SAR TEST REPORT

Reference No.	:	WTS15S1240219E V1
FCC ID................................	:	WA6S5005
Applicant	:	VeryKool USA Inc
Address	:	3636 Nobel Drive, Suite 325, San Diego, CA92122 USA
Manufacturer	:	Shenzhen Fortuneship Technology Co., Ltd
Address	:	6/F, Kanghesheng Building, No.1 Chuangsheng Road,Nanshan District, Shenzhen, Guangdong, China
Product Name	:	Mobile Phone
Model No.	:	s5005, s5004
Brand.	:	verykool
Standards	:	FCC 47 CFR Part2(2.1093) ANSI/IEEE C95.1-2006 IEEE 1528-2013 & Published RF Exposure KDB Procedures
Date of Receipt sample....	:	Nov. 27, 2015
Date of Test	:	Nov. 27 - Nov. 30. 2015
Date of Issue	:	Feb. 25, 2016
Test Result	:	Pass

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China
Tel :+86-755-83551033
Fax:+86-755-83552400

Compiled by:

Zero Zhou / Test Engineer

Approved by:

Philo Zhong / Manager

1 Laboratory Introduction

Waltek Service Co., Ltd. is a professional third-party testing and certification organization with multi-year product testing and certification experience， Established strictly in accordance with ISO/IEC Guide 65 and ISO/IEC 17025，our company has got recognition from CNAS (China National Accreditation Service for Conformity Assessment) and International Laboratory Accreditation Cooperation (ILAC)。 At the same time, our company has been approved by some authoritative organizations， such as EMSD of Hongkong、UL、Intertek-ETL SEMKO、CSA、MET、TÜV Rheinland、TÜV SÜD、SGS、Nemko、FCC 、IC of Canada、CPSC、TMICO and California Energy Commission (CEC)。Since the set-up of our company, we sincerely help our customers to improve their products to achieve relative international standards. We are accepted by various clients in international market and well-known in the same industry.

There are several laboratories in our company which are equipped with advanced equipments for fully testing. It can provide testing and certification services for products exported around the world, also it can ensure that the products reach international standards in aspects of safety, electromagnetic compatibility, virulence, energy efficiency, reliability and so on. To enable our customers can get local services more directly and conveniently, and to realize our promise to provide more high quality services. Our company has set up product testing labs in South China and East China (Shenzhen, Dongguan, Foshan, Suzhou and Ningbo). We can provide our clients with accurate test and technical support services in good faith, and actively follow customer demand. These can fully demonstrate Waltek Services concept -- “One-stop Services”.

Our company has many experienced engineers and customer service representatives to meet our customer’s demand for a number of tests and provide superb technical guidance and modification service; At the same time we can provide global certification services by our global partners to help our customer’s products to successfully extend to the global market.

2 Contents

3 Report Revision History

Report No.	Report Version	Description	Issue Date
WTS15S1240219E	NONE	Original	Jan. 26, 2016
WTS15S1240219E	V1	Version 1	Feb. 25, 2016

4 General Information

4.1 General Description of E.U.T.

Product Name:	:Mobile Phone
Model No.:	: s5005, s5004
Model Description:	: Only different for model name.
GSM Band(s):	GSM 850/900/1800/1900MHz
GPRS/EGPRS Class:	12
WCDMA Band(s):	FDD Band II/IV/V
Wi-Fi Specification:	802.11b/g/n HT20/n HT40
Bluetooth Version:	Bluetooth v3.0+EDR
GPS:	Support
NFC:	N/A
Hardware Version	R613-MB-V0.3
Software Version	s5005_VK_Generic_Dual_SW_1.0

4.2 Details of E.U.T.

Operation Frequency	GSM/GPRS 850: 824~849MHz PCS/GPRS 1900: 1850~1910MHz WCDMA Band II: 1850~1910MHz WCDMA Band IV:1710~1755MHz WCDMA Band V: 824~849MHz WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422-2452MHz Bluetooth: 2402-2480MHz
Max. RF output power	GSM 850: 32.78dBm PCS1900: 29.61dBm WCDMA Band II: 22.52dBm WCDMA Band IV: 22.77dBm WCDMA Band V: 22.51dBm WiFi(2.4G): 9.62dBm Bluetooth: 8.76dBm
Max.SAR:	0.24 W/Kg 1g Head Tissue 0.45 W/Kg 1g Body-worn Tissue 0.45 W/Kg 1g Hotspot Tissue
Max Simultaneous SAR	0.64 W/Kg
Type of Modulation:	GSM,GPRS: GMSK EDGE: GMSK, 8PSK WCDMA: BPSK WiFi: CCK, OFDM

	Bluetooth: GFSK, Pi/4 DQPSK,8DPSK
Antenna installation	GSM/WCDMA: internal permanent antenna WiFi/Bluetooth: internal permanent antenna
Antenna Gain	GSM 850: 0dBi PCS1900: 0dBi WCDMA Band II: -1.5dBi WCDMA Band IV: -1dBi WCDMA Band V: -1dBi WiFi(2.4G): 0dBi Bluetooth: 0dBi
Technical Data	Battery DC 3.8V, 2000mAh DC 5V, 0.2A, Charging from adapter 1 DC 5V, 0.15A, Charging from adapter 2 (Adapter Input:100-240V, 50/60Hz)
Adapter1	:Manufacture: Shenzhen Fortuneship Technology Co., Ltd. Model: s5005
Adapter2	:Manufacture: Shenzhenshi Jingrichang Electronic Technology CO.,LTD Model: JT-MO5100

5 INTRODUCTION

Introduction

This measurement report shows compliance of the EUT with ANSI/IEEE C95.1-2006 and FCC 47 CFR Part2 (2.1093)
.
The test procedures, as described in IEEE 1528-2013 Standard for IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques(300MHz~6GHz) and Published RF Exposure KDB Procedures

SAR Definition

- SAR : Specific Absorption Rate
- The SAR characterize the absorption of energy by a quantity of tissue
- This is related to a increase of the temperature of these tissues during a time period.

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

$$DAS = \frac{\sigma E^2}{\rho}$$

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

SAR definition

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

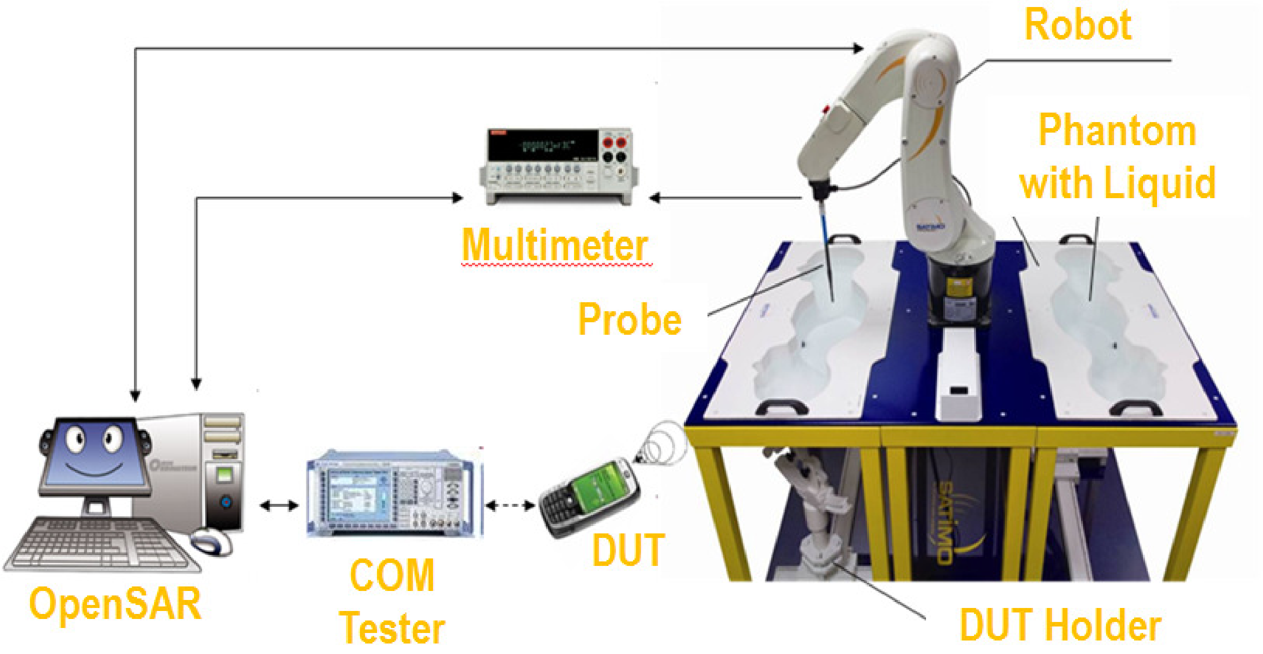
- SAR : Specific Absorption Rate
  - σ : Liquid conductivity
    - $\varepsilon_r = \varepsilon' - j\varepsilon''$ (complex permittivity of liquid)
    - $\sigma = \frac{\varepsilon'' \omega}{\varepsilon_0}$
  - ρ: Liquid density
    - ρ = 1000 g/L = 1000Kg/m³

where:

σ = conductivity of the tissue (S/m)
ρ = mass density of the tissue (kg/m3)
E = rms electric field strength (V/m)

6 SAR MEASUREMENT SETUP

SAR bench sub-systems



Scanning System (robot)

- It must be able to scan all the volume of the phantom to evaluate the tridimensional distribution of SAR.
- Must be able to set the probe orthogonal of the surface of the phantom (±30°).
- Detects stresses on the probe and stop itself if necessary to keep the integrity of the probe.

SAM Phantom (Specific Anthropomorphic Mannequin)

- The probe scanning of the E-Field is done in the 2 half of the normalized head.
- The normalized shape of the phantom corresponds to the dimensions of 90% of an adult head size.
- The materials for the phantom should not affect the radiation of the device under test (DUT)
  - Permittivity < 5
- The head is filled with tissue simulating liquid.
- The hand holding the DUT does not have to be modeled.

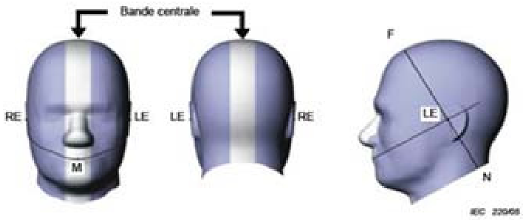
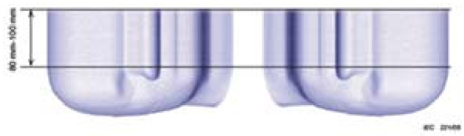
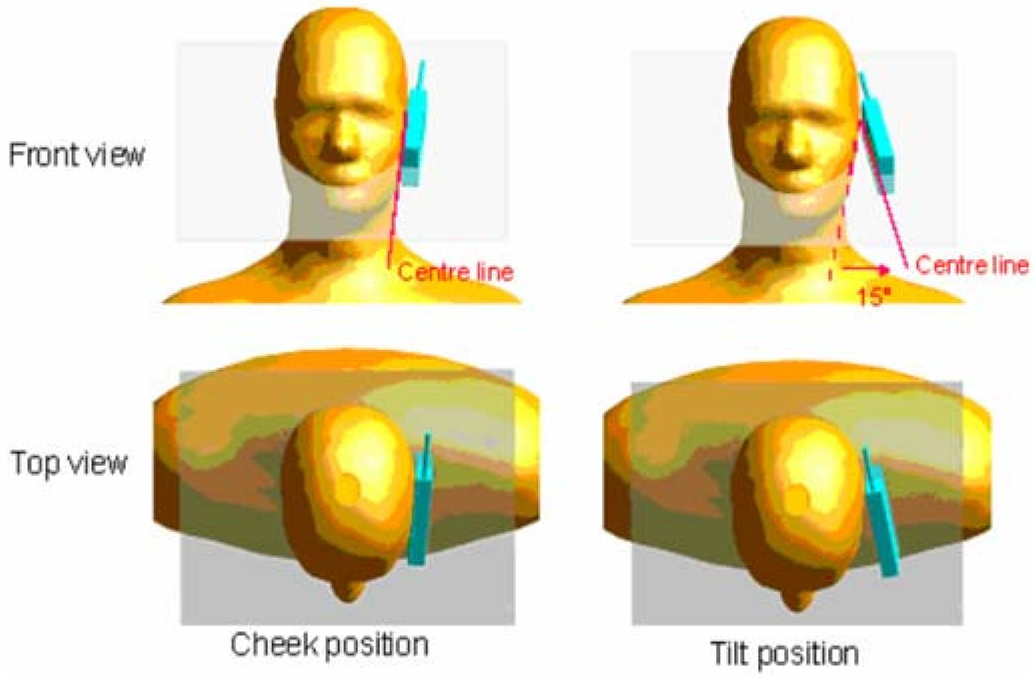


Illustration du fantôme donnant les points de référence des oreilles, RE et LE, le point de référence de la bouche, M, la ligne de référence N-F et la bande centrale



Bi-section sagittale du fantôme avec périmètre étendu (montrée sur le côté comme lors des essais de DAS de l'appareil)



The OPENSAR system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (KUKA) with controller and software.
2. KUKA Control Panel (KCP).
3. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
4. The functions of the PC plug-in card are to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.
5. A computer operating Windows 7.
6. OPENSAR software.
7. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
8. The SAM phantom enabling testing left-hand right-hand and body usage.
9. The Position device for handheld EUT.
10. Tissue simulating liquid mixed according to the given recipes (see Application Note).
11. System validation dipoles to validate the proper functioning of the system.

Data Evaluation

The OPENSAR software automatically executes the following procedure to calculate the field units from the microvolt readings at the probe connector. The parameters used in the valuation are stored in the configuration modules of the software:

Probe Parameters	- Sensitivity	$Norm_i$
	- Conversion factor	ConvFi
	- Diode compression point Dcpi	
Device Parameter	- Frequency	f
	- Crest factor	cf
Media Parametrs	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the OPENSAR components.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

Where V_i *= Compensated signal of channel i (i = x, y, z)*

U_i *= Input signal of channel i (i = x, y, z)*

cf *= Crest factor of exciting field (DASY parameter)*

dcp_i *= Diode compression point (DASY parameter)*

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes: $$H_i = \sqrt{Vi} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$$

Where V_i *= Compensated signal of channel i (i = x, y, z)*
$Norm_i$ *= Sensor sensitivity of channel i (i = x, y, z)*
µV/(V/m)2 for E0field Probes
ConvF= Sensitivity enhancement in solution
a_{ij} *= Sensor sensitivity factors for H-field probes*

f = Carrier frequency (GHz)
E_i *= Electric field strength of channel i in V/m*
H_i *= Magnetic field strength of channel i in A/m*

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

where SAR = local specific absorption rate in mW/g
E_{tot} *= total field strength in V/m*
σ *= conductivity in [mho/m] or [siemens/m]*
ρ *= equivalent tissue density in g/cm3*

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770} \quad or \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

where P_{pwe} *= Equivalent power density of a plane wave in mW/cm2*
E_{tot} *= total electric field strength in V/m*
H_{tot} *= total magnetic field strength in A/m*

SAR Evaluation – Peak Spatial - Average

The procedure for assessing the peak spatial-average SAR value consists of the following steps

- **Power Reference Measurement**

  The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in OPENSAR software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

- **Zoom Scan**

  Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- **Power Drift measurement**

  The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded.

SAR Evaluation – Peak SAR

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g. The OPENSAR system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation.
They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the fourth order least square polynomial method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

Definition of Reference Points

Ear Reference Point

Figure 6.2 shows the front, back and side views of the SAM Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERPs are 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 6.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 6.1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

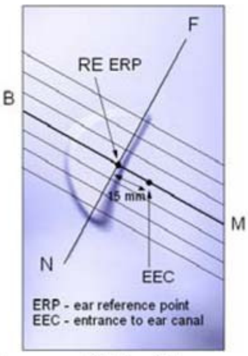


Figure 6.1 Close-up side view of ERP's

Figure 6.2 Front, back and side view of SAM

Device Reference Points

Two imaginary lines on the device need to be established: the vertical centerline and the horizontal line. The test device is placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 6.3). The "test device reference point" is than located at the same level as the center of the ear reference point. The test device is positioned so that the "vertical centerline" is bisecting the front surface of the device at it's top and bottom edges, positioning the "ear reference point" on the outer surface of both the left and right head phantoms on the ear reference point [5].

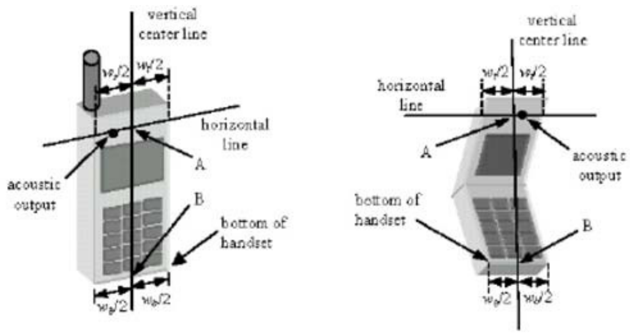


Figure 6.3 Handset Vertical Center & Horizontal Line Reference Points

Test Configuration – Positioning for Cheek / Touch

1. Position the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure below), such that the plane defined by the vertical center line and the horizontal line of the device is approximately parallel to the sagittal plane of the phantom

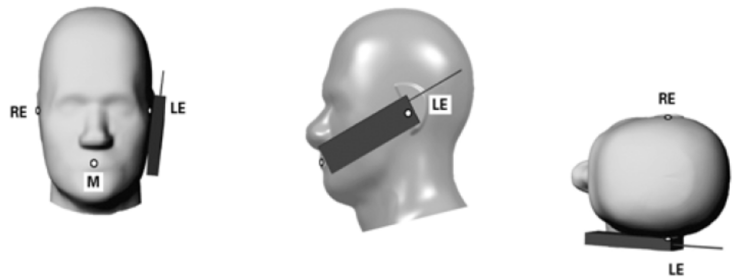


Figure 7.1 Front, Side and Top View of Cheek/Touch Position

2. Translate the device towards the phantom along the line passing through RE and LE until the device touches the ear.

3. While maintaining the device in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
4. Rotate the device around the vertical centerline until the device (horizontal line) is symmetrical with respect to the line NF.

5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the device contact with the ear, rotate the device about the line NF until any point on the device is in contact with a phantom point below the ear (cheek). See Figure below.

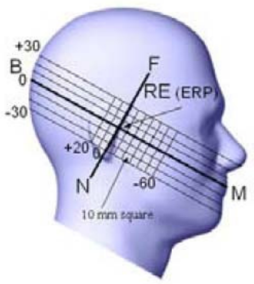


Figure 7.2 Side view w/ relevant markings

Test Configuration – Positioning for Ear / 15° Tilt

With the test device aligned in the Cheek/Touch Position”:

1. While maintaining the orientation of the device, retracted the device parallel to the reference plane far enough to enable a rotation of the device by 15 degrees.

2. Rotate the device around the horizontal line by 15 degrees.

3. While maintaining the orientation of the device, move the device parallel to the reference plane until any part of the device touches the head. (In this position, point A is located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the device shall be reduced. The tilted position is obtained when any part of the device is in contact with the ear as well as a second part of the device is in contact with the head (see Figure below).

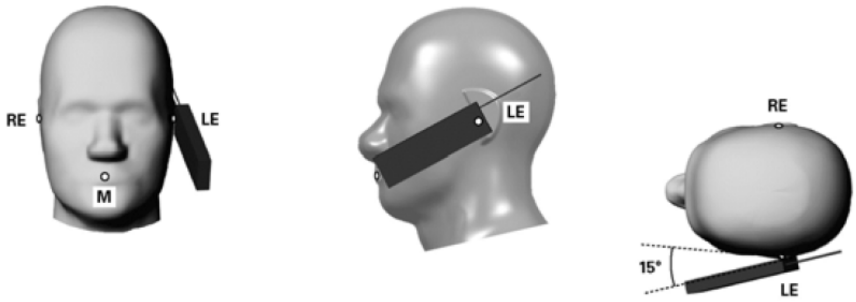
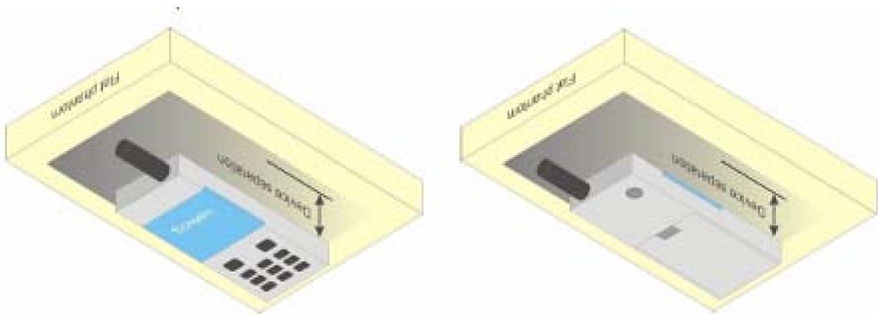


Figure 7.3 Front, Side and Top View of Ear/15° Tilt Position

Test Position – Body Configurations

Body Worn 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 1.5 cm or holster surface and the flat phantom
to 0 cm.



7 EXPOSURE LIMIT

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements are included in the user's manual.

Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 8.1 Human Exposure Limits

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIROMENT Professional Population (W/kg) or (mW/g)
SPATIAL PEAK SAR[1] Brain	1.60	8.00
SPATIAL AVERAGE SAR[2] Whole Body	0.08	0.40
SPATIAL PEAK SAR[3] Hands, Feet, Ankles, Wrists	4.00	20.00

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
[2] The Spatial Average value of the SAR averaged over the whole body.
[3] The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

8 SYSTEM AND LIQUID VALIDATION

System Validation

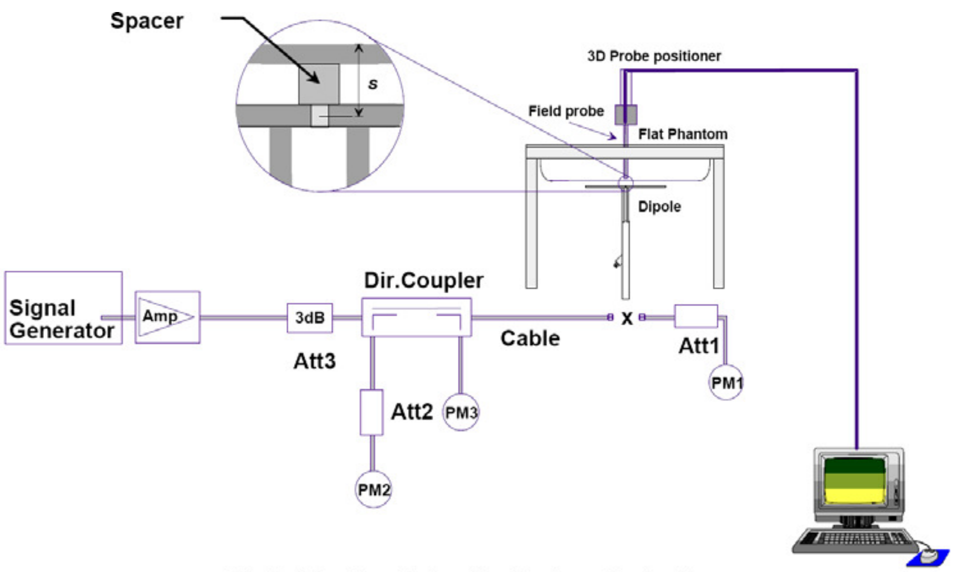


Fig 8.1 System Setup for System Evaluation

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.

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

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 30 dBm (1000 mW) before dipole is connected.

Numerical reference SAR values (W/kg) for reference dipole and flat phantom

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed-point)	Local SAR at surface (y = 2 cm offset from feed-point)[a]
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	4.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2000	41.1	21.1	74.6	6.5
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

Table 1: system validation (1g)

Measurement Date	Frequency (MHz)	Liquid Type (head/body)	Target SAR1g (W/kg)	Measured SAR1g (W/kg)	Normalized SAR1g (W/kg)	Deviation (%)
Nov 27,2015	835	head	9.53	0.0960	9.60	0.7
Nov 27,2015	835	body	9.44	0.0932	9.32	-1.3
Nov 30,2015	1800	head	37.56	0.3884	38.84	3.4
Nov 30,2015	1800	body	37.91	0.3743	37.43	-1.3
Nov 30,2015	1900	head	39.37	0.3976	39.76	1.0
Nov 30,2015	1900	body	38.58	0.3895	38.95	1.0

Note: system check input power: 10mW

Liquid Validation

The dielectric parameters were checked prior to assessment using the HP85070C dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

KDB 865664 recommended Tissue Dielectric Parameters

The head and body tissue parameters given in this below table should be used to measure the SAR of transmitters operating in 100 MHz to 6 GHz frequency range. The tissue dielectric parameters of the tissue medium at the test frequency should be within the tolerance required in this document. The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

The head tissue dielectric parameters recommended by IEEE Std 1528-2013 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 1528 are derived from tissue dielectric parameters computed from the 4-Cole-Cole equations described above and extrapolated according to the head parameters specified in 1528.

Target Frequency	Head Tissue		Body Tissue	
MHz	εr	Ơ (S/m)	εr	Ơ (S/m)
150	52.3	0.76	61.9	0.80
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	0.98	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

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 Power drifts 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.

Table 2: Recommended Dielectric Performance of Tissue

Recommended Dielectric Performance of Tissue						
Ingredients (% by weight)	Frequency (MHz)					
	835		1800		1900	
Tissue Type	**Head**	**Body**	**Head**	**Body**	**Head**	**Body**
Water	41.46	52.4	55.2	70.2	54.9	40.4
Salt (Nacl)	1.45	1.4	0.3	0.4	0.18	0.5
Sugar	56.0	45.0	0.0	0.0	0.0	58.0
HEC	1.0	1.0	0.0	0.0	0.0	1.0
Bactericide	0.1	0.1	0.0	0.0	0.0	0.1
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	44.5	29.4	44.92	0.0
Dielectric Constant	42.54	56.1	40.0	53.3	39.9	54.0
Conductivity (s/m)	0.91	1 0.95	1.40	1.52	1.42	1.45

Table 3: Dielectric Performance of Head Tissue Simulating Liquid

Temperature: 21°C , Relative humidity: 57%

Frequency(MHz)	Measured Date	Description	Dielectric Parameters	
			εr	σ(s/m)
835	Nov 27,2015	Target Value ±5% window	41.50 39.43 — 43.58	0.90 0.855 — 0.945
		Measurement Value	41.39	0.91
1700	Nov 30,2015	Target Value ±5% window	40.10 38.10 — 42.10	1.37 1.31 — 1.43
		Measurement Value	40.51	1.39
1800	Nov 30,2015	Target Value ±5% window	40.00 38.00 — 42.00	1.40 1.33 — 1.47
		Measurement Value	40.72	1.42
1900	Nov 30,2015	Target Value ±5% window	40.00 38.00 — 42.00	1.40 1.33 — 1.47
		Measurement Value	40.51	1.39

Table 4: Dielectric Performance of Body Tissue Simulating Liquid

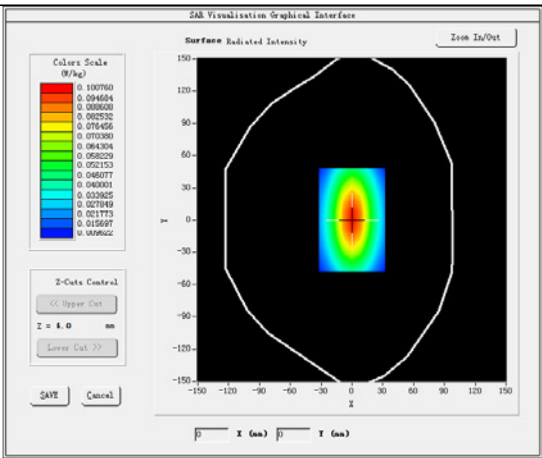
Temperature: 21°C , Relative humidity: 57% , Measured Date: Nov 30,2015

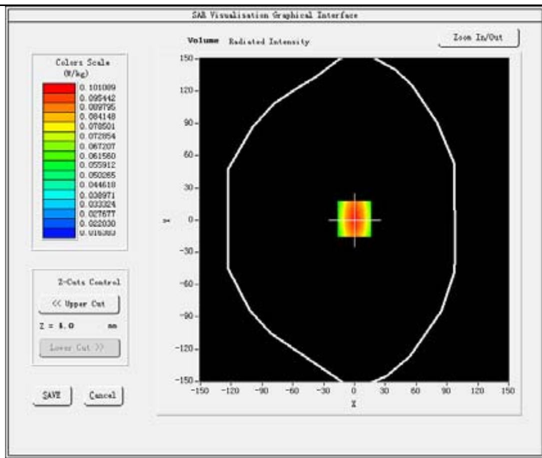
Frequency(MHz)	Measured Date	Description	Dielectric Parameters	
			εr	σ(s/m)
835	Nov 27,2015	Target Value ±5% window	55.2 52.25 — 57.75	0.97 0.922 — 1.018
		Measurement Value	55.66	0.96
1700	Nov 30,2015	Target Value ±5% window	53.40 50.73 — 56.07	1.49 1.42 — 1.56
		Measurement Value	53.20	1.48
1800	Nov 30,2015	Target Value ±5% window	53.30 50.64 — 55.97	1.52 1.44 — 1.60
		Measurement Value	53.57	1.51
1900	Nov 30,2015	Target Value ±5% window	53.30 50.64 — 55.97	1.52 1.44 — 1.60
		Measurement Value	53.82	1.50

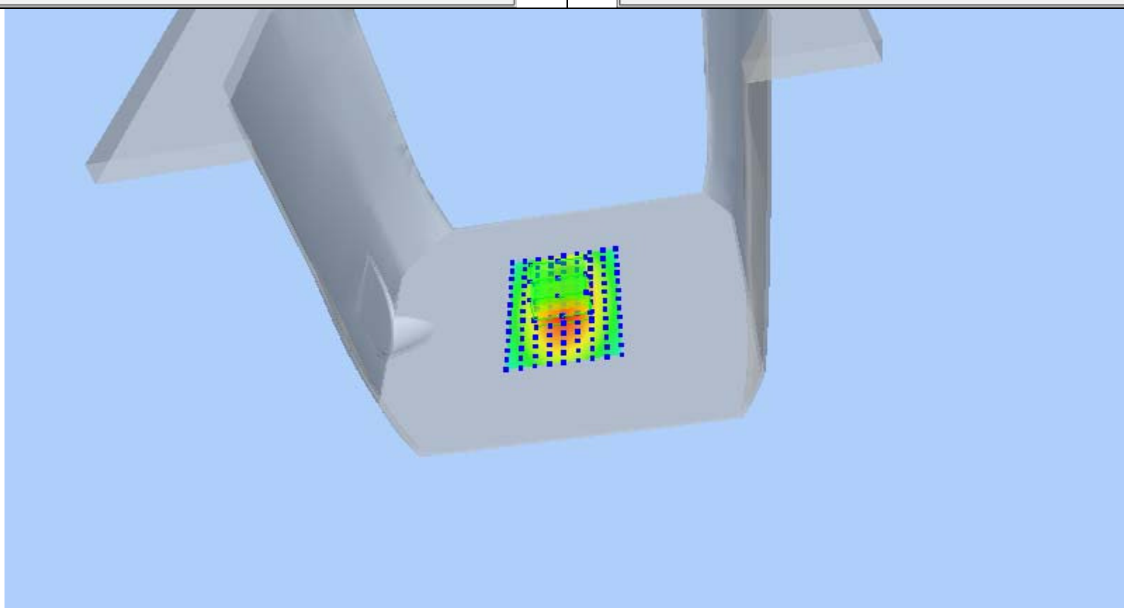
System Verification Plots

Product Description: Dipole
Model: SID835
Test Date: Nov 27,2015

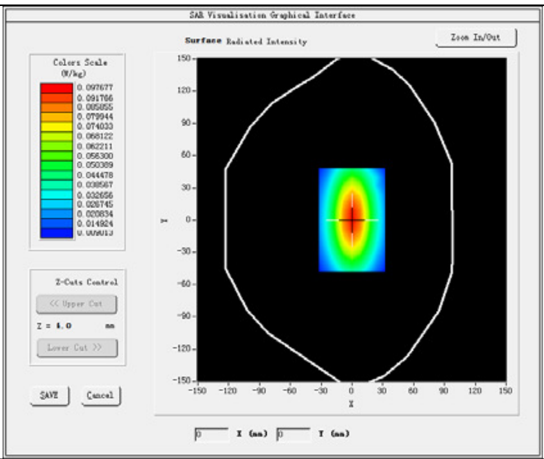
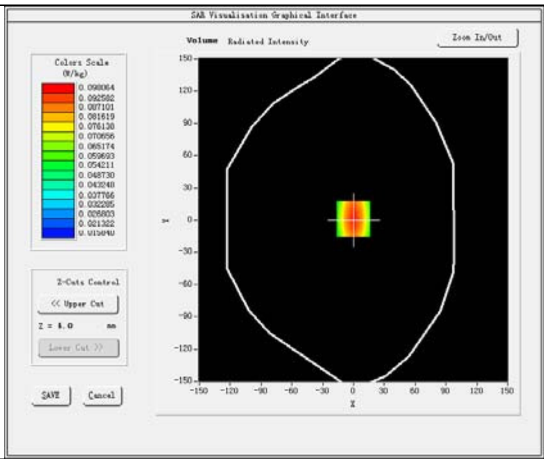
Medium(liquid type)	HSL_835
Frequency (MHz)	835.000000
Relative permittivity (real part)	41.39
Conductivity (S/m)	0.91
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	4.66
Sensor-surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.32
SAR 10g (W/Kg)	0.062053
SAR 1g (W/Kg)	0.096027
SURFACE SAR	**VOLUME SAR**

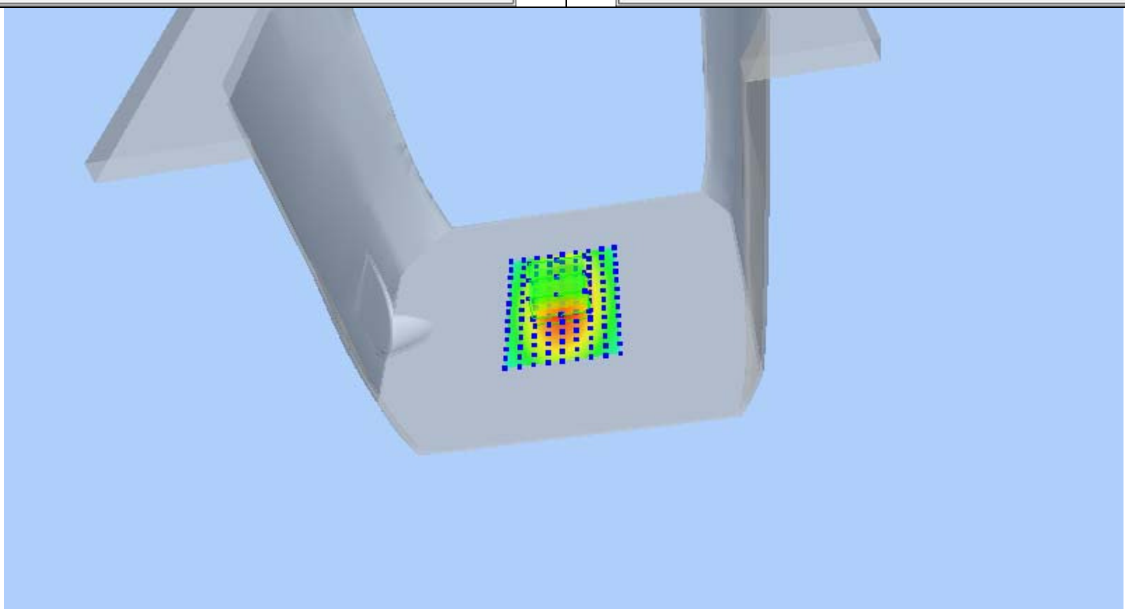






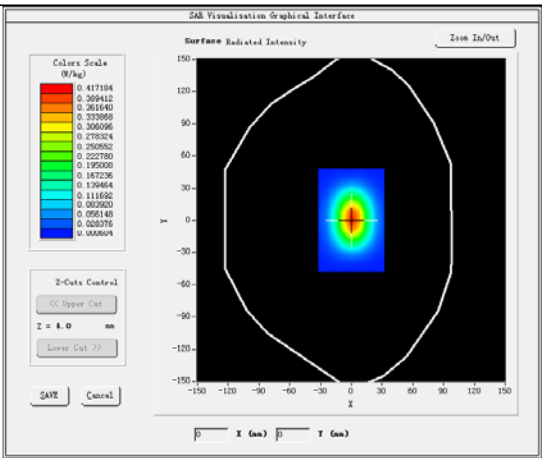
Product Description: Dipole
Model: SID835
Test Date: Nov 27,2015

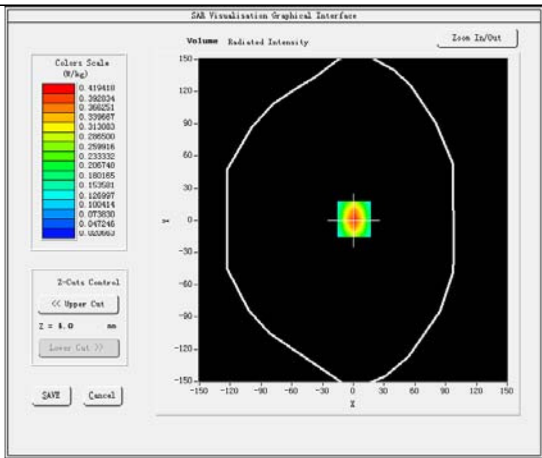
Medium(liquid type)	MSL_835
Frequency (MHz)	835.000000
Relative permittivity (real part)	55.66
Conductivity (S/m)	0.96
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	4.80
Sensor-surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.19
SAR 10g (W/Kg)	0.060257
SAR 1g (W/Kg)	0.093153
SURFACE SAR	**VOLUME SAR**
	

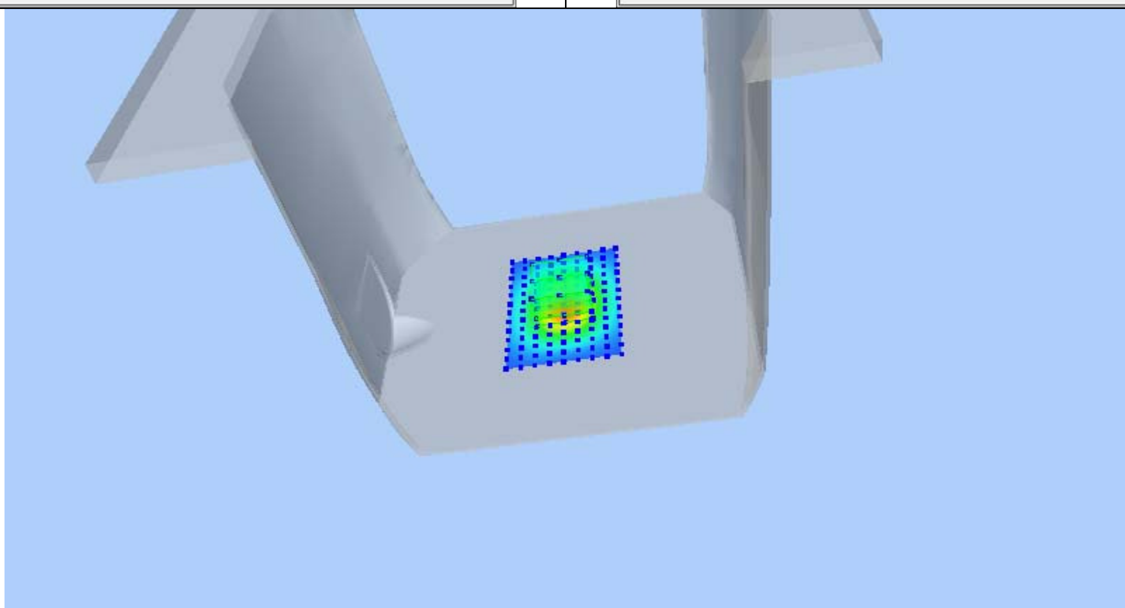


Product Description: Dipole
Model: SID1800
Test Date: Nov 30,2015

Medium(liquid type)	HSL_1800
Frequency (MHz)	1800.000
Relative permittivity (real part)	40.72
Conductivity (S/m)	1.42
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	3.86
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.90
SAR 10g (W/Kg)	0.206390
SAR 1g (W/Kg)	0.388391
SURFACE SAR	**VOLUME SAR**

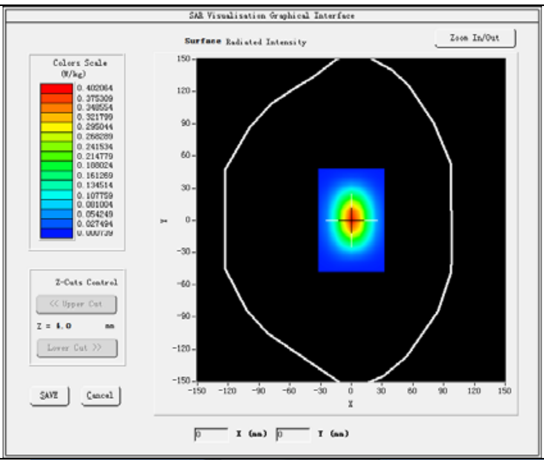


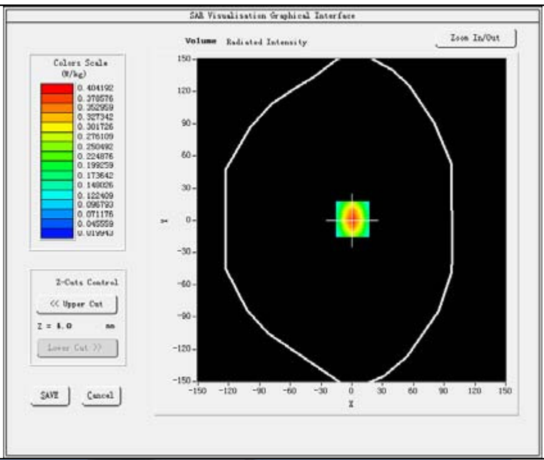


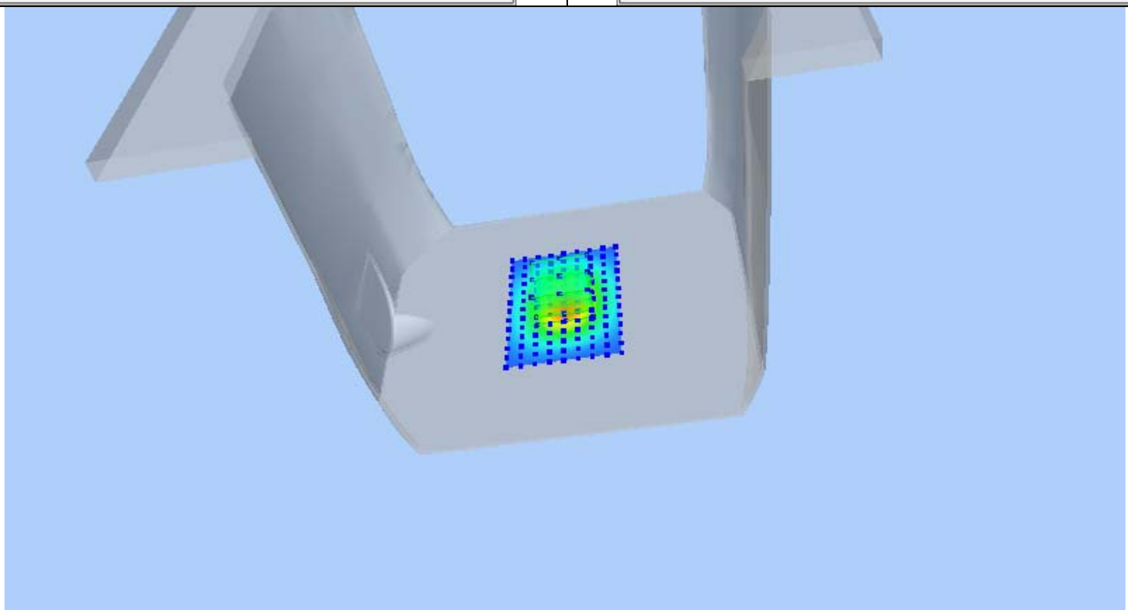


Product Description: Dipole
Model: SID1800
Test Date: Nov 30,2015

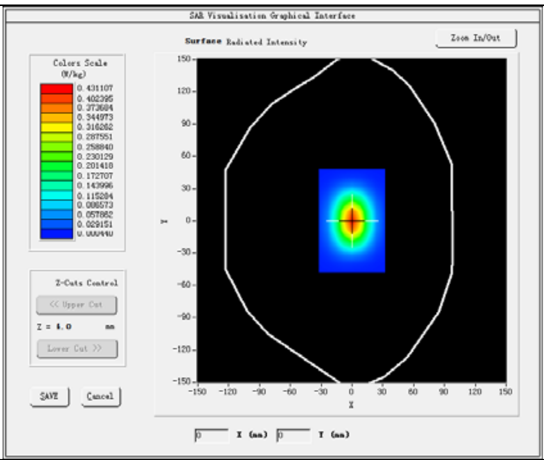
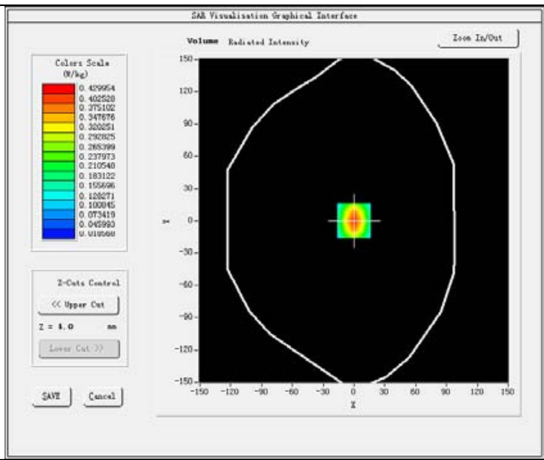
Medium(liquid type)	MSL_1800
Frequency (MHz)	1800.000
Relative permittivity (real part)	53.57
Conductivity (S/m)	1.51
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	3.94
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.60
SAR 10g (W/Kg)	0.198695
SAR 1g (W/Kg)	0.374253
SURFACE SAR	**VOLUME SAR**

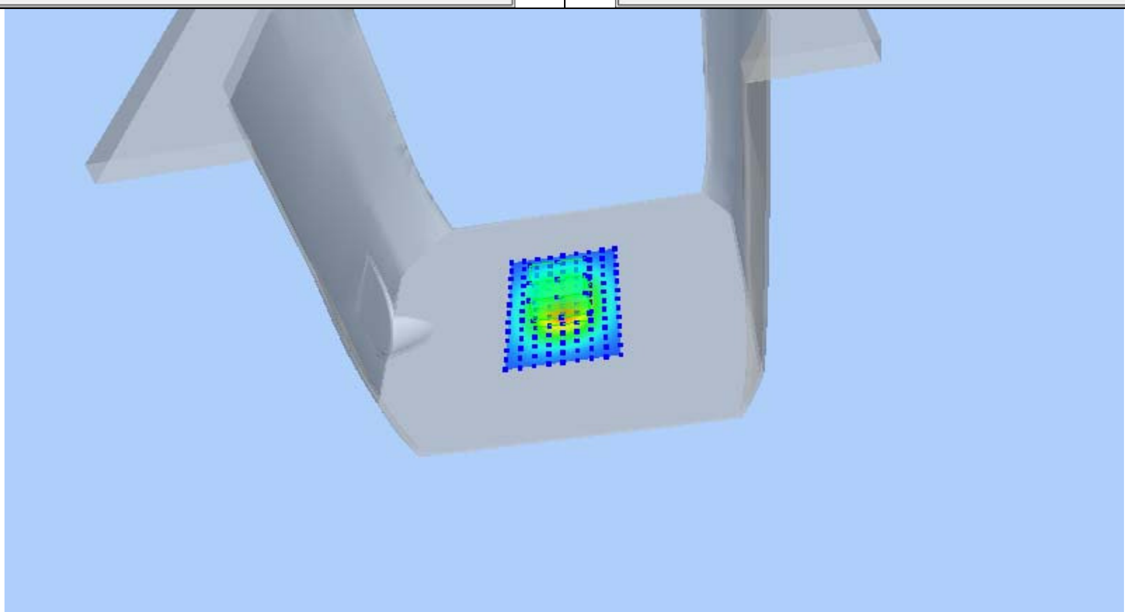




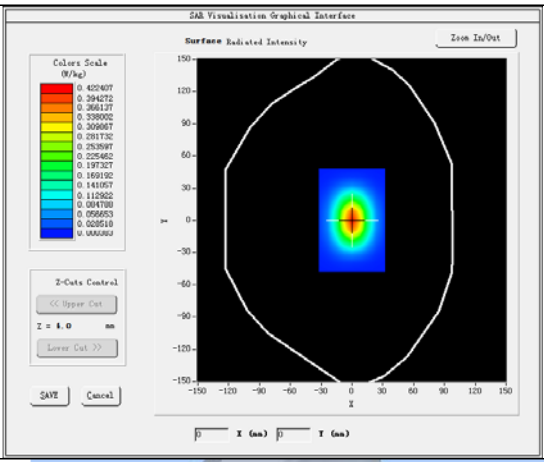
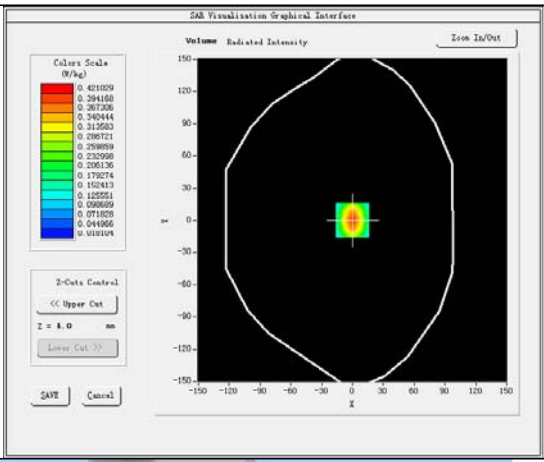


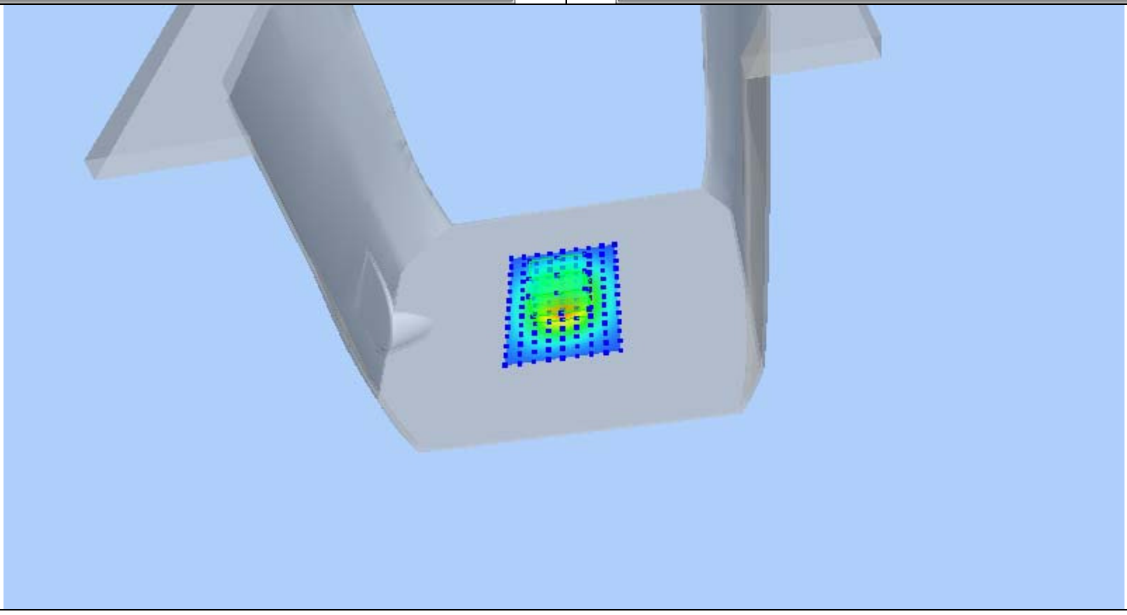
Product Description: Dipole
Model: SID1900
Test Date: Nov 30,2015

Medium(liquid type)	HSL_1900
Frequency (MHz)	1900.000
Relative permittivity (real part)	40.51
Conductivity (S/m)	1.39
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	4.45
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.33
SAR 10g (W/Kg)	0.207358
SAR 1g (W/Kg)	0.397638
SURFACE SAR	**VOLUME SAR**
	



Product Description: Dipole
Model: SID1900
Test Date: Nov 30,2015

Medium(liquid type)	MSL_1900
Frequency (MHz)	1900.000
Relative permittivity (real part)	53.82
Conductivity (S/m)	1.50
Input power	10mW
E-Field Probe	SN 07/15 EP249
Duty cycle	1:1
Conversion Factor	4.57
Sensor-Surface	4mm
Area Scan	dx=8mm dy=8mm
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Variation (%)	-0.14
SAR 10g (W/Kg)	0.202880
SAR 1g (W/Kg)	0.389457
SURFACE SAR	**VOLUME SAR**
	



9 TYPE A 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 specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table below :

Uncertainty Distribution	Normal	Rectangle	Triangular	U Shape
Multi-plying Factor[(a)]	1/k[(b)]	1 / √3	1 / √6	1 / √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

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type -sum-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 COMOSAR Uncertainty Budget is show in below table:

UNCERTAINTY FOR SYSTEM PERFORMANCE CHECK

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	ci (1 g)	ci (10 g)	1 g ui (± %)	10 g ui (± %)	vi
Measurement System								
Probe Calibration	5,8	N	1	1	1	5,8	5,8	∞
Axial Isotropy	3,5	R	√3	(1-cp)1/2	(1-cp)1/2	1,42887	1,42887	∞
Hemispherical Isotropy	5,9	R	√3	√Cp	√Cp	2,40866	2,40866	∞
Boundary Effect	1	R	√3	1	1	0,57735	0,57735	∞
Linearity	4,7	R	√3	1	1	2,71355	2,71355	∞
System Detection Limits	1	R	√3	1	1	0,57735	0,57735	∞
Readout Electronics	0,5	N	1	1	1	0,5	0,5	∞
Response Time	0	R	√3	1	1	0	0	∞
Integration Time	1,4	R	√3	1	1	0,80829	0,80829	∞
RF Ambient Conditions	3	R	√3	1	1	1,73205	1,73205	∞
Probe Positioner Mechanical Tolerance	1,4	R	√3	1	1	0,80829	0,80829	∞
Probe Positioning with respect to Phantom Shell	1,4	R	√3	1	1	0,80829	0,80829	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	2,3	R	√3	1	1	1,32791	1,32791	∞
Dipole								
Dipole Axis to Liquid Distance	2	N	√3	1	1	1,1547	1,1547	N-1
Input Power and SAR drift measurement	5	R	√3	1	1	2,88675	2,88675	∞
Phantom and Tissue Parameters								
Phantom Uncertainty (shape and thickness tolerances)	4	R	√3	1	1	2,3094	2,3094	∞
Liquid Conductivity - deviation from target values	5	R	√3	0,64	0,43	1,84752	1,2413	∞
Liquid Conductivity - measurement uncertainty	4	N	1	0,64	0,43	2,56	1,72	M
Liquid Permittivity - deviation from target values	5	R	√3	0,6	0,49	1,73205	1,41451	∞
Liquid Permittivity - measurement uncertainty	5	N	1	0,6	0,49	3	2,45	M
Combined Standard Uncertainty		RSS				9.6671	9.1646	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)		k				19.3342	18.3292	

UNCERTAINTY EVALUATION FOR HANDSET SAR TEST

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i (1 g)	c_i (10 g)	1 g u_i (± %)	10 g u_i (± %)	v_i
Measurement System								
Probe Calibration	5,8	N	1	1	1	5,8	5,8	∞
Axial Isotropy	3,5	R	√3	$(1-c_p)^{1/2}$	$(1-c_p)^{1/2}$	1,43	1,43	∞
Hemispherical Isotropy	5,9	R	√3	$\sqrt{C_p}$	$\sqrt{C_p}$	2,41	2,41	∞
Boundary Effect	1	R	√3	1	1	0,58	0,58	∞
Linearity	4,7	R	√3	1	1	2,71	2,71	∞
System Detection Limits	1	R	√3	1	1	0,58	0,58	∞
Readout Electronics	0,5	N	1	1	1	0,50	0,50	∞
Response Time	0	R	√3	1	1	0,00	0,00	∞
Integration Time	1,4	R	√3	1	1	0,81	0,81	∞
RF Ambient Conditions	3	R	√3	1	1	1,73	1,73	∞
Probe Positioner Mechanical Tolerance	1,4	R	√3	1	1	0,81	0,81	∞
Probe Positioning with respect to Phantom Shell	1,4	R	√3	1	1	0,81	0,81	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	2,3	R	√3	1	1	1,33	1,33	∞
Test sample Related								
Test Sample Positioning	2,6	N	1	1	1	2,60	2,60	N-1
Device Holder Uncertainty	3	N	1	1	1	3,00	3,00	N-1
Output Power Variation - SAR drift measurement	5	R	√3	1	1	2,89	2,89	∞
Phantom and Tissue Parameters								
Phantom Uncertainty (shape and thickness tolerances)	4	R	√3	1	1	2,31	2,31	∞
Liquid Conductivity - deviation from target values	5	R	√3	0,64	0,43	1,85	1,24	∞
Liquid Conductivity - measurement uncertainty	4	N	1	0,64	0,43	2,56	1,72	M
Liquid Permittivity - deviation from target values	5	R	√3	0,6	0,49	1,73	1,41	∞
Liquid Permittivity - measurement uncertainty	5	N	1	0,6	0,49	3,00	2,45	M
Combined Standard Uncertainty		RSS				10.39	9.92	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)		k				20.78	19.84	

10 TEST INSTRUMENT

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Date	Calibration Due
6 AXIS ROBOT	KUKA	KR6 R900 SIXX	502635	N/A	N/A
SATIMO Test Software	MVG	OPENSAR	OPENSAR V_4_02_27	N/A	N/A
PHANTOM TABLE	MVG	N/A	SAR_1215_01	N/A	N/A
SAM PHANTOM	MVG	SAM118	SN 11/15 SAM118	N/A	N/A
MultiMeter	Keithley	MiltiMeter 2000	4073942	2015-03-16	2016-03-15
Data Acquisition Electronics	MVG	DAE4	915	2015-03-16	2016-03-15
S-Parameter Network Analyzer	Agilent	8753E	JP38160684	2015-04-02	2016-04-01
Universal Radio Communication Tester	ROHDE&SCHW ARZ	CMU200	112461	2015-03-23	2016-03-22
E-Field Probe	MVG	SSE5	SN 07/15 EP249	2015-10-19	2016-10-18
DIPOLE 835	MVG	SID835	SN 09/15 DIP 0G835-358	2015-03-16	2016-03-15
DIPOLE 1800	MVG	SID1800	SN 09/15 DIP 1G800-360	2015-03-16	2016-03-15
DIPOLE 1900	MVG	SID1900	SN 09/15 DIP 1G900-361	2015-03-16	2016-03-15
Limesar Dielectric Probe	MVG	SCLMP	SN 11/15 OCPG 69	2015-03-16	2016-03-15
Power Amplifier	BONN	BLWA 0830 -160/100/40D	128740	2015-09-14	2016-09-14
Signal Generator	R&S	SMB100A	105942	2015-09-14	2016-09-14
Power Meter	R&S	NRP2	102031	2015-09-14	2016-09-14

11 OUTPUT POWER VERIFICATION

Test Condition:

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The base station simulator was connected to the antenna terminal.
2 Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3 Environmental Conditions
Temperature 23°C
Relative Humidity 53%
Atmospheric Pressure 1019mbar
4 Test Date : Nov 27,2015
Tested By : Damon Wang

Test Procedures:

mobile phone radio output power measurement

1. The transmitter output port was connected to base station emulator.
2. Establish communication link between emulator and EUT and set EUT to operate at maximum output power all the time.
3. Select lowest, middle, and highest channels for each band and different possible test mode.
4. Measure the conducted peak burst power and conducted average burst power from EUT antenna port.

Other radio output power measurement

The output power was measured using power meter at low, mid, and hi channels.

Source-based Time Averaged Burst Power Calculation:

For TDMA, the following duty cycle factor was used to calculate the source-based time average power

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Duty cycle factor	-9.03 dB	-6.02 dB	-4.26 dB	-3.01 dB
Crest Factor	8	4	2.66	2

Remark: *Time slot duty cycle factor = 10 * log (1 / Time Slot Duty Cycle)*
Source based time averaged power = Maximum burst averaged power (1 Uplink) – 9.03 dB
Source based time averaged power = Maximum burst averaged power (2 Uplink) – 6.02 dB
Source based time averaged power = Maximum burst averaged power (3 Uplink) – 4.26 dB
Source based time averaged power = Maximum burst averaged power (4 Uplink) – 3.01 dB

Test Result:

Burst Average Power (dBm);								
Band	GSM850				PCS1900			
Channel	128	190	251	Tune up Power tolerant	512	661	810	Tune up Power tolerant
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice	32.74	32.70	32.64	32±1	29.61	29.43	29.59	29±1
GPRS Slot 1	32.78	32.75	32.67	32±1	29.59	29.38	29.53	29±1
GPRS Slot 2	31.32	31.32	31.23	31±1	27.74	27.56	27.40	27±1
GPRS Slot 3	29.45	29.42	29.34	29±1	26.13	25.99	25.85	25.5±1
GPRS Slot 4	27.59	27.54	27.45	27±1	24.06	23.95	23.85	23.5±1
EGPRS Slot 1	26.97	27.07	27.03	27±1	24.51	24.95	25.26	24.5±1
EGPRS Slot 2	26.66	26.77	26.69	26±1	24.26	24.70	25.04	24.5±1
EGPRS Slot 3	25.26	25.32	25.13	25±1	22.57	22.97	23.18	22.5±1
EGPRS Slot 4	22.50	22.62	22.52	22±1	19.95	20.21	20.35	19.5±1

Remark :
GPRS, CS1 coding scheme.
EGPRS, MCS5 coding scheme.
Multi-Slot 1 , Support Max 4 downlink, 1 uplink , 5 working link
Multi-Slot 2 , Support Max 4 downlink, 2 uplink , 5 working link
Multi-Slot 3 , Support Max 4 downlink, 3 uplink , 5 working link
Multi-Slot 4 , Support Max 4 downlink, 4 uplink , 5 working link

Source Based time Average Power (dBm)								
Band	GSM850				PCS1900			
Channel	128	190	251	Time Average factor	512	661	810	Time Average factor
Frequency (MHz)	824.2	836.6	848.8	/	1850.2	1880	1909.8	/
GSM Voice	23.71	23.67	23.61	-9.03	20.58	20.40	20.56	-9.03
GPRS Slot 1	23.75	23.72	23.64	-9.03	20.56	20.35	20.50	-9.03
GPRS Slot 2	25.30	25.30	25.21	-6.02	21.72	21.54	21.38	-6.02
GPRS Slot 3	25.19	25.16	25.08	-4.26	21.87	21.73	21.59	-4.26
GPRS Slot 4	24.58	24.53	24.44	-3.01	21.05	20.94	20.84	-3.01
EGPRS Slot 1	17.94	18.04	18.00	-9.03	15.48	15.92	16.23	-9.03
EGPRS Slot 2	20.64	20.75	20.67	-6.02	18.24	18.68	19.02	-6.02
EGPRS Slot 3	21.00	21.06	20.87	-4.26	18.31	18.71	18.98	-4.26
EGPRS Slot 4	19.49	19.61	19.51	-3.01	16.94	17.20	17.34	-3.01

Remark :
Time average factor = 1 uplink，10*log(1/8)=-9.03dB，2 uplink，10*log(2/8)=-6.02dB，3 uplink，10*log(3/8)=-4.26dB ,4 uplink，10*log(4/8)=-3.01dB
Source based time average power = Burst Average power + Time Average factor

Note: 1.For GPRS850, DUT was set in GPRS(2Tx slots) due to the Maximum source-base time average output power for body SAR.

1.For GPRS1900, DUT was set in GPRS(3Tx slots) due to the Maximum source-base time average output power for body SAR.

WCDMA - Average Power (dBm)								
Band	WCDMA Band II				WCDMA Band V			
Channel	9262	9400	9538	Tune up Power tolerant	4132	4183	4233	Tune up Power tolerant
Frequency (MHz)	1852.4	1880	1907.6	/	826.4	836.6	846.6	/
RMC 12.2k	22.32	22.27	22.52	22±1	22.51	22.46	22.45	22±1
HSDPA Subtest-1	21.40	21.26	21.67	21±1	21.46	21.75	21.24	21±1
HSDPA Subtest-2	20.42	21.05	20.79	21±1	21.44	20.76	21.23	21±1
HSDPA Subtest-3	20.56	21.25	20.88	21±1	21.27	21.03	20.82	21±1
HSDPA Subtest-4	21.01	20.78	21.23	21±1	20.86	21.46	20.94	21±1
HSUPA Subtest-1	21.70	21.05	21.67	21±1	21.18	21.46	21.36	21±1
HSUPA Subtest-2	20.78	20.45	21.24	21±1	20.74	21.20	21.10	21±1
HSUPA Subtest-3	21.03	21.06	21.23	21±1	20.56	21.07	20.80	21±1
HSUPA Subtest-4	21.06	21.17	20.91	21±1	20.65	21.30	20.87	21±1
HSUPA Subtest-5	20.88	20.83	20.83	21±1	20.80	21.14	20.79	21±1

WCDMA - Average Power (dBm)				
Band	**WCDMA BandⅣ**			
Channel	**1312**	**1413**	**1513**	**Tune up Power tolerant**
Frequency (MHz)	**1712.4**	**1732.6**	**1752.6**	/
RMC 12.2k	22.77	22.14	22.35	22±1
HSDPA Subtest-1	21.63	21.31	21.41	21±1
HSDPA Subtest-2	21.33	20.86	21.40	21±1
HSDPA Subtest-3	20.84	21.32	20.96	21±1
HSDPA Subtest-4	20.82	21.11	21.45	21±1
HSUPA Subtest-1	21.49	21.18	21.58	21±1
HSUPA Subtest-2	20.69	21.23	20.63	21±1
HSUPA Subtest-3	20.67	21.32	21.36	21±1
HSUPA Subtest-4	21.12	20.98	20.78	21±1
HSUPA Subtest-5	21.03	20.89	20.69	21±1

WIFI Mode (2.4G)

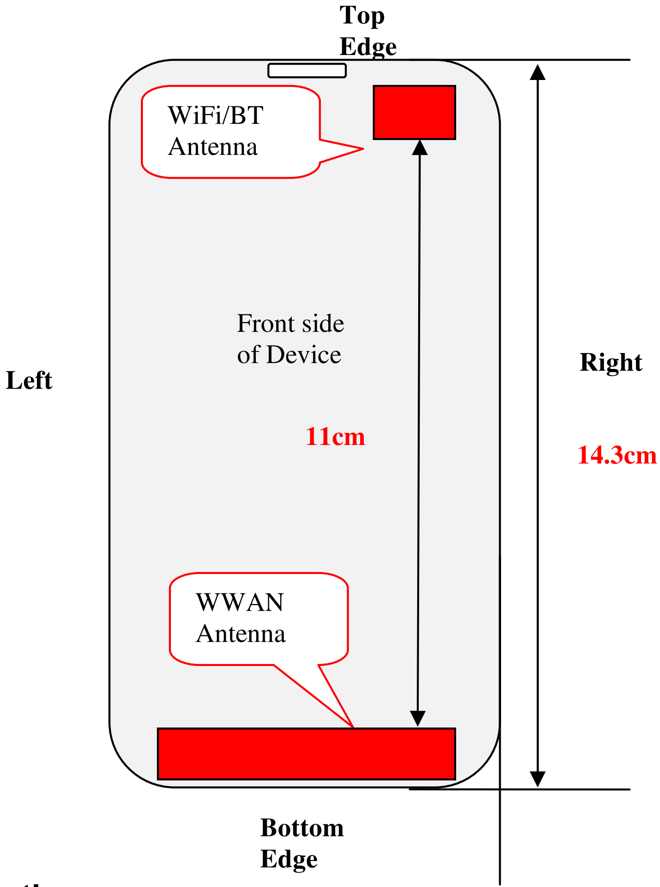
Mode	Channel number	Frequency (MHz)	Data rate(Mbps)	Average Output Power(dBm)	Average Tune up limited(dBm)
802.11b	1	2412	1	9.59	8.7±1
	6	2437	1	9.29	8.7±1
	11	2462	1	9.52	8.7±1
802.11g	1	2412	6	9.17	8.7±1
	6	2437	6	9.35	8.7±1
	11	2462	6	9.21	8.7±1
802.11n(HT20)	1	2412	MCS0	9.62	8.7±1
	6	2437	MCS0	9.29	8.7±1
	11	2462	MCS0	9.11	8.7±1
802.11n(HT40)	3	2422	MCS0	9.32	8.7±1
	6	2437	MCS0	9.37	8.7±1
	9	2452	MCS0	9.40	8.7±1

Bluetooth Measurement Result

Mode	Frequency (MHz)	Output Power(dBm)	Tune up limited(dBm)
GFSK	2402	5.88	6.5±1
	2441	6.18	6.5±1
	2480	7.02	6.5±1
π/4DQPSK	2402	7.65	7.5±1
	2441	7.82	7.5±1
	2480	8.28	7.5±1
8DPSK	2402	7.79	8.0±1
	2441	8.19	8.0±1
	2480	8.76	8.0±1

12 EXPOSURE CONDITIONS CONSIDERATION

EUT antenna location:



Test position consideration:

Distance of EUT antenna-to-edge/surface(mm), Test distance:10mm						
Antennas	Back side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
WWAN	2	9	8	8	129	3
WLAN	2	9	58	4	11	107
Bluetooth	2	9	58	4	11	107

Test distance:10mm						
Antennas	Back side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
WWAN	YES	YES	YES	YES	NO	YES
WLAN	NO	NO	NO	NO	NO	NO
Bluetooth	NO	NO	NO	NO	NO	NO

Note:
1. Head/Body-worn/Hotspot mode SAR assessments are required.
2. Referring to KDB 941225 D06v02r01, 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 located within 25mm from that surface or edge.
3. Per KDB 447498 D01v06, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user, which is 0 mm for head SAR, 10 mm for hotspot SAR, and 10 mm for body-worn SAR.

RF Exposure

Standard Requirement:
According to §15.247 (i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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*)] · [$\sqrt{f_{(GHz)}}$] ≤ 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 calculation[17]
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

Exclusion Thresholds = $P\sqrt{F}/D$
P= Maximum turn-up power in mW
F= Channel frequency in GHz
D= Minimum test separation distance in mm

Test Distance (5mm)

Mode	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
WIFI	9.62	8.7±1	9.7	9.33	2.898	3
Bluetooth	8.76	8.0±1	9.0	7.94	2.500	3

Test Distance (10mm)

Mode	MAX Power (dBm)	Tune Up Power (dBm)	Max Tune Up Power (dBm)	Max Tune Up Power (mW)	Exclusion Thresholds	Limit
WIFI	9.62	8.7±1	9.7	9.33	1.449	3
Bluetooth	8.76	8.0±1	9.0	7.94	1.250	3

Result: Compliance
No SAR measurement is required.