19.58	19.45	19.50	21	3
5	64QAM	12	7	19.62	19.61	19.60		
5	64QAM	12	13	19.65	19.58	19.59		
5	64QAM	25	0	19.57	19.49	19.55		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.52	22.47	22.48	24	0
3	QPSK	1	8	22.51	22.48	22.52		
3	QPSK	1	14	22.50	22.47	22.46		
3	QPSK	8	0	21.56	21.52	21.55	23	1
3	QPSK	8	4	21.60	21.58	21.59		
3	QPSK	8	7	21.55	21.52	21.54		
3	QPSK	15	0	21.55	21.51	21.52		
3	16QAM	1	0	21.81	21.85	21.77	23	1
3	16QAM	1	8	21.77	21.77	21.89		
3	16QAM	1	14	21.82	21.75	21.76		
3	16QAM	8	0	20.64	20.61	20.63	22	2
3	16QAM	8	4	20.69	20.63	20.67		
3	16QAM	8	7	20.62	20.58	20.61		
3	16QAM	15	0	20.58	20.54	20.55		
3	64QAM	1	0	20.74	20.69	20.66	22	2
3	64QAM	1	8	20.74	20.75	20.77		
3	64QAM	1	14	20.74	20.74	20.78		
3	64QAM	8	0	19.60	19.53	19.59	21	3
3	64QAM	8	4	19.63	19.57	19.63		
3	64QAM	8	7	19.61	19.56	19.59		
3	64QAM	15	0	19.52	19.50	19.55		

Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.44	22.40	22.43	24	0
1.4	QPSK	1	3	22.57	22.57	22.54		
1.4	QPSK	1	5	22.43	22.41	22.44		
1.4	QPSK	3	0	22.54	22.52	22.53		
1.4	QPSK	3	1	22.59	22.57	22.59		
1.4	QPSK	3	3	22.59	22.53	22.52		
1.4	QPSK	6	0	21.59	21.52	21.54	23	1
1.4	16QAM	1	0	21.65	21.77	21.76	23	1
1.4	16QAM	1	3	21.84	21.88	21.93		
1.4	16QAM	1	5	21.74	21.79	21.83		
1.4	16QAM	3	0	21.55	21.52	21.59		
1.4	16QAM	3	1	21.63	21.53	21.63		
1.4	16QAM	3	3	21.61	21.55	21.48		
1.4	16QAM	6	0	20.67	20.65	20.64	22	2
1.4	64QAM	1	0	20.65	20.66	20.62	22	2
1.4	64QAM	1	3	20.76	20.79	20.77		
1.4	64QAM	1	5	20.76	20.63	20.68		
1.4	64QAM	3	0	20.69	20.58	20.68		
1.4	64QAM	3	1	20.74	20.63	20.70		
1.4	64QAM	3	3	20.69	20.57	20.62		
1.4	64QAM	6	0	19.54	19.53	19.55	21	3

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.83	22.90	22.97	24	0
10	QPSK	1	25	23.05	23.04	23.17		
10	QPSK	1	49	22.86	22.94	22.99		
10	QPSK	25	0	22.07	22.06	22.13	23	1
10	QPSK	25	12	22.06	22.07	22.20		
10	QPSK	25	25	22.02	22.11	22.14		
10	QPSK	50	0	22.06	22.09	22.16		
10	16QAM	1	0	22.21	22.18	22.23	23	1
10	16QAM	1	25	22.27	22.43	22.43		
10	16QAM	1	49	22.21	22.26	22.29		
10	16QAM	25	0	21.04	21.07	20.90	22	2
10	16QAM	25	12	21.04	21.07	20.95		
10	16QAM	25	25	21.02	21.11	20.90		
10	16QAM	50	0	21.03	21.08	20.93		
10	64QAM	1	0	21.04	21.13	20.91	22	2
10	64QAM	1	25	21.27	21.29	21.13		
10	64QAM	1	49	21.15	21.17	20.98		
10	64QAM	25	0	20.03	20.06	19.90	21	3
10	64QAM	25	12	20.03	20.05	19.97		
10	64QAM	25	25	20.00	20.12	19.94		
10	64QAM	50	0	20.02	20.08	19.91		

Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.59	22.59	22.72	24	0
5	QPSK	1	12	22.84	22.88	23.00		
5	QPSK	1	24	22.61	22.62	22.70		
5	QPSK	12	0	21.75	21.78	21.92	23	1
5	QPSK	12	7	21.81	21.85	21.95		
5	QPSK	12	13	21.78	21.85	21.90		
5	QPSK	25	0	21.76	21.77	21.91		
5	16QAM	1	0	21.84	21.89	22.01	23	1
5	16QAM	1	12	22.10	22.09	22.14		
5	16QAM	1	24	22.01	21.96	21.95		
5	16QAM	12	0	20.74	20.76	20.87	22	2
5	16QAM	12	7	20.80	20.82	20.89		
5	16QAM	12	13	20.77	20.82	20.85		
5	16QAM	25	0	20.76	20.78	20.89		
5	64QAM	1	0	20.81	20.78	20.89	22	2
5	64QAM	1	12	21.07	21.09	21.21		
5	64QAM	1	24	20.82	20.90	20.92		
5	64QAM	12	0	19.73	19.74	19.90	21	3
5	64QAM	12	7	19.80	19.82	19.94		
5	64QAM	12	13	19.78	19.83	19.90		
5	64QAM	25	0	19.73	19.76	19.87		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.68	22.72	22.83	24	0
3	QPSK	1	8	22.67	22.68	22.81		
3	QPSK	1	14	22.71	22.75	22.80		
3	QPSK	8	0	21.75	21.76	21.89	23	1
3	QPSK	8	4	21.80	21.85	21.93		
3	QPSK	8	7	21.76	21.81	21.87		
3	QPSK	15	0	21.75	21.77	21.90		
3	16QAM	1	0	21.97	21.99	22.04	23	1
3	16QAM	1	8	22.04	21.94	22.10		
3	16QAM	1	14	22.04	21.99	22.08		
3	16QAM	8	0	20.80	20.84	20.93	22	2
3	16QAM	8	4	20.86	20.91	20.98		
3	16QAM	8	7	20.81	20.85	20.90		
3	16QAM	15	0	20.74	20.78	20.88		
3	64QAM	1	0	20.89	20.95	21.05	22	2
3	64QAM	1	8	20.87	20.99	20.98		
3	64QAM	1	14	20.94	21.00	20.98		
3	64QAM	8	0	19.75	19.79	19.91	21	3
3	64QAM	8	4	19.81	19.89	19.91		
3	64QAM	8	7	19.79	19.83	19.93		
3	64QAM	15	0	19.71	19.75	19.85		

Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.60	22.62	22.72	24	0
1.4	QPSK	1	3	22.69	22.75	22.84		
1.4	QPSK	1	5	22.63	22.61	22.72		
1.4	QPSK	3	0	22.69	22.73	22.83		
1.4	QPSK	3	1	22.74	22.80	22.89		
1.4	QPSK	3	3	22.70	22.74	22.84		
1.4	QPSK	6	0	21.76	21.79	21.90	23	1
1.4	16QAM	1	0	21.94	21.92	21.92	23	1
1.4	16QAM	1	3	21.96	22.08	22.04		
1.4	16QAM	1	5	21.84	22.01	21.96		
1.4	16QAM	3	0	21.72	21.73	21.85		
1.4	16QAM	3	1	21.76	21.80	21.90		
1.4	16QAM	3	3	21.72	21.79	21.86		
1.4	16QAM	6	0	20.82	20.88	20.95	22	2
1.4	64QAM	1	0	20.88	20.85	20.85	22	2
1.4	64QAM	1	3	20.95	20.97	20.98		
1.4	64QAM	1	5	20.84	20.86	20.94		
1.4	64QAM	3	0	20.79	20.87	20.92		
1.4	64QAM	3	1	20.86	20.90	21.02		
1.4	64QAM	3	3	20.80	20.84	20.92		
1.4	64QAM	6	0	19.71	19.74	19.86	21	3

<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel					23230			
Frequency (MHz)					782			
10	QPSK	1	0		23.14		24	0
10	QPSK	1	25		23.03			
10	QPSK	1	49		22.78			
10	QPSK	25	0		21.77		23	1
10	QPSK	25	12		21.90			
10	QPSK	25	25		21.91			
10	QPSK	50	0		21.83			
10	16QAM	1	0		22.07		23	1
10	16QAM	1	25		22.09			
10	16QAM	1	49		21.98			
10	16QAM	25	0		20.78		22	2
10	16QAM	25	12		20.89			
10	16QAM	25	25		20.81			
10	16QAM	50	0		20.81			
10	64QAM	1	0		20.95		22	2
10	64QAM	1	25		21.08			
10	64QAM	1	49		20.89			
10	64QAM	25	0		19.78		21	3
10	64QAM	25	12		19.92			
10	64QAM	25	25		19.83			
10	64QAM	50	0		19.83			

Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.75	22.74	22.73	24	0
5	QPSK	1	12	23.01	22.97	22.96		
5	QPSK	1	24	22.69	22.68	22.71		
5	QPSK	12	0	21.81	21.79	21.87	23	1
5	QPSK	12	7	21.89	21.91	21.88		
5	QPSK	12	13	21.94	21.84	21.88		
5	QPSK	25	0	21.90	21.81	21.91		
5	16QAM	1	0	21.89	22.00	21.89	23	1
5	16QAM	1	12	22.24	22.24	22.24		
5	16QAM	1	24	21.91	21.84	22.00		
5	16QAM	12	0	20.78	20.80	20.87	22	2
5	16QAM	12	7	20.93	20.91	20.87		
5	16QAM	12	13	20.96	20.82	20.86		
5	16QAM	25	0	20.90	20.83	20.90		
5	64QAM	1	0	20.85	20.92	20.87	22	2
5	64QAM	1	12	21.23	21.14	21.04		
5	64QAM	1	24	20.83	20.82	20.98		
5	64QAM	12	0	19.88	19.84	19.92	21	3
5	64QAM	12	7	19.96	19.95	19.89		
5	64QAM	12	13	20.01	19.86	19.89		
5	64QAM	25	0	19.94	19.81	19.91		

<LTE Band 66>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				132072	132322	132572		
Frequency (MHz)				1720	1745	1770		
20	QPSK	1	0	22.60	22.68	22.67	24	0
20	QPSK	1	49	22.61	22.59	22.63		
20	QPSK	1	99	22.29	22.34	22.33		
20	QPSK	50	0	21.44	21.62	21.61	23	1
20	QPSK	50	24	21.57	21.54	21.60		
20	QPSK	50	50	21.55	21.60	21.49		
20	QPSK	100	0	21.52	21.57	21.51		
20	16QAM	1	0	21.63	21.68	21.67	23	1
20	16QAM	1	49	21.92	21.97	21.96		
20	16QAM	1	99	21.69	21.76	21.74		
20	16QAM	50	0	20.48	20.53	20.71	22	2
20	16QAM	50	24	20.59	20.57	20.62		
20	16QAM	50	50	20.58	20.63	20.49		
20	16QAM	100	0	20.51	20.58	20.61		
20	64QAM	1	0	20.61	20.60	20.56	22	2
20	64QAM	1	49	20.82	20.83	20.85		
20	64QAM	1	99	20.49	20.61	20.52		
20	64QAM	50	0	19.45	19.50	19.45	21	3
20	64QAM	50	24	19.53	19.55	19.58		
20	64QAM	50	50	19.55	19.62	19.48		
20	64QAM	100	0	19.49	19.58	19.54		

Channel				132047	132322	132597	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1745	1772.5		
15	QPSK	1	0	22.41	22.41	22.41	24	0
15	QPSK	1	37	22.63	22.62	22.67		
15	QPSK	1	74	22.37	22.42	22.39		
15	QPSK	36	0	21.54	21.51	21.68	23	1
15	QPSK	36	20	21.57	21.57	21.60		
15	QPSK	36	39	21.56	21.58	21.56		
15	QPSK	75	0	21.52	21.57	21.61		
15	16QAM	1	0	21.69	21.79	21.69	23	1
15	16QAM	1	37	22.01	21.93	21.98		
15	16QAM	1	74	21.68	21.66	21.78		
15	16QAM	36	0	20.51	20.49	20.63	22	2
15	16QAM	36	20	20.55	20.55	20.57		
15	16QAM	36	39	20.52	20.57	20.54		
15	16QAM	75	0	20.54	20.56	20.57		
15	64QAM	1	0	20.66	20.68	20.56	22	2
15	64QAM	1	37	20.88	20.79	20.81		
15	64QAM	1	74	20.65	20.64	20.66		
15	64QAM	36	0	19.52	19.52	19.62	21	3
15	64QAM	36	20	19.58	19.60	19.57		
15	64QAM	36	39	19.53	19.58	19.54		
15	64QAM	75	0	19.51	19.54	19.58		
Channel				132022	132322	132622	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1745	1775		
10	QPSK	1	0	22.44	22.44	22.47	24	0
10	QPSK	1	25	22.60	22.58	22.62		
10	QPSK	1	49	22.42	22.49	22.45		
10	QPSK	25	0	21.52	21.52	21.65	23	1
10	QPSK	25	12	21.58	21.55	21.57		
10	QPSK	25	25	21.59	21.62	21.59		
10	QPSK	50	0	21.59	21.59	21.63		
10	16QAM	1	0	21.75	21.87	21.83	23	1
10	16QAM	1	25	21.89	21.98	21.92		
10	16QAM	1	49	21.75	21.89	21.78		
10	16QAM	25	0	20.56	20.56	20.68	22	2
10	16QAM	25	12	20.61	20.58	20.61		
10	16QAM	25	25	20.62	20.63	20.60		
10	16QAM	50	0	20.60	20.61	20.63		
10	64QAM	1	0	20.64	20.69	20.61	22	2
10	64QAM	1	25	20.86	20.85	20.73		
10	64QAM	1	49	20.71	20.65	20.62		
10	64QAM	25	0	19.55	19.54	19.66	21	3
10	64QAM	25	12	19.60	19.54	19.57		
10	64QAM	25	25	19.62	19.61	19.59		
10	64QAM	50	0	19.57	19.59	19.62		

Channel				131997	132322	132647	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1745	1777.5		
5	QPSK	1	0	22.41	22.39	22.39	24	0
5	QPSK	1	12	22.61	22.63	22.67		
5	QPSK	1	24	22.38	22.41	22.41		
5	QPSK	12	0	21.55	21.49	21.55	23	1
5	QPSK	12	7	21.59	21.56	21.61		
5	QPSK	12	13	21.60	21.57	21.60		
5	QPSK	25	0	21.57	21.52	21.57		
5	16QAM	1	0	21.72	21.62	21.67	23	1
5	16QAM	1	12	21.88	22.03	22.04		
5	16QAM	1	24	21.72	21.70	21.74		
5	16QAM	12	0	20.53	20.49	20.56	22	2
5	16QAM	12	7	20.59	20.56	20.59		
5	16QAM	12	13	20.60	20.59	20.61		
5	16QAM	25	0	20.58	20.56	20.59		
5	64QAM	1	0	20.61	20.65	20.64	22	2
5	64QAM	1	12	20.91	20.81	20.89		
5	64QAM	1	24	20.62	20.62	20.65		
5	64QAM	12	0	19.58	19.51	19.58	21	3
5	64QAM	12	7	19.60	19.57	19.64		
5	64QAM	12	13	19.64	19.59	19.61		
5	64QAM	25	0	19.56	19.54	19.56		
Channel				131987	132322	132657	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1745	1778.5		
3	QPSK	1	0	22.54	22.47	22.53	24	0
3	QPSK	1	8	22.49	22.45	22.51		
3	QPSK	1	14	22.52	22.48	22.50		
3	QPSK	8	0	21.57	21.50	21.56	23	1
3	QPSK	8	4	21.60	21.55	21.60		
3	QPSK	8	7	21.55	21.52	21.55		
3	QPSK	15	0	21.55	21.52	21.55		
3	16QAM	1	0	21.84	21.87	21.89	23	1
3	16QAM	1	8	21.84	21.88	21.76		
3	16QAM	1	14	21.79	21.82	21.87		
3	16QAM	8	0	20.63	20.59	20.64	22	2
3	16QAM	8	4	20.67	20.63	20.67		
3	16QAM	8	7	20.64	20.64	20.65		
3	16QAM	15	0	20.57	20.55	20.57		
3	64QAM	1	0	20.69	20.66	20.74	22	2
3	64QAM	1	8	20.75	20.76	20.81		
3	64QAM	1	14	20.77	20.76	20.82		
3	64QAM	8	0	19.61	19.57	19.61	21	3
3	64QAM	8	4	19.64	19.57	19.63		
3	64QAM	8	7	19.61	19.58	19.58		
3	64QAM	15	0	19.54	19.50	19.48		

Channel				131979	132322	132665	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1745	1779.3		
1.4	QPSK	1	0	22.39	22.37	22.41	24	0
1.4	QPSK	1	3	22.54	22.53	22.54		
1.4	QPSK	1	5	22.41	22.39	22.40		
1.4	QPSK	3	0	22.51	22.48	22.50		
1.4	QPSK	3	1	22.57	22.55	22.58		
1.4	QPSK	3	3	22.51	22.47	22.52		
1.4	QPSK	6	0	21.51	21.49	21.52	23	1
1.4	16QAM	1	0	21.76	21.70	21.78	23	1
1.4	16QAM	1	3	21.85	21.80	21.76		
1.4	16QAM	1	5	21.73	21.73	21.77		
1.4	16QAM	3	0	21.52	21.52	21.58		
1.4	16QAM	3	1	21.56	21.50	21.62		
1.4	16QAM	3	3	21.54	21.49	21.52		
1.4	16QAM	6	0	20.65	20.62	20.66	22	2
1.4	64QAM	1	0	20.60	20.55	20.73	22	2
1.4	64QAM	1	3	20.77	20.81	20.70		
1.4	64QAM	1	5	20.68	20.65	20.62		
1.4	64QAM	3	0	20.63	20.62	20.69		
1.4	64QAM	3	1	20.66	20.64	20.70		
1.4	64QAM	3	3	20.64	20.60	20.62		
1.4	64QAM	6	0	19.52	19.46	19.55	21	3

<LTE Carrier Aggregation>

General Note:

1. This device supports Carrier Aggregation on downlink for inter and intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. In applying the existing power measurement procedure of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of the frequency band and CCs in each row need consideration, and for this device that all the configurations were choose to power measurement.

Index	2CC
2CC #1	CA_2A-2A
2CC #2	CA_2A-4A
2CC #3	CA_2A-66A
2CC #4	CA_4A-2A
2CC #5	CA_4A-4A
2CC #6	CA_5A-2A
2CC #7	CA_5A-4A
2CC #8	CA_5A-5A
2CC #9	CA_13A -2A
2CC #10	CA_13A -4A
2CC #11	CA_66A-66A

LTE Carrier Aggregation Conducted Power (Downlink)

General Note:

i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

iii. The device supports downlink two carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.

iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

v. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.

vi. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.

vii. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \ [\text{MHz}]$$

Configure		CA List	PCC LTE Band	PCC BW (MHz)	PCC UL Freq. (MHz)	PCC UL Channel	PCC Mod.	PCC UL# RB	PCC UL RB Offset	SCC LTE Band	SCC BW (MHz)	SCC DL Freq. (MHz)	SCC DL Channel	Power With CA Tx. Power (dBm)	Power Without CA Tx. Power (dBm)
Inter-Band		CA_2A-4A	Band 2	20M	1880	18900	QPSK	1	0	Band 4	20M	2132.5	2175	22.65	22.69
			Band 4	20M	1720	20050	QPSK	1	0	Band 2	20M	1960	900	22.69	22.72
		CA_5A-2A	Band 5	10M	836.5	20525	QPSK	1	25	Band 2	20M	1960	900	23.00	23.04
		CA_13A-2A	Band 13	10M	782	23230	QPSK	1	0	Band 2	20M	1960	900	23.07	23.14
		CA_2A-66A	Band 2	20M	1880	18900	QPSK	1	0	Band 66	20M	2155	66886	22.64	22.69
		CA_5A-4A	Band 5	10M	836.5	20525	QPSK	1	25	Band 4	20M	2132.5	2175	22.98	23.04
		CA_13A-4A	Band 13	10M	782	23230	QPSK	1	0	Band 4	20M	2132.5	2175	23.05	23.14
Intra-Band	Non-Contiguous	CA_2A-2A	Band 2	20M	1880	18900	QPSK	1	0	Band 2	5M	1987.5	1175	22.63	22.69
		CA_4A-4A	Band 4	20M	1720	20050	QPSK	1	0	Band 4	5M	2152.5	2375	22.66	22.72
		CA_5A-5A	Band 5	10M	836.5	20525	QPSK	1	25	Band 5	5M	891.5	2625	22.97	23.04
		CA_66A-66A	Band 66	20M	1745	132322	QPSK	1	0	Band 66	5M	2197.5	67311	22.62	22.68

Note: Inter band CA downlink, only CA_2A_4A can support LTE band 2 as PCC or LTE band 4 as PCC, other inter band CA , only one LTE band can support PCC.

<WLAN Conducted Power>

General Note:

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

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	**18.97**	19.50	100.00
		6	2437	18.86	19.50	
		11	2462	18.73	19.50	
	802.11g 6Mbps	1	2412	15.26	16.50	97.46
		6	2437	15.52	16.50	
		11	2462	15.40	16.50	
	802.11n-HT20 MCS0	1	2412	14.90	16.00	97.30
		6	2437	14.70	16.00	
		11	2462	14.65	16.00	
	802.11n-HT40 MCS0	3	2422	12.88	14.00	94.87
		6	2437	13.11	14.00	
		9	2452	12.89	14.00	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11n-HT20 MCS0	36	5180	16.61	17.00	97.30
		40	5200	**16.74**	17.00	
		44	5220	16.25	17.00	
		48	5240	16.57	17.00	
	802.11n-HT40 MCS0	38	5190	13.38	15.00	94.71
		46	5230	15.55	16.50	
	802.11ac-VHT20 MCS0	36	5180	16.58	17.50	97.31
		40	5200	15.98	17.50	
		44	5220	16.60	17.50	
		48	5240	16.03	17.50	
	802.11ac-VHT40 MCS0	38	5190	13.53	15.00	97.72
		46	5230	15.33	16.50	
	802.11ac-VHT80 MCS0	42	5210	10.47	12.00	89.20

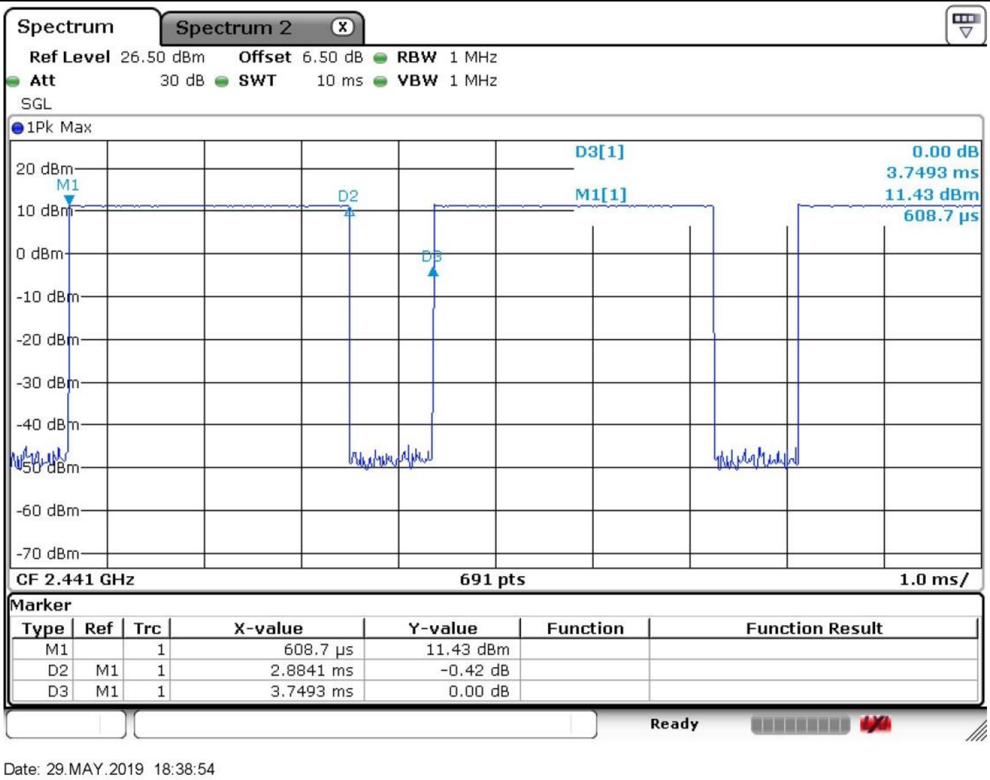
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11n-HT20 MCS0	149	5745	15.73	16.00	97.30
		157	5785	15.76	16.00	
		165	5825	15.44	16.00	
	802.11n-HT40 MCS0	151	5755	14.52	15.50	94.71
		159	5795	14.58	15.50	
	802.11ac-VHT20 MCS0	149	5745	15.77	16.50	97.31
		157	5785	**15.85**	16.50	
		165	5825	15.74	16.50	
	802.11ac-VHT40 MCS0	151	5755	14.71	15.50	97.72
		159	5795	14.82	15.50	
	802.11ac-VHT80 MCS0	155	5775	14.14	15.50	89.20

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 76.92 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.

Bluetooth time-domain plot



Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
v3.0 with EDR	CH 00	2402	**11.56**
	CH 39	2441	11.42
	CH 78	2480	11.52
Tune-up limit (dBm)			12.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0 with LE	CH 00	2402	6.69
	CH 19	2440	**6.95**
	CH 39	2480	6.85
Tune-up limit (dBm)			8.00

13. Bluetooth Exclusions Applied

Mode Band	Max Average power(dBm)	
	BR/EDR	LE
2.4GHz Bluetooth	12.00	8.00

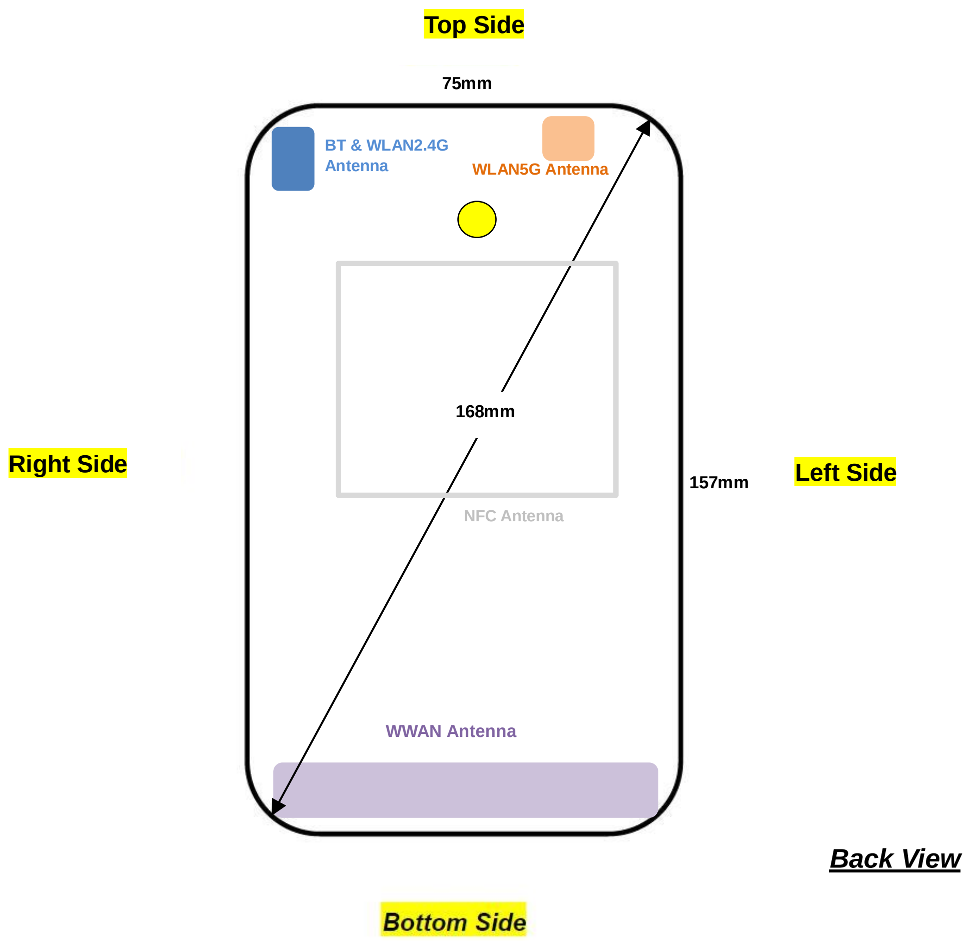
Note:

1. 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

Hotspot & Body Worn SAR			
Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion thresholds
12.00	10	2.48	2.5

Note: Per KDB 447498 D01v06, a distance of 10 mm is applied to determine SAR test exclusion. The test exclusion threshold is 2.5 which is <= 3, hotspot and Body Worn SAR testing is not required.

14. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
Bluetooth & WLAN2.4GHz	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm
WLAN5GHz	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	>25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	Yes	Yes	No	Yes	Yes	Yes
Bluetooth & WLAN2.4GHz	Yes	Yes	Yes	No	Yes	No
WLAN5GHz	Yes	Yes	Yes	No	No	Yes

General Note:
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 WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
3. 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.
4. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15cm or an overall diagonal dimension > 16cm, 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, in this report all the hotspot mode results are < 1.2W/kg.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B5 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE B 4 SAR test was covered by LTE B66; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

WLAN/Bluetooth 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

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	LTE Band 5	10M	QPSK	1	25	Right Cheek	20525	836.5	23.04	24.00	1.247	0.06	0.190	0.237
	LTE Band 5	10M	QPSK	25	12	Right Cheek	20525	836.5	22.07	23.00	1.239	0.01	0.145	0.180
	LTE Band 5	10M	QPSK	1	25	Right Tilted	20525	836.5	23.04	24.00	1.247	0.02	0.177	0.221
	LTE Band 5	10M	QPSK	25	12	Right Tilted	20525	836.5	22.07	23.00	1.239	0.01	0.116	0.144
	LTE Band 5	10M	QPSK	1	25	Left Cheek	20525	836.5	23.04	24.00	1.247	-0.02	0.161	0.201
	LTE Band 5	10M	QPSK	25	12	Left Cheek	20525	836.5	22.07	23.00	1.239	0.02	0.127	0.157
	LTE Band 5	10M	QPSK	1	25	Left Tilted	20525	836.5	23.04	24.00	1.247	0.01	0.086	0.107
	LTE Band 5	10M	QPSK	25	12	Left Tilted	20525	836.5	22.07	23.00	1.239	0.03	0.068	0.085
02	LTE Band 13	10M	QPSK	1	0	Right Cheek	23230	782	23.14	24.00	1.219	0.02	0.143	0.174
	LTE Band 13	10M	QPSK	25	25	Right Cheek	23230	782	21.91	23.00	1.285	0.01	0.100	0.128
	LTE Band 13	10M	QPSK	1	0	Right Tilted	23230	782	23.14	24.00	1.219	0.03	0.064	0.078
	LTE Band 13	10M	QPSK	25	25	Right Tilted	23230	782	21.91	23.00	1.285	0.08	0.049	0.063
	LTE Band 13	10M	QPSK	1	0	Left Cheek	23230	782	23.14	24.00	1.219	0.03	0.113	0.138
	LTE Band 13	10M	QPSK	25	25	Left Cheek	23230	782	21.91	23.00	1.285	-0.07	0.087	0.111
	LTE Band 13	10M	QPSK	1	0	Left Tilted	23230	782	23.14	24.00	1.219	-0.02	0.067	0.082
	LTE Band 13	10M	QPSK	25	25	Left Tilted	23230	782	21.91	23.00	1.285	0.01	0.053	0.068
03	LTE Band 2	20M	QPSK	1	0	Right Cheek	18900	1880	22.69	24.00	1.352	0.01	0.109	0.147
	LTE Band 2	20M	QPSK	50	0	Right Cheek	18900	1880	21.56	23.00	1.393	0.03	0.077	0.107
	LTE Band 2	20M	QPSK	1	0	Right Tilted	18900	1880	22.69	24.00	1.352	-0.07	0.036	0.049
	LTE Band 2	20M	QPSK	50	0	Right Tilted	18900	1880	21.56	23.00	1.393	-0.02	0.022	0.031
	LTE Band 2	20M	QPSK	1	0	Left Cheek	18900	1880	22.69	24.00	1.352	0.02	0.082	0.111
	LTE Band 2	20M	QPSK	50	0	Left Cheek	18900	1880	21.56	23.00	1.393	0.01	0.069	0.097
	LTE Band 2	20M	QPSK	1	0	Left Tilted	18900	1880	22.69	24.00	1.352	0.02	0.060	0.081
	LTE Band 2	20M	QPSK	50	0	Left Tilted	18900	1880	21.56	23.00	1.393	0.01	0.052	0.072
04	LTE Band 66	20M	QPSK	1	0	Right Cheek	132322	1745	22.68	24.00	1.355	0.02	0.222	0.301
	LTE Band 66	20M	QPSK	50	0	Right Cheek	132322	1745	21.62	23.00	1.374	0.03	0.145	0.199
	LTE Band 66	20M	QPSK	1	0	Right Tilted	132322	1745	22.68	24.00	1.355	0.02	0.074	0.100
	LTE Band 66	20M	QPSK	50	0	Right Tilted	132322	1745	21.62	23.00	1.374	0.01	0.057	0.078
	LTE Band 66	20M	QPSK	1	0	Left Cheek	132322	1745	22.68	24.00	1.355	-0.03	0.133	0.180
	LTE Band 66	20M	QPSK	50	0	Left Cheek	132322	1745	21.62	23.00	1.374	0.02	0.103	0.142
	LTE Band 66	20M	QPSK	1	0	Left Tilted	132322	1745	22.68	24.00	1.355	0.01	0.069	0.093
	LTE Band 66	20M	QPSK	50	0	Left Tilted	132322	1745	21.62	23.00	1.374	0.03	0.053	0.072

<WLAN 2.4G SAR>

Plot No.	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)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	1	2412	18.97	19.50	1.130	100	1.000	-0.09	0.119	0.134
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	1	2412	18.97	19.50	1.130	100	1.000	0.05	0.112	0.127
05	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	1	2412	18.97	19.50	1.130	100	1.000	-0.01	0.238	**0.269**
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	1	2412	18.97	19.50	1.130	100	1.000	-0.03	0.217	0.245

<Bluetooth SAR>

Plot No.	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)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Right Cheek	00	2402	11.56	12.00	1.107	76.92	1.083	-0.09	0.016	0.019
	Bluetooth	1Mbps	Right Tilted	00	2402	11.56	12.00	1.107	76.92	1.083	0.05	0.011	0.013
06	Bluetooth	1Mbps	Left Cheek	00	2402	11.56	12.00	1.107	76.92	1.083	0.01	0.026	**0.031**
	Bluetooth	1Mbps	Left Tilted	00	2402	11.56	12.00	1.107	76.92	1.083	0.08	0.022	0.027

<WLAN 5G SAR>

Plot No.	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)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Right Cheek	44	5220	16.60	17.50	1.230	97.31	1.028	0.02	0.675	0.854
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Right Cheek	36	5180	16.58	17.50	1.236	97.31	1.028	0.01	0.532	0.676
07	WLAN5.2GHz	802.11ac-VHT20 MCS0	Right Tilted	44	5220	16.60	17.50	1.230	97.31	1.028	0.04	0.868	**1.098**
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Right Tilted	36	5180	16.58	17.50	1.236	97.31	1.028	-0.03	0.659	0.837
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Left Cheek	44	5220	16.60	17.50	1.230	97.31	1.028	0.02	0.540	0.683
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Left Tilted	44	5220	16.60	17.50	1.230	97.31	1.028	0.05	0.616	0.779
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Right Cheek	157	5785	15.85	16.50	1.161	97.31	1.028	-0.03	0.763	0.911
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Right Cheek	149	5745	15.77	16.50	1.183	97.31	1.028	0.01	0.761	0.926
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Right Tilted	157	5785	15.85	16.50	1.161	97.31	1.028	0.04	0.950	1.134
08	WLAN5.8GHz	802.11ac-VHT20 MCS0	Right Tilted	149	5745	15.77	16.50	1.183	97.31	1.028	-0.02	0.981	**1.193**
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Left Cheek	157	5785	15.85	16.50	1.161	97.31	1.028	0.02	0.616	0.735
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Left Tilted	157	5785	15.85	16.50	1.161	97.31	1.028	0.1	0.657	0.784

15.2 Hotspot SAR

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 5	10M	QPSK	1	25	Front	10	20525	836.5	23.04	24.00	1.247	0.03	0.130	0.162
	LTE Band 5	10M	QPSK	25	12	Front	10	20525	836.5	22.07	23.00	1.239	0.02	0.103	0.128
09	LTE Band 5	10M	QPSK	1	25	Back	10	20525	836.5	23.04	24.00	1.247	0.01	0.460	**0.574**
	LTE Band 5	10M	QPSK	25	12	Back	10	20525	836.5	22.07	23.00	1.239	0.01	0.362	0.448
	LTE Band 5	10M	QPSK	1	25	Left Side	10	20525	836.5	23.04	24.00	1.247	0.02	0.088	0.110
	LTE Band 5	10M	QPSK	25	12	Left Side	10	20525	836.5	22.07	23.00	1.239	0.03	0.069	0.086
	LTE Band 5	10M	QPSK	1	25	Right Side	10	20525	836.5	23.04	24.00	1.247	-0.03	0.179	0.223
	LTE Band 5	10M	QPSK	25	12	Right Side	10	20525	836.5	22.07	23.00	1.239	0.02	0.143	0.177
	LTE Band 5	10M	QPSK	1	25	Bottom Side	10	20525	836.5	23.04	24.00	1.247	0.01	0.179	0.223
	LTE Band 5	10M	QPSK	25	12	Bottom Side	10	20525	836.5	22.07	23.00	1.239	0.03	0.140	0.173
	LTE Band 13	10M	QPSK	1	0	Front	10	23230	782	23.14	24.00	1.219	0.01	0.168	0.205
	LTE Band 13	10M	QPSK	25	25	Front	10	23230	782	21.91	23.00	1.285	0.03	0.132	0.170
10	LTE Band 13	10M	QPSK	1	0	Back	10	23230	782	23.14	24.00	1.219	0.01	0.302	**0.368**
	LTE Band 13	10M	QPSK	25	25	Back	10	23230	782	21.91	23.00	1.285	0.02	0.258	0.332
	LTE Band 13	10M	QPSK	1	0	Left Side	10	23230	782	23.14	24.00	1.219	0.03	0.118	0.144
	LTE Band 13	10M	QPSK	25	25	Left Side	10	23230	782	21.91	23.00	1.285	0.03	0.098	0.125
	LTE Band 13	10M	QPSK	1	0	Right Side	10	23230	782	23.14	24.00	1.219	0.01	0.273	0.333
	LTE Band 13	10M	QPSK	25	25	Right Side	10	23230	782	21.91	23.00	1.285	0.03	0.224	0.288
	LTE Band 13	10M	QPSK	1	0	Bottom Side	10	23230	782	23.14	24.00	1.219	0.02	0.092	0.112
	LTE Band 13	10M	QPSK	25	25	Bottom Side	10	23230	782	21.91	23.00	1.285	0.01	0.071	0.092
	LTE Band 2	20M	QPSK	1	0	Front	10	18900	1880	22.69	24.00	1.352	0.02	0.240	0.324
	LTE Band 2	20M	QPSK	50	0	Front	10	18900	1880	21.56	23.00	1.393	0.01	0.204	0.284
	LTE Band 2	20M	QPSK	1	0	Back	10	18900	1880	22.69	24.00	1.352	0.03	0.442	0.598
	LTE Band 2	20M	QPSK	50	0	Back	10	18900	1880	21.56	23.00	1.393	-0.03	0.365	0.509
	LTE Band 2	20M	QPSK	1	0	Left Side	10	18900	1880	22.69	24.00	1.352	0.02	0.116	0.157
	LTE Band 2	20M	QPSK	50	0	Left Side	10	18900	1880	21.56	23.00	1.393	0.01	0.102	0.142
	LTE Band 2	20M	QPSK	1	0	Right Side	10	18900	1880	22.69	24.00	1.352	0.03	0.114	0.154
	LTE Band 2	20M	QPSK	50	0	Right Side	10	18900	1880	21.56	23.00	1.393	0.03	0.094	0.130
11	LTE Band 2	20M	QPSK	1	0	Bottom Side	10	18900	1880	22.69	24.00	1.352	0.01	0.468	**0.633**
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10	18900	1880	21.56	23.00	1.393	0.03	0.389	0.542

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 66	20M	QPSK	1	0	Front	10	132322	1745	22.68	24.00	1.355	0.02	0.383	0.519
	LTE Band 66	20M	QPSK	50	0	Front	10	132322	1745	21.62	23.00	1.374	0.01	0.297	0.408
	LTE Band 66	20M	QPSK	1	0	Back	10	132322	1745	22.68	24.00	1.355	0.03	0.474	0.642
	LTE Band 66	20M	QPSK	50	0	Back	10	132322	1745	21.62	23.00	1.374	0.01	0.375	0.515
	LTE Band 66	20M	QPSK	1	0	Left Side	10	132322	1745	22.68	24.00	1.355	0.02	0.164	0.222
	LTE Band 66	20M	QPSK	50	0	Left Side	10	132322	1745	21.62	23.00	1.374	-0.04	0.113	0.155
	LTE Band 66	20M	QPSK	1	0	Right Side	10	132322	1745	22.68	24.00	1.355	0.01	0.239	0.324
	LTE Band 66	20M	QPSK	50	0	Right Side	10	132322	1745	21.62	23.00	1.374	0.02	0.187	0.257
12	LTE Band 66	20M	QPSK	1	0	Bottom Side	10	132322	1745	22.68	24.00	1.355	-0.16	0.489	**0.663**
	LTE Band 66	20M	QPSK	50	0	Bottom Side	10	132322	1745	21.62	23.00	1.374	0.05	0.379	0.521

<WLAN 2.4G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front	10	1	2412	18.97	19.50	1.130	100	1.000	-0.02	0.043	0.049
13	WLAN2.4GHz	802.11b 1Mbps	Back	10	1	2412	18.97	19.50	1.130	100	1.000	0.04	0.110	**0.124**
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10	1	2412	18.97	19.50	1.130	100	1.000	0.09	0.011	0.012
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	1	2412	18.97	19.50	1.130	100	1.000	0.08	0.064	0.072

<WLAN 5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Front	10	44	5220	16.60	17.50	1.230	97.31	1.028	0.02	0.097	0.123
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Back	10	44	5220	16.60	17.50	1.230	97.31	1.028	0.06	0.363	0.459
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Left Side	10	44	5220	16.60	17.50	1.230	97.31	1.028	0.05	0.066	0.083
14	WLAN5.2GHz	802.11ac-VHT20 MCS0	Top Side	10	44	5220	16.60	17.50	1.230	97.31	1.028	-0.06	0.394	**0.498**
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Front	10	157	5785	15.85	16.50	1.161	97.31	1.028	0.09	0.078	0.093
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Back	10	157	5785	15.85	16.50	1.161	97.31	1.028	-0.07	0.404	0.482
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Left Side	10	157	5785	15.85	16.50	1.161	97.31	1.028	0.04	0.105	0.125
15	WLAN5.8GHz	802.11ac-VHT20 MCS0	Top Side	10	157	5785	15.85	16.50	1.161	97.31	1.028	-0.01	0.553	**0.660**

15.3 Body Worn Accessory SAR

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 5	10M	QPSK	1	25	Front	10	20525	836.5	23.04	24.00	1.247	0.03	0.130	0.162
	LTE Band 5	10M	QPSK	25	12	Front	10	20525	836.5	22.07	23.00	1.239	0.02	0.103	0.128
16	LTE Band 5	10M	QPSK	1	25	Back	10	20525	836.5	23.04	24.00	1.247	0.01	0.460	0.574
	LTE Band 5	10M	QPSK	25	12	Back	10	20525	836.5	22.07	23.00	1.239	0.01	0.362	0.448
	LTE Band 13	10M	QPSK	1	0	Front	10	23230	782	23.14	24.00	1.219	0.01	0.168	0.205
	LTE Band 13	10M	QPSK	25	25	Front	10	23230	782	21.91	23.00	1.285	0.03	0.132	0.170
17	LTE Band 13	10M	QPSK	1	0	Back	10	23230	782	23.14	24.00	1.219	0.01	0.302	0.368
	LTE Band 13	10M	QPSK	25	25	Back	10	23230	782	21.91	23.00	1.285	0.02	0.258	0.332
	LTE Band 2	20M	QPSK	1	0	Front	10	18900	1880	22.69	24.00	1.352	0.02	0.240	0.324
	LTE Band 2	20M	QPSK	50	0	Front	10	18900	1880	21.56	23.00	1.393	0.01	0.204	0.284
18	LTE Band 2	20M	QPSK	1	0	Back	10	18900	1880	22.69	24.00	1.352	0.03	0.442	0.598
	LTE Band 2	20M	QPSK	50	0	Back	10	18900	1880	21.56	23.00	1.393	-0.03	0.365	0.509
	LTE Band 66	20M	QPSK	1	0	Front	10	132322	1745	22.68	24.00	1.355	0.02	0.383	0.519
	LTE Band 66	20M	QPSK	50	0	Front	10	132322	1745	21.62	23.00	1.374	0.01	0.297	0.408
19	LTE Band 66	20M	QPSK	1	0	Back	10	132322	1745	22.68	24.00	1.355	0.03	0.474	0.642
	LTE Band 66	20M	QPSK	50	0	Back	10	132322	1745	21.62	23.00	1.374	0.01	0.375	0.515

<WLAN 2.4G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Front	10	1	2412	18.97	19.50	1.130	100	1.000	-0.02	0.043	0.049
20	WLAN2.4GHz	802.11b 1Mbps	Back	10	1	2412	18.97	19.50	1.130	100	1.000	0.04	0.110	0.124

<WLAN 5G SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5.2GHz	802.11ac-VHT20 MCS0	Front	10	44	5220	16.60	17.50	1.230	97.31	1.028	0.02	0.097	0.123
21	WLAN5.2GHz	802.11ac-VHT20 MCS0	Back	10	44	5220	16.60	17.50	1.230	97.31	1.028	0.06	0.363	0.459
	WLAN5.8GHz	802.11ac-VHT20 MCS0	Front	10	157	5785	15.85	16.50	1.161	97.31	1.028	0.09	0.078	0.093
22	WLAN5.8GHz	802.11ac-VHT20 MCS0	Back	10	157	5785	15.85	16.50	1.161	97.31	1.028	-0.07	0.404	0.482

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset		
		Head	Body-worn	Hotspot
1.	LTE + WLAN2.4GHz	Yes	Yes	Yes
2.	LTE + Bluetooth	Yes	Yes	Yes
3.	LTE + WLAN5.2/5.8GHz	Yes	Yes	Yes
4.	Bluetooth+ WLAN5.2/5.8GHz	Yes	Yes	Yes
5.	LTE + WLAN5.2/5.8GHz+ Bluetooth	Yes	Yes	Yes

General Note:

1. This device supports VoIP in LTE (e.g. for 3rd-party VoIP), and LTE supports VoLTE function.
2. This device WLAN 2.4GHz supports hotspot operation and Bluetooth support tethering applications.
3. WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
4. According to EUT character, WLAN5GHz can transmit with Bluetooth simultaneously.
5. This device 2.4GHz WLAN/ 5.2GHz WLAN/5.8GHz WLAN support hotspot operation, and 5.2GHz WLAN/5.8GHz WLAN supports WLAN Direct (GC/GO).
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.
7. Chose the worst SAR of WLAN5GHz to do co-located analysis with WWAN.
8. For simultaneously analysis, since the SAR summation of 3 transmitters can cover others combination of 2 transmitters, therefore in this section did not additional to evaluate 2TX combination of simultaneously transmission.
9. All licensed modes share the same antenna part and cannot transmit simultaneously.
10. The reported SAR summation is calculated based on the same configuration and test position
11. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
    i) Scalar SAR summation < 1.6W/kg.
    ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
    iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
    iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
12. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
    i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
    ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
    iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power (dBm)	Exposure Position	Hotspot /Body worn
	Test separation	10 mm
12.00	Estimated 1g SAR (W/kg)	0.333

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)	4 Bluetooth 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	1+3+4 Summed 1g SAR (W/kg)
LTE	Band 5	Right Cheek	0.237	0.134	0.926	0.019	0.37	1.18
		Right Tilted	0.221	0.127	1.193	0.013	0.35	1.43
		Left Cheek	0.201	0.269	0.735	0.031	0.47	0.97
		Left Tilted	0.107	0.245	0.784	0.027	0.35	0.92
	Band 13	Right Cheek	0.174	0.134	0.926	0.019	0.31	1.12
		Right Tilted	0.078	0.127	1.193	0.013	0.21	1.28
		Left Cheek	0.138	0.269	0.735	0.031	0.41	0.90
		Left Tilted	0.082	0.245	0.784	0.027	0.33	0.89
	Band 2	Right Cheek	0.147	0.134	0.926	0.019	0.28	1.09
		Right Tilted	0.049	0.127	1.193	0.013	0.18	1.26
		Left Cheek	0.111	0.269	0.735	0.031	0.38	0.88
		Left Tilted	0.081	0.245	0.784	0.027	0.33	0.89
	Band 66	Right Cheek	0.301	0.134	0.926	0.019	0.44	1.25
		Right Tilted	0.100	0.127	1.193	0.013	0.23	1.31
		Left Cheek	0.180	0.269	0.735	0.031	0.45	0.95
		Left Tilted	0.093	0.245	0.784	0.027	0.34	0.90

16.2 Hotspot 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+4 Summed 1g SAR (W/kg)
LTE	Band 5	Front	0.162	0.049	0.123	0.333	0.21	0.62
		Back	0.574	0.124	0.482	0.333	0.70	1.39
		Left side	0.110		0.125		0.11	0.24
		Right side	0.223	0.012		0.333	0.24	0.56
		Top side		0.072	0.660	0.333	0.07	0.99
		Bottom side	0.223				0.22	0.22
	Band 13	Front	0.205	0.049	0.123	0.333	0.25	0.66
		Back	0.368	0.124	0.482	0.333	0.49	1.18
		Left side	0.144		0.125		0.14	0.27
		Right side	0.333	0.012		0.333	0.35	0.67
		Top side		0.072	0.660	0.333	0.07	0.99
		Bottom side	0.112				0.11	0.11
	Band 2	Front	0.324	0.049	0.123	0.333	0.37	0.78
		Back	0.598	0.124	0.482	0.333	0.72	1.41
		Left side	0.157		0.125		0.16	0.28
		Right side	0.154	0.012		0.333	0.17	0.49
		Top side		0.072	0.660	0.333	0.07	0.99
		Bottom side	0.633				0.63	0.63
	Band 66	Front	0.519	0.049	0.123	0.333	0.57	0.98
		Back	0.642	0.124	0.482	0.333	0.77	1.46
		Left side	0.222		0.125		0.22	0.35
		Right side	0.324	0.012		0.333	0.34	0.66
		Top side		0.072	0.660	0.333	0.07	0.99
		Bottom side	0.663				0.66	0.66

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+4 Summed 1g SAR (W/kg)
LTE	Band 5	Front	0.162	0.049	0.123	0.333	0.21	0.62
		Back	0.574	0.124	0.482	0.333	0.70	1.39
	Band 13	Front	0.205	0.049	0.123	0.333	0.25	0.66
		Back	0.368	0.124	0.482	0.333	0.49	1.18
	Band 2	Front	0.324	0.049	0.123	0.333	0.37	0.78
		Back	0.598	0.124	0.482	0.333	0.72	1.41
	Band 66	Front	0.519	0.049	0.123	0.333	0.57	0.98
		Back	0.642	0.124	0.482	0.333	0.77	1.46

Test Engineer : Nick Hu

17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

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 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

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

[9] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.

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

[11] 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_750MHz

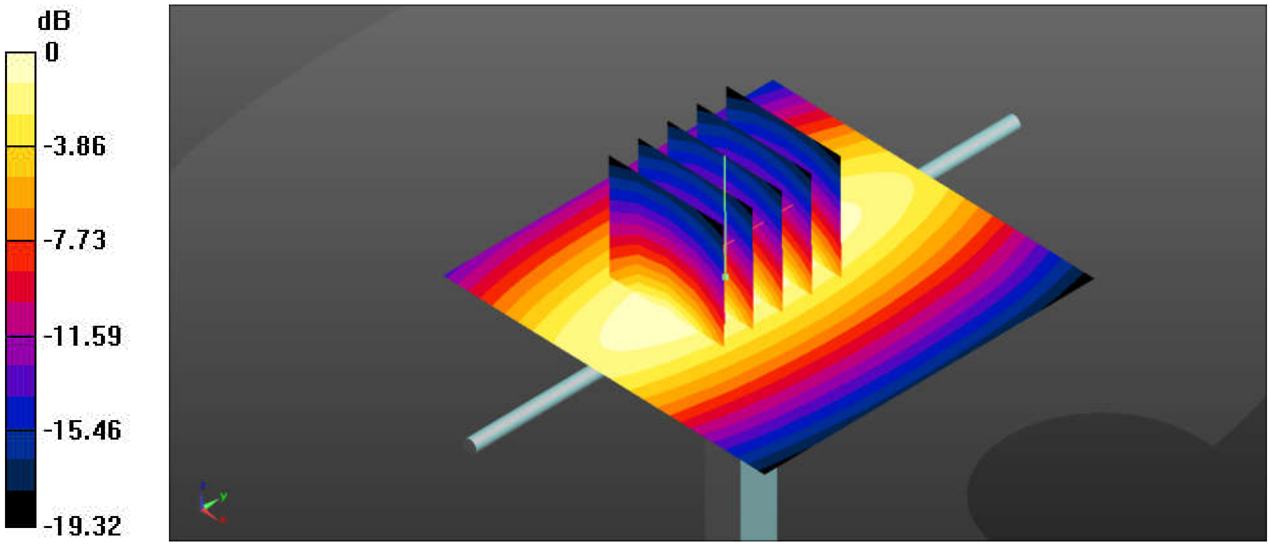
DUT: D750V3 - SN:1087

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 41.707; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.78, 6.78, 6.78); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.46 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 45.70 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 1.95 W/kg; SAR(10 g) = 1.3 W/kg
Maximum value of SAR (measured) = 2.48 W/kg



0 dB = 2.46 W/kg = 3.91 dBW/kg

System Check_Head_835MHz

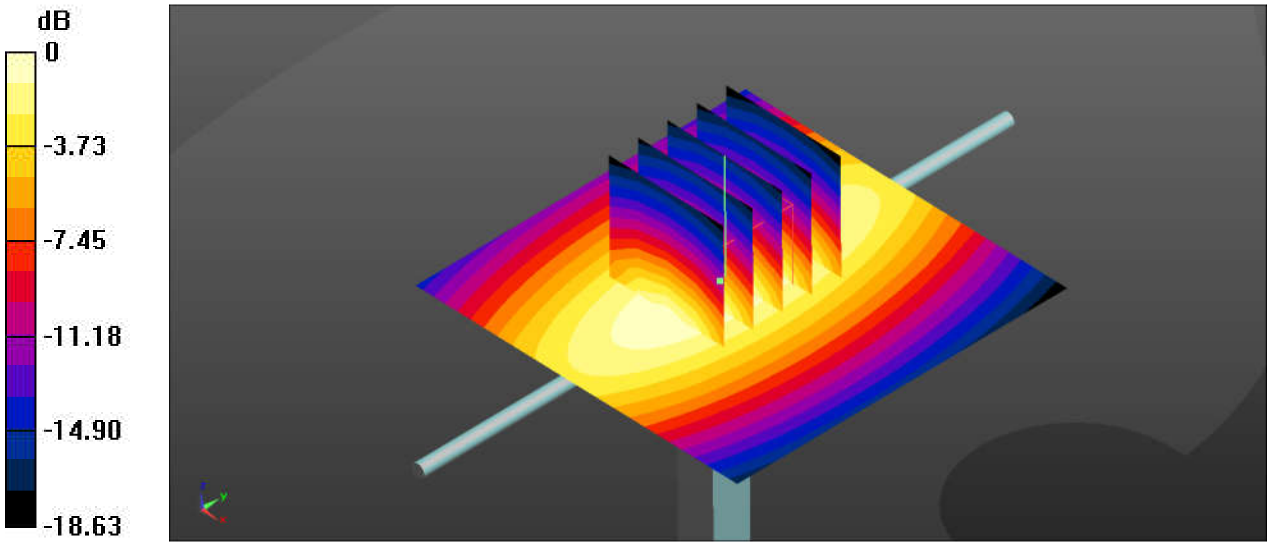
DUT: D835V2 - SN:4d151

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 835 MHz; σ = 0.921 S/m; ε_r = 42.546; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.47, 6.47, 6.47); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.04 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.23 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.07 W/kg



0 dB = 3.07 W/kg = 4.87 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.10

System Check_Head_1750MHz

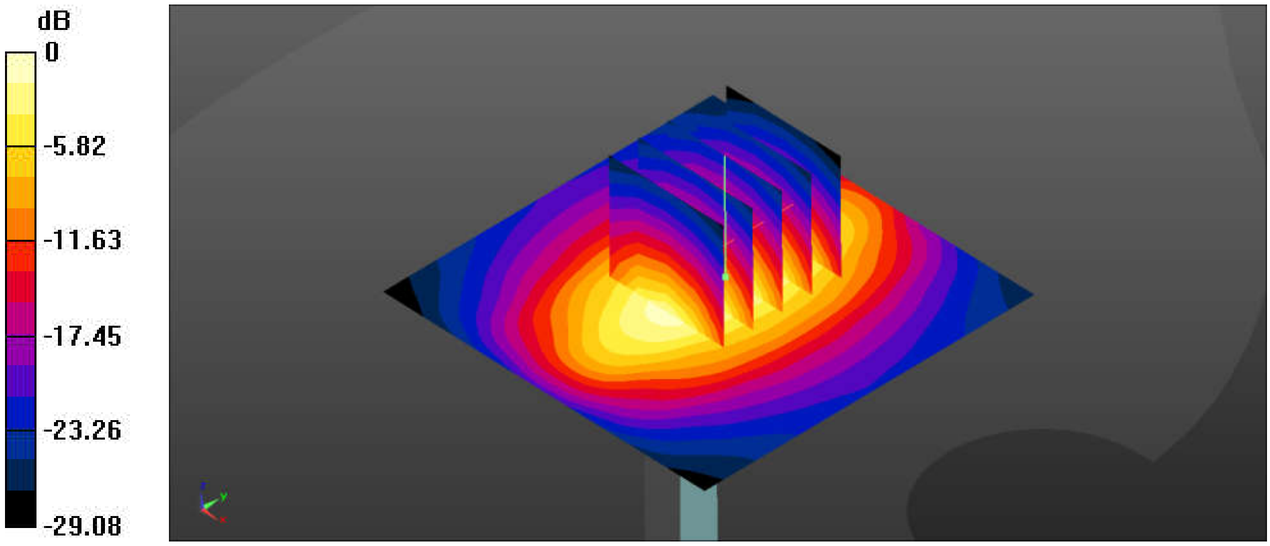
DUT: D1750V2 - SN:1090

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1750 MHz; σ = 1.346 S/m; ε_r = 40.242; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.4, 5.4, 5.4); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.2 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 84.71 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 8.84 W/kg; SAR(10 g) = 4.62 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 13.2 W/kg = 11.21 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.11

System Check_Head_1900MHz

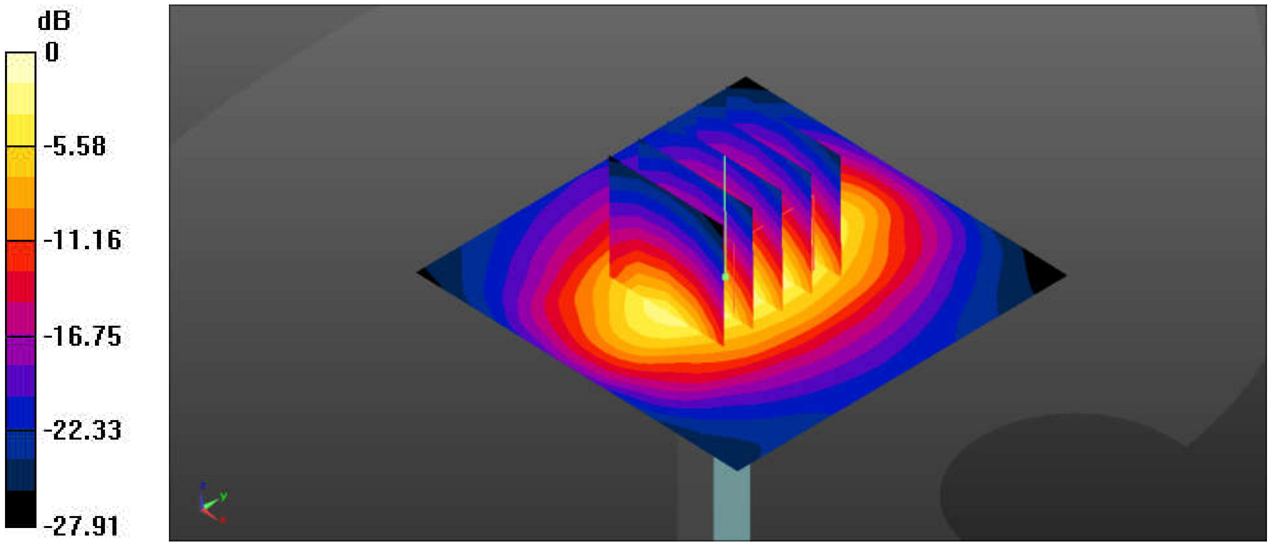
DUT: D1900V2 - SN:5d170

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.431 S/m; ε_r = 39.108; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.19, 5.19, 5.19); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.1 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 97.66 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 19.3 W/kg
SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.35 W/kg
Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 13.1 W/kg = 11.17 dBW/kg

System Check_Head_2450MHz

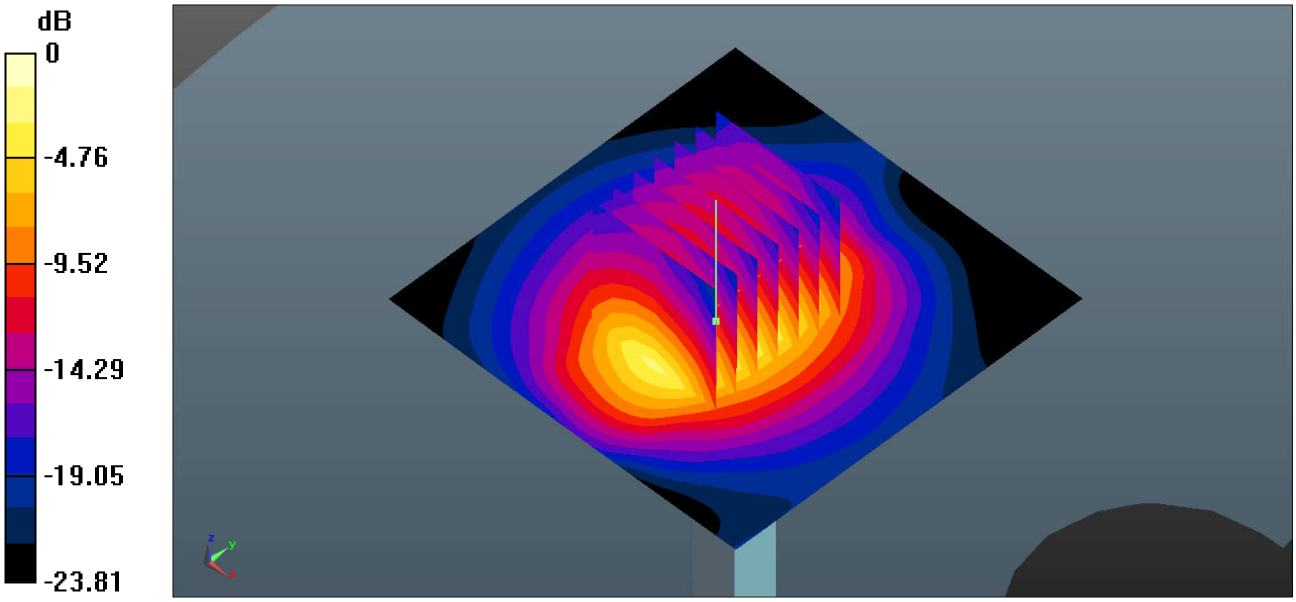
DUT: D2450V2 - SN:908

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 40.275; ρ= 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.11 (7439)

Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 20.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.94 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.38 W/kg
Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.8.6

System Check_Head_5250MHz

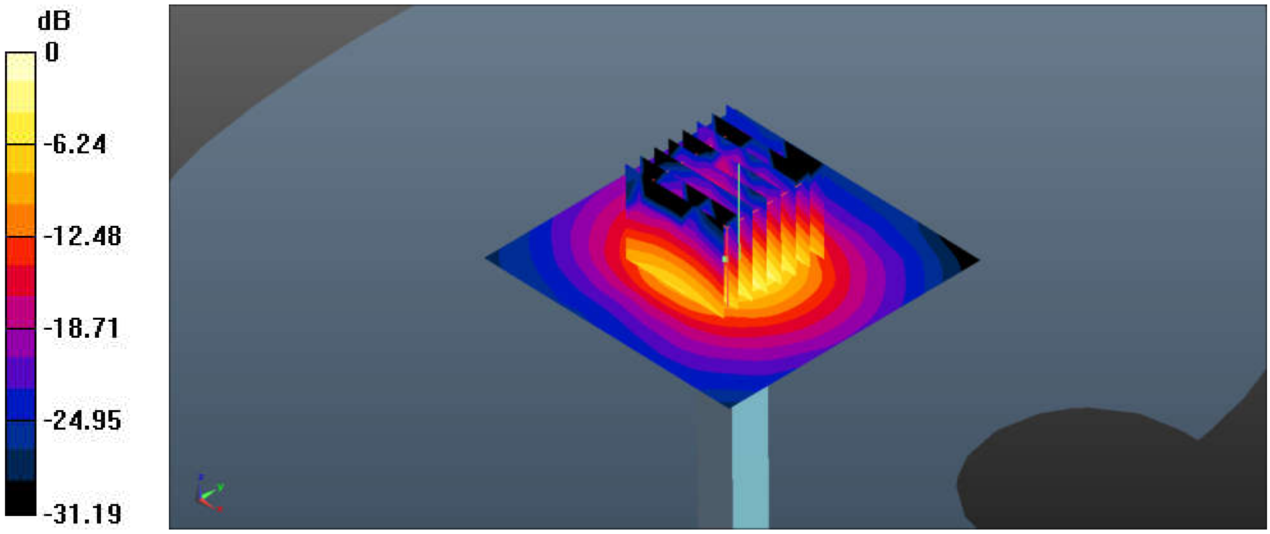
DUT: D5GHzV2-SN:1006

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5250 MHz; σ = 4.842 S/m; ε_r = 36.481; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 18.4 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mmReference Value = 43.38 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.7 W/kg
SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.8.6

System Check_Head_5750MHz

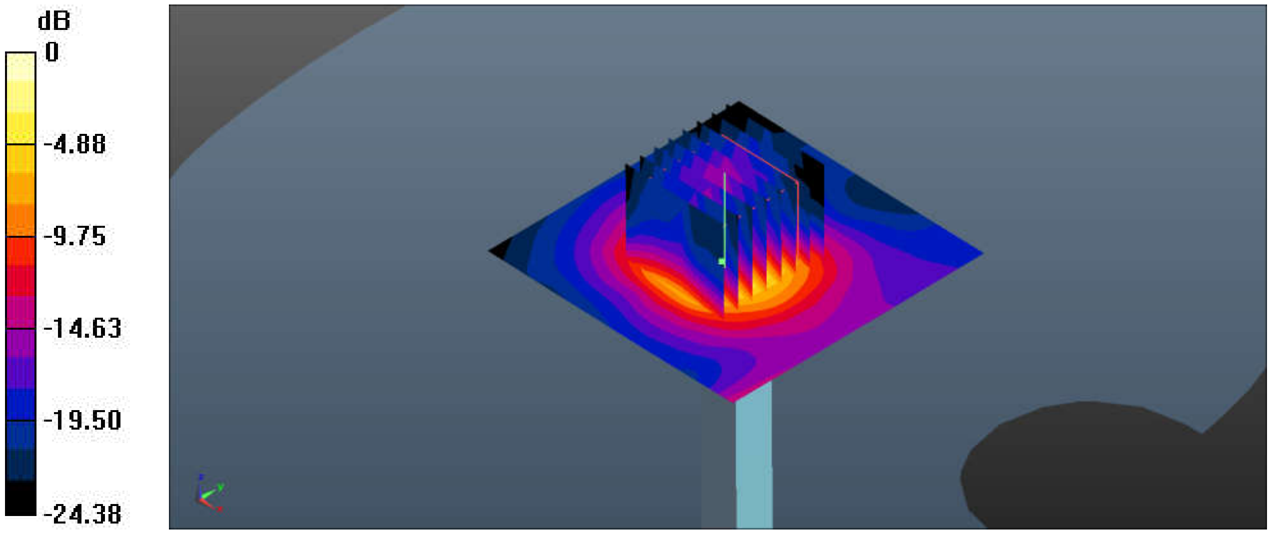
DUT: D5GHzV2-SN:1006

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5750 MHz; σ = 5.375 S/m; ε_r = 35.709; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (71x71x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 17.0 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mmReference Value = 36.82 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.0 W/kg = 12.30 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: 2019.7.9

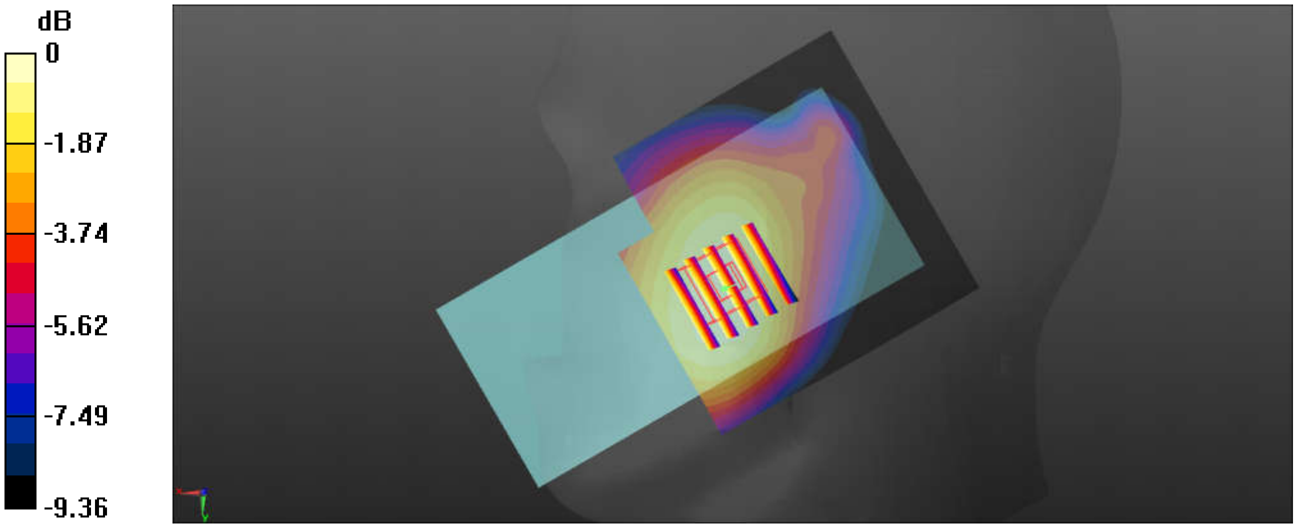
01_LTE Band 5_10M_QPSK_1RB_25offest_Right Cheek_0mm_Ch20525

Communication System: UID 0, LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.922 S/m; ε_r = 42.531; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.47, 6.47, 6.47); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch20525/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.233 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.388 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.254 W/kg
SAR(1 g) = 0.190 W/kg; SAR(10 g) = 0.145 W/kg
Maximum value of SAR (measured) = 0.229 W/kg



0 dB = 0.229 W/kg = -6.40 dBW/kg

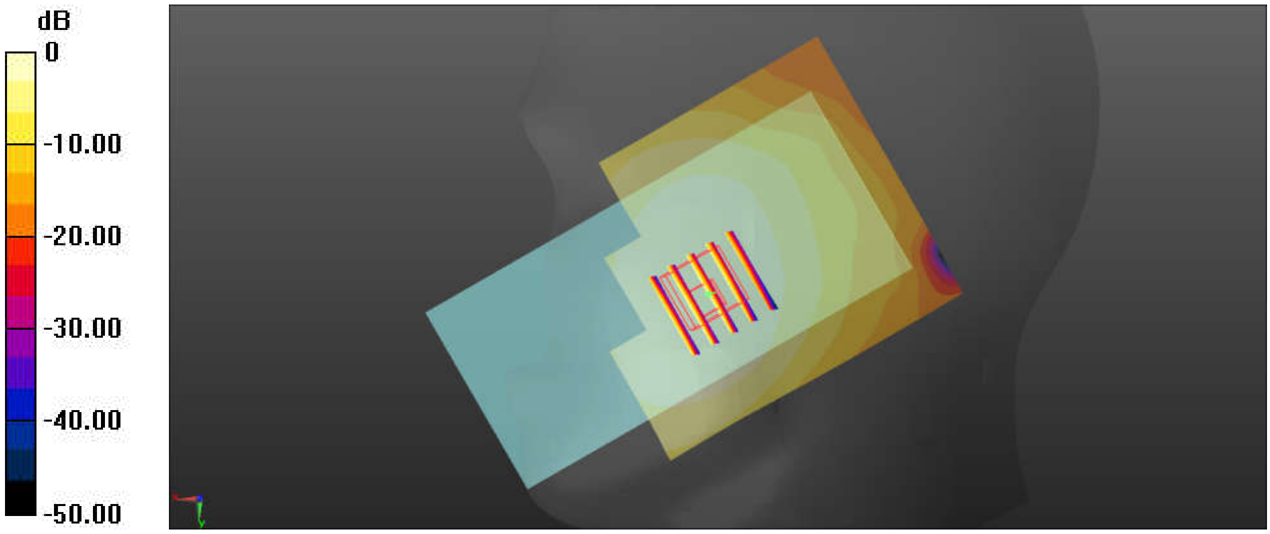
02_LTE Band 13_10M_QPSK_1RB_0offest_Right Cheek_0mm_Ch23230

Communication System: UID 0, LTE-FDD (0); Frequency: 782 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 782 MHz; σ = 0.926 S/m; ε_r = 41.246; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.78, 6.78, 6.78); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch23230/Area Scan (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.169 W/kg

Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.071 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.179 W/kg
SAR(1 g) = 0.143 W/kg; SAR(10 g) = 0.113 W/kg
Maximum value of SAR (measured) = 0.165 W/kg



0 dB = 0.169 W/kg = -7.72 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.11

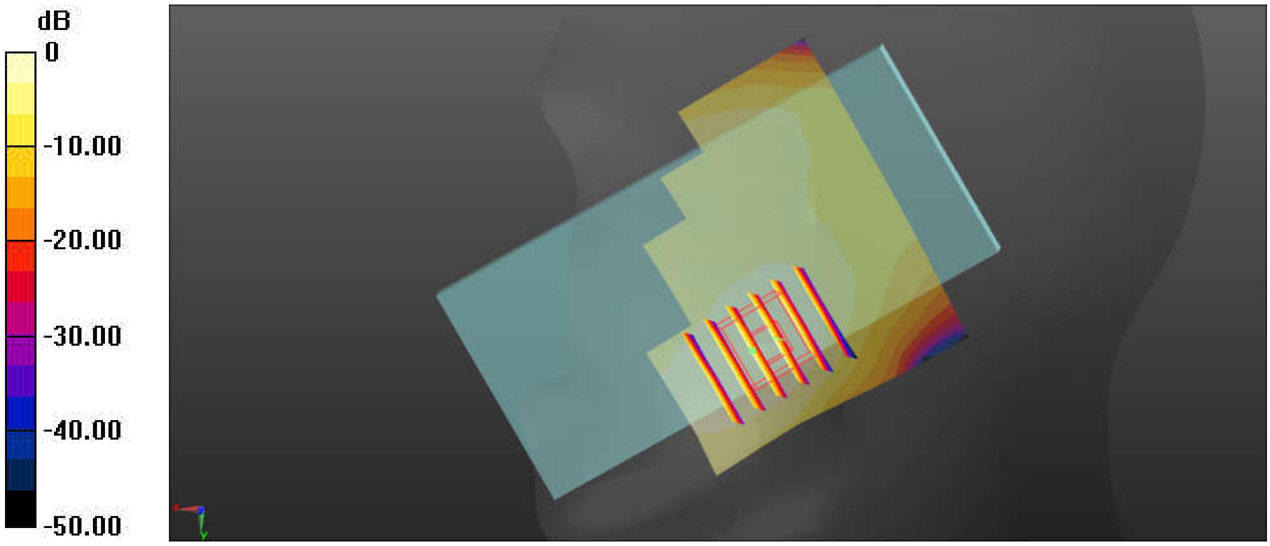
03_LTE Band 2_20M_QPSK_1RB_0offest_Right Cheek_0mm_Ch18900

Communication System: UID 0, LTE-FDD (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1880 MHz; σ = 1.41 S/m; ε_r = 39.189; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.19, 5.19, 5.19); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch18900/Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.108 W/kg

Ch18900/Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.984 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.162 W/kg
SAR(1 g) = 0.109 W/kg; SAR(10 g) = 0.068 W/kg
Maximum value of SAR (measured) = 0.127 W/kg



0 dB = 0.108 W/kg = -9.67 dBW/kg

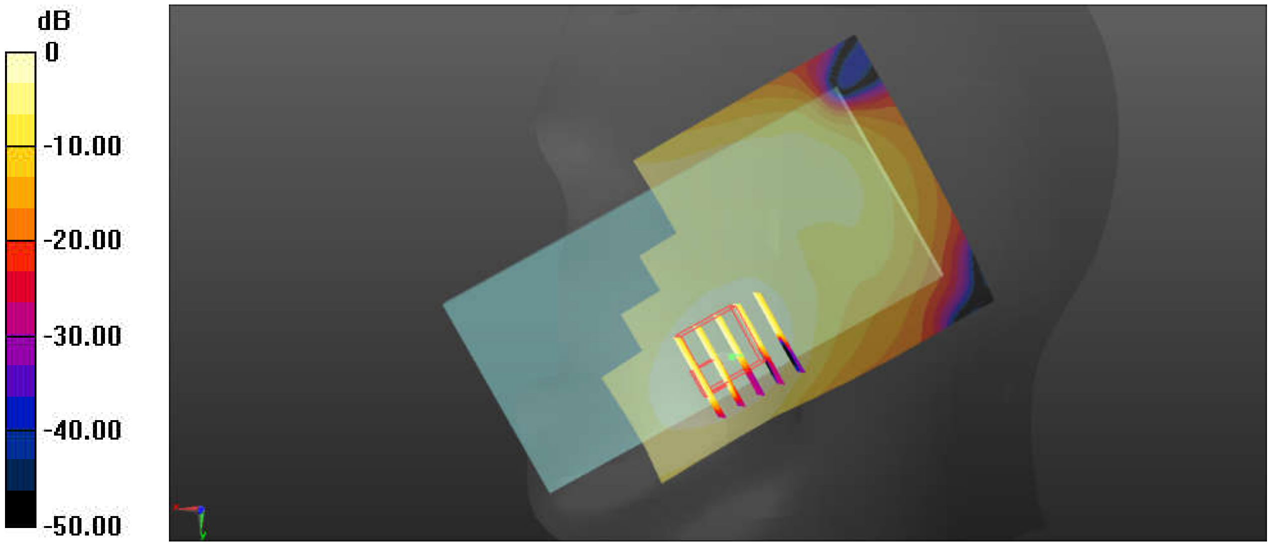
04_LTE Band 66_20M_QPSK_1RB_0offest_Right Cheek_0mm_Ch132322

Communication System: UID 0, LTE-FDD (0); Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1745 MHz; σ = 1.342 S/m; ε_r = 40.263; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.4, 5.4, 5.4); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch132322/Area Scan (71x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.206 W/kg

Ch132322/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.273 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.575 W/kg
SAR(1 g) = 0.222 W/kg; SAR(10 g) = 0.112 W/kg
Maximum value of SAR (measured) = 0.211 W/kg



0 dB = 0.206 W/kg = -6.86 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.12

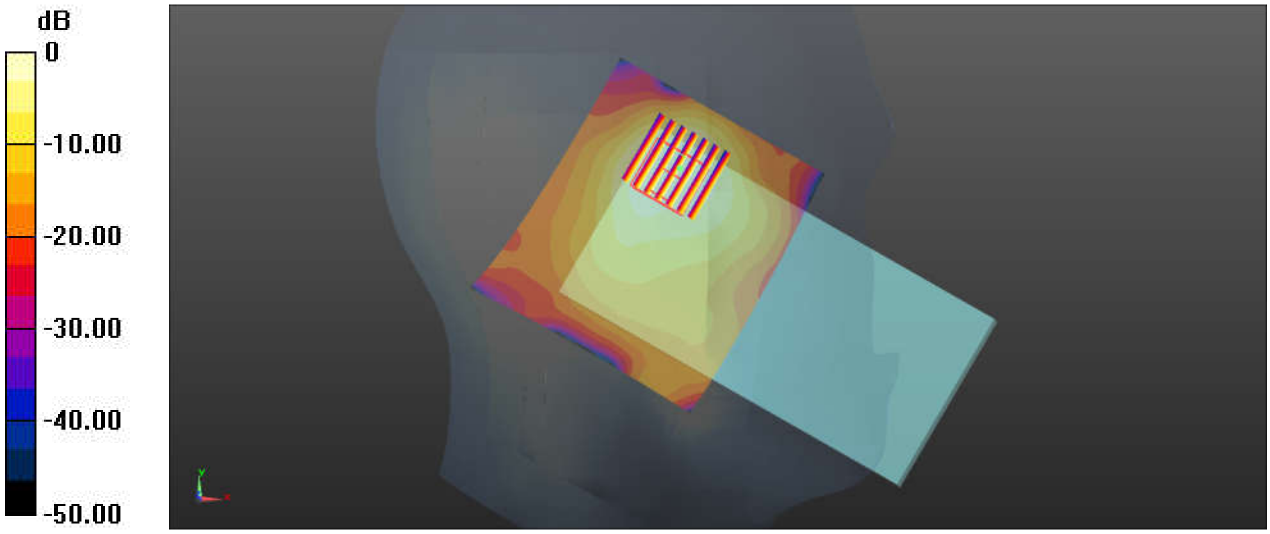
05_WLAN 2.4GHz _802.11b 1Mbps_Left Cheek_0mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2412 MHz; σ = 1.814 S/m; ε_r = 40.428; ρ = 1000kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch1/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.449 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.886 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.569 W/kg
SAR(1 g) = 0.238 W/kg; SAR(10 g) = 0.127 W/kg
Maximum value of SAR (measured) = 0.422 W/kg



0 dB = 0.449 W/kg = -3.48 dBW/kg

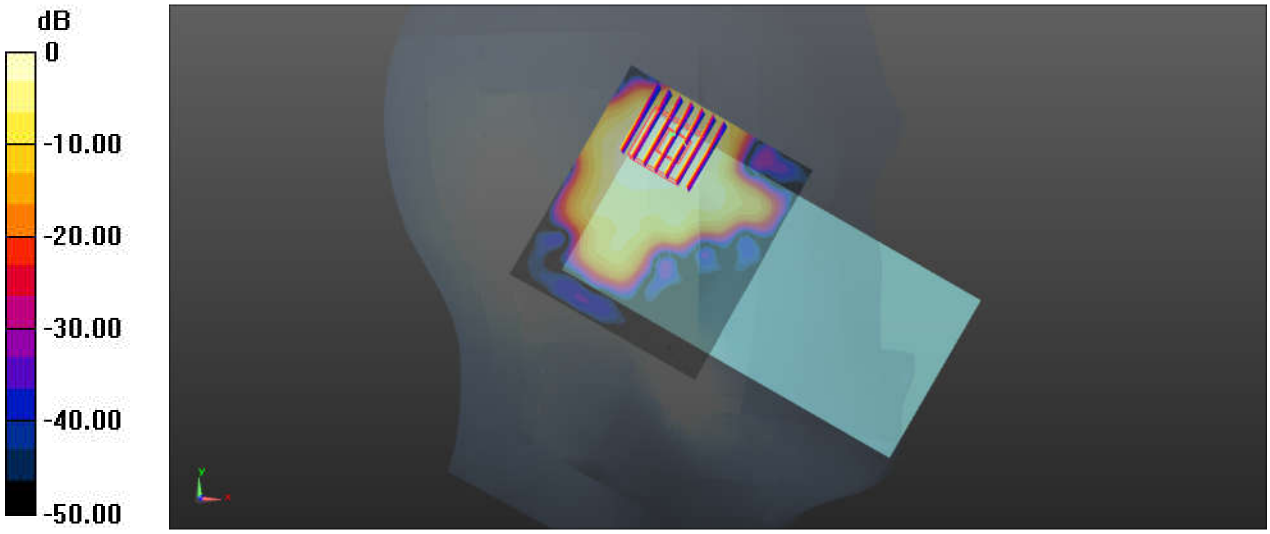
06_Bluetooth_1Mbps_Left Cheek_0mm_Ch00

Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz;Duty Cycle: 1:1.3
Medium: HSL_2450 Medium parameters used (interpolated): f = 2402 MHz; σ = 1.802 S/m; ε_r =40.469; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch00/Area Scan (81x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0361 W/kg

Ch00/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.764 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.0590 W/kg
SAR(1 g) = 0.026 W/kg; SAR(10 g) = 0.013 W/kg
Maximum value of SAR (measured) = 0.0335 W/kg



0 dB = 0.0361 W/kg = -14.42 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.8.6

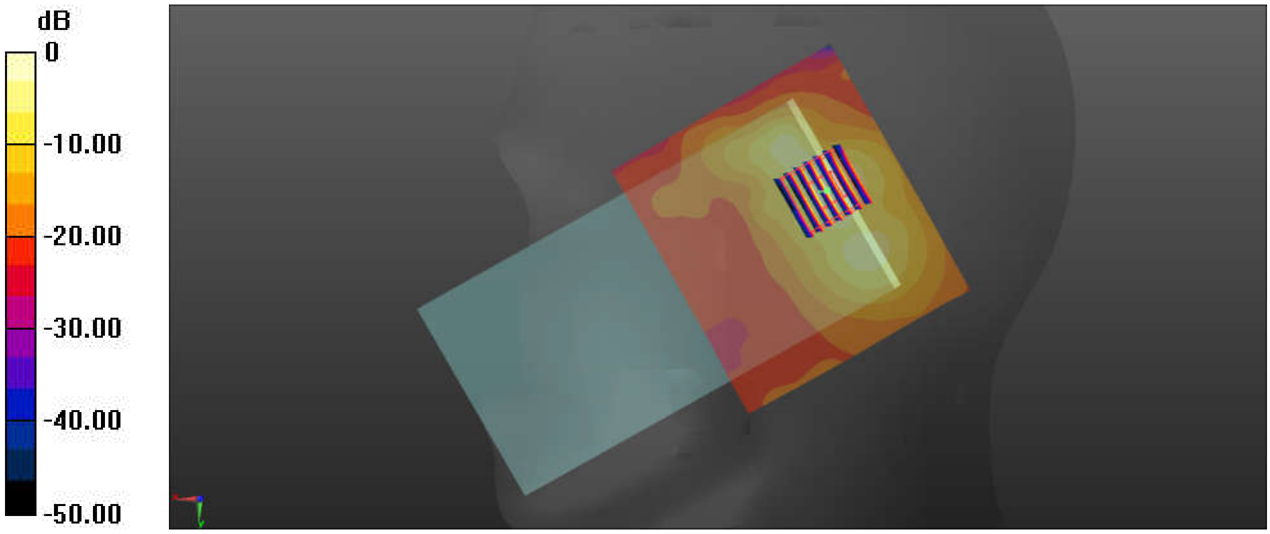
07_WLAN 5GHz _802.11ac-VHT20 MCS0_Right Tilted_0mm_Ch44

Communication System: UID 0, WIFI (0); Frequency: 5220 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5220 MHz; σ = 4.813 S/m; ε_r = 36.545; ρ = 1000kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch44/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.07 W/kg

Ch44/Zoom Scan (7x7x16)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 21.08 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.49 W/kg
SAR(1 g) = 0.868 W/kg; SAR(10 g) = 0.250 W/kg
Maximum value of SAR (measured) = 2.22 W/kg



0 dB = 2.07 W/kg = 3.16 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.8.6

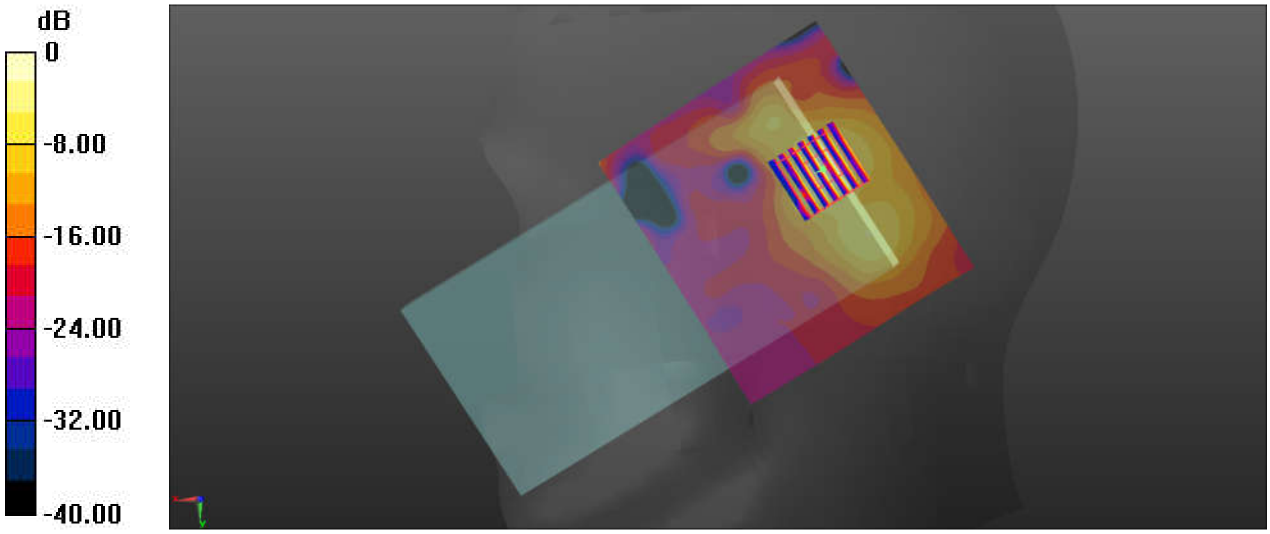
08_WLAN 5GHz _802.11ac-VHT20 MCS0_Right Tilted_0mm_Ch149

Communication System: UID 0, WIFI (0); Frequency: 5745 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5745 MHz; σ = 5.369 S/m; ε_r = 35.716; ρ = 1000kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch149/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.59 W/kg

Ch149/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 21.40 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 4.12 W/kg
SAR(1 g) = 0.981 W/kg; SAR(10 g) = 0.289 W/kg
Maximum value of SAR (measured) = 2.66 W/kg



0 dB = 2.59 W/kg = 4.13 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.9

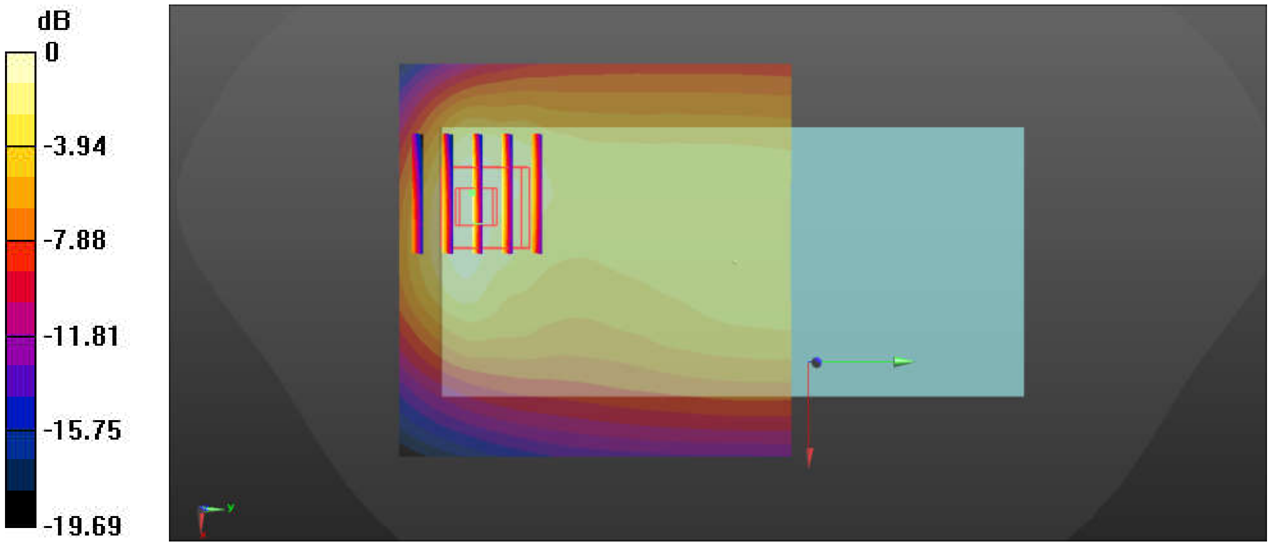
09_LTE Band 5_10M_QPSK_1RB_25offest_Back_10mm_Ch20525

Communication System: UID 0, LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.922 S/m; ε_r = 42.531; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.47, 6.47, 6.47); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch20525/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.554 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.92 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.784 W/kg
SAR(1 g) = 0.460 W/kg; SAR(10 g) = 0.268 W/kg
Maximum value of SAR (measured) = 0.562 W/kg



0 dB = 0.554 W/kg = -2.56 dBW/kg

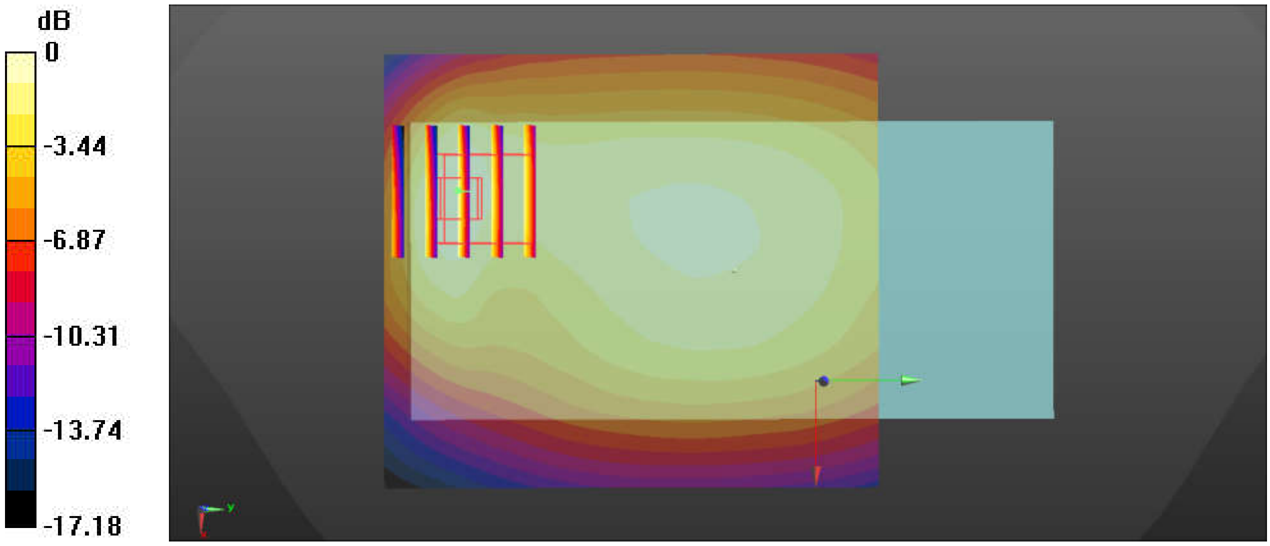
10_LTE Band 13_10M_QPSK_1RB_0offest_Back_10mm_Ch23230

Communication System: UID 0, LTE-FDD (0); Frequency: 782 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 782 MHz; σ = 0.926 S/m; ε_r = 41.246; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.78, 6.78, 6.78); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch23230/Area Scan (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.406 W/kg

Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.66 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.501 W/kg
SAR(1 g) = 0.302 W/kg; SAR(10 g) = 0.192 W/kg
Maximum value of SAR (measured) = 0.364 W/kg



0 dB = 0.406 W/kg = -3.91 dBW/kg

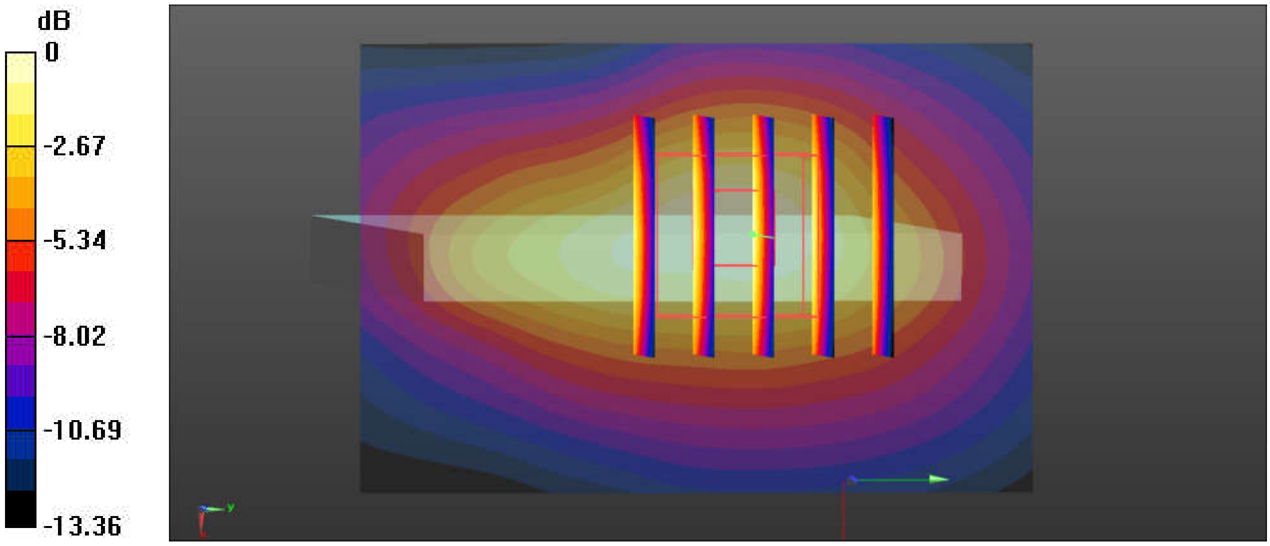
11_LTE Band 2_20M_QPSK_1RB_0offest_Bottom Side_10mm_Ch18900

Communication System: UID 0, LTE-FDD (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1880 MHz; σ = 1.41 S/m; ε_r = 39.189; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.19, 5.19, 5.19); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch18900/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.588 W/kg

Ch18900/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.35 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.761 W/kg
SAR(1 g) = 0.468 W/kg; SAR(10 g) = 0.268 W/kg
Maximum value of SAR (measured) = 0.573 W/kg



0 dB = 0.588 W/kg = -2.31 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.10

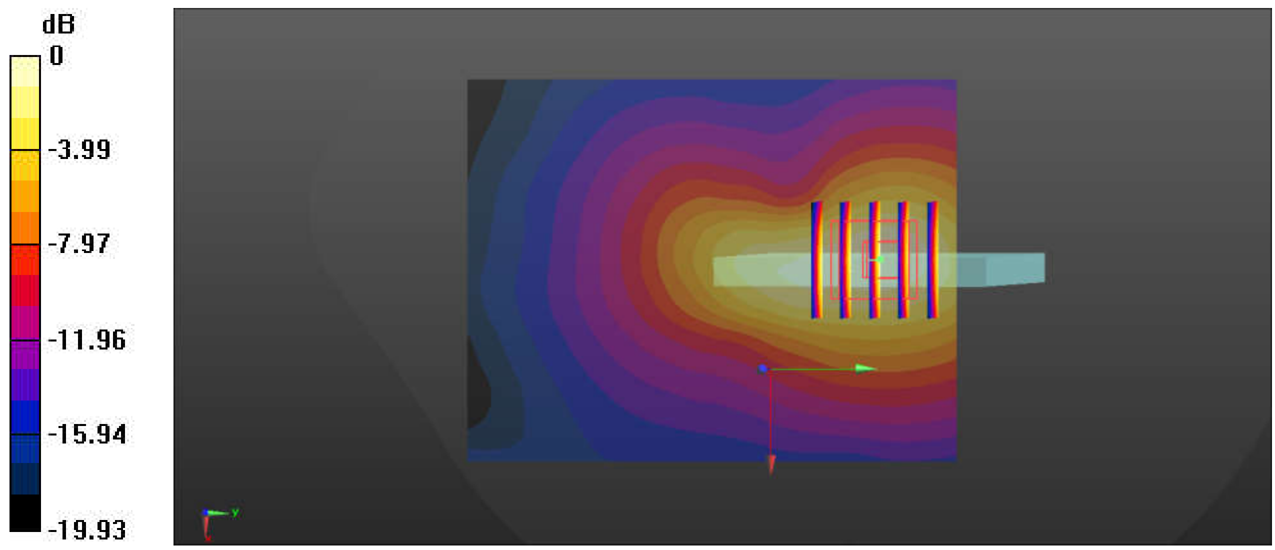
12_LTE Band 66_20M_QPSK_1RB_0offest_Bottom Side_10mm_Ch132322

Communication System: UID 0, LTE-FDD (0); Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1745 MHz; σ = 1.342 S/m; ε_r = 40.263; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.4, 5.4, 5.4); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch132322/Area Scan (71x91x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.597 W/kg

Ch132322/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.61 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.750 W/kg
SAR(1 g) = 0.489 W/kg; SAR(10 g) = 0.297 W/kg
Maximum value of SAR (measured) = 0.588 W/kg



0 dB = 0.597 W/kg = -2.24 dBW/kg

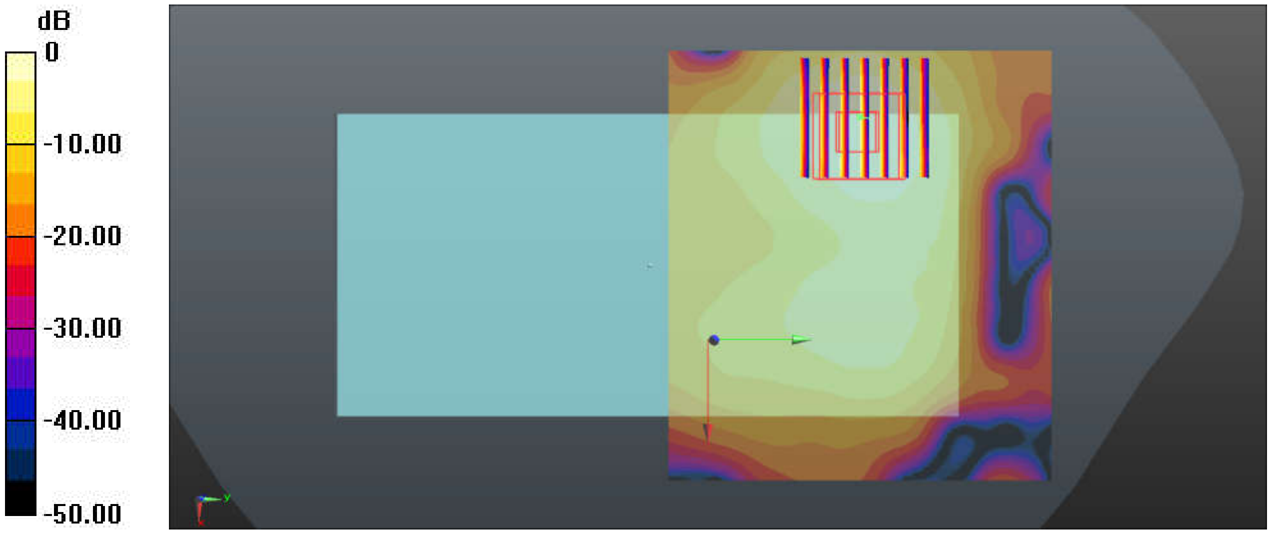
13_WLAN 2.4GHz _802.11b 1Mbps_Back_10mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2412 MHz; σ = 1.814 S/m; ε_r = 40.428; ρ = 1000kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch1/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.191 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.911 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.056 W/kg
Maximum value of SAR (measured) = 0.184 W/kg



0 dB = 0.191 W/kg = -7.19 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.8.6

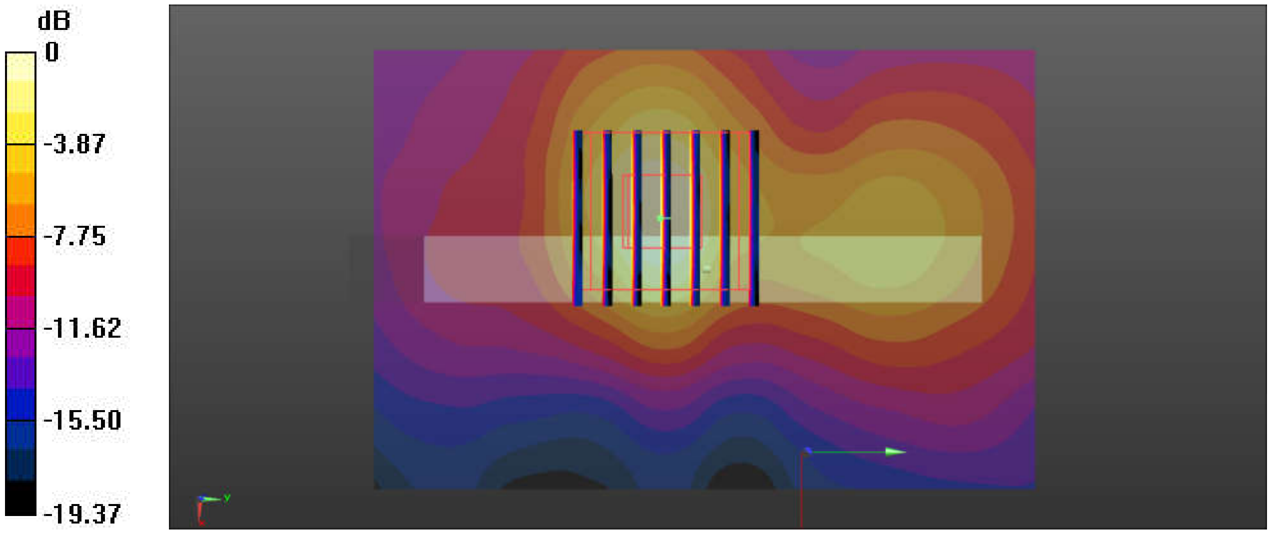
14_WLAN5.2GHz _802.11ac-VHT20 MCS0_Top Side_10mm_Ch44

Communication System: UID 0, WIFI (0); Frequency: 5220 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5220 MHz; σ = 4.813 S/m; ε_r = 36.545; ρ = 1000kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch44/Area Scan (61x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.877 W/kg

Ch44/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 10.69 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.43 W/kg
SAR(1 g) = 0.394 W/kg; SAR(10 g) = 0.137 W/kg
Maximum value of SAR (measured) = 0.908 W/kg



0 dB = 0.877 W/kg = -0.57 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.8.6

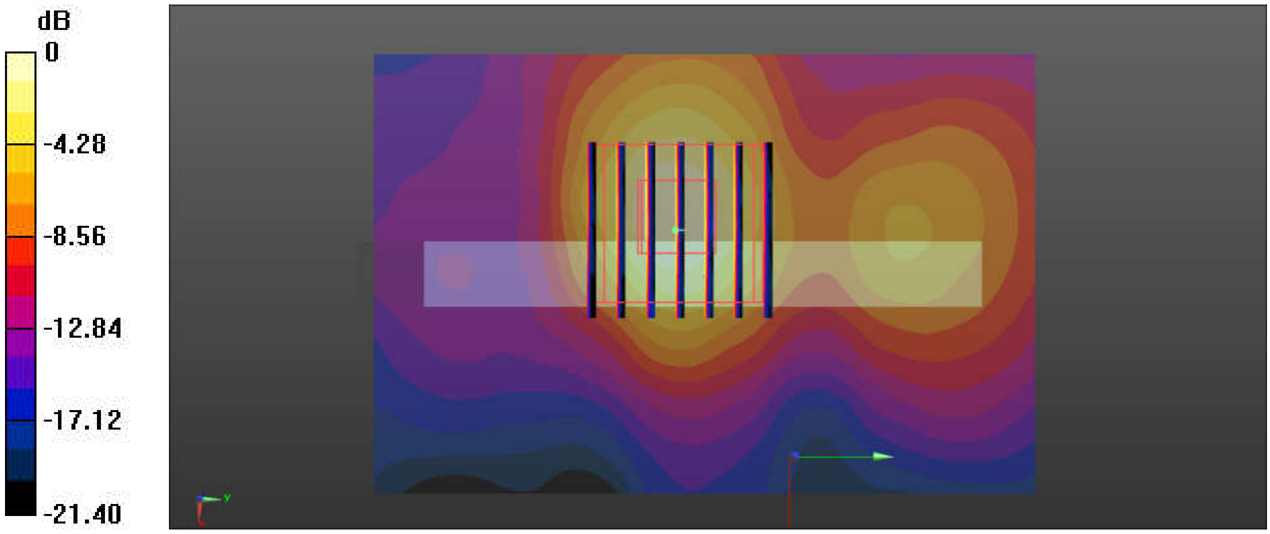
15_WLAN5.8GHz _802.11ac-VHT20 MCS0_Top Side_10mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5785 MHz; σ = 5.412 S/m; ε_r = 35.679; ρ = 1000kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch157/Area Scan (61x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.29 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 13.58 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 0.553 W/kg; SAR(10 g) = 0.190 W/kg
Maximum value of SAR (measured) = 1.30 W/kg



0 dB = 1.29 W/kg = 1.11 dBW/kg

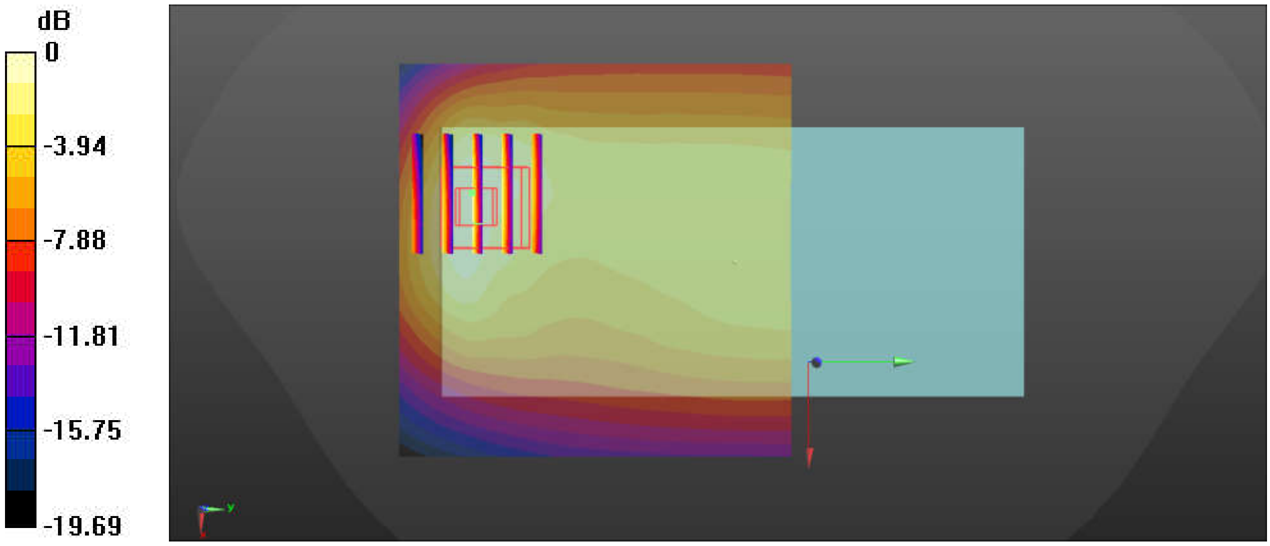
16_LTE Band 5_10M_QPSK_1RB_25offest_Back_10mm_Ch20525

Communication System: UID 0, LTE-FDD (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.922 S/m; ε_r = 42.531; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.47, 6.47, 6.47); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch20525/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.554 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.92 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.784 W/kg
SAR(1 g) = 0.460 W/kg; SAR(10 g) = 0.268 W/kg
Maximum value of SAR (measured) = 0.562 W/kg



0 dB = 0.554 W/kg = -2.56 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.9

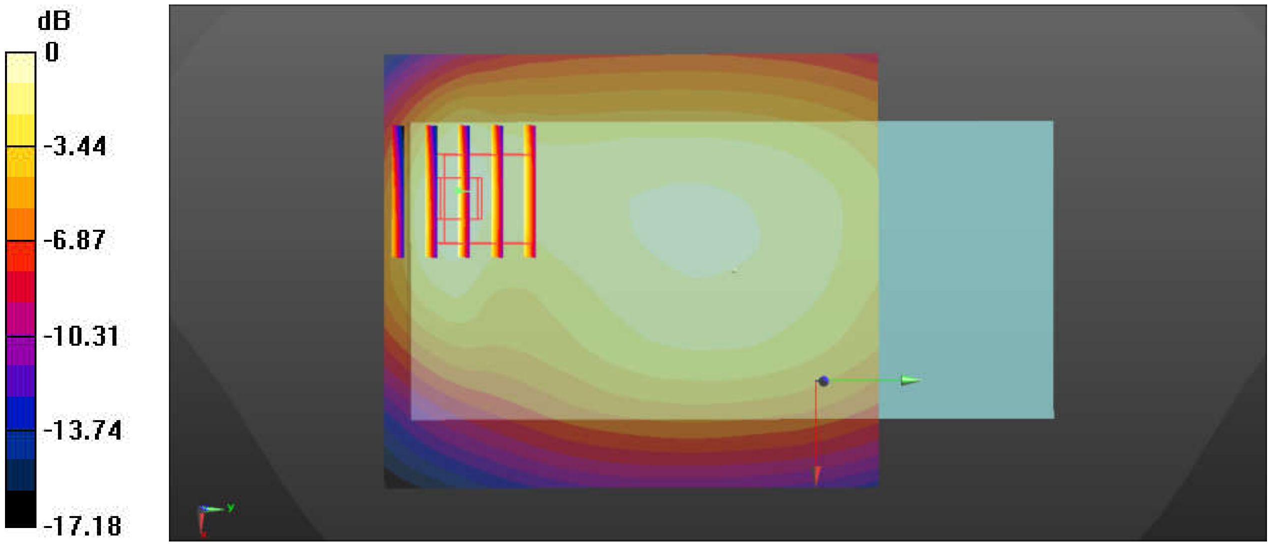
17_LTE Band 13_10M_QPSK_1RB_0offest_Back_10mm_Ch23230

Communication System: UID 0, LTE-FDD (0); Frequency: 782 MHz;Duty Cycle: 1:1
Medium: HSL_750 Medium parameters used: f = 782 MHz; σ = 0.926 S/m; ε_r = 41.246; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(6.78, 6.78, 6.78); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch23230/Area Scan (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.406 W/kg

Ch23230/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.66 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.501 W/kg
SAR(1 g) = 0.302 W/kg; SAR(10 g) = 0.192 W/kg
Maximum value of SAR (measured) = 0.364 W/kg



0 dB = 0.406 W/kg = -3.91 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.11

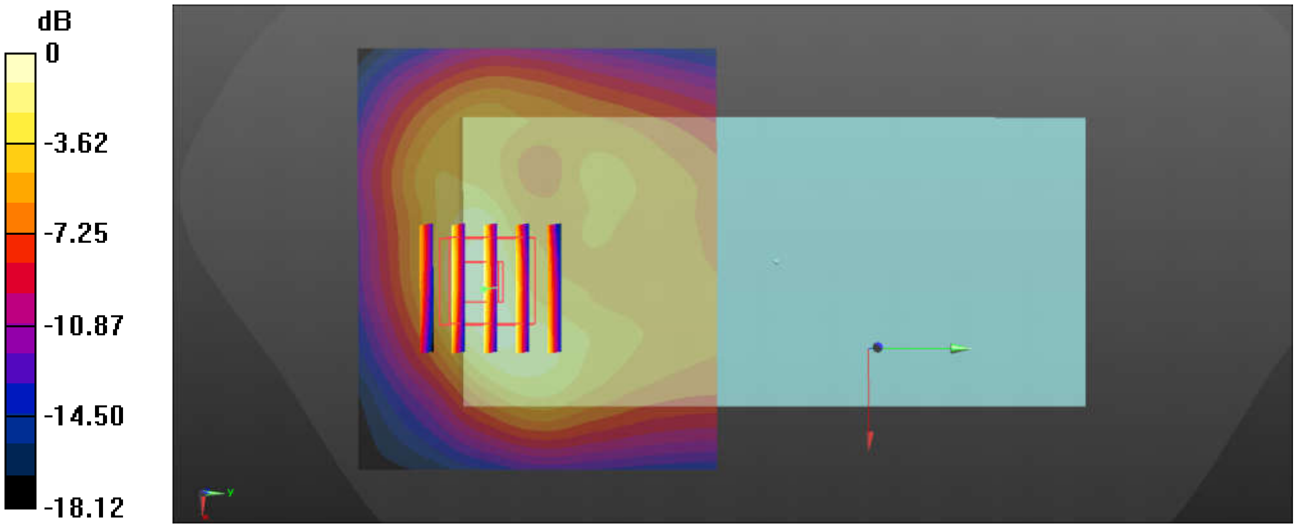
18_LTE Band 2_20M_QPSK_1RB_0offest_Back_10mm_Ch18900

Communication System: UID 0, LTE-FDD (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1880 MHz; σ = 1.41 S/m; ϵ_r = 39.189; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.19, 5.19, 5.19); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch18900/Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.575 W/kg

Ch18900/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.207 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.767 W/kg
SAR(1 g) = 0.442 W/kg; SAR(10 g) = 0.240 W/kg
Maximum value of SAR (measured) = 0.560 W/kg



0 dB = 0.560 W/kg = -2.52 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.10

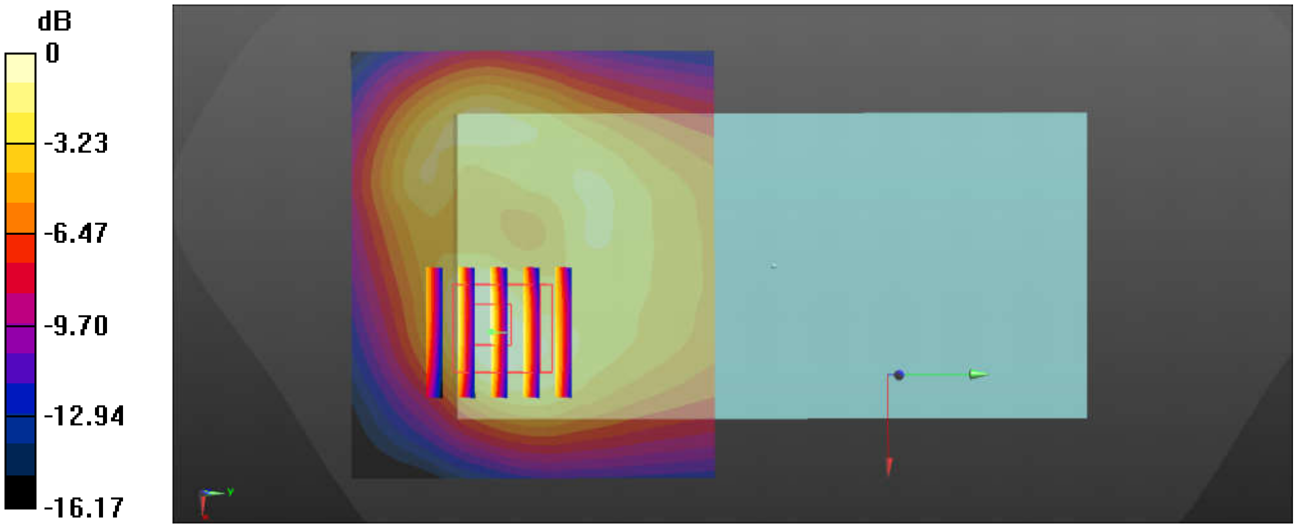
19_LTE Band 66_20M_QPSK_1RB_0offest_Back_10mm_Ch132322

Communication System: UID 0, LTE-FDD (0); Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1745 MHz; σ = 1.342 S/m; ε_r = 40.263; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(5.4, 5.4, 5.4); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch132322/Area Scan (71x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.607 W/kg

Ch132322/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.707 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.791 W/kg
SAR(1 g) = 0.474 W/kg; SAR(10 g) = 0.275 W/kg
Maximum value of SAR (measured) = 0.579 W/kg



0 dB = 0.579 W/kg = -2.37 dBW/kg

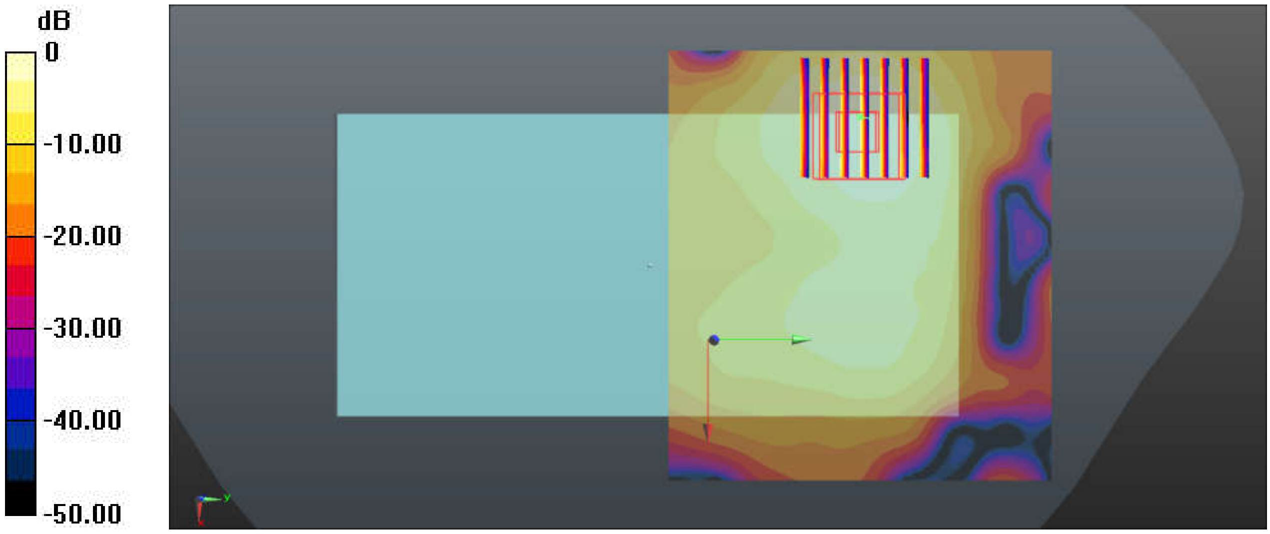
20_WLAN 2.4GHz _802.11b 1Mbps_Back_10mm_Ch1

Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2412 MHz; σ = 1.814 S/m; ε_r = 40.428; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.5, 7.5, 7.5); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM2; Type: SAM; Serial: TP-1842
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch1/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.191 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.911 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.238 W/kg
SAR(1 g) = 0.110 W/kg; SAR(10 g) = 0.056 W/kg
Maximum value of SAR (measured) = 0.184 W/kg



0 dB = 0.191 W/kg = -7.19 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.8.6

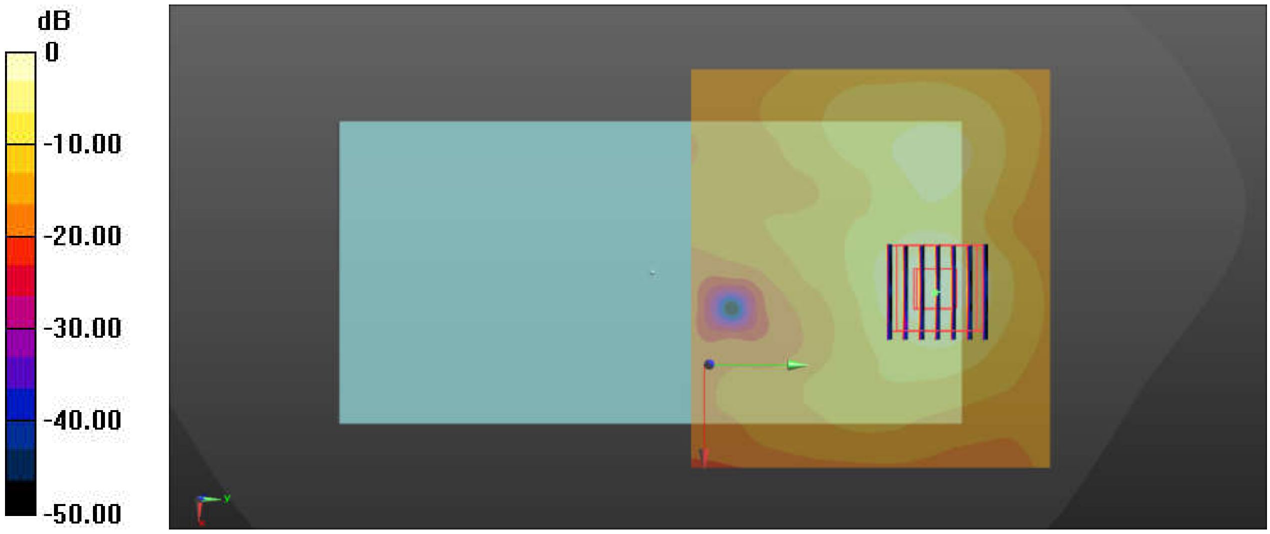
21_WLAN5.2GHz _802.11ac-VHT20 MCS0_Back_10mm_Ch44

Communication System: UID 0, WIFI (0); Frequency: 5220 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5220 MHz; σ = 4.813 S/m; ε_r = 36.545; ρ =1000kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.19, 5.19, 5.19); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch44/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.889 W/kg

Ch44/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.417 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.363 W/kg; SAR(10 g) = 0.124 W/kg
Maximum value of SAR (measured) = 0.842 W/kg



0 dB = 0.889 W/kg = -0.51 dBW/kg

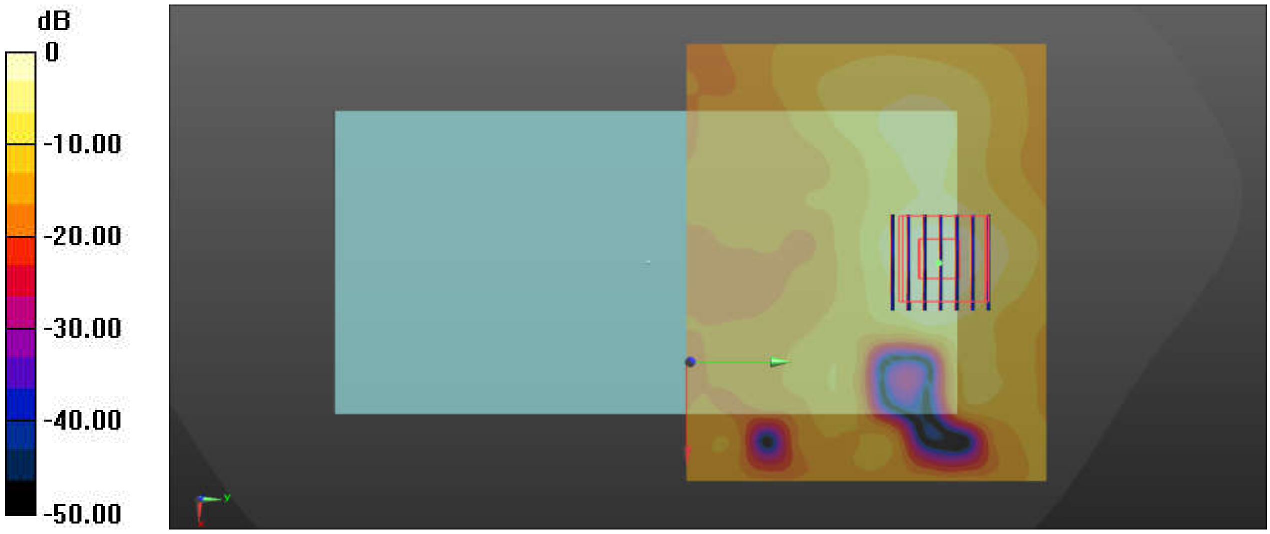
22_WLAN5.8GHz _802.11ac-VHT20 MCS0_Back_10mm_Ch157

Communication System: UID 0, WIFI (0); Frequency: 5785 MHz;Duty Cycle: 1:1.028
Medium: HSL_5000 Medium parameters used: f = 5785 MHz; σ = 5.412 S/m; ε_r = 35.679; ρ = 1000kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(5.17, 5.17, 5.17); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2018.12.3
- Phantom: SAM1; Type: SAM; Serial: TP-1542
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch157/Area Scan (111x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.02 W/kg

Ch157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 2.668 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.404 W/kg; SAR(10 g) = 0.146 W/kg
Maximum value of SAR (measured) = 0.945 W/kg



0 dB = 1.02 W/kg = 0.09 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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

中国认可
国际互认
校准
CALIBRATION
CNAS L0570

Client **Sporton** **Certificate No: Z19-60081**

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1087
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 27, 2019

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	106277	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Power sensor NRP8S	104291	20-Aug-18 (CTTL, No.J18X06862)	Aug-19
Reference Probe EX3DV4	SN 3617	31-Jan-19(SPEAG,No.EX3-3617_Jan19)	Jan-20
DAE4	SN 1331	06-Feb-19(SPEAG,No.DAE4-1331_Feb19)	Feb-20
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	23-Jan-19 (CTTL, No.J19X00336)	Jan-20
NetworkAnalyzer E5071C	MY46110673	24-Jan-19 (CTTL, No.J19X00547)	Jan-20

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

Issued: March 29, 2019

In Collaboration with
speag
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com http://www.chinattl.cn

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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E-mail: cttl@chinattl.com http://www.chinattl.cn

Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.0 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.36 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.65 W/kg ± 18.7 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.9 ± 6 %	0.94 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.75 W/kg ±18.7 % (k=2)**

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

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4Ω- 2.59jΩ
Return Loss	- 29.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.6Ω- 3.86jΩ
Return Loss	- 27.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	0.898 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

Additional EUT Data

Manufactured by	SPEAG

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1087

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

Medium parameters used: f = 750 MHz; σ = 0.903 S/m; ε_r = 43.01; ρ = 1000 kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.03, 10.03, 10.03) @ 750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 2/6/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

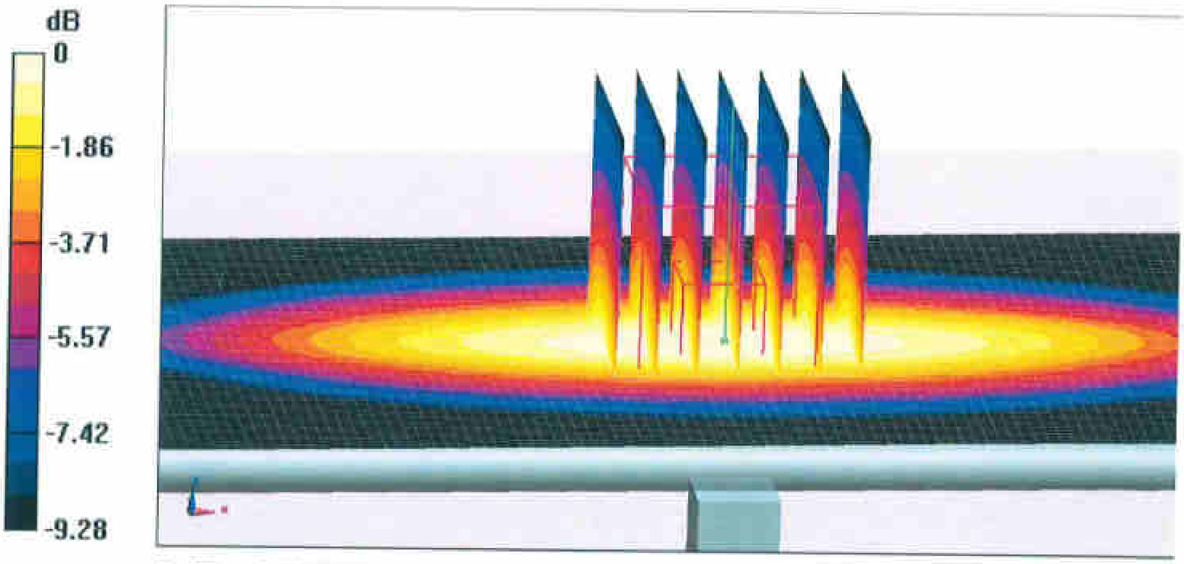
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.05 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.00 W/kg

SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.42 W/kg

Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dBW/kg

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Impedance Measurement Plot for Head TSL