FCC SAR Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	10713
FCC ID	:	IHDT56WC5
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

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

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

Prepared by: Mark Qu / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

Sporton International (KunShan) INC.
No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, 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 Specification of Accessory 7
4.3 General LTE SAR Test and Reporting Considerations 8
5. RF Exposure Limits **9**
5.1 Uncontrolled Environment 9
5.2 Controlled Environment 9
6. Specific Absorption Rate (SAR) **10**
6.1 Introduction 10
6.2 SAR Definition 10
7. System Description and Setup **11**
7.1 E-Field Probe 12
7.2 Data Acquisition Electronics (DAE) 12
7.3 Phantom 13
7.4 Device Holder 14
8. Measurement Procedures **15**
8.1 Spatial Peak SAR Evaluation 15
8.2 Power Reference Measurement 16
8.3 Area Scan 16
8.4 Zoom Scan 17
8.5 Volume Scan Procedures 17
8.6 Power Drift Monitoring 17
9. Test Equipment List **18**
10. System Verification **19**
10.1 Tissue Simulating Liquids 19
10.2 Tissue Verification 20
10.3 System Performance Check Results 21
11. RF Exposure Positions **22**
11.1 Ear and handset reference point 22
11.2 Definition of the cheek position 23
11.3 Definition of the tilt position 24
11.4 Body Worn Accessory 25
11.5 Wireless Router 25
12. Conducted RF Output Power (Unit: dBm) **26**
13. Bluetooth Exclusions Applied **41**
14. Antenna Location **42**
15. SAR Test Results **43**
15.1 Head SAR 43
15.2 Hotspot SAR 45
15.3 Body Worn Accessory SAR 46
15.4 Repeated SAR Measurement 47
16. Simultaneous Transmission Analysis **48**
16.1 Head Exposure Conditions 49
16.2 Hotspot Exposure Conditions 50
16.3 Body-Worn Accessory Exposure Conditions 51
17. Uncertainty Assessment **52**
18. References **54**
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos
Appendix E. Product Equality Declaration
Appendix F. Original Report

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA742708-01	Rev. 01	Initial issue of report	Jul. 07, 2017

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Mobility LLC, Mobile Cellular Phone, 10713** are as follows.

Equipment Class	Frequency Band		Highest SAR Summary			Highest Simultaneous Transmission 1g SAR (W/kg)
			Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 10mm)	
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.58	**0.87**	**0.87**	1.56
		GSM1900	0.27	0.37	0.37	
	WCDMA	Band V	0.44	0.66	0.66	
		Band II	0.40	0.51	0.51	
	LTE	Band 5	0.38	0.65	0.65	
		Band 7	0.38	0.69	0.69	
		Band 38	0.26	0.46	0.41	
DTS	WLAN	2.4GHz WLAN	**1.15**	0.40	0.40	1.56
Date of Testing:			2017.4.27 ~ 2017.4.29			

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

2. Administration Data

Testing Site	
Test Site	Sporton International (KunShan) INC.
Test Site Location	No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958

Applicant	
Company Name	Motorola Mobility LLC
Address	222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

Manufacturer	
Company Name	Motorola Mobility LLC
Address	222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

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	Mobile Cellular Phone
Brand Name	Motorola
Model Name	10713
FCC ID	IHDT56WC5
IMEI Code	355638080037870
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ LTE 802.11b/g/n HT20 Bluetooth v3.0 + EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE, Bluetooth v4.2 LE NFC
HW Version	WKGMA1A4-3
SW Version	woods- userdebug 7.0 NMA25.27 314 intcfg,test-keys
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
2. 802.11n-HT40 is not supported in 2.4GHz WLAN.
3. This device 2.4GHz WLAN support hotspot operation.
4. This device does not support DTM operation and support GRPS/EGRPS mode up to multi-slot class 12.
5. This is a variant report for 10713. The product equality declaration could be referred to Appendix E. Based on the similarity between current and previous project, only the worse cases from reference report (Sporton Report Number FA711913-01) were verified for the differences.

4.2 Specification of Accessory

Specification of Accessory				
AC Adapter(EU)	Brand Name	Motorola (Chenyang)	Model Name	C-P57 SPN5985A
	Power Rating	I/P: 100-240 Vac, 130mA, O/P: 5.0Vdc, 1000mA		
AC Adapter(US)	Brand Name	Motorola (Chenyang)	Model Name	C-P56 SPN5987A
	Power Rating	I/P: 100-240 Vac, 130mA, O/P: 5.0Vdc, 1000mA		
AC Adapter(UK)	Brand Name	Motorola (Chenyang)	Model Name	C-P58 SPN5981A
	Power Rating	I/P: 100-240 Vac, 130mA, O/P: 5.0Vdc, 1000mA		
AC Adapter(IN)	Brand Name	Motorola (Chenyang)	Model Name	C-P45 SPN5982A
	Power Rating	I/P: 100-240 Vac, 130mA, O/P: 5.0Vdc, 1000mA		
AC Adapter(AU)	Brand Name	Motorola (Chenyang)	Model Name	C-P59 SPN5983A
	Power Rating	I/P: 100-240 Vac, 130mA, O/P: 5.0Vdc, 1000mA		
Battery	Brand Name	Motorola (ATL)	Model Name	GK40
	Power Rating	3.8Vdc,2685/2800mAh (Min/Typ)	Type	Li-ion
Earphone	Brand Name	Motorola (Tenji)	Model Name	TJ101247P
	Signal Line Type	1.32 meter, non-shielded cable, without ferrite core		
USB Cable	Brand Name	Motorola (Liqi)	Model Name	LQ-02300032
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	IHDT56WC5
Equipment Name	Mobile Cellular Phone
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz
Channel Bandwidth	LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz
Uplink Modulations Used	QPSK, and 16QAM
LTE Voice / Data requirements	Voice and Data
LTE MPR Permanently Built-in by Design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

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

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum Plots for RB Configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
LTE Release Version	R9, Cat 4
CA Support	Not Supported

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

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

LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

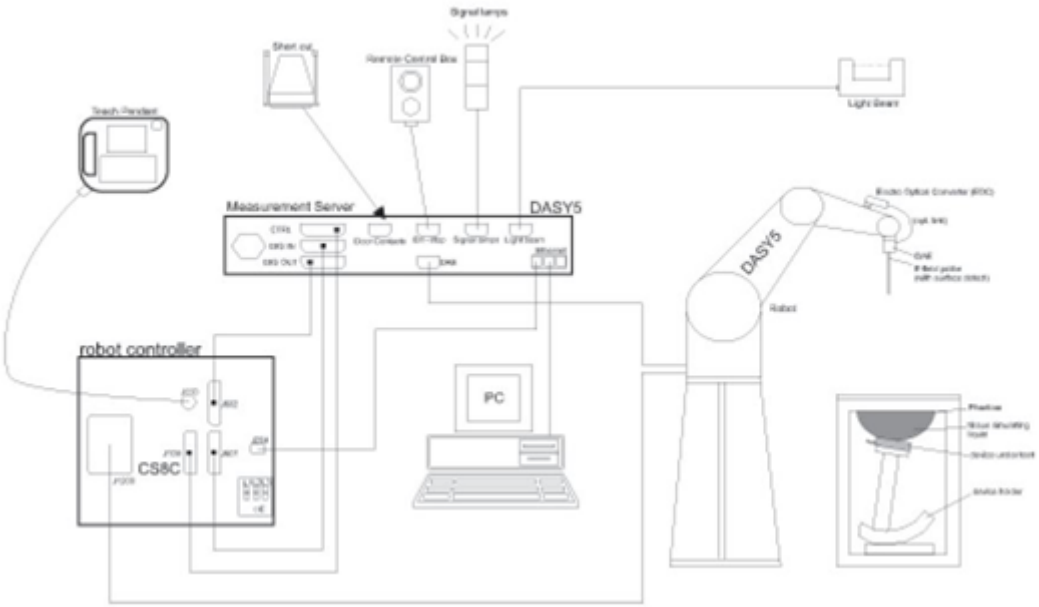
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



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

7.1 E-Field Probe

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

<EX3DV4 Probe>

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

7.2 Data Acquisition Electronics (DAE)

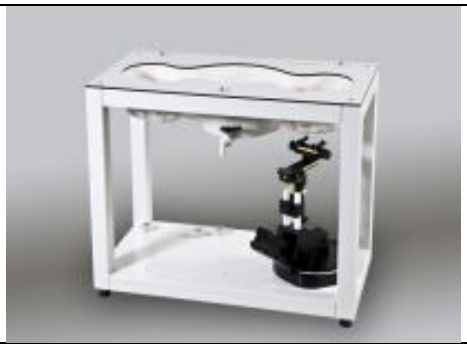
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

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

Fig 5.1 Photo of DAE

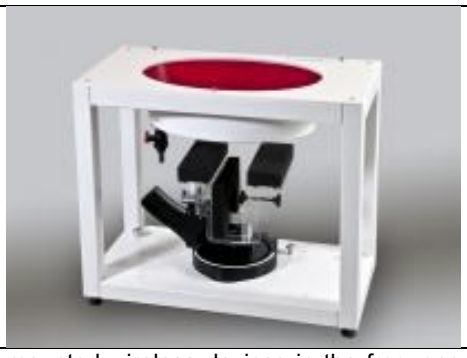
7.3 Phantom

<SAM Twin Phantom>

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

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

<ELI Phantom>

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

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

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

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

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

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

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

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

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

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

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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 Power Reference Measurement

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

8.3 Area Scan

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

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

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

8.4 Zoom Scan

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

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

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

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

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

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d091	2016/11/22	2017/11/21
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	2016/11/24	2017/11/23
SPEAG	2450MHz System Validation Kit	D2450V2	840	2016/11/25	2017/11/24
SPEAG	2600MHz System Validation Kit	D2600V2	1061	2016/11/24	2017/11/23
SPEAG	Data Acquisition Electronics	DAE4	1210	2016/5/18	2017/5/17
SPEAG	Data Acquisition Electronics	DAE4	1437	2016/7/12	2017/7/11
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2016/5/25	2017/5/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	3954	2016/11/28	2017/11/27
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1477	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1479	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1164	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300654	2016/8/8	2017/8/7
Agilent	Wireless Communication Test Set	E5515C	MY52102706	2017/4/18	2018/4/17
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2017/4/18	2018/4/17
R&S	CBT BLUETOOTH TESTER	CBT	101137	2016/8/9	2017/8/8
SPEAG	DAK Kit	DAK3.5	1144	2016/11/23	2017/11/22
R&S	Signal Generator	SMR40	100455	2017/1/19	2018/1/18
Anritsu	Power Senor	MA2411B	1644003	2016/12/23	2017/12/22
Anritsu	Power Meter	ML2495A	1531197	2016/12/23	2017/12/22
Anritsu	Power Senor	MA2411B	1644004	2016/12/23	2017/12/22
Anritsu	Power Meter	ML2495A	1531198	2016/12/23	2017/12/22
R&S	Spectrum Analyzer	FSV7	101631	2016/8/8	2017/8/7
ARRA	Power Divider	A3200-2	NA	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
AR	Amplifier	5S1G4	333096	Note	
mini-circuits	Amplifier	ZVE-3W-83+	162601250	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	

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

10. System Verification

10.1 Tissue Simulating Liquids

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

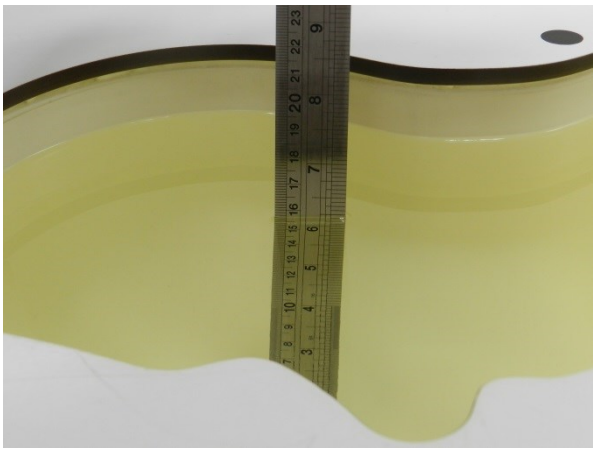


Fig 10.1 Photo of Liquid Height for Head SAR

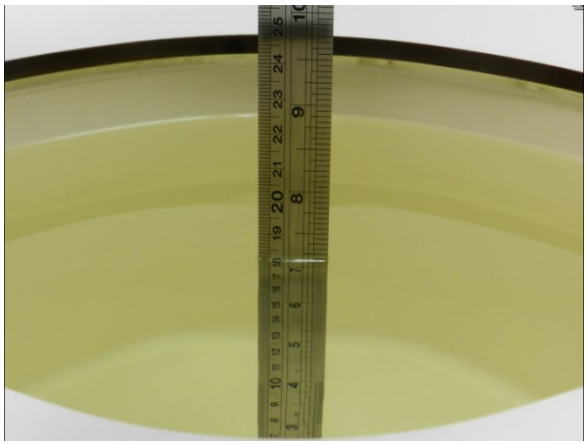


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

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

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

<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
835	Head	22.7	0.899	41.230	0.90	41.50	-0.11	-0.65	±5	2017.4.27
1900	Head	22.8	1.412	38.400	1.40	40.00	0.86	-4.00	±5	2017.4.28
2450	Head	22.7	1.861	38.654	1.80	39.20	3.39	-1.39	±5	2017.4.29
2600	Head	22.7	2.031	38.040	1.96	39.00	3.62	-2.46	±5	2017.4.29
835	Body	22.8	0.969	53.737	0.97	55.20	-0.10	-2.65	±5	2017.4.27
1900	Body	22.9	1.547	53.133	1.52	53.30	1.78	-0.31	±5	2017.4.28
2450	Body	22.7	2.016	52.654	1.95	52.70	3.38	-0.09	±5	2017.4.29
2600	Body	22.7	2.222	52.054	2.16	52.50	2.87	-0.85	±5	2017.4.29

10.3 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2017.4.27	835	Head	250	4d091	3857	1210	2.28	9.31	9.12	-2.04
2017.4.28	1900	Head	250	5d118	3857	1210	10.85	40.40	43.40	7.43
2017.4.29	2450	Head	250	840	3857	1210	14.18	54.00	56.72	5.04
2017.4.29	2600	Head	250	1061	3857	1210	14.68	56.00	58.72	4.86
2017.4.27	835	Body	250	4d091	3954	1437	2.57	9.68	10.28	6.20
2017.4.28	1900	Body	250	5d118	3857	1210	10.75	40.80	43.00	5.39
2017.4.29	2450	Body	250	840	3857	1210	13.56	50.90	54.24	6.56
2017.4.29	2600	Body	250	1061	3857	1210	14.80	55.40	59.20	6.86

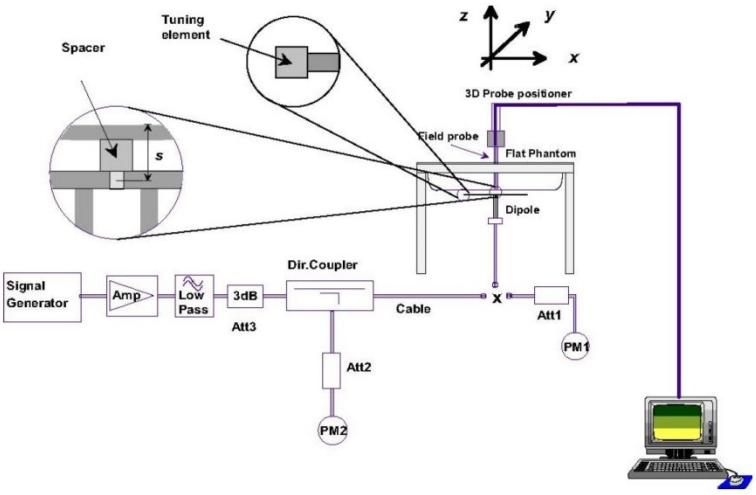


Fig 8.3.1 System Performance Check Setup

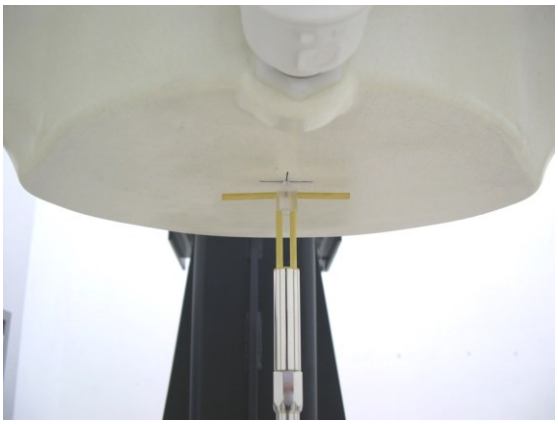


Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

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

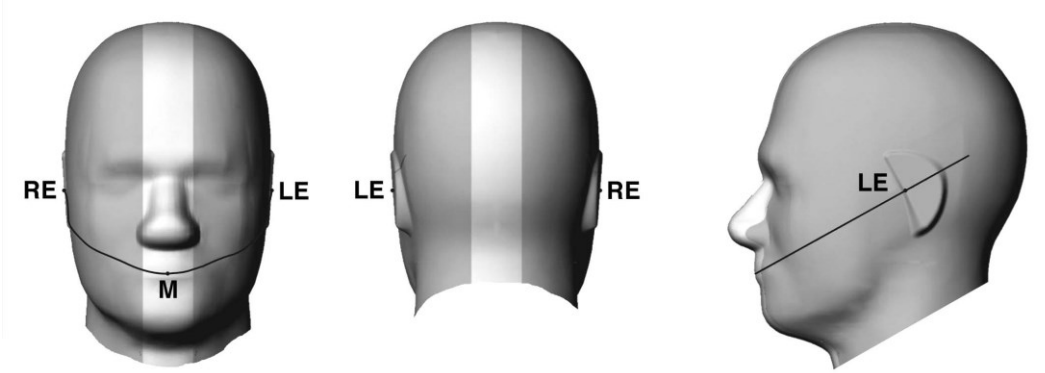


Fig 9.1.1 Front, back, and side views of SAM twin phantom

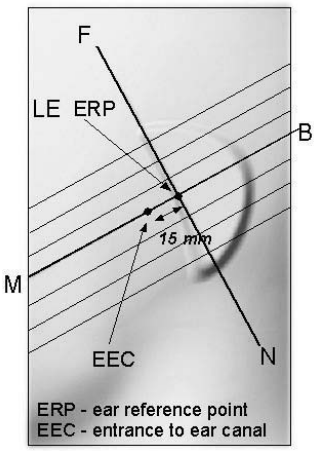


Fig 9.1.2 Close-up side view of phantom showing the ear region.

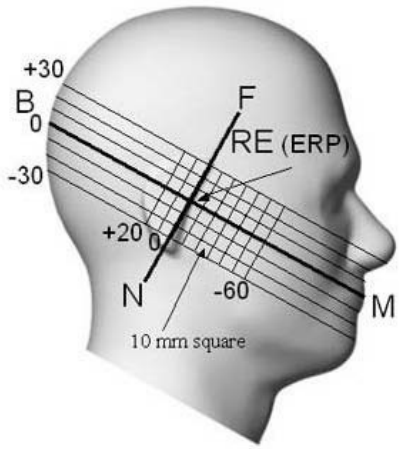


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

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

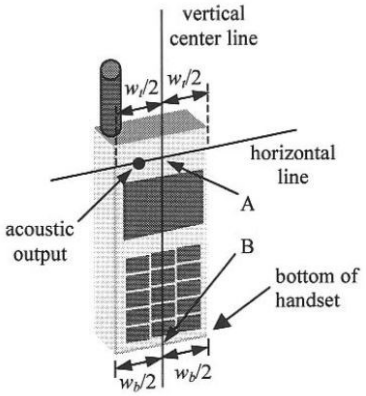


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

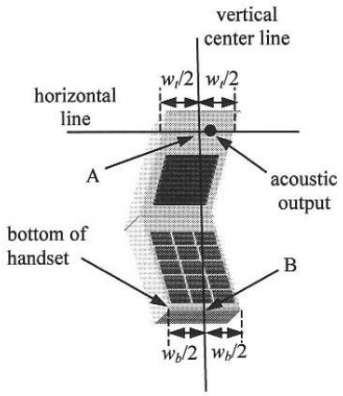


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

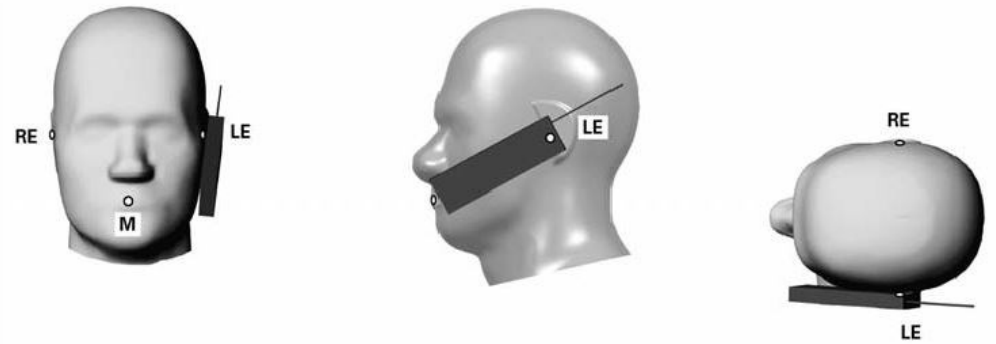


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

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

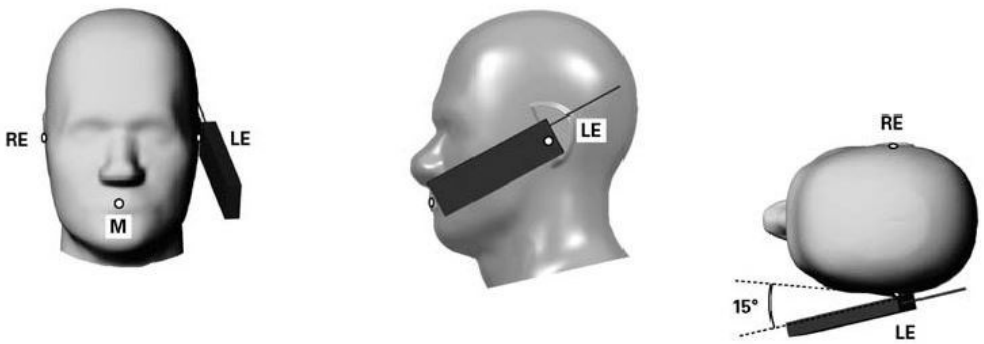


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

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

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

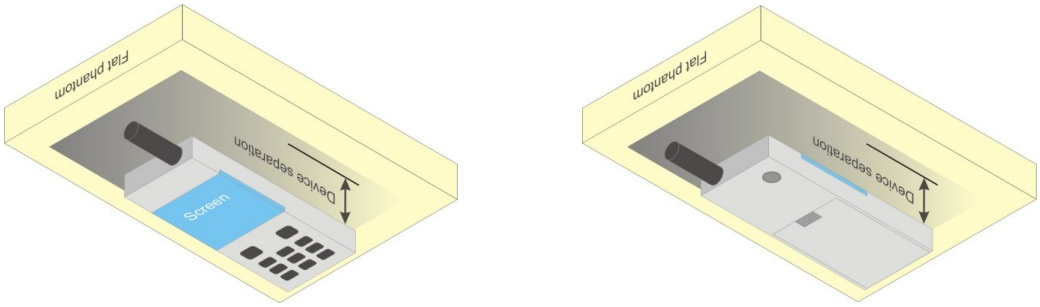


Fig 9.4 Body Worn Position

11.5 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>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	33.11	**33.13**	33.12	33.50	24.11	24.13	24.12	24.50
GPRS 1 Tx slot	33.09	33.12	33.11	33.50	24.09	24.12	24.11	24.50
GPRS 2 Tx slots	32.20	32.23	32.22	32.50	26.20	26.23	26.22	26.50
GPRS 3 Tx slots	29.95	29.37	29.34	30.50	25.69	25.11	25.08	26.24
GPRS 4 Tx slots	28.85	28.86	28.81	29.50	25.85	25.86	25.81	26.50
EDGE 1 Tx slot	26.87	26.85	26.86	27.50	17.87	17.85	17.86	18.50
EDGE 2 Tx slots	25.84	25.83	25.84	26.50	19.84	19.83	19.84	20.50
EDGE 3 Tx slots	23.87	23.85	23.86	24.50	19.61	19.59	19.60	20.24
EDGE 4 Tx slots	22.61	22.60	22.56	23.00	19.61	19.60	19.56	20.00

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

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	29.61	29.81	**29.96**	30.50	20.61	20.81	20.96	21.50
GPRS 1 Tx slot	29.59	29.79	29.94	30.50	20.59	20.79	20.94	21.50
GPRS 2 Tx slots	28.65	28.84	28.97	29.50	22.65	22.84	22.97	23.50
GPRS 3 Tx slots	26.72	26.88	27.02	27.50	22.46	22.62	22.76	23.24
GPRS 4 Tx slots	25.68	25.87	26.00	26.50	22.68	22.87	23.00	23.50
EDGE 1 Tx slot	25.13	25.27	25.29	25.50	16.13	16.27	16.29	16.50
EDGE 2 Tx slots	23.98	24.13	24.15	24.50	17.98	18.13	18.15	18.50
EDGE 3 Tx slots	21.90	22.02	22.07	22.50	17.64	17.76	17.81	18.24
EDGE 4 Tx slots	20.65	20.72	20.80	21.50	17.65	17.72	17.80	18.50

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.
3. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

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

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

C.8.1.12 Fixed Reference Channel Definition H-Set 12

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

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

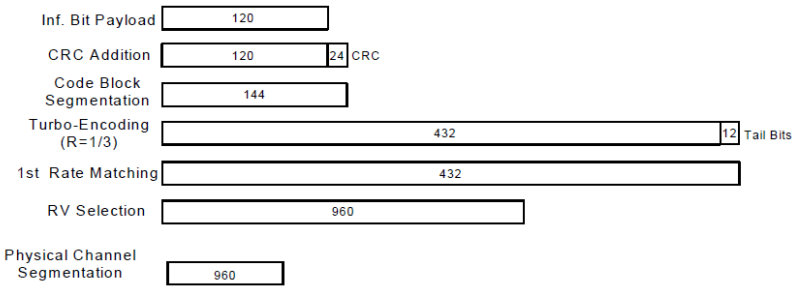


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, 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 = 5.2E:HSPA+:UL with 16QAM
   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, C11.1.4, quoted from the TS 34.121-1 s5.2E
   iii. Set Channel Parms
   iv. Set Cell Power = -86 dBm
   v. Set Channel Type = HSPA
   vi. Set UE Target Power =21 dBm
   vii. Power Ctrl Mode= All Up Bits
   viii. Set Manual Uplink DPCH Bc/Bd = Manual
   ix. Set Manual Uplink DPCH Bc and Bd=15,15(for 34.121-1 v8.10.0 table C11.1.4 sub-test 1)
   x. Set HSPA Conn DL Channel Levels
   xi. Set HS-SCCH Configs
   xii. Set RB Test Mode Setup
   xiii. Set Common HSUPA Parameters
   xiv. Set Serving Grant
   xv. Confirm that E-TFCI is equal to the target E-TFCI of 105 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.4: **β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM**

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	$\beta_{ed}1$: 30/15 $\beta_{ed}2$: 30/15	$\beta_{ed}3$: 24/15 $\beta_{ed}4$: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

Setup Configuration

<WCDMA Conducted Power>

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	22.91	23.07	23.15	23.50	22.92	22.98	22.90	23.50
3GPP Rel 99	RMC 12.2Kbps	22.93	23.08	**23.16**	23.50	22.93	**22.99**	22.92	23.50
3GPP Rel 6	HSDPA Subtest-1	21.95	22.16	22.07	22.50	21.77	21.97	21.90	22.50
3GPP Rel 6	HSDPA Subtest-2	21.93	22.19	22.04	22.50	21.78	21.94	21.93	22.50
3GPP Rel 6	HSDPA Subtest-3	21.49	21.72	21.61	22.00	21.31	21.50	21.44	22.00
3GPP Rel 6	HSDPA Subtest-4	21.45	21.68	21.58	22.00	21.31	21.48	21.43	22.00
3GPP Rel 8	DC-HSDPA Subtest-1	21.44	21.56	21.48	22.50	21.23	21.45	21.43	22.50
3GPP Rel 8	DC-HSDPA Subtest-2	21.40	21.55	21.46	22.50	21.20	21.43	21.41	22.50
3GPP Rel 8	DC-HSDPA Subtest-3	20.95	21.23	21.08	22.00	20.85	20.98	20.92	22.00
3GPP Rel 8	DC-HSDPA Subtest-4	20.93	21.21	21.02	22.00	20.81	20.95	20.90	22.00
3GPP Rel 6	HSUPA Subtest-1	19.97	20.17	20.08	20.50	19.73	19.97	19.93	20.50
3GPP Rel 6	HSUPA Subtest-2	19.93	20.22	20.12	20.50	19.88	19.99	19.94	20.50
3GPP Rel 6	HSUPA Subtest-3	20.90	21.20	21.05	21.50	20.91	20.95	20.92	21.50
3GPP Rel 6	HSUPA Subtest-4	19.35	19.63	19.55	20.50	19.21	19.39	19.31	20.50
3GPP Rel 6	HSUPA Subtest-5	21.90	22.10	22.00	22.50	21.80	21.90	21.90	22.50
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	19.62	19.71	19.66	20.50	19.68	19.88	19.79	20.50

<FDD LTE Conducted Power>

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	23.44	23.25	23.42	24.5	0
10	QPSK	1	25	23.27	23.3	23.38		
10	QPSK	1	49	23.27	23.29	23.4		
10	QPSK	25	0	22.49	22.35	22.46	23.5	1
10	QPSK	25	12	22.32	22.31	22.44		
10	QPSK	25	25	22.31	22.30	22.41		
10	QPSK	50	0	22.47	22.30	22.26		
10	16QAM	1	0	22.48	22.50	22.58	23.5	1
10	16QAM	1	25	22.54	22.53	22.66		
10	16QAM	1	49	22.53	22.54	22.63		
10	16QAM	25	0	22.29	22.31	22.43	22.5	2
10	16QAM	25	12	22.31	22.32	22.45		
10	16QAM	25	25	22.33	22.35	22.45		
10	16QAM	50	0	21.30	21.32	21.44		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	23.24	23.24	23.35	24.5	0
5	QPSK	1	12	23.24	23.25	23.15		
5	QPSK	1	24	23.15	23.27	23.37		
5	QPSK	12	0	22.32	22.29	22.43	23.5	1
5	QPSK	12	7	22.32	22.32	22.40		
5	QPSK	12	13	22.32	22.28	22.40		
5	QPSK	25	0	22.28	22.25	22.36		
5	16QAM	1	0	22.46	22.47	22.60	23.5	1
5	16QAM	1	12	22.51	22.50	22.63		
5	16QAM	1	24	22.46	22.40	22.40		
5	16QAM	12	0	21.31	21.34	21.42	22.5	2
5	16QAM	12	7	21.33	21.32	21.38		
5	16QAM	12	13	21.33	21.28	21.36		
5	16QAM	25	0	21.30	21.27	21.35		

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	23.20	23.19	23.24	24.5	0
3	QPSK	1	8	23.13	23.07	23.05		
3	QPSK	1	14	23.06	23.03	23.01		
3	QPSK	8	0	23.02	22.98	23.09	23.5	1
3	QPSK	8	4	23.29	22.29	22.34		
3	QPSK	8	7	22.27	22.22	22.34		
3	QPSK	15	0	22.28	22.27	22.39		
3	16QAM	1	0	22.36	22.41	22.42	23.5	1
3	16QAM	1	8	22.43	22.43	22.46		
3	16QAM	1	14	22.42	22.33	22.37		
3	16QAM	8	0	21.35	21.36	21.38	22.5	2
3	16QAM	8	4	21.35	21.32	21.34		
3	16QAM	8	7	21.33	21.27	21.34		
3	16QAM	15	0	21.29	21.29	21.36		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	23.21	23.23	23.27	24.5	0
1.4	QPSK	1	3	23.30	23.27	23.36		
1.4	QPSK	1	5	23.18	23.14	23.27		
1.4	QPSK	3	0	23.31	23.31	23.38		
1.4	QPSK	3	1	23.27	23.25	23.33		
1.4	QPSK	3	3	23.27	23.22	23.32		
1.4	QPSK	6	0	22.28	22.28	22.37	23.5	1
1.4	16QAM	1	0	22.42	22.50	22.43	23.5	1
1.4	16QAM	1	3	22.52	22.52	22.56		
1.4	16QAM	1	5	22.43	22.44	22.44		
1.4	16QAM	3	0	22.29	22.32	22.31		
1.4	16QAM	3	1	22.25	22.27	22.27		
1.4	16QAM	3	3	22.24	22.22	22.27		
1.4	16QAM	6	0	21.34	21.35	21.38	22.5	2

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	23.35	23.28	23.42	24	0
20	QPSK	1	49	23.22	23.09	23.41		
20	QPSK	1	99	23.12	23.18	23.39		
20	QPSK	50	0	22.33	22.24	22.51	23	1
20	QPSK	50	24	22.29	22.13	22.50		
20	QPSK	50	50	22.25	22.15	22.49		
20	QPSK	100	0	22.29	22.18	22.48		
20	16QAM	1	0	22.48	22.34	22.60	23	1
20	16QAM	1	49	22.39	22.26	22.59		
20	16QAM	1	99	22.36	22.47	22.58		
20	16QAM	50	0	21.27	21.10	21.41	22	2
20	16QAM	50	24	21.22	21.05	21.42		
20	16QAM	50	50	21.18	21.14	21.43		
20	16QAM	100	0	21.20	21.11	21.39		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	23.31	23.10	23.41	24	0
15	QPSK	1	37	23.24	23.08	23.43		
15	QPSK	1	74	23.17	23.20	23.39		
15	QPSK	36	0	22.37	22.16	22.50	23	1
15	QPSK	36	20	22.31	22.15	22.52		
15	QPSK	36	39	22.28	22.19	22.49		
15	QPSK	75	0	22.32	22.17	22.49		
15	16QAM	1	0	22.45	22.28	22.60	23	1
15	16QAM	1	37	22.42	22.26	22.62		
15	16QAM	1	74	22.35	22.39	22.58		
15	16QAM	36	0	21.24	21.08	21.42	22	2
15	16QAM	36	20	21.21	21.07	21.43		
15	16QAM	36	39	21.18	21.10	21.41		
15	16QAM	75	0	21.22	21.09	21.41		

Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	23.31	23.08	23.40	24	0
10	QPSK	1	25	23.26	23.07	23.39		
10	QPSK	1	49	23.42	23.13	23.50		
10	QPSK	25	0	22.31	22.12	22.45	23	1
10	QPSK	25	12	22.28	22.11	22.45		
10	QPSK	25	25	22.28	22.15	22.43		
10	QPSK	50	0	22.34	22.15	22.47		
10	16QAM	1	0	22.43	22.27	22.58	23	1
10	16QAM	1	25	22.39	22.26	22.56		
10	16QAM	1	49	22.34	22.32	22.51		
10	16QAM	25	0	21.23	21.04	21.40	22	2
10	16QAM	25	12	21.19	21.04	21.37		
10	16QAM	25	25	21.19	21.06	21.35		
10	16QAM	50	0	21.23	21.06	21.40		
Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	23.29	23.06	23.37	24	0
5	QPSK	1	12	23.29	23.39	23.36		
5	QPSK	1	24	23.20	23.19	23.25		
5	QPSK	12	0	22.16	22.10	22.08	23	1
5	QPSK	12	7	22.39	22.08	22.40		
5	QPSK	12	13	22.32	22.10	22.42		
5	QPSK	25	0	22.32	22.08	22.39		
5	16QAM	1	0	22.43	22.23	22.54	23	1
5	16QAM	1	12	22.41	22.23	22.52		
5	16QAM	1	24	22.36	22.26	22.47		
5	16QAM	12	0	21.25	21.05	21.36	22	2
5	16QAM	12	7	21.23	21.02	21.33		
5	16QAM	12	13	21.23	21.02	21.33		
5	16QAM	25	0	21.21	21.01	21.33		

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

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

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

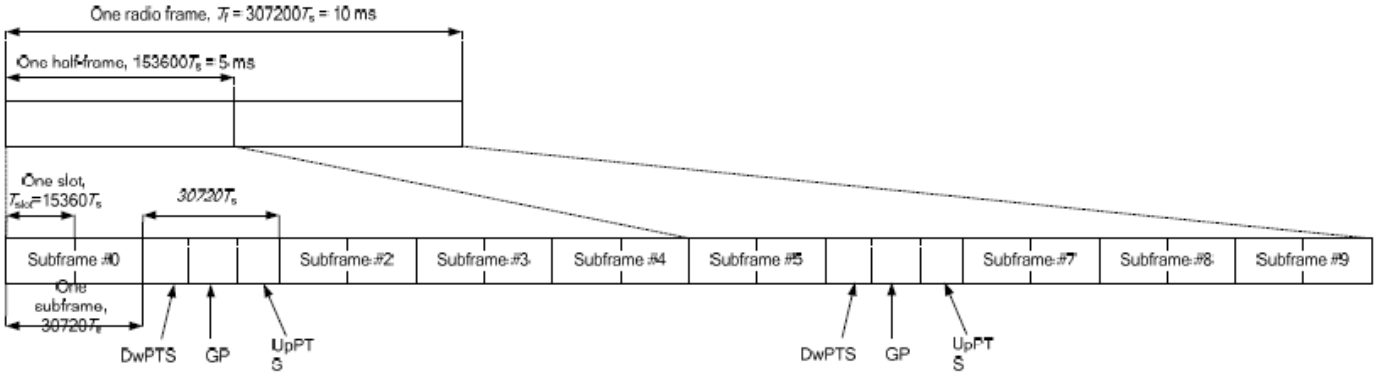


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

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

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

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

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

The highest duty factor is resulted from:

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

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

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

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

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

<LTE Band 38>

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	23.05	22.77	22.80	23.5	0
20	QPSK	1	49	22.85	22.55	22.68		
20	QPSK	1	99	22.73	21.96	22.69		
20	QPSK	50	0	22.04	21.99	21.75	22.5	1
20	QPSK	50	24	21.85	21.58	21.73		
20	QPSK	50	50	21.81	21.59	21.68		
20	QPSK	100	0	21.86	21.61	21.71		
20	16QAM	1	0	22.11	21.83	21.72	22.5	1
20	16QAM	1	49	21.90	21.60	21.76		
20	16QAM	1	99	21.80	21.72	21.87		
20	16QAM	50	0	20.99	20.74	20.73	21.5	2
20	16QAM	50	24	20.91	20.65	20.80		
20	16QAM	50	50	20.86	20.67	20.81		
20	16QAM	100	0	20.92	20.68	20.77		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	23.06	22.75	22.72	23.5	0
15	QPSK	1	37	22.95	22.58	22.75		
15	QPSK	1	74	22.83	22.66	22.82		
15	QPSK	36	0	22.01	21.70	21.72	22.5	1
15	QPSK	36	20	21.96	21.60	21.77		
15	QPSK	36	39	21.88	21.56	21.80		
15	QPSK	75	0	21.92	21.62	21.76		
15	16QAM	1	0	22.05	21.78	21.71	22.5	1
15	16QAM	1	37	21.94	21.60	21.79		
15	16QAM	1	74	21.85	21.67	21.89		
15	16QAM	36	0	20.95	20.68	20.72	21.5	2
15	16QAM	36	20	20.90	20.61	20.77		
15	16QAM	36	39	20.86	20.59	20.79		
15	16QAM	75	0	20.96	20.68	20.82		

Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	22.96	22.66	22.72	23.5	0
10	QPSK	1	25	22.95	22.59	22.78		
10	QPSK	1	49	22.89	22.71	22.79		
10	QPSK	25	0	21.95	21.59	21.72	22.5	1
10	QPSK	25	12	21.94	21.51	21.77		
10	QPSK	25	25	21.91	21.52	21.80		
10	QPSK	50	0	21.92	21.58	21.77		
10	16QAM	1	0	22.03	21.71	21.78	22.5	1
10	16QAM	1	25	21.96	21.68	21.82		
10	16QAM	1	49	21.91	21.58	21.86		
10	16QAM	25	0	20.95	20.65	20.81	21.5	2
10	16QAM	25	12	20.94	20.58	20.83		
10	16QAM	25	25	20.90	20.61	20.84		
10	16QAM	50	0	20.93	20.66	20.83		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	22.67	22.57	22.77	23.5	0
5	QPSK	1	12	22.78	22.59	22.81		
5	QPSK	1	24	22.68	22.56	22.59		
5	QPSK	12	0	21.96	21.67	21.89	22.5	1
5	QPSK	12	7	21.98	21.53	21.81		
5	QPSK	12	13	21.96	21.54	21.82		
5	QPSK	25	0	21.95	21.53	21.79		
5	16QAM	1	0	21.98	21.61	21.80	22.5	1
5	16QAM	1	12	21.99	21.58	21.89		
5	16QAM	1	24	21.87	21.52	21.92		
5	16QAM	12	0	20.93	20.59	20.85	21.5	2
5	16QAM	12	7	20.90	20.54	20.82		
5	16QAM	12	13	20.92	20.56	20.85		
5	16QAM	25	0	20.95	20.58	20.85		

<WLAN Conducted Power>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b	CH 1	2412	1Mbps	15.38	16.00	100.00
		CH 6	2437		**17.64**	18.50	
		CH 11	2462		15.95	17.00	
	802.11g	CH 1	2412	6Mbps	11.76	13.00	97.46
		CH 6	2437		12.72	14.00	
		CH 11	2462		11.65	13.00	
	802.11n-HT20	CH 1	2412	MCS0	11.77	13.00	97.30
		CH 6	2437		12.76	14.00	
		CH 11	2462		12.20	14.00	

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0/4.1/4.2 LE
2.4GHz Bluetooth	7.0	7.0

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

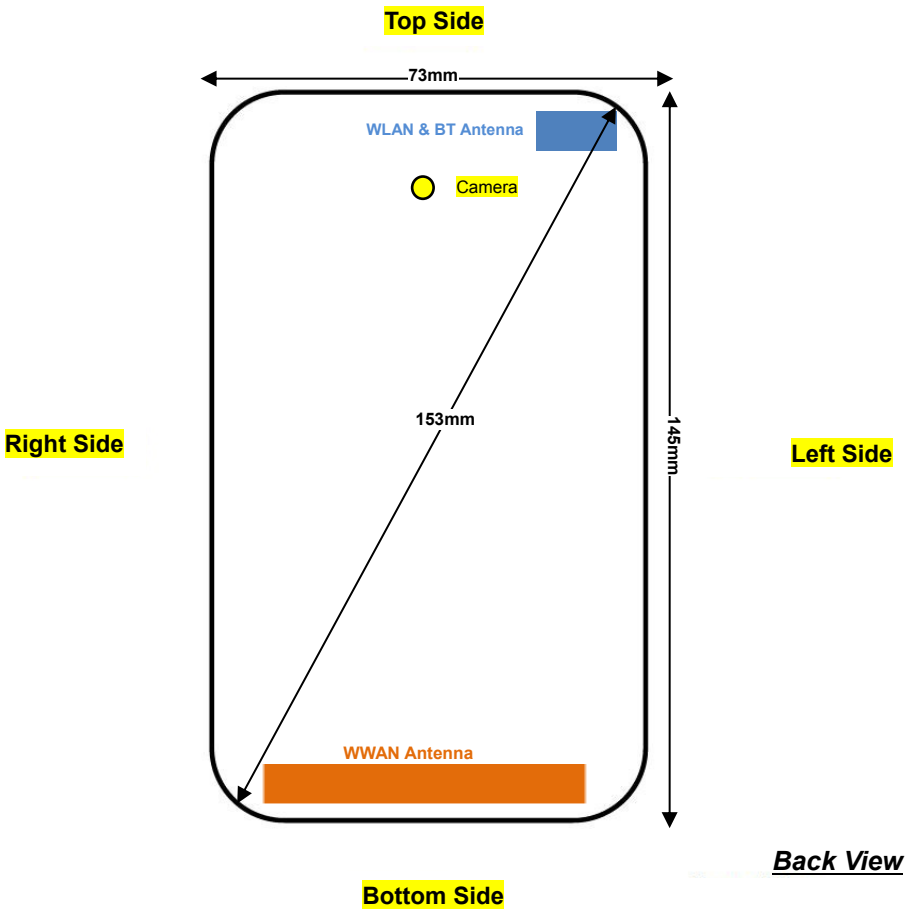
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

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

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion Thresholds
7.0	10	2.48	0.8

Note:
Per KDB 447498 D01v06, the test exclusion threshold is 0.8 which is <= 3, SAR testing is not required.

14. Antenna Location



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

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

General Note:
Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

15.1 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)
#01	GSM850	GPRS 4 Tx slots	Left Cheek	189	836.4	28.86	29.50	1.159	0.08	0.499	**0.578**
#02	GSM1900	GPRS 4 Tx slots	Right Cheek	810	1909.8	26.00	26.50	1.122	0.02	0.243	**0.273**

<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)
#03	WCDMA Band V	RMC 12.2Kbps	Left Cheek	4182	836.4	22.99	23.50	1.125	-0.05	0.392	**0.441**
#04	WCDMA Band II	RMC 12.2Kbps	Right Cheek	9538	1907.6	23.16	23.50	1.081	0.16	0.371	**0.401**

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	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)
#05	LTE Band 5	10M	QPSK	1	0	Left Cheek	20525	836.5	23.25	24.50	1.334	0.02	0.286	**0.381**
#06	LTE Band 7	20M	QPSK	1	0	Left Cheek	21350	2560	23.42	24.00	1.143	0.01	0.328	**0.375**

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	RB Size	RB Offset	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	LTE Band 38	20M	QPSK	1	0	Left Cheek	38000	2595	22.77	23.50	1.183	62.9	1.006	0.08	0.222	**0.264**

<WLAN 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)
#08	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	6	2437	17.64	18.50	1.219	100	1.000	-0.03	0.943	**1.150**
	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	11	2462	15.95	17.00	1.274	100	1.000	-0.03	0.676	0.861

15.2 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)
	GSM850	GPRS 4 Tx slots	Back	10	128	824.2	28.85	29.5	1.161	0.08	0.725	0.842
#09	GSM850	GPRS 4 Tx slots	Back	10	189	836.4	28.86	29.5	1.159	0.03	0.750	**0.869**
	GSM850	GPRS 4 Tx slots	Back	10	251	848.8	28.81	29.5	1.172	0.01	0.718	0.842
#10	GSM1900	GPRS 4 Tx slots	Back	10	810	1909.8	26.00	26.5	1.122	0.02	0.330	**0.370**

<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)
#11	WCDMA Band V	RMC 12.2Kbps	Back	10	4182	836.4	22.99	23.5	1.125	0.01	0.586	**0.659**
#12	WCDMA Band II	RMC 12.2Kbps	Back	10	9538	1907.6	23.16	23.5	1.081	0.03	0.468	**0.506**

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	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)
#13	LTE Band 5	10M	QPSK	1	0	Back	10	20525	836.5	23.25	24.5	1.334	0.04	0.490	**0.653**
#14	LTE Band 7	20M	QPSK	1	0	Front	10	21350	2560	23.42	24	1.143	-0.08	0.601	**0.687**

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	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)	Reported 1g SAR (W/kg)
	LTE Band 38	20M	QPSK	1	0	Front	10	38000	2595	22.77	23.5	1.183	62.9	1.006	-0.13	0.345	0.411
#15	LTE Band 38	20M	QPSK	1	0	Bottom Side	10	38000	2595	22.77	23.5	1.183	62.9	1.006	0.02	0.388	**0.462**

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#16	WLAN 2.4GHz	802.11b 1Mbps	Back	10	6	2437	17.64	18.50	1.219	100	1.000	-0.09	0.331	**0.403**

15.3 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)
	GSM850	GPRS 4 Tx slots	Back	10	128	824.2	28.85	29.5	1.161	0.08	0.725	0.842
#09	GSM850	GPRS 4 Tx slots	Back	10	189	836.4	28.86	29.5	1.159	0.03	0.750	**0.869**
	GSM850	GPRS 4 Tx slots	Back	10	251	848.8	28.81	29.5	1.172	0.01	0.718	0.842
#10	GSM1900	GPRS 4 Tx slots	Back	10	810	1909.8	26	26.5	1.122	0.02	0.330	**0.370**

<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)
#11	WCDMA Band V	RMC 12.2Kbps	Back	10	4182	836.4	22.99	23.5	1.125	0.01	0.586	**0.659**
#12	WCDMA Band II	RMC 12.2Kbps	Back	10	9538	1907.6	23.16	23.5	1.081	0.03	0.468	**0.506**

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	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)
#13	LTE Band 5	10M	QPSK	1	0	Back	10	20525	836.5	23.25	24.5	1.334	0.04	0.490	**0.653**
#14	LTE Band 7	20M	QPSK	1	0	Front	10	21350	2560	23.42	24	1.143	-0.08	0.601	**0.687**

<TDD LTE SAR>

Plot No.	Band	BW (MHz)	Mode	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)	Reported 1g SAR (W/kg)
#17	LTE Band 38	20M	QPSK	1	0	Front	10	38000	2595	22.77	23.5	1.183	62.9	1.006	-0.13	0.345	**0.411**

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#16	WLAN 2.4GHz	802.11b 1Mbps	Back	10	6	2437	17.64	18.50	1.219	100	1.000	-0.09	0.331	**0.403**

15.4 Repeated SAR Measurement

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)	Ratio	Reported 1g SAR (W/kg)
1st	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	6	2437	17.64	18.50	1.219	100	1.000	-0.03	0.943	1	1.150
2nd	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	6	2437	17.64	18.50	1.219	100	1.000	0.09	0.911	1.035	1.110

General Note:

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

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Mobile Cellular Phone			Note
		Head	Body-worn	Hotspot	
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes	Hotspot
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	Hotspot
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	Hotspot
5.	GSM Voice + Bluetooth		Yes		
6.	GPRS/EDGE + Bluetooth		Yes		WWAN VoIP
7.	WCDMA + Bluetooth		Yes		WWAN VoIP
8.	LTE + Bluetooth		Yes		WWAN VoIP

General Note:

1. For simultaneously transmission SAR analysis, SAR values only considered the worst position which we did perform SAR testing on FA742708-01, other test results were leverage from the parent model which referred to the test report number FA711913-01.
2. This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
3. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
4. WLAN 2.4GHz and Bluetooth share the same antenna so can't transmit simultaneously.
5. Chose the worst zoom scan SAR of WLAN2.4GHz SAR correspondingly for co-located with WWAN analysis.
6. The reported SAR summation is calculated based on the same configuration and test position.
7. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
8. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power	Exposure Position	Body Worn
	Test Separation	10 mm
7.0 dBm	Estimated SAR (W/kg)	0.105 W/kg

16.1 Head Exposure Conditions

WWAN Band		Exposure Position	1	2	1+2 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	
			1g SAR (W/kg)	1g SAR (W/kg)	
GSM	GSM850	Right Tilted	0.409	1.150	**1.56**
		Left Cheek	0.578	0.536	1.11
	GSM1900	Right Cheek	0.273	1.016	1.29
		Right Tilted	0.136	1.150	1.29
WCDMA	Band V	Right Tilted	0.196	1.150	1.35
		Left Cheek	0.441	0.536	0.98
	Band II	Right Cheek	0.401	1.016	1.42
		Right Tilted	0.229	1.150	1.38
LTE	Band 5	Right Tilted	0.287	1.150	1.44
		Left Cheek	0.381	0.536	0.92
	Band 7	Right Tilted	0.286	1.150	1.44
		Left Cheek	0.375	0.536	0.91
	Band 38	Right Tilted	0.126	1.150	1.28
		Left Cheek	0.264	0.536	0.80

16.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	1+2 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	
			1g SAR (W/kg)	1g SAR (W/kg)	
GSM	GSM850	Back	0.869	0.403	1.27
	GSM1900	Back	0.370	0.403	0.77
WCDMA	Band V	Back	0.659	0.403	1.06
	Band II	Back	0.506	0.403	0.91
LTE	Band 5	Back	0.653	0.403	1.06
	Band 7	Front	0.687	0.403	1.09
		Back	0.593	0.403	1.00
	Band 38	Front	0.411	0.403	0.81
		Back	0.362	0.403	0.77
		Bottom side	0.462		0.46

16.3 Body-Worn Accessory 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)	Estimated 1g SAR (W/kg)		
GSM	GSM850	Back	0.869	0.403	0.105	1.27	0.97
	GSM1900	Back	0.370	0.403	0.105	0.77	0.48
WCDMA	Band V	Back	0.659	0.403	0.105	1.06	0.76
	Band II	Back	0.506	0.403	0.105	0.91	0.61
LTE	Band 5	Back	0.653	0.403	0.105	1.06	0.76
	Band 7	Front	0.687	0.403	0.105	1.09	0.79
		Back	0.593	0.403	0.105	1.00	0.70
	Band 38	Front	0.411	0.403	0.105	0.81	0.52
		Back	0.362	0.403	0.105	0.77	0.47

Test Engineer： Nick Hu

17. Uncertainty Assessment

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

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

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

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

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

(b) κ is the coverage factor

Table 17.1. Standard Uncertainty for Assumed Distribution

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

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

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

Table 17.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

18. References

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

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

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

[4] SPEAG DASY System Handbook

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

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

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

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

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

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

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

[12] FCC KDB 941225 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: 2017.4.27

System Check_Head_835MHz

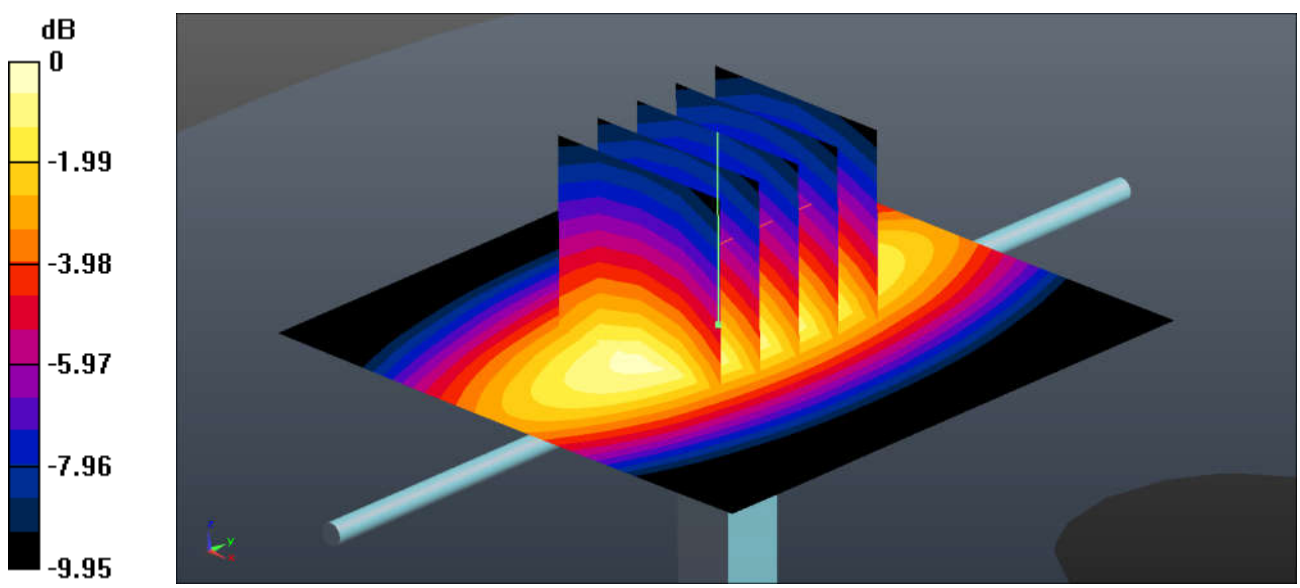
DUT: D835V2 - SN:4d091

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 835 MHz; σ = 0.899 S/m; ε_r = 41.23; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(9.32, 9.32, 9.32); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.85 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.35 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 2.28 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

System Check_Head_1900MHz

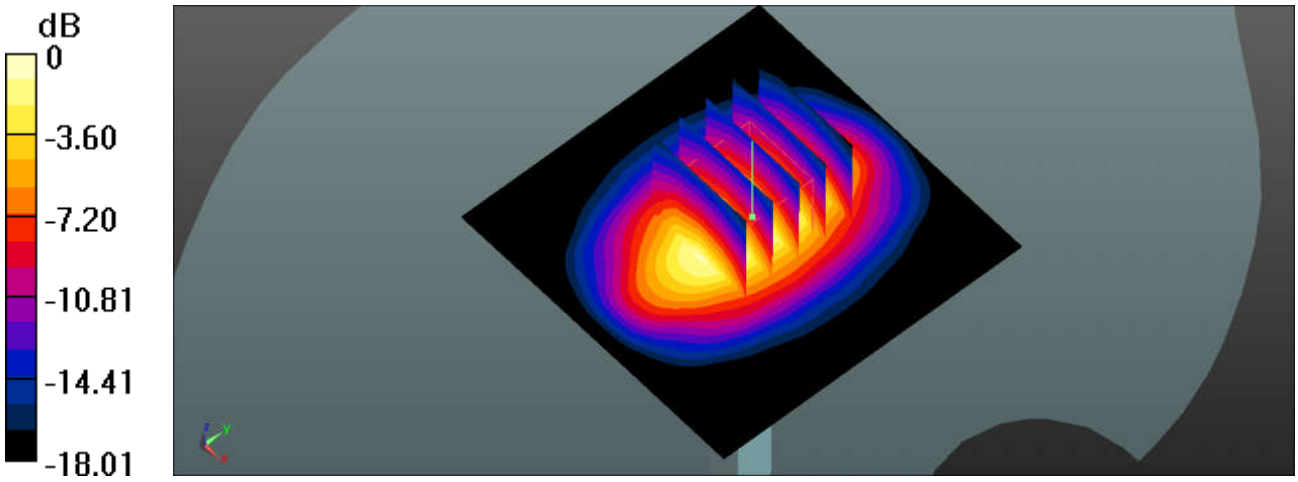
DUT: D1900V2 - SN:5d118

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.412 S/m; ε_r = 38.4; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.85, 7.85, 7.85); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 16.2 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 93.83 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 20.5 W/kg
SAR(1 g) = 10.85 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 14.9 W/kg



0 dB = 14.9 W/kg = 12.01 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

System Check_Head_2450MHz

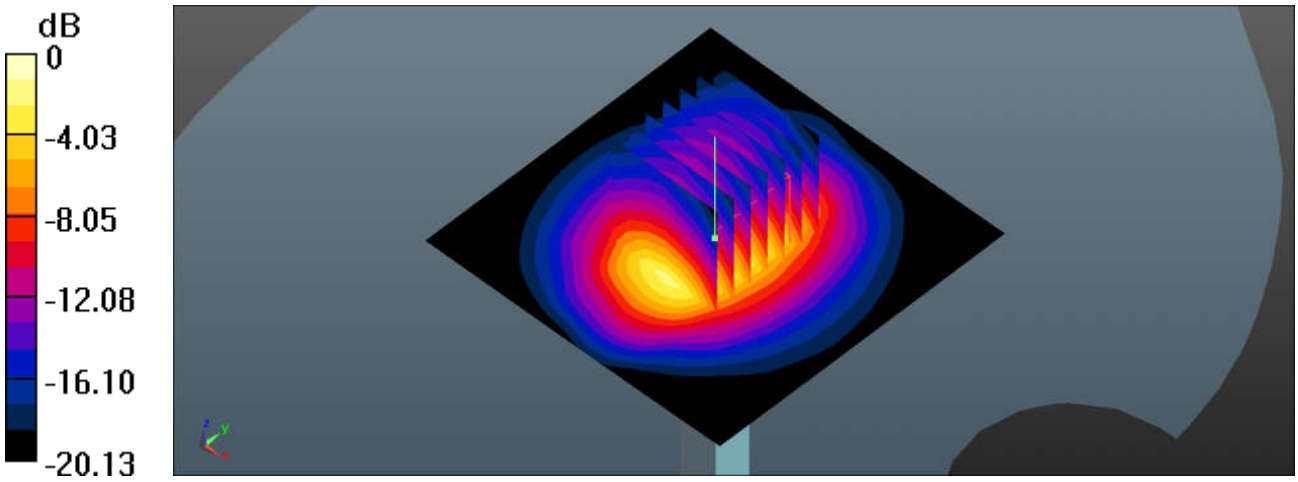
DUT: D2450V2 - SN:840

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2450 MHz; σ = 1.861 S/m; ε_r = 38.654; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.19, 7.19, 7.19); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 22.9 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.58 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 14.18 W/kg; SAR(10 g) = 6.94 W/kg
Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 22.3 W/kg = 13.48 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

System Check_Head_2600MHz

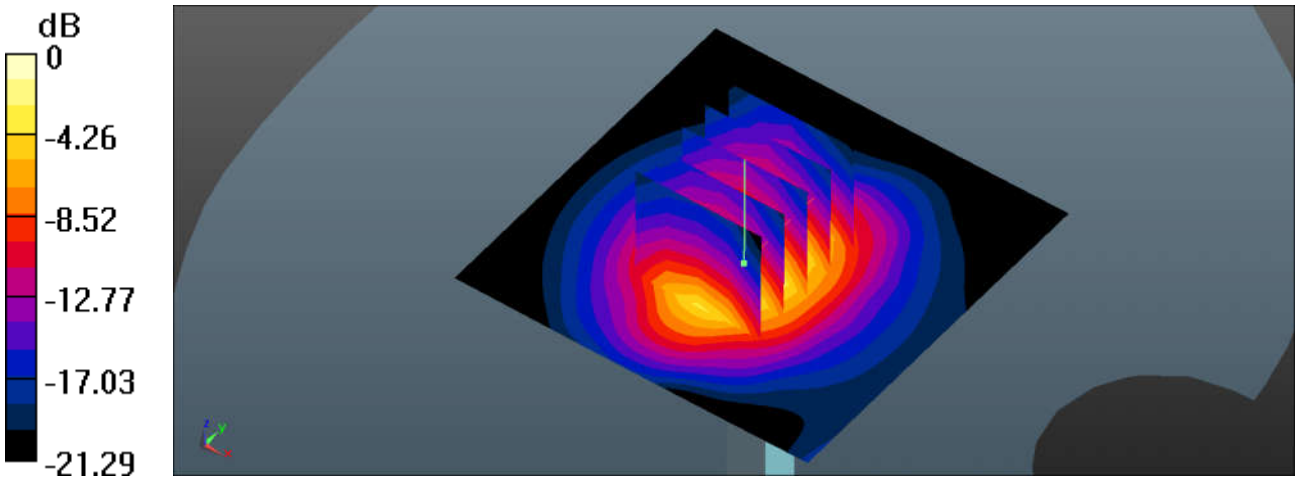
DUT: D2600V2 - SN:1061

Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: HSL_2600 Medium parameters used: f = 2600 MHz; σ = 2.031 S/m; ε_r = 38.04; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.08, 7.08, 7.08); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 24.3 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 90.26 V/m; Power Drift = -0.36 dB
Peak SAR (extrapolated) = 31.1 W/kg
SAR(1 g) = 14.68 W/kg; SAR(10 g) = 6.89 W/kg
Maximum value of SAR (measured) = 22.8 W/kg



0 dB = 22.8 W/kg = 13.77 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

System Check_Body_835MHz

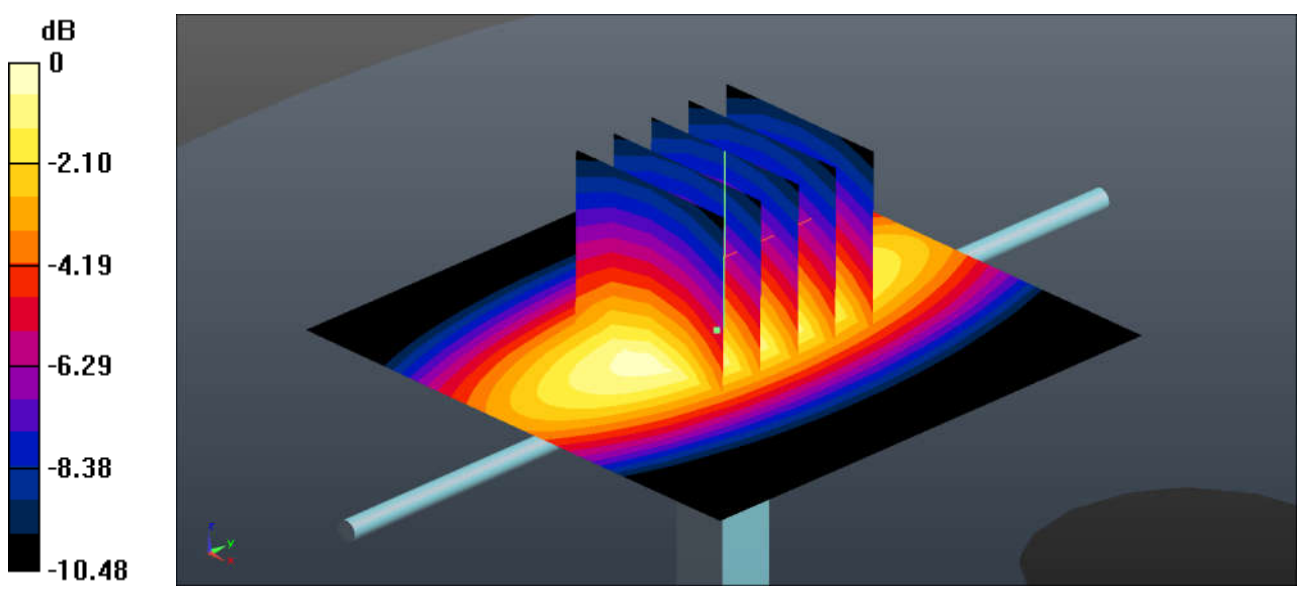
DUT: D835V2 - SN:4d091

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 835 MHz; σ = 0.969 S/m; ε_r = 53.737; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2016.7.12
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.37 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.48 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.87 W/kg
SAR(1 g) = 2.57 W/kg; SAR(10 g) = 1.75 W/kg
Maximum value of SAR (measured) = 3.04 W/kg



0 dB = 3.04 W/kg = 5.24 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

System Check_Body_1900MHz

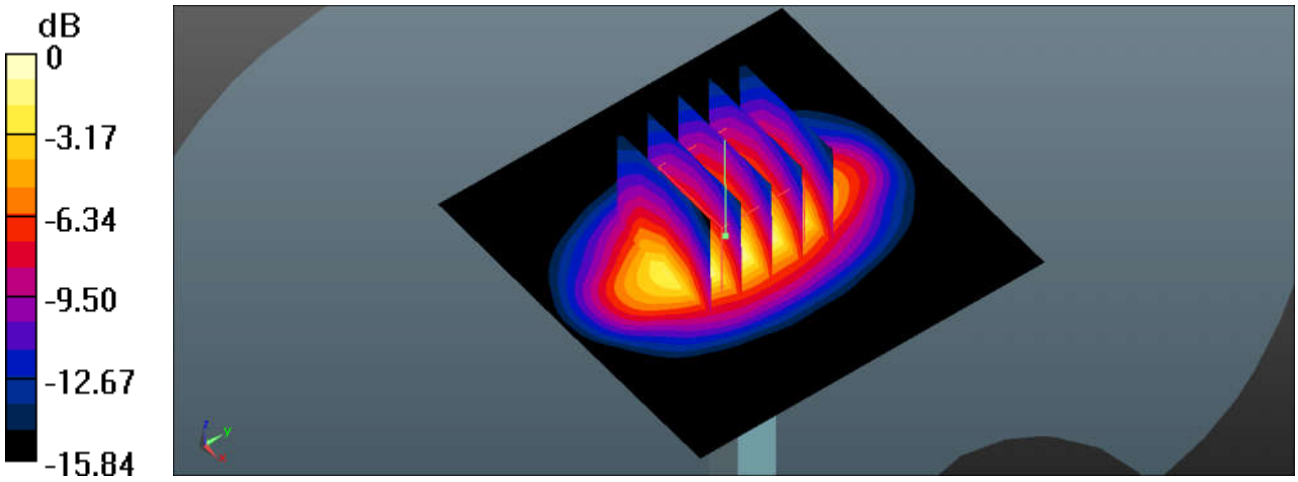
DUT: D1900V2 - SN:5d118

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900 Medium parameters used: f = 1900 MHz; σ = 1.547 S/m; ε_r = 53.133; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 16.4 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 91.26 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 19.8 W/kg
SAR(1 g) = 10.75 W/kg; SAR(10 g) = 5.89 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 12.12 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

System Check_Body_2450MHz

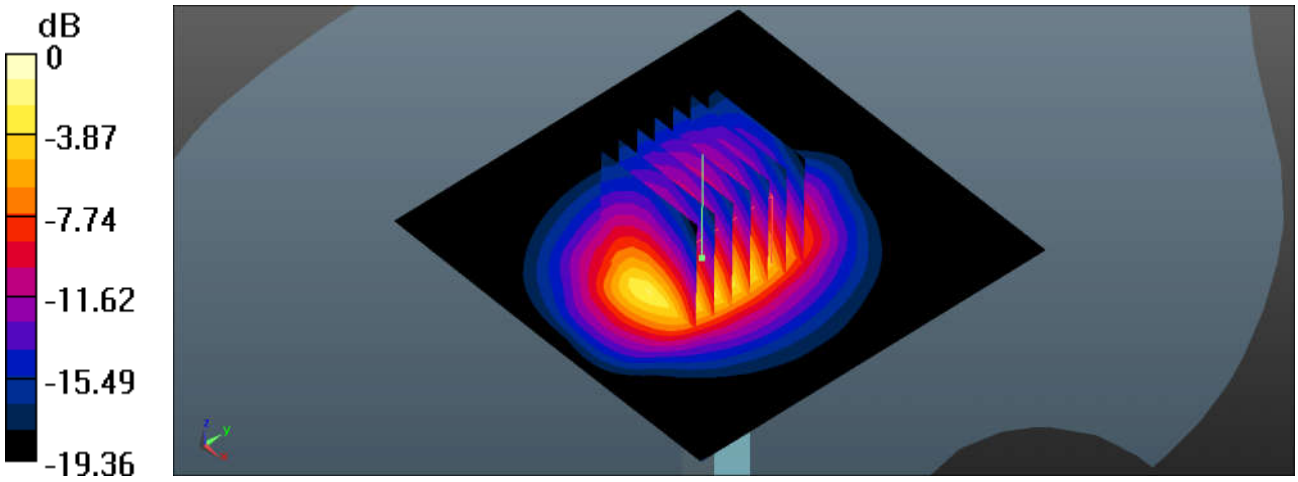
DUT: D2450V2 - SN:840

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450 Medium parameters used: f = 2450 MHz; σ = 2.016 S/m; ε_r = 52.654; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.23, 7.23, 7.23); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 21.0 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.08 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 26.8 W/kg
SAR(1 g) = 13.56 W/kg; SAR(10 g) = 6.75 W/kg
Maximum value of SAR (measured) = 20.7 W/kg



0 dB = 20.7 W/kg = 13.16 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

System Check_Body_2600MHz

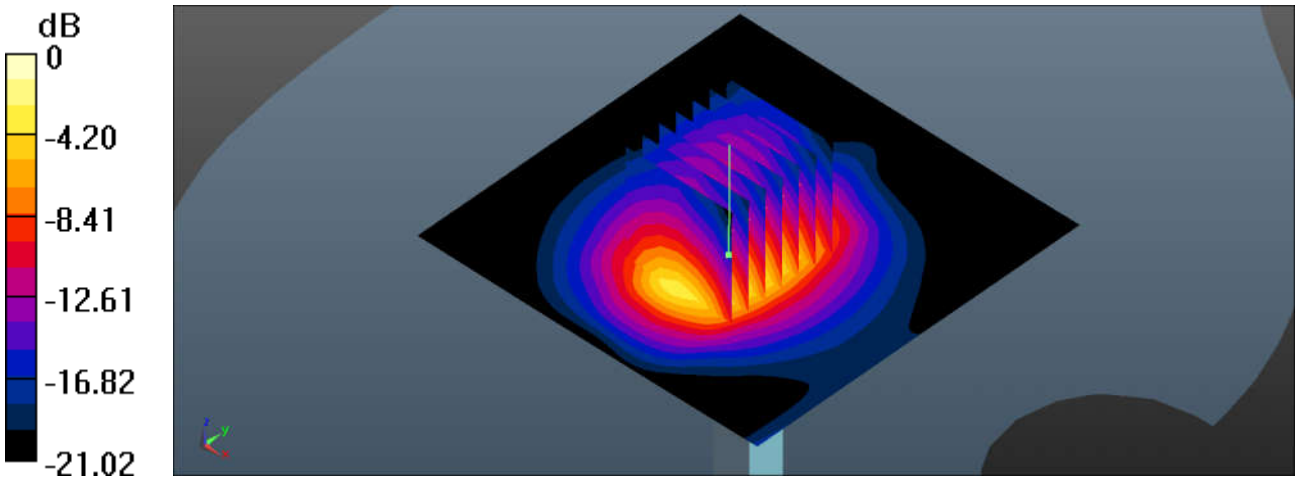
DUT: D2600V2 - SN:1061

Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL_2600 Medium parameters used: f = 2600 MHz; σ = 2.222 S/m; ε_r = 52.054; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 23.8 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.19 V/m; Power Drift = -0.28 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.94 W/kg
Maximum value of SAR (measured) = 20.6 W/kg



0 dB = 20.6 W/kg = 13.73 dBW/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

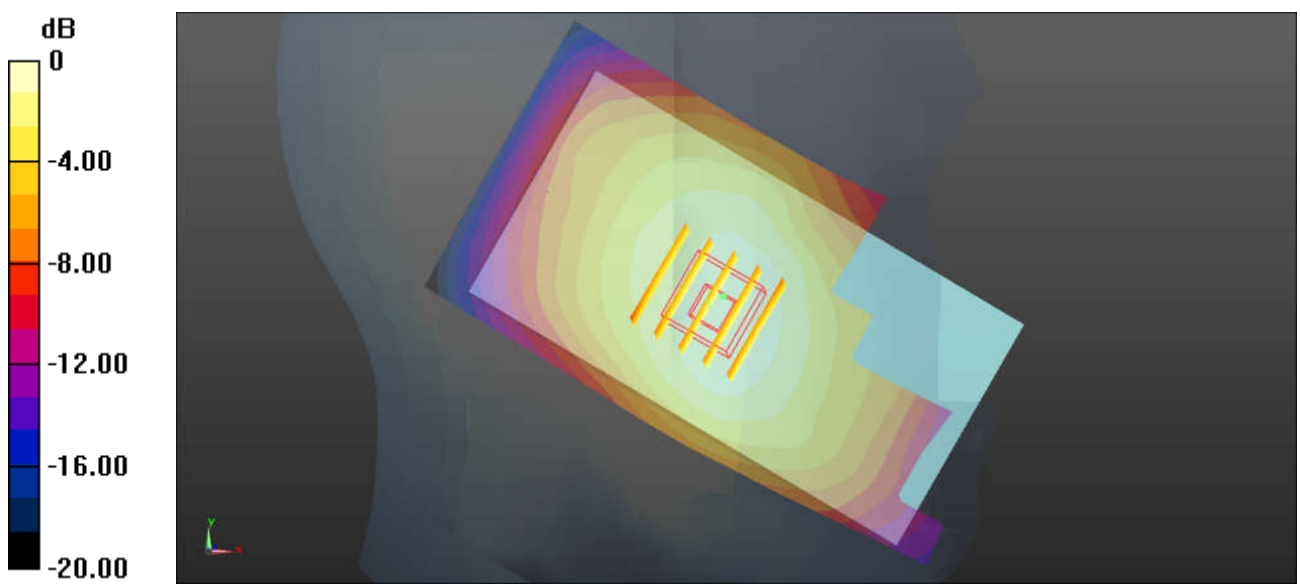
#01_GSM850_GPRS 4 Tx slots_Left Cheek_0mm_Ch189

Communication System: UID 0, GPRS/EDGE (4 Tx slots) (0); Frequency: 836.4 MHz;Duty Cycle: 1:2.08
Medium: HSL_850 Medium parameters used: f = 836.4 MHz; σ = 0.913 S/m; ε_r = 42.739; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(9.32, 9.32, 9.32); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch189/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.594 W/kg

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.99 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.626 W/kg
SAR(1 g) = 0.499 W/kg; SAR(10 g) = 0.386 W/kg
Maximum value of SAR (measured) = 0.564 W/kg



0 dB = 0.594 W/kg = -2.26 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

#02_GSM1900_GPRS 4 Tx slots_Right Cheek_0mm_Ch810

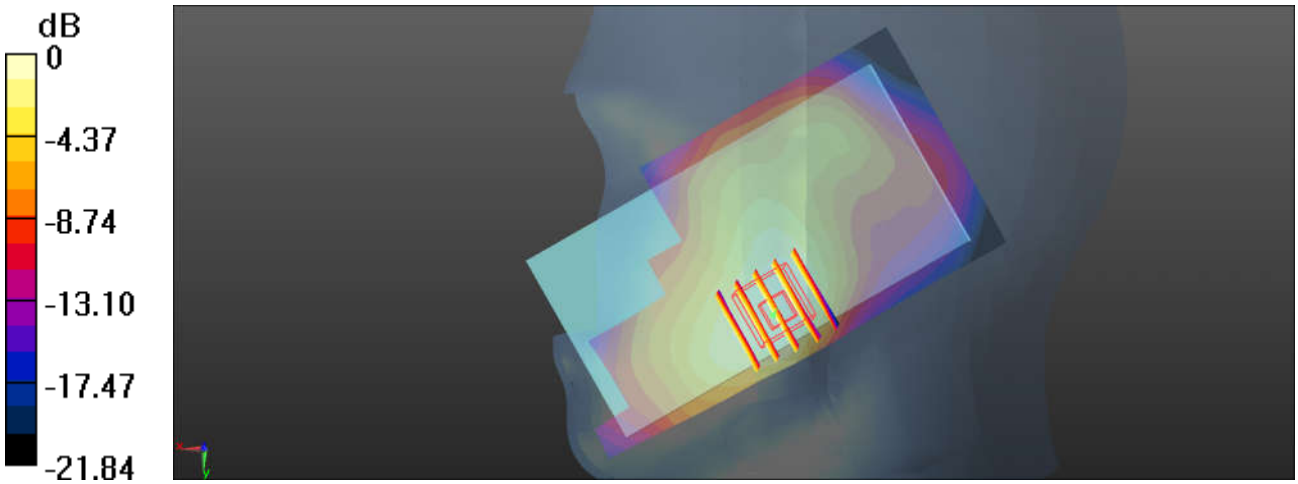
Communication System: UID 0, GPRS/EDGE (4 Tx slots) (0); Frequency: 1909.8 MHz;Duty Cycle:1:2.08
Medium: HSL_1900 Medium parameters used: f = 1909.8 MHz; σ = 1.423 S/m; ε_r = 38.363; ρ = 1000 kg/m^3

Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.85, 7.85, 7.85); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch810/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.332 W/kg

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.409 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.375 W/kg
SAR(1 g) = 0.243 W/kg; SAR(10 g) = 0.151 W/kg
Maximum value of SAR (measured) = 0.312 W/kg



0 dB = 0.312 W/kg = -5.06 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

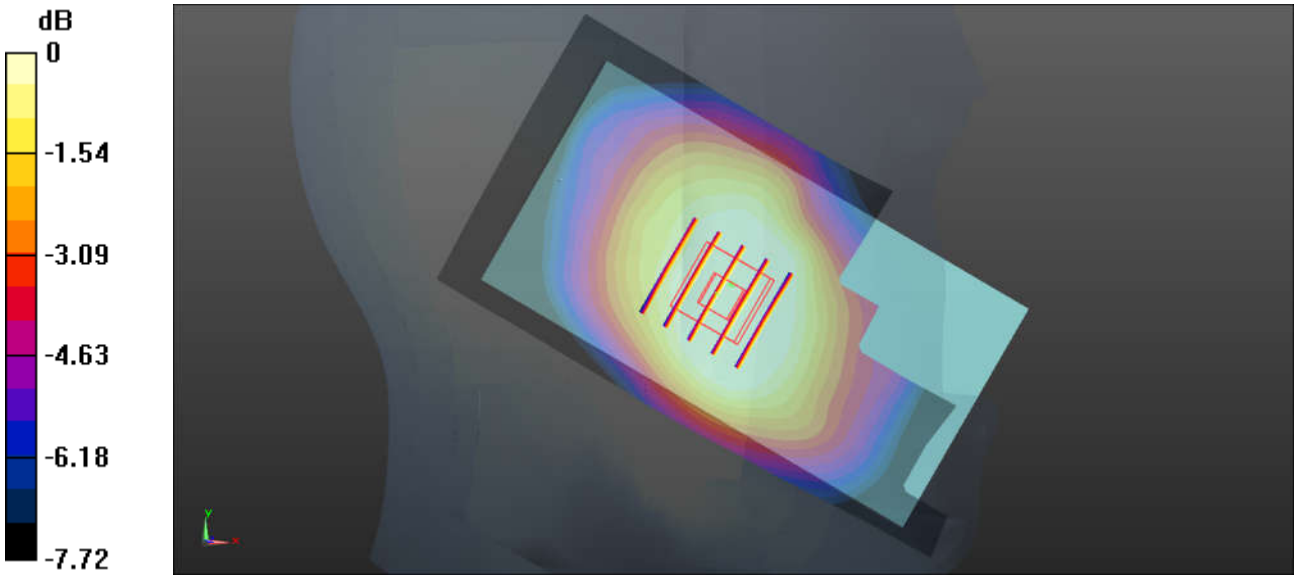
#03_WCDMA Band V_RMC 12.2Kbps_Left Cheek_0mm_4182

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 836.4 MHz; σ = 0.913 S/m; ε_r = 42.739; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(9.32, 9.32, 9.32); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4182/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.589 W/kg

Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.99 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.487 W/kg
SAR(1 g) = 0.392 W/kg; SAR(10 g) = 0.301 W/kg
Maximum value of SAR (measured) = 0.440 W/kg



0 dB = 0.452 W/kg = -3.45 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

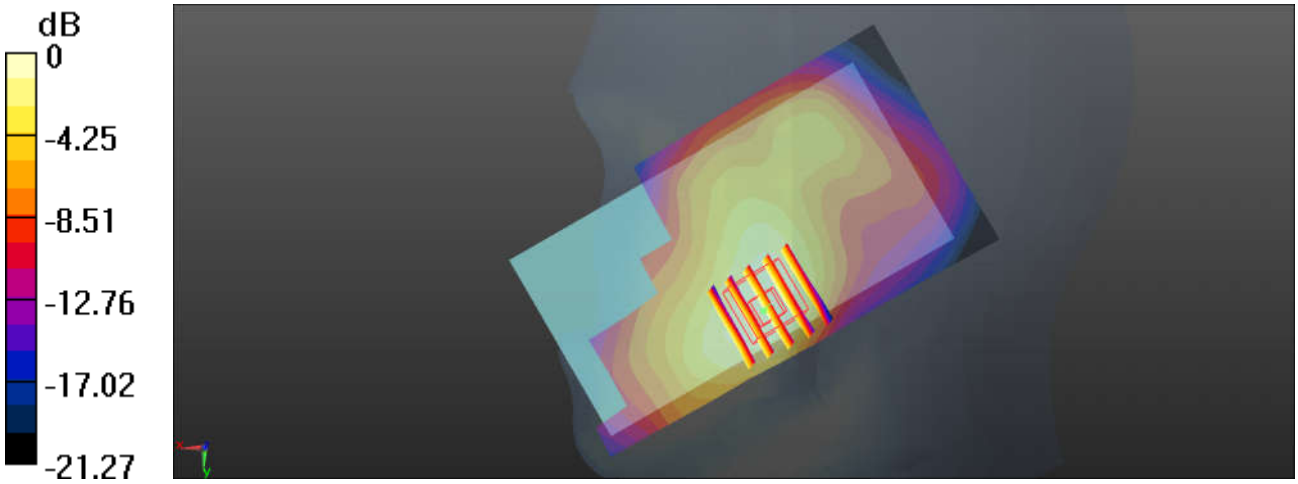
#04_WCDMA Band II_RMC 12.2Kbps_Right Cheek_0mm_Ch9538

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: HSL_1900 Medium parameters used: f = 1907.6 MHz; σ = 1.42 S/m; ε_r = 38.37; ρ = $1000_{kg/m^3}$
Ambient Temperature：23.3 ℃； Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.85, 7.85, 7.85); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9538/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.503 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.899 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.571 W/kg
SAR(1 g) = 0.371 W/kg; SAR(10 g) = 0.232 W/kg
Maximum value of SAR (measured) = 0.475 W/kg



0 dB = 0.475 W/kg = -3.23 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

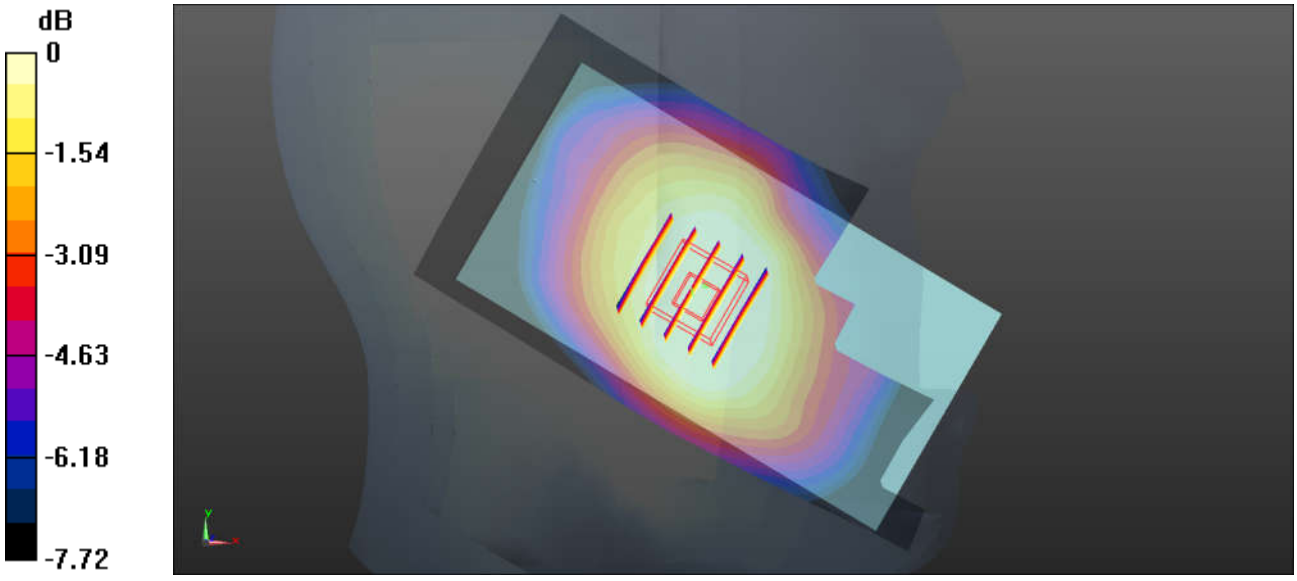
#05_LTE Band 5_10M_QPSK_1RB_0Offset_Left Cheek_0mm_Ch20525

Communication System: UID 0, FDD_LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.913 S/m; ε_r = 42.738; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(9.32, 9.32, 9.32); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20525/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.589 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.587 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.355 W/kg
SAR(1 g) = 0.286 W/kg; SAR(10 g) = 0.220 W/kg
Maximum value of SAR (measured) = 0.323 W/kg



0 dB = 0.452 W/kg = -3.45 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

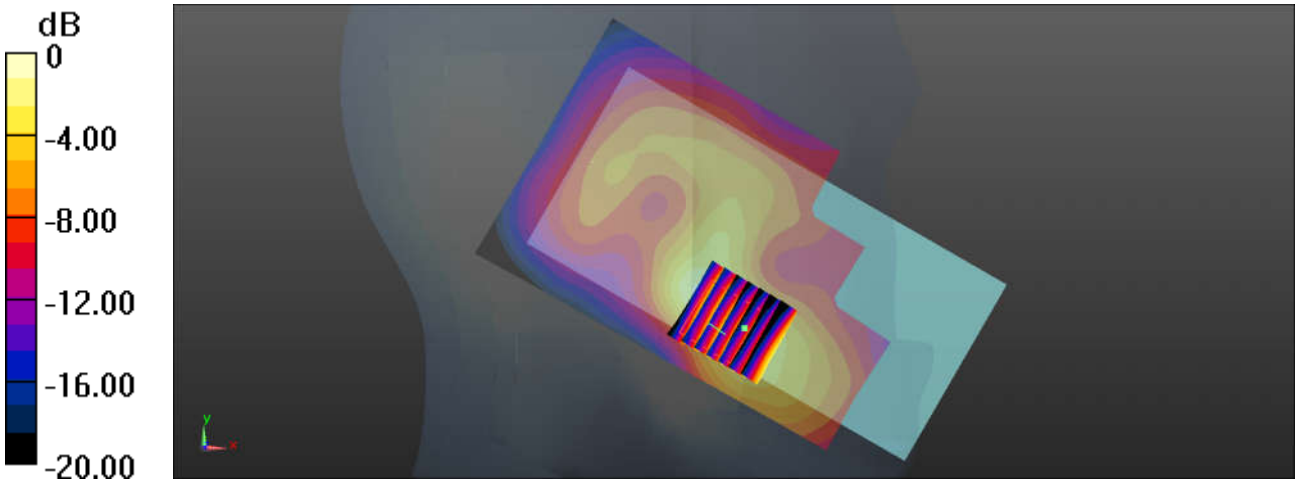
#06_LTE Band 7_20M_QPSK_1RB_0Offset_Left Cheek_0mm_Ch21350

Communication System: UID 0, FDD_LTE (0); Frequency: 2560 MHz;Duty Cycle: 1:1
Medium: HSL_2600 Medium parameters used: f = 2560 MHz; σ = 1.997 S/m; ε_r = 37.823; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.08, 7.08, 7.08); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch21350/Area Scan (41x71x1): Interpolated grid: dx=2.400 mm, dy=2.400 mm
Maximum value of SAR (interpolated) = 0.416 W/kg

Ch21350/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.450 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.619 W/kg
SAR(1 g) = 0.328 W/kg; SAR(10 g) = 0.167 W/kg
Maximum value of SAR (measured) = 0.458 W/kg



0 dB = 0.458 W/kg = -3.39 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

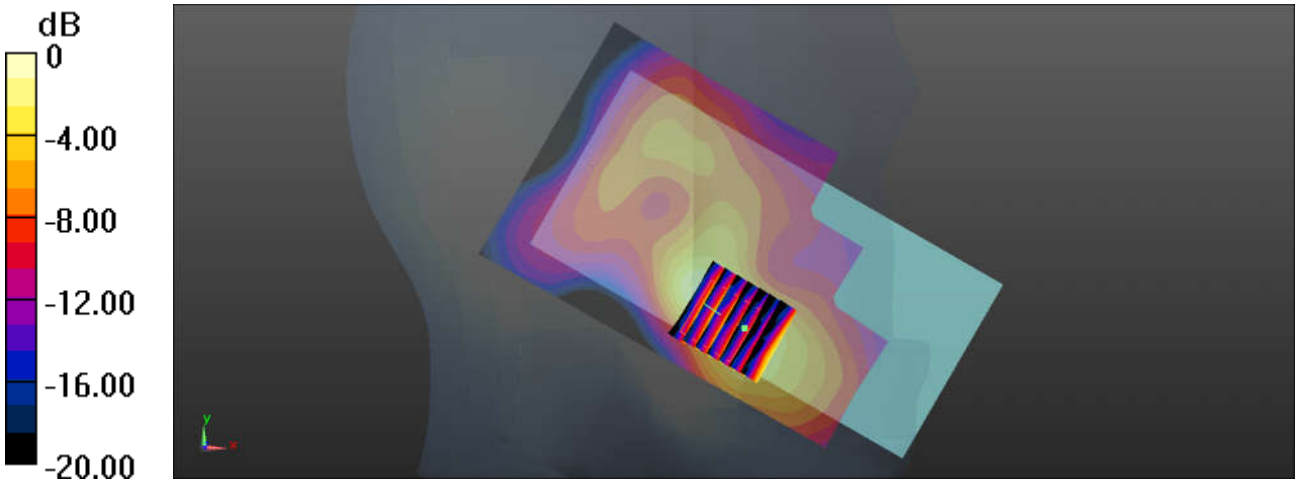
#07_LTE Band 38_20M_QPSK_1RB_0Offset_Left Cheek_0mm_Ch38000

Communication System: UID 0, TDD_LTE (0); Frequency: 2595 MHz;Duty Cycle: 1:1.59
Medium: HSL_2600 Medium parameters used: f = 2595 MHz; σ = 2.04 S/m; ε_r = 37.688; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.08, 7.08, 7.08); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch38000/Area Scan (41x71x1): Interpolated grid: dx=2.400 mm, dy=2.400 mm
Maximum value of SAR (interpolated) = 0.283 W/kg

Ch38000/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.717 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.439 W/kg
SAR(1 g) = 0.222 W/kg; SAR(10 g) = 0.110 W/kg
Maximum value of SAR (measured) = 0.317 W/kg



0 dB = 0.317 W/kg = -4.99 dBW/kg

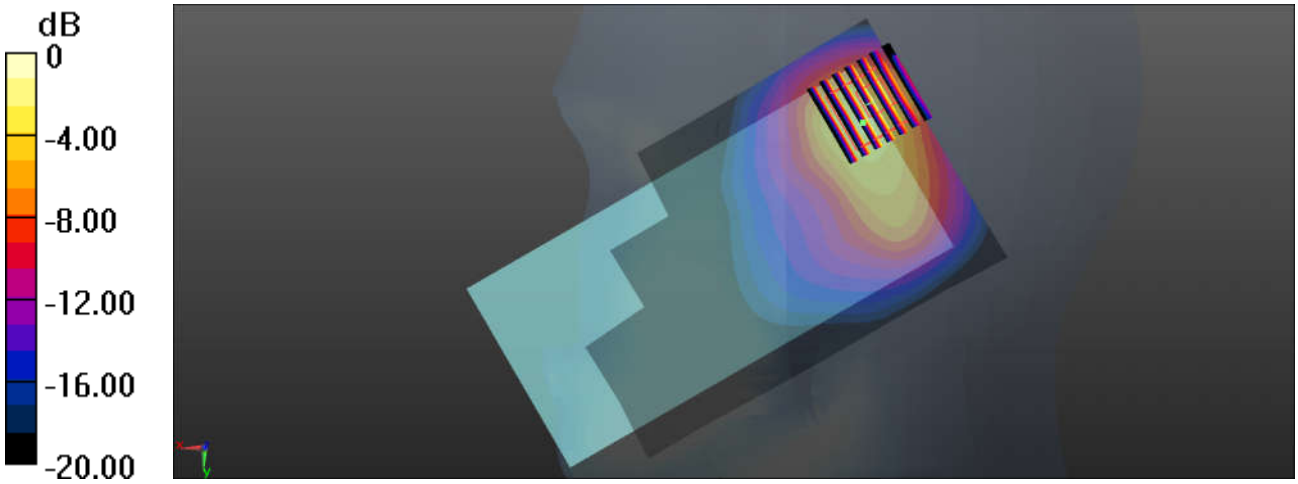
#08_WLAN 2.4GHz_802.11b 1Mbps_Right Cheek_0mm_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: HSL_2450 Medium parameters used: f = 2437 MHz; σ = 1.86 S/m; ε_r = 38.322; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.19, 7.19, 7.19); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (41x71x1): Interpolated grid: dx=2.400 mm, dy=2.400 mm
Maximum value of SAR (interpolated) = 1.87 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.47 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.35 W/kg
SAR(1 g) = 0.943 W/kg; SAR(10 g) = 0.403 W/kg
Maximum value of SAR (measured) = 1.62 W/kg



0 dB = 1.62 W/kg = 2.10 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

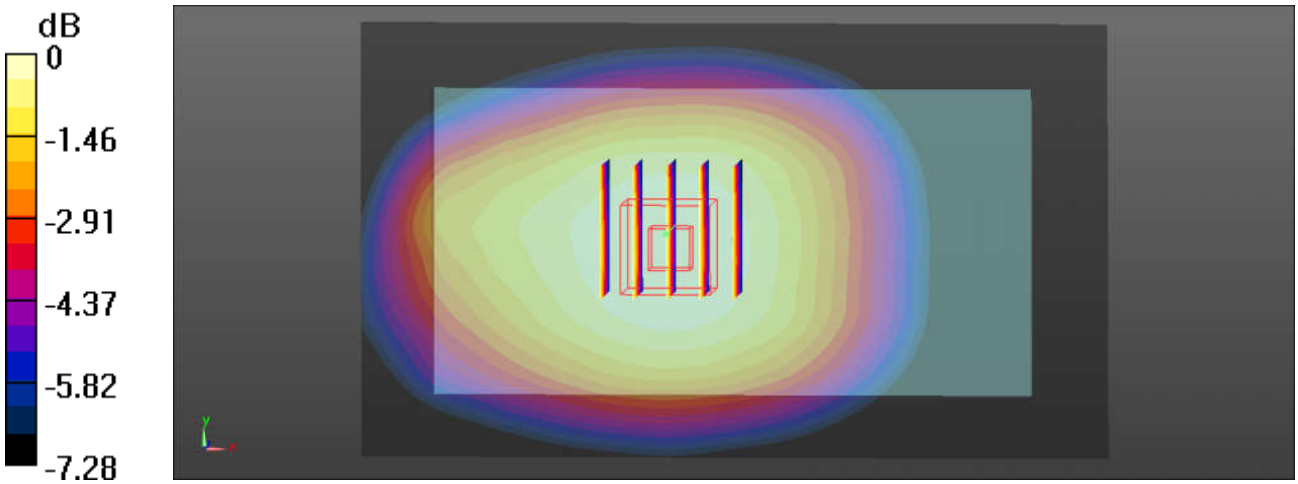
#09_GSM850_GPRS (4 Tx slots)_Back_10mm_Ch189

Communication System: UID 0, GPRS/EDGE (4 Tx slots) (0); Frequency: 836.4 MHz;Duty Cycle: 1:2.08
Medium: MSL_850 Medium parameters used: f = 836.4 MHz; σ = 0.996 S/m; ε_r = 54.615; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2016.7.12
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch189/Area Scan (121x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.857 W/kg

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.52 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.926 W/kg
SAR(1 g) = 0.750 W/kg; SAR(10 g) = 0.585 W/kg
Maximum value of SAR (measured) = 0.851 W/kg



0 dB = 0.851 W/kg = -0.70 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

#10_GSM 1900_GPRS 4 Tx slots_Back_10mm_Ch810

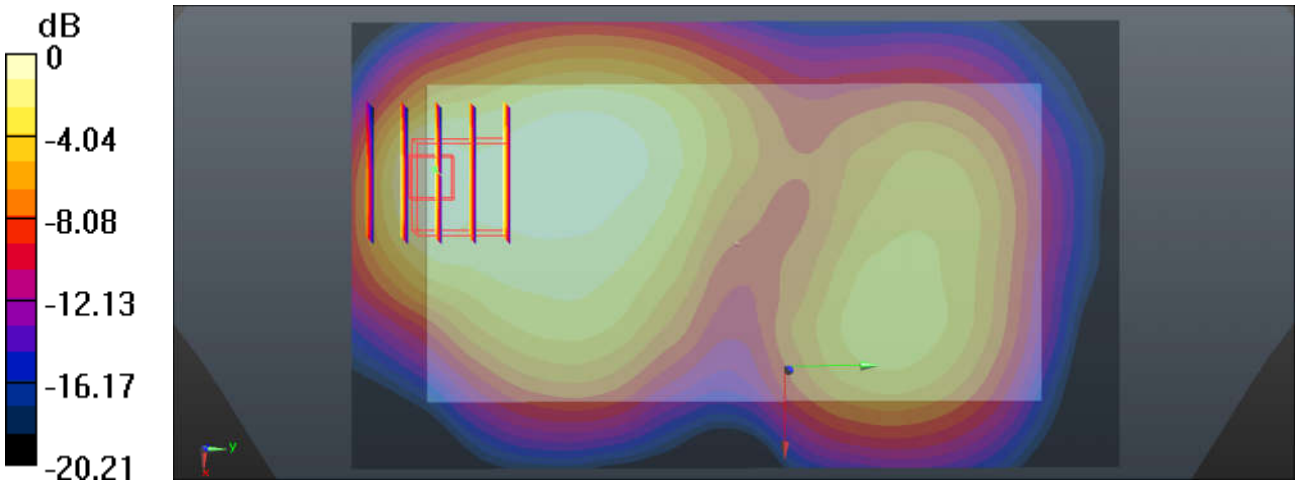
Communication System: UID 0, GPRS/EDGE (4 Tx slots) (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.08
Medium: MS_1900 Medium parameters used: f = 1909.8 MHz; σ = 1.551 S/m; ε_r = 53.308; ρ = 1000 kg/m^3

Ambient Temperature：23.3 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch810/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.508 W/kg

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.944 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.619 W/kg
SAR(1 g) = 0.330 W/kg; SAR(10 g) = 0.187 W/kg
Maximum value of SAR (measured) = 0.479 W/kg



0 dB = 0.479 W/kg = -3.20 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

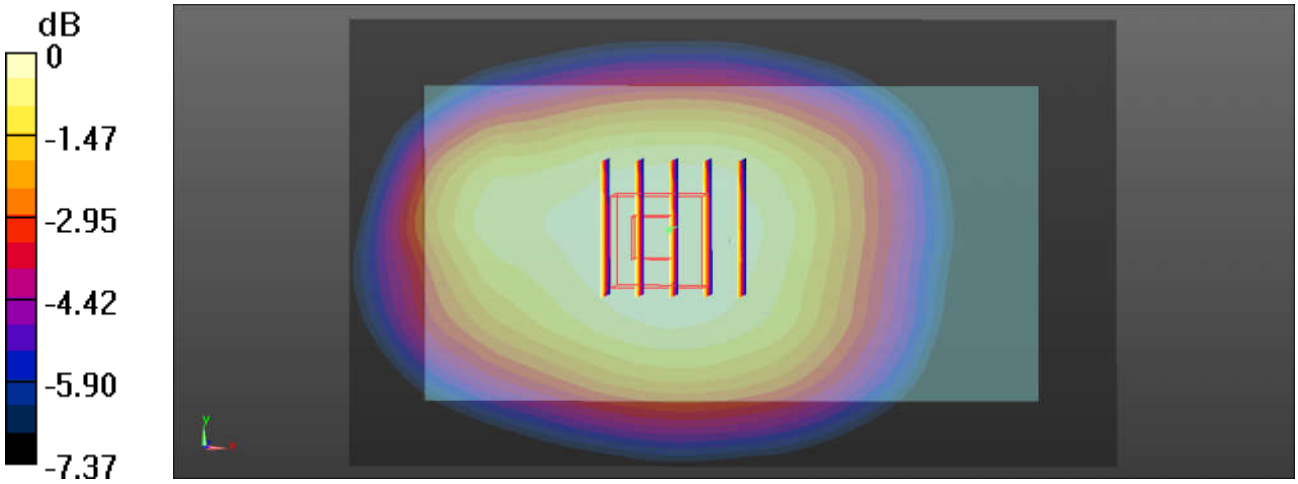
#11_WCDMA Band V_RMC 12.2Kbps_Back_10mm_Ch4182

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 836.4 MHz; σ = 0.996 S/m; ε_r = 54.615; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2016.7.12
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4182/Area Scan (121x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.670 W/kg

Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.54 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.722 W/kg
SAR(1 g) = 0.586 W/kg; SAR(10 g) = 0.460 W/kg
Maximum value of SAR (measured) = 0.663 W/kg



0 dB = 0.663 W/kg = -1.78 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.28

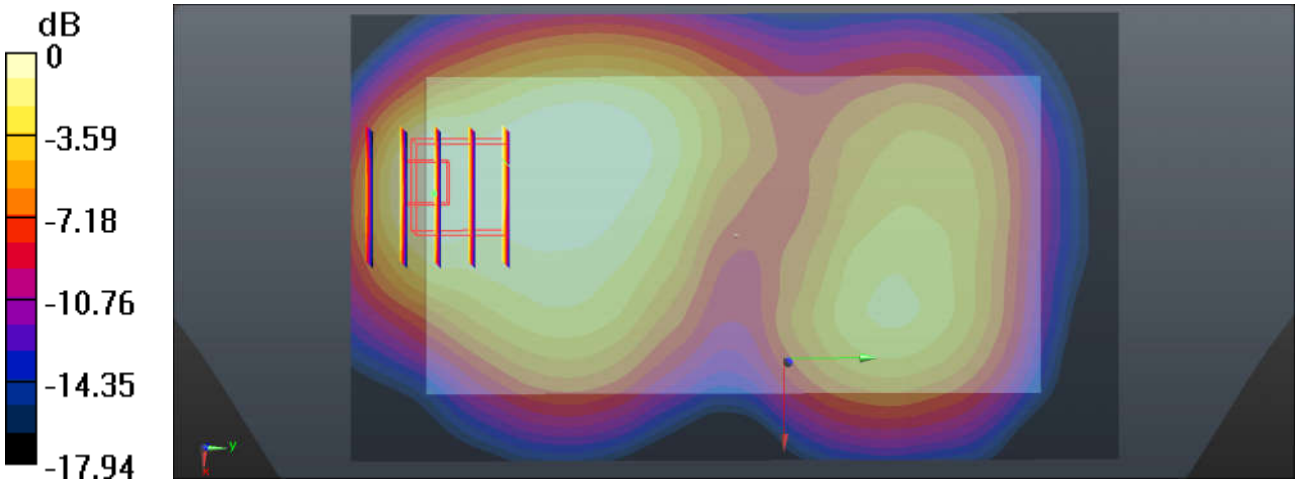
#12_WCDMA Band II_RMC 12.2Kbps_Back_10mm_Ch9538

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MS_1900 Medium parameters used: f = 1907.6 MHz; σ = 1.548 S/m; ε_r = 53.313; ρ = 1000kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.55, 7.55, 7.55); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9538/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.715 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.523 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.850 W/kg
SAR(1 g) = 0.468 W/kg; SAR(10 g) = 0.272 W/kg
Maximum value of SAR (measured) = 0.651 W/kg



0 dB = 0.651 W/kg = -1.86 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.27

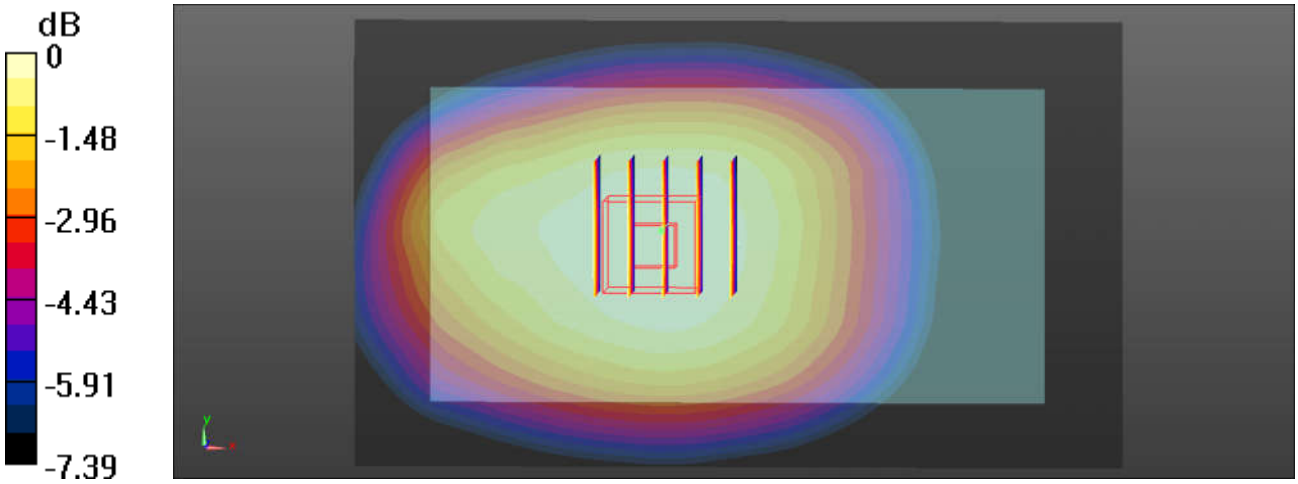
#13_LTE Band 5_10M_QPSK_1RB_0Offset_Back_10mm_Ch20525

Communication System: UID 0, FDD_LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: MSL_850 Medium parameters used: f = 836.5 MHz; σ = 0.996 S/m; ε_r = 54.614; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3954; ConvF(10.32, 10.32, 10.32); Calibrated: 2016.11.28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2016.7.12
- Phantom: SAM1; Type: SAM; Serial: TP-1164
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20525/Area Scan (121x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.559 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.90 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.605 W/kg
SAR(1 g) = 0.490 W/kg; SAR(10 g) = 0.384 W/kg
Maximum value of SAR (measured) = 0.556 W/kg



0 dB = 0.556 W/kg = -2.55 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

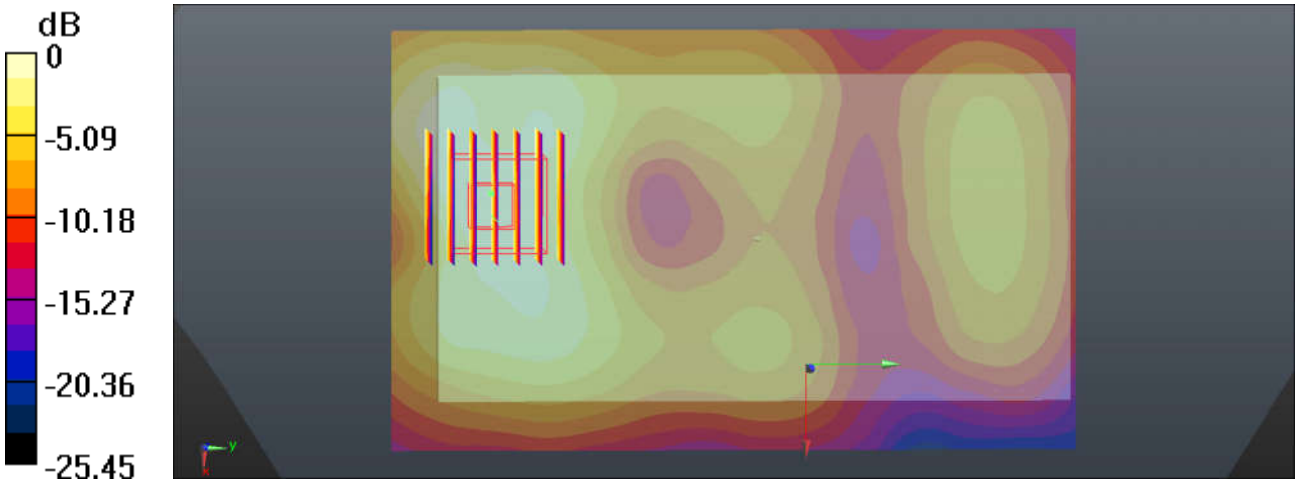
#14_LTE Band 7_20M_QPSK_1RB_0Offset_Front_10mm_Ch21350

Communication System: UID 0, FDD_LTE (0); Frequency: 2560 MHz;Duty Cycle: 1:1
Medium: MSL_2600 Medium parameters used: f = 2560 MHz; σ = 2.165 S/m; ε_r = 52.202; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch21350/Area Scan (81x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.839 W/kg

Ch21350/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.851 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.26 W/kg
SAR(1 g) = 0.601 W/kg; SAR(10 g) = 0.303 W/kg
Maximum value of SAR (measured) = 0.890 W/kg



0 dB = 0.890 W/kg = -0.51 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

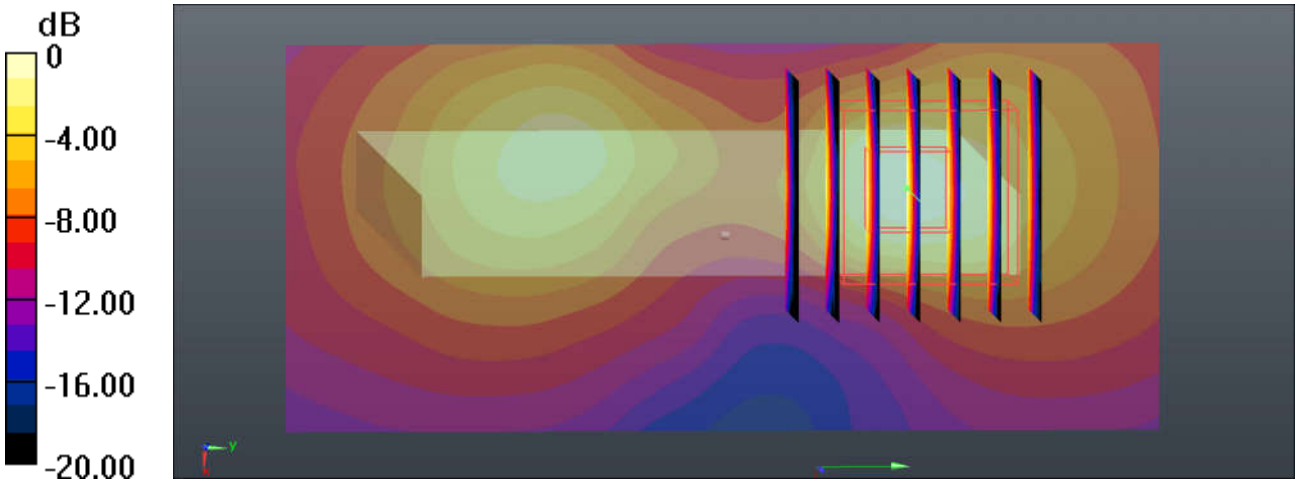
#15_LTE Band 38_20M_QPSK_1RB_0Offset_Bottom Side_10mm_Ch38000

Communication System: UID 0, TDD_LTE (0); Frequency: 2595 MHz;Duty Cycle: 1:1.59
Medium: MSL_2600 Medium parameters used: f = 2595 MHz; σ = 2.215 S/m; ε_r = 52.069; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch38000/Area Scan (41x91x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.588 W/kg

Ch38000/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.955 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.851 W/kg
SAR(1 g) = 0.388 W/kg; SAR(10 g) = 0.158 W/kg
Maximum value of SAR (measured) = 0.624 W/kg



0 dB = 0.624 W/kg = -2.05 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

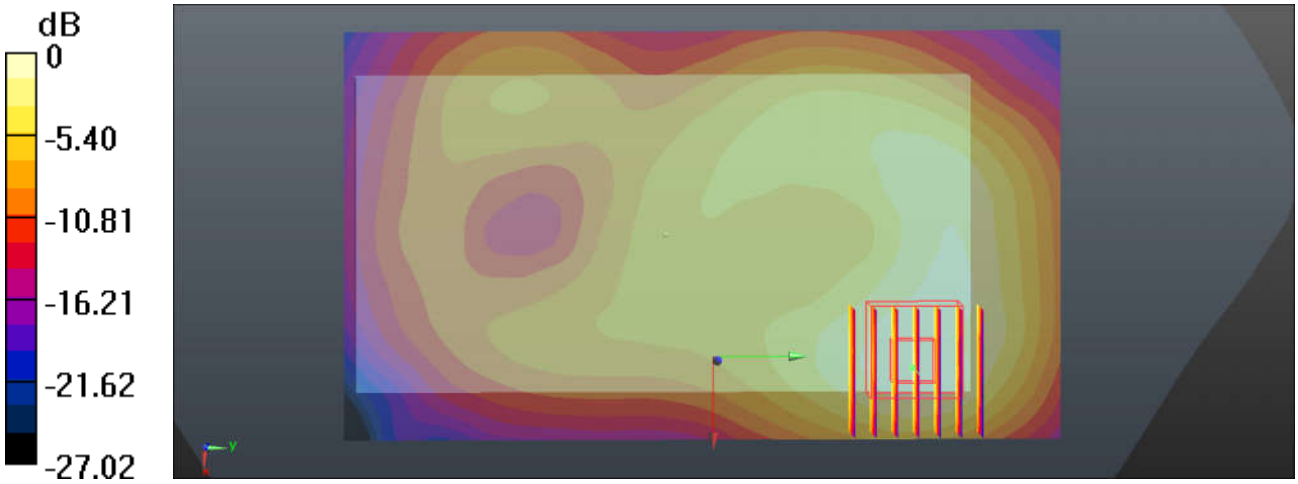
#16_WLAN2.4GHz_802.11b 1Mbps_Back_10mm_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450 Medium parameters used: f = 2437 MHz; σ = 1.998 S/m; ε_r = 52.714; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.23, 7.23, 7.23); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch6/Area Scan (81x141x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.484 W/kg

Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.999 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.694 W/kg
SAR(1 g) = 0.331 W/kg; SAR(10 g) = 0.170 W/kg
Maximum value of SAR (measured) = 0.492 W/kg



0 dB = 0.492 W/kg = -3.08 dBW/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.4.29

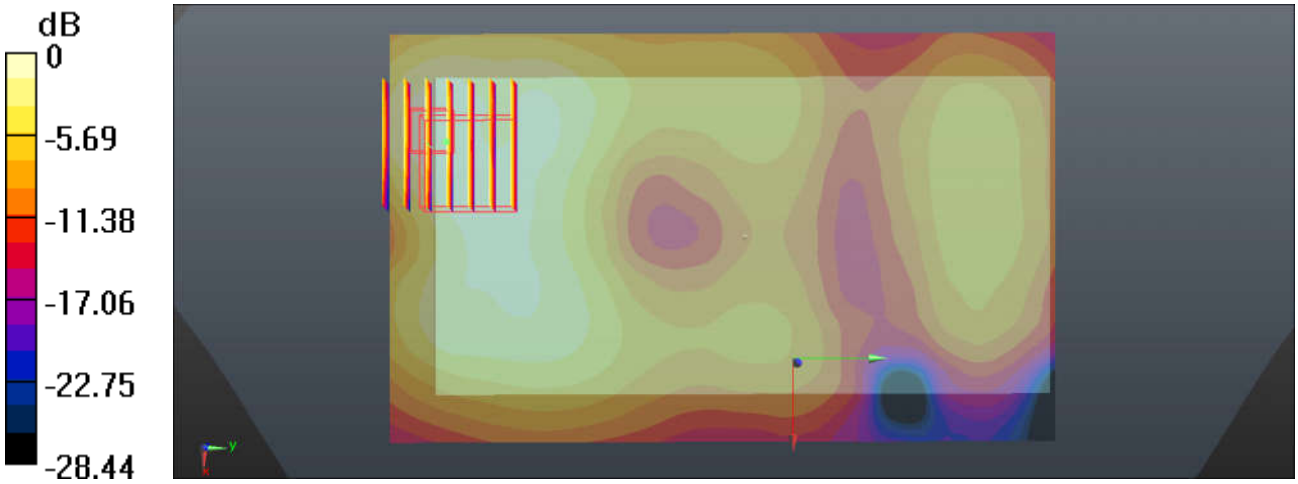
#17_LTE Band 38_20M_QPSK_1RB_0Offset_Front_10mm_Ch38000

Communication System: UID 0, TDD_LTE (0); Frequency: 2595 MHz;Duty Cycle: 1:1.59
Medium: MSL_2600 Medium parameters used: f = 2595 MHz; σ = 2.215 S/m; ε_r = 52.069; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.13, 7.13, 7.13); Calibrated: 2016.5.25;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2016.5.18
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch38000/Area Scan (81x131x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 0.506 W/kg

Ch38000/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.233 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.727 W/kg
SAR(1 g) = 0.345 W/kg; SAR(10 g) = 0.166 W/kg
Maximum value of SAR (measured) = 0.510 W/kg



0 dB = 0.510 W/kg = -2.92 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-CN** **Certificate No: Z16-97223**

CALIBRATION CERTIFICATE

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

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04777)	Jun-17
Reference Probe EX3DV4	SN 7433	26-Sep-16(SPEAG,No.EX3-7433_Sep16)	Sep-17
DAE4	SN 771	02-Feb-16(CTTL-SPEAG,No.Z16-97011)	Feb-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	01-Feb-16 (CTTL, No.J16X00893)	Jan-17
Network Analyzer E5071C	MY46110673	26-Jan-16 (CTTL, No.J16X00894)	Jan-17

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

Issued: November 26, 2016

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