FCC SAR EVALUATION REPORT

In accordance with the requirements of
FCC 47 CFR Part 2(2.1093), ANSI/IEEE C95.1-1992 and
IEEE Std 1528-2013

Product Name： mobile phone

Trademark： Karbonn

Model Name： K9 Viraat Plus

Serial Model： N/A

Report No.： SER180825305

FCC ID： 2AQ9Z-K9VIRAATPLUS

Prepared for

JAINA MARKETING AND ASSOCIATES

D-170, OKHLA INDUSTRIAL AREA PHASE-1, NEW DELHI 110020 INDIA

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name	JAINA MARKETING AND ASSOCIATES
Address	D-170, OKHLA INDUSTRIAL AREA PHASE-1, NEW DELHI 110020 INDIA
Manufacturer's Name	Vsun Mobile Pvt. Ltd.
Address	PLOT NO. 2, N. H. NO. 8, ICD BAWAL, SECTOR - 8, BAWAL, DISTRICT - Rewari, Haryana, India

Product description

Product name	mobile phone
Trademark	Karbonn
Model and/or type reference	K9 Viraat Plus
Serial Model	N/A
Standards	FCC 47 CFR Part 2(2.1093) ANSI/IEEE C95.1-1992 IEEE Std 1528-2013 Published RF exposure KDB procedures

This device described above has been tested by Shenzhen NTEK. In accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 and KDB 865664 D01. Testing has shown that this device is capable of compliance with localized specific absorption rate (SAR) specified in FCC 47 CFR Part 2(2.1093) and ANSI/IEEE C95.1-1992. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of Test

Date (s) of performance of tests	Sep. 07, 2018, 2018 ~ Nov. 12, 2018
Date of Issue	Nov. 22, 2018
Test Result	**Pass**

Prepared By (Test Engineer) : Cheng Jiawen

(Cheng Jiawen)

Approved By (Lab Manager) : Sam. Chen

(Sam Chen)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Nov. 22, 2018	Cheng Jiawen

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1. General Information

1.1. RF exposure limits

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

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

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

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

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

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

Are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

NOTE

HEAD AND TRUNK LIMIT

1.6 W/kg

APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for K9 Viraat Plus are as follows.

Band	Max Reported SAR Value(W/kg)			
	1-g Head	1-g Body-Worn (Separation distance of 10mm)	1-g Hotspot (Separation distance of 10mm)	Max Simultaneous Tx
LTE Band V	0.125	0.184	0.184	0.540
LTE Band XL A	0.250	0.337	0.337	
LTE Band XL B	0.152	0.195	0.195	
WLAN 2.4G	0.227	0.233	0.233	

Note: The Max Simultaneous Tx is calculated based on the same configuration and test position.

This 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(2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 & KDB 865664 D01.

1.3. EUT Description

Device Information			
Product Name	mobile phone		
Trade Name	Karbonn		
Model Name	K9 Viraat Plus		
Serial Model	N/A		
FCC ID	2AQ9Z-K9VIRAATPLUS		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna	FPCB Antenna		
Battery Information	DC 3.8V, 2800mAh		
Device Operating Configurations			
Supporting Mode(s)	LTE Band V/XL, WLAN 2.4G, Bluetooth		
Test Modulation	LTE(QPSK/16QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	LTE Band V	824-849	869-894
	LTE Band XL A	2305-2320	
	LTE Band XL B	2345-2360	
	WLAN 2.4G	2412-2462	
	Bluetooth	2402-2480	
Power Class	3, tested with power control all Max.(LTE Band V)		
	3, tested with power control all Max.(LTE Band XL)		
Test Channels (low-mid-high)	20407-20525-20643(LTE Band V BW=1.4MHz)		
	20415-20525-20635(LTE Band V BW=3MHz)		
	20425-20525-20625(LTE Band V BW=5MHz)		
	20450-20525-20600(LTE Band V BW=10MHz)		
	38725-38775-38825 (LTE Band XL A BW=5MHz)		
	38750-38775-38800 (LTE Band XL A BW=10MHz)		
	38775 (LTE Band XL A BW=15MHz)		
	39125-39175-39225 (LTE Band XL B BW=5MHz)		
	39150-39175-39200 (LTE Band XL B BW=10MHz)		
	39175 (LTE Band XL B BW=15MHz)		
	1-3-6-9-11(WLAN 2.4G)		

1.4. Test specification(s)

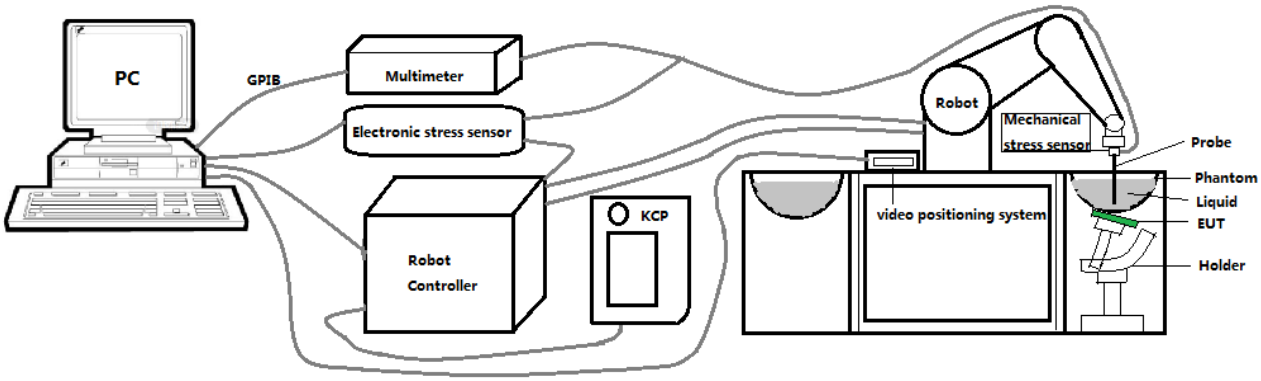
FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting
KDB 447498 D01 General RF Exposure Guidance
KDB 248227 D01 802.11 Wi-Fi SAR
KDB 941225 D05 SAR for LTE Devices
KDB 941225 D06 Hotspot SAR
KDB 648474 D04 Handset SAR

1.5. Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



These measurements were performed with the automated near-field scanning system OPENSAR from SATIMO. The system is based on a high precision robot (working range: 901 mm), which positions the probes with a positional repeatability of better than ±0.03 mm. The SAR measurements were conducted with dosimetric probe (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation.

The first step of the field measurement is the evaluation of the voltages induced on the probe by the device under test. Probe diode detectors are nonlinear. Below the diode compression point, the output voltage is proportional to the square of the applied E-field; above the diode compression point, it is linear to the applied E-field. The compression point depends on the diode, and a calibration procedure is necessary for each sensor of the probe.

The Keithley multimeter reads the voltage of each sensor and send these three values to the PC. The corresponding E field value is calculated using the probe calibration factors, which are stored in the working directory. This evaluation includes linearization of the diode characteristics. The field calculation is done separately for each sensor. Each component of the E field is displayed on the "Dipole Area Scan Interface" and the total E field is displayed on the "3D Interface"

2.2. Robot

The SATIMO SAR system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA) from KUKA is used. The KUKA robot series have many features that are important for our application:

- High precision (repeatability ±0.03 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

2.3. E-Field Probe

This E-field detection probe is composed of three orthogonal dipoles linked to special Schottky diodes with low detection thresholds. The probe allows the measurement of electric fields in liquids such as the one defined in the IEEE and CENELEC standards.

For the measurements the Specific Dosimetric E-Field Probe SN 08/16 EPGO287 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter: 2.5 mm
- Distance between probe tip and sensor center: 1 mm
- Distance between sensor center and the inner phantom surface: 2 mm (repeatability better than ±1 mm).
- Probe linearity: ±0.08 dB
- Axial isotropy: 0.06 dB
- Hemispherical Isotropy: 0.08 dB
- Calibration range: 650MHz to 5900MHz for head & body simulating liquid.
- Lower detection limit: 7mW/kg

Angle between probe axis (evaluation axis) and surface normal line: less than 30°.

For the measurements the Specific Dosimetric E-Field Probe SN 07/15 EP247 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 5 mm
- Distance between probe tip and sensor center: 2.7 mm
- Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than ±1 mm).
- Probe linearity: ±0.05 dB
- Axial isotropy: <0.25 dB
- Hemispherical Isotropy: <0.50 dB
- Calibration range: 450MHz to 2600MHz for head & body simulating liquid.
- Lower detection limit: 8mW/kg

Angle between probe axis (evaluation axis) and surface normal line: less than 30°.

2.3.1. E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy shall be evaluated and within ±0.25dB. The sensitivity parameters (Norm X, Norm Y, and Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe are tested. The calibration data can be referred to appendix D of this report.

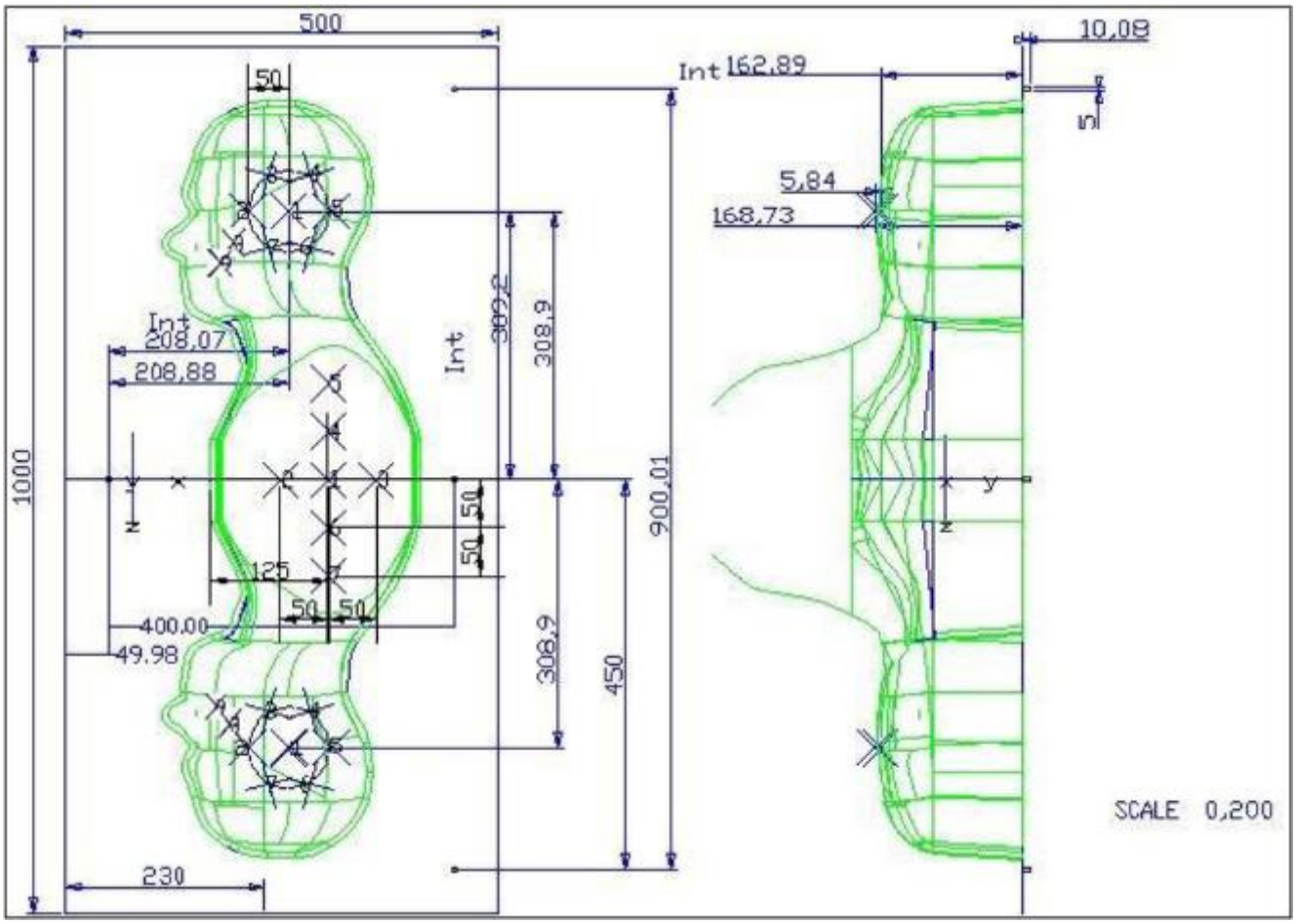
2.4. SAM phantoms

Photo of SAM phantom SN 16/15 SAM119

The SAM phantom is used to measure the SAR relative to people exposed to electro-magnetic field radiated by mobile phones.

2.4.1. Technical Data

Serial Number	Shell thickness	Filling volume	Dimensions	Positionner Material	Permittivity	Loss Tangent
SN 16/15 SAM119	2 mm ±0.2 mm	27 liters	Length:1000 mm Width:500 mm Height:200 mm	Gelcoat with fiberglass	3.4	0.02

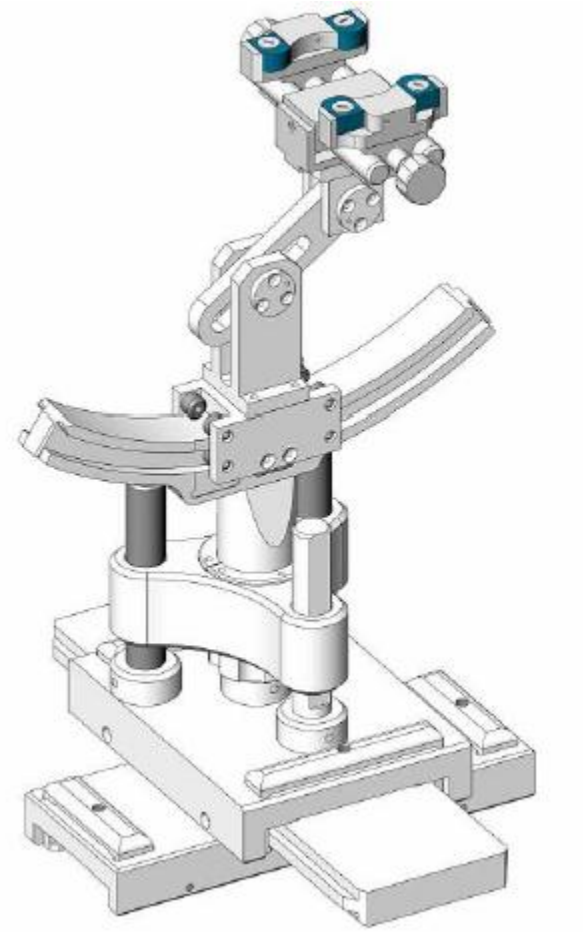


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

The test, based on ultrasonic system, allows measuring the thickness with an accuracy of 10 µm.

2.5. 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 degree.



Serial Number	Holder Material	Permittivity	Loss Tangent
SN 16/15 MSH100	Delrin	3.7	0.005

2.6. Test Equipment List

This table gives a complete overview of the SAR measurement equipment.
Devices used during the test described are marked ☒

	Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
					Last Cal.	Due Date
☒	MVG	E FIELD PROBE	SSE2	SN 08/16 EPGO287	Sep. 18, 2017	Sep. 17, 2018
					Sep. 17, 2018	Sep. 16, 2019
☒	MVG	E FIELD PROBE	SSE5	SN 07/15 EP247	Apr. 06, 2018	Apr. 05, 2019
☐	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Apr. 19, 2018	Apr. 18, 2021
☒	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Apr. 19, 2018	Apr. 18, 2021
☒	MVG	2300 MHz Dipole	SID2300	SN 03/16 DIP 2G300-358	Nov. 09, 2017	Nov. 08, 2020
☒	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Apr. 19, 2018	Apr. 18, 2021
☐	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Apr. 19, 2018	Apr. 18, 2021
☒	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
☒	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
☒	KEITHLEY	Millivoltmeter	2000	4072790	NCR	NCR
☐	R&S	Universal radio communication tester	CMU200	117858	Aug. 05, 2018	Aug. 04, 2019

☒	R&S	Wideband radio communication tester	CMW500	103917	Oct. 26, 2017	Oct. 25, 2018
					Oct. 08, 2018	Oct. 07, 2019
☒	HP	Network Analyzer	8753D	3410J01136	Aug. 05, 2018	Aug. 04, 2019
☒	Agilent	PSG Analog Signal Generator	E8257D	MY51110112	Aug. 05, 2018	Aug. 04, 2019
☒	Agilent	Power meter	E4419B	MY45102538	Aug. 05, 2018	Aug. 04, 2019
☒	Agilent	Power sensor	E9301A	MY41495644	Aug. 05, 2018	Aug. 04, 2019
☒	Agilent	Power sensor	E9301A	US39212148	Aug. 05, 2018	Aug. 04, 2019
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Aug. 05, 2018	Aug. 04, 2019

3. SAR Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.

(b) Read the WWAN RF power level from the base station simulator.

(c) For WLAN/Bluetooth power measurement, use engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power in each supported wireless interface and frequency band.

(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/Bluetooth output power.

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power, in the highest power channel.

(b) Place the EUT in the positions as Appendix A demonstrates.

(c) Set scan area, grid size and other setting on the OPENSAR software.

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

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

(f) Measure SAR results for other channels in worst SAR testing position if the reported 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

3.1. Power Reference

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

3.2. Area scan & Zoom scan

The area scan is a 2D scan to find the hot spot location on the DUT. The zoom scan is a 3D scan above the hot spot to calculate the 1g and 10g SAR value.

Measurement of the SAR distribution with a grid of 8 to 16 mm * 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme. Around this point, a cube of 30 * 30 *30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8 * 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that will not be within the zoom scan of other peaks; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR compliance limit (e.g., 1 W/kg for 1,6 W/kg 1 g limit, or 1,26 W/kg for 2 W/kg, 10 g limit).

Area scan & Zoom scan scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

3.3. Description of interpolation/extrapolation scheme

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 minimise 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 1 mm 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 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

3.4. Volumetric Scan

The volumetric scan consists to a full 3D scan over a specific area. This 3D scan is useful form multi Tx SAR measurement. Indeed, it is possible with OpenSAR to add, point by point, several volumetric scan to calculate the SAR value of the combined measurement as it is define in the standard IEEE1528 and IEC62209.

3.5. Power Drift

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In OpenSAR 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 V/m. If the power drifts more than ±5%, the SAR will be retested.

4. System Verification Procedure

4.1. Tissue Verification

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

Ingredients (% of weight)	Head Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	34.40	34.40	34.40	55.36	55.36	57.87	57.87	57.87	65.53	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	24.24	24.24
DGBE	0.00	0.00	0.00	13.84	13.84	22.00	22.00	22.00	10.23	10.23
Ingredients (% of weight)	Body Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	50.30	50.30	50.30	69.91	69.91	71.88	71.88	71.88	79.54	79.54
NaCl	0.60	0.60	0.60	0.13	0.13	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	49.10	49.10	49.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	9.99	9.99	19.97	19.97	19.97	11.24	11.24
DGBE	0.00	0.00	0.00	19.97	19.97	7.99	7.99	7.99	9.22	9.22

4.1.1. Tissue Dielectric Parameter Check Results

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ±5% of the target values.

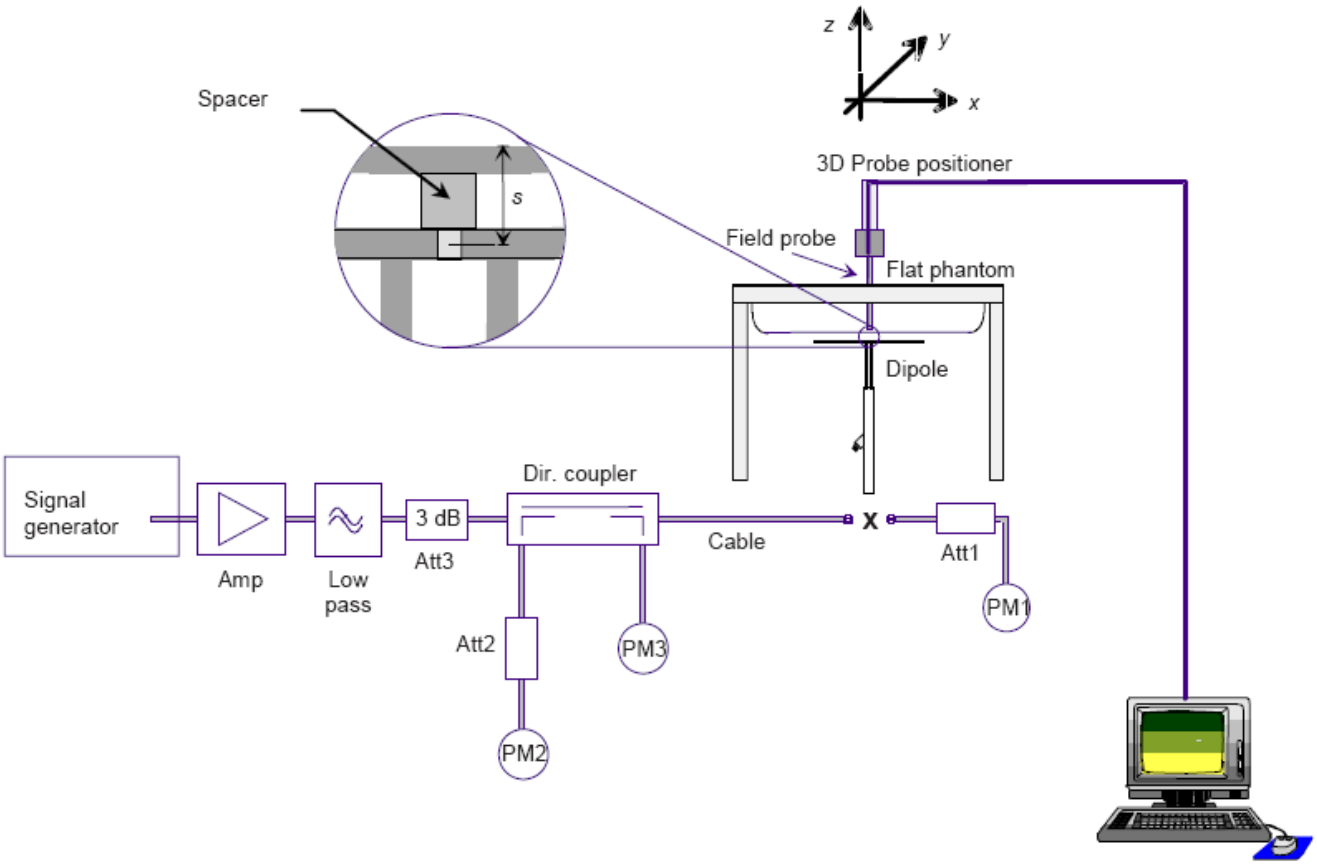
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		εr (±5%)	σ (S/m) (±5%)	εr	σ (S/m)		
Head 850	835	41.50 (39.43~43.57)	0.90 (0.86~0.94)	42.74	0.88	21.5 °C	Sep. 07, 2018
Body 850	835	55.20 (52.44~57.96)	0.97 (0.92~1.01)	55.34	0.98	21.4 °C	Sep. 07, 2018
Head 2300	2300	39.47 (37.50~41.44)	1.67 (1.59~1.75)	39.39	1.70	21.5 °C	Nov. 12, 2018
Head 2300	2300	52.90 (50.26~55.54)	1.81 (1.72~1.90)	52.46	1.78	21.3 °C	Nov. 12, 2018
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	39.67	1.79	21.8 °C	Sep. 12, 2018
Body 2450	2450	52.70 (50.07~55.33)	1.95 (1.85~2.04)	52.38	1.97	21.7 °C	Sep. 13, 2018

NOTE: The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

4.2. System Verification Procedure

The system verification is performed for verifying the accuracy of the complete measurement system and performance of the software. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 100mW (below 5GHz) or 100mW (above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system verification to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system verification to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

The system verification is shown as below picture:



4.2.1. System Verification Results

Comparing to the original SAR value provided by SATIMO, the verification data should be within its specification of ±10%. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance verification can meet the variation criterion and the plots can be referred to Appendix B of this report.

System Verification	Target SAR (1W) (±10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
835MHz Head	9.56 (8.60~10.51)	6.22 (5.60~6.84)	9.67	6.53	21.5 °C	Sep. 07, 2018
835MHz Body	9.48 (8.53~10.42)	6.29 (5.66~6.91)	9.52	6.41	21.4 °C	Sep. 07, 2018
2300MHz Head	48.70 (43.83~53.57)	23.30 (20.97~25.63)	47.34	22.74	21.5 °C	Nov. 12, 2018
2300MHz Body	45.57 (41.02~50.12)	21.27 (19.15~23.39)	45.36	21.42	21.3 °C	Nov. 12, 2018
2450MHz Head	52.40 (47.16~57.64)	24.00 (21.60~26.40)	54.06	25.20	21.8 °C	Sep. 12, 2018
2450MHz Body	49.32 (44.39~54.25)	22.89 (20.60~25.17)	52.40	23.62	21.7 °C	Sep. 13, 2018

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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.

5.2. SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

6. RF Exposure Positions

6.1. Ear and handset reference point

Figure 6.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M”, the left ear reference point (ERP) is marked “LE”, and the right ERP is marked “RE”.

Fig 6.1.1 Front, back, and side views of SAM phantom

6.2. Definition of the cheek position

1. Define two imaginary lines on the handset, the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width w_t of the handset at the level of the acoustic output (point A in Figure 6.2.1 and Figure 6.2.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 6.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 6.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
2. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
3. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP
4. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
5. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.

6. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 6.2.3. The actual rotation angles should be documented in the test report.

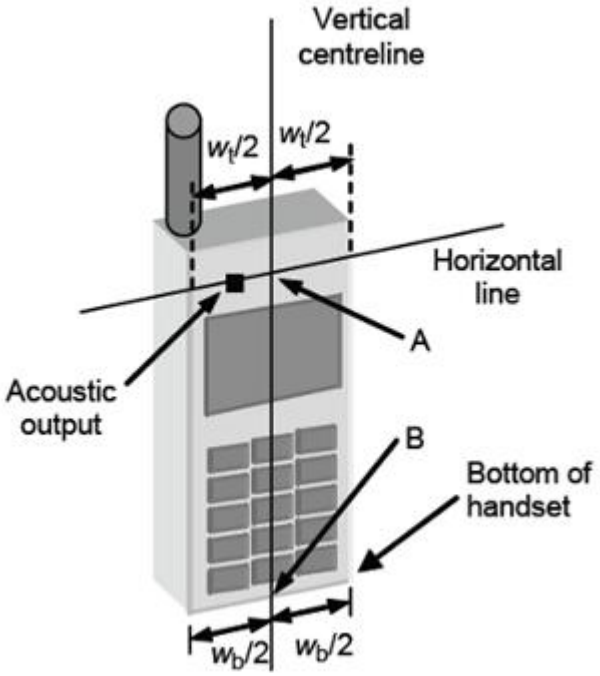


Fig 6.2.1 Handset vertical and horizontal reference lines—"fixed case

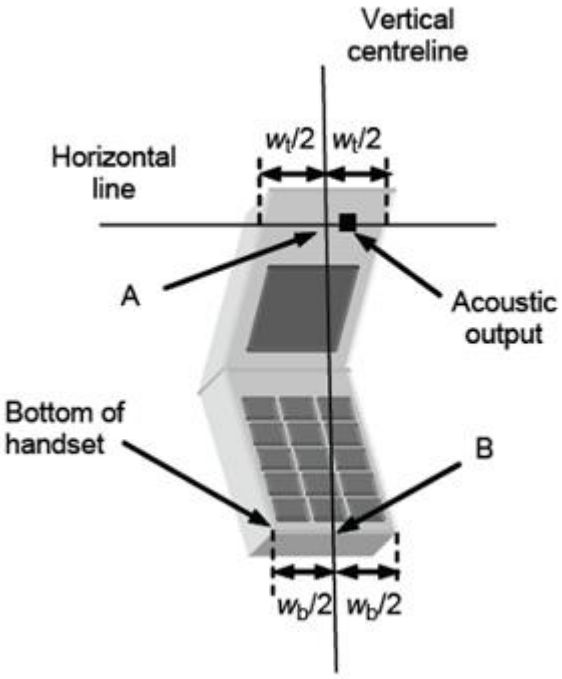


Fig 6.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

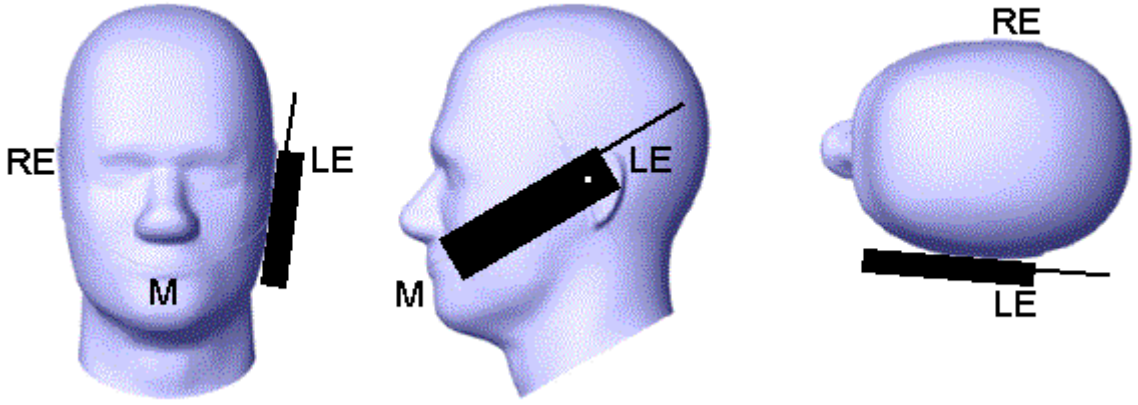


Fig 6.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

6.3. Definition of the tilt position

1. While maintaining the orientation of the handset, retract the handset parallel to the reference plane far enough away from the phantom to enable a rotation of the device by 15 degree.
2. Rotate the Handset around the horizontal line by 15 degree (see Figure 6.3.1).
3. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, e.g., the antenna with the back of the phantom head, the angle of the handset shall be reduced. In this case, the tilt position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is in contact with the phantom, e.g., the antenna with the back of the head.

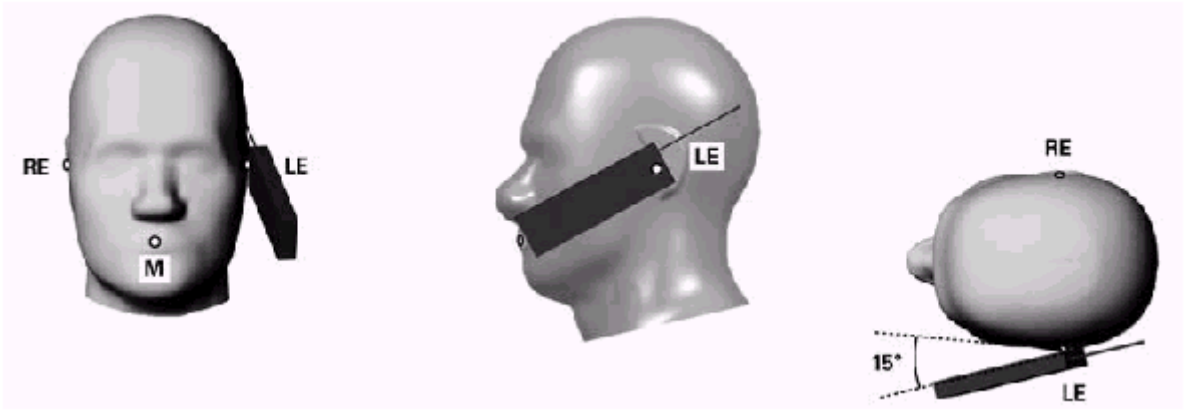


Figure 6.3.1 – Tilt position of the wireless device on the left side of SAM

6.4. Body Worn Accessory

1. Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6.4.1). Per KDB 648474 D04, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is < 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset attached to the handset.
2. Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest

spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

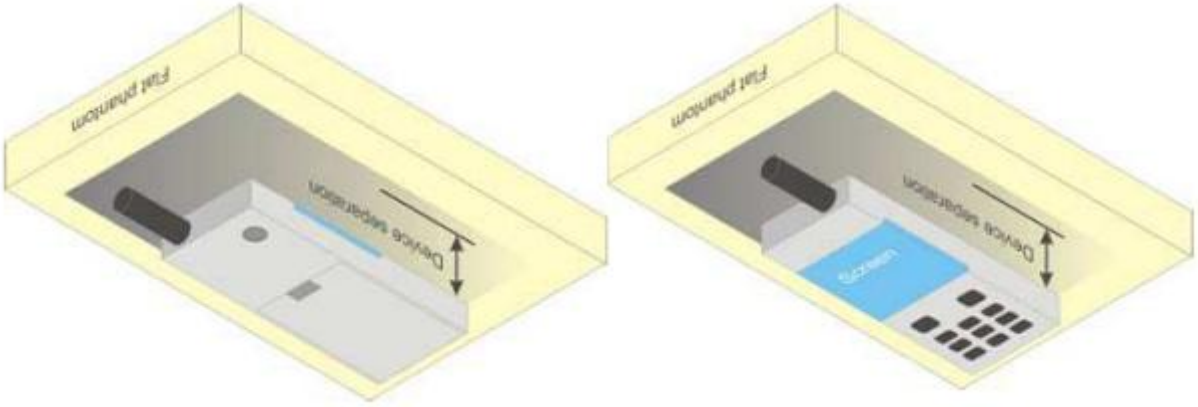


Figure 6.4.1 – Test positions for body-worn devices

6.5. Wireless Router Devices

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WLAN simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined form general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WLAN transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WLAN transmitter according to FCC KDB Publication 447498 D01 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

7. RF Output Power

7.1. Maximum Tune-up Limit

Band	Mode	The Tune-up Maximum Power (Customer Declared)(dBm)	Range	Measured Maximum Output Power(dBm)
LTE Band V	QPSK	22±1	21~23	22.97
	16QAM	21±1	20~22	21.79
LTE Band XL A	QPSK	21±1	20~22	21.95
	16QAM	20±1	19~21	20.97
LTE Band XL B	QPSK	21±1	20~22	21.99
	16QAM	20±1	19~21	20.99
WLAN 2.4G	802.11b	13.5±1	12.5~14.5	14.4
	802.11g	11.5±1	10.5~12.5	12.1
	802.11n	11.5±1	10.5~12.5	11.9
Bluetooth	BR	6±1	5~7	6.13
	EDR	5±1	4~6	5.61
	BLE	6±1	5~7	6.16

7.2. LTE Conducted Power

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20407/824.7	20525/836.5	20643/848.3
LTE Band V	1.4MHz	QPSK	1	0	23.00	22.91	22.77	22.39
			1	2	23.00	22.97	22.84	22.54
			1	5	23.00	22.88	22.74	22.36
			3	0	23.00	22.51	22.64	22.09
			3	1	23.00	22.47	22.58	22.08
			3	2	23.00	22.40	22.66	22.03
			6	0	22.00	21.95	21.85	21.67
		16QAM	1	0	22.00	21.38	21.63	21.25
			1	2	22.00	21.56	21.79	21.41
			1	5	22.00	21.39	21.70	21.26
			3	0	22.00	21.50	21.70	20.89
			3	1	22.00	21.43	21.68	20.95
			3	2	22.00	21.42	21.75	21.05
			6	0	21.00	20.78	20.65	20.56
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20415/825.5	20525/836.5	20635/847.5
LTE Band V	3MHz	QPSK	1	0	23.00	22.45	22.38	22.40
			1	7	23.00	22.56	22.31	22.43
			1	14	23.00	22.50	22.22	22.40
			8	0	22.00	21.46	21.33	21.46
			8	4	22.00	21.46	21.25	21.45
			8	7	22.00	21.47	21.27	21.47
			15	0	22.00	21.33	21.22	21.26
		16QAM	1	0	22.00	21.58	21.19	21.30
			1	7	22.00	21.58	21.27	21.31
			1	14	22.00	21.53	21.15	21.33
			8	0	21.00	20.38	20.38	20.15
			8	4	21.00	20.38	20.39	20.15
			8	7	21.00	20.37	20.48	20.19
			15	0	21.00	20.19	20.48	20.03

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20425/826.5	20525/836.5	20625/846.5
LTE Band V	5MHz	QPSK	1	0	23.00	22.25	22.29	22.31
			1	12	23.00	22.54	22.27	22.46
			1	24	23.00	22.38	22.08	22.32
			12	0	22.00	21.27	21.19	21.21
			12	6	22.00	21.28	21.15	21.28
			12	11	22.00	21.31	21.17	21.29
			25	0	22.00	21.23	21.17	21.22
		16QAM	1	0	22.00	21.01	21.13	21.28
			1	12	22.00	21.16	21.26	21.44
			1	24	22.00	21.06	21.07	21.32
			12	0	21.00	20.10	20.10	20.04
			12	6	21.00	20.10	20.11	20.05
			12	11	21.00	20.09	20.13	20.09
			25	0	21.00	20.12	20.15	19.95

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20450/829	20525/836.5	20600/844
LTE Band V	10MHz	QPSK	1	0	23.00	22.44	22.53	22.24
			1	24	23.00	22.71	22.50	22.56
			1	49	23.00	22.45	22.28	22.42
			25	0	22.00	21.34	21.24	21.32
			25	12	22.00	21.38	21.15	21.35
			25	24	22.00	21.48	21.13	21.37
			50	0	22.00	21.35	21.19	21.27
		16QAM	1	0	22.00	21.58	21.18	21.29
			1	24	22.00	21.72	21.26	21.42
			1	49	22.00	21.59	21.14	21.30
			25	0	21.00	20.17	20.58	20.60
			25	12	21.00	20.35	20.58	20.60
			25	24	21.00	20.34	20.66	20.60
			50	0	21.00	20.18	20.61	20.59

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		38725/2307.5	38775/2312.5	38825/2317.5
LTE Band XL A	5MHz	QPSK	1	0	22.00	21.84	21.78	21.76
			1	12	22.00	21.95	21.87	21.85
			1	24	22.00	21.83	21.73	21.77
			12	0	21.00	20.82	20.78	20.82
			12	6	21.00	20.81	20.75	20.79
			12	11	21.00	20.80	20.75	20.73
			25	0	21.00	20.86	20.82	20.82
		16QAM	1	0	21.00	20.94	20.82	20.87
			1	12	21.00	20.97	20.95	20.96
			1	24	21.00	20.95	20.80	20.88
			12	0	20.00	19.83	19.88	19.87
			12	6	20.00	19.82	19.85	19.80
			12	11	20.00	19.80	19.77	19.76
			25	0	20.00	19.78	19.77	19.84
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		38750/2310	38775/2312.5	38800/2315
LTE Band XL A	10MHz	QPSK	1	0	22.00	21.47	21.49	21.41
			1	24	22.00	21.72	21.73	21.69
			1	49	22.00	21.44	21.42	21.50
			25	0	21.00	20.47	20.47	20.54
			25	12	21.00	20.46	20.41	20.41
			25	24	21.00	20.29	20.32	20.28
			50	0	21.00	20.38	20.37	20.38
		16QAM	1	0	21.00	20.34	20.60	20.37
			1	24	21.00	20.58	20.88	20.64
			1	49	21.00	20.30	20.56	20.45
			25	0	20.00	19.89	19.45	19.44
			25	12	20.00	19.56	19.35	19.43
			25	24	20.00	19.43	19.30	19.25
			50	0	20.00	19.34	19.33	19.33

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)
			RB Size	RB Offset		38775/2312.5
LTE Band XL A	15MHz	QPSK	1	0	22.00	21.68
			1	37	22.00	21.71
			1	74	22.00	21.63
			36	0	21.00	20.77
			36	18	21.00	20.69
			36	37	21.00	20.61
			75	0	21.00	20.61
		16QAM	1	0	21.00	20.73
			1	37	21.00	20.88
			1	74	21.00	20.63
			36	0	20.00	19.71
			36	18	20.00	19.70
			36	37	20.00	19.58
			75	0	20.00	19.58

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		39125/2347.5	39175/2352.5	39225/2357.5
LTE Band XL B	5MHz	QPSK	1	0	22.00	21.99	21.95	21.95
			1	12	22.00	21.95	21.95	21.96
			1	24	22.00	21.96	21.97	21.93
			12	0	21.00	20.92	20.93	20.93
			12	6	21.00	20.89	20.91	20.92
			12	11	21.00	20.94	20.96	20.96
			25	0	21.00	20.98	20.98	20.98
		16QAM	1	0	21.00	20.92	20.84	20.78
			1	12	21.00	20.98	20.92	20.90
			1	24	21.00	20.90	20.77	20.74
			12	0	20.00	19.94	19.89	19.96
			12	6	20.00	19.91	19.89	19.95
			12	11	20.00	19.93	19.93	19.97
			25	0	20.00	19.93	19.94	19.95

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		39150/2350	39175/2352.5	39200/2355
LTE Band XL B	10MHz	QPSK	1	0	22.00	21.77	21.82	21.78
			1	24	22.00	21.98	21.95	21.94
			1	49	22.00	21.76	21.90	21.74
			25	0	21.00	21.00	20.92	20.98
			25	12	21.00	20.88	20.98	20.99
			25	24	21.00	21.00	20.92	20.92
			50	0	21.00	20.99	20.95	21.00
		16QAM	1	0	21.00	20.99	20.95	20.93
			1	24	21.00	20.87	20.96	20.80
			1	49	21.00	20.86	20.87	20.90
			25	0	20.00	19.96	19.98	19.99
			25	12	20.00	19.98	19.99	19.89
			25	24	20.00	19.98	19.99	19.95
			50	0	20.00	19.95	19.98	19.96

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)
			RB Size	RB Offset		39175/2352.5
LTE Band XL B	15MHz	QPSK	1	0	22.00	21.92
			1	37	22.00	21.94
			1	74	22.00	21.92
			36	0	21.00	20.96
			36	18	21.00	20.85
			36	37	21.00	20.95
			75	0	21.00	20.98
		16QAM	1	0	21.00	20.98
			1	37	21.00	20.88
			1	74	21.00	20.94
			36	0	20.00	19.99
			36	18	20.00	19.95
			36	37	20.00	19.91
			75	0	20.00	19.96

7.3. WLAN & Bluetooth Output Power

7.3.1. Output Power Results Of WLAN

The output power of WLAN is as following:

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11b	1	2412	14.5	14.1
	6	2437	14.5	14.4
	11	2462	14.5	13.9
802.11g	1	2412	12.5	12.1
	6	2437	12.5	11.8
	11	2462	12.5	11.7
802.11n 20M	1	2412	12.5	11.6
	6	2437	12.5	11.8
	11	2462	12.5	11.7
802.11n 40M	3	2422	12.5	11.8
	6	2437	12.5	11.8
	9	2452	12.5	11.9

7.3.2. Output Power Results Of Bluetooth

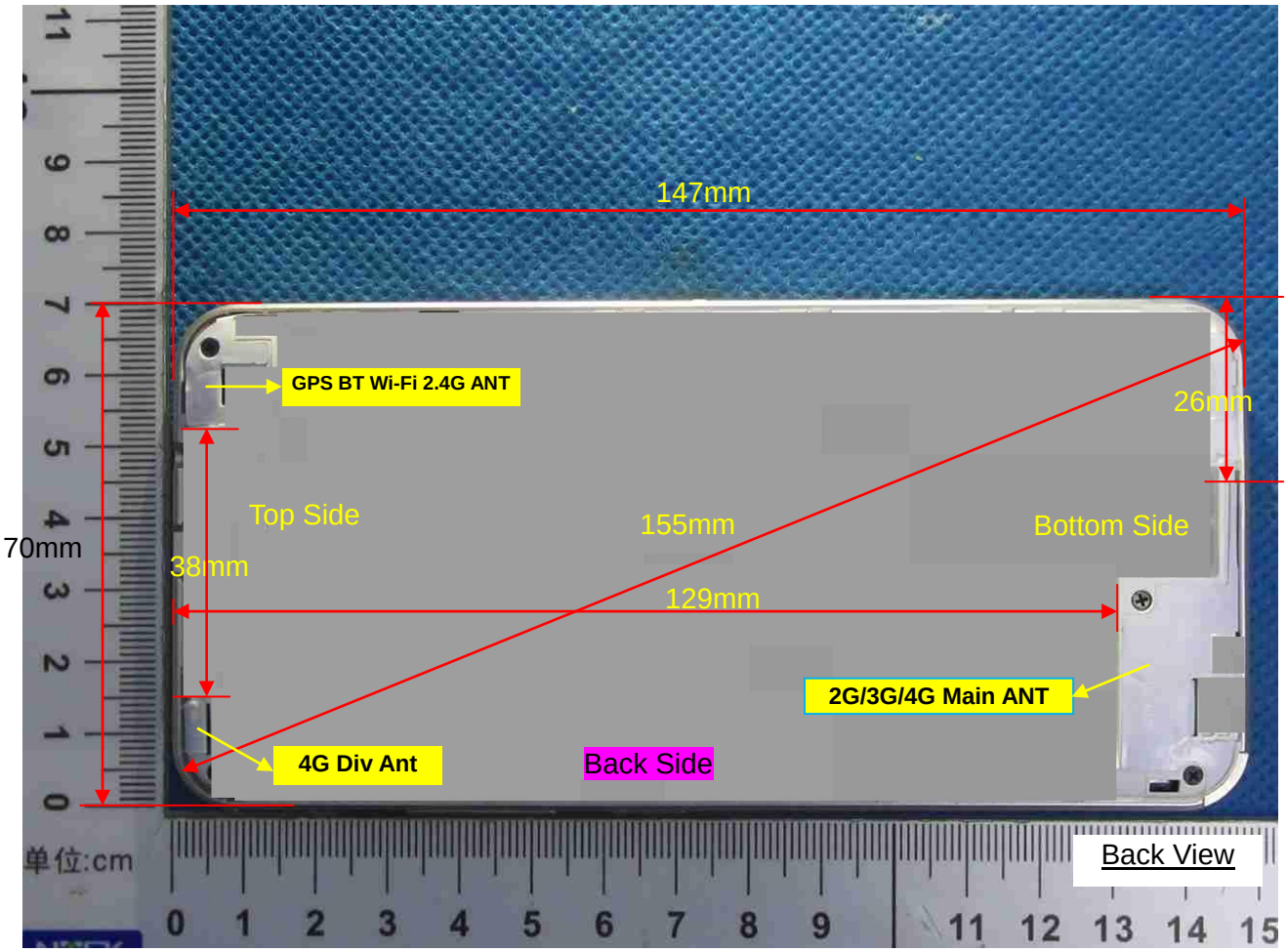
The output power of Bluetooth is as following:

	Output Power (dBm)				
BR+EDR	Channel	Tune-up	Data Rates		
			0CH	39CH	78CH
	1M	7.00	5.68	6.13	5.04
	2M	6.00	4.65	5.32	4.20
	3M	6.00	5.01	5.61	4.50

	Channel	Tune-up	Output Power (dBm)
BLE	0CH	7.00	5.77
	19CH	7.00	6.16
	39CH	7.00	5.07

8. Antenna Location

Left Side



Right Side

Distance of the Antenna to the EUT surface/edge						
Antennas	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WWAN Main	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm	≤ 25mm
WLAN & Bluetooth	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm
Positions for SAR tests						
Antennas	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WWAN Main	Yes	Yes	NO	Yes	NO	Yes
WLAN & Bluetooth	Yes	Yes	Yes	NO	Yes	NO

9. Stand-alone SAR test exclusion

Refer to FCC KDB 447498D01, the 1-g SAR 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)]·[$\sqrt{f_{(GHZ)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- $f_{(GHZ)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
Bluetooth	7.00	5.01	5	2.480	1.58	3.0	Yes

NOTE: Standalone SAR test exclusion for Bluetooth

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)] * [$\sqrt{f_{(GHZ)}}$/x] W/kg for test separation distances ≤ 50mm, where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/Kg)
Bluetooth	Head	7.00	5.01	5	2.480	7.5	0.210
Bluetooth	Body	7.00	5.01	10	2.480	7.5	0.105
Bluetooth	Hotspot	7.00	5.01	10	2.480	7.5	0.105

NOTE: Estimated SAR calculation for Bluetooth

10. SAR Results

10.1. SAR measurement results

10.1.1. SAR measurement Result of LTE Band V

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Left Cheek	20525/836.5	10M QPSK(1,24)	0.111	0.082	-2.05	22.50	23.00	0.125
Left Tilt 15 Degree	20525/836.5	10M QPSK(1,24)	0.055	0.041	-2.50	22.50	23.00	0.062
Right Cheek	20525/836.5	10M QPSK(1,24)	0.087	0.068	-1.26	22.50	23.00	0.098
Right Tilt 15 Degree	20525/836.5	10M QPSK(1,24)	0.059	0.044	-4.01	22.50	23.00	0.066
50%RB								
Left Cheek	20525/836.5	1.4M QPSK(3,2)	0.075	0.055	-2.27	22.66	23.00	0.081
Left Tilt 15 Degree	20525/836.5	1.4M QPSK(3,2)	0.042	0.029	-2.48	22.66	23.00	0.045
Right Cheek	20525/836.5	1.4M QPSK(3,2)	0.064	0.048	-3.09	22.66	23.00	0.069
Right Tilt 15 Degree	20525/836.5	1.4M QPSK(3,2)	0.033	0.024	-3.02	22.66	23.00	0.036

NOTE: Head SAR test results of LTE Band V

Test Position of Body - Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Front Side	20525/836.5	10M QPSK(1,24)	0.102	0.076	-2.57	22.50	23.00	0.114
Back Side	20525/836.5	10M	0.164	0.117	-1.02	22.50	23.00	0.184

		QPSK(1,24)						
50%RB								
Front Side	20525/836.5	1.4M QPSK(3,2)	0.073	0.055	2.06	22.66	23.00	0.079
Back Side	20525/836.5	1.4M QPSK(3,2)	0.111	0.082	1.48	22.66	23.00	0.120

NOTE: Body-Worn SAR test results of LTE Band V

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Front Side	20525/836.5	10M QPSK(1,24)	0.102	0.076	-2.57	22.50	23.00	0.114
Back Side	20525/836.5	10M QPSK(1,24)	0.164	0.117	-1.02	22.50	23.00	0.184
Right Side	20525/836.5	10M QPSK(1,24)	0.077	0.054	0.43	22.50	23.00	0.086
Bottom Side	20525/836.5	10M QPSK(1,24)	0.073	0.042	0.78	22.50	23.00	0.082
50%RB								
Front Side	20525/836.5	1.4M QPSK(3,2)	0.073	0.055	2.06	22.66	23.00	0.079
Back Side	20525/836.5	1.4M QPSK(3,2)	0.111	0.082	1.48	22.66	23.00	0.120
Right Side	20525/836.5	1.4M QPSK(3,2)	0.067	0.041	-0.86	22.66	23.00	0.072
Bottom Side	20525/836.5	1.4M QPSK(3,2)	0.048	0.030	-0.42	22.66	23.00	0.052

NOTE: Hotspot SAR test results of LTE Band V

10.1.2. SAR measurement Result of LTE Band XL A

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Left Cheek	38775/2312.5	15M QPSK(1,37)	0.095	0.051	-1.13	21.71	22.00	0.102

Left Tilt 15 Degree	38775/2312.5	15M QPSK(1,37)	0.041	0.016	0.25	21.71	22.00	0.044
Right Cheek	38775/2312.5	15M QPSK(1,37)	0.234	0.127	-3.49	21.71	22.00	0.250
Right Tilt 15 Degree	38775/2312.5	15M QPSK(1,37)	0.068	0.035	-2.58	21.71	22.00	0.073
50%RB								
Left Cheek	38775/2312.5	15M QPSK(36,0)	0.076	0.034	-1.15	20.77	21.00	0.080
Left Tilt 15 Degree	38775/2312.5	15M QPSK(36,0)	0.031	0.015	0.58	20.77	21.00	0.033
Right Cheek	38775/2312.5	15M QPSK(36,0)	0.158	0.081	-1.35	20.77	21.00	0.167
Right Tilt 15 Degree	38775/2312.5	15M QPSK(36,0)	0.051	0.023	-2.23	20.77	21.00	0.054

NOTE: Head SAR test results of LTE Band XL A

Test Position of Body - Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Front Side	38775/2312.5	15M QPSK(1,37)	0.195	0.088	0.08	21.71	22.00	0.208
Back Side	38775/2312.5	15M QPSK(1,37)	0.315	0.158	-4.19	21.71	22.00	0.337
50%RB								
Front Side	38775/2312.5	15M QPSK(36,0)	0.105	0.056	0.87	20.77	21.00	0.111
Back Side	38775/2312.5	15M QPSK(36,0)	0.228	0.114	-2.33	20.77	21.00	0.240

NOTE: Body-Worn SAR test results of LTE Band XL A

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				

1RB								
Front Side	38775/2312.5	15M QPSK(1,37)	0.195	0.088	0.08	21.71	22.00	0.208
Back Side	38775/2312.5	15M QPSK(1,37)	0.315	0.158	-4.19	21.71	22.00	0.337
Right Side	38775/2312.5	15M QPSK(1,37)	0.089	0.041	1.13	21.71	22.00	0.095
Bottom Side	38775/2312.5	15M QPSK(1,37)	0.116	0.056	0.08	21.71	22.00	0.124
50%RB								
Front Side	38775/2312.5	15M QPSK(36,0)	0.105	0.056	0.87	20.77	21.00	0.111
Back Side	38775/2312.5	15M QPSK(36,0)	0.228	0.114	-2.33	20.77	21.00	0.240
Right Side	38775/2312.5	15M QPSK(36,0)	0.074	0.035	-2.31	20.77	21.00	0.078
Bottom Side	38775/2312.5	15M QPSK(36,0)	0.113	0.048	-1.57	20.77	21.00	0.119

NOTE: Hotspot SAR test results of LTE Band XL A

10.1.3. SAR measurement Result of LTE Band XL B

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Left Cheek	39175/2352.5	15M QPSK(1,37)	0.089	0.048	-1.13	21.94	22.00	0.090
Left Tilt 15 Degree	39175/2352.5	15M QPSK(1,37)	0.034	0.015	0.52	21.94	22.00	0.034
Right Cheek	39175/2352.5	15M QPSK(1,37)	0.150	0.105	-2.80	21.94	22.00	0.152
Right Tilt 15 Degree	39175/2352.5	15M QPSK(1,37)	0.046	0.028	-1.10	21.94	22.00	0.047
50%RB								
Left Cheek	39175/2352.5	15M QPSK(36,0)	0.064	0.038	0.15	20.96	21.00	0.065
Left Tilt	39175/2352.5	15M QPSK(36,0)	0.031	0.018	0.08	20.96	21.00	0.031

15 Degree								
Right Cheek	39175/2352.5	15M QPSK(36,0)	0.115	0.042	0.14	20.96	21.00	0.116
Right Tilt 15 Degree	39175/2352.5	15M QPSK(36,0)	0.035	0.021	-1.19	20.96	21.00	0.035

NOTE: Head SAR test results of LTE Band XL B

Test Position of Body - Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Front Side	39175/2352.5	15M QPSK(1,37)	0.188	0.081	-1.10	21.94	22.00	0.191
Back Side	39175/2352.5	15M QPSK(1,37)	0.192	0.090	4.24	21.94	22.00	0.195
50%RB								
Front Side	39175/2352.5	15M QPSK(36,0)	0.114	0.065	0.25	20.96	21.00	0.115
Back Side	39175/2352.5	15M QPSK(36,0)	0.186	0.076	0.01	20.96	21.00	0.188

NOTE: Body-Worn SAR test results of LTE Band XL B

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
1RB								
Front Side	39175/2352.5	15M QPSK(1,37)	0.188	0.081	-1.10	21.94	22.00	0.191
Back Side	39175/2352.5	15M QPSK(1,37)	0.192	0.090	4.24	21.94	22.00	0.195
Right Side	39175/2352.5	15M QPSK(1,37)	0.088	0.046	-1.13	21.94	22.00	0.089
Bottom Side	39175/2352.5	15M QPSK(1,37)	0.169	0.075	0.05	21.94	22.00	0.171
50%RB								
Front Side	39175/2352.5	15M QPSK(36,0)	0.114	0.065	0.25	20.96	21.00	0.115

Back Side	39175/2352.5	15M QPSK(36,0)	0.186	0.076	0.01	20.96	21.00	0.188
Right Side	39175/2352.5	15M QPSK(36,0)	0.071	0.046	-1.25	20.96	21.00	0.072
Bottom Side	39175/2352.5	15M QPSK(36,0)	0.114	0.058	-2.31	20.96	21.00	0.115

NOTE: Hotspot SAR test results of LTE Band XL B

10.1.4. SAR measurement Result of WLAN 2.4G

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
Left Cheek	6/2437	802.11 b	0.117	0.054	-1.31	14.40	14.50	0.120
Left Tilt 15 Degree	6/2437	802.11 b	0.105	0.051	0.99	14.40	14.50	0.107
Right Cheek	6/2437	802.11 b	0.222	0.101	-3.92	14.40	14.50	0.227
Right Tilt 15 Degree	6/2437	802.11 b	0.195	0.071	-4.83	14.40	14.50	0.200

NOTE: Head SAR test results of WLAN 2.4G

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
Front Side	6/2437	802.11 b	0.228	0.124	-2.12	14.40	14.50	0.233
Back Side	6/2437	802.11 b	0.199	0.098	-3.13	14.40	14.50	0.204

NOTE: Body-Worn SAR test results of WLAN 2.4G

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)
			1g	10g				
Front Side	6/2437	802.11 b	0.228	0.124	-2.12	14.40	14.50	0.233
Back Side	6/2437	802.11 b	0.199	0.098	-3.13	14.40	14.50	0.204
Left Side	6/2437	802.11 b	0.063	0.031	-1.17	14.40	14.50	0.064
Top Side	6/2437	802.11 b	0.054	0.026	-3.65	14.40	14.50	0.055

NOTE: Hotspot SAR test results of WLAN 2.4G

10.2. Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration	Head	Body	Hotspot	Note
1	LTE(data) + WLAN 2.4GHz(data)	Yes	Yes	Yes	2.4GHz Hotspot
2	LTE(data) + Bluetooth(data)	Yes	Yes	Yes	Bluetooth Tethering

NOTE:

1) This device supported VoIP in LTE(e.g. 3rd party VoIP).

2) This device WLAN 2.4GHz supports Hotspot operation.

3) WLAN 2.4GHz and Bluetooth share the same antenna, and cannot transmit simultaneously.

4) The Scaled SAR Simultaneous Tx is calculated based on the same configuration and test position.

10.3. SAR Summation Scenario

Refer to KDB 447498 D01, simultaneous transmission SAR is compliant if,

1) Scalar SAR summation < 1.6W/kg.

2) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan. If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band V	WLAN 2.4G			
Head	Left Cheek	0.125	0.120	0.244	N/A	N/A
	Left Tilt 15 Degree	0.062	0.107	0.169	N/A	N/A
	Right Cheek	0.098	0.227	0.325	N/A	N/A
	Right Tilt 15 Degree	0.066	0.200	0.266	N/A	N/A
Body-Worn	Front Side	0.114	0.233	0.348	N/A	N/A
	Back Side	0.184	0.204	0.388	N/A	N/A
Hotspot	Front Side	0.114	0.233	0.348	N/A	N/A
	Back Side	0.184	0.204	0.388	N/A	N/A
	Left Side	N/A	0.064	0.064	N/A	N/A
	Right Side	0.086	N/A	0.086	N/A	N/A
	Top Side	N/A	0.055	0.055	N/A	N/A
	Bottom Side	0.082	N/A	0.082	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band V and WLAN 2.4G.

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band XL A	WLAN 2.4G			
Head	Left Cheek	0.102	0.120	0.221	N/A	N/A
	Left Tilt 15 Degree	0.044	0.107	0.151	N/A	N/A
	Right Cheek	0.250	0.227	0.477	N/A	N/A
	Right Tilt 15 Degree	0.073	0.200	0.272	N/A	N/A
Body-Worn	Front Side	0.208	0.233	0.442	N/A	N/A
	Back Side	0.337	0.204	0.540	N/A	N/A
Hotspot	Front Side	0.208	0.233	0.442	N/A	N/A
	Back Side	0.337	0.204	0.540	N/A	N/A
	Left Side	N/A	0.064	0.064	N/A	N/A
	Right Side	0.095	N/A	0.095	N/A	N/A
	Top Side	N/A	0.055	0.055	N/A	N/A
	Bottom Side	0.124	N/A	0.124	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band XL A and WLAN 2.4G.

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band XL B	WLAN 2.4G			
Head	Left Cheek	0.090	0.120	0.210	N/A	N/A
	Left Tilt 15 Degree	0.034	0.107	0.142	N/A	N/A
	Right Cheek	0.152	0.227	0.379	N/A	N/A
	Right Tilt 15 Degree	0.047	0.200	0.246	N/A	N/A
Body-Worn	Front Side	0.191	0.233	0.424	N/A	N/A
	Back Side	0.195	0.204	0.398	N/A	N/A
Hotspot	Front Side	0.191	0.233	0.424	N/A	N/A
	Back Side	0.195	0.204	0.398	N/A	N/A
	Left Side	N/A	0.064	0.064	N/A	N/A
	Right Side	0.089	N/A	0.089	N/A	N/A
	Top Side	N/A	0.055	0.055	N/A	N/A
	Bottom Side	0.171	N/A	0.171	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band XL B and WLAN 2.4G.

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band V	Bluetooth			
Head	Left Cheek	0.125	0.210	0.335	N/A	N/A
	Left Tilt 15 Degree	0.062	0.210	0.272	N/A	N/A
	Right Cheek	0.098	0.210	0.308	N/A	N/A
	Right Tilt 15 Degree	0.066	0.210	0.277	N/A	N/A
Body-Worn	Front Side	0.114	0.105	0.220	N/A	N/A
	Back Side	0.184	0.105	0.289	N/A	N/A
Hotspot	Front Side	0.114	0.105	0.220	N/A	N/A
	Back Side	0.184	0.105	0.289	N/A	N/A
	Left Side	N/A	0.105	0.105	N/A	N/A
	Right Side	0.086	N/A	0.086	N/A	N/A
	Top Side	N/A	0.105	0.105	N/A	N/A
	Bottom Side	0.082	N/A	0.082	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band V and Bluetooth

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band XL A	Bluetooth			
Head	Left Cheek	0.102	0.210	0.312	N/A	N/A
	Left Tilt 15 Degree	0.044	0.210	0.254	N/A	N/A
	Right Cheek	0.250	0.210	0.461	N/A	N/A
	Right Tilt 15 Degree	0.073	0.210	0.283	N/A	N/A
Body-Worn	Front Side	0.208	0.105	0.314	N/A	N/A
	Back Side	0.337	0.105	0.442	N/A	N/A
Hotspot	Front Side	0.208	0.105	0.314	N/A	N/A
	Back Side	0.337	0.105	0.442	N/A	N/A
	Left Side	N/A	0.105	0.105	N/A	N/A
	Right Side	0.095	N/A	0.095	N/A	N/A
	Top Side	N/A	0.105	0.105	N/A	N/A
	Bottom Side	0.124	N/A	0.124	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band XL A and Bluetooth

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		LTE Band XL B	Bluetooth			
Head	Left Cheek	0.090	0.210	0.301	N/A	N/A
	Left Tilt 15 Degree	0.034	0.210	0.245	N/A	N/A
	Right Cheek	0.152	0.210	0.363	N/A	N/A
	Right Tilt 15 Degree	0.047	0.210	0.257	N/A	N/A
Body-Worn	Front Side	0.191	0.105	0.296	N/A	N/A
	Back Side	0.195	0.105	0.300	N/A	N/A
Hotspot	Front Side	0.191	0.105	0.296	N/A	N/A
	Back Side	0.195	0.105	0.300	N/A	N/A
	Left Side	N/A	0.105	0.105	N/A	N/A
	Right Side	0.089	N/A	0.089	N/A	N/A
	Top Side	N/A	0.105	0.105	N/A	N/A
	Bottom Side	0.171	N/A	0.171	N/A	N/A

NOTE: 1-g SAR Simultaneous Tx Combination of LTE Band XL B and Bluetooth

11. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

12. Appendix B. System Check Plots

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MEASUREMENT 6 System Performance Check - SID2450 - Body

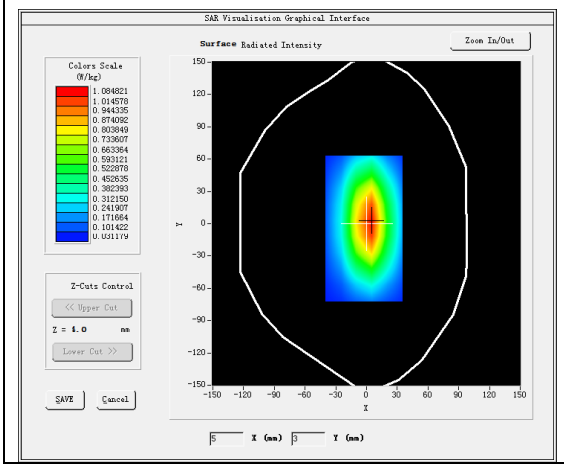
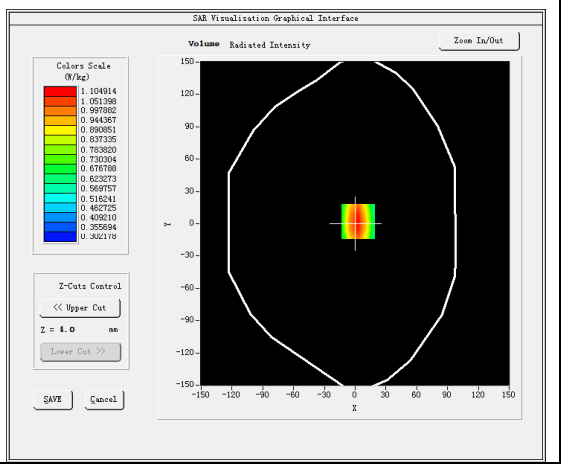
MEASUREMENT 1

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

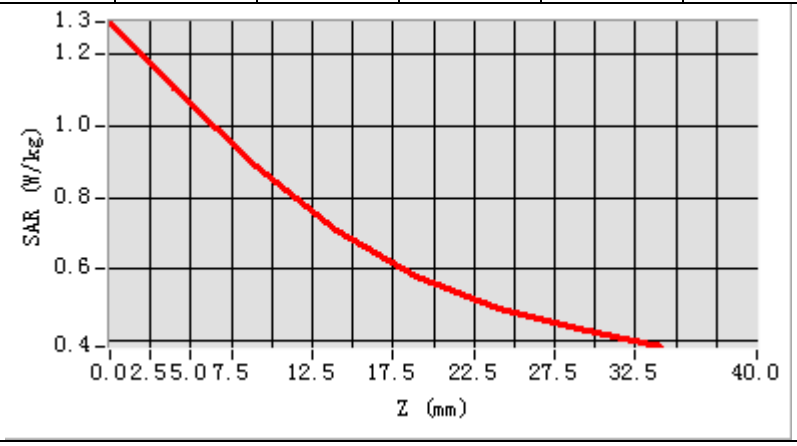
Frequency (MHz)	835.000000
Relative permittivity (real part)	42.740899
Relative permittivity (imaginary part)	19.026380
Conductivity (S/m)	0.883335
Variation (%)	0.070000

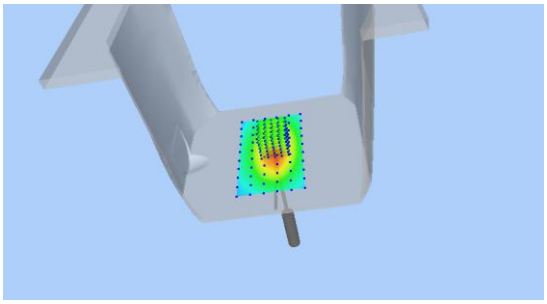
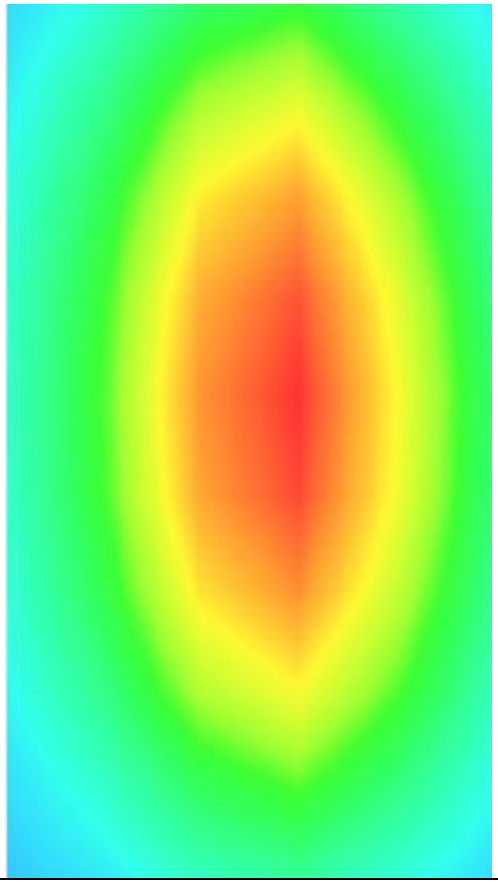
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=2.00
SAR Peak: 1.30 W/kg

SAR 10g (W/Kg)	0.652561
SAR 1g (W/Kg)	0.966890

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2922	1.1049	0.8877	0.7107	0.5783	0.4911	0.4354



3D screen shot	Hot spot position
	

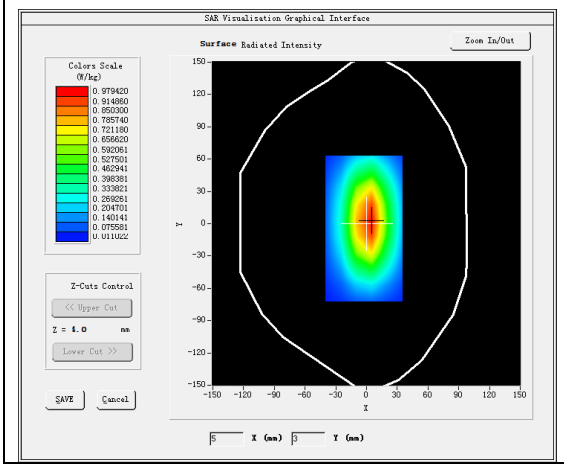
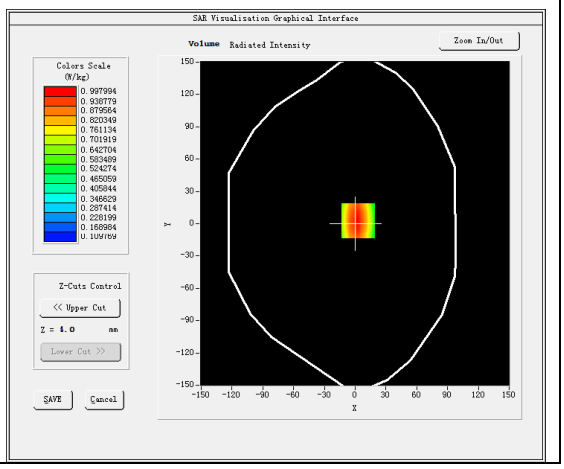
MEASUREMENT 2

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

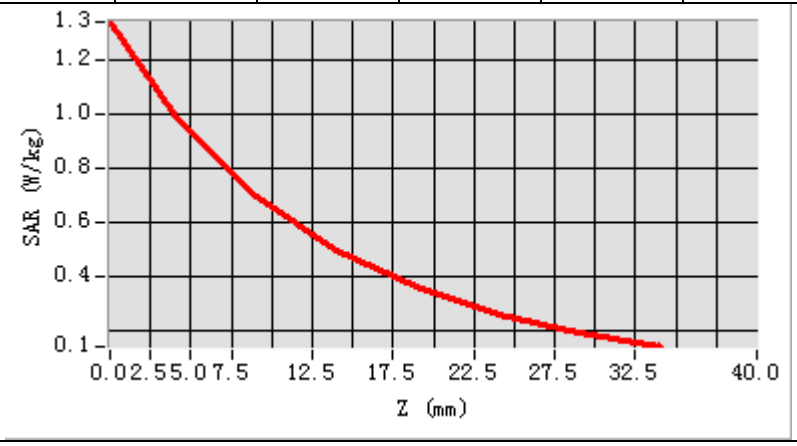
Frequency (MHz)	835.000000
Relative permittivity (real part)	55.339587
Relative permittivity (imaginary part)	21.129612
Conductivity (S/m)	0.978065
Variation (%)	0.100000

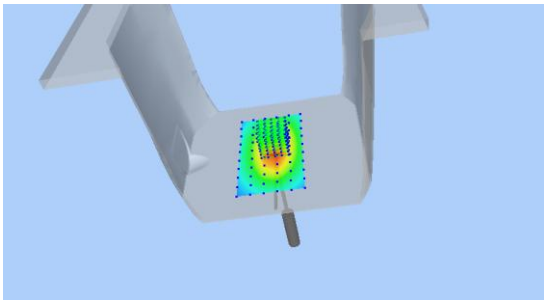
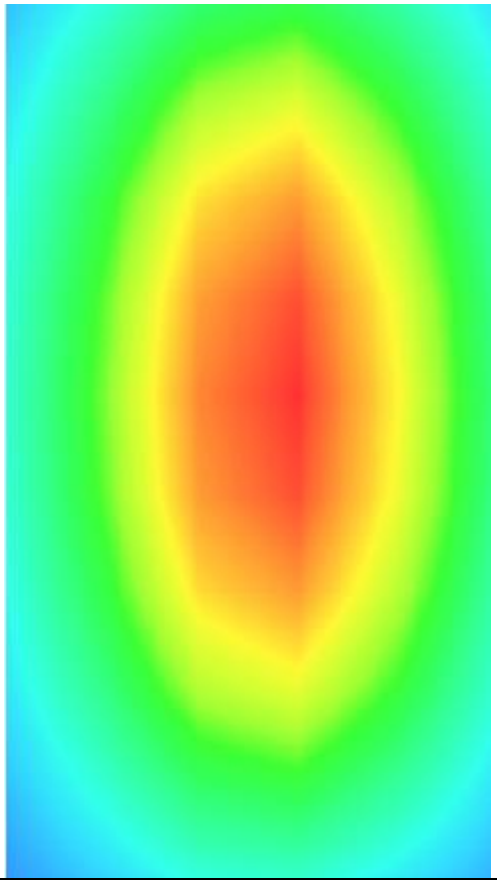
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=3.00, Y=3.00
SAR Peak: 1.34 W/kg

SAR 10g (W/Kg)	0.641322
SAR 1g (W/Kg)	0.952303

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3377	0.9980	0.6983	0.4988	0.3612	0.2639	0.1929



3D screen shot	Hot spot position
	

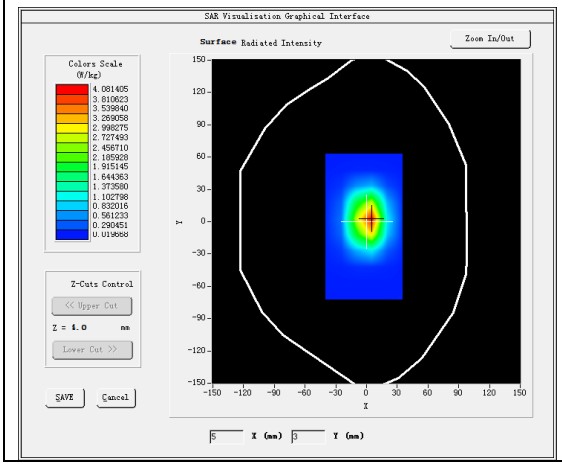
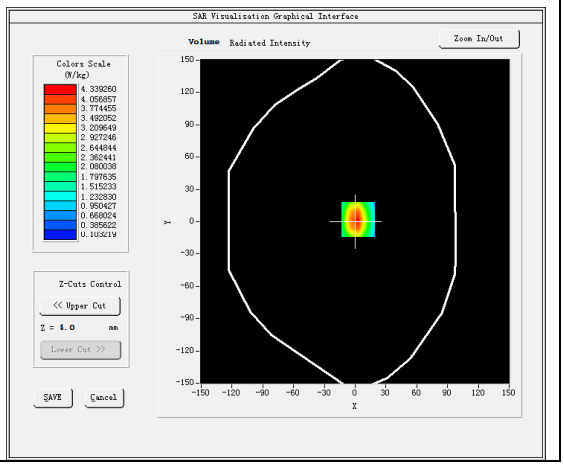
MEASUREMENT 3

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2300
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

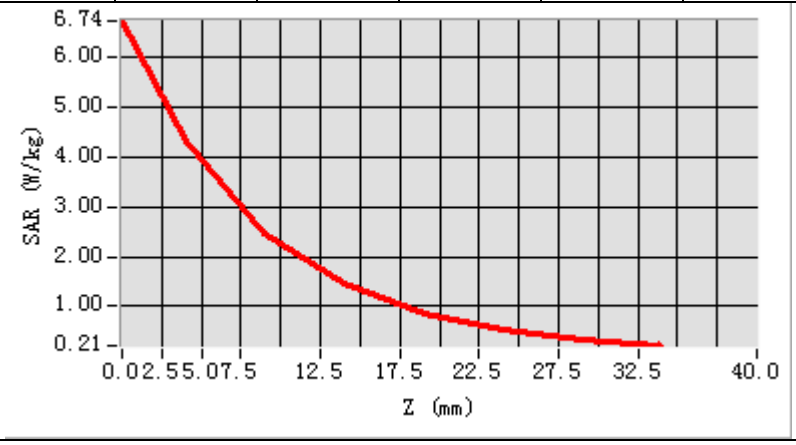
Frequency (MHz)	2300.000000
Relative permittivity (real part)	39.387691
Relative permittivity (imaginary part)	13.273442
Conductivity (S/m)	1.701344
Variation (%)	-0.460000

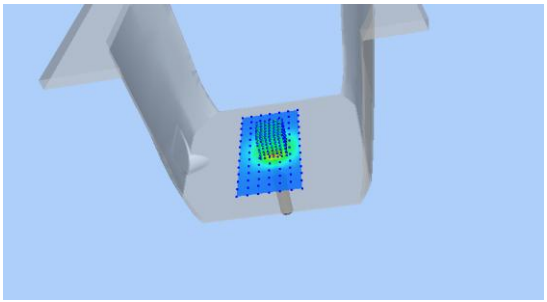
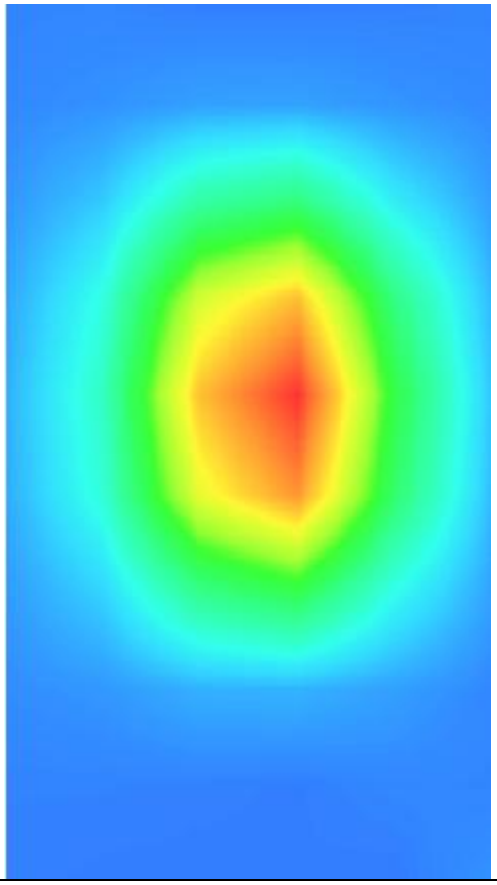
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=2.00
SAR Peak: 6.82 W/kg

SAR 10g (W/Kg)	2.274357
SAR 1g (W/Kg)	4.734276

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.7439	4.3393	2.4587	1.4415	0.8652	0.5290	0.3313



3D screen shot	Hot spot position
	

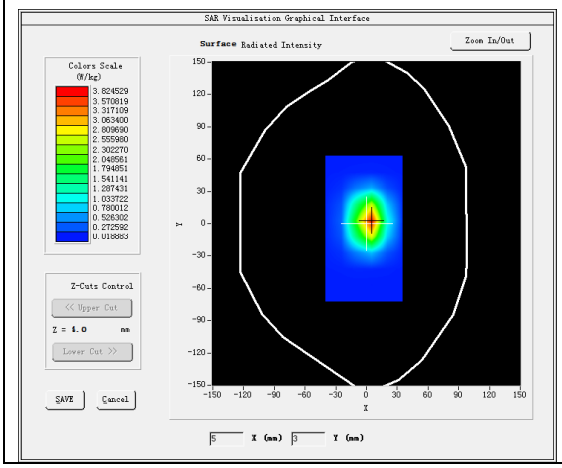
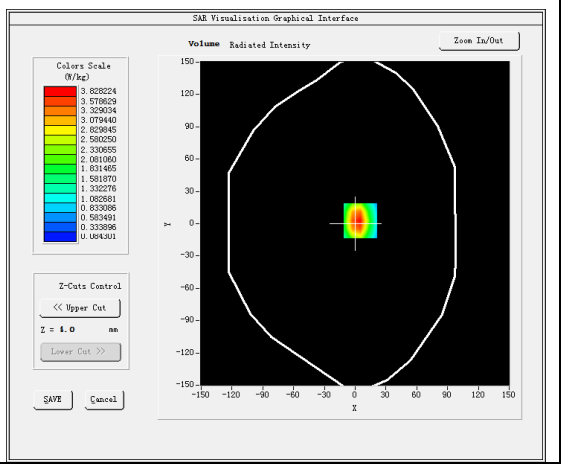
MEASUREMENT 4

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2300
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

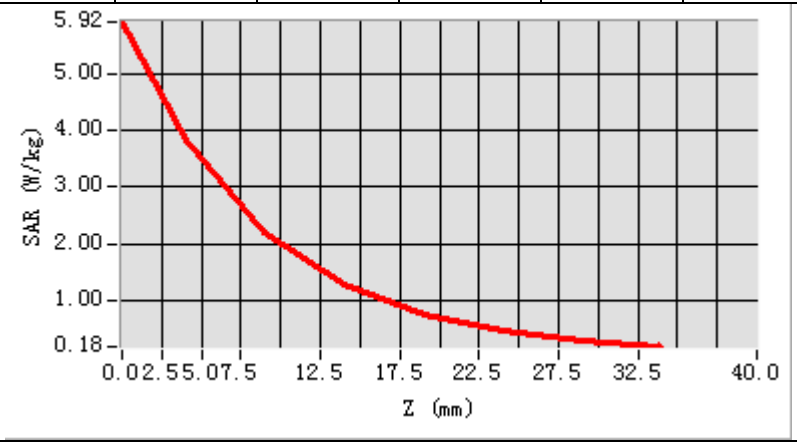
Frequency (MHz)	2300.000000
Relative permittivity (real part)	52.455098
Relative permittivity (imaginary part)	13.949900
Conductivity (S/m)	1.778656
Variation (%)	0.680000

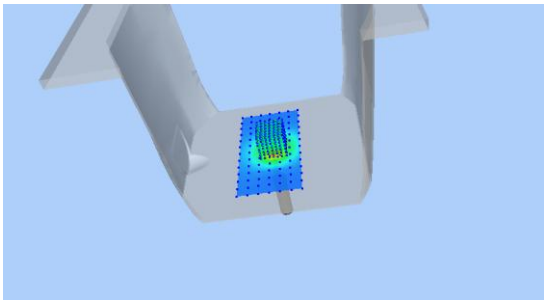
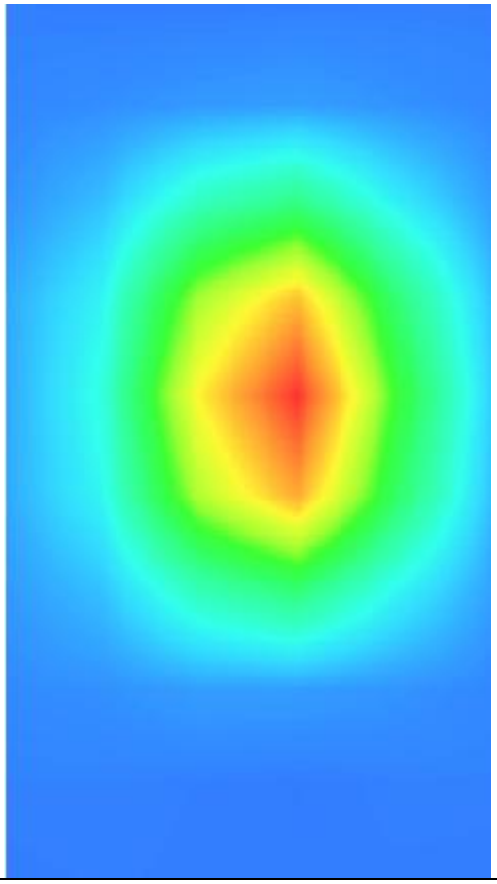
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=3.00
SAR Peak: 6.10 W/kg

SAR 10g (W/Kg)	2.142127
SAR 1g (W/Kg)	4.535725

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.9164	3.8282	2.1841	1.2789	0.7613	0.4716	0.2856



3D screen shot	Hot spot position
	

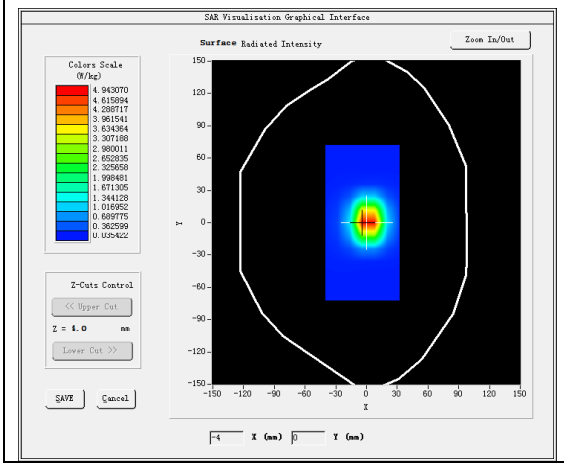
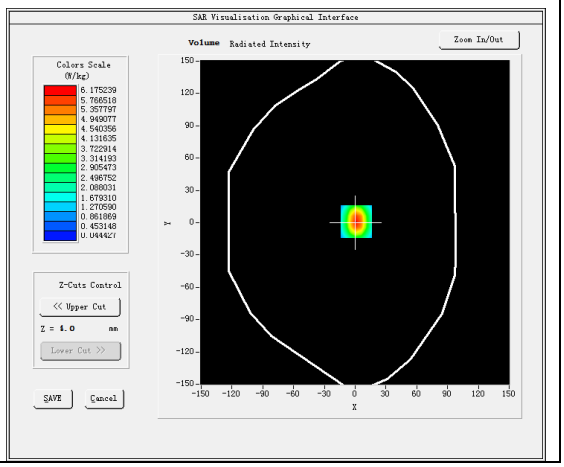
MEASUREMENT 5

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

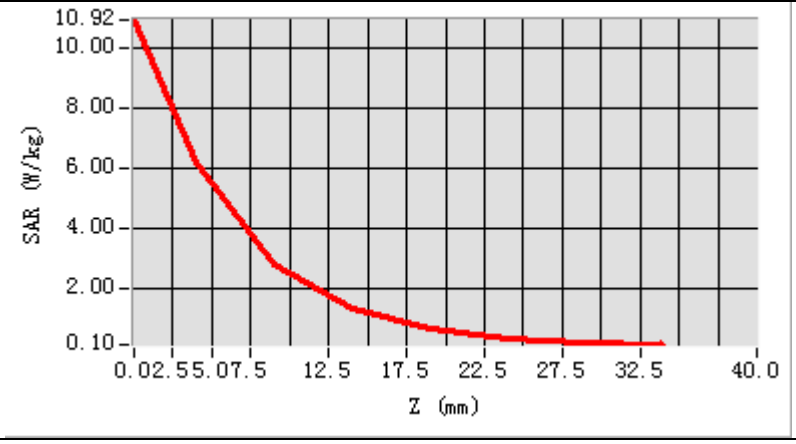
Frequency (MHz)	2450.000000
Relative permittivity (real part)	39.674097
Relative permittivity (imaginary part)	13.172800
Conductivity (S/m)	1.786738
Variation (%)	-0.050000

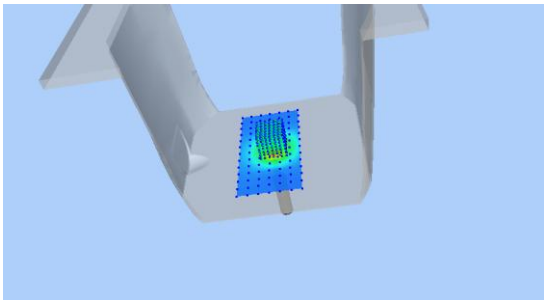
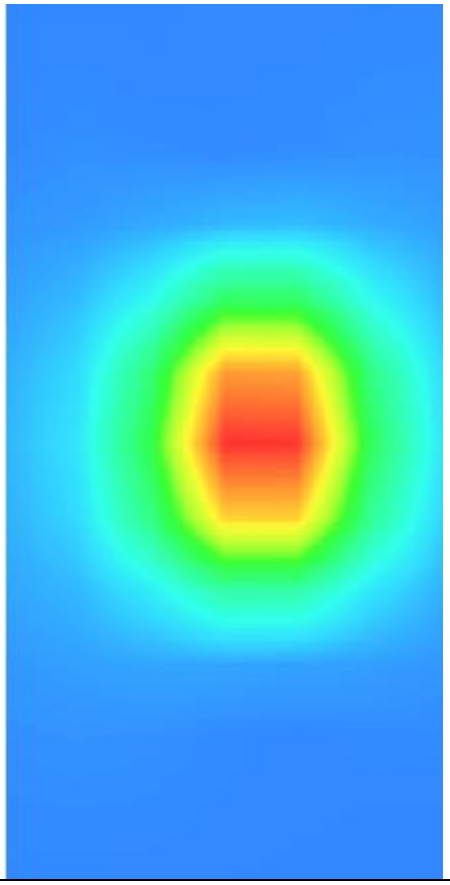
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=1.00, Y=1.00
SAR Peak: 10.79 W/kg

SAR 10g (W/Kg)	2.520240
SAR 1g (W/Kg)	5.405527

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.9228	6.1752	2.7995	1.2967	0.6248	0.3106	0.1658



3D screen shot	Hot spot position
	

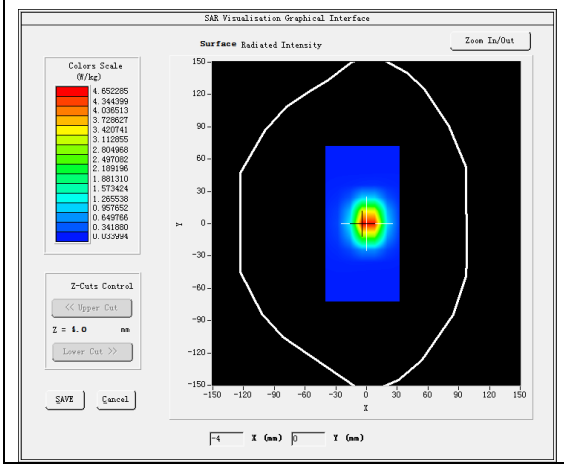
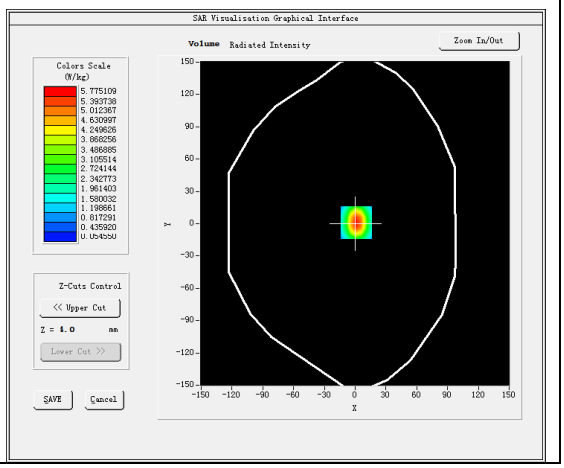
MEASUREMENT 6

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

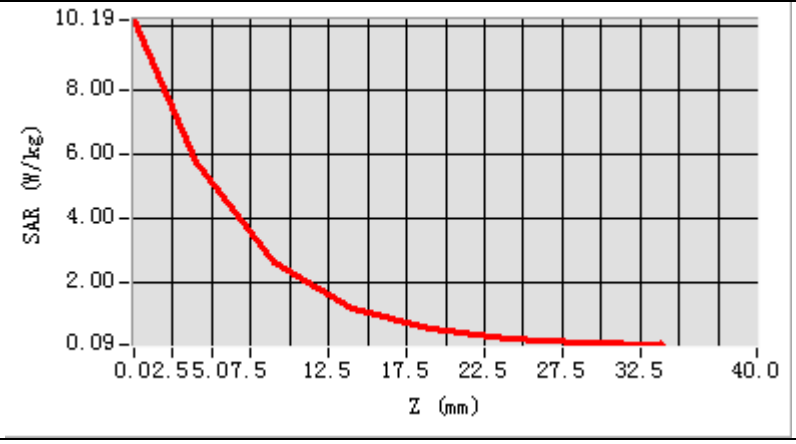
Frequency (MHz)	2450.000000
Relative permittivity (real part)	52.384097
Relative permittivity (imaginary part)	14.450933
Conductivity (S/m)	1.966738
Variation (%)	-0.050000

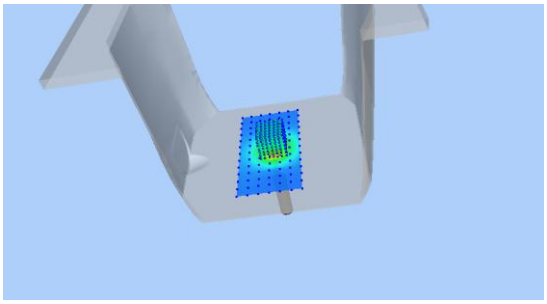
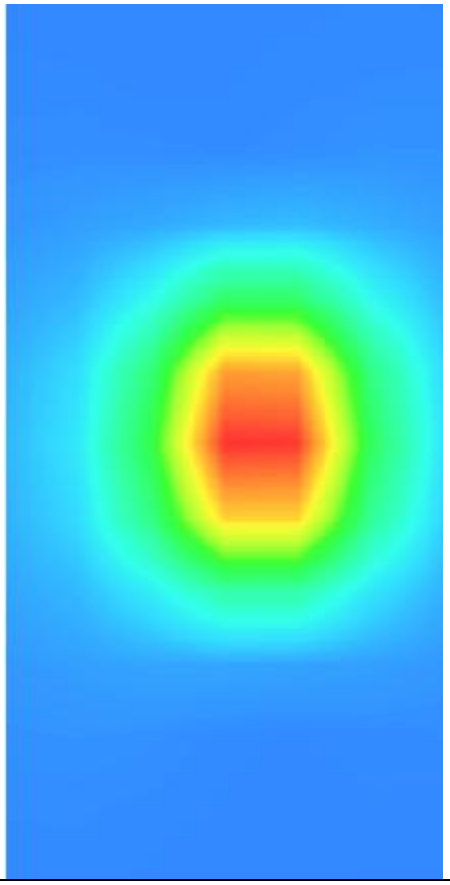
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=1.00, Y=1.00
SAR Peak: 10.08 W/kg

SAR 10g (W/Kg)	2.362453
SAR 1g (W/Kg)	5.239995

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.1922	5.7751	2.6280	1.2137	0.5848	0.2917	0.1545



3D screen shot	Hot spot position
	

13. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 6 LTE Band XL B Head
MEASUREMENT 7 LTE Band XL A Body& Hotspot
MEASUREMENT 8 LTE Band XL B Body& Hotspot

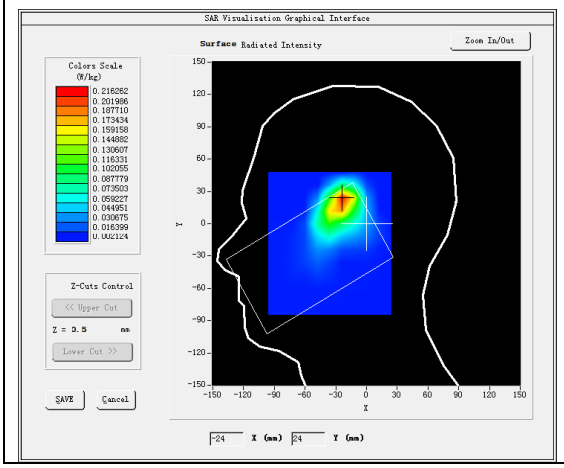
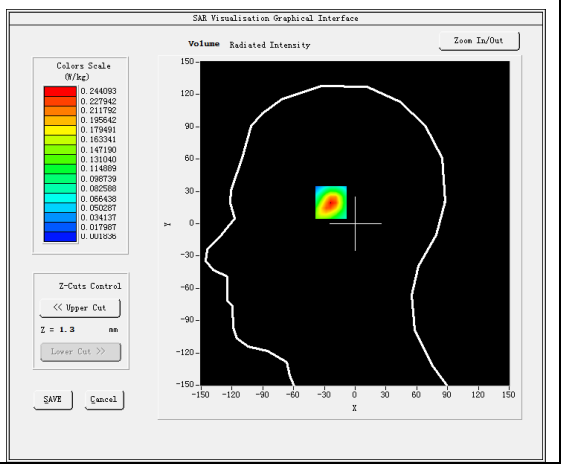
MEASUREMENT 1

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.11b (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative permittivity (real part)	40.188999
Relative permittivity (imaginary part)	13.034300
Conductivity (S/m)	1.764699
Variation (%)	-3.919998

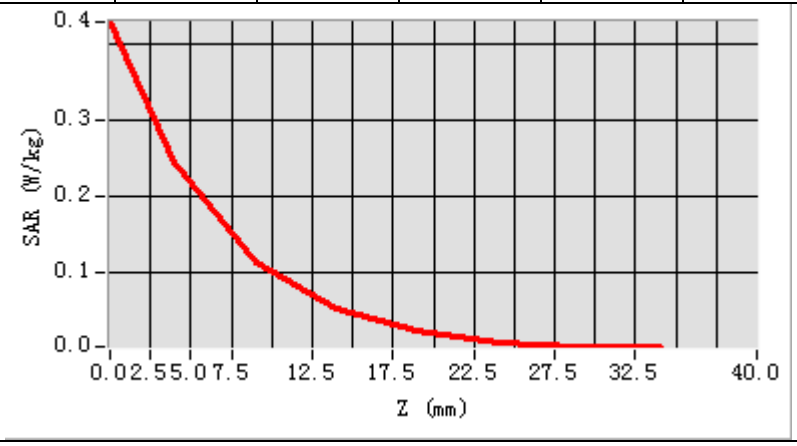
SURFACE SAR	**VOLUME SAR**
	

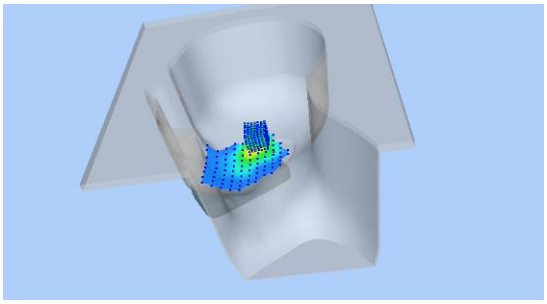
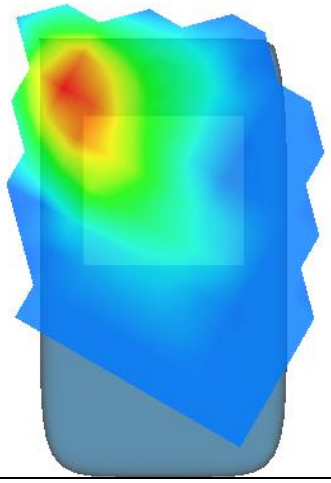
Maximum location: X=-23.00, Y=22.00

SAR Peak: 0.43 W/kg

SAR 10g (W/Kg)	0.101241
SAR 1g (W/Kg)	0.221584

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4280	0.2441	0.1125	0.0530	0.0241	0.0088	0.0026



3D screen shot	Hot spot position
	

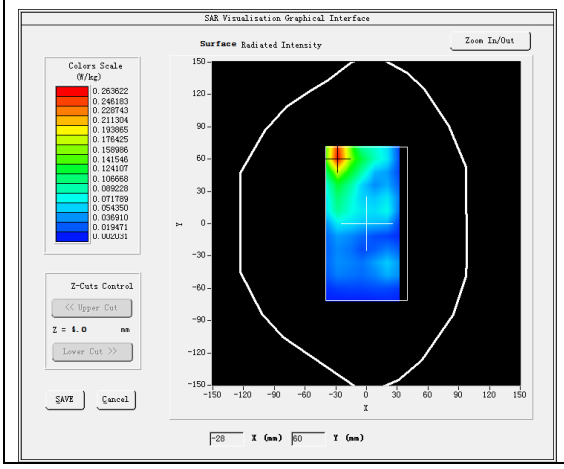
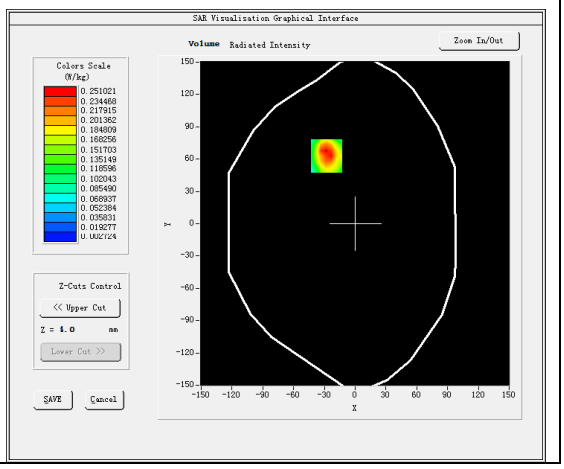
MEASUREMENT 2

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.11b (Crest factor: 1.0)

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.440601
Relative permittivity (imaginary part)	14.402620
Conductivity (S/m)	1.949955
Variation (%)	-2.120000

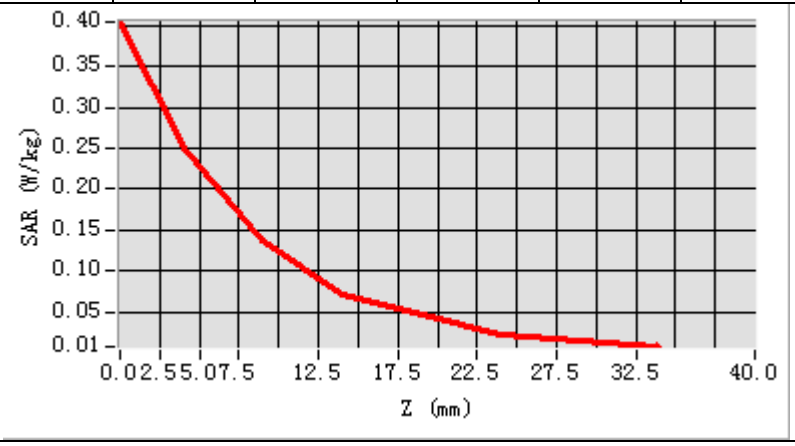
SURFACE SAR	**VOLUME SAR**
	

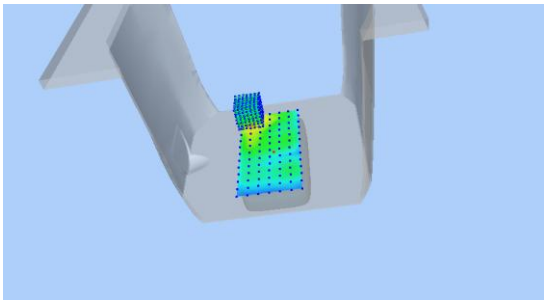
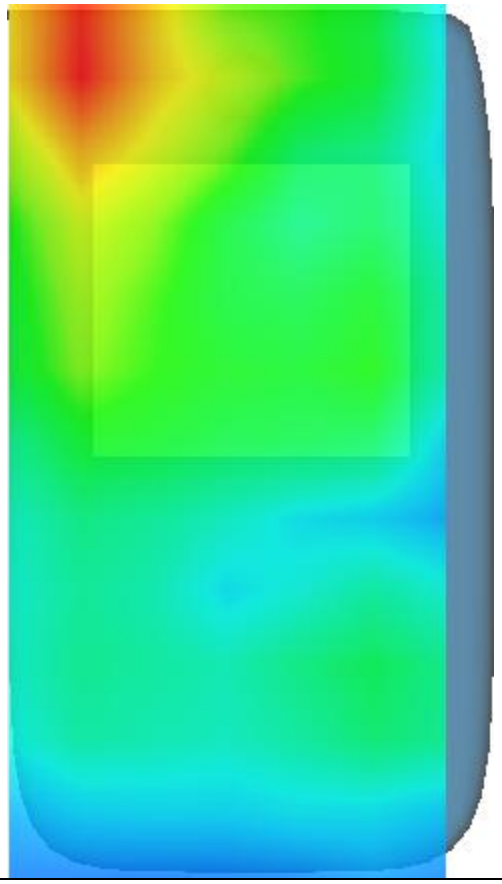
Maximum location: X=-28.00, Y=63.00

SAR Peak: 0.39 W/kg

SAR 10g (W/Kg)	0.124085
SAR 1g (W/Kg)	0.227942

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4044	0.2510	0.1364	0.0705	0.0467	0.0228	0.0158



3D screen shot	Hot spot position
	

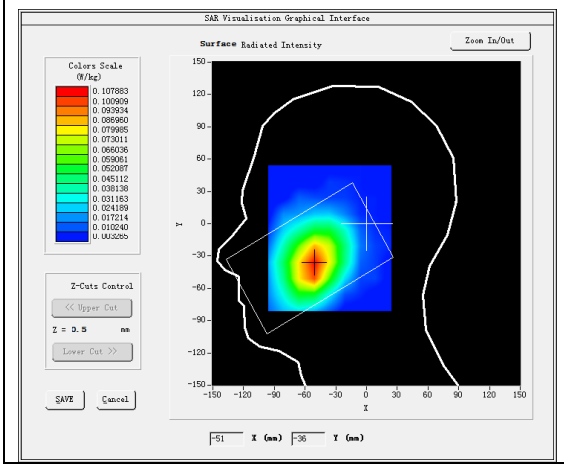
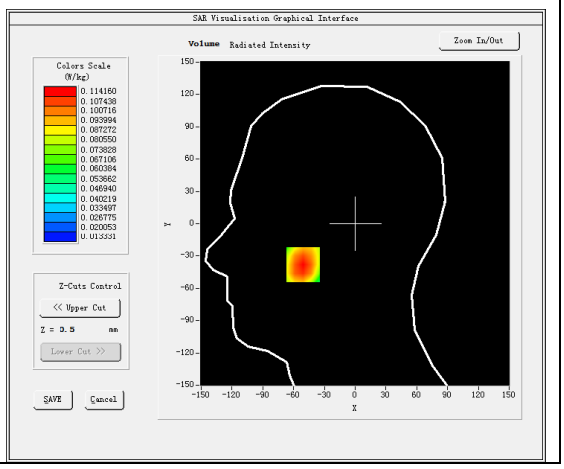
MEASUREMENT 3

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 5
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

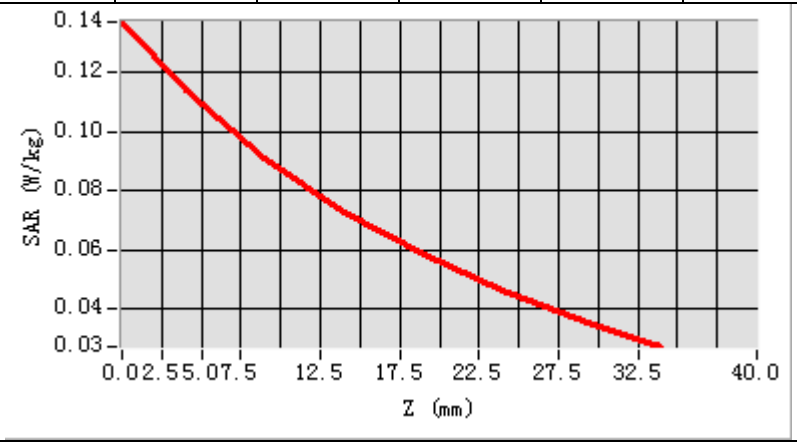
Frequency (MHz)	836.500000
Relative permittivity (real part)	42.704945
Relative permittivity (imaginary part)	19.060659
Conductivity (S/m)	0.885791
Variation (%)	-2.050000

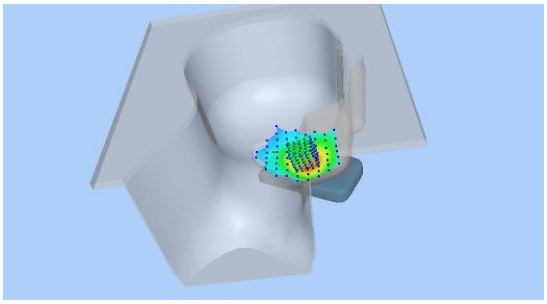
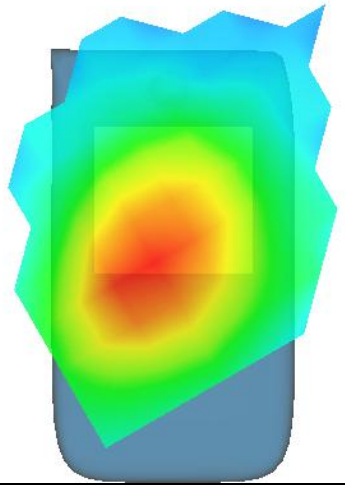
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-38.00
SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.082070
SAR 1g (W/Kg)	0.110609

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1371	0.1142	0.0912	0.0727	0.0583	0.0462	0.0360



3D screen shot	Hot spot position
	

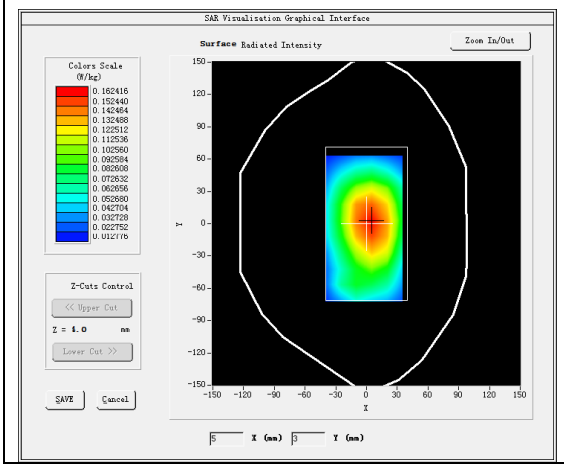
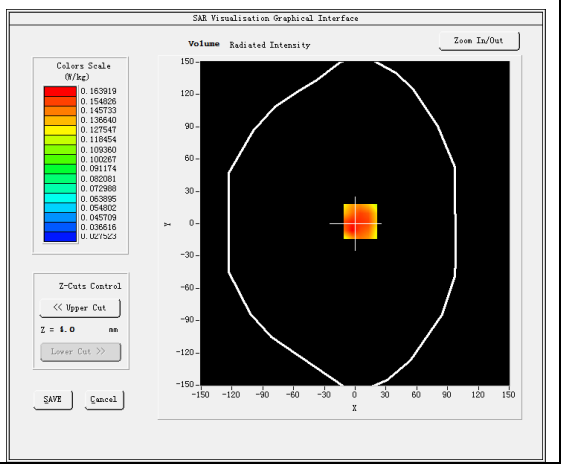
MEASUREMENT 4

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 5
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

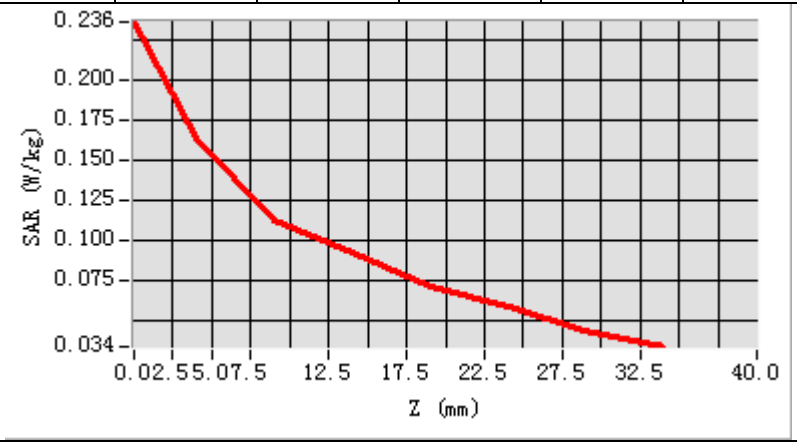
Frequency (MHz)	836.500000
Relative permittivity (real part)	55.301243
Relative permittivity (imaginary part)	21.166700
Conductivity (S/m)	0.983664
Variation (%)	-1.020000

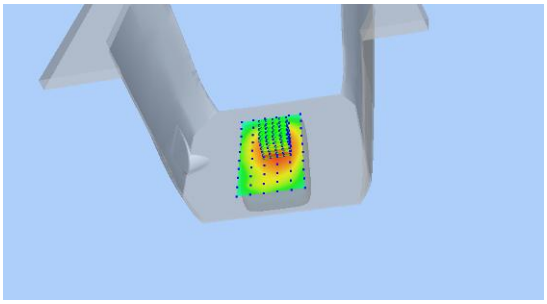
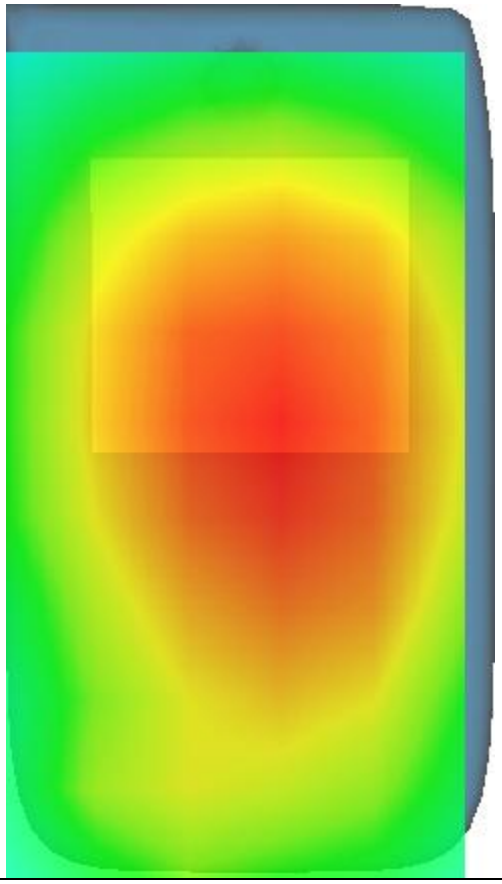
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=2.00
SAR Peak: 0.24 W/kg

SAR 10g (W/Kg)	0.116740
SAR 1g (W/Kg)	0.164446

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2359	0.1639	0.1122	0.0916	0.0707	0.0579	0.0430



3D screen shot	Hot spot position
	

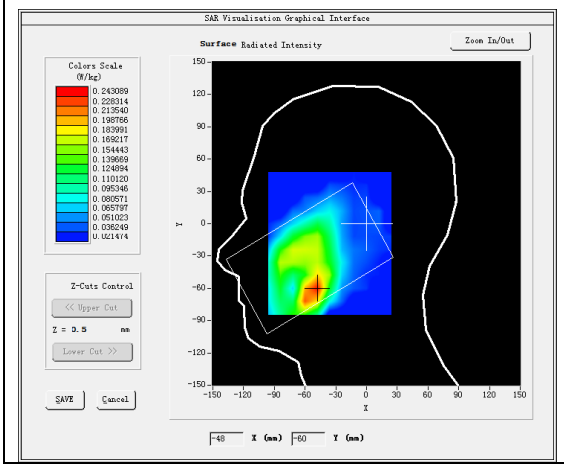
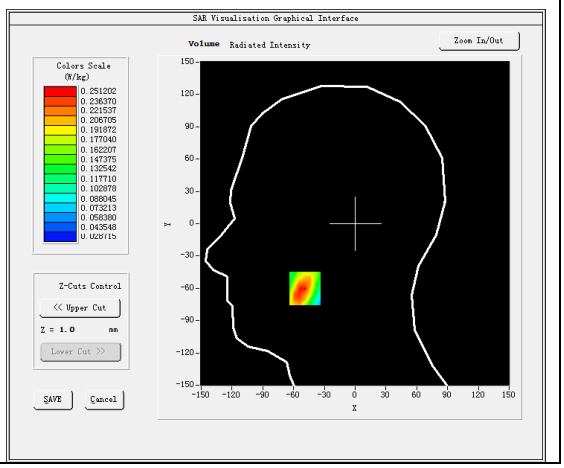
MEASUREMENT 5

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	LTE band 40 A
Channels	Middle
Signal	LTE (Crest factor: 1.6)

B. SAR Measurement Results

Frequency (MHz)	2312.500000
Relative permittivity (real part)	39.280224
Relative permittivity (imaginary part)	13.242531
Conductivity (S/m)	1.705050
Variation (%)	-3.490000

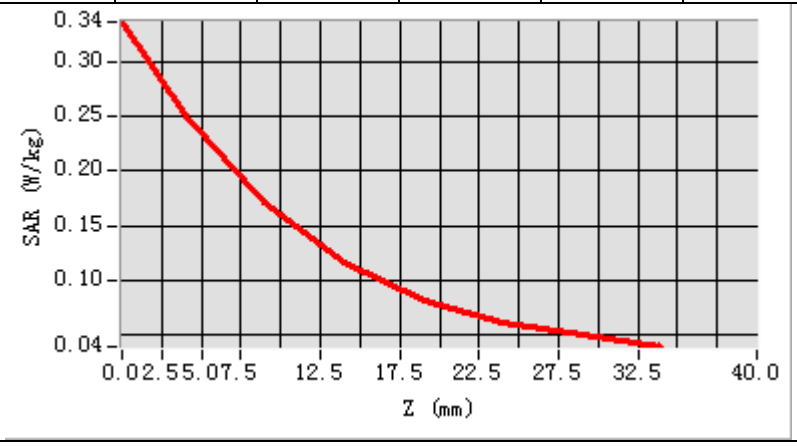
SURFACE SAR	VOLUME SAR
	

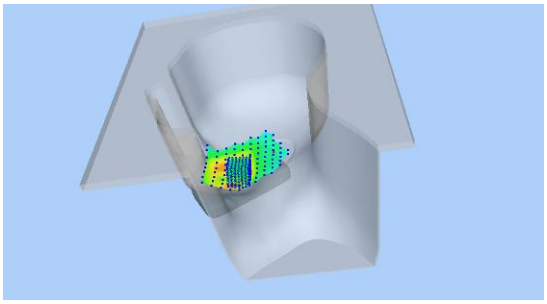
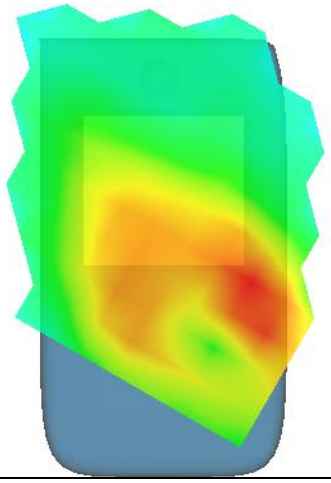
Maximum location: X=-49.00, Y=-60.00

SAR Peak: 0.35 W/kg

SAR 10g (W/Kg)	0.126978
SAR 1g (W/Kg)	0.233922

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3367	0.2512	0.1709	0.1159	0.0821	0.0606	0.0501



3D screen shot	Hot spot position
	

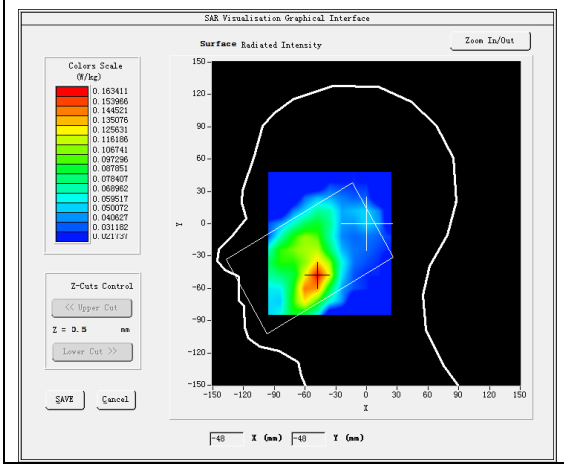
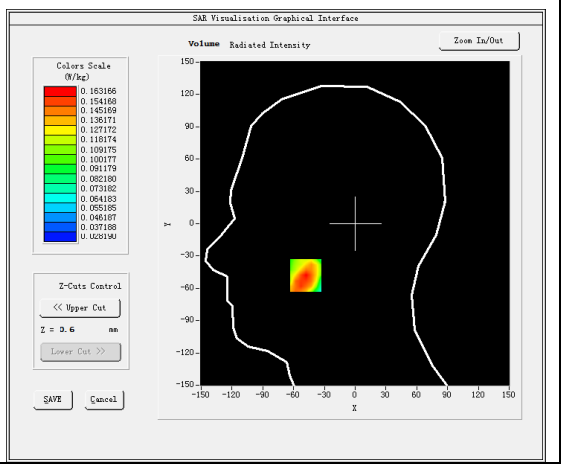
MEASUREMENT 6

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Right head
Device Position	Cheek
Band	LTE band 40 B
Channels	Middle
Signal	LTE (Crest factor: 1.6)

B. SAR Measurement Results

Frequency (MHz)	2352.500000
Relative permittivity (real part)	39.108899
Relative permittivity (imaginary part)	13.357520
Conductivity (S/m)	1.748787
Variation (%)	-2.800000

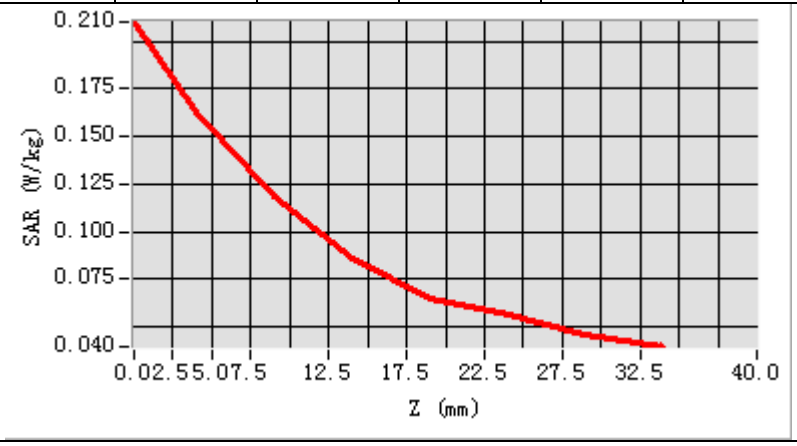
SURFACE SAR	VOLUME SAR
	

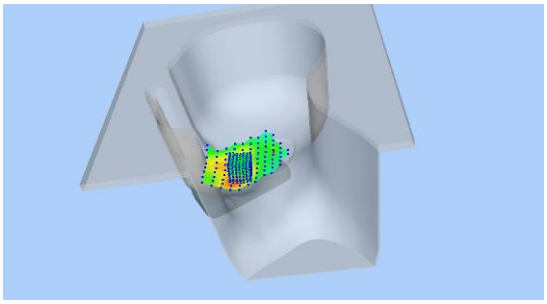
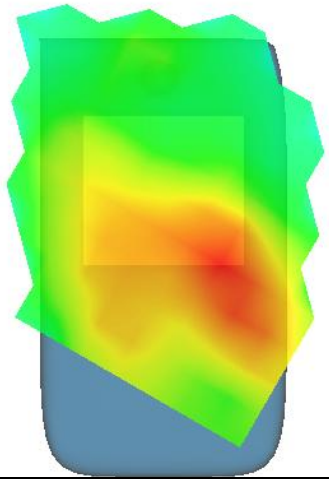
Maximum location: X=-48.00, Y=-48.00

SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.104665
SAR 1g (W/Kg)	0.150093

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2102	0.1632	0.1187	0.0861	0.0652	0.0563	0.0458



3D screen shot	Hot spot position
	

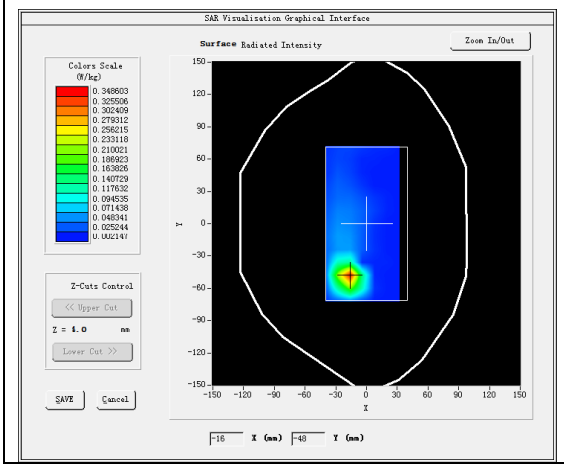
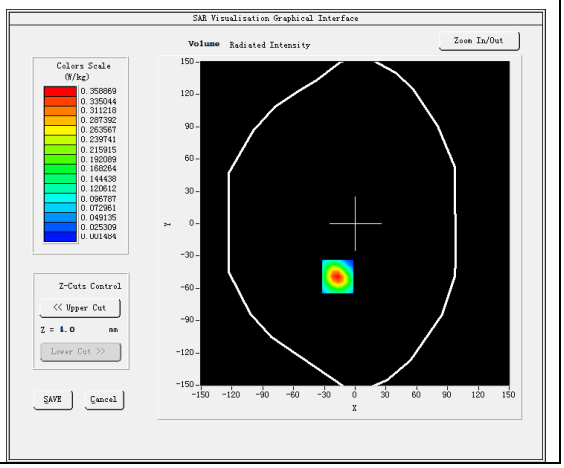
MEASUREMENT 7

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 40 A
Channels	Middle
Signal	LTE (Crest factor: 1.6)

B. SAR Measurement Results

Frequency (MHz)	2312.500000
Relative permittivity (real part)	52.353347
Relative permittivity (imaginary part)	13.987520
Conductivity (S/m)	1.788787
Variation (%)	-4.190000

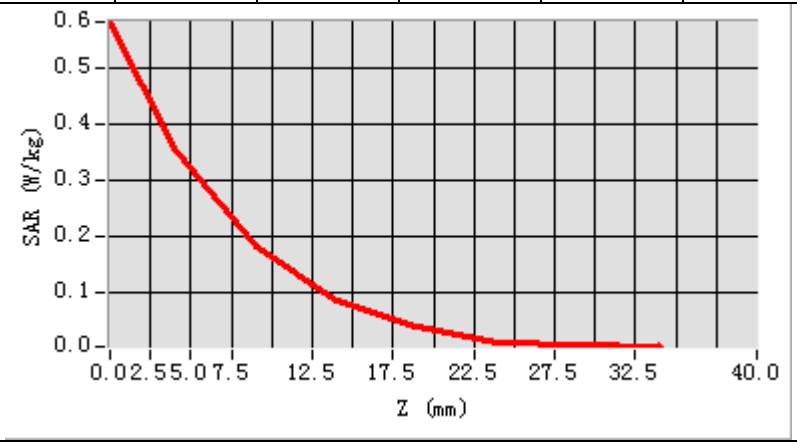
SURFACE SAR	VOLUME SAR
	

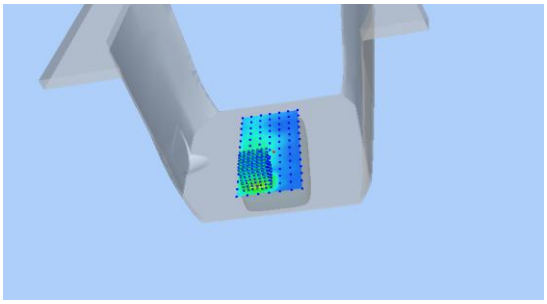
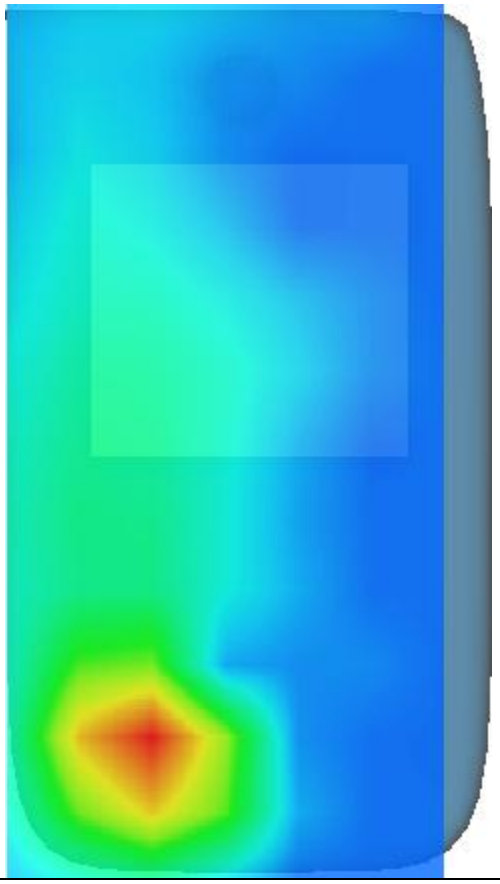
Maximum location: X=-17.00, Y=-49.00

SAR Peak: 0.58 W/kg

SAR 10g (W/Kg)	0.158283
SAR 1g (W/Kg)	0.314761

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5831	0.3589	0.1811	0.0852	0.0370	0.0102	0.0053



3D screen shot	Hot spot position
	

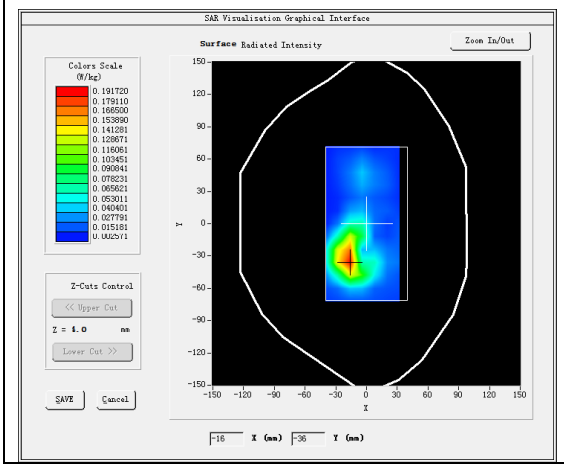
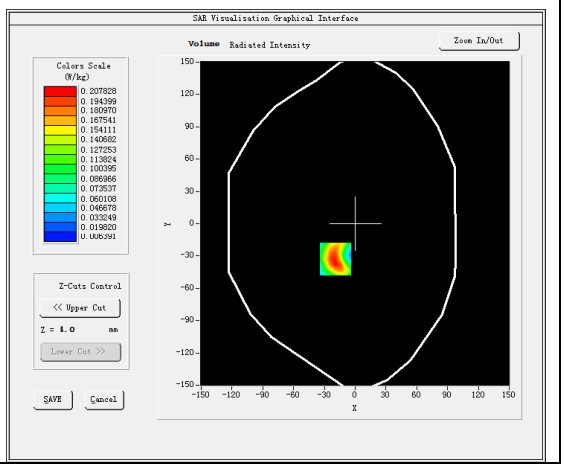
MEASUREMENT 8

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 40 B
Channels	Middle
Signal	LTE (Crest factor: 1.6)

B. SAR Measurement Results

Frequency (MHz)	2352.500000
Relative permittivity (real part)	52.130585
Relative permittivity (imaginary part)	14.153860
Conductivity (S/m)	1.855799
Variation (%)	4.240002

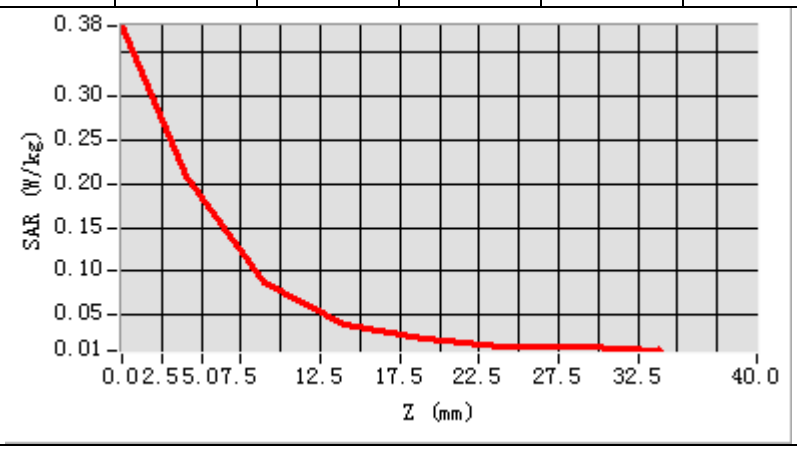
SURFACE SAR	VOLUME SAR
	

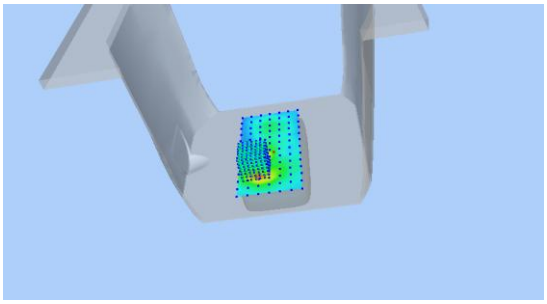
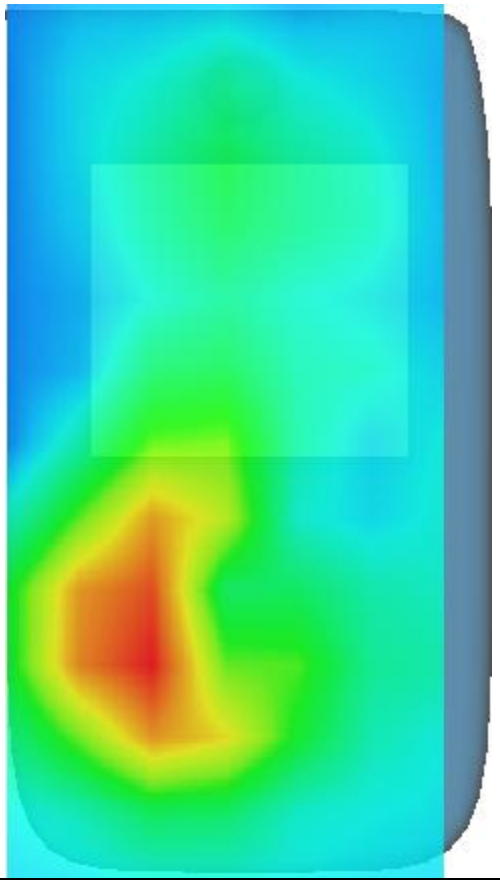
Maximum location: X=-19.00, Y=-33.00

SAR Peak: 0.36 W/kg

SAR 10g (W/Kg)	0.089680
SAR 1g (W/Kg)	0.192323

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3806	0.2078	0.0881	0.0398	0.0231	0.0135	0.0142



3D screen shot	Hot spot position
	

14. Appendix D. Calibration Certificate

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E Field Probe - SN 08/16 EPGO287
E Field Probe - SN 07/15 EP247
835 MHz Dipole - SN 03/15 DIP 0G835-347
2300 MHz Dipole - SN 03/16 DIP 2G300-358
2450 MHz Dipole - SN 03/15 DIP 2G450-352

COMOSAR E-Field Probe Calibration Report

Ref : ACR.261.2.17.SATU.A

Shenzhen NTEK Testing Technology Co., Ltd.
BUILDING E, FENDA SCIENCE PARK,
SANWEI COMMUNITY, XIXIANG STREET,
BAO'AN DISTRICT, SHENZHEN, GUANGDONG, CHINA

MVG COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 08/16 EPGO287

Calibrated at MVG US
2105 Barrett Park Dr. - Kennesaw, GA 30144

Calibration Date: 09/18/2017

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in MVG USA using the CALISAR / CALIBAIR test bench, for use with a COMOSAR system only. All calibration results are traceable to national metrology institutions.