FCC SAR Test Report

APPLICANT	:	ZTE CORPORATION
EQUIPMENT	:	LTE/WCDMA Multi-Mode Digital Mobile Phone
BRAND NAME	:	ZTE
MODEL NAME	:	Z2321A
FCC ID	:	SRQ-Z2321A
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, Sporton International (Shenzhen) 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 (Shenzhen) Inc., the test report shall not be reproduced except in full.

Approved by: Mark Qu / Manager

TESTING
NVLAP LAB CODE 600156-0

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA7N2807	Rev. 01	Initial issue of report	Jan. 16, 2018

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ZTE CORPORATION, LTE/WCDMA Multi-Mode Digital Mobile Phone, Z2321A,** are as follows.

Highest SAR Summary					
Equipment Class	Frequency Band		Head (Separation 0mm)	Body-worn (Separation 15mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)		
Licensed	WCDMA	Band V	0.53	0.68	1.26
		Band II	0.45	0.82	
	LTE	Band 12	0.57	0.37	
		Band 5	**0.77**	0.96	
		Band 4	0.33	**1.04**	
		Band 2	0.45	0.76	
DTS	Bluetooth	Bluetooth			1.26
Date of Testing:		2017/12/17 ~ 2017/12/20			

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

2. Administration Data

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

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

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

3. Guidance Applied

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

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

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	LTE/WCDMA Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z2321A
FCC ID	SRQ-Z2321A
IMEI Code	867075030003887
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	RMC/AMR 12.2Kbps HSDPA HSUPA HSPA+ (16QAM uplink is not supported) LTE: QPSK, 16QAM Bluetooth v2.0+EDR, Bluetooth v4.2 LE
HW Version	Z2321AHW1.0
SW Version	Z2321AV1.0.0B01
EUT Stage	Identical Prototype
Remark: 1. This device doesn't support VoIP function. 2. This device supports VoLTE operation.	

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	SRQ-Z2321A
Equipment Name	LTE/WCDMA Multi-Mode Digital Mobile Phone
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz
uplink modulations used	QPSK / 16QAM
LTE Voice / Data requirements	Voice and Data
LTE Release Version	R10, Cat4
CA Support	Not Supported
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

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.

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

LTE Band 2

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

LTE Band 4

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

LTE Band 5

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

LTE Band 12

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

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:

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

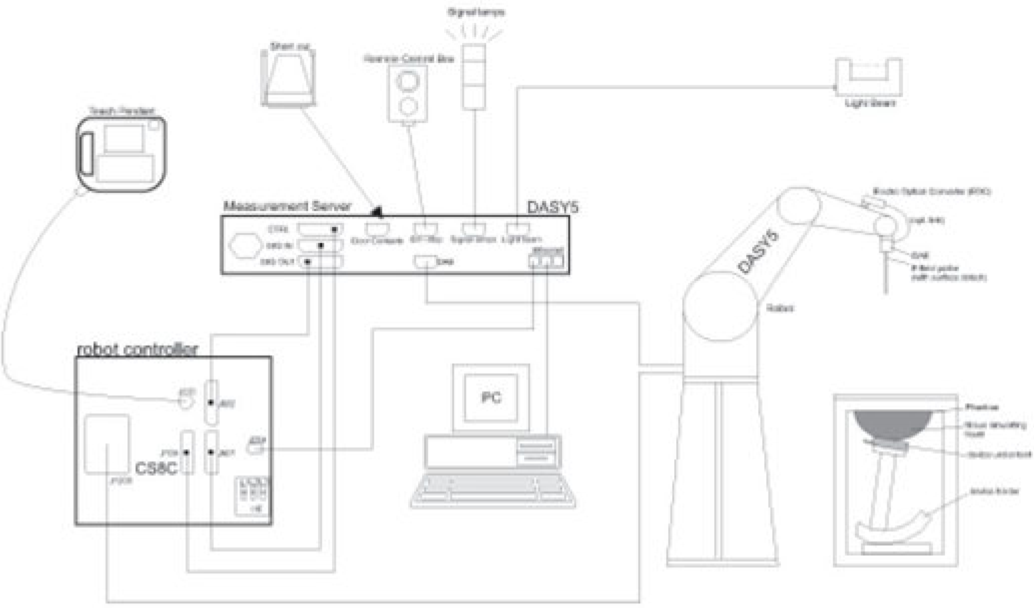
SAR is expressed in units of Watts per kilogram (W/kg)

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

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 BT power measurement, use engineering software to configure EUT 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 BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT 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.

<table>
<tr><th></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

8.4 Zoom Scan

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

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

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

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	2017/3/20	2018/3/19
SPEAG	835MHz System Validation Kit	D835V2	4d151	2017/3/20	2018/3/19
SPEAG	1750MHz System Validation Kit	D1750V2	1137	2017/6/5	2018/6/4
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	2017/3/22	2018/3/21
SPEAG	Data Acquisition Electronics	DAE4	1386	2017/7/20	2018/7/19
SPEAG	Dosimetric E-Field Probe	EX3DV4	3753	2017/5/5	2018/5/4
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1671	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	2017/7/19	2018/7/18
Agilent	Wireless Communication Test Set	E5515C	MY50267224	2017/9/12	2018/9/11
Agilent	Network Analyzer	E5071C	MY46523671	2017/10/18	2018/10/17
SPEAG	Dielectric Assessment KIT	DAK-3.5	1146	2017/7/18	2018/7/17
Agilent	Signal Generator	N5181A	MY50145381	2017/1/3	2018/1/2
Anritsu	Power Senor	MA2411B	1306099	2017/8/21	2018/8/20
Anritsu	Power Meter	ML2495A	1349001	2017/7/19	2018/7/18
Anritsu	Power Sensor	MA2411B	1207253	2017/1/3	2018/1/2
Anritsu	Power Meter	ML2495A	1218010	2017/1/3	2018/1/2
R&S	CBT BLUETOOTH TESTER	CBT	100963	2017/1/3	2018/1/2
R&S	Spectrum Analyzer	FSP7	100818	2017/7/19	2018/7/18
LKM electronic	Hygrometer	DTM3000	3241	2017/7/21	2018/7/20
Anymetre	Thermo-Hygrometer	JR593	2015030904	2017/4/22	2018/4/21
ARRA	Power Divider	A3200-2	N/A	Note	
Agilent	Dual Directional Coupler	778D	50422	Note	
PASTERNACK	Dual Directional Coupler	PE2214-10	N/A	Note	
MCL	Attenuation1	BW-S10W5+	N/A	Note	
MCL	Attenuation2	BW-S10W5+	N/A	Note	
MCL	Attenuation3	BW-S10W5+	N/A	Note	
AR	Amplifier	5S1G4	333096	Note	
mini-circuits	Amplifier	ZVE-3W-83+	162601250	Note	

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

10. System Verification

10.1 Tissue Simulating Liquids

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

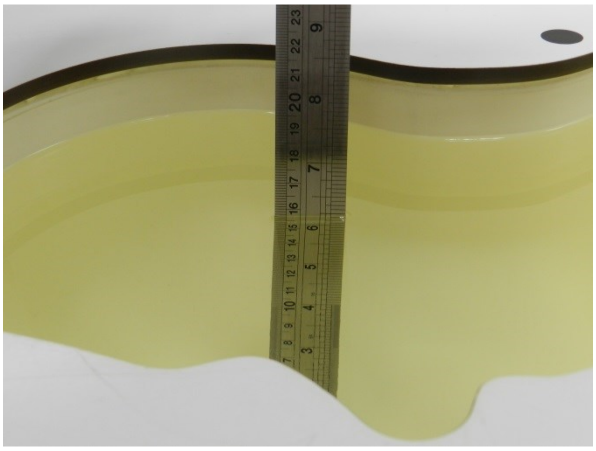


Fig 10.1Photo of Liquid Height for Head SAR

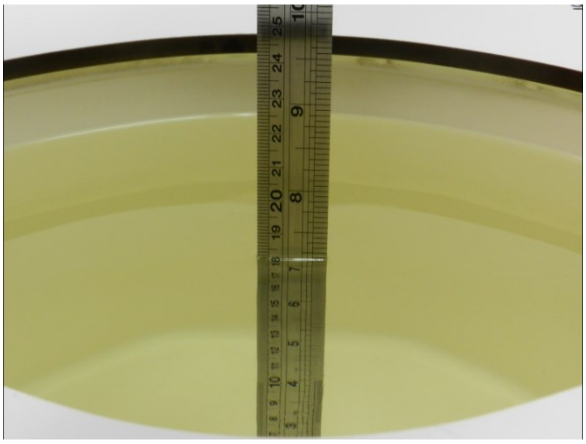


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.5	0.890	40.918	0.89	41.90	0.00	-2.34	±5	2017/12/18
835	Head	22.5	0.916	41.029	0.90	41.50	1.78	-1.13	±5	2017/12/18
1750	Head	22.8	1.373	41.392	1.37	40.10	0.22	3.22	±5	2017/12/17
1900	Head	22.9	1.440	40.038	1.40	40.00	2.86	0.09	±5	2017/12/17
750	Body	22.9	0.961	53.917	0.96	55.50	0.10	-2.85	±5	2017/12/20
835	Body	22.7	0.968	57.458	0.97	55.20	-0.21	4.09	±5	2017/12/20
1750	Body	22.6	1.522	52.519	1.49	53.40	2.15	-1.65	±5	2017/12/19
1900	Body	22.7	1.580	54.631	1.52	53.30	3.95	2.50	±5	2017/12/19

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 (%)
2017/12/18	750	Head	250	1087	3753	1386	2.06	8.37	8.24	-1.55
2017/12/18	835	Head	250	4d151	3753	1386	2.40	9.73	9.60	-1.34
2017/12/17	1750	Head	250	1137	3753	1386	8.60	36.60	34.40	-6.01
2017/12/17	1900	Head	250	5d170	3753	1386	9.67	40.00	38.68	-3.30
2017/12/20	750	Body	250	1087	3753	1386	2.16	8.73	8.64	-1.03
2017/12/20	835	Body	250	4d151	3753	1386	2.29	9.72	9.16	-5.76
2017/12/19	1750	Body	250	1137	3753	1386	9.07	37.00	36.28	-1.95
2017/12/19	1900	Body	250	5d170	3753	1386	10.40	40.70	41.60	2.21

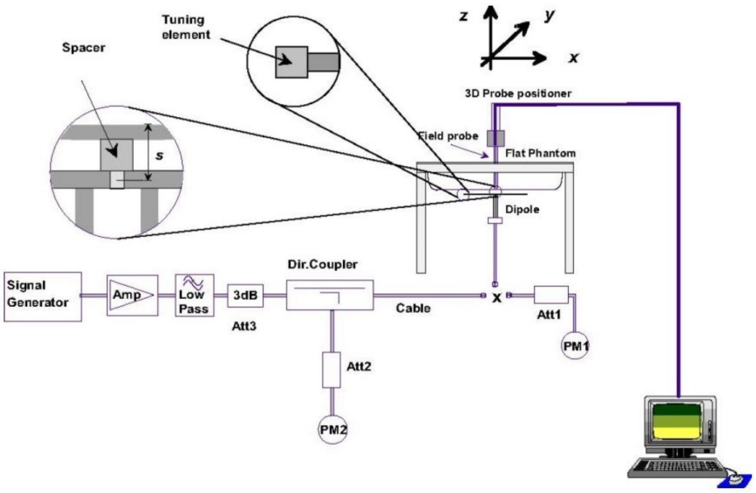


Fig 8.3.1 System Performance Check Setup

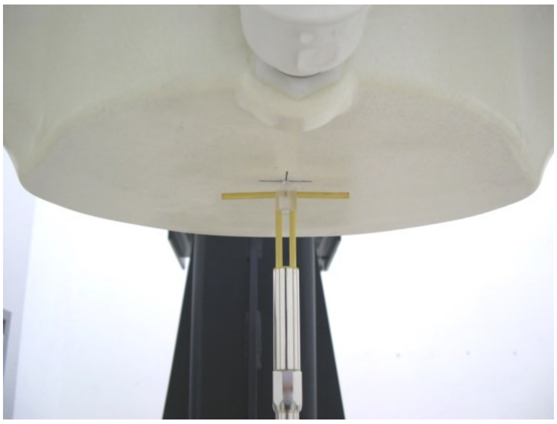


Fig 8.3.2 Setup Photo

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.

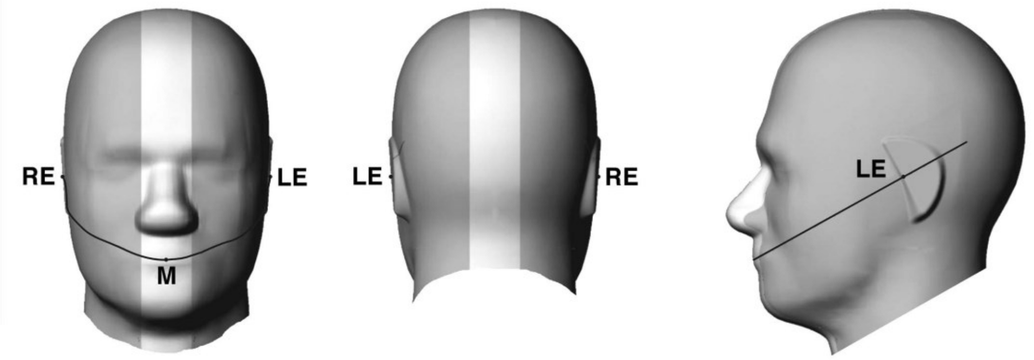


Fig 9.1.1 Front, back, and side views of SAM twin phantom

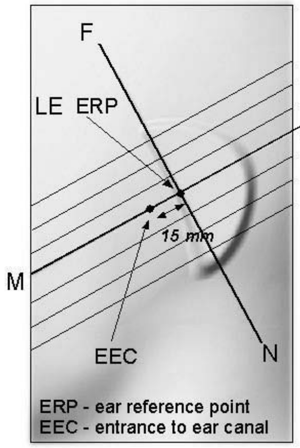


Fig 9.1.2 Close-up side view of phantom showing the ear region.

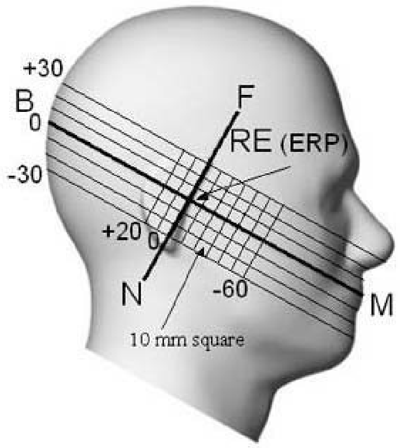


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

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.

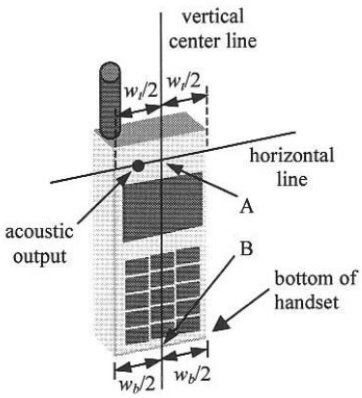


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

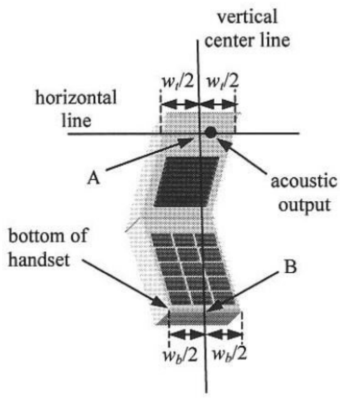


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

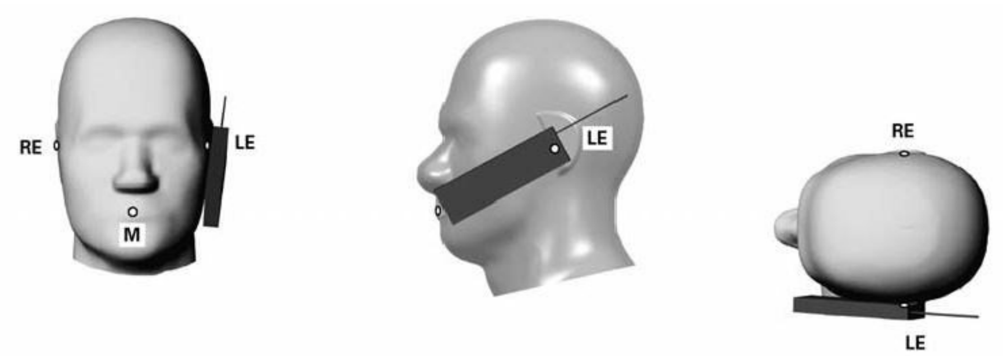


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

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

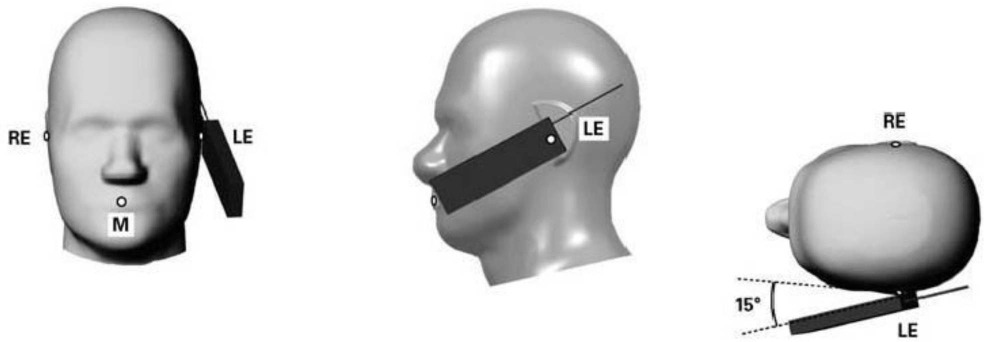


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

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.

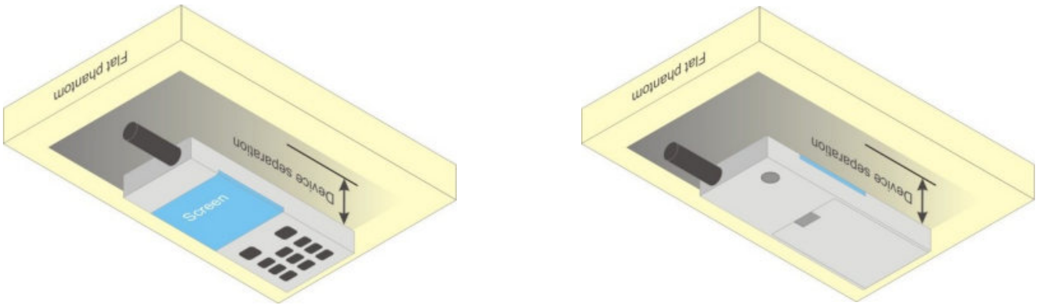


Fig 9.4 Body Worn Position

12. Conducted RF Output Power (Unit: dBm)

<WCDMA Conducted Power>

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

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

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

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

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

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

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

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

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

Setup Configuration

<WCDMA Conducted Power>

General Note:

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

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band 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	23.80	23.73	23.68	24.00	23.62	23.62	23.60	24.00
3GPP Rel 99	RMC 12.2Kbps	**23.82**	23.75	23.70	24.00	23.64	**23.66**	23.61	24.00
3GPP Rel 6	HSDPA Subtest-1	22.71	22.70	22.74	23.00	22.78	22.80	22.76	23.00
3GPP Rel 6	HSDPA Subtest-2	22.76	22.85	22.82	23.00	22.81	22.57	22.65	23.00
3GPP Rel 6	HSDPA Subtest-3	22.37	22.38	22.36	22.50	22.35	22.10	22.28	22.50
3GPP Rel 6	HSDPA Subtest-4	22.37	22.39	22.36	22.50	22.35	21.65	22.27	22.50
3GPP Rel 6	HSUPA Subtest-1	22.66	22.75	22.07	23.00	22.33	22.19	22.19	23.00
3GPP Rel 6	HSUPA Subtest-2	21.23	21.55	21.68	22.00	21.76	21.74	21.60	22.00
3GPP Rel 6	HSUPA Subtest-3	21.34	21.38	21.42	22.00	21.59	21.37	21.34	22.00
3GPP Rel 6	HSUPA Subtest-4	21.70	21.64	21.67	22.00	21.59	21.75	21.52	22.00
3GPP Rel 6	HSUPA Subtest-5	22.70	22.80	22.70	23.00	22.70	22.60	22.60	23.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	23.82	23.89	23.80	24.5	0
20	QPSK	1	49	24.35	24.14	24.06		
20	QPSK	1	99	23.60	23.73	23.74		
20	QPSK	50	0	23.04	22.95	22.95	23.5	1
20	QPSK	50	24	22.96	22.95	22.98		
20	QPSK	50	50	22.87	22.73	22.92		
20	QPSK	100	0	22.96	22.90	22.88		
20	16QAM	1	0	22.92	23.04	23.41	23.5	1
20	16QAM	1	49	22.49	23.13	23.16		
20	16QAM	1	99	22.44	22.83	23.05		
20	16QAM	50	0	22.12	21.97	21.95	22.5	2
20	16QAM	50	24	22.10	22.02	22.01		
20	16QAM	50	50	21.94	22.02	21.97		
20	16QAM	100	0	21.89	21.98	21.93		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	24.12	24.10	23.95	24.5	0
15	QPSK	1	37	24.13	24.04	24.06		
15	QPSK	1	74	23.89	23.51	23.96		
15	QPSK	36	0	23.05	22.97	22.96	23.5	1
15	QPSK	36	20	22.96	22.93	22.91		
15	QPSK	36	39	22.90	22.88	22.88		
15	QPSK	75	0	22.90	22.93	22.91		
15	16QAM	1	0	22.90	22.92	22.29	23.5	1
15	16QAM	1	37	22.46	22.52	22.47		
15	16QAM	1	74	22.46	22.24	22.13		
15	16QAM	36	0	22.05	22.08	21.93	22.5	2
15	16QAM	36	20	22.01	22.08	21.96		
15	16QAM	36	39	21.95	21.81	21.99		
15	16QAM	75	0	22.06	21.90	21.97		

Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	24.05	23.81	24.09	24.5	0
10	QPSK	1	25	24.06	24.34	24.06		
10	QPSK	1	49	24.05	23.51	23.81		
10	QPSK	25	0	22.97	22.95	22.88	23.5	1
10	QPSK	25	12	22.93	22.91	22.86		
10	QPSK	25	25	22.84	22.81	22.93		
10	QPSK	50	0	22.85	22.88	22.86		
10	16QAM	1	0	22.83	22.96	22.37	23.5	1
10	16QAM	1	25	23.24	22.91	22.25		
10	16QAM	1	49	22.51	22.28	22.59		
10	16QAM	25	0	22.07	21.82	22.09	22.5	2
10	16QAM	25	12	21.93	21.98	22.02		
10	16QAM	25	25	22.02	21.75	21.98		
10	16QAM	50	0	22.06	21.99	21.90		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.97	23.80	23.96	24.5	0
5	QPSK	1	12	24.09	24.00	24.15		
5	QPSK	1	24	23.78	23.88	23.61		
5	QPSK	12	0	22.94	22.85	22.81	23.5	1
5	QPSK	12	7	22.97	22.81	22.93		
5	QPSK	12	13	22.84	22.76	22.86		
5	QPSK	25	0	22.84	22.79	22.94		
5	16QAM	1	0	22.42	22.21	21.95	23.5	1
5	16QAM	1	12	22.92	22.70	22.78		
5	16QAM	1	24	21.95	22.16	22.43		
5	16QAM	12	0	21.84	21.61	21.74	22.5	2
5	16QAM	12	7	22.00	21.85	21.84		
5	16QAM	12	13	21.86	21.84	21.93		
5	16QAM	25	0	22.03	21.94	21.78		

Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	23.86	23.73	23.90	24.5	0
3	QPSK	1	8	23.75	23.85	23.86		
3	QPSK	1	14	23.88	23.86	23.69		
3	QPSK	8	0	23.00	22.89	22.93	23.5	1
3	QPSK	8	4	22.98	22.74	22.83		
3	QPSK	8	7	22.92	22.79	22.87		
3	QPSK	15	0	22.94	22.74	22.90		
3	16QAM	1	0	22.18	22.28	22.53	23.5	1
3	16QAM	1	8	23.15	22.58	22.45		
3	16QAM	1	14	22.41	22.27	22.61		
3	16QAM	8	0	21.68	21.86	22.09	22.5	2
3	16QAM	8	4	21.86	22.09	22.00		
3	16QAM	8	7	22.02	21.76	22.04		
3	16QAM	15	0	22.07	21.84	21.99		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	23.64	23.70	23.94	24.5	0
1.4	QPSK	1	3	23.60	23.71	23.84		
1.4	QPSK	1	5	23.52	23.66	23.79		
1.4	QPSK	3	0	23.92	23.86	23.97		
1.4	QPSK	3	1	23.79	23.74	23.93		
1.4	QPSK	3	3	23.89	23.72	23.80		
1.4	QPSK	6	0	22.78	22.75	22.75	23.5	1
1.4	16QAM	1	0	22.87	22.45	23.00	23.5	1
1.4	16QAM	1	3	22.13	22.36	22.09		
1.4	16QAM	1	5	22.55	22.41	22.21		
1.4	16QAM	3	0	22.68	22.69	23.06		
1.4	16QAM	3	1	22.81	22.69	22.85		
1.4	16QAM	3	3	22.71	22.42	22.87		
1.4	16QAM	6	0	21.71	21.57	21.73	22.5	2

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

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	23.21	23.47	23.80	24.5	0
20	QPSK	1	49	24.14	23.95	23.87		
20	QPSK	1	99	23.46	23.44	23.58		
20	QPSK	50	0	22.97	22.80	22.75	23.5	1
20	QPSK	50	24	22.68	22.66	22.70		
20	QPSK	50	50	22.68	22.72	22.55		
20	QPSK	100	0	22.81	22.78	22.75		
20	16QAM	1	0	21.90	21.98	22.29	23.5	1
20	16QAM	1	49	22.88	22.65	22.21		
20	16QAM	1	99	22.43	22.35	22.53		
20	16QAM	50	0	21.74	21.90	21.78	22.5	2
20	16QAM	50	24	21.76	21.94	21.68		
20	16QAM	50	50	21.76	21.86	21.46		
20	16QAM	100	0	21.79	21.82	21.88		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	23.31	23.44	23.76	24.5	0
15	QPSK	1	37	23.72	23.99	23.82		
15	QPSK	1	74	23.41	23.64	23.68		
15	QPSK	36	0	22.70	22.74	22.76	23.5	1
15	QPSK	36	20	22.72	22.76	22.70		
15	QPSK	36	39	22.63	22.69	22.75		
15	QPSK	75	0	22.65	22.74	22.69		
15	16QAM	1	0	22.75	22.14	22.79	23.5	1
15	16QAM	1	37	22.49	22.61	22.62		
15	16QAM	1	74	22.38	21.99	22.29		
15	16QAM	36	0	21.51	21.75	21.74	22.5	2
15	16QAM	36	20	21.65	21.73	21.74		
15	16QAM	36	39	21.52	21.76	21.64		
15	16QAM	75	0	21.59	21.85	21.78		

Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	23.43	23.54	23.54	24.5	0
10	QPSK	1	25	23.83	23.83	23.75		
10	QPSK	1	49	23.53	23.75	23.73		
10	QPSK	25	0	22.58	22.69	22.76	23.5	1
10	QPSK	25	12	22.66	22.64	22.72		
10	QPSK	25	25	22.50	22.68	22.80		
10	QPSK	50	0	22.54	22.76	22.71		
10	16QAM	1	0	22.54	22.31	22.14	23.5	1
10	16QAM	1	25	22.89	23.07	22.10		
10	16QAM	1	49	22.17	22.40	22.10		
10	16QAM	25	0	21.56	21.70	21.78	22.5	2
10	16QAM	25	12	21.55	21.72	21.80		
10	16QAM	25	25	21.39	21.60	21.91		
10	16QAM	50	0	21.68	21.68	21.72		
Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	23.47	23.47	23.53	24.5	0
5	QPSK	1	12	23.78	23.65	23.73		
5	QPSK	1	24	23.26	23.42	23.77		
5	QPSK	12	0	22.54	22.59	22.76	23.5	1
5	QPSK	12	7	22.48	22.78	22.83		
5	QPSK	12	13	22.47	22.70	22.83		
5	QPSK	25	0	22.54	22.67	22.79		
5	16QAM	1	0	22.68	21.97	22.26	23.5	1
5	16QAM	1	12	22.15	22.07	22.70		
5	16QAM	1	24	21.94	21.99	22.88		
5	16QAM	12	0	21.39	21.39	21.89	22.5	2
5	16QAM	12	7	21.40	21.53	21.94		
5	16QAM	12	13	21.42	21.88	21.95		
5	16QAM	25	0	21.53	21.68	22.01		

Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.31	23.48	23.71	24.5	0
3	QPSK	1	8	23.25	23.66	23.84		
3	QPSK	1	14	23.47	23.62	23.76		
3	QPSK	8	0	22.54	22.61	22.70	23.5	1
3	QPSK	8	4	22.52	22.66	22.73		
3	QPSK	8	7	22.51	22.62	22.78		
3	QPSK	15	0	22.50	22.62	22.73		
3	16QAM	1	0	22.24	22.97	22.27	23.5	1
3	16QAM	1	8	22.43	21.99	22.05		
3	16QAM	1	14	22.17	22.26	22.40		
3	16QAM	8	0	21.17	21.46	21.59	22.5	2
3	16QAM	8	4	21.42	21.41	21.85		
3	16QAM	8	7	21.40	21.40	21.89		
3	16QAM	15	0	21.43	21.68	21.73		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	23.38	23.33	23.52	24.5	0
1.4	QPSK	1	3	23.45	23.38	23.36		
1.4	QPSK	1	5	23.13	23.27	23.32		
1.4	QPSK	3	0	23.33	23.62	23.77		
1.4	QPSK	3	1	23.48	23.67	23.96		
1.4	QPSK	3	3	23.33	23.53	23.97		
1.4	QPSK	6	0	22.36	22.45	22.76	23.5	1
1.4	16QAM	1	0	22.44	22.22	23.15	23.5	1
1.4	16QAM	1	3	22.68	22.57	22.36		
1.4	16QAM	1	5	22.47	22.25	22.31		
1.4	16QAM	3	0	22.38	22.18	22.69		
1.4	16QAM	3	1	22.38	22.41	22.75		
1.4	16QAM	3	3	22.39	22.27	22.67		
1.4	16QAM	6	0	21.13	21.48	21.88	22.5	2

<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	23.46	23.18	23.22	24	0
10	QPSK	1	25	23.89	23.67	23.75		
10	QPSK	1	49	23.44	23.29	23.72		
10	QPSK	25	0	22.67	22.63	22.62	23	1
10	QPSK	25	12	22.59	22.60	22.62		
10	QPSK	25	25	22.59	22.54	22.61		
10	QPSK	50	0	22.61	22.62	22.60		
10	16QAM	1	0	21.84	22.61	22.46	23	1
10	16QAM	1	25	22.04	22.38	22.26		
10	16QAM	1	49	22.07	21.68	22.28		
10	16QAM	25	0	21.67	21.66	21.49	22	2
10	16QAM	25	12	21.69	21.60	21.77		
10	16QAM	25	25	21.56	21.45	21.68		
10	16QAM	50	0	21.78	21.53	21.65		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	23.63	23.28	23.63	24	0
5	QPSK	1	12	23.81	23.64	23.88		
5	QPSK	1	24	23.35	23.63	23.46		
5	QPSK	12	0	22.67	22.54	22.61	23	1
5	QPSK	12	7	22.53	22.61	22.67		
5	QPSK	12	13	22.62	22.67	22.57		
5	QPSK	25	0	22.59	22.49	22.60		
5	16QAM	1	0	22.40	21.58	22.01	23	1
5	16QAM	1	12	22.10	22.53	22.52		
5	16QAM	1	24	22.09	22.02	22.25		
5	16QAM	12	0	21.47	21.55	21.70	22	2
5	16QAM	12	7	21.56	21.75	21.74		
5	16QAM	12	13	21.39	21.37	21.69		
5	16QAM	25	0	21.49	21.40	21.62		

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	23.61	23.28	23.60	24	0
3	QPSK	1	8	23.63	23.88	23.62		
3	QPSK	1	14	23.52	23.66	23.51		
3	QPSK	8	0	22.57	22.63	22.65	23	1
3	QPSK	8	4	22.63	22.74	22.64		
3	QPSK	8	7	22.63	22.66	22.55		
3	QPSK	15	0	22.68	22.65	22.52		
3	16QAM	1	0	21.85	21.88	22.50	23	1
3	16QAM	1	8	22.52	22.61	22.77		
3	16QAM	1	14	22.16	22.58	22.77		
3	16QAM	8	0	21.58	21.66	21.65	22	2
3	16QAM	8	4	21.60	21.66	21.74		
3	16QAM	8	7	21.68	21.66	21.56		
3	16QAM	15	0	21.56	21.49	21.63		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	23.71	23.63	23.68	24	0
1.4	QPSK	1	3	23.76	23.71	23.63		
1.4	QPSK	1	5	23.75	23.52	23.61		
1.4	QPSK	3	0	23.79	23.67	23.78		
1.4	QPSK	3	1	23.76	23.80	23.85		
1.4	QPSK	3	3	23.87	23.67	23.71		
1.4	QPSK	6	0	22.72	22.67	22.52	23	1
1.4	16QAM	1	0	22.36	22.96	22.05	23	1
1.4	16QAM	1	3	22.57	22.89	22.01		
1.4	16QAM	1	5	22.09	22.52	21.99		
1.4	16QAM	3	0	22.35	22.67	22.50		
1.4	16QAM	3	1	22.74	22.73	22.60		
1.4	16QAM	3	3	22.81	22.66	22.52		
1.4	16QAM	6	0	21.52	21.54	21.41	22	2

<LTE Band 12>

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				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	23.51	23.42	23.63	24.5	0
10	QPSK	1	25	24.02	24.20	24.05		
10	QPSK	1	49	23.96	23.73	23.49		
10	QPSK	25	0	22.88	22.95	22.93	23.5	1
10	QPSK	25	12	22.81	22.94	22.92		
10	QPSK	25	25	22.88	22.88	22.89		
10	QPSK	50	0	22.89	22.92	22.89		
10	16QAM	1	0	22.42	22.20	22.55	23.5	1
10	16QAM	1	25	22.52	22.63	23.03		
10	16QAM	1	49	22.49	22.57	22.28		
10	16QAM	25	0	21.78	22.06	21.96	22.5	2
10	16QAM	25	12	21.78	21.97	21.84		
10	16QAM	25	25	21.91	21.92	21.72		
10	16QAM	50	0	21.73	21.96	21.87		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	23.56	23.63	23.61	24.5	0
5	QPSK	1	12	23.87	24.07	24.07		
5	QPSK	1	24	23.95	23.65	23.85		
5	QPSK	12	0	22.74	22.93	22.89	23.5	1
5	QPSK	12	7	22.84	22.94	22.92		
5	QPSK	12	13	22.81	22.94	22.94		
5	QPSK	25	0	22.83	22.92	22.93		
5	16QAM	1	0	22.45	21.86	22.12	23.5	1
5	16QAM	1	12	22.40	22.70	22.49		
5	16QAM	1	24	22.19	22.26	22.05		
5	16QAM	12	0	21.59	21.82	21.80	22.5	2
5	16QAM	12	7	21.68	22.06	22.10		
5	16QAM	12	13	21.88	22.19	22.02		
5	16QAM	25	0	21.78	22.04	21.89		

Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	23.79	23.87	23.77	24.5	0
3	QPSK	1	8	23.91	23.93	23.94		
3	QPSK	1	14	23.73	23.73	23.90		
3	QPSK	8	0	22.93	22.95	22.95	23.5	1
3	QPSK	8	4	22.72	22.87	23.03		
3	QPSK	8	7	22.78	22.99	22.93		
3	QPSK	15	0	22.67	22.94	22.99		
3	16QAM	1	0	22.55	22.63	23.27	23.5	1
3	16QAM	1	8	22.70	22.66	22.99		
3	16QAM	1	14	22.55	22.75	22.38		
3	16QAM	8	0	21.79	21.90	22.04	22.5	2
3	16QAM	8	4	21.80	21.85	21.97		
3	16QAM	8	7	21.83	22.04	21.98		
3	16QAM	15	0	21.82	22.05	21.98		
Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	23.70	23.88	23.79	24.5	0
1.4	QPSK	1	3	23.84	23.95	23.87		
1.4	QPSK	1	5	23.75	23.92	23.88		
1.4	QPSK	3	0	23.88	24.00	23.99		
1.4	QPSK	3	1	23.92	23.97	23.93		
1.4	QPSK	3	3	23.90	23.98	23.98		
1.4	QPSK	6	0	22.74	22.86	22.83	23.5	1
1.4	16QAM	1	0	22.68	22.06	22.47	23.5	1
1.4	16QAM	1	3	22.66	22.49	22.58		
1.4	16QAM	1	5	22.45	22.97	22.47		
1.4	16QAM	3	0	22.79	22.70	22.63		
1.4	16QAM	3	1	22.76	22.99	22.87		
1.4	16QAM	3	3	22.74	22.82	22.93		
1.4	16QAM	6	0	21.74	21.77	21.83	22.5	2

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v2.0+EDR	Bluetooth v4.2 LE
2.4GHz Bluetooth	12.00	2.50

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

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

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

Bluetooth Max Power (dBm)	Frequency (GHz)	Separation Distance (mm)	Exclusion Thresholds
12.00	2.48	15	1.7

Note:
Per KDB 447498 D01v06, a distance of 15 mm is applied to determine 1g SAR test exclusion. The test exclusion threshold is 1.7 which is <= 3, SAR testing is not required.

14. Antenna Dimensions and Separation Distances

Please refer to the separate filing document.

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. Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 0.8W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

WCDMA Note:

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

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / B5 / B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

15.1 Head SAR

<WCDMA SAR>

Plot No.	Flip Configuration	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	Open	WCDMA Band V	RMC 12.2Kbps	Right Cheek	4182	836.4	23.66	24.00	1.081	0.05	0.491	0.531
	Open	WCDMA Band V	RMC 12.2Kbps	Right Tilted	4182	836.4	23.66	24.00	1.081	0.04	0.271	0.293
	Open	WCDMA Band V	RMC 12.2Kbps	Left Cheek	4182	836.4	23.66	24.00	1.081	0.03	0.483	0.522
	Open	WCDMA Band V	RMC 12.2Kbps	Left Tilted	4182	836.4	23.66	24.00	1.081	0.02	0.242	0.262
02	Open	WCDMA Band II	RMC 12.2Kbps	Right Cheek	9262	1852.4	23.82	24.00	1.042	0.05	0.434	0.452
	Open	WCDMA Band II	RMC 12.2Kbps	Right Tilted	9262	1852.4	23.82	24.00	1.042	-0.04	0.230	0.240
	Open	WCDMA Band II	RMC 12.2Kbps	Left Cheek	9262	1852.4	23.82	24.00	1.042	0.03	0.383	0.399
	Open	WCDMA Band II	RMC 12.2Kbps	Left Tilted	9262	1852.4	23.82	24.00	1.042	0.02	0.234	0.244

<LTE SAR>

Plot No.	Flip Configuration	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Open	LTE Band 12	10M	QPSK	1	25	Right Cheek	23095	707.5	24.20	24.50	1.072	0.09	0.338	0.362
	Open	LTE Band 12	10M	QPSK	25	0	Right Cheek	23095	707.5	22.95	23.50	1.135	0.02	0.236	0.268
	Open	LTE Band 12	10M	QPSK	1	25	Right Tilted	23095	707.5	24.20	24.50	1.072	0.02	0.143	0.153
	Open	LTE Band 12	10M	QPSK	25	0	Right Tilted	23095	707.5	22.95	23.50	1.135	0.03	0.101	0.115
03	Open	LTE Band 12	10M	QPSK	1	25	Left Cheek	23095	707.5	24.20	24.50	1.072	0.08	0.532	0.570
	Open	LTE Band 12	10M	QPSK	25	0	Left Cheek	23095	707.5	22.95	23.50	1.135	0.06	0.268	0.304
	Open	LTE Band 12	10M	QPSK	1	25	Left Tilted	23095	707.5	24.20	24.50	1.072	0.04	0.150	0.161
	Open	LTE Band 12	10M	QPSK	25	0	Left Tilted	23095	707.5	22.95	23.50	1.135	0.07	0.107	0.121
	Open	LTE Band 5	10M	QPSK	1	25	Right Cheek	20525	836.5	23.67	24.00	1.079	0.02	0.556	0.600
	Open	LTE Band 5	10M	QPSK	25	0	Right Cheek	20525	836.5	22.63	23.00	1.089	0.05	0.444	0.483
	Open	LTE Band 5	10M	QPSK	1	25	Right Tilted	20525	836.5	23.67	24.00	1.079	0.01	0.284	0.306
	Open	LTE Band 5	10M	QPSK	25	0	Right Tilted	20525	836.5	22.63	23.00	1.089	0.06	0.250	0.272
04	Open	LTE Band 5	10M	QPSK	1	25	Left Cheek	20525	836.5	23.67	24.00	1.079	-0.02	0.712	0.768
	Open	LTE Band 5	10M	QPSK	25	0	Left Cheek	20525	836.5	22.63	23.00	1.089	0.02	0.578	0.629
	Open	LTE Band 5	10M	QPSK	1	25	Left Tilted	20525	836.5	23.67	24.00	1.079	-0.05	0.275	0.297
	Open	LTE Band 5	10M	QPSK	25	0	Left Tilted	20525	836.5	22.63	23.00	1.089	0.03	0.238	0.259
05	Open	LTE Band 4	20M	QPSK	1	49	Right Cheek	20175	1732.5	23.95	24.50	1.135	0.07	0.293	0.333
	Open	LTE Band 4	20M	QPSK	50	0	Right Cheek	20175	1732.5	22.80	23.50	1.175	0.03	0.224	0.263
	Open	LTE Band 4	20M	QPSK	1	49	Right Tilted	20175	1732.5	23.95	24.50	1.135	0.03	0.171	0.194
	Open	LTE Band 4	20M	QPSK	50	0	Right Tilted	20175	1732.5	22.80	23.50	1.175	0.01	0.135	0.159
	Open	LTE Band 4	20M	QPSK	1	49	Left Cheek	20175	1732.5	23.95	24.50	1.135	0.01	0.263	0.299
	Open	LTE Band 4	20M	QPSK	50	0	Left Cheek	20175	1732.5	22.80	23.50	1.175	-0.04	0.198	0.233
	Open	LTE Band 4	20M	QPSK	1	49	Left Tilted	20175	1732.5	23.95	24.50	1.135	0.02	0.176	0.200
	Open	LTE Band 4	20M	QPSK	50	0	Left Tilted	20175	1732.5	22.80	23.50	1.175	0.05	0.133	0.156
06	Open	LTE Band 2	20M	QPSK	1	49	Right Cheek	18700	1860	24.35	24.50	1.035	0.06	0.432	0.447
	Open	LTE Band 2	20M	QPSK	50	0	Right Cheek	18700	1860	23.04	23.50	1.112	0.02	0.349	0.388
	Open	LTE Band 2	20M	QPSK	1	49	Right Tilted	18700	1860	24.35	24.50	1.035	0.09	0.224	0.232
	Open	LTE Band 2	20M	QPSK	50	0	Right Tilted	18700	1860	23.04	23.50	1.112	0.08	0.173	0.192
	Open	LTE Band 2	20M	QPSK	1	49	Left Cheek	18700	1860	24.35	24.50	1.035	0.09	0.401	0.415
	Open	LTE Band 2	20M	QPSK	50	0	Left Cheek	18700	1860	23.04	23.50	1.112	0.07	0.310	0.345
	Open	LTE Band 2	20M	QPSK	1	49	Left Tilted	18700	1860	24.35	24.50	1.035	0.02	0.228	0.236
	Open	LTE Band 2	20M	QPSK	50	0	Left Tilted	18700	1860	23.04	23.50	1.112	-0.04	0.178	0.198

15.2 Body Worn Accessory SAR

<WCDMA SAR>

Plot No.	Flip Configuration	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)
	Close	WCDMA Band V	RMC 12.2Kbps	Front	15	4182	836.4	23.66	24.00	1.081	-0.07	0.376	0.407
07	Close	WCDMA Band V	RMC 12.2Kbps	Back	15	4182	836.4	23.66	24.00	1.081	-0.03	0.632	**0.683**
	Close	WCDMA Band II	RMC 12.2Kbps	Front	15	9262	1852.4	23.82	24.00	1.042	0.05	0.294	0.306
08	Close	WCDMA Band II	RMC 12.2Kbps	Back	15	9262	1852.4	23.82	24.00	1.042	-0.01	0.790	**0.823**
	Close	WCDMA Band II	RMC 12.2Kbps	Back	15	9400	1880	23.75	24.00	1.059	-0.15	0.763	0.808
	Close	WCDMA Band II	RMC 12.2Kbps	Back	15	9538	1907.6	23.70	24.00	1.072	-0.02	0.704	0.754

<LTE SAR>

Plot No.	Flip Configuration	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Close	LTE Band 12	10M	QPSK	1	25	Front	15	23095	707.5	24.20	24.50	1.072	0.05	0.131	0.140
	Close	LTE Band 12	10M	QPSK	25	0	Front	15	23095	707.5	22.95	23.50	1.135	0.07	0.068	0.077
09	Close	LTE Band 12	10M	QPSK	1	25	Back	15	23095	707.5	24.20	24.50	1.072	0.02	0.341	**0.365**
	Close	LTE Band 12	10M	QPSK	25	0	Back	15	23095	707.5	22.95	23.50	1.135	-0.03	0.196	0.222
	Close	LTE Band 5	10M	QPSK	1	25	Front	15	20525	836.5	23.67	24.00	1.079	0.06	0.392	0.423
	Close	LTE Band 5	10M	QPSK	25	0	Front	15	20525	836.5	22.63	23.00	1.089	0.04	0.317	0.345
10	Close	LTE Band 5	10M	QPSK	1	25	Back	15	20525	836.5	23.67	24.00	1.079	-0.09	0.889	**0.959**
	Close	LTE Band 5	10M	QPSK	25	0	Back	15	20525	836.5	22.63	23.00	1.089	-0.02	0.726	0.791
	Close	LTE Band 5	10M	QPSK	50	0	Back	15	20525	836.5	22.62	23.00	1.091	0.03	0.704	0.768
	Close	LTE Band 4	20M	QPSK	1	49	Front	15	20175	1732.5	23.95	24.50	1.135	-0.04	0.223	0.253
	Close	LTE Band 4	20M	QPSK	50	0	Front	15	20175	1732.5	22.80	23.50	1.175	-0.08	0.174	0.204
11	Close	LTE Band 4	20M	QPSK	1	49	Back	15	20175	1732.5	23.95	24.50	1.135	-0.01	0.912	**1.035**
	Close	LTE Band 4	20M	QPSK	50	0	Back	15	20175	1732.5	22.80	23.50	1.175	-0.15	0.698	0.820
	Close	LTE Band 4	20M	QPSK	100	0	Back	15	20175	1732.5	22.78	23.50	1.180	-0.06	0.709	0.837
	Close	LTE Band 2	20M	QPSK	1	49	Front	15	18700	1860	24.35	24.50	1.035	0.05	0.282	0.292
	Close	LTE Band 2	20M	QPSK	50	0	Front	15	18700	1860	23.04	23.50	1.112	-0.12	0.236	0.262
12	Close	LTE Band 2	20M	QPSK	1	49	Back	15	18700	1860	24.35	24.50	1.035	-0.08	0.734	**0.760**
	Close	LTE Band 2	20M	QPSK	50	0	Back	15	18700	1860	23.04	23.50	1.112	0.04	0.576	0.640

15.3 Repeated SAR Measurement

No.	Flip Configuration	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	Close	LTE Band 5	10M	QPSK	1	25	Back	15	20525	836.5	23.67	24.00	1.079	-0.09	0.889	1	0.959
2nd	Close	LTE Band 5	10M	QPSK	1	25	Back	15	20525	836.5	23.67	24.00	1.079	0.13	0.868	1.024	0.937
1st	Close	LTE Band 4	20M	QPSK	1	49	Back	15	20175	1732.5	23.95	24.50	1.135	-0.01	0.912	1	1.035
2nd	Close	LTE Band 4	20M	QPSK	1	49	Back	15	20175	1732.5	23.95	24.50	1.135	-0.07	0.853	1.069	0.968

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	Head	Body-worn
1.	WCDMA + Bluetooth		Yes
2.	LTE + Bluetooth		Yes

General Note:

1. This device has no VoIP function, LTE supports VoLTE operation.
2. EUT will choose either WCDMA or LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
3. The reported SAR summation is calculated based on the same configuration and test position.
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.

Bluetooth Max Power (dBm)	Exposure Position	Body worn
	Test separation	15 mm
12.00	Estimated 1g SAR (W/kg)	0.224

16.1 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1	2	1+2 Summed 1g SAR (W/kg)
			WWAN	Bluetooth	
			1g SAR (W/kg)	Estimated 1g SAR (W/kg)	
WCDMA	Band V	Front	0.407	0.224	0.63
		Back	0.683	0.224	0.91
	Band II	Front	0.306	0.224	0.53
		Back	0.823	0.224	1.05
LTE	Band 12	Front	0.140	0.224	0.36
		Back	0.365	0.224	0.59
	Band 5	Front	0.423	0.224	0.65
		Back	0.959	0.224	1.18
	Band 4	Front	0.253	0.224	0.48
		Back	1.035	0.224	**1.26**
	Band 2	Front	0.292	0.224	0.52
		Back	0.760	0.224	0.98

Test Engineer：Johnny Chen

17. Uncertainty Assessment

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

18. References

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

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

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

[4] SPEAG DASY System Handbook

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

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

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

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

Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_750MHz_171218

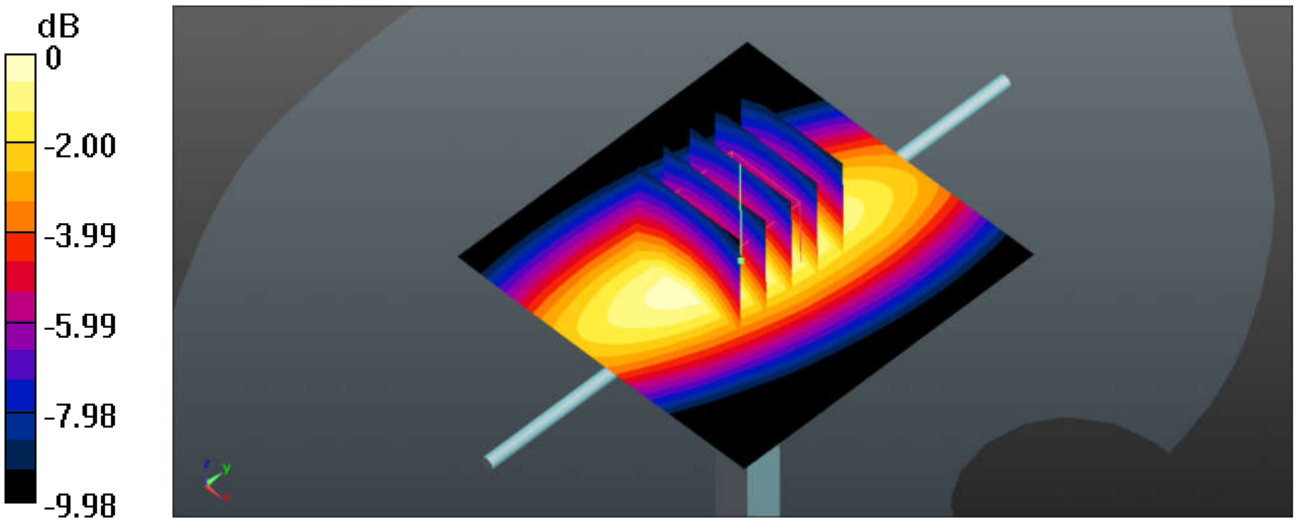
DUT: D750V3-SN:1087

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium: HSL_750_171218 Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 40.918; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.42, 9.42, 9.42); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.56 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.97 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 2.06 W/kg; SAR(10 g) = 1.39 W/kg
Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.56 W/kg

System Check_Head_835MHz_171218

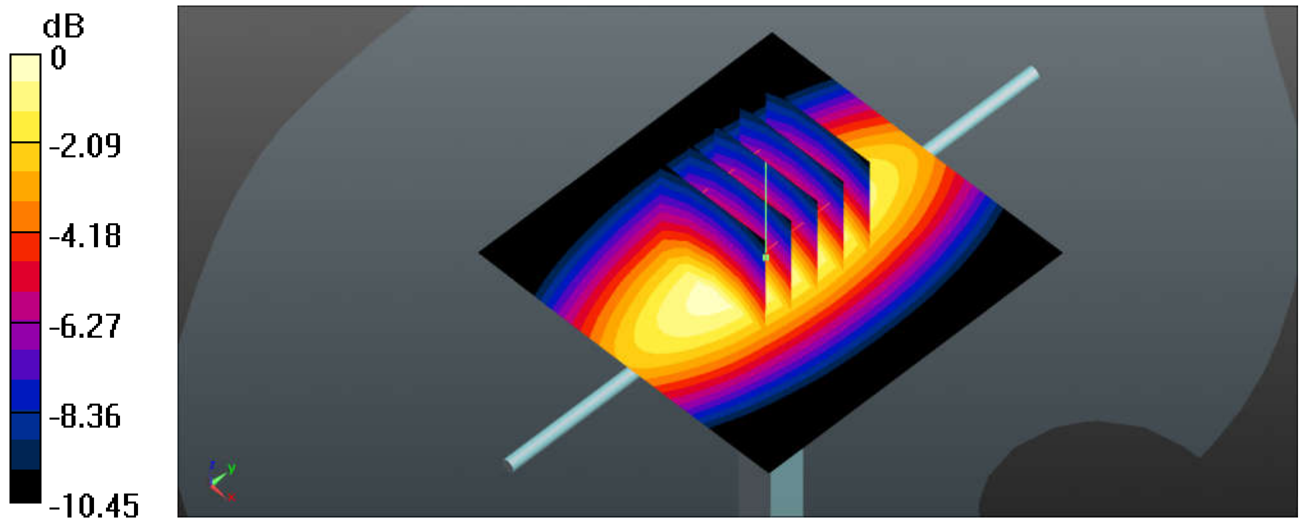
DUT: D835V2-SN:4d151

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL_835_171218 Medium parameters used: f = 835 MHz; σ = 0.916 S/m; ε_r = 41.029; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.13, 9.13, 9.13); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.01 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.63 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 3.48 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 3.01 W/kg



0 dB = 3.01 W/kg

System Check_Head_1750MHz_171217

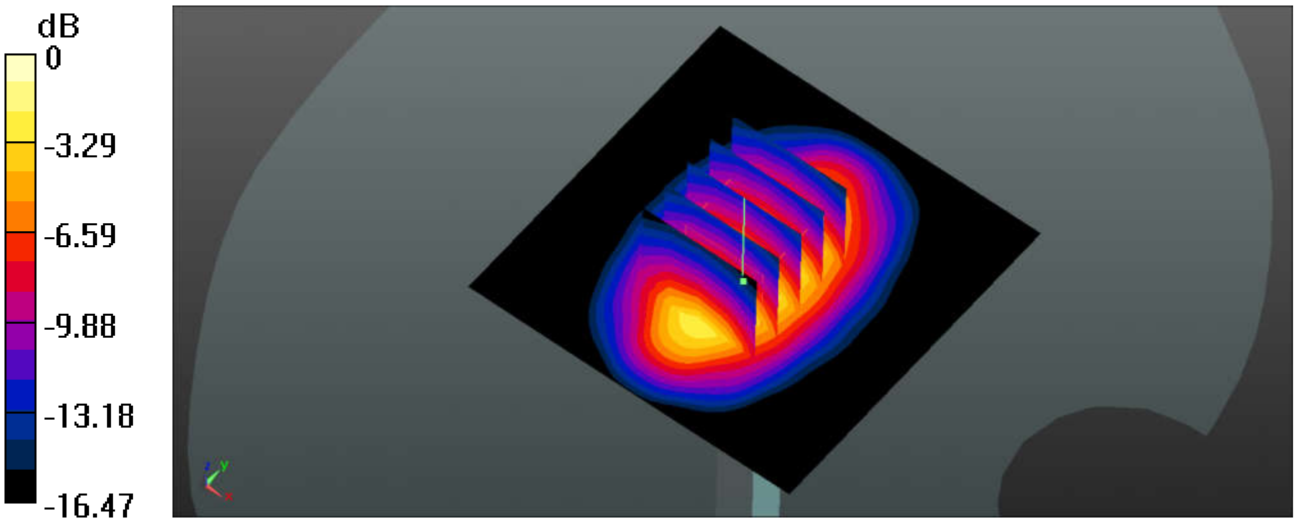
DUT: D1750V2-SN:1137

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: HSL_1750_171217 Medium parameters used: f = 1750 MHz; σ = 1.373 S/m; ε_r = 41.392; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(8.16, 8.16, 8.16); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.2 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 93.99 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 14.8 W/kg
SAR(1 g) = 8.6 W/kg; SAR(10 g) = 4.67 W/kg
Maximum value of SAR (measured) = 11.9 W/kg



0 dB = 12.2 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2017.12.17

System Check_Head_1900MHz_171217

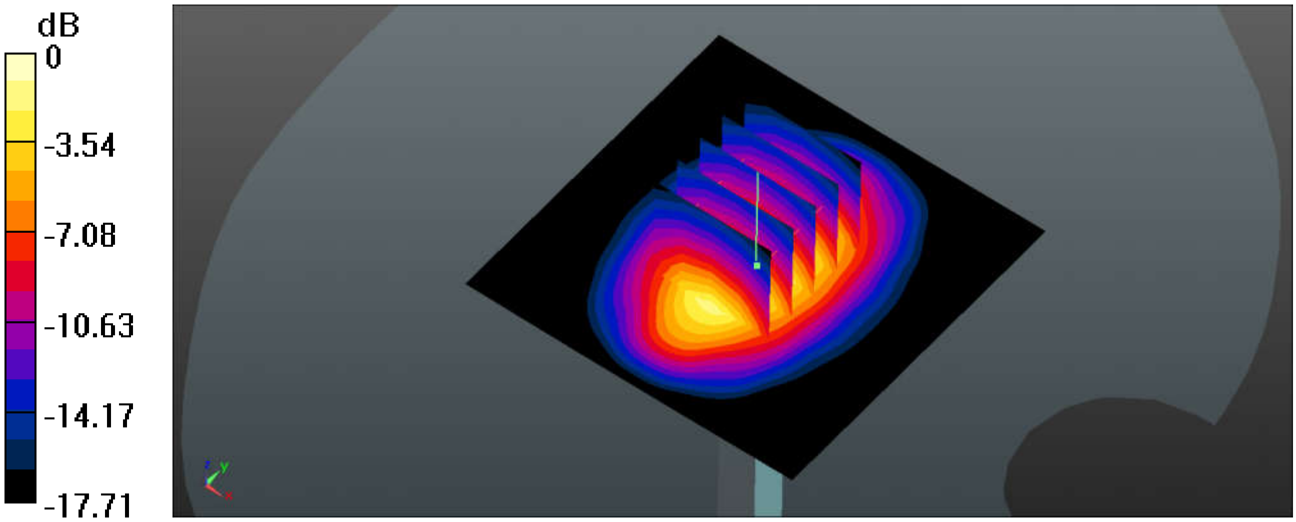
DUT: D1900V2-SN:5d170

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900_171217 Medium parameters used: f = 1900 MHz; σ = 1.44 S/m; ε_r = 40.038; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.79, 7.79, 7.79); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.0 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 99.38 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 9.67 W/kg; SAR(10 g) = 5.05 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 14.0 W/kg

System Check_Body_750MHz_171220

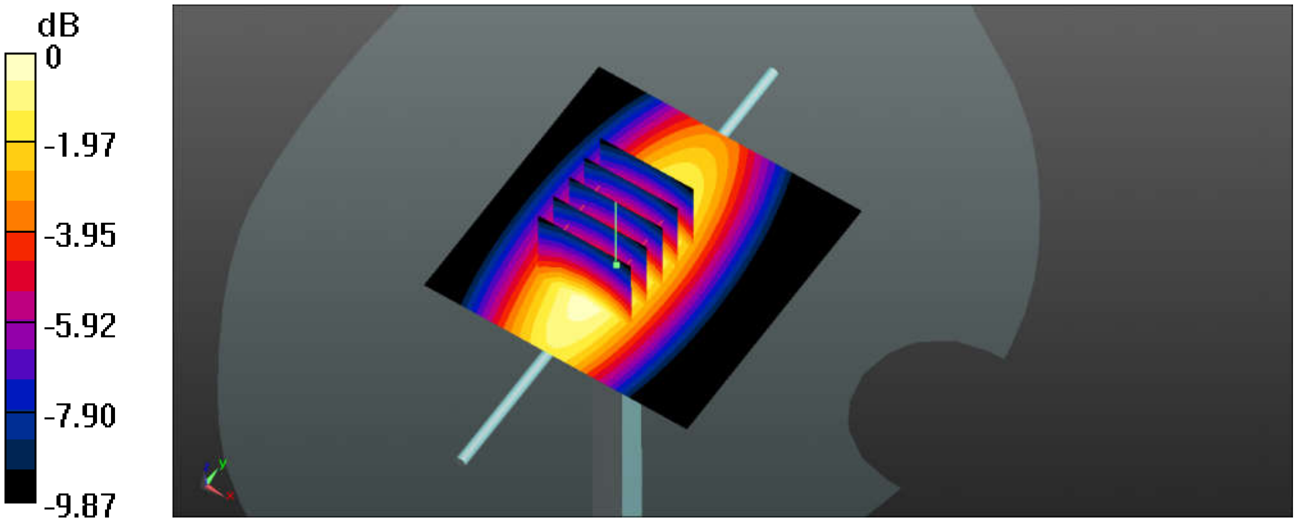
DUT: D750V3-SN:1087

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium: MSL_750_171220 Medium parameters used: f = 750 MHz; σ = 0.961 S/m; ε_r = 53.917; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.43, 9.43, 9.43); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.42 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 49.14 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 2.88 W/kg
SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.41 W/kg
Maximum value of SAR (measured) = 2.46 W/kg



0 dB = 2.46 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.12.20

System Check_Body_835MHz_171220

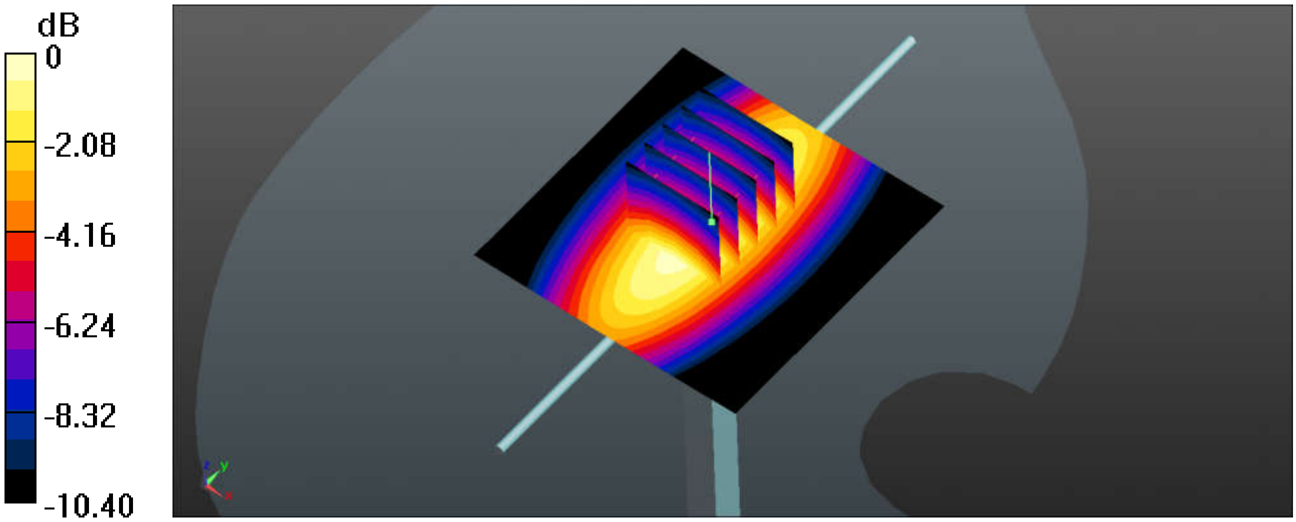
DUT: D835V2-SN:4d151

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_835_171220 Medium parameters used: f = 835 MHz; σ = 0.968 S/m; ε_r = 57.458; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.21, 9.21, 9.21); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.70 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.55 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 3.29 W/kg
SAR(1 g) = 2.29 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 2.78 W/kg



0 dB = 2.78 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.12.19

System Check_Body_1750MHz_171219

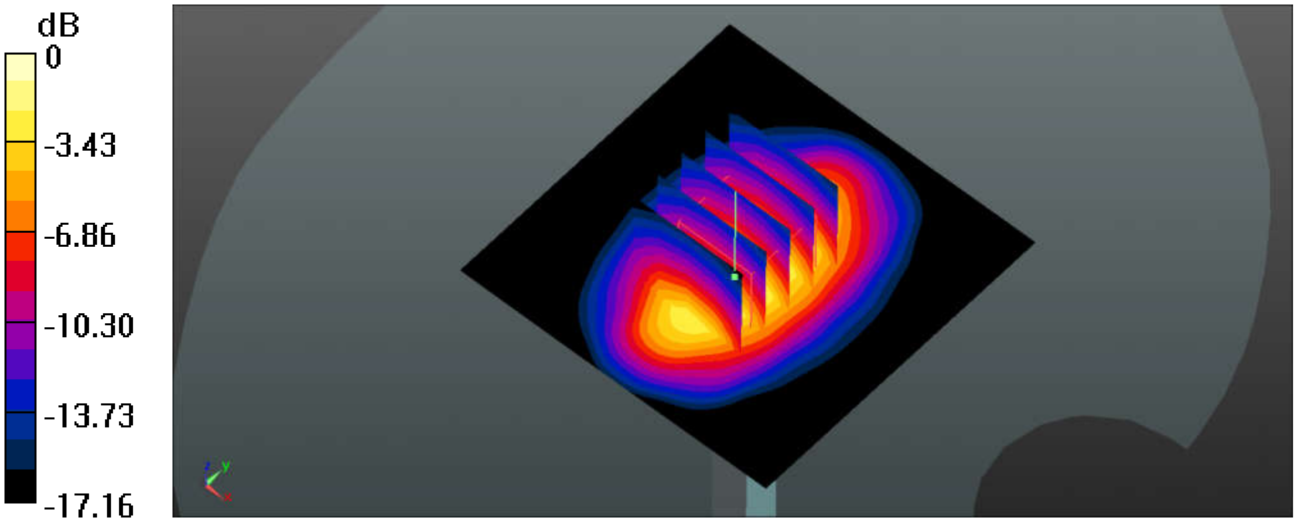
DUT: D1750V2-SN:1137

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_171219 Medium parameters used: f = 1750 MHz; σ = 1.522 S/m; ε_r = 52.519; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.87, 7.87, 7.87); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 13.0 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 92.16 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.84 W/kg
Maximum value of SAR (measured) = 12.5 W/kg



0 dB = 13.0 W/kg

System Check_Body_1900MHz_171219

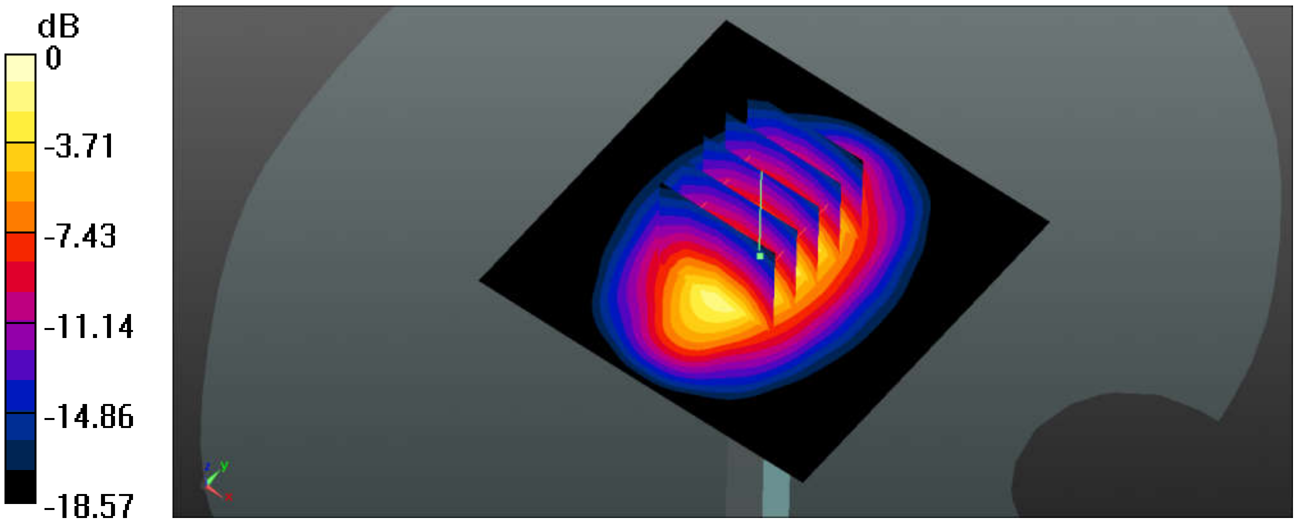
DUT: D1900V2-SN:5d170

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_171219 Medium parameters used: f = 1900 MHz; σ = 1.58 S/m; ε_r = 54.631; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.58, 7.58, 7.58); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.9 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 85.67 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 14.6 W/kg



0 dB = 14.9 W/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.12.18

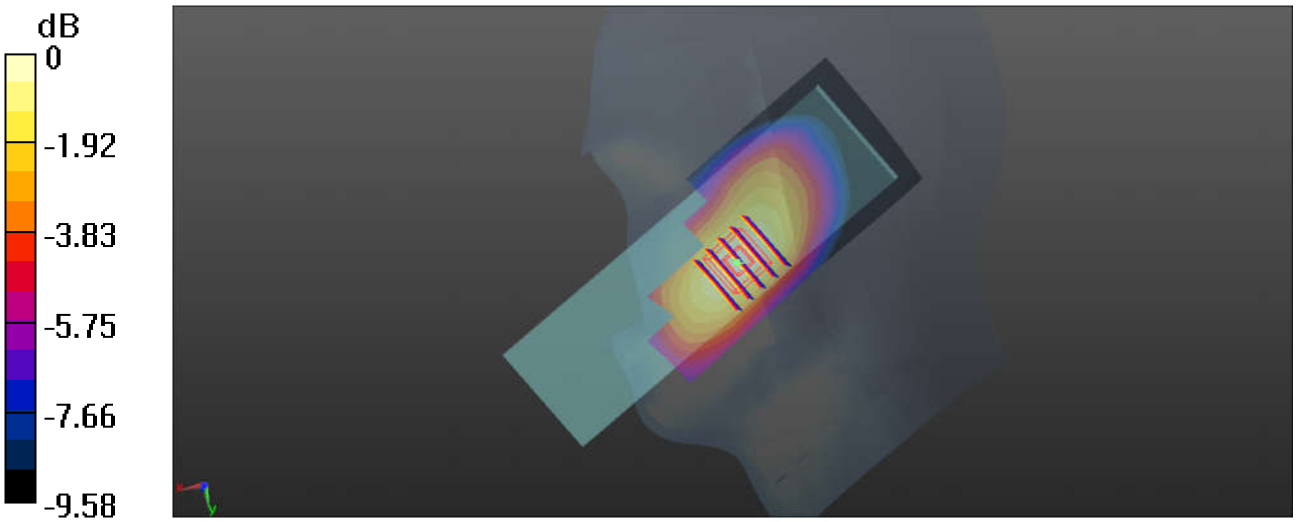
01_WCDMA Band V_RMC 12.2Kbps_Right Cheek_Ch4182_Flip Open

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: HSL_835_171218 Medium parameters used: f = 836.4 MHz; σ = 0.917 S/m; ε_r = 41.014; ρ= 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.13, 9.13, 9.13); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4182/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.636 W/kg

Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.558 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.758 W/kg
SAR(1 g) = 0.491 W/kg; SAR(10 g) = 0.334 W/kg
Maximum value of SAR (measured) = 0.621 W/kg



0 dB = 0.621 W/kg

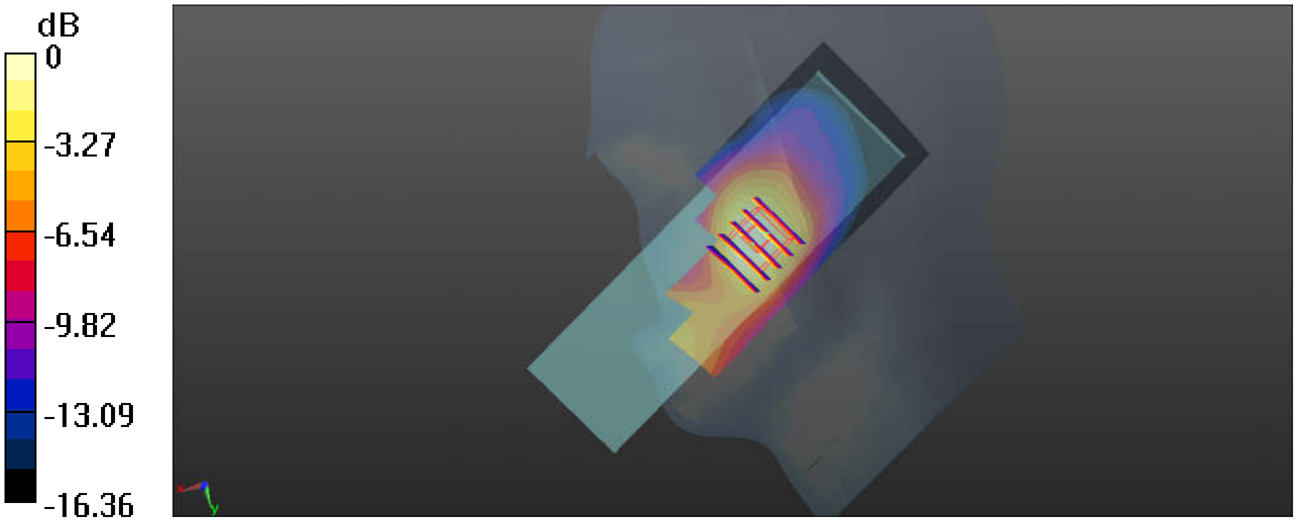
02_WCDMA Band II_RMC 12.2Kbps_Right Cheek_Ch9262_Flip Open

Communication System: UID 0, UMTS (0); Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium: HSL_1900_171217 Medium parameters used: f = 1852.4 MHz; σ = 1.391 S/m; ε_r = 40.251; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.79, 7.79, 7.79); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9262/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.588 W/kg

Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.7030 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.696 W/kg
SAR(1 g) = 0.434 W/kg; SAR(10 g) = 0.253 W/kg
Maximum value of SAR (measured) = 0.558 W/kg



0 dB = 0.588 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab   Date: 2017.12.18

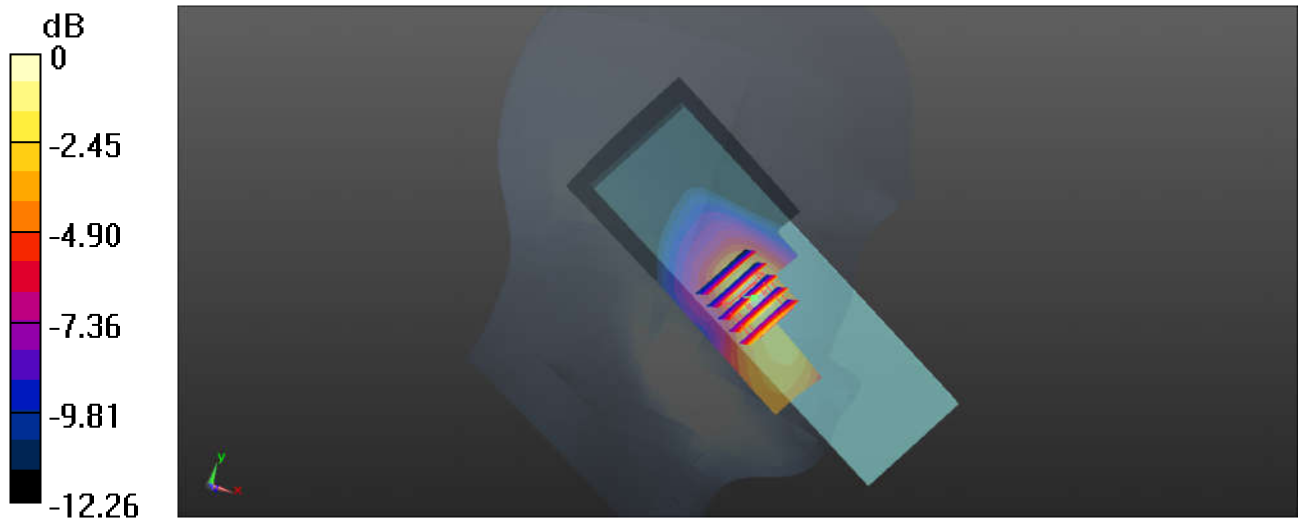
03_LTE Band 12_10M_QPSK_1RB_25Offset_Left Cheek_Ch23095_Flip Open

Communication System: UID 0, LTE (0); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: HSL_750_171218 Medium parameters used: f = 707.5 MHz; σ = 0.867 S/m; ε_r = 41.841; ρ= 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.42, 9.42, 9.42); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23095/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.799 W/kg

Ch23095/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.717 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.532 W/kg; SAR(10 g) = 0.323 W/kg
Maximum value of SAR (measured) = 0.806 W/kg



0 dB = 0.799 W/kg

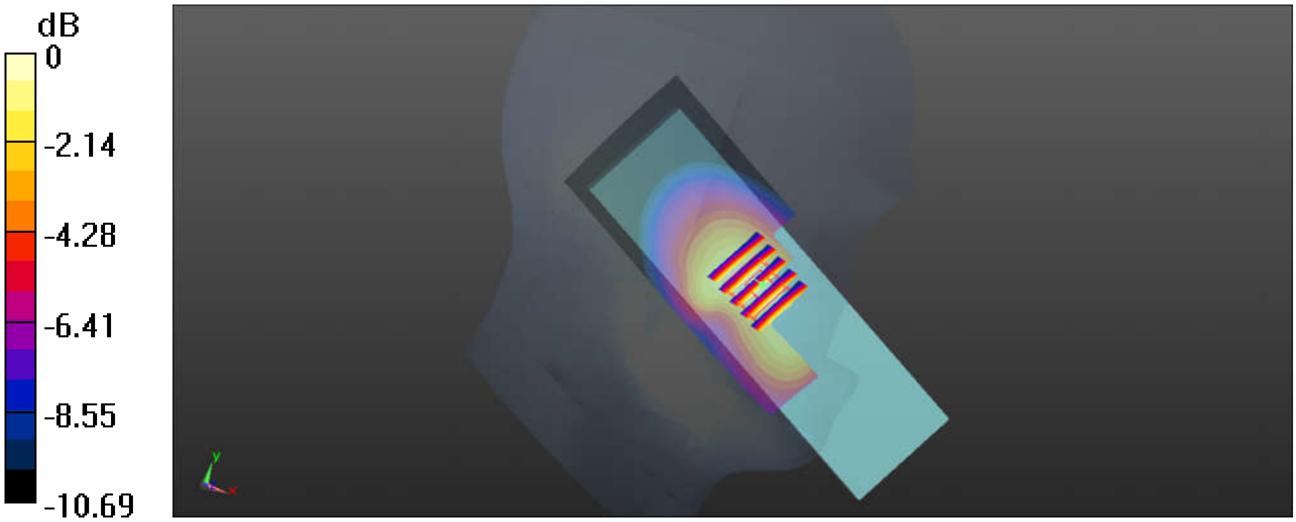
04_LTE Band 5_10M_QPSK_1RB_25Offset_Left Cheek_Ch20525_Flip Open

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: HSL_835_171218 Medium parameters used: f = 836.5 MHz; σ = 0.917 S/m; ε_r = 41.014; ρ= 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.13, 9.13, 9.13); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20525/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.881 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.905 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.712 W/kg; SAR(10 g) = 0.471 W/kg
Maximum value of SAR (measured) = 0.915 W/kg



0 dB = 0.881 W/kg

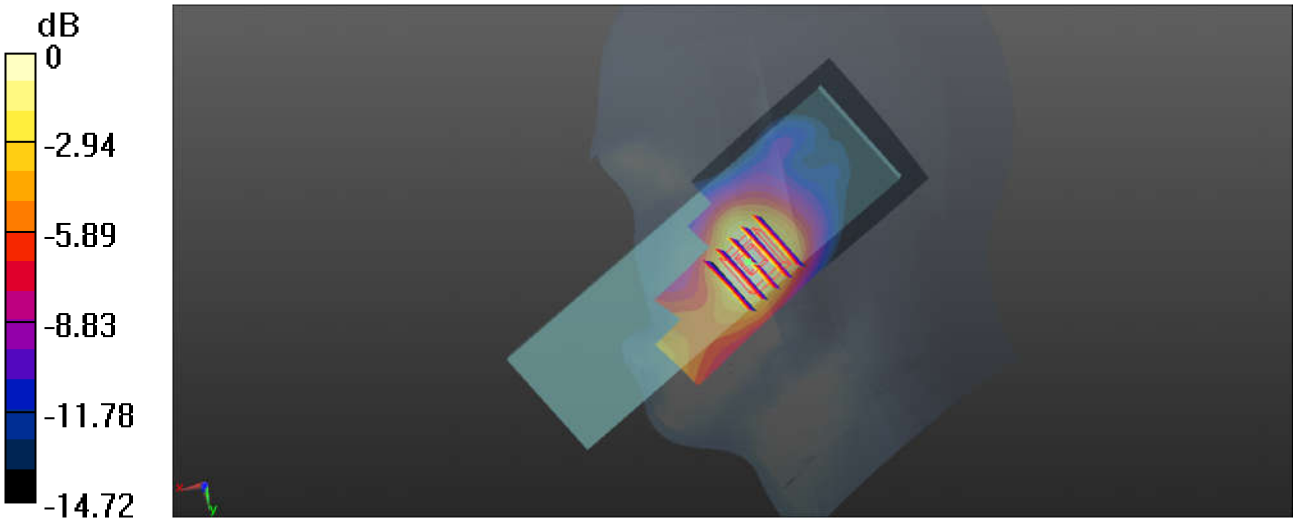
05_LTE Band 4_20M_QPSK_1RB_49Offset_Right Cheek_Ch20175_Flip Open

Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: HSL_1750_171217 Medium parameters used: f = 1732.5 MHz; σ = 1.355 S/m; ε_r = 41.479; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(8.16, 8.16, 8.16); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20175/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.433 W/kg

Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.5800 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.450 W/kg
SAR(1 g) = 0.293 W/kg; SAR(10 g) = 0.176 W/kg
Maximum value of SAR (measured) = 0.371 W/kg



0 dB = 0.371 W/kg

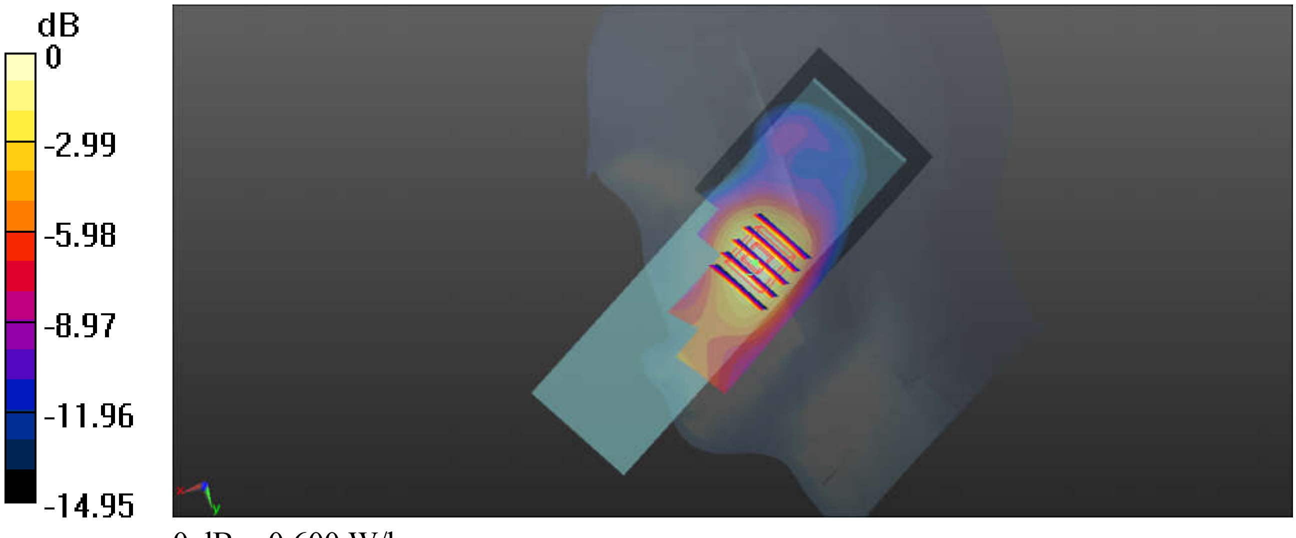
06_LTE Band 2_20M_QPSK_1RB_49Offset_Right Cheek_Ch18700_Flip Open

Communication System: UID 0, LTE (0); Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: HSL_1900_171217 Medium parameters used: f = 1860 MHz; σ = 1.399 S/m; ε_r = 40.219; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.79, 7.79, 7.79); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch18700/Area Scan (51x151x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.600 W/kg

Ch18700/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.178 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.697 W/kg
SAR(1 g) = 0.432 W/kg; SAR(10 g) = 0.257 W/kg
Maximum value of SAR (measured) = 0.557 W/kg



0 dB = 0.600 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.12.20

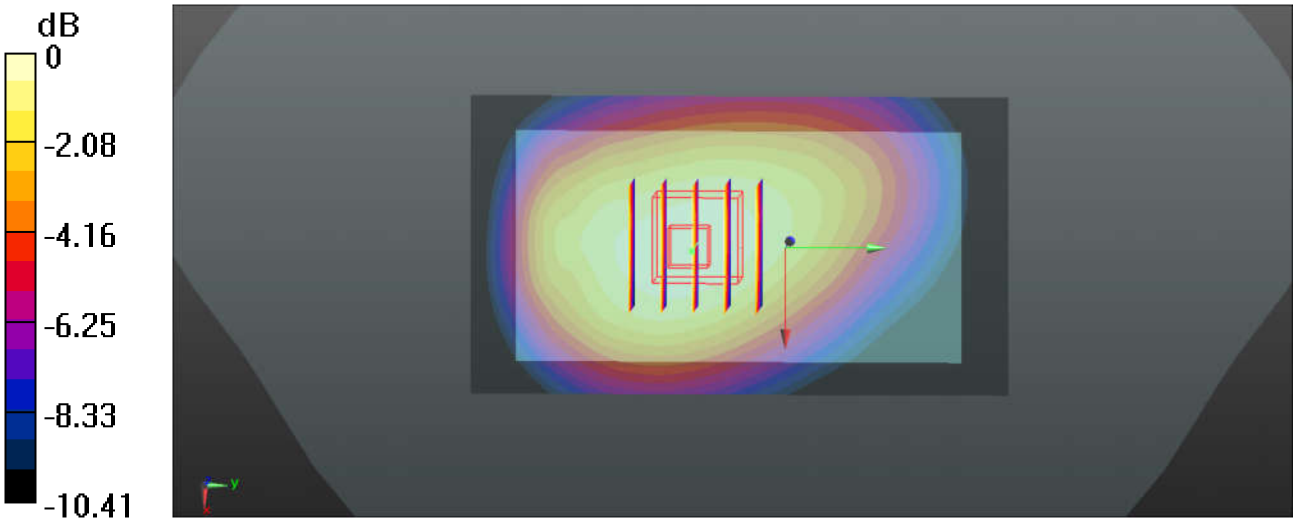
07_WCDMA Band V_RMC 12.2Kbps_Back_15mm_Ch4182_Flip Close

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: MSL_835_171220 Medium parameters used: f = 836.4 MHz; σ = 0.969 S/m; ε_r = 57.444; ρ= 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.21, 9.21, 9.21); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4182/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.745 W/kg

Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.499 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.855 W/kg
SAR(1 g) = 0.632 W/kg; SAR(10 g) = 0.453 W/kg
Maximum value of SAR (measured) = 0.752 W/kg



0 dB = 0.752 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2017.12.19

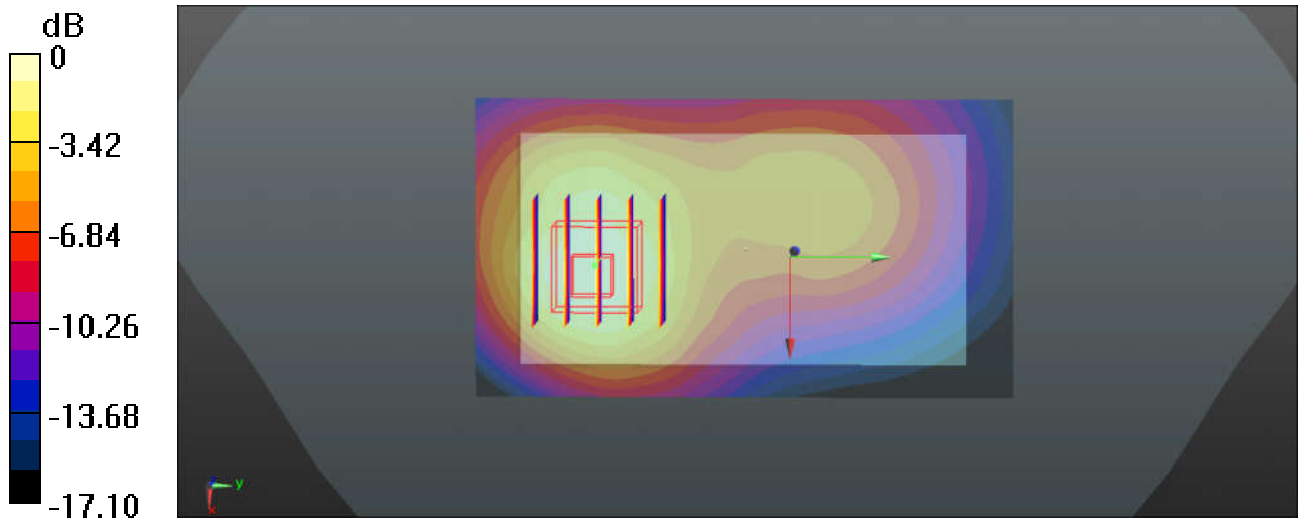
08_WCDMA Band II_RMC 12.2Kbps_Back_15mm_Ch9262_Flip Close

Communication System: UID 0, UMTS (0); Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium: MSL_1900_171219 Medium parameters used: f = 1852.4 MHz; σ = 1.518 S/m; ε_r = 54.738; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.58, 7.58, 7.58); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9262/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.07 W/kg

Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.609 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.790 W/kg; SAR(10 g) = 0.453 W/kg
Maximum value of SAR (measured) = 1.04 W/kg



0 dB = 1.04 W/kg

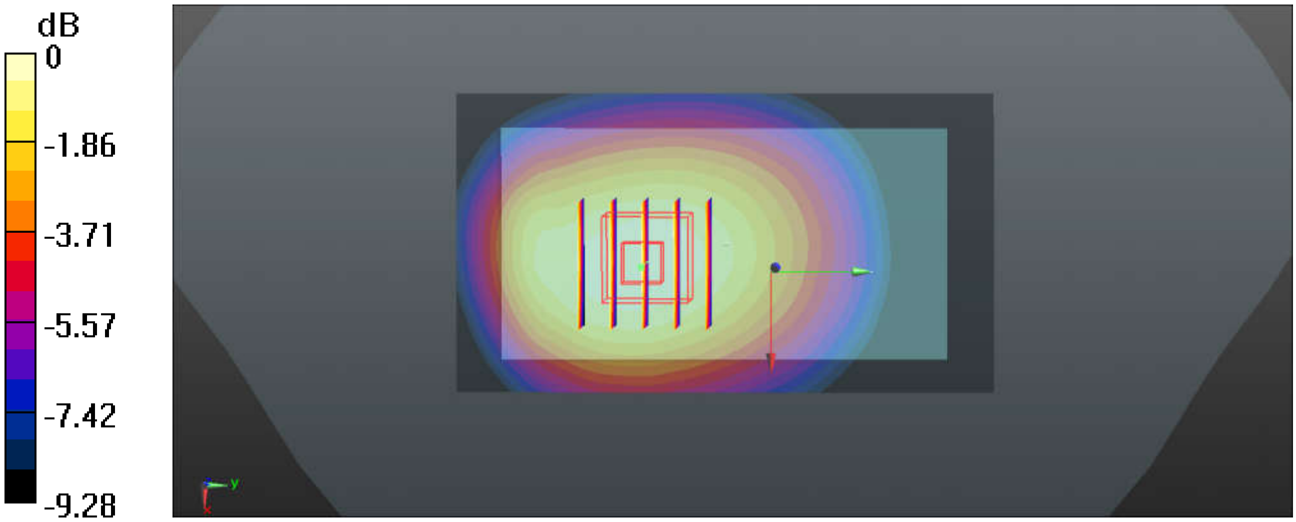
09_LTE Band 12_10M_QPSK_1RB_25Offset_Back_15mm_Ch23095_Flip Close

Communication System: UID 0, LTE (0); Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: MSL_750_171220 Medium parameters used: f = 707.5 MHz; σ = 0.931 S/m; ε_r = 54.883; ρ= 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.43, 9.43, 9.43); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch23095/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.402 W/kg

Ch23095/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.045 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.452 W/kg
SAR(1 g) = 0.341 W/kg; SAR(10 g) = 0.252 W/kg
Maximum value of SAR (measured) = 0.402 W/kg



0 dB = 0.402 W/kg

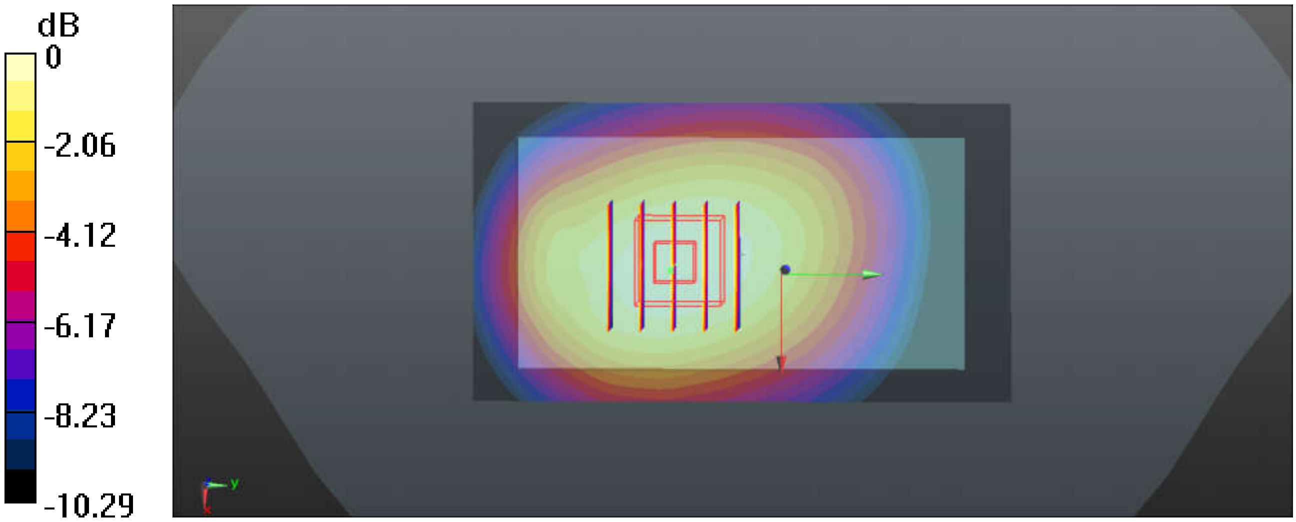
10_LTE Band 5_10M_QPSK_1RB_25Offset_Back_15mm_Ch20525_Flip Close

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz;Duty Cycle: 1:1
Medium: MSL_835_171220 Medium parameters used: f = 836.5 MHz; σ = 0.97 S/m; ε_r = 57.443; ρ =1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(9.21, 9.21, 9.21); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20525/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.06 W/kg

Ch20525/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.081 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.889 W/kg; SAR(10 g) = 0.644 W/kg
Maximum value of SAR (measured) = 1.06 W/kg



0 dB = 1.06 W/kg

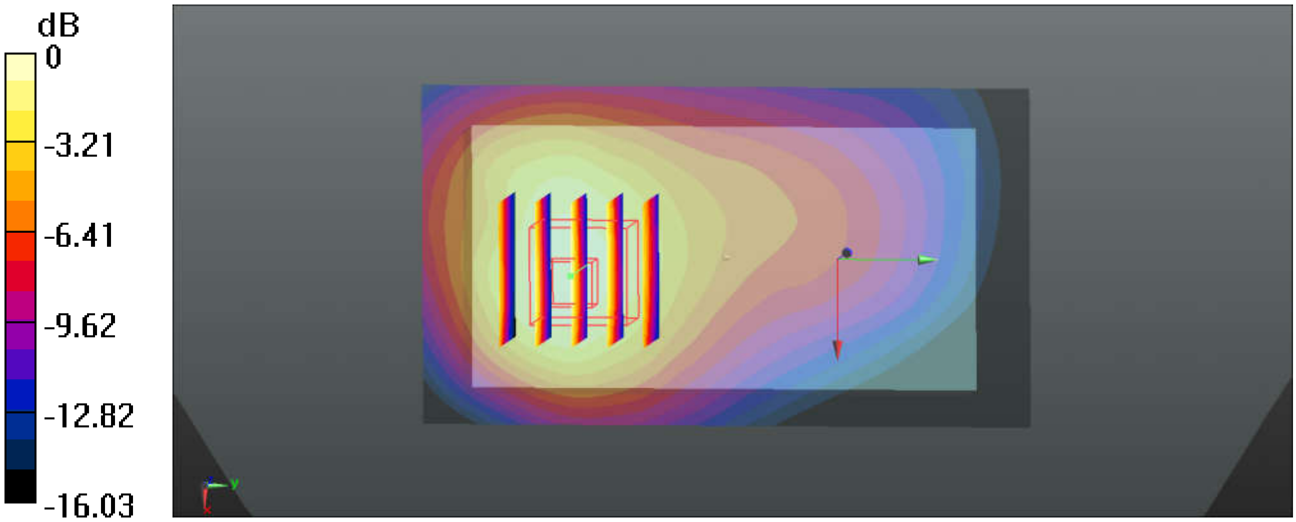
11_LTE Band 4_20M_QPSK_1RB_49Offset_Back_15mm_Ch20175_Flip Close

Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz;Duty Cycle: 1:1
Medium: MSL_1750_171219 Medium parameters used: f = 1732.5 MHz; σ = 1.502 S/m; ε_r = 52.553; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.87, 7.87, 7.87); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20175/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.23 W/kg

Ch20175/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.941 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.912 W/kg; SAR(10 g) = 0.543 W/kg
Maximum value of SAR (measured) = 1.20 W/kg



0 dB = 1.23 W/kg

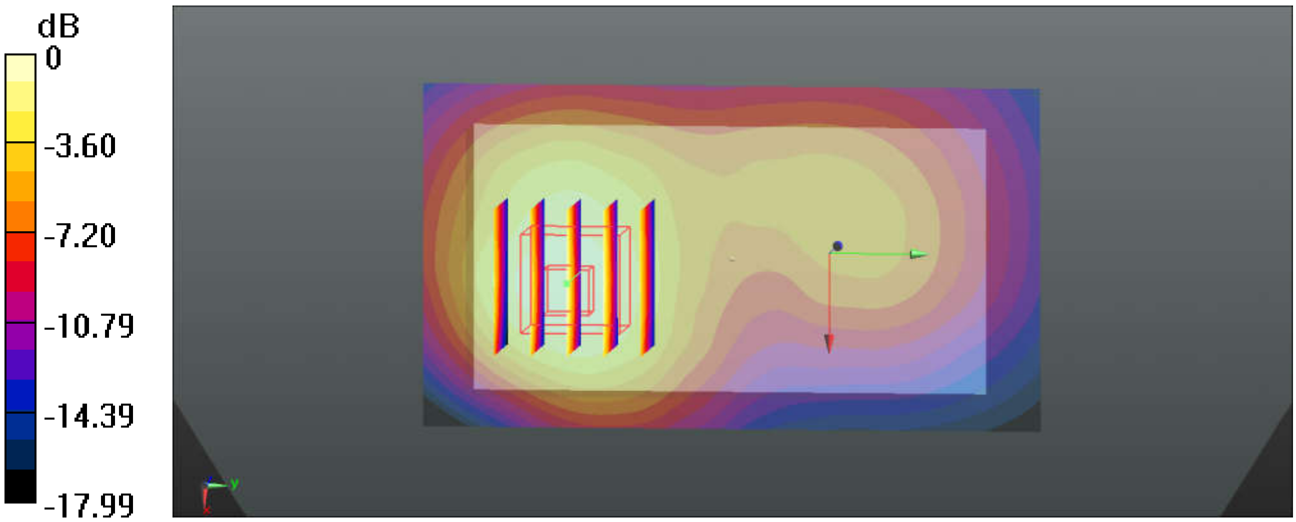
12_LTE Band 2_20M_QPSK_1RB_49Offset_Back_15mm_Ch18700_Flip Close

Communication System: UID 0, LTE (0); Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: MSL_1900_171219 Medium parameters used: f = 1860 MHz; $\sigma = 1.528$ S/m; $\varepsilon_r = 54.71$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(7.58, 7.58, 7.58); Calibrated: 2017.05.05;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2017.07.20
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch18700/Area Scan (51x91x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.00 W/kg

Ch18700/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.262 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.734 W/kg; SAR(10 g) = 0.424 W/kg
Maximum value of SAR (measured) = 0.978 W/kg



0 dB = 1.00 W/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

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国际互认
校准
CALIBRATION
CNAS L0570

Client **Sporton_XA** **Certificate No: Z17-97037**

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1087
Calibration Procedure(s)	FD-Z11-003-01 Calibration Procedures for dipole validation kits
Calibration date:	March 20, 2017

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.J16X04771)	Jun-17
Power sensor NRP-Z91	101547	27-Jun-16 (CTTL, No.J16X04771)	Jun-17
Reference Probe EX3DV4	SN 3617	23-Jan-17(SPEAG,No.EX3-3617_Jan17)	Jan-18
DAE4	SN 777	22-Aug-16(CTTL-SPEAG,No.Z16-97138)	Aug-17
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL, No.J17X00285)	Jan-18

	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: March 24, 2017

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Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005

c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010

d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1258
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.13 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**8.37 mW /g ± 20.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.41 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**5.56 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	0.95 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.17 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**8.73 mW /g ± 20.8 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**5.87 mW /g ± 20.4 % (k=2)**

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0Ω- 3.15jΩ
Return Loss	- 29.7dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7Ω- 2.50jΩ
Return Loss	- 32.0dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.115 ns

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

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

Additional EUT Data

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DASY5 Validation Report for Head TSL

Date: 03.20.2017

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 750 MHz; σ = 0.908 S/m; ε_r = 41.38; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.05, 10.05, 10.05); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 8/22/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

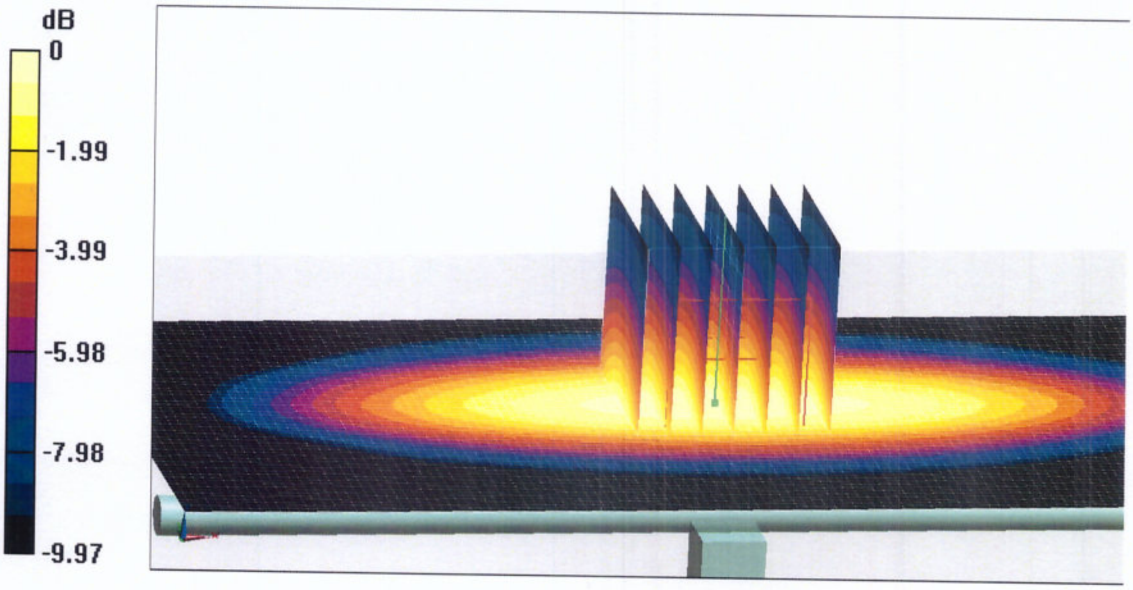
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.61 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.22 W/kg

SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.84 W/kg



0 dB = 2.84 W/kg = 4.53 dBW/kg

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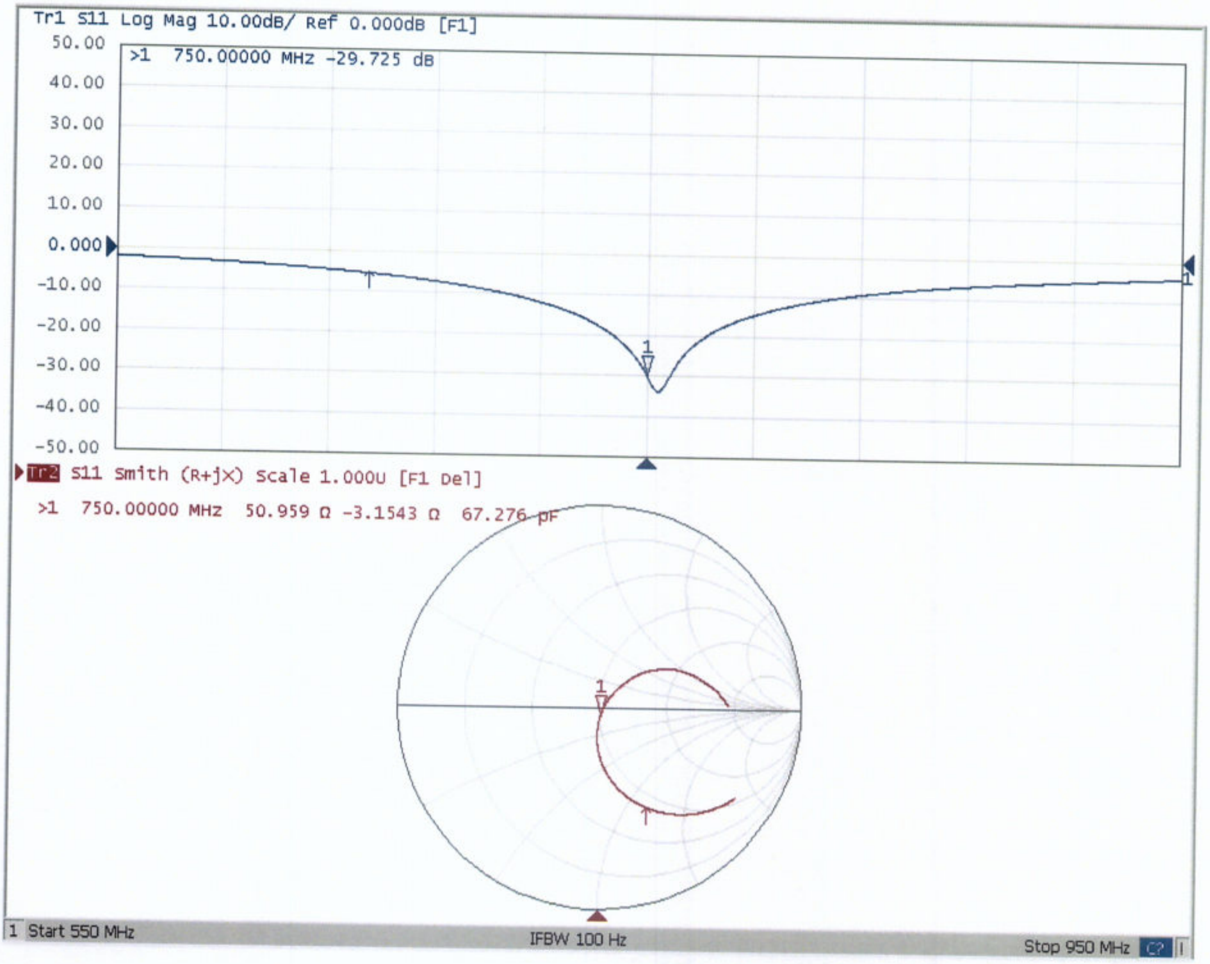
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 03.20.2017

Test Laboratory: CTTL, Beijing, China

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

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

Medium parameters used: f = 750 MHz; σ = 0.952 S/m; ε_r = 55.23; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(9.8, 9.8, 9.8); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn777; Calibrated: 8/22/2016
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: xxxx
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7372)

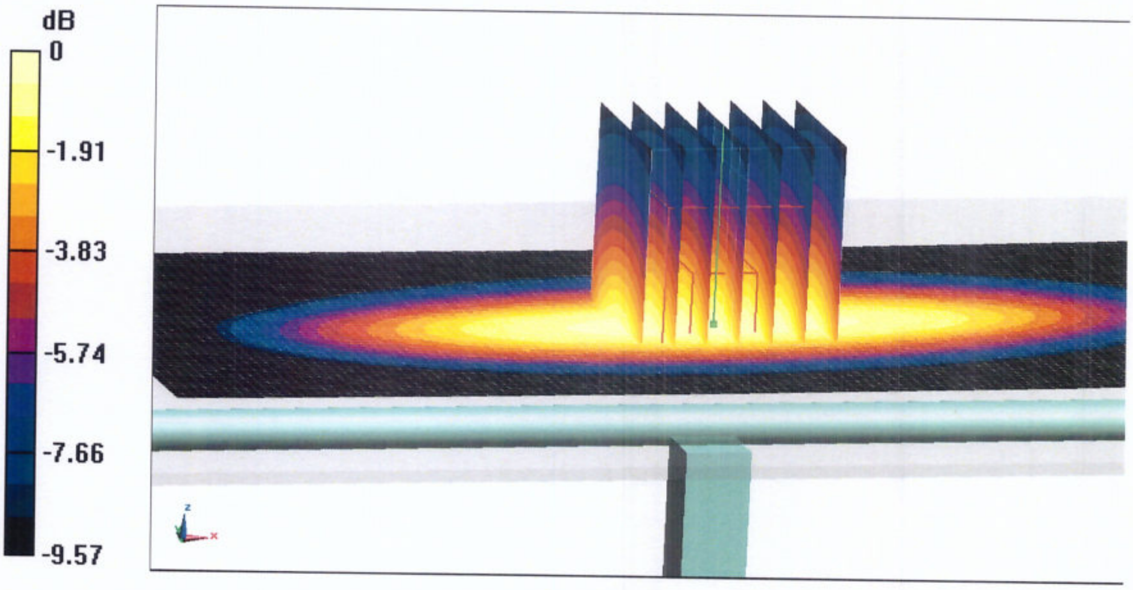
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.49 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.18 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.46 W/kg

Maximum value of SAR (measured) = 2.85 W/kg



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

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Impedance Measurement Plot for Body TSL