

FCC SAR

Measurement and Test Report

For

ECR Solutions Ltd.

Church House, Church Lane, Kings Langley, Hertfordshire, WD4 8JP, UK.

FCC ID: 2AKGOECRGO2

FCC Rules: FCC Part 2.1093
ANSI / IEEE C95.1 :2005
ANSI / IEEE C95.3 :2002

Product Description: Handheld Terminal

Tested Model: ECRGo2

Report No.: STR16118031H

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Tested By: Lucy Wei / Engineer

Lucy Wei

Reviewed By: Silin Chen / EMC Manager

Silin Chen

Approved & Authorized By: Jandy So / PSQ Manager

Jandy So

Prepared By:

Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ECR Solutions Ltd.
Address of applicant: Church House, Church Lane, Kings Langley, Hertfordshire, WD4 8JP, UK.

Manufacturer: Maxpad Technolgy Co.,Ltd.
Address of manufacturer: Room B04, 4/F, Bldg R2-B, No.20 Gaoxin Ave 7th, South, Hi-tech Industrial park, Nanshan, Shenzhen, China

General Description of EUT	
Product Name:	Handheld Terminal
Brand Name:	ECR
Model No.:	ECRGo2
Adding Model:	MX3606
Software Version:	Windows 10 Enterprise 2016
Hardware Version:	VPOS3606-Main-V01.02
Rated Voltage:	Main Battery: DC 7.4V , Vice Battery: DC 3.7V
Battery Capacity:	Main Battery:2500mAh ,Vice Battery: 2400mAh
The EUT is WCDMA Band 5, LTE Band 5/7 Handheld Terminal. The Handheld Terminal is not support GSM voice mode. It is equipped with WIFI, Bluetooth and NFC functions. For more information see the following datasheet Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band 5
Uplink Frequency:	WCDMA Band 5: 824~849MHz
Downlink Frequency:	WCDMA Band 5: 869~894MHz
RF Output Power:	WCDMA Band 5: 22.50dBm
Type of Modulation:	BPSK
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA Band 5: 0dBi,
WIFI	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20)

	2422-2452MHz for 802.11n(HT40)
AV Output Power:	12.87dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11/7
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
Bluetooth	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
AV Output Power:	5.26dBm (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
4G	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 5, 7
Uplink Frequency:	FDD-LTE Band 5: Tx: 824-849MHz, FDD-LTE Band 7: Tx:2500-2570MHz,
Downlink Frequency:	FDD-LTE Band 5: Rx:869-894MHz, FDD-LTE Band 7: Rx: 2620-2690MHz,
RF Output Power:	FDD-LTE Band 5: 23.59dBm, FDD-LTE Band 7: 24.91dBm
Type of Modulation:	QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi

1.2 Test Standards

The following report is prepared on behalf of the ECR Solutions Ltd. in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-2005, IEEE 1528-2013 and KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02

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:

Body SAR(5mm Gap)

Frequency Band	Maximum SAR _{1g} (W/kg)	SAR _{1g} Limit (W/kg)
WCDMA Band V	0.654	1.6
LTE Band 5	0.140	1.6
LTE Band 7	0.523	1.6
WLAN 2.4GHz	0.046	1.6
Simultaneous Transmission	0.654	1.6

Hand SAR(0mm Gap)

Frequency Band	Maximum SAR _{10g} (W/kg)	SAR _{10g} Limit (W/kg)
WCDMA Band V	0.747	4.0
LTE Band 5	0.723	4.0
LTE Band 7	0.793	4.0
WLAN 2.4GHz	0.212	4.0
Simultaneous Transmission	0.793	4.0

Remark:

*The highest reported SAR values for body, and Hand and simultaneous transmission conditions are **0.654W/kg, 0.793W/kg, and 0.793W/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 techniques 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:

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

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

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

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

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

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.

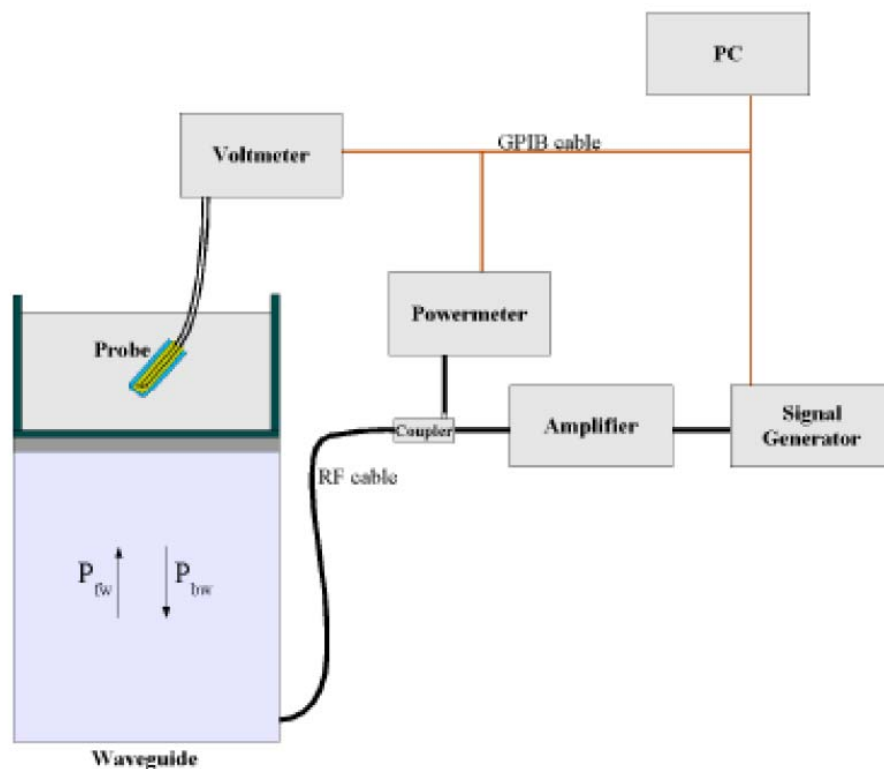
4.2 Probe

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 surface normal line: less 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 annex technique using reference guide at the five frequencies.



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

Where :

P_{fw} = Forward Power

P_{bw} = Backward Power

a and b = Waveguide dimensions

l = 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:

$$CF(N)=SAR(N)/V_{lin}(N) \quad (N=1,2,3)$$

The linearised output voltage $V_{lin}(N)$ is obtained from the displayed output voltage $V(N)$ using

$$V_{lin}(N)=V(N)*(1+V(N)/DCP(N)) \quad (N=1,2,3)$$

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.

Where:

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

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,

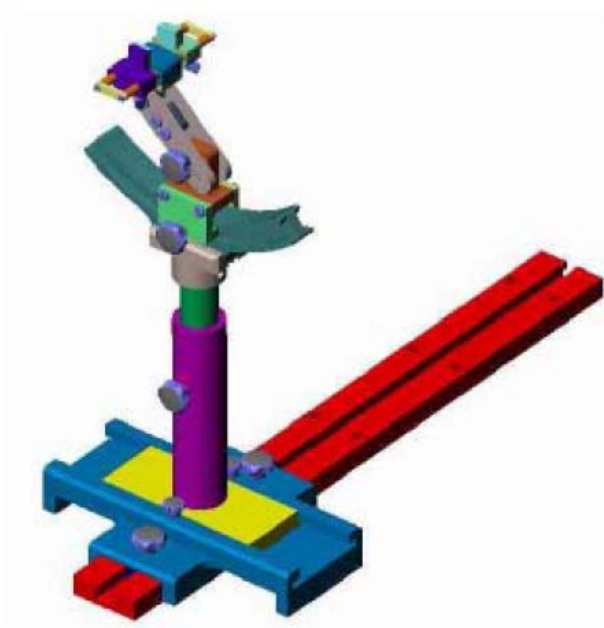
ρ = Tissue density (1.25 g/cm³ for brain tissue)

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
2450MHz Dipole	SATIMO	SID2450	SN 13/15 DIP 2G450-364	2016-03-20	2017-03-19
2600MHz Dipole	SATIMO	SID2600	SN 13/15 DIP 2G450-365	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
Universal Tester	Rohde & Schwarz	CMW500	148650	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 Head SAR



Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

Frequency (MHz)	Water (%)	Salt (%)	Sugar (%)	HEC (%)	Preventol (%)	DGBE (%)
Body						
835	40.3	1.4	57.9	0.2	0.2	0.00
2450	55.0	0.1	0	0	0	44.9
2600	54.9	0.1	0	0	0	45.0

5.2 Tissue Dielectric Parameters for Head and Body Phantoms

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

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
750	0.89	41.9	0.96	55.5
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. (°C)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (ϵ_r)	Target (ϵ_r)	Delta (%)		
835	21.2	0.95	0.97	-2.06	54.85	55.20	-0.63	± 5	2016-11-14
2450	21.3	1.91	1.95	-2.05	52.01	52.70	-1.31	± 5	2016-11-14
2600	21.3	2.12	2.16	-1.85	52.24	52.50	-0.50	± 5	2016-11-14

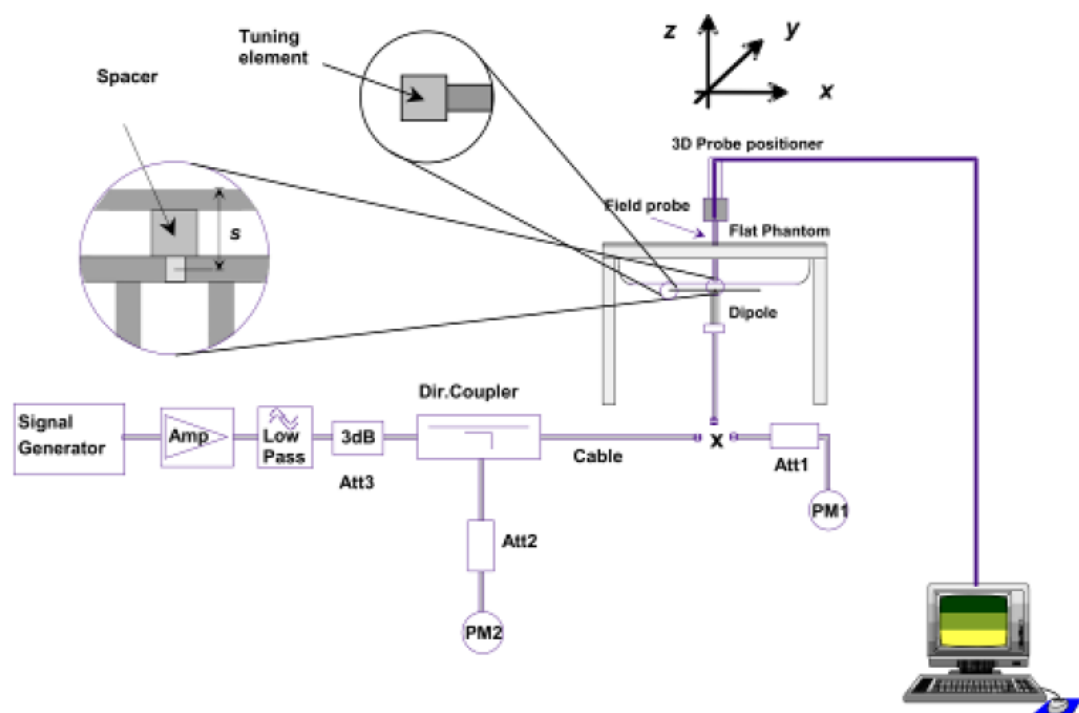
6. SAR Measurement Evaluation

6.1 Purpose of System Performance Check

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

6.2 System Setup

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



System Verification Setup Block Diagram



Setup Photo of Dipole Antenna

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

6.3 Validation Results

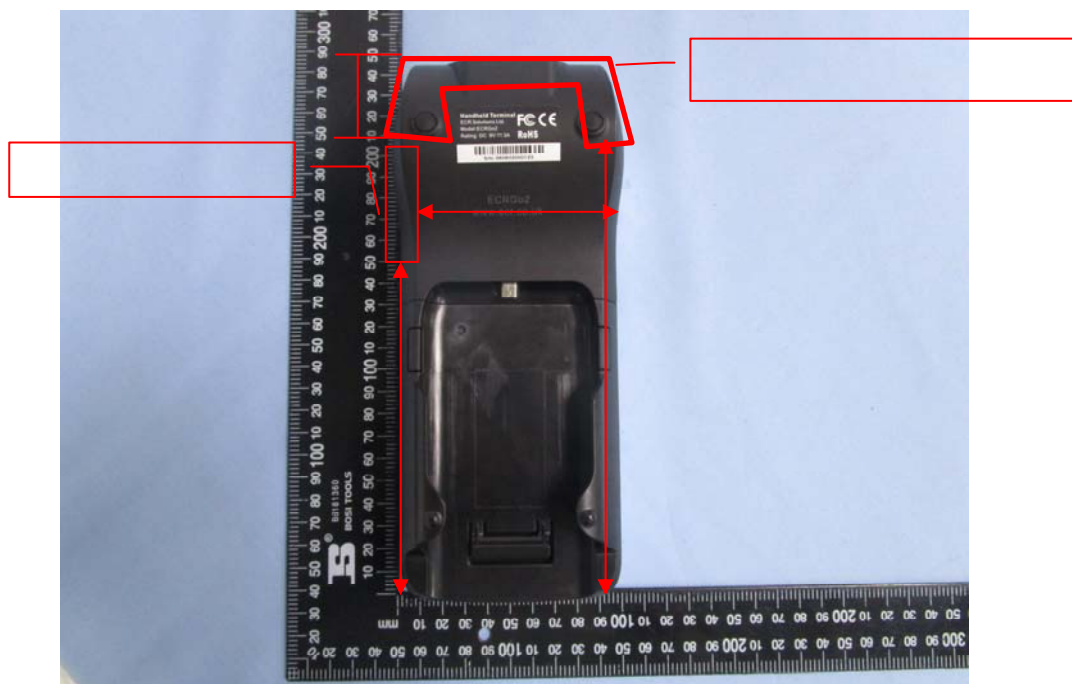
Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10 %. Table 6.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion.

Frequency	Targeted SAR _{1g}	Measured SAR _{1g}	Normalized SAR _{1g}	Tolerance
MHz	(W/kg)	(W/kg)	(W/kg)	(%)
Body				
835	9.38	2.35	9.4	0.21
2450	50.41	12.59	50.36	-0.10
2600	53.89	13.48	53.92	0.06

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

7. EUT Testing Position

7.1 EUT Antenna Position



7.2 EUT Testing Position

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

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

Hand SAR tests, Test distance: 0mm						
Antennas	Front	Back	Right Side	Left Side	Top Side	Bottom Side
WWAN	Yes	Yes	Yes	Yes	Yes	No
WLAN	Yes	Yes	Yes	No	No	No

Remark:

1. Referring to KDB 941225 D06, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test separation distances of body and hand is 5 mm and 0mm *respectively*. 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 from 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

WCDMA - Average Power (dBm)						
Band	WCDMA Band V					
Channel	4132	4183	4233			
Frequency (MHz)	826.4	836.6	846.6			
RMC 12.2k	22.29	22.5	22.46			
HSDPA Subtest-1	22.04	21.94	22.07			
HSDPA Subtest-2	21.99	21.89	21.94			
HSDPA Subtest-3	21.87	21.75	21.82			
HSDPA Subtest-4	21.82	21.63	21.77			
HSUPA Subtest-1	21.54	21.53	21.71			
HSUPA Subtest-2	21.51	21.49	21.64			
HSUPA Subtest-3	21.43	21.42	21.59			
HSUPA Subtest-4	21.35	21.37	21.53			
HSUPA Subtest-5	21.24	21.25	21.47			

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 $\leq 1.2\text{W/kg}$, HSDPA SAR evaluation can be excluded.

LTE Band 5:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	23.05	
		1	3	22.99	
		1	5	22.73	
		3	0	22.91	
		3	2	22.97	
		3	3	22.91	
		6	0	21.99	
	MCH	1	0	22.95	
		1	3	23.23	
		1	5	23.06	
		3	0	22.96	
		3	2	23.03	
		3	3	22.77	
		6	0	21.84	
	HCH	1	0	23.19	
		1	3	23.44	
		1	5	23.16	
		3	0	23.17	
		3	2	23.29	
		3	3	23.20	
		6	0	22.22	
16QAM	LCH	1	0	22.52	
		1	3	22.24	
		1	5	21.71	
		3	0	22.24	
		3	2	22.11	
		3	3	22.14	
		6	0	20.85	
	MCH	1	0	21.86	
		1	3	22.08	
		1	5	21.88	
		3	0	21.98	
		3	2	22.20	
		3	3	22.04	
		6	0	20.87	
	HCH	1	0	22.15	
		1	3	22.31	

		1	5	22.01	
		3	0	22.42	
		3	2	22.49	
		3	3	22.42	
		6	0	21.22	

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	23.01	
		1	7	22.76	
		1	14	22.46	
		8	0	22.03	
		8	4	21.82	
		8	7	21.74	
		15	0	21.83	
	MCH	1	0	22.70	
		1	7	23.15	
		1	14	22.81	
		8	0	21.86	
		8	4	22.08	
		8	7	21.96	
		15	0	21.83	
	HCH	1	0	23.06	
		1	7	23.58	
		1	14	23.29	
		8	0	22.15	
		8	4	22.31	
		8	7	22.30	
		15	0	22.09	
16QAM	LCH	1	0	22.36	
		1	7	22.01	
		1	14	21.68	
		8	0	21.15	
		8	4	20.90	
		8	7	20.48	
		15	0	20.78	
	MCH	1	0	21.96	
		1	7	22.27	
		1	14	21.99	
		8	0	20.77	
		8	4	20.97	
		8	7	20.94	

		15	0	20.68	
	HCH	1	0	22.09	
		1	7	22.85	
		1	14	22.82	
		8	0	20.76	
		8	4	21.15	
		8	7	21.35	
		15	0	21.01	

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	22.78	
		1	12	22.51	
		1	24	22.21	
		12	0	21.84	
		12	6	21.62	
		12	13	21.43	
		25	0	21.76	
	MCH	1	0	22.44	
		1	12	23.35	
		1	24	22.66	
		12	0	21.70	
		12	6	21.90	
		12	13	21.73	
		25	0	21.69	
	HCH	1	0	22.69	
		1	12	23.39	
		1	24	23.51	
		12	0	21.91	
		12	6	22.07	
		12	13	22.35	
		25	0	21.97	
16QAM	LCH	1	0	22.23	
		1	12	21.87	
		1	24	21.49	
		12	0	20.84	
		12	6	20.66	
		12	13	20.37	
		25	0	20.79	
	MCH	1	0	21.69	
		1	12	22.40	
		1	24	21.54	

		12	0	20.74	
		12	6	21.01	
		12	13	20.77	
		25	0	20.68	
	HCH	1	0	21.56	
		1	12	22.40	
		1	24	22.81	
		12	0	20.94	
		12	6	21.24	
		12	13	21.53	
		25	0	21.05	

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	22.95	
		1	24	22.41	
		1	49	22.82	
		25	0	21.61	
		25	12	21.44	
		25	25	21.55	
		50	0	21.56	
	MCH	1	0	22.65	
		1	24	23.59	
		1	49	22.36	
		25	0	21.73	
		25	12	21.92	
		25	25	21.72	
		50	0	21.72	
	HCH	1	0	22.87	
		1	24	22.55	
		1	49	23.48	
		25	0	21.62	
		25	12	21.69	
		25	25	22.04	
		50	0	21.79	
16QAM	LCH	1	0	22.59	
		1	24	21.63	
		1	49	22.28	
		25	0	20.73	
		25	12	20.47	
		25	25	20.62	
		50	0	20.66	

	MCH	1	0	21.72	
		1	24	22.90	
		1	49	21.60	
		25	0	20.63	
		25	12	20.95	
		25	25	20.61	
		50	0	20.79	
	HCH	1	0	22.09	
		1	24	21.56	
		1	49	23.03	
		25	0	20.57	
		25	12	20.61	
		25	25	21.01	
		50	0	20.89	

LTE Band 7:

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	24.67	
		1	12	24.61	
		1	24	24.84	
		12	0	23.93	
		12	6	23.97	
		12	13	24.01	
		25	0	24.02	
	MCH	1	0	23.11	
		1	12	23.56	
		1	24	23.18	
		12	0	22.07	
		12	6	22.11	
		12	13	22.09	
		25	0	21.90	
	HCH	1	0	22.32	
		1	12	22.74	
		1	24	22.68	
		12	0	21.45	
		12	6	21.69	
		12	13	21.71	
		25	0	21.65	
16QAM	LCH	1	0	23.96	

		1	12	24.03	
		1	24	24.01	
		12	0	23.00	
		12	6	23.10	
		12	13	23.14	
		25	0	22.99	
	MCH	1	0	22.24	
		1	12	22.54	
		1	24	22.28	
		12	0	21.63	
		12	6	21.32	
		12	13	21.30	
		25	0	21.07	
	HCH	1	0	21.32	
		1	12	21.88	
		1	24	21.04	
		12	0	20.45	
		12	6	20.81	
		12	13	21.01	
		25	0	20.88	

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	24.81	
		1	24	24.86	
		1	49	24.83	
		25	0	23.99	
		25	12	23.79	
		25	25	23.86	
	MCH	50	0	23.91	
		1	0	23.47	
		1	24	23.41	
		1	49	22.75	
		25	0	22.25	
		25	12	22.18	
		25	25	21.94	
	HCH	50	0	21.98	
		1	0	22.00	
		1	24	22.81	
		1	49	22.69	
		25	0	21.09	
		25	12	21.31	

		25	25	21.64	
		50	0	21.16	
16QAM	LCH	1	0	24.39	
		1	24	23.92	
		1	49	23.87	
		25	0	22.96	
		25	12	22.85	
		25	25	23.04	
		50	0	22.95	
		1	0	22.01	
	MCH	1	24	22.92	
		1	49	22.32	
		25	0	21.10	
		25	12	21.16	
		25	25	20.94	
		50	0	21.04	
		1	0	21.08	
	HCH	1	24	22.06	
		1	49	21.95	
		25	0	20.11	
		25	12	20.39	
		25	25	20.83	
		50	0	20.17	

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	24.64	
		1	37	24.74	
		1	74	24.52	
		37	0	23.80	
		37	18	23.76	
		37	38	23.82	
		75	0	23.82	
	MCH	1	0	23.52	
		1	37	23.50	
		1	74	22.37	
		37	0	22.13	
		37	18	22.13	
		37	38	21.78	
		75	0	21.90	
	HCH	1	0	21.65	
		1	37	22.44	

		1	74	22.60	
		37	0	20.78	
		37	18	21.18	
		37	38	21.42	
		75	0	20.99	
16QAM	LCH	1	0	24.51	
		1	37	24.11	
		1	74	23.79	
		37	0	22.84	
		37	18	22.69	
		37	38	22.75	
		75	0	22.89	
	MCH	1	0	22.62	
		1	37	22.96	
		1	74	22.12	
		37	0	21.21	
		37	18	20.97	
		37	38	20.83	
		75	0	20.95	
	HCH	1	0	21.20	
		1	37	21.83	
		1	74	22.50	
		37	0	19.70	
		37	18	20.21	
		37	38	20.46	
		75	0	20.05	

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	
		Size	Offset		
QPSK	LCH	1	0	24.91	
		1	49	24.45	
		1	99	24.02	
		50	0	23.80	
		50	25	23.64	
		50	50	23.51	
		100	0	23.68	
	MCH	1	0	23.41	
		1	49	23.41	
		1	99	21.76	
		50	0	22.10	
		50	25	22.02	
		50	50	21.43	

	HCH	100	0	21.61	
		1	0	21.69	
		1	49	22.23	
		1	99	23.00	
		50	0	20.59	
		50	25	20.96	
		50	50	21.25	
		100	0	20.85	
16QAM	LCH	1	0	23.24	
		1	49	22.99	
		1	99	22.36	
		50	0	22.85	
		50	25	22.63	
		50	50	22.50	
		100	0	22.77	
	MCH	1	0	21.79	
		1	49	22.01	
		1	99	20.27	
		50	0	20.89	
		50	25	21.04	
		50	50	20.49	
		100	0	20.67	
	HCH	1	0	20.31	
		1	49	20.82	
		1	99	21.98	
		50	0	19.53	
		50	25	19.98	
		50	50	20.30	
		100	0	19.89	

Remark:

1. Per KDB941225 D05 v02r05, Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.8 When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2. Per KDB941225 D05 v02r05, the procedures required for 1 RB allocation in section 4.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.
3. Per KDB941225 D05 v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in sections 4.2.1 and 4.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test

channels must also be tested.

4. Per KDB941225 D05 v02r05, For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 4.2.1, 5.2.2 and 4.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

WLAN - Maximum Average Power				
Test Mode	Data Rate	Channel	Frequency (MHz)	Average Power (dBm)
802.11b	1Mbps	CH 01	2412	12.87
		CH 06	2437	12.24
		CH 11	2462	11.64
802.11g	54Mbps	CH 01	2412	12.23
		CH 06	2437	12.03
		CH 11	2462	11.25
802.11n (20MHz)	MCS7	CH 01	2412	12.18
		CH 06	2437	11.63
		CH 11	2462	11.04
802.11n (40MHz)	MCS7	CH 03	2422	12.47
		CH 06	2437	12.37
		CH 09	2452	12.10

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	5.26
Pi/4 QDPSK	2Mbps	3.24
8DPSK	3Mbps	3.31

Bluetooth - Maximum Average Power				
Test Mode	Data Rate	Channel	Frequency (MHz)	Average Power (dBm)
BLE	1Mbps	CH 00	2402	-5.649
		CH 19	2440	-4.323
		CH 39	2480	-4.572

Remark:

Bluetooth maximum output power is 5.26dBm, and Tune-Up output power is 5.5dBm. 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:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
 for 1-g SAR and ≤ 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
5.5	3.55	5	2.441	1.11	3

The exclusion thresholds is $1.11 < 3$, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Body SAR

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					
1.	RMC 12.2k	Back Side	4183	836.6	22.5	23.0	1.1220	0.2272	0.2549
2.	RMC 12.2k	Front Side	4183	836.6	22.5	23.0	1.1220	0.0226	0.0254
3.	RMC 12.2k	Top side	4183	836.6	22.5	23.0	1.1220	0.1986	0.2228
4.	RMC 12.2k	Right side	4183	836.6	22.5	23.0	1.1220	0.0447	0.0502
5.	RMC 12.2k	Left side	4183	836.6	22.5	23.0	1.1220	0.5828	0.6539

LTE Band 5–Body SAR Test (Gap: 5mm)								
Plot No.	Mode	Test Position Body	Freque ncy	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
6.	RMC QPSK 10MHz 1RB	Back Side	836.5	23.59	24.0	1.0990	0.1276	0.1402
7.	RMC QPSK 10MHz 1RB	Front Side	836.5	23.59	24.0	1.0990	0.0721	0.0792
8.	RMC QPSK 10MHz 1RB	Top side	836.5	23.59	24.0	1.0990	0.1126	0.1237
9.	RMC QPSK 10MHz 1RB	Right side	836.5	23.59	24.0	1.0990	0.0222	0.0244
10.	RMC QPSK 10MHz 1RB	Left side	836.5	23.59	24.0	1.0990	0.0082	0.0090
11.	RMC QPSK 10MHz 50%RB	Back Side	844.0	22.04	22.5	1.1117	0.1164	0.1294
12.	RMC QPSK 10MHz 50%RB	Front Side	844.0	22.04	22.5	1.1117	0.0404	0.0449
13.	RMC QPSK 10MHz 50%RB	Top side	844.0	22.04	22.5	1.1117	0.1023	0.1137
14.	RMC QPSK 10MHz 50%RB	Right side	844.0	22.04	22.5	1.1117	0.0214	0.0238
15.	RMC QPSK 10MHz 50%RB	Left side	844.0	22.04	22.5	1.1117	0.0052	0.0058

LTE Band 7–Body SAR Test (Gap: 5mm)								
Plot No.	Mode	Test Position Body	Freque ncy	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
16.	RMC QPSK 20MHz 1RB	Back Side	2510.0	24.91	25.0	1.0209	0.1488	0.1519
17.	RMC QPSK 20MHz 1RB	Front Side	2510.0	24.91	25.0	1.0209	0.1039	0.1061
18.	RMC QPSK 20MHz 1RB	Top side	2510.0	24.91	25.0	1.0209	0.5122	0.5229
19.	RMC QPSK 20MHz 1RB	Right side	2510.0	24.91	25.0	1.0209	0.0225	0.0230
20.	RMC QPSK 20MHz 1RB	Left side	2510.0	24.91	25.0	1.0209	0.0557	0.0569
21.	RMC QPSK 20MHz 50%RB	Back Side	2510.0	23.80	24.0	1.0471	0.1325	0.1387
22.	RMC QPSK 20MHz 50%RB	Front Side	2510.0	23.80	24.0	1.0471	0.0837	0.0876
23.	RMC QPSK 20MHz 50%RB	Top side	2510.0	23.80	24.0	1.0471	0.4105	0.4298
24.	RMC QPSK 20MHz 50%R	Right side	2510.0	23.80	24.0	1.0471	0.0261	0.0273
25.	RMC QPSK 20MHz 50%RB	Left side	2510.0	23.80	24.0	1.0471	0.0455	0.0476

WLAN 2.4GHz –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					
26.	802.11b	Back Side	01	2412	12.87	13.0	1.0304	0.0447	0.0461
27.	802.11b	Front Side	01	2412	12.87	13.0	1.0304	0.0126	0.0130
28.	802.11b	Right side	01	2412	12.87	13.0	1.0304	0.0348	0.0359

Remark: Per KDB 447498 D01 v06 , if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

Hand SAR

WCDMA Band V – Body SAR Test (Gap: 0mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10 g (W/kg)	Scaled SAR10 g (W/kg)
			CH.	MHz					
29.	RMC 12.2k	Back Side	4183	836.6	22.5	23.0	1.1220	0.5090	0.5711
30.	RMC 12.2k	Front Side	4183	836.6	22.5	23.0	1.1220	0.0219	0.0246
31.	RMC 12.2k	Top side	4183	836.6	22.5	23.0	1.1220	0.5553	0.6231
32.	RMC 12.2k	Right side	4183	836.6	22.5	23.0	1.1220	0.0214	0.0240
33.	RMC 12.2k	Left side	4183	836.6	22.5	23.0	1.1220	0.6661	0.7474

LTE Band 5–Body SAR Test (Gap: 0mm)								
Plot No.	Mode	Test Position Body	Freque ncy	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10 g (W/kg)	Scaled SAR10 g (W/kg)
	Modulation, Bandwidth, RB		MHz					
34.	RMC QPSK 10MHz 1RB	Back Side	836.5	23.59	24.0	1.0990	0.3966	0.4359
35.	RMC QPSK 10MHz 1RB	Front Side	836.5	23.59	24.0	1.0990	0.0211	0.0232
36.	RMC QPSK 10MHz 1RB	Top side	836.5	23.59	24.0	1.0990	0.2521	0.2771
37.	RMC QPSK 10MHz 1RB	Right side	836.5	23.59	24.0	1.0990	0.0122	0.0134
38.	RMC QPSK 10MHz 1RB	Left side	836.5	23.59	24.0	1.0990	0.6576	0.7227
39.	RMC QPSK 10MHz 50%RB	Back Side	844.0	22.04	22.5	1.1117	0.3234	0.3595
40.	RMC QPSK 10MHz 50%RB	Front Side	844.0	22.04	22.5	1.1117	0.0412	0.0458
41.	RMC QPSK 10MHz 50%RB	Top side	844.0	22.04	22.5	1.1117	0.2123	0.2360
42.	RMC QPSK 10MHz 50%RB	Right side	844.0	22.04	22.5	1.1117	0.0162	0.0180
43.	RMC QPSK 10MHz 50%RB	Left side	844.0	22.04	22.5	1.1117	0.5373	0.5973

LTE Band 7–Body SAR Test (Gap: 0mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10 g (W/kg)	Scaled SAR10 g (W/kg)
	Modulation, Bandwidth, RB		MHz					
44.	RMC QPSK 20MHz 1RB	Back Side	2510.0	24.91	25.0	1.0209	0.1207	0.1232
45.	RMC QPSK 20MHz 1RB	Front Side	2510.0	24.91	25.0	1.0209	0.0673	0.0687
46.	RMC QPSK 20MHz 1RB	Top side	2510.0	24.91	25.0	1.0209	0.7766	0.7929
47.	RMC QPSK 20MHz 1RB	Right side	2510.0	24.91	25.0	1.0209	0.0498	0.0508
48.	RMC QPSK 20MHz 1RB	Left side	2510.0	24.91	25.0	1.0209	0.0794	0.0811
49.	RMC QPSK 20MHz 50%RB	Back Side	2510.0	23.80	24.0	1.0471	0.1038	0.1087
50.	RMC QPSK 20MHz 50%RB	Front Side	2510.0	23.80	24.0	1.0471	0.0526	0.0551
51.	RMC QPSK 20MHz 50%RB	Top side	2510.0	23.80	24.0	1.0471	0.6952	0.7280
52.	RMC QPSK 20MHz 50%R	Right side	2510.0	23.80	24.0	1.0471	0.0245	0.0257
53.	RMC QPSK 20MHz 50%RB	Left side	2510.0	23.80	24.0	1.0471	0.0655	0.0686

WLAN 2.4GHz –Body SAR Test (Gap: 0mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10 g (W/kg)	Scaled SAR10 g (W/kg)
			CH.	MHz					
54.	802.11b	Back Side	01	2412	12.87	13.0	1.0304	0.2056	0.2118
55.	802.11b	Front Side	01	2412	12.87	13.0	1.0304	0.1028	0.1059
56.	802.11b	Right side	01	2412	12.87	13.0	1.0304	0.1243	0.1281

Remark: Per KDB 447498 D01 v06 , if the highest output channel SAR for each exposure position ≤ 2.0 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	Hand SAR	Body SAR
1	WCDMA(Data)/HSDPA(Data)/ HSUPA(Data)/ LTE(Data) + WLAN(2.4G)(Data)	Yes	Yes
2	WCDMA(Data)/HSDPA(Data)/ HSUPA(Data)/ LTE(Data)+ Bluetooth(Data)	Yes	Yes

Remark:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. According to the KDB 447498 D01v06, 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:

$$(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})}/x] \text{ W/kg}$$
for test separation distances $\leq 50 \text{ mm}$;
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 D01v06 as below:

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	X	SAR(1g) 5mm	SAR(10g) 5mm
5.5	3.55	5	2.441	7.5/18.75	0.1479	0.0592

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

Body SAR

WWAN and WLAN

Position	WWAN		WLAN	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	WCDMA Band 5	0.2549	0.0461	0.301
Front	WCDMA Band 5	0.0254	0.0130	0.0384
Top side	WCDMA Band 5	0.2228	--	0.2228
Bottom side	WCDMA Band 5	--	--	--
Right side	WCDMA Band 5	0.0502	0.0359	0.0861
Left side	WCDMA Band 5	0.6539	--	0.6539
Back	LTE Band 5	0.1402	0.0461	0.1863
Front	LTE Band 5	0.0792	0.0130	0.0922
Top side	LTE Band 5	0.1237	--	0.1237
Bottom side	LTE Band 5	--	--	--
Right side	LTE Band 5	0.0244	0.0359	0.0603
Left side	LTE Band 5	0.0090	--	0.0090
Back	LTE Band 7	0.1519	0.0461	0.198
Front	LTE Band 7	0.1061	0.0130	0.1191
Top side	LTE Band 7	0.5229	--	0.5229
Bottom side	LTE Band 7	--	--	--
Right side	LTE Band 7	0.0230	0.0359	0.0589
Left side	LTE Band 7	0.0569	--	0.0569

WWAN and Bluetooth

Position	WWAN		Bluetooth	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	WCDMA Band 5	0.2549	0.1479	0.4028
Front	WCDMA Band 5	0.0254	0.1479	0.1733
Top side	WCDMA Band 5	0.2228	--	0.2228
Bottom side	WCDMA Band 5	--	--	--
Right side	WCDMA Band 5	0.0502	0.1479	0.1981
Left side	WCDMA Band 5	0.6539	--	0.6539
Back	LTE Band 5	0.1402	0.1479	0.2881
Front	LTE Band 5	0.0792	0.1479	0.2271
Top side	LTE Band 5	0.1237	--	0.1237
Bottom side	LTE Band 5	--	--	--
Right side	LTE Band 5	0.0244	0.1479	0.1723
Left side	LTE Band 5	0.0090	--	0.0090
Back	LTE Band 7	0.1519	0.1479	0.2998

Front	LTE Band 7	0.1061	0.1479	0.254
Top side	LTE Band 7	0.5229	--	0.5229
Bottom side	LTE Band 7	--	--	--
Right side	LTE Band 7	0.0230	0.1479	0.1709
Left side	LTE Band 7	0.0569	--	0.0569

Hand SAR

WWAN and WLAN

Position	WWAN		WLAN	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	WCDMA Band 5	0.5711	0.2118	0.7829
Front	WCDMA Band 5	0.0246	0.1059	0.1305
Top side	WCDMA Band 5	0.6231	--	0.6231
Bottom side	WCDMA Band 5	--	--	--
Right side	WCDMA Band 5	0.0240	0.1281	0.1521
Left side	WCDMA Band 5	0.7474	--	0.7474
Back	LTE Band 5	0.4359	0.2118	0.6477
Front	LTE Band 5	0.0232	0.1059	0.1291
Top side	LTE Band 5	0.2771	--	0.2771
Bottom side	LTE Band 5	--	--	--
Right side	LTE Band 5	0.0134	0.1281	0.1415
Left side	LTE Band 5	0.7227	--	0.7227
Back	LTE Band 7	0.1232	0.2118	0.335
Front	LTE Band 7	0.0687	0.1059	0.1746
Top side	LTE Band 7	0.7929	--	0.7929
Bottom side	LTE Band 7	--	--	--
Right side	LTE Band 7	0.0508	0.1281	0.1789
Left side	LTE Band 7	0.0811	--	0.0811

WWAN and Bluetooth

Position	WWAN		Bluetooth	Summed SAR (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	WCDMA Band 5	0.5711	0.0592	0.6303
Front	WCDMA Band 5	0.0246	0.0592	0.0838
Top side	WCDMA Band 5	0.6231	--	0.6231
Bottom side	WCDMA Band 5	--	--	--
Right side	WCDMA Band 5	0.0240	0.0592	0.0832
Left side	WCDMA Band 5	0.7474	--	0.7474
Back	LTE Band 5	0.4359	0.0592	0.4951
Front	LTE Band 5	0.0232	0.0592	0.0824
Top side	LTE Band 5	0.2771	--	0.2771
Bottom side	LTE Band 5	--	--	--
Right side	LTE Band 5	0.0134	0.0592	0.0726
Left side	LTE Band 5	0.7227	--	0.7227
Back	LTE Band 7	0.1232	0.0592	0.1824

Front	LTE Band 7	0.0687	0.0592	0.1279
Top side	LTE Band 7	0.7929	--	0.7929
Bottom side	LTE Band 7	--	--	--
Right side	LTE Band 7	0.0508	0.0592	0.11
Left side	LTE Band 7	0.0811	--	0.0811

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	$\sqrt{3}$	$(1_{Cp})^{1/2}$	$(1_{Cp})^{1/2}$	1.02	1.02	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	$(Cp)^{1/2}$	$(Cp)^{1/2}$	1.63	1.63	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions – Noise	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient Conditions - Reflections	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	E.5	5.0	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	6.94	6.94	∞
SAR scaling	E6.5	0.0	R	$\sqrt{3}$	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	1.9	R	$\sqrt{3}$	1	0.84	1.10	0.90	∞
Liquid conductivity - deviation	E.3.2	5.00	R	$\sqrt{3}$	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	$\sqrt{3}$	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	$\sqrt{3}$	$(1_Cp)^{1/2}$	$(1_Cp)^{1/2}$	1.02	1.02	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	$(Cp)^{1/2}$	$(Cp)^{1/2}$	1.63	1.63	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	E.2.5	0	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions – Noise	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient Conditions - Reflections	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algorithms for Max.	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞

SAR Evaluation									
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	N-1
Input power and SAR drift measurement	8,6.6.2	12.02	R	$\sqrt{3}$	1	1	6.94	6.94	∞
Deviation of experimental dipole from numerical dipole	E.6.4	5.5	R	$\sqrt{3}$	1	1	3.20	3.20	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Uncertainty in SAR correction for deviations in permittivity and conductivity	E.3.2	2.0	R	$\sqrt{3}$	1	0.84	1.10	1.10	∞
Liquid conductivity - deviation from target value	E.3.2	5.00	R	$\sqrt{3}$	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	$\sqrt{3}$	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: 11/14/2016

Measurement duration: 12 minutes 21 seconds

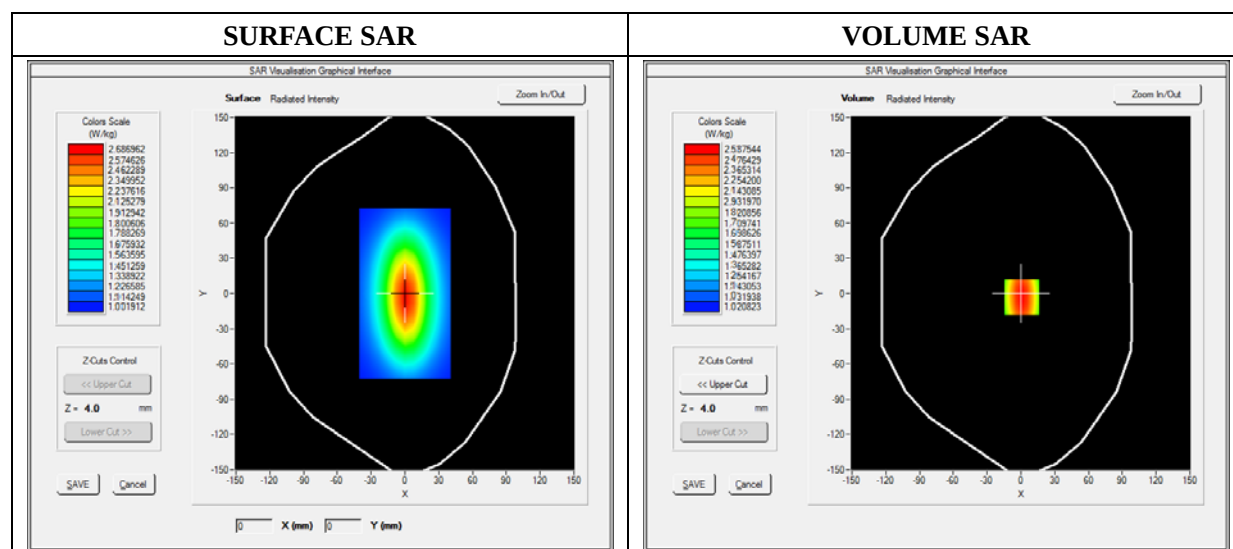
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

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

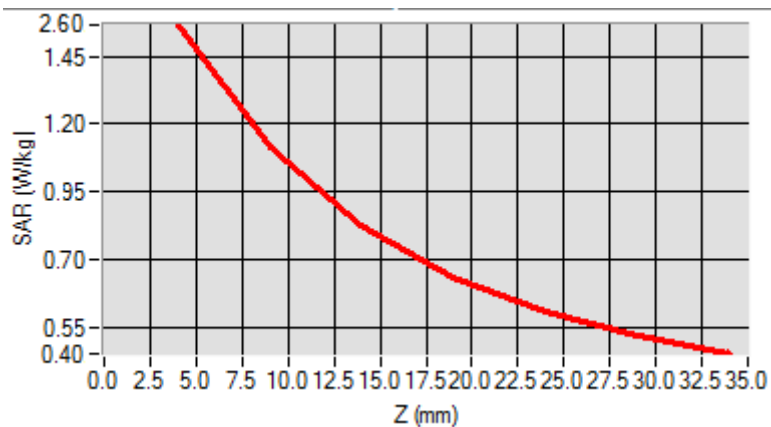


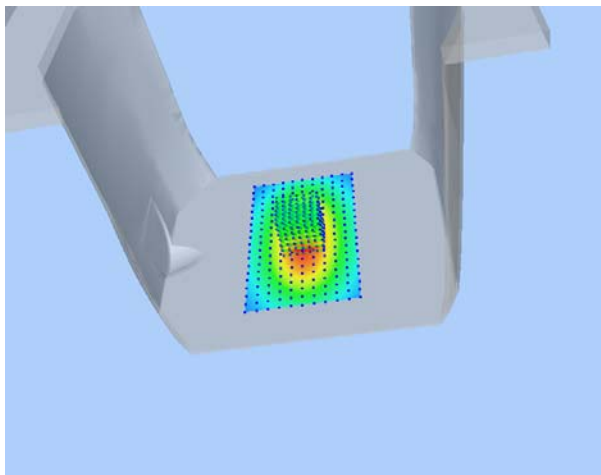
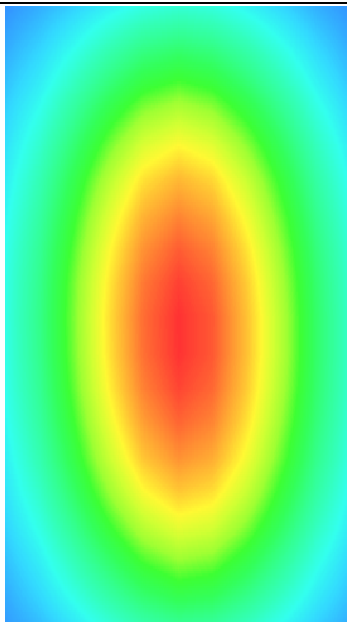
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.438956
SAR 1g (W/Kg)	2.354211

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: 11/14/2016

Measurement duration: 12 minutes 21 seconds

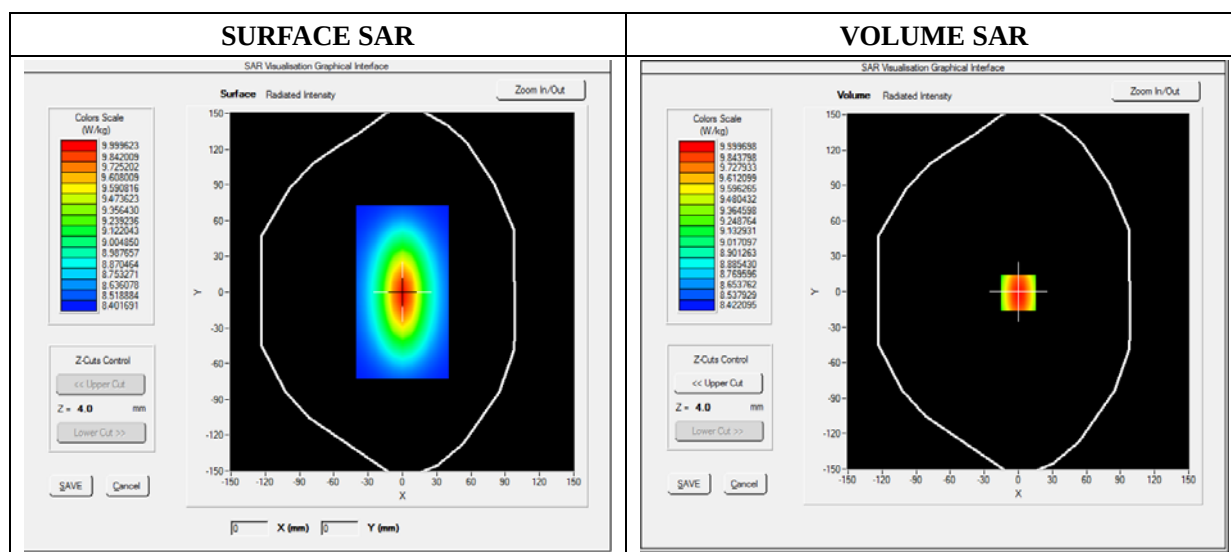
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative Permittivity (real part)	52.010212
Conductivity (S/m)	1.910255
Power Variation (%)	1.369745
Ambient Temperature	21.1
Liquid Temperature	21.2

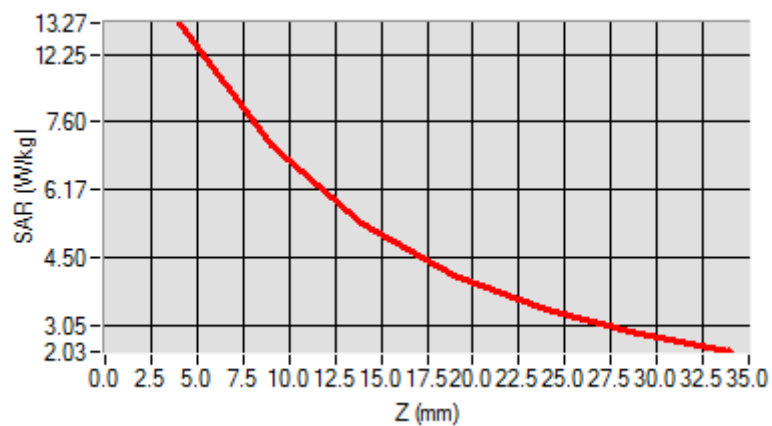


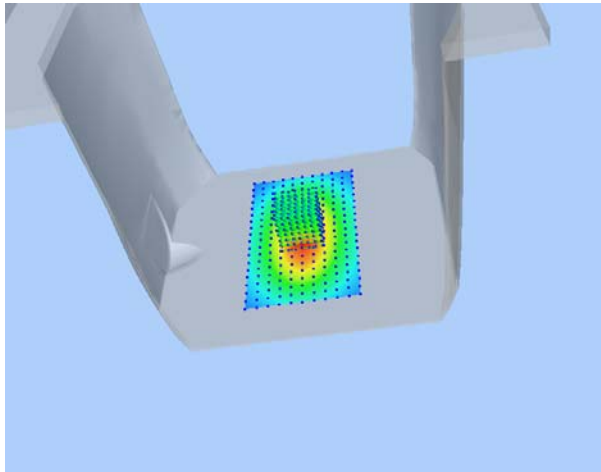
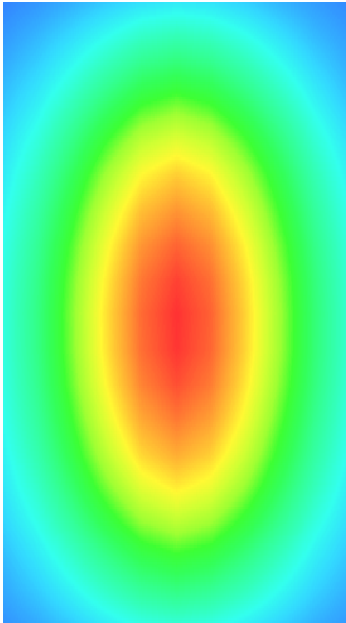
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	6.119522
SAR 1g (W/Kg)	12.592360

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	13.3911	11.7951	9.2945	8.5400	6.3712	4.6225



3D screen shot	Hot spot position
	

MEASUREMENT 3

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 21 seconds

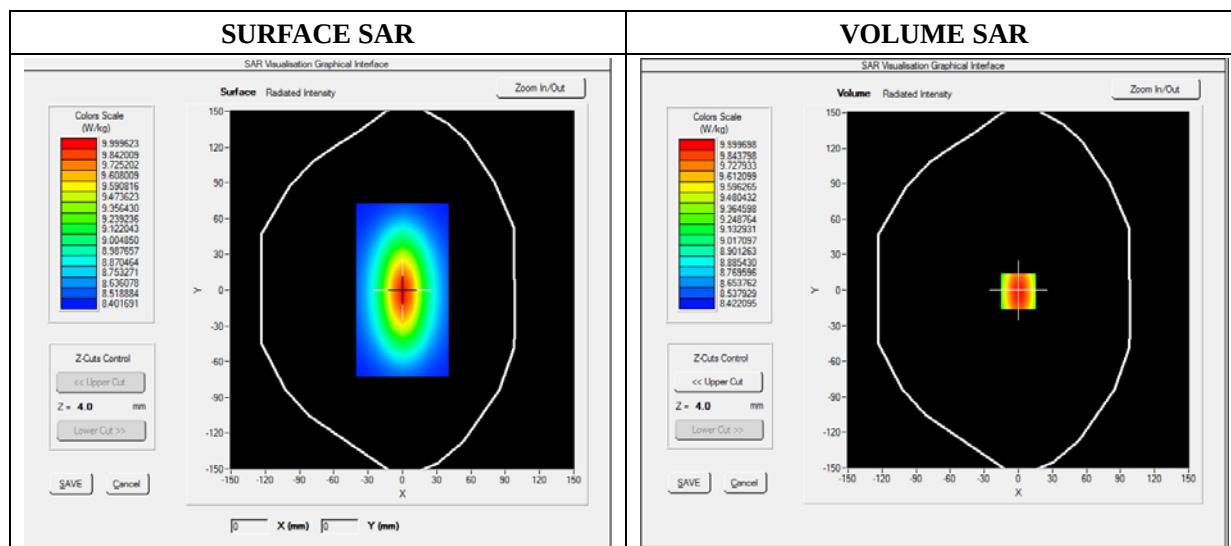
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.58; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2600.000000
Relative Permittivity (real part)	52.241202
Conductivity (S/m)	2.120943
Power Variation (%)	1.038832
Ambient Temperature	21.1
Liquid Temperature	21.2

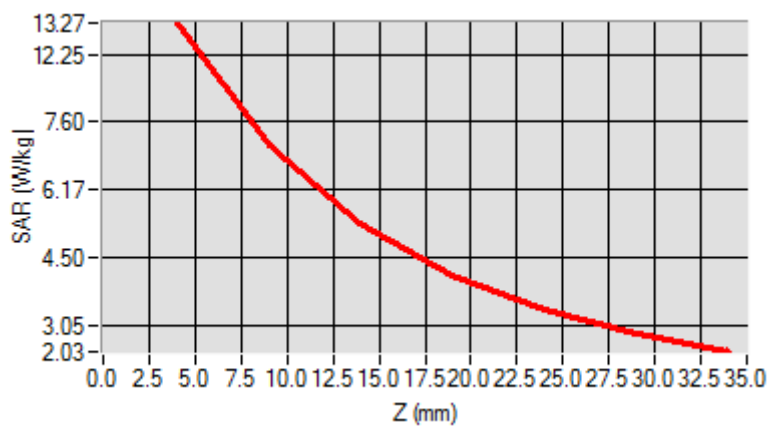


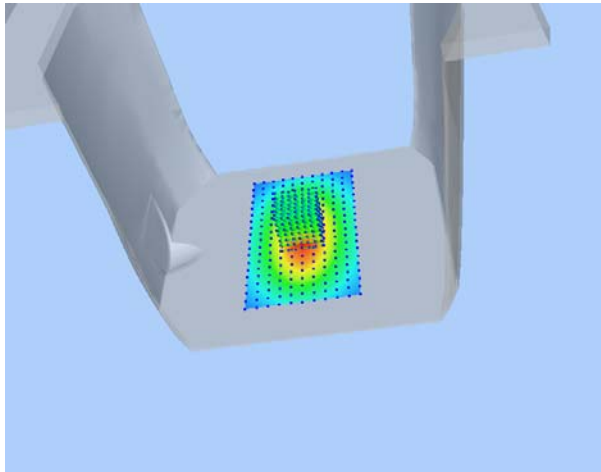
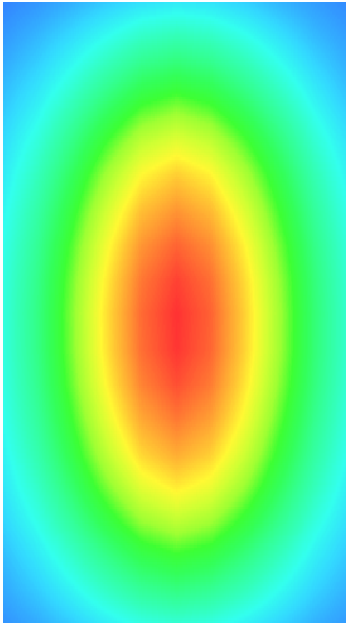
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	6.083781
SAR 1g (W/Kg)	13.480481

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	13.6473	11.8441	9.3627	8.5782	6.4357	4.6342



3D screen shot	Hot spot position
	

Annex B. Plots of SAR Measurement

Body mode Exposure Conditions:

<u>TYPE</u>	<u>BAND</u>	<u>PARAMETERS</u>
Tablet	WCDMA850_RMC	<u>Measurement 5:</u> Flat Plane with Left device position on Middle Channel in WCDMA mode
Tablet	LTE Band 5_RMC	<u>Measurement 6:</u> Flat Plane with Back device position on Middle Channel in LTE mode
Tablet	LTE Band 7_RMC	<u>Measurement 18:</u> Flat Plane with Top device position on Low Channel in LTE mode
Tablet	WiFi_802.11b	<u>Measurement 26:</u> 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.		

Hand exposure Conditions:

<u>TYPE</u>	<u>BAND</u>	<u>PARAMETERS</u>
Tablet	WCDMA850_RMC	<u>Measurement 33:</u> Flat Plane with Left device position on Middle Channel in WCDMA mode
Tablet	LTE Band 5_RMC	<u>Measurement 38:</u> Flat Plane with Left device position on Middle Channel in LTE mode
Tablet	LTE Band 7_RMC	<u>Measurement 46:</u> Flat Plane with Top device position on Low Channel in LTE mode
Tablet	WiFi_802.11b	<u>Measurement 54:</u> 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 5

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

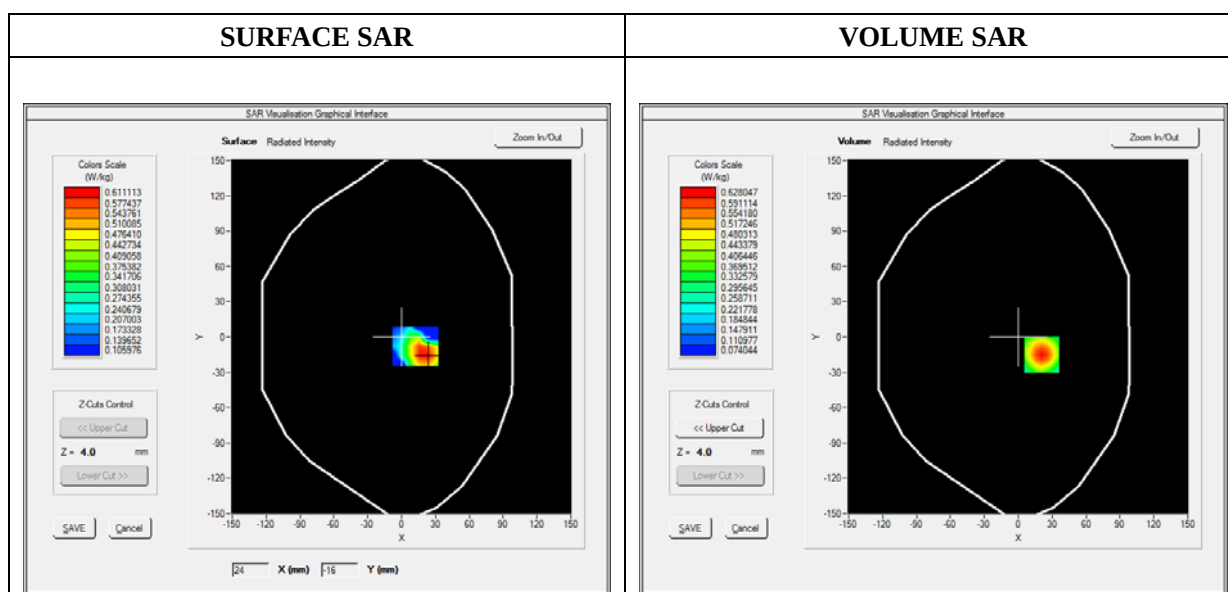
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

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

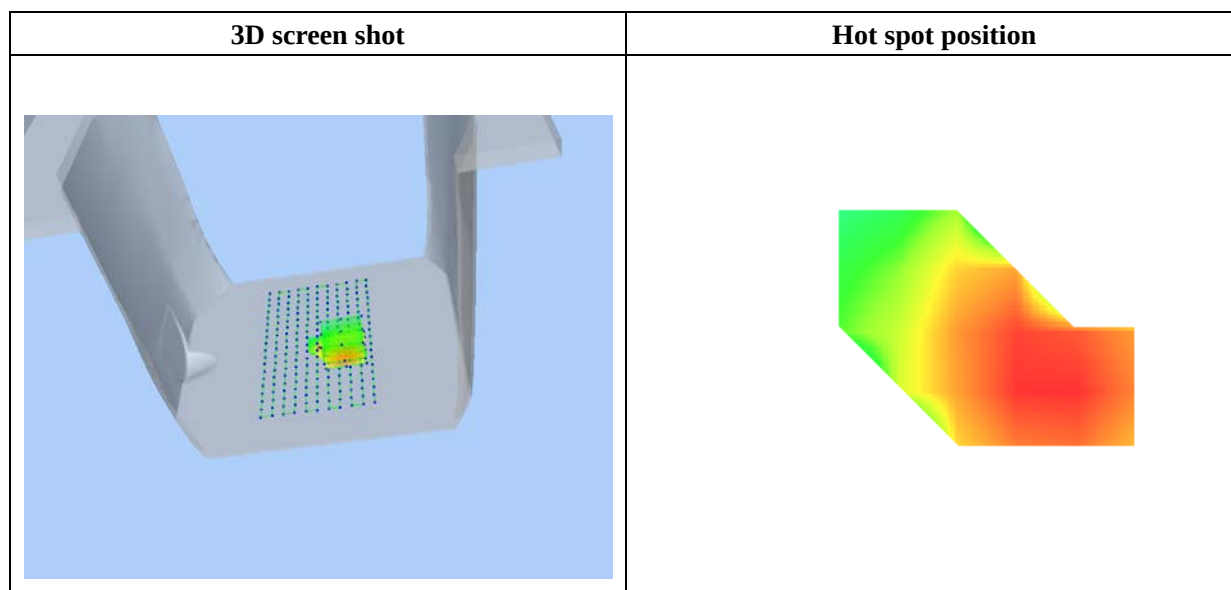
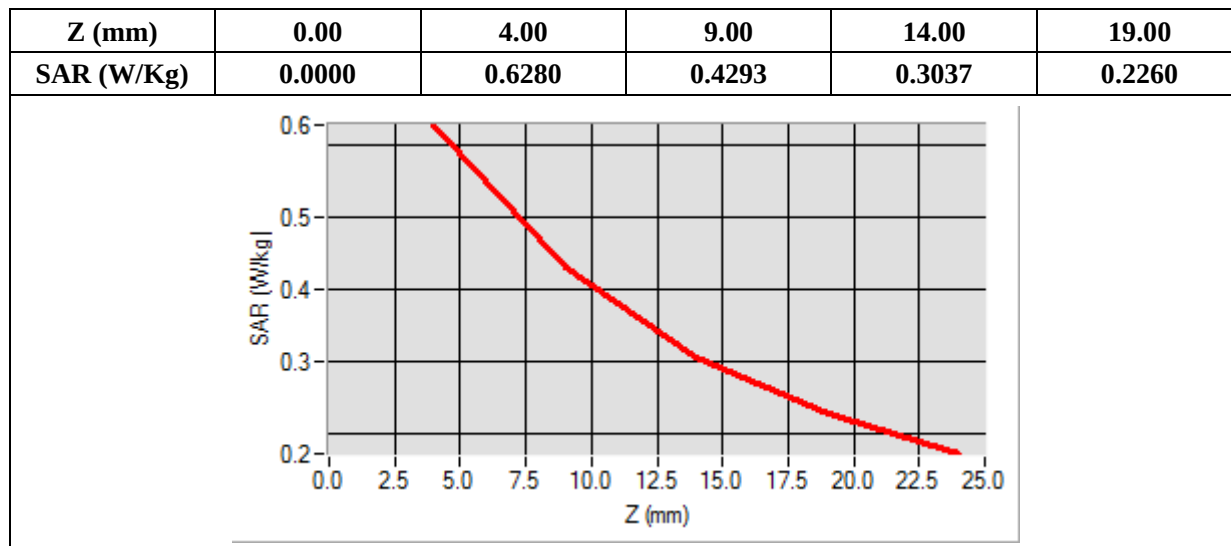
B. SAR Measurement Results

Frequency (MHz)	836.600000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.754261
Ambient Temperature	21.1
Liquid Temperature	21.3



Maximum location: X=21.00, Y=-15.00

SAR 10g (W/Kg)	0.373490
SAR 1g (W/Kg)	0.582808



MEASUREMENT 6

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

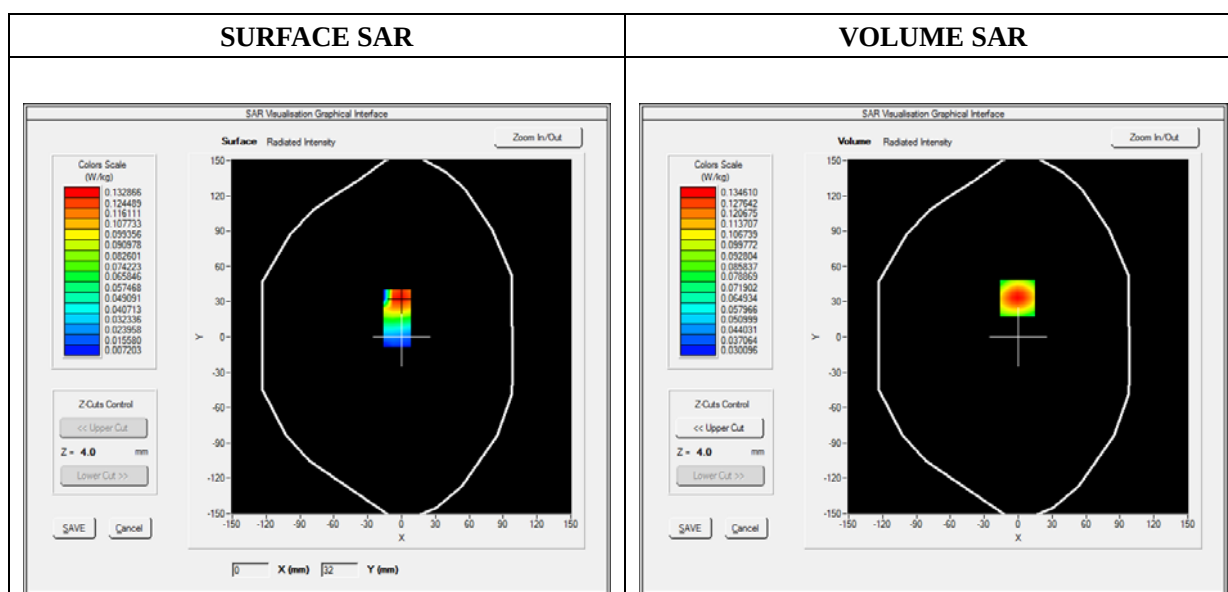
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back
Band	LTE Band 5_RMC
Channels	QPSK, 10MHz, 1RB, Middle
Signal	Duty Cycle 1:1

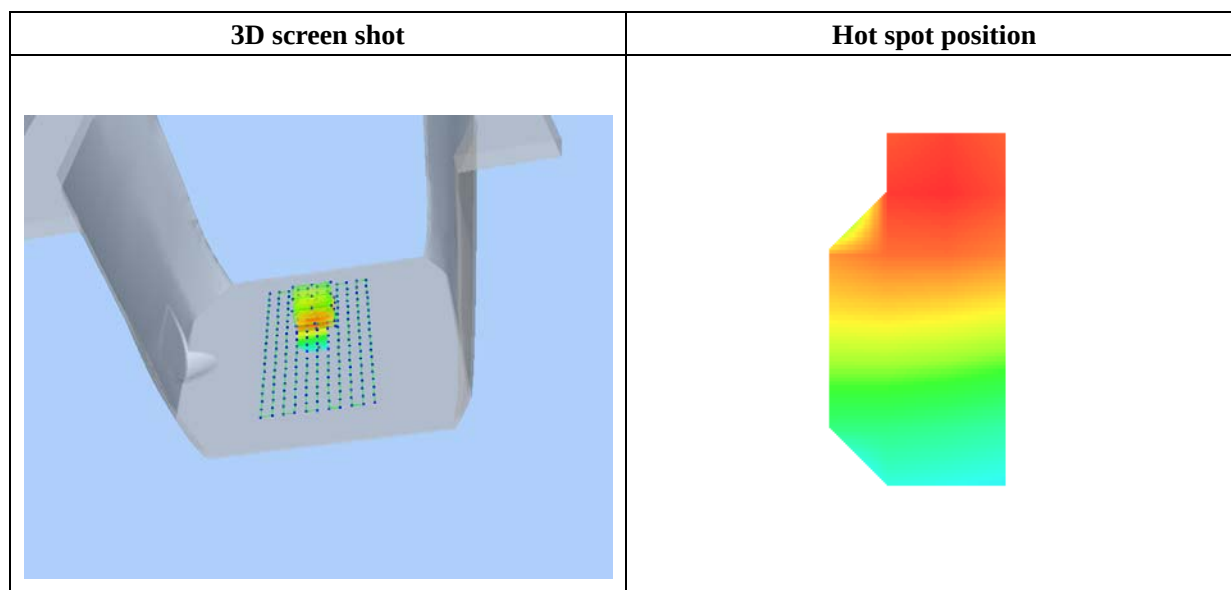
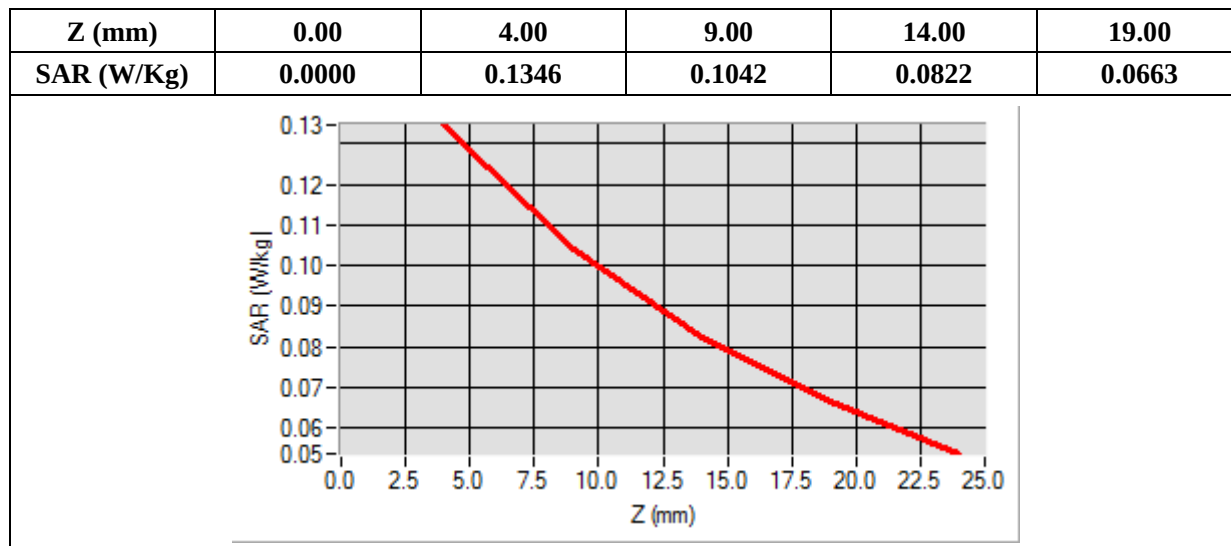
B. SAR Measurement Results

Frequency (MHz)	836.500000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	1.523573
Ambient Temperature	21.1
Liquid Temperature	21.3



Maximum location: X=-1.00, Y=33.00

SAR 10g (W/Kg)	0.092925
SAR 1g (W/Kg)	0.127610



MEASUREMENT 18

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

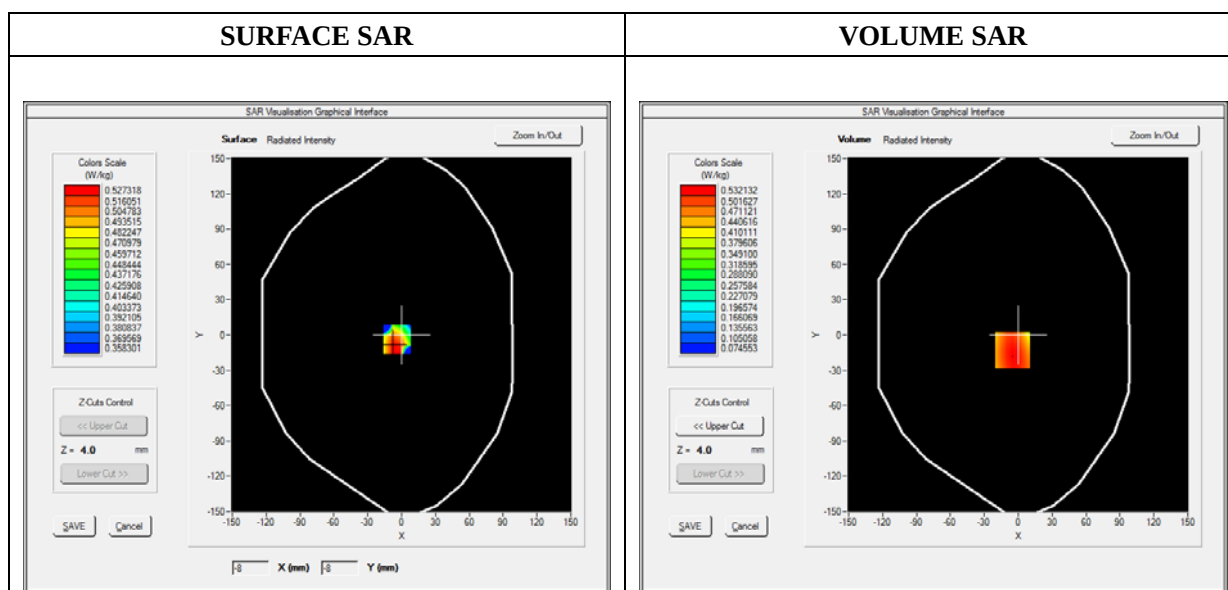
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.58; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Top
Band	LTE Band 7_RMC
Channels	QPSK, 20MHz, 1RB, Low
Signal	Duty Cycle 1:1

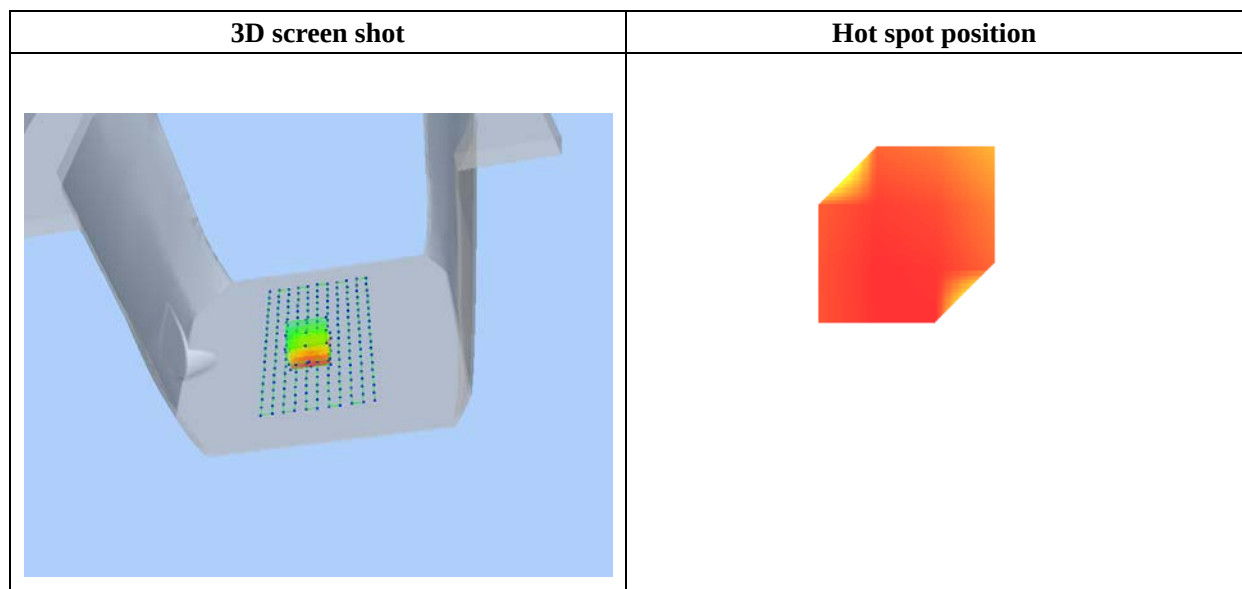
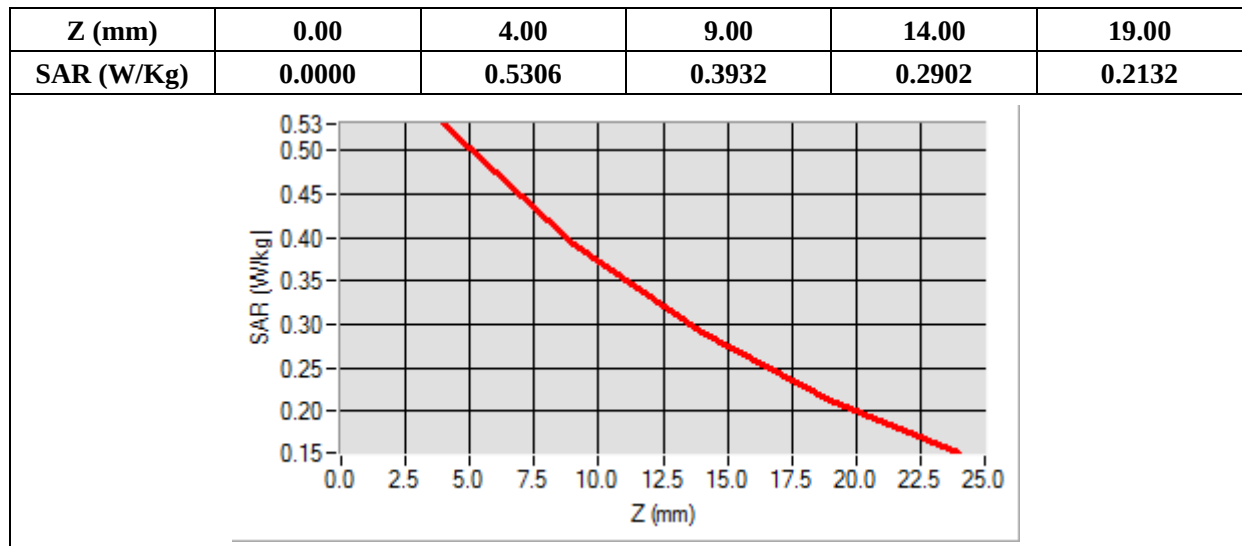
B. SAR Measurement Results

Frequency (MHz)	2510.000000
Relative Permittivity (real part)	52.241202
Conductivity (S/m)	2.120943
Power Variation (%)	0.858383
Ambient Temperature	21.1
Liquid Temperature	21.2



Maximum location: X=-5.00, Y=-13.00

SAR 10g (W/Kg)	0.369319
SAR 1g (W/Kg)	0.512199



MEASUREMENT 26

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

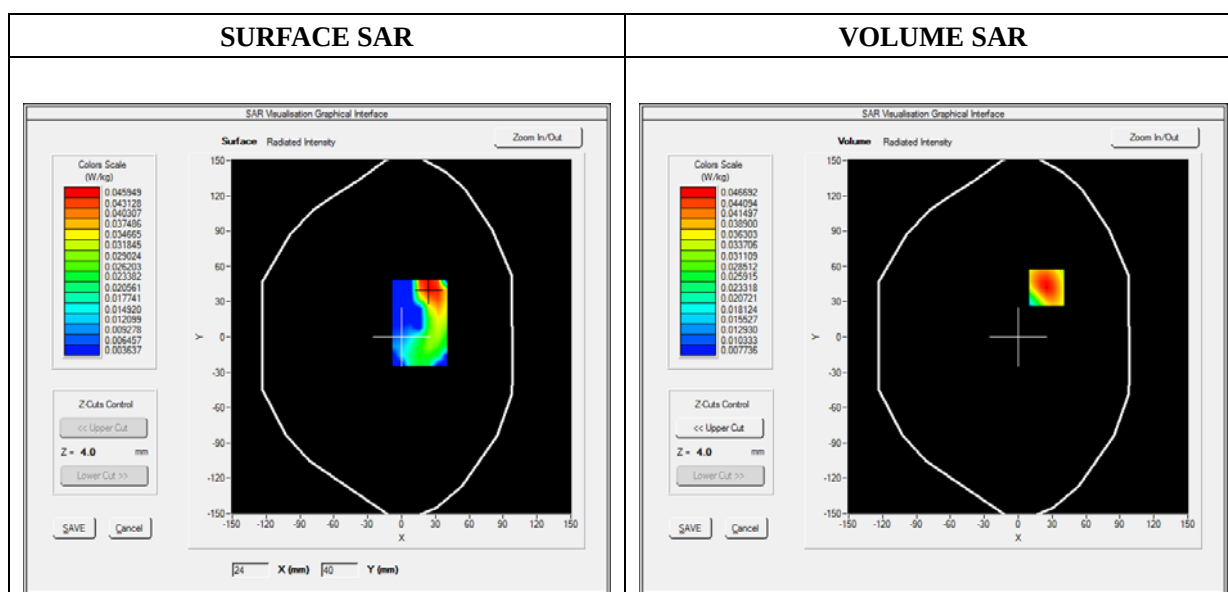
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

A. Experimental conditions

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

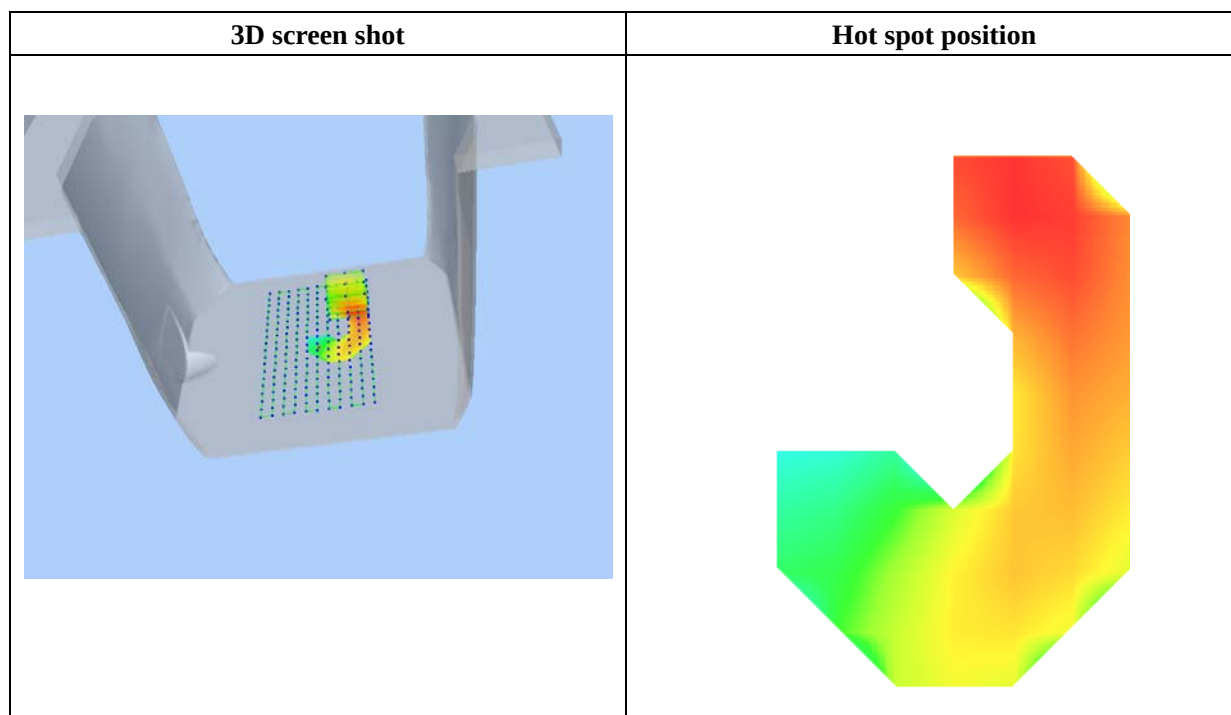
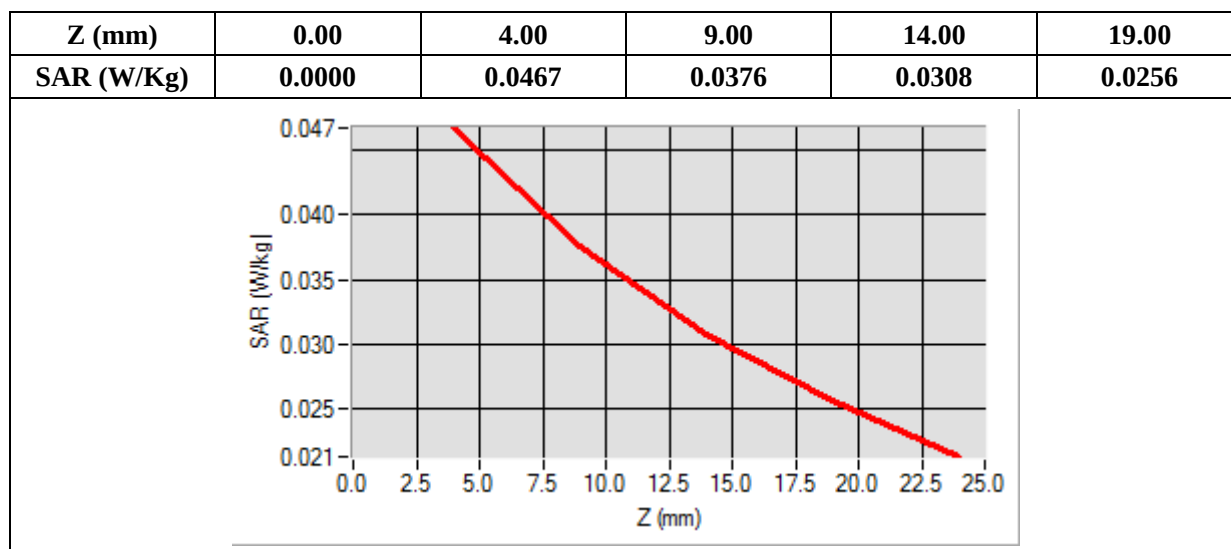
B. SAR Measurement Results

Frequency (MHz)	2412.000000
Relative Permittivity (real part)	52.010212
Conductivity (S/m)	1.910255
Power Variation (%)	0.462345
Ambient Temperature	21.1
Liquid Temperature	21.2



Maximum location: X=25.00, Y=42.00

SAR 10g (W/Kg)	0.034175
SAR 1g (W/Kg)	0.044714



MEASUREMENT 33

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

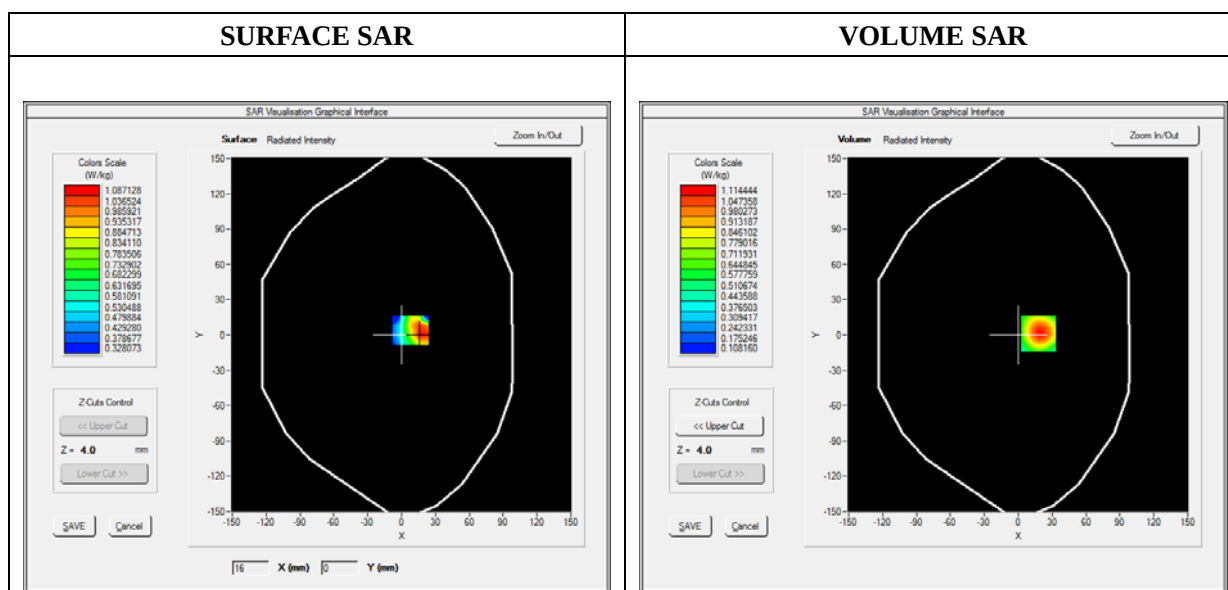
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2016

A. Experimental conditions

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

B. SAR Measurement Results

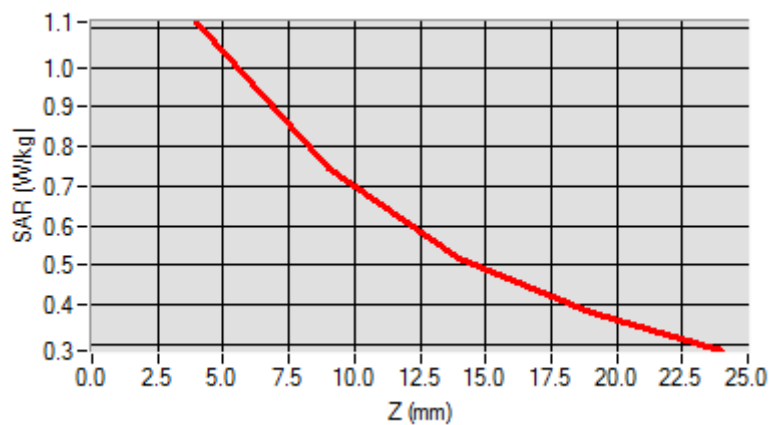
Frequency (MHz)	836.600000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.754261
Ambient Temperature	21.1
Liquid Temperature	21.3

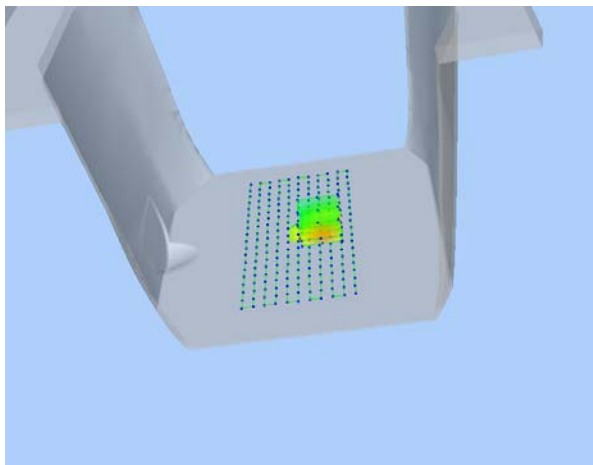
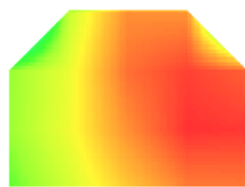


Maximum location: X=18.00, Y=1.00

SAR 10g (W/Kg)	0.666117
SAR 1g (W/Kg)	1.044795

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0000	1.1144	0.7445	0.5160	0.3786



3D screen shot	Hot spot position
	

MEASUREMENT 38

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

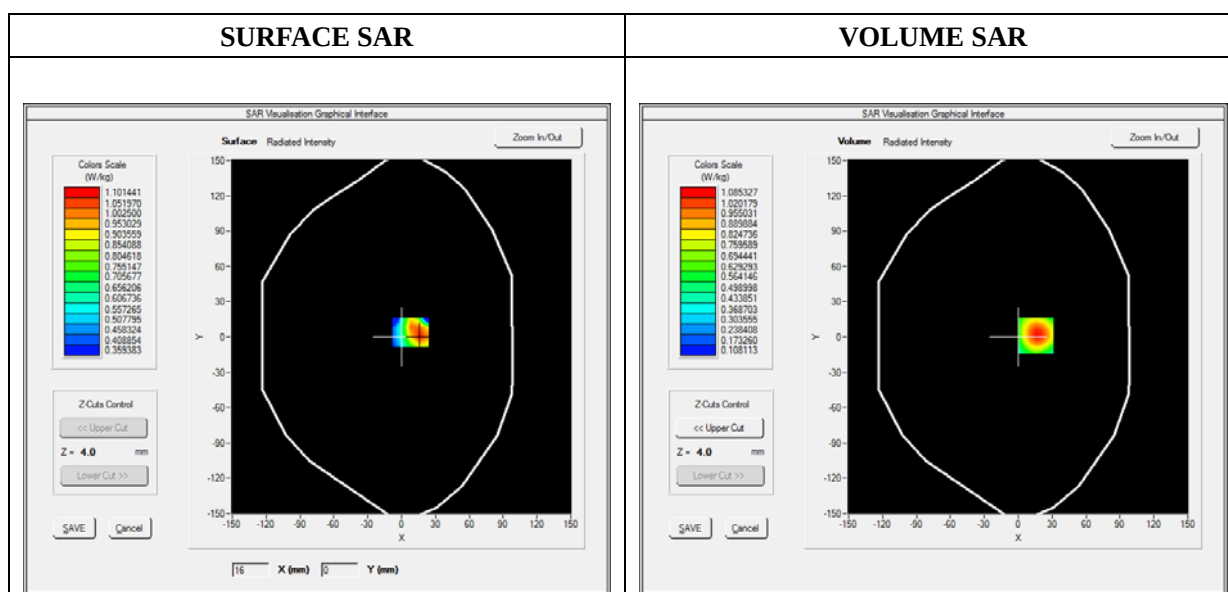
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13 Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Left
Band	LTE Band 5_RMC
Channels	QPSK, 10MHz, 1RB, Middle
Signal	Duty Cycle 1:1

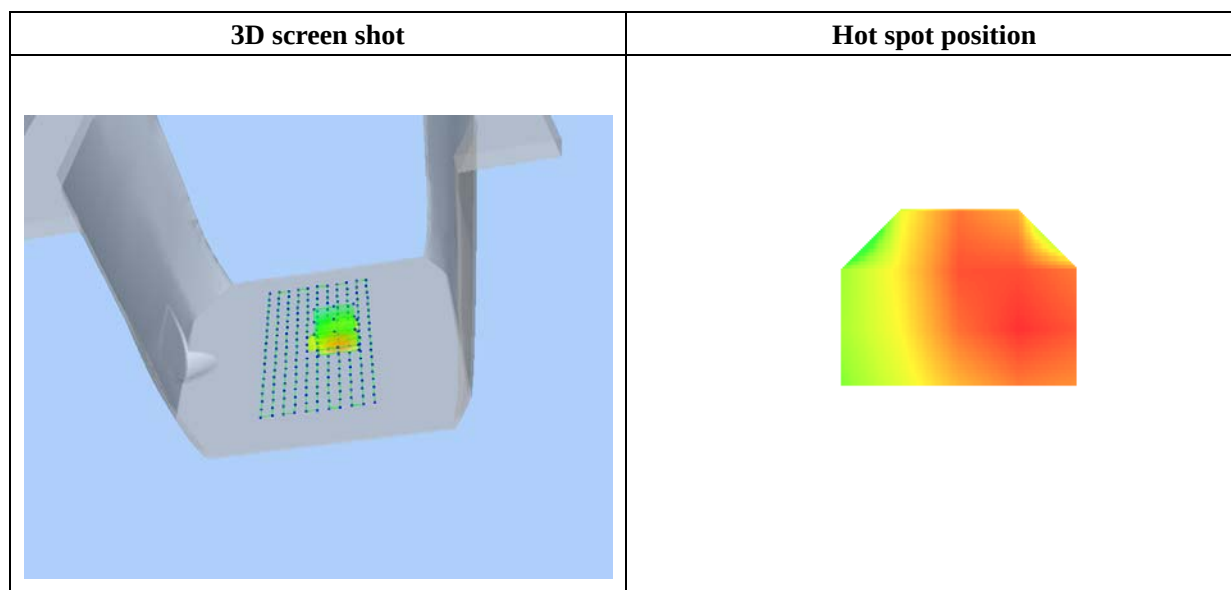
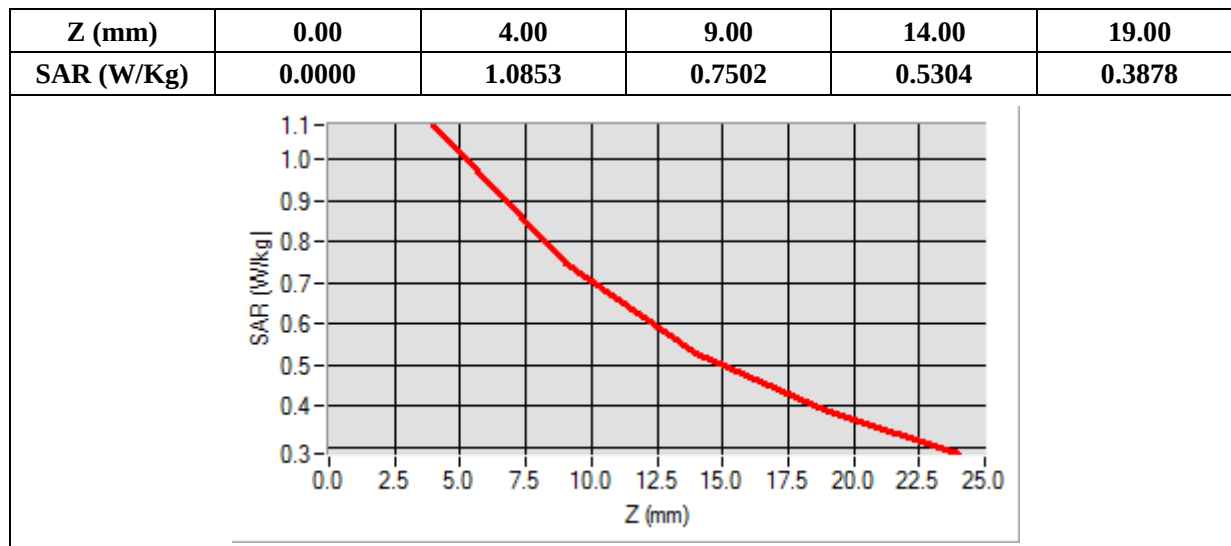
B. SAR Measurement Results

Frequency (MHz)	836.500000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	1.523573
Ambient Temperature	21.1
Liquid Temperature	21.3



Maximum location: X=16.00, Y=1.00

SAR 10g (W/Kg)	0.657610
SAR 1g (W/Kg)	1.017845



MEASUREMENT 46

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

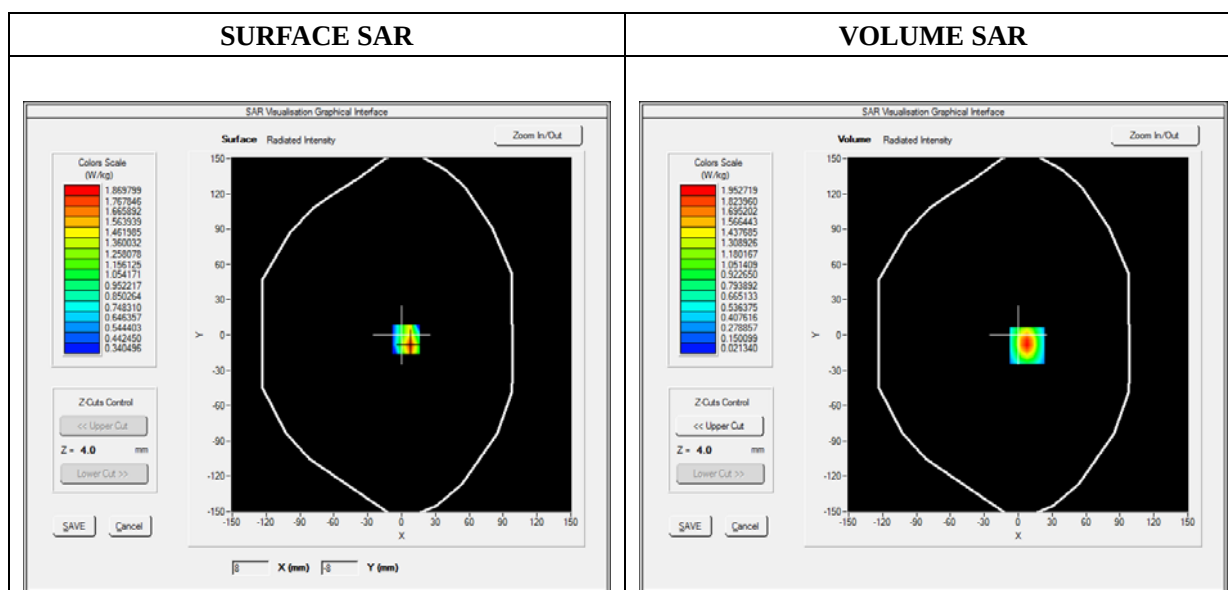
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.58; Calibrated: 06/01/2016

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Top
Band	LTE Band 7_RMC
Channels	QPSK, 20MHz, 1RB, Low
Signal	Duty Cycle 1:1

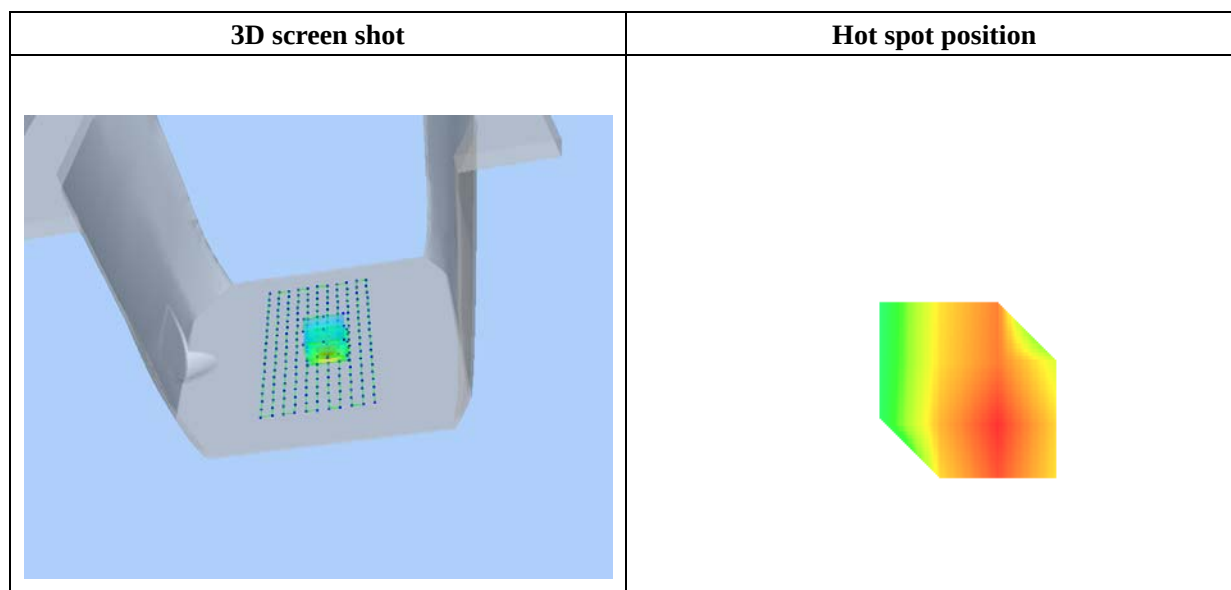
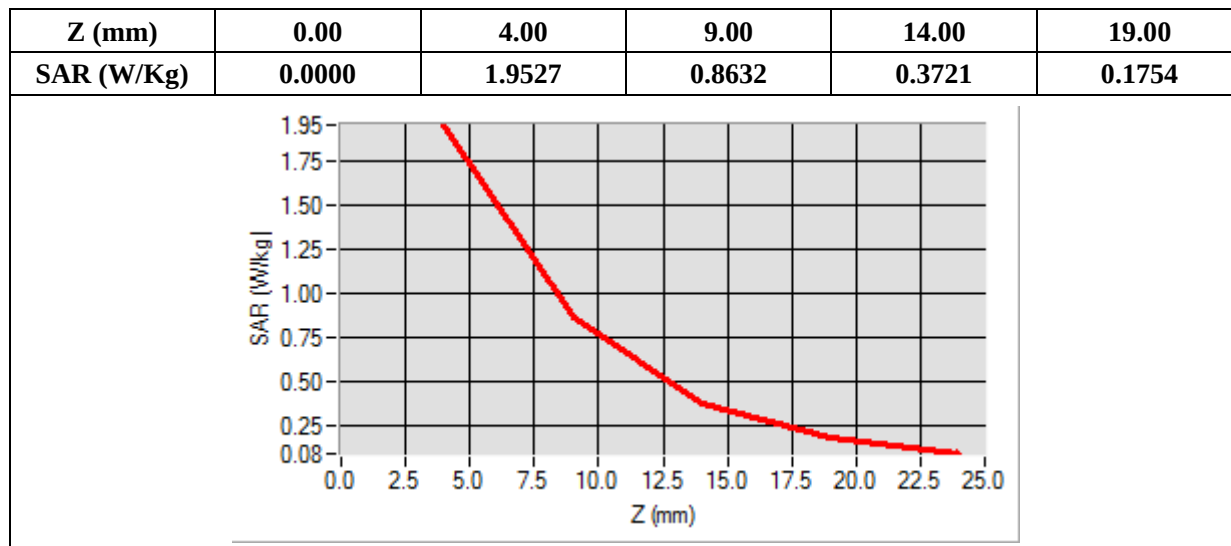
B. SAR Measurement Results

Frequency (MHz)	2510.000000
Relative Permittivity (real part)	52.241202
Conductivity (S/m)	2.120943
Power Variation (%)	0.858383
Ambient Temperature	21.1
Liquid Temperature	21.2



Maximum location: X=8.00, Y=-9.00

SAR 10g (W/Kg)	0.776598
SAR 1g (W/Kg)	1.755286



MEASUREMENT 54

Type: Phone measurement (Complete)

Date of measurement: 11/14/2016

Measurement duration: 12 minutes 3 seconds

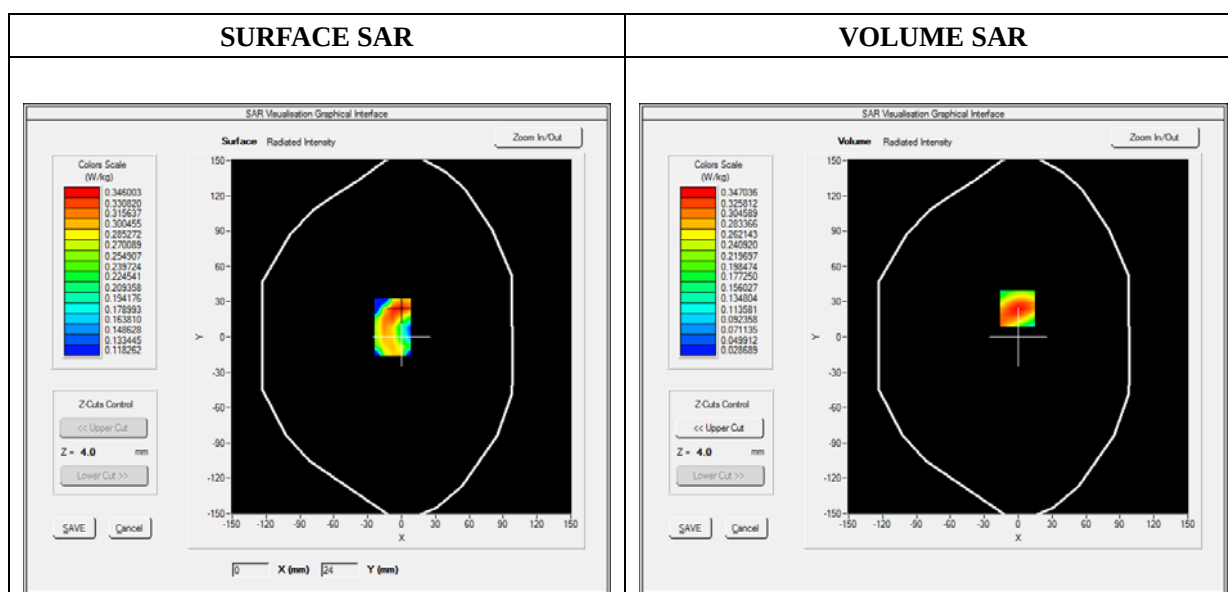
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2016

A. Experimental conditions

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

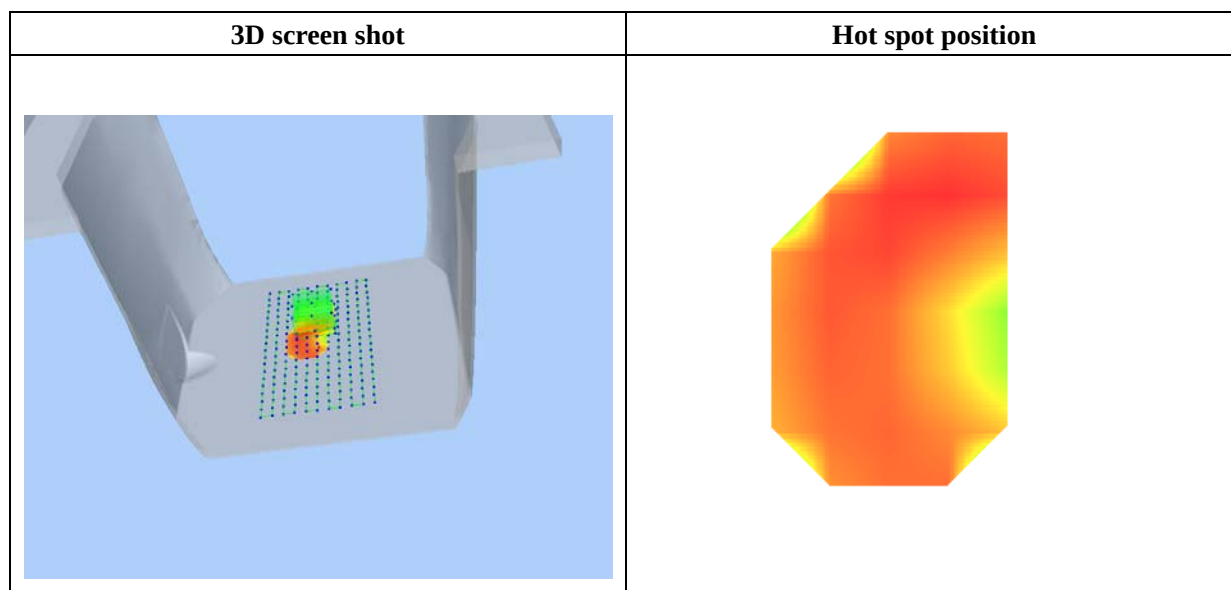
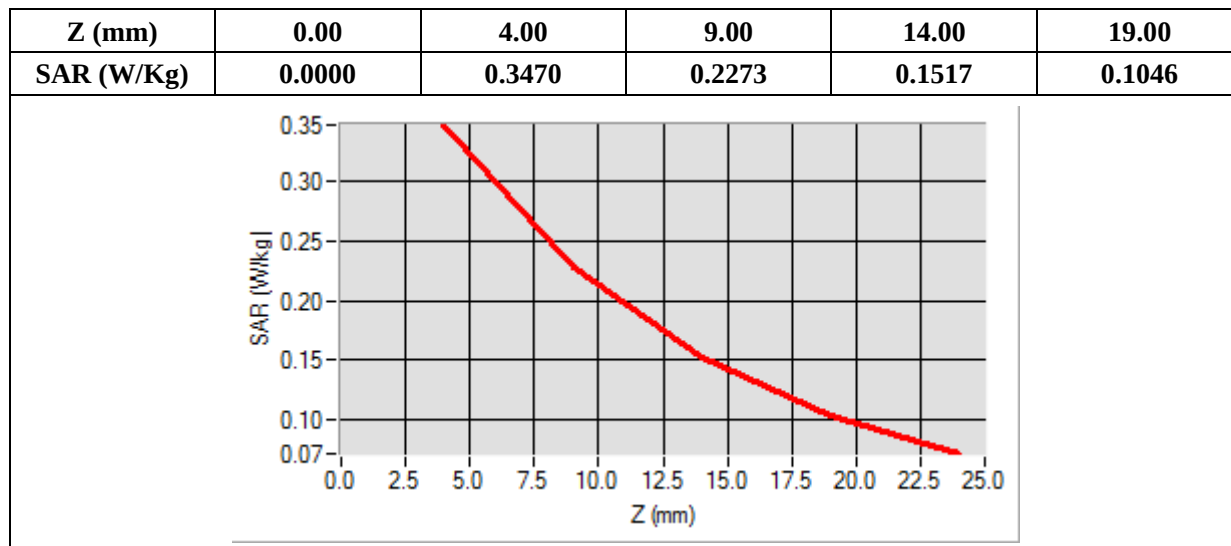
B. SAR Measurement Results

Frequency (MHz)	2412.000000
Relative Permittivity (real part)	52.010212
Conductivity (S/m)	1.910255
Power Variation (%)	0.462345
Ambient Temperature	21.1
Liquid Temperature	21.2



Maximum location: X=-1.00, Y=24.00

SAR 10g (W/Kg)	0.205559
SAR 1g (W/Kg)	0.324885



Annex C. EUT Photos

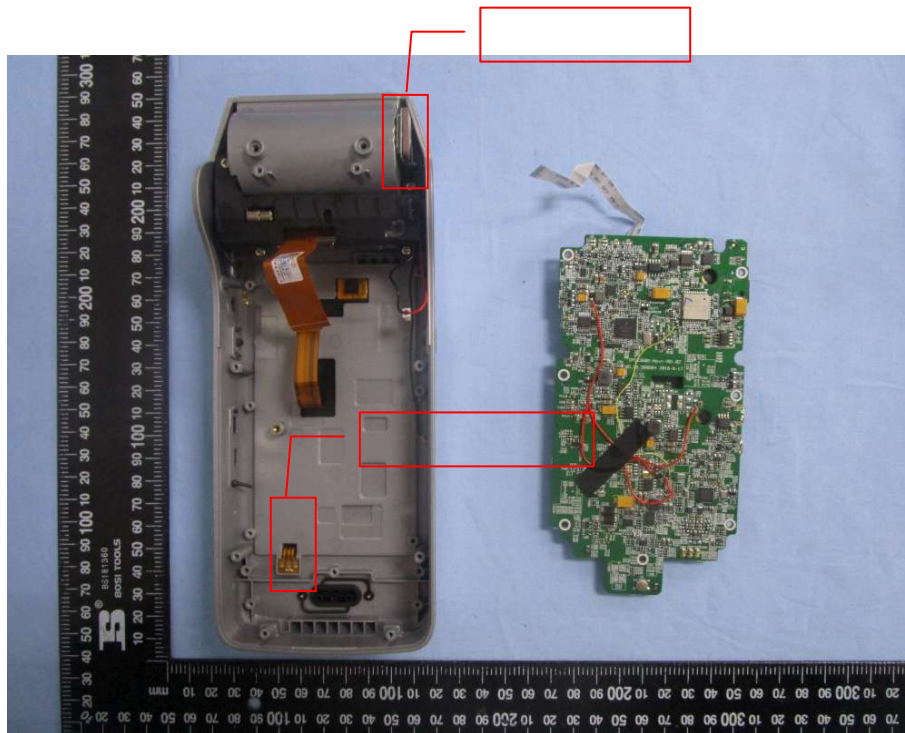
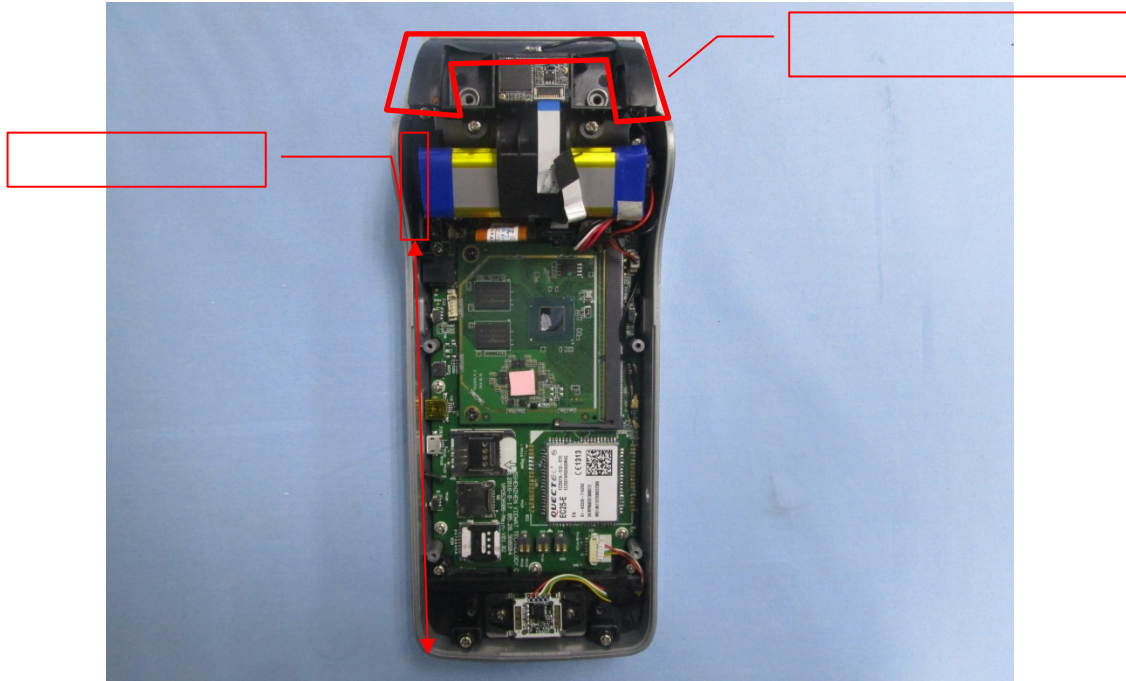
EUT View Front



EUT View Back



Antenna View



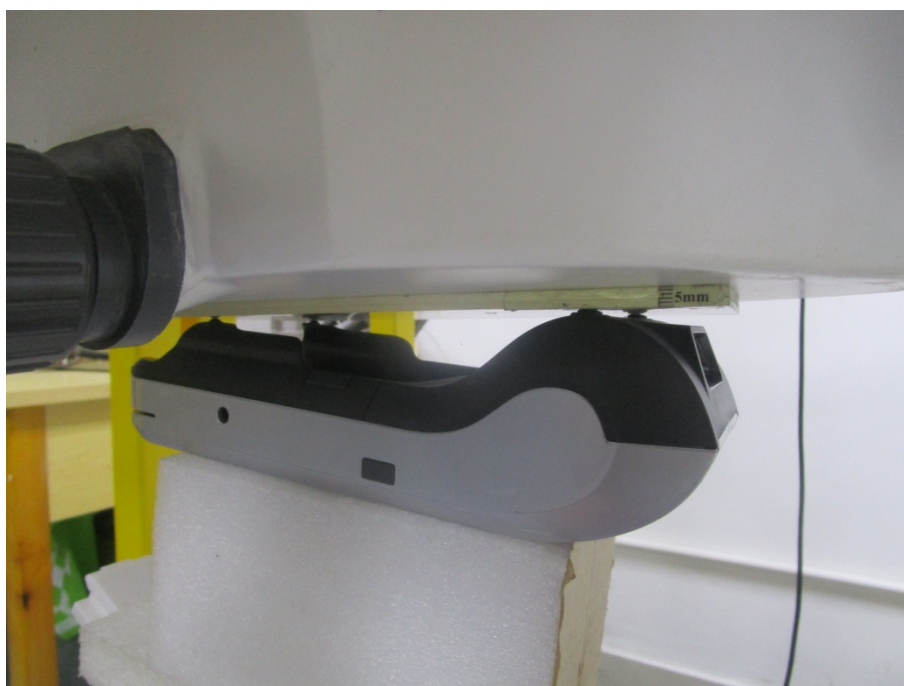
Annex D. Test Setup Photos

Body mode Exposure Conditions

Body Front



Body Back



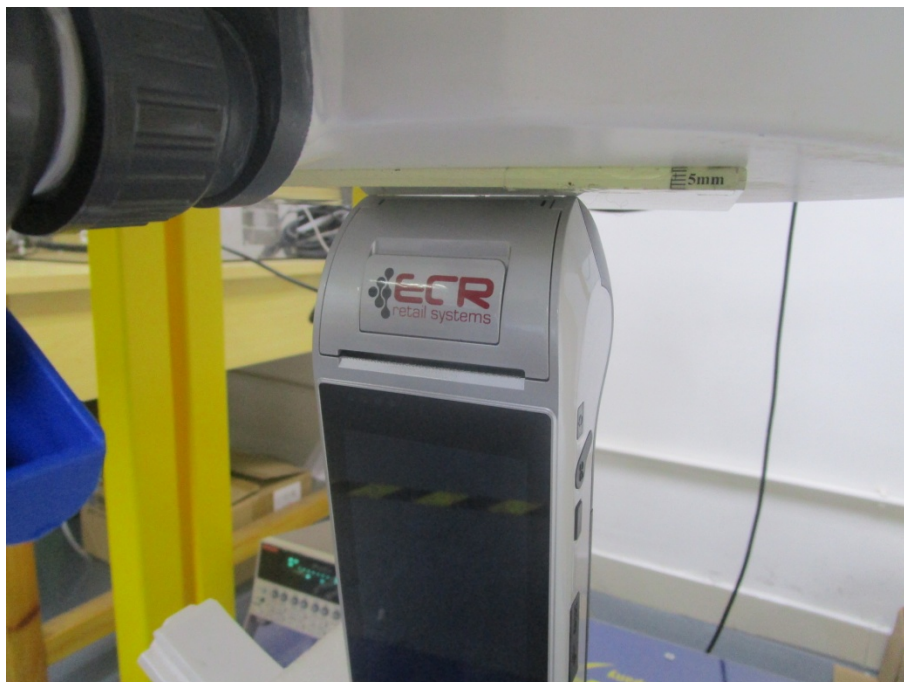
Body Right



Body Left



Body Top



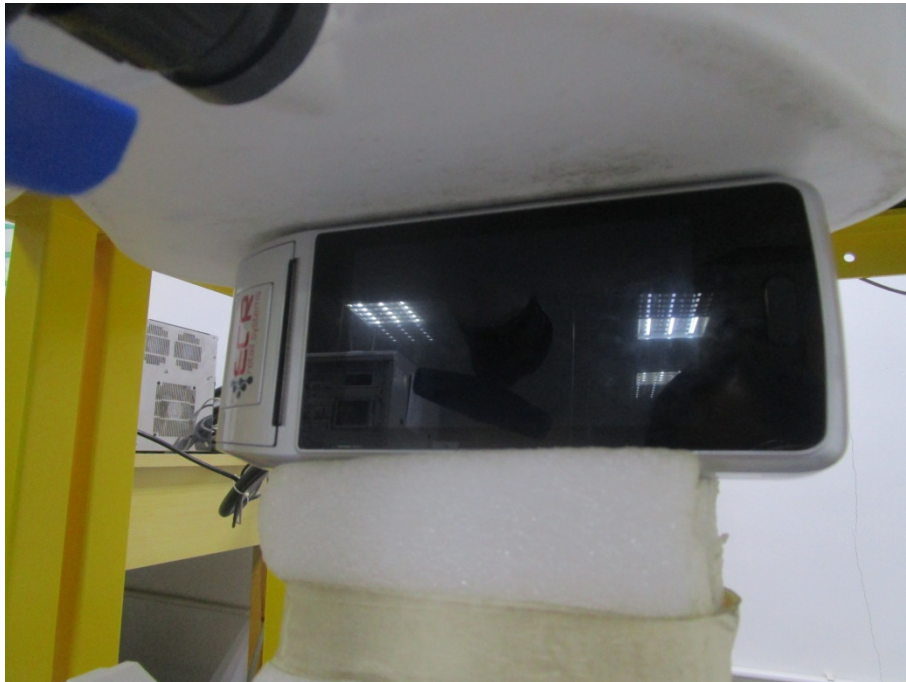
Hand exposure Conditions

Body Front



Body Back



Body Right**Body Left**

Body Top

Annex E. Calibration Certificate

Please refer to the Exhibit for the Calibration Certificate

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