

FCC SAR EVALUATION REPORT

**In accordance with the requirements of
FCC 47 CFR Part 2(2.1093) and
IEEE Std 1528-2013**

Product Name : Laptop

Trademark : acer

Model Name : Aspire 3 A325-45

Family Model : N/A

Report No. : S24042603306001

FCC ID : 2BGQ7-ASP32545

Prepared for

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TEST RESULT CERTIFICATION

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Product description

Product name Laptop

Trademark acer

Model Name Aspire 3 A325-45

Family Model N/A

FCC 47 CFR Part 2(2.1093)

Standards IEEE Std 1528-2013

Published RF exposure KDB procedures

This device described above has been tested by Shenzhen NTEK. In accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 and KDB 865664 D01. Testing has shown that this device is capable of compliance with localized specific absorption rate (SAR) specified in FCC 47 CFR Part 2(2.1093). 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 S240426033006

Date of Test

Date (s) of performance of tests ... May. 11, 2024~ May. 17, 2024

Date of Issue Jun. 05, 2024

Test Result **Pass**

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Revision History

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REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Jun. 05, 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	8.0	20.0

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

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

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

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

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

NOTE
TRUNK LIMIT
1.6 W/kg
APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Aspire 3 A325-45 are as follows.

RF Exposure Conditions		Max Reported SAR Value(W/kg)
1-g Bottom surface of the keyboard with 0mm		0.641
Max Simultaneous Tx	Bottom surface of the keyboard	0.462

Note: This device is in compliance with Specific Absorption Rate (SAR) for general population / uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR Part 2(2.1093), and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 & KDB 865664 D01.

1.3. EUT Description

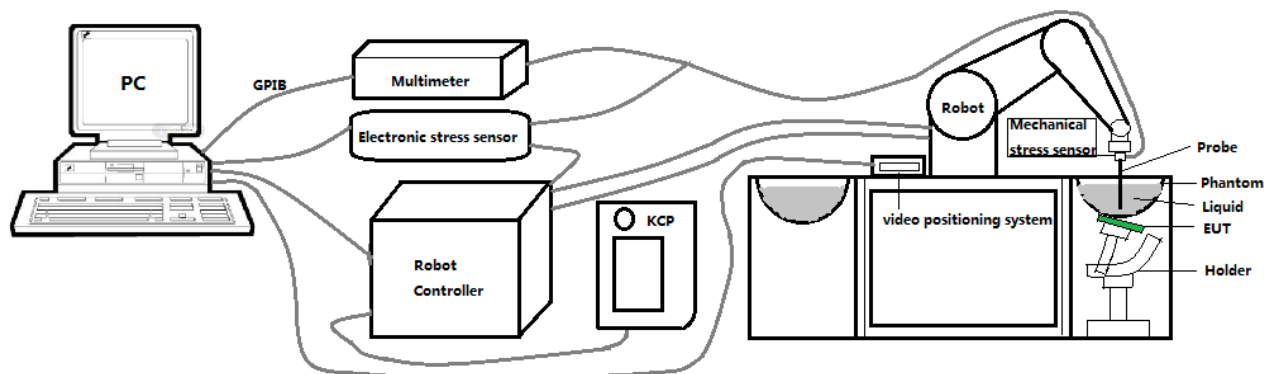
Device Information			
Product Name	Laptop		
Trade Name	acer		
Model Name	Aspire 3 A325-45		
Family Model	N/A		
Model Difference	N/A		
FCC ID	2BGQ7-ASP32545		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna	PIFA Antenna		
Battery Information	DC 7.6V, 5000mAh, 38Wh		
Hardware version	T140JR430		
FW Version	OS: BM_OS_T140JR430_B_20240418		
Software version	BIOS: BM_BI_T140JR430_11A_E_20240424; EC: BM_EC_T140JR430_11A_C_20240424;		
Device Operating Configurations			
Supporting Mode(s)	WLAN 2.4G/5G, Bluetooth		
Test Modulation	WLAN(DSSS/OFDM), Bluetooth(GFSK, $\pi/4$ -DQPSK, 8DPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	WLAN 2.4G	2412-2462	
	WLAN 5.2G	5180-5240	
	WLAN 5.3G	5260-5320	
	WLAN 5.6G	5500-5700	

	WLAN 5.8G	5745-5825
	Bluetooth	2402-2480

CNAS Lab. : The Certificate Registration Number is L5516
 A2LA Lab. : The Certificate Registration Number is 4298.01
 FCC Accredited : Test Firm Registration Number: 463705
 Designation Number: CN1184
 ISED Registration : Company Number: 9270A
 CAB identifier: CN0074

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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



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

2.3. E-Field Probe

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

For the measurements the Specific Dosimetric E-Field Probe 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 ± 1 mm).
- Probe linearity: ± 0.06 dB
- Axial isotropy: ± 0.01 dB
- Hemispherical Isotropy: ± 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° .

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 ± 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

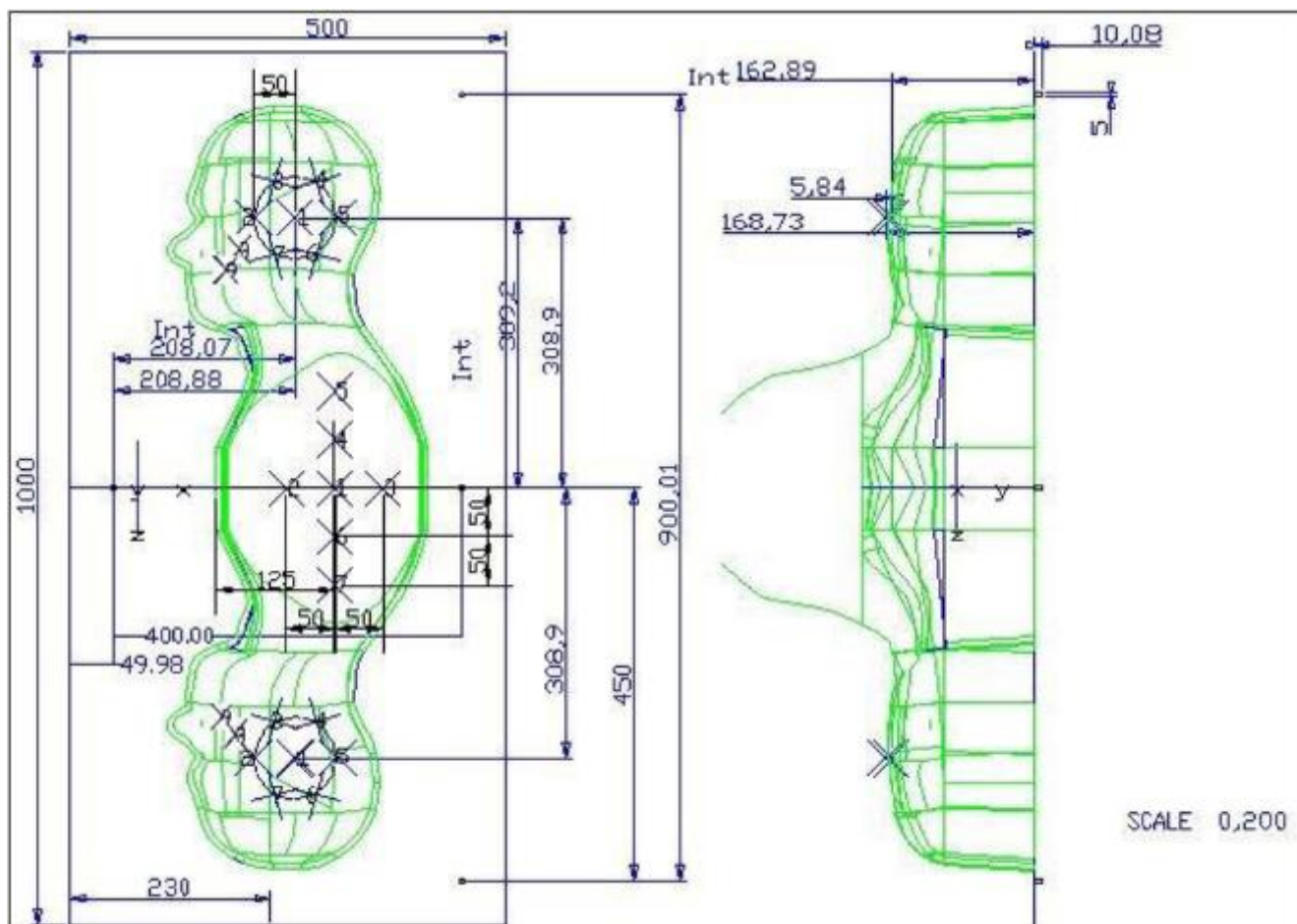
Photo of SAM phantom SN 16/15 SAM119



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

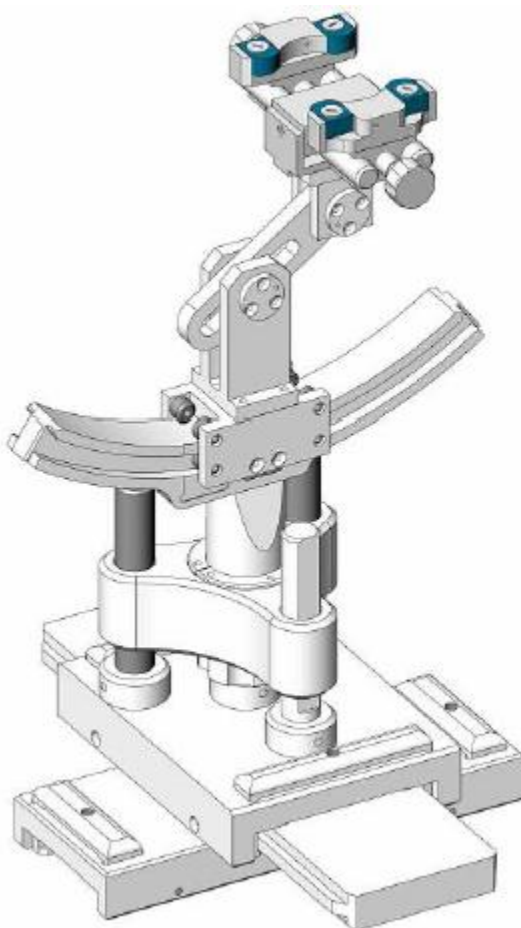


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

The test, based on ultrasonic system, allows measuring the thickness with an accuracy of 10 μ 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
☒	MVG	E FIELD PROBE	SSE2	3423-EPGO-426	Sep. 18, 2023	Sep. 17, 2024
☐	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2300 MHz Dipole	SID2300	SN 03/16 DIP 2G300-358	Feb. 21, 2024	Feb. 20, 2027
☒	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	3500 MHz Dipole	SID3500	SN 09/12 DIP 3G500-360	Oct. 15, 2022	Oct. 14, 2025
☐	MVG	3700 MHz Dipole	SID3700	SN 09/12 DIP 3G/700-361	Oct. 15, 2022	Oct. 14, 2025
☒	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Feb. 21, 2024	Feb. 20, 2027
☒	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
☒	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
☒	KEITHLEY	Millivoltmeter	2000	4072790	NCR	NCR
☐	R&S	Universal radio communication tester	CMU200	117858	May 29, 2023	May 28, 2024

☐	R&S	Wideband radio communication tester	CMW500	103917	May 29, 2023	May 28, 2024
☒	HP	Network Analyzer	8753D	3410J01136	May 29, 2023	May 28, 2024
☒	Agilent	MXG Vector Signal Generator	N5182A	MY47070317	May 29, 2023	May 28, 2024
☒	Agilent	Power meter	E4419B	MY45102538	May 29, 2023	May 28, 2024
☒	Agilent	Power sensor	E9301A	MY41495644	May 29, 2023	May 28, 2024
☒	Agilent	Power sensor	E9301A	US39212148	May 29, 2023	May 28, 2024
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Jul. 04, 2023	Jul. 03, 2024
☒	N/A	Thermometer	N/A	LES-085	Mar. 27, 2023	Mar. 26, 2026
☒	MVG	SAM Phantom	SSM2	SN 16/15 SAM119	NCR	NCR
☒	MVG	Device Holder	SMPPD	SN 16/15 MSH100	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 2450	Head 2450	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 5200	Head 5200	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 5400	Head 5400	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 5600	Head 5600	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 5800	Head 5800	NCR	NCR

	Communication Technology Co., Ltd.					
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3. SAR Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/Bluetooth power measurement, use engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/Bluetooth output power.

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix A demonstrates.
- (c) Set scan area, grid size and other setting on the OPENSAR software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band.
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

3.1. Power Reference

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

3.2. Area scan & Zoom scan

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

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

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

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

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

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 used to determine 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 for 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 defined 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.

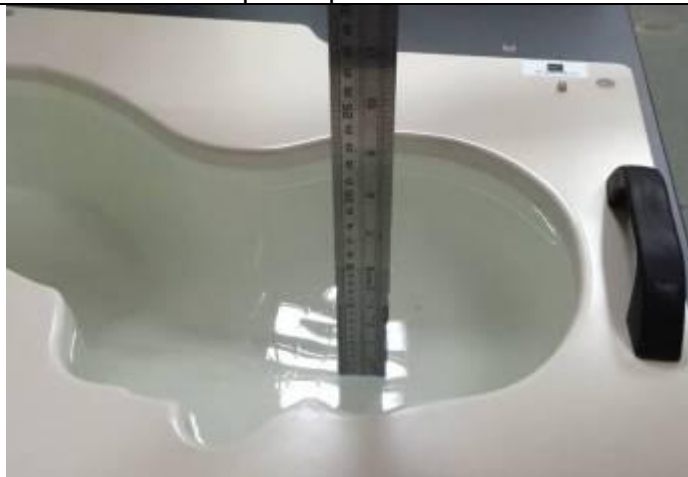
4. System Verification Procedure

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

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.

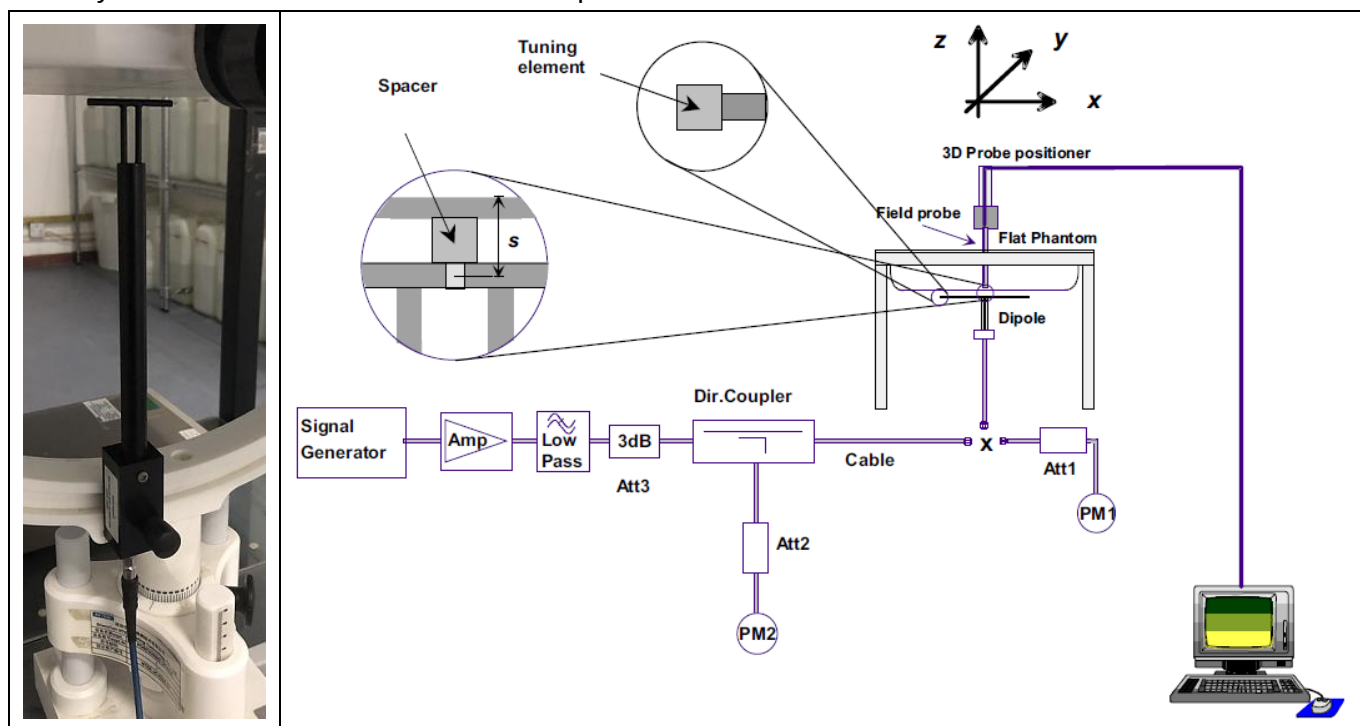
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		$\epsilon_r (\pm 5\%)$	σ (S/m) ($\pm 5\%$)	ϵ_r	σ (S/m)		
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.67	1.78	21.4 °C	May. 14, 2024
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	34.68	4.56	21.9 °C	May. 11, 2024
Head 5400	5400	35.80 (34.01~37.59)	4.86 (4.62~5.10)	34.45	4.85	21.8 °C	May. 17, 2024
Head 5600	5600	35.50 (33.73~37.28)	5.07 (4.82~5.32)	34.52	4.97	21.2 °C	May. 16, 2024
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	34.11	5.21	21.5 °C	May. 12, 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)		Measured SAR		Liquid Temp.	Test Date
	(±10%)		(Normalized to 1W)			
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	52.66	24.47	21.4 °C	May. 14, 2024
5200MHz	162.59 (146.33~178.85)	56.21 (50.59~61.83)	172.23	57.75	21.9 °C	May. 11, 2024
5400MHz	159.81 (143.83~175.79)	55.00 (49.50~60.50)	170.77	55.18	21.8 °C	May. 17, 2024
5600MHz	179.15 (161.24~197.07)	61.01 (54.91~67.11)	164.44	61.00	21.2 °C	May. 16, 2024
5800MHz	182.20 (163.98~200.42)	61.32 (55.19~67.45)	166.10	55.44	21.5 °C	May. 12, 2024

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

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

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

5.2. SAR measurement uncertainty

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

6. RF Exposure Positions

6.1. Laptop host platform test requirements

The required minimum test separation distance for incorporating transmitters and antennas into laptop, notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required.

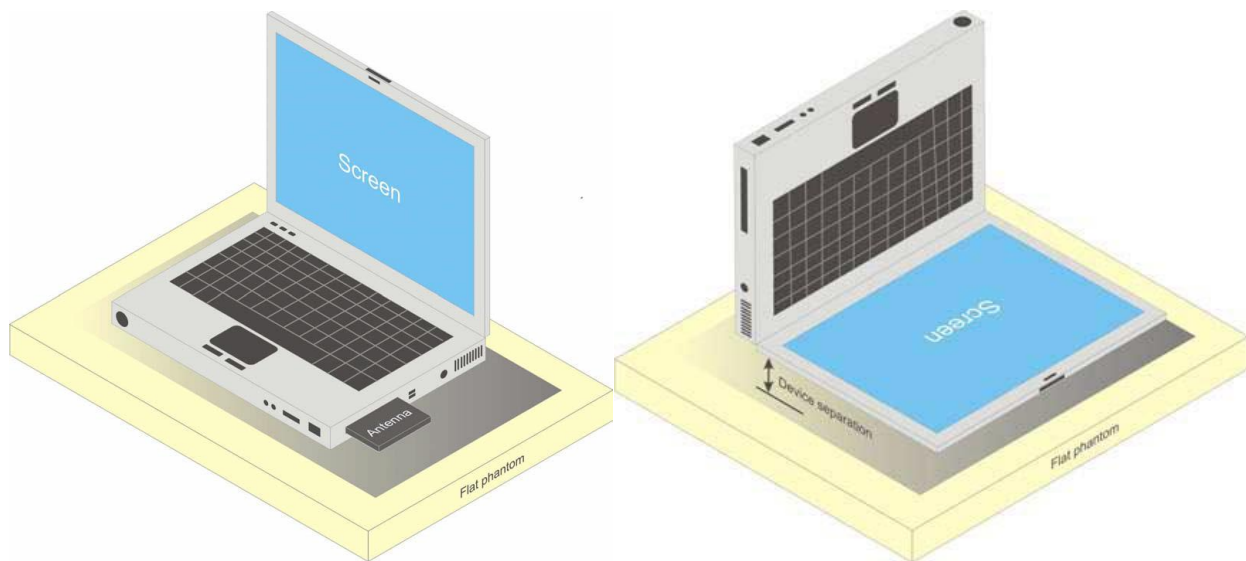


Figure 6.1 – Test positions for Laptop

7. RF Output Power

7.1. WLAN & Bluetooth Output Power

7.1.1. Output Power Results Of WLAN

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)ANT1	Tune-up	Output Power (dBm)ANT2	Tune-up	Output Power (dBm)MIMO
802.11b	1	2412	16.00	15.87	16.50	16.44	/	/
	6	2437	16.00	15.84	16.50	16.42	/	/
	11	2462	16.00	15.58	16.50	16.45	/	/
802.11g	1	2412	14.00	13.88	13.50	13.46	/	/
	6	2437	14.00	13.73	13.50	13.45	/	/
	11	2462	14.00	13.48	13.50	13.34	/	/
802.11n (HT20)	1	2412	14.00	13.67	12.50	12.45	15.50	15.21
	6	2437	14.00	13.66	12.50	12.41	15.50	15.14
	11	2462	14.00	13.35	12.50	12.28	15.50	14.94
802.11n (HT40)	3	2422	13.00	12.73	12.50	12.40	15.00	14.87
	6	2437	13.00	12.65	12.50	12.48	15.00	14.80
	9	2452	13.00	12.47	12.50	12.39	15.00	14.69

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)ANT1	Tune-up	Output Power (dBm)ANT2	Tune-up	Output Power (dBm)MIMO
802.11a	36	5180	13.50	12.96	13.50	12.69	/	/
	40	5200	13.50	13.18	13.50	13.10	/	/
	48	5240	13.50	12.28	13.50	12.41	/	/
802.11n HT20	36	5180	13.50	12.83	13.00	12.89	14.50	13.94
	40	5200	13.50	13.06	13.00	12.71	14.50	14.12
	48	5240	13.50	12.30	13.00	12.21	14.50	13.76
802.11n HT40	38	5190	13.50	13.28	13.00	12.75	14.50	14.24
	46	5230	13.50	12.86	13.00	12.83	14.50	14.05
802.11ac VHT20	36	5180	13.50	12.89	13.00	12.64	14.50	14.00
	40	5200	13.50	13.13	13.00	12.81	14.50	14.24
	48	5240	13.50	12.26	13.00	12.32	14.50	13.67
802.11ac VHT40	38	5190	13.50	13.27	13.00	13.00	14.50	14.23
	46	5230	13.50	12.81	13.00	12.55	14.50	14.02

802.11ac VHT80	42	5210	13.50	13.36	13.00	12.86	14.50	13.60
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NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)ANT1	Tune-up	Output Power (dBm)ANT2	Tune-up	Output Power (dBm)MIMO
802.11a	52	5260	13.00	12.77	13.50	12.80	/	/
	56	5280	13.00	12.63	13.50	13.21	/	/
	64	5320	13.00	12.86	13.50	12.79	/	/
802.11n HT20	52	5260	13.50	12.43	13.00	12.40	15.00	14.28
	56	5280	13.50	12.68	13.00	12.73	15.00	14.35
	64	5320	13.50	13.08	13.00	12.91	15.00	14.57
802.11n HT40	54	5270	13.50	12.74	13.50	13.06	15.00	14.52
	62	5310	13.50	13.11	13.50	13.02	15.00	14.75
802.11ac VHT20	52	5260	13.50	12.62	13.00	12.66	15.00	14.22
	56	5280	13.50	12.48	13.00	12.69	15.00	14.41
	64	5320	11.00	13.12	13.00	12.84	15.00	14.58
802.11ac VHT40	54	5270	13.50	12.72	13.00	12.96	15.00	14.47
	62	5310	13.50	13.16	13.00	12.99	15.00	14.73
802.11ac VHT80	58	5290	13.50	13.03	13.50	13.13	15.00	13.53

NOTE: Power measurement results of WLAN 5.3G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)ANT1	Tune-up	Output Power (dBm)ANT2	Tune-up	Output Power (dBm)MIMO
802.11a	100	5500	14.00	13.66	13.50	12.89	/	/
	120	5600	14.00	12.99	13.50	12.85	/	/
	140	5700	14.00	13.34	13.50	13.07	/	/
802.11 n20	100	5500	13.50	13.41	13.00	12.71	15.00	14.51
	120	5600	13.50	13.02	13.00	12.66	15.00	14.28
	140	5700	13.50	13.12	13.00	12.82	15.00	14.67
802.11 n40	102	5510	13.50	13.32	13.50	12.92	15.00	14.61
	118	5590	13.50	13.04	13.50	13.11	15.00	14.46
	134	5670	13.50	13.06	13.50	12.83	15.00	14.94
802.11ac (VHT20)	100	5500	13.50	13.17	13.00	12.71	15.00	14.52
	120	5600	13.50	12.97	13.00	12.67	15.00	14.32
	140	5700	13.50	13.16	13.00	12.79	15.00	14.64
802.11ac	102	5510	13.50	13.49	13.50	12.90	15.00	13.62

(VHT40)	118	5590	13.50	13.19	13.50	13.03	15.00	14.50
	134	5670	13.50	13.37	13.50	13.14	15.00	14.96
802.11ac	106	5530	13.50	13.34	13.50	12.70	15.00	13.47
(VHT80)	122	5610	13.50	13.46	13.50	13.00	15.00	13.39

NOTE: Power measurement results of WLAN 5.6G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)ANT1	Tune-up	Output Power (dBm)ANT2	Tune-up	Output Power (dBm)MIMO
802.11a	149	5745	14.00	12.96	13.50	13.24	/	/
	157	5785	14.00	12.82	13.50	13.13	/	/
	165	5825	14.00	13.50	13.50	13.46	/	/
802.11n HT20	149	5745	13.50	12.96	13.50	12.91	15.00	14.21
	157	5785	13.50	12.95	13.50	12.90	15.00	14.28
	165	5825	13.50	13.28	13.50	13.08	15.00	14.70
802.11n HT40	151	5755	13.50	13.31	13.50	13.09	15.00	14.60
	159	5795	13.50	13.46	13.50	13.24	15.00	14.69
802.11ac VHT20	149	5745	13.50	13.14	13.50	13.05	15.00	14.19
	157	5785	13.50	13.04	13.50	12.95	15.00	14.33
	165	5825	13.50	13.36	13.50	13.07	15.00	14.63
802.11ac VHT40	151	5755	13.50	13.24	13.50	13.09	15.00	14.40
	159	5795	13.50	13.41	13.50	13.20	15.00	14.72
802.11ac VHT80	155	5775	14.00	13.53	13.50	13.32	15.00	14.36

NOTE: Power measurement results of WLAN 5.8G.

BR+EDR	Output Power (dBm)				
	Data Rates	Tune-up (dBm)	Channel		
			0CH	39CH	78CH
	1M	6.00	4.71	5.73	5.58
	2M	7.00	6.19	6.29	6.12
	3M	7.00	6.35	6.39	6.10

BLE	Channel	Tune-up	Output Power (dBm)	
			1M	2M
	0CH	7.00	6.35	6.30
	19CH	7.00	6.31	6.34
	39CH	7.00	6.02	6.06

NOTE: Power measurement results of Bluetooth.

8. Stand-alone SAR test exclusion

Refer to FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0$$
 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

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

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

Mode	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
Bluetooth	7.00	5.01	5	2.480	1.6	3.0	Yes

NOTE: Standalone SAR test exclusion for Bluetooth.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}/x] \leq 7.5$$
 W/kg for test separation distances ≤ 50 mm, where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

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

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/Kg)
Bluetooth	Body	7.00	5.01	5	2.48	7.5	0.210

NOTE: Estimated SAR calculation for Bluetooth

9. SAR Results

9.1. SAR measurement results

9.1.1. SAR measurement Result of WLAN 2.4G ANT1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with	1/2412	802.11b	0.622	0.294	-2.07	15.87	16.00	0.641	2024/5/14	17#

0mm

NOTE: Body SAR test results of WLAN 2.4G

ANT2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	11/2462	802.11b	0.386	0.186	2.79	16.45	16.50	0.390	2024/5/14	18#

NOTE: Body SAR test results of WLAN 2.4G

MIMO1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	1/2412	802.11n HT20	0.260	0.128	1.71	15.21	15.50	0.278	2024/5/14	19#

NOTE: Body SAR test results of WLAN 2.4G

MIMO2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	1/2412	802.11n HT20	0.172	0.086	-1.72	15.21	15.50	0.184	2024/5/14	20#

NOTE: Body SAR test results of WLAN 2.4G

9.1.2. SAR measurement Result of WLAN 5.2G

ANT1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	42/5210	802.11ac VHT80	0.369	0.143	2.30	13.36	13.50	0.381	2024/5/11	1#

NOTE: Body SAR test results of WLAN 5.2G

ANT2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	40/5200	802.11a	0.140	0.061	2.88	13.10	13.50	0.154	2024/5/11	2#

NOTE: Body SAR test results of WLAN 5.2G

MIMO1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	40/5200	802.11ac VHT20	0.226	0.090	1.17	14.24	14.50	0.240	2024/5/11	3#

NOTE: Body SAR test results of WLAN 5.2G

MIMO2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	40/5200	802.11ac VHT20	0.066	0.036	-2.65	14.24	14.50	0.070	2024/5/11	4#

NOTE: Body SAR test results of WLAN 5.2G

9.1.3. SAR measurement Result of WLAN 5.3G

ANT1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	62/5310	802.11ac VHT40	0.355	0.138	-0.08	13.16	13.50	0.384	2024/5/17	5#

ANT2

NOTE: Body SAR test results of WLAN 5.3G

MIMO1

NOTE: Body SAR test results of WLAN 5.3G

MIMO2

NOTE: Body SAR test results of WLAN 5.3G

9.1.4. SAR measurement Result of WLAN 5.6G

ANT1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						

Bottom surface of the keyboard with 0mm	100/5500	802.11a	0.429	0.192	3.53	13.66	14.00	0.464	2024/5/16	9#
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NOTE: Body SAR test results of WLAN 5.6G

ANT2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	134/5670	802.11ac (VHT40)	0.138	0.059	-1.03	13.14	13.50	0.150	2024/5/16	10#

NOTE: Body SAR test results of WLAN 5.6G

MIMO1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	134/5670	802.11ac (VHT40)	0.253	0.103	-3.01	14.96	15.00	0.255	2024/5/16	11#

NOTE: Body SAR test results of WLAN 5.6G

MIMO2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	134/5670	802.11ac (VHT40)	0.103	0.048	3.75	14.96	15.00	0.104	2024/5/16	12#

NOTE: Body SAR test results of WLAN 5.6G

9.1.5. SAR measurement Result of WLAN 5.8G

ANT1

Test Position	Test	Mode	SAR Value	Power	Conducted	Tune-up	Scaled	Date	Plot
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	channel /Freq.		(W/kg)		Drift(%)	Power (dBm)	Power (dBm)	SAR 1-g (W/Kg)		
			1-g	10-g						
Bottom surface of the keyboard with 0mm	155/5775	802.11ac VHT80	0.252	0.129	2.35	13.53	14.00	0.281	2024/5/12	13#

NOTE: Body SAR test results of WLAN 5.8G

ANT2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	165/5825	802.11a	0.133	0.086	0.70	13.46	13.50	0.134	2024/5/12	14#

NOTE: Body SAR test results of WLAN 5.8G

MIMO1

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	159/5795	802.11ac VHT40	0.150	0.090	2.30	14.72	15.00	0.160	2024/5/12	15#

NOTE: Body SAR test results of WLAN 5.8G

MIMO2

Test Position	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Bottom surface of the keyboard with 0mm	159/5795	802.11ac VHT40	0.097	0.070	4.56	14.72	15.00	0.103	2024/5/12	16#

NOTE: Body SAR test results of WLAN 5.8G

9.2. Simultaneous Transmission Analysis

Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

- 1) Scalar SAR summation < 1.6W/kg.

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

Test Position	Scaled SAR _{MAX}		Σ 1-g SAR (W/Kg)	SPLSR	Remark
	MIMO1	MIMO2			
Bottom surface of the keyboard with 0mm	0.278	0.184	0.462	N/A	N/A

10. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

11. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 2450MHz
MEASUREMENT 2 System Performance Check - 5200MHz
MEASUREMENT 3 System Performance Check - 5400MHz
MEASUREMENT 4 System Performance Check - 5600MHz
MEASUREMENT 5 System Performance Check - 5800MHz

MEASUREMENT 1

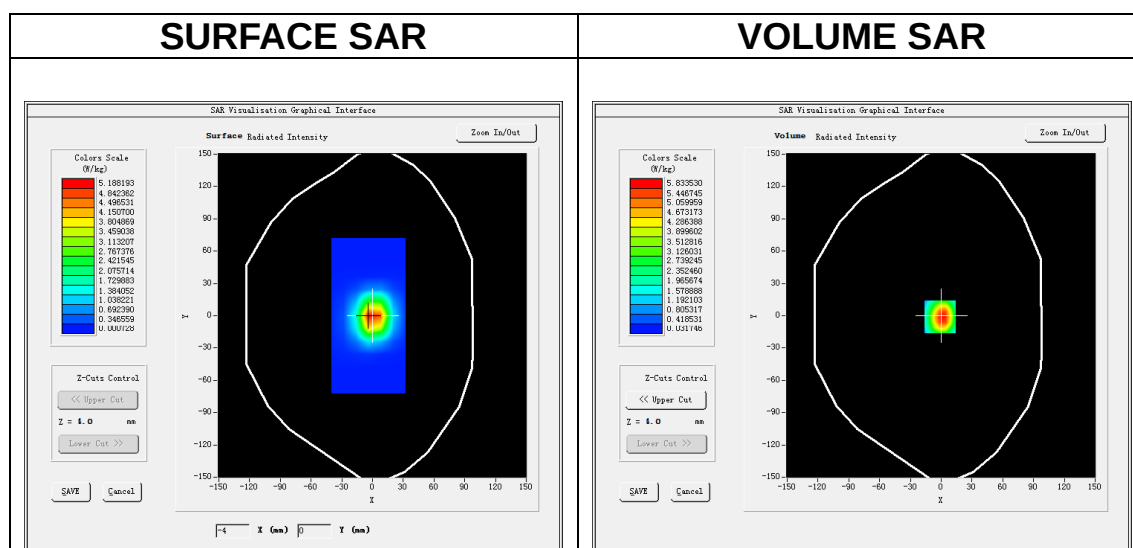
Date of measurement: 14/5/2024

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

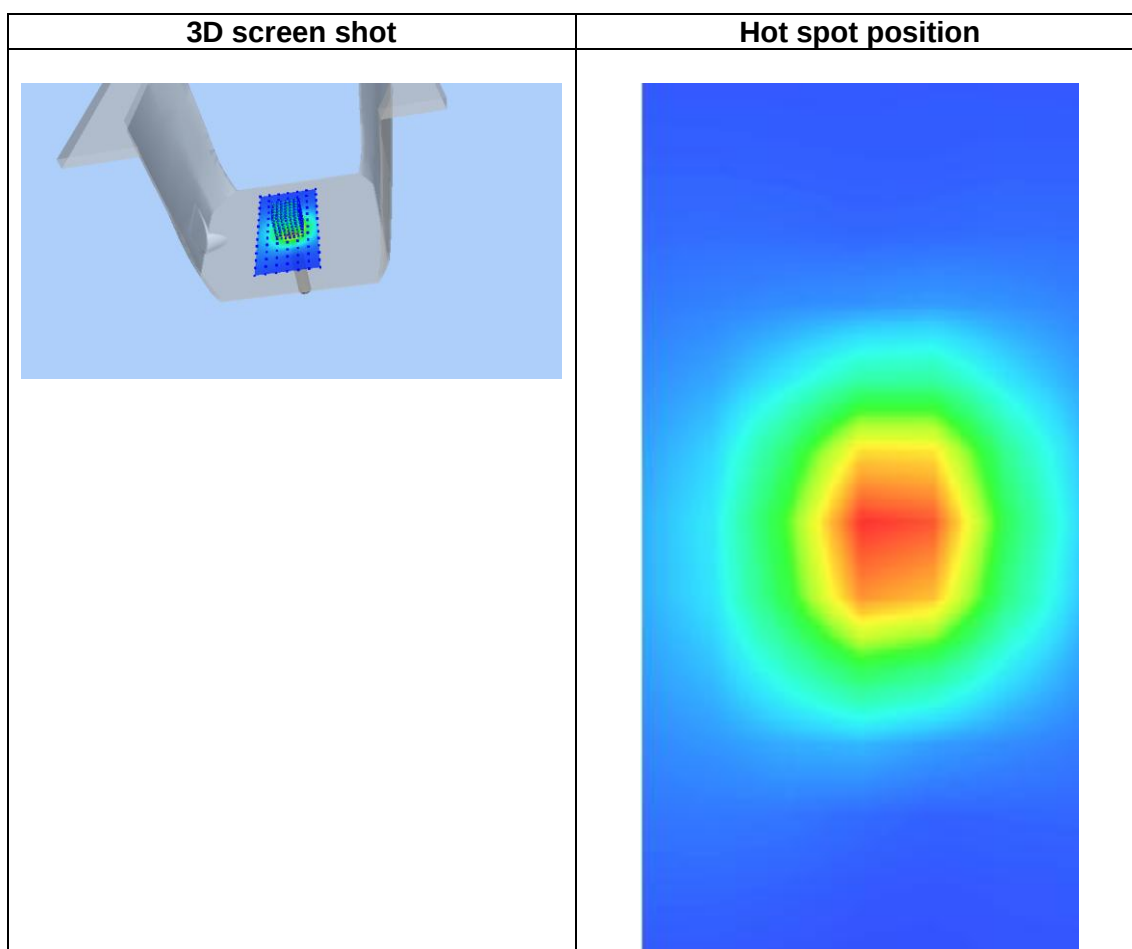
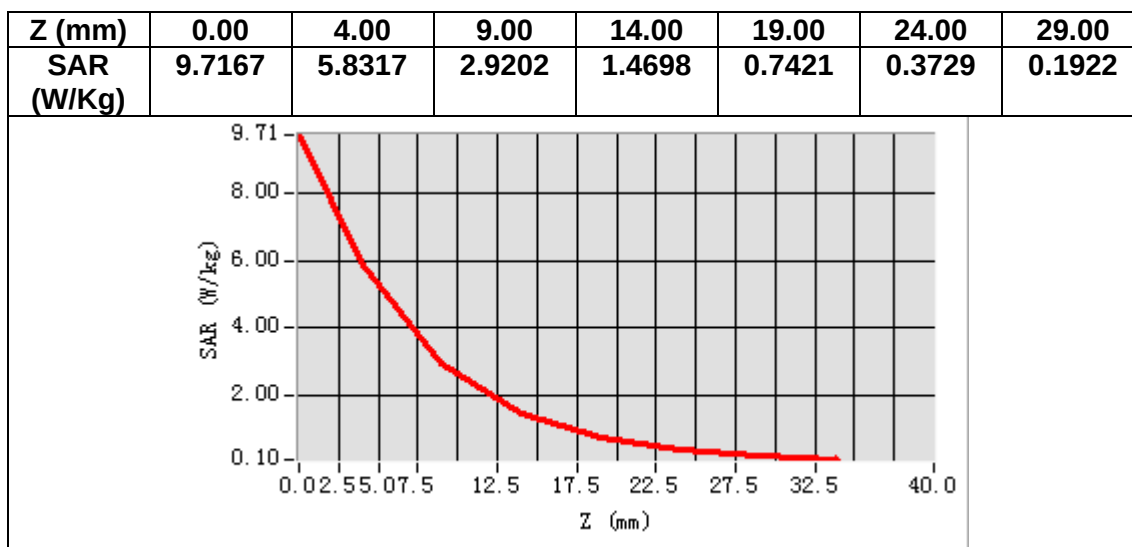
Frequency (MHz)	2450.000000
Relative permittivity (real part)	37.667635
Relative permittivity (imaginary part)	13.049236
Conductivity (S/m)	1.776146
Variation (%)	1.770000



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

SAR Peak: 9.83 W/kg

SAR 10g (W/Kg)	2.447267
SAR 1g (W/Kg)	5.266338



MEASUREMENT 2

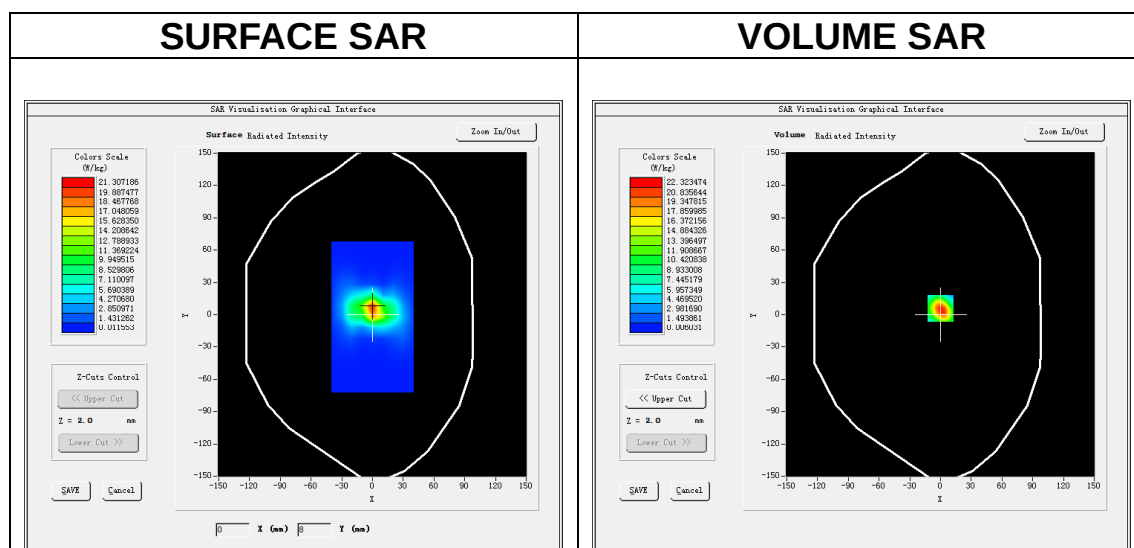
Date of measurement: 11/5/2024

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5200</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.07</u>

B. SAR Measurement Results

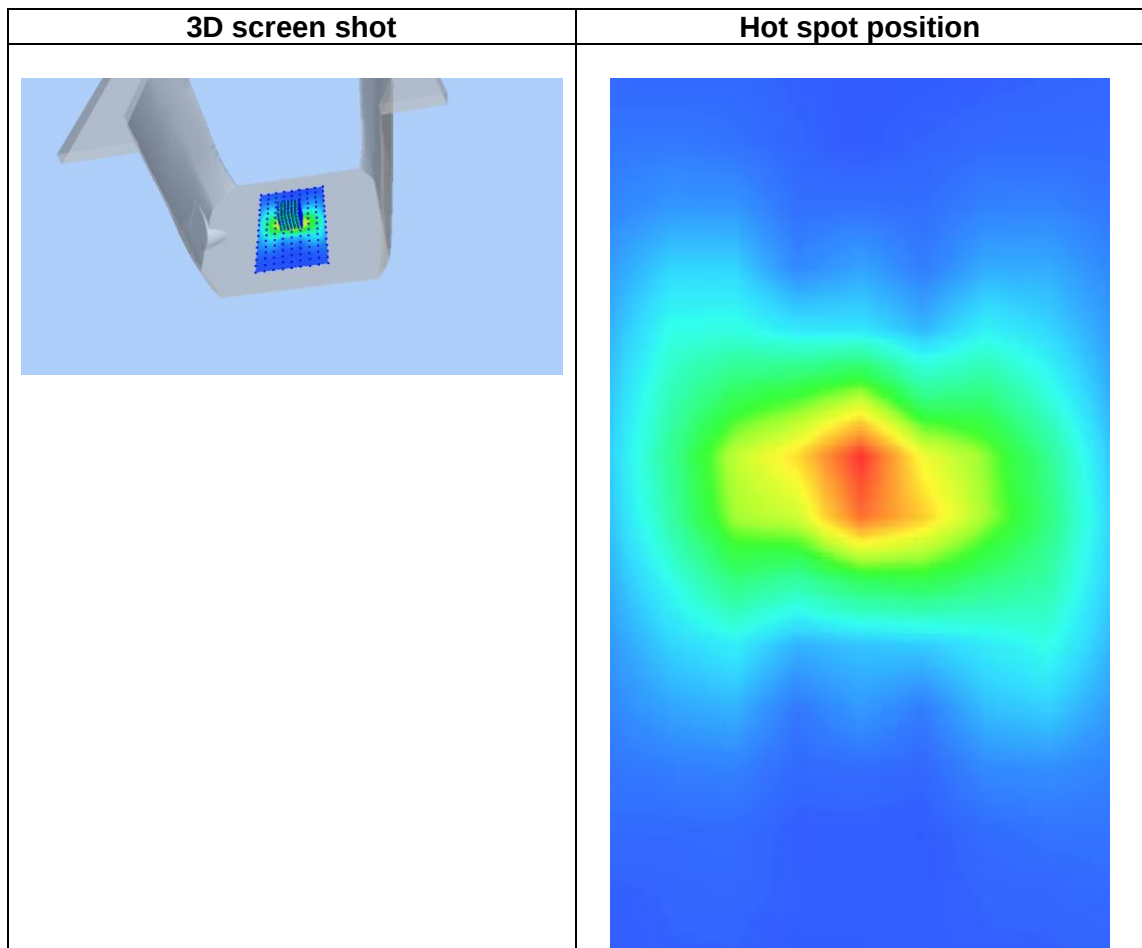
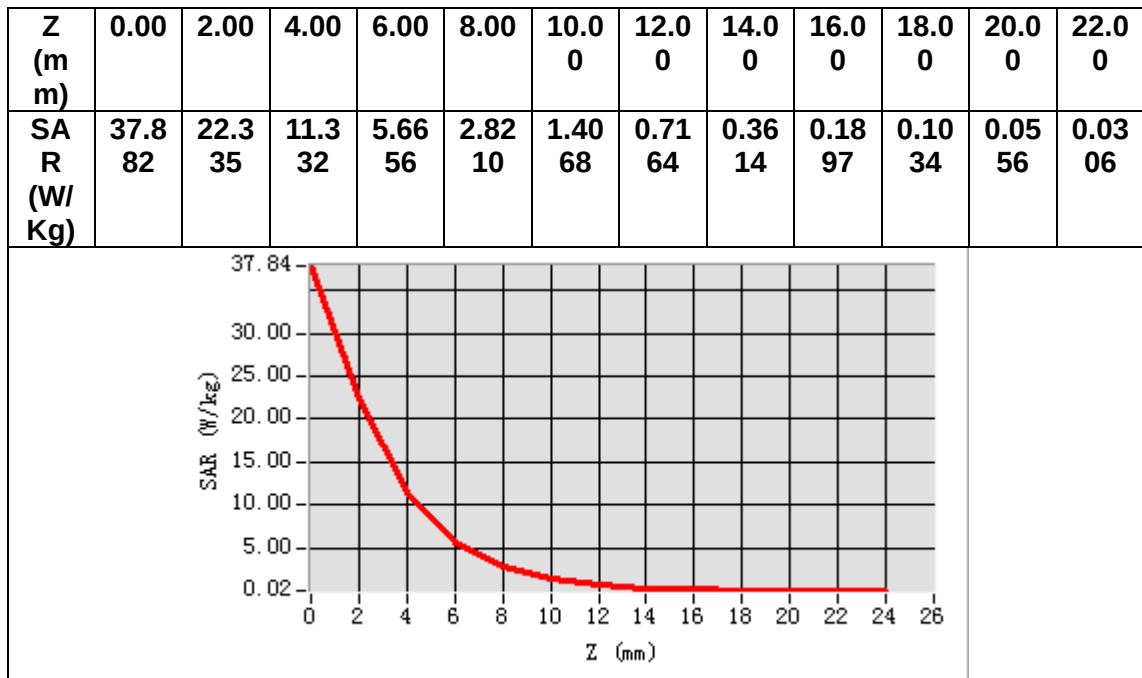
Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.675906
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	1.750000



Maximum location: X=0.00, Y=6.00

SAR Peak: 40.06 W/kg

SAR 10g (W/Kg)	5.775331
SAR 1g (W/Kg)	17.223173



MEASUREMENT 3

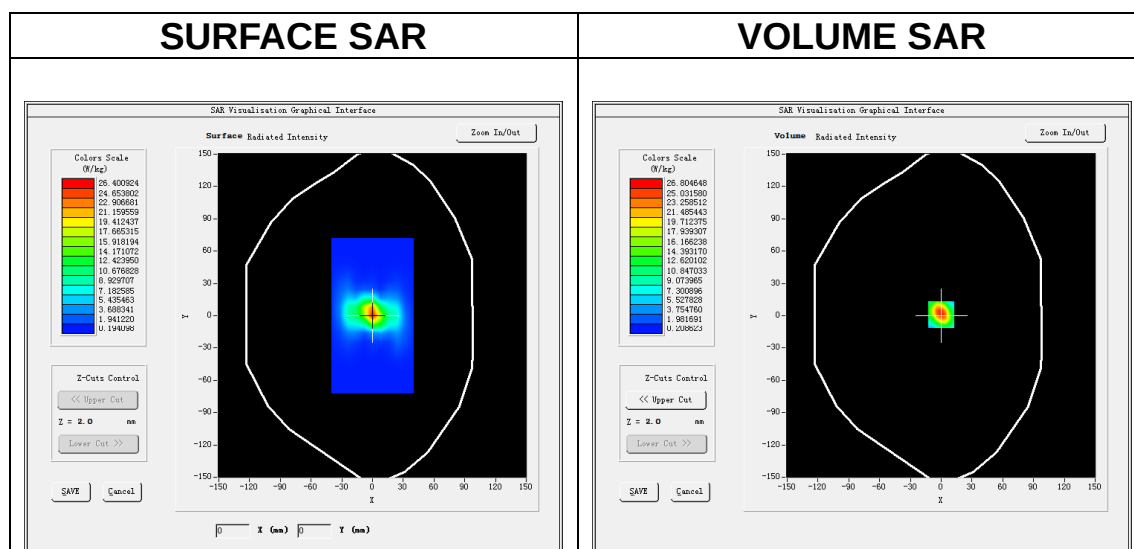
Date of measurement: 17/5/2024

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5400</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.11</u>

B. SAR Measurement Results

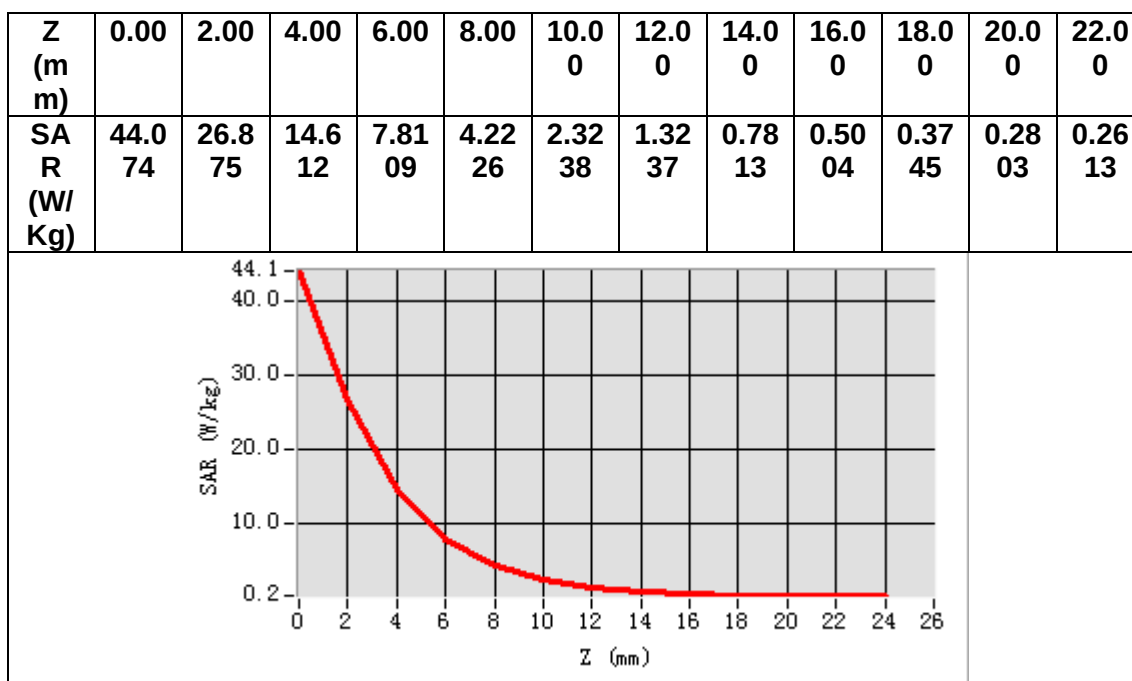
Frequency (MHz)	5400.000000
Relative permittivity (real part)	34.451037
Relative permittivity (imaginary part)	16.163451
Conductivity (S/m)	4.849035
Variation (%)	-0.700000



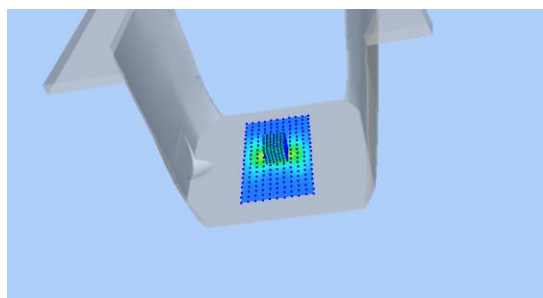
Maximum location: X=0.00, Y=1.00

SAR Peak: 46.18 W/kg

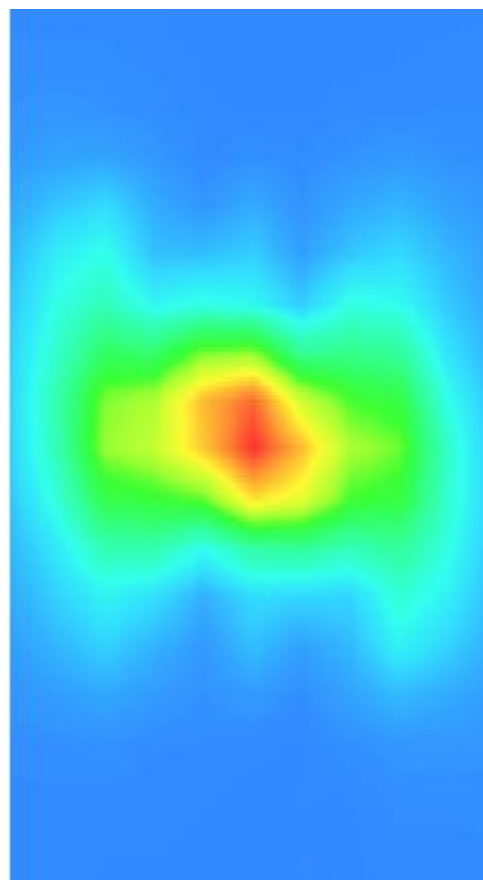
SAR 10g (W/Kg)	5.518369
SAR 1g (W/Kg)	17.077356



3D screen shot



Hot spot position



MEASUREMENT 4

Date of measurement: 16/5/2024

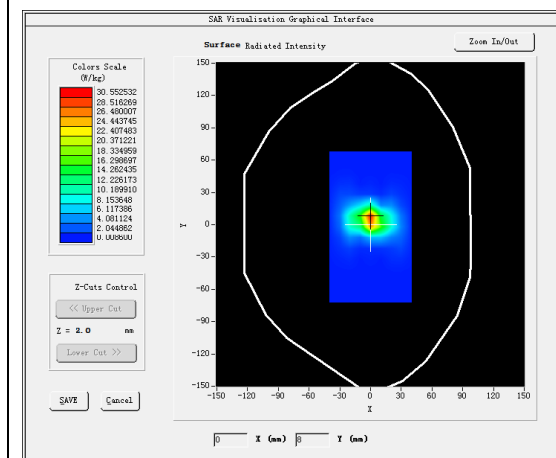
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5600</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.20</u>

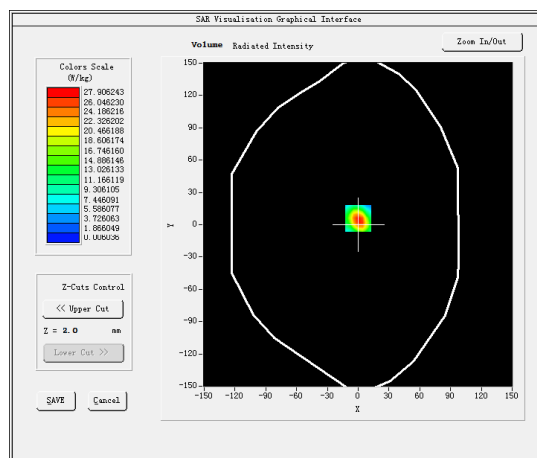
B. SAR Measurement Results

Frequency (MHz)	5600.000000
Relative permittivity (real part)	34.522334
Relative permittivity (imaginary part)	15.980551
Conductivity (S/m)	4.971727
Variation (%)	-2.480000

SURFACE SAR



VOLUME SAR

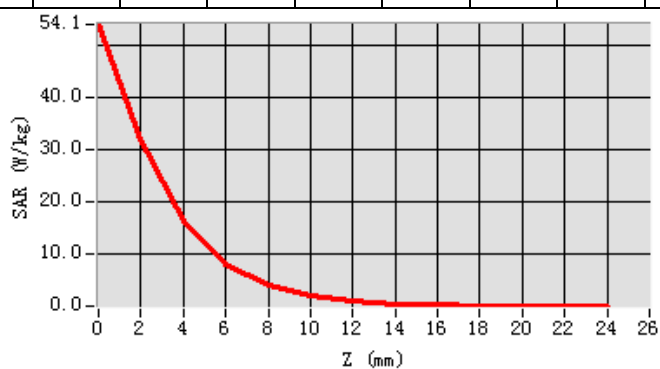


Maximum location: X=0.00, Y=6.00

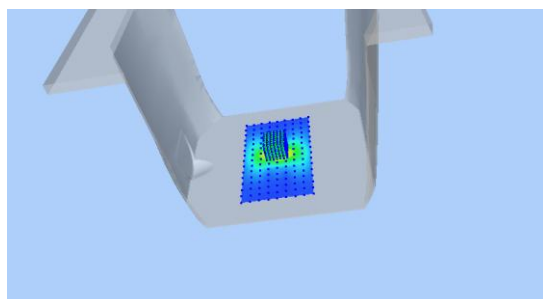
SAR Peak: 51.23 W/kg

SAR 10g (W/Kg)	6.100030
SAR 1g (W/Kg)	16.444274

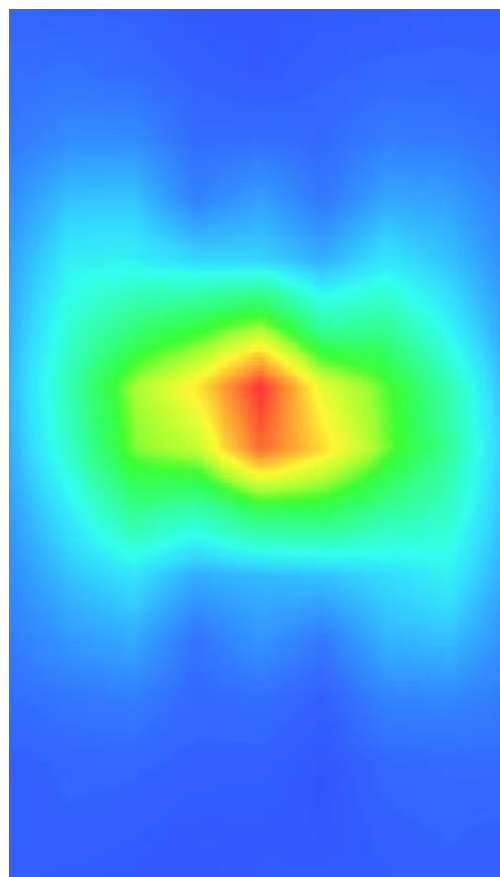
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0 0	12.0 0	14.0 0	16.0 0	18.0 0	20.0 0	22.0 0
SAR (W/ Kg)	54.1 93	31.9 65	16.3 77	8.17 67	4.08 25	3.81 55	1.03 24	0.46 39	0.27 55	0.13 40	0.07 31	0.05 61



3D screen shot



Hot spot position



MEASUREMENT 5

Date of measurement: 12/5/2024

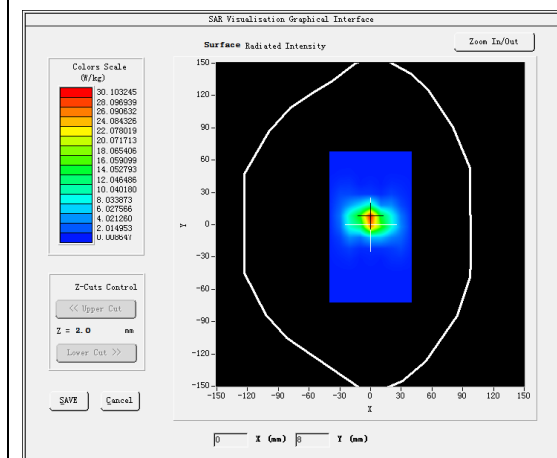
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5800</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.04</u>

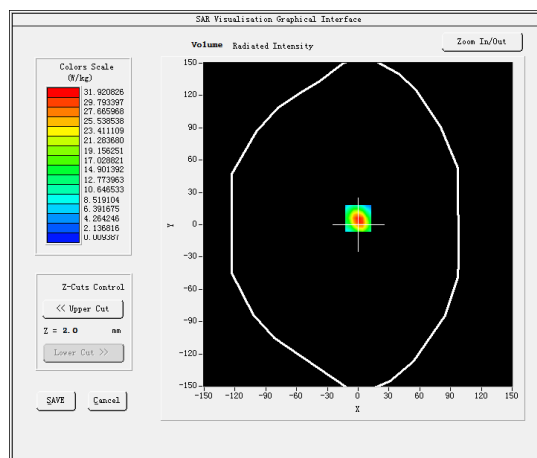
B. SAR Measurement Results

Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.107056
Relative permittivity (imaginary part)	16.182741
Conductivity (S/m)	5.214439
Variation (%)	-0.630000

SURFACE SAR



VOLUME SAR

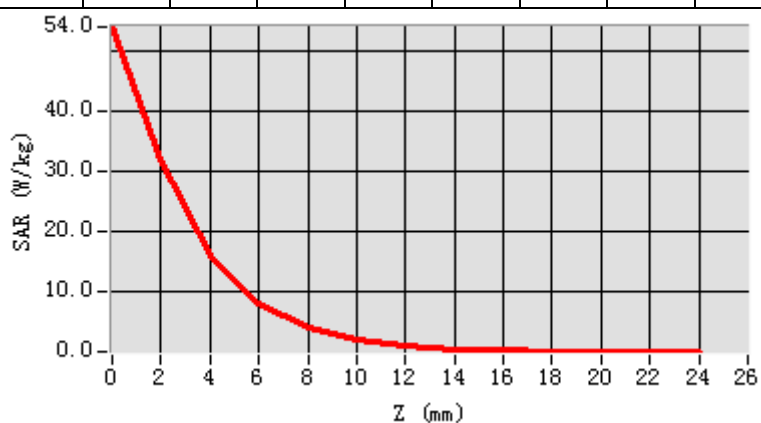


Maximum location: X=0.00, Y=6.00

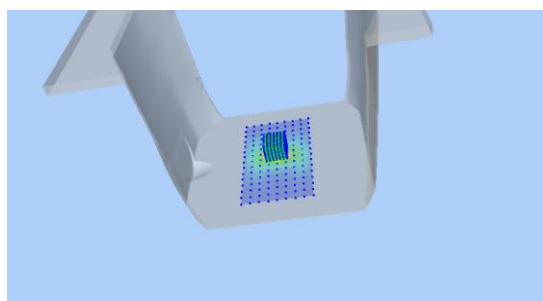
SAR Peak: 57.37 W/kg

SAR 10g (W/Kg)	5.544102
SAR 1g (W/Kg)	16.610336

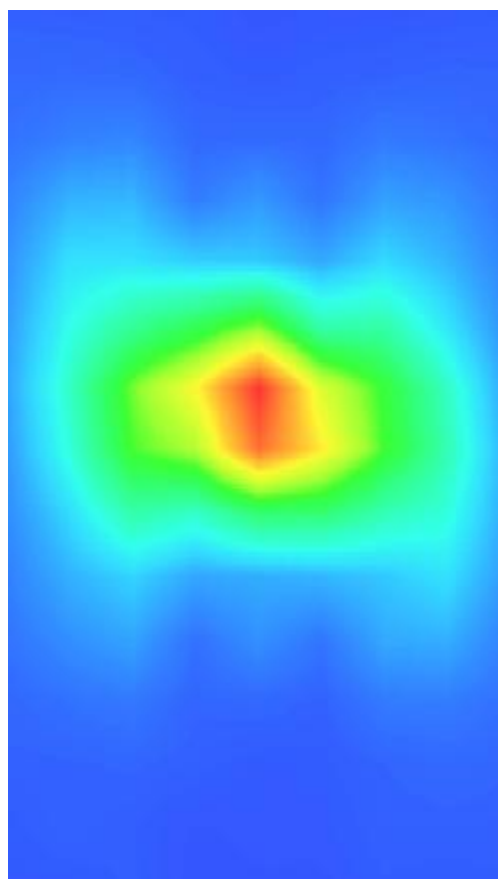
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/ Kg)	54.0 37	31.9 20	16.1 80	8.17 47	4.08 78	2.05 24	1.03 88	0.51 44	0.27 32	0.15 85	0.07 56	0.04 07



3D screen shot



Hot spot position



12. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 1

Date of measurement: 11/5/2024

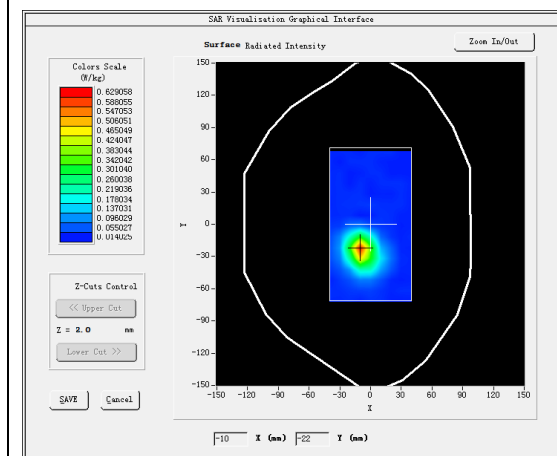
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.07</u>

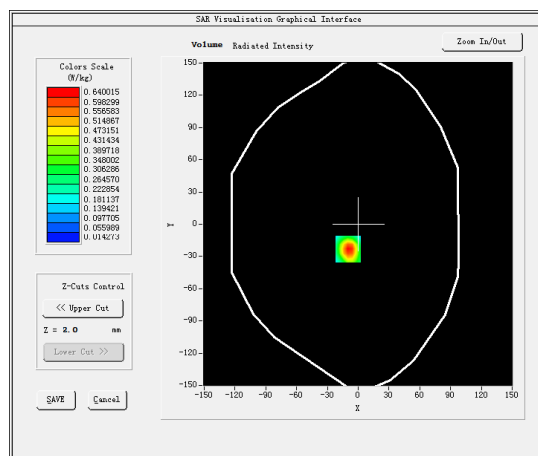
B. SAR Measurement Results

Frequency (MHz)	5210.000000
Relative permittivity (real part)	34.603811
Relative permittivity (imaginary part)	15.776328
Conductivity (S/m)	4.566370
Variation (%)	2.299999

SURFACE SAR



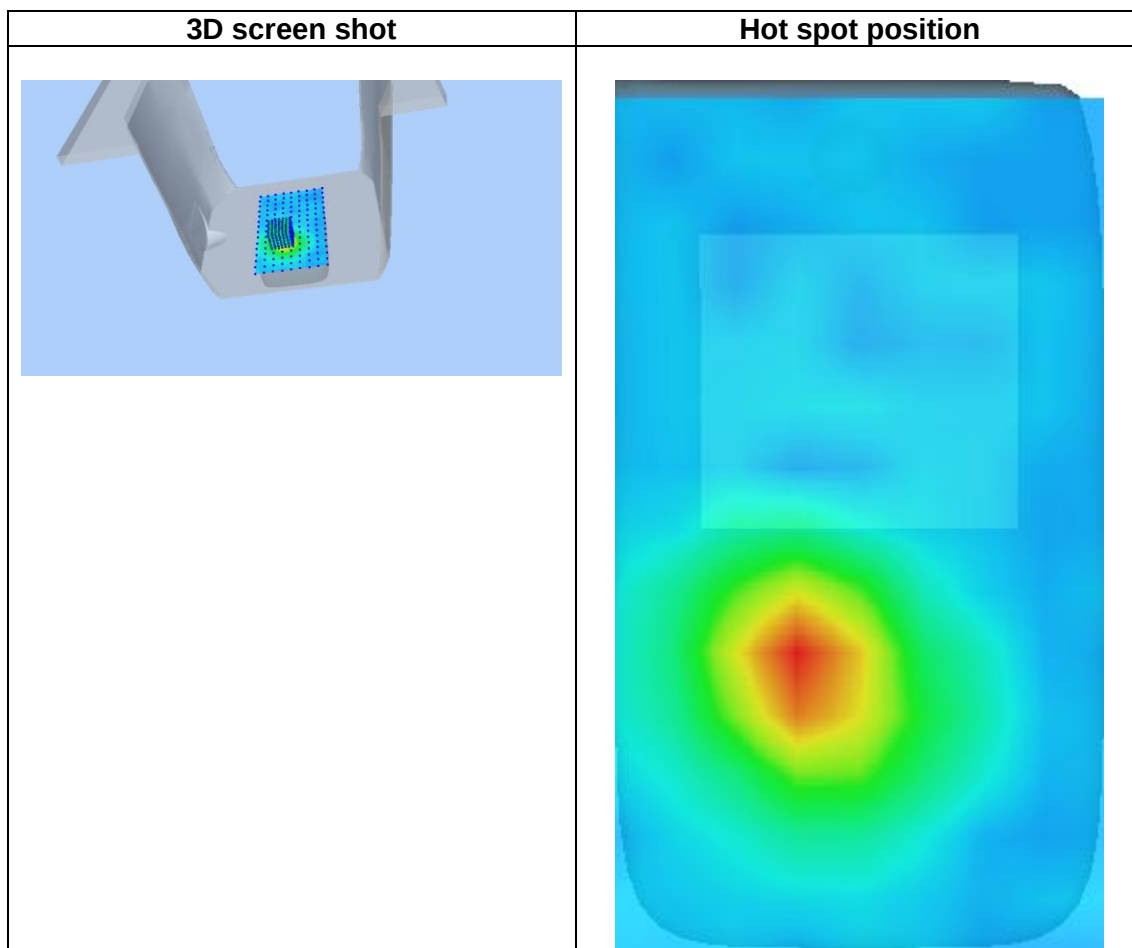
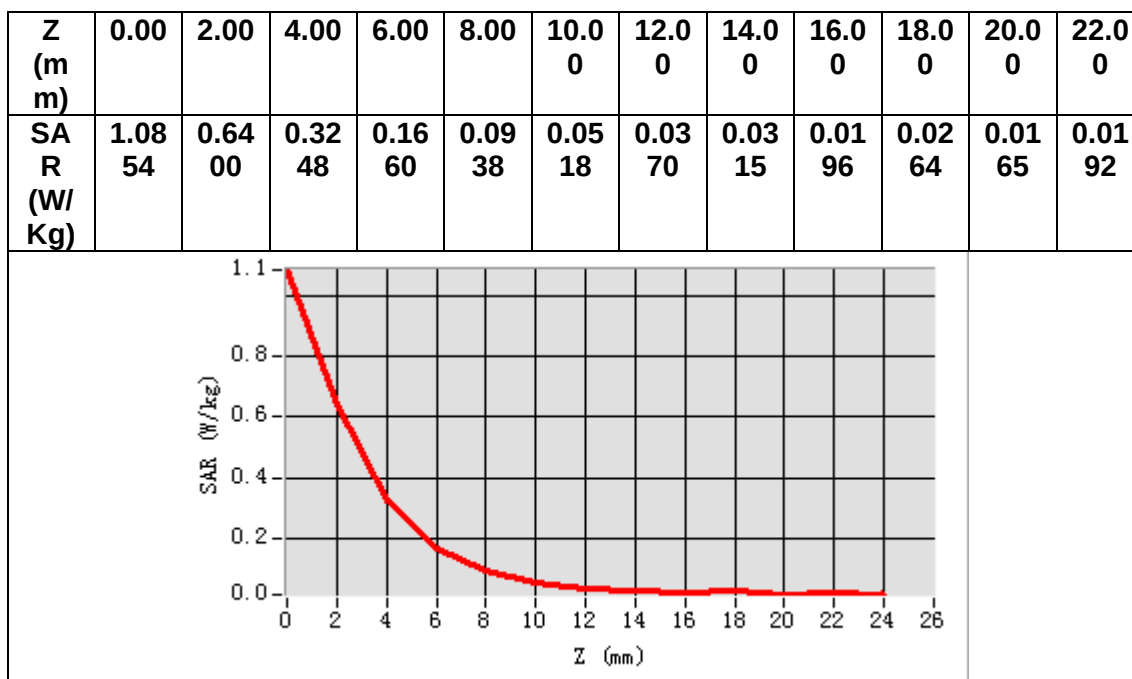
VOLUME SAR



Maximum location: X=-10.00, Y=-23.00

SAR Peak: 1.14 W/kg

SAR 10g (W/Kg)	0.142700
SAR 1g (W/Kg)	0.369126



MEASUREMENT 2

Date of measurement: 11/5/2024

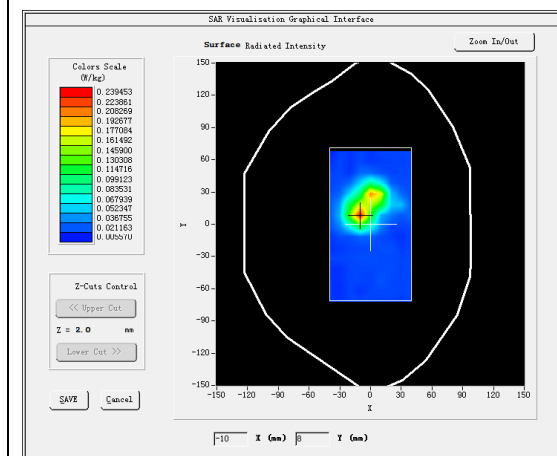
A. Experimental conditions.

Area Scan	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body</u>
Band	<u>IEEE 802.11a U-NII</u>
Channels	<u>Middle</u>
Signal	<u>IEEE802.11a (Crest factor: 1.0)</u>
ConvF	<u>2.07</u>

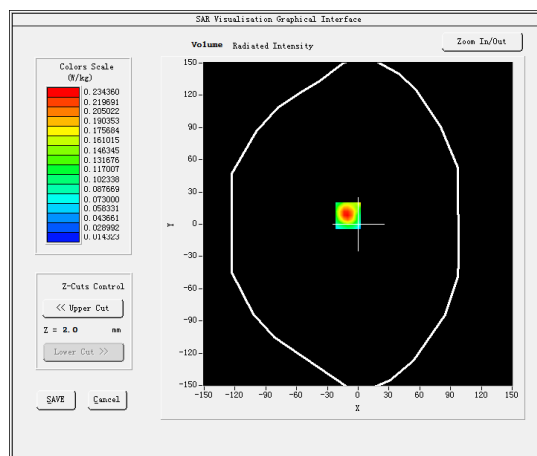
B. SAR Measurement Results

Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.675907
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	2.879999

SURFACE SAR



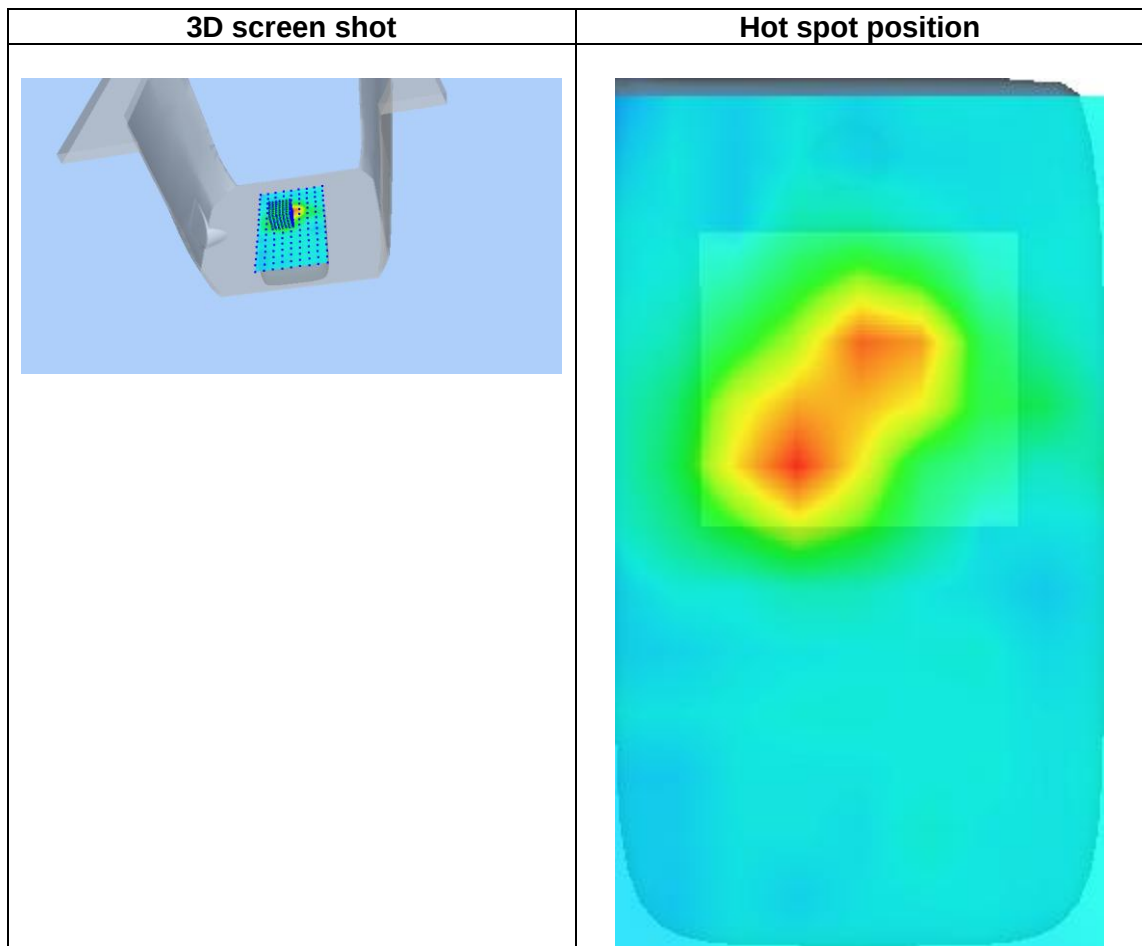
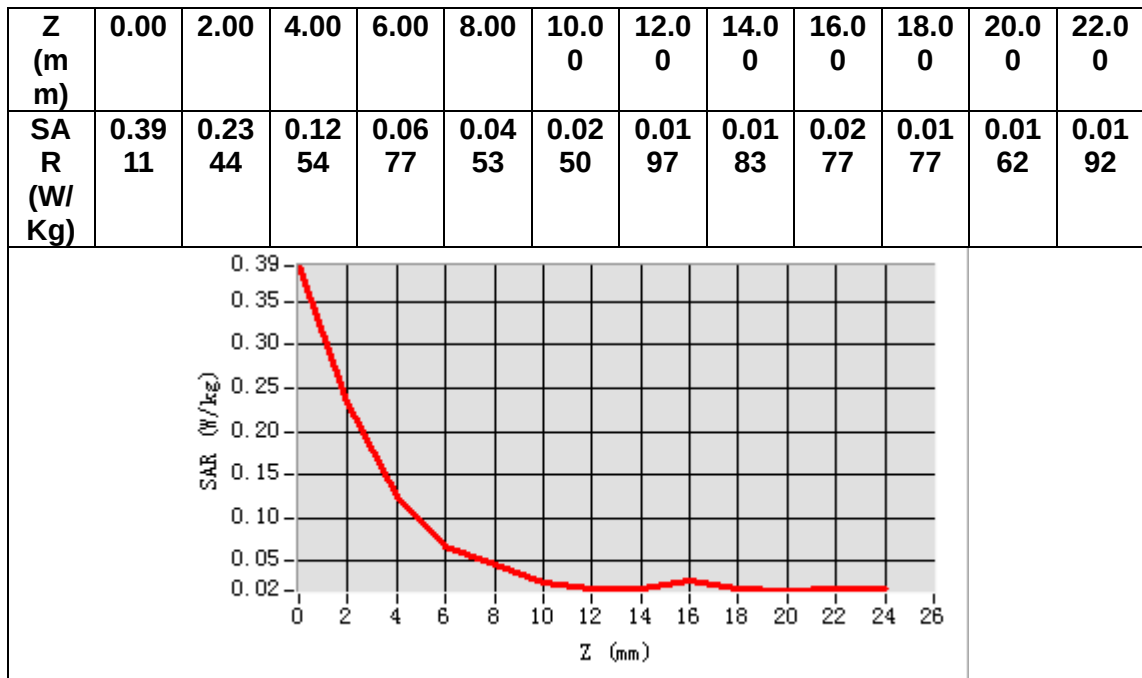
VOLUME SAR



Maximum location: X=-10.00, Y=8.00

SAR Peak: 0.42 W/kg

SAR 10g (W/Kg)	0.061006
SAR 1g (W/Kg)	0.139912



MEASUREMENT 3

Date of measurement: 11/5/2024

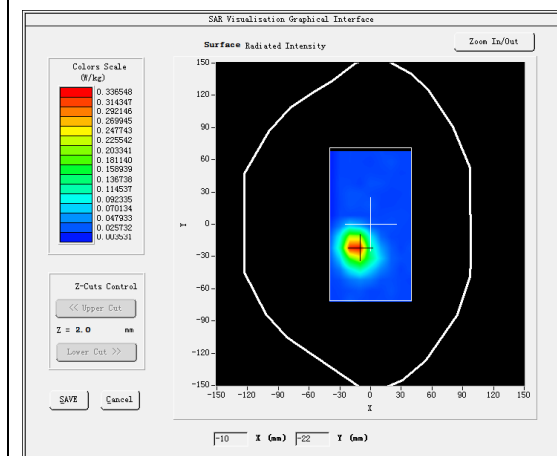
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.07</u>

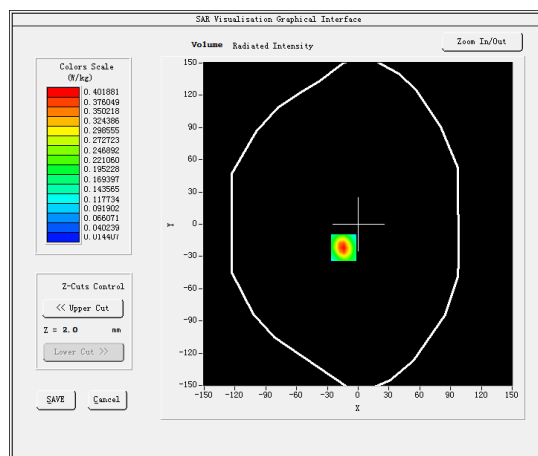
B. SAR Measurement Results

Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.675907
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	1.170000

SURFACE SAR



VOLUME SAR

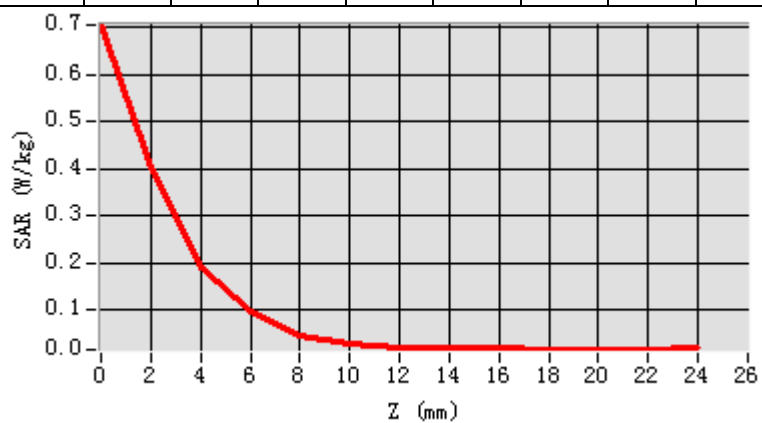


Maximum location: X=-14.00, Y=-22.00

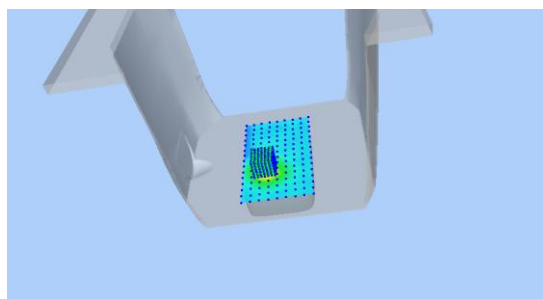
SAR Peak: 0.74 W/kg

SAR 10g (W/Kg)	0.089600
SAR 1g (W/Kg)	0.225620

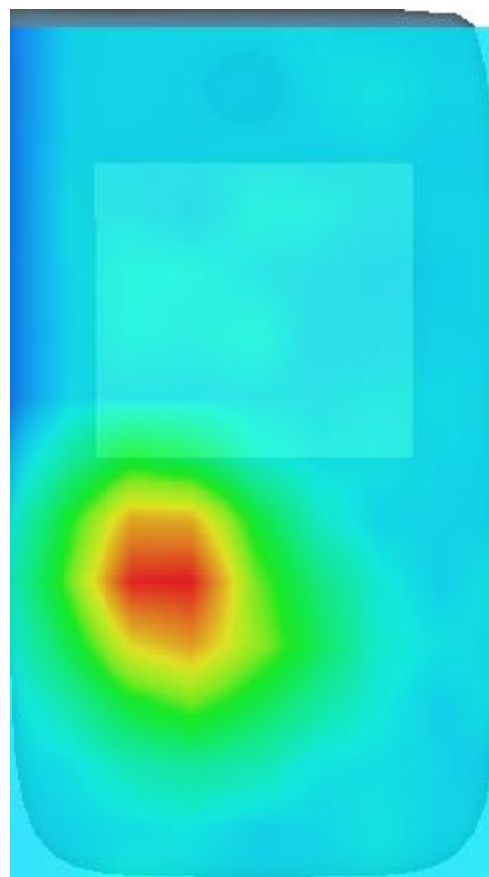
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SA R (W/ Kg)	0.70 45	0.40 19	0.19 22	0.09 48	0.04 40	0.02 84	0.02 04	0.02 22	0.01 94	0.01 70	0.01 70	0.01 61



3D screen shot



Hot spot position



MEASUREMENT 4

Date of measurement: 11/5/2024

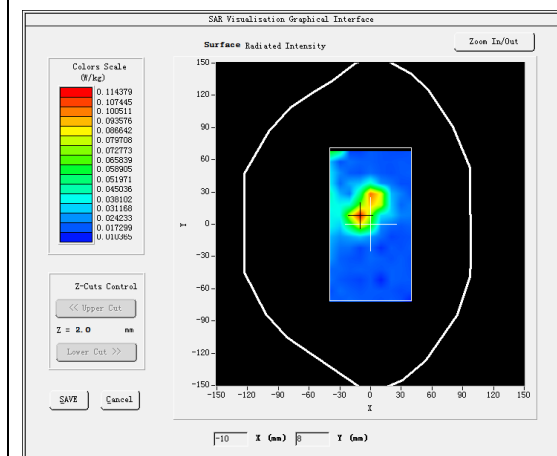
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.07</u>

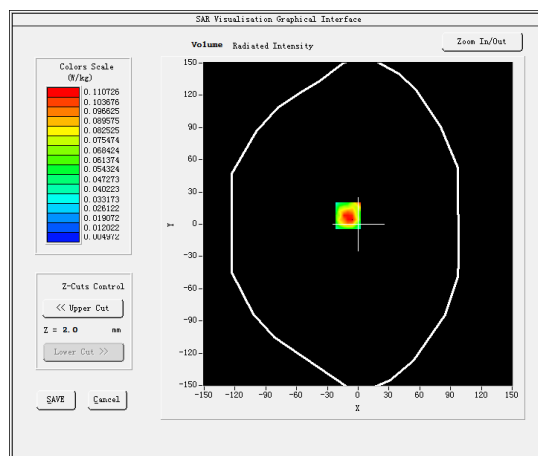
B. SAR Measurement Results

Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.675907
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	-2.650000

SURFACE SAR



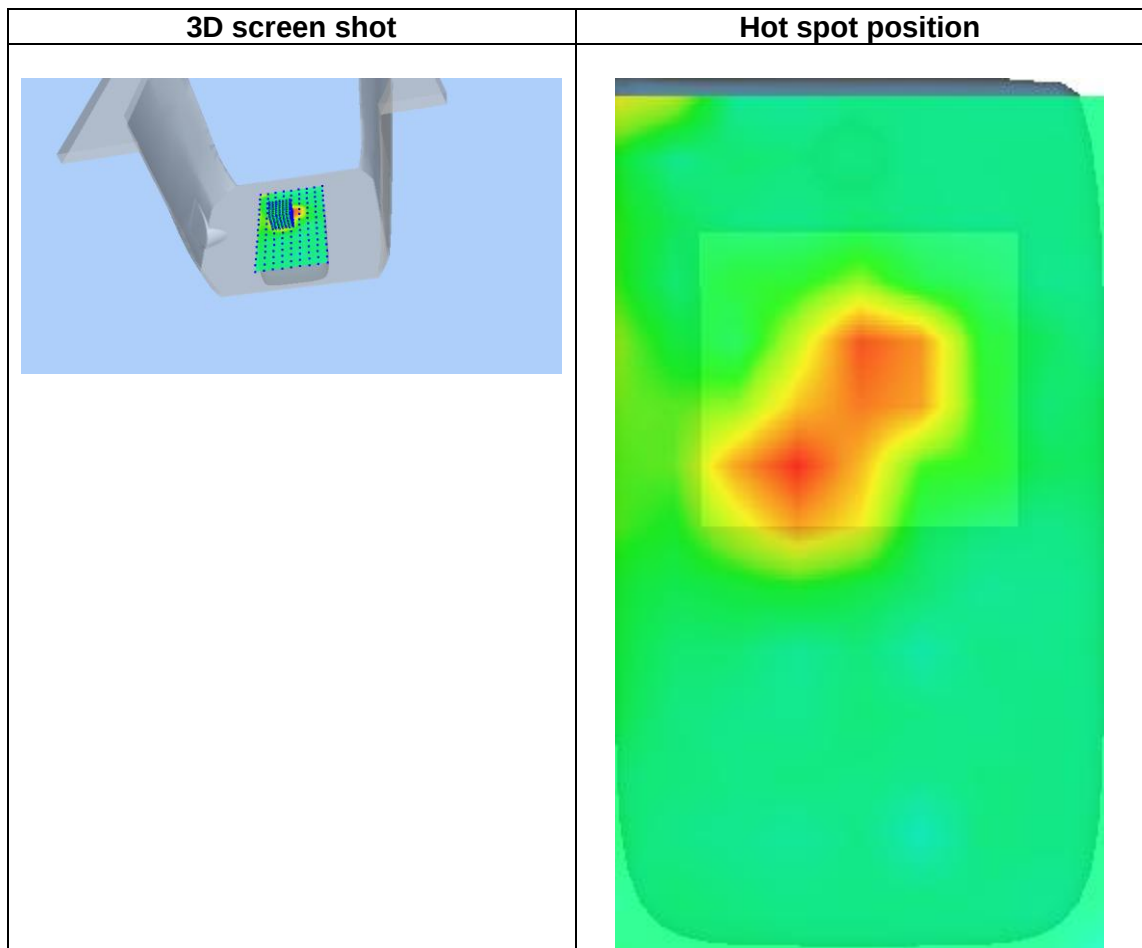
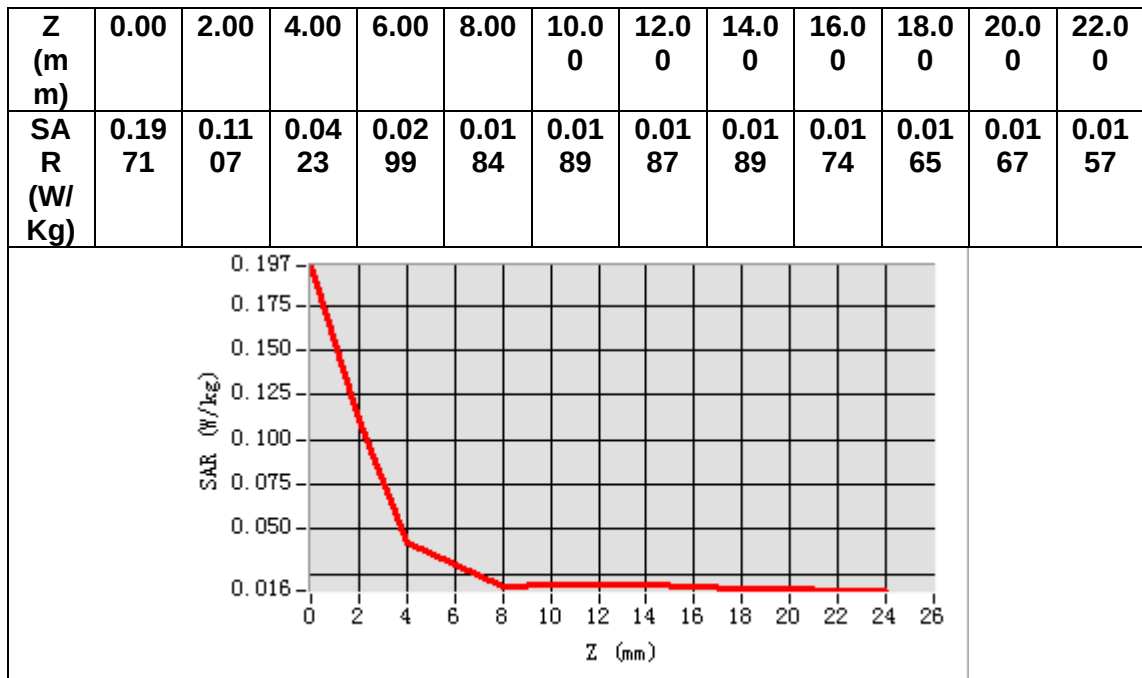
VOLUME SAR



Maximum location: X=-10.00, Y=8.00

SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.035700
SAR 1g (W/Kg)	0.066118



MEASUREMENT 5

Date of measurement: 17/5/2024

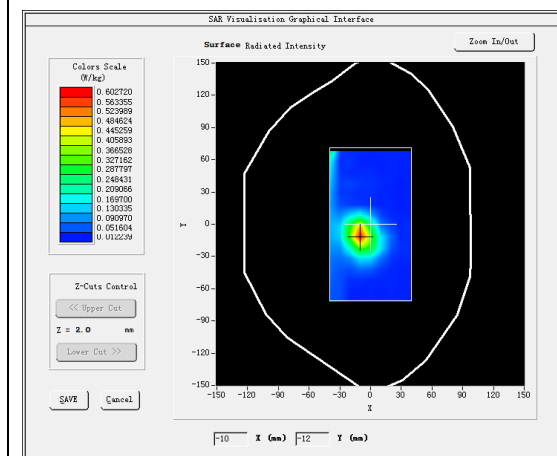
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.11</u>

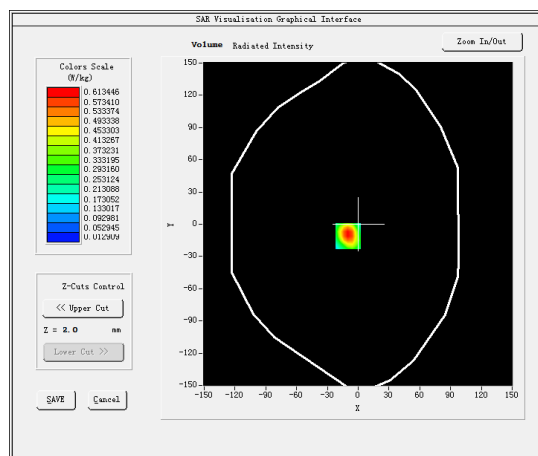
B. SAR Measurement Results

Frequency (MHz)	5310.000000
Relative permittivity (real part)	34.717784
Relative permittivity (imaginary part)	16.032355
Conductivity (S/m)	4.729545
Variation (%)	-0.080000

SURFACE SAR



VOLUME SAR

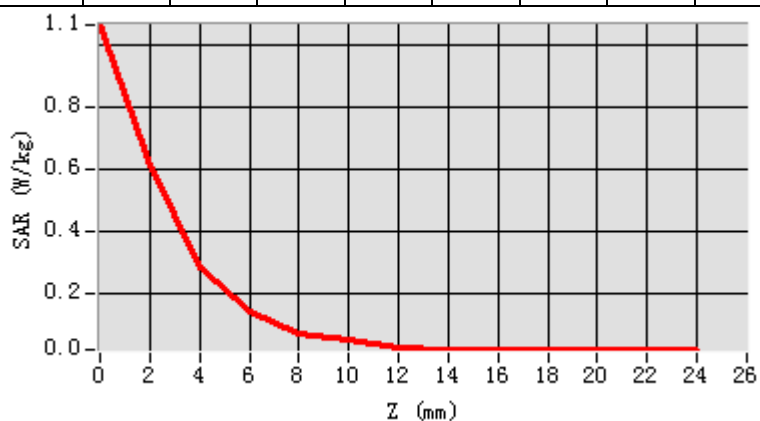


Maximum location: X=-10.00, Y=-11.00

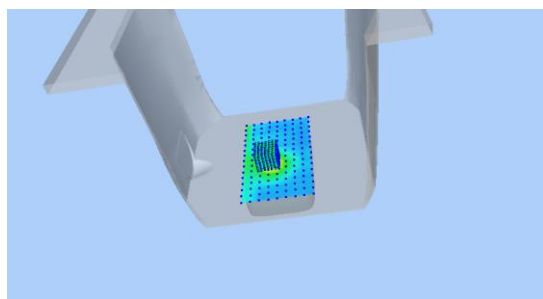
SAR Peak: 1.15 W/kg

SAR 10g (W/Kg)	0.137611
SAR 1g (W/Kg)	0.354586

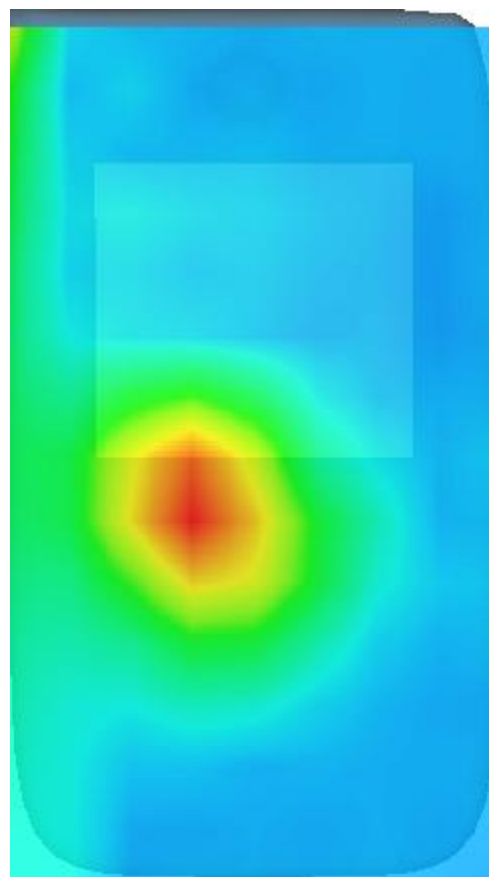
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SA R (W/ Kg)	1.06 58	0.61 34	0.28 16	0.13 89	0.07 16	0.04 91	0.02 48	0.01 88	0.01 79	0.01 91	0.01 85	0.01 76



3D screen shot



Hot spot position



MEASUREMENT 6

Date of measurement: 11/5/2024

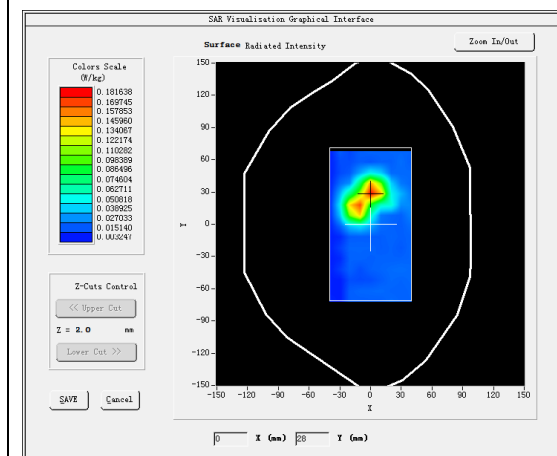
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11a (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.07</u>

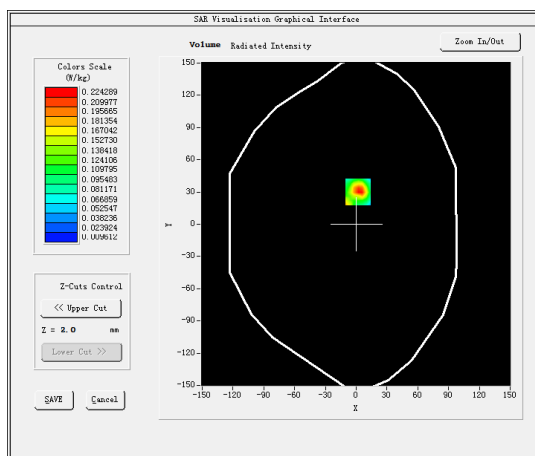
B. SAR Measurement Results

Frequency (MHz)	5280.000000
Relative permittivity (real part)	34.805031
Relative permittivity (imaginary part)	15.914992
Conductivity (S/m)	4.668398
Variation (%)	1.190000

SURFACE SAR



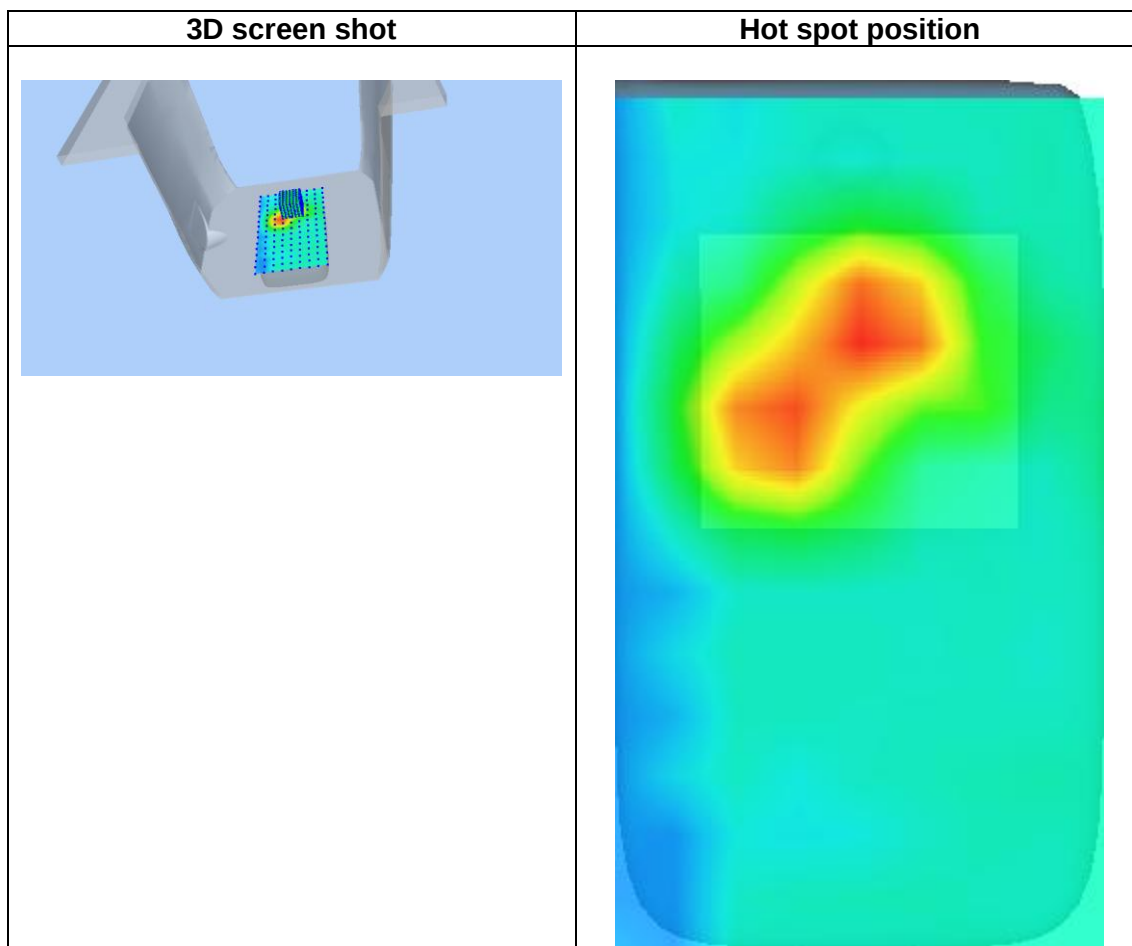
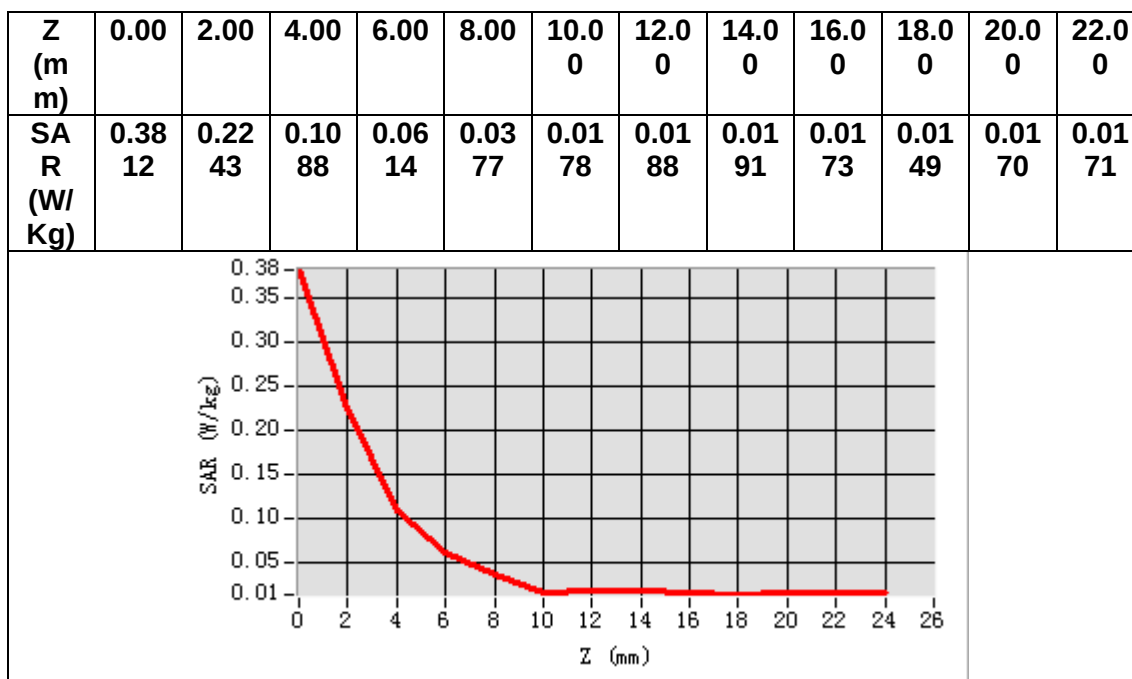
VOLUME SAR



Maximum location: X=2.00, Y=30.00

SAR Peak: 0.42 W/kg

SAR 10g (W/Kg)	0.054285
SAR 1g (W/Kg)	0.128894



MEASUREMENT 7

Date of measurement: 17/5/2024

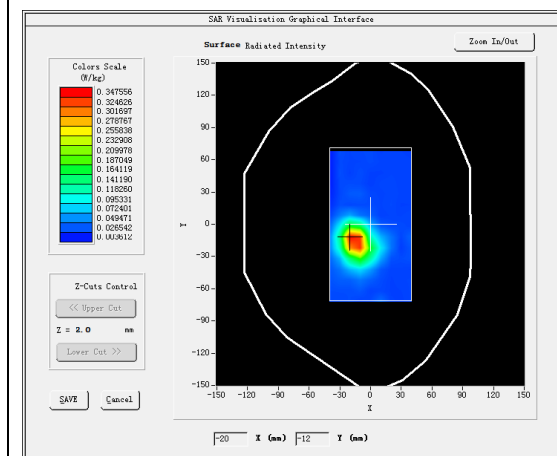
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11n U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11n (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.11</u>

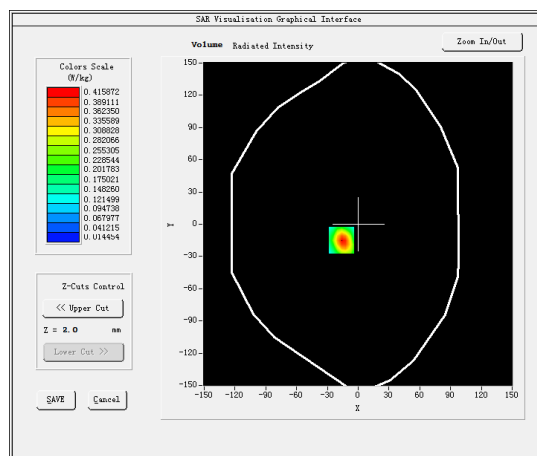
B. SAR Measurement Results

Frequency (MHz)	5310.000000
Relative permittivity (real part)	34.717784
Relative permittivity (imaginary part)	16.032355
Conductivity (S/m)	4.729545
Variation (%)	3.740000

SURFACE SAR



VOLUME SAR

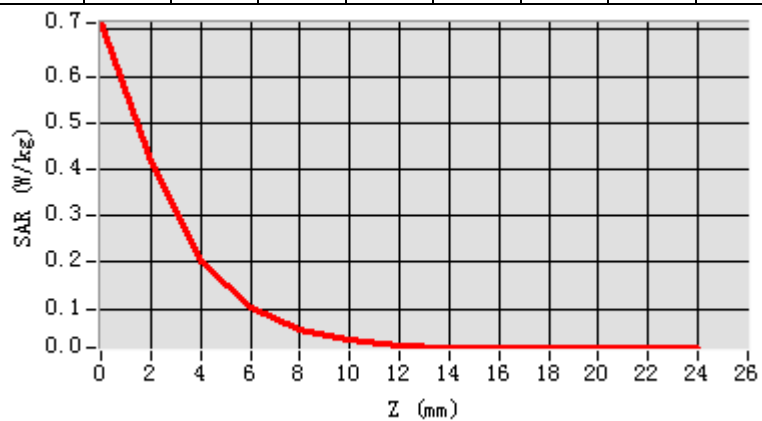


Maximum location: X=-16.00, Y=-15.00

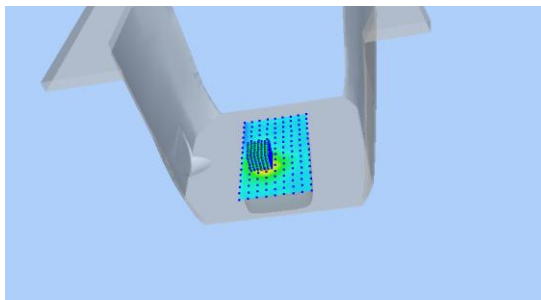
SAR Peak: 0.77 W/kg

SAR 10g (W/Kg)	0.096983
SAR 1g (W/Kg)	0.237841

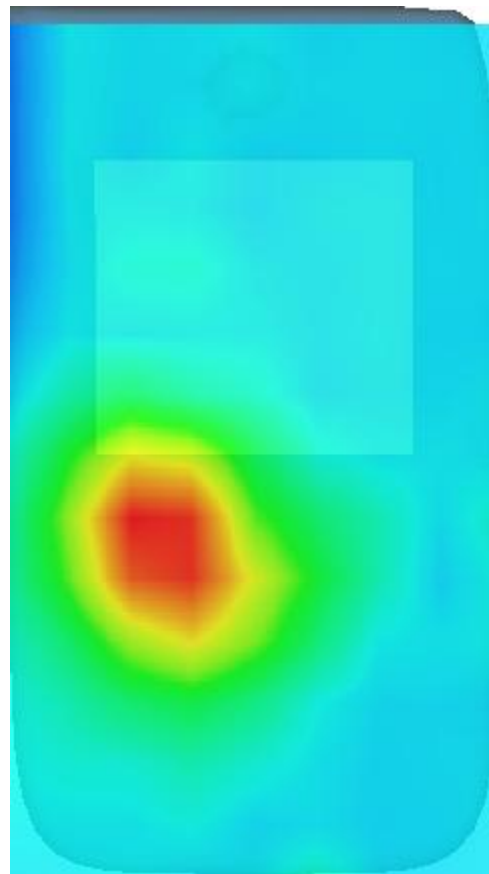
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/ Kg)	0.71 43	0.41 59	0.20 11	0.10 19	0.05 53	0.03 28	0.02 09	0.01 91	0.01 70	0.01 89	0.01 75	0.01 78



3D screen shot



Hot spot position



MEASUREMENT 8

Date of measurement: 17/5/2024

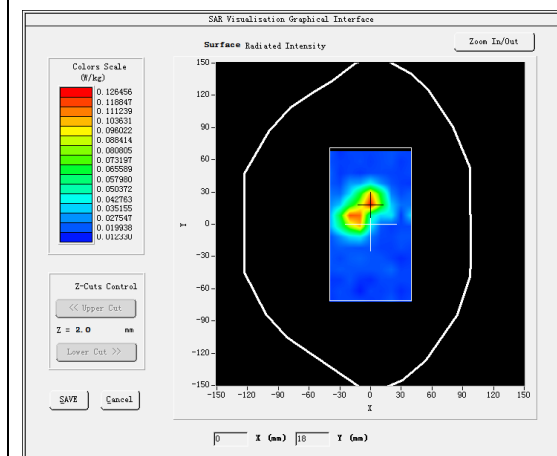
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11n U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11n (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.11</u>

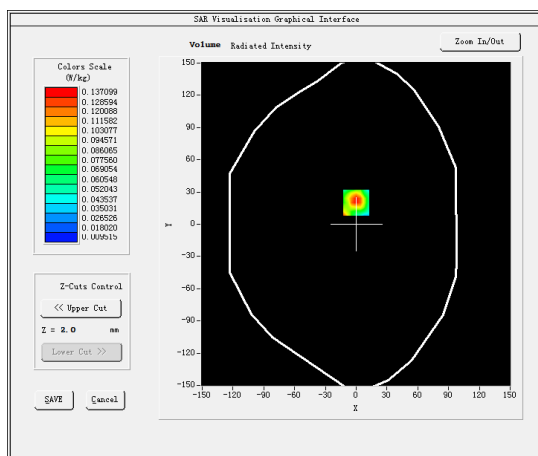
B. SAR Measurement Results

Frequency (MHz)	5310.000000
Relative permittivity (real part)	34.717784
Relative permittivity (imaginary part)	16.032355
Conductivity (S/m)	4.729545
Variation (%)	1.350000

SURFACE SAR



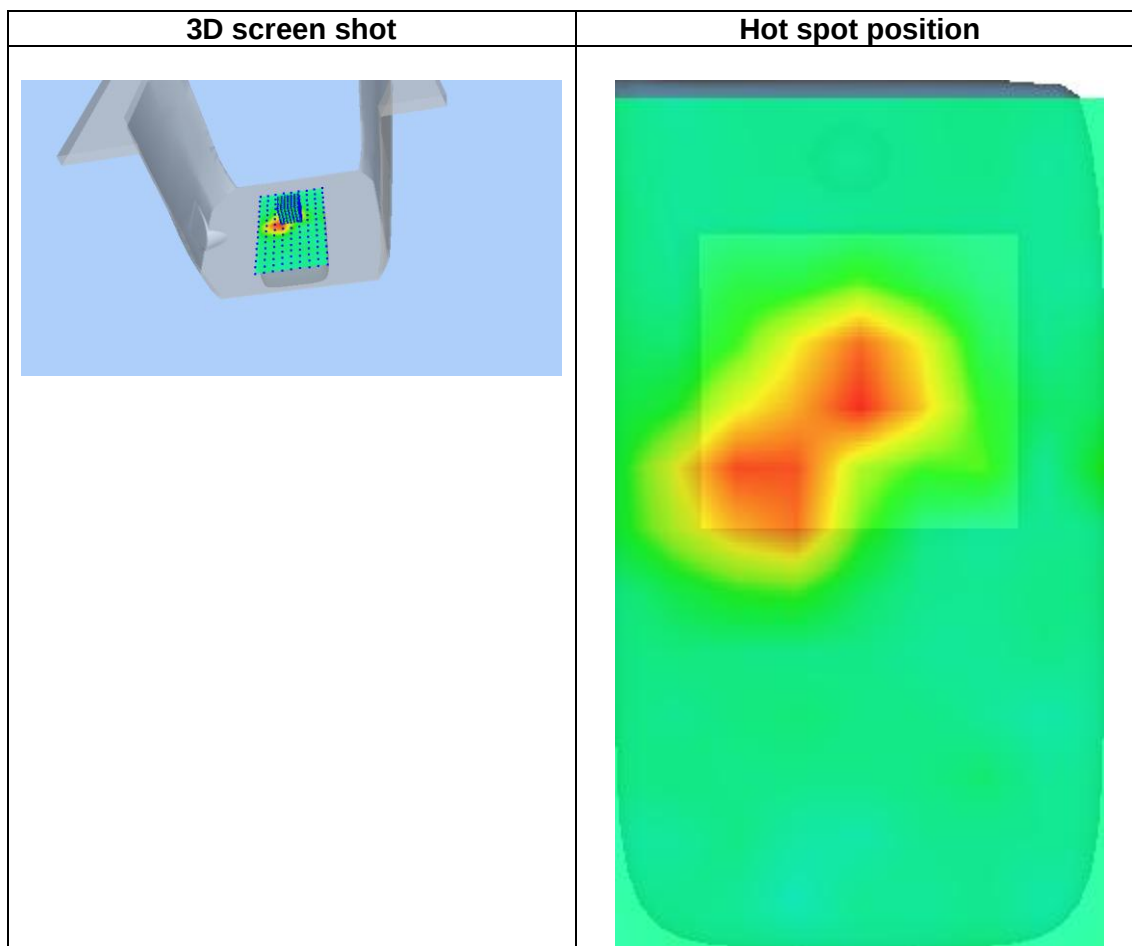
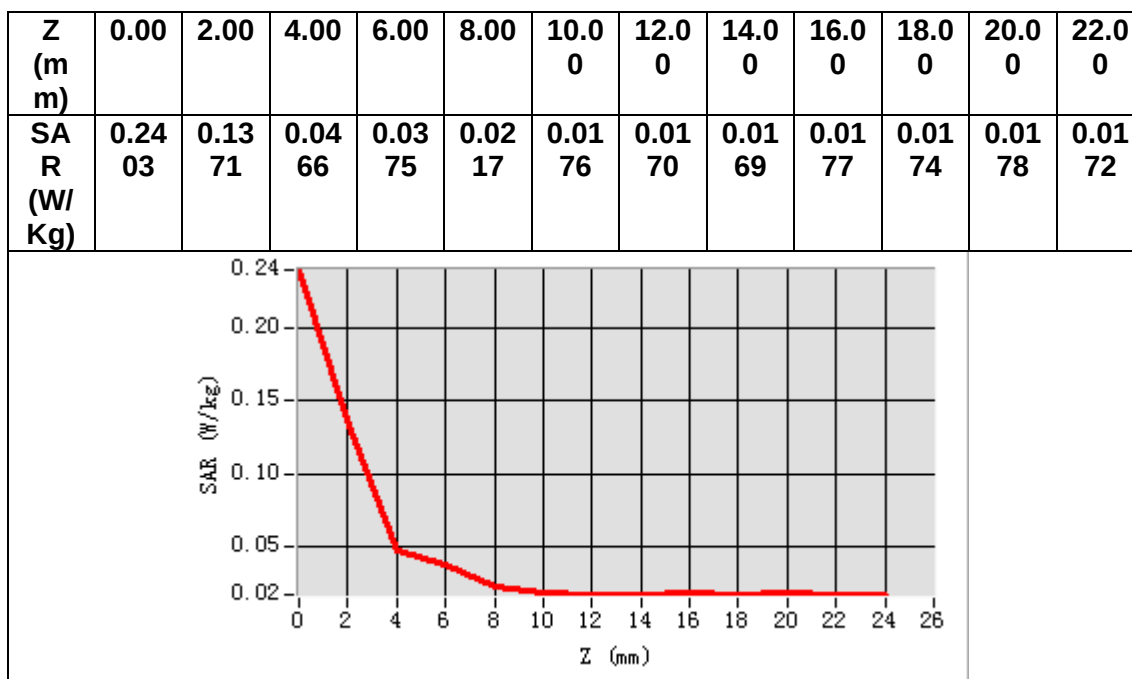
VOLUME SAR



Maximum location: X=0.00, Y=20.00

SAR Peak: 0.25 W/kg

SAR 10g (W/Kg)	0.039182
SAR 1g (W/Kg)	0.082009



MEASUREMENT 9

Date of measurement: 16/5/2024

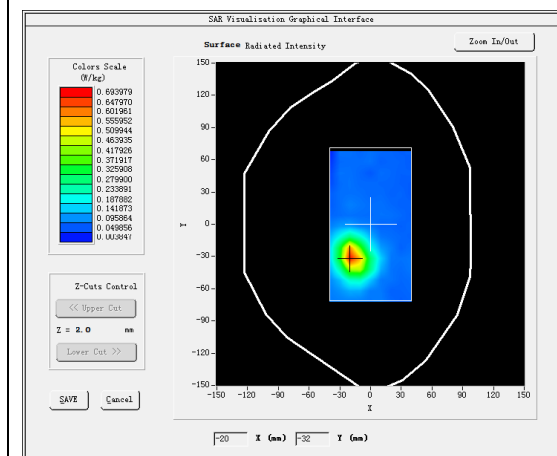
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII</u>
<u>Channels</u>	<u>Low</u>
<u>Signal</u>	<u>IEEE802.11a (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.20</u>

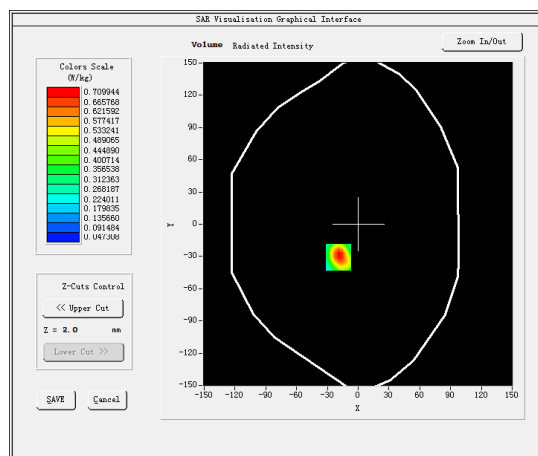
B. SAR Measurement Results

Frequency (MHz)	5500.000000
Relative permittivity (real part)	34.816934
Relative permittivity (imaginary part)	15.904870
Conductivity (S/m)	4.859821
Variation (%)	3.529999

SURFACE SAR



VOLUME SAR

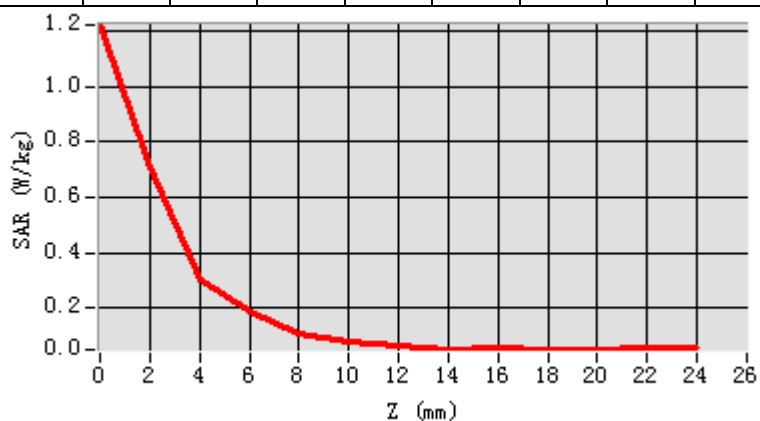


Maximum location: X=-19.00, Y=-31.00

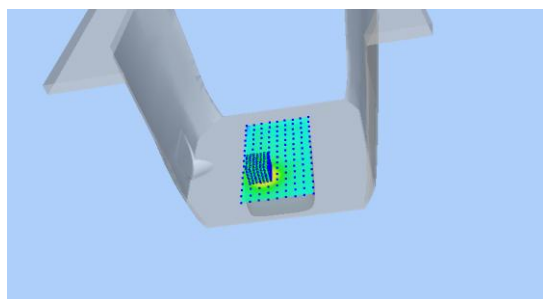
SAR Peak: 1.30 W/kg

SAR 10g (W/Kg)	0.191889
SAR 1g (W/Kg)	0.429221

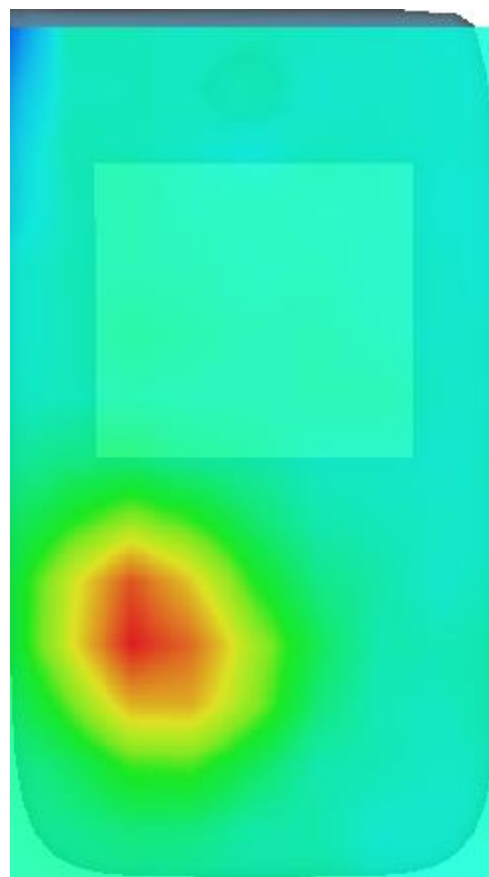
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SA R (W/ Kg)	1.22 31	0.70 99	0.30 04	0.18 80	0.10 95	0.07 95	0.06 72	0.05 26	0.05 61	0.05 00	0.05 22	0.05 47



3D screen shot



Hot spot position



MEASUREMENT 10

Date of measurement: 16/5/2024

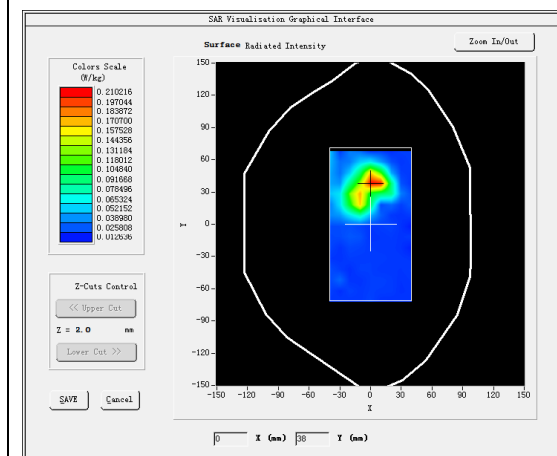
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.20</u>

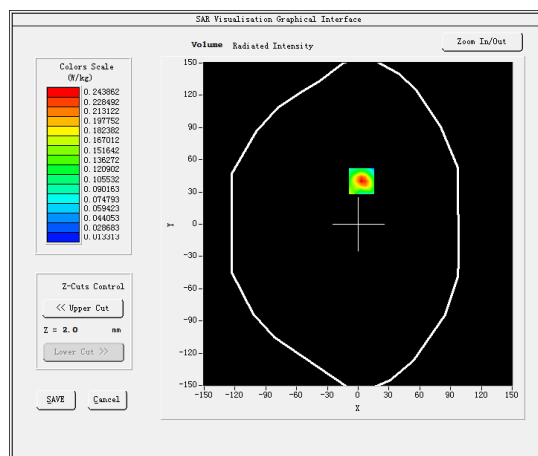
B. SAR Measurement Results

Frequency (MHz)	5670.000000
Relative permittivity (real part)	34.395823
Relative permittivity (imaginary part)	16.057601
Conductivity (S/m)	5.058144
Variation (%)	-1.029999

SURFACE SAR



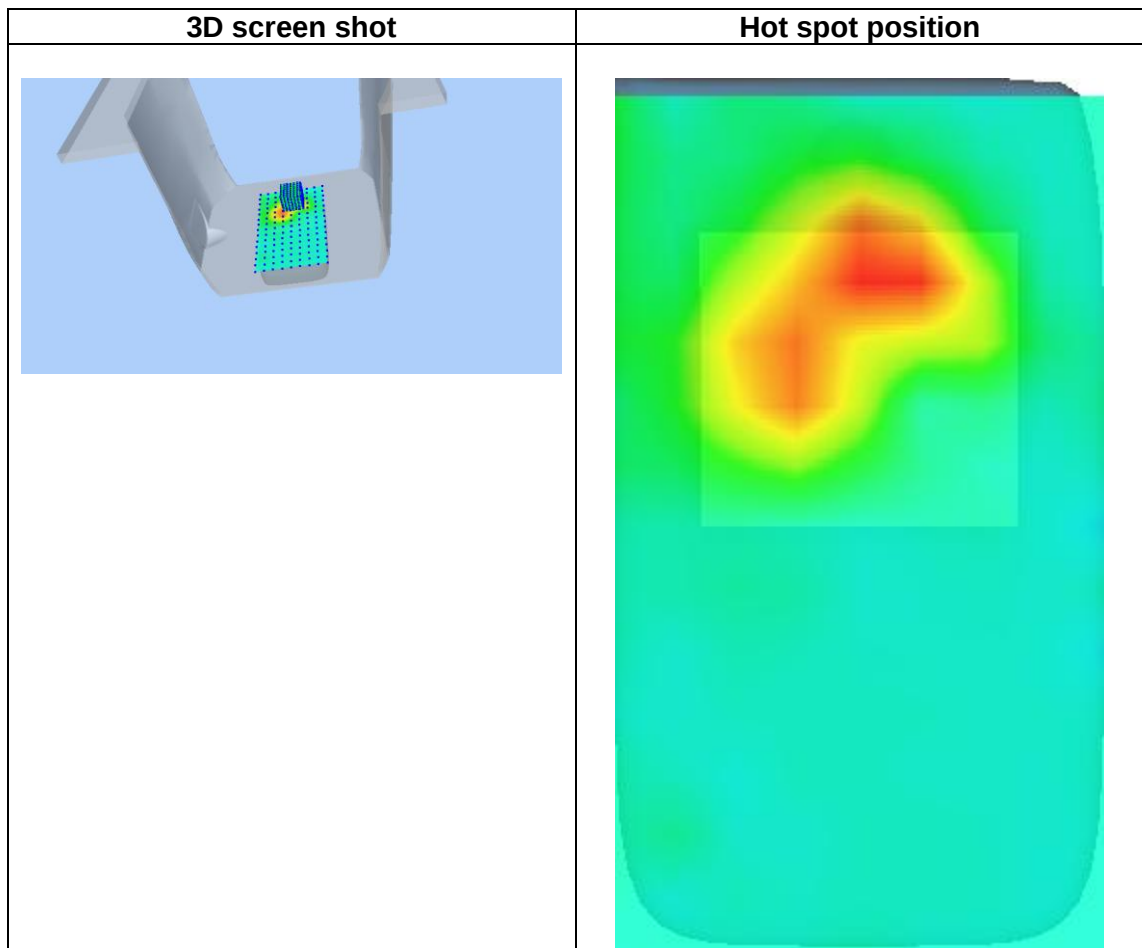
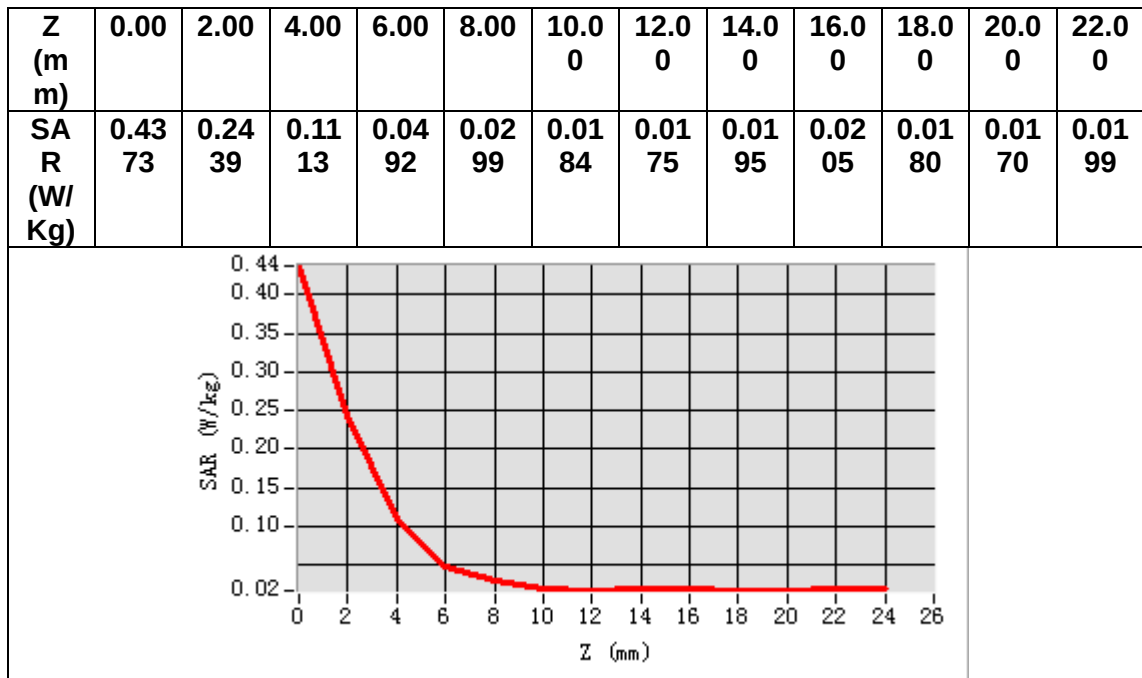
VOLUME SAR



Maximum location: X=3.00, Y=40.00

SAR Peak: 0.46 W/kg

SAR 10g (W/Kg)	0.058935
SAR 1g (W/Kg)	0.137627



MEASUREMENT 11

Date of measurement: 16/5/2024

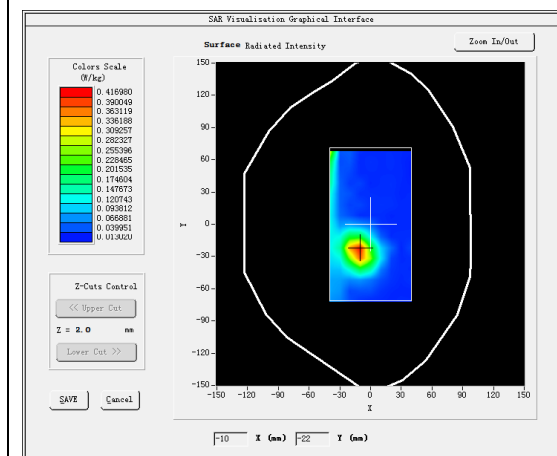
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.20</u>

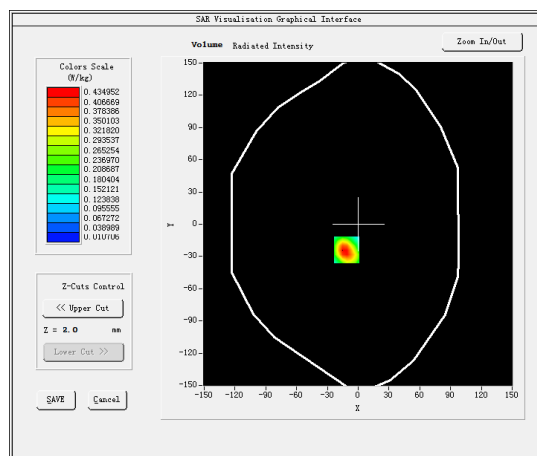
B. SAR Measurement Results

Frequency (MHz)	5670.000000
Relative permittivity (real part)	34.395823
Relative permittivity (imaginary part)	16.057601
Conductivity (S/m)	5.058144
Variation (%)	-3.009998

SURFACE SAR



VOLUME SAR

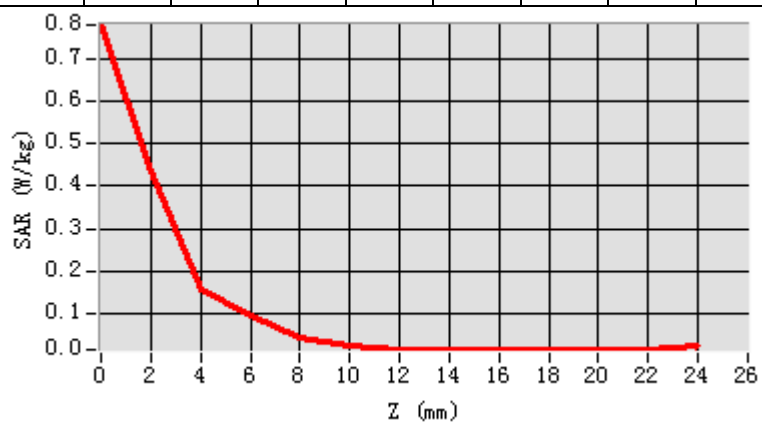


Maximum location: X=-11.00, Y=-24.00

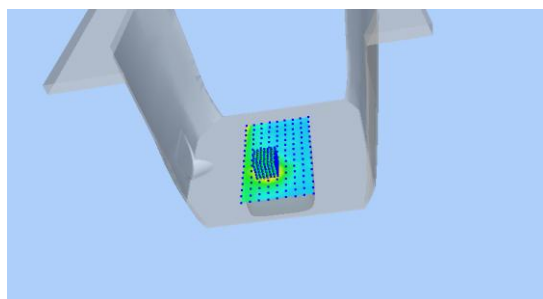
SAR Peak: 0.82 W/kg

SAR 10g (W/Kg)	0.103271
SAR 1g (W/Kg)	0.253482

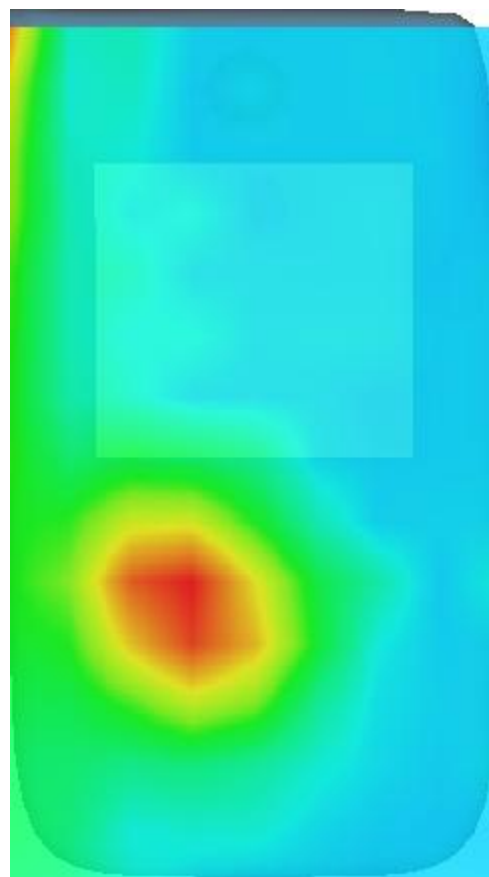
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SA R (W/ Kg)	0.77 74	0.43 50	0.15 97	0.09 73	0.04 51	0.02 55	0.01 83	0.01 90	0.01 90	0.02 02	0.01 79	0.01 80



3D screen shot



Hot spot position



MEASUREMENT 12

Date of measurement: 16/5/2024

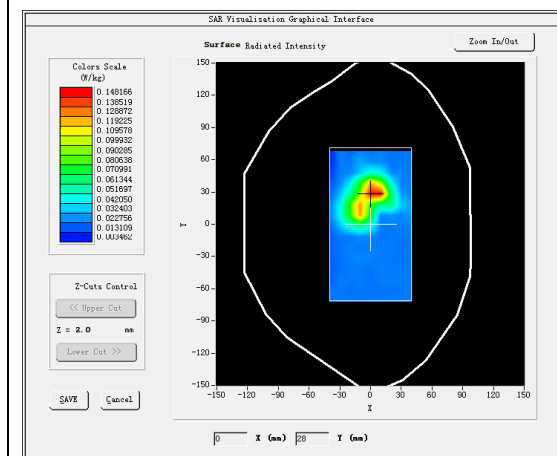
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.20</u>

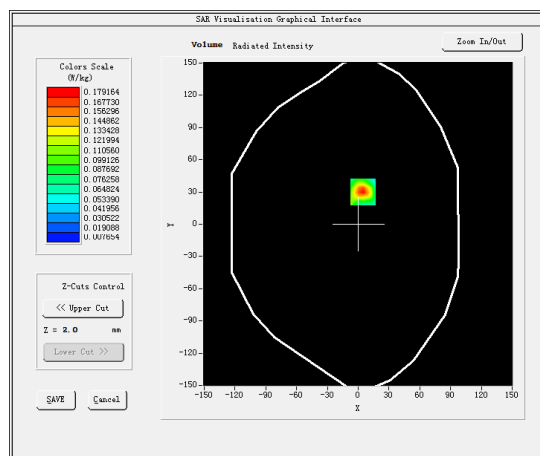
B. SAR Measurement Results

Frequency (MHz)	5670.000000
Relative permittivity (real part)	34.395823
Relative permittivity (imaginary part)	16.057601
Conductivity (S/m)	5.058144
Variation (%)	3.750000

SURFACE SAR



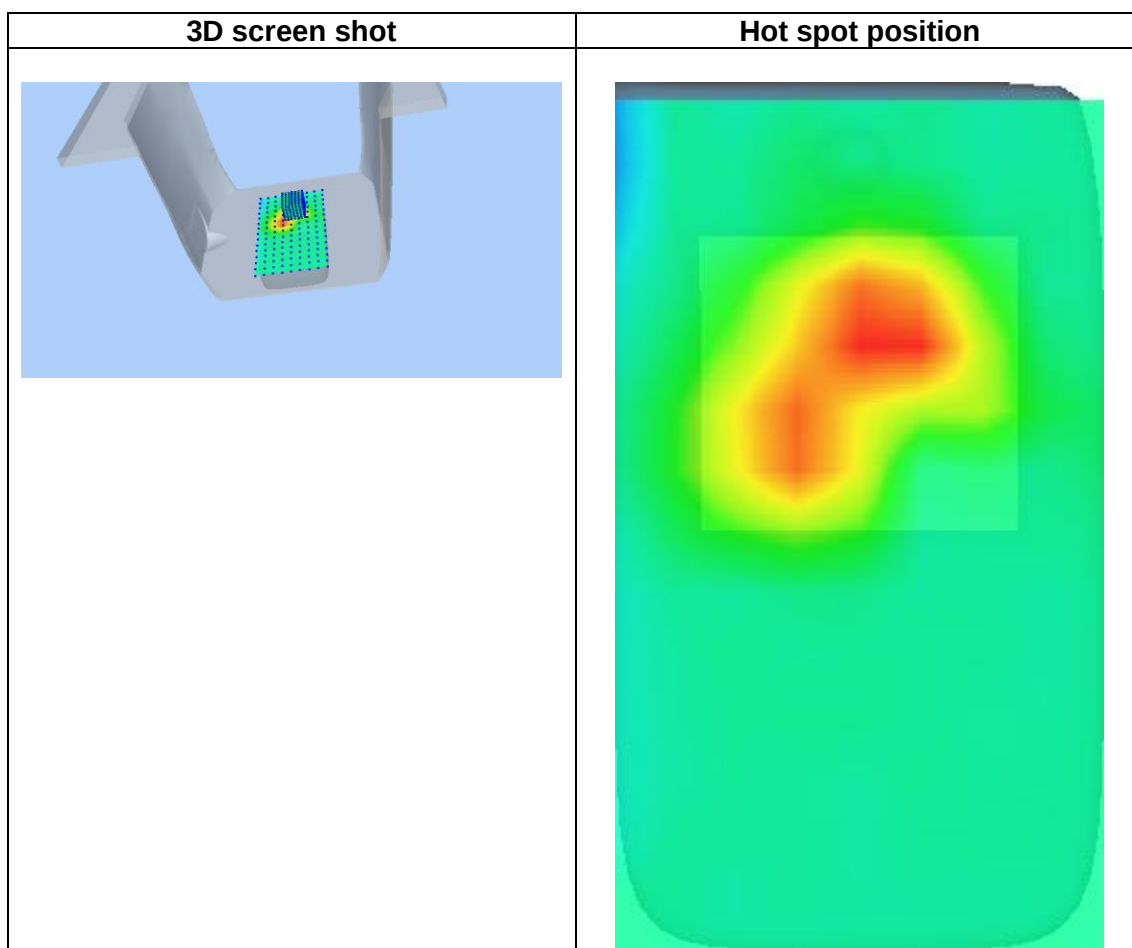
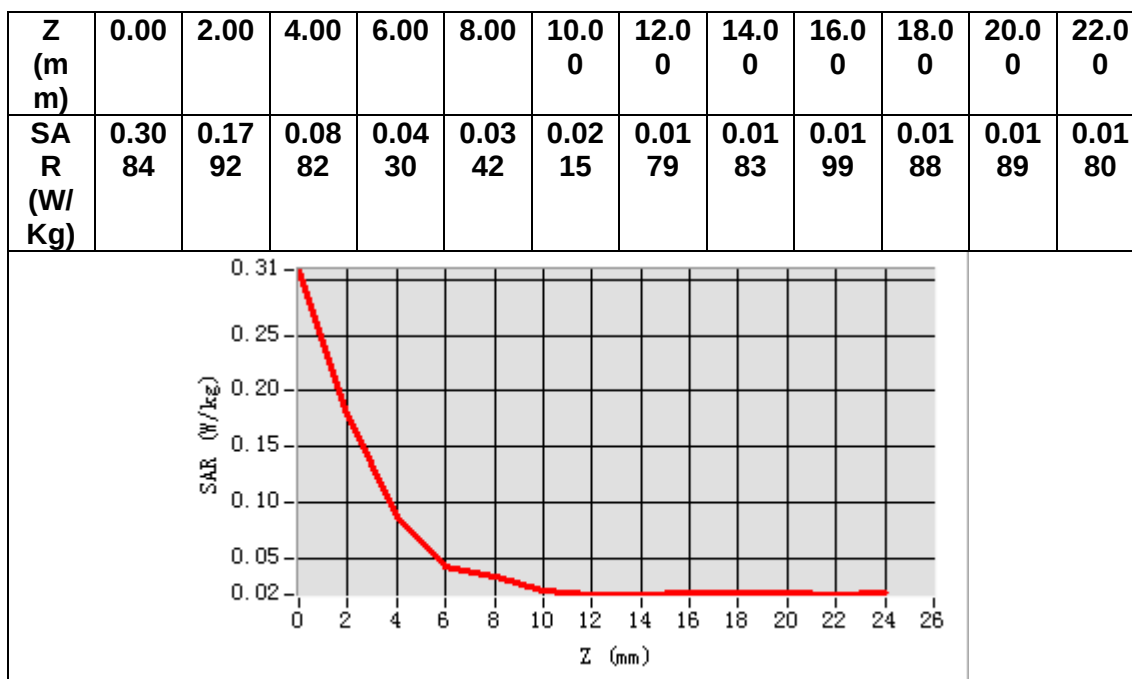
VOLUME SAR



Maximum location: X=5.00, Y=30.00

SAR Peak: 0.33 W/kg

SAR 10g (W/Kg)	0.047531
SAR 1g (W/Kg)	0.103291



MEASUREMENT 13

Date of measurement: 12/5/2024

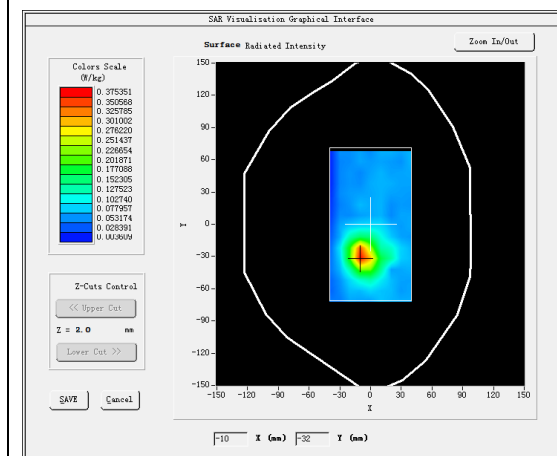
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.04</u>

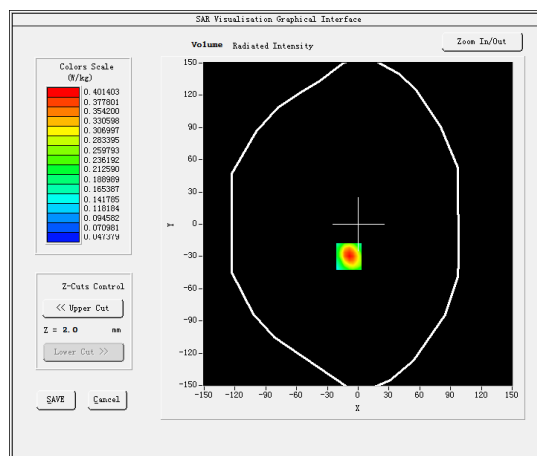
B. SAR Measurement Results

Frequency (MHz)	5775.000000
Relative permittivity (real part)	34.202077
Relative permittivity (imaginary part)	16.202177
Conductivity (S/m)	5.198198
Variation (%)	2.350000

SURFACE SAR



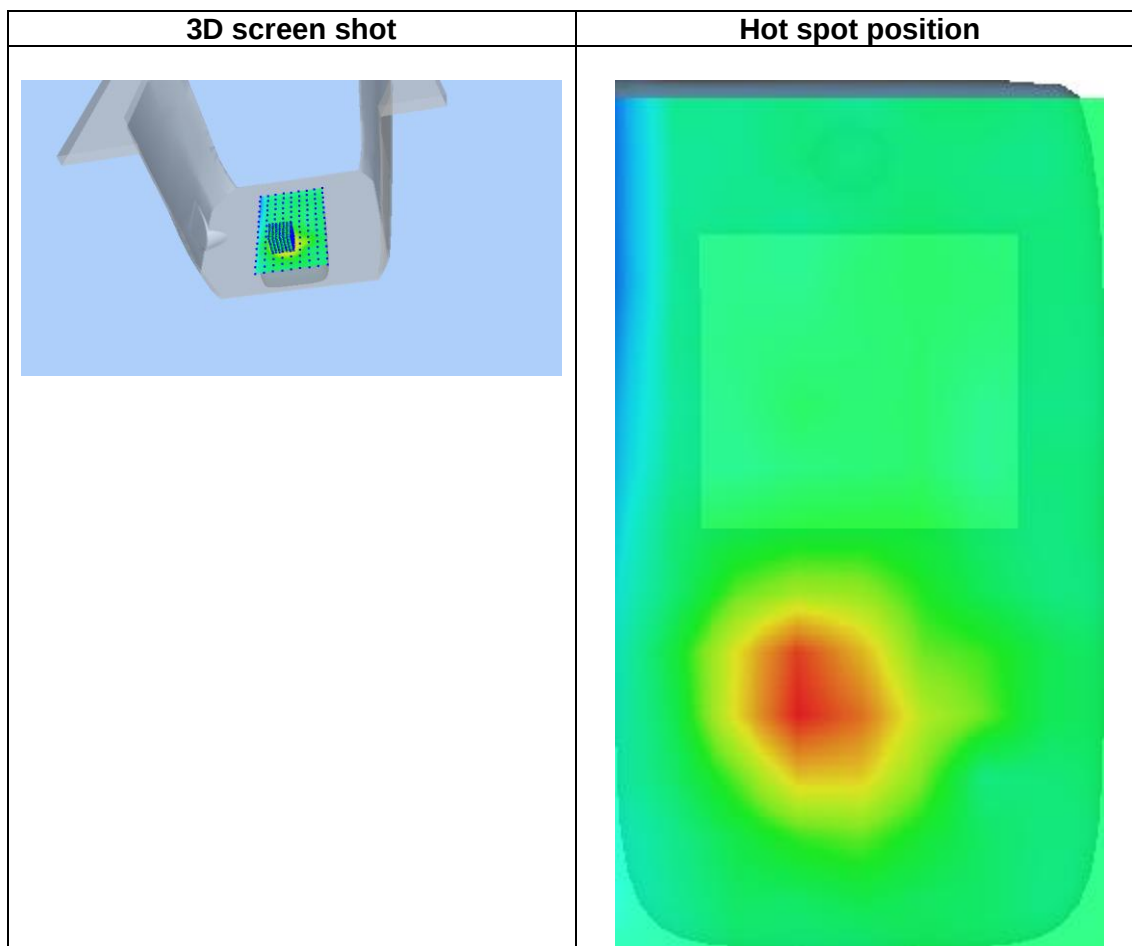
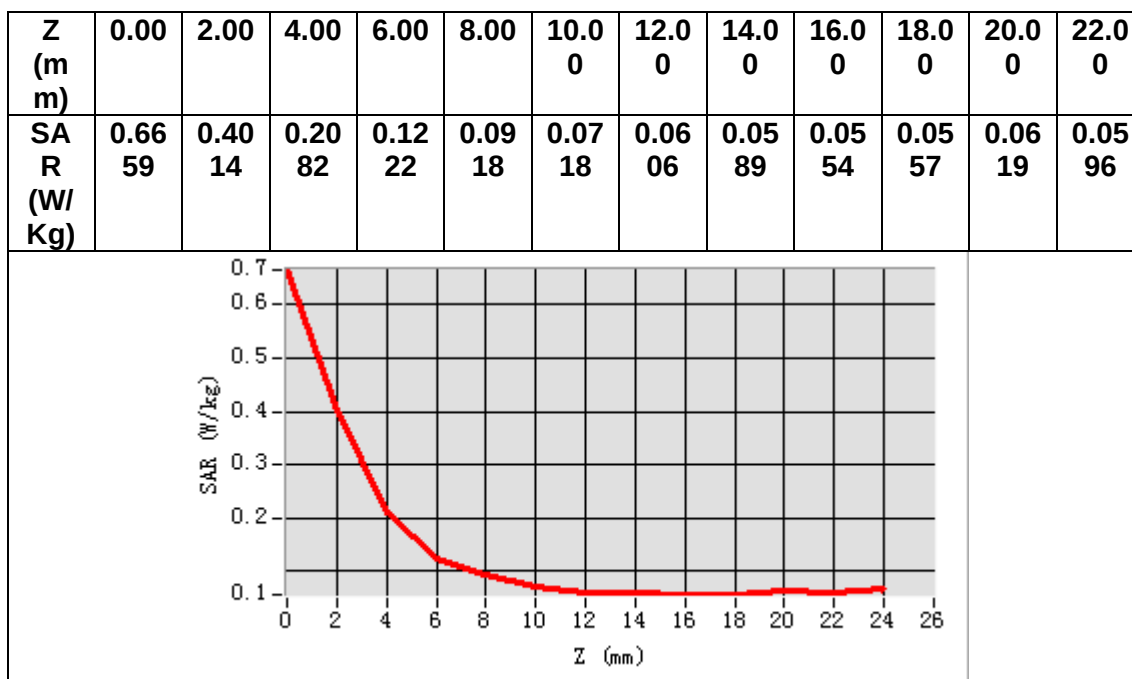
VOLUME SAR



Maximum location: X=-9.00, Y=-30.00

SAR Peak: 0.70 W/kg

SAR 10g (W/Kg)	0.128745
SAR 1g (W/Kg)	0.251834



MEASUREMENT 14

Date of measurement: 12/5/2024

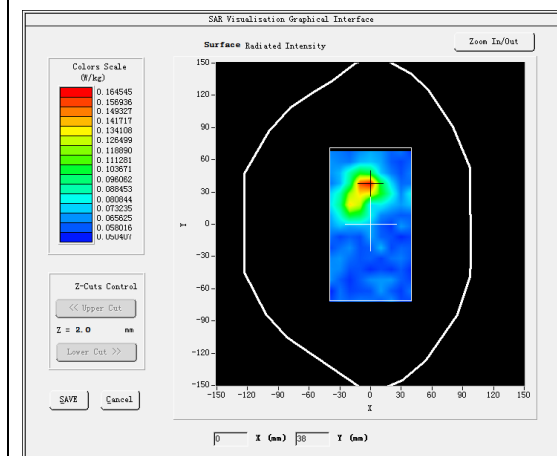
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11a (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.04</u>

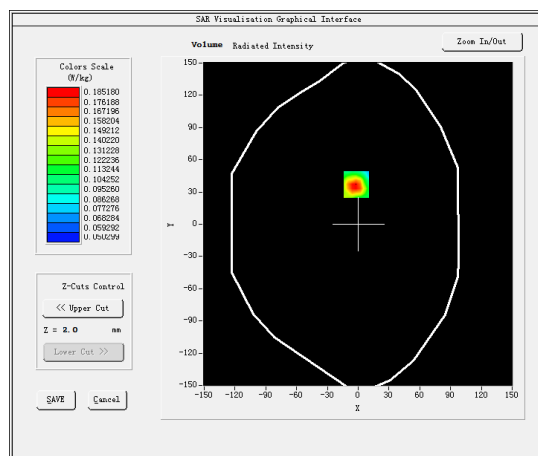
B. SAR Measurement Results

Frequency (MHz)	5825.000000
Relative permittivity (real part)	34.040967
Relative permittivity (imaginary part)	16.163672
Conductivity (S/m)	5.230744
Variation (%)	0.700000

SURFACE SAR



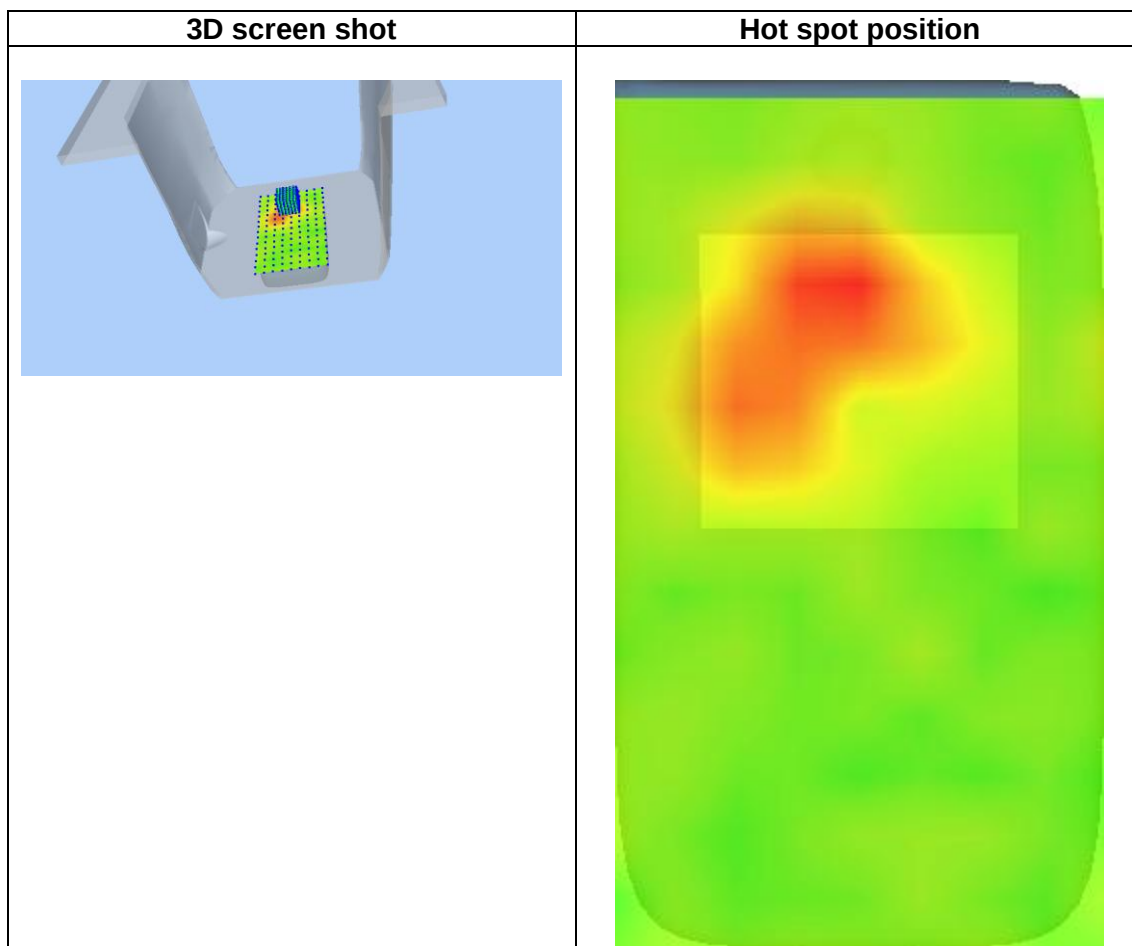
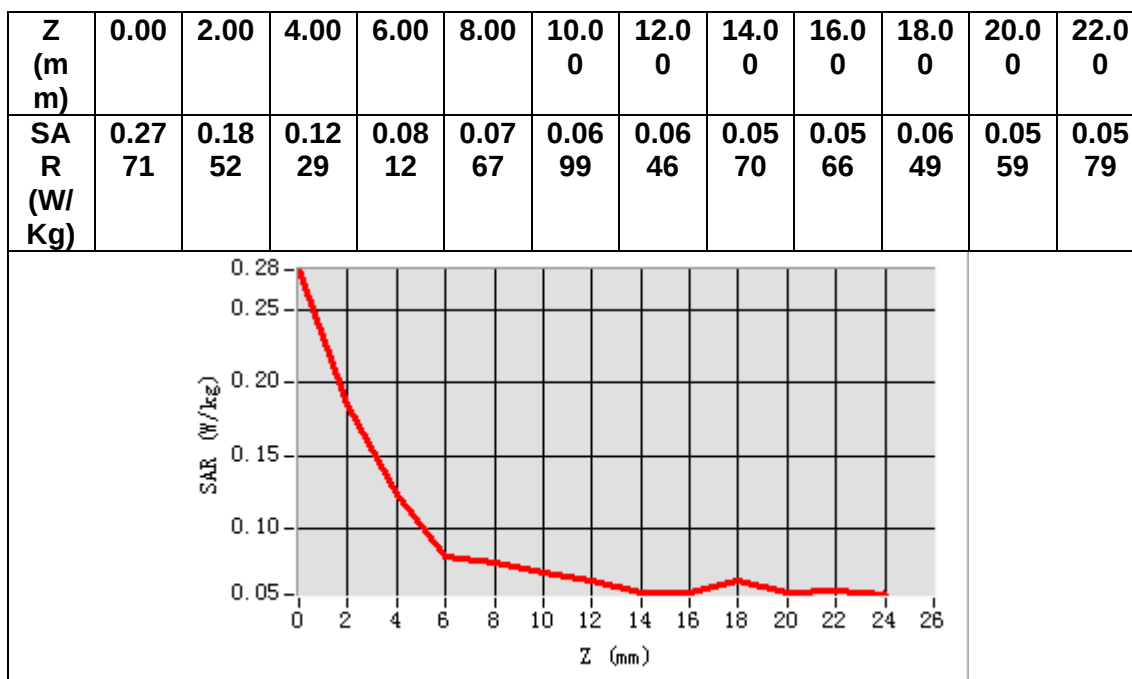
VOLUME SAR



Maximum location: X=-2.00, Y=37.00

SAR Peak: 0.32 W/kg

SAR 10g (W/Kg)	0.085966
SAR 1g (W/Kg)	0.132616



MEASUREMENT 15

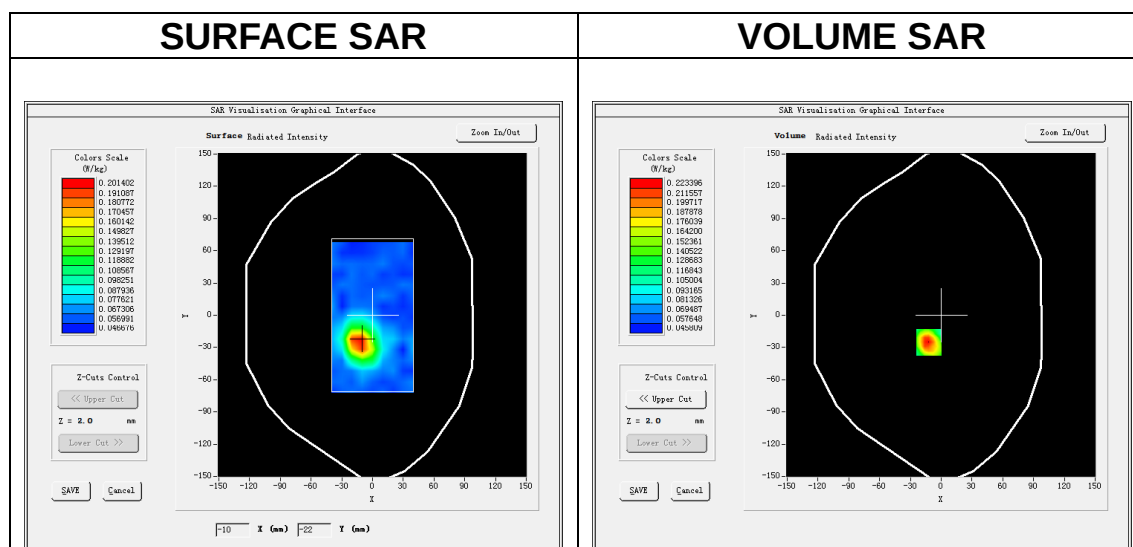
Date of measurement: 12/5/2024

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.04</u>

B. SAR Measurement Results

Frequency (MHz)	5795.000000
Relative permittivity (real part)	34.097264
Relative permittivity (imaginary part)	16.229417
Conductivity (S/m)	5.224971
Variation (%)	2.300000

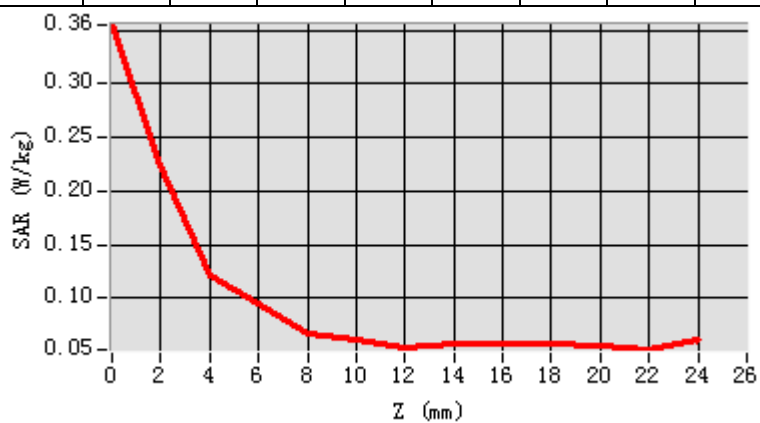


Maximum location: X=-12.00, Y=-25.00

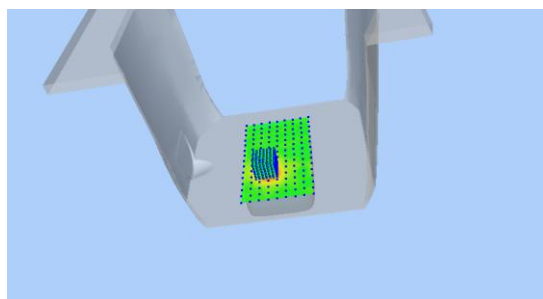
SAR Peak: 0.38 W/kg

SAR 10g (W/Kg)	0.090439
SAR 1g (W/Kg)	0.149664

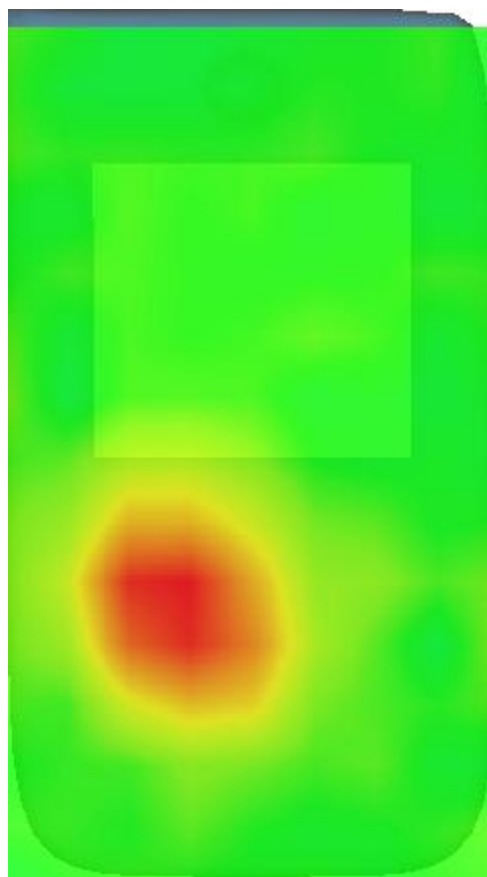
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/ Kg)	0.35 52	0.22 34	0.12 11	0.09 39	0.06 76	0.06 19	0.05 46	0.05 65	0.05 66	0.05 82	0.05 48	0.05 18



3D screen shot



Hot spot position



MEASUREMENT 16

Date of measurement: 12/5/2024

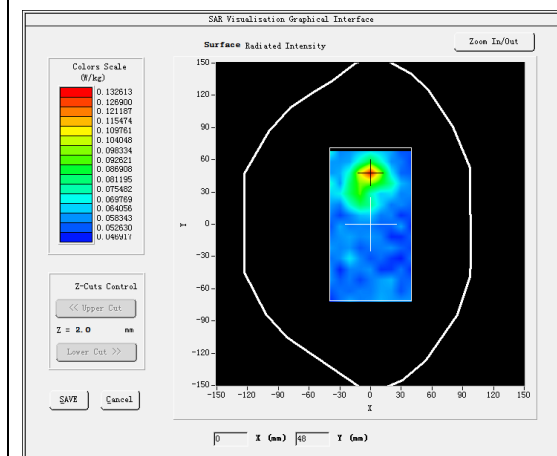
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm, h= 2.00 mm</u>
<u>ZoomScan</u>	<u>7x7x12,dx=4mm dy=4mm dz=2mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11ac U-NII</u>
<u>Channels</u>	<u>High</u>
<u>Signal</u>	<u>IEEE802.11ac (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.04</u>

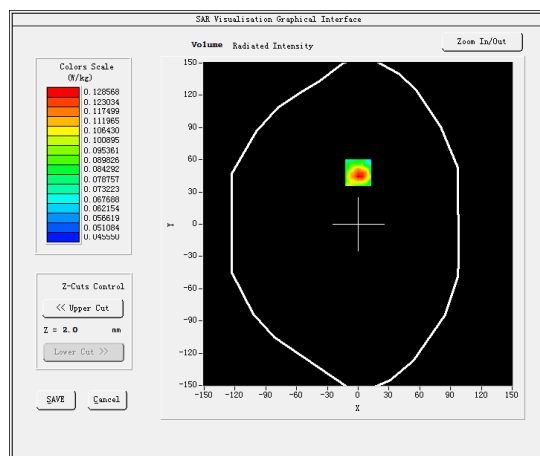
B. SAR Measurement Results

Frequency (MHz)	5795.000000
Relative permittivity (real part)	34.097264
Relative permittivity (imaginary part)	16.229417
Conductivity (S/m)	5.224971
Variation (%)	4.560000

SURFACE SAR



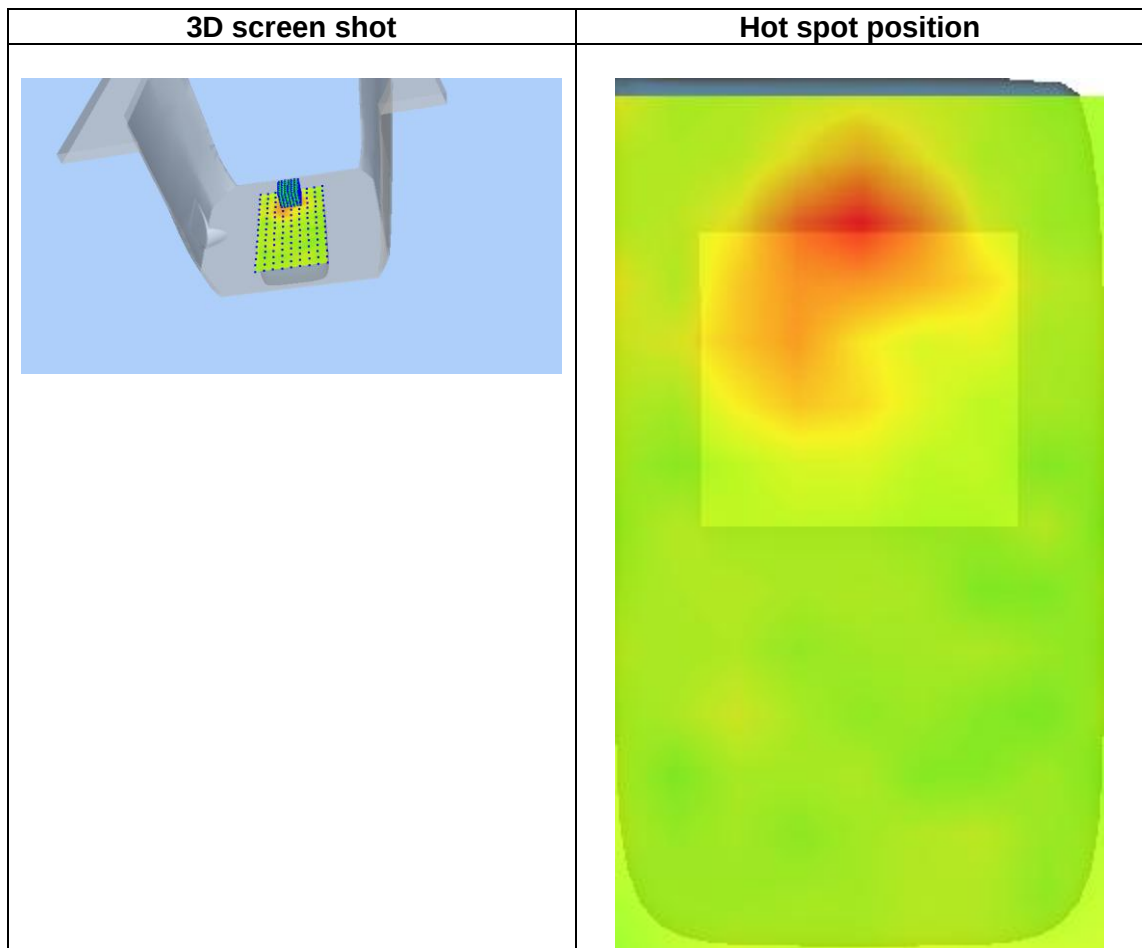
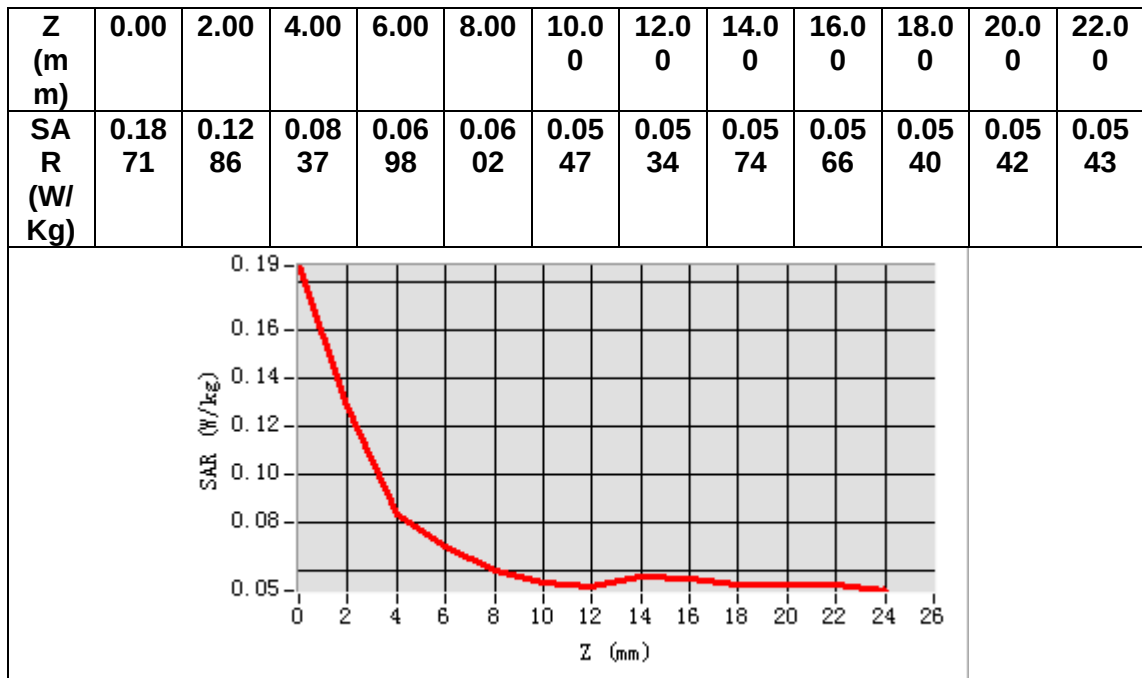
VOLUME SAR



Maximum location: X=0.00, Y=48.00

SAR Peak: 0.21 W/kg

SAR 10g (W/Kg)	0.070361
SAR 1g (W/Kg)	0.096737



MEASUREMENT 17

Date of measurement: 14/5/2024

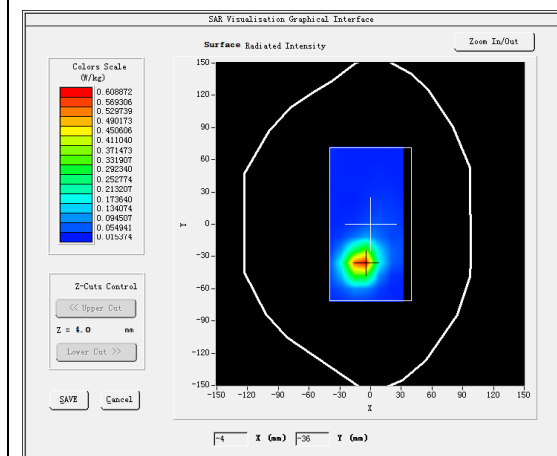
A. Experimental conditions.

<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>Low</u>
<u>Signal</u>	<u>IEEE802.11b (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

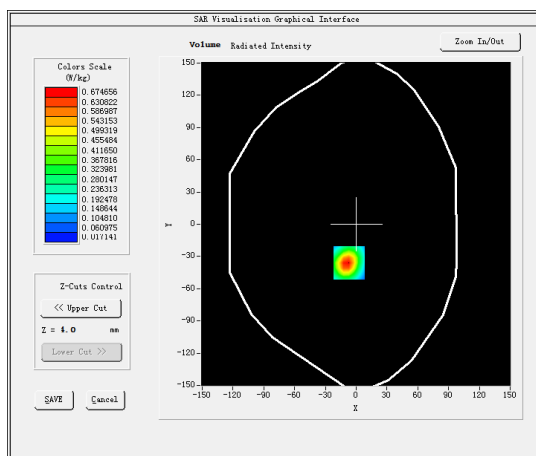
B. SAR Measurement Results

Frequency (MHz)	2412.000000
Relative permittivity (real part)	37.764335
Relative permittivity (imaginary part)	12.998436
Conductivity (S/m)	1.741790
Variation (%)	-2.070000

SURFACE SAR



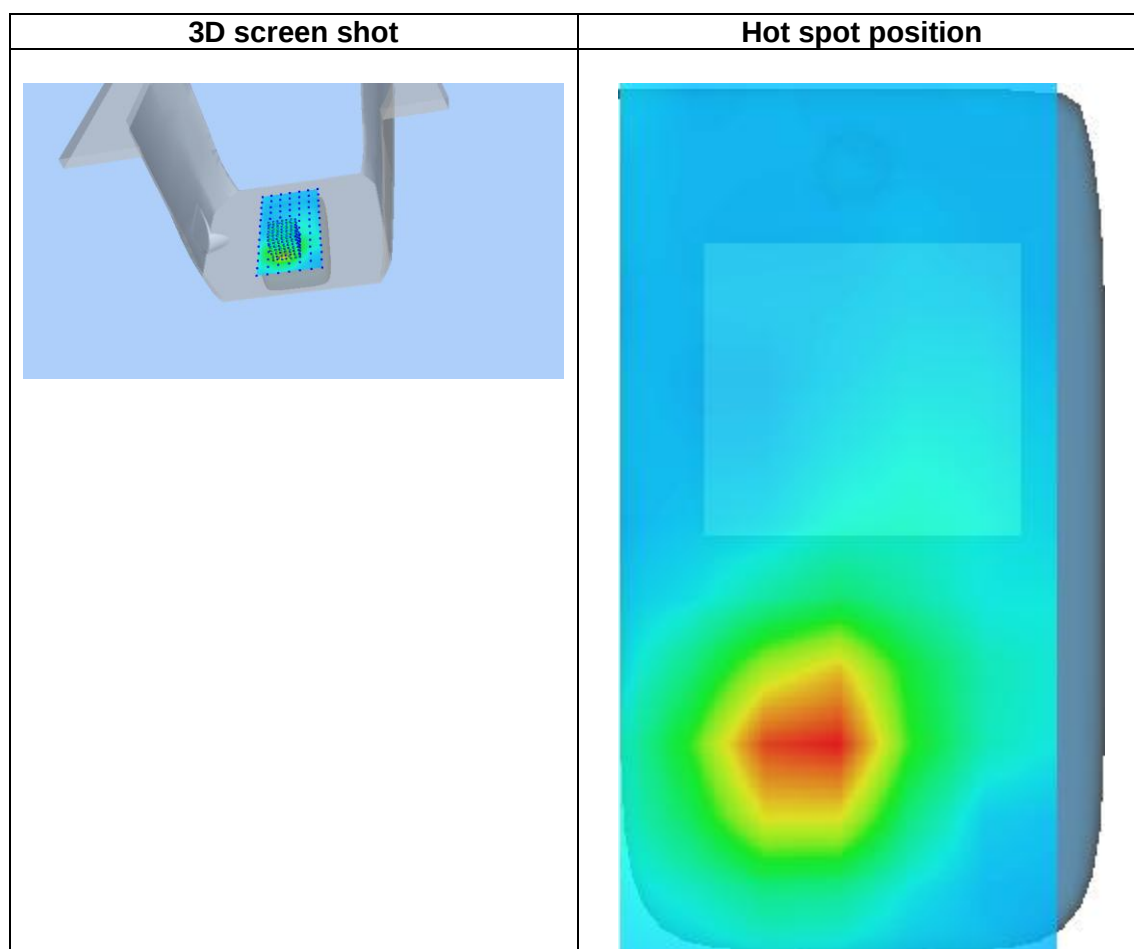
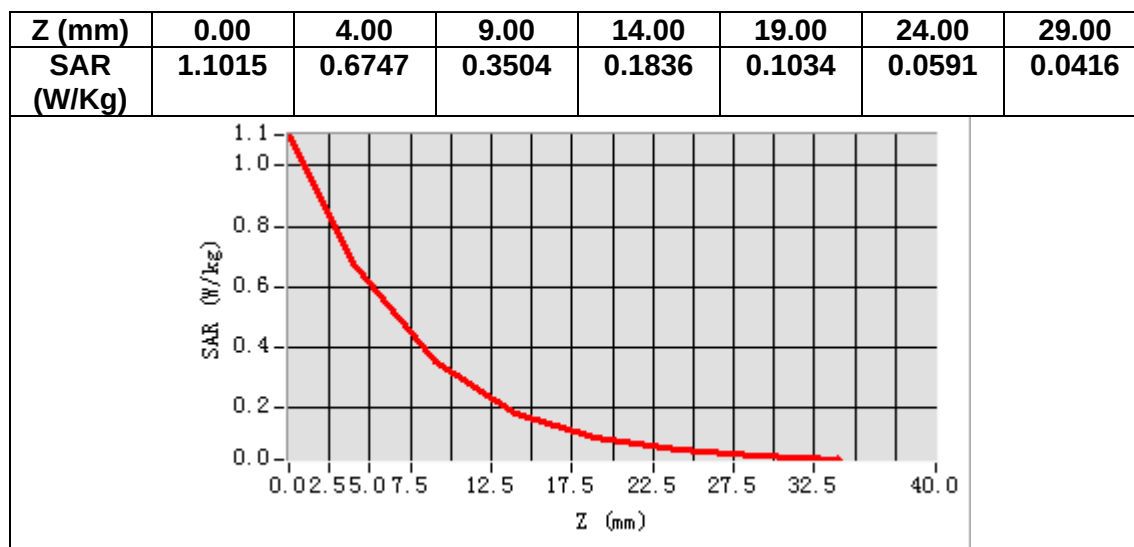
VOLUME SAR



Maximum location: X=-7.00, Y=-36.00

SAR Peak: 1.12 W/kg

SAR 10g (W/Kg)	0.294068
SAR 1g (W/Kg)	0.622056



MEASUREMENT 18

Date of measurement: 14/5/2024

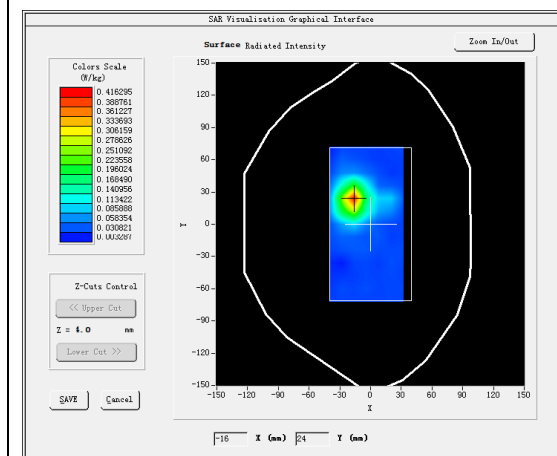
A. Experimental conditions.

<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>High</u>
<u>Signal</u>	<u>IEEE802.11b (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

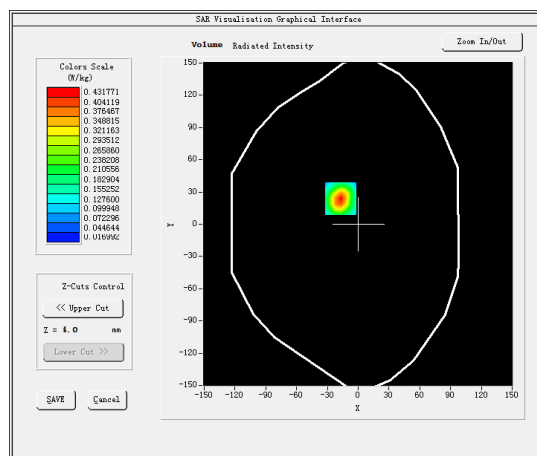
B. SAR Measurement Results

Frequency (MHz)	2462.000000
Relative permittivity (real part)	37.643635
Relative permittivity (imaginary part)	13.108536
Conductivity (S/m)	1.755687
Variation (%)	2.789993

SURFACE SAR



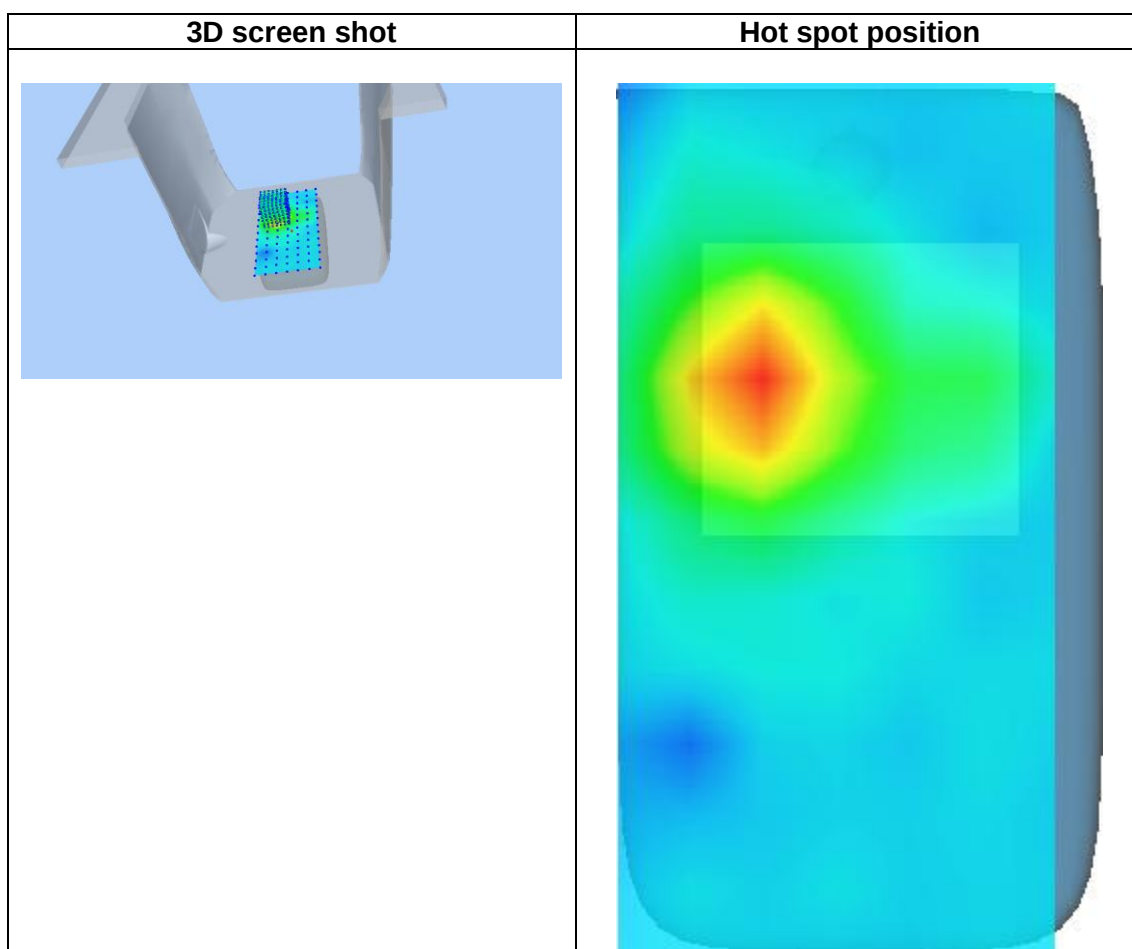
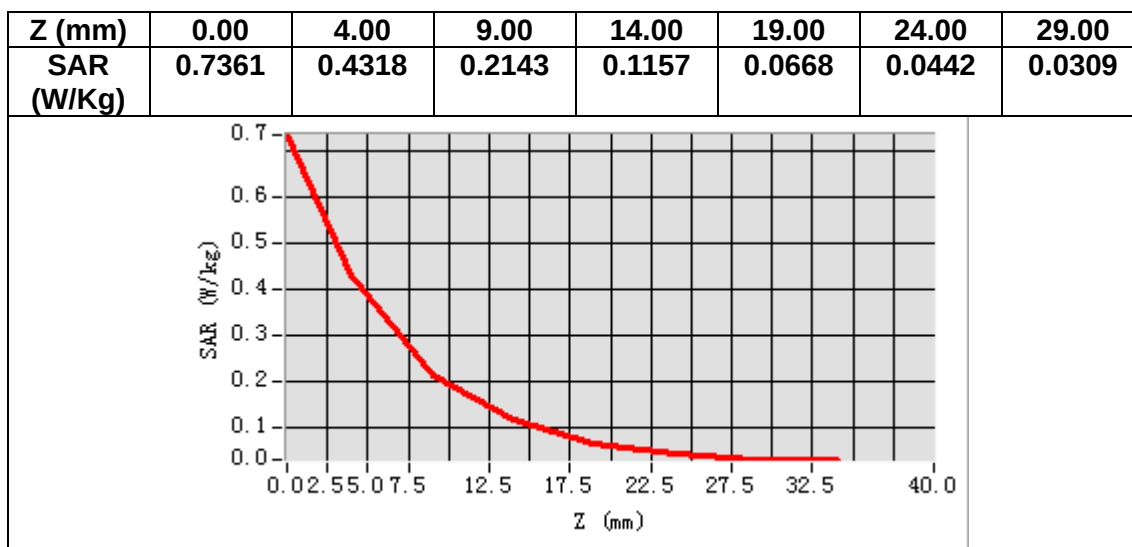
VOLUME SAR



Maximum location: X=-17.00, Y=24.00

SAR Peak: 0.73 W/kg

SAR 10g (W/Kg)	0.186485
SAR 1g (W/Kg)	0.385852



MEASUREMENT 19

Date of measurement: 14/5/2024

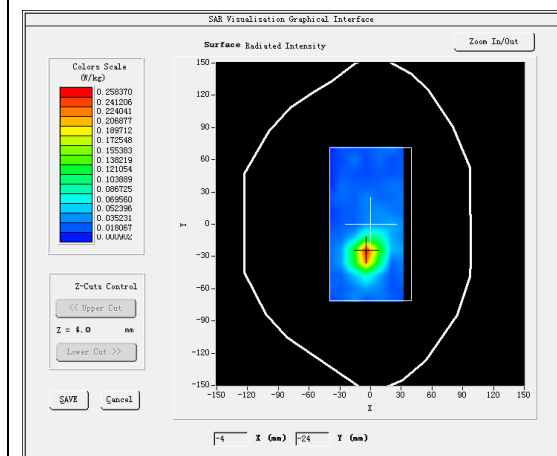
A. Experimental conditions.

<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 802.11n ISM</u>
<u>Channels</u>	<u>Low</u>
<u>Signal</u>	<u>IEEE802.11n (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

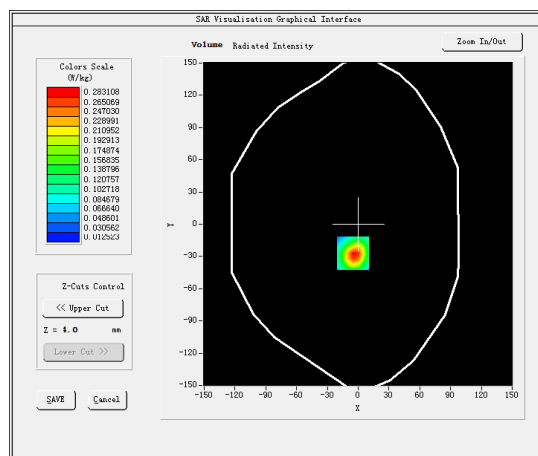
B. SAR Measurement Results

Frequency (MHz)	2412.000000
Relative permittivity (real part)	37.764335
Relative permittivity (imaginary part)	12.998436
Conductivity (S/m)	1.741790
Variation (%)	1.710000

SURFACE SAR



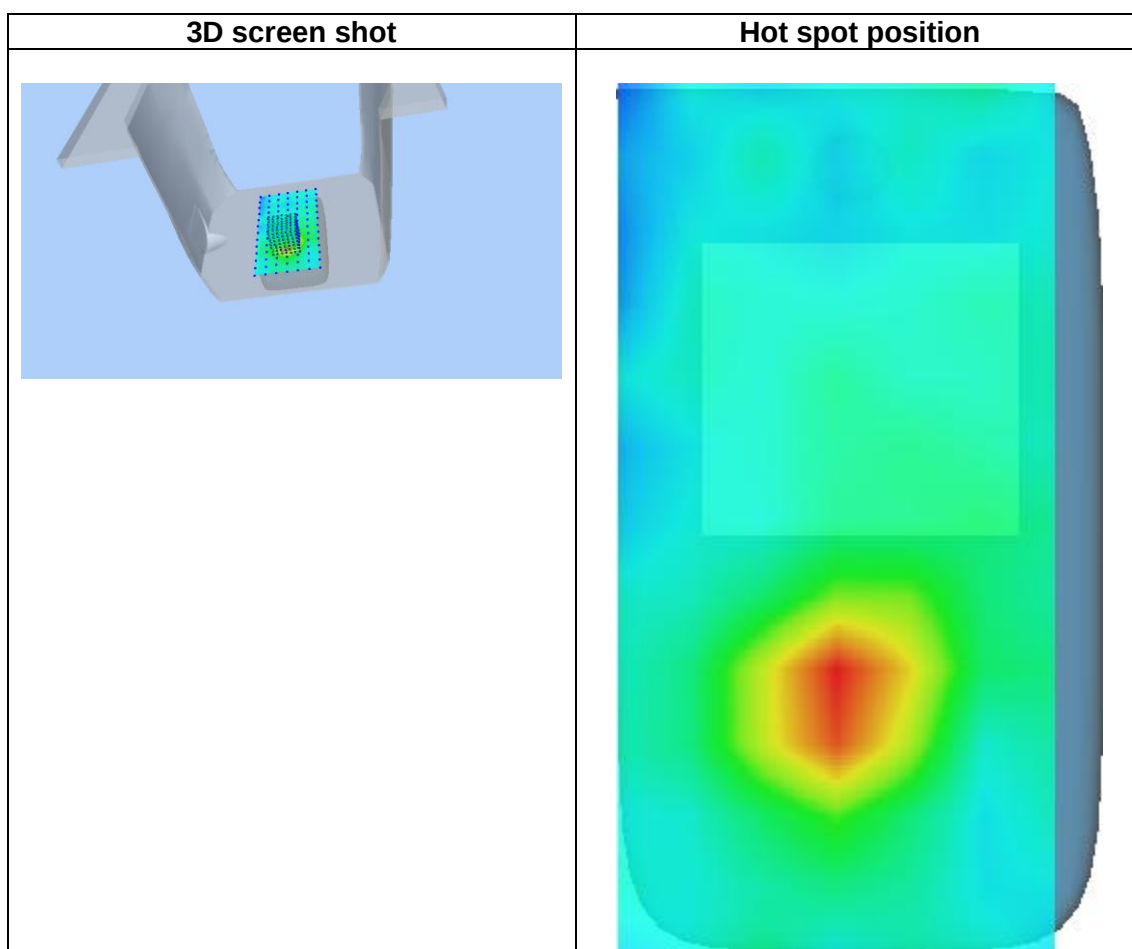
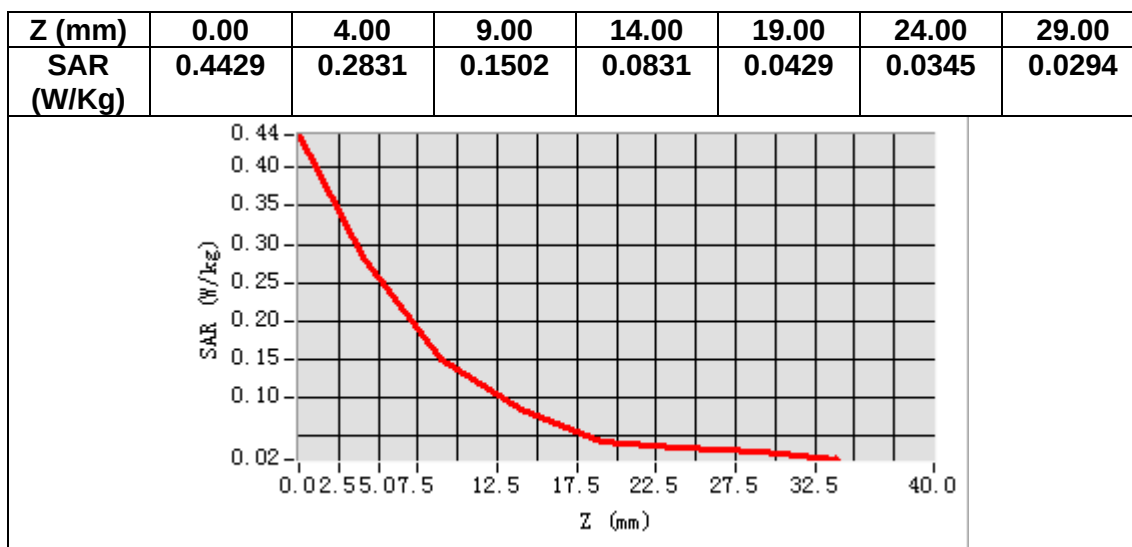
VOLUME SAR



Maximum location: X=-5.00, Y=-27.00

SAR Peak: 0.45 W/kg

SAR 10g (W/Kg)	0.127628
SAR 1g (W/Kg)	0.260104



MEASUREMENT 20

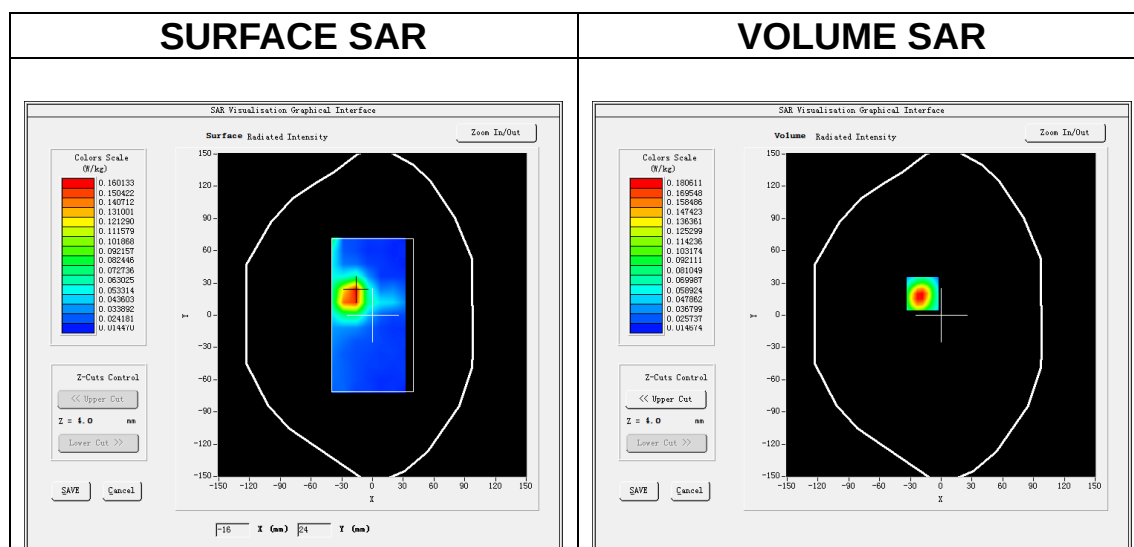
Date of measurement: 14/5/2024

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 802.11n ISM</u>
<u>Channels</u>	<u>Low</u>
<u>Signal</u>	<u>IEEE802.11n (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.85</u>

B. SAR Measurement Results

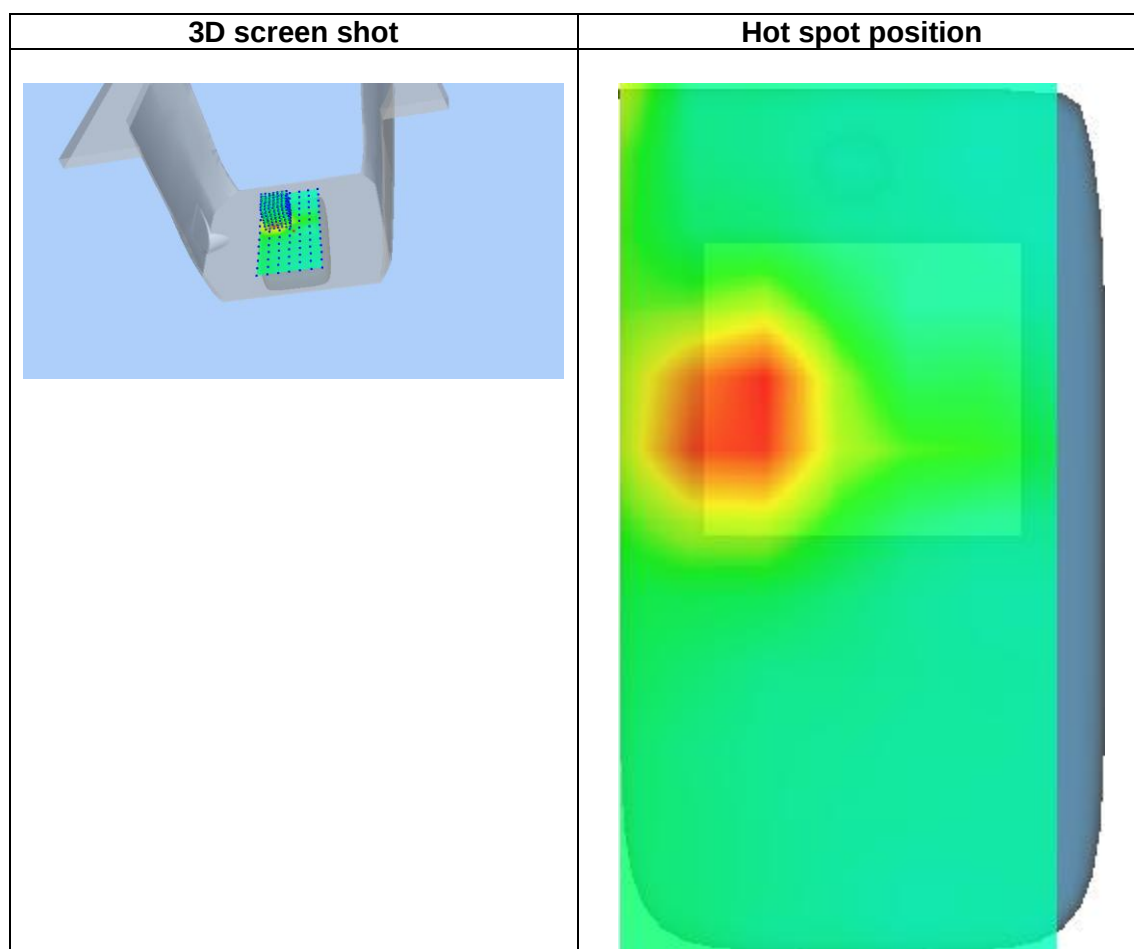
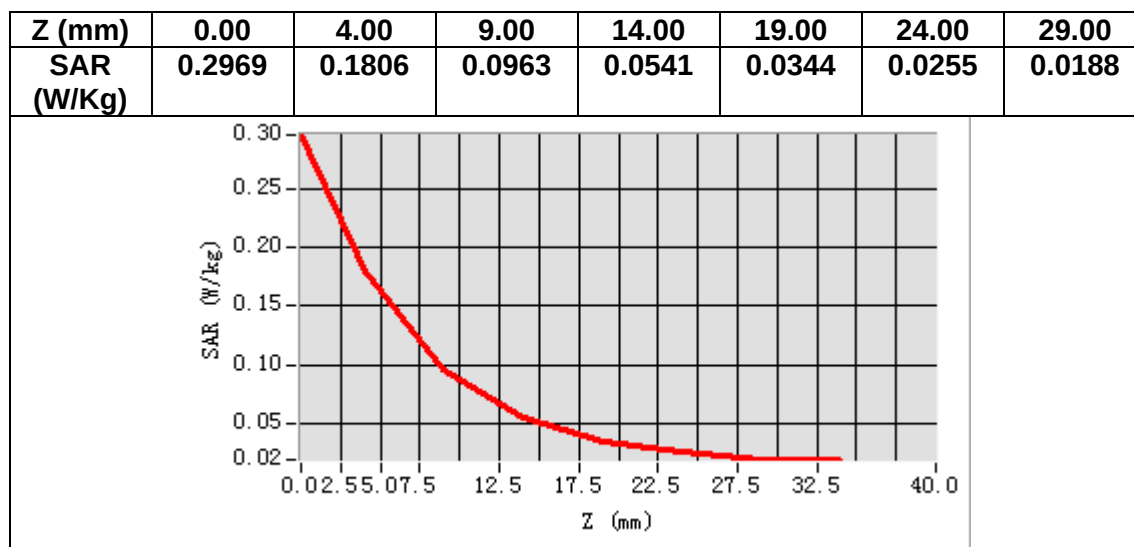
Frequency (MHz)	2412.000000
Relative permittivity (real part)	37.764335
Relative permittivity (imaginary part)	12.998436
Conductivity (S/m)	1.741790
Variation (%)	-1.720000



Maximum location: X=-18.00, Y=20.00

SAR Peak: 0.31 W/kg

SAR 10g (W/Kg)	0.086328
SAR 1g (W/Kg)	0.172175



13. Appendix D. Calibration Certificate

Table of contents
E Field Probe - 3423-EPGO-426
2450 MHz Dipole - SN 03/15 DIP 2G450-352
5000-6000 MHz Dipole - SN 13/14 WGA 33



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

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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

	Name	Function	Date	Signature
Prepared by :	Cyrille ONNEE	Measurement Responsible	9/18/2023	
Checked & approved by:	Jérôme Luc	Technical Manager	9/18/2023	
Authorized by:	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'

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

Issue	Name	Date	Modifications
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:

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

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
Δ_{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
δ	is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx 14 \text{ mm}$ at 3 GHz;
ΔSAR_{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 $SAR_{uncertainty}[\%]$ 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.

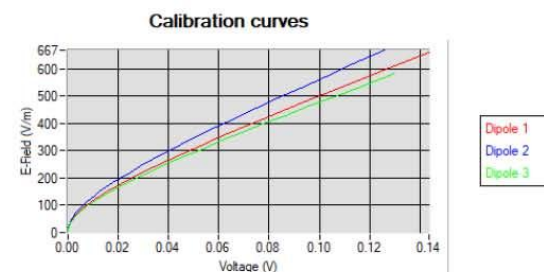
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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