

# CE SAR EVALUATION REPORT

**In accordance with the requirements of  
EN50360, EN50566, EN62209-1/-2, EN62479 and COUNCIL  
RECOMMENDATION 1999/519/EC**

**Product Name :** Smartphone

**Trademark :** CUBOT

**Model Name :** A10

**Family Model :** N/A

**Report No. :** S24040904104001

**Prepared for**

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## TEST RESULT CERTIFICATION

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### Product description

Product name .....: Smartphone  
 Trademark .....: CUBOT  
 Model and/or type reference ..: A10  
 Family Model .....: N/A

EN 50360:2017;  
 EN 50566:2017;

**Standards** .....: EN 62209-1:2016;  
 EN 62209-2:2010;  
 EN 62479:2010;

This device described above has been tested by Shenzhen NTEK. In accordance with the measurement methods and procedures specified in EN62209. Testing has shown that this device is capable of compliance with localized specific absorption rate (SAR) specified in COUNCIL 1999/519/EC. 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.

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Test Sample Number ..... S240409041004

### Date of Test

Date (s) of performance of tests ..... Apr. 11, 2024 ~ Apr. 24, 2024

Date of Issue..... May 14, 2024

Test Result..... **Pass**

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※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	May 14, 2024	Jack Li

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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	10.0	20.0

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	2.0	4.0

NOTE: **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 10 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  
 2.0 W/kg AND MEMBER LIMIT 4.0 W/kg  
 APPLIED TO THIS EUT

## 1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for A10 are as follows.

RF Exposure Conditions	Max SAR Value(W/kg)		
	10-g Head	10-g Body & Hotspot (Separation distance of 5mm)	10-g Member DAS (See note <sup>3</sup> ) (Separation distance of 0mm)
	0.226	0.736	1.914
Max Simultaneous Tx	0.414	0.870	2.138

NOTE: 1. The Max Simultaneous Tx is calculated based on the same configuration and test position.

2. This device is in compliance with Specific Absorption Rate (SAR) for general population / uncontrolled exposure limits (2.0 W/kg for head and body, 4.0 W/kg for member) specified in COUNCIL RECOMMENDATION 1999/519/EC, and had been tested in accordance with the measurement methods and procedures specified in EN 62209-1:2016 & EN 62209-2:2010.

3. The member DAS, It is only an assessment required by the ANFR (Sell to France).

## 1.3. EUT Description

Device Information			
Product Name	Smartphone		
Trademark	CUBOT		
Model Name	A10		
Family Model	N/A		
Model Difference	N/A		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna Type	PIFA Antenna		
Battery Information	DC 3.87V, 5100mAh, 19.74Wh		
Hardware version	Q12D V2.0		
Software version	CUBOT_A10_E045C_V01		
Device Operating Configurations			
Supporting Mode(s)	GSM 850/900/1800/1900, WCDMA Band 1/8, LTE Band 1/3/7/8/20/28/41, WLAN 2.4G/5G, Bluetooth, GPS		
Test Modulation	GSM(GMSK/8PSK), WCDMA(QPSK), LTE(QPSK/16-QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, $\pi/4$ -DQPSK, 8DPSK) , GPS(BPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824-849	869-894
	GSM 900	880-915	925-960
	GSM 1800	1710-1785	1805-1880

	GSM 1900	1850-1910	1930-1990
	WCDMA Band 1	1920-1980	2110-2170
	WCDMA Band 8	880-915	925-960
	LTE Band 1	1920-1980	2110-2170
	LTE Band 3	1710-1785	1805-1880
	LTE Band 7	2500-2570	2620-2690
	LTE Band 8	880- 915	925- 960
	LTE Band 20	832-862	791-821
	LTE Band 28	703-748	758-803
	LTE Band 41	2535-2655	
	WLAN 2.4G	2412-2472	
	WLAN 5.2G	5180-5240	
	WLAN 5.8G	5745-5825	
	Bluetooth	2402-2480	
	GPS	N/A	1575.42
GPRS Multislot Class(12)	Max Number of Timeslots in Uplink		4
	Max Number of Timeslots in Downlink		4
	Max Total Timeslot		5
EGPRS Multislot Class(12)	Max Number of Timeslots in Uplink		4
	Max Number of Timeslots in Downlink		4
	Max Total Timeslot		5
Power Class	4, tested with power level 5(GSM 850)		
	4, tested with power level 5(GSM 900)		
	1, tested with power level 0(GSM 1800)		
	1, tested with power level 0(GSM 1900)		
	3, tested with power control "all 1"(WCDMA Band 1)		
	3, tested with power control "all 1"(WCDMA Band 8)		
	3, tested with power control all Max.(LTE Band 1)		
	3, tested with power control all Max.(LTE Band 3)		
	3, tested with power control all Max.(LTE Band 7)		
	3, tested with power control all Max.(LTE Band 8)		
	3, tested with power control all Max.(LTE Band 20)		
	3, tested with power control all Max.(LTE Band 28)		
	3, tested with power control all Max.(LTE Band 41)		

#### 1.4. Test specification(s)

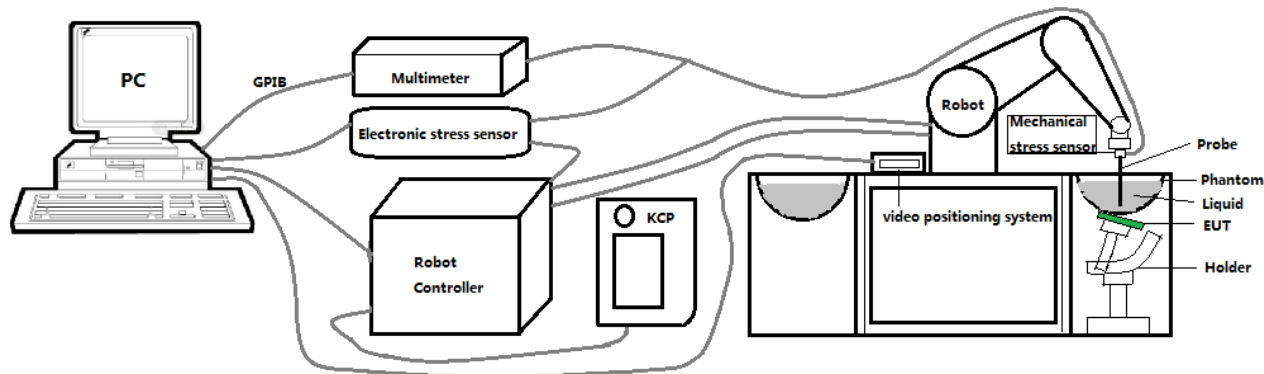
EN 50360:2017	Product standard to demonstrate the compliance of wireless communication devices, with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 300 MHz to 6 GHz: devices used next to the ear
EN 50566:2017	Product standard to demonstrate the compliance of wireless communication devices with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 30 MHz to 6 GHz: hand-held and body mounted devices in close proximity to the human body
EN 62209-1:2016	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz)
EN 62209-2:2010	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30MHz to 6GHz Handheld and Body-Mounted Devices used in close proximity to the body
EN 62479:2010	Assessment of the compliance of low-power electronic and electrical equipment with the restrictions related to human exposure to electromagnetic fields(10 MHz to 300 GHz)

#### 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  $\pm 0.03$  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  $\pm 0.03$  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 3423-EPGO-426 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  $\pm 1$  mm).
  - Probe linearity:  $\pm 0.06$  dB
  - Axial isotropy:  $\pm 0.01$  dB
  - Hemispherical Isotropy:  $\pm 0.01$  dB
  - Calibration range: 650MHz to 5900MHz for head & body simulating liquid.
  - Lower detection limit: 8mW/kg
- Angle between probe axis (evaluation axis) and surface normal line: less than  $30^\circ$ .

### 2.3.1. E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy shall be evaluated and within  $\pm 0.25$ dB. 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

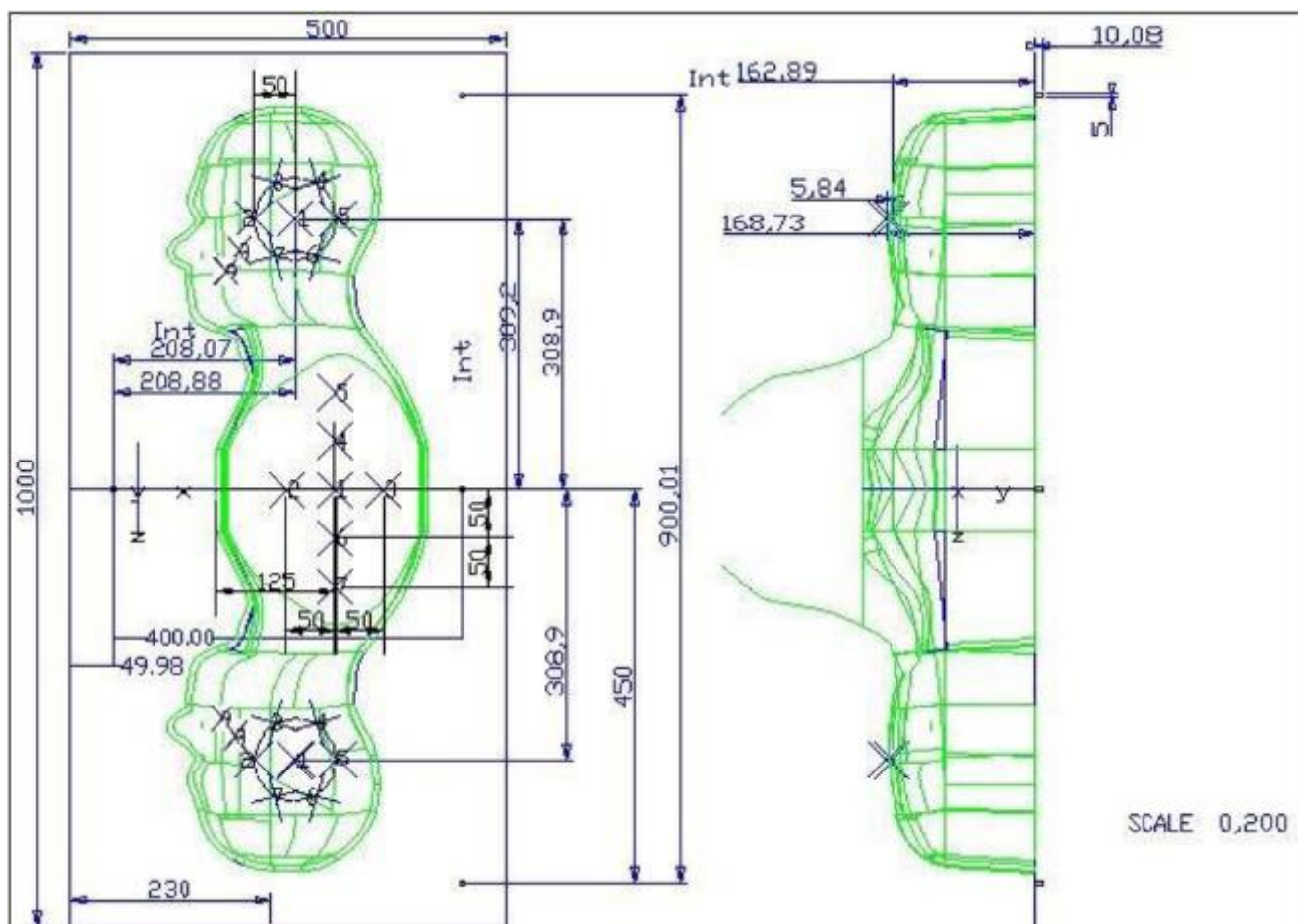
Photo of SAM phantom SN 16/15 SAM119



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
<b>SN 16/15 SAM119</b>	2 mm $\pm 0.2$ mm	27 liters	Length:1000 mm Width:500 mm Height:200 mm	Gelcoat with fiberglass	3.4	0.02

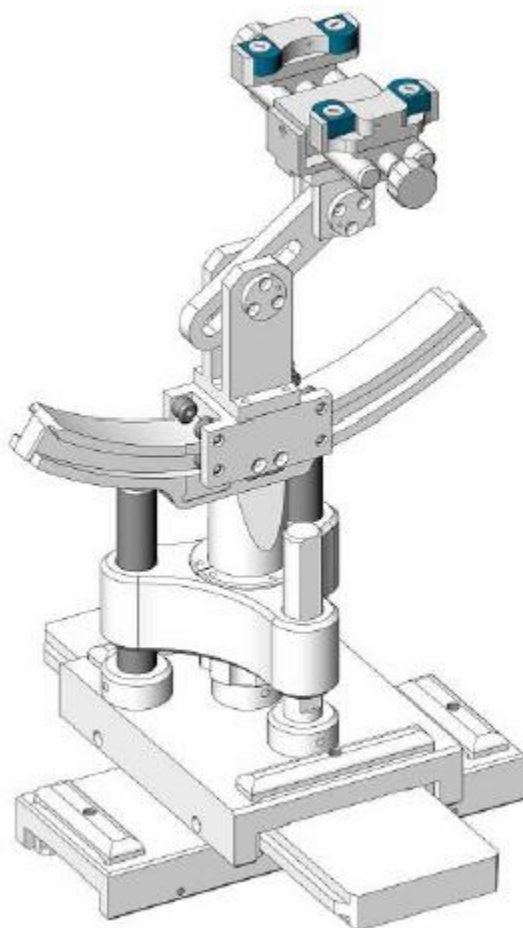


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
<b>SN 16/15 SAM119</b>	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

The test, based on ultrasonic system, allows measuring the thickness with an accuracy of 10  $\mu$ m.

## 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
<input checked="" type="checkbox"/>	MVG	E FIELD PROBE	SSE2	3423-EPGO-426	Sep. 18, 2023	Sep. 17, 2024
<input checked="" type="checkbox"/>	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	2300 MHz Dipole	SID2300	SN 03/16 DIP 2G300-358	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	3500 MHz Dipole	SID3500	SN 09/12 DIP 3G500-360	Oct. 15, 2022	Oct. 14, 2025
<input type="checkbox"/>	MVG	3700 MHz Dipole	SID3700	SN 09/12 DIP 3G/700-361	Oct. 15 2022	Oct. 14 2025
<input type="checkbox"/>	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
<input checked="" type="checkbox"/>	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
<input checked="" type="checkbox"/>	KEITHLEY	Millivoltmeter	2000	4072790	NCR	NCR
<input checked="" type="checkbox"/>	R&S	Universal radio communication	CMU200	117858	May. 29, 2023	May. 28, 2024

		tester				
<input checked="" type="checkbox"/>	R&S	Wideband radio communication tester	CMW500	103917	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	HP	Network Analyzer	8753D	3410J01136	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	Agilent	MXG Vector Signal Generator	N5182A	MY47070317	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	Agilent	Power meter	E4419B	MY45102538	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	Agilent	Power sensor	E9301A	MY41495644	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	Agilent	Power sensor	E9301A	US39212148	May. 29, 2023	May. 28, 2024
<input checked="" type="checkbox"/>	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Jul. 04, 2023	Jul. 03, 2024
<input checked="" type="checkbox"/>	N/A	Thermometer	N/A	LES-085	Mar. 27, 2023	Mar. 26, 2026
<input checked="" type="checkbox"/>	MVG	SAM Phantom	SSM2	SN 16/15 SAM119	NCR	NCR
<input checked="" type="checkbox"/>	MVG	Device Holder	SMPPD	SN 16/15 MSH100	NCR	NCR

### 3. SAR 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 middle channel.
- (b) Keep EUT to radiate maximum output power or 100% duty factor (if applicable)
- (c) Measure output power through RF cable and power meter.
- (d) Place the EUT in the positions as setup photos demonstrates.
- (e) Set scan area, grid size and other setting on the OPENSAR software.
- (f) Measure SAR transmitting at the middle channel for all applicable exposure positions.
- (g) Identify the exposure position and device configuration resulting the highest SAR
- (h) Measure SAR at the lowest and highest channels at the worst exposure position and device configuration.

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).

### **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  $\pm 5\%$ , 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	5000
Water	34.40	34.40	34.40	55.36	55.36	71.88	71.88	71.88	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00
1,2-Propanediol	64.81	64.81	64.81	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	17.24
DGBE	0.00	0.00	0.00	13.84	13.84	7.99	7.99	7.99	0.00

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid depth from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm.

Photo of Liquid depth for Head Position	Photo of Liquid depth for Body Position
	

#### 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 if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within  $\pm 5\%$  of the target values.

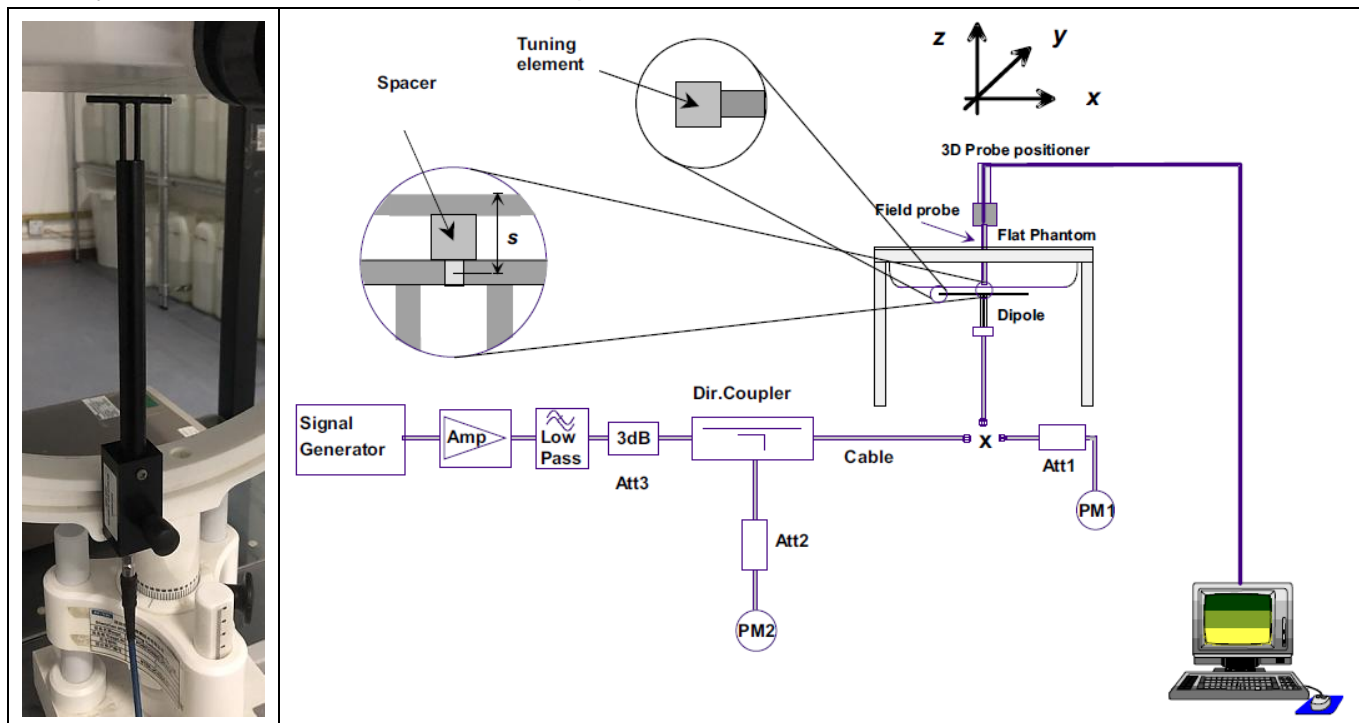
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		$\epsilon_r (\pm 5\%)$	$\sigma \text{ (S/m)} (\pm 5\%)$	$\epsilon_r$	$\sigma \text{ (S/m)}$		
Head 750	750	41.96 (39.86~44.06)	0.89 (0.85~0.93)	41.07	0.90	21.9 °C	Apr. 19, 2024
Head 900	900	41.50 (39.43~43.58)	0.97 (0.92~1.02)	41.37	0.98	21.6 °C	Apr. 18, 2024
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	39.05	1.39	21.1 °C	Apr. 24, 2024
Head 2000	2000	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.61	1.44	21.1 °C	Apr. 11, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.67	1.76	21.5 °C	Apr. 12, 2024
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	38.82	1.97	21.0 °C	Apr. 16, 2024

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  $\pm 10\%$ . 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) ( $\pm 10\%$ )		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)		
750MHz	8.60 (7.74~9.46)	5.78 (5.20~6.36)	8.58	5.47	21.9 °C	Apr. 19, 2024
900MHz	10.63 (9.57~11.69)	7.01 (6.31~7.71)	10.64	6.77	21.6 °C	Apr. 18, 2024
1800MHz	37.06 (33.35~40.77)	20.01 (18.01~22.01)	36.07	18.67	21.1 °C	Apr. 24, 2024
2000MHz	38.27 (34.44~42.10)	19.79 (17.81~21.77)	36.28	21.18	21.1 °C	Apr. 11, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	51.62	24.52	21.5 °C	Apr. 12, 2024
2600MHz	54.16 (48.74~59.58)	24.85 (22.37~27.34)	59.50	22.90	21.0 °C	Apr. 16, 2024

## 5. SAR Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in IEEE 1528: 2003. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Uncertainty Component	Tol. (±%)	Prob. Dist.	Div.	Ci (1 g)	Ci (10 g)	1 g Ui (±%)	10 g Ui (±%)	Vi
Measurement System <input type="checkbox"/>								
Probe Calibration	5.8	N	1	1	1	5.80	5.80	∞
Axial Isotropy	3.5	R	√3	0.97	0.97	1.98	1.98	∞
Hemispherical Isotropy	5.9	R	√3	0.28	0.28	0.96	0.96	∞
Boundary Effect	1	R	√3	1	1	0.58	0.58	∞
Linearity	4.7	R	√3	1	1	2.71	2.71	∞
System Detection Limits	1	R	√3	1	1	0.58	0.58	∞
Modulation response	3	N	1	1	1	3.00	3.00	∞
Readout Electronics	0.5	N	1	1	1	0.50	0.50	∞
Response Time	0	R	√3	1	1	0.00	0.00	∞
Integration Time	1.4	R	√3	1	1	0.81	0.81	∞
RF Ambient Conditions - Noise	3	R	√3	1	1	1.73	1.73	∞
RF Ambient Conditions - Reflections	3	R	√3	1	1	1.73	1.73	∞
Probe Positioner Mechanical Tolerance	1.4	R	√3	1	1	0.81	0.81	∞
Probe Positioning with respect to Phantom Shell	1.4	R	√3	1	1	0.81	0.81	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	2.3	R	√3	1	1	1.33	1.33	∞
Test sample Related								
Test Sample Positioning	2.6	N	1	1	1	2.60	2.60	11
Device Holder Uncertainty	3	N	1	1	1	3.00	3.00	7
Output Power Variation - SAR drift measurement	5	R	√3	1	1	2.89	2.89	∞
SAR scaling	2	R	√3	1	1	1.15	1.15	∞
Phantom and Tissue Parameters <input type="checkbox"/>								
Phantom Uncertainty (shape and thickness tolerances)	4	R	√3	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2.00	1.68	∞
Liquid Conductivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	∞
Liquid conductivity - measurement uncertainty	1.59	N	1	0.23	0.26	0.37	0.41	99

Liquid permittivity (temperature uncertainty)	2.5	N	1	0.78	0.71	1.95	1.78	∞
Liquid permittivity - measurement uncertainty	1.65	N	1	0.23	0.26	0.38	0.43	99
Combined Standard Uncertainty		RSS				10.19	10.02	
Expanded Uncertainty (95% Confidence interval)		k				20.38	20.04	

## 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”.

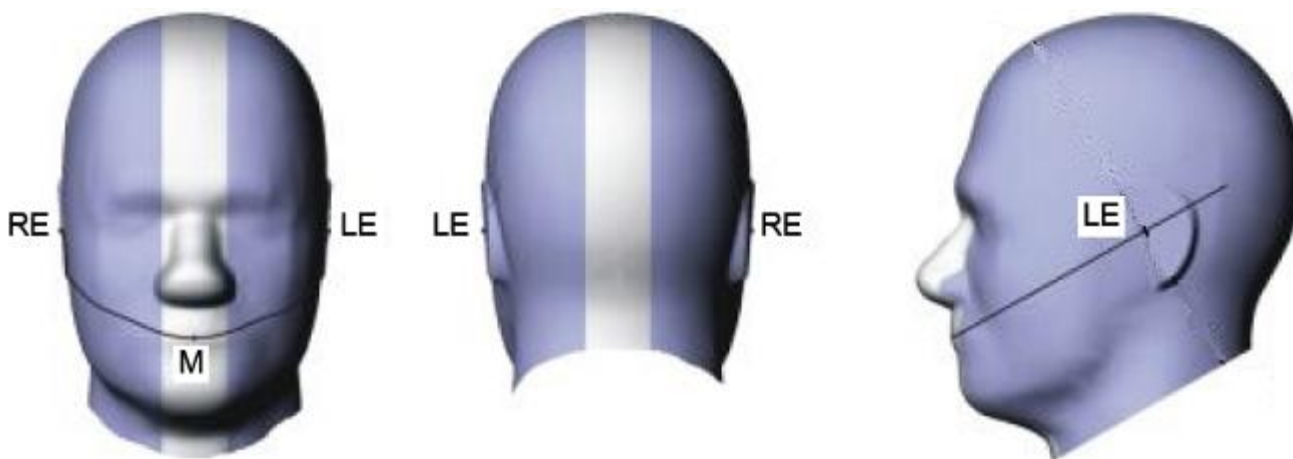


Fig 6.1.1 Front, back, and side views of SAM phantom

### 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.

- 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.

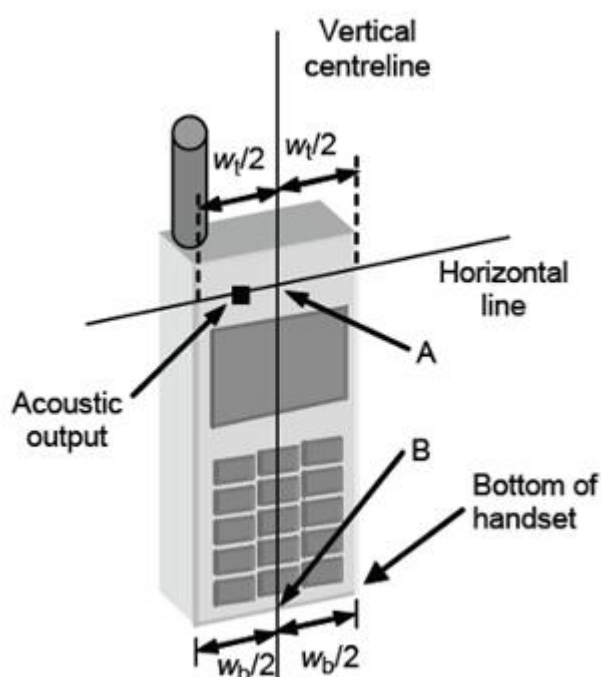


Fig 6.2.1 Handset vertical and horizontal reference lines—"fixed case"

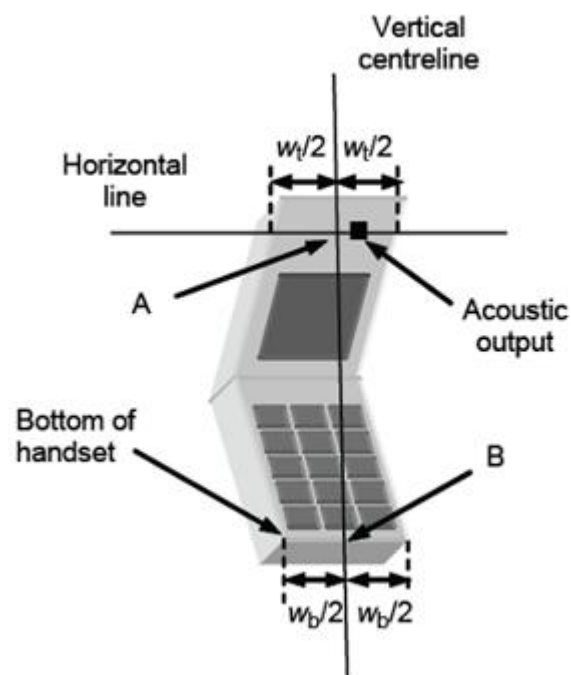


Fig 6.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

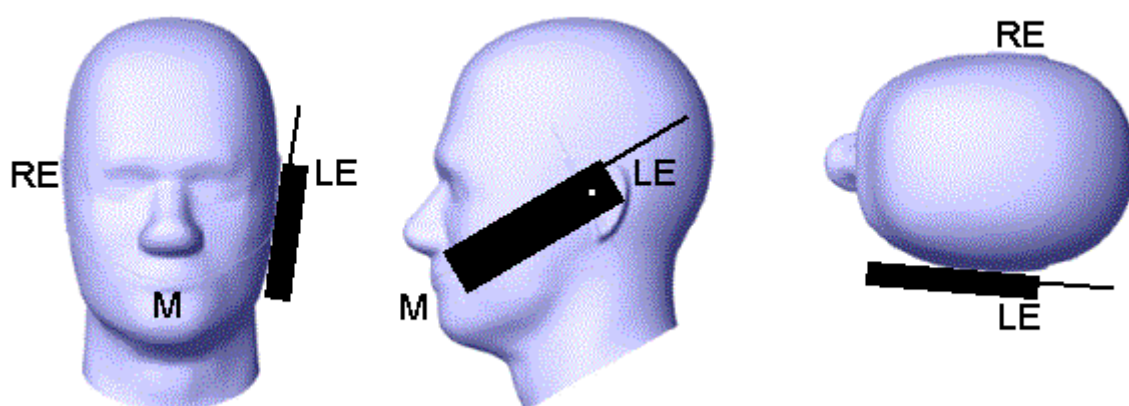


Fig 6.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

### 6.3. Definition of the tilt position

- 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.

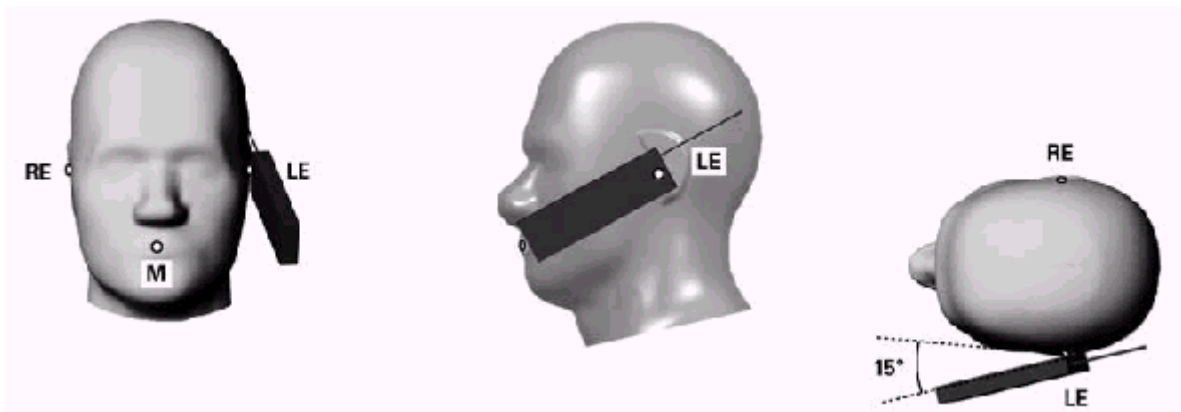


Figure 6.3.1 – Tilt position of the wireless device on the left side of SAM

#### 6.4. Body-worn device

A typical example of a body-worn device is a mobile phone, wireless enabled PDA or other battery operated wireless device with the ability to transmit while mounted on a person's body using a carry accessory approved by the wireless device manufacturer. The device shall be positioned as intended at the distance to the outer surface of the phantom that corresponds to the specified distance (See figure 6.1). Adjust the distance between the device surface and the flat phantom to 5mm.

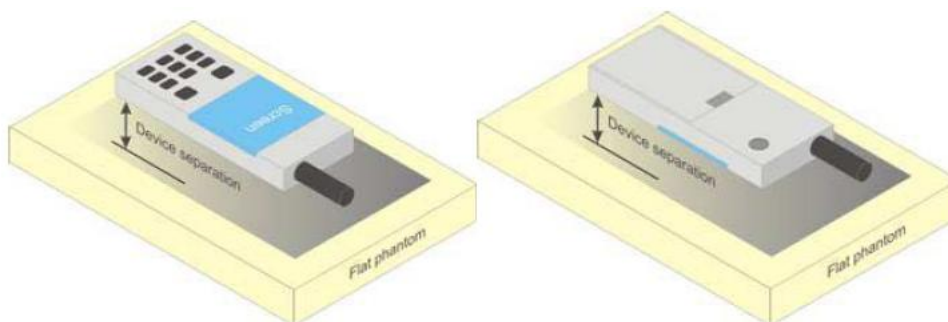


Figure 6.1 – Test positions for Body-worn device

## 7. RF Output Power

### 7.1. GSM Conducted Power

Band GSM850	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	128	190	251	Tune-up	128	190	251
Frequency (MHz)		824.2	836.6	848.8		824.2	836.6	848.8
GSM (GMSK)	34.50	34.07	33.62	33.63	25.47	25.04	24.59	24.60
GPRS(GMSK,1 Tx slot)	34.50	34.12	33.68	33.59	25.47	25.09	24.65	24.56
GPRS(GMSK,2 Tx slot)	34.00	33.51	33.08	32.95	27.98	27.49	27.06	26.93
GPRS(GMSK,3 Tx slot)	31.50	31.47	31.17	30.92	27.24	27.21	26.91	26.66
GPRS(GMSK,4 Tx slot)	30.50	30.29	30.05	29.82	27.49	27.28	27.04	26.81
EGPRS(8PSK,1 Tx slot)	26.50	25.99	26.03	25.40	17.47	16.96	17.00	16.37
EGPRS(8PSK,2 Tx slot)	26.00	25.56	25.54	24.92	19.98	19.54	19.52	18.90
EGPRS(8PSK,3 Tx slot)	25.00	24.70	24.68	24.08	20.74	20.44	20.42	19.82
EGPRS(8PSK,4 Tx slot)	24.50	24.18	24.08	23.53	21.49	21.17	21.07	20.52

Band GSM900	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	975	38	124	Tune-up	975	38	124
Frequency (MHz)		880.2	897.6	914.8		880.2	897.6	914.8
GSM (GMSK)	33.50	32.85	33.06	33.20	24.47	23.82	24.03	24.17
GPRS(GMSK,1 Tx slot)	33.50	32.89	33.08	33.19	24.47	23.86	24.05	24.16
GPRS(GMSK,2 Tx slot)	33.00	32.31	32.49	32.57	26.98	26.29	26.47	26.55
GPRS(GMSK,3 Tx slot)	31.00	30.74	30.95	30.99	26.74	26.48	26.69	26.73
GPRS(GMSK,4 Tx slot)	30.00	29.51	29.71	29.76	26.99	26.50	26.70	26.75
EGPRS(8PSK,1 Tx slot)	26.00	25.38	25.65	25.80	16.97	16.35	16.62	16.77
EGPRS(8PSK,2 Tx slot)	25.50	24.95	25.20	25.37	19.48	18.93	19.18	19.35
EGPRS(8PSK,3 Tx slot)	23.00	22.53	22.74	22.92	18.74	18.27	18.48	18.66
EGPRS(8PSK,4 Tx slot)	22.00	21.28	21.45	21.61	18.99	18.27	18.44	18.60

Band GSM1800	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	512	698	885	Tune-up	512	698	885
Frequency (MHz)		1710.2	1747.4	1784.8		1710.2	1747.4	1784.8
GSM (GMSK)	32.00	30.75	31.23	31.53	22.97	21.72	22.20	22.50
GPRS(GMSK,1 Tx slot)	32.00	30.82	31.24	31.55	22.97	21.79	22.21	22.52
GPRS(GMSK,2 Tx slot)	31.00	30.21	30.63	30.97	24.98	24.19	24.61	24.95
GPRS(GMSK,3 Tx slot)	29.50	28.41	28.84	29.19	25.24	24.15	24.58	24.93

GPRS(GMSK,4 Tx slot)	28.50	27.29	27.71	28.12	25.49	24.28	24.70	25.11
EGPRS(8PSK,1 Tx slot)	27.00	26.67	25.76	26.27	17.97	17.64	16.73	17.24
EGPRS(8PSK,2 Tx slot)	26.50	26.23	25.29	25.82	20.48	20.21	19.27	19.80
EGPRS(8PSK,3 Tx slot)	25.50	25.35	24.44	24.95	21.24	21.09	20.18	20.69
EGPRS(8PSK,4 Tx slot)	25.00	24.74	23.84	24.34	21.99	21.73	20.83	21.33

Band GSM1900	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	512	661	810	Tune-up	512	661	810
Frequency (MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8
GSM (GMSK)	31.00	30.64	30.56	30.61	21.97	21.61	21.53	21.58
GPRS(GMSK,1 Tx slot)	30.50	30.34	30.32	30.35	21.47	21.31	21.29	21.32
GPRS(GMSK,2 Tx slot)	30.00	29.77	29.77	29.76	23.98	23.75	23.75	23.74
GPRS(GMSK,3 Tx slot)	28.50	27.94	28.07	28.01	24.24	23.68	23.81	23.75
GPRS(GMSK,4 Tx slot)	27.00	26.96	27.00	26.90	23.99	23.95	23.99	23.89
EGPRS(8PSK,1 Tx slot)	27.00	26.48	26.48	26.74	17.97	17.45	17.45	17.71
EGPRS(8PSK,2 Tx slot)	26.50	25.98	25.96	26.30	20.48	19.96	19.94	20.28
EGPRS(8PSK,3 Tx slot)	25.50	25.10	25.09	25.41	21.24	20.84	20.83	21.15
EGPRS(8PSK,4 Tx slot)	25.00	24.58	24.58	24.83	21.99	21.57	21.57	21.82

Note: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots. The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9.03 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6.02 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3.01 dB

## 7.2. WCDMA Conducted Power

WCDMA Band1	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	9612	9750	9888
Frequency (MHz)		1922.4	1950	1977.6
RMC12.2K	23.00	22.98	22.89	22.88
HSDPA Sub 1	23.00	22.79	22.31	22.52
HSDPA Sub 2	22.50	22.33	21.90	22.32
HSDPA Sub 3	22.00	21.96	21.54	21.97
HSDPA Sub 4	22.00	21.78	21.54	21.84
HSUPA Sub 1	23.00	22.72	22.05	22.43
HSUPA Sub 2	23.00	22.53	22.15	22.61
HSUPA Sub 3	22.50	22.28	21.68	22.14
HSUPA Sub 4	23.00	22.45	22.21	22.63
HSUPA Sub 5	22.50	22.34	21.90	22.42
WCDMA Band 8	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	2712	2788	2863
Frequency (MHz)		882.4	897.6	912.6
RMC12.2K	23.00	22.83	22.63	22.49
HSDPA Sub 1	23.00	22.56	22.26	22.09
HSDPA Sub 2	22.50	22.21	22.05	21.96
HSDPA Sub 3	22.00	21.97	21.73	21.59
HSDPA Sub 4	22.00	21.61	21.29	21.46
HSUPA Sub 1	22.50	22.46	22.05	21.86
HSUPA Sub 2	22.50	22.46	22.24	22.11
HSUPA Sub 3	22.00	21.97	21.62	21.77
HSUPA Sub 4	22.50	22.40	22.22	22.10
HSUPA Sub 5	22.50	22.27	22.01	21.92

### 7.3. LTE Conducted Power

Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Tune-up	Power (dBm)
Band1	5	18025	1	#0	QPSK	24.00	23.32
Band1	5	18025	8	#0	QPSK	24.00	23.51
Band1	5	18025	25	#0	QPSK	24.00	22.46
Band1	5	18300	1	#0	QPSK	24.00	23.10
Band1	5	18300	8	#0	QPSK	24.00	23.19
Band1	5	18300	25	#0	QPSK	24.00	22.24
Band1	5	18575	1	#0	QPSK	24.00	23.13
Band1	5	18575	8	#0	QPSK	24.00	23.05
Band1	5	18575	25	#0	QPSK	24.00	22.16
Band1	20	18100	1	#0	QPSK	24.00	23.41
Band1	20	18100	18	#0	QPSK	24.00	23.53
Band1	20	18100	100	#0	QPSK	24.00	22.30
Band1	20	18300	1	#0	QPSK	24.00	23.02
Band1	20	18300	18	#0	QPSK	24.00	23.18
Band1	20	18300	100	#0	QPSK	24.00	22.13
Band1	20	18500	1	#0	QPSK	24.00	23.18
Band1	20	18500	18	#0	QPSK	24.00	23.14
Band1	20	18500	100	#0	QPSK	24.00	22.15
Band20	5	24175	1	#0	QPSK	23.50	23.07
Band20	5	24175	1	#Max	QPSK	23.50	23.22
Band20	5	24175	8	#0	QPSK	23.50	23.35
Band20	5	24175	8	#Max	QPSK	23.50	23.29
Band20	5	24175	25	#0	QPSK	23.50	22.29
Band20	5	24300	1	#0	QPSK	23.50	23.35
Band20	5	24300	1	#Max	QPSK	23.50	23.27
Band20	5	24300	8	#0	QPSK	23.50	23.33
Band20	5	24300	8	#Max	QPSK	23.50	23.40
Band20	5	24300	25	#0	QPSK	23.50	22.32
Band20	5	24425	1	#0	QPSK	23.50	23.04
Band20	5	24425	1	#Max	QPSK	23.50	23.21
Band20	5	24425	8	#0	QPSK	23.50	23.27
Band20	5	24425	8	#Max	QPSK	23.50	23.34
Band20	5	24425	25	#0	QPSK	23.50	22.25
Band20	20	24250	1	#0	QPSK	23.50	23.05

Band20	20	24250	1	#Max	QPSK	23.50	22.97
Band20	20	24250	18	#0	QPSK	23.50	23.29
Band20	20	24250	18	#Max	QPSK	23.50	23.37
Band20	20	24250	100	#0	QPSK	23.50	22.41
Band20	20	24300	1	#0	QPSK	23.50	23.40
Band20	20	24300	1	#Max	QPSK	23.50	23.04
Band20	20	24300	18	#0	QPSK	23.50	23.50
Band20	20	24300	18	#Max	QPSK	23.50	23.05
Band20	20	24300	100	#0	QPSK	23.50	22.23
Band20	20	24350	1	#0	QPSK	23.50	23.33
Band20	20	24350	1	#Max	QPSK	23.50	23.03
Band20	20	24350	18	#0	QPSK	23.50	23.42
Band20	20	24350	18	#Max	QPSK	23.50	23.23
Band20	20	24350	100	#0	QPSK	23.50	22.22
Band28	3	27225	1	#0	QPSK	24.00	23.64
Band28	3	27225	1	#Max	QPSK	24.00	23.54
Band28	3	27225	4	#0	QPSK	24.00	23.79
Band28	3	27225	4	#Max	QPSK	24.00	23.66
Band28	3	27375	1	#0	QPSK	24.00	23.22
Band28	3	27375	1	#Max	QPSK	24.00	23.31
Band28	3	27375	4	#0	QPSK	24.00	23.44
Band28	3	27375	4	#Max	QPSK	24.00	23.52
Band28	3	27525	1	#0	QPSK	24.00	23.53
Band28	3	27525	1	#Max	QPSK	24.00	23.46
Band28	3	27525	4	#0	QPSK	24.00	23.61
Band28	3	27525	4	#Max	QPSK	24.00	23.49
Band28	5	27235	1	#0	QPSK	24.00	23.58
Band28	5	27235	1	#Max	QPSK	24.00	23.51
Band28	5	27235	8	#0	QPSK	24.00	23.81
Band28	5	27235	8	#Max	QPSK	24.00	23.72
Band28	5	27385	1	#0	QPSK	24.00	23.56
Band28	5	27385	1	#Max	QPSK	24.00	23.41
Band28	5	27385	8	#0	QPSK	24.00	23.42
Band28	5	27385	8	#Max	QPSK	24.00	23.48
Band28	5	27515	1	#0	QPSK	24.00	23.50
Band28	5	27515	1	#Max	QPSK	24.00	23.48
Band28	5	27515	8	#0	QPSK	24.00	23.75
Band28	5	27515	8	#Max	QPSK	24.00	23.52
Band28	20	27310	1	#0	QPSK	24.00	23.65

Band28	20	27310	1	#Max	QPSK	24.00	23.18
Band28	20	27310	18	#0	QPSK	24.00	23.85
Band28	20	27310	18	#Max	QPSK	24.00	23.54
Band28	20	27460	1	#0	QPSK	24.00	23.40
Band28	20	27460	1	#Max	QPSK	24.00	23.40
Band28	20	27460	18	#0	QPSK	24.00	23.61
Band28	20	27460	18	#Max	QPSK	24.00	23.46
Band28	20	27440	1	#0	QPSK	24.00	23.63
Band28	20	27440	1	#Max	QPSK	24.00	23.46
Band28	20	27440	18	#0	QPSK	24.00	23.49
Band28	20	27440	18	#Max	QPSK	24.00	23.57
Band3	1.4	19207	1	#0	QPSK	24.50	23.05
Band3	1.4	19207	5	#0	QPSK	24.50	23.16
Band3	1.4	19207	6	#0	QPSK	24.50	22.15
Band3	1.4	19575	1	#0	QPSK	24.50	23.80
Band3	1.4	19575	5	#0	QPSK	24.50	23.90
Band3	1.4	19575	6	#0	QPSK	24.50	22.96
Band3	1.4	19943	1	#0	QPSK	24.50	23.32
Band3	1.4	19943	5	#0	QPSK	24.50	23.44
Band3	1.4	19943	6	#0	QPSK	24.50	22.55
Band3	5	19225	1	#0	QPSK	24.50	23.01
Band3	5	19225	8	#0	QPSK	24.50	23.16
Band3	5	19225	25	#0	QPSK	24.50	22.23
Band3	5	19575	1	#0	QPSK	24.50	23.69
Band3	5	19575	8	#0	QPSK	24.50	23.92
Band3	5	19575	25	#0	QPSK	24.50	23.01
Band3	5	19925	1	#0	QPSK	24.50	23.40
Band3	5	19925	8	#0	QPSK	24.50	23.60
Band3	5	19925	25	#0	QPSK	24.50	22.44
Band3	20	19300	1	#0	QPSK	24.50	22.98
Band3	20	19300	18	#0	QPSK	24.50	23.36
Band3	20	19300	100	#0	QPSK	24.50	22.70
Band3	20	19575	1	#0	QPSK	24.50	23.71
Band3	20	19575	18	#0	QPSK	24.50	23.90
Band3	20	19575	100	#0	QPSK	24.50	22.85
Band3	20	19850	1	#0	QPSK	24.50	23.88
Band3	20	19850	18	#0	QPSK	24.50	24.00
Band3	20	19850	100	#0	QPSK	24.50	22.70
Band41	5	40065	1	#0	QPSK	24.00	23.56

Band41	5	40065	8	#0	QPSK	24.00	23.61
Band41	5	40065	25	#0	QPSK	24.00	22.57
Band41	5	40740	1	#0	QPSK	24.00	23.36
Band41	5	40740	8	#0	QPSK	24.00	23.37
Band41	5	40740	25	#0	QPSK	24.00	22.30
Band41	5	41215	1	#0	QPSK	24.00	23.35
Band41	5	41215	8	#0	QPSK	24.00	23.40
Band41	5	41215	25	#0	QPSK	24.00	22.40
Band41	20	40140	1	#0	QPSK	24.00	23.53
Band41	20	40140	18	#0	QPSK	24.00	23.48
Band41	20	40140	100	#0	QPSK	24.00	22.46
Band41	20	40740	1	#0	QPSK	24.00	23.15
Band41	20	40740	18	#0	QPSK	24.00	23.22
Band41	20	40740	100	#0	QPSK	24.00	22.29
Band41	20	41140	1	#0	QPSK	24.00	23.49
Band41	20	41140	18	#0	QPSK	24.00	23.54
Band41	20	41140	100	#0	QPSK	24.00	22.37
Band7	5	20775	1	#0	QPSK	23.00	22.52
Band7	5	20775	8	#0	QPSK	23.00	22.72
Band7	5	20775	25	#0	QPSK	23.00	21.70
Band7	5	21100	1	#0	QPSK	23.00	22.72
Band7	5	21100	8	#0	QPSK	23.00	22.74
Band7	5	21100	25	#0	QPSK	23.00	21.72
Band7	5	21425	1	#0	QPSK	23.00	22.52
Band7	5	21425	8	#0	QPSK	23.00	22.58
Band7	5	21425	25	#0	QPSK	23.00	21.52
Band7	20	20850	1	#0	QPSK	23.00	22.48
Band7	20	20850	18	#0	QPSK	23.00	22.59
Band7	20	20850	100	#0	QPSK	23.00	21.63
Band7	20	21100	1	#0	QPSK	23.00	22.83
Band7	20	21100	18	#0	QPSK	23.00	22.94
Band7	20	21100	100	#0	QPSK	23.00	21.83
Band7	20	21350	1	#0	QPSK	23.00	22.65
Band7	20	21350	18	#0	QPSK	23.00	22.79
Band7	20	21350	100	#0	QPSK	23.00	21.65
Band8	1.4	21457	1	#0	QPSK	23.50	23.01
Band8	1.4	21457	5	#0	QPSK	23.50	23.10
Band8	1.4	21457	6	#0	QPSK	23.50	22.18
Band8	1.4	21625	1	#0	QPSK	23.50	23.01

Band8	1.4	21625	5	#0	QPSK	23.50	23.09
Band8	1.4	21625	6	#0	QPSK	23.50	22.09
Band8	1.4	21793	1	#0	QPSK	23.50	22.91
Band8	1.4	21793	5	#0	QPSK	23.50	22.82
Band8	1.4	21793	6	#0	QPSK	23.50	21.94
Band8	5	21475	1	#0	QPSK	23.50	22.96
Band8	5	21475	8	#0	QPSK	23.50	23.19
Band8	5	21475	25	#0	QPSK	23.50	22.17
Band8	5	21625	1	#0	QPSK	23.50	22.91
Band8	5	21625	8	#0	QPSK	23.50	23.14
Band8	5	21625	25	#0	QPSK	23.50	22.05
Band8	5	21775	1	#0	QPSK	23.50	22.89
Band8	5	21775	8	#0	QPSK	23.50	23.13
Band8	5	21775	25	#0	QPSK	23.50	21.83
Band8	10	21500	1	#0	QPSK	23.50	23.12
Band8	10	21500	12	#0	QPSK	23.50	23.13
Band8	10	21500	50	#0	QPSK	23.50	21.95
Band8	10	21625	1	#0	QPSK	23.50	23.01
Band8	10	21625	12	#0	QPSK	23.50	23.09
Band8	10	21625	50	#0	QPSK	23.50	22.13
Band8	10	21750	1	#0	QPSK	23.50	23.16
Band8	10	21750	12	#0	QPSK	23.50	23.04
Band8	10	21750	50	#0	QPSK	23.50	22.11

#### 7.4. WLAN & Bluetooth Output Power

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11b	1	2412	14.50	14.21
	7	2442	14.50	13.96
	13	2472	14.50	13.20
802.11g	1	2412	11.50	11.04
	7	2442	11.50	10.35
	13	2472	11.50	11.24
802.11n (HT20)	1	2412	11.00	10.97
	7	2442	11.00	10.48
	13	2472	11.00	10.14
802.11n (HT40)	3	2422	10.50	10.07
	7	2442	10.50	10.18

	11	2462	10.50	9.47
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NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	36	5180	10.50	10.41
	40	5200	10.50	9.95
	48	5240	10.50	9.63
802.11n HT20	36	5180	10.50	10.05
	40	5200	10.50	9.65
	48	5240	10.50	9.25
802.11n HT40	38	5190	11.00	10.75
	46	5230	11.00	9.77
802.11ac VHT20	36	5180	10.50	10.11
	40	5200	10.50	9.52
	48	5240	10.50	9.73
802.11ac VHT40	38	5190	11.00	10.64
	46	5230	11.00	9.81
802.11ac VHT80	42	5210	11.00	10.64

NOTE: Power measurement results of WLAN 5.2G. Refer to EN 62479, the available power of this EUT is 11.00dBm (12.59mW), the power is less than the low-power exclusion level defined in 4.2 (P max: 20mW), So WLAN 5.2G stand-alone SAR is not required

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	149	5745	10.50	10.09
	157	5785	10.50	8.89
	165	5825	10.50	8.57
802.11n HT20	149	5745	11.00	10.54
	157	5785	11.00	9.62
	165	5825	11.00	8.66
802.11n HT40	151	5755	11.00	10.86
	159	5795	11.00	9.29
802.11ac VHT20	149	5745	10.50	10.11
	157	5785	10.50	9.33
	165	5825	10.50	8.35
802.11ac VHT40	151	5755	11.00	10.61
	159	5795	11.00	9.30

802.11ac VHT80	155	5775	10.50	10.09
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NOTE: Power measurement results of WLAN 5.8G. Refer to EN 62479, the available power of this EUT is 11.00dBm (12.59mW), the power is less than the low-power exclusion level defined in 4.2 (P max: 20mW), So WLAN 5.8G stand-alone SAR is not required

BR+EDR	Data Rates	Tune - up(dBm)	Output Power (dBm)
	GFSK DH5	7.00	6.78
	Pi/4 DQPSK DH5	6.00	5.59
	8DPSK DH5	6.00	5.18

BLE	Channel	Tune - up	Output Power (dBm)	
			1M	2M
	0CH	-5.00	-5.56	-6.09
	19CH	-6.00	-6.00	-6.09
	39CH	-1.00	-1.63	-2.05

NOTE: Power measurement results of Bluetooth. Refer to EN 62479, the available power of this EUT is 7.00dBm (5.01mW), the power is less than the low-power exclusion level defined in 4.2 (P max: 20mW), So Bluetooth stand-alone SAR is not required

### 8. Assessment of the compliance of low power equipment

According to EN 62479 Clause 4.1& 4.2, these require does not apply to the receivers that has no transmit. So, GPS is compliance.

### 9. SAR Results

#### 9.1. SAR measurement results

##### 9.1.1. SAR measurement Result of GSM850

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	189/836.4	GPRS(GMSK 2TS)	0	0.188	0.137	-3.65	33.08	34.00	0.169	2024/4/18
Left Tilt 15	189/836.4	GPRS(GMSK 2TS)	0	0.099	0.071	0.80	33.08	34.00	0.088	2024/4/18

### 9.1.2. SAR measurement Result of GSM900

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	38/897.6	GPRS(GMSK 4TS)	0	0.174	0.128	1.31	29.71	30.00	0.137	2024/4/18
Left Tilt 15 Degree	38/897.6	GPRS(GMSK 4TS)	0	0.095	0.069	-3.36	29.71	30.00	0.074	2024/4/18
Right Cheek	38/897.6	GPRS(GMSK 4TS)	0	0.152	0.108	-1.21	29.71	30.00	0.115	2024/4/18
Right Tilt 15 Degree	38/897.6	GPRS(GMSK 4TS)	0	0.079	0.056	-1.65	29.71	30.00	0.060	2024/4/18
Extremity										

Front Side	38/897.6	GPRS(GMSK 4TS)	0	0.561	0.340	1.19	29.71	30.00	0.363	2024/4/18
Back Side	38/897.6	GPRS(GMSK 4TS)	0	0.877	0.560	-0.81	29.71	30.00	0.599	2024/4/18
Left Side	38/897.6	GPRS(GMSK 4TS)	0	0.474	0.300	-2.58	29.71	30.00	0.321	2024/4/18
Right Side	38/897.6	GPRS(GMSK 4TS)	0	0.447	0.280	2.63	29.71	30.00	0.299	2024/4/18
Top Side	38/897.6	GPRS(GMSK 4TS)	0	0.123	0.076	-3.71	29.71	30.00	0.081	2024/4/18
Bottom Side	38/897.6	GPRS(GMSK 4TS)	0	0.570	0.349	3.92	29.71	30.00	0.373	2024/4/18
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	38/897.6	GPRS(GMSK 4TS)	5	0.386	0.239	0.54	29.71	30.00	0.256	2024/4/18

### 9.1.3. SAR measurement Result of GSM1800

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	698/1747.4	GPRS(GMSK 4TS)	0	0.022	0.018	1.85	27.71	28.50	0.022	2024/4/24
Left Tilt 15 Degree	698/1747.4	GPRS(GMSK 4TS)	0	0.013	0.011	5.64	27.71	28.50	0.013	2024/4/24
Right Cheek	698/1747.4	GPRS(GMSK 4TS)	0	0.020	0.018	2.31	27.71	28.50	0.022	2024/4/24
Right Tilt 15 Degree	698/1747.4	GPRS(GMSK 4TS)	0	0.010	0.008	0.85	27.71	28.50	0.010	2024/4/24
Extremity										
Front Side	698/1747.4	GPRS(GMSK 4TS)	0	0.892	0.438	-3.63	27.71	28.50	0.525	2024/4/24
Back Side	698/1747.4	GPRS(GMSK 4TS)	0	1.438	0.714	-2.66	27.71	28.50	0.856	2024/4/24
Left Side	698/1747.4	GPRS(GMSK 4TS)	0	0.733	0.360	-2.49	27.71	28.50	0.432	2024/4/24

#### 9.1.4. SAR measurement Result of GSM1900

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	661/1880	GPRS(GMSK 3TS)	0	0.020	0.017	-2.36	28.07	28.50	0.019	2024/4/24
Left Tilt 15 Degree	661/1880	GPRS(GMSK 3TS)	0	0.011	0.009	-0.53	28.07	28.50	0.010	2024/4/24
Right Cheek	661/1880	GPRS(GMSK 3TS)	0	0.018	0.016	4.81	28.07	28.50	0.018	2024/4/24
Right Tilt 15 Degree	661/1880	GPRS(GMSK 3TS)	0	0.009	0.007	-3.49	28.07	28.50	0.008	2024/4/24
Extremity										
Front Side	661/1880	GPRS(GMSK 3TS)	0	0.808	0.357	2.32	28.07	28.50	0.394	2024/4/24
Back Side	661/1880	GPRS(GMSK 3TS)	0	1.304	0.594	2.02	28.07	28.50	0.656	2024/4/24
Left Side	661/1880	GPRS(GMSK 3TS)	0	0.704	0.314	3.58	28.07	28.50	0.347	2024/4/24
Right Side	661/1880	GPRS(GMSK 3TS)	0	0.704	0.317	2.26	28.07	28.50	0.350	2024/4/24
Top Side	661/1880	GPRS(GMSK 3TS)	0	0.170	0.077	3.97	28.07	28.50	0.085	2024/4/24
Bottom Side	661/1880	GPRS(GMSK 3TS)	0	0.808	0.357	3.44	28.07	28.50	0.394	2024/4/24
Body & Hotspot with 5mm (Worst-case position for 0mm)										

Back Side	661/1880	GPRS(GMSK 3TS)	5	0.548	0.250	-1.93	28.07	28.50	0.276	2024/4/24
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### 9.1.5. SAR measurement Result of WCDMA Band 1

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	9750/1950	RMC12.2K	0	0.033	0.024	-0.54	22.89	23.00	0.025	2024/4/11
Left Tilt 15 Degree	9750/1950	RMC12.2K	0	0.019	0.017	3.15	22.89	23.00	0.017	2024/4/11
Right Cheek	9750/1950	RMC12.2K	0	0.028	0.020	-2.24	22.89	23.00	0.021	2024/4/11
Right Tilt 15 Degree	9750/1950	RMC12.2K	0	0.013	0.011	-3.25	22.89	23.00	0.011	2024/4/11
Extremity										
Front Side	9750/1950	RMC12.2K	0	1.586	0.655	-0.47	22.89	23.00	0.672	2024/4/11
Back Side	9750/1950	RMC12.2K	0	2.643	1.137	4.10	22.89	23.00	1.166	2024/4/11
Left Side	9750/1950	RMC12.2K	0	1.348	0.574	1.55	22.89	23.00	0.589	2024/4/11
Right Side	9750/1950	RMC12.2K	0	1.454	0.607	-2.34	22.89	23.00	0.623	2024/4/11
Top Side	9750/1950	RMC12.2K	0	0.344	0.142	-1.05	22.89	23.00	0.146	2024/4/11
Bottom Side	9750/1950	RMC12.2K	0	1.718	0.710	0.83	22.89	23.00	0.728	2024/4/11
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	9750/1950	RMC12.2K	5	1.057	0.455	-1.71	22.89	23.00	0.467	2024/4/11

### 9.1.6. SAR measurement Result of WCDMA Band 8

Test Position	Test channel /Freq.	Test Mode	Separation distance	SAR Value (W/kg)		Power Drift	Conducted power	Tune-up power	Scaled SAR	Date
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			(mm)	1g	10g	(±5%)	(dBm)	(dBm)	10g (W/Kg)	
Head										
Left Cheek	2788/897.6	RMC12.2K	0	0.239	0.176	-3.95	22.63	23.00	0.192	2024/4/18
Left Tilt 15 Degree	2788/897.6	RMC12.2K	0	0.130	0.092	4.70	22.63	23.00	0.100	2024/4/18
Right Cheek	2788/897.6	RMC12.2K	0	0.212	0.156	-2.00	22.63	23.00	0.170	2024/4/18
Right Tilt 15 Degree	2788/897.6	RMC12.2K	0	0.112	0.082	-0.94	22.63	23.00	0.089	2024/4/18
Extremity										
Front Side	2788/897.6	RMC12.2K	0	0.352	0.222	0.30	22.63	23.00	0.242	2024/4/18
Back Side	2788/897.6	RMC12.2K	0	0.541	0.351	-0.59	22.63	23.00	0.382	2024/4/18
Left Side	2788/897.6	RMC12.2K	0	0.276	0.174	-1.31	22.63	23.00	0.189	2024/4/18
Right Side	2788/897.6	RMC12.2K	0	0.276	0.177	-1.67	22.63	23.00	0.193	2024/4/18
Top Side	2788/897.6	RMC12.2K	0	0.054	0.035	-2.36	22.63	23.00	0.038	2024/4/18
Bottom Side	2788/897.6	RMC12.2K	0	0.346	0.213	1.32	22.63	23.00	0.232	2024/4/18
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	2788/897.6	RMC12.2K	5	0.216	0.133	0.05	22.63	23.00	0.145	2024/4/18

#### 9.1.7. SAR measurement Result of LTE Band 1

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	18300/1950	20M QPSK(1,0)	0	0.041	0.029	0.43	23.02	24.00	0.036	2024/4/11
Left Tilt	18300/1950	20M	0	0.023	0.016	-3.49	23.02	24.00	0.020	2024/4/11

15 Degree		QPSK(1,0)								
Right Cheek	18300/1950	20M QPSK(1,0)	0	0.038	0.026	-4.52	23.02	24.00	0.033	2024/4/11
Right Tilt 15 Degree	18300/1950	20M QPSK(1,0)	0	0.018	0.016	-2.61	23.02	24.00	0.020	2024/4/11
Extremity										
Front Side	18300/1950	20M QPSK(1,0)	0	2.182	0.914	3.68	23.02	24.00	1.145	2024/4/11
Back Side	18300/1950	20M QPSK(1,0)	0	3.463	1.527	-0.79	23.02	24.00	1.914	2024/4/11
Left Side	18300/1950	20M QPSK(1,0)	0	1.905	0.798	-3.60	23.02	24.00	1.000	2024/4/11
Right Side	18300/1950	20M QPSK(1,0)	0	1.801	0.794	3.69	23.02	24.00	0.995	2024/4/11
Top Side	18300/1950	20M QPSK(1,0)	0	0.381	0.166	-1.06	23.02	24.00	0.208	2024/4/11
Bottom Side	18300/1950	20M QPSK(1,0)	0	2.112	0.903	-3.68	23.02	24.00	1.132	2024/4/11
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	18300/1950	20M QPSK(1,0)	5	1.420	0.587	3.50	23.02	24.00	0.736	2024/4/11

### 9.1.8. SAR measurement Result of LTE Band 3

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	19575/1747.5	20M QPSK(1,0)	0	0.026	0.021	4.65	23.71	24.50	0.025	2024/4/24
Left Tilt 15 Degree	19575/1747.5	20M QPSK(1,0)	0	0.014	0.012	0.92	23.71	24.50	0.014	2024/4/24
Right Cheek	19575/1747.5	20M QPSK(1,0)	0	0.024	0.019	0.87	23.71	24.50	0.023	2024/4/24
Right Tilt 15	19575/1747.5	20M QPSK(1,0)	0	0.012	0.010	-3.16	23.71	24.50	0.012	2024/4/24

Degree										
Extremity										
Front Side	19575/1747.5	20M QPSK(1,0)	0	1.216	0.609	-2.23	23.71	24.50	0.730	2024/4/24
Back Side	19575/1747.5	20M QPSK(1,0)	0	1.993	1.009	2.48	23.71	24.50	1.210	2024/4/24
Left Side	19575/1747.5	20M QPSK(1,0)	0	1.036	0.524	0.76	23.71	24.50	0.629	2024/4/24
Right Side	19575/1747.5	20M QPSK(1,0)	0	0.997	0.500	3.61	23.71	24.50	0.600	2024/4/24
Top Side	19575/1747.5	20M QPSK(1,0)	0	0.199	0.101	-3.57	23.71	24.50	0.121	2024/4/24
Bottom Side	19575/1747.5	20M QPSK(1,0)	0	1.216	0.603	-0.88	23.71	24.50	0.723	2024/4/24
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	19575/1747.5	20M QPSK(1,0)	5	0.817	0.393	2.92	23.71	24.50	0.471	2024/4/24

### 9.1.9. SAR measurement Result of LTE Band 7

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	21100/2535	20M QPSK(1,0)	0	0.142	0.081	-1.25	22.83	23.00	0.084	2024/4/16
Left Tilt 15 Degree	21100/2535	20M QPSK(1,0)	0	0.082	0.045	1.35	22.83	23.00	0.047	2024/4/16
Right Cheek	21100/2535	20M QPSK(1,0)	0	0.121	0.068	0.68	22.83	23.00	0.071	2024/4/16
Right Tilt 15 Degree	21100/2535	20M QPSK(1,0)	0	0.065	0.035	-1.19	22.83	23.00	0.036	2024/4/16
Extremity										
Front Side	21100/2535	20M QPSK(1,0)	0	1.394	0.587	-1.55	22.83	23.00	0.610	2024/4/16
Back Side	21100/2535	20M QPSK(1,0)	0	2.249	0.967	2.69	22.83	23.00	1.006	2024/4/16

Left Side	21100/2535	20M QPSK(1,0)	0	1.237	0.527	-0.47	22.83	23.00	0.548	2024/4/16
Right Side	21100/2535	20M QPSK(1,0)	0	1.192	0.497	2.42	22.83	23.00	0.517	2024/4/16
Top Side	21100/2535	20M QPSK(1,0)	0	0.247	0.102	-0.87	22.83	23.00	0.106	2024/4/16
Bottom Side	21100/2535	20M QPSK(1,0)	0	1.394	0.587	-1.39	22.83	23.00	0.610	2024/4/16
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	21100/2535	20M QPSK(1,0)	5	0.900	0.375	0.12	22.83	23.00	0.390	2024/4/16

#### 9.1.10. SAR measurement Result of LTE Band 8

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	21625/897.5	10M QPSK(1,0)	0	0.269	0.202	2.80	23.01	23.50	0.226	2024/4/18
Left Tilt 15 Degree	21625/897.5	10M QPSK(1,0)	0	0.160	0.117	-3.63	23.01	23.50	0.131	2024/4/18
Right Cheek	21625/897.5	10M QPSK(1,0)	0	0.229	0.163	-4.34	23.01	23.50	0.182	2024/4/18
Right Tilt 15 Degree	21625/897.5	10M QPSK(1,0)	0	0.111	0.083	3.71	23.01	23.50	0.093	2024/4/18
Extremity										
Front Side	21625/897.5	10M QPSK(1,0)	0	0.381	0.253	-2.17	23.01	23.50	0.283	2024/4/18
Back Side	21625/897.5	10M QPSK(1,0)	0	0.635	0.426	2.13	23.01	23.50	0.477	2024/4/18
Left Side	21625/897.5	10M QPSK(1,0)	0	0.324	0.217	-0.05	23.01	23.50	0.243	2024/4/18
Right Side	21625/897.5	10M QPSK(1,0)	0	0.330	0.210	1.63	23.01	23.50	0.235	2024/4/18
Top Side	21625/897.5	10M QPSK(1,0)	0	0.076	0.051	2.96	23.01	23.50	0.057	2024/4/18
Bottom	21625/897.5	10M	0	0.394	0.254	2.56	23.01	23.50	0.284	2024/4/18

Side		QPSK(1,0)								
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	21625/897.5	10M QPSK(1,0)	5	0.279	0.180	1.30	23.01	23.50	0.201	2024/4/18

#### 9.1.11. SAR measurement Result of LTE Band 20

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	24300/847	20M QPSK(1,0)	0	0.206	0.156	0.43	23.05	23.50	0.173	2024/4/18
Left Tilt 15 Degree	24300/847	20M QPSK(1,0)	0	0.116	0.085	-3.38	23.05	23.50	0.094	2024/4/18
Right Cheek	24300/847	20M QPSK(1,0)	0	0.184	0.137	-4.36	23.05	23.50	0.152	2024/4/18
Right Tilt 15 Degree	24300/847	20M QPSK(1,0)	0	0.089	0.066	3.94	23.05	23.50	0.073	2024/4/18
Extremity										
Front Side	24300/847	20M QPSK(1,0)	0	0.556	0.364	-1.17	23.05	23.50	0.404	2024/4/18
Back Side	24300/847	20M QPSK(1,0)	0	0.927	0.633	-2.39	23.05	23.50	0.702	2024/4/18
Left Side	24300/847	20M QPSK(1,0)	0	0.491	0.329	3.56	23.05	23.50	0.365	2024/4/18
Right Side	24300/847	20M QPSK(1,0)	0	0.510	0.348	-0.92	23.05	23.50	0.386	2024/4/18
Top Side	24300/847	20M QPSK(1,0)	0	0.111	0.073	0.14	23.05	23.50	0.081	2024/4/18
Bottom Side	24300/847	20M QPSK(1,0)	0	0.584	0.387	2.16	23.05	23.50	0.429	2024/4/18
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	24300/847	20M QPSK(1,0)	5	0.371	0.248	0.48	23.05	23.50	0.275	2024/4/18

### 9.1.12. SAR measurement Result of LTE Band 28

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	27460/728	20M QPSK(1,0)	0	0.099	0.080	-1.07	23.40	24.00	0.092	2024/4/19
Left Tilt 15 Degree	27460/728	20M QPSK(1,0)	0	0.055	0.042	-2.41	23.40	24.00	0.048	2024/4/19
Right Cheek	27460/728	20M QPSK(1,0)	0	0.094	0.072	0.39	23.40	24.00	0.083	2024/4/19
Right Tilt 15 Degree	27460/728	20M QPSK(1,0)	0	0.050	0.040	-2.78	23.40	24.00	0.046	2024/4/19
Extremity										
Front Side	27460/728	20M QPSK(1,0)	0	0.436	0.286	-3.19	23.40	24.00	0.328	2024/4/19
Back Side	27460/728	20M QPSK(1,0)	0	0.681	0.465	-1.12	23.40	24.00	0.534	2024/4/19
Left Side	27460/728	20M QPSK(1,0)	0	0.354	0.237	-3.39	23.40	24.00	0.272	2024/4/19
Right Side	27460/728	20M QPSK(1,0)	0	0.361	0.242	2.15	23.40	24.00	0.278	2024/4/19
Top Side	27460/728	20M QPSK(1,0)	0	0.089	0.059	2.68	23.40	24.00	0.068	2024/4/19
Bottom Side	27460/728	20M QPSK(1,0)	0	0.443	0.302	-1.17	23.40	24.00	0.347	2024/4/19
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	27460/728	20M QPSK(1,0)	5	0.293	0.194	-0.12	23.40	24.00	0.223	2024/4/19

### 9.1.13. SAR measurement Result of LTE Band 41

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

Head										
Left Cheek	40740/2605	20M QPSK(1,0)	0	0.101	0.065	-1.22	23.15	24.00	0.079	2024/4/16
Left Tilt 15 Degree	40740/2605	20M QPSK(1,0)	0	0.054	0.034	-1.45	23.15	24.00	0.041	2024/4/16
Right Cheek	40740/2605	20M QPSK(1,0)	0	0.092	0.057	0.45	23.15	24.00	0.069	2024/4/16
Right Tilt 15 Degree	40740/2605	20M QPSK(1,0)	0	0.041	0.025	4.28	23.15	24.00	0.030	2024/4/16
Extremity										
Front Side	40740/2605	20M QPSK(1,0)	0	0.827	0.371	-2.46	23.15	24.00	0.451	2024/4/16
Back Side	40740/2605	20M QPSK(1,0)	0	1.378	0.618	2.32	23.15	24.00	0.752	2024/4/16
Left Side	40740/2605	20M QPSK(1,0)	0	0.758	0.323	1.89	23.15	24.00	0.393	2024/4/16
Right Side	40740/2605	20M QPSK(1,0)	0	0.689	0.303	2.64	23.15	24.00	0.369	2024/4/16
Top Side	40740/2605	20M QPSK(1,0)	0	0.179	0.079	-1.51	23.15	24.00	0.096	2024/4/16
Bottom Side	40740/2605	20M QPSK(1,0)	0	0.854	0.375	0.12	23.15	24.00	0.456	2024/4/16
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	40740/2605	20M QPSK(1,0)	5	0.606	0.258	-3.62	23.15	24.00	0.314	2024/4/16

#### 9.1.14. SAR measurement Result of WLAN 2.4G

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	7/2442	802.11 b	0	0.308	0.166	4.86	13.96	14.50	0.188	2024/4/12
Left Tilt 15 Degree	7/2442	802.11 b	0	0.175	0.091	2.76	13.96	14.50	0.103	2024/4/12
Right	7/2442	802.11	0	0.281	0.150	4.40	13.96	14.50	0.170	2024/4/12

Cheek		b								
Right Tilt 15 Degree	7/2442	802.11 b	0	0.139	0.071	-4.36	13.96	14.50	0.080	2024/4/12
Extremity										
Front Side	7/2442	802.11 b	0	0.272	0.122	0.34	13.96	14.50	0.138	2024/4/12
Back Side	7/2442	802.11 b	0	0.418	0.198	-1.13	13.96	14.50	0.224	2024/4/12
Left Side	7/2442	802.11 b	0	0.063	0.030	-0.21	13.96	14.50	0.034	2024/4/12
Right Side	7/2442	802.11 b	0	0.217	0.100	-2.73	13.96	14.50	0.113	2024/4/12
Top Side	7/2442	802.11 b	0	0.305	0.142	-1.44	13.96	14.50	0.161	2024/4/12
Bottom Side	7/2442	802.11 b	0	0.021	0.010	1.68	13.96	14.50	0.011	2024/4/12
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	7/2442	802.11 b	5	0.255	0.118	2.78	13.96	14.50	0.134	2024/4/12

## 9.2. Simultaneous Transmission Analysis

Refer to EN 62209-2:2010 Annex K, the secondary transmitter SAR test exclusion thresholds are determined by:

$$P_{\text{available}} = P_{\text{th},m} \left( \frac{\text{SAR}_{\text{lim}} - \text{SAR}_1}{\text{SAR}_{\text{lim}}} \right)$$

$P_{\text{th},m}$  is the threshold exclusion power level taken from Annex B of EN 62479.

Mode	$P_{\text{max}}$ (dBm)	$P_{\text{max}}$ (mW)	$P_{\text{th},m}$ (mW)	$\text{SAR}_{\text{lim}}$ (W/Kg)	$\text{SAR}_1$ (W/Kg)	Calculation Result (mW)	Simultaneous Transmission Exclusion
Bluetooth	7.00	5.01	20	2	0.736	12.64	YES
Bluetooth	7.00	5.01	40	4	1.914	20.86	YES
WLAN 5.2G	11.00	12.59	20	2	0.736	12.64	YES
WLAN 5.2G	11.00	12.59	40	4	1.914	20.86	YES
WLAN 5.8G	11.00	12.59	20	2	0.736	12.64	YES
WLAN 5.8G	11.00	12.59	40	4	1.914	20.86	YES

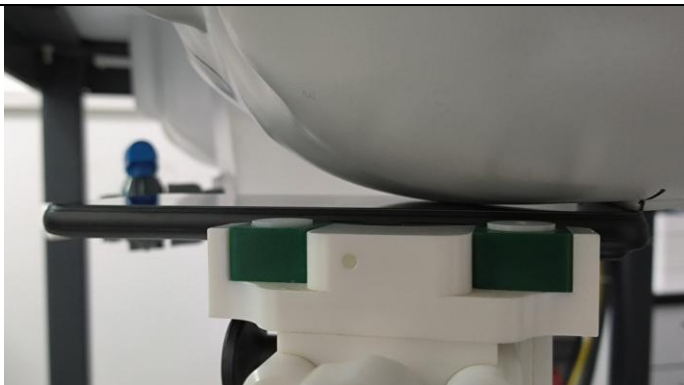

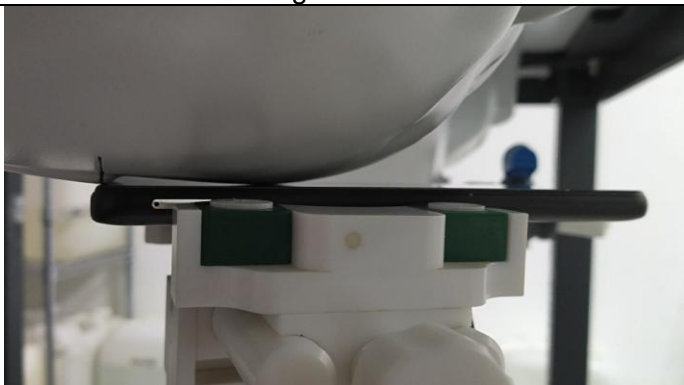
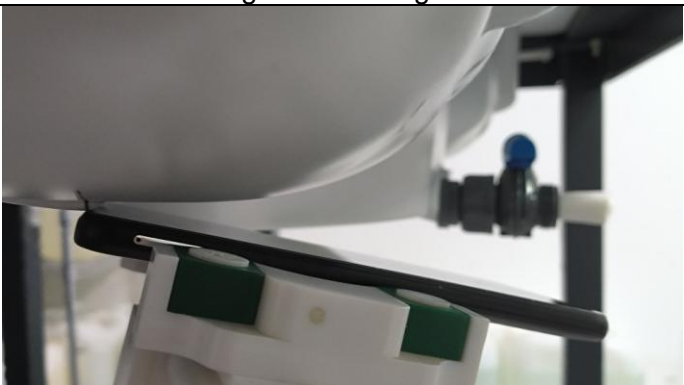


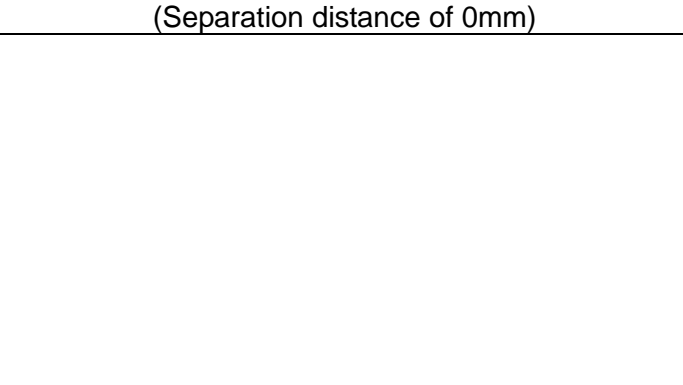
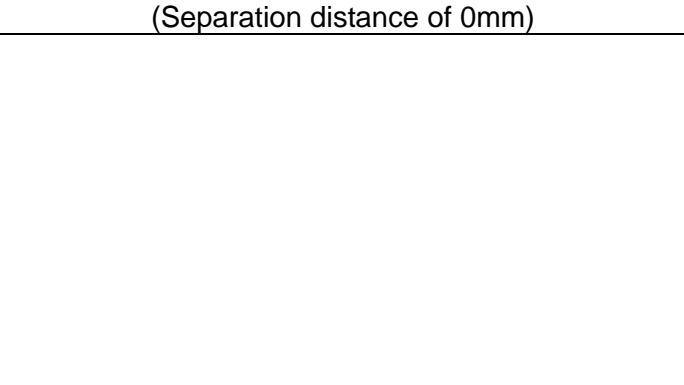
### 9.3. Exposure Conditions

Exposure Position		WWAN Band	WLAN Band	Simultaneous Tx SAR(W/Kg)
		SAR(W/Kg)	SAR(W/Kg)	
Head	Left Cheek	0.226	0.188	0.414
	Left Tilt 15 Degree	0.131	0.103	0.234
	Right Cheek	0.182	0.170	0.352
	Right Tilt 15 Degree	0.093	0.080	0.173
Member	Front Side	1.145	0.138	1.283
	Back Side	1.914	0.224	2.138
	Left Side	1.000	0.034	1.034
	Right Side	0.995	0.113	1.108
	Top Side	0.208	0.161	0.369
	Bottom Side	1.132	0.011	1.143
Body&Hotspot	Back Side	0.736	0.134	0.870

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

## 10. Appendix A. Photo documentation

### Test Positions

Left Cheek	Left Tilt 15 Degree
	
Right Cheek	Right Tilt 15 Degree
	
Front Side (Separation distance of 0mm)	Back Side (Separation distance of 0mm)
	
Left Side (Separation distance of 0mm)	Right Side (Separation distance of 0mm)
	



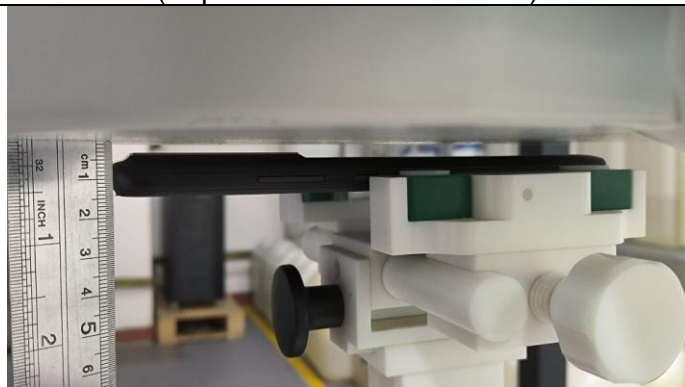
Top Side  
(Separation distance of 0mm)



Bottom Side  
(Separation distance of 0mm)



Back Side  
(Separation distance of 5mm)



## 11. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 750MHz
MEASUREMENT 2 System Performance Check - 900MHz
MEASUREMENT 3 System Performance Check - 1800MHz
MEASUREMENT 4 System Performance Check - 2000MHz
MEASUREMENT 5 System Performance Check - 2450MHz
MEASUREMENT 6 System Performance Check - 2600MHz

## MEASUREMENT 1

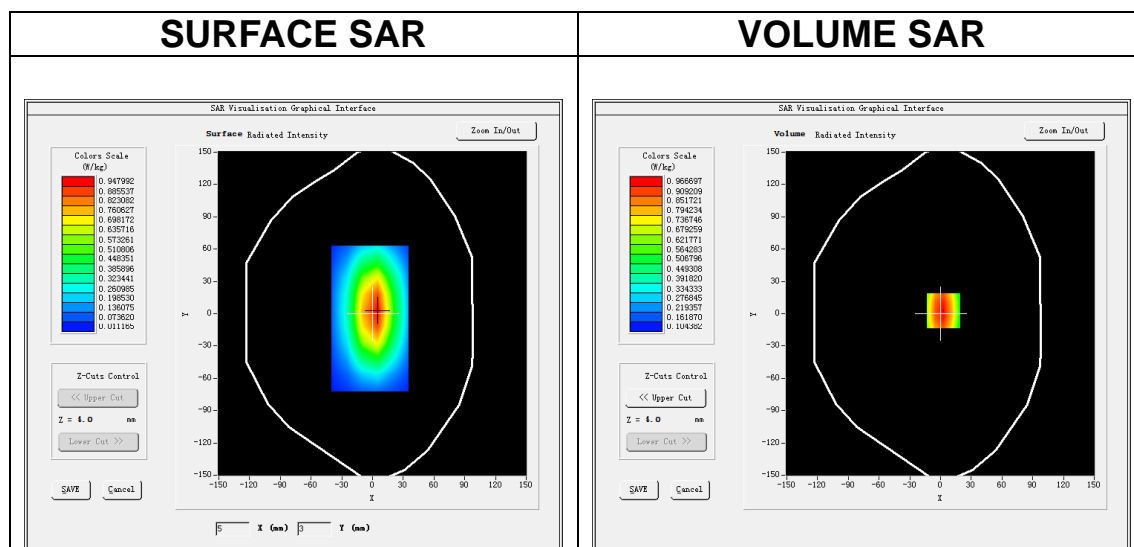
Date of measurement: 19/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW750</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.37</u>

### B. SAR Measurement Results

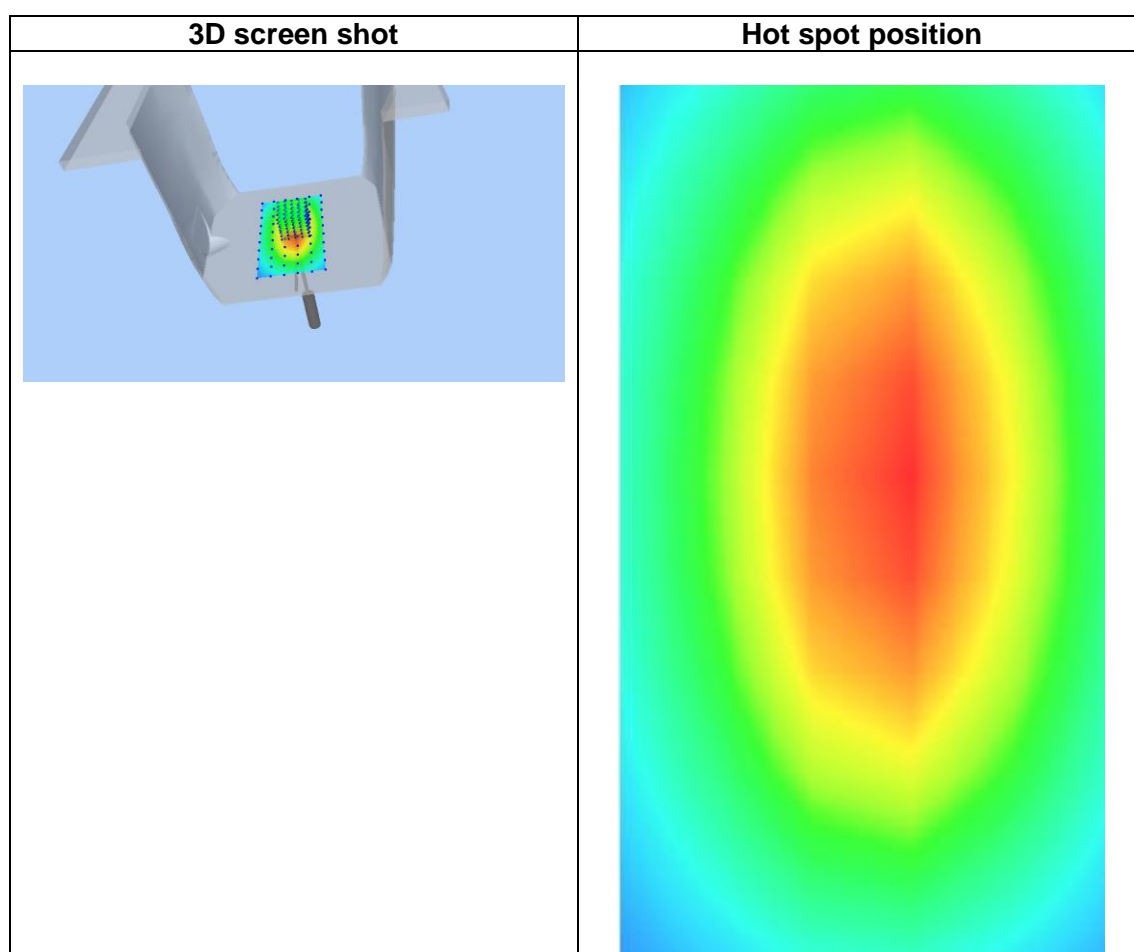
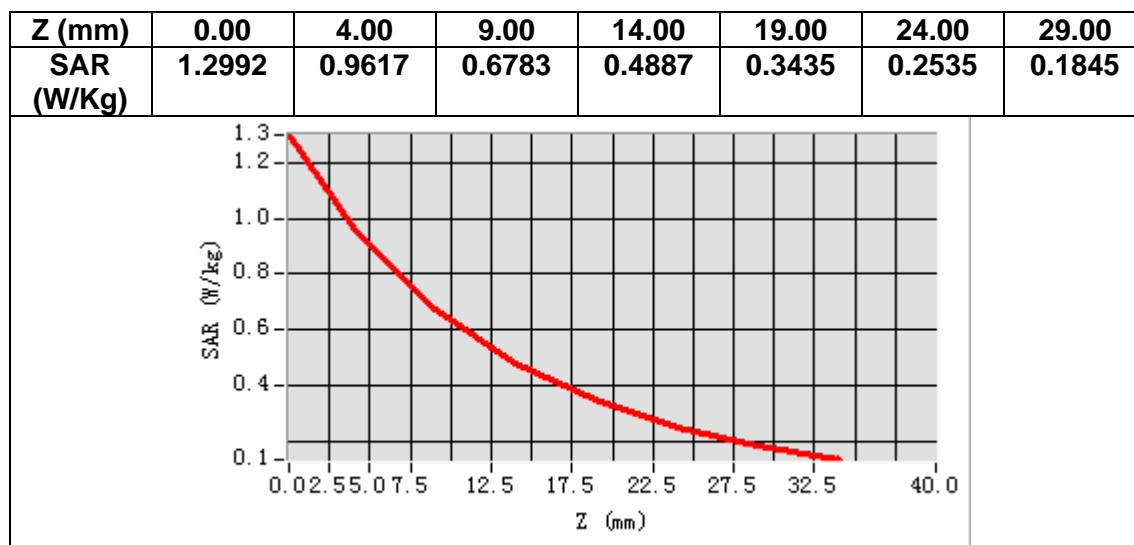
<b>Frequency (MHz)</b>	750.000000
<b>Relative permittivity (real part)</b>	41.072612
<b>Relative permittivity (imaginary part)</b>	21.692421
<b>Conductivity (S/m)</b>	0.903851
<b>Variation (%)</b>	2.730000



Maximum location: X=3.00, Y=3.00

SAR Peak: 1.30 W/kg

<b>SAR 10g (W/Kg)</b>	0.547332
<b>SAR 1g (W/Kg)</b>	0.858321



## MEASUREMENT 2

Date of measurement: 18/4/2024

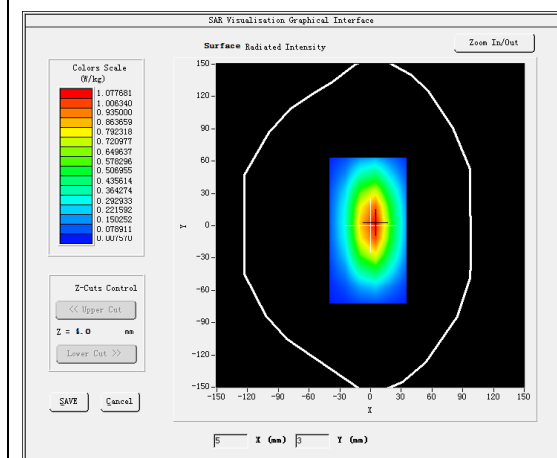
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

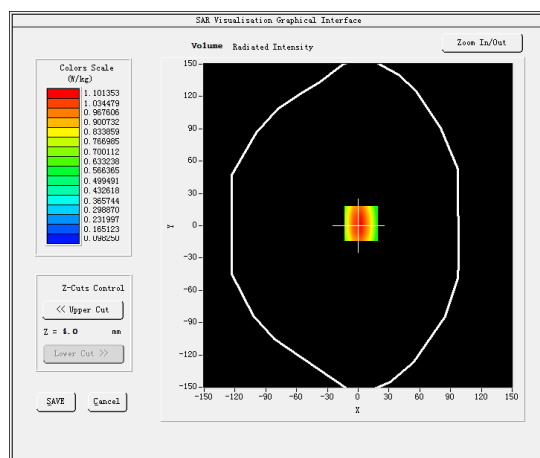
### B. SAR Measurement Results

Frequency (MHz)	900.000000
Relative permittivity (real part)	41.365707
Relative permittivity (imaginary part)	19.561065
Conductivity (S/m)	0.978053
Variation (%)	-2.720000

#### SURFACE SAR



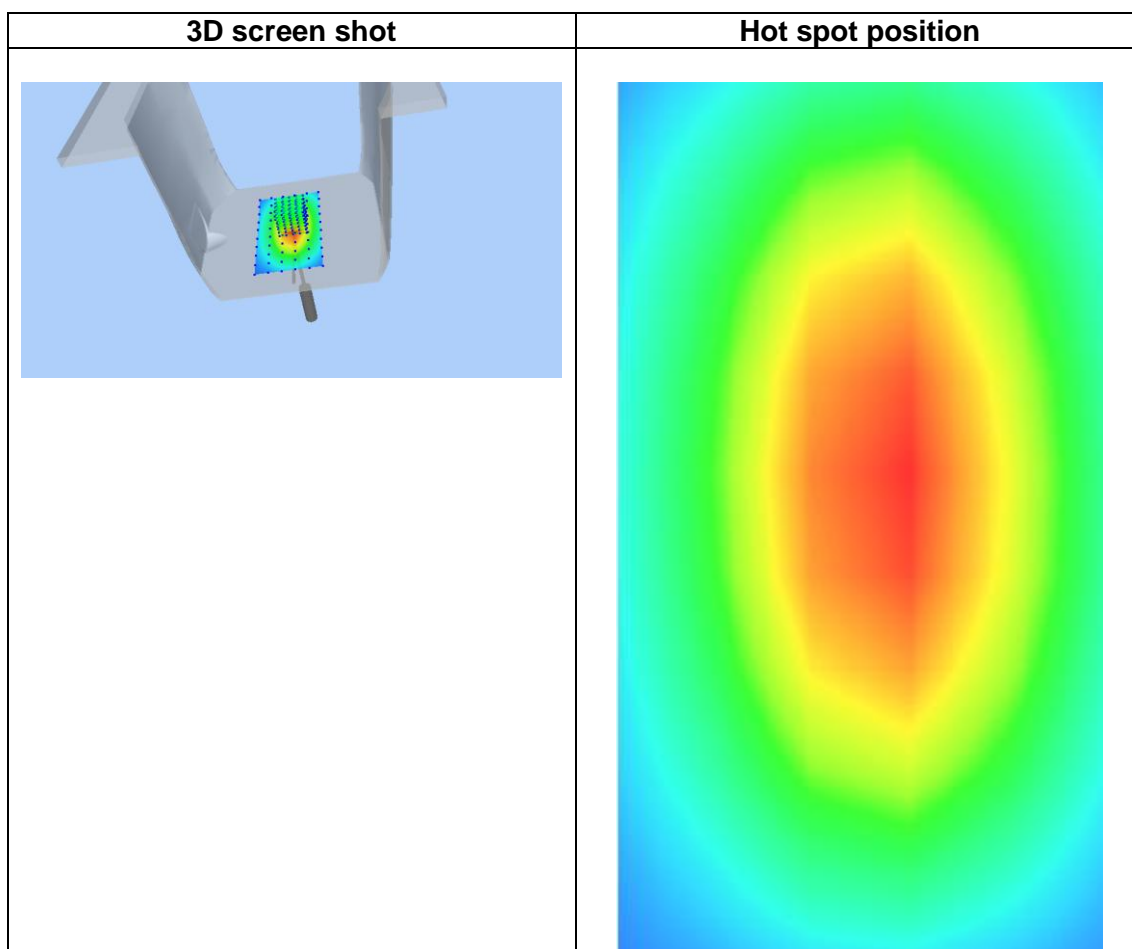
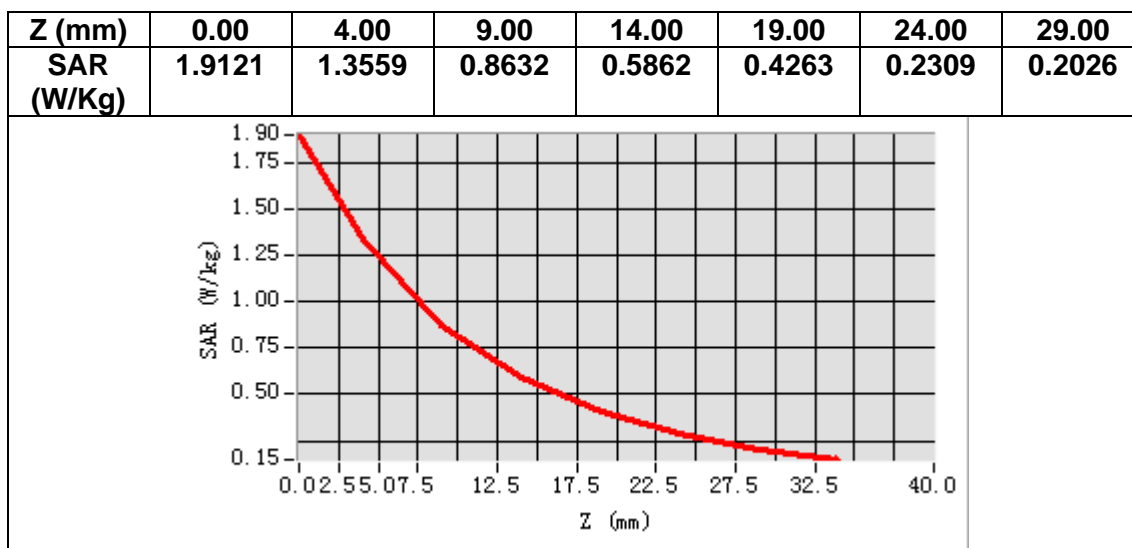
#### VOLUME SAR



Maximum location: X=3.00, Y=3.00

SAR Peak: 1.90 W/kg

SAR 10g (W/Kg)	0.677333
SAR 1g (W/Kg)	1.064172



## MEASUREMENT 3

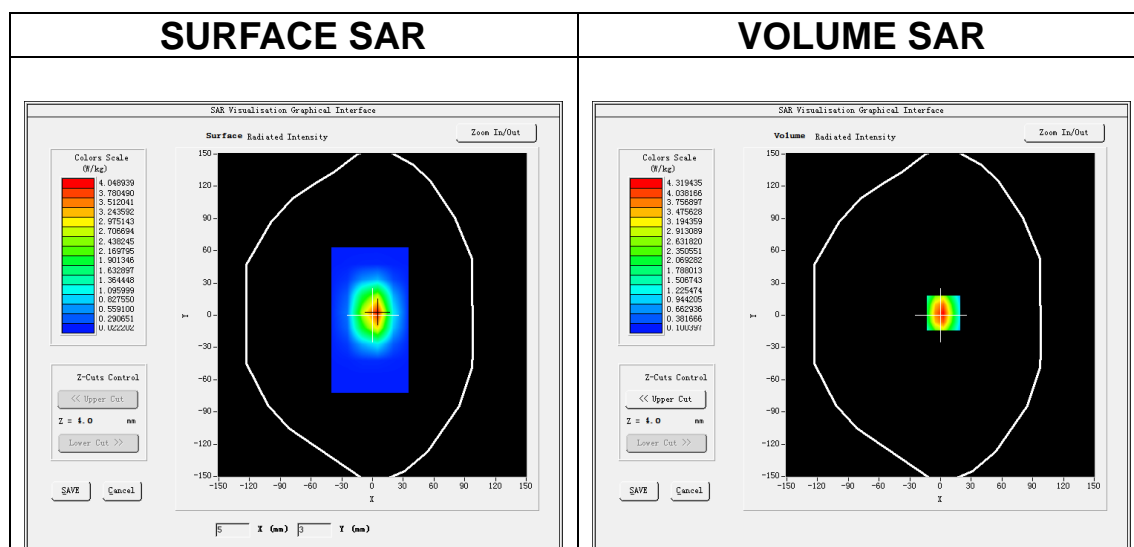
Date of measurement: 24/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW1800</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

### B. SAR Measurement Results

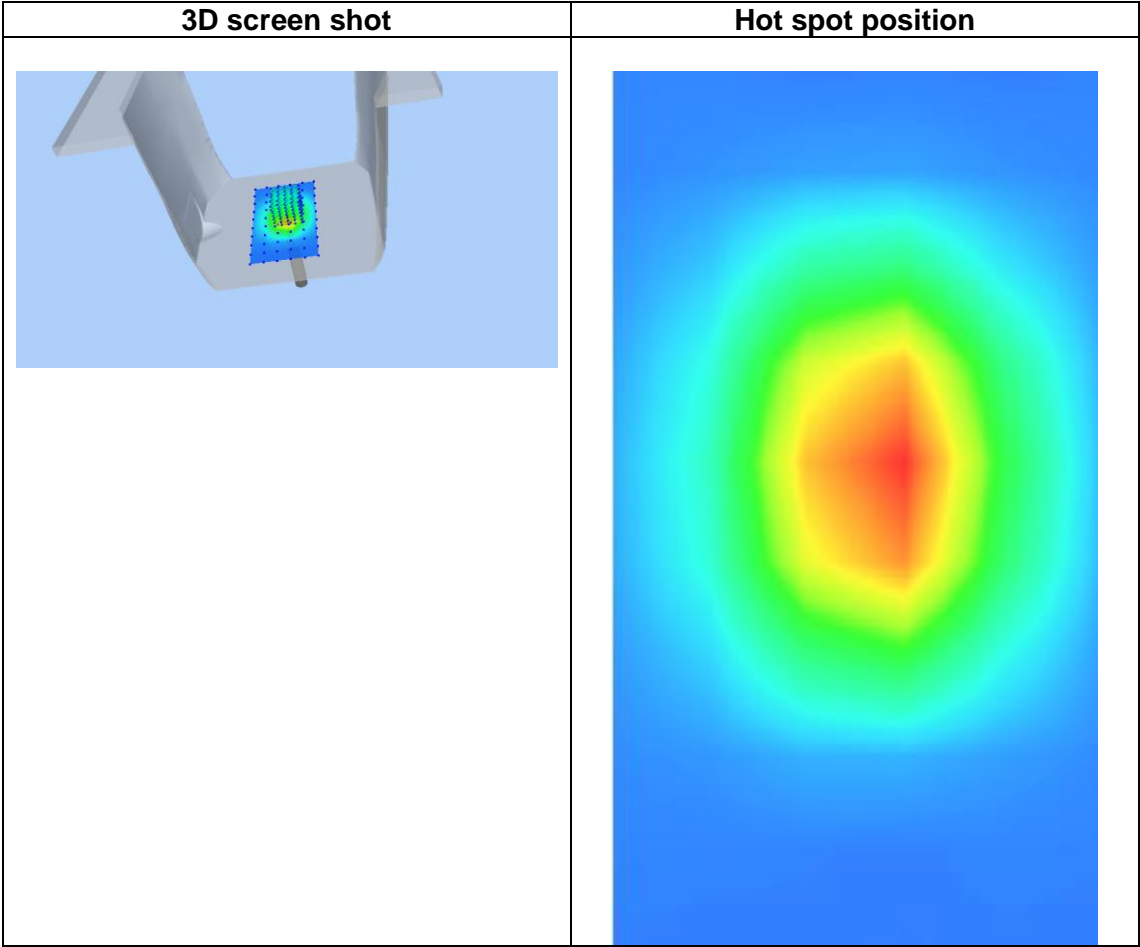
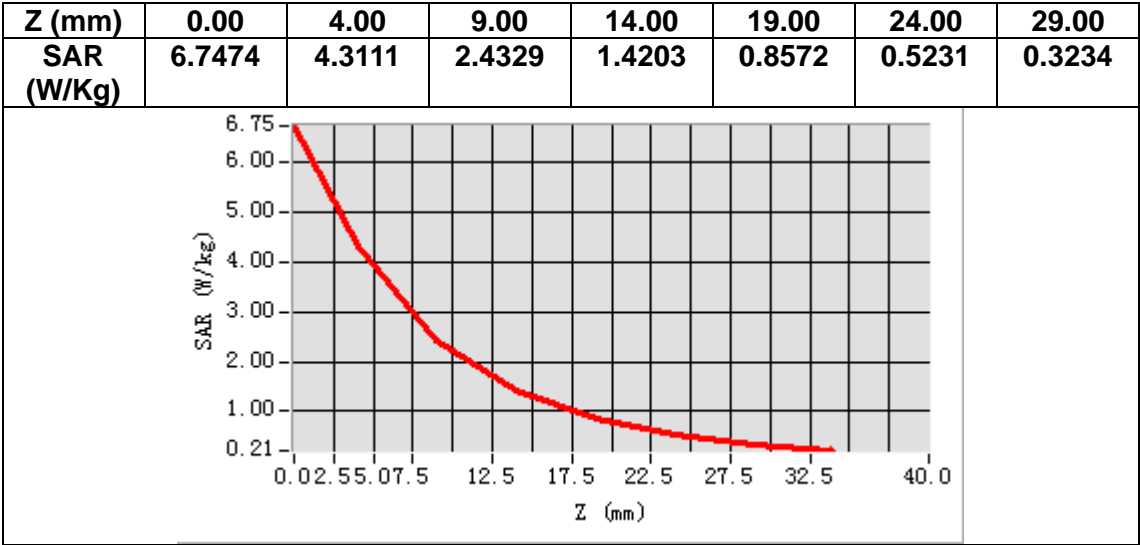
<b>Frequency (MHz)</b>	1800.000000
<b>Relative permittivity (real part)</b>	39.053883
<b>Relative permittivity (imaginary part)</b>	13.852505
<b>Conductivity (S/m)</b>	1.385251
<b>Variation (%)</b>	2.980000



Maximum location: X=3.00, Y=2.00

SAR Peak: 6.82 W/kg

<b>SAR 10g (W/Kg)</b>	1.867307
<b>SAR 1g (W/Kg)</b>	3.607066



## MEASUREMENT 4

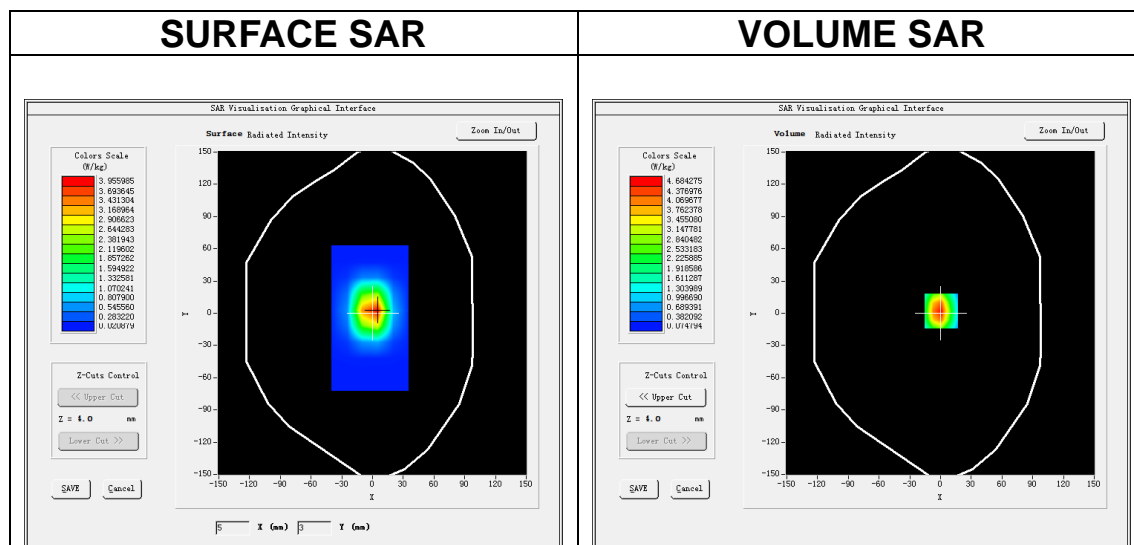
Date of measurement: 11/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW2000</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.83</u>

### B. SAR Measurement Results

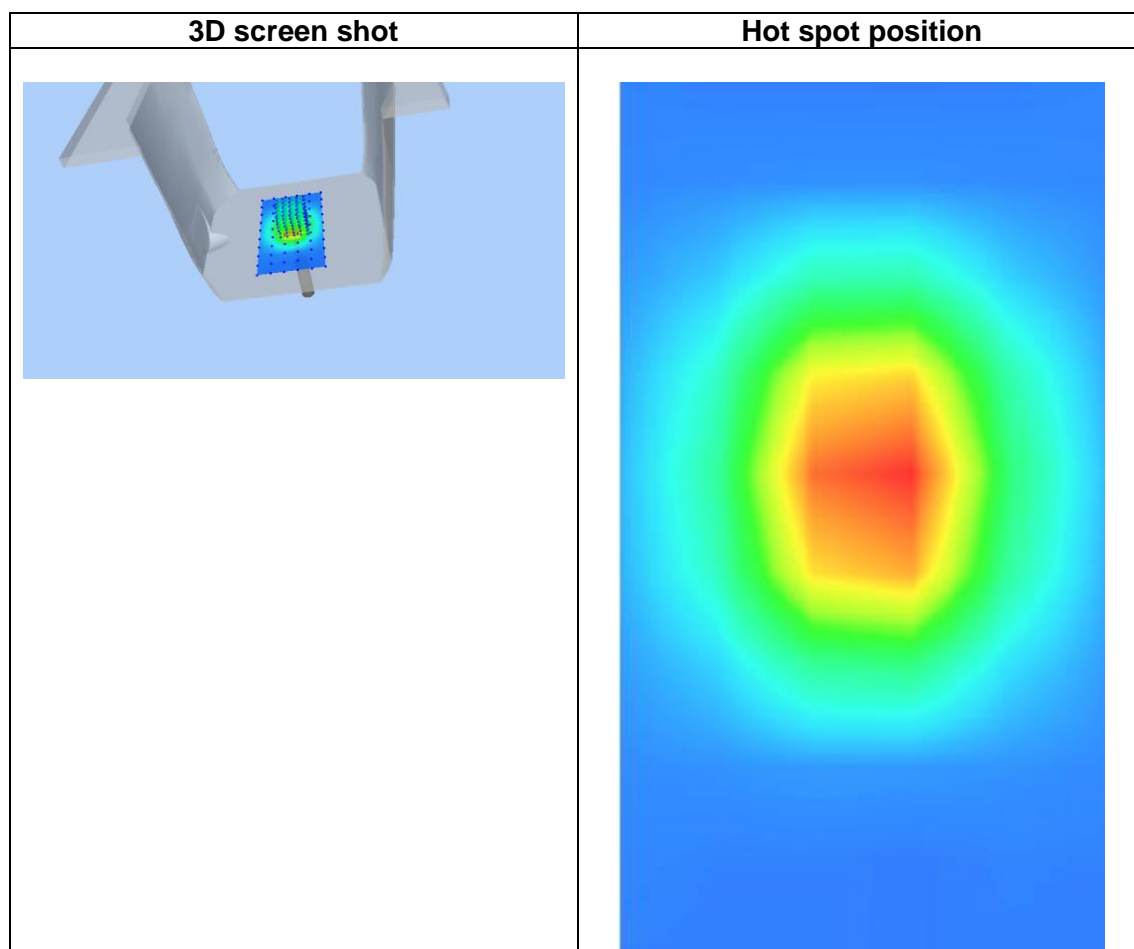
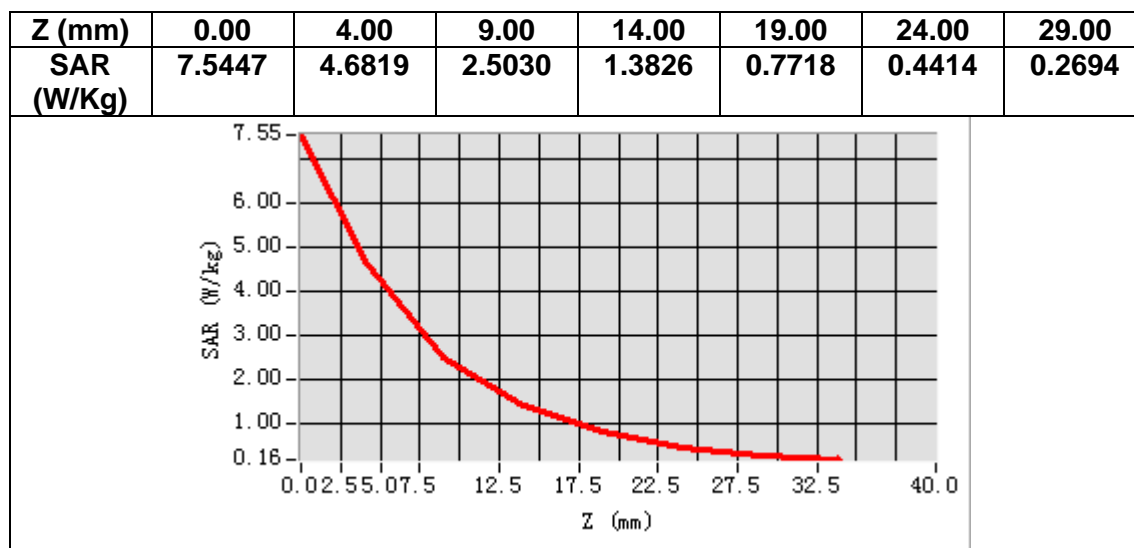
<b>Frequency (MHz)</b>	2000.000000
<b>Relative permittivity (real part)</b>	38.610816
<b>Relative permittivity (imaginary part)</b>	12.959892
<b>Conductivity (S/m)</b>	1.439988
<b>Variation (%)</b>	2.220000



Maximum location: X=1.00, Y=2.00

SAR Peak: 7.65 W/kg

<b>SAR 10g (W/Kg)</b>	2.118347
<b>SAR 1g (W/Kg)</b>	3.628221



## MEASUREMENT 5

Date of measurement: 12/4/2024

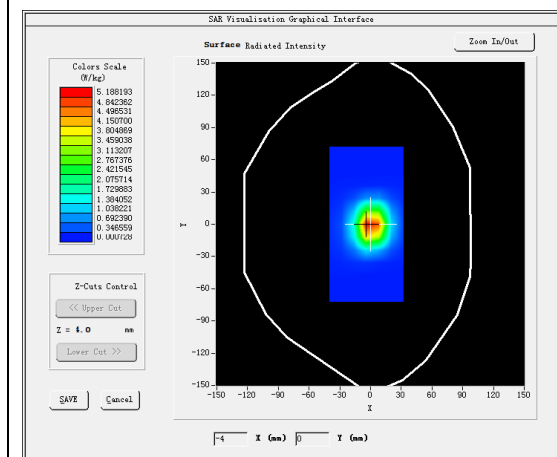
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW2450</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

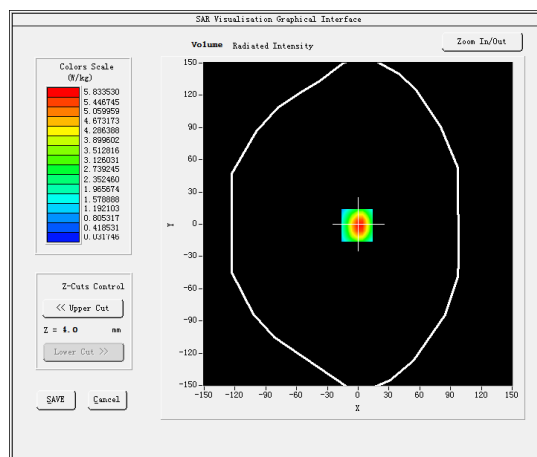
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	2450.000000
<b>Relative permittivity (real part)</b>	37.674635
<b>Relative permittivity (imaginary part)</b>	12.895778
<b>Conductivity (S/m)</b>	1.755259
<b>Variation (%)</b>	1.290000

#### SURFACE SAR



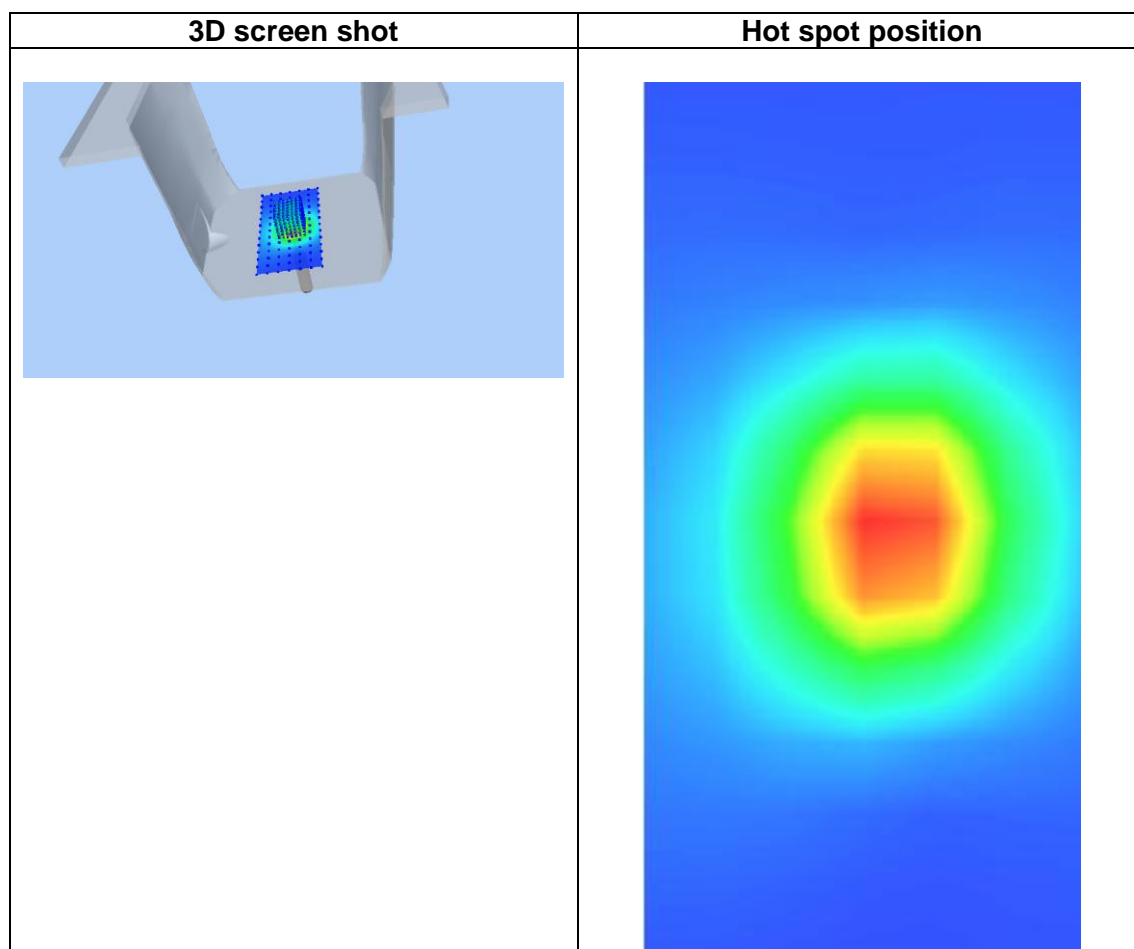
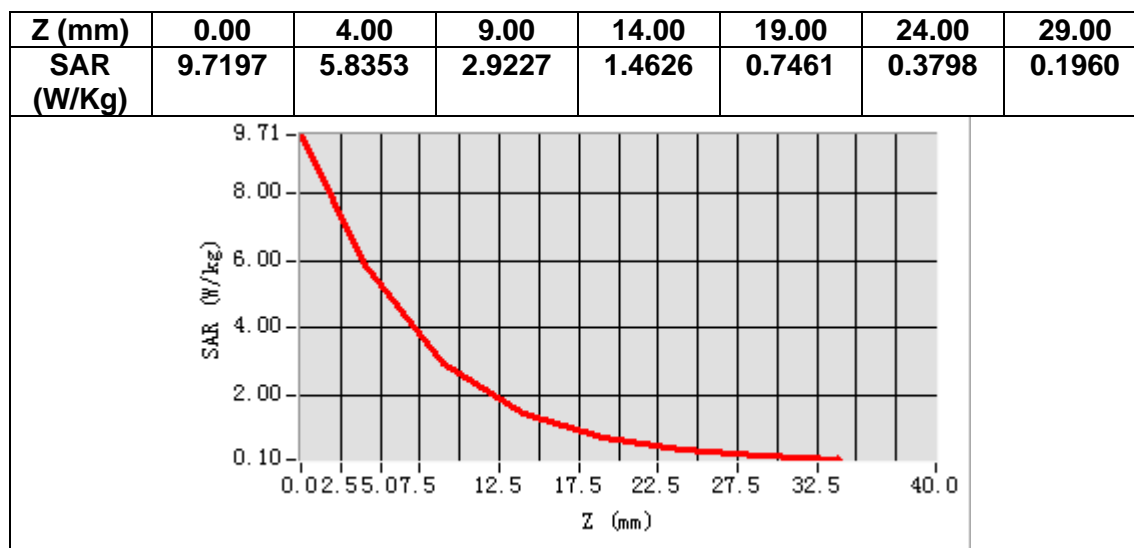
#### VOLUME SAR



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

SAR Peak: 9.83 W/kg

<b>SAR 10g (W/Kg)</b>	2.452106
<b>SAR 1g (W/Kg)</b>	5.162340



MEASUREMENT 6

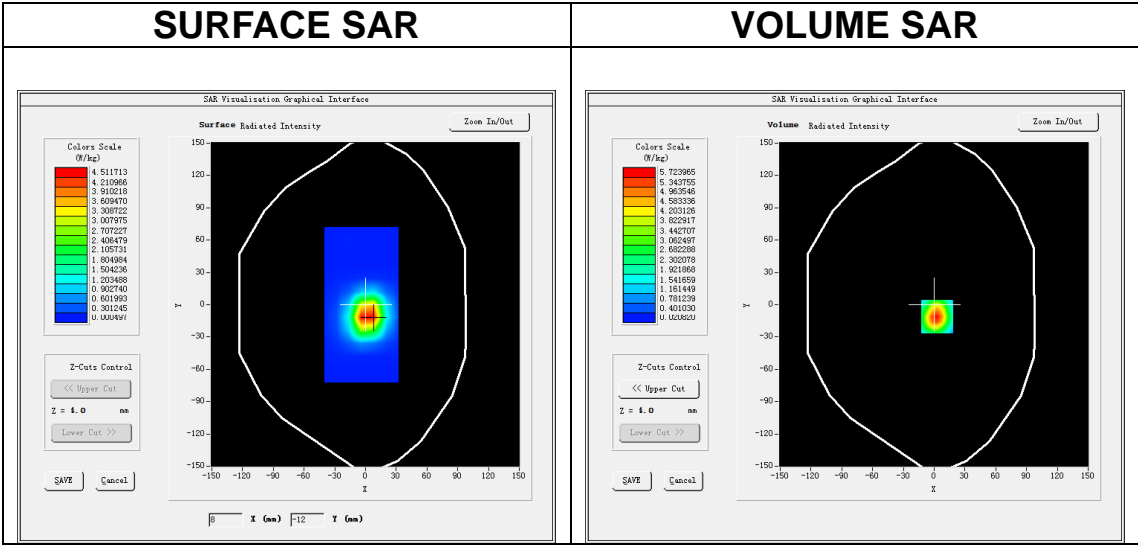
Date of measurement: 16/4/2024

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	CW2600
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.65

B. SAR Measurement Results

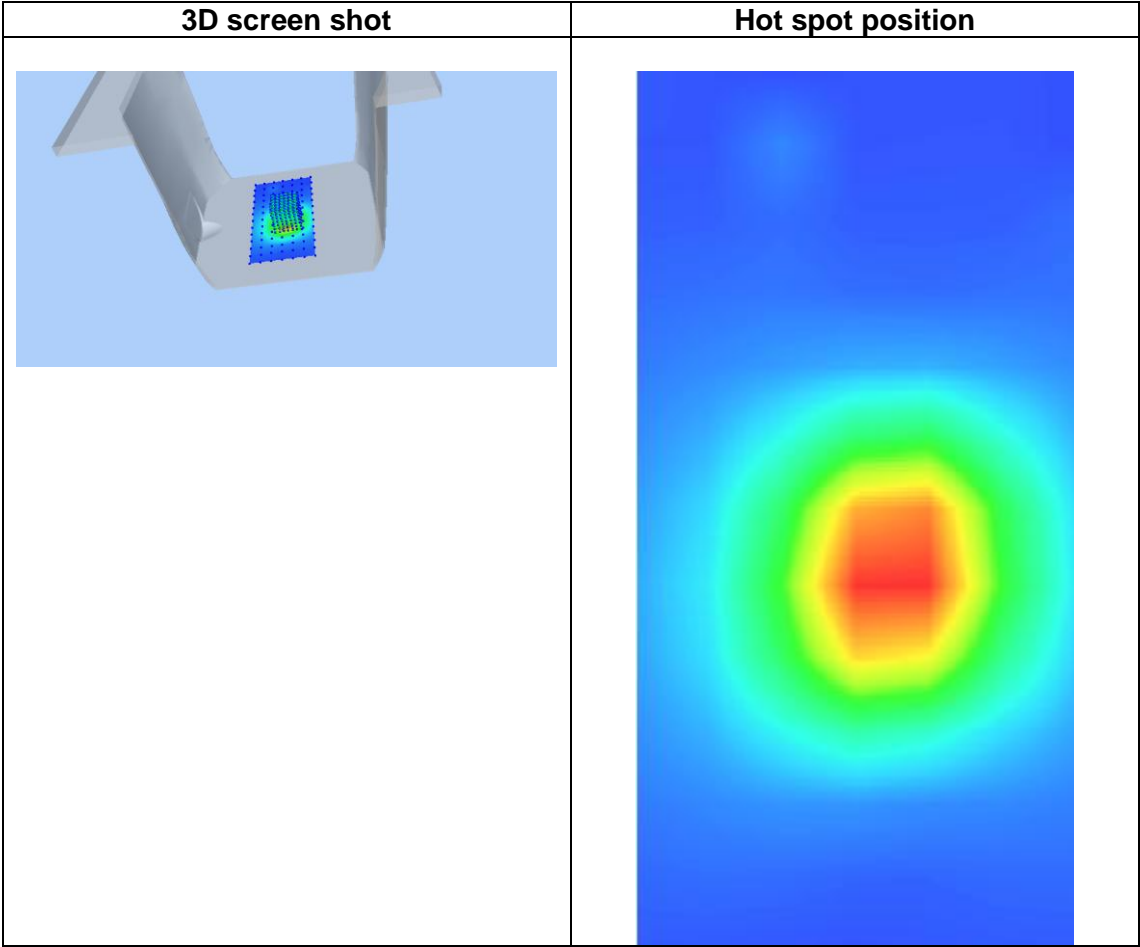
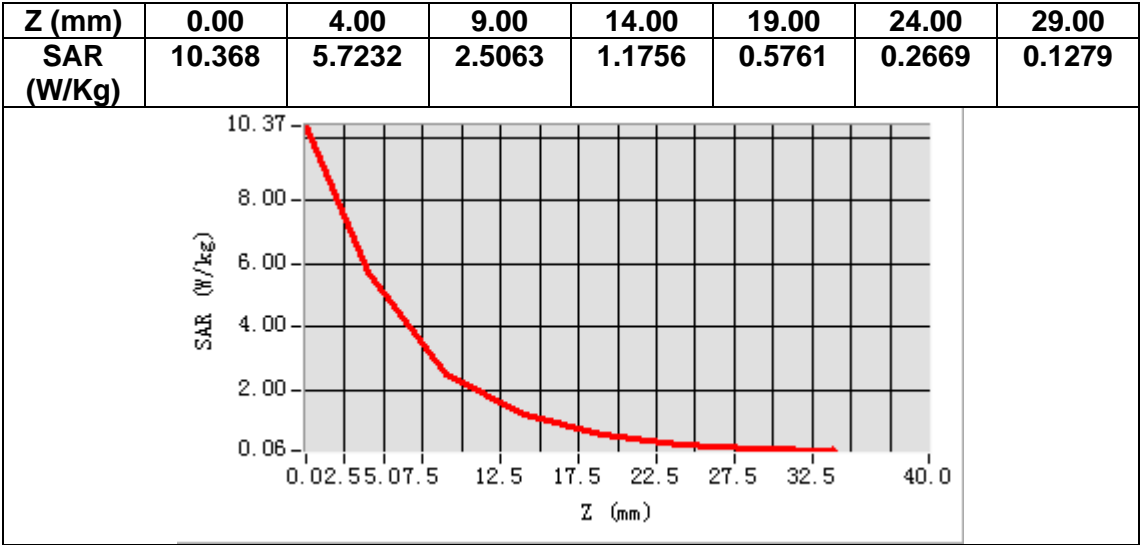
Frequency (MHz)	2600.000000
Relative permittivity (real part)	38.822242
Relative permittivity (imaginary part)	13.647932
Conductivity (S/m)	1.971368
Variation (%)	0.250000



Maximum location: X=3.00, Y=-11.00

SAR Peak: 10.29 W/kg

SAR 10g (W/Kg)	2.290037
SAR 1g (W/Kg)	5.950199



## 12. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 28 LTE Band 28 Extremity

## MEASUREMENT 1

Date of measurement: 18/4/2024

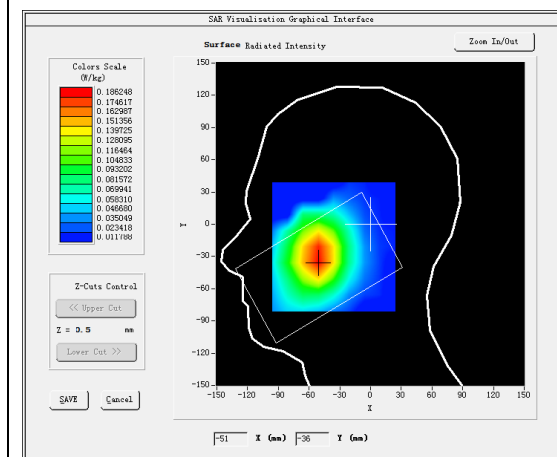
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>GSM850</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 4.0)</u>
<u>ConvF</u>	<u>2.32</u>

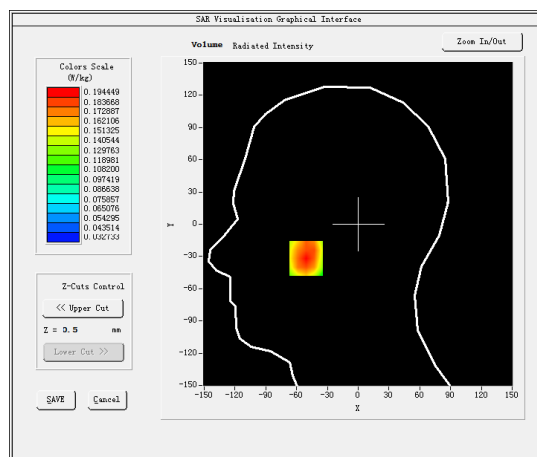
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	836.400000
<b>Relative permittivity (real part)</b>	42.245388
<b>Relative permittivity (imaginary part)</b>	19.285604
<b>Conductivity (S/m)</b>	0.896138
<b>Variation (%)</b>	-3.650000

#### SURFACE SAR



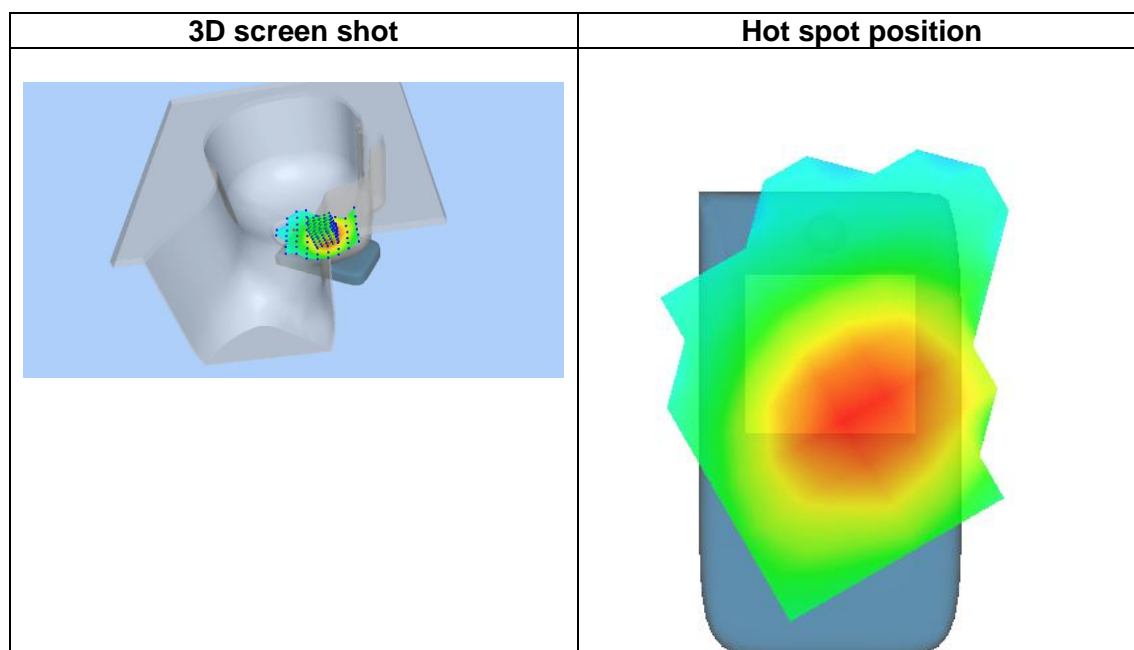
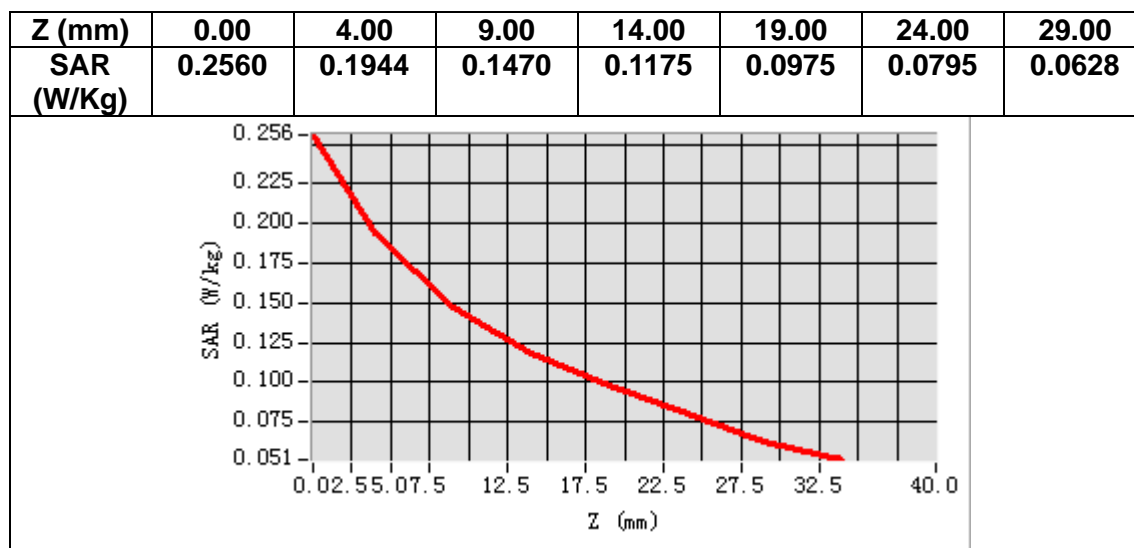
#### VOLUME SAR



Maximum location: X=-51.00, Y=-32.00

SAR Peak: 0.25 W/kg

<b>SAR 10g (W/Kg)</b>	0.137101
<b>SAR 1g (W/Kg)</b>	0.187888



## MEASUREMENT 2

Date of measurement: 18/4/2024

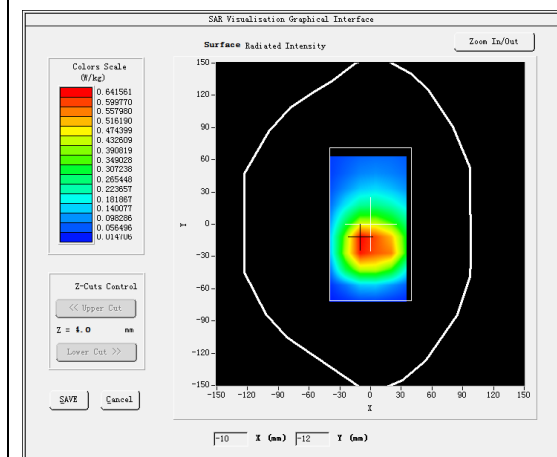
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>GSM850</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 4.0)</u>
<u>ConvF</u>	<u>2.32</u>

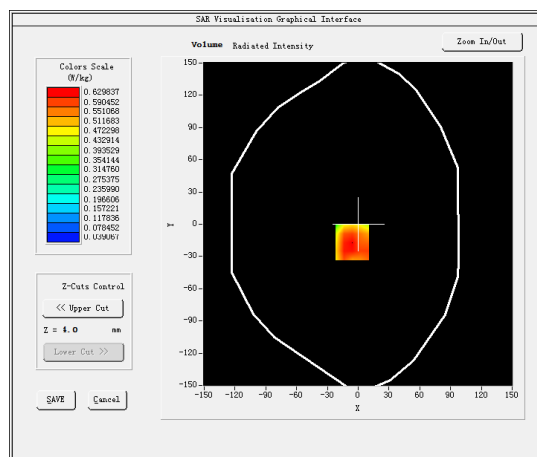
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	836.400000
<b>Relative permittivity (real part)</b>	42.245388
<b>Relative permittivity (imaginary part)</b>	19.285604
<b>Conductivity (S/m)</b>	0.896138
<b>Variation (%)</b>	-4.730000

#### SURFACE SAR



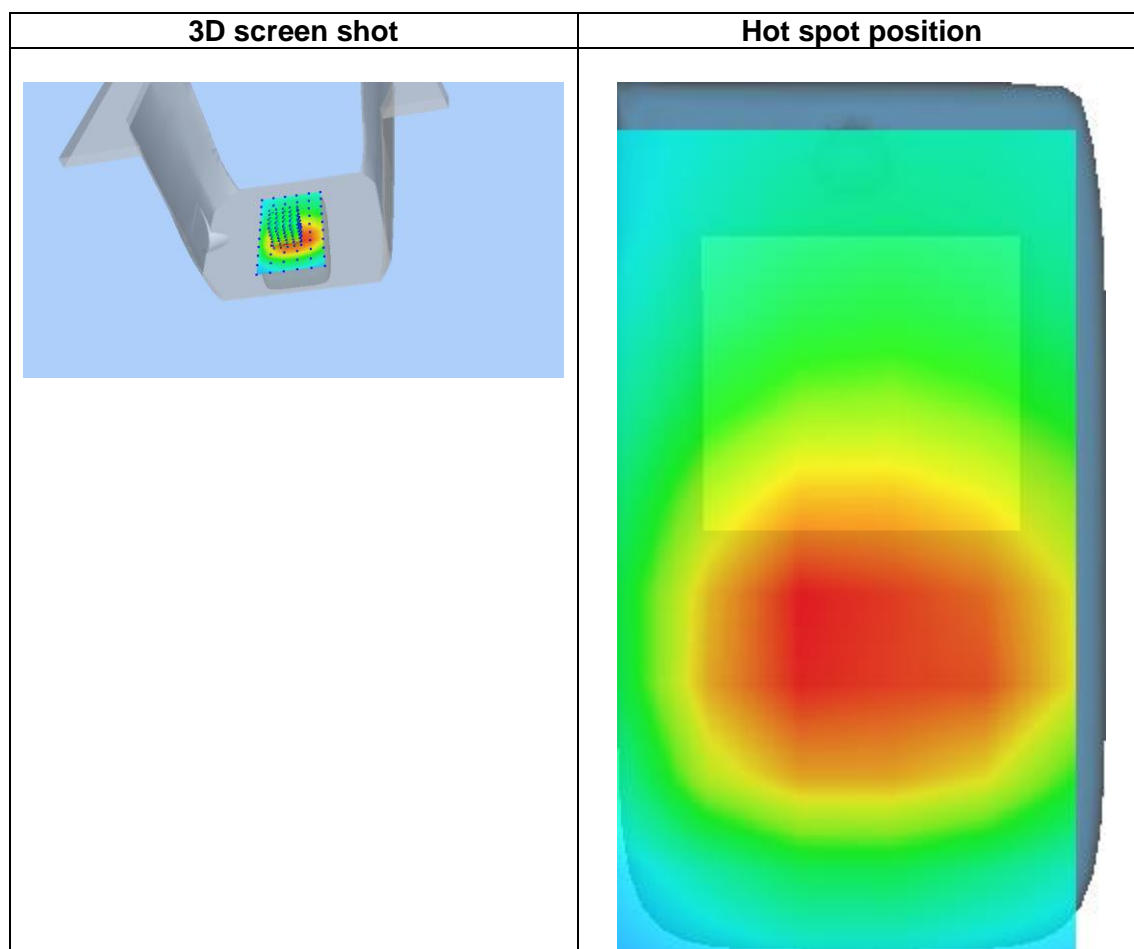
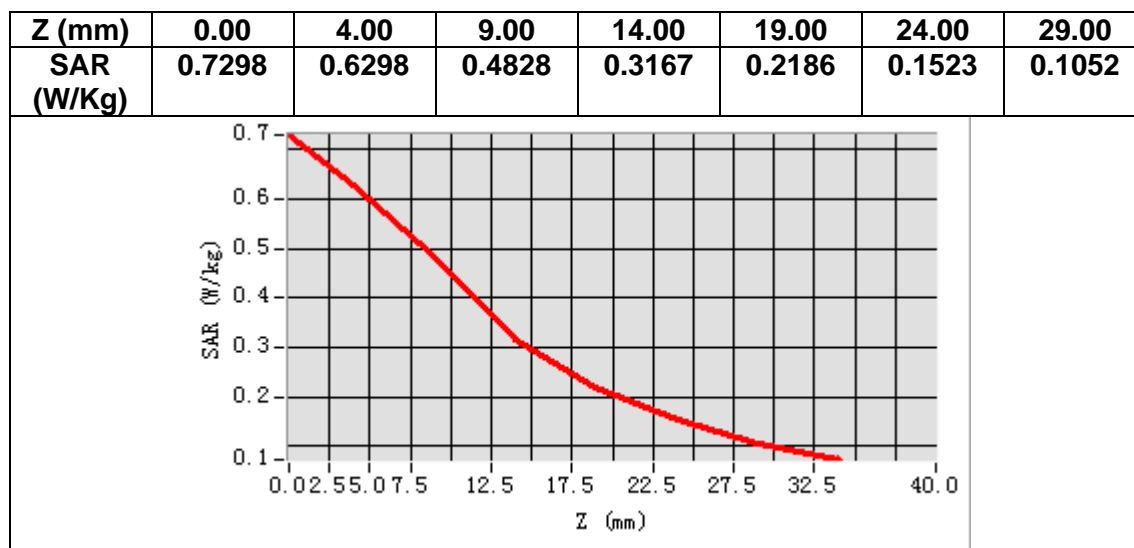
#### VOLUME SAR



Maximum location: X=-6.00, Y=-17.00

SAR Peak: 0.92 W/kg

<b>SAR 10g (W/Kg)</b>	0.412359
<b>SAR 1g (W/Kg)</b>	0.618859



## MEASUREMENT 3

Date of measurement: 18/4/2024

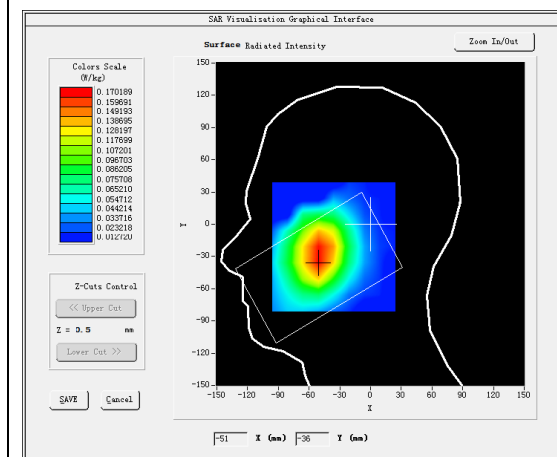
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>GSM900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 2.0)</u>
<u>ConvF</u>	<u>2.23</u>

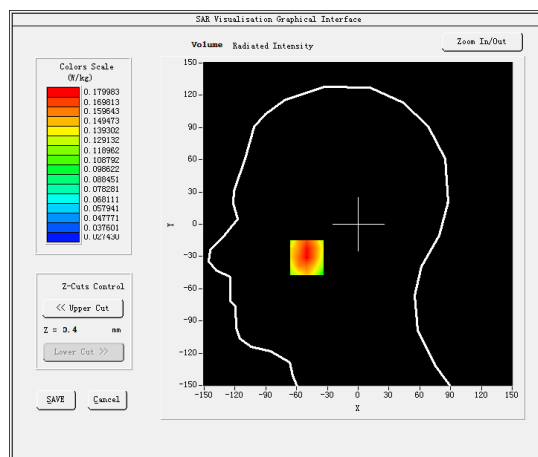
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	897.600000
<b>Relative permittivity (real part)</b>	41.446068
<b>Relative permittivity (imaginary part)</b>	19.614885
<b>Conductivity (S/m)</b>	0.978129
<b>Variation (%)</b>	1.310000

#### SURFACE SAR



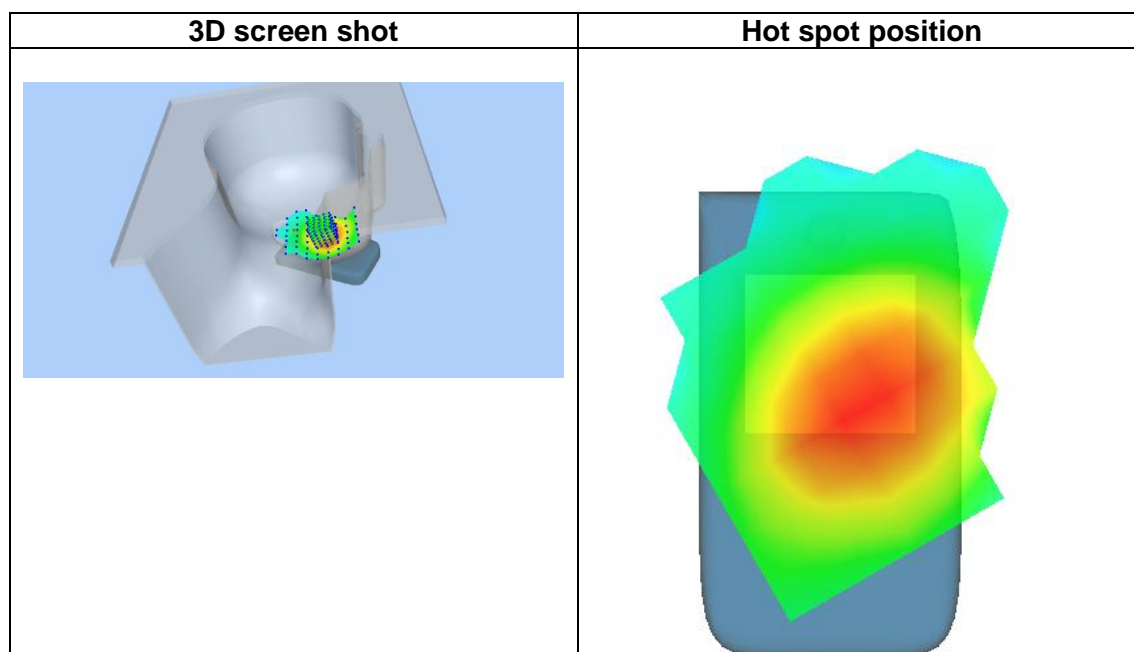
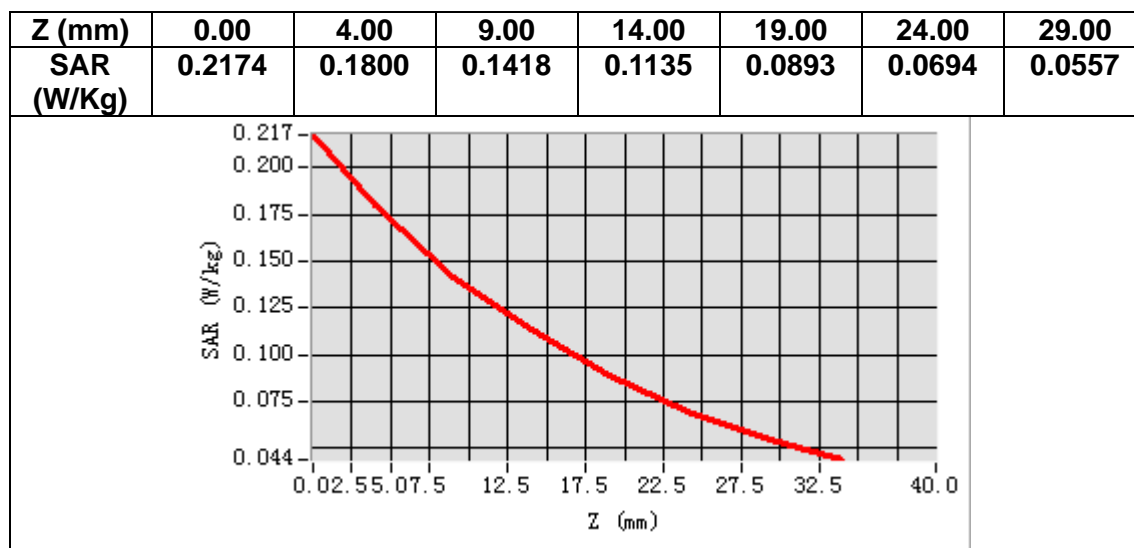
#### VOLUME SAR



Maximum location: X=-50.00, Y=-31.00

SAR Peak: 0.22 W/kg

<b>SAR 10g (W/Kg)</b>	0.128410
<b>SAR 1g (W/Kg)</b>	0.173667



## MEASUREMENT 4

Date of measurement: 18/4/2024

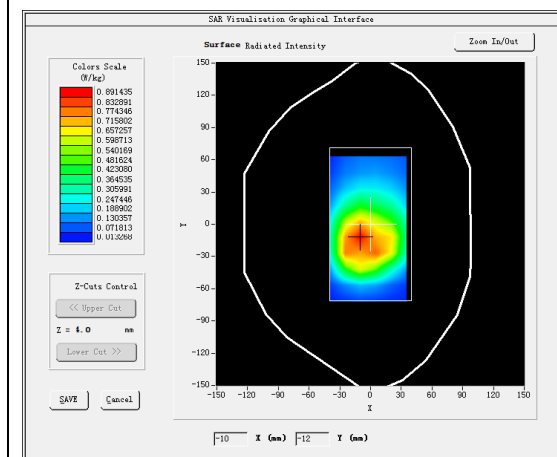
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>GSM900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 2.0)</u>
<u>ConvF</u>	<u>2.23</u>

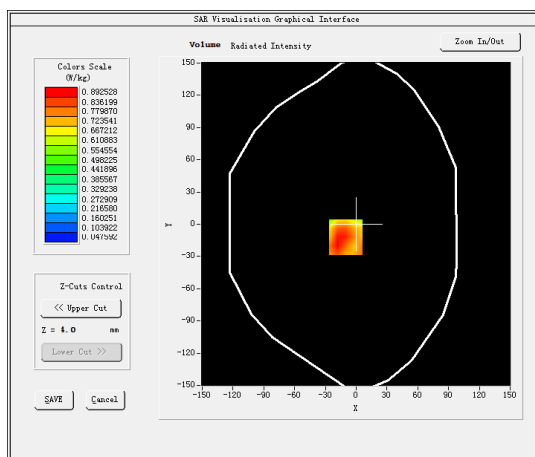
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	897.600000
<b>Relative permittivity (real part)</b>	41.446068
<b>Relative permittivity (imaginary part)</b>	19.614885
<b>Conductivity (S/m)</b>	0.978129
<b>Variation (%)</b>	-0.810000

#### SURFACE SAR



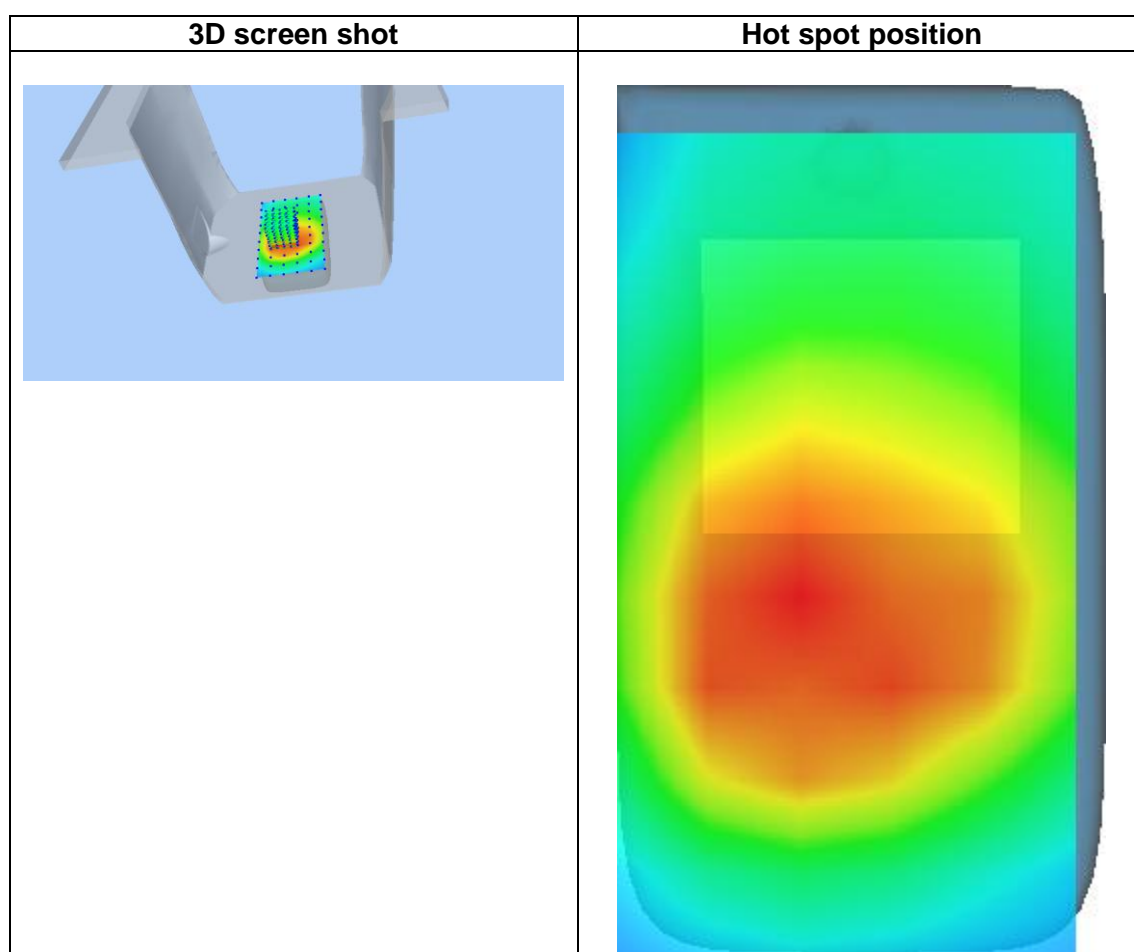
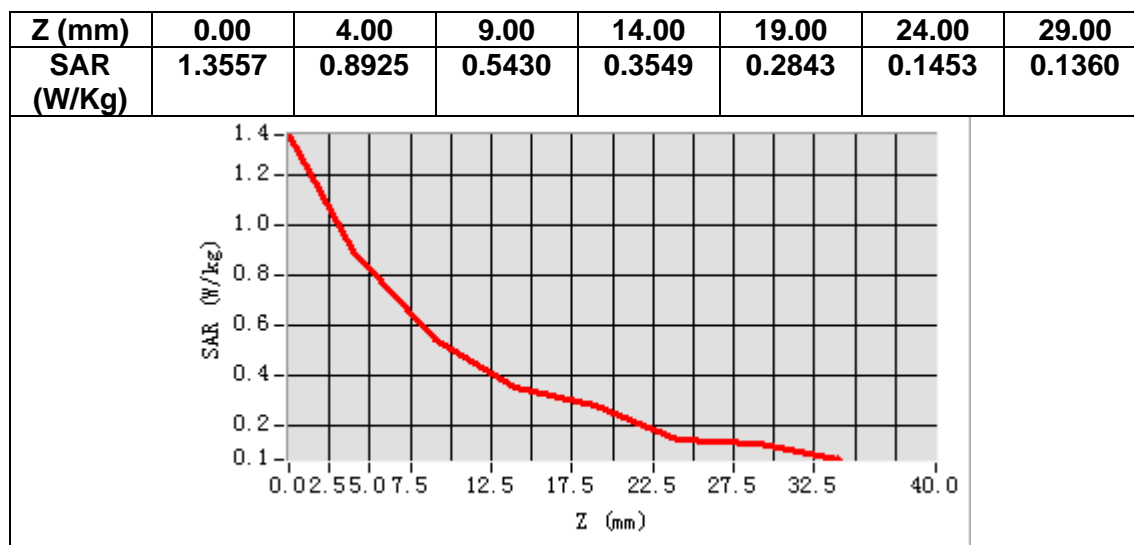
#### VOLUME SAR



Maximum location: X=-10.00, Y=-12.00

SAR Peak: 1.32 W/kg

<b>SAR 10g (W/Kg)</b>	0.559772
<b>SAR 1g (W/Kg)</b>	0.876993



## MEASUREMENT 5

Date of measurement: 24/4/2024

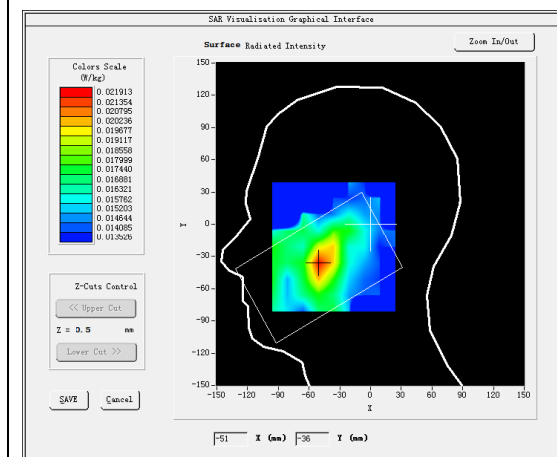
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>GSM1800</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 2.0)</u>
<u>ConvF</u>	<u>2.45</u>

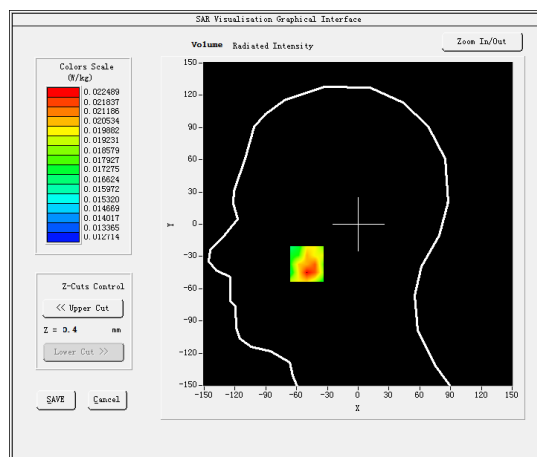
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1747.400000
<b>Relative permittivity (real part)</b>	39.408344
<b>Relative permittivity (imaginary part)</b>	13.820385
<b>Conductivity (S/m)</b>	1.341652
<b>Variation (%)</b>	1.850000

#### SURFACE SAR



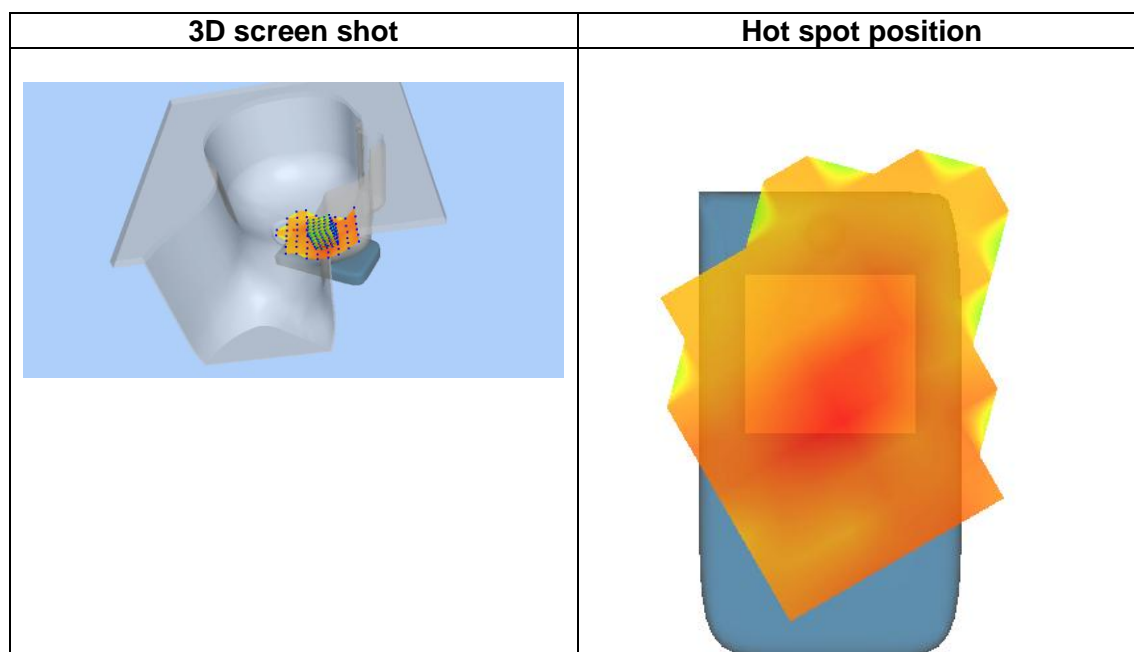
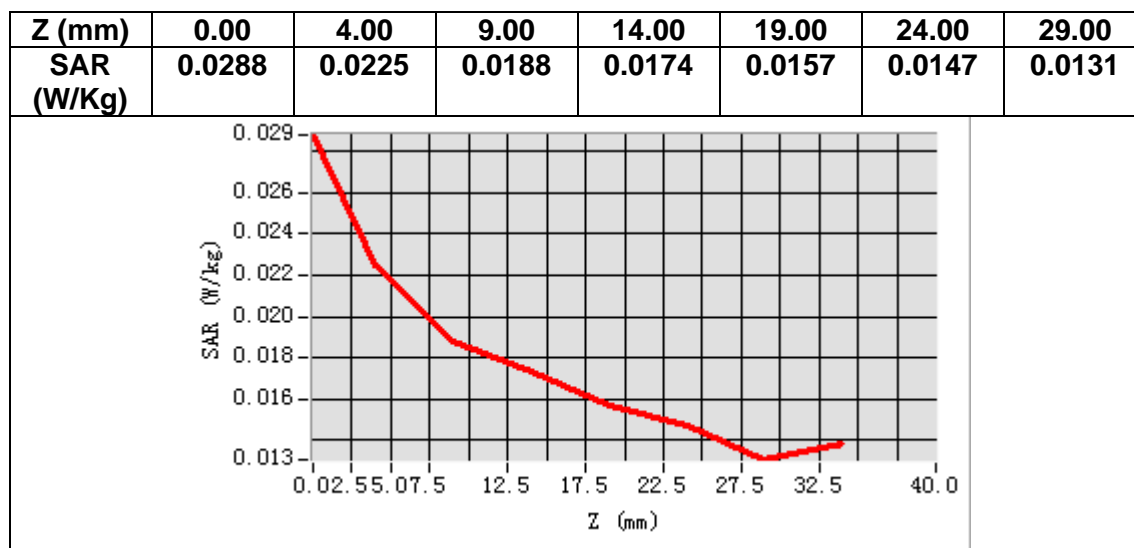
#### VOLUME SAR



Maximum location: X=-50.00, Y=-37.00

SAR Peak: 0.03 W/kg

<b>SAR 10g (W/Kg)</b>	0.018304
<b>SAR 1g (W/Kg)</b>	0.022476



MEASUREMENT 6

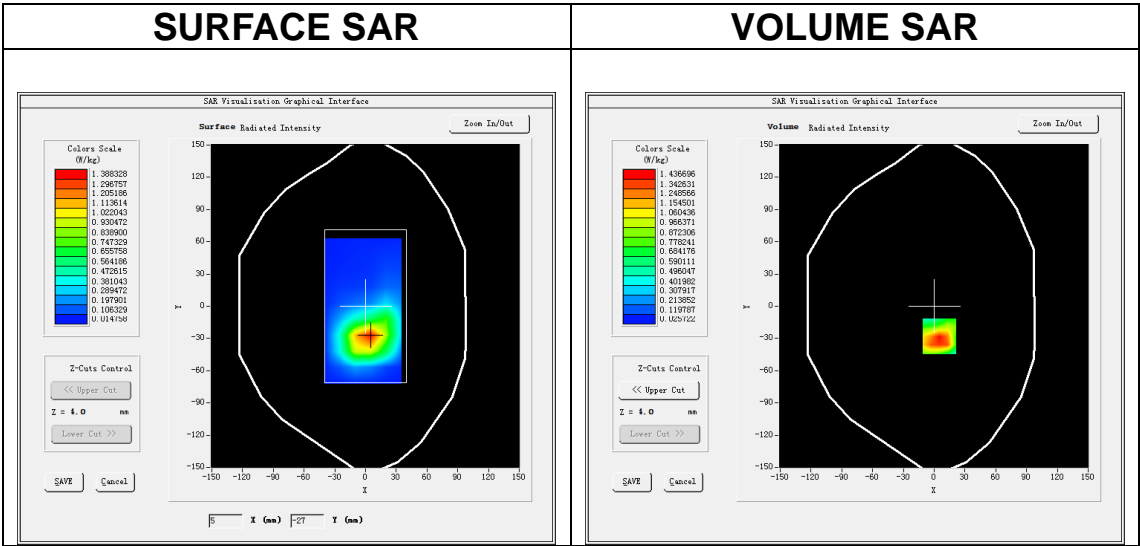
Date of measurement: 24/4/2024

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	GSM1800
Channels	Middle
Signal	TDMA (Crest factor: 2.0)
ConvF	2.45

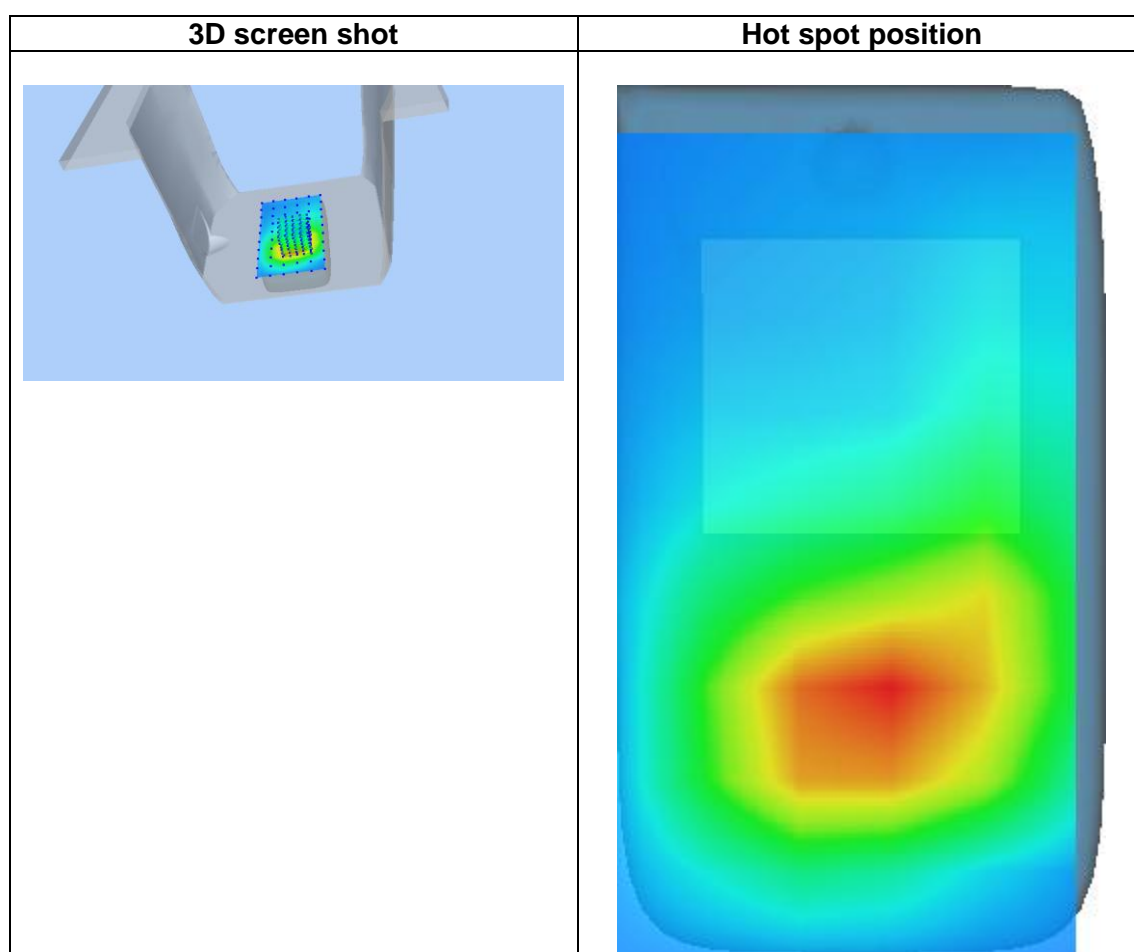
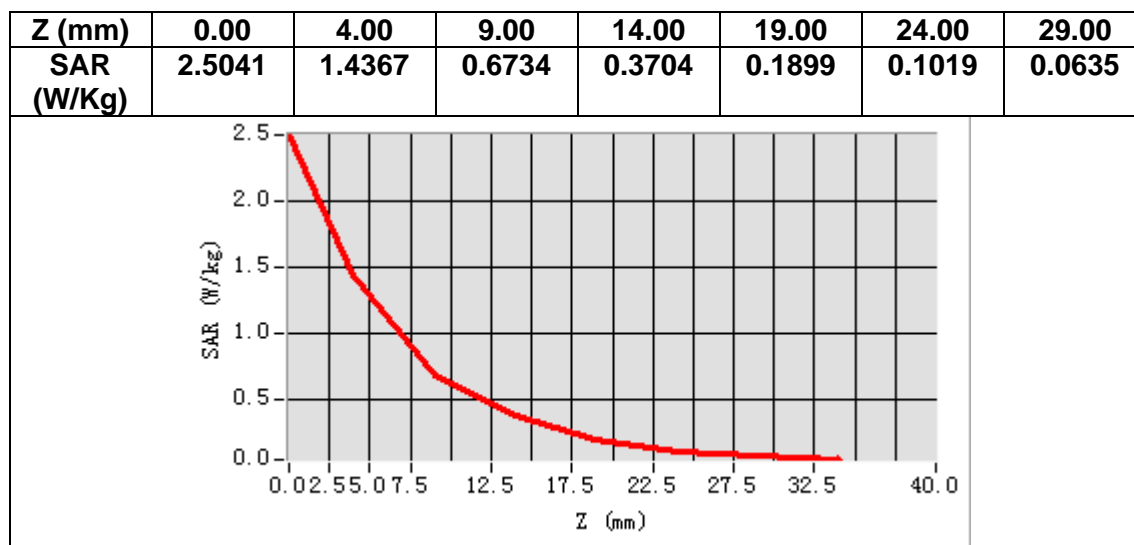
B. SAR Measurement Results

Frequency (MHz)	1747.400000
Relative permittivity (real part)	39.408344
Relative permittivity (imaginary part)	13.820385
Conductivity (S/m)	1.341652
Variation (%)	-2.660000



Maximum location: X=5.00, Y=-28.00  
SAR Peak: 2.73 W/kg

SAR 10g (W/Kg)	0.713610
SAR 1g (W/Kg)	1.437882



## MEASUREMENT 7

Date of measurement: 24/4/2024

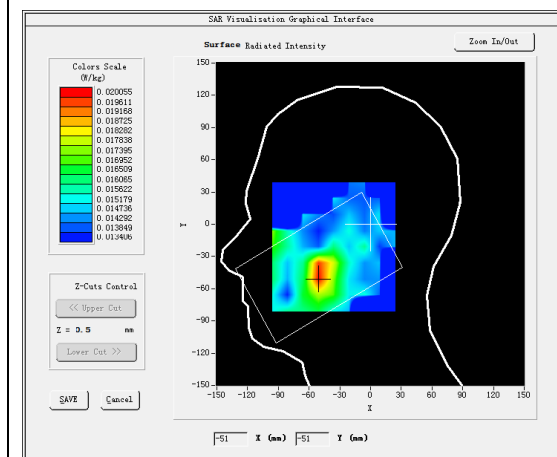
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>GSM1900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 2.7)</u>
<u>ConvF</u>	<u>2.63</u>

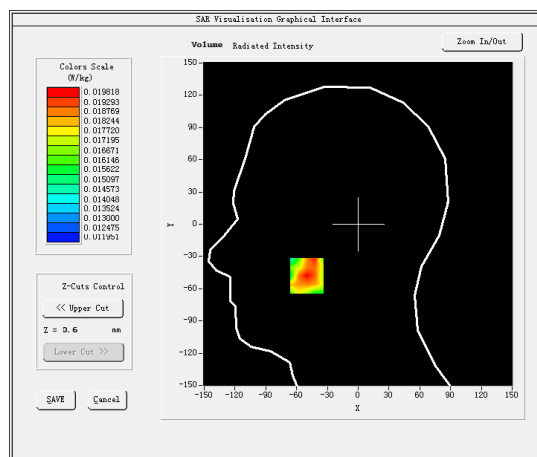
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1880.000000
<b>Relative permittivity (real part)</b>	38.631283
<b>Relative permittivity (imaginary part)</b>	13.744705
<b>Conductivity (S/m)</b>	1.435558
<b>Variation (%)</b>	-2.360000

#### SURFACE SAR



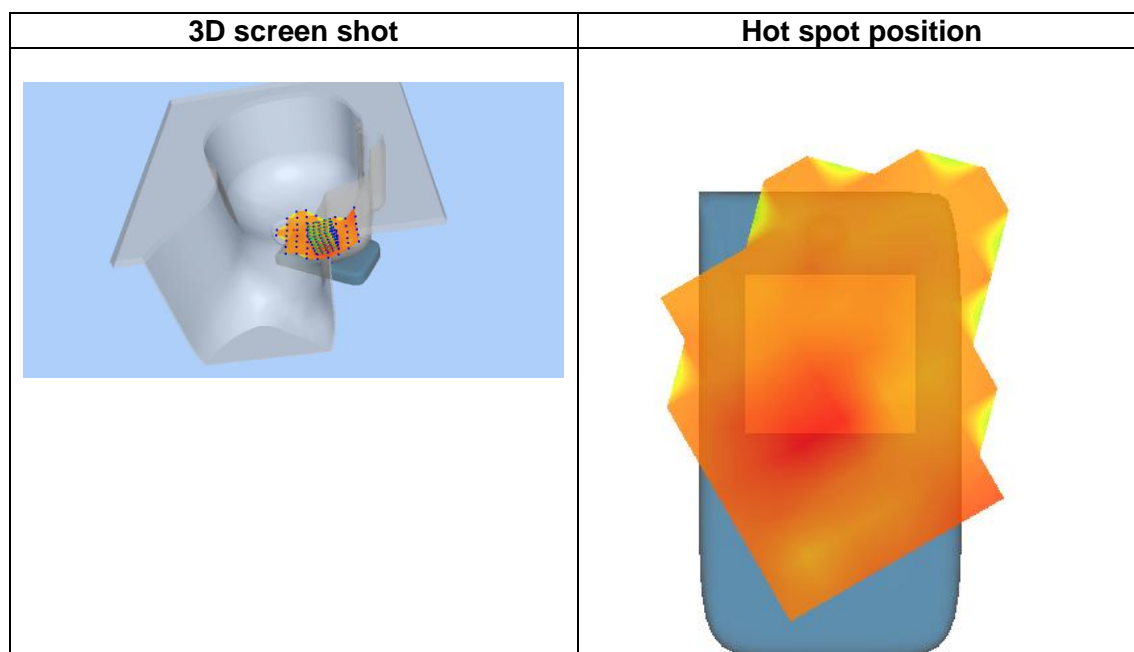
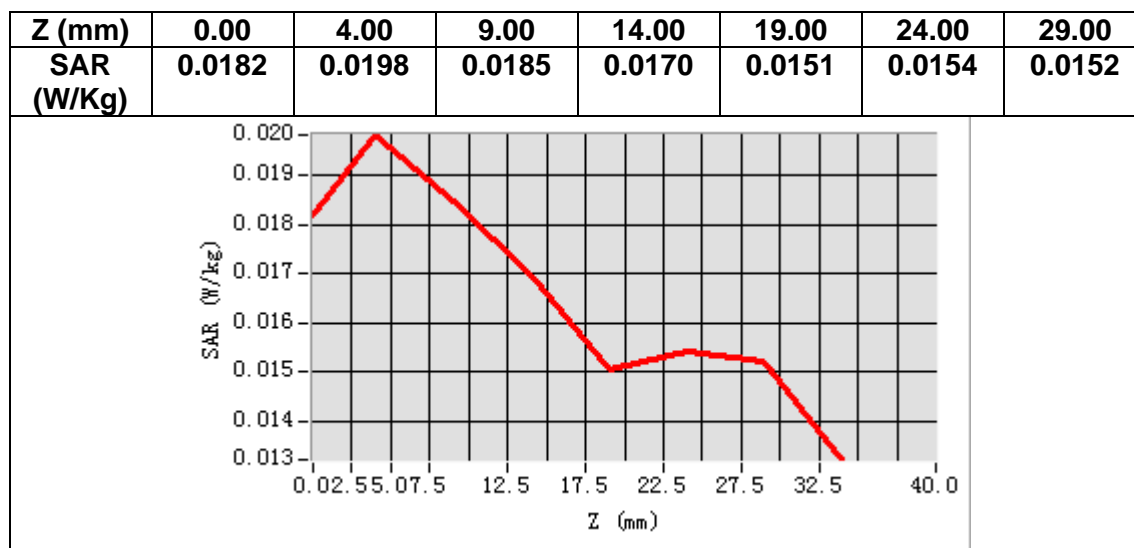
#### VOLUME SAR



Maximum location: X=-50.00, Y=-48.00

SAR Peak: 0.02 W/kg

<b>SAR 10g (W/Kg)</b>	0.017235
<b>SAR 1g (W/Kg)</b>	0.020148



## MEASUREMENT 8

Date of measurement: 24/4/2024

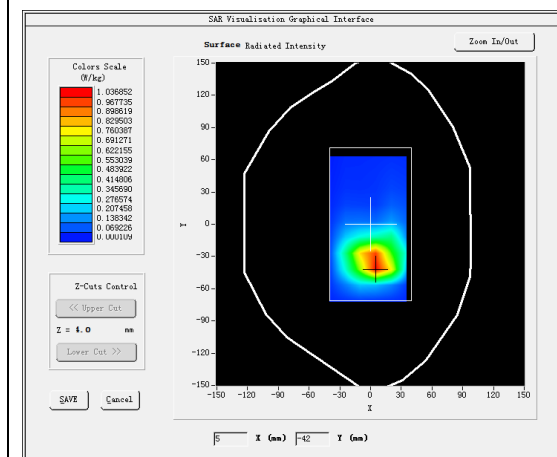
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>GSM1900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>TDMA (Crest factor: 2.7)</u>
<u>ConvF</u>	<u>2.63</u>

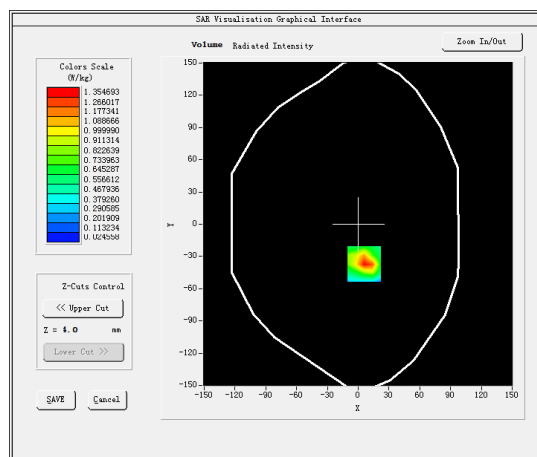
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1880.000000
<b>Relative permittivity (real part)</b>	38.631283
<b>Relative permittivity (imaginary part)</b>	13.744705
<b>Conductivity (S/m)</b>	1.435558
<b>Variation (%)</b>	2.020000

#### SURFACE SAR



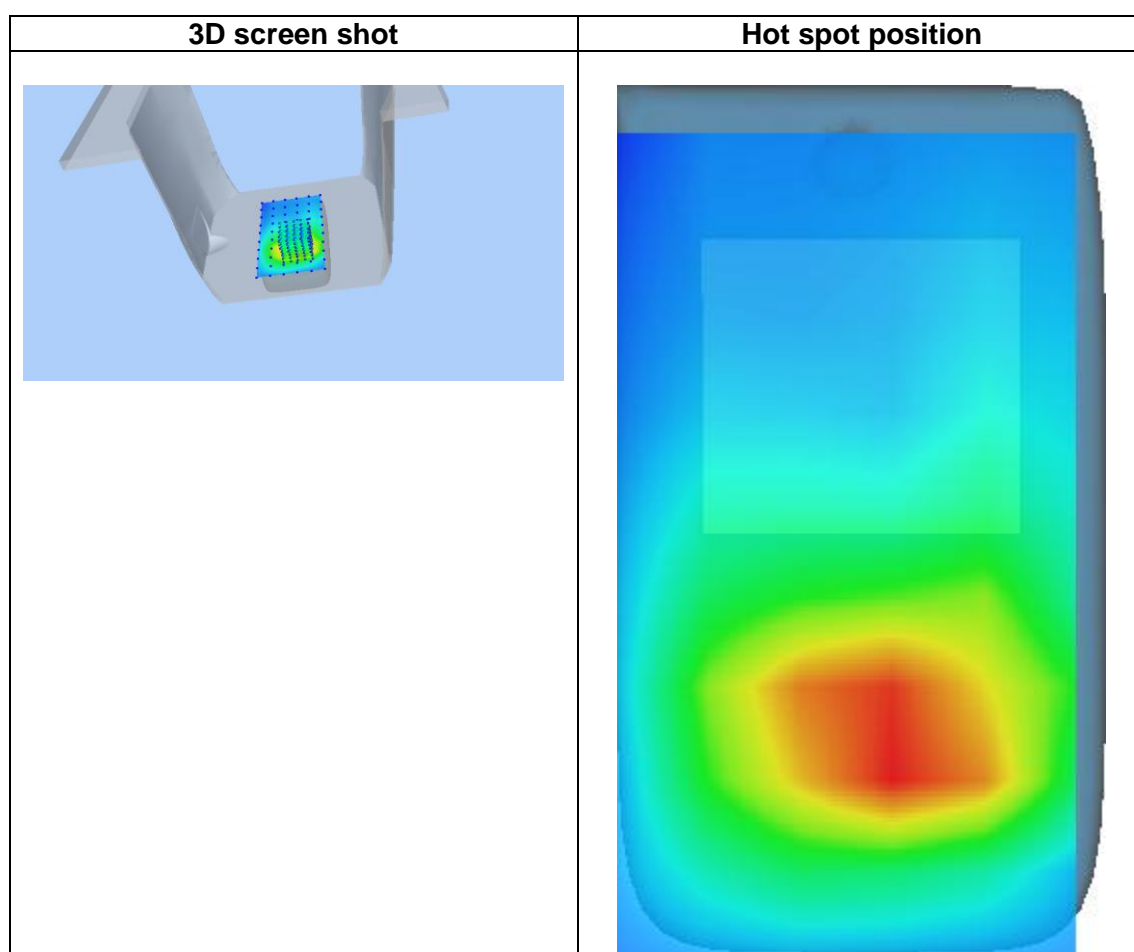
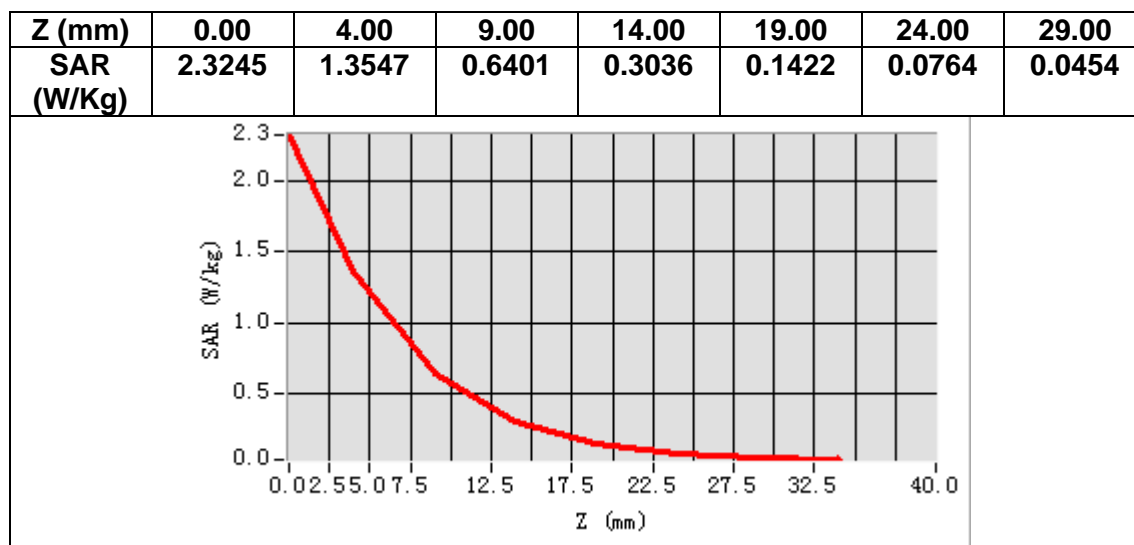
#### VOLUME SAR



Maximum location: X=6.00, Y=-37.00

SAR Peak: 2.49 W/kg

<b>SAR 10g (W/Kg)</b>	0.593752
<b>SAR 1g (W/Kg)</b>	1.304221



## MEASUREMENT 9

Date of measurement: 11/4/2024

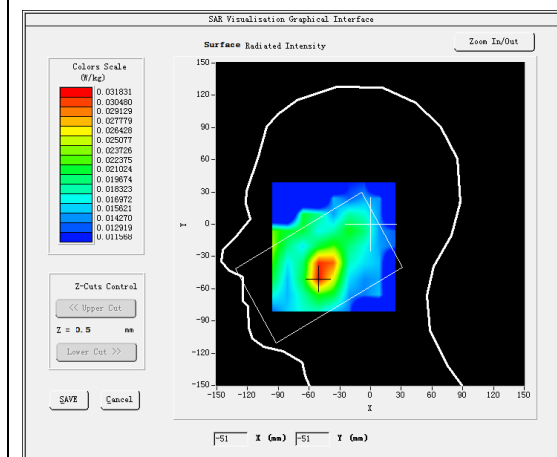
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>Band1_ UMTS</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.83</u>

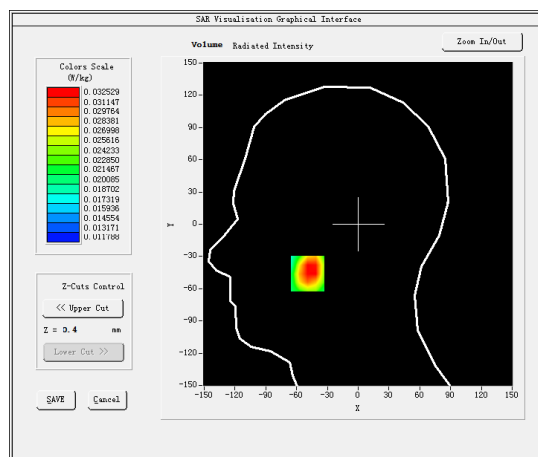
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1950.000000
<b>Relative permittivity (real part)</b>	38.743916
<b>Relative permittivity (imaginary part)</b>	12.920192
<b>Conductivity (S/m)</b>	1.399687
<b>Variation (%)</b>	-0.540000

#### SURFACE SAR



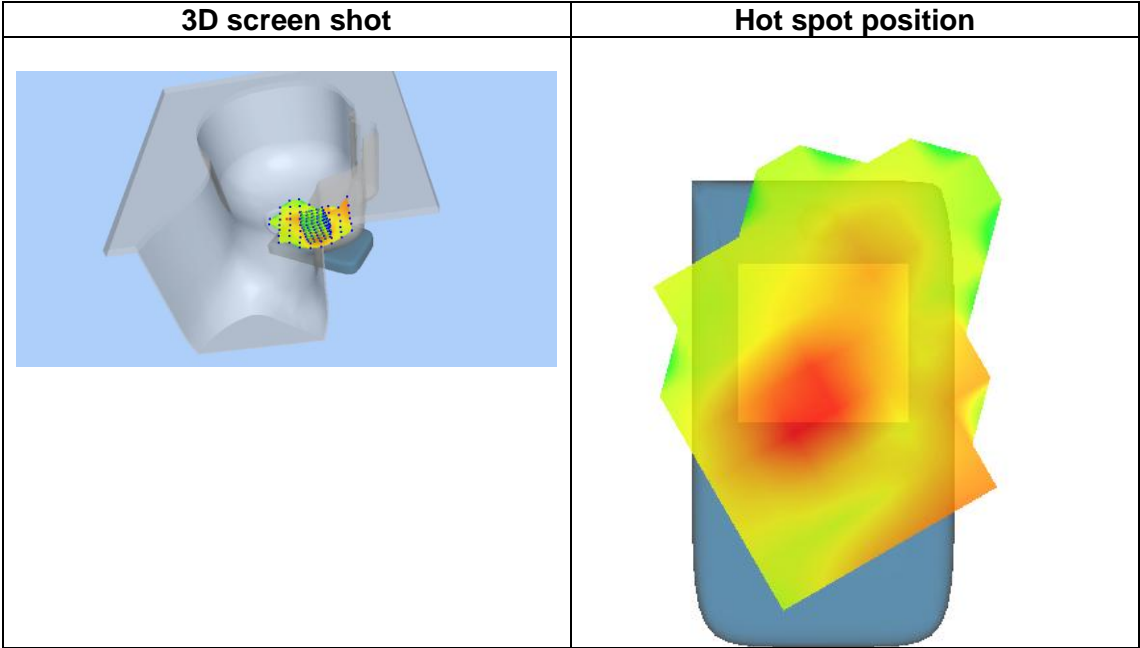
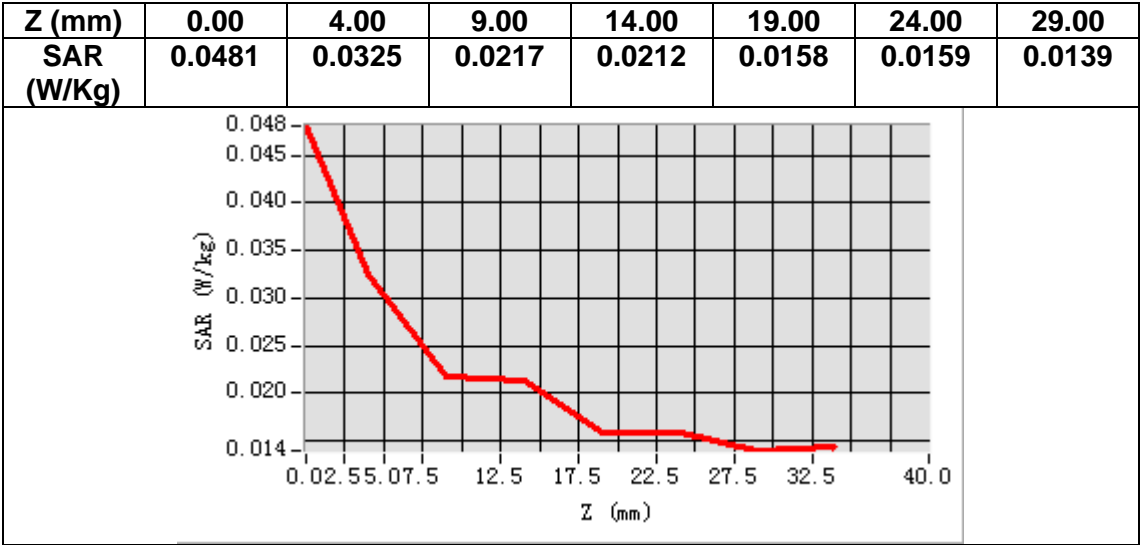
#### VOLUME SAR



Maximum location: X=-49.00, Y=-46.00

SAR Peak: 0.05 W/kg

<b>SAR 10g (W/Kg)</b>	0.023639
<b>SAR 1g (W/Kg)</b>	0.032763



## MEASUREMENT 10

Date of measurement: 11/4/2024

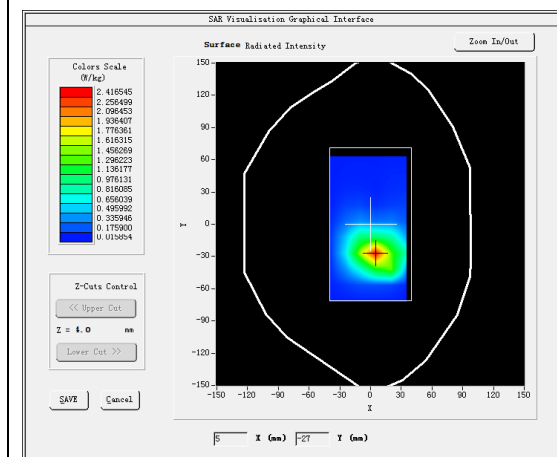
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>Band1_ UMTS</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.83</u>

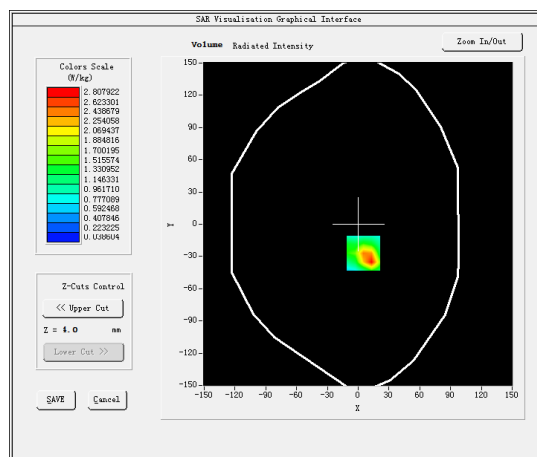
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1950.000000
<b>Relative permittivity (real part)</b>	38.743916
<b>Relative permittivity (imaginary part)</b>	12.920192
<b>Conductivity (S/m)</b>	1.399687
<b>Variation (%)</b>	4.100000

#### SURFACE SAR



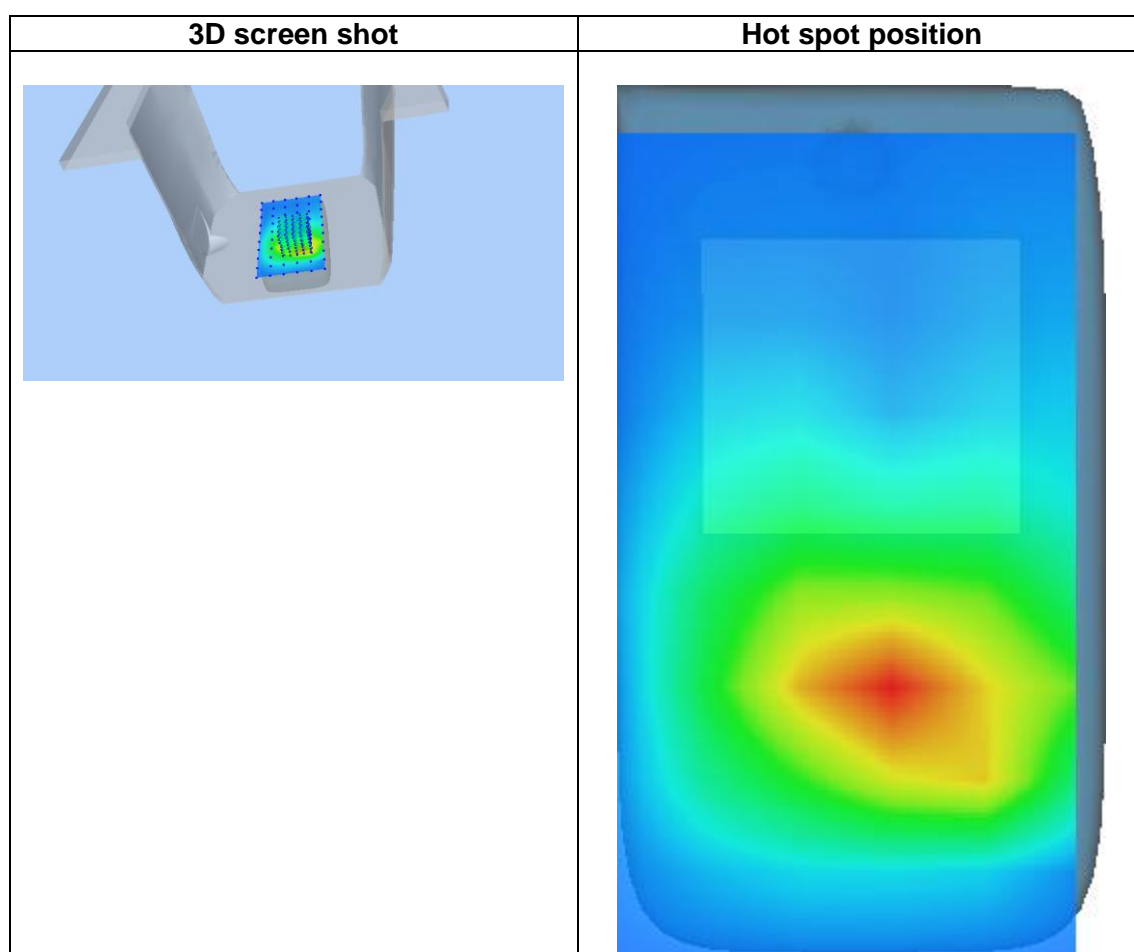
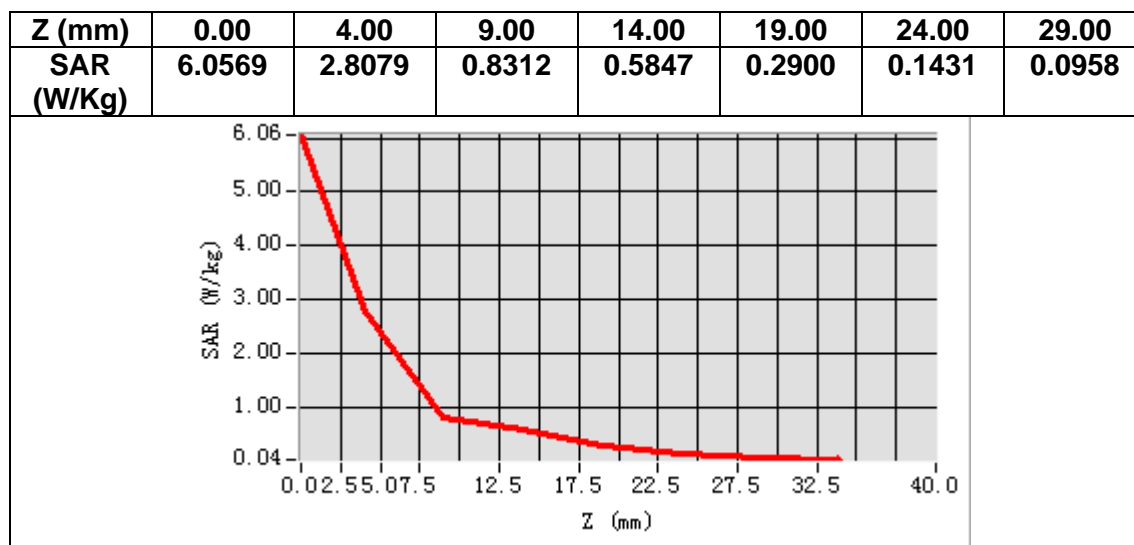
#### VOLUME SAR



Maximum location: X=5.00, Y=-27.00

SAR Peak: 5.27 W/kg

<b>SAR 10g (W/Kg)</b>	1.136909
<b>SAR 1g (W/Kg)</b>	2.643209



## MEASUREMENT 11

Date of measurement: 18/4/2024

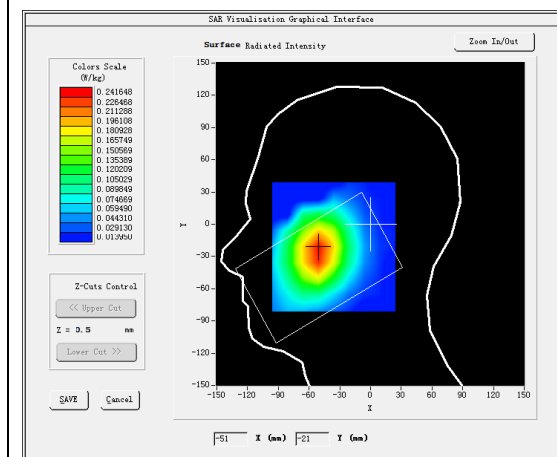
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>Band8_WCDMA900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

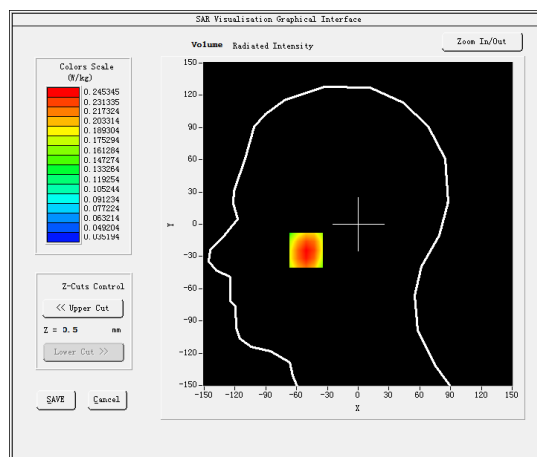
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	897.600000
<b>Relative permittivity (real part)</b>	41.446068
<b>Relative permittivity (imaginary part)</b>	19.614885
<b>Conductivity (S/m)</b>	0.978129
<b>Variation (%)</b>	-3.950000

#### SURFACE SAR



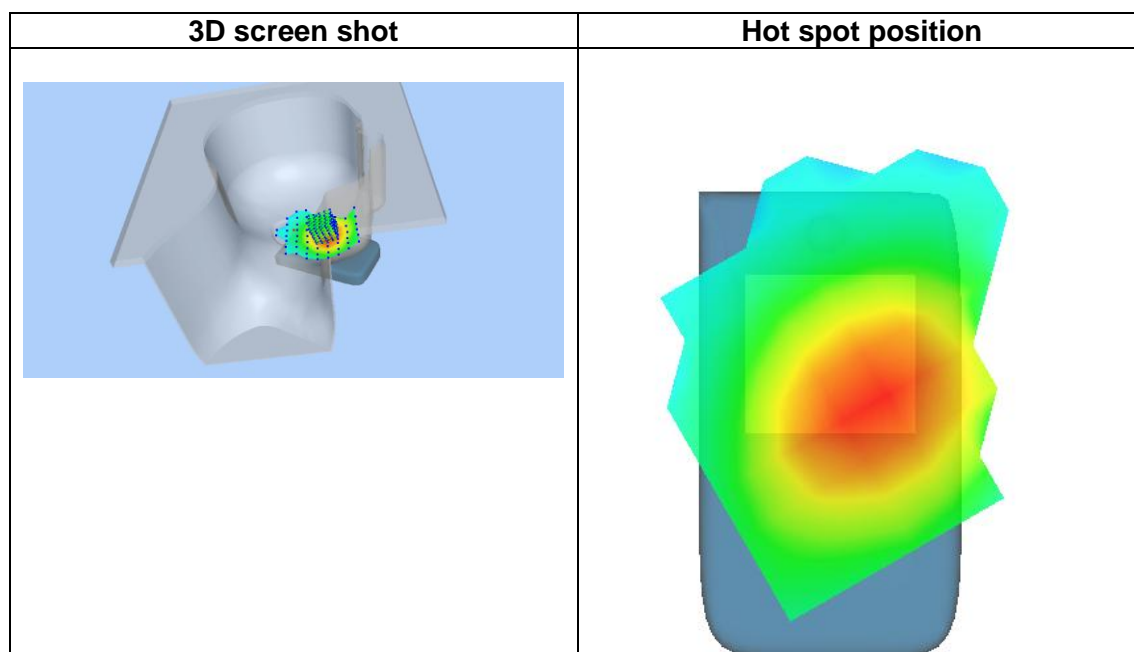
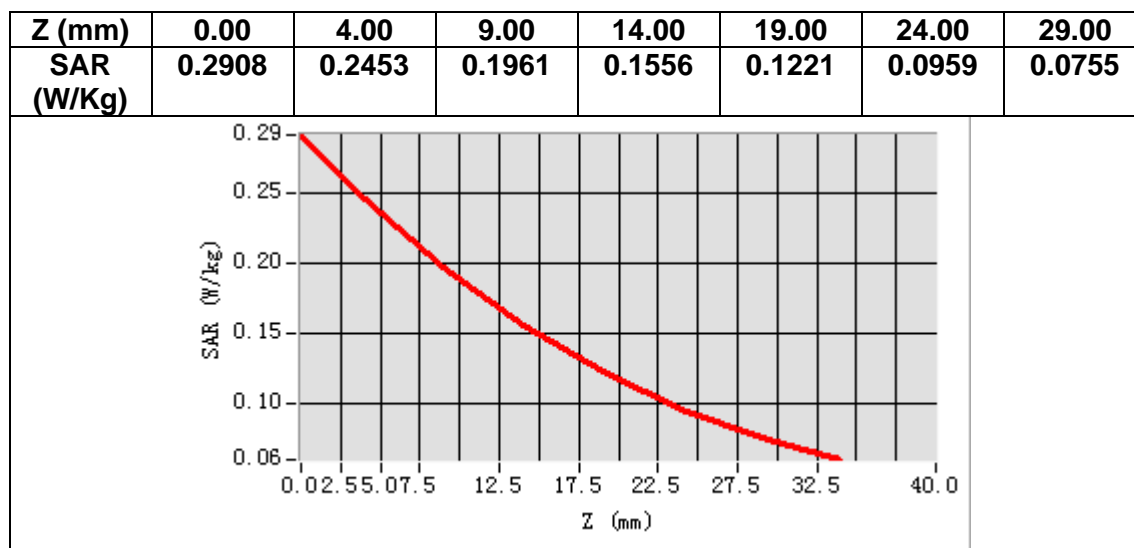
#### VOLUME SAR



Maximum location: X=-51.00, Y=-24.00

SAR Peak: 0.30 W/kg

<b>SAR 10g (W/Kg)</b>	0.176353
<b>SAR 1g (W/Kg)</b>	0.238848



## MEASUREMENT 12

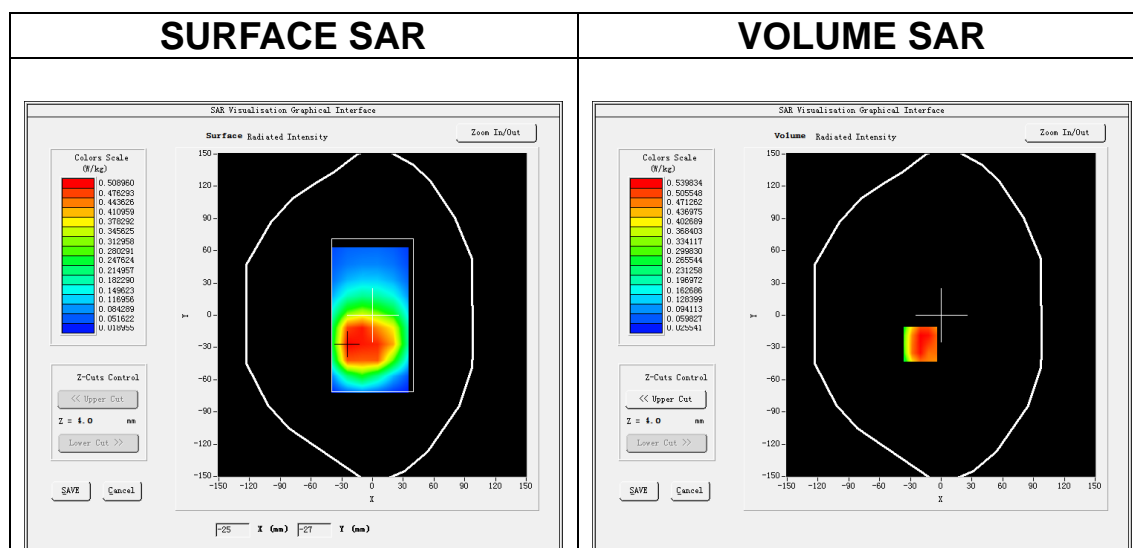
Date of measurement: 18/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>Band8_WCDMA900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

### B. SAR Measurement Results

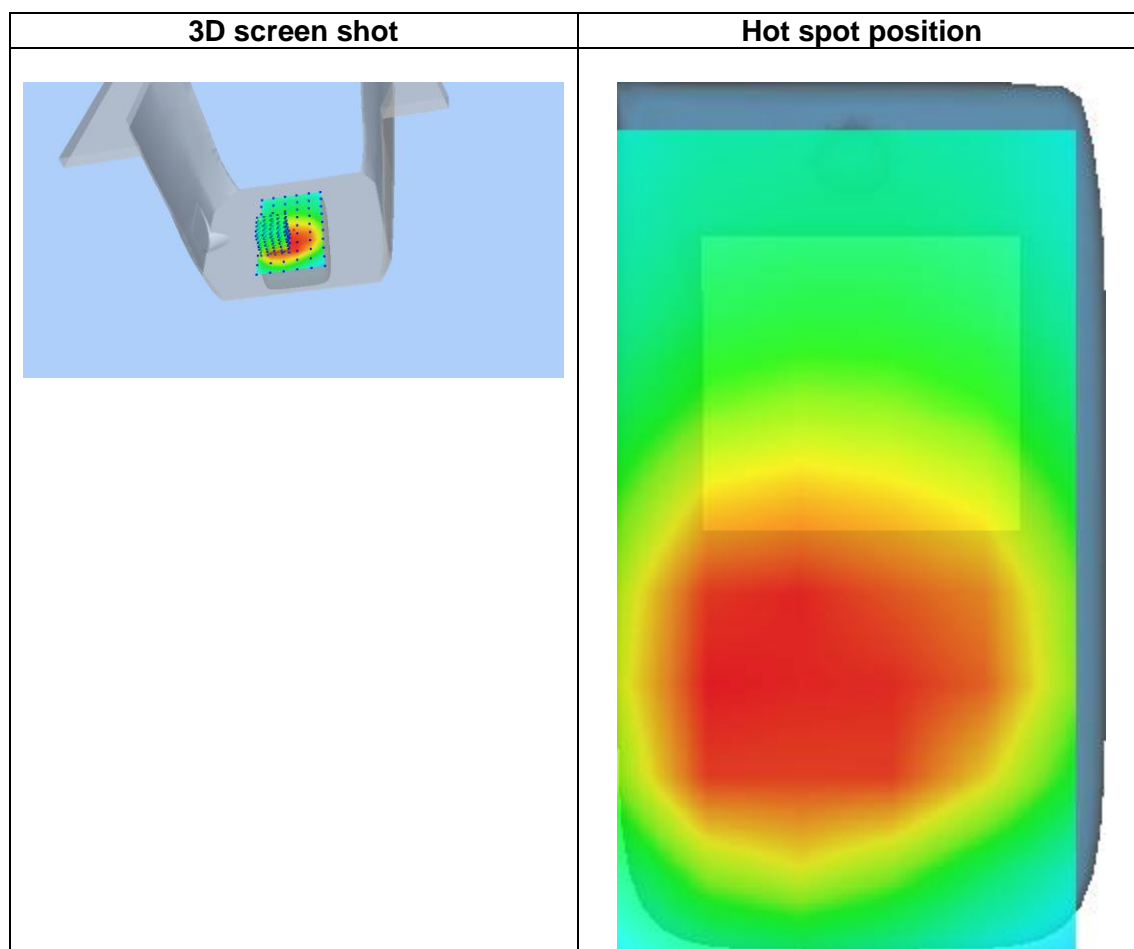
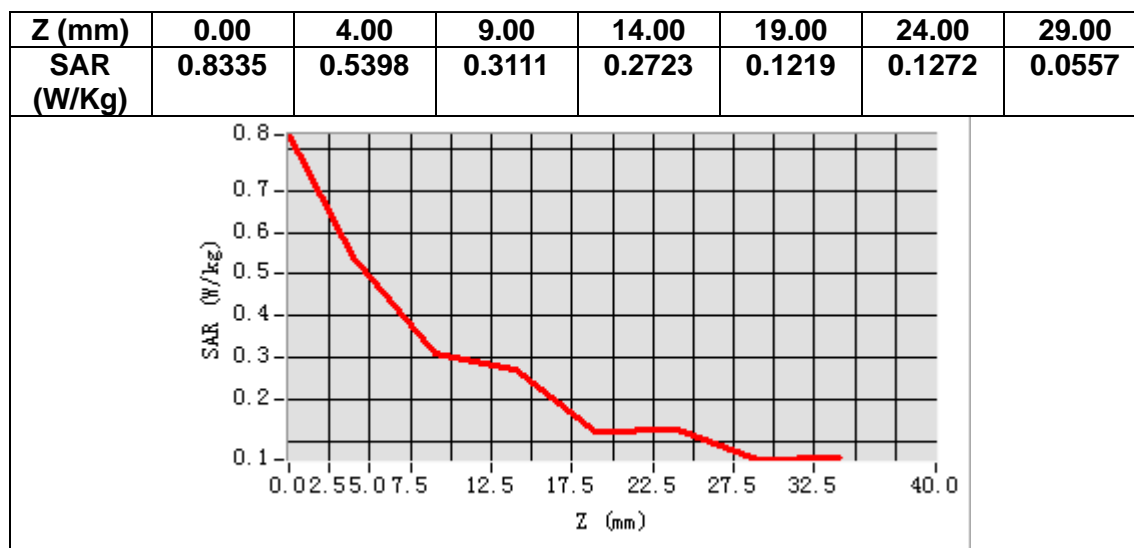
<b>Frequency (MHz)</b>	897.600000
<b>Relative permittivity (real part)</b>	41.446068
<b>Relative permittivity (imaginary part)</b>	19.614885
<b>Conductivity (S/m)</b>	0.978129
<b>Variation (%)</b>	-0.590000



Maximum location: X=-20.00, Y=-27.00

SAR Peak: 0.83 W/kg

<b>SAR 10g (W/Kg)</b>	0.350934
<b>SAR 1g (W/Kg)</b>	0.541180



## MEASUREMENT 13

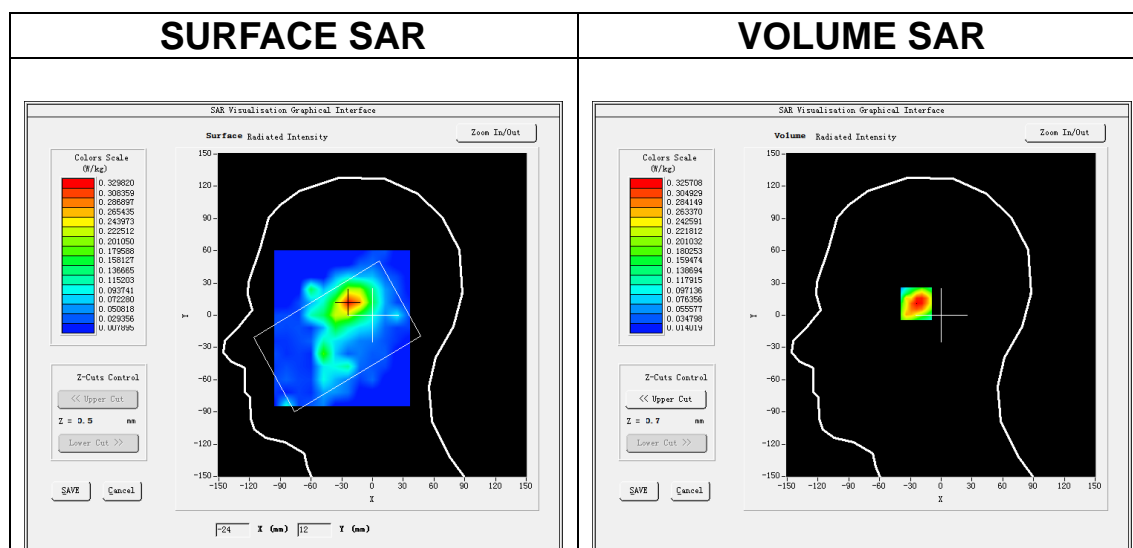
Date of measurement: 12/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>IEEE 802.11b ISM</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11b (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

### B. SAR Measurement Results

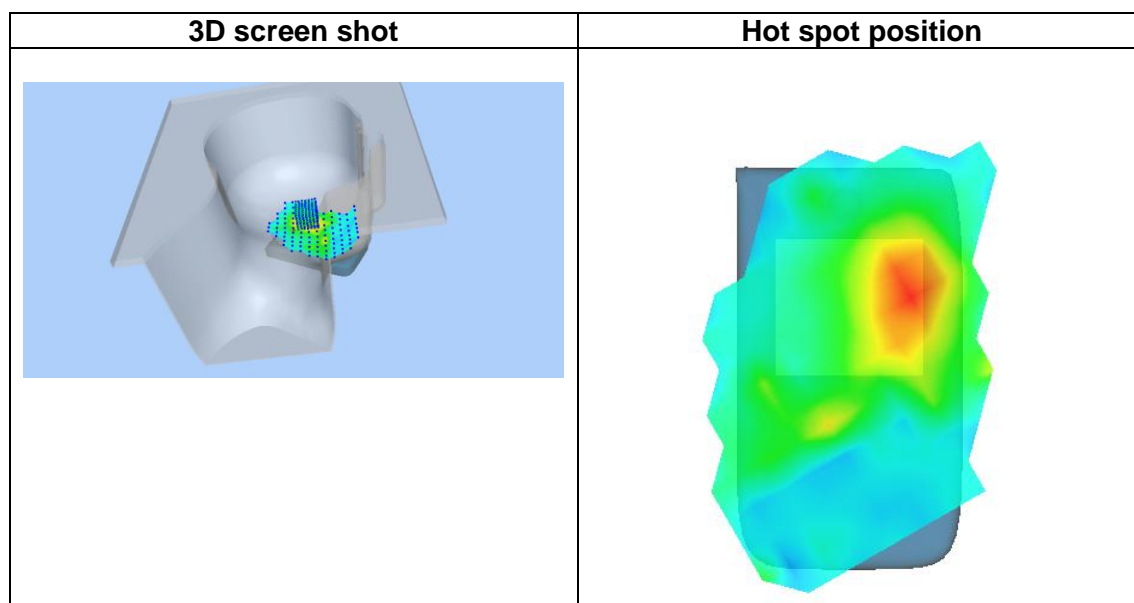
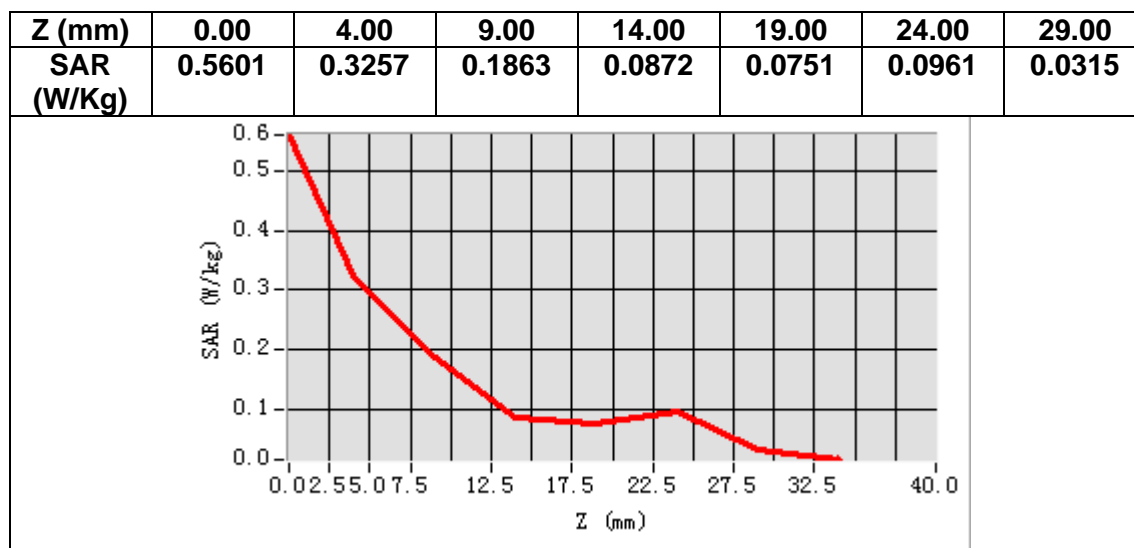
<b>Frequency (MHz)</b>	2442.000000
<b>Relative permittivity (real part)</b>	37.749935
<b>Relative permittivity (imaginary part)</b>	12.889278
<b>Conductivity (S/m)</b>	1.748645
<b>Variation (%)</b>	4.860000



Maximum location: X=-23.00, Y=12.00

SAR Peak: 0.56 W/kg

<b>SAR 10g (W/Kg)</b>	0.166265
<b>SAR 1g (W/Kg)</b>	0.307997



## MEASUREMENT 14

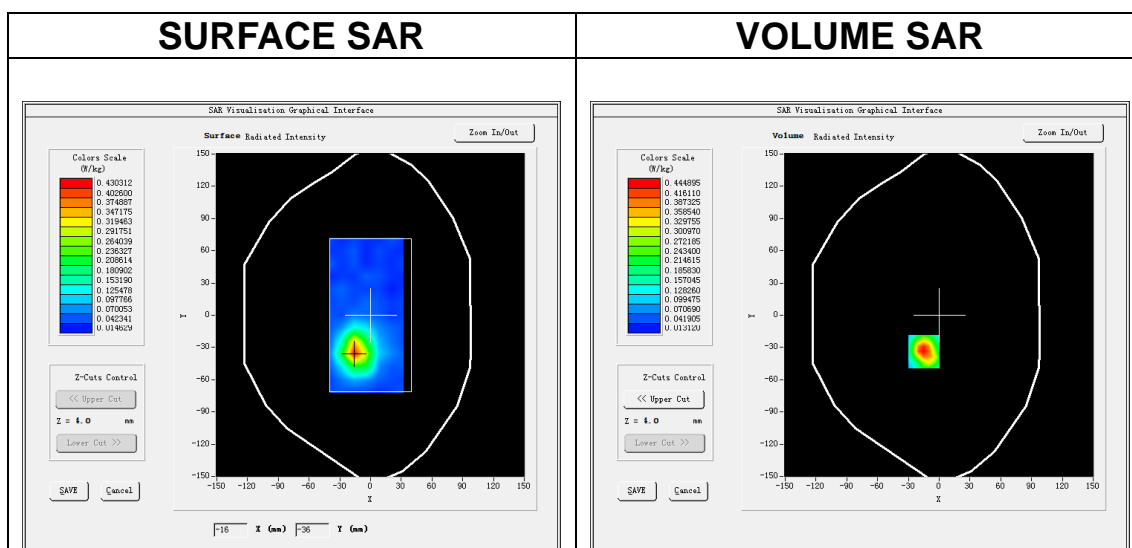
Date of measurement: 12/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7, dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11b ISM</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11b (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

### B. SAR Measurement Results

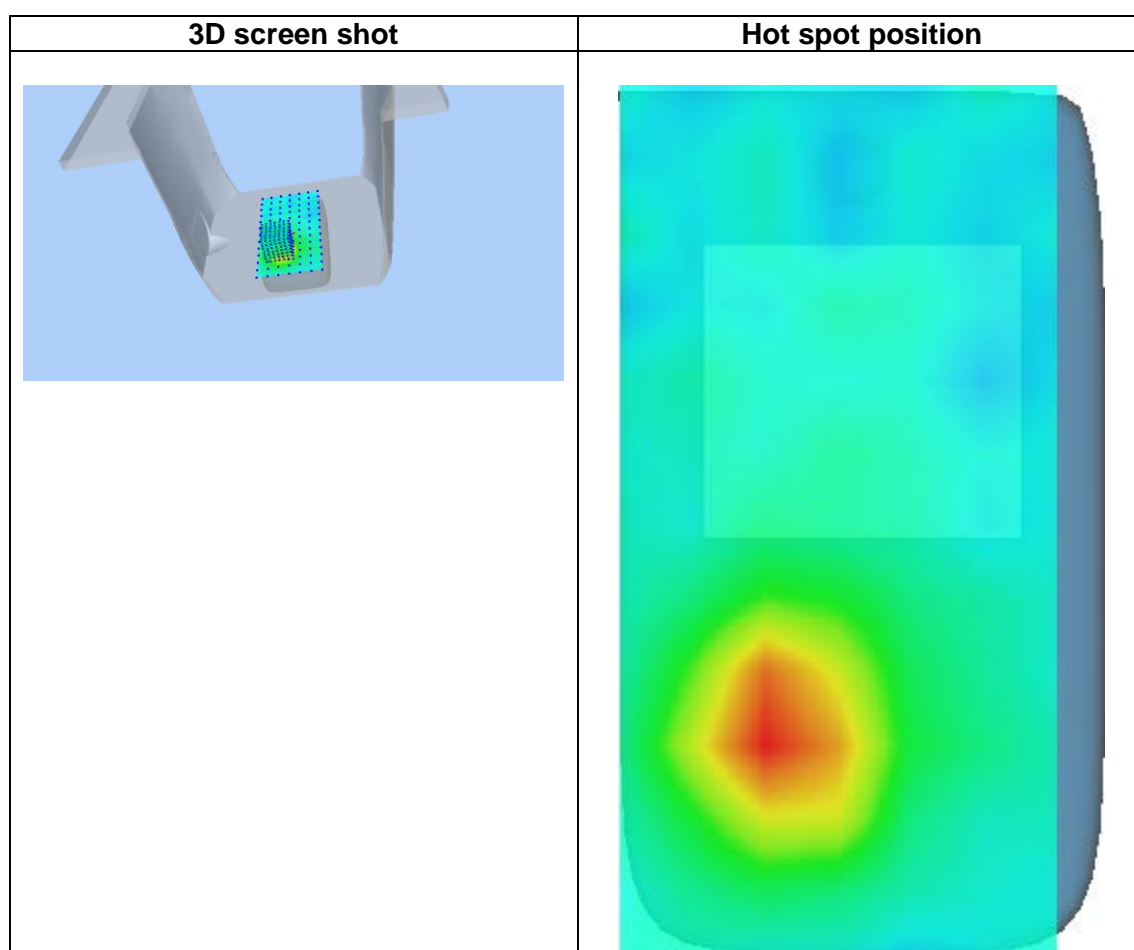
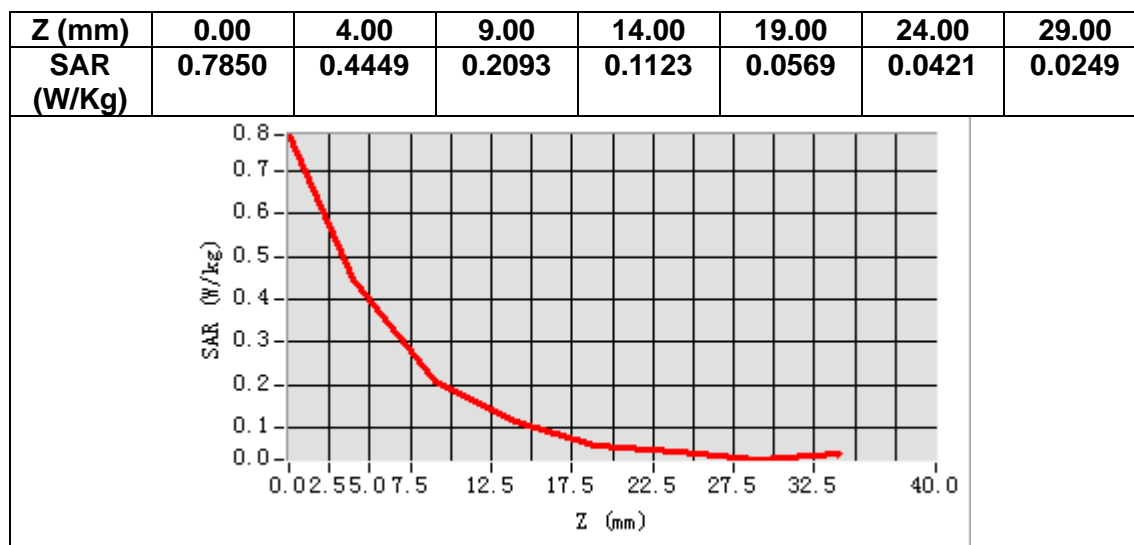
<b>Frequency (MHz)</b>	2442.000000
<b>Relative permittivity (real part)</b>	37.749935
<b>Relative permittivity (imaginary part)</b>	12.889278
<b>Conductivity (S/m)</b>	1.748645
<b>Variation (%)</b>	-1.130000



Maximum location: X=-15.00, Y=-34.00

SAR Peak: 0.78 W/kg

<b>SAR 10g (W/Kg)</b>	0.197510
<b>SAR 1g (W/Kg)</b>	0.417602



MEASUREMENT 15

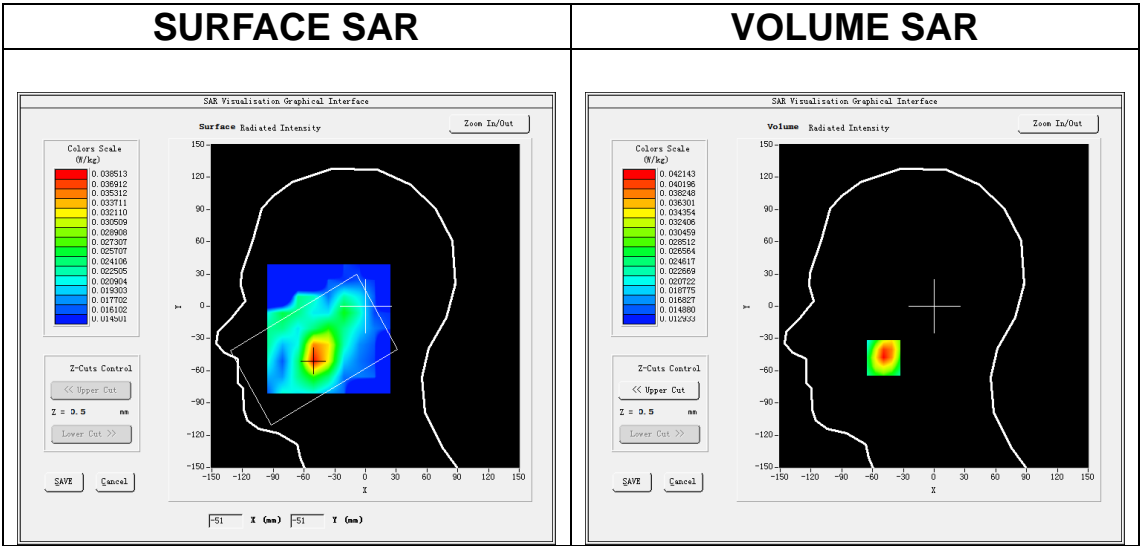
Date of measurement: 11/4/2024

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 1
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.83

B. SAR Measurement Results

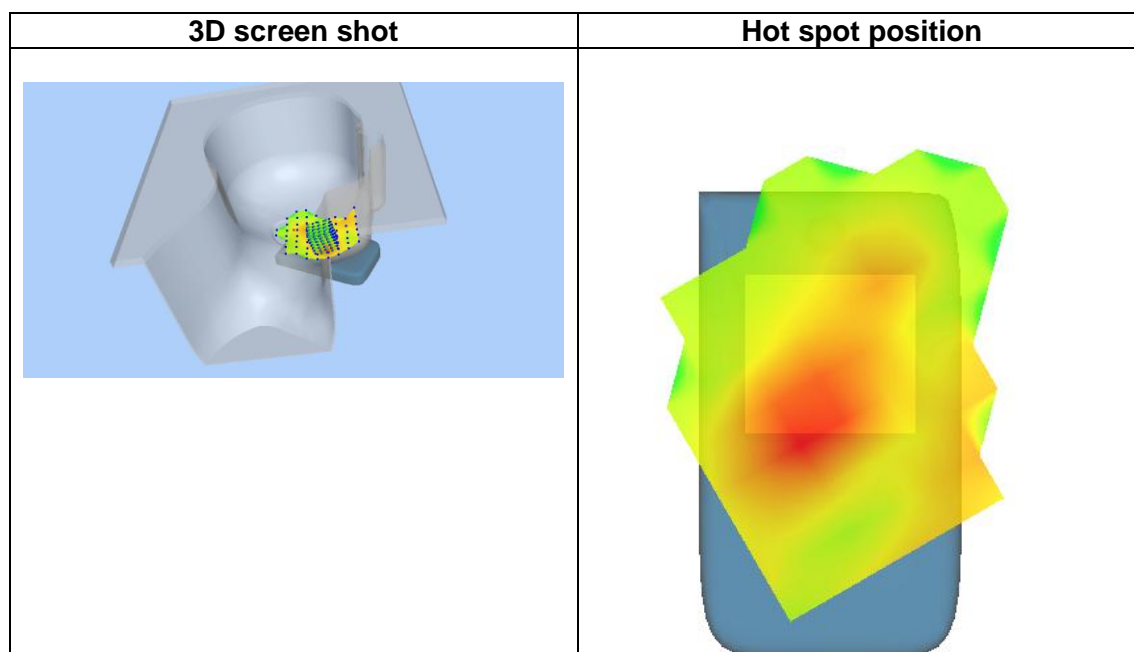
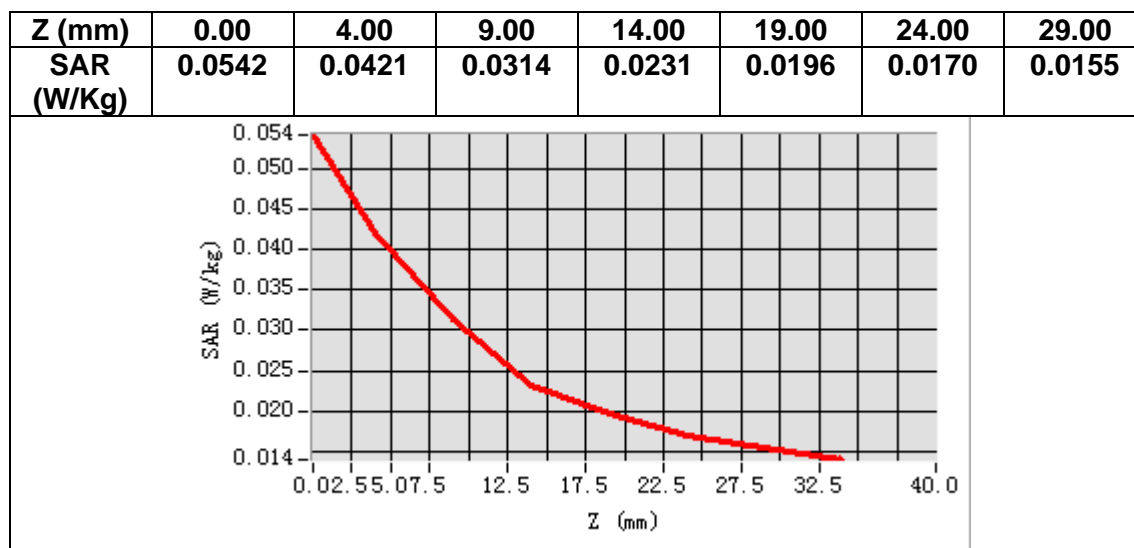
Frequency (MHz)	1950.000000
Relative permittivity (real part)	38.743916
Relative permittivity (imaginary part)	12.920192
Conductivity (S/m)	1.399687
Variation (%)	0.430000



Maximum location: X=-49.00, Y=-48.00

SAR Peak: 0.06 W/kg

SAR 10g (W/Kg)	0.028502
SAR 1g (W/Kg)	0.041129



## MEASUREMENT 16

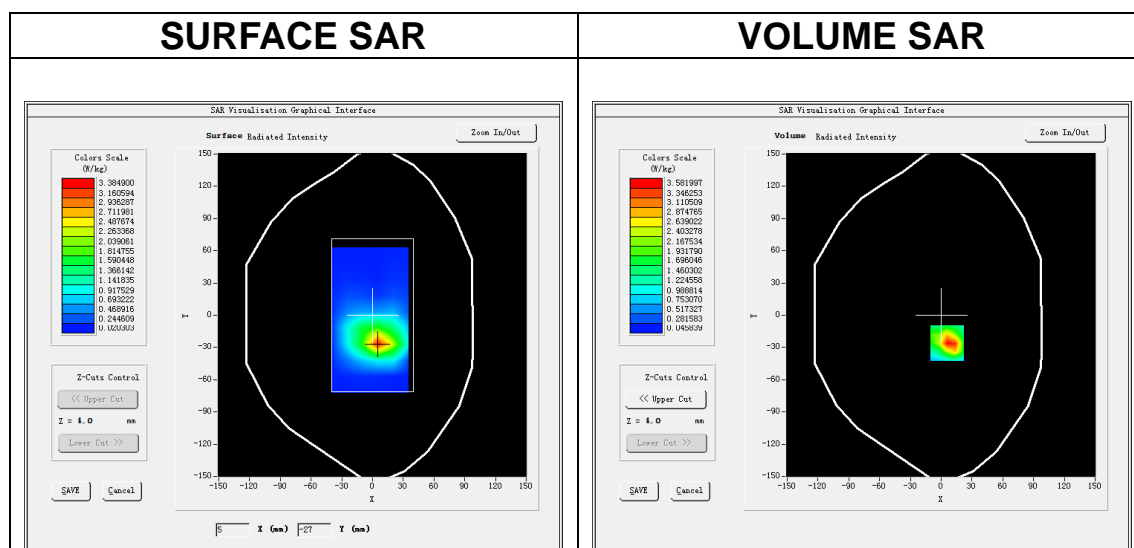
Date of measurement: 11/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 1</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.83</u>

### B. SAR Measurement Results

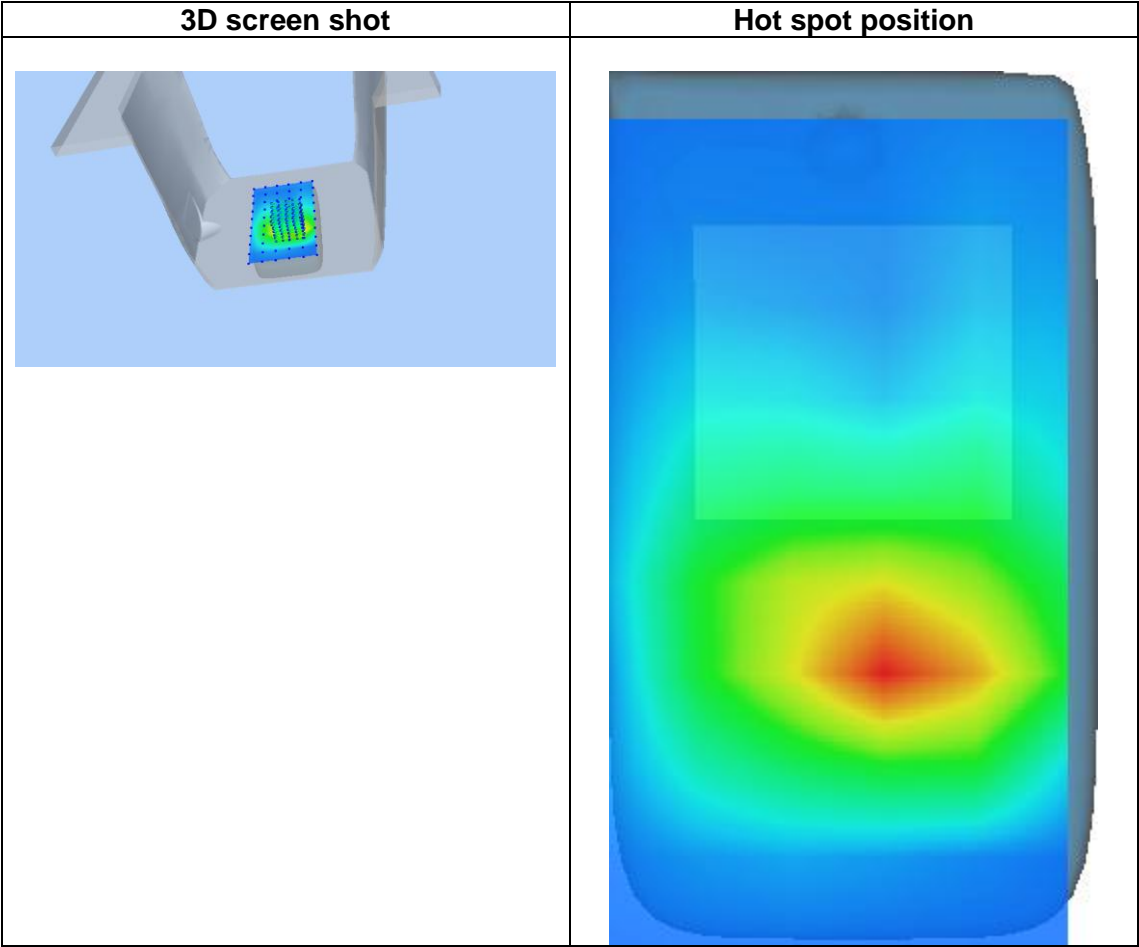
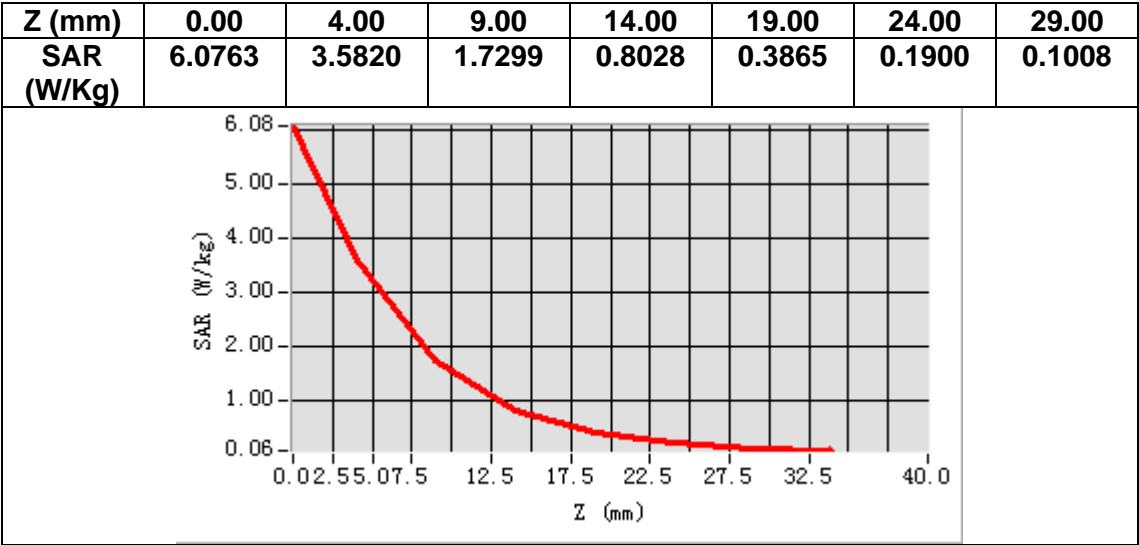
<b>Frequency (MHz)</b>	1950.000000
<b>Relative permittivity (real part)</b>	38.743916
<b>Relative permittivity (imaginary part)</b>	12.920192
<b>Conductivity (S/m)</b>	1.399687
<b>Variation (%)</b>	-0.790000



Maximum location: X=6.00, Y=-26.00

SAR Peak: 6.61 W/kg

<b>SAR 10g (W/Kg)</b>	1.527215
<b>SAR 1g (W/Kg)</b>	3.462748



## MEASUREMENT 17

Date of measurement: 24/4/2024

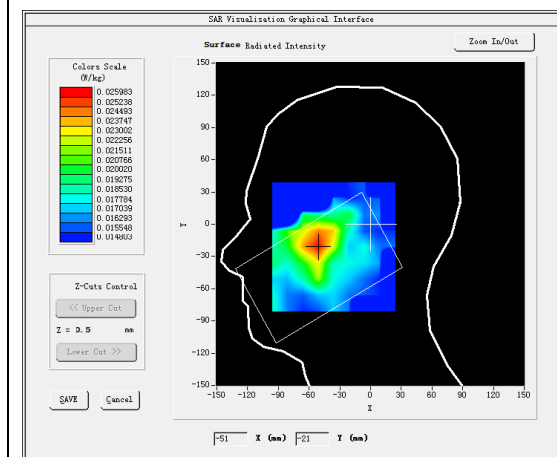
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 3</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

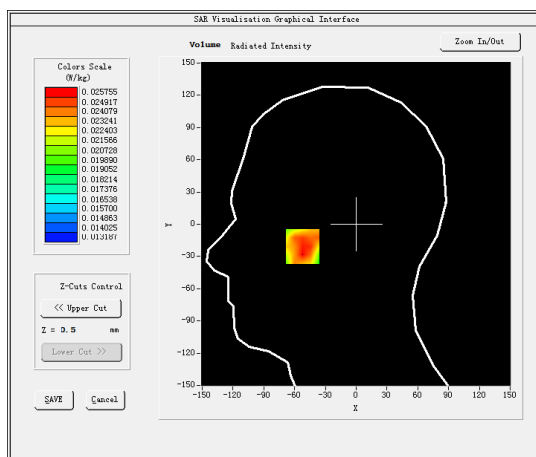
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	1747.500000
<b>Relative permittivity (real part)</b>	39.407784
<b>Relative permittivity (imaginary part)</b>	13.818905
<b>Conductivity (S/m)</b>	1.341202
<b>Variation (%)</b>	4.650000

#### SURFACE SAR



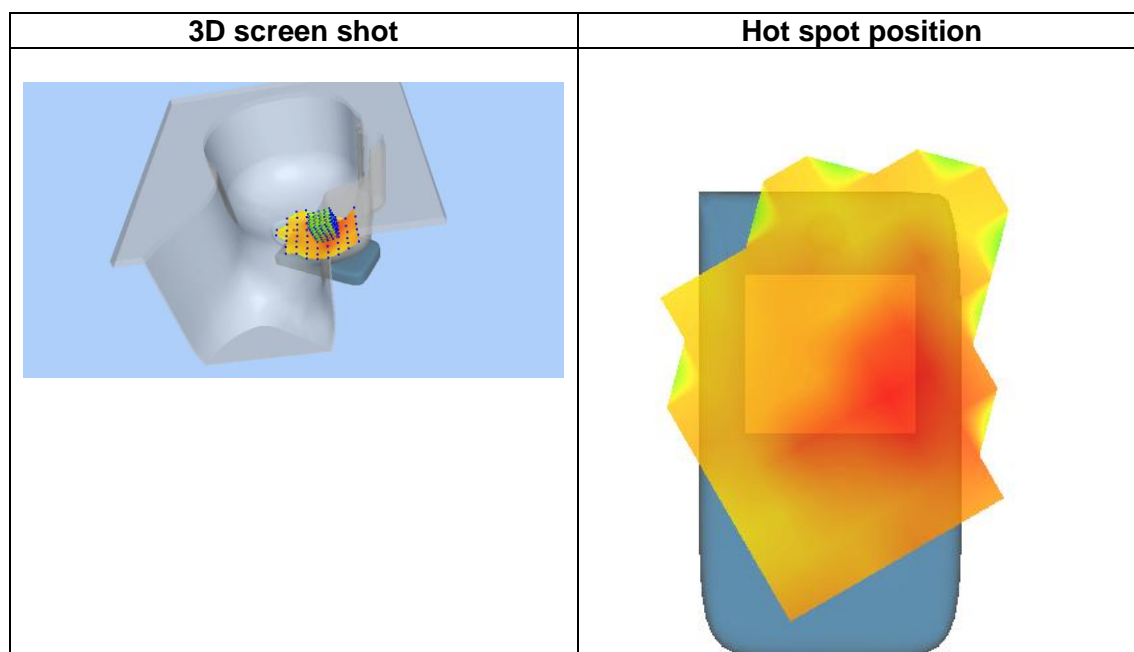
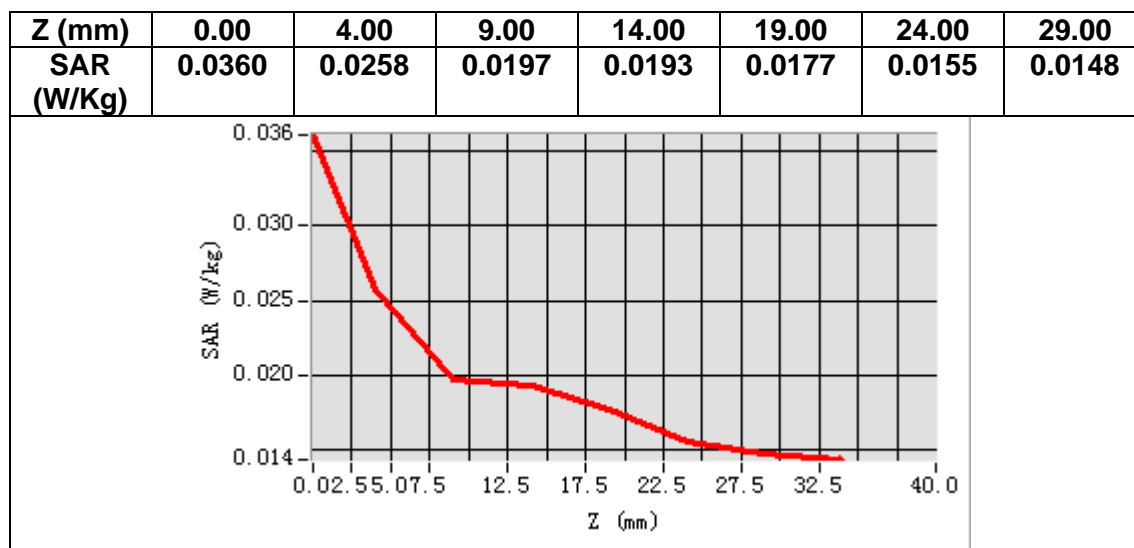
#### VOLUME SAR



Maximum location: X=-52.00, Y=-20.00

SAR Peak: 0.04 W/kg

<b>SAR 10g (W/Kg)</b>	0.021022
<b>SAR 1g (W/Kg)</b>	0.025701



## MEASUREMENT 18

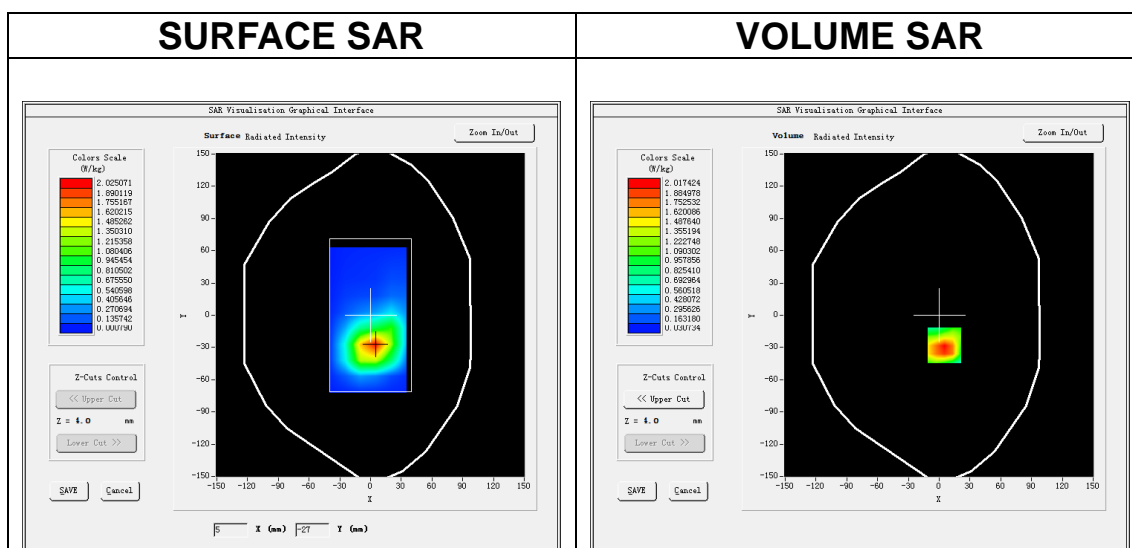
Date of measurement: 24/4/2024

### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 3</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.45</u>

### B. SAR Measurement Results

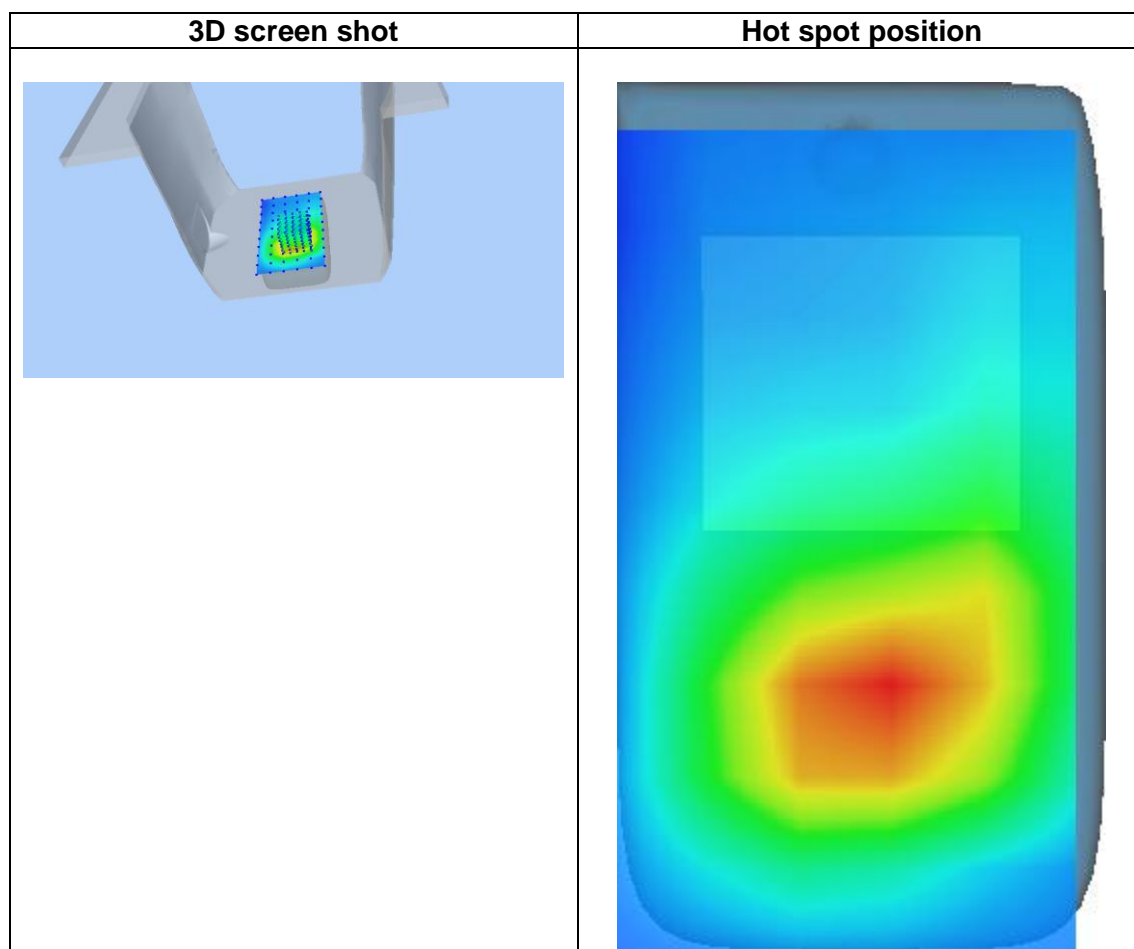
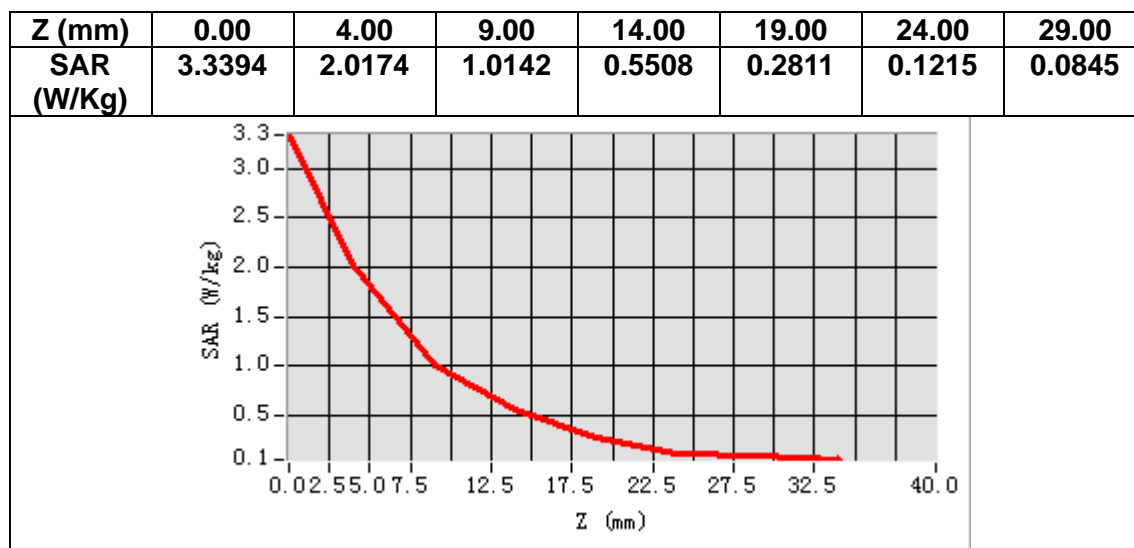
<b>Frequency (MHz)</b>	1747.500000
<b>Relative permittivity (real part)</b>	39.407784
<b>Relative permittivity (imaginary part)</b>	13.818905
<b>Conductivity (S/m)</b>	1.341202
<b>Variation (%)</b>	2.480000



Maximum location: X=5.00, Y=-28.00

SAR Peak: 3.66 W/kg

<b>SAR 10g (W/Kg)</b>	1.009182
<b>SAR 1g (W/Kg)</b>	1.993307



## MEASUREMENT 19

Date of measurement: 16/4/2024

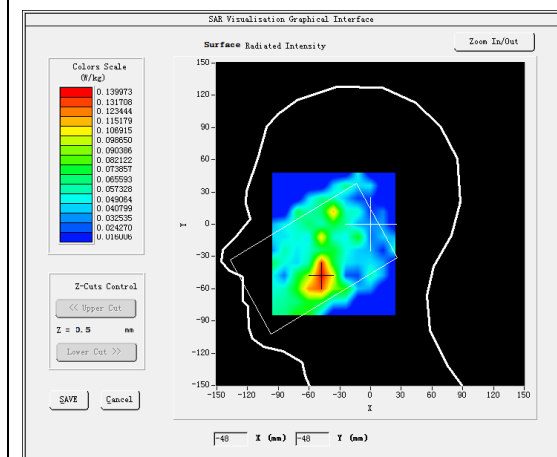
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 7</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.65</u>

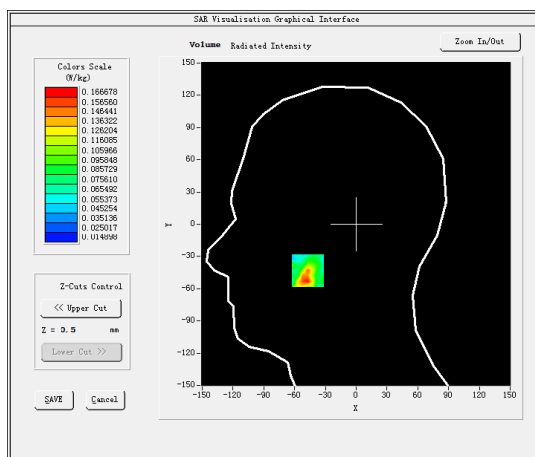
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	2535.000000
<b>Relative permittivity (real part)</b>	39.157543
<b>Relative permittivity (imaginary part)</b>	13.515832
<b>Conductivity (S/m)</b>	1.903480
<b>Variation (%)</b>	-1.250000

#### SURFACE SAR



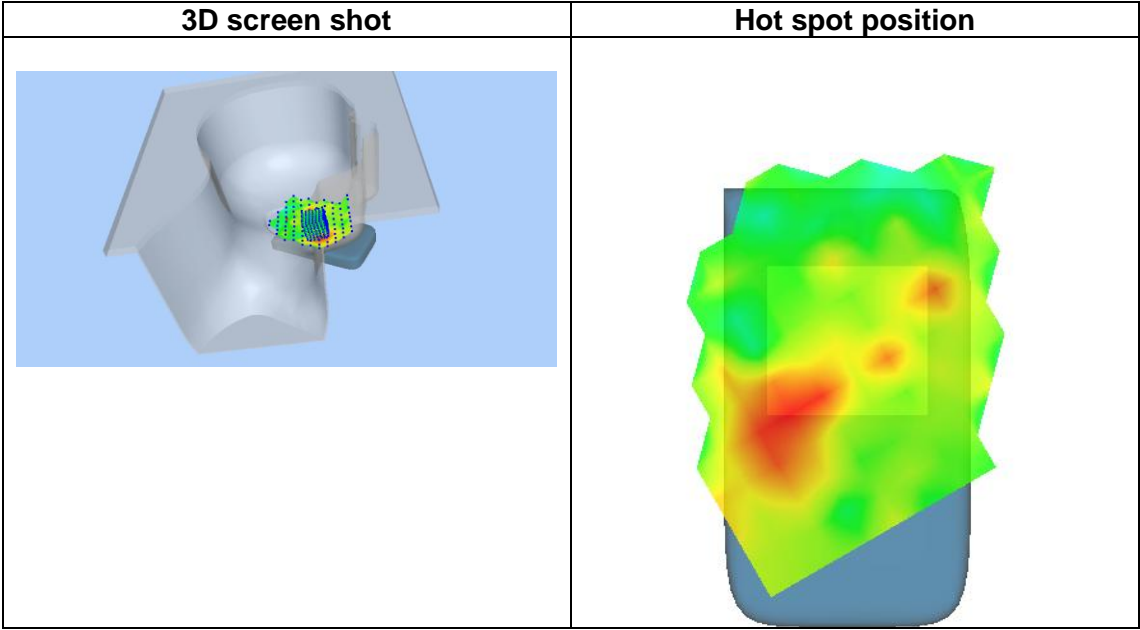
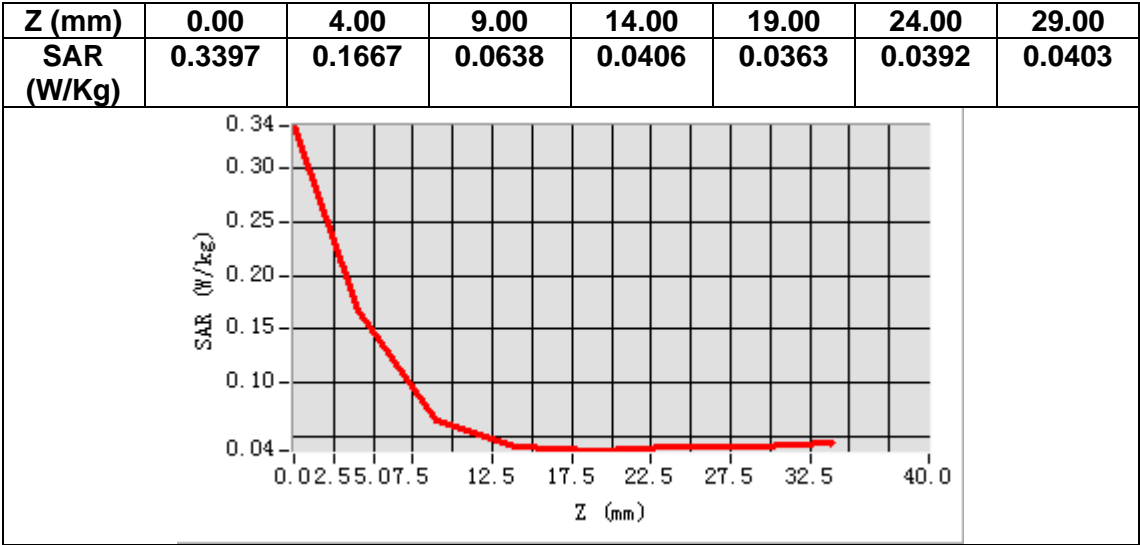
#### VOLUME SAR



Maximum location: X=-47.00, Y=-43.00

SAR Peak: 0.33 W/kg

<b>SAR 10g (W/Kg)</b>	0.080542
<b>SAR 1g (W/Kg)</b>	0.142124



## MEASUREMENT 20

Date of measurement: 16/4/2024

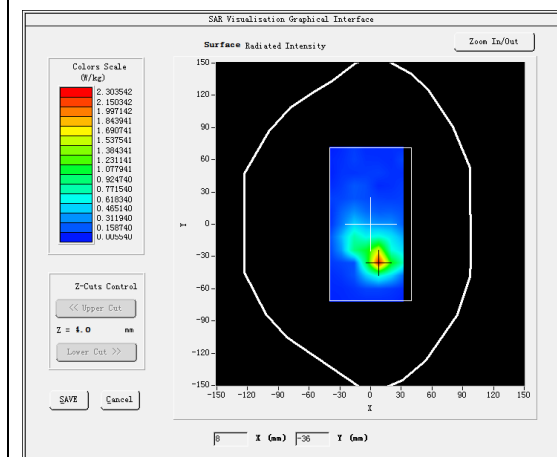
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 7</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.65</u>

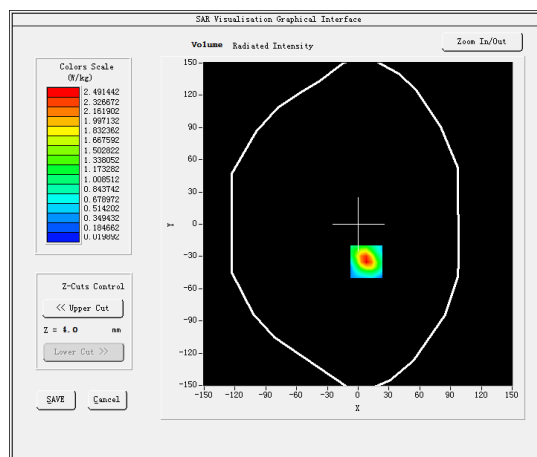
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	2535.000000
<b>Relative permittivity (real part)</b>	39.157543
<b>Relative permittivity (imaginary part)</b>	13.515832
<b>Conductivity (S/m)</b>	1.903480
<b>Variation (%)</b>	2.690000

#### SURFACE SAR



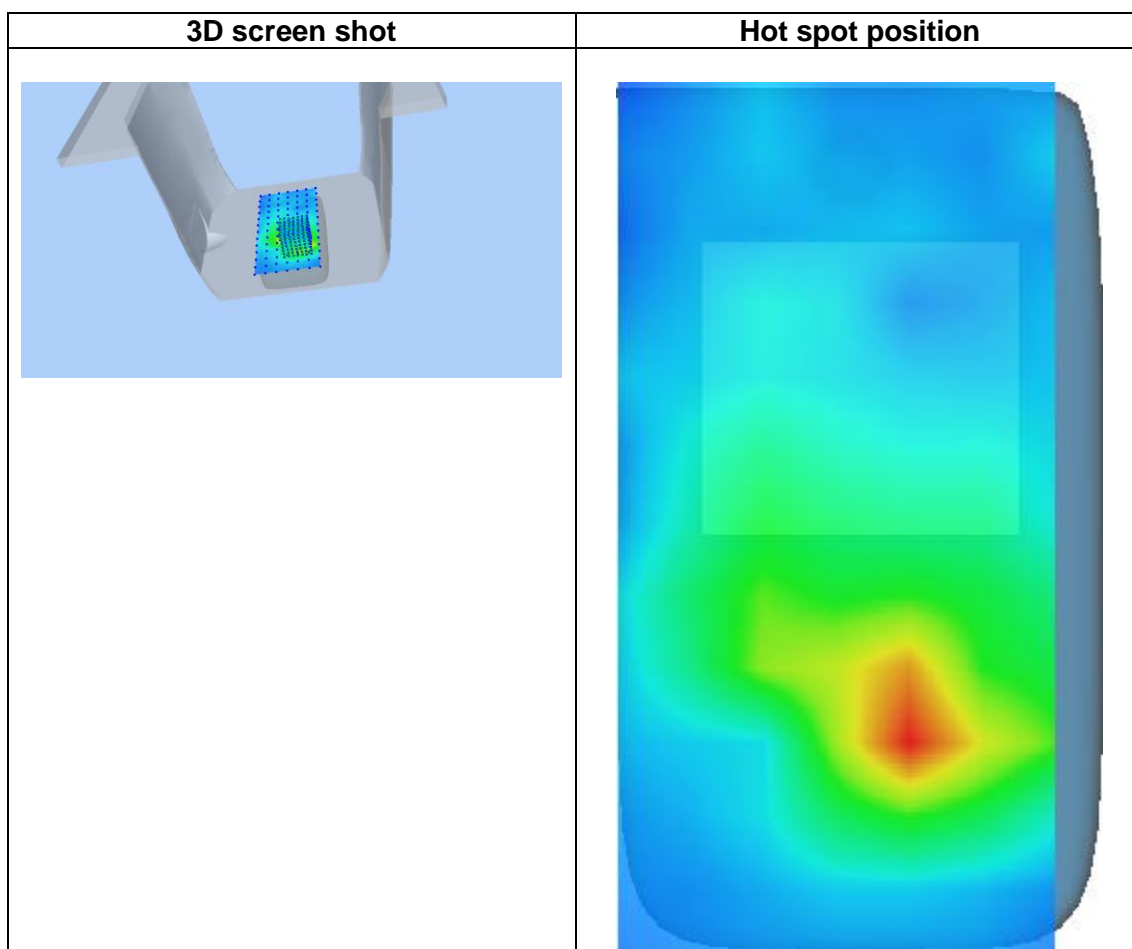
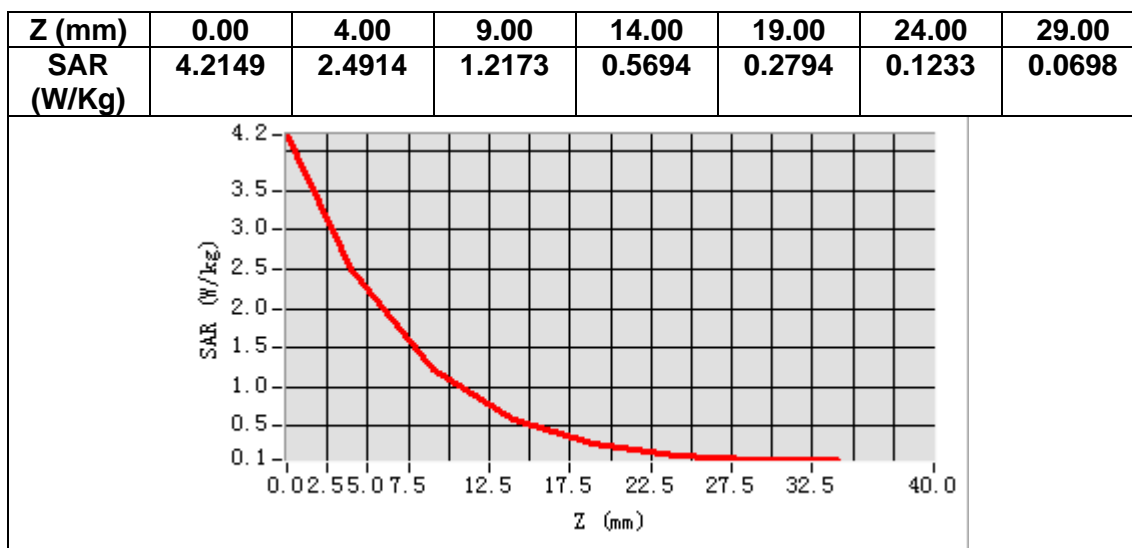
#### VOLUME SAR



Maximum location: X=8.00, Y=-35.00

SAR Peak: 4.24 W/kg

<b>SAR 10g (W/Kg)</b>	0.966817
<b>SAR 1g (W/Kg)</b>	2.248538



## MEASUREMENT 21

Date of measurement: 18/4/2024

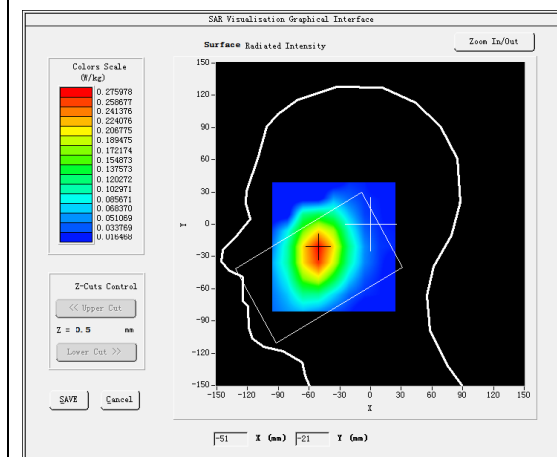
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 8</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

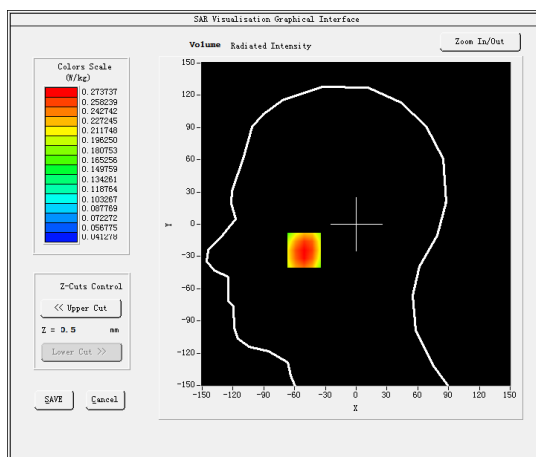
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	897.500000
<b>Relative permittivity (real part)</b>	41.460709
<b>Relative permittivity (imaginary part)</b>	19.575464
<b>Conductivity (S/m)</b>	0.975511
<b>Variation (%)</b>	2.800000

#### SURFACE SAR



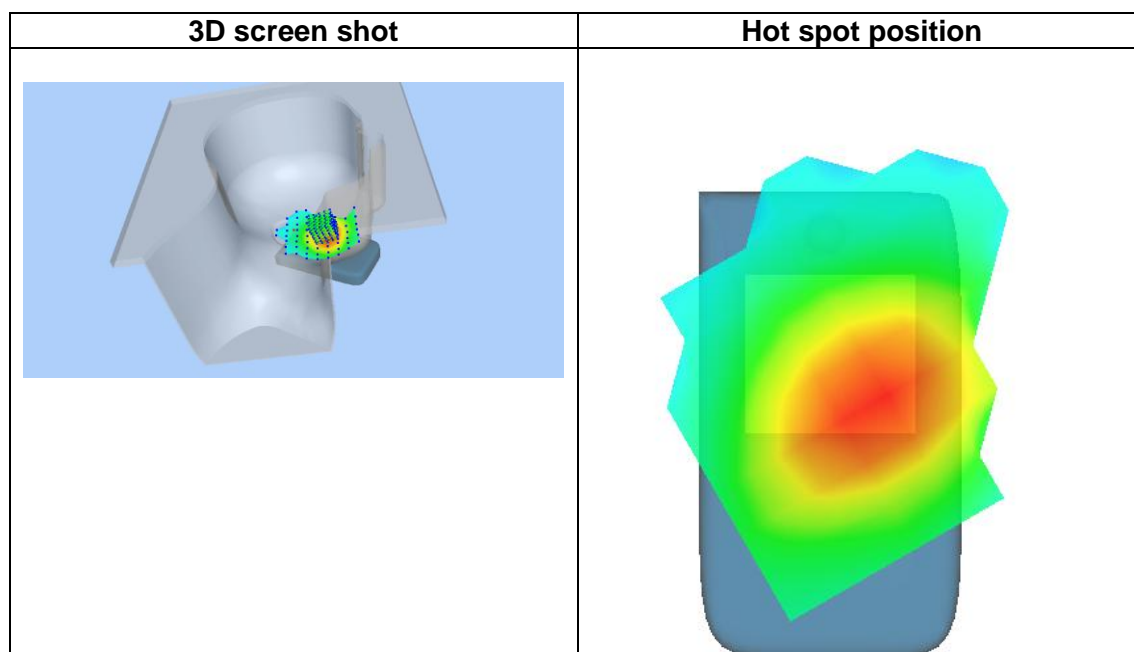
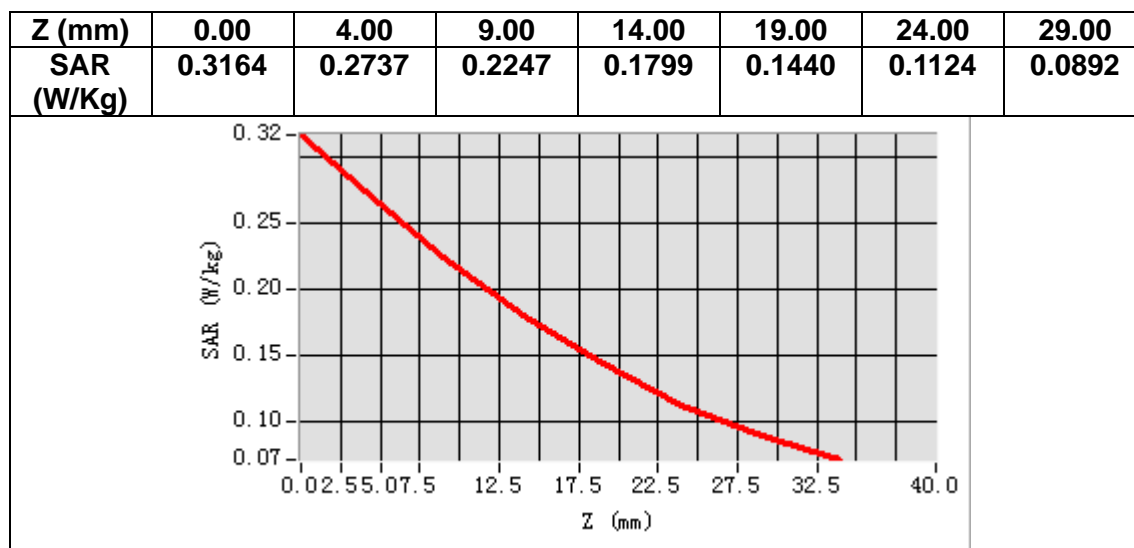
#### VOLUME SAR



Maximum location: X=-51.00, Y=-24.00

SAR Peak: 0.33 W/kg

<b>SAR 10g (W/Kg)</b>	0.201684
<b>SAR 1g (W/Kg)</b>	0.268590



## MEASUREMENT 22

Date of measurement: 18/4/2024

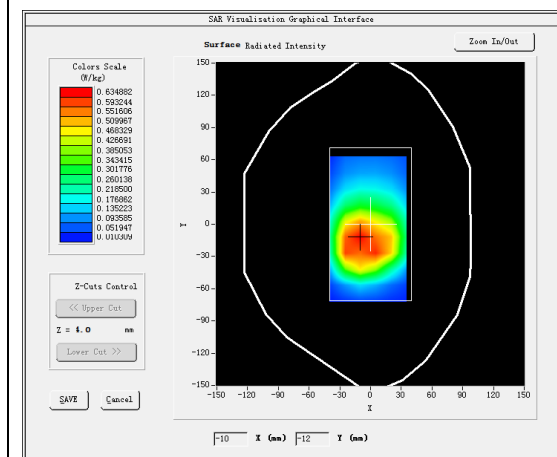
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 8</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

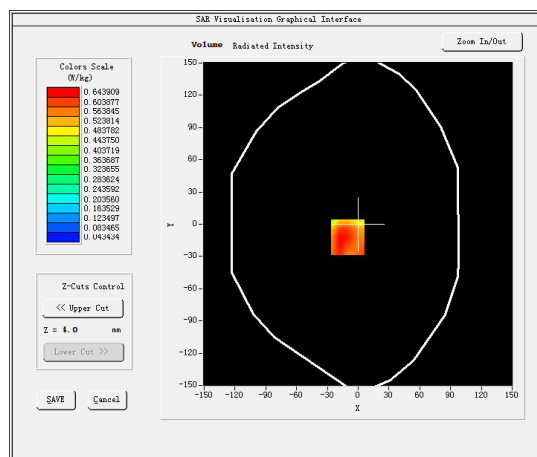
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	897.500000
<b>Relative permittivity (real part)</b>	41.460709
<b>Relative permittivity (imaginary part)</b>	19.575464
<b>Conductivity (S/m)</b>	0.975511
<b>Variation (%)</b>	2.130000

#### SURFACE SAR



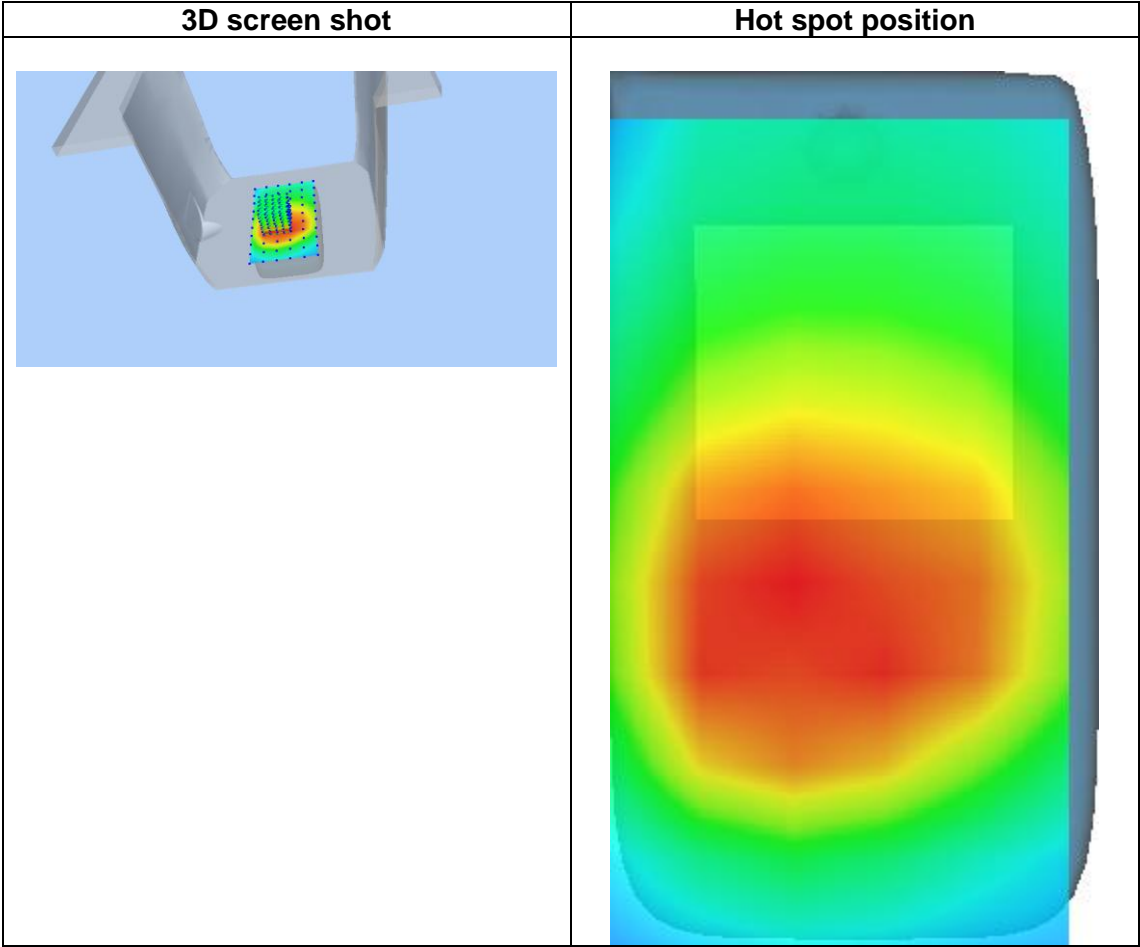
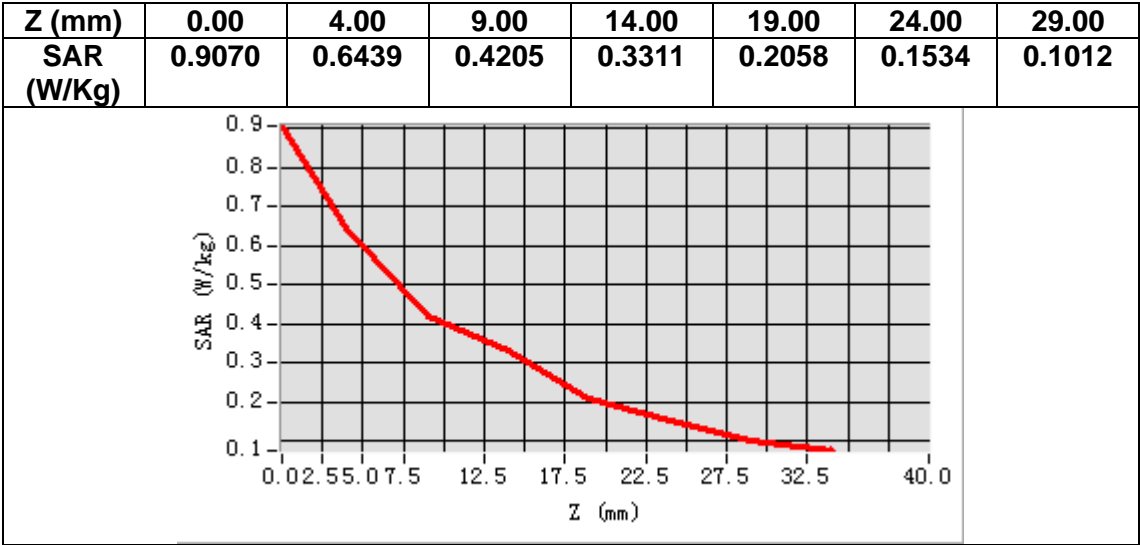
#### VOLUME SAR



Maximum location: X=-10.00, Y=-12.00

SAR Peak: 0.96 W/kg

<b>SAR 10g (W/Kg)</b>	0.425904
<b>SAR 1g (W/Kg)</b>	0.634962



## MEASUREMENT 23

Date of measurement: 18/4/2024

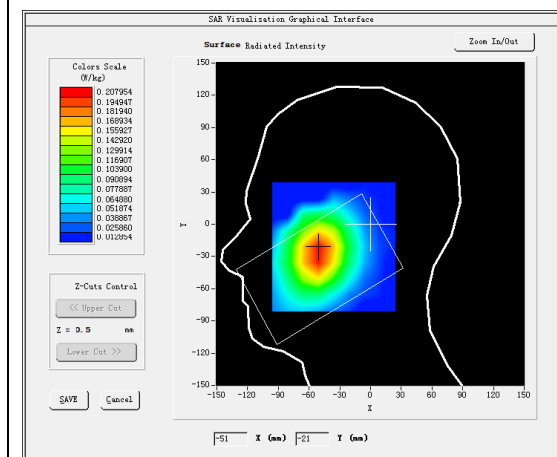
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 20</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

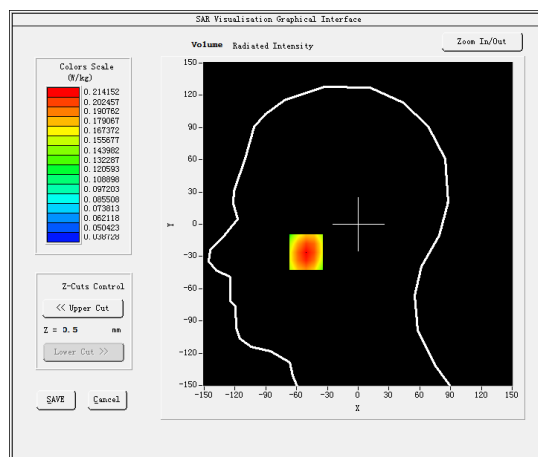
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	847.000000
<b>Relative permittivity (real part)</b>	42.079506
<b>Relative permittivity (imaginary part)</b>	19.360565
<b>Conductivity (S/m)</b>	0.911022
<b>Variation (%)</b>	0.430000

#### SURFACE SAR



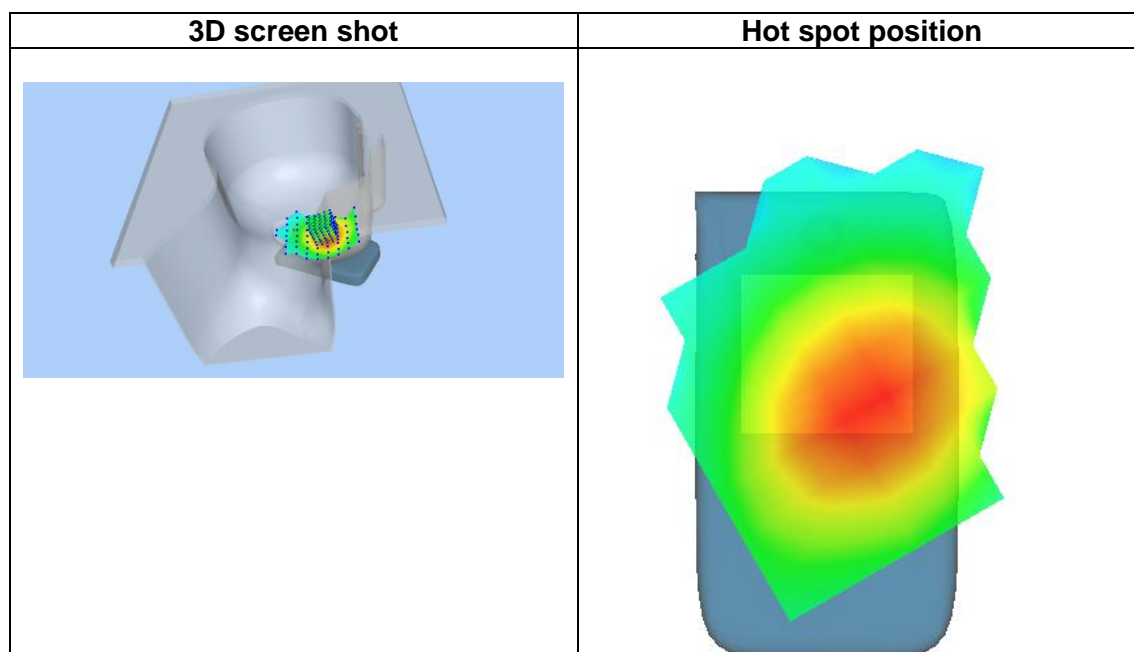
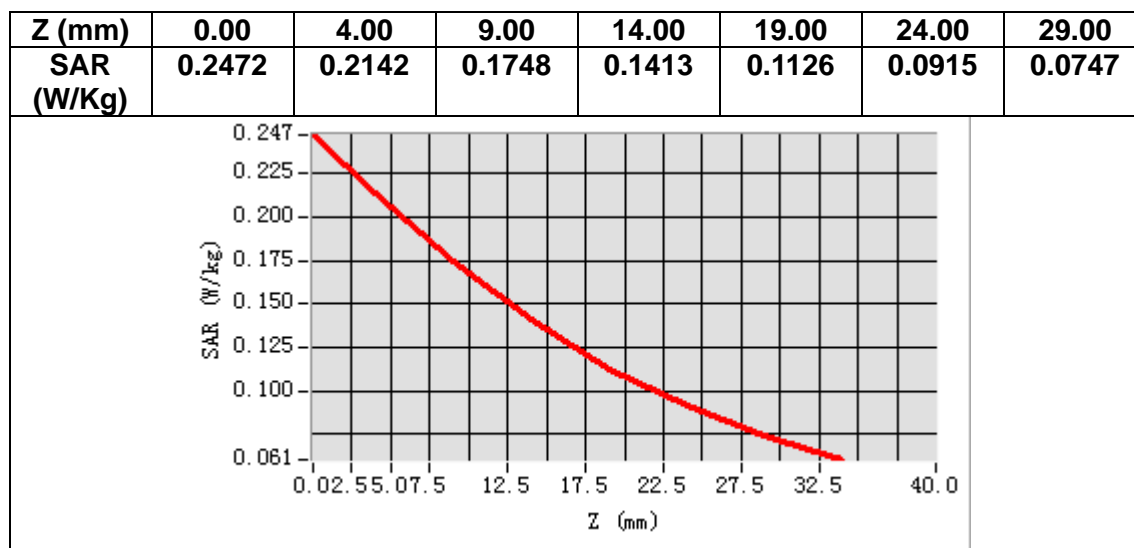
#### VOLUME SAR



Maximum location: X=-51.00, Y=-26.00

SAR Peak: 0.25 W/kg

<b>SAR 10g (W/Kg)</b>	0.156308
<b>SAR 1g (W/Kg)</b>	0.205797



## MEASUREMENT 24

Date of measurement: 18/4/2024

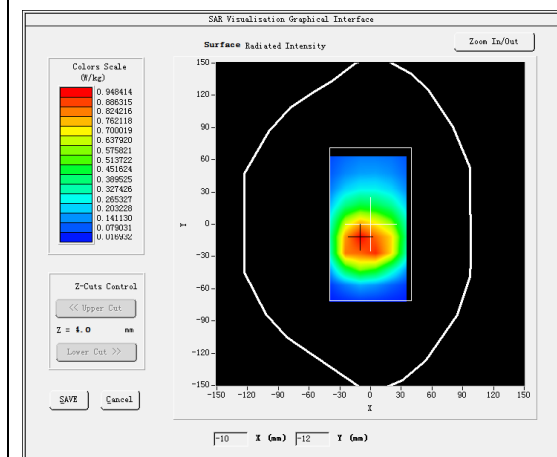
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 20</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

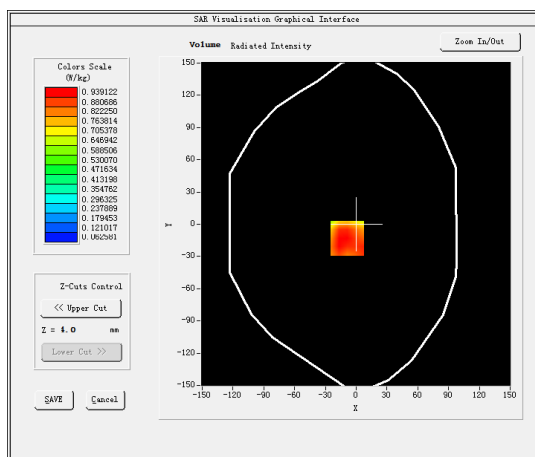
### B. SAR Measurement Results

Frequency (MHz)	847.000000
Relative permittivity (real part)	42.079506
Relative permittivity (imaginary part)	19.360565
Conductivity (S/m)	0.911022
Variation (%)	-2.390000

#### SURFACE SAR



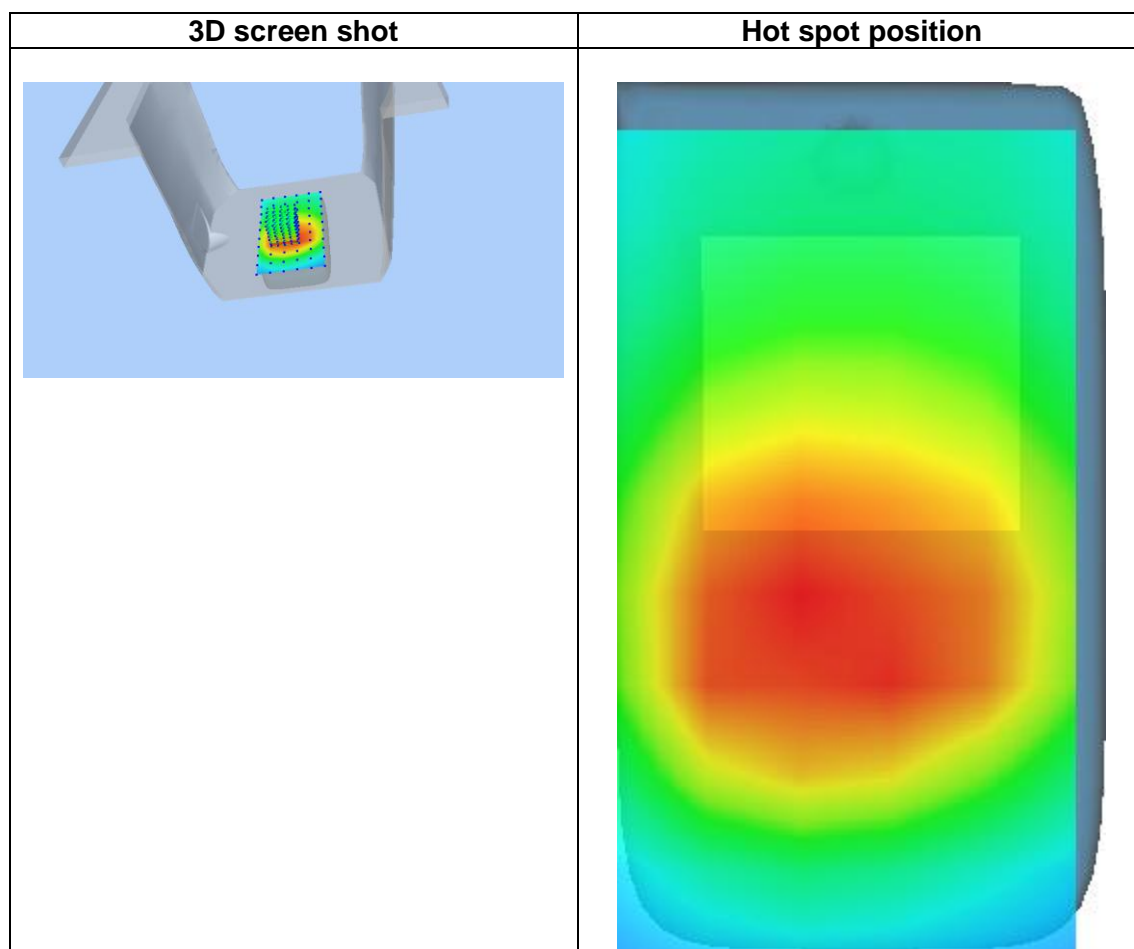
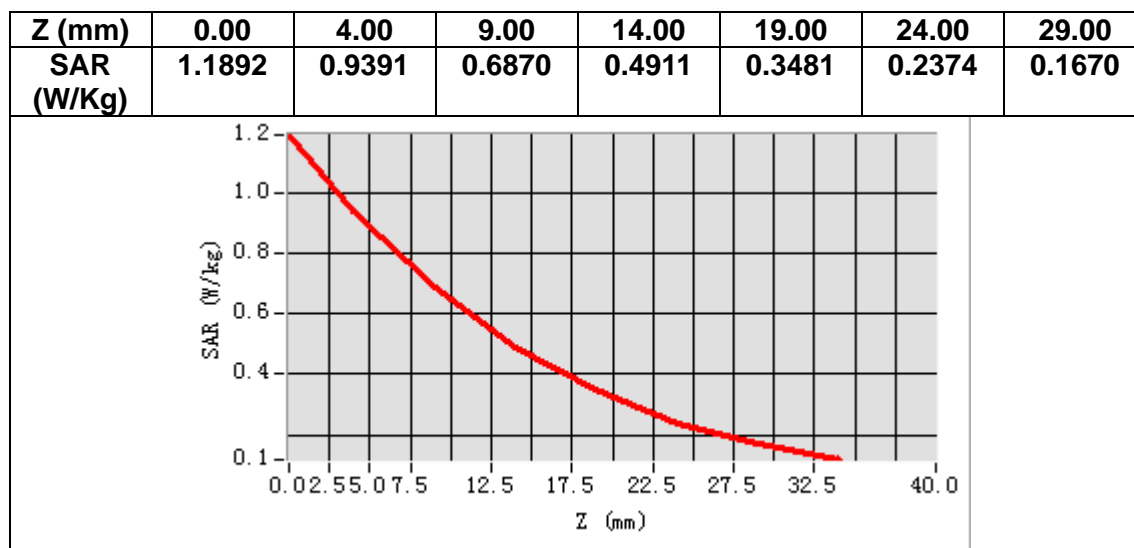
#### VOLUME SAR



Maximum location: X=-9.00, Y=-13.00

SAR Peak: 1.37 W/kg

SAR 10g (W/Kg)	0.632990
SAR 1g (W/Kg)	0.926690



## MEASUREMENT 25

Date of measurement: 16/4/2024

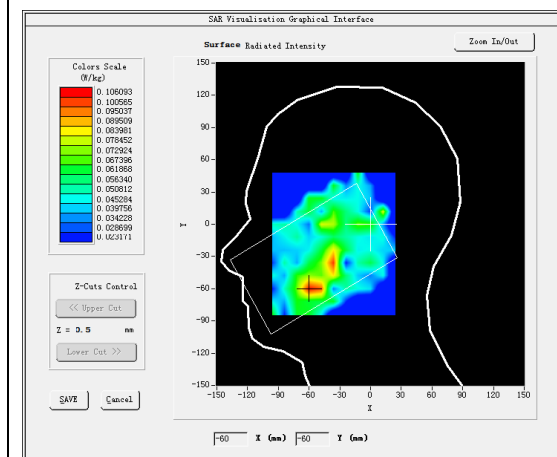
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 41</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.65</u>

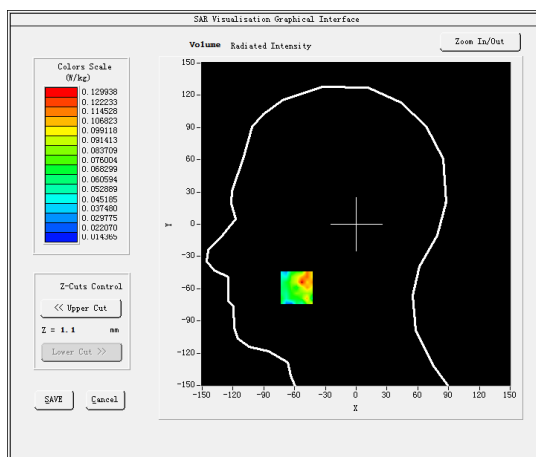
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	2605.000000
<b>Relative permittivity (real part)</b>	38.777142
<b>Relative permittivity (imaginary part)</b>	13.698232
<b>Conductivity (S/m)</b>	1.982439
<b>Variation (%)</b>	-1.220000

#### SURFACE SAR



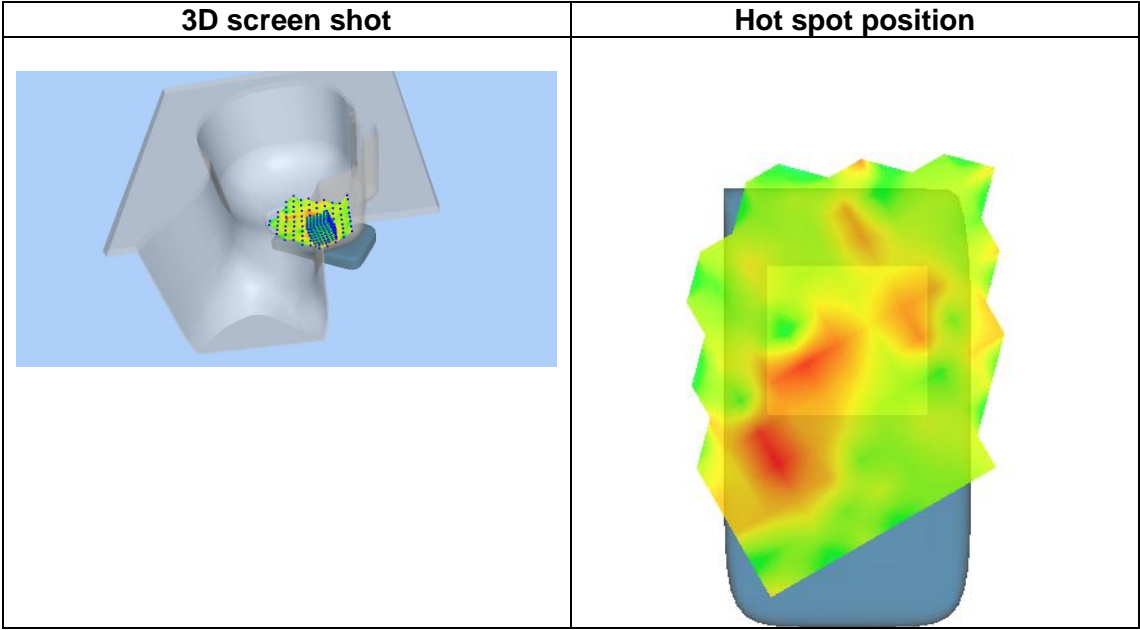
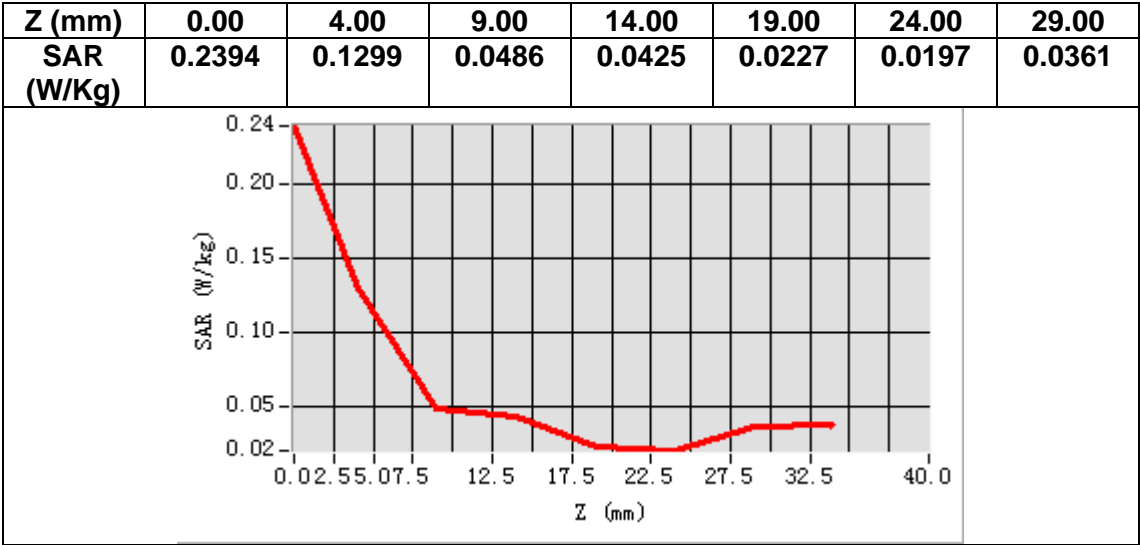
#### VOLUME SAR



Maximum location: X=-58.00, Y=-59.00

SAR Peak: 0.21 W/kg

<b>SAR 10g (W/Kg)</b>	0.064747
<b>SAR 1g (W/Kg)</b>	0.101125



## MEASUREMENT 26

Date of measurement: 16/4/2024

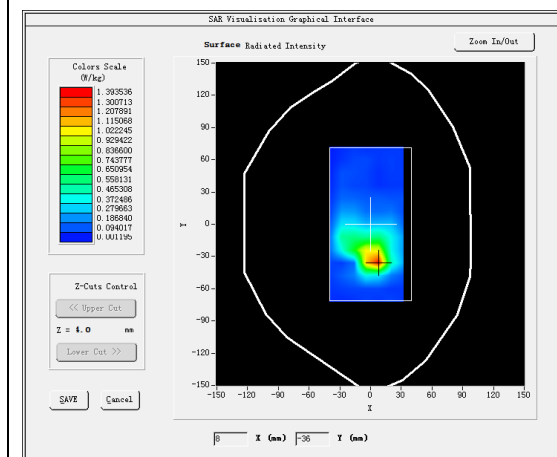
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 41</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.65</u>

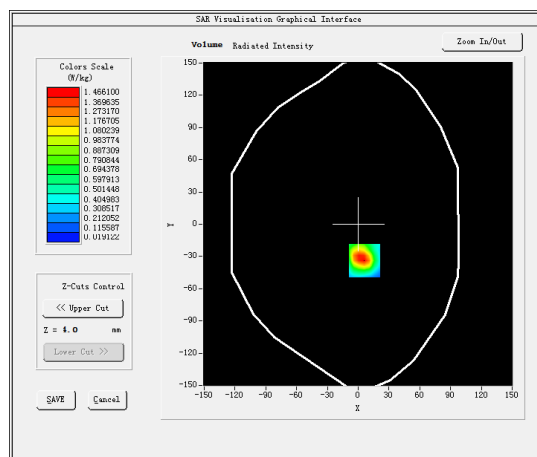
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	2605.000000
<b>Relative permittivity (real part)</b>	38.777142
<b>Relative permittivity (imaginary part)</b>	13.698232
<b>Conductivity (S/m)</b>	1.982439
<b>Variation (%)</b>	2.320000

#### SURFACE SAR



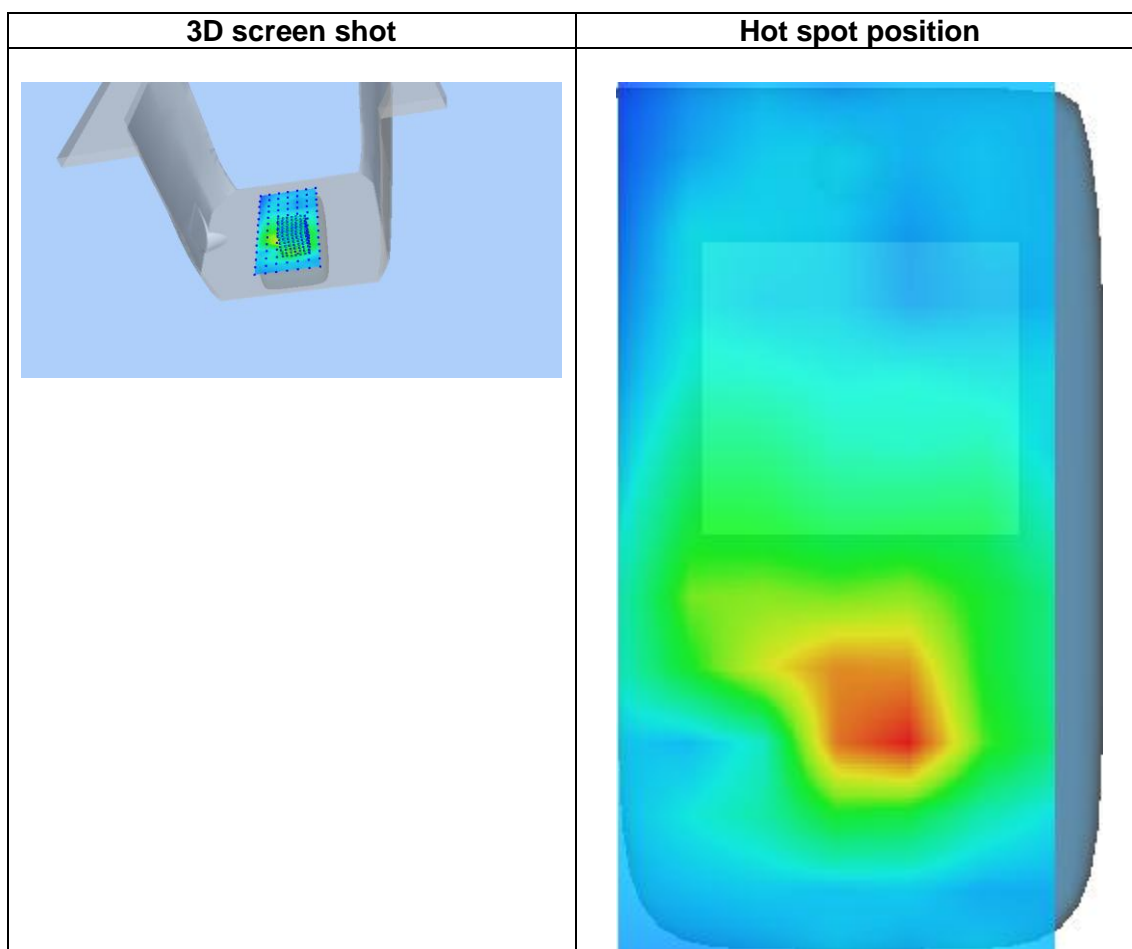
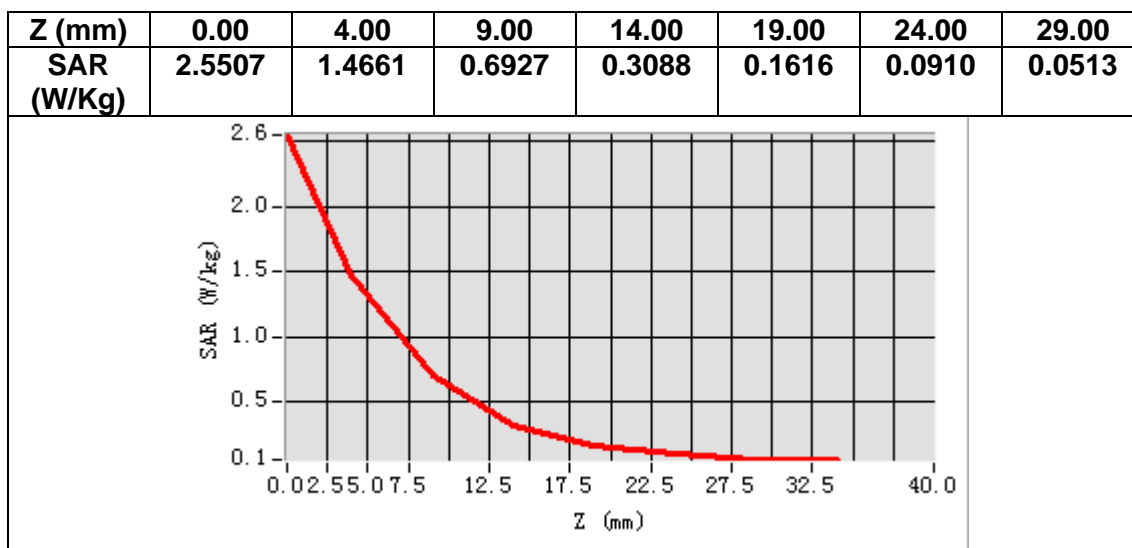
#### VOLUME SAR



Maximum location: X=6.00, Y=-34.00

SAR Peak: 2.55 W/kg

<b>SAR 10g (W/Kg)</b>	0.617706
<b>SAR 1g (W/Kg)</b>	1.377628



## MEASUREMENT 27

Date of measurement: 19/4/2024

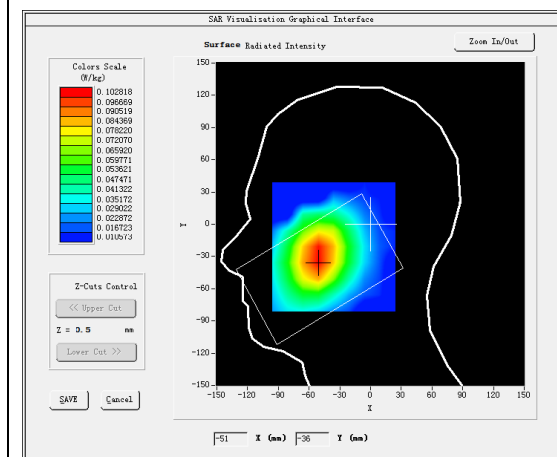
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>FDDBand28</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.37</u>

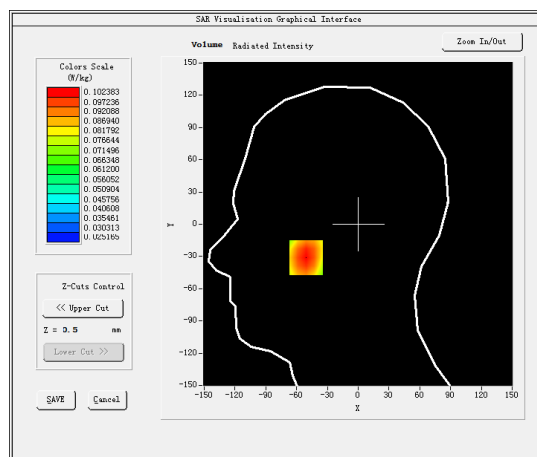
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	728.000000
<b>Relative permittivity (real part)</b>	41.374210
<b>Relative permittivity (imaginary part)</b>	21.781321
<b>Conductivity (S/m)</b>	0.880933
<b>Variation (%)</b>	-1.070000

#### SURFACE SAR



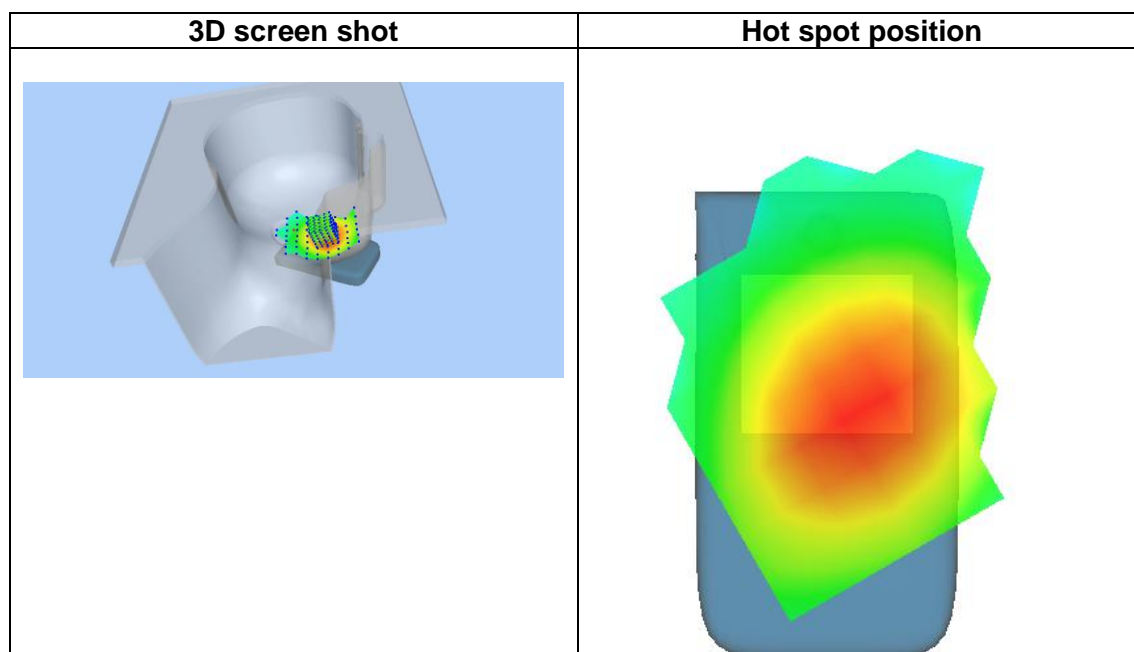
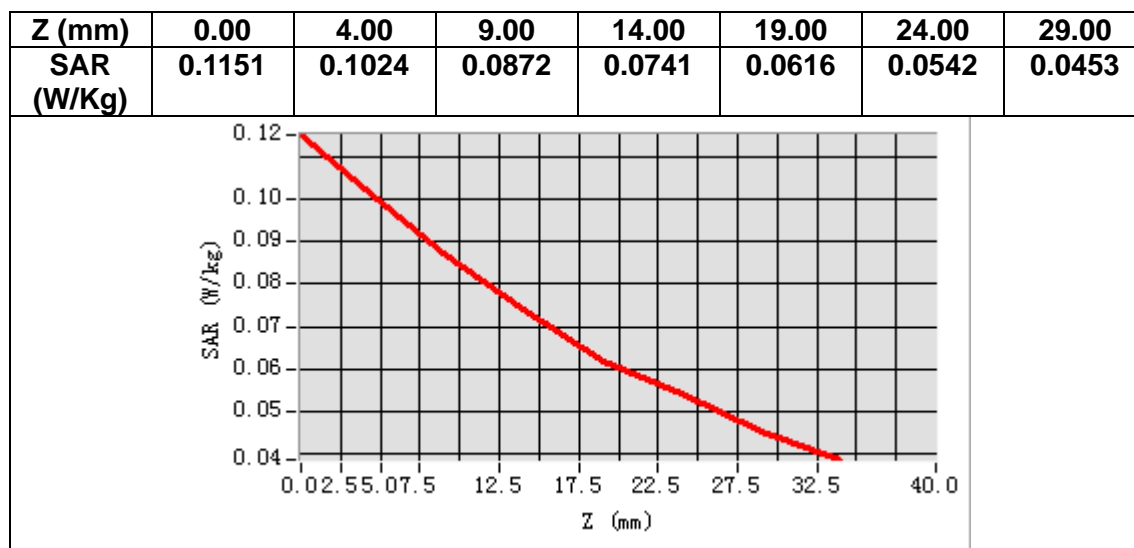
#### VOLUME SAR



Maximum location: X=-51.00, Y=-31.00

SAR Peak: 0.12 W/kg

<b>SAR 10g (W/Kg)</b>	0.080004
<b>SAR 1g (W/Kg)</b>	0.099037



## MEASUREMENT 28

Date of measurement: 19/4/2024

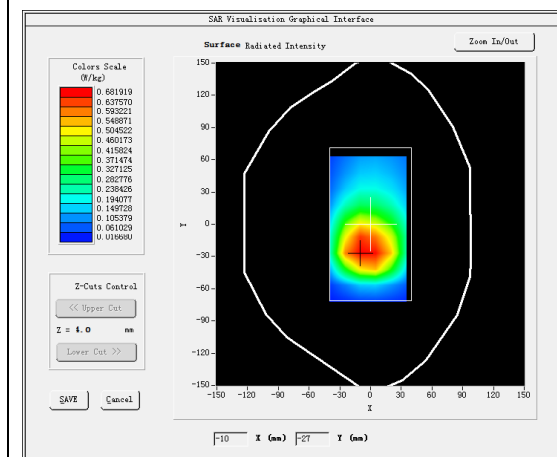
### A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>FDDBand28</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.37</u>

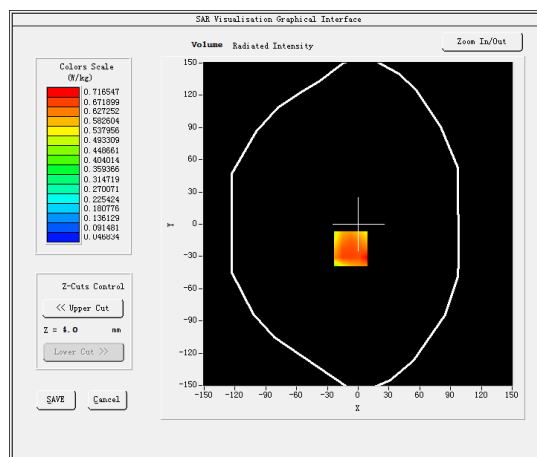
### B. SAR Measurement Results

<b>Frequency (MHz)</b>	728.000000
<b>Relative permittivity (real part)</b>	41.374210
<b>Relative permittivity (imaginary part)</b>	21.781321
<b>Conductivity (S/m)</b>	0.880933
<b>Variation (%)</b>	-1.120000

#### SURFACE SAR



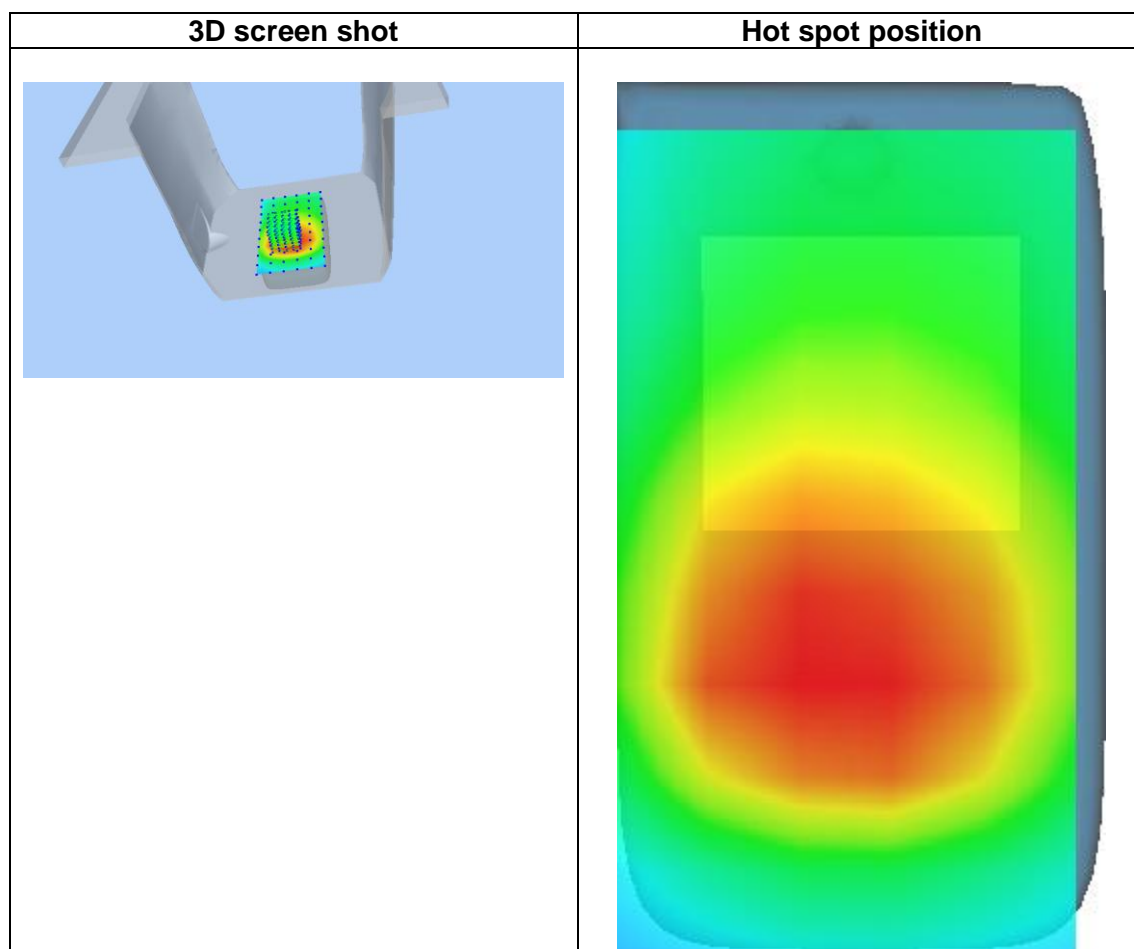
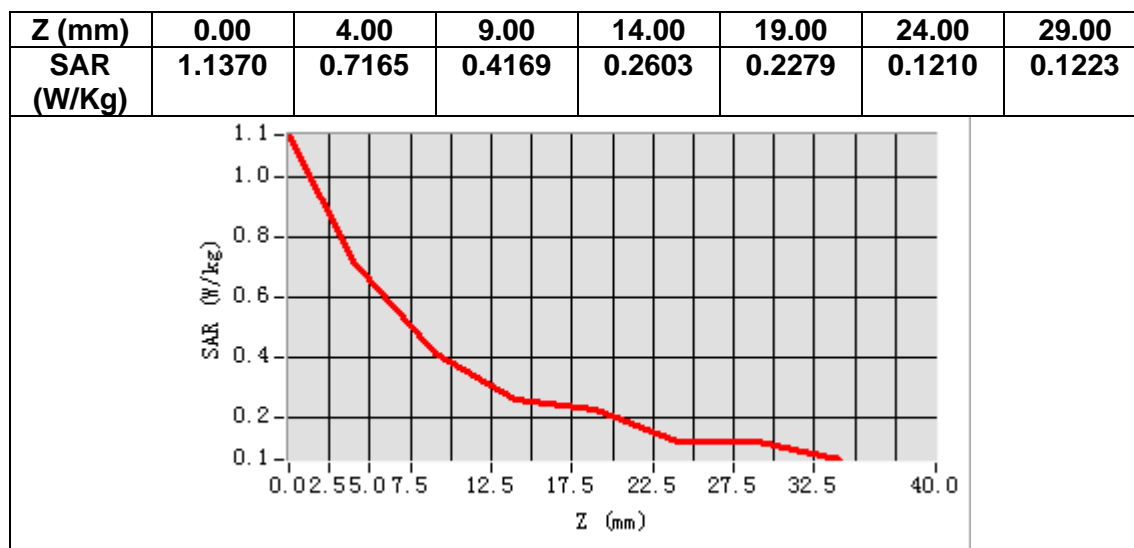
#### VOLUME SAR



Maximum location: X=-7.00, Y=-23.00

SAR Peak: 1.12 W/kg

<b>SAR 10g (W/Kg)</b>	0.464836
<b>SAR 1g (W/Kg)</b>	0.680511



### 13. Appendix D. Calibration Certificate

Table of contents
E Field Probe - 3423-EPGO-426
750 MHz Dipole - SN 03/15 DIP 0G750-355
900 MHz Dipole - SN 03/15 DIP 0G900-348
1800 MHz Dipole - SN 03/15 DIP 1G800-349
2000 MHz Dipole - SN 03/15 DIP 2G000-351
2450 MHz Dipole - SN 03/15 DIP 2G450-352
2600 MHz Dipole - SN 03/15 DIP 2G600-356



## COMOSAR E-Field Probe Calibration Report

Ref : ACR.261.11.23.BES.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.: 3423-EPGO-426**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon  
29280 PLOUZANE - FRANCE**

**Calibration date: 09/18/2023**



Accreditations #2-6789  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOSAR system only. The test results covered by accreditation are traceable to the International System of Units (SI).



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Cyrille ONNEE	Measurement Responsible	9/18/2023	
<i>Checked &amp; approved by:</i>	Jérôme Luc	Technical Manager	9/18/2023	
<i>Authorized by:</i>	Yann Toutain	Laboratory Director	9/19/2023	

Yann  
Toutain ID  Signature  
numérique de  
Yann Toutain ID  
Date : 2023.09.19  
09:08:14 +02'00'

	<i>Customer Name</i>
<i>Distribution :</i>	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Cyrille ONNEE	9/18/2023	Initial release



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

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**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.261.11.23.BES.A

## 1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	3423-EPGO-426
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.261 MΩ Dipole 2: R2=0.213 MΩ Dipole 3: R3=0.233 MΩ

## 2 PRODUCT DESCRIPTION

### 2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards.



**Figure 1 – MVG COMOSAR Dosimetric E field Probe**

Probe Length	330 mm
Length of Individual Dipoles	2 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.5 mm
Distance between dipoles / probe extremity	1 mm

## 3 MEASUREMENT METHOD

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their effect. All calibrations / measurements performed meet the fore-mentioned standards.

### 3.1 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards for frequency range 600-7500MHz and using the calorimeter cell method (transfer method) as outlined in the standards for frequency 150-450 MHz.



## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

### 3.2 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01 W/kg to 100 W/kg.

### 3.3 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 to 360 degrees in 15-degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

### 3.4 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

The boundary effect uncertainty can be estimated according to the following uncertainty approximation formula based on linear and exponential extrapolations between the surface and  $d_{be} + d_{step}$  along lines that are approximately normal to the surface:

$$SAR_{uncertainty} [\%] = \Delta SAR_{be} \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{(e^{-d_{be}/\delta})}{\delta/2} \quad \text{for } (d_{be} + d_{step}) < 10 \text{ mm}$$

where

$SAR_{uncertainty}$	is the uncertainty in percent of the probe boundary effect
$d_{be}$	is the distance between the surface and the closest <i>zoom-scan</i> measurement point, in millimetre
$\Delta_{step}$	is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible
$\delta$	is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx 14$ mm at 3 GHz;
$\Delta SAR_{be}$	in percent of SAR is the deviation between the measured SAR value, at the distance $d_{be}$ from the boundary, and the analytical SAR value.

The measured worst case boundary effect SARuncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).



**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.261.11.23.BES.A

#### 4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with a SAR probe calibration using the waveguide or calorimetric cell technique depending on the frequency.

The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.

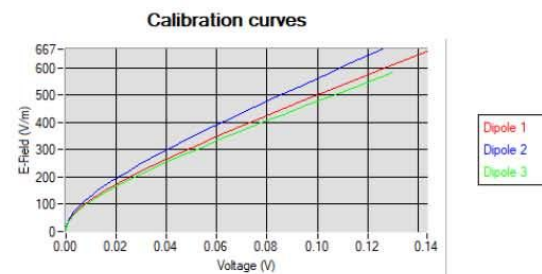
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

#### 5 CALIBRATION RESULTS

Ambient condition	
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

##### 5.1 CALIBRATION IN AIR

The following curve represents the measurement in waveguide of the voltage picked up by the probe toward the E-field generated inside the waveguide.



From this curve, the sensitivity in air is calculated using the below formula.

$$E^2 = \sum_{i=1}^3 \frac{V_i (1 + V_i / DCP_i)}{Norm_i}$$

where

Vi=voltage readings on the 3 channels of the probe

DCPi=diode compression point given below for the 3 channels of the probe

Normi=dipole sensitivity given below for the 3 channels of the probe



**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.261.11.23.BES.A

Normx dipole 1 ( $\mu\text{V}/(\text{V}/\text{m})^2$ )	Normy dipole 2 ( $\mu\text{V}/(\text{V}/\text{m})^2$ )	Normz dipole 3 ( $\mu\text{V}/(\text{V}/\text{m})^2$ )
0.78	0.62	0.85

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
105	108	107

## 5.2 CALIBRATION IN LIQUID

The calorimeter cell or the waveguide is used to determine the calibration in liquid using the formula below.

$$\text{ConvF} = \frac{E_{\text{liquid}}^2}{E_{\text{air}}^2}$$

The E-field in the liquid is determined from the SAR measurement according to the below formula.

$$E_{\text{liquid}}^2 = \frac{\rho \text{ SAR}}{\sigma}$$

where

$\sigma$ =the conductivity of the liquid

$\rho$ =the volumetric density of the liquid

SAR=the SAR measured from the formula that depends on the setup used. The SAR formulas are given below

For the calorimeter cell (150-450 MHz), the formula is:

$$\text{SAR} = c \frac{dT}{dt}$$

where

$c$ =the specific heat for the liquid

$dT/dt$ =the temperature rises over the time

For the waveguide setup (600-75000 MHz), the formula is:

$$\text{SAR} = \frac{4P_W}{ab\delta} e^{-\frac{2z}{\delta}}$$

where

$a$ =the larger cross-sectional of the waveguide

$b$ =the smaller cross-sectional of the waveguide

$\delta$ =the skin depth for the liquid in the waveguide

$P_W$ =the power delivered to the liquid



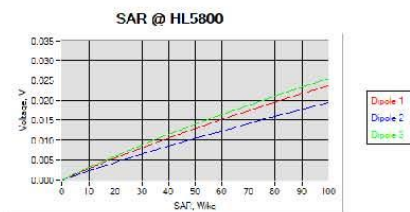
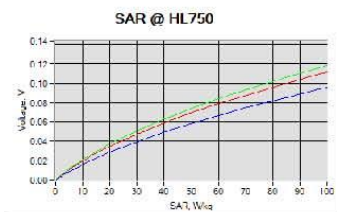
## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

The below table summarize the ConvF for the calibrated liquid. The curves give examples for the measured SAR depending on the voltage in some liquid.

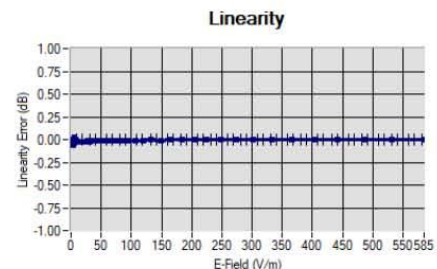
Liquid	Frequency (MHz*)	ConvF
HL750	750	2.37
HL850	835	2.32
HL900	900	2.23
HL1800	1800	2.45
HL1900	1900	2.63
HL2000	2000	2.83
HL2300	2300	2.81
HL2450	2450	2.85
HL2600	2600	2.65
HL3300	3300	2.21
HL3500	3500	2.20
HL3700	3700	2.11
HL3900	3900	2.40
HL4200	4200	2.40
HL4600	4600	2.33
HL4900	4900	2.37
HL5200	5200	2.07
HL5400	5400	2.11
HL5600	5600	2.20
HL5800	5800	2.04

(\*) Frequency validity is +/-50MHz below 600MHz, +/-100MHz from 600MHz to 6GHz and +/-700MHz above 6GHz

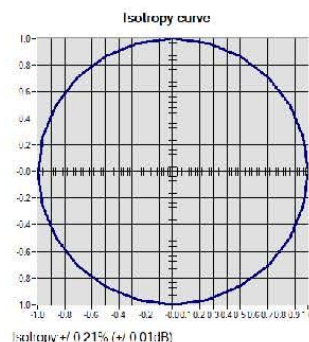


## 6 VERIFICATION RESULTS

The figures below represent the measured linearity and axial isotropy for this probe. The probe specification is +/-0.2 dB for linearity and +/-0.15 dB for axial isotropy.



Linearity: +/-1.42% (+/-0.06dB)



Isotropy: +/-0.21% (+/-0.01dB)



**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.261.11.23.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
CALIPROBE Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2019	10/2023
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Fluoroptic Thermometer	LumaSense Luxtron 812	94264	09/2022	09/2025
Coaxial cell	MVG	SN 32/16 COAXCELL_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG2_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G600_1	Validated. No cal required.	Validated. No cal required.

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**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.261.11.23.BES.A

Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG14_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_7G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.23.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 750 MHZ**

**SERIAL NO.: SN 03/15DIP0G750-355**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**

**29280 PLOUZANE - FRANCE**

**Calibration date: 02/21/2024**



Accreditations #2-6789 and #2-6814  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
Toutain ID

Signature  
numérique de  
Yann Toutain ID  
Date : 2024.02.27  
08:54:37 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

REF : ACR.53.23.24.BES.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

## 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 750 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID750
Serial Number	SN 03/15DIP0G 750-355
Product Condition (new / used)	Used

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

REF : ACR.53.23.24.BES.A

## **4 MEASUREMENT METHOD**

### **4.1 MECHANICAL REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

### **4.2 S11 PARAMETER REQUIREMENTS**

The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

### **4.3 SAR REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore-mentioned standards.

## **5 MEASUREMENT UNCERTAINTY**

### **5.1 MECHANICAL DIMENSIONS**

For the measurement in the range 0-300mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.20 mm with respect to measurement conditions.

For the measurement in the range 300-450mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.44 mm with respect to measurement conditions.

### **5.2 S11 PARAMETER**

The estimated expanded uncertainty (k=2) in calibration for the S11 parameter in linear is +/-0.08 with respect to measurement conditions.

### **5.3 SAR**

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty for validation measurements.

The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

Page: 5/8

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

REF : ACR.53.23.24.BES.A

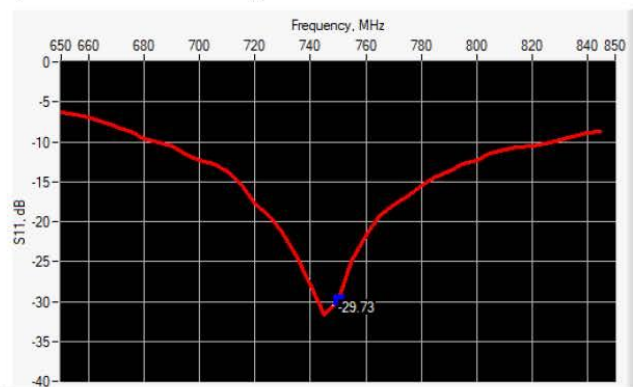
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	176.00 +/- 2%	-	100.00 +/- 2%	-	6.35 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
750	-29.73	-20	$52.5\Omega + 2.2j\Omega$

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

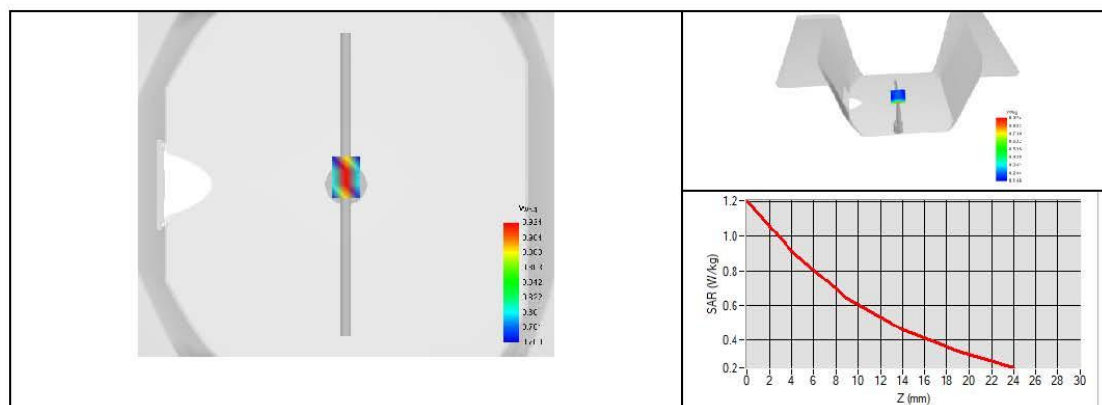


**SAR REFERENCE DIPOLE CALIBRATION REPORT**

REF : ACR.53.23.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 45.0$ $\sigma : 0.87$
Distance between dipole center and liquid	15.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	750 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
750 MHz	0.86	8.60	8.49	0.58	5.78	5.55





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

REF : ACR.53.23.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.25.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 900 MHZ**

**SERIAL NO.: SN 03/15DIP0G900-348**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**

**29280 PLOUZANE - FRANCE**

**Calibration date: 21/02/2024**



Accreditations #2-6789 and #2-6814  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.25.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
Toutain ID

Signature numérique de  
Yann Toutain ID  
Date : 2024.02.27  
08:55:46 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.25.24.BES.A

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.25.24.BES.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

## 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 900 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID900
Serial Number	SN 03/15DIP0G900-348
Product Condition (new / used)	Used

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

### 4 MEASUREMENT METHOD

#### 4.1 MECHANICAL REQUIREMENTS

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

#### 4.2 S11 PARAMETER REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

#### 4.3 SAR REQUIREMENTS

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore-mentioned standards.

### 5 MEASUREMENT UNCERTAINTY

#### 5.1 MECHANICAL DIMENSIONS

For the measurement in the range 0-300mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.20 mm with respect to measurement conditions.

For the measurement in the range 300-450mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.44 mm with respect to measurement conditions.

#### 5.2 S11 PARAMETER

The estimated expanded uncertainty (k=2) in calibration for the S11 parameter in linear is +/-0.08 with respect to measurement conditions.

#### 5.3 SAR

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty for validation measurements.

The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

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*Template\_ACR.DDD.N.YY.MVGB.ISSUE\_SAR Reference Dipole vL*

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.25.24.BES.A

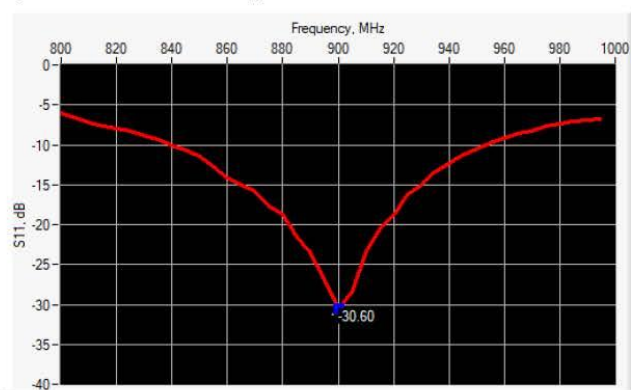
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	149.00 +/- 2%	-	83.30 +/- 2%	-	3.60 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
900	-30.60	-20	$51.5\Omega + 2.6j\Omega$

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

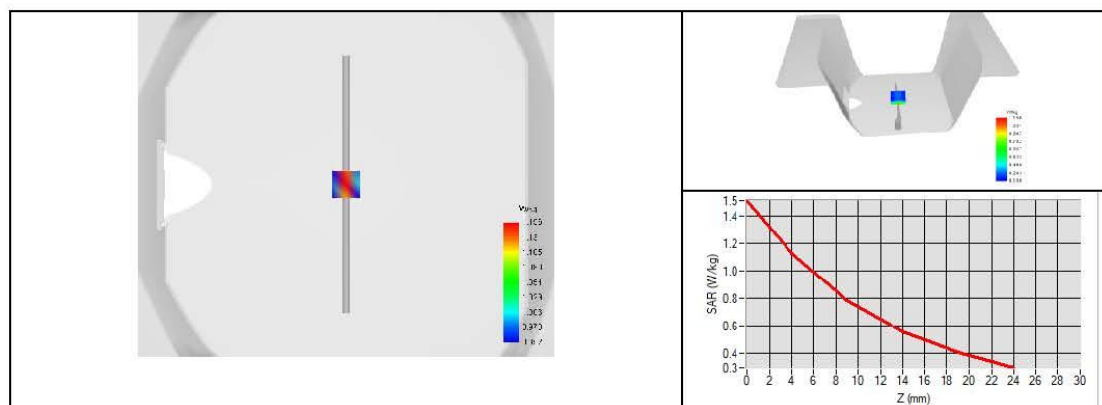


**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.25.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 44.6$ $\sigma : 0.92$
Distance between dipole center and liquid	15.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	900 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
900 MHz	1.06	10.63	10.90	0.70	7.01	6.99





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.25.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.26.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 1800 MHZ**

**SERIAL NO.: SN 03/15DIP1G800-349**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**

**29280 PLOUZANE - FRANCE**

**Calibration date: 02/21/2024**



Accreditations #2-6789 and #2-6814  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.26.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
Toutain ID

Signature numérique de  
Yann Toutain ID  
Date : 2024.02.27  
08:56:12 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.26.24.BES.A

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7	List of Equipment .....	8



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.26.24.BES.A

### 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

### 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1800 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID1800
Serial Number	SN 03/15DIP1G800-349
Product Condition (new / used)	Used

### 3 PRODUCT DESCRIPTION

#### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.26.24.BES.A

## **4 MEASUREMENT METHOD**

### **4.1 MECHANICAL REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

### **4.2 S11 PARAMETER REQUIREMENTS**

The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

### **4.3 SAR REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore-mentioned standards.

## **5 MEASUREMENT UNCERTAINTY**

### **5.1 MECHANICAL DIMENSIONS**

For the measurement in the range 0-300mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.20 mm with respect to measurement conditions.

For the measurement in the range 300-450mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.44 mm with respect to measurement conditions.

### **5.2 S11 PARAMETER**

The estimated expanded uncertainty (k=2) in calibration for the S11 parameter in linear is +/-0.08 with respect to measurement conditions.

### **5.3 SAR**

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty for validation measurements.

The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

Page: 5/8

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.26.24.BES.A

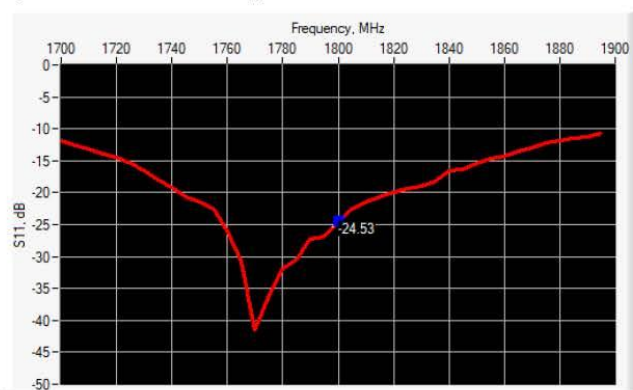
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	72.00 +/- 2%	-	41.70 +/- 2%	-	3.60 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
1800	-24.53	-20	$44.8\Omega + 2.0j\Omega$

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

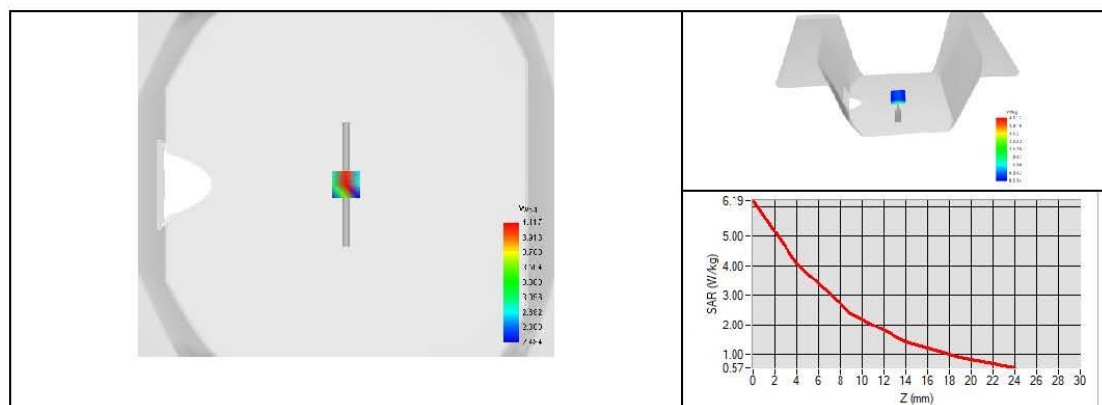


**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.26.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 42.7$ $\sigma : 1.36$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	1800 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
1800 MHz	3.71	37.06	38.40	2.00	20.01	20.10





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.26.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.28.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2000 MHZ**

**SERIAL NO.: SN 03/15DIP2G000-351**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon  
29280 PLOUZANE - FRANCE**

**Calibration date: 02/21/2024**



Accreditations #2-6789 and #2-6814  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.28.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
Toutain ID  Signature numérique  
de Yann Toutain ID  
Date : 2024.02.27  
08:57:13 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.28.24.BES.A

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.28.24.BES.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

## 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2000 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2000
Serial Number	SN 03/15DIP2G000-351
Product Condition (new / used)	Used

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.28.24.BES.A

## **4 MEASUREMENT METHOD**

### **4.1 MECHANICAL REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

### **4.2 S11 PARAMETER REQUIREMENTS**

The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

### **4.3 SAR REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore-mentioned standards.

## **5 MEASUREMENT UNCERTAINTY**

### **5.1 MECHANICAL DIMENSIONS**

For the measurement in the range 0-300mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.20 mm with respect to measurement conditions.

For the measurement in the range 300-450mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.44 mm with respect to measurement conditions.

### **5.2 S11 PARAMETER**

The estimated expanded uncertainty (k=2) in calibration for the S11 parameter in linear is +/-0.08 with respect to measurement conditions.

### **5.3 SAR**

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty for validation measurements.

The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

Page: 5/8

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.28.24.BES.A

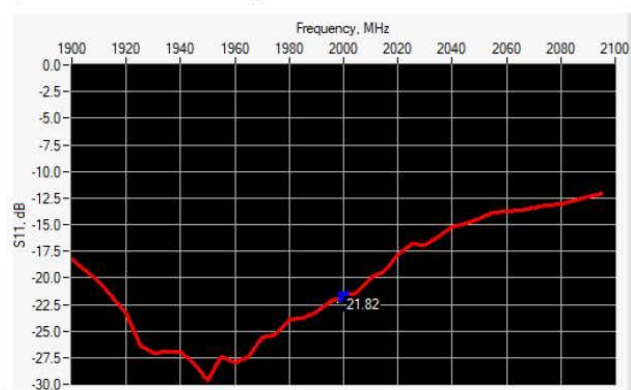
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	64.50 +/- 2%	-	37.50 +/- 2%	-	3.60 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2000	-21.82	-20	$58.3\Omega + 2.9j\Omega$

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

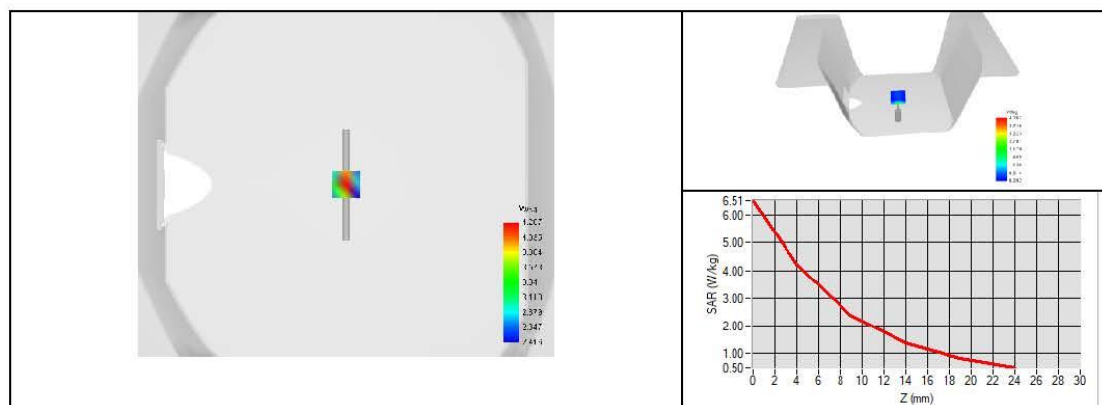


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.28.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 42.6$ $\sigma : 1.46$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$
Frequency	2000 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
2000 MHz	3.83	38.27	41.10	1.98	19.79	21.10





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.28.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref: ACR.53.32.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.29.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2450 MHZ**

**SERIAL NO.: SN 03/15DIP2G450-352**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon  
29280 PLOUZANE - FRANCE**

**Calibration date: 02/21/2024**



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Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.29.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
 Toutain ID
 

Signature  
 numérique de  
 Yann Toutain ID  
 Date : 2024.02.27  
 08:57:39 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.29.24.BES.A

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.29.24.BES.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

## 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2450
Serial Number	SN 03/15DIP2G450-352
Product Condition (new / used)	Used

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.29.24.BES.A

## **4 MEASUREMENT METHOD**

### **4.1 MECHANICAL REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

### **4.2 S11 PARAMETER REQUIREMENTS**

The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

### **4.3 SAR REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore-mentioned standards.

## **5 MEASUREMENT UNCERTAINTY**

### **5.1 MECHANICAL DIMENSIONS**

For the measurement in the range 0-300mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.20 mm with respect to measurement conditions.

For the measurement in the range 300-450mm, the estimated expanded uncertainty (k=2) in calibration for the dimension measurement in mm is +/-0.44 mm with respect to measurement conditions.

### **5.2 S11 PARAMETER**

The estimated expanded uncertainty (k=2) in calibration for the S11 parameter in linear is +/-0.08 with respect to measurement conditions.

### **5.3 SAR**

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty for validation measurements.

The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

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*Template\_ACR.DDD.N.YY.MVGB.ISSUE\_SAR Reference Dipole vL*

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.29.24.BES.A

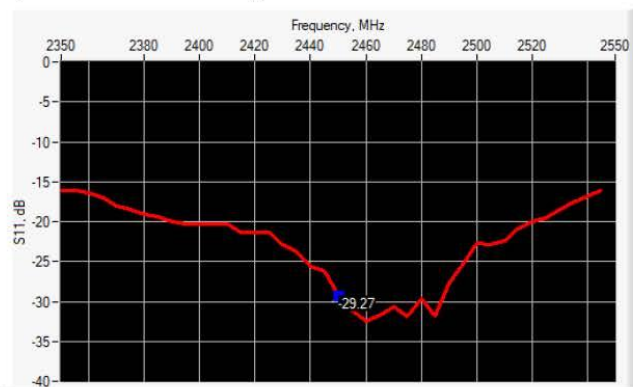
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	51.50 +/- 2%	-	30.40 +/- 2%	-	3.60 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2450	-29.27	-20	$53.6\Omega + 0.1j\Omega$

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

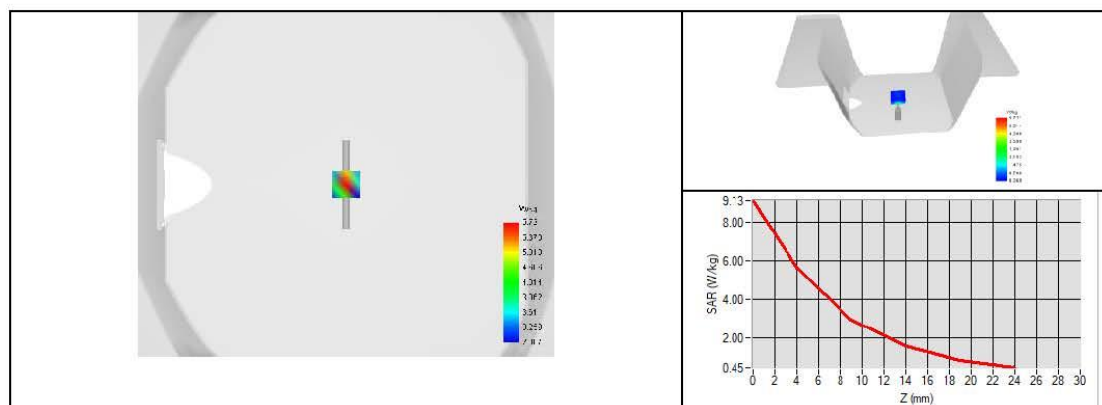


**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.29.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 42.1$ $\sigma : 1.83$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
2450 MHz	5.00	50.05	52.40	2.38	23.80	24.00





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.29.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024



## SAR Reference Dipole Calibration Report

Ref : ACR.53.30.24.BES.A

**SHENZHEN NTEK TESTING TECHNOLOGY  
CO., LTD.**

**BUILDING E, FENDA SCIENCE PARK, SANWEI  
COMMUNITY, XIXIANG STREET,  
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA  
MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2600 MHZ**

**SERIAL NO.: SN 03/15DIP2G600-356**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon  
29280 PLOUZANE - FRANCE**

**Calibration date: 02/21/2024**



Accreditations #2-6789 and #2-6814  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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### *Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.30.24.BES.A

	Name	Function	Date	Signature
Prepared by :	Pedro Ruiz	Measurement Responsible	2/22/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	2/22/2024	
Authorized by:	Yann Toutain	Laboratory Director	2/27/2024	

Yann  
Toutain  
ID

Signature  
numérique de  
Yann Toutain ID  
Date : 2024.02.27  
08:58:12 +01'00'

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Pedro Ruiz	2/22/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.30.24.BES.A

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5	Measurement Uncertainty.....	5
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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.30.24.BES.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

## 2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2600 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2600
Serial Number	SN 03/15DIP2G600-356
Product Condition (new / used)	Used

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards. The product is designed for use with the COMOSAR test bench only.



**Figure 1 – MVG COMOSAR Validation Dipole**



**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.30.24.BES.A

## **4 MEASUREMENT METHOD**

### **4.1 MECHANICAL REQUIREMENTS**

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

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The dipole used for SAR system validation measurements and checks must have a S11 of -20 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

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The estimated expanded uncertainty (k=2) in calibration for the 1g and 10g SAR measurement in W/kg is +/-19% with respect to measurement conditions.

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**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.30.24.BES.A

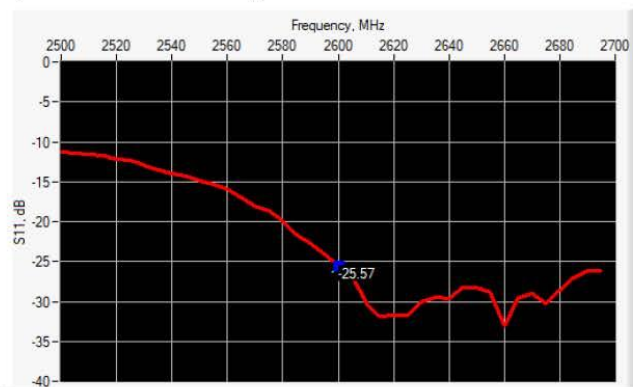
## 6 CALIBRATION RESULTS

### 6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	48.50 +/- 2%	-	28.80 +/- 2%	-	3.60 +/- 2%

### 6.2 S11 PARAMETER

#### 6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2600	-25.57	-20	54.5Ω - 3.2jΩ

### 6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

#### 6.3.1 SAR with Head Liquid

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

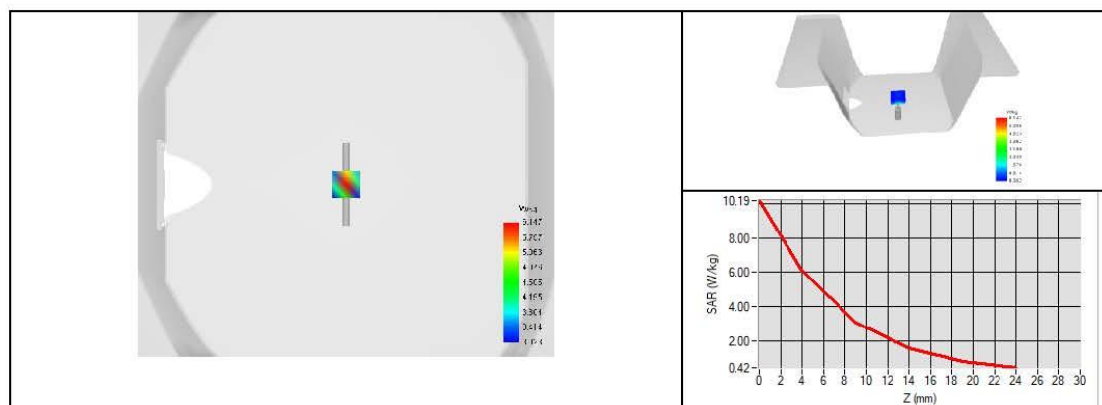


**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref : ACR.53.30.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_p' : 41.3$ $\sigma : 1.95$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$
Frequency	2600 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
2600 MHz	5.42	54.16	55.30	2.49	24.85	24.60





**SAR REFERENCE DIPOLE CALIBRATION REPORT**

Ref.: ACR.53.30.24.BES.A

**7 LIST OF EQUIPMENT**

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3523-EPGO-429	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

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**END**