FCC SAR EVALUATION REPORT

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

Product Name :	Remote control
Trade mark :	GDU
Model Name :	GDU RC SEE
Family Model :	N/A
Report No. :	S22092902307001
FCC ID :	2A8WC-S400-0102

Prepared for

GDU-Tech Co., Ltd.

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name..................:	GDU-Tech Co., Ltd.
Address ....:	Building 2, No.5, Huanglongshan South Road, Donghu New Technology Development Zone, Wuhan 430074, China
Manufacturer's Name...........:	GDU-Tech Co., Ltd.
Address ....:	Building 2, No.5, Huanglongshan South Road, Donghu New Technology Development Zone, Wuhan 430074, China
Product description	
Product name.........................:	Remote control
Trade mark ....:	GDU
Model Name ....:	GDU RC SEE
Family Model..........................:	N/A
Standards..............................:	FCC 47 CFR Part 2(2.1093) ANSI/IEEE C95.1-1992 IEEE Std 1528-2013 Published RF exposure KDB procedures

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

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Test Sample Number S220929023003

Date of Test

Date (s) of performance of tests ....:	Mar. 01, 2024- May 17, 2024
Date of Issue..:	May 22, 2024
Test Result ....:	**Pass**

Prepared By : Jack Li	Reviewed By : Aaron Cheng	Approved By : Alex Li
Jack Li (Project Engineer)	Aaron Cheng (Supervisor)	Alex Li (Manager)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	May 22, 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 GDU RC SEE are as follows.

RF Exposure Conditions		Max Reported SAR Value(W/kg)
1-g Body (Separation distance of 0mm)		0.798
Max Simultaneous Tx	Body	1.582

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

1.3. EUT Description

Device Information			
Product Name	Remote control		
Trade Name			
Model Name	GDU RC SEE		
Family Model	N/A		
FCC ID	2A8WC-S400-0102		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna	FPC Antenna		
Battery Information	DC 7.2V, 7000mAh		
Hardware version:	N/A		
Software version	N/A		
Device Operating Configurations			
Supporting Mode(s)	LTEBand2/7/41, WLAN 2.4G/5G, User-defined 2.4G/5G, Bluetooth		
Test Modulation	LTE(QPSK/16QAM), WLAN(DSSS/OFDM), User-defined (BPSK, QPSK, 16QAM, 64QAM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	LTE Band 2	1850-1910	1930-1990
	LTE Band 7	2500-2570	2620-2690
	LTE Band 41	2555-2655	
	WLAN 2.4G	2412-2462	
	WLAN 5.2G	5180-5240	
	WLAN 5.8G	5745-5825	

	Bluetooth	2402-2480
	User-defined 2.4G	2420-2460 [Note1]
	User-defined 5.8G	5740-5820 [Note1]
Power Class	3, tested with power control all Max.(LTE Band 2)	
	3, tested with power control all Max.(LTE Band 7)	
	3, tested with power control all Max.(LTE Band 41)	

Note 1:
Number Of Channel List

User-defined 2.4G		User-defined 5.8G	
10M/20M/40M	2420	40M	5760
	2430		5780
	2440		5800
	2450		5820
	2460		/
	/	10M/20M	5740
	/		5760
	/		5780
	/		5800
	/		5820

1.4. Test specification(s)

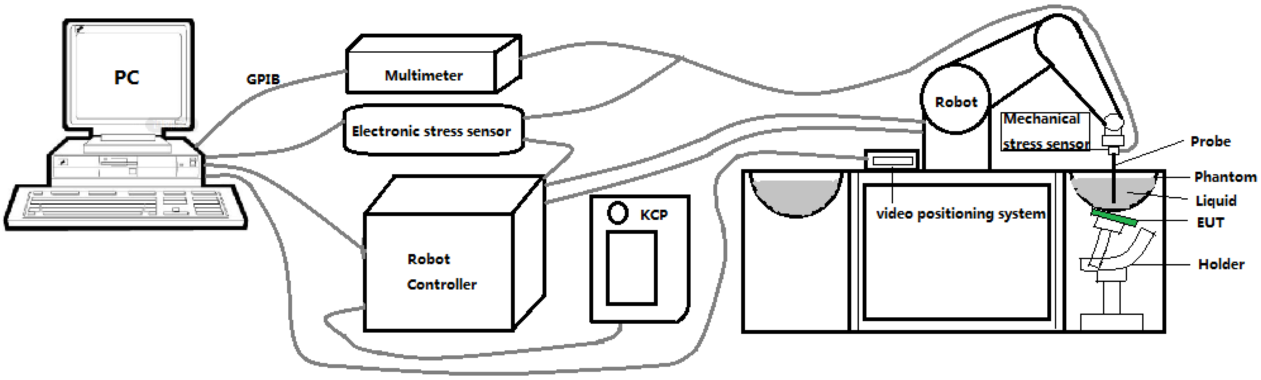
FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting
KDB 447498 D01 General RF Exposure Guidance
KDB 248227 D01 802.11 Wi-Fi SAR
KDB 941225 D05 SAR for LTE Devices

1.5. Ambient Condition

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

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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

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

2.3. E-Field Probe

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

For the measurements the Specific Dosimetric E-Field Probe 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 ±10%. The spherical isotropy shall be evaluated and within ±0.25dB. The sensitivity parameters (Norm X, Norm Y, and Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe are tested. The calibration data can be referred to appendix D of this report.

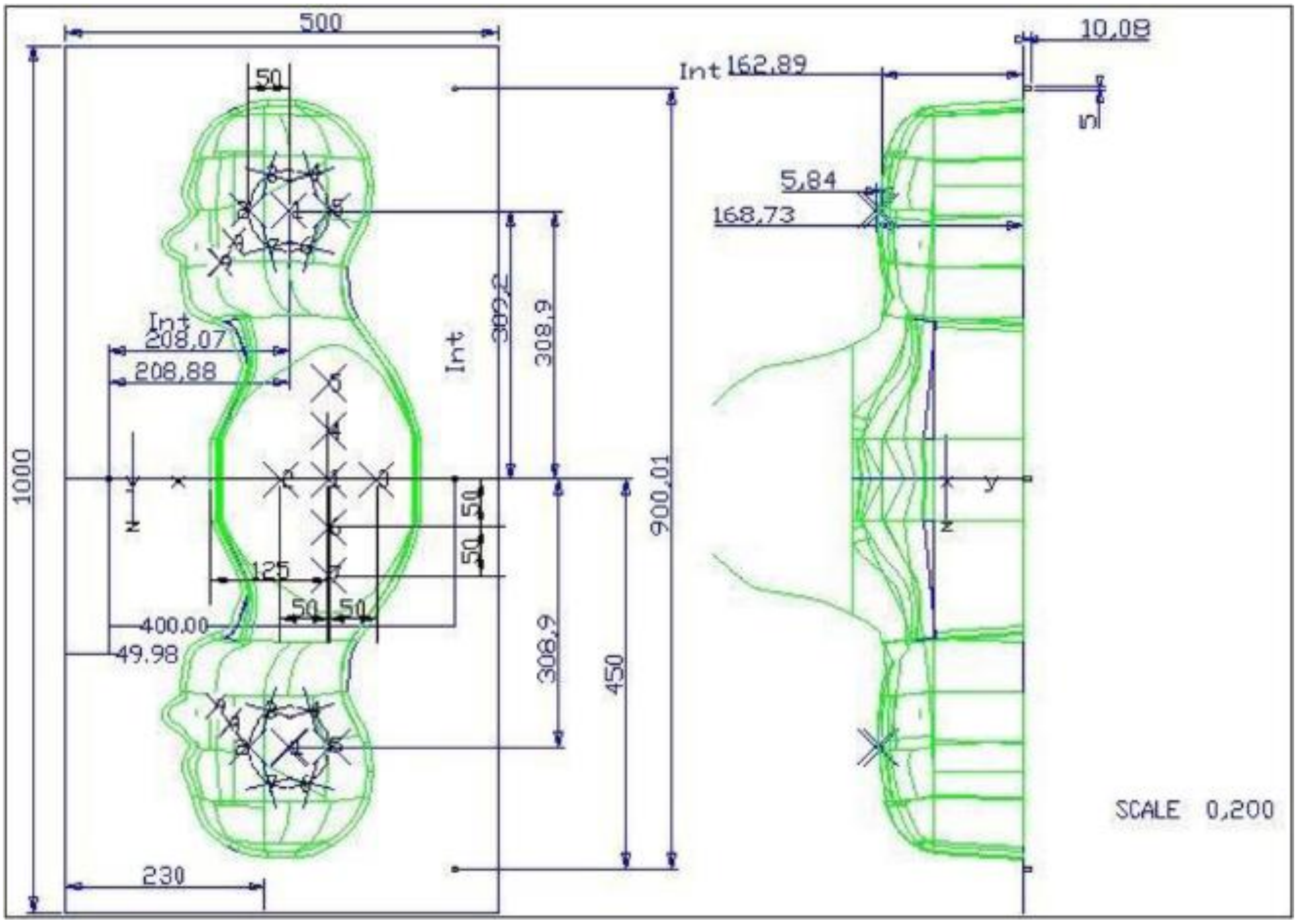
2.4. SAM phantoms

Photo of SAM phantom SN 16/15 SAM119

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

2.4.1. Technical Data

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

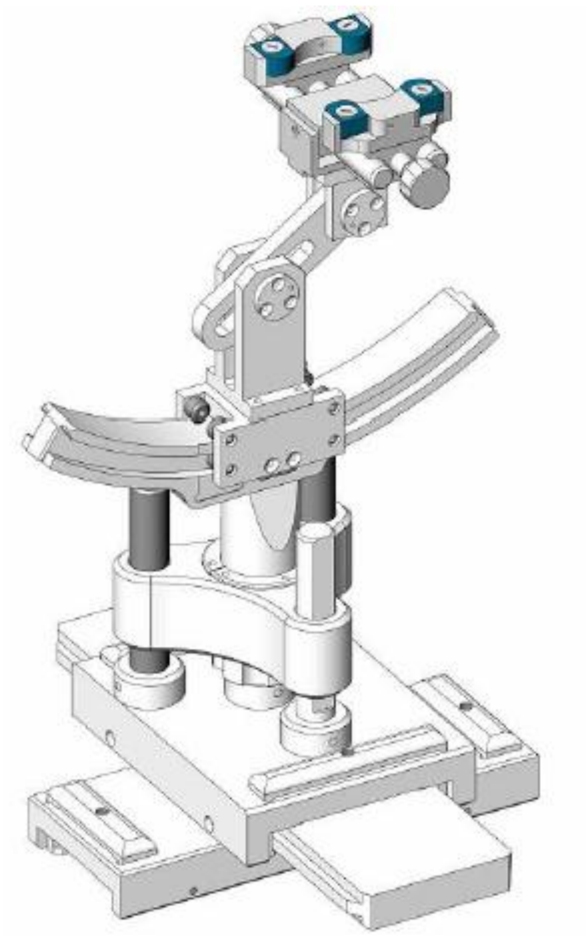


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

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

2.5. Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1 degree.



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

2.6. Test Equipment List

This table gives a complete overview of the SAR measurement equipment.

Devices used during the test described are marked ☒

	Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
					Last Cal.	Due Date
☒	MVG	E FIELD PROBE	SSE2	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	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	8753D	3410J01136	May 29,	May 28,

		Analyzer			2023	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 1900	Head 1900	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 2600	Head 2600	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 5800	Head 5800	NCR	NCR

3. SAR Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

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

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

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

<SAR measurement>

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

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

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

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

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

(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg.

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

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

3.1. Power Reference

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

3.2. Area scan & Zoom scan

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

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

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

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

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

3.3. Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.
An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1 mm step.
The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

3.4. Volumetric Scan

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

3.5. Power Drift

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In OpenSAR measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in V/m. If the power drifts more than ±5%, the SAR will be retested.

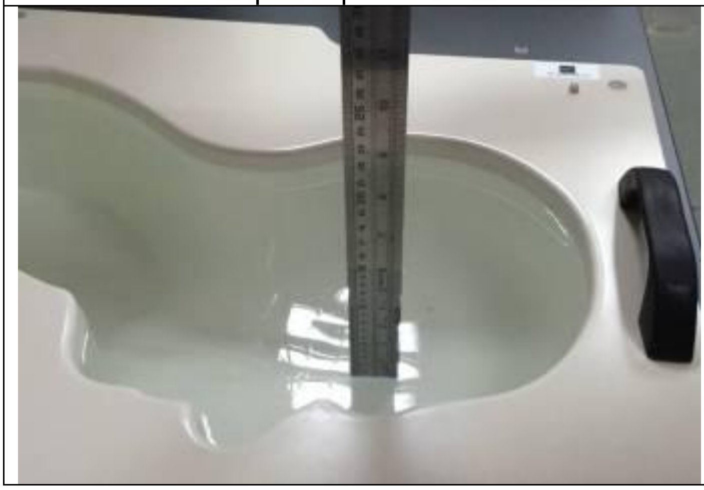
4. System Verification Procedure

4.1. Tissue Verification

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

Ingredients (% of weight)	Head Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	34.40	34.40	34.40	55.36	55.36	57.87	57.87	57.87	65.53	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	24.24	24.24
DGBE	0.00	0.00	0.00	13.84	13.84	22.00	22.00	22.00	10.23	10.23

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 of the dielectric parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ±5% of the target values.

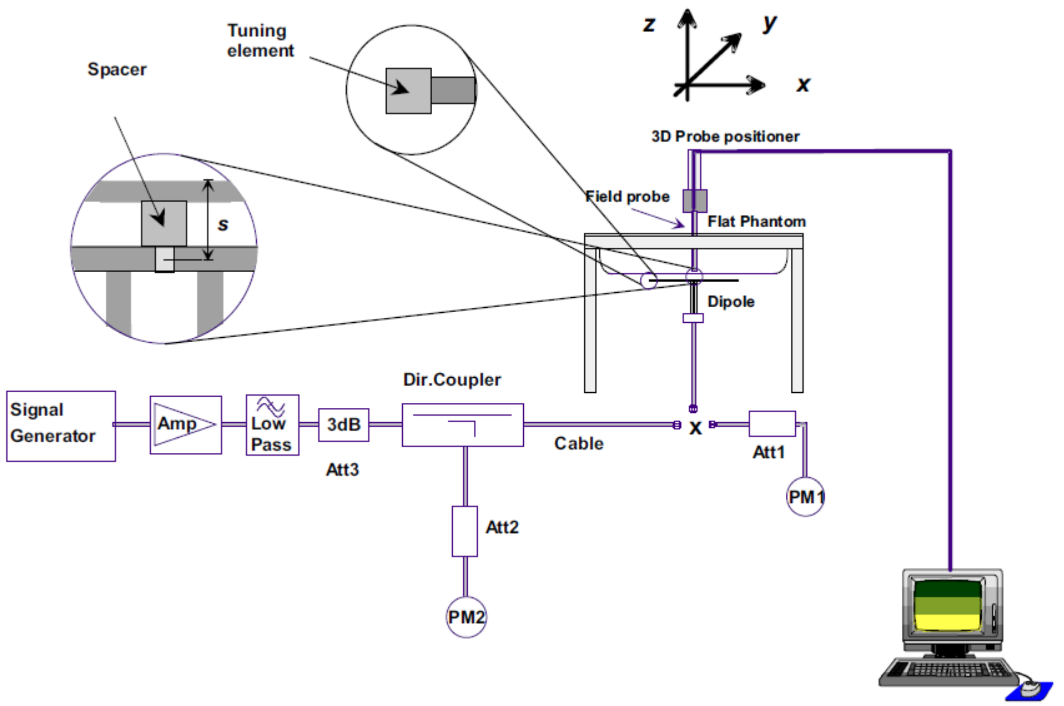
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		εr (±5%)	σ (S/m) (±5%)	εr	σ (S/m)		
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.85	1.43	21.7 °C	Mar. 01, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	38.19	1.76	21.5 °C	Mar. 07, 2024
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	38.19	2.00	21.3 °C	Mar. 14, 2024
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	36.13	4.77	21.5 °C	Mar. 21, 2024
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	34.71	5.29	21.5 °C	Mar. 28, 2024
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.93	1.45	21.7 °C	May 15, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.67	1.78	21.7 °C	May 14, 2024
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	39.02	2.00	21.7 °C	May 10, 2024
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	34.68	4.56	21.5 °C	May 11, 2024
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	34.11	5.21	21.6 °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 ±10%. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance verification can meet the variation criterion and the plots can be referred to Appendix B of this report.

System Verification	Target SAR (1W) (±10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
1900MHz	39.69 (35.72~43.66)	20.92 (18.83~23.01)	37.61	19.63	21.7 °C	Mar. 01, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	48.59	26.17	21.5 °C	Mar. 07, 2024
2600MHz	54.16 (48.74~59.58)	24.85 (22.37~27.34)	57.88	25.03	21.3 °C	Mar. 14, 2024
5200MHz	162.59 (146.33~178.85)	56.21 (50.59~61.83)	154.20	60.04	21.5 °C	Mar. 21, 2024
5800MHz	182.20 (163.98~200.42)	61.32 (55.19~67.45)	194.25	62.62	21.5 °C	Mar. 28, 2024
1900MHz	39.69 (35.72~43.66)	20.92 (18.83~23.01)	37.62	18.91	21.7 °C	May 15, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	48.78	23.40	21.7 °C	May 14, 2024
2600MHz	54.16 (48.74~59.58)	24.85 (22.37~27.34)	51.25	24.23	21.7 °C	May 10, 2024
5200MHz	162.59 (146.33~178.85)	56.21 (50.59~61.83)	162.00	56.65	21.5 °C	May 11, 2024
5800MHz	182.20 (163.98~200.42)	61.32 (55.19~67.45)	188.69	57.30	21.6 °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 (~ 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. Generic device

The SAR evaluation shall be performed for surface of the DUT that are accessible during intended use, as indicated in Figure 6.1. Adjust the distance between the device surface and the flat phantom to 0mm.

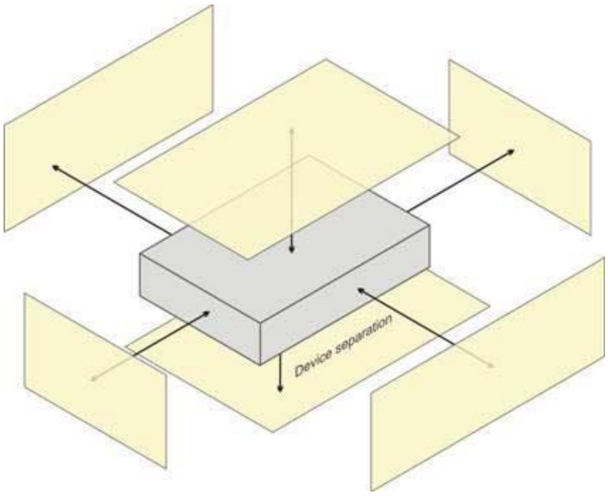


Figure 6.1 – Test positions for generic device

7. RF Output Power

7.1. LTE Conducted Power

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18607/1850.7	18900/1880	19193/1909.3
LTE Band 2	1.4MHz	QPSK	1	0	22.50	21.37	21.90	22.00
			1	2	22.50	21.52	21.86	22.19
			1	5	22.50	21.37	21.64	22.04
			3	0	22.50	21.50	21.54	22.14
			3	1	22.50	21.50	21.74	22.16
			3	2	22.50	21.50	21.54	22.15
			6	0	21.50	20.51	20.53	21.19
		16QAM	1	0	21.50	20.49	20.63	21.31
			1	2	21.50	20.69	20.80	21.38
			1	5	21.50	20.55	20.73	21.29
			3	0	21.50	20.45	20.45	21.14
			3	1	21.50	20.43	20.54	21.22
			3	2	21.50	20.42	20.48	21.12
			6	0	20.50	19.52	19.60	20.28

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18615/1851.5	18900/1880	19185/1908.5
LTE Band 2	3MHz	QPSK	1	0	22.50	20.90	21.44	22.00
			1	7	22.50	20.91	21.45	22.05
			1	14	22.50	20.91	21.45	22.05
			8	0	21.50	19.94	20.47	21.10
			8	4	21.50	19.96	20.50	21.16
			8	7	21.50	19.93	20.48	21.11
			15	0	21.50	19.94	20.46	21.12
		16QAM	1	0	21.50	20.08	20.71	21.22
			1	7	21.50	20.20	20.78	21.27
			1	14	21.50	20.13	20.66	21.38
			8	0	20.50	18.97	19.54	20.20
			8	4	20.50	19.00	19.52	20.26
			8	7	20.50	18.94	19.51	20.17
			15	0	20.50	18.93	19.45	20.15

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18625/1852.5	18900/1880	19175/1907.5
LTE Band 2	5MHz	QPSK	1	0	22.50	20.83	21.35	21.92
			1	12	22.50	20.94	21.50	22.07
			1	24	22.50	20.84	21.36	21.96
			12	0	21.50	20.00	20.52	21.15
			12	6	21.50	20.00	20.55	21.17
			12	11	21.50	19.95	20.46	21.11
			25	0	21.50	19.97	20.49	21.13
		16QAM	1	0	21.50	20.06	20.66	21.22
			1	12	21.50	20.21	20.73	21.37
			1	24	21.50	20.02	20.68	21.25
			12	0	20.50	18.94	19.52	20.15
			12	6	20.50	18.99	19.50	20.18
			12	11	20.50	18.92	19.43	20.12
			25	0	20.50	18.95	19.48	20.14

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18650/1855	18900/1880	19150/1905
LTE Band 2	10MHz	QPSK	1	0	22.50	20.93	21.40	21.91
			1	24	22.50	21.01	21.57	22.16
			1	49	22.50	20.94	21.42	22.04
			25	0	21.50	20.03	20.61	21.14
			25	12	21.50	20.00	20.52	21.10
			25	24	21.50	20.03	20.45	21.07
			50	0	21.50	20.03	20.55	21.10
		16QAM	1	0	21.50	20.19	20.73	21.17
			1	24	21.50	20.32	20.90	21.33
			1	49	21.50	20.25	20.68	21.26
			25	0	20.50	19.03	19.63	20.14
			25	12	20.50	19.01	19.54	20.12
			25	24	20.50	19.02	19.45	20.09
			50	0	20.50	19.03	19.51	20.12

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18675/1857.5	18900/1880	19125/1902.5

LTE Band 2	15MHz	QPSK	1	0	22.50	20.85	21.34	21.69
			1	37	22.50	20.99	21.49	22.01
			1	74	22.50	21.01	21.37	21.99
			36	0	21.50	20.01	20.54	20.92
			36	18	21.50	20.03	20.52	21.07
			36	37	21.50	20.07	20.47	21.05
			75	0	21.00	20.04	20.50	20.99
		16QAM	1	0	21.50	20.16	20.51	20.95
			1	37	21.50	20.33	20.66	21.30
			1	74	21.50	20.37	20.59	21.19
			36	0	20.50	18.95	19.49	19.92
			36	18	20.50	19.00	19.50	20.05
			36	37	20.50	19.06	19.43	20.03
			75	0	20.00	19.01	19.48	19.99

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18700/1860	18900/1880	19100/1900
LTE Band 2	20MHz	QPSK	1	0	22.00	20.80	21.22	21.54
			1	49	22.00	21.12	21.56	21.96
			1	99	22.00	21.09	21.34	21.90
			50	0	21.00	20.00	20.54	20.74
			50	24	21.00	20.07	20.52	20.95
			50	49	21.00	20.16	20.39	20.90
			100	0	21.00	20.06	20.45	20.83
		16QAM	1	0	21.50	20.07	20.39	20.80
			1	49	21.50	20.41	20.86	21.24
			1	99	21.50	20.37	20.67	21.15
			50	0	20.00	18.96	19.53	19.75
			50	24	20.00	19.06	19.51	19.97
			50	49	20.00	19.16	19.36	19.94
			100	0	20.00	19.08	19.43	19.84

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20775/2502.5	21100/2535	21425/2567.5
LTE Band 7	5MHz	QPSK	1	0	24.00	23.64	23.44	23.41
			1	12	24.00	23.72	23.55	23.62
			1	24	24.00	23.64	23.47	23.48

			12	0	23.00	22.80	22.64	22.65
			12	6	23.00	22.83	22.64	22.70
			12	11	23.00	22.76	22.55	22.63
			25	0	23.00	22.83	22.63	22.65
		16QAM	1	0	23.00	22.77	22.64	22.71
			1	12	23.00	22.73	22.76	22.92
			1	24	23.00	22.68	22.56	22.80
			12	0	22.00	21.73	21.64	21.67
			12	6	22.00	21.76	21.63	21.73
			12	11	22.00	21.71	21.54	21.67
			25	0	22.00	21.78	21.62	21.68

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20800/2505	21100/2535	21400/2565
LTE Band 7	10MHz	QPSK	1	0	24.00	23.76	23.06	22.91
			1	24	24.00	23.68	23.16	23.14
			1	49	24.00	23.64	23.09	23.07
			25	0	23.00	22.66	22.32	22.04
			25	12	23.00	22.54	22.19	22.15
			25	24	23.00	22.57	22.15	22.17
			50	0	22.50	22.46	22.27	22.15
		16QAM	1	0	23.00	22.42	22.35	22.17
			1	24	23.00	22.50	22.32	22.53
			1	49	23.00	22.42	22.17	22.41
			25	0	21.50	21.35	21.33	21.16
			25	12	21.50	21.37	21.19	21.25
			25	24	21.50	21.47	21.13	21.22
			50	0	21.50	21.43	21.30	21.22

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20825/2507.5	21100/2535	21375/2562.5
LTE Band 7	15MHz	QPSK	1	0	23.50	23.24	23.06	22.88
			1	37	23.50	23.32	23.11	23.01
			1	74	23.50	23.21	23.05	23.04
			36	0	22.50	22.37	22.32	22.00
			36	18	22.50	22.41	22.24	22.15
			36	37	22.50	22.46	22.19	22.17
			75	0	22.50	22.45	22.28	22.07

		16QAM	1	0	23.00	22.36	22.26	22.15
			1	37	23.00	22.41	22.35	22.35
			1	74	23.00	22.60	22.16	22.26
			36	0	21.50	21.35	21.32	21.10
			36	18	21.50	21.43	21.23	21.22
			36	37	21.50	21.49	21.16	21.22
			75	0	21.50	21.47	21.28	21.17

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20850/2510	21100/2535	21350/2560
LTE Band 7	20MHz	QPSK	1	0	23.50	23.20	23.04	22.94
			1	49	23.50	23.39	23.21	23.01
			1	99	23.50	23.10	22.96	22.99
			50	0	23.00	22.29	22.17	21.93
			50	24	23.00	22.44	22.28	22.12
			50	49	23.00	22.51	22.15	22.17
			100	0	22.50	22.43	22.29	22.08
		16QAM	1	0	23.00	22.23	22.20	22.02
			1	49	23.00	22.69	22.36	22.33
			1	99	23.00	22.37	22.06	22.26
			50	0	22.00	21.32	21.46	20.99
			50	24	22.00	21.48	21.28	21.21
			50	49	22.00	21.58	21.12	21.24
			100	0	21.50	21.46	21.29	21.16

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		40265/2557.5	40740/2605	41215/2652.5
LTE Band 41	5MHz	QPSK	1	0	23.50	23.10	23.35	22.82
			1	12	23.50	23.17	23.42	22.90
			1	24	23.50	23.03	23.24	22.77
			12	0	23.00	22.19	22.49	21.96
			12	6	23.00	22.19	22.52	21.99
			12	11	23.00	22.14	22.46	21.96
			25	0	22.50	22.13	22.43	21.97
		16QAM	1	0	23.00	22.20	22.48	22.06
			1	12	23.00	22.29	22.54	22.18
			1	24	23.00	22.18	22.35	22.04

			12	0	21.50	21.12	21.43	21.12
			12	6	21.50	21.13	21.45	21.16
			12	11	21.50	21.09	21.39	21.13
			25	0	21.50	21.10	21.43	21.15

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		40290/2560	40740/2605	41190/2650
LTE Band 41	10MHz	QPSK	1	0	23.50	23.14	23.41	22.88
			1	24	23.50	23.22	23.47	22.94
			1	49	23.50	23.11	23.21	22.81
			25	0	22.50	22.19	22.49	21.99
			25	12	22.50	22.15	22.46	21.97
			25	24	22.50	22.18	22.41	21.97
			50	0	23.00	22.19	22.50	21.96
		16QAM	1	0	23.00	22.27	22.59	22.16
			1	24	23.00	22.39	22.60	22.20
			1	49	23.00	22.32	22.33	22.10
			25	0	22.00	21.18	21.50	21.18
			25	12	22.00	21.14	21.45	21.13
			25	24	22.00	21.15	21.39	21.13
			50	0	21.50	21.18	21.47	21.16

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		40315/2562.5	40740/2605	41165/2647.5
LTE Band 41	15MHz	QPSK	1	0	23.50	23.05	23.33	22.88
			1	37	23.50	23.13	23.37	22.84
			1	74	23.50	23.07	23.04	22.72
			36	0	23.00	22.18	22.51	21.98
			36	18	23.00	22.18	22.49	21.95
			36	37	23.00	22.18	22.32	21.89
			75	0	22.50	22.15	22.35	21.96
		16QAM	1	0	23.00	22.16	22.52	22.15
			1	37	23.00	22.31	22.51	22.14
			1	74	23.00	22.29	22.15	22.01
			36	0	21.50	21.07	21.41	21.07
			36	18	21.50	21.10	21.37	21.04
			36	37	21.50	21.13	21.20	21.00
			75	0	21.50	21.09	21.32	21.12

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		40340/2565	40740/2605	41140/2645
LTE Band 41	20MHz	QPSK	1	0	23.50	23.02	23.26	23.25
			1	49	23.50	23.24	23.44	23.11
			1	99	23.50	23.00	22.95	22.78
			50	0	23.00	22.21	22.47	22.29
			50	24	23.00	22.28	22.55	22.27
			50	49	23.00	22.18	22.41	22.21
			100	0	23.00	22.22	22.61	22.40
		16QAM	1	0	23.00	22.14	22.53	22.40
			1	49	23.00	22.45	22.60	22.35
			1	99	23.00	22.26	22.04	21.99
			50	0	22.00	21.22	21.52	21.32
			50	24	22.00	21.33	21.84	21.40
			50	49	22.00	21.30	21.61	21.26
			100	0	22.00	21.26	21.75	21.43

7.2. WLAN & Bluetooth Output Power

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11b	1	2412	18.00	17.61
	6	2437	18.00	17.19
	11	2462	18.00	17.28
802.11g	1	2412	15.00	14.77
	6	2437	15.00	14.93
	11	2462	15.00	14.56
802.11n HT20	1	2412	15.50	15.01
	6	2437	15.50	15.04
	11	2462	15.50	15.05
802.11n HT40	3	2422	15.50	15.12
	6	2437	15.50	14.88
	9	2452	15.50	14.65

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)

802.11a	36	5180	11.50	10.97
	40	5200	11.50	11.02
	48	5240	11.50	10.72
802.11n HT20	36	5180	10.50	9.38
	40	5200	10.50	10.18
	48	5240	10.50	9.35
802.11n HT40	38	5190	10.00	8.17
	46	5230	10.00	9.53
802.11ac VHT20	36	5180	9.00	8.58
	40	5200	9.00	8.97
	48	5240	9.00	8.15
802.11ac VHT40	38	5190	9.00	8.09
	46	5230	9.00	8.99
802.11ac VHT80	42	5210	9.00	8.74

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	149	5745	11.00	10.51
	157	5785	11.00	10.00
	165	5825	11.00	10.47
802.11n HT20	149	5745	10.00	9.56
	157	5785	10.00	9.04
	165	5825	10.00	9.09
802.11n HT40	151	5755	8.50	8.13
	159	5795	8.50	7.84
802.11ac VHT20	149	5745	9.50	7.97
	157	5785	9.50	9.20
	165	5825	9.50	7.97
802.11ac VHT40	151	5755	9.00	8.10
	159	5795	9.00	8.94
802.11ac VHT80	155	5775	8.00	7.65

NOTE: Power measurement results of WLAN 5.8G.

Mode	Frequency (MHz)	Output Power (dBm) ANT1	Tune-up ANT1	Output Power (dBm) ANT2	Tune-up ANT2	Output Power (dBm) MIMO	Tune-up MIMO
user10M	2420	14.34	14.50	14.33	14.50	17.35	17.50
	2440	14.28	14.50	14.03	14.50	17.17	17.50
	2460	14.06	14.50	14.02	14.50	17.05	17.50
user20M	2420	14.28	14.50	14.08	14.50	17.19	17.50
	2440	14.17	14.50	13.89	14.50	17.04	17.50
	2460	13.97	14.50	13.62	14.50	16.81	17.50
user40M	2420	13.86	14.00	13.73	14.00	16.81	17.00
	2440	13.51	14.00	13.36	14.00	16.45	17.00
	2460	13.54	14.00	13.41	14.00	16.49	17.00

NOTE: Power measurement results of User-defined 2.4G

Mode	Frequency (MHz)	Output Power (dBm) ANT1	Tune-up ANT1	Output Power (dBm) ANT2	Tune-up ANT2	Output Power (dBm) MIMO	Tune-up MIMO
user10M	5740	12.75	13.50	13.27	13.50	16.03	16.50
	5780	12.34	13.50	12.66	13.50	15.51	16.50
	5820	13.02	13.50	13.10	13.50	16.07	16.50
user20M	5740	12.97	13.00	13.39	13.50	16.20	16.50
	5780	12.15	13.00	12.46	13.50	15.32	16.50
	5820	12.26	13.00	12.57	13.50	15.43	16.50
user40M	5760	13.11	13.50	13.58	14.00	16.36	16.50
	5780	12.83	13.50	13.25	14.00	16.06	16.50
	5820	12.89	13.50	13.26	14.00	16.09	16.50

NOTE: Power measurement results of User-defined 5.8G

	Output Power (dBm)				
	Channel	Tune-up (dBm)	Data Rates 1M	Data Rates 2M	Data Rates 3M
BR+EDR	0CH	9.00	8.35	7.80	7.74
	39CH	9.00	8.41	8.30	8.16
	78CH	9.00	8.51	8.52	8.15

BLE	Channel	Tune-up (dBm)	Output Power (dBm)
			1M
	0CH	6.00	5.97
	19CH	5.00	4.78
	39CH	6.00	5.98

NOTE: Power measurement results of Bluetooth.

7.3. Stand-alone SAR test exclusion

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

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

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

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

Mode	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
Bluetooth	9.00	7.94	5	2.480	2.5	3	Yes

NOTE: Standalone SAR test exclusion for Bluetooth.

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

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

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

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/Kg)
Bluetooth	Body	9.00	7.94	5	2.48	7.5	0.332

NOTE: Estimated SAR calculation for Bluetooth

8. SAR Results

8.1. SAR measurement results

8.1.1. SAR measurement Result of LTE Band 2

Test Position of Body with 0mm	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						
1RB										
Right Side	18900/1880	20M QPSK(1,49)	0.420	0.191	-1.47	21.56	22.00	0.465	2024/3/01	
Back Side	18900/1880	20M QPSK(1,49)	0.721	0.327	-2.66	21.56	22.00	0.798	2024/5/15	4#
Left Side	18900/1880	20M QPSK(1,49)	0.216	0.099	-0.39	21.56	22.00	0.239	2024/3/01	
Front Side	18900/1880	20M QPSK(1,49)	0.512	0.218	1.45	21.56	22.00	0.567	2024/5/15	
Bottom Side	18900/1880	20M QPSK(1,49)	0.012	0.010	-3.49	21.56	22.00	0.013	2024/3/01	
Top Side	18900/1880	20M QPSK(1,49)	0.355	0.166	-1.45	21.56	22.00	0.393	2024/3/01	
50%RB										
Right Side	18900/1880	20M QPSK(50,24)	0.211	0.113	0.09	20.52	21.00	0.236	2024/3/01	
Back Side	18900/1880	20M QPSK(50,24)	0.398	0.183	-0.20	20.52	21.00	0.445	2024/5/15	
Left Side	18900/1880	20M QPSK(50,0)	0.119	0.057	4.08	20.52	21.00	0.133	2024/3/01	
Front Side	18900/1880	20M QPSK(50,24)	0.282	0.125	3.59	20.52	21.00	0.315	2024/5/15	
Bottom Side	18900/1880	20M QPSK(50,0)	0.007	0.006	0.93	20.52	21.00	0.008	2024/3/01	
Top Side	18900/1880	20M QPSK(50,0)	0.203	0.093	-0.03	20.52	21.00	0.227	2024/3/01	

8.1.2. SAR measurement Result of LTE Band 7

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

of Body with 0mm			1-g	10-g		(dBm)	(dBm)	1-g (W/Kg)		
1RB										
Right Side	21100/2535	20M QPSK(1,49)	0.372	0.159	0.06	23.21	23.50	0.398	2024/3/14	
Back Side	21100/2535	20M QPSK(1,49)	0.742	0.439	0.90	23.21	23.50	0.793	2024/5/10	5#
Left Side	21100/2535	20M QPSK(1,49)	0.186	0.077	-3.22	23.21	23.50	0.199	2024/3/14	
Front Side	21100/2535	20M QPSK(1,49)	0.530	0.224	1.86	23.21	23.50	0.567	2024/5/10	
Bottom Side	21100/2535	20M QPSK(1,49)	0.006	0.004	-2.68	23.21	23.50	0.006	2024/3/14	
Top Side	21100/2535	20M QPSK(1,49)	0.310	0.129	3.65	23.21	23.50	0.331	2024/3/14	
50%RB										
Right Side	21100/2535	20M QPSK(50,49)	0.197	0.087	1.70	22.15	23.00	0.240	2024/3/14	
Back Side	21100/2535	20M QPSK(50,49)	0.375	0.263	-2.91	22.15	23.00	0.456	2024/5/10	
Left Side	21100/2535	20M QPSK(50,49)	0.097	0.041	-0.01	23.21	23.50	0.104	2024/3/14	
Front Side	21100/2535	20M QPSK(50,49)	0.275	0.120	3.43	22.15	23.00	0.334	2024/5/10	
Bottom Side	21100/2535	20M QPSK(50,49)	0.004	0.002	-1.47	23.21	23.50	0.004	2024/3/14	
Top Side	21100/2535	20M QPSK(50,49)	0.177	0.076	-4.73	23.21	23.50	0.189	2024/3/14	

8.1.3. SAR measurement Result of LTE Band 41

Test Position of Body with 0mm	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						
1RB										
Right Side	40740/2605	20M QPSK(1,49)	0.408	0.187	-2.59	23.44	23.50	0.414	2024/3/14	
Back	40740/2605	20M	0.734	0.440	-0.04	23.44	23.50	0.744	2024/5/10	6#

Side		QPSK(1,49)								
Left Side	40740/2605	20M QPSK(1,0)	0.201	0.092	3.85	23.44	23.50	0.204	2024/3/14	
Front Side	40740/2605	20M QPSK(1,49)	0.524	0.219	-1.68	23.44	23.50	0.531	2024/5/10	
Bottom Side	40740/2605	20M QPSK(1,0)	0.009	0.007	2.30	23.44	23.50	0.009	2024/3/14	
Top Side	40740/2605	20M QPSK(1,0)	0.330	0.151	3.14	23.44	23.50	0.335	2024/3/14	
50%RB										
Right Side	40740/2605	20M QPSK(50,24)	0.208	0.102	-2.43	22.55	23.00	0.231	2024/3/14	
Back Side	40740/2605	20M QPSK(50,24)	0.405	0.248	-2.24	22.55	23.00	0.449	2024/5/10	
Left Side	40740/2605	20M QPSK(50,0)	0.108	0.050	-2.45	22.55	23.00	0.120	2024/3/14	
Front Side	40740/2605	20M QPSK(50,24)	0.311	0.127	-2.73	22.55	23.00	0.345	2024/5/10	
Bottom Side	40740/2605	20M QPSK(50,0)	0.005	0.004	-0.97	22.55	23.00	0.006	2024/3/14	
Top Side	40740/2605	20M QPSK(50,0)	0.173	0.084	-4.93	22.55	23.00	0.192	2024/3/14	

8.1.4. SAR measurement Result of User-defined 2.4G

Test Position of Body with 0mm	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						
Body-MIMO										
Front Side	2420	user10M	0.062	0.030	0.14	17.35	17.50	0.064	2024/5/14	
Back Side	2420	user10M	0.070	0.038	0.57	17.35	17.50	0.072	2024/5/14	
Top Side	2420	user10M	0.235	0.150	0.17	17.35	17.50	0.243	2024/3/07	7#

NOTE: Body SAR test results of User-defined 2.4G

8.1.5. SAR measurement Result of WLAN 2.4G

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g	Date	Plot
			1-g	10-g						

								(W/Kg)		
Body										
Right Side	1/2412	802.11b	0.270	0.108	0.57	17.61	18.00	0.295	2024/3/07	
Back Side	1/2412	802.11b	0.651	0.269	-3.36	17.61	18.00	0.712	2024/5/14	3#
Left Side	1/2412	802.11b	0.141	0.058	2.10	17.61	18.00	0.154	2024/3/07	
Front Side	1/2412	802.11b	0.447	0.222	-3.07	17.61	18.00	0.489	2024/5/14	
Top Side	1/2412	802.11b	0.024	0.010	-0.72	17.61	18.00	0.026	2024/3/07	
Bottom Side	1/2412	802.11b	0.027	0.012	-3.21	17.61	18.00	0.030	2024/3/07	

NOTE: Body SAR test results of WLAN 2.4G

8.1.6. SAR measurement Result of WLAN 5.2G

Test Position of Body with 0mm	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						
Right Side	40/5200	802.11a	0.060	0.044	0.86	11.02	11.50	0.067	2024/3/21	
Back Side	40/5200	802.11a	0.384	0.167	3.59	11.02	11.50	0.429	2024/5/11	1#
Left Side	40/5200	802.11a	0.042	0.031	-0.61	11.02	11.50	0.047	2024/3/21	
Front Side	40/5200	802.11a	0.240	0.129	-3.10	11.02	11.50	0.268	2024/5/11	
Top Side	40/5200	802.11a	0.030	0.022	1.12	11.02	11.50	0.034	2024/3/21	
Bottom Side	40/5200	802.11a	0.030	0.021	1.47	11.02	11.50	0.034	2024/3/21	

NOTE: Body SAR test results of WLAN 5.2G

8.1.7. SAR measurement Result of User-defined 5.8G

Test Position of Body with 0mm	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						
Body-MIMO										
Front Side	5760	user40M	0.017	0.012	1.04	16.36	16.50	0.018	2024/5/12	
Back Side	5760	user40M	0.020	0.016	0.12	16.36	16.50	0.021	2024/5/12	
Top Side	5760	user40M	0.040	0.031	1.21	16.36	16.50	0.041	2024/3/28	8#

NOTE: Body SAR test results of User-defined 5.8G

8.1.8. SAR measurement Result of WLAN 5.8G

Test Position of Body with 0mm	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						
Body										
Right Side	149/5745	802.11a	0.048	0.038	-3.30	10.51	11.00	0.054	2024/3/28	
Back Side	149/5745	802.11a	0.312	0.149	1.42	10.51	11.00	0.349	2024/5/12	2#
Left Side	149/5745	802.11a	0.033	0.026	-1.94	10.51	11.00	0.037	2024/3/28	
Front Side	149/5745	802.11a	0.254	0.112	-3.72	10.51	11.00	0.284	2024/5/12	
Top Side	149/5745	802.11a	0.030	0.023	2.45	10.51	11.00	0.034	2024/3/28	
Bottom Side	149/5745	802.11a	0.024	0.019	3.64	10.51	11.00	0.027	2024/3/28	

NOTE: Body SAR test results of WLAN 5.8G

8.2. Simultaneous Transmission Analysis

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

1) Scalar SAR summation < 1.6W/kg.

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

Test Position		Scaled SAR_{MAX}			Σ1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	WLAN/BT	User-defined			
Body	Right Side	0.465	0.332	N/A	0.797	N/A	N/A
	Back Side	0.798	0.712	0.072	1.582	N/A	N/A
	Left Side	0.239	0.332	N/A	0.571	N/A	N/A
	Front Side	0.567	0.489	0.064	1.120	N/A	N/A
	Top Side	0.393	0.332	0.243	0.968	N/A	N/A
	Bottom Side	0.013	0.332	N/A	0.345	N/A	N/A

9. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

10. Appendix B. System Check Plots

Table of contents

MEASUREMENT 1

Date of measurement: 1/3/2024

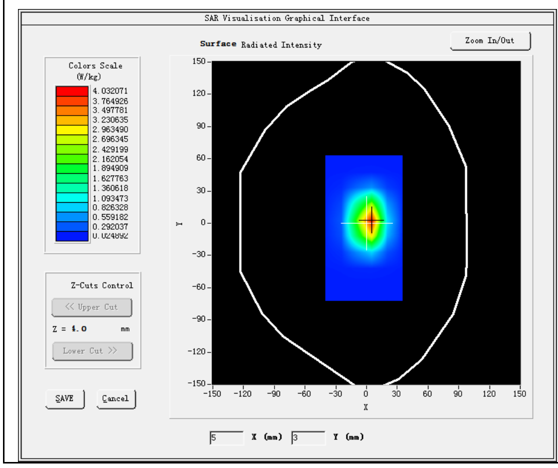
A. Experimental conditions.

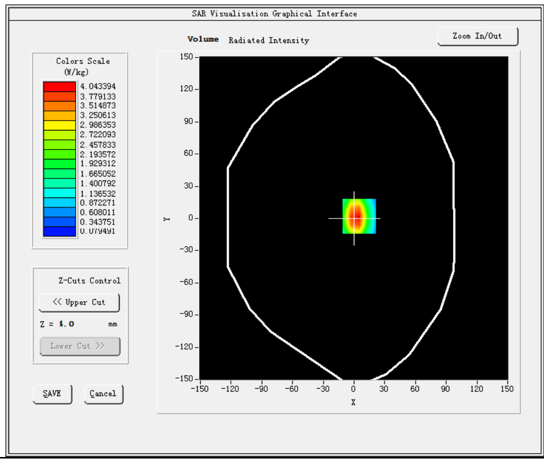
Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.63

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative permittivity (real part)	38.845711
Relative permittivity (imaginary part)	13.547294
Conductivity (S/m)	1.429992
Variation (%)	2.350000

SURFACE SAR	VOLUME SAR

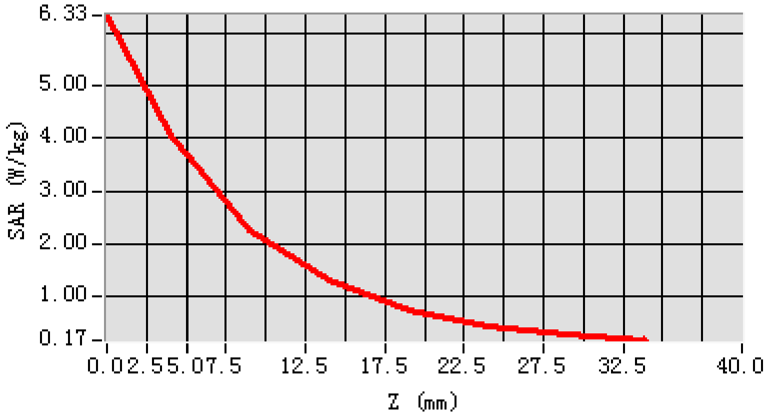


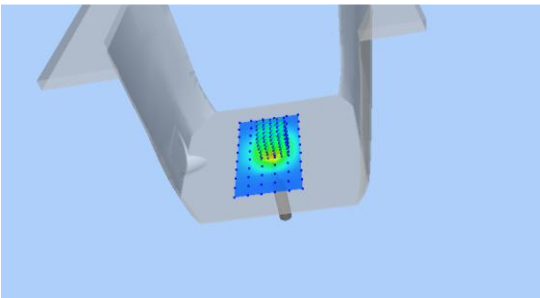
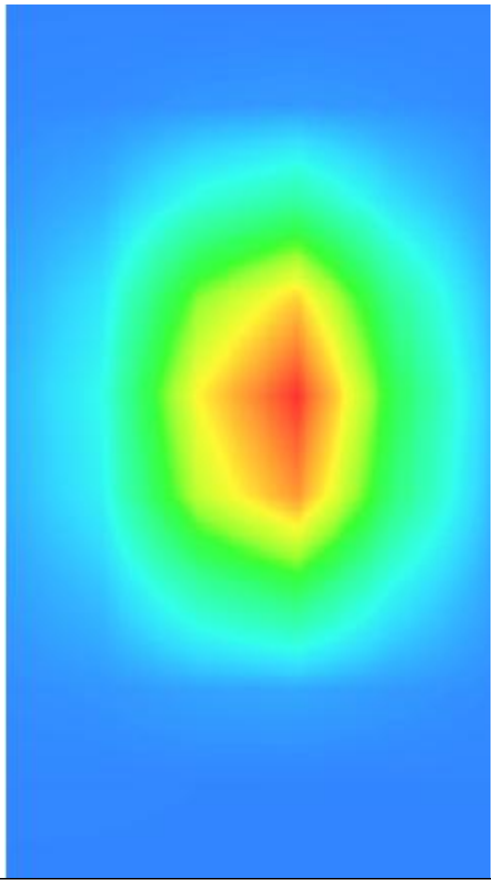


Maximum location: X=5.00, Y=2.00
SAR Peak: 6.70 W/kg

SAR 10g (W/Kg)	1.963012
SAR 1g (W/Kg)	3.761014

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.3280	4.0454	2.2604	1.3064	0.7649	0.4595	0.2756



3D screen shot	Hot spot position
	

MEASUREMENT 2

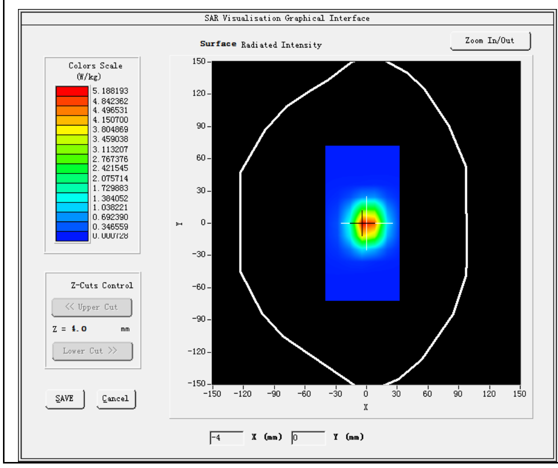
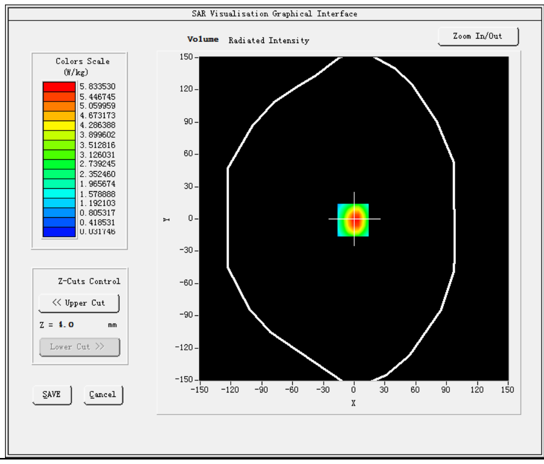
Date of measurement: 7/3/2024

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	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.85

B. SAR Measurement Results

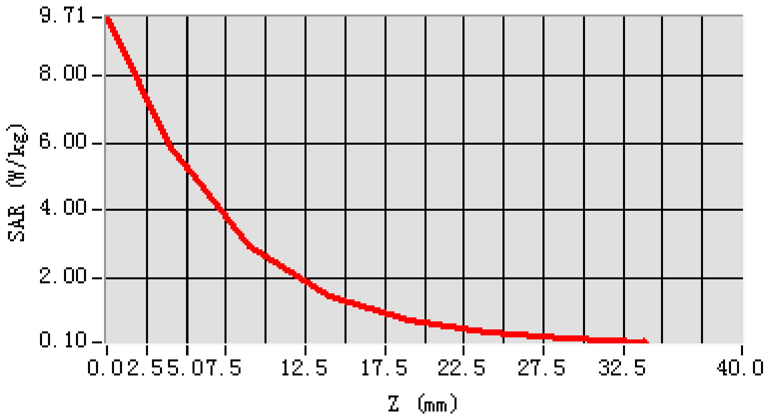
Frequency (MHz)	2450.000000
Relative permittivity (real part)	38.188018
Relative permittivity (imaginary part)	12.965869
Conductivity (S/m)	1.764799
Variation (%)	0.390000

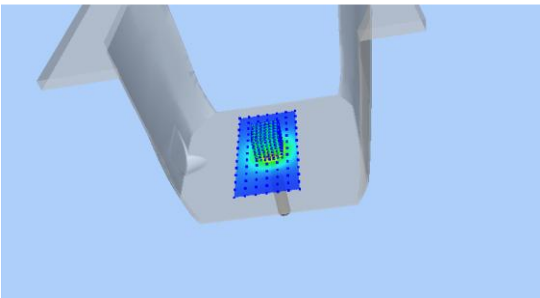
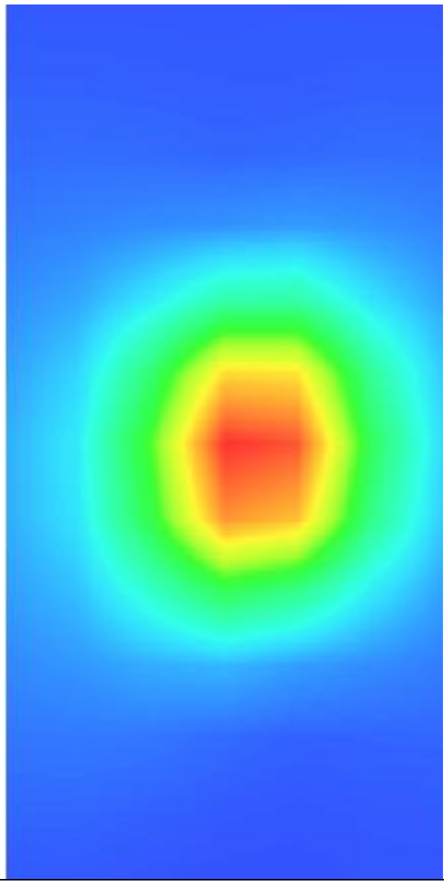
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-1.00, Y=-1.00
SAR Peak: 9.83 W/kg

SAR 10g (W/Kg)	2.617210
SAR 1g (W/Kg)	4.859079

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	9.7157	5.8304	2.9203	1.4665	0.7453	0.3797	0.1954



3D screen shot	Hot spot position
	

MEASUREMENT 3

Date of measurement: 14/3/2024

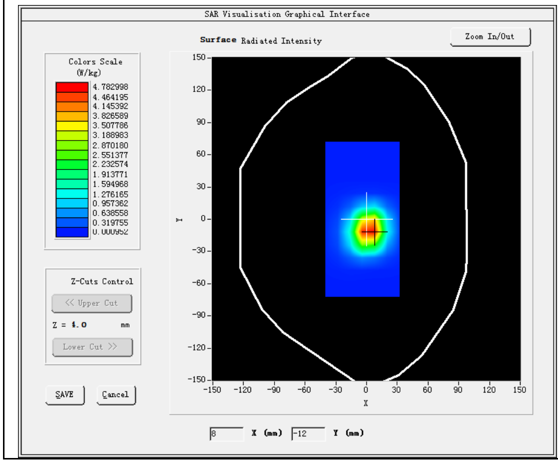
A. Experimental conditions.

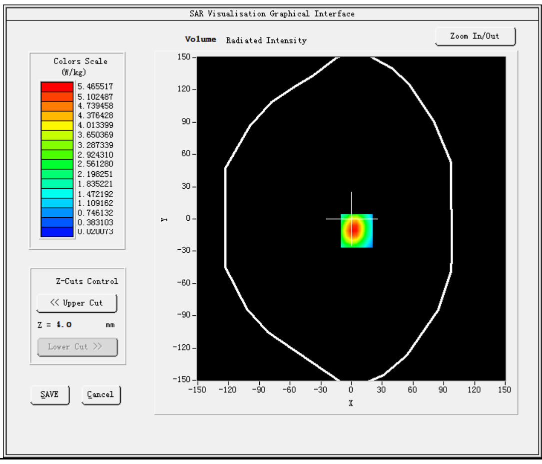
Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.65

B. SAR Measurement Results

Frequency (MHz)	2600.000000
Relative permittivity (real part)	38.193826
Relative permittivity (imaginary part)	13.832281
Conductivity (S/m)	1.997996
Variation (%)	-1.240000

SURFACE SAR	VOLUME SAR



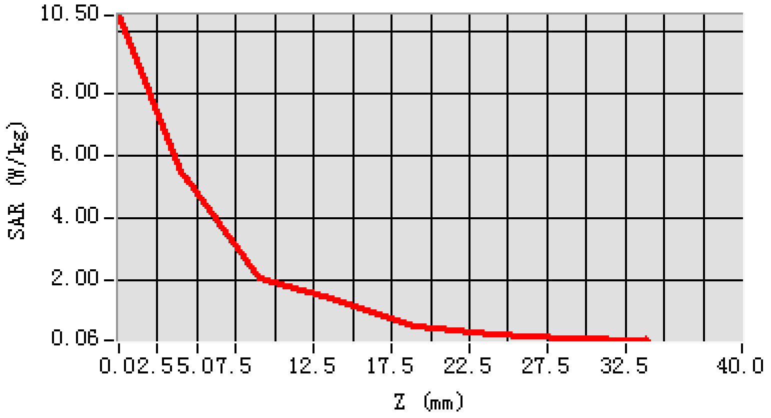


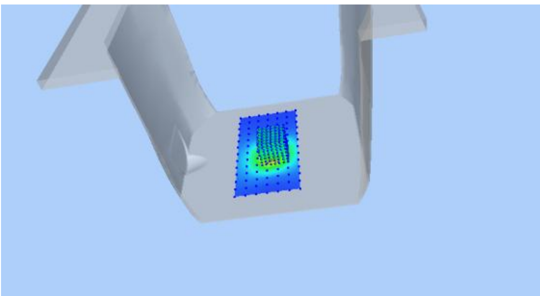
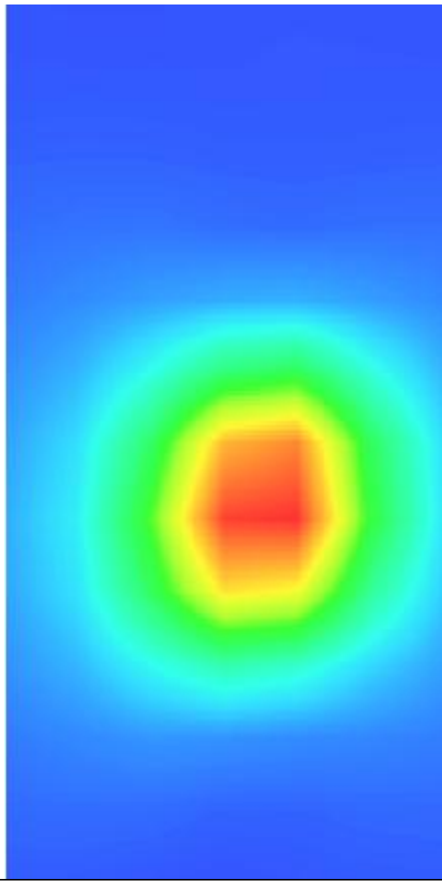
Maximum location: X=5.00, Y=-11.00

SAR Peak: 9.43 W/kg

SAR 10g (W/Kg)	2.503302
SAR 1g (W/Kg)	5.788280

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.567	5.4607	2.0842	1.3369	0.5096	0.2806	0.1290



3D screen shot	Hot spot position
	

MEASUREMENT 4

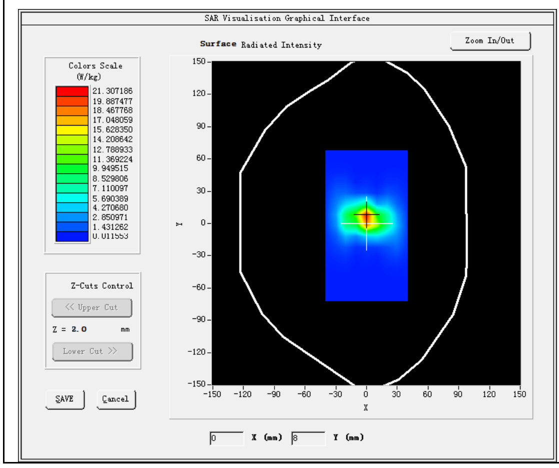
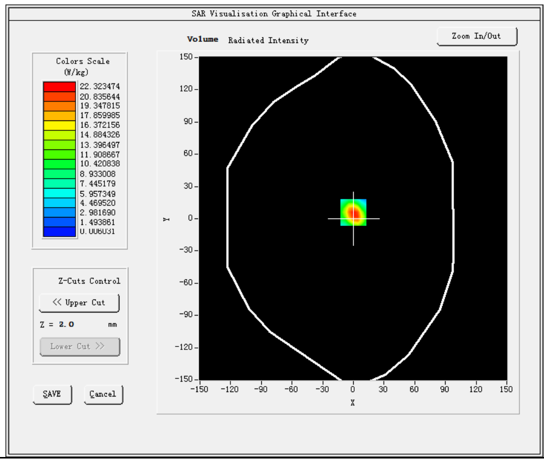
Date of measurement: 21/3/2024

A. Experimental conditions.

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

B. SAR Measurement Results

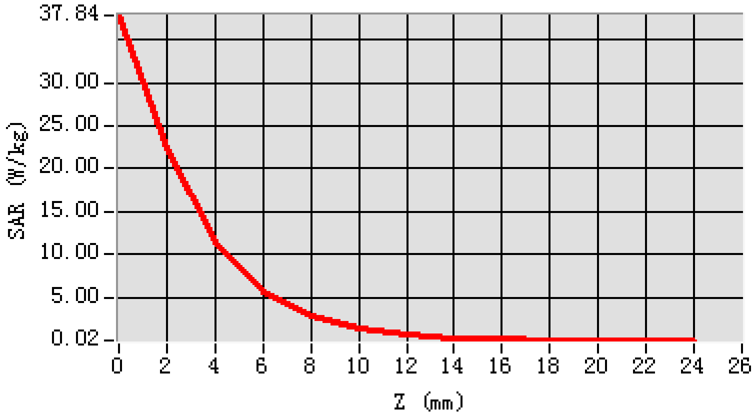
Frequency (MHz)	5200.000000
Relative permittivity (real part)	36.129725
Relative permittivity (imaginary part)	16.514098
Conductivity (S/m)	4.770739
Variation (%)	-3.560000

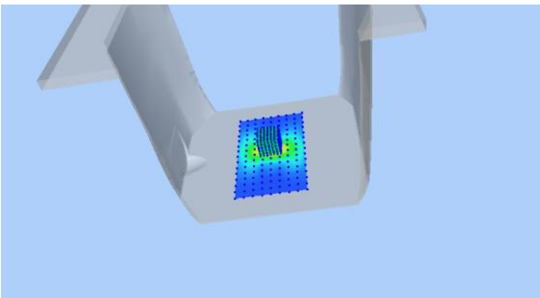
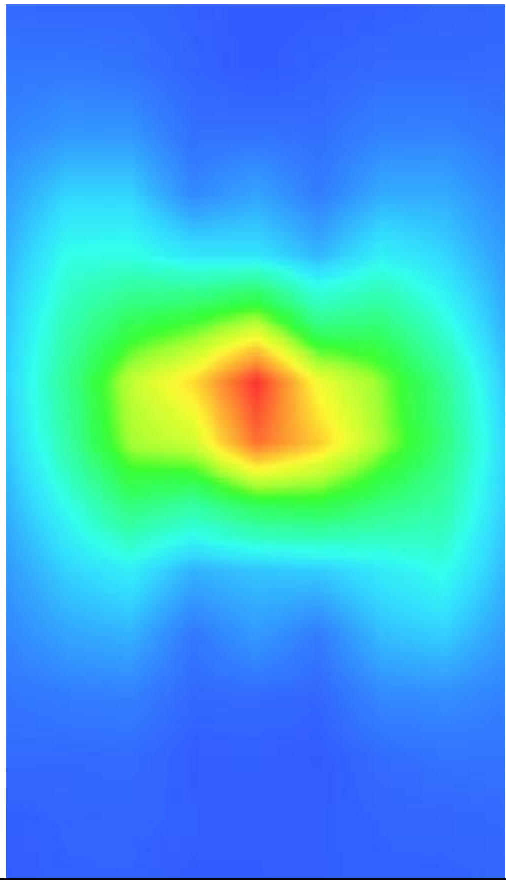
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 40.06 W/kg

SAR 10g (W/Kg)	6.004321
SAR 1g (W/Kg)	15.420092

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	37.853	22.345	11.374	5.6630	2.8245	1.4075	0.7168	0.3647	0.1876	0.1071	0.0570	0.0329



3D screen shot	Hot spot position
	

MEASUREMENT 5

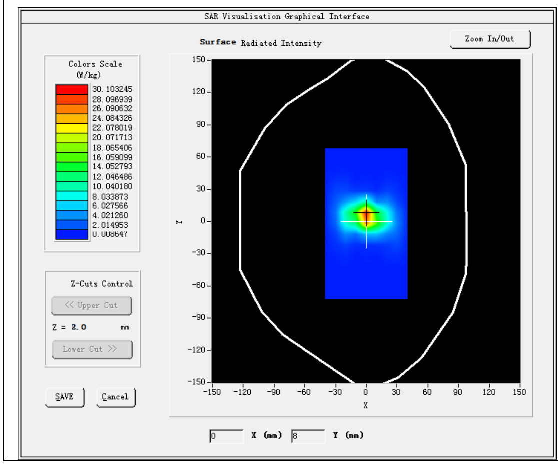
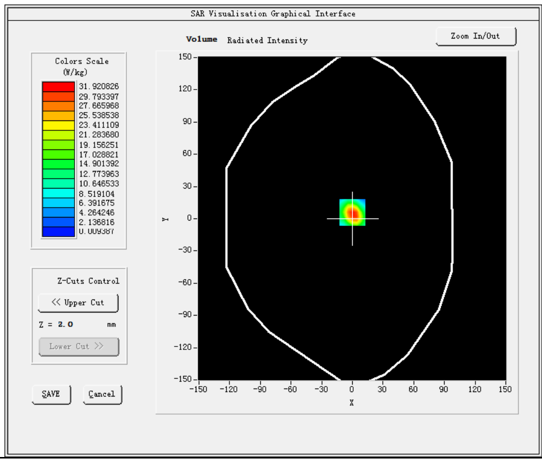
Date of measurement: 28/3/2024

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.708642
Relative permittivity (imaginary part)	16.415659
Conductivity (S/m)	5.289490
Variation (%)	-1.950000

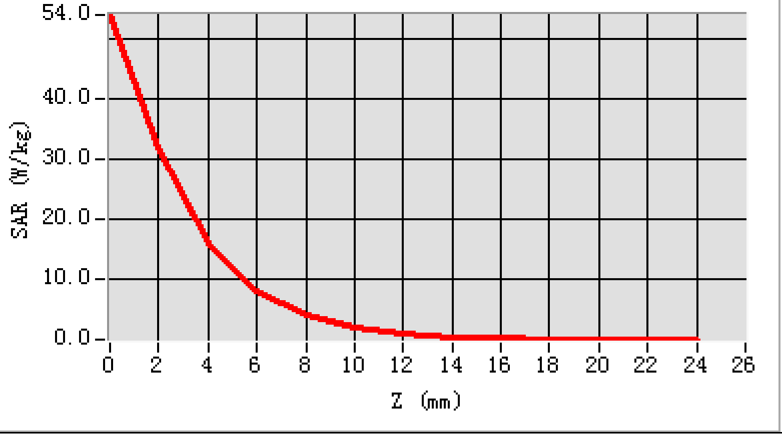
SURFACE SAR	VOLUME SAR
	

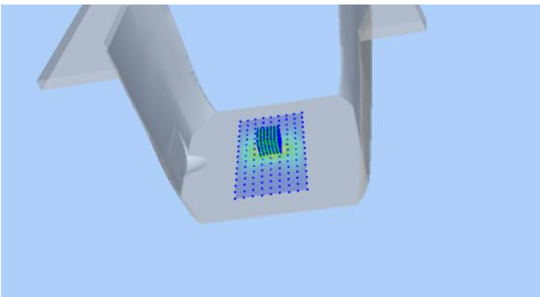
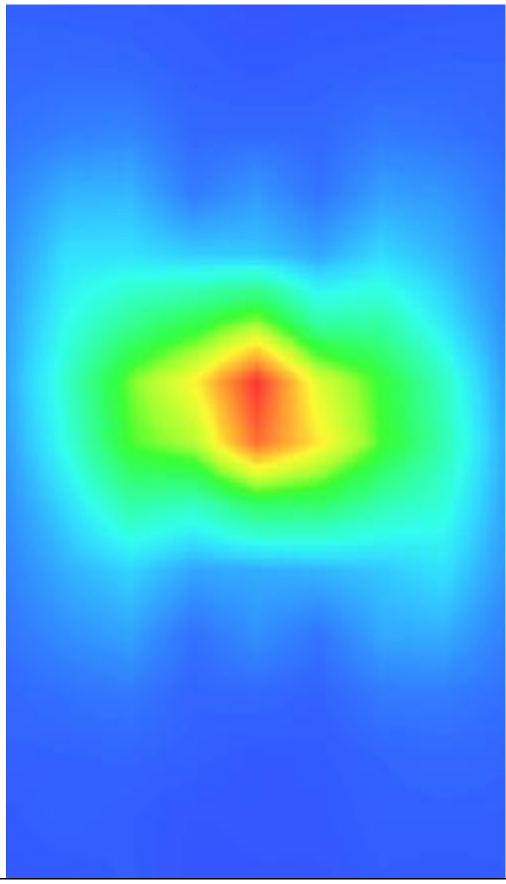
Maximum location: X=0.00, Y=6.00

SAR Peak: 57.37 W/kg

SAR 10g (W/Kg)	6.262334
SAR 1g (W/Kg)	19.425260

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	54.076	31.977	16.138	8.1778	4.0823	2.0553	1.0325	0.5161	0.2706	0.1586	0.0741	0.0449



3D screen shot	Hot spot position
	

MEASUREMENT 6

Date of measurement: 15/5/2024

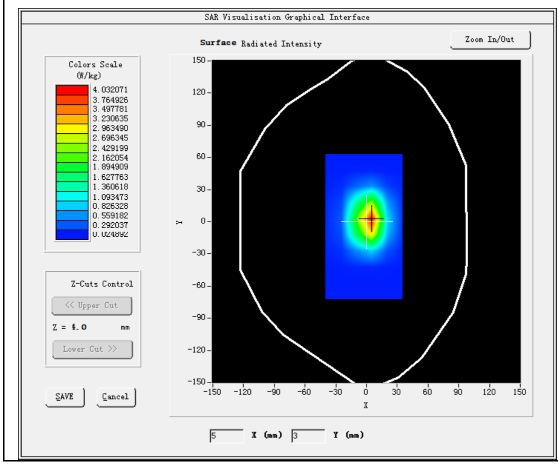
A. Experimental conditions.

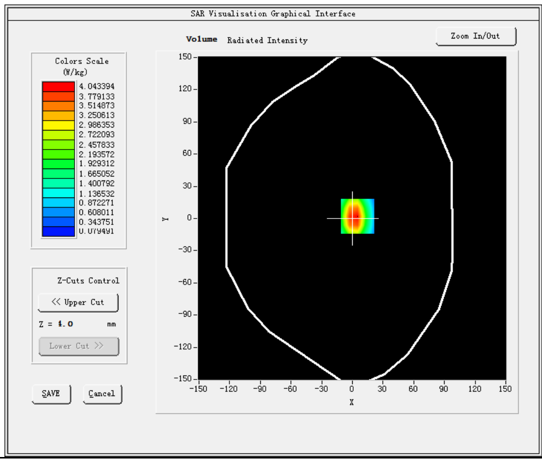
Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.63

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative permittivity (real part)	38.930002
Relative permittivity (imaginary part)	13.743476
Conductivity (S/m)	1.450700
Variation (%)	-2.750000

SURFACE SAR	VOLUME SAR

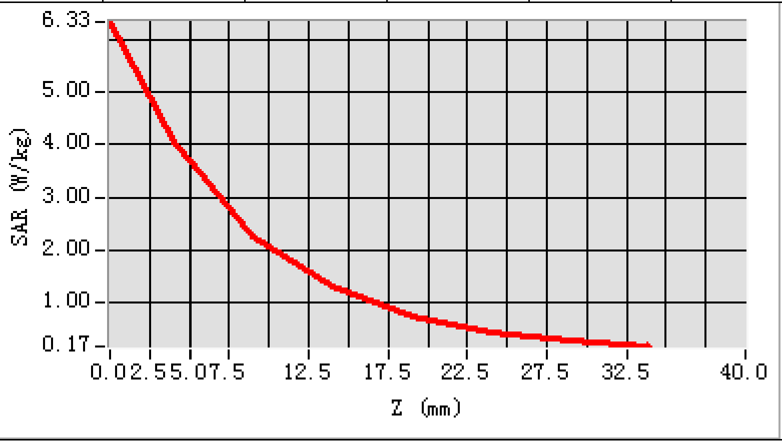


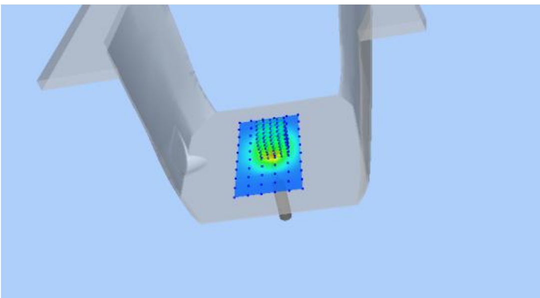
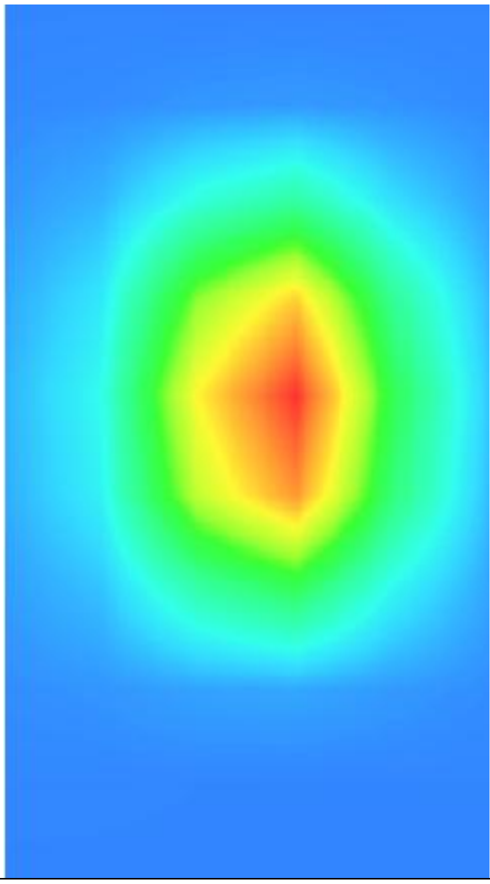


Maximum location: X=5.00, Y=2.00
SAR Peak: 6.70 W/kg

SAR 10g (W/Kg)	1.891207
SAR 1g (W/Kg)	3.762192

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.3266	4.0483	2.2605	1.3003	0.7642	0.4590	0.2766



3D screen shot	Hot spot position
	

MEASUREMENT 7

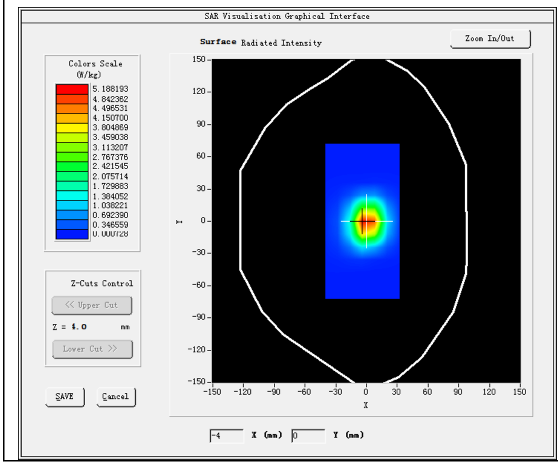
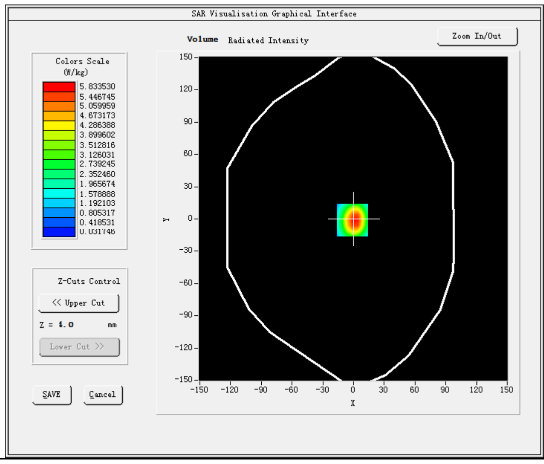
Date of measurement: 14/5/2024

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	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.85

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 (%)	-1.080000

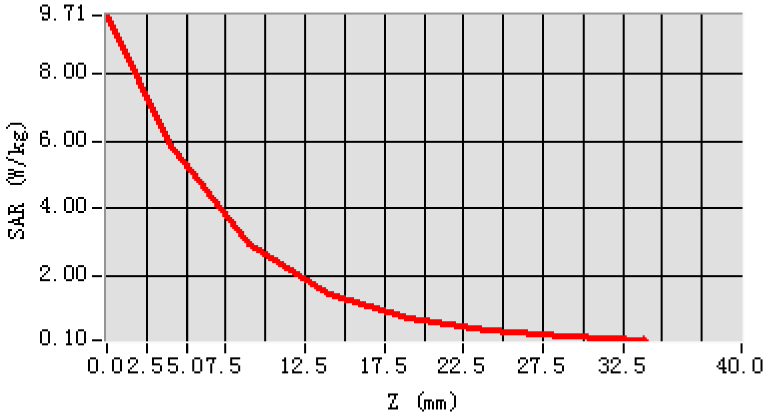
SURFACE SAR	VOLUME SAR
	

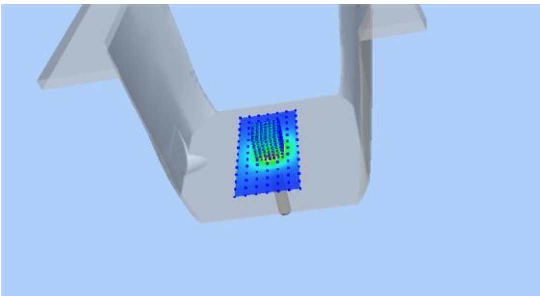
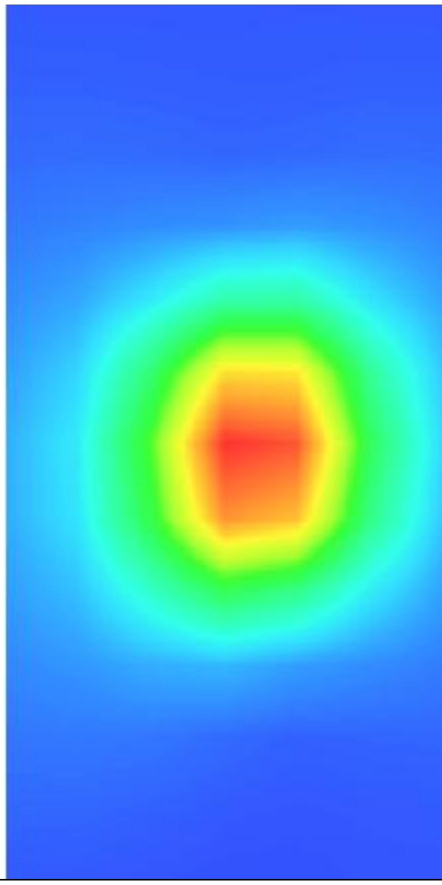
Maximum location: X=-1.00, Y=-1.00

SAR Peak: 9.83 W/kg

SAR 10g (W/Kg)	2.340244
SAR 1g (W/Kg)	4.878091

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	9.7133	5.8325	2.9272	1.4655	0.7499	0.3728	0.1974



3D screen shot	Hot spot position
	

MEASUREMENT 8

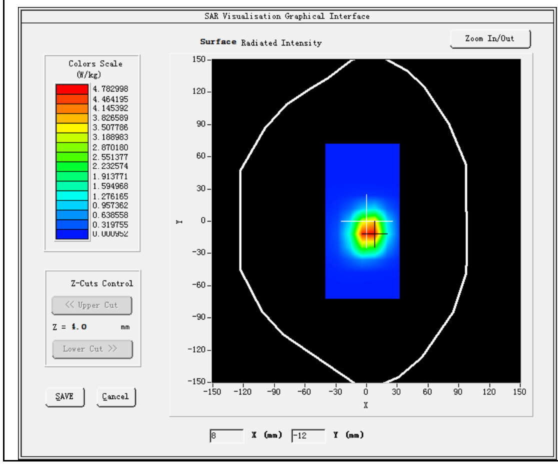
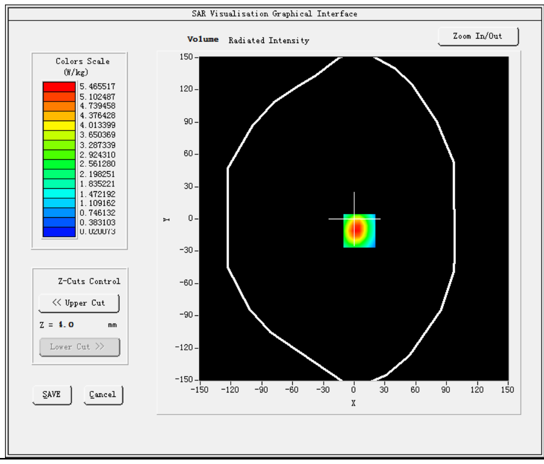
Date of measurement: 10/5/2024

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

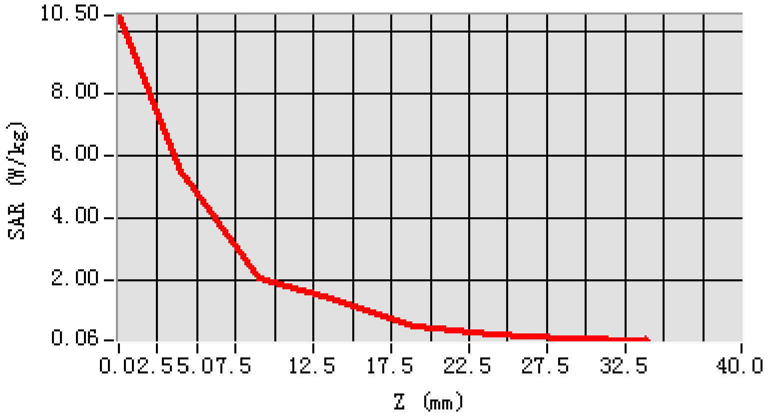
Frequency (MHz)	2600.000000
Relative permittivity (real part)	39.019763
Relative permittivity (imaginary part)	13.815390
Conductivity (S/m)	1.995556
Variation (%)	0.720000

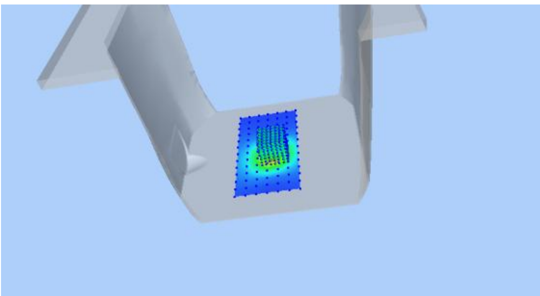
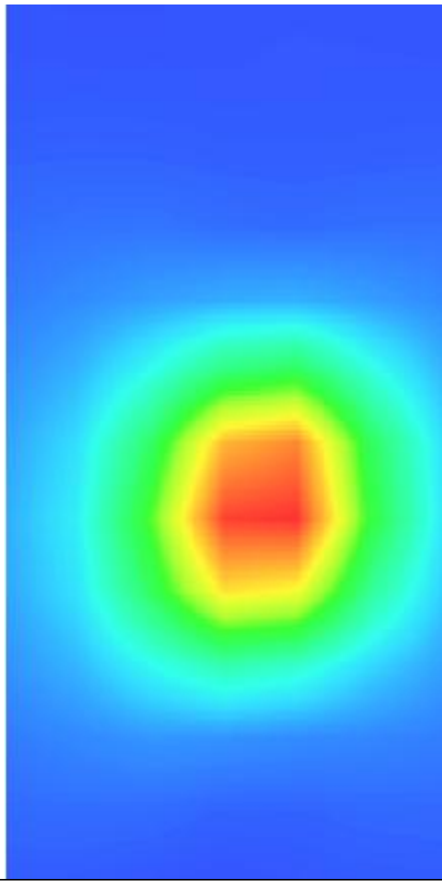
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=-11.00
SAR Peak: 9.43 W/kg

SAR 10g (W/Kg)	2.423362
SAR 1g (W/Kg)	5.125140

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.561	5.4667	2.0874	1.3304	0.5050	0.2841	0.1213



3D screen shot	Hot spot position
	

MEASUREMENT 9

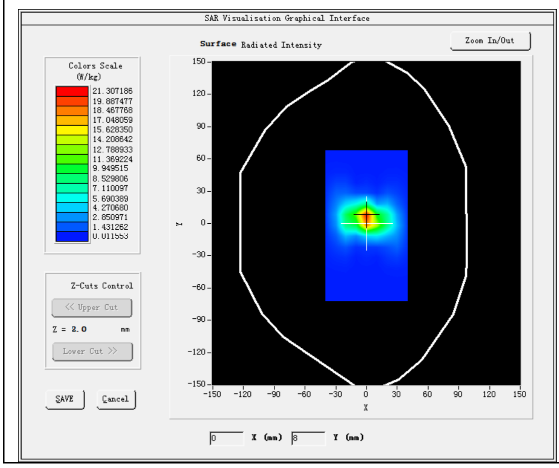
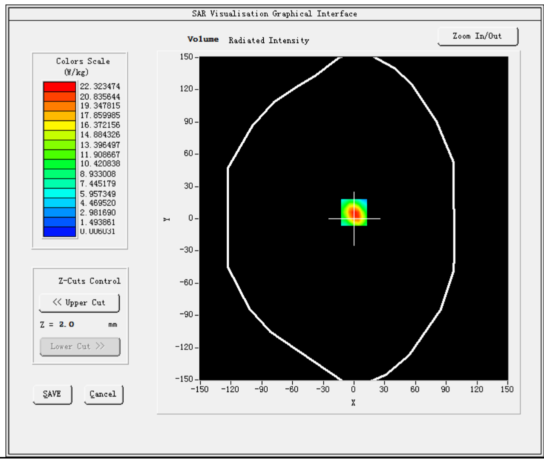
Date of measurement: 11/5/2024

A. Experimental conditions.

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

B. SAR Measurement Results

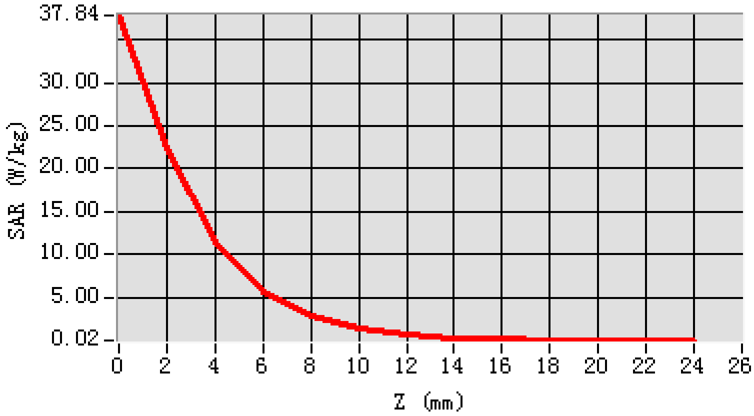
Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.675906
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	-0.340000

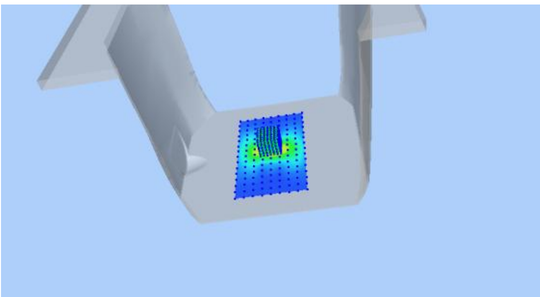
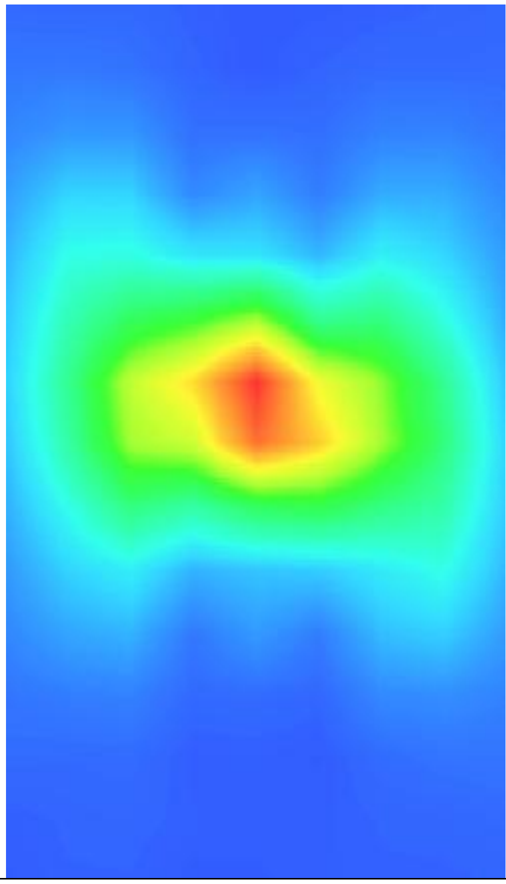
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 40.06 W/kg

SAR 10g (W/Kg)	5.665068
SAR 1g (W/Kg)	16.200289

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	37.849	22.321	11.353	5.6653	2.8220	1.4063	0.7158	0.3645	0.1830	0.1011	0.0517	0.0321



3D screen shot	Hot spot position
	

MEASUREMENT 10

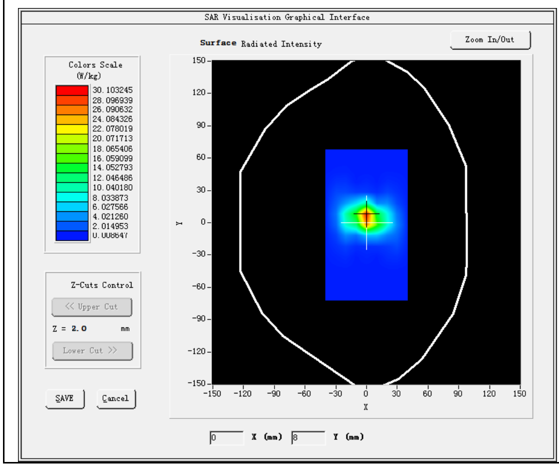
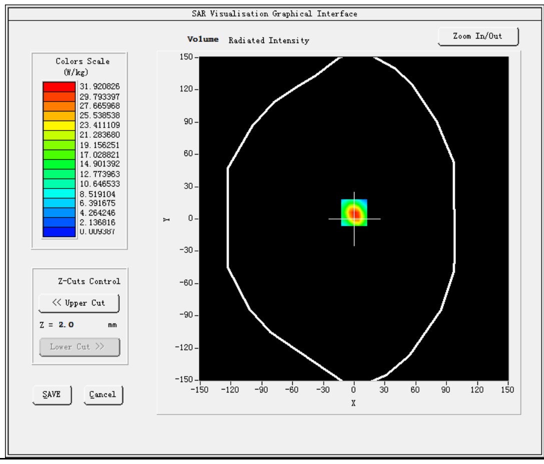
Date of measurement: 12/5/2024

A. Experimental conditions.

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

B. SAR Measurement Results

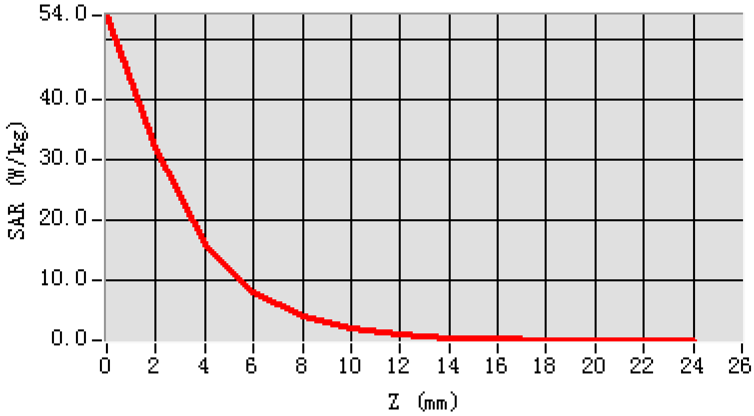
Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.107056
Relative permittivity (imaginary part)	16.182741
Conductivity (S/m)	5.214439
Variation (%)	3.190000

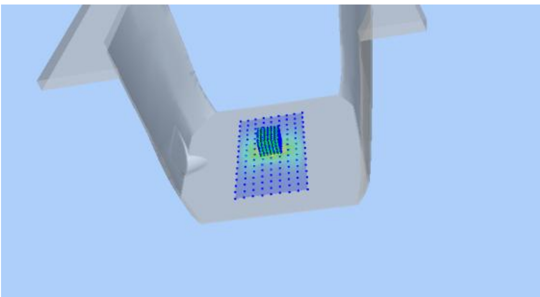
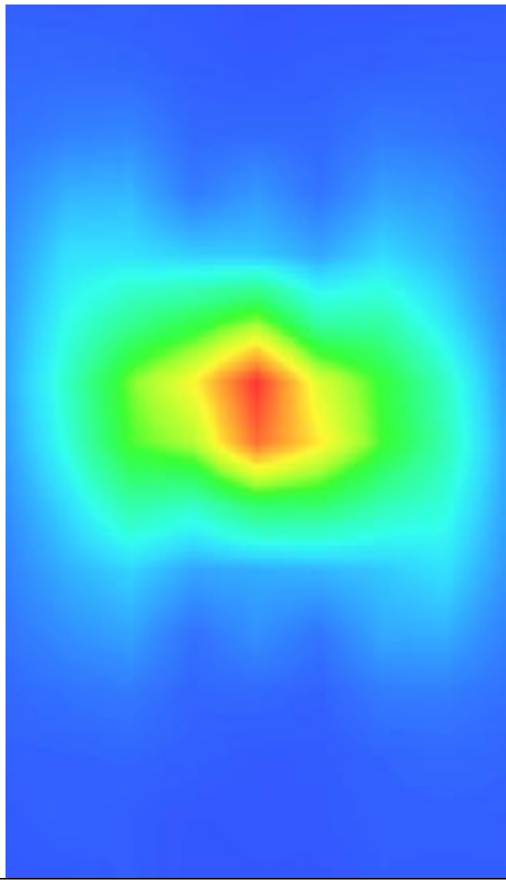
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 57.37 W/kg

SAR 10g (W/Kg)	5.730080
SAR 1g (W/Kg)	18.869098

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	54.007	31.972	16.194	8.1773	4.0826	2.0554	1.0367	0.5101	0.2710	0.1559	0.0723	0.0484



3D screen shot	Hot spot position
	

11. Appendix C. Plots of High SAR Measurement

Table of contents

MEASUREMENT 1

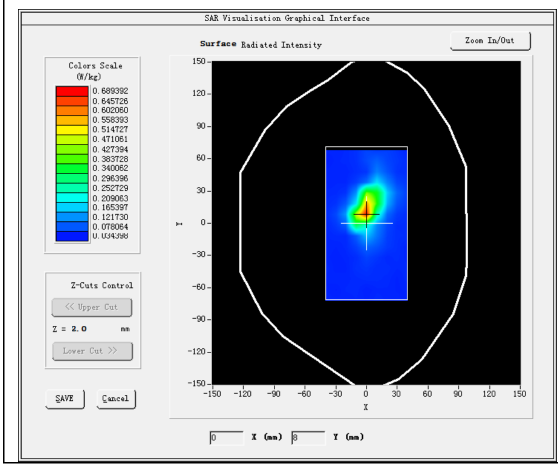
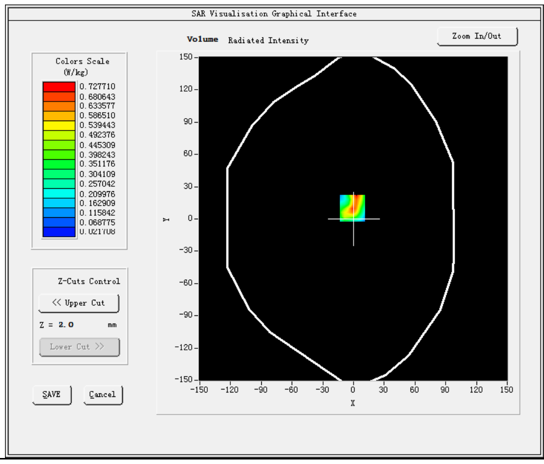
Date of measurement: 11/5/2024

A. Experimental conditions.

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

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 (%)	3.590000

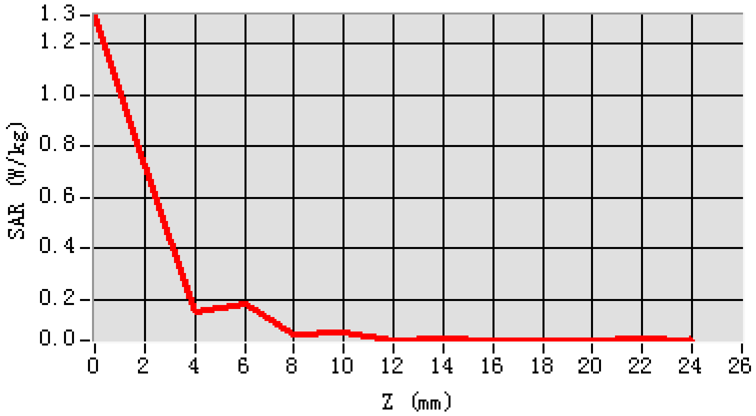
SURFACE SAR	VOLUME SAR
	

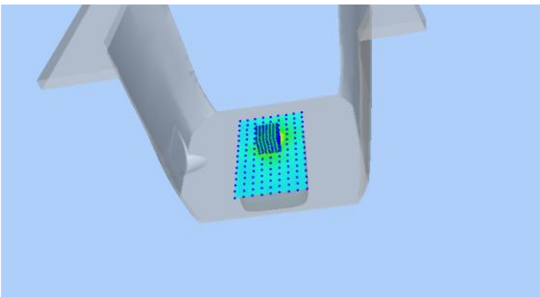
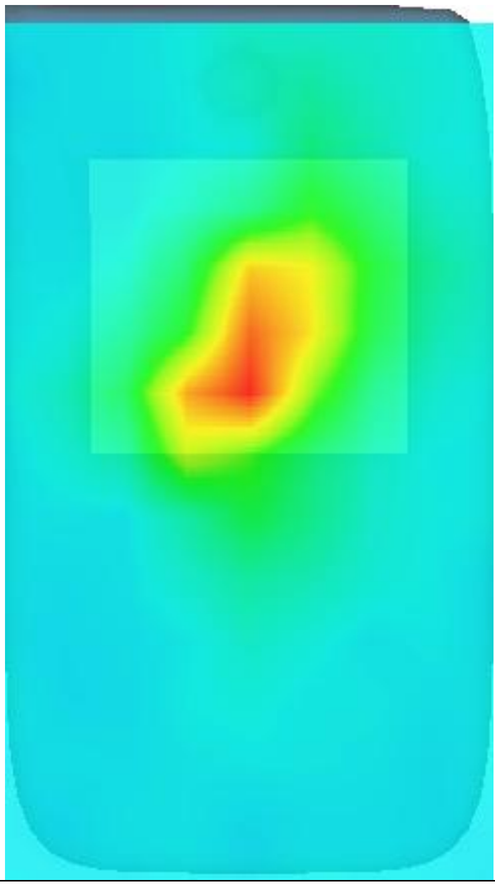
Maximum location: X=-1.00, Y=10.00

SAR Peak: 1.33 W/kg

SAR 10g (W/Kg)	0.167169
SAR 1g (W/Kg)	0.383852

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	1.3122	0.7277	0.1541	0.1808	0.0647	0.0713	0.0449	0.0475	0.0460	0.0456	0.0432	0.0474



3D screen shot	Hot spot position
	

MEASUREMENT 2

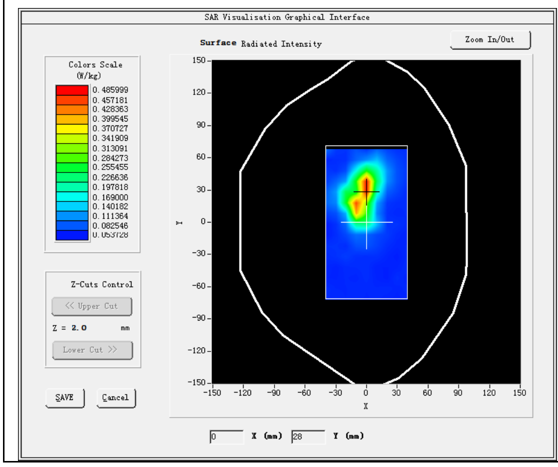
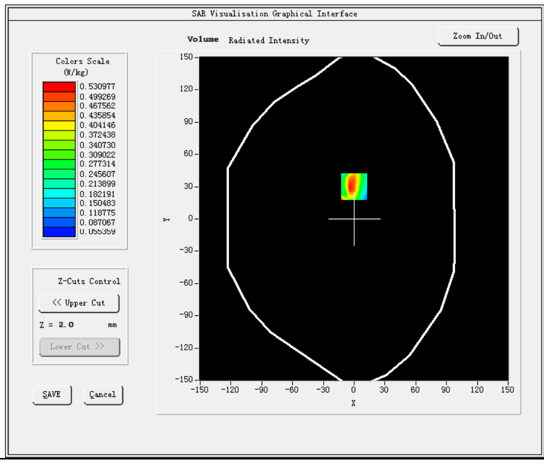
Date of measurement: 12/5/2024

A. Experimental conditions.

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

B. SAR Measurement Results

Frequency (MHz)	5745.000000
Relative permittivity (real part)	34.237278
Relative permittivity (imaginary part)	16.222098
Conductivity (S/m)	5.177553
Variation (%)	1.419998

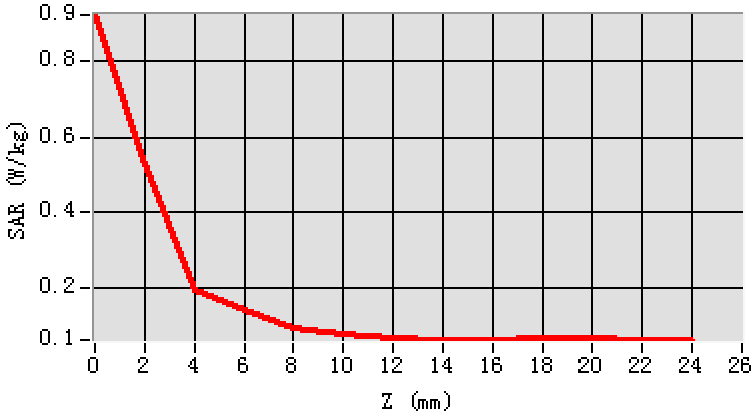
SURFACE SAR	VOLUME SAR
	

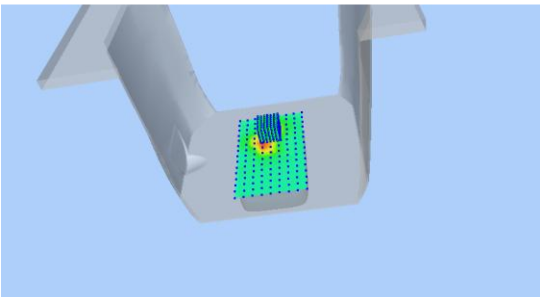
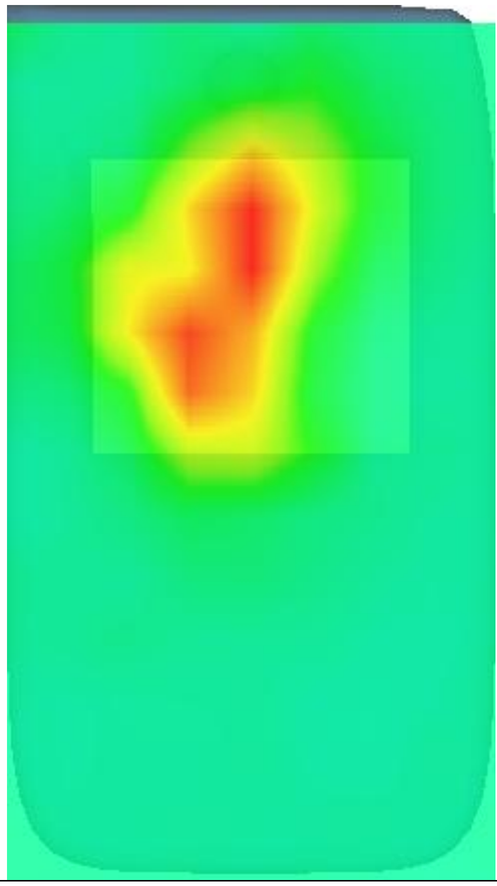
Maximum location: X=0.00, Y=30.00

SAR Peak: 0.98 W/kg

SAR 10g (W/Kg)	0.148866
SAR 1g (W/Kg)	0.312441

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.9218	0.5310	0.1974	0.1420	0.0928	0.0777	0.0686	0.0633	0.0650	0.0661	0.0681	0.0642



3D screen shot	Hot spot position
	

MEASUREMENT 3

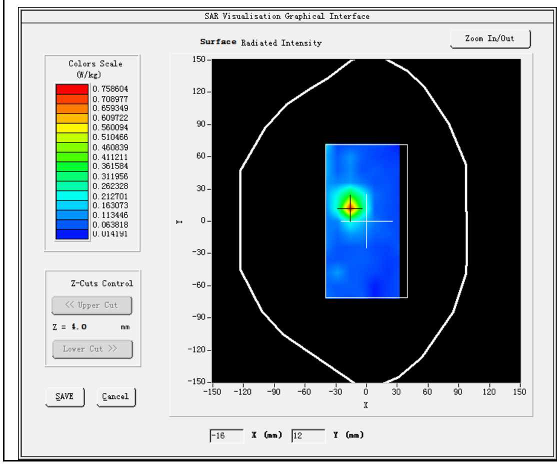
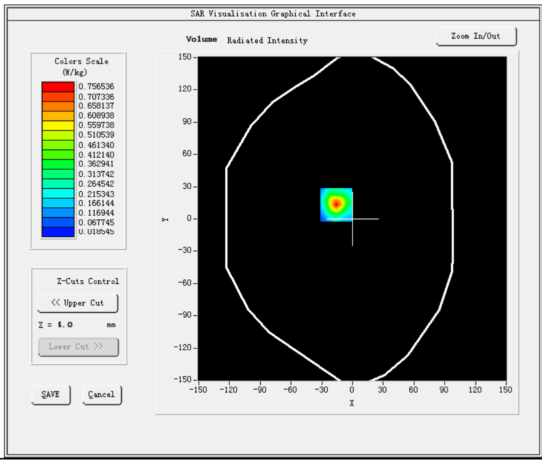
Date of measurement: 14/5/2024

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	Body
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.11b (Crest factor: 1.0)
ConvF	2.85

B. SAR Measurement Results

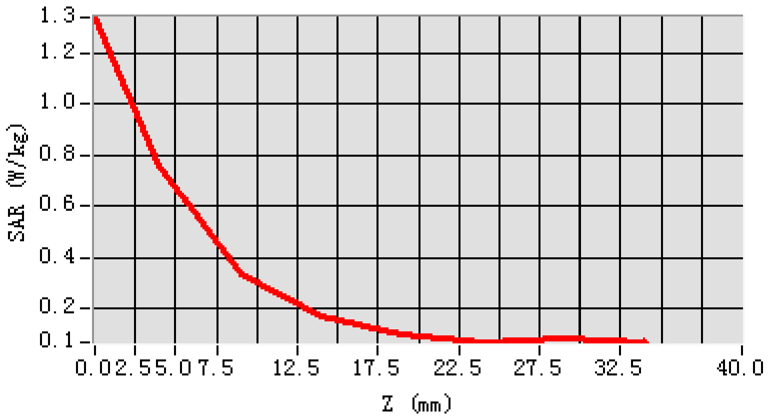
Frequency (MHz)	2412.000000
Relative permittivity (real part)	37.764335
Relative permittivity (imaginary part)	12.998436
Conductivity (S/m)	1.741790
Variation (%)	-3.360000

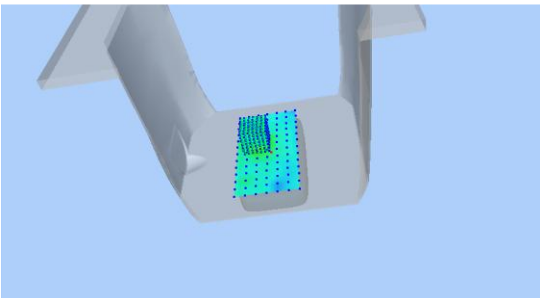
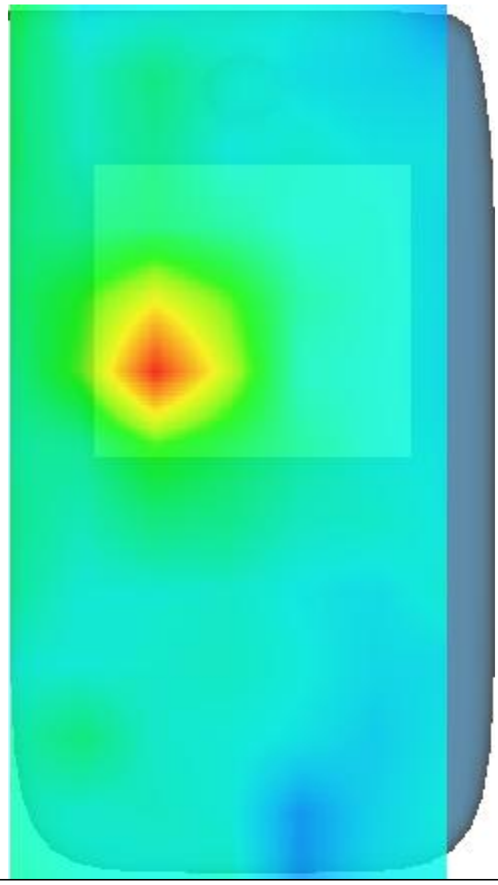
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-16.00, Y=13.00
SAR Peak: 1.33 W/kg

SAR 10g (W/Kg)	0.269348
SAR 1g (W/Kg)	0.651164

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3431	0.7565	0.3351	0.1667	0.0996	0.0685	0.0827



3D screen shot	Hot spot position
	

MEASUREMENT 4

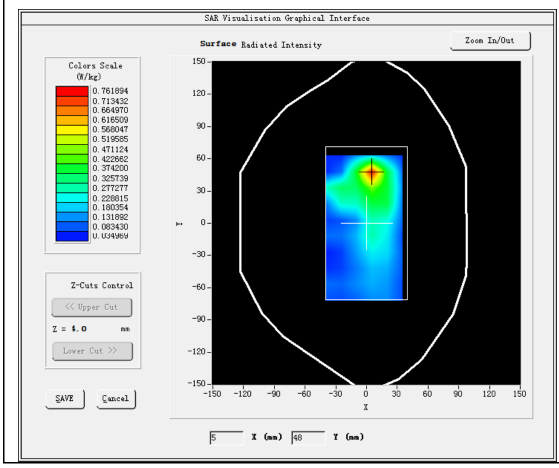
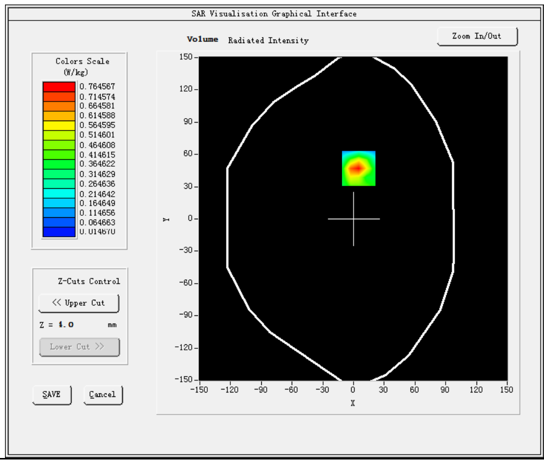
Date of measurement: 15/5/2024

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	LTE band 2
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.63

B. SAR Measurement Results

Frequency (MHz)	1880.000000
Relative permittivity (real part)	39.005302
Relative permittivity (imaginary part)	13.791376
Conductivity (S/m)	1.440433
Variation (%)	-2.660000

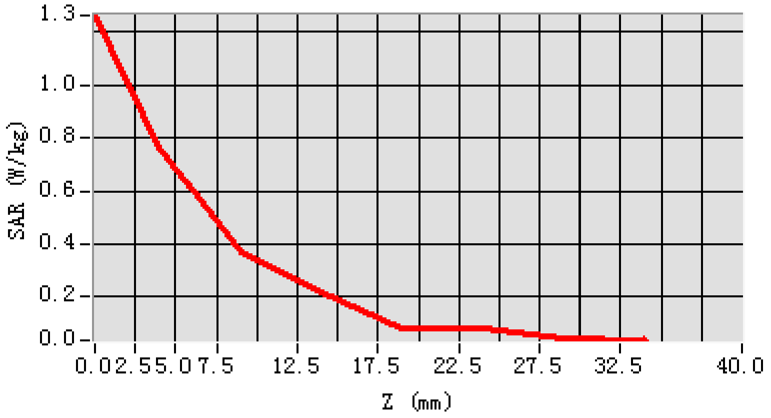
SURFACE SAR	VOLUME SAR
	

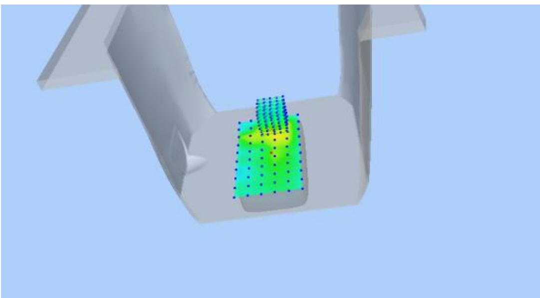
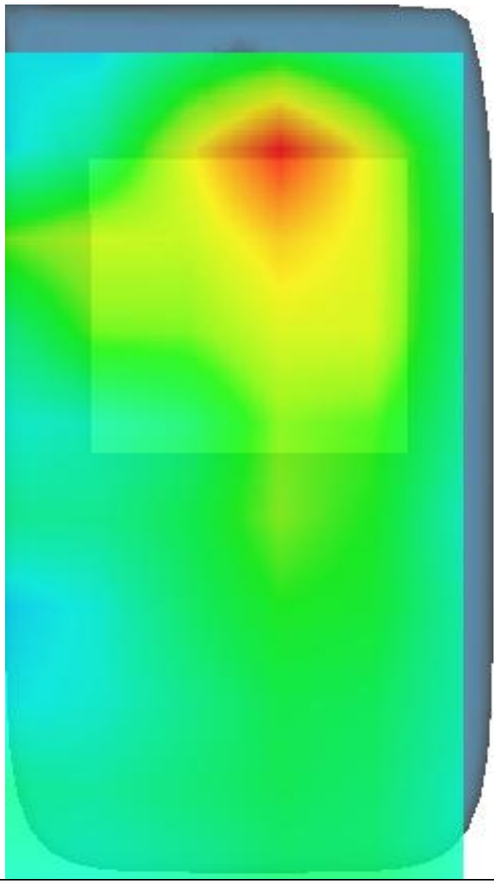
Maximum location: X=5.00, Y=47.00

SAR Peak: 1.32 W/kg

SAR 10g (W/Kg)	0.326671
SAR 1g (W/Kg)	0.721414

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2644	0.7646	0.3714	0.2186	0.0796	0.0824	0.0472



3D screen shot	Hot spot position
	

MEASUREMENT 5

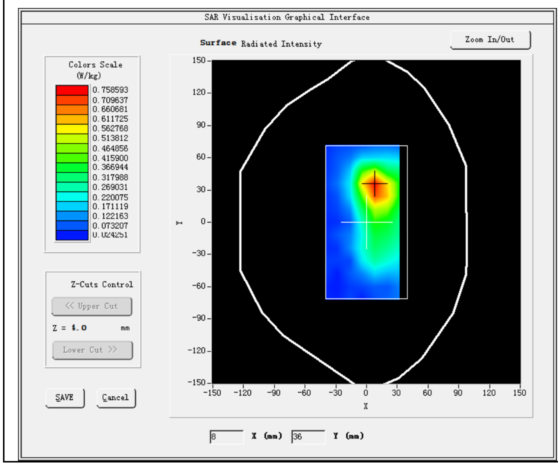
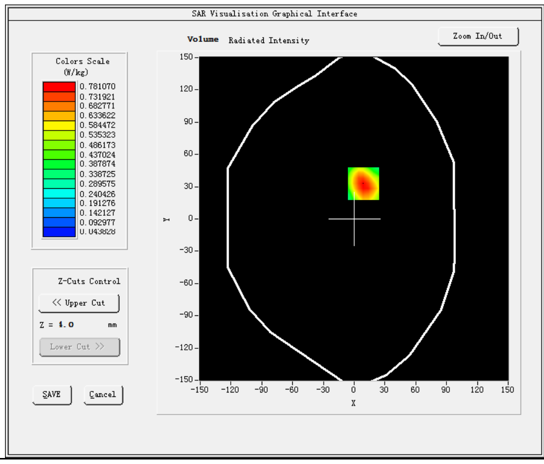
Date of measurement: 10/5/2024

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	Body
Band	LTE band 7
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.65

B. SAR Measurement Results

Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.355064
Relative permittivity (imaginary part)	13.683290
Conductivity (S/m)	1.927063
Variation (%)	0.900000

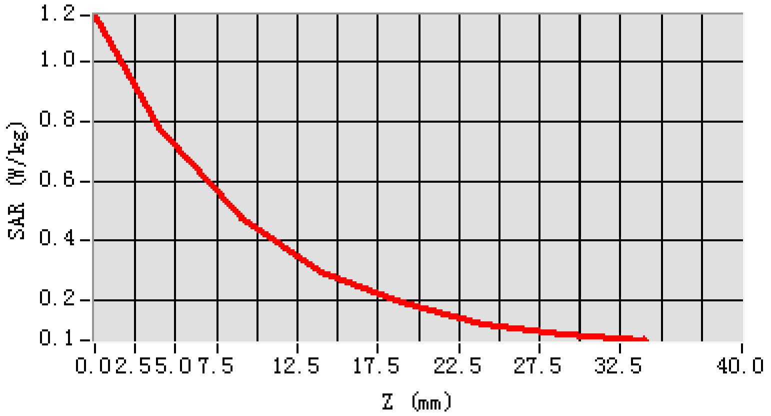
SURFACE SAR	VOLUME SAR
	

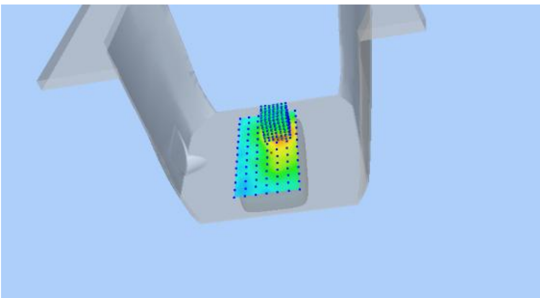
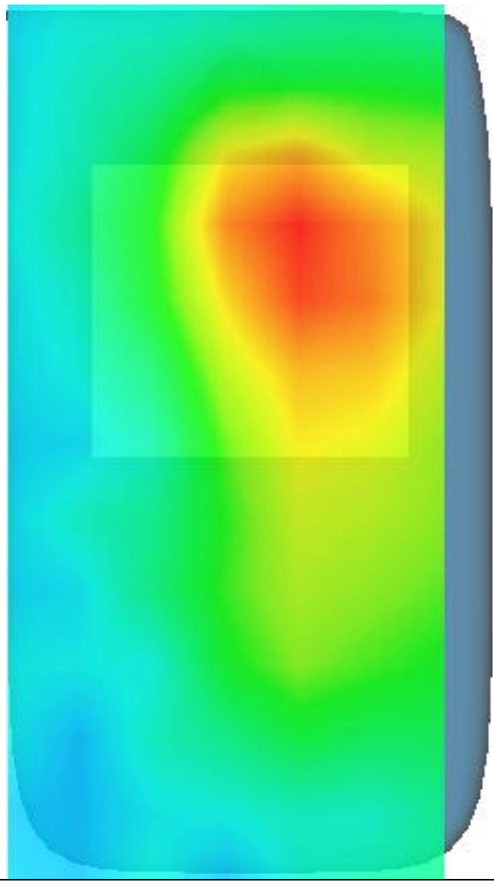
Maximum location: X=9.00, Y=33.00

SAR Peak: 1.15 W/kg

SAR 10g (W/Kg)	0.438617
SAR 1g (W/Kg)	0.742076

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.1538	0.7811	0.4783	0.2967	0.1951	0.1215	0.0870



3D screen shot	Hot spot position
	

MEASUREMENT 6

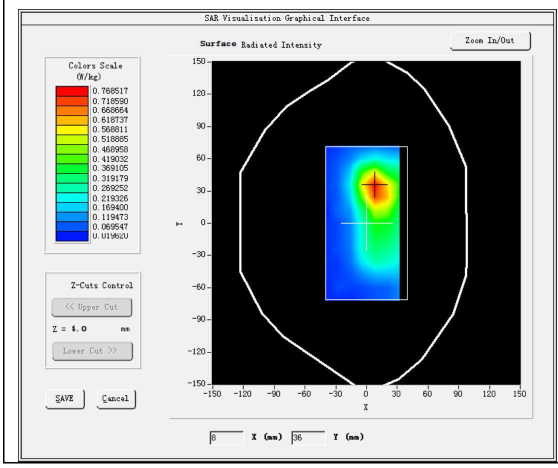
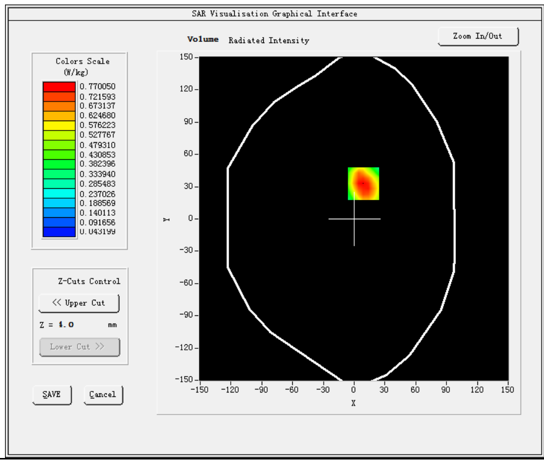
Date of measurement: 10/5/2024

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	Body
Band	LTE band 41
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.65

B. SAR Measurement Results

Frequency (MHz)	2605.000000
Relative permittivity (real part)	38.974663
Relative permittivity (imaginary part)	13.865690
Conductivity (S/m)	2.006673
Variation (%)	-0.040000

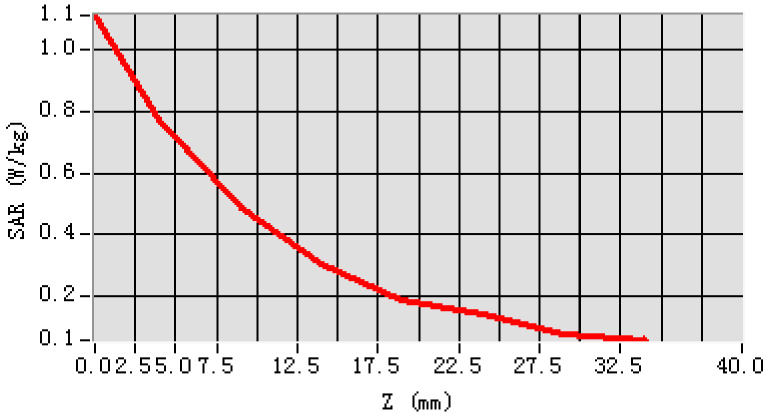
SURFACE SAR	VOLUME SAR
	

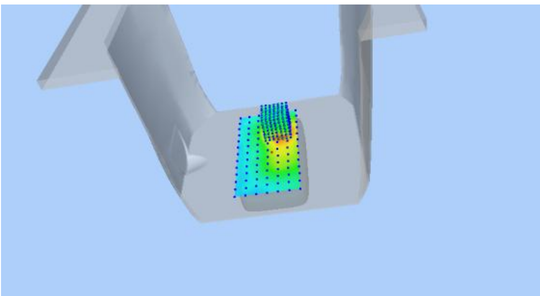
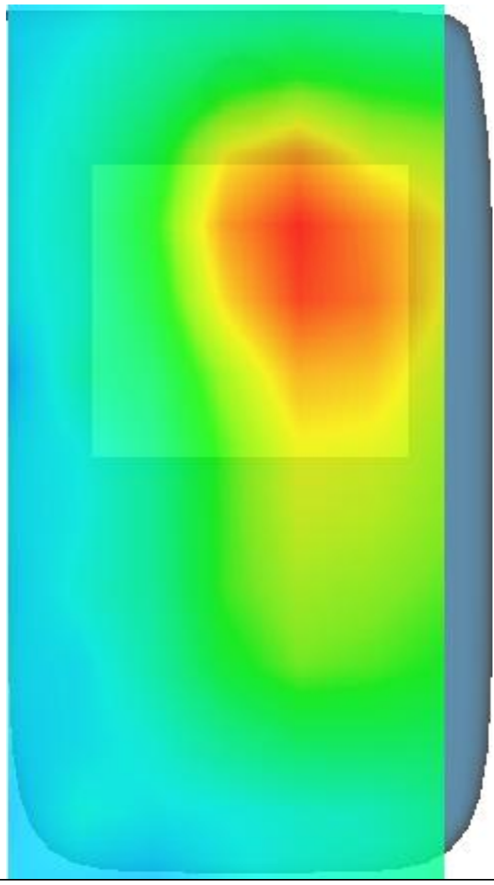
Maximum location: X=9.00, Y=33.00

SAR Peak: 1.12 W/kg

SAR 10g (W/Kg)	0.439987
SAR 1g (W/Kg)	0.733809

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.1116	0.7701	0.4849	0.3027	0.1858	0.1386	0.0766



3D screen shot	Hot spot position
	

MEASUREMENT 7

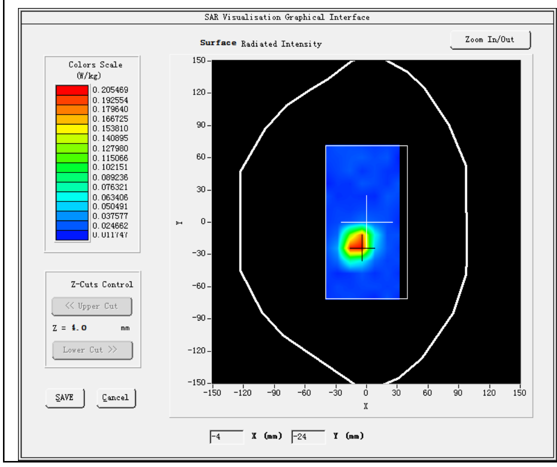
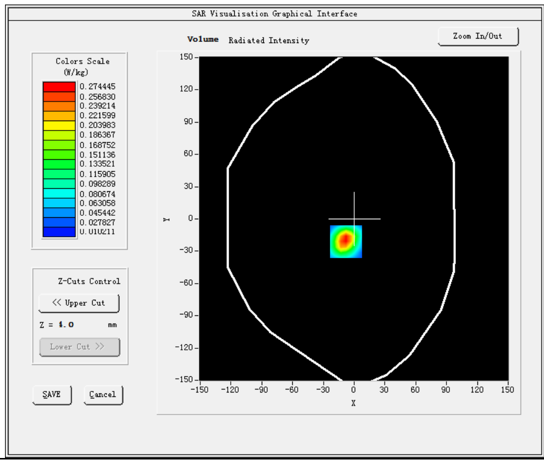
Date of measurement: 7/3/2024

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	Body
Band	user10M
Channels	Low
Signal	user10M (Crest factor: 1.0)
ConvF	2.85

B. SAR Measurement Results

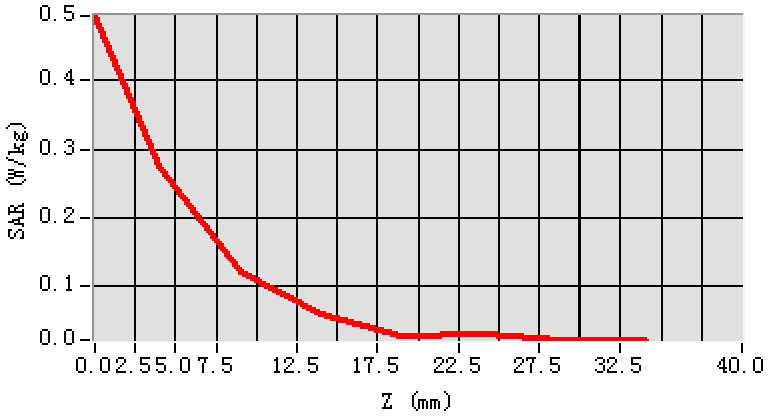
Frequency (MHz)	2420.000000
Relative permittivity (real part)	38.253318
Relative permittivity (imaginary part)	12.886869
Conductivity (S/m)	1.732568
Variation (%)	0.170000

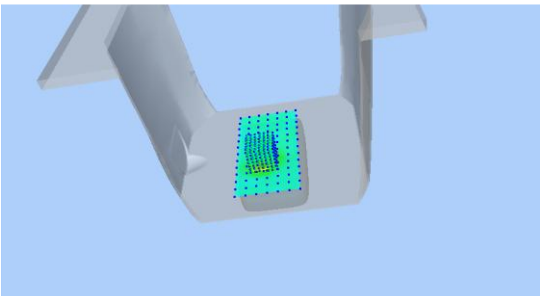
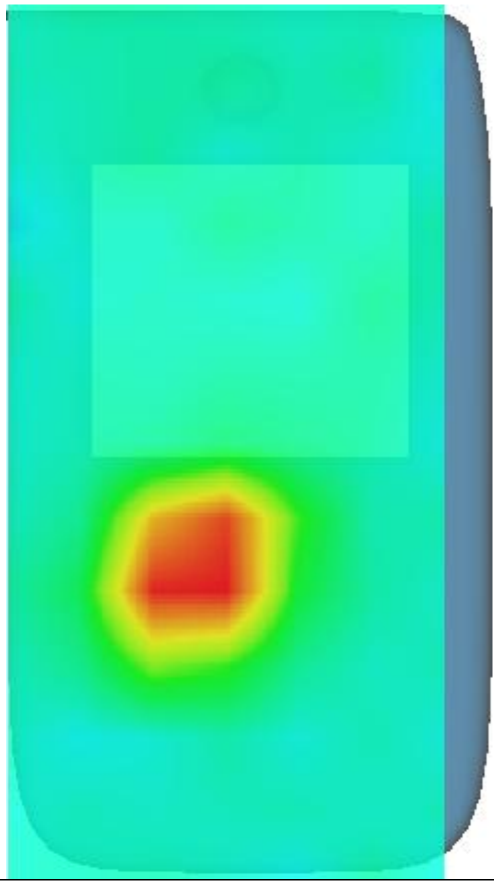
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=-21.00
SAR Peak: 0.50 W/kg

SAR 10g (W/Kg)	0.150417
SAR 1g (W/Kg)	0.235492

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4947	0.2744	0.1202	0.0590	0.0274	0.0305	0.0214



3D screen shot	Hot spot position
	

MEASUREMENT 8

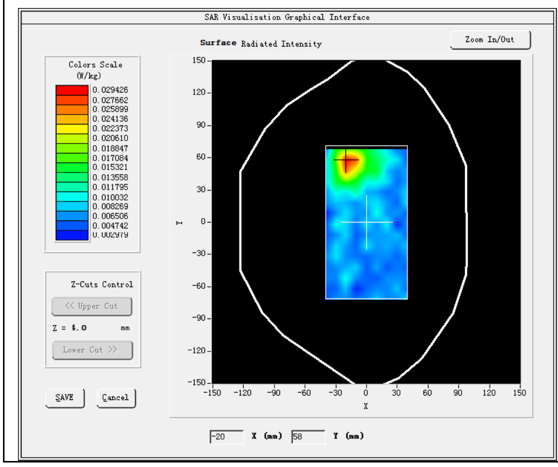
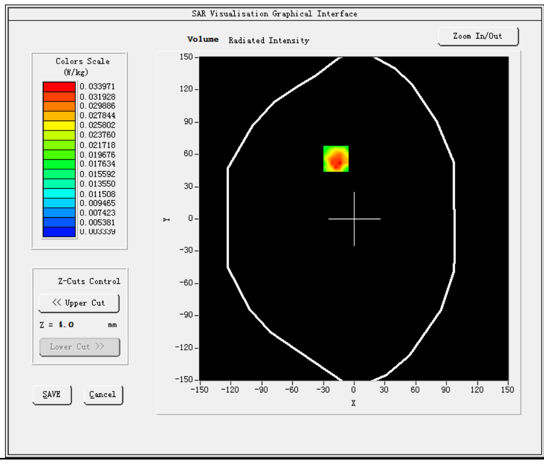
Date of measurement: 28/3/2024

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	user40M
Channels	Low
Signal	user40M (Crest factor: 1.0)
ConvF	2.07

B. SAR Measurement Results

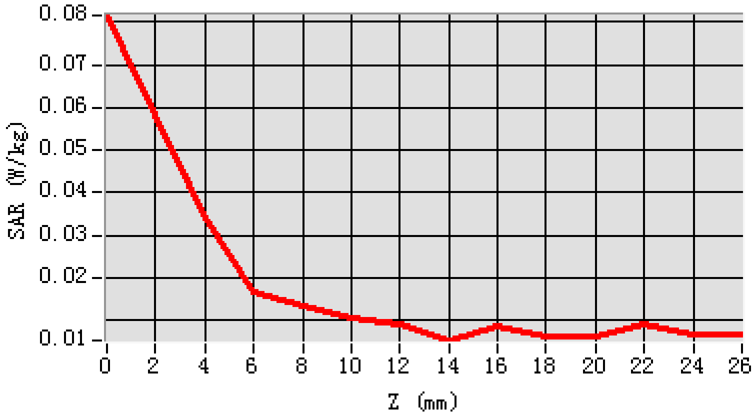
Frequency (MHz)	5760.000000
Relative permittivity (real part)	34.843092
Relative permittivity (imaginary part)	16.390961
Conductivity (S/m)	5.245108
Variation (%)	1.210000

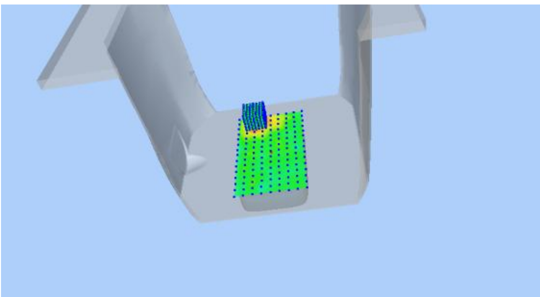
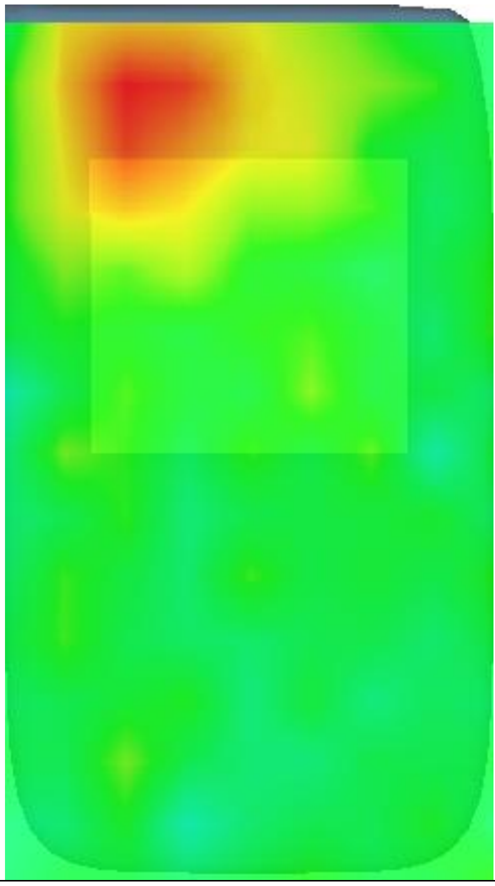
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-18.00, Y=56.00
SAR Peak: 0.08 W/kg

SAR 10g (W/Kg)	0.031175
SAR 1g (W/Kg)	0.040019

Z (mm)	0.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00
SAR (W/Kg)	0.0814	0.0340	0.0167	0.0134	0.0107	0.0092	0.0053	0.0088	0.0061	0.0063	0.0090	0.0066



3D screen shot	Hot spot position
	

12. Appendix D. Calibration Certificate

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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

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).

	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

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

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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.

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 0.01W/kg to 100W/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:

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

where

$SAR_{uncertainty}$	is the uncertainty in percent of the probe boundary effect
d_{be}	is the distance between the surface and the closest *zoom-scan* 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 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 SARuncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).

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.

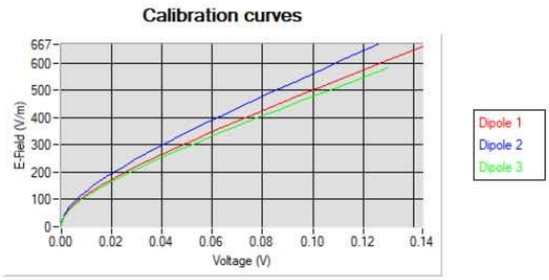
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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.

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

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

Normx dipole 1 (μV/(V/m)^2)	Normy dipole 2 (μV/(V/m)^2)	Normz dipole 3 (μV/(V/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.

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

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

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

where
σ=the conductivity of the liquid
ρ=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:

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

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:

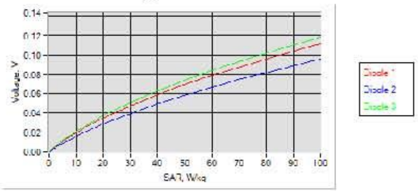
$$SAR = \frac{4Pw}{ab\delta}e^{\frac{-2z}{\delta}}$$

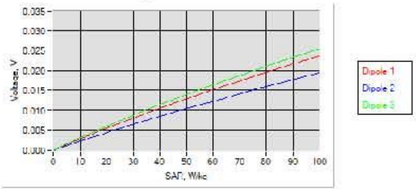
where
a=the larger cross-sectional of the waveguide
b=the smaller cross-sectional of the waveguide
δ=the skin depth for the liquid in the waveguide
Pw=the power delivered to the liquid

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

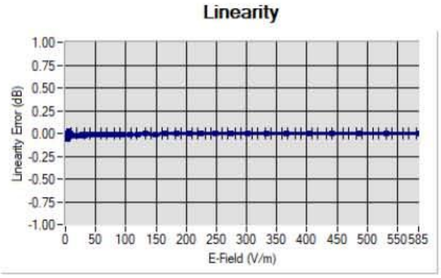
(*) Frequency validity is +/-50MHz below 600MHz, +/-100MHz from 600MHz to 6GHz and +/-700MHz above 6GHz



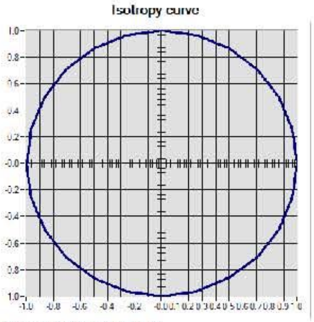


6 VERIFICATION RESULTS

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)

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.

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