FCC SAR
Measurement and Test Report

For

Uonmap International Limited

Unit 1010, 10/F, Miramar Tower, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong

FCC ID: 2AJMAU-100

FCC Rules:	FCC Part 2.1093 ANSI / IEEE C95.1 :2005 ANSI / IEEE C95.3 :2002
Product Description:	CarDroid
Tested Model:	U-100
Report No.:	STR16068341H
Tested Date:	2016-09-27 to 2016-09-29
Issued Date:	2016-09-29
Tested By:	Lucy Wei / Engineer — Lucy Wei
Reviewed By:	Silin Chen / EMC Manager — Silin chen
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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Uonmap International Limited
Address of applicant:	Unit 1010, 10/F, Miramar Tower, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer:	Shenzhen Ptah Technology Co., Ltd
Address of manufacturer:	4/F, D Block, Xinda Technonogy Innovation Park, Baotian 2rd Road, XiXiang, Bao'an, Shenzhen, China

General Description of EUT	
Product Name:	CarDroid
Trade Name:	UonMap
Model No.:	U-100
Adding Model(s):	U-200, U-300, U-400, U-500, U-600
Rated Voltage:	DC 3.8V by battery
Battery:	2150mAh
Device Category:	Mobile Device
Software Version:	V1.1
Hardware Version:	V2.2
Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model U-100, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
2G	
Support Networks:	GSM, GPRS
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS 850: 869~894MHz GSM/GPRS 1900: 1930~1990MHz
Max RF Output Power:	GSM850: 31.74dBm, GSM1900: 29.10dBm
Type of Modulation:	GMSK
Antenna Type:	Internal Antenna
Antenna Gain:	0dBi,
GPRS Class:	Class 12
3G	

Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band V
Uplink Frequency:	WCDMA Band V: 824~849MHz
Downlink Frequency:	WCDMA Band V: 869~894MHz
RF Output Power:	WCDMA850: 22.97dBm
Type of Modulation:	BPSK, QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
WIFI	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20)
AV Output Power:	Antenna 1:16.91dBm (Conducted) Antenna 2:16.33dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11 for 802.11b/g/n(HT20)
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
Bluetooth	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
AV Output Power:	-4.786dBm (Conducted)
Data Rate:	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK, Pi/4 QDPSK, 8DPSK
Quantity of Channels:	79/40
Channel Separation:	1MHz/2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi

1.2 Test Standards

The following report is prepared on behalf of the Uonmap International Limited in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-2005, KDB 865664 D01 v01r04, KDB 865664 D02 v01r02, KDB 941225 D06 Hotspot mode v02r01, KDB 447498 D01 v06, and KDB 941225 D01 v03.

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

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

1.3 Test Methodology

All measurements contained in this report were conducted with KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02. The public notice KDB 447498 D01 v06 for Mobile and Portable Devices RF Exposure Procedure also.

1.4 Test Facility

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

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

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

2. Summary of Test Results

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

Frequency Band	Body-worn (5mm Gap)	Hotspot (5mm Gap)	SAR_{1g} Limit (W/kg)
	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	
GSM850	0.248	0.288	1.6
GSM1900	0.251	0.390	1.6
WCDMA Band V	**0.507**	**0.507**	1.6
Antenna 1:WLAN 2.4GHz	0.072	0.072	1.6
Antenna 2:WLAN 2.4GHz	0.047	/	1.6
Simultaneous Transmission	**0.563**	0.541	1.6

The highest reported SAR values for body-worn accessory, wireless router(hotspot) , and simultaneous transmission conditions are ***0.507W/kg , 0.507W/kg, and 0.563W/kg*** *respectively*

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR Part 2.1093 and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedure specified in KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02

3. Specific Absorption Rate (SAR)

3.1 Introduction

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

3.2 SAR Definition

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

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

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

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

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

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

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

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

4. SAR Measurement System

4.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:
- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.

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

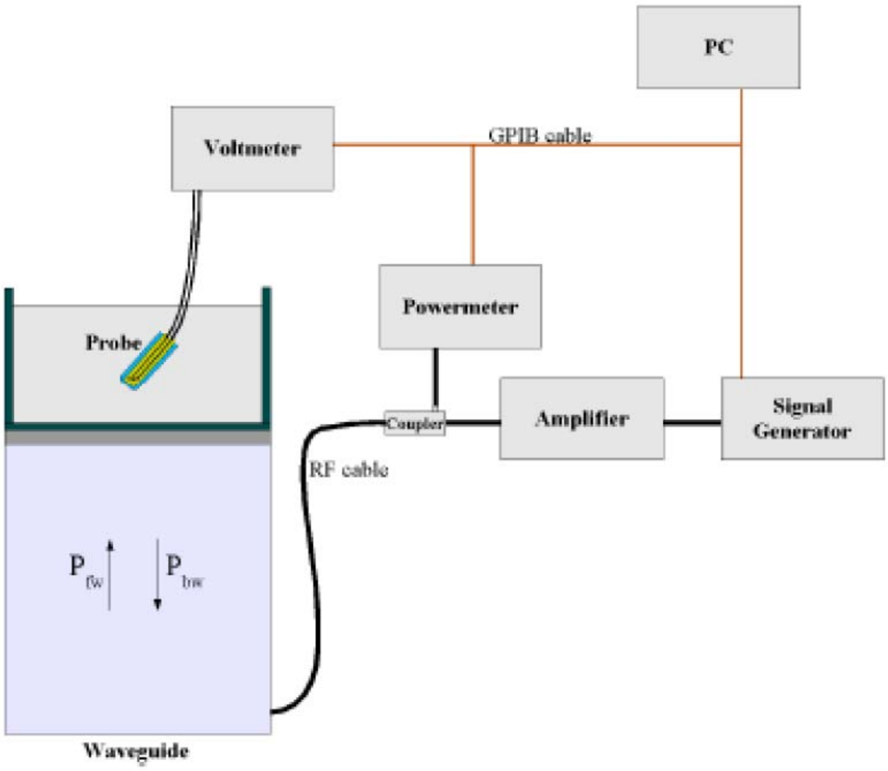
4.2 Probe

For the measurements the Specific Dosimetric E-Field Probe SSE5 SN 09/13 EP168 with following specifications is used
- Dynamic range: 0.01-100 W/kg
- Probe Length: 330 mm
- Length of Individual Dipoles: 4.5 mm
- Maximum external diameter: 8 mm
- Probe Tip External Diameter : 5 mm
- Distance between dipoles / probe extremity: 2.7mm

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

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

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



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

Where :

Pfw = Forward Power

Pbw = Backward Power

a and b =Waveguide dimensions

I = Skin depth

Keithley configuration:

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

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

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

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

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

where DCP is the diode compression point in mV.

4.3 Probe Calibration Process

Dosimetric Assessment Procedure

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

Free Space Assessment Procedure

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

Temperature Assessment Procedure

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

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

Where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

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

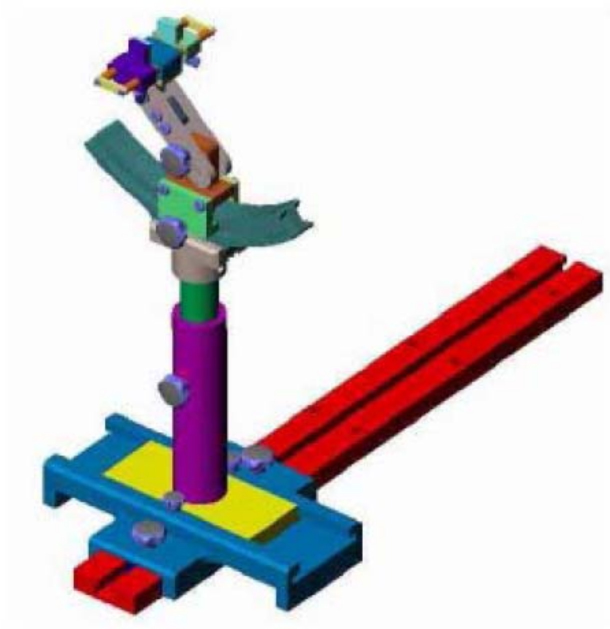
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

4.4 Phantom

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

4.5 Device Holder

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



System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

4.6 Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	SATIMO	SSE5	SN 09/13 EP168	2016-06-01	2017-05-31
835MHz Dipole	SATIMO	SID835	SN 47/12 DIP 0G835-204	2016-03-20	2017-03-19
1900MHz Dipole	SATIMO	SID1900	SN 47/12 DIP 1G900-207	2016-03-20	2017-03-19
2450MHz Dipole	SATIMO	SID2450	SN 13/15 DIP 2G450-364	2016-03-20	2017-03-19
Dielectric Probe Kit	SATIMO	SCLMP	SN 47/12 OCPG49	2016-03-20	2017-03-19
SAM Phantom	SATIMO	SAM	SN/ 47/12 SAM95	N/A	N/A
MULTIMETER	KEITHLEY	Keithley 2000	4006367	2016-06-04	2017-06-03
Signal Generator	Rohde & Schwarz	SMR20	100047	2016-06-04	2017-06-03
Universal Tester	Rohde & Schwarz	CMU200	112012	2016-06-04	2017-06-03
Network Analyzer	HP	8753C	2901A00831	2016-06-04	2017-06-03
Directional Couplers	Agilent	778D	20160	2016-06-04	2017-06-03

5. Tissue Simulating Liquids

5.1 Composition of Tissue Simulating Liquid

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

Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

Frequency (MHz)	Water (%)	Salt (%)	Triton (%)	HEC (%)	Preventol (%)	DGBE (%)
Body						
835	52.87	1.07	0.00	0.00	46.10	0.00
1900	69.99	0.41	20.66	0.00	0.00	8.93
2450	70.56	0.35	20.88	0.00	0.00	8.21

5.2 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

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

5.3 Tissue Calibration Result

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

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (εr)	Target (εr)	Delta (%)		
835	21.2	0.95	0.97	-2.06	54.85	55.20	-0.63	±5	2016-09-27
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2016-09-27
2450	21.3	2.00	1.95	2.56	52.3	52.7	-0.76	±5	2016-09-27

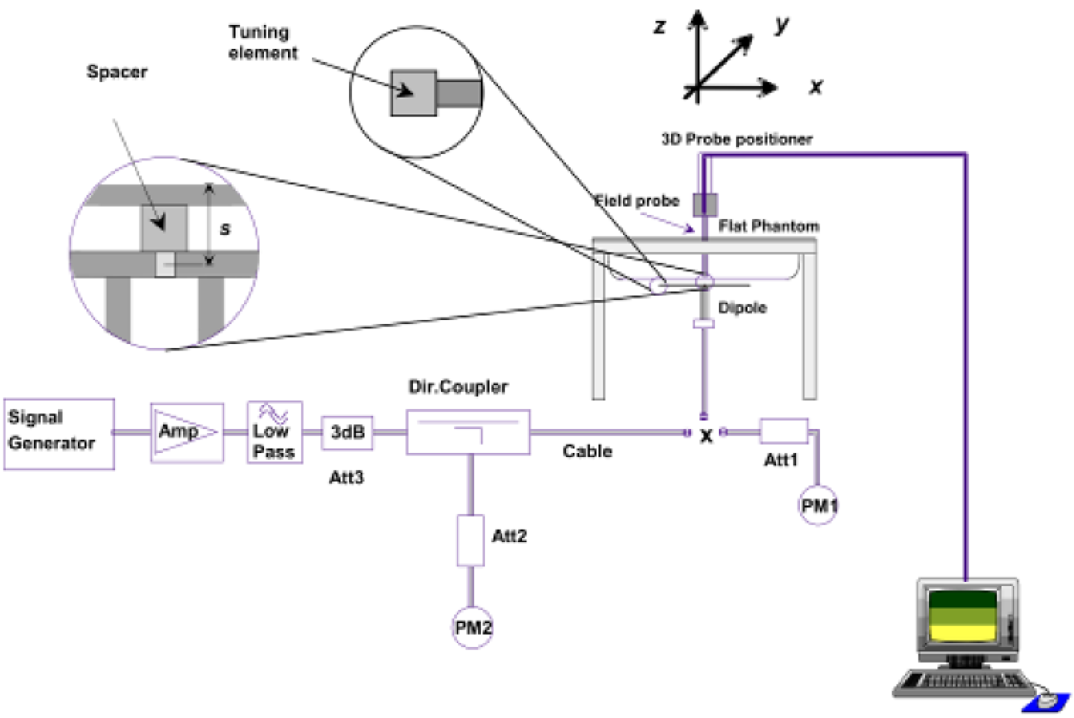
6. SAR Measurement Evaluation

6.1 Purpose of System Performance Check

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

6.2 System Setup

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



System Verification Setup Block Diagram

Setup Photo of Dipole Antenna

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

6.3 Validation Results

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

Frequency	Targeted SAR_{1g}	Measured SAR_{1g}	Normalized SAR_{1g}	Tolerance
MHz	(W/kg)	(W/kg)	(W/kg)	(%)
Body				
835	9.38	2.36	9.44	0.64
1900	39.10	9.80	39.2	0.26
2450	50.41	12.60	50.4	-0.02

Targeted and Measurement SAR

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

7. EUT Testing Position

7.1 Body Position

(a) To position the device parallel to the phantom surface with either keypad up or down.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 5mm.

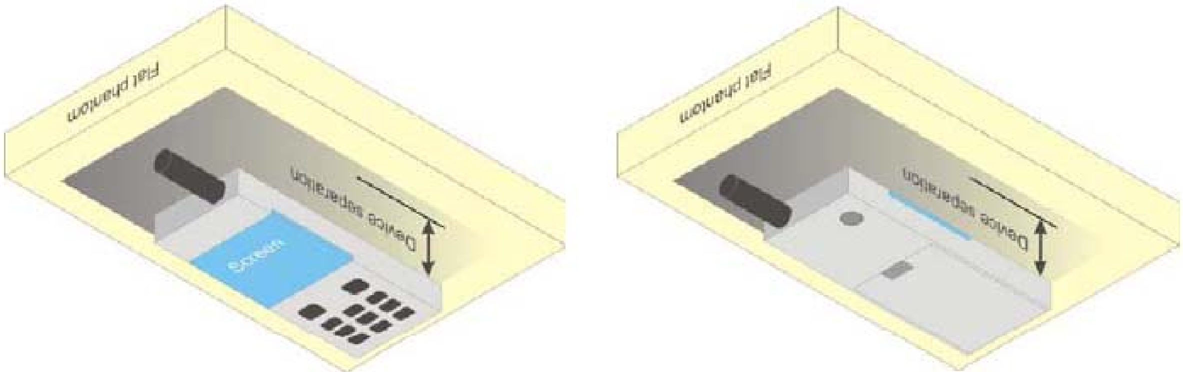
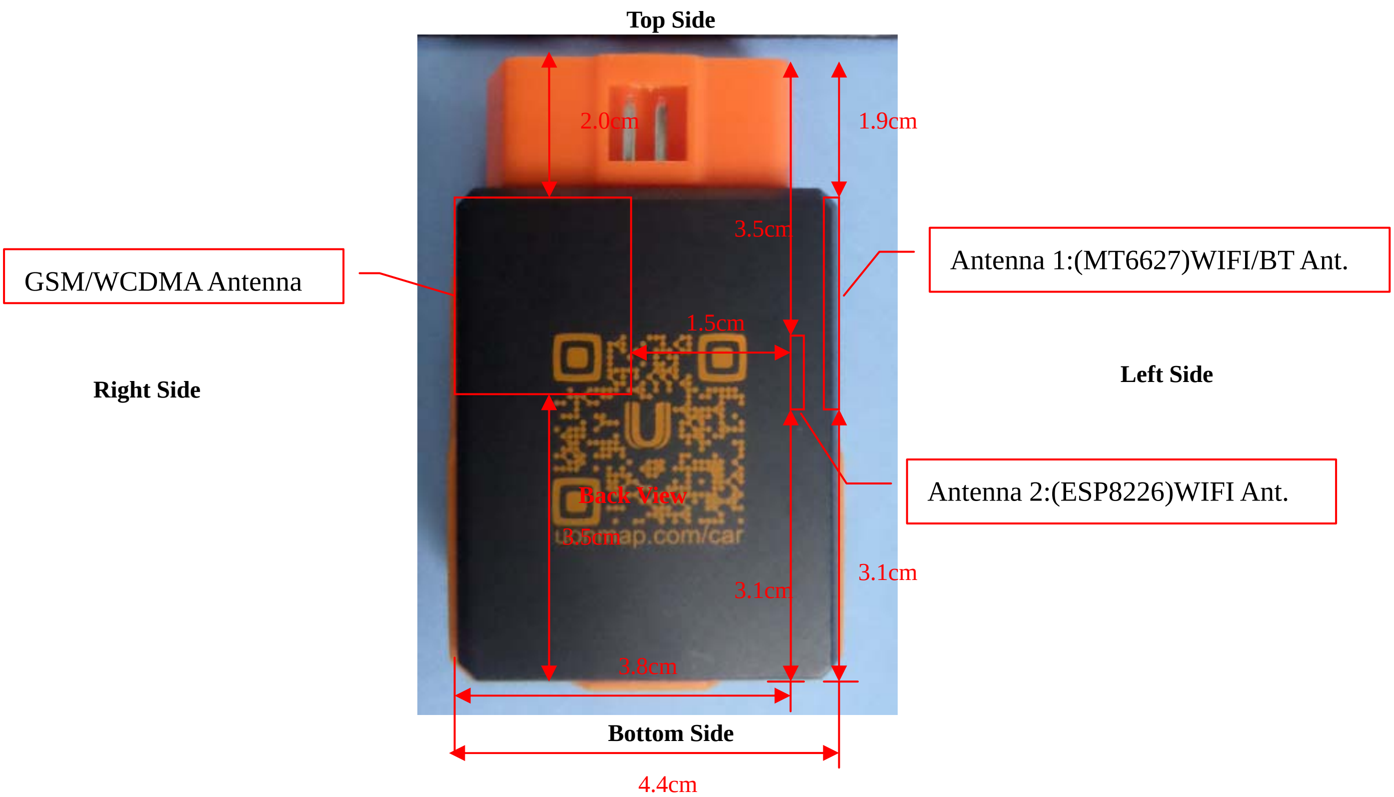


Illustration for Body Position

7.2 EUT Antenna Position



Block Diagram for EUT Antenna Position

7.3 EUT Testing Position

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

Hotspot SAR tests, Test distance: 5mm						
Antennas	**Front**	**Back**	**Right Side**	**Left Side**	**Top Side**	**Bottom Side**
WWAN	Yes	Yes	Yes	Yes	Yes	No
WLAN 1	Yes	Yes	No	Yes	Yes	No

Body-worn SAR tests, Test distance: 5mm		
Antennas	**Front**	**Back**
WWAN	Yes	Yes
WLAN	Yes	Yes

Remark:

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

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

8. SAR Measurement Procedures

8.1 Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.

(b) Keep EUT to radiate maximum output power or 100% factor (if applicable)

(c) Measure output power through RF cable and power meter.

(d) Place the EUT in the positions as Annex E demonstrates.

(e) Set scan area, grid size and other setting on the SATIMO software.

(f) Measure SAR results for the highest power channel on each testing position.

(g) Find out the largest SAR result on these testing positions of each band

(h) Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

8.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The SATIMO software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine. The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan

(b) Calculation of the SAR value at every measurement point based on all stored data

(c) Generation of a high-resolution mesh within the measured volume

(d) Interpolation of all measured values form the measurement grid to the high-resolution grid

(e) Extrapolation of the entire 3D field distribution to the phantom surface over the distance from sensor to surface

(f) Calculation of the averaged SAR within masses of 1g and 10g

8.3 Area & Zoom Scan Procedures

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

8.4 Volume Scan Procedures

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

8.5 SAR Averaged Methods

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

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

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

8.6 Power Drift Monitoring

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

9. SAR Test Result

9.1 Conducted RF Output Power

GSM - Burst Average Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880	1909.8
GSM	31.73	31.74	31.69	28.64	28.93	29.10
GPRS (1 slot)	31.60	31.35	31.36	29.31	29.47	29.64
GPRS (2 slots)	29.85	29.85	29.86	28.43	28.58	28.82
GPRS (3 slots)	28.14	28.14	28.12	25.7	26.73	26.89
GPRS (4 slots)	27.91	27.75	27.58	24.68	25.1	25.62

GSM - Source-Based Time-Average Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880	1909.8
GSM	22.73	22.74	22.69	19.64	19.93	20.10
GPRS (1 slot)	22.61	22.35	22.36	20.31	20.47	20.64
GPRS (2 slots)	23.85	23.85	23.86	22.43	22.58	22.82
GPRS (3 slots)	23.89	23.89	23.87	21.45	22.48	22.64
GPRS (4 slots)	24.91	24.75	24.58	21.68	22.10	22.62
Note: The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. The calculated method are shown as below: Source based time-average power = Burst averaged power - Duty cycle factor in dB						

Remark:

1. For Body SAR testing, GPRS should be evaluated, therefore the EUT was set in GPRS (4Tx slots) for GSM850 and GPRS (2Tx slots) for GSM1900 due to its highest source-based time-average power.
2. Per KDB 447498 D01 v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
3. The DUT do not support DTM function.

WCDMA - Average Power (dBm)						
Band	**WCDMA Band V**					
Channel	**4132**	**4183**	**4233**			
Frequency (MHz)	**826.4**	**836.6**	**846.6**			
RMC 12.2k	22.81	22.67	22.97			
HSDPA Subtest-1	22.43	22.23	22.45			
HSDPA Subtest-2	22.38	22.18	22.39			
HSDPA Subtest-3	22.24	22.04	22.27			
HSDPA Subtest-4	22.10	21.90	22.13			
HSUPA Subtest-1	22.45	22.27	22.49			
HSUPA Subtest-2	22.37	22.14	22.39			
HSUPA Subtest-3	22.28	22.08	22.30			
HSUPA Subtest-4	22.25	21.95	22.26			
HSUPA Subtest-5	22.12	21.83	22.22			

Remark:

1. For Body SAR, per KDB 941225 D01 v03, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA subset-1 output power is < 1/4 dB higher than RMC, and SAR with RMC 12.2kbps setting is ≦1.2W/kg, HSDPA SAR evaluation can be excluded.

Antenna 1:WLAN(2.4G) - Maximum Average Power				
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**
802.11b	1Mbps	CH 01	2412	16.91
		CH 06	2437	16.16
		CH 11	2462	16.00
802.11g	54Mbps	CH 01	2412	12.37
		CH 06	2437	12.61
		CH 11	2462	12.42
802.11n (20MHz)	MCS7	CH 01	2412	9.99
		CH 06	2437	10.13
		CH 11	2462	10.07

Antenna 2:WLAN(2.4G) - Maximum Average Power				
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**
802.11b	1Mbps	CH 01	2412	16.33
		CH 06	2437	15.50
		CH 11	2462	15.41
802.11g	54Mbps	CH 01	2412	13.53
		CH 06	2437	13.08
		CH 11	2462	12.82
802.11n (20MHz)	MCS7	CH 01	2412	12.03
		CH 06	2437	12.00
		CH 11	2462	12.76

Remark:

1. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion

2. Per KDB 248227 D01 v02r02, if 11g and 11n average output power is higher than 1/4 dB higher than 11b mode, SAR will be verified.

3. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4 dB higher than those measured at the lowest data rate. For 802.11n mode, SAR test according to the highest power channel with correspondence data rates.

Bluetooth - Maximum Average Power		
Test Mode	**Data Rate**	**Average Power(dBm)**
GFSK	1Mbps	-4.786
Pi/4 QDPSK	2Mbps	-5.764
8DPSK	3Mbps	-5.461

Bluetooth - Maximum Average Power				
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**
BLE	1Mbps	CH 00	2402	-5.584
		CH 19	2440	-5.661
		CH 39	2480	-6.613

Remark:

Bluetooth maximum output power is-4.786dBm, and Tune-Up output power is -4.5dBm. Per KDB 447498 D01 v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,16 where

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

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
-4.5	0.35	5	2.441	0.11	3

The exclusion thresholds is 0.11< 3, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Body-worn SAR

GSM850 – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
1.	GSM	Back	190	836.4	31.74	32.0	1.0617	0.2337	0.2481
2.	GSM	Front	190	836.4	31.74	32.0	1.0617	0.1861	0.1976

GSM1900 – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
3.	GSM	Back	810	1909.8	29.10	29.5	1.0965	0.2287	0.2508
4.	GSM	Front	810	1909.8	29.10	29.5	1.0965	0.1713	0.1878

WCDMA Band V – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
15	RMC 12.2k	Back Side	4233	846.6	22.97	23.0	1.0069	0.4242	0.4271
16	RMC 12.2k	Front Side	4233	846.6	22.97	23.0	1.0069	0.5038	0.5073

Antenna 1:WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
20	802.11b	Back Side	01	2412	16.91	17.0	1.0209	0.0706	0.0721
21	802.11b	Front Side	01	2412	16.91	17.0	1.0209	0.0334	0.0341

Antenna 2:WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
24	802.11b	Back Side	01	2412	16.33	16.5	1.0399	0.0456	0.0474
25	802.11b	Front Side	01	2412	16.33	16.5	1.0399	0.0212	0.0220

Hotspot SAR

GSM850 – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
5.	GPRS_4TX	Back Side	128	824.2	27.91	28.0	1.0209	0.2821	0.2880
6.	GPRS_4TX	Front Side	128	824.2	27.91	28.0	1.0209	0.2013	0.2055
7.	GPRS_4TX	Top side	128	824.2	27.91	28.0	1.0209	0.0396	0.0404
8.	GPRS_4TX	Right side	128	824.2	27.91	28.0	1.0209	0.2456	0.2507
9.	GPRS_4TX	Left side	128	824.2	27.91	28.0	1.0209	0.0396	0.0404

GSM1900 – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
10.	GPRS_2TX	Back Side	810	1909.8	28.82	29.0	1.0423	0.3741	0.3899
11.	GPRS_2TX	Front Side	810	1909.8	28.82	29.0	1.0423	0.2567	0.2676
12.	GPRS_2TX	Top side	810	1909.8	28.82	29.0	1.0423	0.0086	0.0090
13.	GPRS_2TX	Right side	810	1909.8	28.82	29.0	1.0423	0.0479	0.0499
14.	GPRS_2TX	Left side	810	1909.8	28.82	29.0	1.0423	0.0223	0.0232

WCDMA Band V – Body SAR Test (Gap: 5mm)									
Plot No.	Mode	Test Position Body	Frequency CH.	Frequency MHz	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
15.	RMC 12.2k	Back Side	4233	846.6	22.97	23.0	1.0069	0.4242	0.4271
16.	RMC 12.2k	Front Side	4233	846.6	22.97	23.0	1.0069	0.5038	0.5073
17.	RMC 12.2k	Top side	4233	846.6	22.97	23.0	1.0069	0.0706	0.0711
18.	RMC 12.2k	Right side	4233	846.6	22.97	23.0	1.0069	0.4996	0.5031
19.	RMC 12.2k	Left side	4233	846.6	22.97	23.0	1.0069	0.2412	0.2429

Antenna 1:WLAN 2.4GHz –Body SAR Test									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
20.	802.11b	Back Side	01	2412	16.91	17.0	1.0209	0.0706	0.0721
21.	802.11b	Front Side	01	2412	16.91	17.0	1.0209	0.0334	0.0341
22.	802.11b	Left side	01	2412	16.91	17.0	1.0209	0.0645	0.0659
23.	802.11b	Top Side	01	2412	16.91	17.0	1.0209	0.0193	0.0197

Remark: Per KDB447498 D01 v06, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

9.3 Simultaneous Multi-band Transmission SAR Analysis

List of Mode for Simultaneous Multi-band Transmission

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

Remark:

1. GSM and WCDMA share the same antenna, and cannot transmit simultaneously.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 D01 v06, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 v06 as below:

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm
-4.5	0.35	5/10	2.441	7.5	0.0146

4. The maximum SAR summation is calculated based on the same configuration and test position.
5.WLAN 1(MT6627) is used for Wi-Fi hotspot, and WLAN 2(ESP8266) is used for helping the indoor tracking.
They can work in simultaneously.

Body-worn SAR

WWAN and WLAN

	WWAN		WLAN 1	WLAN 2	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.2481	0.0721	0.0474	0.3676
Front	GSM850	0.1976	0.0341	0.0220	0.2537
Back	GSM1900	0.2508	0.0721	0.0474	0.3703
Front	GSM1900	0.1878	0.0341	0.0220	0.2439
Back	WCDMA Band V	0.4271	0.0721	0.0474	0.5466
Front	WCDMA Band V	0.5073	0.0341	0.0220	**0.5634**

WWAN and Bluetooth and WLAN

	WWAN		Bluetooth	WLAN 2	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.2481	0.0146	0.0474	0.3101
Front	GSM850	0.1976	0.0146	0.0220	0.2342
Back	GSM1900	0.2508	0.0146	0.0474	0.3128
Front	GSM1900	0.1878	0.0146	0.0220	0.2244
Back	WCDMA Band V	0.4271	0.0146	0.0474	0.4891
Front	WCDMA Band V	0.5073	0.0146	0.0220	**0.5439**

Hotspot SAR

WWAN and WLAN

	WWAN		WLAN 1	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.2880	0.0721	0.3601
Front	GSM850	0.2055	0.0341	0.2396
Top side	GSM850	0.0404	0.0197	0.0601
Bottom side	GSM850	--	--	--
Right side	GSM850	0.2507	--	0.2507
Left side	GSM850	0.0404	0.0659	0.1063
Back	GSM1900	0.3899	0.0721	0.462
Front	GSM1900	0.2676	0.0341	0.3017
Top side	GSM1900	0.0090	0.0197	0.0287
Bottom side	GSM1900	--	--	--
Right side	GSM1900	0.0499	--	0.0499
Left side	GSM1900	0.0232	0.0659	0.0891
Back	WCDMA Band V	0.4271	0.0721	0.4992
Front	WCDMA Band V	0.5073	0.0341	**0.5414**
Top side	WCDMA Band V	0.0711	0.0197	0.0908
Bottom side	WCDMA Band V	--	--	--
Right side	WCDMA Band V	0.5031	--	0.5031
Left side	WCDMA Band V	0.2429	0.0659	0.3088

10. Measurement Uncertainty

10.1 Uncertainty for EUT SAR Test

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions – Noise	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
RF ambient Conditions - Reflections	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5	5.0	R	√3	1	1	2.89	2.89	∝
Test Sample Related									
Test sample positioning	E.4.2	0.03	N	1	1	1	0.03	0.03	N–1
Device Holder Uncertainty	E.4.1	5.00	N	1	1	1	5.00	5.00	
Output power Variation - SAR drift measurement	E.2.9	12.02	R	√3	1	1	6.94	6.94	∝
SAR scaling	E6.5	0.0	R	√3	1	1	0.0	0.0	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	1.9	R	√3	1	0.84	1.10	0.90	∝
Liquid conductivity - deviation	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	∝

from target value									
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	∝
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	∝
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	∝
Combined Standard Uncertainty			RSS				12.98	12.53	
Expanded Uncertainty (95% Confidence interval)			K=2				25.32	24.43	

10.2 Uncertainty for System Performance Check

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	**Sec.**	**Tol (+- %)**	**Prob. Dist.**	**Div.**	**Ci (1g)**	**Ci (10g)**	**1g Ui (+-%)**	**10g Ui (+-%)**	**Vi**
Measurement System									
Probe calibration	E.2.1	7.0	N	1	1	1	7.00	7.00	∝
Axial Isotropy	E.2.2	2.5	R	√3	(1_Cp)^1/2	(1_Cp)^1/2	1.02	1.02	∝
Hemispherical Isotropy	E.2.2	4.0	R	√3	(Cp)^1/2	(Cp)^1/2	1.63	1.63	∝
Boundary effect	E.2.3	1.0	R	√3	1	1	0.58	0.58	∝
Linearity	E.2.4	5.0	R	√3	1	1	2.89	2.89	∝
System detection limits	E.2.5	1.0	R	√3	1	1	0.58	0.58	∝
Modulation response	E.2.5	0	R	√3	0	0	0.0	0.0	∝
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∝
Reponse Time	E.2.7	3.0	R	√3	1	1	1.73	1.73	∝
Integration Time	E.2.8	2.0	R	√3	1	1	1.15	1.15	∝
RF ambient Conditions – Noise	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
RF ambient Conditions - Reflections	E.6.1	3.0	R	√3	1	1	1.73	1.73	∝
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	√3	1	1	1.15	1.15	∝
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	√3	1	1	0.03	0.03	∝
Extrapolation, interpolation and integration Algoritms for Max.	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝

SAR Evaluation									
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	√3	1	1	0.58	0.58	N−1
Input power and SAR drift measurement	8,6.6.2	12.02	R	√3	1	1	6.94	6.94	∝
Deviation of experimental dipole from numerical dipole	E.6.4	5.5	R	√3	1	1	3.20	3.20	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	2.0	R	√3	1	0.84	1.10	1.10	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M
Combined Standard Uncertainty			RSS				12.00	11.50	
Expanded Uncertainty (95% Confidence interval)			K=2				23.39	22.43	

Annex A. Plots of System Performance Check

MEASUREMENT 1

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 09/27/2016

Measurement duration: 12 minutes 21 seconds

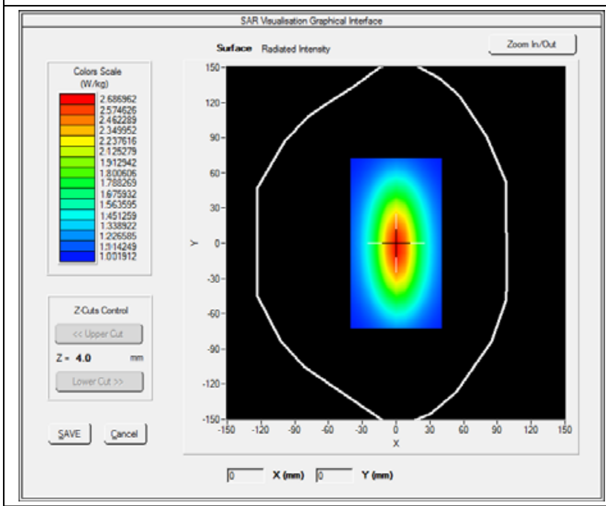
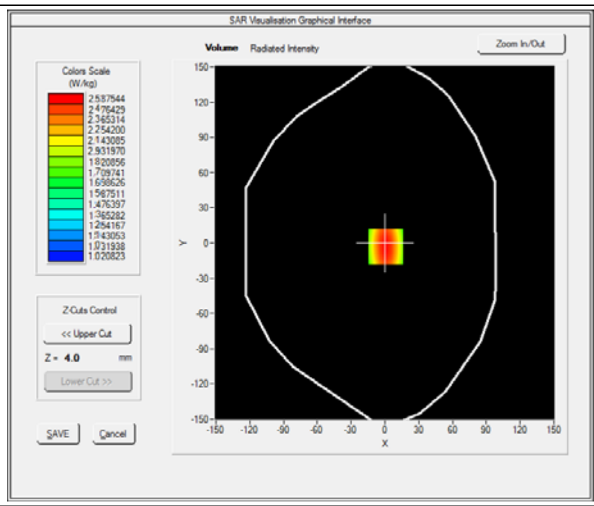
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

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

B. SAR Measurement Results

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

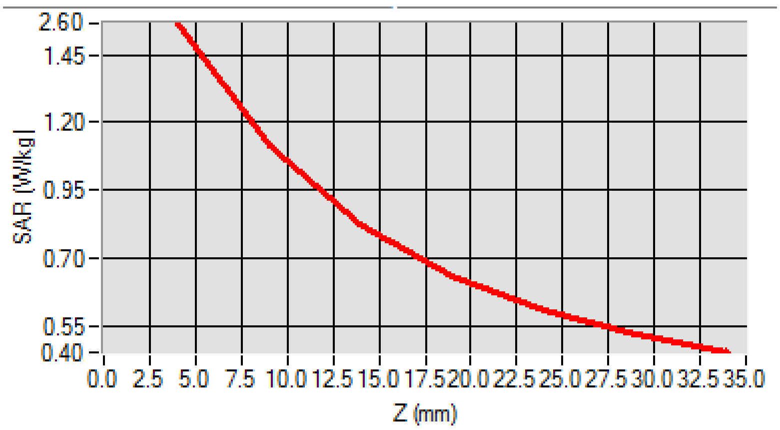
SURFACE SAR	VOLUME SAR
	

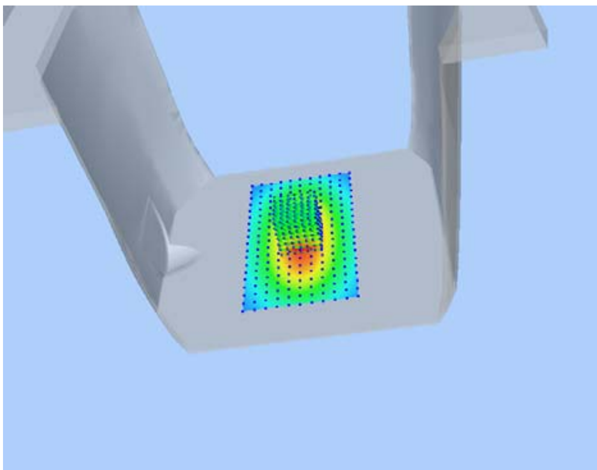
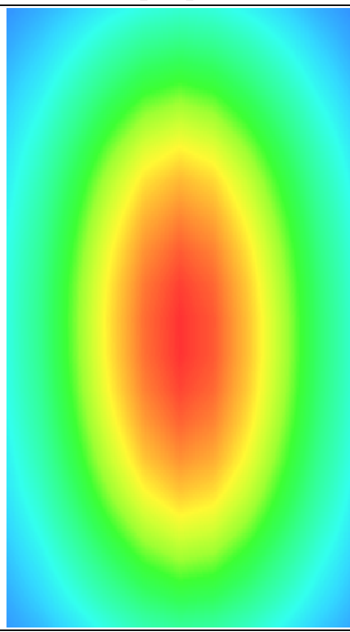
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.028956
SAR 1g (W/Kg)	2.364211

Z Axis Scan

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



3D screen shot	Hot spot position
	

MEASUREMENT 2

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 09/27/2016

Measurement duration: 12 minutes 21 seconds

E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2016

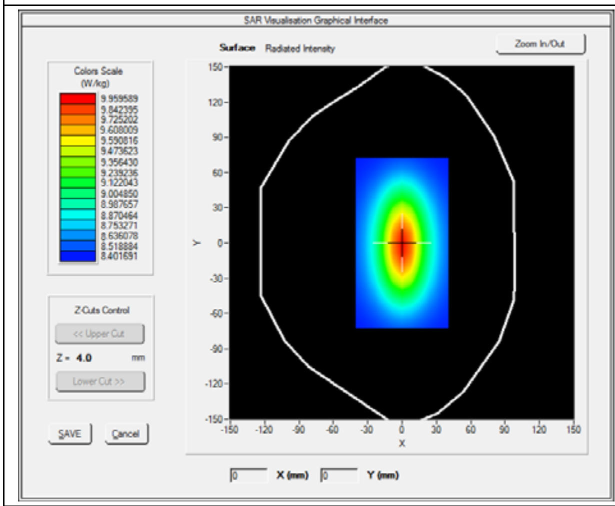
A. Experimental conditions

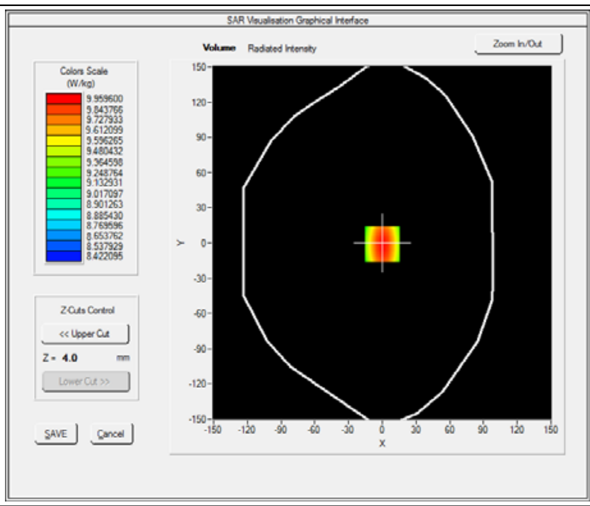
Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Signal	Duty Cycle 1:1

B. SAR Measurement Results

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

SURFACE SAR	VOLUME SAR



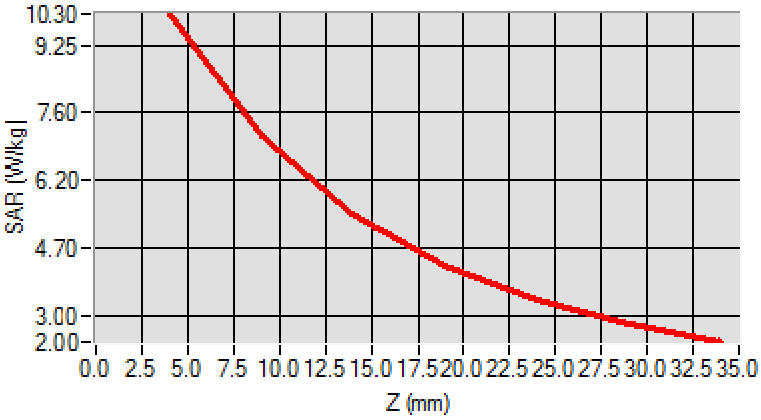


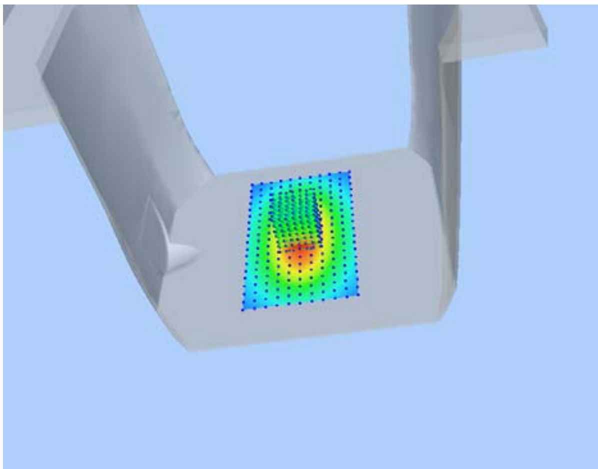
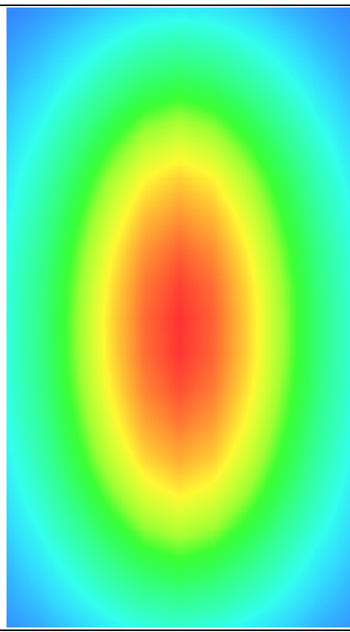
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	5.134651
SAR 1g (W/Kg)	9.801550

Z Axis Scan

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



3D screen shot	Hot spot position
	

MEASUREMENT 3

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 09/27/2016

Measurement duration: 12 minutes 21 seconds

E-field Probe: SSE5 -   SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

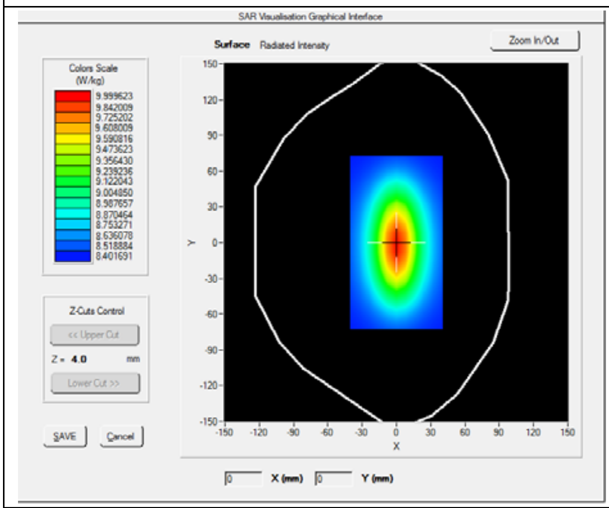
A. Experimental conditions

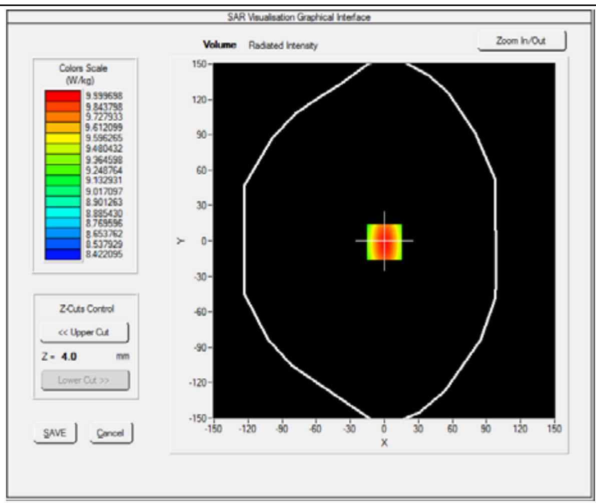
Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative Permittivity (real part)	52.315622
Conductivity (S/m)	2.001255
Power Variation (%)	0.542660
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR



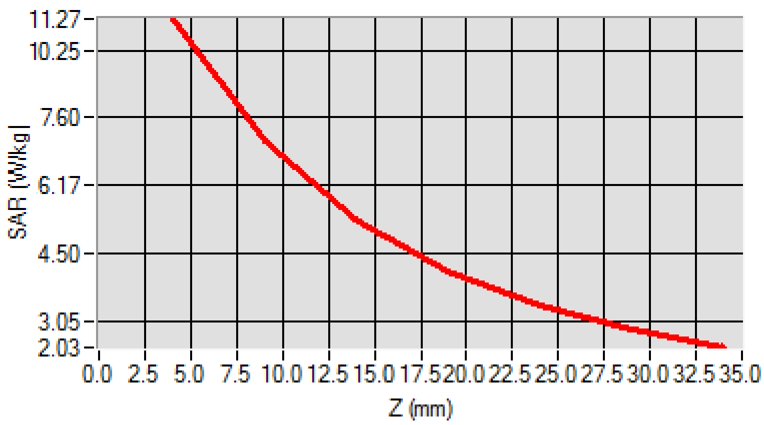


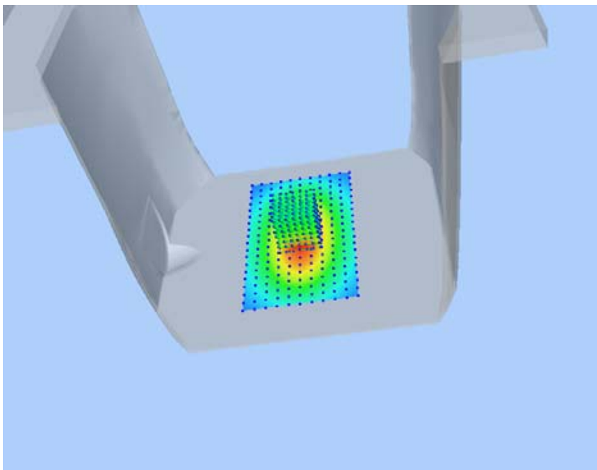
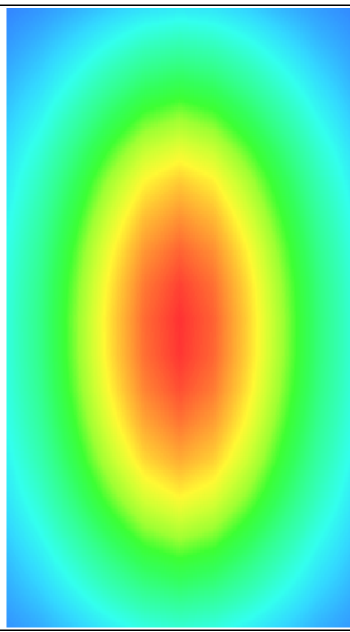
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**6.351512**
SAR 1g (W/Kg)	**12.600533**

Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**	**24.00**	**29.00**
SAR (W/Kg)	**0.0000**	**12.1631**	**10.01221**	**9.2566**	**8.5623**	**6.3469**	**4.5626**



3D screen shot	**Hot spot position**
	

Annex B. Plots of SAR Measurement

TYPE	BAND	PARAMETERS
Phone	**GSM850**	Measurement 1: Flat Plane with Back(Body-worn) device position on Middle Channel in GSM mode
Phone	**GSM1900**	Measurement 3: Flat Plane with Back(Body-worn) device position on High Channel in GSM mode
Phone	**GPRS850_4TX**	Measurement 5: Flat Plane with Back device position on Low Channel in GPRS mode
Phone	**GPRS1900_2TX**	Measurement 10: Flat Plane with Back device position on High Channel in GPRS mode
Phone	**WCDMA850_RMC**	Measurement 16: Flat Plane with Front device position on High Channel in WCDMA mode
Phone	**Antenna 1:WiFi_802.11b**	Measurement 20: Flat Plane with Back side device position on Low Channel in 802.11b mode
Phone	**Antenna 2:WiFi_802.11b**	Measurement 24: Flat Plane with Back side device position on Low Channel in 802.11b mode
Remark: SAR plot is showed the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.		

MEASUREMENT 1

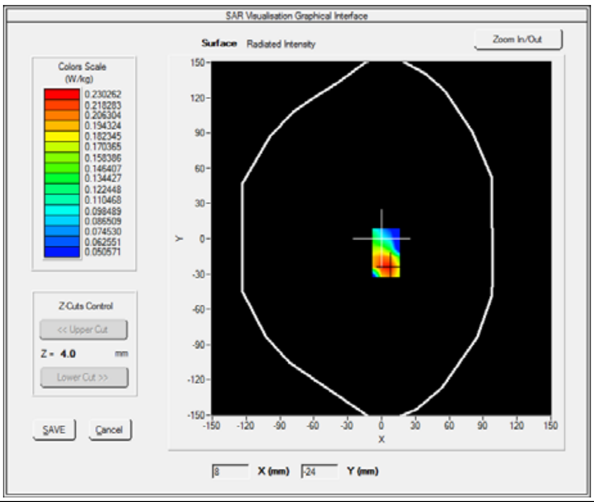
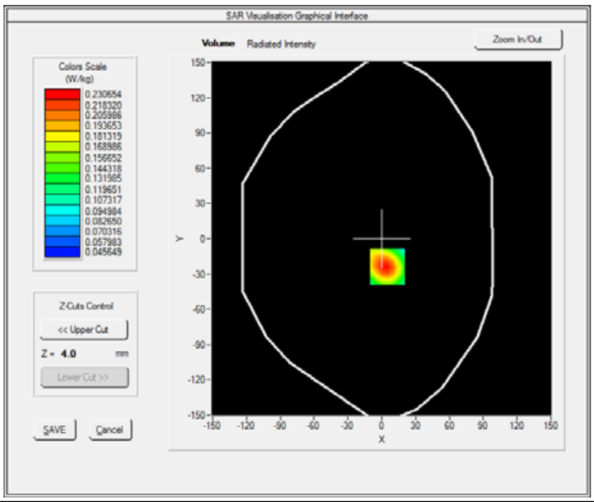
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back(Body-worn)
Band	GSM850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

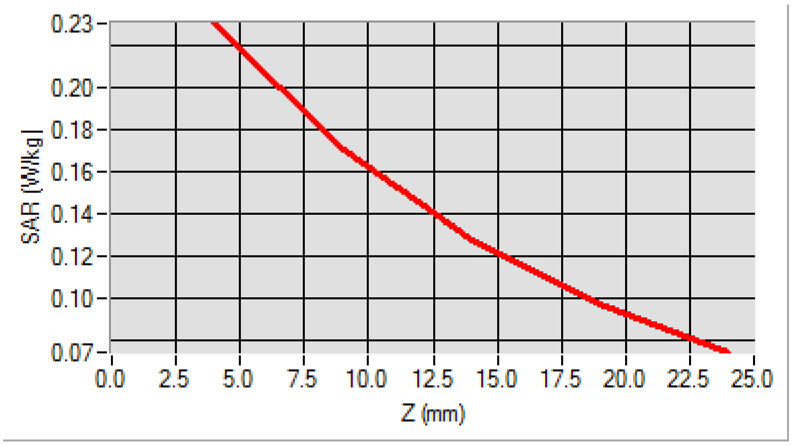
Frequency (MHz)	836.400000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.785060
Ambient Temperature	21.1
Liquid Temperature	21.3

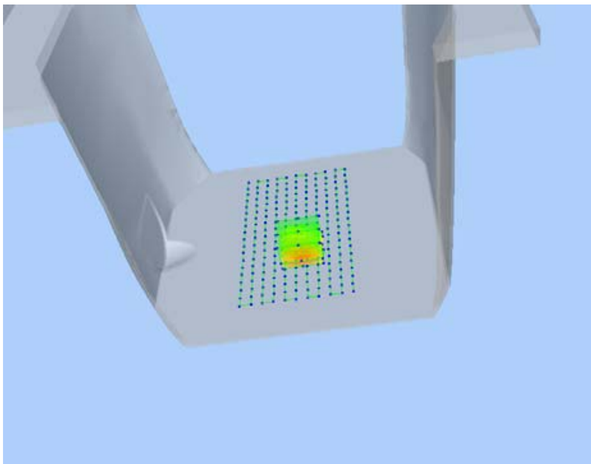
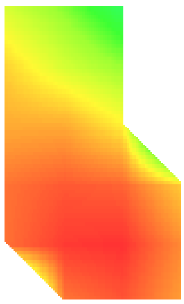
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=-24.00

SAR 10g (W/Kg)	0.159259
SAR 1g (W/Kg)	0.233710

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2307	0.1703	0.1277	0.0976



3D screen shot	Hot spot position
	

MEASUREMENT 3

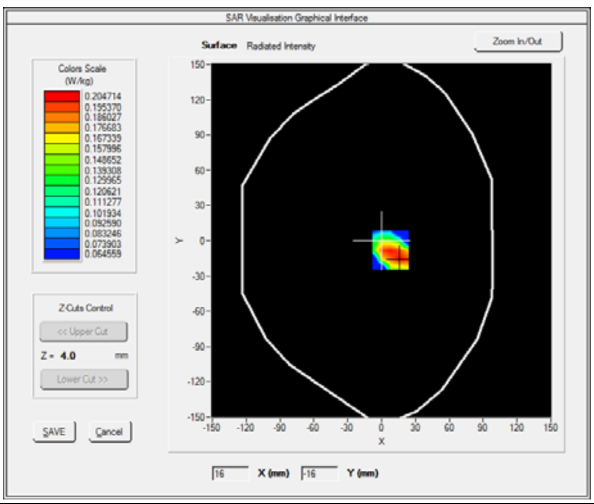
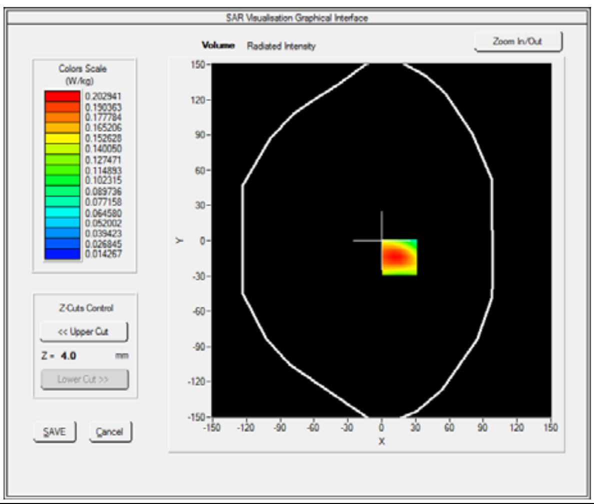
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back(Body-worn)
Band	GSM1900
Channels	High
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

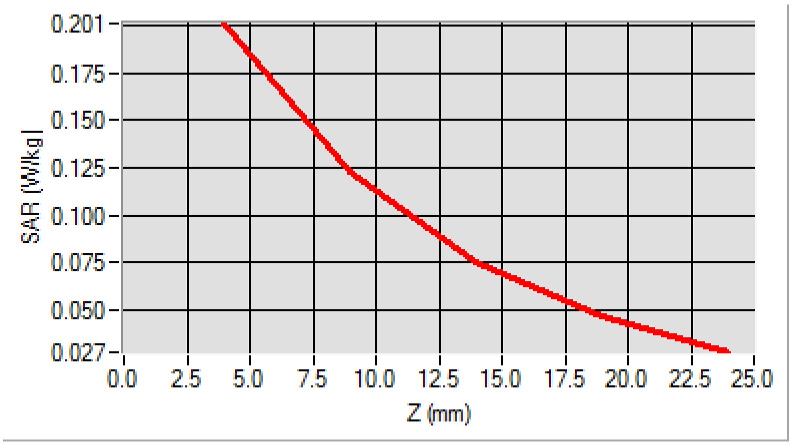
Frequency (MHz)	1909.800000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.568946
Ambient Temperature	21.1
Liquid Temperature	21.3

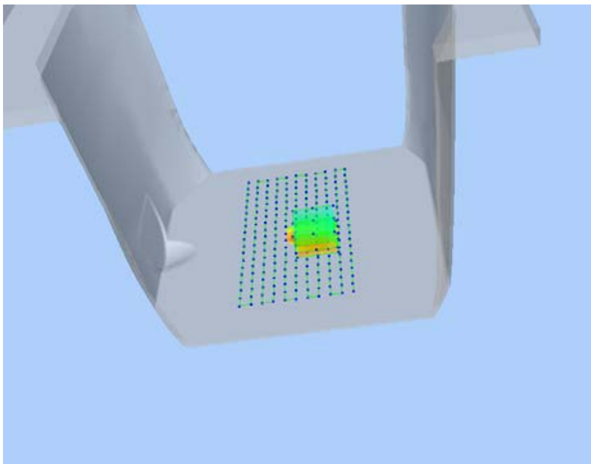
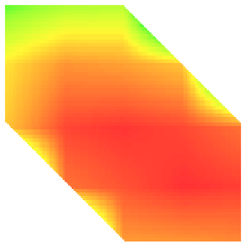
SURFACE SAR	VOLUME SAR
	

Maximum location: X=16.00, Y=-14.00

SAR 10g (W/Kg)	0.137289
SAR 1g (W/Kg)	0.228696

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.2014	0.1227	0.0747	0.0462



3D screen shot	Hot spot position
	

MEASUREMENT 5

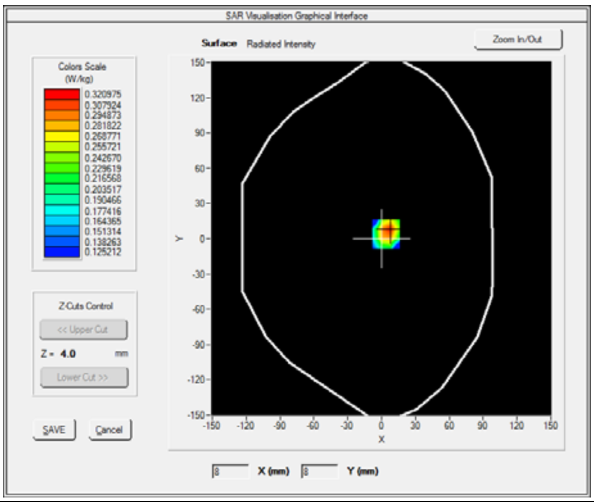
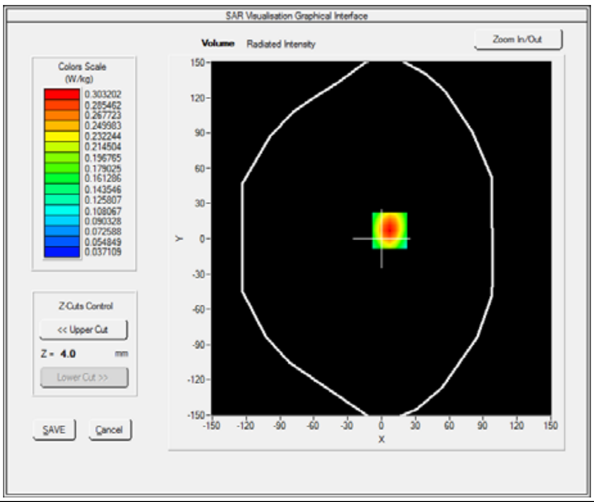
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat plane
Device Position	Back
Band	GPRS850_4TX
Channels	Low
Signal	Duty Cycle: 1:2

B. SAR Measurement Results

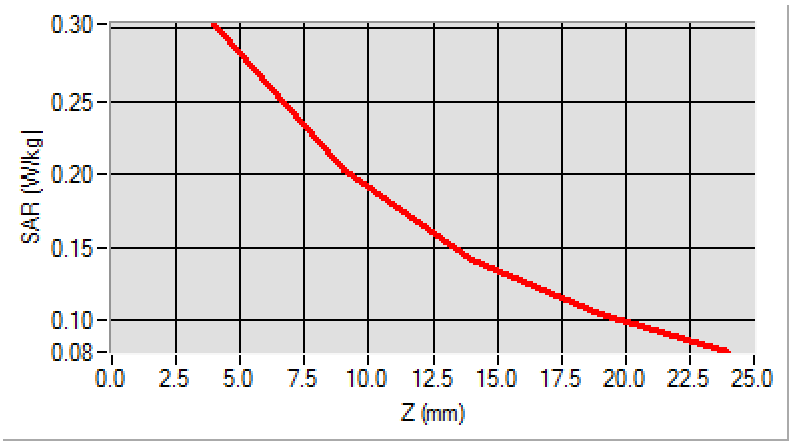
Frequency (MHz)	824.200000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.562472
Ambient Temperature	21.1
Liquid Temperature	21.3

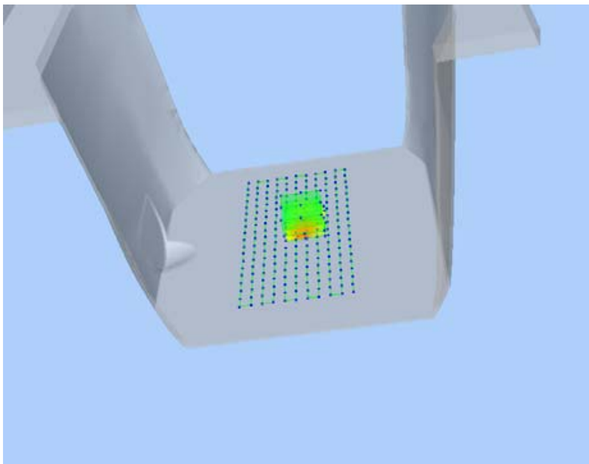
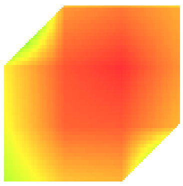
SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=7.00

SAR 10g (W/Kg)	**0.180701**
SAR 1g (W/Kg)	**0.282092**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.0000**	**0.3032**	**0.2028**	**0.1408**	**0.1037**



3D screen shot	**Hot spot position**
	

MEASUREMENT 10

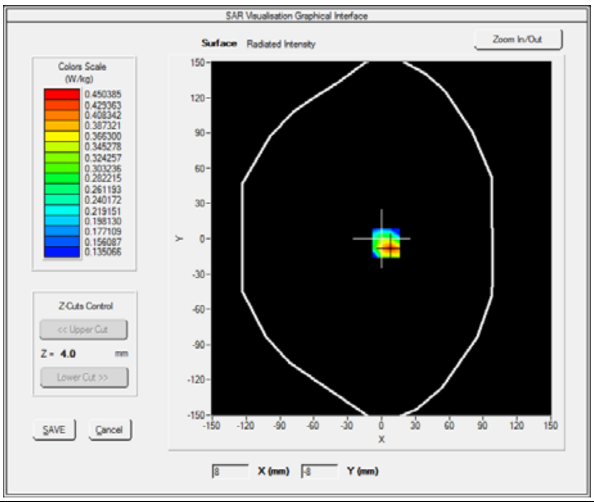
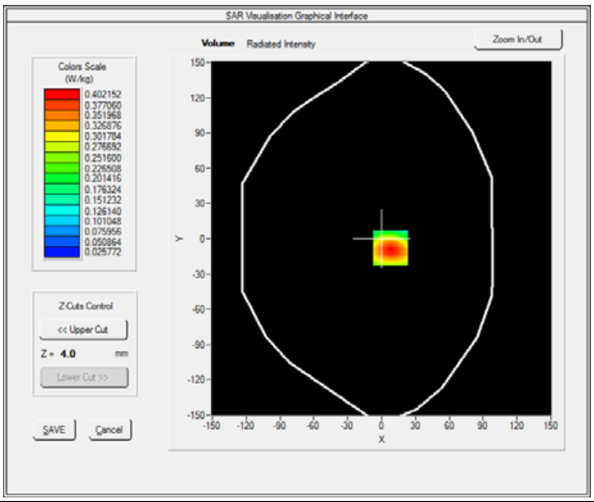
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat plane
Device Position	Back side
Band	GPRS1900_2TX
Channels	High
Signal	Duty Cycle: 1:4

B. SAR Measurement Results

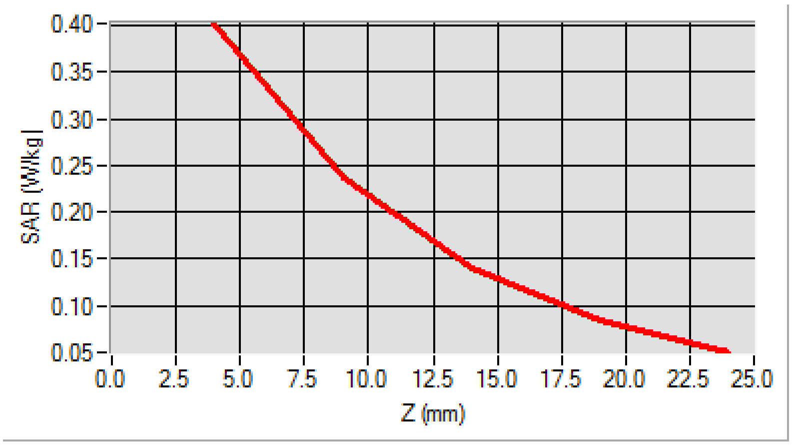
Frequency (MHz)	1909.800000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.986340
Ambient Temperature	21.1
Liquid Temperature	21.3

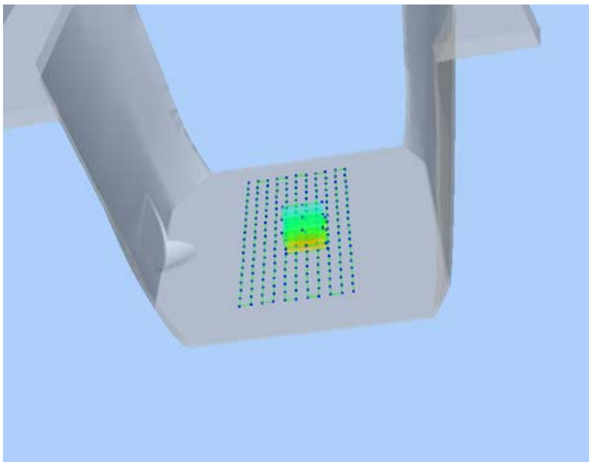
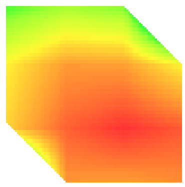
SURFACE SAR	VOLUME SAR
	

Maximum location: X=8.00, Y=-8.00

SAR 10g (W/Kg)	**0.214522**
SAR 1g (W/Kg)	**0.374134**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.0000**	**0.4022**	**0.2375**	**0.1405**	**0.0852**



3D screen shot	**Hot spot position**
	

MEASUREMENT 16

Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

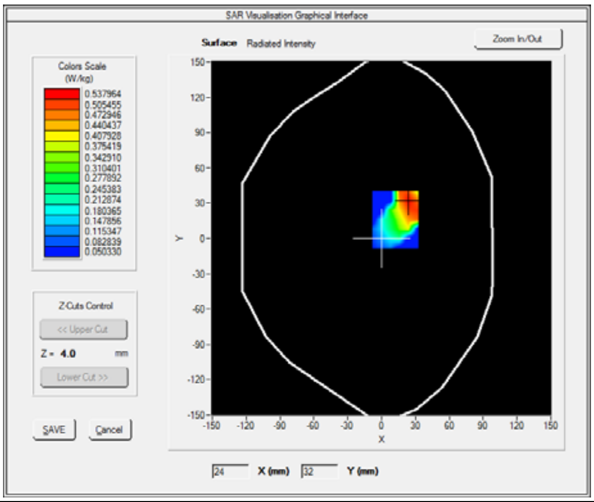
A. Experimental conditions

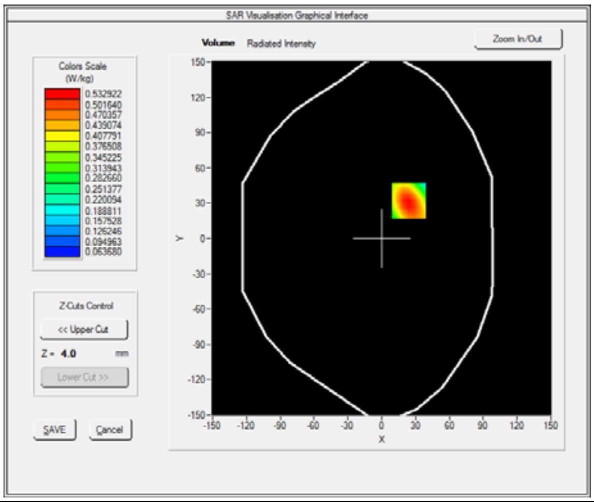
Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Front
Band	WCDMA850_RMC
Channels	High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	846.600000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.986458
Ambient Temperature	21.1
Liquid Temperature	21.3

SURFACE SAR	VOLUME SAR

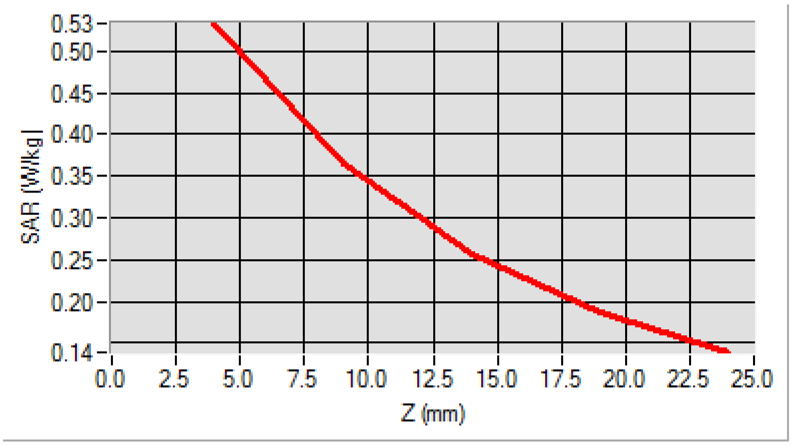


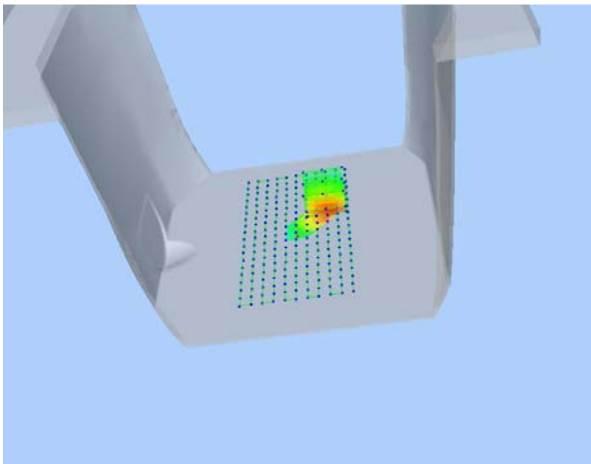
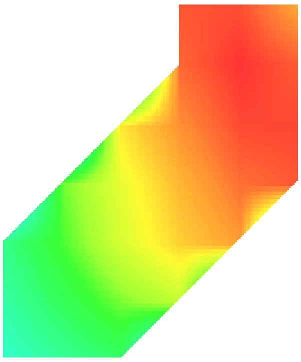


Maximum location: X=24.00, Y=32.00

SAR 10g (W/Kg)	**0.337419**
SAR 1g (W/Kg)	**0.503817**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.0000**	**0.5329**	**0.3640**	**0.2557**	**0.1874**



3D screen shot	**Hot spot position**
	

MEASUREMENT 20

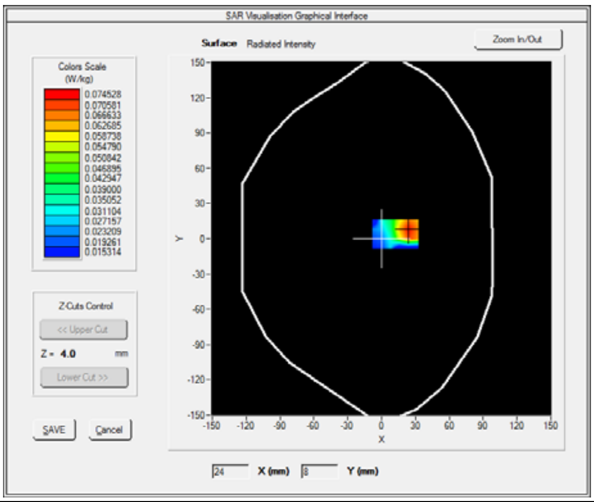
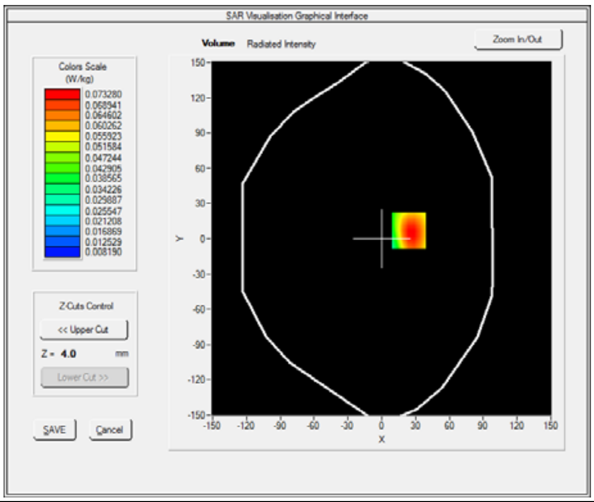
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back
Band	Antenna 1:WiFi_802.11b
Channels	Low
Signal	Duty Cycle: 1:1

B. SAR Measurement Results

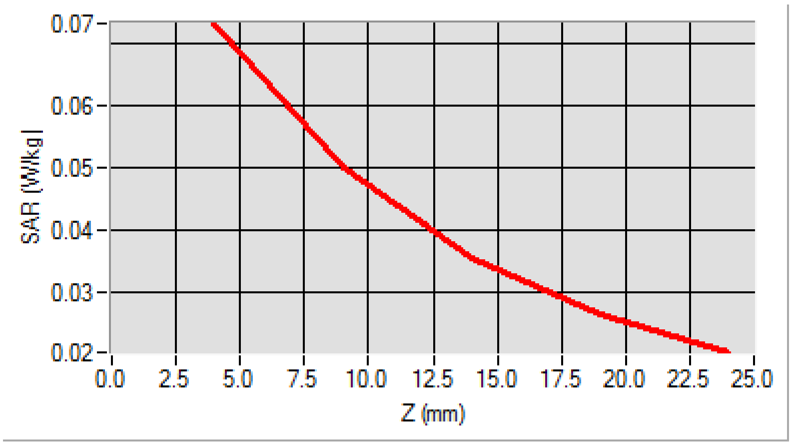
Frequency (MHz)	2412.000000
Relative Permittivity (real part)	52.315622
Conductivity (S/m)	2.001255
Power Variation (%)	0.968546
Ambient Temperature	21.1
Liquid Temperature	21.2

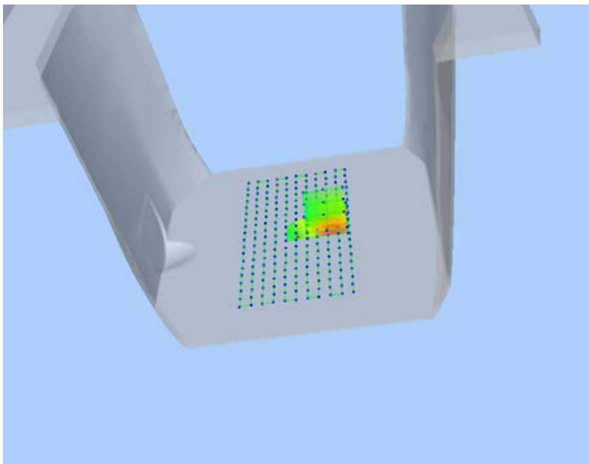
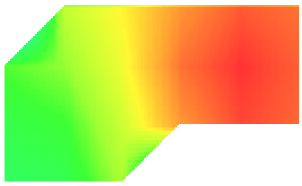
SURFACE SAR	VOLUME SAR
	

Maximum location: X=24.00, Y=7.00

SAR 10g (W/Kg)	0.048174
SAR 1g (W/Kg)	0.070559

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.0732	0.0501	0.0355	0.0266



3D screen shot	Hot spot position
	

MEASUREMENT 24

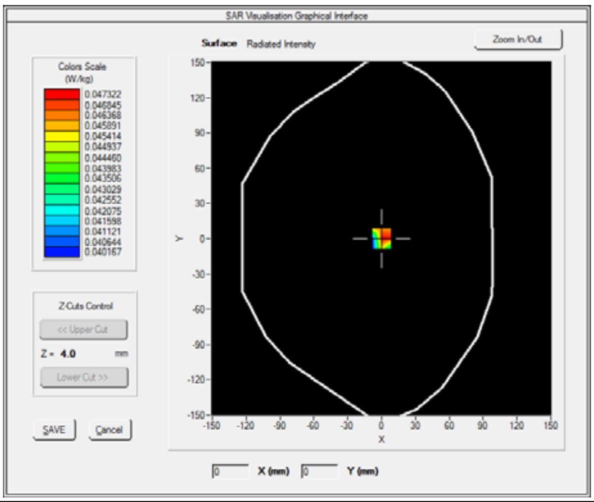
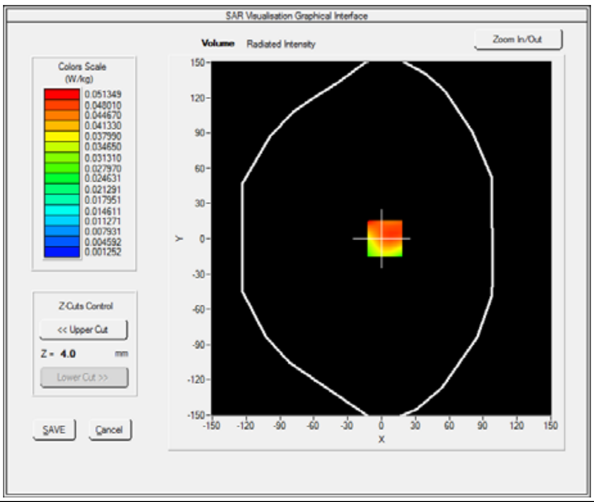
Type: Phone measurement (Complete)
Date of measurement: 09/27/2016
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back
Band	Antenna 2:WiFi_802.11b
Channels	Low
Signal	Duty Cycle: 1:1

B. SAR Measurement Results

Frequency (MHz)	2412.000000
Relative Permittivity (real part)	52.315622
Conductivity (S/m)	2.001255
Power Variation (%)	0.993830
Ambient Temperature	21.1
Liquid Temperature	21.2

<table>
<tr><th>SURFACE SAR</th><th>VOLUME SAR</th></tr>
<tr><td>
</td><td>
</td></tr>
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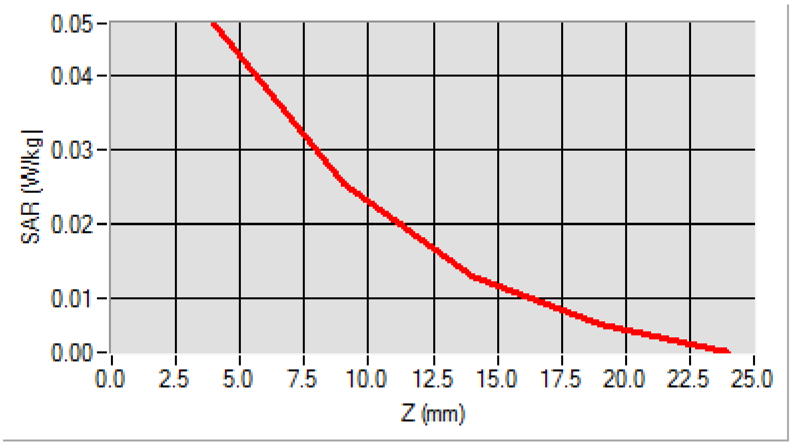
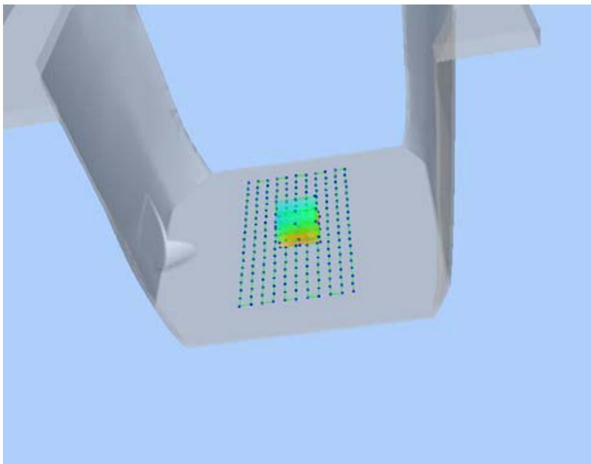
Maximum location: X=3.00, Y=0.00

SAR 10g (W/Kg)	0.026588
SAR 1g (W/Kg)	0.045620

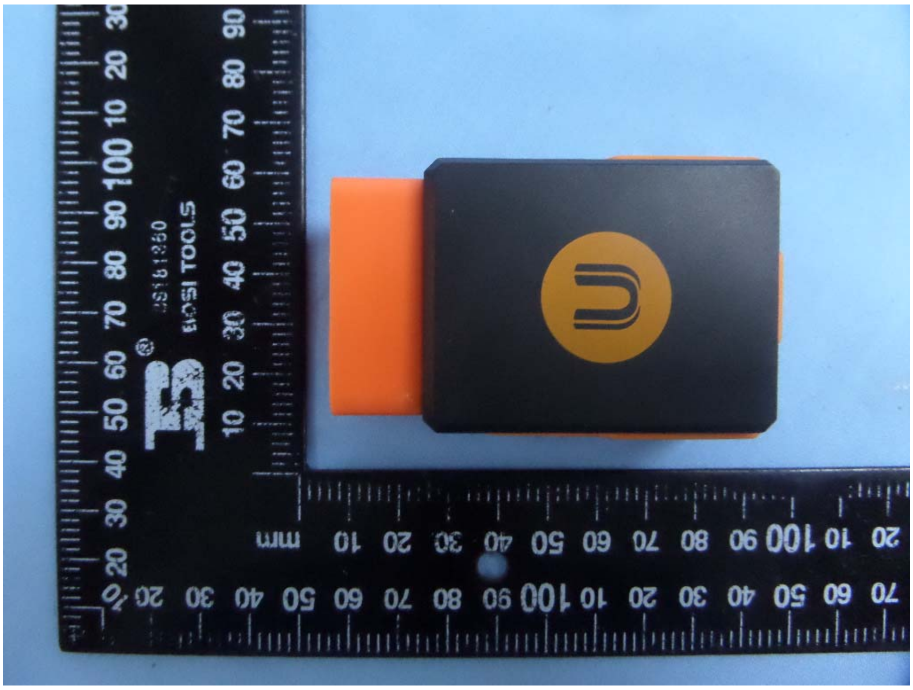
Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	0.0472	0.0254	0.0131	0.0065



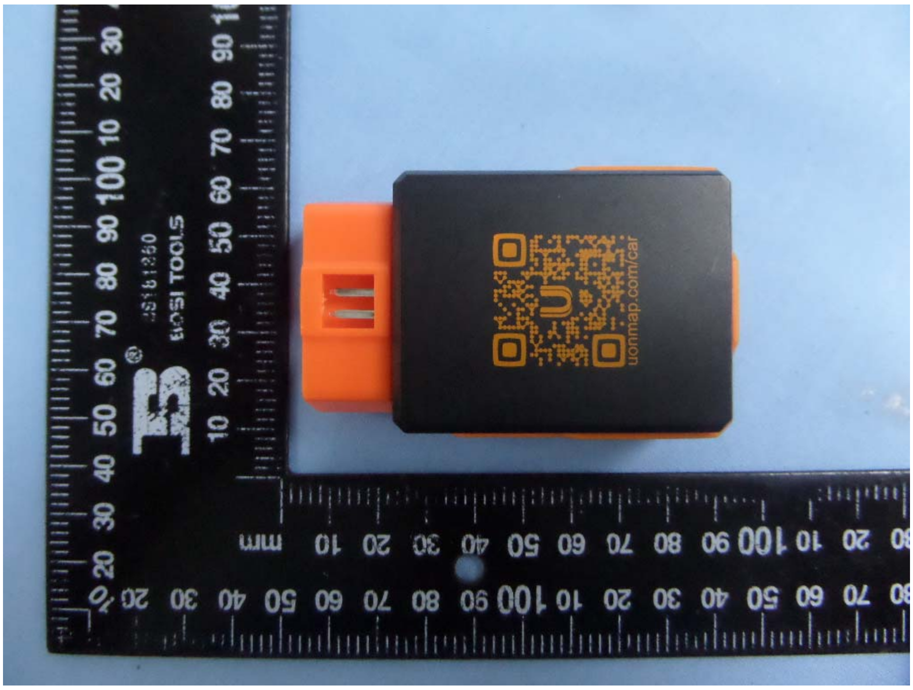
3D screen shot	Hot spot position
	

Annex C. EUT Photos

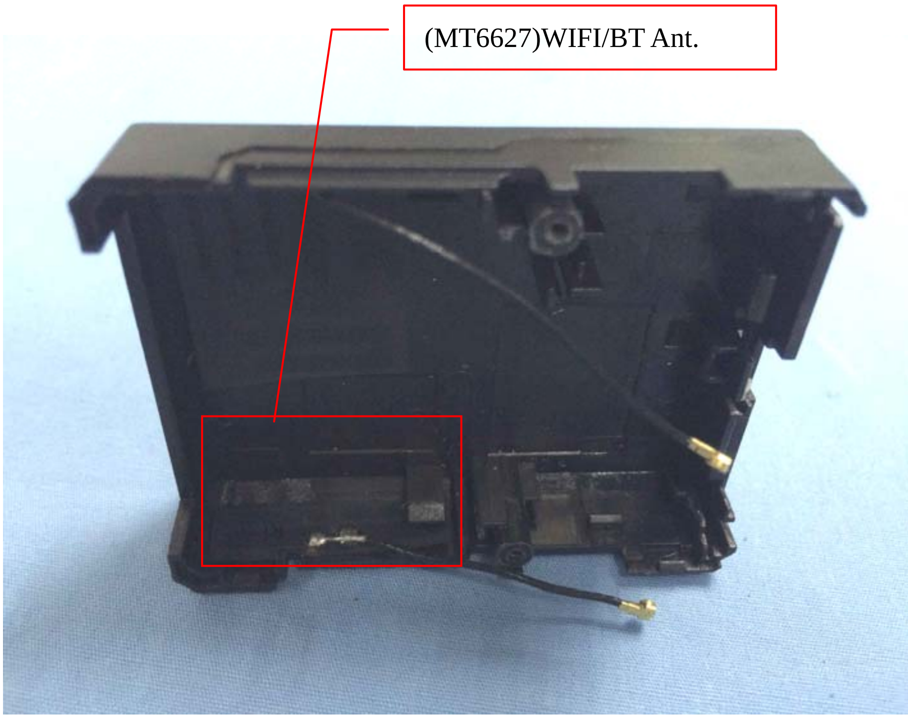
EUT View Front



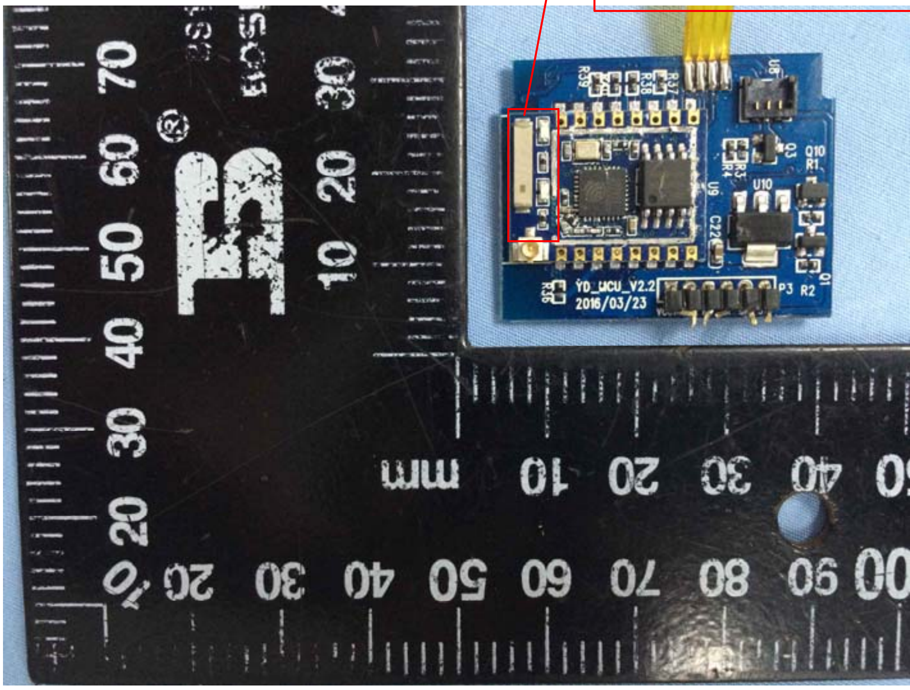
EUT View Back



Antenna View



(ESP8226)WIF Ant.



Annex D. Test Setup Photos

Body-worn & Hotspot mode Exposure Conditions

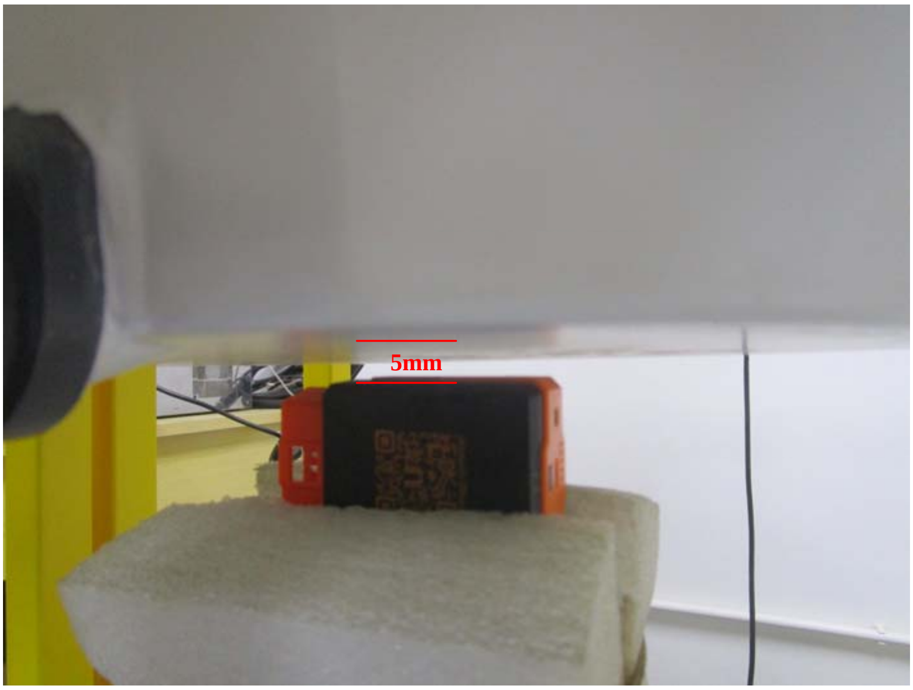
Body Front

Body Back

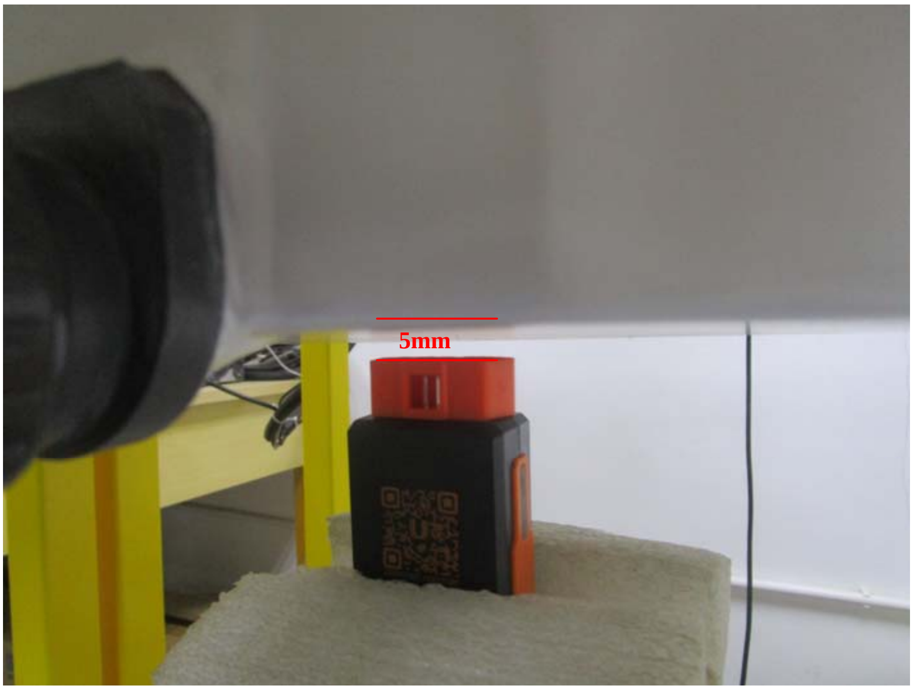
Hotspot Exposure Conditions

Body Right

Body Left



Body Top



Annex E. Calibration Certificate

Please refer to the Exhibit for the Calibration Certificate

******* END OF REPORT *******