

**In accordance with the requirements of FCC Report and Order:  
FCC 47 CFR Part 2 ( 2.1093)**

## **FCC SAR TEST REPORT**

**For**

**Product Name: mobile phone**

**Brand Name: MOVIC**

**Model No.: E4001,E4002,E4003,E4004,E4005,E4501,  
E4502,E4503,E4504,E4505,E5001,E5002,E5003,E5004,E5005,E5501,  
E5502,E5503,E5504,E5505,E6001,E6002,E6003,E6004,E6005**

**Series Model: N/A**

**Test Report Number: C170720S01-SF**

**Issued for**

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**Issued by**

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## Revision History

Revision	REPORT NO.	Date	Page Revised	Contents
Original	C170720S01-SF	July 24, 2017	N/A	N/A

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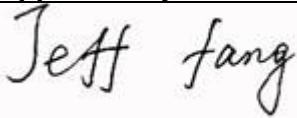
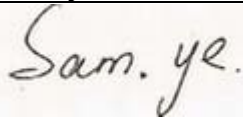
# 1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

<b>Product Name:</b>	mobile phone
<b>Brand Name:</b>	MOVIC
<b>Model Name.:</b>	E4001,E4002,E4003,E4004,E4005,E4501,E4502,E4503,E4504,E4505,E5001, E5002,E5003,E5004,E5005,E5501,E5502,E5503,E5504,E5505,E6001,E6002, E6003,E6004,E6005
<b>Series Model:</b>	N/A
<b>Devices supporting GPRS/EDGE:</b>	Class B
<b>Device Category:</b>	Portable DEVICES
<b>Exposure Category:</b>	GENERAL POPULATION/UNCONTROLLED EXPOSURE
<b>Date of Test:</b>	July 18, 2017 to July 21, 2017
<b>Applicant Address:</b>	<b>Distribuidora Sinn, S.A. DE C.V.</b> Lago Zurich No.219 Piso 12, Colonia Ampliacion Granada, Del. Miguel Hidalgo, Mexico City, Mexico
<b>Manufacturer Address:</b>	<b>ZTECH communication (shenzhen ) Co.,Ltd</b> 7 floor. D block.ZHIGU .Xixiang,BAOAN District, ShenZhen, China, 518000.
<b>Application Type:</b>	Certification

### APPLICABLE STANDARDS AND TEST PROCEDURES

STANDARDS AND TEST PROCEDURES	TEST RESULT
KDB 865664	No non-compliance noted
Deviation from Applicable Standard	
None	

The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in KDB 865664 The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

<b>Approved by:</b> 	<b>Tested by:</b> 
Jeff.fang RF Manager Compliance Certification Services Inc.	Sam.ye Test Engineer Compliance Certification Services Inc.

## 2. EUT DESCRIPTION

<b>Product Name:</b>	mobile phone			
<b>Brand Name:</b>	MOVIC			
<b>Model Name.:</b>	Please refer clause 1			
<b>Series Model:</b>	N/A			
<b>Model Discrepancy:</b>	N/A			
<b>FCC ID:</b>	2AKSAMOVIC-E			
<b>IMEI:</b>	358651070000417			
<b>Power reduction:</b>	NO			
<b>DTM Description:</b>	N/A			
<b>Device Category:</b>	Production unit			
<b>Frequency Range:</b>	GSM 850: 824.2 ~ 848.8 MHz GSM1900: 1850.2 ~ 1909.8 MHz WCDMA Band II:1852.4~1907.6MHz WCDMA Band V:826.4~846.6 MHz WLAN 2.4G: 2412 ~ 2462 MHz Bluetooth: 2402 ~ 2480 MHz			
<b>Max. Reported SAR(1g):</b>	Test Location:	PCE	WLAN	Simultaneous
	Head:	0.623 W/kg	0.491 W/kg	1.114W/kg
	Body:	1.113 W/kg	0.486 W/kg	1.599 W/kg
	Hotspot:	0.641 W/kg	0.232 W/kg	0.873 W/kg
<b>Modulation Technique:</b>	GSM/GPRS: GMSK EDGE:8PSK RMC/AMR: QPSK WCDMA: QPSK Release version: WCDMA:R99 HSDPA:Rel.7 HSUPA:Rel.6 IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK,DBPSK)+OFDM (QPSK, BPSK, 16-QAM, 64-QAM) IEEE 802.11n: OFDM(MCS 0-7) Bluetooth 3.0+EDR: GFSK + $\pi/4$ DQPSK+8DPSK BLE 4.0: GFSK			
<b>Wireless Router (Hotspot)</b>	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi enabled devices. Mobile Hotspot (Wi-Fi 2.4 GHz)			
<b>Accessories:</b>	Battery(rating): Capacitance: 1400 mAh Rated Voltage: 3.7V			
<b>Antenna Specification:</b>	GSM&WCDMA: PIFA Antenna Wifi&Bluetooth: PIFA Antenna			
<b>Operating Mode:</b>	Maximum continuous output			
<b>Remark:</b>	The product details information please refer to the product specification			

### **3. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC**

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 W/Kg for an uncontrolled environment and 8.0 W/Kg for an occupational/controlled environment as recommended by the FCC 47 CFR Part 2 ( 2.1093).

### **4. TEST METHODOLOGY**

The Specific Absorption Rate (SAR) testing specification, method and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 ( 2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528:2013
- KDB 248227 D01v02r02      802 11 Wi-Fi SAR
- KDB 447498 D01v06      General RF Exposure Guidance
- KDB 648474 D04v01r03      Handset SAR
- KDB 865664 D01v01r04      SAR Measurement 100 MHz to 6 GHz
- KDB 865664 D02v01r02      RF Exposure Reporting
- KDB 941225 D01v03r01      3G SAR Procedures
- KDB 941225 D06v02r01      Hotspot SAR

### **5. TEST CONFIGURATION**

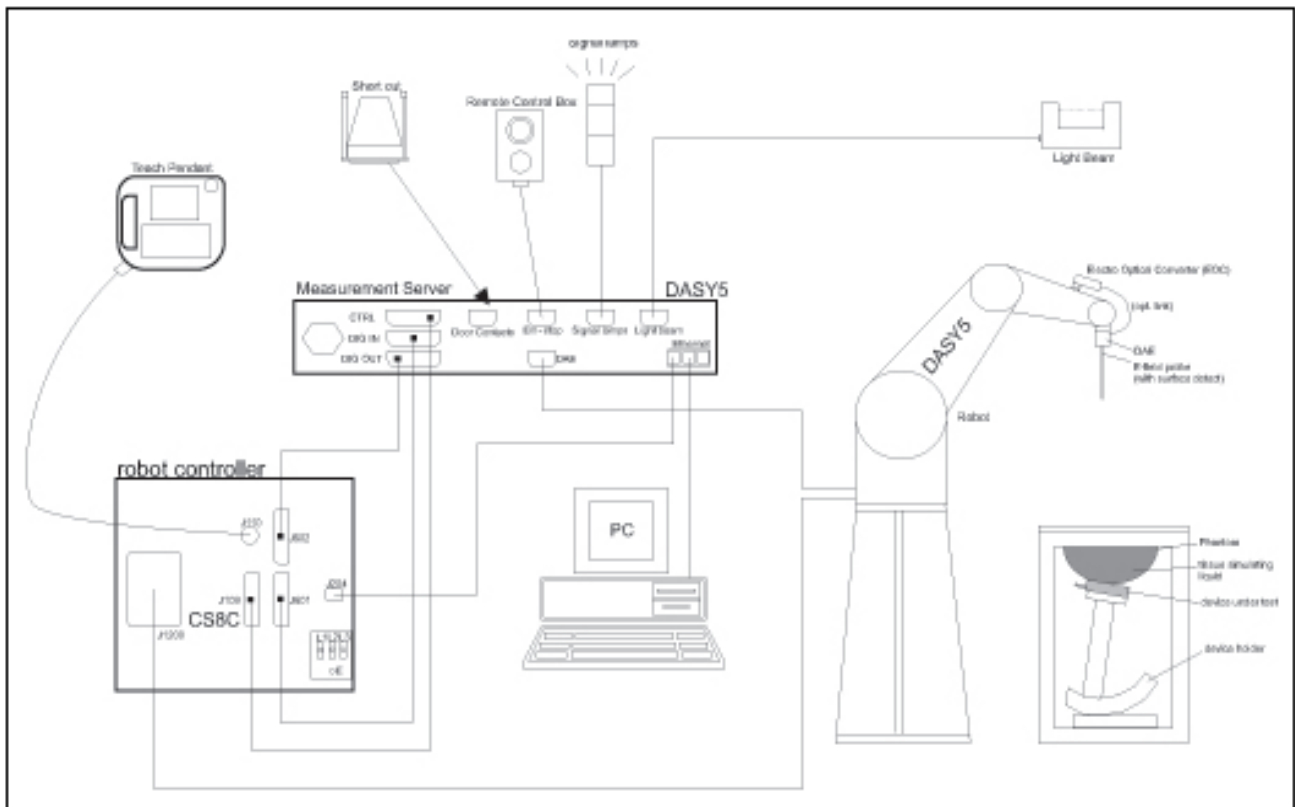
For WWAN SAR testing The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting For WLAN SAR testing, WLAN engineering test software installed on the EUT can provide continuous transmitting RF signal and duty cycle is 100%.

## 6. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system DASY 5 from SPEAG. The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than  $\pm 0.02$  mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the E-field PROBE EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure described in [8] and found to be better than  $\pm 0.25$  dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEE P1528 and CENELEC EN 62209.



### 6.1 MEASUREMENT SYSTEM DIAGRAM



**The DASYS system for performing compliance tests consists of the following items:**

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- 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.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASYS software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

**6.2 SYSTEM COMPONENTS**

	<p>The DASYS measurement server is based on a PC/104 CPU board with a 400MHz intel ULV celeron, 128MB chip-disk and 128 MB RAM. The necessary circuits for communication with either the DAE4(or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASYS I/O-board, which is directly connected to the PC/104 bus of the CPU board.</p> <p>The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.</p>
	<p>The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.</p>
<p><b>Data Acquisition Electronics (DAE)</b></p>	





The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements**



**Construction:** Symmetrical design with triangular core  
 Built-in shielding against static charges  
 PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

**Calibration:** Basic Broad Band Calibration in air: 10-3000 MHz.  
 Conversion Factors (CF) for HSL 900 and HSL 1800  
 CF-Calibration for other liquids and frequencies upon request.

**Frequency:** 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

**Directivity:** ± 0.3 dB in HSL (rotation around probe axis)  
 ± 0.5 dB in HSL (rotation normal to probe axis)

**Dynamic Range:** 10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB  
 (noise: typically < 1 µW/g)

**Dimensions:** Overall length: 337 mm (Tip: 9 mm)  
 Tip diameter: 2.5 mm (Body: 10 mm)  
 Distance from probe tip to dipole centers: 1 mm

**Application:** High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



Interior of probe

**SAM Twin Phantom**

**Construction:**

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50360 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.



**Shell Thickness:** 2 ±0.2 mm

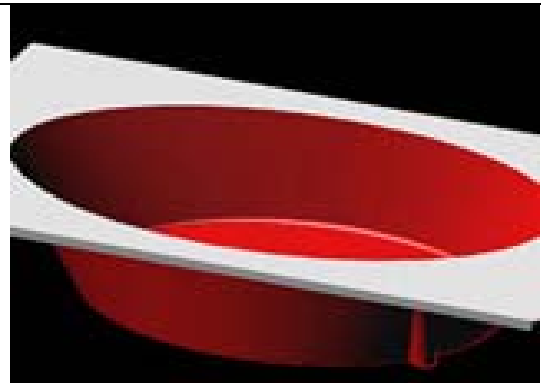
**Filling Volume:** Approx. 25 liters

**Dimensions:** Height: 850mm; Length: 1000mm; Width: 750mm

**SAM Phantom (ELI4 v4.0)**

**Description Construction:**

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles



**Shell Thickness:** 2.0 ± 0.2 mm (sagging: <1%)

**Filling Volume:** Approx. 25 liters

**Dimensions:** Major ellipse axis: 600 mm

**Minor axis:** 400 mm 500mm

**Device Holder for SAM Twin Phantom**

**Construction:** In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).



**System Validation Kits for SAM Twin Phantom**

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 900,1800,2450,5800 MHz

**ReTune loss:** > 20 dB at specified validation position

**Power capability:** > 100 W (f < 1GHz); > 40 W (f > 1GHz)

**Dimensions:**

D835V2: dipole length: 161 mm; overall height: 340 mm

D1800V2: dipole length: 72.5 mm; overall height: 300 mm

D1900V2: dipole length: 67.7 mm; overall height: 300 mm

D2450V2: dipole length: 51.5 mm; overall height: 290 mm

D5GHzV2: dipole length: 20.6 mm; overall height: 300mm



**System Validation Kits for ELI4 phantom**

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 900, 1800, 2450, 5800 MHz

**ReTune loss:** > 20 dB at specified validation position

**Power capability:** > 100 W (f < 1GHz); > 40 W (f > 1GHz)

**Dimensions:**

D835V2: dipole length: 161 mm; overall height: 340 mm

D1800V2: dipole length: 72.5 mm; overall height: 300 mm

D1900V2: dipole length: 67.7 mm; overall height: 300 mm

D2450V2: dipole length: 51.5 mm; overall height: 290 mm

D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm



## 7. EVALUATION PROCEDURES

### DATA EVALUATION

The DASY 5 post processing software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	$ConvF_i$
	- Diode compression point	$dcp_i$
Device parameters:	- Frequency	$f$
	- Crest factor	$cf$
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY 5 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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:

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

with	$V_i$	= 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 5 parameter)
	$dcp_i$	= Diode compression point (DASY 5 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:

$$H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

with	$V_i$	= Compensated signal of channel i (i = x, y, z)
	$Norm_i$	= Sensor sensitivity of channel i (i = x, y, z) $\mu V/(V/m)^2$ 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.

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

with  $SAR$  = local specific absorption rate in mW/g

$E_{tot}$  = total field strength in V/m

$\sigma$  = conductivity in [mho/m] or [Siemens/m]

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

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.

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

with  $P_{pwe}$  = Equivalent power density of a plane wave in mW/cm<sup>2</sup>

$E_{tot}$  = total electric field strength in V/m

$H_{tot}$  = total magnetic field strength in A/m

## **SAR EVALUATION PROCEDURES**

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 DASY 5 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 than 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 DASY 5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

## SPATIAL PEAK SAR EVALUATION

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 DASY 5 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.

Extrapolation routines require at least 10 measurement points in 3-D space. 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 modified Quadratic Shepard's 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.

### Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b \exp\left(-\frac{z}{a}\right) \cos\left(\pi \frac{z}{\lambda}\right)$$

Since the decay of the boundary effect dominates for small probes ( $a \ll \lambda$ ), the cos-term can be omitted. Factors  $S_b$  (parameter Alpha in the DASY 5 software) and  $a$  (parameter Delta in the DASY 5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30° to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY 5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

## 8. MEASUREMENT UNCERTAINTY

Measurement uncertainty for 30 MHz to 3 GHz averaged over 1 gram

Uncertainty Component	Uncertainty	Prob.	Div.	$C_i(1g)$	Std. Unc. (1-g)	$V_i$ or $V_{eff}$
<b>Measurement System</b>						
Probe Calibration ( $k=1$ )	6.00	Normal	1	1	6.00	$\infty$
Probe Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	1.90	$\infty$
Modulation Response	2.40	Rectangular	$\sqrt{3}$	1	1.39	$\infty$
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	3.88	$\infty$
Boundary Effect	2.00	Rectangular	$\sqrt{3}$	1	1.15	$\infty$
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.71	$\infty$
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.58	$\infty$
Readout Electronics	0.30	Normal	1	1	0.30	$\infty$
Response Time	0.80	Rectangular	$\sqrt{3}$	1	0.46	$\infty$
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1.50	$\infty$
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1.73	$\infty$
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.73	$\infty$
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	0.23	$\infty$
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1.67	$\infty$
Max. SAR Evaluation	2.00	Rectangular	$\sqrt{3}$	1	1.15	$\infty$
<b>Test sample Related</b>						
Test sample Positioning	2.9	Normal	1	1	2.9	145
Device Holder Uncertainty	3.6	Normal	1	1	3.6	5
Power drift	5	Rectangular	$\sqrt{3}$	1	2.89	$\infty$
Power Scaling	0	Rectangular	$\sqrt{3}$	1	0.00	$\infty$
<b>Phantom and Tissue Parameters</b>						
Phantom Uncertainty	6.1	Rectangular	$\sqrt{3}$	1	3.52	$\infty$
SAR correction	1.9	Rectangular	$\sqrt{3}$	1	1.10	$\infty$
Liquid Conductivity (target)	5	Rectangular	$\sqrt{3}$	0.64	1.85	$\infty$
Liquid Conductivity (meas)	2.83	Rectangular	$\sqrt{3}$	0.78	1.27	$\infty$
Liquid Permittivity (target )	5	Rectangular	$\sqrt{3}$	0.6	1.73	$\infty$
Liquid Permittivity (meas)	-3.43	Rectangular	$\sqrt{3}$	0.26	-0.51	$\infty$
Temp. unc. - Conductivity	3.4	Rectangular	$\sqrt{3}$	0.78	1.53	$\infty$
Temp. unc. - Permittivity	0.4	Rectangular	$\sqrt{3}$	0.23	0.05	$\infty$
<b>Combined Std. Uncertainty</b>		RSS			11.50	361
<b>Expanded STD Uncertainty</b>		$k=2$			23.01%	
<b>Expanded STD Uncertainty</b>		$k=2$			1.80dB	



**Measurement uncertainty for 30 MHz to 3 GHz averaged over 1 gram**

Uncertainty Component	Uncertainty	Prob.	Div.	$C_i(1g)$	Std. Unc. (1-g)	$V_i$ or $V_{eff}$
Measurement System						
Probe Calibration ( $k=1$ )	6.00	Normal	1	1	6.0	$\infty$
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	1.9	$\infty$
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	3.9	$\infty$
Boundary Effect	1.00	Rectangular	$\sqrt{3}$	1	0.6	$\infty$
Linearity	4.70	Rectangular	$\sqrt{3}$	1	2.7	$\infty$
System Detection Limit	1.00	Rectangular	$\sqrt{3}$	1	0.6	$\infty$
Readout Electronics	0.30	Normal	1	1	0.3	$\infty$
Response Time	0.80	Rectangular	$\sqrt{3}$	0	0.0	$\infty$
Integration Time	2.60	Rectangular	$\sqrt{3}$	0	0.0	$\infty$
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1.7	$\infty$
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1.7	$\infty$
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	0.2	$\infty$
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1.7	$\infty$
Max. SAR Evaluation	1.00	Rectangular	$\sqrt{3}$	1	0.6	$\infty$
<b>System validation source (dipole)</b>						
Deviation of experimental dipole from numerical dipole	5	Normal	1	1	5.0	$\infty$
Dipole axis to liquid distance	2	Rectangular	$\sqrt{3}$	1	1.2	$\infty$
Input power and SAR drift	4.7	Rectangular	$\sqrt{3}$	1	2.7	$\infty$
<b>Phantom and Tissue Parameters</b>						
Phantom Uncertainty	4	Rectangular	$\sqrt{3}$	1	2.3	$\infty$
SAR correction	1.9	Rectangular	1	1	1.9	$\infty$
Liquid Conductivity (meas)	2.83	Rectangular	1	0.78	2.21	$\infty$
Liquid Permittivity (meas)	-3.43	Rectangular	1	0.23	-0.79	$\infty$
Temp. unc. - Conductivity	1.7	Rectangular	$\sqrt{3}$	0.78	0.77	$\infty$
Temp. unc. - Permittivity	0.3	Rectangular	$\sqrt{3}$	0.23	0.04	$\infty$
<b>Combined Std. Uncertainty</b>		RSS			11.0	361
<b>Expanded STD Uncertainty</b>		$k=2$			21.97%	
<b>Expanded STD Uncertainty</b>		$k=2$			1.73dB	

Table: Worst-case uncertainty for DASY5 assessed according to IEEE1528-2013. The budget is valid for the frequency range 300 MHz to 6 GHz and represents a worst-case analysis.

## 9. EXPOSURE LIMIT

(A). Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

**Note:** **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. **SAR for hands, wrists, feet and ankles** is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

**Population/Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**Occupational/Controlled Environments** are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

**NOTE**  
**GENERAL POPULATION/UNCONTROLLED EXPOSURE**  
**PARTIAL BODY LIMIT**  
**1.6 W/kg**

## 10. EUT ARRANGEMENT

Please refer to IEEE1528-2013 illustration below.

### 10.1 ANTHROPOMORPHIC HEAD PHANTOM

Figure 7-1a shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 7-1b. The plane passing through the two ear reference points and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 7-1c). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs. Anterior to the N-F line, the ear is truncated as illustrated in Figure 7-1b. The ear truncation is introduced to avoid the handset from touching the ear lobe, which can cause unstable handset positioning at the cheek.

Figure 7-1a  
Front, back and side view of SAM (model for the phantom shell)



Figure 7-1b  
Close up side view of phantom showing the ear region

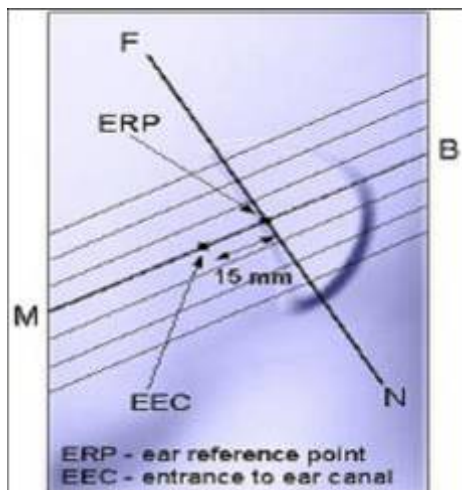


Figure 7-1b  
Close up side view of phantom showing the ear region

Figure 7-1c  
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations

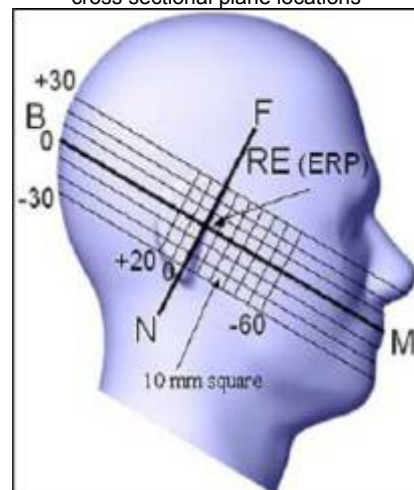


Figure 7-1c  
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations

## 10.2 DEFINITION OF THE “CHEEK/TOUCH” POSITION

The “cheek” or “touch” position is defined as follows:

- a. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
- b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width  $w_t$  of the handset at the level of the acoustic output (point A on Figures 7-2a and 7-2b), and the midpoint of the width  $w_b$  of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7-2a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7-2b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.
- c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7-2c), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
- d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
- e. e) While maintaining the handset 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).
- f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.
- g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 7-2c. The physical angles of rotation should be noted.

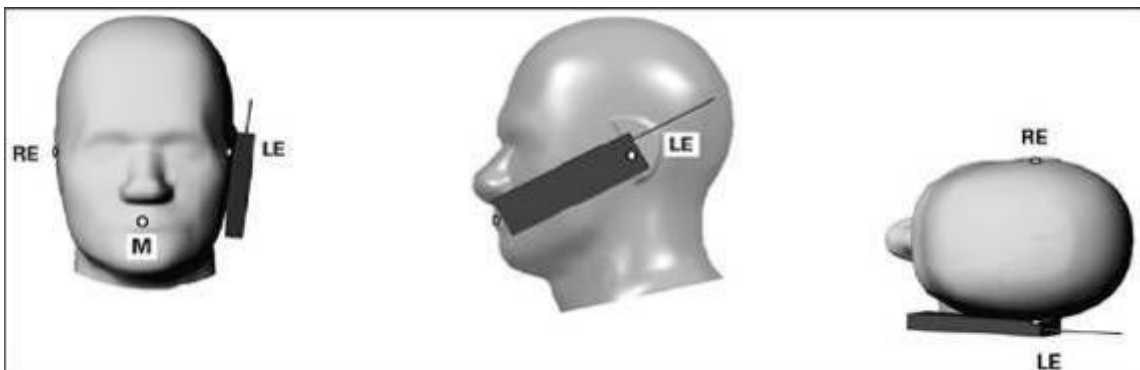


Figure 7.2c

Phone “cheek” or “touch” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.

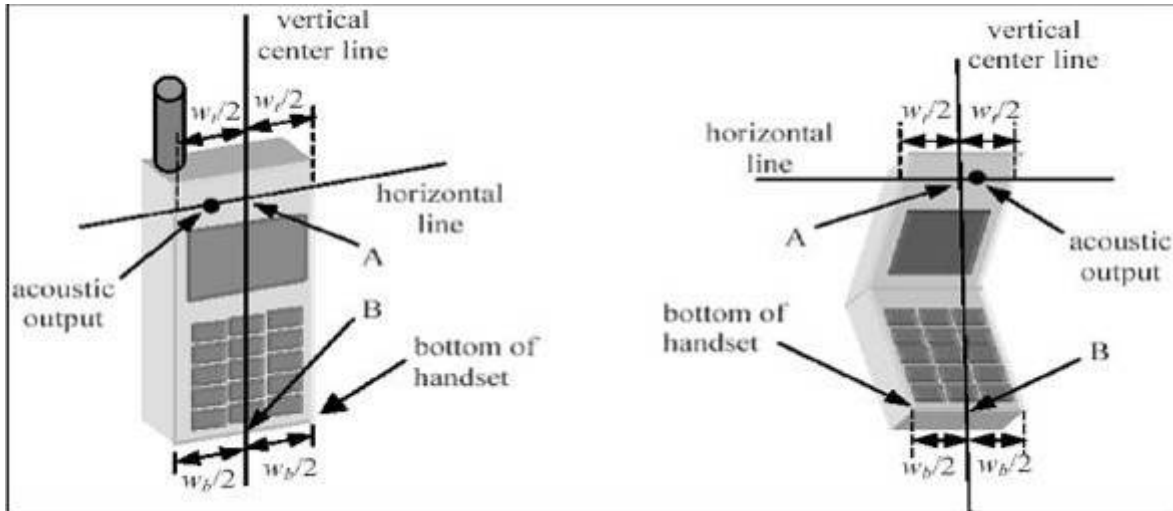


Figure 7.2a

Figure 7.2b

### 10.3 DEFINITION OF THE “TILTED” POSITION

The “tilted” position is defined as follows:

- Repeat steps (a) – (g) of 7.2 to place the device in the “cheek position.”
- While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
- Rotate the handset around the horizontal line by 15 degrees.
- While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).

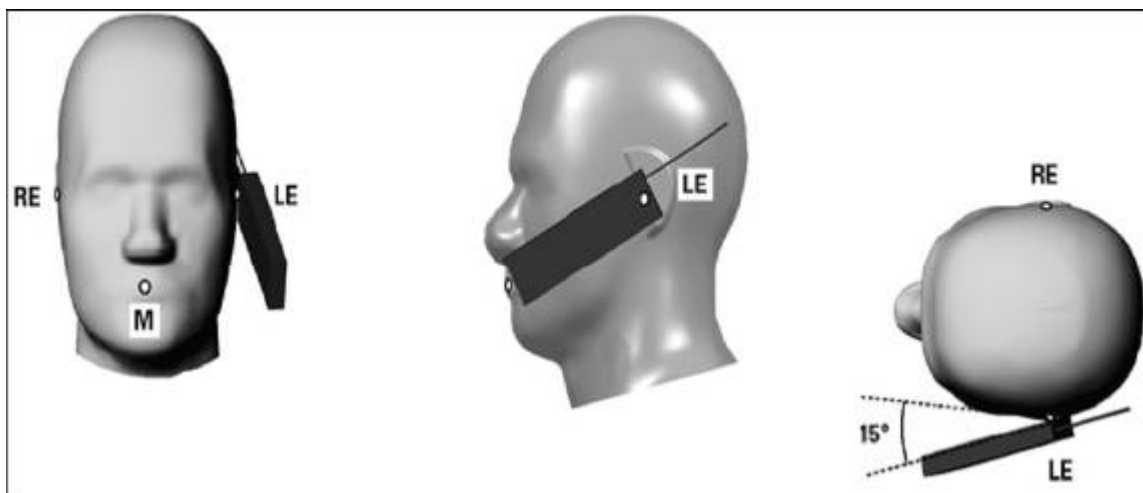


Figure 7-3

Phone “tilted” position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.

## 11. MEASUREMENT RESULTS

### 11.1 TEST LIQUIDS CONFIRMATION

#### SIMULATED TISSUE LIQUID PARAMETER CONFIRMATION

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

#### KDB865664 D01 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

The head and Body tissue dielectric parameters recommended by the KDB865664 D01 have been incorporated in the following table.

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho = 1000 \text{ kg/m}^3$ )

**11.2 LIQUID MEASUREMENT RESULTS**

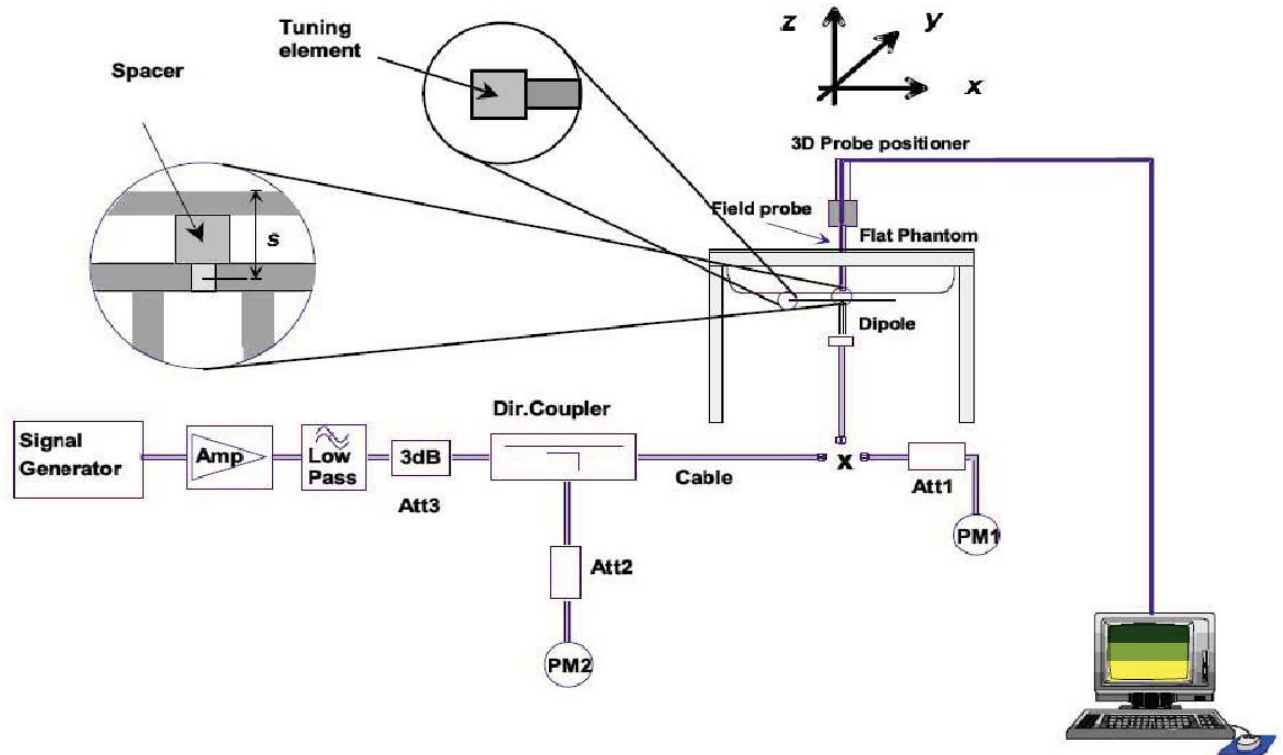
The following table show the measuring results for simulating liquid:

Liquid Type	Liquid Temp. (°C)	Parameters	Target	Measured	Deviation (%)	Limited (%)	Measured Date
Head835	21.5	Permittivity( $\epsilon$ )	41.50	41.75	0.61	$\pm 5$	2017-7-18
		Conductivity( $\sigma$ )	0.90	0.91	0.89	$\pm 5$	
Body835	21.5	Permittivity( $\epsilon$ )	55.20	55.29	0.16	$\pm 5$	2017-7-18
		Conductivity( $\sigma$ )	0.97	0.95	-1.65	$\pm 5$	
Head1900	21.5	Permittivity( $\epsilon$ )	40.00	39.41	-1.49	$\pm 5$	2017-7-19
		Conductivity( $\sigma$ )	1.40	1.42	1.50	$\pm 5$	
Body1900	21.5	Permittivity( $\epsilon$ )	53.30	52.46	-1.58	$\pm 5$	2017-7-19
		Conductivity( $\sigma$ )	1.52	1.56	2.83	$\pm 5$	
Head2450	21.5	Permittivity( $\epsilon$ )	39.20	37.86	-3.43	$\pm 5$	2017-7-20
		Conductivity( $\sigma$ )	1.80	1.83	1.39	$\pm 5$	
Body2450	21.5	Permittivity( $\epsilon$ )	52.70	51.71	-1.89	$\pm 5$	2017-7-20
		Conductivity( $\sigma$ )	1.95	1.95	0.05	$\pm 5$	

### 11.3 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of  $\pm 10\%$ . The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system .

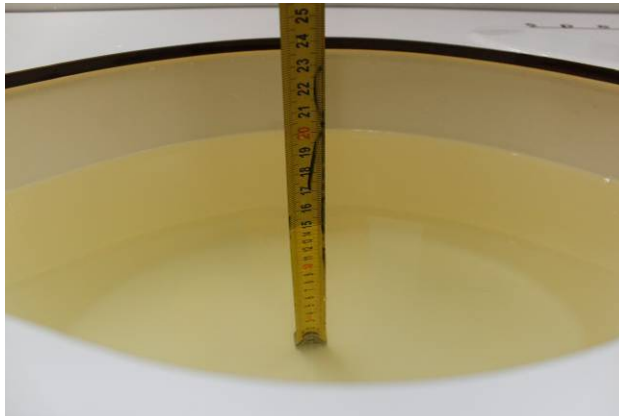
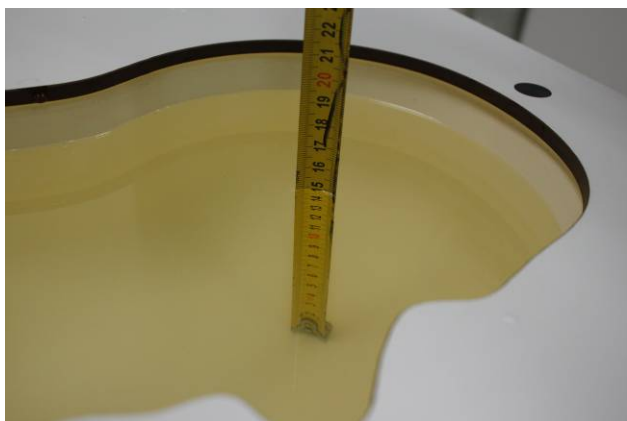


#### SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The DASY5 system with an E-field probe EX3DV4 : 3798 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration (dx= 5 mm, dy= 5 mm, dz= 5 mm).
- Distance between probe sensors and phantom surface was set to 2 mm.
- The dipole input power was  $250\text{mW} \pm 3\%$ .
- The results are normalized to 1 W input power.



**Depth of Liquid**



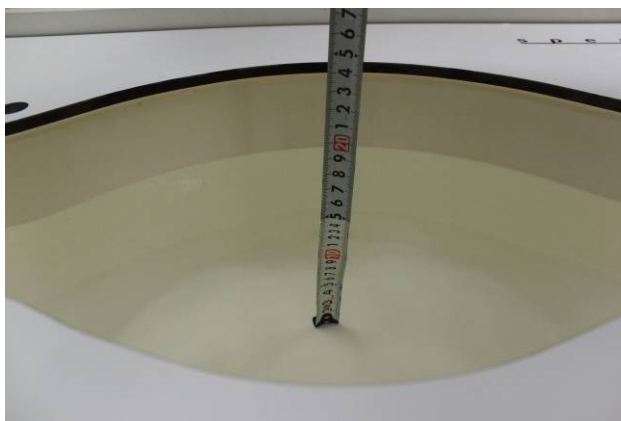
Liquid depth in the head Phantom (835 MHz 15cm depth)

Liquid depth in the Body Phantom (835 MHz 15cm depth)



Liquid depth in the head Phantom (1900 MHz 15cm depth)

Liquid depth in the Body Phantom (1900 MHz 15cm depth)



Liquid depth in the head Phantom (2450 MHz 15cm depth)

Liquid depth in the Body Phantom (2450 MHz 15cm depth)

**The following table gives the recipes for tissue simulating liquids.**

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency	water	sugar	cellulose	Salt	bactericide	DGBE	conductivity	permittivity
<b>For Head</b>								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
<b>For Body</b>								
835	50.6	48.2	0.2	0.9	0.1	0	0.97	55.2
1800,1900,2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

alt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose  
 DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

**<Tissue Dielectric Parameter Check Results>**

Liquid Type	Ambient Temp. (°C)	Liquid Temp. (°C)	Input Power (W)	Measured SAR1g (W/Kg)	1W Target SAR1g(W/Kg)	1W Normalized SAR1g(W/Kg)	Deviation (%)	Limited (%)	Date
Head835	22	21.5	0.25	2.29	9.50	9.16	-3.58	± 10	2017-7-18
Body835	22	21.5	0.25	2.45	9.53	9.8	2.83	± 10	2017-7-18
Head1900	22	21.5	0.25	9.98	40.40	39.92	-1.19	± 10	2017-7-19
Body1900	22	21.5	0.25	10.20	40.50	40.80	0.74	± 10	2017-7-19
Head2450	22	21.5	0.25	12.50	52.60	50.00	-4.94	± 10	2017-7-20
Body2450	22	21.5	0.25	12.40	49.20	49.60	0.81	± 10	2017-7-20

**11.4 EUT TUNE-UP PROCEDURES AND TEST MODE**

The following procedure had been used to prepare the EUT for the SAR test.

To setup the desire channel frequency and the maximum output power. A Radio Communication Tester “CMU200 ” was used to program the EUT.

**General Note:**

1. Per KDB 447498 D01, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. For head SAR testing, the EUT was set in GSM Voice for GSM850 and GSM1900 due to its highest frame-average power.
3. For body worn SAR testing, the EUT was set in GPRS 4 Tx slots for GSM850 and GPRS 4 Tx GSM1900 due to its highest frame-average power.
4. For hotspot SAR testing, the EUT was set in GPRS 4 Tx slots for GSM850 and GPRS 4 Tx GSM1900 due to its highest frame-average power.

**GSM Conducted output power(dBm):**

Band	GSM 850			GSM 1900		
Channel	128	190	251	512	661	810
Frequency(MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
<b>Maximum Burst-Averaged Output Power</b>						
<b>GSM(GMSK,1Uplink)</b>	32.46	<b>32.58</b>	32.51	<b>28.78</b>	28.67	28.65
<b>GPRS 8 (GMSK,1 Uplink)</b>	32.45	32.56	32.51	28.72	28.68	28.64
<b>GPRS 10 (GMSK,2 Uplink)</b>	31.51	31.52	31.46	27.62	27.59	27.56
<b>GPRS 11 (GMSK,3 Uplink)</b>	30.53	30.45	30.43	26.64	26.46	26.55
<b>GPRS 12 (GMSK,4 Uplink)</b>	29.45	29.38	29.56	25.65	25.58	25.43
<b>EDGE 8 (8PSK,1 Uplink)</b>	27.59	27.65	27.52	25.68	25.65	25.47
<b>EDGE 10 (8PSK,2 Uplink)</b>	26.55	26.57	26.53	24.57	24.54	24.35
<b>Maximum Frame-Averaged Output Power</b>						
<b>GSM(GMSK,1Uplink)</b>	23.44	23.56	23.49	19.76	19.65	19.63
<b>GPRS 8 (GMSK,1 Uplink)</b>	23.42	23.53	23.48	19.69	19.65	19.61
<b>GPRS 10 (GMSK,2 Uplink)</b>	25.48	25.49	25.43	21.59	21.56	21.53
<b>GPRS 11 (GMSK,3 Uplink)</b>	26.27	26.19	26.17	22.38	22.20	22.29
<b>GPRS 12 (GMSK,4 Uplink)</b>	26.44	26.37	<b>26.55</b>	<b>22.64</b>	22.57	22.42
<b>EDGE 8 (8PSK,1 Uplink)</b>	18.56	18.62	18.49	16.65	16.62	16.44
<b>EDGE 10 (8PSK,2 Uplink)</b>	20.53	20.55	20.51	18.55	18.52	18.33

**Remark:** The frame-averaged power is linearly scaled the maximum burst-averaged power based on time slots. The calculated methods are shown as below:

Frame-averaged power = Burst-averaged power (1 Uplink) – 9.03 dBm

Frame-averaged power = Burst averaged power (2 Uplink) – 6.02 dBm

Frame-averaged power = Burst-averaged power (3 Uplink) – 4.26 dBm

Frame-averaged power = Burst averaged power (4 Uplink) – 3.01 dBm

**Note:**

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
3. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.
4. Per KDB 447498 D01, the maximum output power channel is used for SAR testing and for further SAR test reduction.

**WCDMA Conducted output power(dBm):**

As the SAR body tests for WCDMA **Band II and Band V** , we established the radio link through call processing. The Maximum Burst-Averaged Output Power were verified on high, middle and low channels for each test band according to 3GPP TS 34.121 with the following configuration: a 12.2kbps RMC, 64,144,384 kbps RMC with TPC set to all "all '1's"b Test loop Mode 1  
The following procedures had been used to prepare the EUT for the SAR test.

**HSDPA Setup Configuration:**

**Table C.10.1.4:  $\beta$  values for transmitter characteristics tests with HS-DPCCH**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{hs}$ (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1:  $\Delta_{ACK}, \Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{hs} = 30/15 * \beta_c$ .

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA,  $\Delta_{ACK}$  and  $\Delta_{NACK} = 30/15$  with  $\beta_{hs} = 30/15 * \beta_c$ , and  $\Delta_{CQI} = 24/15$  with  $\beta_{hs} = 24/15 * \beta_c$ .

Note 3: CM = 1 for  $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the  $\beta_c/\beta_d$  ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 11/15$  and  $\beta_d = 15/15$ .

## HSUPA Setup Configuration:

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

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note 1)	$\beta_{ec}$	$\beta_{ed}$ (Note 5) (Note 6)	$\beta_{ed}$ (SF)	$\beta_{ed}$ (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/25	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}$ : 47/15 $\beta_{ed2}$ : 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1:  $\Delta_{ACK}, \Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{HS} = 30/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_c/\beta_d = 12/15, \beta_{HS}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 14/15$  and  $\beta_d = 15/15$ .

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6:  $\beta_{ed}$  can not be set directly, it is set by Absolute Grant Value.

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
Maximum Burst-Averaged Output Power						
AMR	22.33	22.42	22.35	22.26	22.42	22.35
RMC12.2K	23.12	<b>23.24</b>	23.17	23.24	23.28	<b>23.31</b>
HSDPA Subtest-1	22.24	22.35	22.21	22.36	22.43	22.38
HSDPA Subtest-2	22.12	22.23	22.20	22.21	22.24	22.26
HSDPA Subtest-3	22.04	22.08	22.10	22.14	22.15	22.18
HSDPA Subtest-4	21.95	21.88	21.94	22.03	22.05	22.01
HSUPA Subtest-1	22.25	22.31	22.24	22.35	22.28	22.30
HSUPA Subtest-2	22.15	22.23	22.16	22.23	22.18	22.16
HSUPA Subtest-3	22.03	22.09	22.05	22.11	22.06	22.08
HSUPA Subtest-4	21.97	21.95	21.94	21.89	21.76	21.75
HSUPA Subtest-5	21.85	21.83	21.79	21.72	21.69	21.67

**Note:**

Per KDB 941225 D01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC, HSDPA/HSUPA SAR evaluation can be excluded.

**General Note:**

- 1 Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.
- 2 Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.
  - 1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.
  - 2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.
- 3 For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

**WLAN 2.4G Conducted output power(dBm):**

Mode	Channel	Frequency	Average power(dBm)
802.11 b	1	2412 MHZ	15.86
	6	2437 MHZ	16.36
	11	2462 MHZ	<b>16.65</b>
802.11 g	1	2412 MHZ	10.59
	6	2437 MHZ	11.02
	11	2462 MHZ	11.03
802.11 n 20M	1	2412 MHZ	10.02
	6	2437 MHZ	10.41
	11	2462 MHZ	10.89
802.11 n 40M	3	2422 MHZ	6.30
	7	2442 MHZ	8.19
	11	2462 MHZ	7.22

**Bluetooth 3.0 Conducted output power(dBm):**

Channel	Frequency	Average power(dBm)		
		Date Rate		
		1Mbps	2Mbps	3Mbps
CH00	2402MHZ	-0.21	-0.28	-0.46
CH39	2441MHZ	0.41	0.26	-0.20
CH78	2480MHZ	0.62	0.15	-0.23

**Bluetooth 4.0 Conducted output power(dBm):**

Channel	Frequency	Average power(dBm)
		Date Rate
		1Mbps
CH00	2402MHZ	-7.08
CH19	2440MHZ	-7.05
CH39	2480MHZ	-7.63

According to KDB447498 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:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR,<sup>24</sup> where

- $f_{\text{GHz}}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation<sup>25</sup>
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below
- If the test separation distance (antenna-user) is < 5mm, 5mm is used for excluded SAR calculation

	Wireless Interface	Bluetooth
	Tune-up Maximum power (dBm)	1
	Tune-up Maximum rated power (mW)	1.259
Head & Body	Antenna to user (mm)	5
	Frequency(GHz)	2.480
	SAR exclusion threshold	0.397
Body	Antenna to user (mm)	10
	Frequency(GHz)	2.480
	SAR exclusion threshold	0.198

Per KDB 447498 D01 exclusion thresholds is  $[(\text{max. power of channel, including tune-up tolerance: } 1.259 \text{ mW}) / (\text{min. test separation distance: } 5\text{mm})] \cdot [\sqrt{2.480}] = 0.397 < 3$ , Bluetooth RF exposure evaluation is not required.



**Maximum Burst-Averaged output power for Product unit**

Mode	The Tune-up Maximum Power(Customer Declared)(dBm)	Tune up limit	Measured Conduct Maximum Power(dBm)
GSM 850	32+/-1	33	32.58
GPRS 850-1TS	32+/-1	33	32.56
GPRS 850-2TS	31+/-1	32	31.52
GPRS 850-3TS	30+/-1	31	30.53
GPRS 850-4TS	29+/-1	30	29.56
EDGE 850-1TS	27+/-1	28	27.65
EDGE 850-2TS	26+/-1	27	26.57
GSM 1900	28+/-1	29	28.78
GPRS 1900-1TS	28+/-1	29	28.72
GPRS 1900-2TS	27+/-1	28	27.62
GPRS 1900-3TS	26+/-1	27	26.64
GPRS 1900-4TS	25+/-1	26	25.65
EDGE 1900-1TS	25+/-1	26	25.68
EDGE 1900-2TS	24+/-1	25	24.57
WCDMA Band II RMC 12.2K	22.5+/-1	23.5	23.24
WCDMA Band II AMR	22+/-1	23	22.42
HSDPA Band II	22+/-1	23	22.35
HSUPA Band II	22+/-1	23	22.31
WCDMA Band V RMC 12.2K	22.5+/-1	23.5	23.31
WCDMA Band V AMR	22+/-1	23	22.42
HSDPA Band V	22+/-1	23	22.43
HSUPA Band V	22 +/-1	23	22.35
IEEE 802.11b	16+/-1	17	16.64
IEEE 802.11g	10.5+/-1	11.5	11.03
IEEE 802.11n(20M)	10+/-1	11	10.89
IEEE 802.11n(40M)	7.5+/-1.5	9	8.19

**Maximum output power for Product unit**

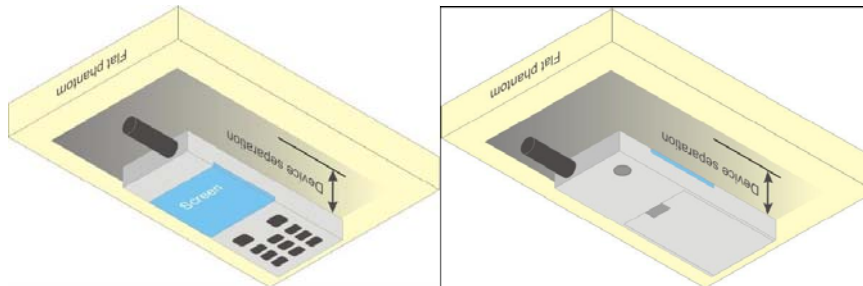
Mode	The Tune-up Maximum Power(Customer Declared)(dBm)	Tune up limit	Measured Conduct Maximum Power(dBm)
Bluetooth 1Mbps	0+/-1	1	0.62
Bluetooth 2Mbps	0+/-1	1	0.26
Bluetooth 3Mbps	-1+/-1	0	-0.20
Bluetooth 4.0	-8+/-1	-7	-7.05

So, they are in tune-up range and complied.

## 11.5 SAR TEST CONFIGURATIONS

### Body-Support Accessory Exposure Conditions

- (1) To position the EUT parallel to the phantom surface.
- (2) To adjust the EUT parallel to the flat phantom.
- (3) To adjust the distance between the EUT surface and the flat phantom to 5mm.

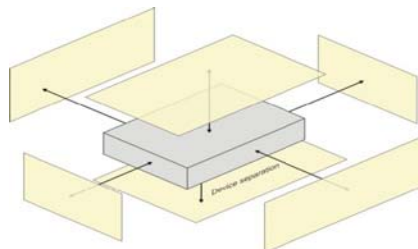


**Illustration for Body Worn Position**

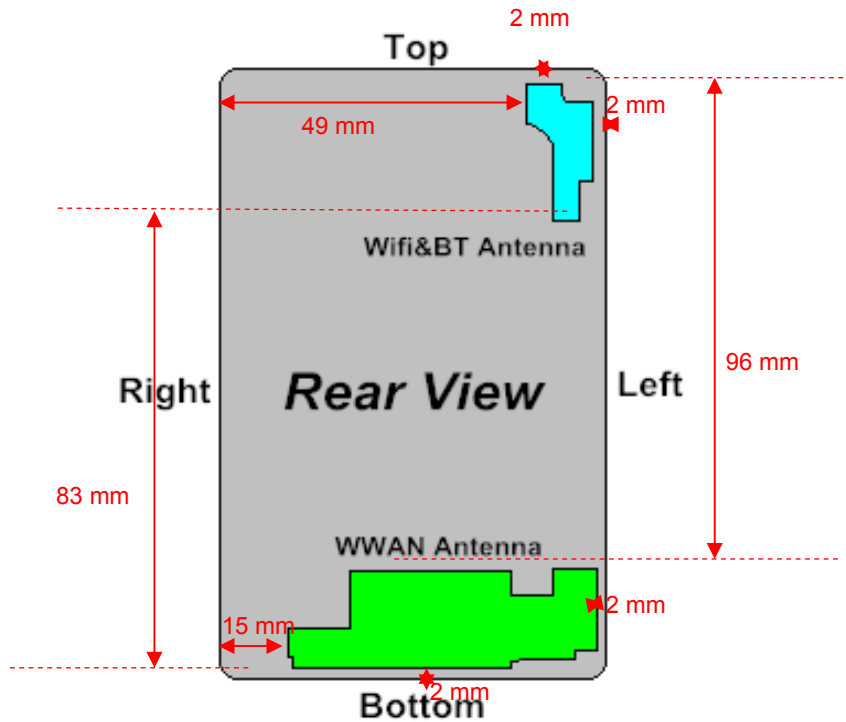
### Hotspot Mode Exposure conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225 D06. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm.

- (1) To position the EUT parallel to the phantom surface.
- (2) To adjust the EUT parallel to the flat phantom.
- (3) To adjust the distance between the EUT surface and the flat phantom to 10mm.



**11.6 ANTENNA POSITION**



Device dimensions (H x W): 120 x 66 mm

Antenna	Wireless Interface
WWAN Antenna	GSM850/GSM1900 WCDMA Band II WCDMA Band V
WiFi&BT Antenna	WLAN 2.4G Bluetooth

**Test Mode**

GSM 850/GSM1900	Voice/Data transmission mode(GPRS)
WCDMA Band II WCDMA Band V	Data transmission mode(12.2k RMC)
WLAN 2.4GHz	Data transmission mode(802.11b)

**Body Exposure Condition**

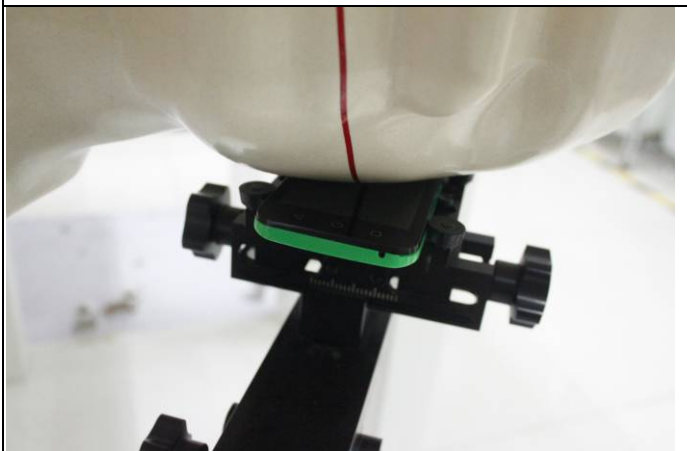
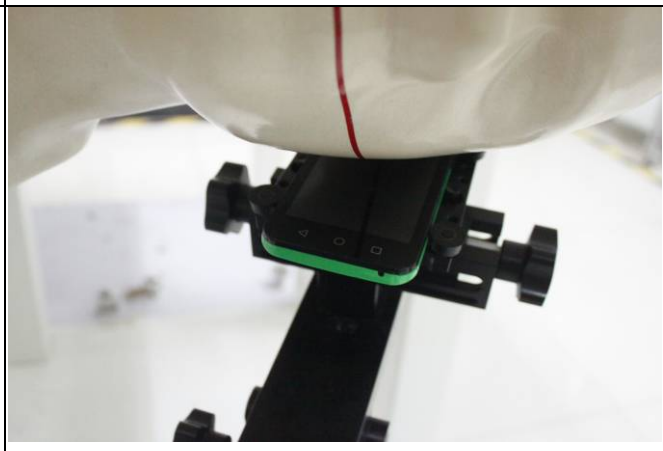
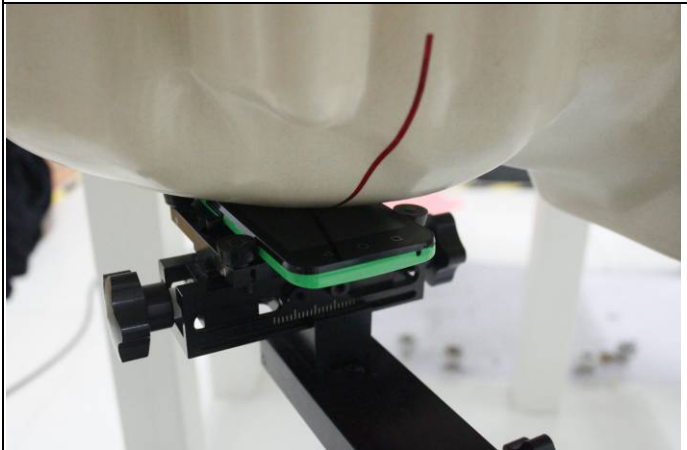
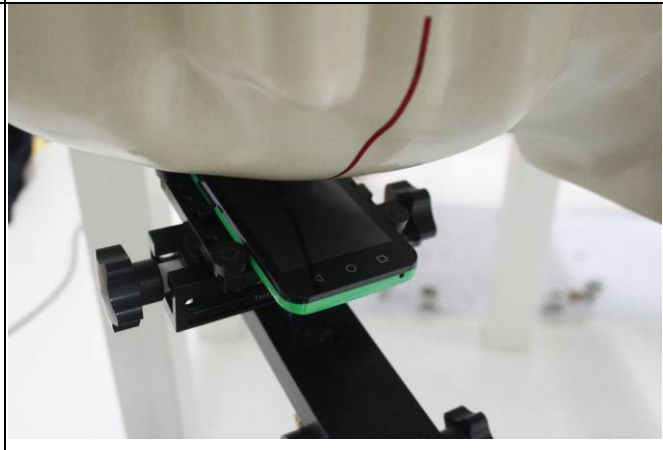
Distance of the Antenna to the EUT surface/edge Test distance: 10 mm						
Antenna	Front (mm)	Rear (mm)	Right side (mm)	Left side (mm)	Top side (mm)	Bottom side (mm)
WWAN	5<25	2<25	15<25	2<25	96>25	2<25
WLAN	7<25	2<25	49>25	2<25	2<25	83>25

**Body test position**

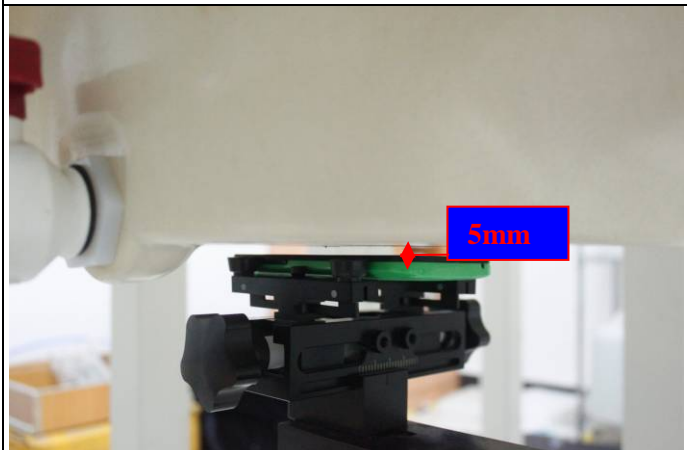
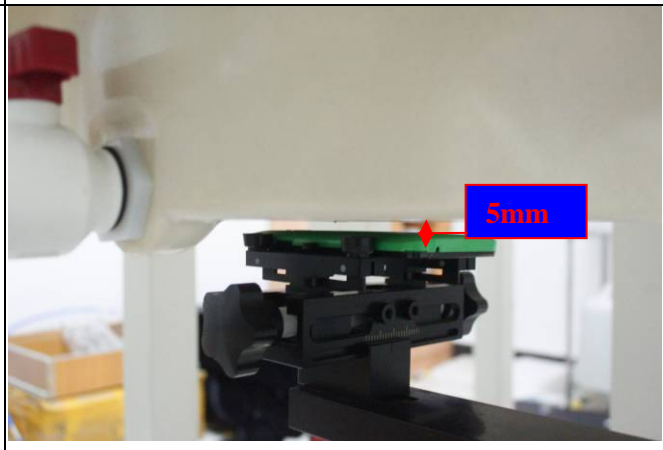
Distance of the Antenna to the EUT surface/edge Test distance: 10 mm						
Antenna	Front	Rear	Right side	Left side	Top side	Bottom side
WWAN	Yes	Yes	Yes	Yes	No	Yes
WLAN	Yes	Yes	No	Yes	Yes	No

### 11.7 EUT SETUP PHOTOS

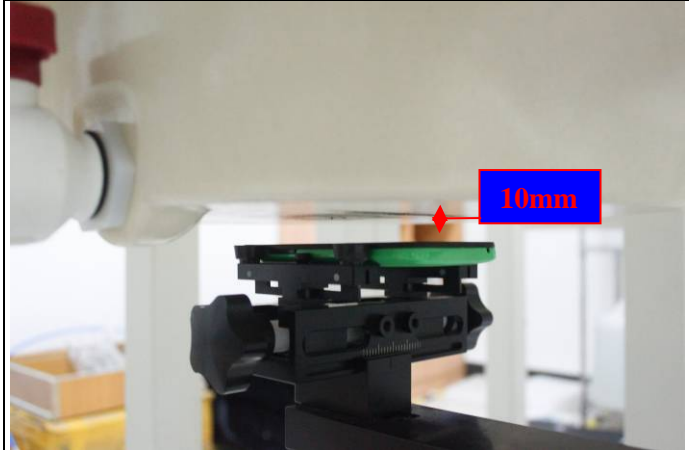
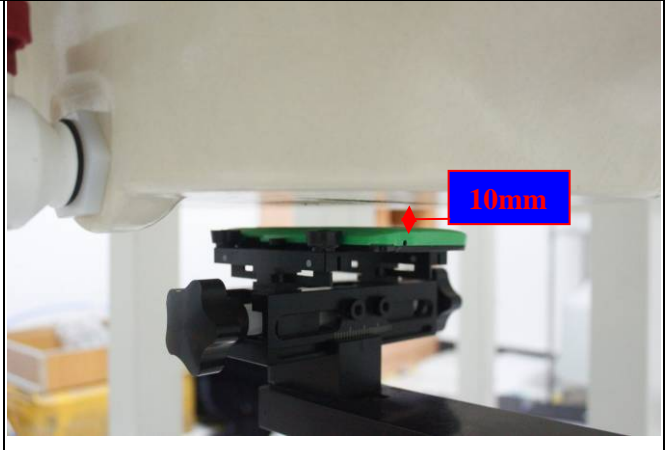
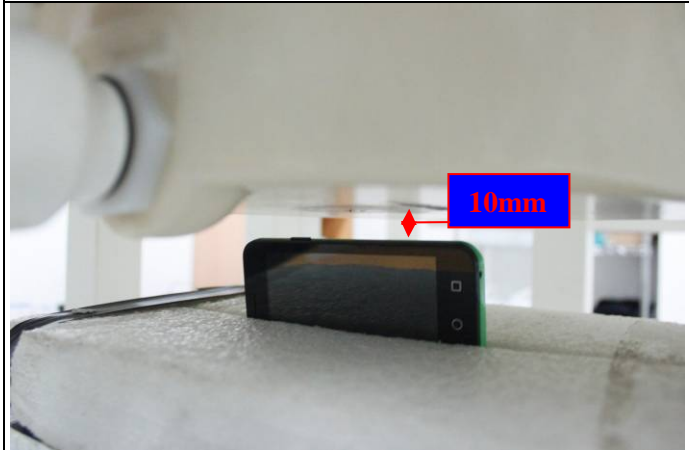
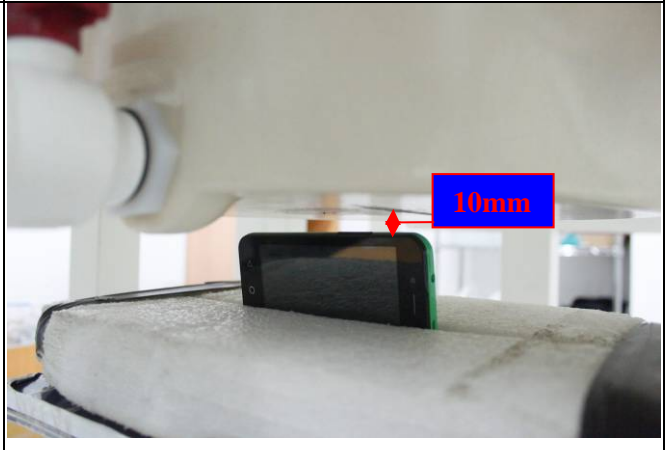


#### Head position

Cheek device with right head phantom.	Tilt device with right head phantom
	
<u>EUT Setup Configuration 1</u>	<u>EUT Setup Configuration 2</u>
Cheek device with left head phantom.	Tilt device with left head phantom
	
<u>UT Setup Configuration 3</u>	<u>EUT Setup Configuration 4</u>

#### Body Support test position

Front in body position	Rear in body position
	
<u>EUT Setup Configuration 5</u>	<u>EUT Setup Configuration 6</u>

**Hotspot test position**

<p style="text-align: center;"><b>Front in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 7</b></p>	<p style="text-align: center;"><b>Rear in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 8</b></p>
<p style="text-align: center;"><b>Right Side in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 9</b></p>	<p style="text-align: center;"><b>Left Side in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 10</b></p>
<p style="text-align: center;"><b>Top Side in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 11</b></p>	<p style="text-align: center;"><b>Bottom Side in body position</b></p>  <p style="text-align: center;"><b>EUT Setup Configuration 12</b></p>

## 11.8 SAR MEASUREMENT RESULTS

### Head SAR Test Records

Band	Mode	Test Position	Ch.	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
GSM850	Voice	Right Cheek	190	836.6	32.58	33	1.102	0.00	0.302	0.333
GSM850	Voice	Right Tilted	190	836.6	32.58	33	1.102	0.13	0.204	0.225
GSM850	Voice	Left Cheek	190	836.6	32.58	33	1.102	0.12	0.320	0.352
GSM850	Voice	Left Tilted	190	836.6	32.58	33	1.102	0.11	0.169	0.186
GSM1900	Voice	Right Cheek	512	1850.2	28.78	29	1.052	0.08	0.336	0.353
GSM1900	Voice	Right Tilted	512	1850.2	28.78	29	1.052	0.09	0.110	0.116
GSM1900	Voice	Left Cheek	512	1850.2	28.78	29	1.052	-0.10	0.512	0.539
GSM1900	Voice	Left Tilted	512	1850.2	28.78	29	1.052	0.01	0.121	0.127
WCDMA II	RMC 12.2k	Right Cheek	9400	1880	23.24	23.5	1.062	-0.09	0.587	0.623
WCDMA II	RMC 12.2k	Right Tilted	9400	1880	23.24	23.5	1.062	-0.05	0.196	0.208
WCDMA II	RMC 12.2k	Left Cheek	9400	1880	23.24	23.5	1.062	0.08	0.594	0.631
WCDMA II	RMC 12.2k	Left Tilted	9400	1880	23.24	23.5	1.062	-0.01	0.254	0.270
WCDMA V	RMC 12.2k	Right Cheek	4233	846.6	23.31	23.5	1.045	-0.02	0.296	0.309
WCDMA V	RMC 12.2k	Right Tilted	4233	846.6	23.31	23.5	1.045	0.11	0.186	0.194
WCDMA V	RMC 12.2k	Left Cheek	4233	846.6	23.31	23.5	1.045	0.14	0.295	0.308
WCDMA V	RMC 12.2k	Left Tilted	4233	846.6	23.31	23.5	1.045	-0.08	0.184	0.192
WLAN 2.4G	802.11 b	Right Cheek	11	2462	16.65	17	1.084	0.03	0.453	0.491
WLAN 2.4G	802.11 b	Right Tilted	11	2462	16.65	17	1.084	-0.10	0.418	0.453
WLAN 2.4G	802.11 b	Left Cheek	11	2462	16.65	17	1.084	0.12	0.377	0.409
WLAN 2.4G	802.11 b	Left Tilted	11	2462	16.65	17	1.084	0.06	0.234	0.254



## SAR for Body-Worn Test Records

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
GSM850	GPRS 4slots	Front	5	251	848.8	29.56	30	1.107	0.03	0.327	0.362
GSM850	GPRS 4slots	Rear	5	128	824.2	29.45	30	1.135	0.04	0.912	1.035
GSM850	GPRS 4slots	Rear	5	190	836.6	29.38	30	1.153	0.02	0.878	1.013
GSM850	GPRS 4slots	Rear	5	251	848.8	29.56	30	1.107	0.11	0.794	0.879
GSM1900	GPRS 4slots	Front	5	512	1850.2	25.65	26	1.084	0.03	0.412	0.447
GSM1900	GPRS 4slots	Rear	5	512	1850.2	25.65	26	1.084	-0.03	0.901	0.977
GSM1900	GPRS 4slots	Rear	5	661	1880	25.58	26	1.102	-0.00	1.01	1.113
GSM1900	GPRS 4slots	Rear	5	810	1909.8	25.43	26	1.140	-0.00	0.852	0.971
WCDMA II	RMC 12.2k	Front	5	9400	1880	23.24	23.5	1.062	-0.01	0.503	0.534
WCDMA II	RMC 12.2k	Rear	5	9262	1852.4	23.12	23.5	1.091	-0.06	0.981	1.071
WCDMA II	RMC 12.2k	Rear	5	9400	1880	23.24	23.5	1.062	0.01	0.957	1.016
WCDMA II	RMC 12.2k	Rear	5	9538	1907.6	23.17	23.5	1.079	-0.16	1.03	1.111
WCDMA V	RMC 12.2k	Front	5	4233	846.6	23.31	23.5	1.045	-0.16	0.345	0.360
WCDMA V	RMC 12.2k	Rear	5	4132	826.4	23.24	23.5	1.062	-0.00	0.826	0.877
WCDMA V	RMC 12.2k	Rear	5	4182	836.4	23.28	23.5	1.052	0.01	0.971	1.021
WCDMA V	RMC 12.2k	Rear	5	4233	846.6	23.31	23.5	1.045	0.00	0.803	0.839
WLAN 2.4G	802.11 b	Front	5	11	2462	16.65	17	1.084	0.03	0.203	0.220
WLAN 2.4G	802.11 b	Rear	5	11	2462	16.65	17	1.084	-0.01	0.448	0.486

**Note:**

According to October 2013TCB Workshop, For GSM / GPRS , the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, Considering the possibility of e.g. 3rd party VoIP operation for body-worn SAR testing, the EUT was set in GPRS (4Tx slots) for GSM850/GSM1900 band due to its highest frame-average power.

**SAR for Hotspot Test Records**

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
GSM850	GPRS 4slots	Front	10	251	848.8	29.56	30	1.107	-0.17	0.198	0.219
GSM850	GPRS 4slots	Rear	10	251	848.8	29.56	30	1.107	0.06	0.510	0.564
GSM850	GPRS 4slots	Right	10	251	848.8	29.56	30	1.107	-0.18	0.277	0.307
GSM850	GPRS 4slots	Left	10	251	848.8	29.56	30	1.107	-0.13	0.367	0.406
GSM850	GPRS 4slots	Bottom	10	251	848.8	29.56	30	1.107	-0.04	0.083	0.092
GSM1900	GPRS 4slots	Front	10	512	1850.2	25.65	26	1.084	0.13	0.256	0.277
GSM1900	GPRS 4slots	Rear	10	512	1850.2	25.65	26	1.084	0.03	0.534	0.579
GSM1900	GPRS 4slots	Right	10	512	1850.2	25.65	26	1.084	-0.07	0.065	0.070
GSM1900	GPRS 4slots	Left	10	512	1850.2	25.65	26	1.084	-0.07	0.107	0.116
GSM1900	GPRS 4slots	Bottom	10	512	1850.2	25.65	26	1.084	0.12	0.278	0.301
WCDMA II	RMC 12.2k	Front	10	9400	1880	23.24	23.5	1.062	-0.03	0.321	0.341
WCDMA II	RMC 12.2k	Rear	10	9400	1880	23.24	23.5	1.062	-0.00	0.604	0.641
WCDMA II	RMC 12.2k	Right	10	9400	1880	23.24	23.5	1.062	-0.02	0.152	0.161
WCDMA II	RMC 12.2k	Left	10	9400	1880	23.24	23.5	1.062	-0.14	0.232	0.246
WCDMA II	RMC 12.2k	Bottom	10	9400	1880	23.24	23.5	1.062	-0.11	0.348	0.369
WCDMA V	RMC 12.2k	Front	10	4233	846.6	23.31	23.5	1.045	-0.01	0.205	0.214
WCDMA V	RMC 12.2k	Rear	10	4233	846.6	23.31	23.5	1.045	-0.01	0.483	0.505
WCDMA V	RMC 12.2k	Right	10	4233	846.6	23.31	23.5	1.045	0.02	0.240	0.251
WCDMA V	RMC 12.2k	Left	10	4233	846.6	23.31	23.5	1.045	0.03	0.231	0.241
WCDMA V	RMC 12.2k	Bottom	10	4233	846.6	23.31	23.5	1.045	-0.14	0.057	0.060
WLAN 2.4G	802.11 b	Front	10	11	2462	16.65	17	1.084	0.06	0.101	0.109
WLAN 2.4G	802.11 b	Rear	10	11	2462	16.65	17	1.084	0.08	0.214	0.232
WLAN 2.4G	802.11 b	Left	10	11	2462	16.65	17	1.084	-0.06	0.155	0.168
WLAN 2.4G	802.11 b	Top	10	11	2462	16.65	17	1.084	-0.08	0.110	0.119

**Repeated SAR Test Records**

Band	Mode	Test Position	Dist. (mm)	Ch.	Freq. (MHZ)	max Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	SAR1g (mW/g)	Scaled SAR1g (mW/g)
GSM850	GPRS 4slots	Rear	5	128	824.2	29.45	30	1.135	0.12	0.904	1.026
GSM1900	GPRS 4slots	Rear	5	661	1880	25.58	26	1.102	-0.03	0.977	1.076
WCDMA II	RMC 12.2k	Rear	5	9538	1907.6	23.17	23.5	1.079	0.04	1.02	1.101
WCDMA V	RMC 12.2k	Rear	5	4182	836.4	23.28	23.5	1.052	-0.12	0.947	0.996

**11.9 REPEATED SAR MEASUREMENT**

Band	Mode	Test Position	Dist. (mm)	Ch.	Original Measured SAR1g (mW/g)	1st Repeated SAR1g (mW/g)	Ratio	Original Measured SAR1g (mW/g)	2nd Repeated SAR1g (mW/g)	Ratio
GSM850	GPRS 4slots	Rear	5	128	0.912	0.904	1.009	--	--	--
GSM1900	GPRS 4slots	Rear	5	661	1.01	0.977	1.034	--	--	--
WCDMA II	RMC 12.2k	Rear	5	9538	1.03	1.02	1.010	--	--	--
WCDMA V	RMC 12.2k	Rear	5	4182	0.971	0.947	1.025	--	--	--

**Note:**

1. Per KDB 865664 D01v01, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8\text{W/Kg}$
2. Per KDB 865664 D01v01, if the ratio of largest to smallest SAR for the original and first repeated measurement is  $\leq 1.2$  and the measured SAR  $< 1.45\text{W/Kg}$ , only one repeated measurement is required.
3. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is  $> 1.20$  or when the original or repeated measurement is  $\geq 1.45\text{W/kg}$
4. The ratio is the difference in percentage between original and repeated measured SAR.

## 12. SAR HANDSETS MULTI XMITER ASSESSMENT

	Position	Applicable Combination
Simultaneous Transmission	Head	WWAN + WLAN
		WWAN + BT
	Body-worn	WWAN + WLAN
		WWAN + BT
	Hotspot	WWAN + WLAN
		WWAN + BT

**Note:**

- 2.4GHz WLAN and BT share the same antenna, and cannot transmit simultaneously.
- The reported SAR summation is calculated based on the same configuration and test position.
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below.  

$$(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$$
 for test separation distances  $\leq 50$  mm; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.  
 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50$  mm.

**Bluetooth:**

	Max power	Head & Body (5mm distance)	Body (10mm distance)
Estimated SAR (W/kg)	1 dBm	0.053 W/kg	0.026 W/kg

- Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions
- Per KDB 447498 D01, simultaneous transmission SAR is compliant if,
  - Scalar SAR summation  $< 1.6\text{W/kg}$ .
  - $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$ , and the peak separation distance is determined from the square root of  $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$ , where  $(x1, y1, z1)$  and  $(x2, y2, z2)$  are the coordinates of the extrapolated peak SAR locations in the zoom scan  
 If  $\text{SPLSR} \leq 0.04$ , simultaneously transmission SAR is compliant
  - Simultaneously transmission SAR measurement, and the reported multi-band SAR  $< 1.6\text{W/kg}$

**Result of SUM  $\Sigma$ SAR<sub>1g</sub> of Head**

SUM $\Sigma$ SAR <sub>1g</sub> (GSM850+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GSM 850	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Right Cheek	0	0.333	0.491	0.053	0.824	0.386
Right Tilted	0	0.225	0.453	0.053	0.678	0.278
Left Cheek	0	0.352	0.409	0.053	0.761	0.405
Left Tilted	0	0.186	0.254	0.053	0.440	0.239

SUM $\Sigma$ SAR <sub>1g</sub> (GSM1900+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GSM 1900	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Right Cheek	0	0.353	0.491	0.053	0.844	0.406
Right Tilted	0	0.116	0.453	0.053	0.569	0.169
Left Cheek	0	0.539	0.409	0.053	0.948	0.592
Left Tilted	0	0.127	0.254	0.053	0.381	0.180

SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band II+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA II	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Right Cheek	0	0.623	0.491	0.053	1.114	0.676
Right Tilted	0	0.208	0.453	0.053	0.661	0.261
Left Cheek	0	0.631	0.409	0.053	1.040	0.684
Left Tilted	0	0.270	0.254	0.053	0.524	0.323

SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band V+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA V	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Right Cheek	0	0.309	0.491	0.053	0.800	0.362
Right Tilted	0	0.194	0.453	0.053	0.647	0.247
Left Cheek	0	0.308	0.409	0.053	0.717	0.361
Left Tilted	0	0.192	0.254	0.053	0.446	0.245

**Result of SUM  $\Sigma$ SAR<sub>1g</sub> for Body Support**

SUM $\Sigma$ SAR <sub>1g</sub> (GSM850+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GPRS850	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	5	0.362	0.220	0.053	0.582	0.415
Rear	5	1.035	0.486	0.053	1.521	1.088

SUM $\Sigma$ SAR <sub>1g</sub> (GSM1900+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GPRS 1900	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	5	0.447	0.220	0.053	0.667	0.500
Rear	5	1.113	0.486	0.053	1.599	1.166

SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band II+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA II	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	5	0.534	0.220	0.053	0.754	0.587
Rear	5	1.111	0.486	0.053	1.597	1.164

SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band V+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA V	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	5	0.360	0.220	0.053	0.580	0.413
Rear	5	1.021	0.486	0.053	1.507	1.074

**Result of SUM  $\Sigma$ SAR<sub>1g</sub> for Hotspot**

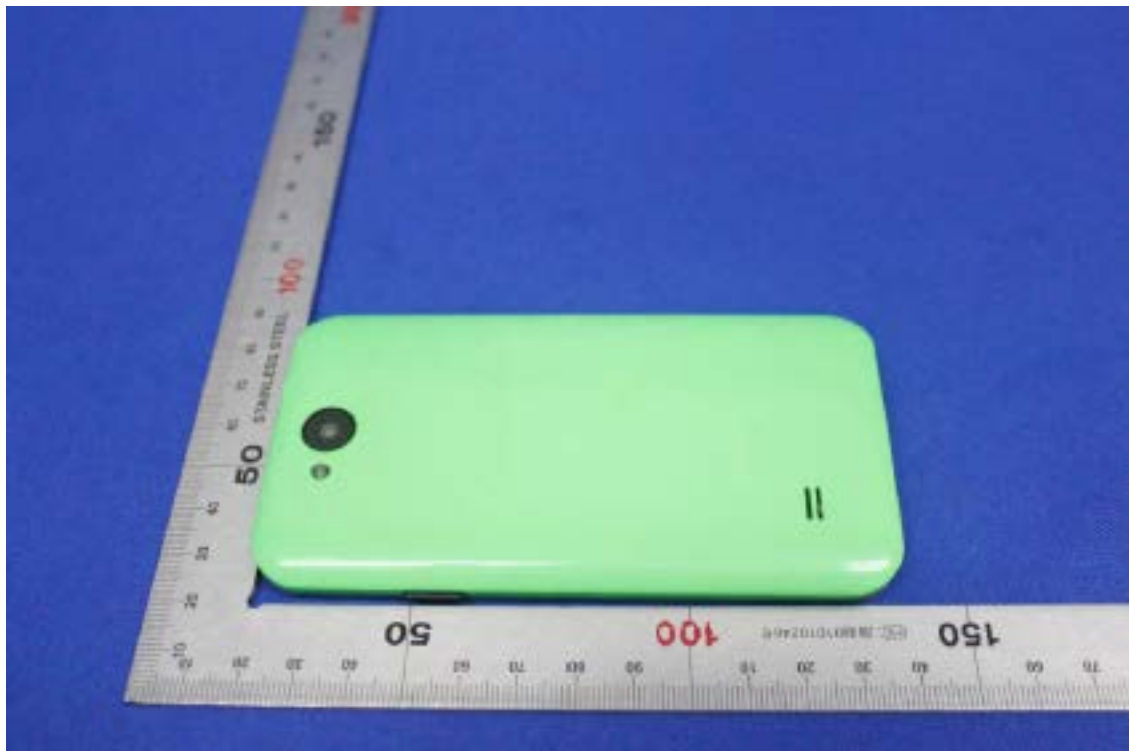
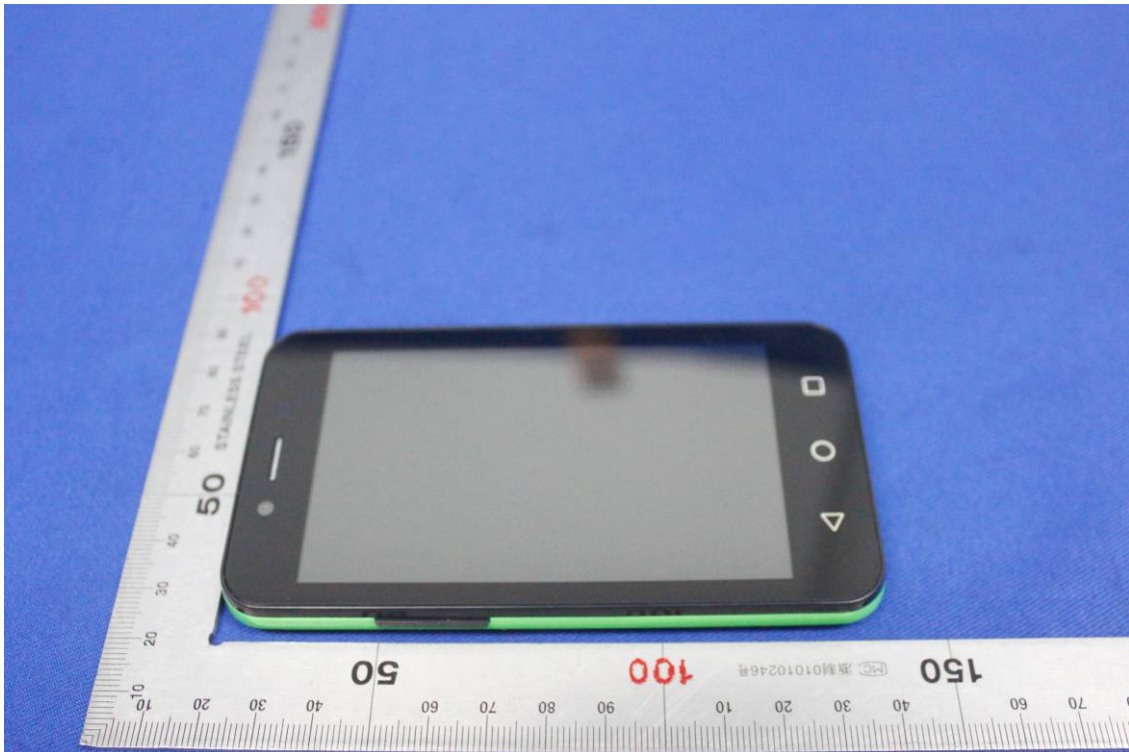
SUM $\Sigma$ SAR <sub>1g</sub> (GSM850+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GPRS850	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	10	0.219	0.109	0.026	0.328	0.245
Rear	10	0.564	0.232	0.026	0.796	0.590
Left Side	10	0.406	0.168	0.026	0.574	0.432

SUM $\Sigma$ SAR <sub>1g</sub> (GSM1900+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	GPRS 1900	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	10	0.277	0.109	0.026	0.386	0.303
Rear	10	0.579	0.232	0.026	0.811	0.605
Left Side	10	0.116	0.168	0.026	0.284	0.142

SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band II+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA II	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	10	0.341	0.109	0.026	0.450	0.367
Rear	10	0.641	0.232	0.026	0.873	0.667
Left Side	10	0.246	0.168	0.026	0.414	0.272

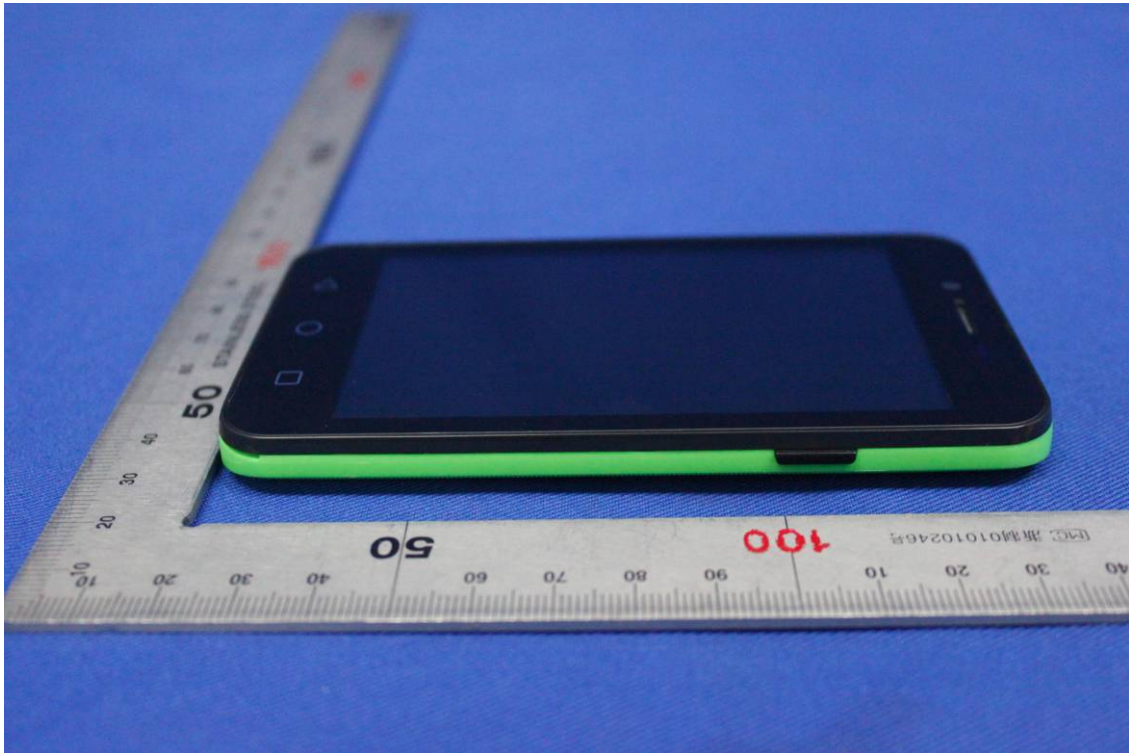
SUM $\Sigma$ SAR <sub>1g</sub> (WCDMA Band V+WLAN(2.4G) or Bluetooth)						
Position	Distance	Stand alone SAR(1g) [W/kg]			SUM SAR(1g)[W/kg]	SUM SAR(1g)[W/kg]
	[mm]	WCDMA V	WLAN 2.4G	Bluetooth	WWAN + WLAN(2.4G)	WWAN + Bluetooth
Front	10	0.214	0.109	0.026	0.323	0.240
Rear	10	0.505	0.232	0.026	0.737	0.531
Left Side	10	0.241	0.168	0.026	0.409	0.267

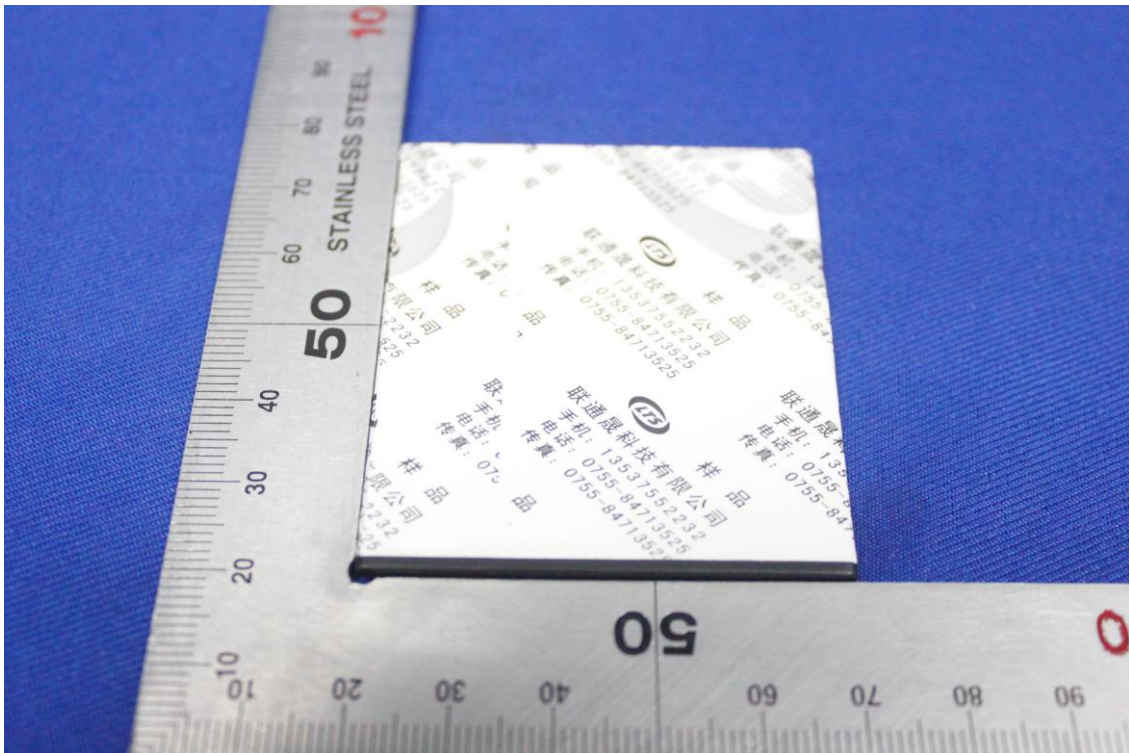
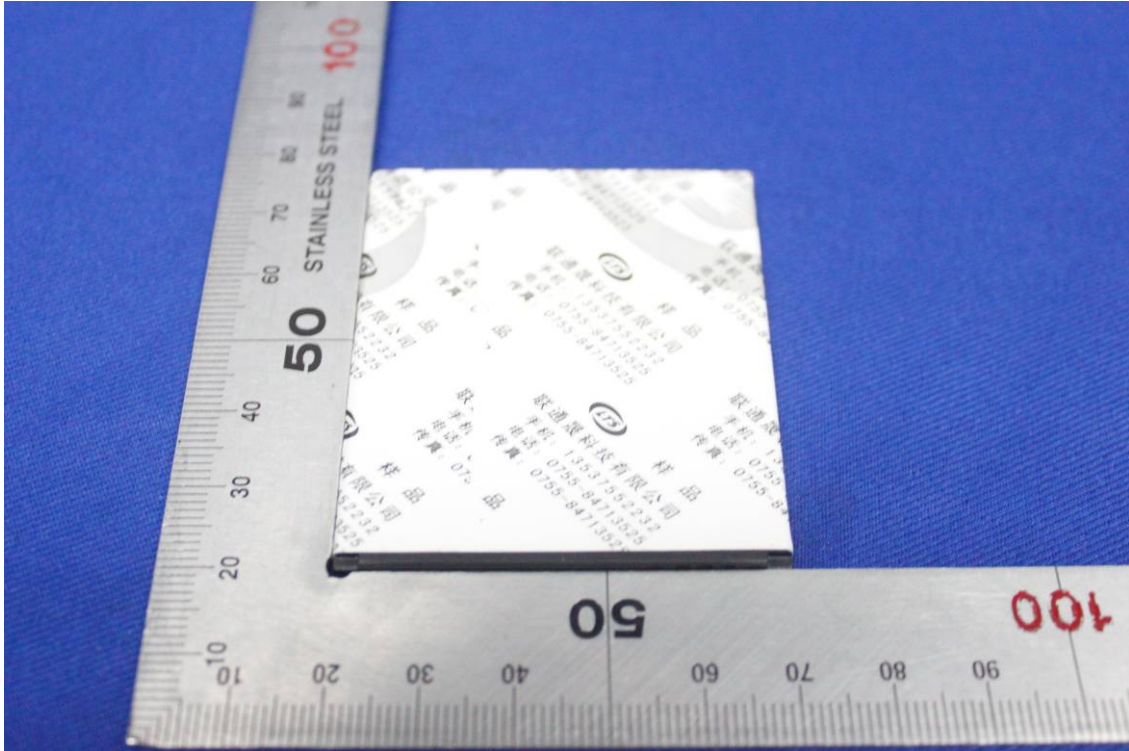
### 13. EUT PHOTO











**14. EQUIPMENT LIST & CALIBRATION STATUS**

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Calibration	Calibration Due
P C	HP	Core(rm)3.16G	CZCO48171H	N/A	N/A
Signal Generator	Agilent	E8257C	MY43321570	11/19/2016	11/18/2017
S-Parameter Network Analyzer	Agilent	E5071B	MY42301382	03/02/2017	03/01/2018
Wireless Communication Test Set	R&S	CMU200	SN:109525	01/06/2017	01/05/2018
Power Meter	Agilent	E4416A	GB41292714	03/02/2017	03/01/2018
Peak & Average sensor	Agilent	E9327A	us40441788	03/02/2017	03/01/2018
E-field PROBE	SPEAG	EX3DV4	3798	07/28/2016	07/27/2017
DAE	SPEAG	DEA4	1245	07/28/2016	07/27/2017
DIPOLE 835MHZ ANTENNA	SPEAG	D835V2	4d114	05/30/2016	05/27/2019
DIPOLE 1900MHZ ANTENNA	SPEAG	D1900V2	5d136	05/25/2016	05/22/2019
DIPOLE 2450MHZ ANTENNA	SPEAG	D2450V2	817	05/31/2016	05/28/2019
Dielectric Probe Kit	SPEAG	DAK 3.5	1102	N/A	N/A
Dual Directional Coupler	Woken	20W couple	DOM2BHW1A1	N/A	N/A
DUMMY PROBE	SPEAG	DP_2	SPDP2001AA	N/A	N/A
SAM PHANTOM (ELI4 v4.0)	SPEAG	QDOVA001BB	1102	N/A	N/A
Twin SAM Phantom	SPEAG	QD000P40CD	1609	N/A	N/A
ROBOT	SPEAG	TX60	F10/5E6AA1/A101	N/A	N/A
ROBOT KRC	SPEAG	CS8C	F10/5E6AA1/C101	N/A	N/A
LIQUID CALIBRATION KIT	ANTENNESSA	41/05 OCP9	00425167	N/A	N/A

## 15. FACILITIES

All measurement facilities used to collect the measurement data are located at

No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.

## 16. REFERENCES

- [1] Federal Communications Commission, "Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, "Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, Office of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetric evaluation of mobile communications equipment with known precision", IEEE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, "Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz – 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15{17, 1997, pp. 120{124.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172{175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard Kuhn, and Niels Kuster, "The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865{1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, "The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
- [11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992. Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10

**APPENDIX A: PLOTS OF PERFORMANCE CHECK**

The plots are showing as followings.

Test Laboratory: Compliance Certification Services Inc.

**System Performance Check-Head D835**

Date: 7/18/2017

**DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: 4d114**

Communication System: UID 0, CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 835$  MHz;  $\sigma = 0.908$  S/m;  $\epsilon_r = 41.754$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(9.13, 9.13, 9.13); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.37 W/kg

**System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

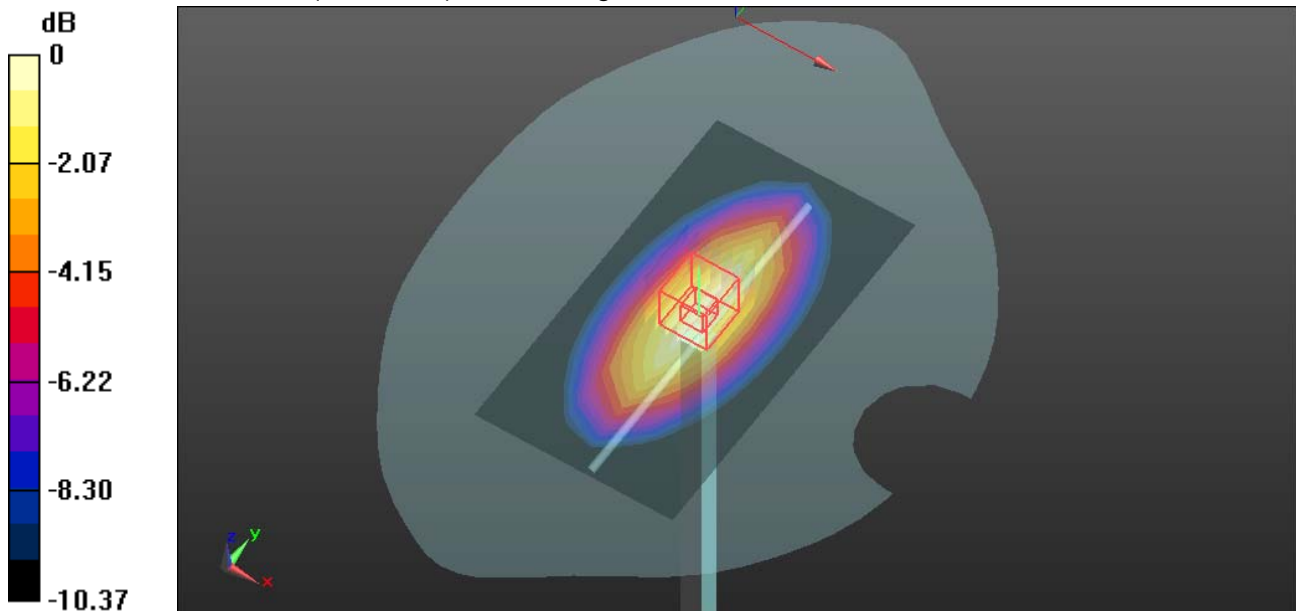
Reference Value = 52.73 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.80 W/kg

**SAR(1 g) = 2.29 W/kg; SAR(10 g) = 1.55 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 2.39 W/kg



0 dB = 2.39 W/kg = 3.78 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 7/18/2017

### System Performance Check-Body D835

**DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: 4d114**

Communication System: UID 0, CW; Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.954 \text{ S/m}$ ;  $\epsilon_r = 55.288$ ;  $\rho = 1000 \text{ kg/m}^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(8.87, 8.87, 8.87); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.62 W/kg

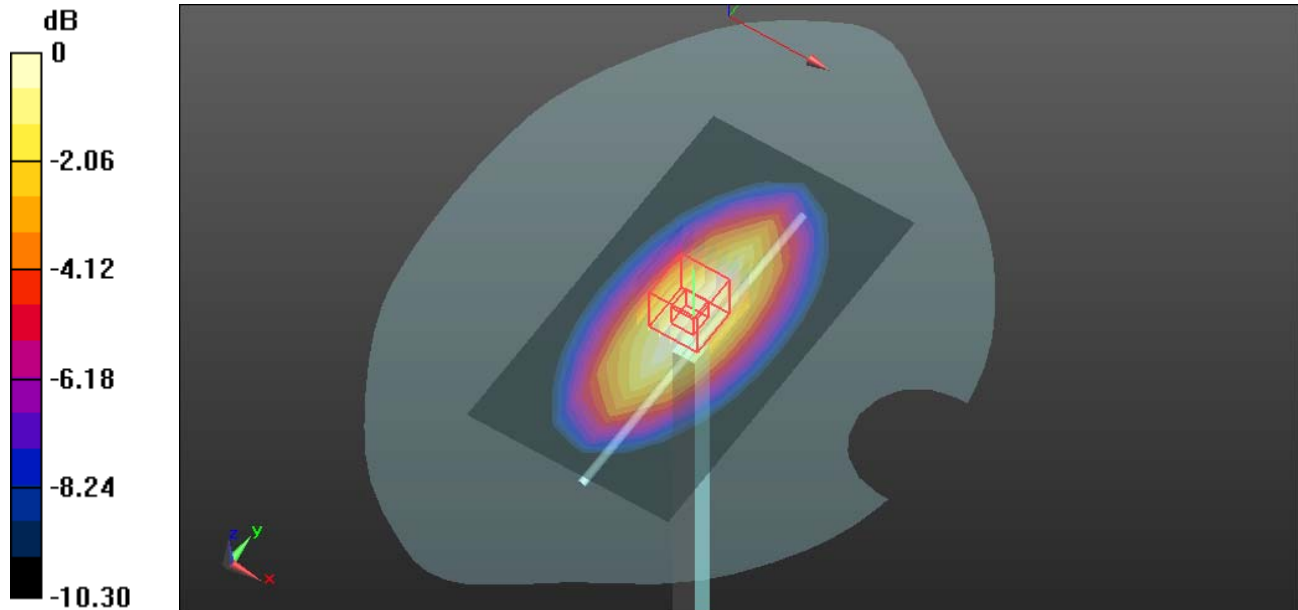
**System Performance Check at Frequencies Low 1 GHz/d=15mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.91 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 2.84 W/kg

**SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.68 W/kg**

Maximum value of SAR (measured) = 2.43 W/kg



0 dB = 2.43 W/kg = 3.86 dBW/kg



Test Laboratory: Compliance Certification Services Inc.

Date: 7/19/2017

### System Performance Check-Head D1900

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: 5d136**

Communication System: UID 0, CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.421$  S/m;  $\epsilon_r = 39.406$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.63, 7.63, 7.63); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

### System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm

(EX-Probe)/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 13.8 W/kg

### System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm

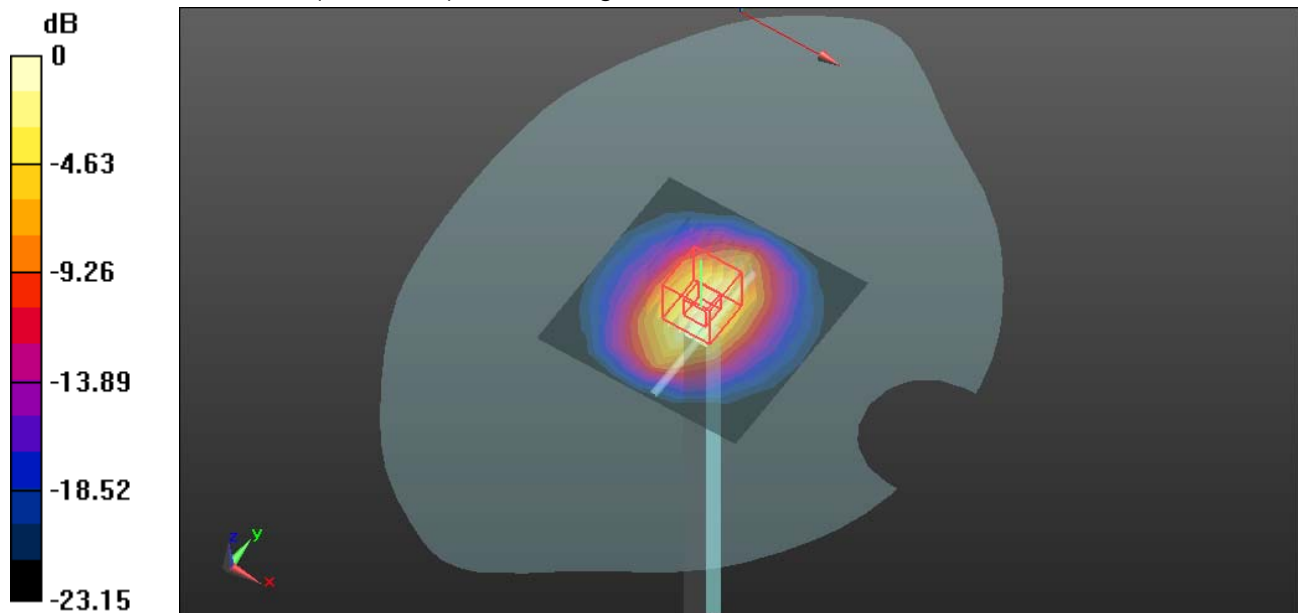
(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.2 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 21.4 W/kg

**SAR(1 g) = 9.98 W/kg; SAR(10 g) = 4.59 W/kg**

Maximum value of SAR (measured) = 15.2 W/kg



Test Laboratory: Compliance Certification Services Inc.

Date: 7/19/2017

**System Performance Check-Body D1900**

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: 5d136**

Communication System: UID 0, CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.563$  S/m;  $\epsilon_r = 52.456$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.29, 7.29, 7.29); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASYS52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**

**(EX-Probe)/Area Scan (7x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 16.5 W/kg

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**

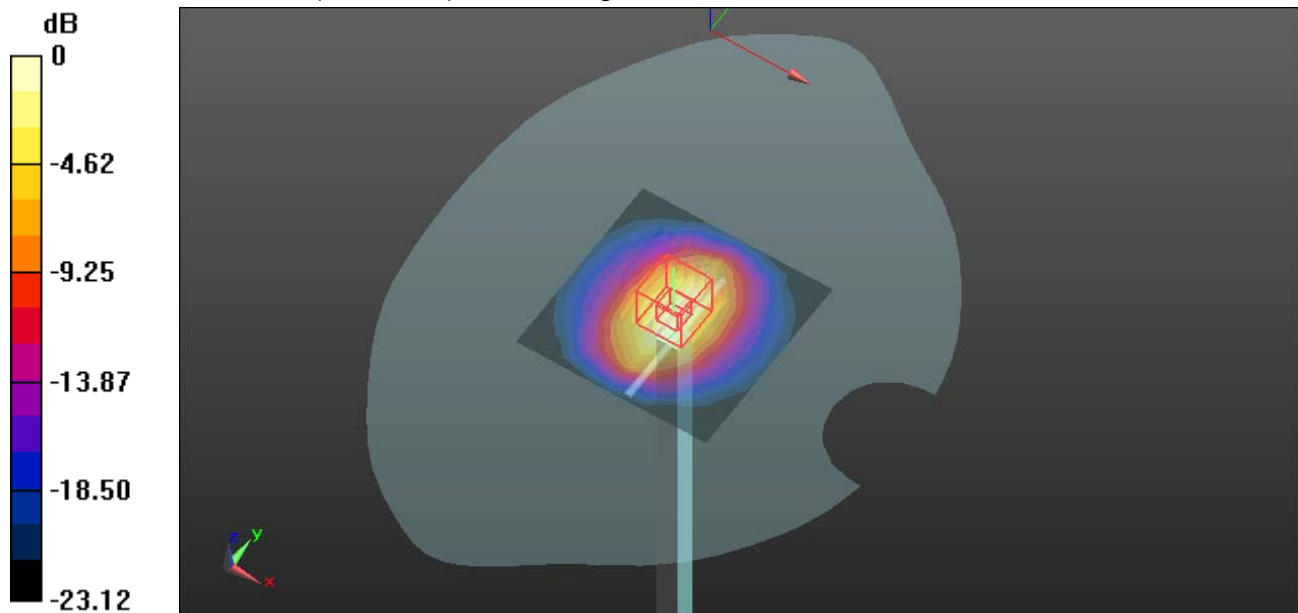
**(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.5 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 22.3 W/kg

**SAR(1 g) = 10.2 W/kg; SAR(10 g) = 4.77 W/kg**

Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 7/20/2017

**System Performance Check-Head D2450**

**DUT: Dipole 2450 MHz D2450V2; Type: D24500V2; Serial: 817**

Communication System: UID 0, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.825$  S/m;  $\epsilon_r = 37.857$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(6.97, 6.97, 6.97); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**

**(EX-Probe)/Area Scan (7x9x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 21.0 W/kg

**System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=2.0mm**

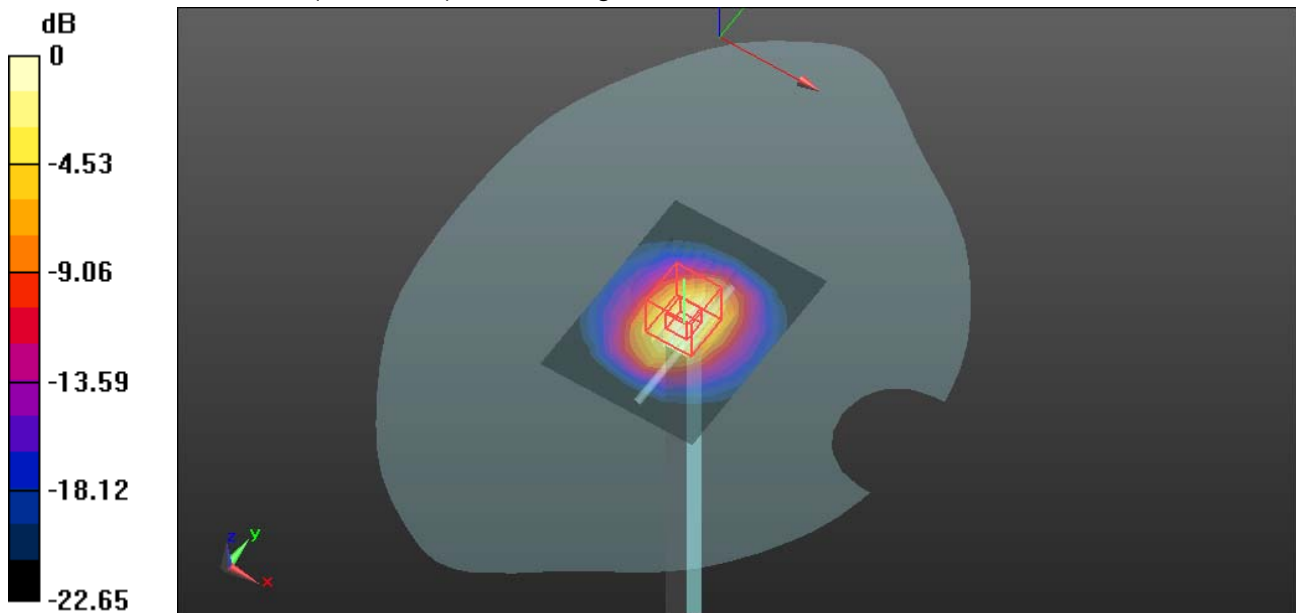
**(EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.6 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 28.5 W/kg

**SAR(1 g) = 12.5 W/kg; SAR(10 g) = 6.17 W/kg**

Maximum value of SAR (measured) = 20.9 W/kg



0 dB = 20.9 W/kg = 13.20 dBW/kg

Test Laboratory: Compliance Certification Services Inc.

Date: 7/20/2017

**System Performance Check-Body D2450**

**DUT: Dipole 2450 MHz D2450V2; Type: D24500V2; Serial: 817**

Communication System: UID 0, CW; Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.951$  S/m;  $\epsilon_r = 51.705$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3798; ConvF(7.08, 7.08, 7.08); Calibrated: 7/28/2016;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1245; Calibrated: 7/28/2016
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check at Frequencies above 1 GHz/Pin=250 mW, dist=10mm (EX-Probe)/Area Scan (9x10x1):** Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 21.1 W/kg

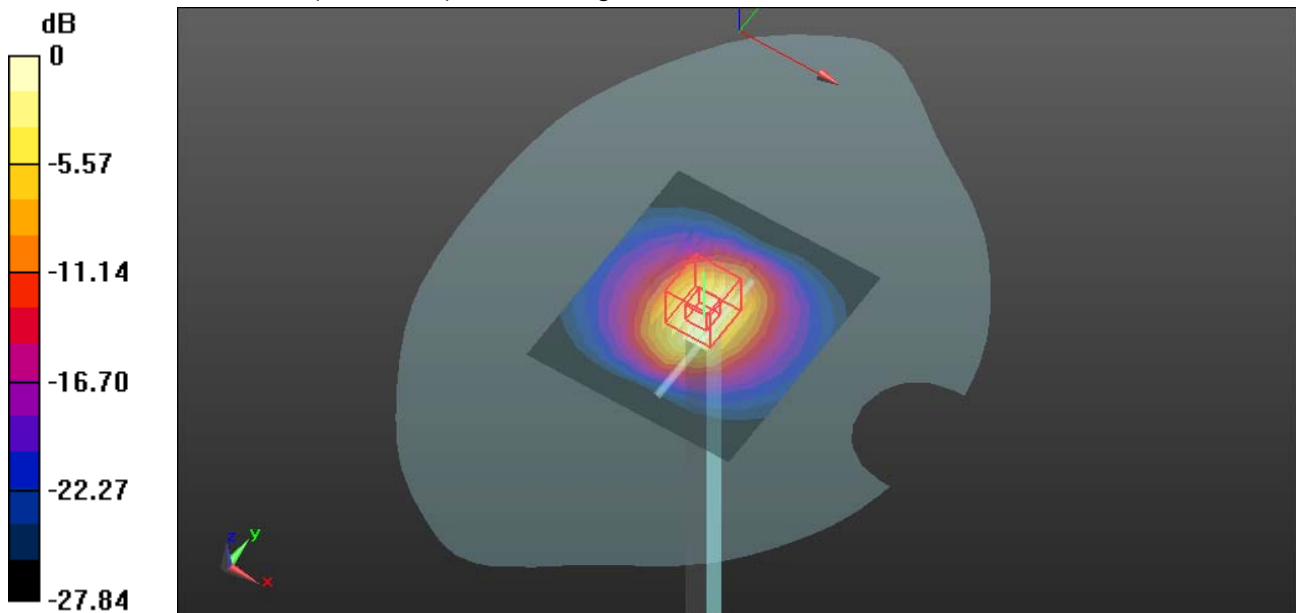
**System Performance Check at Frequencies above 1 GHz/Pin=250 mW, dist=10mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.9 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 34.7 W/kg

**SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.88 W/kg**

Maximum value of SAR (measured) = 22.7 W/kg



0 dB = 22.7 W/kg = 13.56 dBW/kg

**APPENDIX B: DASY CALIBRATION CERTIFICATE**

The DASY Calibration Certificates are showing in the file named Appendix B DASY Calibration Certificate.

**APPENDIX C: PLOTS OF HIGHEST SAR TEST RESULT**

The plots are showing in the file named Appendix C Plots of Highest SAR Test Result

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**END REPORT**