FCC SAR
Measurement and Test Report

For

Catalia Health Inc.

118 2nd Street, 2nd Floor, San Francisco, CA, USA, 94105

FCC ID: 2AK8Y-M0208

Test Standards:	FCC Part 2.1093 ANSI / IEEE C95.1 :2005+A1:2010 ANSI / IEEE C95.3 : 2002(R2008) IEEE 1528 :2013
Product Description:	Mabu
Tested Model:	M0208
Report No.:	WTX20X05026059W
Sample Received Date:	2020-05-11
Tested Date:	2020-05-18 to 2020-05-25
Issued Date:	2019-05-26
Tested By:	Jack Sun / Engineer
Reviewed By:	Lion Cai / RF Manager
Approved & Authorized By:	Silin Chen / Manager
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1. General Information

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Catalia Health Inc.
Address of applicant:	118 2nd Street, 2nd Floor, San Francisco, CA, USA, 94105
Manufacturer:	Seveco Global Ltd.
Address of manufacturer:	Room 1301-4, Kwong Kin Trade Centre, 5 Kin Fat Street, Tuen Mun, Hong Kong

General Description of EUT:	
Product Name:	Mabu
Brand Name:	MABU2
Model No.:	M0208
Adding Model(s):	/
Rated Voltage:	DC7.4V by Battery
Battery:	300mAh
S/N:	TBBJ-20191125-25
Software Version:	1.0
Hardware Version:	1.0
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT:	
4G	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 2,4, 12
Uplink Frequency:	FDD-LTE Band 2: Tx: 1850-1910MHz, FDD-LTE Band 4: Tx: 1710-1755MHz, FDD-LTE Band 12: Tx: 699-716MHz,
Downlink Frequency:	FDD-LTE Band 2: Rx: 1930-1990MHz, FDD-LTE Band 4: Rx: 2110-2155MHz, FDD-LTE Band 12: Rx: 729-746MHz,
RF Output Power:	FDD-LTE Band 2: 23.39dBm, FDD-LTE Band 4: 23.38dBm, FDD-LTE Band 12: 23.42dBm,
Type of Modulation:	QPSK, 16QAM
Antenna Type:	PIFA Antenna
Antenna Gain:	FDD-LTE Band 2: 2.5dBi FDD-LTE Band 4: 2.5dBi FDD-LTE Band 12: 2.5dBi
WIFI	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 11b/g/n(HT20)
RF Output Power:	15.59dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11
Channel Separation:	5MHz
Antenna Type:	FPC Antenna
Antenna Gain:	1.3dBi
Bluetooth	
Bluetooth Version:	V4.2(only BLE)
Frequency Range:	2402-2480MHz
RF Output Power:	6.470dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK,
Quantity of Channels:	40
Channel Separation:	2MHz
Antenna Type:	FPC Antenna
Antenna Gain:	1.3dBi

1.2 Test Standards

The following report is prepared on behalf of the Catalia Health Inc. in accordance with FCC 47 CFR Part 2.1093, ANSI/IEEE C95.1-2005, ANSI / IEEE C95.3 :2002, IEEE 1528-2013, KDB 447498 D01 v06, , KDB 248227 D01 v02r02, KDB 941225 D05 v02r05 , KDB 941225 D07 v01r02 and KDB 865664 D01 v01r04 and KDB 865664 D02 v01r02.

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

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

1.3 Test Methodology

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

1.4 Test Facility

Address of the test laboratory
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990
Waltek Testing Group (Shenzhen) 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 Waltek Testing Group (Shenzhen) 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	Body (10mm Gap) Maximum SAR_{1g} (W/kg)	SAR_{1g} Limit (W/kg)
LTE	1.289	1.6
WLAN 2.4G	0.277	1.6
Simultaneous Transmission	**1.336**	1.6

Frequency Band	Body (0mm Gap) Maximum SAR_{10g} (W/kg)	SAR_{10g} Limit (W/kg)
LTE	2.895	4.0
WLAN 2.4G	0.402	4.0
Simultaneous Transmission	**2.942**	4.0

Remark:

The highest reported SAR values for body transmission conditions, Simultaneous Transmission（10mm） *are* ***1.289 W/kg, and 1.336 W/kg*** *respectively for* SAR_{1g}, Simultaneous Transmission（0mm） *are* ***2.895 W/kg and 2.942 W/kg*** *respectively for* SAR_{10g}.

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

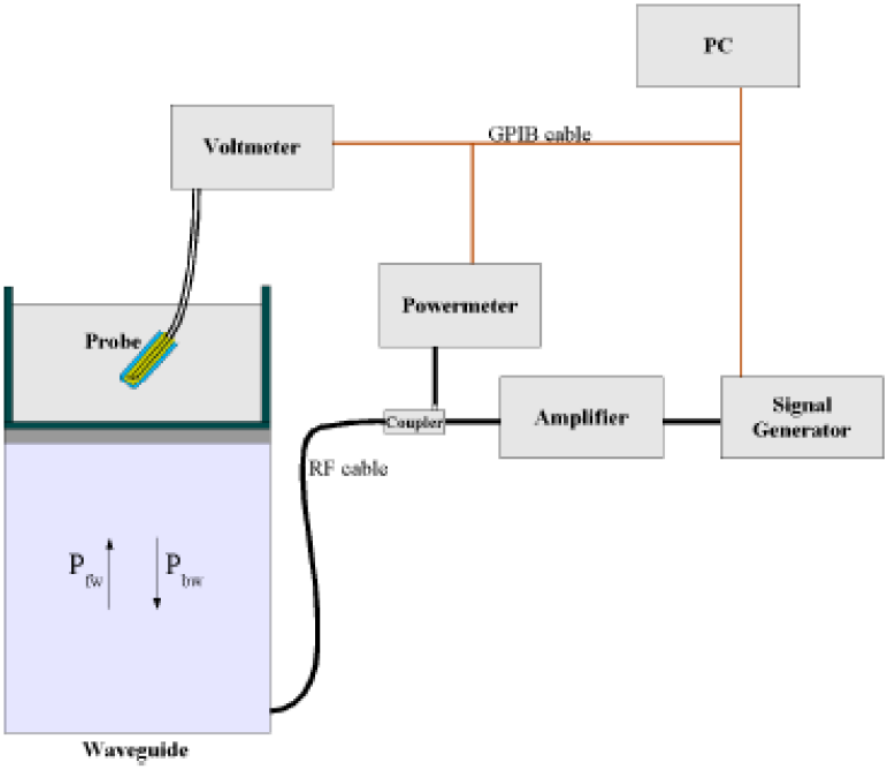
For the measurements the Specific Dosimetric E-Field Probe SSE2 SN 45/15 EPGO280 with following specifications is used

- 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.

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

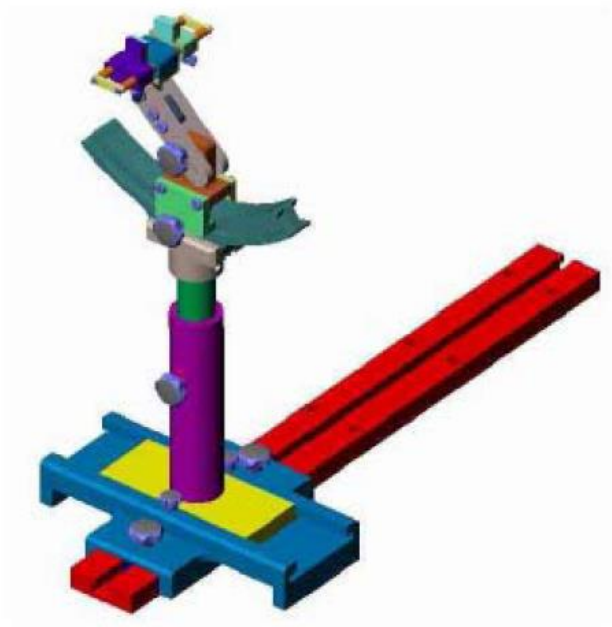
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

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

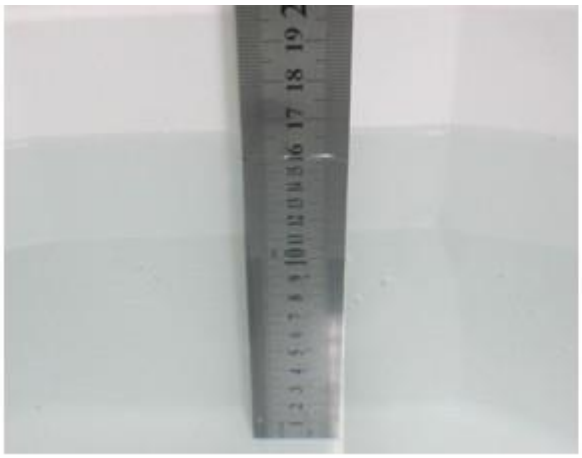
4.6 Test Equipment List

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
E-Field Probe	MVG	SSE2	SN 45/15 EPGO280	2019-07-08	2020-07-07
750MHz Dipole	MVG	SID750	SN 47/12 DIP 0G750-203	2020-03-11	2021-03-10
835MHz Dipole	MVG	SID835	SN 47/12 DIP 0G835-204	2020-03-11	2021-03-10
1800MHz Dipole	MVG	SID1800	SN 47/12 DIP 1G800-206	2020-03-11	2021-03-10
1900MHz Dipole	MVG	SID1900	SN 47/12 DIP 1G900-207	2020-03-11	2021-03-10
2450MHz Dipole	MVG	SID2450	SN 13/15 DIP 2G450-364	2020-03-11	2021-03-10
2600MHz Dipole	MVG	SID2600	SN 13/15 DIP 2G600-365	2020-03-11	2021-03-10
Dielectric Probe Kit	SATIMO	SCLMP	SN 47/12 OCPG49	2020-03-11	2021-03-10
SAM Phantom	SATIMO	SAM	SN/ 47/12 SAM95	N/A	N/A
MULTIMETER	KEITHLEY	Keithley 2000	4006367	2020-03-11	2021-03-10
Signal Generator	Agilent	N5182A	MY47070282	2020-03-11	2021-03-10
Universal Tester	Rohde & Schwarz	CMU200	112315	2020-03-11	2021-03-10
Communications Tester	Rohde & Schwarz	CMW500	148650	2020-03-11	2021-03-10
Network Analyzer	HP	8753C	SEMT-1064	2020-03-11	2021-03-10
Directional Couplers	Agilent	778D	SEMT-1198	2020-03-11	2021-03-10

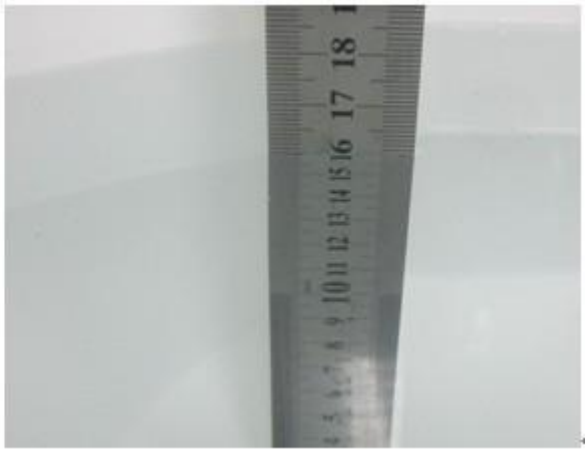
5. Tissue Simulating Liquids

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						
750	41.1	1.4	57.0	0.2	0.3	0
1700-1900	55.2	0.3	0	0	0	44.5
2450	55.0	0.1	0	0	0	44.9
Body						
750	50.0	0.8	48.8	0.2	0.2	0
1700-1900	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
750	**0.89**	**41.9**	**0.96**	**55.5**
835	0.90	41.5	0.97	55.2
900	0.97	41.5	1.05	55.0
915	0.98	41.5	1.06	55.0
1450	1.20	40.5	1.30	54.0
1610	1.29	40.3	1.40	53.8
1750	**1.37**	**40.1**	**1.49**	**53.4**
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
5200	4.66	36.0	5.30	49.0
5800	5.27	35.3	6.00	48.2

5.3 Tissue Calibration Result

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

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Body Tissue Simulating Liquid									
Freq. MHz.	Temp. (℃)	Conductivity			Permittivity			Limit (%)	Date
		Reading (σ)	Target (σ)	Delta (%)	Reading (ε r)	Target (ε r)	Delta (%)		
750	21.2	0.93	0.96	-3.12	54.96	55.50	-0.97	±5	2020-05-18
1800	21.3	1.46	1.52	-3.95	51.22	53.30	-3.90	±5	2020-05-19
1900	21.3	1.50	1.52	-1.32	52.42	53.30	-1.65	±5	2020-05-21
2450	21.3	1.91	1.95	-2.05	52.01	52.70	-1.31	±5	2020-05-25

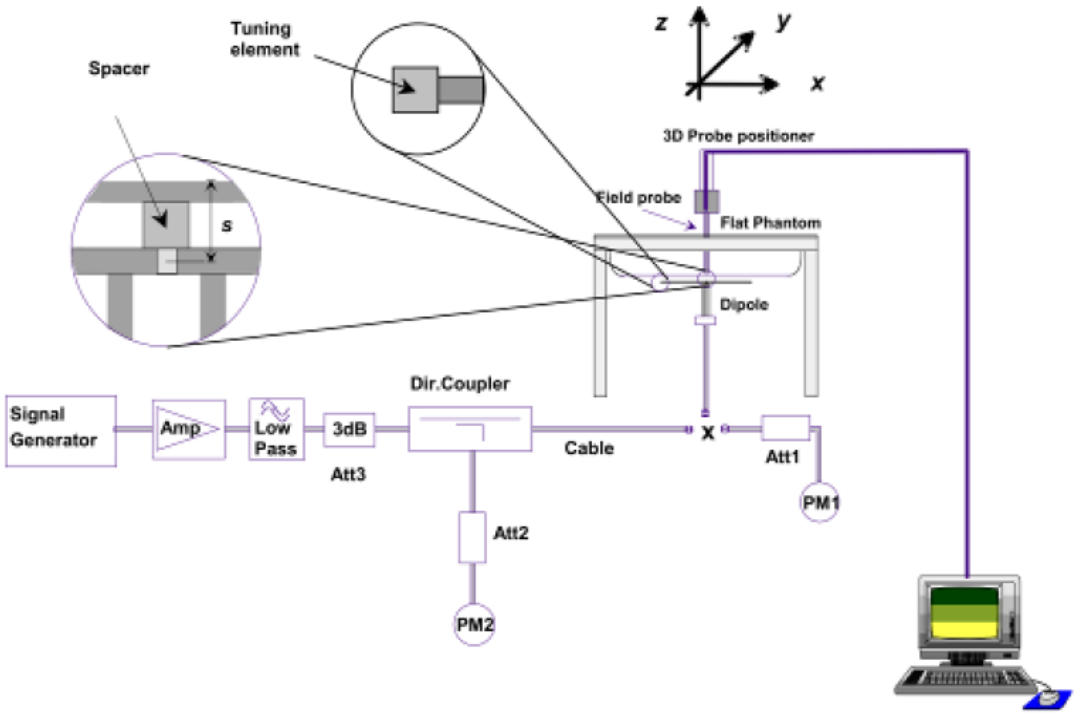
6. SAR Measurement Evaluation

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 835MHz ,1800MHz, 1900MHz 2450MHz,2600MHz,and 5GHz. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom.



System Verification Setup Block Diagram

Setup Photo of Dipole Antenna

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

6.3 Validation Results

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

Frequency	Targeted SAR_{1g}	Measured SAR_{1g}	Normalized SAR_{1g}	Tolerance
MHz	(W/kg)	(W/kg)	(W/kg)	(%)
Body				
750	8.40	2.12	8.48	-0.01
1800	38.51	9.58	38.32	0.00
1900	39.58	9.78	39.12	0.01
2450	53.69	13.45	53.8	0.00

Frequency	Targeted SAR_{10g}	Measured SAR_{10g}	Normalized SAR_{10g}	Tolerance
MHz	(W/kg)	(W/kg)	(W/kg)	(%)
Body				
750	5.51	1.00	4.00	-0.27
1800	20.85	5.22	20.88	0.00
1900	20.58	5.13	20.52	0.00
2450	23.35	6.02	24.08	0.03

Remark: Referring to IEEE 1528-2013, Section 8.2, The system check shall be performed at a test frequency that is within ±10% or ±100 MHz of the compliance test mid-band frequency, so the 1750 MHz system verification is made of 1800MHz Dipole.

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.

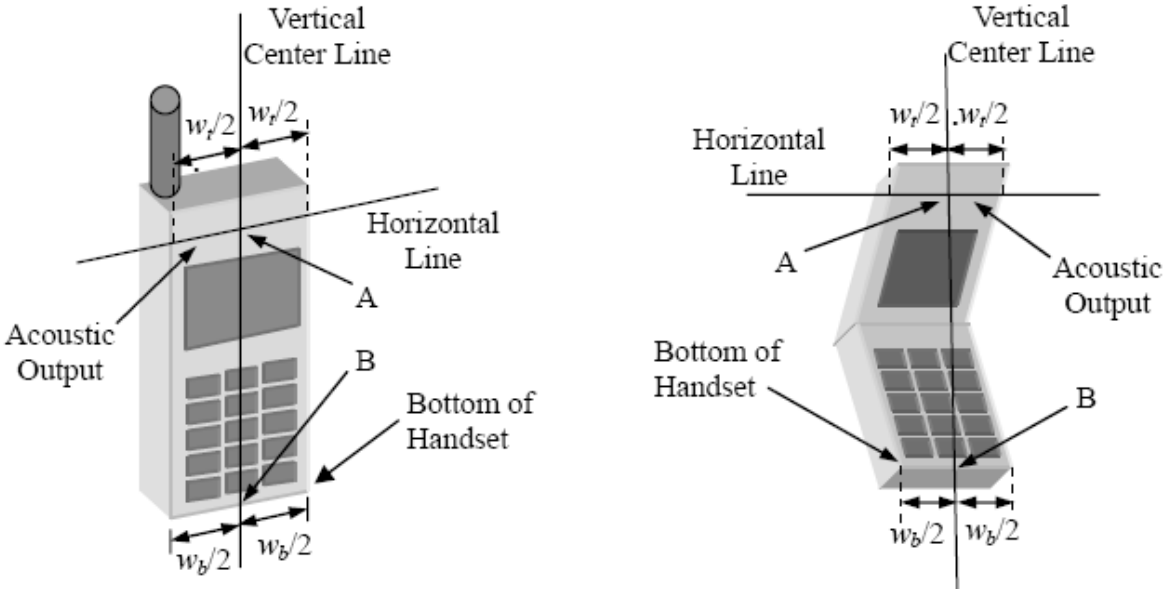


Illustration for Handset Vertical and Horizontal Reference Lines

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).

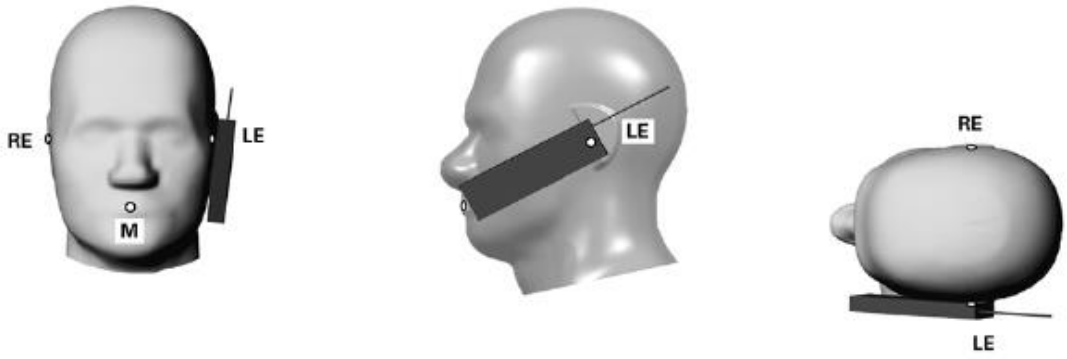


Illustration for Cheek Position

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).

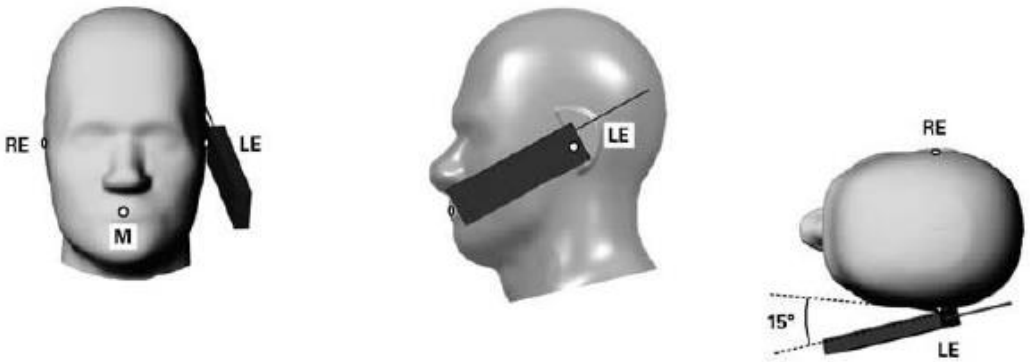


Illustration for Tilted Position

7.4 Body Position

(a) To position the device parallel to the phantom surface with each side.
(b) To adjust the device parallel to the flat phantom.
(c) To adjust the distance between the device surface and the flat phantom to 0mm.

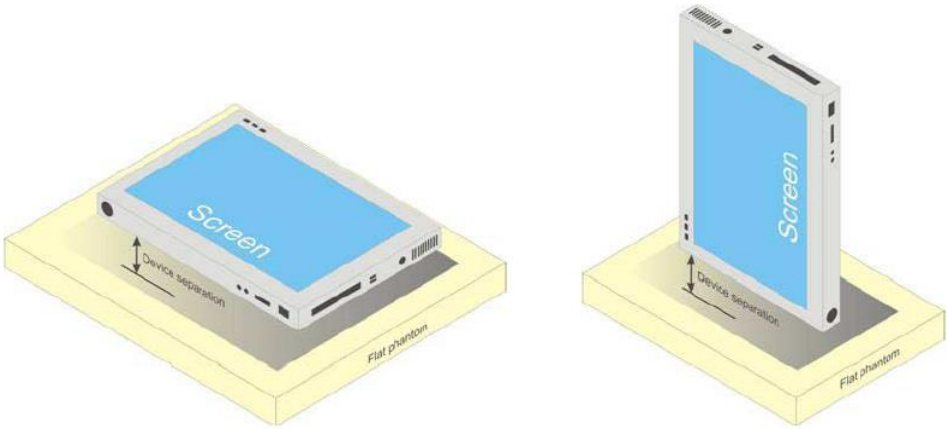
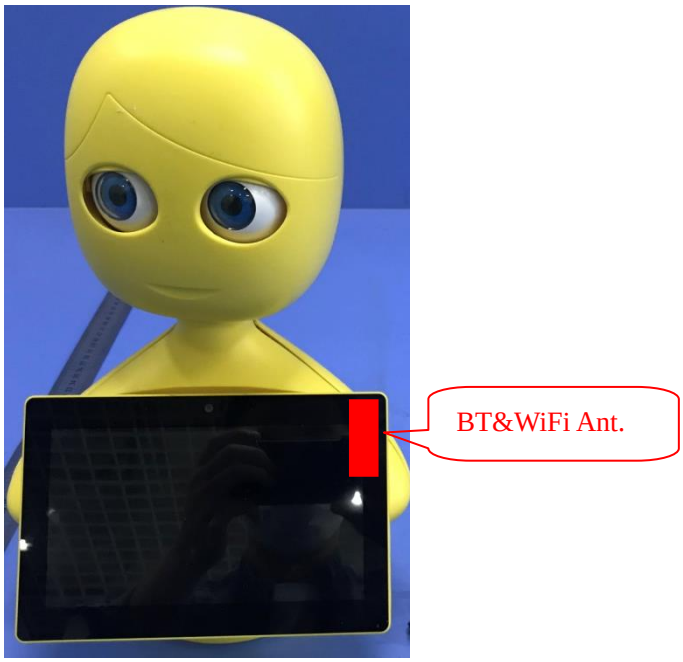


Illustration for Body Position

7.5 EUT Antenna Position



Front Side

Front Side

Block Diagram for EUT Antenna Position

Body SAR tests, Test distance: 10mm						
Antennas	**Back side**	**Front side**	**Left Edge**	**Right Edge**	**Top Edge**	**Bottom Edge**
WWAN	<25	<25	<25	300	300	60
WIFI	<25	<25	200	<25	<25	120

7.6 EUT Testing Position

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

Body SAR tests, Test distance: 0mm						
Antennas	**Front**	**Back**	**Right Side**	**Left Side**	**Top Side**	**Bottom Side**
WWAN	Yes	Yes	No	Yes	No	No
WIFI	Yes	Yes	Yes	No	Yes	No

Remark:

1. Referring to KDB 616217 D04 v01r02, KDB 248227 D01 v02r02 and KDB 447498 D01 v06, this device is overall diagonal dimension(>20cm) tablet, tested in direct contact (no gap) with flat phantom.

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

FDD-LTE Band 2:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.37	0
		1	3	23.34	0
		1	5	23.38	0
		3	0	23.26	0
		3	2	23.29	0
		3	3	23.38	0
		6	0	22.37	1
	MCH	1	0	23.00	0
		1	3	23.17	0
		1	5	23.06	0
		3	0	23.19	0
		3	2	23.22	0
		3	3	23.17	0
		6	0	22.20	1
	HCH	1	0	23.38	0
		1	3	23.45	0
		1	5	23.35	0
		3	0	23.25	0
		3	2	23.39	0
		3	3	23.37	0
		6	0	22.42	1
16QAM	LCH	1	0	21.99	1
		1	3	21.86	1
		1	5	21.80	1
		3	0	22.37	1
		3	2	22.46	1
		3	3	22.66	1
		6	0	21.45	2
	MCH	1	0	22.20	1
		1	3	22.32	1
		1	5	22.18	1
		3	0	21.05	1
		3	2	21.88	1
		3	3	21.80	1

		6	0	21.19	2
	HCH	1	0	22.12	1
		1	3	22.07	1
		1	5	21.99	1
		3	0	22.28	1
		3	2	22.34	1
		3	3	22.29	1
		6	0	21.33	2

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.15	0
		1	7	23.07	0
		1	14	23.27	0
		8	0	22.24	1
		8	4	22.36	1
		8	7	22.30	1
		15	0	22.33	1
	MCH	1	0	23.19	0
		1	7	22.97	0
		1	14	23.10	0
		8	0	22.26	1
		8	4	22.25	1
		8	7	22.22	1
		15	0	22.24	1
	HCH	1	0	23.44	0
		1	7	23.07	0
		1	14	23.21	0
		8	0	22.35	1
		8	4	22.20	1
		8	7	22.26	1
		15	0	22.37	1
16QAM	LCH	1	0	22.43	1
		1	7	21.99	1
		1	14	22.09	1
		8	0	21.30	2
		8	4	21.30	2
		8	7	21.26	2
		15	0	21.19	2
	MCH	1	0	21.98	1
		1	7	21.97	1
		1	14	22.24	1

		8	0	21.45	2
		8	4	21.45	2
		8	7	21.41	2
		15	0	21.31	2
	HCH	1	0	22.47	1
		1	7	22.12	1
		1	14	22.27	1
		8	0	21.24	2
		8	4	21.17	2
		8	7	21.19	2
		15	0	21.30	2

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.14	0
		1	12	23.27	0
		1	24	23.12	0
		12	0	22.23	1
		12	6	22.25	1
		12	13	22.21	1
		25	0	22.26	1
	MCH	1	0	23.12	0
		1	12	23.24	0
		1	24	23.19	0
		12	0	22.16	1
		12	6	22.11	1
		12	13	22.20	1
		25	0	22.13	1
	HCH	1	0	23.45	0
		1	12	23.55	0
		1	24	23.47	0
		12	0	22.30	1
		12	6	22.29	1
		12	13	22.36	1
		25	0	22.42	1
16QAM	LCH	1	0	21.91	1
		1	12	21.59	1
		1	24	21.80	1
		12	0	21.26	2
		12	6	21.27	2
		12	13	21.24	2
		25	0	21.25	2

	MCH	1	0	22.18	1
		1	12	21.77	1
		1	24	22.06	1
		12	0	20.93	2
		12	6	21.08	2
		12	13	21.27	2
		25	0	21.12	2
	HCH	1	0	21.99	1
		1	12	21.99	1
		1	24	21.90	1
		12	0	21.18	2
		12	6	21.09	2
		12	13	21.16	2
		25	0	21.04	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.28	0
		1	24	23.08	0
		1	49	22.36	0
		25	0	22.28	1
		25	12	22.33	1
		25	25	22.33	1
		50	0	22.23	1
	MCH	1	0	23.08	0
		1	24	23.05	0
		1	49	23.02	0
		25	0	22.04	1
		25	12	22.00	1
		25	25	22.15	1
		50	0	22.19	1
	HCH	1	0	23.21	0
		1	24	23.09	0
		1	49	22.99	0
		25	0	22.14	1
		25	12	22.36	1
		25	25	22.29	1
		50	0	22.13	1

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.22	0
		1	37	23.08	0
		1	74	23.00	0
		37	0	22.20	1
		37	18	22.05	1
		37	38	22.11	1
		75	0	21.98	1
	MCH	1	0	23.23	0
		1	37	23.41	0
		1	74	23.20	0
		37	0	22.38	1
		37	18	22.37	1
		37	38	22.31	1
		75	0	22.10	1
	HCH	1	0	23.43	0
		1	37	23.56	0
		1	74	23.39	0
		37	0	22.52	1
		37	18	22.52	1
		37	38	22.54	1
		75	0	17.17	1

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.35	0
		1	49	23.28	0
		1	99	22.91	0
		50	0	22.43	1
		50	25	22.34	1
		50	50	22.47	1
		100	0	22.10	1
	MCH	1	0	23.11	0
		1	49	23.22	0
		1	99	23.16	0
		50	0	22.29	1
		50	25	22.41	1
		50	50	22.41	1
		100	0	22.05	1

	HCH	1	0	23.22	0
		1	49	23.39	0
		1	99	23.34	0
		50	0	22.47	1
		50	25	22.47	1
		50	50	22.45	1
		100	0	22.25	1

FDD-LTE Band 4:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.04	0
		1	3	23.27	0
		1	5	23.18	0
		3	0	23.21	0
		3	2	23.23	0
		3	3	23.12	0
		6	0	22.16	1
	MCH	1	0	23.13	0
		1	3	23.35	0
		1	5	23.23	0
		3	0	23.23	0
		3	2	23.29	0
		3	3	23.21	0
		6	0	22.15	1
	HCH	1	0	22.97	0
		1	3	23.15	0
		1	5	23.13	0
		3	0	23.15	0
		3	2	23.11	0
		3	3	23.11	0
		6	0	22.15	1
16QAM	LCH	1	0	21.88	1
		1	3	22.14	1
		1	5	21.75	1
		3	0	21.77	1
		3	2	21.66	1
		3	3	21.56	1
		6	0	21.06	2
	MCH	1	0	22.05	1
		1	3	21.96	1

		1	5	21.87	1
		3	0	22.19	1
		3	2	22.26	1
		3	3	22.18	1
		6	0	21.17	2
	HCH	1	0	21.77	1
		1	3	21.89	1
		1	5	21.79	1
		3	0	21.90	1
		3	2	21.98	1
		3	3	21.99	1
		6	0	21.26	2

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	22.97	0
		1	7	22.87	0
		1	14	23.21	0
		8	0	21.95	1
		8	4	22.09	1
		8	7	22.01	1
		15	0	21.99	1
	MCH	1	0	23.07	0
		1	7	22.98	0
		1	14	23.05	0
		8	0	22.02	1
		8	4	22.16	1
		8	7	22.19	1
		15	0	22.10	1
	HCH	1	0	22.92	0
		1	7	22.94	0
		1	14	23.13	0
		8	0	21.84	1
		8	4	21.96	1
		8	7	21.99	1
		15	0	21.94	1
16QAM	LCH	1	0	21.70	1
		1	7	21.48	1
		1	14	21.72	1
		8	0	20.94	2
		8	4	21.04	2
		8	7	20.98	2

		15	0	20.97	2
	MCH	1	0	21.87	1
		1	7	21.84	1
		1	14	21.94	1
		8	0	20.99	2
		8	4	21.00	2
		8	7	20.97	2
		15	0	20.85	2
	HCH	1	0	22.02	1
		1	7	21.72	1
		1	14	21.94	1
		8	0	20.87	2
		8	4	20.98	2
		8	7	21.02	2
		15	0	20.89	2

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	22.96	0
		1	12	22.92	0
		1	24	22.87	0
		12	0	21.99	1
		12	6	21.97	1
		12	13	22.14	1
		25	0	22.01	1
	MCH	1	0	22.93	0
		1	12	23.14	0
		1	24	23.15	0
		12	0	21.96	1
		12	6	21.98	1
		12	13	22.03	1
		25	0	22.00	1
	HCH	1	0	22.97	0
		1	12	23.19	0
		1	24	23.33	0
		12	0	21.87	1
		12	6	21.82	1
		12	13	21.96	1
		25	0	21.86	1
16QAM	LCH	1	0	21.53	1
		1	12	21.29	1
		1	24	21.88	1

		12	0	21.09	2
		12	6	20.99	2
		12	13	21.07	2
		25	0	21.03	2
	MCH	1	0	21.69	1
		1	12	21.63	1
		1	24	21.85	1
		12	0	20.87	2
		12	6	20.93	2
		12	13	20.90	2
		25	0	20.54	2
	HCH	1	0	21.56	1
		1	12	21.82	1
		1	24	21.80	1
		12	0	20.80	2
		12	6	20.74	2
		12	13	20.88	2
		25	0	20.26	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.01	0
		1	24	22.98	0
		1	49	23.01	0
		25	0	21.86	1
		25	12	21.88	1
		25	25	21.91	1
		50	0	21.84	1
	MCH	1	0	22.99	0
		1	24	23.12	0
		1	49	22.98	0
		25	0	21.98	1
		25	12	22.01	1
		25	25	22.00	1
		50	0	22.00	1
	HCH	1	0	22.93	0
		1	24	23.28	0
		1	49	23.24	0
		25	0	21.71	1
		25	12	21.77	1
		25	25	21.81	1
		50	0	21.77	1

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	22.88	0
		1	37	23.07	0
		1	74	23.14	0
		37	0	21.80	1
		37	18	21.75	1
		37	38	21.84	1
		75	0	21.26	1
	MCH	1	0	23.04	0
		1	37	23.20	0
		1	74	23.10	0
		37	0	22.12	1
		37	18	22.26	1
		37	38	22.30	1
		75	0	22.19	1
	HCH	1	0	23.25	0
		1	37	23.41	0
		1	74	23.17	0
		37	0	22.08	1
		37	18	22.12	1
		37	38	22.13	1
		75	0	22.26	1

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.09	0
		1	49	23.11	0
		1	99	22.83	0
		50	0	22.10	1
		50	25	22.17	1
		50	50	22.16	1
		100	0	18.40	1
	MCH	1	0	23.14	0
		1	49	23.09	0
		1	99	23.00	0
		50	0	22.28	1
		50	25	22.23	1
		50	50	22.16	1
		100	0	18.44	1

	HCH	1	0	23.19	0
		1	49	23.38	0
		1	99	23.11	0
		50	0	22.34	1
		50	25	22.26	1
		50	50	22.11	1
		100	0	22.13	1

FDD-LTE Band 12:

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.20	0
		1	3	23.34	0
		1	5	23.33	0
		3	0	23.33	0
		3	2	23.33	0
		3	3	23.41	0
		6	0	22.36	1
	MCH	1	0	22.97	0
		1	3	23.10	0
		1	5	23.27	0
		3	0	23.14	0
		3	2	23.21	0
		3	3	23.22	0
		6	0	22.23	1
	HCH	1	0	23.05	0
		1	3	23.23	0
		1	5	23.19	0
		3	0	23.23	0
		3	2	23.25	0
		3	3	22.21	0
		6	0	22.26	1
16QAM	LCH	1	0	22.03	1
		1	3	22.31	1
		1	5	22.32	1
		3	0	22.15	1
		3	2	22.27	1
		3	3	22.30	1
		6	0	21.26	2
	MCH	1	0	22.04	1
		1	3	22.32	1

		1	5	22.10	1
		3	0	21.95	1
		3	2	21.92	1
		3	3	21.89	1
		6	0	21.21	2
	HCH	1	0	22.54	1
		1	3	22.49	1
		1	5	22.39	1
		3	0	22.34	1
		3	2	22.32	1
		3	3	21.25	1
		6	0	21.79	2

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.27	0
		1	7	23.32	0
		1	14	23.19	0
		8	0	22.38	1
		8	4	22.42	1
		8	7	22.33	1
		15	0	22.40	1
	MCH	1	0	23.09	0
		1	7	23.13	0
		1	14	23.11	0
		8	0	22.29	1
		8	4	22.28	1
		8	7	22.25	1
		15	0	22.37	1
	HCH	1	0	23.48	0
		1	7	23.38	0
		1	14	23.56	0
		8	0	22.17	1
		8	4	22.30	1
		8	7	22.23	1
		15	0	22.23	1
16QAM	LCH	1	0	22.53	1
		1	7	22.59	1
		1	14	22.52	1
		8	0	21.65	2
		8	4	21.62	2
		8	7	21.53	2

		15	0	21.34	2
	MCH	1	0	22.18	1
		1	7	22.14	1
		1	14	22.15	1
		8	0	21.14	2
		8	4	21.28	2
		8	7	21.32	2
		15	0	21.11	2
	HCH	1	0	22.28	1
		1	7	22.23	1
		1	14	22.23	1
		8	0	20.93	2
		8	4	21.02	2
		8	7	20.98	2
		15	0	21.20	2

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.25	0
		1	12	23.35	0
		1	24	23.38	0
		12	0	22.21	1
		12	6	22.18	1
		12	13	22.17	1
		25	0	22.20	1
	MCH	1	0	23.12	0
		1	12	23.03	0
		1	24	23.13	0
		12	0	22.15	1
		12	6	22.22	1
		12	13	22.20	1
		25	0	22.22	1
	HCH	1	0	23.15	0
		1	12	23.23	0
		1	24	23.29	0
		12	0	22.35	1
		12	6	22.37	1
		12	13	22.27	1
		25	0	22.26	1
16QAM	LCH	1	0	21.75	1
		1	12	21.92	1
		1	24	21.78	1

		12	0	21.18	2
		12	6	21.18	2
		12	13	21.23	2
		25	0	21.90	2
	MCH	1	0	21.87	1
		1	12	21.89	1
		1	24	21.80	1
		12	0	21.11	2
		12	6	21.19	2
		12	13	21.25	2
		25	0	21.81	2
	HCH	1	0	21.82	1
		1	12	21.71	1
		1	24	21.80	1
		12	0	20.98	2
		12	6	21.04	2
		12	13	20.93	2
		25	0	20.82	2

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Average Power [dBm]	MPR (dB)
		Size	Offset		
QPSK	LCH	1	0	23.12	0
		1	24	23.33	0
		1	49	23.01	0
		25	0	22.25	1
		25	12	22.21	1
		25	25	22.09	1
		50	0	22.38	1
	MCH	1	0	23.15	0
		1	24	23.09	0
		1	49	23.14	0
		25	0	23.17	1
		25	12	22.06	1
		25	25	22.25	1
		50	0	22.27	1
	HCH	1	0	22.94	0
		1	24	23.42	0
		1	49	22.99	0
		25	0	22.10	1
		25	12	22.38	1
		25	25	22.32	1
		50	0	22.23	1

Remark:

1. Per KDB941225 D05 v02r05, Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each required test channel. When the reported SAR is≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. 6 When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.
2. Per KDB941225 D05 v02r05, The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.
3. Per KDB941225 D05 v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB941225 D05 v02r05, For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

WLAN - Maximum Average Power					
Test Mode	**Data Rate**	**Channel**	**Frequency (MHz)**	**Average Power (dBm)**	**Tune-up power (dBm)**
802.11b	1Mbps	CH 01	2412	15.52	16.0
		CH 06	2437	15.59	16.0
		CH 11	2462	15.38	16.0
802.11g	6Mbps	CH 01	2412	14.85	15.0
		CH 06	2437	14.73	15.0
		CH 11	2462	14.70	15.0
802.11n (20MHz)	MCS0	CH 01	2412	14.00	14.5
		CH 06	2437	14.19	14.5
		CH 11	2462	14.48	14.5

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	**Channel(MHz)**	**Average Power(dBm)**	**Tune- up power (dBm)**
BLE	2402	6.376	6.5
	2440	6.065	6.5
	2480	6.470	6.5

Remark:

Bluetooth maximum output power is 6.47dBm *respectively*, and Maximum Tune-Up output power is 6.5dBm *respectively*,. 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

Bluetooth:

Tune-Up Power (dBm)	Max. Power (mW)	Distance (mm)	Frequency (GHz)	Result	Limit
6.5	4.47	10	2.480	0.70	3

The exclusion thresholds is 0.70< 3, therefore, the RF exposure evaluation is not required.

9.2 Test Results for Standalone SAR Test

Body SAR

LTE Band 2–Body SAR Test antenna (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
1.	QPSK 20MHz 1RB	Back Face	1900.0	23.39	24.0	1.151	0.958	1.102
2.	QPSK 20MHz 1RB	Back Face	1880.0	23.09	24.0	1.233	0.950	1.171
3.	QPSK 20MHz 1RB	Back Face	1860.0	23.33	24.0	1.167	0.266	0.310
4.	QPSK 20MHz 1RB	Front Face	1900.0	23.39	24.0	1.151	0.213	0.245
5.	QPSK 20MHz 1RB	Left Side	1900.0	23.39	24.0	1.151	0.861	0.991
6.	QPSK 20MHz 1RB	Left Side	1880.0	23.09	24.0	1.233	0.854	1.053
7.	QPSK 20MHz 1RB	Left Side	1860.0	23.33	24.0	1.167	0.691	0.806
8.	QPSK 20MHz 50%RB	Back Face	1900.0	22.47	23.0	1.130	0.421	0.476
9.	QPSK 20MHz 50%RB	Front Face	1900.0	22.47	23.0	1.130	0.113	0.128
10.	QPSK 20MHz 50%RB	Left Side	1900.0	22.47	23.0	1.130	0.357	0.403

LTE Band 2–Body SAR Test antenna (Gap: 0mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
	Modulation, Bandwidth, RB		MHz					
11.	QPSK 20MHz 1RB	Back Face	1900.0	23.39	24.0	1.151	1.782	2.051
12.	QPSK 20MHz 1RB	Front Face	1900.0	23.39	24.0	1.151	0.386	0.444
13.	QPSK 20MHz 1RB	Left Side	1900.0	23.39	24.0	1.151	2.516	2.895
14.	QPSK 20MHz 1RB	Left Side	1880.0	23.09	24.0	1.233	0.887	1.094
15.	QPSK 20MHz 1RB	Left Side	1860.0	23.33	24.0	1.167	0.692	0.807
16.	QPSK 20MHz 50%RB	Back Face	1900.0	22.47	23.0	1.130	0.721	0.815
17.	QPSK 20MHz 50%RB	Front Face	1900.0	22.47	23.0	1.130	0.073	0.082
18.	QPSK 20MHz 50%RB	Left Side	1900.0	22.47	23.0	1.130	0.957	1.081

LTE Band 4–Body SAR Test antenna (Gap: 10mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR1g (W/kg)	Scaled SAR1g (W/kg)
	Modulation, Bandwidth, RB		MHz					
19.	QPSK 20MHz 1RB	Back Face	1745.0	23.38	23.5	1.028	0.693	0.712
20.	QPSK 20MHz 1RB	Front Face	1745.0	23.38	23.5	1.028	0.148	0.152
21.	QPSK 20MHz 1RB	Left Side	1745.0	23.38	23.5	1.028	0.911	0.937
22.	QPSK 20MHz 1RB	Left Side	1732.5	23.09	23.5	1.099	1.173	1.289
23.	QPSK 20MHz 1RB	Left Side	1720.0	23.11	23.5	1.094	0.780	0.853
24.	QPSK 20MHz 50%RB	Back Face	1745.0	22.26	22.5	1.057	0.336	0.355

25.	QPSK 20MHz 50%RB	Front Face	1745.0	22.26	22.5	1.057	0.069	0.073
26.	QPSK 20MHz 50%RB	Left Side	1745.0	22.26	22.5	1.057	0.457	0.483

LTE Band 4–Body SAR Test antenna (Gap: 0mm)								
Plot No.	**Mode**	**Test Position Body**	**Frequency**	**Output Power (dBm)**	**Rated Limit (dBm)**	**Scaling Factor**	**SAR10g (W/kg)**	**Scaled SAR10g (W/kg)**
	Modulation, Bandwidth, RB		**MHz**					
27.	QPSK 20MHz 1RB	Back Face	1745.0	23.38	23.5	1.028	1.716	1.764
28.	QPSK 20MHz 1RB	Front Face	1745.0	23.38	23.5	1.028	0.167	0.172
29.	QPSK 20MHz 1RB	Left Side	1745.0	23.38	23.5	1.028	1.912	1.966
30.	QPSK 20MHz 1RB	Left Side	1732.5	23.09	23.5	1.099	0.852	0.936
31.	QPSK 20MHz 1RB	Left Side	1720.0	23.11	23.5	1.094	0.973	1.064
32.	QPSK 20MHz 50%RB	Back Face	1745.0	22.26	22.5	1.057	0.831	0.878
33.	QPSK 20MHz 50%RB	Front Face	1745.0	22.26	22.5	1.057	0.057	0.060
34.	QPSK 20MHz 50%RB	Left Side	1745.0	22.26	22.5	1.057	0.916	0.968

LTE Band 12–Body SAR Test antenna (Gap: 10mm)								
Plot No.	**Mode**	**Test Position Body**	**Frequency**	**Output Power (dBm)**	**Rated Limit (dBm)**	**Scaling Factor**	**SAR1g (W/kg)**	**Scaled SAR1g (W/kg)**
	Modulation, Bandwidth, RB		**MHz**					
35.	RMC QPSK 10MHz 1RB	Back Face	711.0	23.42	23.5	1.019	0.237	0.241
36.	RMC QPSK 10MHz 1RB	Front Face	711.0	23.42	23.5	1.019	0.076	0.077
37.	RMC QPSK 10MHz 1RB	Left Side	711.0	23.42	23.5	1.019	0.230	0.234
38.	RMC QPSK 10MHz 50%RB	Back Side	711.0	22.23	22.5	1.064	0.122	0.130
39.	RMC QPSK 10MHz 50%RB	Front Side	711.0	22.23	22.5	1.064	0.039	0.042
40.	RMC QPSK 10MHz 50%RB	Left side	711.0	22.23	22.5	1.064	0.115	0.122

LTE Band 12–Body SAR Test antenna (Gap: 0mm)								
Plot No.	**Mode**	**Test Position Body**	**Frequency**	**Output Power (dBm)**	**Rated Limit (dBm)**	**Scaling Factor**	**SAR10g (W/kg)**	**Scaled SAR10g (W/kg)**
	Modulation, Bandwidth, RB		**MHz**					
41.	RMC QPSK 10MHz 1RB	Back Face	711.0	23.42	23.5	1.019	0.296	0.302
42.	RMC QPSK 10MHz 1RB	Front Face	711.0	23.42	23.5	1.019	0.034	0.035
43.	RMC QPSK 10MHz 1RB	Left Side	711.0	23.42	23.5	1.019	0.310	0.316
44.	RMC QPSK 10MHz 50%RB	Back Side	711.0	22.23	22.5	1.064	0.132	0.140
45.	RMC QPSK 10MHz 50%RB	Front Side	711.0	22.23	22.5	1.064	0.018	0.019
46.	RMC QPSK 10MHz 50%RB	Left side	711.0	22.23	22.5	1.064	0.151	0.161

WLAN 2.4GHz –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.	802.11b	Back Face	06	2437	15.59	16.0	1.099	0.135	0.148
48.	802.11b	Front Face	06	2437	15.59	16.0	1.099	0.104	0.114
49.	802.11b	Right Side	06	2437	15.59	16.0	1.099	0.252	0.277
50.	802.11b	Top Side	06	2437	15.59	16.0	1.099	0.037	0.041

WLAN 2.4GHz –Body SAR Test(Gap: 0mm)									
Plot No.	Mode	Test Position Body	Frequency		Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
			CH.	MHz					
51.	802.11b	Back Face	06	2437	15.59	16.0	1.099	0.366	0.402
52.	802.11b	Front Face	06	2437	15.59	16.0	1.099	0.225	0.247
53.	802.11b	Right Side	06	2437	15.59	16.0	1.099	0.333	0.366
54.	802.11b	Top Side	06	2437	15.59	16.0	1.099	0.080	0.088

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

Repeated SAR

LTE Band 2–Body SAR Test antenna (Gap: 0mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
	Modulation, Bandwidth, RB		MHz					
55.	QPSK 20MHz 1RB	Back Face	1900.0	23.39	24.0	1.151	1.274	1.466
56.	QPSK 20MHz 1RB	Left Side	1900.0	23.39	24.0	1.151	1.695	1.951

LTE Band 4–Body SAR Test antenna (Gap: 0mm)								
Plot No.	Mode	Test Position Body	Frequency	Output Power (dBm)	Rated Limit (dBm)	Scaling Factor	SAR10g (W/kg)	Scaled SAR10g (W/kg)
	Modulation, Bandwidth, RB		MHz					
57.	QPSK 20MHz 1RB	Back Face	1745.0	23.38	23.5	1.028	1.370	1.408
58.	QPSK 20MHz 1RB	Left Side	1745.0	23.38	23.5	1.028	1.844	1.896

9.3 Simultaneous Multi-band Transmission SAR Analysis

List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Body-worn SAR
1	LTE(Data) + (2.4G)WLAN(Data)	Yes
2	LTE(Data) + Bluetooth(Data)	Yes

Remark:

1. GSM ,WCDMA and LTE 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(10g) 10mm
6.5	4.47	5/10	2.480	7.5	0.188	0.047

10mm

Position	WWAN		WLAN(2.4G)	Summed SAR1g (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	LTE Band 2	1.171	0.148	1.319
Front	LTE Band 2	0.245	0.114	0.359
Right side	LTE Band 2	--	0.277	0.277
Left side	LTE Band 2	1.053	--	1.053
Back	LTE Band 4	0.712	0.148	0.86
Front	LTE Band 4	0.152	0.114	0.266
Right side	LTE Band 4	--	0.277	0.277
Left side	LTE Band 4	1.289	--	1.289
Back	LTE Band 12	0.241	0.148	0.389
Front	LTE Band 12	0.077	0.114	0.191
Right side	LTE Band 12	--	0.277	0.277
Left side	LTE Band 12	0.234	--	0.234
Top side	LTE Band 12	--	0.037	0.037

Position	WWAN		Bluetooth	Summed SAR1g (W/kg)
	Band	Scaled SAR (W/kg)	Scaled SAR (W/kg)	
Back	LTE Band 2	1.171	0.047	1.218
Front	LTE Band 2	0.245	0.047	0.292
Right side	LTE Band 2	--	0.047	0.047
Left side	LTE Band 2	1.053	0.047	1.10
Back	LTE Band 4	0.712	0.047	0.759
Front	LTE Band 4	0.152	0.047	0.199
Right side	LTE Band 4	--	0.047	0.047
Left side	LTE Band 4	1.289	0.047	1.336
Back	LTE Band 12	0.241	0.047	0.288
Front	LTE Band 12	0.077	0.047	0.124
Right side	LTE Band 12	--	0.047	0.047
Left side	LTE Band 12	0.234	0.047	0.281
Top side	LTE Band 12	--	0.047	0.047

0mm

	WWAN		WLAN(2.4G)	Summed SAR10g (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	LTE Band 2	2.051	0.402	2.453
Front	LTE Band 2	0.444	0.247	0.691
Right side	LTE Band 2	--	0.366	0.366
Left side	LTE Band 2	2.895	--	2.895
Back	LTE Band 4	1.764	0.402	2.166
Front	LTE Band 4	0.172	0.247	0.419
Right side	LTE Band 4	--	0.366	0.366
Left side	LTE Band 4	1.966	--	1.966
Back	LTE Band 12	0.302	0.402	0.704
Front	LTE Band 12	0.035	0.247	0.282
Right side	LTE Band 12	--	0.366	0.366
Left side	LTE Band 12	0.316	--	0.316

	WWAN		Bluetooth	Summed SAR10g (W/kg)
Position	**Band**	**Scaled SAR (W/kg)**	**Scaled SAR (W/kg)**	
Back	LTE Band 2	2.051	0.047	2.098
Front	LTE Band 2	0.444	0.047	0.491
Right side	LTE Band 2	--	0.047	0.047
Left side	LTE Band 2	2.895	0.047	2.942
Back	LTE Band 4	1.764	0.047	1.811
Front	LTE Band 4	0.172	0.047	0.219
Right side	LTE Band 4	--	0.047	0.047
Left side	LTE Band 4	1.966	0.047	2.013
Back	LTE Band 12	0.302	0.047	0.349
Front	LTE Band 12	0.035	0.047	0.082
Right side	LTE Band 12	--	0.047	0.047
Left side	LTE Band 12	0.316	0.047	0.363

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. SAR Evaluation	E.5.2	5.0	R	√3	1	1	2.89	2.89	∝
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	√3	1	1	0.58	0.58	N–1
Input power and SAR drift measurement	8,6.6.2	12.02	R	√3	1	1	6.94	6.94	∝
Deviation of experimental dipole from numerical dipole	E.6.4	5.5	R	√3	1	1	3.20	3.20	∝
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	√3	1	1	0.03	0.03	∝
Uncertainty in SAR correction for deviations in permittivity and conductivity	E3.2	2.0	R	√3	1	0.84	1.10	1.10	∝
Liquid conductivity - deviation from target value	E.3.2	5.00	R	√3	0.64	0.43	1.85	1.24	

Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	1	0.64	0.43	3.20	2.15	
Liquid permittivity - deviation from target value	E.3.2	0.37	R	√3	0.6	0.49	0.13	0.10	
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	1	0.6	0.49	6.00	4.90	M
Combined Standard Uncertainty			RSS				12.00	11.50	
Expanded Uncertainty (95% Confidence interval)			K=2				23.39	22.43	

Annex A. Plots of System Performance Check

MEASUREMENT 1

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Measurement duration: 12 minutes 21 seconds

Test Date :2020-05-18

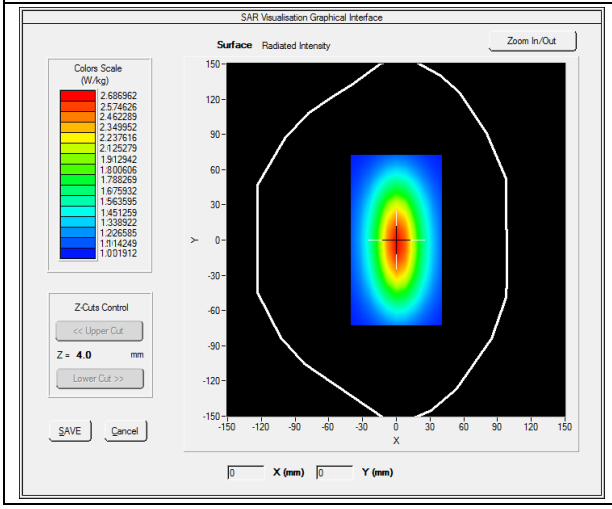
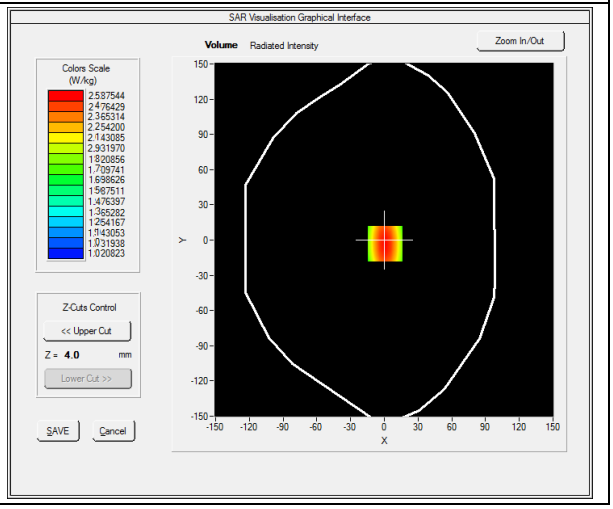
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW750
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	750.000000
Relative Permittivity (real part)	54.964739
Conductivity (S/m)	0.931048
Power Variation (%)	0.034745
Ambient Temperature	21.1
Liquid Temperature	21.3

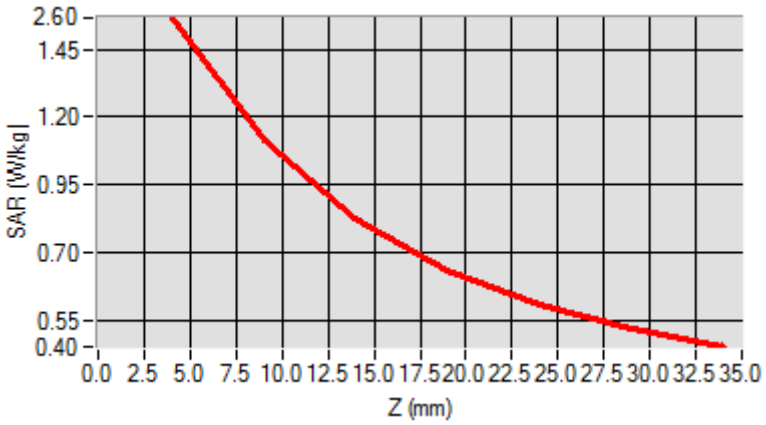
SURFACE SAR	VOLUME SAR
	

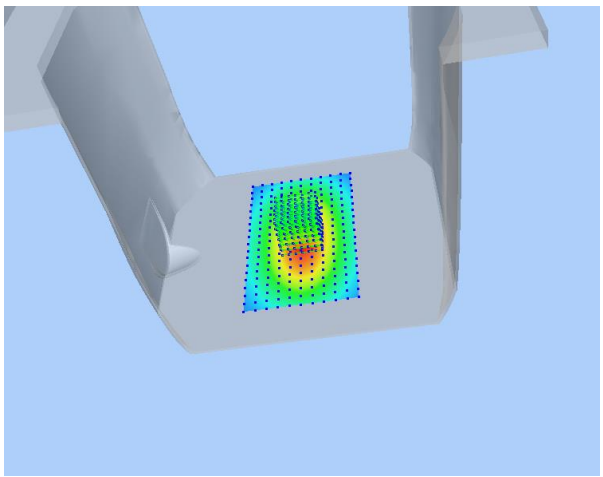
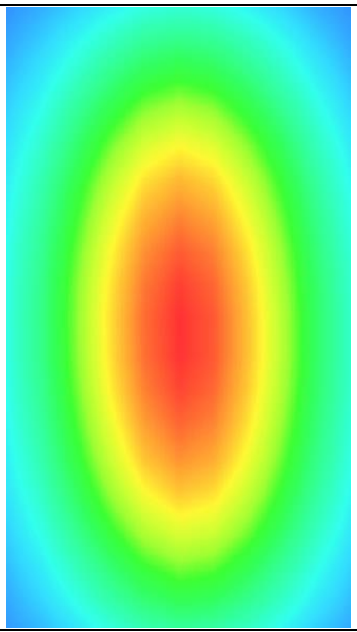
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	1.000865
SAR 1g (W/Kg)	2.124211

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	2.5132	1.1087	0.8214	0.5160	0.4875	0.4864



3D screen shot	Hot spot position
	

MEASUREMENT 2

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Measurement duration: 12 minutes 21 seconds

Test Date :2020-05-19

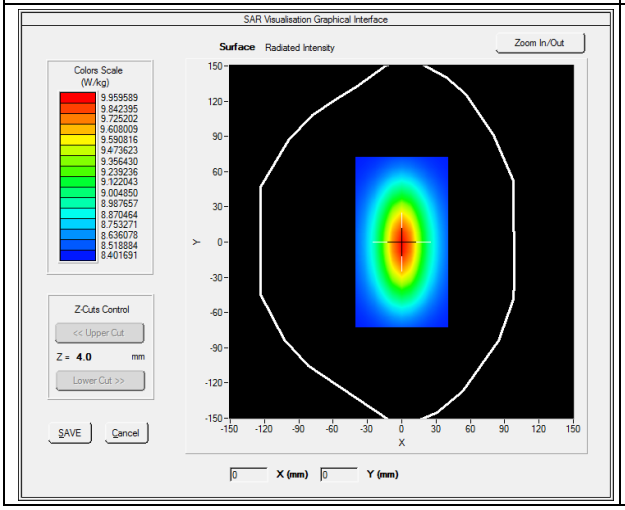
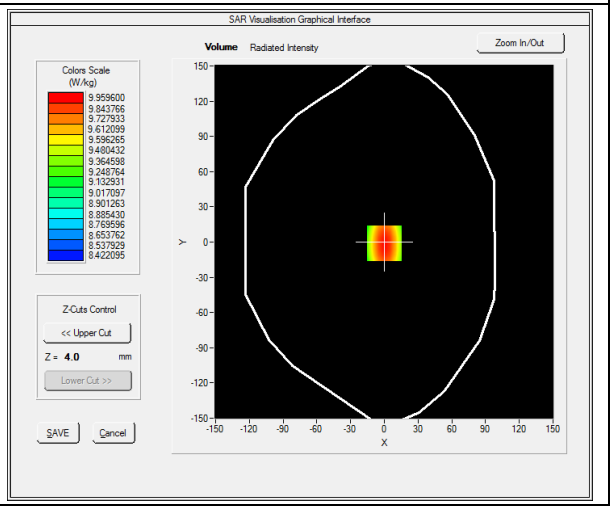
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1800
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	1800.000000
Relative Permittivity (real part)	51.224510
Conductivity (S/m)	1.461261
Power Variation (%)	0.845690
Ambient Temperature	21.1
Liquid Temperature	21.2

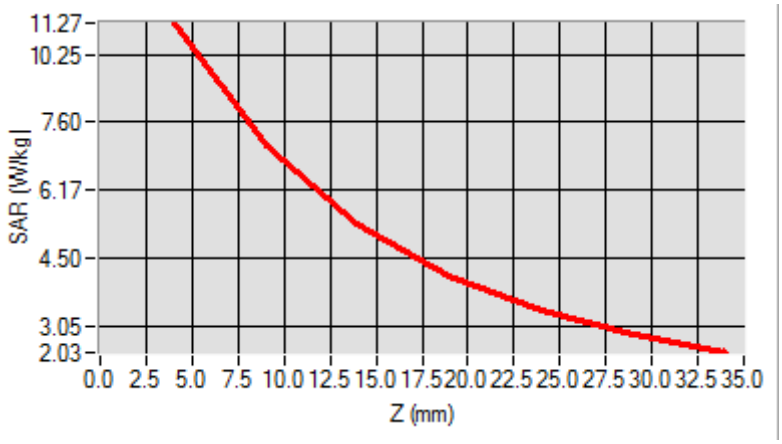
SURFACE SAR	VOLUME SAR
	

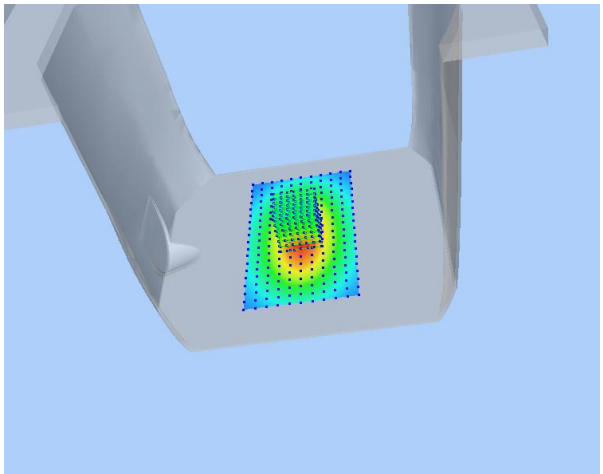
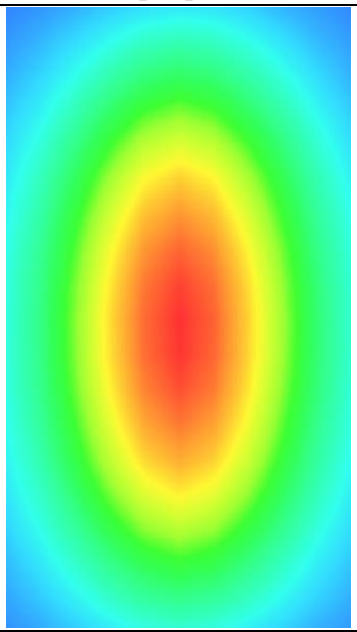
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	**5.221202**
SAR 1g (W/Kg)	**9.582560**

Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**	**24.00**	**29.00**
SAR (W/Kg)	**0.0000**	**11.2425**	**9.4123**	**8.0345**	**6.9125**	**6.3092**	**3.9460**



3D screen shot	**Hot spot position**
	

MEASUREMENT 3

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Measurement duration: 12 minutes 21 seconds

Test Date :2020-05-21

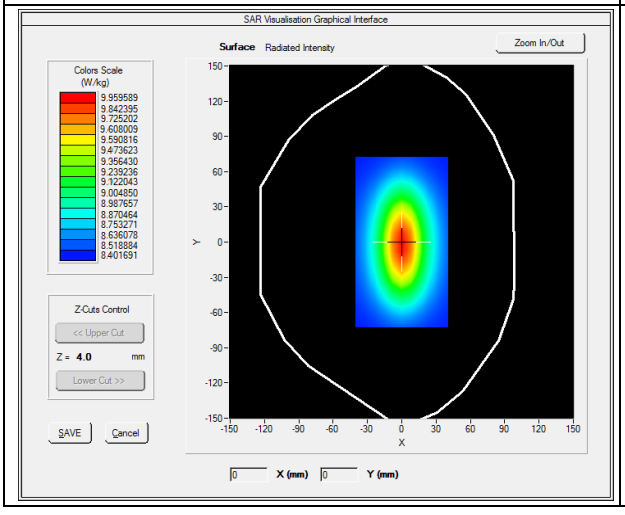
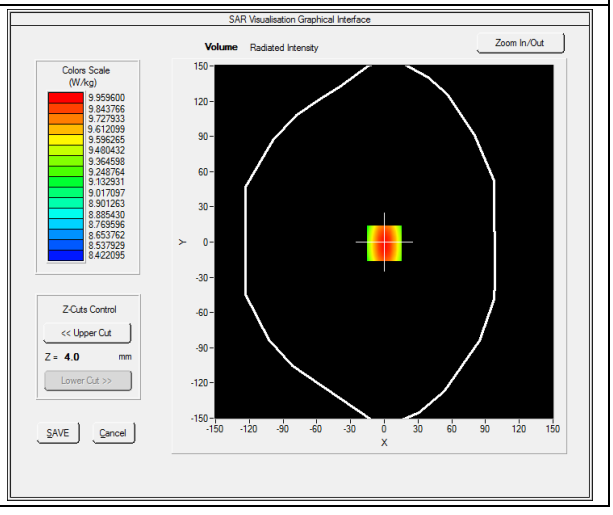
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

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

B. SAR Measurement Results

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

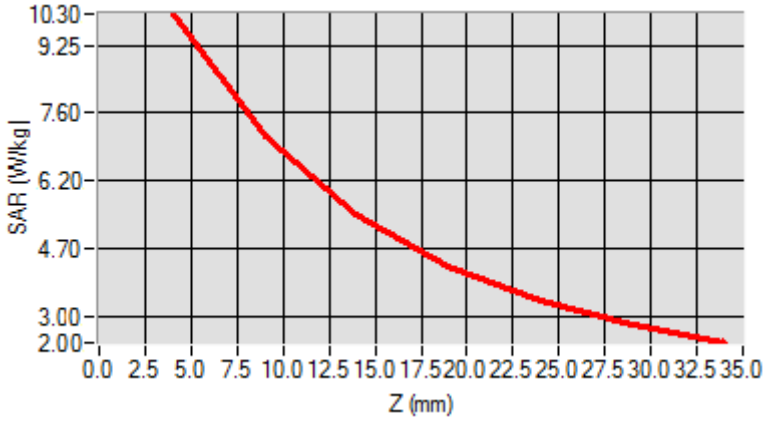
SURFACE SAR	VOLUME SAR
	

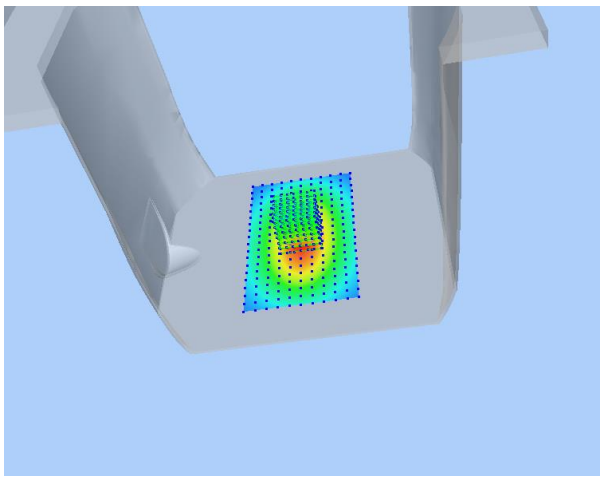
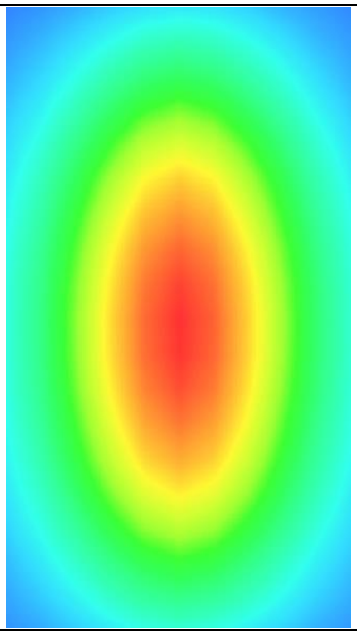
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	5.134651
SAR 1g (W/Kg)	9.781550

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 4

For Body Liquid

Type: Validation measurement (Fast, 75.00 %)

Measurement duration: 12 minutes 21 seconds

Test Date :2020-05-25

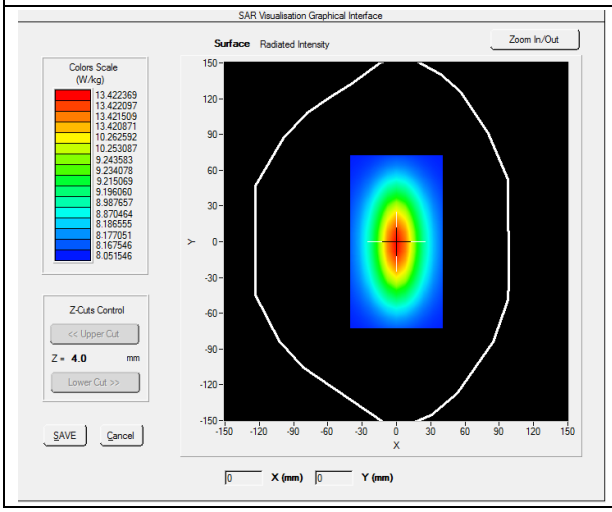
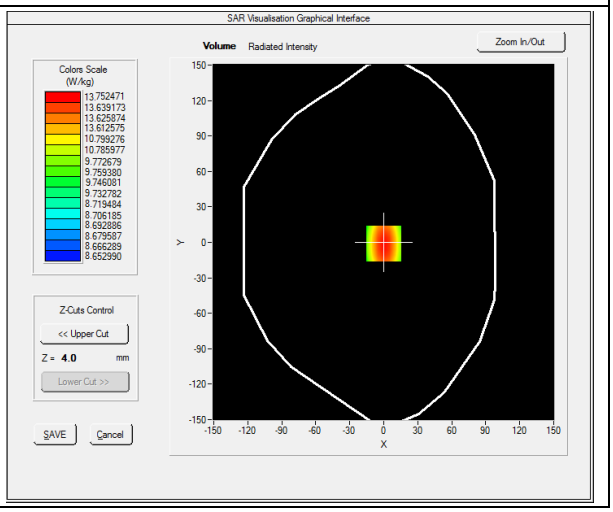
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

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	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative Permittivity (real part)	38.153660
Conductivity (S/m)	1.740236
Power Variation (%)	1.141452
Ambient Temperature	21.1
Liquid Temperature	21.2

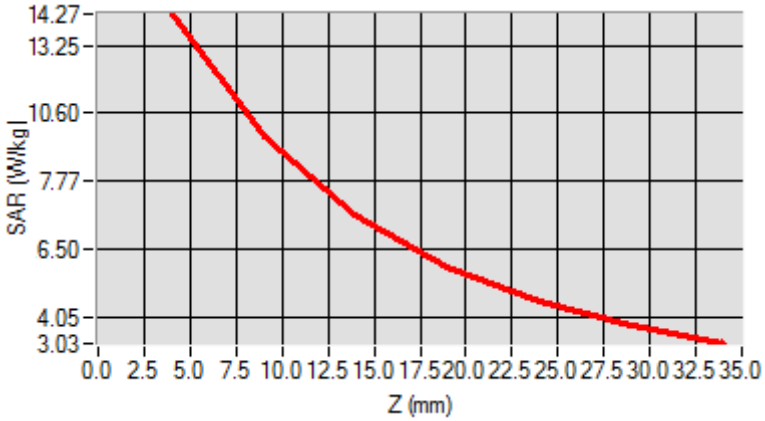
SURFACE SAR	VOLUME SAR
	

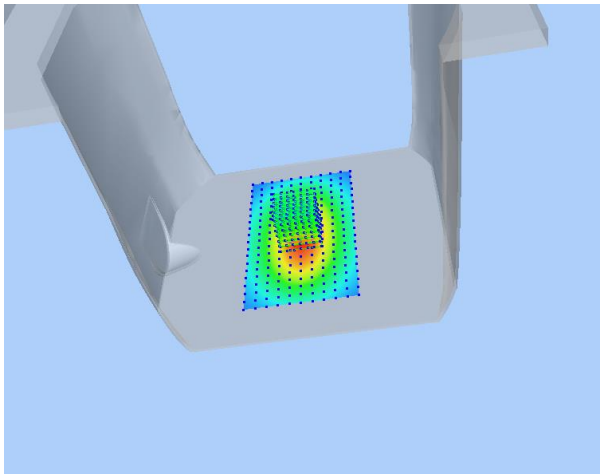
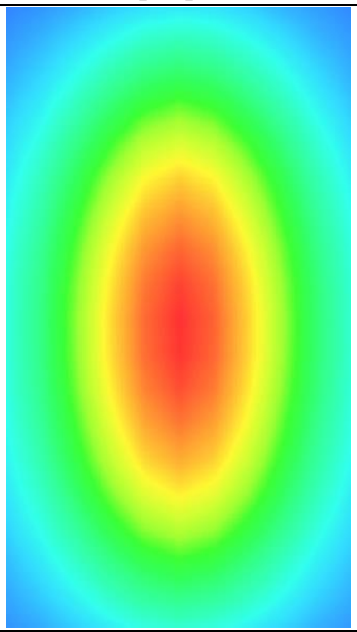
Maximum location: X=0.00, Y=0.00

SAR 10g (W/Kg)	6.020427
SAR 1g (W/Kg)	13.452457

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0000	14.1034	12.0012	10.2624	7.4715	5.9022	4.5114



3D screen shot	Hot spot position
	

Annex B. Plots of SAR Measurement

TYPE	BAND	PARAMETERS
Mabu	**LTE Band 2_RMC（10mm）**	Measurement 2: Flat Plane with Back device position on Middle Channel in LTE mode
Mabu	**LTE Band 2_RMC（0mm）**	Measurement 13: Flat Plane with Left device position on High Channel in LTE mode
Mabu	**LTE Band 4_RMC（10mm）**	Measurement 22: Flat Plane with Left device position on Middle Channel in LTE mode
Mabu	**LTE Band 4_RMC（0mm）**	Measurement 29: Flat Plane with Left device position on High Channel in LTE mode
Mabu	**LTE Band 12_RMC（10mm）**	Measurement 35: Flat Plane with Back device position on High Channel in LTE mode
Mabu	**LTE Band 12_RMC（0mm）**	Measurement 43: Flat Plane with Left device position on High Channel in LTE mode
Mabu	**WIFI(2.4G)_802.11b（10mm）**	Measurement 49: Flat Plane with Right device position on Middle Channel in LTE mode
Mabu	**WIFI(2.4G)_802.11b（0mm）**	Measurement 51: Flat Plane with Back device position on Middle Channel in LTE mode
Mabu	**LTE Band 2_RMC（0mm）**	Measurement 56: Flat Plane with Left device position on High Channel in LTE mode
Mabu	**LTE Band 4_RMC（0mm）**	Measurement 58: Flat Plane with Left device position on High Channel in LTE mode
Remark: SAR plot is showed the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.		

MEASUREMENT 2

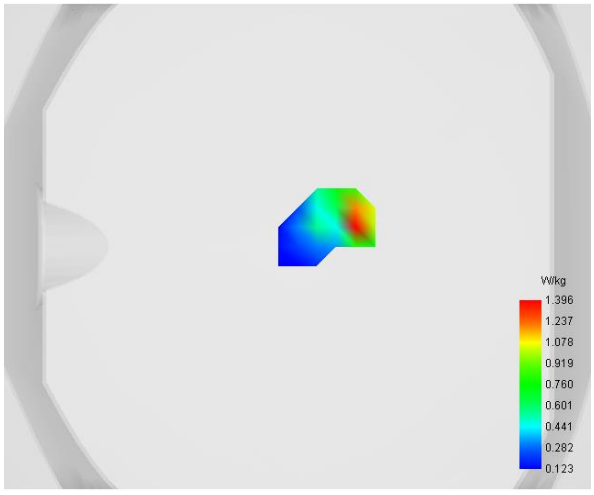
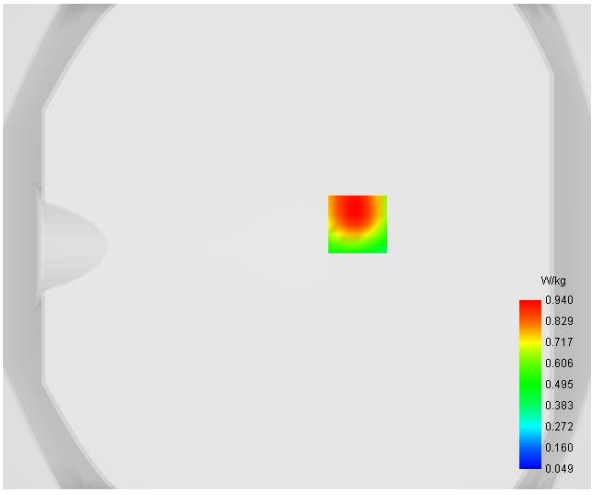
Type: Phone measurement (Complete)
Date of measurement: 2020-05-21
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Back
Band	LTE Band 2
Channels	QPSK, 20MHz, 1RB, Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1880.000000
Relative Permittivity (real part)	38.560124
Conductivity (S/m)	1.380369
Power Variation (%)	1.743564
Ambient Temperature	21.1
Liquid Temperature	21.3

SURFACE SAR	VOLUME SAR
	

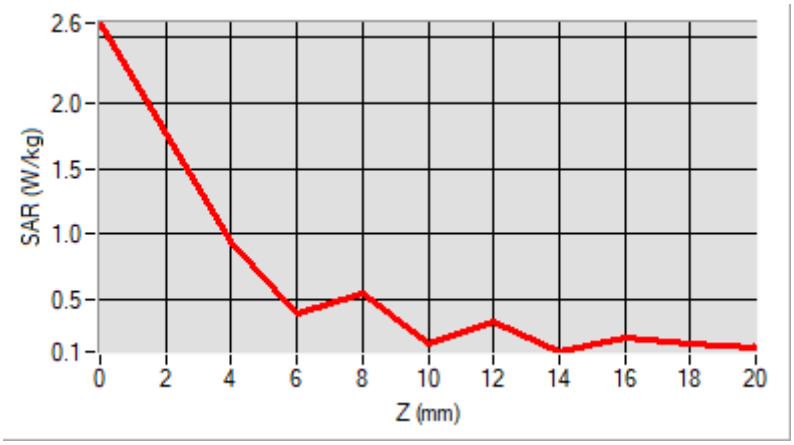
Maximum location: X=25.00, Y=9.00

D. SAR 1g & 10g

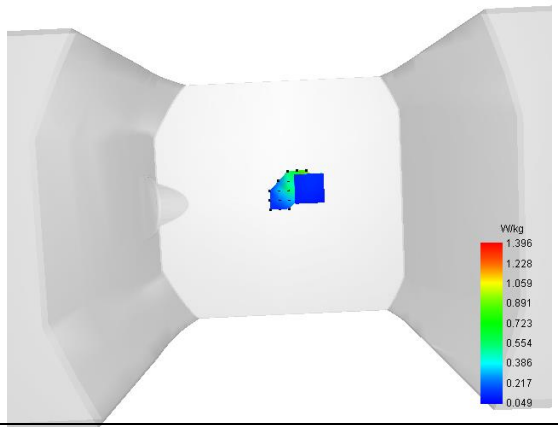
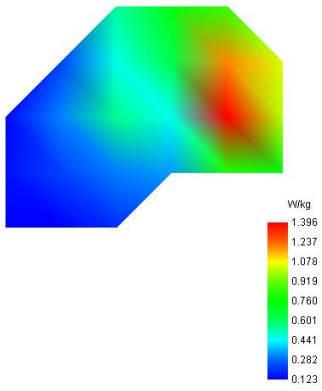
SAR 10g (W/Kg)	**0.463435**
SAR 1g (W/Kg)	**0.949537**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**6.00**	**8.00**	**10.00**	**12.00**	**14.00**	**16.00**	**18.00**
SAR (W/Kg)	**2.6093**	**0.9400**	**0.3952**	**0.5504**	**0.1691**	**0.3334**	**0.1053**	**0.2094**	**0.1661**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 13

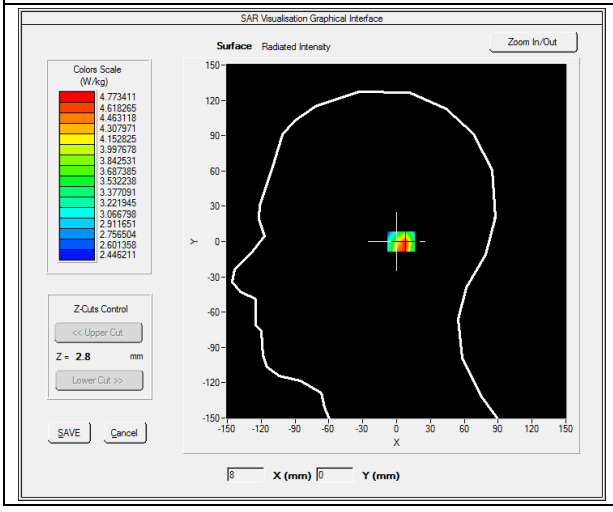
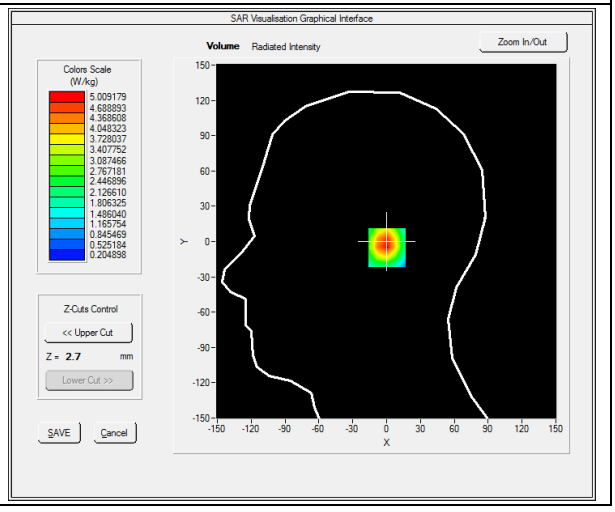
Type: Phone measurement (Complete)
Date of measurement: 2020-05-21
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Left Side
Band	LTE Band 2
Channels	QPSK, 20MHz, 1RB, Middle
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 (%)	1.743564
Ambient Temperature	21.1
Liquid Temperature	21.3

SURFACE SAR	VOLUME SAR
	

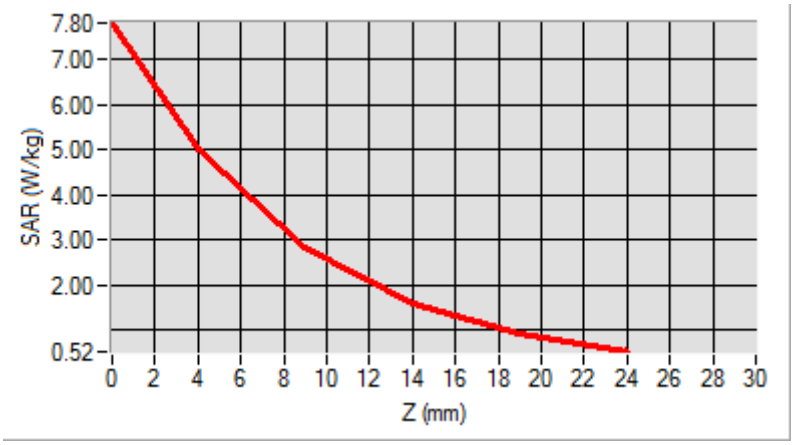
Maximum location: X=6.00, Y=-5.00

D. SAR 1g & 10g

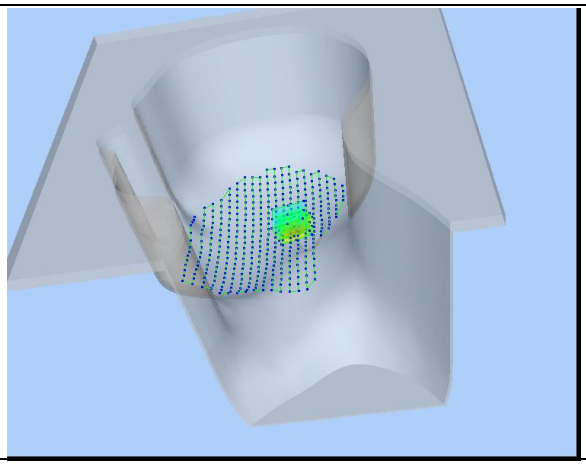
SAR 10g (W/Kg)	**2.516398**
SAR 1g (W/Kg)	**4.751174**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**7.7988**	**5.0092**	**2.8050**	**1.5737**	**0.9152**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 22

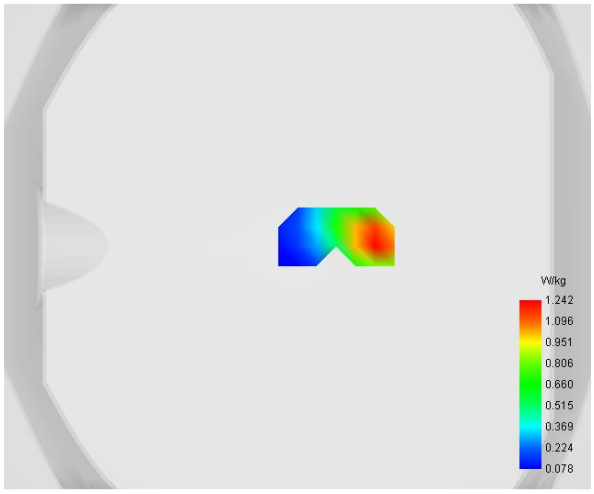
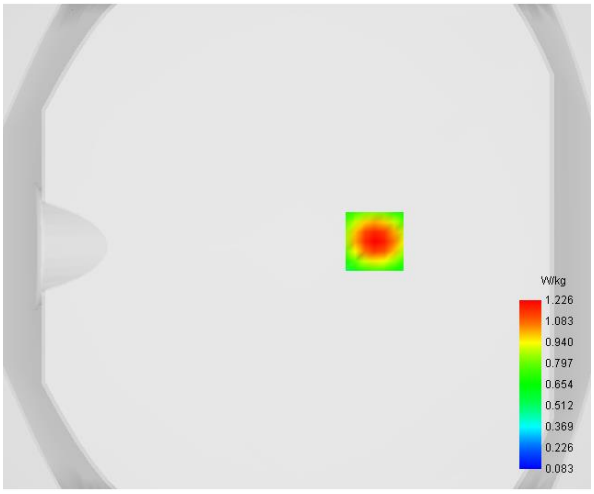
Type: Phone measurement (Complete)
Date of measurement: 2020-05-19
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Left Side
Band	LTE Band 4
Channels	QPSK, 20MHz, 1RB, Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1732.500000
Relative Permittivity (real part)	51.224510
Conductivity (S/m)	1.461261
Power Variation (%)	0.858383
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

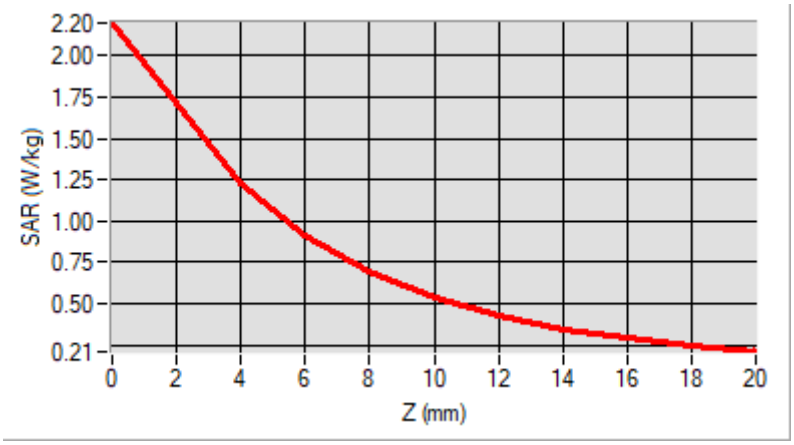
Maximum location: X=32.00, Y=2.00

D. SAR 1g & 10g

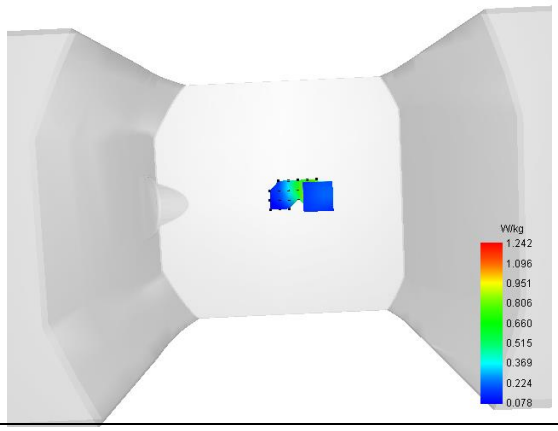
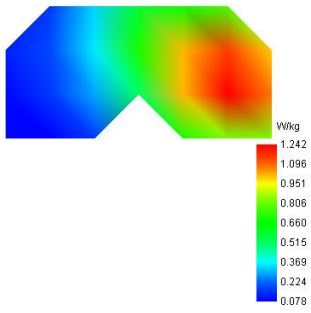
SAR 10g (W/Kg)	**0.619003**
SAR 1g (W/Kg)	**1.172959**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**6.00**	**8.00**	**10.00**	**12.00**	**14.00**	**16.00**	**18.00**
SAR (W/Kg)	**2.1967**	**1.2260**	**0.9188**	**0.6944**	**0.5372**	**0.4268**	**0.3483**	**0.2910**	**0.2471**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 29

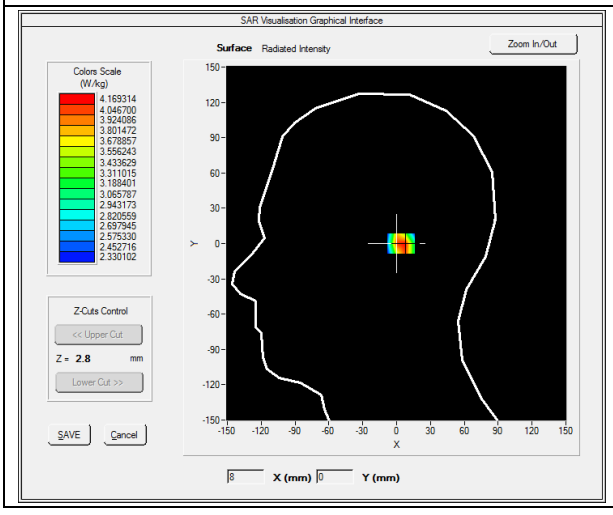
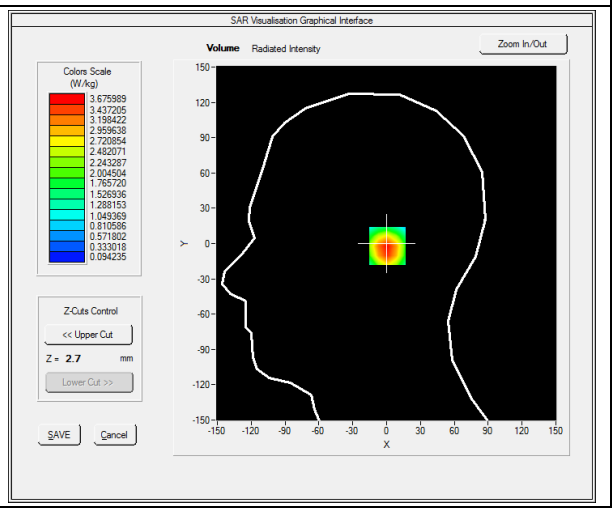
Type: Phone measurement (Complete)
Date of measurement: 2020-05-19
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Left Side
Band	LTE Band 4
Channels	QPSK, 20MHz, 1RB, High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1745.000000
Relative Permittivity (real part)	51.224510
Conductivity (S/m)	1.461261
Power Variation (%)	0.858383
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

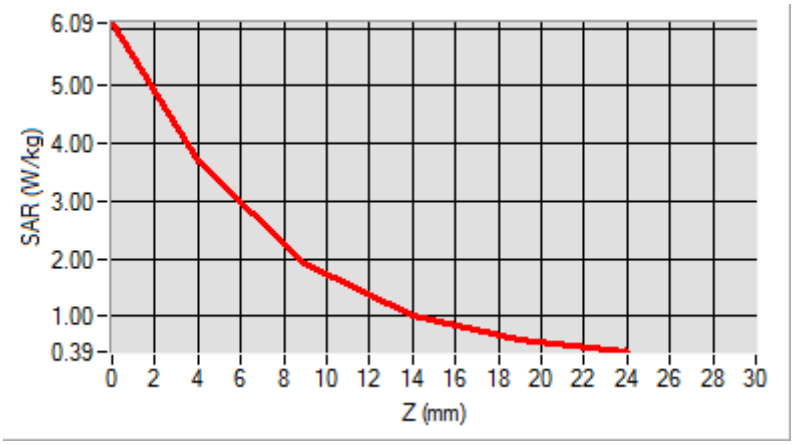
Maximum location: X=6.00, Y=-2.00

D. SAR 1g & 10g

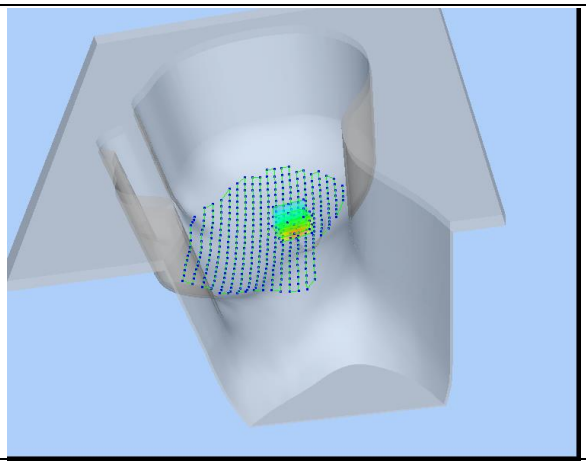
SAR 10g (W/Kg)	**1.911545**
SAR 1g (W/Kg)	**3.516434**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**6.0874**	**3.6760**	**1.9011**	**1.0147**	**0.6068**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 35

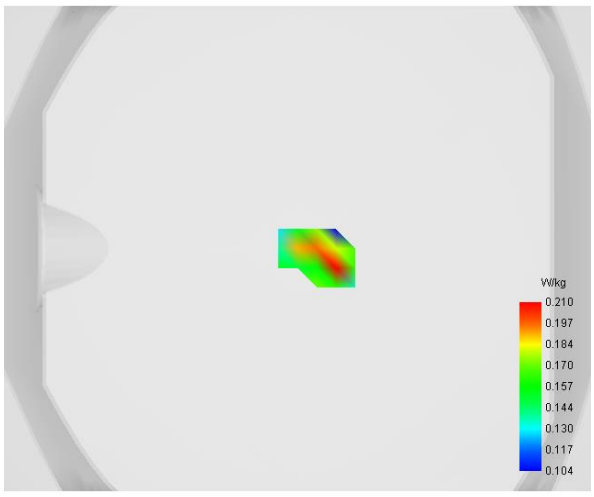
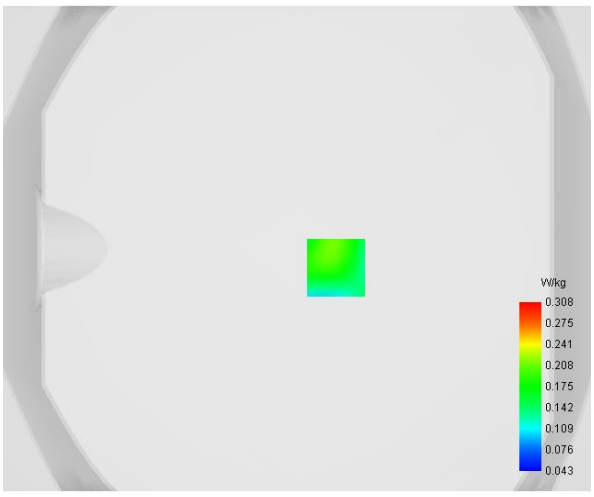
Type: Phone measurement (Complete)
Date of measurement: 2020-05-18
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back
Band	LTE Band 12
Channels	QPSK, 10MHz, 1RB, High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	711.000000
Relative Permittivity (real part)	54.964739
Conductivity (S/m)	0.931048
Power Variation (%)	1.536271
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

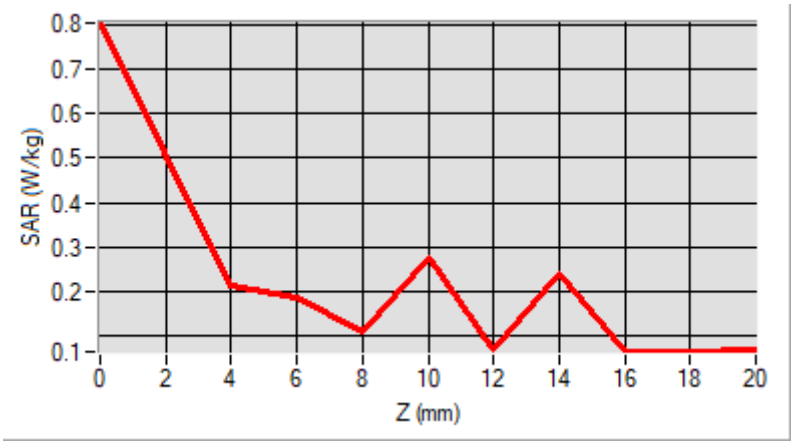
Maximum location: X=16.00, Y=-8.00

D. SAR 1g & 10g

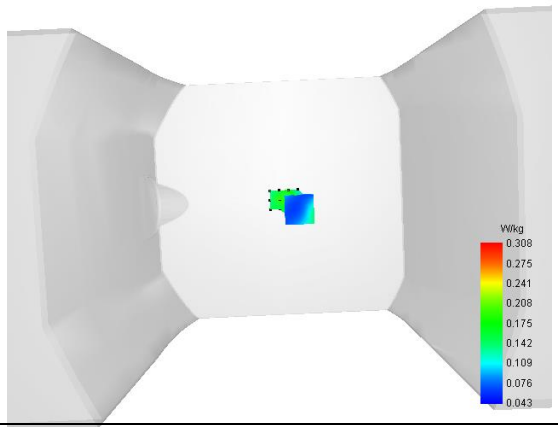
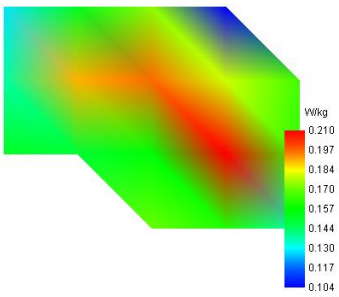
SAR 10g (W/Kg)	**0.140771**
SAR 1g (W/Kg)	**0.237341**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**6.00**	**8.00**	**10.00**	**12.00**	**14.00**	**16.00**	**18.00**
SAR (W/Kg)	**0.8054**	**0.2123**	**0.1854**	**0.1067**	**0.2774**	**0.0694**	**0.2410**	**0.0627**	**0.0649**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 43

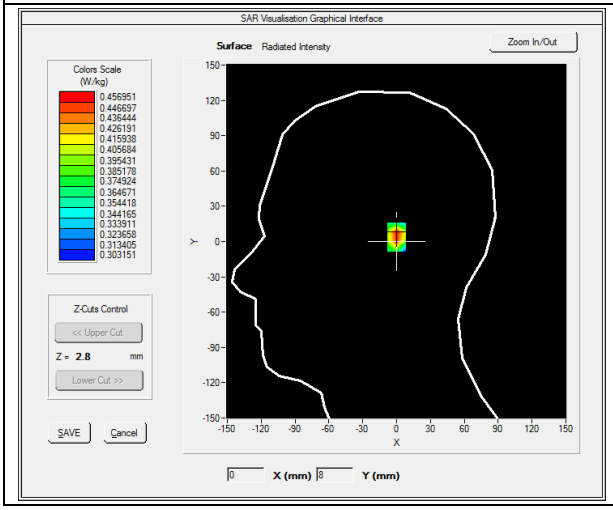
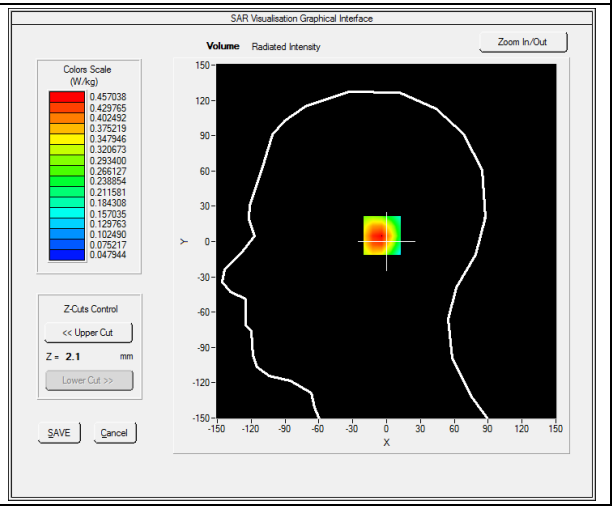
Type: Phone measurement (Complete)
Date of measurement: 2020-05-18
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Back
Band	LTE Band 12
Channels	QPSK, 10MHz, 1RB, High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	711.000000
Relative Permittivity (real part)	54.964739
Conductivity (S/m)	0.931048
Power Variation (%)	1.536271
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

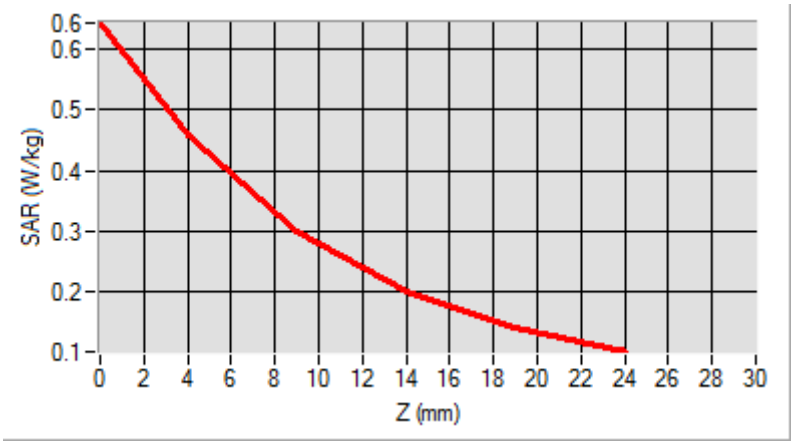
Maximum location: X=0.00, Y=5.00

D. SAR 1g & 10g

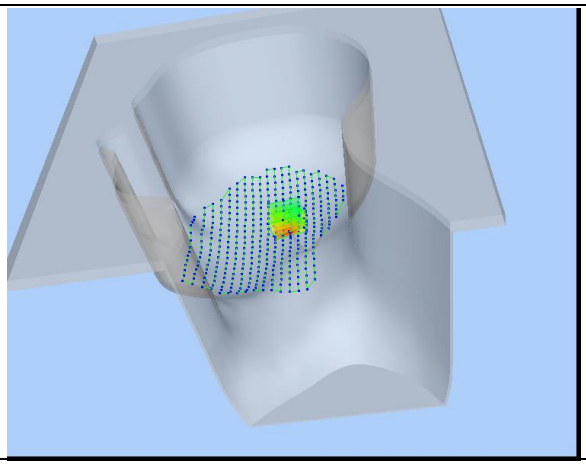
SAR 10g (W/Kg)	**0.309521**
SAR 1g (W/Kg)	**0.468153**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**0.6431**	**0.4570**	**0.2987**	**0.2010**	**0.1422**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 49

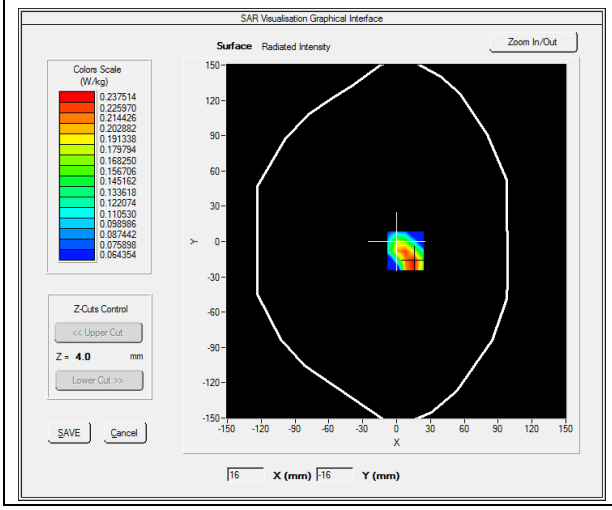
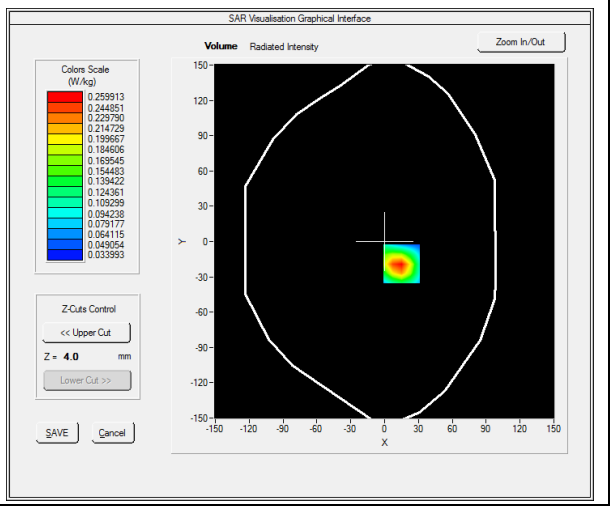
Type: Phone measurement (Complete)
Date of measurement: 2020-05-25
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

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

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative Permittivity (real part)	52.010212
Conductivity (S/m)	1.910255
Power Variation (%)	2.492743
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

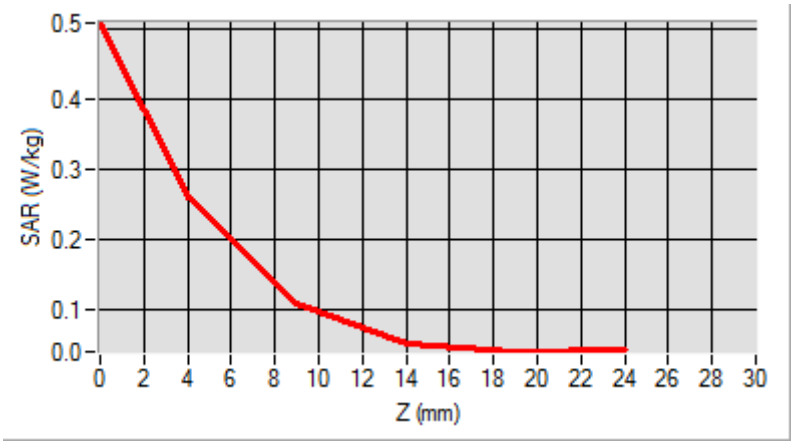
Maximum location: X=15.00, Y=-19.00

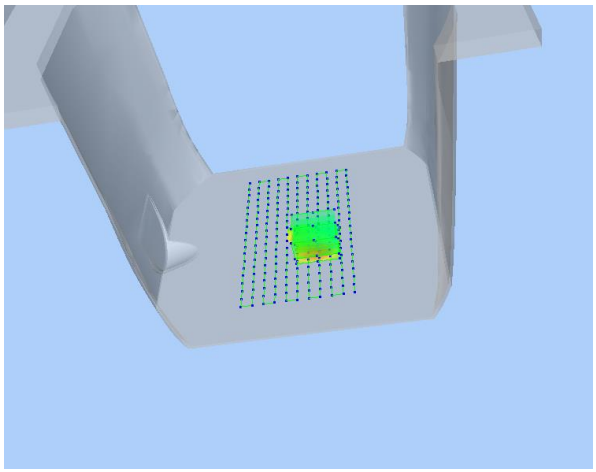
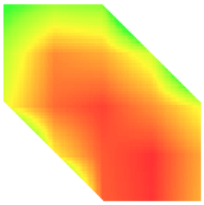
SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)	0.127109
SAR 1g (W/Kg)	0.252022

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5080	0.2599	0.1062	0.0508	0.0387



3D screen shot	Hot spot position
	

MEASUREMENT 51

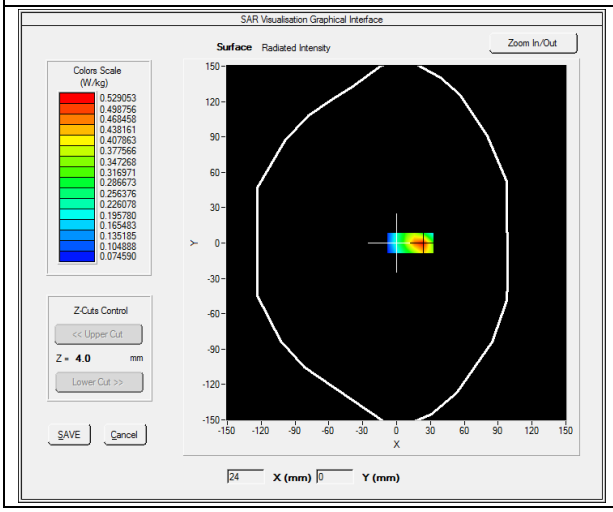
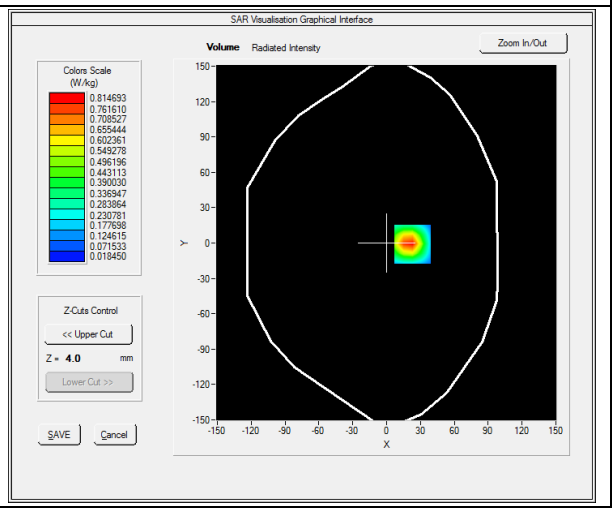
Type: Phone measurement (Complete)
Date of measurement: 2020-05-25
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

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	WiFi_802.11b
Channels	Middle
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative Permittivity (real part)	52.010212
Conductivity (S/m)	1.910255
Power Variation (%)	2.492743
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

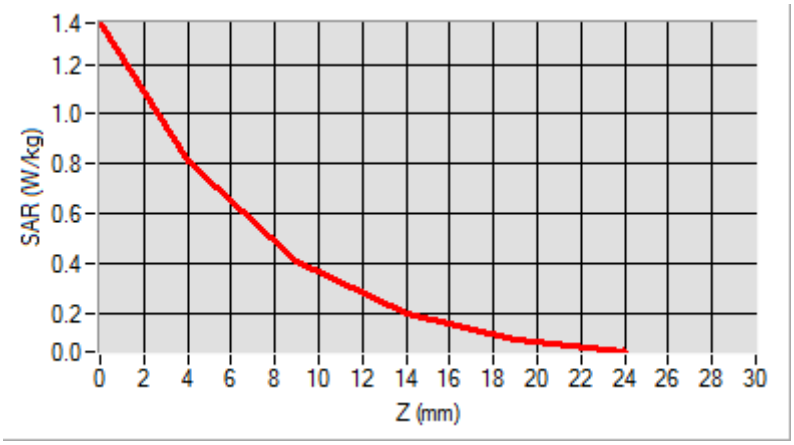
Maximum location: X=23.00, Y=-1.00

D. SAR 1g & 10g

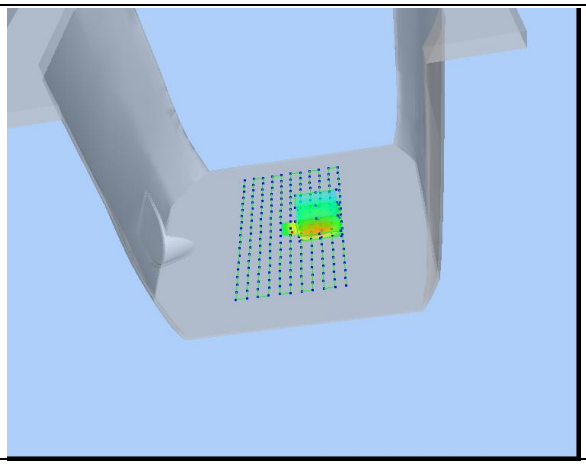
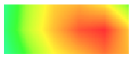
SAR 10g (W/Kg)	**0.365561**
SAR 1g (W/Kg)	**0.767844**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**1.3652**	**0.8147**	**0.4061**	**0.1984**	**0.1002**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 56

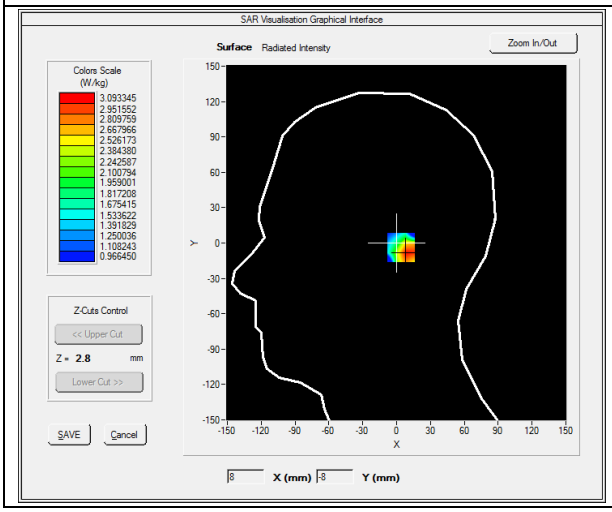
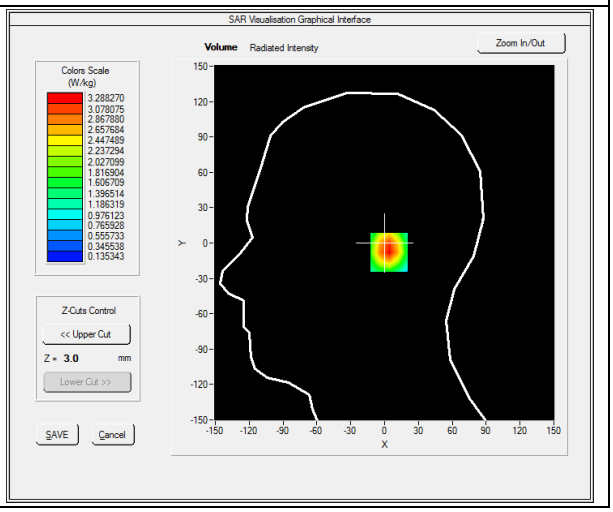
Type: Phone measurement (Complete)
Date of measurement: 2020-05-21
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	dx=8mm dy=8mm
Zoom Scan	dx=8mm dy=8mm dz=5mm
Phantom	Flat Plane
Device Position	Left Side
Band	LTE Band 2
Channels	QPSK, 20MHz, 1RB, High
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 (%)	1.743564
Ambient Temperature	21.1
Liquid Temperature	21.3

SURFACE SAR	**VOLUME SAR**
	

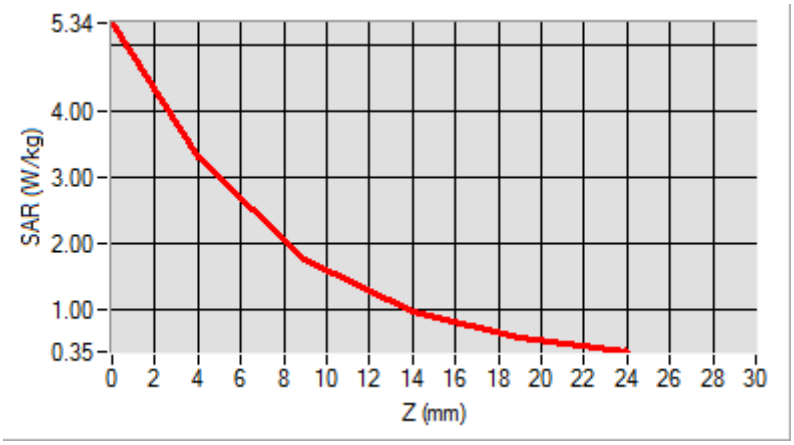
Maximum location: X=10.00, Y=-8.00

D. SAR 1g & 10g

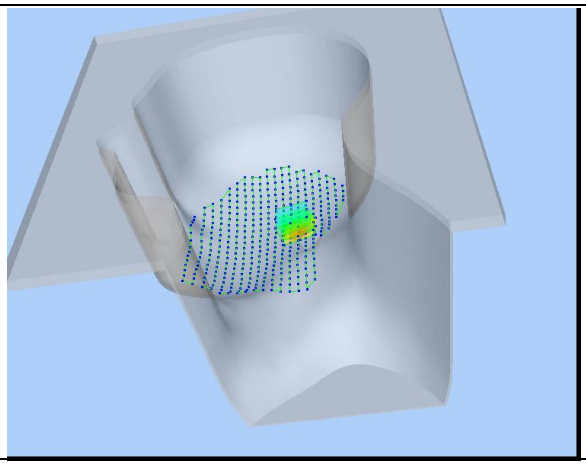
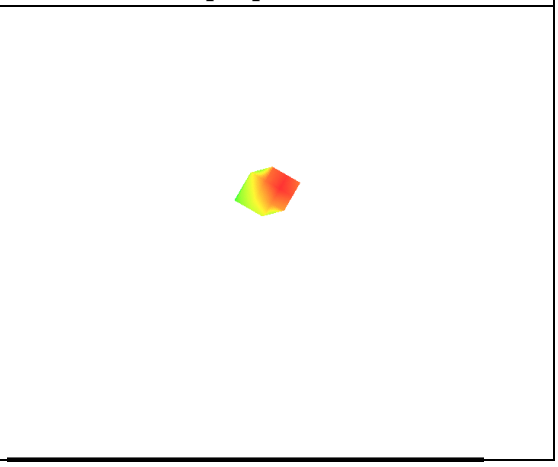
SAR 10g (W/Kg)	**1.694917**
SAR 1g (W/Kg)	**3.154888**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**5.3433**	**3.2883**	**1.7448**	**0.9484**	**0.5646**



F. 3D Image

3D screen shot	**Hot spot position**
	

MEASUREMENT 58

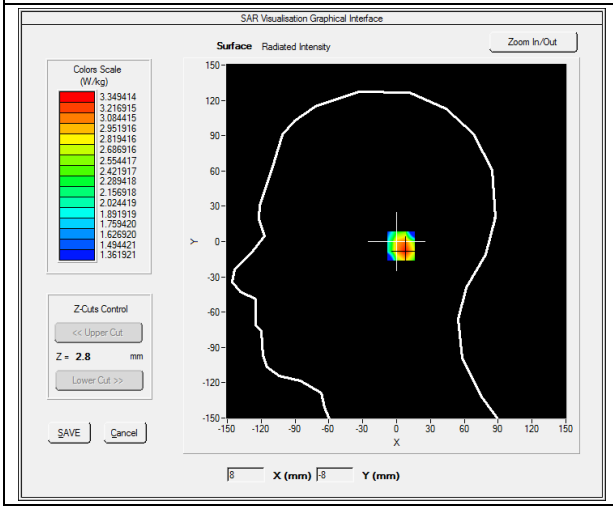
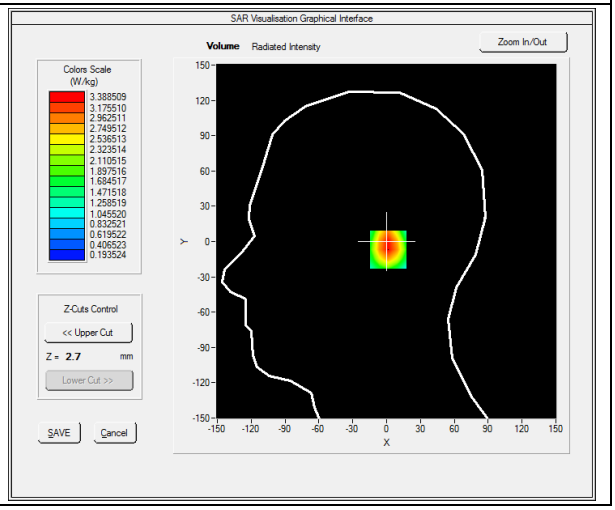
Type: Phone measurement (Complete)
Date of measurement: 2020-05-19
Measurement duration: 12 minutes 3 seconds
E-field Probe: SSE2 - SN 45/15 EPGO280; ConvF: Reference Calibration Certificate; Calibrated: 2019/07/08

A. Experimental conditions

Area Scan	sam_direct_droit2_surf8mm.txt
Phantom	Flat Plane
Device Position	Left Side
Band	LTE Band 4
Channels	QPSK, 20MHz, 1RB, High
Signal	Duty Cycle 1:1

B. SAR Measurement Results

Frequency (MHz)	1745.000000
Relative Permittivity (real part)	51.224510
Conductivity (S/m)	1.461261
Power Variation (%)	0.858383
Ambient Temperature	21.1
Liquid Temperature	21.2

SURFACE SAR	VOLUME SAR
	

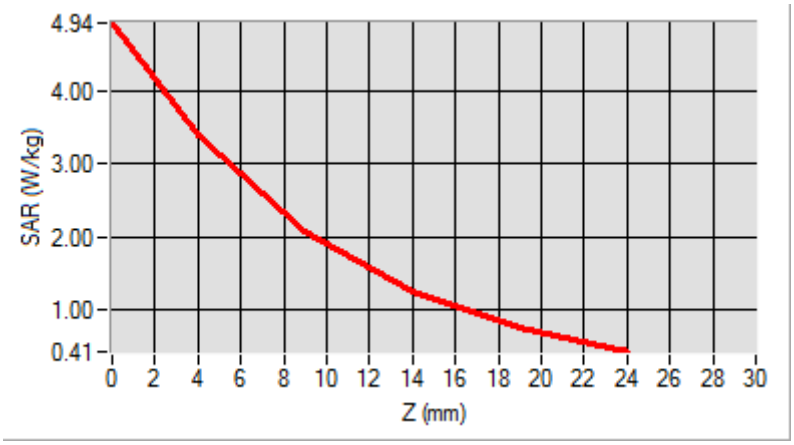
Maximum location: X=7.00, Y=-7.00

D. SAR 1g & 10g

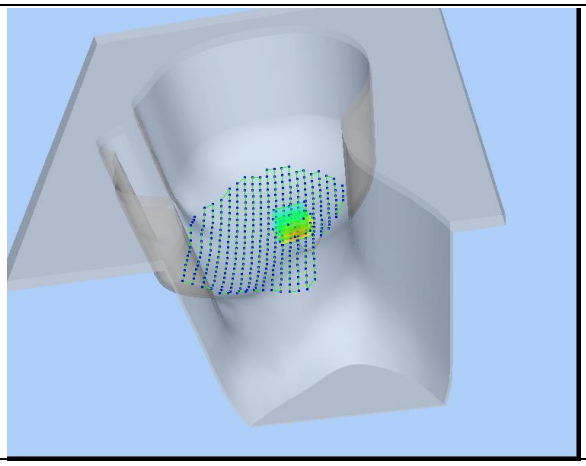
SAR 10g (W/Kg)	**1.844441**
SAR 1g (W/Kg)	**3.234516**

E. Z Axis Scan

Z (mm)	**0.00**	**4.00**	**9.00**	**14.00**	**19.00**
SAR (W/Kg)	**4.9415**	**3.3885**	**2.0658**	**1.2428**	**0.7425**

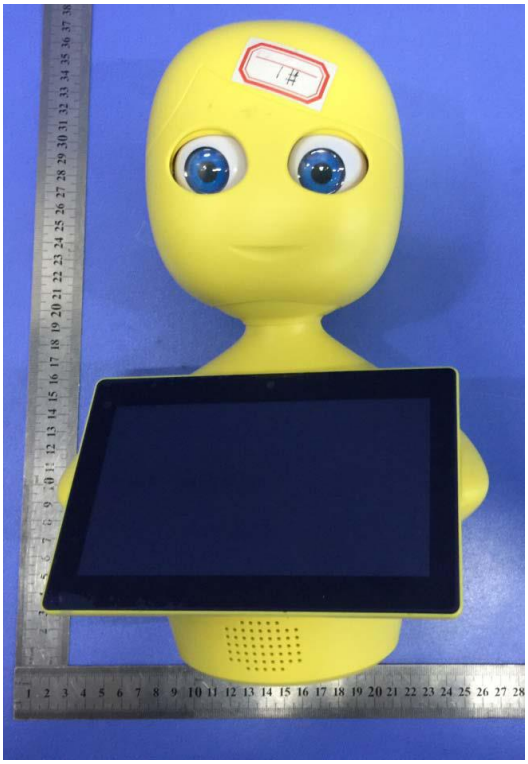


F. 3D Image

3D screen shot	**Hot spot position**
	

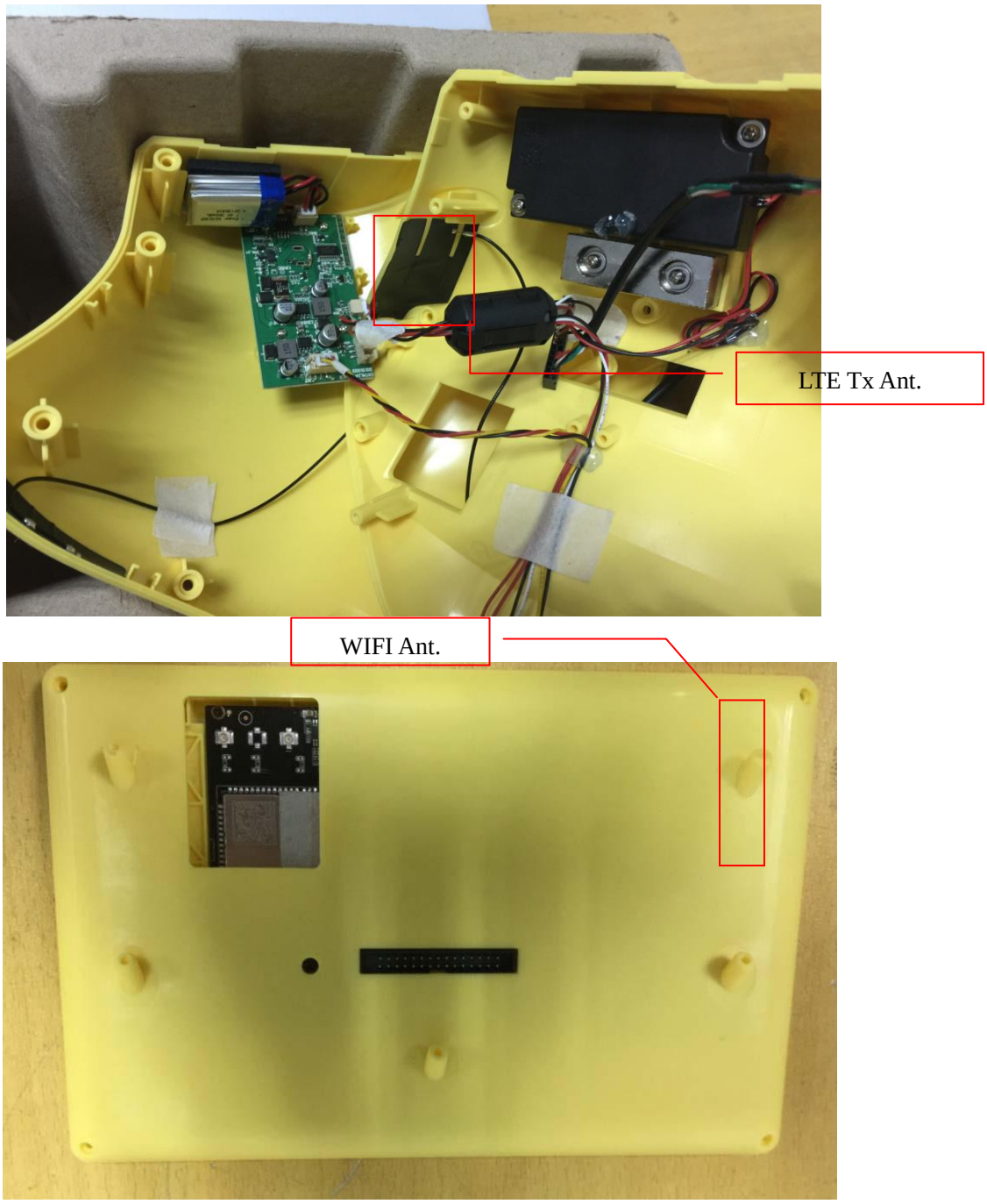
Annex C. EUT Photos

EUT View Front



EUT View Back

Antenna View



Annex D. Test Setup Photos

LTE（10mm）

Left

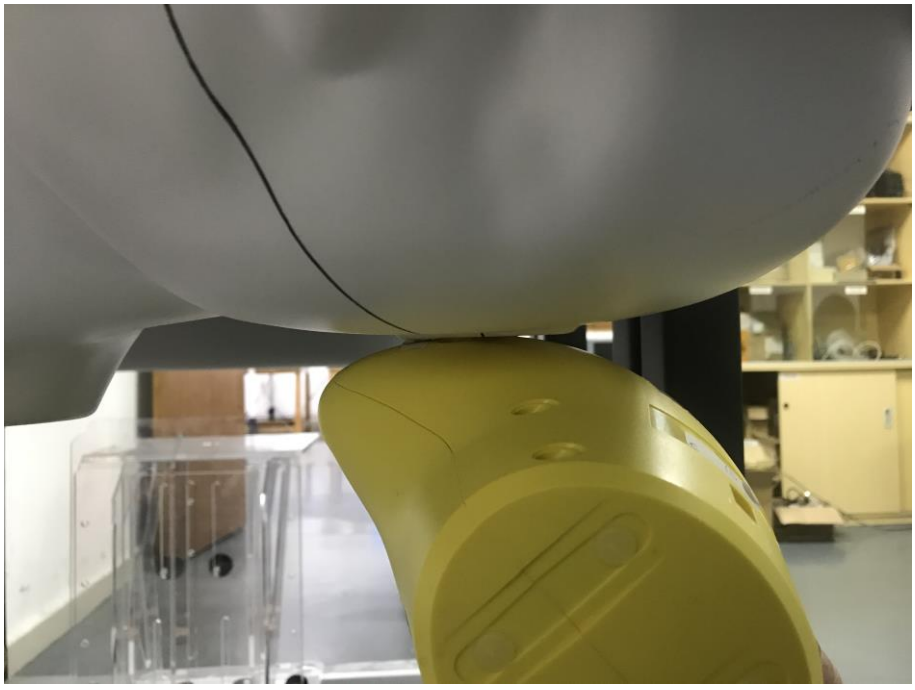
Back

Front

LTE（0mm）

Front

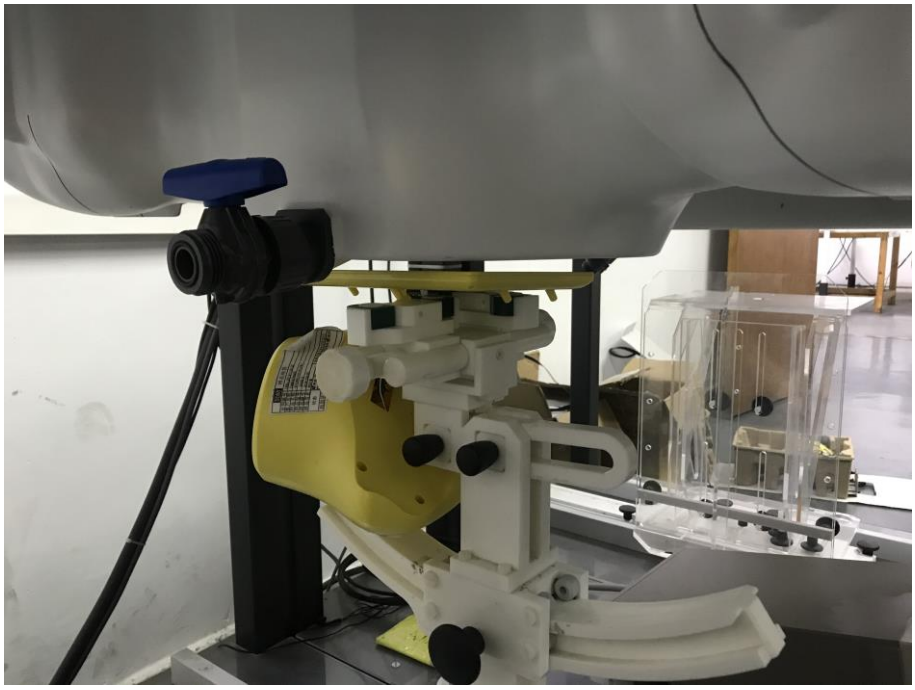
Back



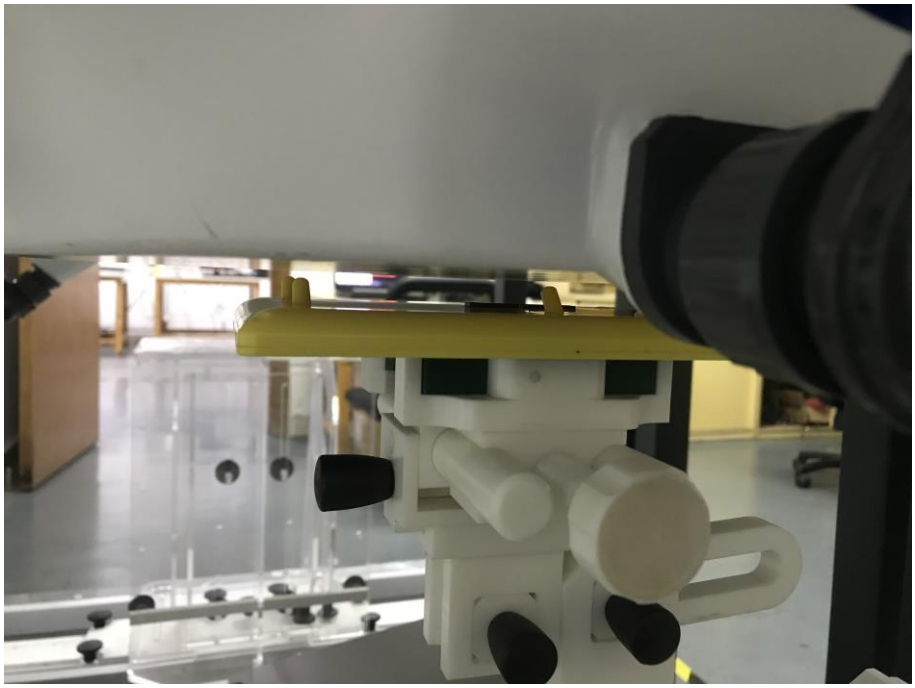
Left

WIFI（10mm）

Body Front

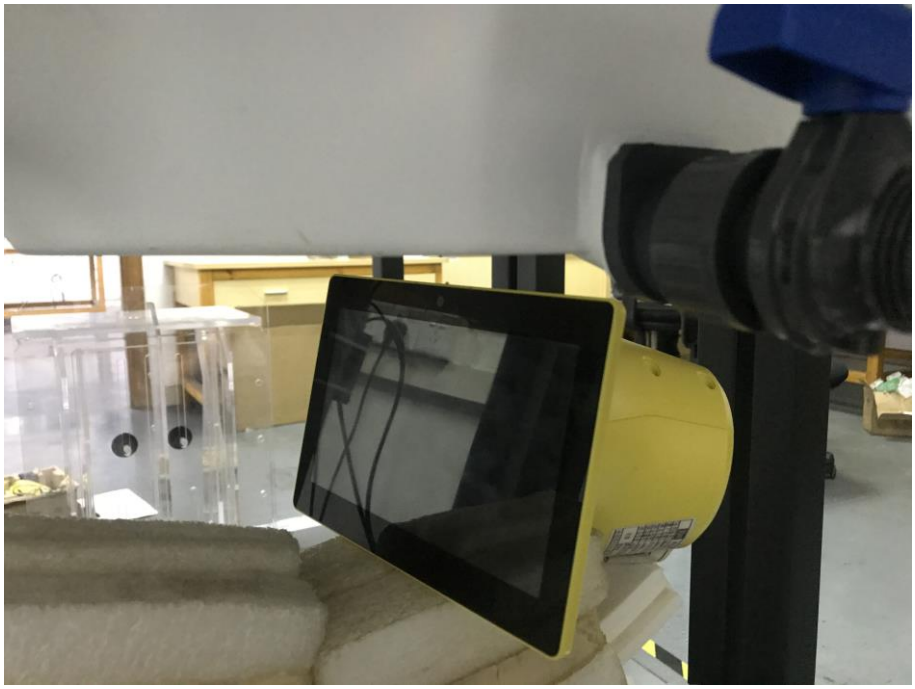


Body Back



Body Right

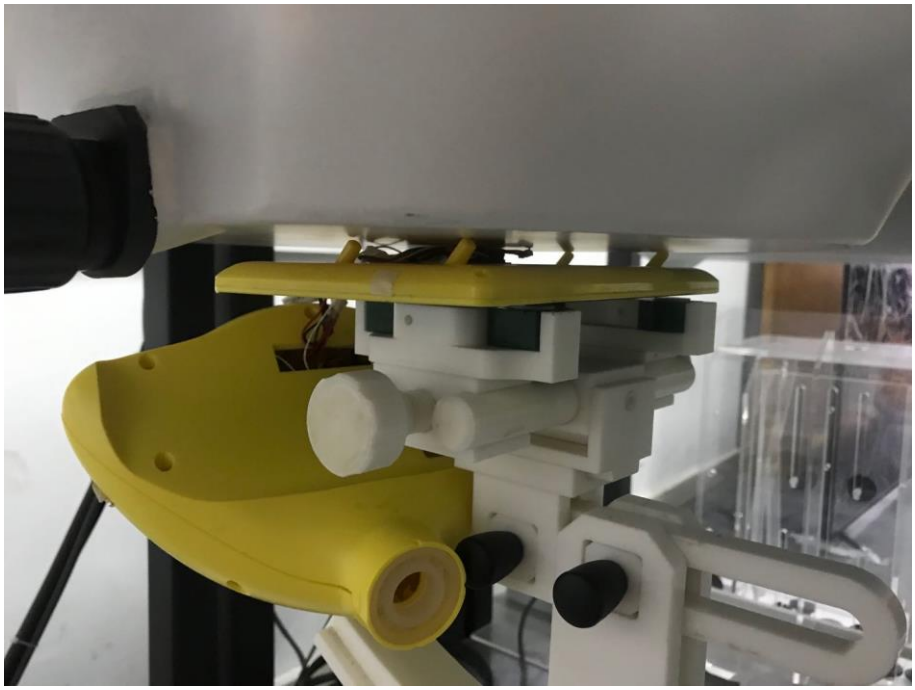
Body Top



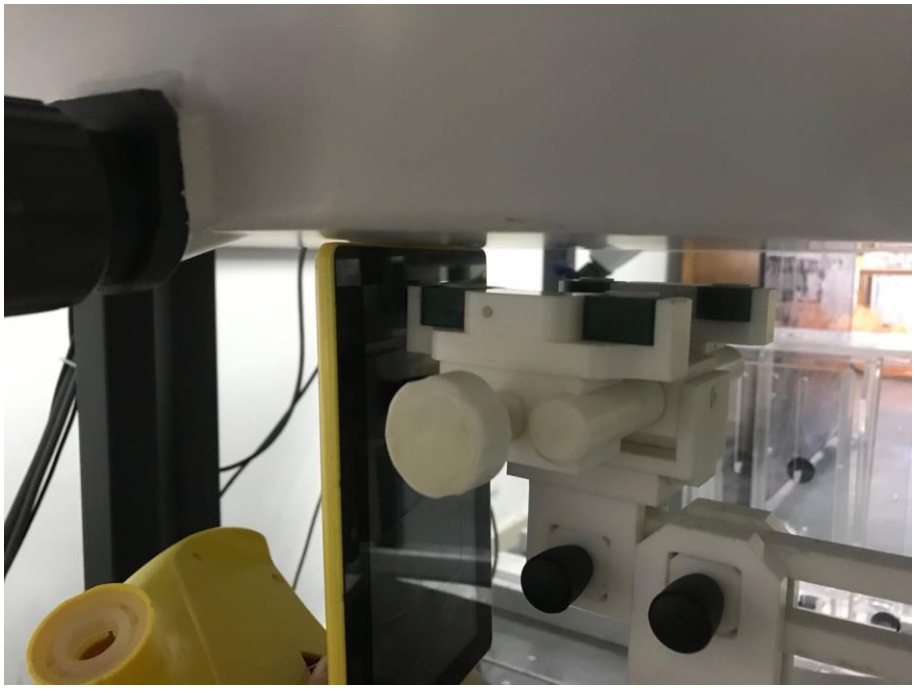
WIFI（0mm）

Front

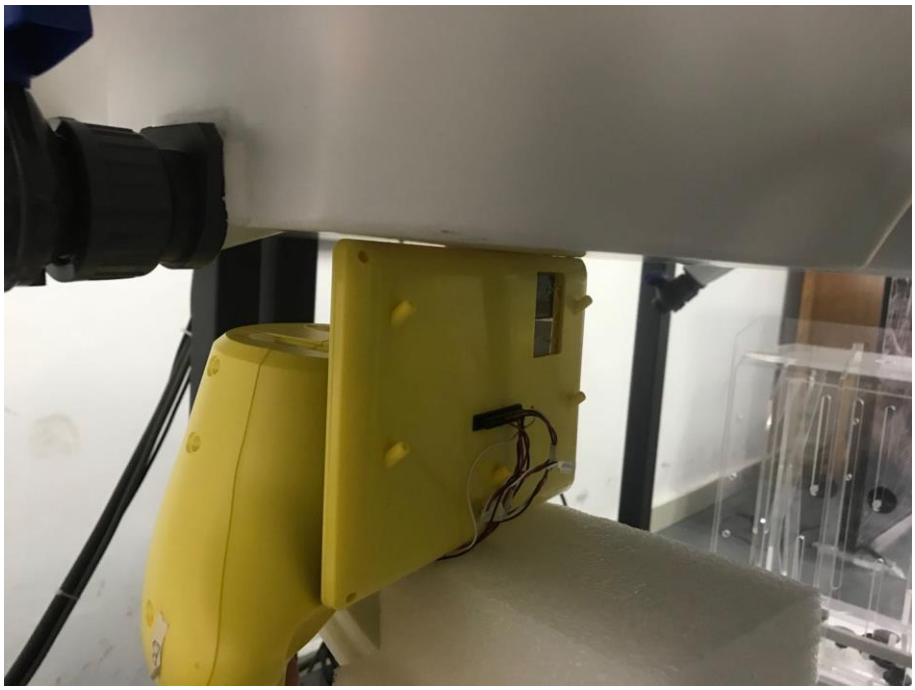
Back



Right



Top



Annex E. Calibration Certificate

Please refer to the exhibit for the calibration certificate

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