FCC SAR EVALUATION REPORT

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

Product Name： Tracker

Trademark： huiye

Model Name： QHY007

Family Model： N/A

FCC ID： 2A5B3-QHY006

Report No.： S24101804103001

Prepared for

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TEST RESULT CERTIFICATION

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Manufacturer's Name ..... : Chongqing Huiye IoT Technology Co.,Ltd

Address..... : No.6-4,Zong bao Avenue, Shapingba District, Chongqing City, P.R.China

Product description

Product name ..... : Tracker

Trademark ..... : huiye

Model Name ..... : QHY007

Family Model ..... : N/A

Standards ..... : FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992;IEEE Std 1528-2013
Published RF exposure KDB procedures

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

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Test Sample Number S241018041001

Date of Test

Date (s) of performance of tests.....: Oct. 28, 2024

Date of Issue.....: Nov. 26, 2024

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

Prepared By (Test Engineer) : Owen Xiao
(Jack Li)

Approved By (Lab Manager) : Alex
(Alex Li)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Nov. 30, 2024	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 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 QHY007 are as follows.

RF Exposure Conditions	Max. Reported SAR Value(W/kg)
1-g Body (Separation distance of 0mm)	0.708
Max Simultaneous Tx	0.774

Note: This device is in compliance with Specific Absorption Rate (SAR) for general population/ uncontrolled exposure limits (1.6 W/kg for Body) specified in FCC 47 CFR Part 2(2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 & KDB 865664 D01.

1.3. EUT Description

Device Information			
Product Name	Tracker		
Trade Name	huiye		
Model Name	QHY007		
Family Model	N/A		
FCC ID	2A5B3-QHY006		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna	LDS Antenna		
Battery	3.7V, 720mAh, 2.66Wh		
Hard Ware Version	V1.02		
Soft Ware Version	QHY007_M1_V08		
Device Operating Configurations			
Supporting Mode(s)	LTE Band 2/4/5/12/13/25/26/66, Bluetooth		
Test Modulation	LTE(QPSK/16QAM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	LTE Band 2	1850-1910	
	LTE Band 4	1710-1755	
	LTE Band 5	824-849	
	LTE Band 12	699-716	
	LTE Band 13	777-787	

	LTE Band 25	1850-1915
	LTE Band 26	814-849
	LTE Band 66	1710-1780
	Bluetooth	2402-2480
Power Class	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 12)	
	3, tested with power control all Max.(LTE Band 13)	
	3, tested with power control all Max.(LTE Band 25)	
	3, tested with power control all Max.(LTE Band 26)	
	3, tested with power control all Max.(LTE Band 66)	

1.4. Test specification(s)

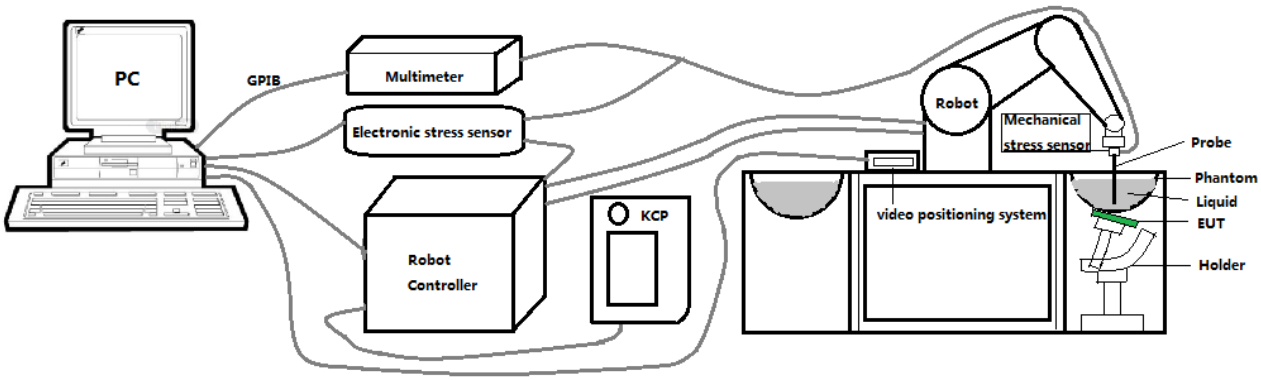
FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting
KDB 941225 D05 SAR for LTE Devices
KDB 447498 D01 General RF Exposure Guidance

1.5. Ambient Condition

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

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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

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

2.3. E-Field Probe

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

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

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 2.5 mm
- Distance between probe tip and sensor center: 1 mm
- Distance between sensor center and the inner phantom surface: 2 mm (repeatability better than ±1 mm).
- Probe linearity: ±0.08 dB
- Axial isotropy: ±0.01 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.

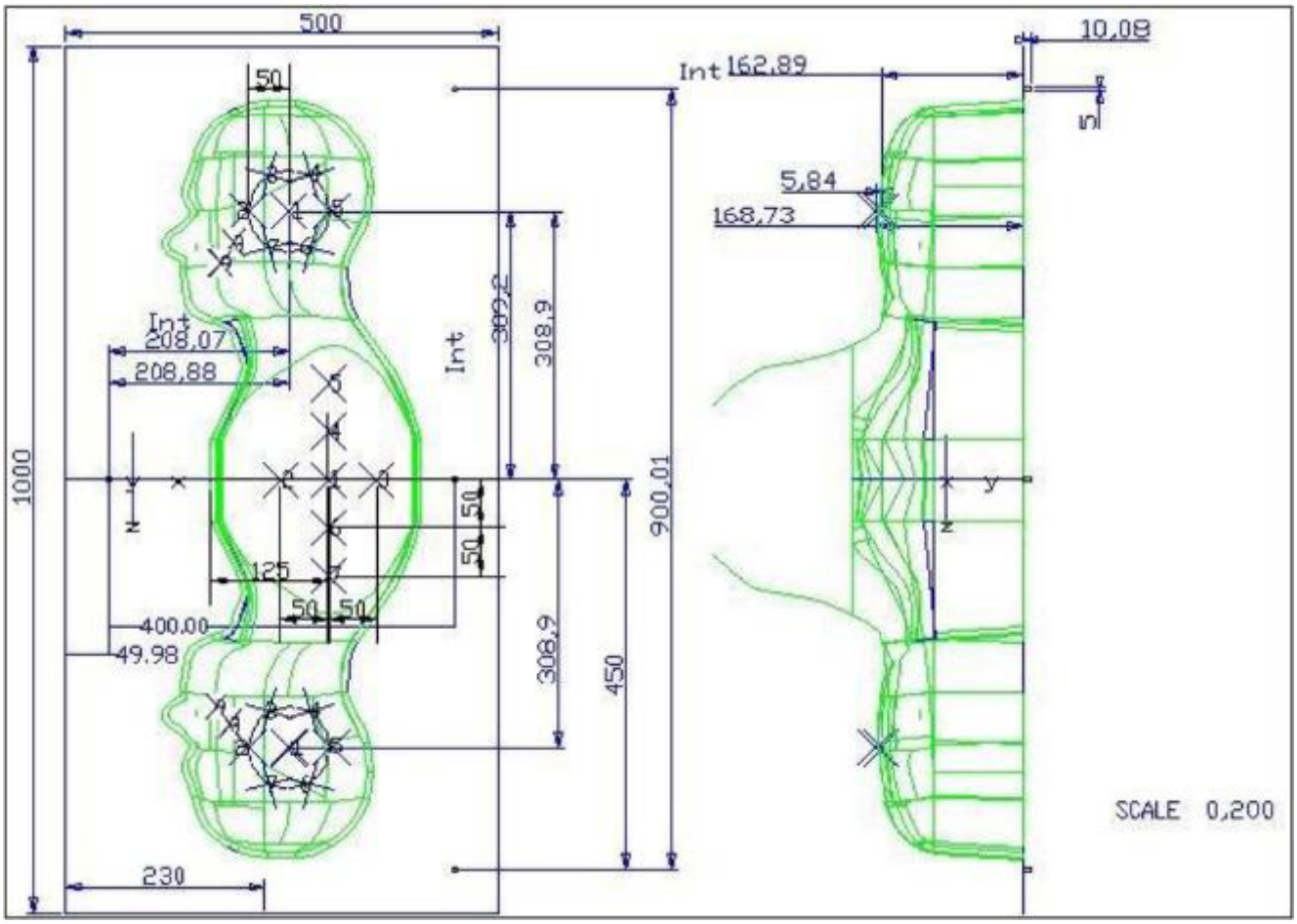
2.4. SAM phantoms

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 iPulseOx Pulse Oximeters.

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

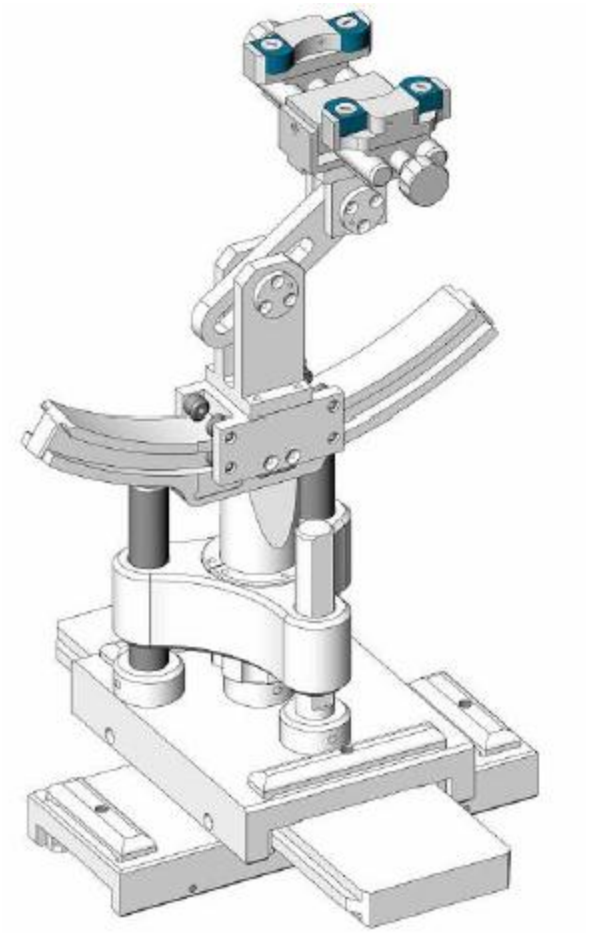


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

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

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

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

<SAR measurement>

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

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

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

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

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

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

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

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

3.1. Power Reference

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

3.2. Area scan & Zoom scan

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

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

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

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

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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

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

3.3. Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.
An extrapolation is 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.

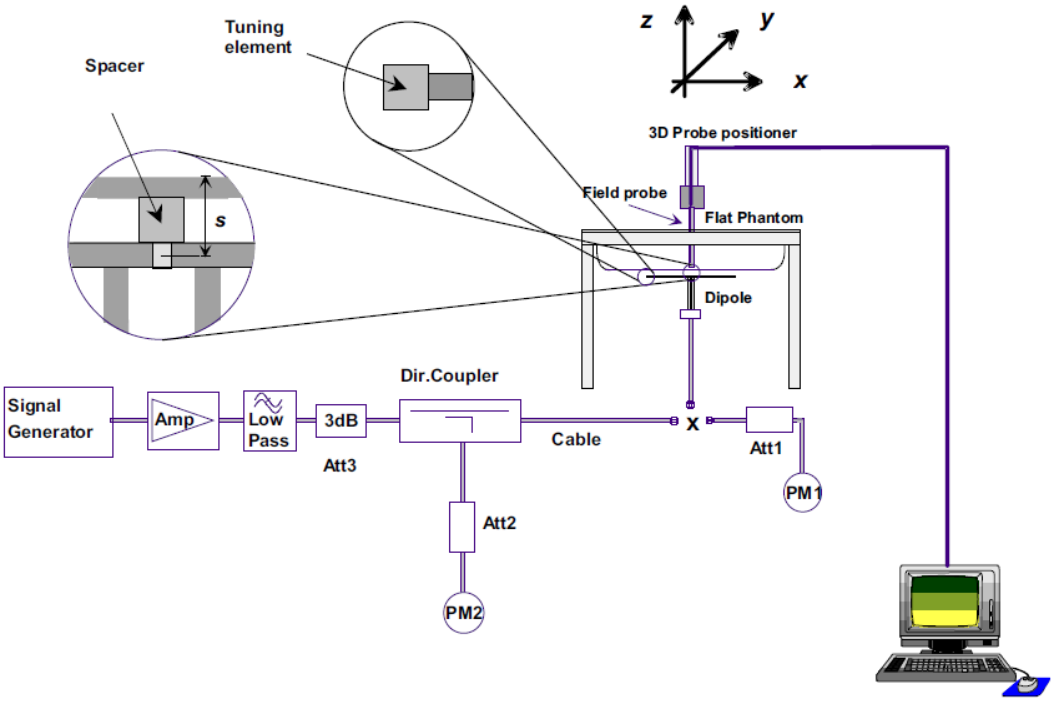
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		εr (±5%)	σ (S/m) (±5%)	εr	σ (S/m)		
Head 750	750	41.96 (39.86~44.06)	0.89 (0.85~0.93)	41.02	0.90	21.9 °C	Oct. 28, 2024
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	42.08	0.92	21.7 °C	Nov. 05, 2024
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	42.08	0.92	21.5 °C	Nov. 26, 2024
Head 900	900	41.50 (39.43~43.58)	0.97 (0.92~1.02)	41.56	0.99	21.9 °C	Oct. 29, 2024
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	39.23	1.40	21.0 °C	Oct. 30, 2024
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.48	1.46	21.3 °C	Nov. 06, 2024
Head 2000	2000	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.86	1.43	21.5 °C	Oct. 31, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.84	1.78	21.3 °C	Nov. 03, 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)	18dBm	0.544	0.367	8.62	5.82	21.9 °C	Oct. 28, 2024
835MHz	9.40 (8.46~10.34)	6.28 (5.65~6.91)	18dBm	0.575	0.376	9.11	5.96	21.7 °C	Nov. 05, 2024
835MHz	9.40 (8.46~10.34)	6.28 (5.65~6.91)	18dBm	0.574	0.376	9.10	5.96	21.5 °C	Nov. 26, 2024
900MHz	10.63 (9.57~11.69)	7.01 (6.31~7.71)	18dBm	0.627	0.409	9.94	6.48	21.9 °C	Oct. 29, 2024
1800MHz	37.06 (33.35~40.77)	20.01 (18.01~22.01)	18dBm	2.386	1.239	37.81	19.64	21.0 °C	Oct. 30, 2024
1900MHz	39.69 (35.72~43.66)	20.92 (18.83~23.01)	18dBm	2.511	1.236	39.79	19.59	21.3 °C	Nov. 06, 2024
2000MHz	38.27 (34.44~42.10)	19.79 (17.81~21.77)	18dBm	2.465	1.174	39.07	18.61	21.5 °C	Oct. 31, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	18dBm	2.989	1.426	47.37	22.60	21.3 °C	Nov. 03, 2024

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

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

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

5.2. SAR measurement uncertainty

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

6. RF Exposure Positions

6.1. Generic device

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

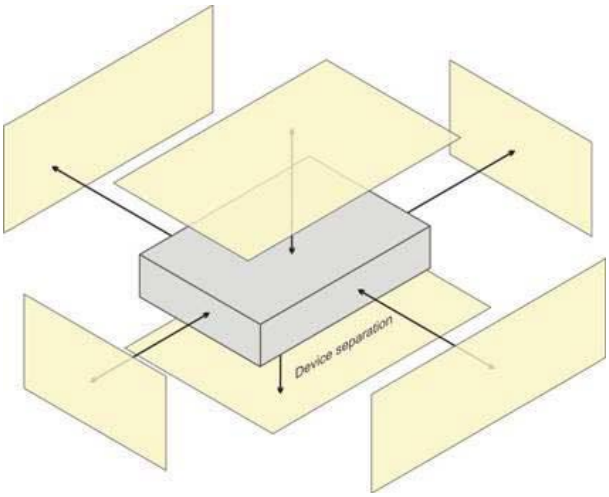


Figure 6.1 – Test positions for generic device

7. RF Output Power

7.1. LTE Output 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
eMTC Band 2	1.4MHz	QPSK	1	0	21.00	20.82	20.73	20.52
			1	5	21.00	20.42	20.36	20.87
			3	0	20.00	19.28	19.35	19.05
			6	0	19.00	18.80	18.00	18.56
		16QAM	1	0	20.00	19.75	19.03	19.54
			1	5	20.00	19.21	19.08	19.38
			3	0	19.00	18.63	18.54	18.31
			6	0	19.00	18.69	18.34	18.96
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18615/1851.5	18900/1880	19185/1908.5
	3MHz	QPSK	1	0	21.00	20.83	20.30	20.41
			1	5	21.00	20.55	20.36	20.87
			3	0	20.00	19.35	19.25	19.08
			6	0	19.00	18.63	17.95	18.48
		16QAM	1	0	20.00	19.75	19.03	19.32
			1	5	20.00	19.42	19.12	19.53
			3	0	19.00	18.61	18.34	18.42
			6	0	19.00	18.90	18.16	18.78
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18625/1852.5	18900/1880	19175/1907.5
	5MHz	QPSK	1	0	21.00	20.86	20.22	20.72
			1	5	21.00	20.33	20.51	20.72
			3	0	20.00	19.42	19.27	19.05
			6	0	20.00	19.68	19.03	19.56
		16QAM	1	0	21.00	20.64	20.10	20.37
			1	5	21.00	20.41	20.37	20.53
			3	0	20.00	19.27	19.35	19.05
			6	0	20.00	19.79	19.17	19.79
	Band	Modulation	RB		Tune-up	Channel/Frequency(MHz)		

Width		Configuration					
		RB Size	RB Offset	(dBm)	18650/1855	18900/1880	19150/19095
10MHz	QPSK	1	0	21.00	20.77	20.29	20.53
		1	5	21.00	20.57	20.36	20.74
		3	0	20.00	19.35	19.48	19.52
		4	0	21.00	20.89	20.29	20.65
		4	2	21.00	19.72	19.65	19.85
	16QAM	1	0	21.00	20.61	20.05	20.08
		1	5	21.00	20.25	20.07	20.46
		3	0	21.00	19.53	19.28	19.30
		4	0	21.00	20.81	20.59	20.88
		4	2	21.00	19.47	19.54	19.76
Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
		RB Size	RB Offset	(dBm)	18675/1857.5	18900/1880	19125/1902.5
15MHz	QPSK	1	0	21.00	20.71	20.41	20.38
		1	5	21.00	20.15	20.24	20.39
		3	0	20.00	19.33	19.27	19.06
		6	0	21.00	20.76	20.15	20.49
	16QAM	1	0	21.00	20.80	20.16	20.48
		1	5	21.00	20.11	20.05	20.13
		3	0	21.00	19.25	19.41	19.31
		6	0	21.00	20.85	20.35	20.70
Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
		RB Size	RB Offset	(dBm)	18700/1860	18900/1880	19100/1900
20MHz	QPSK	1	0	21.00	20.81	20.36	20.48
		1	5	21.00	20.05	20.15	20.39
		3	0	20.50	19.59	19.62	19.33
		6	0	20.50	20.71	20.19	20.31
	16QAM	1	0	21.00	20.63	20.14	20.47
		1	5	21.00	20.14	20.20	20.23
		3	0	20.50	19.21	19.05	19.31
		6	0	20.50	20.23	20.35	20.49

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
eMTC Band 4	1.4MHz	QPSK	1	0	21.00	20.40	20.79	20.55
			1	5	21.00	20.35	20.48	20.75
			3	0	20.00	19.22	19.28	19.15
			6	0	18.50	18.42	18.29	18.36
		16QAM	1	0	20.00	19.72	19.30	19.25
			1	5	20.00	19.41	19.25	19.48
			3	0	19.00	19.02	18.64	18.84
			6	0	19.00	18.29	18.66	18.69
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19965/1711.5	20175/1732.5	20385/1753.5
	3MHz	QPSK	1	0	21.00	20.43	20.41	20.24
			1	5	21.00	20.36	20.49	20.64
			3	0	20.00	19.54	19.36	19.42
			6	0	18.50	18.41	18.29	18.49
		16QAM	1	0	19.50	19.17	19.02	19.12
			1	5	19.50	19.15	19.21	19.31
			3	0	19.00	18.24	18.35	18.51
			6	0	19.00	18.68	18.54	18.75
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19975/1712.5	20175/1732.5	20375/1752.5
	5MHz	QPSK	1	0	21.00	20.57	20.34	20.05
			1	5	21.00	20.42	20.41	20.56
			3	0	20.00	19.51	19.32	19.41
			6	0	19.50	19.35	19.37	19.43
		16QAM	1	0	20.50	20.11	20.09	20.06
			1	5	20.50	20.13	20.11	20.17
			3	0	20.00	19.35	19.41	19.32
			6	0	20.00	19.51	19.42	19.75
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		

		RB Size	RB Offset	(dBm)	20000/1715	20175/1732.5	20350/1750
10MHz	QPSK	1	0	21.00	20.52	20.32	20.21
		1	5	21.00	20.31	20.15	20.52
		3	0	20.50	20.12	20.05	20.14
		4	0	20.50	20.23	20.38	20.41
		4	2	21.00	20.12	20.27	20.48
	16QAM	1	0	21.00	20.14	20.08	20.02
		1	5	21.00	20.23	20.17	20.54
		3	0	20.50	19.63	19.47	19.38
		4	0	20.50	20.32	20.44	20.17
		4	2	20.50	19.86	19.78	20.25

Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
		RB Size	RB Offset	(dBm)	20025/1717.5	20175/1732.5	20325/1747.5
15MHz	QPSK	1	0	21.00	20.55	20.51	20.27
		1	5	21.00	20.17	20.24	20.41
		3	0	20.50	19.35	19.42	19.63
		6	0	20.50	20.42	20.33	20.32
	16QAM	1	0	20.50	20.25	20.12	20.04
		1	5	20.50	20.02	19.58	20.13
		3	0	20.50	19.42	19.33	19.57
		6	0	20.50	20.23	20.46	20.38

Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
		RB Size	RB Offset	(dBm)	20050/1720	20175/1732.5	20300/1745
20MHz	QPSK	1	0	21.00	20.53	20.45	20.14
		1	5	21.00	20.14	20.25	20.43
		3	0	20.50	19.68	19.34	19.42
		6	0	20.50	20.38	20.32	20.27
	16QAM	1	0	20.50	20.18	20.18	20.04
		1	5	20.50	19.47	19.74	20.08
		6	0	21.00	20.50	20.44	20.36

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
eMTC Band 5	1.4MHz	QPSK	1	0	21.00	19.83	20.65	20.45
			1	5	21.00	20.54	20.21	20.37
			3	0	20.00	19.21	19.42	19.36
			6	0	18.50	18.17	18.31	17.99
		16QAM	1	0	20.00	19.55	18.97	19.32
			1	5	20.00	18.73	18.64	18.81
			3	0	19.00	18.61	18.34	18.25
			6	0	19.00	17.89	18.54	18.78
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20415/825.5	20525/836.5	20635/847.5
	3MHz	QPSK	1	0	21.00	20.31	20.53	20.32
			1	5	21.00	20.26	20.14	20.40
			3	0	20.00	19.43	19.52	19.34
			6	0	18.50	18.02	18.31	18.02
		16QAM	1	0	19.50	18.90	19.13	18.87
			1	5	19.50	18.72	18.86	19.02
			3	0	19.00	18.65	18.43	18.38
			6	0	19.00	18.37	18.51	18.34
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20425/826.5	20525/836.5	20625/846.5
	5MHz	QPSK	1	0	20.50	20.04	20.42	20.35
			1	5	20.50	20.31	20.15	20.20
			3	0	19.00	18.87	18.65	18.92
			6	0	19.50	19.11	19.31	19.23
		16QAM	1	0	20.50	20.16	20.02	20.05
			1	5	20.50	19.35	19.15	19.90
			3	0	20.00	19.34	19.42	19.22
			6	0	20.00	19.63	19.53	19.36
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		

			RB Size	RB Offset	(dBm)	20450/829	20525/836.5	20600/844
	10MHz	QPSK	1	0	21.00	20.25	20.41	20.13
			1	5	21.00	20.12	20.05	20.14
			3	0	21.00	19.32	19.42	19.05
			4	0	21.00	19.78	19.93	19.53
			4	2	21.00	20.31	20.15	20.33
		16QAM	1	0	21.00	19.78	19.93	19.43
			1	5	21.00	19.47	19.62	19.81
			3	0	20.50	20.35	20.41	20.05
			4	0	20.50	20.35	20.46	20.32
			4	2	20.50	20.14	20.05	20.28

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	23017/699.7	23095/707.5	23173/715.3
eMTC Band 12	1.4MHz	QPSK	1	0	20.50	20.20	20.41	20.26
			1	5	20.50	20.14	20.24	20.40
			3	0	19.50	18.84	18.73	18.58
			6	0	18.50	18.36	18.17	18.08
		16QAM	1	0	19.50	19.15	18.95	18.34
			1	5	19.50	18.65	18.47	18.93
			3	0	19.00	18.63	18.57	18.00
			6	0	19.00	18.17	18.66	18.46
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	23025/700.5	23095/707.5	23165/714.5
	3MHz	QPSK	1	0	20.50	20.42	20.37	20.25
			1	5	20.50	20.23	20.15	20.38
			3	0	20.00	19.74	19.51	19.36
			6	0	18.50	18.26	18.10	18.13
		16QAM	1	0	19.50	19.27	19.15	19.32
			1	5	19.50	19.05	19.12	19.16
			3	0	19.00	18.23	18.15	18.05
			6	0	19.00	18.57	18.35	18.37
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		

			RB Size	RB Offset	(dBm)	23035/701.5	23095/707.5	23155/713.5
	5MHz	QPSK	1	0	20.50	20.42	20.29	20.14
			1	5	20.50	19.87	19.76	20.16
			3	0	20.00	19.12	19.05	18.93
			6	0	19.50	19.43	19.22	19.08
		16QAM	1	0	20.50	20.16	20.02	19.68
			1	5	20.50	19.51	19.63	19.90
			3	0	20.00	19.23	19.30	19.12
			6	0	20.00	19.63	19.53	19.36
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	23060/704	23095/707.5	23130/711
	10MHz	QPSK	1	0	20.50	20.41	20.32	20.24
			1	5	20.50	19.69	19.74	20.03
			3	0	20.50	19.35	19.51	19.28
			4	0	20.50	20.33	20.38	20.05
			4	2	20.50	20.05	20.14	20.28
		16QAM	1	0	20.50	20.19	20.01	19.63
			1	5	20.50	19.57	19.62	19.88
			3	0	20.50	19.23	19.37	19.05
			4	0	20.50	20.38	20.40	20.24
			4	2	20.50	20.08	20.15	20.25

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	23205/779.5	23230/782	23255/784.5
eMTC Band 13	5MHz	QPSK	1	0	21.00	20.40	20.79	20.63
			1	5	21.00	20.45	20.62	20.75
			3	0	19.50	19.25	19.05	19.38
			6	0	18.50	18.42	18.29	18.36
		16QAM	1	0	20.00	19.72	19.30	19.62
			1	5	20.00	19.42	19.32	19.48
			3	0	19.00	18.35	18.05	18.24
			6	0	19.00	18.29	18.66	18.69
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		

			RB Size	RB Offset	(dBm)	/	23230/782	/
	10MHz	QPSK	1	0	20.50	/	20.29	/
			3	0	20.50		19.62	
			4	0	20.50	/	20.35	/
		16QAM	4	0	20.50	/	20.47	/
			3	0	20.00	/	19.32	/
			6	0	20.00	/	19.97	/

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	26047/1850.7	26365/1882.5	26683/1914.3
eMTC Band 25	1.4MHz	QPSK	1	0	20.50	19.73	20.39	19.58
			1	5	20.50	20.21	20.15	20.37
			3	0	18.50	18.24	18.43	18.15
			6	0	18.00	17.79	17.88	17.86
		16QAM	1	0	19.50	19.20	18.93	18.67
			1	5	19.50	18.52	18.73	18.93
			3	0	18.50	17.95	17.63	17.85
			6	0	18.50	17.52	18.32	18.24
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	26055/1851.5	26365/1882.5	26675/1913.5
	3MHz	QPSK	1	0	20.50	19.88	20.14	20.04
			1	5	20.50	19.58	19.76	20.12
			3	0	18.50	18.12	18.25	18.02
			6	0	18.00	17.80	17.85	17.88
		16QAM	1	0	19.00	18.77	18.92	18.63
			1	5	19.00	18.82	18.75	18.94
			3	0	18.00	17.54	17.38	17.46
			6	0	18.50	17.94	18.03	18.05
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	26065/1852.5	26365/1882.5	26665/1912.5
	5MHz	QPSK	1	0	20.00	19.77	19.97	19.71
			1	5	20.00	19.52	19.65	19.98

		3	0	19.00	18.35	18.42	18.27
		6	0	19.00	18.74	18.82	18.88
	16QAM	1	0	20.00	19.59	19.81	18.62
		1	5	20.00	19.48	19.52	19.71
		3	0	19.50	18.32	18.45	18.01
		6	0	19.50	18.90	19.06	19.07
Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		26090/1855	26365/1882.5	26640/1910
10MHz	QPSK	1	0	21.00	19.62	19.96	19.51
		1	5	21.00	20.37	20.51	20.74
		3	0	20.00	19.52	19.48	19.22
		4	0	20.00	19.68	19.91	19.34
		4	2	20.00	19.58	19.63	19.85
	16QAM	1	0	20.50	19.92	19.73	19.62
		1	5	20.50	19.48	19.57	19.69
		3	0	20.50	19.05	19.25	19.54
		4	0	20.00	19.49	19.65	19.14
		4	2	20.00	19.43	19.57	19.72
Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		26115/1857.5	26365/1882.5	26615/1907.5
15MHz	QPSK	1	0	20.00	19.79	19.91	19.84
		1	5	20.00	19.65	19.76	19.99
		3	0	20.00	19.46	19.35	19.05
		6	0	20.00	19.62	19.82	19.76
	16QAM	1	0	20.00	19.58	19.76	19.45
		1	5	20.00	19.41	19.35	19.66
		3	0	20.00	18.65	18.35	18.42
		6	0	20.00	19.71	19.96	19.66
Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		26140/1860	26365/1882.5	26590/1905
20MHz	QPSK	1	0	20.00	19.75	19.87	19.62
		1	5	20.00	19.62	19.74	19.95
		3	0	20.00	18.66	18.53	18.64

			6	0	20.00	19.62	19.87	19.78
		16QAM	1	0	20.00	19.54	19.67	19.24
			1	5	20.00	19.32	19.41	19.70
			3	0	20.00	19.02	19.12	18.87
			6	0	20.00	19.75	19.91	19.99

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		26697/814.7	26740/819	26783/823.3
eMTC Band 26a	1.4MHz	QPSK	1	0	20.50	19.89	20.42	19.61
			3	0				
			1	5	20.50	20.25	20.14	20.31
			6	0	18.50	18.13	18.09	18.05
		16QAM	1	0	20.00	19.57	18.75	18.87
			1	5	20.00	18.54	18.65	18.74
			3	0	19.50	19.21	19.02	19.11
			6	0	19.00	17.92	18.91	18.92
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		26705/815.5	26740/819	26775/822.5
	3MHz	QPSK	1	0	20.50	20.25	20.25	20.12
			1	5	20.50	20.21	20.15	20.40
			3	0	19.00	18.64	18.92	18.74
			6	0	18.50	18.08	18.05	18.04
		16QAM	1	0	19.00	18.97	18.98	18.85
			1	5	19.00	18.43	18.65	18.80
			3	0	18.50	18.12	18.02	18.26
			6	0	18.50	18.45	18.41	18.41
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		26715/816.5	26740/819	26765/821.5
	5MHz	QPSK	1	0	20.50	20.20	20.18	19.84
			1	5	20.50	19.63	19.54	20.09
			3	0	19.50	18.69	18.72	18.35
			6	0	19.50	19.16	19.14	19.13
		16QAM	1	0	20.00	19.83	19.85	19.62

			1	5	20.00	19.43	19.52	19.61
			3	0	19.50	19.02	18.87	18.69
			6	0	19.50	19.45	19.44	19.41
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		/	26740/819	/
	10MHz	QPSK	1	0	20.50	/	20.28	/
			3	0	20.50	/	19.45	/
			4	0	20.50	/	20.17	/
		16QAM	1	0	20.50	/	19.81	/
			3	0	20.50	/	19.54	/
			4	0	20.50	/	20.49	/

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		26797/824.7	26915/836.5	27033/848.3
eMTC Band 26b	1.4MHz	QPSK	1	0	20.50	20.46	20.31	20.24
			1	5	20.50	20.01	20.12	20.17
			3	0	20.00	19.28	19.34	19.40
			6	0	18.50	18.21	17.90	17.98
		16QAM	1	0	19.50	19.10	18.63	18.52
			1	5	19.50	18.33	18.51	18.68
			3	0	19.00	18.21	18.02	18.11
			6	0	19.00	18.38	18.75	18.73
	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		26805/825.5	26915/836.5	27025/847.5
	3MHz	QPSK	1	0	20.50	20.26	20.09	20.15
			1	5	20.50	19.68	19.54	20.05
			3	0	20.00	19.35	19.47	19.28
			6	0	18.50	18.06	17.91	18.01
		16QAM	1	0	19.00	18.96	18.84	18.53
			1	5	19.00	18.37	18.51	18.64
			3	0	18.50	18.21	18.12	18.05
			6	0	18.50	18.38	18.32	18.03
	Band	Modulation	RB		Tune-up	Channel/Frequency(MHz)		

Width		Configuration		(dBm)			
		RB Size	RB Offset		26815/826.5	26915/836.5	27015/846.5
5MHz	QPSK	1	0	20.50	20.10	19.82	19.67
		1	5	20.50	19.35	19.54	19.86
		3	0	20.00	19.42	19.35	19.12
		6	0	19.50	19.15	19.06	19.08
	16QAM	1	0	20.50	19.79	20.24	20.02
		1	5	20.50	19.14	19.25	19.36
		3	0	19.50	18.98	19.87	19.65
		6	0	19.50	19.35	19.24	19.35
Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		26840/829	26915/836.5	26990/844
10MHz	QPSK	1	0	20.50	20.21	20.09	19.84
		1	5	20.50	19.63	19.87	19.94
		3	0	20.50	19.58	19.33	19.25
		4	0	20.50	20.17	20.07	19.54
		4	2	20.50	20.14	20.05	20.15
	16QAM	1	0	20.00	19.71	19.65	19.54
		1	5	20.00	19.14	19.25	19.48
		3	0	20.00	19.21	19.54	19.32
		4	0	20.50	20.44	20.46	20.25
		4	2	20.50	20.32	20.14	20.49
Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		26865/831.5	26915/836.5	26965/841.5
15MHz	QPSK	1	0	20.50	20.15	20.05	19.54
		1	5	20.50	19.63	19.74	19.91
		3	0	20.50	19.24	19.32	19.05
		6	0	20.50	20.11	20.06	20.08
	16QAM	1	0	20.50	19.85	19.72	19.54
		1	5	20.50	19.24	19.35	19.52
		3	0	20.50	19.13	19.24	19.17
		6	0	20.50	20.22	20.39	20.33

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	131979/1710.7	132322/1745	132665/1779.3
eMTC Band 66	1.4MHz	QPSK	1	0	20.50	19.74	20.01	19.63
			1	5	20.50	19.52	19.76	19.98
			3	0	19.50	19.12	19.23	19.05
			6	0	18.00	17.65	17.49	17.73
		16QAM	1	0	20.00	19.02	18.73	19.54
			1	5	20.00	18.02	18.11	18.23
			3	0	18.50	18.23	18.13	18.36
			6	0	18.50	17.51	17.88	18.39
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	131987/1711.5	132322/1745	132657/1778.5
	3MHz	QPSK	1	0	20.00	19.89	19.89	19.15
			1	5	20.00	19.58	19.35	19.77
			3	0	19.00	18.28	18.34	18.62
			6	0	18.50	17.69	17.90	18.11
		16QAM	1	0	19.00	18.52	18.39	18.14
			1	5	19.00	18.21	18.02	18.35
			3	0	18.50	18.12	18.32	18.05
			6	0	18.50	17.96	17.90	18.11
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset	(dBm)	131997/1712.5	132322/1745	132647/1777.5
	5MHz	QPSK	1	0	20.00	19.88	19.86	19.43
			1	5	20.00	19.38	19.58	19.71
			3	0	19.00	18.47	18.39	18.63
			6	0	19.00	18.77	18.69	18.71
		16QAM	1	0	20.50	19.48	20.03	19.41
			1	5	20.50	19.05	19.21	19.33
			3	0	19.00	18.35	18.43	18.63
			6	0	19.00	18.84	18.74	18.98
	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		

		RB Size	RB Offset	(dBm)	132022/1715	132022/1745	132622/1775
10MHz	QPSK	1	0	20.00	19.93	19.75	19.52
		1	5	20.00	19.17	19.05	19.23
		3	0	20.00	18.68	18.71	18.54
		4	0	20.00	19.86	19.67	19.57
		4	2	20.00	19.11	19.20	19.33
	16QAM	1	0	21.00	20.14	20.08	19.76
		1	5	21.00	20.24	20.38	20.54
		3	0	21.00	20.05	20.15	20.31
		4	0	21.00	20.57	20.44	20.37
		4	2	21.00	20.24	20.12	20.25

Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		132047/1717.5	132322/1745	132597/1772.5
15MHz	QPSK	1	0	20.00	19.91	19.73	19.53
		1	5	20.00	19.07	19.15	19.21
		3	0	20.00	19.12	19.24	19.05
		6	0	20.00	19.78	19.65	19.39
	16QAM	1	0	20.00	19.55	19.52	19.41
		1	5	20.00	19.12	19.24	19.31
		3	0	20.00	18.35	18.58	19.13
		6	0	20.00	19.87	19.73	19.54

Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
		RB Size	RB Offset		132072/1720	132322/1745	132572/1770
20MHz	QPSK	1	0	21.00	19.76	19.74	19.52
		1	5	21.00	19.05	19.12	19.31
		3	0	21.00	18.54	19.35	19.02
		6	0	21.00	19.84	19.67	19.38
	16QAM	1	0	20.00	19.99	19.77	19.54
		1	5	20.00	18.57	18.63	18.95
		3	0	20.00	19.12	19.05	18.75
		6	0	20.00	19.83	19.55	19.52

7.2. Bluetooth Output Power

	Channel	Tune-up (dBm)	Output Power (dBm)
			Data Rates 1M
BLE	0CH	0	-0.47
	19CH	0.5	0.38
	39CH	1	0.89

NOTE: Power measurement results of Bluetooth.

8. SAR Results

8.1. SAR measurement results
8.1.1. SAR measurement Result
8.1.2. SAR measurement Result of LTE Band 2

Test Position of Hotspot with 0mm	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	18900/1880	20M QPSK(1,0)	0.457	0.219	-0.45	20.36	21.00	0.530	2024/11/06	#2
Back Side	18900/1880	20M QPSK(1,0)	0.294	0.135	-1.15	20.36	21.00	0.341	2024/11/06	
Left Side	18900/1880	20M QPSK(1,0)	0.200	0.093	1.75	20.36	21.00	0.232	2024/11/06	
Right Side	18900/1880	20M QPSK(1,0)	0.343	0.156	2.29	20.36	21.00	0.397	2024/11/06	
Top Side	18900/1880	20M QPSK(1,0)	0.044	0.020	1.65	20.36	21.00	0.051	2024/11/06	
Bottom Side	18900/1880	20M QPSK(1,0)	0.138	0.065	1.81	20.36	21.00	0.160	2024/11/06	
50%RB										
Front Side	18900/1880	20M QPSK(3,0)	0.419	0.186	-2.65	19.62	20.50	0.513	2024/11/06	
Back Side	18900/1880	20M QPSK(3,0)	0.274	0.121	-3.99	19.62	20.50	0.336	2024/11/06	
Left Side	18900/1880	20M QPSK(3,0)	0.184	0.088	4.43	19.62	20.50	0.225	2024/11/06	

Right Side	18900/1880	20M QPSK(3,0)	0.302	0.142	2.01	19.62	20.50	0.370	2024/11/06	
Top Side	18900/1880	20M QPSK(3,0)	0.041	0.019	1.26	19.62	20.50	0.050	2024/11/06	
Bottom Side	18900/1880	20M QPSK(3,0)	0.118	0.06	-1.37	19.62	20.50	0.145	2024/11/06	

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

8.1.3. SAR measurement Result of LTE Band 4

Test Position of Hotspot with 0mm	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(1,0)	0.404	0.199	-0.01	20.45	21.00	0.459	2024/10/30	#3
Back Side	20175/1732.5	20M QPSK(1,0)	0.270	0.132	-2.96	20.45	21.00	0.306	2024/10/30	
Left Side	20175/1732.5	20M QPSK(1,0)	0.172	0.080	1.2	20.45	21.00	0.195	2024/10/30	
Right Side	20175/1732.5	20M QPSK(1,0)	0.315	0.149	0.98	20.45	21.00	0.358	2024/10/30	
Top Side	20175/1732.5	20M QPSK(1,0)	0.036	0.016	-0.27	20.45	21.00	0.041	2024/10/30	
Bottom Side	20175/1732.5	20M QPSK(1,0)	0.093	0.045	-0.29	20.45	21.00	0.106	2024/10/30	
50%RB										
Front Side	20175/1732.5	20M QPSK(3,0)	0.366	0.17	-3.67	19.34	20.50	0.478	2024/10/30	
Back Side	20175/1732.5	20M QPSK(3,0)	0.243	0.115	0.45	19.34	20.50	0.317	2024/10/30	
Left Side	20175/1732.5	20M QPSK(3,0)	0.15	0.07	0.92	19.34	20.50	0.196	2024/10/30	
Right Side	20175/1732.5	20M QPSK(3,0)	0.272	0.13	1.81	19.34	20.50	0.355	2024/10/30	
Top Side	20175/1732.5	20M QPSK(3,0)	0.034	0.015	-2.3	19.34	20.50	0.044	2024/10/30	
Bottom Side	20175/1732.5	20M QPSK(3,0)	0.088	0.039	3.25	19.34	20.50	0.115	2024/10/30	

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

8.1.4. SAR measurement Result of LTE Band 5

Test Position of Hotspot with 0mm	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	20525/836.5	10M QPSK(1,0)	0.110	0.059	3.58	20.41	21.00	0.126	2024/11/05	
Back Side	20525/836.5	10M QPSK(1,0)	0.097	0.054	0.85	20.41	21.00	0.111	2024/11/05	
Left Side	20525/836.5	10M QPSK(1,0)	0.056	0.030	-1.98	20.41	21.00	0.064	2024/11/05	
Right Side	20525/836.5	10M QPSK(1,0)	0.112	0.060	3.48	20.41	21.00	0.128	2024/11/05	#4
Top Side	20525/836.5	10M QPSK(1,0)	0.014	0.012	1.46	20.41	21.00	0.016	2024/11/05	
Bottom Side	20525/836.5	10M QPSK(1,0)	0.072	0.038	-3.11	20.41	21.00	0.082	2024/11/05	
50%RB										
Front Side	20525/836.5	10M QPSK(3,0)	0.097	0.056	-4.02	19.42	20.00	0.111	2024/11/05	
Back Side	20525/836.5	10M QPSK(3,0)	0.092	0.046	-3.12	19.42	20.00	0.105	2024/11/05	
Left Side	20525/836.5	10M QPSK(3,0)	0.049	0.026	-4.21	19.42	20.00	0.056	2024/11/05	
Right Side	20525/836.5	10M QPSK(3,0)	0.106	0.056	1.02	19.42	20.00	0.121	2024/11/05	
Top Side	20525/836.5	10M QPSK(3,0)	0.013	0.011	-1.19	19.42	20.00	0.015	2024/11/05	
Bottom Side	20525/836.5	10M QPSK(3,0)	0.067	0.033	-0.08	19.42	20.00	0.077	2024/11/05	

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

8.1.5. SAR measurement Result of LTE Band 12

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

of Hotspot with 0mm	/Freq.		1-g	10-g	(±5%)	(dBm)	(dBm)	1g (W/Kg)		
1RB										
Front Side	23095/707.5	10M QPSK(1,0)	0.170	0.092	-2.7	20.32	20.50	0.177	2024/10/28	#5
Back Side	23095/707.5	10M QPSK(1,0)	0.121	0.066	0.27	20.32	20.50	0.126	2024/10/28	
Left Side	23095/707.5	10M QPSK(1,0)	0.056	0.030	2.73	20.32	20.50	0.058	2024/10/28	
Right Side	23095/707.5	10M QPSK(1,0)	0.104	0.056	2.28	20.32	20.50	0.108	2024/10/28	
Top Side	23095/707.5	10M QPSK(3,0)	0.012	0.006	-0.15	20.32	20.50	0.013	2024/10/28	
Bottom Side	23095/707.5	10M QPSK(1,0)	0.078	0.042	-1.98	20.32	20.50	0.081	2024/10/28	
50%RB										
Front Side	23095/707.5	10M QPSK(3,0)	0.152	0.083	-2.27	19.51	20.00	0.170	2024/10/28	
Back Side	23095/707.5	10M QPSK(3,0)	0.103	0.06	-1.92	19.51	20.00	0.115	2024/10/28	
Left Side	23095/707.5	10M QPSK(3,0)	0.053	0.028	3.98	19.51	20.00	0.059	2024/10/28	
Right Side	23095/707.5	10M QPSK(3,0)	0.098	0.051	0.42	19.51	20.00	0.110	2024/10/28	
Top Side	23095/707.5	10M QPSK(3,0)	0.01	0.005	4.16	19.51	20.00	0.011	2024/10/28	
Bottom Side	23095/707.5	10M QPSK(3,0)	0.071	0.039	3.02	19.51	20.00	0.079	2024/10/28	

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

8.1.6. SAR measurement Result of LTE Band 13

Test Position of Hotspot with 0mm	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	23230/782	10M	0.210	0.106	0.10	20.29	20.50	0.220	2024/11/05	

Side		QPSK(1,0)								#6
Back Side	23230/782	10M QPSK(1,0)	0.176	0.085	1.41	20.29	20.50	0.185	2024/11/05	
Left Side	23230/782	10M QPSK(1,0)	0.080	0.037	-3.98	20.29	20.50	0.084	2024/11/05	
Right Side	23230/782	10M QPSK(1,0)	0.152	0.073	-0.67	20.29	20.50	0.160	2024/11/05	
Top Side	23230/782	10M QPSK(1,0)	0.036	0.017	-2.99	20.29	20.50	0.038	2024/11/05	
Bottom Side	23230/782	10M QPSK(1,0)	0.114	0.053	-1.92	20.29	20.50	0.120	2024/11/05	
50%RB										
Front Side	23230/782	10M QPSK(3,0)	0.112	0.054	0.37	19.62	20.50	0.137	2024/11/05	
Back Side	23230/782	10M QPSK(3,0)	0.093	0.044	4.24	19.62	20.50	0.114	2024/11/05	
Left Side	23230/782	10M QPSK(3,0)	0.046	0.022	4.03	19.62	20.50	0.056	2024/11/05	
Right Side	23230/782	10M QPSK(3,0)	0.084	0.039	1.04	19.62	20.50	0.103	2024/11/05	
Top Side	23230/782	10M QPSK(3,0)	0.021	0.01	-1.16	19.62	20.50	0.026	2024/11/05	
Bottom Side	23230/782	10M QPSK(3,0)	0.06	0.029	-2.64	19.62	20.50	0.073	2024/11/05	

NOTE: Body-Worn SAR test results of LTE Band 13

8.1.7. SAR measurement Result of LTE Band 25

Test Position of Hotspot with 0mm	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	26365/1882.5	20M QPSK(1,0)	0.455	0.219	-0.19	19.87	20.00	0.469	2024/11/06	#7
Back Side	26365/1882.5	20M QPSK(1,0)	0.294	0.142	0.76	19.87	20.00	0.303	2024/11/06	
Left Side	26365/1882.5	20M QPSK(1,0)	0.144	0.067	-1.24	19.87	20.00	0.148	2024/11/06	
Right	26365/1882.5	20M	0.138	0.064	3.64	19.87	20.00	0.142	2024/11/06	

Side		QPSK(1,0)								
Top Side	26365/1882.5	20M QPSK(1,0)	0.105	0.046	1.36	19.87	20.00	0.108	2024/11/06	
Bottom Side	26365/1882.5	20M QPSK(1,0)	0.235	0.113	2.94	19.87	20.00	0.242	2024/11/06	
50%RB										
Front Side	26365/1882.5	20M QPSK(3,0)	0.249	0.12	0.64	18.53	20.00	0.349	2024/11/06	
Back Side	26365/1882.5	20M QPSK(3,0)	0.148	0.073	4.78	18.53	20.00	0.208	2024/11/06	
Left Side	26365/1882.5	20M QPSK(3,0)	0.076	0.037	0.13	18.53	20.00	0.107	2024/11/06	
Right Side	26365/1882.5	20M QPSK(3,0)	0.071	0.033	2.83	18.53	20.00	0.100	2024/11/06	
Top Side	26365/1882.5	20M QPSK(3,0)	0.057	0.031	-1.63	18.53	20.00	0.080	2024/11/06	
Bottom Side	26365/1882.5	20M QPSK(25,0)	0.121	0.057	-4.21	18.53	20.00	0.170	2024/11/06	

NOTE: Body-Worn SAR test results of LTE Band 25

8.1.8. SAR measurement Result of LTE Band 26a

Test Position of Hotspot with 0mm	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	26740/819	10M QPSK(1,0)	0.108	0.059	-1.64	20.28	20.50	0.114	2024/11/05	#8
Back Side	26740/819	10M QPSK(1,0)	0.078	0.040	3.85	20.28	20.50	0.082	2024/11/05	
Left Side	26740/819	10M QPSK(1,0)	0.036	0.019	-3	20.28	20.50	0.038	2024/11/05	
Right Side	26740/819	10M QPSK(1,0)	0.033	0.018	1.32	20.28	20.50	0.035	2024/11/05	
Bottom Side	26740/819	10M QPSK(1,0)	0.060	0.032	3.5	20.28	20.50	0.063	2024/11/05	
Front Side	26740/819	10M QPSK(1,0)	0.108	0.059	-1.64	20.28	20.50	0.114	2024/11/05	
50%RB										

Front Side	26740/819	10M QPSK(3,0)	0.058	0.031	4.61	19.45	20.00	0.066	2024/11/05	
Back Side	26740/819	10M QPSK(3,0)	0.042	0.023	-0.2	19.45	20.00	0.048	2024/11/05	
Left Side	26740/819	10M QPSK(3,0)	0.02	0.011	4	19.45	20.00	0.023	2024/11/05	
Right Side	26740/819	10M QPSK(3,0)	0.018	0.009	-3.98	19.45	20.00	0.020	2024/11/05	
Bottom Side	26740/819	10M QPSK(3,0)	0.036	0.019	-5	19.45	20.00	0.041	2024/11/05	
Front Side	26740/819	10M QPSK(3,0)	0.058	0.031	4.61	19.45	20.00	0.066	2024/11/05	

NOTE: Body-Worn SAR test results of LTE Band 26a

8.1.9. SAR measurement Result of LTE Band 26b

Test Position of Hotspot with 0mm	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	26865/831.5	15M QPSK(1,0)	0.121	0.066	-1.13	20.05	20.50	0.134	2024/11/05	#9
Back Side	26865/831.5	15M QPSK(1,0)	0.096	0.051	-0.8	20.05	20.50	0.106	2024/11/05	
Left Side	26865/831.5	15M QPSK(1,0)	0.039	0.020	-0.87	20.05	20.50	0.043	2024/11/05	
Right Side	26865/831.5	15M QPSK(1,0)	0.045	0.024	-3.63	20.05	20.50	0.050	2024/11/05	
Top Side	26865/831.5	15M QPSK(1,0)	0.035	0.018	1.59	20.05	20.50	0.039	2024/11/05	
Bottom Side	26865/831.5	15M QPSK(1,0)	0.085	0.045	1.59	20.05	20.50	0.094	2024/11/05	
50%RB										
Front Side	26865/831.5	15M QPSK(3,0)	0.056	0.027	3.2	19.32	20.50	0.073	2024/11/05	
Back Side	26865/831.5	15M QPSK(3,0)	0.069	0.037	-3.67	19.32	20.50	0.091	2024/11/05	
Left Side	26865/831.5	15M QPSK(3,0)	0.023	0.012	-0.05	19.32	20.50	0.030	2024/11/05	

Right Side	26865/831.5	15M QPSK(3,0)	0.026	0.013	-1.67	19.32	20.50	0.034	2024/11/05	
Top Side	26865/831.5	15M QPSK(3,0)	0.012	0.008	1.63	19.32	20.50	0.016	2024/11/05	
Bottom Side	26865/831.5	15M QPSK(3,0)	0.045	0.024	2.7	19.32	20.50	0.059	2024/11/05	

NOTE: Body-Worn SAR test results of LTE Band 26b

8.1.10. SAR measurement Result of LTE Band 66

Test Position of Hotspot with 0mm	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	132322/1745	20M QPSK(1,0)	0.667	0.282	0.04	19.74	20.00	0.708	2024/10/30	#10
Back Side	132322/1745	20M QPSK(1,0)	0.426	0.156	1.63	19.74	20.00	0.452	2024/10/30	
Left Side	132322/1745	20M QPSK(1,0)	0.180	0.063	-1.79	19.74	20.00	0.191	2024/10/30	
Right Side	132322/1745	20M QPSK(1,0)	0.376	0.131	0.15	19.74	20.00	0.399	2024/10/30	
Top Side	132322/1745	20M QPSK(1,0)	0.136	0.056	-1.95	19.74	20.00	0.144	2024/10/30	
Bottom Side	132322/1745	20M QPSK(1,0)	0.094	0.033	1.88	19.74	20.00	0.100	2024/10/30	
50%RB										
Front Side	132322/1745	20M QPSK(3,0)	0.582	0.243	-3.92	19.35	20.00	0.676	2024/10/30	
Back Side	132322/1745	20M QPSK(3,0)	0.375	0.138	-3.97	19.35	20.00	0.436	2024/10/30	
Left Side	132322/1745	20M QPSK(3,0)	0.165	0.054	-3.73	19.35	20.00	0.192	2024/10/30	
Right Side	132322/1745	20M QPSK(3,0)	0.326	0.124	2.24	19.35	20.00	0.379	2024/10/30	
Top Side	132322/1745	20M QPSK(3,0)	0.123	0.051	-3.62	19.35	20.00	0.143	2024/10/30	
Bottom Side	132322/1745	20M QPSK(3,0)	0.085	0.029	-4.98	19.35	20.00	0.099	2024/10/30	

NOTE: Body-Worn SAR test results of LTE Band 66

8.1.11. SAR measurement Result of Bluetooth

Test Position	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	78/2480	GFSK	0.064	0.032	0.51	0.89	1.00	0.066	2024/11/03	
Back Side	78/2480	GFSK	0.030	0.016	2.03	0.89	1.00	0.031	2024/11/03	
Left Side	78/2480	GFSK	0.011	0.006	2.19	0.89	1.00	0.011	2024/11/03	
Right Side	78/2480	GFSK	0.014	0.007	2.41	0.89	1.00	0.014	2024/11/03	
Top Side	78/2480	GFSK	0.084	0.038	0.20	0.89	1.00	0.086	2024/11/03	#1
Bottom Side	78/2480	GFSK	0.010	0.005	-0.29	0.89	1.00	0.010	2024/11/03	

9. Simultaneous Transmission Analysis

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	DSS			
Body-Worn	Front Side	0.708	0.066	0.774	N/A	N/A
	Back Side	0.452	0.031	0.483	N/A	N/A
	Left Side	0.232	0.011	0.243	N/A	N/A
	Right Side	0.399	0.014	0.413	N/A	N/A
	Top Side	0.144	0.086	0.23	N/A	N/A
	Bottom Side	0.242	0.010	0.252	N/A	N/A

10. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

11. Appendix B. System Check Plots

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MEASUREMENT 1 System Performance Check - 750MHz
MEASUREMENT 2 System Performance Check - 850MHz
MEASUREMENT 3 System Performance Check - 850MHz
MEASUREMENT 4 System Performance Check - 900MHz
MEASUREMENT 5 System Performance Check - 1800MHz
MEASUREMENT 6 System Performance Check - 1900MHz
MEASUREMENT 7 System Performance Check - 2000MHz
MEASUREMENT 8 System Performance Check - 2450MHz

MEASUREMENT 1

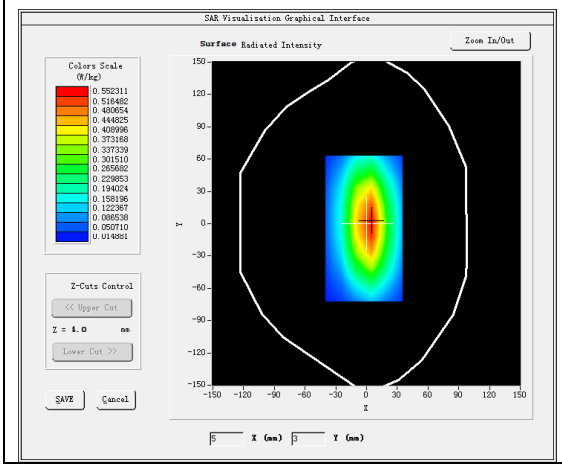
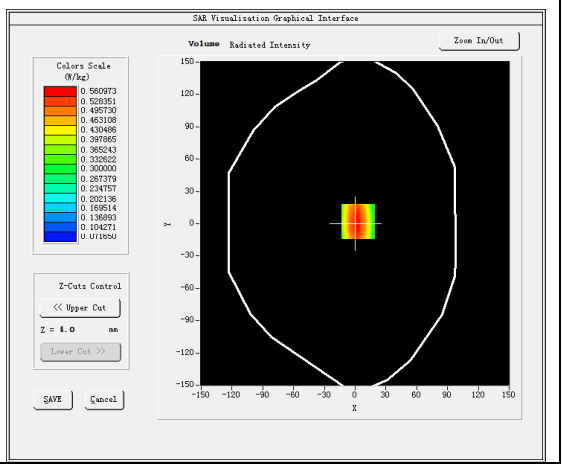
Date of measurement: 28/10/2024

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

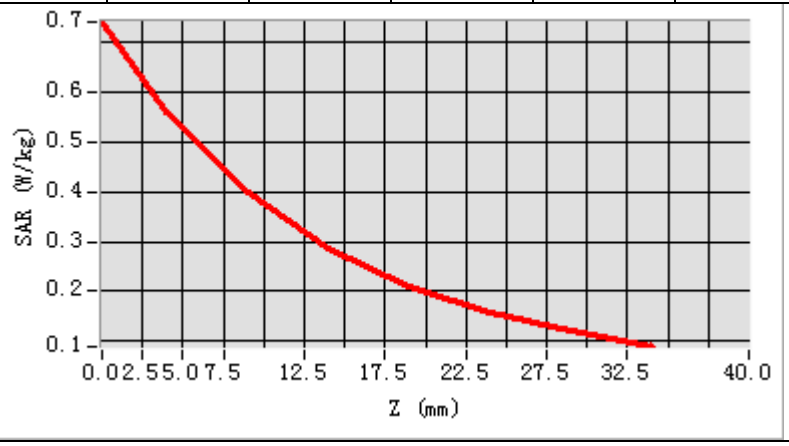
Frequency (MHz)	750.000000
Relative permittivity (real part)	41.017045
Relative permittivity (imaginary part)	21.616004
Conductivity (S/m)	0.900667
Variation (%)	-0.440000

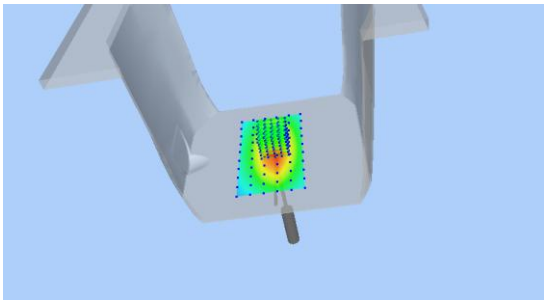
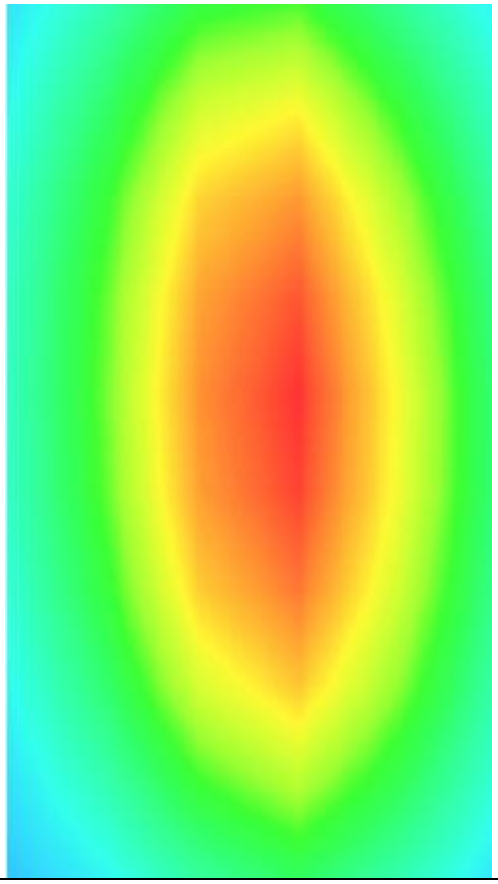
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=2.00
SAR Peak: 0.74 W/kg

SAR 10g (W/Kg)	0.366519
SAR 1g (W/Kg)	0.543682

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7397	0.5610	0.3983	0.2872	0.2110	0.1579	0.1199



3D screen shot	Hot spot position
	

MEASUREMENT 2

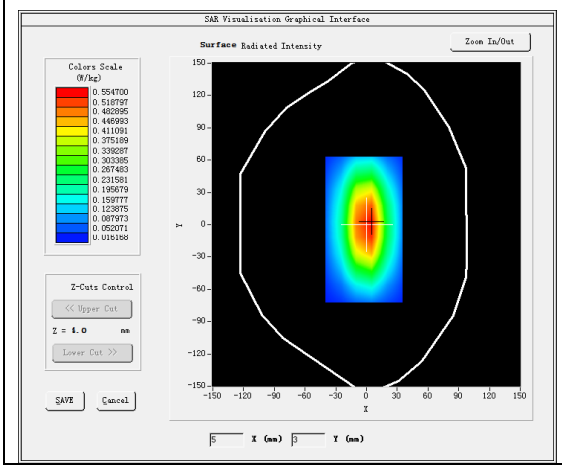
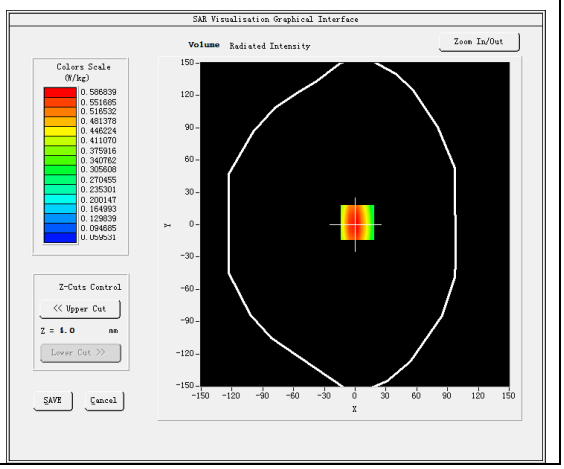
Date of measurement: 5/11/2024

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)	42.082089
Relative permittivity (imaginary part)	19.827689
Conductivity (S/m)	0.919784
Variation (%)	-0.290000

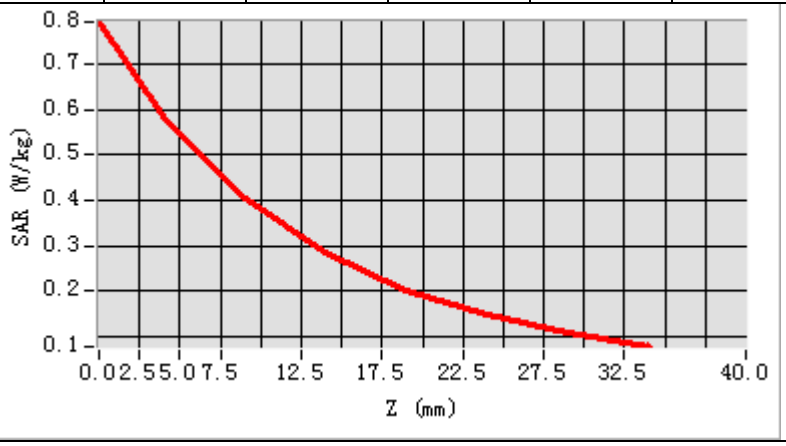
SURFACE SAR	VOLUME SAR
	

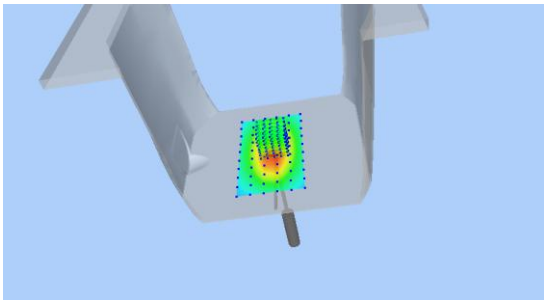
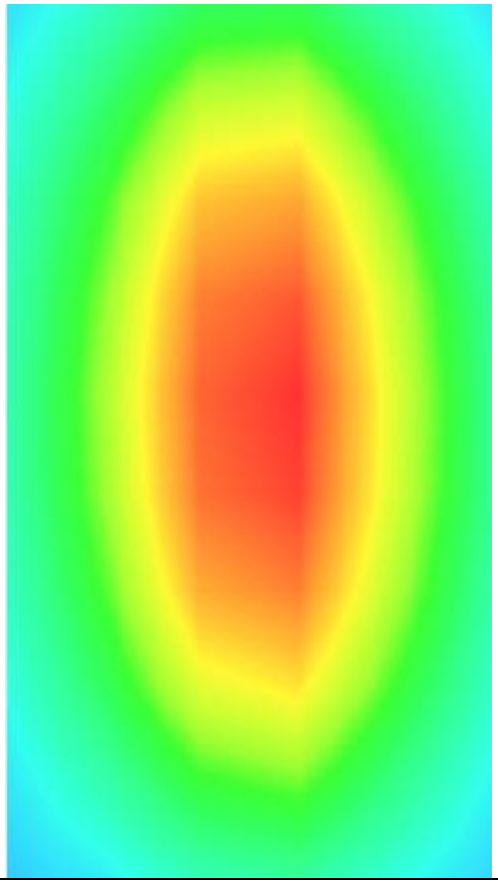
Maximum location: X=2.00, Y=2.00

SAR Peak: 0.80 W/kg

SAR 10g (W/Kg)	0.375866
SAR 1g (W/Kg)	0.574581

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7931	0.5868	0.4045	0.2847	0.2035	0.1487	0.1091



3D screen shot	Hot spot position
	

MEASUREMENT 3

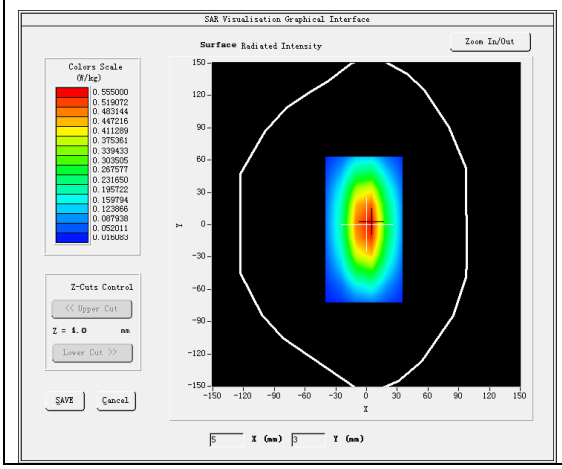
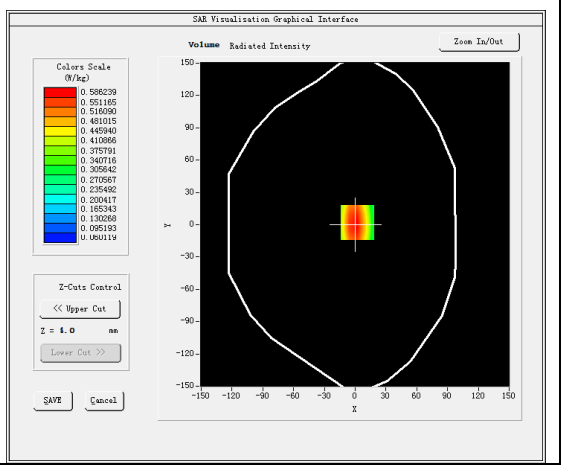
Date of measurement: 26/11/2024

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)	41.934568
Relative permittivity (imaginary part)	19.710231
Conductivity (S/m)	0.914336
Variation (%)	-0.150000

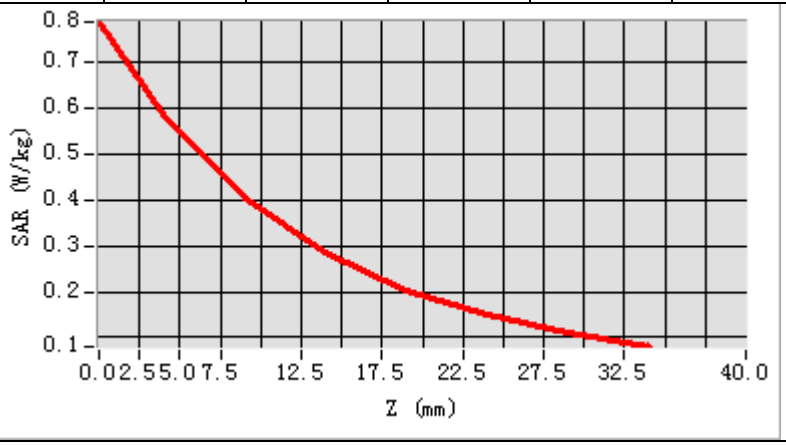
SURFACE SAR	VOLUME SAR
	

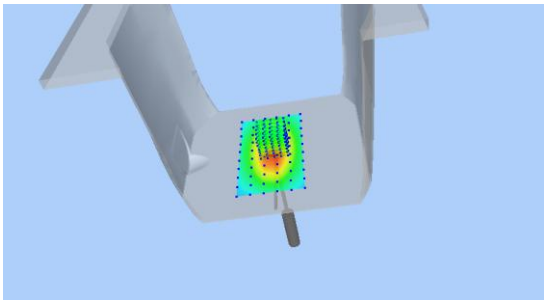
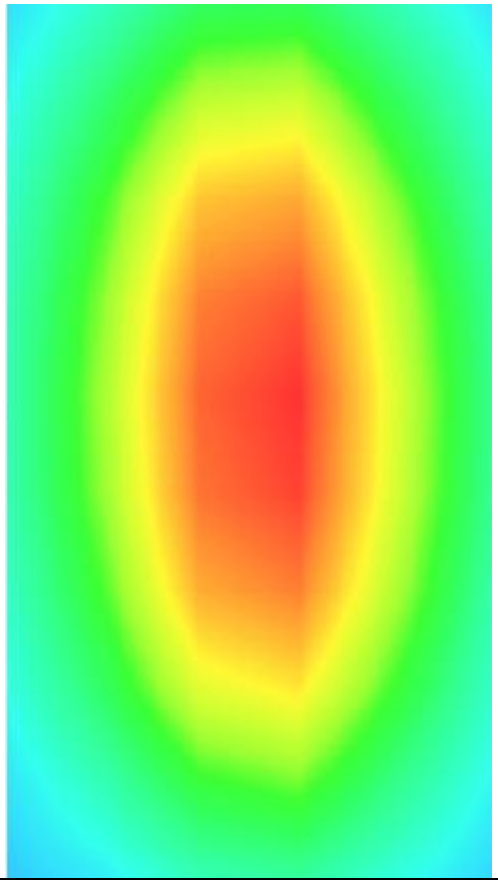
Maximum location: X=2.00, Y=2.00

SAR Peak: 0.80 W/kg

SAR 10g (W/Kg)	0.375675
SAR 1g (W/Kg)	0.574430

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7893	0.5862	0.4057	0.2841	0.2034	0.1486	0.1088



3D screen shot	Hot spot position
	

MEASUREMENT 4

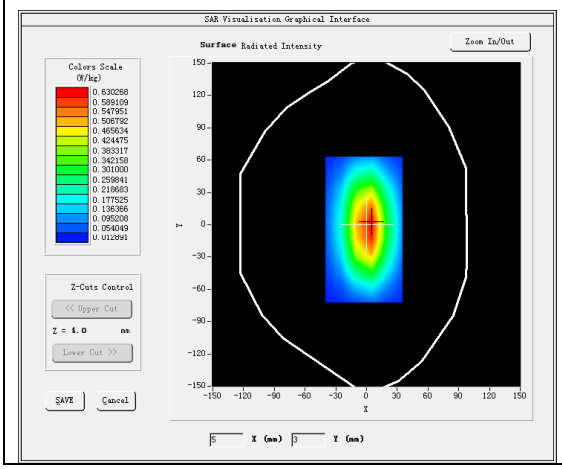
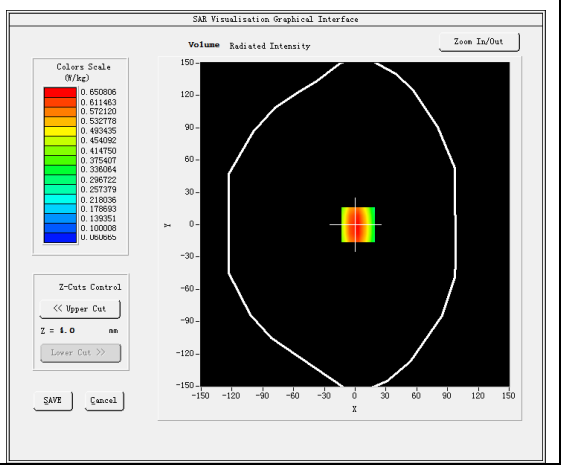
Date of measurement: 29/10/2024

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	CW900
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.24

B. SAR Measurement Results

Frequency (MHz)	900.000000
Relative permittivity (real part)	41.562627
Relative permittivity (imaginary part)	19.747423
Conductivity (S/m)	0.987371
Variation (%)	-0.480000

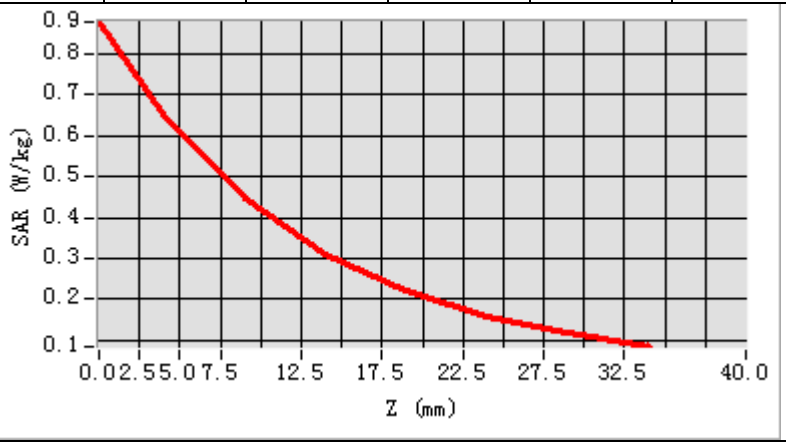
SURFACE SAR	VOLUME SAR
	

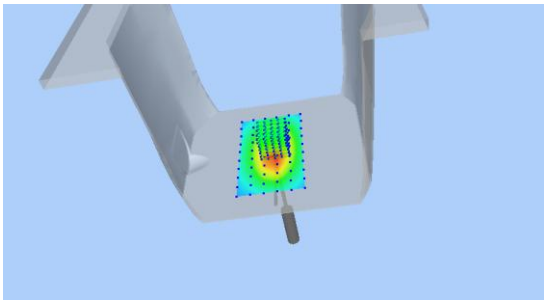
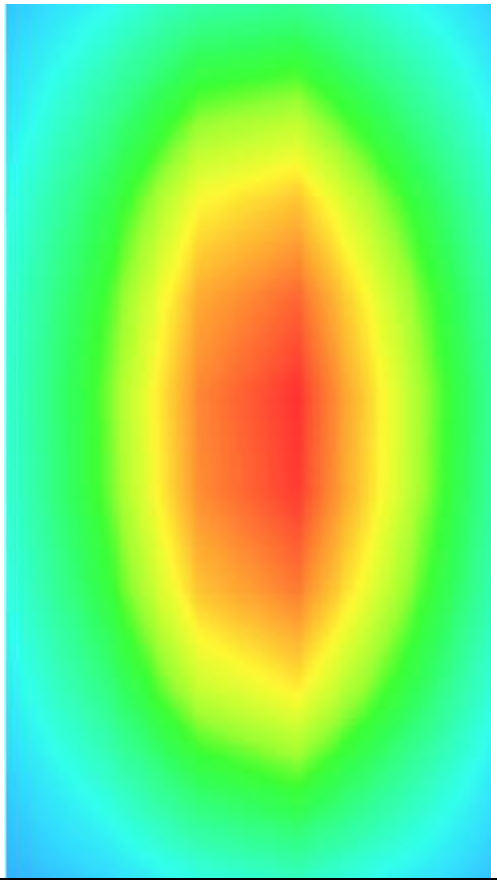
Maximum location: X=3.00, Y=0.00

SAR Peak: 0.89 W/kg

SAR 10g (W/Kg)	0.408790
SAR 1g (W/Kg)	0.626873

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.8790	0.6508	0.4473	0.3102	0.2198	0.1595	0.1159



3D screen shot	Hot spot position
	

MEASUREMENT 5

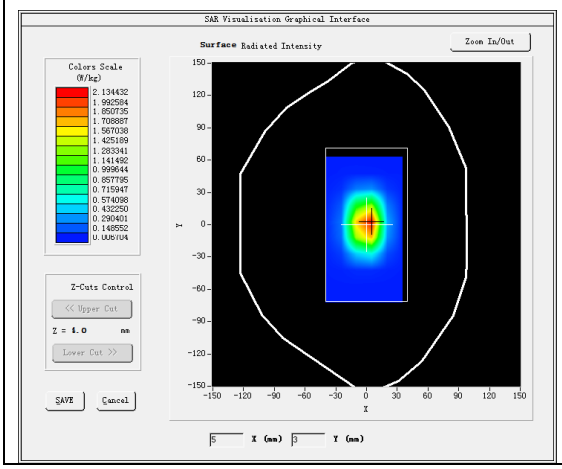
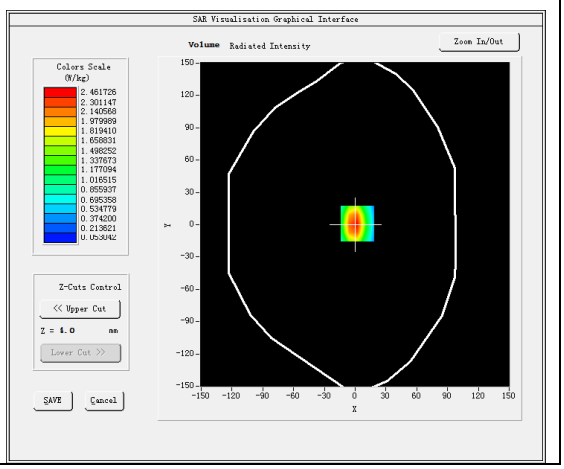
Date of measurement: 30/10/2024

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)	39.225225
Relative permittivity (imaginary part)	13.982463
Conductivity (S/m)	1.398246
Variation (%)	-0.280000

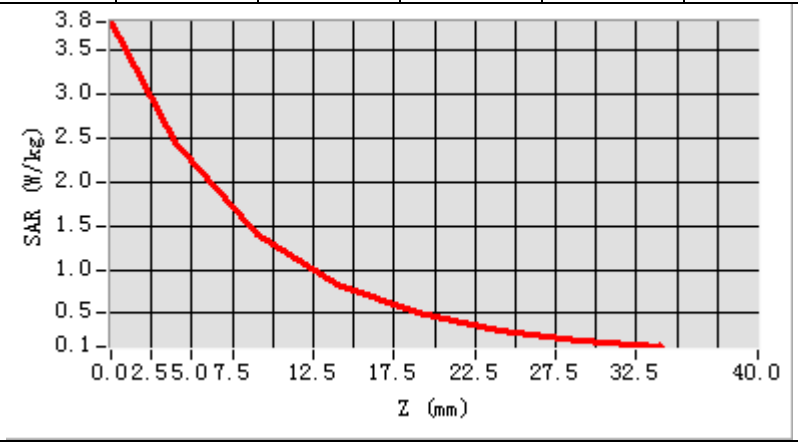
SURFACE SAR	VOLUME SAR
	

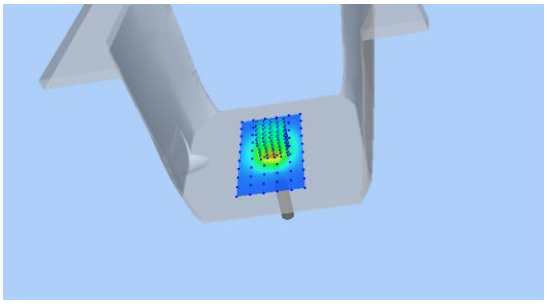
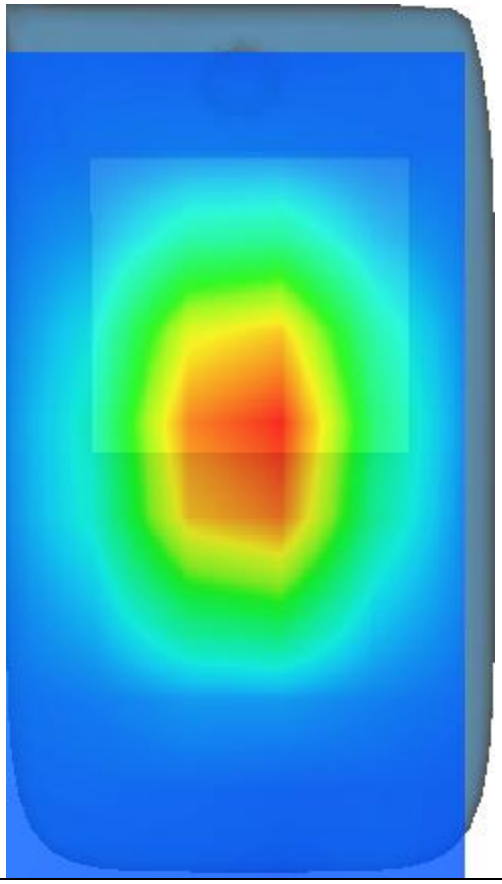
Maximum location: X=2.00, Y=1.00

SAR Peak: 3.95 W/kg

SAR 10g (W/Kg)	1.238802
SAR 1g (W/Kg)	2.386329

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	3.8200	2.4617	1.4020	0.8260	0.5042	0.3104	0.1967



3D screen shot	Hot spot position
	

MEASUREMENT 6

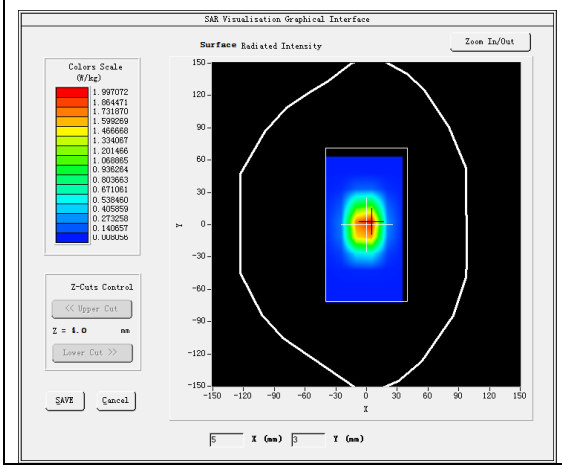
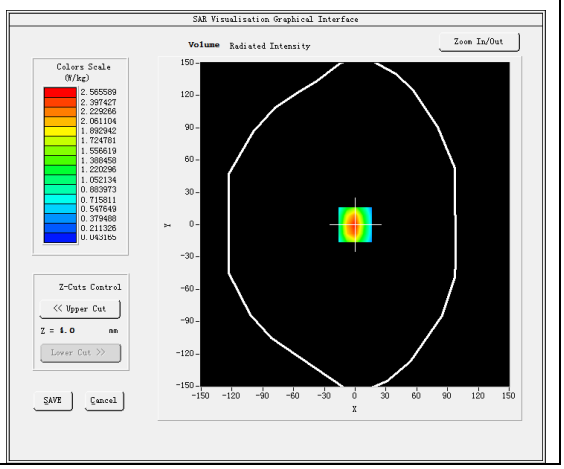
Date of measurement: 6/11/2024

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)	38.476233
Relative permittivity (imaginary part)	13.797089
Conductivity (S/m)	1.456359
Variation (%)	-0.450000

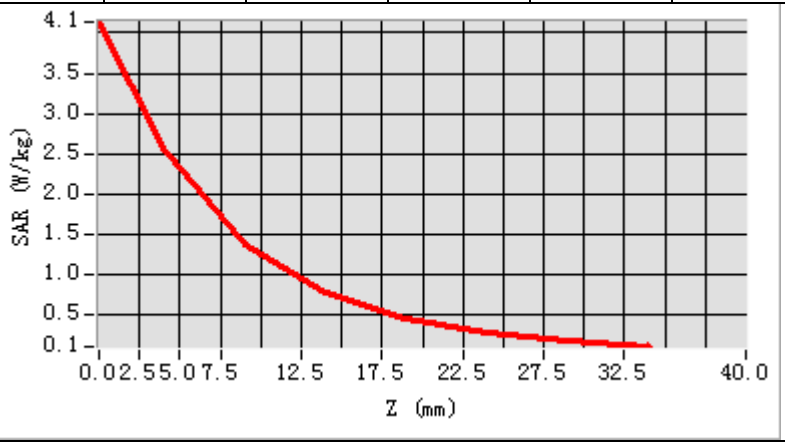
SURFACE SAR	VOLUME SAR
	

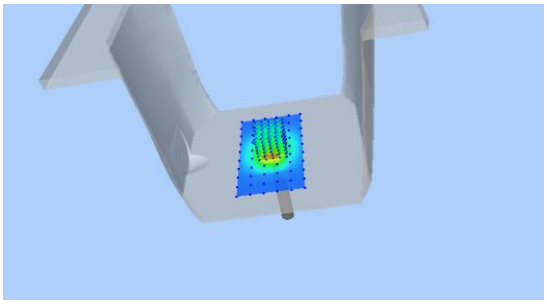
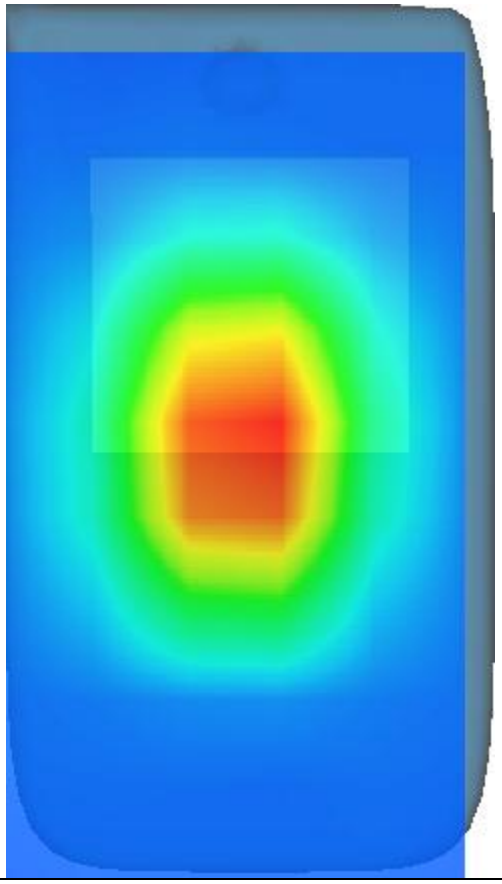
Maximum location: X=0.00, Y=0.00

SAR Peak: 4.16 W/kg

SAR 10g (W/Kg)	1.235526
SAR 1g (W/Kg)	2.510543

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	4.1361	2.5656	1.3787	0.7727	0.4513	0.2662	0.1622



3D screen shot	Hot spot position
	

MEASUREMENT 7

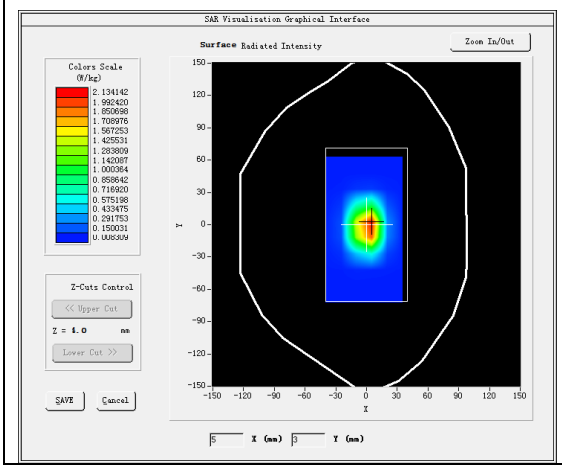
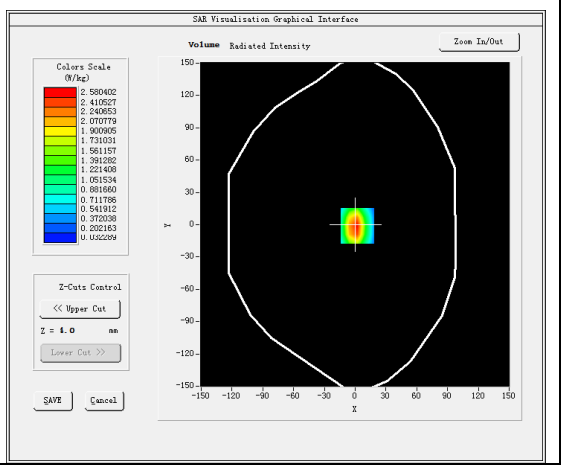
Date of measurement: 31/10/2024

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	CW2000
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.64

B. SAR Measurement Results

Frequency (MHz)	2000.000000
Relative permittivity (real part)	38.858337
Relative permittivity (imaginary part)	12.837350
Conductivity (S/m)	1.426372
Variation (%)	-0.190000

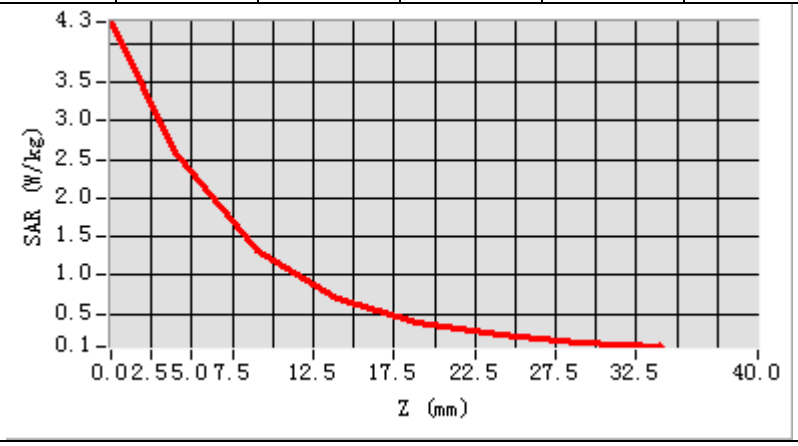
SURFACE SAR	VOLUME SAR
	

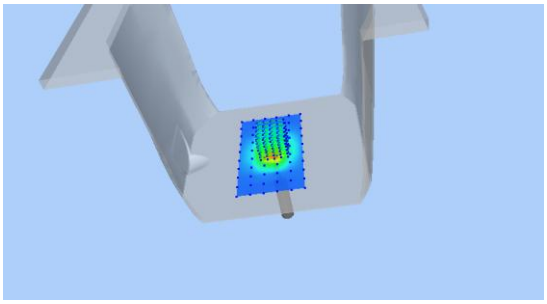
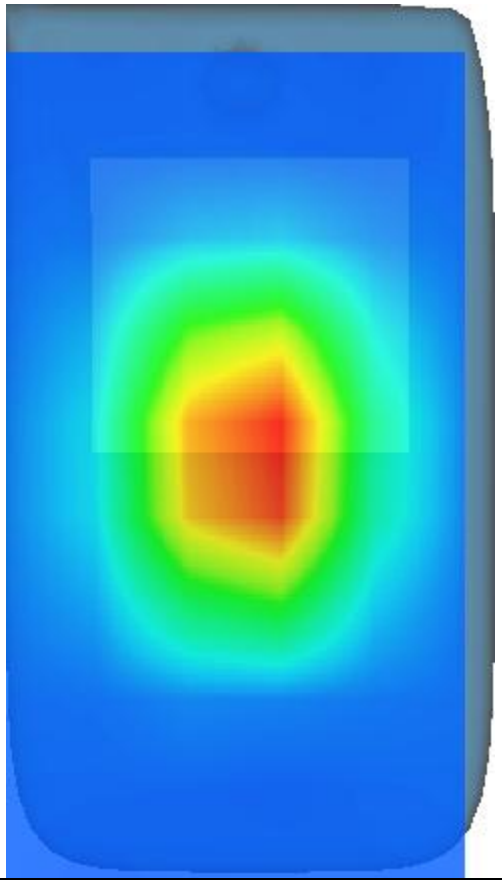
Maximum location: X=2.00, Y=-1.00

SAR Peak: 4.37 W/kg

SAR 10g (W/Kg)	1.173842
SAR 1g (W/Kg)	2.465051

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	4.2773	2.5804	1.3233	0.7101	0.3953	0.2254	0.1312



3D screen shot	Hot spot position
	

MEASUREMENT 8

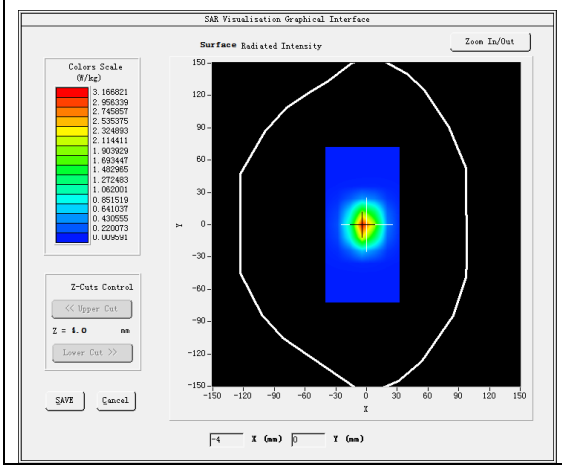
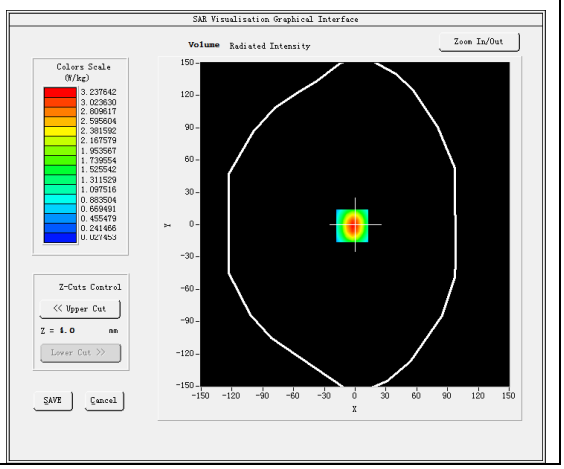
Date of measurement: 3/11/2024

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)	37.838986
Relative permittivity (imaginary part)	13.085579
Conductivity (S/m)	1.781093
Variation (%)	3.070000

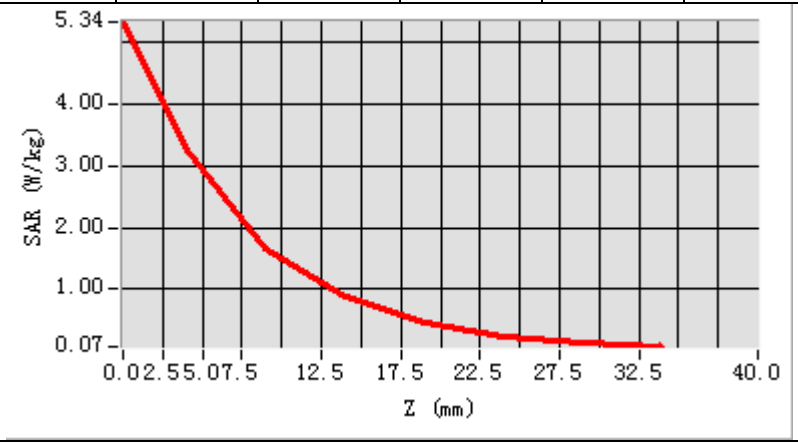
SURFACE SAR	VOLUME SAR
	

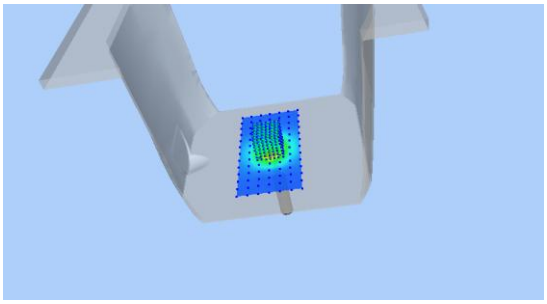
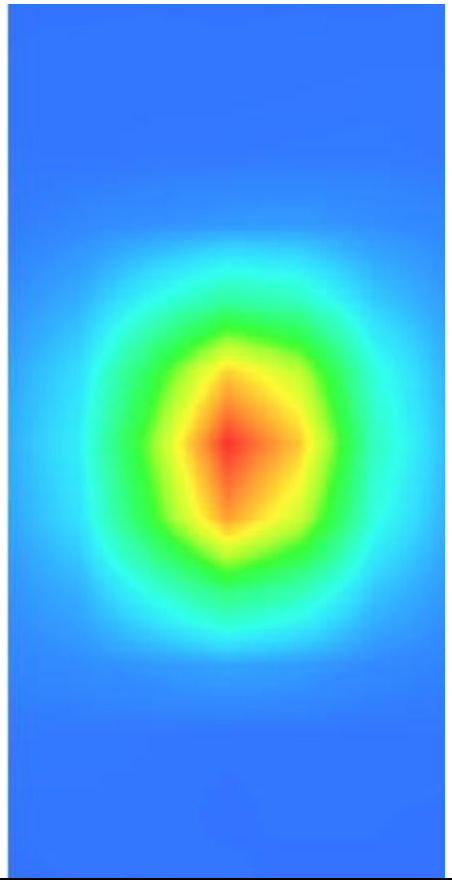
Maximum location: X=-3.00, Y=-1.00

SAR Peak: 5.31 W/kg

SAR 10g (W/Kg)	1.426298
SAR 1g (W/Kg)	2.989339

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.3357	3.2376	1.6533	0.8643	0.4478	0.2325	0.1245



3D screen shot	Hot spot position
	

12. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 8 LTE Band 26a Body
MEASUREMENT 9 LTE Band 26b Body
MEASUREMENT 10 LTE Band 66 Body

MEASUREMENT 1

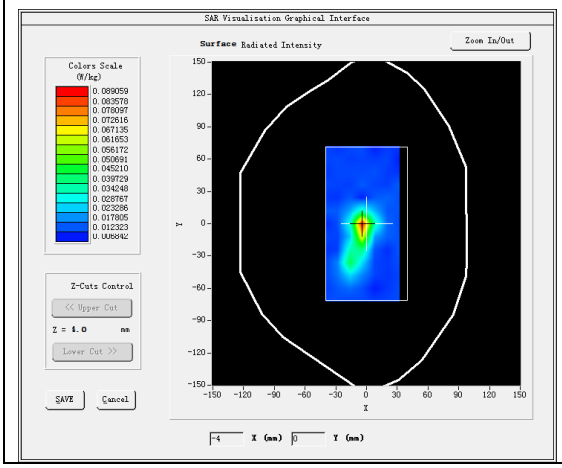
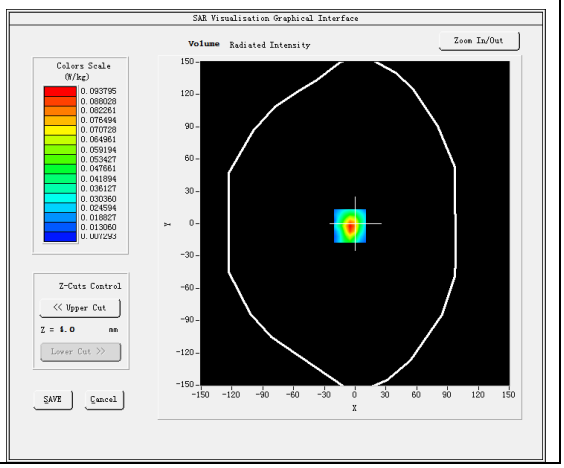
Date of measurement: 3/11/2024

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	Bluetooth
Channels	Middle
Signal	Bluetooth (Crest factor: 1.0)
ConvF	2.74

B. SAR Measurement Results

Frequency (MHz)	2480.000000
Relative permittivity (real part)	37.866985
Relative permittivity (imaginary part)	13.015179
Conductivity (S/m)	1.765003
Variation (%)	0.200000

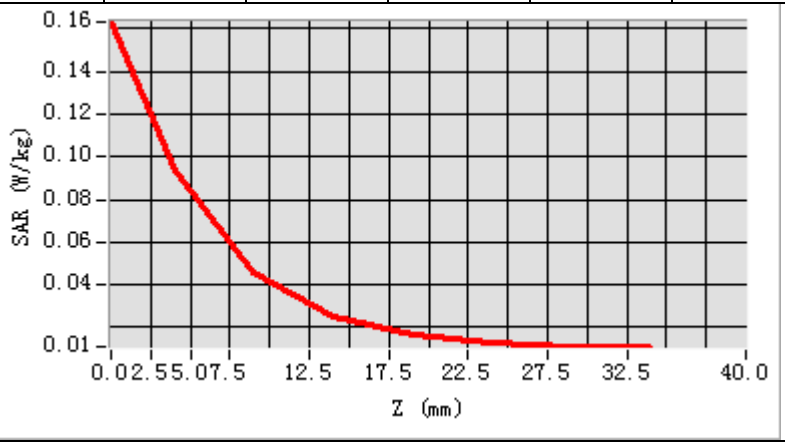
SURFACE SAR	VOLUME SAR
	

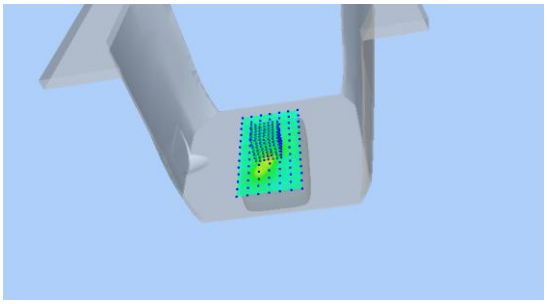
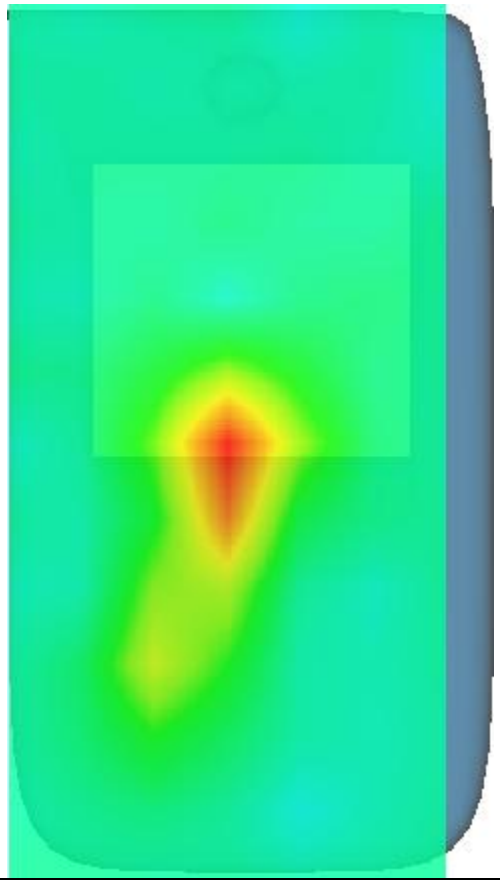
Maximum location: X=-5.00, Y=-2.00

SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)	0.037899
SAR 1g (W/Kg)	0.084224

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1630	0.0938	0.0457	0.0249	0.0162	0.0129	0.0111



3D screen shot	Hot spot position
	

MEASUREMENT 2

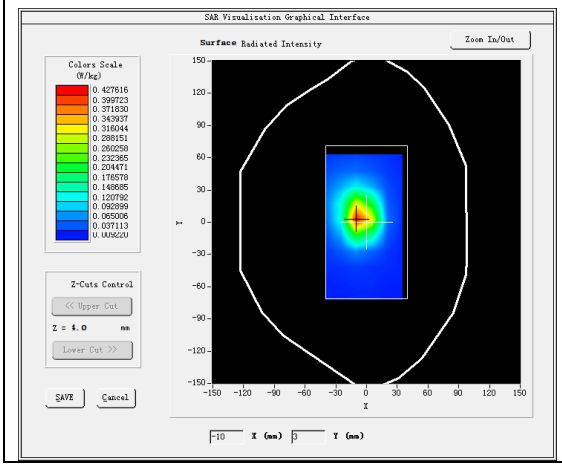
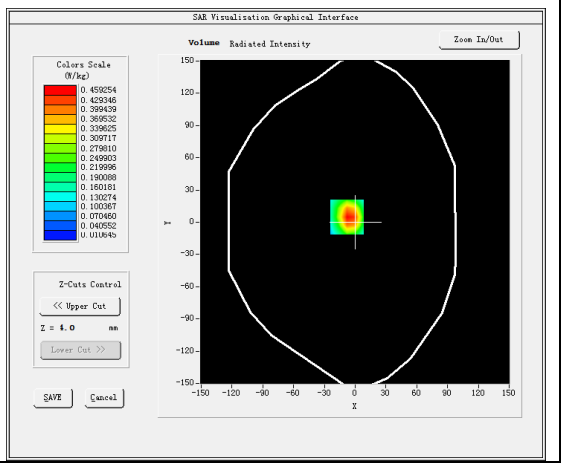
Date of measurement: 6/11/2024

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

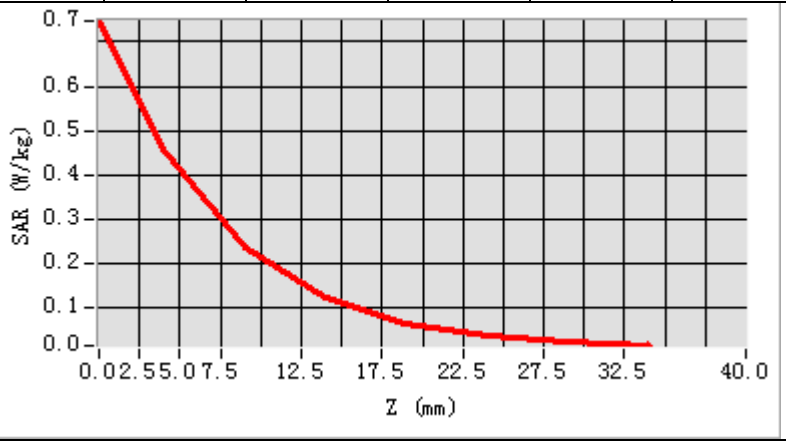
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.562633
Relative permittivity (imaginary part)	13.814889
Conductivity (S/m)	1.442888
Variation (%)	-0.450000

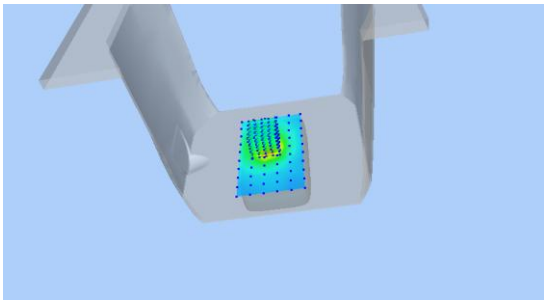
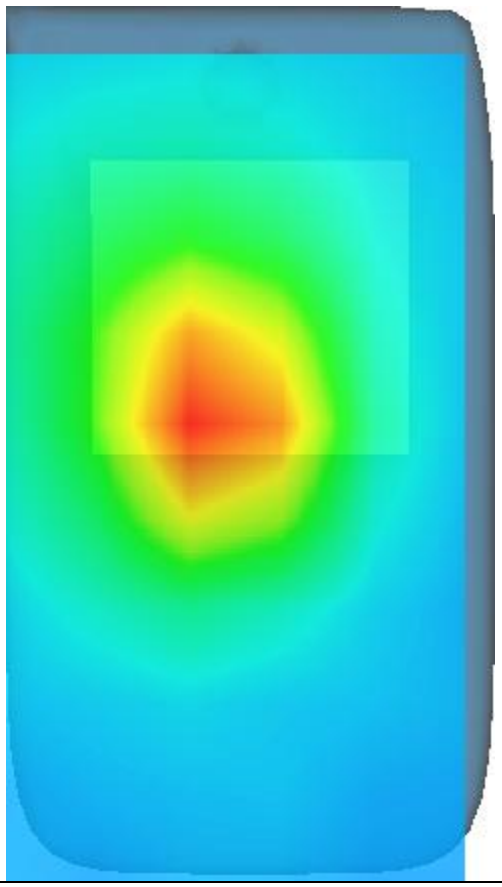
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=5.00
SAR Peak: 0.79 W/kg

SAR 10g (W/Kg)	0.218883
SAR 1g (W/Kg)	0.457226

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7467	0.4593	0.2395	0.1236	0.0683	0.0378	0.0251



3D screen shot	Hot spot position
	

MEASUREMENT 3

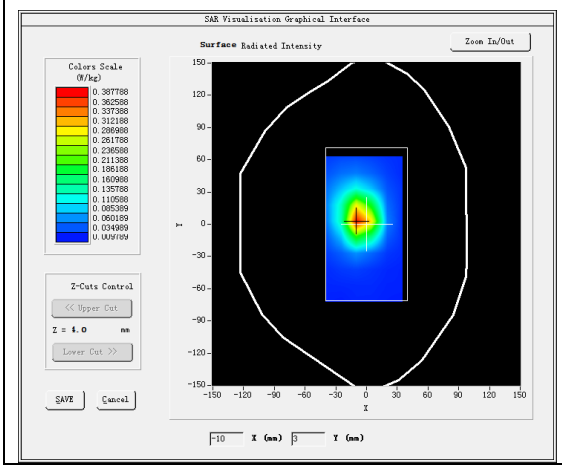
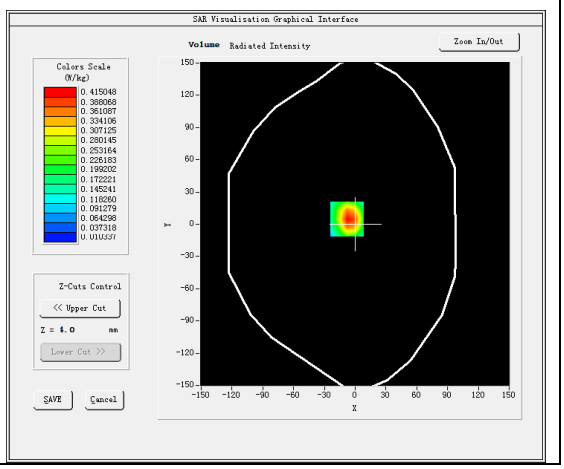
Date of measurement: 30/10/2024

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	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

Frequency (MHz)	1732.500000
Relative permittivity (real part)	39.692825
Relative permittivity (imaginary part)	13.919613
Conductivity (S/m)	1.339763
Variation (%)	-0.010000

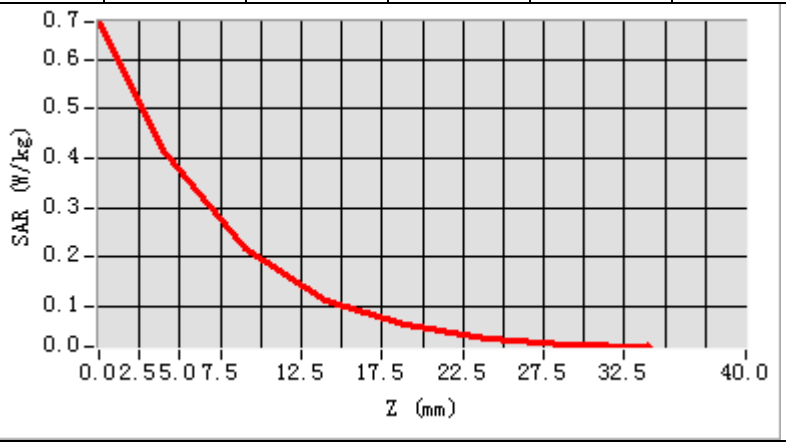
SURFACE SAR	VOLUME SAR
	

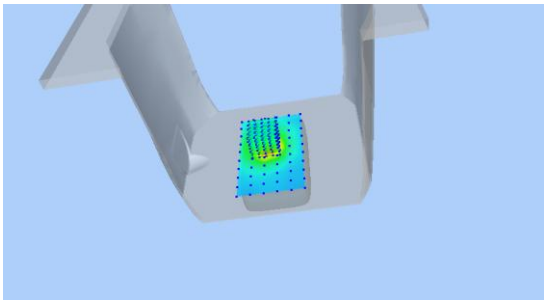
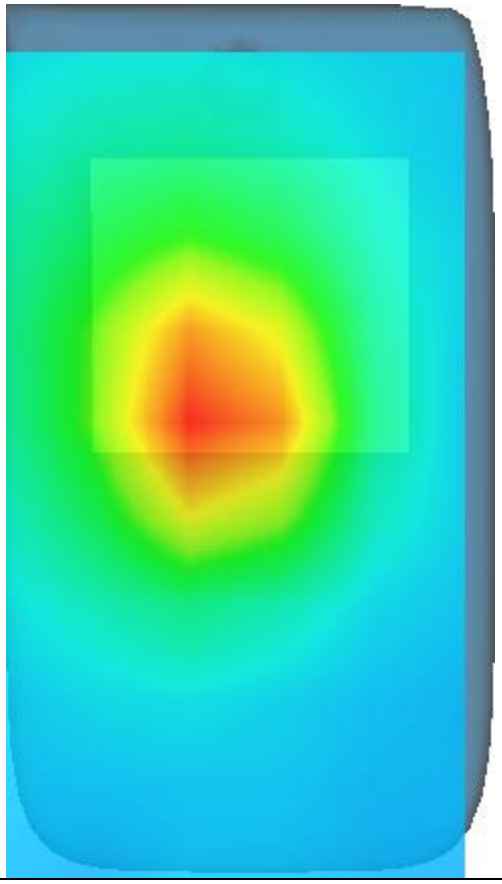
Maximum location: X=-8.00, Y=5.00

SAR Peak: 0.70 W/kg

SAR 10g (W/Kg)	0.198613
SAR 1g (W/Kg)	0.403666

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.6767	0.4150	0.2166	0.1126	0.0625	0.0355	0.0232



3D screen shot	Hot spot position
	

MEASUREMENT 4

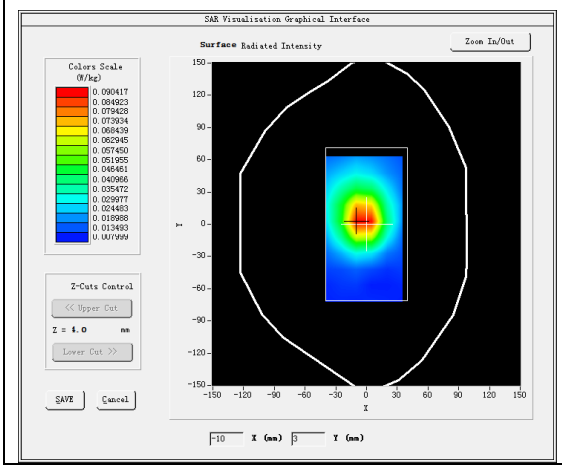
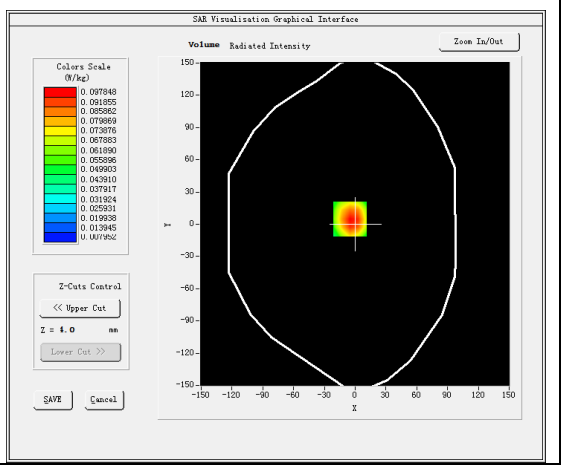
Date of measurement: 5/11/2024

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

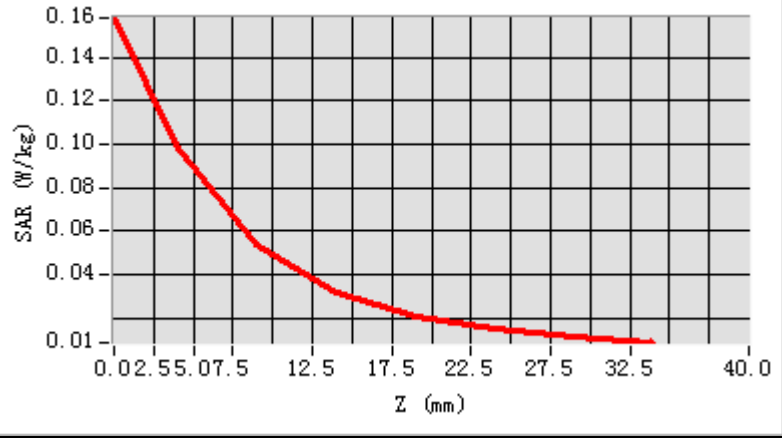
Frequency (MHz)	836.500000
Relative permittivity (real part)	42.000340
Relative permittivity (imaginary part)	19.852188
Conductivity (S/m)	0.922575
Variation (%)	0.850000

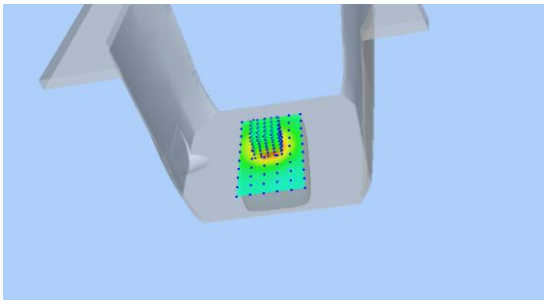
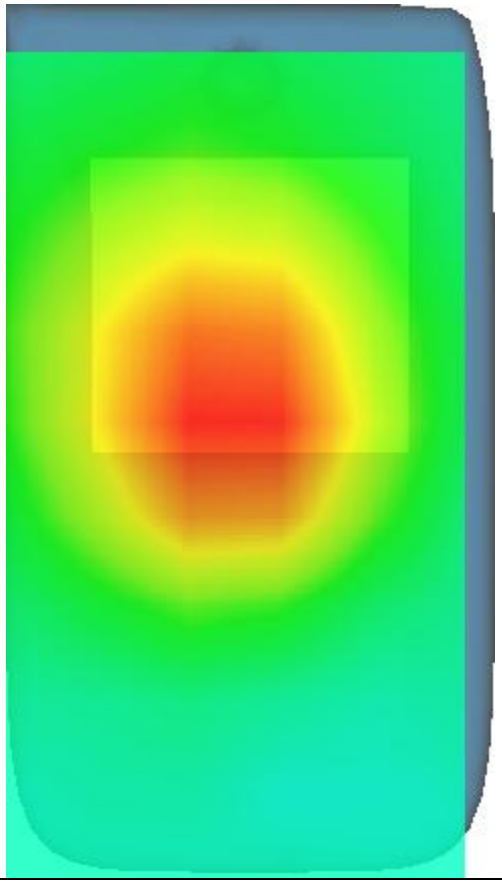
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=5.00
SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)	0.059510
SAR 1g (W/Kg)	0.112494

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1580	0.0978	0.0537	0.0318	0.0213	0.0153	0.0114



3D screen shot	Hot spot position
	

MEASUREMENT 5

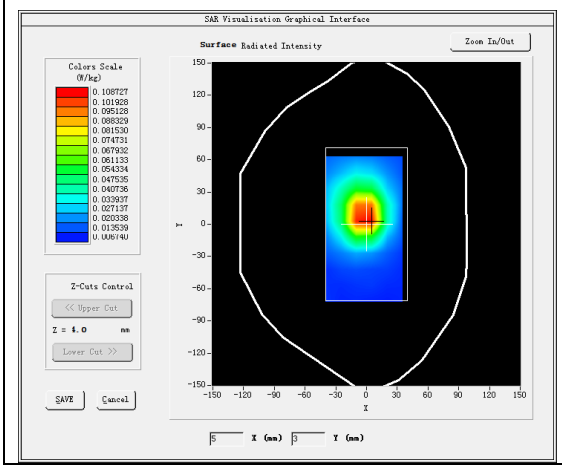
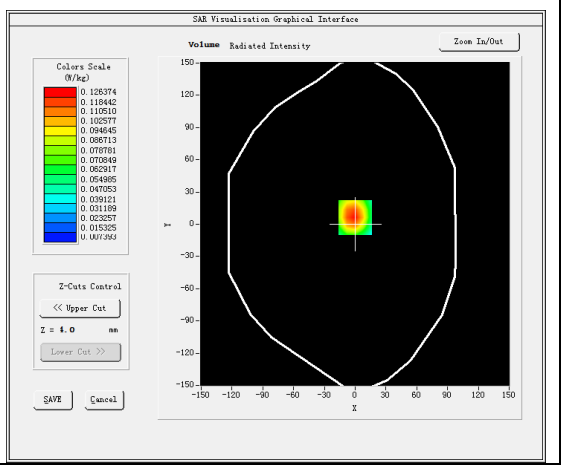
Date of measurement: 28/10/2024

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

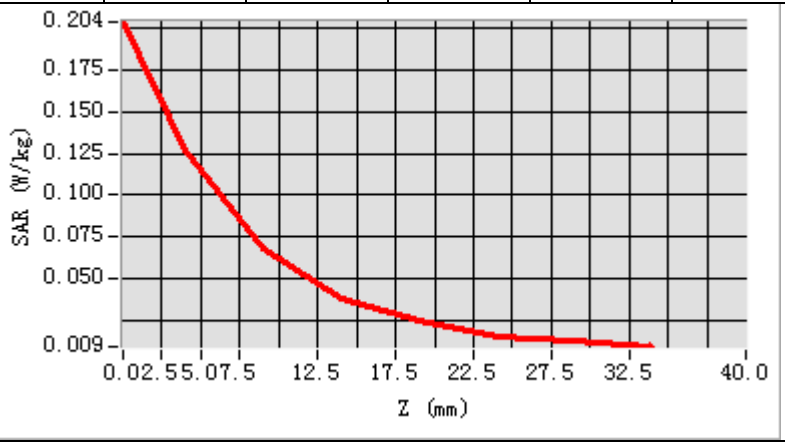
Frequency (MHz)	707.500000
Relative permittivity (real part)	41.559696
Relative permittivity (imaginary part)	21.927753
Conductivity (S/m)	0.861883
Variation (%)	0.270000

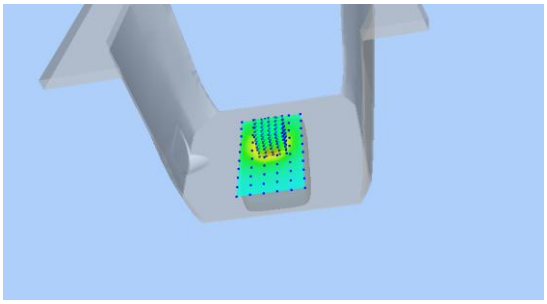
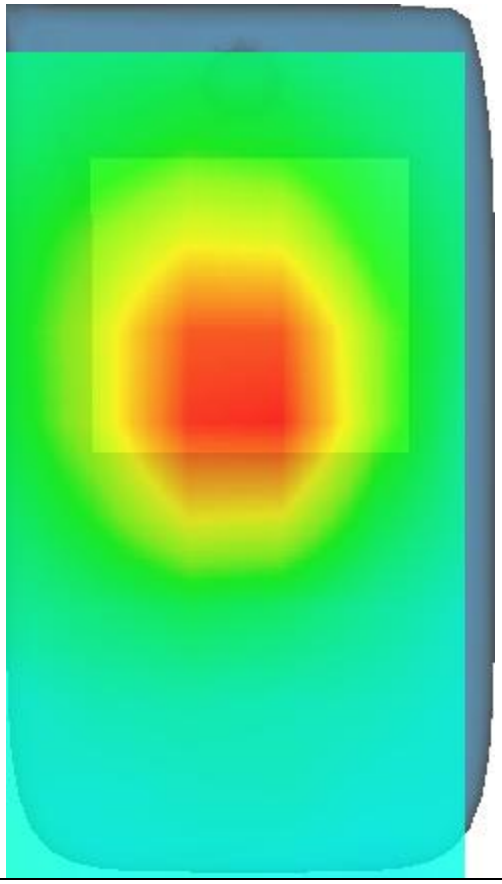
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.091563
SAR 1g (W/Kg)	0.170344

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2040	0.1264	0.0683	0.0384	0.0250	0.0152	0.0121



3D screen shot	Hot spot position
	

MEASUREMENT 6

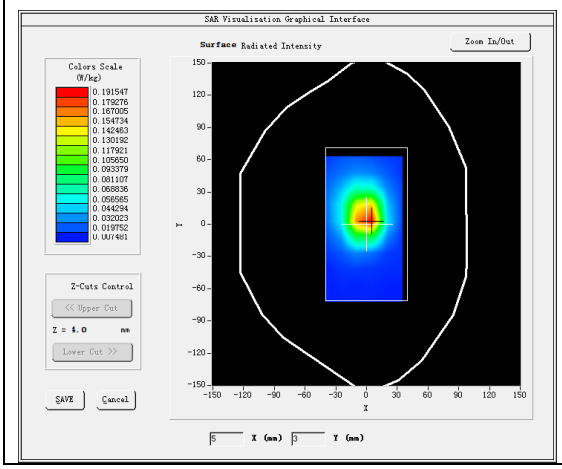
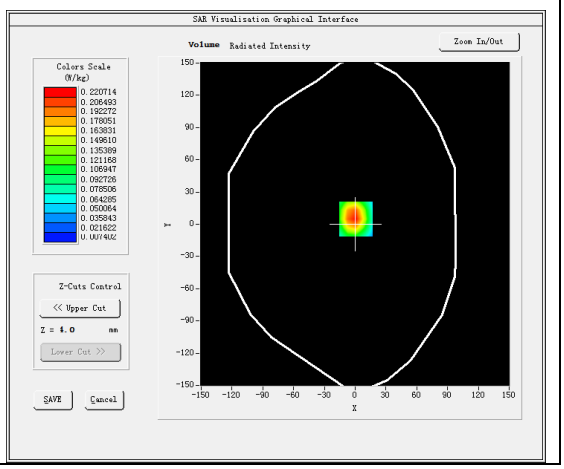
Date of measurement: 5/11/2024

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 13
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.42

B. SAR Measurement Results

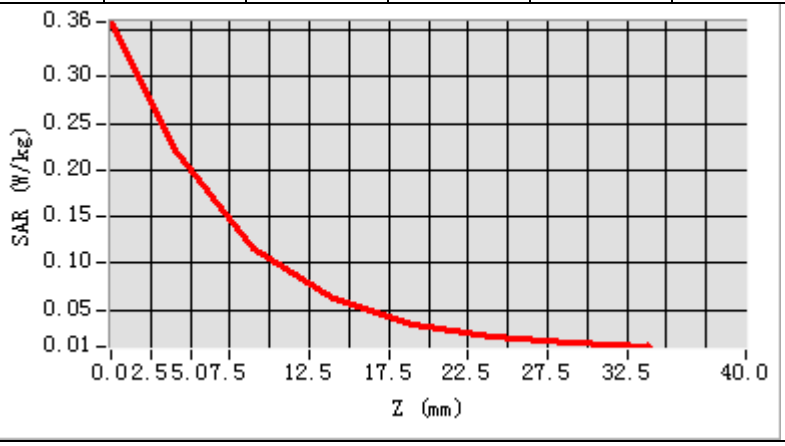
Frequency (MHz)	782.000000
Relative permittivity (real part)	41.930889
Relative permittivity (imaginary part)	19.856789
Conductivity (S/m)	0.862667
Variation (%)	0.100000

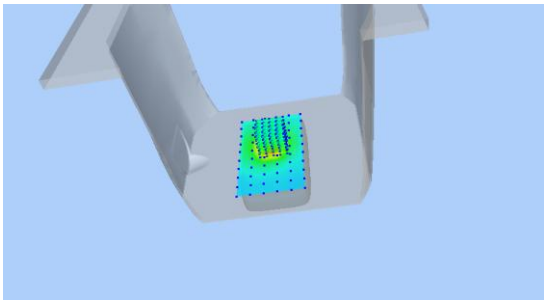
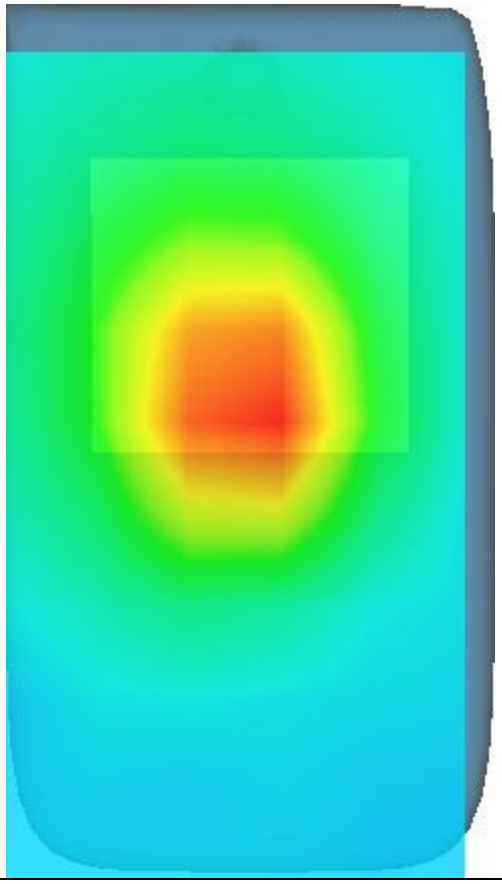
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=5.00
SAR Peak: 0.36 W/kg

SAR 10g (W/Kg)	0.106413
SAR 1g (W/Kg)	0.210351

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.3591	0.2207	0.1157	0.0625	0.0350	0.0216	0.0145



3D screen shot	Hot spot position
	

MEASUREMENT 7

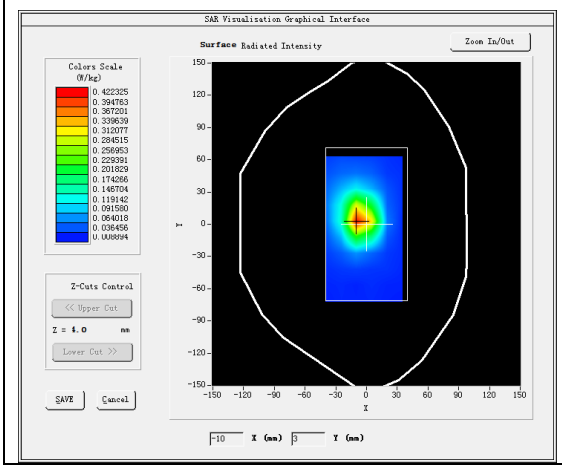
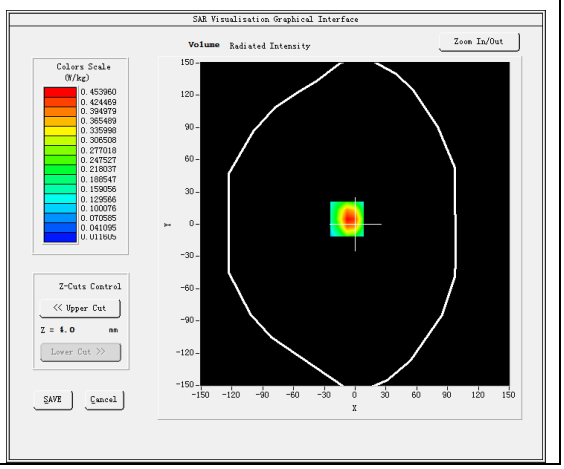
Date of measurement: 6/11/2024

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 25
Channels	Middle
Signal	LTE (Crest factor: 1.0)
ConvF	2.57

B. SAR Measurement Results

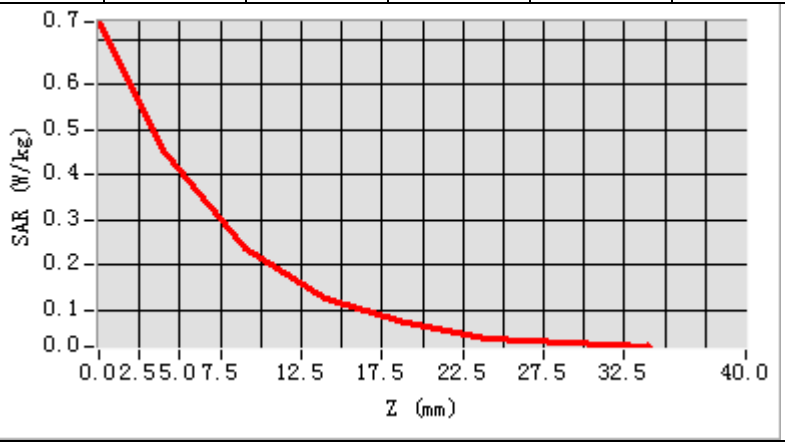
Frequency (MHz)	1882.500000
Relative permittivity (real part)	38.562733
Relative permittivity (imaginary part)	13.843689
Conductivity (S/m)	1.447435
Variation (%)	-0.190000

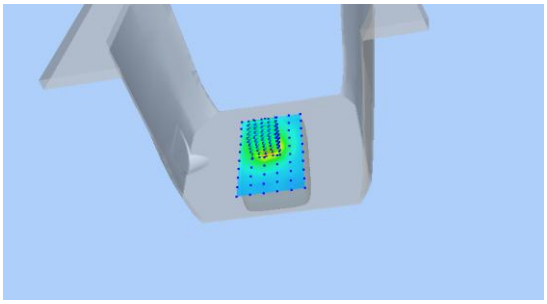
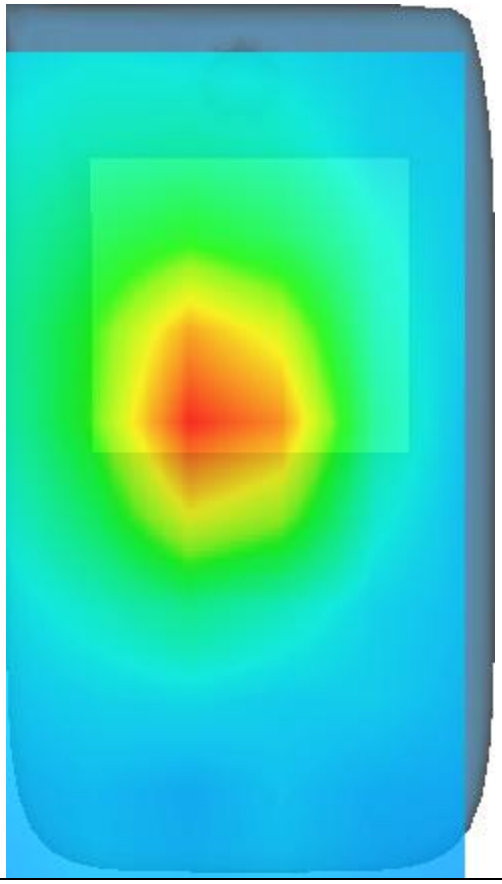
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=5.00
SAR Peak: 0.78 W/kg

SAR 10g (W/Kg)	0.218546
SAR 1g (W/Kg)	0.454829

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.7404	0.4540	0.2361	0.1236	0.0695	0.0377	0.0265



3D screen shot	Hot spot position
	

MEASUREMENT 8

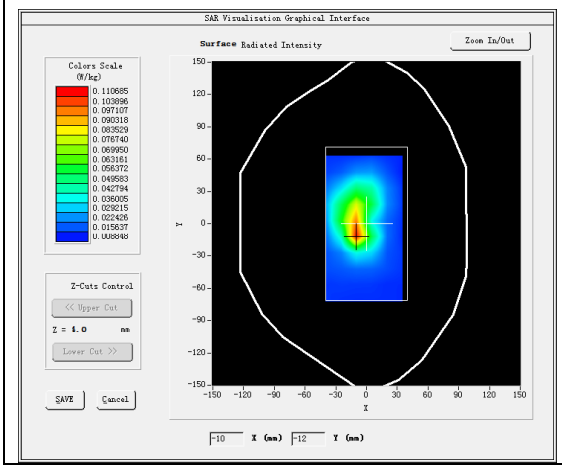
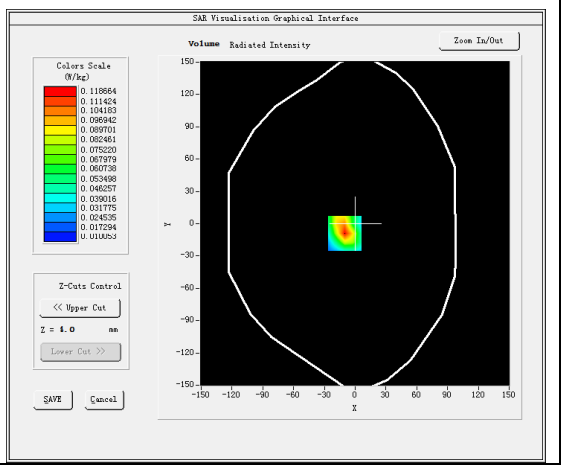
Date of measurement: 5/11/2024

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	FDDBand26a
Channels	Middle
Signal	(Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

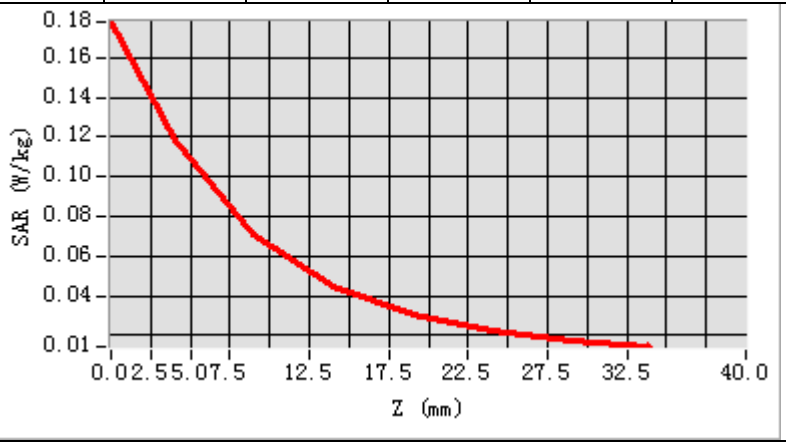
Frequency (MHz)	819.000000
Relative permittivity (real part)	42.266991
Relative permittivity (imaginary part)	19.835989
Conductivity (S/m)	0.902537
Variation (%)	-1.640000

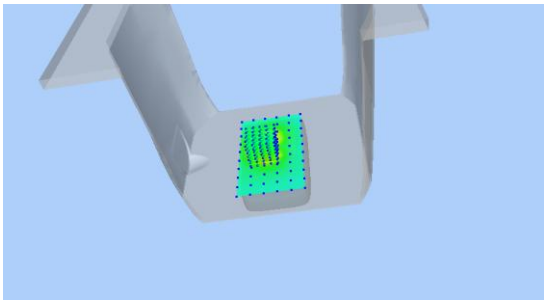
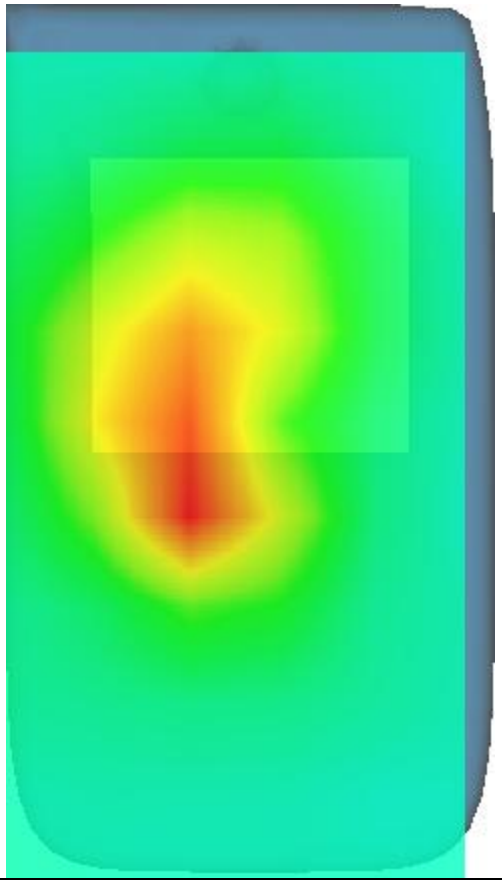
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-10.00, Y=-9.00
SAR Peak: 0.18 W/kg

SAR 10g (W/Kg)	0.059199
SAR 1g (W/Kg)	0.108218

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1781	0.1187	0.0713	0.0448	0.0304	0.0221	0.0177



3D screen shot	Hot spot position
	

MEASUREMENT 9

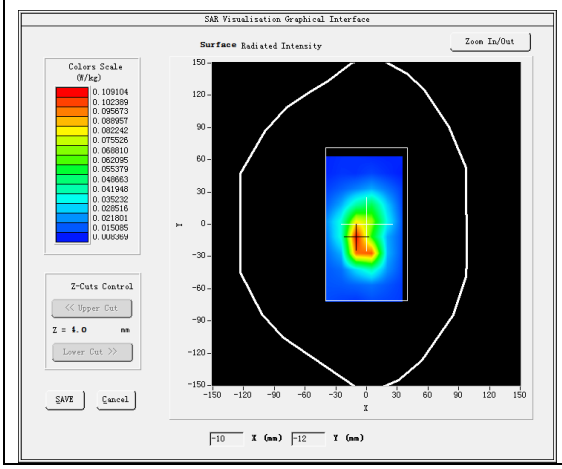
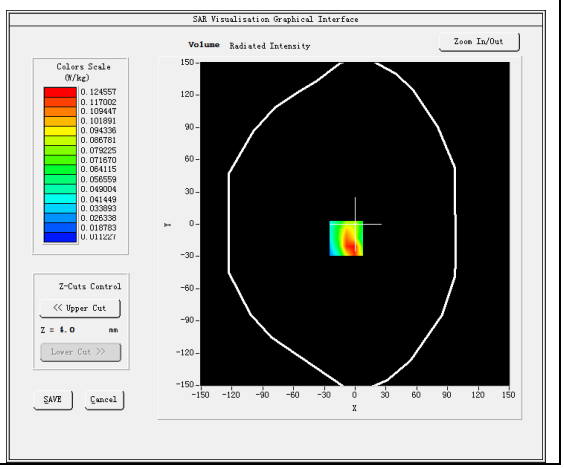
Date of measurement: 5/11/2024

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	FDDBand26b
Channels	Middle
Signal	(Crest factor: 1.0)
ConvF	2.34

B. SAR Measurement Results

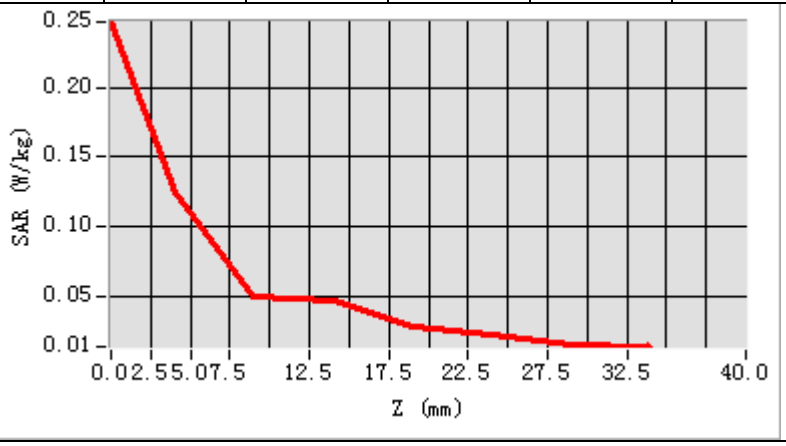
Frequency (MHz)	831.500000
Relative permittivity (real part)	42.051041
Relative permittivity (imaginary part)	19.841940
Conductivity (S/m)	0.916587
Variation (%)	-1.130000

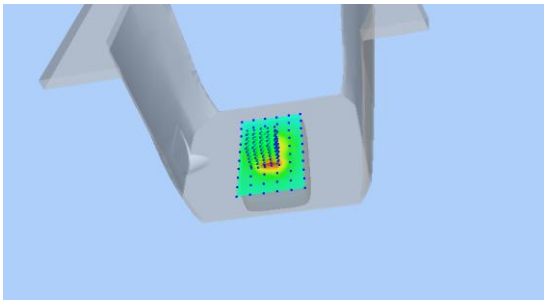
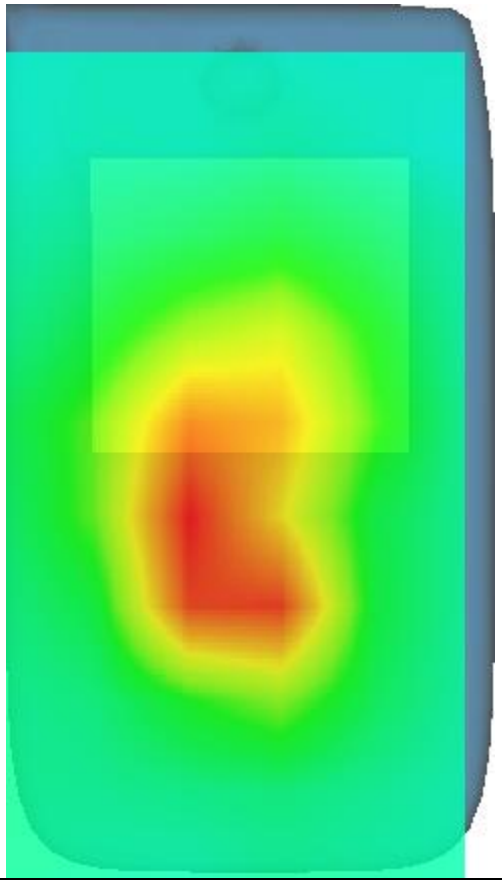
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-13.00
SAR Peak: 0.20 W/kg

SAR 10g (W/Kg)	0.065991
SAR 1g (W/Kg)	0.120673

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2469	0.1246	0.0496	0.0466	0.0273	0.0220	0.0154



3D screen shot	Hot spot position
	

MEASUREMENT 10

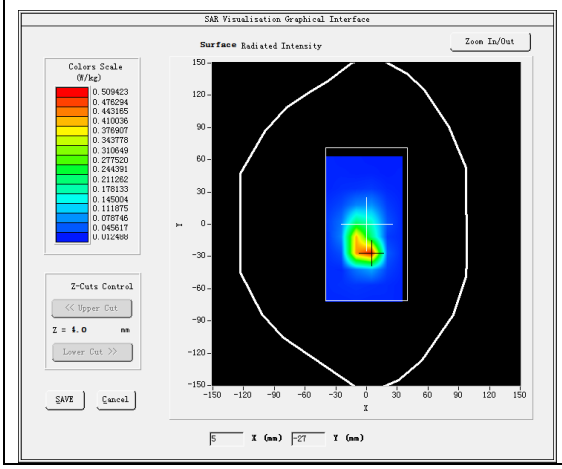
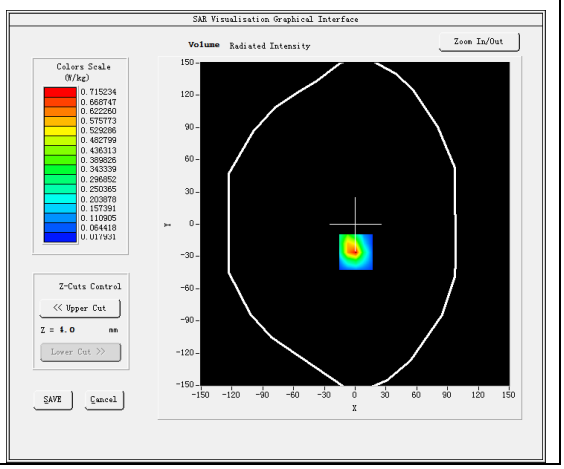
Date of measurement: 30/10/2024

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	FDDBand66
Channels	Middle
Signal	(Crest factor: 1.0)
ConvF	2.51

B. SAR Measurement Results

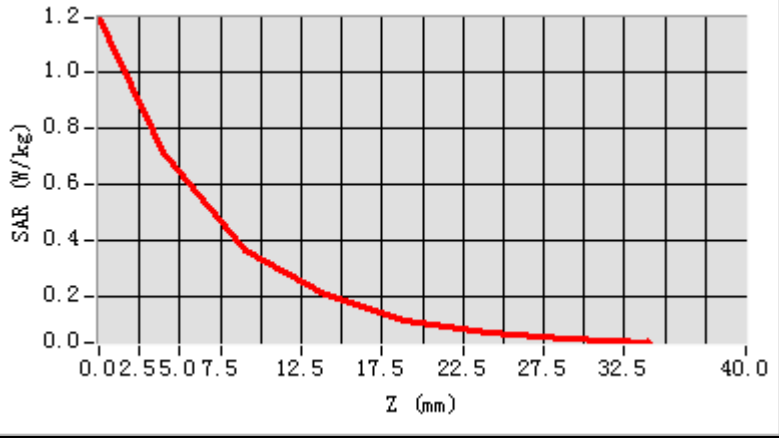
Frequency (MHz)	1745.000000
Relative permittivity (real part)	39.621025
Relative permittivity (imaginary part)	13.917163
Conductivity (S/m)	1.349192
Variation (%)	0.040000

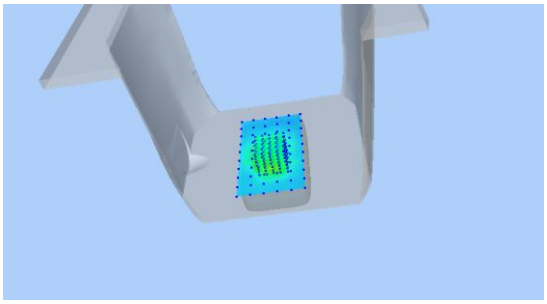
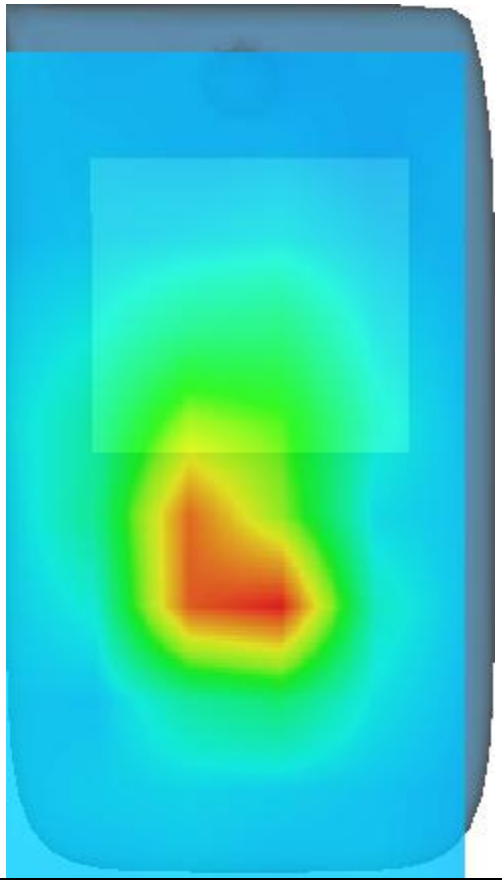
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-26.00
SAR Peak: 1.26 W/kg

SAR 10g (W/Kg)	0.281807
SAR 1g (W/Kg)	0.667045

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.1946	0.7152	0.3625	0.2035	0.1147	0.0700	0.0475



3D screen shot	Hot spot position
	

13. Appendix D. Calibration Certificate

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E Field Probe - 4024-EPGO-442
750 MHz Dipole - SN 03/15 DIP 0G750-355
835 MHz Dipole - SN 03/15 DIP 0G835-347
900 MHz Dipole - SN 03/15 DIP 0G900-348
1800 MHz Dipole - SN 03/15 DIP 1G800-349
1900 MHz Dipole - SN 03/15 DIP 1G900-350
2000 MHz Dipole - SN 03/15 DIP 2G000-351
2450 MHz Dipole - SN 03/15 DIP 2G450-352

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

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Summary:

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

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

	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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7 List of Equipment 9

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

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:

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

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.

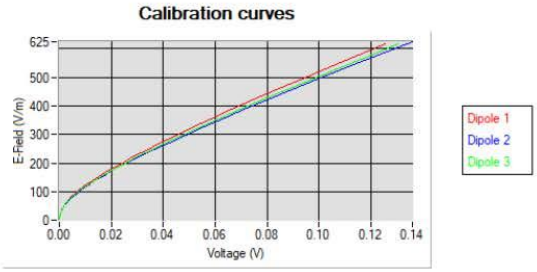
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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.

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

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

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

where
σ=the conductivity of the liquid
ρ=the volumetric density of the liquid
SAR=the SAR measured from the formula that depends on the setup used. The SAR formulas are given below

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

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

where
c=the specific heat for the liquid
dT/dt=the temperature rises over the time

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

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

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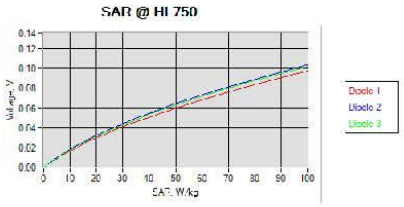
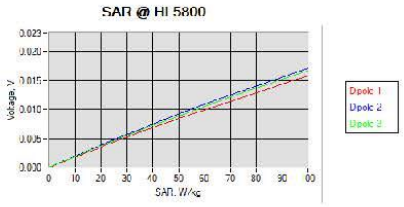
where
a=the larger cross-sectional of the waveguide
b=the smaller cross-sectional of the waveguide
δ=the skin depth for the liquid in the waveguide
Pw=the power delivered to the liquid

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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