

# FCC SAR Test Report

APPLICANT : Yulong Computer Telecommunication  
Scientific (Shenzhen) Co., Ltd.

EQUIPMENT : mobile phone

BRAND NAME : Vodafone

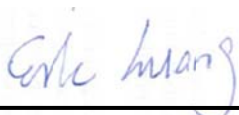
MODEL NAME : 889N

FCC ID : R38YL889N

STANDARD : FCC 47 CFR Part 2 (2.1093)  
ANSI/IEEE C95.1-1992  
IEEE 1528-2003

We, SPORTON INTERNATIONAL (XI'AN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the 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 (XI'AN) INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Deputy Manager



Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL (XI'AN) INC.**

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## Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA412407	Rev. 01	Initial issue of report	May 30, 2014

## 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd., mobile phone, 889N** , are as follows.

Equipment Class	Frequency Band	Operating Mode	Highest SAR Summary			
			Head 1g SAR (W/kg)	Body-worn 1g SAR (W/kg) (Separation 1cm)	Wireless Router 1g SAR (W/kg) (Separation 1cm)	Simultaneous Transmission SAR (W/kg)
PCE	GSM1900	Voice/Data	0.38	1.13	1.43	1.43
	LTE Band 7	Data	0.43	1.32	1.32	
DTS	WLAN 2.4GHz Band	Data	0.02	0.05	0.05	1.43
DSS	Bluetooth	Data				1.43
Date of Testing:			04/14/2014 ~ 04/19/2014			

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 1528-2003.

## 2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (XI'AN) INC.
Test Site Location	1F, Building A3, No. 39 Chuangye Rd., Xi'an Hi-tech Zone, Shanxi Province, P. R. C. TEL: +86-029-8860-8767 FAX: +86-029-8860-8791

Applicant	
Company Name	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.
Address	Coolpad Information Harbor, 2nd Mengxi Road, Northern Part of Science&Technology Park, Nanshan district, Shenzhen, P.R.China

Manufacturer	
Company Name	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd.
Address	Coolpad Information Harbor, 2nd Mengxi Road, Northern Part of Science&Technology Park, Nanshan district, Shenzhen, P.R.China

## 3. Guidance Standard

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 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- FCC KDB 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- FCC KDB 941225 D05 SAR for LTE Devices v02r03
- FCC KDB 941225 D06 Hotspot Mode SAR v01r01

## 4. Equipment Under Test (EUT)

### 4.1 General Information

Product Feature & Specification	
Equipment Name	mobile phone
Brand Name	Vodafone
Model Name	889N
FCC ID	R38YL889N
IMEI Code	008600250424883
Wireless Technology and Frequency Range	GSM1900: 1850.2 MHz ~ 1909.8 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	<ul style="list-style-type: none"> <li>• GSM/GPRS/EGPRS</li> <li>• LTE: QPSK, 16QAM</li> <li>• 802.11b/g/n HT20</li> <li>• Bluetooth v3.0+EDR , Bluetooth v4.0 LE</li> <li>• NFC:ASK</li> </ul>
HW Version	T3
SW Version	4.4.257.00.T3.140506.KVT49L.VF.DE
GSM / (E)GPRS Dual Transfer mode	Class A – EUT can support Packet Switched and Circuit Switched Network simultaneously.
EUT Stage	Production Unit
<b>Remark:</b> <ol style="list-style-type: none"> <li>1. 802.11n-HT40 is not supported in 2.4GHz WLAN.</li> <li>2. This device 2.4GHz WLAN supports Hotspot operation.</li> <li>3. This device supported VoIP in GPRS/EGPRS, LTE (e.g. 3rd party VoIP).</li> <li>4. This device supports DTM operation. Per KDB 941225 D04 v01 requirement, the required test configuration for this device is as below: <ol style="list-style-type: none"> <li>1) This EUT is class A device</li> <li>2) This EUT supports (E)GPRS multi-slot class 12 (max. uplink : 4, max. downlink : 4, total timeslots : 5)</li> <li>3) This EUT supports DTM multi-slot class 11 (max. uplink : 3 for 1 CS &amp; 2 PS, max. downlink : 4, total timeslots : 5)</li> <li>4) The measured maximum conducted power can be referred to section 12 of this report</li> <li>5) For DTM multi-slot class 11 link mode, the device was linked with system emulator (Agilent E5515C) and transmit maximum power on maximum number of Tx slots (one CS timeslot and two PS timeslots per frame).</li> </ol> </li> </ol>	

**4.2 Maximum Tune-up Limit**

Mode		Burst average power(dBm)
		GSM 1900
GSM (GMSK, 1 Tx slot)		30
GPRS (GMSK, 1 Tx slot)		30
GPRS (GMSK, 2 Tx slots)		28
GPRS (GMSK, 3 Tx slots)		28
GPRS (GMSK, 4 Tx slots)		25
EDGE (8PSK, 1 Tx slot)		27
EDGE (8PSK, 2 Tx slots)		23
EDGE (8PSK, 3 Tx slots)		23
EDGE (8PSK, 4 Tx slots)		20
DTM 5	GSM (GMSK, 1 Tx slot)	28
	GPRS (GMSK, 1 Tx slot)	28
DTM 9	GSM (GMSK, 1 Tx slot)	28
	GPRS (GMSK, 1 Tx slot)	28
DTM11	GSM (GMSK, 1 Tx slot)	28
	GPRS (GMSK, 2 Tx slots)	27
DTM 5	GSM (GMSK, 1 Tx slot)	28
	EDGE (8PSK, 1 Tx slot)	23
DTM 9	GSM (GMSK, 1 Tx slot)	28
	EDGE (8PSK, 1 Tx slot)	23
DTM 11	GSM (GMSK, 1 Tx slot)	28
	EDGE (8PSK, 2 Tx slots)	23

LTE Band 7				
Average Power (dBm)				
Modulation	BW (MHz)	RB size	MPR	Target Power
QPSK	20	$\leq 18$	0	23
QPSK	20	$> 18$	1	22
16QAM	20	$\leq 18$	1	22
16QAM	20	$> 18$	2	21
QPSK	15	$\leq 16$	0	23
QPSK	15	$> 16$	1	22
16QAM	15	$\leq 16$	1	22
16QAM	15	$> 16$	2	21
QPSK	10	$\leq 12$	0	23
QPSK	10	$> 12$	1	22
16QAM	10	$\leq 12$	1	22
16QAM	10	$> 12$	2	21
QPSK	5	$\leq 8$	0	23
QPSK	5	$> 8$	1	22
16QAM	5	$\leq 8$	1	22
16QAM	5	$> 8$	2	21

Mode		Maximum Average Power (dBm)
2.4GHz	802.11b	12
	802.11g	11
	802.11n-HT20	10.5
Bluetooth v3.0+EDR		-0.5
Bluetooth v4.0+LE		-0.5

### 4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r03																																																					
FCC ID	R38YL889N																																																				
Equipment Name	mobile phone																																																				
Operating Frequency Range of each LTE transmission band	LTE Band 7: 2502.5 MHz ~ 2567.5 MHz																																																				
Channel Bandwidth	5MHz, 10MHz, 15MHz, 20MHz																																																				
uplink modulations used	QPSK and 16QAM																																																				
LTE transmitter and antenna implementation (standalone or sharing hardware components / antennas )	A primary antenna is used for LTE and other wireless interfaces (GSM/GPRS/EDGE) for transmitting and receiving. LTE and other wireless interfaces (GSM/GPRS/EDGE) share the same antenna, and cannot transmit simultaneously. A 2nd antenna is used for LTE receiving only, standalone.																																																				
LTE Voice / Data requirements	Data only																																																				
LTE MPR permanently built-in by design	<div>Yes, per 3GPP TS 36.101</div> <div><table><tr><th colspan="8">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 18</td><td>≤ 2</td></tr></table></div>							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
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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 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

## **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

1. 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 ( $\rho$ ). The equation description is as below:

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

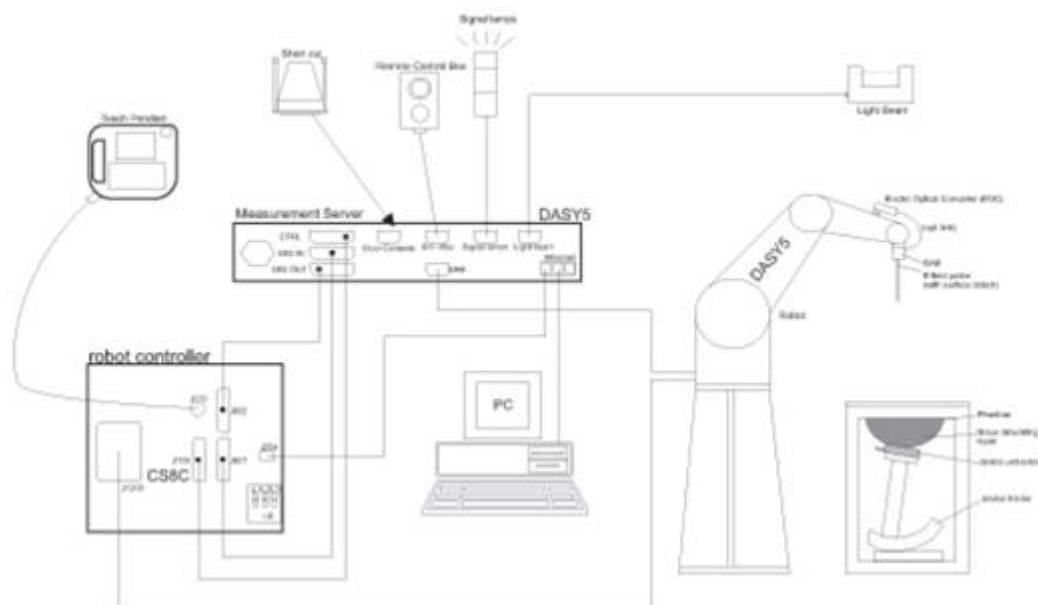
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  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.

## **8. Measurement Procedures**

The measurement procedures are as follows:

### <Conducted power measurement>

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

### <SAR measurement>

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

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

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

### **8.1 Spatial Peak SAR Evaluation**

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

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

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

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from 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 D01v01r03 SAR measurement 100 MHz to 6 GHz.

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

## 8.4 Zoom Scan

Zoom scans are used to 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 whose 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 D01v01r03 SAR measurement 100 MHz to 6 GHz.

			$\leq 3$ GHz	$> 3$ GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ mm
		$\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm
Note: $\delta$ 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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

## 8.5 Volume Scan Procedures

The volume scan is used to 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	1900MHz System Validation Kit	D1900V2	5d170	Mar. 27, 2013	Mar. 25, 2015
SPEAG	2450MHz System Validation Kit	D2450V2	908	Mar. 26, 2013	Mar. 24, 2015
SPEAG	2600MHz System Validation Kit	D2600V2	1061	Mar. 26, 2013	Mar. 24, 2015
SPEAG	Data Acquisition Electronics	DAE4	1353	Jan. 30, 2014	Jan. 29, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3898	Mar. 10, 2014	Mar. 09, 2015
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	MY52102600	Dec. 30, 2013	Dec. 29, 2014
Anritsu	Radio communication analyzer	MT8820C	6201074235	Nov. 05, 2013	Nov. 04, 2014
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	Dec. 30, 2013	Dec. 29, 2014
Agilent	Dielectric Probe Kit	85070E	MY44300751	NCR	NCR
Anritsu	Power Meter	ML2495A	1005002	Feb. 27, 2014	Feb. 26, 2015
Anritsu	Power Sensor	MA2411B	917070	Feb. 27, 2014	Feb. 26, 2015
R&S	Spectrum Analyzer	FSP7	101045	Dec. 30, 2013	Dec. 29, 2014
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1753	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1754	NCR	NCR
Agilent	Dual Directional Coupler	778D	50422	*CBT	
Woken	Attenuator	WK0602-XX	N/A	*CBT	
PE	Attenuator	PE7005-10	N/A	*CBT	
PE	Attenuator	PE7005- 3	N/A	*CBT	
AR	Power Amplifier	5S1G4M2	0328767	*CBT	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	*CBT	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	*CBT	

**General Note:**

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r03, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D1900V2, SN: 5d170, D2450V2, SN: 908, D2600V2, SN: 1061, can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.
4. \*CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing an amplifier, coupler and attenuator were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurement.

## 10. System Verification

### 10.1 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 ( $\sigma$ )	Permittivity ( $\epsilon_r$ )
For Head								
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

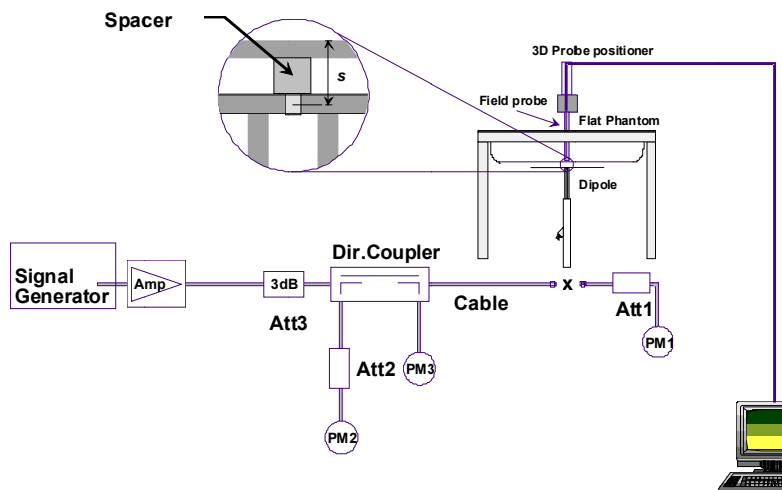
### <Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity ( $\sigma$ )	Permittivity ( $\epsilon_r$ )	Conductivity Target ( $\sigma$ )	Permittivity Target ( $\epsilon_r$ )	Delta ( $\sigma$ ) (%)	Delta ( $\epsilon_r$ ) (%)	Limit (%)	Date
1900	Head	22.5	1.456	40.840	1.40	40.00	4.00	2.10	±5	2014.04.14
2450	Head	22.2	1.810	37.626	1.80	39.20	0.56	-4.02	±5	2014.04.18
2600	Head	22.5	1.981	38.254	1.96	39.00	1.07	-1.91	±5	2014.04.19
1900	Body	22.5	1.542	55.338	1.52	53.30	1.45	3.82	±5	2014.04.14
2450	Body	22.6	1.949	53.894	1.95	52.70	-0.05	2.27	±5	2014.04.18
2600	Body	22.3	2.201	52.823	2.16	52.50	1.90	0.62	±5	2014.04.17

## 10.2 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 SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2014.04.14	1900	Head	250	5d170	3898	1353	10.40	40.20	41.6	3.48
2014.04.18	2450	Head	250	908	3898	1353	13.70	54.00	54.8	1.48
2014.04.19	2600	Head	250	1061	3898	1353	15.10	58.60	60.4	3.07
2014.04.14	1900	Body	250	5d170	3898	1353	9.43	41.20	37.72	-8.45
2014.04.18	2450	Body	250	908	3898	1353	12.90	50.40	51.6	2.38
2014.04.17	2600	Body	250	1061	3898	1353	14.70	55.60	58.8	5.76



**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.

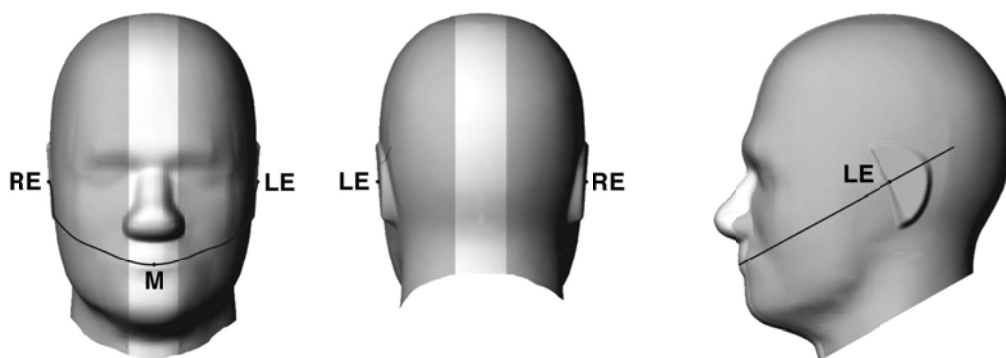


Fig 9.1.1 Front, back, and side views of SAM twin phantom

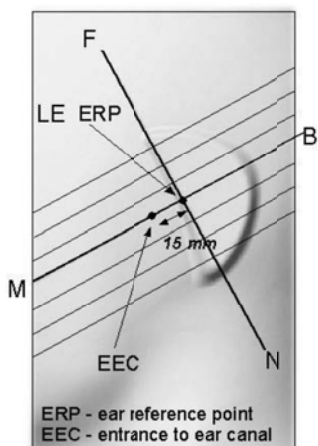


Fig 9.1.2 Close-up side view of phantom showing the ear region.

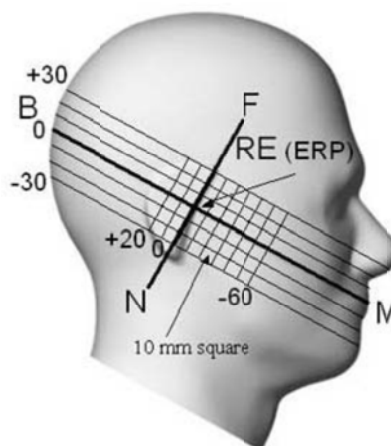


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

## 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  $w_t$  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  $w_b$  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.

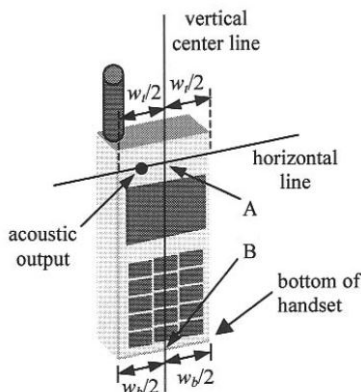


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case"

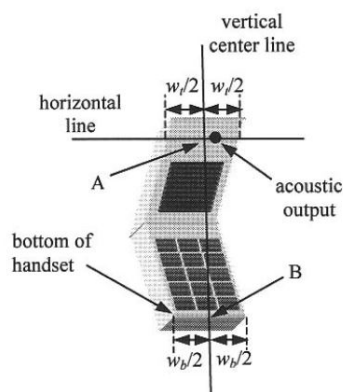


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

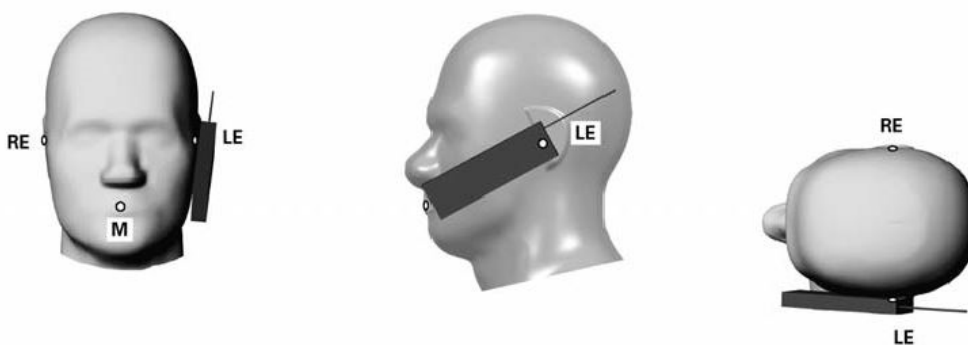
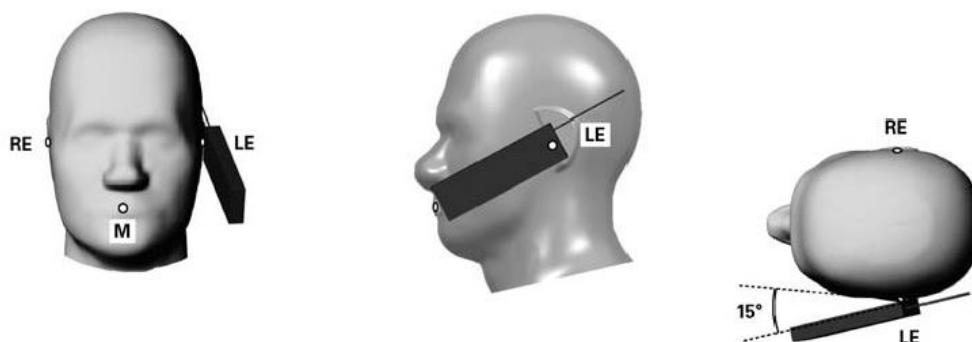


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

### **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

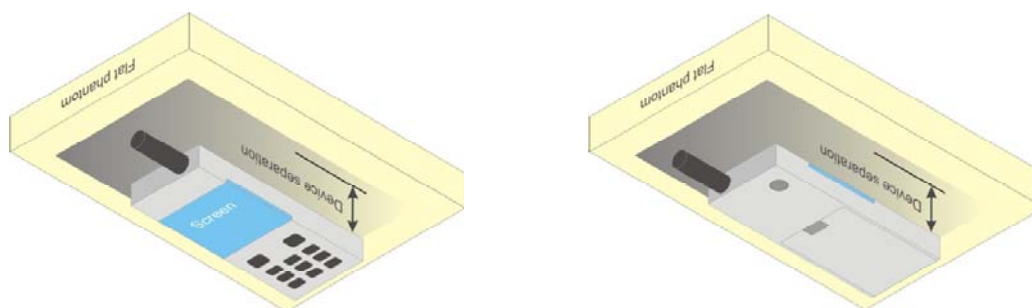


**Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.**

## **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 KDB 648474 D04v01r02, 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 D01v05r02 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  $< 1.2 \text{ W/kg}$ , the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset 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. 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-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.



**Fig 9.4 Body Worn Position**

## **11.5 Wireless Router**

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC HDB Publication 941225 D06v01r01 where SAR test considerations for handsets ( $L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$ ) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v05r02 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

## 12. Conducted RF Output Power (Unit: dBm)

### <GSM Conducted Power>

- For DTM multi-slot class mode, the device was linked with base station simulator (Agilent E5515C) and transmit maximum power on maximum number of TX slots, i.e. one CS timeslot, and additional PS timeslots (1 for DTM class 5 and 9, 2 for DTM class 11) in one TDMA frame.
- Agilent E5515C was used to setup the device operated under DTM mode for power measurement and SAR testing. For conducted power, the power of the burst for voice and the power of the bursts for data was reported separately in the table above, and the frame-average power is derived below to determine SAR testing.

$$DTM \text{ frame average power (dBm)} = 10 \cdot \log [\sum (\text{power of each slot, in mW}) / 8]$$

- Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
- According to October 2013TCB Workshop, the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, For time slots with equivalent maximum average output power specifications, including tolerance when the measured maximum output power levels are within 0.25 dB of each other, test the configuration with the most number of time slots. For GSM/GPRS/DTM, including tolerance, the GPRS 3Tx was chose to test SAR.
- According to October 2013TCB Workshop, For GSM / EGPRS, the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, Considering the possibility of e.g. 3rd party VoIP operation for head and body-worn SAR testing, the EUT was set in GPRS (3Tx slots) for GSM1900 band due to its highest frame-average power.
- For hotspot mode SAR testing, GPRS should be evaluated; therefore the EUT was set in GPRS 3 Tx slots for GSM1900 band due to its highest frame-average power.

Band GSM1900		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel		512	661	810		512	661	810	
Frequency (MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)		29.92	29.83	29.78	30	20.92	20.83	20.78	21
GPRS (GMSK, 1 Tx slot) – CS1		29.86	29.68	29.60	30	20.86	20.68	20.60	21
GPRS (GMSK, 2 Tx slots) – CS1		27.46	27.41	27.37	28	21.46	21.41	21.37	22
GPRS (GMSK, 3 Tx slots) – CS1		27.36	27.34	27.28	28	23.10	23.08	23.02	23.74
GPRS (GMSK, 4 Tx slots) – CS1		24.30	24.24	24.28	25	21.30	21.24	21.28	22
EDGE (8PSK, 1 Tx slot) – MCS5		26.60	26.60	26.61	27	17.60	17.60	17.61	18
EDGE (8PSK, 2 Tx slots) – MCS5		22.55	22.50	22.61	23	16.55	16.50	16.61	17
EDGE (8PSK, 3 Tx slots) – MCS5		22.48	22.45	22.54	23	18.22	18.19	18.28	18.74
EDGE (8PSK, 4 Tx slots) – MCS5		19.67	19.84	19.74	20	16.67	16.84	16.74	17
DTM 5 (2Tx slots)	GSM (GMSK, 1 Tx slot)	27.00	27.07	27.12	28	20.95	21.01	21.06	21.98
	GPRS (GMSK, 1 Tx slot) – CS1	26.94	27.00	27.05	28				
DTM 9 (2Tx slots)	GSM (GMSK, 1 Tx slot)	26.99	27.06	27.12	28	20.94	21.01	21.07	21.98
	GPRS (GMSK, 1 Tx slot) – CS1	26.94	27.00	27.06	28				
DTM 11 (3Tx slots)	GSM (GMSK, 1 Tx slot)	26.91	26.96	27.10	28	22.57	22.63	22.76	23.10
	GPRS (GMSK, 2 Tx slots) – CS1	26.79	26.85	26.98	27				
DTM 5 (2Tx slots)	GSM (GMSK, 1 Tx slot)	27.08	27.16	27.20	28	19.29	19.35	19.42	20.16
	EDGE (8PSK, 1 Tx slot) – MCS5	22.27	22.26	22.44	23				
DTM 9 (2Tx slots)	GSM (GMSK, 1 Tx slot)	27.08	27.15	27.23	28	19.26	19.32	19.42	20.16
	EDGE (8PSK, 1 Tx slot) – MCS5	22.16	22.17	22.35	23				
DTM 11 (3Tx slots)	GSM (GMSK, 1 Tx slot)	26.90	26.95	27.00	28	20.04	20.07	20.18	21.10
	EDGE (8PSK, 2 Tx slots) – MCS5	22.00	22.02	22.20	23				

**Remark:** The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

**<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 D05v02r03, 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 D05v02r03, 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 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, 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  $\leq 0.8$  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 D05v02r03, 16QAM output power for each RB allocation configuration is  $>$  not  $\frac{1}{2}$  dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r03, smaller bandwidth output power for each RB allocation configuration is  $>$  not  $\frac{1}{2}$  dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

**<LTE Band 7>**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune up Limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.75	22.75	22.60	23	0
20	QPSK	1	49	22.77	22.80	22.83		
20	QPSK	1	99	22.71	22.79	22.73		
20	QPSK	50	0	21.84	21.70	21.74	22	0-1
20	QPSK	50	24	21.77	21.68	21.69		
20	QPSK	50	49	21.73	21.65	21.72		
20	QPSK	100	0	21.68	21.68	21.69		
20	16QAM	1	0	21.76	21.15	21.60	22	0-1
20	16QAM	1	49	21.95	21.86	21.84		
20	16QAM	1	99	21.46	21.69	21.36		
20	16QAM	50	0	20.57	20.52	20.53	21	0-2
20	16QAM	50	24	20.71	20.59	20.65		
20	16QAM	50	49	20.60	20.57	20.63		
20	16QAM	100	0	20.45	20.54	20.64		
Channel				20825	21100	21375		
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.65	22.69	22.51	23	0
15	QPSK	1	37	22.68	22.71	22.80		
15	QPSK	1	74	22.56	22.59	22.69		
15	QPSK	36	0	21.72	21.65	21.72	22	0-1
15	QPSK	36	18	21.68	21.63	21.72		
15	QPSK	36	37	21.71	21.66	21.66		
15	QPSK	75	0	21.66	21.68	21.68		
15	16QAM	1	0	21.73	21.52	21.63	22	0-1
15	16QAM	1	37	21.81	21.57	21.71		
15	16QAM	1	74	21.47	21.52	21.67		
15	16QAM	36	0	20.44	20.47	20.56	21	0-2
15	16QAM	36	18	20.48	20.52	20.51		
15	16QAM	36	37	20.60	20.58	20.54		
15	16QAM	75	0	20.48	20.54	20.57		
Channel				20800	21100	21400		
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.66	22.60	22.63	23	0
10	QPSK	1	24	22.69	22.69	22.70		
10	QPSK	1	49	22.68	22.67	22.59		
10	QPSK	25	0	21.65	21.62	21.63	22	0-1
10	QPSK	25	12	21.55	21.56	21.66		
10	QPSK	25	24	21.75	21.57	21.61		
10	QPSK	50	0	21.73	21.58	21.60		
10	16QAM	1	0	21.57	21.46	21.53	22	0-1
10	16QAM	1	24	21.74	21.66	21.59		
10	16QAM	1	49	21.63	21.58	21.26		
10	16QAM	25	0	20.44	20.55	20.49	21	0-2
10	16QAM	25	12	20.35	20.47	20.55		
10	16QAM	25	24	20.60	20.57	20.48		
10	16QAM	50	0	20.62	20.49	20.52		



# FCC SAR Test Report

Report No. : FA412407

Channel				20775	21100	21425	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.47	22.40	22.35	23	0
5	QPSK	1	12	22.57	22.58	22.54		
5	QPSK	1	24	22.43	22.48	22.26		
5	QPSK	12	0	21.53	21.35	21.30	22	0-1
5	QPSK	12	6	21.45	21.32	21.27		
5	QPSK	12	11	21.49	21.40	21.25		
5	QPSK	25	0	21.42	21.39	21.25		
5	16QAM	1	0	21.30	21.04	21.14	22	0-1
5	16QAM	1	12	21.49	21.41	21.43		
5	16QAM	1	24	21.30	21.38	21.37		
5	16QAM	12	0	20.31	20.20	20.22	21	0-2
5	16QAM	12	6	20.28	20.26	20.21		
5	16QAM	12	11	20.20	20.25	20.20		
5	16QAM	25	0	20.27	20.28	20.24		

**<WLAN Conducted Power>**
**General Note:**

For 2.4GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were selected for SAR evaluation. 802.11g/n HT20 were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.

802.11b Average Power (dBm)					
Channel	Frequency (MHz)	Data Rate (bps)			
		1M bps	2M bps	5.5M bps	11M bps
CH 01	2412	10.26	10.22	10.25	10.24
CH 06	2437	10.98	10.94	10.97	10.96
CH 11	2462	11.04	11	11.03	11.02

802.11g Average Power (dBm)									
Channel	Frequency (MHz)	Data Rate (bps)							
		6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps
CH 01	2412	9.65	9.58	9.64	9.61	9.64	9.62	9.57	9.6
CH 06	2437	10.22	10.15	10.21	10.18	10.21	10.19	10.14	10.17
CH 11	2462	10.31	10.24	10.3	10.27	10.3	10.28	10.23	10.26

WLAN 2.4GHz Band 802.11n-HT20 Average Power (dBm)									
Channel	Frequency (MHz)	MCS Index							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412	8.67	8.65	8.64	8.63	8.61	8.66	8.64	8.62
CH 06	2437	9.35	9.33	9.32	9.31	9.29	9.34	9.32	9.3
CH 11	2462	9.4	9.38	9.37	9.36	9.34	9.39	9.37	9.35

### 13. Bluetooth Exclusions Applied

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

**Note:**

- Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for

1-g SAR and  $\leq 7.5$  for 10-g extremity SAR

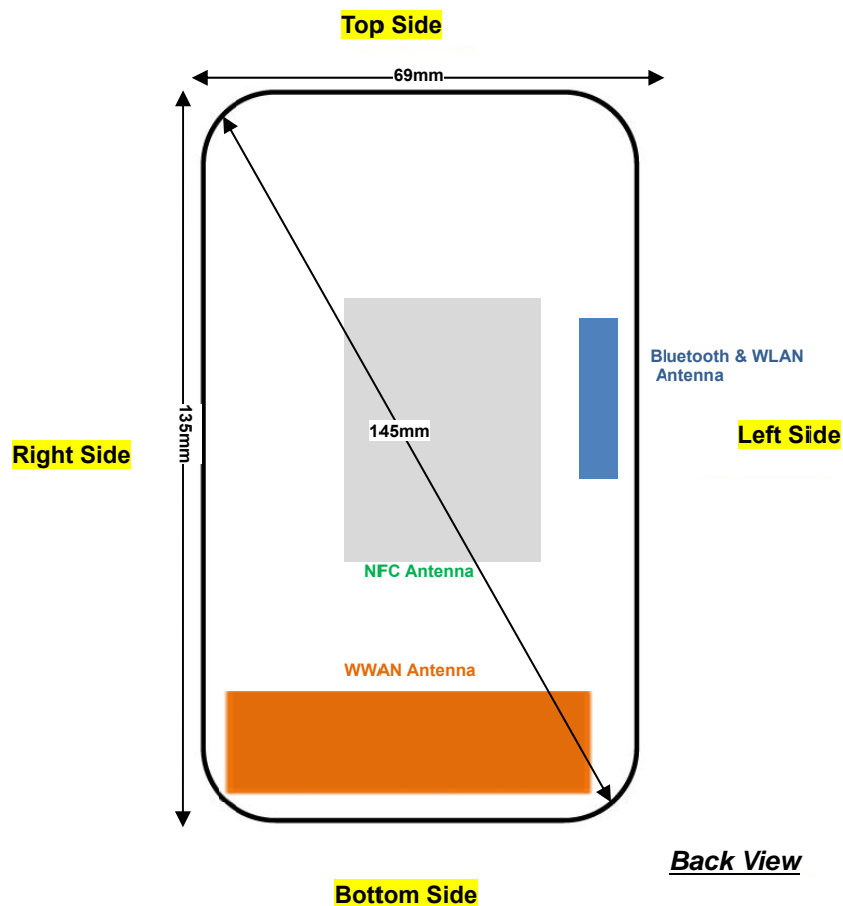
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
-0.5	0	2.48	0.31

**Note:**

Per KDB 447498 D01v05r02, when the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.31 which is  $\leq 3$ , SAR testing is not required.

## 14. Antenna Location



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	≤ 25mm	≤ 25mm	118mm	≤ 25mm	≤ 25mm	≤ 25mm
Bluetooth & WLAN	≤ 25mm	≤ 25mm	38mm	70mm	63mm	≤ 25mm

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

**Note:** Referring to KDB 941225 D06 v01r01, when the overall device length and width are  $\geq 9\text{cm} \times 5\text{cm}$ , the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

## 15. SAR Test Results

### General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
  - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
  - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
  - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)\*Tune-up Scaling Factor  
For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)\* Duty Cycle scaling factor \* Tune-up scaling factor,  
802.11b, 1Mbps Duty Cycle: 97.63%
2. Per KDB 447498 D01v05r02, 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:
  - $\leq 0.8$  W/kg or  $2.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
  - $\leq 0.6$  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
  - $\leq 0.4$  W/kg or  $1.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz
3. According to October 2013TCB Workshop, For GSM / EGPRS, the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, Considering the possibility of e.g. 3rd party VoIP operation for head and body-worn SAR testing, the EUT was set in GPRS (3Tx slots) for GSM1900 band due to its highest frame-average power.
4. For hotspot mode SAR testing, GPRS should be evaluated; therefore the EUT was set in GPRS 3 Tx slots for GSM1900 band due to its highest frame-average power.
5. This device 2.4GHz WLAN supports hotspot operation.
6. Per KDB648474 D04v01r02, when the reported SAR for a 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 headset attached to the handset. Additional WLAN SAR with headset testing was performed for simultaneous transmission analysis.
7. Per KDB 941225 D05v02r03, 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.
8. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
9. Per KDB 941225 D05v02r03, 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  $\leq 0.8$  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.
10. Per KDB 941225 D05v02r03, 16QAM output power for each RB allocation configuration is  $> \text{not } \frac{1}{2}$  dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
11. Per KDB 941225 D05v02r03, smaller bandwidth output power for each RB allocation configuration is  $> \text{not } \frac{1}{2}$  dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is  $\leq 1.45$  W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

**15.1 Head SAR****<GSM SAR>**

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS(GMSK 3 Tx slots)	Right Cheek	512	1850.2	27.36	28	1.159	0.02	0.181	0.210
	GSM1900	GPRS(GMSK 3 Tx slots)	Right Tilted	512	1850.2	27.36	28	1.159	-0.08	0.083	0.096
<b>01</b>	<b>GSM1900</b>	<b>GPRS(GMSK 3 Tx slots)</b>	<b>Left Cheek</b>	<b>512</b>	<b>1850.2</b>	<b>27.36</b>	<b>28</b>	<b>1.159</b>	<b>0.06</b>	<b>0.328</b>	<b>0.380</b>
	GSM1900	GPRS(GMSK 3 Tx slots)	Left Tilted	512	1850.2	27.36	28	1.159	0.15	0.055	0.064

**<LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
<b>02</b>	<b>LTE Band 7</b>	<b>20M</b>	<b>QPSK</b>	<b>1</b>	<b>49</b>	<b>Right Cheek</b>	<b>21350</b>	<b>2560</b>	<b>22.83</b>	<b>23</b>	<b>1.040</b>	<b>0.07</b>	<b>0.409</b>	<b>0.425</b>
	LTE Band 7	20M	QPSK	1	49	Right Tilted	21350	2560	22.83	23	1.040	0.11	0.115	0.120
	LTE Band 7	20M	QPSK	1	49	Left Cheek	21350	2560	22.83	23	1.040	0.06	0.207	0.215
	LTE Band 7	20M	QPSK	1	49	Left Tilted	21350	2560	22.83	23	1.040	0.06	0.094	0.098
	LTE Band 7	20M	QPSK	50	0	Right Cheek	20850	2510	21.84	22	1.038	0.06	0.342	0.355
	LTE Band 7	20M	QPSK	50	0	Right Tilted	20850	2510	21.84	22	1.038	0.07	0.09	0.093
	LTE Band 7	20M	QPSK	50	0	Left Cheek	20850	2510	21.84	22	1.038	0.01	0.191	0.198
	LTE Band 7	20M	QPSK	50	0	Left Tilted	20850	2510	21.84	22	1.038	0.14	0.083	0.086

**<DTS WLAN SAR>**

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
<b>03</b>	<b>WLAN 2.4G</b>	<b>802.11b</b>	<b>Right Cheek</b>	<b>11</b>	<b>2462</b>	<b>1M</b>	<b>11.04</b>	<b>12</b>	<b>1.247</b>	<b>1.024</b>	<b>0.04</b>	<b>0.019</b>	<b>0.024</b>
	WLAN 2.4G	802.11b	Right Tilted	11	2462	1M	11.04	12	1.247	1.024	0.04	0.00413	0.005
	WLAN 2.4G	802.11b	Left Cheek	11	2462	1M	11.04	12	1.247	1.024	0.07	0.00701	0.009
	WLAN 2.4G	802.11b	Left Tilted	11	2462	1M	11.04	12	1.247	1.024	0.05	0.00186	0.002

## 15.2 Hotspot SAR

Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN	≤ 25mm	≤ 25mm	118mm	≤ 25mm	≤ 25mm	≤ 25mm
Bluetooth & WLAN	≤ 25mm	≤ 25mm	38mm	70mm	63mm	≤ 25mm

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

**Note:** Referring to KDB 941225 D06 v01r01, when the overall device length and width are  $\geq 9\text{cm} \times 5\text{cm}$ , the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

### <GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS(GMSK 3 Tx slots)	Front	1	512	1850.2	27.36	28	1.159	-0.14	0.595	0.689
	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	512	1850.2	27.36	28	1.159	-0.01	0.815	0.944
	GSM1900	GPRS(GMSK 3 Tx slots)	Left side	1	512	1850.2	27.36	28	1.159	0.09	0.107	0.124
	GSM1900	GPRS(GMSK 3 Tx slots)	Right side	1	512	1850.2	27.36	28	1.159	0.08	0.077	0.089
	GSM1900	GPRS(GMSK 3 Tx slots)	Bottom side	1	512	1850.2	27.36	28	1.159	-0.03	1.12	1.298
	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	661	1880	27.34	28	1.164	-0.11	0.929	1.081
	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	810	1909.8	27.28	28	1.180	0.01	0.955	1.127
	GSM1900	GPRS(GMSK 3 Tx slots)	Bottom side	1	661	1880	27.34	28	1.164	-0.02	1.19	1.385
04	GSM1900	GPRS(GMSK 3 Tx slots)	Bottom side	1	810	1909.8	27.28	28	1.180	-0.06	1.21	1.428

**<LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 7	20M	QPSK	1	49	Front	1	21350	2560	22.83	23	1.040	-0.01	0.473	0.492
	LTE Band 7	20M	QPSK	1	49	Back	1	21350	2560	22.83	23	1.040	0.05	1.05	1.092
	LTE Band 7	20M	QPSK	1	49	Left side	1	21350	2560	22.83	23	1.040	0.03	0.085	0.088
	LTE Band 7	20M	QPSK	1	49	Right side	1	21350	2560	22.83	23	1.040	0.07	0.26	0.270
	LTE Band 7	20M	QPSK	1	49	Bottom side	1	21350	2560	22.83	23	1.040	-0.11	1.11	1.154
<b>05</b>	<b>LTE Band 7</b>	<b>20M</b>	<b>QPSK</b>	<b>1</b>	<b>49</b>	<b>Back</b>	<b>1</b>	<b>20850</b>	<b>2510</b>	<b>22.77</b>	<b>23</b>	<b>1.054</b>	<b>0.02</b>	<b>1.25</b>	<b>1.318</b>
	LTE Band 7	20M	QPSK	1	49	Back	1	21100	2535	22.80	23	1.047	-0.03	1.21	1.267
	LTE Band 7	20M	QPSK	1	49	Bottom side	1	20850	2510	22.77	23	1.054	-0.01	1.13	1.191
	LTE Band 7	20M	QPSK	1	49	Bottom side	1	21100	2535	22.80	23	1.047	0.04	1.14	1.194
	LTE Band 7	20M	QPSK	50	0	Front	1	20850	2510	21.84	22	1.038	0.1	0.441	0.458
	LTE Band 7	20M	QPSK	50	0	Back	1	20850	2510	21.84	22	1.038	0.1	0.949	0.985
	LTE Band 7	20M	QPSK	50	0	Left side	1	20850	2510	21.84	22	1.038	0.02	0.082	0.085
	LTE Band 7	20M	QPSK	50	0	Right side	1	20850	2510	21.84	22	1.038	0.1	0.218	0.226
	LTE Band 7	20M	QPSK	50	0	Bottom side	1	20850	2510	21.84	22	1.038	0.04	0.929	0.964
	LTE Band 7	20M	QPSK	50	0	Back	1	21100	2535	21.7	22	1.072	0.11	0.922	0.988
	LTE Band 7	20M	QPSK	50	0	Back	1	21350	2560	21.74	22	1.062	-0.04	0.955	1.014
	LTE Band 7	20M	QPSK	50	0	Bottom side	1	21100	2535	21.7	22	1.072	0.16	0.886	0.949
	LTE Band 7	20M	QPSK	50	0	Bottom side	1	21350	2560	21.74	22	1.062	-0.09	0.813	0.863
	LTE Band 7	20M	QPSK	100	0	Front	1	21350	2560	21.69	22	1.074	-0.06	0.349	0.375
	LTE Band 7	20M	QPSK	100	0	Back	1	21350	2560	21.69	22	1.074	-0.04	0.889	0.955
	LTE Band 7	20M	QPSK	100	0	Left side	1	21350	2560	21.69	22	1.074	0.06	0.065	0.070
	LTE Band 7	20M	QPSK	100	0	Right side	1	21350	2560	21.69	22	1.074	0.03	0.2	0.215
	LTE Band 7	20M	QPSK	100	0	Bottom side	1	21350	2560	21.69	22	1.074	0.13	0.817	0.877

**<DTS WLAN SAR>**

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN 2.4GHz	802.11b	Front	1	11	2462	1M	11.04	12	1.247	1.024	0.02	0.000934	0.001
<b>06</b>	<b>WLAN 2.4GHz</b>	<b>802.11b</b>	<b>Back</b>	<b>1</b>	<b>11</b>	<b>2462</b>	<b>1M</b>	<b>11.04</b>	<b>12</b>	<b>1.247</b>	<b>1.024</b>	<b>0.05</b>	<b>0.038</b>	<b>0.049</b>
	WLAN 2.4GHz	802.11b	Left side	1	11	2462	1M	11.04	12	1.247	1.024	0.02	0.026	0.033

**15.3 Body Worn Accessory SAR**
**<GSM SAR>**

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS(GMSK 3 Tx slots)	Front	1	512	1850.2	27.36	28	1.159	-0.14	0.595	0.689
	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	512	1850.2	27.36	28	1.159	-0.01	0.815	0.944
	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	661	1880	27.34	28	1.164	-0.11	0.929	1.081
07	GSM1900	GPRS(GMSK 3 Tx slots)	Back	1	810	1909.8	27.28	28	1.180	0.01	0.955	1.127

**<LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 7	20M	QPSK	1	49	Front	1	21350	2560	22.83	23	1.040	-0.01	0.473	0.492
	LTE Band 7	20M	QPSK	1	49	Back	1	21350	2560	22.83	23	1.040	0.05	1.05	1.092
<b>05</b>	<b>LTE Band 7</b>	<b>20M</b>	<b>QPSK</b>	<b>1</b>	<b>49</b>	<b>Back</b>	<b>1</b>	<b>20850</b>	<b>2510</b>	<b>22.77</b>	<b>23</b>	<b>1.054</b>	<b>0.02</b>	<b>1.25</b>	<b>1.318</b>
	LTE Band 7	20M	QPSK	1	49	Back	1	21100	2535	22.80	23	1.047	-0.03	1.21	1.267
	LTE Band 7	20M	QPSK	1	49	Back with Headset	1	20850	2510	22.77	23	1.054	0.03	1.15	1.213
	LTE Band 7	20M	QPSK	1	49	Back with Headset	1	21100	2535	22.80	23	1.047	0.05	1.13	1.183
	LTE Band 7	20M	QPSK	1	49	Back with Headset	1	21350	2560	22.83	23	1.040	0.1	1.07	1.113
	LTE Band 7	20M	QPSK	50	0	Front	1	20850	2510	21.84	22	1.038	0.1	0.441	0.458
	LTE Band 7	20M	QPSK	50	0	Back	1	20850	2510	21.84	22	1.038	0.1	0.949	0.985
	LTE Band 7	20M	QPSK	50	0	Back	1	21100	2535	21.7	22	1.072	0.11	0.922	0.988
	LTE Band 7	20M	QPSK	50	0	Back	1	21350	2560	21.74	22	1.062	-0.04	0.955	1.014
	LTE Band 7	20M	QPSK	100	0	Front	1	21350	2560	21.69	22	1.074	-0.06	0.349	0.375
	LTE Band 7	20M	QPSK	100	0	Back	1	21350	2560	21.69	22	1.074	-0.04	0.889	0.955

**<DTS WLAN SAR>**

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Data Rate (bps)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN 2.4GHz	802.11b	Front	1	11	2462	1M	11.04	12	1.247	1.024	0.02	0.000934	0.001
<b>06</b>	<b>WLAN 2.4GHz</b>	<b>802.11b</b>	<b>Back</b>	<b>1</b>	<b>11</b>	<b>2462</b>	<b>1M</b>	<b>11.04</b>	<b>12</b>	<b>1.247</b>	<b>1.024</b>	<b>0.05</b>	<b>0.038</b>	<b>0.049</b>
	WLAN 2.4GHz	802.11b	Back with Headset	1	11	2462	1M	11.04	12	1.247	1.024	0.03	0.036	0.046

**15.4 Repeated SAR Measurement**

No.	Band	BW (MHz)	Mode	RB Size	RB offset	Test Position	Gap (cm)	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	GSM1900	-	GPRS(GMSK 3 Tx slots)	-	-	Bottom side	1	810	1909.8	27.28	28	1.180	-0.06	1.21	1	1.428
2nd	GSM1900	-	GPRS(GMSK 3 Tx slots)	-	-	Bottom side	1	810	1909.8	27.28	28	1.180	-0.07	1.2	1.008	1.416
1st	LTE Band 7	20M	QPSK	1	49	Back	1	20850	2510	22.77	23	1.054	0.02	1.25	1	1.318
2nd	LTE Band 7	20M	QPSK	1	49	Back	1	20850	2510	22.77	23	1.054	0.02	1.23	1.016	1.297

**General Note:**

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8$ W/kg
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is  $\leq 1.2$  and the measured SAR  $< 1.45$ W/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	Portable Handset			Note
		Head	Body-worn	Hotspot	
1.	GSM(Voice) + WLAN2.4GHz(data)	Yes	Yes	-	-
2.	GSM(Voice) + Bluetooth(data)	Yes	Yes	-	-
3.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
4.	LTE(Data) + WLAN2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
5.	GPRS/EDGE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering
6.	LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering

### General Note:

- This device supported VoIP in GPRS/EGPRS, LTE (e.g. 3rd party VoIP).
- This device 2.4GHz WLAN supports Hotspot operation.
- WLAN 2.4GHz and Bluetooth share the same antenna, and cannot transmit simultaneously.
- EUT will choose each of GSM and LTE according to the network signal condition; therefore, they will not transmit simultaneously at any moment.
- The Reported SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
  - Scalar SAR summation  $< 1.6\text{W/kg}$ .
  - $\text{SPLSR} = (\text{SAR}_1 + \text{SAR}_2)^{1.5} / (\text{min. separation distance, mm})$ , and the peak separation distance is determined from the square root of  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$ , where  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  are the coordinates of the extrapolated peak SAR locations in the zoom scan.
  - If  $\text{SPLSR} \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.
  - Simultaneously transmission SAR measurement, and the reported multi-band SAR  $< 1.6\text{W/kg}$ .
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
  - $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$  for test separation distances  $\leq 50 \text{ mm}$ ; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
  - When the minimum separation distance is  $< 5\text{mm}$ , the distance is used 5mm to determine SAR test exclusion.
  - 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50 \text{ mm}$ .
  - Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power	Exposure Position	Head	Hotspot	Body worn
	Test separation	0 mm	10 mm	10 mm
-0.5 dBm	Estimated SAR (W/kg)	0.042 W/kg	0.021 W/kg	0.021 W/kg

**16.1 Head Exposure Conditions**

WWAN Band		Exposure Position	WWAN	WLAN DTS		Bluetooth DSS	WWAN + WLAN Summed SAR (W/kg)	WWAN + Bluetooth Summed SAR (W/kg)
			SAR (W/kg)	Band	SAR (W/kg)	Estimated SAR (W/kg)		
GSM	GSM1900	Right Cheek	0.210	WLAN2.4G	0.024	0.042	<b>0.23</b>	<b>0.25</b>
		Right Tilted	0.096	WLAN2.4G	0.005	0.042	<b>0.10</b>	<b>0.14</b>
		Left Cheek	0.380	WLAN2.4G	0.009	0.042	<b>0.39</b>	<b>0.42</b>
		Left Tilted	0.064	WLAN2.4G	0.002	0.042	<b>0.07</b>	<b>0.11</b>
LTE	Band 7	Right Cheek	0.425	WLAN2.4G	0.024	0.042	<b>0.45</b>	<b>0.47</b>
		Right Tilted	0.120	WLAN2.4G	0.005	0.042	<b>0.13</b>	<b>0.16</b>
		Left Cheek	0.215	WLAN2.4G	0.009	0.042	<b>0.22</b>	<b>0.26</b>
		Left Tilted	0.098	WLAN2.4G	0.002	0.042	<b>0.10</b>	<b>0.14</b>

**16.2 Hotspot Exposure Conditions**

WWAN Band		Exposure Position	WWAN SAR (W/kg)	WLAN DTS		Bluetooth DSS Estimated SAR (W/kg)	WWAN + WLAN Summed SAR (W/kg)	WWAN + Bluetooth Summed SAR (W/kg)
				Band	SAR (W/kg)			
GSM	GSM1900	Front	0.689	WLAN2.4G	0.001	0.021	<b>0.69</b>	<b>0.71</b>
		Back	1.127	WLAN2.4G	0.049	0.021	<b>1.18</b>	<b>1.15</b>
		Left side	0.124	WLAN2.4G	0.033	0.021	<b>0.16</b>	<b>0.15</b>
		Right side	0.089				<b>0.09</b>	<b>0.09</b>
		Bottom side	1.428				<b>1.43</b>	<b>1.43</b>
LTE	Band 7	Front	0.492	WLAN2.4G	0.001	0.021	<b>0.49</b>	<b>0.51</b>
		Back	1.318	WLAN2.4G	0.049	0.021	<b>1.37</b>	<b>1.34</b>
		Left side	0.088	WLAN2.4G	0.033	0.021	<b>0.12</b>	<b>0.11</b>
		Right side	0.27				<b>0.27</b>	<b>0.27</b>
		Bottom side	1.194				<b>1.19</b>	<b>1.19</b>

**16.3 Body-Worn Accessory Exposure Conditions**

WWAN Band		Exposure Position	WWAN	WLAN DTS		Bluetooth DSS	WWAN + WLAN Summed SAR (W/kg)	WWAN + Bluetooth Summed SAR (W/kg)
			SAR (W/kg)	Band	SAR (W/kg)	Estimated SAR (W/kg)		
GSM	GSM1900	Front	0.689	WLAN2.4G	0.001	0.021	<b>0.69</b>	<b>0.71</b>
		Back	1.127	WLAN2.4G	0.049	0.021	<b>1.18</b>	<b>1.15</b>
		Back with Headset		WLAN2.4G	0.046	0.021	<b>0.05</b>	<b>0.02</b>
LTE	Band 7	Front	0.492	WLAN2.4G	0.001	0.021	<b>0.49</b>	<b>0.51</b>
		Back	1.318	WLAN2.4G	0.049	0.021	<b>1.37</b>	<b>1.34</b>
		Back with Headset	1.213	WLAN2.4G	0.046	0.021	<b>1.26</b>	<b>1.23</b>

**Test Engineer :** Kat Yin

## 17. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor <sup>(a)</sup>	1/ $\kappa$ <sup>(b)</sup>	1/ $\sqrt{3}$	1/ $\sqrt{6}$	1/ $\sqrt{2}$

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

(b)  $\kappa$  is the coverage factor

**Table 17.1 Standard Uncertainty for Assumed Distribution**

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

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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
<b>Measurement System</b>							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
<b>Test Sample Related</b>							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
<b>Phantom and Setup</b>							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
<b>Combined Standard Uncertainty</b>						± 11.0 %	± 10.8 %
<b>Coverage Factor for 95 %</b>						K=2	
<b>Expanded Uncertainty</b>						± 22.0 %	± 21.5 %

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

## **18. References**

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007
- [6] FCC KDB 447498 D01 v05r02, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Feb 2014
- [7] FCC KDB 648474 D04 v01r02, "SAR Evaluation Considerations for Wireless Handsets", Dec 2013.
- [8] FCC KDB 941225 D03 v01, "Recommended SAR Test Reduction Procedures for GSM / GPRS / EDGE", December 2008
- [9] FCC KDB 941225 D04 v01, "Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode", January 2010
- [10] FCC KDB 941225 D05 v02r03, "SAR Evaluation Considerations for LTE Devices", Dec 2013
- [11] FCC KDB 941225 D06 v01r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", May 2013.
- [12] FCC KDB 865664 D01 v01r03, "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014.
- [13] FCC KDB 865664 D02 v01r01, "RF Exposure Compliance Reporting and Documentation Considerations" May 2013.



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**Appendix A.     *Plots of System Performance Check***

The plots are shown as follows.

## System Check\_Head\_1900MHz\_140414

### DUT: D1900V2 - SN:5d170

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL\_1900\_140414 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.456$  S/m;  $\epsilon_r = 40.84$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(8.2, 8.2, 8.2); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 15.0 W/kg

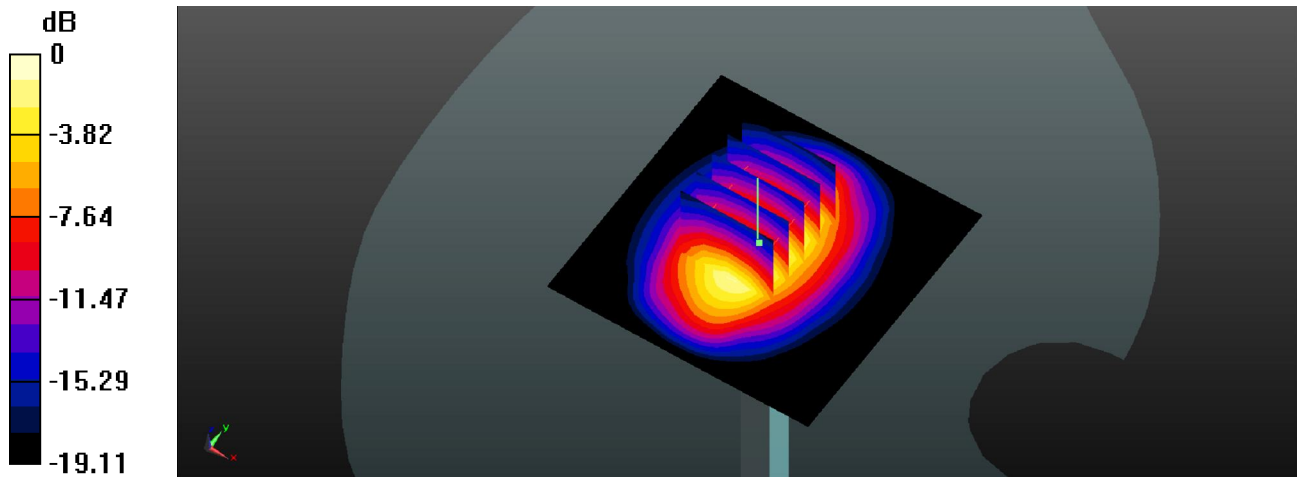
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 19.3 W/kg

**SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.34 W/kg**

Maximum value of SAR (measured) = 14.6 W/kg



0 dB = 14.6 W/kg

**System Check\_Head\_2450MHz\_140418****DUT: D2450V2 - SN:908**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL\_2450\_140418 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.81$  S/m;  $\epsilon_r = 37.626$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.2 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 21.2 W/kg

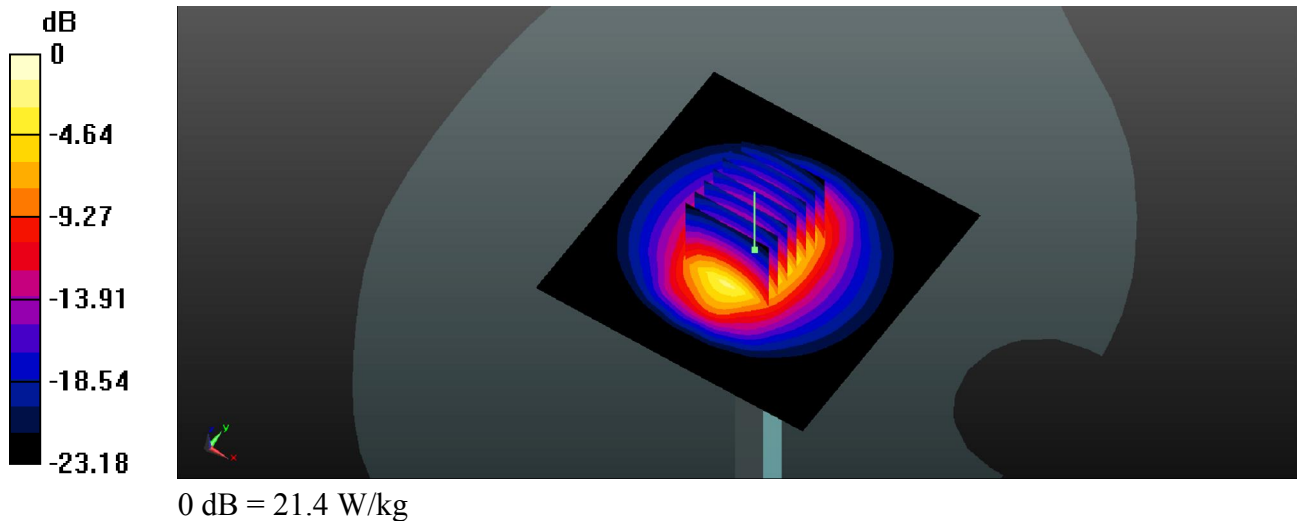
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.315 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 29.2 W/kg

**SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.19 W/kg**

Maximum value of SAR (measured) = 21.4 W/kg



## System Check\_Head\_2600MHz\_140419

### DUT: D2600V2 - SN: 1061

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: HSL\_2600\_140419 Medium parameters used:  $f = 2600$  MHz;  $\sigma = 1.981$  S/m;  $\epsilon_r = 38.254$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.34, 7.34, 7.34); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 25.3 W/kg

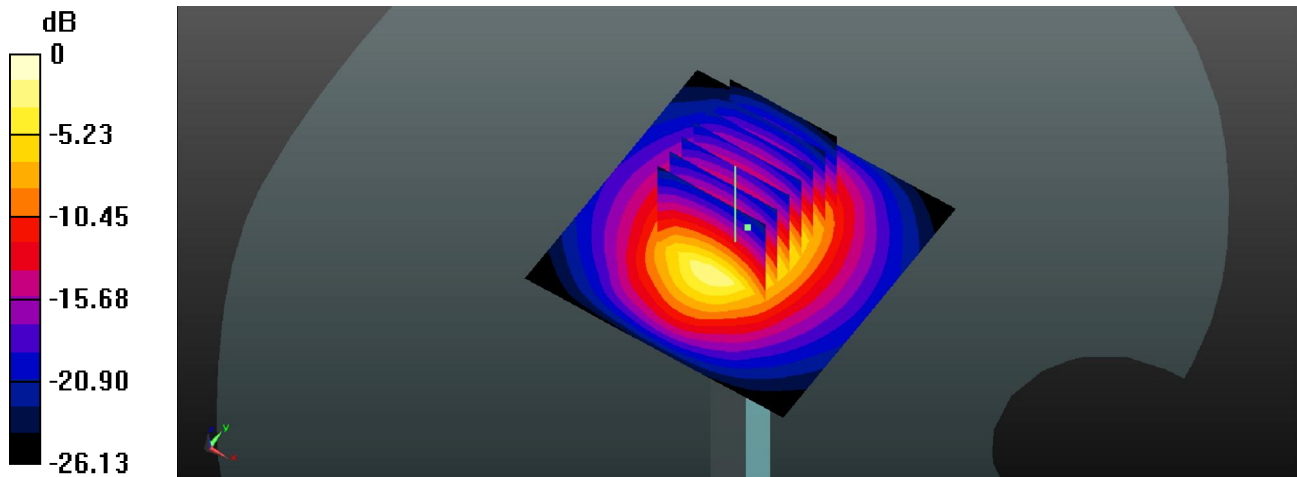
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 110.7 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 34.5 W/kg

**SAR(1 g) = 15.1 W/kg; SAR(10 g) = 6.64 W/kg**

Maximum value of SAR (measured) = 23.9 W/kg



0 dB = 23.9 W/kg

**System Check\_Body\_1900MHz\_140414****DUT: D1900V2 - SN: 5d170**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL\_1900\_140414 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.542$  S/m;  $\epsilon_r = 55.338$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3898; ConvF(7.83, 7.83, 7.83); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 13.3 W/kg

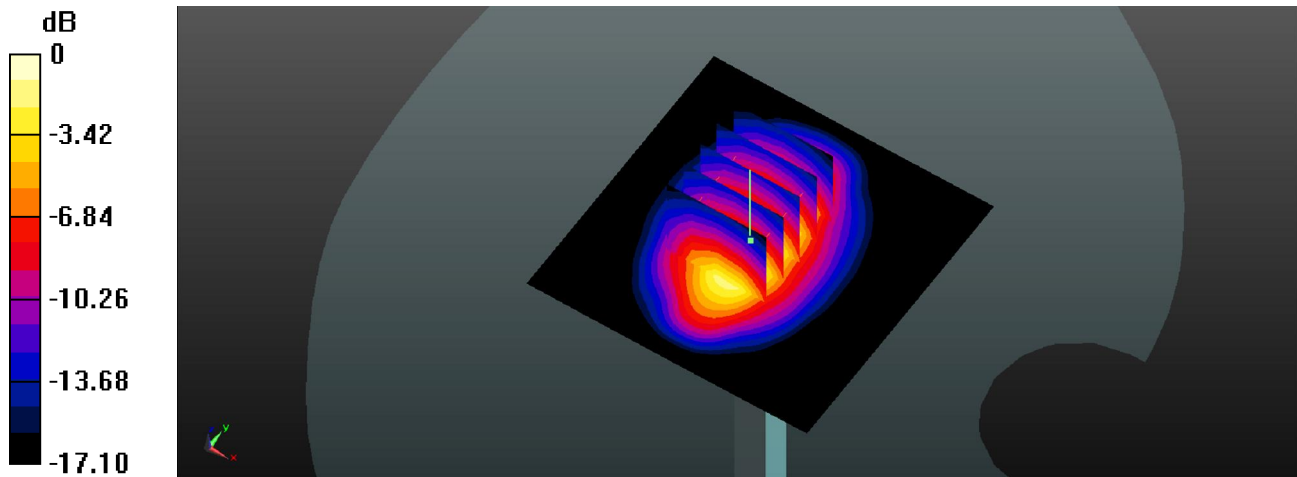
**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 81.978 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 16.6 W/kg

**SAR(1 g) = 9.43 W/kg; SAR(10 g) = 4.95 W/kg**

Maximum value of SAR (measured) = 13.3 W/kg



0 dB = 13.3 W/kg

## System Check\_Body\_2450MHz\_140418

### DUT: D2450V2 - SN:908

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL\_2450\_140418 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.949$  S/m;  $\epsilon_r = 53.894$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.6 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.49, 7.49, 7.49); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 19.9 W/kg

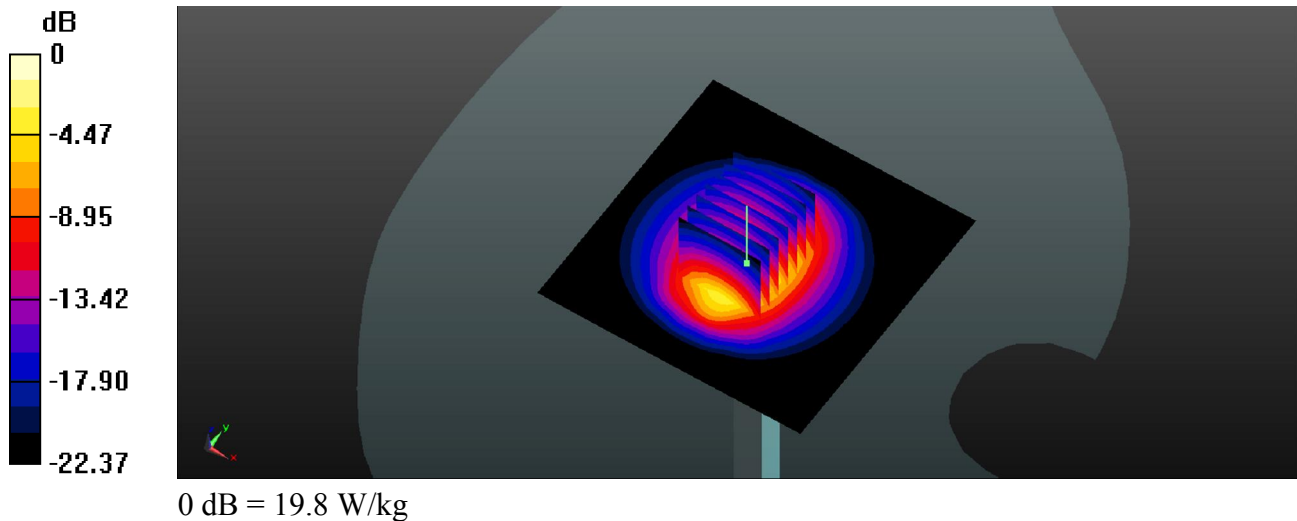
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.050 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.0 W/kg

**SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.94 W/kg**

Maximum value of SAR (measured) = 19.8 W/kg



## System Check\_Body\_2600MHz\_140417

### DUT: D2600V2 - SN: 1061

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: MSL\_2600\_140417 Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.201$  S/m;  $\epsilon_r = 52.823$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.3 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.06, 7.06, 7.06); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 25.1 W/kg

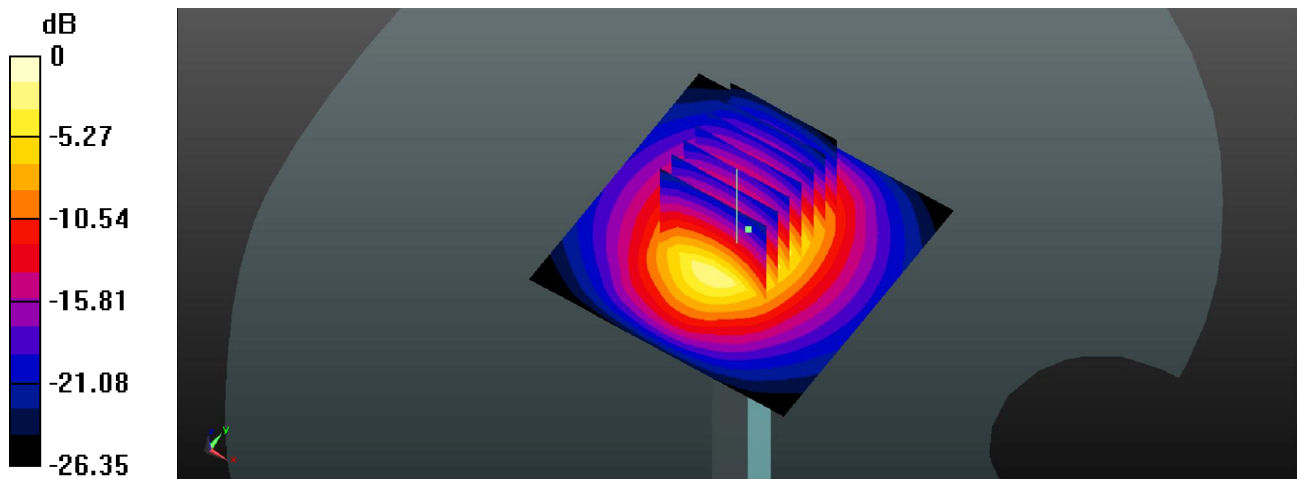
**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.4 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 34.1 W/kg

**SAR(1 g) = 14.7 W/kg; SAR(10 g) = 6.48 W/kg**

Maximum value of SAR (measured) = 23.2 W/kg



0 dB = 23.2 W/kg



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***Appendix B. Plots of High SAR Measurement***

The plots are shown as follows.

**01 GSM1900\_GPRS (GMSK 3 Tx slots)\_Left Cheek\_Ch512**

Communication System: GPRS (GMSK 3 Tx slot); Frequency: 1850.2 MHz; Duty Cycle: 1:2.77

Medium: HSL\_1900\_140414 Medium parameters used:  $f = 1850.2$  MHz;  $\sigma = 1.403$  S/m;  $\epsilon_r = 41.06$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(8.2, 8.2, 8.2); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch512/Area Scan (61x111x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.446 W/kg

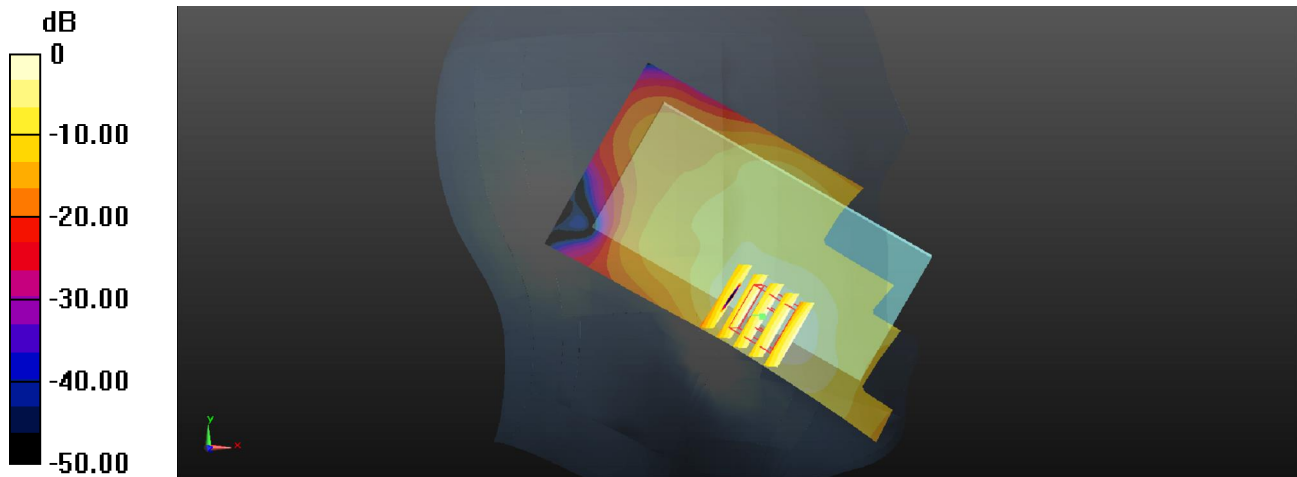
**Ch512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.064 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.503 W/kg

**SAR(1 g) = 0.328 W/kg; SAR(10 g) = 0.200 W/kg**

Maximum value of SAR (measured) = 0.424 W/kg



0 dB = 0.424 W/kg

**02 LTE Band 7\_QPSK\_20M(1,49)\_Right Cheek\_Ch21350**

Communication System: LTE; Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: HSL\_2600\_140419 Medium parameters used:  $f = 2560$  MHz;  $\sigma = 1.944$  S/m;  $\epsilon_r = 38.479$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.34, 7.34, 7.34); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch21350/Area Scan (71x131x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.621 W/kg

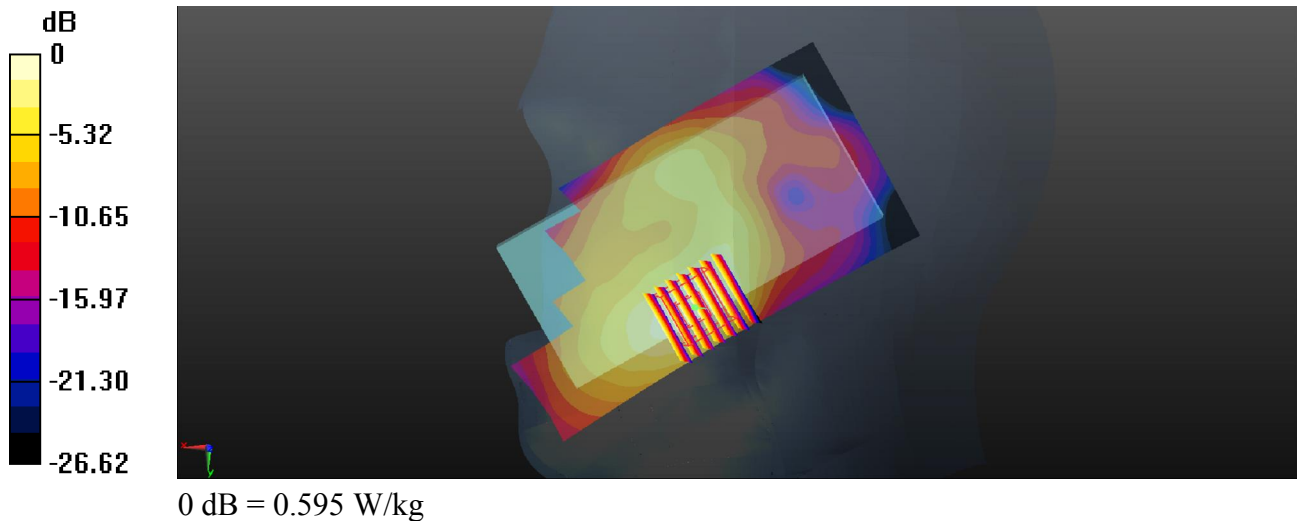
**Ch21350/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.431 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.797 W/kg

**SAR(1 g) = 0.409 W/kg; SAR(10 g) = 0.211 W/kg**

Maximum value of SAR (measured) = 0.595 W/kg



### 03 WLAN2.4GHz\_802.11b\_Right Cheek\_Ch11

Communication System: 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1.024

Medium: HSL\_2450\_140418 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 1.824$  S/m;  $\epsilon_r = 37.585$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch11/Area Scan (71x131x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.0467 W/kg

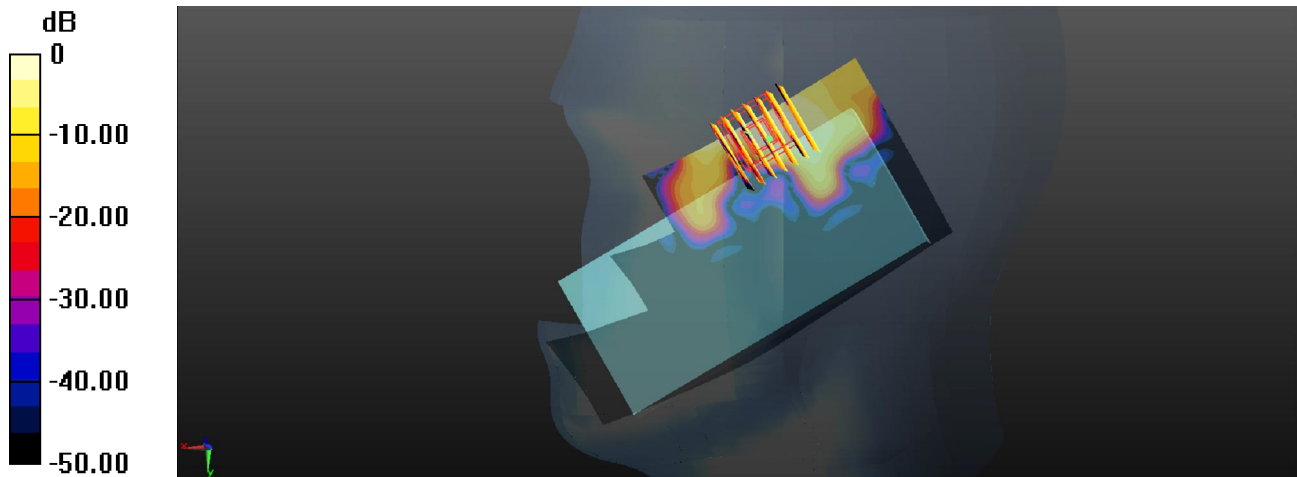
**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.871 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.0900 W/kg

**SAR(1 g) = 0.019 W/kg; SAR(10 g) = 0.00697 W/kg**

Maximum value of SAR (measured) = 0.0306 W/kg



**04 GSM1900\_GPRS (GMSK 3 Tx slots)\_Bottom side \_1.0cm\_Ch810**

Communication System: GPRS (GMSK 3 Tx slot); Frequency: 1909.8 MHz; Duty Cycle: 1:2.77

Medium: MSL\_1900\_140414 Medium parameters used:  $f = 1909.8$  MHz;  $\sigma = 1.554$  S/m;  $\epsilon_r = 55.263$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.83, 7.83, 7.83); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch810/Area Scan (31x61x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.64 W/kg

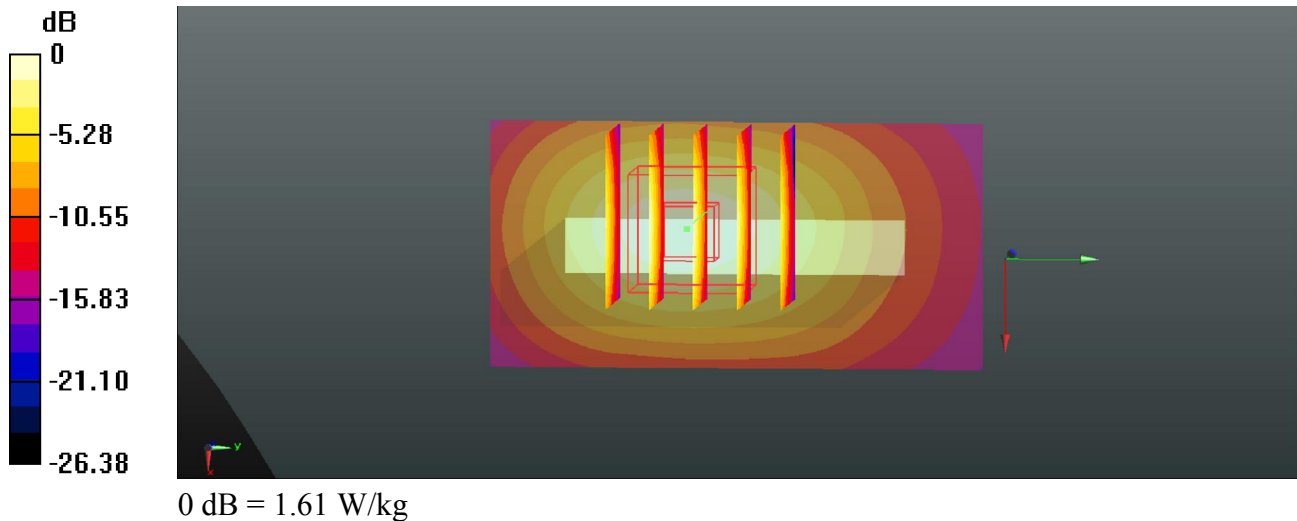
**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.111 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.94 W/kg

**SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.639 W/kg**

Maximum value of SAR (measured) = 1.61 W/kg



**05 LTE Band 7\_QPSK\_20M(1,49)\_Back\_1.0cm\_Ch20850**

Communication System: LTE; Frequency: 2510 MHz; Duty Cycle: 1:1

Medium: MSL\_2600\_140417 Medium parameters used:  $f = 2510$  MHz;  $\sigma = 2.085$  S/m;  $\epsilon_r = 52.993$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.06, 7.06, 7.06); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch20850/Area Scan (71x131x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 1.75 W/kg

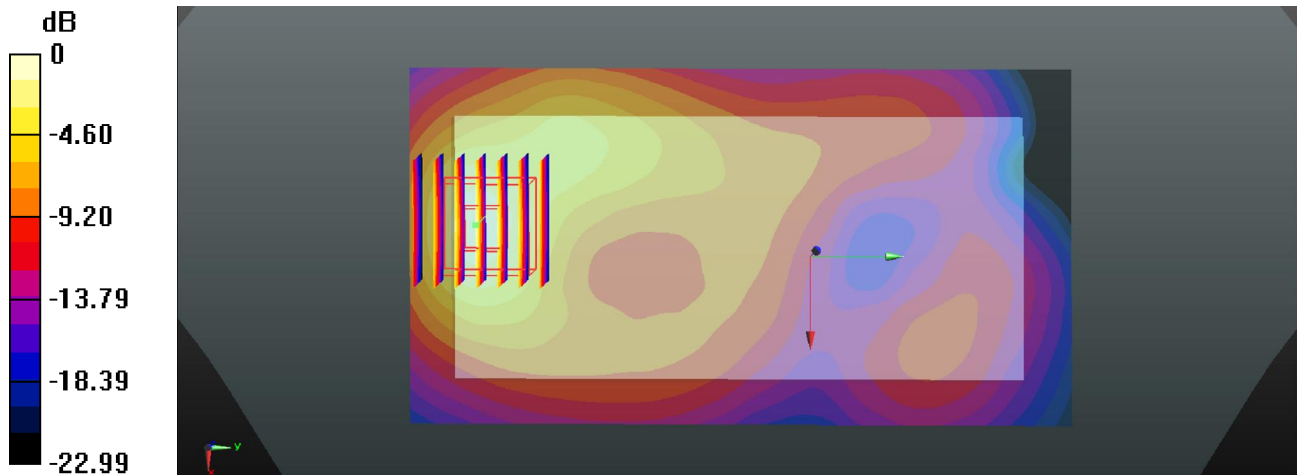
**Ch20850/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.806 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.47 W/kg

**SAR(1 g) = 1.25 W/kg; SAR(10 g) = 0.580 W/kg**

Maximum value of SAR (measured) = 1.85 W/kg



0 dB = 1.85 W/kg

## 06 WLAN2.4GHz\_802.11b\_Back\_1.0cm\_Ch11

Communication System: 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1.024

Medium: MSL\_2450\_140418 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 1.974$  S/m;  $\epsilon_r = 53.843$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.49, 7.49, 7.49); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1754
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch11/Area Scan (71x131x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.0661 W/kg

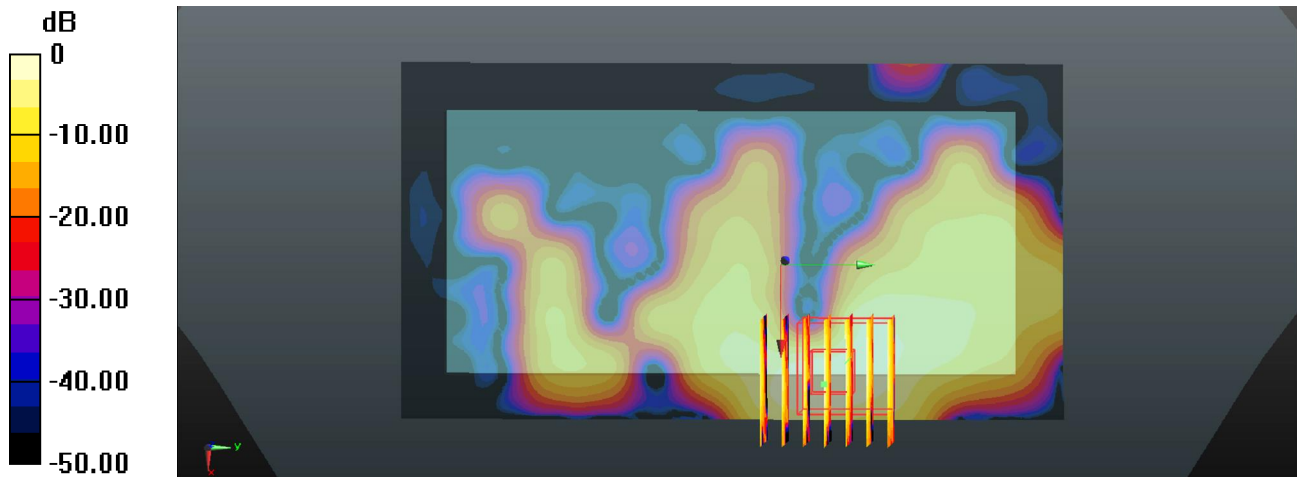
**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.997 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.0820 W/kg

**SAR(1 g) = 0.038 W/kg; SAR(10 g) = 0.015 W/kg**

Maximum value of SAR (measured) = 0.0575 W/kg



0 dB = 0.0575 W/kg

**07 GSM1900\_GPRS (GMSK 3 Tx slots)\_Back\_1.0cm\_Ch810**

Communication System: GPRS (GMSK 3 Tx slot); Frequency: 1909.8 MHz; Duty Cycle: 1:2.77

Medium: MSL\_1900\_140414 Medium parameters used:  $f = 1909.8$  MHz;  $\sigma = 1.554$  S/m;  $\epsilon_r = 55.263$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C ; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.83, 7.83, 7.83); Calibrated: 2014/3/10;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1353; Calibrated: 2014/1/30
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1753
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Ch810/Area Scan (61x111x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.15 W/kg

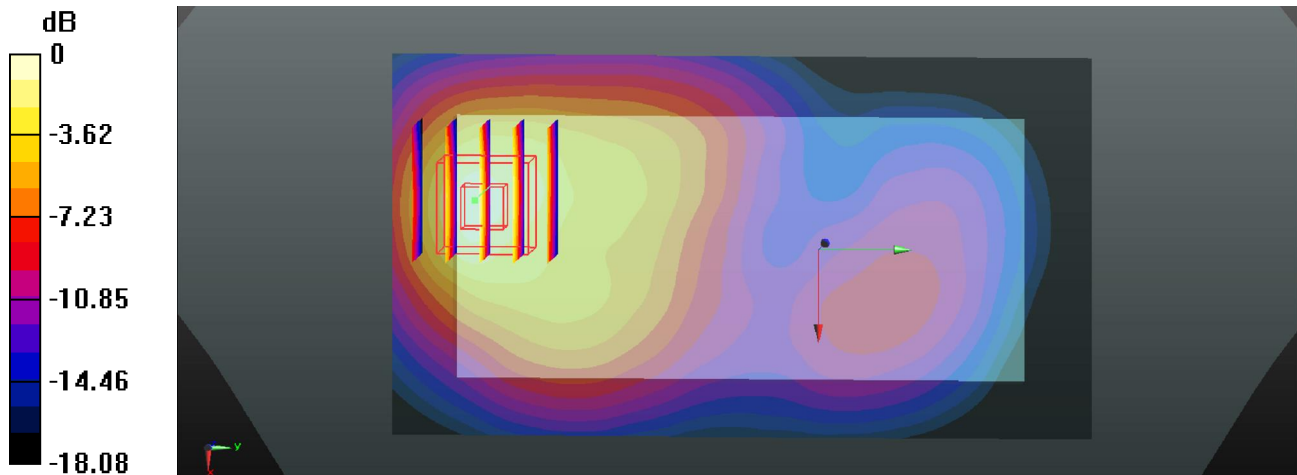
**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.899 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.51 W/kg

**SAR(1 g) = 0.955 W/kg; SAR(10 g) = 0.522 W/kg**

Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.28 W/kg