

CE SAR EVALUATION REPORT

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

Product Name : Smartphone

Trademark : CUBOT

Model Name : A20

Family Model : N/A

Report No. : S24061405204001

Prepared for

Shenzhen Huafului Technology Co., Ltd.

Unit 601-03, 6/F, Block A, Building 1, Ganfeng Technology Building, No. 993 Jiaxian
Road, Xiangjiaotang Community, Bantian Street, Longgang District,
Shenzhen, P.R. China

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

1&5/F, Building C, 1&2/F, Building E, Fenda Science Park, Sanwei Community,
Hangcheng Street, Baoan District, Shenzhen ,Guangdong, China

Tel. 400-800-6106, 0755-2320 0050, 0755-2320 0090

Website: <http://www.ntek.org.cn>

TEST RESULT CERTIFICATION

Applicant's name.....: Shenzhen Huafului Technology Co., Ltd.
Unit 601-03, 6/F, Block A, Building 1, Ganfeng Technology Building, No.
Address: 993 Jiaxian Road, Xiangjiaotang Community, Bantian Street,
Longgang District, Shenzhen, P.R. China
Manufacturer's Name.....: Shenzhen Huafului Technology Co., Ltd.
Unit 601-03, 6/F, Block A, Building 1, Ganfeng Technology Building, No.
Address: 993 Jiaxian Road, Xiangjiaotang Community, Bantian Street,
Longgang District, Shenzhen, P.R. China

Product description

Product name.....: Smartphone
Trademark: CUBOT
Model and/or type reference ..: A20
Family Model.....: N/A

Standards.....: EN 50360:2017;
EN 50566:2017;
EN 62209-1:2016;
EN 62209-2:2010;
EN 62479:2010;

This device described above has been tested by Shenzhen NTEK. In accordance with the measurement methods and procedures specified in EN62209. Testing has shown that this device is capable of compliance with localized specific absorption rate (SAR) specified in COUNCIL 1999/519/EC. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

This report shall not be reproduced except in full, without the written approval of Shenzhen NTEK, this document may be altered or revised by Shenzhen NTEK, personal only, and shall be noted in the revision of the document.

Test Sample Number S240614052004

Date of Test

Date (s) of performance of tests Jun. 17, 2024 ~ Jun. 29, 2024

Date of Issue..... Jul. 29, 2024

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

Prepared By : Jack Li
Jack Li
(Project Engineer)

Reviewed By : Aaron Cheng
Aaron Cheng
(Supervisor)

Approved By : Alex Li
Alex Li
(Manager)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Jul. 29, 2024	Jack Li

TABLE OF CONTENTS

1. General Information	6
1.1. RF exposure limits.....	6
1.2. Statement of Compliance	7
1.3. EUT Description	7
1.4. Test specification(s)	9
1.5. Ambient Condition.....	9
2. SAR Measurement System	10
2.1. SATIMO SAR Measurement Set-up Diagram	10
2.2. Robot	11
2.3. E-Field Probe.....	12
2.3.1. E-Field Probe Calibration	12
2.4. SAM phantoms	13
2.4.1. Technical Data	14
2.5. Device Holder	15
2.6. Test Equipment List	16
3. SAR Measurement Procedures	18
3.1. Power Reference	18
3.2. Area scan & Zoom scan.....	18
3.3. Description of interpolation/extrapolation scheme	19
3.4. Volumetric Scan	19
3.5. Power Drift	19
4. System Verification Procedure	20
4.1. Tissue Verification	20
4.1.1. Tissue Dielectric Parameter Check Results	21
4.2. System Verification Procedure	22
4.2.1. System Verification Results	23
5. SAR Measurement Uncertainty	24
6. RF Exposure Positions	26
6.1. Ear and handset reference point	26
6.2. Definition of the cheek position	26
6.3. Definition of the tilt position	27
6.4. Body-worn device	28
7. RF Output Power	29
7.1. GSM Conducted Power	29
7.2. WCDMA Conducted Power	30
7.3. LTE Conducted Power	31
7.4. WLAN & Bluetooth Output Power	35
8. Assessment of the compliance of low power equipment.....	37
9. SAR Results	37

9.1. SAR measurement results	37
9.1.1. SAR measurement Result of GSM900	37
9.1.2. SAR measurement Result of GSM1800	38
9.1.3. SAR measurement Result of WCDMA Band 1	39
9.1.4. SAR measurement Result of WCDMA Band 8	40
9.1.5. SAR measurement Result of LTE Band 1	41
9.1.6. SAR measurement Result of LTE Band 3	43
9.1.7. SAR measurement Result of LTE Band 7	44
9.1.8. SAR measurement Result of LTE Band 8	45
9.1.9. SAR measurement Result of LTE Band 20	46
9.1.10. SAR measurement Result of LTE Band 28	47
9.1.11. SAR measurement Result of LTE Band 40	48
9.1.12. SAR measurement Result of LTE Band 41	49
9.1.13. SAR measurement Result of WLAN 2.4G	50
9.1.14. SAR measurement Result of WLAN 5.2G	51
9.1.15. SAR measurement Result of WLAN 5.8G	52
9.2. Simultaneous Transmission Analysis	53
9.3. Exposure Conditions	54
10. Appendix A. Photo documentation	55
11. Appendix B. System Check Plots	57
12. Appendix C. Plots of High SAR Measurement	76
13. Appendix D. Calibration Certificate	137

1. General Information

1.1. RF exposure limits

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

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	10.0	20.0

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

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

NOTE: **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 10 gram of tissue defined as a tissue volume in the shape of a cube.

SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

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

NOTE

HEAD AND TRUNK LIMIT
2.0 W/kg AND MEMBER LIMIT 4.0 W/kg
APPLIED TO THIS EUT

1.2. Statement of Compliance

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

Max SAR Value(W/kg)			
RF Exposure Conditions	10-g Head	10-g Body & Hotspot (Separation distance of 5mm)	10-g Member DAS (See note ³) (Separation distance of 0mm)
	0.182	1.192	2.644
Max Simultaneous Tx	0.437	1.594	3.336

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

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

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

1.3. EUT Description

Device Information			
Product Name	Smartphone		
Trademark	CUBOT		
Model Name	A20		
Family Model	N/A		
Model Difference	N/A		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna Type	PIFA Antenna		
Battery Information	DC 3.87V, 5100 mAh, 19.737Wh		
Hardware version	G3320G-UF-V1.1		
Software version	CUBOT_E091C_A20_V01		
Device Operating Configurations			
Supporting Mode(s)	GSM/900/1800, WCDMA Band 1/8, LTE Band 1/3/7/8/20/28/40/41, WLAN 2.4G/5G, Bluetooth, GPS		
Test Modulation	GSM(GMSK/8PSK), WCDMA(QPSK), LTE(QPSK/16-QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, $\pi/4$ -DQPSK, 8DPSK) , GPS(BPSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 900	880-915	925-960
	GSM 1800	1710-1785	1805-1880
	WCDMA Band 1	1920-1980	2110-2170

	WCDMA Band 8	880-915	925-960
	LTE Band 1	1920-1980	2110-2170
	LTE Band 3	1710-1785	1805-1880
	LTE Band 7	2500-2570	2620-2690
	LTE Band 8	880- 915	925– 960
	LTE Band 20	832-862	791-821
	LTE Band 28	703-736	758-791
	LTE Band 40	2300-2400	
	LTE Band 41	2535-2655	
	WLAN 2.4G	2412-2472	
	WLAN 5.2G	5180-5240	
	WLAN 5.8G	5745-5825	
	Bluetooth	2402-2480	
	GPS	N/A	1575.42
GPRS Multislot Class(12)	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
Power Class	4, tested with power level 5(GSM 900)		
	1, tested with power level 0(GSM 1800)		
	3, tested with power control “all 1”(WCDMA Band 1)		
	3, tested with power control “all 1”(WCDMA Band 8)		
	3, tested with power control all Max.(LTE Band 1)		
	3, tested with power control all Max.(LTE Band 3)		
	3, tested with power control all Max.(LTE Band 7)		
	3, tested with power control all Max.(LTE Band 8)		
	3, tested with power control all Max.(LTE Band 20)		
	3, tested with power control all Max.(LTE Band 28)		
	3, tested with power control all Max.(LTE Band 40)		
	3, tested with power control all Max.(LTE Band 41)		

1.4. Test specification(s)

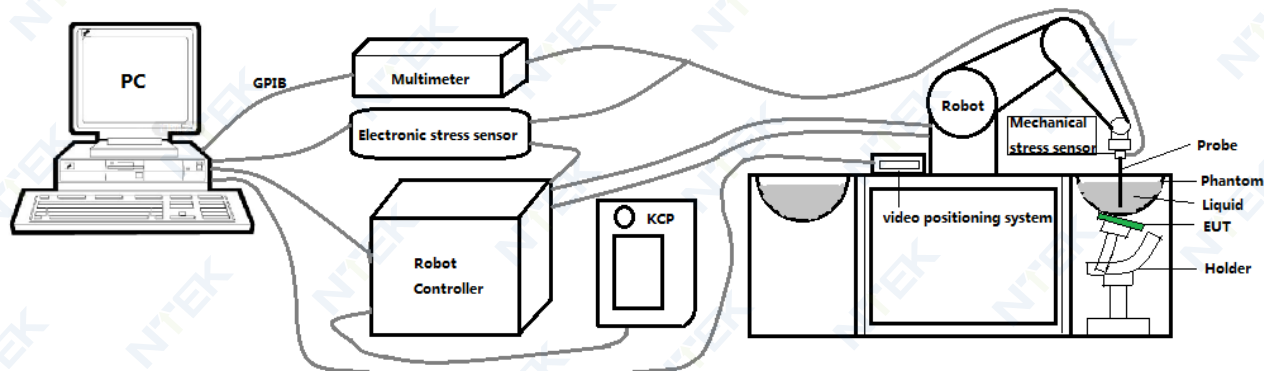
EN 50360:2017	Product standard to demonstrate the compliance of wireless communication devices, with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 300 MHz to 6 GHz: devices used next to the ear
EN 50566:2017	Product standard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

1.5. Ambient Condition

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

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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



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

2.3. E-Field Probe

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

For the measurements the Specific Dosimetric E-Field Probe 3423-EPGO-426 with following specifications is used



- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 2.5 mm
- Distance between probe tip and sensor center: 1 mm
- Distance between sensor center and the inner phantom surface: 2 mm (repeatability better than ± 1 mm).
- Probe linearity: ± 0.06 dB
- Axial isotropy: ± 0.01 dB
- Hemispherical Isotropy: ± 0.01 dB
- Calibration range: 650MHz to 5900MHz for head & body simulating liquid.
- Lower detection limit: 8mW/kg

Angle between probe axis (evaluation axis) and surface normal line: less than 30° .

2.3.1. E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (Norm X, Norm Y, and Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe are tested. The calibration data can be referred to appendix D of this report.

2.4. SAM phantoms

Photo of SAM phantom SN 16/15 SAM119

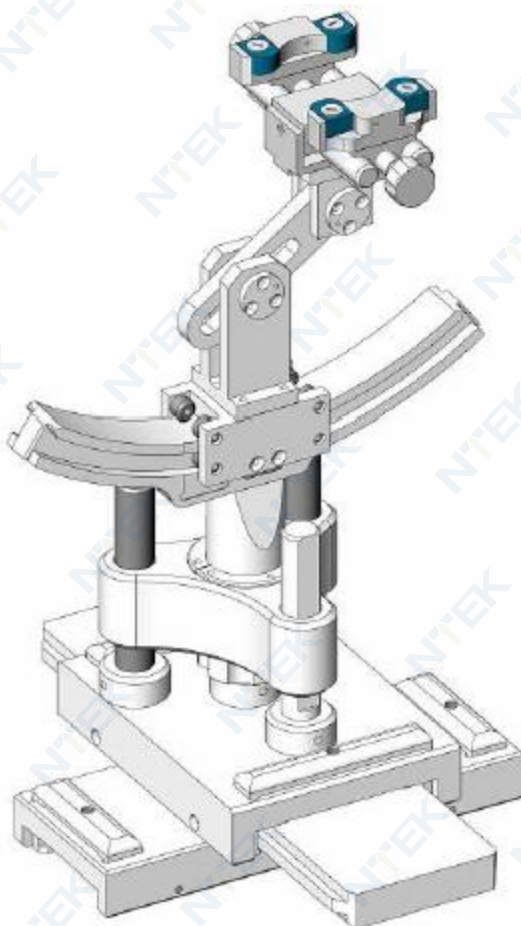


The SAM phantom is used to measure the SAR relative to people exposed to electro-magnetic field radiated by mobile phones.

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
<input checked="" type="checkbox"/>	MVG	E FIELD PROBE	SSE2	3423-EPGO-426	Sep. 18, 2023	Sep. 17, 2024
<input checked="" type="checkbox"/>	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2300 MHz Dipole	SID2300	SN 03/16 DIP 2G300-358	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Feb. 21, 2024	Feb. 20, 2027
<input type="checkbox"/>	MVG	3500 MHz Dipole	SID3500	SN 09/12 DIP 3G500-360	Oct. 15, 2022	Oct. 14, 2025
<input type="checkbox"/>	MVG	3700 MHz Dipole	SID3700	SN 09/12 DIP 3G/700-361	Oct. 15 2022	Oct. 14 2025
<input checked="" type="checkbox"/>	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Feb. 21, 2024	Feb. 20, 2027
<input checked="" type="checkbox"/>	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
<input checked="" type="checkbox"/>	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
<input checked="" type="checkbox"/>	KEITHLEY	Millivoltmeter	2000	4072790	NCR	NCR
<input checked="" type="checkbox"/>	R&S	Universal radio communication	CMU200	117858	Apr. 26, 2024	Apr. 25, 2025

		tester				
<input checked="" type="checkbox"/>	R&S	Wideband radio communication tester	CMW500	103917	Apr. 26, 2024	Apr. 25, 2025
<input checked="" type="checkbox"/>	HP	Network Analyzer	8753D	3410J01136	Apr. 26, 2024	Apr. 25, 2025
<input checked="" type="checkbox"/>	Agilent	MXG Vector Signal Generator	N5182A	MY47070317	Apr. 25, 2024	Apr. 24, 2025
<input checked="" type="checkbox"/>	Agilent	Power meter	E4419B	MY45102538	Apr. 25, 2024	Apr. 24, 2025
<input checked="" type="checkbox"/>	Agilent	Power sensor	E9301A	MY41495644	Apr. 25, 2024	Apr. 24, 2025
<input checked="" type="checkbox"/>	Agilent	Power sensor	E9301A	US39212148	Apr. 25, 2024	Apr. 24, 2025
<input checked="" type="checkbox"/>	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Apr. 26, 2024	Apr. 25, 2027
<input checked="" type="checkbox"/>	N/A	Thermometer	N/A	LES-085	Mar. 27, 2023	Mar. 26, 2026
<input checked="" type="checkbox"/>	MVG	SAM Phantom	SSM2	SN 16/15 SAM119	NCR	NCR
<input checked="" type="checkbox"/>	MVG	Device Holder	SMPPD	SN 16/15 MSH100	NCR	NCR

3. SAR Measurement Procedures

The measurement procedures are as follows:

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

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

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

3.1. Power Reference

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

3.2. Area scan & Zoom scan

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

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

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

3.3. Description of interpolation/extrapolation scheme

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

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1 mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

3.4. Volumetric Scan

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

3.5. Power Drift

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

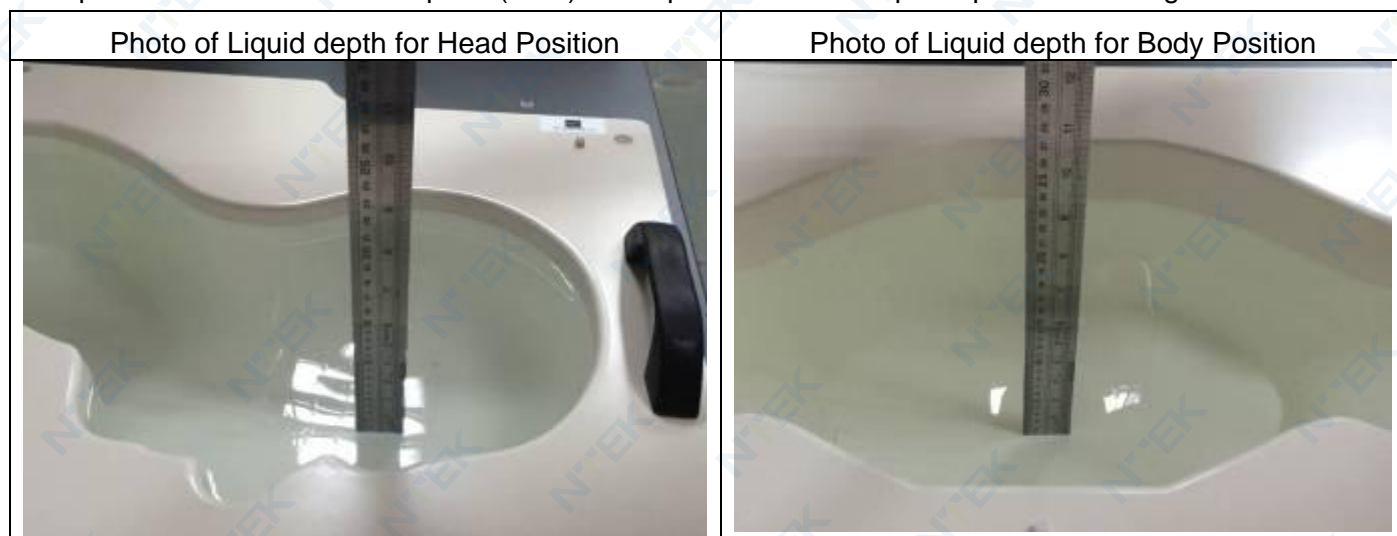
4. System Verification Procedure

4.1. Tissue Verification

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

Ingredients (% of weight)	Head Tissue								
	750	835	900	1800	1900	2000	2450	2600	5000
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5000
Water	34.40	34.40	34.40	55.36	55.36	71.88	71.88	71.88	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	17.24
DGBE	0.00	0.00	0.00	13.84	13.84	7.99	7.99	7.99	0.00

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



4.1.1. Tissue Dielectric Parameter Check Results

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

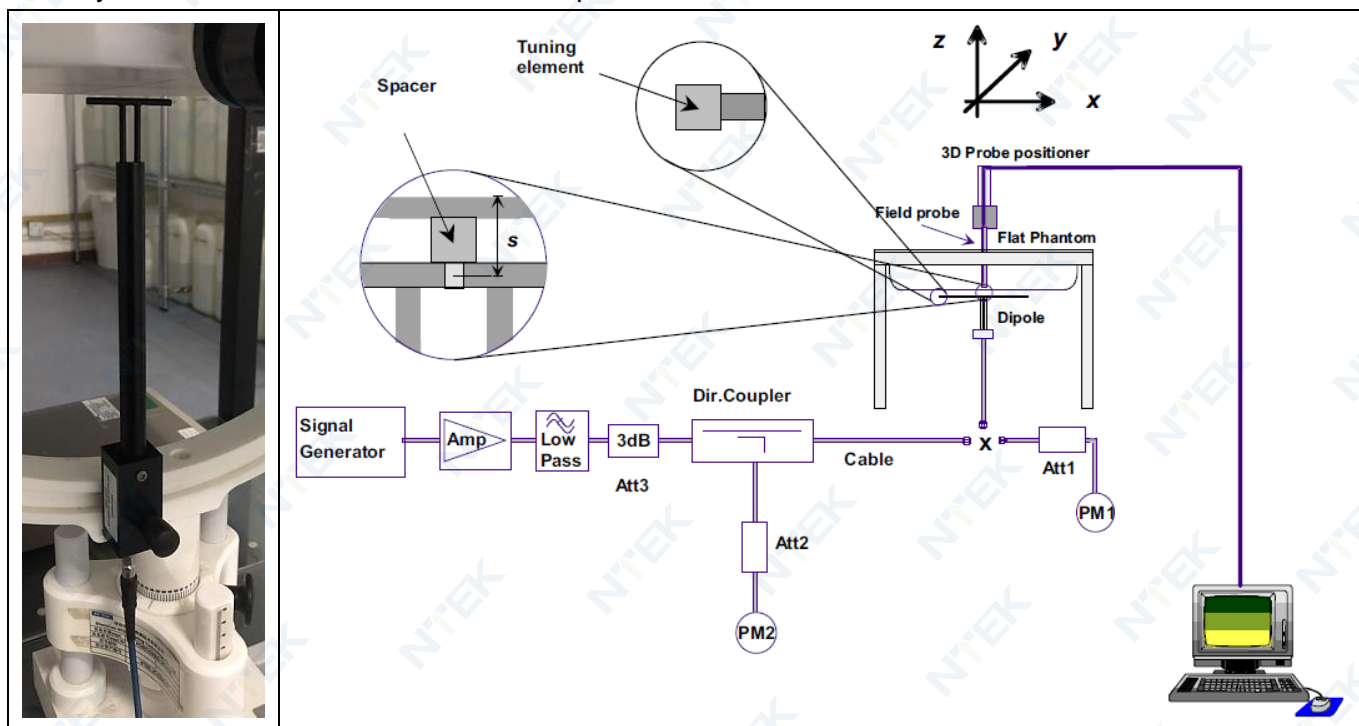
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		$\epsilon_r (\pm 5\%)$	$\sigma \text{ (S/m)} (\pm 5\%)$	ϵ_r	$\sigma \text{ (S/m)}$		
Head 750	750	41.96 (39.86~44.06)	0.89 (0.85~0.93)	41.02	0.90	21.5 °C	Jun. 20, 2024
Head 900	900	41.50 (39.43~43.58)	0.97 (0.92~1.02)	41.56	0.99	21.6 °C	Jun. 17, 2024
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	39.08	1.39	21.7 °C	Jun. 29, 2024
Head 2000	2000	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.86	1.43	21.6 °C	Jun. 27, 2024
Head 2300	2300	39.47 (37.50~41.44)	1.66 (1.58~1.74)	39.70	1.61	21.7 °C	Jun. 22, 2024
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	37.84	1.78	21.5 °C	Jun. 19, 2024
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	39.03	2.00	21.4 °C	Jun. 18, 2024
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	34.73	4.56	21.5 °C	Jun. 25, 2024
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	34.16	5.21	21.9 °C	Jun. 26, 2024

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

4.2. System Verification Procedure

The system verification is performed for verifying the accuracy of the complete measurement system and performance of the software. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 100mW (below 5GHz) or 100mW (above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system verification to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system verification to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

The system verification is shown as below picture:



4.2.1. System Verification Results

Comparing to the original SAR value provided by SATIMO, the verification data should be within its specification of $\pm 10\%$. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance verification can meet the variation criterion and the plots can be referred to Appendix B of this report.

System Verification	Target SAR (1W) ($\pm 10\%$)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
750MHz	8.60 (7.74~9.46)	5.78 (5.20~6.36)	8.16	5.59	21.5 °C	Jun. 20, 2024
900MHz	10.63 (9.57~11.69)	7.01 (6.31~7.71)	10.84	6.48	21.6 °C	Jun. 17, 2024
1800MHz	37.06 (33.35~40.77)	20.01 (18.01~22.01)	34.50	20.12	21.7 °C	Jun. 29, 2024
2000MHz	38.27 (34.44~42.10)	19.79 (17.81~21.77)	38.24	20.18	21.6 °C	Jun. 27, 2024
2300MHz	50.63 (45.57~55.69)	23.51 (21.16~25.86)	46.61	22.81	21.7 °C	Jun. 22, 2024
2450MHz	50.05 (45.05~55.06)	23.80 (21.42~26.18)	45.18	24.26	21.5 °C	Jun. 19, 2024
2600MHz	54.16 (48.74~59.58)	24.85 (22.37~27.34)	54.45	25.96	21.4 °C	Jun. 18, 2024
5200MHz	162.59 (146.33~178.85)	56.21 (50.59~61.83)	149.95	58.07	21.5 °C	Jun. 25, 2024
5800MHz	182.20 (163.98~200.42)	61.32 (55.19~67.45)	182.20	57.90	21.9 °C	Jun. 26, 2024

5. SAR Measurement Uncertainty

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

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

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

6. RF Exposure Positions

6.1. Ear and handset reference point

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



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

6.2. Definition of the cheek position

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

N-F line.

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

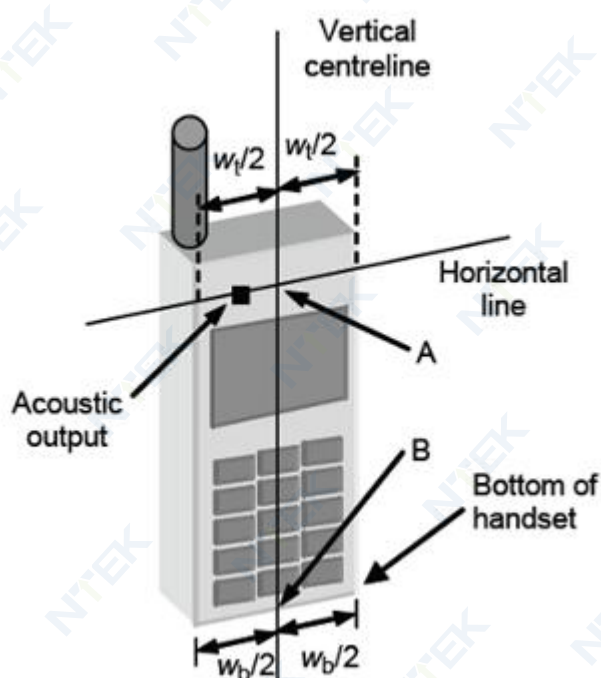


Fig 6.2.1 Handset vertical and horizontal reference lines—"fixed case"

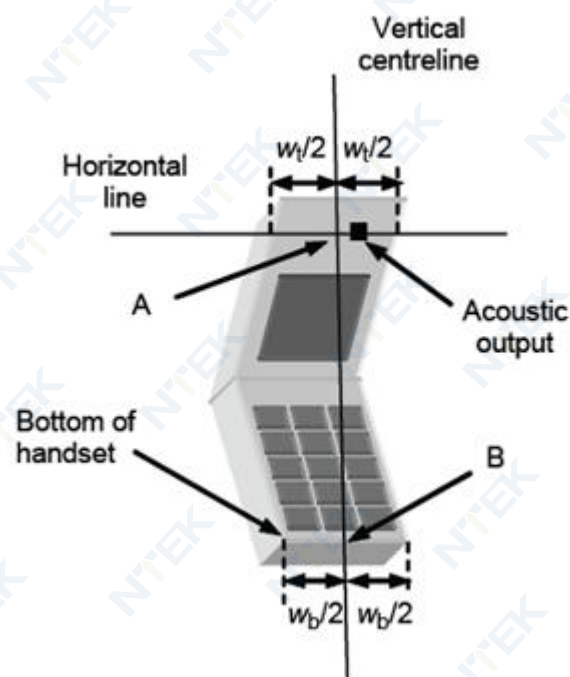


Fig 6.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

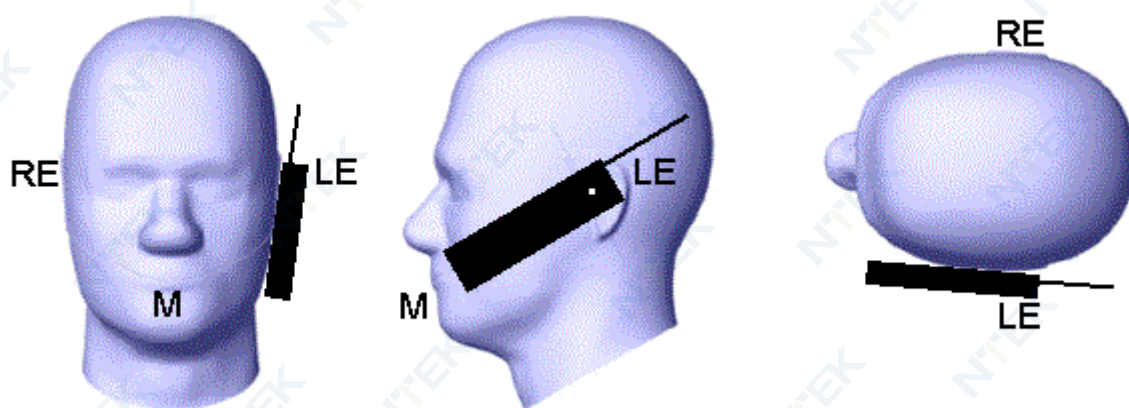


Fig 6.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

6.3. Definition of the tilt position

- While maintaining the orientation of the handset, retract the handset parallel to the reference plane

far enough away from the phantom to enable a rotation of the device by 15 degree.

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



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

6.4. Body-worn device

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

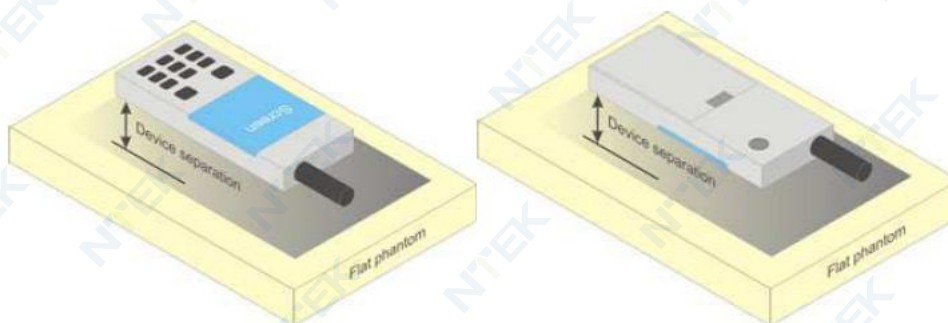


Figure 6.1 – Test positions for Body-worn device

7. RF Output Power

7.1. GSM Conducted Power

Band GSM900	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	975	38	124	Tune-up	975	38	124
Frequency (MHz)		880.2	897.6	914.8		880.2	897.6	914.8
GSM (GMSK)	32.50	32.27	32.35	32.33	23.47	23.24	23.32	23.30
GPRS(GMSK,1 Tx slot)	32.50	32.23	32.35	32.33	23.47	23.20	23.32	23.30
GPRS(GMSK,2 Tx slot)	32.00	31.67	31.79	31.72	25.98	25.65	25.77	25.70
GPRS(GMSK,3 Tx slot)	30.50	30.14	30.21	30.14	26.24	25.88	25.95	25.88
GPRS(GMSK,4 Tx slot)	29.50	28.94	29.01	28.93	26.49	25.93	26.00	25.92

Band GSM1800	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	512	698	885	Tune-up	512	698	885
Frequency (MHz)		1710.2	1747.4	1784.8		1710.2	1747.4	1784.8
GSM (GMSK)	30.00	28.86	29.18	29.94	20.97	19.83	20.15	20.91
GPRS(GMSK,1 Tx slot)	30.50	28.84	29.28	30.03	21.47	19.81	20.25	21.00
GPRS(GMSK,2 Tx slot)	29.50	28.30	28.72	29.48	23.48	22.28	22.70	23.46
GPRS(GMSK,3 Tx slot)	28.00	26.62	27.01	27.73	23.74	22.36	22.75	23.47
GPRS(GMSK,4 Tx slot)	27.00	25.63	25.97	26.76	23.99	22.62	22.96	23.75

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

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

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

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

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

7.2. WCDMA Conducted Power

WCDMA Band1	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	9612	9750	9888
Frequency (MHz)		1922.4	1950	1977.6
RMC12.2K	21.50	21.06	21.16	21.43
HSDPA Sub 1	21.50	21.41	21.01	21.18
HSDPA Sub 2	21.50	21.06	20.71	20.88
HSDPA Sub 3	21.00	20.76	20.49	20.61
HSDPA Sub 4	21.00	20.52	20.23	20.55
HSUPA Sub 1	21.50	21.39	20.89	21.07
HSUPA Sub 2	21.50	21.18	20.98	21.07
HSUPA Sub 3	21.50	21.18	20.48	20.80
HSUPA Sub 4	21.50	21.19	20.97	21.14
HSUPA Sub 5	21.00	20.86	20.72	20.67

WCDMA Band 8	Burst-Averaged output Power (dBm)			
Tx Channel	Tune-up (dBm)	2712	2788	2863
Frequency (MHz)		882.4	897.6	912.6
RMC12.2K	23.50	23.14	23.03	23.15
HSDPA Sub 1	23.00	22.81	22.68	22.42
HSDPA Sub 2	23.00	22.64	22.52	22.06
HSDPA Sub 3	22.50	22.01	21.81	22.00
HSDPA Sub 4	22.50	22.02	22.16	21.81
HSUPA Sub 1	23.00	22.69	22.73	22.35
HSUPA Sub 2	23.00	22.74	22.66	22.41
HSUPA Sub 3	22.50	22.32	22.08	21.94
HSUPA Sub 4	23.00	22.84	22.73	22.44
HSUPA Sub 5	23.00	22.55	22.39	22.04

7.3. LTE Conducted Power

Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Tune-up	Power (dBm)
Band1	5	18025	1	#0	QPSK	24.00	23.08
Band1	5	18025	8	#0	QPSK	24.00	23.30
Band1	5	18025	25	#0	QPSK	22.00	21.71
Band1	5	18300	1	#0	QPSK	24.00	23.54
Band1	5	18300	8	#0	QPSK	24.00	23.59
Band1	5	18300	25	#0	QPSK	24.00	22.20
Band1	5	18575	1	#0	QPSK	24.00	23.49
Band1	5	18575	8	#0	QPSK	24.00	23.71
Band1	5	18575	25	#0	QPSK	24.00	22.17
Band1	20	18100	1	#0	QPSK	24.00	23.26
Band1	20	18100	18	#0	QPSK	24.00	23.28
Band1	20	18100	100	#0	QPSK	22.00	21.95
Band1	20	18300	1	#0	QPSK	24.00	23.37
Band1	20	18300	18	#0	QPSK	24.00	23.48
Band1	20	18300	100	#0	QPSK	24.00	22.26
Band1	20	18500	1	#0	QPSK	24.00	23.72
Band1	20	18500	18	#0	QPSK	24.00	23.77
Band1	20	18500	100	#0	QPSK	24.00	22.45
Band20	5	24175	1	#0	QPSK	24.00	23.25
Band20	5	24175	8	#0	QPSK	24.00	23.44
Band20	5	24175	25	#0	QPSK	24.00	22.47
Band20	5	24300	1	#0	QPSK	24.00	23.41
Band20	5	24300	8	#0	QPSK	24.00	23.67
Band20	5	24300	25	#0	QPSK	24.00	22.64
Band20	5	24425	1	#0	QPSK	24.00	23.37
Band20	5	24425	8	#0	QPSK	24.00	23.37
Band20	5	24425	25	#0	QPSK	24.00	22.47
Band20	20	24250	1	#0	QPSK	24.00	23.32
Band20	20	24250	18	#0	QPSK	24.00	23.45
Band20	20	24250	100	#0	QPSK	24.00	22.72
Band20	20	24300	1	#0	QPSK	24.00	23.52
Band20	20	24300	18	#0	QPSK	24.00	23.63
Band20	20	24300	100	#0	QPSK	24.00	22.77
Band20	20	24350	1	#0	QPSK	24.00	23.46
Band20	20	24350	18	#0	QPSK	24.00	23.61

Band20	20	24350	100	#0	QPSK	24.00	22.60
Band28	3	27225	1	#0	QPSK	22.00	21.12
Band28	3	27225	1	#Max	QPSK	22.00	21.06
Band28	3	27225	4	#0	QPSK	22.00	21.24
Band28	3	27225	4	#Max	QPSK	22.00	21.29
Band28	3	27375	1	#0	QPSK	22.00	21.29
Band28	3	27375	1	#Max	QPSK	22.00	21.11
Band28	3	27375	4	#0	QPSK	22.00	21.29
Band28	3	27375	4	#Max	QPSK	22.00	21.16
Band28	3	27525	1	#0	QPSK	22.00	21.07
Band28	3	27525	1	#Max	QPSK	22.00	20.98
Band28	3	27525	4	#0	QPSK	22.00	21.02
Band28	3	27525	4	#Max	QPSK	22.00	21.15
Band28	5	27235	1	#0	QPSK	22.00	21.29
Band28	5	27235	1	#Max	QPSK	22.00	21.44
Band28	5	27235	8	#0	QPSK	22.00	21.16
Band28	5	27235	8	#Max	QPSK	22.00	21.46
Band28	5	27385	1	#0	QPSK	22.00	21.31
Band28	5	27385	1	#Max	QPSK	22.00	20.97
Band28	5	27385	8	#0	QPSK	22.00	21.32
Band28	5	27385	8	#Max	QPSK	22.00	20.99
Band28	5	27515	1	#0	QPSK	22.00	21.08
Band28	5	27515	1	#Max	QPSK	22.00	21.09
Band28	5	27515	8	#0	QPSK	22.00	21.19
Band28	5	27515	8	#Max	QPSK	22.00	21.34
Band28	20	27310	1	#0	QPSK	22.00	21.35
Band28	20	27310	1	#Max	QPSK	22.00	20.96
Band28	20	27310	18	#0	QPSK	22.00	21.41
Band28	20	27310	18	#Max	QPSK	22.00	21.20
Band28	20	27460	1	#0	QPSK	22.00	21.16
Band28	20	27460	1	#Max	QPSK	22.00	21.01
Band28	20	27460	18	#0	QPSK	22.00	21.27
Band28	20	27460	18	#Max	QPSK	22.00	21.07
Band28	20	27440	1	#0	QPSK	22.00	21.62
Band28	20	27440	1	#Max	QPSK	22.00	21.12
Band28	20	27440	18	#0	QPSK	22.00	21.28
Band28	20	27440	18	#Max	QPSK	22.00	21.04
Band3	1.4	19207	1	#0	QPSK	24.00	23.22
Band3	1.4	19207	5	#0	QPSK	24.00	23.41

Band3	1.4	19207	6	#0	QPSK	24.00	22.37
Band3	1.4	19575	1	#0	QPSK	24.00	23.54
Band3	1.4	19575	5	#0	QPSK	24.00	23.66
Band3	1.4	19575	6	#0	QPSK	24.00	22.74
Band3	1.4	19943	1	#0	QPSK	24.00	23.60
Band3	1.4	19943	5	#0	QPSK	24.00	23.81
Band3	1.4	19943	6	#0	QPSK	24.00	22.94
Band3	5	19225	1	#0	QPSK	24.00	23.36
Band3	5	19225	8	#0	QPSK	24.00	23.49
Band3	5	19225	25	#0	QPSK	24.00	22.46
Band3	5	19575	1	#0	QPSK	24.00	23.41
Band3	5	19575	8	#0	QPSK	24.00	23.64
Band3	5	19575	25	#0	QPSK	24.00	22.68
Band3	5	19925	1	#0	QPSK	24.00	23.70
Band3	5	19925	8	#0	QPSK	24.00	23.73
Band3	5	19925	25	#0	QPSK	24.00	22.76
Band3	20	19300	1	#0	QPSK	24.00	23.25
Band3	20	19300	18	#0	QPSK	24.00	23.46
Band3	20	19300	100	#0	QPSK	24.00	22.69
Band3	20	19575	1	#0	QPSK	24.00	23.46
Band3	20	19575	18	#0	QPSK	24.00	23.58
Band3	20	19575	100	#0	QPSK	24.00	22.63
Band3	20	19850	1	#0	QPSK	24.00	23.51
Band3	20	19850	18	#0	QPSK	24.00	23.75
Band3	20	19850	100	#0	QPSK	24.00	22.78
Band40	5	38675	1	#0	QPSK	23.00	22.85
Band40	5	38675	8	#0	QPSK	23.00	22.86
Band40	5	38675	25	#0	QPSK	23.00	21.84
Band40	5	39150	1	#0	QPSK	23.00	22.86
Band40	5	39150	8	#0	QPSK	23.00	22.83
Band40	5	39150	25	#0	QPSK	23.00	21.80
Band40	5	39625	1	#0	QPSK	23.00	22.88
Band40	5	39625	8	#0	QPSK	23.00	22.89
Band40	5	39625	25	#0	QPSK	23.00	21.92
Band40	20	38750	1	#0	QPSK	23.00	22.91
Band40	20	38750	18	#0	QPSK	23.00	22.89
Band40	20	38750	100	#0	QPSK	23.00	21.82
Band40	20	39150	1	#0	QPSK	23.00	22.95
Band40	20	39150	18	#0	QPSK	23.00	22.89

Band40	20	39150	100	#0	QPSK	23.00	21.87
Band40	20	39550	1	#0	QPSK	23.00	22.76
Band40	20	39550	18	#0	QPSK	23.00	22.75
Band40	20	39550	100	#0	QPSK	23.00	21.82
Band41	5	40065	1	#0	QPSK	24.50	23.47
Band41	5	40065	8	#0	QPSK	24.50	23.49
Band41	5	40065	25	#0	QPSK	23.50	22.49
Band41	5	40740	1	#0	QPSK	24.50	24.17
Band41	5	40740	8	#0	QPSK	24.50	24.16
Band41	5	40740	25	#0	QPSK	24.50	23.09
Band41	5	41215	1	#0	QPSK	24.50	23.70
Band41	5	41215	8	#0	QPSK	24.50	23.82
Band41	5	41215	25	#0	QPSK	24.50	22.85
Band41	20	40140	1	#0	QPSK	24.50	23.54
Band41	20	40140	18	#0	QPSK	24.50	23.54
Band41	20	40140	100	#0	QPSK	23.50	22.10
Band41	20	40740	1	#0	QPSK	24.50	23.95
Band41	20	40740	18	#0	QPSK	24.50	24.12
Band41	20	40740	100	#0	QPSK	24.50	22.54
Band41	20	41140	1	#0	QPSK	24.50	23.83
Band41	20	41140	18	#0	QPSK	24.50	23.86
Band41	20	41140	100	#0	QPSK	23.50	22.46
Band7	5	20775	1	#0	QPSK	24.00	23.18
Band7	5	20775	8	#0	QPSK	24.00	23.37
Band7	5	20775	25	#0	QPSK	24.00	22.23
Band7	5	21100	1	#0	QPSK	24.00	23.49
Band7	5	21100	8	#0	QPSK	24.00	23.62
Band7	5	21100	25	#0	QPSK	24.00	22.52
Band7	5	21425	1	#0	QPSK	24.00	23.69
Band7	5	21425	8	#0	QPSK	24.00	23.82
Band7	5	21425	25	#0	QPSK	24.00	22.75
Band7	20	20850	1	#0	QPSK	24.00	23.23
Band7	20	20850	18	#0	QPSK	24.00	23.32
Band7	20	20850	100	#0	QPSK	24.00	22.28
Band7	20	21100	1	#0	QPSK	24.00	23.49
Band7	20	21100	18	#0	QPSK	24.00	23.58
Band7	20	21100	100	#0	QPSK	24.00	22.48
Band7	20	21350	1	#0	QPSK	24.00	23.70
Band7	20	21350	18	#0	QPSK	24.00	23.86

Band7	20	21350	100	#0	QPSK	24.00	22.83
Band8	1.4	21457	1	#0	QPSK	24.00	23.65
Band8	1.4	21457	5	#0	QPSK	24.00	23.79
Band8	1.4	21457	6	#0	QPSK	24.00	22.23
Band8	1.4	21625	1	#0	QPSK	24.00	23.46
Band8	1.4	21625	5	#0	QPSK	24.00	23.64
Band8	1.4	21625	6	#0	QPSK	24.00	22.08
Band8	1.4	21793	1	#0	QPSK	24.00	23.63
Band8	1.4	21793	5	#0	QPSK	24.00	23.79
Band8	1.4	21793	6	#0	QPSK	24.00	22.27
Band8	5	21475	1	#0	QPSK	24.00	23.73
Band8	5	21475	8	#0	QPSK	24.00	23.70
Band8	5	21475	25	#0	QPSK	24.00	22.17
Band8	5	21625	1	#0	QPSK	24.00	23.41
Band8	5	21625	8	#0	QPSK	24.00	23.66
Band8	5	21625	25	#0	QPSK	24.00	22.05
Band8	5	21775	1	#0	QPSK	24.00	23.56
Band8	5	21775	8	#0	QPSK	24.00	23.76
Band8	5	21775	25	#0	QPSK	24.00	22.19
Band8	10	21500	1	#0	QPSK	24.00	23.78
Band8	10	21500	12	#0	QPSK	24.00	23.84
Band8	10	21500	50	#0	QPSK	24.00	22.24
Band8	10	21625	1	#0	QPSK	24.00	23.59
Band8	10	21625	12	#0	QPSK	24.00	23.71
Band8	10	21625	50	#0	QPSK	22.00	21.96
Band8	10	21750	1	#0	QPSK	24.00	23.75
Band8	10	21750	12	#0	QPSK	24.00	23.89
Band8	10	21750	50	#0	QPSK	24.00	22.22

7.4. WLAN & Bluetooth Output Power

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11b	1	2412	11.50	10.22
	7	2442	11.50	11.09
	13	2472	11.50	10.63
802.11g	1	2412	12.50	11.58
	7	2442	12.50	12.09
	13	2472	12.50	11.71

802.11n (HT20)	1	2412	12.50	11.49
	7	2442	12.50	12.09
	13	2472	12.50	11.58
802.11n (HT40)	3	2422	12.00	10.91
	7	2442	12.00	11.56
	11	2462	12.00	9.82

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	36	5180	12.50	12.34
	40	5200	12.50	11.41
	48	5240	12.50	11.34
802.11n HT20	36	5180	12.50	12.10
	40	5200	12.50	11.19
	48	5240	12.50	11.61
802.11n HT40	38	5190	12.50	12.47
	46	5230	12.50	11.94
802.11ac VHT20	36	5180	12.50	12.06
	40	5200	12.50	11.27
	48	5240	12.50	11.51
802.11ac VHT40	38	5190	12.00	12.00
	46	5230	12.00	11.23
802.11ac VHT80	42	5210	12.00	11.80

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	149	5745	10.00	9.41
	157	5785	10.00	9.56
	165	5825	10.00	9.10
802.11n HT20	149	5745	9.50	9.22
	157	5785	9.50	9.45
	165	5825	9.50	9.26
802.11n HT40	151	5755	10.00	9.59
	159	5795	10.00	9.62
802.11ac VHT20	149	5745	9.50	9.14

NOTE: Power measurement results of WLAN 5.8G.

NOTE: Power measurement results of Bluetooth. Refer to EN 62479, the available power of this EUT is 5.00dBm (3.16mW), the power is less than the low-power exclusion level defined in 4.2 (P max: 20mW), So Bluetooth stand-alone SAR is not required

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

9.1.1. SAR measurement Result of GSM900

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

Left Cheek	38/897.6	GPRS(GMSK 4TS)	0	0.106	0.081	-3.58	29.01	29.50	0.091	2024/6/17
Left Tilt 15 Degree	38/897.6	GPRS(GMSK 4TS)	0	0.059	0.043	1.30	29.01	29.50	0.048	2024/6/17
Right Cheek	38/897.6	GPRS(GMSK 4TS)	0	0.099	0.073	-3.65	29.01	29.50	0.082	2024/6/17
Right Tilt 15 Degree	38/897.6	GPRS(GMSK 4TS)	0	0.047	0.035	1.68	29.01	29.50	0.039	2024/6/17
Left Cheek	975/880.2	GPRS(GMSK 4TS)	0	0.099	0.076	-2.28	28.94	29.50	0.086	2024/6/17
Left Cheek	124/914.8	GPRS(GMSK 4TS)	0	0.094	0.072	0.87	28.93	29.50	0.082	2024/6/17
Extremity										
Front Side	38/897.6	GPRS(GMSK 4TS)	0	0.542	0.261	2.23	29.01	29.50	0.292	2024/6/17
Back Side	38/897.6	GPRS(GMSK 4TS)	0	1.749	0.861	-0.44	29.01	29.50	0.964	2024/6/17
Left Side	38/897.6	GPRS(GMSK 4TS)	0	0.437	0.213	-1.75	29.01	29.50	0.238	2024/6/17
Right Side	38/897.6	GPRS(GMSK 4TS)	0	0.542	0.267	-3.37	29.01	29.50	0.299	2024/6/17
Top Side	38/897.6	GPRS(GMSK 4TS)	0	0.262	0.124	-2.09	29.01	29.50	0.139	2024/6/17
Bottom Side	38/897.6	GPRS(GMSK 4TS)	0	1.119	0.540	2.53	29.01	29.50	0.604	2024/6/17
Back Side	975/880.2	GPRS(GMSK 4TS)	0	1.574	0.775	1.31	28.94	29.50	0.882	2024/6/17
Back Side	124/914.8	GPRS(GMSK 4TS)	0	1.644	0.777	1.40	28.93	29.50	0.886	2024/6/17
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	124/914.8	GPRS(GMSK 4TS)	5	0.875	0.431	-1.66	28.93	29.50	0.491	2024/6/17

9.1.2. SAR measurement Result of GSM1800

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

Head										
Left Cheek	698/1747.4	GPRS(GMSK 4TS)	0	0.138	0.085	-4.13	25.97	27.00	0.108	2024/6/29
Left Tilt 15 Degree	698/1747.4	GPRS(GMSK 4TS)	0	0.074	0.046	-3.20	25.97	27.00	0.058	2024/6/29
Right Cheek	698/1747.4	GPRS(GMSK 4TS)	0	0.128	0.079	-1.60	25.97	27.00	0.100	2024/6/29
Right Tilt 15 Degree	698/1747.4	GPRS(GMSK 4TS)	0	0.064	0.038	3.48	25.97	27.00	0.048	2024/6/29
Left Cheek	512/1710.2	GPRS(GMSK 4TS)	0	0.125	0.075	0.66	25.63	27.00	0.103	2024/6/29
Left Cheek	885/1784.8	GPRS(GMSK 4TS)	0	0.124	0.073	-0.02	26.76	27.00	0.077	2024/6/29
Extremity										
Front Side	698/1747.4	GPRS(GMSK 4TS)	0	0.588	0.249	4.00	25.97	27.00	0.316	2024/6/29
Back Side	698/1747.4	GPRS(GMSK 4TS)	0	1.839	0.812	-2.59	25.97	27.00	1.029	2024/6/29
Left Side	698/1747.4	GPRS(GMSK 4TS)	0	0.368	0.158	-0.55	25.97	27.00	0.200	2024/6/29
Right Side	698/1747.4	GPRS(GMSK 4TS)	0	0.552	0.239	-1.12	25.97	27.00	0.303	2024/6/29
Top Side	698/1747.4	GPRS(GMSK 4TS)	0	0.276	0.117	-3.89	25.97	27.00	0.148	2024/6/29
Bottom Side	698/1747.4	GPRS(GMSK 4TS)	0	1.122	0.490	0.81	25.97	27.00	0.621	2024/6/29
Back Side	512/1710.2	GPRS(GMSK 4TS)	0	1.710	0.717	-0.15	25.63	27.00	0.983	2024/6/29
Back Side	885/1784.8	GPRS(GMSK 4TS)	0	1.784	0.780	2.64	26.76	27.00	0.824	2024/6/29
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	885/1784.8	GPRS(GMSK 4TS)	5	1.195	0.512	-0.29	26.76	27.00	0.541	2024/6/29

9.1.3. SAR measurement Result of WCDMA Band 1

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

									(W/Kg)	
Head										
Left Cheek	9750/1950	RMC12.2K	0	0.172	0.101	0.91	21.16	21.50	0.109	2024/6/27
Left Tilt 15 Degree	9750/1950	RMC12.2K	0	0.097	0.056	0.74	21.16	21.50	0.061	2024/6/27
Right Cheek	9750/1950	RMC12.2K	0	0.159	0.091	3.73	21.16	21.50	0.098	2024/6/27
Right Tilt 15 Degree	9750/1950	RMC12.2K	0	0.081	0.048	-2.04	21.16	21.50	0.052	2024/6/27
Left Cheek	9612/1922.4	RMC12.2K	0	0.162	0.090	-4.97	21.06	21.50	0.100	2024/6/27
Left Cheek	9888/1977.6	RMC12.2K	0	0.148	0.083	3.91	21.43	21.50	0.084	2024/6/27
Extremity										
Front Side	9750/1950	RMC12.2K	0	1.224	0.563	-0.20	21.16	21.50	0.609	2024/6/27
Back Side	9750/1950	RMC12.2K	0	3.497	1.625	-0.63	21.16	21.50	1.757	2024/6/27
Left Side	9750/1950	RMC12.2K	0	0.734	0.324	0.56	21.16	21.50	0.350	2024/6/27
Right Side	9750/1950	RMC12.2K	0	1.154	0.509	-1.76	21.16	21.50	0.550	2024/6/27
Top Side	9750/1950	RMC12.2K	0	0.385	0.172	-3.92	21.16	21.50	0.186	2024/6/27
Bottom Side	9750/1950	RMC12.2K	0	2.238	0.988	-3.66	21.16	21.50	1.068	2024/6/27
Back Side	9612/1922.4	RMC12.2K	0	3.287	1.451	-2.53	21.06	21.50	1.606	2024/6/27
Back Side	9888/1977.6	RMC12.2K	0	3.392	1.497	-3.10	21.43	21.50	1.521	2024/6/27
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	9888/1977.6	RMC12.2K	5	2.273	1.046	-0.14	21.43	21.50	1.063	2024/6/27

9.1.4. SAR measurement Result of WCDMA Band 8

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

			(mm)	1g	10g	(±5%)	(dBm)	(dBm)	10g (W/Kg)	
Head										
Left Cheek	2788/897.6	RMC12.2K	0	0.121	0.094	0.85	23.03	23.50	0.105	2024/6/17
Left Tilt 15 Degree	2788/897.6	RMC12.2K	0	0.072	0.054	3.72	23.03	23.50	0.060	2024/6/17
Right Cheek	2788/897.6	RMC12.2K	0	0.108	0.083	-0.93	23.03	23.50	0.092	2024/6/17
Right Tilt 15 Degree	2788/897.6	RMC12.2K	0	0.052	0.038	0.78	23.03	23.50	0.042	2024/6/17
Left Cheek	2712/882.4	RMC12.2K	0	0.104	0.081	2.56	23.14	23.50	0.088	2024/6/17
Left Cheek	2863/912.6	RMC12.2K	0	0.108	0.083	0.65	23.15	23.50	0.090	2024/6/17
Extremity										
Front Side	2788/897.6	RMC12.2K	0	0.352	0.182	3.60	23.03	23.50	0.203	2024/6/17
Back Side	2788/897.6	RMC12.2K	0	1.066	0.551	2.01	23.03	23.50	0.614	2024/6/17
Left Side	2788/897.6	RMC12.2K	0	0.256	0.132	-1.46	23.03	23.50	0.147	2024/6/17
Right Side	2788/897.6	RMC12.2K	0	0.362	0.187	-1.95	23.03	23.50	0.208	2024/6/17
Top Side	2788/897.6	RMC12.2K	0	0.149	0.076	-1.47	23.03	23.50	0.085	2024/6/17
Bottom Side	2788/897.6	RMC12.2K	0	0.672	0.344	3.13	23.03	23.50	0.383	2024/6/17
Back Side	2712/882.4	RMC12.2K	0	1.002	0.497	3.93	23.14	23.50	0.540	2024/6/17
Back Side	2863/912.6	RMC12.2K	0	1.034	0.529	3.77	23.15	23.50	0.573	2024/6/17
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	2863/912.6	RMC12.2K	5	0.693	0.351	-0.54	23.15	23.50	0.380	2024/6/17

9.1.5. SAR measurement Result of LTE Band 1

Test	Test	Test Mode	Separation	SAR Value	Power	Conducted	Tune-up	Scaled	Date
------	------	-----------	------------	-----------	-------	-----------	---------	--------	------

Position	channel /Freq.		distance (mm)	(W/kg)		Drift (±5%)	power (dBm)	power (dBm)	SAR 10g (W/Kg)	
				1g	10g					
Head										
Left Cheek	18300/1950	20M QPSK(1,0)	0	0.261	0.157	-2.04	23.37	24.00	0.182	2024/6/27
Left Tilt 15 Degree	18300/1950	20M QPSK(1,0)	0	0.146	0.084	-0.85	23.37	24.00	0.097	2024/6/27
Right Cheek	18300/1950	20M QPSK(1,0)	0	0.222	0.130	0.32	23.37	24.00	0.150	2024/6/27
Right Tilt 15 Degree	18300/1950	20M QPSK(1,0)	0	0.102	0.060	3.96	23.37	24.00	0.069	2024/6/27
Left Cheek	18300/1950	20M QPSK(1,0)	0	0.225	0.130	-0.70	23.26	24.00	0.154	2024/6/27
Left Cheek		20M QPSK(1,0)	0	0.246	0.142	-3.10	23.72	24.00	0.151	2024/6/27
Extremity										
Front Side	18300/1950	20M QPSK(1,0)	0	1.738	0.802	0.79	23.37	24.00	0.927	2024/6/27
Back Side	18300/1950	20M QPSK(1,0)	0	4.294	1.942	-1.55	23.37	24.00	2.245	2024/6/27
Left Side	18300/1950	20M QPSK(1,0)	0	1.074	0.496	3.46	23.37	24.00	0.573	2024/6/27
Right Side	18300/1950	20M QPSK(1,0)	0	1.534	0.680	-2.08	23.37	24.00	0.786	2024/6/27
Top Side	18300/1950	20M QPSK(1,0)	0	0.613	0.274	-1.98	23.37	24.00	0.317	2024/6/27
Bottom Side	18300/1950	20M QPSK(1,0)	0	3.272	1.526	-1.21	23.37	24.00	1.764	2024/6/27
Back Side	18100/1930	20M QPSK(1,0)	0	4.141	1.912	-1.03	23.26	24.00	2.267	2024/6/27
Back Side	18500/1970	20M QPSK(1,0)	0	5.309	2.479	-0.39	23.72	24.00	2.644	2024/6/27
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	18500/1970	20M QPSK(1,0)	5	2.576	1.118	0.36	23.72	24.00	1.192	2024/6/27

9.1.6. SAR measurement Result of LTE Band 3

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	19575/1747.5	20M QPSK(1,0)	0	0.109	0.070	-0.97	23.46	24.00	0.079	2024/6/29
Left Tilt 15 Degree	19575/1747.5	20M QPSK(1,0)	0	0.062	0.039	1.79	23.46	24.00	0.044	2024/6/29
Right Cheek	19575/1747.5	20M QPSK(1,0)	0	0.097	0.061	-3.42	23.46	24.00	0.069	2024/6/29
Right Tilt 15 Degree	19575/1747.5	20M QPSK(1,0)	0	0.044	0.028	-4.14	23.46	24.00	0.032	2024/6/29
Left Cheek	19300/1720	20M QPSK(1,0)	0	0.095	0.059	2.26	23.25	24.00	0.070	2024/6/29
Left Cheek	19850/1775	20M QPSK(1,0)	0	0.101	0.065	2.39	23.51	24.00	0.073	2024/6/29
Extremity										
Front Side	19575/1747.5	20M QPSK(1,0)	0	1.294	0.580	-0.14	23.46	24.00	0.657	2024/6/29
Back Side	19575/1747.5	20M QPSK(1,0)	0	3.806	1.797	-0.02	23.46	24.00	2.035	2024/6/29
Left Side	19575/1747.5	20M QPSK(1,0)	0	0.761	0.352	-3.07	23.46	24.00	0.399	2024/6/29
Right Side	19575/1747.5	20M QPSK(1,0)	0	1.180	0.529	-2.36	23.46	24.00	0.599	2024/6/29
Top Side	19575/1747.5	20M QPSK(1,0)	0	0.419	0.194	0.21	23.46	24.00	0.220	2024/6/29
Bottom Side	19575/1747.5	20M QPSK(1,0)	0	2.322	1.052	3.32	23.46	24.00	1.191	2024/6/29
Back Side	19300/1720	20M QPSK(1,0)	0	3.616	1.690	0.74	23.25	24.00	2.009	2024/6/29
Back Side	19850/1775	20M QPSK(1,0)	0	3.540	1.655	1.10	23.51	24.00	1.853	2024/6/29
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	19575/1747.5	20M QPSK(1,0)	5	1.941	0.880	3.93	23.46	24.00	0.997	2024/6/29

9.1.7. SAR measurement Result of LTE Band 7

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	21100/2535	20M QPSK(1,0)	0	0.123	0.065	1.99	23.49	24.00	0.073	2024/6/18
Left Tilt 15 Degree	21100/2535	20M QPSK(1,0)	0	0.072	0.036	5.09	23.49	24.00	0.040	2024/6/18
Right Cheek	21100/2535	20M QPSK(1,0)	0	0.116	0.059	-4.53	23.49	24.00	0.066	2024/6/18
Right Tilt 15 Degree	21100/2535	20M QPSK(1,0)	0	0.056	0.028	2.90	23.49	24.00	0.031	2024/6/18
Left Cheek	20850/2510	20M QPSK(1,0)	0	0.115	0.060	-0.02	23.23	24.00	0.072	2024/6/18
Left Cheek	21350/2560	20M QPSK(1,0)	0	0.105	0.054	4.31	23.70	24.00	0.058	2024/6/18
Extremity										
Front Side	21100/2535	20M QPSK(1,0)	0	1.434	0.557	-2.45	23.49	24.00	0.626	2024/6/18
Back Side	21100/2535	20M QPSK(1,0)	0	4.626	1.816	-2.99	23.49	24.00	2.042	2024/6/18
Left Side	21100/2535	20M QPSK(1,0)	0	1.064	0.409	0.90	23.49	24.00	0.460	2024/6/18
Right Side	21100/2535	20M QPSK(1,0)	0	1.434	0.546	1.67	23.49	24.00	0.614	2024/6/18
Top Side	21100/2535	20M QPSK(1,0)	0	0.648	0.242	-0.59	23.49	24.00	0.272	2024/6/18
Bottom Side	21100/2535	20M QPSK(1,0)	0	2.868	1.126	-1.06	23.49	24.00	1.266	2024/6/18
Back Side	20850/2510	20M QPSK(1,0)	0	4.348	1.690	-3.52	23.23	24.00	2.018	2024/6/18
Back Side	21350/2560	20M QPSK(1,0)	0	4.348	1.707	-2.71	23.70	24.00	1.829	2024/6/18
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back	21100/2535	20M	5	2.452	0.914	1.91	23.49	24.00	1.028	2024/6/18

Side		QPSK(1,0)							
------	--	-----------	--	--	--	--	--	--	--

9.1.8. SAR measurement Result of LTE Band 8

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	21625/897.5	10M QPSK(1,0)	0	0.115	0.085	-3.20	23.59	24.00	0.093	2024/6/17
Left Tilt 15 Degree	21625/897.5	10M QPSK(1,0)	0	0.061	0.045	-3.58	23.59	24.00	0.049	2024/6/17
Right Cheek	21625/897.5	10M QPSK(1,0)	0	0.102	0.075	2.69	23.59	24.00	0.082	2024/6/17
Right Tilt 15 Degree	21625/897.5	10M QPSK(1,0)	0	0.055	0.039	0.99	23.59	24.00	0.043	2024/6/17
Left Cheek	21500/885	10M QPSK(1,0)	0	0.100	0.072	-3.32	23.78	24.00	0.076	2024/6/17
Left Cheek	21750/910	10M QPSK(1,0)	0	0.108	0.080	-1.31	23.75	24.00	0.085	2024/6/17
Extremity										
Front Side	21625/897.5	10M QPSK(1,0)	0	0.377	0.192	0.49	23.59	24.00	0.211	2024/6/17
Back Side	21625/897.5	10M QPSK(1,0)	0	1.256	0.654	-0.13	23.59	24.00	0.719	2024/6/17
Left Side	21625/897.5	10M QPSK(1,0)	0	0.301	0.154	-2.71	23.59	24.00	0.169	2024/6/17
Right Side	21625/897.5	10M QPSK(1,0)	0	0.389	0.194	-2.13	23.59	24.00	0.213	2024/6/17
Top Side	21625/897.5	10M QPSK(1,0)	0	0.151	0.078	-2.27	23.59	24.00	0.086	2024/6/17
Bottom Side	21625/897.5	10M QPSK(1,0)	0	0.816	0.408	2.69	23.59	24.00	0.448	2024/6/17
Back Side	21500/885	10M QPSK(1,0)	0	1.156	0.602	1.38	23.78	24.00	0.633	2024/6/17
Back Side	21750/910	10M QPSK(1,0)	0	1.218	0.634	3.88	23.75	24.00	0.672	2024/6/17
Body & Hotspot with 5mm (Worst-case position for 0mm)										

Back	21625/897.5	10M	5	0.766	0.383	-0.01	23.59	24.00	0.421	2024/6/17
Side		QPSK(1,0)								

9.1.9. SAR measurement Result of LTE Band 20

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	24300/847	20M QPSK(1,0)	0	0.105	0.080	-3.33	23.52	24.00	0.089	2024/6/17
Left Tilt 15 Degree	24300/847	20M QPSK(1,0)	0	0.062	0.045	5.84	23.52	24.00	0.050	2024/6/17
Right Cheek	24300/847	20M QPSK(1,0)	0	0.096	0.071	-3.58	23.52	24.00	0.079	2024/6/17
Right Tilt 15 Degree	24300/847	20M QPSK(1,0)	0	0.044	0.033	-4.59	23.52	24.00	0.037	2024/6/17
Left Cheek	24250/842	20M QPSK(1,0)	0	0.096	0.069	0.73	23.32	24.00	0.081	2024/6/17
Left Cheek	24350/852	20M QPSK(1,0)	0	0.098	0.073	-0.25	23.46	24.00	0.083	2024/6/17
Extremity										
Front Side	24300/847	20M QPSK(1,0)	0	0.307	0.158	-0.29	23.52	24.00	0.176	2024/6/17
Back Side	24300/847	20M QPSK(1,0)	0	0.902	0.464	0.32	23.52	24.00	0.518	2024/6/17
Left Side	24300/847	20M QPSK(1,0)	0	0.189	0.095	-0.40	23.52	24.00	0.106	2024/6/17
Right Side	24300/847	20M QPSK(1,0)	0	0.271	0.135	2.65	23.52	24.00	0.151	2024/6/17
Top Side	24300/847	20M QPSK(1,0)	0	0.099	0.050	-2.58	23.52	24.00	0.056	2024/6/17
Bottom Side	24300/847	20M QPSK(1,0)	0	0.577	0.294	-3.83	23.52	24.00	0.328	2024/6/17
Back Side	24250/842	20M QPSK(1,0)	0	0.848	0.432	2.48	23.32	24.00	0.505	2024/6/17
Back Side	24350/852	20M QPSK(1,0)	0	0.839	0.432	-3.05	23.46	24.00	0.489	2024/6/17

Body & Hotspot with 5mm (Worst-case position for 0mm)

Back Side	24300/847	20M QPSK(1,0)	5	0.577	0.297	-3.74	23.52	24.00	0.332	2024/6/17
-----------	-----------	------------------	---	-------	-------	-------	-------	-------	-------	-----------

9.1.10. SAR measurement Result of LTE Band 28

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	27460/728	20M QPSK(1,0)	0	0.037	0.029	-3.92	21.16	22.00	0.035	2024/6/20
Left Tilt 15 Degree	27460/728	20M QPSK(1,0)	0	0.021	0.016	1.89	21.16	22.00	0.019	2024/6/20
Right Cheek	27460/728	20M QPSK(1,0)	0	0.034	0.026	-3.28	21.16	22.00	0.032	2024/6/20
Right Tilt 15 Degree	27460/728	20M QPSK(1,0)	0	0.018	0.016	1.37	21.16	22.00	0.019	2024/6/20
Left Cheek	27310/713	20M QPSK(1,0)	0	0.032	0.024	0.95	21.35	22.00	0.028	2024/6/20
Left Cheek	27560/738	20M QPSK(1,0)	0	0.034	0.026	4.58	21.62	22.00	0.028	2024/6/20
Extremity										
Front Side	27460/728	20M QPSK(1,0)	0	0.158	0.080	-0.15	21.16	22.00	0.097	2024/6/20
Back Side	27460/728	20M QPSK(1,0)	0	0.464	0.248	-0.68	21.16	22.00	0.301	2024/6/20
Left Side	27460/728	20M QPSK(1,0)	0	0.116	0.061	-1.42	21.16	22.00	0.074	2024/6/20
Right Side	27460/728	20M QPSK(1,0)	0	0.139	0.071	-1.74	21.16	22.00	0.086	2024/6/20
Top Side	27460/728	20M QPSK(1,0)	0	0.056	0.028	-2.63	21.16	22.00	0.034	2024/6/20
Bottom Side	27460/728	20M QPSK(1,0)	0	0.283	0.144	0.31	21.16	22.00	0.175	2024/6/20
Back Side	27310/713	20M QPSK(1,0)	0	0.418	0.221	3.69	21.35	22.00	0.257	2024/6/20
Back	27560/738	20M	0	0.441	0.233	-0.58	21.62	22.00	0.254	2024/6/20

Side		QPSK(1,0)								
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	27460/728	20M QPSK(1,0)	5	0.302	0.157	-3.88	21.16	22.00	0.191	2024/6/20

9.1.11. SAR measurement Result of LTE Band 40

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	39150/2350	20M QPSK(1,0)	0	0.191	0.090	1.14	22.95	23.00	0.091	2024/6/22
Left Tilt 15 Degree	39150/2350	20M QPSK(1,0)	0	0.101	0.047	4.73	22.95	23.00	0.048	2024/6/22
Right Cheek	39150/2350	20M QPSK(1,0)	0	0.168	0.078	2.36	22.95	23.00	0.079	2024/6/22
Right Tilt 15 Degree	39150/2350	20M QPSK(1,0)	0	0.080	0.037	4.25	22.95	23.00	0.037	2024/6/22
Left Cheek	38750/2310	20M QPSK(1,0)	0	0.184	0.085	1.18	22.91	23.00	0.087	2024/6/22
Left Cheek	39550/2390	20M QPSK(1,0)	0	0.178	0.081	3.25	22.76	23.00	0.086	2024/6/22
Extremity										
Front Side	39150/2350	20M QPSK(1,0)	0	0.819	0.325	-0.14	22.95	23.00	0.329	2024/6/22
Back Side	39150/2350	20M QPSK(1,0)	0	1.294	0.523	2.10	22.95	23.00	0.529	2024/6/22
Left Side	39150/2350	20M QPSK(1,0)	0	0.650	0.255	1.03	22.95	23.00	0.258	2024/6/22
Right Side	39150/2350	20M QPSK(1,0)	0	0.565	0.231	2.10	22.95	23.00	0.234	2024/6/22
Top Side	39150/2350	20M QPSK(1,0)	0	0.213	0.123	2.32	22.95	23.00	0.124	2024/6/22
Bottom Side	39150/2350	20M QPSK(1,0)	0	0.712	0.268	2.81	22.95	23.00	0.271	2024/6/22
Back Side	38750/2310	20M QPSK(1,0)	0	1.023	0.420	2.01	22.91	23.00	0.429	2024/6/22

Back Side	39550/2390	20M QPSK(1,0)	0	1.030	0.441	2.78	22.76	23.00	0.466	2024/6/22
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	39150/2350	20M QPSK(1,0)	5	0.825	0.300	1.54	22.95	23.00	0.303	2024/6/22

9.1.12. SAR measurement Result of LTE Band 41

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	40740/2605	20M QPSK(1,0)	0	0.053	0.030	-3.70	23.95	24.50	0.034	2024/6/18
Left Tilt 15 Degree	40740/2605	20M QPSK(1,0)	0	0.028	0.016	-3.34	23.95	24.50	0.018	2024/6/18
Right Cheek	40740/2605	20M QPSK(1,0)	0	0.047	0.026	0.11	23.95	24.50	0.030	2024/6/18
Right Tilt 15 Degree	40740/2605	20M QPSK(1,0)	0	0.022	0.012	4.27	23.95	24.50	0.014	2024/6/18
Left Cheek	40140/2545	20M QPSK(1,0)	0	0.047	0.026	-3.44	23.54	24.50	0.032	2024/6/18
Left Cheek	41140/2645	20M QPSK(1,0)	0	0.050	0.028	-1.97	23.83	24.50	0.033	2024/6/18
Extremity										
Front Side	40740/2605	20M QPSK(1,0)	0	0.871	0.324	-1.09	23.95	24.50	0.368	2024/6/18
Back Side	40740/2605	20M QPSK(1,0)	0	2.639	1.022	-0.08	23.95	24.50	1.160	2024/6/18
Left Side	40740/2605	20M QPSK(1,0)	0	0.607	0.226	2.87	23.95	24.50	0.257	2024/6/18
Right Side	40740/2605	20M QPSK(1,0)	0	0.924	0.347	-2.49	23.95	24.50	0.394	2024/6/18
Top Side	40740/2605	20M QPSK(1,0)	0	0.317	0.120	-0.99	23.95	24.50	0.136	2024/6/18
Bottom Side	40740/2605	20M QPSK(1,0)	0	1.583	0.613	1.57	23.95	24.50	0.696	2024/6/18
Back	40140/2545	20M	0	2.428	0.893	3.50	23.54	24.50	1.114	2024/6/18

Side		QPSK(1,0)								
Back Side	41140/2645	20M QPSK(1,0)	0	2.481	0.932	-1.90	23.83	24.50	1.087	2024/6/18
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	40740/2605	20M QPSK(1,0)	5	1.610	0.611	3.70	23.95	24.50	0.693	2024/6/18

9.1.13. SAR measurement Result of WLAN 2.4G

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	7/2442	802.11 b	0	0.523	0.232	-3.85	11.09	11.50	0.255	2024/6/19
Left Cheek	7/2442	802.11 g	0	0.520	0.221	1.25	12.09	12.50	0.243	2024/6/19
Left Tilt 15 Degree	7/2442	802.11 b	0	0.268	0.119	5.66	11.09	11.50	0.131	2024/6/19
Right Cheek	7/2442	802.11 b	0	0.460	0.204	2.54	11.09	11.50	0.224	2024/6/19
Right Tilt 15 Degree	7/2442	802.11 b	0	0.225	0.100	-2.12	11.09	11.50	0.110	2024/6/19
Left Cheek	1/2412	802.11 b	0	0.446	0.188	4.02	10.22	11.50	0.252	2024/6/19
Left Cheek	13/2472	802.11 b	0	0.463	0.205	-3.69	10.63	11.50	0.250	2024/6/19
Extremity										
Front Side	7/2442	802.11 b	0	0.224	0.102	1.46	11.09	11.50	0.112	2024/6/19
Back Side	7/2442	802.11 b	0	0.659	0.303	-0.52	11.09	11.50	0.333	2024/6/19
Back Side	7/2442	802.11 g	0	0.632	0.287	1.14	12.09	12.50	0.315	2024/6/19
Left Side	7/2442	802.11 b	0	0.152	0.067	-0.53	11.09	11.50	0.074	2024/6/19
Right Side	7/2442	802.11 b	0	0.211	0.095	3.46	11.09	11.50	0.104	2024/6/19

Top Side	7/2442	802.11 b	0	0.099	0.043	1.10	11.09	11.50	0.047	2024/6/19
Bottom Side	7/2442	802.11 b	0	0.409	0.186	0.66	11.09	11.50	0.204	2024/6/19
Back Side	1/2412	802.11 b	0	0.610	0.241	3.76	10.22	11.50	0.324	2024/6/19
Back Side	13/2472	802.11 b	0	0.591	0.234	0.73	10.63	11.50	0.286	2024/6/19
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	7/2442	802.11 b	5	0.409	0.182	0.76	11.09	11.50	0.200	2024/6/19

9.1.14. SAR measurement Result of WLAN 5.2G

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	38/5190	802.11 n40	0	0.245	0.101	0.60	12.47	12.50	0.102	2024/6/25
Left Tilt 15 Degree	38/5190	802.11 n40	0	0.146	0.058	3.12	12.47	12.50	0.058	2024/6/25
Right Cheek	38/5190	802.11 n40	0	0.211	0.085	-2.96	12.47	12.50	0.086	2024/6/25
Right Tilt 15 Degree	38/5190	802.11 n40	0	0.096	0.040	4.09	12.47	12.50	0.040	2024/6/25
Left Cheek	46/5230	802.11 n40	0	0.212	0.083	1.19	11.94	12.50	0.094	2024/6/25
Extremity										
Front Side	38/5190	802.11 n40	0	0.765	0.207	-3.51	12.47	12.50	0.208	2024/6/25
Back Side	38/5190	802.11 n40	0	2.318	0.687	-4.29	12.47	12.50	0.692	2024/6/25
Left Side	38/5190	802.11 n40	0	0.556	0.153	-0.51	12.47	12.50	0.154	2024/6/25
Right Side	38/5190	802.11 n40	0	0.719	0.196	-2.40	12.47	12.50	0.197	2024/6/25
Top Side	38/5190	802.11	0	1.275	0.348	2.86	12.47	12.50	0.350	2024/6/25

		n40								
Bottom Side	38/5190	802.11 n40	0	0.487	0.129	-3.60	12.47	12.50	0.130	2024/6/25
Back Side	46/5230	802.11 n40	0	2.202	0.608	1.81	11.94	12.50	0.692	2024/6/25
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back Side	40/5200	802.11 a	5	1.507	0.399	2.73	12.47	12.50	0.402	2024/6/25

9.1.15. SAR measurement Result of WLAN 5.8G

Test Position	Test channel /Freq.	Test Mode	Separation distance (mm)	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
				1g	10g					
Head										
Left Cheek	155/5775	802.11 ac80	0	0.453	0.146	-0.10	9.62	10.00	0.159	2024/6/26
Left Tilt 15 Degree	155/5775	802.11 ac80	0	0.240	0.077	0.78	9.62	10.00	0.084	2024/6/26
Right Cheek	155/5775	802.11 ac80	0	0.418	0.135	-4.92	9.62	10.00	0.147	2024/6/26
Right Tilt 15 Degree	155/5775	802.11 ac80	0	0.228	0.071	1.28	9.62	10.00	0.077	2024/6/26
Extremity										
Front Side	155/5775	802.11 ac80	0	0.364	0.090	-3.59	9.62	10.00	0.098	2024/6/26
Back Side	155/5775	802.11 ac80	0	1.173	0.301	0.30	9.62	10.00	0.329	2024/6/26
Left Side	155/5775	802.11 ac80	0	0.235	0.060	0.77	9.62	10.00	0.065	2024/6/26
Right Side	155/5775	802.11 ac80	0	0.375	0.091	1.27	9.62	10.00	0.099	2024/6/26
Top Side	155/5775	802.11 ac80	0	0.164	0.041	2.29	9.62	10.00	0.045	2024/6/26
Bottom Side	155/5775	802.11 ac80	0	0.739	0.186	0.20	9.62	10.00	0.203	2024/6/26
Body & Hotspot with 5mm (Worst-case position for 0mm)										
Back	157/5785	802.11	5	0.716	0.176	-1.66	9.62	10.00	0.192	2024/6/26

Side		a								
------	--	---	--	--	--	--	--	--	--	--

9.2. Simultaneous Transmission Analysis

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

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

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

Mode	P_{max} (dBm)	P_{max} (mW)	$P_{\text{th,m}}$ (mW)	SAR_{lim} (W/Kg)	SAR_1 (W/Kg)	Calculation Result (mW)	Simultaneous Transmission Exclusion
Bluetooth	5.00	3.16	20	2	1.192	8.08	YES
Bluetooth	5.00	3.16	40	4	2.644	13.56	YES

9.3. Exposure Conditions

Exposure Position		WWAN	WLAN Band	Simultaneous Tx SAR(W/Kg)
		SAR(W/Kg)	SAR(W/Kg)	
Head	Left Cheek	0.182	0.255	0.437
	Left Tilt 15 Degree	0.097	0.131	0.228
	Right Cheek	0.150	0.224	0.374
	Right Tilt 15 Degree	0.069	0.110	0.179
Member	Front Side	0.927	0.208	1.135
	Back Side	2.644	0.692	3.336
	Left Side	0.573	0.154	0.727
	Right Side	0.786	0.197	0.983
	Top Side	0.317	0.350	0.667
	Bottom Side	1.764	0.204	1.968
Body&Hotspot	Back Side	1.192	0.402	1.594

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

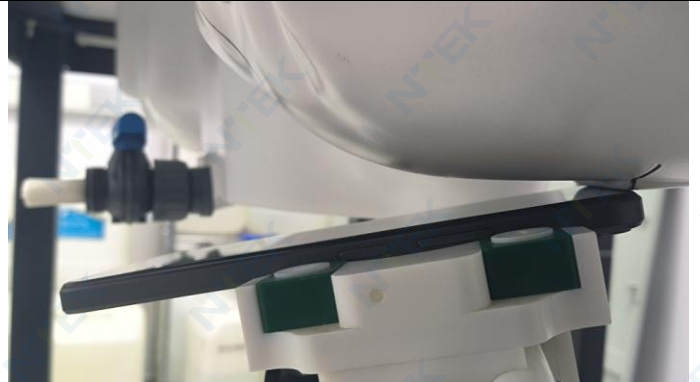
10. Appendix A. Photo documentation

Test Positions

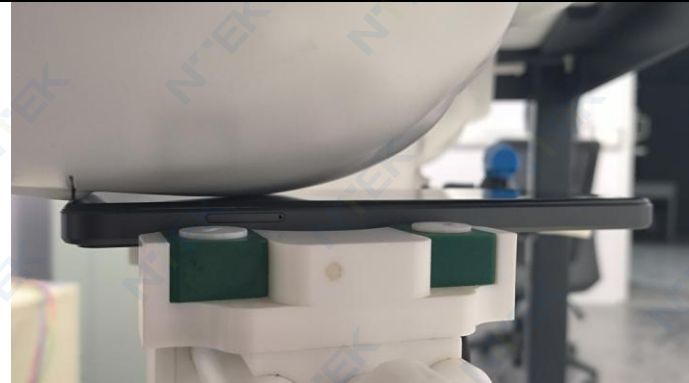
Left Cheek



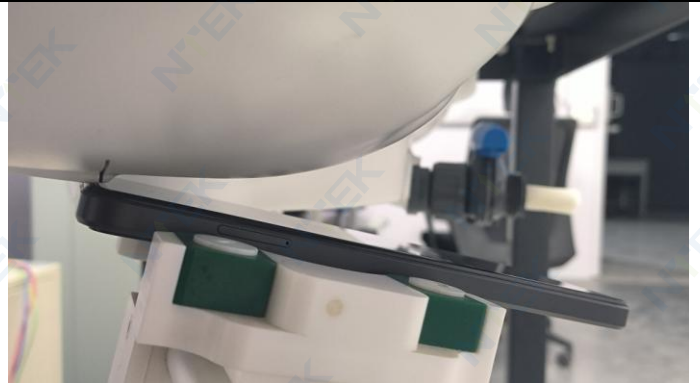
Left Tilt 15 Degree



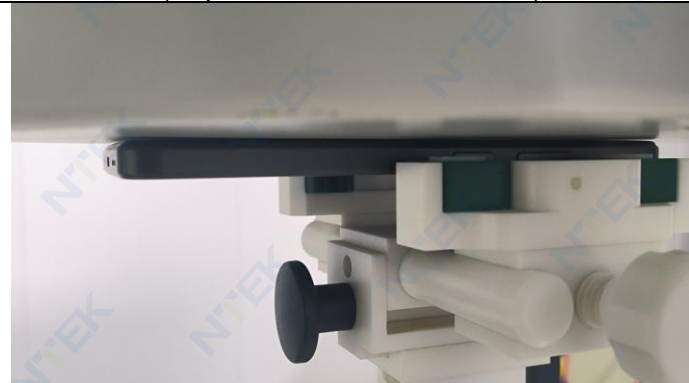
Right Cheek



Right Tilt 15 Degree



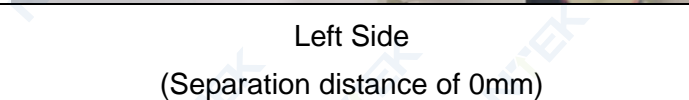
Front Side
(Separation distance of 0mm)



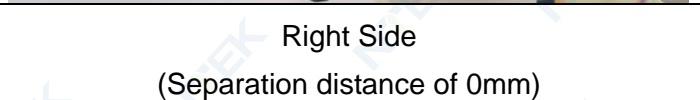
Back Side
(Separation distance of 0mm)



Left Side
(Separation distance of 0mm)



Right Side
(Separation distance of 0mm)





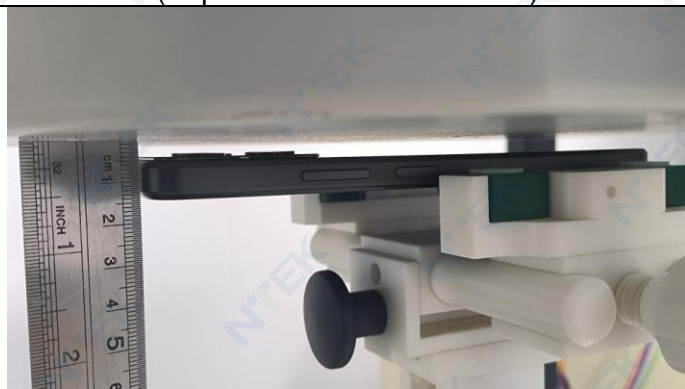
Top Side
(Separation distance of 0mm)



Bottom Side
(Separation distance of 0mm)



Back Side
(Separation distance of 5mm)



11. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 750MHz
MEASUREMENT 2 System Performance Check - 900MHz
MEASUREMENT 3 System Performance Check - 1800MHz
MEASUREMENT 4 System Performance Check - 2000MHz
MEASUREMENT 5 System Performance Check - 2450MHz
MEASUREMENT 6 System Performance Check - 2600MHz
MEASUREMENT 7 System Performance Check - 5200MHz
MEASUREMENT 8 System Performance Check - 5800MHz
MEASUREMENT 9 System Performance Check - 2300MHz

MEASUREMENT 1

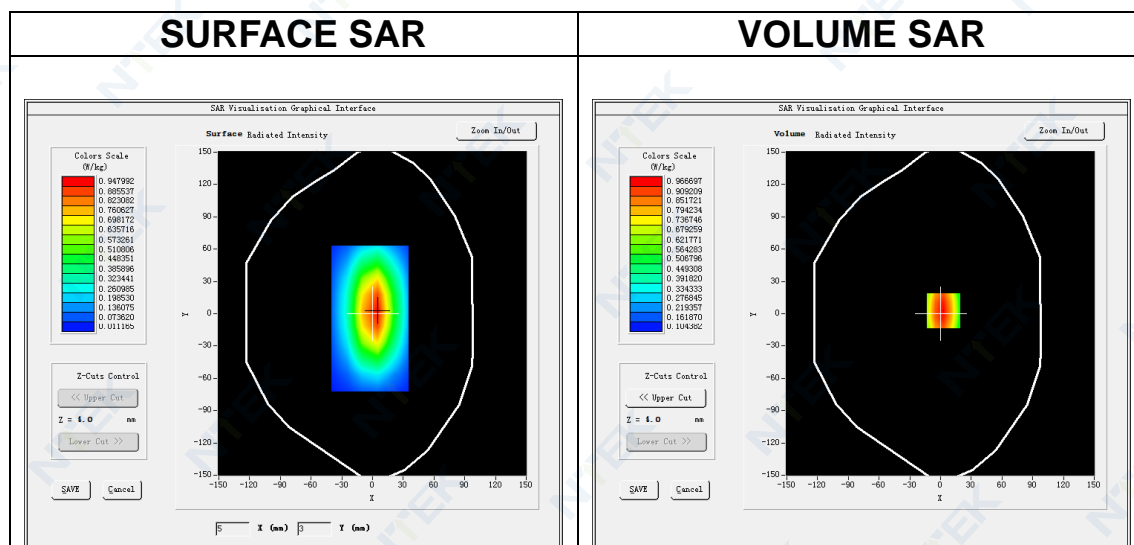
Date of measurement: 20/6/2024

A. Experimental conditions.

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

B. SAR Measurement Results

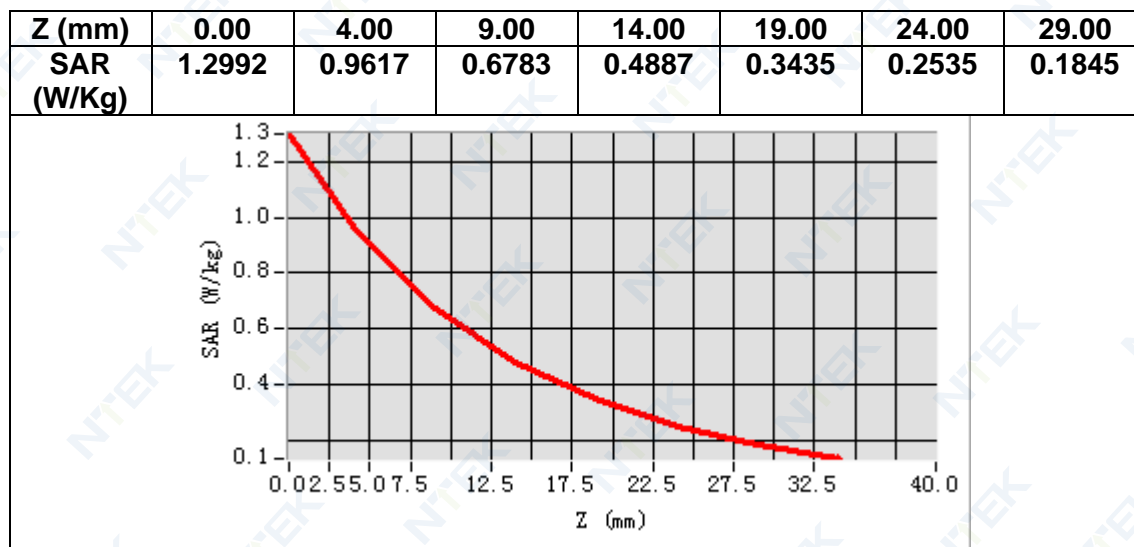
Frequency (MHz)	750.000000
Relative permittivity (real part)	41.017045
Relative permittivity (imaginary part)	21.616004
Conductivity (S/m)	0.900667
Variation (%)	2.730000



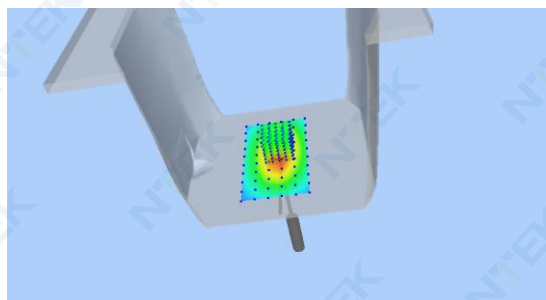
Maximum location: X=3.00, Y=3.00

SAR Peak: 1.30 W/kg

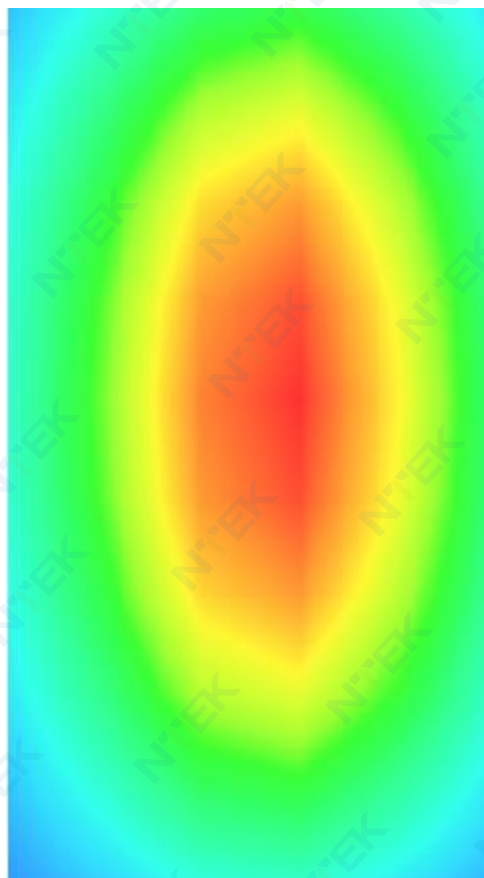
SAR 10g (W/Kg)	0.559332
SAR 1g (W/Kg)	0.816321



3D screen shot



Hot spot position



MEASUREMENT 2

Date of measurement: 17/6/2024

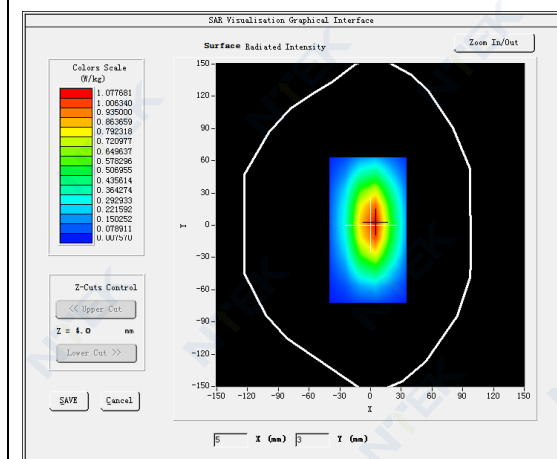
A. Experimental conditions.

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

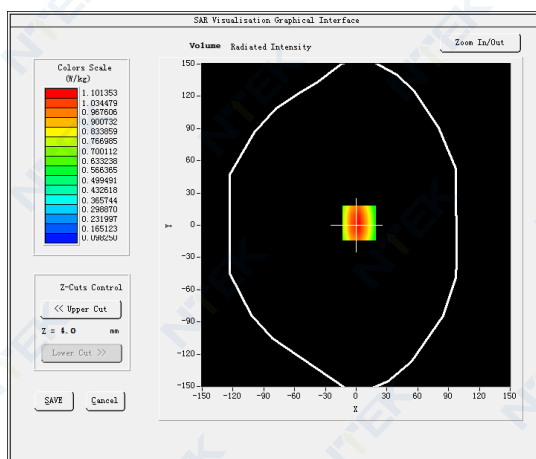
B. SAR Measurement Results

Frequency (MHz)	900.000000
Relative permittivity (real part)	41.562627
Relative permittivity (imaginary part)	19.747423
Conductivity (S/m)	0.987371
Variation (%)	-2.720000

SURFACE SAR



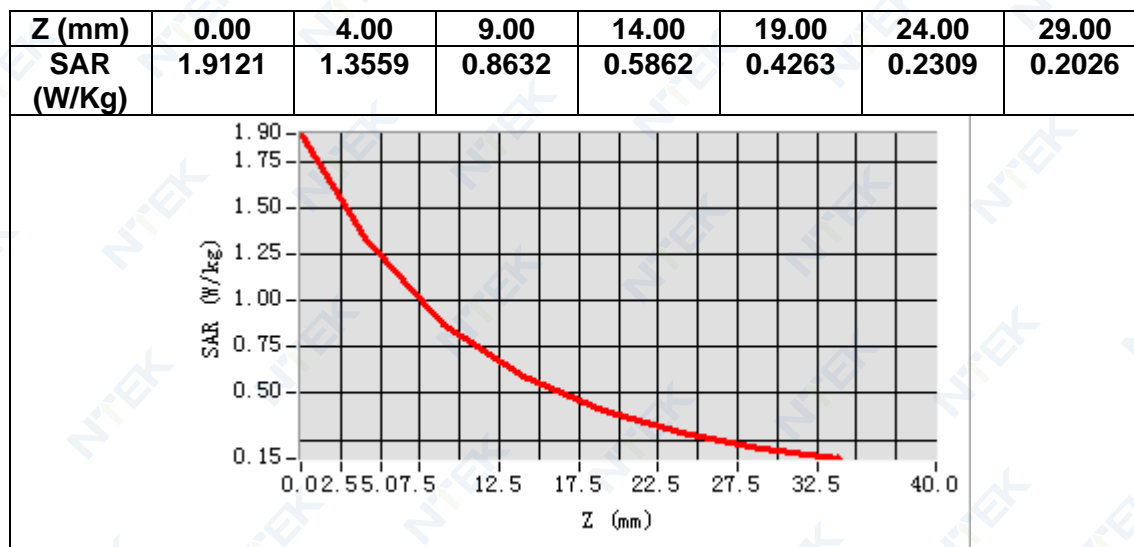
VOLUME SAR



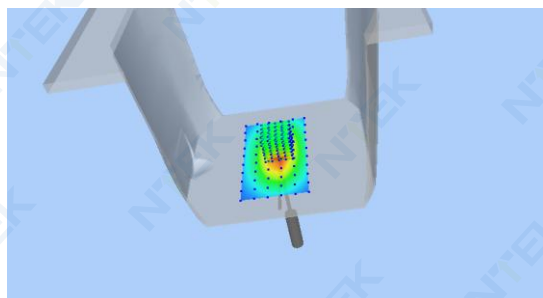
Maximum location: X=3.00, Y=3.00

SAR Peak: 1.90 W/kg

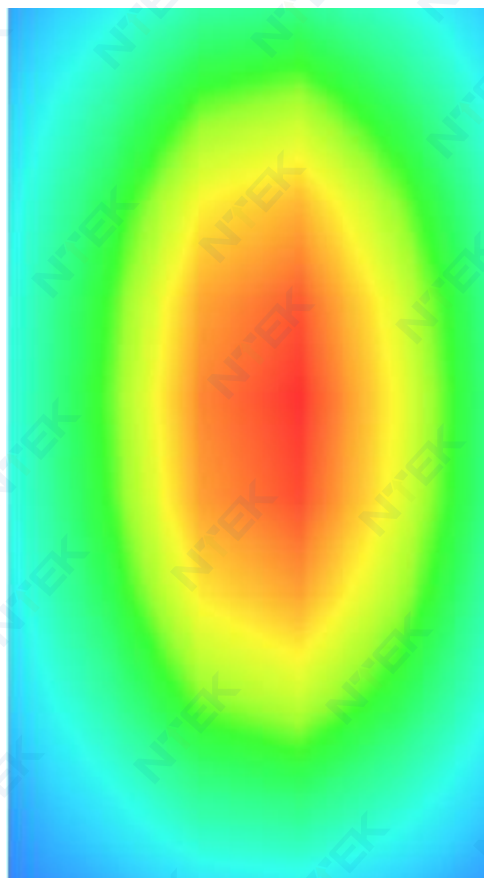
SAR 10g (W/Kg)	0.648333
SAR 1g (W/Kg)	1.084172



3D screen shot



Hot spot position



MEASUREMENT 3

Date of measurement: 29/6/2024

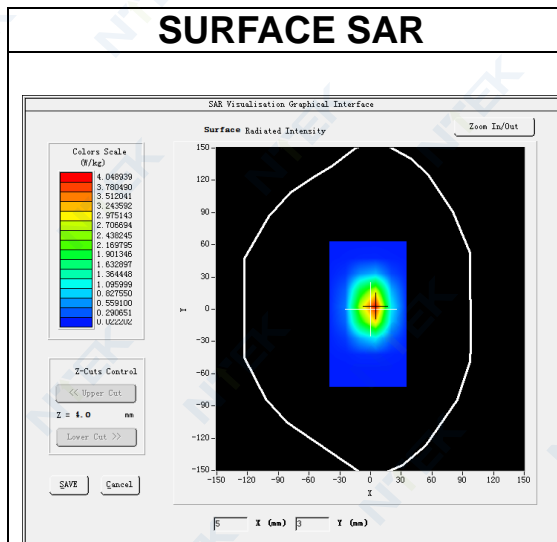
A. Experimental conditions.

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

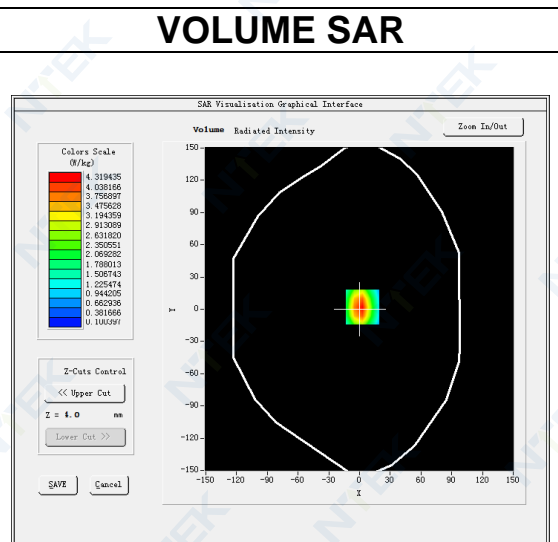
B. SAR Measurement Results

Frequency (MHz)	1800.000000
Relative permittivity (real part)	39.077704
Relative permittivity (imaginary part)	13.865005
Conductivity (S/m)	1.386501
Variation (%)	2.980000

SURFACE SAR



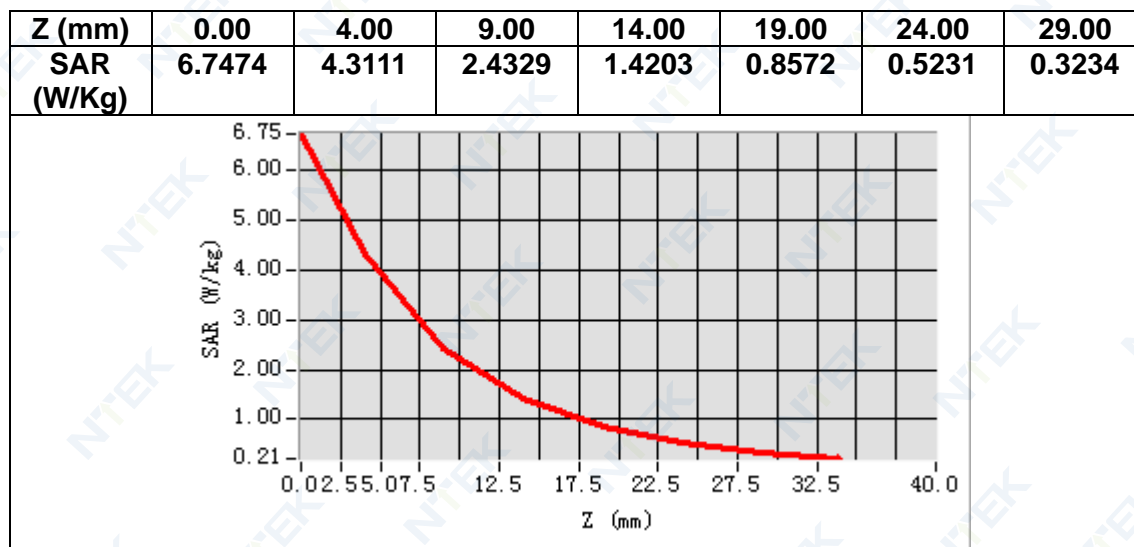
VOLUME SAR



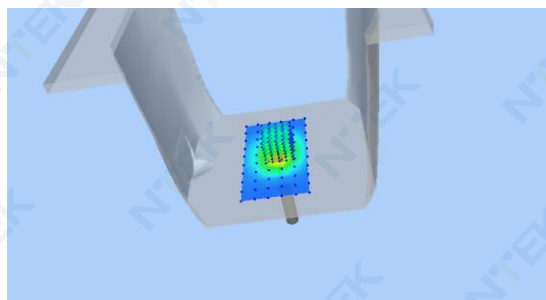
Maximum location: X=3.00, Y=2.00

SAR Peak: 6.82 W/kg

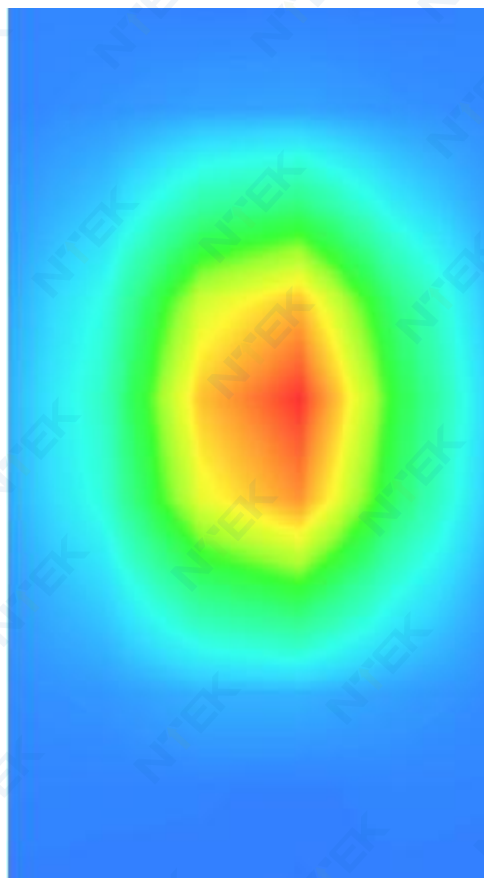
SAR 10g (W/Kg)	2.012307
SAR 1g (W/Kg)	3.450066



3D screen shot



Hot spot position



MEASUREMENT 4

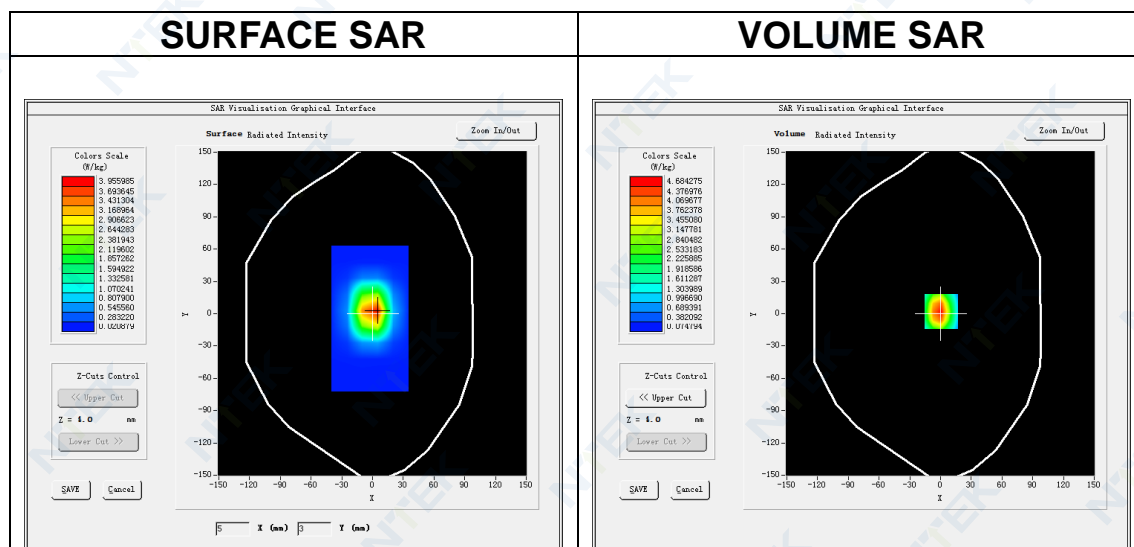
Date of measurement: 27/6/2024

A. Experimental conditions.

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

B. SAR Measurement Results

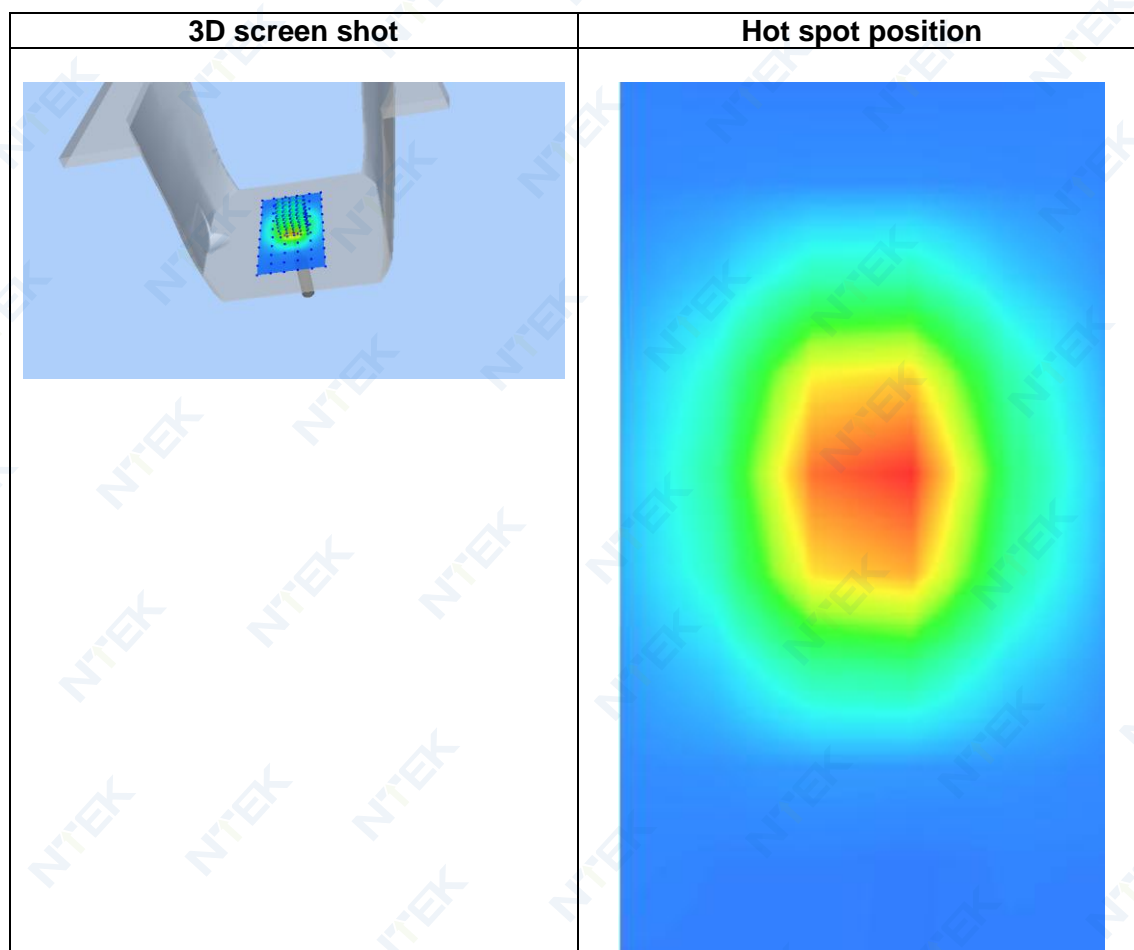
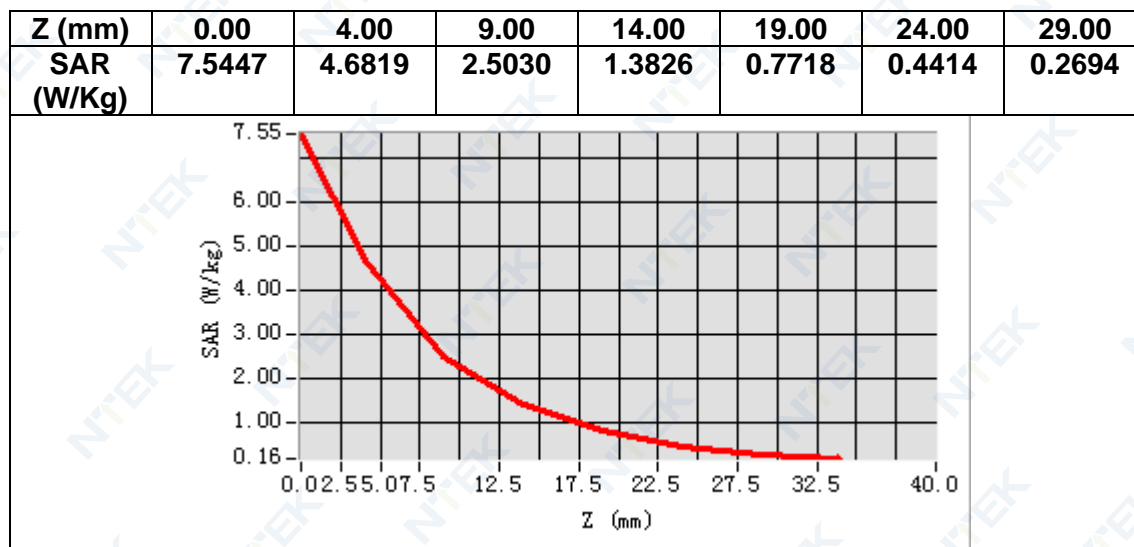
Frequency (MHz)	2000.000000
Relative permittivity (real part)	38.858337
Relative permittivity (imaginary part)	12.837350
Conductivity (S/m)	1.426372
Variation (%)	2.220000



Maximum location: X=1.00, Y=2.00

SAR Peak: 7.65 W/kg

SAR 10g (W/Kg)	2.018347
SAR 1g (W/Kg)	3.824221



MEASUREMENT 5

Date of measurement: 19/6/2024

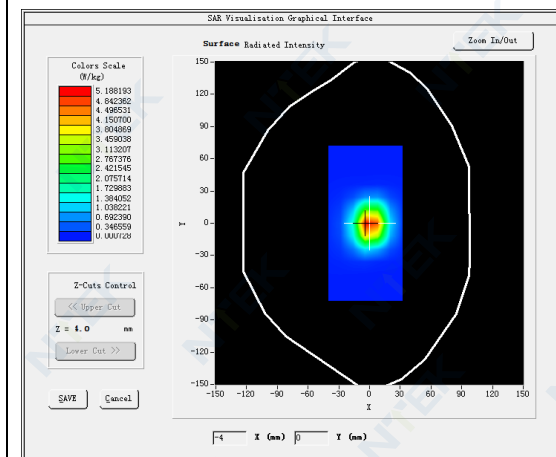
A. Experimental conditions.

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

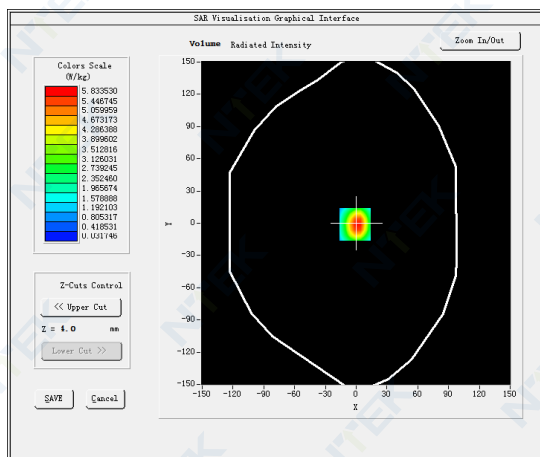
B. SAR Measurement Results

Frequency (MHz)	2450.000000
Relative permittivity (real part)	37.838986
Relative permittivity (imaginary part)	13.085579
Conductivity (S/m)	1.781093
Variation (%)	1.290000

SURFACE SAR



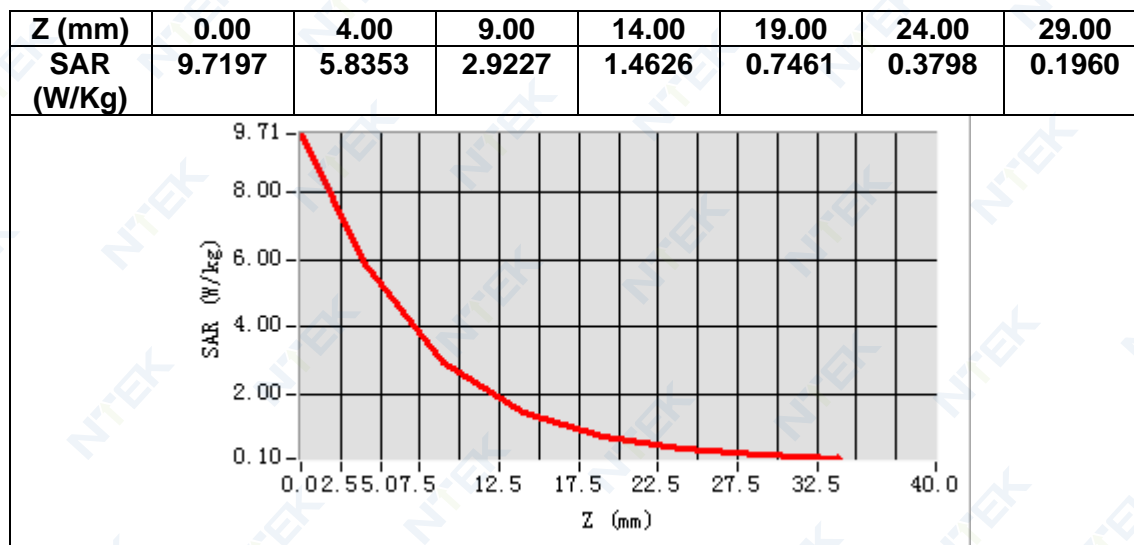
VOLUME SAR



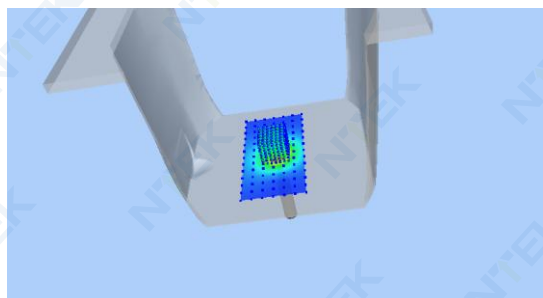
Maximum location: X=-1.00, Y=-1.00

SAR Peak: 9.83 W/kg

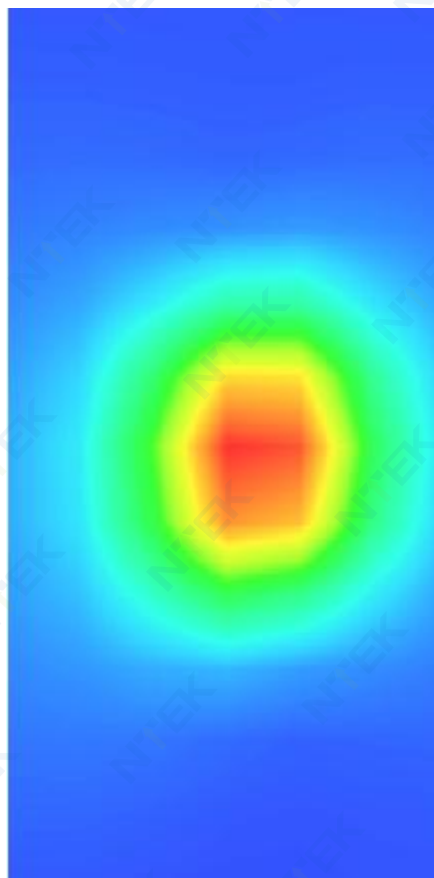
SAR 10g (W/Kg)	2.426106
SAR 1g (W/Kg)	4.518340



3D screen shot



Hot spot position



MEASUREMENT 6

Date of measurement: 18/6/2024

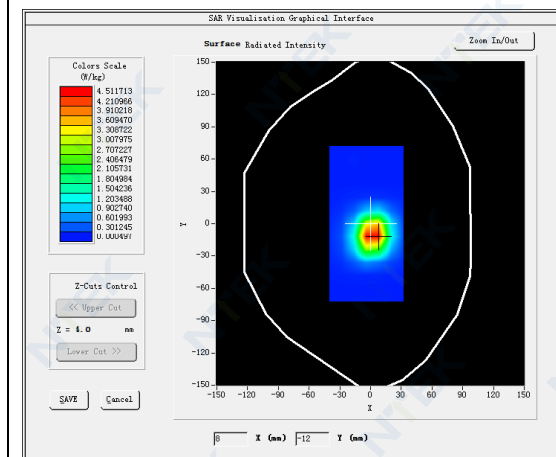
A. Experimental conditions.

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

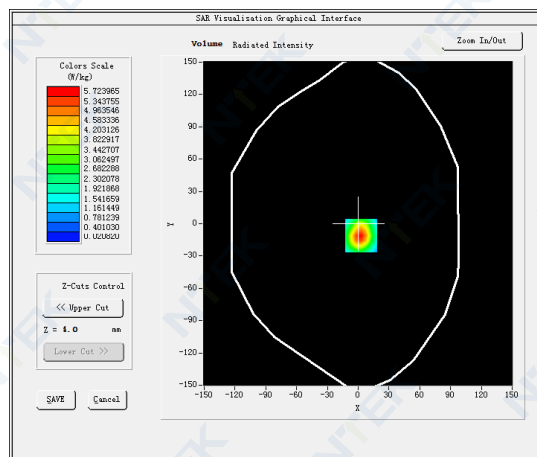
B. SAR Measurement Results

Frequency (MHz)	2600.000000
Relative permittivity (real part)	39.025963
Relative permittivity (imaginary part)	13.848930
Conductivity (S/m)	2.000401
Variation (%)	0.250000

SURFACE SAR



VOLUME SAR

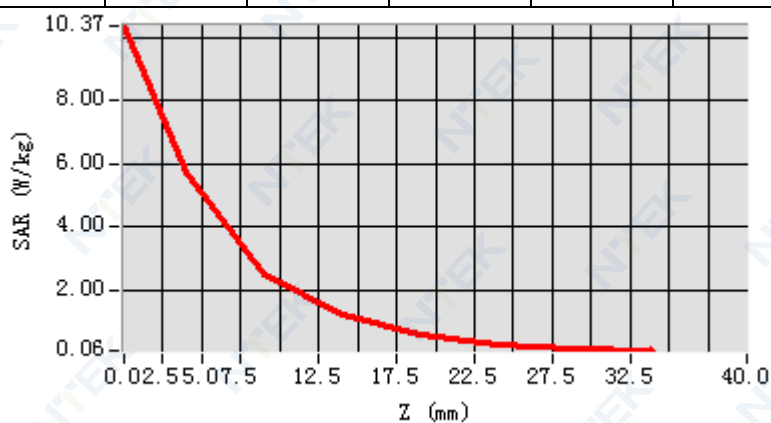


Maximum location: X=3.00, Y=-11.00

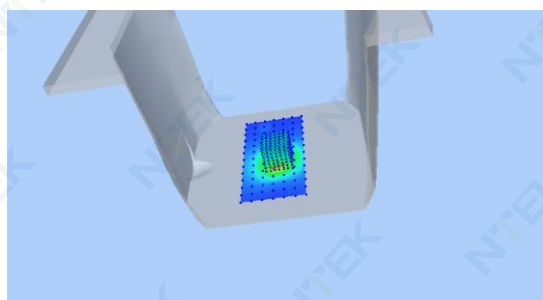
SAR Peak: 10.29 W/kg

SAR 10g (W/Kg)	2.596037
SAR 1g (W/Kg)	5.445199

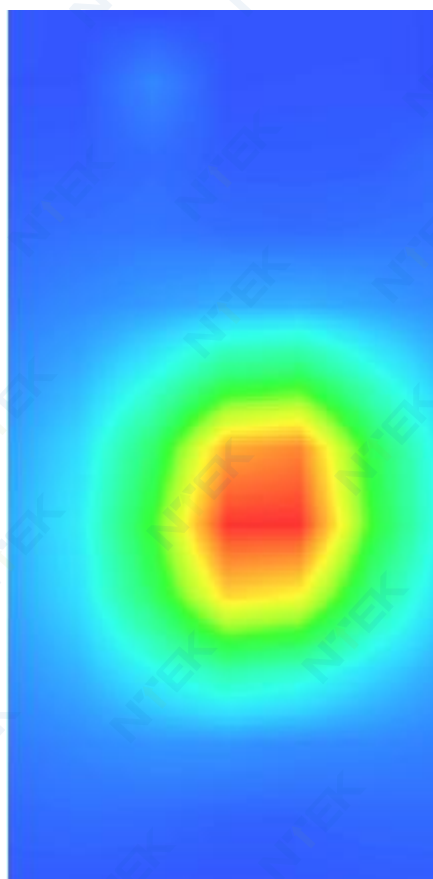
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.368	5.7232	2.5063	1.1756	0.5761	0.2669	0.1279



3D screen shot



Hot spot position



MEASUREMENT 7

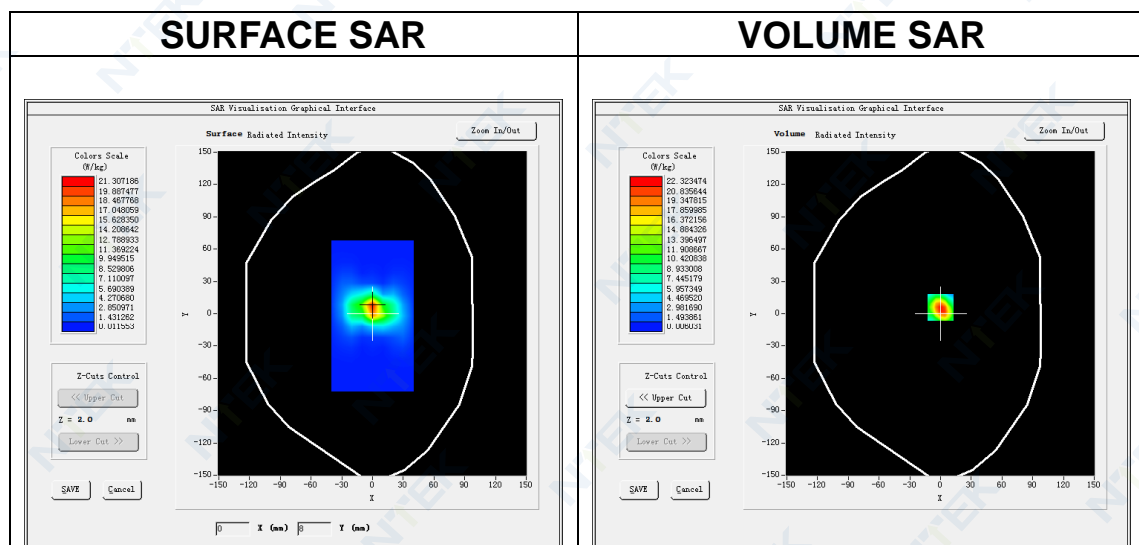
Date of measurement: 25/6/2024

A. Experimental conditions.

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

B. SAR Measurement Results

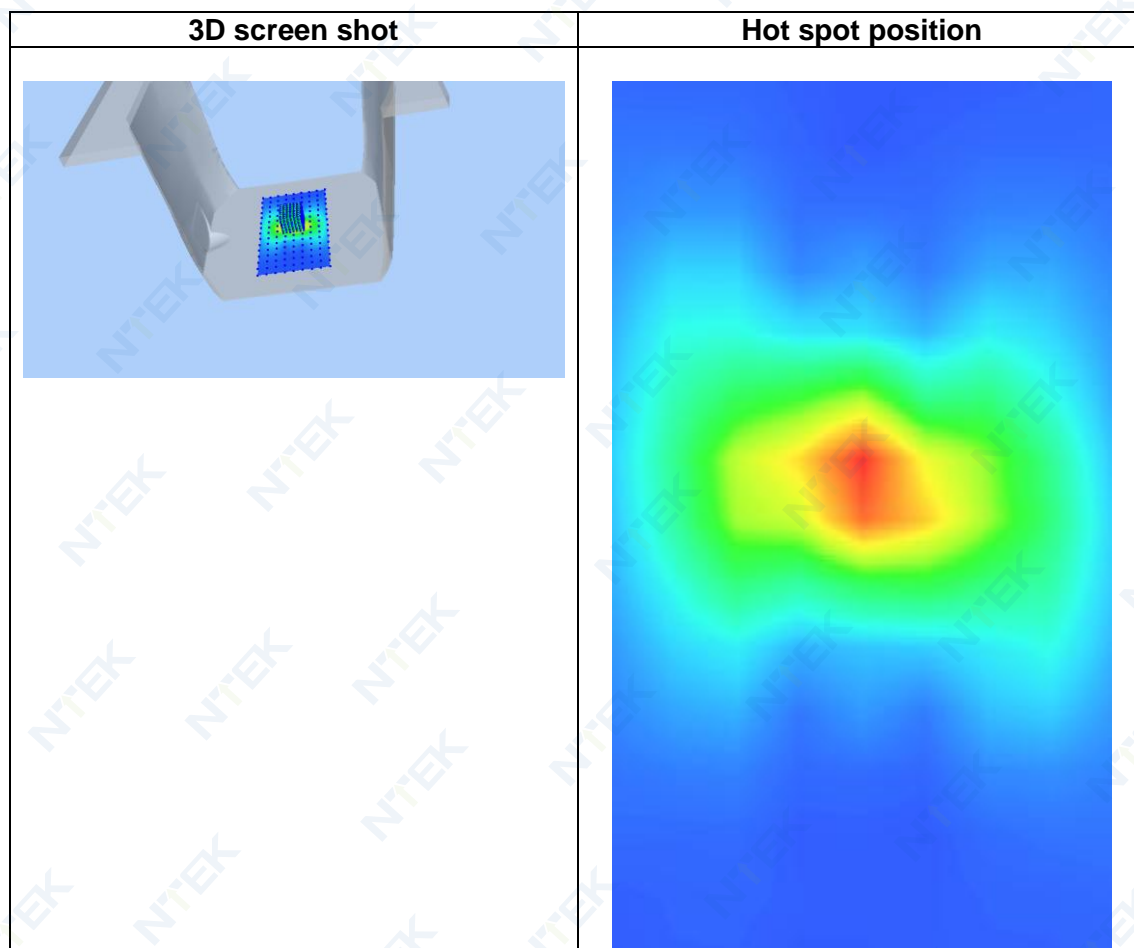
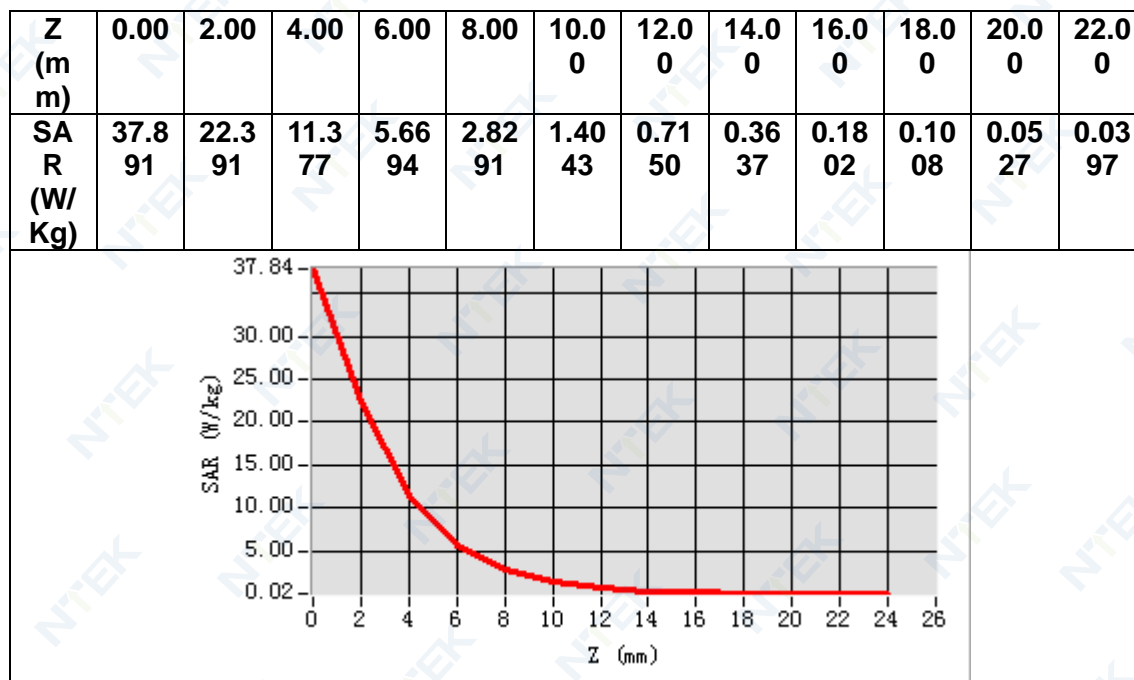
Frequency (MHz)	5200.000000
Relative permittivity (real part)	34.725906
Relative permittivity (imaginary part)	15.795970
Conductivity (S/m)	4.563280
Variation (%)	2.800000



Maximum location: X=0.00, Y=6.00

SAR Peak: 40.06 W/kg

SAR 10g (W/Kg)	5.807162
SAR 1g (W/Kg)	14.995032



MEASUREMENT 8

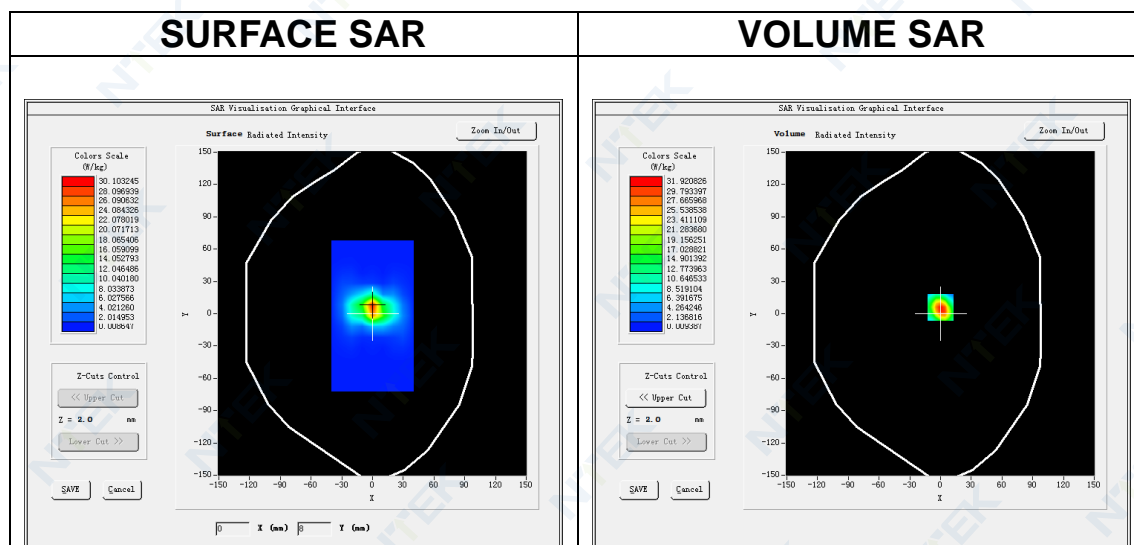
Date of measurement: 26/6/2024

A. Experimental conditions.

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

B. SAR Measurement Results

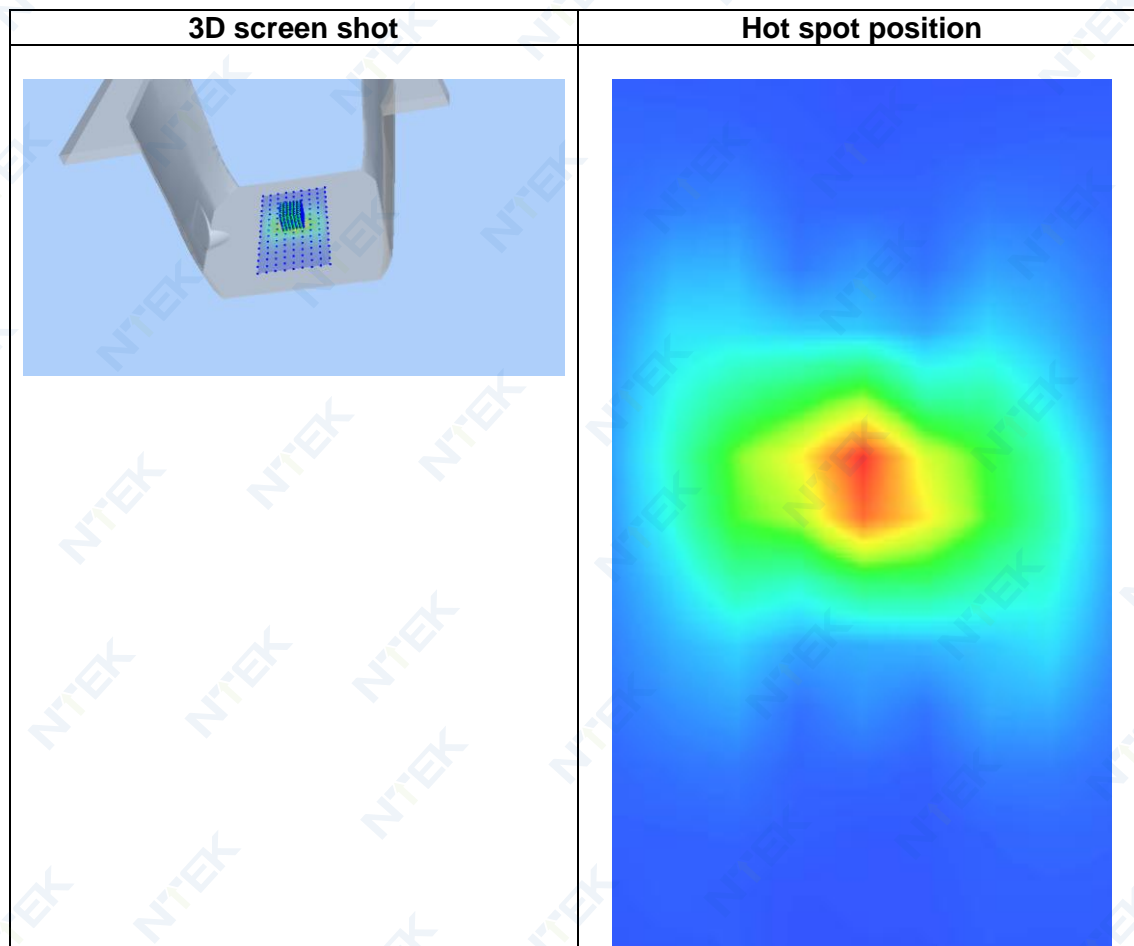
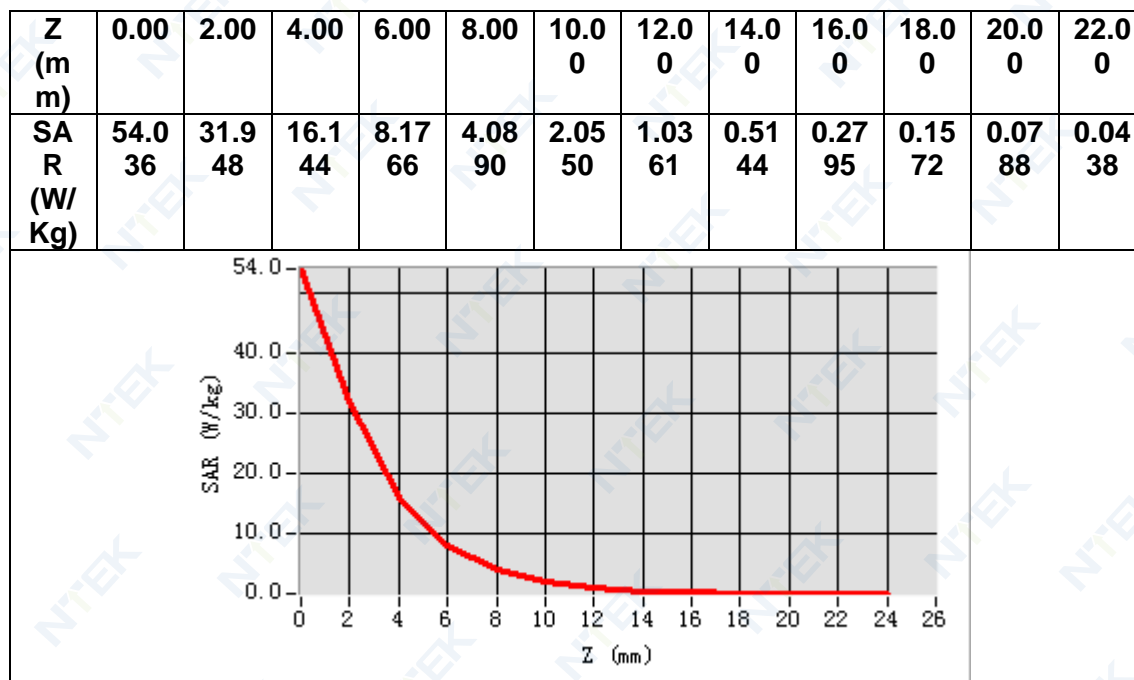
Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.157056
Relative permittivity (imaginary part)	16.182741
Conductivity (S/m)	5.214439
Variation (%)	-0.500000



Maximum location: X=0.00, Y=6.00

SAR Peak: 57.37 W/kg

SAR 10g (W/Kg)	5.790228
SAR 1g (W/Kg)	18.220190



MEASUREMENT 9

Date of measurement: 22/6/2024

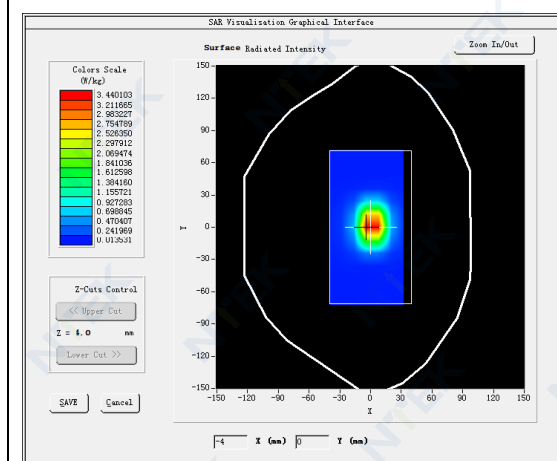
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW2300</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.81</u>

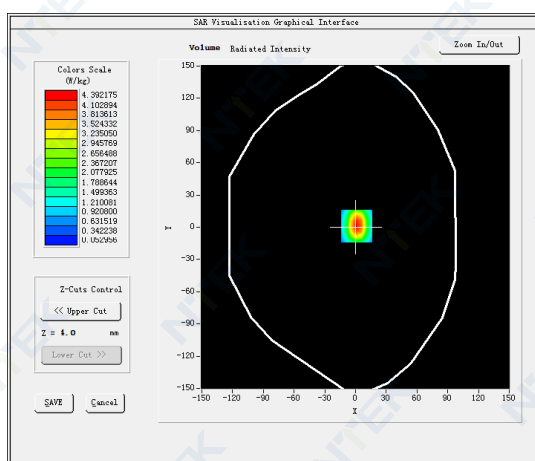
B. SAR Measurement Results

Frequency (MHz)	2300.000000
Relative permittivity (real part)	39.700773
Relative permittivity (imaginary part)	12.607461
Conductivity (S/m)	1.610953
Variation (%)	3.620000

SURFACE SAR



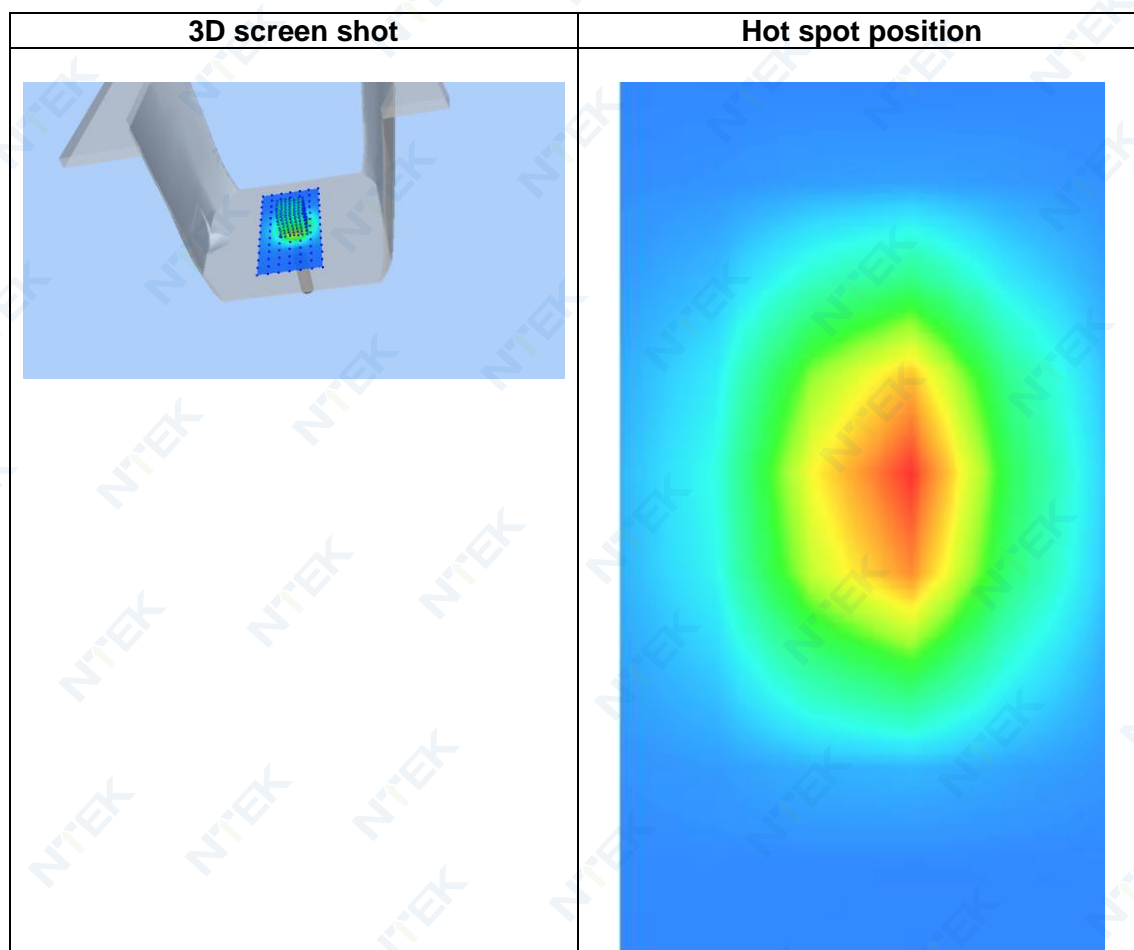
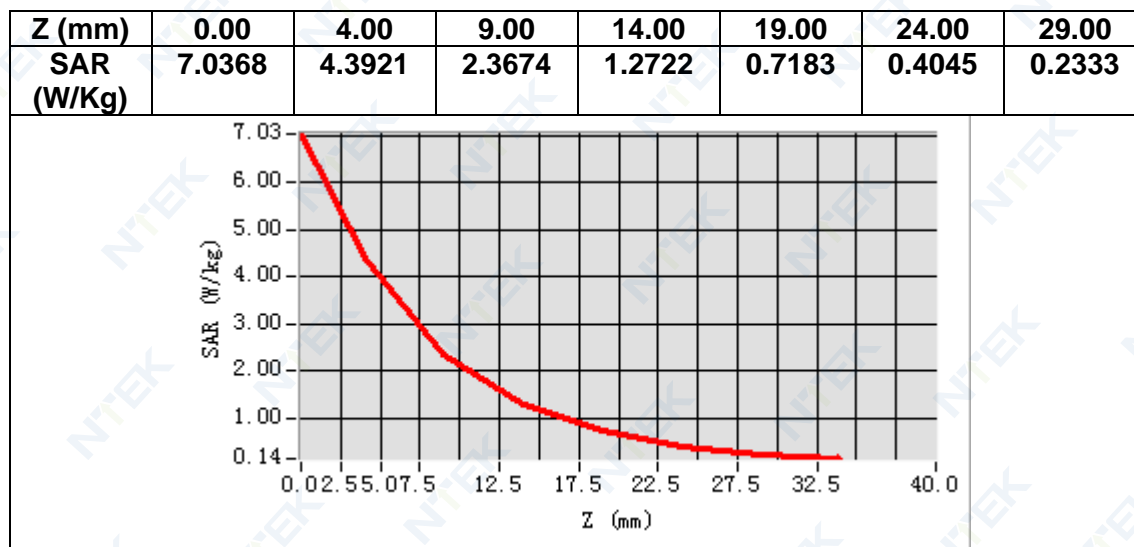
VOLUME SAR



Maximum location: X=1.00, Y=1.00

SAR Peak: 7.04 W/kg

SAR 10g (W/Kg)	2.281368
SAR 1g (W/Kg)	4.661097



12. Appendix C. Plots of High SAR Measurement

Table of contents
MEASUREMENT 1 GSM 900 Head
MEASUREMENT 2 GSM 900 Extremity
MEASUREMENT 3 GSM 1800 Head
MEASUREMENT 4 GSM 1800 Extremity
MEASUREMENT 5 WCDMA Band 1 Head
MEASUREMENT 6 WCDMA Band 1 Extremity
MEASUREMENT 7 WCDMA Band 8 Head
MEASUREMENT 8 WCDMA Band 8 Extremity
MEASUREMENT 9 WLAN 5.2G Head
MEASUREMENT 10 WLAN 5.8G Head
MEASUREMENT 11 WLAN 5.2G Extremity
MEASUREMENT 12 WLAN 5.8G Extremity
MEASUREMENT 13 WLAN 2.4G Head
MEASUREMENT 14 WLAN 2.4G Extremity
MEASUREMENT 15 LTE Band 1 Head
MEASUREMENT 16 LTE Band 1 Extremity
MEASUREMENT 17 LTE Band 3 Head
MEASUREMENT 18 LTE Band 3 Extremity
MEASUREMENT 19 LTE Band 7 Head
MEASUREMENT 20 LTE Band 7 Extremity
MEASUREMENT 21 LTE Band 8 Head
MEASUREMENT 22 LTE Band 8 Extremity
MEASUREMENT 23 LTE Band 20 Head
MEASUREMENT 24 LTE Band 20 Extremity
MEASUREMENT 25 LTE Band 41 Head
MEASUREMENT 26 LTE Band 41 Extremity
MEASUREMENT 27 LTE Band 28 Head
MEASUREMENT 28 LTE Band 28 Extremity
MEASUREMENT 29 LTE Band 40 Head
MEASUREMENT 30 LTE Band 40 Extremity

MEASUREMENT 1

Date of measurement: 17/6/2024

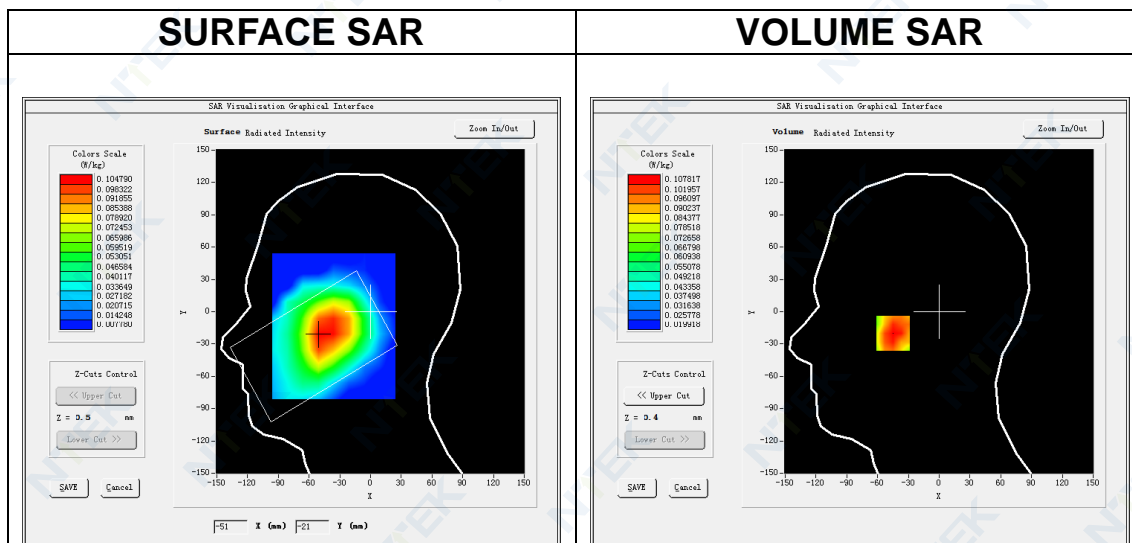
A. Experimental conditions.

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

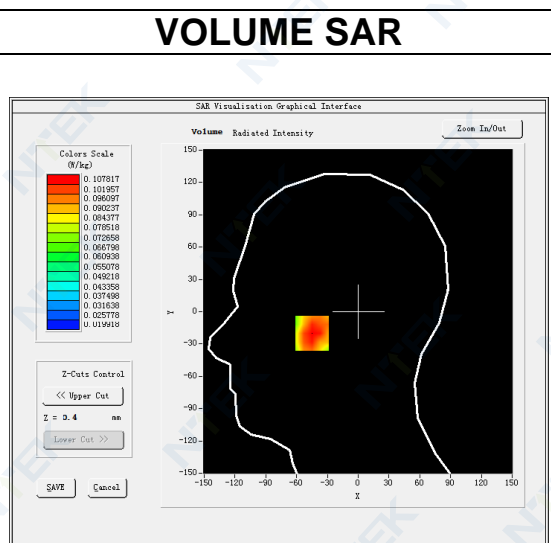
B. SAR Measurement Results

Frequency (MHz)	897.600000
Relative permittivity (real part)	41.642986
Relative permittivity (imaginary part)	19.801243
Conductivity (S/m)	0.987422
Variation (%)	-3.580000

SURFACE SAR



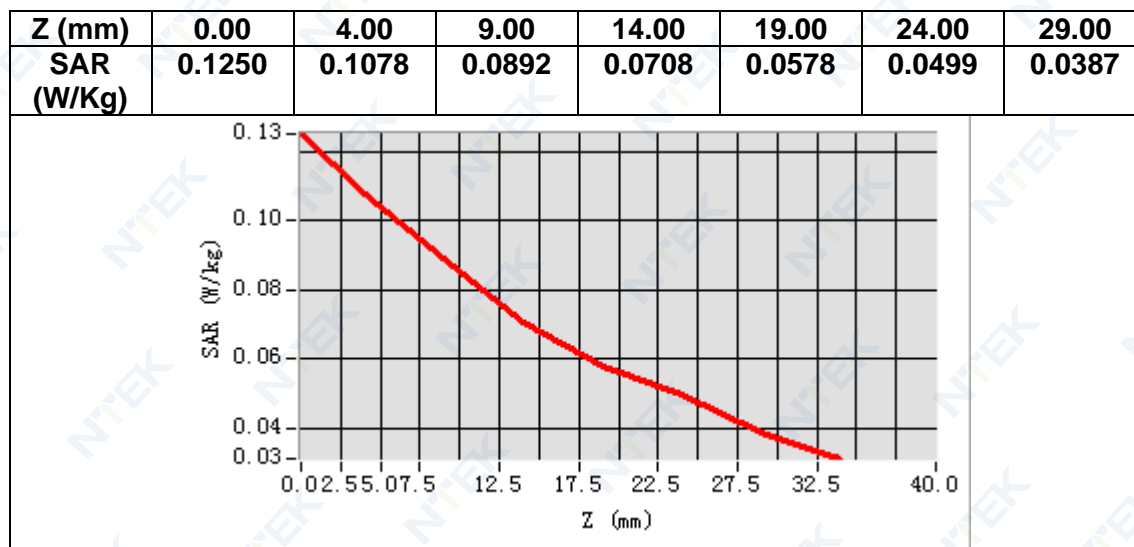
VOLUME SAR



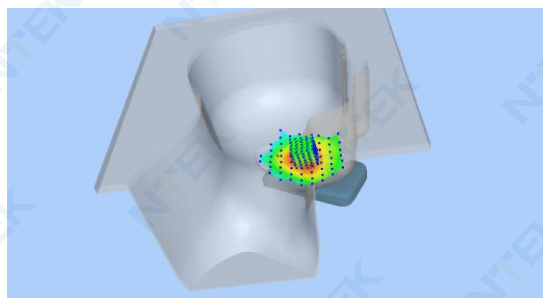
Maximum location: X=-45.00, Y=-20.00

SAR Peak: 0.14 W/kg

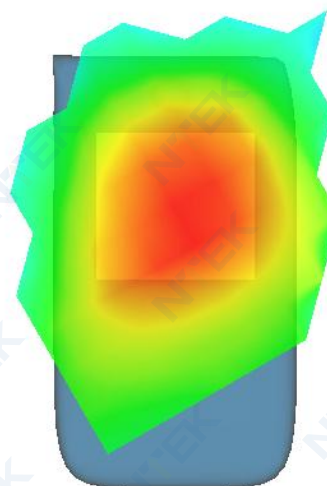
SAR 10g (W/Kg)	0.081351
SAR 1g (W/Kg)	0.106119



3D screen shot



Hot spot position



MEASUREMENT 2

Date of measurement: 17/6/2024

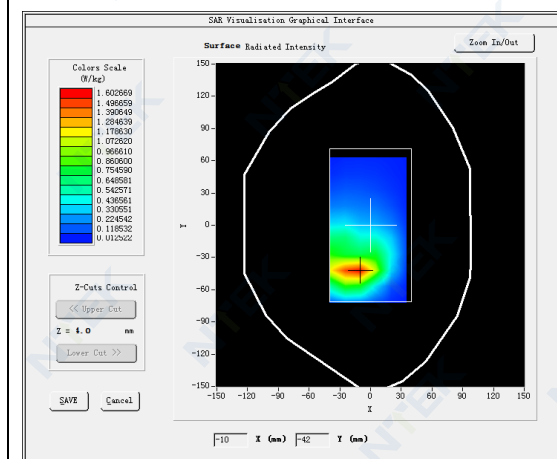
A. Experimental conditions.

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

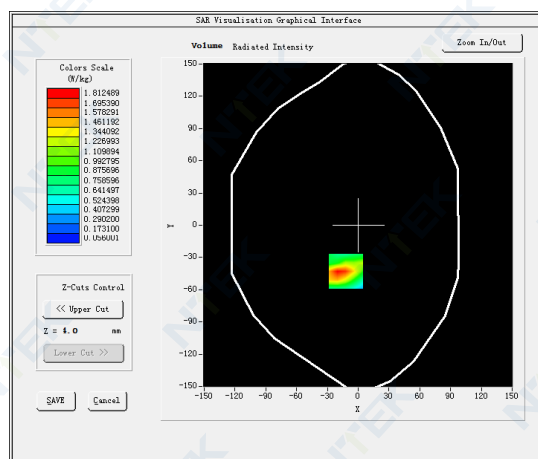
B. SAR Measurement Results

Frequency (MHz)	897.600000
Relative permittivity (real part)	41.642986
Relative permittivity (imaginary part)	19.801243
Conductivity (S/m)	0.987422
Variation (%)	-0.440000

SURFACE SAR



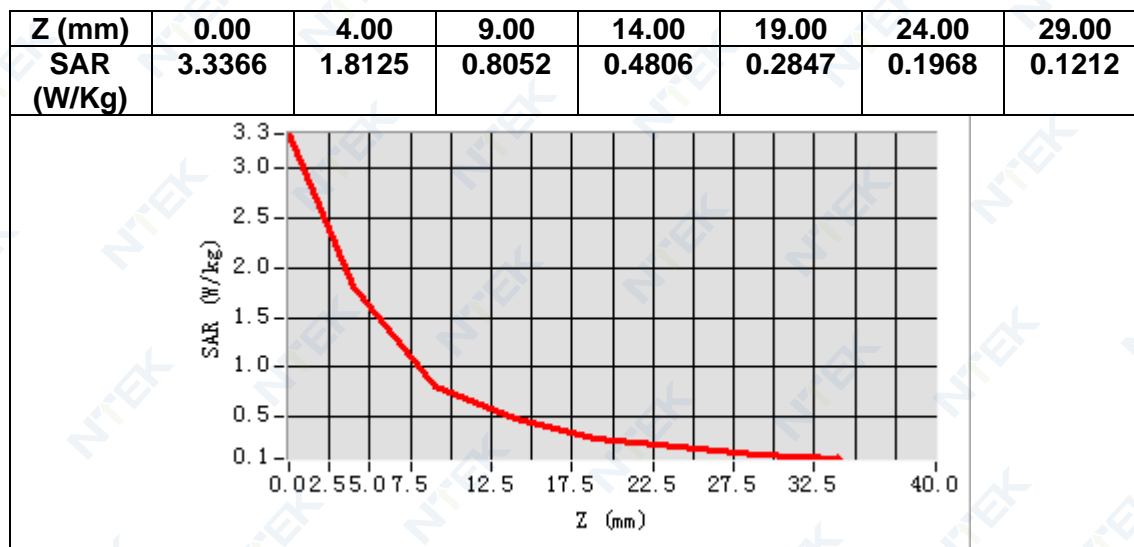
VOLUME SAR



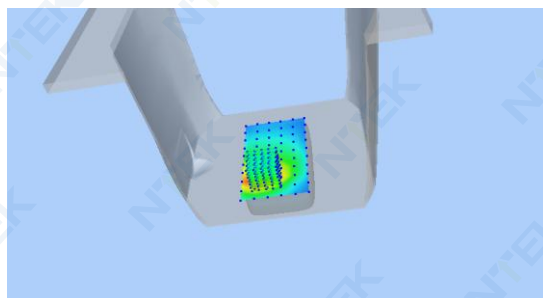
Maximum location: X=-12.00, Y=-43.00

SAR Peak: 3.28 W/kg

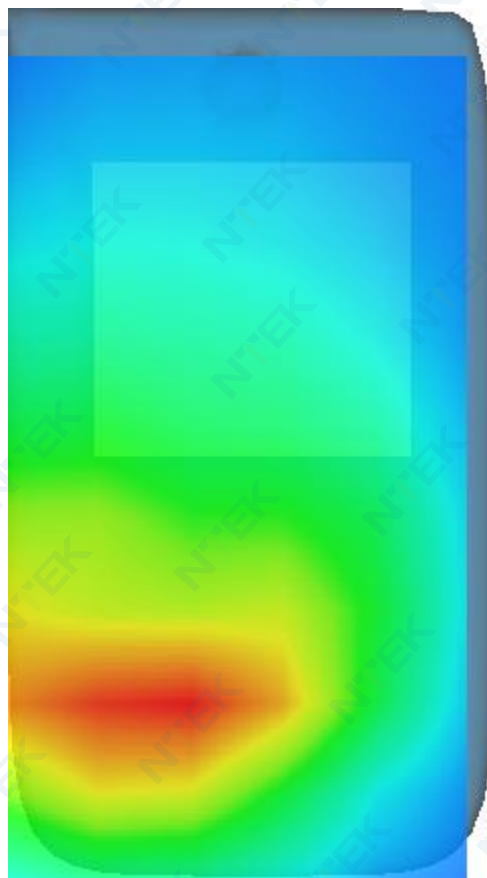
SAR 10g (W/Kg)	0.860691
SAR 1g (W/Kg)	1.748816



3D screen shot



Hot spot position



MEASUREMENT 3

Date of measurement: 29/6/2024

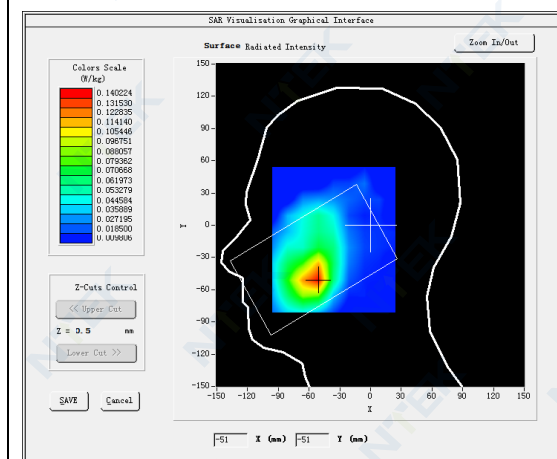
A. Experimental conditions.

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

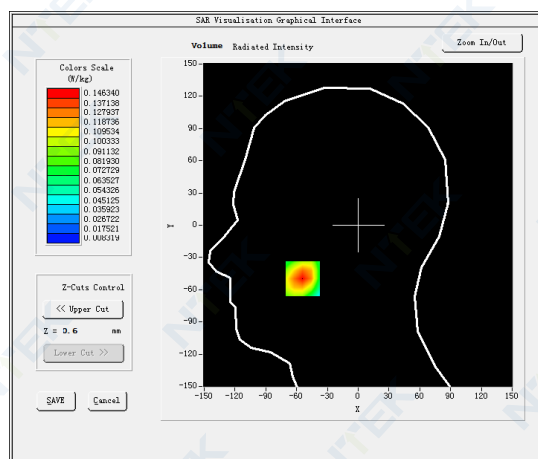
B. SAR Measurement Results

Frequency (MHz)	1747.400000
Relative permittivity (real part)	39.432163
Relative permittivity (imaginary part)	13.832885
Conductivity (S/m)	1.342866
Variation (%)	-4.130000

SURFACE SAR



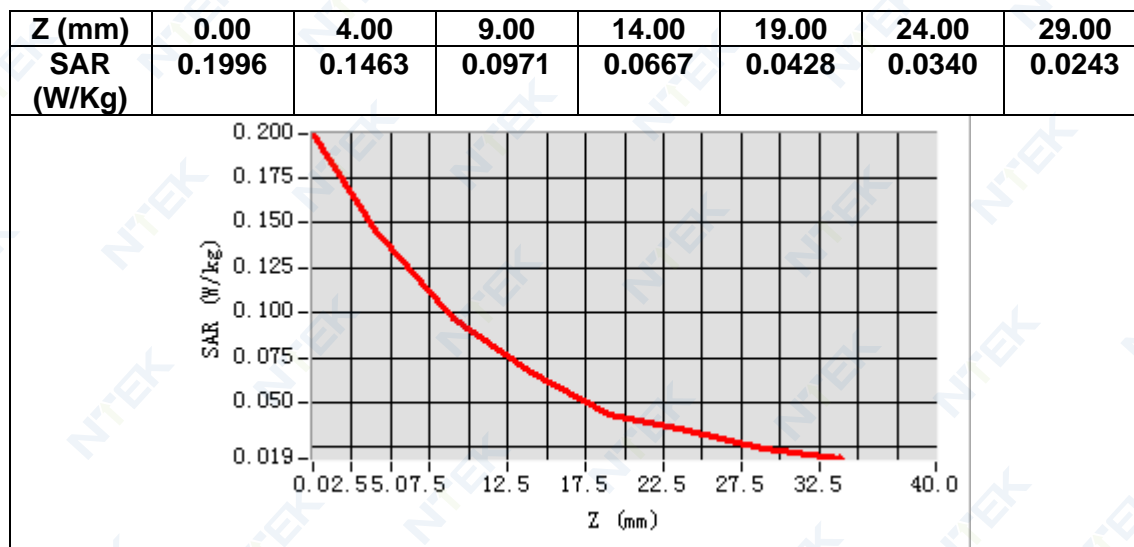
VOLUME SAR



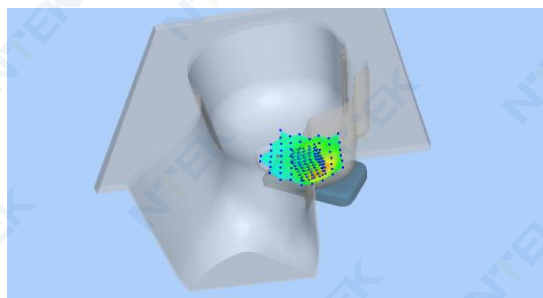
Maximum location: X=-54.00, Y=-50.00

SAR Peak: 0.21 W/kg

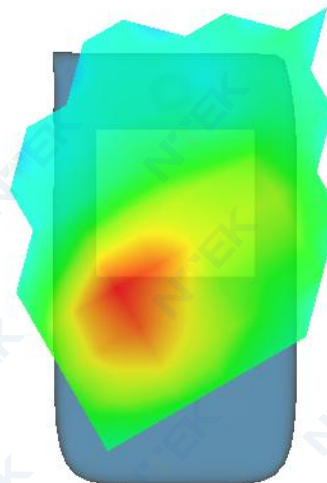
SAR 10g (W/Kg)	0.084681
SAR 1g (W/Kg)	0.137728



3D screen shot



Hot spot position



MEASUREMENT 4

Date of measurement: 29/6/2024

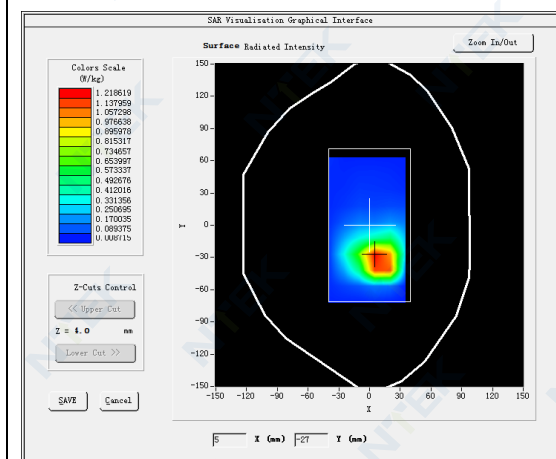
A. Experimental conditions.

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

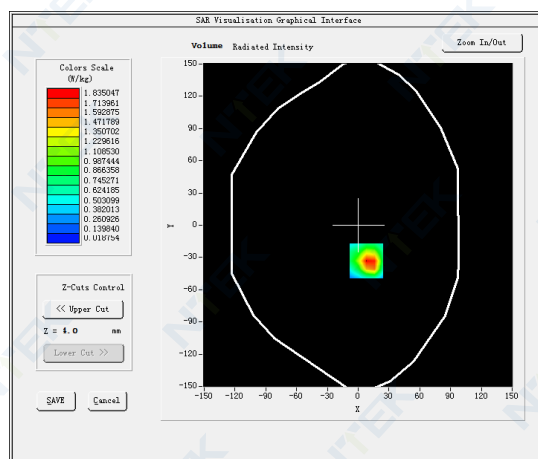
B. SAR Measurement Results

Frequency (MHz)	1747.400000
Relative permittivity (real part)	39.432163
Relative permittivity (imaginary part)	13.832885
Conductivity (S/m)	1.342866
Variation (%)	-2.590000

SURFACE SAR



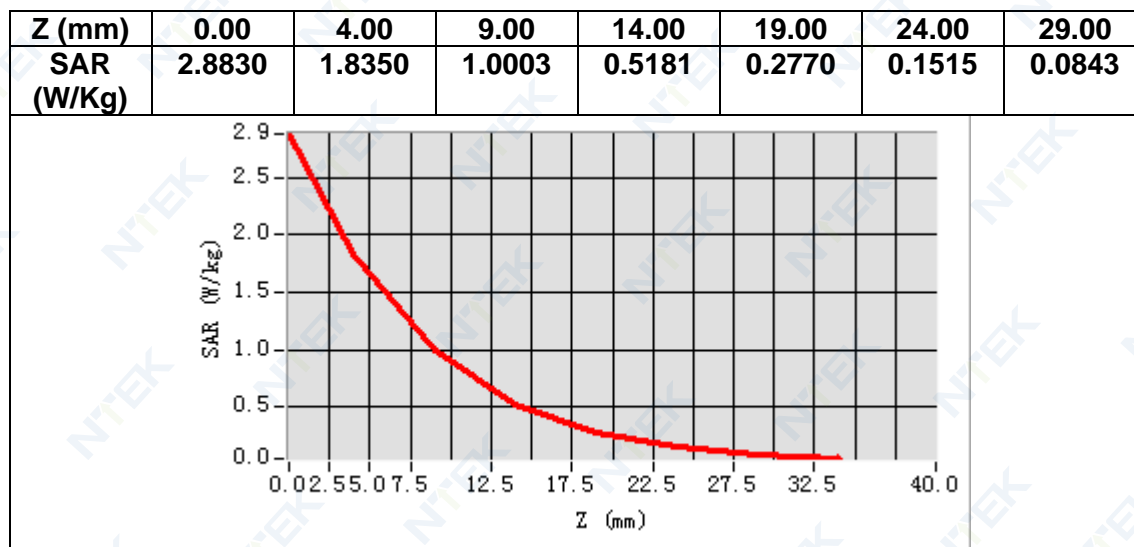
VOLUME SAR



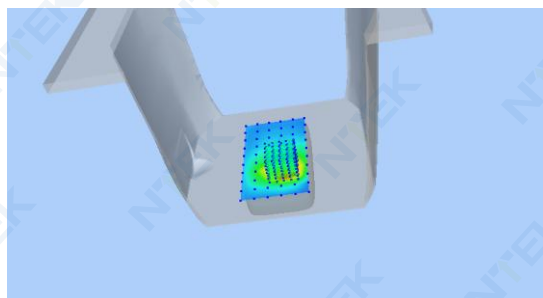
Maximum location: X=8.00, Y=-33.00

SAR Peak: 3.60 W/kg

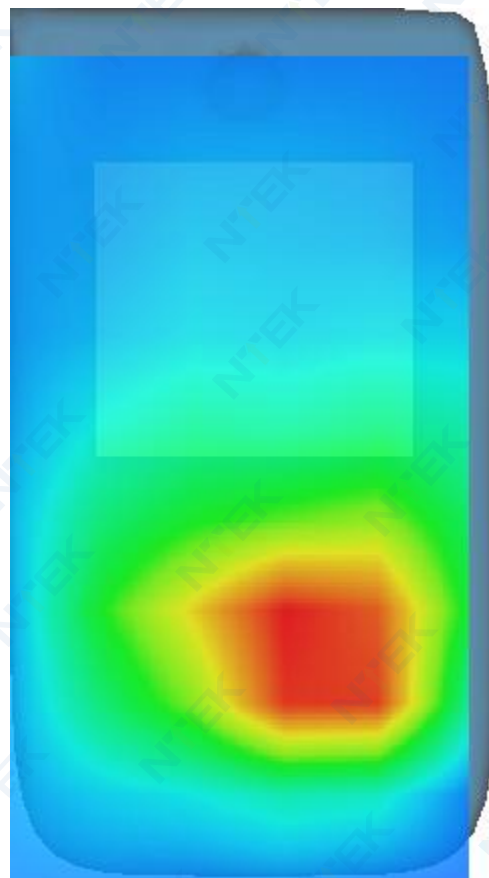
SAR 10g (W/Kg)	0.812396
SAR 1g (W/Kg)	1.838562



3D screen shot



Hot spot position



MEASUREMENT 5

Date of measurement: 27/6/2024

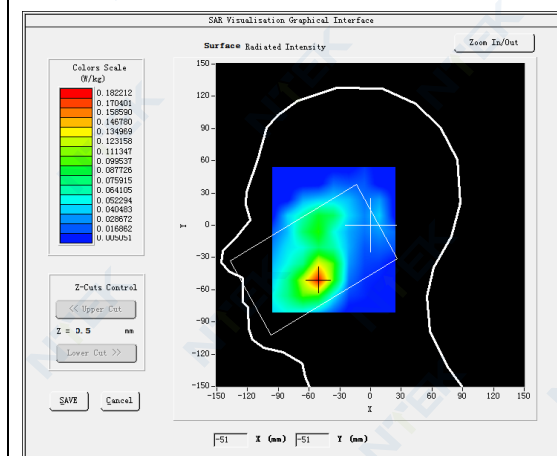
A. Experimental conditions.

Area Scan	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>Band1 UMTS</u>
Channels	<u>Middle</u>
Signal	<u>WCDMA (Crest factor: 1.0)</u>
ConvF	<u>2.83</u>

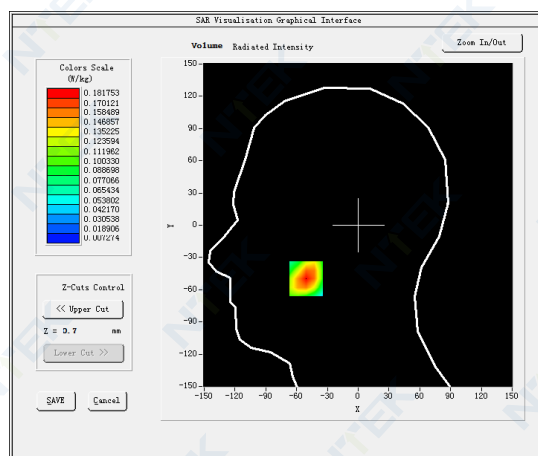
B. SAR Measurement Results

Frequency (MHz)	1950.000000
Relative permittivity (real part)	38.991436
Relative permittivity (imaginary part)	12.797650
Conductivity (S/m)	1.386412
Variation (%)	0.910000

SURFACE SAR



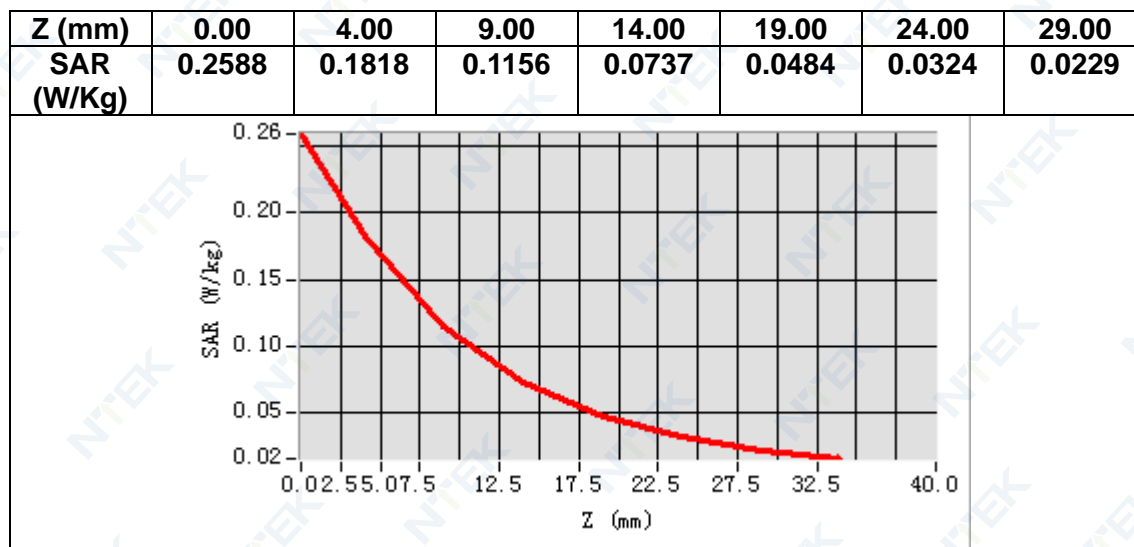
VOLUME SAR



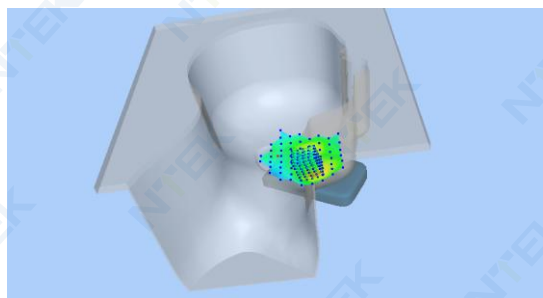
Maximum location: X=-51.00, Y=-50.00

SAR Peak: 0.26 W/kg

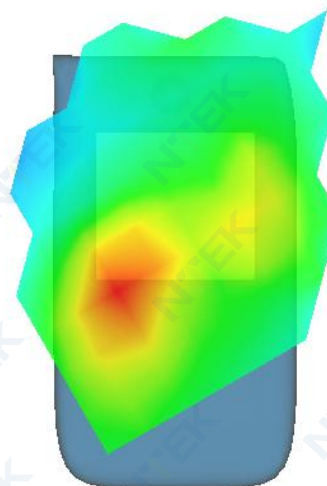
SAR 10g (W/Kg)	0.100550
SAR 1g (W/Kg)	0.172054



3D screen shot



Hot spot position



MEASUREMENT 6

Date of measurement: 27/6/2024

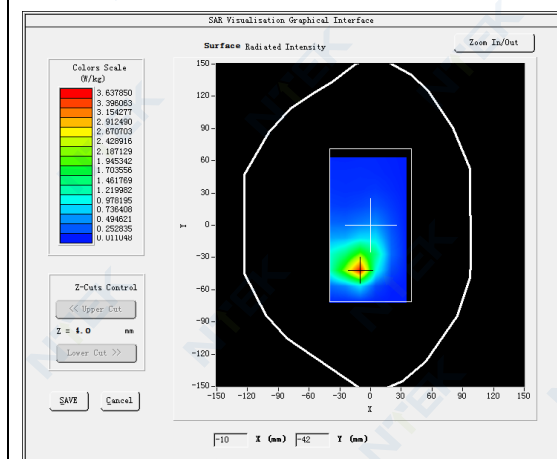
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>Band1 UMTS</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.83</u>

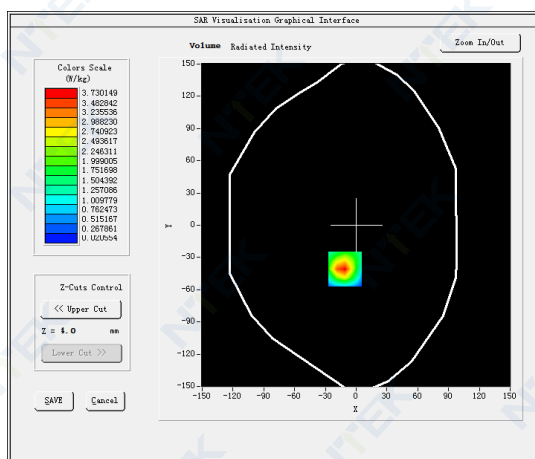
B. SAR Measurement Results

Frequency (MHz)	1950.000000
Relative permittivity (real part)	38.991436
Relative permittivity (imaginary part)	12.797650
Conductivity (S/m)	1.386412
Variation (%)	-0.630000

SURFACE SAR



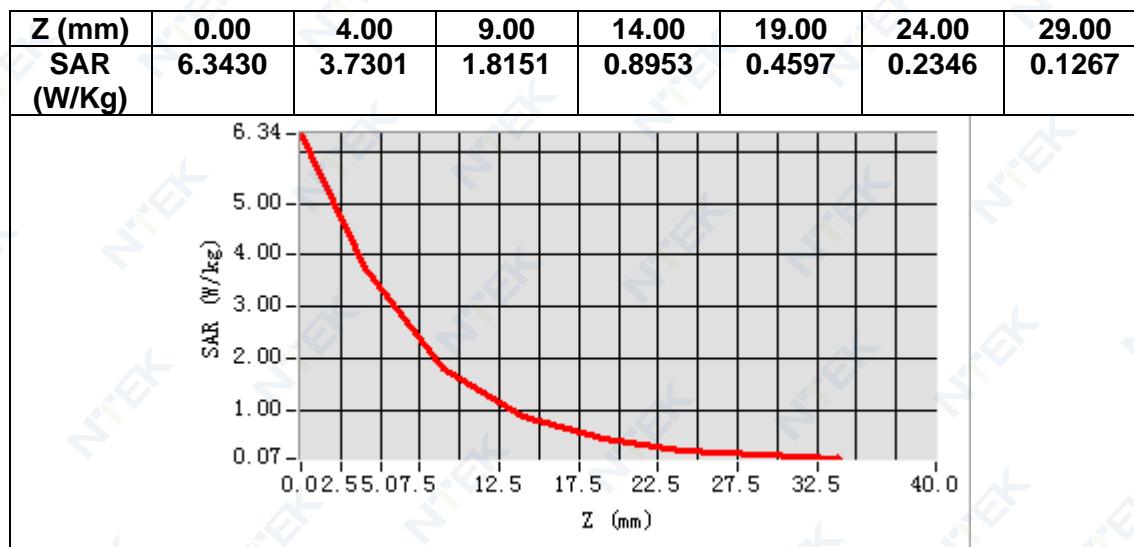
VOLUME SAR



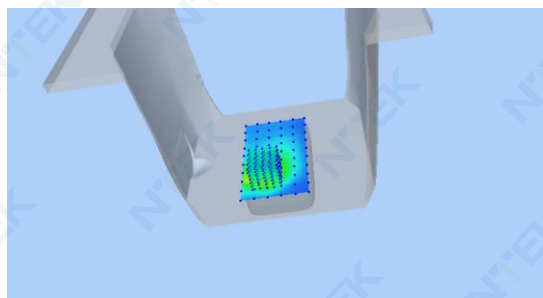
Maximum location: X=-11.00, Y=-41.00

SAR Peak: 6.36 W/kg

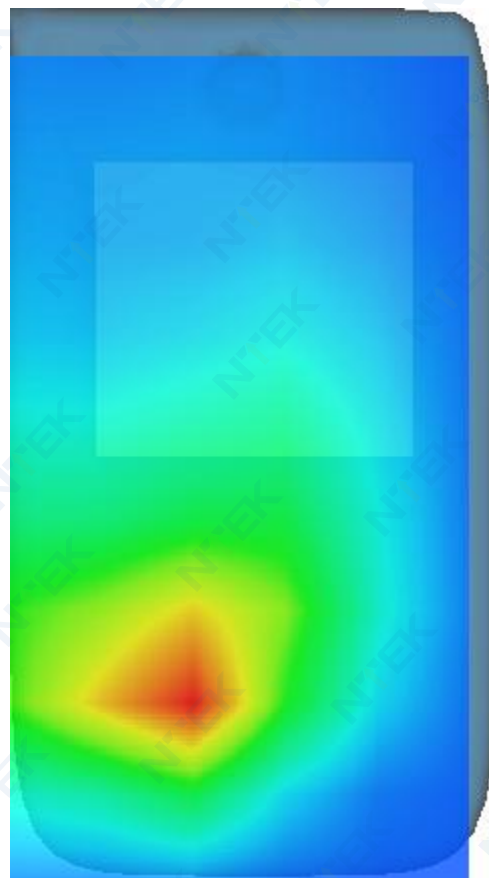
SAR 10g (W/Kg)	1.624615
SAR 1g (W/Kg)	3.496595



3D screen shot



Hot spot position



MEASUREMENT 7

Date of measurement: 17/6/2024

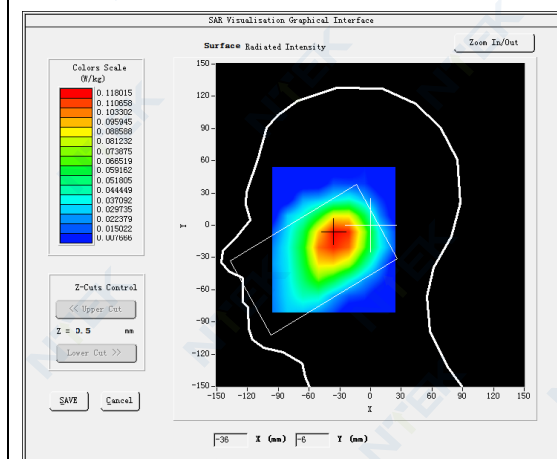
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>Band8 WCDMA900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

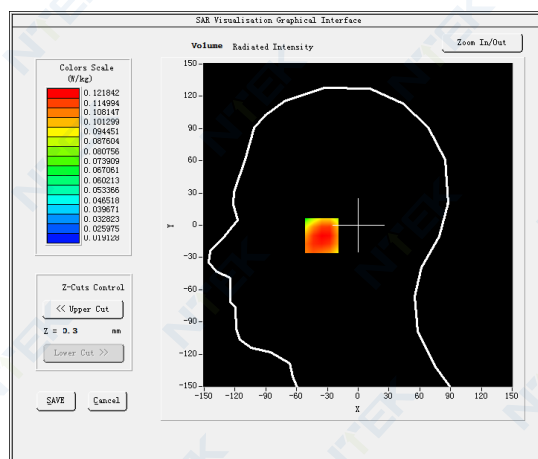
B. SAR Measurement Results

Frequency (MHz)	897.600000
Relative permittivity (real part)	41.642986
Relative permittivity (imaginary part)	19.801243
Conductivity (S/m)	0.987422
Variation (%)	0.850000

SURFACE SAR



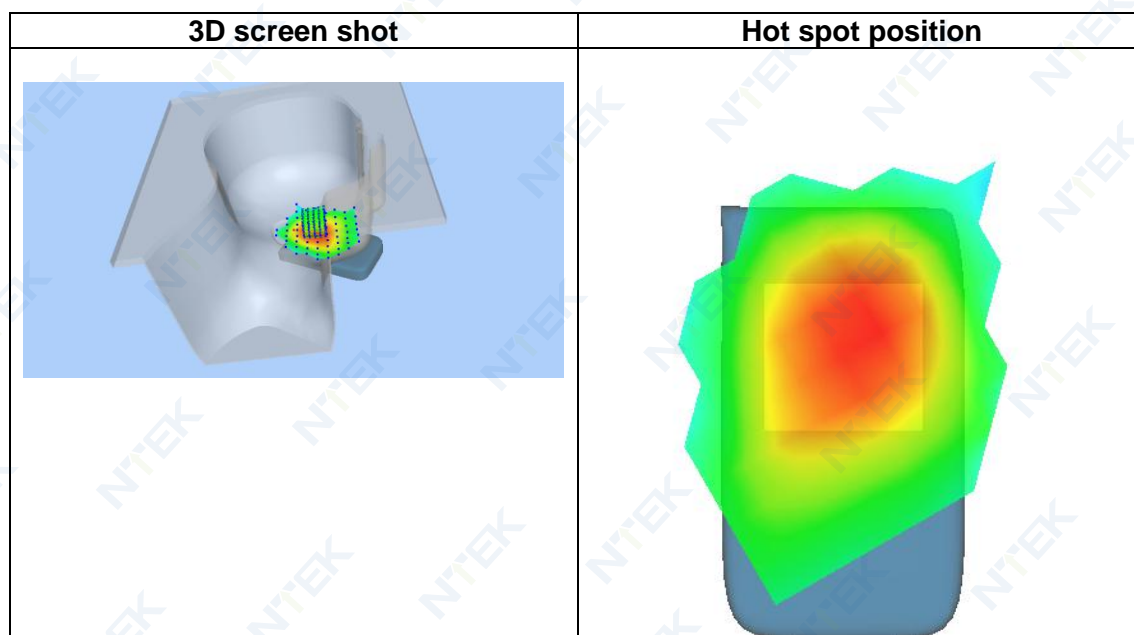
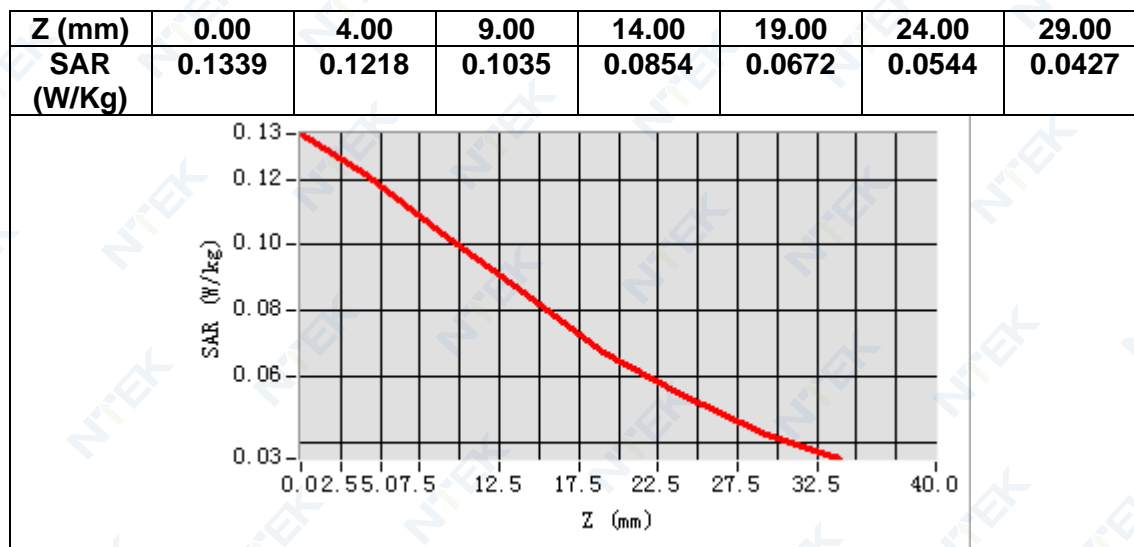
VOLUME SAR



Maximum location: X=-33.00, Y=-9.00

SAR Peak: 0.14 W/kg

SAR 10g (W/Kg)	0.093827
SAR 1g (W/Kg)	0.120618



MEASUREMENT 8

Date of measurement: 17/6/2024

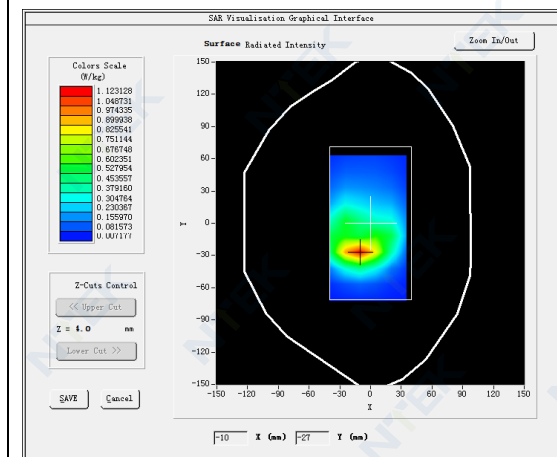
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>Band8 WCDMA900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>WCDMA (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.23</u>

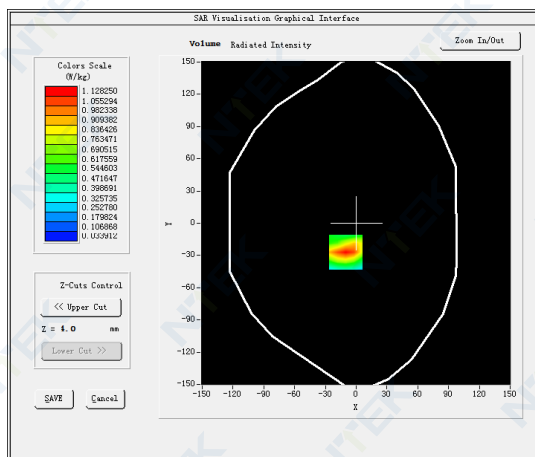
B. SAR Measurement Results

Frequency (MHz)	897.600000
Relative permittivity (real part)	41.642986
Relative permittivity (imaginary part)	19.801243
Conductivity (S/m)	0.987422
Variation (%)	2.010000

SURFACE SAR



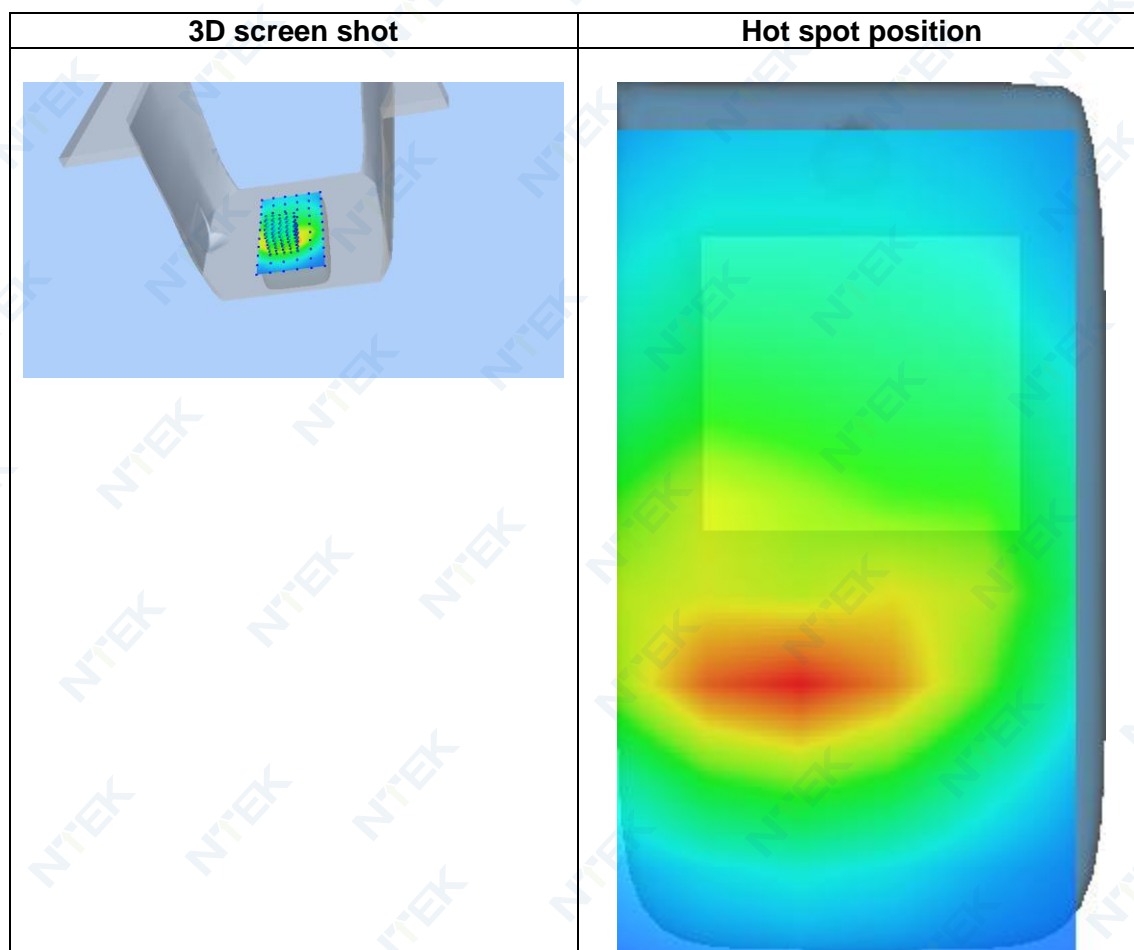
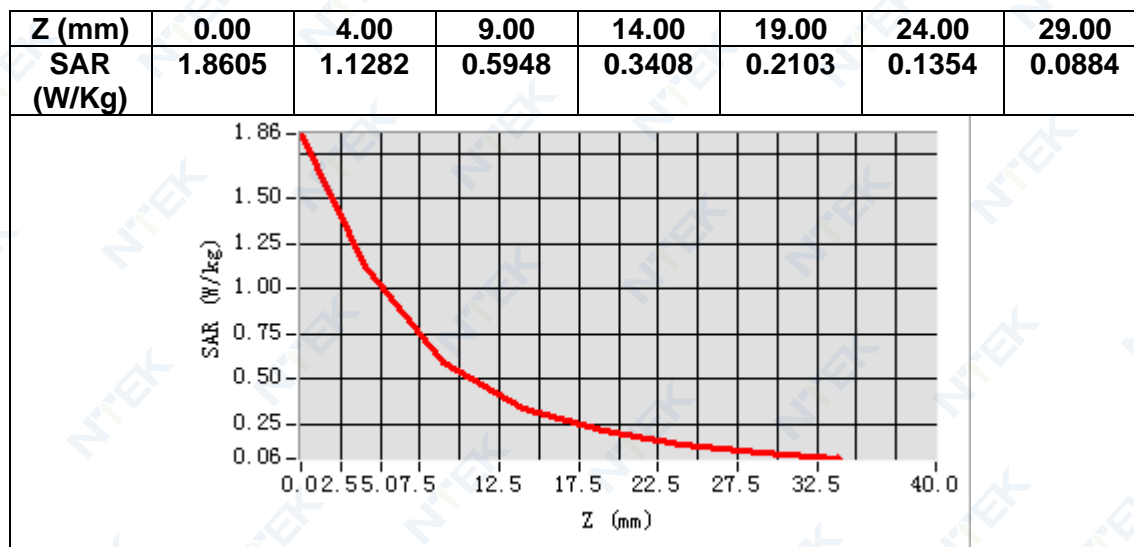
VOLUME SAR



Maximum location: X=-10.00, Y=-27.00

SAR Peak: 1.84 W/kg

SAR 10g (W/Kg)	0.551040
SAR 1g (W/Kg)	1.066392



MEASUREMENT 9

Date of measurement: 25/6/2024

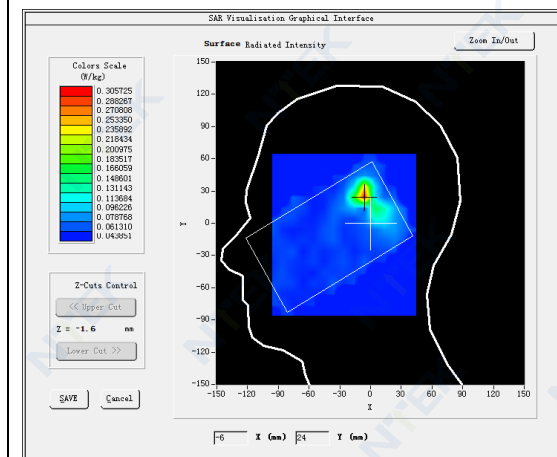
A. Experimental conditions.

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

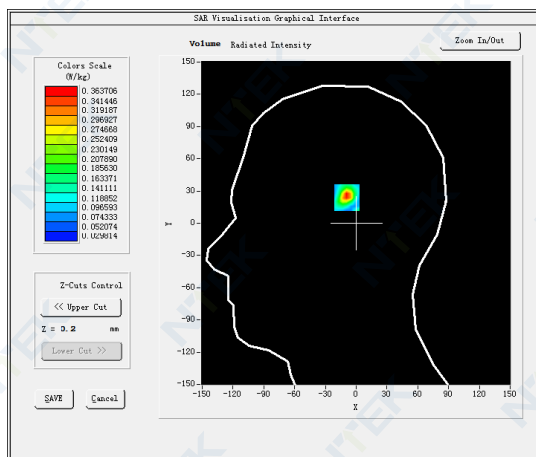
B. SAR Measurement Results

Frequency (MHz)	5190.000000
Relative permittivity (real part)	34.640204
Relative permittivity (imaginary part)	15.602393
Conductivity (S/m)	4.498689
Variation (%)	0.600000

SURFACE SAR



VOLUME SAR

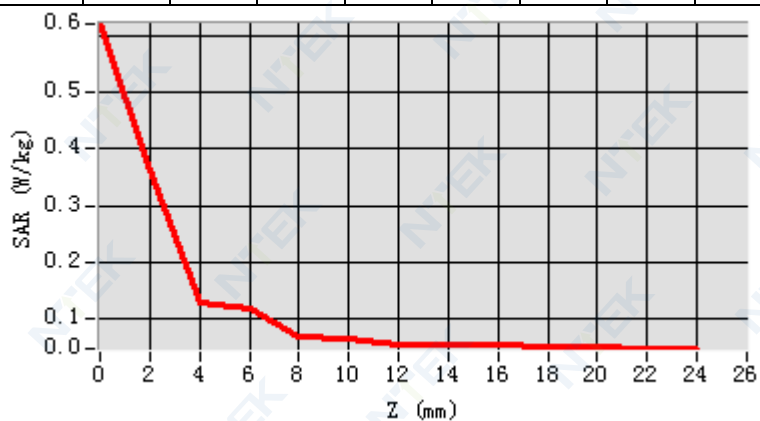


Maximum location: X=-7.00, Y=26.00

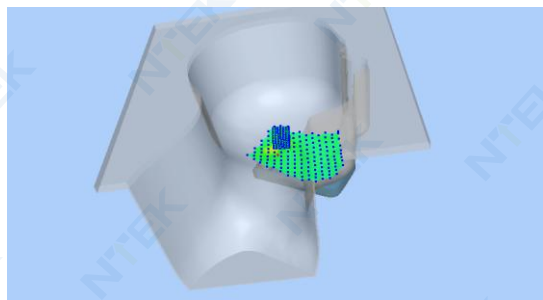
SAR Peak: 0.95 W/kg

SAR 10g (W/Kg)	0.100790
SAR 1g (W/Kg)	0.244602

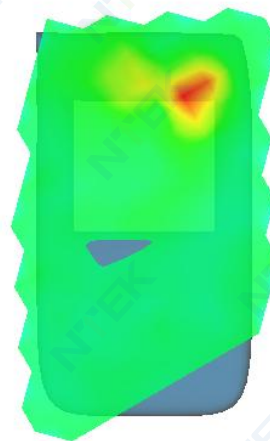
Z (m m)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
SAR (W/ Kg)	0.62 07	0.36 37	0.12 65	0.11 77	0.06 69	0.06 57	0.05 41	0.05 41	0.05 24	0.05 10	0.05 04	0.04 83



3D screen shot



Hot spot position



MEASUREMENT 10

Date of measurement: 26/6/2024

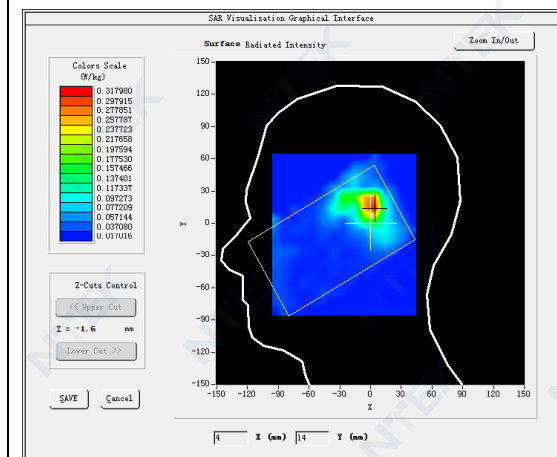
A. Experimental conditions.

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

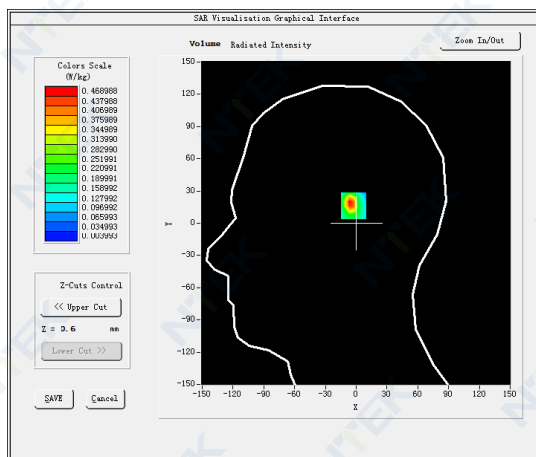
B. SAR Measurement Results

Frequency (MHz)	5775.000000
Relative permittivity (real part)	34.252077
Relative permittivity (imaginary part)	16.202177
Conductivity (S/m)	5.198198
Variation (%)	-0.100000

SURFACE SAR



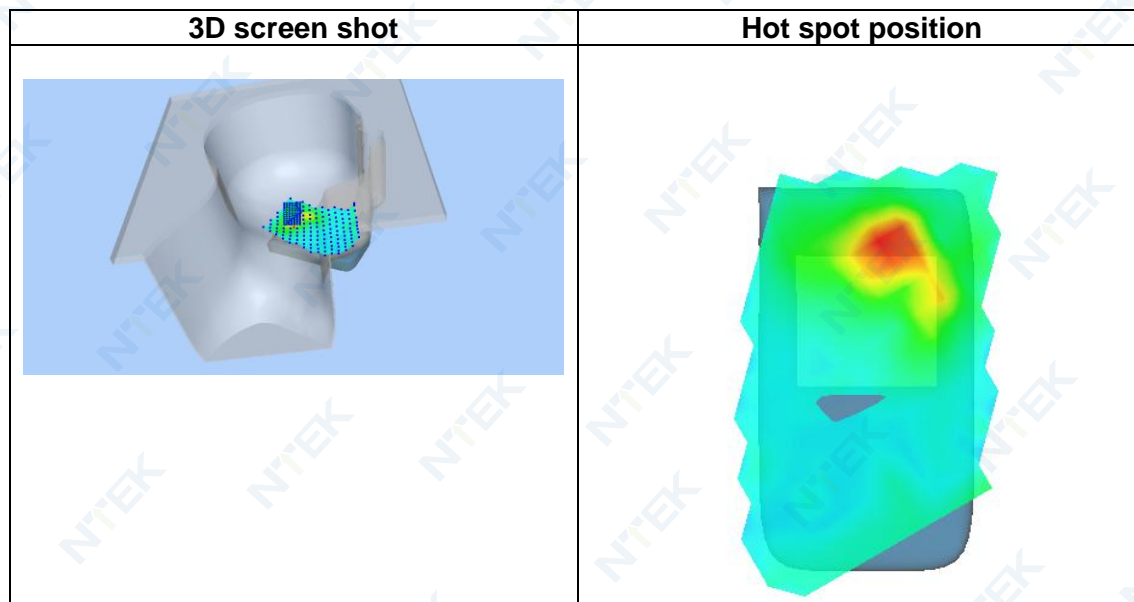
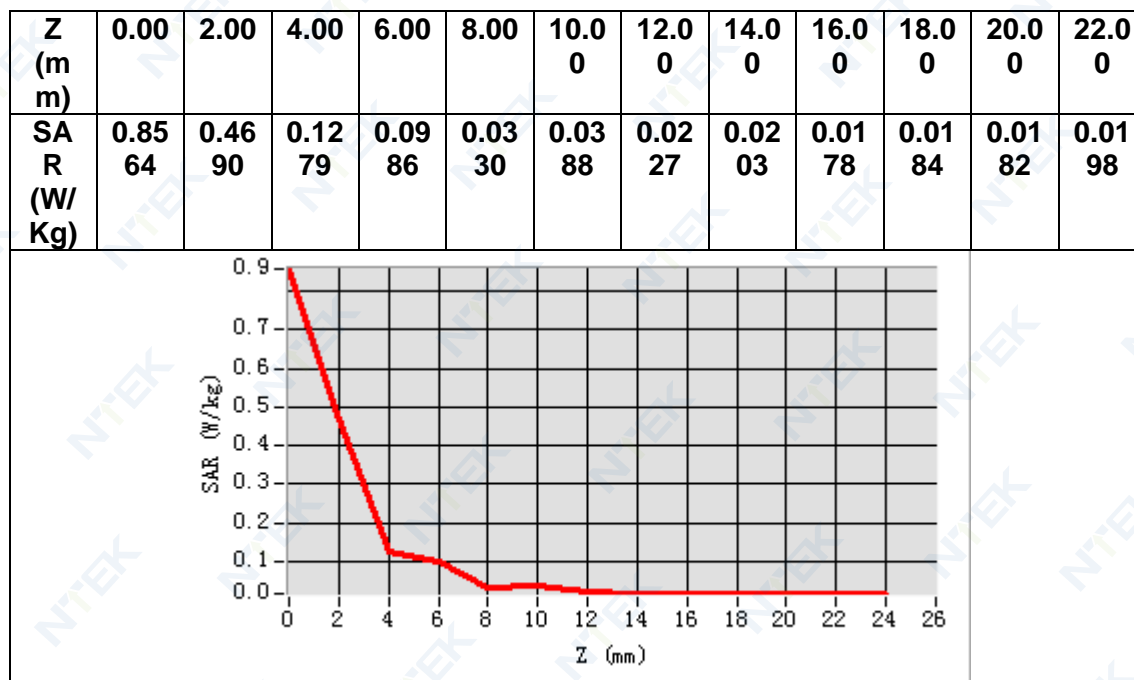
VOLUME SAR



Maximum location: X=2.00, Y=16.00

SAR Peak: 1.37 W/kg

SAR 10g (W/Kg)	0.145920
SAR 1g (W/Kg)	0.453068



MEASUREMENT 11

Date of measurement: 25/6/2024

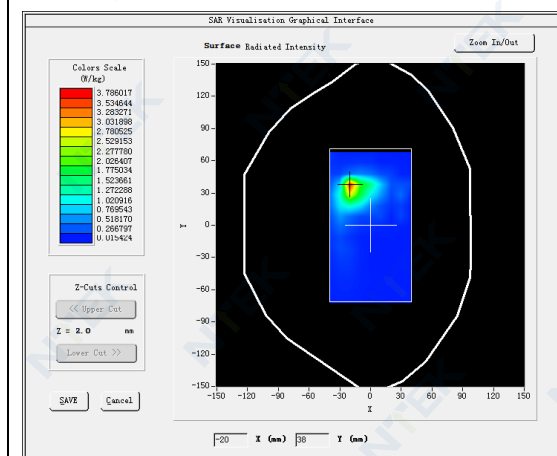
A. Experimental conditions.

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

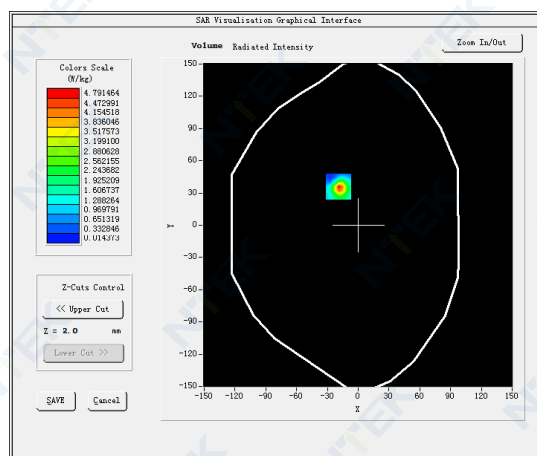
B. SAR Measurement Results

Frequency (MHz)	5190.000000
Relative permittivity (real part)	34.640204
Relative permittivity (imaginary part)	15.602393
Conductivity (S/m)	4.498689
Variation (%)	-4.290000

SURFACE SAR



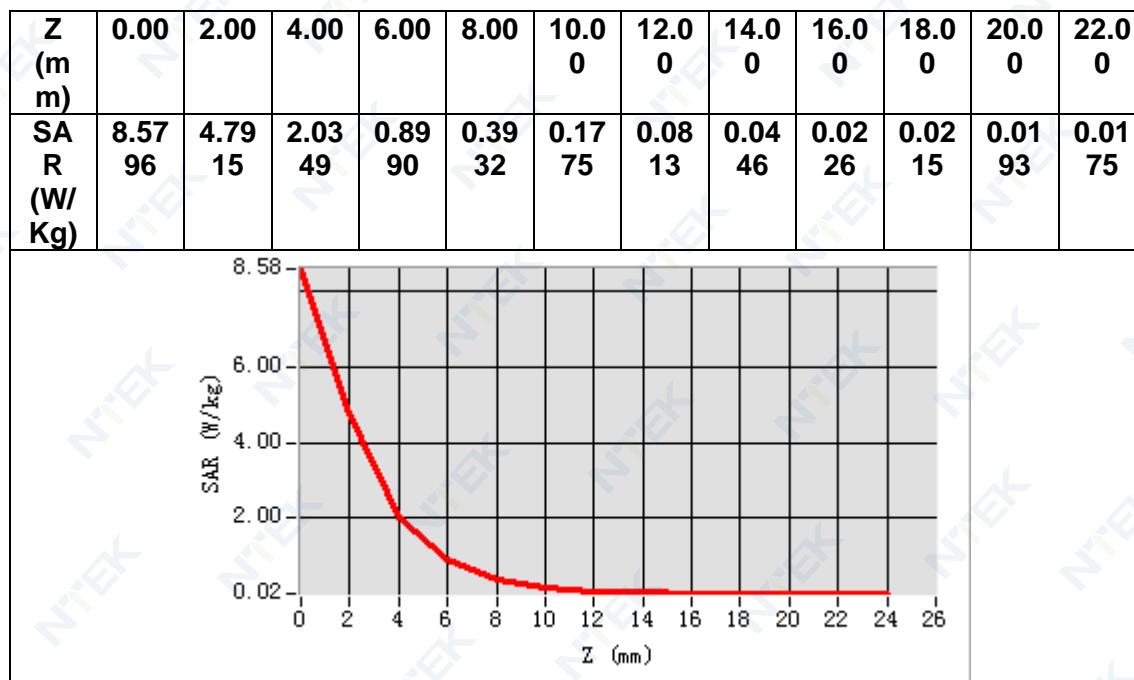
VOLUME SAR



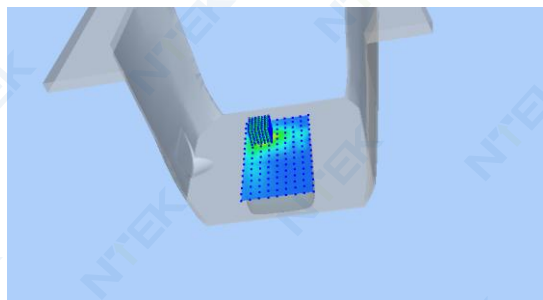
Maximum location: X=-19.00, Y=36.00

SAR Peak: 9.31 W/kg

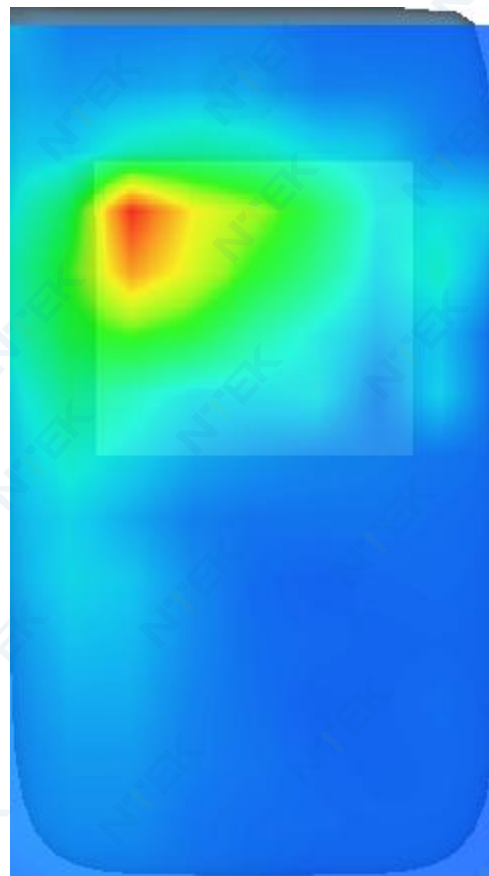
SAR 10g (W/Kg)	0.686665
SAR 1g (W/Kg)	2.318258



3D screen shot



Hot spot position



MEASUREMENT 12

Date of measurement: 26/6/2024

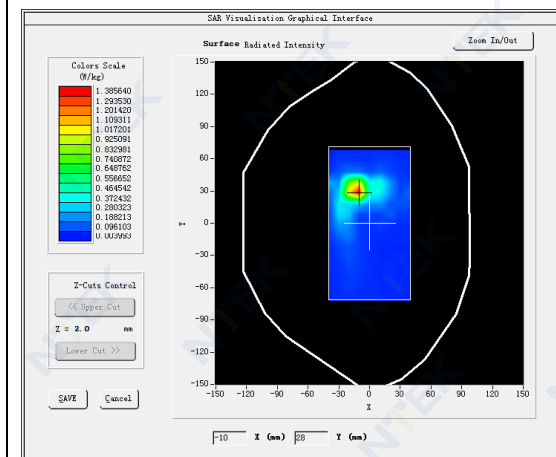
A. Experimental conditions.

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

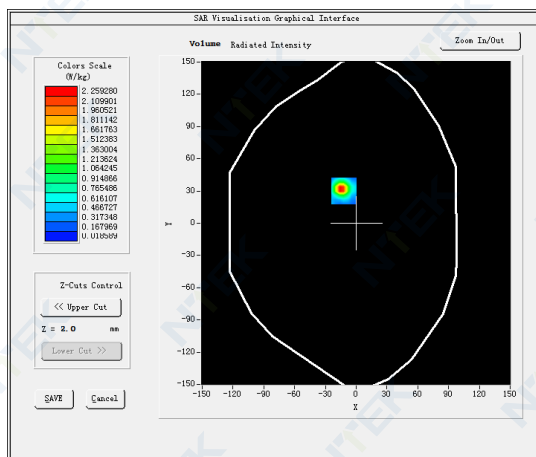
B. SAR Measurement Results

Frequency (MHz)	5775.000000
Relative permittivity (real part)	34.252077
Relative permittivity (imaginary part)	16.202177
Conductivity (S/m)	5.198198
Variation (%)	0.300000

SURFACE SAR



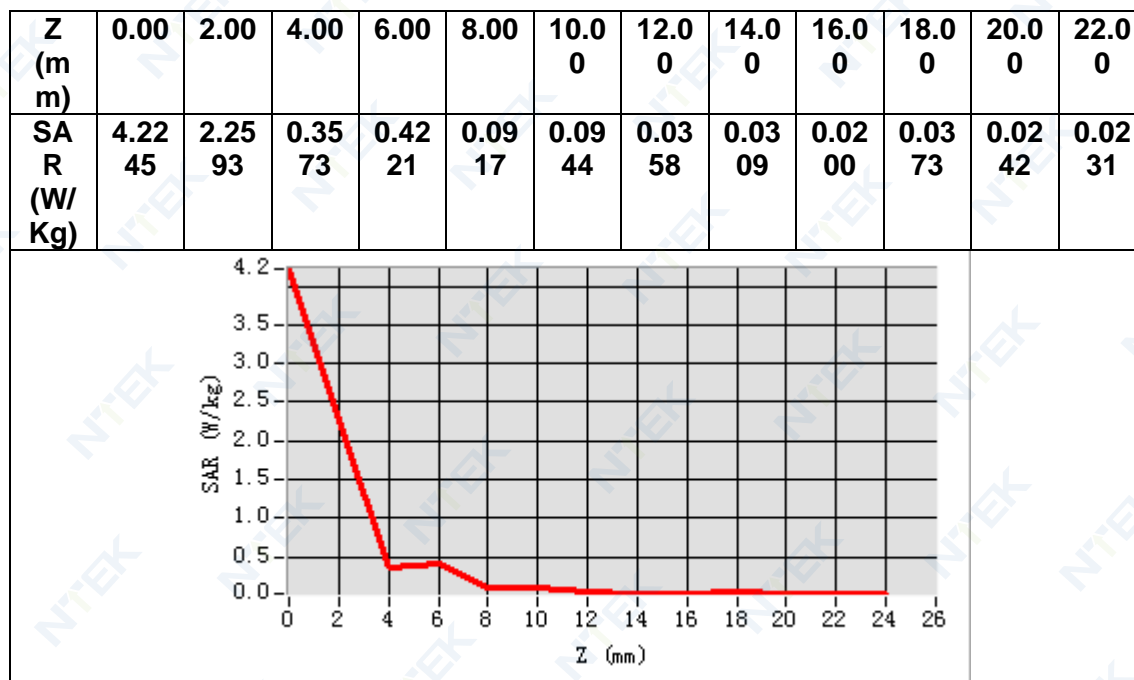
VOLUME SAR



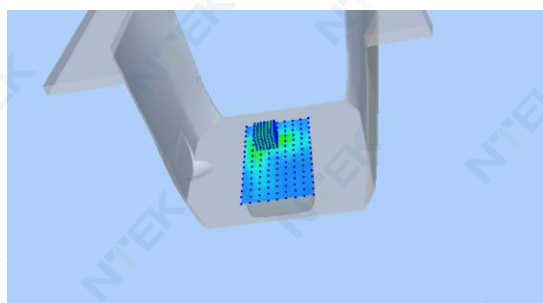
Maximum location: X=-12.00, Y=30.00

SAR Peak: 4.77 W/kg

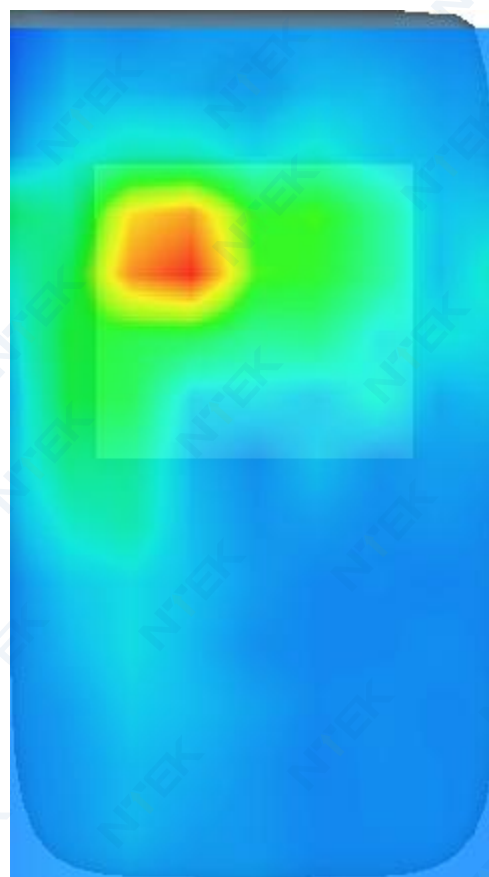
SAR 10g (W/Kg)	0.301326
SAR 1g (W/Kg)	1.172928



3D screen shot



Hot spot position



MEASUREMENT 13

Date of measurement: 19/6/2024

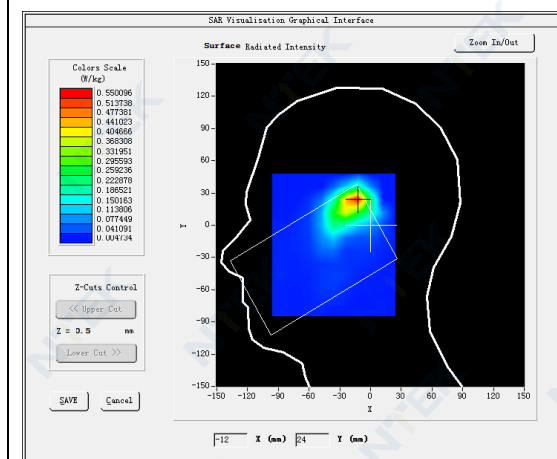
A. Experimental conditions.

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

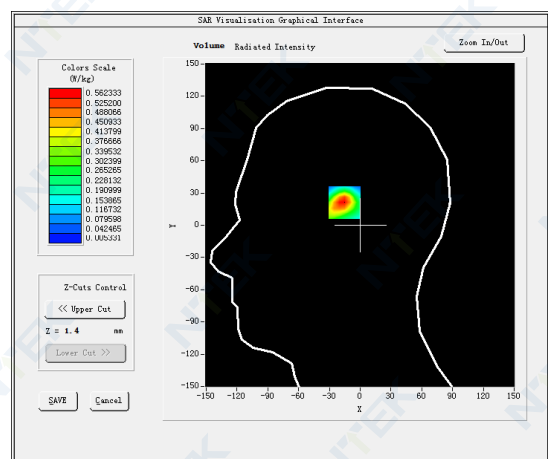
B. SAR Measurement Results

Frequency (MHz)	2442.000000
Relative permittivity (real part)	37.914288
Relative permittivity (imaginary part)	13.079079
Conductivity (S/m)	1.774395
Variation (%)	-3.850000

SURFACE SAR



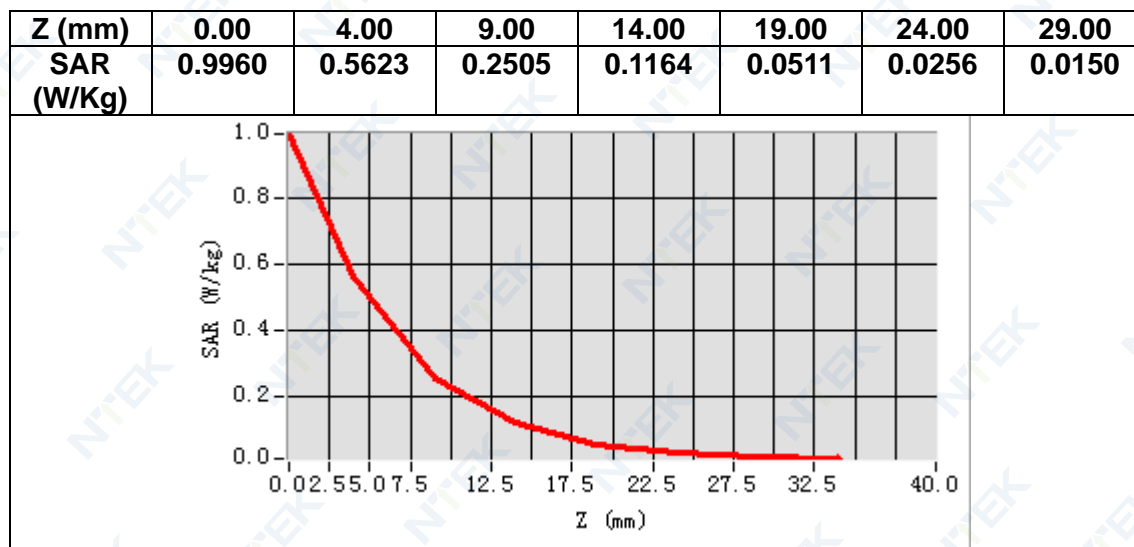
VOLUME SAR



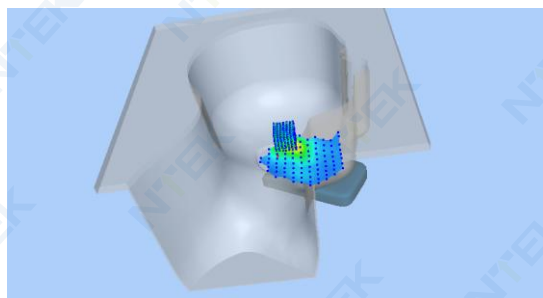
Maximum location: X=-14.00, Y=23.00

SAR Peak: 0.99 W/kg

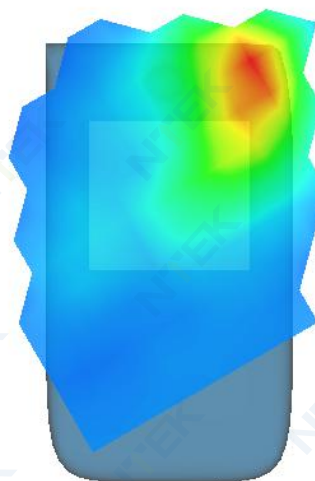
SAR 10g (W/Kg)	0.232263
SAR 1g (W/Kg)	0.522724



3D screen shot



Hot spot position



MEASUREMENT 14

Date of measurement: 19/6/2024

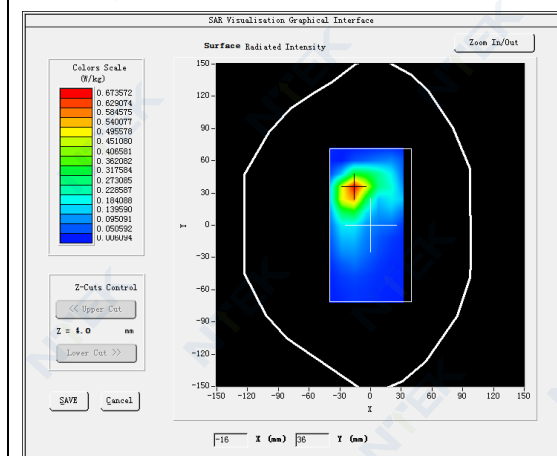
A. Experimental conditions.

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

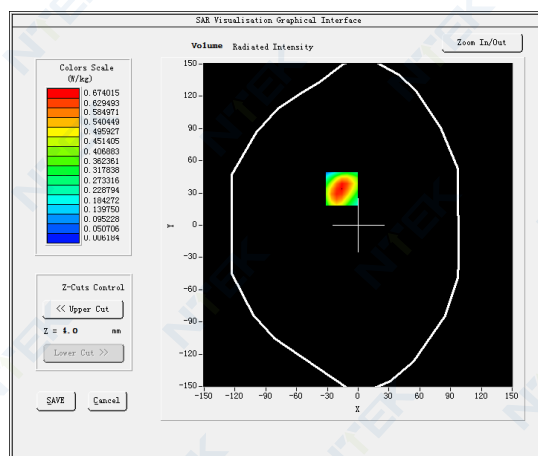
B. SAR Measurement Results

Frequency (MHz)	2442.000000
Relative permittivity (real part)	37.914288
Relative permittivity (imaginary part)	13.079079
Conductivity (S/m)	1.774395
Variation (%)	-0.520000

SURFACE SAR



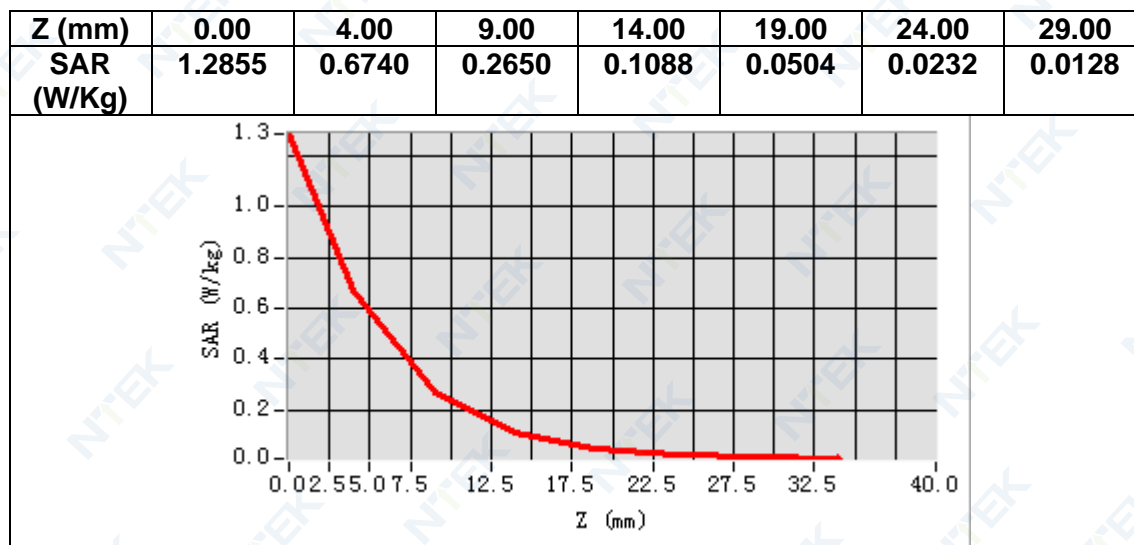
VOLUME SAR



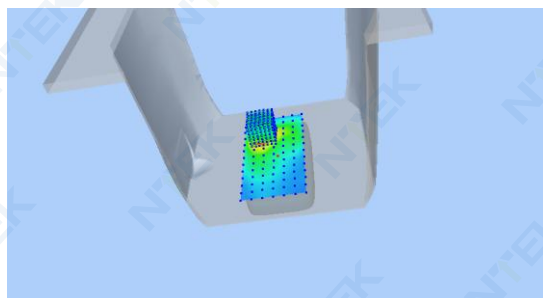
Maximum location: X=-16.00, Y=34.00

SAR Peak: 1.30 W/kg

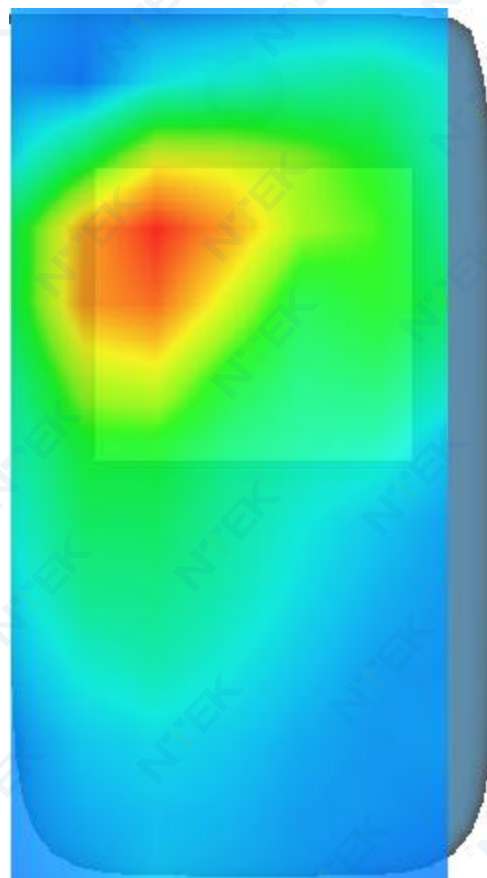
SAR 10g (W/Kg)	0.302621
SAR 1g (W/Kg)	0.659182



3D screen shot



Hot spot position



MEASUREMENT 15

Date of measurement: 27/6/2024

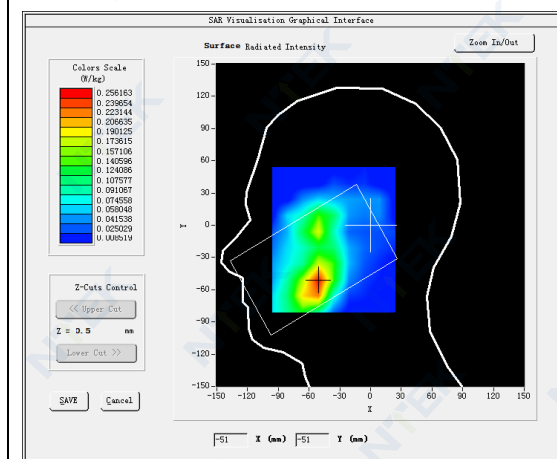
A. Experimental conditions.

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

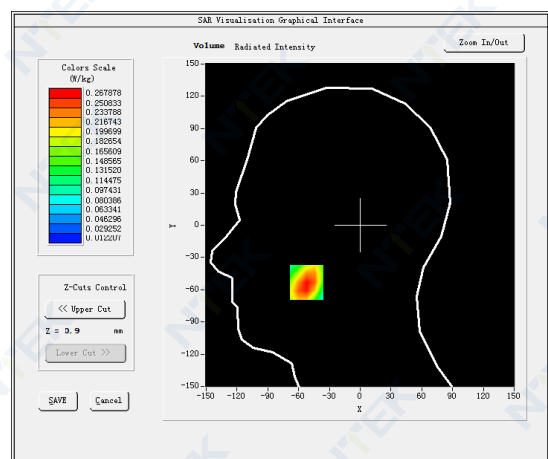
B. SAR Measurement Results

Frequency (MHz)	1950.000000
Relative permittivity (real part)	38.991436
Relative permittivity (imaginary part)	12.797650
Conductivity (S/m)	1.386412
Variation (%)	-2.040000

SURFACE SAR



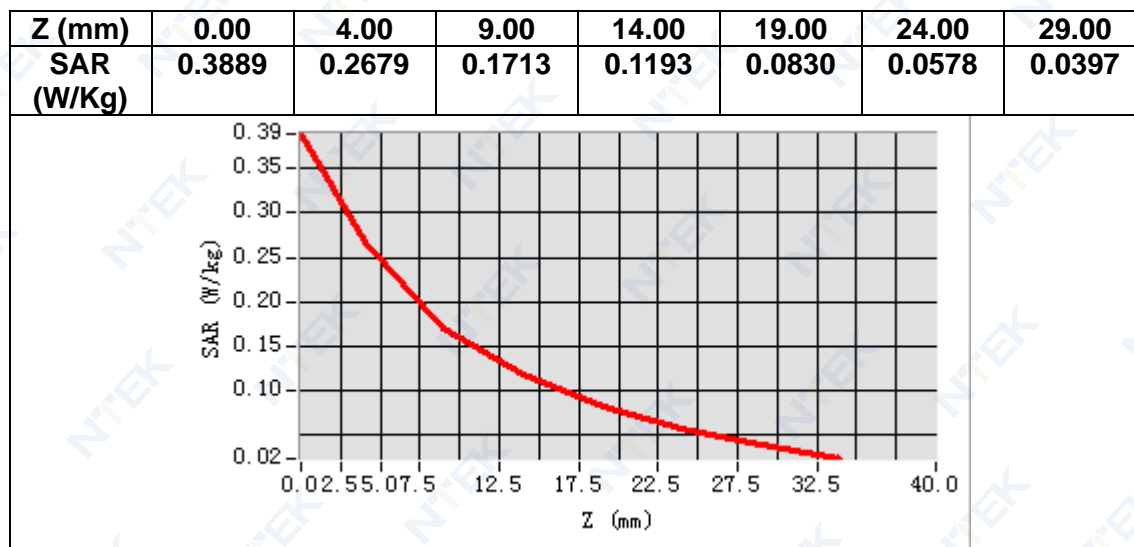
VOLUME SAR



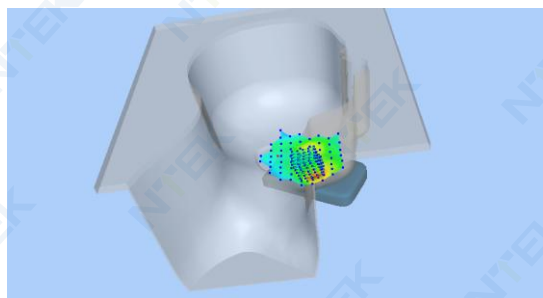
Maximum location: X=-52.00, Y=-53.00

SAR Peak: 0.39 W/kg

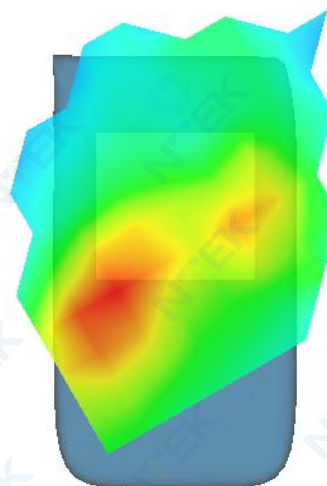
SAR 10g (W/Kg)	0.157100
SAR 1g (W/Kg)	0.260821



3D screen shot



Hot spot position



MEASUREMENT 16

Date of measurement: 27/6/2024

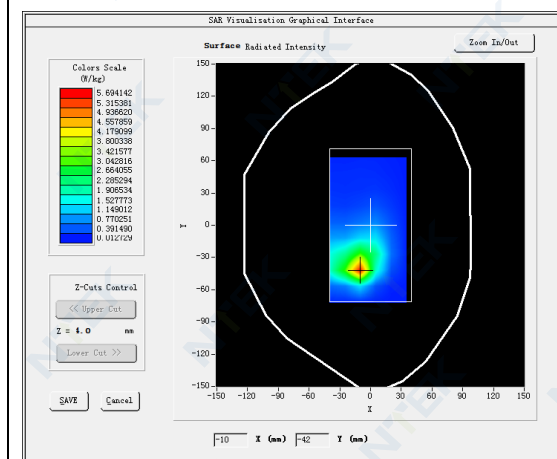
A. Experimental conditions.

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

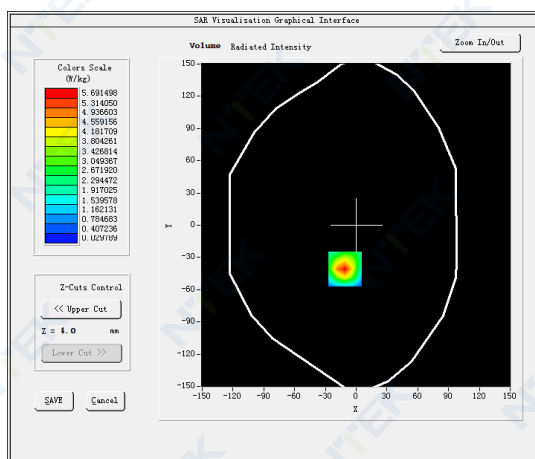
B. SAR Measurement Results

Frequency (MHz)	1970.000000
Relative permittivity (real part)	38.905636
Relative permittivity (imaginary part)	12.769650
Conductivity (S/m)	1.397567
Variation (%)	-0.390000

SURFACE SAR



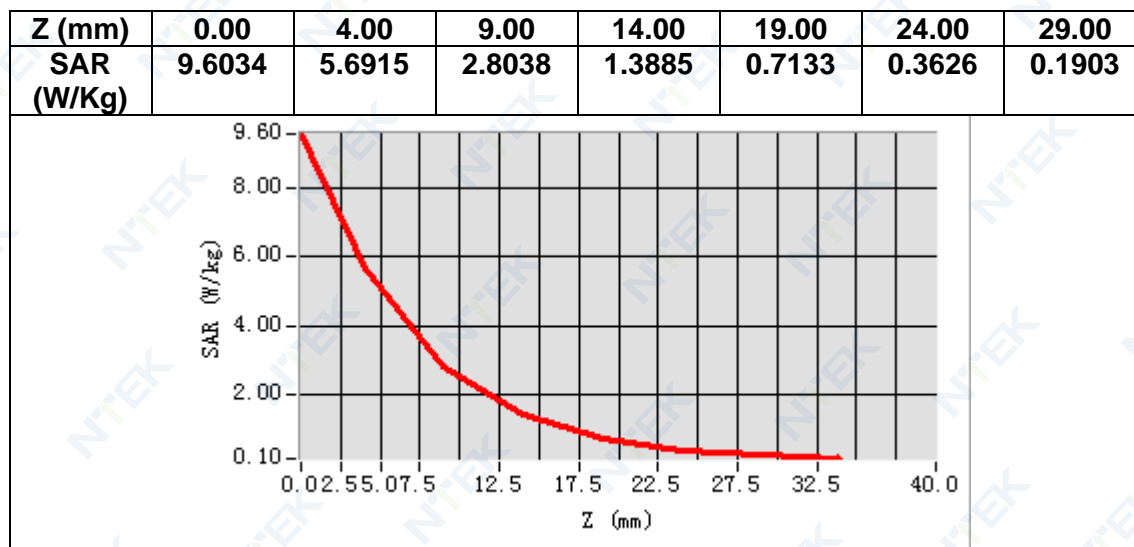
VOLUME SAR



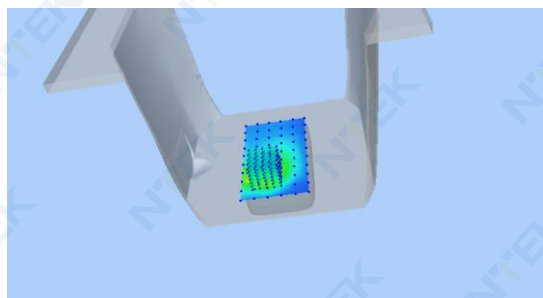
Maximum location: X=-11.00, Y=-41.00

SAR Peak: 9.54 W/kg

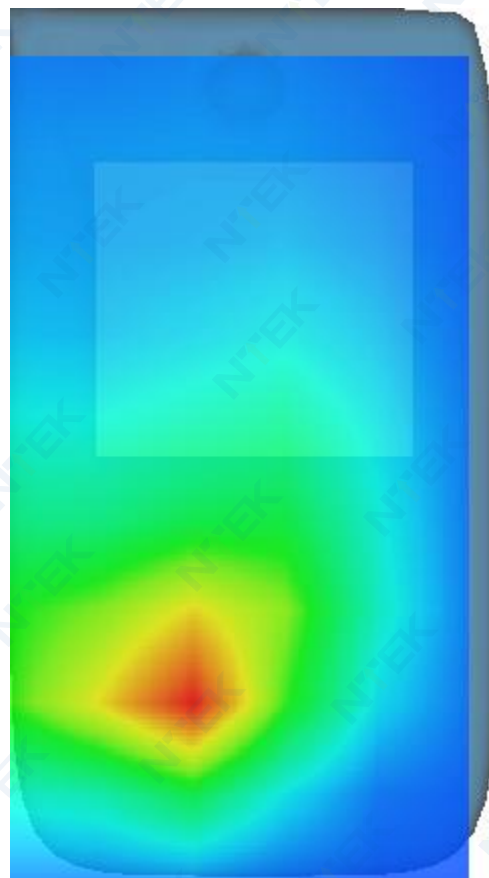
SAR 10g (W/Kg)	2.479168
SAR 1g (W/Kg)	5.309201



3D screen shot



Hot spot position



MEASUREMENT 17

Date of measurement: 29/6/2024

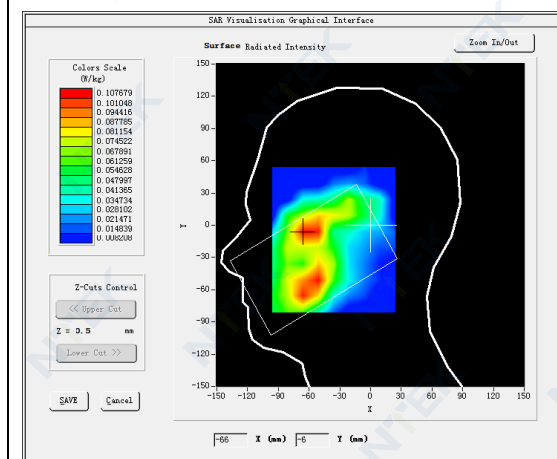
A. Experimental conditions.

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

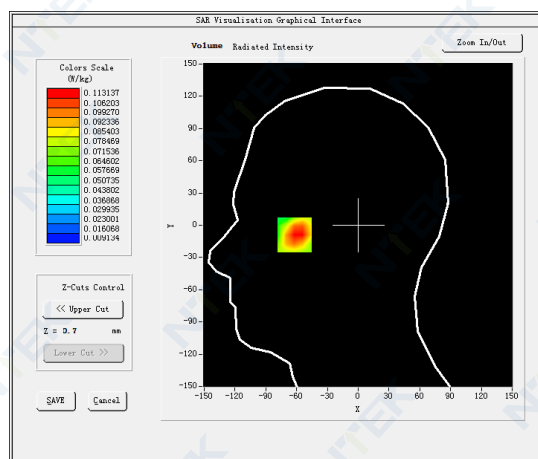
B. SAR Measurement Results

Frequency (MHz)	1747.500000
Relative permittivity (real part)	39.431602
Relative permittivity (imaginary part)	13.831405
Conductivity (S/m)	1.342415
Variation (%)	-0.970000

SURFACE SAR



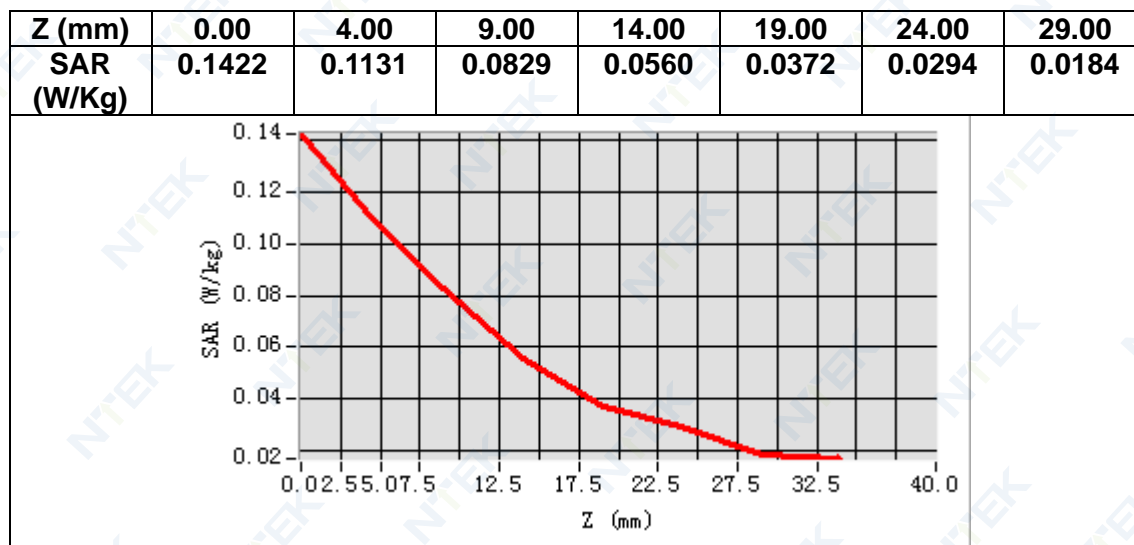
VOLUME SAR



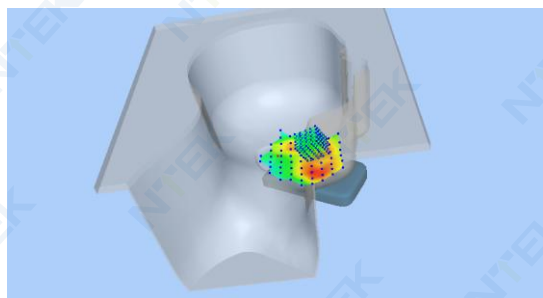
Maximum location: X=-62.00, Y=-6.00

SAR Peak: 0.16 W/kg

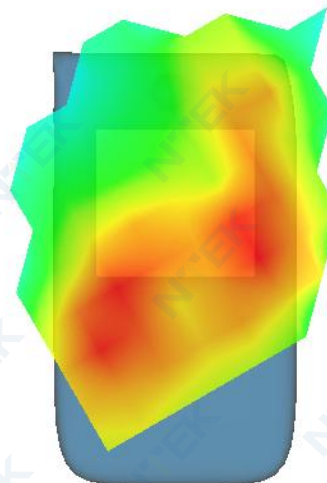
SAR 10g (W/Kg)	0.069848
SAR 1g (W/Kg)	0.108904



3D screen shot



Hot spot position



MEASUREMENT 18

Date of measurement: 29/6/2024

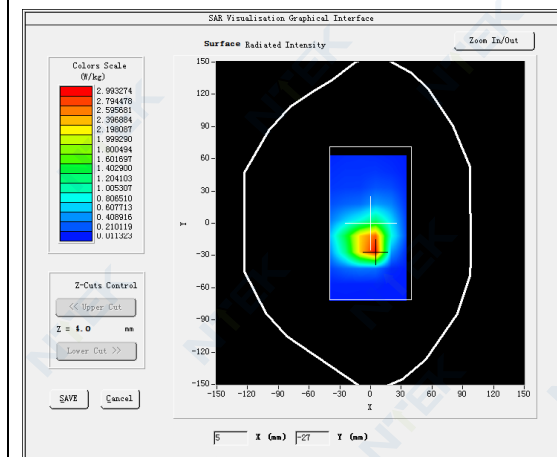
A. Experimental conditions.

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

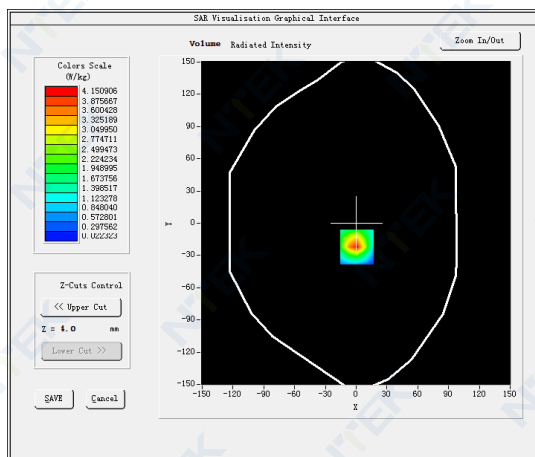
B. SAR Measurement Results

Frequency (MHz)	1747.500000
Relative permittivity (real part)	39.431602
Relative permittivity (imaginary part)	13.831405
Conductivity (S/m)	1.342415
Variation (%)	-0.020000

SURFACE SAR



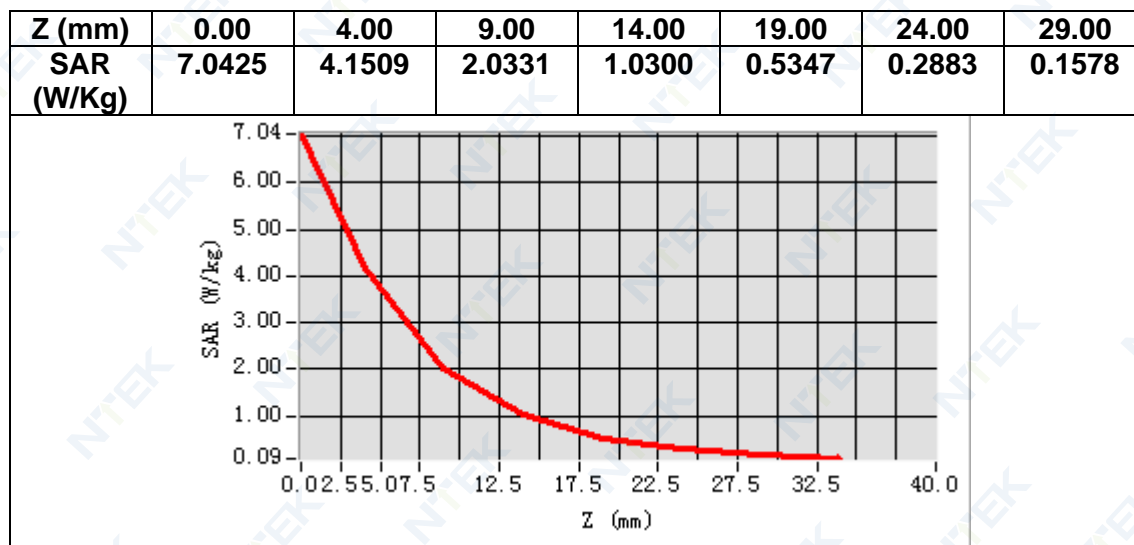
VOLUME SAR



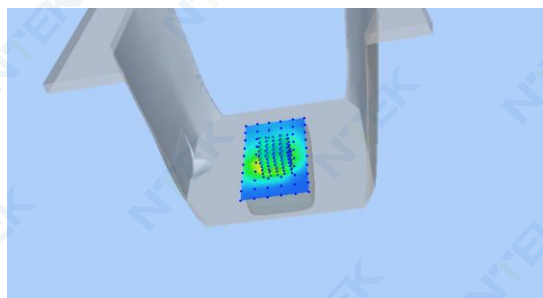
Maximum location: X=1.00, Y=-22.00

SAR Peak: 6.97 W/kg

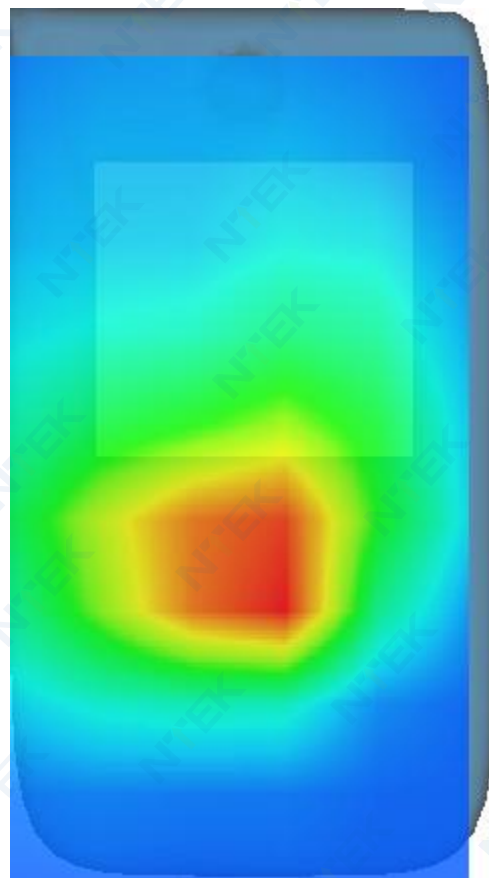
SAR 10g (W/Kg)	1.797079
SAR 1g (W/Kg)	3.805682



3D screen shot



Hot spot position



MEASUREMENT 19

Date of measurement: 18/6/2024

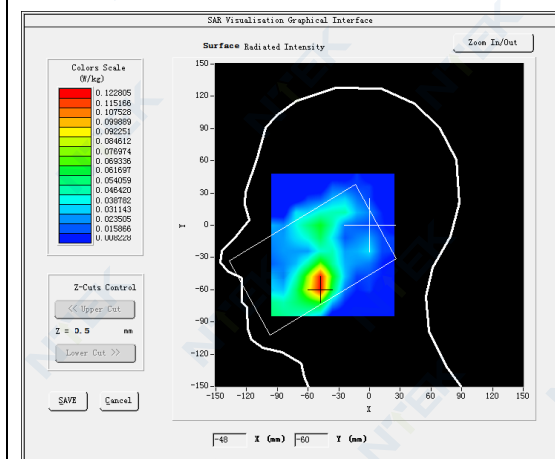
A. Experimental conditions.

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

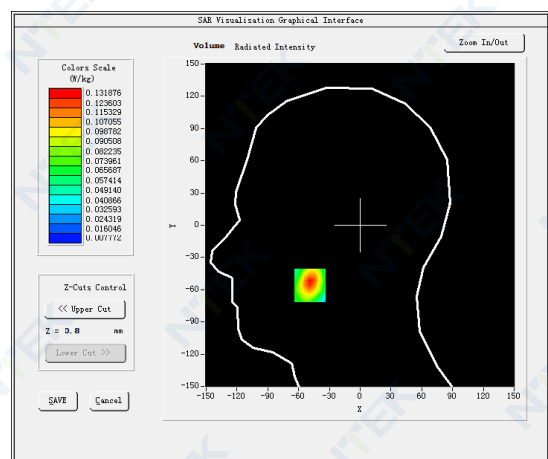
B. SAR Measurement Results

Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.361263
Relative permittivity (imaginary part)	13.716830
Conductivity (S/m)	1.931787
Variation (%)	1.990000

SURFACE SAR



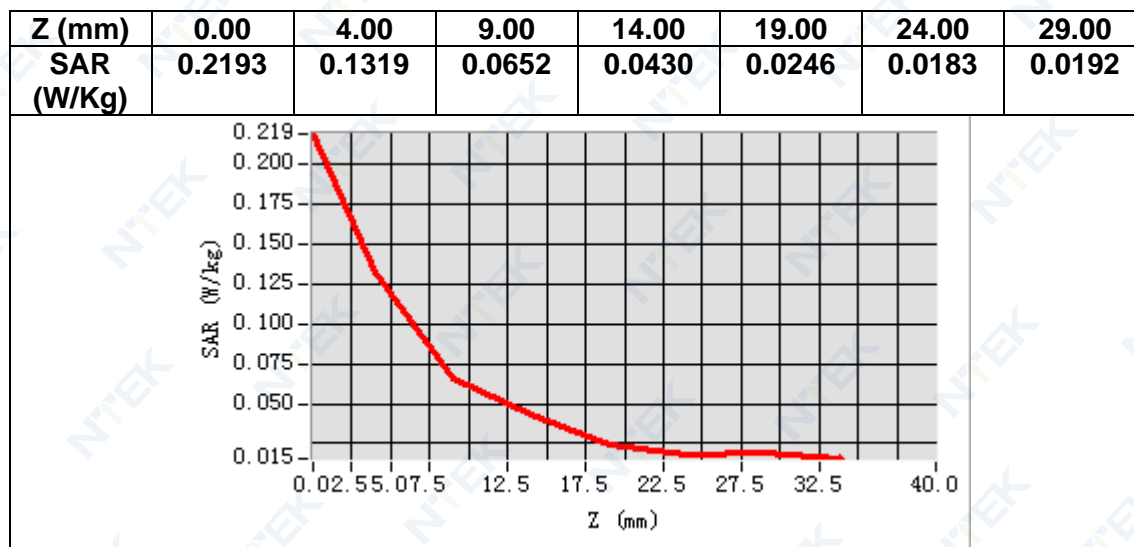
VOLUME SAR



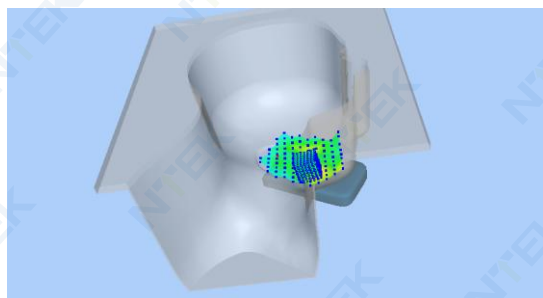
Maximum location: X=-49.00, Y=-56.00

SAR Peak: 0.21 W/kg

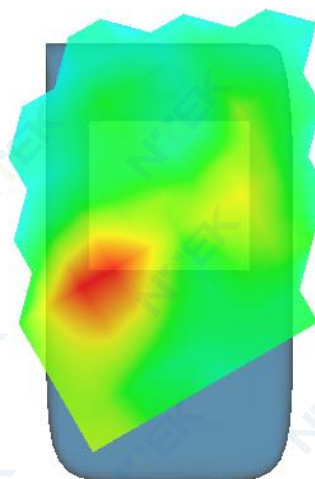
SAR 10g (W/Kg)	0.065044
SAR 1g (W/Kg)	0.122623



3D screen shot



Hot spot position



MEASUREMENT 20

Date of measurement: 18/6/2024

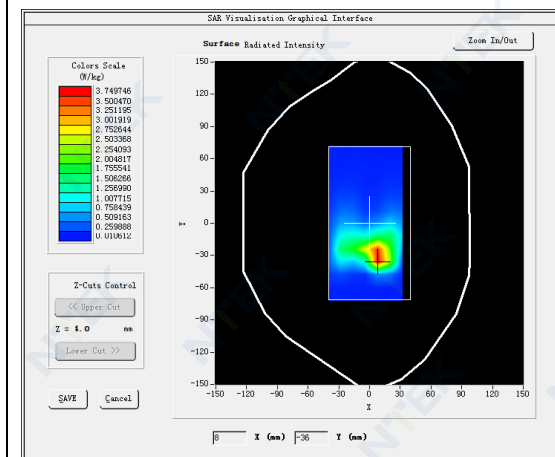
A. Experimental conditions.

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

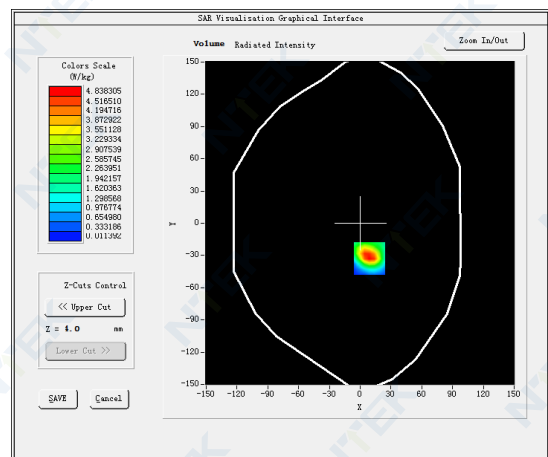
B. SAR Measurement Results

Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.361263
Relative permittivity (imaginary part)	13.716830
Conductivity (S/m)	1.931787
Variation (%)	-2.990000

SURFACE SAR



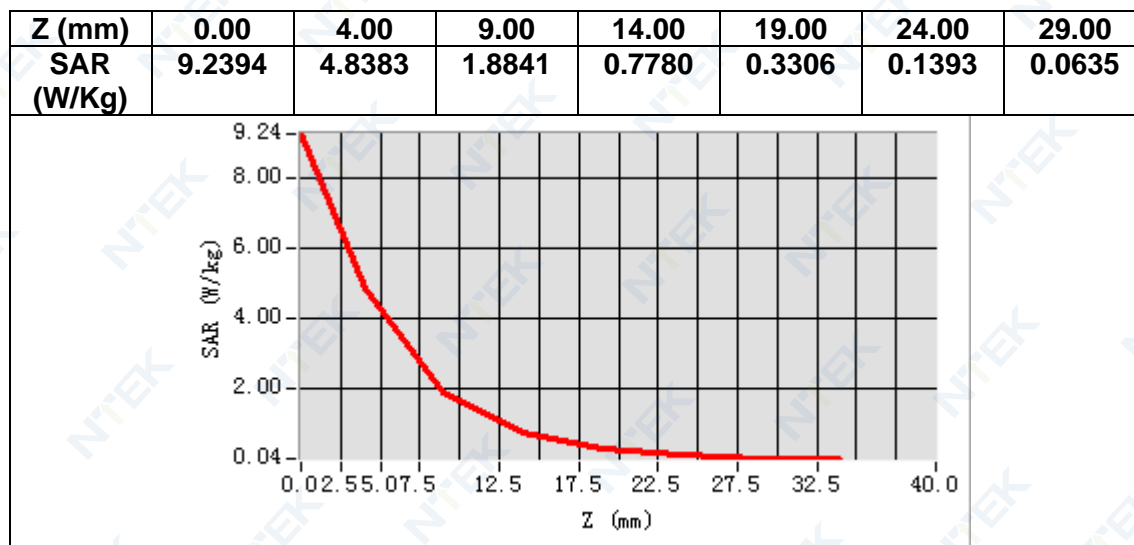
VOLUME SAR



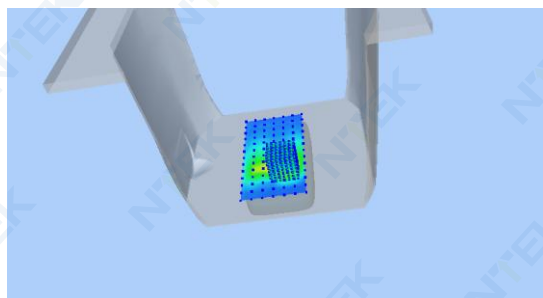
Maximum location: X=9.00, Y=-33.00

SAR Peak: 9.45 W/kg

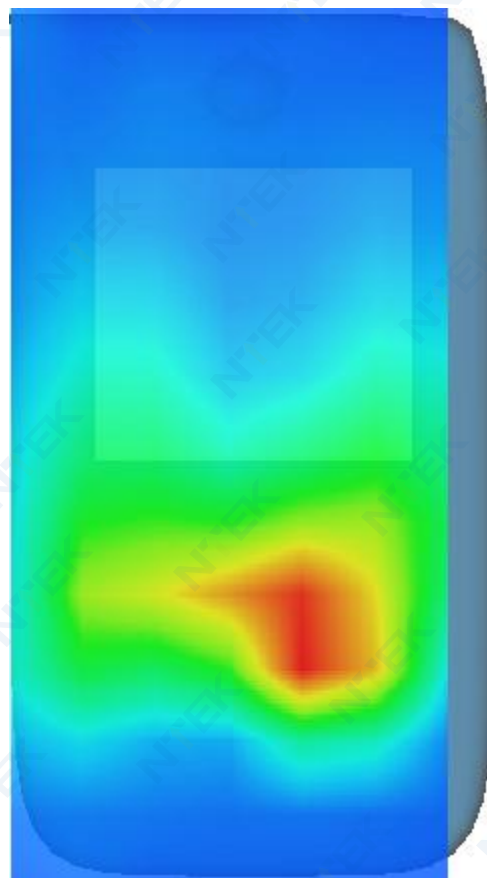
SAR 10g (W/Kg)	1.816474
SAR 1g (W/Kg)	4.625550



3D screen shot



Hot spot position



MEASUREMENT 21

Date of measurement: 17/6/2024

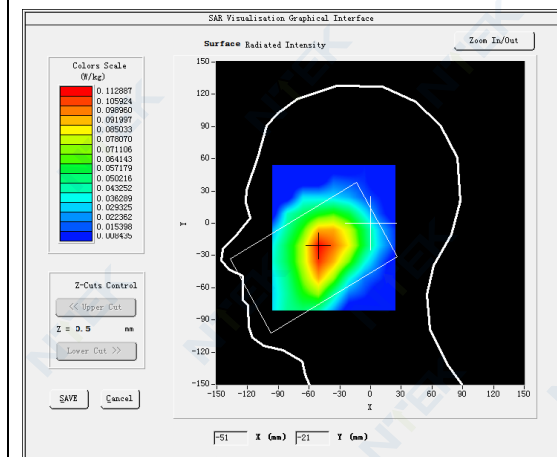
A. Experimental conditions.

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

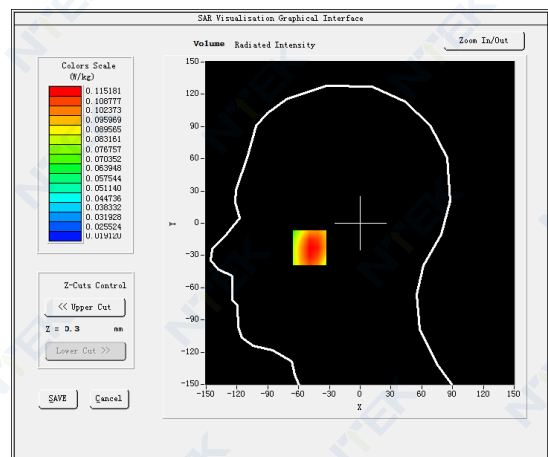
B. SAR Measurement Results

Frequency (MHz)	897.500000
Relative permittivity (real part)	41.657627
Relative permittivity (imaginary part)	19.761824
Conductivity (S/m)	0.984798
Variation (%)	-3.200000

SURFACE SAR



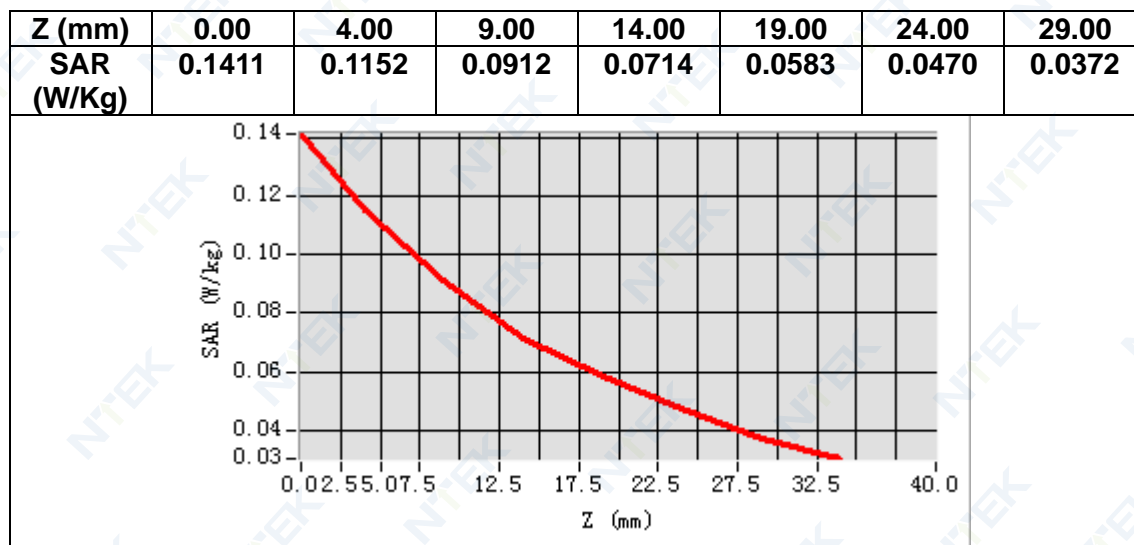
VOLUME SAR



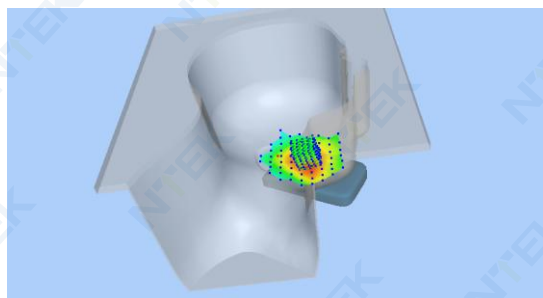
Maximum location: X=-49.00, Y=-23.00

SAR Peak: 0.15 W/kg

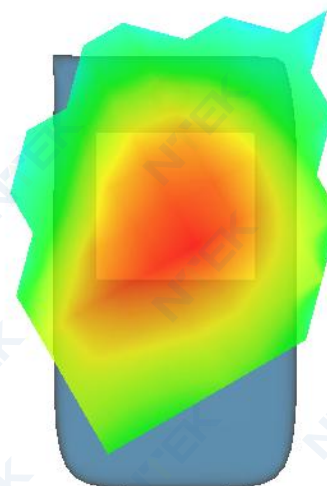
SAR 10g (W/Kg)	0.085359
SAR 1g (W/Kg)	0.114578



3D screen shot



Hot spot position



MEASUREMENT 22

Date of measurement: 17/6/2024

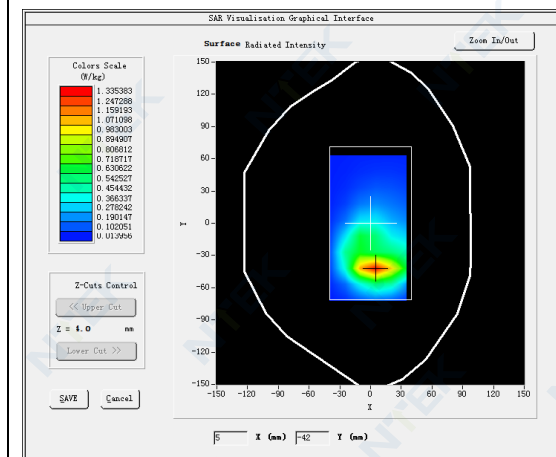
A. Experimental conditions.

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

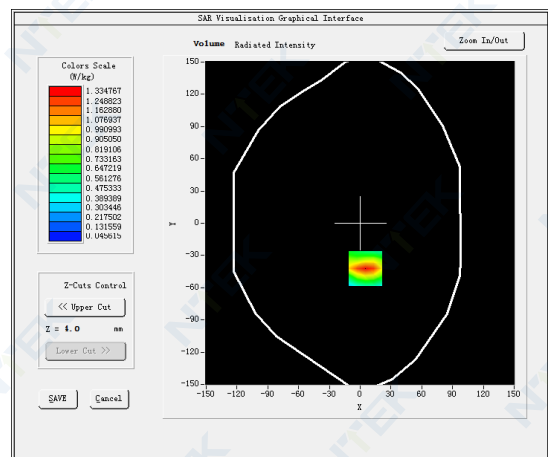
B. SAR Measurement Results

Frequency (MHz)	897.500000
Relative permittivity (real part)	41.657627
Relative permittivity (imaginary part)	19.761824
Conductivity (S/m)	0.984798
Variation (%)	-0.130000

SURFACE SAR



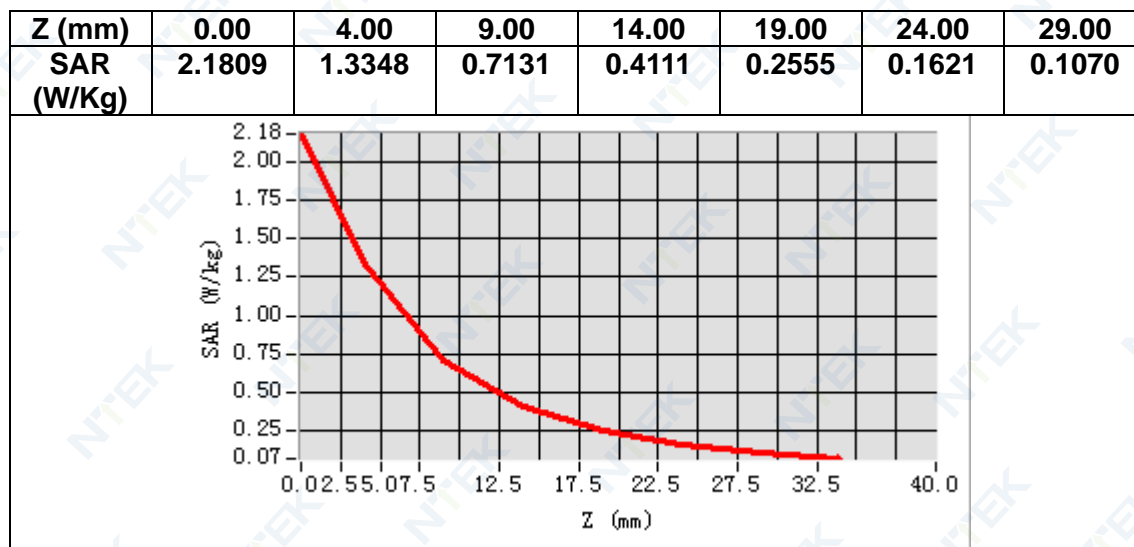
VOLUME SAR



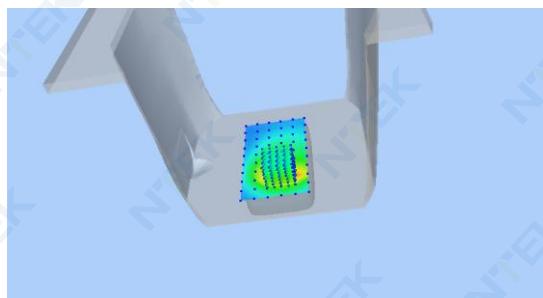
Maximum location: X=5.00, Y=-42.00

SAR Peak: 2.16 W/kg

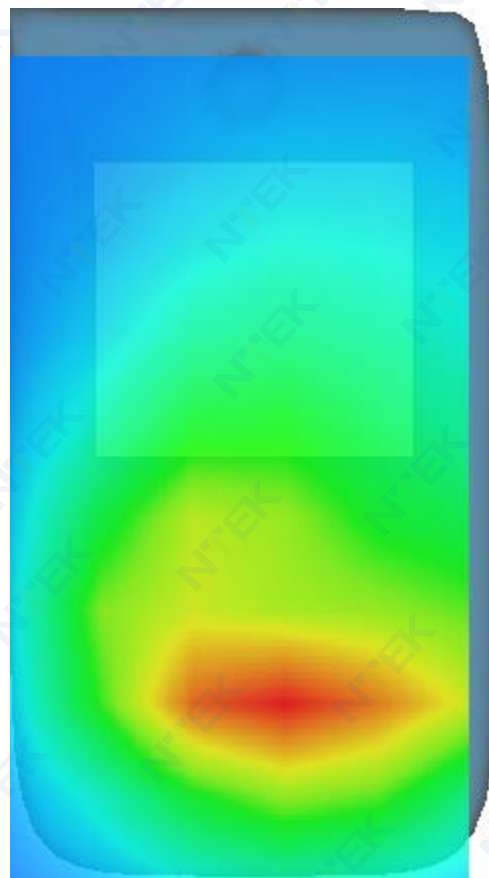
SAR 10g (W/Kg)	0.653642
SAR 1g (W/Kg)	1.255773



3D screen shot



Hot spot position



MEASUREMENT 23

Date of measurement: 17/6/2024

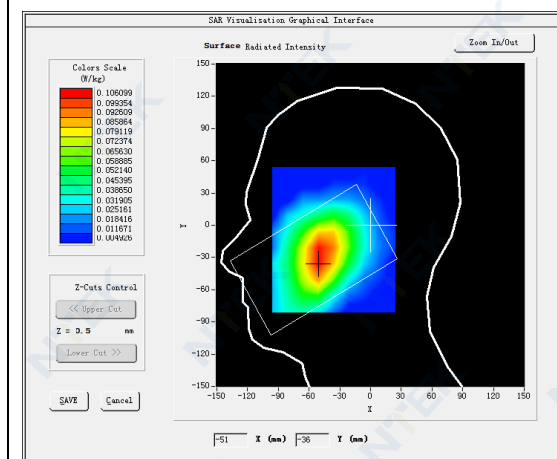
A. Experimental conditions.

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

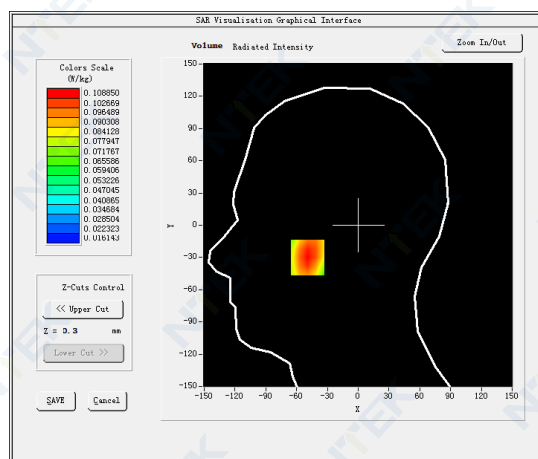
B. SAR Measurement Results

Frequency (MHz)	847.000000
Relative permittivity (real part)	42.276428
Relative permittivity (imaginary part)	19.546923
Conductivity (S/m)	0.919791
Variation (%)	-3.330000

SURFACE SAR



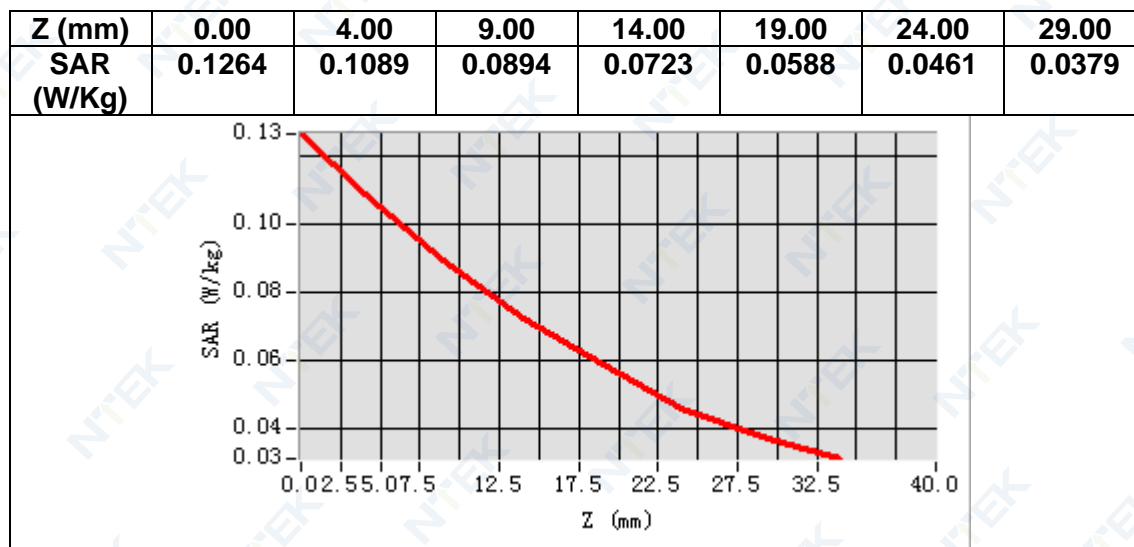
VOLUME SAR



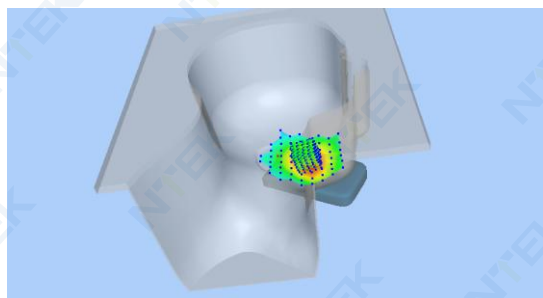
Maximum location: X=-49.00, Y=-30.00

SAR Peak: 0.13 W/kg

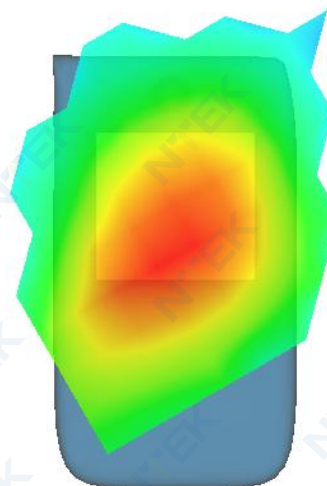
SAR 10g (W/Kg)	0.080253
SAR 1g (W/Kg)	0.105202



3D screen shot



Hot spot position



MEASUREMENT 24

Date of measurement: 17/6/2024

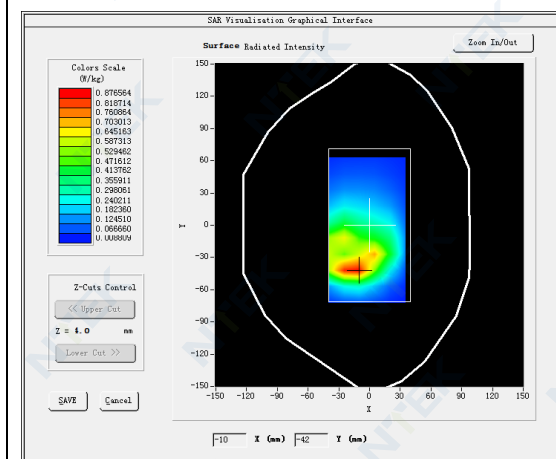
A. Experimental conditions.

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

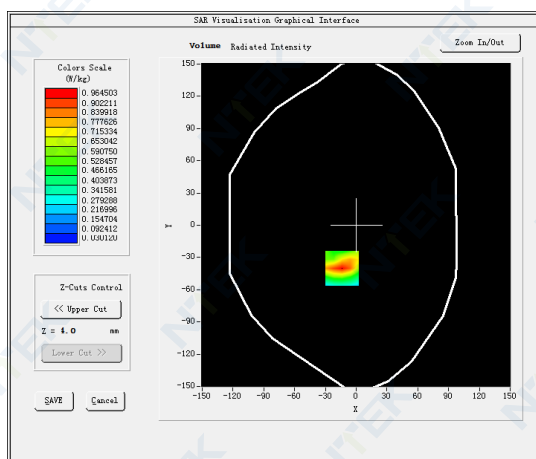
B. SAR Measurement Results

Frequency (MHz)	847.000000
Relative permittivity (real part)	42.276428
Relative permittivity (imaginary part)	19.546923
Conductivity (S/m)	0.919791
Variation (%)	0.320000

SURFACE SAR



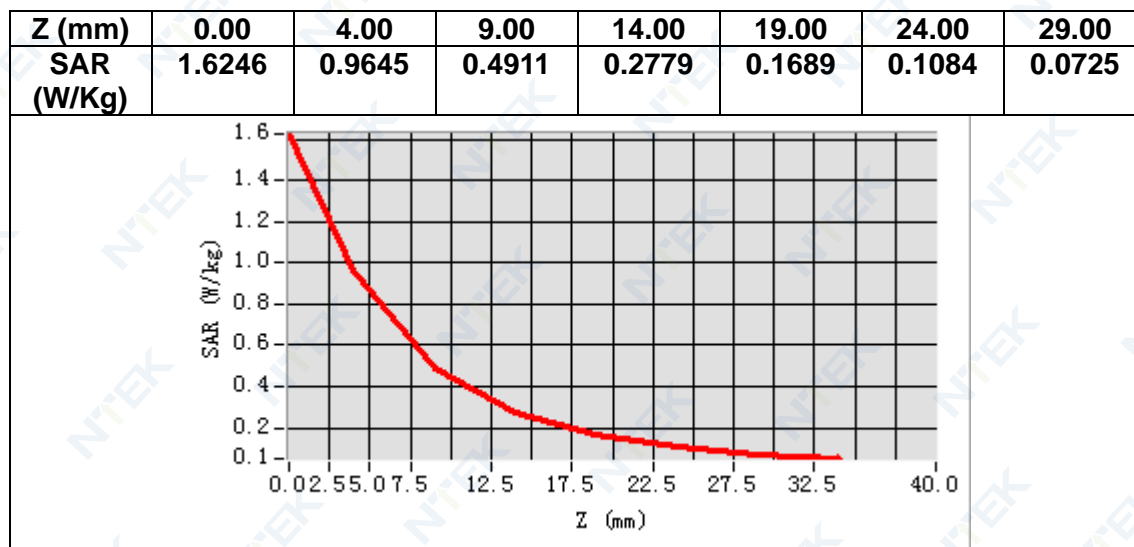
VOLUME SAR



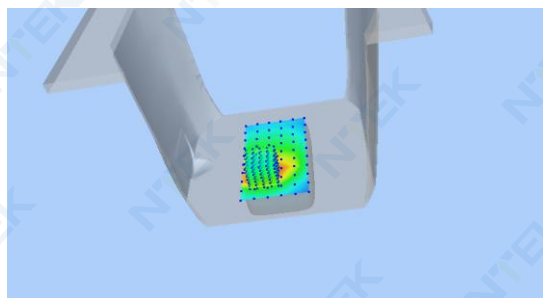
Maximum location: X=-14.00, Y=-40.00

SAR Peak: 1.61 W/kg

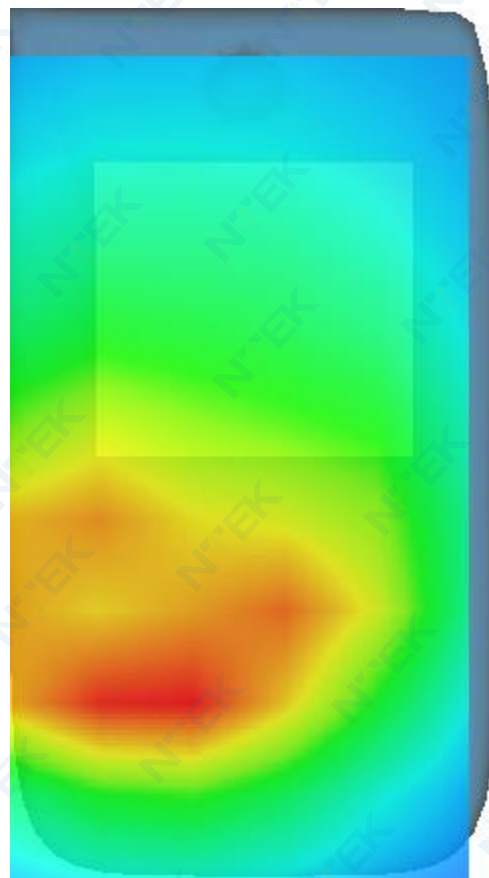
SAR 10g (W/Kg)	0.463783
SAR 1g (W/Kg)	0.901543



3D screen shot



Hot spot position



MEASUREMENT 25

Date of measurement: 18/6/2024

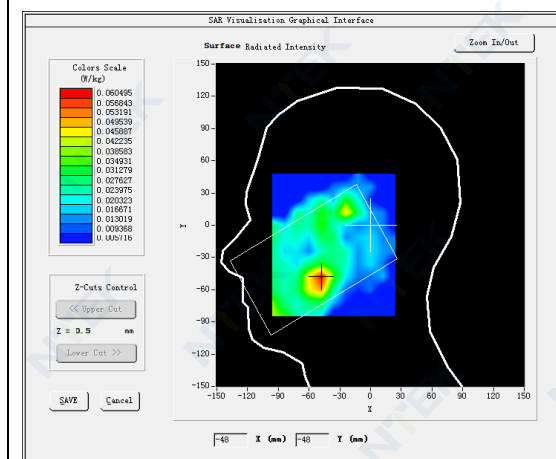
A. Experimental conditions.

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

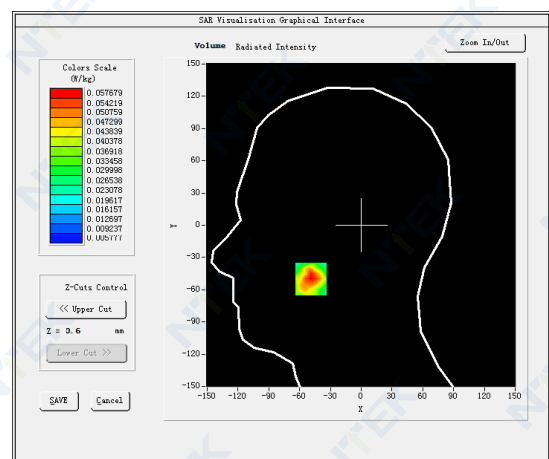
B. SAR Measurement Results

Frequency (MHz)	2605.000000
Relative permittivity (real part)	38.980863
Relative permittivity (imaginary part)	13.899230
Conductivity (S/m)	2.011527
Variation (%)	-3.700000

SURFACE SAR



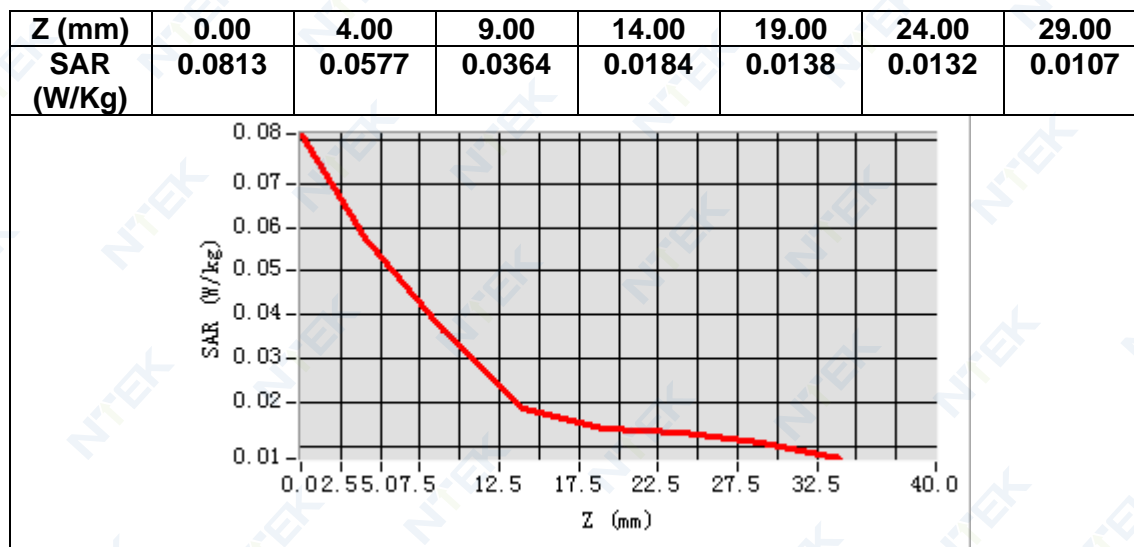
VOLUME SAR



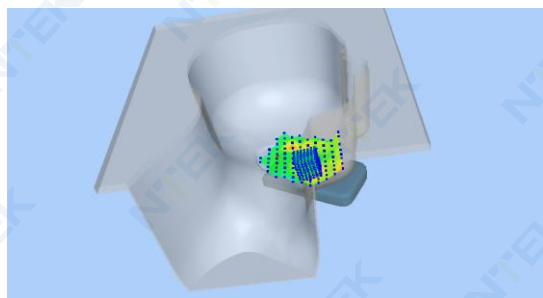
Maximum location: X=-49.00, Y=-50.00

SAR Peak: 0.10 W/kg

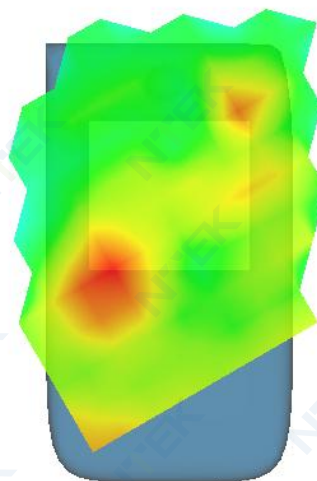
SAR 10g (W/Kg)	0.029952
SAR 1g (W/Kg)	0.053185



3D screen shot



Hot spot position



MEASUREMENT 26

Date of measurement: 18/6/2024

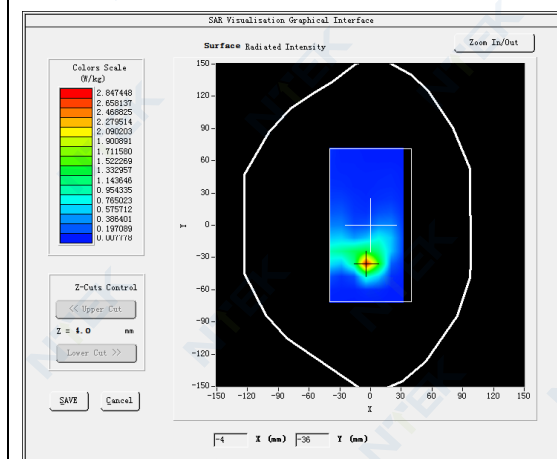
A. Experimental conditions.

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

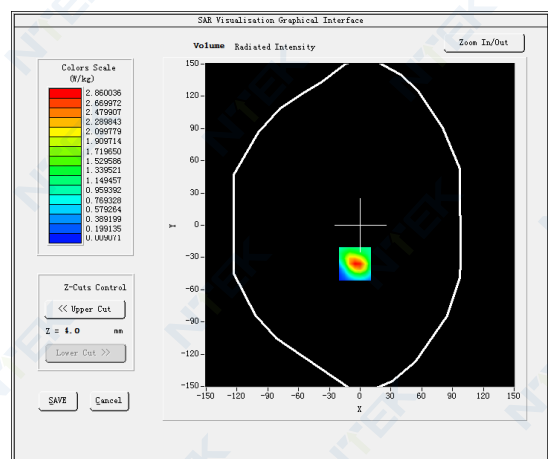
B. SAR Measurement Results

Frequency (MHz)	2605.000000
Relative permittivity (real part)	38.980863
Relative permittivity (imaginary part)	13.899230
Conductivity (S/m)	2.011527
Variation (%)	-0.080000

SURFACE SAR



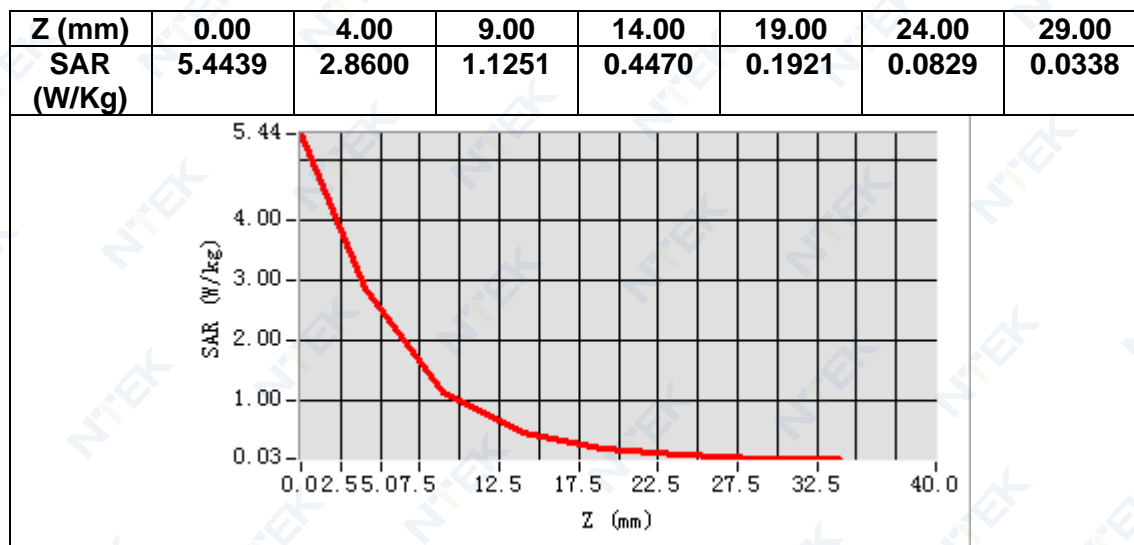
VOLUME SAR



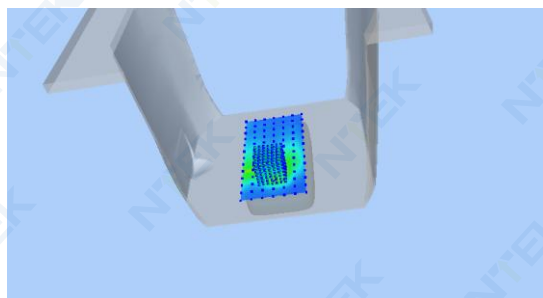
Maximum location: X=-5.00, Y=-36.00

SAR Peak: 5.48 W/kg

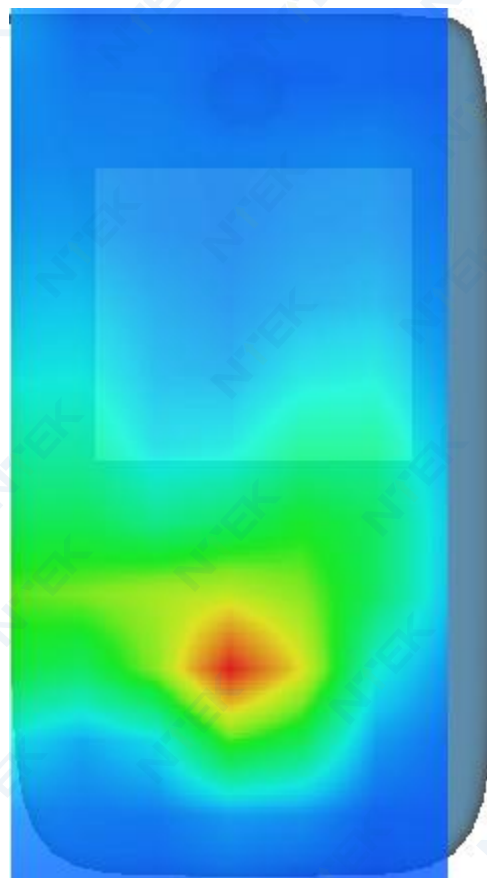
SAR 10g (W/Kg)	1.021803
SAR 1g (W/Kg)	2.638549



3D screen shot



Hot spot position



MEASUREMENT 27

Date of measurement: 20/6/2024

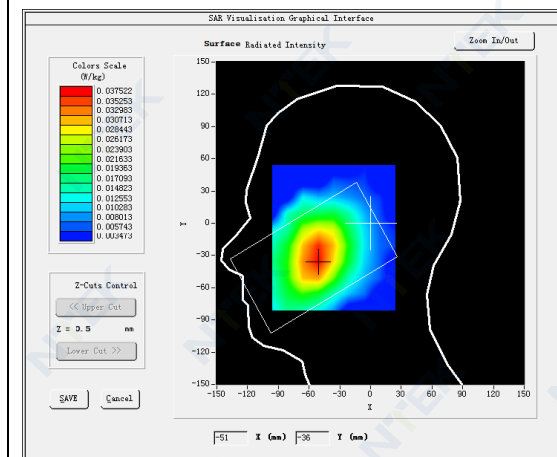
A. Experimental conditions.

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

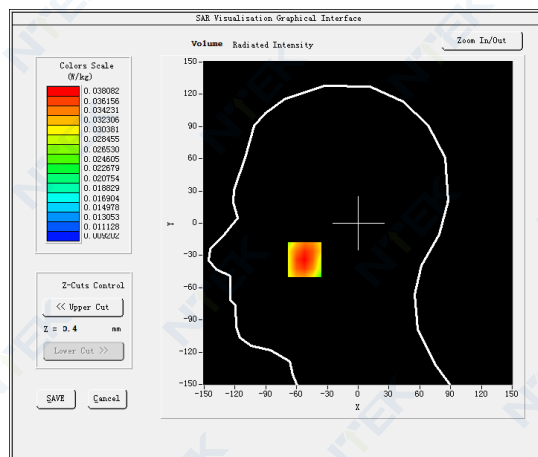
B. SAR Measurement Results

Frequency (MHz)	728.000000
Relative permittivity (real part)	41.318645
Relative permittivity (imaginary part)	21.704905
Conductivity (S/m)	0.877843
Variation (%)	-3.920000

SURFACE SAR



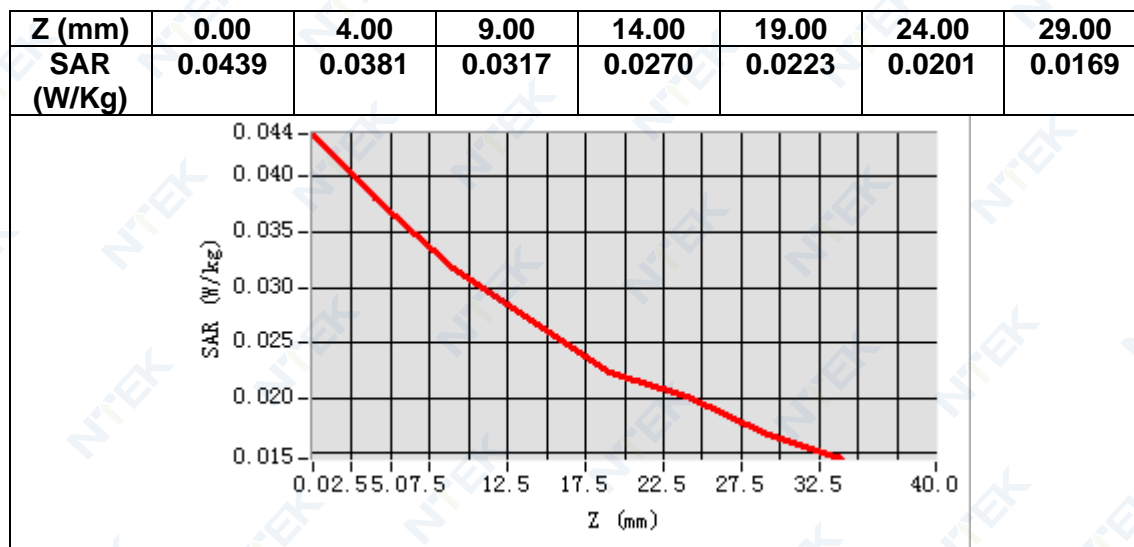
VOLUME SAR



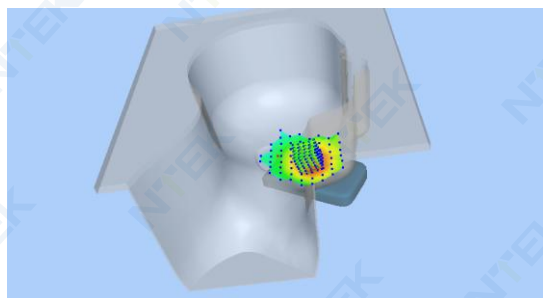
Maximum location: X=-52.00, Y=-34.00

SAR Peak: 0.05 W/kg

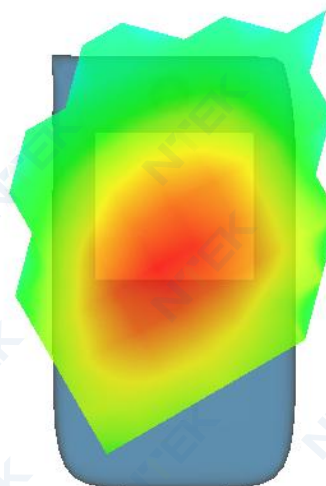
SAR 10g (W/Kg)	0.029418
SAR 1g (W/Kg)	0.037244



3D screen shot



Hot spot position



MEASUREMENT 28

Date of measurement: 20/6/2024

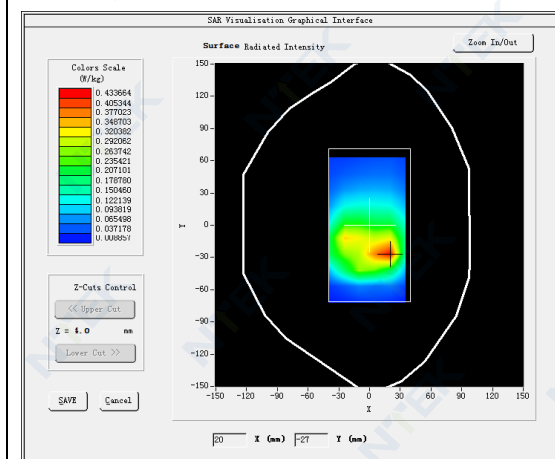
A. Experimental conditions.

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

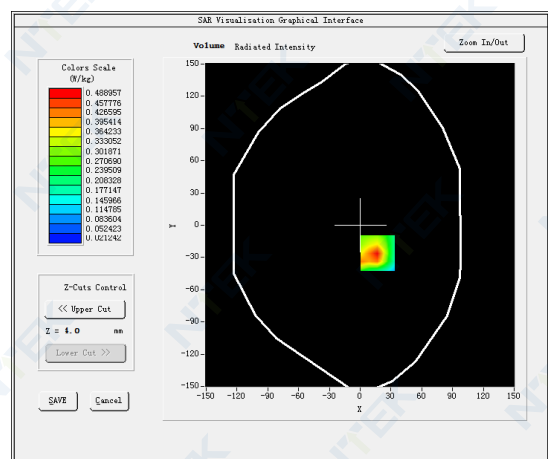
B. SAR Measurement Results

Frequency (MHz)	728.000000
Relative permittivity (real part)	41.318645
Relative permittivity (imaginary part)	21.704905
Conductivity (S/m)	0.877843
Variation (%)	-0.680000

SURFACE SAR



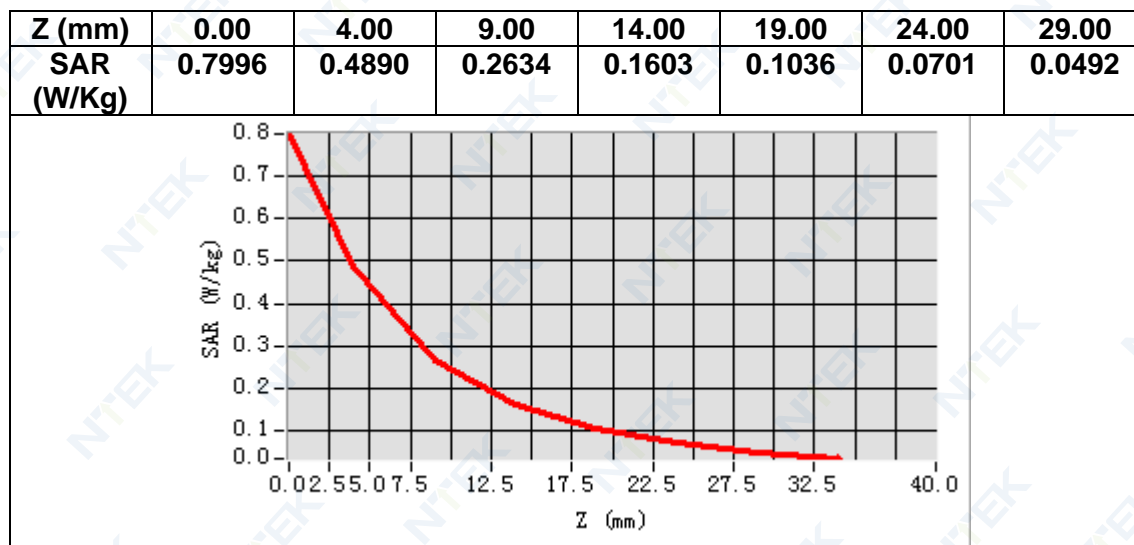
VOLUME SAR



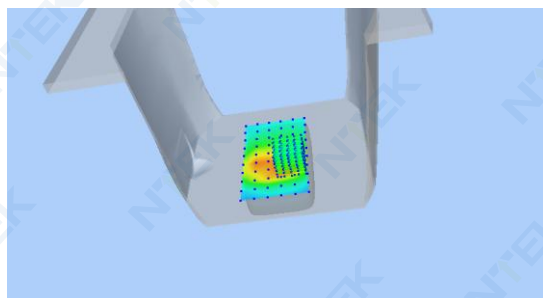
Maximum location: X=17.00, Y=-26.00

SAR Peak: 0.83 W/kg

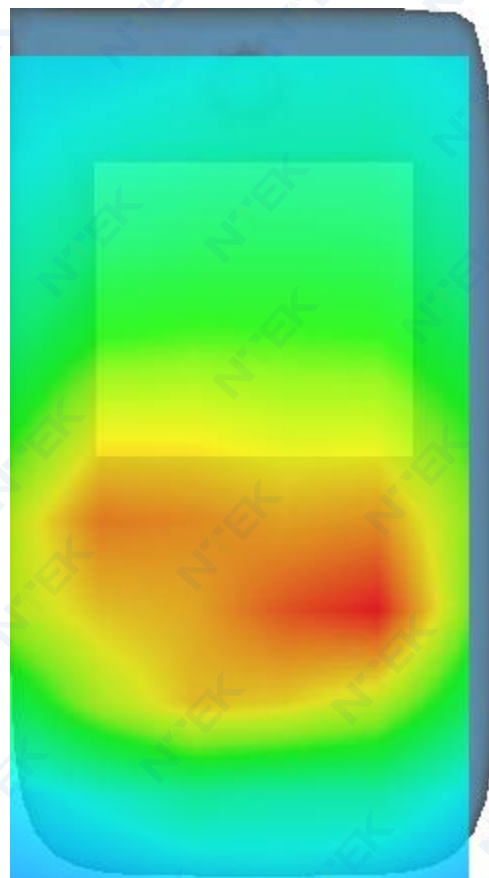
SAR 10g (W/Kg)	0.248001
SAR 1g (W/Kg)	0.464371



3D screen shot



Hot spot position



MEASUREMENT 29

Date of measurement: 22/6/2024

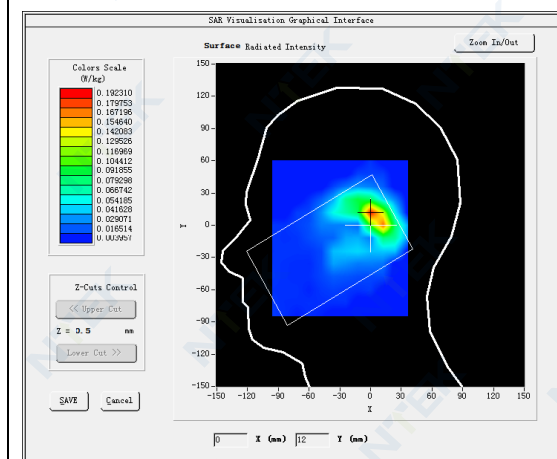
A. Experimental conditions.

Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>LTE band 40</u>
Channels	<u>Middle</u>
Signal	<u>LTE (Crest factor: 1.0)</u>
ConvF	<u>2.81</u>

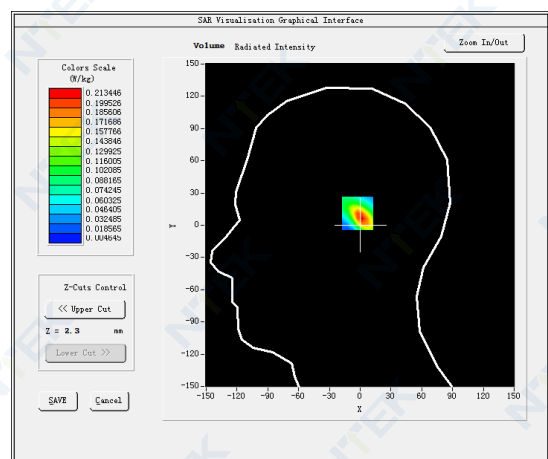
B. SAR Measurement Results

Frequency (MHz)	2350.000000
Relative permittivity (real part)	39.531075
Relative permittivity (imaginary part)	12.883761
Conductivity (S/m)	1.682047
Variation (%)	1.140000

SURFACE SAR



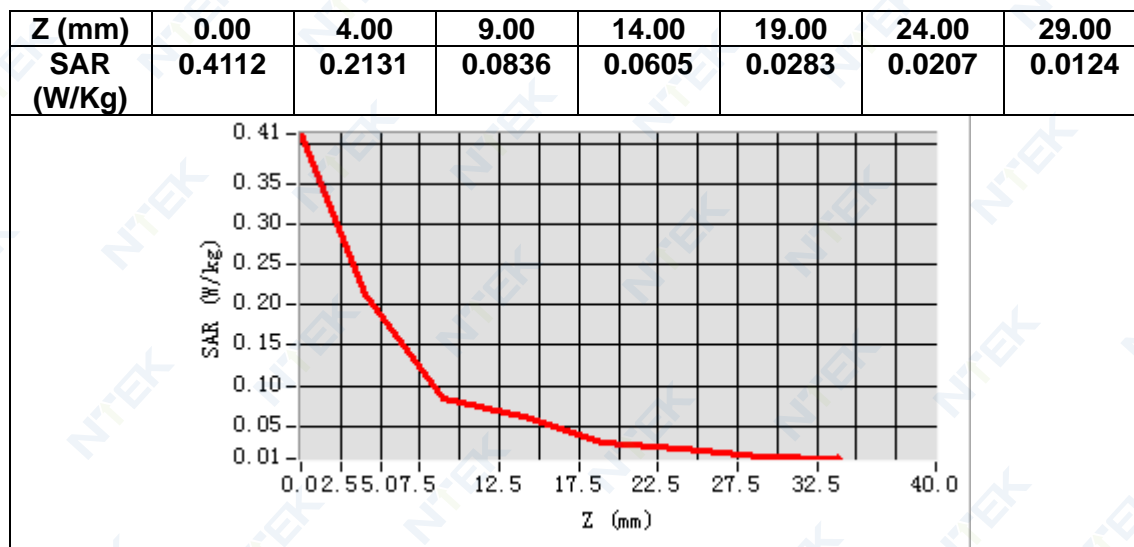
VOLUME SAR



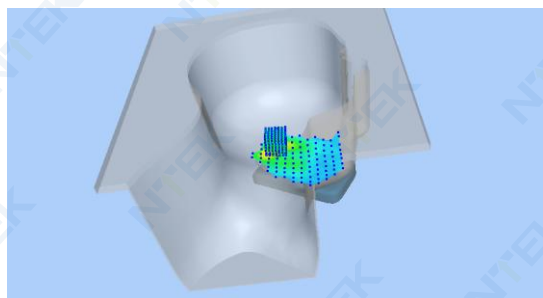
Maximum location: X=1.00, Y=11.00

SAR Peak: 0.34 W/kg

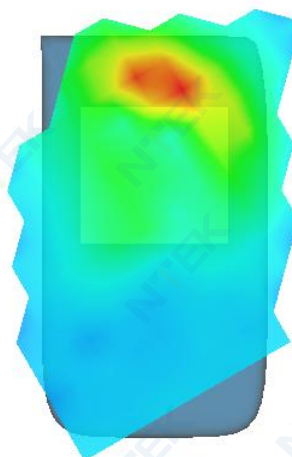
SAR 10g (W/Kg)	0.090741
SAR 1g (W/Kg)	0.191230



3D screen shot



Hot spot position



MEASUREMENT 30

Date of measurement: 22/6/2024

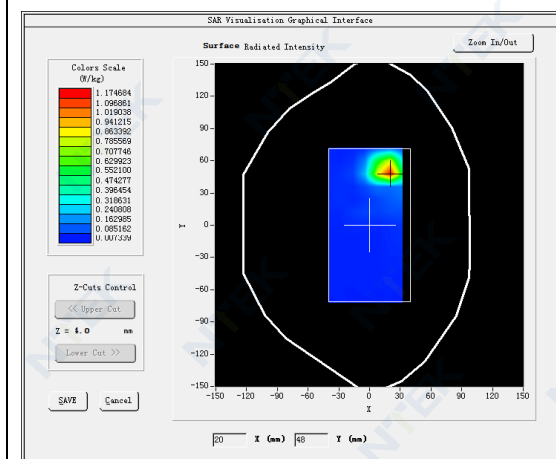
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 40</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.81</u>

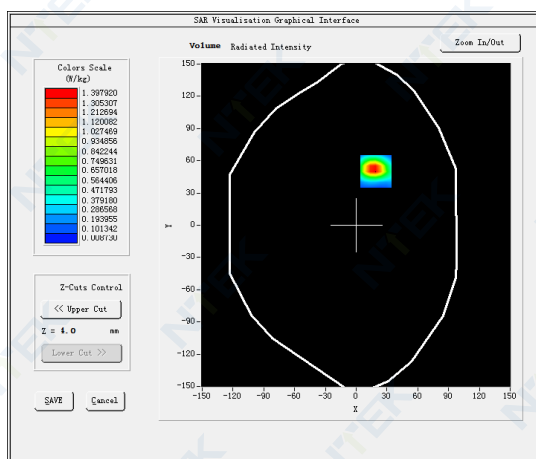
B. SAR Measurement Results

Frequency (MHz)	2350.000000
Relative permittivity (real part)	39.531075
Relative permittivity (imaginary part)	12.883761
Conductivity (S/m)	1.682047
Variation (%)	2.100000

SURFACE SAR



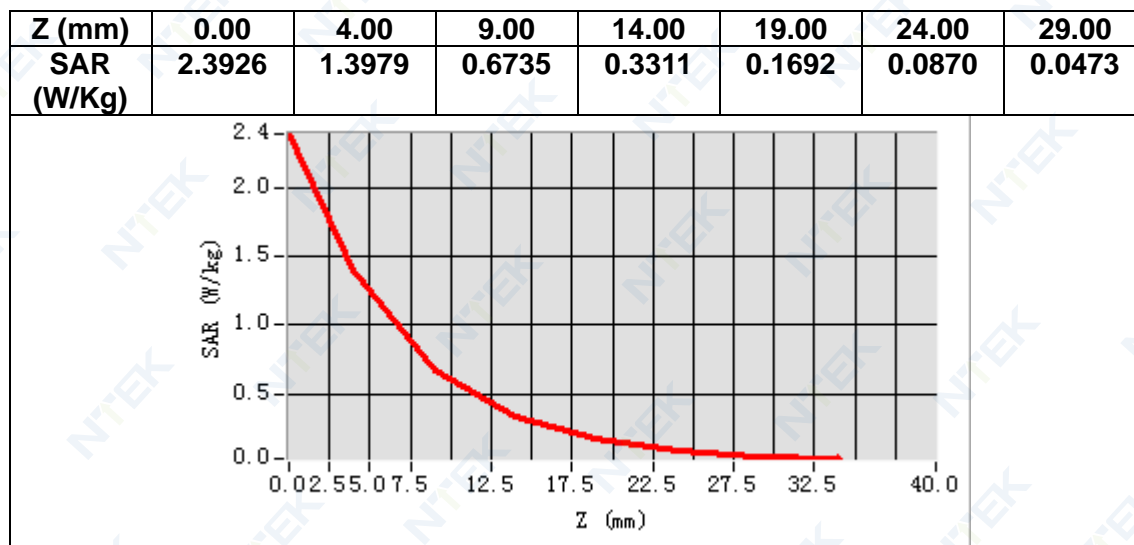
VOLUME SAR



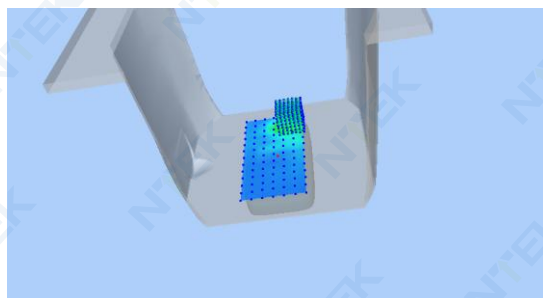
Maximum location: X=19.00, Y=50.00

SAR Peak: 2.50 W/kg

SAR 10g (W/Kg)	0.523421
SAR 1g (W/Kg)	1.294116



3D screen shot



Hot spot position



13. Appendix D. Calibration Certificate

Table of contents
E Field Probe - 3423-EPGO-426
750 MHz Dipole - SN 03/15 DIP 0G750-355
900 MHz Dipole - SN 03/15 DIP 0G900-348
1800 MHz Dipole - SN 03/15 DIP 1G800-349
2000 MHz Dipole - SN 03/15 DIP 2G000-351
2300 MHz Dipole - SN 03/16 DIP 2G300-358
2450 MHz Dipole - SN 03/15 DIP 2G450-352
2600 MHz Dipole - SN 03/15 DIP 2G600-356
5000-6000 MHz Dipole - SN 13/14 WGA 33



COMOSAR E-Field Probe Calibration Report

Ref : ACR.261.11.23.BES.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI
COMMUNITY, XIXIANG STREET,
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: 3423-EPGO-426

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 09/18/2023



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

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

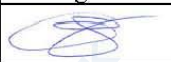


Summary:

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



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

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

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

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

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



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

TABLE OF CONTENTS

1	Device Under Test	4
2	Product Description	4
2.1	General Information	4
3	Measurement Method	4
3.1	Sensitivity	4
3.2	Linearity	5
3.3	Isotropy	5
3.4	Boundary Effect	5
4	Measurement Uncertainty	6
5	Calibration Results	6
5.1	Calibration in air	6
5.2	Calibration in liquid	7
6	Verification Results	8
7	List of Equipment	9



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

1 DEVICE UNDER TEST

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

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Dosimetric E field Probe

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

3 MEASUREMENT METHOD

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

3.1 SENSITIVITY

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



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

3.2 LINEARITY

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

3.3 ISOTROPY

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

3.4 BOUNDARY EFFECT

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

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

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

where

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

The measured worst case boundary effect $SAR_{uncertainty}[\%]$ for scanning distances larger than 4mm is 1.0% Limit ,2%).



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

4 MEASUREMENT UNCERTAINTY

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

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

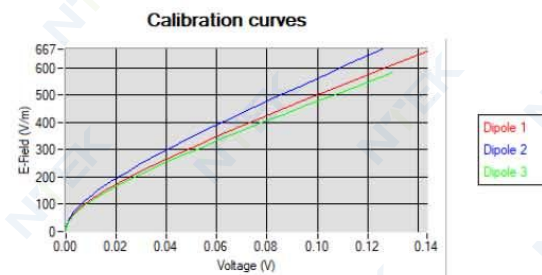
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

5 CALIBRATION RESULTS

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

5.1 CALIBRATION IN AIR

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



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

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

where

V_i =voltage readings on the 3 channels of the probe

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

$Norm_i$ =dipole sensitivity given below for the 3 channels of the probe



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

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

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

5.2 CALIBRATION IN LIQUID

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

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

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

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

where

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:

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

where

c =the specific heat for the liquid

dT/dt =the temperature rises over the time

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

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

where

a =the larger cross-sectional of the waveguide

b =the smaller cross-sectional of the waveguide

δ =the skin depth for the liquid in the waveguide

P_W =the power delivered to the liquid



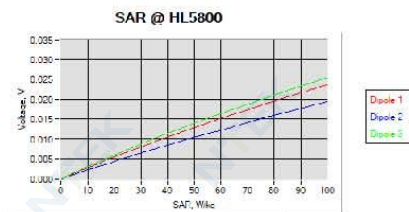
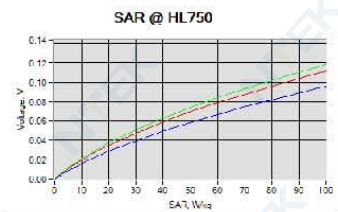
COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

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

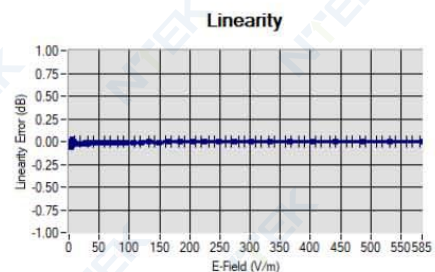
Liquid	Frequency (MHz*)	ConvF
HL750	750	2.37
HL850	835	2.32
HL900	900	2.23
HL1800	1800	2.45
HL1900	1900	2.63
HL2000	2000	2.83
HL2300	2300	2.81
HL2450	2450	2.85
HL2600	2600	2.65
HL3300	3300	2.21
HL3500	3500	2.20
HL3700	3700	2.11
HL3900	3900	2.40
HL4200	4200	2.40
HL4600	4600	2.33
HL4900	4900	2.37
HL5200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

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

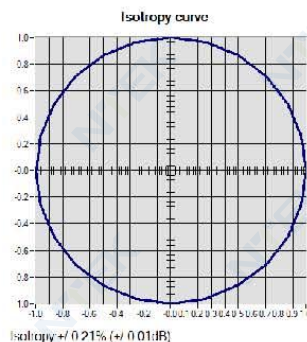


6 VERIFICATION RESULTS

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



Linearity: $\pm 1.42\%$ (± 0.06 dB)





COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

7 LIST OF EQUIPMENT

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

Page: 9/10

Template: ACR.DDD.N.YY.MVGB.ISSUE_COMOSAR_Probe.vL

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.261.11.23.BES.A

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.23.24.BES.A

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

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

FREQUENCY: 750 MHZ

SERIAL NO.: SN 03/15DIP0G750-355

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 02/21/2024



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

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




Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

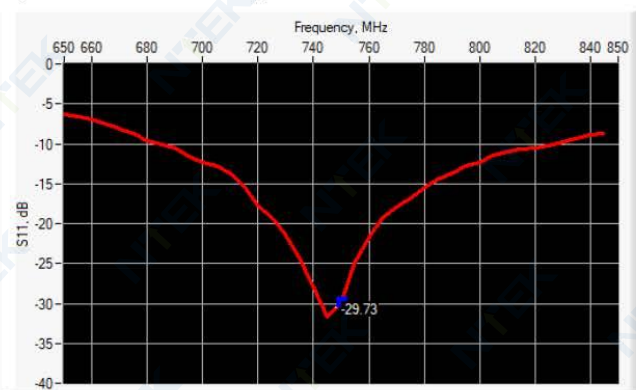
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

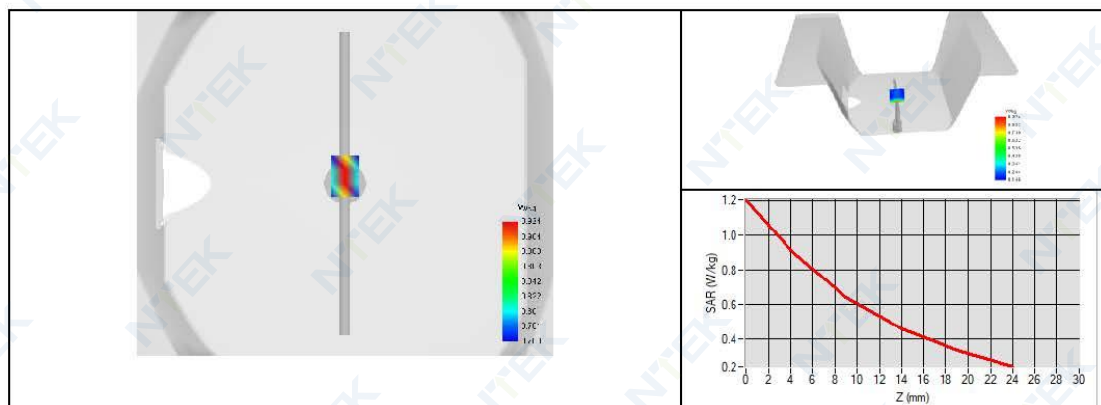


SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.23.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.25.24.BES.A

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

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

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 900 MHZ

SERIAL NO.: SN 03/15DIP0G900-348

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 21/02/2024



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

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




Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.25.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

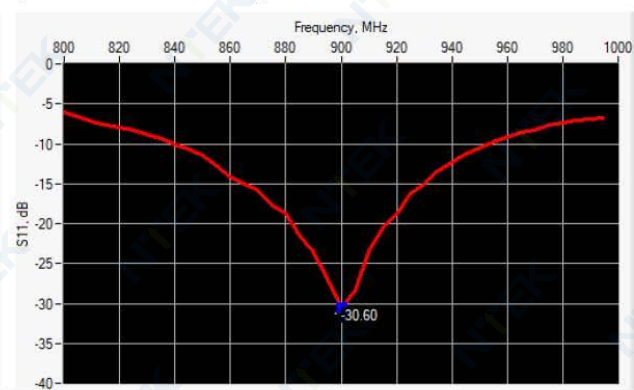
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

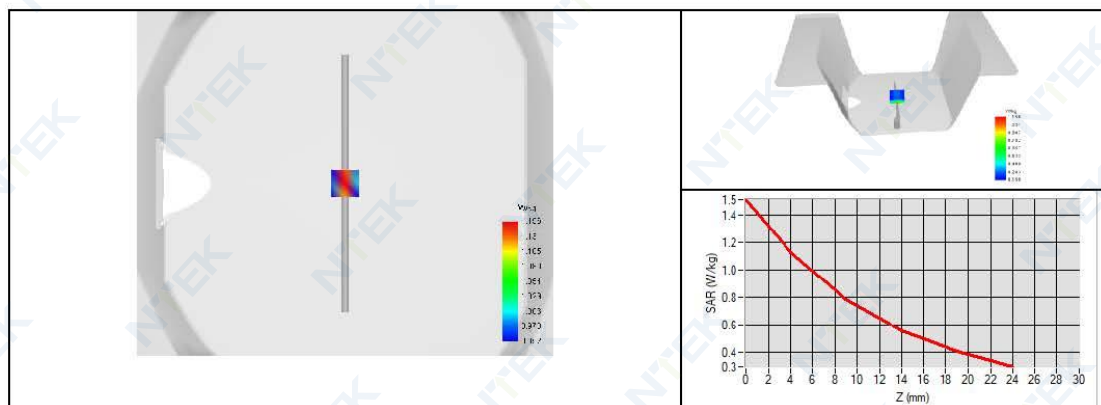


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.25.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.25.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.26.24.BES.A

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

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

FREQUENCY: 1800 MHZ

SERIAL NO.: SN 03/15DIP1G800-349

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024



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

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




Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.26.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

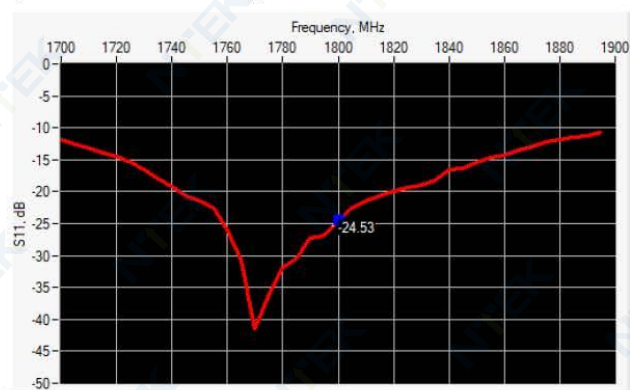
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

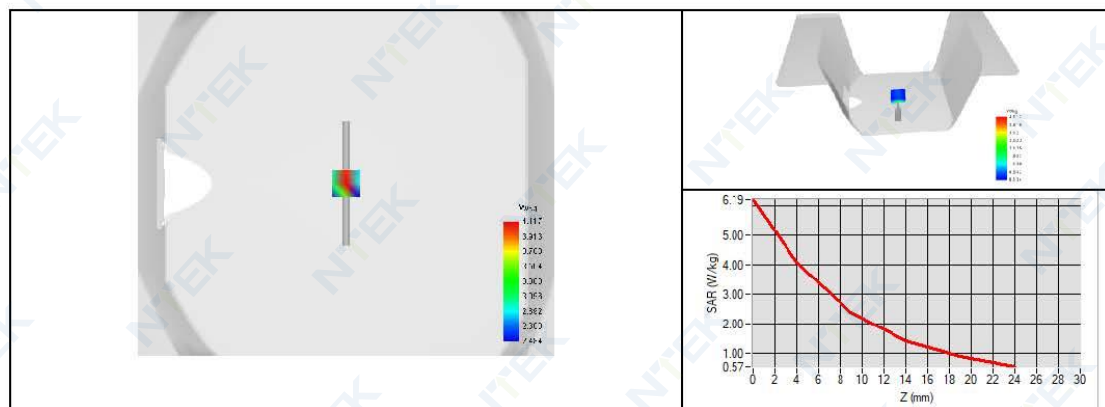


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.26.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.28.24.BES.A

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

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

FREQUENCY: 2000 MHZ

SERIAL NO.: SN 03/15DIP2G000-351

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 02/21/2024



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

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



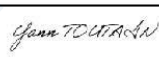
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.28.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.28.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.28.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.28.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.28.24.BES.A

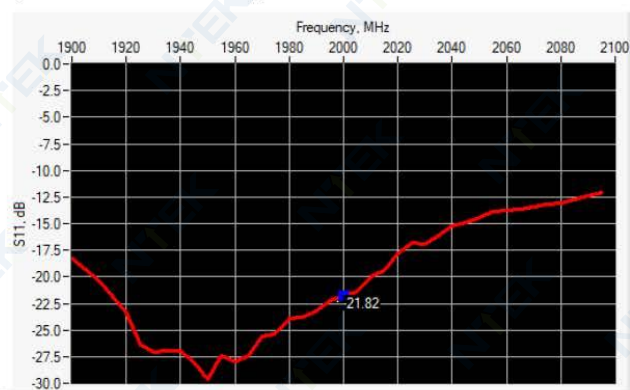
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

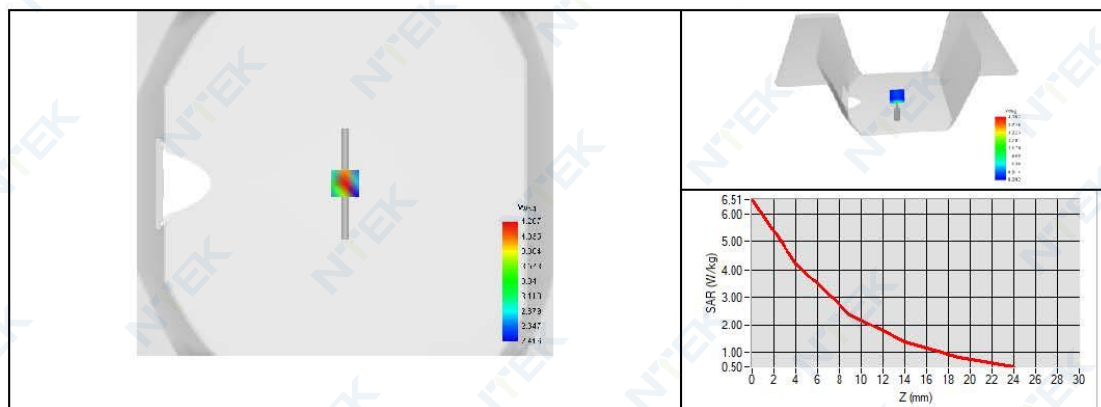


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.28.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.28.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.32.24.BES.A

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

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

FREQUENCY: 2300 MHZ

SERIAL NO.: SN 03/16DIP2G300-358

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 02/21/2024



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

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




Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.32.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty.....	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2300 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2300
Serial Number	SN 03/16DIP2G300-358
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

Page: 5/8

Template ACR.DDD.N.YY.MVGB.ISSUE SAR Reference Dipole vL

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

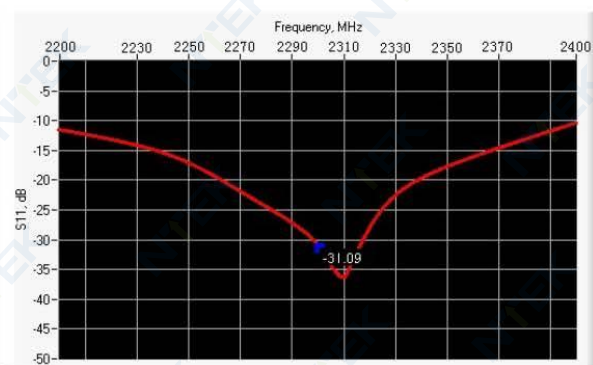
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	55.50 +/- 2%	-	32.60 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
2300	-31.09	-20	56.3Ω - 2.9jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

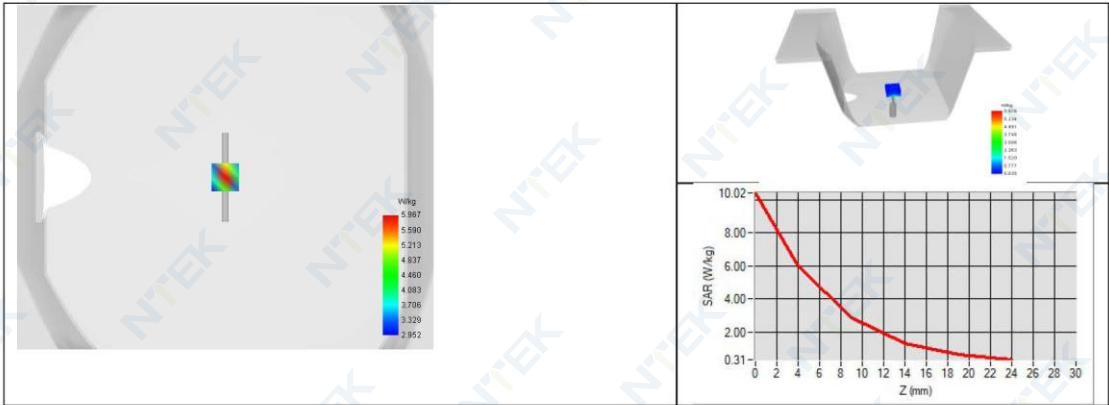


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: eps' : 42.0 sigma : 1.80
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=5mm/dy=5mm/dz=5mm
Frequency	2300 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
2300 MHz	5.06	50.63	48.70	2.35	23.51	23.30





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.32.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.29.24.BES.A

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

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

FREQUENCY: 2450 MHZ

SERIAL NO.: SN 03/15DIP2G450-352

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 02/21/2024



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

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




Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.29.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.29.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.29.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.29.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.29.24.BES.A

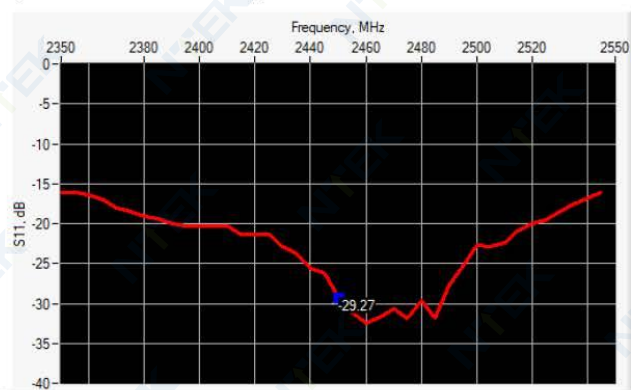
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

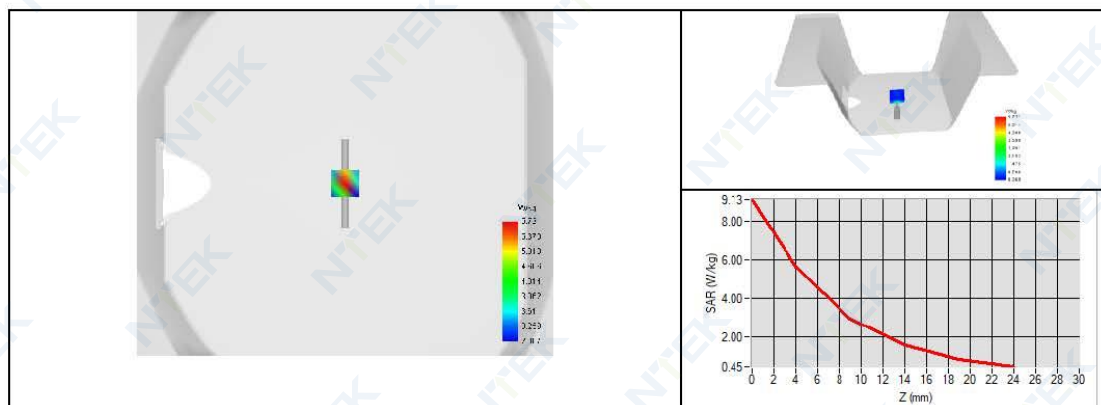


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.29.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.29.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.30.24.BES.A

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

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

FREQUENCY: 2600 MHZ

SERIAL NO.: SN 03/15DIP2G600-356

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024



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

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



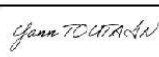
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.30.24.BES.A

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

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

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.30.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	5
4.1	Mechanical Requirements	5
4.2	S11 parameter Requirements	5
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	6
6.1	Mechanical Dimensions	6
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.30.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.30.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.30.24.BES.A

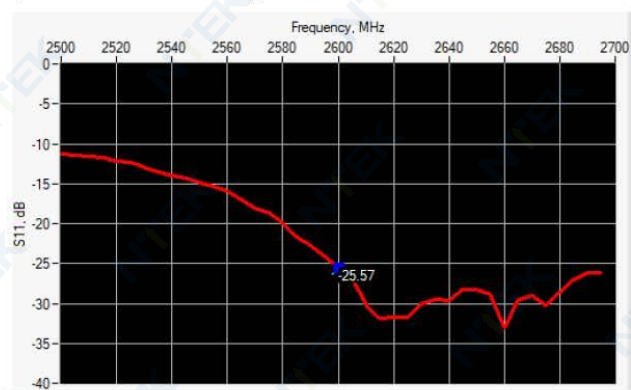
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

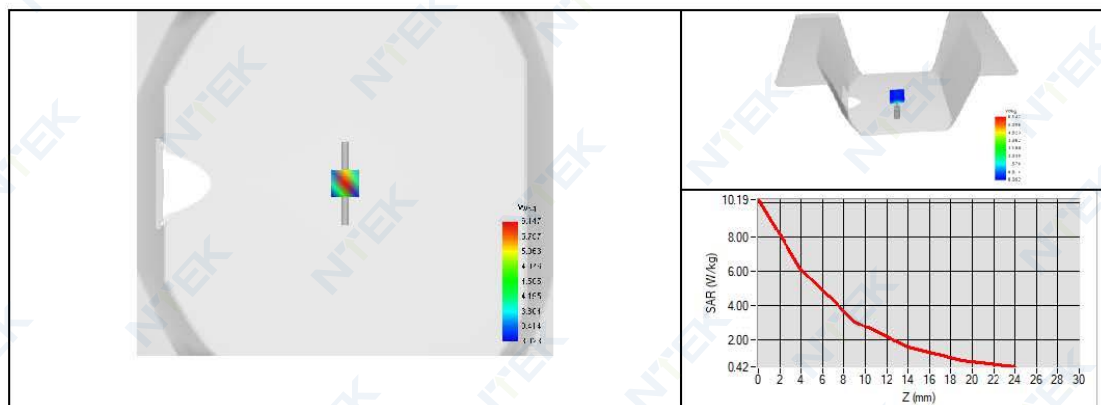


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR.53.30.24.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.30.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Waveguide Calibration Report

Ref: ACR.53.31.24.BES.A

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

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

FREQUENCY: 5000-6000 MHZ

SERIAL NO.: SN 13/14 WGA 33

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/21/2024



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

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



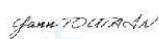
Summary:

This document presents the method and results from an accredited SAR reference waveguide calibration performed at MVG, using the COMOSAR test bench. The test results covered by accreditation are traceable to the International System of Units (SI).



SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref : ACR.53.31.24.BES.A

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

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

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

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



SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

TABLE OF CONTENTS

1	Introduction.....	4
2	Device Under Test	4
3	Product Description	4
3.1	General Information	4
4	Measurement Method	4
4.1	Mechanical Requirements	4
4.2	S11 parameter Requirements	4
4.3	SAR Requirements	5
5	Measurement Uncertainty	5
5.1	Mechanical dimensions	5
5.2	S11 Parameter	5
5.3	SAR	5
6	Calibration Results.....	5
6.1	Mechanical Dimensions	5
6.2	S11 parameter	6
6.3	SAR	6
7	List of Equipment	9



SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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



SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

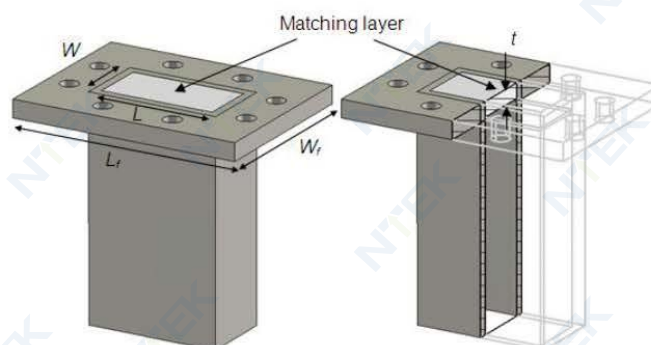
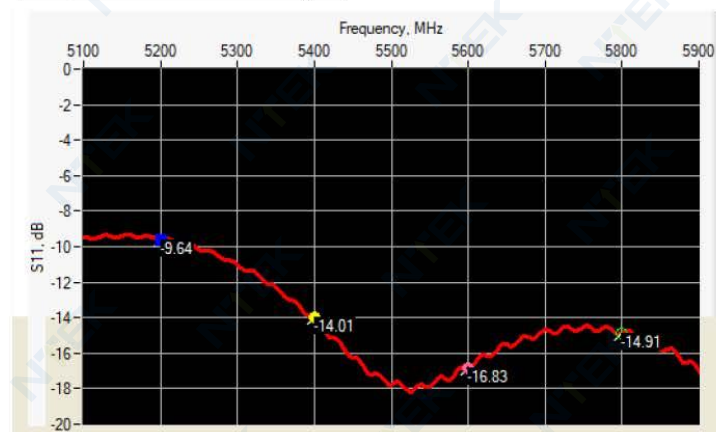


Figure 1: Validation Waveguide Dimensions



SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

6.2 S11 PARAMETER6.2.1 S11 parameter In Head Liquid

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

6.3 SAR

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

6.3.1 SAR With Head Liquid

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



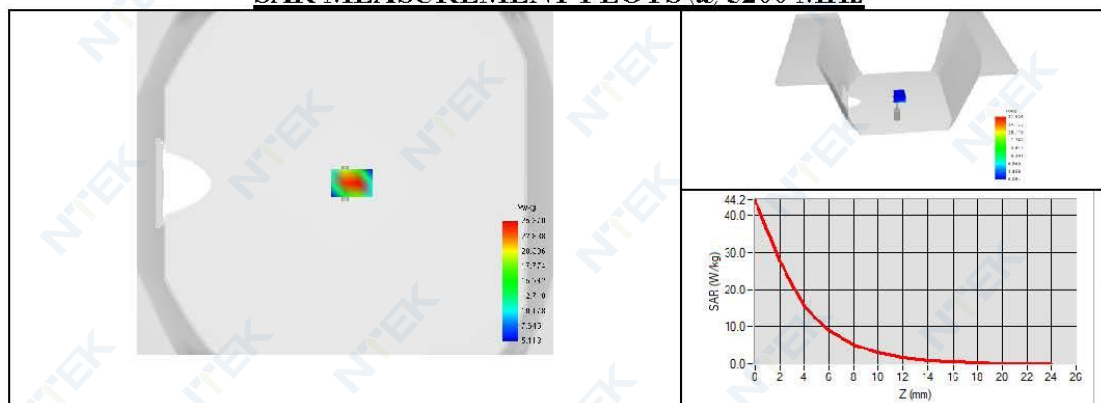
SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

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

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

SAR MEASUREMENT PLOTS @ 5200 MHz

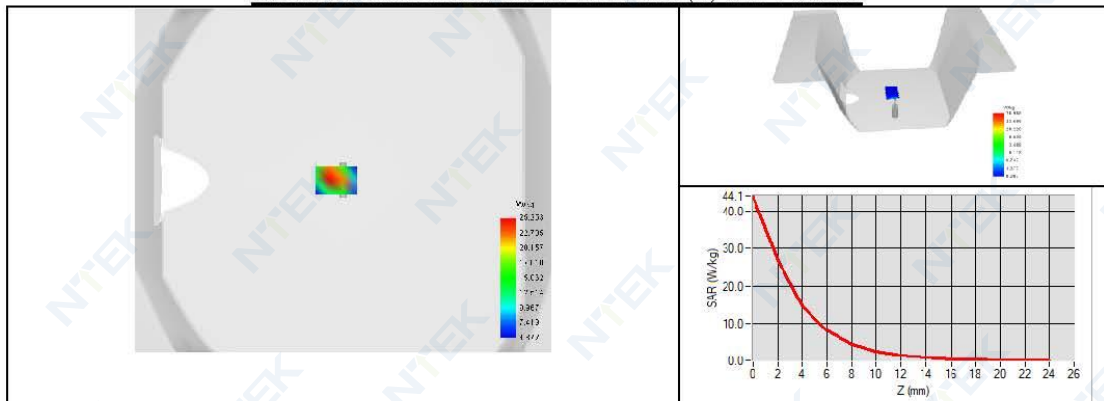




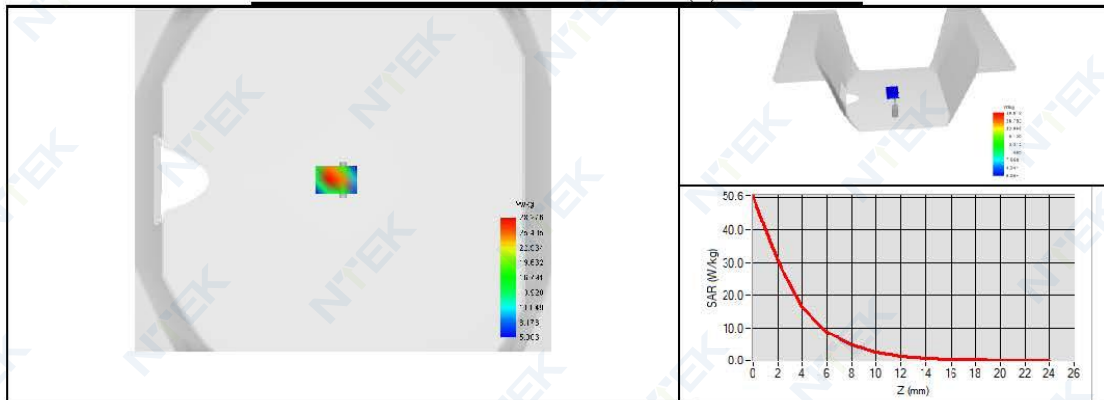
SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

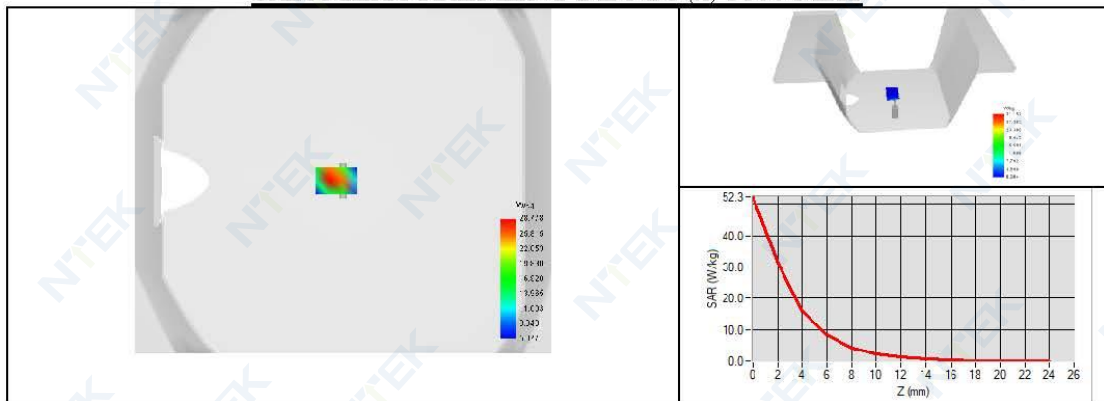
SAR MEASUREMENT PLOTS @ 5400 MHz



SAR MEASUREMENT PLOTS @ 5600 MHz



SAR MEASUREMENT PLOTS @ 5800 MHz





SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.53.31.24.BES.A

7 LIST OF EQUIPMENT

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

Page: 9/9

Template: ACR.DDD.N.YY.MVGB.ISSUE SAR Reference Waveguide vL

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.

END