FCC SAR Test Report

APPLICANT	**:**	**KYOCERA Corporation**
EQUIPMENT	**:**	**GSM/WCDMA/LTE Mobile Telephone**
BRAND NAME	**:**	**KYOCERA**
MODEL NAME	**:**	**CB64**
FCC ID	**:**	**JOYCB64**
STANDARD	**:**	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Jun. 21, 2019 and testing was started from Jul. 07, 2019 and completed on Jul. 17, 2019. We, Sporton International (Kunshan) Inc, would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

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

Rose Wang

Reviewed by: Rose Wang / Supervisor

Kat Yin

Approved by: Kat Yin / Manager

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

Table of Contents

1. Statement of Compliance....4
2. Administration Data....5
3. Guidance Applied....5
4. Equipment Under Test (EUT) Information....6
  4.1 General Information....6
  4.2 General LTE SAR Test and Reporting Considerations....7
5. RF Exposure Limits....8
  5.1 Uncontrolled Environment....8
  5.2 Controlled Environment....8
6. Specific Absorption Rate (SAR)....9
  6.1 Introduction....9
  6.2 SAR Definition....9
7. System Description and Setup....10
  7.1 E-Field Probe....11
  7.2 Data Acquisition Electronics (DAE)....11
  7.3 Phantom....12
  7.4 Device Holder....13
8. Measurement Procedures....14
  8.1 Spatial Peak SAR Evaluation....14
  8.2 Power Reference Measurement....15
  8.3 Area Scan....15
  8.4 Zoom Scan....16
  8.5 Volume Scan Procedures....16
  8.6 Power Drift Monitoring....16
9. Test Equipment List....17
10. System Verification....18
  10.1 Tissue Simulating Liquids....18
  10.2 Tissue Verification....19
  10.3 System Performance Check Results....20
11. RF Exposure Positions....21
  11.1 Ear and handset reference point....21
  11.2 Definition of the cheek position....22
  11.3 Definition of the tilt position....23
  11.4 Body Worn Accessory....24
  11.5 Product Specific 10g SAR Exposure....25
  11.6 Wireless Router....25
12. Conducted RF Output Power (Unit: dBm)....26
13. Antenna Location....43
14. SAR Test Results....44
  14.1 Head SAR....46
  14.2 Hotspot SAR....48
  14.3 Body Worn Accessory SAR....51
  14.4 Product specific 10g SAR....53
  14.5 Repeated SAR Measurement....54
15. Simultaneous Transmission Analysis....55
  15.1 Head Exposure Conditions....56
  15.2 Hotspot Exposure Conditions....57
  15.3 Body-Worn Accessory Exposure Conditions....58
  15.4 SPLSR Evaluation and Analysis....59
16. Uncertainty Assessment....61
17. References....62
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA962113	Rev. 01	Initial issue of report.	Jul. 30, 2019
FA962113	Rev. 02	Deleted WLAN5.2GHz hotspot SAR data.	Aug. 08, 2019

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **KYOCERA Corporation, GSM/WCDMA/LTE Mobile Telephone, CB64,** are as follows.

Highest 1g SAR Summary

Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 10mm)	Highest Simultaneous Transmission
			1g SAR (W/kg)			1g SAR (W/kg)
Licensed	GSM	GSM1900	0.25	1.30	0.90	1.58
	WCDMA	Band II	0.33	**1.34**	0.89	
		Band IV	0.26	0.78	0.65	
	LTE	Band 2	0.33	1.27	**1.01**	
		Band 4	0.29	0.83	0.78	
DTS	WLAN	2.4GHz WLAN	0.39	<0.10	<0.10	1.34
NII		5GHz WLAN	**1.32**		0.23	1.58
DSS	Bluetooth	2.4GHz Bluetooth	0.35	<0.10	<0.10	1.34

Highest 10g SAR Summary

Equipment Class	Frequency Band		Product Specific 10g SAR (W/kg) (Separation 0mm)
Licensed	GSM	GSM1900	2.34
	WCDMA	Band II	2.86
	LTE	Band 2	**3.25**
NII	WLAN	5GHz WLAN	0.78
Date of Testing:			2019/7/7~2019/7/17

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, 4.0 W/kg for Product Specific 10g 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.	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CN1257	314309

Applicant	
Company Name	KYOCERA Corporation
Address	2-1-1 Kagahara, Tsuzuki-ku, Yokohama-shi, Kanagawa, Japan, 224-8502

Manufacturer	
Company Name	KYOCERA Corporation
Address	2-1-1 Kagahara, Tsuzuki-ku, Yokohama-shi, Kanagawa, Japan, 224-8502

3. Guidance Applied

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

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	GSM/WCDMA/LTE Mobile Telephone
Brand Name	KYOCERA
Model Name	CB64
FCC ID	JOYCB64
IMEI Code	356283100010315
Wireless Technology and Frequency Range	GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GSM/GPRS RMC/AMR 12.2Kbps HSDPA HSUPA HSPA+(16QAM uplink is not supported) LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	CB64
SW Version	msm8937_64-userdebug 9
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:
1. This device supports VoIP in GPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. This device does not support DTM operation and supports GRPS mode up to multi-slot class 12.
3. This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering function.
4. This device 5.2GHz/5.3GHz / 5.5GHz WLAN supports WiFi Direct (GC only).

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	JOYCB64
Equipment Name	GSM/WCDMA/LTE Mobile Telephone
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK / 16QAM / 64QAM
LTE Voice / Data requirements	Voice and Data
LTE Release Version	R10, Cat4
CA Support	Not Supported
LTE MPR permanently built-in by design	
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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

5. RF Exposure Limits

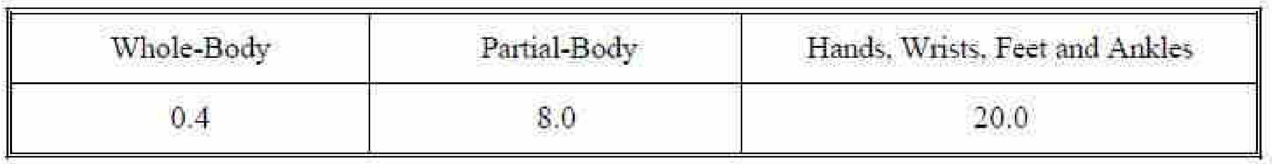
5.1 Uncontrolled Environment

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

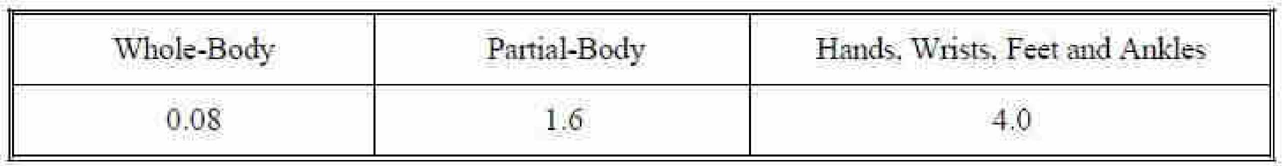
Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed 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:

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

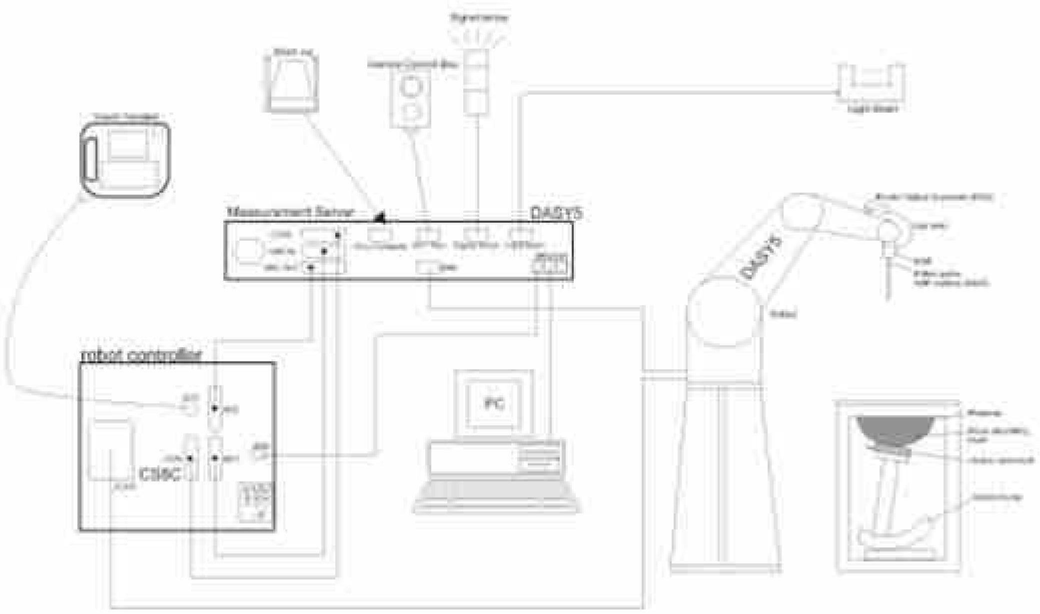
SAR is expressed in units of Watts per kilogram (W/kg)

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

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	

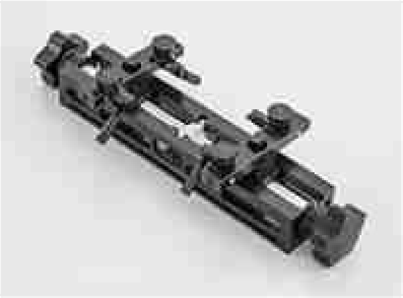
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

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

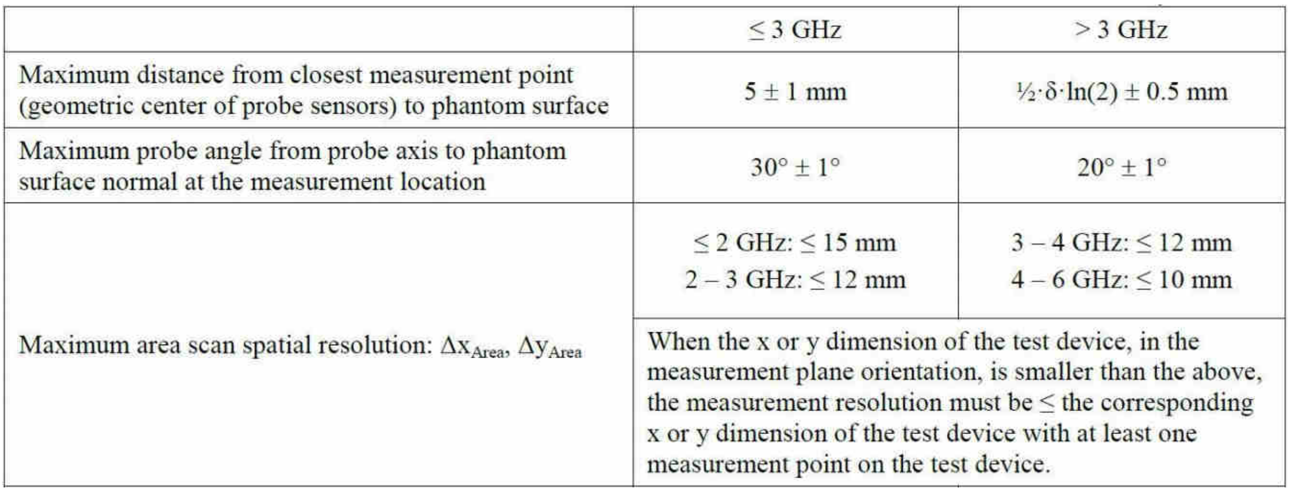
8.2 Power Reference Measurement

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.

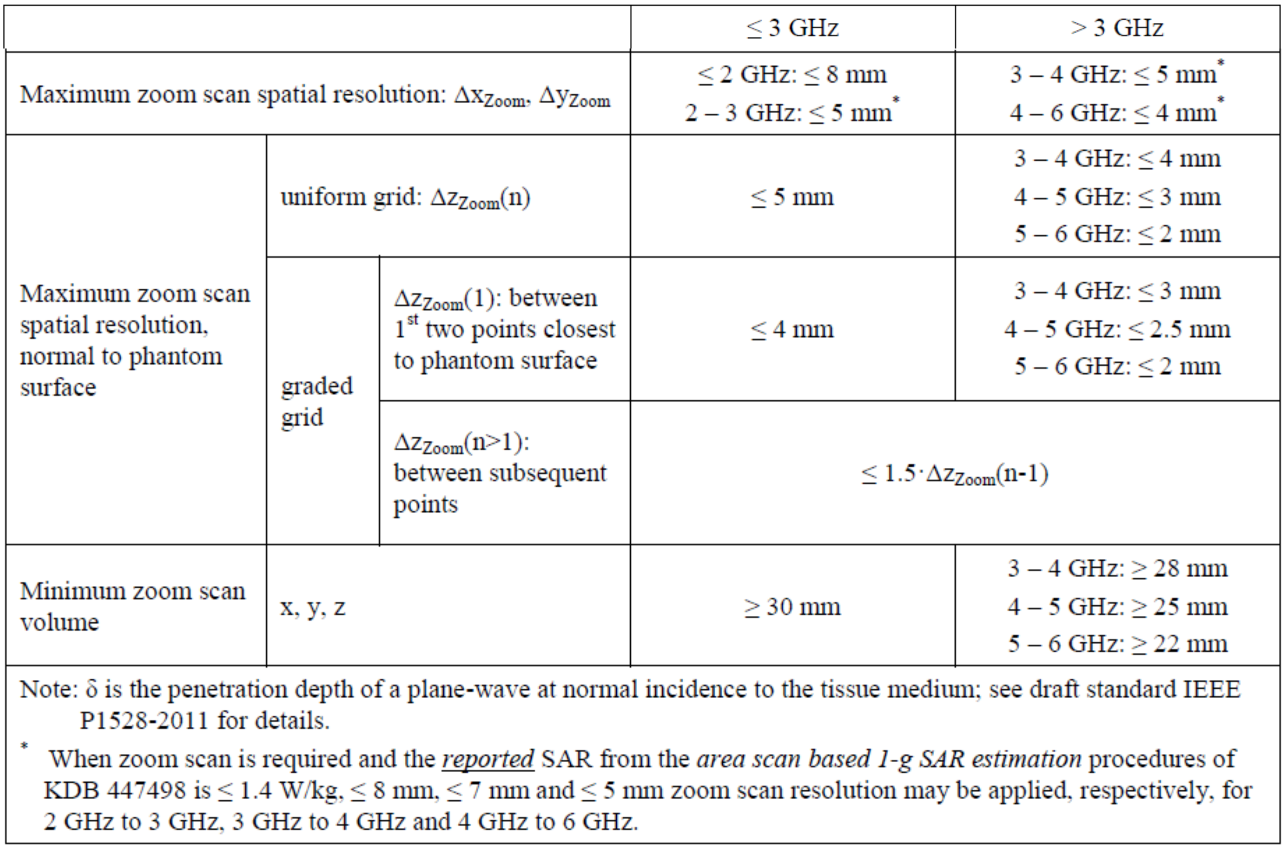


	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area},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

8.4 Zoom Scan

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

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



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

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	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	Dosimetric E-Field Probe	EX3DV4	3857	2019/5/27	2020/5/26
SPEAG	Dosimetric E-Field Probe	ES3DV3	3293	2018/10/25	2019/10/24
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1503	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	2019/4/17	2020/4/16
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2019/4/17	2020/4/16
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	
Agilent	Dual Directional Coupler	778D	20500	Note	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note	
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note	

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

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.1. 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. 11.2.

Fig 11.1 Photo of Liquid Height for Head SAR

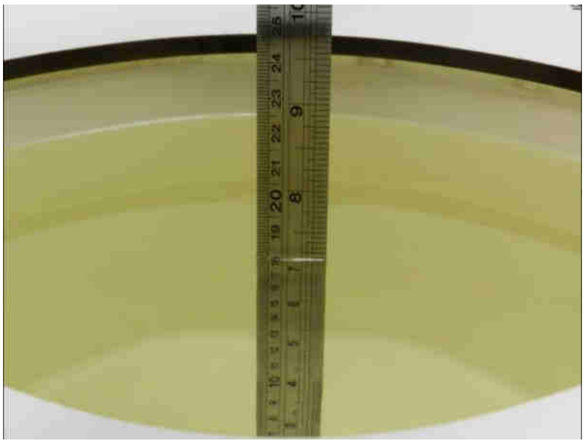


Fig 11.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
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
1750	Head	22.7	1.384	41.115	1.37	40.10	1.02	2.53	±5	2019/7/7
1900	Head	22.8	1.432	39.278	1.40	40.00	2.29	-1.81	±5	2019/7/7
2450	Head	22.8	1.850	40.924	1.80	39.20	2.78	4.40	±5	2019/7/8
5250	Head	22.9	4.631	36.749	4.71	35.90	-1.68	2.36	±5	2019/7/17
5600	Head	22.9	5.039	35.963	5.07	35.50	-0.61	1.30	±5	2019/7/17

10.3 System Performance Check Results

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

<1g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2019/7/7	1750	Head	250	1090	3293	690	9.09	36.40	36.36	-0.11
2019/7/7	1900	Head	250	5d170	3293	690	10.40	39.00	41.6	6.67
2019/7/8	2450	Head	250	908	3293	690	13.00	52.80	52	-1.52
2019/7/17	5250	Head	100	1006	3857	690	7.64	80.70	76.4	-5.33
2019/7/17	5600	Head	100	1006	3857	690	8.16	83.30	81.6	-2.04

<10g SAR>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2019/7/7	1900	Head	250	5d170	3293	690	5.35	20.30	21.4	5.42
2019/7/17	5250	Head	100	1006	3857	690	2.18	23.20	21.8	-6.03
2019/7/17	5600	Head	100	1006	3857	690	2.29	23.80	22.9	-3.78

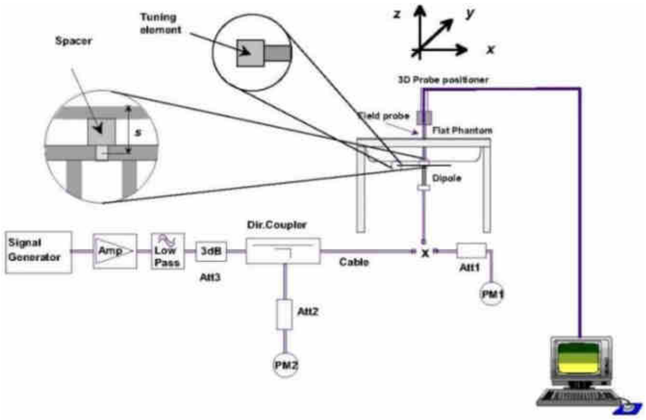


Fig 11.3.1 System Performance Check Setup

Fig 11.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 12.1.1 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 12.1.2 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 12.1.3). 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 12.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

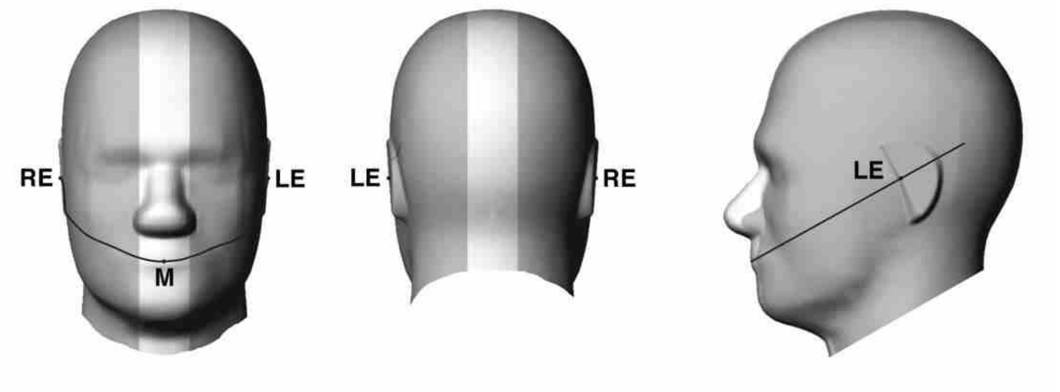


Fig 12.1.1 Front, back, and side views of SAM twin phantom

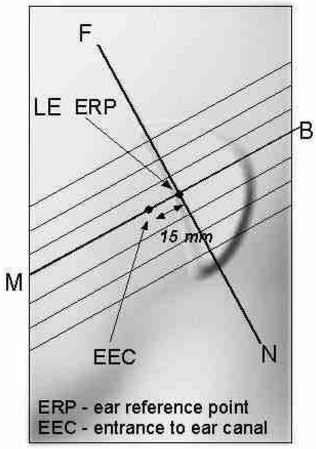


Fig 12.1.2 Close-up side view of phantom showing the ear region.

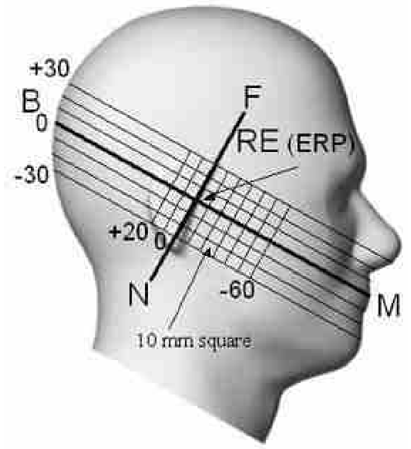


Fig 12.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

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 12.2.1 and Figure 12.2.2), 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 12.2.1). 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 12.2.2), 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 12.2.3), 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 12.2.3. The actual rotation angles should be documented in the test report.

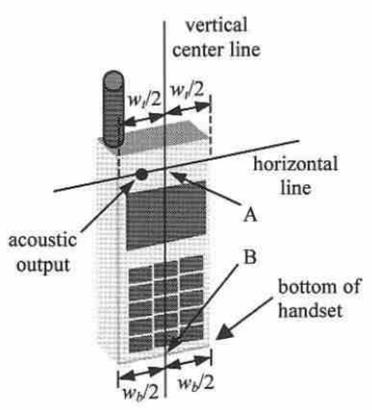


Fig 12.2.1 Handset vertical and horizontal reference lines—"fixed case

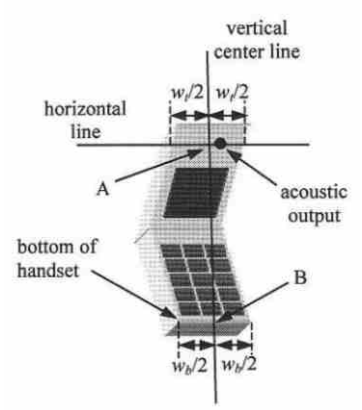


Fig 12.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

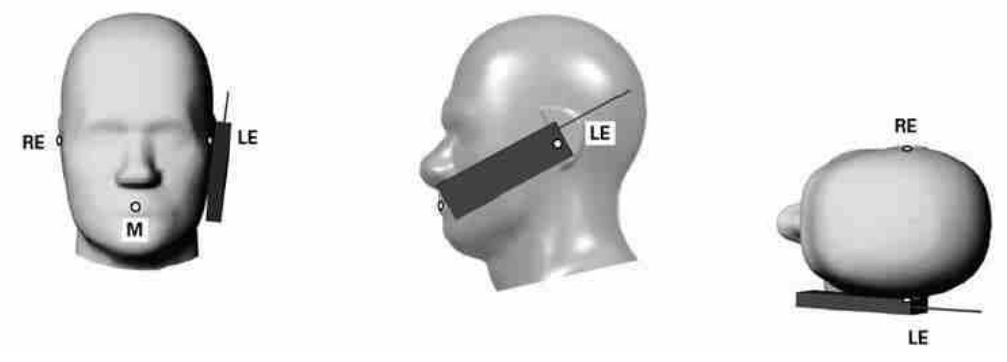


Fig 12.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

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 12.3.1. 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

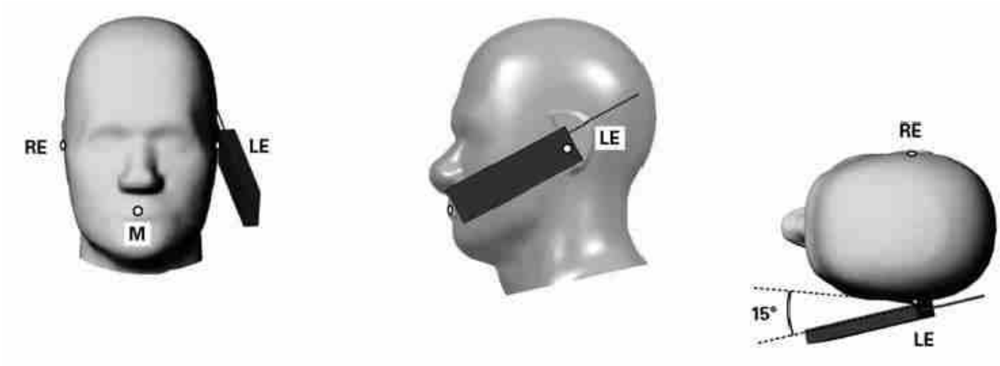


Fig 12.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

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 12.4). 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.

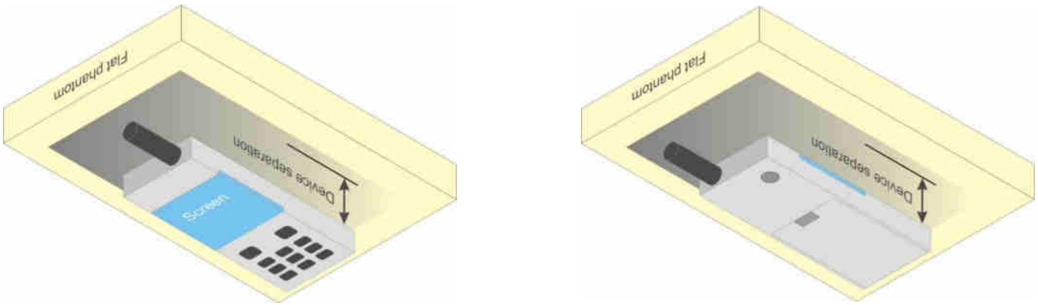


Fig 12.4 Body Worn Position

11.5 Product Specific 10g SAR Exposure

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

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

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

11.6 Wireless Router

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

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

12. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS 4Tx slots for GSM1900 are considered as the primary mode.
3. Other configurations of GSM / GPRS are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	30.05	30.32	30.45	31.50	21.05	21.32	21.45	22.50
GPRS 1 Tx slot	30.04	30.33	30.47	31.50	21.04	21.33	21.47	22.50
GPRS 2 Tx slots	27.20	27.50	27.68	28.50	21.20	21.50	21.68	22.50
GPRS 3 Tx slots	25.17	25.46	25.65	26.50	20.91	21.20	21.39	22.24
GPRS 4 Tx slots	23.83	24.13	24.29	25.50	20.83	21.13	21.29	**22.50**

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

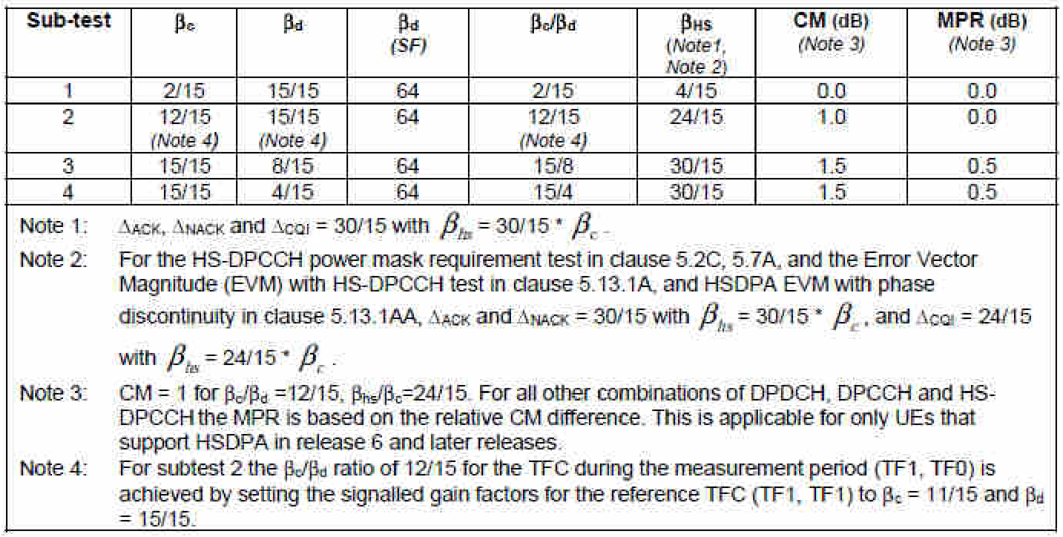
1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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



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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

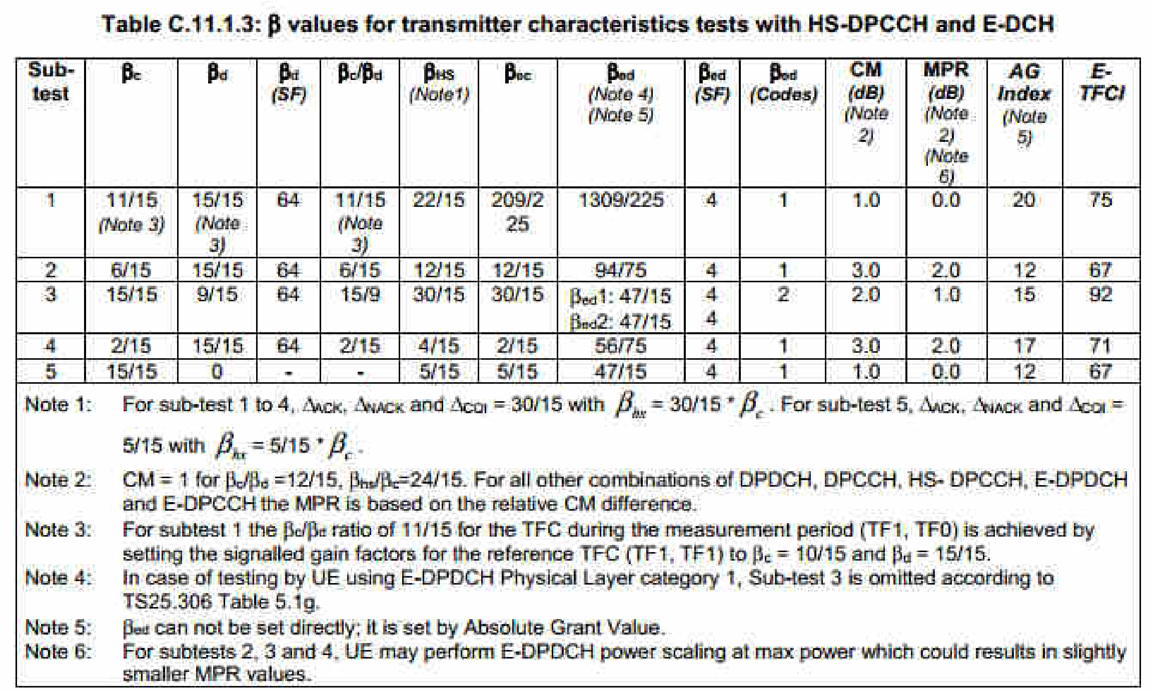


Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with $\beta_{hs} = 5/15 * \beta_c$.

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

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

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

<WCDMA Conducted Power>

General Note:

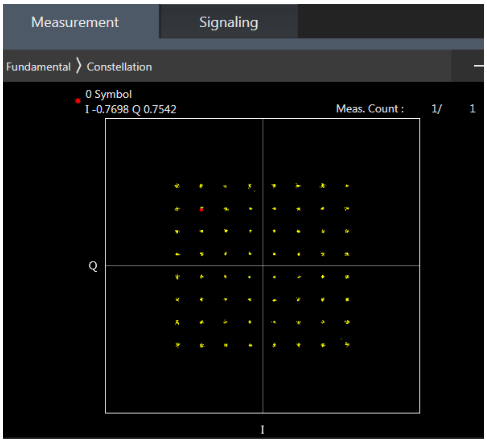
1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher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

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band IV			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		1312	1413	1513	
Rx Channel		9662	9800	9938		1537	1638	1738	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6	
3GPP Rel 99	AMR 12.2Kbps	23.80	23.81	23.60	24.00	23.23	23.65	23.71	25.30
3GPP Rel 99	RMC 12.2Kbps	23.82	**23.85**	23.63	24.00	23.25	23.69	**23.72**	25.30
3GPP Rel 6	HSDPA Subtest-1	23.01	23.05	22.99	23.50	22.05	22.42	22.40	24.30
3GPP Rel 6	HSDPA Subtest-2	23.00	23.05	22.98	23.50	22.08	22.50	22.51	24.30
3GPP Rel 6	HSDPA Subtest-3	22.56	22.58	22.54	23.00	21.60	22.04	22.04	23.80
3GPP Rel 6	HSDPA Subtest-4	22.58	22.59	22.53	23.00	21.82	22.05	22.06	23.80
3GPP Rel 6	HSUPA Subtest-1	23.29	23.37	23.24	23.50	22.12	22.41	22.29	24.30
3GPP Rel 6	HSUPA Subtest-2	21.96	21.94	21.90	22.00	20.92	21.08	21.40	22.80
3GPP Rel 6	HSUPA Subtest-3	21.89	22.03	21.91	22.50	21.20	21.21	21.23	23.30
3GPP Rel 6	HSUPA Subtest-4	21.87	21.85	21.83	22.00	21.28	21.47	21.60	22.80
3GPP Rel 6	HSUPA Subtest-5	22.97	23.05	23.01	23.50	22.10	22.40	22.60	24.30

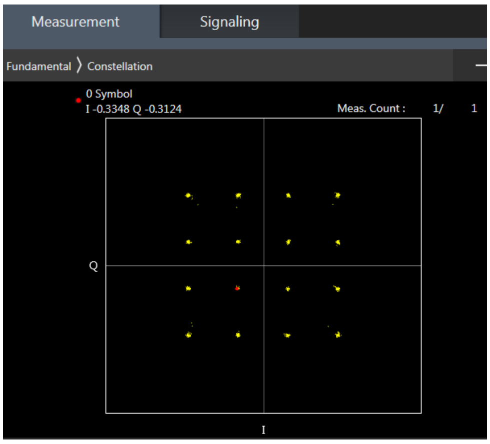
<LTE Conducted Power>

General Note:

1. Anritsu MT8821C 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/64QAM 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/64QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 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. 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	22.70	22.73	22.58	23	0
20	QPSK	1	49	22.69	22.95	22.57		
20	QPSK	1	99	22.56	22.45	22.51		
20	QPSK	50	0	21.92	22.00	21.99	22	1
20	QPSK	50	24	21.97	21.86	21.88		
20	QPSK	50	50	21.78	21.81	21.86		
20	QPSK	100	0	21.85	21.90	21.83		
20	16QAM	1	0	21.88	21.81	21.69	22	1
20	16QAM	1	49	21.85	21.90	21.80		
20	16QAM	1	99	21.53	21.85	21.44		
20	16QAM	50	0	20.77	20.85	20.90	21	2
20	16QAM	50	24	20.95	20.95	21.00		
20	16QAM	50	50	20.66	20.79	20.80		
20	16QAM	100	0	20.84	20.85	20.75		
20	64QAM	1	0	20.65	20.32	20.75	21	2
20	64QAM	1	49	20.47	20.40	20.35		
20	64QAM	1	99	20.72	20.43	20.36		
20	64QAM	50	0	19.86	19.96	19.80	20	3
20	64QAM	50	24	19.85	19.97	19.97		
20	64QAM	50	50	19.85	19.97	20.00		
20	64QAM	100	0	19.92	19.85	19.90		

Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.76	22.94	22.69	23	0
15	QPSK	1	37	22.86	22.82	22.88		
15	QPSK	1	74	22.53	22.92	22.51		
15	QPSK	36	0	21.81	21.99	21.90	22	1
15	QPSK	36	20	21.97	21.92	21.93		
15	QPSK	36	39	21.85	21.92	21.95		
15	QPSK	75	0	21.93	21.97	21.95		
15	16QAM	1	0	21.89	21.93	21.86	22	1
15	16QAM	1	37	21.94	21.91	21.86		
15	16QAM	1	74	21.63	21.65	21.60		
15	16QAM	36	0	20.82	20.79	20.83	21	2
15	16QAM	36	20	20.94	20.93	20.93		
15	16QAM	36	39	20.87	20.96	20.76		
15	16QAM	75	0	21.00	20.98	20.78		
15	64QAM	1	0	20.78	20.65	20.80	21	2
15	64QAM	1	37	20.81	20.73	20.78		
15	64QAM	1	74	20.61	20.70	20.38		
15	64QAM	36	0	19.78	19.79	19.78	20	3
15	64QAM	36	20	19.87	19.89	19.78		
15	64QAM	36	39	19.79	19.87	19.58		
15	64QAM	75	0	19.81	19.69	19.59		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.57	22.59	22.68	23	0
10	QPSK	1	25	22.81	22.80	22.75		
10	QPSK	1	49	22.86	22.86	22.49		
10	QPSK	25	0	21.82	21.90	21.84	22	1
10	QPSK	25	12	21.75	21.90	21.80		
10	QPSK	25	25	21.78	21.98	21.89		
10	QPSK	50	0	21.73	21.98	21.90		
10	16QAM	1	0	21.62	21.53	21.60	22	1
10	16QAM	1	25	21.88	21.91	21.82		
10	16QAM	1	49	21.63	21.60	21.65		
10	16QAM	25	0	20.74	20.80	20.82	21	2
10	16QAM	25	12	20.90	20.83	20.98		
10	16QAM	25	25	20.88	20.94	20.78		
10	16QAM	50	0	20.70	20.93	21.00		
10	64QAM	1	0	20.86	20.80	20.81	21	2
10	64QAM	1	25	20.78	20.81	20.79		
10	64QAM	1	49	20.89	20.80	20.82		
10	64QAM	25	0	19.85	19.92	19.86	20	3
10	64QAM	25	12	19.80	19.94	19.89		
10	64QAM	25	25	19.82	19.91	19.79		
10	64QAM	50	0	19.95	19.92	19.90		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.72	22.78	22.87	23	0
5	QPSK	1	12	22.64	22.57	22.56		
5	QPSK	1	24	22.59	22.73	22.72		
5	QPSK	12	0	21.81	21.87	21.79	22	1
5	QPSK	12	7	21.75	21.82	21.78		
5	QPSK	12	13	21.85	21.76	21.62		
5	QPSK	25	0	21.86	21.84	21.75		
5	16QAM	1	0	21.39	21.77	21.76	22	1
5	16QAM	1	12	21.60	21.69	21.51		
5	16QAM	1	24	21.49	21.42	21.33		
5	16QAM	12	0	20.82	20.75	20.84	21	2
5	16QAM	12	7	20.99	20.98	20.88		
5	16QAM	12	13	20.97	20.90	20.88		
5	16QAM	25	0	20.86	20.87	20.74		
5	64QAM	1	0	20.82	20.80	20.94	21	2
5	64QAM	1	12	20.91	20.99	20.93		
5	64QAM	1	24	20.90	20.85	20.92		
5	64QAM	12	0	19.86	19.82	19.91	20	3
5	64QAM	12	7	19.85	20.00	19.94		
5	64QAM	12	13	20.00	19.91	19.83		
5	64QAM	25	0	19.84	19.89	19.99		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.76	22.93	22.72	23	0
3	QPSK	1	8	22.71	22.85	22.77		
3	QPSK	1	14	22.66	22.85	22.72		
3	QPSK	8	0	21.98	22.00	21.96	22	1
3	QPSK	8	4	21.87	21.95	21.87		
3	QPSK	8	7	21.85	21.85	21.79		
3	QPSK	15	0	21.80	21.89	21.81		
3	16QAM	1	0	21.70	21.48	21.97	22	1
3	16QAM	1	8	21.83	21.93	21.56		
3	16QAM	1	14	21.74	21.97	21.79		
3	16QAM	8	0	20.84	21.00	20.88	21	2
3	16QAM	8	4	20.93	20.86	20.93		
3	16QAM	8	7	20.91	20.96	20.78		
3	16QAM	15	0	20.56	20.67	20.81		
3	64QAM	1	0	20.98	20.80	20.97	21	2
3	64QAM	1	8	20.95	20.98	20.91		
3	64QAM	1	14	20.86	20.89	20.88		
3	64QAM	8	0	19.87	19.88	19.88	20	3
3	64QAM	8	4	19.87	19.92	19.94		
3	64QAM	8	7	19.89	19.81	19.85		
3	64QAM	15	0	19.99	19.85	19.85		

Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.70	22.83	22.59	23	0
1.4	QPSK	1	3	22.86	22.84	22.62		
1.4	QPSK	1	5	22.64	22.78	22.74		
1.4	QPSK	3	0	22.80	22.76	22.71		
1.4	QPSK	3	1	22.75	22.92	22.77		
1.4	QPSK	3	3	22.72	22.92	22.76		
1.4	QPSK	6	0	21.76	21.90	21.68	22	1
1.4	16QAM	1	0	21.95	21.78	21.93	22	1
1.4	16QAM	1	3	21.98	21.78	21.58		
1.4	16QAM	1	5	21.96	21.61	21.73		
1.4	16QAM	3	0	21.75	21.72	21.83		
1.4	16QAM	3	1	21.71	21.99	21.78		
1.4	16QAM	3	3	21.49	21.70	21.56		
1.4	16QAM	6	0	20.66	20.73	20.78	21	2
1.4	64QAM	1	0	20.85	20.73	20.87	21	2
1.4	64QAM	1	3	20.83	20.87	20.93		
1.4	64QAM	1	5	20.91	20.70	20.92		
1.4	64QAM	3	0	20.85	20.82	20.69		
1.4	64QAM	3	1	21.00	20.80	20.98		
1.4	64QAM	3	3	20.86	20.69	20.63		
1.4	64QAM	6	0	19.76	19.70	19.75	20	3

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.63	22.97	22.98	24.3	0
20	QPSK	1	49	22.93	23.12	22.92		
20	QPSK	1	99	22.96	22.75	22.95		
20	QPSK	50	0	22.26	22.24	22.38	23.3	1
20	QPSK	50	24	22.28	22.23	22.19		
20	QPSK	50	50	22.19	22.09	22.03		
20	QPSK	100	0	22.32	22.24	22.17		
20	16QAM	1	0	21.63	21.88	21.97	23.3	1
20	16QAM	1	49	21.60	21.80	21.67		
20	16QAM	1	99	21.69	21.53	21.81		
20	16QAM	50	0	21.37	21.30	21.50	22.3	2
20	16QAM	50	24	21.35	21.23	21.34		
20	16QAM	50	50	21.32	21.04	21.11		
20	16QAM	100	0	21.40	21.15	21.26		
20	64QAM	1	0	20.77	21.03	21.09	22.3	2
20	64QAM	1	49	21.13	20.93	21.12		
20	64QAM	1	99	20.85	20.63	20.86		
20	64QAM	50	0	20.46	20.53	20.58	21.3	3
20	64QAM	50	24	20.51	20.38	20.58		
20	64QAM	50	50	20.53	20.20	20.43		
20	64QAM	100	0	20.44	20.37	20.42		

Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.62	22.97	22.93	24.3	0
15	QPSK	1	37	22.52	22.99	22.94		
15	QPSK	1	74	22.95	22.89	22.91		
15	QPSK	36	0	22.23	22.31	22.20	23.3	1
15	QPSK	36	20	22.30	22.13	22.05		
15	QPSK	36	39	22.16	22.04	22.08		
15	QPSK	75	0	22.17	22.11	22.19		
15	16QAM	1	0	21.93	22.26	21.93	23.3	1
15	16QAM	1	37	22.12	22.38	21.95		
15	16QAM	1	74	21.99	21.96	22.22		
15	16QAM	36	0	21.18	21.31	21.31	22.3	2
15	16QAM	36	20	21.35	21.25	21.24		
15	16QAM	36	39	21.17	21.10	21.15		
15	16QAM	75	0	21.27	21.14	21.28		
15	64QAM	1	0	21.26	21.12	21.07	22.3	2
15	64QAM	1	37	21.22	21.19	21.20		
15	64QAM	1	74	20.85	20.85	21.02		
15	64QAM	36	0	20.35	20.39	20.53	21.3	3
15	64QAM	36	20	20.50	20.34	20.41		
15	64QAM	36	39	20.32	20.11	20.31		
15	64QAM	75	0	20.36	20.39	20.46		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.64	22.96	22.81	24.3	0
10	QPSK	1	25	22.86	22.92	22.61		
10	QPSK	1	49	22.88	22.85	22.71		
10	QPSK	25	0	22.18	22.18	22.05	23.3	1
10	QPSK	25	12	22.32	22.18	22.13		
10	QPSK	25	25	22.16	22.06	22.03		
10	QPSK	50	0	22.12	22.15	22.05		
10	16QAM	1	0	22.07	21.98	22.08	23.3	1
10	16QAM	1	25	22.01	22.02	22.08		
10	16QAM	1	49	21.62	22.11	21.63		
10	16QAM	25	0	21.32	21.21	21.05	22.3	2
10	16QAM	25	12	21.31	21.43	21.21		
10	16QAM	25	25	21.23	21.12	21.19		
10	16QAM	50	0	21.07	21.15	21.20		
10	64QAM	1	0	20.98	21.03	21.01	22.3	2
10	64QAM	1	25	21.14	21.12	20.99		
10	64QAM	1	49	20.72	20.73	20.79		
10	64QAM	25	0	20.39	20.35	20.52	21.3	3
10	64QAM	25	12	20.56	20.44	20.37		
10	64QAM	25	25	20.41	20.17	20.26		
10	64QAM	50	0	20.30	20.36	20.35		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.96	23.07	22.95	24.3	0
5	QPSK	1	12	22.96	22.95	22.94		
5	QPSK	1	24	22.99	22.82	22.91		
5	QPSK	12	0	22.09	22.14	21.92	23.3	1
5	QPSK	12	7	22.20	22.23	22.10		
5	QPSK	12	13	22.07	22.10	22.14		
5	QPSK	25	0	22.01	22.10	22.05		
5	16QAM	1	0	21.96	22.03	21.66	23.3	1
5	16QAM	1	12	21.98	22.03	21.85		
5	16QAM	1	24	21.85	21.63	22.00		
5	16QAM	12	0	20.95	21.00	20.97	22.3	2
5	16QAM	12	7	21.19	21.02	21.10		
5	16QAM	12	13	20.97	21.09	21.35		
5	16QAM	25	0	21.23	21.32	21.31		
5	64QAM	1	0	20.92	21.04	20.68	22.3	2
5	64QAM	1	12	21.17	20.97	21.15		
5	64QAM	1	24	20.77	20.96	20.74		
5	64QAM	12	0	20.11	20.20	19.95	21.3	3
5	64QAM	12	7	20.09	20.29	20.23		
5	64QAM	12	13	20.20	20.19	20.23		
5	64QAM	25	0	20.32	20.26	20.37		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.10	22.89	22.93	24.3	0
3	QPSK	1	8	22.99	22.85	22.97		
3	QPSK	1	14	23.11	22.95	22.82		
3	QPSK	8	0	22.08	22.20	21.93	23.3	1
3	QPSK	8	4	22.12	22.13	22.08		
3	QPSK	8	7	22.19	22.18	22.12		
3	QPSK	15	0	22.17	22.08	22.17		
3	16QAM	1	0	21.60	21.88	21.96	23.3	1
3	16QAM	1	8	21.95	21.94	21.48		
3	16QAM	1	14	21.50	21.66	21.73		
3	16QAM	8	0	21.13	21.32	20.89	22.3	2
3	16QAM	8	4	21.17	20.88	21.09		
3	16QAM	8	7	21.20	21.30	21.01		
3	16QAM	15	0	21.08	21.16	20.82		
3	64QAM	1	0	20.93	21.11	20.89	22.3	2
3	64QAM	1	8	21.13	21.35	21.03		
3	64QAM	1	14	21.24	20.97	21.16		
3	64QAM	8	0	20.25	20.23	20.22	21.3	3
3	64QAM	8	4	20.15	20.26	20.21		
3	64QAM	8	7	20.26	20.38	20.20		
3	64QAM	15	0	20.20	20.42	20.34		

Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.97	23.09	22.93	24.3	0
1.4	QPSK	1	3	22.86	22.84	22.89		
1.4	QPSK	1	5	23.01	23.09	23.02		
1.4	QPSK	3	0	22.85	22.94	22.88		
1.4	QPSK	3	1	22.95	22.93	22.96		
1.4	QPSK	3	3	22.91	22.95	22.98		
1.4	QPSK	6	0	22.21	22.16	22.11	23.3	1
1.4	16QAM	1	0	21.92	22.30	21.93	23.3	1
1.4	16QAM	1	3	22.08	21.95	22.07		
1.4	16QAM	1	5	22.40	22.42	22.01		
1.4	16QAM	3	0	21.93	22.08	22.07		
1.4	16QAM	3	1	22.15	22.18	22.24		
1.4	16QAM	3	3	22.13	22.21	22.24		
1.4	16QAM	6	0	21.13	21.25	21.01	22.3	2
1.4	64QAM	1	0	21.01	21.03	21.06	22.3	2
1.4	64QAM	1	3	21.18	21.23	21.29		
1.4	64QAM	1	5	21.05	21.06	21.37		
1.4	64QAM	3	0	21.46	21.54	21.32		
1.4	64QAM	3	1	21.69	21.39	21.25		
1.4	64QAM	3	3	21.50	21.64	21.25		
1.4	64QAM	6	0	20.29	20.28	20.17	21.3	3

<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	14.96	15.50	97.59
		6	2437	14.79	15.50	
		11	2462	14.73	15.50	
	802.11g 6Mbps	1	2412	10.98	11.50	87.04
		6	2437	10.59	11.50	
		11	2462	10.63	11.50	
	802.11n-HT20 MCS0	1	2412	11.09	11.50	86.27
		6	2437	10.67	11.50	
		11	2462	10.71	11.50	

<5GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.45	13.50	87.44
		40	5200	13.48	13.50	
		44	5220	13.49	13.50	
		48	5240	13.46	13.50	
	802.11n-HT20 MCS0	36	5180	13.47	13.50	86.70
		40	5200	13.46	13.50	
		44	5220	13.46	13.50	
		48	5240	13.48	13.50	
	802.11n-HT40 MCS0	38	5190	12.20	12.50	85.79
		46	5230	12.09	12.50	
	802.11ac-VHT20 MCS0	36	5180	13.47	13.50	83.33
		40	5200	13.45	13.50	
		44	5220	13.44	13.50	
		48	5240	13.46	13.50	
	802.11ac-VHT40 MCS0	38	5190	12.24	12.50	71.12
		46	5230	12.17	12.50	
	802.11ac-VHT80 MCS0	42	5210	12.11	12.50	67.25

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	13.16	13.50	87.44
		56	5280	13.09	13.50	
		60	5300	13.18	13.50	
		64	5320	13.26	13.50	
	802.11n-HT20 MCS0	52	5260	13.22	13.50	86.70
		56	5280	13.20	13.50	
		60	5300	13.09	13.50	
		64	5320	13.16	13.50	
	802.11n-HT40 MCS0	54	5270	11.91	12.50	85.79
		62	5310	12.02	12.50	
	802.11ac-VHT20 MCS0	52	5260	13.17	13.50	83.33
		56	5280	13.14	13.50	
		60	5300	13.11	13.50	
		64	5320	13.15	13.50	
	802.11ac-VHT40 MCS0	54	5270	12.04	12.50	71.12
		62	5310	11.70	12.50	
	802.11ac-VHT80 MCS0	58	5290	11.98	12.50	67.25

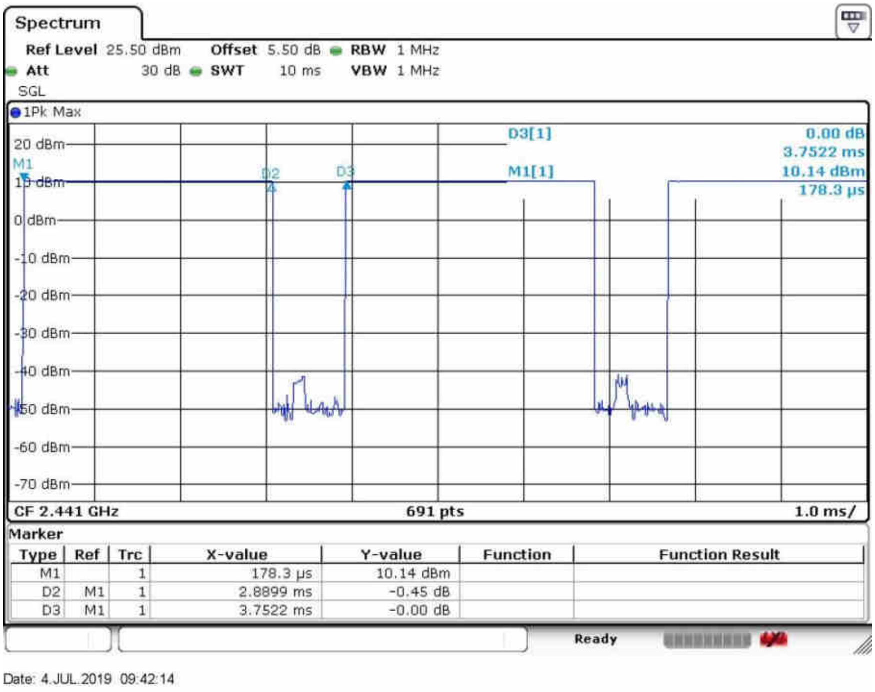
	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	12.88	13.50	87.44
		116	5580	12.98	13.50	
		132	5660	12.86	13.50	
		140	5700	12.63	13.50	
	802.11n-HT20 MCS0	100	5500	12.96	13.50	86.70
		116	5580	12.88	13.50	
		132	5660	12.93	13.50	
		140	5700	12.63	13.50	
	802.11n-HT40 MCS0	102	5510	12.10	12.50	85.79
		110	5550	12.06	12.50	
		134	5670	12.12	12.50	
	802.11ac-VHT20 MCS0	100	5500	12.94	13.50	83.33
		116	5580	12.93	13.50	
		132	5660	12.93	13.50	
		140	5700	12.62	13.50	
	802.11ac-VHT40 MCS0	102	5510	12.03	12.50	71.12
		110	5550	11.92	12.50	
		134	5670	12.00	12.50	
	802.11ac-VHT80 MCS0	106	5530	12.07	12.50	67.25

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 77.02 % 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



Ref Level 25.50 dBm Offset 5.50 dB RBW 1 MHz
Att 30 dB SWT 10 ms VBW 1 MHz

Marker

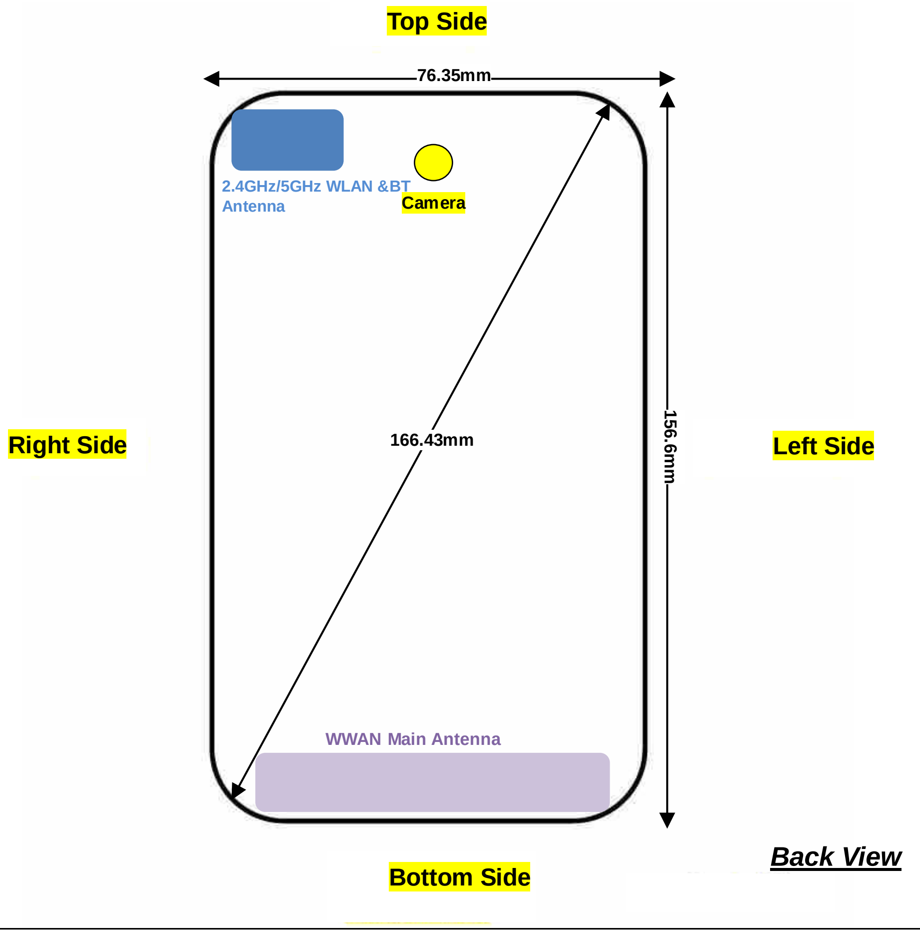
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	178.3 µs	10.14 dBm		
D2	M1	1	2.8899 ms	-0.45 dB		
D3	M1	1	3.7522 ms	-0.00 dB		

Date: 4.JUL.2019 09:42:14

Mode	Channel	Frequency (MHz)	Average power (dBm)
			1Mbps
BR/EDR	CH 00	2402	9.18
	CH 39	2441	10.31
	CH 78	2480	8.22
Tune-up limit (dBm)			11.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0 LE	CH 00	2402	0.09
	CH 19	2440	1.27
	CH 39	2480	-0.79
Tune-up Limit			2.00

13. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main Antenna	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
2.4GHz/5GHz WLAN & BT	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main Antenna	Yes	Yes	No	Yes	Yes	Yes
2.4GHz/5GHz WLAN & BT	Yes	Yes	Yes	No	Yes	No

General Note:

1. 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.

14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor.
   d. For BT/WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 0.8W/kg. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.
   a. For this device SAR for WWAN transmitter scaled to maximum output power mode for product specific 10g SAR is higher than 1.2W/kg of GSM1900, WCDMA Band II, LTE Band 2, therefore product specific 10g SAR is necessary.
   b. WLAN 5.2/5.3/5.5GHz tested the product specific 10g SAR since it has no hotspot mode.
   c. When 10-g product specific 10g SAR is considered, SAR thresholds is specified in the procedures for SAR test reduction and exclusion should be multiplied by 2.5.
6. For Bluetooth SAR, only the worst case of WLAN 2.4GHz SAR was evaluated due to Bluetooth and WLAN 2.4GHz share the same antenna with consistent pattern.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS 4Tx slots for GSM1900 are considered as the primary mode.
2. Other configurations of GSM / GPRS are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

WCDMA Note:

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

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/64QAM 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/64QAM 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 B4 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.

WLAN Note:

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

14.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	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)
	GSM1900	GPRS 4 Tx slots	Right Cheek	810	1909.8	24.29	25.50	1.321	0.02	0.119	0.157
	GSM1900	GPRS 4 Tx slots	Right Tilted	810	1909.8	24.29	25.50	1.321	0.06	0.073	0.096
01	GSM1900	GPRS 4 Tx slots	Left Cheek	810	1909.8	24.29	25.50	1.321	0.01	0.186	0.246
	GSM1900	GPRS 4 Tx slots	Left Tilted	810	1909.8	24.29	25.50	1.321	-0.05	0.060	0.080

<WCDMA SAR>

Plot No.	Band	Mode	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)
	WCDMA II	RMC 12.2Kbps	Right Cheek	9400	1880	23.85	24.00	1.035	0.05	0.164	0.170
	WCDMA II	RMC 12.2Kbps	Right Tilted	9400	1880	23.85	24.00	1.035	-0.05	0.087	0.090
02	WCDMA II	RMC 12.2Kbps	Left Cheek	9400	1880	23.85	24.00	1.035	0.07	0.315	0.326
	WCDMA II	RMC 12.2Kbps	Left Tilted	9400	1880	23.85	24.00	1.035	0.09	0.093	0.096
	WCDMA IV	RMC 12.2Kbps	Right Cheek	1513	1752.6	23.72	25.30	1.439	-0.1	0.081	0.117
	WCDMA IV	RMC 12.2Kbps	Right Tilted	1513	1752.6	23.72	25.30	1.439	-0.04	0.040	0.058
03	WCDMA IV	RMC 12.2Kbps	Left Cheek	1513	1752.6	23.72	25.30	1.439	0.05	0.181	0.260
	WCDMA IV	RMC 12.2Kbps	Left Tilted	1513	1752.6	23.72	25.30	1.439	-0.04	0.048	0.069

<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)
	LTE Band 2	20M	QPSK	1	49	Right Cheek	18900	1880	22.95	23.00	1.012	-0.02	0.135	0.137
	LTE Band 2	20M	QPSK	50	0	Right Cheek	18900	1880	22.00	22.00	1.000	0.09	0.102	0.102
	LTE Band 2	20M	QPSK	1	49	Right Tilted	18900	1880	22.95	23.00	1.012	0.11	0.088	0.089
	LTE Band 2	20M	QPSK	50	0	Right Tilted	18900	1880	22.00	22.00	1.000	-0.09	0.067	0.067
04	LTE Band 2	20M	QPSK	1	49	Left Cheek	18900	1880	22.95	23.00	1.012	0.01	0.323	0.327
	LTE Band 2	20M	QPSK	50	0	Left Cheek	18900	1880	22.00	22.00	1.000	0.07	0.234	0.234
	LTE Band 2	20M	QPSK	1	49	Left Tilted	18900	1880	22.95	23.00	1.012	-0.11	0.093	0.094
	LTE Band 2	20M	QPSK	50	0	Left Tilted	18900	1880	22.00	22.00	1.000	0.07	0.070	0.070
	LTE Band 4	20M	QPSK	1	49	Right Cheek	20175	1732.5	23.12	24.30	1.312	0.01	0.100	0.131
	LTE Band 4	20M	QPSK	50	0	Right Cheek	20175	1732.5	22.24	23.30	1.276	0.02	0.075	0.096
	LTE Band 4	20M	QPSK	1	49	Right Tilted	20175	1732.5	23.12	24.30	1.312	-0.12	0.043	0.057
	LTE Band 4	20M	QPSK	50	0	Right Tilted	20175	1732.5	22.24	23.30	1.276	0.13	0.032	0.041
05	LTE Band 4	20M	QPSK	1	49	Left Cheek	20175	1732.5	23.12	24.30	1.312	0.02	0.222	0.291
	LTE Band 4	20M	QPSK	50	0	Left Cheek	20175	1732.5	22.24	23.30	1.276	0.02	0.165	0.211
	LTE Band 4	20M	QPSK	1	49	Left Tilted	20175	1732.5	23.12	24.30	1.312	0.08	0.053	0.070
	LTE Band 4	20M	QPSK	50	0	Left Tilted	20175	1732.5	22.24	23.30	1.276	0.18	0.041	0.052

<WLAN 2.4GHz 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)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	1	2412	14.96	15.50	1.132	97.59	1.025		0.206		
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	1	2412	14.96	15.50	1.132	97.59	1.025		0.180		
06	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	1	2412	14.96	15.50	1.132	97.59	1.025	-0.09	0.664	0.339	**0.393**
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	1	2412	14.96	15.50	1.132	97.59	1.025		0.501		

<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)
07	Bluetooth	1Mbps	Left Cheek	39	2441	10.31	11.00	1.172	77.02	1.082	-0.01	0.276	**0.350**

<WLAN 5GHz 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)
	WLAN5.3GHz	802.11a 6Mbps	Right Cheek	64	5320	13.26	13.50	1.056	87.44	1.144	-0.05	0.461	0.557
	WLAN5.3GHz	802.11a 6Mbps	Right Tilted	64	5320	13.26	13.50	1.056	87.44	1.144	0.05	0.370	0.447
	WLAN5.3GHz	802.11a 6Mbps	Left Cheek	64	5320	13.26	13.50	1.056	87.44	1.144	-0.06	1.060	1.281
	WLAN5.3GHz	802.11a 6Mbps	Left Tilted	64	5320	13.26	13.50	1.056	87.44	1.144	0.03	0.677	0.818
08	WLAN5.3GHz	802.11a 6Mbps	Left Cheek	60	5300	13.18	13.50	1.076	87.44	1.144	-0.07	1.070	**1.317**
	WLAN5.3GHz	802.11a 6Mbps	Left Cheek	52	5260	13.16	13.50	1.081	87.44	1.144	-0.04	0.950	1.175
	WLAN5.3GHz	802.11a 6Mbps	Left Tilted	60	5300	13.18	13.50	1.076	87.44	1.144	0.07	0.694	0.854
	WLAN5.5GHz	802.11a 6Mbps	Right Cheek	116	5580	12.98	13.50	1.127	87.44	1.144	0.02	0.404	0.521
	WLAN5.5GHz	802.11a 6Mbps	Right Tilted	116	5580	12.98	13.50	1.127	87.44	1.144	0.03	0.375	0.484
	WLAN5.5GHz	802.11a 6Mbps	Left Cheek	116	5580	12.98	13.50	1.127	87.44	1.144	-0.07	0.909	1.172
	WLAN5.5GHz	802.11a 6Mbps	Left Tilted	116	5580	12.98	13.50	1.127	87.44	1.144	0.04	0.803	1.035
09	WLAN5.5GHz	802.11a 6Mbps	Left Cheek	100	5500	12.88	13.50	1.153	87.44	1.144	-0.05	0.937	**1.236**
	WLAN5.5GHz	802.11a 6Mbps	Left Cheek	132	5660	12.86	13.50	1.158	87.44	1.144	-0.01	0.878	1.163
	WLAN5.5GHz	802.11a 6Mbps	Left Tilted	100	5500	12.88	13.50	1.153	87.44	1.144	0.03	0.685	0.904

14.2 Hotspot SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS 4 Tx slots	Front	10	810	1909.8	24.29	25.50	1.321	0.07	0.609	0.805
	GSM1900	GPRS 4 Tx slots	Front	10	512	1850.2	23.83	25.50	1.469	0.05	0.611	0.898
	GSM1900	GPRS 4 Tx slots	Front	10	661	1880	24.13	25.50	1.371	0.15	0.590	0.809
	GSM1900	GPRS 4 Tx slots	Back	10	810	1909.8	24.29	25.50	1.321	-0.07	0.535	0.707
	GSM1900	GPRS 4 Tx slots	Left Side	10	810	1909.8	24.29	25.50	1.321	0.01	0.301	0.398
	GSM1900	GPRS 4 Tx slots	Right Side	10	810	1909.8	24.29	25.50	1.321	0.02	0.107	0.141
	GSM1900	GPRS 4 Tx slots	Bottom Side	10	810	1909.8	24.29	25.50	1.321	-0.16	0.913	1.206
10	GSM1900	GPRS 4 Tx slots	Bottom Side	10	512	1850.2	23.83	25.50	1.469	-0.05	0.887	**1.303**
	GSM1900	GPRS 4 Tx slots	Bottom Side	10	661	1880	24.13	25.50	1.371	-0.07	0.910	1.248

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Front	10	9400	1880	23.85	24.00	1.035	-0.04	0.767	0.794
	WCDMA II	RMC 12.2Kbps	Front	10	9262	1852.4	23.82	24.00	1.042	0.03	0.731	0.762
	WCDMA II	RMC 12.2Kbps	Front	10	9538	1907.6	23.63	24.00	1.089	0.03	0.813	0.885
	WCDMA II	RMC 12.2Kbps	Back	10	9400	1880	23.85	24.00	1.035	-0.05	0.673	0.697
	WCDMA II	RMC 12.2Kbps	Left Side	10	9400	1880	23.85	24.00	1.035	0.03	0.349	0.361
	WCDMA II	RMC 12.2Kbps	Right Side	10	9400	1880	23.85	24.00	1.035	0.02	0.136	0.141
	WCDMA II	RMC 12.2Kbps	Bottom Side	10	9400	1880	23.85	24.00	1.035	-0.11	1.170	1.211
	WCDMA II	RMC 12.2Kbps	Bottom Side	10	9262	1852.4	23.82	24.00	1.042	0.03	1.090	1.136
11	WCDMA II	RMC 12.2Kbps	Bottom Side	10	9538	1907.6	23.63	24.00	1.089	-0.06	1.230	**1.339**
	WCDMA IV	RMC 12.2Kbps	Front	10	1513	1752.6	23.72	25.30	1.439	-0.02	0.451	0.649
	WCDMA IV	RMC 12.2Kbps	Back	10	1513	1752.6	23.72	25.30	1.439	-0.09	0.342	0.492
	WCDMA IV	RMC 12.2Kbps	Left Side	10	1513	1752.6	23.72	25.30	1.439	0.02	0.158	0.227
	WCDMA IV	RMC 12.2Kbps	Right Side	10	1513	1752.6	23.72	25.30	1.439	0.03	0.102	0.147
12	WCDMA IV	RMC 12.2Kbps	Bottom Side	10	1513	1752.6	23.72	25.30	1.439	-0.1	0.543	**0.781**

<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 2	20M	QPSK	1	49	Front	10	18900	1880	22.95	23.00	1.012	0.11	0.870	0.880
	LTE Band 2	20M	QPSK	1	49	Front	10	18700	1860	22.69	23.00	1.074	0.15	0.844	0.906
	LTE Band 2	20M	QPSK	1	49	Front	10	19100	1900	22.57	23.00	1.104	-0.03	0.910	1.005
	LTE Band 2	20M	QPSK	50	0	Front	10	18900	1880	22.00	22.00	1.000	0.08	0.657	0.657
	LTE Band 2	20M	QPSK	100	0	Front	10	18900	1880	21.90	22.00	1.023	-0.02	0.582	0.596
	LTE Band 2	20M	QPSK	1	49	Back	10	18900	1880	22.95	23.00	1.012	0.02	0.777	0.786
	LTE Band 2	20M	QPSK	50	0	Back	10	18900	1880	22.00	22.00	1.000	0.11	0.565	0.565
	LTE Band 2	20M	QPSK	1	49	Left Side	10	18900	1880	22.95	23.00	1.012	0.06	0.342	0.346
	LTE Band 2	20M	QPSK	50	0	Left Side	10	18900	1880	22.00	22.00	1.000	-0.11	0.274	0.274
	LTE Band 2	20M	QPSK	1	49	Right Side	10	18900	1880	22.95	23.00	1.012	0.03	0.184	0.186
	LTE Band 2	20M	QPSK	50	0	Right Side	10	18900	1880	22.00	22.00	1.000	0.05	0.144	0.144
	LTE Band 2	20M	QPSK	1	49	Bottom Side	10	18900	1880	22.95	23.00	1.012	-0.02	1.090	1.103
	LTE Band 2	20M	QPSK	1	49	Bottom Side	10	18700	1860	22.69	23.00	1.074	-0.02	1.020	1.095
13	LTE Band 2	20M	QPSK	1	49	Bottom Side	10	19100	1900	22.57	23.00	1.104	-0.01	1.150	**1.270**
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10	18900	1880	22.00	22.00	1.000	0.02	0.774	0.774
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10	18700	1860	21.92	22.00	1.019	-0.16	0.928	0.945
	LTE Band 2	20M	QPSK	50	0	Bottom Side	10	19100	1900	21.99	22.00	1.002	-0.12	0.839	0.841
	LTE Band 2	20M	QPSK	100	0	Bottom Side	10	18900	1880	21.90	22.00	1.023	0.14	0.845	0.865
	LTE Band 4	20M	QPSK	1	49	Front	10	20175	1732.5	23.12	24.30	1.312	-0.04	0.594	0.779
	LTE Band 4	20M	QPSK	50	0	Front	10	20175	1732.5	22.24	23.30	1.276	0.03	0.462	0.590
	LTE Band 4	20M	QPSK	1	49	Back	10	20175	1732.5	23.12	24.30	1.312	-0.01	0.464	0.609
	LTE Band 4	20M	QPSK	50	0	Back	10	20175	1732.5	22.24	23.30	1.276	-0.17	0.353	0.451
	LTE Band 4	20M	QPSK	1	49	Left Side	10	20175	1732.5	23.12	24.30	1.312	0.06	0.236	0.310
	LTE Band 4	20M	QPSK	50	0	Left Side	10	20175	1732.5	22.24	23.30	1.276	0.05	0.181	0.231
	LTE Band 4	20M	QPSK	1	49	Right Side	10	20175	1732.5	23.12	24.30	1.312	0.04	0.087	0.114
	LTE Band 4	20M	QPSK	50	0	Right Side	10	20175	1732.5	22.24	23.30	1.276	0.06	0.065	0.082
14	LTE Band 4	20M	QPSK	1	49	Bottom Side	10	20175	1732.5	23.12	24.30	1.312	-0.01	0.629	**0.825**
	LTE Band 4	20M	QPSK	50	0	Bottom Side	10	20175	1732.5	22.24	23.30	1.276	-0.09	0.489	0.624

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
15	WLAN2.4GHz	802.11b 1Mbps	Front	10	1	2412	14.96	15.50	1.132	97.59	1.025	0.09	0.101	0.072	**0.084**
	WLAN2.4GHz	802.11b 1Mbps	Back	10	1	2412	14.96	15.50	1.132	97.59	1.025		0.092		
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10	1	2412	14.96	15.50	1.132	97.59	1.025		0.084		
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	1	2412	14.96	15.50	1.132	97.59	1.025		0.042		

<Bluetooth 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)
16	Bluetooth	1Mbps	Front	10	39	2441	10.31	11.00	1.172	77.02	1.082	-0.07	0.063	**0.079**

14.3 Body Worn Accessory SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS 4 Tx slots	Front	10	810	1909.8	24.29	25.50	1.321	0.07	0.609	0.805
18	GSM1900	GPRS 4 Tx slots	Front	10	512	1850.2	23.83	25.50	1.469	0.05	0.611	**0.898**
	GSM1900	GPRS 4 Tx slots	Front	10	661	1880	24.13	25.50	1.371	0.15	0.590	0.809
	GSM1900	GPRS 4 Tx slots	Back	10	810	1909.8	24.29	25.50	1.321	-0.07	0.535	0.707

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA II	RMC 12.2Kbps	Front	10	9400	1880	23.85	24.00	1.035	-0.04	0.767	0.794
	WCDMA II	RMC 12.2Kbps	Front	10	9262	1852.4	23.82	24.00	1.042	0.03	0.731	0.762
19	WCDMA II	RMC 12.2Kbps	Front	10	9538	1907.6	23.63	24.00	1.089	0.03	0.813	**0.885**
	WCDMA II	RMC 12.2Kbps	Back	10	9400	1880	23.85	24.00	1.035	-0.05	0.673	0.697
20	WCDMA IV	RMC 12.2Kbps	Front	10	1513	1752.6	23.72	25.30	1.439	-0.02	0.451	**0.649**
	WCDMA IV	RMC 12.2Kbps	Back	10	1513	1752.6	23.72	25.30	1.439	-0.09	0.342	0.492

<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 2	20M	QPSK	1	49	Front	10	18900	1880	22.95	23.00	1.012	0.11	0.870	0.880
	LTE Band 2	20M	QPSK	1	49	Front	10	18700	1860	22.69	23.00	1.074	0.15	0.844	0.906
21	LTE Band 2	20M	QPSK	1	49	Front	10	19100	1900	22.57	23.00	1.104	-0.03	0.910	**1.005**
	LTE Band 2	20M	QPSK	50	0	Front	10	18900	1880	22.00	22.00	1.000	0.08	0.657	0.657
	LTE Band 2	20M	QPSK	100	0	Front	10	18900	1880	21.90	22.00	1.023	-0.02	0.582	0.596
	LTE Band 2	20M	QPSK	1	49	Back	10	18900	1880	22.95	23.00	1.012	0.02	0.777	0.786
	LTE Band 2	20M	QPSK	50	0	Back	10	18900	1880	22.00	22.00	1.000	0.11	0.565	0.565
22	LTE Band 4	20M	QPSK	1	49	Front	10	20175	1732.5	23.12	24.30	1.312	-0.04	0.594	**0.779**
	LTE Band 4	20M	QPSK	50	0	Front	10	20175	1732.5	22.24	23.30	1.276	0.03	0.462	0.590
	LTE Band 4	20M	QPSK	1	49	Back	10	20175	1732.5	23.12	24.30	1.312	-0.01	0.464	0.609
	LTE Band 4	20M	QPSK	50	0	Back	10	20175	1732.5	22.24	23.30	1.276	-0.17	0.353	0.451

<WLAN 2.4GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
23	WLAN2.4GHz	802.11b 1Mbps	Front	10	1	2412	14.96	15.50	1.132	97.59	1.025	0.09	0.101	0.072	**0.084**
	WLAN2.4GHz	802.11b 1Mbps	Back	10	1	2412	14.96	15.50	1.132	97.59	1.025		0.092		

<Bluetooth 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)
24	Bluetooth	1Mbps	Front	10	39	2441	10.31	11.00	1.172	77.02	1.082	-0.07	0.063	**0.079**

<WLAN 5GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
25	WLAN5.2GHz	802.11a 6Mbps	Front	10	44	5220	13.49	13.50	1.002	87.44	1.144	0.01	0.443	0.202	**0.231**
	WLAN5.2GHz	802.11a 6Mbps	Back	10	44	5220	13.49	13.50	1.002	87.44	1.144		0.221		
26	WLAN5.3GHz	802.11a 6Mbps	Front	10	64	5320	13.26	13.50	1.056	87.44	1.144	-0.08	0.424	0.185	**0.224**
	WLAN5.3GHz	802.11a 6Mbps	Back	10	64	5320	13.26	13.50	1.056	87.44	1.144		0.202		
27	WLAN 5.5GHz	802.11a 6Mbps	Front	10	116	5580	12.98	13.50	1.127	87.44	1.144	-0.09	0.408	0.152	**0.196**
	WLAN 5.5GHz	802.11a 6Mbps	Back	10	116	5580	12.98	13.50	1.127	87.44	1.144		0.204		

14.4 Product specific 10g SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
28	GSM1900	GPRS 4 Tx slots	Bottom Side	0	810	1909.8	24.29	25.50	1.321	0.06	1.770	**2.339**
	GSM1900	GPRS 4 Tx slots	Bottom Side	0	512	1850.2	23.83	25.50	1.469	0.09	1.590	2.336
	GSM1900	GPRS 4 Tx slots	Bottom Side	0	661	1880	24.13	25.50	1.371	-0.11	1.570	2.152

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	0	9400	1880	23.85	24.00	1.035	-0.11	2.540	2.629
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	0	9262	1852.4	23.82	24.00	1.042	0.09	2.210	2.304
29	WCDMA Band II	RMC 12.2Kbps	Bottom Side	0	9538	1907.6	23.63	24.00	1.089	0.01	2.630	**2.864**

<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 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	LTE Band 2	20M	QPSK	1	49	Bottom Side	0	18900	1880	22.95	23.00	1.012	0.06	2.380	2.408
	LTE Band 2	20M	QPSK	1	49	Bottom Side	0	18700	1860	22.69	23.00	1.074	-0.05	2.670	2.868
30	LTE Band 2	20M	QPSK	1	49	Bottom Side	0	19100	1900	22.57	23.00	1.104	-0.04	2.940	**3.246**
	LTE Band 2	20M	QPSK	50	0	Bottom Side	0	18900	1880	22.00	22.00	1.000	0.07	1.990	1.990
	LTE Band 2	20M	QPSK	50	0	Bottom Side	0	18700	1860	21.92	22.00	1.019	-0.07	1.910	1.946
	LTE Band 2	20M	QPSK	50	0	Bottom Side	0	19100	1900	21.99	22.00	1.002	0.06	2.110	2.115
	LTE Band 2	20M	QPSK	100	0	Bottom Side	0	18900	1880	21.90	22.00	1.023	-0.16	1.980	2.026

<WLAN 5GHz SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
31	WLAN5.3GHz	802.11a 6Mbps	Front	0	64	5320	13.26	13.50	1.056	87.44	1.144	0.07	6.420	0.601	**0.726**
	WLAN5.3GHz	802.11a 6Mbps	Back	0	64	5320	13.26	13.50	1.056	87.44	1.144		1.790		
	WLAN5.3GHz	802.11a 6Mbps	Right Side	0	64	5320	13.26	13.50	1.056	87.44	1.144		6.383		
	WLAN5.3GHz	802.11a 6Mbps	Top Side	0	64	5320	13.26	13.50	1.056	87.44	1.144		2.459		
32	WLAN 5.5GHz	802.11a 6Mbps	Front	0	116	5580	12.98	13.50	1.127	87.44	1.144	-0.03	5.210	0.608	**0.784**
	WLAN 5.5GHz	802.11a 6Mbps	Back	0	116	5580	12.98	13.50	1.127	87.44	1.144		1.890		
	WLAN 5.5GHz	802.11a 6Mbps	Right Side	0	116	5580	12.98	13.50	1.127	87.44	1.144		3.613		
	WLAN 5.5GHz	802.11a 6Mbps	Top Side	0	116	5580	12.98	13.50	1.127	87.44	1.144		2.706		

14.5 Repeated SAR Measurement

<1g SAR>

No.	Band	Mode	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	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN5.3GHz	802.11a 6Mbps	-	-	-	-	Left Cheek	0	60	5300	13.18	13.50	1.076	87.44	1.144	-0.07	1.070	1	1.317
2nd	WLAN5.3GHz	802.11a 6Mbps	-	-	-	-	Left Cheek	0	60	5300	13.18	13.50	1.076	87.44	1.144	0.11	1.050	1.019	1.292
1st	WLAN5.5GHz	802.11a 6Mbps	-	-	-	-	Left Cheek	0	100	5500	12.88	13.50	1.153	87.44	1.144	-0.05	0.937	1	1.236
2nd	WLAN5.5GHz	802.11a 6Mbps	-	-	-	-	Left Cheek	0	100	5500	12.88	13.50	1.153	87.44	1.144	0.12	0.909	1.031	1.199
1st	WCDMA II	RMC 12.2Kbps	-	-	-	-	Bottom Side	10	9538	1907.6	23.63	24.00	1.089	-	1.000	-0.06	1.230	1	1.339
2nd	WCDMA II	RMC 12.2Kbps	-	-	-	-	Bottom Side	10	9538	1907.6	23.63	24.00	1.089	-	1.000	-0.06	1.190	1.034	1.296

<10g SAR>

No.	Band	Mode	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	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	LTE Band 2	-	20M	QPSK	1	49	Bottom Side	0	19100	1900	22.57	23.00	1.104	100	1.000	-0.04	2.940	1	3.246
2nd	LTE Band 2	-	20M	QPSK	1	49	Bottom Side	0	19100	1900	22.57	23.00	1.104	100	1.000	0.11	2.880	1.021	3.180

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. The ratio is the difference in percentage between original and repeated *measured SAR*.
5. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

15. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product Specific 10g
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		Yes
2.	GPRS + WLAN2.4GHz	Yes	Yes	Yes	Yes
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	Yes
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	Yes
5.	GSM Voice + WLAN5.2/5.3/5.5GHz	Yes	Yes		Yes
6.	GPRS + WLAN5.2/5.3/5.5GHz	Yes	Yes		Yes
7.	WCDMA + WLAN5.2/5.3/5.5GHz	Yes	Yes		Yes
8.	LTE + WLAN5.2/5.3/5.5GHz	Yes	Yes		Yes
9.	GSM Voice + Bluetooth	Yes	Yes		Yes
10.	GPRS + Bluetooth	Yes	Yes	Yes	Yes
11.	WCDMA + Bluetooth	Yes	Yes	Yes	Yes
12.	LTE + Bluetooth	Yes	Yes	Yes	Yes

General Note:

1. This device supports VoIP in GPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering function.
4. This device 5.2GHz/5.3GHz / 5.5GHz supports WLAN Direct (GC only).
5. 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 for they share the same antenna.
6. WLAN 2.4GHz and Bluetooth share the same antenna so can’t transmit simultaneously.
7. WLAN 5GHz and Bluetooth share the same antenna so can’t transmit simultaneously.
8. Chose the worst zoom scan SAR of WLAN correspondingly for co-located with WWAN analysis.
9. The reported SAR summation is calculated based on the same configuration and test position.
10. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
    i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/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 for 1g SAR and SPLSR≤ 0.10 for 10g SAR , simultaneously transmission SAR measurement is not necessary.
    iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg and 10g SAR < 4.0W/kg.
    v) The SPLSR calculated results please refer to section 15.4.

15.1 Head Exposure Conditions

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3			1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth		Summed 1g SAR (W/kg)	Case No	SPLSR	
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
GSM	GSM1900	Right Cheek	0.157	0.393	0.557	0.350	0.55	0.71			0.51
		Right Tilted	0.096	0.393	0.484	0.350	0.49	0.58			0.45
		Left Cheek	0.246	0.393	1.317	0.350	0.64	1.56			0.60
		Left Tilted	0.080	0.393	1.035	0.350	0.47	1.12			0.43
WCDMA	Band II	Right Cheek	0.170	0.393	0.557	0.350	0.56	0.73			0.52
		Right Tilted	0.090	0.393	0.484	0.350	0.48	0.57			0.44
		Left Cheek	0.326	0.393	1.317	0.350	0.72	**1.64**	**#01**	**0.02**	0.68
		Left Tilted	0.096	0.393	1.035	0.350	0.49	1.13			0.45
	Band IV	Right Cheek	0.117	0.393	0.557	0.350	0.51	0.67			0.47
		Right Tilted	0.058	0.393	0.484	0.350	0.45	0.54			0.41
		Left Cheek	0.260	0.393	1.317	0.350	0.65	**1.58**			0.61
		Left Tilted	0.069	0.393	1.035	0.350	0.46	1.10			0.42
LTE	Band 2	Right Cheek	0.137	0.393	0.557	0.350	0.53	0.69			0.49
		Right Tilted	0.089	0.393	0.484	0.350	0.48	0.57			0.44
		Left Cheek	0.327	0.393	1.317	0.350	0.72	**1.64**	**#02**	**0.02**	0.68
		Left Tilted	0.094	0.393	1.035	0.350	0.49	1.13			0.44
	Band 4	Right Cheek	0.131	0.393	0.557	0.350	0.52	0.69			0.48
		Right Tilted	0.057	0.393	0.484	0.350	0.45	0.54			0.41
		Left Cheek	0.291	0.393	1.317	0.350	0.68	**1.61**	**#03**	**0.02**	0.64
		Left Tilted	0.070	0.393	1.035	0.350	0.46	1.11			0.42

15.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM	GSM1900	Front	0.898	0.084	0.079	0.98	0.98
		Back	0.707	0.084	0.079	0.79	0.79
		Left Side	0.398			0.40	0.40
		Right Side	0.141	0.084	0.079	0.23	0.22
		Top Side		0.084	0.079	0.08	0.08
		Bottom Side	1.303			1.30	1.30
WCDMA	Band II	Front	0.885	0.084	0.079	0.97	0.96
		Back	0.697	0.084	0.079	0.78	0.78
		Left Side	0.361			0.36	0.36
		Right Side	0.141	0.084	0.079	0.23	0.22
		Top Side		0.084	0.079	0.08	0.08
		Bottom Side	1.339			1.34	1.34
	Band IV	Front	0.649	0.084	0.079	0.73	0.73
		Back	0.492	0.084	0.079	0.58	0.57
		Left Side	0.227			0.23	0.23
		Right Side	0.147	0.084	0.079	0.23	0.23
		Top Side		0.084	0.079	0.08	0.08
		Bottom Side	0.781			0.78	0.78
LTE	Band 2	Front	1.005	0.084	0.079	1.09	1.08
		Back	0.786	0.084	0.079	0.87	0.87
		Left Side	0.346			0.35	0.35
		Right Side	0.186	0.084	0.079	0.27	0.27
		Top Side		0.084	0.079	0.08	0.08
		Bottom Side	1.270			1.27	1.27
	Band 4	Front	0.779	0.084	0.079	0.86	0.86
		Back	0.609	0.084	0.079	0.69	0.69
		Left Side	0.310			0.31	0.31
		Right Side	0.114	0.084	0.079	0.20	0.19
		Top Side		0.084	0.079	0.08	0.08
		Bottom Side	0.825			0.83	0.83

15.3 Body-Worn Accessory Exposure Conditions

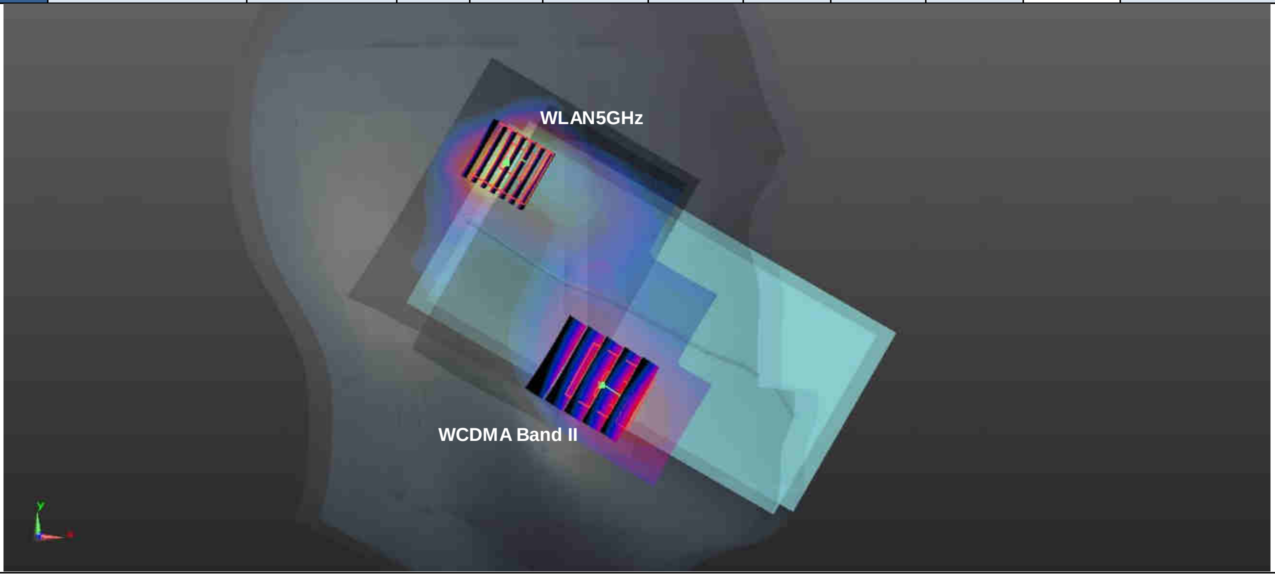
WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
GSM	GSM1900	Front	0.898	0.084	0.231	0.079	0.98	1.13	0.98
		Back	0.707	0.084	0.231	0.079	0.79	0.94	0.79
WCDMA	Band II	Front	0.885	0.084	0.231	0.079	0.97	1.12	0.96
		Back	0.697	0.084	0.231	0.079	0.78	0.93	0.78
	Band IV	Front	0.649	0.084	0.231	0.079	0.73	0.88	0.73
		Back	0.492	0.084	0.231	0.079	0.58	0.72	0.57
LTE	Band 2	Front	1.005	0.084	0.231	0.079	1.09	1.24	1.08
		Back	0.786	0.084	0.231	0.079	0.87	1.02	0.87
	Band 4	Front	0.779	0.084	0.231	0.079	0.86	1.01	0.86
		Back	0.609	0.084	0.231	0.079	0.69	0.84	0.69

15.4 SPLSR Evaluation and Analysis

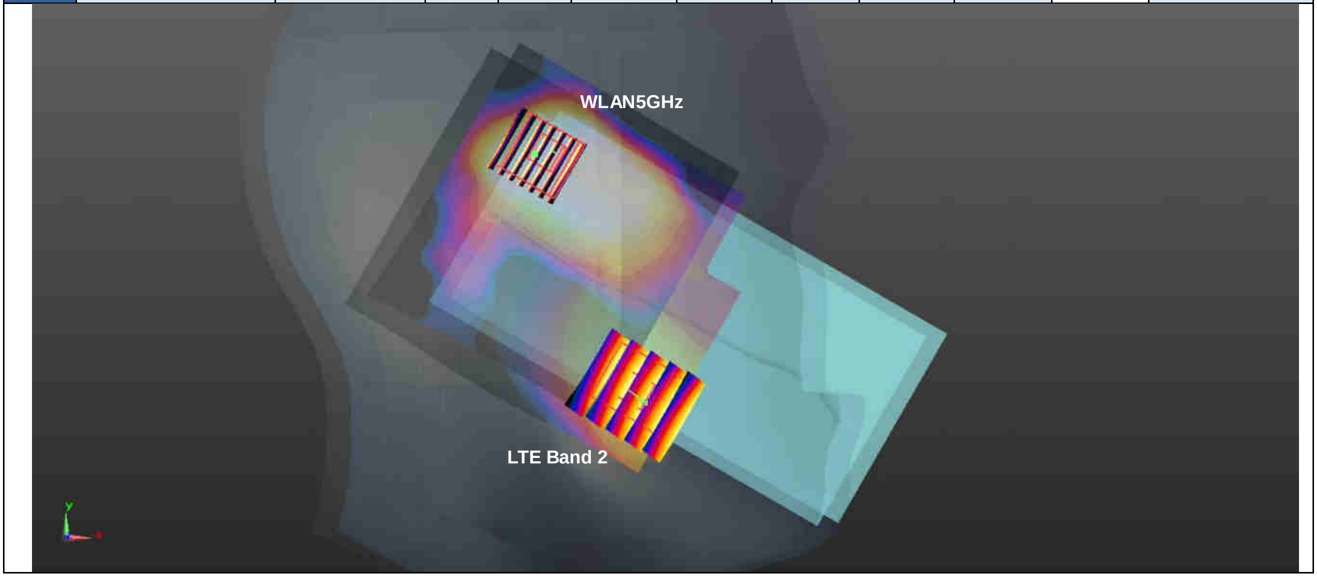
General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of [(x1−x2)2 + (y1−y2)2 + (z1−z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. SPLSR = (SAR1 + SAR2)1.5 / (min. separation distance, mm). If SPLSR ≤ 0.04 for 1g SAR and SPLSR ≤ 0.10 for 10g SAR, simultaneously transmission SAR measurement is not necessary.

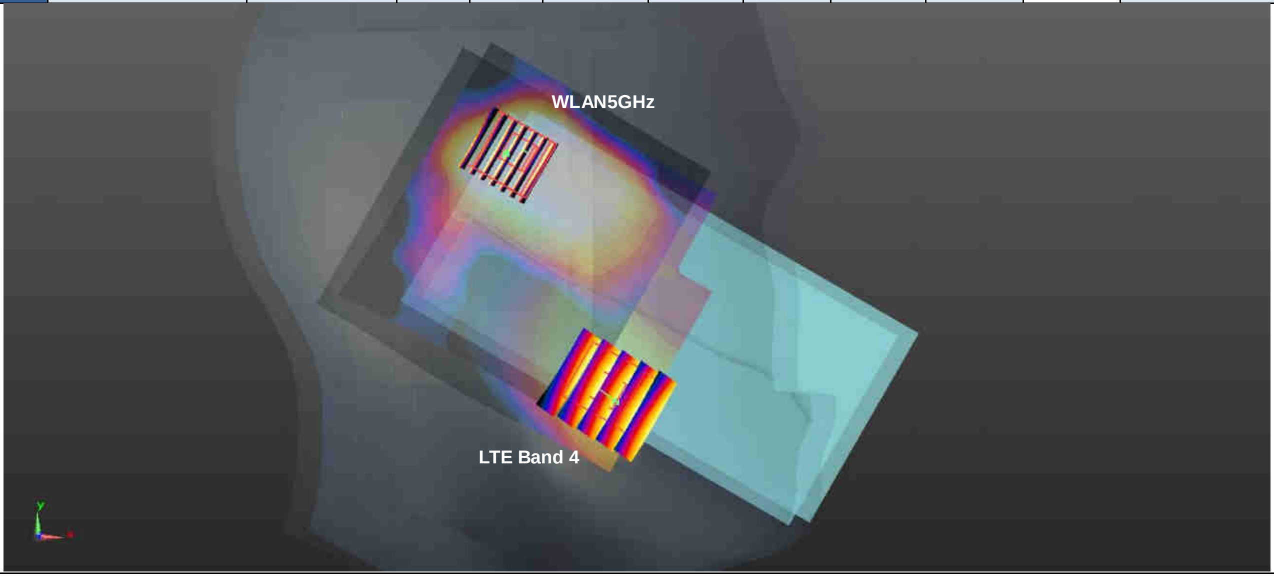
Case #01	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
	WCDMA Band II	Left Cheek	0.326	0mm	55.07	-64.67	2.65	99.2	1.64	0.02	Not required
	WLAN5GHz		1.317	0mm	7.68	22.34	-1.77				



Case #02	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
	LTE Band 2	Left Cheek	0.327	0mm	50.04	-62.84	1.39	95.2	1.64	0.02	Not required
	WLAN5GHz		1.317	0mm	7.68	22.34	-1.77				



Case #03	Band	Position	SAR (W/kg)	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(mm)	X	Y	Z				
	LTE Band 4	Left Cheek	0.291	0mm	52.65	-62.81	1.92	96.4	1.61	0.02	Not required
	WLAN5GHz		1.317	0mm	7.68	22.34	-1.77				



Test Engineer: Nick Hu, Yuan Zhao, Jiaxing Chang, Yuankai Kong

16. 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.

17. References

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

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

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

[4] SPEAG DASY System Handbook

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

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

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

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

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

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

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

[12] FCC KDB 941225 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.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

System Check_Head_1750MHz

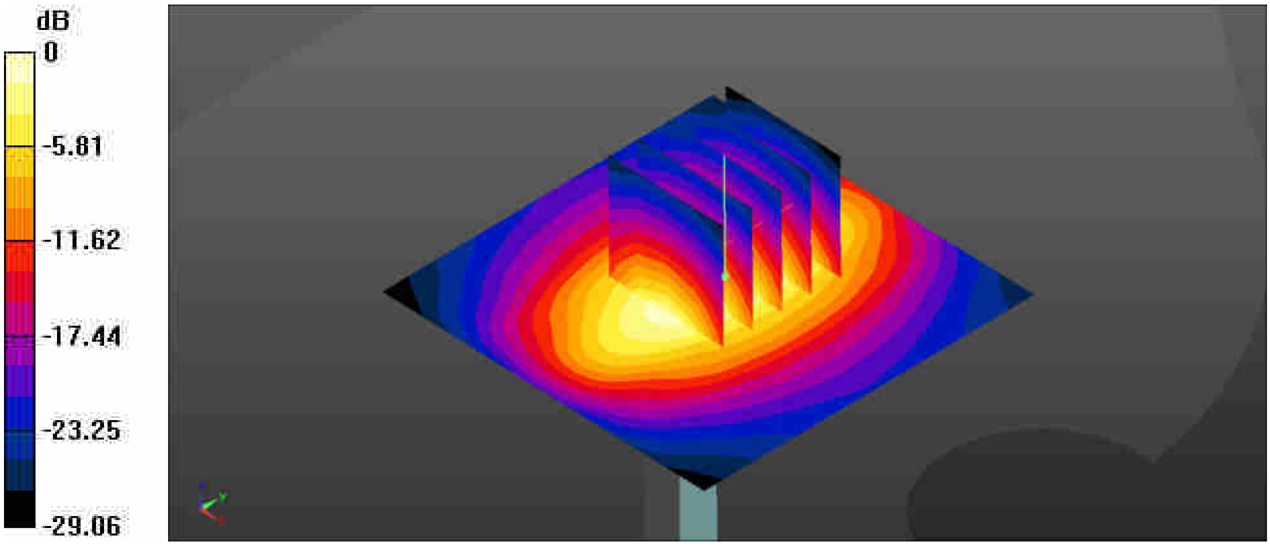
DUT: D1750V2 - SN:1090

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1750 MHz; $\sigma = 1.384$ S/m; $\varepsilon_r = 41.115$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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) = 13.5 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) = 17.2 W/kg
SAR(1 g) = 9.09 W/kg; SAR(10 g) = 4.75 W/kg
Maximum value of SAR (measured) = 13.2 W/kg



0 dB = 13.5 W/kg = 11.30 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

System Check_Head_1900MHz

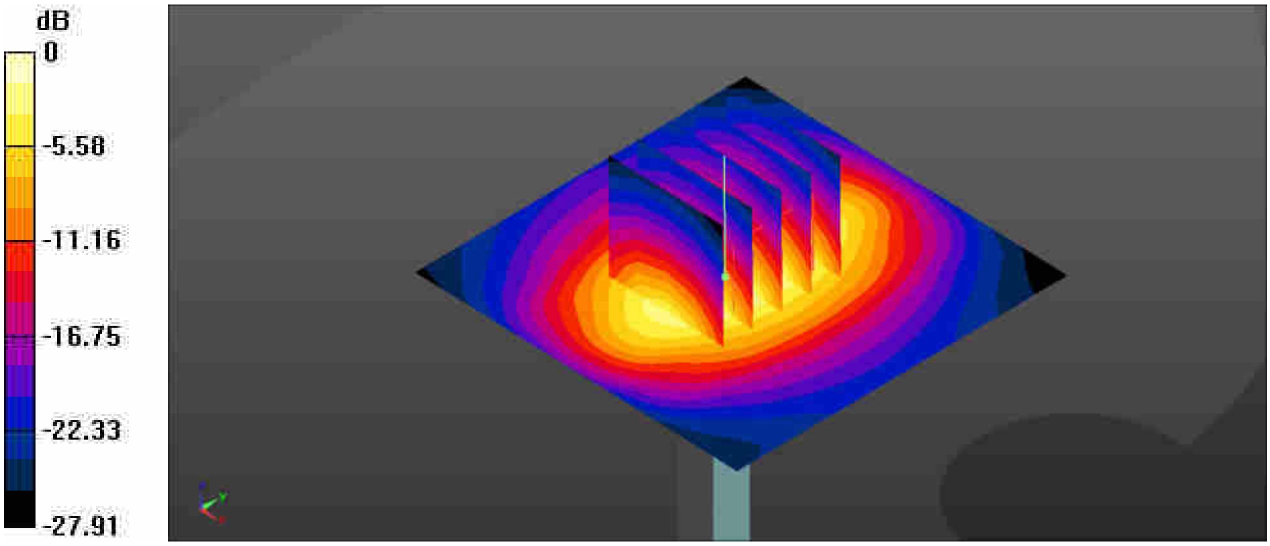
DUT: D1900V2 - SN:5d170

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; $\sigma = 1.432$ S/m; $\varepsilon_r = 39.278$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.8

System Check_Head_2450MHz

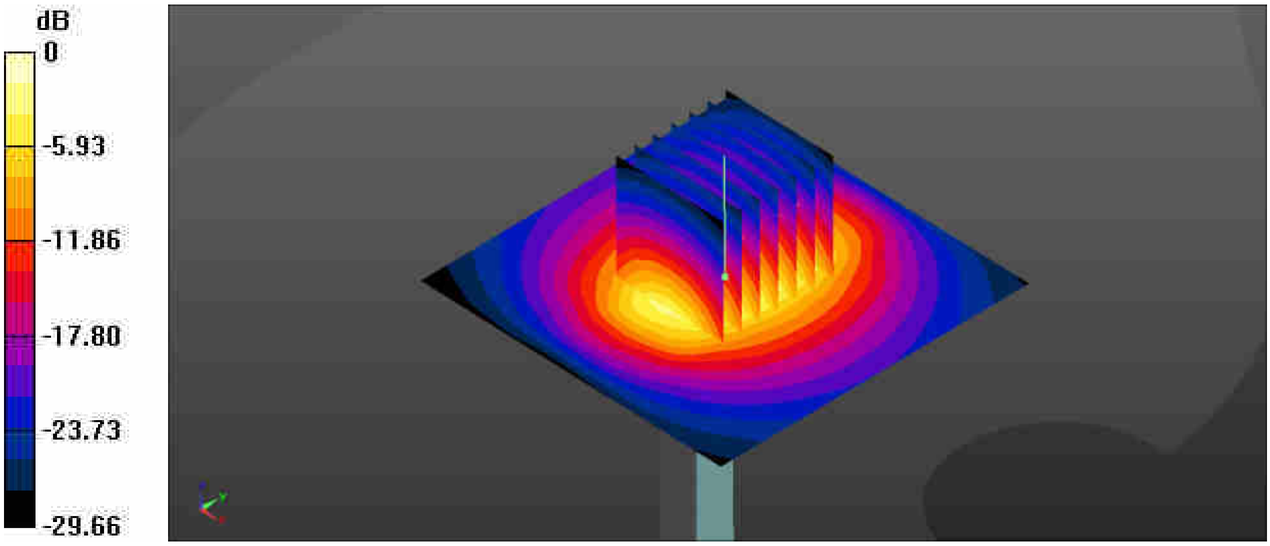
DUT: D2450V2 - SN:908

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; $\sigma = 1.85$ S/m; $\varepsilon_r = 40.924$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); 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) = 18.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.47 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 28.1 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 5.9 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 18.1 W/kg = 12.58 dBW/kg

System Check_Head_5250MHz

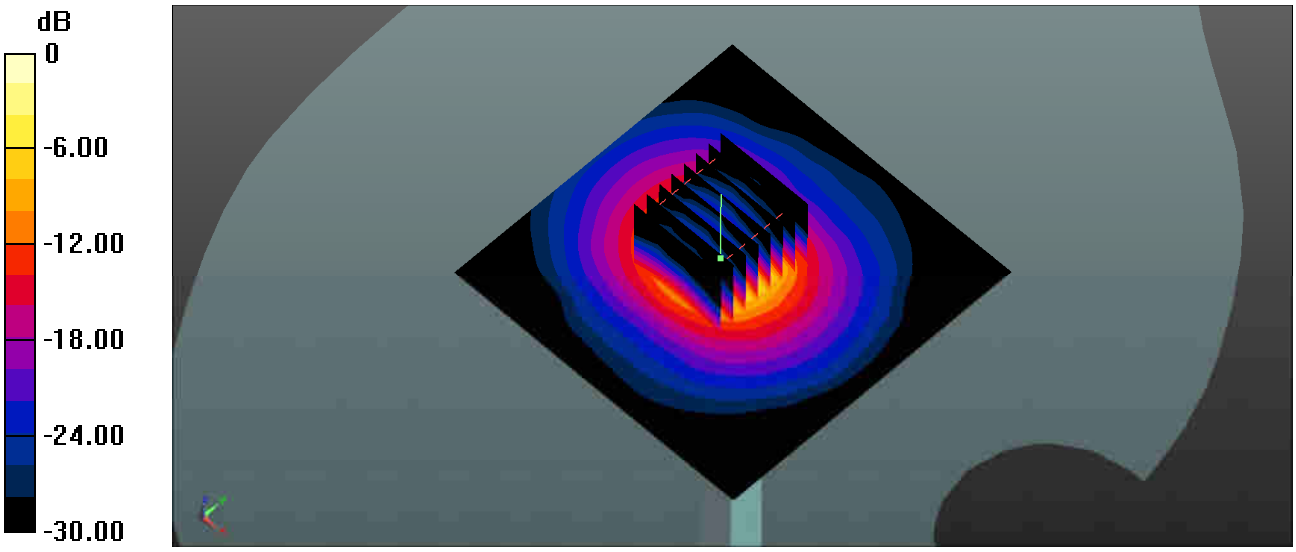
DUT: D5GHzV2 - SN:1006

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5250 MHz; σ = 4.631 S/m; ε_r = 36.749; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

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 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 15.3 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 38.78 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.18 W/kg
Maximum value of SAR (measured) = 18.6 W/kg



0 dB = 18.6 W/kg = 12.70 dBW/kg

System Check_Head_5600MHz

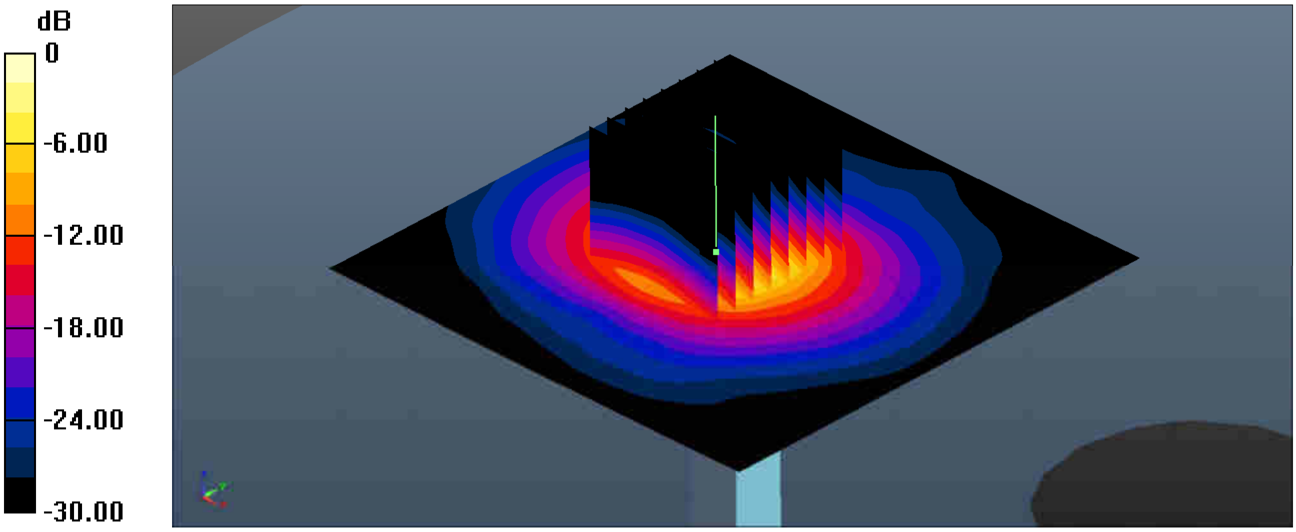
DUT: D5GHzV2 - SN:1006

Communication System: UID 0, CW (0); Frequency: 5600 MHz;Duty Cycle: 1:1
Medium: HSL_5000 Medium parameters used: f = 5600 MHz; σ = 5.039 S/m; ε_r = 35.963; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Pin=100mW/Area Scan (91x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 20.6 W/kg

Pin=100mW/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 38.22 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 36.3 W/kg
SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg = 13.14 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: 2019.7.7

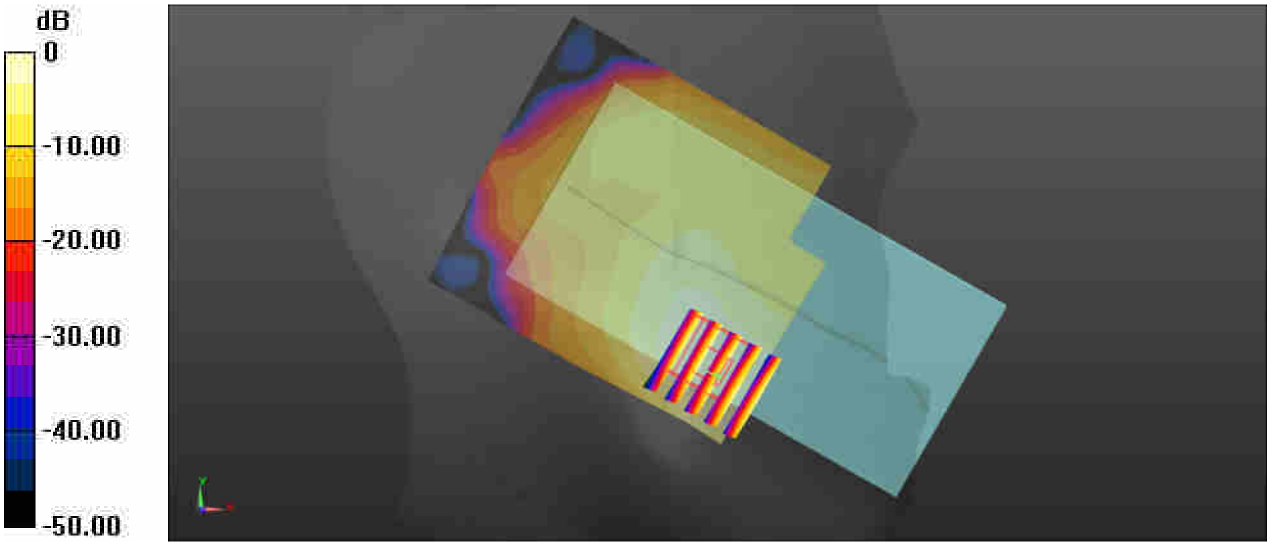
01_GSM1900_GPRS 4 Tx slots_Left Cheek_0mm_Ch810

Communication System: UID 0, PCS (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.08
Medium: HSL_1900 Medium parameters used: f = 1910 MHz; $\sigma = 1.442$ S/m; $\varepsilon_r = 39.23$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch810/Area Scan (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.229 W/kg

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.316 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.295 W/kg
SAR(1 g) = 0.186 W/kg; SAR(10 g) = 0.111 W/kg
Maximum value of SAR (measured) = 0.221 W/kg



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

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

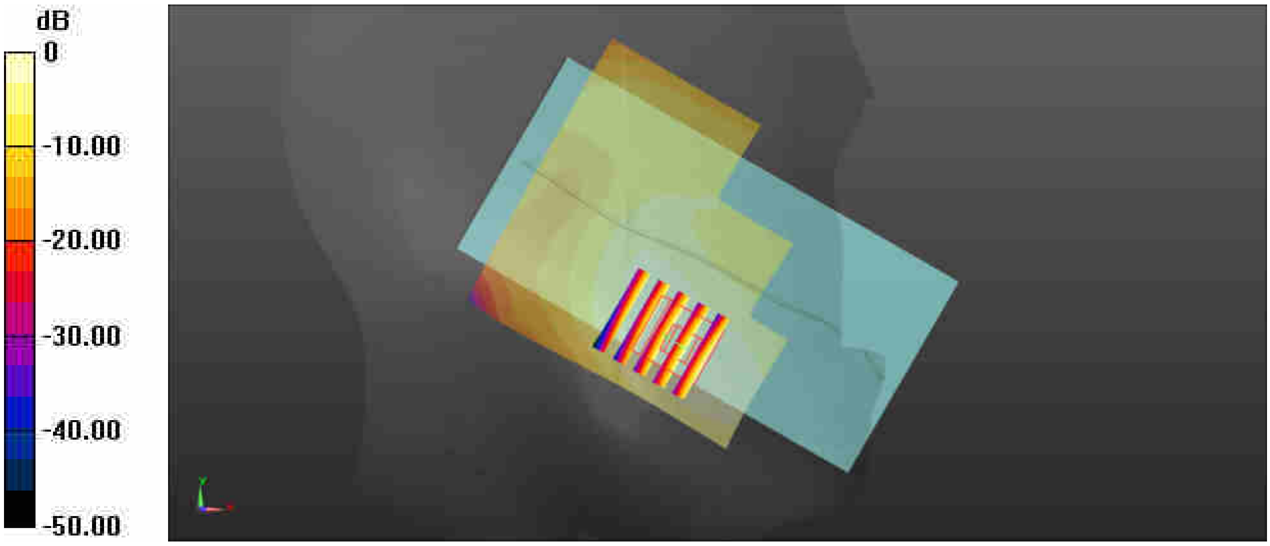
02_WCDMA II_RMC 12.2Kbps_Left Cheek_0mm_Ch9400

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1880 MHz; $\sigma = 1.409$ S/m; $\varepsilon_r = 39.369$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch9400/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.368 W/kg

Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.756 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.479 W/kg
SAR(1 g) = 0.315 W/kg; SAR(10 g) = 0.197 W/kg
Maximum value of SAR (measured) = 0.371 W/kg



0 dB = 0.368 W/kg = -4.34 dBW/kg

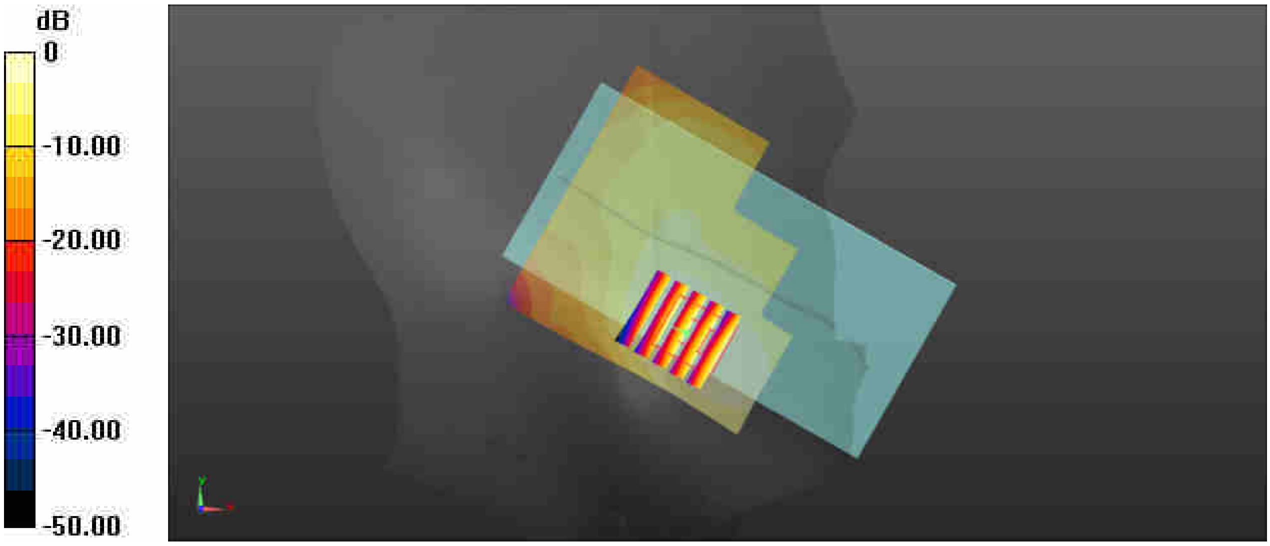
03_WCDMA IV_RMC 12.2Kbps_Left Cheek_0mm_Ch1513

Communication System: UID 0, WCDMA (0); Frequency: 1752.6 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1753 MHz; $\sigma = 1.387$ S/m; $\varepsilon_r = 41.1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch1513/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.211 W/kg

Ch1513/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.273 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.269 W/kg
SAR(1 g) = 0.181 W/kg; SAR(10 g) = 0.116 W/kg
Maximum value of SAR (measured) = 0.211 W/kg



0 dB = 0.211 W/kg = -6.76 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

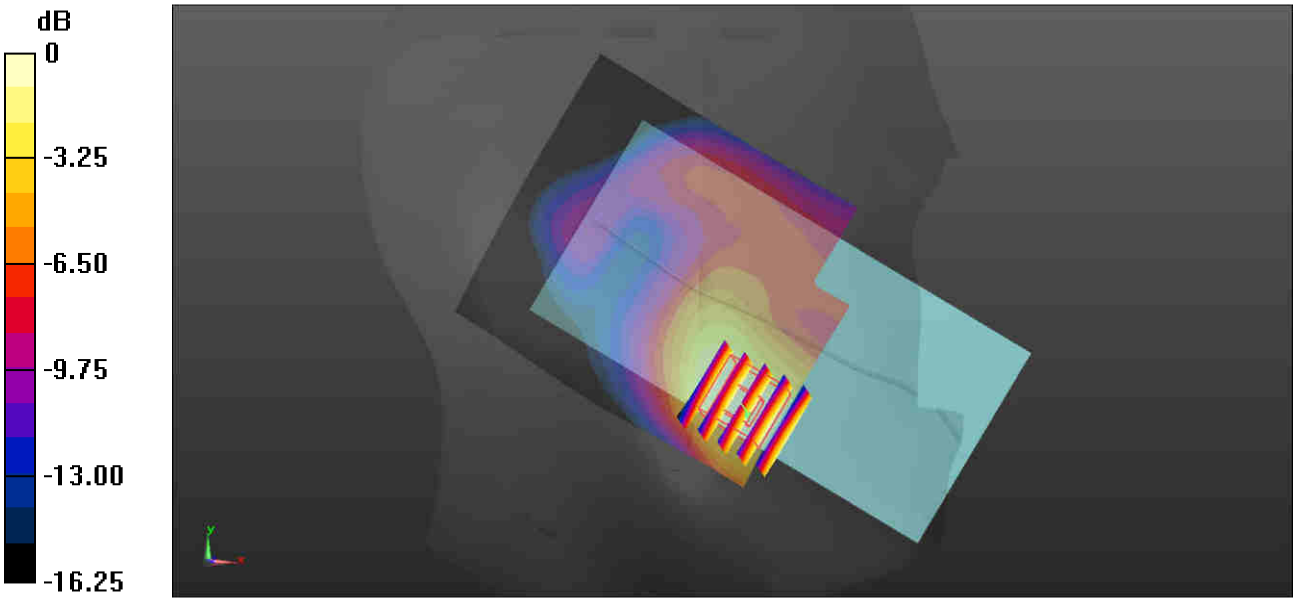
04_LTE Band 2_20M_QPSK_1RB_49Offset_Left Cheek_0mm_Ch18900

Communication System: UID 0, LTE-FDD (0); Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1880 MHz; σ = 1.409 S/m; ε_r = 39.369; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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 (71x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.371 W/kg

Ch18900/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.142 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.492 W/kg
SAR(1 g) = 0.323 W/kg; SAR(10 g) = 0.200 W/kg
Maximum value of SAR (measured) = 0.383 W/kg



0 dB = 0.383 W/kg = -4.17 dBW/kg

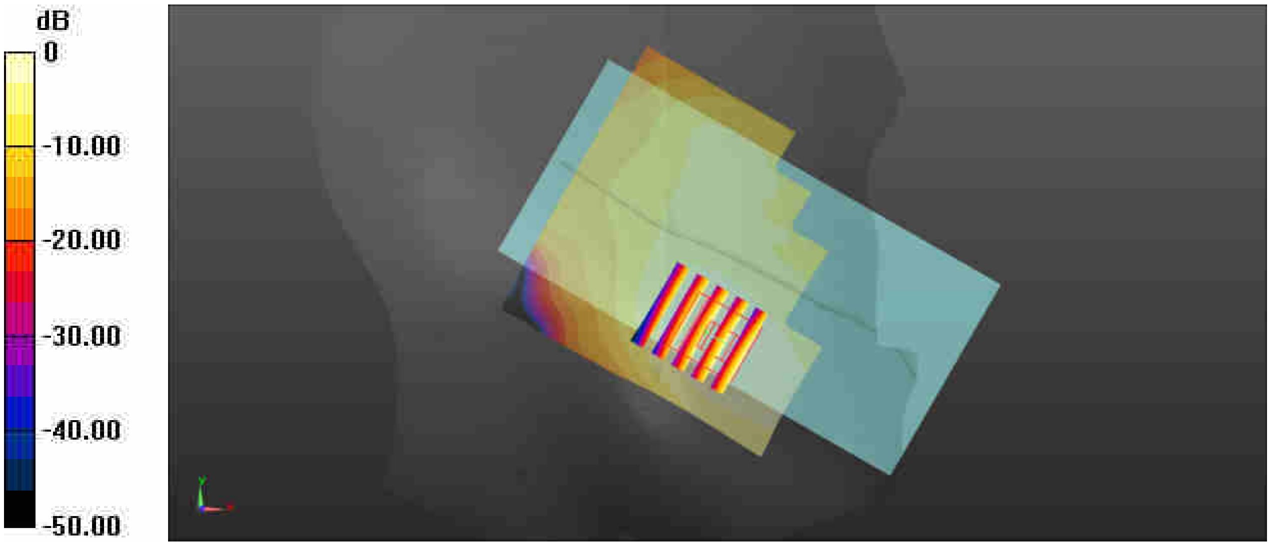
05_LTE Band 4_20M_QPSK_1RB_49Offset_Left Cheek_0mm_Ch20175

Communication System: UID 0, LTE-FDD (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1733 MHz; $\sigma = 1.365$ S/m; $\varepsilon_r = 41.188$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch20175/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.262 W/kg

Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.821 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.324 W/kg
SAR(1 g) = 0.222 W/kg; SAR(10 g) = 0.144 W/kg
Maximum value of SAR (measured) = 0.256 W/kg



0 dB = 0.262 W/kg = -5.82 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.8

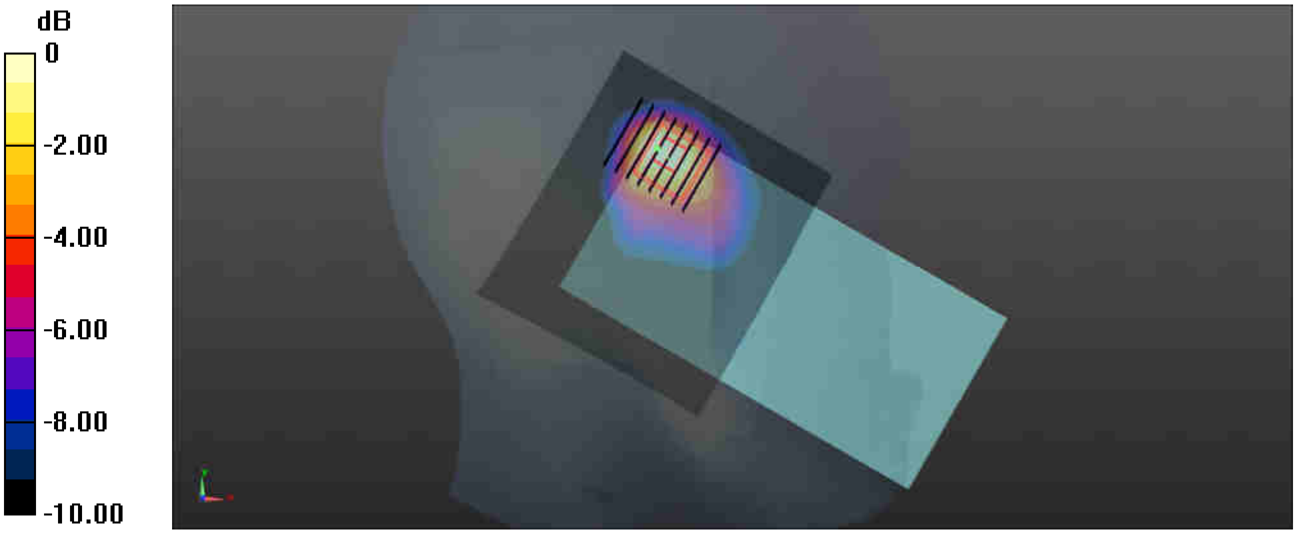
06_ WLAN2.4GHz_802.11b 1Mbps_Left Cheek_0mm_Ch1

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.025
Medium: Head 2450 Medium parameters used: f = 2412 MHz; σ = 1.82 S/m; ε_r = 40.995; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- 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) = 0.664 W/kg

Ch1/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.285 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.746 W/kg
SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.167 W/kg
Maximum value of SAR (measured) = 0.564 W/kg



0 dB = 0.564 W/kg = -2.49 dBW/kg

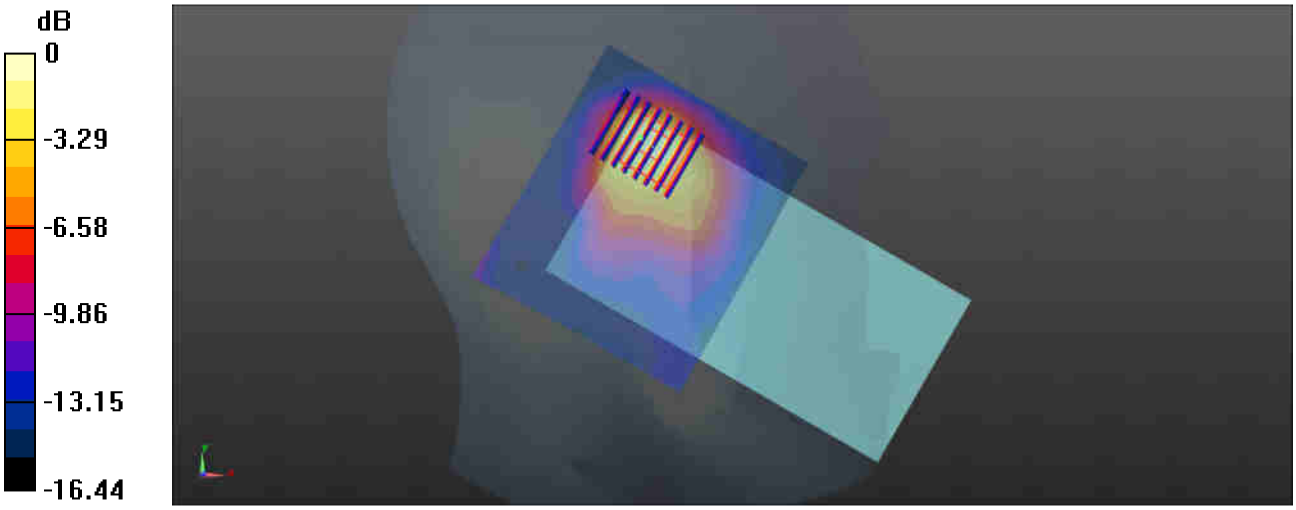
07_Bluetooth_1Mbps_Left Cheek_0mm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.298
Medium: Head 2450 Medium parameters used: f = 2441 MHz; σ = 1.842 S/m; ε_r = 40.94; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch39/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.576 W/kg

Ch39/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.240 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.622 W/kg
SAR(1 g) = 0.276 W/kg; SAR(10 g) = 0.133 W/kg
Maximum value of SAR (measured) = 0.465 W/kg



0 dB = 0.465 W/kg = -3.33 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.17

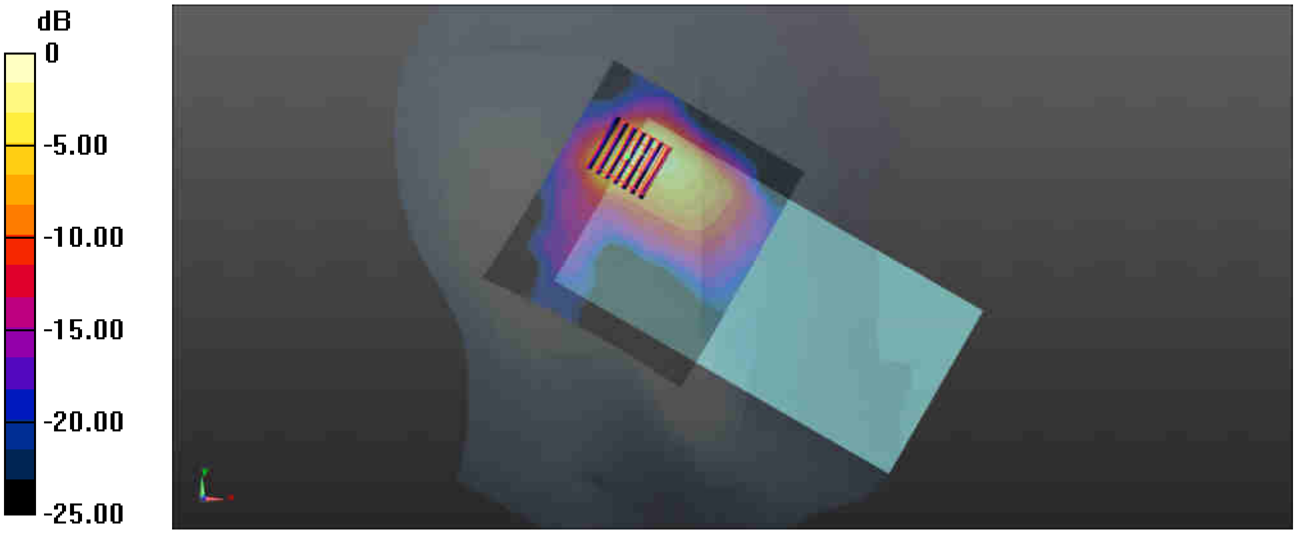
08_WLAN 5GHz _802.11a 6Mbps_Left Cheek_0mm_Ch60

Communication System: UID 0, WIFI (0); Frequency: 5300 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5300 MHz; $\sigma = 4.688$ S/m; $\varepsilon_r = 36.638$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

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 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch60/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.34 W/kg

Ch60/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 6.789 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 4.61 W/kg
SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.341 W/kg
Maximum value of SAR (measured) = 2.64 W/kg



0 dB = 2.64 W/kg = 4.22 dBW/kg

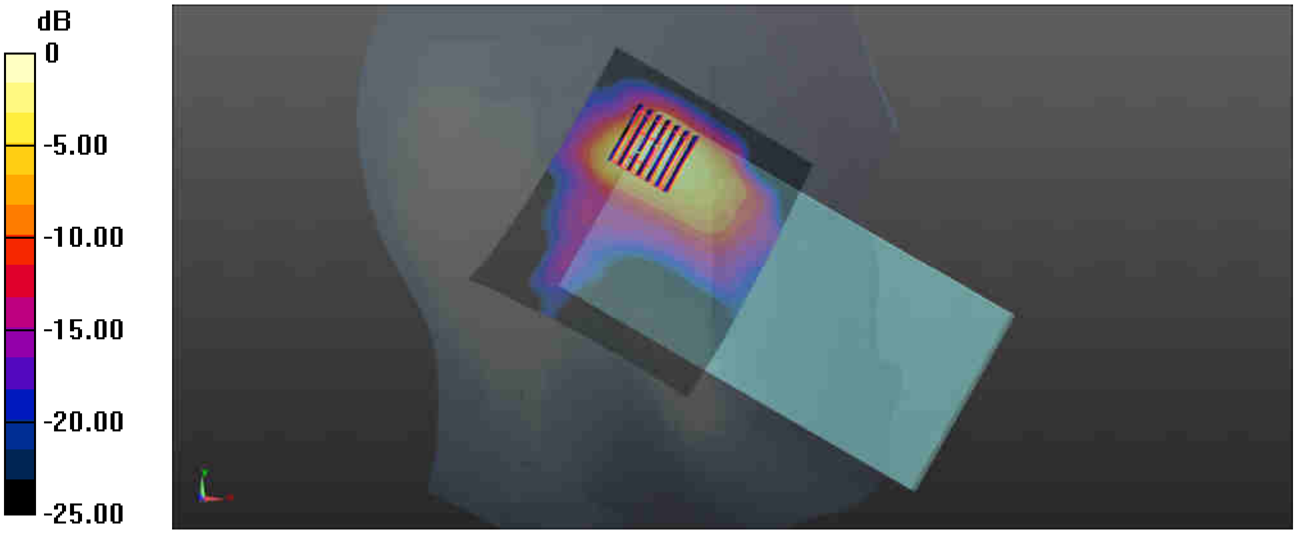
09_WLAN 5GHz _802.11a 6Mbps_Left Cheek_0mm_Ch100

Communication System: UID 0, WIFI (0); Frequency: 5500 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5500 MHz; $\sigma = 4.917$ S/m; $\varepsilon_r = 36.193$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch100/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.02 W/kg

Ch100/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 5.913 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 4.21 W/kg
SAR(1 g) = 0.937 W/kg; SAR(10 g) = 0.311 W/kg
Maximum value of SAR (measured) = 2.31 W/kg



0 dB = 2.31 W/kg = 3.64 dBW/kg

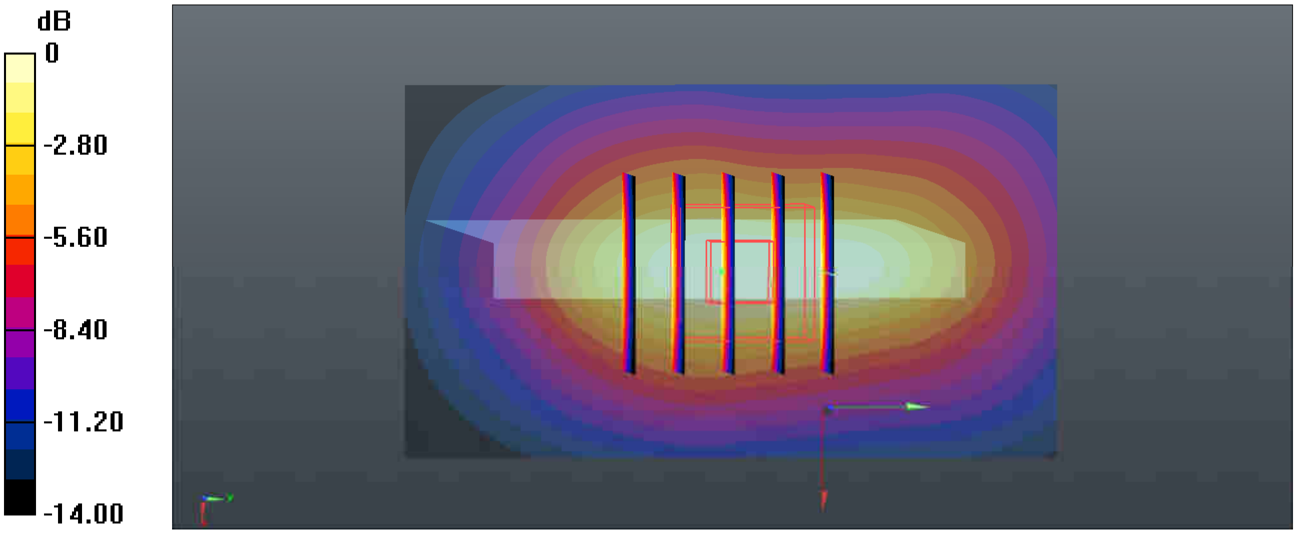
10_GSM1900_GPRS 4 Tx slots_Bottom Side_10mm_Ch512

Communication System: UID 0, PCS (0); Frequency: 1850.2 MHz;Duty Cycle: 1:2.08
Medium: HSL_1900 Medium parameters used: f = 1850.2 MHz; σ = 1.379 S/m; ε_r = 39.501; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch512/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.38 W/kg

Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.21 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.64 W/kg
SAR(1 g) = 0.887 W/kg; SAR(10 g) = 0.491 W/kg
Maximum value of SAR (measured) = 1.34 W/kg



0 dB = 1.34 W/kg = 1.27 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

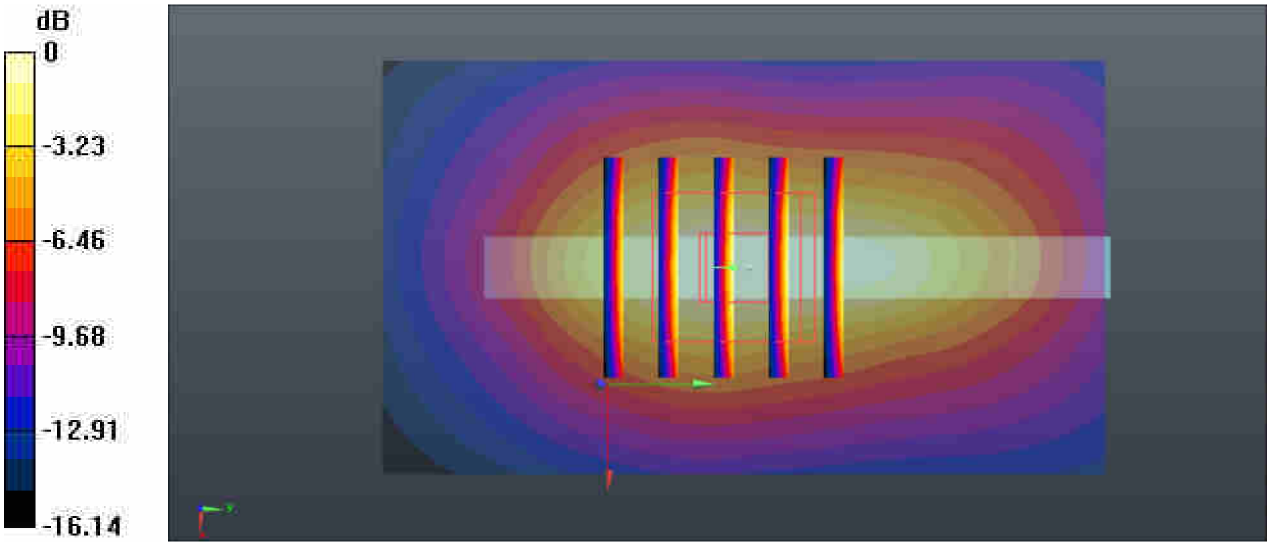
11_WCDMA II_RMC 12.2Kbps_Bottom Side_10mm_Ch9538

Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1908 MHz; $\sigma = 1.44$ S/m; $\varepsilon_r = 39.239$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch9538/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.00 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 37.70 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.27 W/kg
SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.671 W/kg
Maximum value of SAR (measured) = 1.88 W/kg



0 dB = 2.00 W/kg = 3.01 dBW/kg

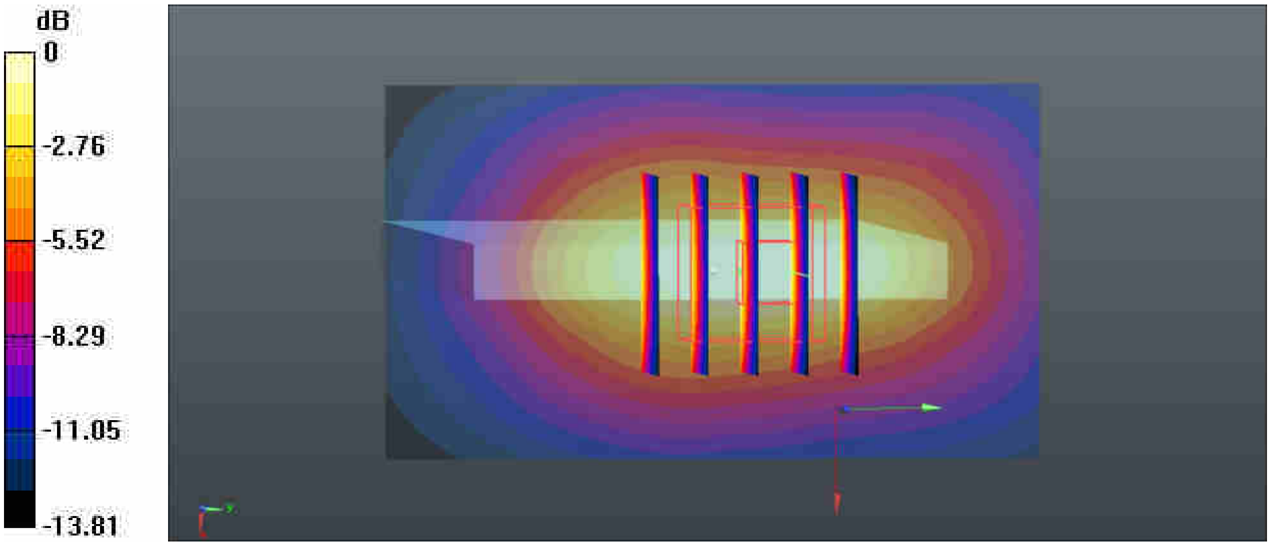
12_WCDMA IV_RMC 12.2Kbps_Bottom Side_10mm_Ch1513

Communication System: UID 0, WCDMA (0); Frequency: 1752.6 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1753 MHz; σ = 1.387 S/m; ε_r = 41.1; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch1513/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.822 W/kg

Ch1513/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.16 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.543 W/kg; SAR(10 g) = 0.307 W/kg
Maximum value of SAR (measured) = 0.844 W/kg



0 dB = 0.822 W/kg = -0.85 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

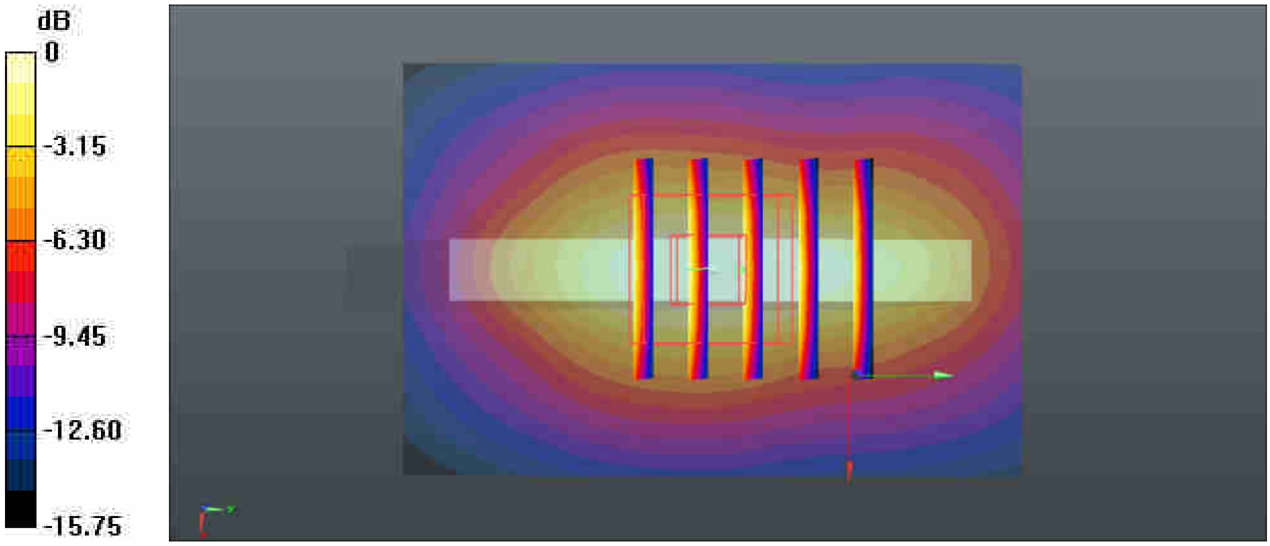
13_LTE Band 2_20M_QPSK_1RB_49Offset_Bottom Side_10mm_Ch19100

Communication System: UID 0, LTE-FDD (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.432 S/m; ε_r = 39.278; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch19100/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.72 W/kg

Ch19100/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.97 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.647 W/kg
Maximum value of SAR (measured) = 1.68 W/kg



0 dB = 1.72 W/kg = 2.36 dBW/kg

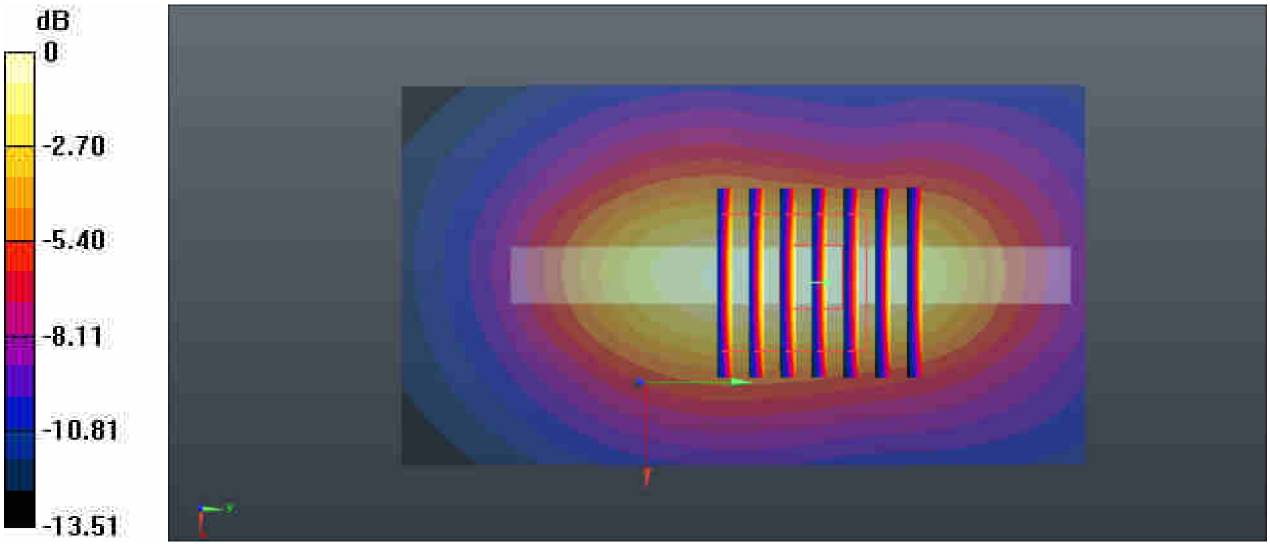
14_LTE Band 4_20M_QPSK_1RB_49Offset_Bottom Side_10mm_Ch20175

Communication System: UID 0, LTE-FDD (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1733 MHz; $\sigma = 1.365$ S/m; $\varepsilon_r = 41.188$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch20175/Area Scan (51x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.00 W/kg

Ch20175/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 26.44 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.629 W/kg; SAR(10 g) = 0.358 W/kg
Maximum value of SAR (measured) = 0.984 W/kg



0 dB = 1.00 W/kg = 0.00 dBW/kg

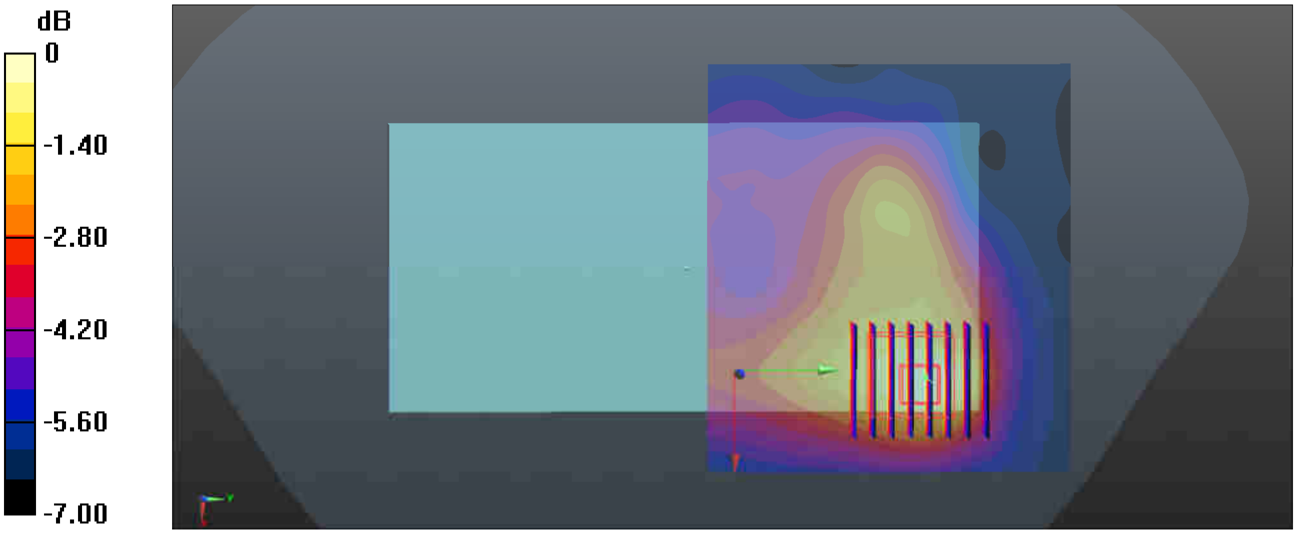
15_ WLAN2.4GHz_802.11b 1Mbps_Front_10mm_Ch1

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.025
Medium: Head 2450 Medium parameters used: f = 2412 MHz; σ = 1.82 S/m; ε_r = 40.995; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- 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) = 0.101 W/kg

Ch1/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.883 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.121 W/kg
SAR(1 g) = 0.072 W/kg; SAR(10 g) = 0.050 W/kg
Maximum value of SAR (measured) = 0.0985 W/kg



0 dB = 0.0985 W/kg = -10.07 dBW/kg

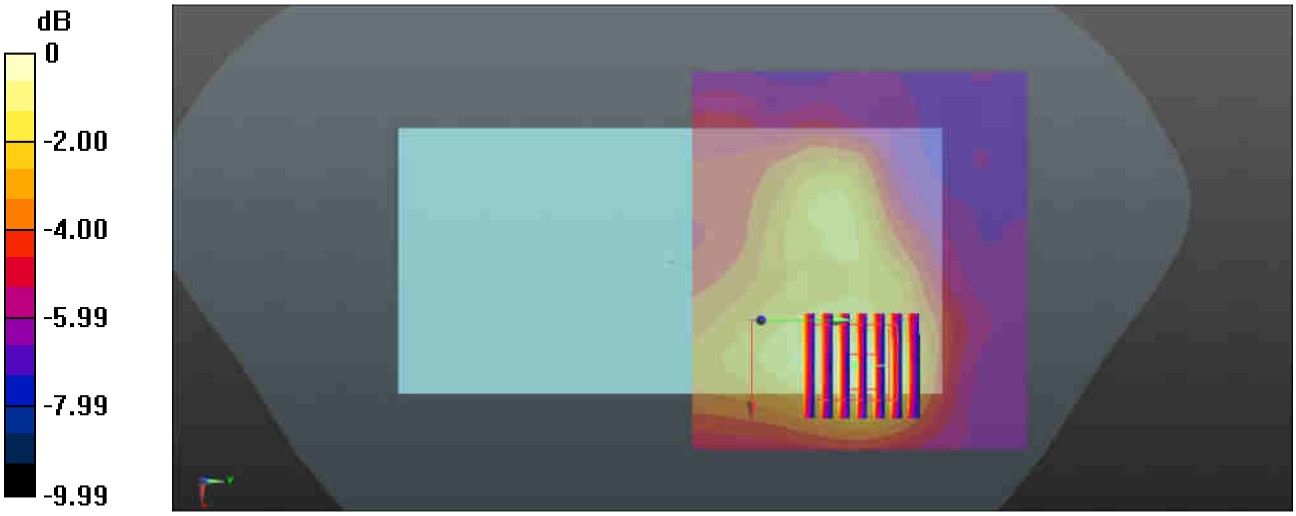
16_Bluetooth_1Mbps_Front_10mm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.298
Medium: Head 2450 Medium parameters used: f = 2441 MHz; σ = 1.842 S/m; ε_r = 40.94; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch39/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0923 W/kg

Ch39/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.187 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.112 W/kg
SAR(1 g) = 0.063 W/kg; SAR(10 g) = 0.041 W/kg
Maximum value of SAR (measured) = 0.0898 W/kg



0 dB = 0.0898 W/kg = -10.47 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

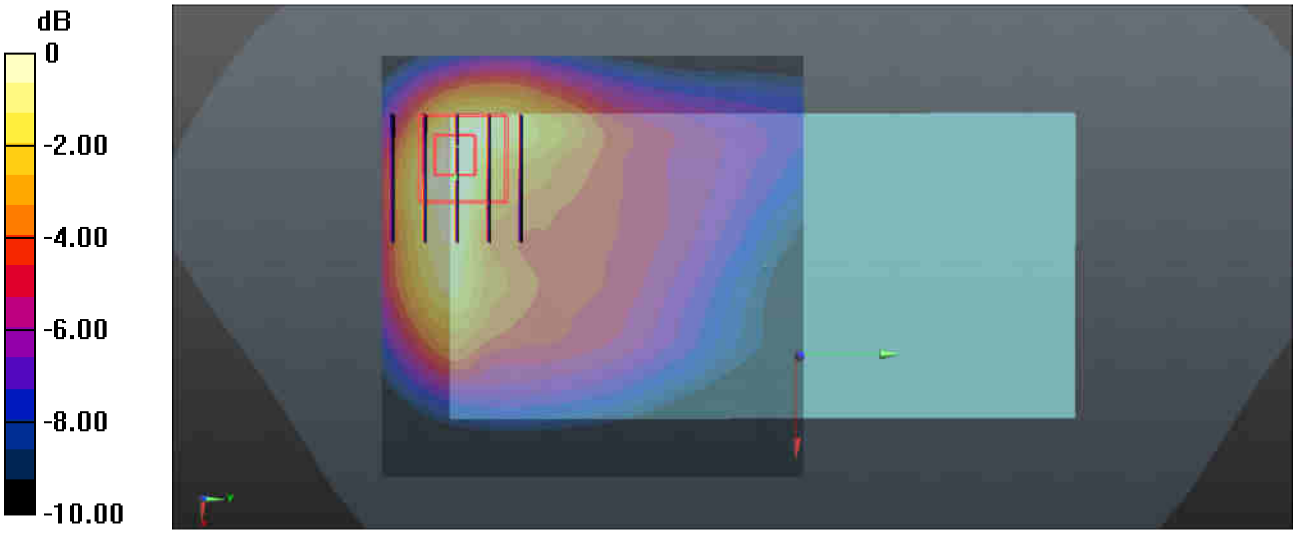
18_GSM1900_GPRS 4 Tx slots_Front_10mm_Ch512

Communication System: UID 0, PCS (0); Frequency: 1850.2 MHz;Duty Cycle: 1:2.08
Medium: HSL_1900 Medium parameters used: f = 1850.2 MHz; $\sigma = 1.379$ S/m; $\varepsilon_r = 39.501$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch512/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.923 W/kg

Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.169 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.611 W/kg; SAR(10 g) = 0.349 W/kg
Maximum value of SAR (measured) = 0.885 W/kg



0 dB = 0.885 W/kg = -0.53 dBW/kg

19_WCDMA II_RMC 12.2Kbps_Front_10mm_Ch9538

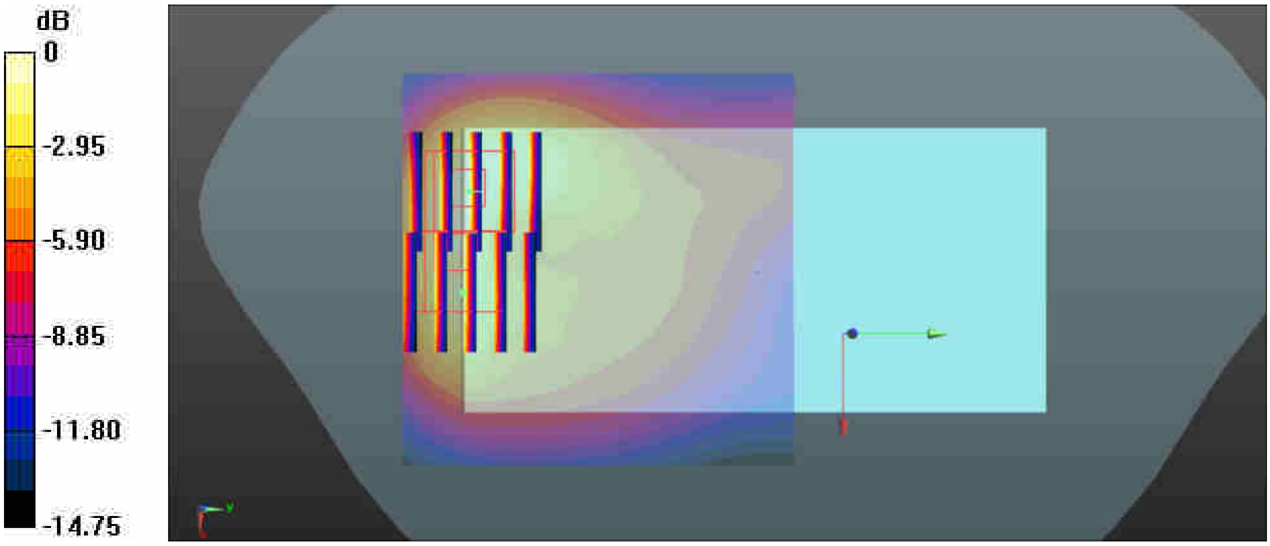
Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1908 MHz; $\sigma = 1.44$ S/m; $\varepsilon_r = 39.239$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch9538/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.33 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.65 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.38 W/kg
SAR(1 g) = 0.753 W/kg; SAR(10 g) = 0.436 W/kg
Maximum value of SAR (measured) = 1.11 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.65 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 0.813 W/kg; SAR(10 g) = 0.452 W/kg
Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.33 W/kg = 1.24 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2019.7.7

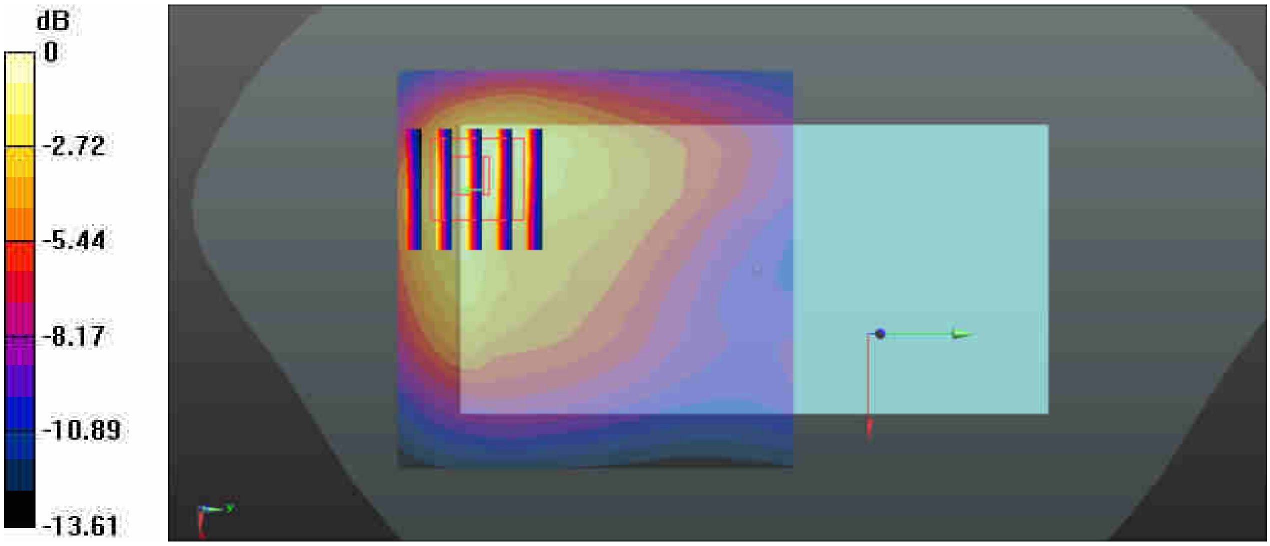
20_WCDMA IV_RMC 12.2Kbps_Front_10mm_Ch1513

Communication System: UID 0, WCDMA (0); Frequency: 1752.6 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1753 MHz; $\sigma = 1.387$ S/m; $\varepsilon_r = 41.1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch1513/Area Scan (71x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.753 W/kg

Ch1513/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.803 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.844 W/kg
SAR(1 g) = 0.451 W/kg; SAR(10 g) = 0.258 W/kg
Maximum value of SAR (measured) = 0.681 W/kg



0 dB = 0.753 W/kg = -1.23 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

21_LTE Band 2_20M_QPSK_1RB_49Offset_Front_10mm_Ch19100

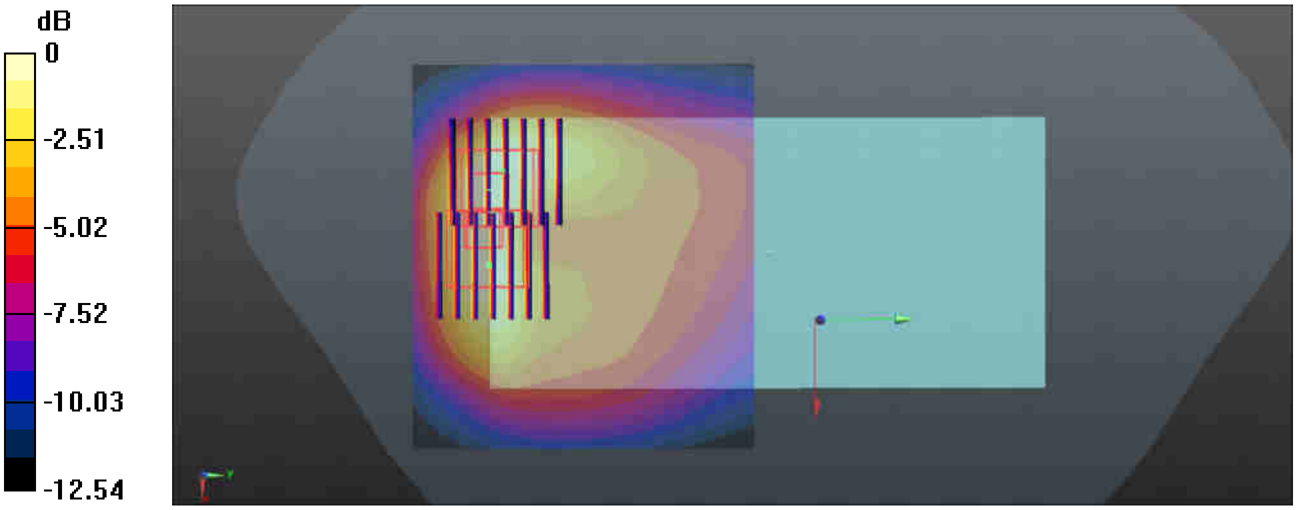
Communication System: UID 0, LTE-FDD (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; $\sigma = 1.432$ S/m; $\varepsilon_r = 39.278$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch19100/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.41 W/kg

Ch19100/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.96 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 0.910 W/kg; SAR(10 g) = 0.502 W/kg
Maximum value of SAR (measured) = 1.44 W/kg

Ch19100/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.96 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.844 W/kg; SAR(10 g) = 0.484 W/kg
Maximum value of SAR (measured) = 1.32 W/kg



0 dB = 1.32 W/kg = 1.21 dBW/kg

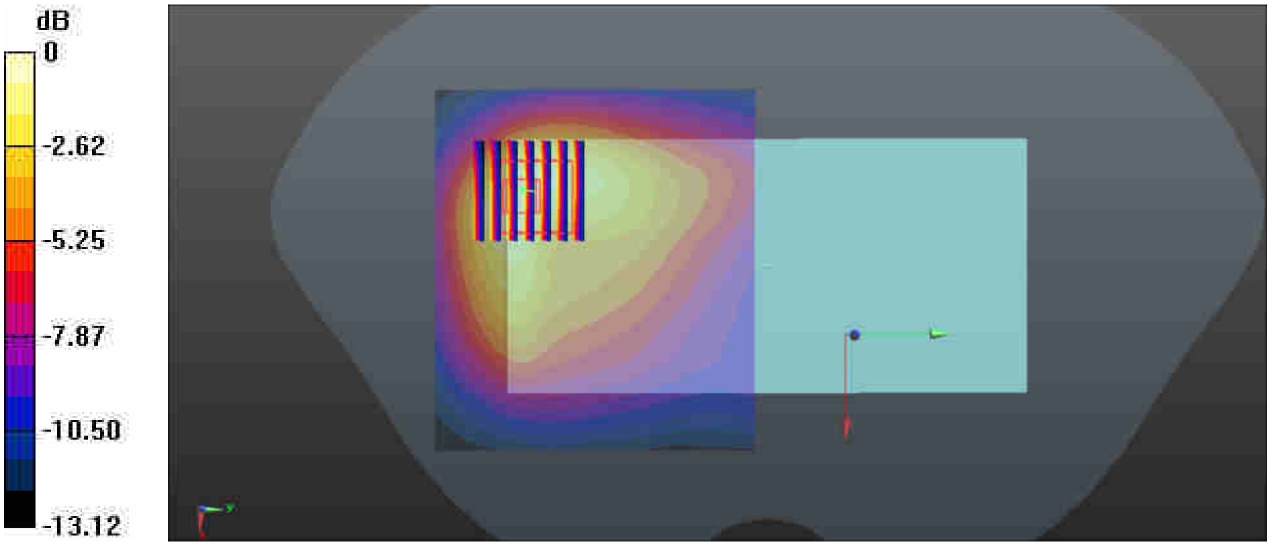
22_LTE Band 4_20M_QPSK_1RB_49Offset_Front_10mm_Ch20175

Communication System: UID 0, LTE-FDD (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: HSL_1750 Medium parameters used: f = 1733 MHz; σ = 1.365 S/m; ε_r = 41.188; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

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)

Ch20175/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.949 W/kg

Ch20175/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.790 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.594 W/kg; SAR(10 g) = 0.345 W/kg
Maximum value of SAR (measured) = 0.897 W/kg



0 dB = 0.949 W/kg = -0.23 dBW/kg

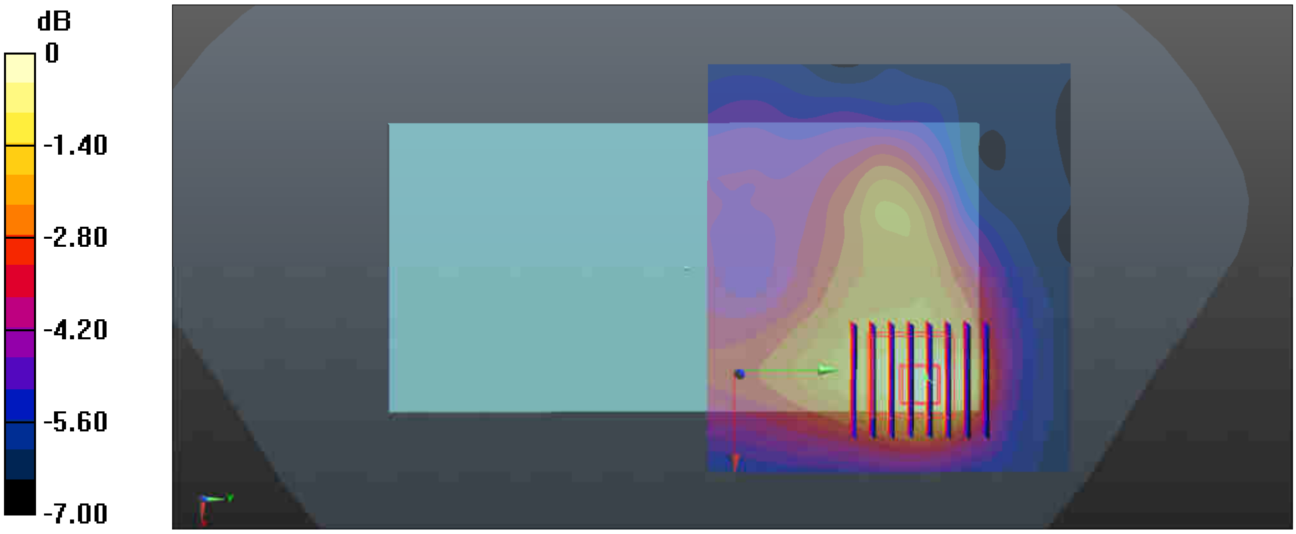
23_ WLAN2.4GHz_802.11b 1Mbps_Front_10mm_Ch1

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.025
Medium: Head 2450 Medium parameters used: f = 2412 MHz; σ = 1.82 S/m; ε_r = 40.995; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- 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) = 0.101 W/kg

Ch1/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.883 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.121 W/kg
SAR(1 g) = 0.072 W/kg; SAR(10 g) = 0.050 W/kg
Maximum value of SAR (measured) = 0.0985 W/kg



0 dB = 0.0985 W/kg = -10.07 dBW/kg

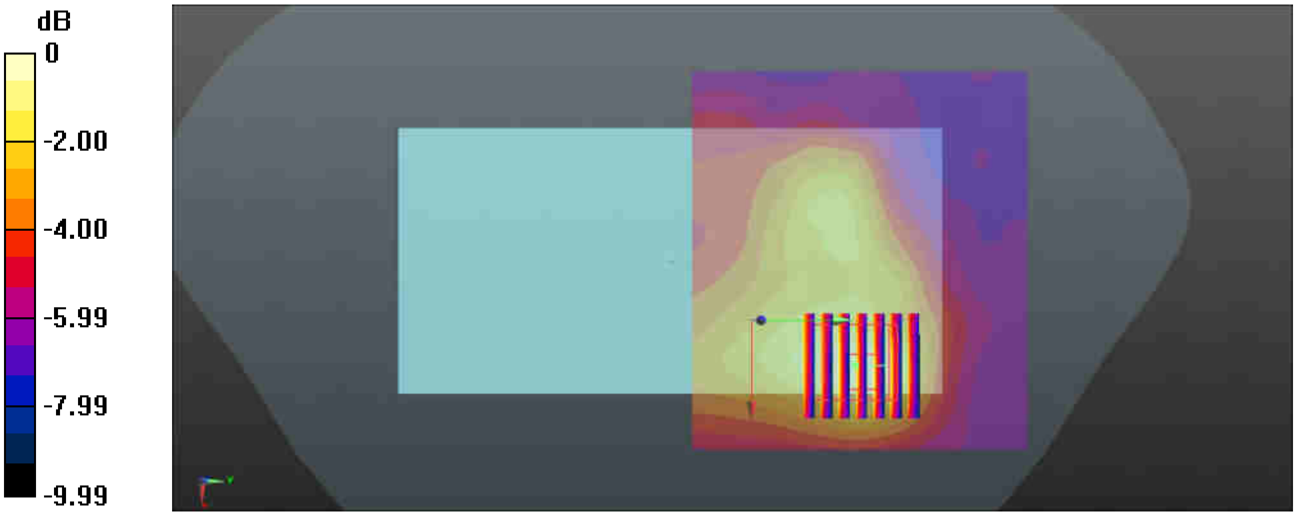
24_Bluetooth_1Mbps_Front_10mm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.298
Medium: Head 2450 Medium parameters used: f = 2441 MHz; $\sigma = 1.842$ S/m; $\varepsilon_r = 40.94$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: ES3DV3 - SN3293; ConvF(4.53, 4.53, 4.53); Calibrated: 2018.10.25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch39/Area Scan (91x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.0923 W/kg

Ch39/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.187 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.112 W/kg
SAR(1 g) = 0.063 W/kg; SAR(10 g) = 0.041 W/kg
Maximum value of SAR (measured) = 0.0898 W/kg



0 dB = 0.0898 W/kg = -10.47 dBW/kg

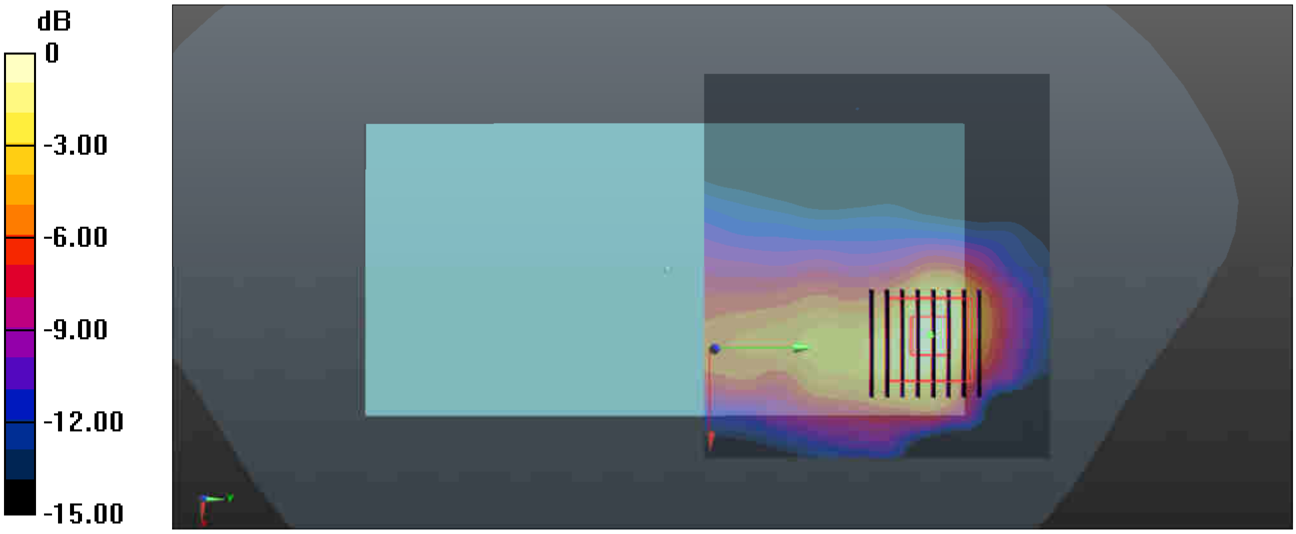
25_WLAN 5GHz _802.11a 6Mbps_Front_10mm_Ch44

Communication System: UID 0, WIFI (0); Frequency: 5220 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5220 MHz; $\sigma = 4.594$ S/m; $\varepsilon_r = 36.811$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

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 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- 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) = 0.443 W/kg

Ch44/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.573 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.712 W/kg
SAR(1 g) = 0.202 W/kg; SAR(10 g) = 0.078 W/kg
Maximum value of SAR (measured) = 0.443 W/kg



0 dB = 0.443 W/kg = -3.54 dBW/kg

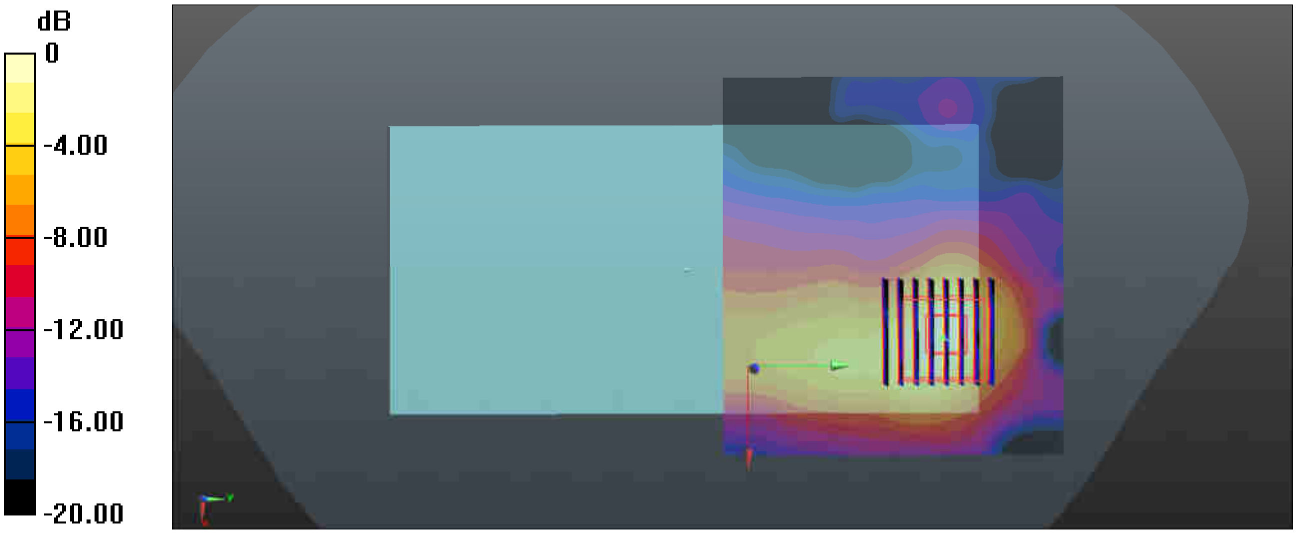
26_WLAN 5GHz _802.11a 6Mbps_Front_10mm_Ch64

Communication System: UID 0, WIFI (0); Frequency: 5320 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5320 MHz; $\sigma = 4.711$ S/m; $\varepsilon_r = 36.584$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

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 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch64/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.424 W/kg

Ch64/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.623 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.832 W/kg
SAR(1 g) = 0.185 W/kg; SAR(10 g) = 0.069 W/kg
Maximum value of SAR (measured) = 0.427 W/kg



0 dB = 0.427 W/kg = -3.70 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.17

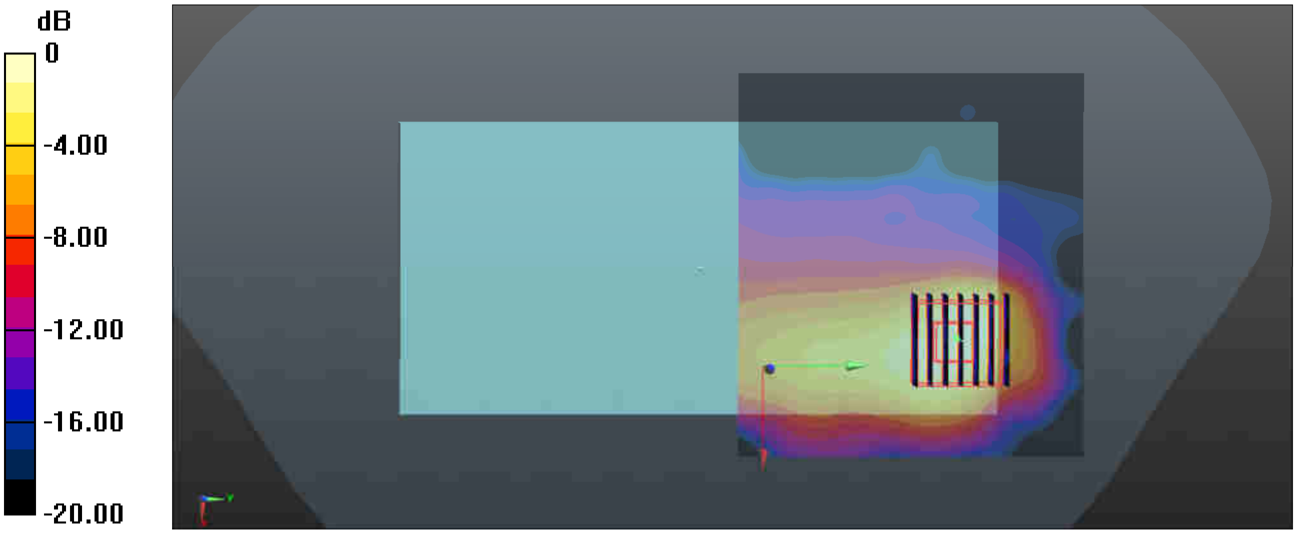
27_WLAN 5GHz _802.11a 6Mbps_Front_10mm_Ch116

Communication System: UID 0, WIFI (0); Frequency: 5580 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5580 MHz; σ = 5.014 S/m; ε_r = 36.014; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch116/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.408 W/kg

Ch116/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.163 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.598 W/kg
SAR(1 g) = 0.152 W/kg; SAR(10 g) = 0.054 W/kg
Maximum value of SAR (measured) = 0.376 W/kg



0 dB = 0.376 W/kg = -4.25 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

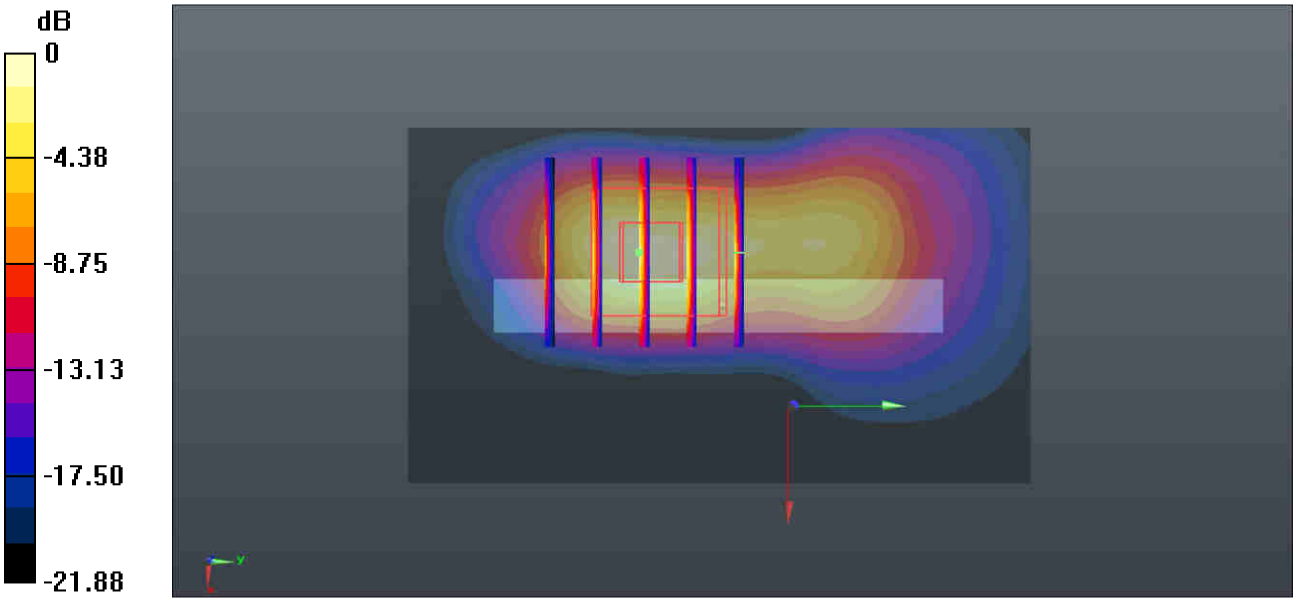
28_GSM1900_GPRS 4 Tx slots_Bottom Side_0mm_Ch810

Communication System: UID 0, PCS (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.08
Medium: HSL_1900 Medium parameters used: f = 1910 MHz; σ = 1.442 S/m; ε_r = 39.23; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch810/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 7.00 W/kg

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.64 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 9.32 W/kg
SAR(1 g) = 3.82 W/kg; SAR(10 g) = 1.77 W/kg
Maximum value of SAR (measured) = 7.03 W/kg



0 dB = 7.03 W/kg = 8.47 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2019.7.7

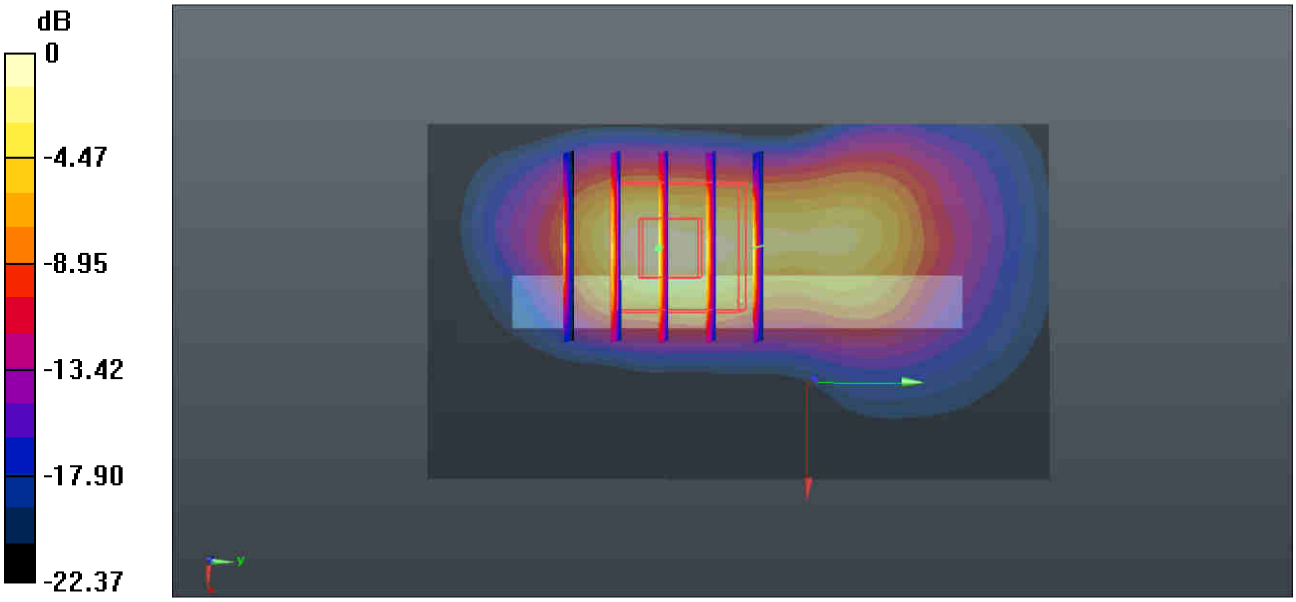
29_WCDMA II_RMC 12.2Kbps_Bottom Side_0mm_Ch9538

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1908 MHz; σ = 1.44 S/m; ε_r = 39.239; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch9538/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 11.1 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 41.55 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 14.9 W/kg
SAR(1 g) = 5.97 W/kg; SAR(10 g) = 2.63 W/kg
Maximum value of SAR (measured) = 11.2 W/kg



0 dB = 11.2 W/kg = 10.49 dBW/kg

30_LTE Band 2_20M_QPSK_1RB_49Offset_Bottom Side_0mm_Ch19100

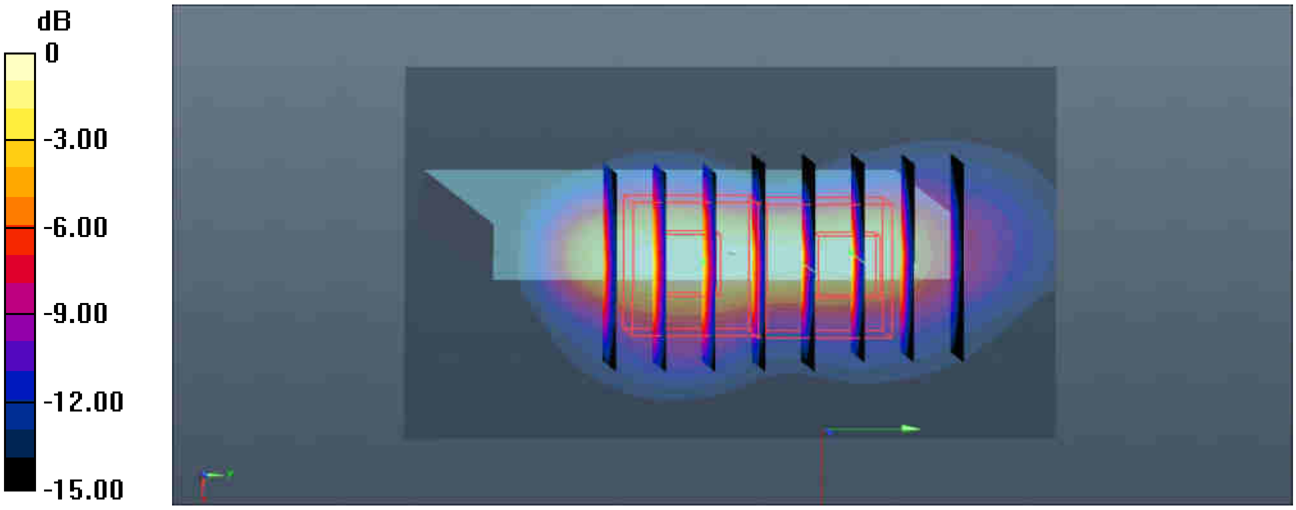
Communication System: UID 0, LTE-FDD (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; $\sigma = 1.432$ S/m; $\varepsilon_r = 39.278$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

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)

Ch19100/Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 10.8 W/kg

Ch19100/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 76.68 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 13.7 W/kg
SAR(1 g) = 6.2 W/kg; SAR(10 g) = 2.94 W/kg
Maximum value of SAR (measured) = 11.1 W/kg

Ch19100/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 76.68 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 13.6 W/kg
SAR(1 g) = 5.41 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 10.8 W/kg



0 dB = 10.8 W/kg = 10.33 dBW/kg

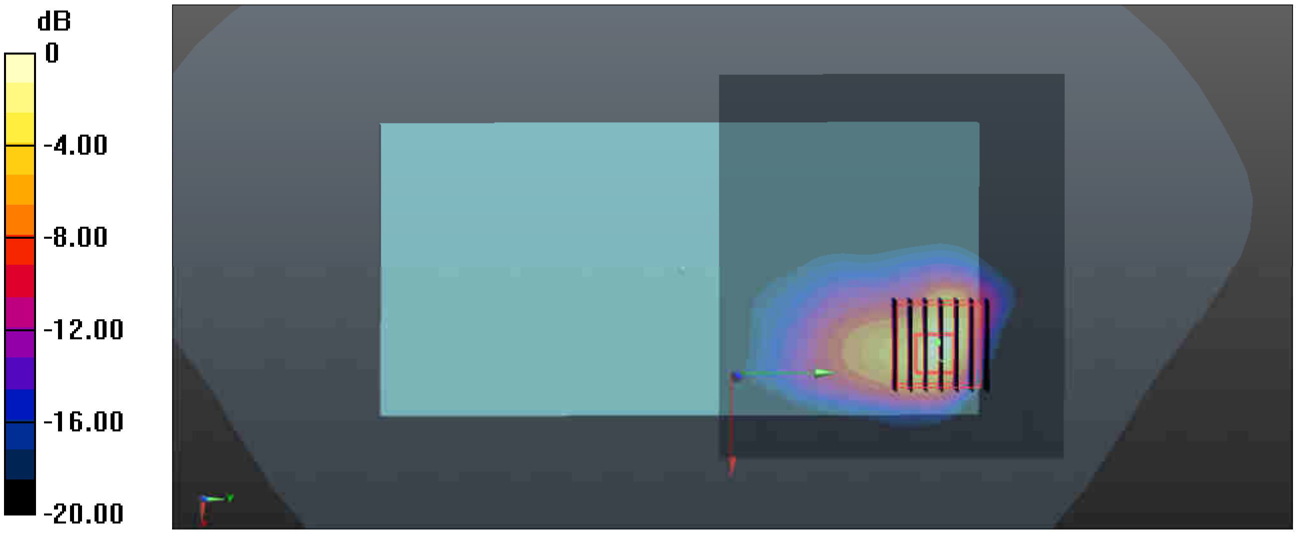
31_WLAN 5GHz _802.11a 6Mbps_Front_0mm_Ch64

Communication System: UID 0, WIFI (0); Frequency: 5320 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5320 MHz; $\sigma = 4.711$ S/m; $\varepsilon_r = 36.584$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

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 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch64/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.42 W/kg

Ch64/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.411 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 12.6 W/kg
SAR(1 g) = 2.24 W/kg; SAR(10 g) = 0.601 W/kg
Maximum value of SAR (measured) = 6.50 W/kg



0 dB = 6.50 W/kg = 8.13 dBW/kg

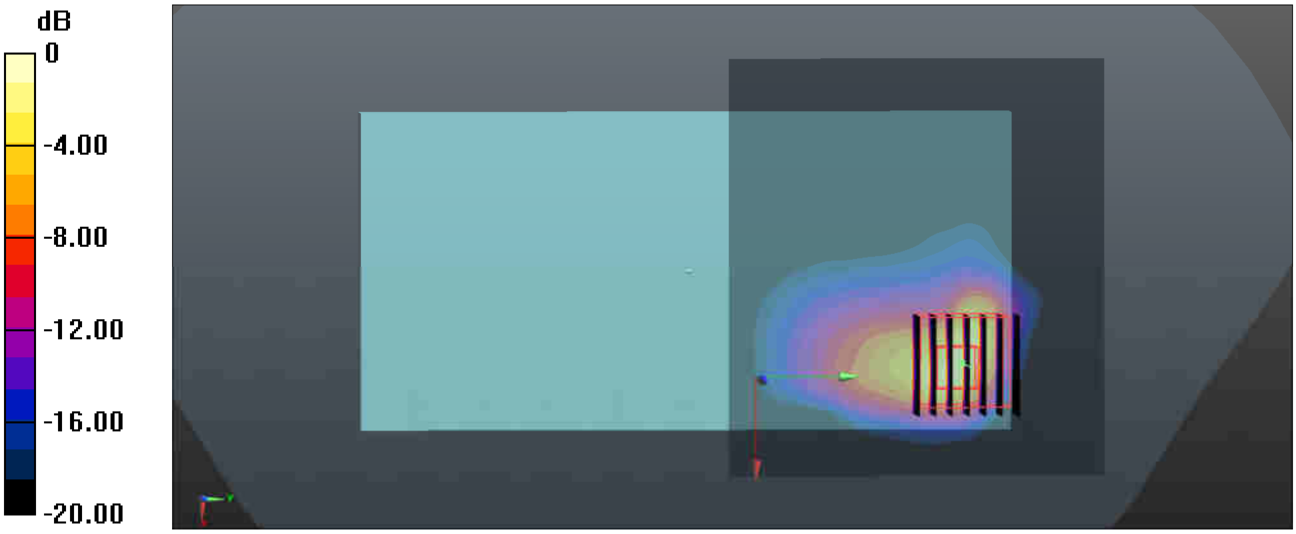
32_WLAN 5GHz _802.11a 6Mbps_Front_0mm_Ch116

Communication System: UID 0, WIFI (0); Frequency: 5580 MHz;Duty Cycle: 1:1.144
Medium: HSL_5000 Medium parameters used: f = 5580 MHz; σ = 5.014 S/m; ε_r = 36.014; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(4.92, 4.92, 4.92); Calibrated: 2019.5.27
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn690; Calibrated: 2019.1.23
- Phantom: SAM1; Type: SAM; Serial: TP-1503
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Ch116/Area Scan (101x91x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 5.21 W/kg

Ch116/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.531 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 14.5 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 0.608 W/kg
Maximum value of SAR (measured) = 6.80 W/kg



0 dB = 6.80 W/kg = 8.33 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: Z19-60084**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1090
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

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

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%.

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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	1.37 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	9.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 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	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	1.45 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	9.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.7 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	4.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.9 W/kg ± 18.7 % (k=2)**

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.5Ω- 2.34 jΩ
Return Loss	- 29.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.9Ω- 2.19 jΩ
Return Loss	- 23.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.085 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

DASY5 Validation Report for Head TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1090

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; $\sigma = 1.37$ S/m; $\varepsilon_r = 41.27$; $\rho = 1000$ kg/m3

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.38, 8.38, 8.38) @ 1750 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)

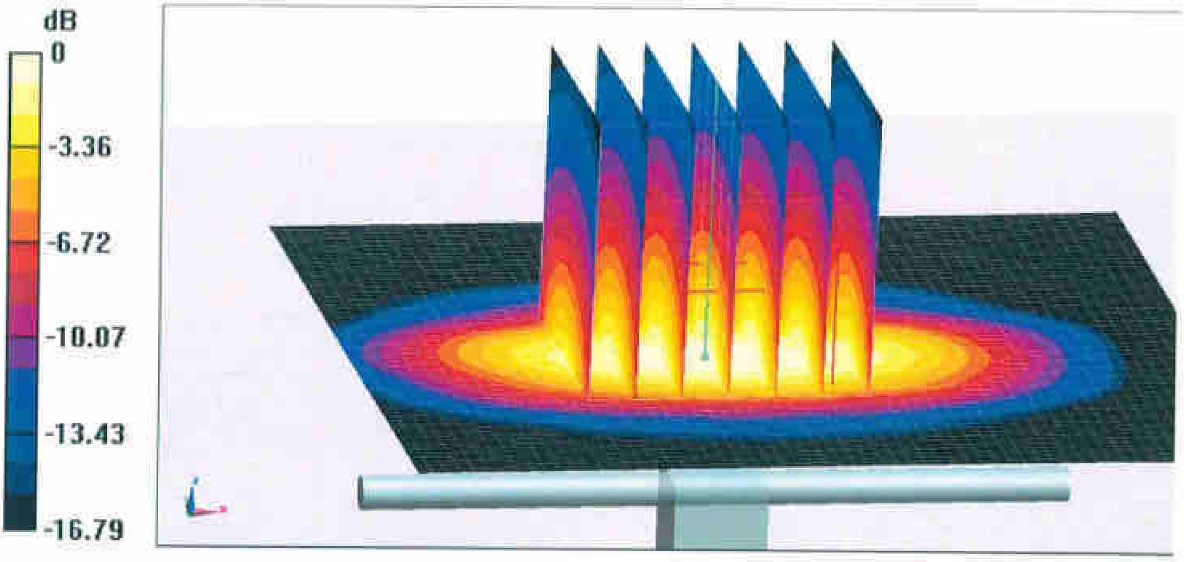
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.03 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.1 W/kg

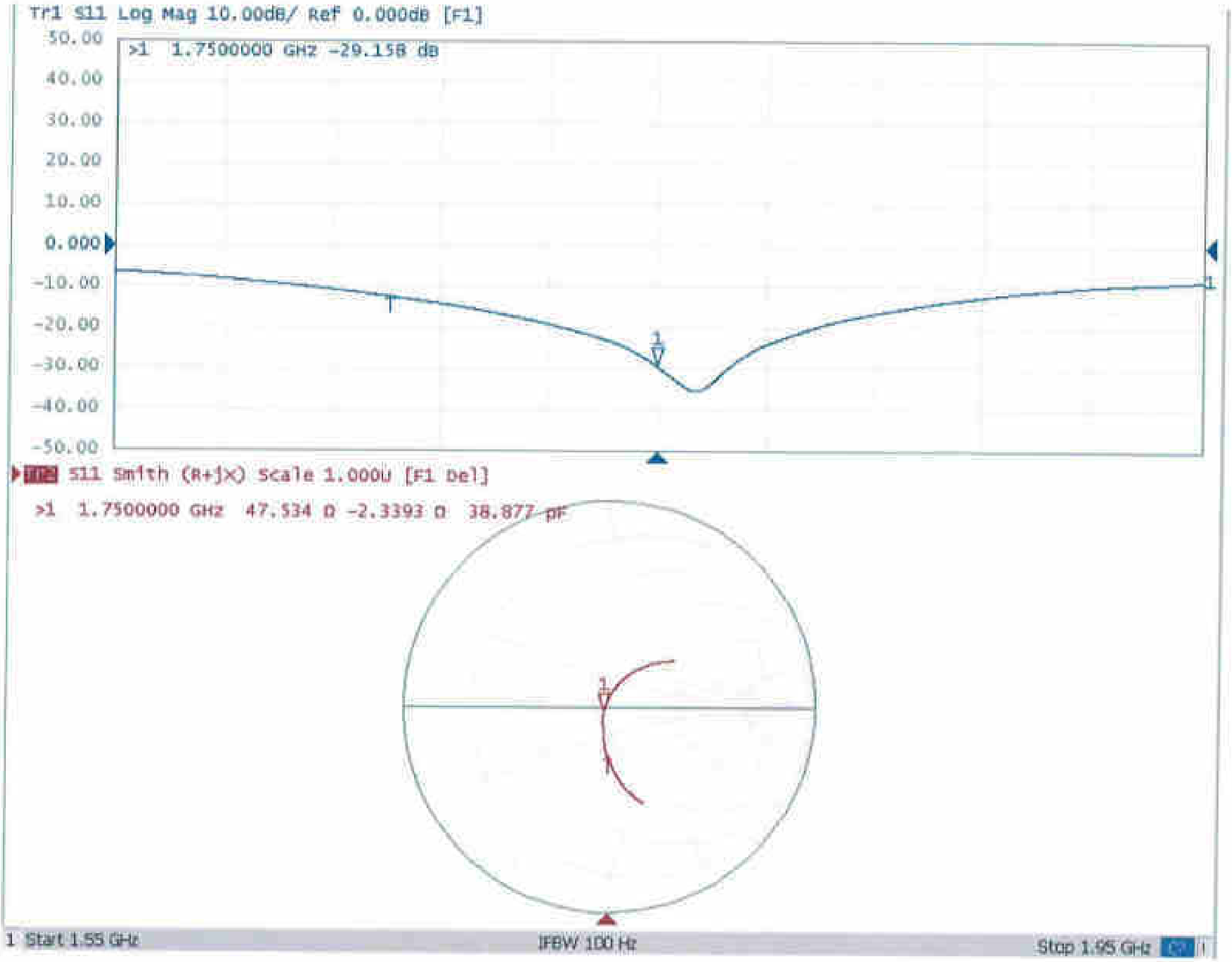
SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.79 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

Impedance Measurement Plot for Head TSL



Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB [F1]

>1 1.7500000 GHz -29.158 dB

Tr2 S11 Smith (R+jX) Scale 1.000U [F1 Del]

>1 1.7500000 GHz 47.534 Ω -2.3393 Ω 38.877 pF

1 Start 1.55 GHz IFBW 100 Hz Stop 1.95 GHz

DASY5 Validation Report for Body TSL Date: 03.26.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1090

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1750 MHz; σ = 1.449 S/m; ε_r = 54.97; ρ = 1000 kg/m3

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(8.03, 8.03, 8.03) @ 1750 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)

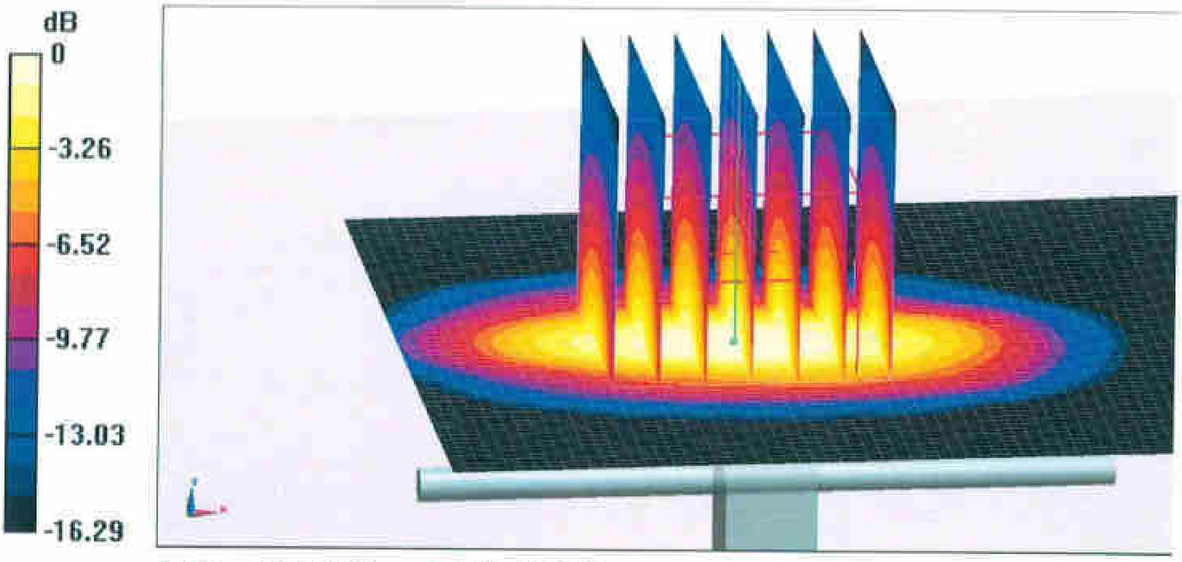
System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.13 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 16.8 W/kg

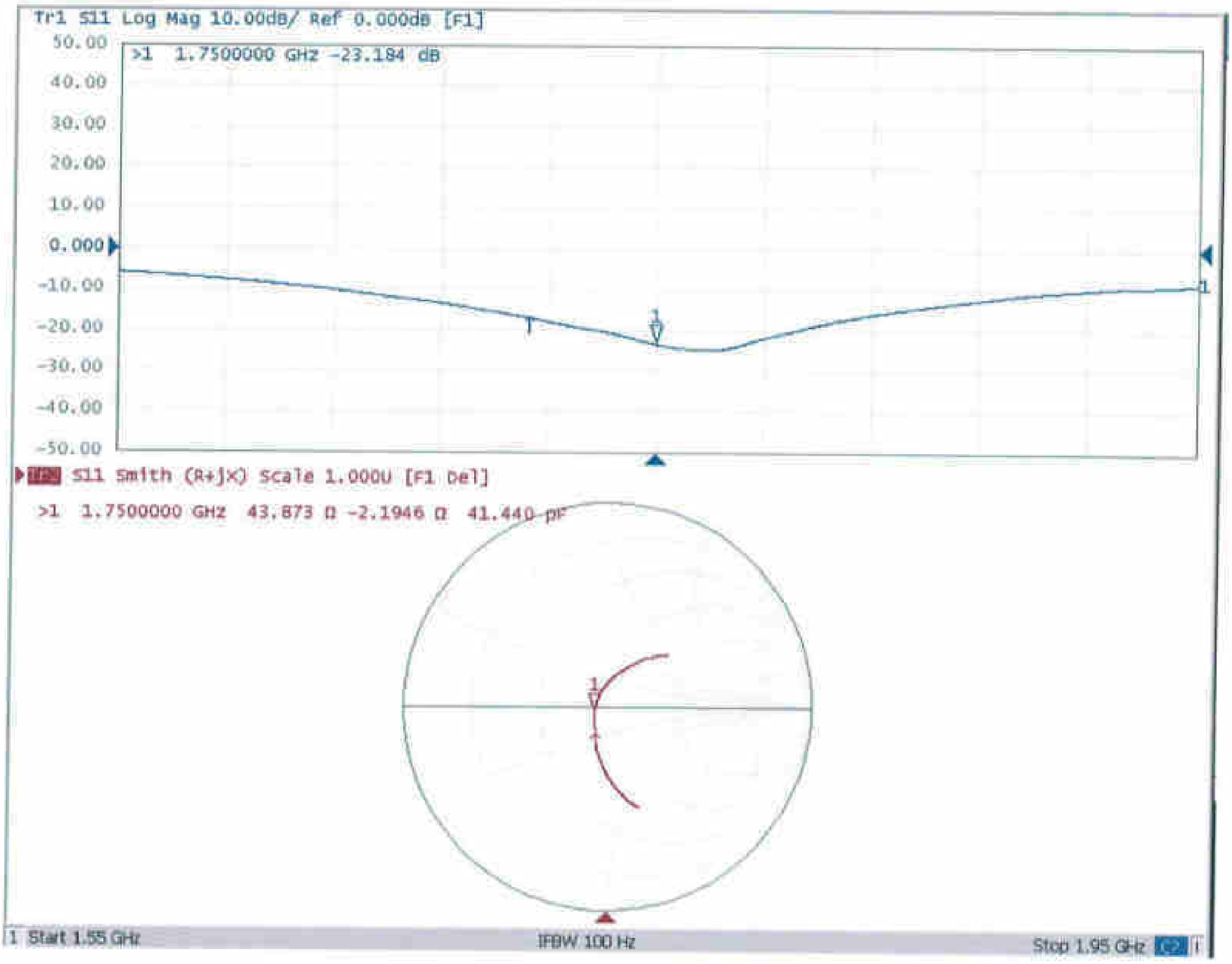
SAR(1 g) = 9.21 W/kg; SAR(10 g) = 4.89 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

Impedance Measurement Plot for Body TSL



TTL
In Collaboration with
speag
CALIBRATION LABORATORY

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

ilac-MRA CNAS 中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client **Sporton** **Certificate No: Z19-60085**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d170
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 26, 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

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

lossary:

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%.

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	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	1.44 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	9.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.0 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	1.56 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.0 W/kg ± 18.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 18.7 % (k=2)**