



# SAR TEST REPORT

No. I16Z40291-SEM01

For

**TCL Communication Ltd.**

**Go Flip**

**Model Name: 4043S**

With

**Hardware Version: PIO1**

**Software Version: 4F25**

**FCC ID: 2ACCJA007**

**Issued Date: 2016-2-25**



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CNAS L0570

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Issue Date</b>	<b>Description</b>
I16Z40291-SEM01	Rev.0	2016-2-25	Initial creation of test report

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## 1 Test Laboratory

### 1.1 Testing Location

Company Name:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

### 1.2 Testing Environment

Temperature:	18°C~25 °C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 $\Omega$
Ambient noise & Reflection:	< 0.012 W/kg

### 1.3 Project Data

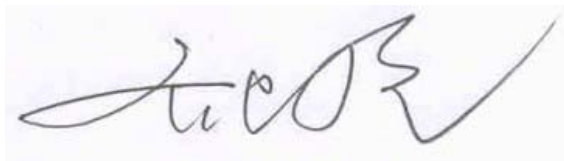
Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	October 17, 2015
Testing End Date:	February 18, 2015

### 1.4 Signature



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Lin Xiaojun  
(Prepared this test report)



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Qi Dianyuan  
(Reviewed this test report)



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Xiao Li  
Deputy Director of the laboratory  
(Approved this test report)

## 2 Statement of Compliance

This EUT is a variant product and the report of original sample is No.I15Z42353-SEM01. According to the client request, we quote the test results of original sample except the data of WLAN. And take the full test of WLAN instead of original sample. The results of spot check are presented in the annex I.

The maximum results found during testing for TCL Communication Ltd. Go Flip 4043S are as follows:

**Table 2.1: Highest Reported SAR (1g)**

Exposure Configuration	Technology Band	Highest Reported SAR 1g (W/Kg)	Equipment Class
Head (Separation Distance 0mm)	CDMA BC0	0.59	PCE
	CDMA BC1	0.51	
	LTE Band 4	0.28	
	LTE Band 13	0.30	
	WLAN 2.4 GHz	0.18	DTS
Body-worn (Separation Distance 15mm)	CDMA BC0	1.04	PCE
	CDMA BC1	0.66	
	LTE Band 4	1.24	
	LTE Band 13	0.95	
	WLAN 2.4 GHz	0.09	DTS

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/Kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 15 mm between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The measurement together with the test system set-up is described in annex C of this test report. A detailed description of the equipment under test can be found in chapter 4 of this test report.

The highest reported SAR value is obtained at the case of (**Table 2.1**), and the values are: **1.24 W/kg (1g)**.

**Table 2.2: The sum of reported SAR values for main antenna and WiFi**

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Right hand, Touch cheek	0.59	0.18	<b>0.77</b>
Highest reported SAR value for Body	Rear open	1.24	0.07	<b>1.31</b>
	Rear closed	1.04	0.09	<b>1.13</b>

**Table 2.3: The sum of reported SAR values for main antenna and Bluetooth**

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Right hand, Touch cheek	0.59	0.27	<b>0.86</b>
Highest reported SAR value for Body	Rear open	1.24	0.13	<b>1.37</b>

BT\* - Estimated SAR for Bluetooth (see the table 13.3)

According to the above tables, the highest sum of reported SAR values is **1.37 W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

### 3 Client Information

#### 3.1 Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
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#### 3.2 Manufacturer Information

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Country:	P.R.China
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-21-51798260
Fax:	0086-21-61460602

## 4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

### 4.1 About EUT

Description:	Go Flip
Model Name:	4043S
Operating mode(s):	CDMA BC0/1, LTE Band4/13, BT, WLAN
Tested Tx Frequency:	824.7 – 848.31 MHz (CDMA BC0)
	1851.25 – 1908.75 MHz (CDMA BC1)
	779.5 – 784.5 MHz (LTE Band13)
	1710.7– 1754.3 MHz (LTE Band4)
	2412 – 2462 MHz (Wi-Fi 2.4G)
Test device Production information:	Production unit
Device type:	Portable device
Antenna type:	Integrated antenna

### 4.2 Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	353462070027862	PIO1	4F25
EUT2	353462070027706	PIO1	4F25
EUT3	353462070027870	PIO1	4F25
EUT4	353462070027698	PIO1	4F25
EUT5	353462070027664	PIO1	4F25
EUT6	353462070026435	PIO1	4F25

\*EUT ID: is used to identify the test sample in the lab internally.

**Note:** It is performed to test SAR with the EUT1&2&4&6 and conducted power with the EUT 3&5.

### 4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	CAB1780000C2	/	SCUD
AE2	Headset	CCB3001A15C2	/	Fly

\*AE ID: is used to identify the test sample in the lab internally.



## 5 TEST METHODOLOGY

### 5.1 Applicable Limit Regulations

**ANSI C95.1–1992:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

### 5.2 Applicable Measurement Standards

**IEEE 1528–2013:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

**KDB447498 D01: General RF Exposure Guidance v06:** Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

**KDB648474 D04 Handset SAR v01r03:** SAR Evaluation Considerations for Wireless Handsets.

**KDB941225 D01 SAR test for 3G devices v03r01:** SAR Measurement Procedures for 3G Devices

**KDB941225 D05 SAR for LTE Devices v02r05:** SAR Evaluation Considerations for LTE Devices

**KDB941225 D06 Hotspot Mode SAR v02r01:** SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

**KDB248227 D01 802.11 Wi-Fi SAR v02r02:** SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

**KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04:** SAR Measurement Requirements for 100 MHz to 6 GHz.

**KDB865664 D02 RF Exposure Reporting v01r02:** RF Exposure Compliance Reporting and Documentation Considerations

## 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 measurement can be either related to the temperature elevation in tissue by

$$SAR = c \left( \frac{\delta T}{\delta t} \right)$$

Where:  $C$  is the specific heat capacity,  $\delta T$  is the temperature rise and  $\delta t$  is the exposure duration, or related to the electrical field in the tissue by

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

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of tissue and  $E$  is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

## 7 Tissue Simulating Liquids

### 7.1 Targets for tissue simulating liquid

**Table 7.1: Targets for tissue simulating liquid**

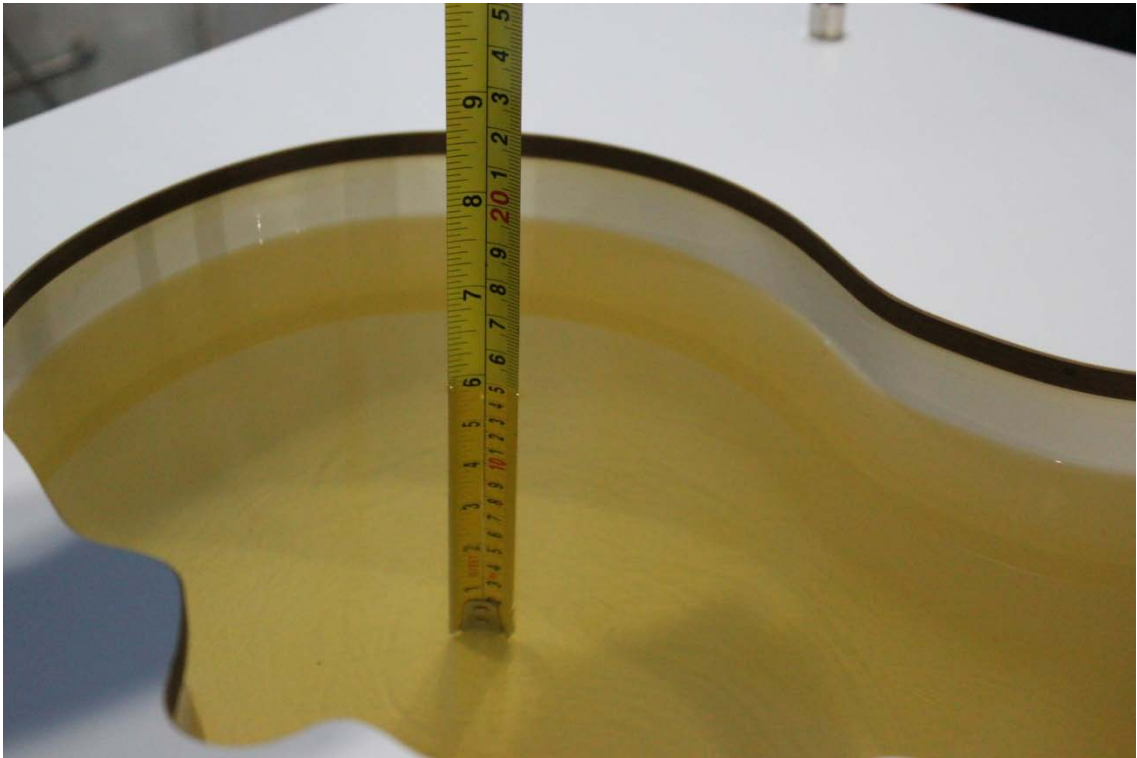
Frequency (MHz)	Liquid Type	Conductivity ( $\sigma$ )	$\pm 5\%$ Range	Permittivity ( $\epsilon$ )	$\pm 5\%$ Range
750	Head	0.89	0.85~0.93	41.94	39.8~44.0
750	Body	0.96	0.91~1.01	55.5	52.7~58.3
835	Head	0.90	0.86~0.95	41.5	39.4~43.6
835	Body	0.97	0.92~1.02	55.2	52.4~58.0
1750	Head	1.37	1.30~1.44	40.08	38.1~42.1
1750	Body	1.49	1.42~1.56	53.4	50.7~56.1
1900	Head	1.40	1.33~1.47	40.0	38.0~42.0
1900	Body	1.52	1.44~1.60	53.3	50.6~56.0
2450	Head	1.80	1.71~1.89	39.2	37.2~41.2
2450	Body	1.95	1.85~2.05	52.7	50.1~55.3

### 7.2 Dielectric Performance

**Table 7.2: Dielectric Performance of Tissue Simulating Liquid**

Measurement Date (yyyy-mm-dd)	Type	Frequency	Permittivity $\epsilon$	Drift (%)	Conductivity $\sigma$ (S/m)	Drift (%)
2015-10-17	Head	750 MHz	43.08	2.72	0.912	2.47
	Body	750 MHz	56.98	2.67	0.946	-1.46
2015-11-04	Head	835 MHz	41.12	-0.92	0.921	2.33
	Body	835 MHz	56.23	1.87	0.972	0.21
2015-10-19	Head	1750 MHz	39.53	-1.37	1.331	-2.85
	Body	1750 MHz	52.7	-1.31	1.472	-1.21
2015-11-05	Head	1900 MHz	40.54	1.35	1.408	0.57
	Body	1900 MHz	52.93	-0.69	1.557	2.43
2016-2-14	Head	750 MHz	43.08	2.72	0.912	2.47
	Body	750 MHz	56.98	2.67	0.946	-1.46
2016-2-15	Head	835 MHz	41.12	-0.92	0.921	2.33
	Body	835 MHz	56.23	1.87	0.972	0.21
2016-2-16	Head	1750 MHz	39.53	-1.37	1.331	-2.85
	Body	1750 MHz	52.7	-1.31	1.472	-1.21
2016-2-17	Head	1900 MHz	40.54	1.35	1.408	0.57
	Body	1900 MHz	52.93	-0.69	1.557	2.43
2016-2-18	Head	2450 MHz	38.38	-2.09	1.827	1.50
	Body	2450 MHz	53.45	1.42	1.941	-0.46

Note: The liquid temperature is 22.0 °C



**Picture 7-1: Liquid depth in the Head Phantom (750 MHz)**



**Picture 7-2: Liquid depth in the Flat Phantom (750 MHz)**

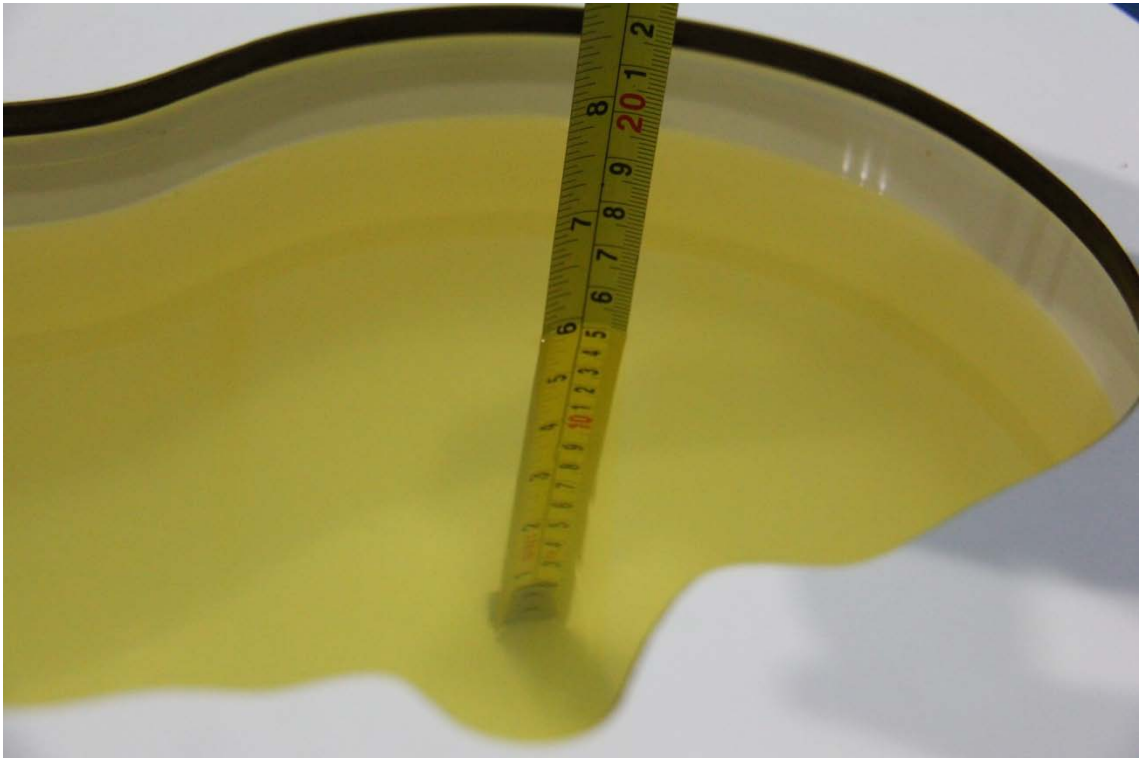


**Picture 7-3: Liquid depth in the Head Phantom (835 MHz)**



**Picture 7-4: Liquid depth in the Flat Phantom (835 MHz)**





**Picture 7-5: Liquid depth in the Head Phantom (1750 MHz)**



**Picture 7-6 Liquid depth in the Flat Phantom (1750MHz)**



**Picture 7-7 Liquid depth in the Head Phantom (1900MHz)**



**Picture 7-8 Liquid depth in the Flat Phantom (1900MHz)**



**Picture 7-9 Liquid depth in the Head Phantom (2450MHz)**



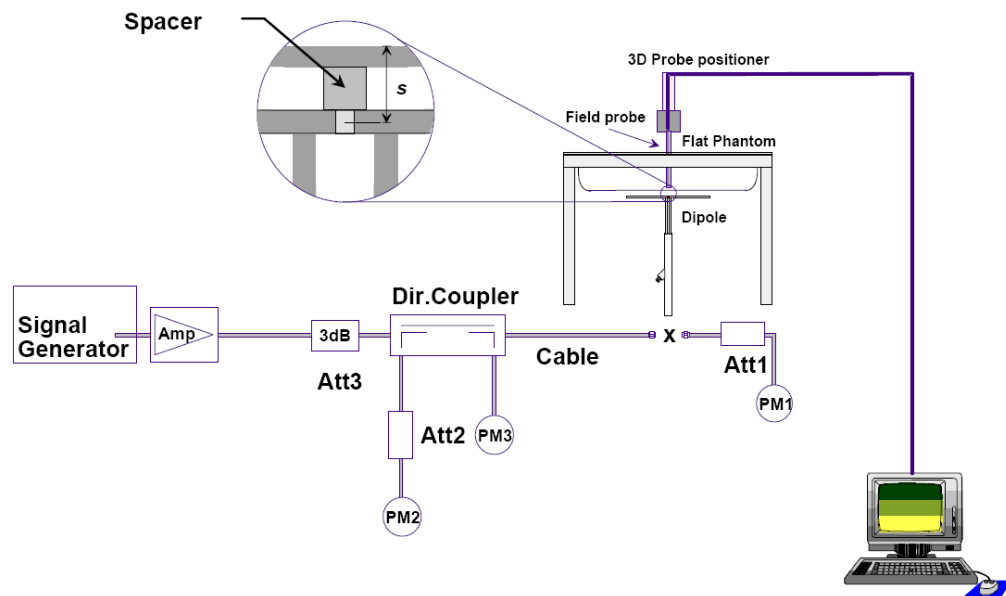
**Picture 7-10 Liquid depth in the Flat Phantom (2450MHz)**



## 8 System verification

### 8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

## 8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

The system verification results are required that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR. The details are presented in annex B.

**Table 8.1: System Verification of Head**

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2015-10-17	750 MHz	5.36	8.2	5.40	8.28	0.75%	0.98%
2015-11-04	835 MHz	5.92	9.12	5.96	9.08	0.68%	-0.44%
2015-10-19	1750 MHz	20.04	37.4	19.28	36.40	-3.79%	-2.67%
2015-11-05	1900 MHz	21.36	40.4	21.44	40.80	0.37%	0.99%
2016-2-14	750 MHz	5.36	8.2	5.40	8.28	0.75%	0.98%
2016-2-15	835 MHz	5.92	9.12	5.96	9.08	0.68%	-0.44%
2016-2-16	1750 MHz	20.04	37.4	19.28	36.40	-3.79%	-2.67%
2016-2-17	1900 MHz	21.36	40.4	21.44	40.80	0.37%	0.99%
2016-2-18	2450 MHz	24.5	52.5	24.24	52.40	-1.06%	-0.19%

**Table 8.2: System Verification of Body**

Measurement Date (yyyy-mm-dd)	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2015-10-17	750 MHz	5.68	8.64	5.80	8.84	2.11%	2.31%
2015-11-04	835 MHz	6.24	9.52	6.24	9.56	0.00%	0.42%
2015-10-19	1750 MHz	20.28	37.48	20.20	37.68	-0.39%	0.53%
2015-11-05	1900 MHz	21.88	40.8	21.44	41.20	-2.01%	0.98%
2016-2-14	750 MHz	5.68	8.64	5.80	8.84	2.11%	2.31%
2016-2-15	835 MHz	6.24	9.52	6.24	9.56	0.00%	0.42%
2016-2-16	1750 MHz	20.28	37.48	20.20	37.68	-0.39%	0.53%
2016-2-17	1900 MHz	21.88	40.8	21.44	41.20	-2.01%	0.98%
2016-2-18	2450 MHz	24.4	52.1	23.96	50.00	-1.80%	-4.03%

## 9 Measurement Procedures

### 9.1 Tests to be performed

In order to determine the highest value of the peak spatial-average SAR of a handset, all device positions, configurations and operational modes shall be tested for each frequency band according to steps 1 to 3 below. A flowchart of the test process is shown in picture 9.1.

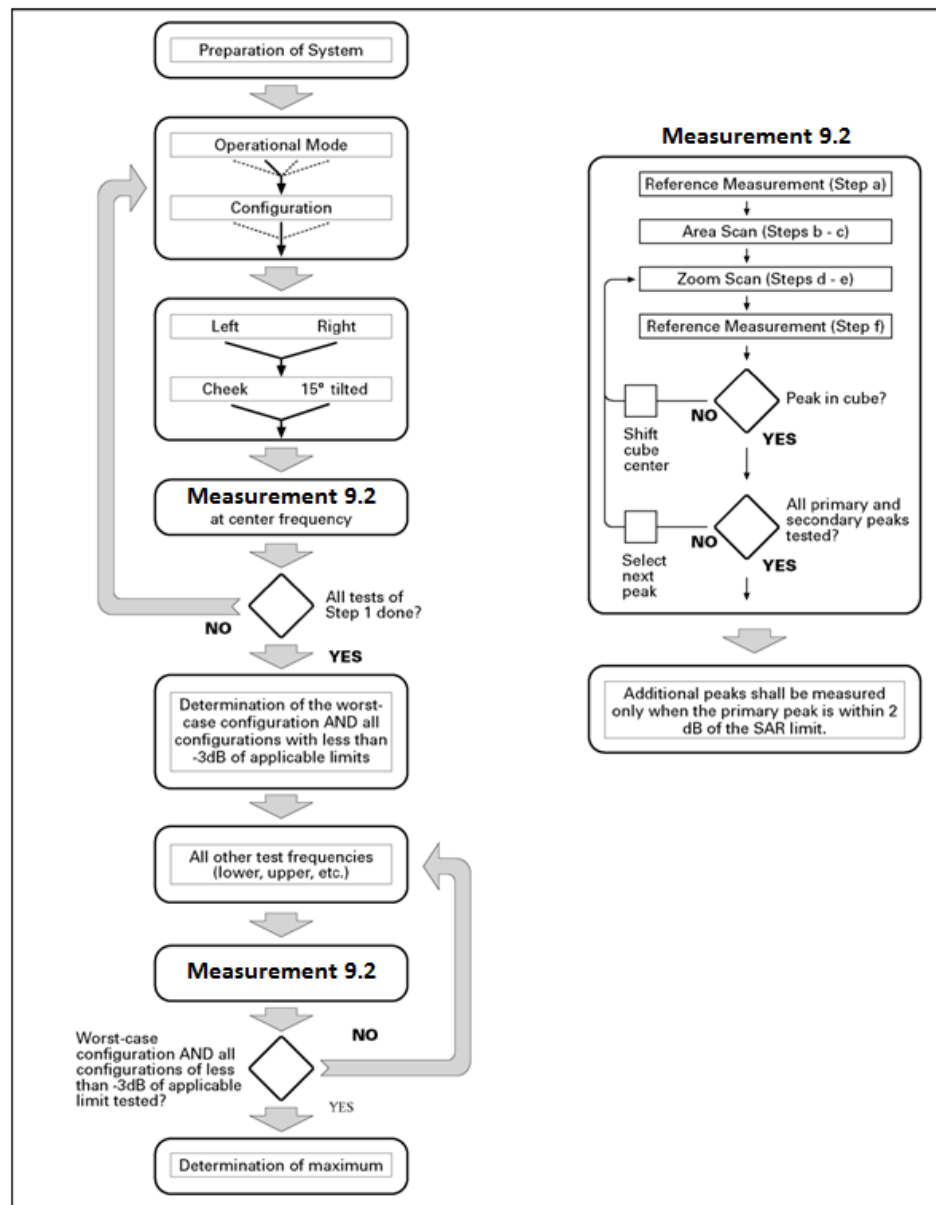
**Step 1:** The tests described in 9.2 shall be performed at the channel that is closest to the centre of the transmit frequency band ( $f_c$ ) for:

- a) all device positions (cheek and tilt, for both left and right sides of the SAM phantom, as described in annex D),
- b) all configurations for each device position in a), e.g., antenna extended and retracted, and
- c) all operational modes, e.g., analogue and digital, for each device position in a) and configuration in b) in each frequency band.

If more than three frequencies need to be tested according to 11.1 (i.e.,  $N_c > 3$ ), then all frequencies, configurations and modes shall be tested for all of the above test conditions.

**Step 2:** For the condition providing highest peak spatial-average SAR determined in Step 1, perform all tests described in 9.2 at all other test frequencies, i.e., lowest and highest frequencies. In addition, for all other conditions (device position, configuration and operational mode) where the peak spatial-average SAR value determined in Step 1 is within 3 dB of the applicable SAR limit, it is recommended that all other test frequencies shall be tested as well.

**Step 3:** Examine all data to determine the highest value of the peak spatial-average SAR found in Steps 1 to 2.



Picture 9.1 Block diagram of the tests to be performed

## 9.2 General Measurement Procedure

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements and fully documented in SAR reports to qualify for TCB approval. Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2003. The results should be documented as part of the system validation records and may be requested to support test results

when all the measurement parameters in the following table are not satisfied.

			$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			$5 \pm 1$ mm	$\frac{1}{4} \delta \ln(2) \pm 0.5$ 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.	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$			$\leq 2$ 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: $\Delta z_{Zoom}(n)$		$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm
	graded grid	$\Delta z_{Zoom}(1)$ : 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
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
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 <u>reported</u> SAR from the area scan based <i>I-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.				

### 9.3 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

## 9.4 Power Drift

To control the output power stability during the SAR test, DASY4 system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. These drift values can be found in Table 14.1 to Table 14.16 labeled as: (Power Drift [dB]). This ensures that the power drift during one measurement is within 5%.

## 10 Area Scan Based 1-g SAR

### 10.1 Requirement of KDB

According to the KDB447498 D01 v05, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-g SAR is  $\leq 1.2$  W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

### 10.2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz) and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55 wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm are 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

## 11 Conducted Output Power

### 11.1 Manufacturing tolerance

**Table 11.1: CDMA**

CDMA BC0			
Channel	Channel 777	Channel 384	Channel 1013
Target (dBm)	24	24	24
Tune-up (dBm)	25	25	25
CDMA BC1			
Channel	Channel 1175	Channel 600	Channel 25
Target (dBm)	24	24	24
Tune-up (dBm)	25	25	25

**Table 11.2: LTE**

Mode	Target (dBm)	Tune-up (dBm)
LTE Band 4	22	23.3
LTE Band 13	23	24

**LTE MPR will follow up 3GPP setting as below:**

Modulation	Channel bandwidth / Transmission bandwidth (NRB)						MPR (dB)
	1.4MHz	3.0MHz	5MHz	10MHz	15MHz	20MHz	
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

**Table 11.3: Bluetooth**

Mode	GFSK		
Channel	0	39	78
Target (dBm)	6.9	7.1	7
Tune-up (dBm)	7.9	8.1	8

**Table 11.4: WiFi**

Mode	Target (dBm)	Tune-up(dBm)
802.11 b (2.4GHz)	15	16
802.11 g (2.4GHz) 6Mbps~12Mbps	12	13
802.11 g (2.4GHz) 18Mbps	11.5	12.5
802.11 g (2.4GHz) 24Mbps	11	12
802.11 g (2.4GHz) 36Mbps	10.5	11.5
802.11 g (2.4GHz) 48Mbps~54Mbps	10	11
802.11 n (2.4GHz HT20) MCS0-MCS1	12	13
802.11 n (2.4GHz HT20) MCS2-MCS3	11.5	12.5
802.11 n (2.4GHz HT20) MCS4	11	12
802.11 n (2.4GHz HT20) MCS4	11	12
802.11 n (2.4GHz HT40) MCS5-MCS6	9.5	10.5
802.11 n (2.4GHz HT40) MCS7	9	10

## 11.2 CDMA Measurement result

During the process of testing, the EUT was controlled via Agilent Digital Radio Communication tester (E5515C) to ensure the maximum power transmission and proper modulation. This result contains conducted output power for the EUT. In all cases, the measured peak output power should be greater and within 5% than EMI measurement.

**Table 11.5: The conducted power measurement results for CDMA**

CDMA BC0	Conducted Power (dBm)		
	Channel 777 (848.31MHz)	Channel 384 (836.52MHz)	Channel 1013 (824.7MHz)
SO55/RC3	24.10	24.25	24.28
SO55/RC1	24.16	24.36	24.34
SO32/RC3(FCH only)	24.08	24.27	24.23
SO32/RC3(FCH+SCH <sub>n</sub> )	24.12	24.24	24.27
EVDO Rev.0	23.67	23.95	23.99
EVDO Rev.A	23.68	23.80	24.00
CDMA BC1	Conducted Power (dBm)		
	Channel 1175 (1908.75MHz)	Channel 600 (1880MHz)	Channel 25 (1851.25MHz)
SO55/RC3	24.11	24.13	24.34
SO55/RC1	24.22	24.18	24.36
SO32/RC3(FCH only)	24.19	24.12	24.35
SO32/RC3(FCH+SCH <sub>n</sub> )	24.21	24.17	24.33
EVDO Rev.0	22.55	22.61	22.98
EVDO Rev.A	23.17	22.79	22.66

## 11.3 LTE Measurement result

**Table 11.6: The conducted Power for LTE**

Band 4							
Bandwidth (MHz)	RB allocation	Frequency (MHz)	Max. Target Power (dBm)	QPSK		16QAM	
	RB offset (Start RB)			Actual output power (dBm)	MPR	Actual output power (dBm)	MPR
1.4 MHz	1RB High (5)	1754.3	24	22.54	0	21.89	1
		1732.5	24	22.65	0	21.73	1
		1710.7	24	22.47	0	21.62	1
	1RB Middle (3)	1754.3	24	22.60	0	21.96	1
		1732.5	24	22.75	0	21.97	1
		1710.7	24	22.81	0	21.89	1
	1RB Low (0)	1754.3	24	22.41	0	21.83	1
		1732.5	24	22.51	0	21.65	1
		1710.7	24	22.50	0	21.55	1
	3RB High (3)	1754.3	24	22.57	0	21.71	1
		1732.5	24	22.52	0	21.58	1
		1710.7	24	22.45	0	21.63	1



	3RB Middle (1)	1754.3	24	22.63	0	21.73	1
		1732.5	24	22.65	0	21.67	1
		1710.7	24	22.70	0	21.85	1
	3RB Low (0)	1754.3	24	22.56	0	21.51	1
		1732.5	24	22.38	0	21.54	1
		1710.7	24	22.64	0	21.75	1
	6RB (0)	1754.3	24	21.65	1	20.68	2
		1732.5	24	21.49	1	20.51	2
		1710.7	24	21.72	1	20.78	2
3 MHz	1RB High (14)	1753.5	24	22.73	0	21.95	1
		1732.5	24	22.35	0	21.39	1
		1711.5	24	22.42	0	21.47	1
	1RB Middle (7)	1753.5	24	22.34	0	21.80	1
		1732.5	24	22.24	0	21.24	1
		1711.5	24	22.43	0	21.52	1
	1RB Low (0)	1753.5	24	22.38	0	21.75	1
		1732.5	24	22.33	0	21.38	1
		1711.5	24	22.52	0	21.54	1
	8RB High (7)	1753.5	24	21.47	1	20.64	2
		1732.5	24	21.50	1	20.49	2
		1711.5	24	21.67	1	20.78	2
	8RB Middle (4)	1753.5	24	21.37	1	20.54	2
		1732.5	24	21.55	1	20.59	2
		1711.5	24	21.54	1	20.56	2
	8RB Low (0)	1753.5	24	21.42	1	20.61	2
		1732.5	24	21.48	1	20.48	2
		1711.5	24	21.57	1	20.62	2
	15RB (0)	1753.5	24	21.46	1	20.62	2
		1732.5	24	21.51	1	20.50	2
		1711.5	24	21.61	1	20.73	2
5 MHz	1RB High (24)	1752.5	24	22.76	0	22.00	1
		1732.5	24	22.30	0	21.61	1
		1712.5	24	22.32	0	21.28	1
	1RB Middle (12)	1752.5	24	22.52	0	21.95	1
		1732.5	24	22.22	0	21.58	1
		1712.5	24	22.29	0	21.26	1
	1RB Low (0)	1752.5	24	22.33	0	21.68	1
		1732.5	24	22.37	0	21.64	1
		1712.5	24	22.25	0	21.24	1
	12RB High (13)	1752.5	24	21.49	1	20.52	2
		1732.5	24	21.41	1	20.46	2
		1712.5	24	21.45	1	20.50	2

	12RB Middle (6)	1752.5	24	21.43	1	20.51	2
		1732.5	24	21.50	1	20.64	2
		1712.5	24	21.38	1	20.44	2
	12RB Low (0)	1752.5	24	21.42	1	20.50	2
		1732.5	24	21.53	1	20.66	2
		1712.5	24	21.40	1	20.45	2
	25RB (0)	1752.5	24	21.48	1	20.50	2
		1732.5	24	21.52	1	20.65	2
		1712.5	24	21.44	1	20.48	2
10 MHz	1RB High (49)	1750	24	22.42	0	21.51	1
		1732.5	24	22.38	0	21.41	1
		1715	24	22.23	0	21.24	1
	1RB Middle (24)	1750	24	22.15	0	21.22	1
		1732.5	24	22.57	0	21.65	1
		1715	24	22.62	0	21.60	1
	1RB Low (0)	1750	24	22.60	0	21.67	1
		1732.5	24	22.33	0	21.32	1
		1715	24	22.70	0	22.00	1
	25RB High (25)	1750	24	21.39	1	20.33	2
		1732.5	24	21.53	1	20.53	2
		1715	24	21.35	1	20.34	2
	25RB Middle (12)	1750	24	21.50	1	20.59	2
		1732.5	24	21.56	1	20.55	2
		1715	24	21.40	1	20.43	2
	25RB Low (0)	1750	24	21.43	1	20.47	2
		1732.5	24	21.45	1	20.49	2
		1715	24	21.63	1	20.73	2
	50RB (0)	1750	24	21.46	1	20.50	2
		1732.5	24	21.50	1	20.54	2
		1715	24	21.60	1	20.67	2
15 MHz	1RB High (74)	1747.5	24	22.42	0	21.70	1
		1732.5	24	22.54	0	21.66	1
		1717.5	24	22.05	0	21.26	1
	1RB Middle (37)	1747.5	24	22.68	0	21.96	1
		1732.5	24	22.21	0	21.23	1
		1717.5	24	22.44	0	21.47	1
	1RB Low (0)	1747.5	24	22.82	0	22.00	1
		1732.5	24	22.33	0	21.33	1
		1717.5	24	22.64	0	21.76	1
	36RB High (38)	1747.5	24	21.32	1	20.32	2
		1732.5	24	21.44	1	20.54	2
		1717.5	24	21.29	1	20.31	2
	36RB Middle (19)	1747.5	24	21.57	1	20.58	2
		1732.5	24	21.39	1	20.47	2

	36RB Low (0)	1717.5	24	21.37	1	20.39	2
		1747.5	24	21.75	1	20.74	2
		1732.5	24	21.38	1	20.42	2
		1717.5	24	21.50	1	20.56	2
	75RB (0)	1747.5	24	21.72	1	20.68	2
		1732.5	24	21.40	1	20.42	2
		1717.5	24	21.46	1	20.43	2
20 MHz	1RB High (99)	1745	24	22.43	0	21.54	1
		1732.5	24	22.81	0	22.00	1
		1720	24	22.29	0	21.59	1
	1RB Middle (50)	1745	24	22.96	0	21.94	1
		1732.5	24	22.30	0	21.69	1
		1720	24	22.28	0	21.61	1
	1RB Low (0)	1745	24	22.90	0	21.90	1
		1732.5	24	22.58	0	21.95	1
		1720	24	22.92	0	22.00	1
	50RB High (50)	1745	24	21.11	1	20.30	2
		1732.5	24	21.45	1	20.55	2
		1720	24	21.28	1	20.40	2
	50RB Middle (25)	1745	24	21.46	1	20.57	2
		1732.5	24	21.35	1	20.37	2
		1720	24	21.15	1	20.26	2
	50RB Low (0)	1745	24	21.64	1	20.70	2
		1732.5	24	21.38	1	20.42	2
		1720	24	21.37	1	20.44	2
	100RB (0)	1745	24	21.61	1	20.65	2
		1732.5	24	21.42	1	20.44	2
		1720	24	21.24	1	20.30	2
Band 13							
Bandwidth (MHz)	RB allocation	Frequency (MHz)	Max. Target Power (dBm)	QPSK		16QAM	
	RB offset (Start RB)			Actual output power (dBm)	MPR	Actual output power (dBm)	MPR
5 MHz	1RB High (24)	784.5	24	22.97	0	22.34	1
		782	24	23.03	0	22.27	1
		779.5	24	22.99	0	22.01	1
	1RB Middle (12)	784.5	24	23.04	0	22.36	1
		782	24	23.05	0	22.28	1
		779.5	24	23.16	0	22.29	1
	1RB Low (0)	784.5	24	23.18	0	22.50	1
		782	24	23.39	0	22.56	1
		779.5	24	23.55	0	22.66	1
	12RB High (13)	784.5	24	21.98	1	21.06	2
		782	24	22.01	1	21.25	2
		779.5	24	21.96	1	21.00	2
	12RB Middle (6)	784.5	24	22.08	1	21.15	2
		782	24	22.12	1	21.31	2
		779.5	24	22.05	1	21.10	2

10 MHz	12RB Low (0)	784.5	24	22.10	1	21.17	2
		782	24	21.95	1	21.20	2
		779.5	24	22.06	1	21.24	2
	25RB (0)	784.5	24	22.09	1	21.11	2
		782	24	22.11	1	21.22	2
		779.5	24	21.98	1	21.01	2
	1RB High (49)	782	24	22.88	0	22.12	1
	1RB Middle (24)	782	24	23.41	0	22.45	1
	1RB Low (0)	782	24	23.19	0	22.25	1
10 MHz	25RB High (25)	782	24	21.98	1	20.92	2
	25RB Middle (12)	782	24	22.15	1	21.08	2
	25RB Low (0)	782	24	22.00	1	21.02	2
	50RB (0)	782	24	22.06	1	21.07	2

#### 11.4 Wi-Fi and BT Measurement result

The output power of BT antenna is as following:

Mode	Conducted Power (dBm)		
	Channel 0 (2402MHz)	Channel 39 (2441MHz)	Channel 78 (2480MHz)
GFSK	6.90	7.12	7.00

The average conducted power for Wi-Fi is as following:

802.11b (dBm)

Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1	14.32	\	14.42	\
6	15.47	\	15.62	\
11	15.64	15.79	15.88	15.56

802.11g (dBm)

Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1	11.53	\	\	\	\	\	\	\
6	12.61	\	\	\	\	\	\	\
11	12.77	12.36	12.11	11.74	11.36	10.79	10.29	10.11

802.11n (dBm) - HT20 (2.4G)

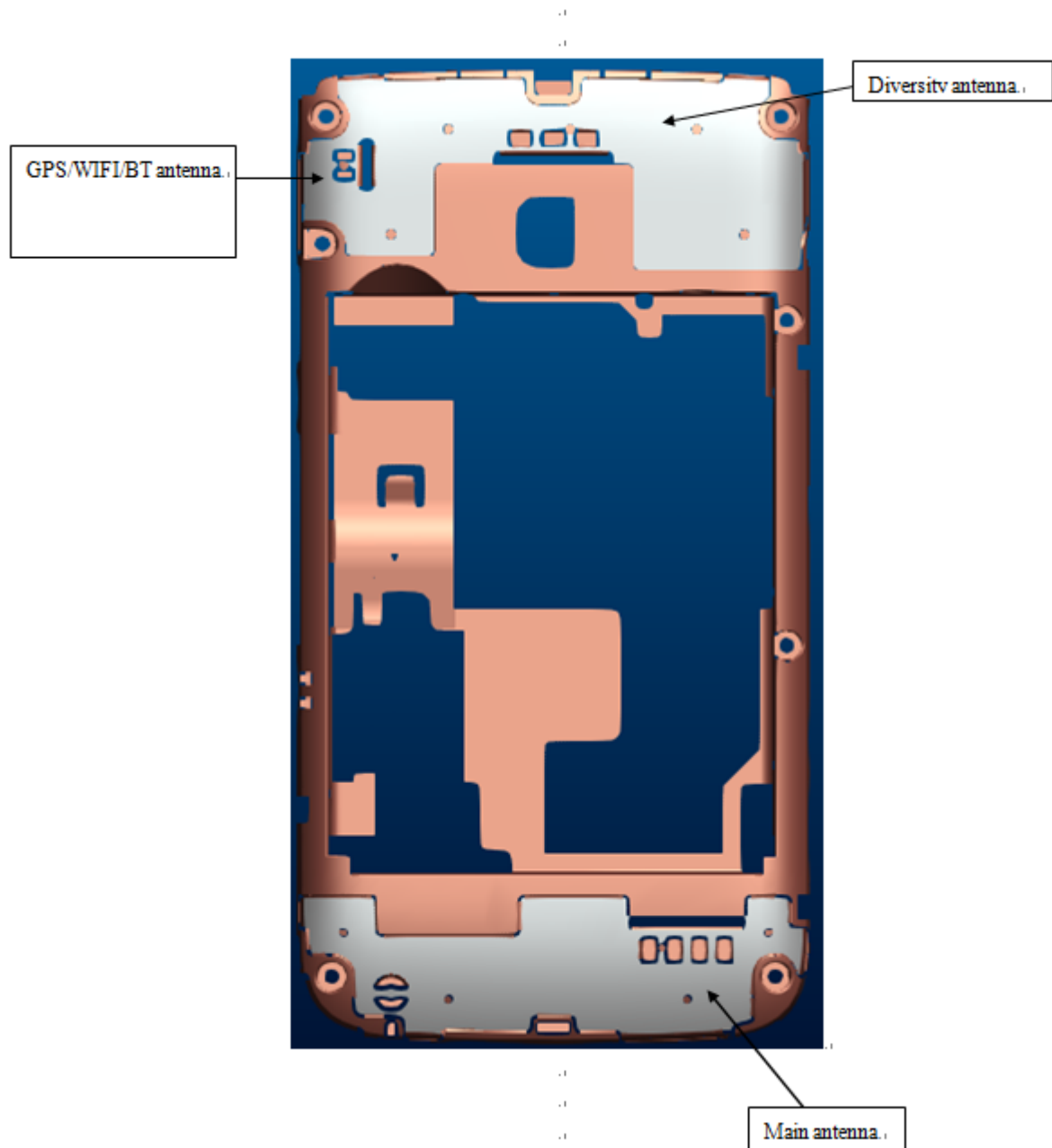
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1	11.37	\	\	\	\	\	\	\
6	12.50	\	\	\	\	\	\	\
11	12.68	12.08	11.67	11.31	10.76	10.33	10.12	9.93

## 12 Simultaneous TX SAR Considerations

### 12.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter. For this device, the BT and Wi-Fi can transmit simultaneous with other transmitters.

### 12.2 Transmit Antenna Separation Distances



Picture 12.1 Antenna Locations

### 12.3 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. The 1-g SAR test exclusion threshold 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, where

- $f(\text{GHz})$  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

**Table 12.1: Standalone SAR test exclusion considerations**

Band/Mode	F(GHz)	Position	SAR test exclusion threshold (mW)	RF output power		SAR test exclusion
				dBm	mW	
Bluetooth	2.441	Head	9.60	8.1	6.46	Yes
		Body	19.20	8.1	6.46	Yes
2.4GHz WLAN 802.11b	2.45	Head	9.58	16	39.81	No
		Body	19.17	16	39.81	No

### 13 Evaluation of Simultaneous

**Table 13.1: The sum of reported SAR values for main antenna and WiFi**

	Position	Main antenna	WiFi	Sum
Highest reported SAR value for Head	Right hand, Touch cheek	0.59	0.18	<b>0.77</b>
Highest reported SAR value for Body	Rear open	1.24	0.07	<b>1.31</b>
	Rear closed	1.04	0.09	<b>1.13</b>

**Table 13.2: The sum of reported SAR values for main antenna and Bluetooth**

	Position	Main antenna	BT*	Sum
Highest reported SAR value for Head	Right hand, Touch cheek	0.59	0.27	<b>0.86</b>
Highest reported SAR value for Body	Rear open	1.24	0.13	<b>1.37</b>

BT\* - Estimated SAR for Bluetooth (see the table 13.2)

**Table 13.3: Estimated SAR for Bluetooth**

Position	F (GHz)	Distance (mm)	Upper limit of power *		Estimated <sub>1g</sub> (W/kg)
			dBm	mW	
Head	2.441	5	8.1	6.46	0.27
Body	2.441	10	8.1	6.46	0.13

\* - Maximum possible output power declared by manufacturer

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$  for test separation distances  $\leq 50 \text{ mm}$ ;

where  $x = 7.5$  for 1-g SAR.

When the minimum test separation distance is  $< 5 \text{ mm}$ , a distance of  $5 \text{ mm}$  is applied to determine SAR test exclusion

#### Conclusion:

According to the above tables, the sum of reported SAR values is  $< 1.6 \text{ W/kg}$ . So the simultaneous transmission SAR with volume scans is not required.

## 14 SAR Test Result

It is determined by user manual for the distance between the EUT and the phantom bottom.

The distance is 10mm and just applied to the condition of body worn accessory.

It is performed for all SAR measurements with area scan based 1-g SAR estimation (Fast SAR). A zoom scan measurement is added when the estimated 1-g SAR is the highest measured SAR in each exposure configuration, wireless mode and frequency band combination or > 1.2W/kg.

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{\text{Target}} - P_{\text{Measured}})/10}$$

Where  $P_{\text{Target}}$  is the power of manufacturing upper limit;

$P_{\text{Measured}}$  is the measured power in chapter 11.

### Duty Cycle

Mode	Duty Cycle
CDMA & LTE	1:1

## 14.1 SAR results for Fast SAR

**Table 14.1-1: SAR Values (CDMA BC0 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
836.52	384	Left	Touch	/	24.25	25	0.237	<b>0.28</b>	0.392	<b>0.47</b>	0.04
836.52	384	Left	Tilt	/	24.25	25	0.149	<b>0.18</b>	0.215	<b>0.26</b>	0.00
848.31	777	Right	Touch	/	24.1	25	0.272	<b>0.33</b>	0.403	<b>0.50</b>	0.14
836.52	384	Right	Touch	/	24.25	25	0.327	<b>0.39</b>	0.493	<b>0.59</b>	-0.17
824.7	1013	Right	Touch	Fig.1	24.28	25	0.211	<b>0.25</b>	0.318	<b>0.38</b>	0.11
836.52	384	Right	Tilt	/	24.25	25	0.108	<b>0.13</b>	0.156	<b>0.19</b>	-0.10

**Table 14.1-2: SAR Values (CDMA BC0 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C				
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
836.52	384	Front closed	/	24.27	25	0.227	<b>0.27</b>	0.324	<b>0.38</b>	-0.05
848.31	777	Rear closed	/	24.23	25	0.429	<b>0.51</b>	0.619	<b>0.74</b>	0.12
836.52	384	Rear closed	/	24.27	25	0.552	<b>0.65</b>	0.804	<b>0.95</b>	0.03
824.7	1013	Rear closed	Fig.2	24.08	25	0.617	<b>0.76</b>	0.843	<b>1.04</b>	0.09
836.52	384	Rear open	/	24.27	25	0.331	<b>0.39</b>	0.488	<b>0.58</b>	-0.14

Note1: The distance between the EUT and the phantom bottom is 15mm.



**Table 14.1-3: SAR Values (CDMA BC1 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1909.75	1175	Left	Touch	/	24.11	25	0.184	<b>0.23</b>	0.309	<b>0.38</b>	0.06
1880	600	Left	Touch	/	24.13	25	0.226	<b>0.28</b>	0.383	<b>0.47</b>	0.08
1851.25	25	Left	Touch	Fig.3	24.34	25	0.278	<b>0.32</b>	0.434	<b>0.51</b>	-0.07
1880	600	Left	Tilt	/	24.13	25	0.0467	<b>0.06</b>	0.0799	<b>0.10</b>	0.12
1880	600	Right	Touch	/	24.13	25	0.178	<b>0.22</b>	0.265	<b>0.32</b>	0.13
1880	600	Right	Tilt	/	24.13	25	0.0379	<b>0.05</b>	0.069	<b>0.08</b>	-0.02

**Table 14.1-4: SAR Values (CDMA BC1 - Body)**

Ambient Temperature: 22.2 °C					Liquid Temperature: 21.7 °C					
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	600	Front closed	/	24.12	25	0.0553	<b>0.07</b>	0.0911	<b>0.11</b>	-0.11
1909.75	1175	Rear closed	/	24.19	25	0.307	<b>0.37</b>	0.518	<b>0.62</b>	-0.01
1880	600	Rear closed	Fig.4	24.12	25	0.325	<b>0.40</b>	0.538	<b>0.66</b>	0.04
1851.25	25	Rear closed	/	24.35	25	0.271	<b>0.31</b>	0.463	<b>0.54</b>	0.06
1880	600	Rear open	/	24.12	25	0.311	<b>0.38</b>	0.514	<b>0.63</b>	0.02

Note1: The distance between the EUT and the phantom bottom is 15mm.

**Table 14.1-5: SAR Values (LTE Band4 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C						
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
1745	20300	1RB_Mid	Left	Touch	Fig.5	22.96	23.3	0.18	<b>0.19</b>	0.261	<b>0.28</b>	-0.15
1745	20300	1RB_Mid	Left	Tilt	/	22.96	23.3	0.0835	<b>0.09</b>	0.145	<b>0.16</b>	-0.04
1745	20300	1RB_Mid	Right	Touch	/	22.96	23.3	0.143	<b>0.15</b>	0.249	<b>0.27</b>	0.07
1745	20300	1RB_Mid	Right	Tilt	/	22.96	23.3	0.0509	<b>0.06</b>	0.0845	<b>0.09</b>	0.06
1745	20300	50RB_Low	Left	Touch	/	21.64	22.3	0.131	<b>0.15</b>	0.219	<b>0.25</b>	0.14
1745	20300	50RB_Low	Left	Tilt	/	21.64	22.3	0.0763	<b>0.09</b>	0.131	<b>0.15</b>	0.03
1745	20300	50RB_Low	Right	Touch	/	21.64	22.3	0.11	<b>0.13</b>	0.206	<b>0.24</b>	0.08
1745	20300	50RB_Low	Right	Tilt	/	21.64	22.3	0.0469	<b>0.05</b>	0.0792	<b>0.09</b>	0.06

Note1: The LTE mode is QPSK\_20MHz.

**Table 14.1-6: SAR Values (LTE Band4 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1745	20300	1RB_Mid	Front closed	/	22.96	23.3	0.0965	<b>0.10</b>	0.15	<b>0.16</b>	0.02
1745	20300	1RB_Mid	Rear closed	/	22.96	23.3	0.327	<b>0.35</b>	0.541	<b>0.59</b>	-0.09
1745	20300	1RB_Mid	Rear open	/	22.96	23.3	0.565	<b>0.61</b>	0.934	<b>1.01</b>	-0.04
1732.5	20175	1RB_Mid	Rear open	Fig.6	22.96	23.3	0.722	<b>0.78</b>	1.15	<b>1.24</b>	0.03
1720	20050	1RB_Mid	Rear open	/	22.96	23.3	0.522	<b>0.56</b>	0.869	<b>0.94</b>	-0.06
1745	20300	50RB_Low	Front closed	/	21.64	22.3	0.0904	<b>0.11</b>	0.141	<b>0.16</b>	-0.10
1745	20300	50RB_Low	Rear closed	/	21.64	22.3	0.319	<b>0.37</b>	0.529	<b>0.62</b>	0.02
1745	20300	50RB_Low	Rear open	/	21.64	22.3	0.554	<b>0.64</b>	0.918	<b>1.07</b>	-0.15
1732.5	20175	50RB_Low	Rear open	/	21.64	22.3	0.459	<b>0.53</b>	0.763	<b>0.89</b>	0.02
1720	20050	50RB_Low	Rear open	/	21.64	22.3	0.394	<b>0.46</b>	0.654	<b>0.76</b>	0.07
1745	20300	100RB	Rear closed	/	21.61	22.3	0.44	<b>0.52</b>	0.726	<b>0.85</b>	-0.02

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The LTE mode is QPSK\_20MHz.

**Table 14.1-7: SAR Values (LTE Band13 - Head)**

Ambient Temperature: 22.2 °C							Liquid Temperature: 21.7 °C					
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
782	23230	1RB_Mid	Left	Touch	/	23.41	24	0.137	<b>0.16</b>	0.215	<b>0.25</b>	0.13
782	23230	1RB_Mid	Left	Tilt	/	23.41	24	0.0577	<b>0.07</b>	0.0819	<b>0.09</b>	0.00
782	23230	1RB_Mid	Right	Touch	Fig.7	23.41	24	0.179	<b>0.21</b>	0.26	<b>0.30</b>	0.14
782	23230	1RB_Mid	Right	Tilt	/	23.41	24	0.0581	<b>0.07</b>	0.0831	<b>0.10</b>	-0.03
782	23230	25RB_Mid	Left	Touch	/	22.15	23	0.111	<b>0.13</b>	0.175	<b>0.21</b>	0.10
782	23230	25RB_Mid	Left	Tilt	/	22.15	23	0.047	<b>0.06</b>	0.0669	<b>0.08</b>	0.04
782	23230	25RB_Mid	Right	Touch	/	22.15	23	0.138	<b>0.17</b>	0.211	<b>0.26</b>	-0.01
782	23230	25RB_Mid	Right	Tilt	/	22.15	23	0.0472	<b>0.06</b>	0.0677	<b>0.08</b>	-0.11

Note1: The LTE mode is QPSK\_10MHz.

**Table 14.1-8: SAR Values (LTE Band13 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
782	23230	1RB_Mid	Front closed	/	23.41	24	0.172	<b>0.20</b>	0.24	<b>0.27</b>	-0.07
782	23230	1RB_Mid	Rear closed	Fig.8	23.41	24	0.577	<b>0.66</b>	0.832	<b>0.95</b>	0.02
782	23230	1RB_Mid	Rear open	/	23.41	24	0.441	<b>0.51</b>	0.623	<b>0.71</b>	-0.02

782	23230	25RB_Mid	Front closed	/	22.15	23	0.128	<b>0.16</b>	0.179	<b>0.22</b>	-0.02
782	23230	25RB_Mid	Rear closed	/	22.15	23	0.443	<b>0.54</b>	0.635	<b>0.77</b>	-0.10
782	23230	25RB_Mid	Rear open	/	22.15	23	0.354	<b>0.43</b>	0.5	<b>0.61</b>	0.05
782	23230	50RB	Rear closed	/	22.06	23	0.397	<b>0.49</b>	0.566	<b>0.70</b>	-0.14

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The LTE mode is QPSK\_10MHz.

## 14.2 SAR results for Standard procedure

There is zoom scan measurement to be added for the highest measured SAR in each exposure configuration/band.

**Table 14.2-1: SAR Values (CDMA BC0 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
836.52	384	Right	Touch	/	24.25	25	0.327	<b>0.39</b>	0.493	<b>0.59</b>	-0.17

**Table 14.2-2: SAR Values (CDMA BC0 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C				
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
824.7	1013	Rear closed	Fig.2	24.08	25	0.617	<b>0.76</b>	0.843	<b>1.04</b>	0.09

Note1: The distance between the EUT and the phantom bottom is 15mm.

**Table 14.2-3: SAR Values (CDMA BC1 - Head)**

Ambient Temperature: 22.2 °C      Liquid Temperature: 21.7 °C											
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1851.25	25	Left	Touch	Fig.3	24.34	25	0.278	<b>0.32</b>	0.434	<b>0.51</b>	-0.07

**Table 14.2-4: SAR Values (CDMA BC1 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C				
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
1880	600	Rear closed	Fig.4	24.12	25	0.325	<b>0.40</b>	0.538	<b>0.66</b>	0.04

Note1: The distance between the EUT and the phantom bottom is 15mm.

**Table 14.2-5: SAR Values (LTE Band4 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C						
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
1745	20300	1RB_Mid	Left	Touch	Fig.5	22.96	23.3	0.18	0.19	0.261	0.28	-0.15

**Table 14.2-6: SAR Values (LTE Band4 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
1732.5	20175	1RB_Mid	Rear open	Fig.6	22.96	23.3	0.722	<b>0.78</b>	1.15	<b>1.24</b>	0.03

**Table 14.2-7: SAR Values (LTE Band13 - Head)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C						
Frequency		Mode	Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.											
782	23230	1RB_Mid	Right	Touch	Fig.7	23.41	24	0.179	0.21	0.26	0.30	0.14

Note1: The LTE mode is QPSK\_10MHz.

**Table 14.2-8: SAR Values (LTE Band13 - Body)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Mode	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
782	23230	1RB_Mid	Rear closed	Fig.8	23.41	24	0.577	<b>0.66</b>	0.832	<b>0.95</b>	0.02

Note1: The distance between the EUT and the phantom bottom is 15mm.

Note2: The LTE mode is QPSK\_10MHz.

### 14.3 WLAN Evaluation

According to the KDB248227 D01, SAR is measured for 2.4GHz 802.11b DSSS using the initial test position procedure.

#### Head Evaluation

**Table 14.3-1: SAR Values (WLAN - Head) – 802.11b 5.5Mbps (Fast SAR)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2462	11	Left	Touch	/	15.88	16	0.0439	<b>0.05</b>	0.107	<b>0.11</b>	0.11
2462	11	Left	Tilt	/	15.88	16	0.0146	<b>0.02</b>	0.028	<b>0.03</b>	0.13
2462	11	Right	Touch	/	15.88	16	0.0828	<b>0.09</b>	0.171	<b>0.18</b>	0.12
2462	11	Right	Tilt	/	15.88	16	0.00863	<b>0.01</b>	0.0161	<b>0.02</b>	0.18

As shown above table, the initial test position for head is “Right Touch”. So the head SAR of WLAN is presented as below:

**Table 14.3-2: SAR Values (WLAN - Head) – 802.11b 5.5Mbps (Full SAR)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C					
Frequency		Side	Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.										
2462	11	Right	Touch	Fig.9	15.88	16	0.0842	<b>0.09</b>	0.173	<b>0.18</b>	0.12

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. A maximum transmission duty factor of 97.48% is achievable for WLAN in this project and the scaled reported SAR is presented as below:

**Table 14.3-3: SAR Values (WLAN - Head) – 802.11b 5.5Mbps (Scaled Reported SAR)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C	
Frequency		Side	Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)
MHz	Ch.						
2462	11	Right	Touch	97.48%	100%	<b>0.18</b>	<b>0.18</b>

SAR is not required for OFDM because the 802.11b adjusted SAR  $\leq$  1.2 W/kg.

## Body Evaluation

**Table 14.3-4: SAR Values (WLAN - Body) – 802.11b 5.5Mbps (Fast SAR)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C				
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2462	11	Front	/	15.88	16	0.00738	<b>0.01</b>	0.0376	<b>0.04</b>	0.14
2462	11	Rear closed	/	15.88	16	0.0433	<b>0.04</b>	0.0826	<b>0.08</b>	0.13
2462	11	Rear open	/	15.88	16	0.0373	<b>0.04</b>	0.0689	<b>0.07</b>	0.03

As shown above table, the initial test position for body is “Rear closed”. So the body SAR of WLAN is presented as below:

**Table 14.3-5: SAR Values (WLAN - Body) – 802.11b 5.5Mbps (Full SAR)**

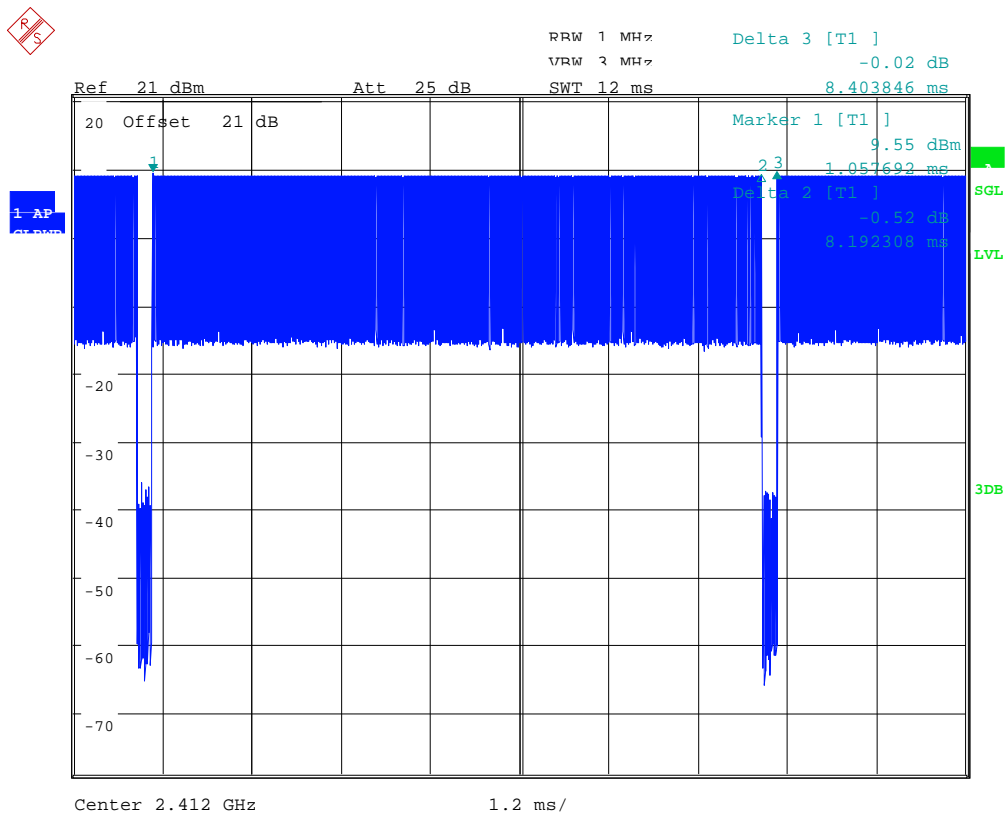
Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C				
Frequency		Test Position	Figure No.	Conducted Power (dBm)	Max. tune-up Power (dBm)	Measured SAR(10g) (W/kg)	Reported SAR(10g) (W/kg)	Measured SAR(1g) (W/kg)	Reported SAR(1g) (W/kg)	Power Drift (dB)
MHz	Ch.									
2462	11	Rear closed	Fig.10	15.88	16	0.0486	<b>0.05</b>	0.0875	<b>0.09</b>	0.13

According to the KDB248227 D01, The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. A maximum transmission duty factor of 97.48% is achievable for WLAN in this project and the scaled reported SAR is presented as below.

**Table 14.3-6: SAR Values (WLAN - Body) – 802.11b 5.5Mbps (Scaled Reported SAR)**

Ambient Temperature: 22.2 °C						Liquid Temperature: 21.7 °C	
Frequency		Test Position	Actual duty factor	maximum duty factor	Reported SAR (1g) (W/kg)	Scaled reported SAR (1g) (W/kg)	
MHz	Ch.						
2462	11	Rear closed	97.48%	100%	<b>0.09</b>	<b>0.09</b>	
2462	11	Rear open	97.48%	100%	<b>0.07</b>	<b>0.07</b>	

SAR is not required for OFDM because the 802.11b adjusted SAR  $\leq 1.2$  W/kg.



Picture 14.1 The plot of duty factor

## 15 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.

- 1) Repeated measurement is not required when the original highest measured SAR is  $< 0.80$  W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$  or when the original or repeated measurement is  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

**Table 15.1: SAR Measurement Variability for Body CDMA BC0 (1g)**

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
824.7	1013	Rear closed	15	0.843	0.847	1.01	/

**Table 15.2: SAR Measurement Variability for Body LTE Band4 (1g)**

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
1720	20175	Rear open	15	1.15	1.15	1.00	/

**Table 15.3: SAR Measurement Variability for Body LTE Band13 (1g)**

Frequency		Test Position	Spacing (mm)	Original SAR (W/kg)	First Repeated SAR (W/kg)	The Ratio	Second Repeated SAR (W/kg)
MHz	Ch.						
782	23230	Rear closed	15	0.832	0.836	1.01	/



## 16 Measurement Uncertainty

### 16.1 Measurement Uncertainty for Normal SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
<b>Measurement system</b>										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	$\infty$
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
<b>Test sample related</b>										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and set-up</b>										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521

Combined standard uncertainty	$u_c' = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					9.25	9.12	257
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$					18.5	18.2	

### 16.2 Measurement Uncertainty for Normal SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
<b>Measurement system</b>										
1	Probe calibration	B	6.5	N	1	1	1	6.5	6.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	$\infty$
13	Post-processing	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
<b>Test sample related</b>										
14	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
15	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
16	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and set-up</b>										
17	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
18	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
19	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43

20	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
21	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$						10.8	10.7	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						21.6	21.4	

### 16.3 Measurement Uncertainty for Fast SAR Tests (300MHz~3GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
<b>Measurement system</b>										
1	Probe calibration	B	5.5	N	1	1	1	5.5	5.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. Restrictions	B	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	$\infty$
12	Probe positioning with respect to phantom shell	B	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
14	Fast SAR z-Approximation	B	7.0	R	$\sqrt{3}$	1	1	4.0	4.0	$\infty$
<b>Test sample related</b>										
15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$

Phantom and set-up										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						10.1	9.95	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						20.2	19.9	

#### 16.4 Measurement Uncertainty for Fast SAR Tests (3~6GHz)

No.	Error Description	Type	Uncertainty value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement system										
1	Probe calibration	B	6.5	N	1	1	1	6.5	6.5	$\infty$
2	Isotropy	B	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
3	Boundary effect	B	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	$\infty$
4	Linearity	B	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
5	Detection limit	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
6	Readout electronics	B	0.3	R	$\sqrt{3}$	1	1	0.3	0.3	$\infty$
7	Response time	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
8	Integration time	B	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
9	RF ambient conditions-noise	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
10	RF ambient conditions-reflection	B	0	R	$\sqrt{3}$	1	1	0	0	$\infty$
11	Probe positioned mech. Restrictions	B	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
12	Probe positioning with respect to phantom shell	B	6.7	R	$\sqrt{3}$	1	1	3.9	3.9	$\infty$
13	Post-processing	B	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
14	Fast SAR z-Approximation	B	14.0	R	$\sqrt{3}$	1	1	8.1	8.1	$\infty$
Test sample related										

15	Test sample positioning	A	3.3	N	1	1	1	3.3	3.3	71
16	Device holder uncertainty	A	3.4	N	1	1	1	3.4	3.4	5
17	Drift of output power	B	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
<b>Phantom and set-up</b>										
18	Phantom uncertainty	B	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
19	Liquid conductivity (target)	B	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
20	Liquid conductivity (meas.)	A	2.06	N	1	0.64	0.43	1.32	0.89	43
21	Liquid permittivity (target)	B	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	$\infty$
22	Liquid permittivity (meas.)	A	1.6	N	1	0.6	0.49	1.0	0.8	521
Combined standard uncertainty		$u_c' = \sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$						13.3	13.2	257
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$						26.6	26.4	

## 17 MAIN TEST INSTRUMENTS

**Table 17.1: List of Main Instruments**

No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	E5071C	MY46110673	January 26, 2016	One year
02	Power meter	NRVD	102196	March 03, 2015	One year
03	Power sensor	NRV-Z5	100596		
04	Signal Generator	E4438C	MY49071430	February 01, 2016	One Year
05	Amplifier	60S1G4	0331848	No Calibration Requested	
06	BTS	E5515C	MY50263375	January 30, 2016	One year
07	BTS	CMW500	129942	March 03, 2015	One year
08	E-field Probe	SPEAG EX3DV4	3617	August 26, 2015	One year
09	DAE	SPEAG DAE4	777	August 26, 2015	One year
10	Dipole Validation Kit	SPEAG D750V3	1017	July 23, 2015	One year
11	Dipole Validation Kit	SPEAG D835V2	4d069	July 23, 2015	One year
12	Dipole Validation Kit	SPEAG D1750V2	1003	July 16, 2015	One year
13	Dipole Validation Kit	SPEAG D1900V2	5d142	June 23, 2015	One year
14	Dipole Validation Kit	SPEAG D2450V2	853	June 24, 2015	One year

\*\*\*END OF REPORT BODY\*\*\*

## ANNEX A Graph Results

### CDMA BC0 Head Right Cheek Middle

Date: 2015-11-04

Electronics: DAE4 Sn777

Medium: Head 850 MHz

Medium parameters used:  $f = 836.5$  MHz;  $\sigma = 0.928$  mho/m;  $\epsilon_r = 41.42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.2°C Liquid Temperature: 21.7°C

Communication System: CDMA BC0 Frequency: 836.5 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(9.56, 9.56, 9.56)

**Area Scan (71x171x1):** Interpolated grid:  $dx=1.000$  mm,  $dy=1.000$  mm

Maximum value of SAR (interpolated) = 0.526 W/kg

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

Reference Value = 5.994 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.832 W/kg

**SAR(1 g) = 0.493 W/kg; SAR(10 g) = 0.327 W/kg**

Maximum value of SAR (measured) = 0.565 W/kg

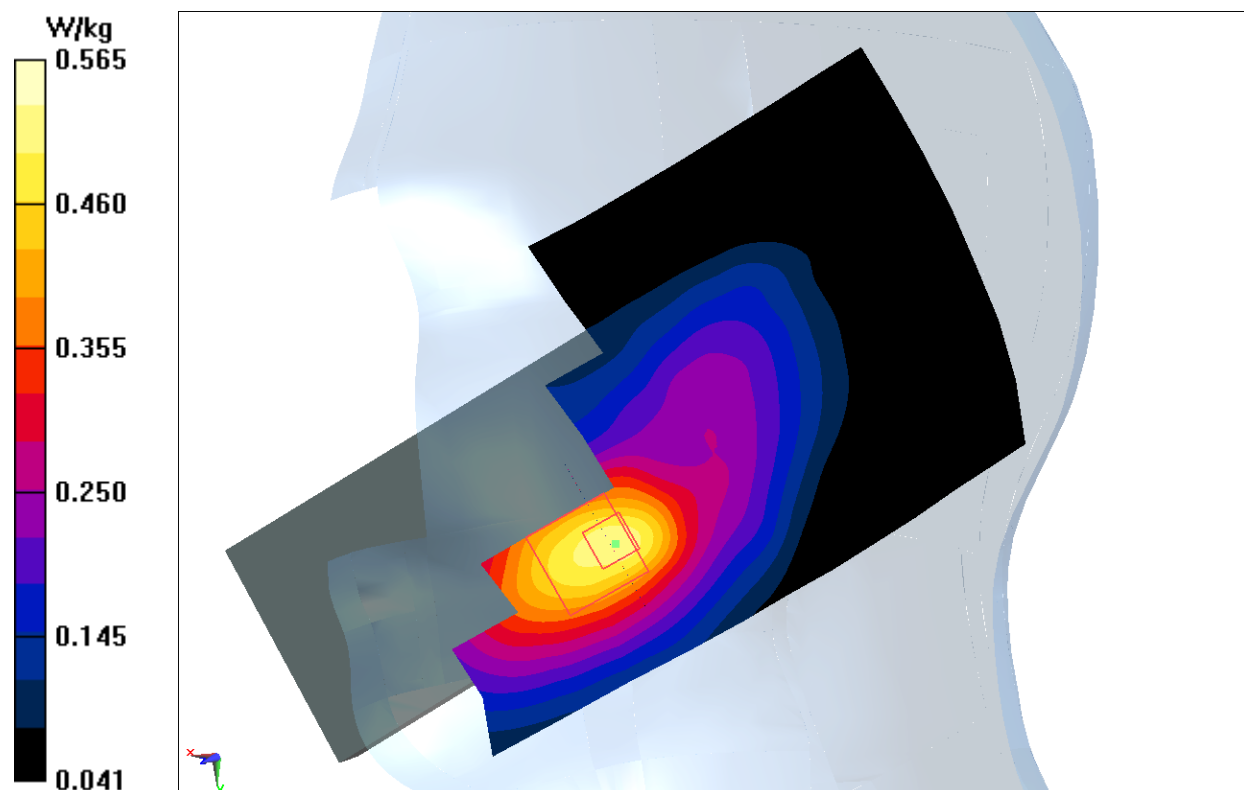
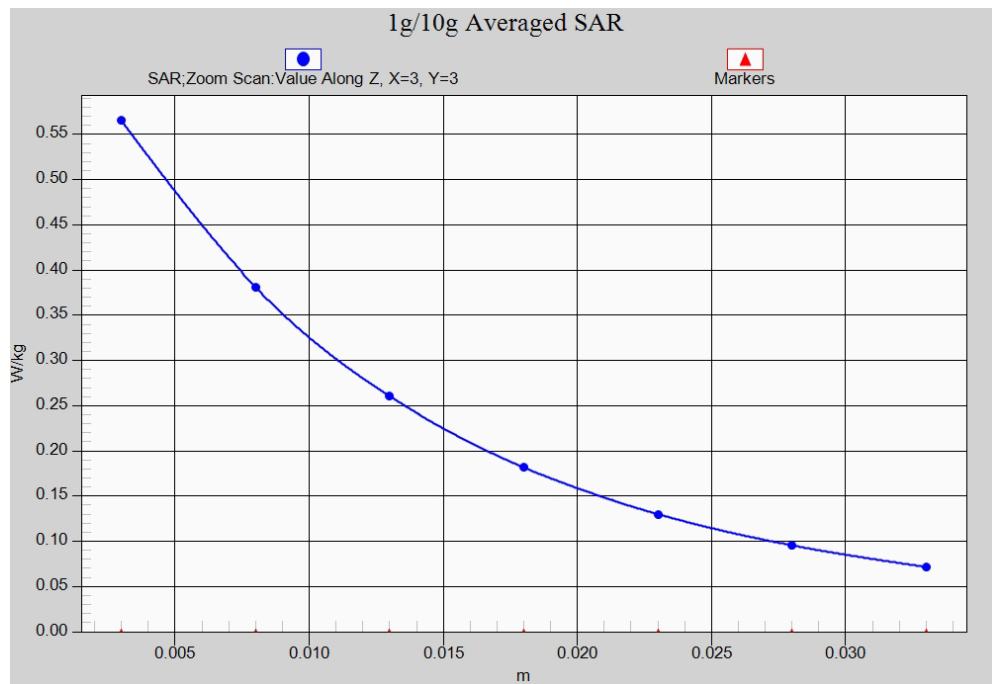


Fig.1 CDMA BC0



**Fig. 1-1 Z-Scan at power reference point (CDMA BC0)**

### CDMA BC0 Body Rear closed Low

Date: 2015-11-04

Electronics: DAE4 Sn777

Medium: Body 850 MHz

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.964$  S/m;  $\epsilon_r = 56.116$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.2°C      Liquid Temperature: 21.7°C

Communication System: CDMA BC0 Frequency: 824.7 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(9.71, 9.71, 9.71)

**Area Scan (61x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.869 W/kg

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

Reference Value = 29.07 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.08 W/kg

**SAR(1 g) = 0.843 W/kg; SAR(10 g) = 0.617 W/kg**

Maximum value of SAR (measured) = 0.890 W/kg

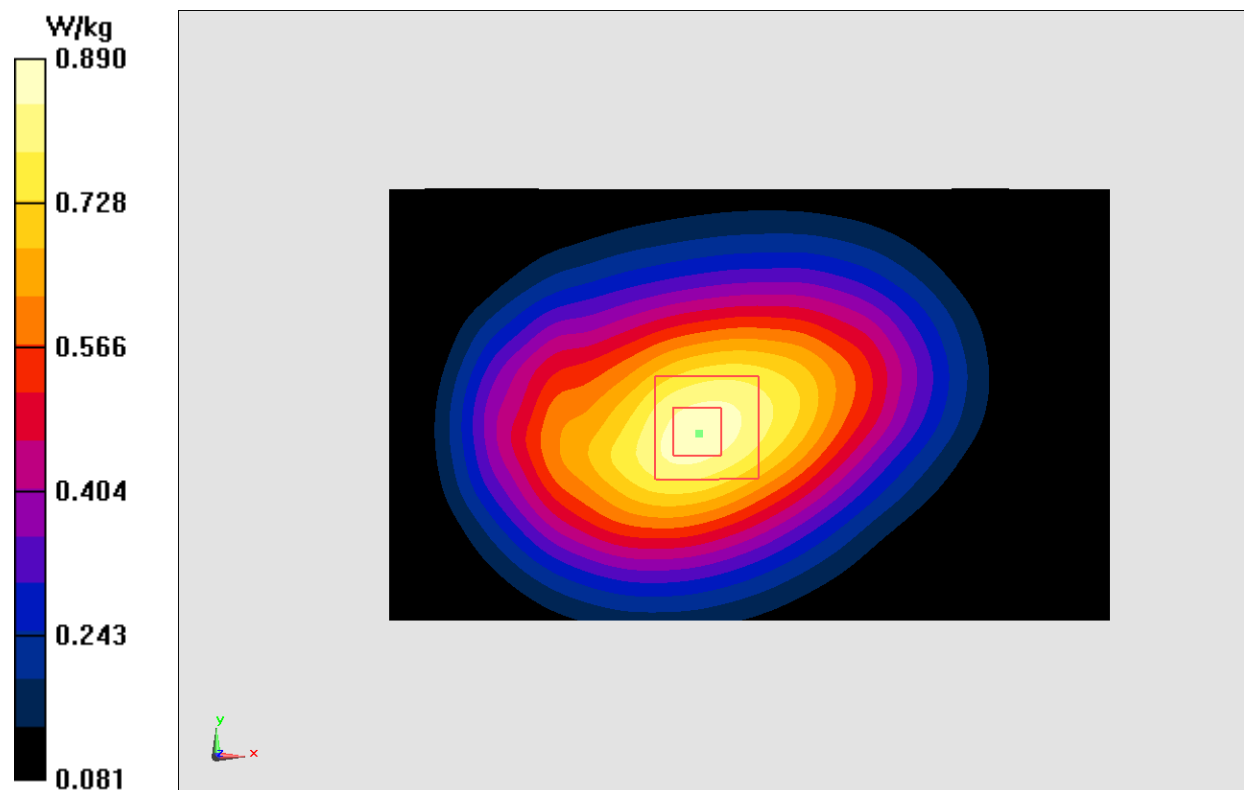
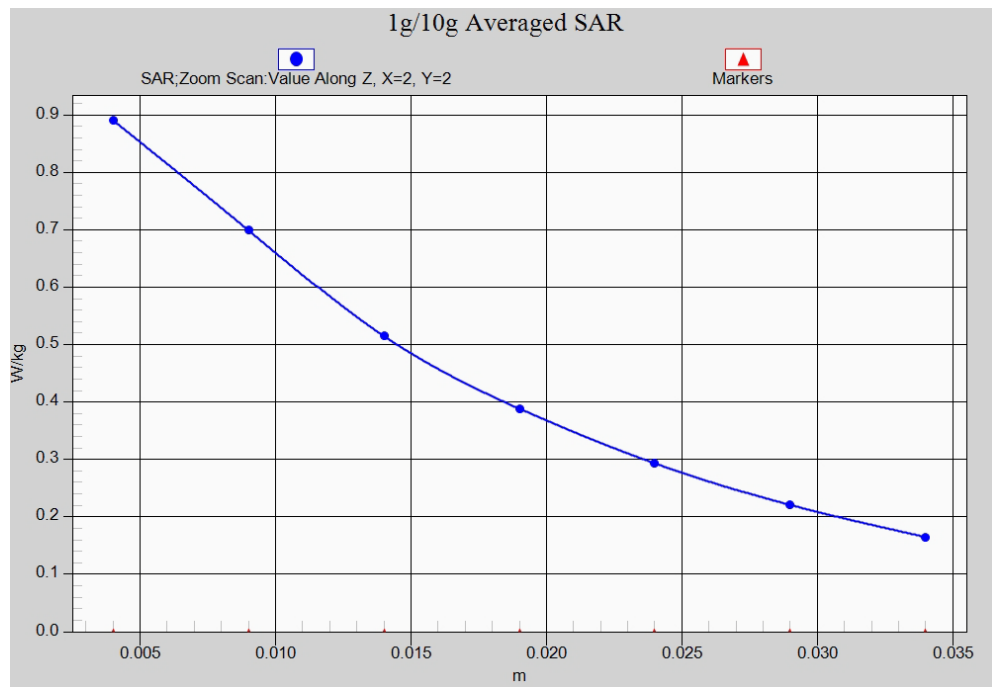


Fig.2 CDMA BC0





**Fig. 2-1 Z-Scan at power reference point (CDMA BC0)**

### CDMA BC1 Head Left Cheek Low

Date: 2015-11-05

Electronics: DAE4 Sn777

Medium: Head 1900 MHz

Medium parameters used (interpolated):  $f = 1851.25$  MHz;  $\sigma = 1.386$  mho/m;  $\epsilon_r = 40.356$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.2°C      Liquid Temperature: 21.7°C

Communication System: CDMA BC1 Frequency: 1851.25 MHz Duty Cycle: 1:1

Probe: EX3DV4 - SN3617 ConvF(8.07, 8.07, 8.07)

**Area Scan (61x151x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.514 W/kg

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

Reference Value = 1.187 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.629 W/kg

**SAR(1 g) = 0.434 W/kg; SAR(10 g) = 0.278 W/kg**

Maximum value of SAR (measured) = 0.488 W/kg

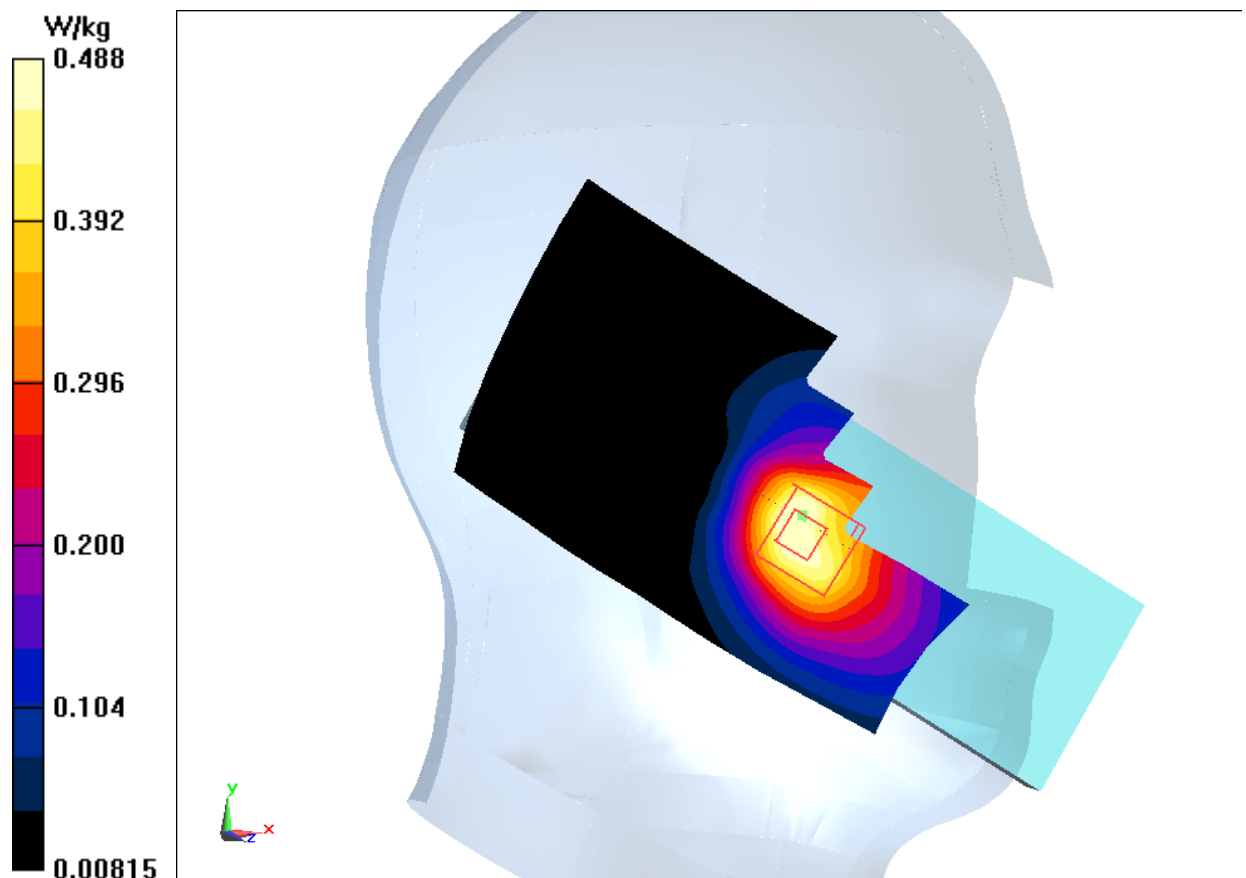


Fig.3 CDMA BC1