SAR Test Report

Report No.: AGC02866150301FH01

FCC ID	:	2AEJ9FREEDOM
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	GSM/WCDMA Mobile Phone
BRAND NAME	:	N/A
MODEL NAME	:	Freedom
CLIENT	:	Digit Secure India Private Limited
DATE OF ISSUE	:	Apr. 30,2015
STANDARD(S)	:	IEEE Std. 1528:2003 IEEE Std. 1528a:2005 47CFR § 2.1093 IEEE/ANSI C95.1
REPORT VERSION	:	V1.0

Attestation of Global Compliance(Shenzhen) Co., Ltd.

CAUTION:
This report shall not be reproduced except in full without the written permission of the test laboratory and shall not be quoted out of context.

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr. 30,2015	Valid	Original Report

Test Report Certification

Applicant Name	:	Digit Secure India Private Limited
Applicant Address	:	Plot No-1303&1304, 4th Floor, Khanamet, HiTech City, Ayappa Society, Madhapur Hyderabad, Telangana, India
Manufacturer Name	:	SHENZHEN HSEM TECHNOLOGY CO., LTD.
Manufacturer Address	:	4TH FLOOR, 5 PLANTS, TONGFUYU INDUSTRIAL, TAOYUAN STREET NANSHAN DISTRICT, SHENZHEN P.R. CHINA
Product Designation	:	GSM/WCDMA Mobile Phone
Brand Name	:	N/A
Model Name	:	Freedom
Different Description		N/A
EUT Voltage	:	DC3.7V by battery
Applicable Standard	:	IEEE Std. 1528:2003 IEEE Std. 1528a:2005 47CFR § 2.1093 IEEE/ANSI C95.1
Test Date	:	Apr. 22,2015 to Apr. 28,2015
Performed Location		Attestation of Global Compliance(Shenzhen) Co., Ltd. 2 F, Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang Street, Bao'an District, Shenzhen, China
Report Template		AGCRT-US-3G3/SAR (2015-05-01)

Tested By: Bobby Wang

Bobby Wang Apr. 30,2015

Checked By: Angela Li

Angela Li Apr. 30,2015

Authorized By: Solger Zhang

Solger Zhang Apr. 30,2015

TABLE OF CONTENTS

1. SUMMARY OF MAXIMUM SAR VALUE

The maximum results of Specific Absorption Rate (SAR) found during testing for EUT are as follows:

Frequency Band	Highest Reported SAR(W/Kg)	
	Head	Body-worn(with 10mm separation)
GSM 850	0.134	0.405
PCS 1900	1.176	1.078
UMTS Band II	1.476	1.027
UMTS Band V	0.081	0.230
WIFI 2.4G	0.092	0.057
Simultaneous Reported SAR	1.581	

This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/Kg) specified in IEEE Std. 1528:2003; IEEE1528a-2005;47CFR § 2.1093; IEEE/ANSI C95.1 and the following specific FCC Test Procedures:

- KDB 447498 D01 General RF Exposure Guidance v05r02
- KDB 648474 D04 Handset SAR v01r02
- KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- KDB 941225 D01 3G SAR Procedures v03
- KDB 941225 D06 Hot Spot SAR v02
- KDB 248227 D01 SAR meas for 802 11 a b g v02

2. GENERAL INFORMATION

2.1. EUT Description

General Information	
Product Designation	GSM/WCDMA Mobile Phone
Test Model	Freedom
Hardware Version	DX01_MB_P2_V01
Software Version	ALPS.KK1.MP1.V2.11
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
GSM and GPRS& EGPRS	
Support Band	☒GSM 850 ☒PCS 1900 ☒GSM 900 ☒DCS 1800
GPRS & EGPRS Type	Class B
GPRS & EGPRS Class	Class 12(1Tx+4Rx, 2Tx+3Rx, 3Tx+2Rx, 4Tx+1Rx)
TX Frequency Range	GSM 850 : 824.2~848.8MHz;; PCS 1900: 1850.2~1909.8MHz;
RX Frequency Range	GSM 850 : 869~894MHz; PCS 1900: 1930~1990MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS; GMSK & 8-PSK for EGPRS
Antenna Gain	-1.0dBi(GSM 850), -0.8dBi (GSM 1900)
Max. Average Power (Max. Peak Power)	GSM850: 31.29dBm(32.62dBm) ;PCS1900: 28.23dBm(29.72dBm)
WCDMA	
Support Band	☒UMTS FDD Band II ☒UMTS FDD Band V ☒UMTS FDD Band I ☐UMTS FDD Band VIII
HS Type	HSPA(HSUPA/HSDPA)
TX Frequency Range	WCDMA FDD Band II: 1852.4 -1907.6MHz WCDMA FDD Band V: 826.4-846.6MHz
RX Frequency Range	WCDMA FDD Band II: 1930-1990MHz WCDMA FDD Band V: 869-894MHz
Release Version	Rel-6
Type of modulation	HSDPA:QPSK/16QAM; HSUPA:BPSK; WCDMA:QPSK
Antenna Gain	-1.0dBi(WCDMA 850), -0.8dBi (WCDMA 1900)
Max. Average Power (Max. Peak Power)	Band II: 21.42dBm (23.58dBm); Band V: 21.38dBm (23.69dBm)

EUT Description(Continue)

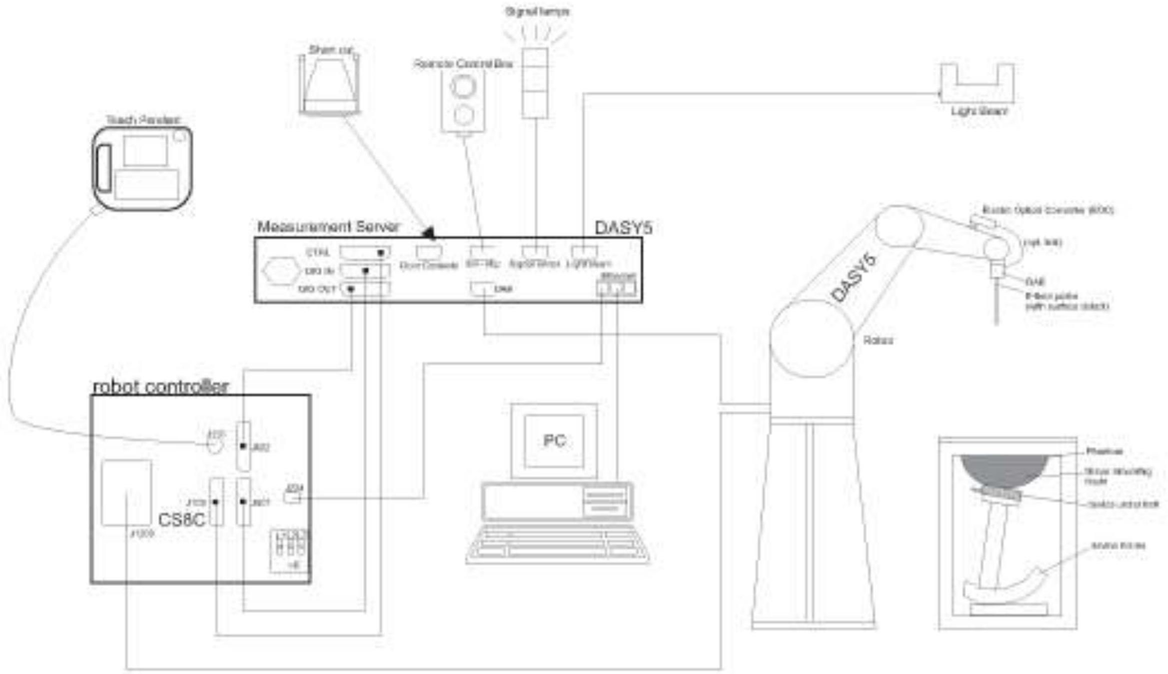
Bluetooth	
Bluetooth Version	☐V2.0 ☐V2.1 ☐V2.1+EDR ☒V3.0 ☐V3.0+HS ☒V4.0
Operation Frequency	2402~2480MHz
Type of modulation	☒GFSK ☒Π/4-DQPSK ☒8-DPSK
Avg. Burst Power	3.41dBm
Antenna Gain	0.7dBi
WIFI	
WIFI Specification	☐802.11a ☒802.11b ☒802.11g ☒802.11n(20) ☒802.11n(40)
Operation Frequency	2412~2462MHz
Avg. Burst Power	11b:10.48dBm,11g:8.53dBm,11n(20):8.25dBm,11n(40):6.73dBm
Antenna Gain	0.8dBi
Accessories	
Battery	Brand name: N/A Model No. : Freedom Voltage and Capacitance: 3.7 V & 4000mAh
Adapter	Brand name: N/A Model No. : Freedom Input: AC 100-240V, 50/60Hz, 0.35A Output: DC 5V, 2000mA
Earphone	Brand name: N/A Model No. : N/A

Note:CMU200 can measure the average power and Peak power at the same time

Product	Type	
	☒ Production unit	☐ Identical Prototype

3. SAR MEASUREMENT SYSTEM

3.1. The DASY5 system used for performing compliance tests consists of following items



- A standard high precision 6-axis robot with controller, teach pendant and software.
- Data acquisition electronics (DAE) which attached to the robot arm extension. The DAE consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock
- A dosimetric probe equipped with an optical surface detector system.
- 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.
- A Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- Phantoms, device holders and other accessories according to the targeted measurement.

3.2. DASY5 E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528 and relevant KDB files.) The calibration data are in Appendix D.

Isotropic E-Field Probe Specification

Model	EX3DV4	
Manufacture	SPEAG	
frequency	0.3GHz-6 GHz Linearity:±0.2dB(300 MHz-6 GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.2dB	
Dimensions	Overall length:337mm Tip diameter:2.5mm Typical distance from probe tip to dipole centers:1mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

3.3. Data Acquisition Electronics description

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

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

DAE4

Input Impedance	200MOhm	
The Inputs	Symmetrical and floating	
Common mode rejection	above 80 dB	

3.4. Robot

The DASY system uses the high precision robots (DASY5:TX60) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from is used.
The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

3.5. Light Beam Unit

The light beam switch allows automatic “tooling” of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned prob.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position. e, the same position will be reached with another aligned probe within 0

3.6. Device Holder

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR). Thus the device needs no repositioning when changing the angles. The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.	

3.7. Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chip-disk (DASY5: 128MB), RAM (DASY5: 128MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DAYS I/O board, which is directly connected to the PC/104 bus of the CPU board. The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.	

3.8. PHANTOM

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas: Left head Right head Flat phantom	

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

ELI4 Phantom

Flat phantom a fiberglass shell flat phantom with 2mm+/- 0.2 mm shell thickness. It has only one measurement area for Flat phantom	

4. SAR MEASUREMENT PROCEDURE

4.1. Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in 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 occupational/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.

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 given mass density (ρ). The equation description is as below:

$$\mathrm{SAR} = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\mathrm{d}m}\right) = \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\mathrm{d}W}{\rho \mathrm{d}V}\right)$$

SAR is expressed in units of Watts per kilogram (W/Kg)
SAR can be obtained using either of the following equations:

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

$$\mathrm{SAR} = c_h \left.\frac{\mathrm{d}T}{\mathrm{d}t}\right|_{t=0}$$

Where

SAR	is the specific absorption rate in watts per kilogram;
E	is the r.m.s. value of the electric field strength in the tissue in volts per meter;
σ	is the conductivity of the tissue in siemens per metre;
ρ	is the density of the tissue in kilograms per cubic metre;
c_h	is the heat capacity of the tissue in joules per kilogram and Kelvin;
$\frac{\mathrm{dT}}{\mathrm{dt}} \mid t = 0$	is the initial time derivative of temperature in the tissue in kelvins per second

4.2. SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface is 2.7mm This distance cannot be smaller than the distance os sensor calibration points to probe tip as `defined in the probe properties,

Step 2: 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in db) is specified in the standards for compliance testing. For example, a 2db range is required in IEEE Standard 1528 and IEC62209 standards, whereby 3db is a requirement when compliance is assessed in accordance with the ARIB standard (Japan) If one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximum are detected, the number of Zoom Scan has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100MHz to 6GHz

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

Step 3: Zoom Scan

Zoom Scan are used to assess the peak spatial SAR value within a cubic average volume containing 1g abd 10g 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 1g and 10g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB865664 d01 SAR Measurement 100MHz to 6GHz

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

Step 4: Power Drift Measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the same settings. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

4.3. RF Exposure Conditions

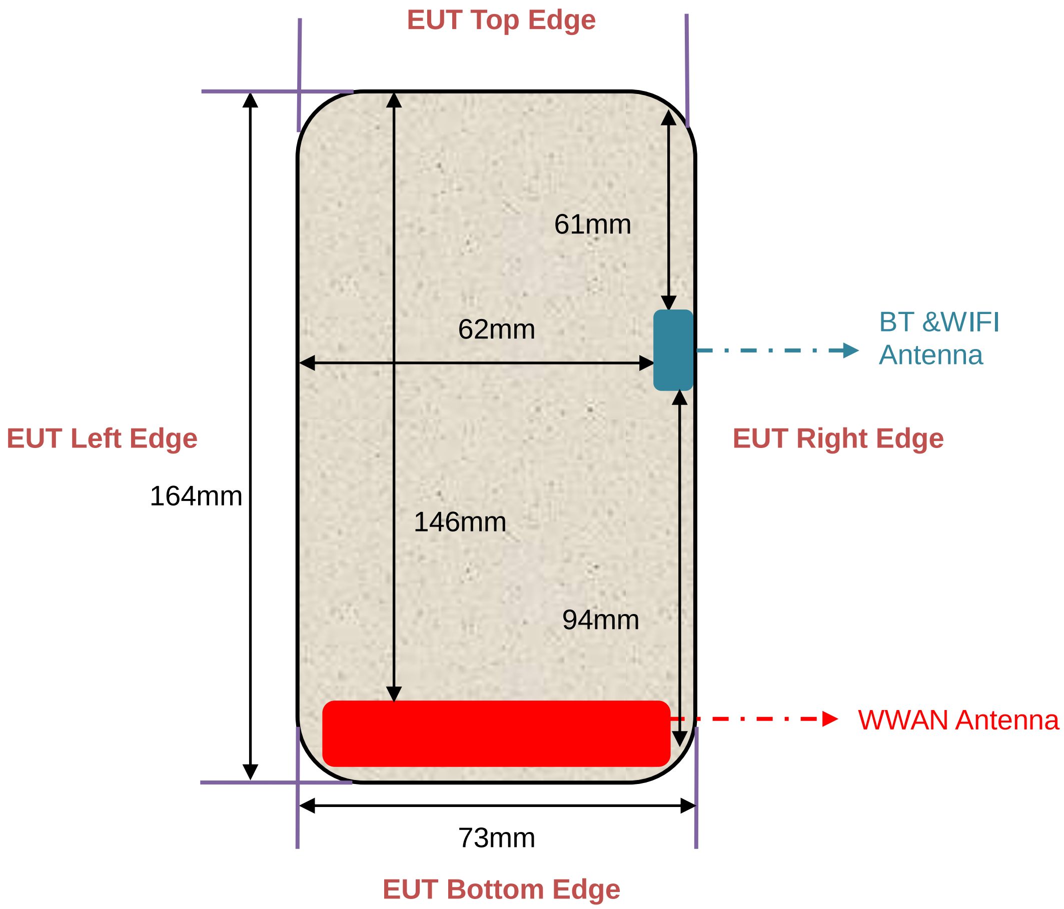
Test Configuration and setting:

The EUT is a model of GSM Portable Mobile Station (MS). It supports GSM/GPRS/EGPRS, WCDMA/HSPA, BT, WIFI, and support hot spot mode.

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator were established by air link. The distance between the EUT and the antenna is larger than 50cm, and the output power radiated from the emulator antenna is at least 30db smaller than the output power of EUT.

For WLAN testing, the EUT is configured with the WLAN continuous TX tool through engineering command.

Antenna Location: (the front view)



For WWAN mode:

Test Configurations	Antenna to edges/surface	SAR required	Note
Head			
Left Touch		Yes	
Left Tilt		Yes	
Right Touch		Yes	
Right Tilt		Yes	
Body			
Back	<25mm	Yes	
Front	<25mm	Yes	
Hotspot			
Back	<25mm	Yes	
Front	<25mm	Yes	
Edge 1 (Top)	146	No	SAR is not required for the distance between the antenna and the edge is>25mm as per KDB 941225D06 Hotspot SAR
Edge 2 (Right)	3	Yes	
Edge 3 (Bottom)	5	Yes	
Edge 4 (Left)	6	Yes	

For WLAN mode:

Test Configurations	Antenna to edges/surface	SAR required	Note
Head			
Left Touch		Yes	
Left Tilt		Yes	
Right Touch		Yes	
Right Tilt		Yes	
Body			
Back	<25mm	Yes	
Front	<25mm	Yes	
Hotspot			
Back	<25mm	Yes	
Front	<25mm	Yes	
Edge 1 (Top)	61	No	SAR is not required for the distance between the antenna and the edge is >25mm as per KDB 941225D06 Hotspot SAR
Edge 2 (Right)	3	Yes	
Edge 3 (Bottom)	94	No	SAR is not required for the distance between the antenna and the edge is >25mm as per KDB 941225D06 Hotspot SAR
Edge 4 (Left)	62	No	SAR is not required for the distance between the antenna and the edge is >25mm as per KDB 941225D06 Hotspot SAR

5. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

5.1. The composition of the tissue simulating liquid

Ingredient	Water	Salt	Sugar	HEC	Preventol	DGBE	TWEEN	Triton X-100
835MHz Head	√	√	√	√	√	--	--	--
835MHz Body	√	√	√	√	√	--	--	--
1900MHz Head	√	√	--	--	--	√	--	--
1900MHz Body	√	√	√	√	√	--	--	--
2450MHz Head	√	√	--	--	--	--	--	√
2450MHz Body	√	√	--	--	--	√	--	--

5.2. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE 1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in IEEE 1528.

Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	**41.5**	**0.90**	**55.2**	**0.97**
900	41.5	0.97	55.0	1.05
915	41.5	1.01	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	**40.0**	**1.40**	**53.3**	**1.52**
2450	**39.2**	**1.80**	**52.7**	**1.95**
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

(εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

5.3. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Dielectric Probe Kit and R&S Network Analyzer ZVL6.

Tissue Stimulant Measurement for 835MHz					
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr 41.5 (39.425-43.575)	δ[s/m] 0.90(0.855-0.945)		
Head	824.2	42.81	0.86	22.1	Apr. 25,2015
	826.4	42.35	0.87		
	835	42.01	0.88		
	836.6	41.37	0.90		
	846.6	40.98	0.91		
	848.8	40.54	0.92		
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr 55.20(52.44-57-96)	δ[s/m]0.97(0.9215-1.0185)		
Body	824.2	56.55	0.94	22.3	Apr. 25,2015
	826.4	55.96	0.95		
	835	55.43	0.96		
	836.6	54.29	0.98		
	846.6	54.00	0.98		
	848.8	53.69	0.99		

Tissue Stimulant Measurement for 1900MHz					
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr40.00(38.00-42.00)	δ[s/m]1.40(1.33-1.47)		
Head	1850.2	41.58	1.37	22	Apr. 22,2015
	1852.4	41.02	1.38		
	1880	40.77	1.39		
	1900	40.32	1.41		
	1907.6	40.08	1.43		
	1909.8	39.33	1.44		
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [°C]	Test time
		εr53.30(50.635-55.965)	δ[s/m]1.52(1.444-1.596)		
Body	1850.2	54.68	1.47	21.7	Apr. 22,2015
	1852.4	53.86	1.48		
	1880	53.17	1.50		
	1900	52.79	1.53		
	1907.6	52.35	1.55		
	1909.8	51.11	1.57		

Tissue Stimulant Measurement for 2450MHz					
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [^{o}C]	Test time
		εr39.2(37.24-41.16)	δ[s/m]1.80(1.71-1.89)		
Head	2412	40.90	1.77	21.5	Apr. 28,2015
	2437	40.24	1.80		
	2450	39.65	1.82		
	2462	38.77	1.83		
	Fr. (MHz)	Dielectric Parameters (±5%)		Tissue Temp [^{o}C]	Test time
		εr52.7(50.065-55.335)	δ[s/m]1.95(1.8525-2.0475)		
Body	2412	54.62	1.89	21.8	Apr. 28,2015
	2437	53.15	1.91		
	2450	52.56	1.94		
	2462	52.13	1.96		

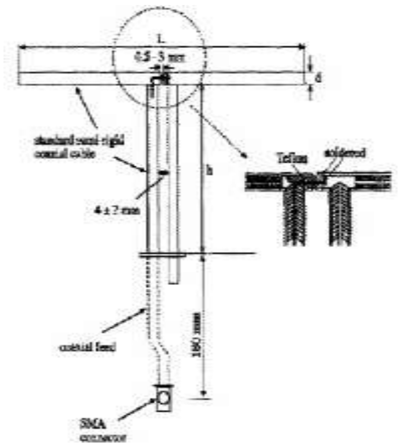
6. SAR SYSTEM CHECK PROCEDURE

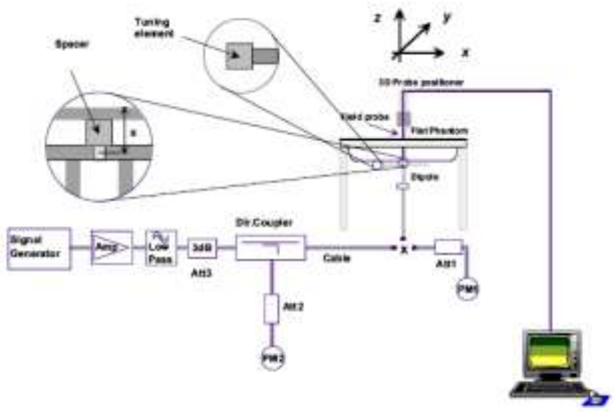
6.1. SAR System Check Procedures

SAR system check 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 same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

Each DASY system is equipped with one or more system check kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system check and system validation. System kit includes a dipole, and dipole device holder.

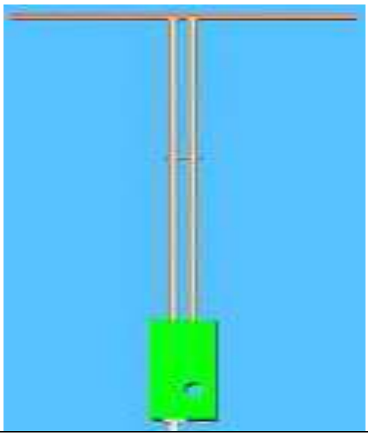
The system check verifies that the system operates within its specifications. It’s performed daily or before every SAR measurement. The system check uses normal SAR measurement in the flat section of the phantom with a matched dipole at a specified distance. The system check setup is shown as below.





6.2. SAR System Check

6.2.1. Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical Specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
835MHz	161.0	89.8	3.6
1900MHz	68	39.5	3.6
2450MHz	51.5	30.4	3.6

6.2.2. System Check Result

System Performance Check at 835MHz&1900MHz for Head								
Validation Kit: SN 46/11DIP 0G835-190 & SN 46/11DIP 1G900-187								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
835	9.60	6.20	8.64-10.56	5.58-6.82	10.544	6.88	22.1	Apr. 25,2015
1900	39.65	20.24	35.685-43.615	18.216-22.264	40.8	21.28	22	Apr. 22,2015
2450	54.40	23.75	48.96-59.84	21.375-26.125	51.52	26.56	21.5	Apr. 28,2015
System Performance Check at 835 MHz &1900MHz for Body								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
835	9.90	6.39	8.91-10.89	5.75-7.03	10.848	7.008	22.3	Apr. 25,2015
1900	40.74	21.43	36.666-44.814	19.287-23.573	38.72	20.16	21.7	Apr. 22,2015
2450	54.19	24.96	48.771-59.609	22.464-27.456	56	25.44	21.8	Apr. 28,2015

7. EUT TEST POSITION

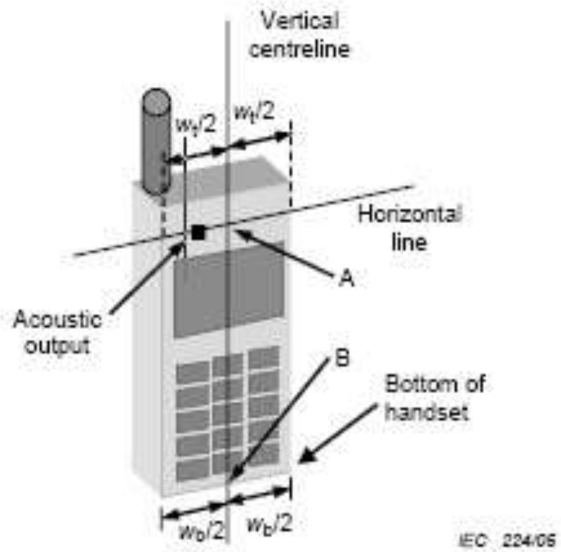
This EUT was tested in **Right Cheek, Right Titled, Left Cheek, Left Titled, Body back and Body front and 4 edges.**

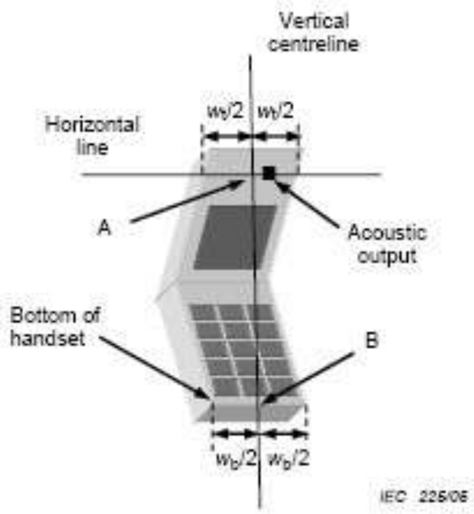
7.1. Define Two Imaginary Lines on the Handset

(1)The vertical centerline passes through two points on the front side of the handset the midpoint of the width wt of the handset at the level of the acoustic output, and the midpoint of the width wb of the handset.

(2)The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(3)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 to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.





7.2. Cheek Position

(1) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center picec in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(2) To move the device towards the phantom with the ear piece aligned with the the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost

7.3. Title Position

(1) To position the device in the “cheek” position described above.

(2) While maintaining the device in the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until with the ear is lost.

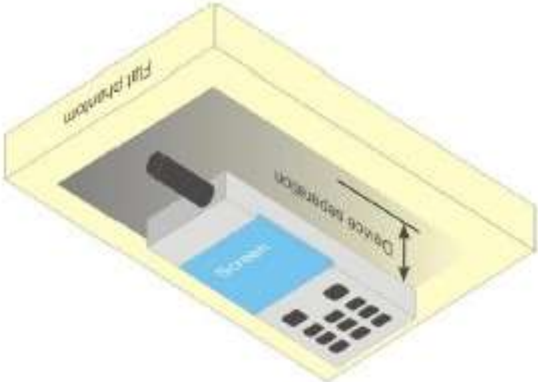
7.4. Body Worn Position

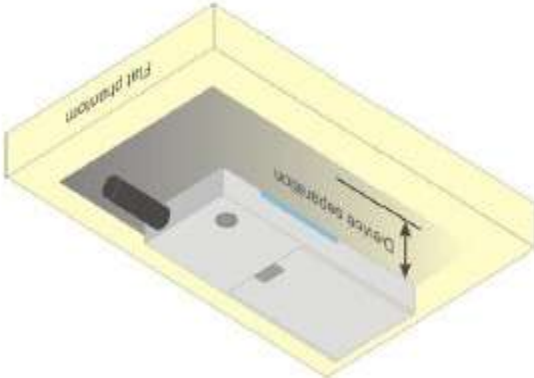
(1) To position the EUT parallel to the phantom surface.

(2) To adjust the EUT parallel to the flat phantom.

(3) To adjust the distance between the EUT surface and the flat phantom to **10mm.**

General Note: Referring KDB941225 D06 v02, when the overall device length and width are ≥ 9cm *5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna within 25mm from that surface or edge.





8. SAR EXPOSURE LIMITS

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

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

Type Exposure	Uncontrolled Environment Limit (W/kg)
Spatial Peak SAR (1g cube tissue for brain or body)	1.60
Spatial Average SAR (Whole body)	0.08
Spatial Peak SAR (Limbs)	4.0

9. TEST EQUIPMENT LIST

Equipment description	Manufacturer/ Model	Identification No.	Current calibration date	Next calibration date
Stäubli Robot	Stäubli-TX60	F13/5Q2UD1/A/01	N/A	N/A
Robot Controller	Stäubli-CS8	139522	N/A	N/A
TISSUE Probe	SATIMO	SN 45/11 OCPG45	12/03/2014	12/02/2015
E-Field Probe	Speag-EX3DV4	3953	11/06/2014	11/05/2015
SAM Twin Phantom	Speag-SAM	1790	N/A	N/A
Device Holder	Speag-SD 000 H01 KA	SD 000 H01 KA	N/A	N/A
DAE4	Speag-SD 000 D04 BM	1398	03/11/2015	03/10/2016
SAR Software	Speag-DASY5	DASY52.8	N/A	N/A
Liquid	SATIMO	-	N/A	N/A
Radio Communication Tester	R&S-CMU200	069Y7-158-13-712	03/06/2015	03/05/2016
Dipole	SATIMO SID835	SN46/11 DIP 0G835-190	10/02/2014	10/01/2017
Dipole	SATIMO SID1900	SN46/11 DIP 1G900-187	11/14/2013	11/13/2016
Dipole	SATIMO SID2450	SN46/11 DIP 2G450-189	11/14/2013	11/13/2016
Signal Generator	Agilent-E4438C	MY44260051	03/06/2015	03/05/2016
Power Sensor	NRP-Z23	US38261498	03/06/2015	03/05/2016
Spectrum Analyzer E4440	Agilent	US41421290	05/27/2014	05/26/2015
Network Analyzer	Rhode & Schwarz ZVL6	SN100132	03/06/2015	03/05/2016
Attenuator	Warison /WATT-6SR1211	N/A	N/A	N/A
Attenuator	Mini-circuits / VAT-10+	N/A	N/A	N/A
Amplifier	EM30180	SN060552	03/06/2015	03/05/2016
Directional Couple	Werlatone/ C5571-10	SN99463	07/30/2014	07/29/2015
Directional Couple	Werlatone/ C6026-10	SN99482	07/30/2014	07/29/2015
Power Sensor	NRP-Z21	1137.6000.02	10/22/2014	10/21/2015
Power Viewer	R&S	V2.3.1.0	N/A	N/A

Note: Per KDB 865664Dipole SAR Validation, AGC Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

10. MEASUREMENT UNCERTAINTY

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

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

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

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

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

(b) κ is the coverage factor

Table 13.1 Standard Uncertainty for Assumed Distribution (above table)

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.

DAYS5 Measurement Uncertainty Measurement uncertainty for 30 MHz to 3GHz averaged over 1 gram / 10 gram.							
Error Description	Uncertainty value(±10%)	Probability Distribution	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.53	Normal	1	1	1	6.53	6.53
Axial Isotropy	4.6	Rectangular	$\sqrt{3}$	1	1	2.66	2.66
Hemispherical Isotropy	9.3	Rectangular	$\sqrt{3}$	1	1	5.37	5.37
Linearity	4.5	Rectangular	$\sqrt{3}$	1	1	2.60	2.60
Probe Modulation Response	0.2	Rectangular	$\sqrt{3}$	1	1	0.12	0.12
System Detection Limits	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52
Boundary Effects	0.9	Rectangular	$\sqrt{3}$	0	0	0	0
Readout Electronics	0.2	Normal	$\sqrt{3}$	1	1	0.12	0.12
Response Time	0	Rectangular	$\sqrt{3}$	1	1	0	0
Integration Time	0	Rectangular	$\sqrt{3}$	1	1	0	0
RF Ambient Noise	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52
RF Ambient Reflection	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52
Probe Positioner	0.7	Rectangular	$\sqrt{3}$	1	1	0.40	0.40
Probe Positioning	6.5	Rectangular	$\sqrt{3}$	1	1	3.75	3.75
Post-processing	3.8	Rectangular	$\sqrt{3}$	1	1	2.19	2.19
Test Sample Related							
Device Positioning	3.6	Normal	1	1	1	3.6	3.6
Device Holder	2.9	Normal	1	1	1	2.9	2.9
Measurement SAR Drift	5.0	Rectangular	$\sqrt{3}$	1	1	2.89	2.89
Power Scaling	0.0	Rectangular	$\sqrt{3}$	1	1	0	0
Phantom and Setup							
Phantom Uncertainty	3.9	Rectangular	$\sqrt{3}$	1	1	2.25	2.25
Liquid Conductivity(Meas.)	2.4	Normal	1	0.78	0.71	1.87	1.70
Liquid Conductivity(Target)	4.9	Rectangular	$\sqrt{3}$	0.64	0.43	1.81	1.22
Liquid Permittivity(Meas.)	2.4	Normal	1	0.26	0.26	0.62	0.62
Liquid Permittivity((Target)	4.9	Rectangular	$\sqrt{3}$	0.6	0.49	1.70	1.39
Liquid Conductivity-temperature uncertainty	1.6	Rectangular	$\sqrt{3}$	0.78	0.71	0.72	0.66
Liquid Permittivity-temperature uncertainty	0.2	Rectangular	$\sqrt{3}$	0.23	0.26	0.026	0.03
Combined Standard Uncertainty						12.03	12.00
Coverage Factor for 95%						K=2	
Expanded Uncertainty						±24.06%	±24.00%

DAYS5 System Check Uncertainty for 30 MHz to 6GHz averaged range								
Error Description	Uncer. value (±10%)	Prob. Dist.	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) V_{eff}
Measurement System								
Probe Calibration	6.53	Normal	1	1	1	6.53	6.53	∞
Axial Isotropy	4.6	Rectangular	$\sqrt{3}$	1	1	2.66	2.66	∞
Hemispherical Isotropy	9.3	Rectangular	$\sqrt{3}$	1	1	5.37	5.37	∞
Boundary Effects	0.9	Rectangular	$\sqrt{3}$	0	0	0	0	∞
Linearity	4.5	Rectangular	$\sqrt{3}$	1	1	2.60	2.60	∞
System Detection Limits	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52	∞
Modulation Response	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
Readout Electronics	0.2	Normal	1	1	1	0.2	0.2	∞
Response Time	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
Integration Time	0	Rectangular	$\sqrt{3}$	1	1	0	0	∞
RF Ambient Noise	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52	∞
RF Ambient Reflection	0.9	Rectangular	$\sqrt{3}$	1	1	0.52	0.52	∞
Probe Positioner	0.7	Rectangular	$\sqrt{3}$	1	1	0.402	0.402	∞
Probe Positioning	6.5	Rectangular	$\sqrt{3}$	1	1	3.752	3.752	∞
Max. SAR Eval.	1.9	Rectangular	$\sqrt{3}$	1	1	1.10	1.10	∞
Dipole Related								
Deviation of exp. dipole	5.3	Rectangular	$\sqrt{3}$	1	1	3.06	3.06	∞
Dipole Axis to Liquid Dist.	2.0	Rectangular	$\sqrt{3}$	1	1	1.15	1.15	∞
Input power & SAR drift	3.3	Rectangular	$\sqrt{3}$	1	1	1.91	1.91	∞
Phantom and Setup								
Phantom Uncertainty	3.9	Rectangular	$\sqrt{3}$	1	1	2.25	2.25	∞
SAR correction	1.8	Rectangular	$\sqrt{3}$	1	0.84	1.04	0.87	∞
Liquid Conductivity(Meas.)	2.4	Normal	1	0.78	0.71	1.87	1.70	∞
Liquid Permittivity(Meas.)	2.4	Normal	1	0.26	0.26	0.62	0.62	∞
Temp. unc. - Conductivity	1.6	Rectangular	$\sqrt{3}$	0.78	0.71	0.72	0.66	∞
Temp. unc. - Permittivity	0.2	Rectangular	$\sqrt{3}$	0.23	0.26	0.02	0.03	∞
Combined Std. Uncertainty						11.16	11.10	
Expanded STD Uncertainty						±22.32%	±22.20%	

11. CONDUCTED POWER MEASUREMENT

GSM BAND

Mode	Frequency(MHz)	Avg. Burst Power(dBm)	Duty cycle Factor(dBm)	Frame Power(dBm)
Maximum Power <1>				
GSM 850	824.2	**31.29**	-9	22.29
	836.6	31.27	-9	22.27
	848.8	31.22	-9	22.22
GPRS 850 （1 Slot）	824.2	30.86	-9	21.86
	836.6	30.82	-9	21.82
	848.8	30.78	-9	21.78
GPRS 850 （2 Slot）	824.2	28.37	-6	**22.37**
	836.6	28.32	-6	22.32
	848.8	28.31	-6	22.31
GPRS 850 （3 Slot）	824.2	26.28	-4.26	22.02
	836.6	26.26	-4.26	22
	848.8	26.21	-4.26	21.95
GPRS 850 （4 Slot）	824.2	25.35	-3	22.35
	836.6	25.32	-3	22.32
	848.8	25.29	-3	22.29
EGPRS 850 （1 Slot）	824.2	25.19	-9	16.19
	836.6	25.16	-9	16.16
	848.8	25.13	-9	16.13
EGPRS 850 （2 Slot）	824.2	24.11	-6	18.11
	836.6	24.08	-6	18.08
	848.8	24.06	-6	18.06
EGPRS 850 （3 Slot）	824.2	22.41	-4.26	18.15
	836.6	22.36	-4.26	18.1
	848.8	22.32	-4.26	18.06
EGPRS 850 （4 Slot）	824.2	21.47	-3	18.47
	836.6	21.42	-3	18.42
	848.8	21.38	-3	18.38

GSM BAND CONTINUE

Mode	Frequency(MHz)	Avg. Burst Power(dBm)	Duty cycle Factor(dBm)	Frame Power(dBm)
PCS1900	1850.2	**28.23**	-9	19.23
	1880	28.18	-9	19.18
	1909.8	28.13	-9	19.13
GPRS1900 （1 Slot）	1850.2	27.83	-9	18.83
	1880	27.77	-9	18.77
	1909.8	27.72	-9	18.72
GPRS1900 （2 Slot）	1850.2	25.32	-6	19.32
	1880	25.29	-6	19.29
	1909.8	25.25	-6	19.25
GPRS1900 （3 Slot）	1850.2	23.23	-4.26	18.97
	1880	23.21	-4.26	18.95
	1909.8	23.18	-4.26	18.92
GPRS1900 （4 Slot）	1850.2	22.34	-3	**19.34**
	1880	22.29	-3	19.29
	1909.8	22.23	-3	19.23
EGPRS1900 （1 Slot）	1850.2	24.34	-9	15.34
	1880	24.31	-9	15.31
	1909.8	24.22	-9	15.22
EGPRS1900 （2 Slot）	1850.2	23.31	-6	17.31
	1880	23.26	-6	17.26
	1909.8	23.22	-6	17.22
EGPRS1900 （3 Slot）	1850.2	21.42	-4.26	17.16
	1880	21.37	-4.26	17.11
	1909.8	21.34	-4.26	17.08
EGPRS1900 （4 Slot）	1850.2	20.41	-3	17.41
	1880	20.35	-3	17.35
	1909.8	20.32	-3	17.32
Maximum Power <2>				
GSM850	824.2	30.75	-9	21.75
PCS1900	1850.2	27.71	-9	18.71

Note 1:
The Frame Power (Source-based time-averaged Power) is scaled the maximum burst average power based on time slots. The calculated methods are show as following:
Frame Power = Max burst power (1 Up Slot) – 9 dB
Frame Power = Max burst power (2 Up Slot) – 6 dB
Frame Power = Max burst power (3 Up Slot) – 4.26 dB
Frame Power = Max burst power (4 Up Slot) – 3 dB

UMTS BAND
HSDPA Setup Configuration:

·The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

·The RF path losses were compensated into the measurements.

·A call was established between EUT and Based Station with following setting:

(1) Set Gain Factors(βc and βd) parameters set according to each

(2) Set RMC 12.2Kbps+HSDPA mode.

(3) Set Cell Power=-86dBm

(4) Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)

(5) Select HSDPA Uplink Parameters

(6) Set Delta ACK, Delta NACK and Delta CQI=8

(7) Set Ack - Nack Repetition Factor to 3

(8) Set CQI Feedback Cycle (k) to 4ms

(9) Set CQI Repetition Factor to 2

(10) Power Ctrl Mode=All Up bits

·The transmitted maximum output power was recorded.

Table C.10.2.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	βc (Note5)	βd	βd (SF)	βc/βd	βHS (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15(Note 4)	15/15(Note 4)	64	12/15(Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: ΔACK, ΔNACK and ΔCQI = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, ΔACK and ΔNACK = 30/15 with β_{hs} = 30/15 * β_c, and ΔCQI = 24/15 with β_{hs} = 24/15 * β_c.
Note 3: CM = 1 for βc/βd =12/15, hs/ c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.
Note 4: For subtest 2 the c/ d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to c = 11/15 and d = 15/15.

HSUPA Setup Configuration:

· The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

· The RF path losses were compensated into the measurements.

· A call was established between EUT and Base Station with following setting * :

(1) Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK

(2) Set the Gain Factors (βc and βd) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121

(3) Set Cell Power = -86 dBm

(4) Set Channel Type = 12.2k + HSPA

(5) Set UE Target Power

(6) Power Ctrl Mode= Alternating bits

(7) Set and observe the E-TFCI

(8) Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI

· The transmitted maximum output power was recorded.

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

Sub-test	βc	βd	βd (SF)	βc/βd	βHS (Note1)	βec	βed (Note 4) (Note 5)	βed (SF)	βed (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	βed1: 47/15 βed2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, ΔACK, ΔNACK and ΔCQI = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, ΔACK, ΔNACK and ΔCQI = 5/15 with β_{hs} = 5/15 * β_c.
Note 2: CM = 1 for βc/βd =12/15, hs/ c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the c/ d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to c = 10/15 and d = 15/15.
Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 5: βed cannot be set directly; it is set by Absolute Grant Value.
Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

UMTS BAND II

Mode	Frequency (MHz)	Avg. Burst Power (dBm)
WCDMA 1900 RMC	1852.4	**21.42**
	1880	21.38
	1907.6	21.32
WCDMA 1900 AMR	1852.4	21.14
	1880	21.12
	1907.6	21.09
HSDPA Subtest 1	1852.4	20.37
	1880	20.34
	1907.6	20.31
HSDPA Subtest 2	1852.4	20.43
	1880	20.38
	1907.6	20.32
HSDPA Subtest 3	1852.4	20.38
	1880	20.34
	1907.6	20.31
HSDPA Subtest 4	1852.4	20.44
	1880	20.41
	1907.6	20.36
HSUPA Subtest 1	1852.4	20.37
	1880	20.35
	1907.6	20.34
HSUPA Subtest 2	1852.4	20.32
	1880	20.31
	1907.6	20.26
HSUPA Subtest 3	1852.4	20.28
	1880	20.23
	1907.6	20.18
HSUPA Subtest 4	1852.4	20.34
	1880	20.36
	1907.6	20.33
HSUPA Subtest 5	1852.4	20.35
	1880	20.29
	1907.6	20.25

UMTS BAND V

Mode	Frequency (MHz)	Avg. Burst Power (dBm)
WCDMA 850 RMC	826.4	**21.38**
	836.6	21.35
	846.6	21.27
WCDMA 850 AMR	826.4	21.14
	836.6	21.11
	846.6	21.09
HSDPA Subtest 1	826.4	20.32
	836.6	20.29
	846.6	20.24
HSDPA Subtest 2	826.4	20.33
	836.6	20.31
	846.6	20.28
HSDPA Subtest 3	826.4	20.41
	836.6	20.36
	846.6	20.34
HSDPA Subtest 4	826.4	20.36
	836.6	20.33
	846.6	20.31
HSUPA Subtest 1	826.4	20.28
	836.6	20.24
	846.6	20.23
HSUPA Subtest 2	826.4	20.36
	836.6	20.31
	846.6	20.27
HSUPA Subtest 3	826.4	20.38
	836.6	20.36
	846.6	20.31
HSUPA Subtest 4	826.4	20.38
	836.6	20.39
	846.6	20.36
HSUPA Subtest 5	826.4	20.32
	836.6	20.27
	846.6	20.24

WIFI

Mode	Data Rate (Mbps)	Channel	Frequency(MHz)	Avg. Burst Power(dBm)
802.11b	1	01	2412	**10.48**
		06	2437	10.43
		11	2462	10.39
802.11g	6	01	2412	8.53
		06	2437	8.44
		11	2462	8.39
802.11n(20)	6.5	01	2412	8.25
		06	2437	8.18
		11	2462	8.14
802.11n(40)	13.5	03	2422	6.73
		06	2437	6.66
		09	2452	6.63

Bluetooth_V3.0

Modulation	Channel	Frequency(MHz)	Average Power (dBm)
GFSK	0	2402	2.76
	39	2441	3.25
	78	2480	**3.41**
π /4-DQPSK	0	2402	1.92
	39	2441	2.42
	78	2480	2.83
8-DPSK	0	2402	1.95
	39	2441	2.4
	78	2480	2.6

Bluetooth_V4.0

Modulation	Channel	Frequency(MHz)	Peak Power (dBm)
GFSK	0	2402	-2.96
	19	2440	**-2.81**
	39	2480	-2.97

According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

UE Transmit Channel Configuration	CM(db)	MPR(db)
For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH	0≤ CM≤3.5	MAX(CM-1,0)
Note: CM=1 for β_c/β_d=12/15, β_{hs}/β_c=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.		

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensation for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

12. TEST RESULTS

12.1. SAR Test Results Summary

12.1.1. Test position and configuration

Head SAR was performed with the device configured in the positions according to IEEE 1528-2003, and Body SAR was performed with the device 10mm from the phantom.

12.1.2. Operation Mode

• According to KDB 447498 D01 v05r02 ,for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.

• Per KDB 865664 D01 v01r03,for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required , that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.

(1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.

(2) 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 ≥1.45 W/Kg.

(3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥ 1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥1.20.

• Body-worn exposure conditions are intended to voice call operations, therefore GSM voice call mode is selected to be test.

• According to KDB 648474 D04 v01r02,when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤1.2W/Kg, SAR testing with a headset connected is not required.

• According to 941225 D06 v02, when the overall device length and width are>9cm×5cm, Hotspot mode with a test separation distance of 10mm. For device with form factors smaller than 9cm×5cm, Hotspot mode with a test separation distance of 5mm. Body SAR was also performed with the headset attached and without.

• According to 248227 D01 v01r02, SAR is not required for 802.11g channels when the maximum average output power is less than 1/4dB higher than measured on the corresponding 802.11b channels.

• Maximum Scaling SAR in order to calculate the Maximum SAR values to test under the standard Peak Power, Calculation method is as follows:
Maximum Scaling SAR =tested SAR (Max.) ×[maximum turn-up power (mw)/ maximum measurement output power(mw)]

12.1.3. Test Result

SAR MEASUREMENT									
Product: GSM/WCDMA Mobile Phone				Relative Humidity (%): 54					
Test Mode: GSM850 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Left Cheek	voice	190	836.6	-0.04	0.057	32	31.27	0.067	1.6
Left Tilt	voice	190	836.6	-0.17	0.032	32	31.27	0.038	1.6
Right Cheek	voice	190	836.6	-0.12	**0.109**	32	31.27	0.129	1.6
Right Tilt	voice	190	836.6	-0.14	0.053	32	31.27	0.063	1.6
Body back	voice	190	836.6	0.09	**0.178**	32	31.27	0.211	1.6
Body front	voice	190	836.6	0.08	0.100	32	31.27	0.118	1.6
Left Cheek	GPRS-2 slot	190	836.6	-0.12	0.102	29	28.32	0.119	1.6
Left Tilt	GPRS-2 slot	190	836.6	0.07	0.061	29	28.32	0.071	1.6
Right Cheek	GPRS-2 slot	190	836.6	-0.03	**0.115**	29	28.32	**0.134**	1.6
Right Tilt	GPRS-2 slot	190	836.6	-0.16	0.062	29	28.32	0.073	1.6
Body back	GPRS-2 slot	190	836.6	0.04	**0.346**	29	28.32	**0.405**	1.6
Body front	GPRS-2 slot	190	836.6	0.05	0.179	29	28.32	0.209	1.6
Edge 1 (Top)	GPRS-2 slot	190	836.6	0.13	0.035	29	28.32	0.041	1.6
Edge 2(Right)	GPRS-2 slot	190	836.6	0.08	0.169	29	28.32	0.198	1.6
Edge 3(Bottom)	GPRS-2 slot	190	836.6	0.02	0.096	29	28.32	0.112	1.6
Edge 4(Left)	GPRS-2 slot	190	836.6	-0.01	0.182	29	28.32	0.213	1.6
SIM 2 Card									
Right Cheek	GPRS-2 slot	190	836.6	0.03	0.100	32	30.75	0.133	1.6

Note:
· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.
·The test separation for body is 10mm of all above table.

SAR MEASUREMENT									
Product: GSM/WCDMA Mobile Phone				Relative Humidity (%): 53					
Test Mode: PCS1900 with GMSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Left Cheek	voice	661	1880.0	-0.08	0.311	29	28.18	0.376	1.6
Left Tilt	voice	661	1880.0	0.14	0.100	29	28.18	0.121	1.6
Right Cheek	voice	661	1880.0	-0.02	**0.564**	29	28.18	0.681	1.6
Right Tilt	voice	661	1880.0	0.11	0.119	29	28.18	0.144	1.6
Body back	voice	661	1880.0	-0.03	**0.591**	29	28.18	**0.714**	1.6
Body front	voice	661	1880.0	0.09	0.345	29	28.18	0.417	1.6
Left Cheek	GPRS-4 slot	512	1850.2	0.16	0.705	23	22.34	0.821	1.6
Left Cheek	GPRS-4 slot	661	1880.0	0.18	0.722	23	22.29	0.850	1.6
Left Cheek	GPRS-4 slot	810	1909.8	0.06	0.710	23	22.23	0.848	1.6
Left Tilt	GPRS-4 slot	661	1880.0	0.18	0.186	23	22.29	0.219	1.6
Right Cheek	GPRS-4 slot	512	1850.2	0.07	**1.01**	23	22.34	**1.176**	1.6
Right Cheek	GPRS-4 slot	661	1880.0	0.11	0.943	23	22.29	1.110	1.6
Right Cheek	GPRS-4 slot	810	1909.8	0.09	0.867	23	22.23	1.035	1.6
Right Tilt	GPRS-4 slot	661	1880.0	0.16	0.201	23	22.29	0.237	1.6
Body back	GPRS-4 slot	512	1850.2	0.02	0.911	23	22.34	1.061	1.6
Body back	GPRS-4 slot	661	1880.0	-0.13	**0.915**	23	22.29	**1.078**	1.6
Body back	GPRS-4 slot	810	1909.8	-0.03	0.793	23	22.23	0.947	1.6
Body front	GPRS-4 slot	661	1880.0	0.13	0.455	23	22.29	0.536	1.6
Edge 1 (Top)	GPRS-4 slot	661	1880.0	0.03	0.117	23	22.29	0.138	1.6
Edge 2(Right)	GPRS-4 slot	661	1880.0	0.02	0.486	23	22.29	0.572	1.6
Edge 3(Bottom)	GPRS-4 slot	512	1850.2	0.03	0.776	23	22.34	0.903	1.6
Edge 3(Bottom)	GPRS-4 slot	661	1880.0	0.02	0.872	23	22.29	1.027	1.6
Edge 3(Bottom)	GPRS-4 slot	810	1909.8	-0.03	0.725	23	22.23	0.866	1.6
Edge 4(Left)	GPRS-4 slot	661	1880.0	0.04	0.175	23	22.29	0.206	1.6
SIM 2 Card									
Right Cheek	GPRS-4 slot	512	1850.2	0.12	0.805	29	27.71	1.083	1.6

Note:
· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.
·The test separation for body is 10mm of all above table.

SAR MEASUREMENT									
Product: GSM/WCDMA Mobile Phone				Relative Humidity (%): 53					
Test Mode: WCDMA Band II with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Left Cheek	RMC 12.2kbps	9262	1852.4	0.07	0.801	22	21.38	0.924	1.6
Left Cheek	RMC 12.2kbps	9400	1880	0.18	1.02	22	21.38	1.177	1.6
Left Cheek	RMC 12.2kbps	9538	1907.6	0.06	0.825	22	21.38	0.952	1.6
Left Tilt	RMC 12.2kbps	9400	1880	0.04	0.156	22	21.38	0.180	1.6
Right Cheek	RMC 12.2kbps	9262	1852.4	0.11	0.938	22	21.38	1.082	1.6
Right Cheek	RMC 12.2kbps	9400	1880	0.04	**1.28**	22	21.38	**1.476**	1.6
Right Cheek	RMC 12.2kbps	9538	1907.6	0.08	0.968	22	21.38	1.117	1.6
Right Tilt	RMC 12.2kbps	9400	1880	0.14	0.171	22	21.38	0.197	1.6
Body back	RMC 12.2kbps	9262	1852.4	-0.02	0.684	22	21.38	0.789	1.6
Body back	RMC 12.2kbps	9400	1880	-0.01	**0.890**	22	21.38	**1.027**	1.6
Body back	RMC 12.2kbps	9538	1907.6	-0.04	0.731	22	21.38	0.843	1.6
Body front	RMC 12.2kbps	9400	1880	0.09	0.389	22	21.38	0.449	1.6
Edge 1 (Top)	RMC 12.2kbps	9400	1880	0.13	0.062	22	21.38	0.072	1.6
Edge 2(Right)	RMC 12.2kbps	9400	1880	-0.03	0.670	22	21.38	0.773	1.6
Edge 3(Bottom)	RMC 12.2kbps	9262	1852.4	-0.07	0.587	22	21.38	0.677	1.6
Edge 3(Bottom)	RMC 12.2kbps	9400	1880	-0.02	0.753	22	21.38	0.869	1.6
Edge 3(Bottom)	RMC 12.2kbps	9538	1907.6	-0.05	0.610	22	21.38	0.704	1.6
Edge 4(Left)	RMC 12.2kbps	9400	1880	0.04	0.159	22	21.38	0.183	1.6

Note:

· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.

·The test separation for body is 10mm of all above table.

SAR MEASUREMENT									
Product: GSM/WCDMA Mobile Phone				Relative Humidity (%):54					
Test Mode: WCDMA Band V with QPSK modulation									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Left Cheek	RMC 12.2kbps	4183	836.6	0.02	**0.070**	22	21.35	**0.081**	1.6
Left Tilt	RMC 12.2kbps	4183	836.6	0.15	0.042	22	21.35	0.049	1.6
Right Cheek	RMC 12.2kbps	4183	836.6	-0.07	0.069	22	21.35	0.080	1.6
Right Tilt	RMC 12.2kbps	4183	836.6	0.13	0.039	22	21.35	0.045	1.6
Body back	RMC 12.2kbps	4183	836.6	0.09	**0.198**	22	21.35	**0.230**	1.6
Body front	RMC 12.2kbps	4183	836.6	0.10	0.108	22	21.35	0.125	1.6
Edge 1 (Top)	RMC 12.2kbps	4183	836.6	0.07	0.028	22	21.35	0.033	1.6
Edge 2(Right)	RMC 12.2kbps	4183	836.6	0.06	0.105	22	21.35	0.122	1.6
Edge 3(Bottom)	RMC 12.2kbps	4183	836.6	-0.02	0.045	22	21.35	0.052	1.6
Edge 4(Left)	RMC 12.2kbps	4183	836.6	-0.03	0.119	22	21.35	0.138	1.6

Note:
· When the 1-g Reported SAR is ≤ 0.8 W/kg, testing for low and high channel is optional. Refer to KDB 447498.
·The test separation for body is 10mm of all above table.

SAR MEASUREMENT									
Product: GSM/WCDMA Mobile Phone				Relative Humidity (%):53					
Test Mode:802.11b									
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**SAR (1g) (W/kg)**	**Max. Turn-up Power (dBm)**	**Meas. output Power (dBm)**	**Scaled SAR (W/Kg)**	**Limit W/kg**
SIM 1 Card									
Left Cheek	DTS	6	2437	0.17	**0.081**	11	10.43	**0.092**	1.6
Left Tilt	DTS	6	2437	0.09	0.020	11	10.43	0.023	1.6
Right Cheek	DTS	6	2437	-0.09	0.046	11	10.43	0.052	1.6
Right Tilt	DTS	6	2437	0.11	0.020	11	10.43	0.023	1.6
Body back	DTS	6	2437	0.12	0.031	11	10.43	0.035	1.6
Body front	DTS	6	2437	0.10	0.029	11	10.43	0.033	1.6
Edge 1 (Top)	DTS	6	2437	0.04	0.016	11	10.43	0.018	1.6
Edge 2(Right)	DTS	6	2437	0.13	**0.050**	11	10.43	**0.057**	1.6
Edge 4(Left)	DTS	6	2437	0.12	0.028	11	10.43	0.032	1.6

Note:
- According to KDB248227, SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels.
- All of above “DTS” means data transmitters.
- The test separation of all above table for body part is 10mm.

Repeated SAR								
Product: GSM/WCDMA Mobile Phone								
Test Mode: PCS1900 & WCDMA Band II with QPSK modulation								
Position	**Mode**	**Ch.**	**Fr. (MHz)**	**Power Drift (<±0.2)**	**Once SAR (1g) (W/kg)**	**Power Drift (<±0.2)**	**Twice SAR (1g) (W/kg)**	**Limit W/kg**
Right Cheek	GPRS-4 slot	512	1850.2	0.08	0.867			1.6
Body back	GPRS-4 slot	661	1880.0	-0.05	0.899			1.6
Right Cheek	RMC 12.2kbps	9400	1880	0.09	1.04	0.11	0.886	1.6
Body back	RMC 12.2kbps	9400	1880					1.6

Simultaneous Multi-band Transmission Evaluation:

Application Simultaneous Transmission information:

No.	Simultaneous state	Portable Handset			Note
		Head	Body-worn	Hotspot	
1	GSM(voice)+WLAN 2.4GHz (data)	Yes	Yes	-	-
2	WCDMA(voice)+WLAN 2.4GHz (data)	Yes	Yes	-	-
3	GSM(voice)+Bluetooth(data)	Yes	Yes	-	-
4	WCDMA(voice)+Bluetooth(data)	Yes	Yes	-	-
5	GPRS/EGDE(Data) + Bluetooth(data)	Yes	Yes	Yes	2.4GHz Hotspot
6	GPRS/EGDE(Data) + WLAN 2.4GHz (data)	Yes	Yes	Yes	2.4GHz Hotspot
7	WCDMA (Data) + Bluetooth(data)	Yes	Yes	Yes	2.4GHz Hotspot
8	WCDMA (Data) + WLAN 2.4GHz (data)	Yes	Yes	Yes	2.4GHz Hotspot

NOTE:

1. WLAN and BT share the same antenna, and cannot transmit simultaneously.
2. Simultaneous with every transmitter must be the same test position.
3. KDB 447498 D01, BT SAR is excluded as below table.
4. KDB 447498 D01, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user; which is 0mm for head SAR and 10mm for body-worn SAR.
5. If the test separation distance is <5mm, 5mm is used for excluded SAR calculation.
6. According to KDB447497 D01 4.3.2, simultaneous transmission SAR test exclusion is as follow:
   (1) Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.
   (2) Any transmitters and antennas should be considered when calculating simultaneous mode.
   (3) For mobile phone and PC, it's the sum of all transmitters and antennas at the same mode with same position in each applicable exposure condition
   (4) When the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

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

   where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
7. When the sum of SAR is larger than the limit, SAR test exclusion is determined by the SAR to peak location separation ratio. The simultaneous transmitting antennas in each operating mode and exposure condition combination must be considered one pair at a time to determine the SAR to peak location separation ratio to qualify for test exclusion. The ratio is determined by (SAR1 + SAR2)1.5/Ri, rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion.

Estimated SAR		Max Power including Tune-up Tolerance		Separation Distance (mm)	Estimated SAR (W/kg)
		dBm	mW		
BT	Head	4	2.512	0	0.105
	Body			10	0.053

Maximum test results (WWAN) with BT SAR:
BT: Head (0 cm gap): 0.105 W/kg and Body (1.0cm gap): 0.053 W/kg

Sum of the SAR for GSM 850 &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		GSM 850 Band	WI-Fi DTS Band	Bluetooth		
Head (voice)	Left Touch	0.067	0.092		0.159	No
	Left Tilt	0.038	0.023		0.061	No
	Right Touch	0.129	0.052		0.181	No
	Right Tilt	0.063	0.023		0.086	No
	Left Touch	0.067		0.105	0.172	No
	Left Tilt	0.038		0.105	0.143	No
	Right Touch	0.129		0.105	0.234	No
	Right Tilt	0.063		0.105	0.168	No
Body-worn	Rear	0.211	0.035		0.246	No
	Front	0.118	0.033		0.151	No
	Rear	0.211		0.053	0.264	No
	Front	0.118		0.053	0.171	No
Head (Data)	Left Touch	0.119	0.092		0.211	No
	Left Tilt	0.071	0.023		0.094	No
	Right Touch	0.134	0.052		0.186	No
	Right Tilt	0.073	0.023		0.096	No
	Left Touch	0.119		0.105	0.224	No
	Left Tilt	0.071		0.105	0.176	No
	Right Touch	0.134		0.105	0.239	No
	Right Tilt	0.073		0.105	0.178	No
Hotspot	Rear	0.405	0.035		0.440	No
	Front	0.209	0.033		0.242	No
	Edge 1	0.041	0.018		0.059	No
	Edge 2	0.198	0.057		0.255	No
	Edge 4	0.213	0.032		0.245	No
	Rear	0.405		0.053	0.458	No
	Front	0.209		0.053	0.262	No
	Edge 1	0.041		0.053	0.094	No
	Edge 2	0.198		0.053	0.251	No
	Edge 3	0.112		0.053	0.165	No
	Edge 4	0.213		0.053	0.266	No

Note:

- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

Sum of the SAR for GSM 1900 &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		GSM1900 Band	WI-Fi DTS Band	Bluetooth		
Head (voice)	Left Touch	0.376	0.092		0.468	No
	Left Tilt	0.121	0.023		0.144	No
	Right Touch	0.681	0.052		0.733	No
	Right Tilt	0.144	0.023		0.167	No
	Left Touch	0.376		0.105	0.481	No
	Left Tilt	0.121		0.105	0.226	No
	Right Touch	0.681		0.105	0.786	No
	Right Tilt	0.144		0.105	0.249	No
Body-worn	Rear	0.714	0.035		0.749	No
	Front	0.417	0.033		0.450	No
	Rear	0.714		0.053	0.767	No
	Front	0.417		0.053	0.470	No
Head (Data)	Left Touch	0.850	0.092		0.942	No
	Left Tilt	0.219	0.023		0.242	No
	Right Touch	1.176	0.052		1.228	No
	Right Tilt	0.237	0.023		0.260	No
	Left Touch	0.850		0.105	0.955	No
	Left Tilt	0.219		0.105	0.324	No
	Right Touch	1.176		0.105	1.281	No
	Right Tilt	0.237		0.105	0.342	No
Hotspot	Rear	1.078	0.035		1.113	No
	Front	0.536	0.033		0.569	No
	Edge 1	0.138	0.018		0.156	No
	Edge 2	0.572	0.057		0.629	No
	Edge 4	0.206	0.032		0.238	No
	Rear	1.078		0.053	1.131	No
	Front	0.536		0.053	0.589	No
	Edge 1	0.138		0.053	0.191	No
	Edge 2	0.572		0.053	0.625	No
	Edge 3	1.027		0.053	1.080	No
	Edge 4	0.206		0.053	0.259	No

Note:

- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

Sum of the SAR for WCDMA Band II &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		Band II Band	WI-Fi DTS Band	Bluetooth		
Head	Left Touch	1.177	0.092		1.269	No
	Left Tilt	0.180	0.023		0.203	No
	Right Touch	1.476	0.052		1.528	No
	Right Tilt	0.197	0.023		0.220	No
	Left Touch	1.177		0.105	1.282	No
	Left Tilt	0.180		0.105	0.285	No
	Right Touch	1.476		0.105	**1.581**	No
	Right Tilt	0.197		0.105	0.302	No
Body-worn	Rear	1.027	0.035		1.062	No
	Front	0.449	0.033		0.482	No
	Edge 1	0.072	0.018		0.090	No
	Edge 2	0.773	0.057		0.830	No
	Edge 4	0.183	0.032		0.215	No
	Rear	1.027		0.053	1.080	No
	Front	0.449		0.053	0.502	No
	Edge 1	0.072		0.053	0.125	No
	Edge 2	0.773		0.053	0.826	No
	Edge 3	0.869		0.053	0.922	No
	Edge 4	0.183		0.053	0.236	No

Note:

- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

Sum of the SAR for WCDMA Band V &Wi-Fi & BT:

RF Exposure Conditions	Test Position	Simultaneous Transmission Scenario			Σ1-g SAR (W/Kg)	SPLSR (Yes/No)
		WCDMA Band V	Wi-Fi DTS Band	Bluetooth		
Head	Left Touch	0.081	0.092		0.173	No
	Left Tilt	0.049	0.023		0.072	No
	Right Touch	0.080	0.052		0.132	No
	Right Tilt	0.045	0.023		0.068	No
	Left Touch	0.081		0.105	0.186	No
	Left Tilt	0.049		0.105	0.154	No
	Right Touch	0.080		0.105	0.185	No
	Right Tilt	0.045		0.105	0.150	No
Body-worn	Rear	0.230	0.035		0.265	No
	Front	0.125	0.033		0.158	No
	Edge 1	0.033	0.018		0.051	No
	Edge 2	0.122	0.057		0.179	No
	Edge 4	0.138	0.032		0.170	No
	Rear	0.230		0.053	0.283	No
	Front	0.125		0.053	0.178	No
	Edge 1	0.033		0.053	0.086	No
	Edge 2	0.122		0.053	0.175	No
	Edge 3	0.052		0.053	0.105	No
	Edge 4	0.138		0.053	0.191	No

Note:

- According to KDB 447498 D01 General RF Exposure Guidance, when the simultaneous transmission SAR is less than1.6 W/Kg, SPLSR assessment is not required.
- SPLSR mean is “The SAR to Peak Location Separation Ratio “

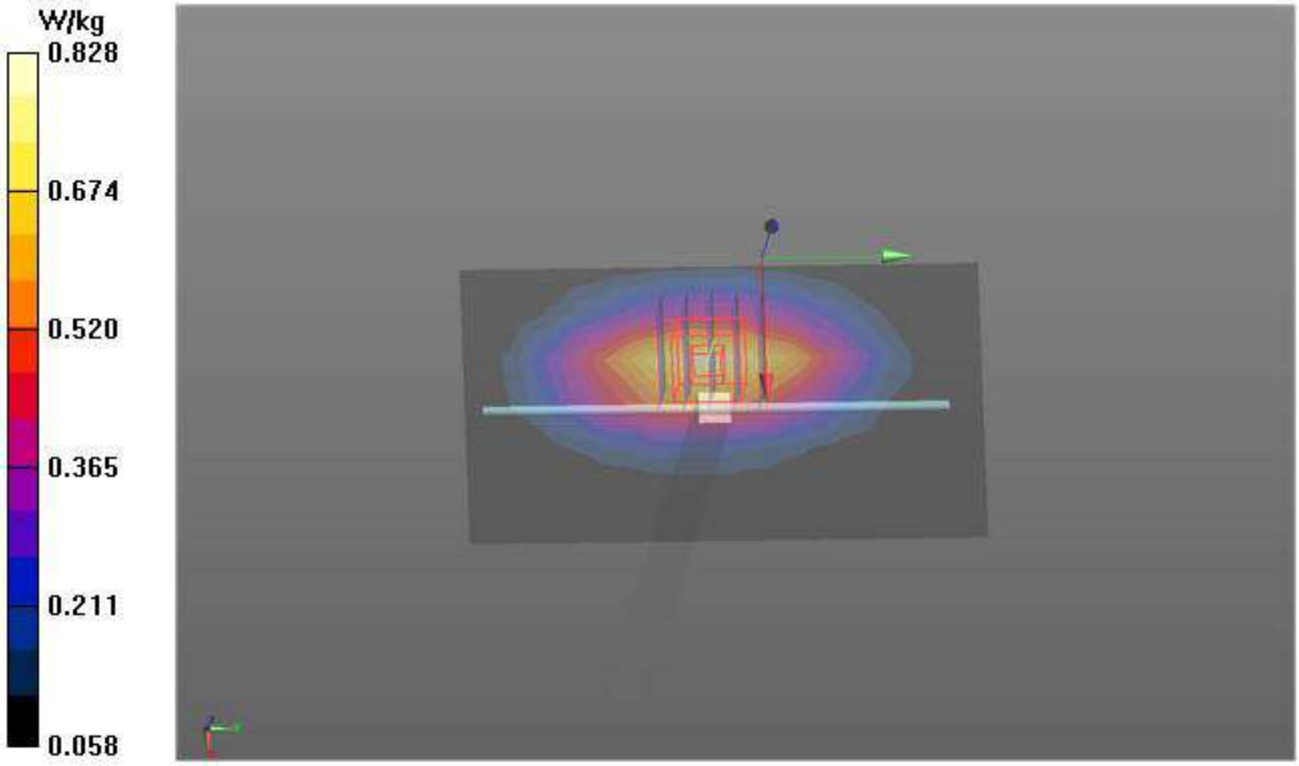
APPENDIX A. SAR SYSTEM CHECK DATA

Test Laboratory: AGC Lab **Date: Apr. 25,2015**
System Check Head 835 MHz
DUT: Dipole 835MHz Type: SID 835
Communication System CW; Communication System Band: D835 (835.0 MHz); Duty Cycle: 1:1;
Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ=0.88 mho/m; εr =42.01; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.1

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.12, 10.12, 10.12); Calibrated:11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 835MHz Head/ Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.820 W/kg

Configuration/System Check 835MHz Head/Zoom Scan (5x5x7)/ Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.916 V/m; Power Drift =-0.08 dB
Peak SAR (extrapolated) = 0.980 W/kg
SAR(1 g) = 0.659 W/kg; SAR(10 g) = 0.430 W/kg
Maximum value of SAR (measured) = 0.828 W/kg

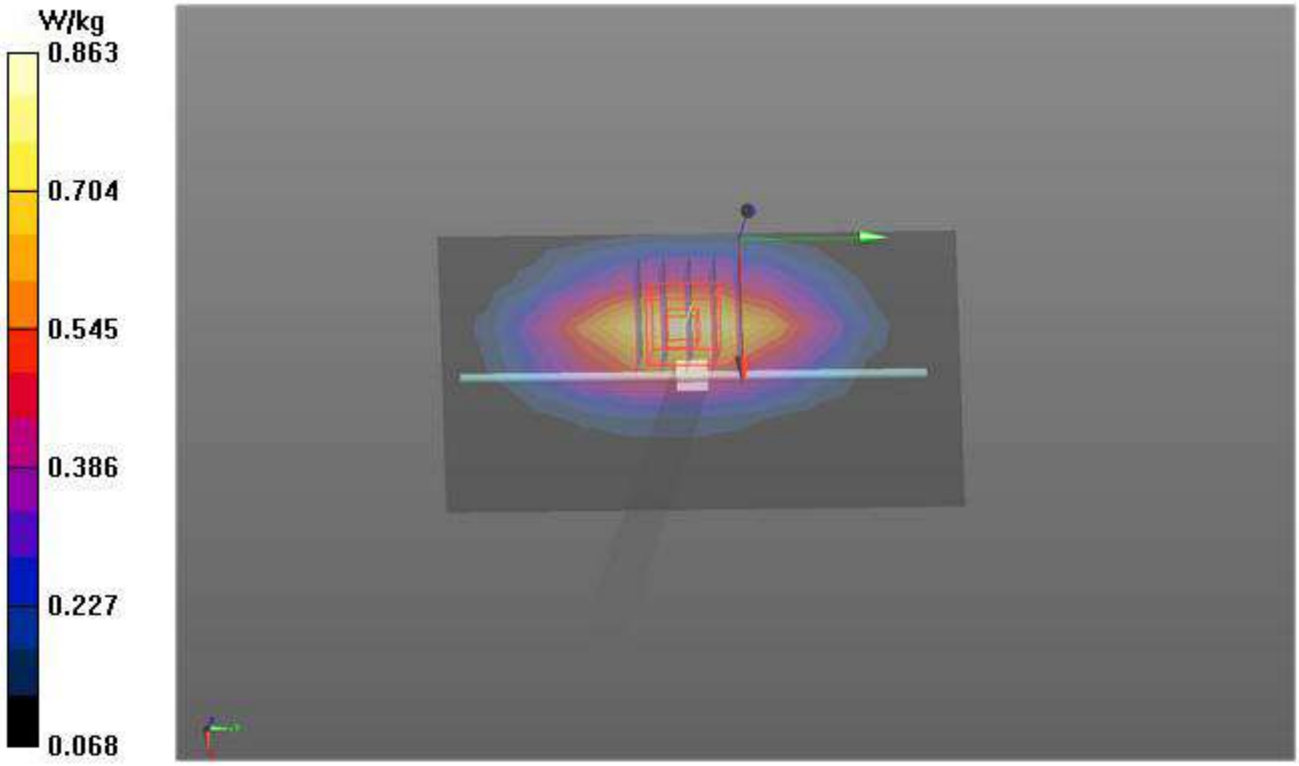


Test Laboratory: AGC Lab **Date: Apr. 25,2015**
System Check Body 835 MHz
DUT: Dipole 835 MHz Type: SID 835
Communication System CW; Communication System Band: D835 (835.0 MHz); Duty Cycle: 1:1;
Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ=0.96 mho/m; εr =55.43; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃): 22.5, Liquid temperature (℃): 22.3

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 835MHz Body/ Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.836 W/kg

Configuration/System Check 835MHz Body/Zoom Scan (5x5x7)/ Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.060 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.678 W/kg; SAR(10 g) = 0.443 W/kg
Maximum value of SAR (measured) = 0.863 W/kg

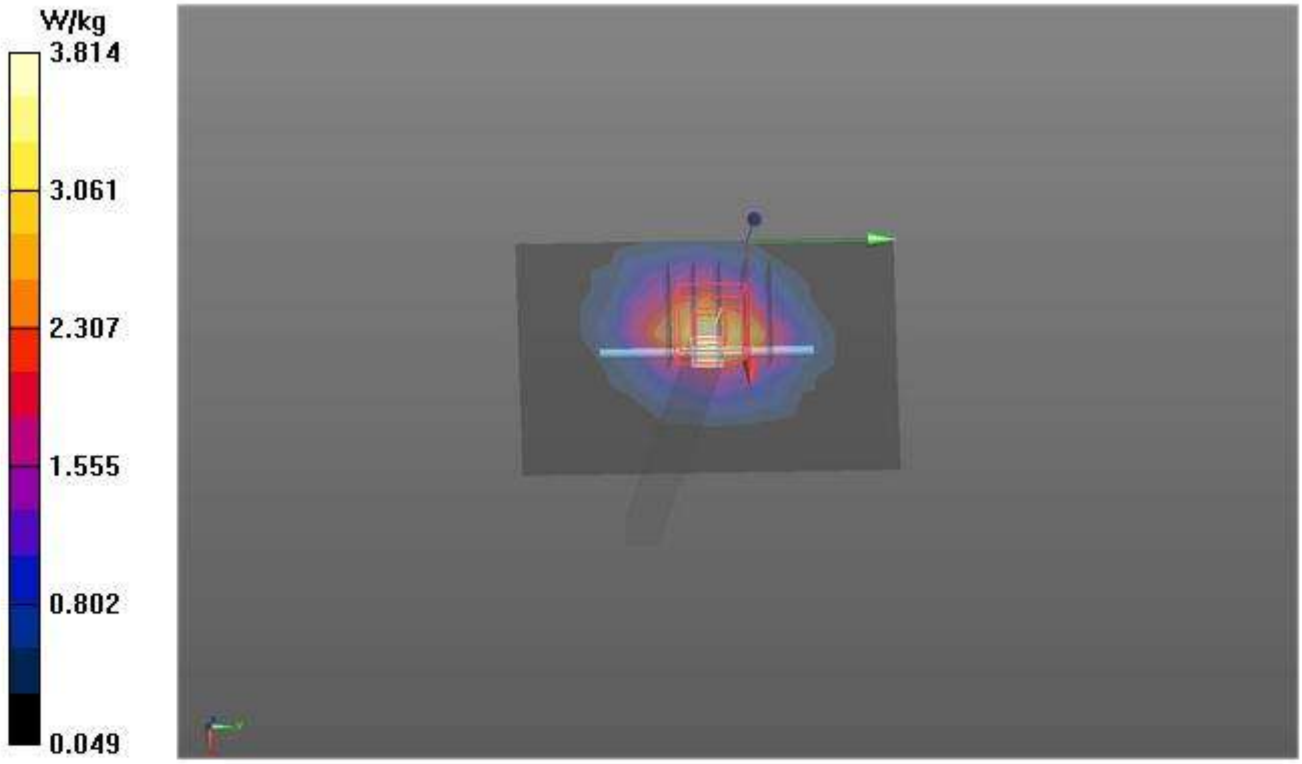


Test Laboratory: AGC Lab **Date: Apr. 22,2015**
System Check Head 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1;
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ=1.41 mho/m; εr =40.32; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 1900MHz Head /Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.73 W/kg

Configuration/System Check 1900MHz Head /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.141 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) =5.04 W/kg
SAR(1 g) = 2.55 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 3.81 W/kg

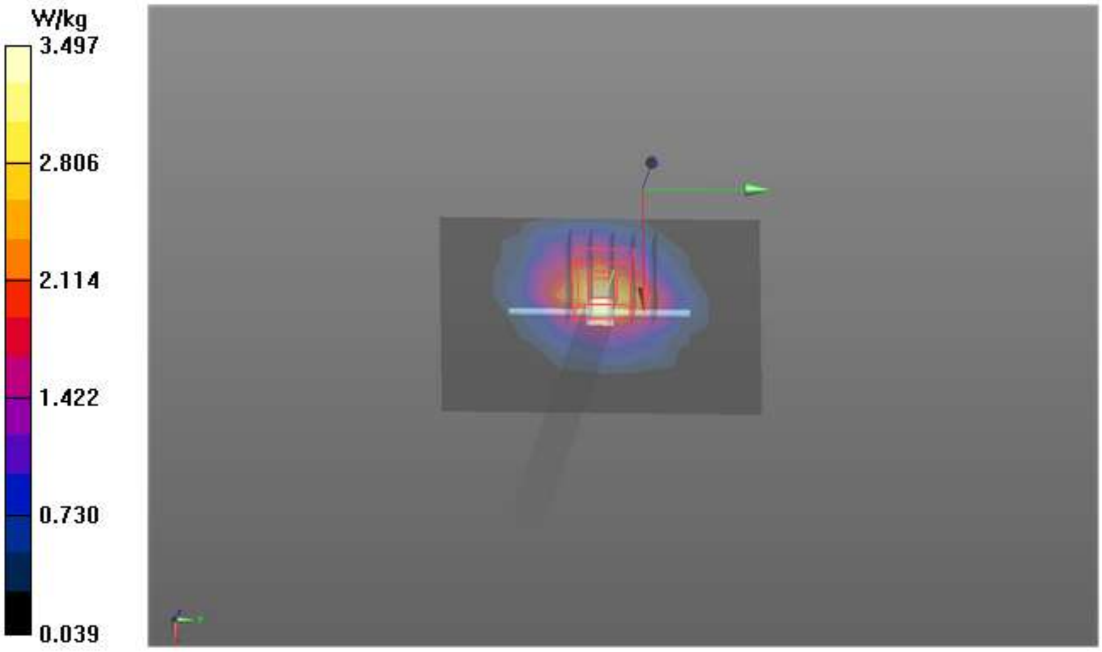


Test Laboratory: AGC Lab **Date: Apr. 22,2015**
System Check Body 1900MHz
DUT: Dipole 1900 MHz; Type: SID 1900
Communication System: CW; Communication System Band: D1900 (1900.0 MHz); Duty Cycle:1:1;
Frequency: 1900 MHz; Medium parameters used: f = 1900 MHz; σ=1.53 mho/m; εr =52.79; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=18dBm
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 1900MHz Body /Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.50 W/kg

Configuration/System Check 1900MHz Body /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 44.363 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 4.62 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.26 W/kg

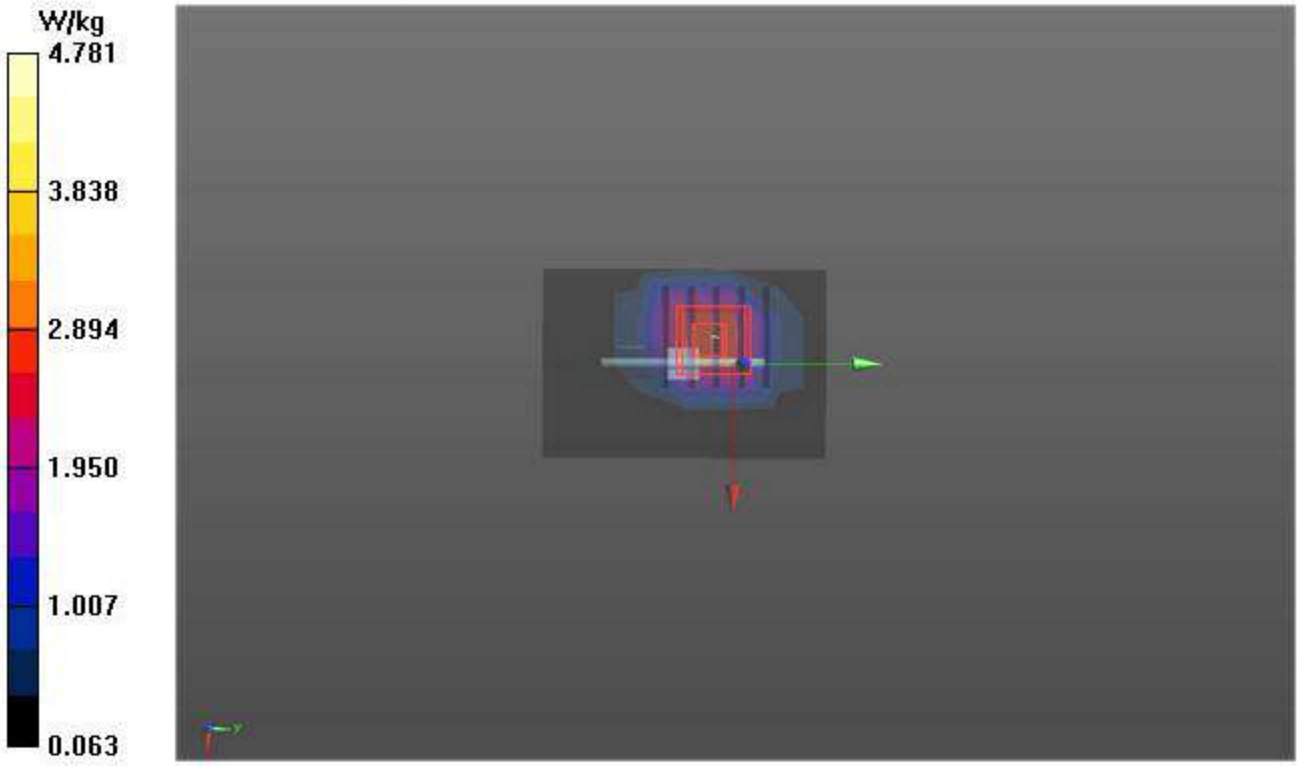


Test Laboratory: AGC Lab **Date: Apr. 28,2015**
System Check Head 2450 MHz
DUT: Dipole 2450 MHz Type: SID 2450
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Duty Cycle: 1:1;
Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ =1.82 mho/m; εr =39.65; ρ= 1000 kg/m^3 ;
Phantom section: Flat Section; Input Power=10dBm
Ambient temperature (℃): 21.9, Liquid temperature (℃): 21.5

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 2450MHz Head /Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.66 W/kg

Configuration/System Check 2450MHz Head /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.423 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 6.26 W/kg
SAR(1 g) = 3.22 W/kg; SAR(10 g) = 1.66 W/kg
Maximum value of SAR (measured) = 4.78 W/kg



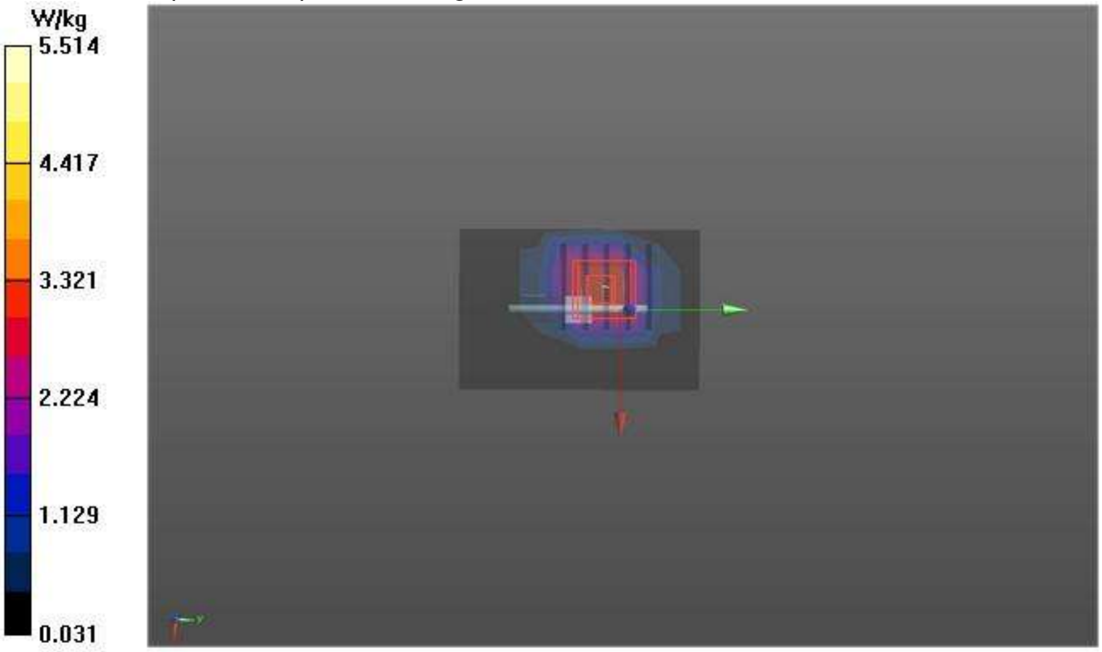
Test Laboratory: AGC Lab **Date: Apr. 28,2015**
System Check Body 2450 MHz
DUT: Dipole 2450 MHz Type: SID 2450
Communication System: CW; Communication System Band: D2450 (2450.0 MHz); Duty Cycle: 1:1;
Frequency: 2450 MHz; Medium parameters used: f = 2450 MHz; σ =1.94 mho/m; εr =52.56; ρ= 1000 kg/m³ ;
Phantom section: Flat Section; Input Power=10dBm
Ambient temperature (℃): 21.9, Liquid temperature (℃): 21.8

DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 2450MHz Body / Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.27 W/kg

Configuration/System Check 2450MHz Body / Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 41.931 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 7.31 W/kg
SAR(1 g) = 3.50 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 5.51 W/kg



APPENDIX B. SAR MEASUREMENT DATA

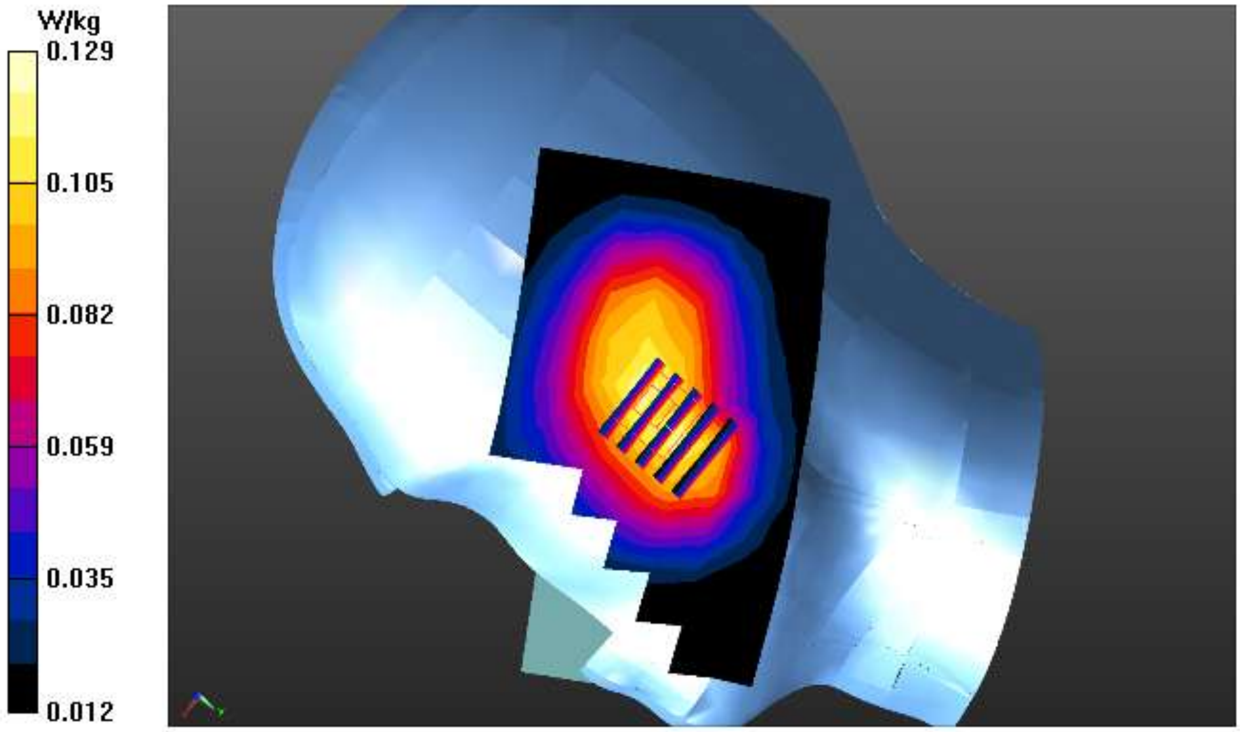
Test Laboratory: AGC Lab **Date: Apr. 25,2015**
GSM 850 Mid-Touch-Right <SIM 1>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, Generic GSM (0); Communication System Band: GSM 850 (824.2 – 848.8 MHz); Duty Cycle: 1:8.3; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ=0.90 mho/m; εr =41.37; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.1

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.12, 10.12, 10.12); Calibrated:11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/R-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.123 W/kg

RIGHT HEAD/R-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.071 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.146 W/kg
SAR(1 g) = 0.109 W/kg; SAR(10 g) = 0.079 W/kg
Maximum value of SAR (measured) = 0.129 W/kg



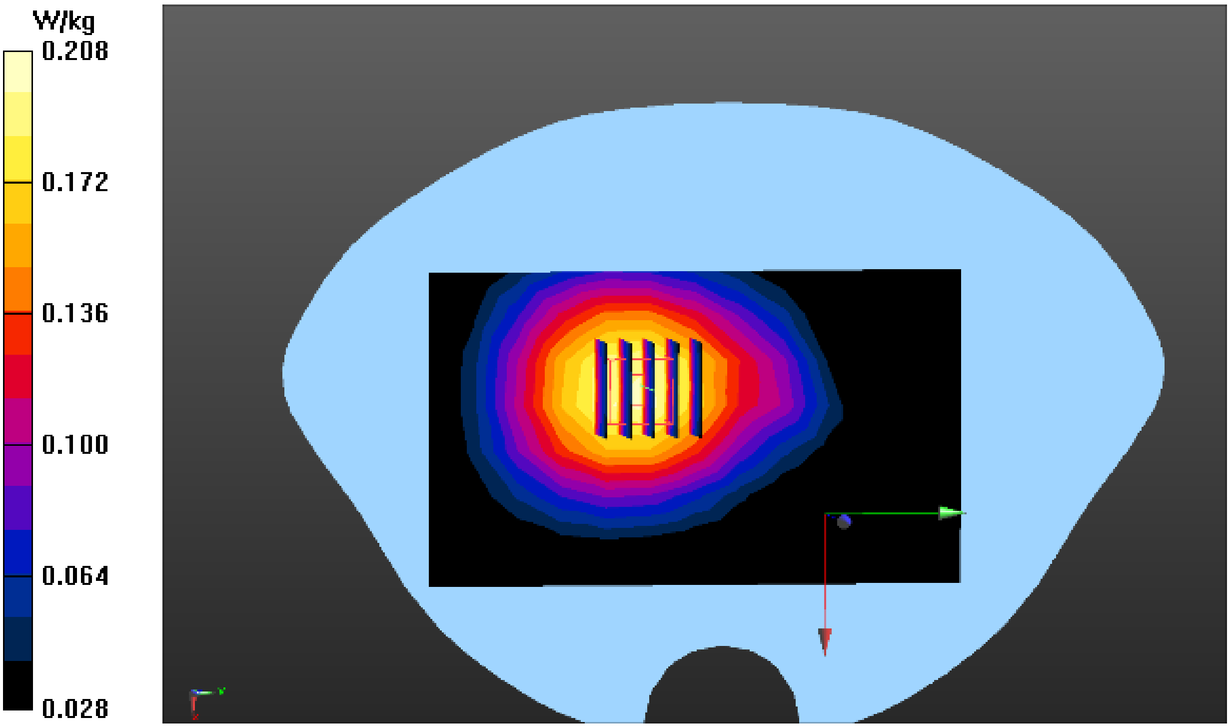
Test Laboratory: AGC Lab **Date: Apr. 25,2015**
GSM 850 Mid- Body- Back
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, Generic GSM (0); Communication System Band: GSM 850 (824.2 – 848.8 MHz); Duty Cycle: 1:8.3;Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ= 0.98mho/m; εr = 54.29; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.3

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QDOVA002AA;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.201 W/kg

BODY/BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.800 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.230 W/kg
SAR(1 g) = 0.178 W/kg; SAR(10 g) = 0.131 W/kg
Maximum value of SAR (measured) = 0.208 W/kg



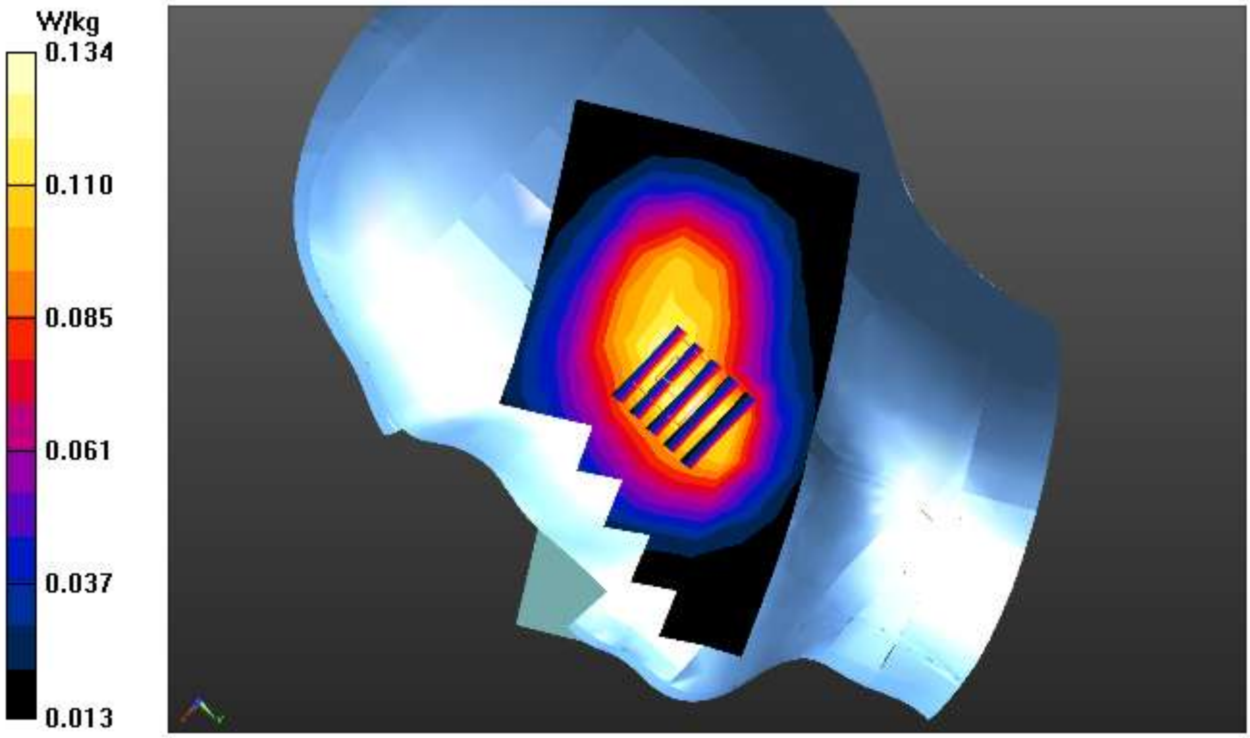
Test Laboratory: AGC Lab **Date: Apr. 25,2015**
GPRS 850 Mid-Touch-Right (2up) <SIM 1>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

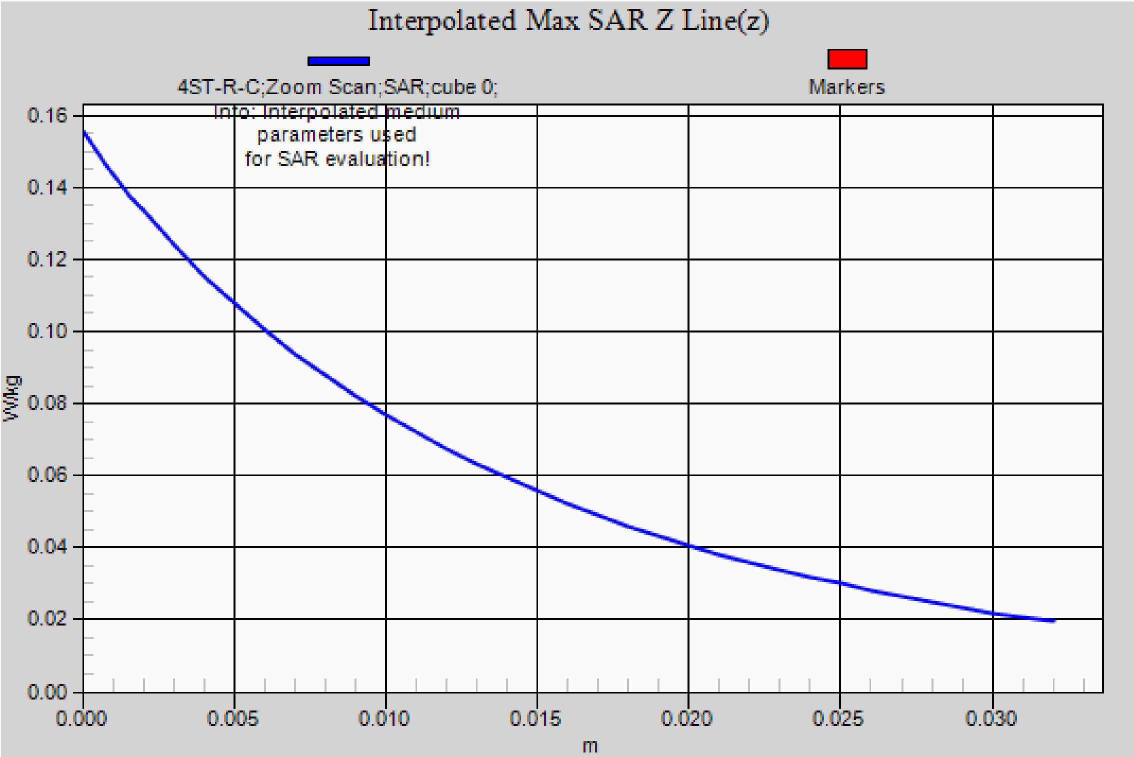
Communication System: GPRS -2 Slot; Communication System Band: GSM 850 (824.2 – 848.8 MHz); Duty Cycle: 1:4.2; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ=0.90 mho/m; εr =41.37; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.1

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.12, 10.12, 10.12); Calibrated:11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/2ST-R-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.135 W/kg

RIGHT HEAD/2ST-R-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.298 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.155 W/kg
SAR(1 g) = 0.115 W/kg; SAR(10 g) = 0.082 W/kg
Maximum value of SAR (measured) = 0.134 W/kg




Interpolated Max SAR Z Line(z)
4ST-R-C;Zoom Scan;SAR;cube 0;
Markers
Info: Interpolated medium parameters used for SAR evaluation!
W/kg
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

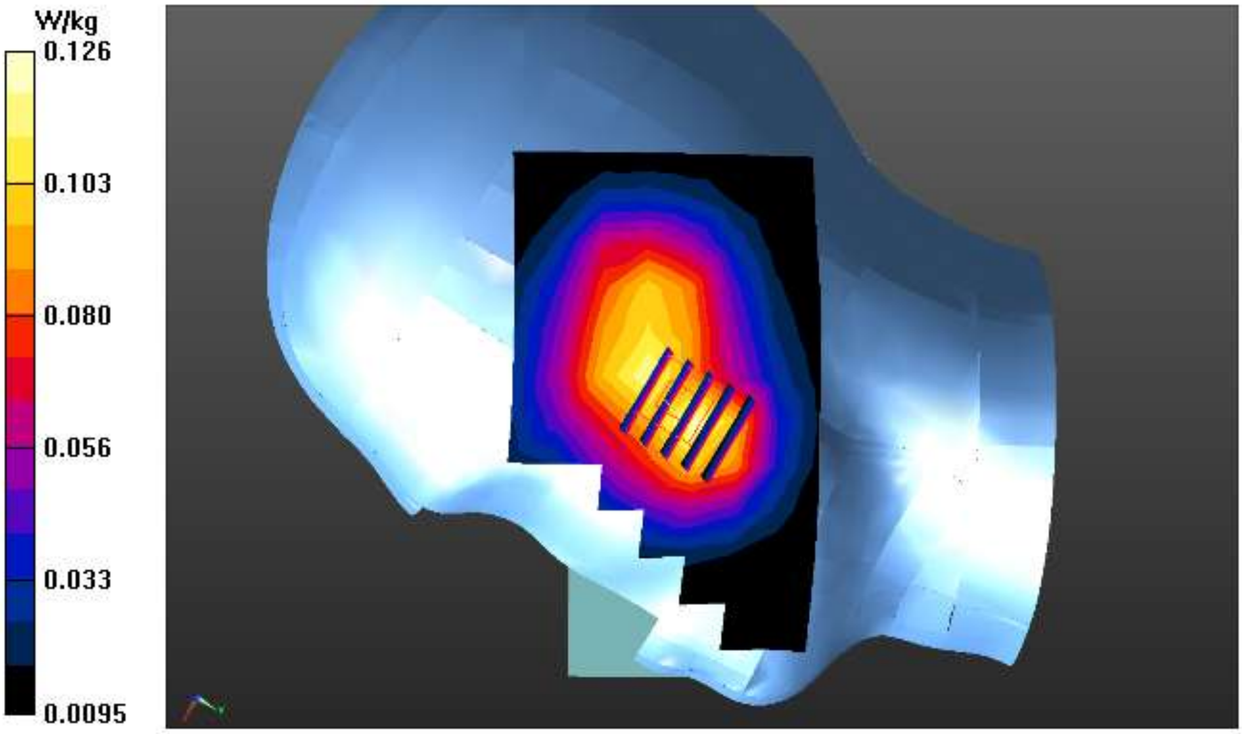
Test Laboratory: AGC Lab **Date: Apr. 25,2015**
GPRS 850 Mid-Touch-Right (2up) <SIM 2>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: GPRS -2 Slot; Communication System Band: GSM 850 (824.2 – 848.8 MHz); Duty Cycle: 1:4.2; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ=0.90 mho/m; εr =41.37; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.1

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.12, 10.12, 10.12); Calibrated:11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/2ST-R-C 2/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.125 W/kg

RIGHT HEAD/2ST-R-C 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.321 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.147 W/kg
SAR(1 g) = 0.100 W/kg; SAR(10 g) = 0.075 W/kg
Maximum value of SAR (measured) = 0.126 W/kg



Test Laboratory: AGC Lab **Date: Apr. 25,2015**
GPRS 850 Mid- Body- Back (2up)
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

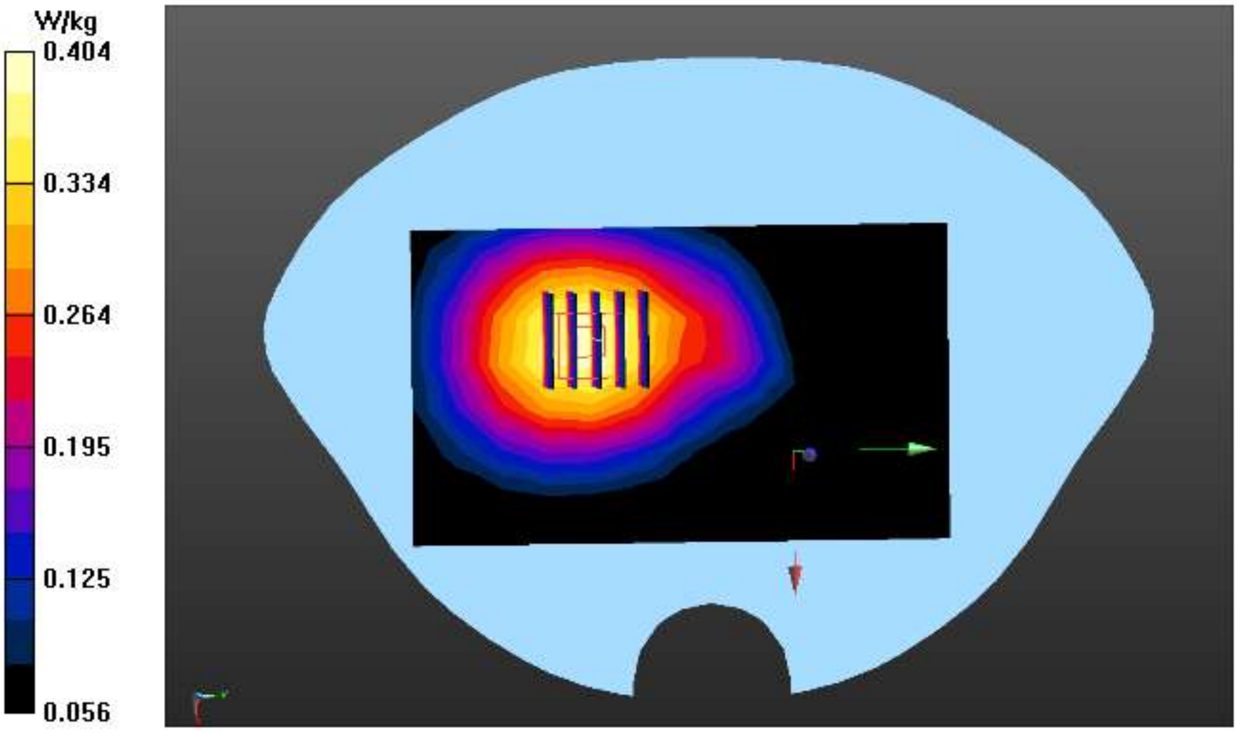
Communication System: GPRS -2 Slot; Communication System Band: GSM 850 (824.2 – 848.8 MHz); Duty Cycle: 1:4.2; Frequency: 836.6 MHz; Medium parameters used: f = 835 MHz; σ= 0.98mho/m; εr = 54.29; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.3

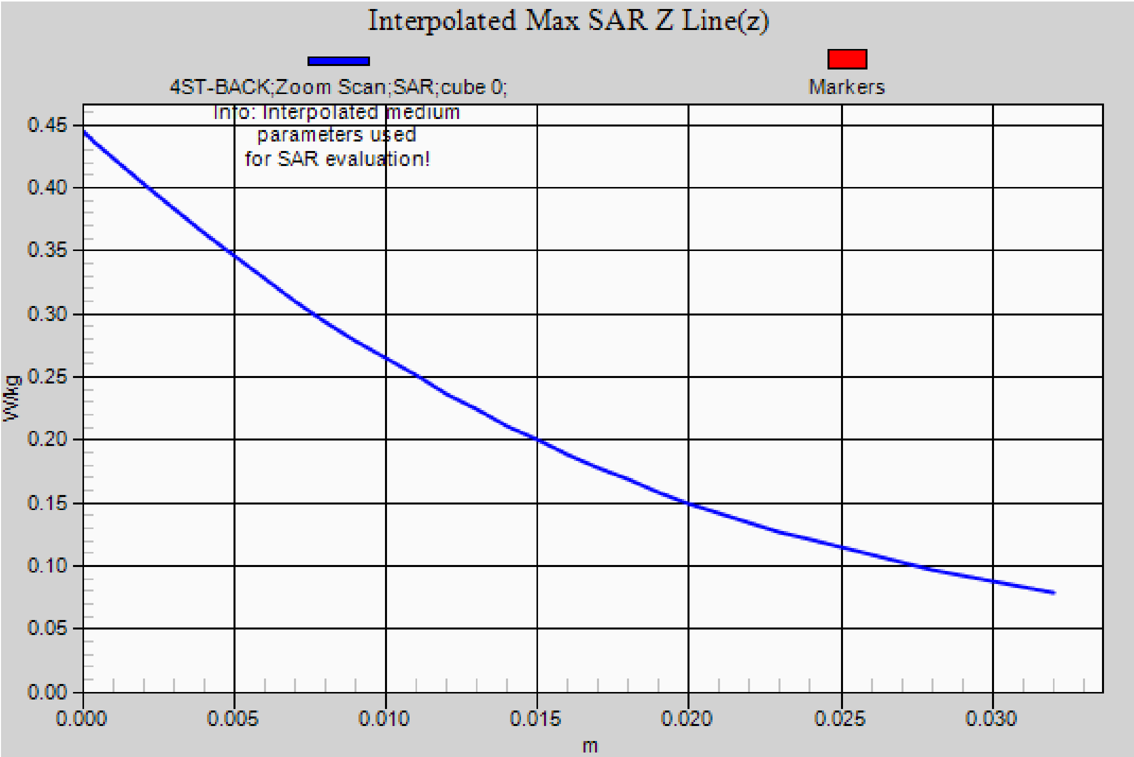
DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QDOVA002AA;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/2ST-BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.398 W/kg

BODY/2ST-BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.799 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.445 W/kg
SAR(1 g) = 0.346 W/kg; SAR(10 g) = 0.255 W/kg
Maximum value of SAR (measured) = 0.404 W/kg




Interpolated Max SAR Z Line(z)
4ST-BACK;Zoom Scan;SAR;cube 0;
Markers
Info: Interpolated medium parameters used for SAR evaluation!
W/kg
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Test Laboratory: AGC Lab **Date: Apr. 22,2015**
PCS 1900 Mid-Touch-Right <SIM 1>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

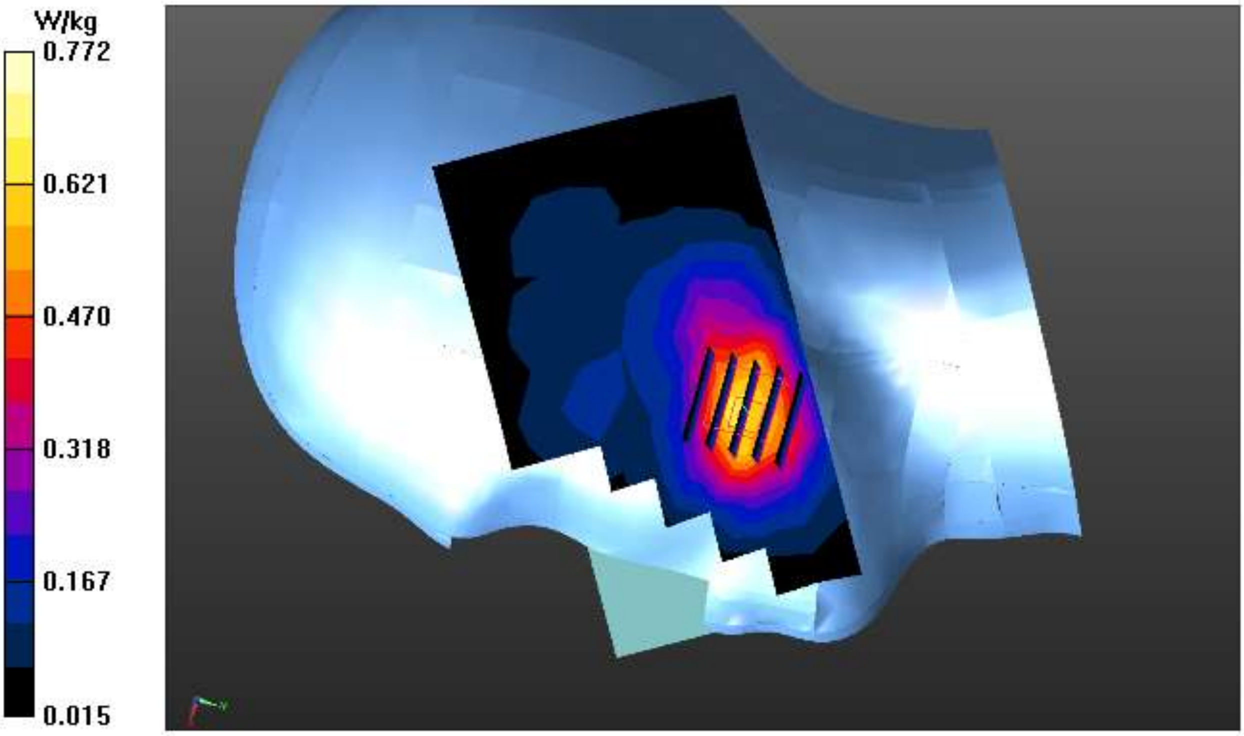
Communication System: UID 0, Generic GSM (0); Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:8.3; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/R-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.673 W/kg

RIGHT HEAD/R-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.724 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.962 W/kg
SAR(1 g) = 0.564 W/kg; SAR(10 g) = 0.324 W/kg
Maximum value of SAR (measured) = 0.772 W/kg



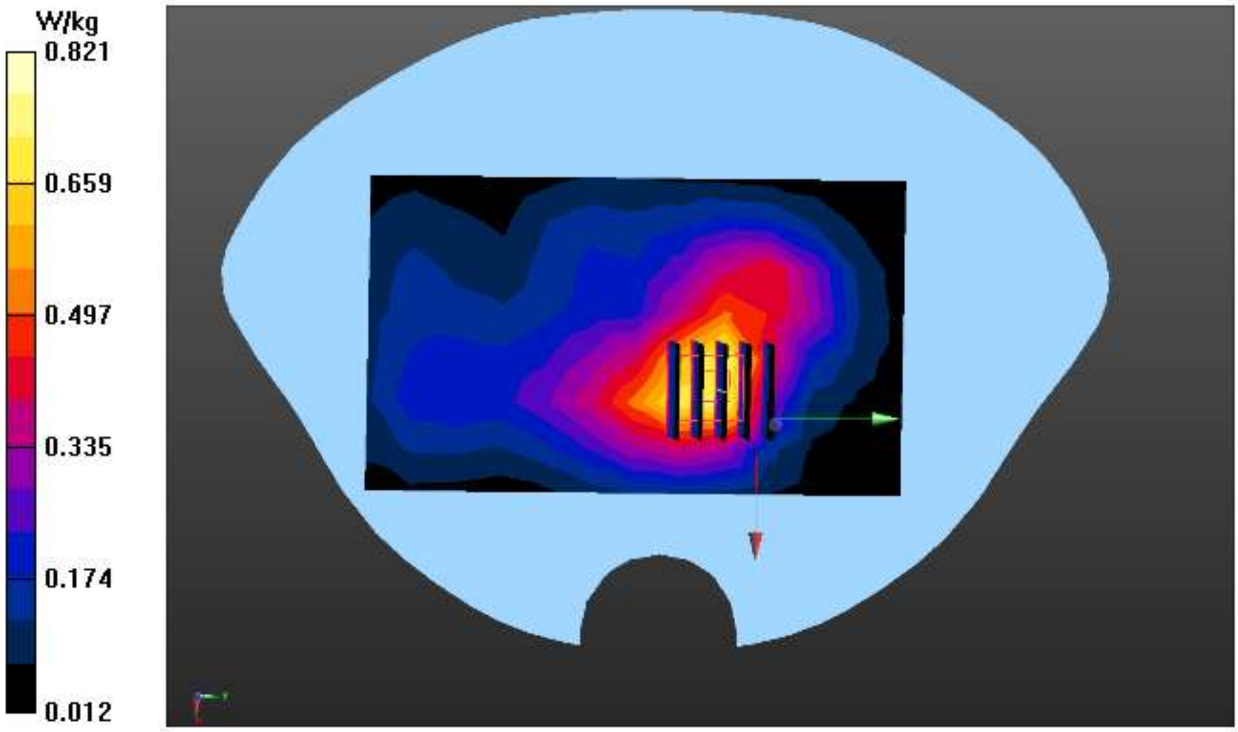
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
PCS 1900 Mid-Body- Back
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, Generic GSM (0); Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:8.3; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.50 mho/m; εr =53.17; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.749 W/kg

BODY/BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.591 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.591 W/kg; SAR(10 g) = 0.339 W/kg
Maximum value of SAR (measured) = 0.821 W/kg



Test Laboratory: AGC Lab **Date: Apr. 22,2015**
GPRS 1900 Low-Touch-Right (4up) <SIM 1>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

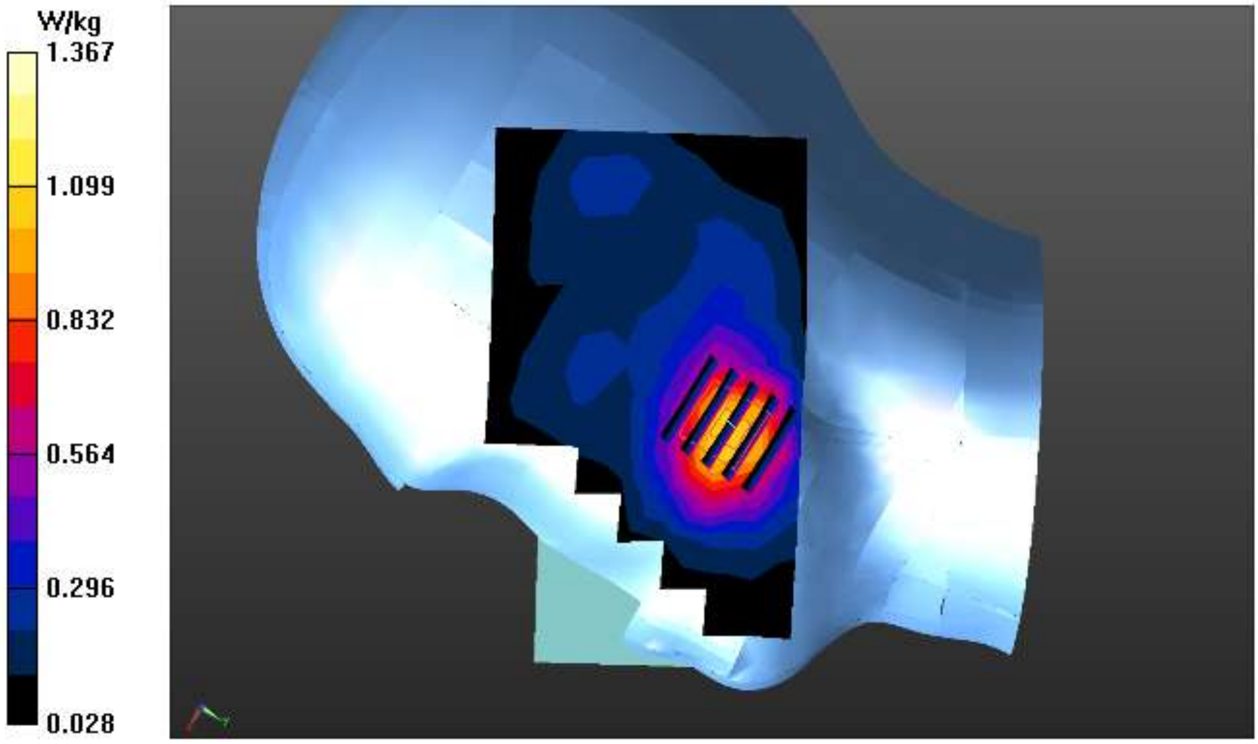
Communication System: GPRS -4 Slot; Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:2.1; Frequency: 1850.2 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

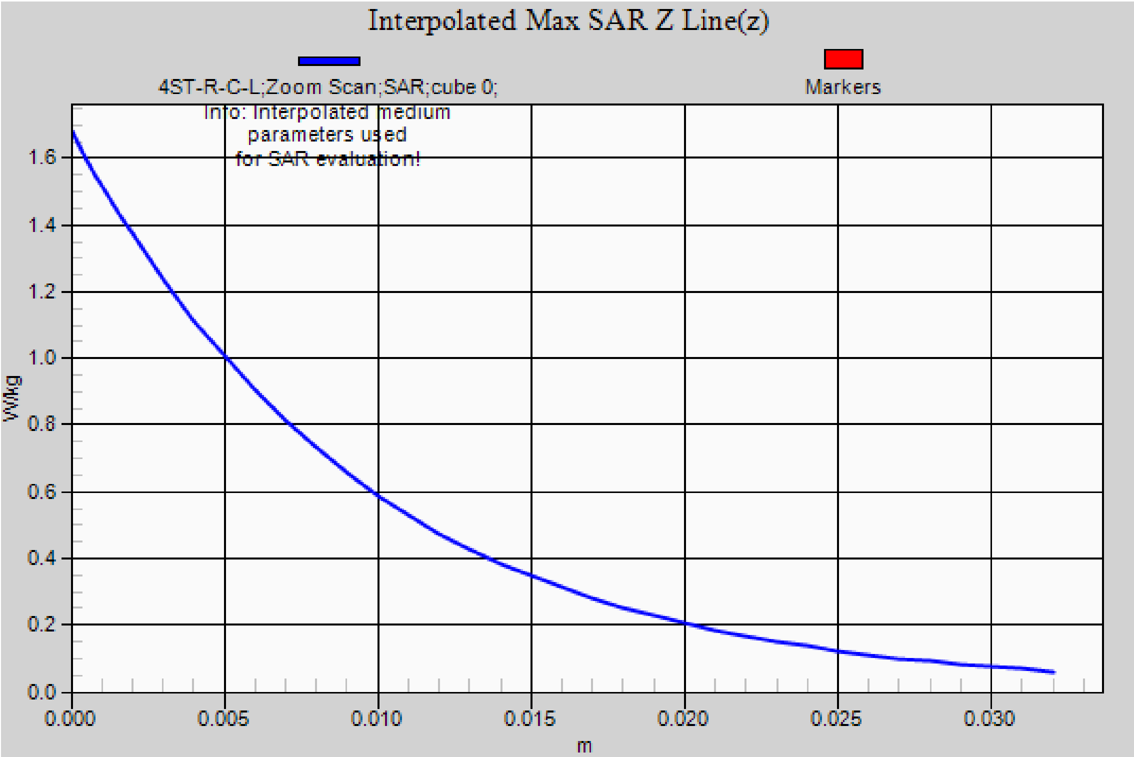
DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/4ST-R-C-L/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.13 W/kg

RIGHT HEAD/4ST-R-C-L/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.540 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.68 W/kg
SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.576 W/kg
Maximum value of SAR (measured) = 1.37 W/kg




Interpolated Max SAR Z Line(z)
4ST-R-C-L;Zoom Scan;SAR;cube 0;
Markers
Info: Interpolated medium
parameters used
for SAR evaluation!
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

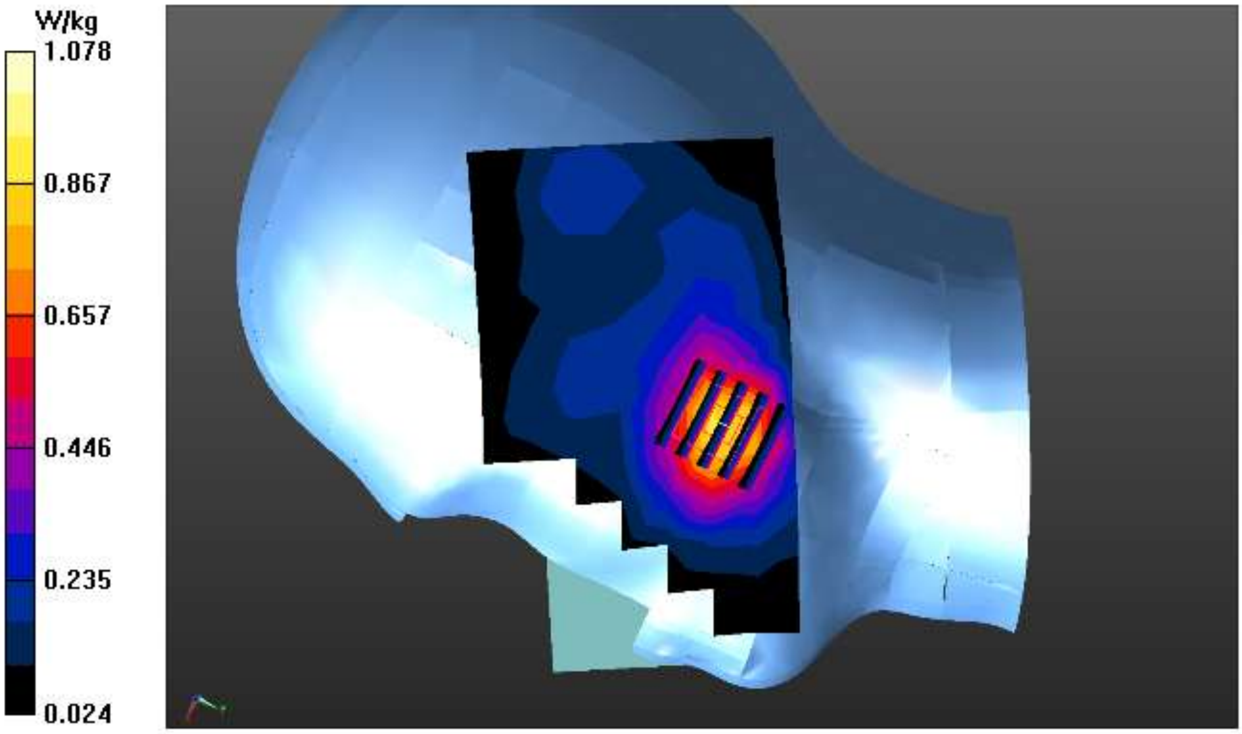
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
GPRS 1900 Low-Touch-Right (4up) <SIM 2>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: GPRS -4 Slot; Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:2.1; Frequency: 1850.2 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/4ST-R-C-L 2/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.888 W/kg

RIGHT HEAD/4ST-R-C-L 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.489 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.805 W/kg; SAR(10 g) = 0.469 W/kg
Maximum value of SAR (measured) = 1.08 W/kg



Test Laboratory: AGC Lab **Date: Apr. 22,2015**
GPRS 1900 Mid-Body- Back (4up)
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

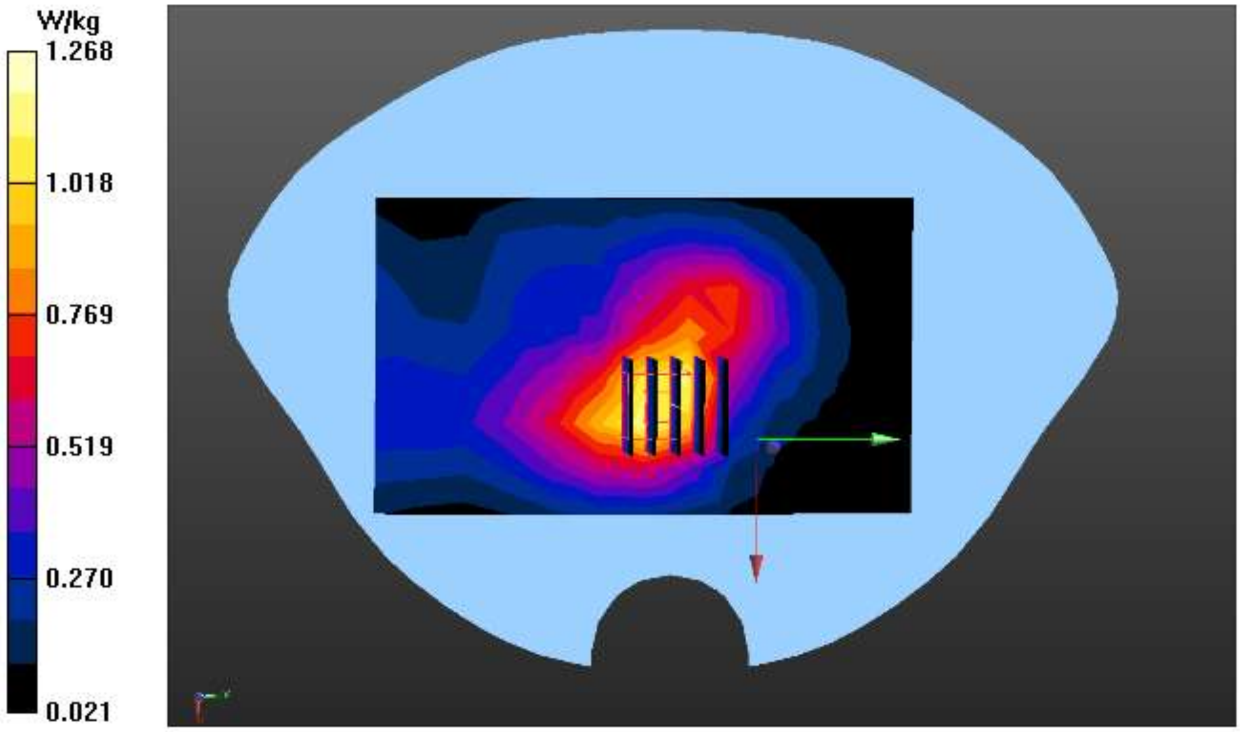
Communication System: GPRS -4 Slot; Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:2.1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.50 mho/m; εr =53.17; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

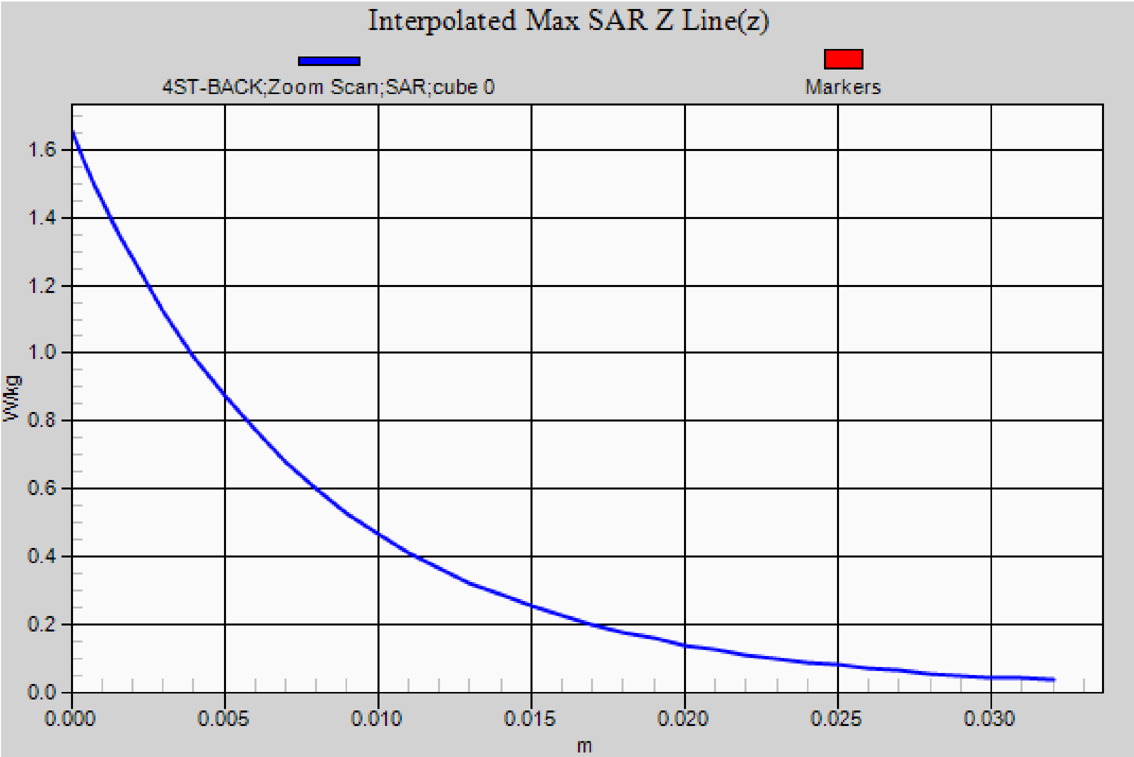
DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/4ST-BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.18 W/kg

BODY/4ST-BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.588 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.915 W/kg; SAR(10 g) = 0.524 W/kg
Maximum value of SAR (measured) = 1.27 W/kg




Interpolated Max SAR Z Line(z)
4ST-BACK;Zoom Scan;SAR;cube 0
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

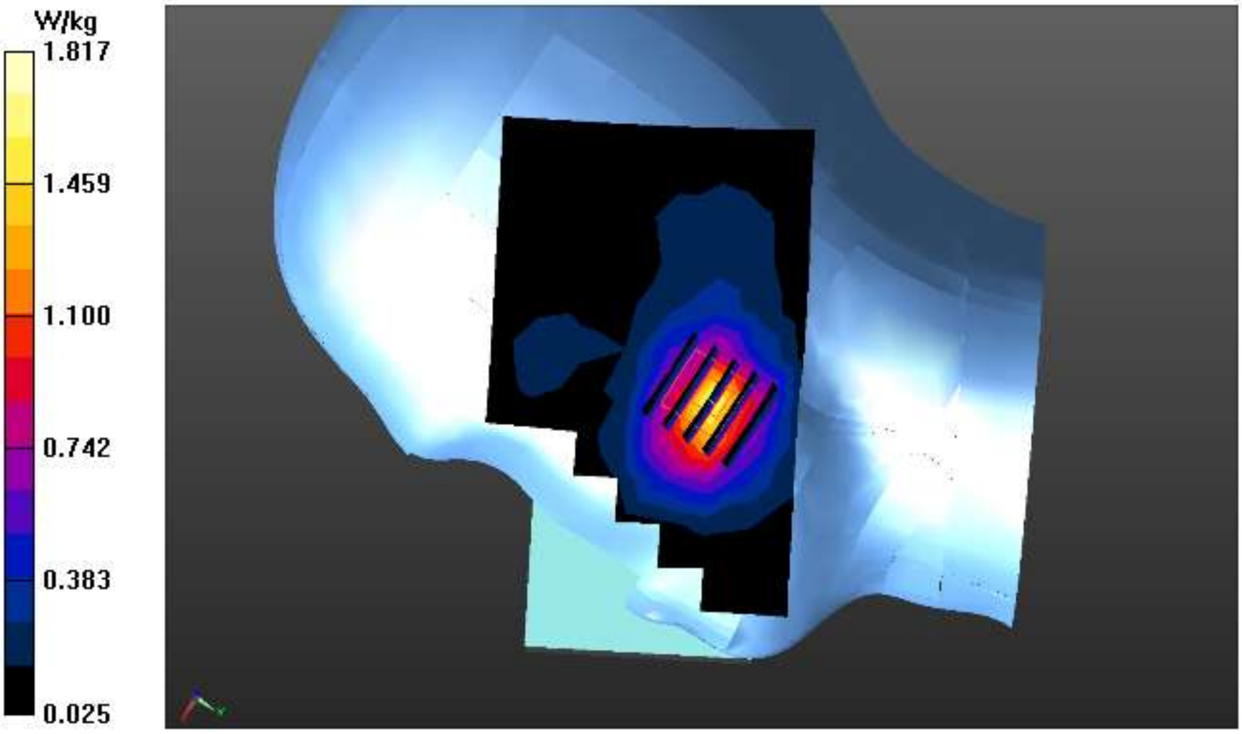
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
WCDMA Band Ⅱ Mid-Touch-Right
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

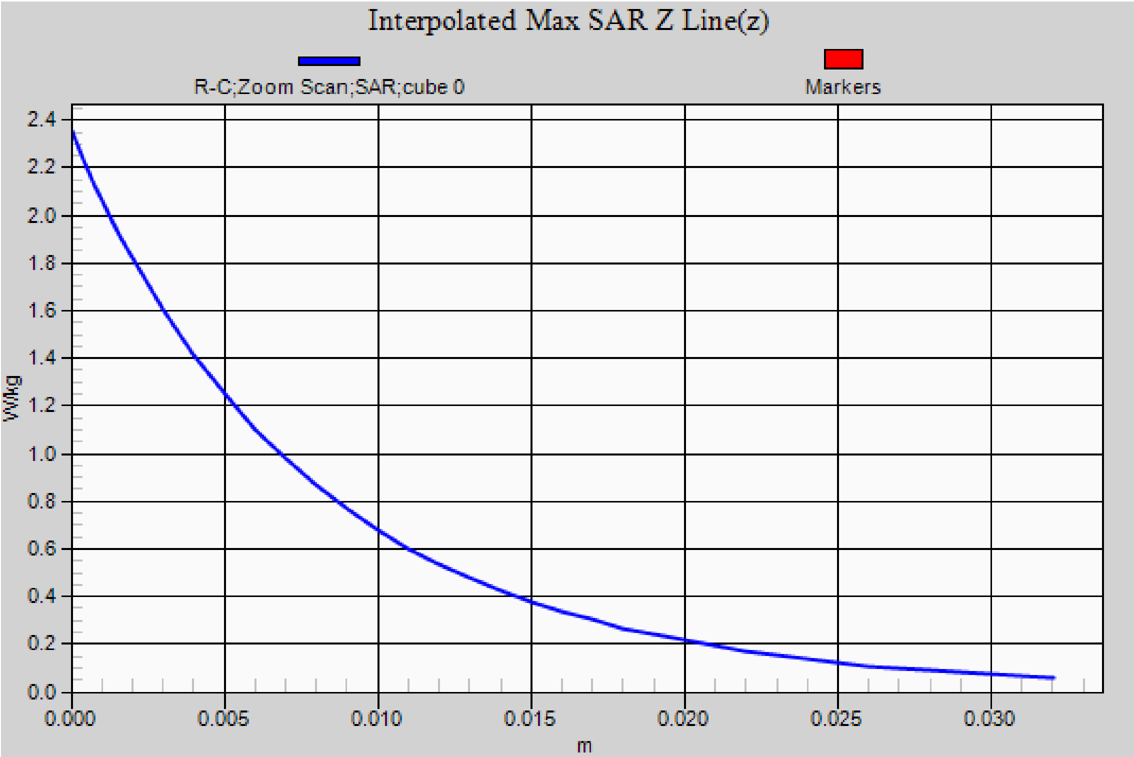
Communication System: UID 0, WCDMA 1900 (0); Communication System Band: Band Ⅱ UTRA/FDD ;
Duty Cycle:1:1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77;
ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/R-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.73 W/kg

RIGHT HEAD/R-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.727 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.35 W/kg
SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.679 W/kg
Maximum value of SAR (measured) = 1.82 W/kg




Interpolated Max SAR Z Line(z)
R-C;Zoom Scan;SAR;cube 0
Markers
W/kg
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

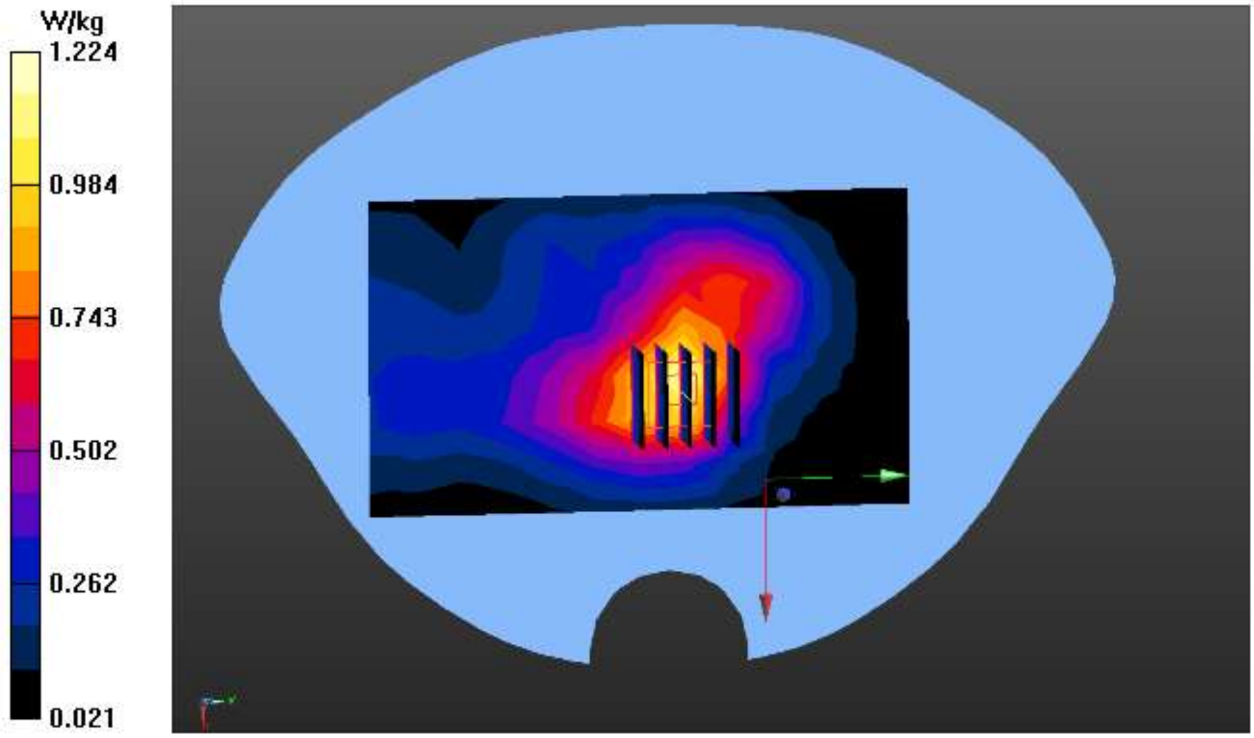
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
WCDMA Band Ⅱ Mid -Body-Towards Grounds
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

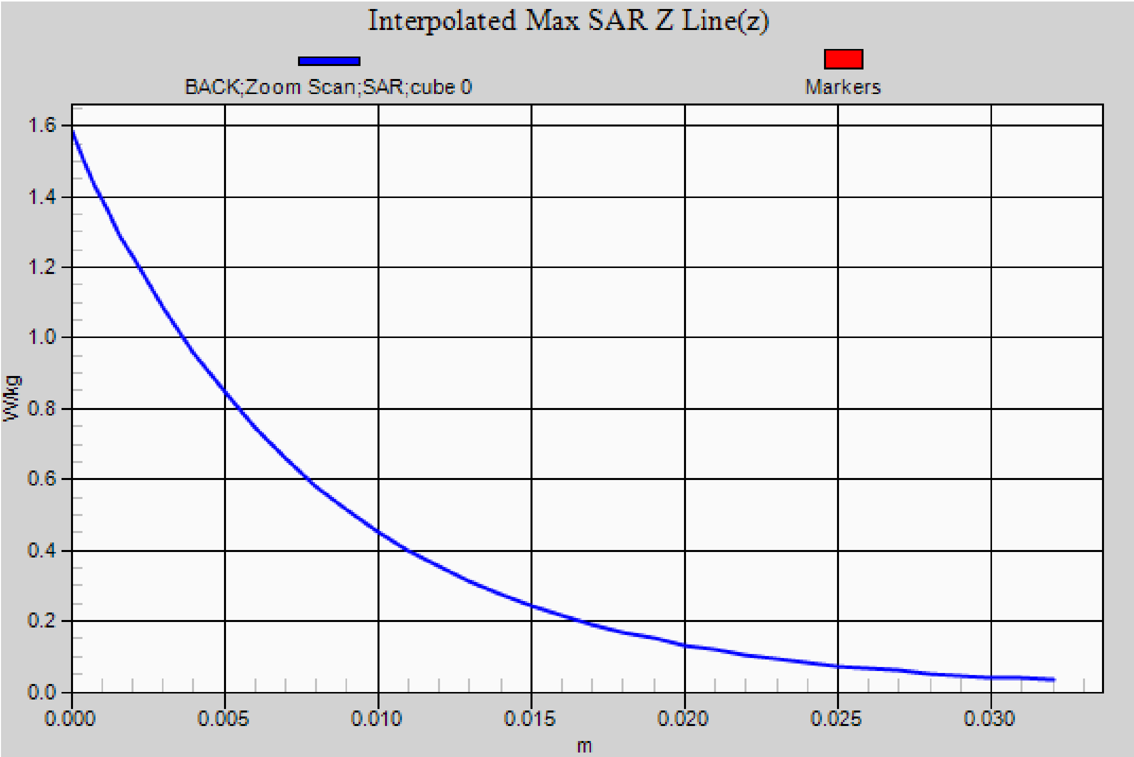
Communication System: UID 0, WCDMA 1900 (0); Communication System Band: Band Ⅱ UTRA/FDD ; Duty Cycle:1:1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ=1.50 mho/m; εr =53.17; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.21 W/kg

BODY/BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.028 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.890 W/kg; SAR(10 g) = 0.511 W/kg
Maximum value of SAR (measured) = 1.22 W/kg




Interpolated Max SAR Z Line(z)
BACK;Zoom Scan;SAR;cube 0
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

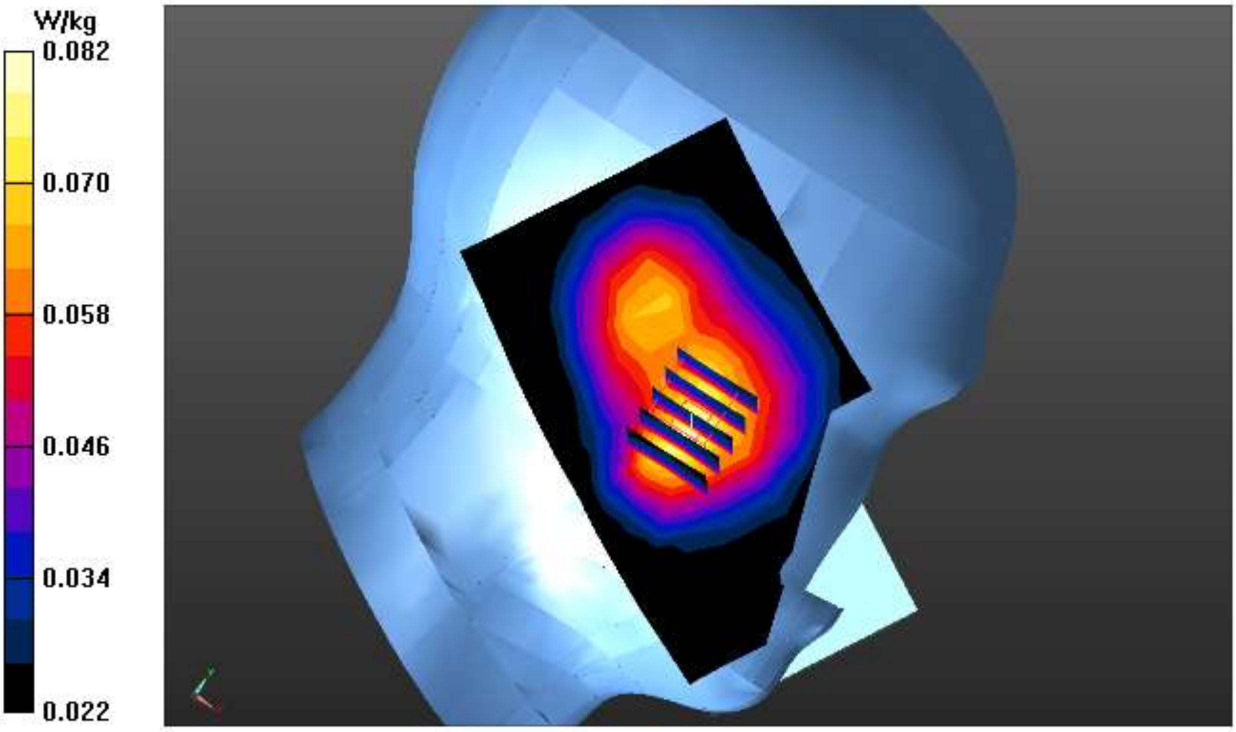
Test Laboratory: AGC Lab **Date: Apr. 25,2015**
WCDMA Band Ⅴ Mid-Touch-Left
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

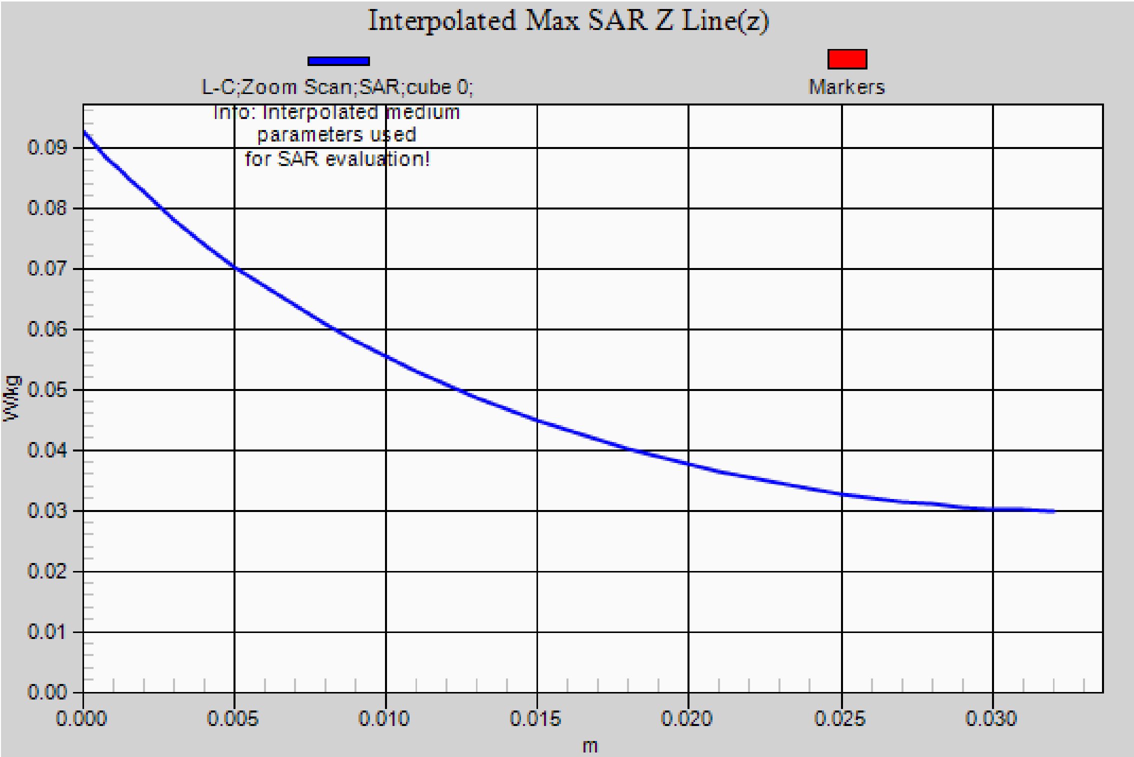
Communication System: UID 0, WCDMA 850 (0); Communication System Band: BAND Ⅴ UTRA/FDD;
Duty Cycle:1:1; Frequency: 835 MHz; Medium parameters used: f = 835 MHz; σ=0.90 mho/m; εr =41.37
ρ= 1000 kg/m³ ;
Phantom section: Left Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.1

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.12, 10.12, 10.12); Calibrated:11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

LEFT HEAD/L-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.0826 W/kg

LEFT HEAD/L-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.355 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.0930 W/kg
SAR(1 g) = 0.070 W/kg; SAR(10 g) = 0.053 W/kg
Maximum value of SAR (measured) = 0.0825 W/kg




Interpolated Max SAR Z Line(z)
L-C;Zoom Scan;SAR;cube 0;
Markers
Info: Interpolated medium
parameters used
for SAR evaluation!
W/kg
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Test Laboratory: AGC Lab **Date: Apr. 25,2015**

WCDMA Band Ⅴ Mid-Body-Towards Grounds

DUT: GSM/WCDMA Mobile Phone; Type: Freedom

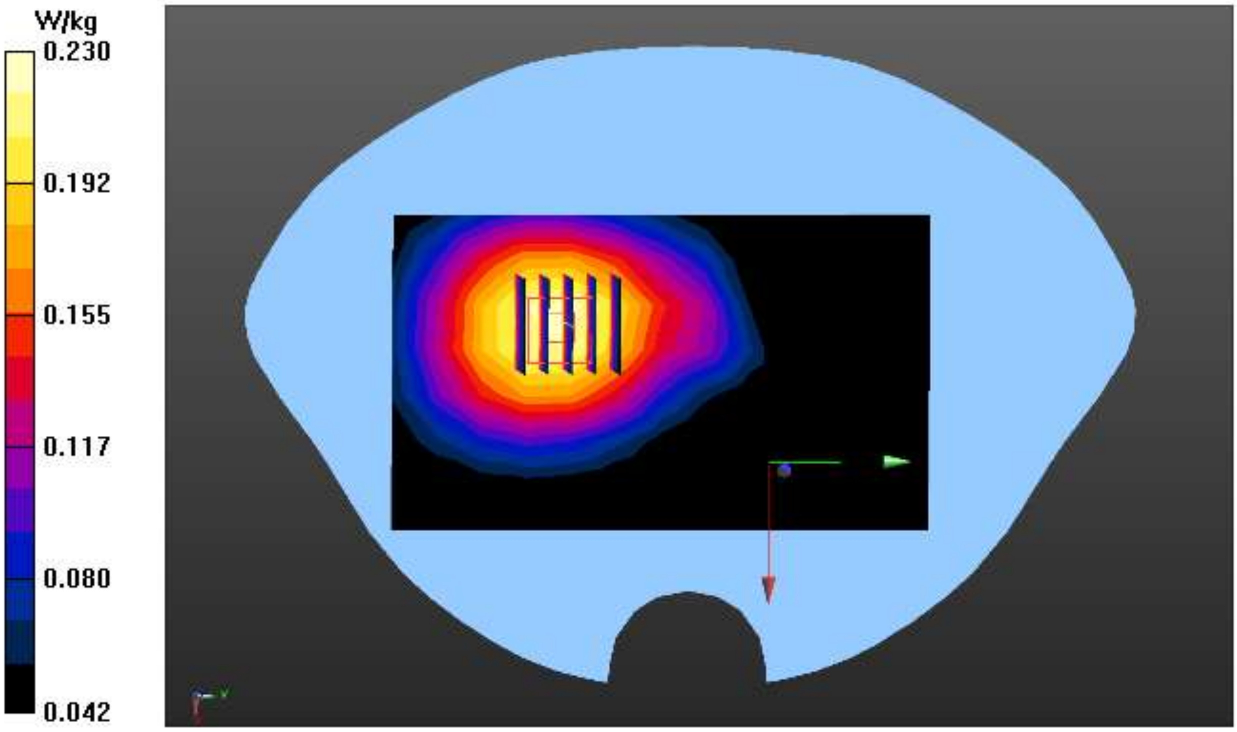
Communication System: UID 0, WCDMA 850 (0); Communication System Band: BAND Ⅴ UTRA/FDD; Duty Cycle:1:1; Frequency: 835 MHz; Medium parameters used: f = 835 MHz;σ=0.98 mho/m; εr =54.29; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.5, Liquid temperature (℃): 22.3

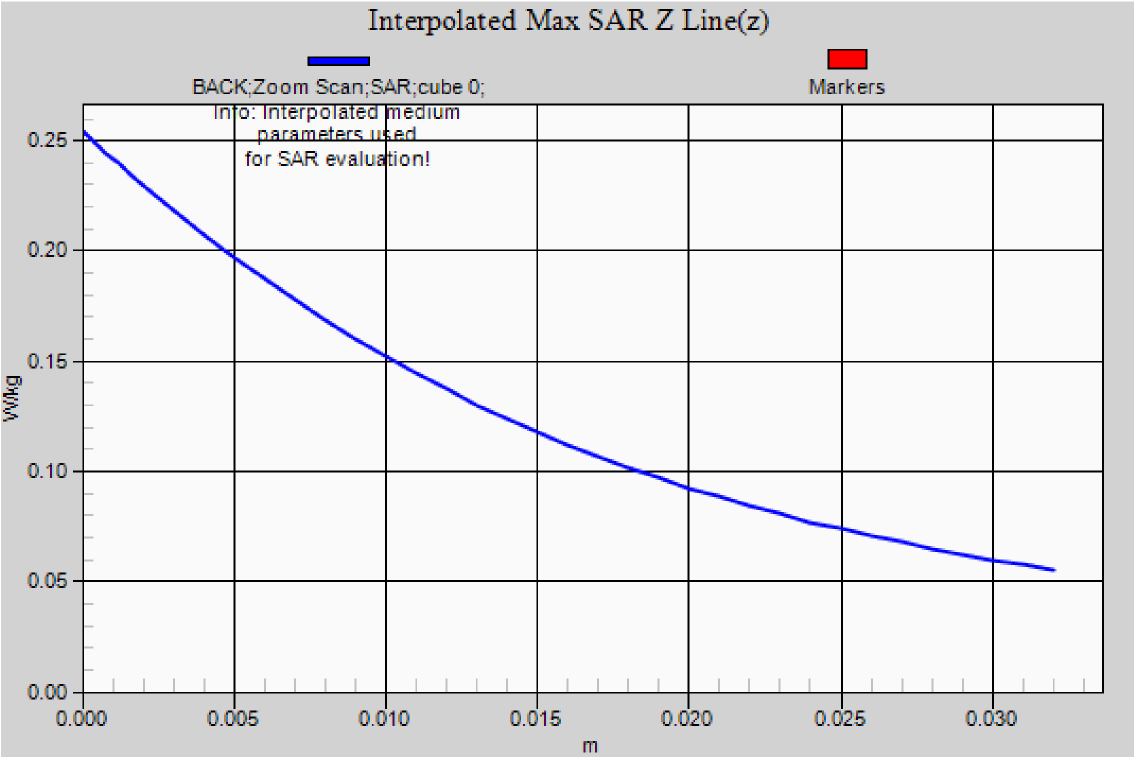
DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.223 W/kg

BODY/BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.427 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.254 W/kg
SAR(1 g) = 0.198 W/kg; SAR(10 g) = 0.149 W/kg
Maximum value of SAR (measured) = 0.230 W/kg




Interpolated Max SAR Z Line(z)
BACK;Zoom Scan;SAR;cube 0;
Markers
Info: Interpolated medium parameters used for SAR evaluation!
W/kg
0.25
0.20
0.15
0.10
0.05
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

WIFI MODE

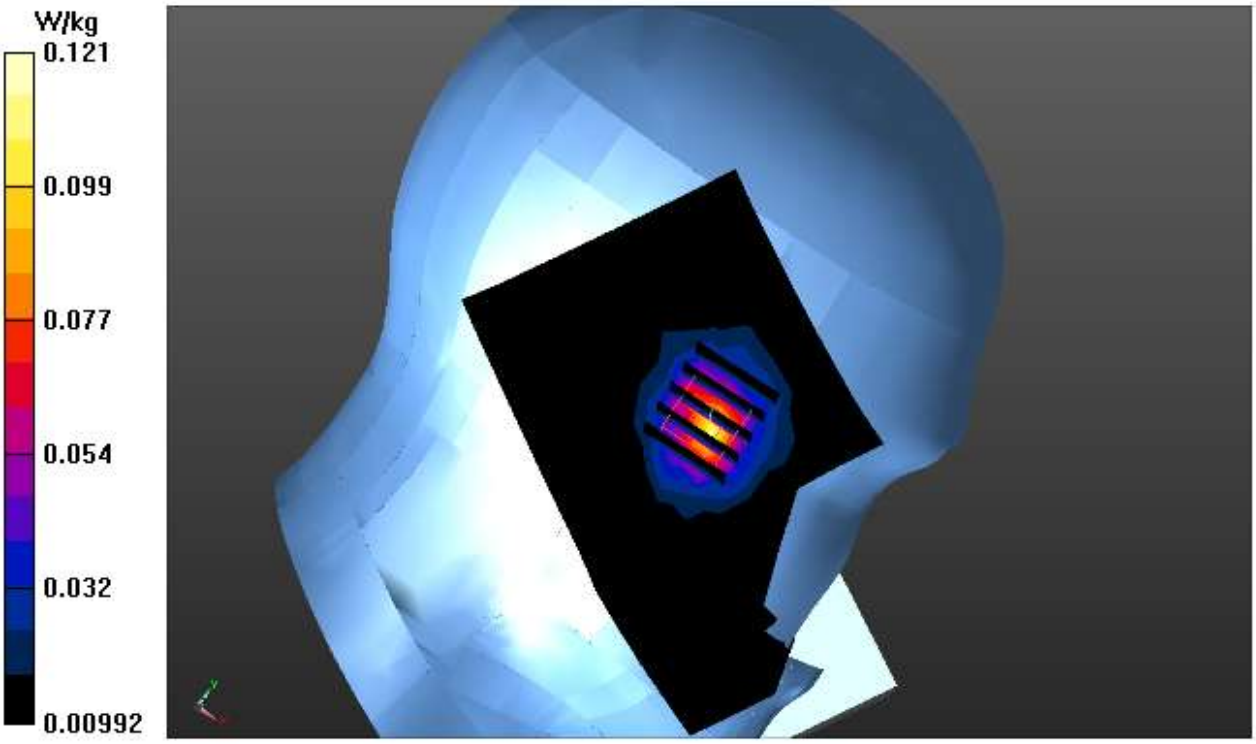
Test Laboratory: AGC Lab **Date: Apr. 28,2015**
802.11b Mid-Touch-Left
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, WiFi 802.11b (0); Communication System Band: 802.11b; Duty Cycle: 1:1; Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=1.80 mho/m; εr =40.24;ρ= 1000 kg/m³ ;
Phantom section: Left Section
Ambient temperature (℃): 21.9, Liquid temperature (℃): 21.5

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

LEFT HEAD/L-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.112 W/kg

LEFT HEAD/L-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.743 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.175 W/kg
SAR(1 g) = 0.081 W/kg; SAR(10 g) = 0.042 W/kg
Maximum value of SAR (measured) = 0.121 W/kg



Test Laboratory: AGC Lab **Date: TTDD**
802.11b Mid- Edge 3 (DTS)
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

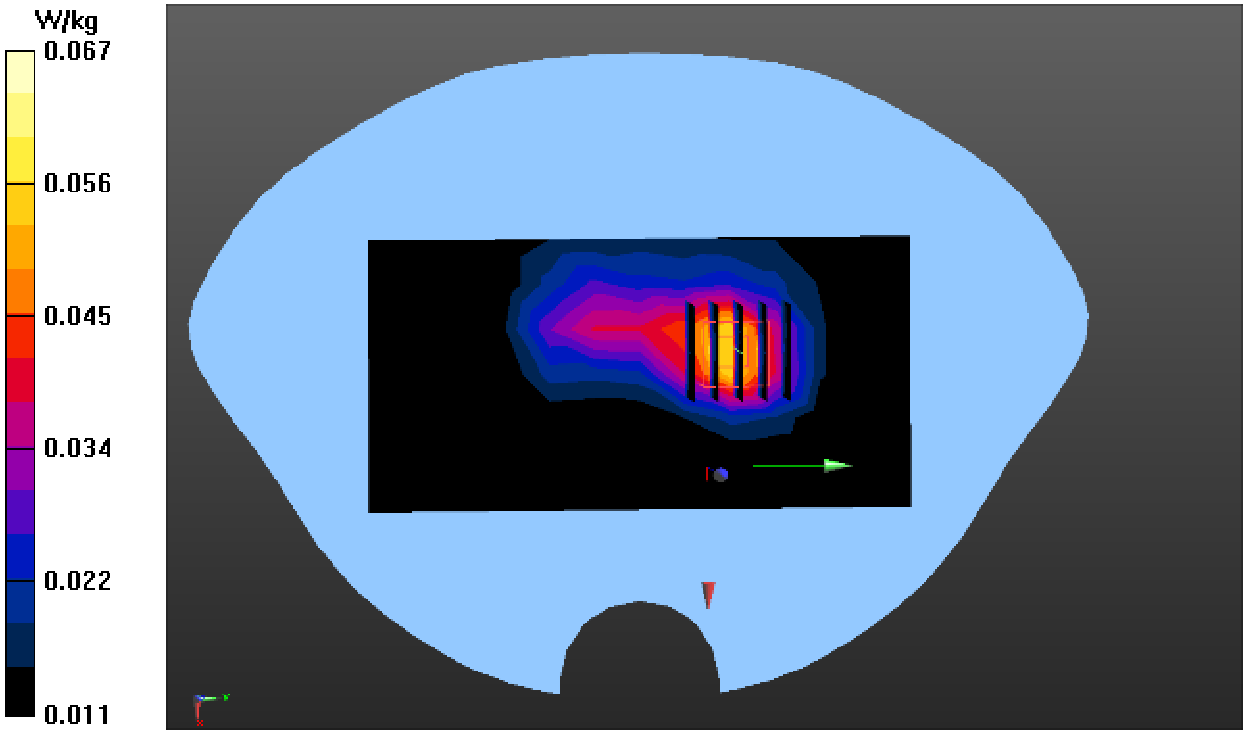
Communication System: UID 0, WiFi 802.11b (0); Communication System Band: 802.11b; Duty Cycle: 1:1;
Frequency: 2437 MHz; Medium parameters used: f = 2450 MHz; σ=σF mho/m; εr =53.15;; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃): 21.9, Liquid temperature (℃): 21.8

DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(10.08,10.08, 10.08); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BDOY/2/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.0561 W/kg

BDOY/2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.242 V/m; Power Drift = 0.30 dB
Peak SAR (extrapolated) = 0.0860 W/kg
SAR(1 g) = 0.050 W/kg; SAR(10 g) = 0.030 W/kg
Maximum value of SAR (measured) = 0.0674 W/kg



Repeated SAR (Once)

Test Laboratory: AGC Lab **Date: Apr. 22,2015**
GPRS 1900 Low-Touch-Right (4up) <SIM 1>
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

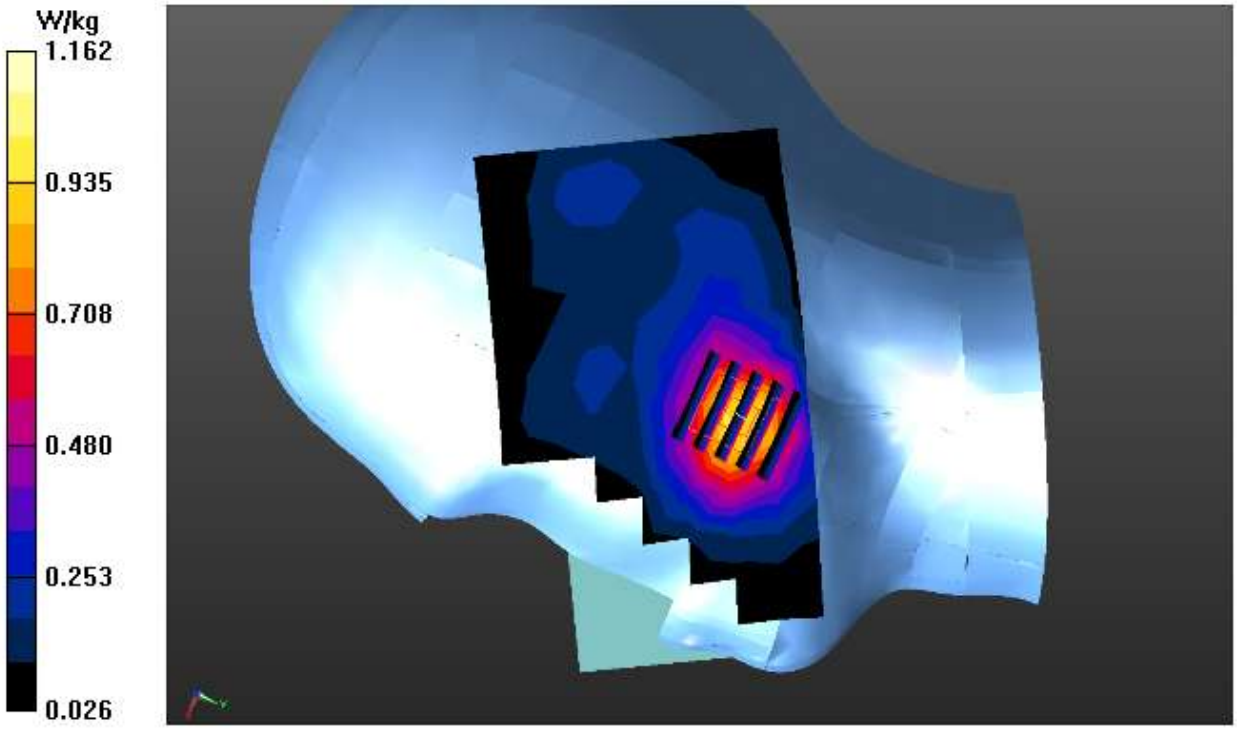
Communication System: GPRS -4 Slot; Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:2.1; Frequency: 1850.2 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77; ρ= 1000 kg/m³ ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/REPEATED-4ST-R-C-L /Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.956 W/kg

RIGHT HEAD/REPEATED-4ST-R-C-L /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.703 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 0.867 W/kg; SAR(10 g) = 0.501 W/kg
Maximum value of SAR (measured) = 1.16 W/kg



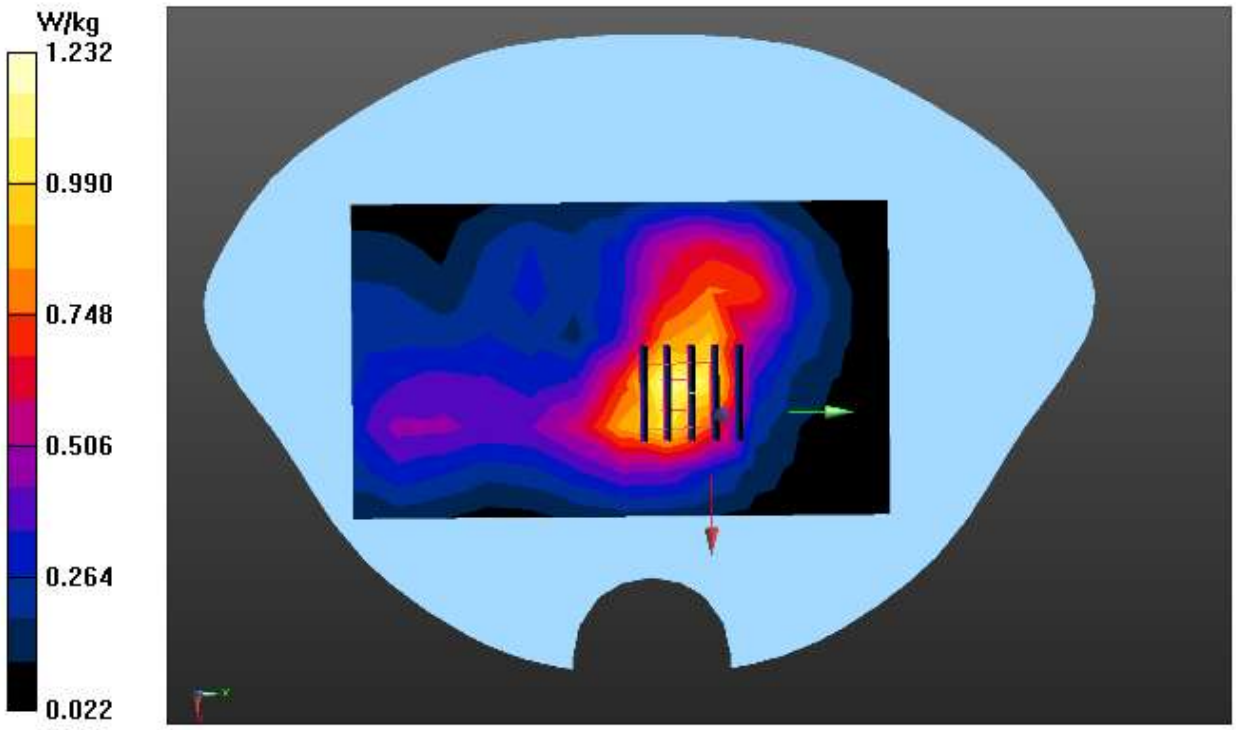
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
GPRS 1900 Mid-Body- Back (4up)
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: GPRS -4 Slot; Communication System Band: PCS 1900 (1850.2 – 1909.8 MHz); Duty Cycle: 1:2.1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.50 mho/m; εr =53.17; ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/REPEATED-4ST-BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.17 W/kg

BODY/REPEATED-4ST-BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.351 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.62 W/kg
SAR(1 g) = 0.899 W/kg; SAR(10 g) = 0.515 W/kg
Maximum value of SAR (measured) = 1.23 W/kg



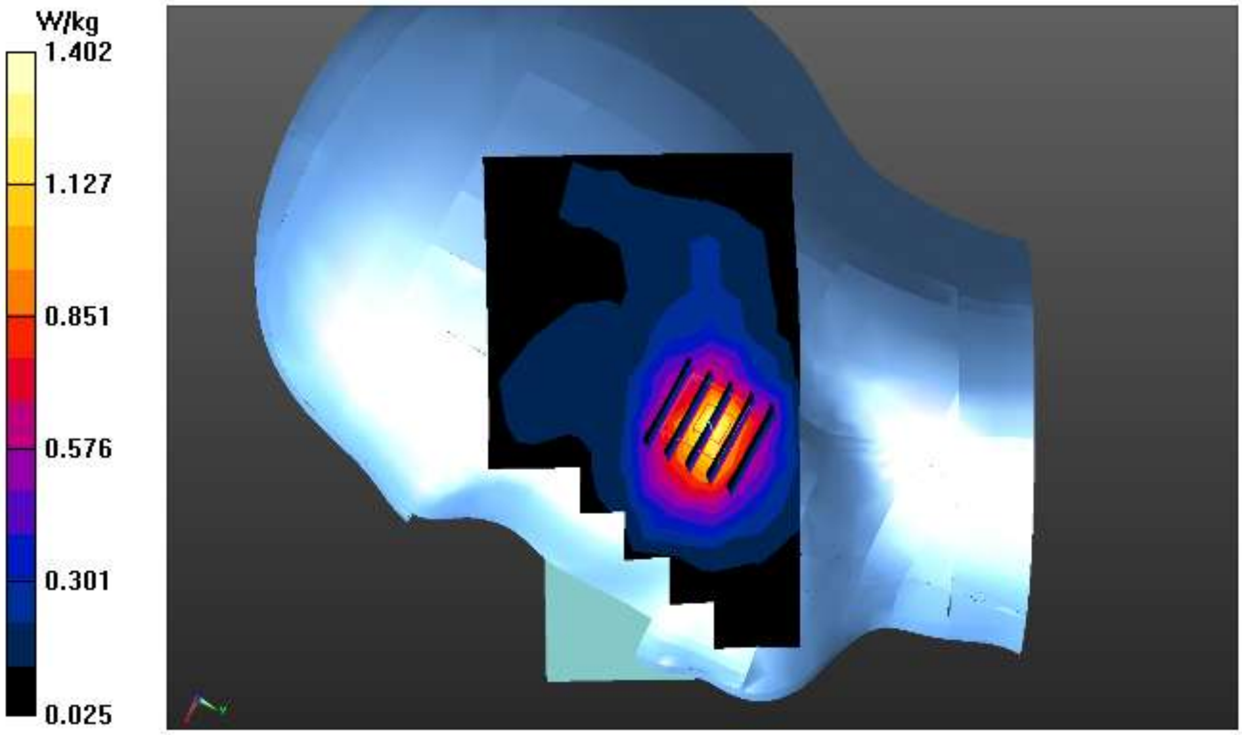
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
WCDMA Band Ⅱ Mid-Touch-Right
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, WCDMA 1900 (0); Communication System Band: Band Ⅱ UTRA/FDD ;
Duty Cycle:1:1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77;
ρ= 1000 kg/m^3 ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/REPEATED-R-C/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.37 W/kg

RIGHT HEAD/REPEATED-R-C/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.614 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 1.04 W/kg; SAR(10 g) = 0.583 W/kg
Maximum value of SAR (measured) = 1.40 W/kg



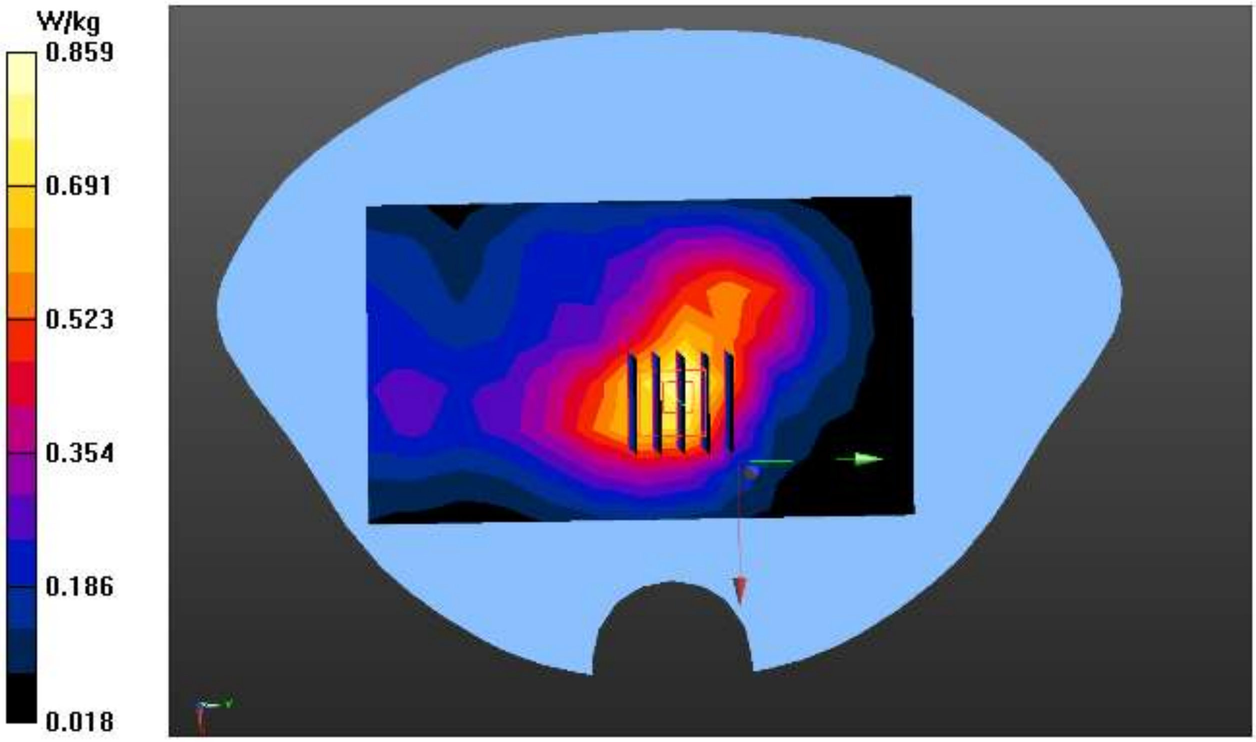
Test Laboratory: AGC Lab **Date: Apr. 22,2015**
WCDMA Band Ⅱ Mid -Body-Towards Grounds
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

Communication System: UID 0, WCDMA 1900 (0); Communication System Band: Band Ⅱ UTRA/FDD ;
Duty Cycle:1:1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ=1.50 mho/m; εr =53.17;
ρ= 1000 kg/m³ ;
Phantom section: Flat Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 21.7

DASY Configuration:
- Probe: EX3DV4 - SN3953; ConvF(7.79,7.79,7.79); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

BODY/REPEATED-BACK/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.846 W/kg

BODY/REPEATED-BACK/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.411 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.631 W/kg; SAR(10 g) = 0.371 W/kg
Maximum value of SAR (measured) = 0.859 W/kg



Repeated SAR (Twice)

Test Laboratory: AGC Lab **Date: Apr. 22,2015**
WCDMA Band Ⅱ Mid-Touch-Right
DUT: GSM/WCDMA Mobile Phone; Type: Freedom

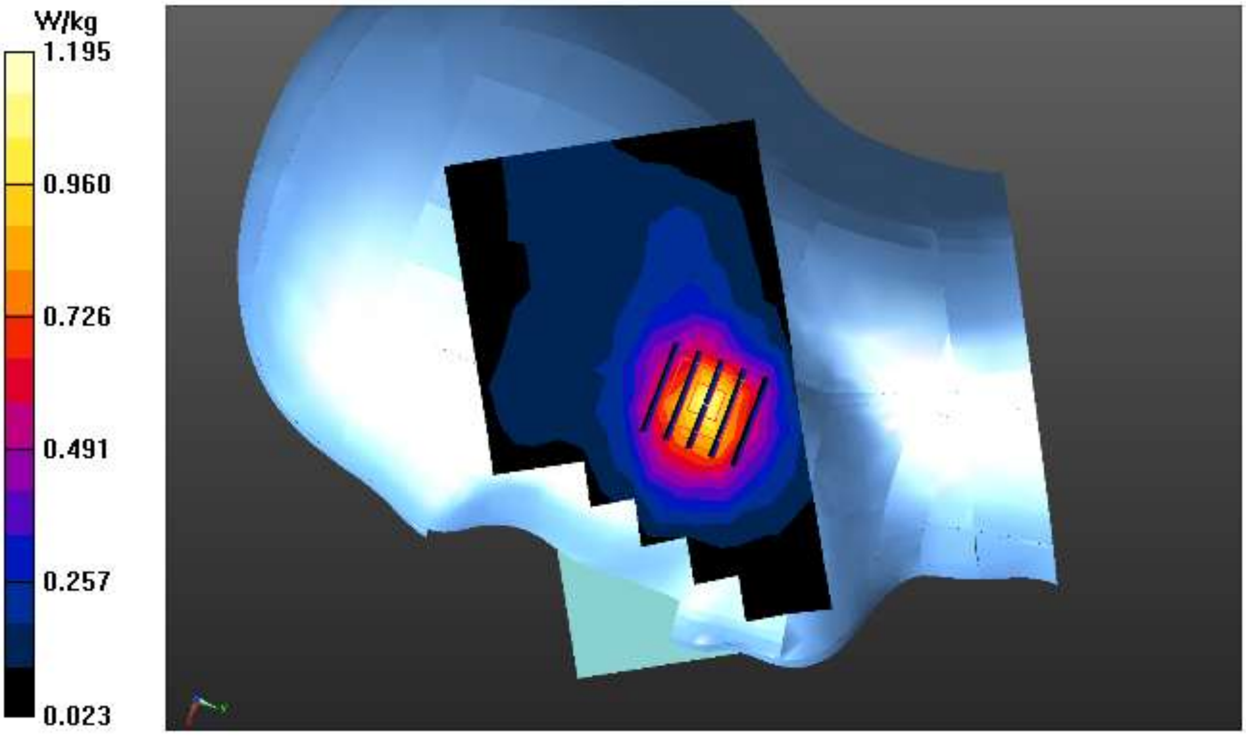
Communication System: UID 0, WCDMA 1900 (0); Communication System Band: Band Ⅱ UTRA/FDD ;
Duty Cycle:1:1; Frequency: 1880 MHz; Medium parameters used: f = 1900 MHz; σ= 1.39 mho/m; εr =40.77;
ρ= 1000 kg/m^3 ;
Phantom section: Right Section
Ambient temperature (℃):22.2, Liquid temperature (℃): 22

DASY Configuration:

- Probe: EX3DV4 - SN3953; ConvF(7.89, 7.89, 7.89); Calibrated: 11/06/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1398; Calibrated: 03/11/2015
- Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

RIGHT HEAD/REPEATED-R-C 2/Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.15 W/kg

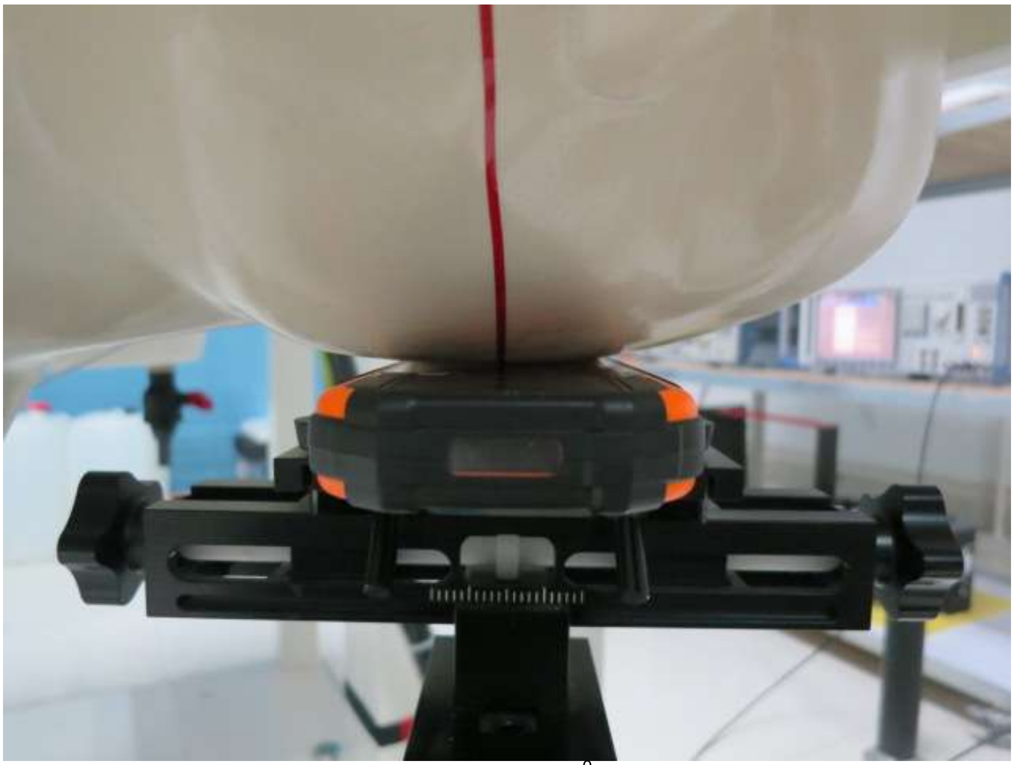
RIGHT HEAD/REPEATED-R-C 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.239 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.46 W/kg
SAR(1 g) = 0.886 W/kg; SAR(10 g) = 0.505 W/kg
Maximum value of SAR (measured) = 1.19 W/kg



APPENDIX C. TEST SETUP PHOTOGRAPHS &EUT PHOTOGRAPHS

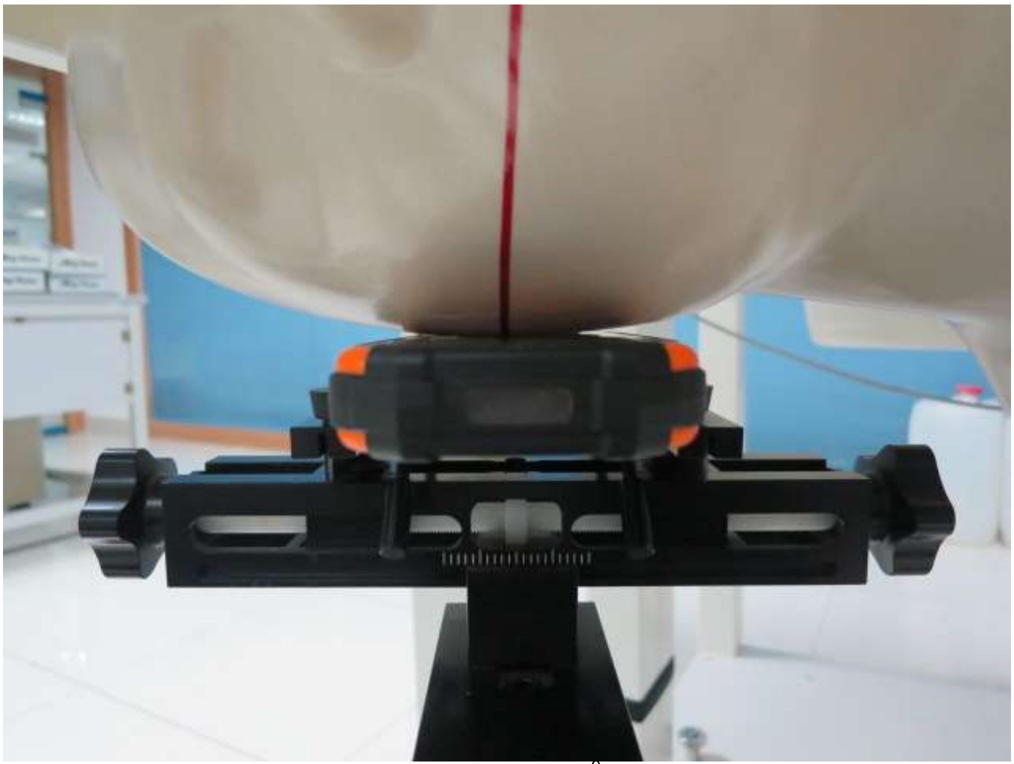
Test Setup Photographs

LEFT-CHECK TOUCH



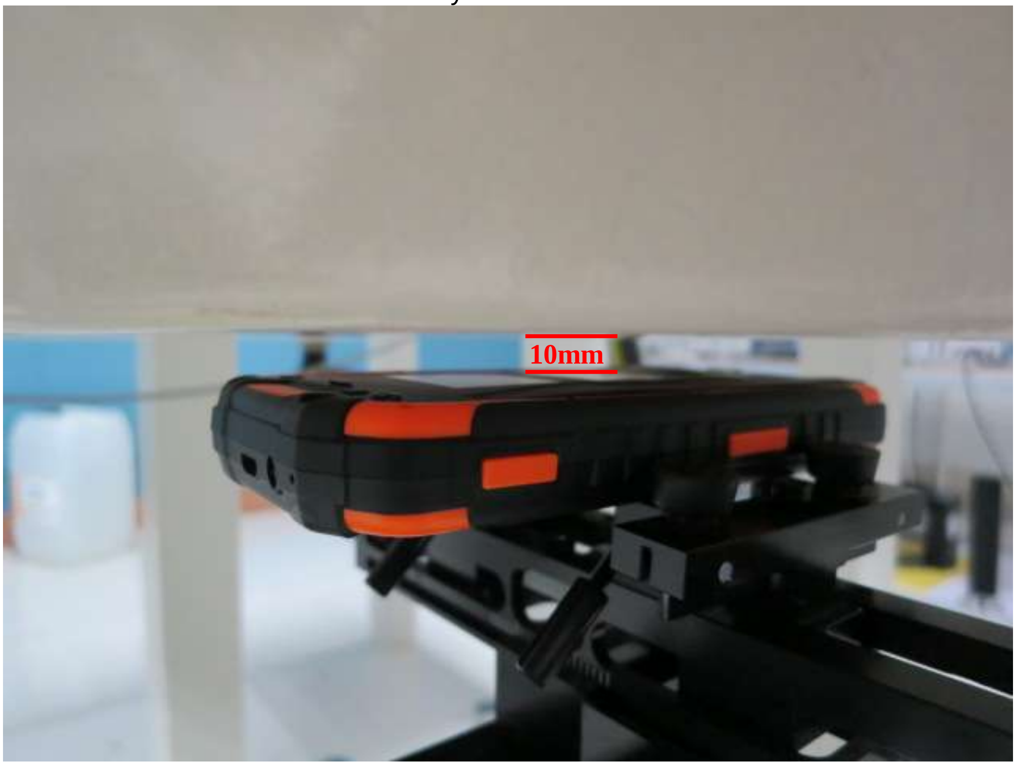
LEFT-TILT 15^0

RIGHT-CHECK TOUCH

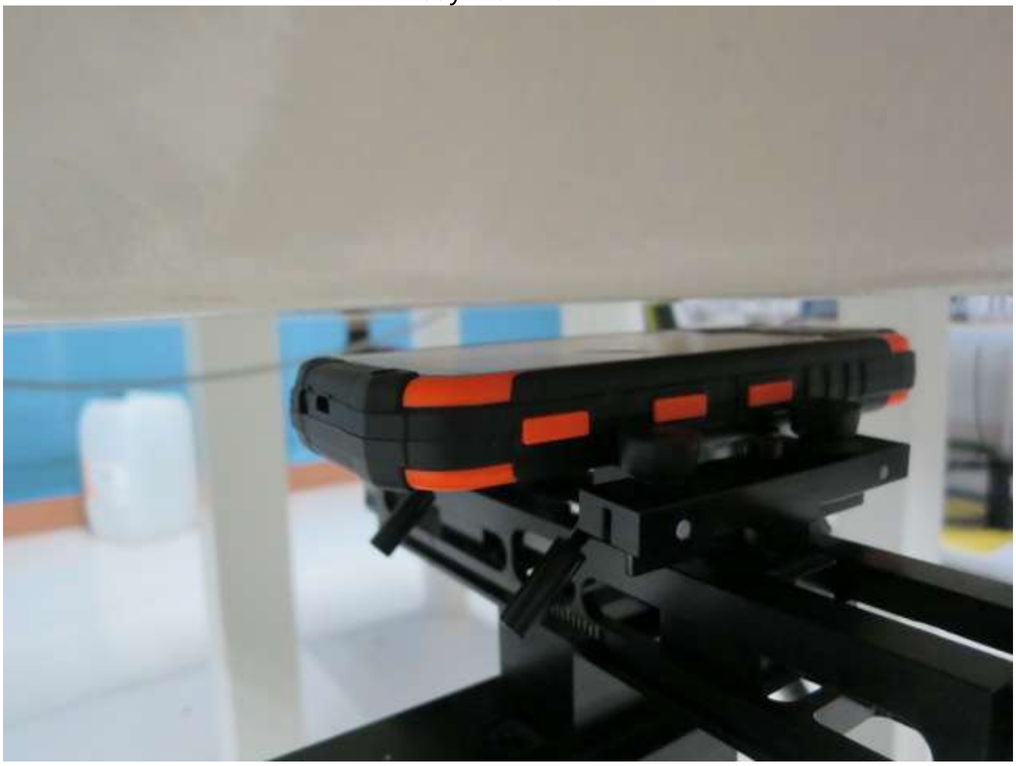


RIGHT-TILT 15^0

Body Back 10mm



Body Front 10mm



Edge 1(Top)

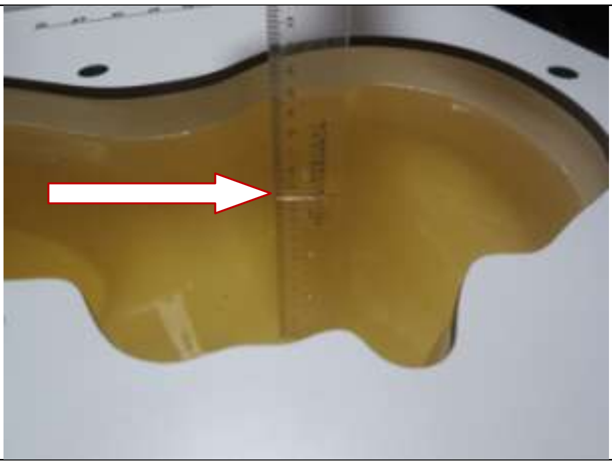
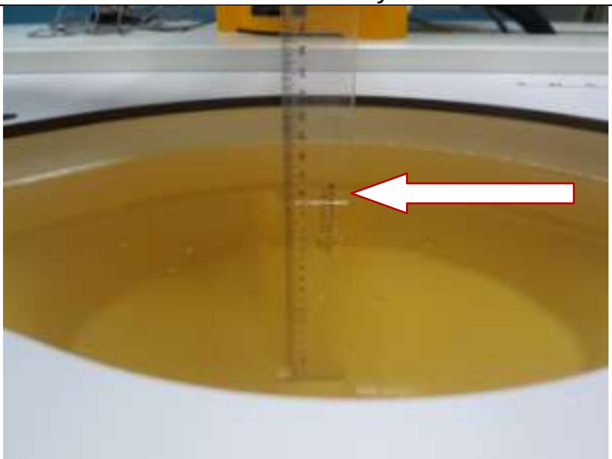
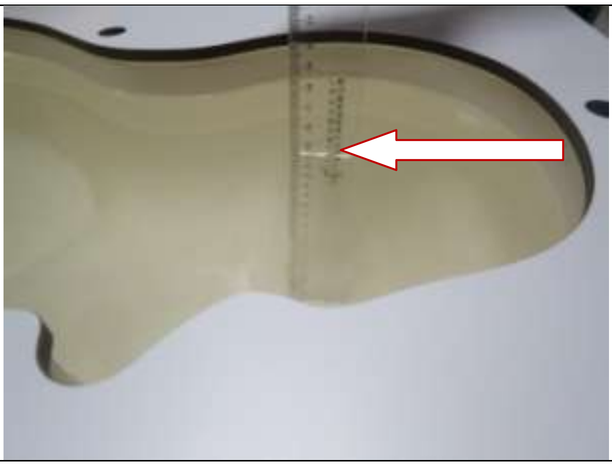
Edge 2(Right)

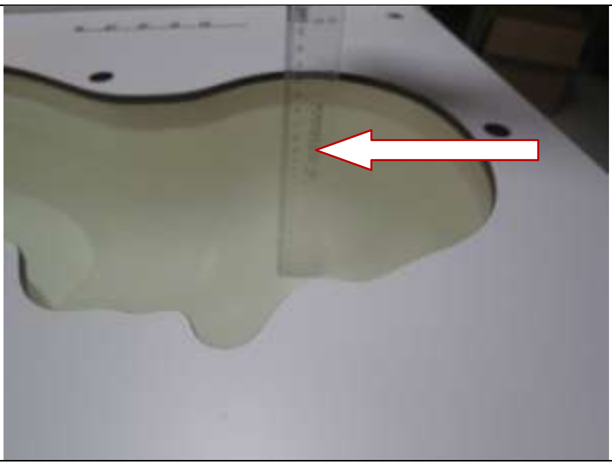
Edge 3(Bottom)

Edge 4(Left)

DEPTH OF THE LIQUID IN THE PHANTOM—ZOOM IN

Note：The position used in the measurement were according to IEEE 1528-2003

850MHz head	850MHz body
	
1900MHz head	1900MHz body
	

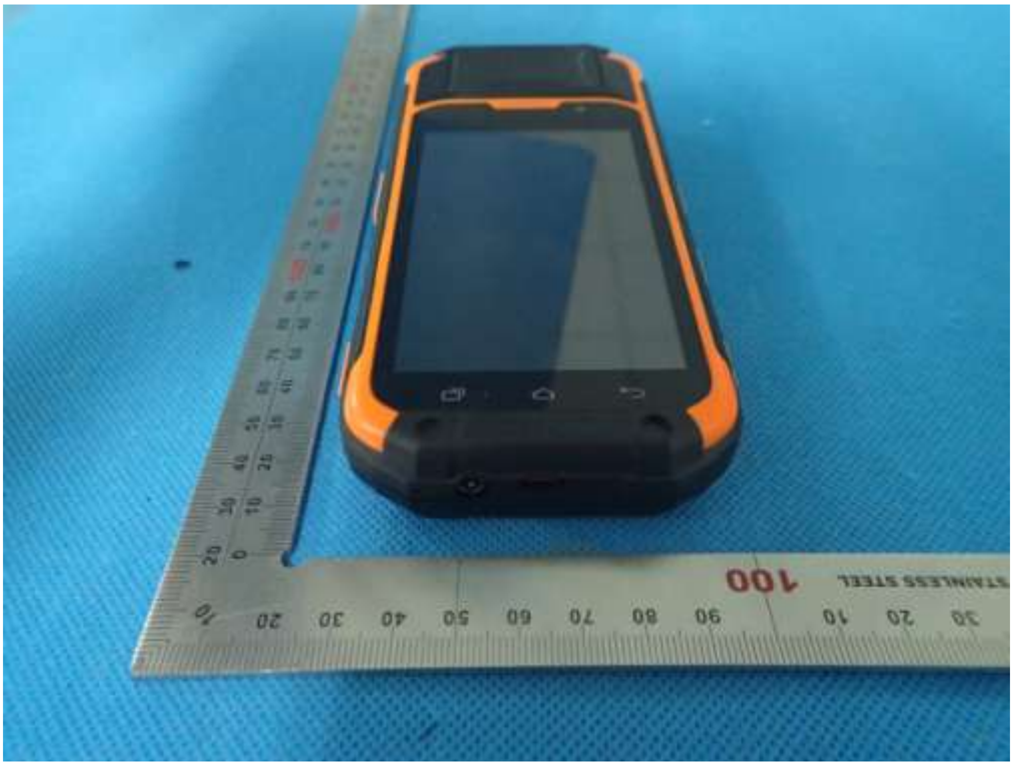
2450MHz head	2450MHz body
	

EUT PHOTOGRAPHS

All VIEW OF EUT

TOP VIEW OF EUT

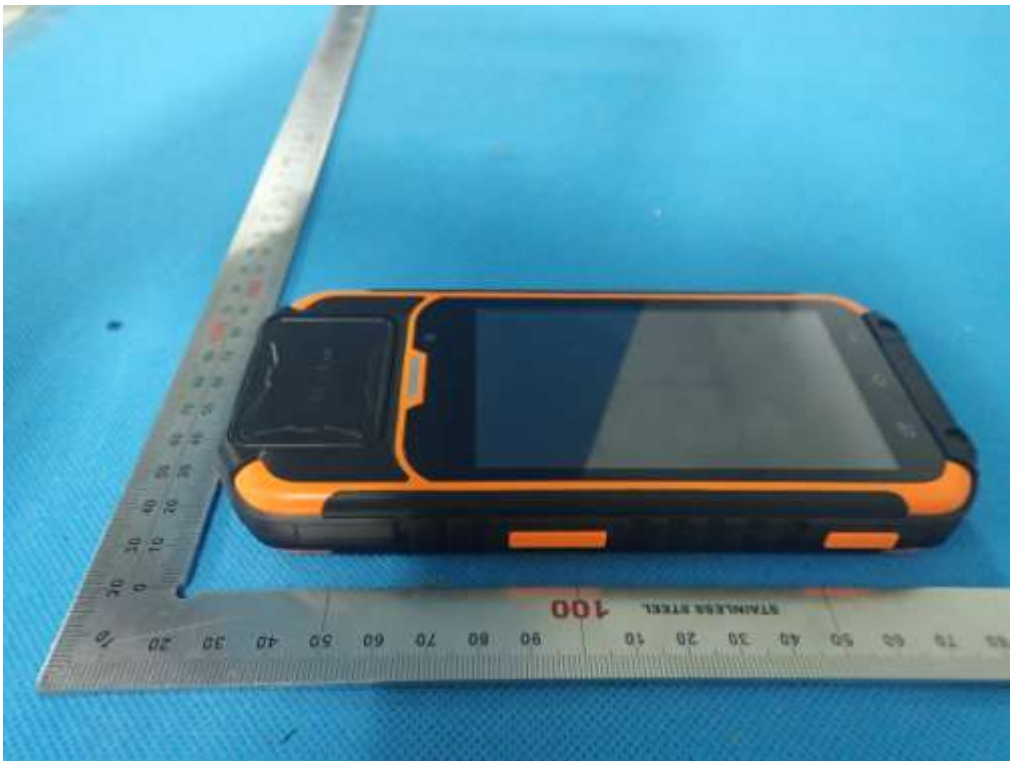
BOTTOM VIEW OF EUT



FRONT VIEW OF EUT

BACK VIEW OF EUT

LEFT VIEW OF EUT

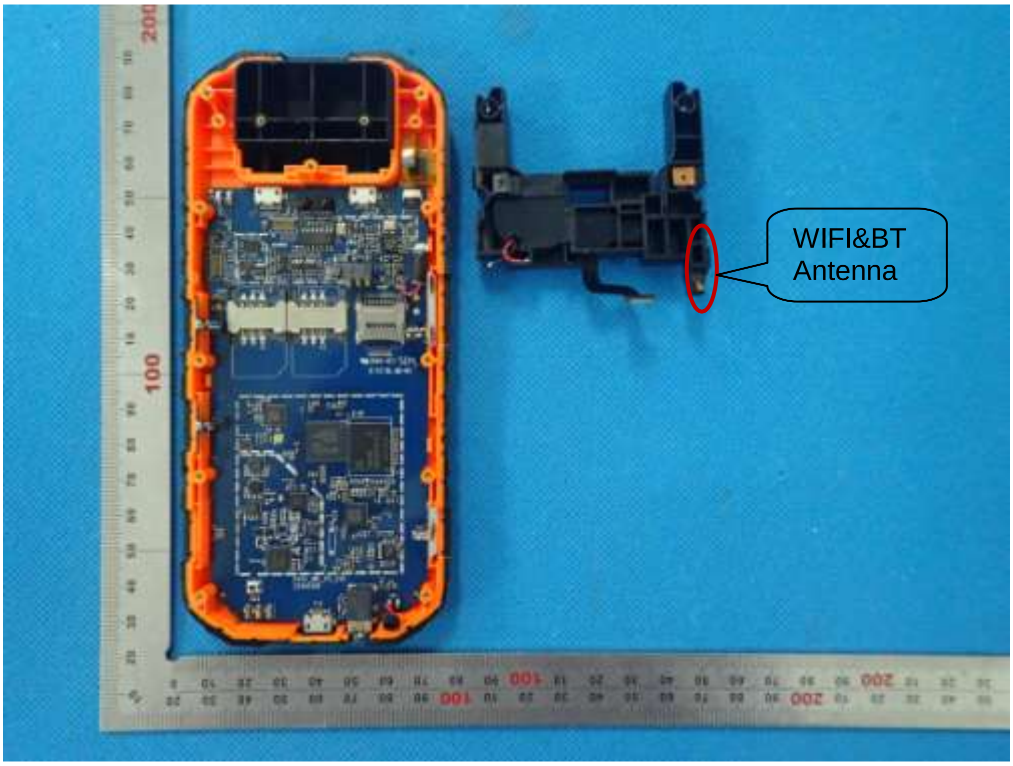


RIGHT VIEW OF EUT

OPEN VIEW OF EUT-1

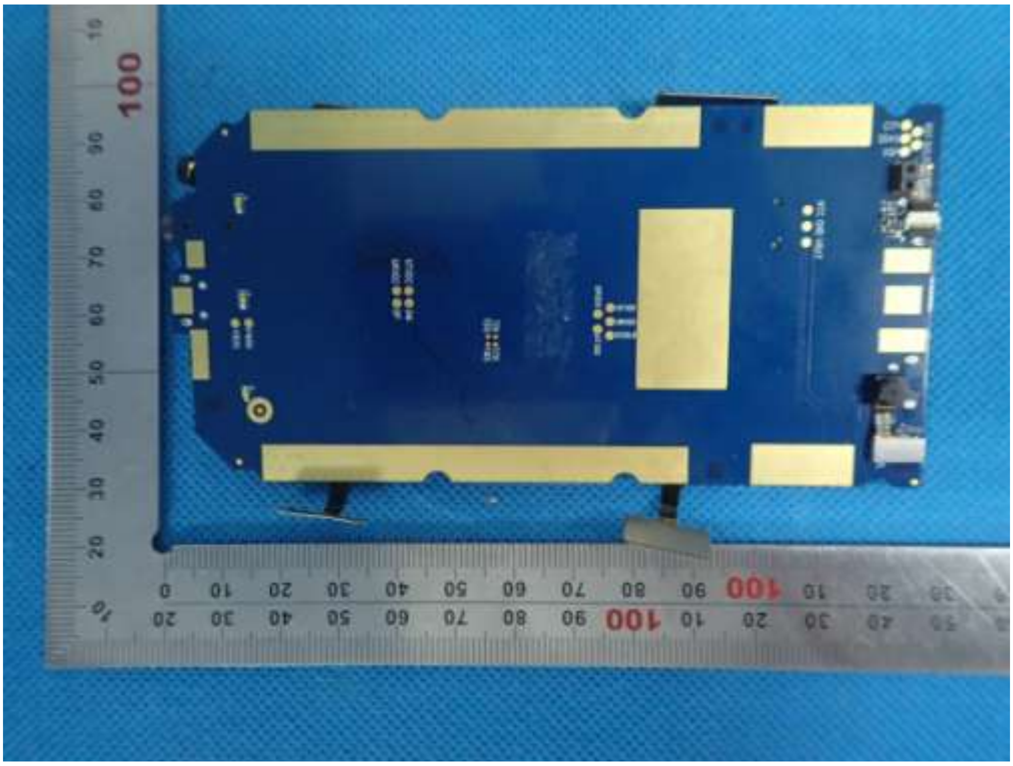
OPEN VIEW OF EUT-2

OPEN VIEW OF EUT-3

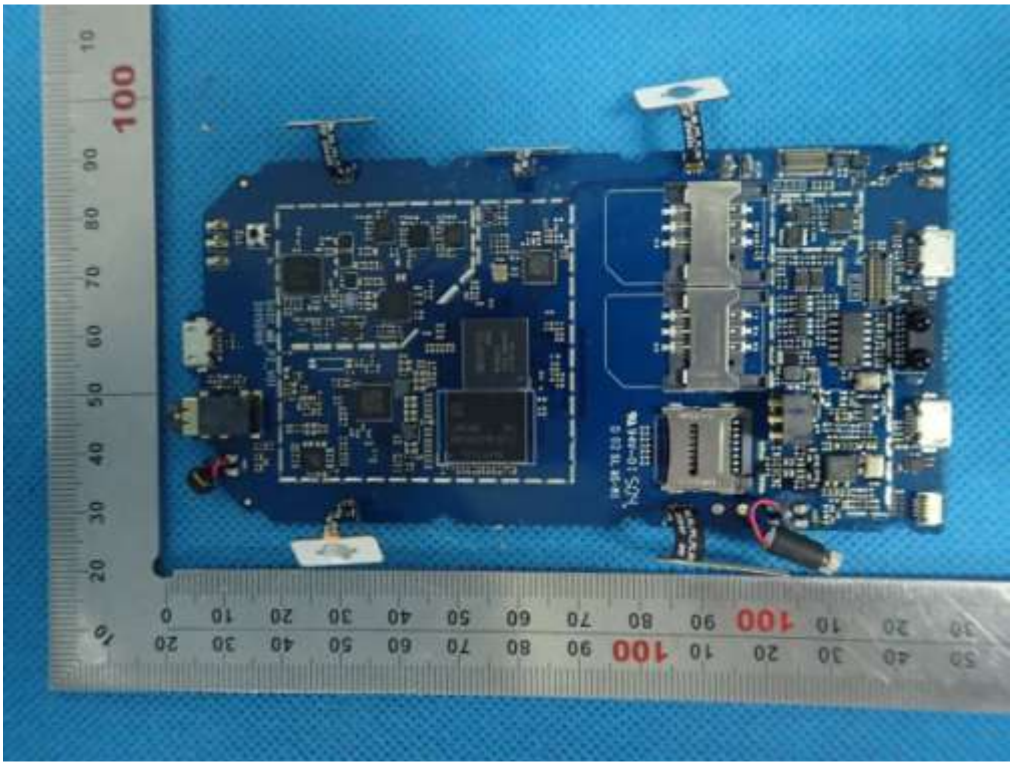


OPEN VIEW OF EUT-4

INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



APPENDIX D. CALIBRATION DATA

PROBE CALIBRATION DATA

In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

CALIBRATION No. L0570

Client agc-cert(鑫宇环) Certificate No: Z14-97116

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3953
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	November 06, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 1331	23-Jan-14 (SPEAG, DAE4-1331_Jan14)	Jan -15
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-15

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

Issued: November 07, 2014

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

In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z; VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Probe EX3DV4

SN: 3953

Calibrated: November 06, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

In Collaboration with
speag
CALIBRATION LABORATORY

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

DASY – Parameters of Probe: EX3DV4 - SN: 3953

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$)[A]	0.53	0.54	0.48	±10.8%
DCP(mV)[B]	101.6	101.2	100.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	192.6	±2.5%
		Y	0.0	0.0	1.0		191.5	
		Z	0.0	0.0	1.0		179.1	

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

[A] The uncertainties of Norm X, Y, Z do not affect the E^2-field uncertainty inside TSL (see Page 5 and Page 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

In Collaboration with
speag
CALIBRATION LABORATORY

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

DASY – Parameters of Probe: EX3DV4 - SN: 3953

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
835	41.5	0.90	10.12	10.12	10.12	0.14	1.25	±12%
900	41.5	0.97	9.70	9.70	9.70	0.23	1.04	±12%
1810	40.0	1.40	8.00	8.00	8.00	0.17	1.34	±12%
1900	40.0	1.40	7.89	7.89	7.89	0.22	1.17	±12%
2100	39.8	1.49	8.05	8.05	8.05	0.16	1.42	±12%
2450	39.2	1.80	7.32	7.32	7.32	0.63	0.66	±12%
3500	37.9	2.91	7.35	7.35	7.35	0.50	0.88	±13%
3700	37.7	3.12	7.03	7.03	7.03	0.45	1.02	±13%
5200	36.0	4.66	5.64	5.64	5.64	0.29	1.53	±13%
5300	35.9	4.76	5.32	5.32	5.32	0.45	0.77	±13%
5500	35.6	4.96	4.78	4.78	4.78	0.36	0.90	±13%
5600	35.5	5.07	4.60	4.60	4.60	0.34	0.96	±13%
5800	35.3	5.27	4.40	4.40	4.40	0.32	0.84	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

DASY – Parameters of Probe: EX3DV4 - SN: 3953

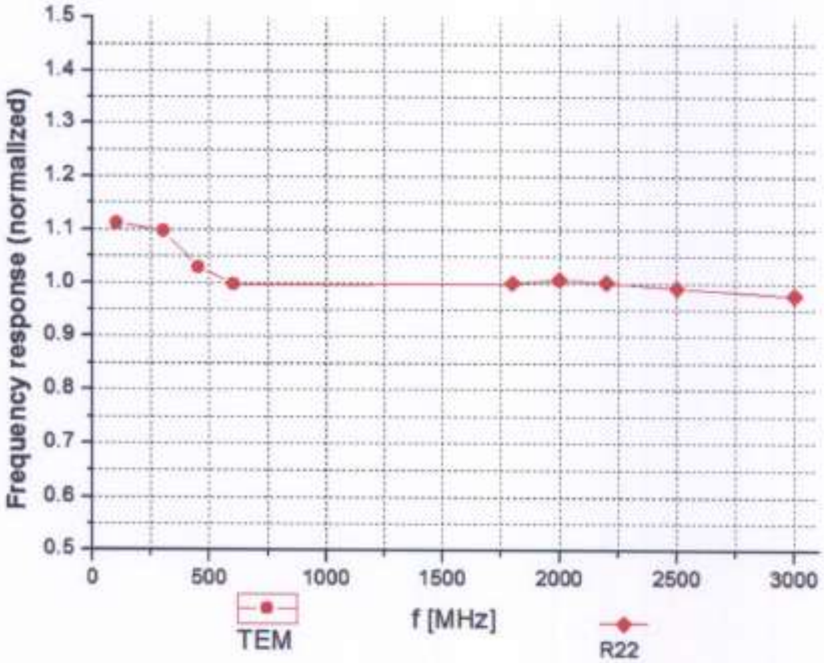
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
835	55.2	0.97	10.08	10.08	10.08	0.19	1.27	±12%
900	55.0	1.05	9.84	9.84	9.84	0.25	1.11	±12%
1810	53.3	1.52	7.93	7.93	7.93	0.16	1.63	±12%
1900	53.3	1.52	7.79	7.79	7.79	0.20	1.24	±12%
2100	53.2	1.62	8.10	8.10	8.10	0.16	1.71	±12%
2450	52.7	1.95	7.48	7.48	7.48	0.48	0.84	±12%
3500	51.3	3.31	6.70	6.70	6.70	0.53	0.90	±13%
3700	51.0	3.55	6.73	6.73	6.73	0.48	0.97	±13%
5200	49.0	5.30	4.92	4.92	4.92	0.43	1.17	±13%
5300	48.9	5.42	4.74	4.74	4.74	0.42	1.20	±13%
5500	48.6	5.65	4.33	4.33	4.33	0.42	1.45	±13%
5600	48.5	5.77	4.23	4.23	4.23	0.43	1.56	±13%
5800	48.2	6.00	4.32	4.32	4.32	0.45	1.69	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

In Collaboration with
s p e a g
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



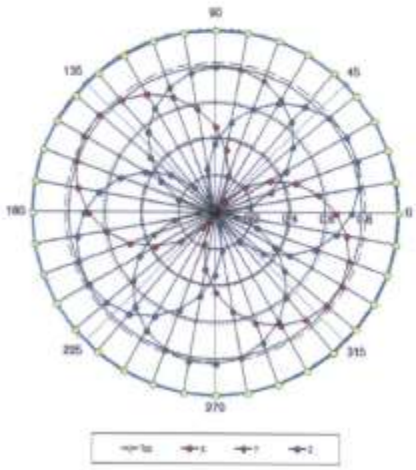
Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

In Collaboration with
s p e a g
CALIBRATION LABORATORY

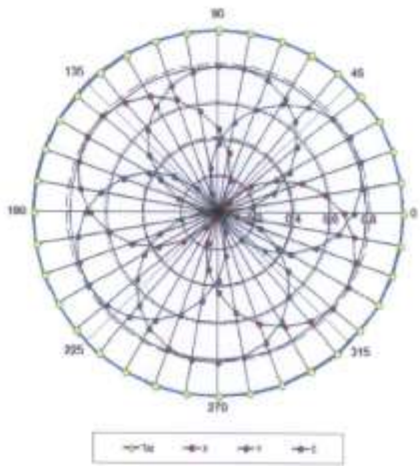
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

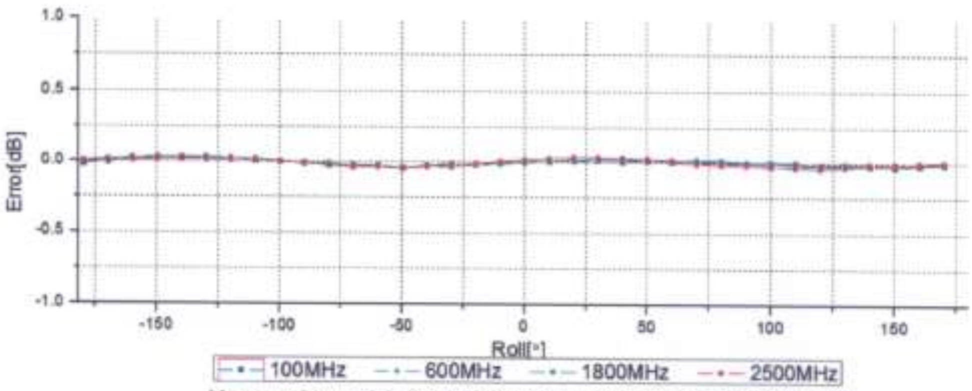
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22



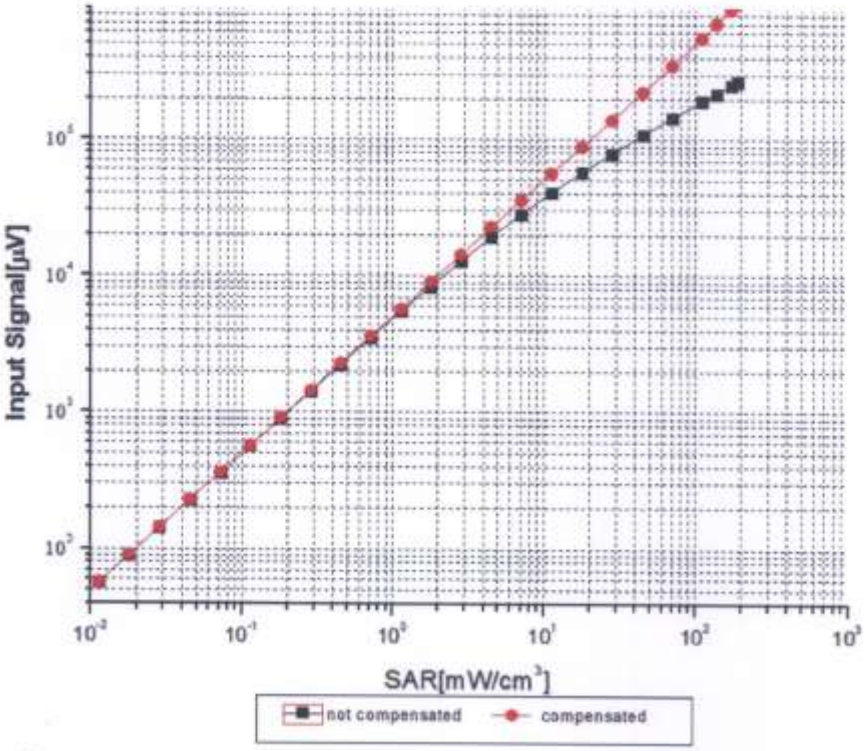


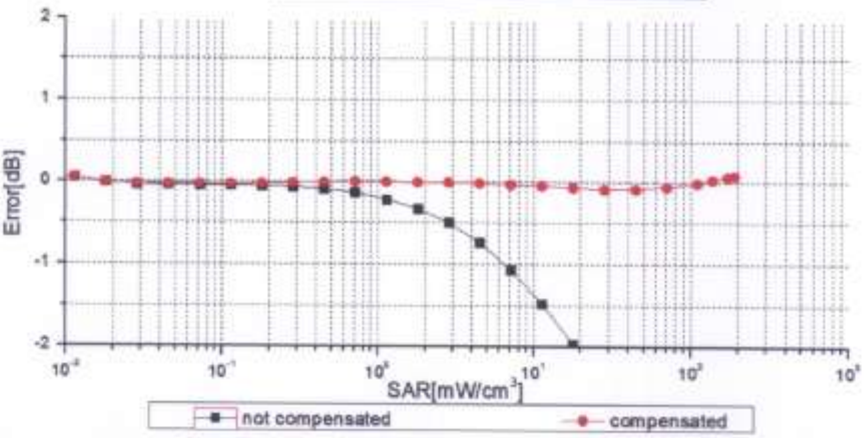
Uncertainty of Axial Isotropy Assessment: ±0.9% (k=2)

In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





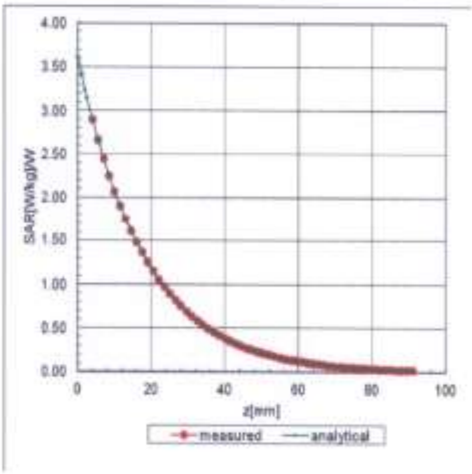
Uncertainty of Linearity Assessment: ±0.9% (k=2)

In Collaboration with
s p e a g
CALIBRATION LABORATORY

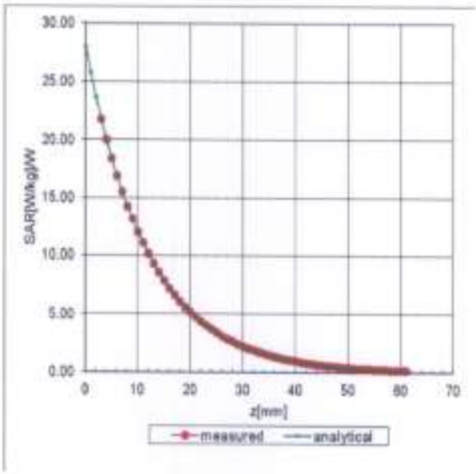
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: cttl@chinattl.com Http://www.chinattl.cn

Conversion Factor Assessment

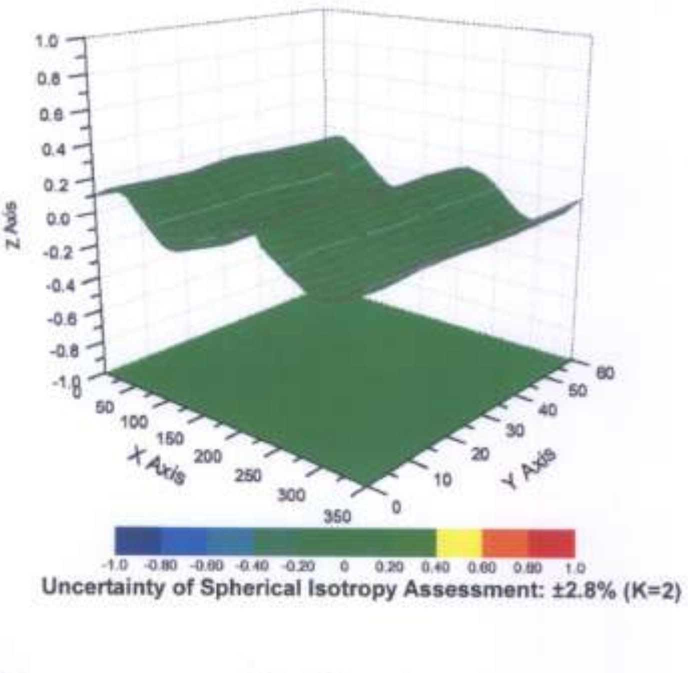
f=900 MHz, WGLS R9(H_convF)



f=1810 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

In Collaboration with
s p e a g
CALIBRATION LABORATORY

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

DASY - Parameters of Probe: EX3DV4 - SN: 3953

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	32
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	2mm

DAE CALIBRATION DATA

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **AGC-CERT (Auden)**

Certificate No: **DAE4-1398_Mar15**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1398
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	March 11, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	06-Jan-15 (in house check)	In house check: Jan-16
Calibrator Box V2.1	SE UMS 006 AA 1002	06-Jan-15 (in house check)	In house check: Jan-16

	Name	Function	Signature
Calibrated by:	R.Mayoraz	Technician	F. Mayoraz
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V.

Issued: March 11, 2015

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

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.177 ± 0.02% (k=2)	404.159 ± 0.02% (k=2)	403.623 ± 0.02% (k=2)
Low Range	3.97359 ± 1.50% (k=2)	3.99241 ± 1.50% (k=2)	3.96904 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	195.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199993.58	-1.10	-0.00
Channel X	+ Input	20001.61	1.19	0.01
Channel X	- Input	-19998.75	2.61	-0.01
Channel Y	+ Input	199994.17	-0.06	-0.00
Channel Y	+ Input	19999.73	-0.66	-0.00
Channel Y	- Input	-20002.27	-0.74	0.00
Channel Z	+ Input	199994.39	-0.01	-0.00
Channel Z	+ Input	19999.60	-0.65	-0.00
Channel Z	- Input	-20002.37	-0.85	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.37	-0.22	-0.01
Channel X	+ Input	201.03	-0.14	-0.07
Channel X	- Input	-198.68	0.01	-0.00
Channel Y	+ Input	2000.16	-0.39	-0.02
Channel Y	+ Input	199.64	-1.42	-0.71
Channel Y	- Input	-200.57	-1.84	0.93
Channel Z	+ Input	2000.33	-0.14	-0.01
Channel Z	+ Input	199.88	-1.17	-0.58
Channel Z	- Input	-200.01	-1.12	0.56

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-13.00	-14.85
	- 200	16.87	14.74
Channel Y	200	8.85	8.14
	- 200	-11.30	-11.41
Channel Z	200	7.15	7.52
	- 200	-9.35	-9.51

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-3.68	-0.69
Channel Y	200	5.01	-	-0.86
Channel Z	200	8.26	0.74	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15958	16128
Channel Y	15964	17962
Channel Z	15846	14478

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.22	-1.08	0.72	0.33
Channel Y	-1.19	-1.94	-0.30	0.32
Channel Z	-1.46	-2.11	0.01	0.32

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

DIPOLE CALIBRATION DATA

SAR Reference Dipole Calibration Report

Ref : ACR.318.10.13.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.
1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET BAOAN DISTRICT, SHENZHEN, P.R. CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 835 MHZ
SERIAL NO.: SN 46/11 DIP 0G835-190

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

10/02/2014

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	10/02/2014	
Checked by :	Jérôme LUC	Product Manager	10/02/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	10/02/2014	Kim Rutkowski

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	*Date*	*Modifications*
A	10/02/2014	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 835 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID835
Serial Number	SN 46/11 DIP 0G835-190
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

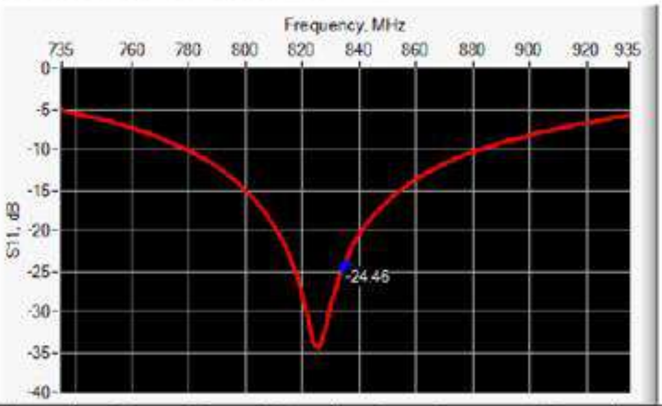
The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
835	-24.46	-20	55.4 Ω + 2.4 jΩ

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.	PASS	89.8 ±1 %.	PASS	3.6 ±1 %.	PASS
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

*This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.*

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %	PASS	0.90 ±5 %	PASS
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

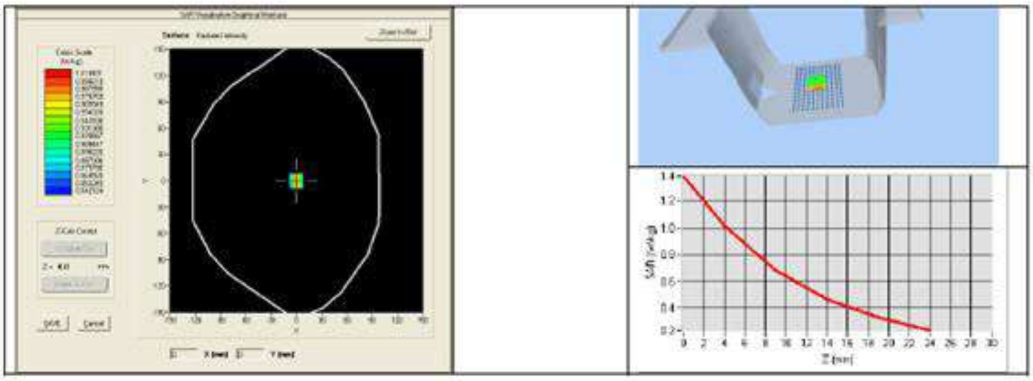
The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 42.3 sigma : 0.92
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56	9.60 (0.96)	6.22	6.20 (0.62)
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.3 BODY LIQUID MEASUREMENT

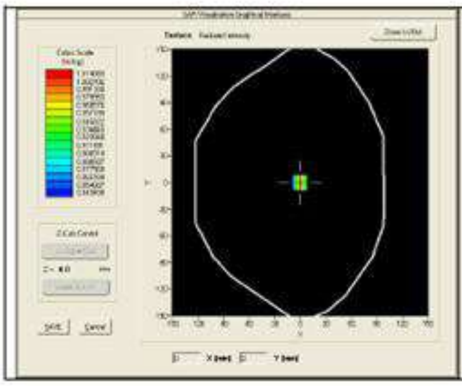
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±5 %		0.80 ±5 %	
300	58.2 ±5 %		0.92 ±5 %	
450	56.7 ±5 %		0.94 ±5 %	
750	55.5 ±5 %		0.96 ±5 %	
835	55.2 ±5 %	PASS	0.97 ±5 %	PASS
900	55.0 ±5 %		1.05 ±5 %	
915	55.0 ±5 %		1.06 ±5 %	
1450	54.0 ±5 %		1.30 ±5 %	
1610	53.8 ±5 %		1.40 ±5 %	
1800	53.3 ±5 %		1.52 ±5 %	
1900	53.3 ±5 %		1.52 ±5 %	
2000	53.3 ±5 %		1.52 ±5 %	
2100	53.2 ±5 %		1.62 ±5 %	
2450	52.7 ±5 %		1.95 ±5 %	
2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

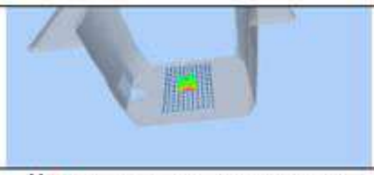
7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

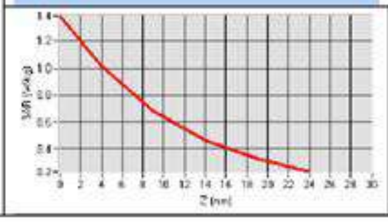
Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 54.1 sigma : 0.97
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
835	9.90 (0.99)	6.39 (0.64)







This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2013	12/2016
Reference Probe	Satimo	EPG122 SN 18/11	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

SAR Reference Dipole Calibration Report

Ref : ACR.318.7.13.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET BAOAN DISTRICT, SHENZHEN, P.R. CHINA

SATIMO COMOSAR REFERENCE DIPOLE

FREQUENCY: 1900 MHZ

SERIAL NO.: SN 46/11 DIP 1G900-187

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED
Calibration CERT #2246.02

11/14/13

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	11/14/2013	
Checked by :	Jérôme LUC	Product Manager	11/14/2013	
Approved by :	Kim RUTKOWSKI	Quality Manager	11/14/2013	Kim Rutkowski

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	Date	Modifications
A	11/14/2013	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1900 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID1900
Serial Number	SN 46/11 DIP 1G900-187
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

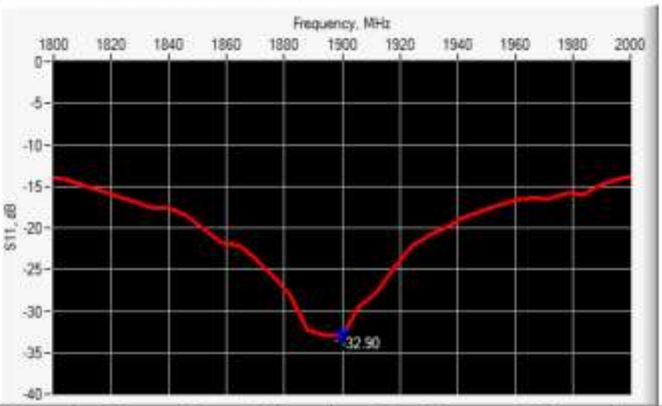
The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1900	-32.90	-20	48.9 Ω + 2.3 jΩ

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.	PASS	39.5 ±1 %.	PASS	3.6 ±1 %.	PASS
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 39.8 sigma : 1.43
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

7.2 HEAD LIQUID MEASUREMENT

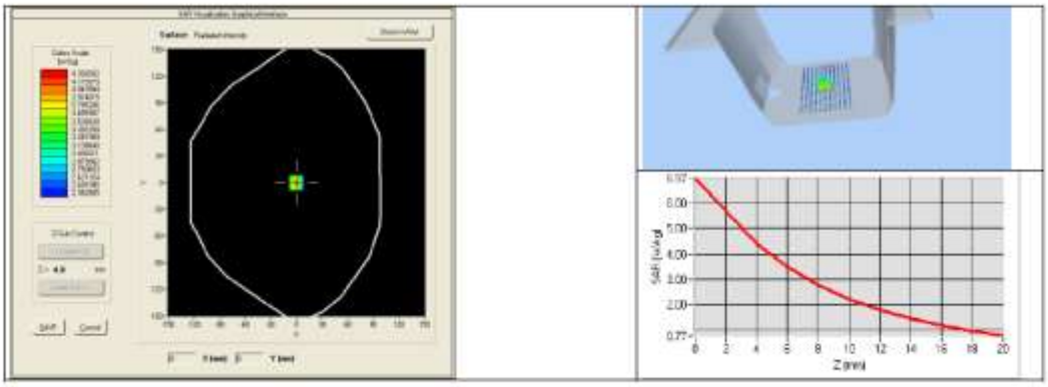
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %	PASS	1.40 ±5 %	PASS
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7	39.65 (3.96)	20.5	20.24 (2.02)
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	

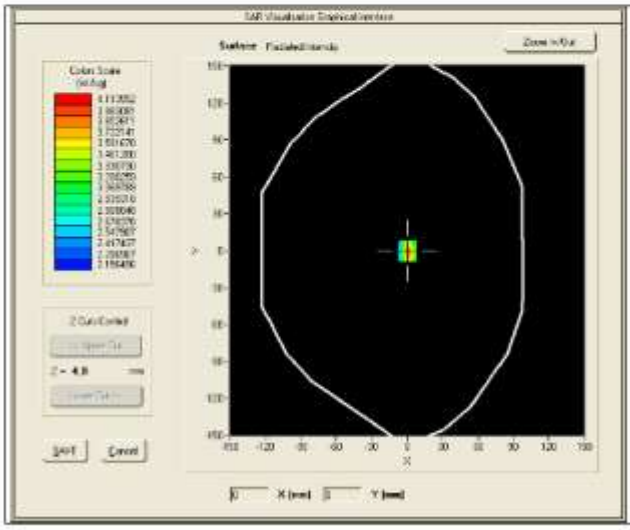


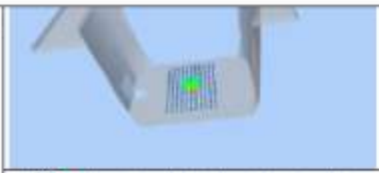
This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

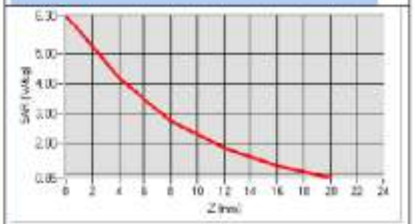
7.4 BODY MEASUREMENT RESULT

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 52.5 sigma : 1.50
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
1900	40.74 (4.07)	21.43 (2.14)







This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2010	12/2013
Reference Probe	Satimo	EPG122 SN 18/11	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	3/2012	3/2014

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

SAR Reference Dipole Calibration Report

Ref: ACR.318.9.13.SATU.A

ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.
1&2F, NO.2 BUILDING, HUAFENG NO.1 INDUSTRIAL PARK, GUSHU COMMUNITY XIXIANG STREET BAOAN DISTRICT, SHENZHEN, P.R. CHINA
SATIMO COMOSAR REFERENCE DIPOLE
FREQUENCY: 2450 MHZ
SERIAL NO.: SN 46/11 DIP 2G450-189

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED
Calibration CERT #2246.02

11/14/13

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	11/14/2013	JS
Checked by :	Jérôme LUC	Product Manager	11/14/2013	JS
Approved by :	Kim RUTKOWSKI	Quality Manager	11/14/2013	Kim Rutkowski

	Customer Name
Distribution :	ATTESTATION OF GLOBAL COMPLIANCE CO. LTD.

Issue	Date	Modifications
A	11/14/2013	Initial release

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

TABLE OF CONTENTS

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2450
Serial Number	SN 46/11 DIP 2G450-189
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

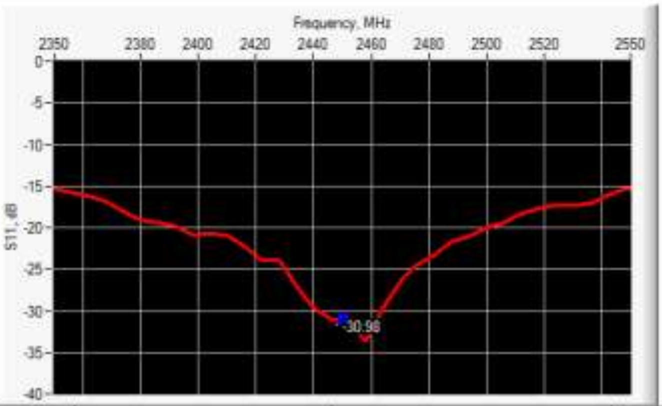
The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-30.98	-20	47.3 Ω + 0.1 jΩ

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.	PASS	30.4 ±1 %.	PASS	3.6 ±1 %.	PASS
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO.
The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 38.6 sigma : 1.82
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

7.2 HEAD LIQUID MEASUREMENT

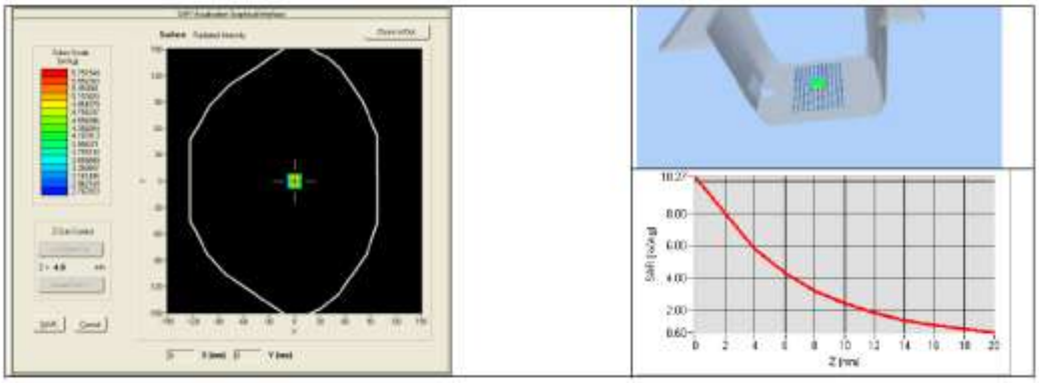
Frequency MHz	Relative permittivity (ϵ_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %	PASS	1.80 ±5 %	PASS
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4	54.40 (5.44)	24	23.75 (2.38)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	

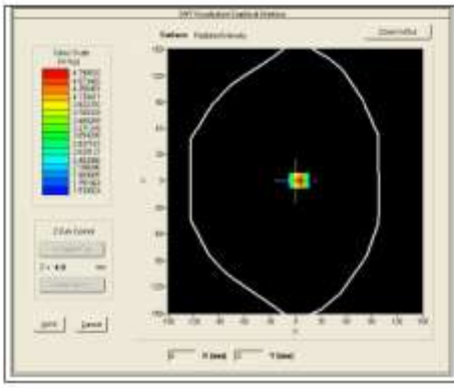


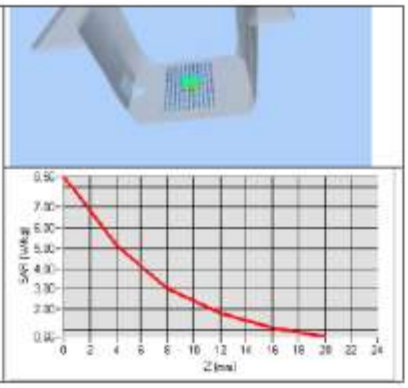
This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

7.4 BODY MEASUREMENT RESULT

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 52.0 sigma : 1.94
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	54.19 (5.42)	24.96 (2.50)





This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2010	12/2013
Reference Probe	Satimo	EPG122 SN 18/11	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	3/2012	3/2014

This document shall not be reproduced, except in full or in part, without the written approval of SATIMO. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of SATIMO.