FCC SAR
Measurement and Test Report

For

iDROID Inc.

1715 Mission Springs Dr.KATy. TEXAS 77450 USA

FCC Rules:	FCC Part 2.1093 ANSI / IEEE C95.1 :2005 ANSI / IEEE C95.3 :2002 IEEE 1528 :2013
Product Description:	Mobile Phone
Tested Model:	KING
Report No.:	STR15058195H
Max. SAR Values:	Head**: 0.452 W/kg(1g)** Body**: 0.629 W/kg(1g)**
Tested Date:	2015-05-25 to 2015-05-28
Issued Date:	2015-05-29
Tested By:	Lucy Wei / Engineer — Lucy Wei
Reviewed By:	Lahm Peng / EMC Manager — Lahm Peng
Approved & Authorized By:	Jandy So / PSQ Manager — Jandyso
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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: iDROID Inc.
Address of applicant: 1715 Mission Springs Dr.KATy. TEXAS 77450 USA

Manufacturer: iDROID Inc.
Address of manufacturer: 1715 Mission Springs Dr.KATy. TEXAS 77450 USA

General Description of EUT	
Product Name:	Mobile Phone
Brand Name:	iDROID
Model No.:	KING
Hardware Version:	8069-01R V1.1
Software Version:	8069-01R_6582_KK_QHD_JF_ROID_V001_20150527_1718
IMEI	100364391378589/730565743232605
Rated Voltage:	DC 3.7V Li-ion Battery
Battery:	2100mAh
Device Category:	Portable Device
The EUT is dual band GSM 850/1900 MHz, WCDMA 850/1900/1700MHz, Mobile Phone. The Mobile Phone is intended for speech and Multimedia Message Service (MMS) transmission. It is equipped with GPRS class 12 for GSM 850/1900 and Wi-Fi, Bluetooth, GPS, and camera functions. For more information see the following datasheet.	
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
2G	
Support Networks:	GSM, GPRS
Support Band:	GSM850/900/1800/1900
Uplink Frequency:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS 850: 869~894MHz GSM/GPRS 1900: 1930~1990MHz
RF Output Power:	GSM850: 32.70dBm, GSM1900: 29.76dBm
Type of Modulation:	GMSK
Antenna Type:	Internal Antenna
Antenna Gain:	GSM850: -1.0dBi, GSM1900: -1.0dBi
GPRS Class:	Class 12

3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band II, WCDMA Band IV, WCDMA Band V
Uplink Frequency:	WCDMA Band II: 1850~1910MHz WCDMA Band V: 824~849MHz WCDMA Band IV: 1710~1755MHz
Downlink Frequency:	WCDMA Band II: 1930~1990MHz WCDMA Band V: 869~894MHz WCDMA Band IV: 2110~2115MHz
RF Output Power:	WCDMA850: 22.40dBm, WCDMA1900: 22.60dBm WCDMA1700: 22.60dBm
Type of Modulation:	BPSK
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA850: -1.0dBi, WCDMA1900: -1.0dBi WCDMA1700: -1.0dBi
WIFI	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/b/n(HT20) 2422-2452MHz for 802.11n(HT40)
AV Output Power:	9.45dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11 for 802.11b/b/n(HT20), 7 for 802.11n(HT40)
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	-1.0dBi
Bluetooth	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
AV Output Power:	2.16dBm (Conducted)
Data Rate:	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK, Pi/4 QDPSK, 8DPSK
Quantity of Channels:	79/40
Channel Separation:	1MHz/2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	-1.0dBi

1.2 Test Standards

The following report is prepared on behalf of the iDROID Inc. in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-1992, IEEE 1528-2003 and KDB 865664 D01 v01r03 and KDB 865664 D02 v01r01

The objective is to determine compliance with FCC Part 2.1093 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with KDB 865664 D01 v01r03 and KDB 865664 D02 v01r01. The public notice KDB 447498 D01 v05r02 for Mobile and Portable Devices RF Exposure Procedure also.

1.4 Test Facility

- **FCC – Registration No.: 934118**
  Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

- **Industry Canada (IC) Registration No.: 11464A**
  The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

- **CNAS Registration No.: L4062**
  Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101)

2. Summary of Test Results

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

Frequency Band	Head SAR	Body-worn (10mm Gap)	Hotspot (10mm Gap)	SAR_{1g} Limit (W/kg)
	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	
GSM850	0.175	0.339	0.548	1.6
GSM1900	0.138	0.248	0.495	1.6
WCDMA Band V	0.033	0.073	0.073	1.6
WCDMA Band II	0.210	0.271	0.364	1.6
WCDMA Band IV	**0.452**	**0.629**	**0.629**	1.6

The highest reported SAR values for head, body-worn accessory, wireless router(hotspot) are ***0.452 W/kg, 0.629 W/kg and 0.629 W/kg*** *respectively.*

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR Part 2.1093 and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedure specified in IEEE 1528-2003 and KDB 865664 D01 v01r03 and KDB 865664 D02 v01r01

3. Specific Absorption Rate (SAR)

3.1 Introduction

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

3.2 SAR Definition

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

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

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

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

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

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

4. SAR Measurement System

4.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.

The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

4.2 Probe

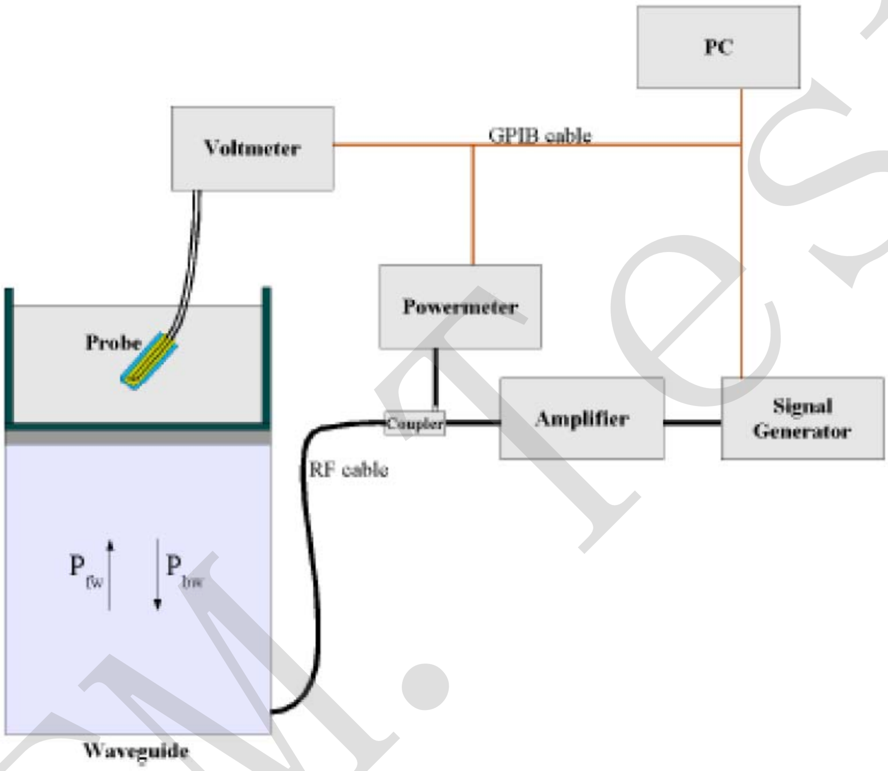
For the measurements the Specific Dosimetric E-Field Probe SSE5 SN 09/13 EP168 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Probe Length: 330 mm
- Length of Individual Dipoles: 4.5 mm
- Maximum external diameter: 8 mm
- Probe Tip External Diameter : 5 mm
- Distance between dipoles / probe extremity: 2.7mm

- Probe linearity: ＜0.25 dB
- Axial Isotropy: ＜0.25 dB
- Spherical Isotropy: ＜0.50 dB
- Calibration range: 700 to 3000MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and suface normal line:1ess than 30°

Probe calibration is realized, in compliance with EN 62209-1 and IEEE 1528 STD, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1 annexe technique using reference guide at the five frequencies.



$$SAR = \frac{4\left(P_{fw} - P_{bw}\right)}{ab\delta}\cos^2\left(\pi\frac{y}{a}\right)e^{(2z/\delta)}$$

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b =Waveguide dimensions

I = Skin depth

Keithley configuration:

Rate = Medium; Filter = ON; RDGS = 10; Filter type = Moving Average; Range auto after each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

$$CF(N)=SAR(N)/Vlin(N)\ (N=1,2,3)$$

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

$$Vlin(N)=V(N)*(1+V(N)/DCP(N))\ (N=1,2,3)$$

where DCP is the diode compression point in mV.

4.3 Probe Calibration Process

Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm2) using an with CALISAR, Antenna proprietary calibration system.

Free Space Assessment Procedure

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1mW/cm2.

Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

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

Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

4.4 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

4.5 Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1°.

System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

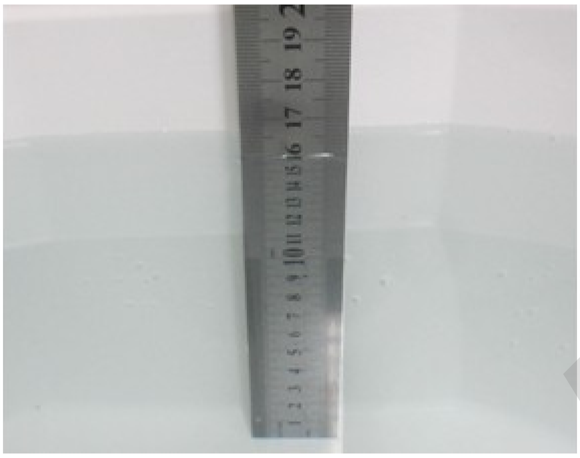
4.6 Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	SATIMO	SSE5	SN 09/13 EP168	2015-03-16	2016-03-15
835MHz Dipole	SATIMO	SID835	SN 47/12 DIP 0G835-204	2015-03-16	2016-03-15
1900MHz Dipole	SATIMO	SID1900	SN 47/12 DIP 1G900-207	2015-03-16	2016-03-15
Dielectric Probe Kit	SATIMO	SCLMP	SN 47/12 OCPG49	2015-03-16	2016-03-15
SAM Phantom	SATIMO	SAM	SN/ 47/12 SAM95	N/A	N/A
MULTIMETER	KEITHLEY	Keithley 2000	4006367	2015-05-28	2016-05-27
Signal Generator	Rohde & Schwarz	SMR20	100047	2015-05-28	2016-05-27
Universal Tester	Rohde & Schwarz	CMU200	112012	2015-05-28	2016-05-27
Network Analyzer	HP	8753C	2901A00831	2015-05-28	2016-05-27
Data Acquisition Electronics	SATIMO	DAE4	915	2015-05-28	2016-05-27
Directional Couplers	Agilent	778D	20160	2015-05-28	2016-05-27

5. Tissue Simulating Liquids

5.1 Composition of Tissue Simulating Liquid

For the measurement of the field distribution inside the SAM phantom with SMTIMO, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. Please see the following photos for the liquid height.



Liquid Height for Head SAR

Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

Frequency (MHz)	Water (%)	Salt (%)	Triton (%)	HEC (%)	Preventol (%)	DGBE (%)
Head						
835	35.34	0.98	0.00	0.00	63.68	0.00
1900	55.26	0.52	30.40	0.00	0.00	13.82
Body						
835	52.87	1.07	0.00	0.00	46.10	0.00
1900	69.99	0.41	20.66	0.00	0.00	8.93

5.2 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 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 P1528 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 P1528.

Target Frequency (MHz)	**Head**		**Body**	
	Conductivity (σ)	**Permittivity** (ε_r)	**Conductivity** (σ)	**Permittivity** (ε_r)
150	0.76	52.3	0.80	61.9
300	0.87	45.3	0.92	58.2
450	0.87	43.5	0.94	56.7
835	**0.90**	**41.5**	**0.97**	**55.2**
900	0.97	41.5	1.05	55.0
915	0.98	41.5	1.06	55.0
1450	1.20	40.5	1.30	54.0
1610	1.29	40.3	1.40	53.8
1800-2000	**1.40**	**40.0**	**1.52**	**53.3**
2450	1.80	39.2	1.95	52.7
3000	2.40	38.5	2.73	52.0
5800	5.27	35.3	6.00	48.2

5.3 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using COMOSAR Dielectric Probe Kit and an Agilent Network Analyzer.

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Head Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (εr)	Target (εr)	Delta (%)		
835	21.2	0.87	0.90	-3.33	41.11	41.50	-0.94	±5	2015-05-25
1900	21.3	1.38	1.40	-1.43	38.56	40.00	-3.60	±5	2015-05-25

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (εr)	Target (εr)	Delta (%)		
835	21.2	0.95	0.97	-2.06	54.85	55.20	-0.63	±5	2015-05-25
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2015-05-25

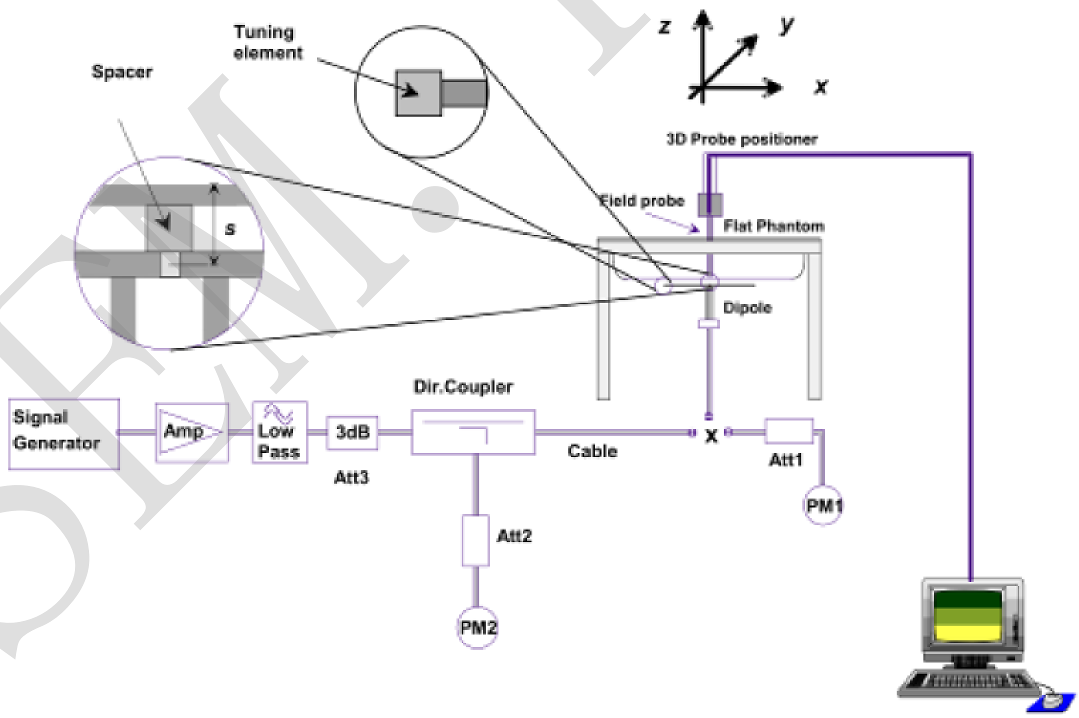
6. SAR Measurement Evaluation

6.1 Purpose of System Performance Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

6.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator at frequency 835 MHz and 1900 MHz. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom.



System Verification Setup Block Diagram

Setup Photo of Dipole Antenna

The output power on dipole port must be calibrated to 24dBm (250mW) before dipole is connected.

6.3 Validation Results

Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10 %. Table 6.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion.

Frequency MHz	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Normalized SAR_{1g} (W/kg)	Tolerance (%)
Head				
835	9.56	2.41	9.65	0.94
1900	39.70	9.90	39.59	-0.28
Body				
835	9.56	2.34	9.36	-2.09
1900	39.70	9.75	39.01	-1.74

Targeted and Measurement SAR

Please refer to Annex A for the plots of system performance check.

7. EUT Testing Position

7.1 Define Two Imaginary Lines on The Handset

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

(b) 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.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

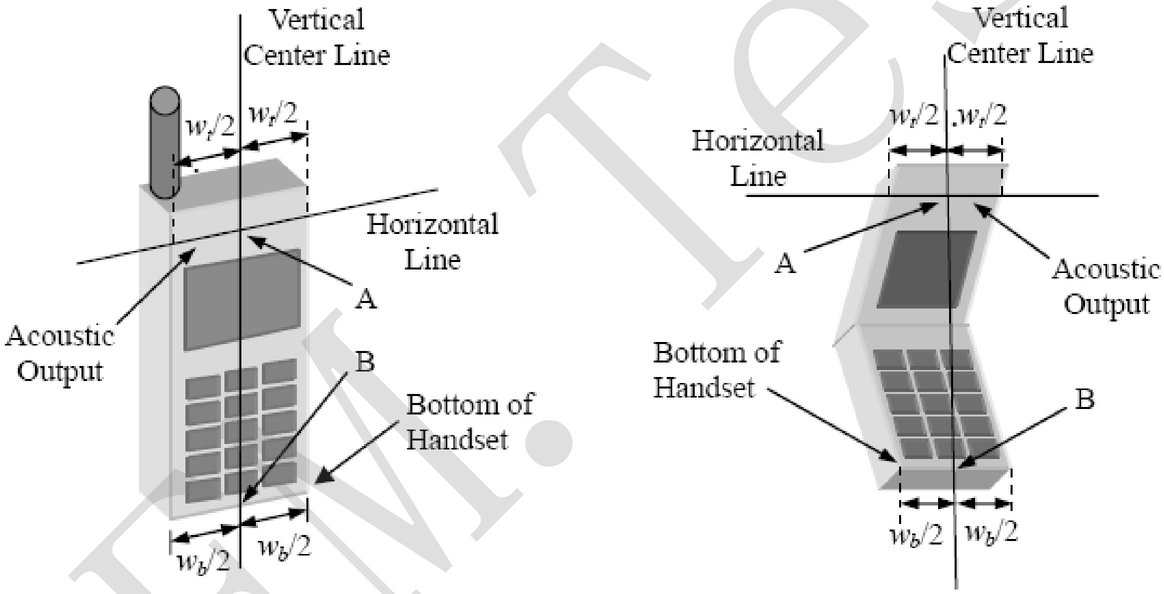


Illustration for Handset Vertical and Horizontal Reference Lines

7.2 Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece 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 three 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.
(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the 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 (see Fig. 7.2).

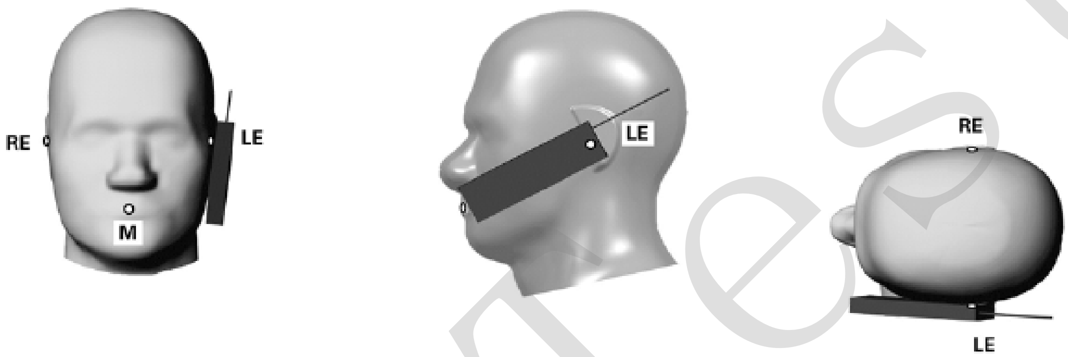


Illustration for Cheek Position

7.3 Tilted Position

(a) To position the device in the “cheek” position described above.
(b) While maintaining the device 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 contact with the ear is lost (see Fig. 7.3).

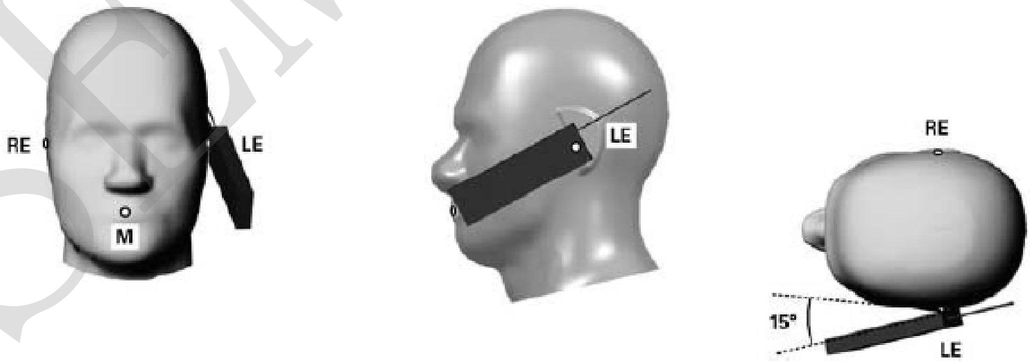


Illustration for Tilted Position

7.4 Body Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 10mm.

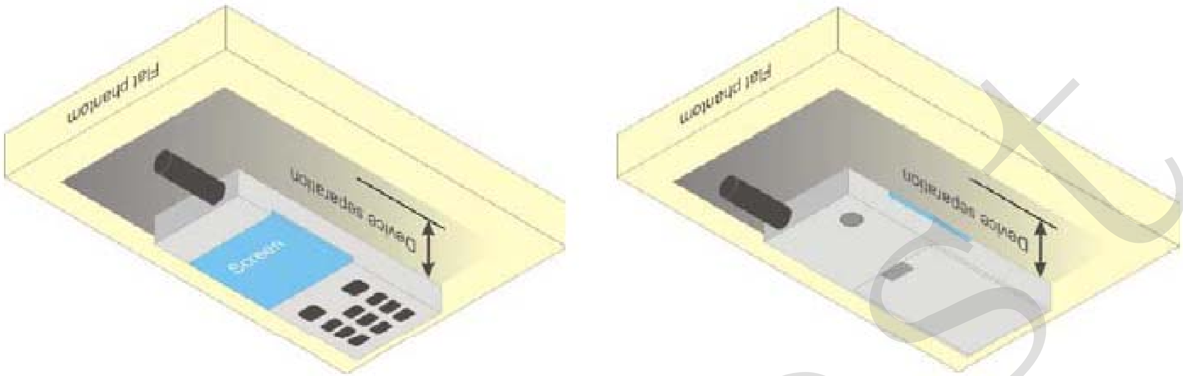
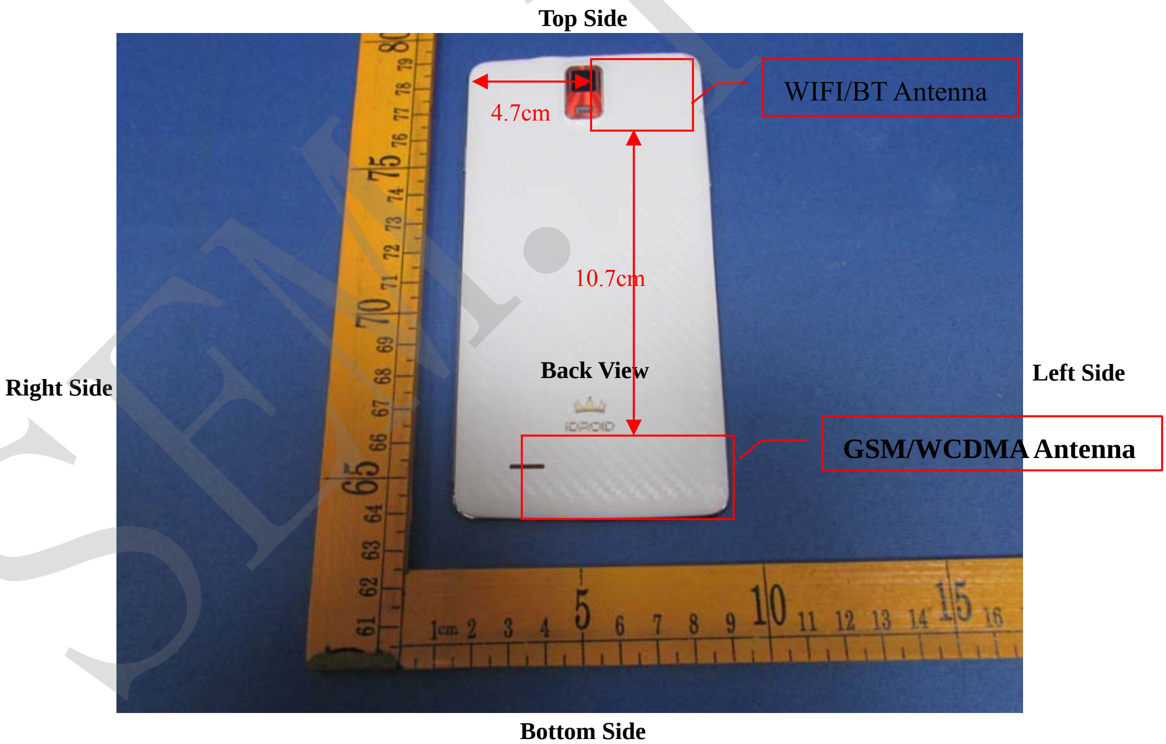


Illustration for Body Position

7.5 EUT Antenna Position



Block Diagram for EUT Antenna Position

7.6 EUT Testing Position

Head/Body-worn/Hotspot mode SAR assessments are required for this device. This EUT was tested in different positions for different SAR test modes, more information as below:

Head SAR tests				
Antennas	**Right Cheek**	**Left Cheek**	**Right Tilted**	**Left Tilted**
WWAN	Yes	Yes	Yes	Yes
WLAN	No	No	No	No

Hotspot SAR tests, Test distance: 10mm						
Antennas	**Front**	**Back**	**Right Side**	**Left Side**	**Top Side**	**Bottom Side**
WWAN	Yes	Yes	Yes	Yes	No	Yes
WLAN	No	No	No	No	No	No

Body-worn SAR tests, Test distance: 10mm		
Antennas	**Front**	**Back**
WWAN	Yes	Yes
WLAN	No	No

Remark:

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

Please refer to Annex D for the EUT test setup photos.

8. SAR Measurement Procedures

8.1 Measurement Procedures

The measurement procedures are as follows:
(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.
(b) Keep EUT to radiate maximum output power or 100% factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the EUT in the positions as Annex E demonstrates.
(e) Set scan area, grid size and other setting on the SATIMO software.
(f) Measure SAR results for the highest power channel on each testing position.
(g) Find out the largest SAR result on these testing positions of each band
(h) Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:
(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The SATIMO software includes all numerical procedures necessary to evaluate the spatial peak SAR value.
The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.
The entire evaluation of the spatial peak values is performed within the post-processing engine. The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:
(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

8.4 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.5 SAR Averaged Methods

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10g and 1 g requires a very fine resolution in the three dimensional scanned data array.

8.6 Power Drift Monitoring

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

9. SAR Test Result

9.1 Conducted RF Output Power

GSM - Burst Average Power (dBm)						
Band	**GSM850**			**PCS1900**		
Channel	**128**	**190**	**251**	**512**	**661**	**810**
Frequency (MHz)	**824.2**	**836.4**	**848.8**	**1850.2**	**1880**	**1909.8**
GSM	32.57	32.61	32.58	29.52	29.73	29.76
GPRS (1 slot)	32.63	32.70	32.68	29.54	29.70	29.74
GPRS (2 slots)	31.74	31.84	31.86	28.62	28.91	28.98
GPRS (3 slots)	29.69	29.81	29.87	26.64	27.06	27.29
GPRS (4 slots)	28.40	28.56	28.62	25.31	25.79	26.16

GSM - Source-Based Time-Average Power (dBm)						
Band	**GSM850**			**PCS1900**		
Channel	**128**	**190**	**251**	**512**	**661**	**810**
Frequency (MHz)	**824.2**	**836.4**	**848.8**	**1850.2**	**1880**	**1909.8**
GSM	23.57	23.61	23.58	20.52	20.73	20.76
GPRS (1 slot)	23.63	23.70	23.68	20.54	20.70	20.74
GPRS (2 slots)	25.74	25.84	25.86	22.62	22.91	22.98
GPRS (3 slots)	25.44	25.56	25.62	22.39	22.81	23.04
GPRS (4 slots)	25.40	25.56	25.62	22.31	22.79	23.16
Note: The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. The calculated method are shown as below: Source based time-average power = Burst averaged power - Duty cycle factor in dB						

Remark:

1. For Head SAR testing, GSM should be evaluated, therefore the EUT was set in GSM for GSM850 and GSM1900 due to its highest source-based time-average power.
2. For Body SAR testing, GPRS should be evaluated, therefore the EUT was set in GPRS (2Tx slots) for GSM850 and GPRS (4Tx slots) for GSM1900 due to its highest source-based time-average power.
3. Per KDB 447498 D01 v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
4. The DUT do not support DTM function.

WCDMA - Average Power (dBm)						
Band	**WCDMA Band II**			**WCDMA Band V**		
Channel	**9262**	**9400**	**9538**	**4132**	**4182**	**4233**
Frequency (MHz)	**1852.4**	**1880**	**1907.6**	**826.4**	**836.4**	**846.6**
RMC 12.2k	22.56	22.60	22.42	22.40	22.28	22.26
HSDPA Subtest-1	21.31	21.54	21.33	21.59	21.44	21.21
HSDPA Subtest-2	21.39	21.68	21.56	21.11	21.56	21.49
HSDPA Subtest-3	21.69	21.19	21.43	21.36	21.63	21.54
HSDPA Subtest-4	21.93	21.46	21.38	21.57	21.58	21.25
HSUPA Subtest-1	21.41	21.52	21.28	21.47	21.36	21.61
HSUPA Subtest-2	21.25	21.78	21.39	21.22	21.39	21.06
HSUPA Subtest-3	21.63	21.98	21.73	21.39	21.16	21.52
HSUPA Subtest-4	21.18	21.85	21.24	21.21	21.29	21.71
HSUPA Subtest-5	21.34	21.29	21.57	21.87	21.37	21.35

WCDMA - Average Power (dBm)						
Band	**WCDMA Band IV**					
Channel	**1312**	**1413**	**1513**			
Frequency (MHz)	**1712.4**	**1732.6**	**1752.6**			
RMC 12.2k	22.60	21.93	21.90			
HSDPA Subtest-1	21.57	21.43	20.93			
HSDPA Subtest-2	21.23	21.40	21.06			
HSDPA Subtest-3	21.40	21.38	20.85			
HSDPA Subtest-4	21.33	21.52	20.89			
HSUPA Subtest-1	21.61	20.99	20.98			
HSUPA Subtest-2	21.40	20.89	21.18			
HSUPA Subtest-3	21.56	21.04	20.84			
HSUPA Subtest-4	21.30	20.92	21.07			
HSUPA Subtest-5	21.59	21.13	20.94			

Remark:

1. For Head SAR, per KDB 941225 D01 v02, RMC 12.2kbps setting is used to evaluate SAR. If AMR 12.2kbps power is < 1/4 dB higher than RMC, SAR tests with AMR 12.2kbps can be excluded.
2. For Body SAR, per KDB 941225 D01 v02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA subset-1 output power is < 1/4 dB higher than RMC, and SAR with RMC 12.2kbps setting is ≦1.2W/kg, HSDPA SAR evaluation can be excluded.

WLAN - Maximum Average Power				
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**
802.11b	1Mbps	CH 01	2412	9.39
		CH 06	2437	9.22
		CH 11	2462	9.14
802.11g	54Mbps	CH 01	2412	9.16
		CH 06	2437	9.18
		CH 11	2462	9.17
802.11n (20MHz)	MCS7	CH 01	2412	9.36
		CH 06	2437	9.42
		CH 11	2462	9.35
802.11n (40MHz)	MCS7	CH 03	2422	9.39
		CH 06	2437	9.41
		CH 09	2452	9.45

Remark:

WLAN maximum output power is 9.45dBm, and Tune-Up output power is 9.5dBm. Per KDB 648474 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by: [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,16 where

- f(GHz) is the RF channel transmit frequency in GHz

- Power and distance are rounded to the nearest mW and mm before calculation17
- The result is rounded to one decimal place for comparison

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
9.5	8.91	5	2.452	2.79	3

The exclusion thresholds is 2.79< 3, therefore, the RF exposure evaluation is not required.

Bluetooth - Maximum Average Power				
Test Mode	**Data Rate**	**Average Power(dBm)**		
		CH00	**CH39**	**CH78**
GFSK	1Mbps	-0.51	1.12	2.16
4*π4DQPSK	2Mbps	-0.94	0.60	1.67
8DPSK	3Mbps	-0.57	1.05	2.13

Bluetooth - Maximum Average Power				
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**
BLE	1Mbps	CH 00	2402	-8.24
		CH 19	2440	-7.15
		CH 39	2480	-6.14

Remark:

Bluetooth maximum output power is 2.16dBm, and Tune-Up output power is 2.5dBm. Per KDB 648474 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by: [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,16 where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation17
- The result is rounded to one decimal place for comparison

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
2.5	1.78	5	2.480	0.56	3

The exclusion thresholds is 0.56< 3, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Head SAR

GSM850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
1	GSM	Right Cheek	190	836.6	32.61	33.0	1.0940	0.1601	0.1751
2	GSM	Right Tilted	190	836.6	32.61	33.0	1.0940	0.0741	0.0811
3	GSM	Left Cheek	190	836.6	32.61	33.0	1.0940	0.1155	0.1264
4	GSM	Left Tilted	190	836.6	32.61	33.0	1.0940	0.0526	0.0575

GSM1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency CH.	Frequency M Hz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
12	GSM	Right Cheek	810	1909.8	29.76	30.0	1.0568	0.0750	0.0793
13	GSM	Right Tilted	810	1909.8	29.76	30.0	1.0568	0.0301	0.0318
14	GSM	Left Cheek	810	1909.8	29.76	30.0	1.0568	0.1303	0.1377
15	GSM	Left Tilted	810	1909.8	29.76	30.0	1.0568	0.0406	0.0429

WCDMA Band V – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
23	RMC	Right Cheek	4132	826.4	22.40	22.5	1.0233	0.0326	0.0334
24	RMC	Right Tilted	4132	826.4	22.40	22.5	1.0233	0.0273	0.0279
25	RMC	Left Cheek	4132	826.4	22.40	22.5	1.0233	0.0310	0.0317
26	RMC	Left Tilted	4132	826.4	22.40	22.5	1.0233	0.0260	0.0266

WCDMA Band II – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
32	RMC	Right Cheek	9400	1880.0	22.60	23.0	1.0965	0.1289	0.1413
33	RMC	Right Tilted	9400	1880.0	22.60	23.0	1.0965	0.0416	0.0456
34	RMC	Left Cheek	9400	1880.0	22.60	23.0	1.0965	0.1915	0.2100
35	RMC	Left Tilted	9400	1880.0	22.60	23.0	1.0965	0.0400	0.0439

WCDMA Band IV– Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
41	RMC	Right Cheek	1312	1712.4	22.60	23.0	1.0965	0.2044	0.2241
42	RMC	Right Tilted	1312	1712.4	22.60	23.0	1.0965	0.0968	0.1061
43	RMC	Left Cheek	1312	1712.4	22.60	23.0	1.0965	0.4119	0.4516
44	RMC	Left Tilted	1312	1712.4	22.60	23.0	1.0965	0.1329	0.1457

Remark: Per KDB 447498 D01 v05r02, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

Body-worn SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
5	GSM	Back	190	836.6	32.61	33.0	1.0940	0.3094	0.3385
6	GSM	Front	190	836.6	32.61	33.0	1.0940	0.1242	0.1359

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
16	GSM	Back	810	1909.8	29.76	30.0	1.0568	0.2350	0.2484
17	GSM	Front	810	1909.8	29.76	30.0	1.0568	0.1853	0.1958

WCDMA Band V – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
27	RMC 12.2k	Back	4132	826.4	22.40	22.5	1.0233	0.0710	0.0727
28	RMC 12.2k	Front	4132	826.4	22.40	22.5	1.0233	0.0503	0.0515

WCDMA Band II – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
45	RMC 12.2k	Back	9400	1880.0	22.60	23.0	1.0965	0.2474	0.2713
46	RMC 12.2k	Front	9400	1880.0	22.60	23.0	1.0965	0.1925	0.2111

WCDMA Band IV– Head SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
45	RMC 12.2k	Back	1312	1712.4	22.60	23.0	1.0965	0.5736	0.6289
46	RMC 12.2k	Front	1312	1712.4	22.60	23.0	1.0965	0.5735	0.6288

Remark: Per KDB 447498 D01 v05r02, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

Hotspot SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
7	GPRS_2TX	Back Side	251	848.8	31.86	32.0	1.0328	0.5307	0.5481
8	GPRS_2TX	Front Side	251	848.8	31.86	32.0	1.0328	0.1898	0.1960
9	GPRS_2TX	Bottom side	251	848.8	31.86	32.0	1.0328	0.0621	0.0641
10	GPRS_2TX	Right side	251	848.8	31.86	32.0	1.0328	0.0503	0.0519
11	GPRS_2TX	Left side	251	848.8	31.86	32.0	1.0328	0.3238	0.3344

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
18	GPRS_4TX	Back Side	810	1909.8	26.16	26.5	1.0814	0.3988	0.4313
19	GPRS_4TX	Front Side	810	1909.8	26.16	26.5	1.0814	0.3922	0.4241
20	GPRS_4TX	Bottom side	810	1909.8	26.16	26.5	1.0814	0.4577	0.4950
21	GPRS_4TX	Right side	810	1909.8	26.16	26.5	1.0814	0.0534	0.0577
22	GPRS_4TX	Left side	810	1909.8	26.16	26.5	1.0814	0.0971	0.1050

WCDMA Band V – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
27	RMC 12.2k	Back Side	4132	826.4	22.40	22.5	1.0233	0.0710	0.0727
28	RMC 12.2k	Front Side	4132	826.4	22.40	22.5	1.0233	0.0503	0.0515
29	RMC 12.2k	Bottom side	4132	826.4	22.40	22.5	1.0233	0.0087	0.0089
30	RMC 12.2k	Right side	4132	826.4	22.40	22.5	1.0233	0.0459	0.0470
31	RMC 12.2k	Left side	4132	826.4	22.40	22.5	1.0233	0.0523	0.0535

WCDMA Band II – Body SAR Test (Gap: 10mm)										
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
36	RMC 12.2k	Back Side	9400	1880.0	22.60	23.0	1.0965	0.2474	0.2713
37	RMC 12.2k	Front Side	9400	1880.0	22.60	23.0	1.0965	0.1925	0.2111
38	RMC 12.2k	Bottom side	9400	1880.0	22.60	23.0	1.0965	0.3318	0.3638
39	RMC 12.2k	Right side	9400	1880.0	22.60	23.0	1.0965	0.0344	0.0377
40	RMC 12.2k	Left side	9400	1880.0	22.60	23.0	1.0965	0.1222	0.1340

WCDMA Band IV– Head SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
45	RMC 12.2k	Back Side	1312	1712.4	22.60	23.0	1.0965	0.5736	0.6289
46	RMC 12.2k	Front Side	1312	1712.4	22.60	23.0	1.0965	0.5735	0.6288
47	RMC 12.2k	Bottom side	1312	1712.4	22.60	23.0	1.0965	0.4122	0.4520
48	RMC 12.2k	Right side	1312	1712.4	22.60	23.0	1.0965	0.1873	0.2054
49	RMC 12.2k	Left side	1312	1712.4	22.60	23.0	1.0965	0.4080	0.4474

Remark: Per KDB 447498 D01 v05r02, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

9.3 Simultaneous Multi-band Transmission SAR Analysis

List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Head SAR	Body-worn SAR	Hotspot SAR
1	GSM + WLAN	Yes	Yes	-
2	GPRS + WLAN	-	-	Yes
3	WCDMA + WLAN	Yes	Yes	-
4	HSDPA + WLAN	-	-	Yes
5	HSUPA + WLAN	-	-	Yes
6	GSM + Bluetooth	Yes	Yes	-
7	GPRS + Bluetooth	-	-	Yes
8	WCDMA + Bluetooth	Yes	Yes	-
9	HSDPA + Bluetooth	-	-	Yes
10	HSUPA + Bluetooth	-	-	Yes

Remark:

1. GSM and WCDMA share the same antenna, and cannot transmit simultaneously.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 D01v05r01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

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

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

For simultaneous transmission analysis, WIFI/Bluetooth SAR is estimated per KDB 447498 D01v05r01 as below:

WIFI:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
9.5	8.91	5/10	2.452	7.5	0.3721	0.1860

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(1g) 10mm
2.5	1.78	5/10	2.480	7.5	0.0748	0.0374

4. The maximum SAR summation is calculated based on the same configuration and test position.

Head SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.1751	0.3721	0.5472
Right Tilted	GSM850	0.0811	0.3721	0.4532
Left Cheek	GSM850	0.1264	0.3721	0.4985
Left Tilted	GSM850	0.0575	0.3721	0.4296
Right Cheek	GSM1900	0.0793	0.3721	0.4514
Right Tilted	GSM1900	0.0318	0.3721	0.4039
Left Cheek	GSM1900	0.1377	0.3721	0.5098
Left Tilted	GSM1900	0.0429	0.3721	0.415
Right Cheek	WCDMA Band V	0.0334	0.3721	0.4055
Right Tilted	WCDMA Band V	0.0279	0.3721	0.4
Left Cheek	WCDMA Band V	0.0317	0.3721	0.4038
Left Tilted	WCDMA Band V	0.0266	0.3721	0.3987
Right Cheek	WCDMA Band II	0.1413	0.3721	0.5134
Right Tilted	WCDMA Band II	0.0456	0.3721	0.4177
Left Cheek	WCDMA Band II	0.2100	0.3721	0.5821
Left Tilted	WCDMA Band II	0.0439	0.3721	0.416
Right Cheek	WCDMA Band IV	0.2241	0.3721	0.5962
Right Tilted	WCDMA Band IV	0.1061	0.3721	0.4782
Left Cheek	WCDMA Band IV	0.4516	0.3721	**0.8237**
Left Tilted	WCDMA Band IV	0.1457	0.3721	0.5178

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.1751	0.0748	0.2499
Right Tilted	GSM850	0.0811	0.0748	0.1559
Left Cheek	GSM850	0.1264	0.0748	0.2012
Left Tilted	GSM850	0.0575	0.0748	0.1323
Right Cheek	GSM1900	0.0793	0.0748	0.1541
Right Tilted	GSM1900	0.0318	0.0748	0.1066
Left Cheek	GSM1900	0.1377	0.0748	0.2125
Left Tilted	GSM1900	0.0429	0.0748	0.1177
Right Cheek	WCDMA Band V	0.0334	0.0748	0.1082
Right Tilted	WCDMA Band V	0.0279	0.0748	0.1027
Left Cheek	WCDMA Band V	0.0317	0.0748	0.1065
Left Tilted	WCDMA Band V	0.0266	0.0748	0.1014

Right Cheek	WCDMA Band II	0.1413	0.0748	0.2161
Right Tilted	WCDMA Band II	0.0456	0.0748	0.1204
Left Cheek	WCDMA Band II	0.2100	0.0748	0.2848
Left Tilted	WCDMA Band II	0.0439	0.0748	0.1187
Right Cheek	WCDMA Band IV	0.2241	0.0748	0.2989
Right Tilted	WCDMA Band IV	0.1061	0.0748	0.1809
Left Cheek	WCDMA Band IV	0.4516	0.0748	**0.5264**
Left Tilted	WCDMA Band IV	0.1457	0.0748	0.2205

Body-worn SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.3385	0.1860	0.5245
Front	GSM850	0.1359	0.1860	0.3219
Back	GSM1900	0.2484	0.1860	0.4344
Front	GSM1900	0.1958	0.1860	0.3818
Back	WCDMA Band V	0.0727	0.1860	0.2587
Front	WCDMA Band V	0.0515	0.1860	0.2375
Back	WCDMA Band II	0.2713	0.1860	0.4573
Front	WCDMA Band II	0.2111	0.1860	0.3971
Back	WCDMA Band IV	0.6289	0.1860	**0.8149**
Front	WCDMA Band IV	0.6288	0.1860	0.8148

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.3385	0.0374	0.3759
Front	GSM850	0.1359	0.0374	0.1733
Back	GSM1900	0.2484	0.0374	0.2858
Front	GSM1900	0.1958	0.0374	0.2332
Back	WCDMA Band V	0.0727	0.0374	0.1101
Front	WCDMA Band V	0.0515	0.0374	0.0889
Back	WCDMA Band II	0.2713	0.0374	0.3087
Front	WCDMA Band II	0.2111	0.0374	0.2485
Back	WCDMA Band IV	0.6289	0.0374	**0.6663**
Front	WCDMA Band IV	0.6288	0.0374	0.6662

Remark: For WIFI, BT the 1g SAR value is not being captured by the measurement system, the 1g-SAR value is conservatively used for simultaneous transmission analysis.

Hotspot SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.5481	0.1860	0.7341
Front	GSM850	0.1960	0.1860	0.382
Top side	GSM850	--	0.1860	0.1860
Bottom side	GSM850	0.0641	0.1860	0.2501
Right side	GSM850	0.0519	0.1860	0.2379
Left side	GSM850	0.3344	0.1860	0.5204
Back	GSM1900	0.4313	0.1860	0.6173
Front	GSM1900	0.4241	0.1860	0.6101
Top side	GSM1900	--	0.1860	0.1860
Bottom side	GSM1900	0.4950	0.1860	0.681
Right side	GSM1900	0.0577	0.1860	0.2437
Left side	GSM1900	0.1050	0.1860	0.291
Back	WCDMA Band V	0.0727	0.1860	0.2587
Front	WCDMA Band V	0.0515	0.1860	0.2375
Top side	WCDMA Band V	--	0.1860	0.1860
Bottom side	WCDMA Band V	0.0089	0.1860	0.1949
Right side	WCDMA Band V	0.0470	0.1860	0.233
Left side	WCDMA Band V	0.0535	0.1860	0.2395
Back	WCDMA Band II	0.2713	0.1860	0.4573
Front	WCDMA Band II	0.2111	0.1860	0.3971
Top side	WCDMA Band II	--	0.1860	0.1860
Bottom side	WCDMA Band II	0.3638	0.1860	0.5498
Right side	WCDMA Band II	0.0377	0.1860	0.2237
Left side	WCDMA Band II	0.1340	0.1860	0.32
Back	WCDMA Band IV	0.6289	0.1860	**0.8149**
Front	WCDMA Band IV	0.6288	0.1860	0.8148
Top side	WCDMA Band IV	--	0.1860	0.1860
Bottom side	WCDMA Band IV	0.4520	0.1860	0.638
Right side	WCDMA Band IV	0.2054	0.1860	0.3914
Left side	WCDMA Band IV	0.4474	0.1860	0.6334

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	GSM850	0.5481	0.0527	0.6008
Front	GSM850	0.1960	0.0527	0.2487
Top side	GSM850	--	0.0527	0.0527
Bottom side	GSM850	0.0641	0.0527	0.1168
Right side	GSM850	0.0519	0.0527	0.1046
Left side	GSM850	0.3344	0.0527	0.3871
Back	GSM1900	0.4313	0.0527	0.484
Front	GSM1900	0.4241	0.0527	0.4768
Top side	GSM1900	--	0.0527	0.0527
Bottom side	GSM1900	0.4950	0.0527	0.5477
Right side	GSM1900	0.0577	0.0527	0.1104
Left side	GSM1900	0.1050	0.0527	0.1577
Back	WCDMA Band V	0.0727	0.0527	0.1254
Front	WCDMA Band V	0.0515	0.0527	0.1042
Top side	WCDMA Band V	--	0.0527	0.0527
Bottom side	WCDMA Band V	0.0089	0.0527	0.0616
Right side	WCDMA Band V	0.0470	0.0527	0.0997
Left side	WCDMA Band V	0.0535	0.0527	0.1062
Back	WCDMA Band II	0.2713	0.0527	0.324
Front	WCDMA Band II	0.2111	0.0527	0.2638
Top side	WCDMA Band II	--	0.0527	0.0527
Bottom side	WCDMA Band II	0.3638	0.0527	0.4165
Right side	WCDMA Band II	0.0377	0.0527	0.0904
Left side	WCDMA Band II	0.1340	0.0527	0.1867
Back	WCDMA Band IV	0.6289	0.0527	**0.6816**
Front	WCDMA Band IV	0.6288	0.0527	0.6815
Top side	WCDMA Band IV	--	0.0527	0.0527
Bottom side	WCDMA Band IV	0.4520	0.0527	0.5047
Right side	WCDMA Band IV	0.2054	0.0527	0.2581
Left side	WCDMA Band IV	0.4474	0.0527	0.5001

Remark: For WIFI, BT the 1g SAR value is not being captured by the measurement system, the 1g-SAR value is conservatively used for simultaneous transmission analysis.

10. Measurement Uncertainty

10.1 Uncertainty for EUT SAR Test

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝
Test Sample Related									
Test sample positioning	E.4.2.1	0.03	N	1	1	1	0.03	0.03	N–1
Device Holder Uncertainty	E.4.1.1	5.00	N	1	1	1	5.00	5.00	
Output power Variation - SAR drift measurement	6.6.2	12.02	R	√3	1	1	6.94	6.94	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	
Liquid permittivity -	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M

measurement uncertainty									
Combined Standard Uncertainty			RSS				12.98	12.53	
Expanded Uncertainty (95% Confidence interval)			K=2				25.32	24.43	

10.2 Uncertainty for System Performance Check

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	√3	1	1	0.58	0.58	N−1
Input power and SAR drift measurement	8,6.6.2	12.02	R	√3	1	1	6.94	6.94	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	

Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M
Combined Standard Uncertainty			RSS				12.00	11.50	
Expanded Uncertainty (95% Confidence interval)			K=2				23.39	22.43	

Annex A. Plots of System Performance Check

MEASUREMENT 1

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 05/25/2015

Measurement duration: 7 minutes 21 seconds

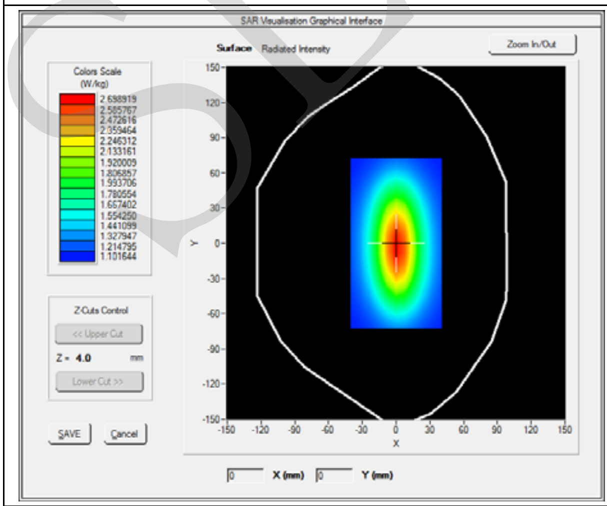
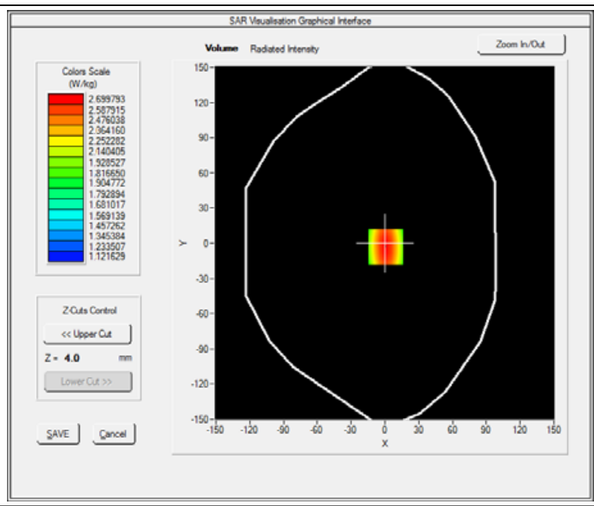
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.25; Calibrated: 03/16/2015

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	835.000000
Relative Permittivity (real part)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	1.814580
Ambient Temperature	21.1
Liquid Temperature	21.3

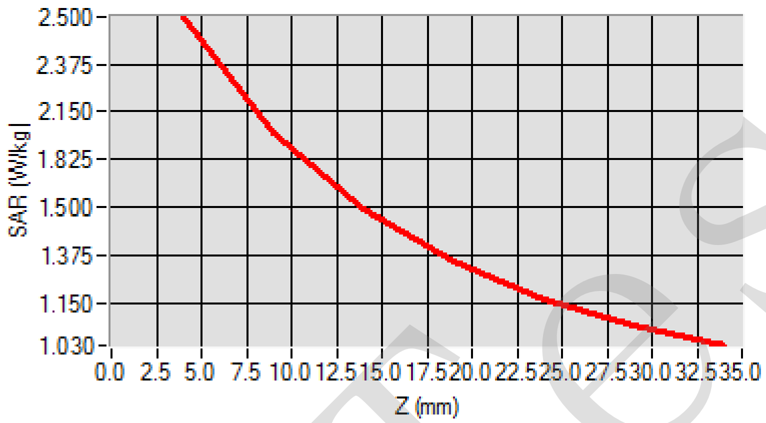
SURFACE SAR	**VOLUME SAR**
	

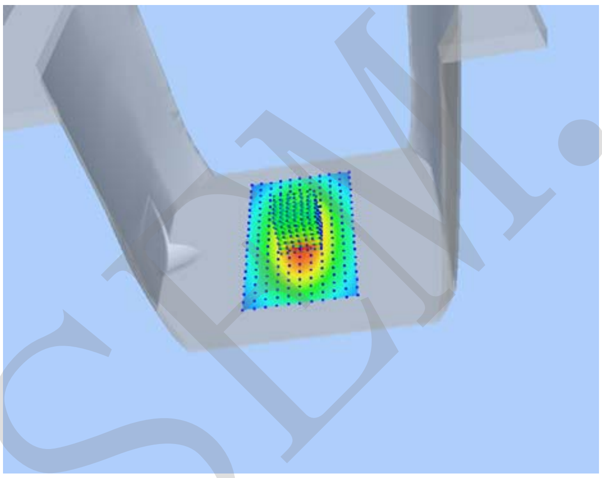
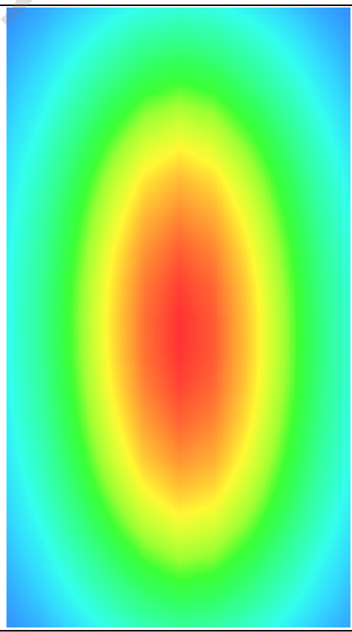
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.129489
SAR 1g (W/Kg)	2.41125

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.4900	1.8942	1.4811	1.3541	1.1123	1.0539



3D screen shot	Hot spot position
	

MEASUREMENT 2

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 05/25/2015

Measurement duration: 12 minutes 21 seconds

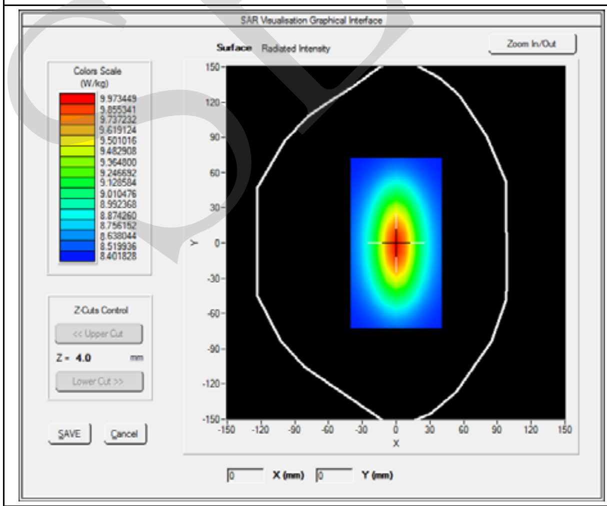
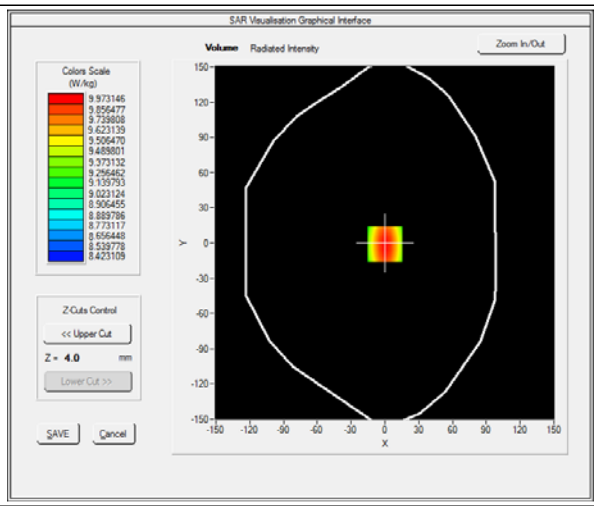
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.16; Calibrated: 03/16/2015

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.022540
Ambient Temperature	21.1
Liquid Temperature	21.3

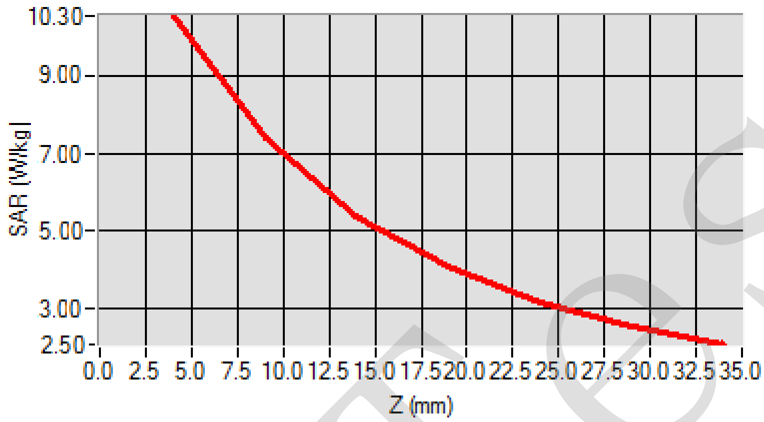
SURFACE SAR	VOLUME SAR
	

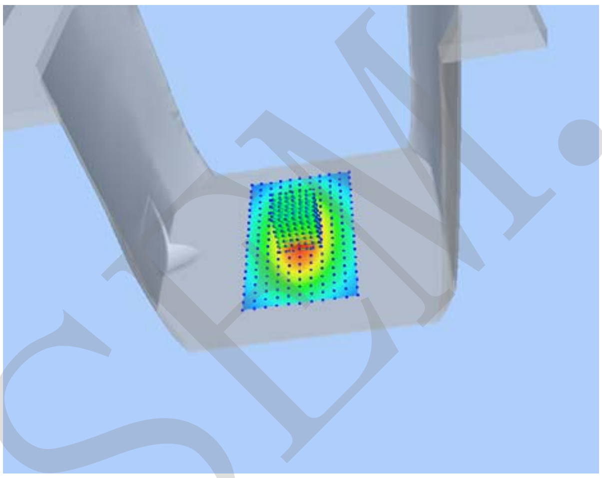
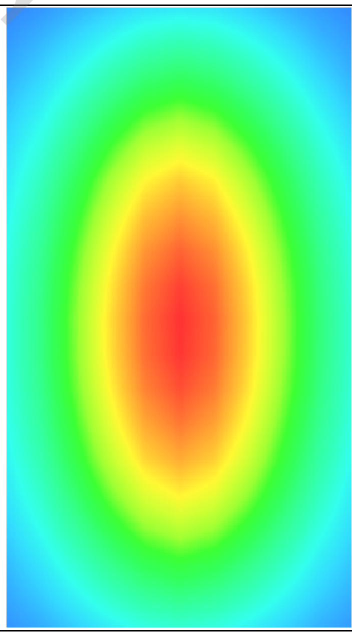
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**7.174526**
SAR 1g (W/Kg)	**9.903214**

Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**	**24.00**	**29.00**
SAR (W/Kg)	**0.0000**	**10.2354**	**6.8400**	**5.0121**	**4.1189**	**3.0522**	**2.8424**



3D screen shot	**Hot spot position**
	

MEASUREMENT 3

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 05/25/2015

Measurement duration: 12 minutes 21 seconds

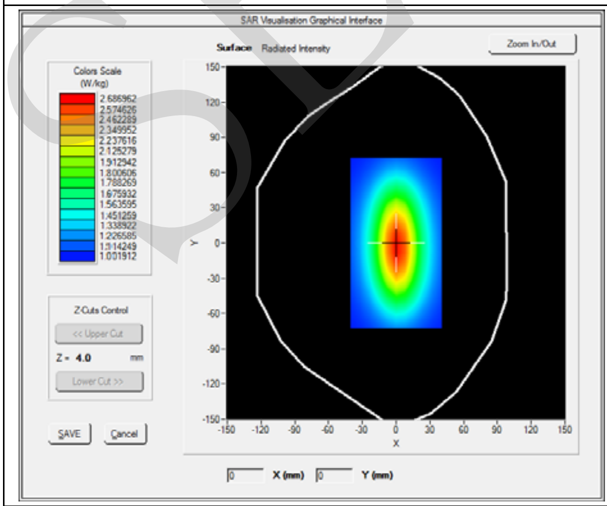
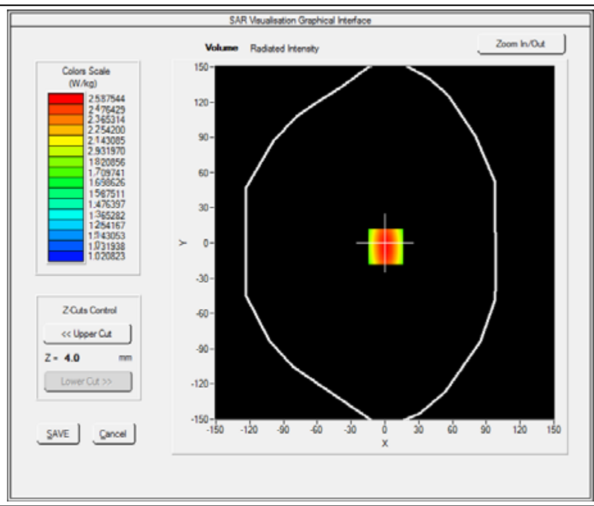
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.50; Calibrated: 03/16/2015

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	835.000000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.901472
Ambient Temperature	21.1
Liquid Temperature	21.3

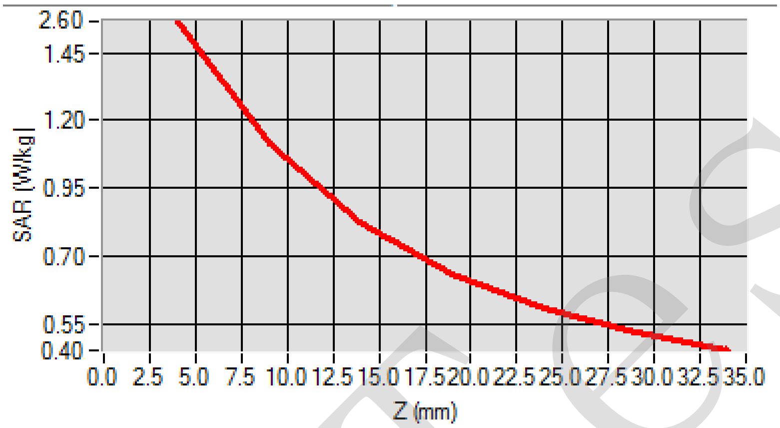
SURFACE SAR	VOLUME SAR
	

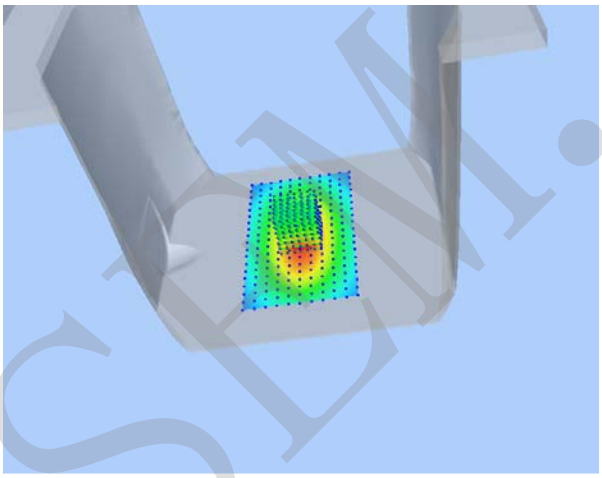
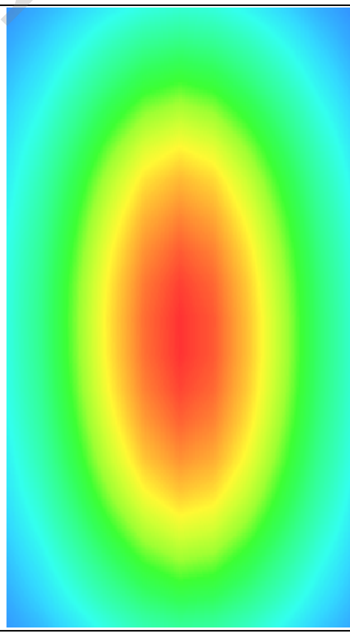
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**1.028956**
SAR 1g (W/Kg)	**2.344211**

Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**	**24.00**	**29.00**
SAR (W/Kg)	**0.0000**	**2.5789**	**1.1300**	**0.8795**	**0.5940**	**0.5011**	**0.5100**



3D screen shot	**Hot spot position**
	

MEASUREMENT 4

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 05/25/2015

Measurement duration: 12 minutes 21 seconds

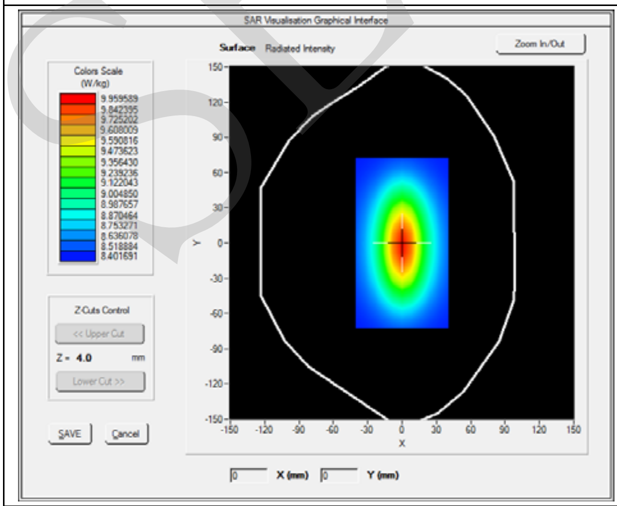
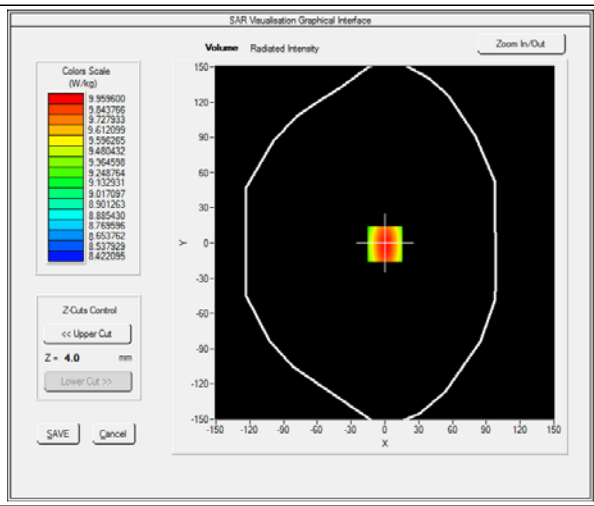
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.30; Calibrated: 03/16/2015

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.541872
Ambient Temperature	21.1
Liquid Temperature	21.3

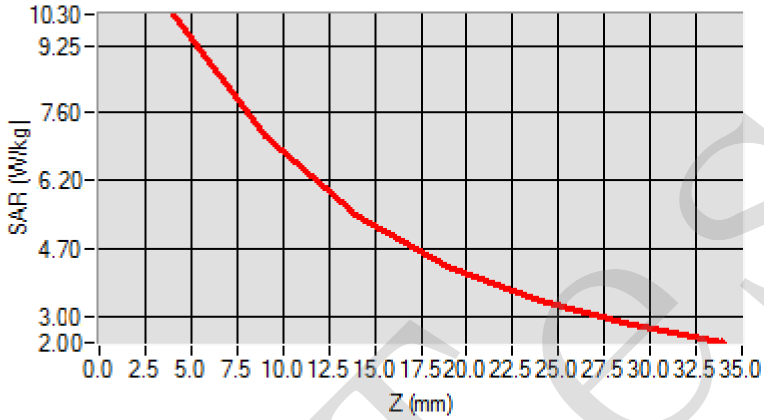
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**5.134651**
SAR 1g (W/Kg)	**9.751550**

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	10.2031	6.43001	4.9011	4.5325	3.1201	2.5024



3D screen shot	Hot spot position