FCC SAR
Measurement and Test Report

For

Worldwide telecom limited

2F Block C; Shenfang Building, Zhen Hualu, Futian, Shenzhen, China.

FCC ID: 2ARO3-WS5SE

FCC Rules:	FCC Part 2.1093 ANSI / IEEE C95.1 :2005+A1:2010 ANSI / IEEE C95.3 :2002(R2008) IEEE 1528 :2013
Product Description:	Smart phone
Tested Model:	WS5SE
Report No.:	WTX19X10071420W
Sample Received Date:	2019-10-17
Tested Date:	2019-10-17 to 2019-11-18
Issued Date:	2019-11-19
Tested By:	Ruler Liu / Engineer
Reviewed By:	Silin Chen / EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager
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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Worldwide telecom limited
Address of applicant:	2F Block C; Shenfang Building, Zhen Hualu, Futian, Shenzhen, China.
Manufacturer:	Worldwide telecom limited
Address of manufacturer:	2F Block C; Shenfang Building, Zhen Hualu, Futian, Shenzhen, China.

General Description of EUT	
Product Name:	Smart phone
Brand Name:	WOLKI
Model No.:	WS5SE
Adding Model:	/
Rated Voltage:	DC 3.7V Battery
Battery Capacity:	1580mAh
Note: The test data is gathered from a production sample, provided by the manufacturer. For more information see the following datasheet	

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: 31.85dBm, GSM1900: 29.10dBm
Type of Modulation:	GMSK
Antenna Type:	Integral Antenna
Antenna Gain:	GSM850: -0.5dBi; GSM1900: 0.5dBi
GPRS Class:	Class 12
3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band II, WCDMA Band V
Uplink Frequency:	WCDMA Band II: 1850~1910MHz WCDMA Band V: 824~849MHz

Downlink Frequency:	WCDMA Band II: 1930~1990MHz WCDMA Band V: 869~894MHz
RF Output Power:	WCDMA Band II: 25.04dBm, WCDMA Band V: 24.51dBm
Type of Modulation:	BPSK, QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA Band II: 0.5dBi, WCDMA Band V: -0.5dBi
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:	15.87dBm (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:	0.7dBi
Bluetooth	
Bluetooth Version:	V4.0
Frequency Range:	2402-2480MHz
AV Output Power:	2.964dBm (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:	0.7dBi

1.2 Test Standards

The following report is prepared on behalf of the Worldwide telecom limited in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-2005, IEEE 1528-2013, KDB 865664 D01 v01r04, KDB 865664 D02 v01r02, KDB 941225 D06 Hotspot mode v02r01, KDB 447498 D01 v06, KDB 648474 D04 v01r03 and KDB 941225 D01 v03r01 and KDB 248227 D01 v02r02.

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

Address of the test laboratory
Laboratory: Shenzhen SEM Test Technology Co., Ltd.
Address: 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C. (518101）

FCC – Registration No.: 125990
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. The Designation Number is CN5010.Test Firm Registration Number is 125990.

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.

2. Summary of Test Results

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

Frequency Band	Head SAR	Body-worn (10mm Gap)	Hotspot (10mm Gap)	SAR_{1g} Limit (W/kg)
	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	Maximum SAR_{1g} (W/kg)	
GSM850	**0.470**	0.666	1.025	1.6
GSM1900	0.037	0.401	0.554	1.6
WCDMA Band V	0.124	0.297	0.297	1.6
WCDMA Band II	0.103	**1.450**	**1.450**	1.6
WLAN 2.4GHz	0.146	0.055	0.055	1.6
Simultaneous Transmission	0.616	1.505	**1.505**	1.6

The highest reported SAR values for head, body-worn accessory, wireless router(hotspot) , and simultaneous transmission conditions are ***0.470 W/kg, 1.450W/kg , 1.450W/kg, and 1.505W/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 IEEE 1528-2013 and 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:

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

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

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

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

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

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

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

4. SAR Measurement System

4.1 The Measurement System

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

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

The following figure shows the system.

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

4.2 Probe

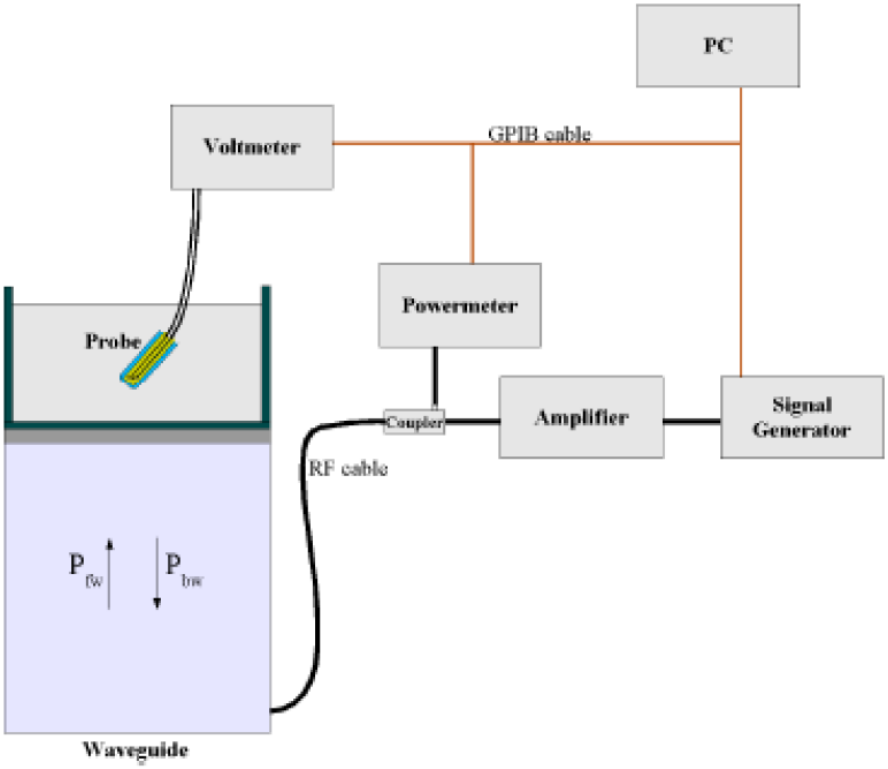
For the measurements the Specific Dosimetric E-Field Probe SSE5 SN 09/13 EP168 with following specifications is used

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

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

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

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



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

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:

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

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

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

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.

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

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.

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

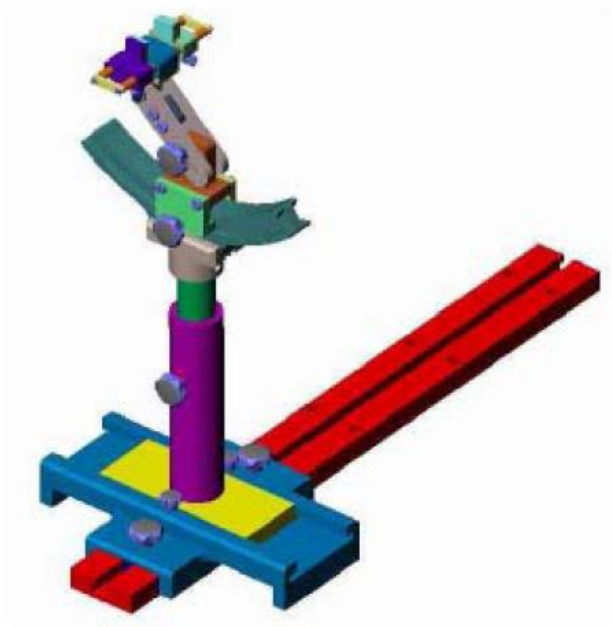
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

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

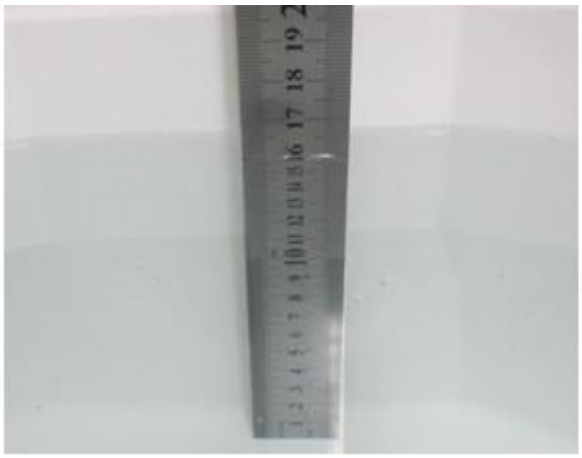
4.6 Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	MVG	SSE5	SN 09/13 EP168	2019-05-22	2020-05-21
835MHz Dipole	MVG	SID835	SN 47/12 DIP 0G835-204	2019-03-16	2020-03-15
1900MHz Dipole	MVG	SID1900	SN 47/12 DIP 1G900-207	2019-03-16	2020-03-15
2450MHz Dipole	MVG	SID2450	SN 13/15 DIP 2G450-364	2019-03-16	2020-03-15
Dielectric Probe Kit	SATIMO	SCLMP	SN 47/12 OCPG49	2019-03-16	2020-03-15
SAM Phantom	SATIMO	SAM	SN/ 47/12 SAM95	N/A	N/A
MULTIMETER	KEITHLEY	Keithley 2000	4006367	2019-04-30	2020-04-29
Signal Generator	Rohde & Schwarz	SMR20	100047	2019-04-30	2020-04-29
Universal Tester	Rohde & Schwarz	CMU200	112012	2019-04-30	2020-04-29
Network Analyzer	HP	8753C	2901A00831	2019-04-30	2020-04-29
Directional Couplers	Agilent	778D	20160	2019-04-30	2020-04-29

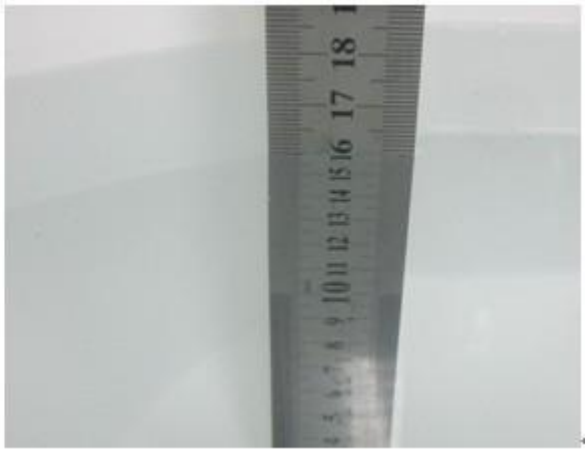
5. Tissue Simulating Liquids

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 (%)
Head						
835	40.3	1.4	57.9	0.2	0.2	0
1900	55.2	0.3	0	0	0	44.5
2450	55.0	0.1	0	0	0	44.9
Body						
835	50.8	0.9	48.2	0	0.1	0.00
1900	70.2	0.4	0	0	0	29.4
2450	68.6	0.1	0	0	0	31.3

5.2 Tissue Dielectric Parameters for Head and Body Phantoms

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

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

5.3 Tissue Calibration Result

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

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Head Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (ε r)	Target (ε r)	Delta (%)		
835	21.2	0.87	0.90	-3.33	41.11	41.50	-0.94	±5	2019-11-11
1900	21.3	1.38	1.40	-1.43	38.56	40.00	-3.60	±5	2019-11-12
2450	21.3	1.76	1.80	-2.22	38.6	39.2	-1.53	±5	2019-11-13

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	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	2019-11-11
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2019-11-12
2450	21.3	2.00	1.95	2.56	52.3	52.7	-0.76	±5	2019-11-13

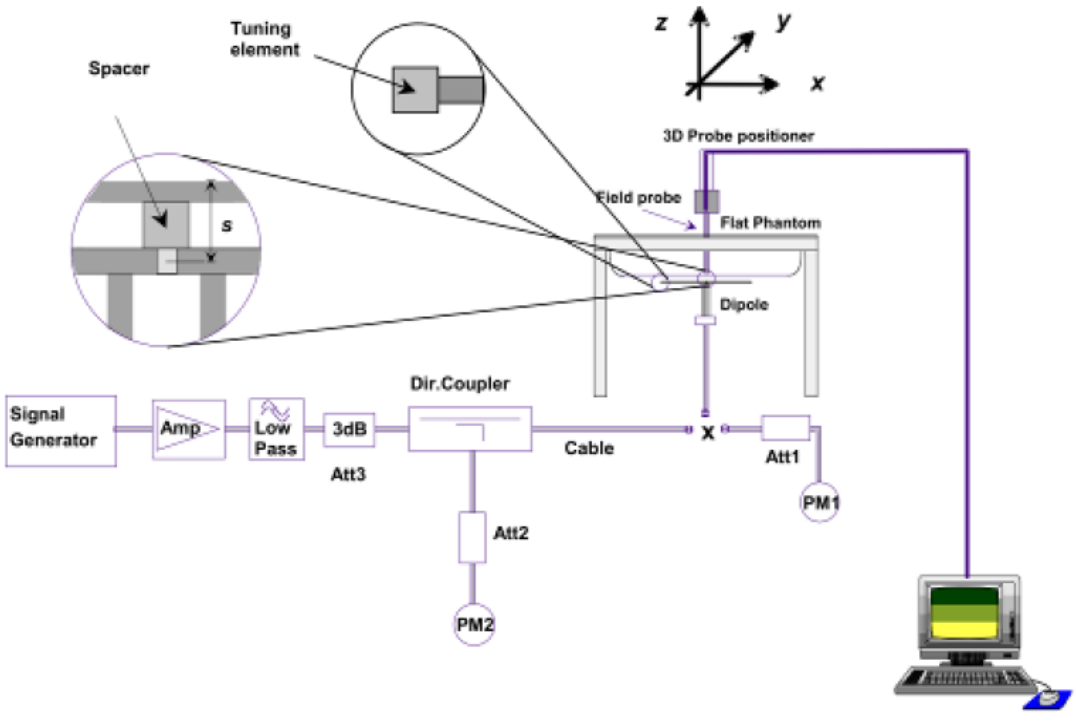
6. SAR Measurement Evaluation

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,1900MHz and 2450MHz. 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)	(%)
Head				
835	9.67	2.39	9.56	-1.14
1900	39.58	9.91	39.64	0.15
2450	53.69	13.46	53.84	0.28
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 Define Two Imaginary Lines on The Handset

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

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

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

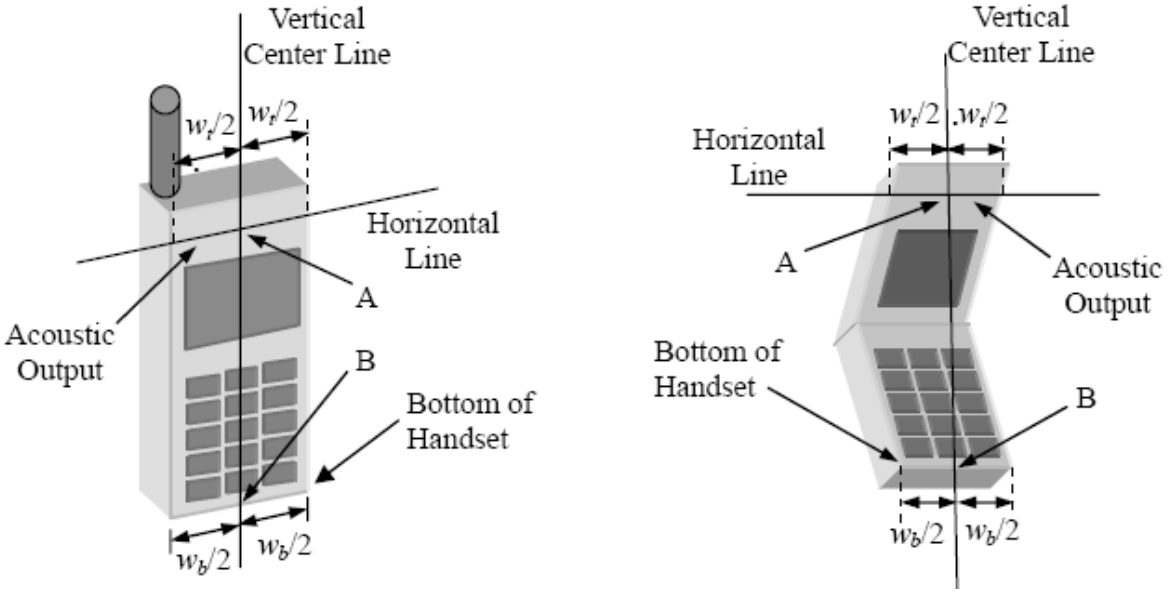


Illustration for Handset Vertical and Horizontal Reference Lines

7.2 Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 7.2).

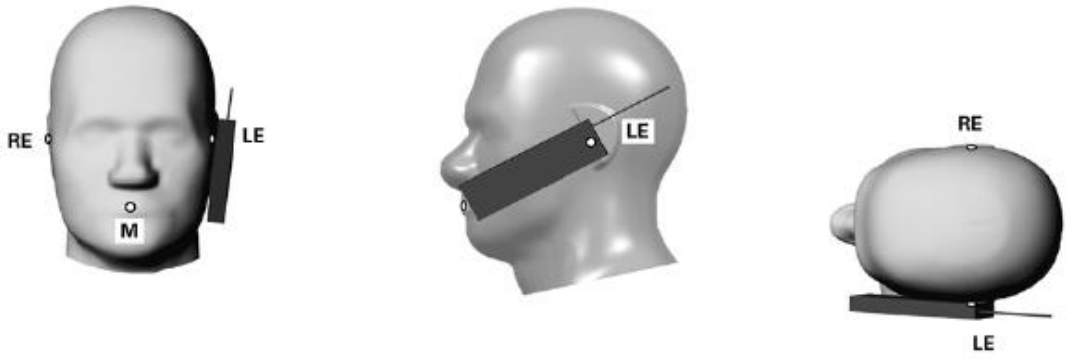


Illustration for Cheek Position

7.3 Tilted Position

(a) To position the device in the “cheek” position described above.
(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 7.3).

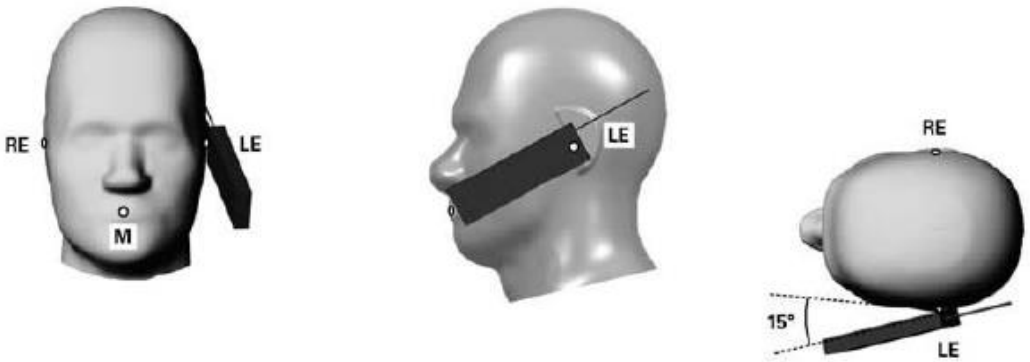


Illustration for Tilted Position

7.4 Body Position

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

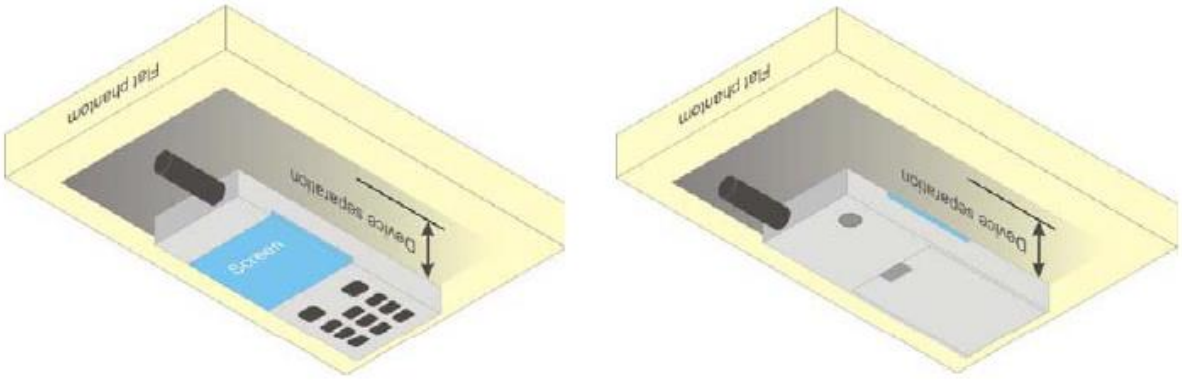
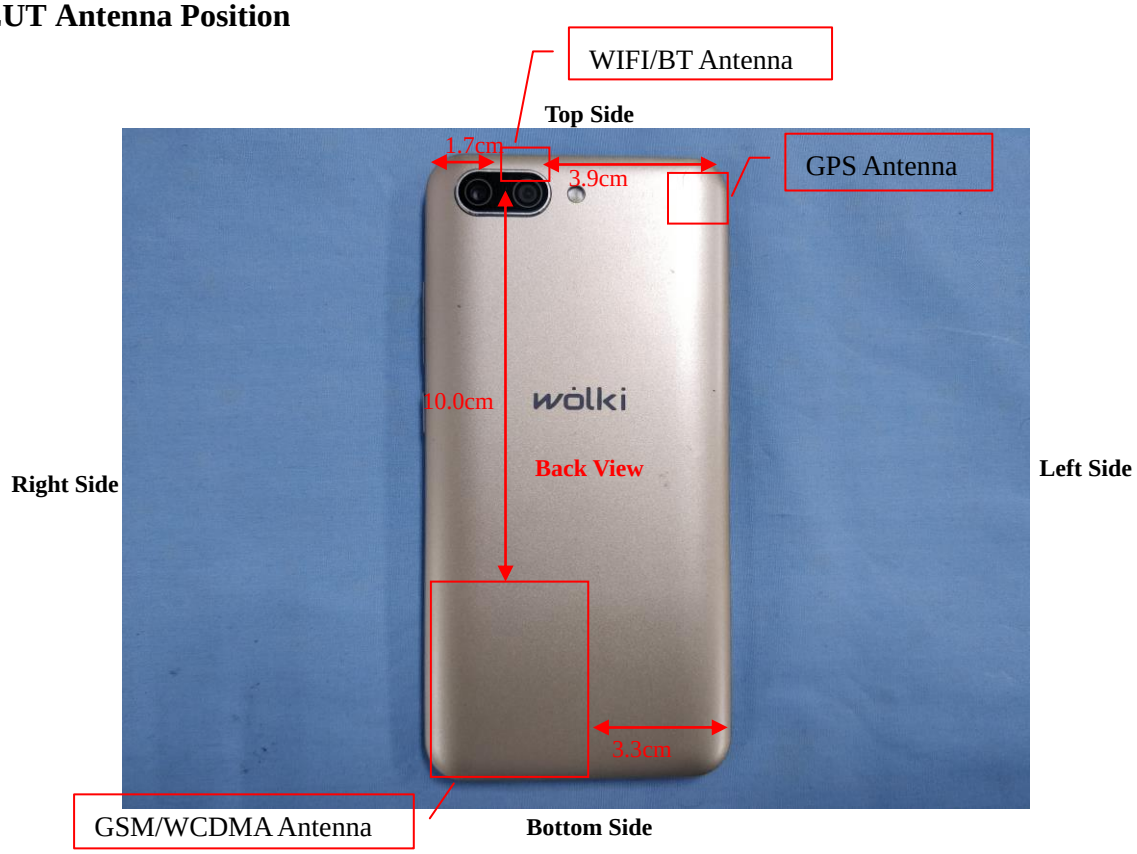


Illustration for Body Position

7.5 EUT Antenna Position



Block Diagram for EUT Antenna Position

7.6 EUT Testing Position

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

Head SAR tests				
Antennas	**Right Cheek**	**Left Cheek**	**Right Tilted**	**Left Tilted**
WWAN	Yes	Yes	Yes	Yes
WLAN	Yes	Yes	Yes	Yes

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

Body-worn SAR tests, Test distance: 10mm		
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 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

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

8. SAR Measurement Procedures

8.1 Measurement Procedures

The measurement procedures are as follows:
(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.
(b) Keep EUT to radiate maximum output power or 100% factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the EUT in the positions as Annex D 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**			**Tune-up power (dBm)**	**PCS1900**			**Tune-up power (dBm)**
Channel	**128**	**190**	**251**		**512**	**661**	**810**	
Frequency (MHz)	**824.2**	**836.6**	**848.8**		**1850.2**	**1880**	**1909.8**	
GSM	31.19	31.47	31.76	32.0	29.10	28.54	28.20	29.5
GPRS (1 slot)	31.26	31.60	31.85	32.0	29.06	28.53	28.22	29.5
GPRS (2 slots)	30.89	30.81	31.06	31.5	28.66	28.03	27.53	29.0
GPRS (3 slots)	28.46	28.83	29.09	29.5	27.24	26.43	25.79	27.5
GPRS (4 slots)	27.15	27.53	27.78	28.0	26.23	25.77	25.70	26.5

GSM - Source-Based Time-Average Power (dBm)								
Band	**GSM850**			**Tune-up power (dBm)**	**PCS1900**			**Tune-up power (dBm)**
Channel	**128**	**190**	**251**		**512**	**661**	**810**	
Frequency (MHz)	**824.2**	**836.6**	**848.8**		**1850.2**	**1880**	**1909.8**	
GSM	22.19	22.47	22.76	23.0	20.10	19.54	19.20	20.5
GPRS (1 slot)	22.26	22.60	22.85	23.0	20.06	19.53	19.22	20.5
GPRS (2 slots)	24.89	24.81	25.06	25.5	22.66	22.03	21.53	23.0
GPRS (3 slots)	24.21	24.58	24.84	25.0	22.99	22.18	21.54	23.0
GPRS (4 slots)	24.15	24.53	24.78	25.0	23.23	22.77	22.70	23.5
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 Duty cycle factor = 9 dB for 1 Tx slot, 6 dB for 2 Tx slots, 4.25 dB for 3 Tx slots, 3 dB for 4 Tx slots								

Remark:

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

WCDMA - Average Power (dBm)								
Band	**WCDMA Band II**				**WCDMA Band V**			
Channel	**9262**	**9400**	**9538**	**Tune-up power (dBm)**	**4132**	**4183**	**4233**	**Tune-up power (dBm)**
Frequency (MHz)	**1852.4**	**1880.0**	**1907.6**		**826.4**	**836.6**	**846.6**	
RMC 12.2k	25.04	25.03	24.91	25.5	24.08	24.15	24.51	25.0
HSDPA Subtest-1	24.38	23.12	23.87	24.5	23.77	23.04	23.67	24.0
HSDPA Subtest-2	24.36	23.11	23.85	24.5	23.75	23.01	23.65	24.0
HSDPA Subtest-3	24.37	23.10	23.86	24.5	23.75	23.02	23.64	24.0
HSDPA Subtest-4	24.36	23.09	23.86	24.5	23.76	23.02	23.63	24.0
HSUPA Subtest-1	24.61	24.99	24.66	25.0	23.96	23.98	23.61	24.0
HSUPA Subtest-2	24.59	24.96	24.61	25.0	23.92	23.96	23.59	24.0
HSUPA Subtest-3	24.56	24.95	24.62	25.0	23.94	23.97	23.57	24.0
HSUPA Subtest-4	24.57	24.93	24.62	25.0	23.95	23.96	23.57	24.0
HSUPA Subtest-5	24.56	24.96	24.63	25.0	23.94	23.96	23.58	24.0

Remark:

1. per KDB 941225 D01 v03, The 12.2kbps RMC mode was selected for SAR testing(the primary mode).

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤1/4 dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

WLAN - Maximum Average Power					
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**	**Tune-up power (dBm)**
802.11b	1Mbps	CH 01	2412	14.65	16.0
		CH 06	2437	15.87	16.0
		CH 11	2462	14.97	16.0
802.11g	6Mbps	CH 01	2412	13.07	14.5
		CH 06	2437	13.75	14.5
		CH 11	2462	14.06	14.5
802.11n (20MHz)	MCS0	CH 01	2412	13.06	14.0
		CH 06	2437	13.33	14.0
		CH 11	2462	13.96	14.0
802.11n (40MHz)	MCS0	CH 03	2422	13.29	15.0
		CH 06	2437	14.58	15.0
		CH 09	2452	14.33	15.0

Remark:

1. Per KDB 248227 D01 v02r02, For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

2. Per KDB 248227 D01 v02r02, For 802.11b DSSS SAR measurements ,when the reported SAR of the highest measured maximum output power channel (see 3.1) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

3 .For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is <= 1.2W/kg.

Bluetooth - Maximum Average Power			
Test Mode	**Data Rate**	**Average Power(dBm)**	**Tune-up power (dBm)**
GFSK	1Mbps	2.964	3.0
Pi/4 QDPSK	2Mbps	1.955	3.0
8DPSK	3Mbps	2.426	3.0

Bluetooth - Maximum Average Power					
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**	**Tune-up power (dBm)**
BLE	1Mbps	CH 00	2402	-4.913	-4.0
		CH 19	2440	-5.189	-4.0
		CH 39	2480	-4.417	-4.0

Remark:

Bluetooth maximum output power is 2.964dBm, and Tune-Up output power is 3.0dBm. 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
3.0	2.0	5	2.480	0.630	3

The exclusion thresholds is 0.630< 3, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Head SAR

GSM850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
1.	GSM	Right Cheek	251	848.8	31.76	32.0	1.057	0.245	0.259
2.	GSM	Right Tilted	251	848.8	31.76	32.0	1.057	0.133	0.141
3.	GSM	Left Cheek	251	848.8	31.76	32.0	1.057	0.202	0.213
4.	GSM	Left Tilted	251	848.8	31.76	32.0	1.057	0.118	0.125

GSM1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	M Hz					
5.	GSM	Right Cheek	512	1850.2	29.10	29.5	1.096	0.023	0.025
6.	GSM	Right Tilted	512	1850.2	29.10	29.5	1.096	0.013	0.014
7.	GSM	Left Cheek	512	1850.2	29.10	29.5	1.096	0.022	0.024
8.	GSM	Left Tilted	512	1850.2	29.10	29.5	1.096	0.011	0.012

GSM850 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
9.	GPRS_2TX	Right Cheek	251	848.8	31.06	31.5	1.107	0.425	0.470
10.	GPRS_2TX	Right Tilted	251	848.8	31.06	31.5	1.107	0.255	0.282
11.	GPRS_2TX	Left Cheek	251	848.8	31.06	31.5	1.107	0.417	0.461
12.	GPRS_2TX	Left Tilted	251	848.8	31.06	31.5	1.107	0.229	0.253

GSM1900 – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	M Hz					
13.	GPRS_4TX	Right Cheek	512	1850.2	26.23	26.5	1.064	0.026	0.028
14.	GPRS_4TX	Right Tilted	512	1850.2	26.23	26.5	1.064	0.015	0.016
15.	GPRS_4TX	Left Cheek	512	1850.2	26.23	26.5	1.064	0.035	0.037
16.	GPRS_4TX	Left Tilted	512	1850.2	26.23	26.5	1.064	0.018	0.019

WCDMA Band V – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
17.	RMC	Right Cheek	4233	846.6	24.51	25.0	1.119	0.111	0.124
18.	RMC	Right Tilted	4233	846.6	24.51	25.0	1.119	0.066	0.074
19.	RMC	Left Cheek	4233	846.6	24.51	25.0	1.119	0.111	0.124
20.	RMC	Left Tilted	4233	846.6	24.51	25.0	1.119	0.064	0.072

WCDMA Band II – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
21.	RMC	Right Cheek	9262	1852.4	25.04	25.5	1.112	0.080	0.089
22.	RMC	Right Tilted	9262	1852.4	25.04	25.5	1.112	0.043	0.048
23.	RMC	Left Cheek	9262	1852.4	25.04	25.5	1.112	0.093	0.103
24.	RMC	Left Tilted	9262	1852.4	25.04	25.5	1.112	0.051	0.057

WLAN 2.4GHz – Head SAR Test									
Plot No.	Mode	Test Position Head	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
25.	802.11b	Right Cheek	06	2437	15.87	16.0	1.030	0.142	0.146
26.	802.11b	Right Tilted	06	2437	15.87	16.0	1.030	0.068	0.070
27.	802.11b	Left Cheek	06	2437	15.87	16.0	1.030	0.077	0.079
28.	802.11b	Left Tilted	06	2437	15.87	16.0	1.030	0.041	0.042

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.

Body-worn SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
29.	GSM	Back	251	848.8	31.76	32.0	1.057	0.630	0.666
30.	GSM	Front	251	848.8	31.76	32.0	1.057	0.117	0.124

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
31.	GSM	Back	512	1850.2	29.10	29.5	1.096	0.366	0.401
32.	GSM	Front	512	1850.2	29.10	29.5	1.096	0.046	0.050

WCDMA Band V – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
33.	RMC 12.2k	Back Side	4233	846.6	24.51	25.0	1.119	0.265	0.297
34.	RMC 12.2k	Front Side	4233	846.6	24.51	25.0	1.119	0.067	0.075

WCDMA Band II – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
35.	RMC 12.2k	Back Side	9262	1852.4	25.04	25.5	1.112	1.304	1.450
36.	RMC 12.2k	Back Side	9400	1880.0	25.03	25.5	1.114	1.236	1.377
37.	RMC 12.2k	Back Side	9538	1907.6	24.91	25.5	1.146	0.920	1.054
38.	RMC 12.2k	Front Side	9262	1852.4	25.04	25.5	1.112	0.200	0.222

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					
39.	802.11b	Back Side	06	2437	15.87	16.0	1.030	0.053	0.055
40.	802.11b	Front Side	06	2437	15.87	16.0	1.030	0.024	0.025

Hotspot SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
41.	GPRS_2TX	Back Side	251	848.8	31.06	31.5	1.107	0.926	1.025
42.	GPRS_2TX	Back Side	128	824.2	30.89	31.5	1.151	0.777	0.894
43.	GPRS_2TX	Back Side	190	836.6	30.81	31.5	1.172	0.797	0.934
44.	GPRS_2TX	Front Side	251	848.8	31.06	31.5	1.107	0.233	0.258
45.	GPRS_2TX	Right side	251	848.8	31.06	31.5	1.107	0.151	0.167
46.	GPRS_2TX	Bottom side	251	848.8	31.06	31.5	1.107	0.281	0.311

GSM1900 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
47.	GPRS_4TX	Back Side	512	1850.2	26.23	26.5	1.064	0.521	0.554
48.	GPRS_4TX	Front Side	512	1850.2	26.23	26.5	1.064	0.071	0.076
49.	GPRS_4TX	Right side	512	1850.2	26.23	26.5	1.064	0.113	0.120
50.	GPRS_4TX	Bottom side	512	1850.2	26.23	26.5	1.064	0.259	0.276

WCDMA Band V – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
51.	RMC 12.2k	Back Side	4233	846.6	24.51	25.0	1.119	0.265	0.297
52.	RMC 12.2k	Front Side	4233	846.6	24.51	25.0	1.119	0.067	0.075
53.	RMC 12.2k	Right side	4233	846.6	24.51	25.0	1.119	0.051	0.057
54.	RMC 12.2k	Bottom side	4233	846.6	24.51	25.0	1.119	0.074	0.083

WCDMA Band II – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
55.	RMC 12.2k	Back Side	9262	1852.4	25.04	25.5	1.112	1.304	1.450
56.	RMC 12.2k	Back Side	9400	1880.0	25.03	25.5	1.114	1.236	1.377
57.	RMC 12.2k	Back Side	9538	1907.6	24.91	25.5	1.146	0.920	1.054
58.	RMC 12.2k	Front Side	9262	1852.4	25.04	25.5	1.112	0.200	0.222
59.	RMC 12.2k	Right side	9262	1852.4	25.04	25.5	1.112	0.237	0.263
60.	RMC 12.2k	Bottom side	9262	1852.4	25.04	25.5	1.112	0.654	0.727

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					
61.	802.11b	Back Side	06	2437	15.87	16.0	1.030	0.053	0.055
62.	802.11b	Front Side	06	2437	15.87	16.0	1.030	0.024	0.025
63.	802.11b	Right side	06	2437	15.87	16.0	1.030	0.006	0.006
64.	802.11b	Top Side	06	2437	15.87	16.0	1.030	0.027	0.028

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.

Repeated SAR

GSM850 – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
65.	GPRS_2TX	Back Side	251	848.8	31.06	31.5	1.107	0.911	1.008

WCDMA Band II – Body SAR Test (Gap: 10mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
			CH.	MHz					
66.	RMC 12.2k	Back Side	9262	1852.4	25.04	25.5	1.112	1.281	1.424

Remark:

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

9.3 Simultaneous Multi-band Transmission SAR Analysis

List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Head SAR	Body-worn SAR	Hotspot SAR
1	GSM(Voice/Data) + WLAN(Data)	Yes	Yes	Yes
2	WCDMA (Voice/Data) + WLAN(Data)	Yes	Yes	Yes
3	GSM(Voice/Data) + Bluetooth(Data)	Yes	Yes	-
4	WCDMA(Voice/Data) + Bluetooth(Data)	Yes	Yes	-

Remark:

1. GSM and WCDMA share the same antenna, and cannot transmit simultaneously.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. According to the KDB 447498 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	SAR(1g) 10mm
3.0	2.0	5/10	2.480	7.5	0.084	0.042

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

Head SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.259	0.146	0.405
Right Tilted	GSM850	0.141	0.070	0.211
Left Cheek	GSM850	0.213	0.079	0.292
Left Tilted	GSM850	0.125	0.042	0.167
Right Cheek	GSM1900	0.025	0.146	0.171
Right Tilted	GSM1900	0.014	0.070	0.084
Left Cheek	GSM1900	0.024	0.079	0.103
Left Tilted	GSM1900	0.012	0.042	0.054
Right Cheek	GPRS850	0.470	0.146	**0.616**
Right Tilted	GPRS850	0.282	0.070	0.352
Left Cheek	GPRS850	0.461	0.079	0.540
Left Tilted	GPRS850	0.253	0.042	0.295
Right Cheek	GPRS1900	0.028	0.146	0.174
Right Tilted	GPRS1900	0.016	0.070	0.086
Left Cheek	GPRS1900	0.037	0.079	0.116
Left Tilted	GPRS1900	0.019	0.042	0.061
Right Cheek	WCDMA Band V	0.090	0.146	0.236
Right Tilted	WCDMA Band V	0.048	0.070	0.118
Left Cheek	WCDMA Band V	0.104	0.079	0.183
Left Tilted	WCDMA Band V	0.057	0.042	0.099
Right Cheek	WCDMA Band II	0.089	0.146	0.235
Right Tilted	WCDMA Band II	0.048	0.070	0.118
Left Cheek	WCDMA Band II	0.103	0.079	0.182
Left Tilted	WCDMA Band II	0.057	0.042	0.099

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Right Cheek	GSM850	0.259	0.084	0.343
Right Tilted	GSM850	0.141	0.084	0.225
Left Cheek	GSM850	0.213	0.084	0.297
Left Tilted	GSM850	0.125	0.084	0.209
Right Cheek	GSM1900	0.025	0.084	0.109
Right Tilted	GSM1900	0.014	0.084	0.098
Left Cheek	GSM1900	0.024	0.084	0.108
Left Tilted	GSM1900	0.012	0.084	0.096
Right Cheek	GPRS850	0.470	0.084	**0.554**
Right Tilted	GPRS850	0.282	0.084	0.366
Left Cheek	GPRS850	0.461	0.084	0.545
Left Tilted	GPRS850	0.253	0.084	0.337
Right Cheek	GPRS1900	0.028	0.084	0.112
Right Tilted	GPRS1900	0.016	0.084	0.100
Left Cheek	GPRS1900	0.037	0.084	0.121
Left Tilted	GPRS1900	0.019	0.084	0.103
Right Cheek	WCDMA Band V	0.090	0.084	0.174
Right Tilted	WCDMA Band V	0.048	0.084	0.132
Left Cheek	WCDMA Band V	0.104	0.084	0.188
Left Tilted	WCDMA Band V	0.057	0.084	0.141
Right Cheek	WCDMA Band II	0.089	0.084	0.173
Right Tilted	WCDMA Band II	0.048	0.084	0.132
Left Cheek	WCDMA Band II	0.103	0.084	0.187
Left Tilted	WCDMA Band II	0.057	0.084	0.141

Body-worn SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.666	0.055	0.721
Front	GSM850	0.124	0.025	0.149
Back	GSM1900	0.401	0.055	0.456
Front	GSM1900	0.050	0.025	0.075
Back	WCDMA Band V	0.297	0.055	0.352
Front	WCDMA Band V	0.075	0.025	0.100
Back	WCDMA Band II	1.450	0.055	**1.505**
Front	WCDMA Band II	0.222	0.025	0.247

WWAN and Bluetooth

	WWAN		Bluetooth	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	0.666	0.042	0.708
Front	GSM850	0.124	0.042	0.166
Back	GSM1900	0.401	0.042	0.443
Front	GSM1900	0.050	0.042	0.092
Back	WCDMA Band V	0.297	0.042	0.339
Front	WCDMA Band V	0.075	0.042	0.117
Back	WCDMA Band II	1.450	0.042	**1.492**
Front	WCDMA Band II	0.222	0.042	0.264

Hotspot SAR

WWAN and WLAN

	WWAN		WLAN	Summed SAR (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	GSM850	1.025	0.055	1.080
Front	GSM850	0.258	0.025	0.283
Top side	GSM850	--	0.028	0.028
Left side	GSM850	--	--	--
Right side	GSM850	0.167	0.006	0.173
Bottom side	GSM850	0.311	--	0.311
Back	GSM1900	0.554	0.055	0.609
Front	GSM1900	0.076	0.025	0.101
Top side	GSM1900	--	0.028	0.028
Left side	GSM1900	--	--	--
Right side	GSM1900	0.120	0.006	0.126
Bottom side	GSM1900	0.276	--	0.276
Back	WCDMA Band V	0.297	0.055	0.352
Front	WCDMA Band V	0.075	0.025	0.100
Top side	WCDMA Band V	--	0.028	0.028
Left side	WCDMA Band V	--	--	--
Right side	WCDMA Band V	0.057	0.006	0.063
Bottom side	WCDMA Band V	0.083	--	0.083
Back	WCDMA Band II	1.450	0.055	**1.505**
Front	WCDMA Band II	0.222	0.025	0.247
Top side	WCDMA Band II	--	0.028	0.028
Left side	WCDMA Band II	--	--	--
Right side	WCDMA Band II	0.263	0.006	0.269
Bottom side	WCDMA Band II	0.727	--	0.727

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 Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/11/2019

Measurement duration: 7 minutes 21 seconds

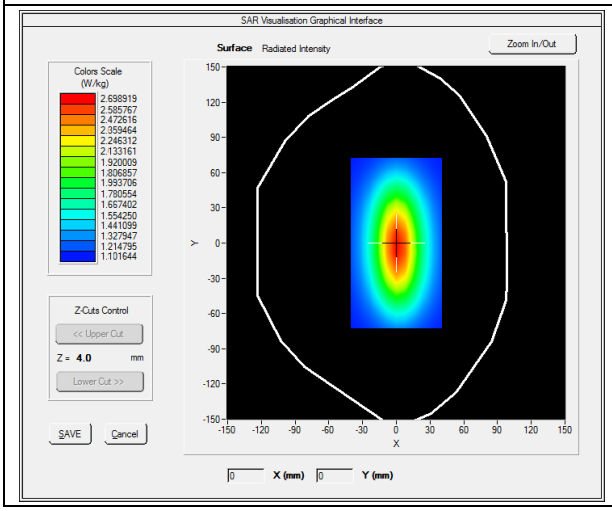
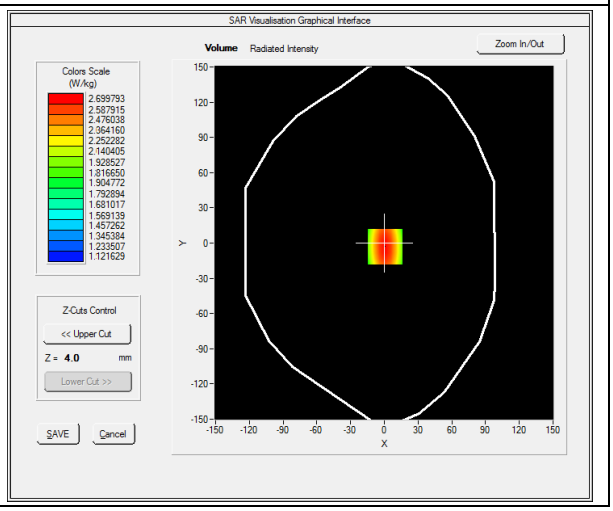
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.93; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	1.814580
Ambient Temperature	21.1
Liquid Temperature	21.3

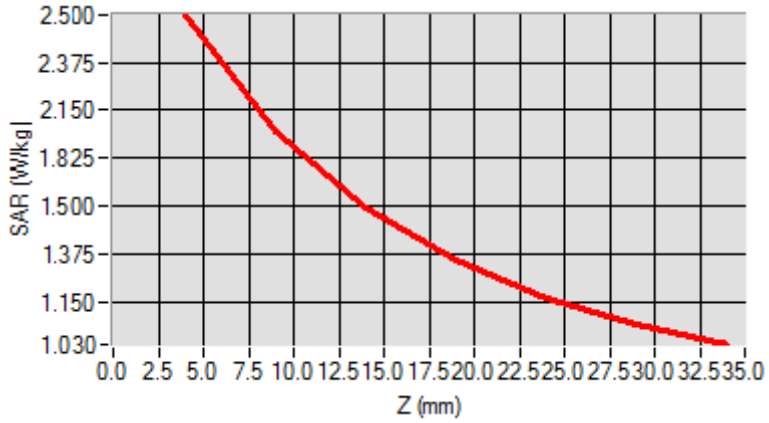
SURFACE SAR	VOLUME SAR
	

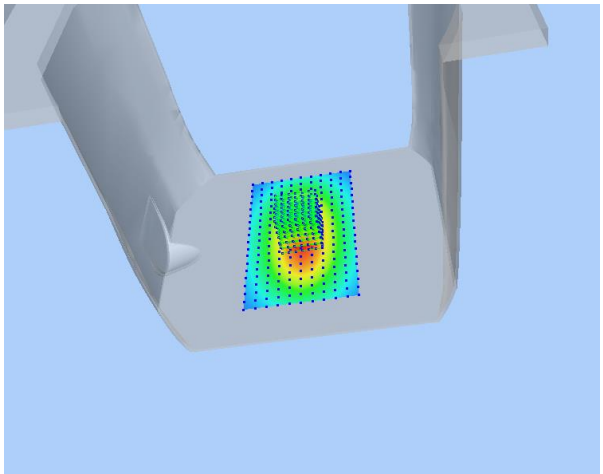
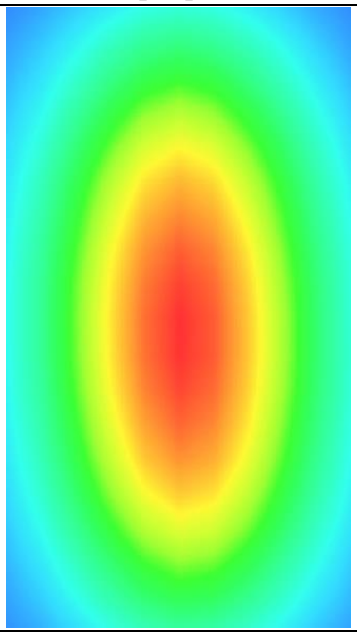
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**1.529489**
SAR 1g (W/Kg)	**2.391250**

Z Axis Scan

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



3D screen shot	**Hot spot position**
	

MEASUREMENT 2

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/12/2019

Measurement duration: 12 minutes 21 seconds

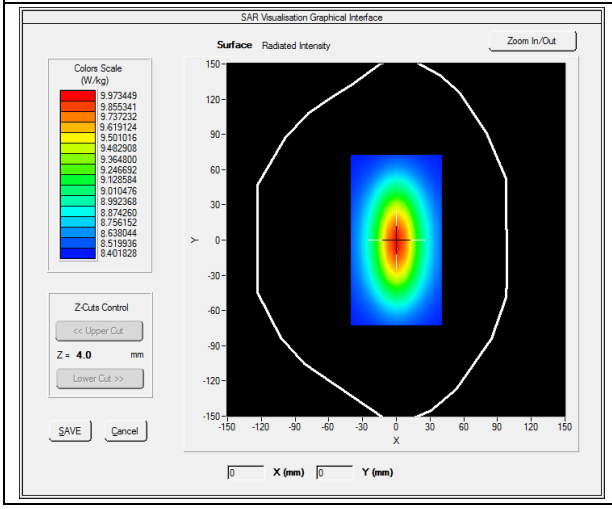
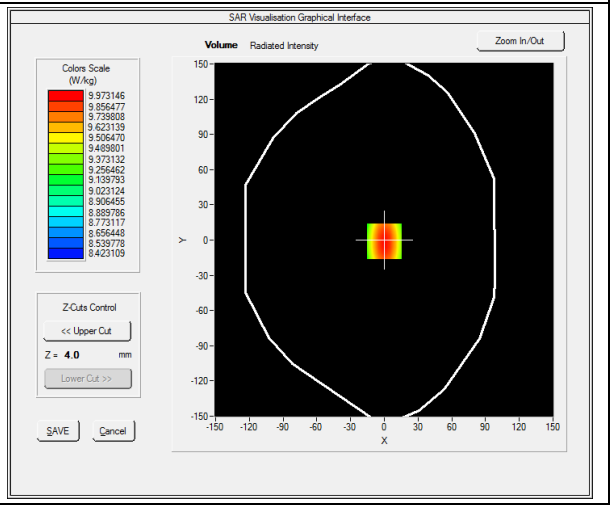
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.35; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.022540
Ambient Temperature	21.1
Liquid Temperature	21.3

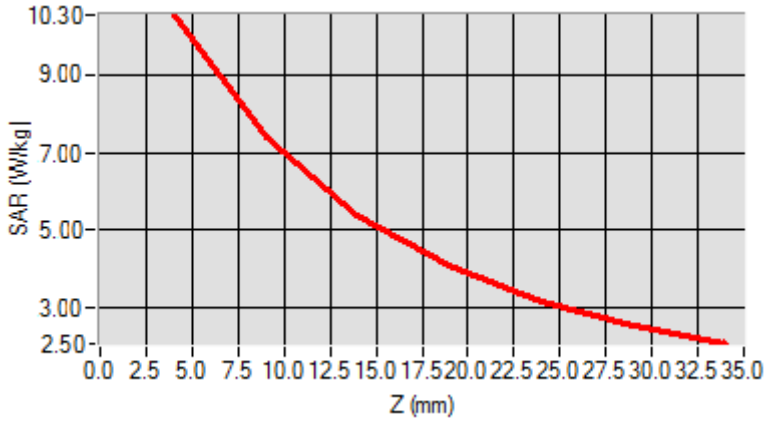
SURFACE SAR	VOLUME SAR
	

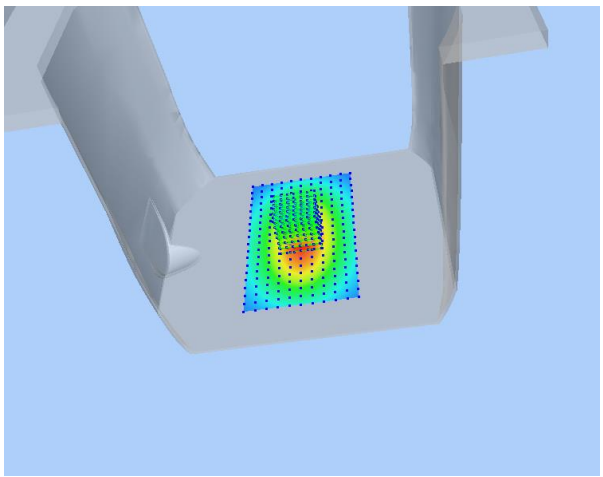
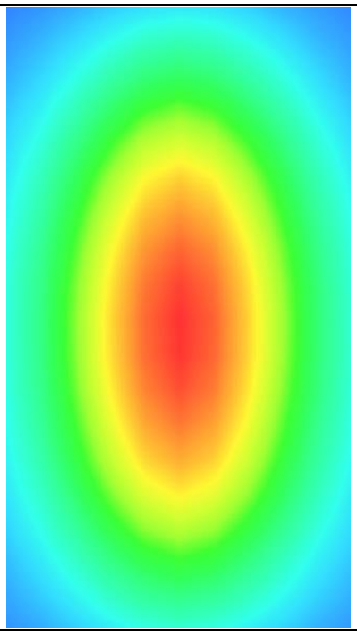
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	5.174526
SAR 1g (W/Kg)	9.913214

Z Axis Scan

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



3D screen shot	Hot spot position
	

MEASUREMENT 3

For Head Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/13/2019

Measurement duration: 12 minutes 21 seconds

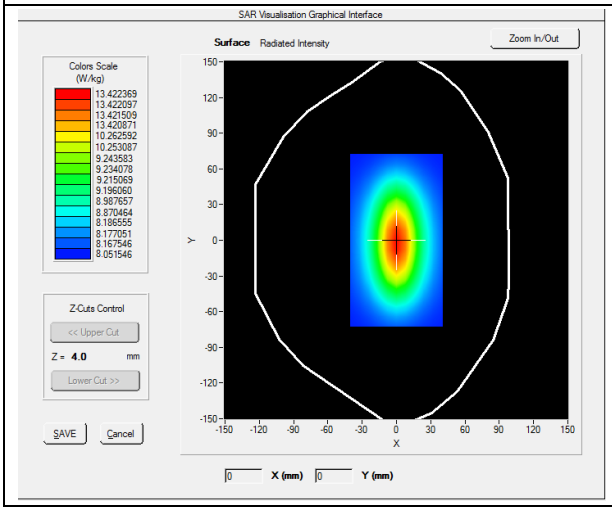
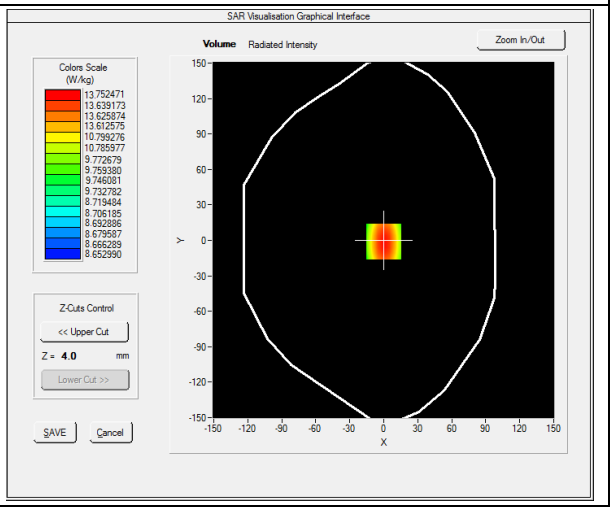
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.64; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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)	38.611212
Conductivity (S/m)	1.761202
Power Variation (%)	1.144120
Ambient Temperature	21.1
Liquid Temperature	21.2

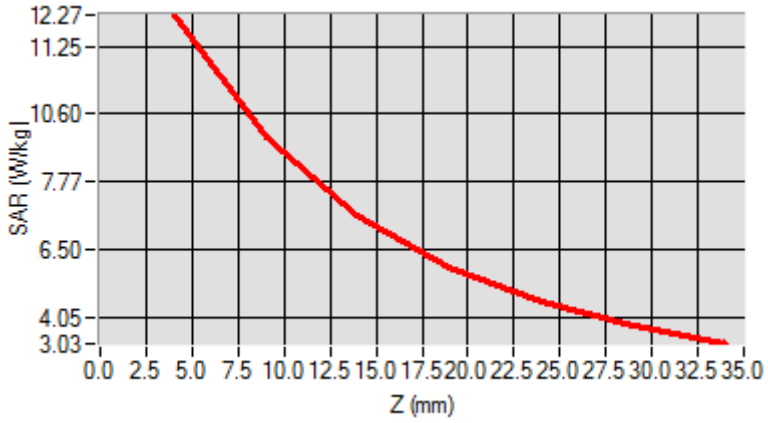
SURFACE SAR	VOLUME SAR
	

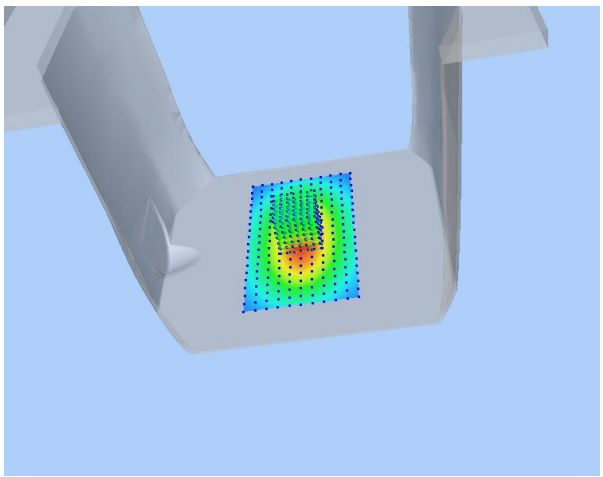
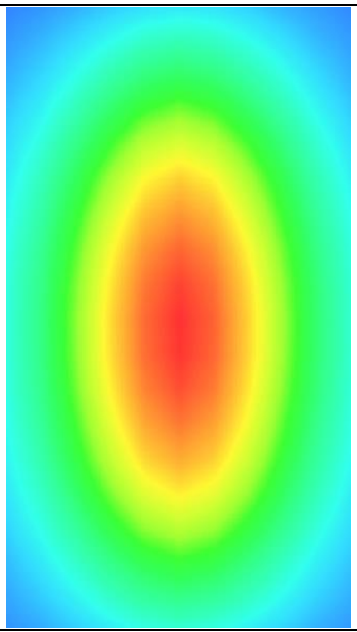
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	6.352122
SAR 1g (W/Kg)	13.462010

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	12.1355	10.3301	8.4512	6.4365	5.6123	3.5621



3D screen shot	Hot spot position
	

MEASUREMENT 4

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/11/2019

Measurement duration: 12 minutes 21 seconds

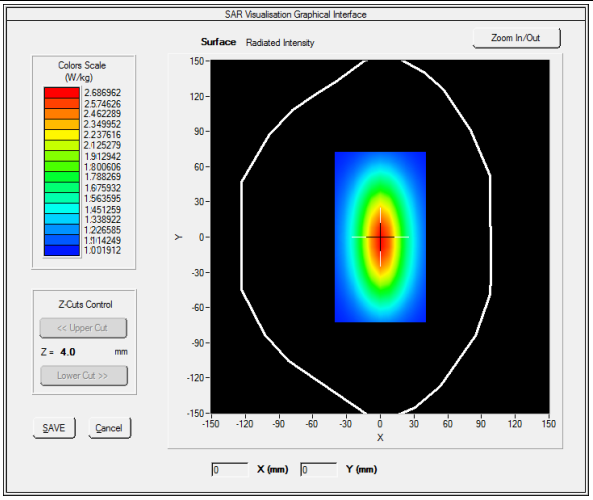
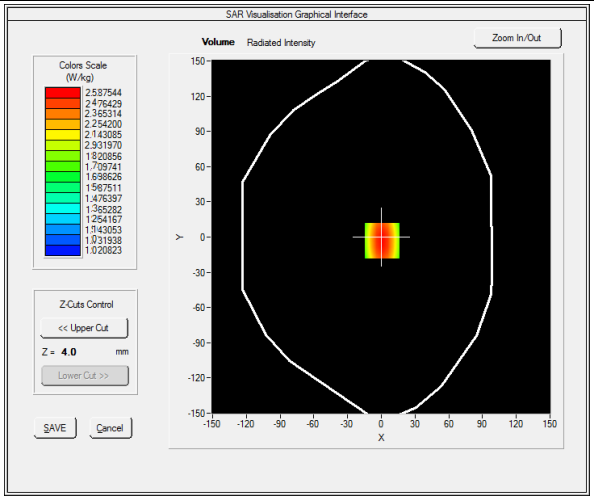
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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

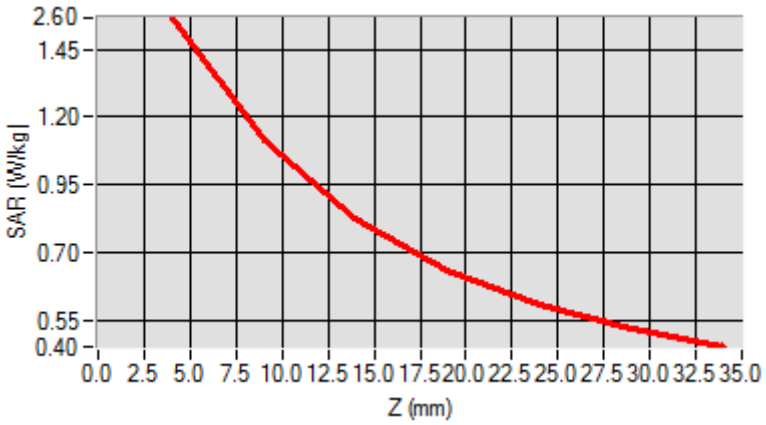
SURFACE SAR	VOLUME SAR
	

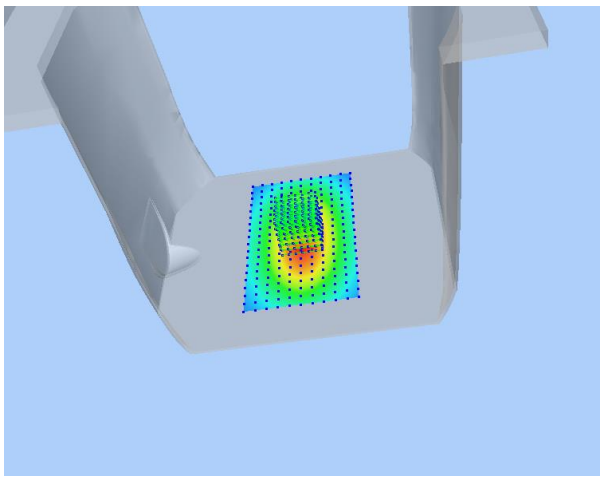
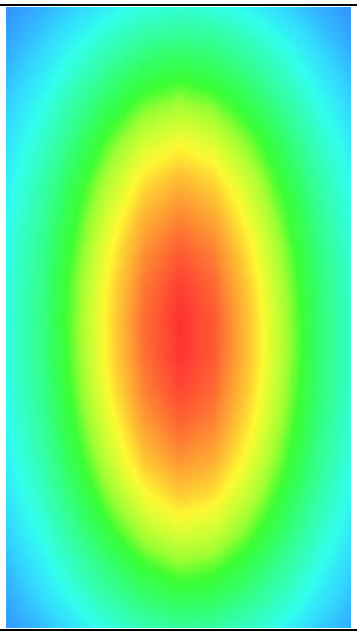
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.528956
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 5

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/12/2019

Measurement duration: 12 minutes 21 seconds

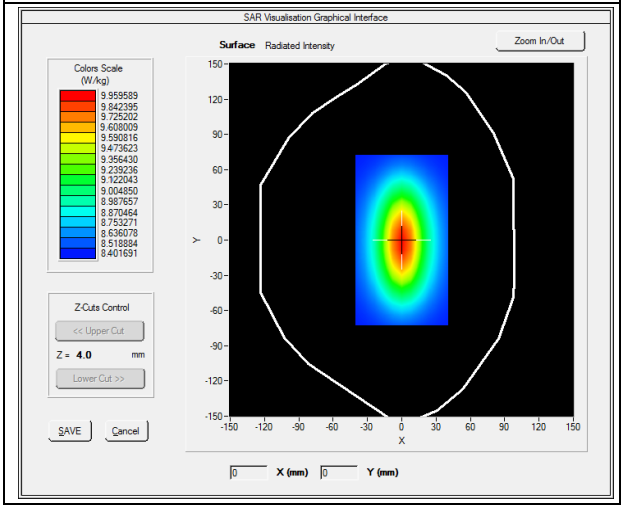
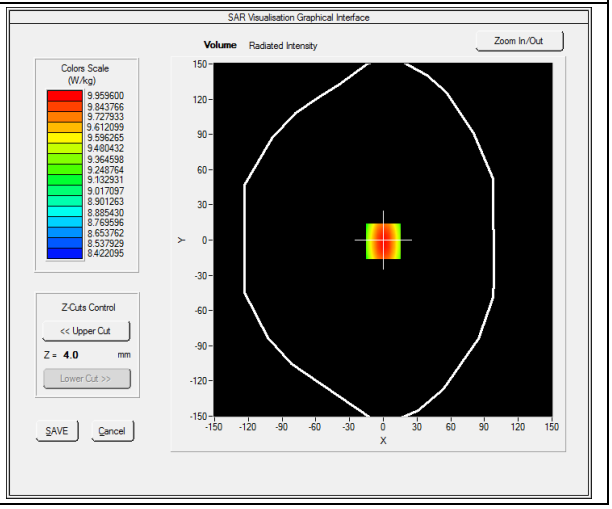
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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

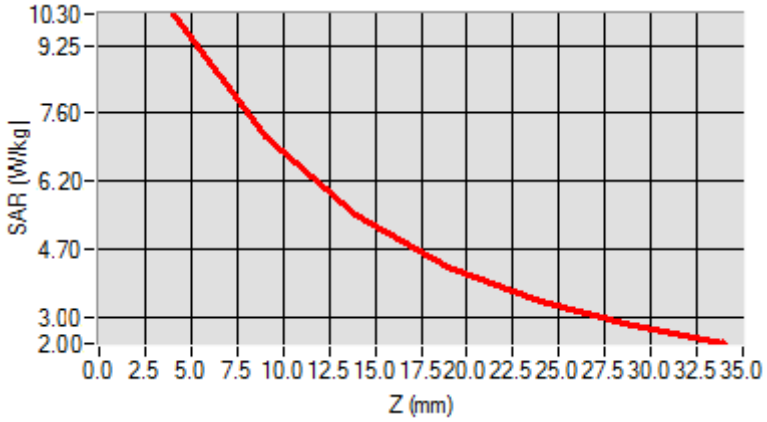
SURFACE SAR	VOLUME SAR
	

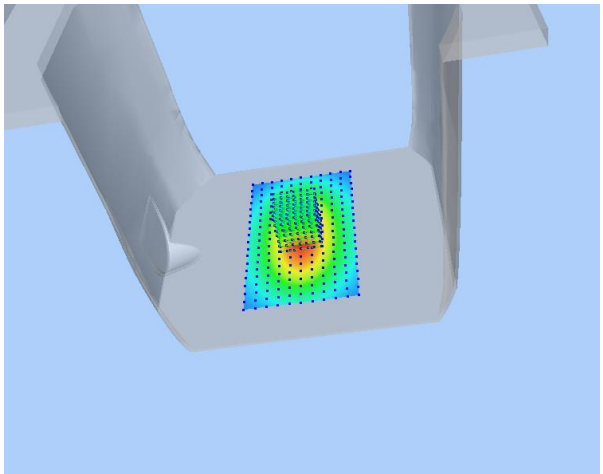
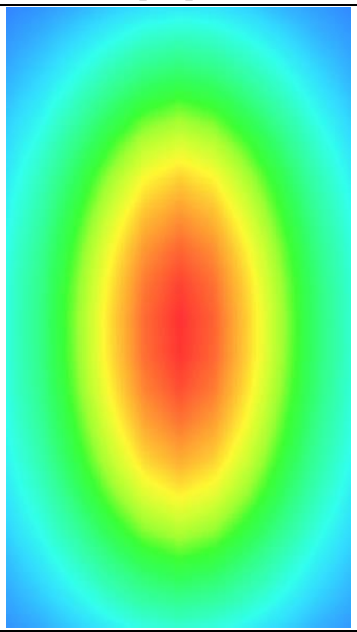
Maximum location: X=0.00, Y=0.00

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 6

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Date of measurement: 11/13/2019

Measurement duration: 12 minutes 21 seconds

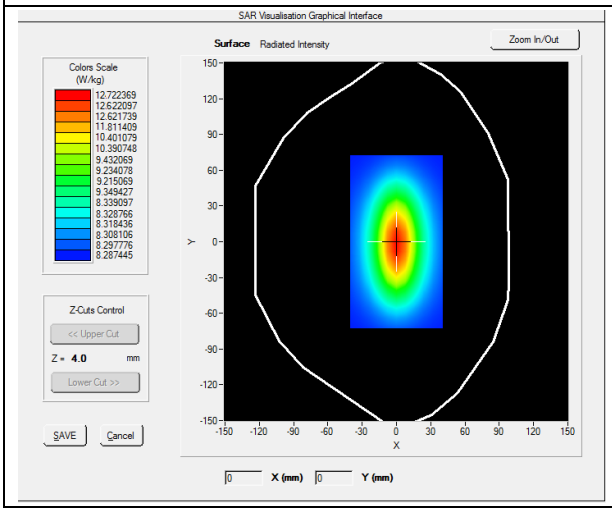
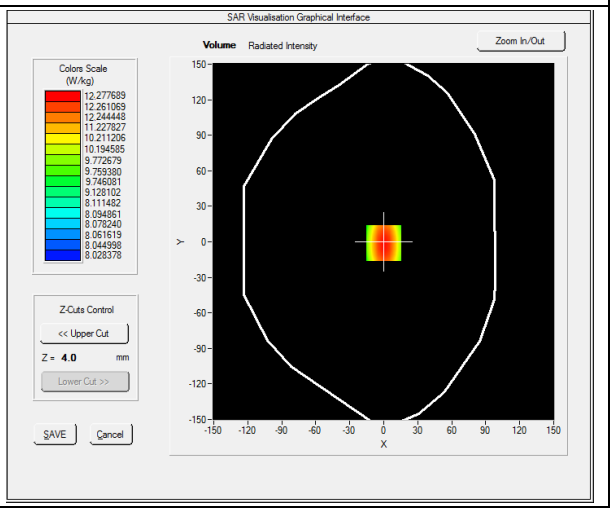
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
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

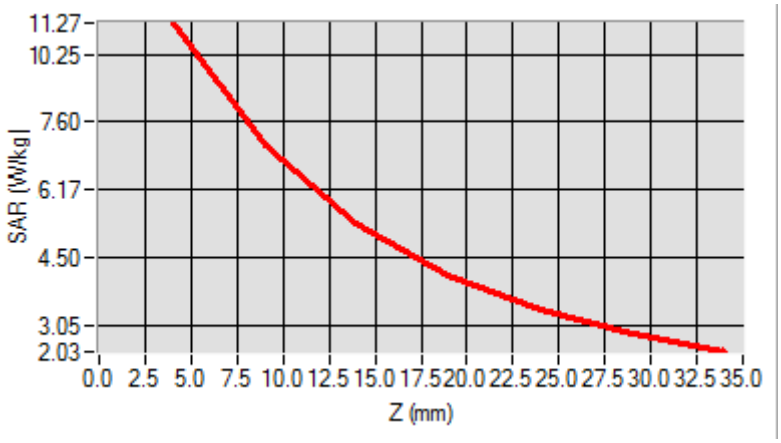
SURFACE SAR	VOLUME SAR
	

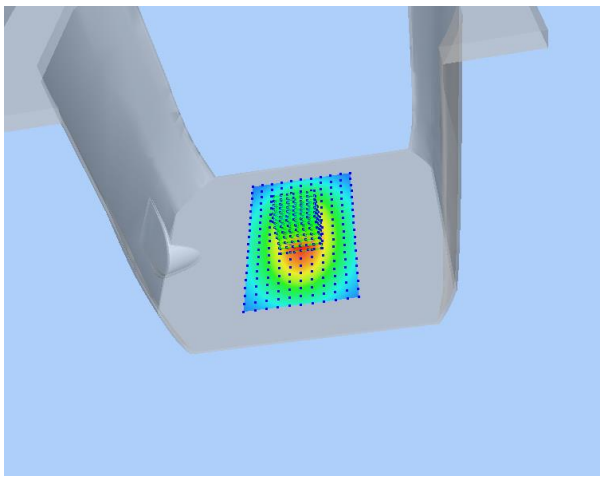
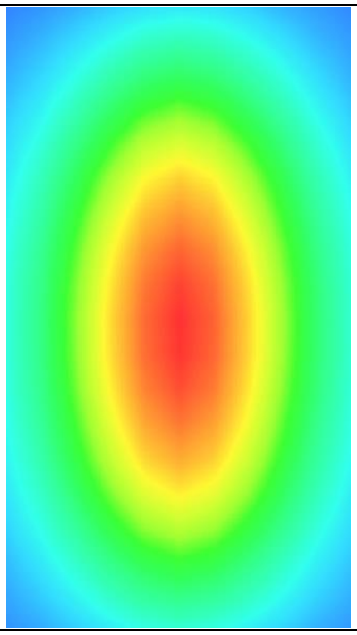
Maximum location: X=0.00, Y=0.00

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: Right Head with Cheek device position on High Channel in GSM mode
Phone	**GSM1900**	Measurement 5: Right Head with Cheek device position on Low Channel in GSM mode
Phone	**GPRS850_2TX**	Measurement 9: Right Head with Cheek device position on High Channel in GPRS mode
Phone	**GPRS1900_4TX**	Measurement 15: Left Head with Cheek device position on Low Channel in GPRS mode
Phone	**WCDMA850_RMC**	Measurement 19: Left Head with Cheek device position on High Channel in WCDMA mode
Phone	**WCDMA1900_RMC**	Measurement 23: Left Head with Cheek device position on Low Channel in WCDMA mode
Phone	**WiFi_802.11b**	Measurement 25:Right Head with Cheek device position on Middle Channel in 802.11b mode
Phone	**GSM850**	Measurement 29: Flat Plane with Back(Body-worn) device position on High Channel in GSM mode
Phone	**GSM1900**	Measurement 31: Flat Plane with Back(Body-worn) device position on Low Channel in GSM mode
Phone	**GPRS850_2TX**	Measurement 41: Flat Plane with Back device position on High Channel in GPRS mode
Phone	**GPRS1900_4TX**	Measurement 47: Flat Plane with Back device position on Low Channel in GPRS mode
Phone	**WCDMA850_RMC**	Measurement 51: Flat Plane with Back device position on High Channel in WCDMA mode
Phone	**WCDMA1900_RMC**	Measurement 55: Flat Plane with Back device position on Low Channel in WCDMA mode
Phone	**WiFi_802.11b**	Measurement 61: Flat Plane with Back side device position on Middle 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

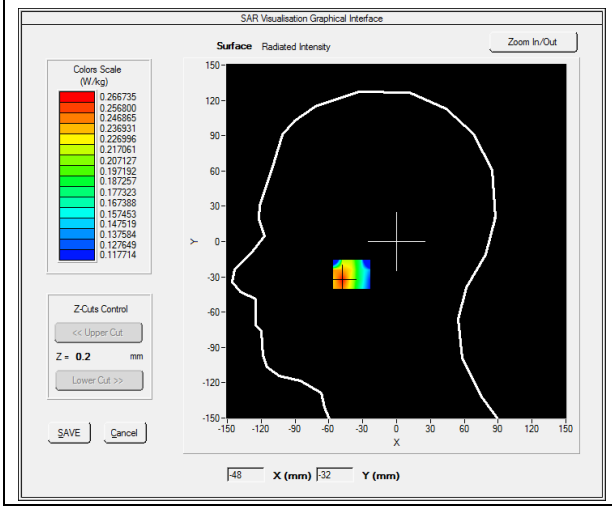
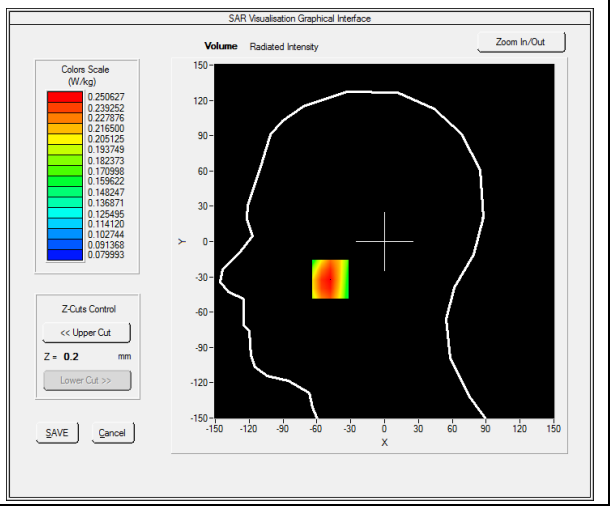
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 11 minutes 48 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.93; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	GSM850
Channels	High
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

Frequency (MHz)	848.800000
Relative Permittivity (real part)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	1.956700
Ambient Temperature	21.1
Liquid Temperature	21.3

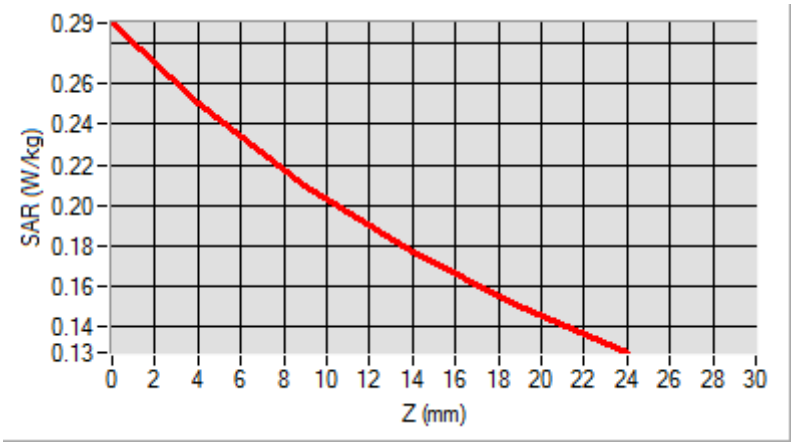
SURFACE SAR	VOLUME SAR
	

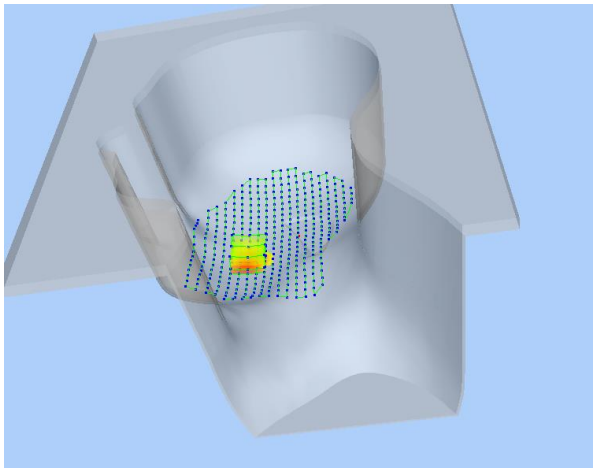
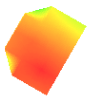
Maximum location: X=-48.00, Y=-32.00

SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)	0.191675
SAR 1g (W/Kg)	0.244542

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2902	0.2506	0.2094	0.1764	0.1498



3D screen shot	Hot spot position
	

MEASUREMENT 5

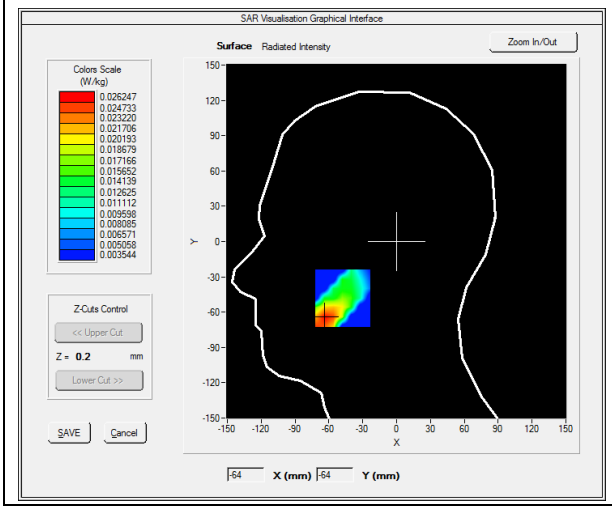
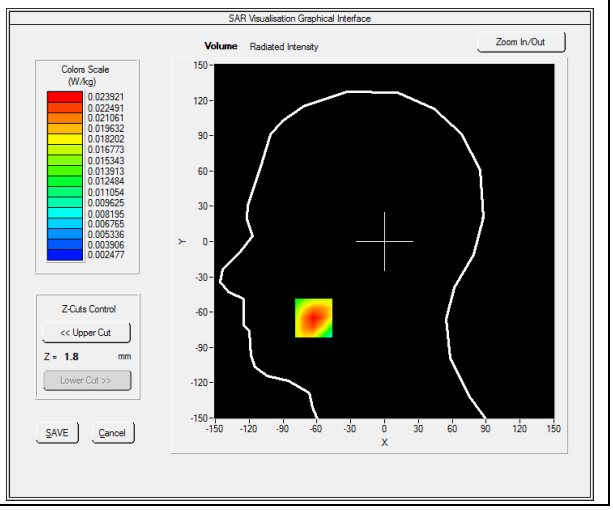
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.35; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	GSM1900
Channels	Low
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

Frequency (MHz)	1850.200000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.869568
Ambient Temperature	21.1
Liquid Temperature	21.3

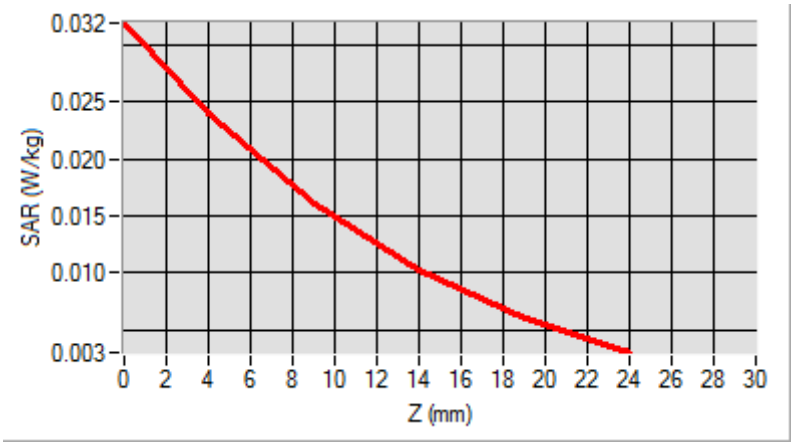
SURFACE SAR	VOLUME SAR
	

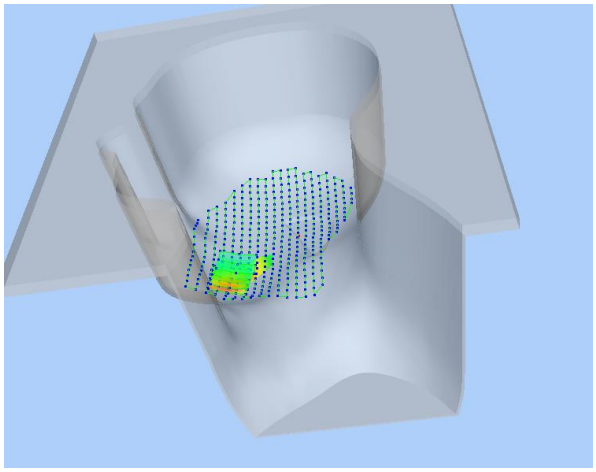
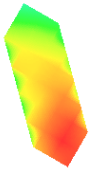
Maximum location: X=-63.00, Y=-65.00

SAR Peak: 0.03 W/kg

SAR 10g (W/Kg)	0.013820
SAR 1g (W/Kg)	0.022626

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0319	0.0239	0.0161	0.0103	0.0061



3D screen shot	Hot spot position
	

MEASUREMENT 9

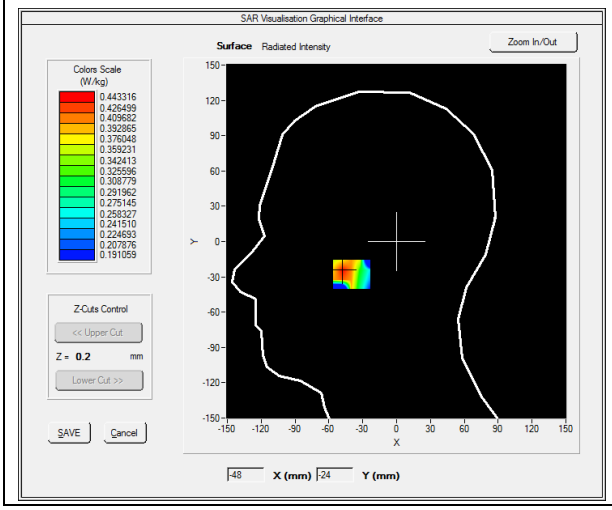
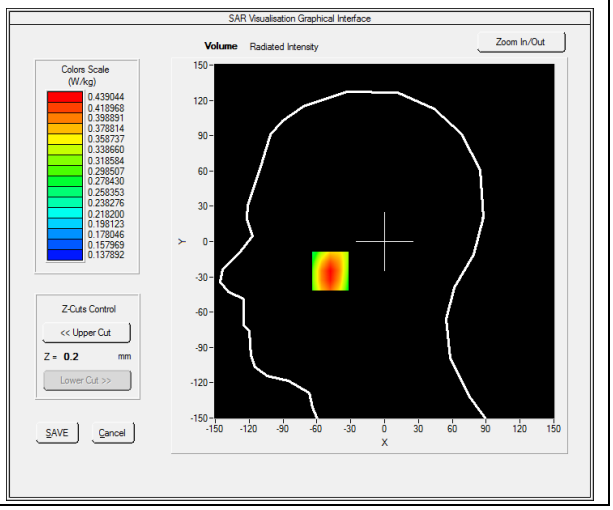
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 11 minutes 48 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.93; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	GPRS850_2TX
Channels	High
Signal	Duty Cycle: 1:4

B. SAR Measurement Results

Frequency (MHz)	848.800000
Relative Permittivity (real part)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	1.903833
Ambient Temperature	21.1
Liquid Temperature	21.3

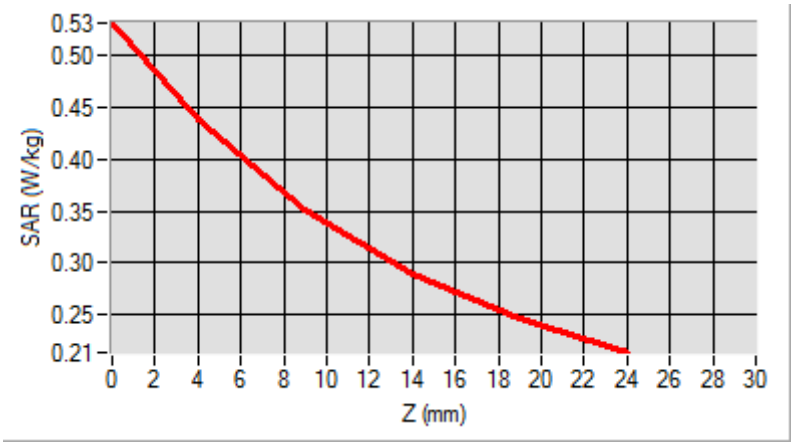
SURFACE SAR	VOLUME SAR
	

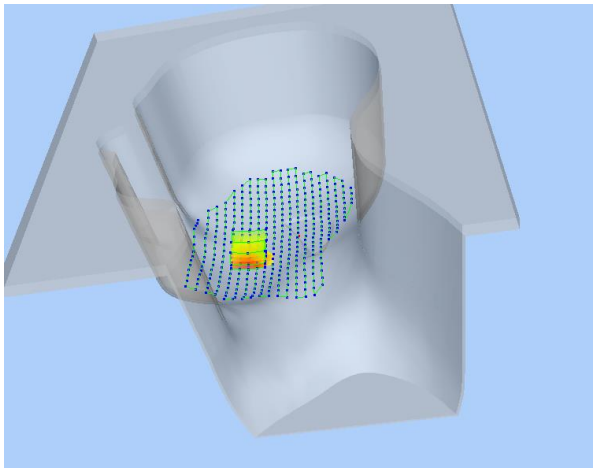
Maximum location: X=-48.00, Y=-25.00

SAR Peak: 0.53 W/kg

SAR 10g (W/Kg)	0.325772
SAR 1g (W/Kg)	0.424694

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5321	0.4390	0.3508	0.2890	0.2462



3D screen shot	Hot spot position
	

MEASUREMENT 15

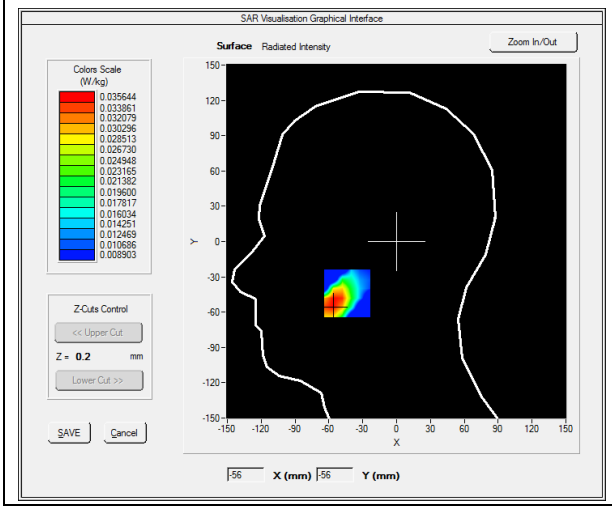
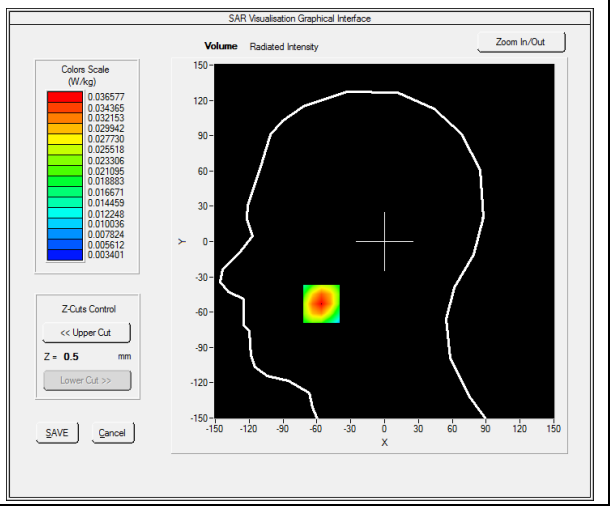
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.35; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	GPRS1900_4TX
Channels	Low
Signal	Duty Cycle: 1:2

B. SAR Measurement Results

Frequency (MHz)	1850.200000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.536272
Ambient Temperature	21.1
Liquid Temperature	21.3

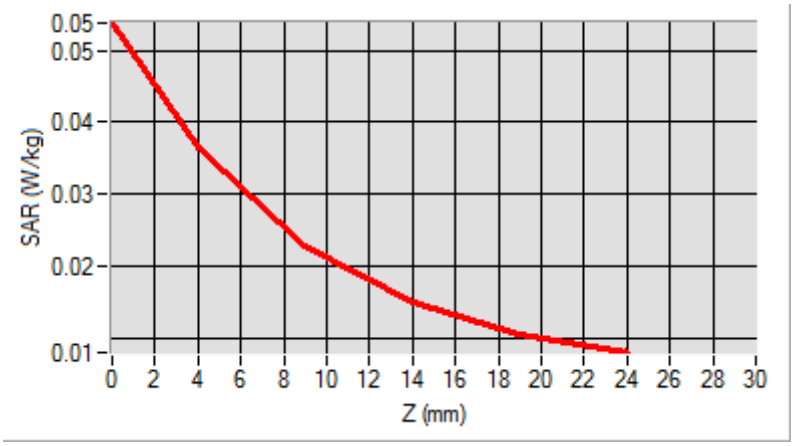
SURFACE SAR	VOLUME SAR
	

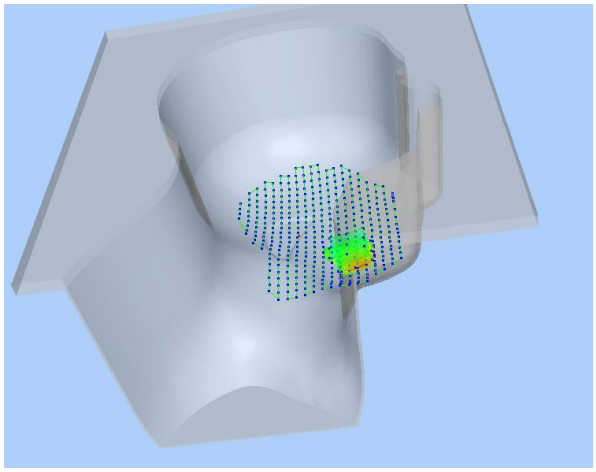
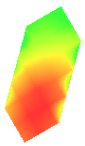
Maximum location: X=-56.00, Y=-53.00

SAR Peak: 0.05 W/kg

SAR 10g (W/Kg)	0.020781
SAR 1g (W/Kg)	0.034533

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0539	0.0366	0.0227	0.0148	0.0106



3D screen shot	Hot spot position
	

MEASUREMENT 19

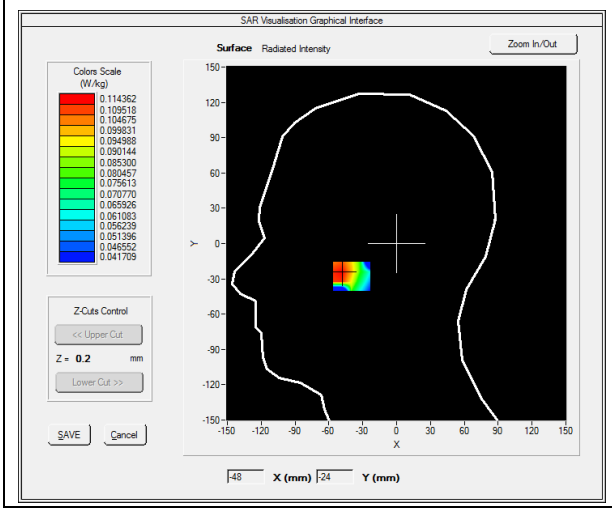
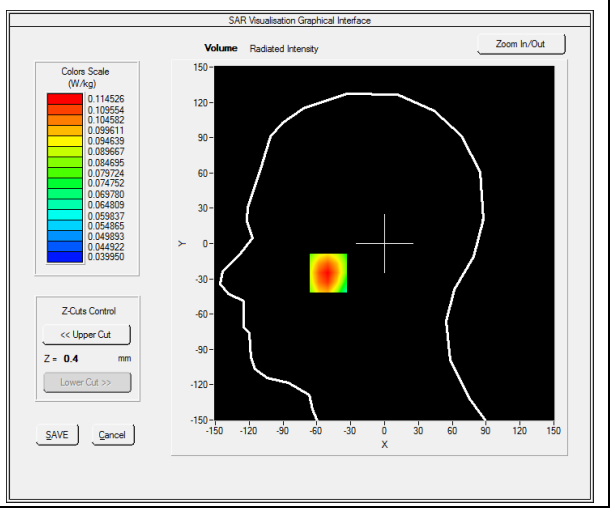
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.93; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	WCDMA850_RMC
Channels	High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	846.600000
Relative Permittivity (real part)	41.110245
Conductivity (S/m)	0.871245
Power Variation (%)	1.753989
Ambient Temperature	21.1
Liquid Temperature	21.3

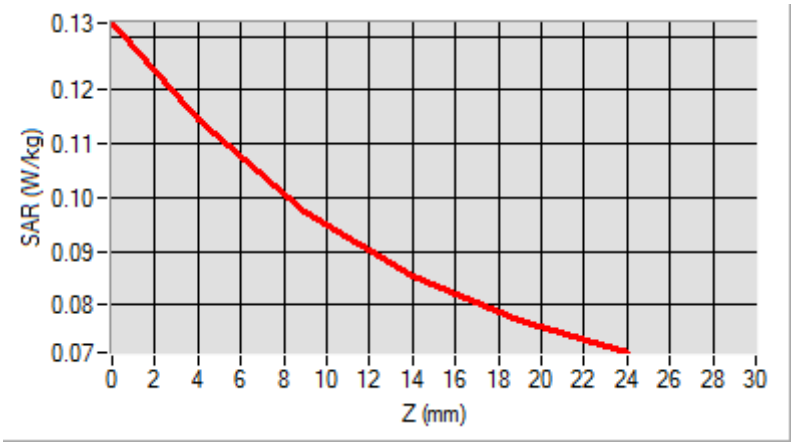
SURFACE SAR	VOLUME SAR
	

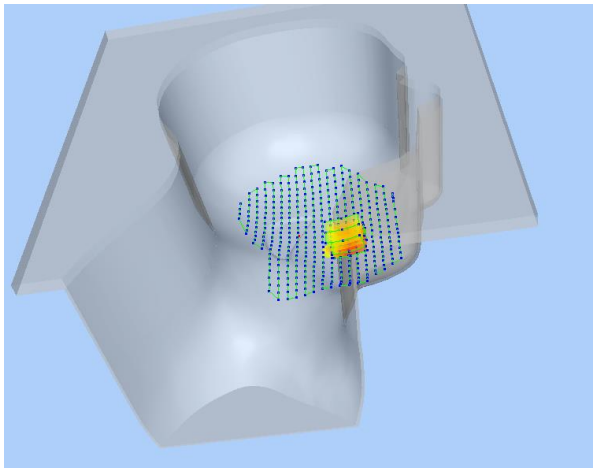
Maximum location: X=-50.00, Y=-25.00

SAR Peak: 0.13 W/kg

SAR 10g (W/Kg)	**0.090244**
SAR 1g (W/Kg)	**0.111434**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.1325**	**0.1145**	**0.0973**	**0.0854**	**0.0773**



3D screen shot	**Hot spot position**
	

MEASUREMENT 23

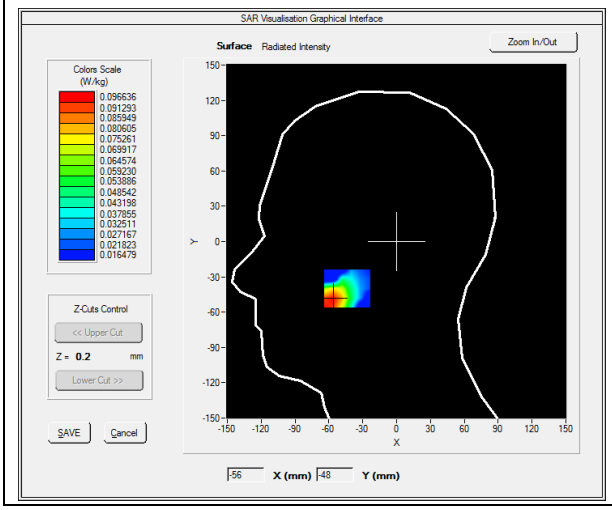
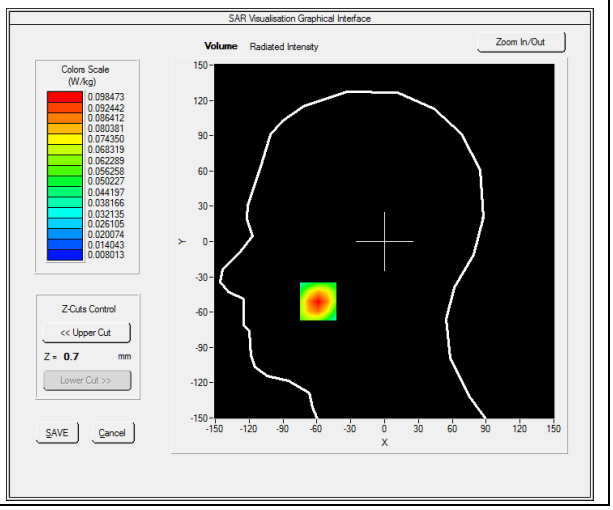
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.35; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	WCDMA1900_RMC
Channels	Low
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1852.400000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.546537
Ambient Temperature	21.1
Liquid Temperature	21.3

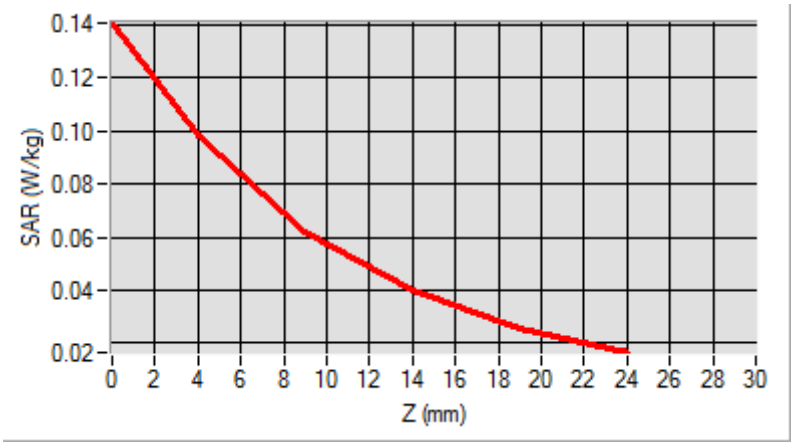
SURFACE SAR	VOLUME SAR
	

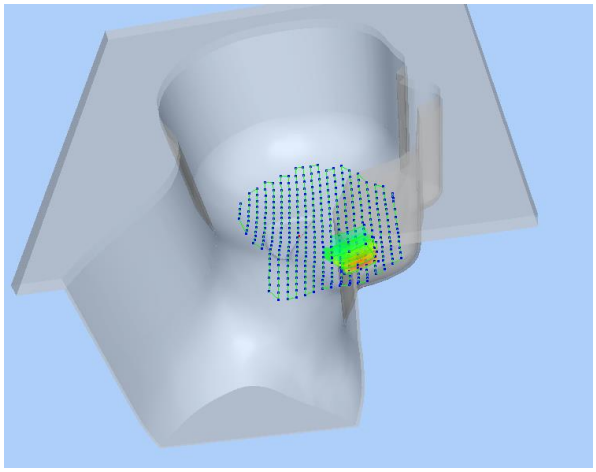
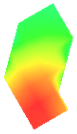
Maximum location: X=-59.00, Y=-51.00

SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.055062
SAR 1g (W/Kg)	0.092646

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1407	0.0985	0.0624	0.0398	0.0260



3D screen shot	Hot spot position
	

MEASUREMENT 25

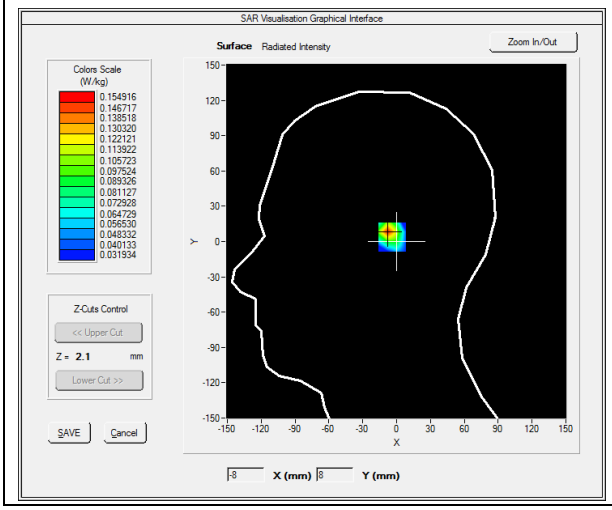
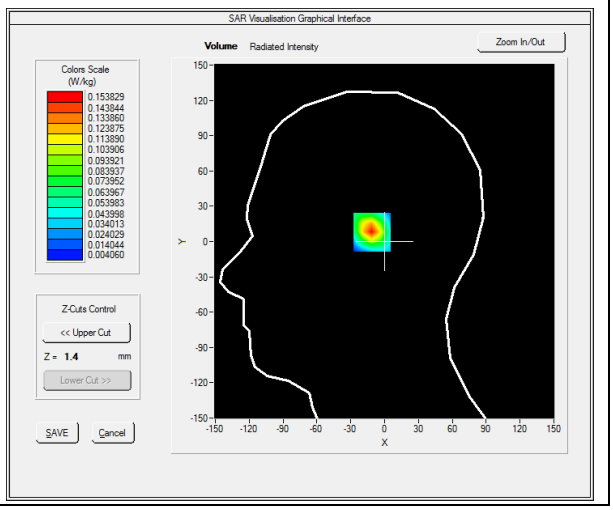
Type: Phone measurement (Complete)
Date of measurement: 11/13/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.64; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	WiFi_802.11b
Channels	Middle
Signal	Duty Cycle: 1:1

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative Permittivity (real part)	38.611212
Conductivity (S/m)	1.761202
Power Variation (%)	1.867589
Ambient Temperature	21.1
Liquid Temperature	21.2

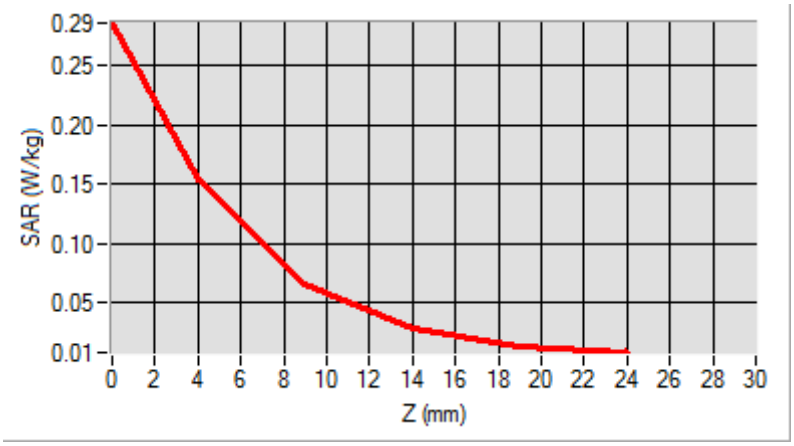
SURFACE SAR	VOLUME SAR
	

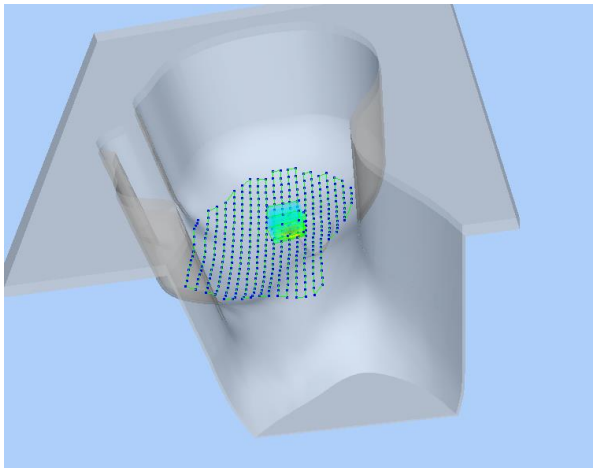
Maximum location: X=-8.00, Y=8.00

SAR Peak: 0.29 W/kg

SAR 10g (W/Kg)	**0.062142**
SAR 1g (W/Kg)	**0.141768**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.2864**	**0.1538**	**0.0654**	**0.0278**	**0.0140**



3D screen shot	**Hot spot position**
	

MEASUREMENT 29

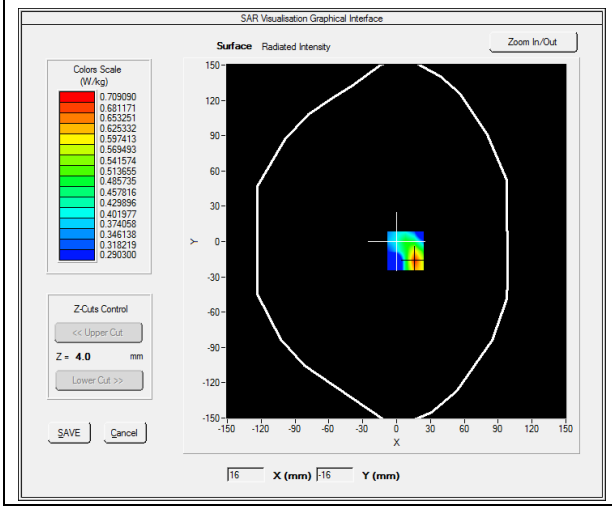
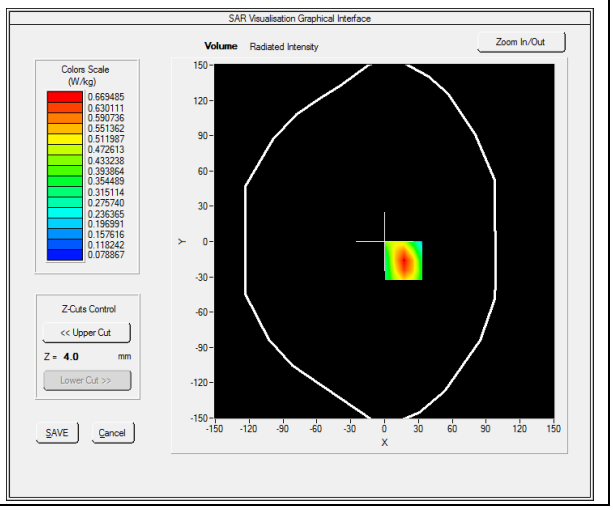
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back(Body-worn)
Band	GSM850
Channels	High
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

Frequency (MHz)	848.800000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.785060
Ambient Temperature	21.1
Liquid Temperature	21.3

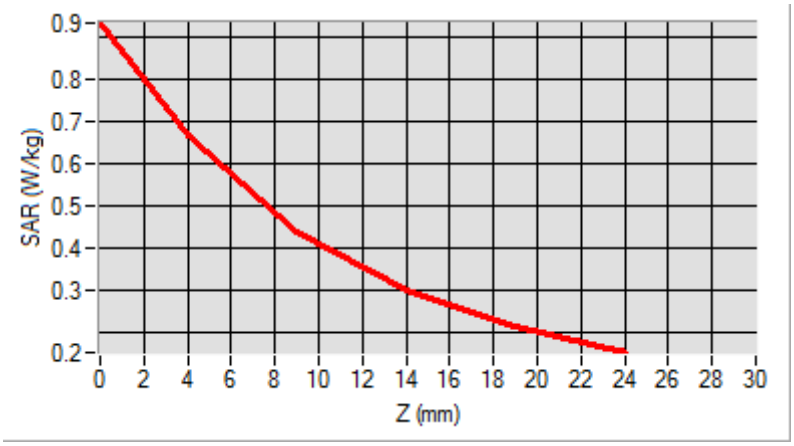
SURFACE SAR	VOLUME SAR
	

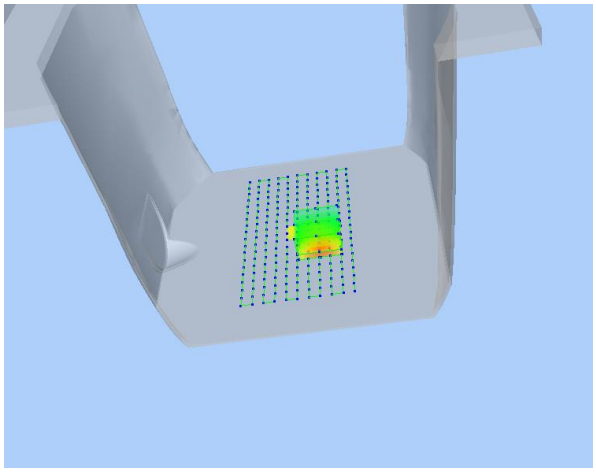
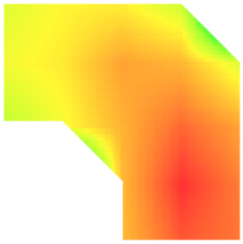
Maximum location: X=17.00, Y=-16.00

SAR Peak: 0.94 W/kg

SAR 10g (W/Kg)	0.403185
SAR 1g (W/Kg)	0.630456

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.9356	0.6695	0.4414	0.2994	0.2128



3D screen shot	Hot spot position
	

MEASUREMENT 31

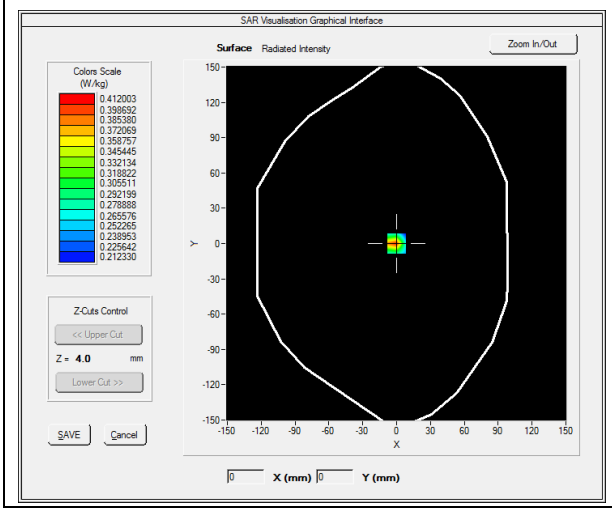
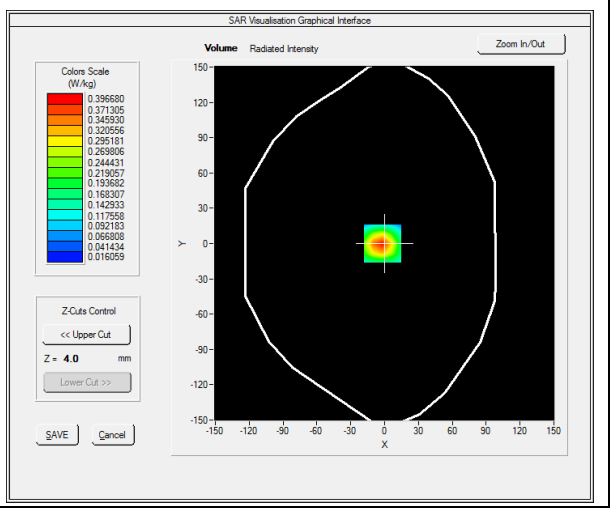
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back(Body-worn)
Band	GSM1900
Channels	Low
Signal	TDMA (Crest factor: 8.0)

B. SAR Measurement Results

Frequency (MHz)	1850.200000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.568946
Ambient Temperature	21.1
Liquid Temperature	21.3

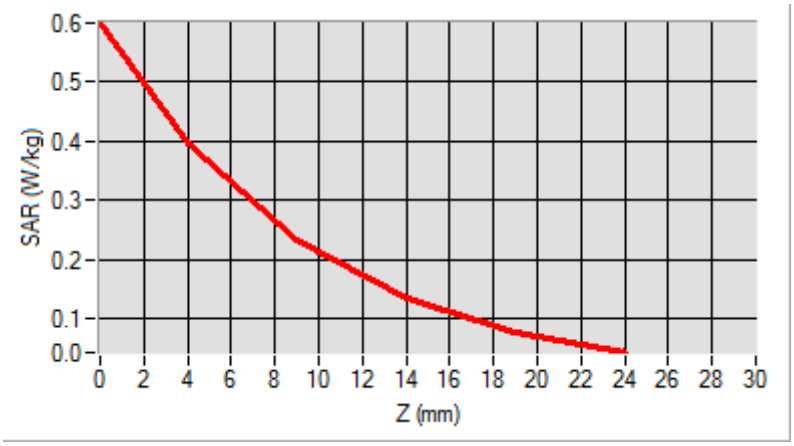
SURFACE SAR	VOLUME SAR
	

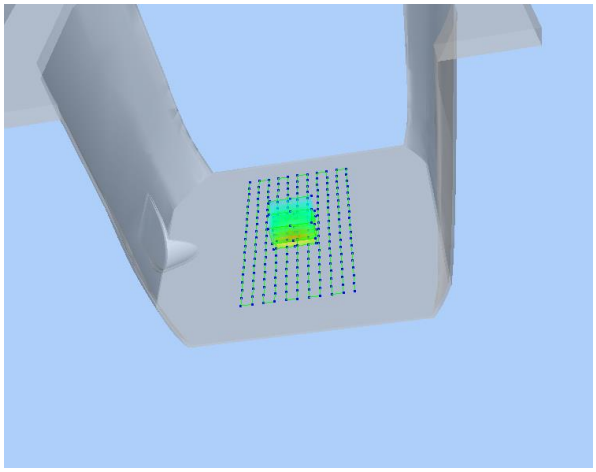
Maximum location: X=-2.00, Y=0.00

SAR Peak: 0.60 W/kg

SAR 10g (W/Kg)	0.192216
SAR 1g (W/Kg)	0.366452

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5986	0.3967	0.2312	0.1337	0.0782



3D screen shot	Hot spot position
	

MEASUREMENT 41

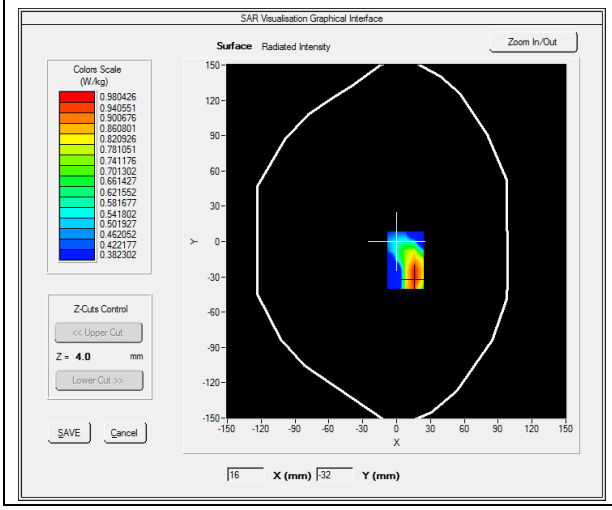
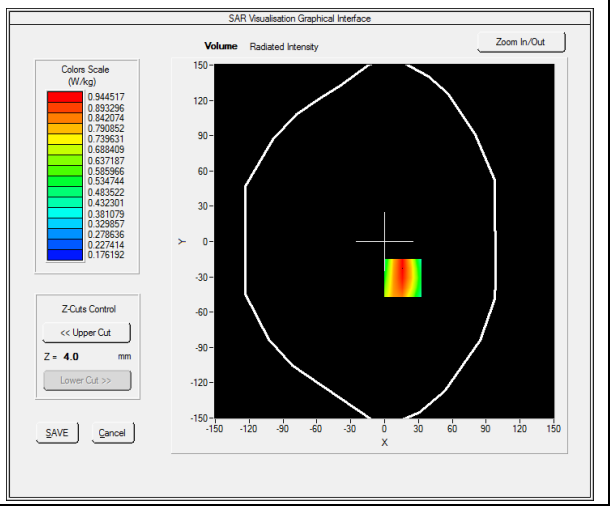
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat plane
Device Position	Back
Band	GPRS850_2TX
Channels	High
Signal	Duty Cycle: 1:4

B. SAR Measurement Results

Frequency (MHz)	848.800000
Relative Permittivity (real part)	54.851214
Conductivity (S/m)	0.951454
Power Variation (%)	0.562472
Ambient Temperature	21.1
Liquid Temperature	21.3

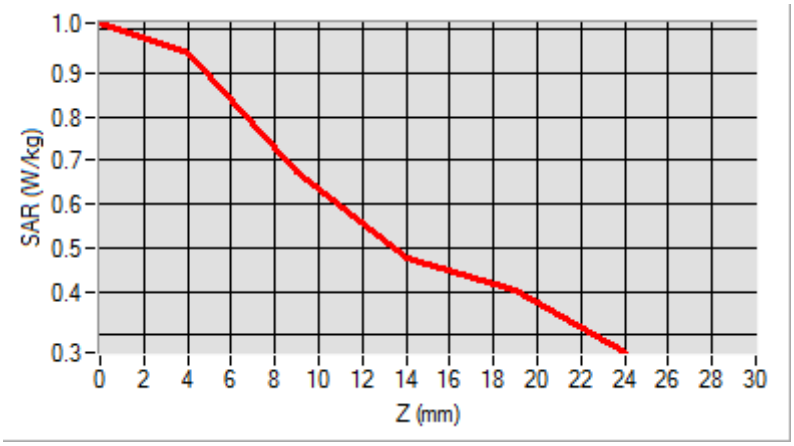
SURFACE SAR	VOLUME SAR
	

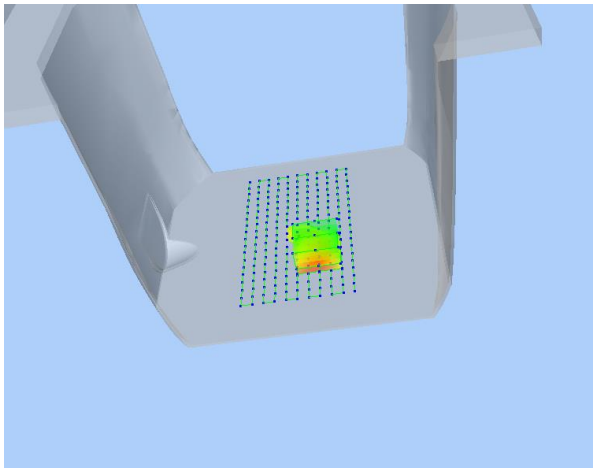
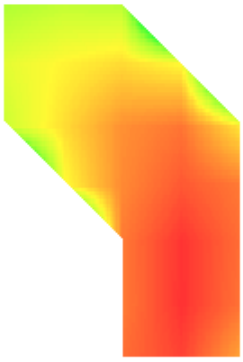
Maximum location: X=16.00, Y=-31.00

SAR Peak: 1.42 W/kg

SAR 10g (W/Kg)	0.629368
SAR 1g (W/Kg)	0.926194

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.0136	0.9445	0.6748	0.4752	0.4018



3D screen shot	Hot spot position
	

MEASUREMENT 47

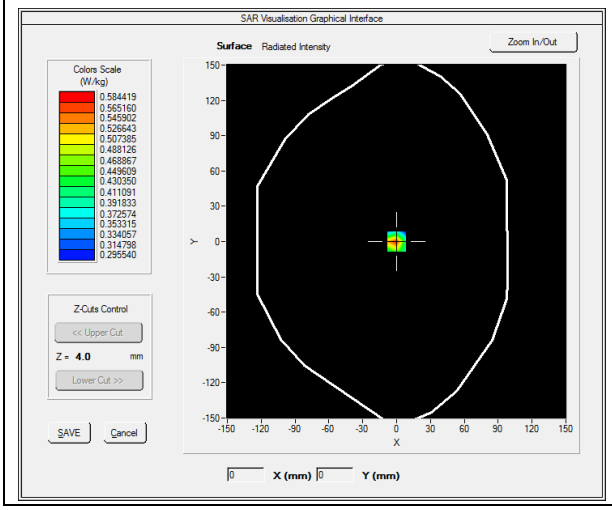
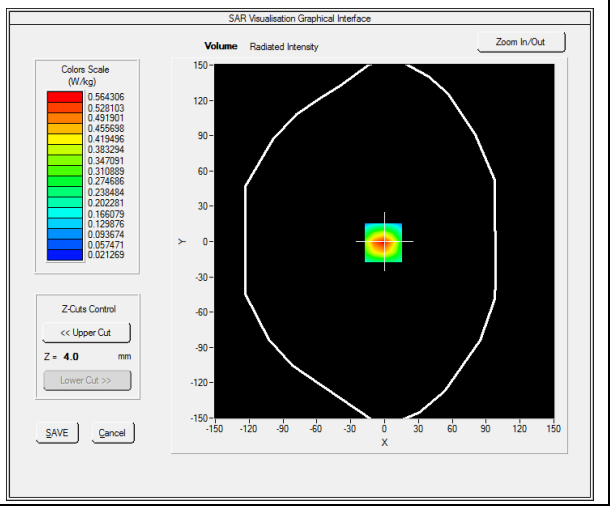
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat plane
Device Position	Back side
Band	GPRS1900_4TX
Channels	Low
Signal	Duty Cycle: 1:2

B. SAR Measurement Results

Frequency (MHz)	1850.200000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.986340
Ambient Temperature	21.1
Liquid Temperature	21.3

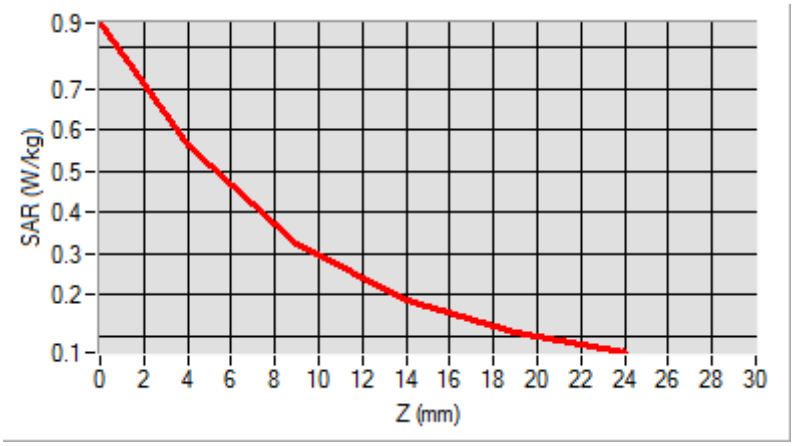
SURFACE SAR	VOLUME SAR
	

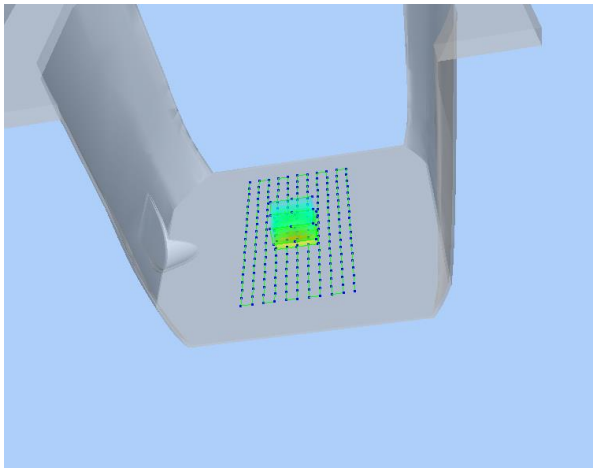
Maximum location: X=-1.00, Y=-1.00

SAR Peak: 0.87 W/kg

SAR 10g (W/Kg)	**0.272532**
SAR 1g (W/Kg)	**0.521181**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.8595**	**0.5643**	**0.3252**	**0.1866**	**0.1091**



3D screen shot	**Hot spot position**
	

MEASUREMENT 51

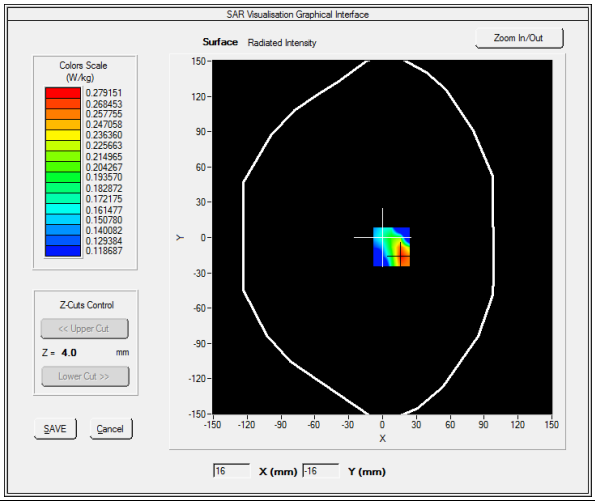
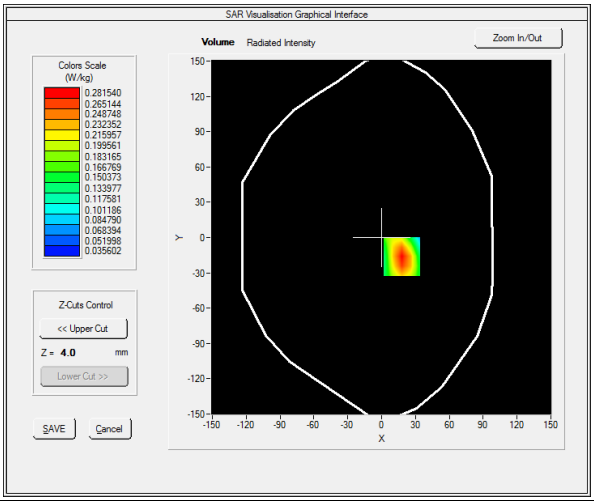
Type: Phone measurement (Complete)
Date of measurement: 11/11/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 7.13; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back
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 (%)	0.965422
Ambient Temperature	21.1
Liquid Temperature	21.3

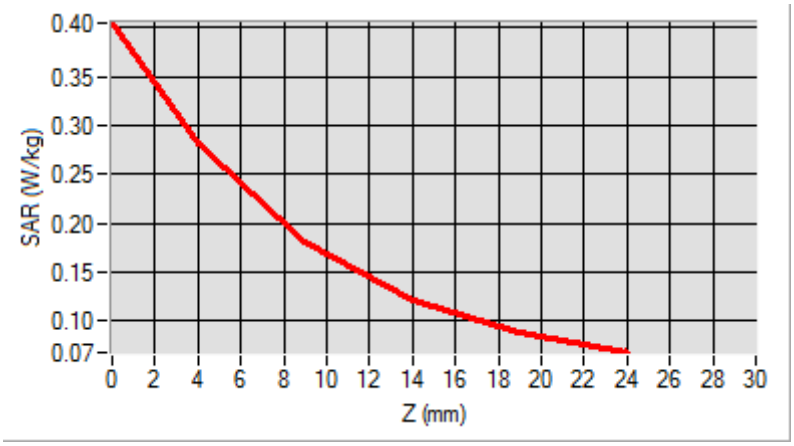
SURFACE SAR	VOLUME SAR
	

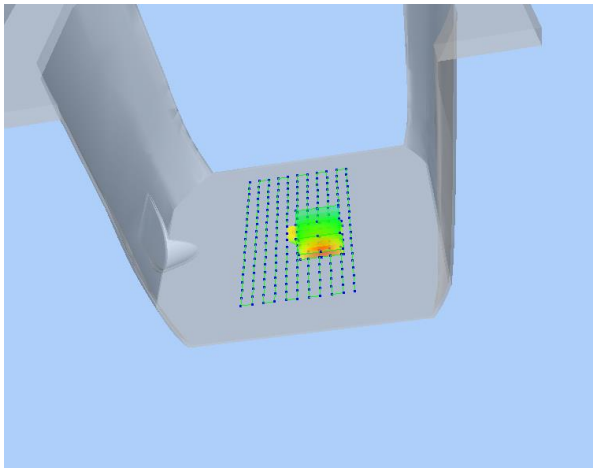
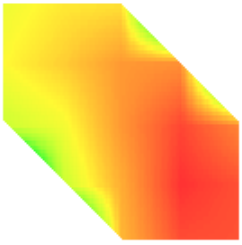
Maximum location: X=18.00, Y=-16.00

SAR Peak: 0.40 W/kg

SAR 10g (W/Kg)	0.168983
SAR 1g (W/Kg)	0.265457

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4046	0.2815	0.1805	0.1217	0.0890



3D screen shot	Hot spot position
	

MEASUREMENT 55

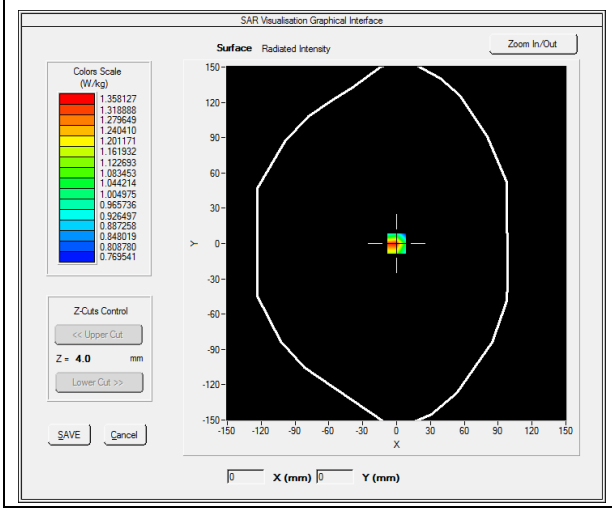
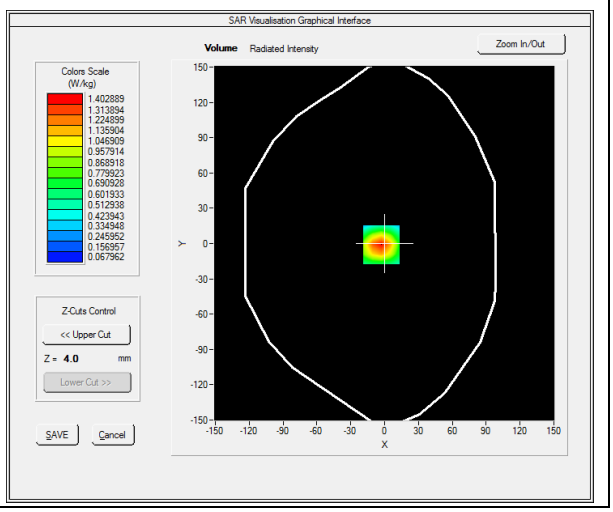
Type: Phone measurement (Complete)
Date of measurement: 11/12/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 6.55; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back
Band	WCDMA1900_RMC
Channels	Low
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1852.400000
Relative Permittivity (real part)	52.420415
Conductivity (S/m)	1.501966
Power Variation (%)	0.687492
Ambient Temperature	21.1
Liquid Temperature	21.3

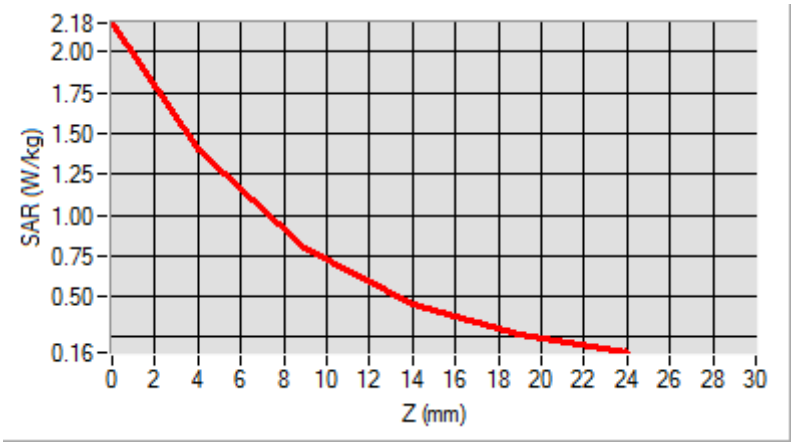
SURFACE SAR	VOLUME SAR
	

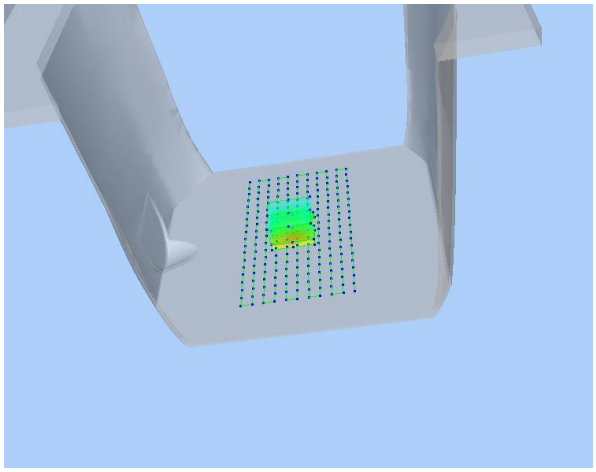
Maximum location: X=-3.00, Y=-1.00

SAR Peak: 2.19 W/kg

SAR 10g (W/Kg)	**0.694322**
SAR 1g (W/Kg)	**1.304378**

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**2.1769**	**1.4029**	**0.7913**	**0.4497**	**0.2672**



3D screen shot	**Hot spot position**
	

MEASUREMENT 61

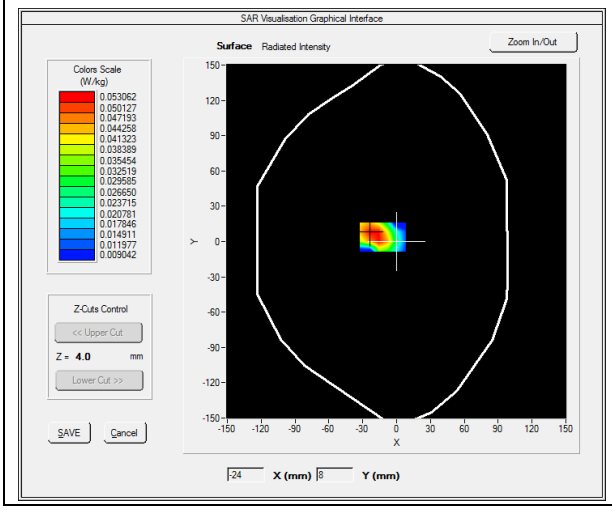
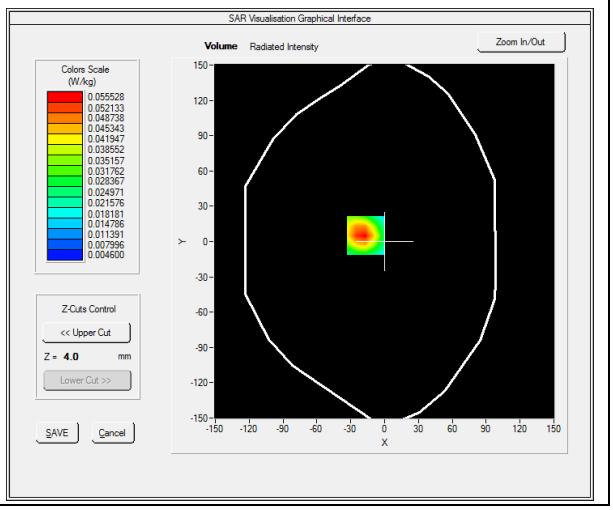
Type: Phone measurement (Complete)
Date of measurement: 11/13/2019
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE5 - SN 09/13 EP168; ConvF: 5.80; Calibrated: 06/01/2018

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back
Band	WiFi_802.11b
Channels	Middle
Signal	Duty Cycle: 1:1

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative Permittivity (real part)	52.315622
Conductivity (S/m)	2.001255
Power Variation (%)	0.968546
Ambient Temperature	21.1
Liquid Temperature	21.2

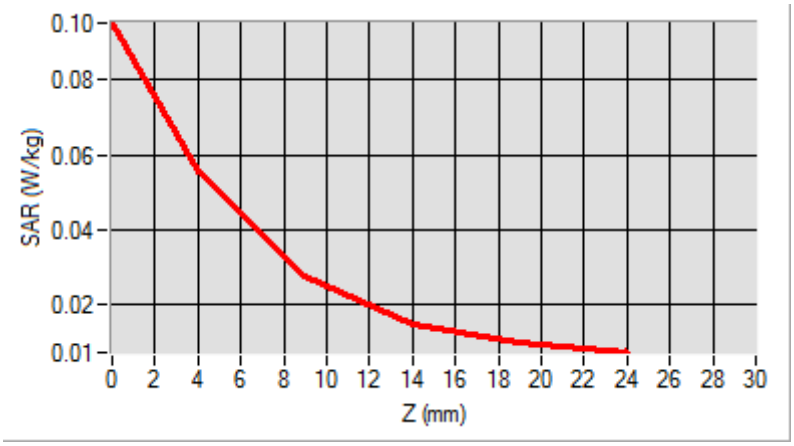
SURFACE SAR	VOLUME SAR
	

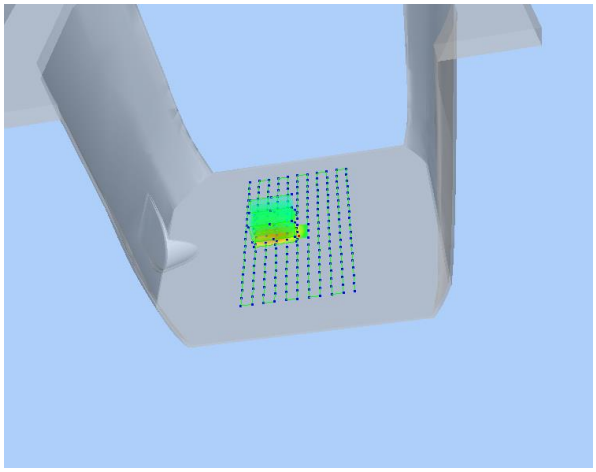
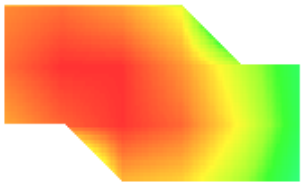
Maximum location: X=-17.00, Y=5.00

SAR Peak: 0.10 W/kg

SAR 10g (W/Kg)	0.027926
SAR 1g (W/Kg)	0.052911

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.0954	0.0555	0.0275	0.0145	0.0092



3D screen shot	Hot spot position
	

Annex C. EUT Photos

EUT View Front

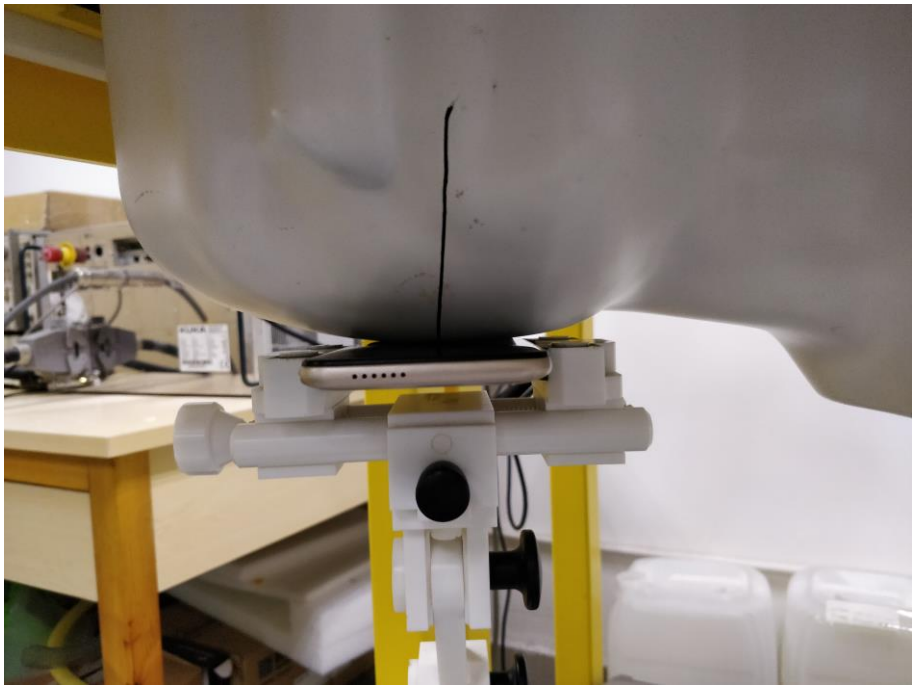
EUT View Back

Antenna View

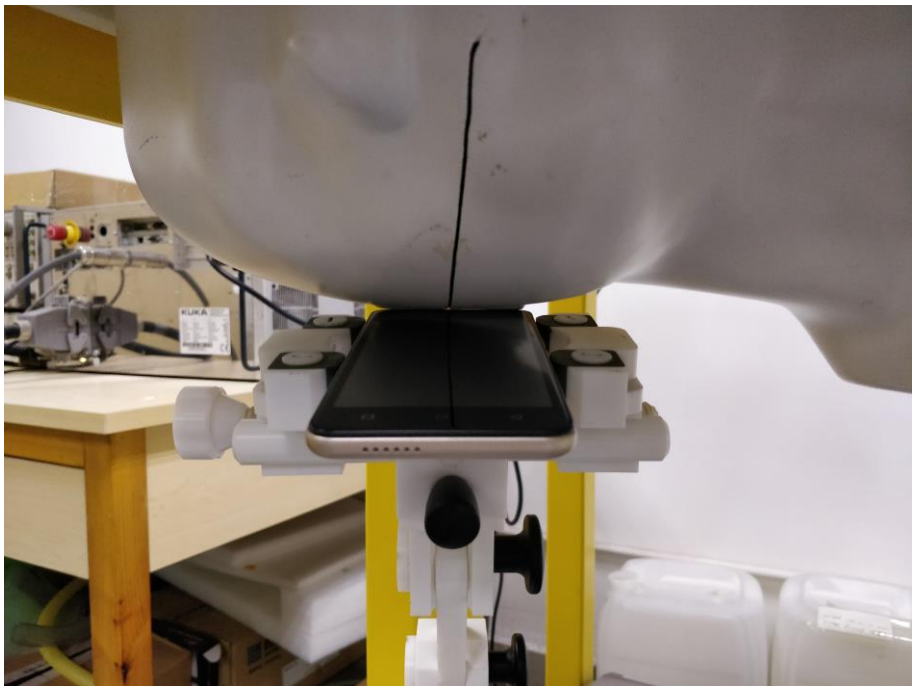
Annex D. Test Setup Photos

Head Exposure Conditions

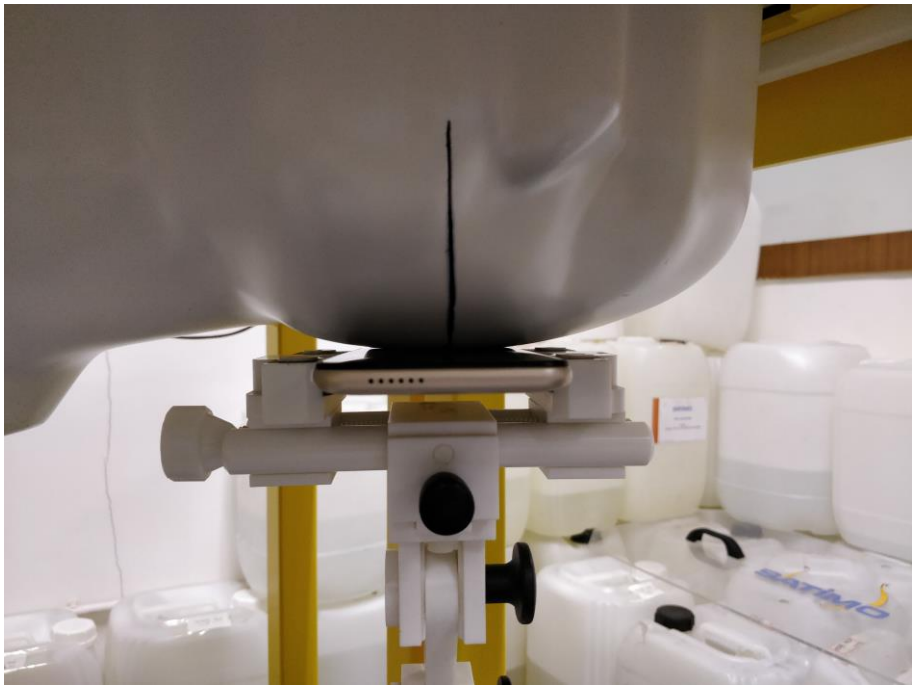
Cheek



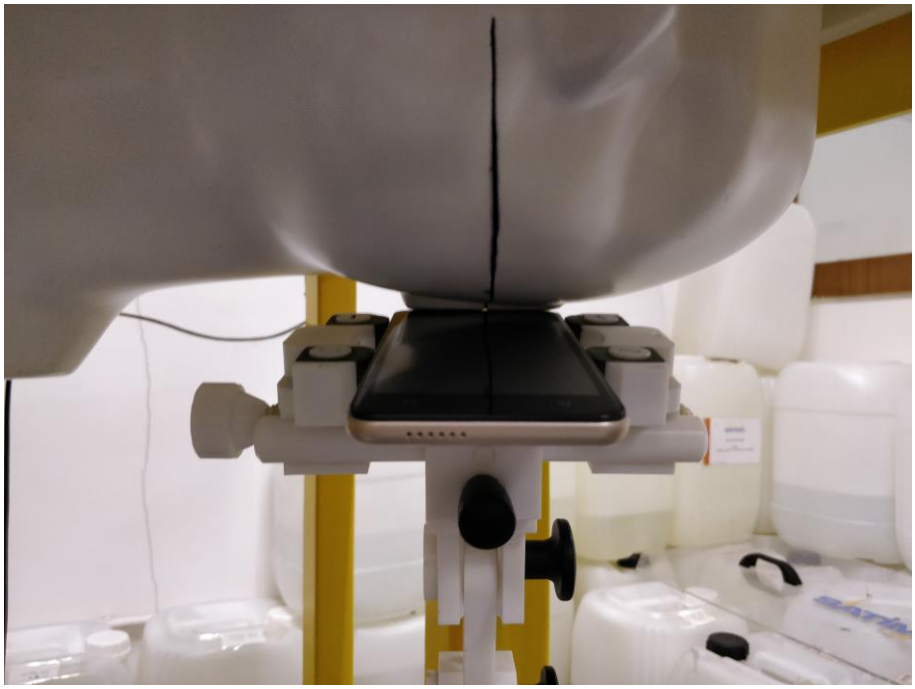
Tilt



Cheek

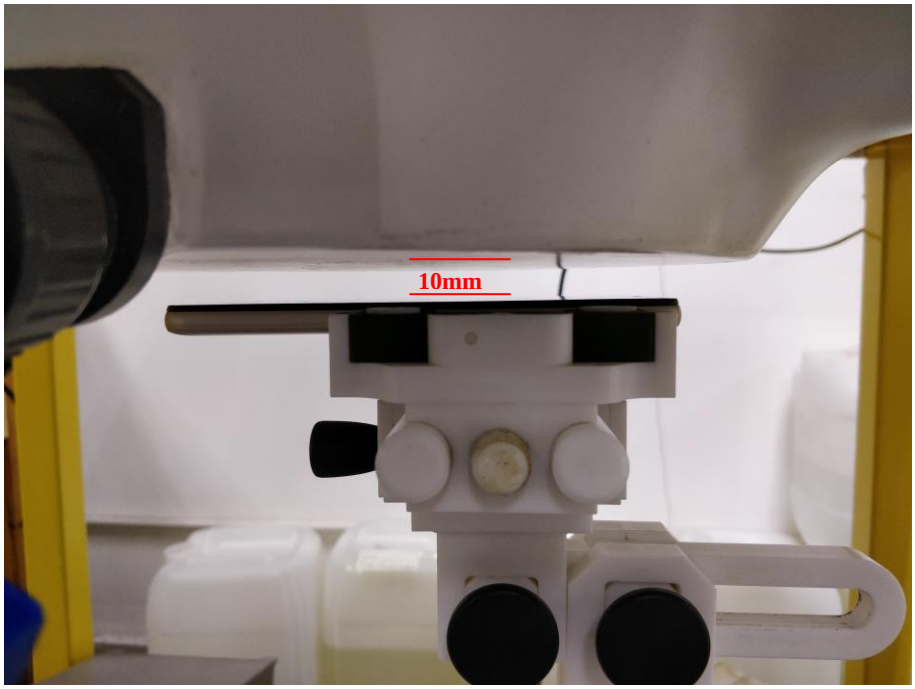


Tilt

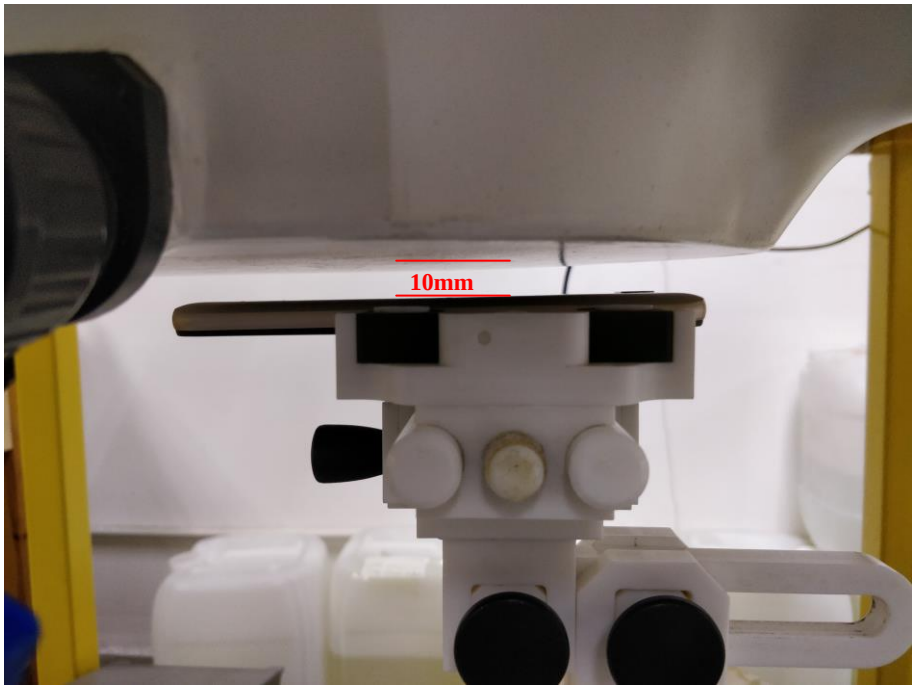


Body-worn & Hotspot mode Exposure Conditions

Body Front



Body Back

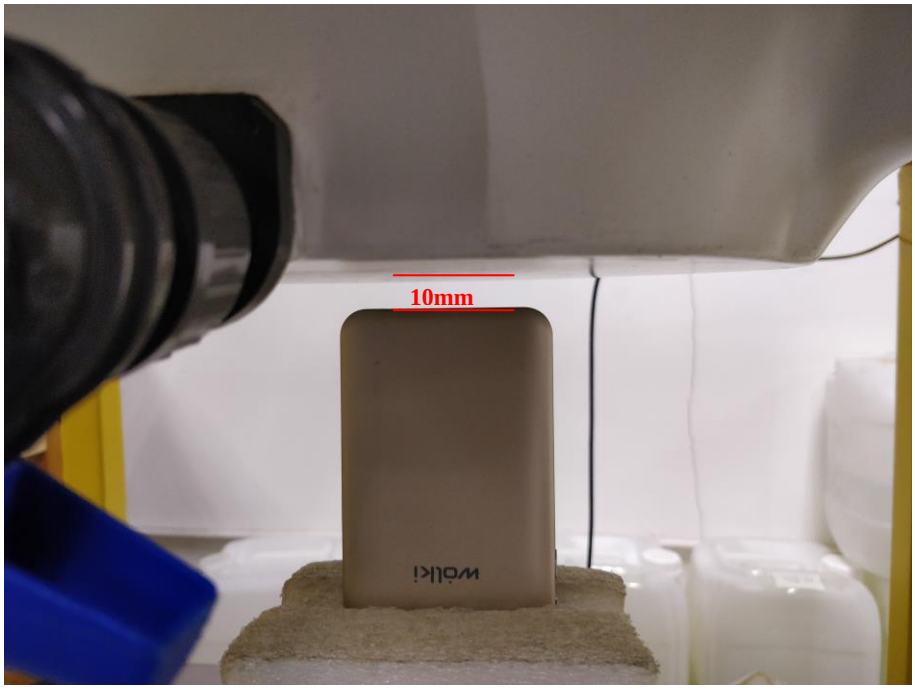


Hotspot Exposure Conditions

Body Right

Body Top

Body Bottom



Annex E. Calibration Certificate

Please refer to the Exhibit for the Calibration Certificate

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