FCC SAR EVALUATION REPORT

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

Product Name： Smartphone

Brand Name： CUBOT

Model Name： A20

Family Model： A10, A30, NOTE 60, P90

Report No.： S24112100403001

FCC ID： 2AHZ5-A20

Prepared for

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TEST RESULT CERTIFICATION

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Product description

Product name	Smartphone
Brand Name	CUBOT
Model and/or type reference	A20
Family Model	A10, A30, NOTE 60, P90
Standards	FCC 47 CFR Part 2(2.1093)
	IEEE Std 1528-2013
	Published RF exposure KDB procedures

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

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Test Sample Number S241121004001

Date of Test

Date (s) of performance of tests.. Nov.30, 2024~ Dec.16, 2024

Date of Issue..... Jan.20, 2025

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

Prepared By :	Reviewed By :	Approved By :
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※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Jan.20, 2025	Owen Xiao

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1. General Information

1.1. RF exposure limits

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

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

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

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

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

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

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

NOTE
HEAD AND TRUNK LIMIT
1.6 W/kg
APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for A20 are as follows.

RF Exposure Conditions		Equipment Class -Highest Reported SAR (W/kg)				Max. Reported SAR (W/kg)
		PCE	DTS	NII	DSS	
1-g Head		0.244	0.382	1.053	0.133	1.053
1-g Body-Worn (Separation distance of 10mm)		0.728	0.124	0.421	0.066	0.823
1-g Hotspot (Separation distance of 10mm)		0.823	0.124	0.518	0.066	
Max Simultaneous Tx	Head	1.297	0.626	1.297	0.377	1.297
	Body-Worn	1.149	0.852	1.149	0.794	1.149
	Hotspot	1.149	0.852	1.149	0.823	

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

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR Part 2(2.1093), and 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	Smartphone
Brand Name	CUBOT
Model Name	A20
Family Model	A10, A30, NOTE 60, P90
Model Difference	All models are the same circuit and RF module, except for model names.
FCC ID	2AHZ5-A20
Device Phase	Identical Prototype
Exposure Category	General population / Uncontrolled environment
Antenna Type	PIFA Antenna
Battery Information	DC 3.87V, 5100mAh, 19.737Wh
HW Version	G3320G-UF-V1.1
SW Version	CUBOT_A20_E091C_V2.0
Device Operating Configurations	
Supporting	GSM850/1900,WCDMABand2/4/5,LTEBand2/4/5/7/12/17 ,WLAN 2.4G/5G, Bluetooth

Mode(s)			
Test Modulation	GSM(GMSK), WCDMA(QPSK), LTE(QPSK/16QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824-849	869-894
	GSM 1900	1850-1910	1930-1990
	WCDMA Band 2	1850-1910	1930-1990
	WCDMA Band 5	824-849	869-894
	LTE Band 2	1850-1910	1930-1990
	LTE Band 4	1710-1755	2110-2155
	LTE Band 5	824-849	869-894
	LTE Band 7	2500-2570	2620-2690
	LTE Band 12	699-716	729-746
	LTE Band 17	704-716	734-746
	WLAN 2.4G	2412-2462	
	WLAN 5.2G	5180-5240	
	WLAN 5.8G	5745-5825	
	Bluetooth	2402-2480	
Power Class	4, tested with power level 5(GSM 850)		
	1, tested with power level 0(GSM 1900)		
	3, tested with power control “all 1”(WCDMA Band 2)		
	3, tested with power control “all 1”(WCDMA Band 5)		
	3, tested with power control all Max.(LTE Band 2)		
	3, tested with power control all Max.(LTE Band 4)		
	3, tested with power control all Max.(LTE Band 5)		
	3, tested with power control all Max.(LTE Band 7)		
	3, tested with power control all Max.(LTE Band 12)		
	3, tested with power control all Max.(LTE Band 17)		

1.4. Test specification(s)

FCC 47 CFR Part 2(2.1093)
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 D01 3G SAR Procedures
KDB 941225 D05 SAR for LTE Devices
KDB 941225 D06 Hotspot SAR

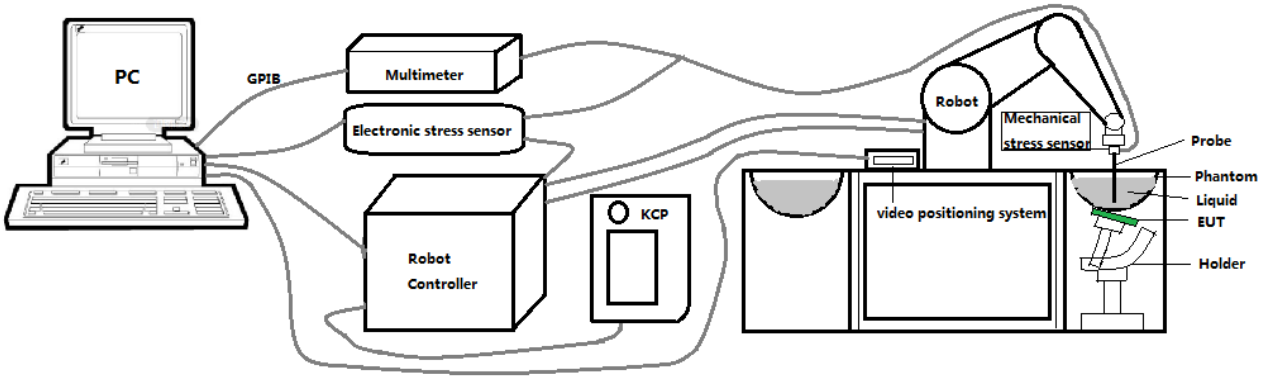
KDB 648474 D04 Handset SAR

1.5. Ambient Condition

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

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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



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

2.3. E-Field Probe

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

For the measurements the Specific Dosimetric E-Field Probe 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

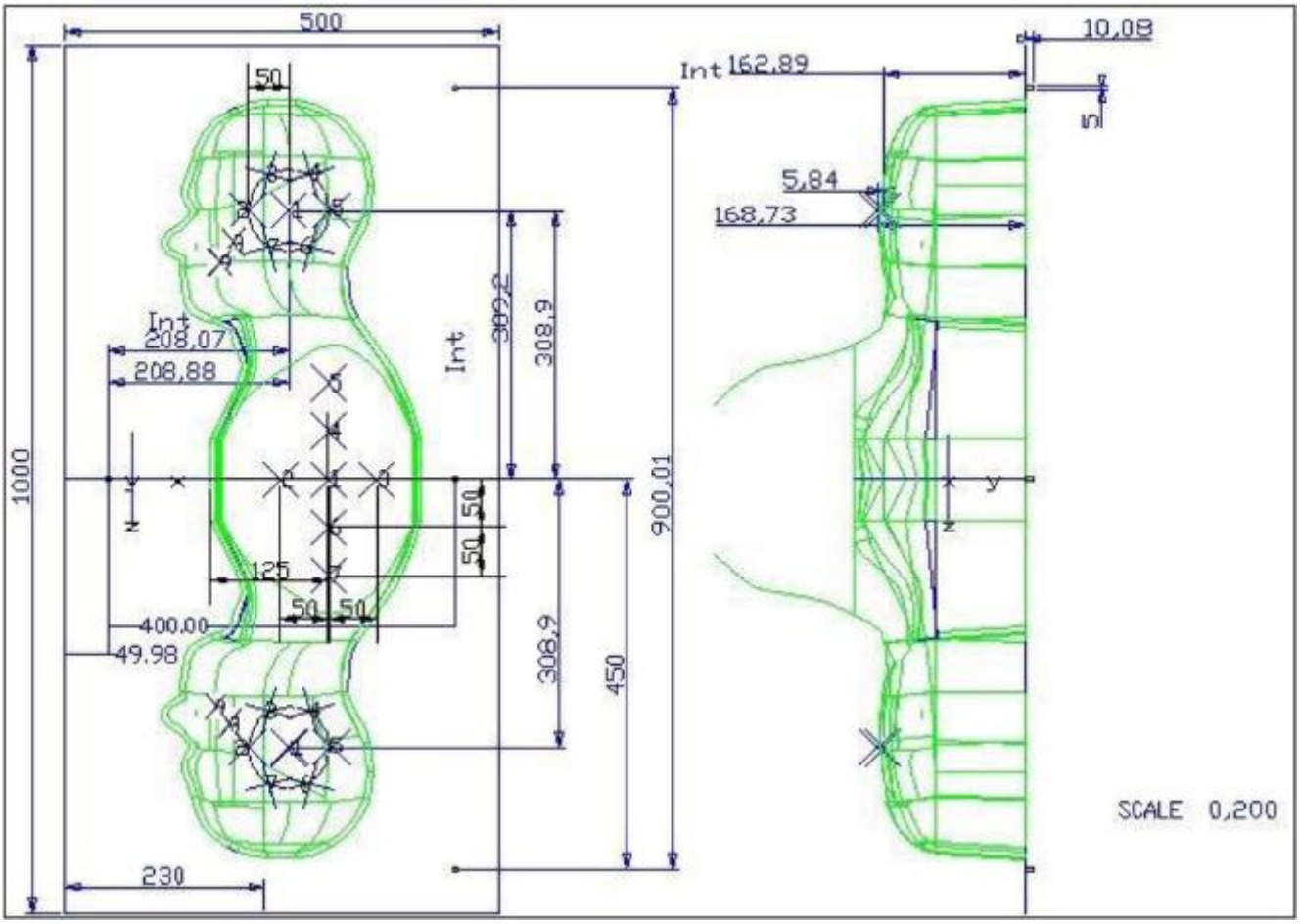
Photo of SAM phantom SN 16/15 SAM119



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

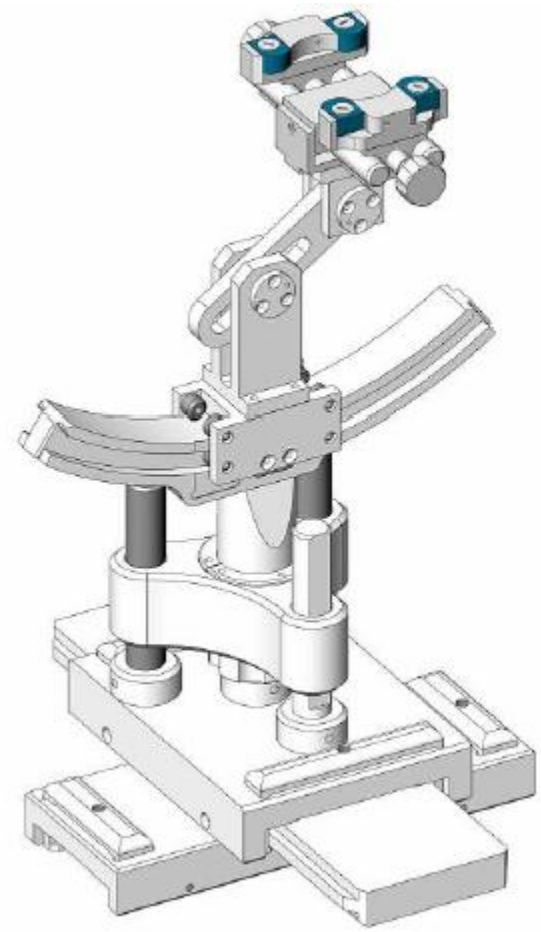


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

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	4024-EPGO-442	Oct.4.2024	Oct.3.2025
☒	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	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	105747	Apr. 26, 2024	Apr. 25, 2025
☒	R&S	Wideband radio communication tester	CMW500	103917	Apr. 26, 2024	Apr. 25, 2025
☒	HP	Network	8753D	3410J01136	Apr. 26,	Apr. 25,

		Analyzer			2024	2025
☒	Agilent	MXG Vector Signal Generator	N5182A	MY47070317	Apr. 25, 2024	Apr. 24, 2025
☒	Agilent	Power meter	E4419B	MY45102538	Apr. 25, 2024	Apr. 24, 2025
☒	Agilent	Power sensor	E9301A	MY41495644	Apr. 25, 2024	Apr. 24, 2025
☒	Agilent	Power sensor	E9301A	US39212148	Apr. 25, 2024	Apr. 24, 2025
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Apr. 26, 2024	Apr. 25, 2027
☒	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 750	Head 750	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 835	Head 835	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 1800	Head 1800	NCR	NCR
☒	Shenzhen Tianxu Communication Technology Co., Ltd.	Human Simulating Liquid	Head 1900	Head 1900	NCR	NCR
☒	Shenzhen Tianxu Communication Technology	Human Simulating Liquid	Head 2450	Head 2450	NCR	NCR

	Co., Ltd.					
☒	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 5000	Head 5000	NCR	NCR

Measurement Software

Manufacturer	Software Name	Software Version
SATIMO	OpenSAR	V4_02_31

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 Wi-Fi/BT power measurement, use engineering software to configure EUT Wi-Fi/BT 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 Wi-Fi/BT output power.

<SAR measurement>

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

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

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

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

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

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

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

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

3.1. Power Reference

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

3.2. Area scan & Zoom scan

The area scan is a 2D scan to find the hot spot location on the DUT. The zoom scan is a 3D scan

above the hot spot to calculate the 1g and 10g SAR value.

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

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

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

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

3.3. Description of interpolation/extrapolation scheme

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

3.4. Volumetric Scan

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

3.5. Power Drift

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

4. System Verification Procedure

4.1. Tissue Verification

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

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

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 750	750	41.96 (39.86~44.06)	0.89 (0.85~0.93)	40.77	0.90	21.6 °C	Dec. 13, 2024
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	41.83	0.91	21.2 °C	Dec. 11, 2024
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.97	1.37	21.5 °C	Dec. 06, 2024
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.46	1.46	21.6 °C	Dec. 09, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.81	1.78	21.6 °C	Dec. 12, 2024
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	38.78	1.97	21.3 °C	Dec. 16, 2024
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	34.65	4.50	21.3 °C	Dec. 11, 2024
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	34.03	5.17	21.4 °C	Nov. 30, 2024

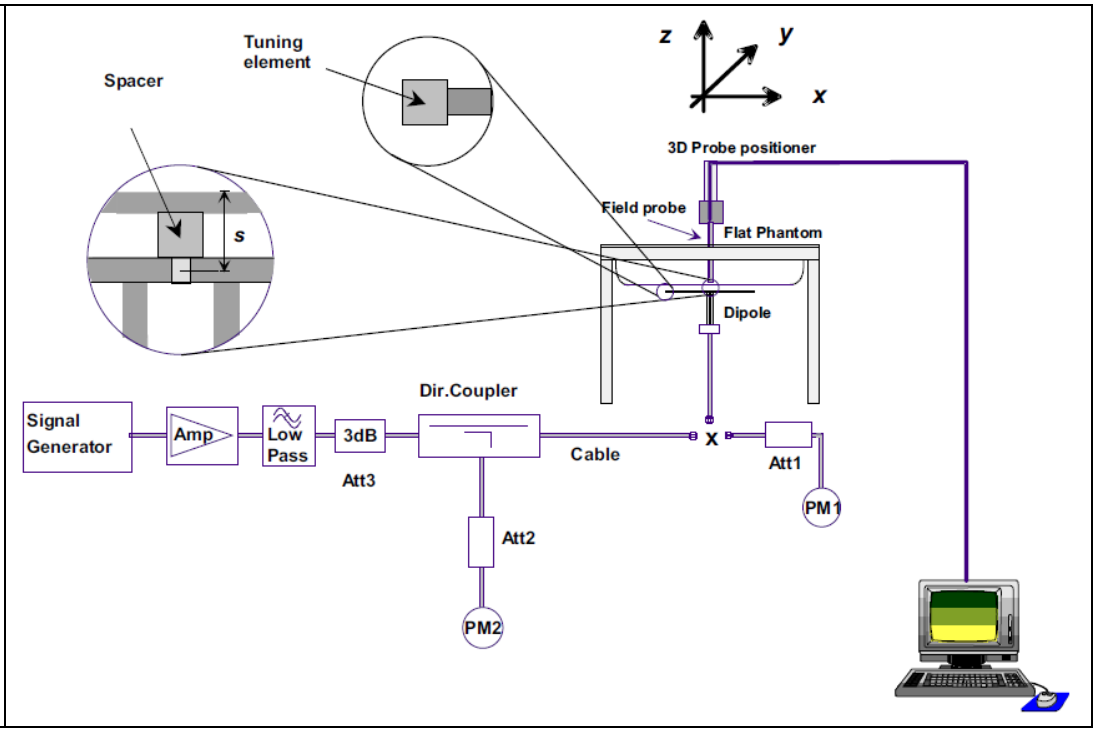
NOTE: The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

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. 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			Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	Input Power	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
750MHz	8.60 (7.74~9.46)	5.78 (5.20~6.36)	20dBm	0.905	0.554	9.05	5.54	21.6 °C	Dec. 13, 2024
835MHz	9.40 (8.46~10.34)	6.28 (5.65~6.91)	18dBm	0.595	0.384	9.43	6.09	21.2 °C	Dec. 11, 2024
1800MHz	37.06 (33.35~40.77)	20.01 (18.01~22.01)	18dBm	2.273	1.176	36.02	18.64	21.5 °C	Dec. 06, 2024
1900MHz	39.69 (35.72~43.66)	20.92 (18.83~23.01)	18dBm	2.396	1.181	37.97	18.72	21.6 °C	Dec. 09, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	20dBm	4.962	2.217	49.62	22.17	21.6 °C	Dec. 12, 2024
2600MHz	54.16 (48.74~59.58)	24.85 (22.37~27.34)	20dBm	5.859	2.452	58.59	24.52	21.3 °C	Dec. 16, 2024
5200MHz	162.59 (146.33~178.85)	56.21 (50.59~61.83)	20dBm	15.654	5.450	156.54	54.50	21.3 °C	Dec. 11, 2024
5800MHz	182.20 (163.98~200.42)	61.32 (55.19~67.45)	20dBm	19.246	6.543	192.46	65.43	21.4 °C	Nov. 30, 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. Ear and handset reference point

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



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

6.2. Definition of the cheek position

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

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

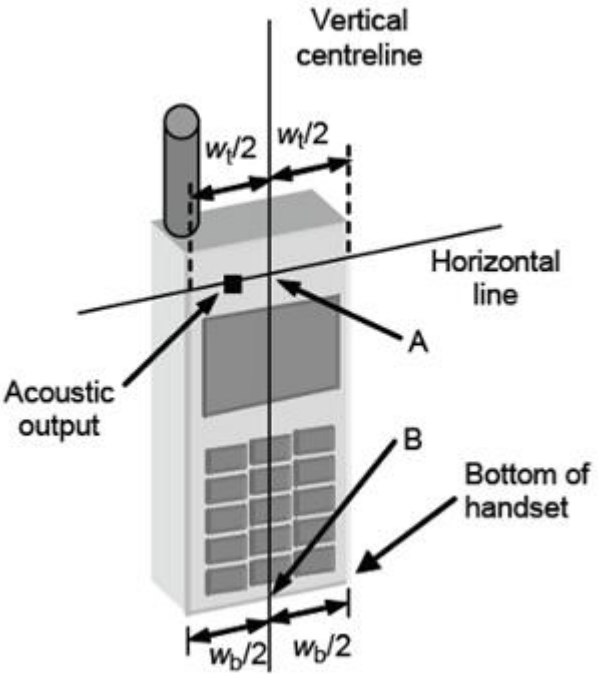


Fig 6.2.1 Handset vertical and horizontal reference lines—"fixed case

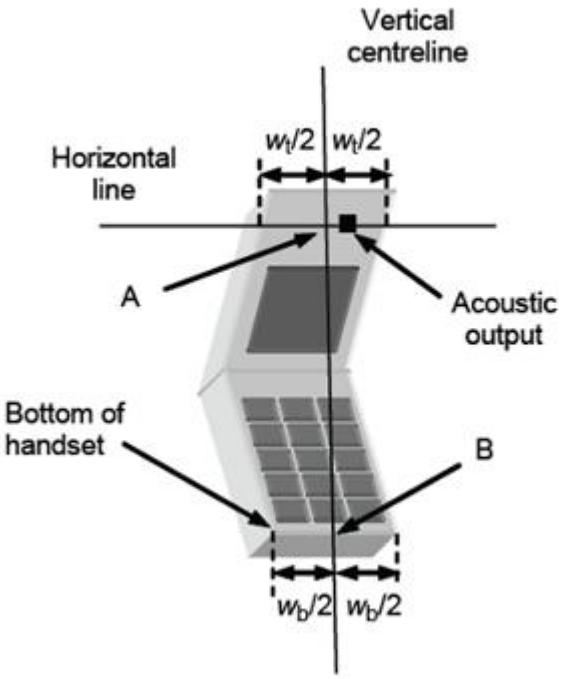


Fig 6.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

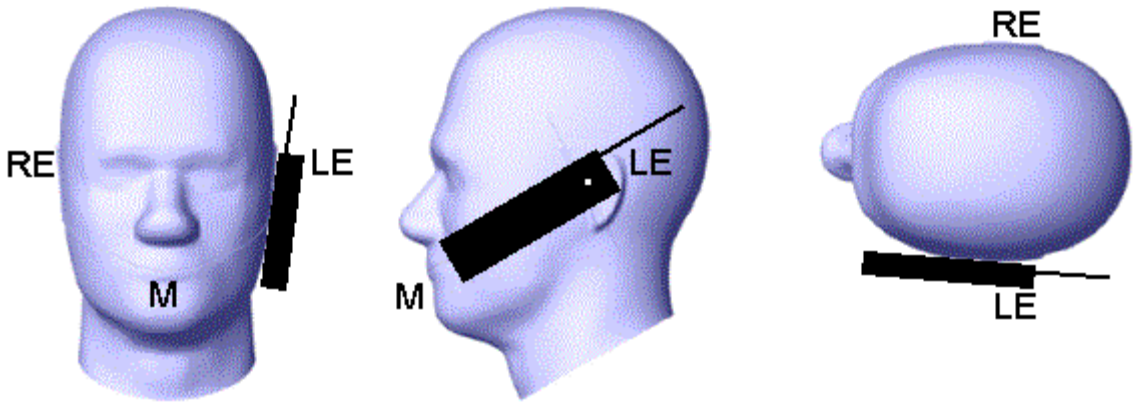


Fig 6.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

6.3. Definition of the tilt position

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

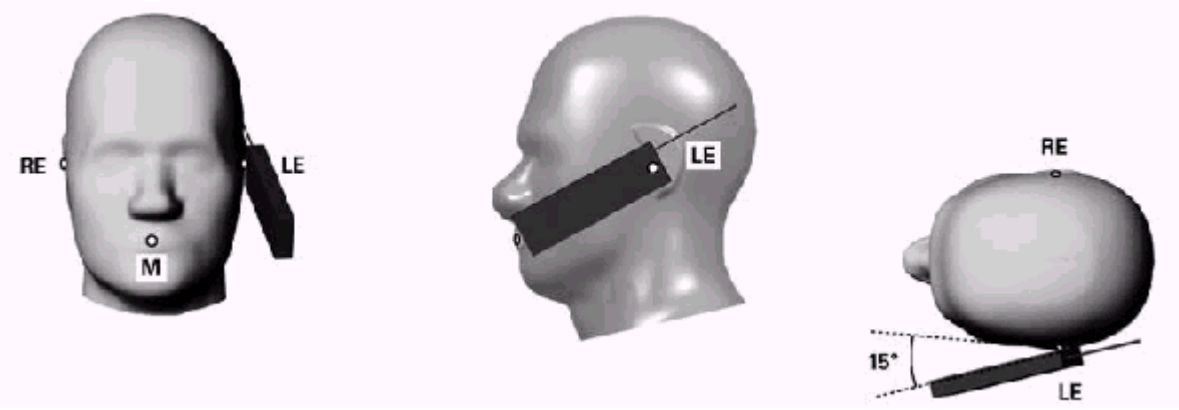


Figure 6.3.1 – Tilt position of the wireless device on the left side of SAM

6.4. Body Worn Accessory

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

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

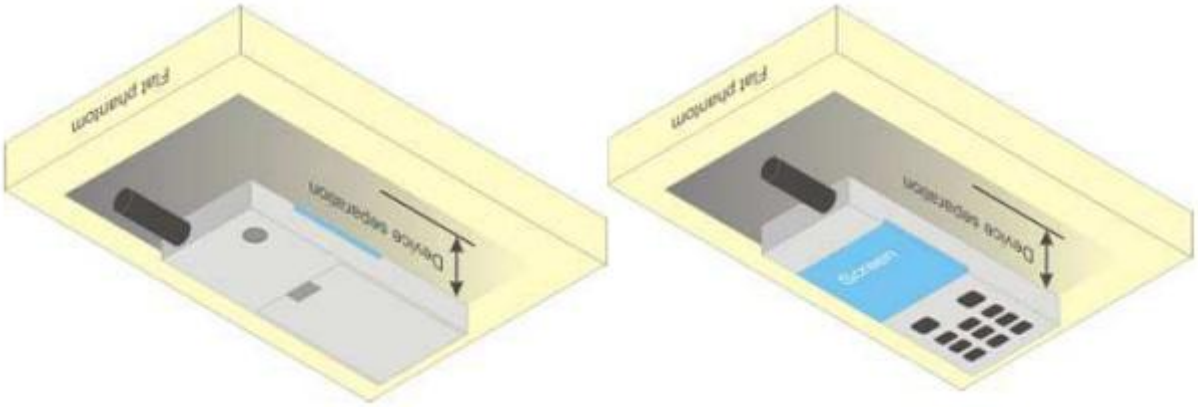


Figure 6.4.1 – Test positions for body-worn devices

6.5. Wireless Router Devices

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

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

7. RF Output Power

7.1. GSM Conducted Power

Band GSM850	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	128	189	251	Tune-up	128	189	251
Frequency (MHz)	(dBm)	824.2	836.4	848.8		824.2	836.4	848.8
GSM (GMSK)	33.00	32.82	32.81	32.72	23.97	23.79	23.78	23.69
GPRS(GMSK,1 Tx slot)	33.00	32.74	32.74	32.67	23.97	23.71	23.71	23.64
GPRS(GMSK,2 Tx slot)	31.00	30.56	30.43	30.30	24.98	24.54	24.41	24.28
GPRS(GMSK,3 Tx slot)	29.00	28.53	28.40	28.25	24.74	24.27	24.14	23.99
GPRS(GMSK,4 Tx slot)	26.50	26.19	26.16	25.91	23.49	23.18	23.15	22.90
Band GSM1900	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	512	661	810	Tune-up	512	661	810
Frequency (MHz)	(dBm)	1850.2	1880	1909.8		1850.2	1880	1909.8
GSM (GMSK)	29.50	29.37	29.20	28.87	20.47	20.34	20.17	19.84
GPRS(GMSK,1 Tx slot)	29.50	29.45	29.32	29.02	20.47	20.42	20.29	19.99
GPRS(GMSK,2 Tx slot)	27.00	26.94	26.77	26.43	20.98	20.92	20.75	20.41
GPRS(GMSK,3 Tx slot)	25.50	25.25	25.07	24.77	21.24	20.99	20.81	20.51
GPRS(GMSK,4 Tx slot)	23.50	23.17	23.03	22.73	20.49	20.16	20.02	19.72

7.2. WCDMA Conducted Power

WCDMA Band 2	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up	9262	9400	9538
Frequency (MHz)	(dBm)	1852.4	1880	1907.6
RMC12.2K	23.00	22.98	22.55	22.23
HSDPA Sub 1	23.00	22.90	22.58	21.87
HSDPA Sub 2	22.50	22.38	22.29	21.57
HSDPA Sub 3	22.50	22.25	22.04	21.31
HSDPA Sub 4	22.50	22.08	21.86	21.33
HSUPA Sub 1	23.00	22.73	22.24	21.57
HSUPA Sub 2	23.00	22.67	22.51	21.82
HSUPA Sub 3	23.00	22.56	22.20	21.21
HSUPA Sub 4	23.00	22.55	22.24	21.77
HSUPA Sub 5	23.00	22.64	22.19	21.59
WCDMA Band 4	Burst-Averaged output Power (dBm)			

Tx Channel	Tune-up	1312	1413	1513
Frequency (MHz)	(dBm)	1712.4	1732.6	1752.6
RMC12.2K	24.00	23.17	23.44	23.53
HSDPA Sub 1	23.00	22.57	22.78	22.76
HSDPA Sub 2	23.00	22.32	22.55	22.41
HSDPA Sub 3	22.50	21.98	22.26	22.19
HSDPA Sub 4	22.50	21.74	22.21	21.66
HSUPA Sub 1	23.00	22.43	22.60	22.63
HSUPA Sub 2	23.00	22.49	22.73	22.80
HSUPA Sub 3	22.50	22.26	22.45	22.36
HSUPA Sub 4	23.00	22.49	22.44	22.79
HSUPA Sub 5	23.00	22.24	22.70	22.42
WCDMA Band 5	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up	4132	4182	4233
Frequency (MHz)	(dBm)	826.4	836.4	846.6
RMC12.2K	23.50	23.18	23.35	23.18
HSDPA Sub 1	23.50	23.13	23.00	22.53
HSDPA Sub 2	23.00	22.80	22.76	22.29
HSDPA Sub 3	23.00	22.51	22.51	22.10
HSDPA Sub 4	22.50	22.28	22.09	21.90
HSUPA Sub 1	23.00	22.83	22.88	22.52
HSUPA Sub 2	23.50	23.07	22.99	22.56
HSUPA Sub 3	23.00	22.60	22.89	22.27
HSUPA Sub 4	23.50	23.05	22.99	22.57
HSUPA Sub 5	23.00	22.65	22.84	22.25

7.3. 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	24.50	24.09	23.89	24.44
			1	2	24.50	24.22	23.67	24.42
			1	5	24.50	24.14	23.79	24.26
			3	0	24.50	24.42	23.71	24.36
			3	1	24.50	24.45	23.73	24.30
			3	2	24.50	24.39	23.62	24.31
			6	0	23.50	23.31	22.76	23.28
		16QAM	1	0	24.50	23.92	22.65	23.76
			1	2	24.50	24.02	22.69	23.82
			1	5	24.50	23.88	22.56	23.78
			3	0	24.00	23.50	22.85	23.55
			3	1	24.00	23.68	22.88	23.53
			3	2	24.00	23.68	22.69	23.64
			6	0	22.50	22.11	21.52	22.00
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	25.00	24.43	23.83	24.23
			1	7	25.00	24.40	23.76	24.43
			1	14	25.00	24.45	23.86	24.68
			8	0	23.50	23.40	22.69	23.08
			8	4	23.50	23.36	22.67	23.36
			8	7	23.50	23.36	22.57	23.27
			15	0	23.50	23.31	22.77	23.31
		16QAM	1	0	24.00	24.00	22.65	23.66
			1	7	24.00	23.90	22.57	23.93
			1	14	24.00	23.95	22.66	23.82
			8	0	23.00	22.48	21.82	22.28
			8	4	23.00	22.46	21.79	22.47
			8	7	23.00	22.47	21.79	22.52
			15	0	22.50	22.49	21.85	22.42
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	5MHz	QPSK	1	0	25.00	24.95	23.75	23.98

Band 2			1	12	25.00	24.85	23.64	24.17
			1	24	25.00	24.63	23.73	24.41
			12	0	24.00	23.49	22.80	23.19
			12	6	24.00	23.50	22.73	23.02
			12	11	24.00	23.42	22.68	23.31
			25	0	23.50	23.36	22.82	23.11
		16QAM	1	0	24.00	23.47	23.27	23.64
			1	12	24.00	23.53	23.21	23.26
			1	24	24.00	23.42	23.20	23.89
			12	0	23.00	22.56	21.80	22.21
			12	6	23.00	22.51	21.79	22.17
			12	11	23.00	22.44	21.81	22.39
			25	0	23.00	22.67	21.81	22.19
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	25.00	24.77	24.13	23.59
			1	24	25.00	24.70	23.99	24.21
			1	49	25.00	24.55	24.06	24.34
			25	0	23.50	23.40	22.66	22.66
			25	12	23.50	23.44	22.84	22.91
			25	24	23.50	23.41	22.60	23.18
			50	0	23.50	23.38	22.82	22.91
		16QAM	1	0	24.00	23.57	22.67	23.09
			1	24	24.00	23.47	22.86	23.45
			1	49	24.00	23.31	22.84	23.79
			25	0	23.00	22.71	21.97	21.73
			25	12	23.00	22.60	21.94	21.85
			25	24	23.00	22.56	21.94	22.14
			50	0	22.50	22.41	21.78	21.91
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	24.50	24.44	23.85	23.68
			1	37	24.50	24.36	23.93	23.76
			1	74	24.50	24.13	23.79	24.42
			36	0	23.50	23.27	22.65	22.50
			36	18	23.50	23.24	22.77	22.66
			36	37	23.50	23.08	22.74	23.13

			75	0	23.50	23.19	22.69	22.80
		16QAM	1	0	24.00	23.97	23.45	23.09
			1	37	24.00	23.89	23.11	23.26
			1	74	24.00	23.58	23.18	23.84
			36	0	22.50	22.39	21.65	21.55
			36	18	22.50	22.27	21.70	21.82
			36	37	22.50	22.14	21.68	22.20
			75	0	22.50	22.48	21.77	21.91

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	24.50	24.46	23.91	23.74
			1	49	24.50	24.39	23.80	23.59
			1	99	24.50	24.00	23.88	24.41
			50	0	23.50	23.42	22.70	22.68
			50	24	23.50	23.13	22.64	22.63
			50	49	23.50	23.08	22.57	22.92
			100	0	23.50	23.25	22.63	22.59
		16QAM	1	0	24.50	24.05	22.77	23.39
			1	49	24.50	23.86	22.67	23.05
			1	99	24.50	23.43	22.70	23.81
			50	0	22.50	22.36	21.82	21.64
			50	24	22.50	22.22	21.70	21.58
			50	49	22.50	22.03	21.67	21.94
			100	0	22.50	22.33	21.84	21.61

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19957/1710.7	20175/1732.5	20393/1754.3
LTE Band 4	1.4MHz	QPSK	1	0	23.00	21.84	22.46	22.49
			1	2	23.00	21.89	22.32	22.50
			1	5	23.00	21.91	22.23	22.57
			3	0	22.50	22.12	22.05	22.40
			3	1	22.50	22.20	22.12	22.34
			3	2	22.50	22.13	22.05	22.39
			6	0	21.50	21.04	20.96	21.25
		16QAM	1	0	22.50	22.18	21.63	22.01
			1	2	22.50	22.14	21.52	21.98
			1	5	22.50	22.17	21.48	21.93

			3	0	22.00	21.29	21.24	21.58
			3	1	22.00	21.38	21.16	21.66
			3	2	22.00	21.27	21.21	21.62
			6	0	20.50	19.82	19.99	20.21
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19965/1711.5	20175/1732.5	20385/1753.5
LTE Band 4	3MHz	QPSK	1	0	23.00	22.30	22.12	22.51
			1	7	23.00	22.42	22.40	22.63
			1	14	23.00	22.13	22.32	22.55
			8	0	21.50	21.12	21.12	21.37
			8	4	21.50	21.24	21.08	21.41
			8	7	21.50	21.00	21.03	21.40
			15	0	21.50	21.17	21.02	21.38
		16QAM	1	0	22.50	22.14	22.24	22.12
			1	7	22.50	22.24	22.18	22.08
			1	14	22.50	22.21	22.07	21.94
			8	0	21.00	20.26	20.28	20.54
			8	4	21.00	20.31	20.12	20.47
			8	7	21.00	20.31	20.13	20.45
			15	0	20.50	20.32	20.22	20.47
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19975/1712.5	20175/1732.5	20375/1752.5
LTE Band 4	5MHz	QPSK	1	0	23.00	22.39	22.42	22.78
			1	12	23.00	22.40	22.27	22.72
			1	24	23.00	22.46	22.57	22.74
			12	0	22.00	21.14	21.14	21.50
			12	6	22.00	12.75	21.03	21.56
			12	11	22.00	-47.46	21.10	21.46
			25	0	21.50	-47.45	21.07	21.44
		16QAM	1	0	22.50	21.60	21.67	22.09
			1	12	22.50	22.23	21.70	21.87
			1	24	22.50	22.39	21.62	21.79
			12	0	21.00	20.30	20.14	20.58
			12	6	21.00	20.23	20.14	20.41
			12	11	21.00	20.27	20.20	20.53

			25	0	21.00	20.12	20.38	20.64
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20000/1715	20175/1732.5	20350/1750
LTE Band 4	10MHz	QPSK	1	0	23.00	22.14	22.09	22.41
			1	24	23.00	22.38	22.36	22.61
			1	49	23.00	22.48	22.39	22.39
			25	0	22.00	21.05	21.06	21.37
			25	12	22.00	13.93	21.11	21.62
			25	24	22.00	-44.45	21.13	21.52
			50	0	22.00	-44.48	21.11	21.53
		16QAM	1	0	23.00	22.15	22.15	22.70
			1	24	23.00	22.37	22.22	22.64
			1	49	23.00	22.36	22.06	22.60
			25	0	21.00	20.41	20.19	20.44
			25	12	21.00	20.54	20.12	20.65
			25	24	21.00	20.57	20.17	20.44
			50	0	21.00	20.37	20.19	20.60
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20025/1717.5	20175/1732.5	20325/1747.5
LTE Band 4	15MHz	QPSK	1	0	23.00	22.23	22.49	22.21
			1	37	23.00	22.40	22.35	22.70
			1	74	23.00	22.33	22.40	22.46
			36	0	22.00	21.35	21.10	21.42
			36	18	22.00	21.21	21.17	21.45
			36	37	22.00	21.46	21.01	21.66
			75	0	21.50	21.38	21.06	21.43
		16QAM	1	0	23.00	22.15	21.83	22.33
			1	37	23.00	22.43	21.60	22.50
			1	74	23.00	22.48	21.69	22.44
			36	0	20.50	20.26	20.22	20.42
			36	18	20.50	20.32	20.18	20.42
			36	37	20.50	20.39	20.19	20.45
			75	0	21.00	20.38	20.12	20.51
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		

			RB Size	RB Offset		20050/1720	20175/1732.5	20300/1745
LTE Band 4	20MHz	QPSK	1	0	23.00	22.43	22.25	22.33
			1	49	23.00	22.68	22.04	22.60
			1	99	23.00	22.30	22.34	22.74
			50	0	22.00	21.26	21.11	21.35
			50	24	22.00	21.48	21.09	21.54
			50	49	22.00	21.41	21.10	21.53
			100	0	21.50	21.30	21.27	21.45
		16QAM	1	0	23.00	21.78	22.31	22.21
			1	49	23.00	21.87	22.22	22.46
			1	99	23.00	21.69	22.46	22.54
			50	0	21.00	20.36	20.27	20.38
			50	24	21.00	20.40	20.20	20.57
			50	49	21.00	20.40	20.21	20.61
			100	0	20.50	20.34	20.27	20.45

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20407/824.7	20525/836.5	20643/848.3
LTE Band 5	1.4MHz	QPSK	1	0	22.00	21.91	21.76	21.93
			1	2	22.00	21.93	21.63	21.96
			1	5	22.00	-54.11	21.70	21.94
			3	0	22.50	-11.70	21.77	22.02
			3	1	22.50	-54.07	21.77	22.15
			3	2	22.50	-54.12	21.69	22.08
			6	0	21.50	21.40	21.21	21.12
		16QAM	1	0	22.50	22.24	21.63	21.77
			1	2	22.50	22.27	22.00	21.94
			1	5	22.50	22.24	21.98	22.02
			3	0	22.00	21.67	21.40	21.22
			3	1	22.00	21.70	21.47	21.22
			3	2	22.00	21.57	21.41	21.26
			6	0	20.50	20.24	19.92	19.93
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20415/825.5	20525/836.5	20635/847.5
LTE Band 5	3MHz	QPSK	1	0	22.50	22.10	22.04	22.15
			1	7	22.50	22.02	21.93	22.10
			1	14	22.50	22.09	21.94	22.14

			8	0	21.50	21.44	20.74	21.01
			8	4	21.50	21.48	21.27	21.01
			8	7	21.50	21.05	21.20	21.18
			15	0	21.50	21.33	21.21	20.97
		16QAM	1	0	22.50	22.41	21.23	21.31
			1	7	22.50	22.36	21.61	21.54
			1	14	22.50	21.82	21.55	21.53
			8	0	21.00	20.60	19.87	20.10
			8	4	21.00	20.58	20.32	20.15
			8	7	21.00	20.17	20.32	20.18
			15	0	21.00	20.60	20.29	20.14
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20425/826.5	20525/836.5	20625/846.5
LTE Band 5	5MHz	QPSK	1	0	22.50	22.31	21.78	21.97
			1	12	22.50	22.30	21.75	22.00
			1	24	22.50	22.17	21.73	22.14
			12	0	21.50	21.36	20.81	20.87
			12	6	21.50	21.02	21.29	20.96
			12	11	21.50	20.97	21.10	20.97
			25	0	21.50	21.06	21.26	20.96
		16QAM	1	0	22.50	21.96	21.59	21.96
			1	12	22.50	21.49	22.19	21.93
			1	24	22.50	21.89	22.16	22.17
			12	0	20.50	20.47	19.77	19.95
			12	6	20.50	20.01	20.24	20.09
			12	11	20.50	19.97	20.26	20.03
			25	0	20.50	20.22	20.16	19.90
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20450/829	20525/836.5	20600/844
LTE Band 5	10MHz	QPSK	1	0	22.50	22.07	22.13	22.03
			1	24	22.50	21.85	21.74	22.17
			1	49	22.50	21.68	21.85	22.36
			25	0	21.50	20.98	20.84	21.26
			25	12	21.50	21.28	21.12	21.01
			25	24	21.50	20.76	21.27	20.99
			50	0	21.50	21.33	21.15	20.85
		16QAM	1	0	22.50	22.48	21.70	21.70

			1	24	22.50	22.23	22.05	21.29
			1	49	22.50	22.18	22.33	21.60
			25	0	21.00	19.90	19.72	20.57
			25	12	21.00	20.34	20.28	20.10
			25	24	21.00	19.80	20.19	20.11
			50	0	20.50	20.34	20.30	19.86

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	25.00	24.08	24.66	24.84
			1	12	25.00	24.00	24.64	24.78
			1	24	25.00	24.11	24.63	24.09
			12	0	24.00	23.15	23.51	23.64
			12	6	24.00	23.05	23.53	23.61
			12	11	24.00	22.97	23.45	23.60
			25	0	24.00	23.05	23.49	23.57
		16QAM	1	0	24.50	24.35	24.05	24.19
			1	12	24.50	24.28	24.02	24.16
			1	24	24.50	24.34	24.07	23.82
			12	0	23.00	22.28	22.70	22.82
			12	6	23.00	22.20	22.60	22.72
			12	11	23.00	22.23	22.64	22.57
			25	0	23.00	22.16	22.69	22.81
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	25.00	24.34	24.48	24.82
			1	24	25.00	24.41	24.45	24.70
			1	49	25.00	24.43	24.60	24.52
			25	0	24.00	23.16	23.52	23.70
			25	12	24.00	23.16	23.46	23.51
			25	24	24.00	23.27	23.53	23.56
			50	0	24.00	23.23	23.39	23.58
		16QAM	1	0	25.00	23.80	24.56	24.86
			1	24	25.00	23.77	24.49	24.71
			1	49	25.00	23.85	24.43	24.17
			25	0	23.00	22.44	22.48	22.73
			25	12	23.00	22.44	22.51	22.67
			25	24	23.00	22.46	22.48	22.60

			50	0	23.00	22.24	22.48	22.69
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	25.00	24.19	24.35	24.70
			1	37	25.00	24.18	24.47	24.75
			1	74	25.00	24.07	24.41	24.47
			36	0	24.00	23.27	23.53	23.67
			36	18	24.00	23.31	23.36	23.57
			36	37	24.00	23.24	23.35	23.54
			75	0	24.00	23.05	23.45	23.65
		16QAM	1	0	25.00	24.33	24.56	24.95
			1	37	25.00	24.53	24.57	24.94
			1	74	25.00	24.33	24.51	24.04
			36	0	23.00	22.16	22.45	22.81
			36	18	23.00	22.17	22.57	22.66
			36	37	23.00	22.03	22.46	22.61
			75	0	23.00	22.37	22.56	22.82
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	25.00	24.35	24.41	24.74
			1	49	25.00	24.30	24.56	24.92
			1	99	25.00	24.15	24.53	24.60
			50	0	24.00	23.20	23.43	23.67
			50	24	24.00	23.06	23.43	23.73
			50	49	24.00	23.10	23.45	23.54
			100	0	24.00	23.12	23.34	23.68
		16QAM	1	0	24.50	23.74	23.88	24.15
			1	49	24.50	23.76	24.17	24.27
			1	99	24.50	23.41	24.08	23.97
			50	0	23.00	22.22	22.48	22.77
			50	24	23.00	22.22	22.55	22.81
			50	49	23.00	22.07	22.43	22.60
			100	0	23.00	22.24	22.50	22.77

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23017/699.7	23095/707.5	23173/715.3

LTE Band 12	1.4MHz	QPSK	1	0	24.50	23.55	24.08	23.65
			1	2	24.50	23.51	24.08	23.62
			1	5	24.50	23.54	24.06	23.63
			3	0	24.00	23.70	23.90	23.84
			3	1	24.00	23.78	23.83	23.78
			3	2	24.00	23.72	23.90	23.74
			6	0	23.00	22.63	22.79	22.67
		16QAM	1	0	23.50	23.07	22.76	23.26
			1	2	23.50	23.22	22.77	23.28
			1	5	23.50	23.28	22.71	23.20
			3	0	23.50	23.08	23.11	22.95
			3	1	23.50	22.96	23.04	22.87
			3	2	23.50	22.88	23.09	23.05
			6	0	22.00	21.39	21.65	21.43
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23025/700.5	23095/707.5	23165/714.5
LTE Band 12	3MHz	QPSK	1	0	24.50	23.95	24.13	23.92
			1	7	24.50	23.97	24.09	23.87
			1	14	24.50	24.01	24.09	23.81
			8	0	23.00	22.66	22.91	22.91
			8	4	23.00	22.76	22.94	22.86
			8	7	23.00	22.77	22.90	22.75
			15	0	23.00	22.71	22.93	22.85
		16QAM	1	0	23.00	22.74	22.92	22.76
			1	7	23.00	22.69	22.77	22.55
			1	14	23.00	22.70	22.81	22.59
			8	0	22.50	21.86	22.00	21.89
			8	4	22.50	21.84	22.04	21.84
			8	7	22.50	21.92	22.03	21.83
			15	0	22.50	21.76	22.02	21.79
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23035/701.5	23095/707.5	23155/713.5
LTE Band 12	5MHz	QPSK	1	0	24.50	23.72	24.11	24.19
			1	12	24.50	23.73	24.13	24.17
			1	24	24.50	23.89	24.12	23.96
			12	0	23.00	22.77	22.86	22.97
			12	6	23.00	22.85	22.99	22.96

			12	11	23.00	22.82	22.90	22.74
			25	0	23.00	22.74	22.92	22.88
		16QAM	1	0	23.50	23.12	22.89	22.70
			1	12	23.50	23.18	22.73	22.86
			1	24	23.50	23.32	22.74	22.59
			12	0	22.00	21.72	21.95	21.86
			12	6	22.00	21.73	21.89	21.80
			12	11	22.00	21.74	21.92	21.69
			25	0	22.50	21.71	22.07	21.91

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23060/704	23095/707.5	23130/711
LTE Band 12	10MHz	QPSK	1	0	24.50	24.06	23.89	23.91
			1	24	24.50	24.24	23.86	23.80
			1	49	24.50	24.20	23.83	23.80
			25	0	23.00	22.75	22.88	22.83
			25	12	23.00	-30.57	22.82	22.85
			25	24	23.00	-46.43	22.85	22.75
			50	0	23.00	-46.44	22.87	22.83
		16QAM	1	0	23.50	23.18	23.34	23.38
			1	24	23.50	23.21	23.31	23.13
			1	49	23.50	23.16	23.21	23.09
			25	0	22.00	21.69	21.81	21.92
			25	12	22.00	21.65	21.82	21.78
			25	24	22.00	21.81	21.79	21.70
			50	0	22.00	21.67	21.83	21.79

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23755/706.5	23790/710	23825/713.5
LTE Band 17	5MHz	QPSK	1	0	24.50	23.78	24.11	24.18
			1	12	24.50	23.69	24.01	24.09
			1	24	24.50	23.78	24.09	23.94
			12	0	23.00	22.99	22.91	22.98
			12	6	23.00	22.86	22.72	22.91
			12	11	23.00	22.85	22.92	22.84
			25	0	23.00	22.96	22.88	22.89
		16QAM	1	0	23.00	22.75	22.89	22.96
			1	12	23.00	22.79	22.83	22.78

			1	24	23.00	22.67	22.82	22.57
			12	0	22.00	21.92	22.00	21.81
			12	6	22.00	21.84	21.81	21.77
			12	11	22.00	21.85	21.92	21.73
			25	0	22.50	22.12	21.98	21.96
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		23780/709	23790/710	23800/711
LTE Band 17	10MHz	QPSK	1	0	24.50	24.16	23.93	23.82
			1	24	24.50	24.08	23.89	23.84
			1	49	24.50	24.06	23.72	23.69
			25	0	23.00	22.93	22.90	22.81
			25	12	23.00	22.95	22.77	22.79
			25	24	23.00	22.94	22.87	22.78
			50	0	23.00	22.86	22.85	22.72
		16QAM	1	0	23.50	22.82	23.30	23.13
			1	24	23.50	22.77	23.28	23.18
			1	49	23.50	22.81	23.11	23.13
			25	0	22.50	22.08	21.88	21.83
			25	12	22.50	22.09	21.84	21.73
			25	24	22.50	22.11	21.83	21.71
			50	0	22.00	21.87	21.81	21.75

7.4. WLAN & Bluetooth Output Power

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11b	1	2412	14.00	13.11
	6	2437	14.00	13.94
	11	2462	14.00	12.61
802.11g	1	2412	12.50	11.31
	6	2437	12.50	12.43
	11	2462	12.50	11.30
802.11n HT20	1	2412	12.50	11.34
	6	2437	12.50	12.41
	11	2462	12.50	11.30
802.11n HT40	3	2422	12.50	10.59
	6	2437	12.50	12.17
	9	2452	12.50	10.75

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	36	5180	12.00	11.34
	40	5200	12.00	11.74
	48	5240	12.00	11.66
802.11n HT20	36	5180	12.00	11.28
	40	5200	12.00	11.95
	48	5240	12.00	11.65
802.11n HT40	38	5190	12.50	11.81
	46	5230	12.50	12.30
802.11ac VHT20	36	5180	12.00	11.18
	40	5200	12.00	11.88
	48	5240	12.00	11.64
802.11ac VHT40	38	5190	12.50	11.80
	46	5230	12.50	12.39
802.11ac VHT80	42	5210	12.00	11.96

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	149	5745	11.50	11.36
	157	5785	11.50	10.70
	165	5825	11.50	10.05
802.11n HT20	149	5745	11.50	11.31
	157	5785	11.50	10.42
	165	5825	11.50	9.91
802.11n HT40	151	5755	11.00	10.89
	159	5795	11.00	9.92
802.11ac VHT20	149	5745	11.50	11.13
	157	5785	11.50	10.62
	165	5825	11.50	9.68
802.11ac VHT40	151	5755	11.00	10.86
	159	5795	11.00	9.80
802.11ac VHT80	155	5775	10.50	10.37

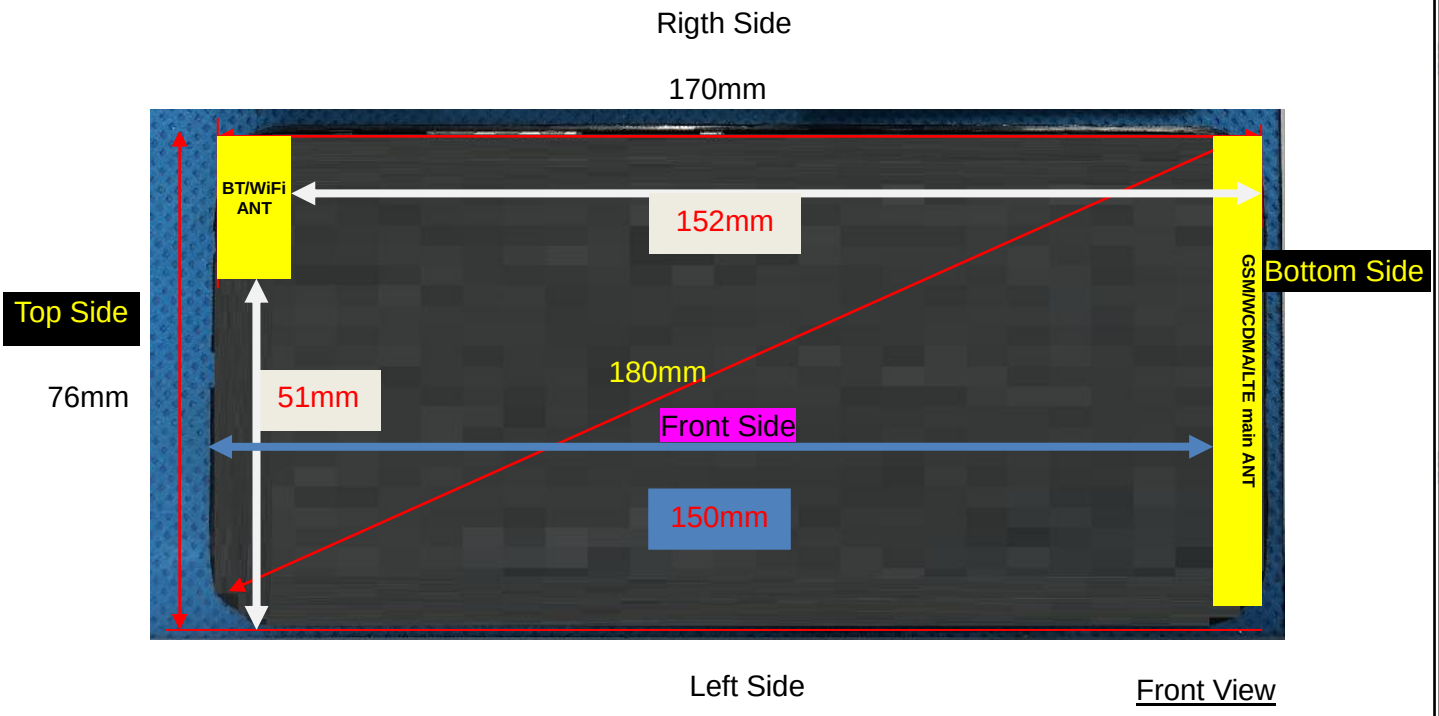
NOTE: Power measurement results of WLAN 5.8G.

BR+EDR	Output Power (dBm)				
	Data Rates	Tune-up (dBm)	Channel		
			0CH	39CH	78CH
	1M	4	2.38	3.70	2.12
	2M	5	3.01	4.63	3.25
	3M	5	3.20	4.69	3.05

BLE	Output Power (dBm)				
	Data Rates	Tune-up (dBm)	Channe		
			0CH	19CH	39CH
	1M	2.5	2.23	0.58	0.63
	2M	0.5	-1.07	0.48	-1.04

NOTE: Power measurement results of Bluetooth.

8. Antenna Location



Note: Since the confidentiality request of EUT，the antenna location example diagram see as above.

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

10. 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}	P_{max}	Distance	f	Calculation	SAR Exclusion	SAR test

	(dBm)	(mW)	(mm)	(GHz)	Result	threshold	exclusion
Bluetooth	5.00	3.162	5	2.480	0.996	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	Head	5.00	3.16	5	2.48	7.5	0.133
Bluetooth	Body	5.00	3.16	10	2.48	7.5	0.066
Bluetooth	Hotspot	5.00	3.16	10	2.48	7.5	0.066

NOTE: Estimated SAR calculation for Bluetooth

11. SAR Results

11.1. SAR measurement Result

11.1.1. SAR measurement Result of GSM850

Test Position of Head	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(±5%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	189/836.4	GPRS(GMSK 2TS)	0.161	0.123	-1.05	30.43	31.00	0.184	2024/12/11	#1
Left Tilt 15 Degree	189/836.4	GPRS(GMSK 2TS)	0.092	0.070	-2.97	30.43	31.00	0.105	2024/12/11	
Right Cheek	189/836.4	GPRS(GMSK 2TS)	0.152	0.113	3.45	30.43	31.00	0.173	2024/12/11	
Right Tilt 15 Degree	189/836.4	GPRS(GMSK 2TS)	0.076	0.056	2.61	30.43	31.00	0.087	2024/12/11	

NOTE: Head SAR test results of GSM850.

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	189/836.4	GPRS(GMSK 2TS)	0.234	0.154	-3.32	30.29	31.00	0.276	2024/11/05	
Back Side	189/836.4	GPRS(GMSK 2TS)	0.331	0.227	-2.55	30.29	31.00	0.390	2024/11/05	

NOTE: Body-Worn SAR test results of GSM850

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	189/836.4	GPRS(GMSK 2TS)	0.149	0.089	1.64	30.43	31.00	0.170	2024/12/11	
Back Side	189/836.4	GPRS(GMSK 2TS)	0.220	0.133	-2.10	30.43	31.00	0.251	2024/12/11	#2
Left Side	189/836.4	GPRS(GMSK 2TS)	0.096	0.056	0.47	30.43	31.00	0.109	2024/12/11	
Right Side	189/836.4	GPRS(GMSK 2TS)	0.143	0.086	0.64	30.43	31.00	0.163	2024/12/11	
Bottom Side	189/836.4	GPRS(GMSK 2TS)	0.161	0.093	0.28	30.43	31.00	0.184	2024/12/11	

NOTE: Hotspot SAR test results of GSM850

11.1.2. SAR measurement Result of GSM1900

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	661/1880	GPRS(GMSK 3TS)	0.185	0.112	4.24	25.00	26.00	0.233	2024/12/09	#3
Left Tilt 15 Degree	661/1880	GPRS(GMSK 3TS)	0.096	0.058	2.33	25.00	26.00	0.121	2024/12/09	
Right Cheek	661/1880	GPRS(GMSK 3TS)	0.169	0.101	-1.74	25.00	26.00	0.213	2024/12/09	
Right	661/1880	GPRS(GMSK	0.091	0.053	2.13	25.00	26.00	0.115	2024/12/09	

Tilt 15 Degree		3TS)								

NOTE: Head SAR test results of GSM1900

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	661/1880	GPRS(GMSK 3TS)	0.387	0.218	-2.54	25.00	26.00	0.487	2024/12/09	
Back Side	661/1880	GPRS(GMSK 3TS)	0.402	0.231	-1.43	25.00	26.00	0.506	2024/12/09	

NOTE: Body-Worn SAR test results of GSM1900

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	661/1880	GPRS(GMSK 3TS)	0.387	0.218	-2.54	25.00	26.00	0.487	2024/12/09	
Back Side	661/1880	GPRS(GMSK 3TS)	0.402	0.231	-1.43	25.00	26.00	0.506	2024/12/09	
Left Side	661/1880	GPRS(GMSK 3TS)	0.210	0.117	-1.20	25.00	26.00	0.264	2024/12/09	
Right Side	661/1880	GPRS(GMSK 3TS)	0.090	0.051	-0.50	25.00	26.00	0.113	2024/12/09	
Bottom Side	661/1880	GPRS(GMSK 3TS)	0.503	0.287	-1.24	25.00	26.00	0.633	2024/12/09	#4

NOTE: Hotspot SAR test results of GSM1900

11.1.3. SAR measurement Result of WCDMA Band 2

Test Position of Head	Test channel /Freq	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	9400/1880	RMC12.2K	0.156	0.095	1.94	22.55	23.00	0.173	2024/12/09	#5
Left Tilt 15 Degree	9400/1880	RMC12.2K	0.092	0.055	-0.56	22.55	23.00	0.102	2024/12/09	
Right	9400/1880	RMC12.2K	0.138	0.081	2.50	22.55	23.00	0.153	2024/12/09	

Cheek										
Right Tilt 15 Degree	9400/1880	RMC12.2K	0.071	0.042	3.45	22.55	23.00	0.079	2024/12/09	

NOTE: Head SAR test results of WCDMA Band 2

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	9400/1880	RMC12.2K	0.378	0.210	0.28	22.55	23.00	0.419	2024/12/09	
Back Side	9400/1880	RMC12.2K	0.372	0.209	-2.60	22.55	23.00	0.413	2024/12/09	

NOTE: Body-Worn SAR test results of WCDMA Band 2

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	9400/1880	RMC12.2K	0.378	0.210	0.28	22.55	23.00	0.419	2024/12/09	
Back Side	9400/1880	RMC12.2K	0.372	0.209	-2.60	22.55	23.00	0.413	2024/12/09	
Left Side	9400/1880	RMC12.2K	0.195	0.108	3.56	22.55	23.00	0.216	2024/12/09	
Right Side	9400/1880	RMC12.2K	0.080	0.044	-3.76	22.55	23.00	0.089	2024/12/09	
Bottom Side	9400/1880	RMC12.2K	0.465	0.260	-1.74	22.55	23.00	0.516	2024/12/09	#6

NOTE: Hotspot SAR test results of WCDMA Band 2

11.1.4. SAR measurement Result of WCDMA Band 4

Test Position of Head	Test channel /Freq	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	1413/1732.6	RMC12.2K	0.124	0.082	0.33	23.44	24.00	0.141	2024/12/06	#7
Left Tilt 15 Degree	1413/1732.6	RMC12.2K	0.066	0.043	0.16	23.44	24.00	0.075	2024/12/06	
Right Cheek	1413/1732.6	RMC12.2K	0.117	0.077	-3.87	23.44	24.00	0.133	2024/12/06	
Right Tilt 15	1413/1732.6	RMC12.2K	0.063	0.040	-3.86	23.44	24.00	0.072	2024/12/06	

Degree										

NOTE: Head SAR test results of WCDMA Band 4

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	1413/1732.6	RMC12.2K	0.369	0.209	0.07	23.44	24.00	0.420	2024/12/06	
Back Side	1413/1732.6	RMC12.2K	0.389	0.229	-3.66	23.44	24.00	0.443	2024/12/06	

NOTE: Body-Worn SAR test results of WCDMA Band 4

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	1413/1732.6	RMC12.2K	0.369	0.209	0.07	23.44	24.00	0.420	2024/12/06	
Back Side	1413/1732.6	RMC12.2K	0.389	0.229	-3.66	23.44	24.00	0.443	2024/12/06	
Left Side	1413/1732.6	RMC12.2K	0.195	0.110	-2.14	23.44	24.00	0.222	2024/12/06	
Right Side	1413/1732.6	RMC12.2K	0.080	0.045	1.53	23.44	24.00	0.091	2024/12/06	
Bottom Side	1413/1732.6	RMC12.2K	0.498	0.292	-1.70	23.44	24.00	0.567	2024/12/06	#8

NOTE: Hotspot SAR test results of WCDMA Band 4

11.1.5. SAR measurement Result of WCDMA Band 5

Test Position of Head	Test channel /Freq	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	4182/836.4	RMC12.2K	0.211	0.164	-2.96	23.35	23.50	0.218	2024/12/11	#9
Left Tilt 15 Degree	4182/836.4	RMC12.2K	0.111	0.085	-3.14	23.35	23.50	0.115	2024/12/11	
Right Cheek	4182/836.4	RMC12.2K	0.190	0.142	3.30	23.35	23.50	0.197	2024/12/11	

Right Tilt 15 Degree	4182/836.4	RMC12.2K	0.093	0.072	3.85	23.35	23.50	0.096	2024/12/11	

NOTE: Head SAR test results of WCDMA Band 5

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	4182/836.4	RMC12.2K	0.160	0.095	-1.75	23.35	23.50	0.166	2024/12/11	
Back Side	4182/836.4	RMC12.2K	0.289	0.176	-2.18	23.35	23.50	0.299	2024/12/11	#10

NOTE: Body-Worn SAR test results of WCDMA Band 5

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	4182/836.4	RMC12.2K	0.160	0.095	-1.75	23.35	23.50	0.166	2024/12/11	
Back Side	4182/836.4	RMC12.2K	0.289	0.176	-2.18	23.35	23.50	0.299	2024/12/11	#10
Left Side	4182/836.4	RMC12.2K	0.128	0.075	2.77	23.35	23.50	0.132	2024/12/11	
Right Side	4182/836.4	RMC12.2K	0.189	0.112	3.95	23.35	23.50	0.196	2024/12/11	
Bottom Side	4182/836.4	RMC12.2K	0.203	0.122	1.60	23.35	23.50	0.210	2024/12/11	

NOTE: Hotspot SAR test results of WCDMA Band 5

11.1.6. SAR measurement Result of LTE Band 2

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	18900/1880	20M QPSK(1,0)	0.201	0.122	-4.47	23.91	24.50	0.230	2024/12/09	#17
Left Tilt 15	18900/1880	20M QPSK(1,0)	0.119	0.072	3.78	23.91	24.50	0.136	2024/12/09	

Degree										
Right Cheek	18900/1880	20M QPSK(1,0)	0.181	0.110	0.65	23.91	24.50	0.207	2024/12/09	
Right Tilt 15 Degree	18900/1880	20M QPSK(1,0)	0.082	0.048	1.23	23.91	24.50	0.094	2024/12/09	
50%RB										
Left Cheek	18900/1880	20M QPSK(50,0)	0.105	0.062	-2.91	22.70	23.50	0.126	2024/12/09	
Left Tilt 15 Degree	18900/1880	20M QPSK(50,0)	0.061	0.043	-4.10	22.70	23.50	0.073	2024/12/09	
Right Cheek	18900/1880	20M QPSK(50,0)	0.097	0.059	0.89	22.70	23.50	0.117	2024/12/09	
Right Tilt 15 Degree	18900/1880	20M QPSK(50,0)	0.049	0.026	1.85	22.70	23.50	0.059	2024/12/09	

NOTE: Head SAR test results of LTE Band 2

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	18900/1880	20M QPSK(1,0)	0.459	0.275	-2.50	23.91	24.50	0.526	2024/12/09	
Back Side	18900/1880	20M QPSK(1,0)	0.501	0.300	0.33	23.91	24.50	0.574	2024/12/09	
50%RB										
Front Side	18900/1880	20M QPSK(50,0)	0.236	0.164	3.29	22.70	23.50	0.284	2024/12/09	
Back Side	18900/1880	20M QPSK(50,0)	0.267	0.172	2.07	22.70	23.50	0.321	2024/12/09	

NOTE: Body-Worn SAR test results of LTE Band 2

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

Hotspot with 10mm								(W/Kg)		
1RB										
Front Side	18900/1880	20M QPSK(1,0)	0.459	0.275	-2.50	23.91	24.50	0.526	2024/12/09	
Back Side	18900/1880	20M QPSK(1,0)	0.501	0.300	0.33	23.91	24.50	0.574	2024/12/09	
Left Side	18900/1880	20M QPSK(1,0)	0.260	0.153	-3.50	23.91	24.50	0.298	2024/12/09	
Right Side	18900/1880	20M QPSK(1,0)	0.108	0.061	0.87	23.91	24.50	0.124	2024/12/09	
Bottom Side	18900/1880	20M QPSK(1,0)	0.615	0.350	0.26	23.91	24.50	0.704	2024/12/09	#18
50%RB										
Front Side	18900/1880	20M QPSK(50,0)	0.236	0.164	3.29	22.70	23.50	0.284	2024/12/09	
Back Side	18900/1880	20M QPSK(50,0)	0.267	0.172	2.07	22.70	23.50	0.321	2024/12/09	
Left Side	18900/1880	20M QPSK(50,0)	0.133	0.085	1.36	22.70	23.50	0.160	2024/12/09	
Right Side	18900/1880	20M QPSK(50,0)	0.062	0.031	-2.58	22.70	23.50	0.075	2024/12/09	
Bottom Side	18900/1880	20M QPSK(50,0)	0.321	0.187	-0.76	22.70	23.50	0.386	2024/12/09	

NOTE: Hotspot SAR test results of LTE Band 2

11.1.7. SAR measurement Result of LTE Band 4

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	20175/1732.5	20M QPSK(1,99)	0.137	0.090	1.28	22.34	23.00	0.159	2024/12/06	#19
Left Tilt 15 Degree	20175/1732.5	20M QPSK(1,99)	0.072	0.045	3.68	22.34	23.00	0.084	2024/12/06	
Right	20175/1732.5	20M	0.124	0.081	-2.45	22.34	23.00	0.144	2024/12/06	

Cheek		QPSK(1,99)								
Right Tilt 15 Degree	20175/1732.5	20M QPSK(1,99)	0.067	0.042	3.12	22.34	23.00	0.078	2024/12/06	
50%RB										
Left Cheek	20175/1732.5	20M QPSK(50,0)	0.074	0.046	4.42	21.10	22.00	0.091	2024/12/06	
Left Tilt 15 Degree	20175/1732.5	20M QPSK(50,0)	0.039	0.024	4.00	21.10	22.00	0.048	2024/12/06	
Right Cheek	20175/1732.5	20M QPSK(50,0)	0.063	0.044	1.17	21.10	22.00	0.078	2024/12/06	
Right Tilt 15 Degree	20175/1732.5	20M QPSK(50,0)	0.034	0.022	3.94	21.10	22.00	0.042	2024/12/06	

NOTE: Head SAR test results of LTE Band 4

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	20175/1732.5	20M QPSK(1,99)	0.513	0.319	-1.94	22.34	23.00	0.597	2024/12/06	
Back Side	20175/1732.5	20M QPSK(1,99)	0.557	0.346	-2.33	22.34	23.00	0.648	2024/12/06	
50%RB										
Front Side	20175/1732.5	20M QPSK(50,0)	0.258	0.162	0.51	21.10	22.00	0.317	2024/12/06	
Back Side	20175/1732.5	20M QPSK(50,0)	0.285	0.201	-1.96	21.10	22.00	0.351	2024/12/06	

NOTE: Body-Worn SAR test results of LTE Band 4

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

1RB										
Front Side	20175/1732.5	20M QPSK(1,99)	0.513	0.319	-1.94	22.34	23.00	0.597	2024/12/06	
Back Side	20175/1732.5	20M QPSK(1,99)	0.557	0.346	-2.33	22.34	23.00	0.648	2024/12/06	
Left Side	20175/1732.5	20M QPSK(1,99)	0.280	0.174	3.83	22.34	23.00	0.326	2024/12/06	
Right Side	20175/1732.5	20M QPSK(1,99)	0.118	0.072	-0.55	22.34	23.00	0.137	2024/12/06	
Bottom Side	20175/1732.5	20M QPSK(1,99)	0.707	0.417	-0.25	22.34	23.00	0.823	2024/12/06	
Bottom Side	20050/1720	20M QPSK(1,99)	0.685	0.378	3.74	22.30	23.00	0.805	2024/12/06	
Bottom Side	20300/1745	20M QPSK(1,99)	0.725	0.431	2.84	22.74	23.00	0.770	2024/12/06	#20
Bottom Repeated	20300/1745	20M QPSK(1,99)	0.714	0.422	-0.21	22.74	23.00	0.758	2024/12/06	
50%RB										
Front Side	20175/1732.5	20M QPSK(50,0)	0.258	0.162	0.51	21.10	22.00	0.317	2024/12/06	
Back Side	20175/1732.5	20M QPSK(50,0)	0.285	0.201	-1.96	21.10	22.00	0.351	2024/12/06	
Left Side	20175/1732.5	20M QPSK(50,0)	0.159	0.100	0.00	21.10	22.00	0.196	2024/12/06	
Right Side	20175/1732.5	20M QPSK(50,0)	0.070	0.041	3.04	21.10	22.00	0.086	2024/12/06	
Bottom Side	20175/1732.5	20M QPSK(50,0)	0.390	0.243	-3.67	21.10	22.00	0.480	2024/12/06	
100%RB										
Bottom Side	20175/1732.5	20M QPSK(100,0)	0.254	0.125	-3.61	21.27	21.50	0.268	2024/12/06	

NOTE: Hotspot SAR test results of LTE Band 4

11.1.8. SAR measurement Result of LTE Band 5

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	20525/836.5	10M QPSK(1,0)	0.204	0.156	3.68	22.13	22.50	0.222	2024/12/11	#21
Left Tilt 15 Degree	20525/836.5	10M QPSK(1,0)	0.109	0.080	-0.12	22.13	22.50	0.119	2024/12/11	

Right Cheek	20525/836.5	10M QPSK(1,0)	0.187	0.140	3.79	22.13	22.50	0.204	2024/12/11	
Right Tilt 15 Degree	20525/836.5	10M QPSK(1,0)	0.100	0.076	-0.42	22.13	22.50	0.109	2024/12/11	
50%RB										
Left Cheek	20525/836.5	10M QPSK(25,24)	0.106	0.080	2.75	21.27	21.50	0.112	2024/12/11	
Left Tilt 15 Degree	20525/836.5	10M QPSK(25,24)	0.055	0.046	4.99	21.27	21.50	0.058	2024/12/11	
Right Cheek	20525/836.5	10M QPSK(25,24)	0.107	0.083	3.20	21.27	21.50	0.113	2024/12/11	
Right Tilt 15 Degree	20525/836.5	10M QPSK(25,24)	0.056	0.044	-4.87	21.27	21.50	0.059	2024/12/11	

NOTE: Head SAR test results of LTE Band 5

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	20525/836.5	10M QPSK(1,0)	0.182	0.106	0.70	22.13	22.50	0.198	2024/12/11	
Back Side	20525/836.5	10M QPSK(1,0)	0.322	0.197	-1.28	22.13	22.50	0.351	2024/12/11	#22
50%RB										
Front Side	20525/836.5	10M QPSK(25,24)	0.107	0.055	-3.68	21.27	21.50	0.113	2024/12/11	
Back Side	20525/836.5	10M QPSK(25,24)	0.189	0.101	-1.64	21.27	21.50	0.199	2024/12/11	

NOTE: Body-Worn SAR test results of LTE Band 5

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

Hotspot with 10mm								(W/Kg)		
1RB										
Front Side	20525/836.5	10M QPSK(1,0)	0.182	0.106	0.70	22.13	22.50	0.198	2024/12/11	
Back Side	20525/836.5	10M QPSK(1,0)	0.322	0.197	-1.28	22.13	22.50	0.351	2024/12/11	#22
Left Side	20525/836.5	10M QPSK(1,0)	0.144	0.087	3.10	22.13	22.50	0.157	2024/12/11	
Right Side	20525/836.5	10M QPSK(1,0)	0.228	0.134	-0.19	22.13	22.50	0.248	2024/12/11	
Bottom Side	20525/836.5	10M QPSK(1,0)	0.231	0.141	-3.73	22.13	22.50	0.252	2024/12/11	
50%RB										
Front Side	20525/836.5	10M QPSK(25,24)	0.107	0.055	-3.68	21.27	21.50	0.113	2024/12/11	
Back Side	20525/836.5	10M QPSK(25,24)	0.189	0.101	-1.64	21.27	21.50	0.199	2024/12/11	
Left Side	20525/836.5	10M QPSK(25,24)	0.073	0.050	-3.16	21.27	21.50	0.077	2024/12/11	
Right Side	20525/836.5	10M QPSK(25,24)	0.121	0.078	-0.40	21.27	21.50	0.128	2024/12/11	
Bottom Side	20525/836.5	10M QPSK(25,24)	0.136	0.076	-2.17	21.27	21.50	0.143	2024/12/11	

NOTE: Hotspot SAR test results of LTE Band 5

11.1.9. SAR measurement Result of LTE Band 7

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	21100/2535	20M QPSK(1,49)	0.114	0.060	1.91	24.56	25.00	0.126	2024/12/16	#23
Left Tilt 15 Degree	21100/2535	20M QPSK(1,49)	0.064	0.034	-0.26	24.56	25.00	0.071	2024/12/16	
Right	21100/2535	20M	0.101	0.051	-2.98	24.56	25.00	0.112	2024/12/16	

Cheek		QPSK(1,49)								
Right Tilt 15 Degree	21100/2535	20M QPSK(1,49)	0.054	0.027	1.50	24.56	25.00	0.060	2024/12/16	
50%RB										
Left Cheek	21100/2535	20M QPSK(50,49)	0.065	0.031	-2.37	23.45	24.00	0.074	2024/12/16	
Left Tilt 15 Degree	21100/2535	20M QPSK(50,49)	0.036	0.018	-4.09	23.45	24.00	0.041	2024/12/16	
Right Cheek	21100/2535	20M QPSK(50,49)	0.060	0.029	-0.28	23.45	24.00	0.068	2024/12/16	
Right Tilt 15 Degree	21100/2535	20M QPSK(50,49)	0.030	0.015	0.96	23.45	24.00	0.034	2024/12/16	

NOTE: Head SAR test results of LTE Band 7

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	21100/2535	20M QPSK(1,49)	0.221	0.105	-2.83	24.56	25.00	0.245	2024/12/16	
Back Side	21100/2535	20M QPSK(1,49)	0.658	0.321	3.63	24.56	25.00	0.728	2024/12/16	#24
50%RB										
Front Side	21100/2535	20M QPSK(50,49)	0.126	0.054	0.07	23.45	24.00	0.143	2024/12/16	
Back Side	21100/2535	20M QPSK(50,49)	0.349	0.174	-1.88	23.45	24.00	0.396	2024/12/16	

NOTE: Body-Worn SAR test results of LTE Band 7

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

with 10mm										
1RB										
Front Side	21100/2535	20M QPSK(1,49)	0.221	0.105	-2.83	24.56	25.00	0.245	2024/12/16	
Back Side	21100/2535	20M QPSK(1,49)	0.658	0.321	3.63	24.56	25.00	0.728	2024/12/16	#24
Left Side	21100/2535	20M QPSK(1,49)	0.082	0.039	-1.03	24.56	25.00	0.091	2024/12/16	
Right Side	21100/2535	20M QPSK(1,49)	0.143	0.066	2.16	24.56	25.00	0.158	2024/12/16	
Bottom Side	21100/2535	20M QPSK(1,49)	0.650	0.317	-3.75	24.56	25.00	0.719	2024/12/16	
50%RB										
Front Side	21100/2535	20M QPSK(50,49)	0.126	0.054	0.07	23.45	24.00	0.143	2024/12/16	
Back Side	21100/2535	20M QPSK(50,49)	0.349	0.174	-1.88	23.45	24.00	0.396	2024/12/16	
Left Side	21100/2535	20M QPSK(50,49)	0.046	0.020	-2.05	23.45	24.00	0.052	2024/12/16	
Right Side	21100/2535	20M QPSK(50,49)	0.085	0.033	-0.47	23.45	24.00	0.096	2024/12/16	
Bottom Side	21100/2535	20M QPSK(50,49)	0.338	0.176	1.03	23.45	24.00	0.384	2024/12/16	

NOTE: Hotspot SAR test results of LTE Band 7

11.1.10. SAR measurement Result of LTE Band 12

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	23095/707.5	10M QPSK(1,0)	0.200	0.165	2.40	23.89	24.50	0.230	2024/12/13	#25
Left Tilt 15 Degree	23095/707.5	10M QPSK(1,0)	0.115	0.091	-1.94	23.89	24.50	0.132	2024/12/13	
Right Cheek	23095/707.5	10M QPSK(1,0)	0.186	0.152	0.54	23.89	24.50	0.214	2024/12/13	

Right Tilt 15 Degree	23095/707.5	10M QPSK(1,0)	0.092	0.076	1.72	23.89	24.50	0.106	2024/12/13	
50%RB										
Left Cheek	23095/707.5	10M QPSK(25,0)	0.105	0.095	-4.34	22.88	23.00	0.108	2024/12/13	
Left Tilt 15 Degree	23095/707.5	10M QPSK(25,0)	0.068	0.053	3.68	22.88	23.00	0.070	2024/12/13	
Right Cheek	23095/707.5	10M QPSK(25,0)	0.093	0.084	-2.63	22.88	23.00	0.096	2024/12/13	
Right Tilt 15 Degree	23095/707.5	10M QPSK(25,0)	0.053	0.045	-4.38	22.88	23.00	0.054	2024/12/13	

NOTE: Head SAR test results of LTE Band 12

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Front Side	23095/707.5	10M QPSK(1,0)	0.262	0.203	-2.37	23.89	24.50	0.302	2024/12/13	
Back Side	23095/707.5	10M QPSK(1,0)	0.315	0.251	-0.35	23.89	24.50	0.363	2024/12/13	#26
50%RB										
Front Side	23095/707.5	10M QPSK(25,0)	0.157	0.113	-4.49	22.88	23.00	0.161	2024/12/13	
Back Side	23095/707.5	10M QPSK(25,0)	0.167	0.132	1.34	22.88	23.00	0.172	2024/12/13	

NOTE: Body-Worn SAR test results of LTE Band 12

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Front	23095/707.5	10M	0.262	0.203	-2.37	23.89	24.50	0.302	2024/12/13	

Side		QPSK(1,0)								
Back Side	23095/707.5	10M QPSK(1,0)	0.315	0.251	-0.35	23.89	24.50	0.363	2024/12/13	#26
Left Side	23095/707.5	10M QPSK(1,0)	0.240	0.184	0.37	23.89	24.50	0.276	2024/12/13	
Right Side	23095/707.5	10M QPSK(1,0)	0.304	0.230	3.38	23.89	24.50	0.350	2024/12/13	
Bottom Side	23095/707.5	10M QPSK(1,0)	0.118	0.089	1.88	23.89	24.50	0.136	2024/12/13	
50%RB										
Front Side	23095/707.5	10M QPSK(25,0)	0.157	0.113	-4.49	22.88	23.00	0.161	2024/12/13	
Back Side	23095/707.5	10M QPSK(25,0)	0.167	0.132	1.34	22.88	23.00	0.172	2024/12/13	
Left Side	23095/707.5	10M QPSK(25,0)	0.134	0.107	0.69	22.88	23.00	0.138	2024/12/13	
Right Side	23095/707.5	10M QPSK(25,0)	0.159	0.117	1.16	22.88	23.00	0.163	2024/12/13	
Bottom Side	23095/707.5	10M QPSK(25,0)	0.064	0.050	0.41	22.88	23.00	0.066	2024/12/13	

NOTE: Hotspot SAR test results of LTE Band 12

11.1.11. SAR measurement Result of LTE Band 17

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Left Cheek	23790/710	10M QPSK(1,0)	0.214	0.173	4.99	23.93	24.50	0.244	2024/12/13	#27
Left Tilt 15 Degree	23790/710	10M QPSK(1,0)	0.108	0.085	-2.01	23.93	24.50	0.123	2024/12/13	
Right Cheek	23790/710	10M QPSK(1,0)	0.189	0.153	-2.66	23.93	24.50	0.216	2024/12/13	
Right Tilt 15 Degree	23790/710	10M QPSK(1,0)	0.103	0.079	1.55	23.93	24.50	0.117	2024/12/13	
50%RB										
Left	23790/710	10M	0.111	0.099	-0.08	22.90	23.00	0.114	2024/12/13	

Cheek		QPSK(25,0)								
Left Tilt 15 Degree	23790/710	10M QPSK(25,0)	0.057	0.043	2.44	22.90	23.00	0.058	2024/12/13	
Right Cheek	23790/710	10M QPSK(25,0)	0.101	0.091	3.67	22.90	23.00	0.103	2024/12/13	
Right Tilt 15 Degree	23790/710	10M QPSK(25,0)	0.057	0.040	2.81	22.90	23.00	0.058	2024/12/13	

NOTE: Head SAR test results of LTE Band 17

Test Position of Body-Worn with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Front Side	23790/710	10M QPSK(1,0)	0.270	0.212	-2.15	23.93	24.50	0.308	2024/12/13	
Back Side	23790/710	10M QPSK(1,0)	0.324	0.259	-1.28	23.93	24.50	0.369	2024/12/13	#28
50%RB										
Front Side	23790/710	10M QPSK(25,0)	0.147	0.120	3.98	22.90	23.00	0.150	2024/12/13	
Back Side	23790/710	10M QPSK(25,0)	0.174	0.132	-1.53	22.90	23.00	0.178	2024/12/13	

NOTE: Body-Worn SAR test results of LTE Band 17

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
1RB										
Front Side	23790/710	10M QPSK(1,0)	0.270	0.212	-2.15	23.93	24.50	0.308	2024/12/13	
Back Side	23790/710	10M QPSK(1,0)	0.324	0.259	-1.28	23.93	24.50	0.369	2024/12/13	#28
Left Side	23790/710	10M QPSK(1,0)	0.263	0.200	1.60	23.93	24.50	0.300	2024/12/13	

Right Side	23790/710	10M QPSK(1,0)	0.323	0.248	-2.38	23.93	24.50	0.368	2024/12/13	
Bottom Side	23790/710	10M QPSK(1,0)	0.126	0.099	3.49	23.93	24.50	0.144	2024/12/13	
50%RB										
Front Side	23790/710	10M QPSK(25,0)	0.147	0.120	3.98	22.90	23.00	0.150	2024/12/13	
Back Side	23790/710	10M QPSK(25,0)	0.174	0.132	-1.53	22.90	23.00	0.178	2024/12/13	
Left Side	23790/710	10M QPSK(25,0)	0.152	0.104	0.67	22.90	23.00	0.156	2024/12/13	
Right Side	23790/710	10M QPSK(25,0)	0.162	0.140	2.75	22.90	23.00	0.166	2024/12/13	
Bottom Side	23790/710	10M QPSK(25,0)	0.071	0.055	-3.65	22.90	23.00	0.073	2024/12/13	

NOTE: Hotspot SAR test results of LTE Band 17

11.1.12. SAR measurement Result of WLAN2.4G

Test Position of Head	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Left Cheek	6/2437	802.11b	0.377	0.181	0.39	13.94	14.00	0.382	2024/12/12	#15
Left Tilt 15 Degree	6/2437	802.11b	0.202	0.092	-2.55	13.94	14.00	0.205	2024/12/12	
Right Cheek	6/2437	802.11b	0.347	0.160	-2.98	13.94	14.00	0.352	2024/12/12	
Right Tilt 15 Degree	6/2437	802.11b	0.172	0.082	-2.66	13.94	14.00	0.174	2024/12/12	

NOTE: Head SAR test results of WLAN2.4G

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

Front Side	6/2437	802.11b	0.102	0.057	2.41	13.94	14.00	0.103	2024/12/12	
Back Side	6/2437	802.11b	0.122	0.066	-0.66	13.94	14.00	0.124	2024/12/12	#16

NOTE: Body-worn SAR test results of WLAN2.4G

Test Position of Hotspot with 10mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1-g	10-g						
Front Side	6/2437	802.11b	0.102	0.057	2.41	13.94	14.00	0.103	2024/12/12	
Back Side	6/2437	802.11b	0.122	0.066	-0.66	13.94	14.00	0.124	2024/12/12	#16
Right Side	6/2437	802.11b	0.094	0.050	-0.46	13.94	14.00	0.095	2024/12/12	
Top Side	6/2437	802.11b	0.074	0.039	-3.83	13.94	14.00	0.075	2024/12/12	

NOTE: Hotspot SAR test results of WLAN2.4G

11.1.13. SAR measurement Result of WLAN5.2G

Test Position of Head	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						
Left Cheek	46/5230	802.11ac VHT40	1.027	0.424	2.96	12.39	12.50	1.053	2024/12/11	#12
Left Tilt 15 Degree	46/5230	802.11ac VHT40	0.571	0.233	-1.20	12.39	12.50	0.586	2024/12/11	
Right Cheek	46/5230	802.11ac VHT40	0.938	0.368	-1.26	12.39	12.50	0.962	2024/12/11	
Right Tilt 15 Degree	46/5230	802.11ac VHT40	0.432	0.177	3.26	12.39	12.50	0.443	2024/12/11	
Left Cheek	38/5190	802.11ac VHT40	0.845	0.269	-2.54	11.80	12.50	0.993	2024/12/11	
Left Cheek Repeated	38/5190	802.11ac VHT40	1.015	0.418	2.87	12.39	12.50	1.041	2024/12/11	

NOTE: Head SAR test results of WLAN5.2G

Test Position of Body-Worn with 10mm	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						
Front Side	46/5230	802.11ac VHT40	0.330	0.144	-3.55	12.39	12.50	0.338	2024/12/11	
Back Side	46/5230	802.11ac VHT40	0.410	0.188	-1.96	12.39	12.50	0.421	2024/12/11	

NOTE: Body-worn SAR test results of WLAN5.2G

Test Position of Hotspot with 10mm	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						
Front Side	46/5230	802.11ac VHT40	0.330	0.144	-3.55	12.39	12.50	0.338	2024/12/11	
Back Side	46/5230	802.11ac VHT40	0.410	0.188	-1.96	12.39	12.50	0.421	2024/12/11	
Right Side	46/5230	802.11ac VHT40	0.409	0.184	-0.01	12.39	12.50	0.419	2024/12/11	
Top Side	46/5230	802.11ac VHT40	0.505	0.229	3.96	12.39	12.50	0.518	2024/12/11	#13

NOTE: Hotspot SAR test results of WLAN5.2G

11.1.14. SAR measurement Result of WLAN5.8G

Test Position of Head	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						
Left Cheek	149/5745	802.11ac VHT20	0.602	0.216	0.99	11.13	11.50	0.656	2024/11/30	#11
Left Tilt 15 Degree	149/5745	802.11ac VHT20	0.350	0.124	3.14	11.13	11.50	0.381	2024/11/30	

Right Cheek	149/5745	802.11ac VHT20	0.530	0.184	2.38	11.13	11.50	0.577	2024/11/30	
Right Tilt 15 Degree	149/5745	802.11ac VHT20	0.284	0.102	2.73	11.13	11.50	0.309	2024/11/30	

NOTE: Head SAR test results of WLAN5.8G

Test Position of Body-Worn with 10mm	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						
Front Side	149/5745	802.11ac VHT20	0.263	0.109	2.31	11.13	11.50	0.286	2024/11/30	
Back Side	149/5745	802.11ac VHT20	0.300	0.130	-0.22	11.13	11.50	0.327	2024/11/30	

NOTE: Body-worn SAR test results of WLAN5.8G

Test Position of Hotspot with 10mm	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						
Front Side	149/5745	802.11ac VHT20	0.263	0.109	2.31	11.13	11.50	0.286	2024/11/30	
Back Side	149/5745	802.11ac VHT20	0.300	0.130	-0.22	11.13	11.50	0.327	2024/11/30	
Right Side	149/5745	802.11ac VHT20	0.295	0.121	-1.91	11.13	11.50	0.321	2024/11/30	
Top Side	149/5745	802.11ac VHT20	0.392	0.169	2.74	11.13	11.50	0.427	2024/11/30	#14

NOTE: Hotspot SAR test results of WLAN5.8G

11.2. 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}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	DTS			
Head	Left Cheek	0.244	0.382	0.626	N/A	N/A
	Left Tilt 15 Degree	0.136	0.205	0.341	N/A	N/A
	Right Cheek	0.216	0.352	0.568	N/A	N/A
	Right Tilt 15 Degree	0.117	0.174	0.291	N/A	N/A
Body-Worn	Front Side	0.597	0.103	0.700	N/A	N/A
	Back Side	0.728	0.124	0.852	N/A	N/A
Hotspot	Front Side	0.597	0.103	0.700	N/A	N/A
	Back Side	0.728	0.124	0.852	N/A	N/A
	Left Side	0.326	N/A	0.326	N/A	N/A
	Right Side	0.368	0.095	0.463	N/A	N/A
	Top Side	N/A	0.075	0.075	N/A	N/A
	Bottom Side	0.823	N/A	0.823	N/A	N/A

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	NII			
Head	Left Cheek	0.244	1.053	1.297	N/A	N/A
	Left Tilt 15 Degree	0.136	0.586	0.722	N/A	N/A
	Right Cheek	0.216	0.962	1.178	N/A	N/A
	Right Tilt 15 Degree	0.117	0.443	0.56	N/A	N/A
Body-Worn	Front Side	0.597	0.338	0.935	N/A	N/A
	Back Side	0.728	0.421	1.149	N/A	N/A
Hotspot	Front Side	0.597	0.338	0.935	N/A	N/A
	Back Side	0.728	0.421	1.149	N/A	N/A
	Left Side	0.326	N/A	0.326	N/A	N/A
	Right Side	0.368	0.419	0.787	N/A	N/A
	Top Side	N/A	0.518	0.518	N/A	N/A

	Bottom Side	0.823	N/A	0.823	N/A	N/A

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	DSS			
Head	Left Cheek	0.244	0.133	0.377	N/A	N/A
	Left Tilt 15 Degree	0.136	0.133	0.269	N/A	N/A
	Right Cheek	0.216	0.133	0.349	N/A	N/A
	Right Tilt 15 Degree	0.117	0.133	0.25	N/A	N/A
Body-Worn	Front Side	0.597	0.066	0.663	N/A	N/A
	Back Side	0.728	0.066	0.794	N/A	N/A
Hotspot	Front Side	0.597	0.066	0.663	N/A	N/A
	Back Side	0.728	0.066	0.794	N/A	N/A
	Left Side	0.326	N/A	0.326	N/A	N/A
	Right Side	0.368	0.066	0.434	N/A	N/A
	Top Side	N/A	0.066	0.066	N/A	N/A
	Bottom Side	0.823	N/A	0.823	N/A	N/A

12. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

13. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 750MHz
MEASUREMENT 2 System Performance Check - 835MHz
MEASUREMENT 3 System Performance Check - 1800MHz
MEASUREMENT 4 System Performance Check - 1900MHz
MEASUREMENT 5 System Performance Check - 2450MHz
MEASUREMENT 6 System Performance Check - 2600MHz
MEASUREMENT 7 System Performance Check - 5200MHz
MEASUREMENT 8 System Performance Check - 5800MHz

MEASUREMENT 1

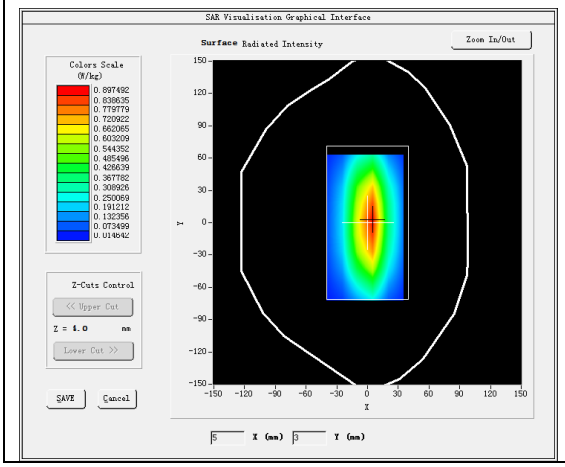
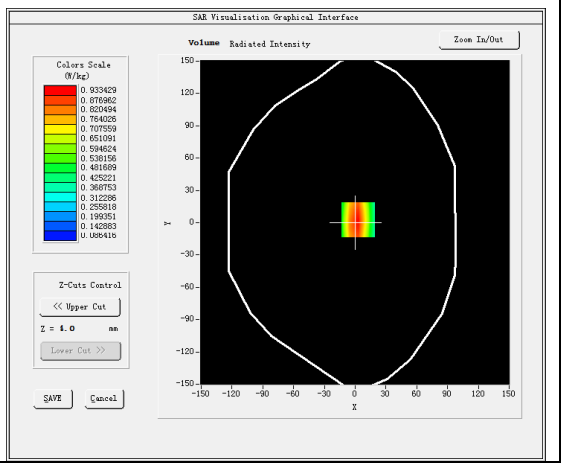
Date of measurement: 13/12/2024

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	CW750
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

Frequency (MHz)	750.000000
Relative permittivity (real part)	40.772003
Relative permittivity (imaginary part)	21.548546
Conductivity (S/m)	0.897856
Variation (%)	-0.560000

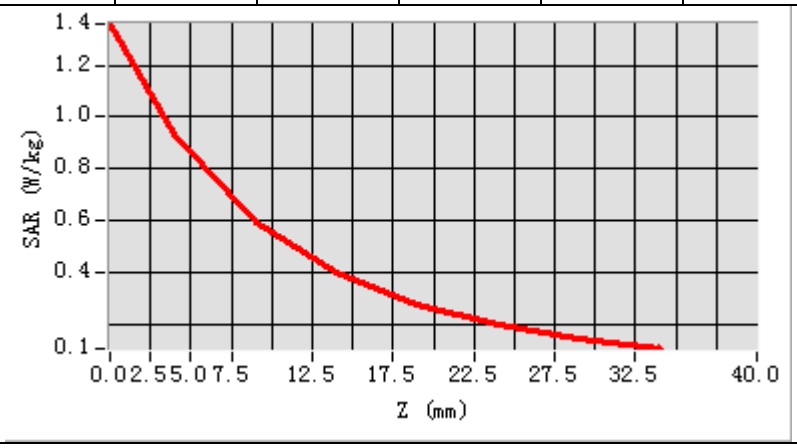
SURFACE SAR	VOLUME SAR
	

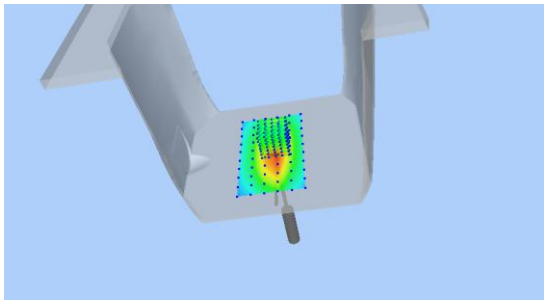
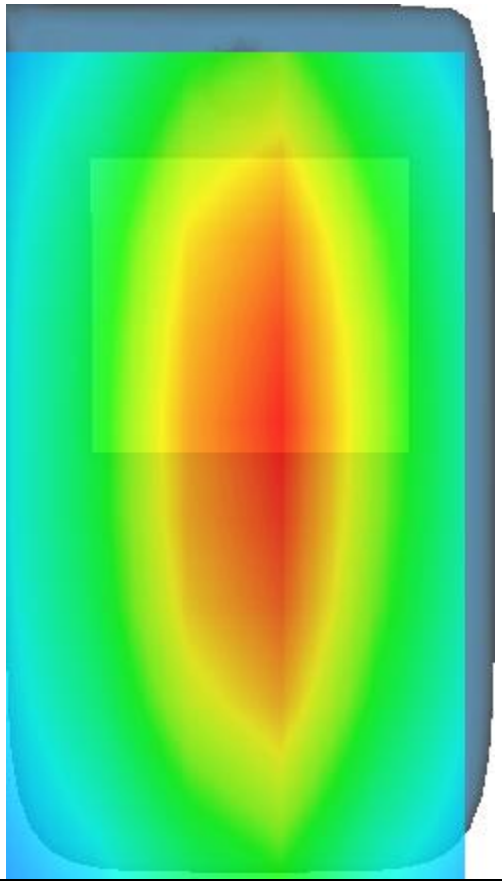
Maximum location: X=3.00, Y=3.00

SAR Peak: 1.36 W/kg

SAR 10g (W/Kg)	0.553716
SAR 1g (W/Kg)	0.905030

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3581	0.9334	0.5924	0.4006	0.2795	0.1985	0.1470



3D screen shot	Hot spot position
	

MEASUREMENT 2

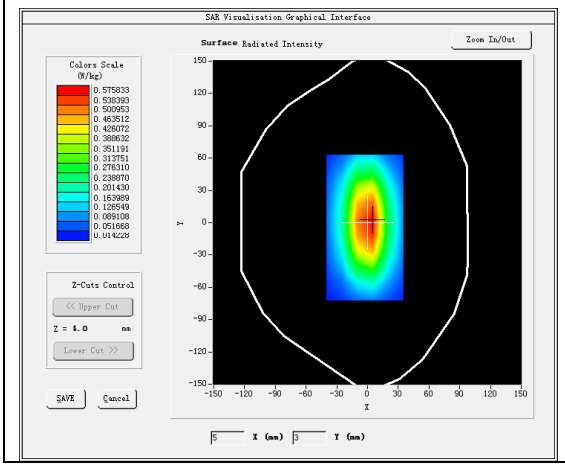
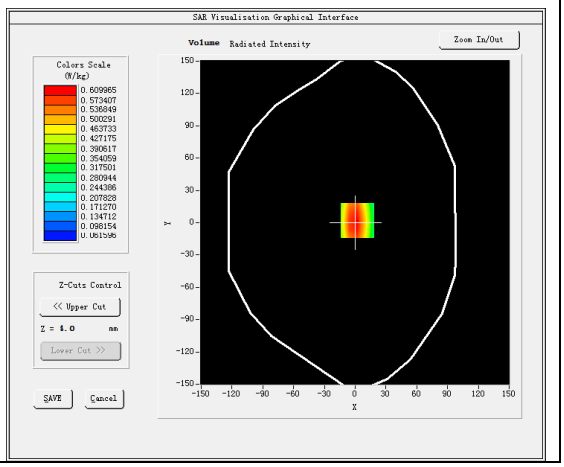
Date of measurement: 11/12/2024

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	CW835
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

Frequency (MHz)	835.000000
Relative permittivity (real part)	41.827047
Relative permittivity (imaginary part)	19.592773
Conductivity (S/m)	0.908887
Variation (%)	-0.250000

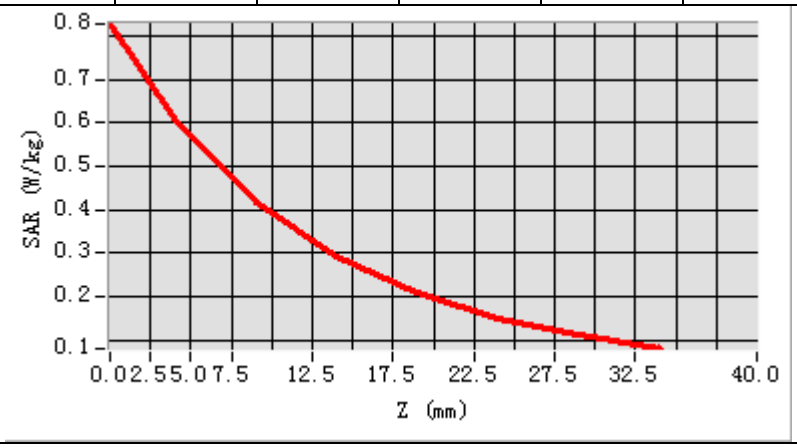
SURFACE SAR	VOLUME SAR
	

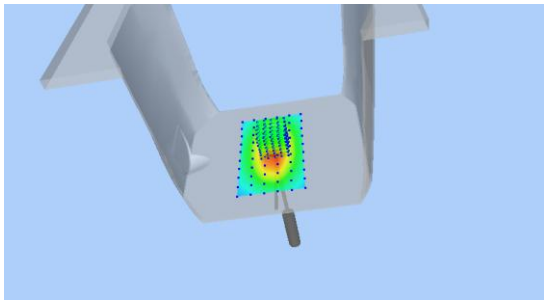
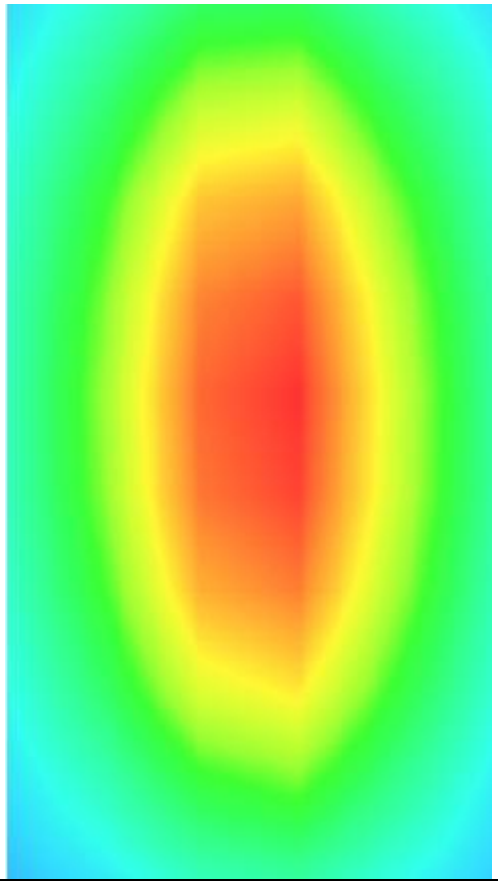
Maximum location: X=2.00, Y=2.00

SAR Peak: 0.84 W/kg

SAR 10g (W/Kg)	0.383559
SAR 1g (W/Kg)	0.595418

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.8285	0.6100	0.4185	0.2920	0.2086	0.1510	0.1102



3D screen shot	Hot spot position
	

MEASUREMENT 3

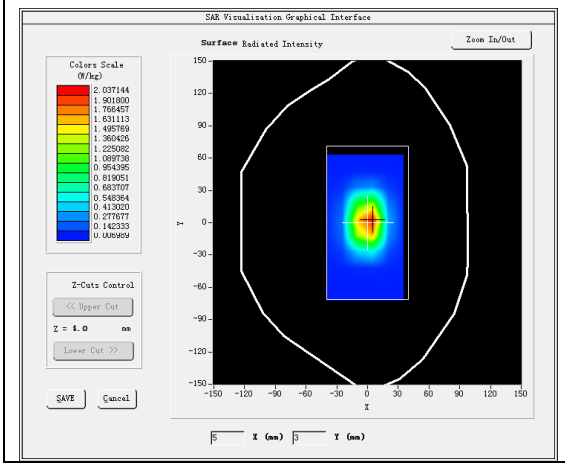
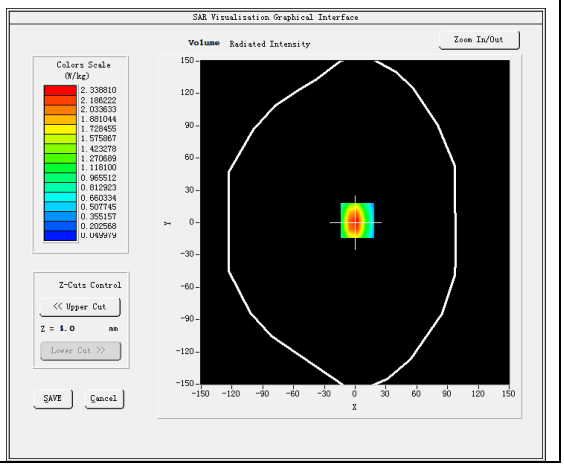
Date of measurement: 6/12/2024

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	CW1800
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

Frequency (MHz)	1800.000000
Relative permittivity (real part)	38.970183
Relative permittivity (imaginary part)	13.747547
Conductivity (S/m)	1.374755
Variation (%)	-1.030000

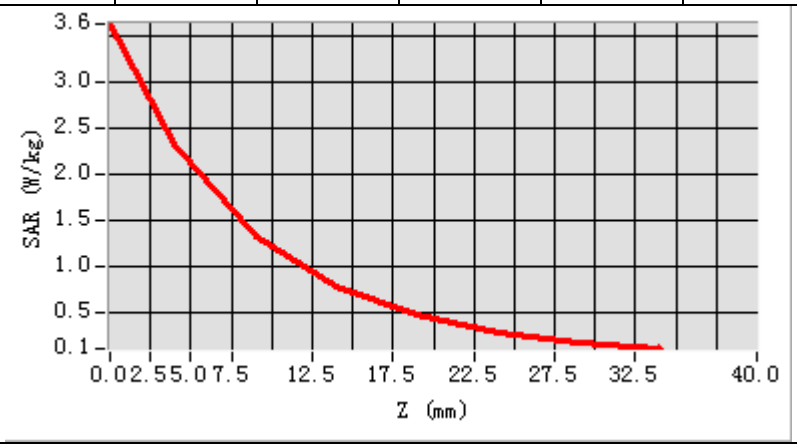
SURFACE SAR	VOLUME SAR
	

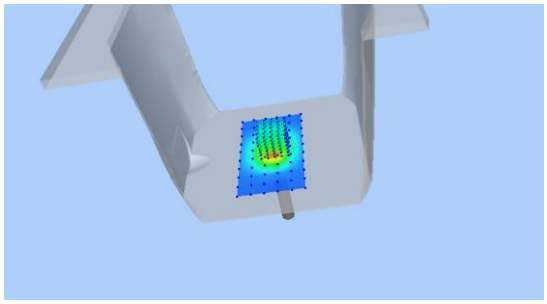
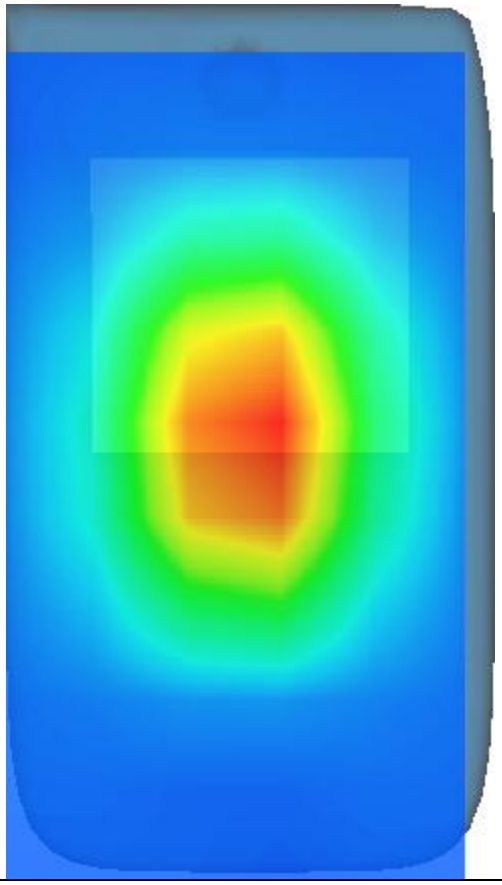
Maximum location: X=2.00, Y=2.00

SAR Peak: 3.77 W/kg

SAR 10g (W/Kg)	1.175927
SAR 1g (W/Kg)	2.272606

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	3.6321	2.3388	1.3298	0.7822	0.4767	0.2922	0.1855



3D screen shot	Hot spot position
	

MEASUREMENT 4

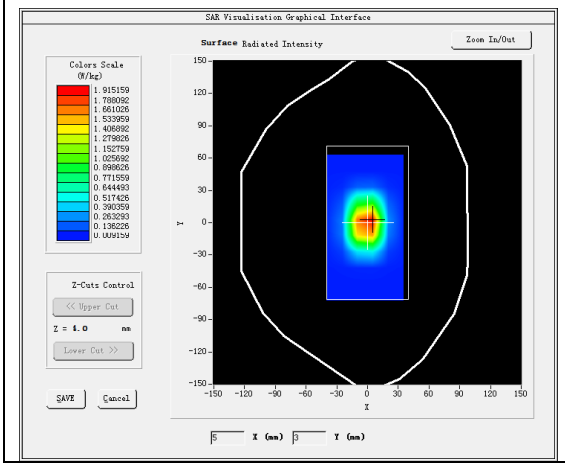
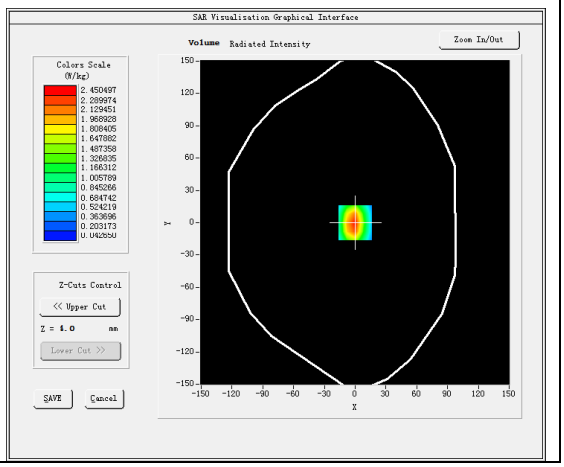
Date of measurement: 9/12/2024

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	2.57

B. SAR Measurement Results

Frequency (MHz)	1900.000000
Relative permittivity (real part)	38.457178
Relative permittivity (imaginary part)	13.792131
Conductivity (S/m)	1.455836
Variation (%)	-0.210000

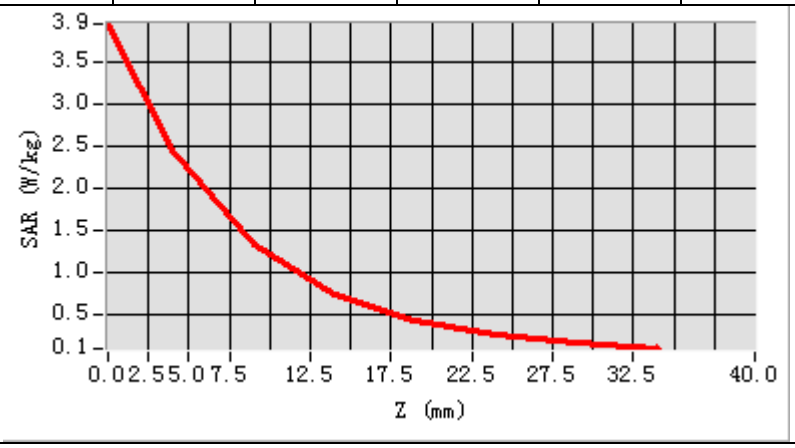
SURFACE SAR	VOLUME SAR
	

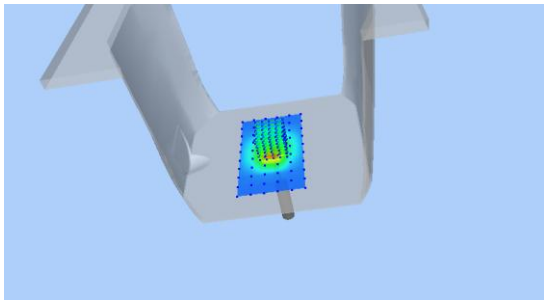
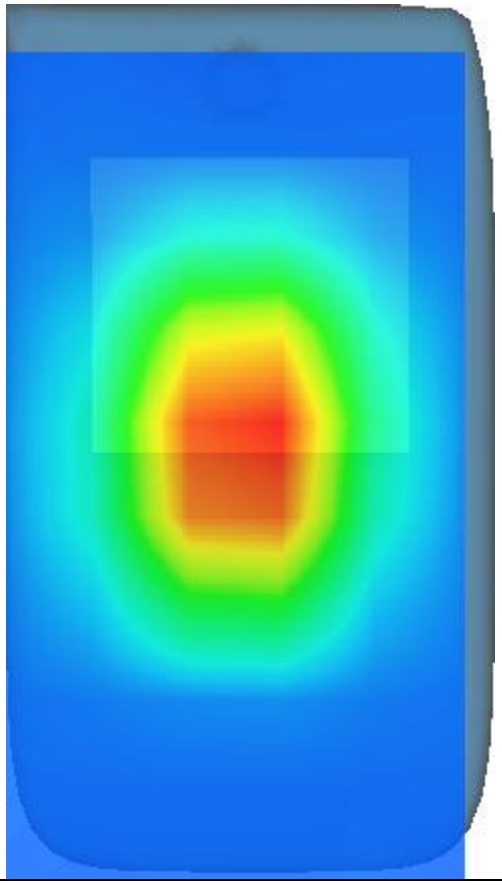
Maximum location: X=0.00, Y=0.00

SAR Peak: 3.97 W/kg

SAR 10g (W/Kg)	1.181231
SAR 1g (W/Kg)	2.396499

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	3.9415	2.4505	1.3195	0.7376	0.4282	0.2542	0.1538



3D screen shot	Hot spot position
	

MEASUREMENT 5

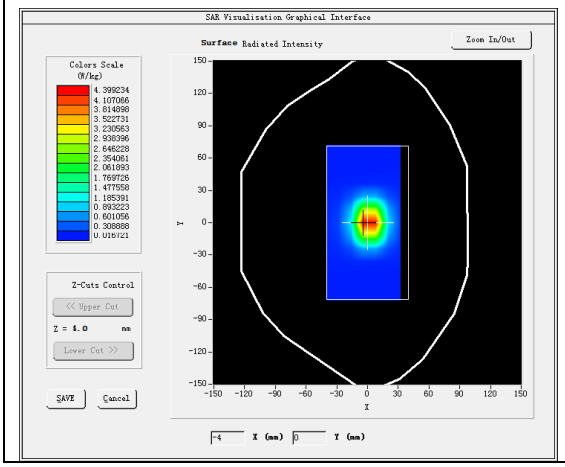
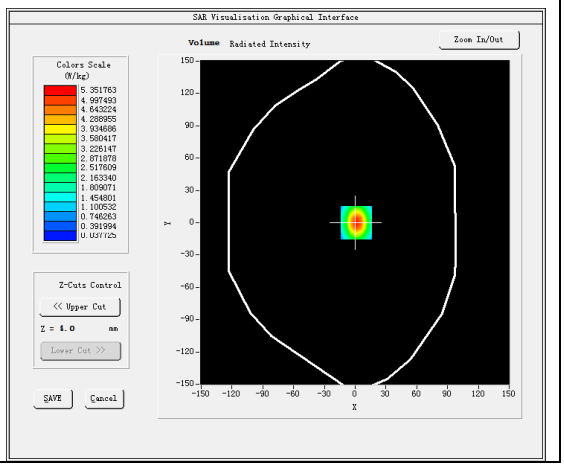
Date of measurement: 12/12/2024

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	2.74

B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative permittivity (real part)	37.814490
Relative permittivity (imaginary part)	13.088029
Conductivity (S/m)	1.781426
Variation (%)	-0.120000

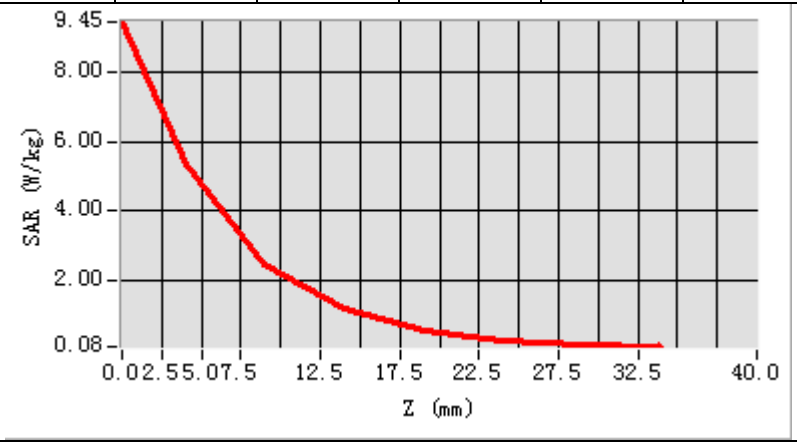
SURFACE SAR	VOLUME SAR
	

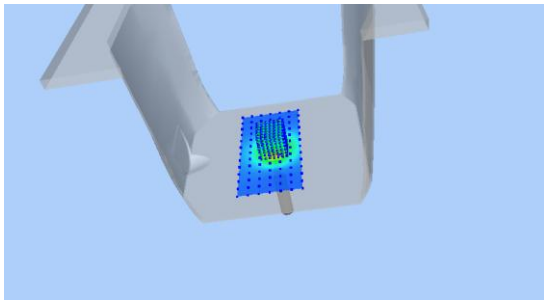
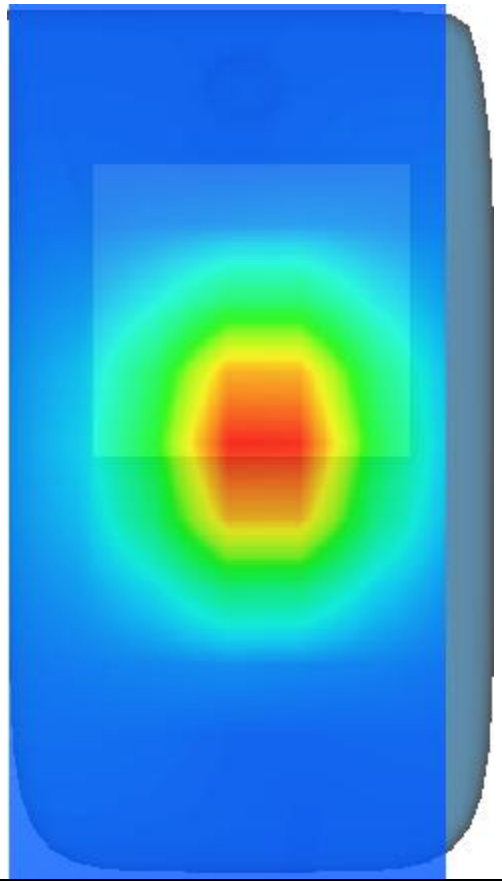
Maximum location: X=1.00, Y=0.00

SAR Peak: 9.35 W/kg

SAR 10g (W/Kg)	2.216730
SAR 1g (W/Kg)	4.962190

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	9.4489	5.3518	2.4364	1.1509	0.5548	0.2722	0.1404



3D screen shot	Hot spot position
	

MEASUREMENT 6

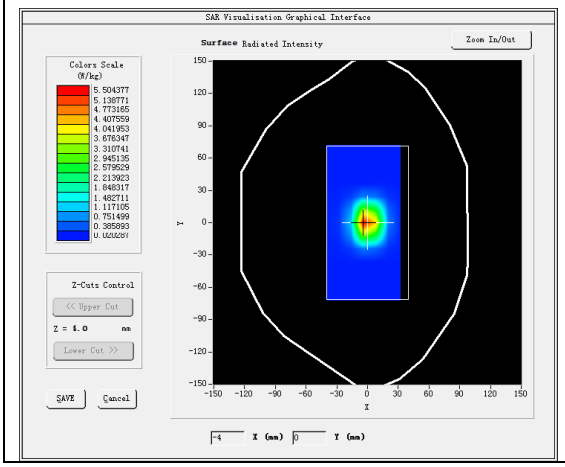
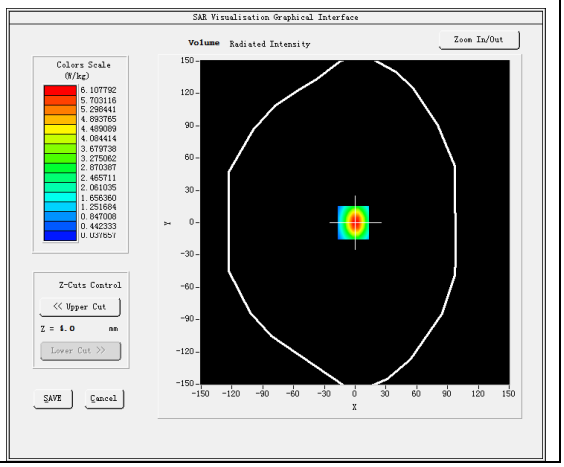
Date of measurement: 16/12/2024

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	2.51

B. SAR Measurement Results

Frequency (MHz)	2600.000000
Relative permittivity (real part)	38.780921
Relative permittivity (imaginary part)	13.634014
Conductivity (S/m)	1.969358
Variation (%)	0.060000

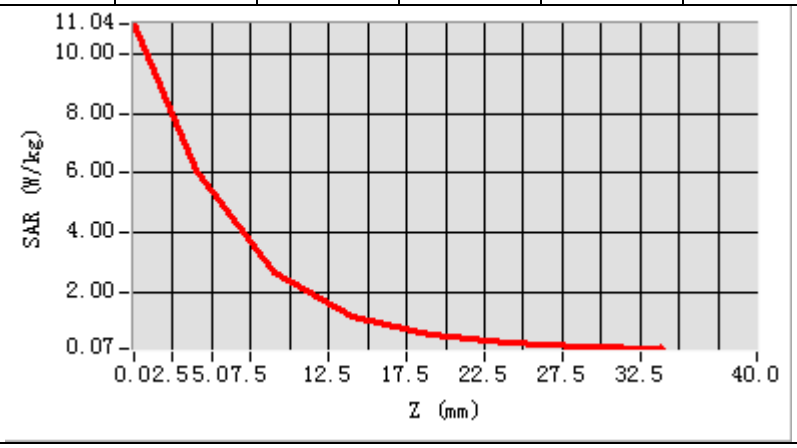
SURFACE SAR	VOLUME SAR
	

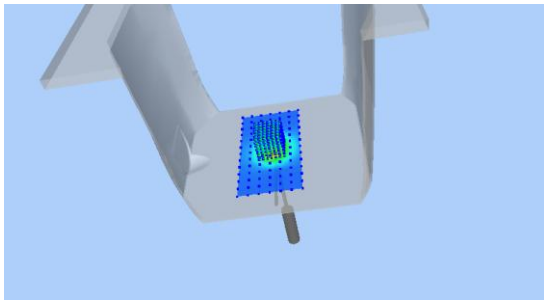
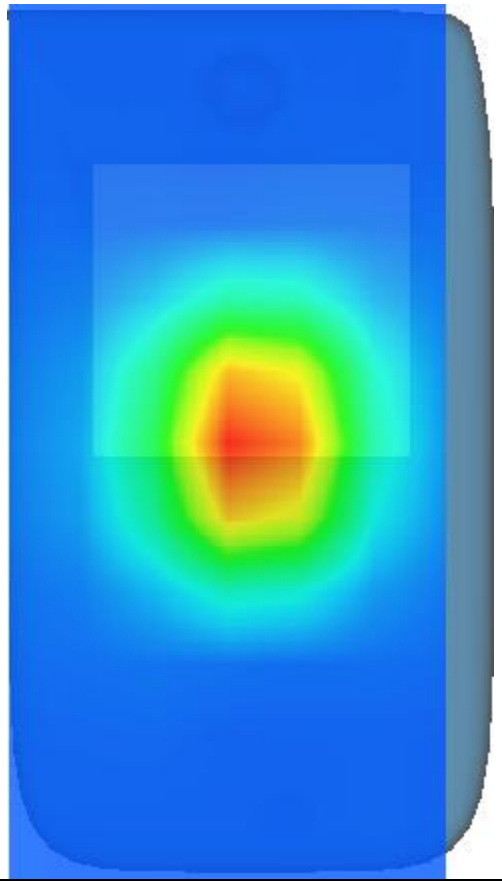
Maximum location: X=-2.00, Y=0.00

SAR Peak: 11.37 W/kg

SAR 10g (W/Kg)	2.451632
SAR 1g (W/Kg)	5.858735

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	11.0395	6.1078	2.6593	1.1897	0.5516	0.2634	0.1313



3D screen shot	Hot spot position
	

MEASUREMENT 7

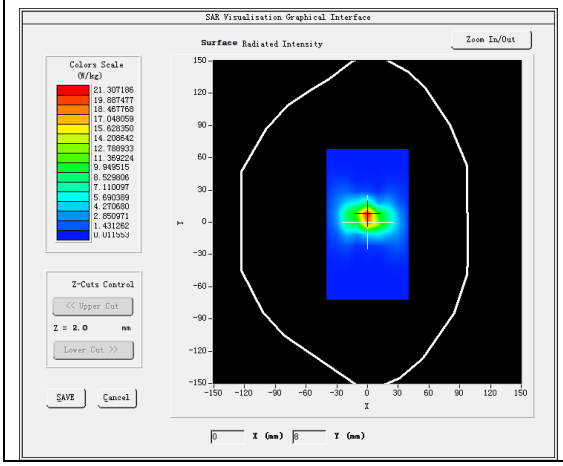
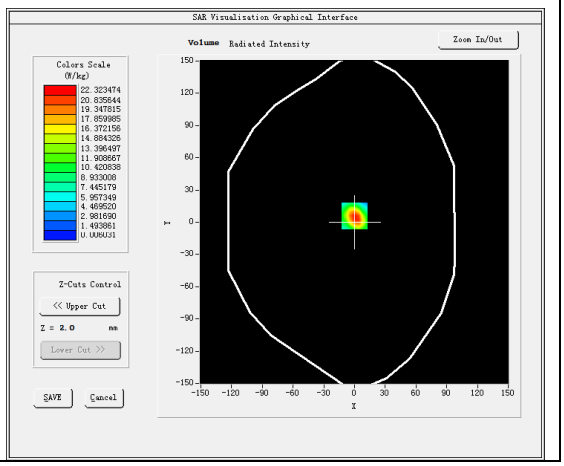
Date of measurement: 11/12/2024

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	1.89

B. SAR Measurement Results

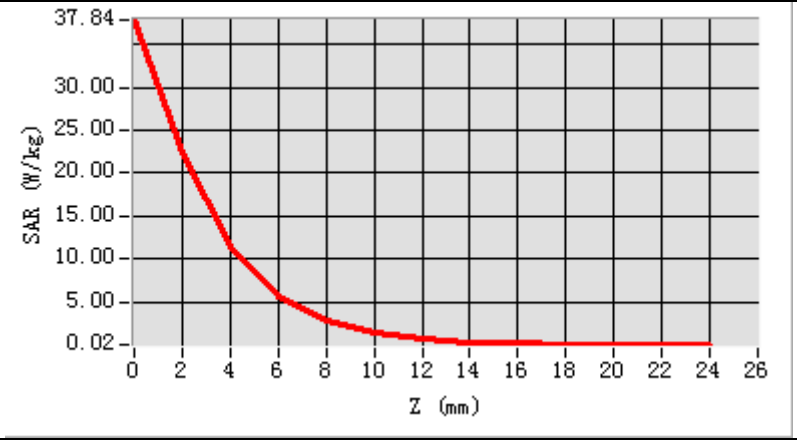
Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.652485
Relative permittivity (imaginary part)	15.561054
Conductivity (S/m)	4.4954156
Variation (%)	1.590000

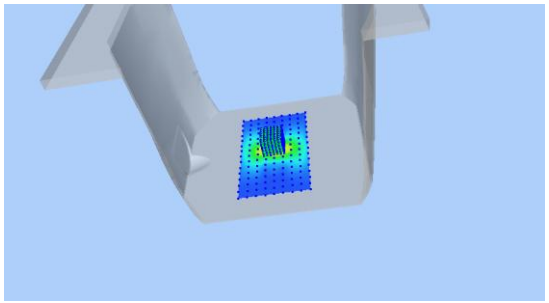
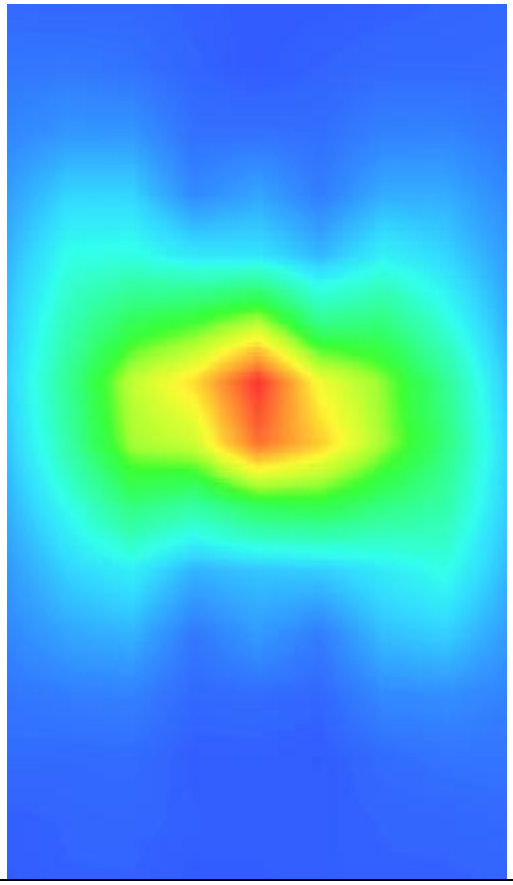
SURFACE SAR	**VOLUME SAR**
	

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

SAR 10g (W/Kg)	5.450374
SAR 1g (W/Kg)	15.653564

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)	37.8356	22.3278	11.3730	5.6618	2.8255	1.4093	0.7124	0.3660	0.1808	0.1012	0.0513	0.0323



3D screen shot	Hot spot position
	

MEASUREMENT 8

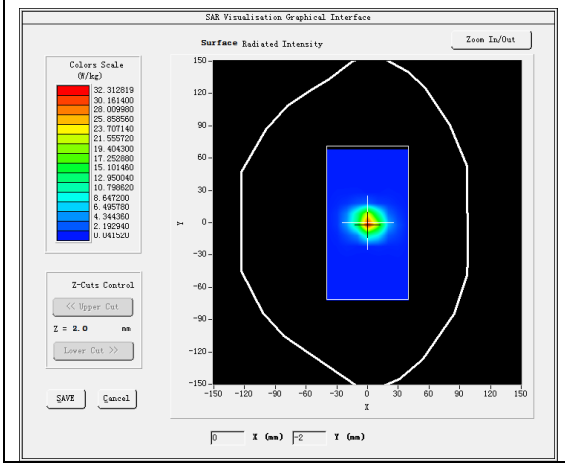
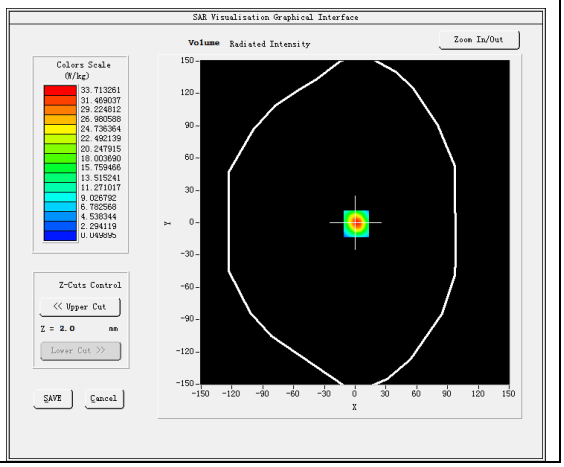
Date of measurement: 30/11/2024

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	1.90

B. SAR Measurement Results

Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.030204
Relative permittivity (imaginary part)	16.052683
Conductivity (S/m)	5.172531
Variation (%)	-0.760000

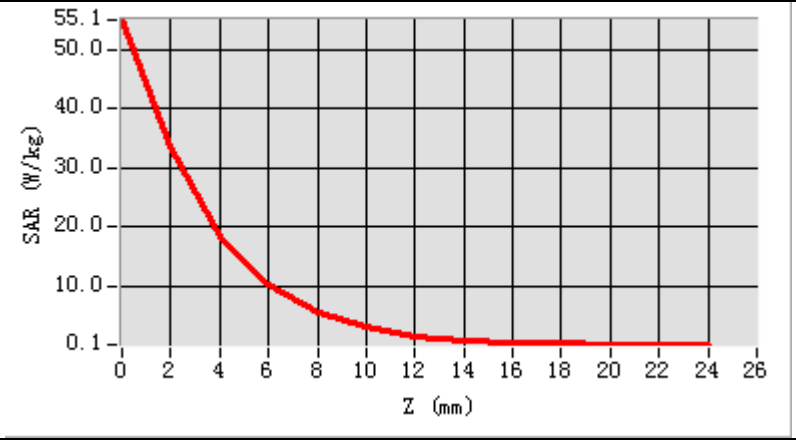
SURFACE SAR	VOLUME SAR
	

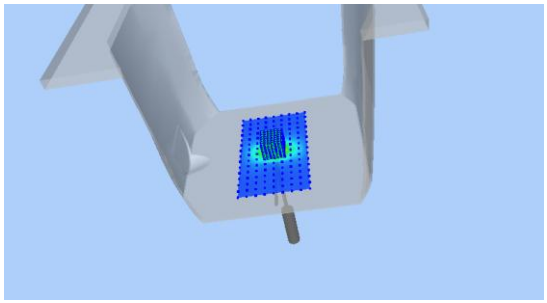
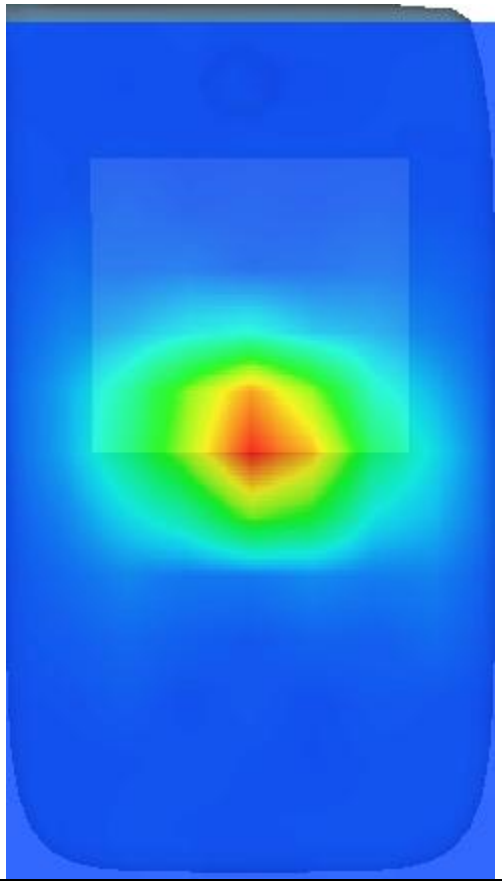
Maximum location: X=1.00, Y=-1.00

SAR Peak: 57.73 W/kg

SAR 10g (W/Kg)	6.542945
SAR 1g (W/Kg)	19.246353

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)	55.0870	33.7133	18.2706	10.1046	5.45 54	2.9903	1.6125	0.8917	0.5175	0.2985	0.1933	0.1267



3D screen shot	Hot spot position
	

14. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 1

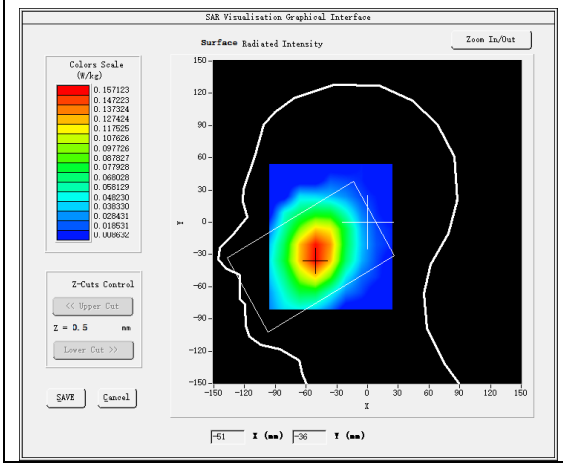
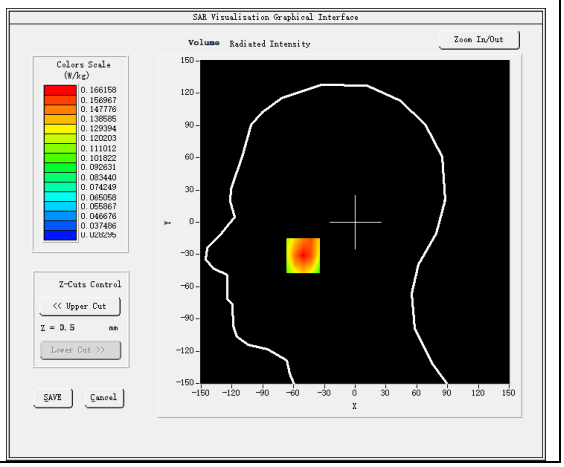
Date of measurement: 11/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	GSM850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)
ConvF	2.34

B. SAR Measurement Results

Frequency (MHz)	836.400000
Relative permittivity (real part)	41.742706
Relative permittivity (imaginary part)	19.618612
Conductivity (S/m)	0.911612
Variation (%)	-1.050000

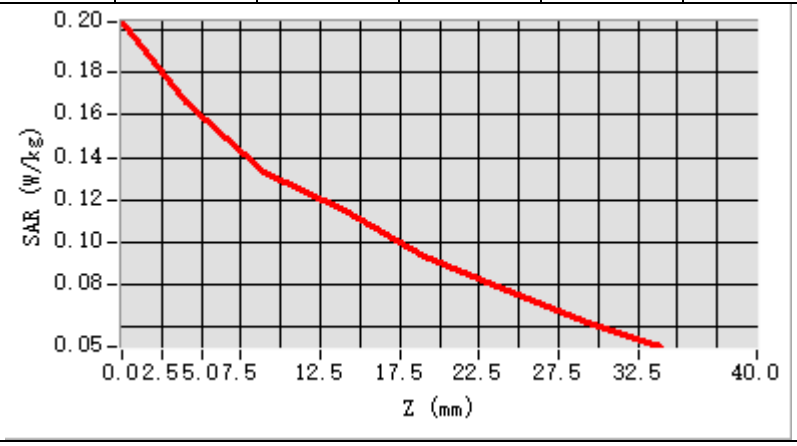
SURFACE SAR	VOLUME SAR
	

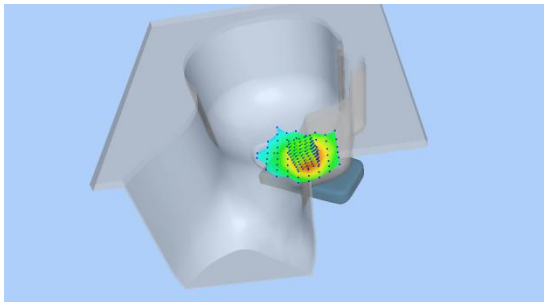
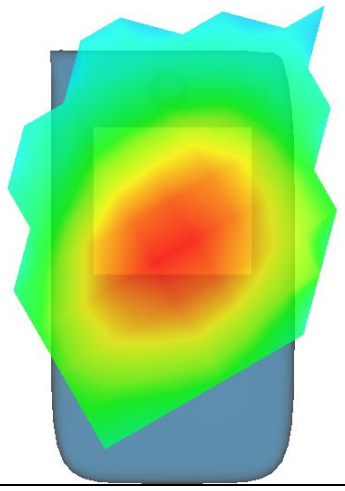
Maximum location: X=-51.00, Y=-31.00

SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.123369
SAR 1g (W/Kg)	0.160862

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2038	0.1662	0.1332	0.1147	0.0935	0.0783	0.0631



3D screen shot	Hot spot position
	

MEASUREMENT 2

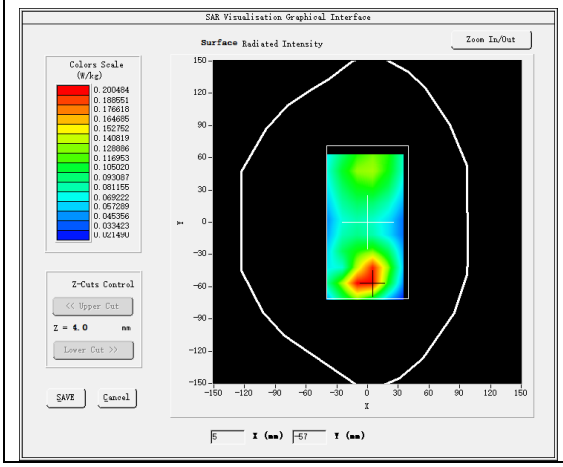
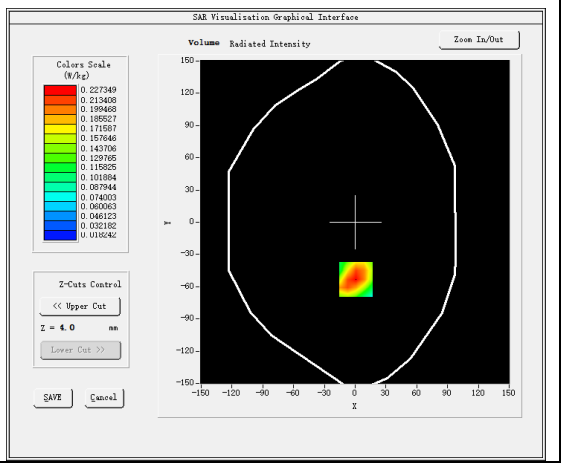
Date of measurement: 11/12/2024

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	GSM850
Channels	Middle
Signal	TDMA (Crest factor: 8.0)
ConvF	2.34

B. SAR Measurement Results

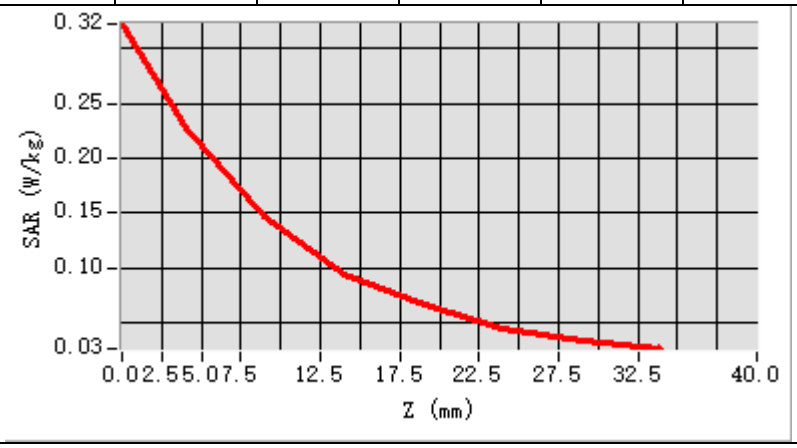
Frequency (MHz)	836.400000
Relative permittivity (real part)	41.742706
Relative permittivity (imaginary part)	19.618612
Conductivity (S/m)	0.911612
Variation (%)	-2.100000

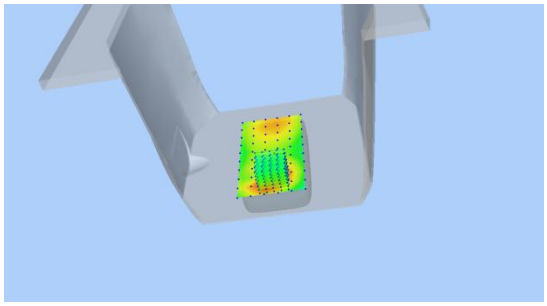
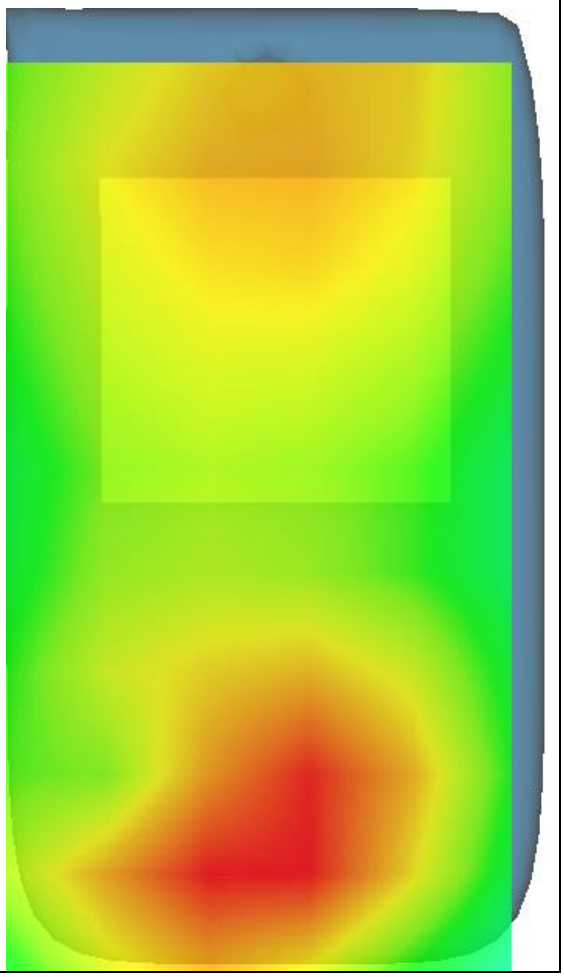
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-53.00
SAR Peak: 0.34 W/kg

SAR 10g (W/Kg)	0.132963
SAR 1g (W/Kg)	0.220052

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3228	0.2273	0.1469	0.0940	0.0655	0.0443	0.0333



3D screen shot	Hot spot position
	

MEASUREMENT 3

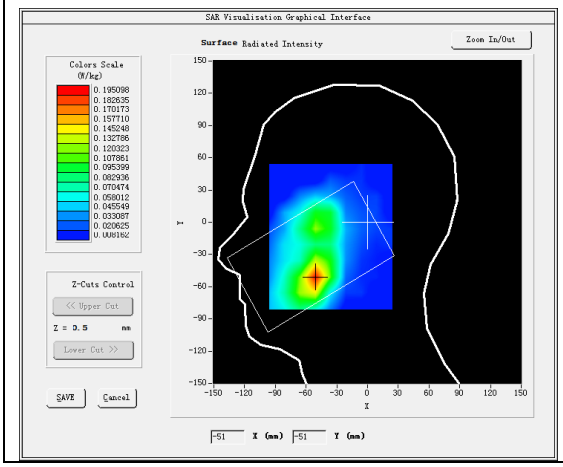
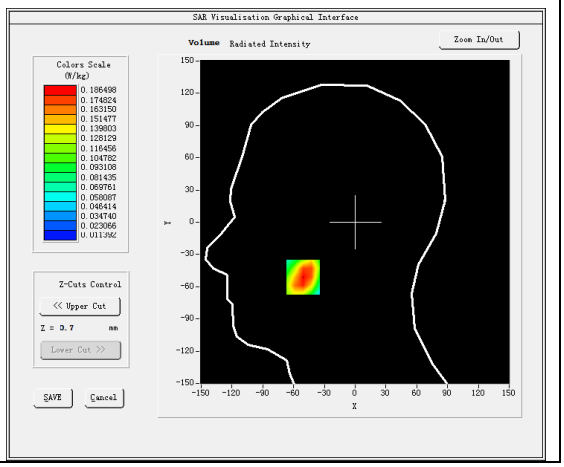
Date of measurement: 9/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	GSM1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)
ConvF	2.57

B. SAR Measurement Results

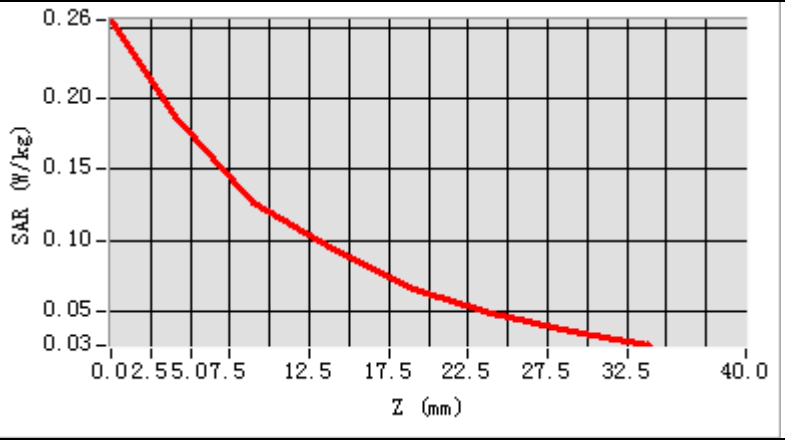
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	4.240000

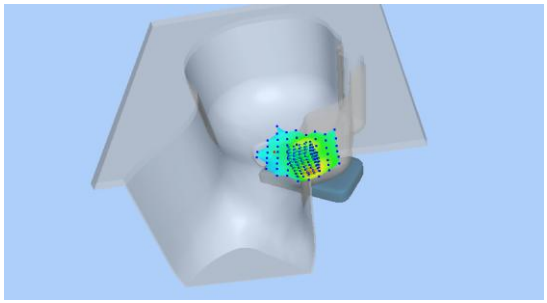
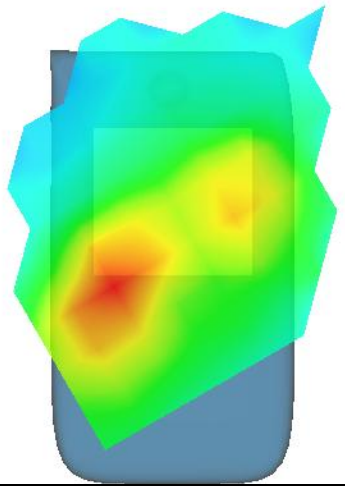
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-51.00
SAR Peak: 0.27 W/kg

SAR 10g (W/Kg)	0.112300
SAR 1g (W/Kg)	0.185215

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2551	0.1865	0.1268	0.0945	0.0650	0.0483	0.0352



3D screen shot	Hot spot position
	

MEASUREMENT 4

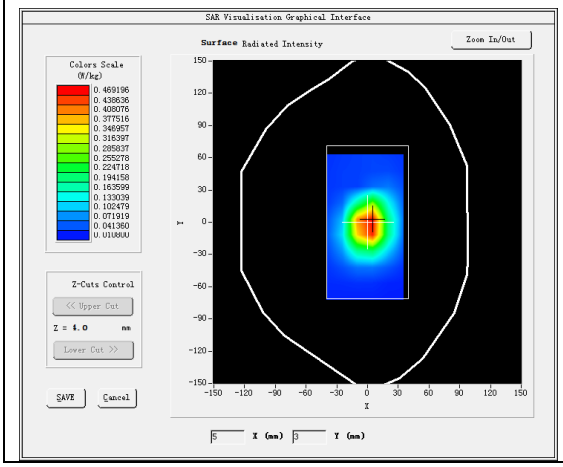
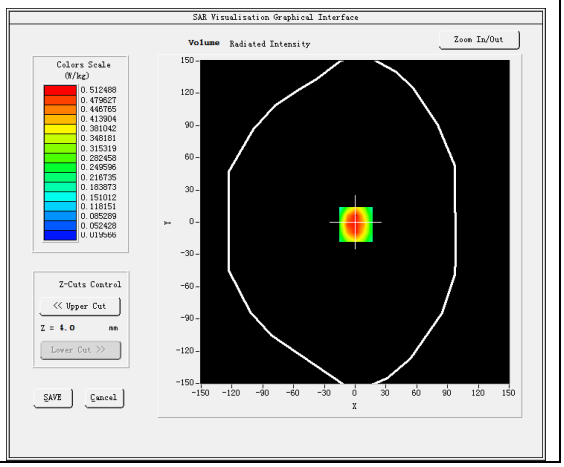
Date of measurement: 9/12/2024

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	GSM1900
Channels	Middle
Signal	TDMA (Crest factor: 8.0)
ConvF	2.57

B. SAR Measurement Results

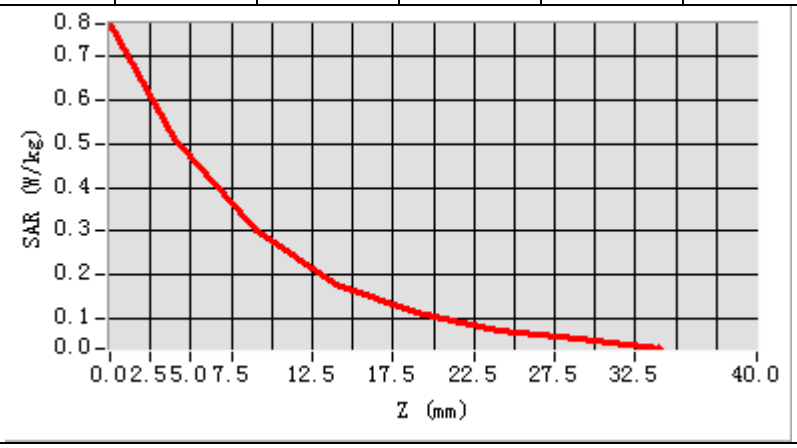
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	-1.240000

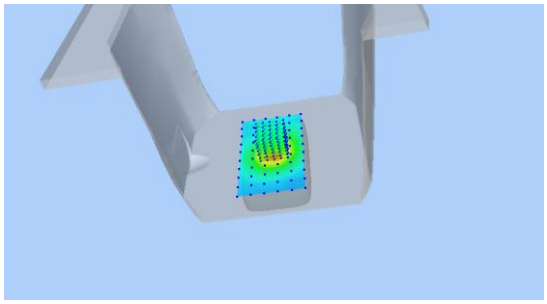
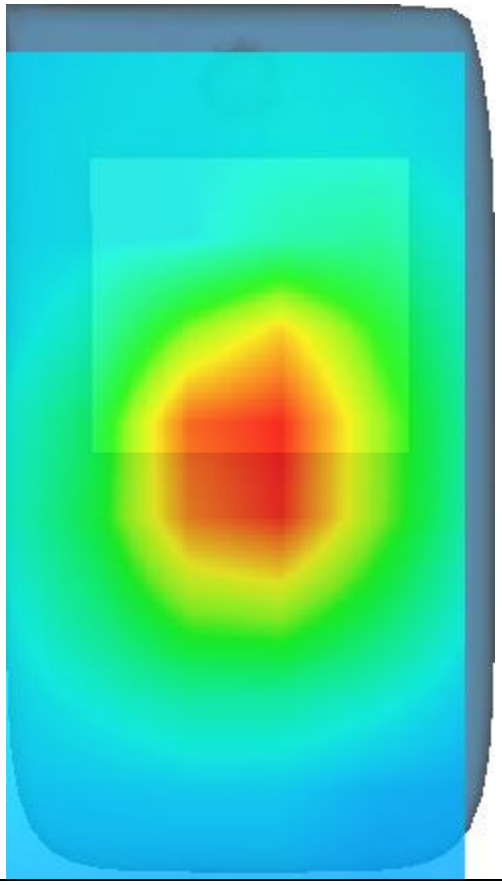
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-2.00
SAR Peak: 0.76 W/kg

SAR 10g (W/Kg)	0.287021
SAR 1g (W/Kg)	0.502696

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7724	0.5125	0.3005	0.1805	0.1148	0.0757	0.0558



3D screen shot	Hot spot position
	

MEASUREMENT 5

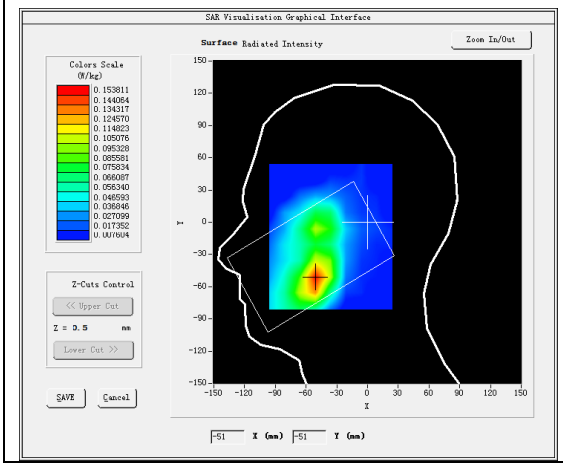
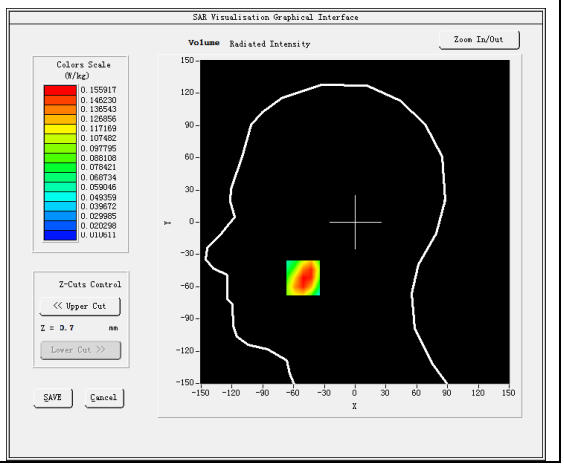
Date of measurement: 9/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	Band2_WCDMA1900
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.57

B. SAR Measurement Results

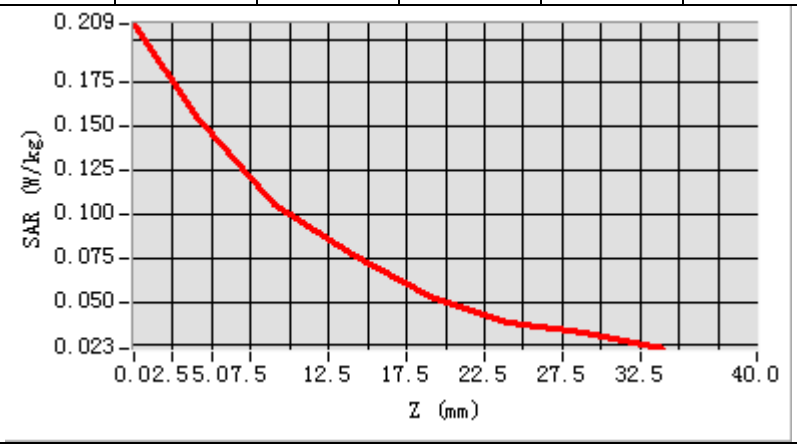
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	1.940000

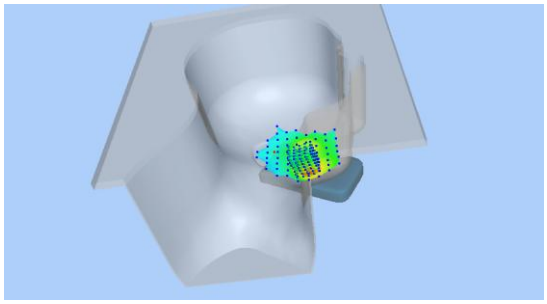
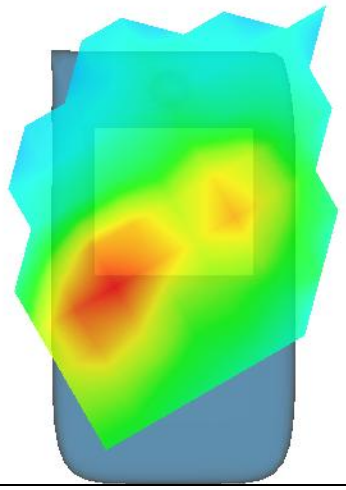
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-52.00
SAR Peak: 0.22 W/kg

SAR 10g (W/Kg)	0.094602
SAR 1g (W/Kg)	0.155637

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2087	0.1559	0.1055	0.0765	0.0524	0.0382	0.0318



3D screen shot	Hot spot position
	

MEASUREMENT 6

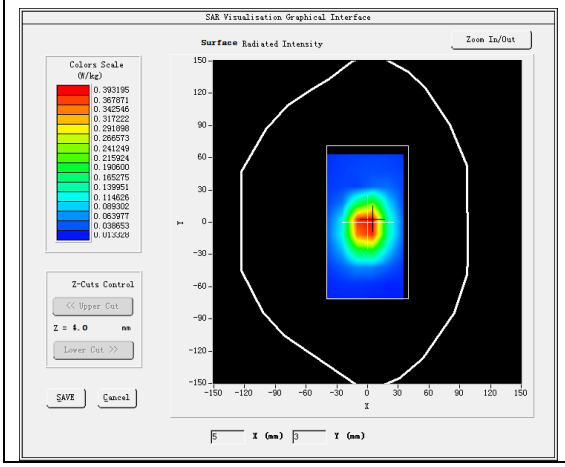
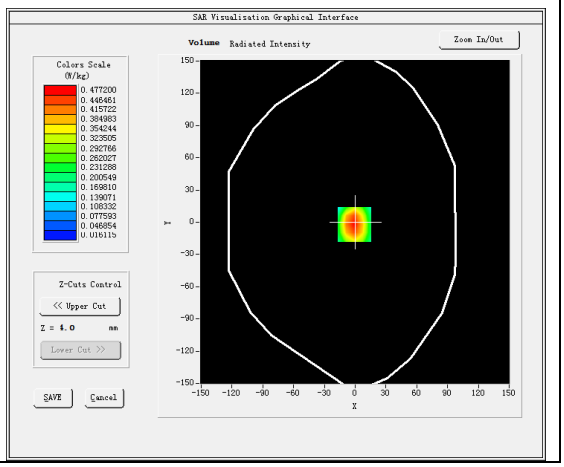
Date of measurement: 9/12/2024

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	Band2_WCDMA1900
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.57

B. SAR Measurement Results

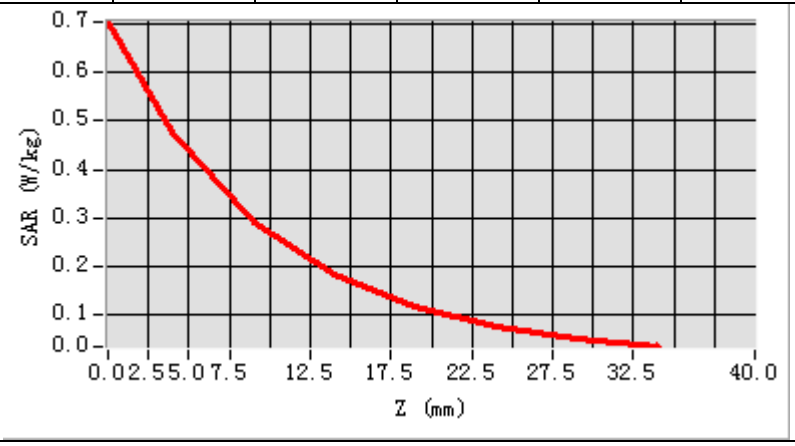
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	-1.740000

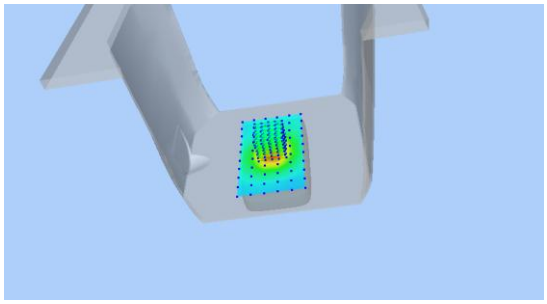
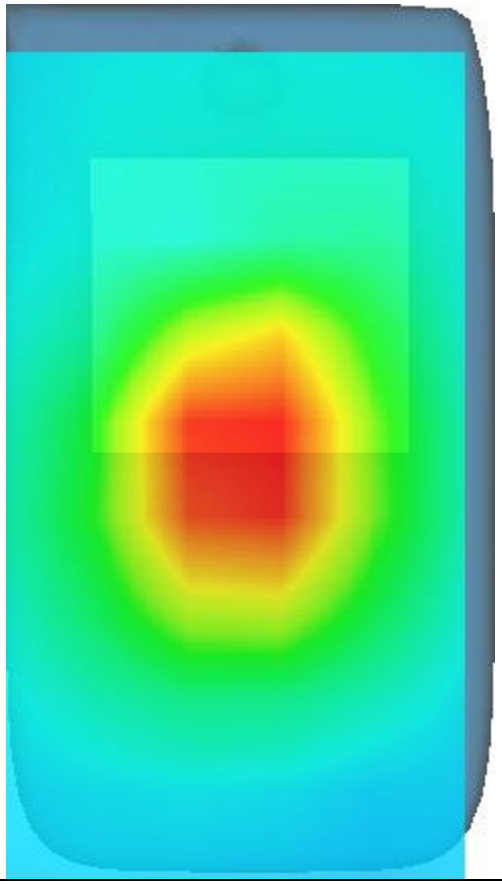
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-1.00, Y=-2.00
SAR Peak: 0.71 W/kg

SAR 10g (W/Kg)	0.259899
SAR 1g (W/Kg)	0.464597

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7056	0.4772	0.2901	0.1832	0.1157	0.0737	0.0491



3D screen shot	Hot spot position
	

MEASUREMENT 7

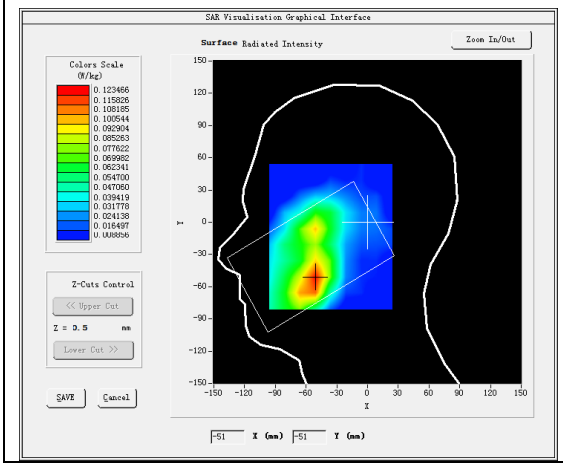
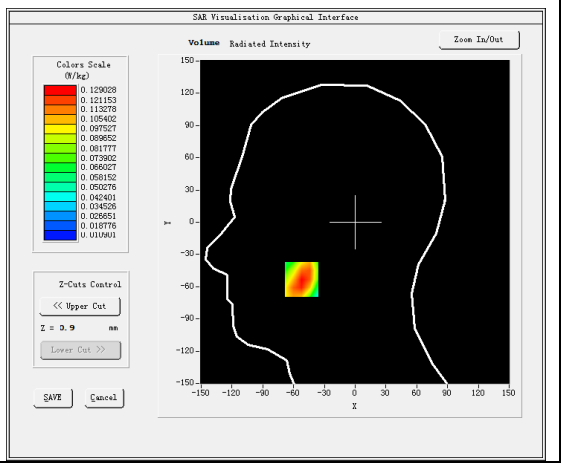
Date of measurement: 6/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	Band4_WCDMA1700
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

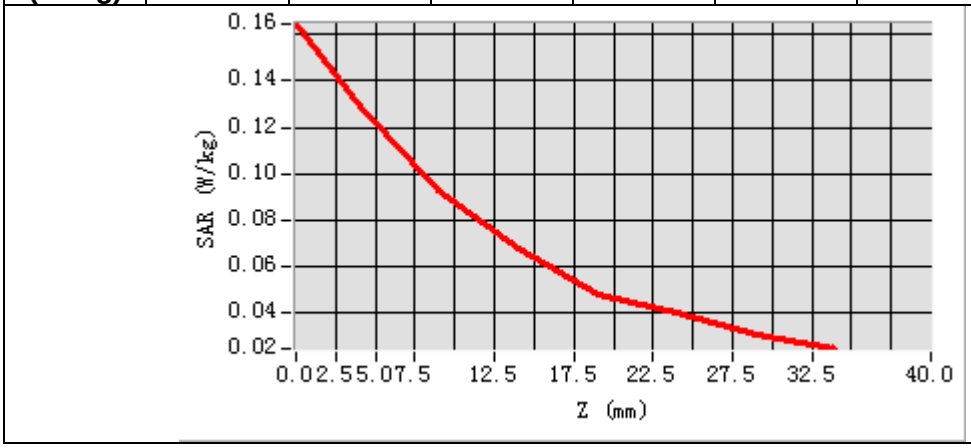
Frequency (MHz)	1732.600000
Relative permittivity (real part)	39.429882
Relative permittivity (imaginary part)	13.699847
Conductivity (S/m)	1.318230
Variation (%)	0.330000

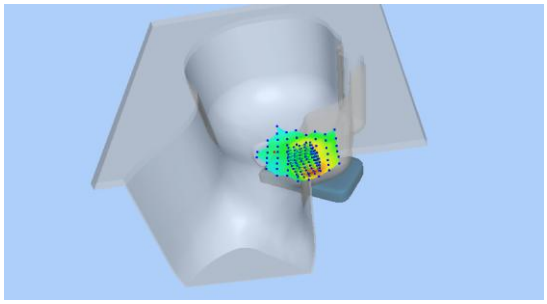
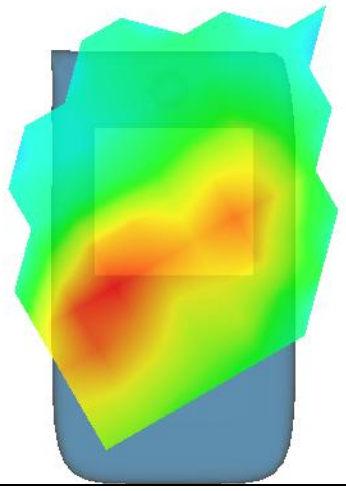
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-52.00, Y=-53.00
SAR Peak: 0.18 W/kg

SAR 10g (W/Kg)	0.081661
SAR 1g (W/Kg)	0.124071

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1646	0.1290	0.0931	0.0683	0.0485	0.0402	0.0312



3D screen shot	Hot spot position
	

MEASUREMENT 8

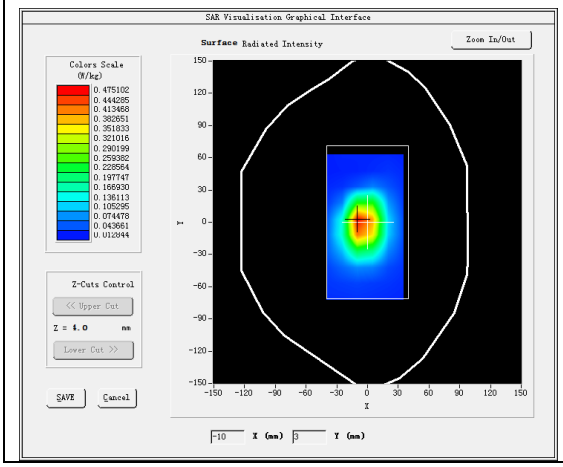
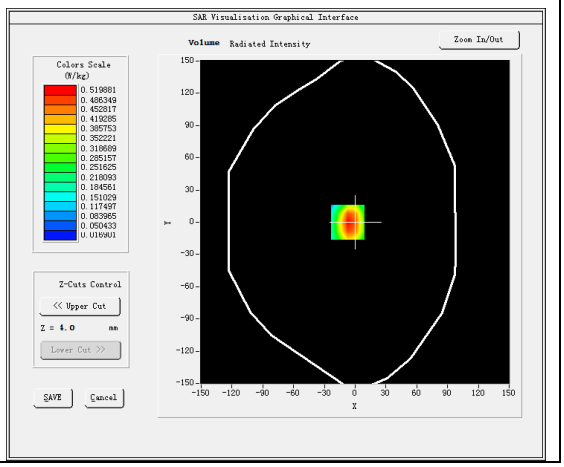
Date of measurement: 6/12/2024

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	Band4_WCDMA1700
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

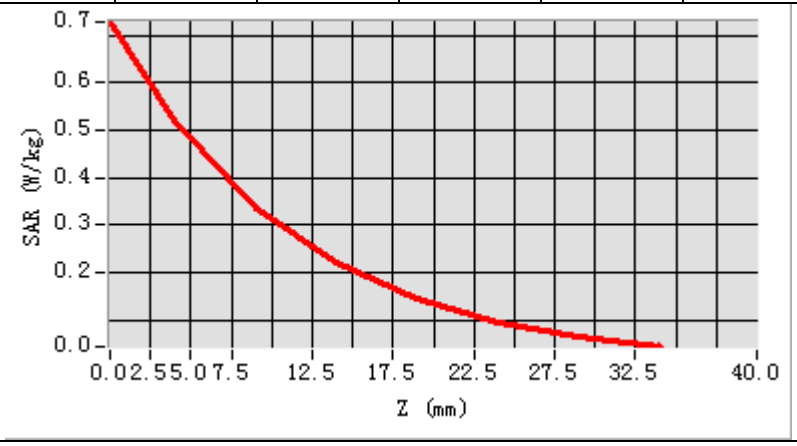
Frequency (MHz)	1732.600000
Relative permittivity (real part)	39.429882
Relative permittivity (imaginary part)	13.699847
Conductivity (S/m)	1.318230
Variation (%)	-1.700000

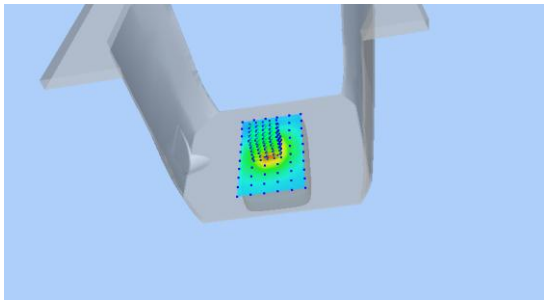
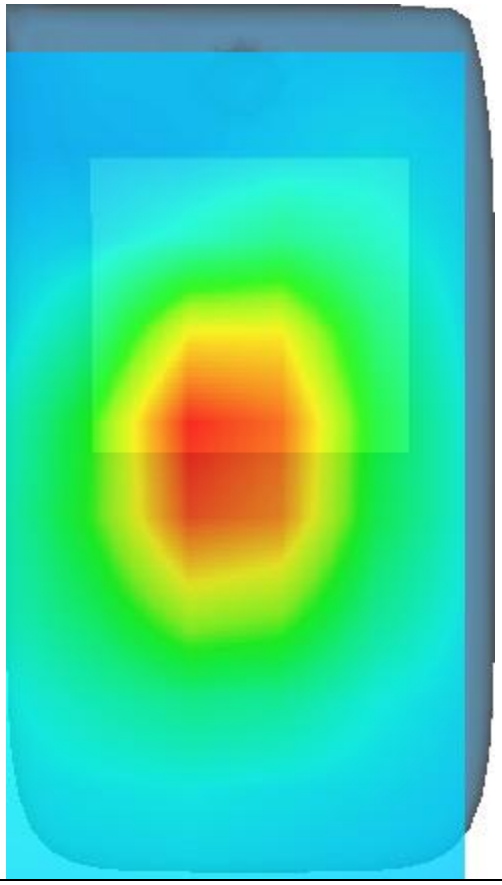
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=-7.00, Y=0.00
SAR Peak: 0.75 W/kg

SAR 10g (W/Kg)	0.291884
SAR 1g (W/Kg)	0.497685

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7287	0.5199	0.3365	0.2233	0.1447	0.0951	0.0653



3D screen shot	Hot spot position
	

MEASUREMENT 9

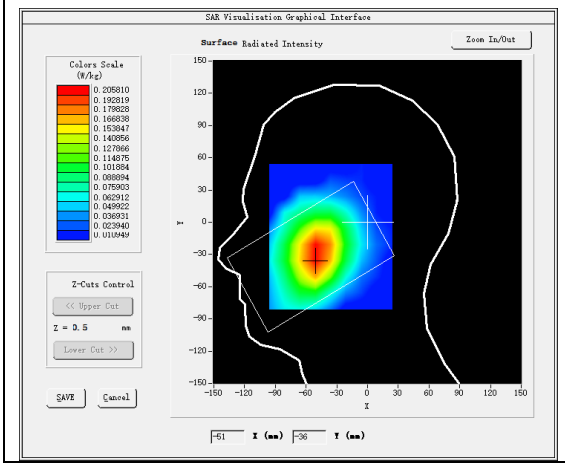
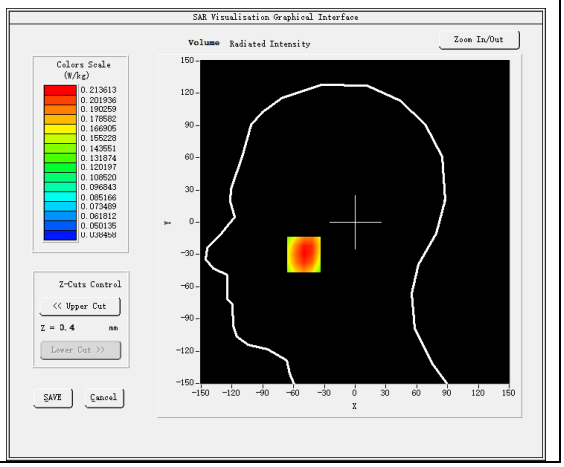
Date of measurement: 11/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	Band5_WCDMA850
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

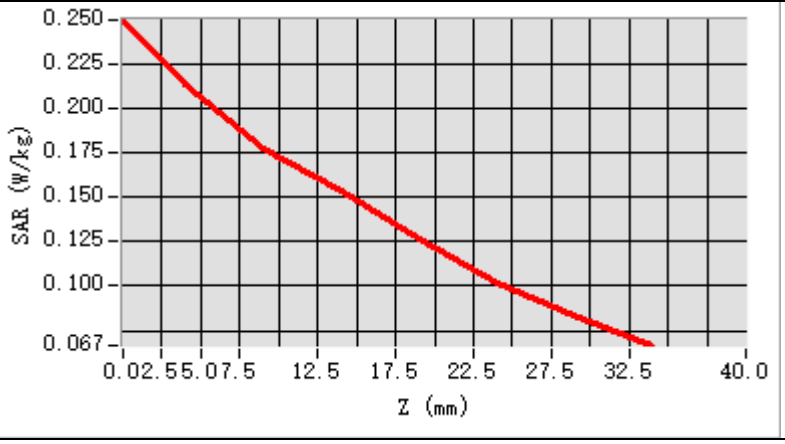
Frequency (MHz)	836.400000
Relative permittivity (real part)	41.742706
Relative permittivity (imaginary part)	19.618612
Conductivity (S/m)	0.911612
Variation (%)	-2.960000

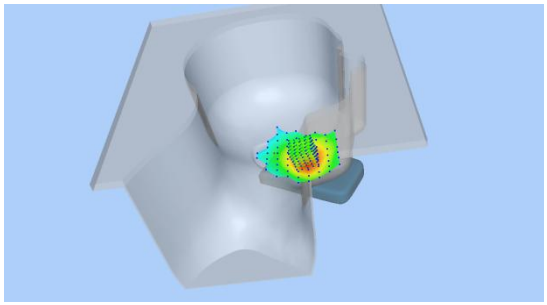
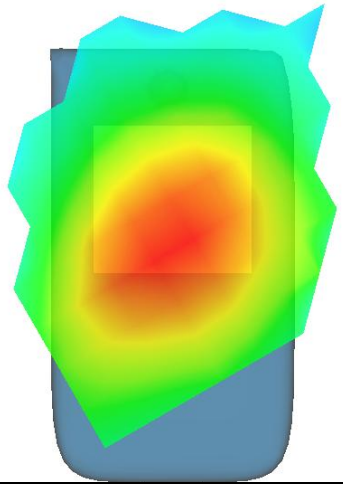
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-50.00, Y=-30.00
SAR Peak: 0.26 W/kg

SAR 10g (W/Kg)	0.163675
SAR 1g (W/Kg)	0.211223

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2497	0.2136	0.1778	0.1532	0.1267	0.1011	0.0831



3D screen shot	Hot spot position
	

MEASUREMENT 10

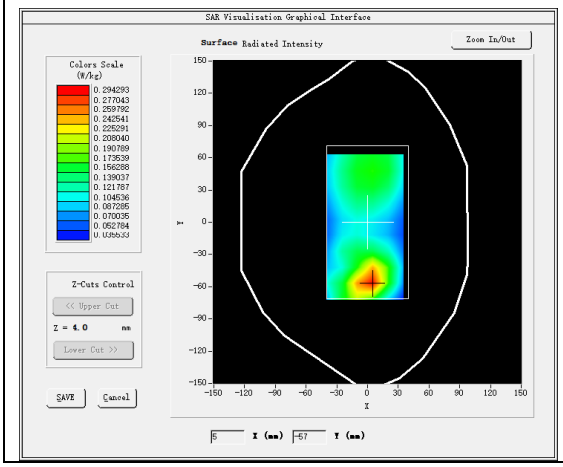
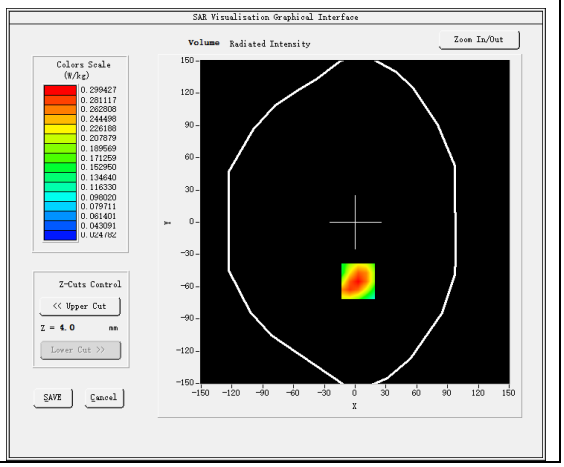
Date of measurement: 11/12/2024

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	Band5_WCDMA850
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

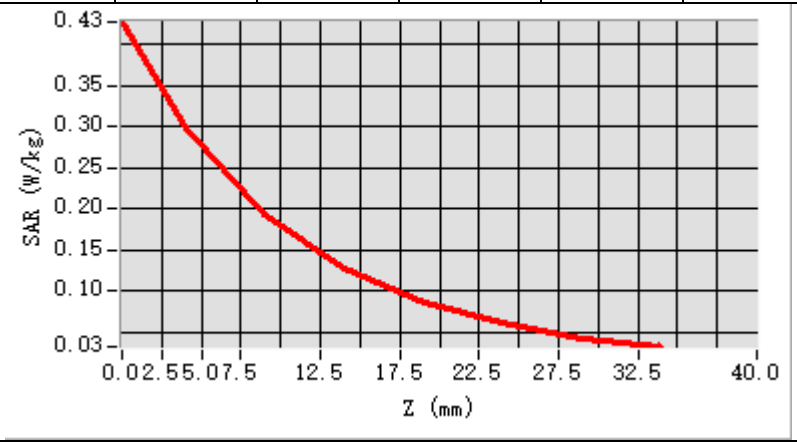
Frequency (MHz)	836.400000
Relative permittivity (real part)	41.742706
Relative permittivity (imaginary part)	19.618612
Conductivity (S/m)	0.911612
Variation (%)	-2.180000

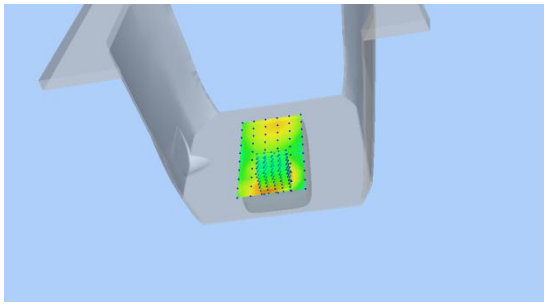
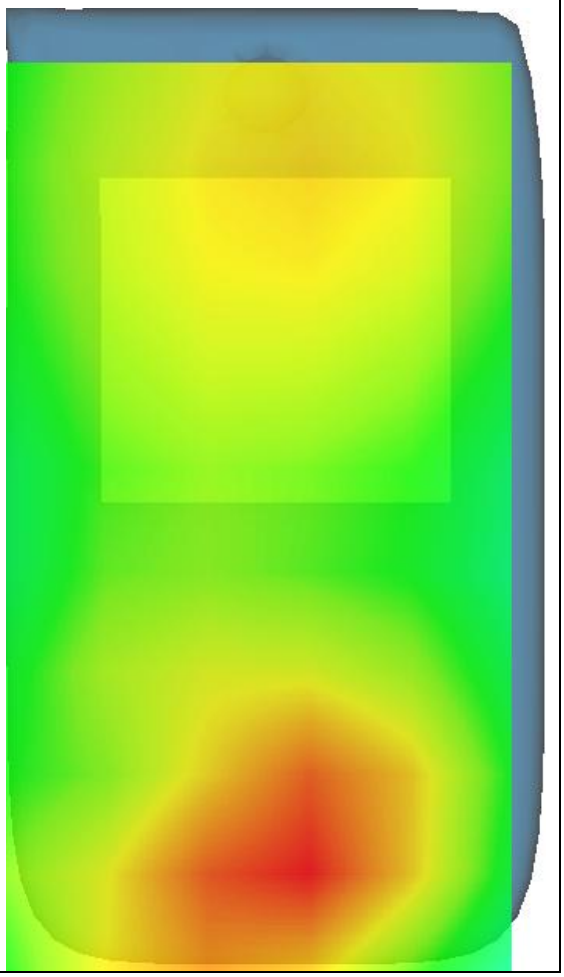
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=-55.00
SAR Peak: 0.43 W/kg

SAR 10g (W/Kg)	0.176063
SAR 1g (W/Kg)	0.289070

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4280	0.2994	0.1928	0.1275	0.0868	0.0608	0.0430



3D screen shot	Hot spot position
	

MEASUREMENT 11

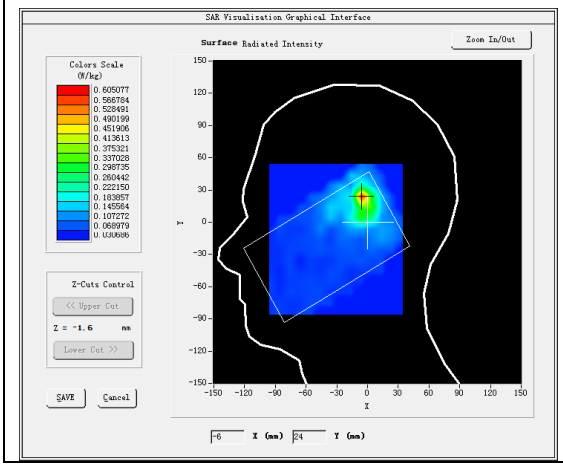
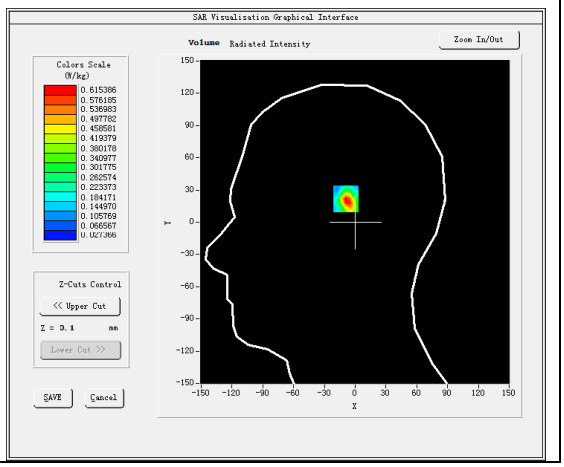
Date of measurement: 30/11/2024

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11a U-NII
Channels	Middle
Signal	IEEE802.11ac (Crest factor: 1.0)
ConvF	1.90

B. SAR Measurement Results

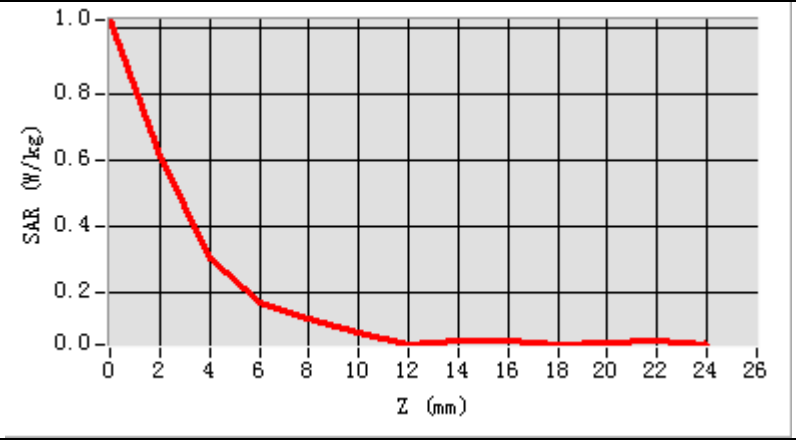
Frequency (MHz)	5745.000000
Relative permittivity (real part)	34.106155
Relative permittivity (imaginary part)	15.928240
Conductivity (S/m)	5.119159
Variation (%)	0.990000

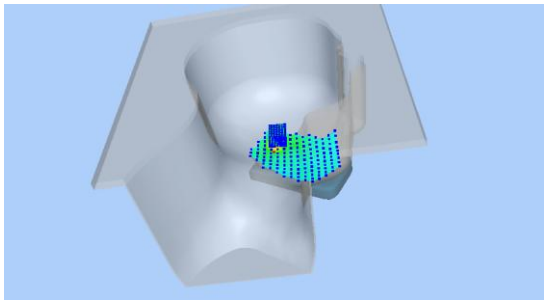
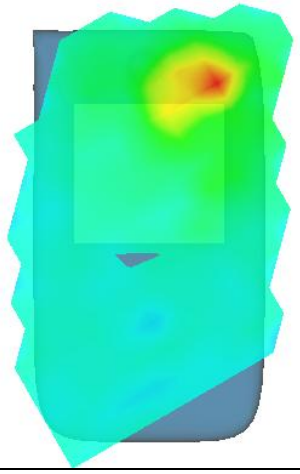
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-6.00, Y=24.00
SAR Peak: 1.66 W/kg

SAR 10g (W/Kg)	0.216479
SAR 1g (W/Kg)	0.602370

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)	1.0257	0.6154	0.3027	0.1668	0.1187	0.0755	0.0429	0.0559	0.0545	0.0437	0.0502	0.0549



3D screen shot	Hot spot position
	

MEASUREMENT 13

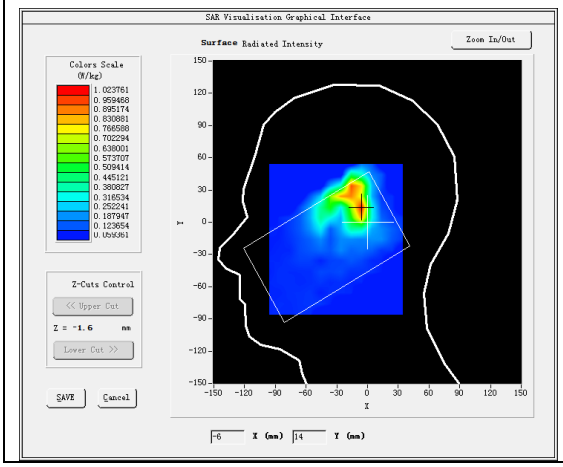
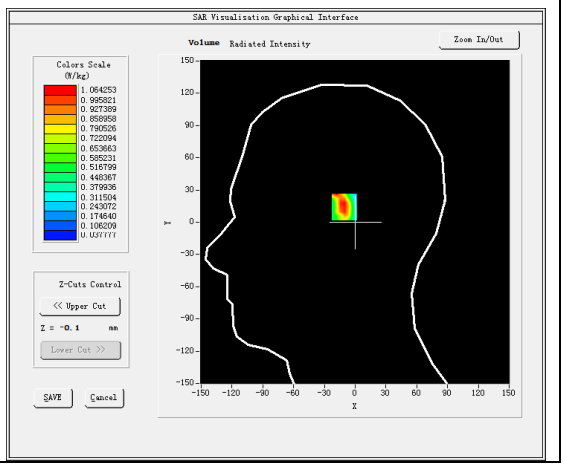
Date of measurement: 11/12/2024

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11a U-NII
Channels	Middle
Signal	IEEE802.11ac (Crest factor: 1.0)
ConvF	1.89

B. SAR Measurement Results

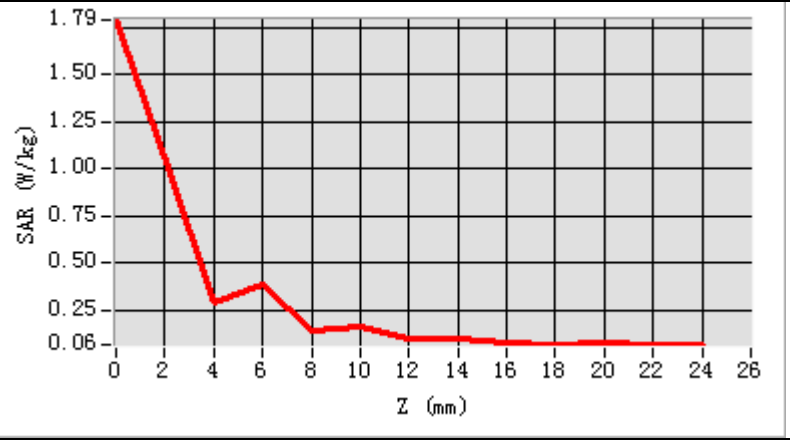
Frequency (MHz)	5230.000000
Relative permittivity (real part)	34.652485
Relative permittivity (imaginary part)	15.561054
Conductivity (S/m)	4.495416
Variation (%)	2.960000

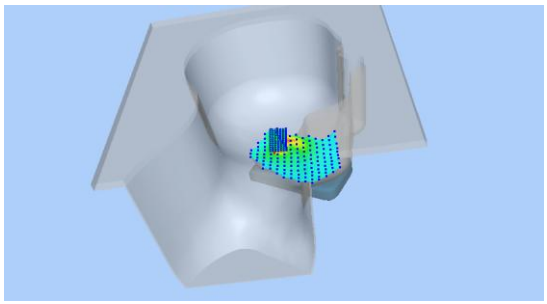
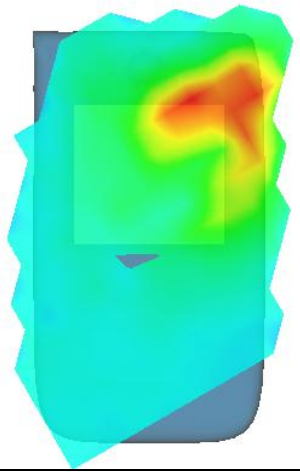
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-7.00, Y=14.00
SAR Peak: 2.78 W/kg

SAR 10g (W/Kg)	0.423609
SAR 1g (W/Kg)	1.027411

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)	1.7921	1.0643	0.2916	0.3852	0.1369	0.1573	0.0914	0.0999	0.0742	0.0639	0.0724	0.0690



3D screen shot	Hot spot position
	

MEASUREMENT 13

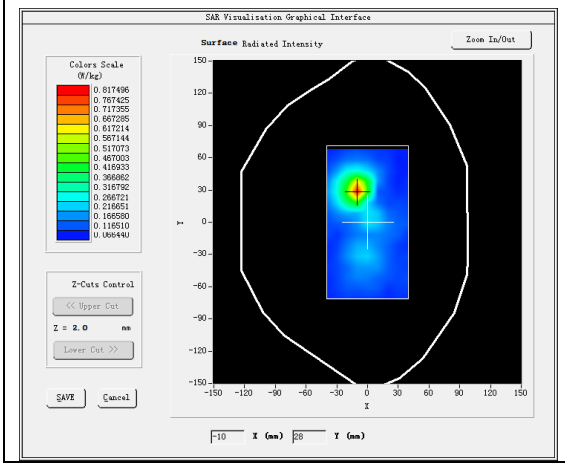
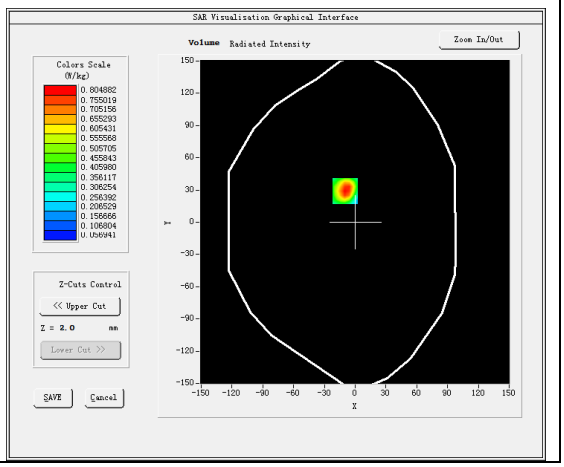
Date of measurement: 11/12/2024

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	1.89

B. SAR Measurement Results

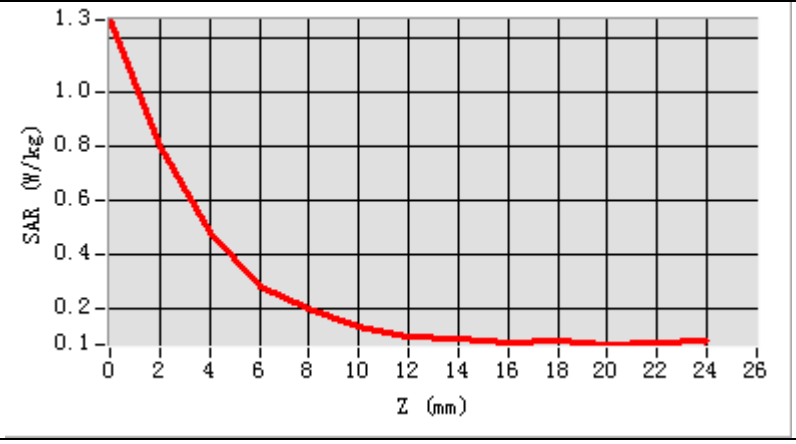
Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.652485
Relative permittivity (imaginary part)	15.561054
Conductivity (S/m)	4.495416
Variation (%)	3.960000

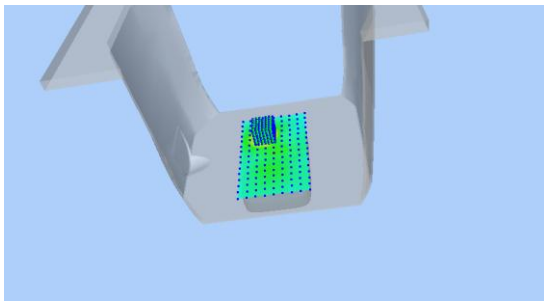
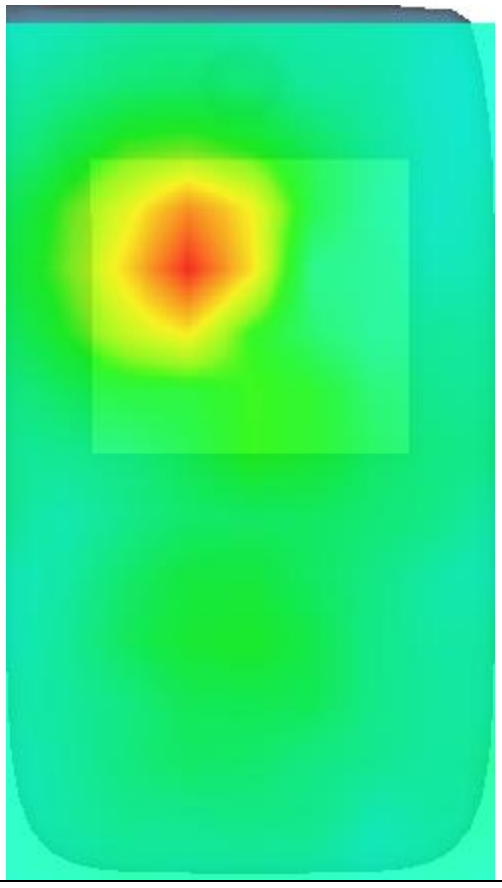
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-10.00, Y=29.00
SAR Peak: 1.32 W/kg

SAR 10g (W/Kg)	0.228886
SAR 1g (W/Kg)	0.504930

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)	1.2706	0.8049	0.4792	0.2843	0.1971	0.1334	0.0945	0.0891	0.0753	0.0800	0.0655	0.0709



3D screen shot	Hot spot position
	

MEASUREMENT 14

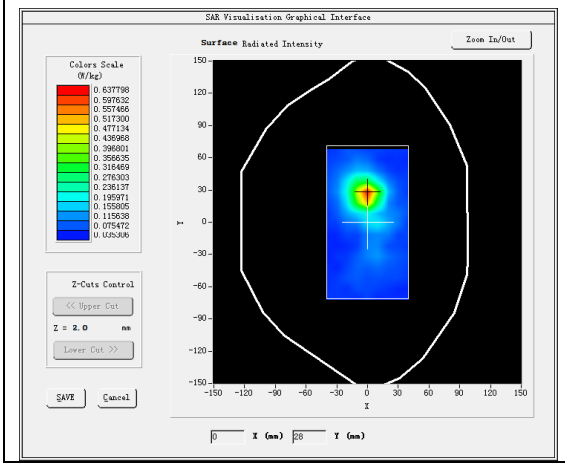
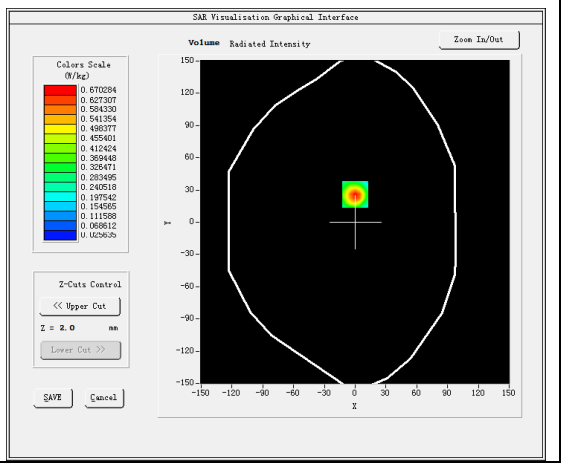
Date of measurement: 30/11/2024

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	1.90

B. SAR Measurement Results

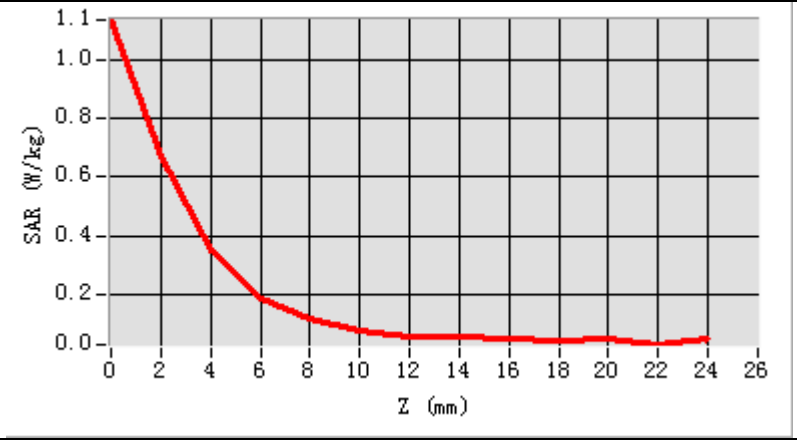
Frequency (MHz)	5785.000000
Relative permittivity (real part)	34.106155
Relative permittivity (imaginary part)	15.928240
Conductivity (S/m)	5.119159
Variation (%)	2.740000

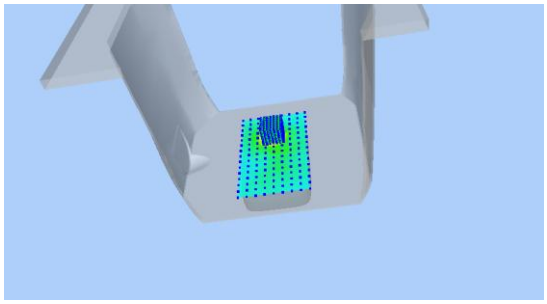
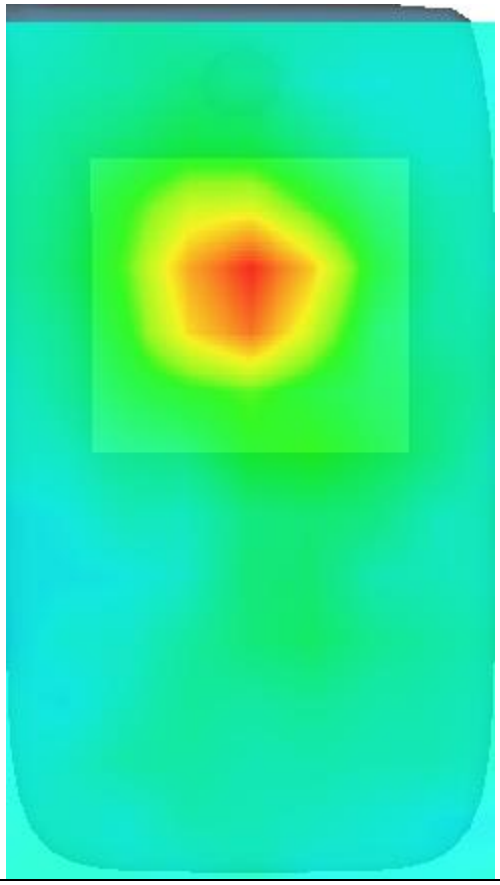
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=26.00
SAR Peak: 1.19 W/kg

SAR 10g (W/Kg)	0.169417
SAR 1g (W/Kg)	0.392054

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)	1.1328	0.6703	0.3504	0.1853	0.1232	0.0782	0.0561	0.0610	0.0529	0.0451	0.0503	0.0319



3D screen shot	Hot spot position
	

MEASUREMENT 17

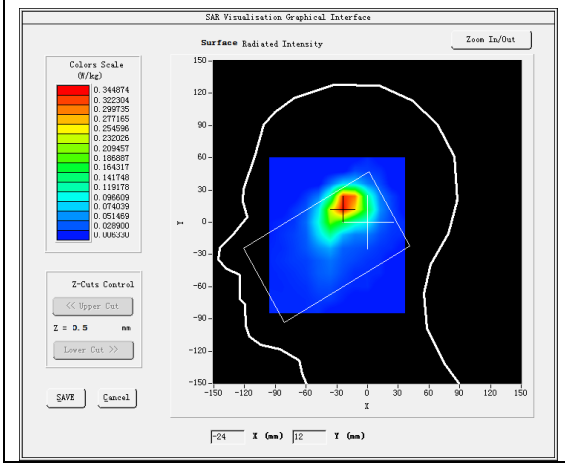
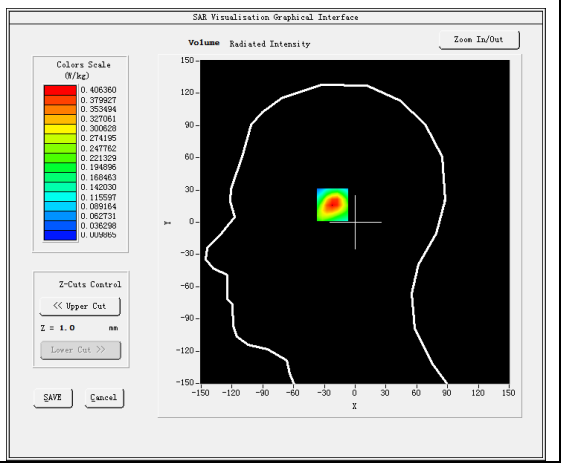
Date of measurement: 12/12/2024

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.11b (Crest factor: 1.0)
ConvF	2.74

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative permittivity (real part)	37.866589
Relative permittivity (imaginary part)	13.006529
Conductivity (S/m)	1.760940
Variation (%)	0.390000

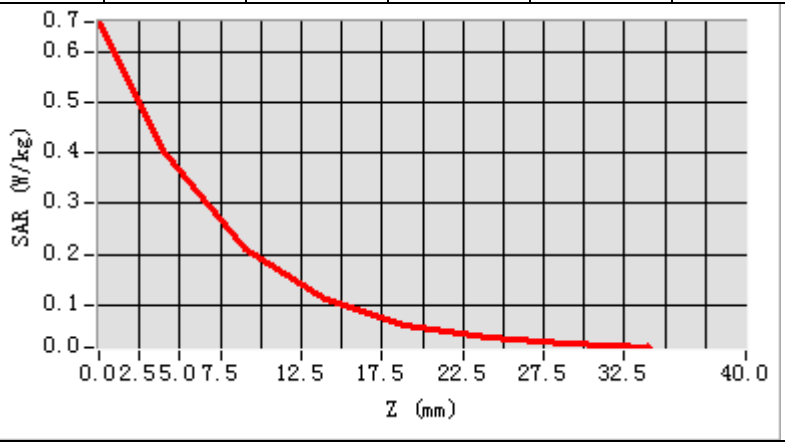
SURFACE SAR	VOLUME SAR
	

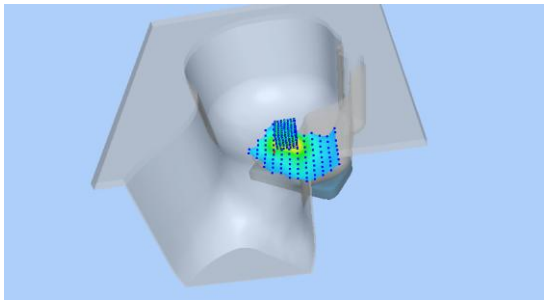
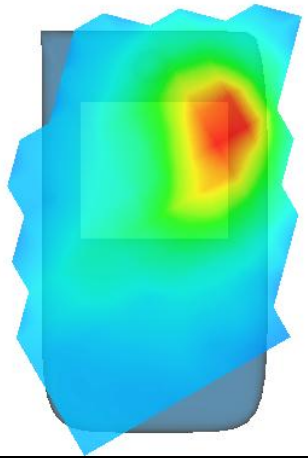
Maximum location: X=-21.00, Y=18.00

SAR Peak: 0.69 W/kg

SAR 10g (W/Kg)	0.180870
SAR 1g (W/Kg)	0.376893

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.6584	0.4064	0.2118	0.1098	0.0585	0.0356	0.0233



3D screen shot	Hot spot position
	

MEASUREMENT 18

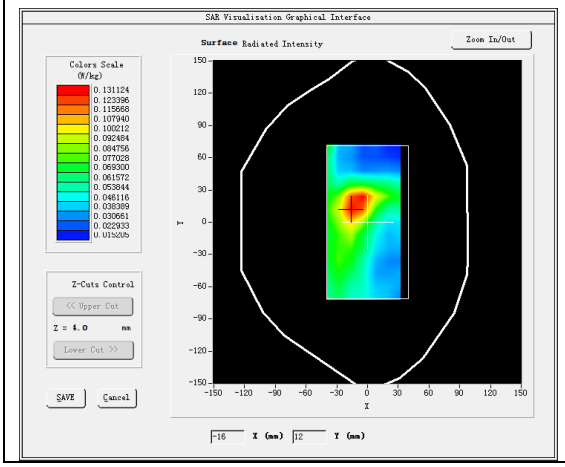
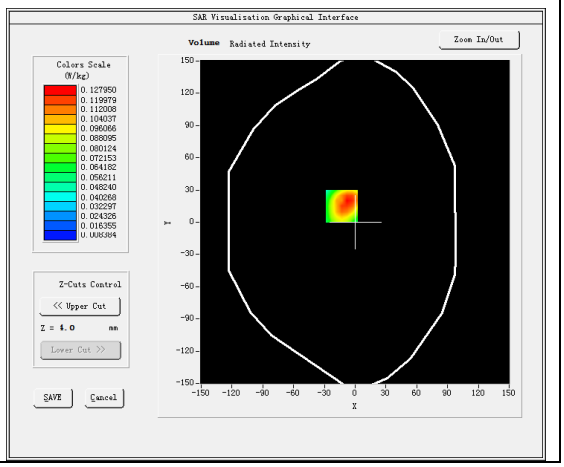
Date of measurement: 12/12/2024

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	Middle
Signal	IEEE802.11b (Crest factor: 1.0)
ConvF	2.74

B. SAR Measurement Results

Frequency (MHz)	2437.000000
Relative permittivity (real part)	37.866589
Relative permittivity (imaginary part)	13.006529
Conductivity (S/m)	1.760940
Variation (%)	-0.660000

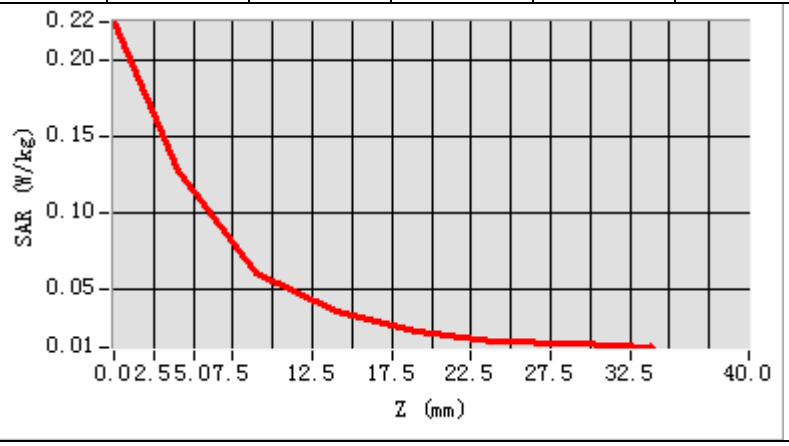
SURFACE SAR	VOLUME SAR
	

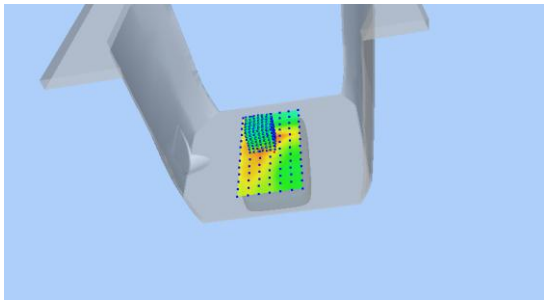
Maximum location: X=-13.00, Y=15.00

SAR Peak: 0.23 W/kg

SAR 10g (W/Kg)	0.065702
SAR 1g (W/Kg)	0.121949

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2248	0.1280	0.0603	0.0364	0.0229	0.0163	0.0149



3D screen shot	Hot spot position
	

MEASUREMENT 17

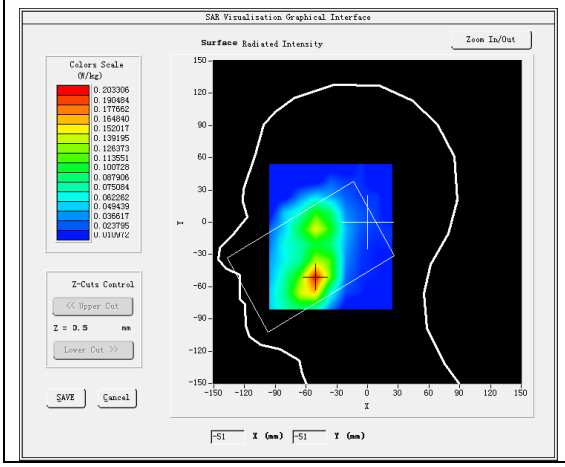
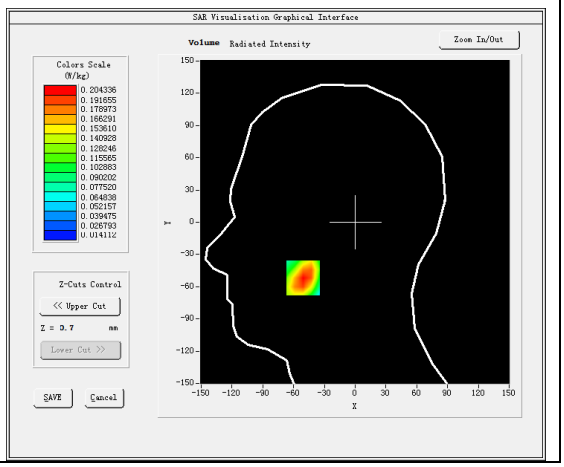
Date of measurement: 9/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 2
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.57

B. SAR Measurement Results

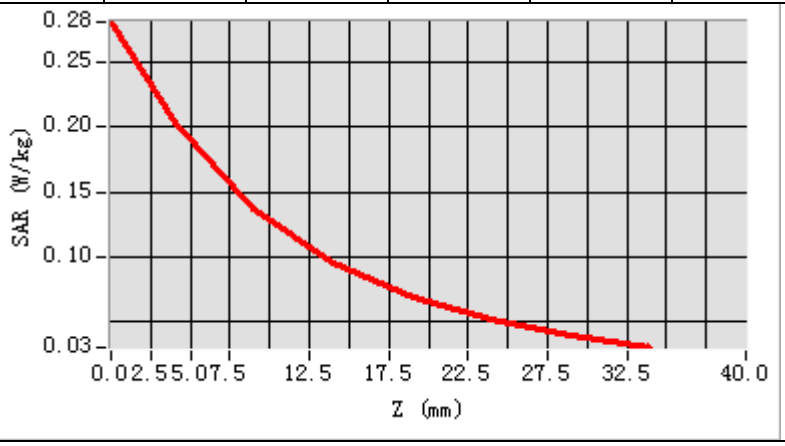
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	-4.470000

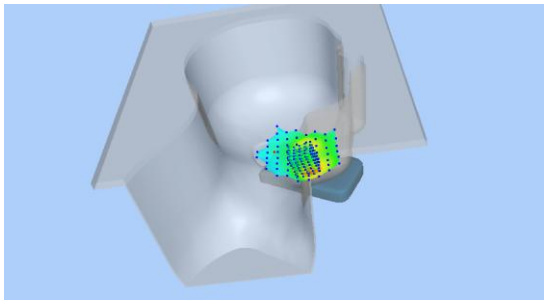
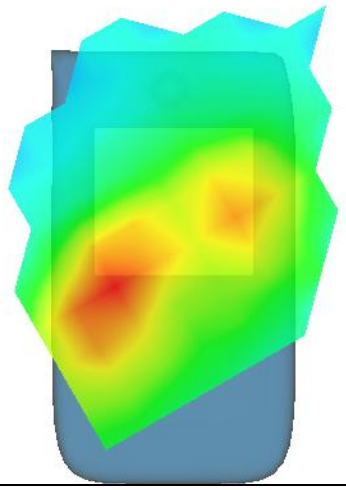
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-52.00
SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)	0.121992
SAR 1g (W/Kg)	0.200578

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2813	0.2043	0.1379	0.0948	0.0692	0.0513	0.0402



3D screen shot	Hot spot position
	

MEASUREMENT 18

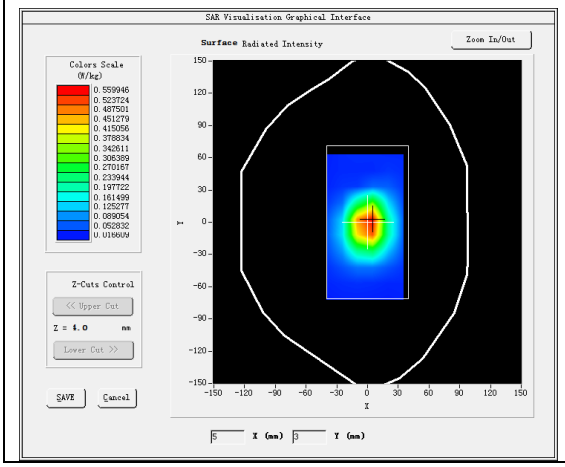
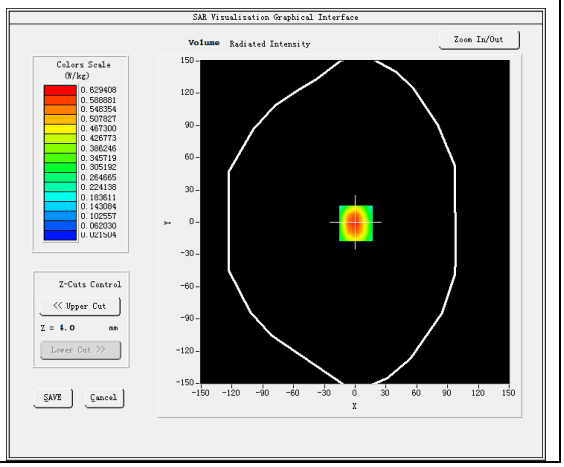
Date of measurement: 9/12/2024

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	2.57

B. SAR Measurement Results

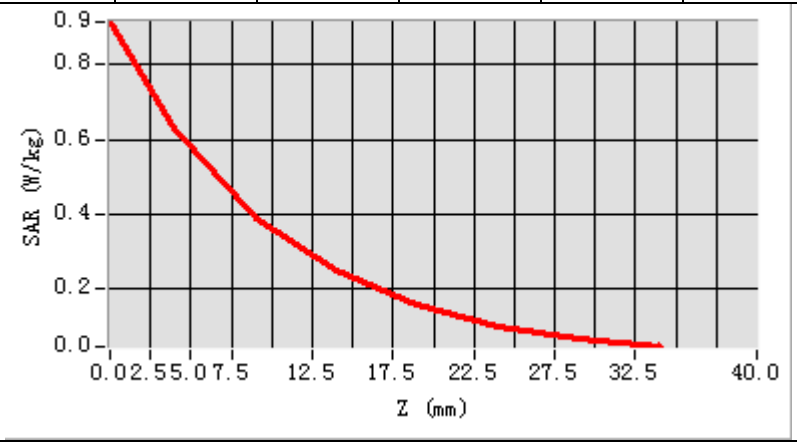
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.543579
Relative permittivity (imaginary part)	13.809931
Conductivity (S/m)	1.442371
Variation (%)	0.260000

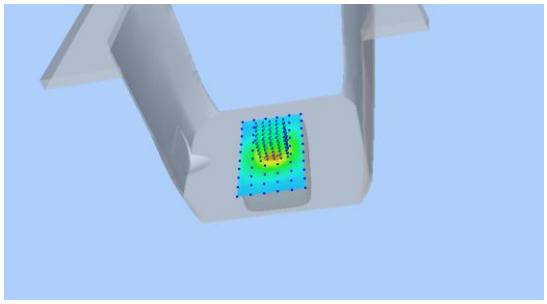
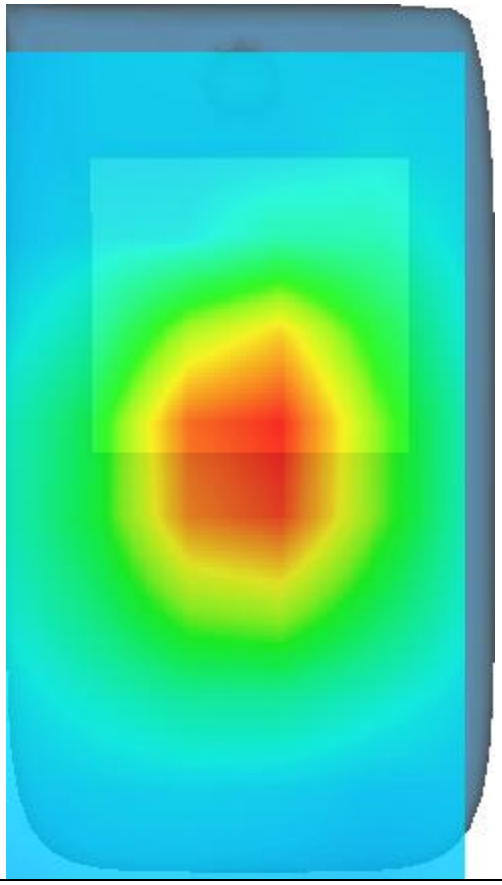
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-1.00
SAR Peak: 0.92 W/kg

SAR 10g (W/Kg)	0.349747
SAR 1g (W/Kg)	0.614890

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.9129	0.6294	0.3911	0.2483	0.1573	0.1033	0.0688



3D screen shot	Hot spot position
	

MEASUREMENT 19

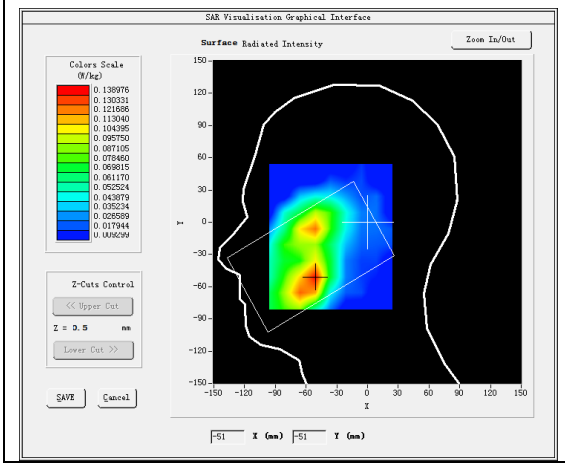
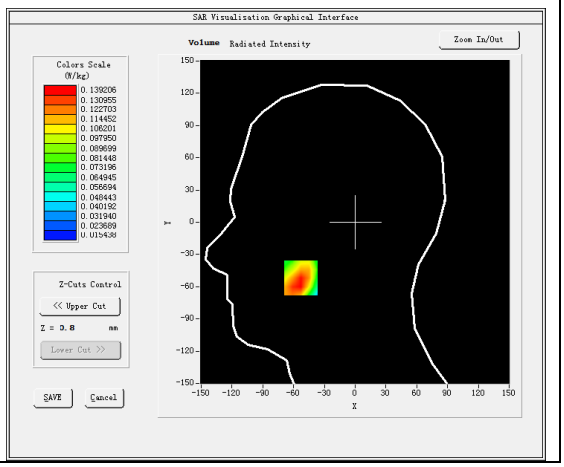
Date of measurement: 6/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 4
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

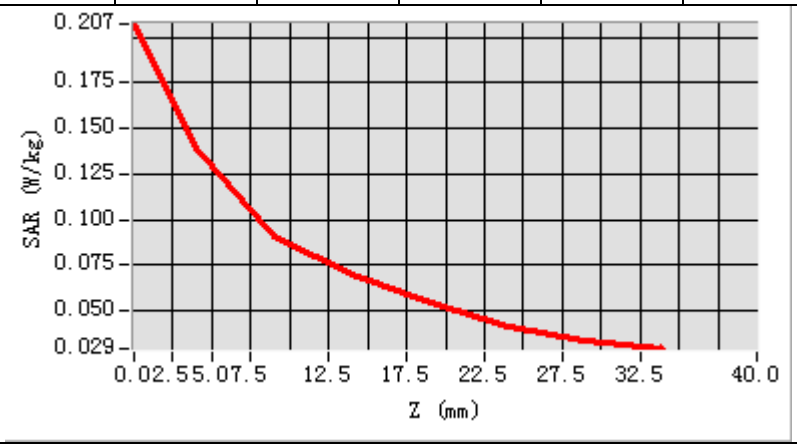
Frequency (MHz)	1732.500000
Relative permittivity (real part)	39.437782
Relative permittivity (imaginary part)	13.684697
Conductivity (S/m)	1.317152
Variation (%)	1.280000

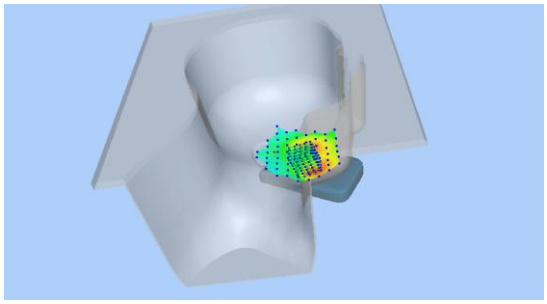
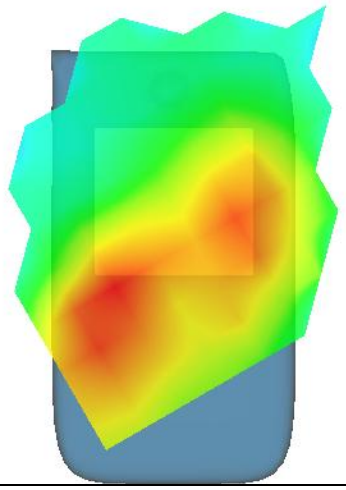
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-53.00, Y=-52.00
SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.090467
SAR 1g (W/Kg)	0.136994

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2072	0.1392	0.0909	0.0704	0.0549	0.0417	0.0337



3D screen shot	Hot spot position
	

MEASUREMENT 20

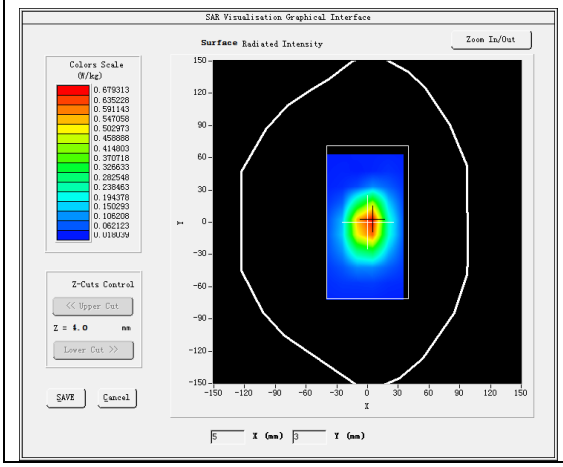
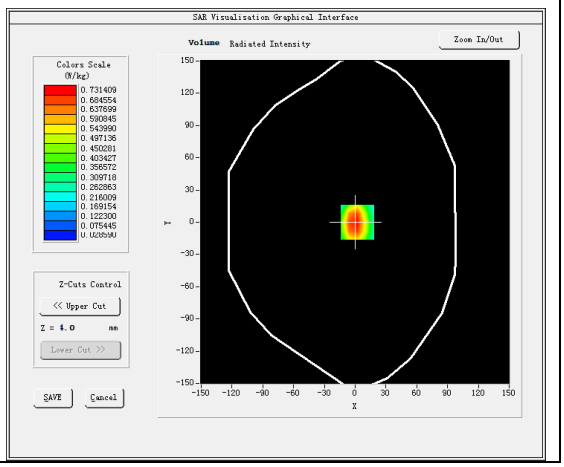
Date of measurement: 6/12/2024

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 4
Channels	High
Signal	LTE (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

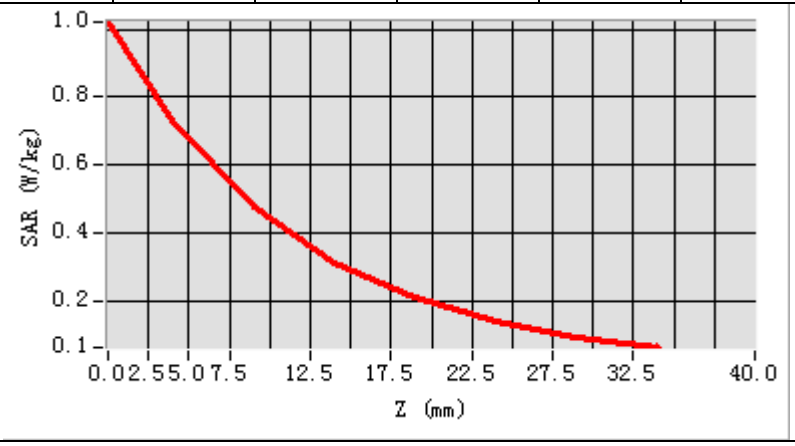
Frequency (MHz)	1745.000000
Relative permittivity (real part)	39.437782
Relative permittivity (imaginary part)	13.684697
Conductivity (S/m)	1.317152
Variation (%)	-0.250000

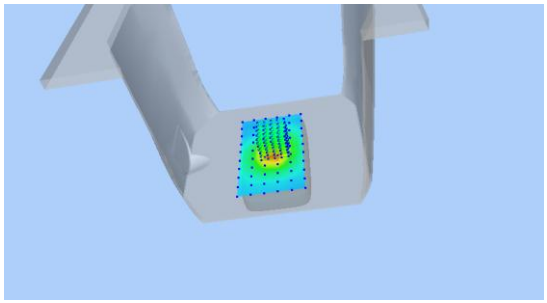
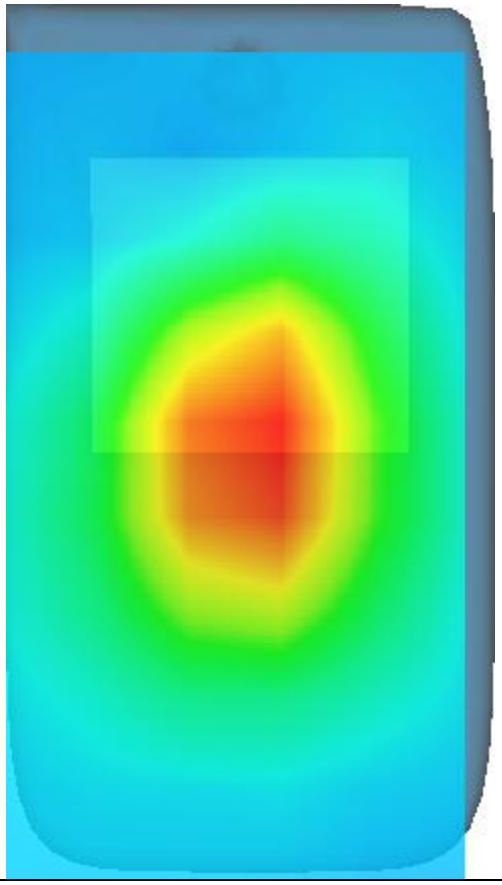
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=0.00
SAR Peak: 1.05 W/kg

SAR 10g (W/Kg)	0.431230
SAR 1g (W/Kg)	0.725740

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.0211	0.7314	0.4804	0.3124	0.2116	0.1395	0.0952



3D screen shot	Hot spot position
	

MEASUREMENT 21

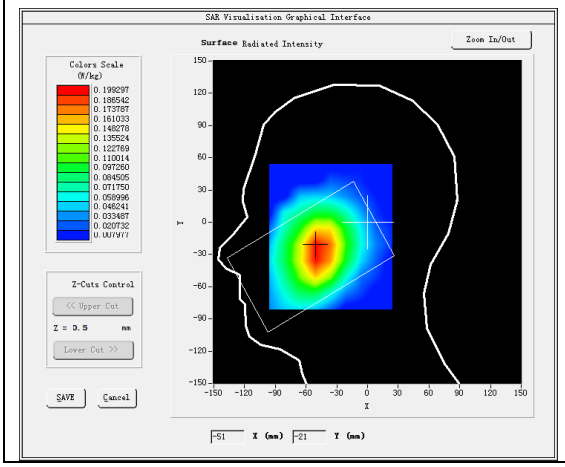
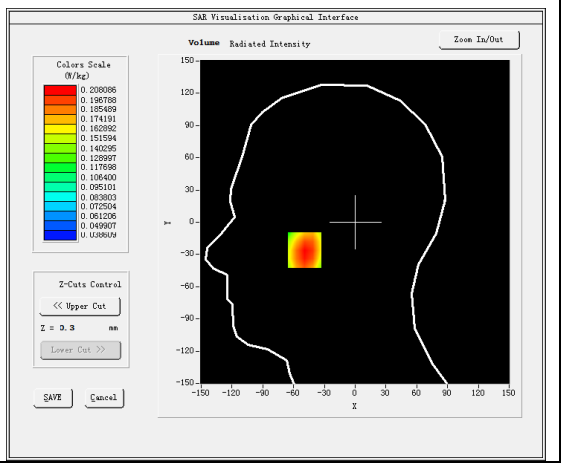
Date of measurement: 11/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 5
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

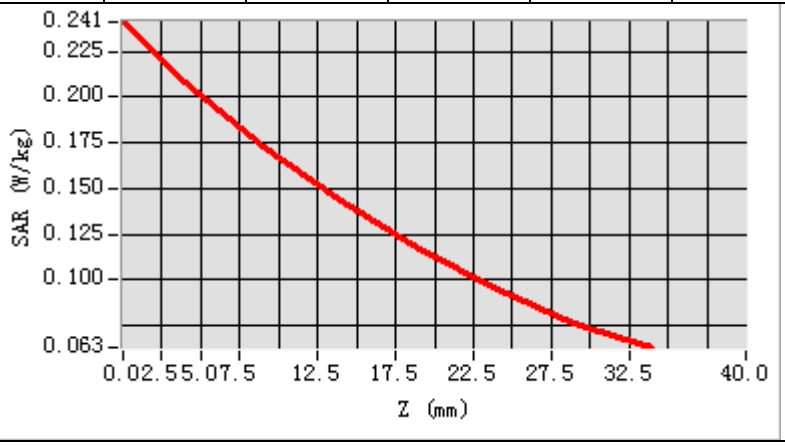
Frequency (MHz)	836.500000
Relative permittivity (real part)	41.745296
Relative permittivity (imaginary part)	19.617273
Conductivity (S/m)	0.911658
Variation (%)	3.680000

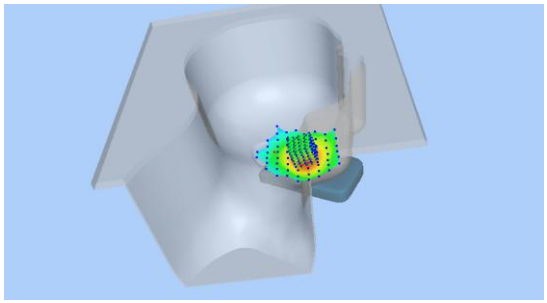
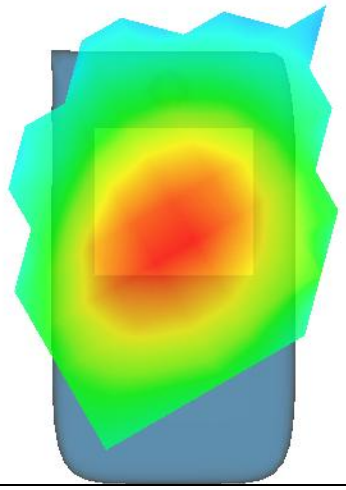
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-49.00, Y=-26.00
SAR Peak: 0.25 W/kg

SAR 10g (W/Kg)	0.156070
SAR 1g (W/Kg)	0.204233

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2412	0.2081	0.1727	0.1437	0.1170	0.0953	0.0768



3D screen shot	Hot spot position
	

MEASUREMENT 22

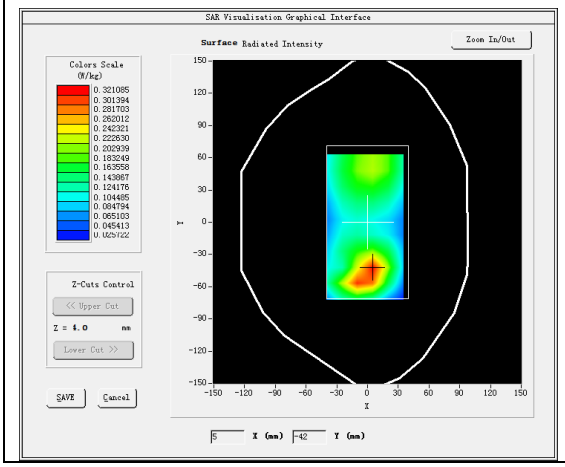
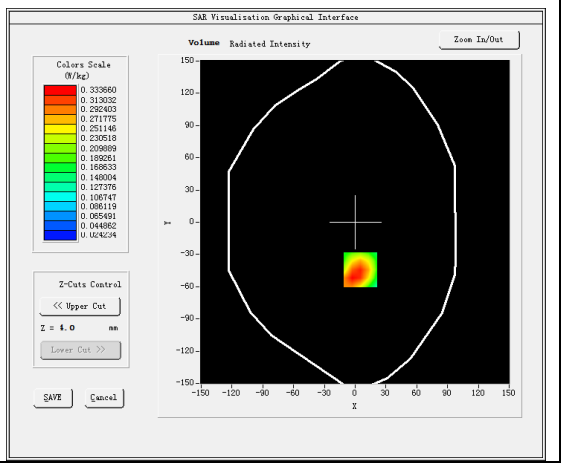
Date of measurement: 11/12/2024

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 5
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

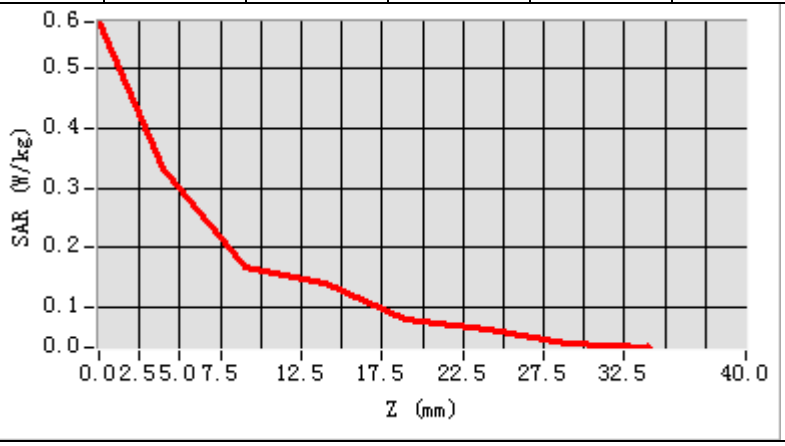
Frequency (MHz)	836.500000
Relative permittivity (real part)	41.745296
Relative permittivity (imaginary part)	19.617273
Conductivity (S/m)	0.911658
Variation (%)	-1.280000

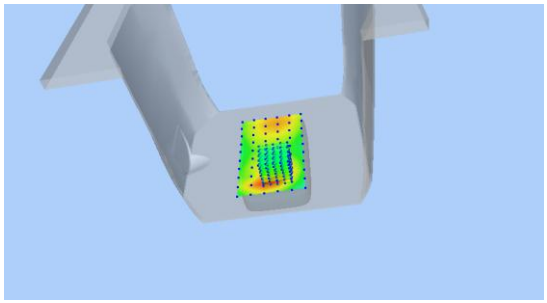
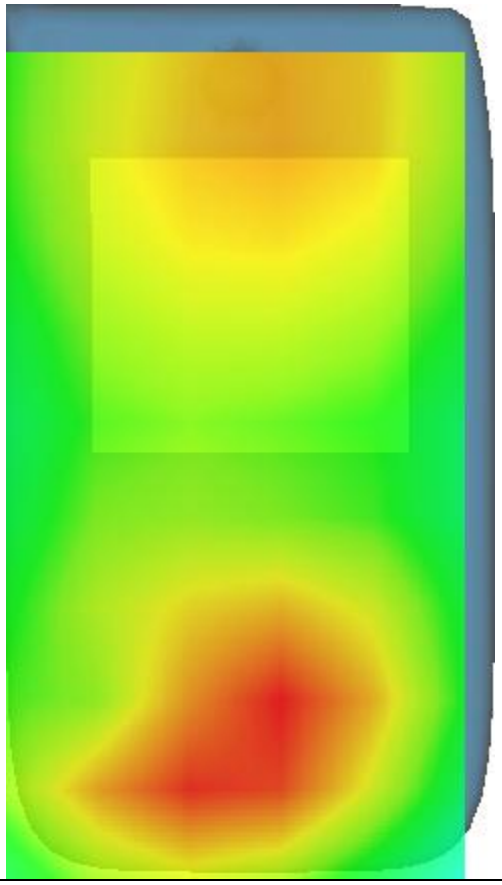
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=-44.00
SAR Peak: 0.48 W/kg

SAR 10g (W/Kg)	0.197220
SAR 1g (W/Kg)	0.322476

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5780	0.3337	0.1682	0.1394	0.0810	0.0622	0.0400



3D screen shot	Hot spot position
	

MEASUREMENT 23

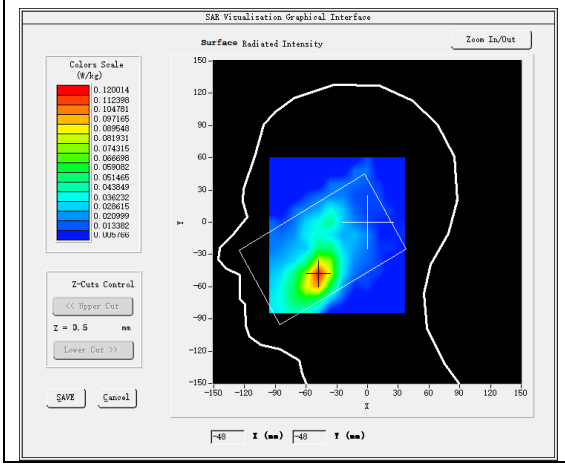
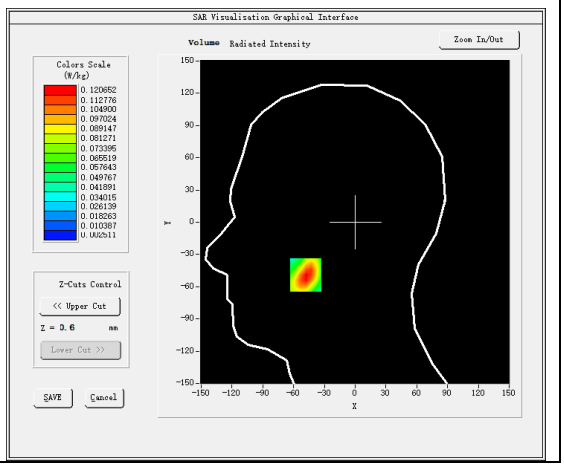
Date of measurement: 16/12/2024

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 7
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

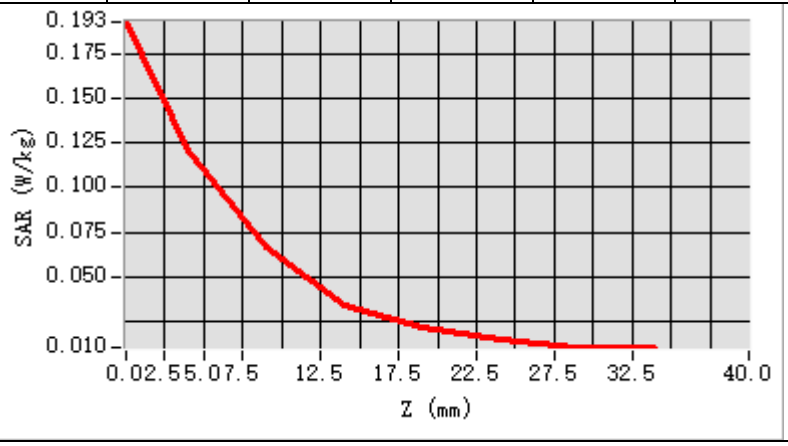
Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.116222
Relative permittivity (imaginary part)	13.501914
Conductivity (S/m)	1.901520
Variation (%)	1.910000

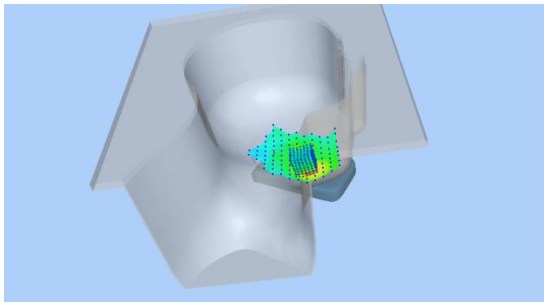
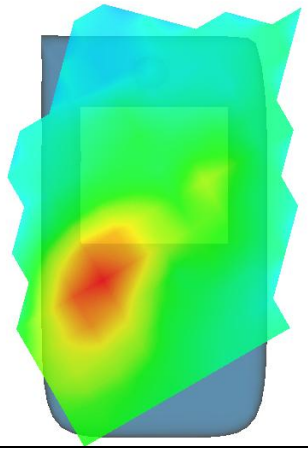
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-48.00, Y=-49.00
SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.060074
SAR 1g (W/Kg)	0.114324

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1930	0.1207	0.0664	0.0342	0.0216	0.0152	0.0103



3D screen shot	Hot spot position
	

MEASUREMENT 24

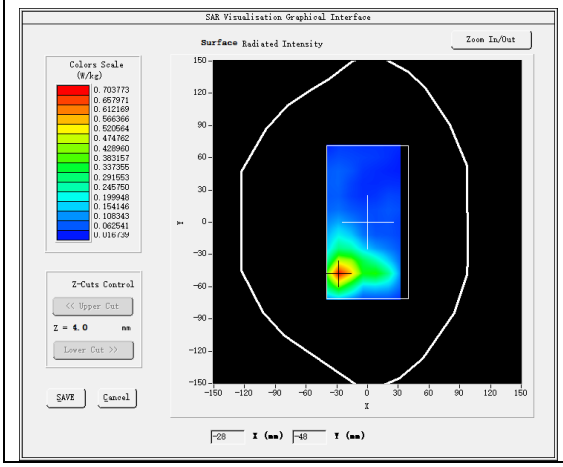
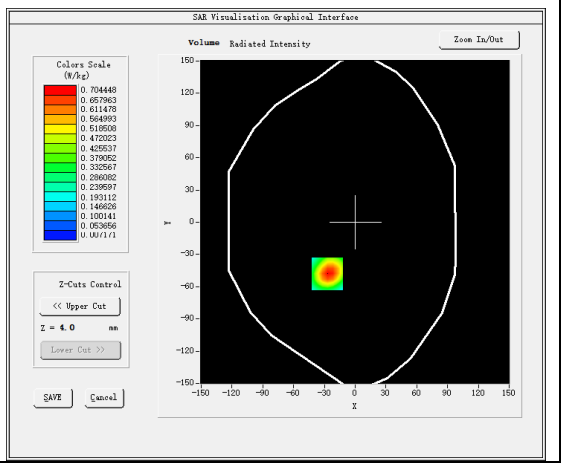
Date of measurement: 16/12/2024

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	2.51

B. SAR Measurement Results

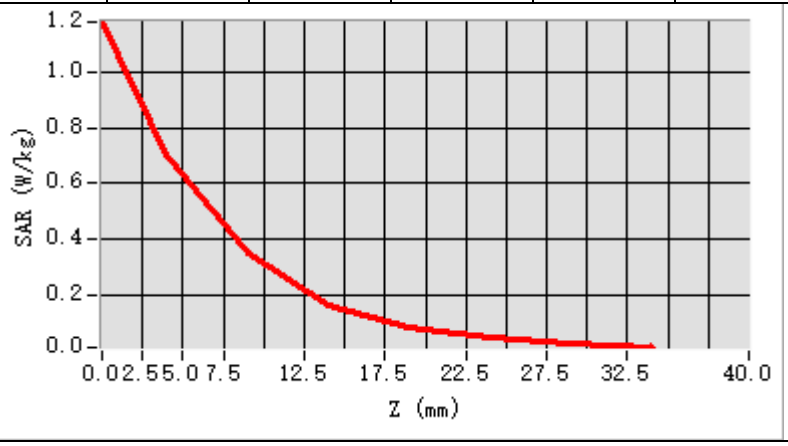
Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.116222
Relative permittivity (imaginary part)	13.501914
Conductivity (S/m)	1.901520
Variation (%)	3.630000

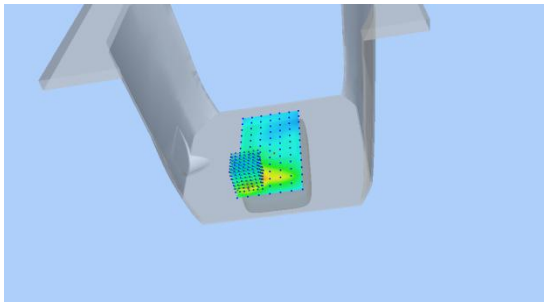
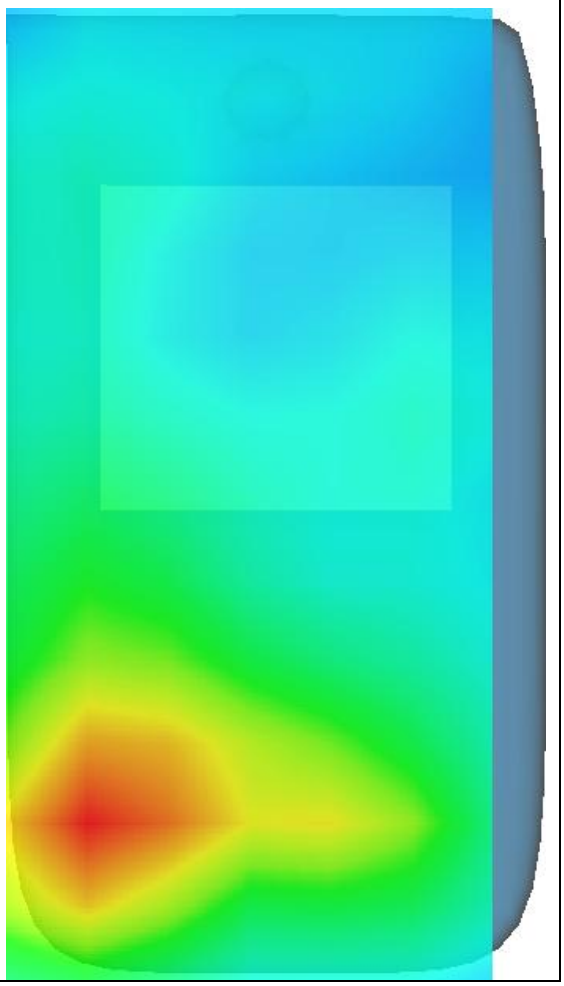
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-27.00, Y=-48.00
SAR Peak: 1.17 W/kg

SAR 10g (W/Kg)	0.320823
SAR 1g (W/Kg)	0.658025

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.1787	0.7044	0.3485	0.1656	0.0845	0.0469	0.0275



3D screen shot	Hot spot position
	

MEASUREMENT 25

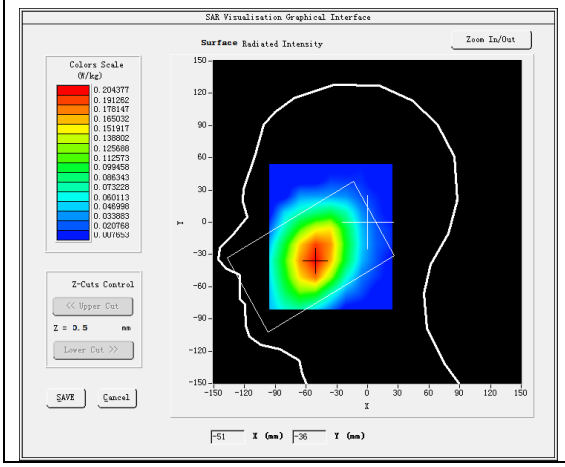
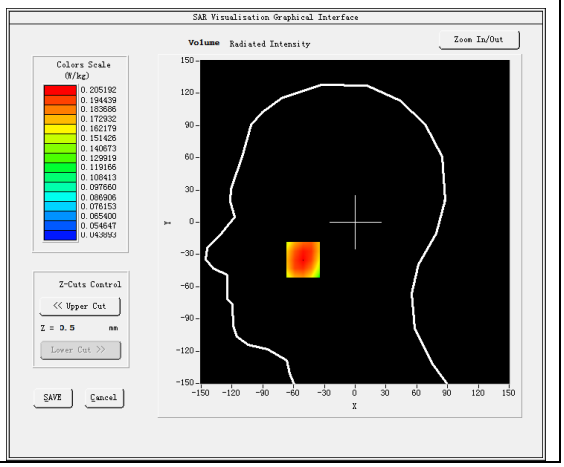
Date of measurement: 13/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 12
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

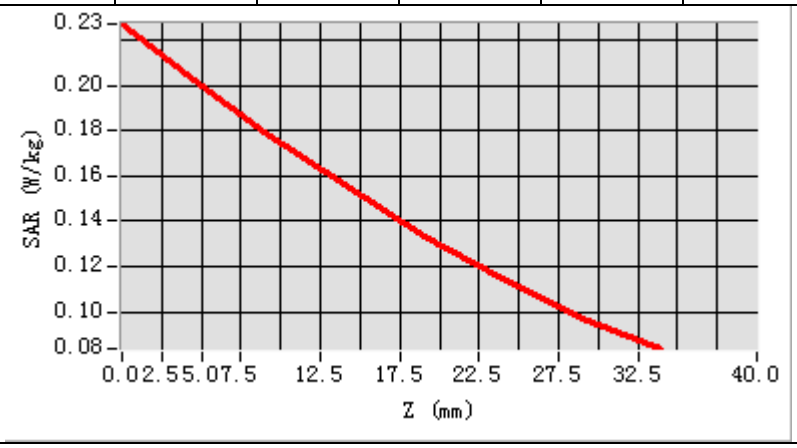
Frequency (MHz)	707.500000
Relative permittivity (real part)	41.314651
Relative permittivity (imaginary part)	21.860296
Conductivity (S/m)	0.859231
Variation (%)	2.400000

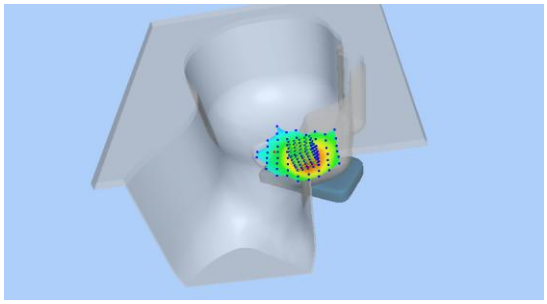
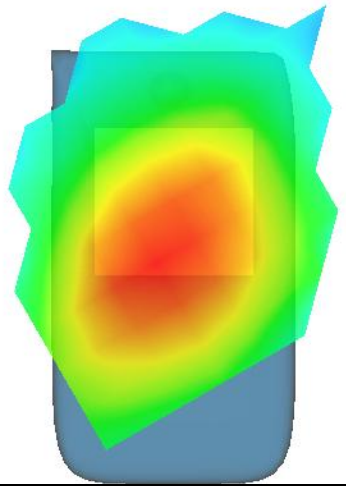
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-35.00
SAR Peak: 0.23 W/kg

SAR 10g (W/Kg)	0.164657
SAR 1g (W/Kg)	0.200082

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2273	0.2052	0.1793	0.1562	0.1329	0.1149	0.0968



3D screen shot	Hot spot position
	

MEASUREMENT 26

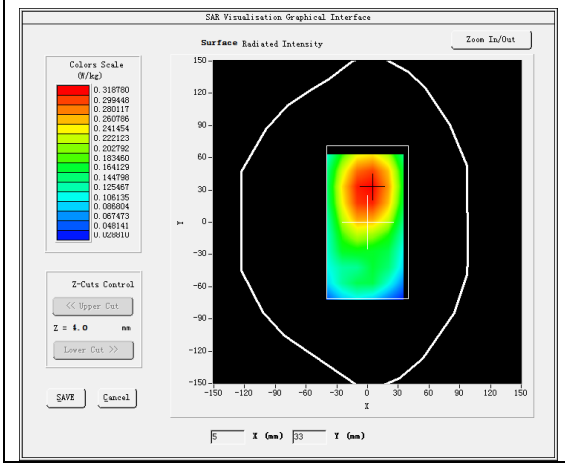
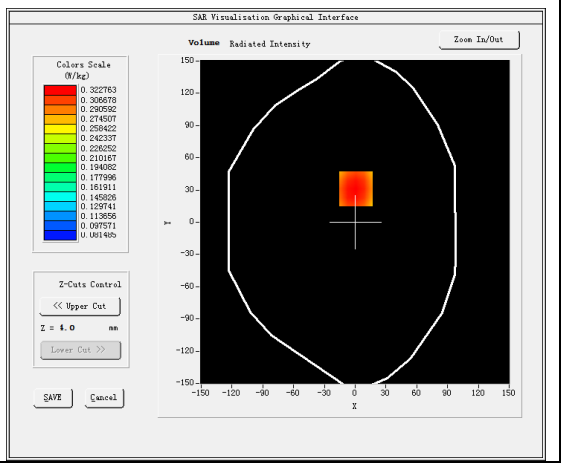
Date of measurement: 13/12/2024

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 12
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

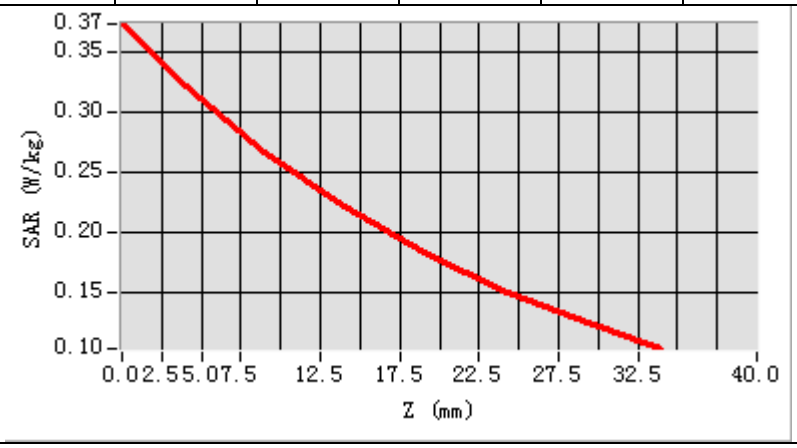
Frequency (MHz)	707.500000
Relative permittivity (real part)	41.314651
Relative permittivity (imaginary part)	21.860296
Conductivity (S/m)	0.859231
Variation (%)	-0.350000

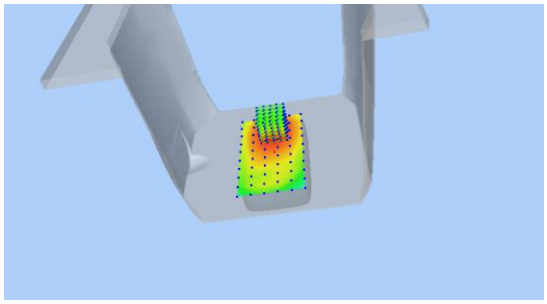
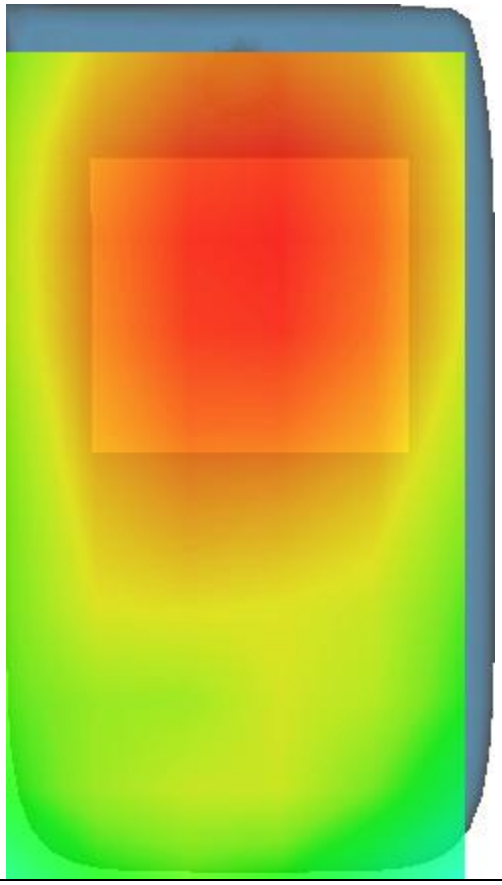
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=31.00
SAR Peak: 0.38 W/kg

SAR 10g (W/Kg)	0.251068
SAR 1g (W/Kg)	0.314923

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3740	0.3228	0.2671	0.2218	0.1834	0.1515	0.1266



3D screen shot	Hot spot position
	

MEASUREMENT 27

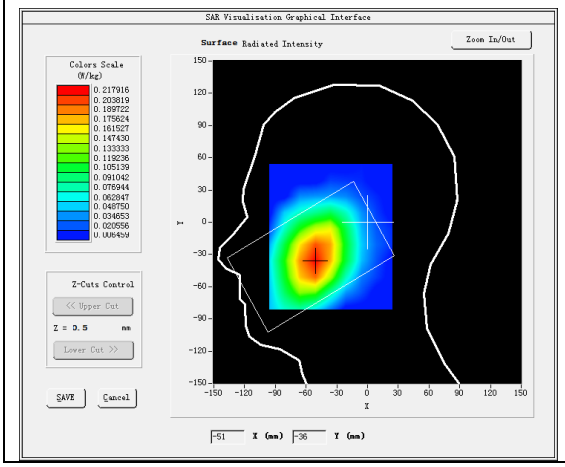
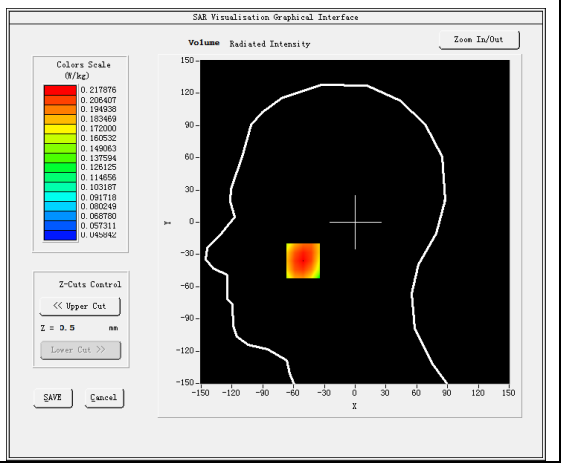
Date of measurement: 13/12/2024

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Left head
Device Position	Cheek
Band	LTE band 17
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

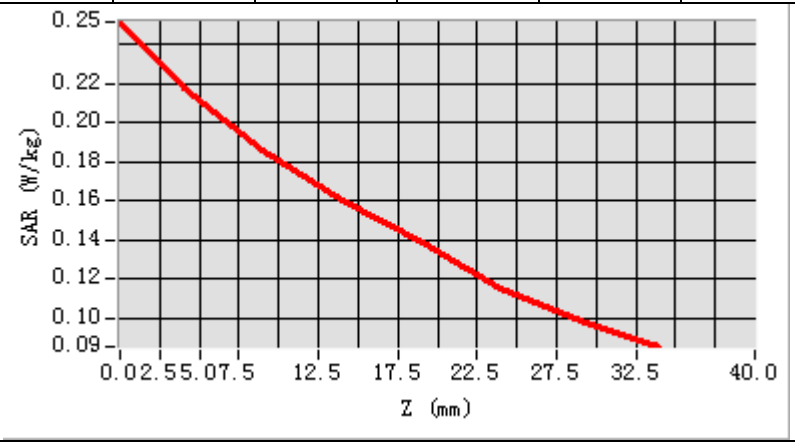
Frequency (MHz)	710.000000
Relative permittivity (real part)	41.299301
Relative permittivity (imaginary part)	21.800747
Conductivity (S/m)	0.859918
Variation (%)	4.990000

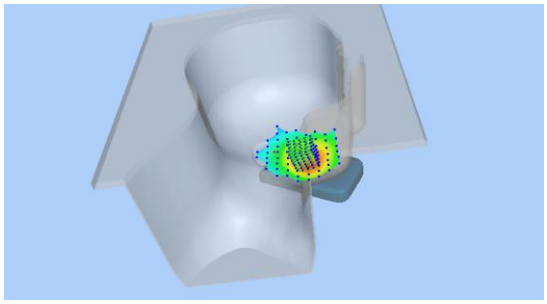
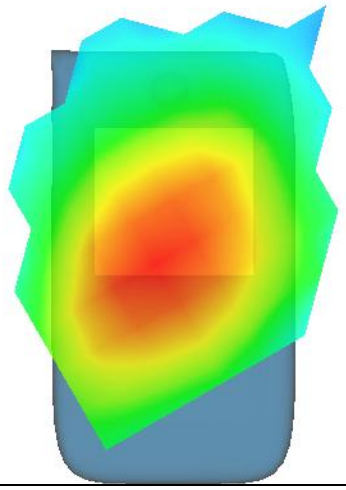
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-51.00, Y=-36.00
SAR Peak: 0.25 W/kg

SAR 10g (W/Kg)	0.172907
SAR 1g (W/Kg)	0.213741

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2514	0.2179	0.1854	0.1603	0.1385	0.1147	0.0992



3D screen shot	Hot spot position
	

MEASUREMENT 28

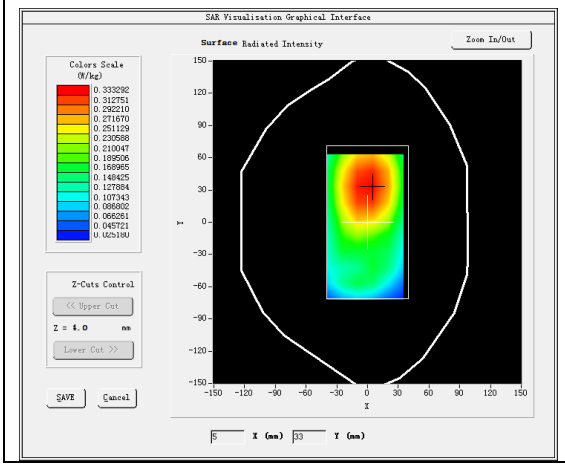
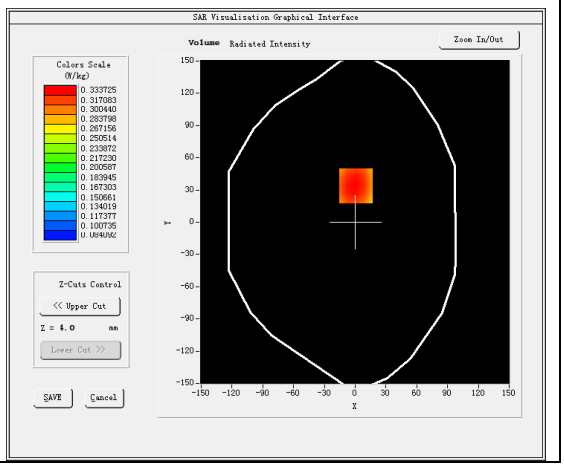
Date of measurement: 13/12/2024

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 17
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

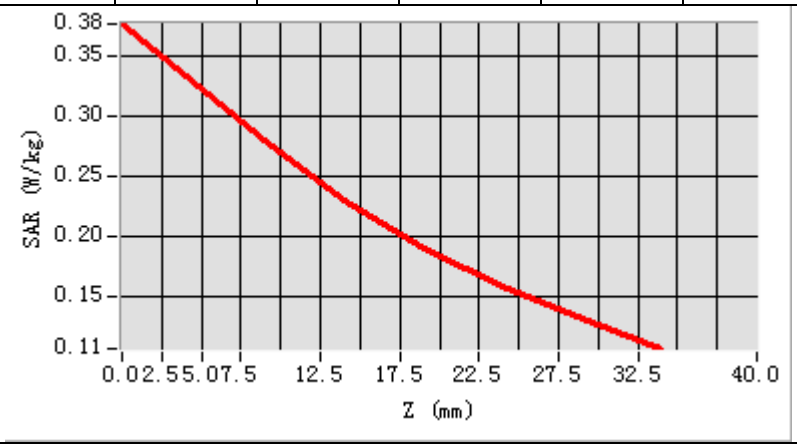
Frequency (MHz)	710.000000
Relative permittivity (real part)	41.299301
Relative permittivity (imaginary part)	21.800747
Conductivity (S/m)	0.859918
Variation (%)	-1.280000

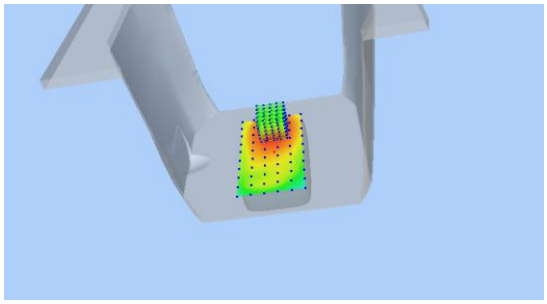
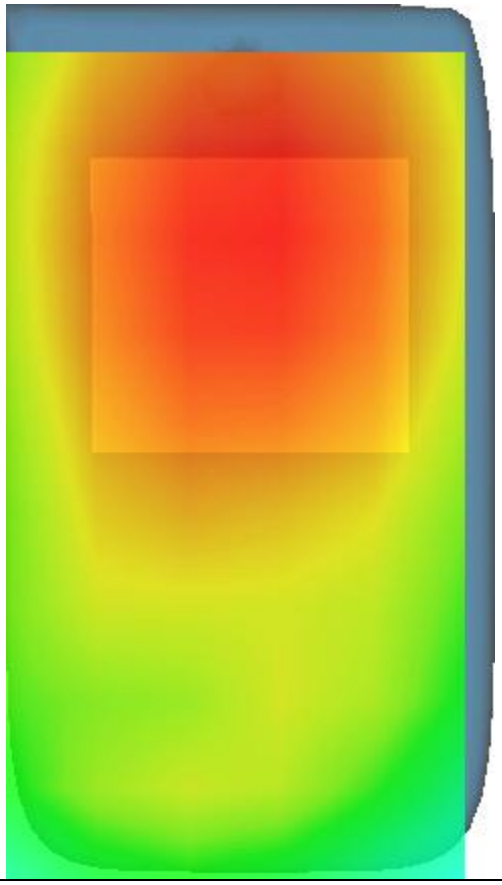
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=34.00
SAR Peak: 0.38 W/kg

SAR 10g (W/Kg)	0.259106
SAR 1g (W/Kg)	0.323941

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3763	0.3337	0.2801	0.2289	0.1891	0.1574	0.1308



3D screen shot	Hot spot position
	

15. ppendix D. Calibration Certificate

Table of contents
E Field Probe - 4024-EPGO-442
750 MHz Dipole - SN 03/15 DIP 0G750-355
835 MHz Dipole - SN 03/15 DIP 0G835-347
1800 MHz Dipole - SN 03/15 DIP 1G800-349
1900 MHz Dipole - SN 03/15 DIP 1G900-350
2450 MHz Dipole - SN 03/15 DIP 2G450-352
2600 MHz Dipole - SN 03/15 DIP 2G600-356
5000-6000 MHz Dipole - SN 13/14 WGA 33

Docusign Envelope ID: 223C1A7C-4751-4B95-8502-1618DC0951E3

COMOSAR E-Field Probe Calibration Report

Ref : ACR.278.12.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: 4024-EPGO-442

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 10/04/2024

Accreditations #2-6789
Scope available on www.cofrac.fr

The use of the Cofrac brand and the accreditation references is prohibited from any reproduction.

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).

Docusign Envelope ID: 223C1A7C-4751-4B95-8502-1618DC0951E3

COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.278.12.24.BES.A

	Name	*Function*	*Date*	*Signature*
Prepared by :	Cyrille ONNEE	Measurement Responsible	10/4/2024	
Checked & approved by:	Pedro Ruiz	Technical Manager	10/4/2024	
Authorized by:	Pedro Ruiz	Laboratory Director	10/4/2024 Assinado por: Pedro RUIZ 29093B31C46F428...	

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

Issue	*Name*	*Date*	*Modifications*
A	Cyrille ONNEE	10/4/2024	Initial release

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Docusign Envelope ID: 223C1A7C-4751-4B95-8502-1618DC0951E3

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	4024-EPGO-442
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.206 MΩ Dipole 2: R2=0.223 MΩ Dipole 3: R3=0.235 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.

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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:

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

where

$\mathrm{SAR}_{\mathrm{uncertainty}}$	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;
$\Delta\mathrm{SAR}_{be}$	in percent of SAR is the deviation between the measured SAR value, at the distance d_{be} from the boundary, and the analytical SAR value.

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

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3.5 PROBE MODULATION RESPONSE

MVG's probe were evaluated experimentally with various modulated signal and the deviation from CW response were found neglectable in the used power range of the probe. So the correction to taking into account the linearization parameters for different modulation is null, therefore the CW factor given in this report can be used whatever the measured modulation

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.

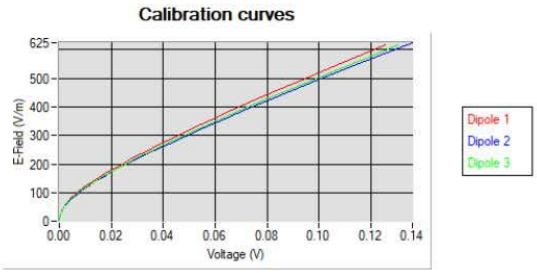
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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.

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

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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)
0.73	0.79	0.78

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
105	109	103

5.2 CALIBRATION IN LIQUID

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

$$ConvF = \frac{E^2_{liquid}}{E^2_{air}}$$

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

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

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:

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

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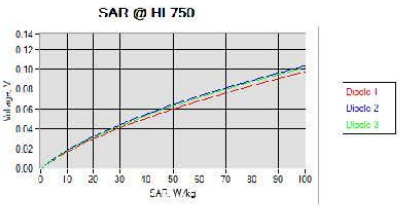
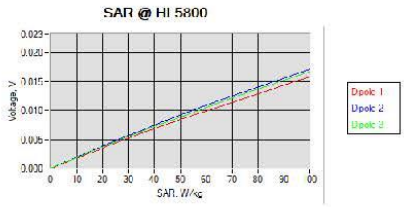
where
a=the larger cross-sectional of the waveguide
b=the smaller cross-sectional of the waveguide
δ=the skin depth for the liquid in the waveguide
Pw=the power delivered to the liquid

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	2.42
HL850	835	2.34
HL900	900	2.24
HL1800	1800	2.51
HL1900	1900	2.57
HL2000	2000	2.64
HL2300	2300	2.73
HL2450	2450	2.74
HL2600	2600	2.51
HL3300	3300	2.11
HL3500	3500	2.15
HL3700	3700	2.08
HL3900	3900	2.27
HL4200	4200	2.39
HL4600	4600	2.30
HL4900	4900	2.13
HL5200	5200	1.89
HL5400	5400	1.97
HL5600	5600	1.88
HL5800	5800	1.90

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





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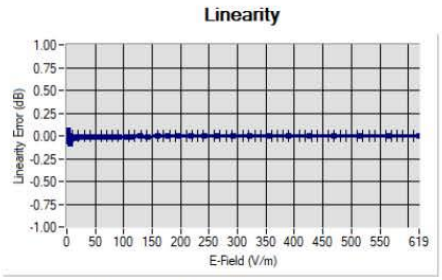
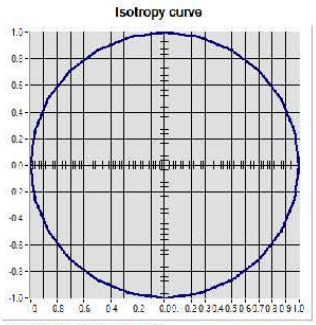
6 VERIFICATION RESULTS

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:+/-1.90% (+/-0.08dB)



Isotropy +/-0.12% (+/-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	08/2026
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	06/2026
USB Sensor	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.

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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	44235403	02/2024	02/2027

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SAR Reference Dipole Calibration Report

Ref : ACR.53.23.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 750 MHZ

SERIAL NO.: SN 03/15DIP0G750-355

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

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

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

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 750 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID750
Serial Number	SN 03/15DIP0G750-355
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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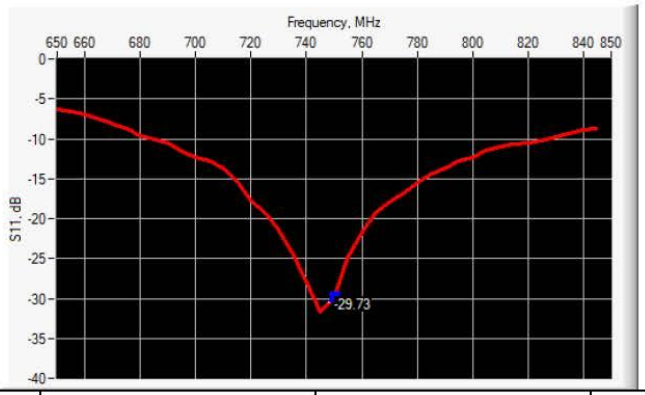
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
750	-29.73	-20	52.5Ω + 2.2jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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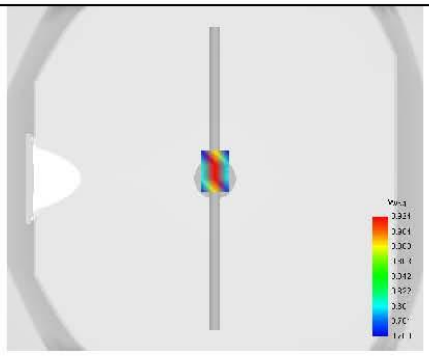
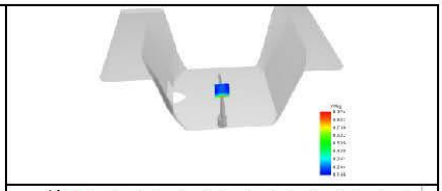
SAR REFERENCE DIPOLE CALIBRATION REPORT

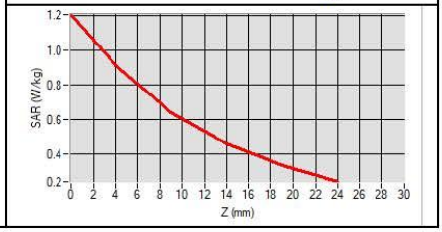
REF : ACR.53.23.24.BES.A

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

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







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7 LIST OF EQUIPMENT

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

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SAR Reference Dipole Calibration Report

Ref : ACR.53.24.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 835 MHZ

SERIAL NO.: SN 03/15DIP0G835-347

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.24.24.BES.A

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

Yann Toutain ID

Signature numérique de Yann Toutain ID
Date : 2024.02.27 08:55:11 +01'00'

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 835 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID835
Serial Number	SN 03/15DIP0G835-347
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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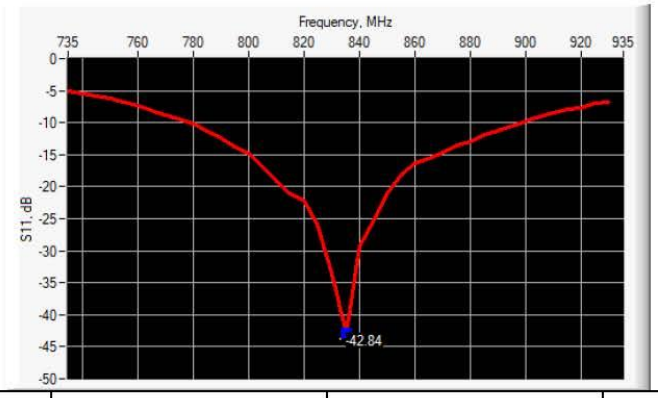
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	**Required**	**Measured**	**Required**	**Measured**	**Required**
-	161.00 +/- 2%	-	89.80 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
835	-42.84	-20	50.5Ω + 0.5jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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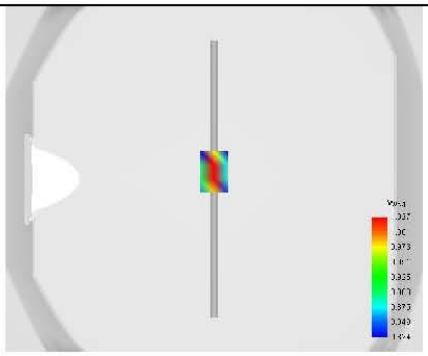
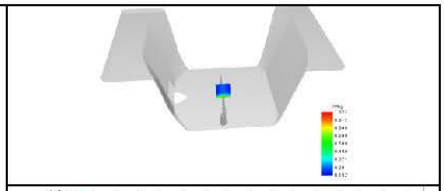
SAR REFERENCE DIPOLE CALIBRATION REPORT

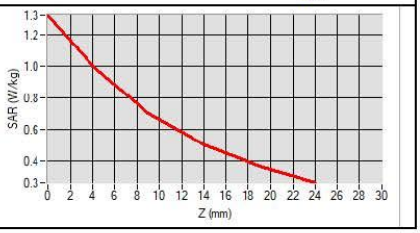
Ref : ACR.53.24.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: eps' : 44.8 sigma : 0.90
Distance between dipole center and liquid	15.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
835 MHz	0.94	9.40	9.56	0.63	6.28	6.22







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7 LIST OF EQUIPMENT

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

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SAR Reference Dipole Calibration Report

Ref : ACR.53.26.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 1800 MHZ

SERIAL NO.: SN 03/15DIP1G800-349

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.26.24.BES.A

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

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

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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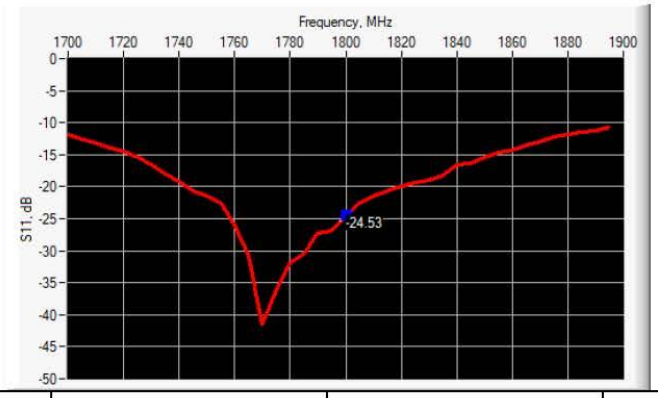
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
1800	-24.53	-20	44.8Ω + 2.0jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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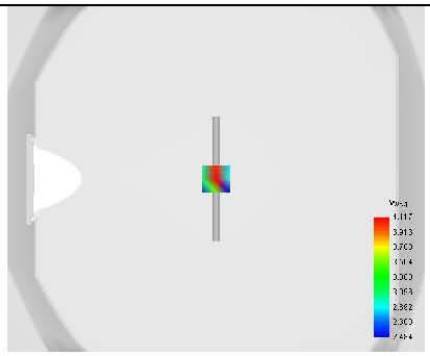
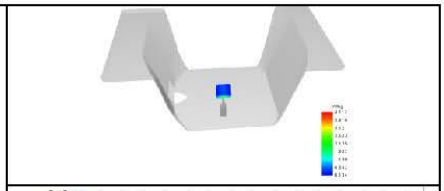
SAR REFERENCE DIPOLE CALIBRATION REPORT

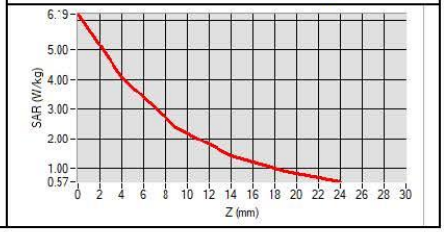
Ref : ACR.53.26.24.BES.A

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

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







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7 LIST OF EQUIPMENT

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

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SAR Reference Dipole Calibration Report

Ref : ACR.53.27.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 1900 MHZ

SERIAL NO.: SN 03/15DIP1G900-350

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.27.24.BES.A

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

Yann Toutain ID Signature numérique de Yann Toutain ID Date : 2024.02.27 08:56:45 +01'00'

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1900 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID1900
Serial Number	SN 03/15DIP1G900-350
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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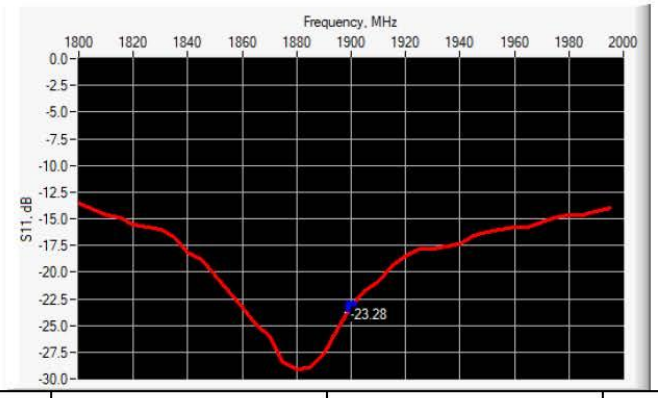
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	**Required**	**Measured**	**Required**	**Measured**	**Required**
-	68.00 +/- 2%	-	39.50 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
1900	-23.28	-20	46.2Ω + 5.4jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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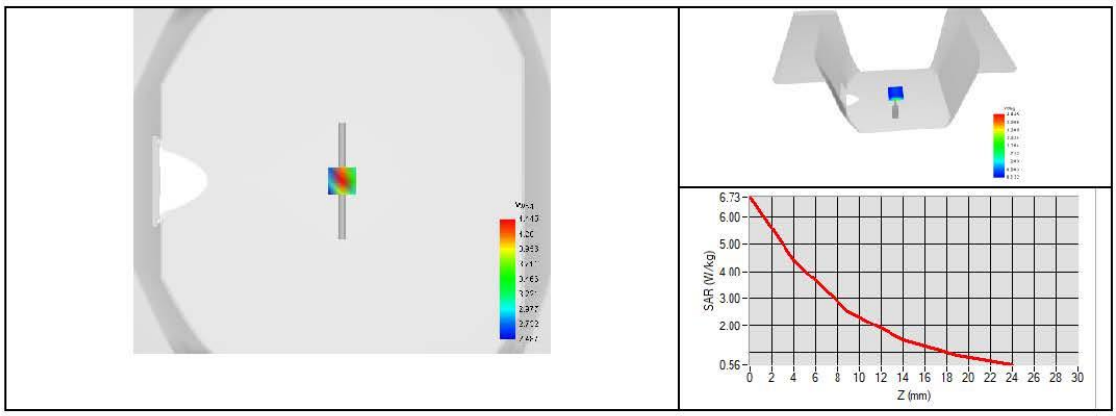
SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.27.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: eps' : 42.5 sigma : 1.39
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8mm/dz=5mm
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
1900 MHz	3.97	39.69	39.70	2.09	20.92	20.50



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7 LIST OF EQUIPMENT

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

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.28.24.BES.A

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

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

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

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

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7 LIST OF EQUIPMENT

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

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SAR Reference Dipole Calibration Report

Ref : ACR.53.29.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 2450 MHZ

SERIAL NO.: SN 03/15DIP2G450-352

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.29.24.BES.A

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

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

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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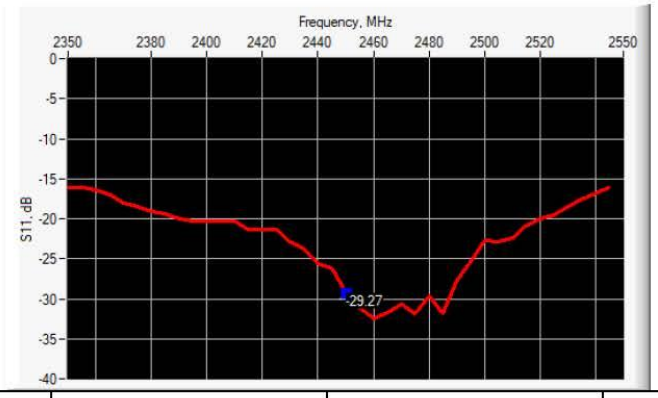
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2450	-29.27	-20	53.6Ω + 0.1jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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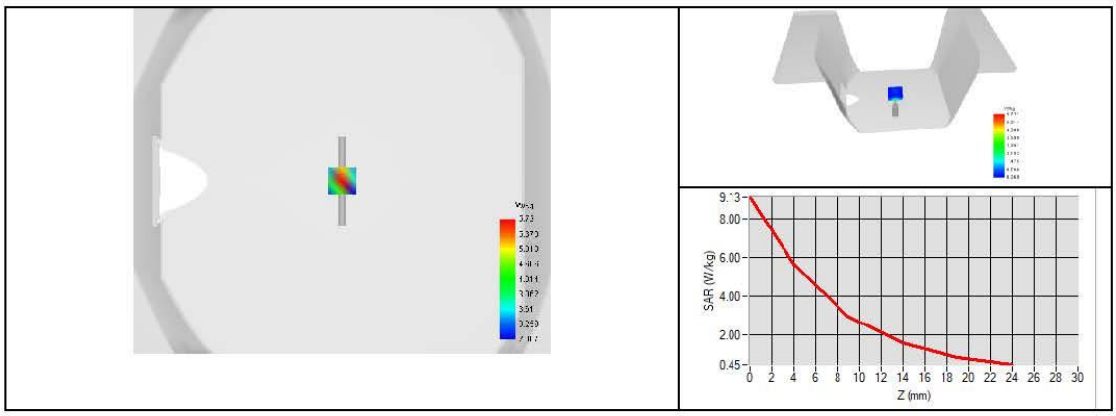
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.29.24.BES.A

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

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



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7 LIST OF EQUIPMENT

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

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SAR Reference Dipole Calibration Report

Ref : ACR.53.30.24.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 2600 MHZ

SERIAL NO.: SN 03/15DIP2G600-356

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

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Summary:

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

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.30.24.BES.A

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

Yann Toutain ID

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

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – *MVG COMOSAR Validation Dipole*

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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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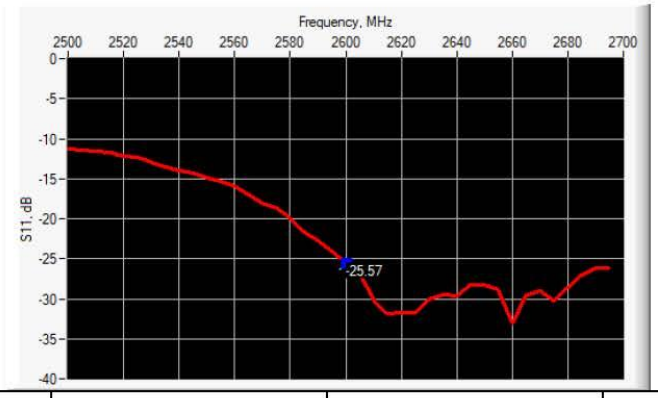
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

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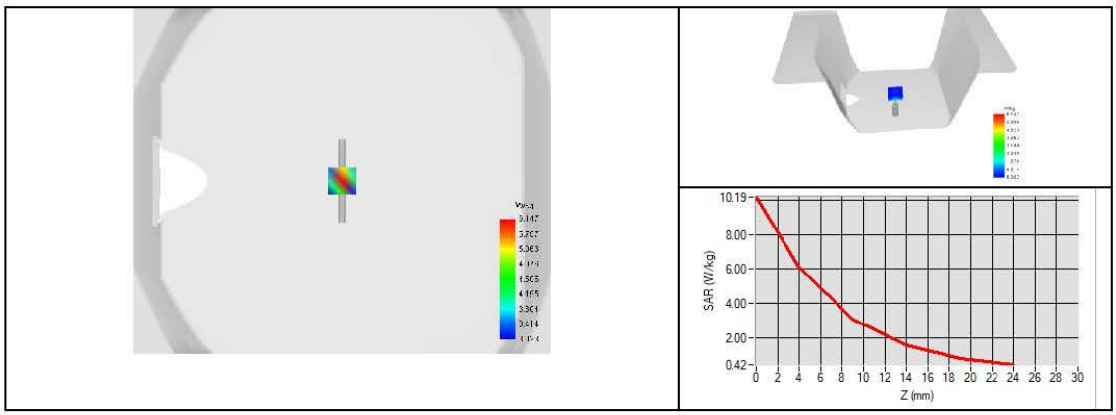
SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.30.24.BES.A

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

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



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7 LIST OF EQUIPMENT

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

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SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref : ACR.53.31.24.BES.A

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

Yann Toutain ID
Signature numérique de Yann Toutain ID
Date : 2024.02.27 08:58:45 +01'00'

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

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

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 5000-6000 MHz REFERENCE WAVEGUIDE
Manufacturer	MVG
Model	SWG5500
Serial Number	SN 13/14 WGA 33
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a S11 of -8 dB or better. The S11 measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

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4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

Frequency (MHz)	L (mm)		W (mm)		Lf (mm)		Wf (mm)	
	Required	Measured	Required	Measured	Required	Measured	Required	Measured
5800	40.39 ± 0.13	-	20.19 ± 0.13	-	81.03 ± 0.13	-	61.98 ± 0.13	-

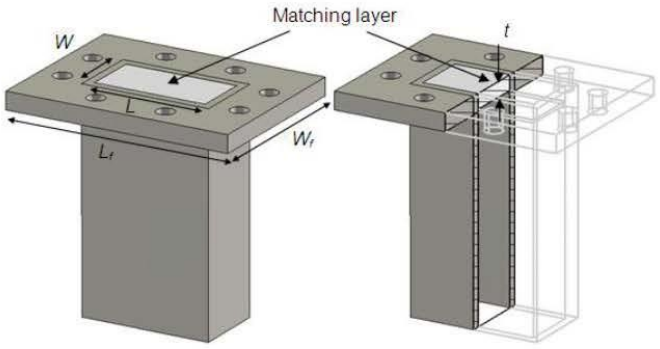

Figure 1: Validation Waveguide Dimensions

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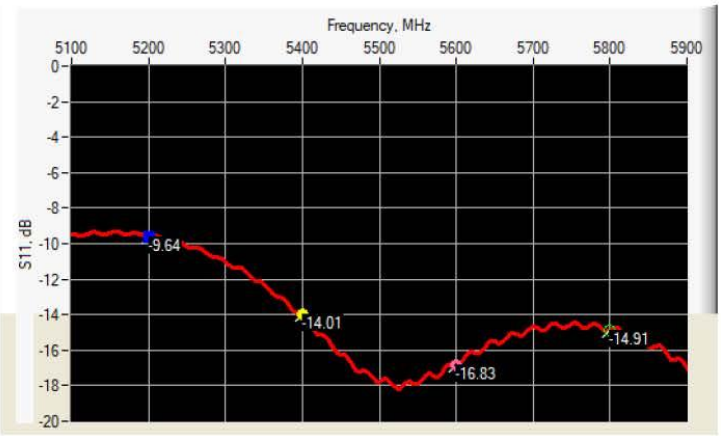
6.2 S11 PARAMETER

6.2.1 S11 parameter In Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
5200	-9.64	-8	25.80 Ω - 6.58 jΩ
5400	-14.01	-8	51.53 Ω + 20.60 jΩ
5600	-16.83	-8	44.12 Ω - 12.35 jΩ
5800	-14.91	-8	38.53 Ω + 11.21 jΩ

6.3 SAR

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards state that the system validation measurements must be performed using a reference waveguide meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed with the matching layer placed in the open end of the waveguide, with the waveguide and matching layer in direct contact with the phantom shell.

6.3.1 SAR With Head Liquid

At those frequencies, the target SAR value can not be generic. Hereunder is the target SAR value defined by MVG, within the uncertainty for the system validation. All SAR values are normalized to 1 W net power. In bracket, the measured SAR is given with the used input power.

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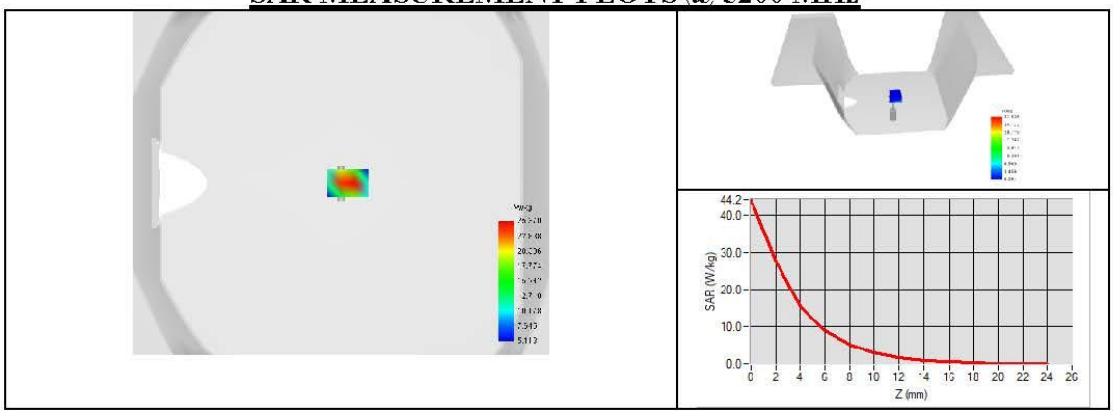
SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref : ACR.53.31.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values 5200 MHz: eps' :34.16 sigma : 4.42 Head Liquid Values 5400 MHz: eps' :33.63 sigma : 4.64 Head Liquid Values 5600 MHz: eps' :33.12 sigma : 4.87 Head Liquid Values 5800 MHz: eps' :32.57 sigma : 5.12
Distance between dipole waveguide and liquid	0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5200 MHz 5400 MHz 5600 MHz 5800 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency (MHz)	1 g SAR (W/kg)			10 g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
5200	16.26	162.59	159.00	5.62	56.21	56.90
5400	15.98	159.81	166.40	5.50	55.00	58.43
5600	17.91	179.15	173.80	6.10	61.01	59.97
5800	18.22	182.20	181.20	6.13	61.32	61.50

SAR MEASUREMENT PLOTS @ 5200 MHz



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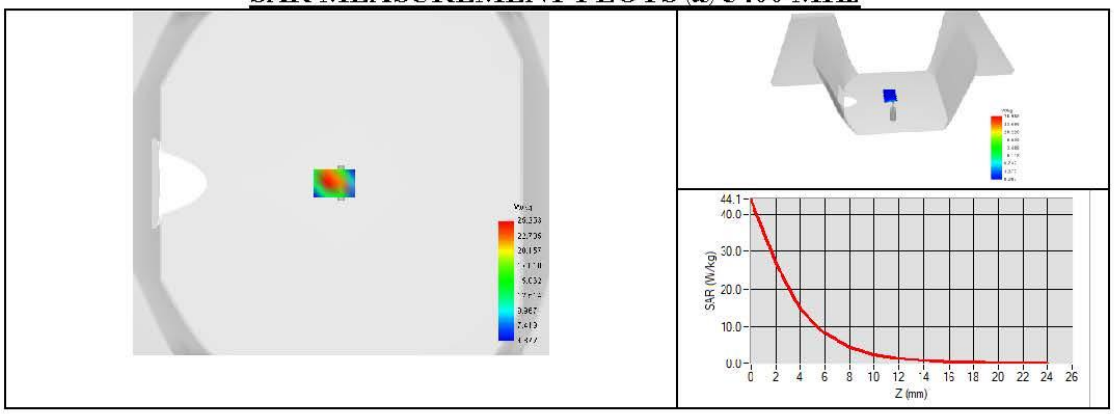
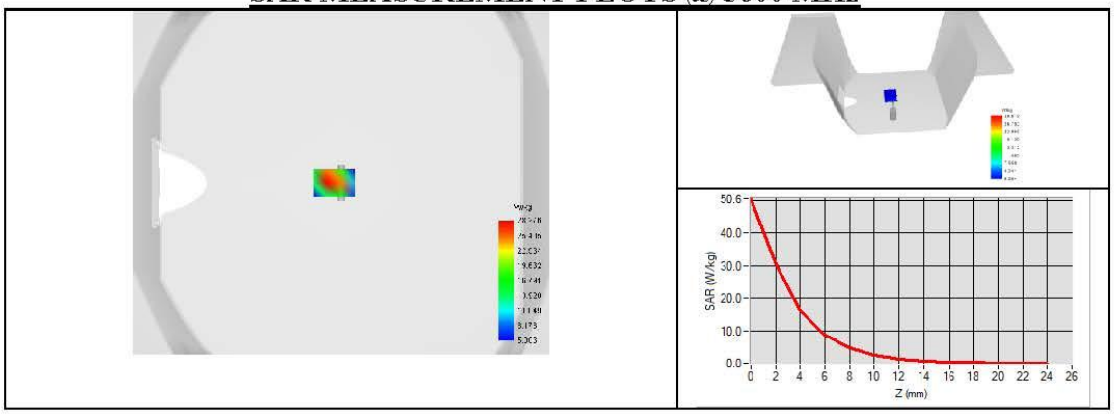
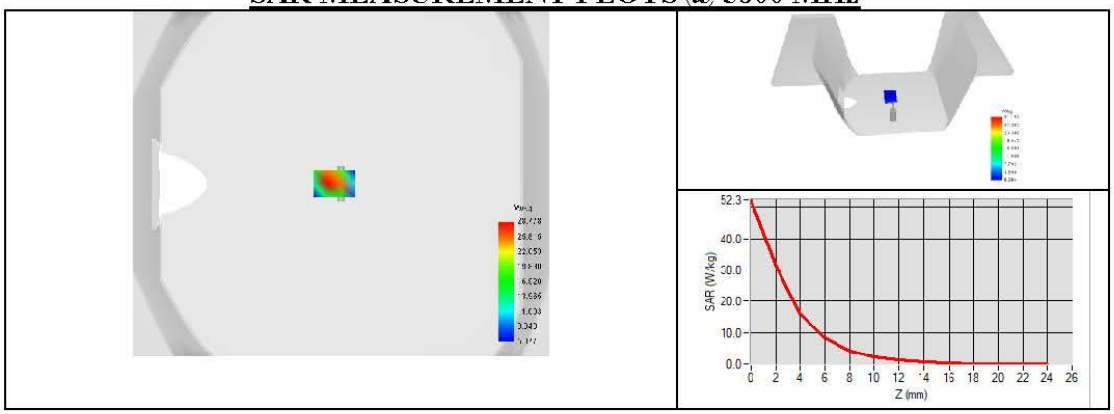
SAR MEASUREMENT PLOTS @ 5400 MHz



SAR MEASUREMENT PLOTS @ 5600 MHz



SAR MEASUREMENT PLOTS @ 5800 MHz



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7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
Calipers	Mitutoyo	SN 0009732	11/2022	11/2025
Reference Probe	MVG	3623-EPGO-431	11/2023	11/2024
Multimeter	Keithley 2000	4013982	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2021	06/2024
Power Meter	Keysight U2000A	SN: MY62340002	10/2022	10/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

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END