




# SAR Test Report

Test Report No. ....:	TCT250320E012	
Date of issue .....	Apr. 21, 2025	
Testing laboratory .....	Shenzhen TCT Testing Technology Co., Ltd.	
Testing location/ address:	2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China	
Applicant's name .....	Shenzhen Huafurui Technology Co., Ltd.	
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Manufacturer's name .....	Shenzhen Huafurui Technology Co., Ltd.	
Address .....	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	
Test item description .....	Smartphone	
Trade Mark.....	CUBOT	
Model/Type reference .....	KINGKONG 11	
SAR Max. Values.....	0.27 W/Kg (10g) for Head; 0.36 W/Kg (10g) for Body; 0.69W/Kg (10g) for Limbs	
Simultaneous Reported SAR.....	0.49W/Kg (10g) for Head;0.49W/Kg (10g) for Body; 0.97W/Kg (10g) for Limbs	
Date of receipt of test item .....	Mar. 20, 2025	
Date (s) of performance of test .....	Mar. 20, 2025 ~ Apr. 21, 2025	
Tested by (+signature).....	Karl WANG	
Check by (+signature) .....	Beryl Zhao	
Approved by (+signature):	Tomsin	

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## 1. General Product Information

### 1.1. EUT description

Test item description.....:	Smartphone
Model/Type reference.....:	KINGKONG 11
Hardware Version.....:	3370V-MQ-V11
Software Version.....:	CUBOT_KINGKONG 11_F041C_V01
Rating(s).....:	Rechargeable Li-polymer Battery DC 3.87V
<b>2G</b>	
Operation Band.....:	GSM900,GSM1800
Supported type.....:	GSM/GPRS/EGPRS
Power Class.....:	GSM900:Power Class 5; GSM1800:Power Class 0
Modulation Type.....:	GMSK for GSM/GPRS; 8PSK for EGPRS
GSM Release Version.....:	R99
GPRS Multislot Class.....:	12
EGPRS Multislot Class.....:	12
<b>3G</b>	
Operation Band.....:	WCDMA Band I & Band VIII
Power Class.....:	Power Class 3
Modulation Type.....:	16QAM for HSDPA and HSUPA
WCDMA Release Version.....:	R99
HSDPA Release Version.....:	Release 5
HSUPA Release Version.....:	Release 6
DC-HSUPA Release Version.....:	Not Supported
<b>LTE</b>	
Operation Band.....:	LTE Band 1 & LTE Band 3 & LTE Band 7 & LTE Band 8 & LTE Band 20 & LTE Band 28 & LTE Band 38 & LTE Band 40
Power Class.....:	Power Class 3
Modulation Type.....:	QPSK &16-QAM for LTE
<b>5G NR</b>	
Operation Band.....:	5G NR n1 & 5G NR n3 & 5G NR n7
Modulation Type.....:	DFT-BPSK, DFT-QPSK, DFT-16QAM, DFT-64QAM, DFT-256QAM, CP-BPSK, CP-QPSK, CP-16QAM, CP-64QAM, CP-256QAM
<b>WiFi 2.4G</b>	
Supported type.....:	802.11b/802.11g/802.11n
Modulation Type.....:	802.11b: DSSS; 802.11g/802.11n:OFDM
Operation Frequency.....:	802.11b/802.11g/802.11n(HT20):2412MHz~2472MHz; 802.11n(HT40):2422MHz~2462MHz
Channel number.....:	802.11b/802.11g/802.11n(HT20):13; 802.11n(HT40):9
Channel separation.....:	5MHz

Bluetooth	
Bluetooth Version.....:	Supported BT5.0
Modulation.....:	GFSK(1Mbps) , $\pi$ /4-DQPSK(2Mbps) , 8-DPSK(3Mbps)
Operation Frequency.....:	2402MHz~2480MHz
Channel number.....:	79/40
Channel separation.....:	1MHz/2MHz
Wi-Fi 5G	
Operation Frequency.....:	Band 1: 5150 MHz -5250 MHz Band 2A: 5250 MHz -5350 MHz Band 2C: 5470 MHz -5725 MHz Band 3: 5725 MHz -5875 MHz
Channel Bandwidth.....:	802.11a: 20MHz 802.11n: 20MHz, 40MHz 802.11ac: 20MHz, 40MHz, 80MHz
Modulation Technology.....:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type.....:	256QAM, 64QAM, 16QAM, BPSK, QPSK
NFC	
Operation Frequency.....:	13.56MHz
Antenna Type.....:	Internal Antenna

## 1.2. Model(s) list

None.



## 2. Test standard

The tests were performed according to following standards:

EN 50566:2017+A1:2023

EN 50663:2017

EN IEC/IEEE 62209-1528:2021

EN 50360:2017+A1:2023

EN 62479:2010

## 3. Test Facilities

Shenzhen TCT Testing Technology Co., Ltd.

Address: 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict,  
Bao'an District, Shenzhen, Guangdong, China

### 3.1. Environment Condition

Temperature:	18°C ~25°C
Humidity:	35%~75% RH
Atmospheric Pressure:	1011 mbar

## 4. Test Result Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:  
<Highest Reported standalone SAR Summary>

Highest Reported Standards SAR Summary				
Exposure Position	Frequency Band	Reported 10g SAR (W/kg)	Equipment Class	Highest Reported 10-g SAR (W/kg)
Head	GSM 900	0.14	PCE	0.27
	GSM 1800	0.12		
	WCDMA Band I	0.12		
	WCDMA Band VIII	0.13		
	LTE Band 1	0.20		
	LTE Band 3	0.27		
	LTE Band 7	0.19		
	LTE Band 8	0.10		
	LTE Band 20	0.09		
	LTE Band 28	0.11		
	LTE Band 38	0.11		
	LTE Band 40	0.08		
	5G NR N1	0.18		
	5G NR N3	0.19		
	5G NR N7	0.12		
	5.2GWLAN	0.15	NII	
	5.3GWLAN	0.10		
	5.6GWLAN	0.08		
	5.8GWLAN	0.13		
	2.4GWLAN	0.22	DTS	
Body (5 mm Gap)	GSM 900	0.13	PCE	0.36
	GSM 1800	0.17		
	WCDMA Band I	0.21		
	WCDMA Band VIII	0.13		
	LTE Band 1	0.18		
	LTE Band 3	0.33		
	LTE Band 7	0.11		
	LTE Band 8	0.13		
	LTE Band 20	0.16		
	LTE Band 28	0.16		
	LTE Band 38	0.07		
	LTE Band 40	0.10		
	5G NR N1	0.30		
	5G NR N3	0.36		
	5G NR N7	0.22		
	5.2GWLAN	0.10	NII	
	5.3GWLAN	0.11		
	5.6GWLAN	0.08		
	5.8GWLAN	0.07		
	2.4GWLAN	0.09	DTS	

Wrist Worn (0 mm Gap)	GSM 900	0.28	PCE	0.69
	GSM 1800	0.36		
	WCDMA Band I	0.57		
	WCDMA Band VIII	0.33		
	LTE Band 1	0.43		
	LTE Band 3	0.69		
	LTE Band 7	0.42		
	LTE Band 8	0.33		
	LTE Band 20	0.45		
	LTE Band 28	0.53		
	LTE Band 38	0.20		
	LTE Band 40	0.17		
	5G NR N1	0.53		
	5G NR N3	0.45		
	5G NR N7	0.58		
	5.2GWLAN	0.16	NII	
	5.3GWLAN	0.20		
	5.6GWLAN	0.12		
	5.8GWLAN	0.12		
	2.4GWLAN	0.28	DTS	

<Highest Reported simultaneous SAR Summary>

Exposure Position	Highest Reported Simultaneous Transmission SAR (W/kg)	Limit (W/Kg)
Head 10-g SAR	0.49	2
Body-worn 10-g SAR (5 mm Gap)	0.47	2
Wrist Worn 10-g SAR (0 mm Gap)	0.97	

The EUT battery must be fully charged and checked periodically during the test to ascertain inform power output

## 5. RF Exposure Limit

Type Exposure	AR (W kg)
	Uncontrolled Exposure Limit
Spatial Peak SAR (10g cube tissue for head and trunk)	2.00
Spatial Peak SAR (10g cube tissue for limbs)	4.00
Spatial Peak SAR (10g cube tissue for whole body)	0.08

**Note:**

1. This limit is according to recommendation 1999/519/EC, Annex II (Basic Restrictions)
2. Occupational/Uncontrolled 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)

## 6. SAR Measurement System Configuration

### 6.1. SAR Measurement Set-up

The OPENSAR system for performing compliance tests consist of the following items:

A standard high precision 6-axis robot (KUKA) with controller and software.

KUKA Control Panel (KCP)

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with a Video Positioning System (VPS).

The stress sensor is composed with mechanical and electronic when the electronic part detects a change on the electro-mechanical switch; it sends an “Emergency signal” to the robot controller that to stop robot’s moves A computer operating Windows XP.

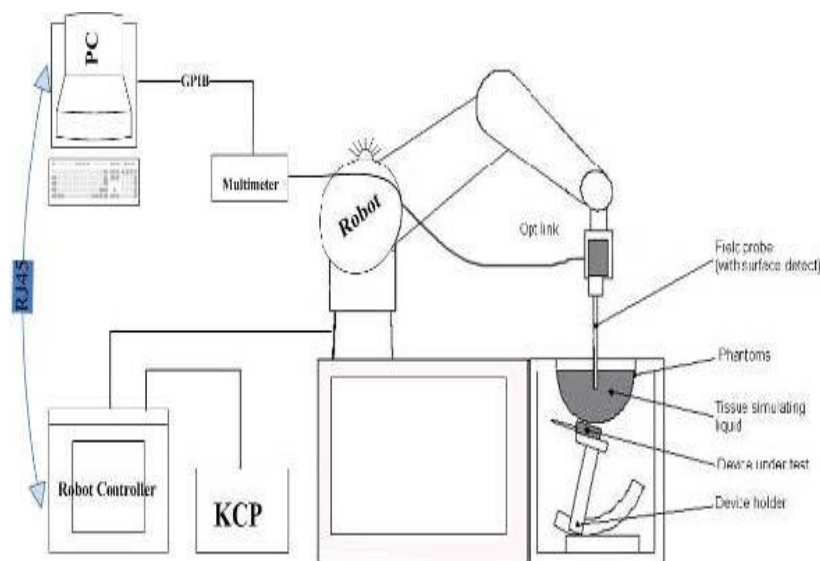
OPENSAR software Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

The SAM phantom enabling testing left-hand right-hand and body usage.

The Position device for handheld EUT

Tissue simulating liquid mixed according to the given recipes.

System validation dipoles to validate the proper functioning of the system.



**KUKA SAR Test Sysytem Configuration**

## 6.2. E-field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by MVG).  
The probe is specially designed and calibrated for use in liquid with high permittivity.  
The dosimetric probe has special calibration in liquid at different frequency.  
This probe has a built in optical surface detection system to prevent from collision with phantom.

### Probe Specification

Construction Symmetrical design with triangular core  
Interleaved sensors  
Built-in shielding against static charges  
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)  
Calibration ISO/IEC 17025 calibration service available.

Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 25/22 EPGO375
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.197 M Dipole 2: R2=0.230 M Dipole 3: R3=0.208 M

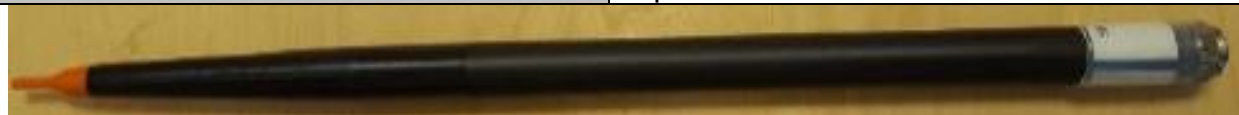


Photo of E-Field Probe

## 6.3. Phantom

The SAM Phantom SAM120 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is in compliance with the specification set in EN IEC/IEEE 62209-1528:2021.

The phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region.

A cover prevents the evaporation of the liquid.

Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot

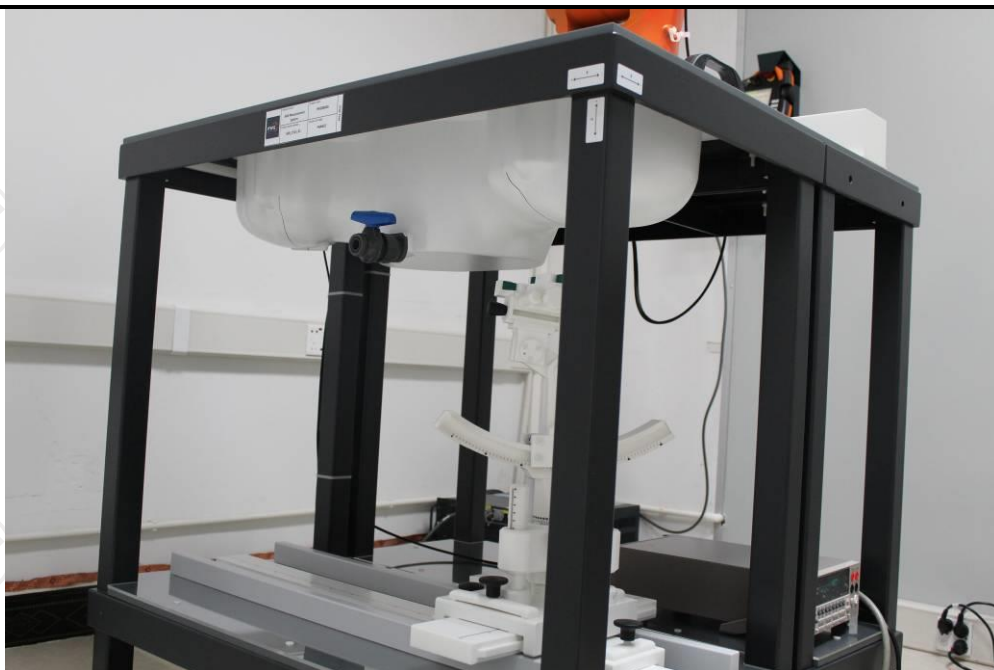
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections.

Body SAR testing also used the flat section between the head profiles.

Name: COMOSAR IEEE SAM PHANTOM

S/N: SN 19/15 SAM 120

Manufacture: MVG

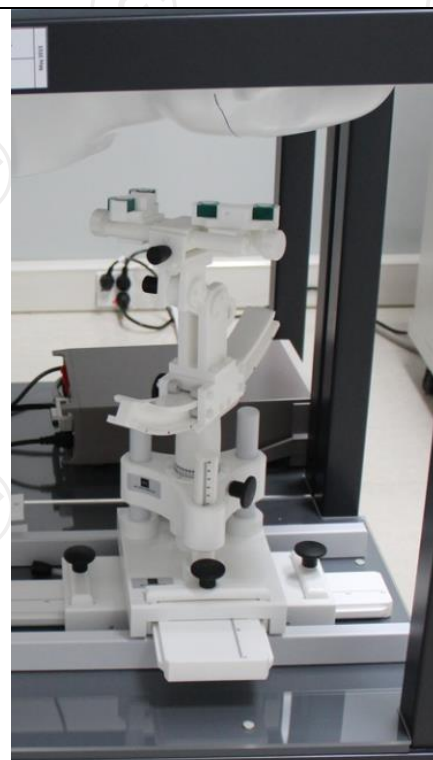
**SAM Twin Phantom**

#### 6.4. Device Holder

In combination with the Generic Twin Phantom SAM120, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening.

The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications.

The device holder can be locked at different phantom locations (left head, right head, flat phantom).

**COMOSAR Mobile  
phone positioning  
system**



## 6.5. Data Storage and Evaluation

### Data Storage

The OPENSAR software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### Data Evaluation

The OPENSAR software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	<i>Normi, ai0, ai1, ai2</i>
	- Conversion factor	<i>ConvFi</i>
	- Diode compression point	<i>Dcpi</i>
Device parameters:	- Frequency	<i>f</i>
	- Crest factor	<i>cf</i>
Media parameters:	- Conductivity	$\sigma$
	- Density	$\rho$

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the OPENSAR components. In the direct measuring mode of the millimetre option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c f / d c p i$$

With  $V_i$  = compensated signal of channel  $i$  ( $i = x, y, z$ )  
 $U_i$  = input signal of channel  $i$  ( $i = x, y, z$ )  
 $cf$  = crest factor of exciting field (MVG parameter)  
 $dcpi$  = diode compression point (MVG parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$E\text{-field probes: } E_i = (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2}$$

$$H\text{-field probes: } H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With	$V_i$	= compensated signal of channel $i$	( $i = x, y, z$ )
	$\text{Norm}_i$	= sensor sensitivity of channel $i$	( $i = x, y, z$ )
		[mV/(V/m) <sup>2</sup> ] for E-field Probes	
	$\text{ConvF}$	= sensitivity enhancement in solution	
	$a_{ij}$	= sensor sensitivity factors for H-field probes	
	$f$	= carrier frequency [GHz]	
	$E_i$	= electric field strength of channel $i$ in V/m	
	$H_i$	= magnetic field strength of channel $i$ in A/m	

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{\text{tot}} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$\text{SAR} = (E_{\text{tot}}^2 \cdot \sigma) / (\rho \cdot 1000)$$

with	$\text{SAR}$	= local specific absorption rate in mW/g
	$E_{\text{tot}}$	= total field strength in V/m
	$\sigma$	= conductivity in [mho/m] or [Siemens/m]
	$\rho$	= equivalent tissue density in g/cm <sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

## 6.6. Position of the wireless device in relation to the phantom

### Handset Reference Points

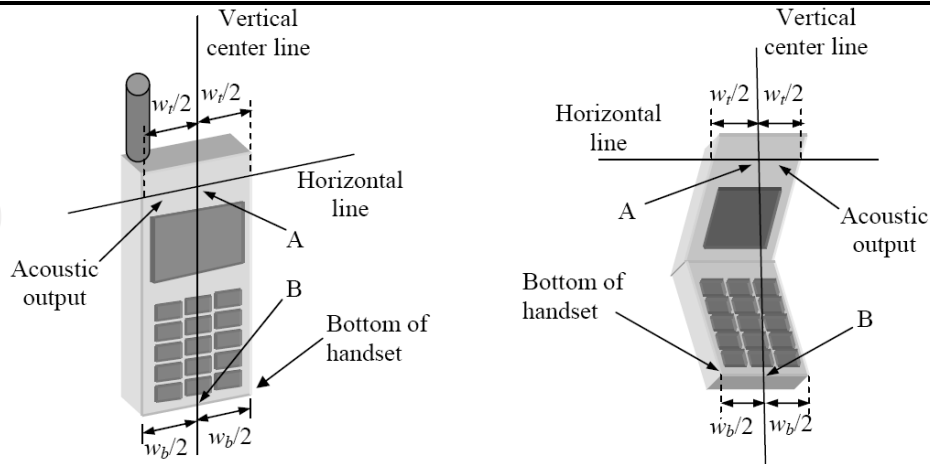
$$P_{\text{pwe}} = E_{\text{tot}}^2 / 3770 \text{ or } P_{\text{pwe}} = H_{\text{tot}}^2 \cdot 37.7$$

With  $P_{\text{pwe}}$  = equivalent power density of a plane wave in mW/cm<sup>2</sup>

$E_{\text{tot}}$  = total electric field strength in V/m

$H_{\text{tot}}$  = total magnetic field strength in A/m





$W_t$  Width of the handset at the level of the acoustic

$W_b$  Width of the bottom of the handset

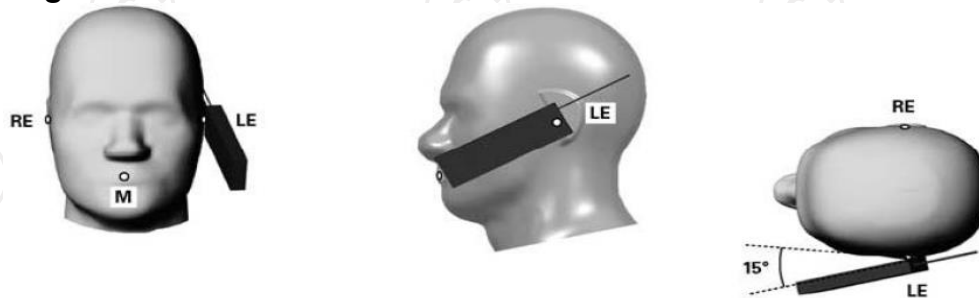
A Midpoint of the width  $w_t$  of the handset at the level of the acoustic output

B Midpoint of the width  $w_b$  of the bottom of the handset

## Positioning for Cheek / Touch



## Positioning for Ear / 15° Tilt



## Body Worn Accessory Configurations

To position the device parallel to the phantom surface with either keypad up or down.

To adjust the device parallel to the flat phantom.

To adjust the distance between the device surface and the flat phantom to 5mm or holster surface and the flat phantom to 0 mm.

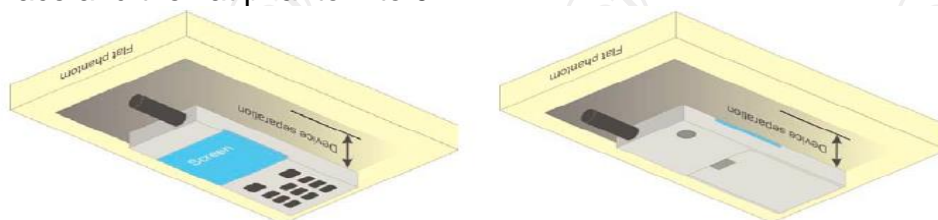


Illustration for Body Worn Position

## 6.7. Tissue Dielectric Parameters

According to EN IEC/IEEE 62209-1528:2021, the liquid parameters for head are the same as body requirements. For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid a depth of at least 15cm, For head SAR testing, the liquid height from the ear reference point(ERP) of the phantom to the liquid top surface is larger than 15cm, For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.

Frequency (MHz)	Liquid Type	Liquid Type ( $\sigma$ )	$\pm$ 5% Range	Permittivity ( $\epsilon$ )	$\pm$ 5% Range
300	Head	0.87	0.83~0.91	45.3	43.04~47.57
750	Head	0.87	0.83~0.91	43.5	41.33~45.68
835	Head	0.90	0.86~0.95	41.5	39.43~43.58
900	Head	0.97	0.92~1.02	41.5	39.43~43.58
1800-2000	Head	1.40	1.33~1.47	40.0	38.00~42.00
2450	Head	1.80	1.71~1.89	39.2	37.24~41.16
2600	Head	1.96	1.86~2.06	39.0	37.05~40.95
3000	Head	2.40	2.28~2.52	38.5	36.58~40.43
3500	Head	2.91	2.35~3.06	37.8	35.91~39.69
3700	Head	3.11	2.95~3.27	37.5	35.63~39.38
5800	Head	5.27	5.01~5.53	35.3	33.54~37.07

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho$  = 1000 kg/m<sup>3</sup>)

## 6.8. Tissue-equivalent Liquid Properties

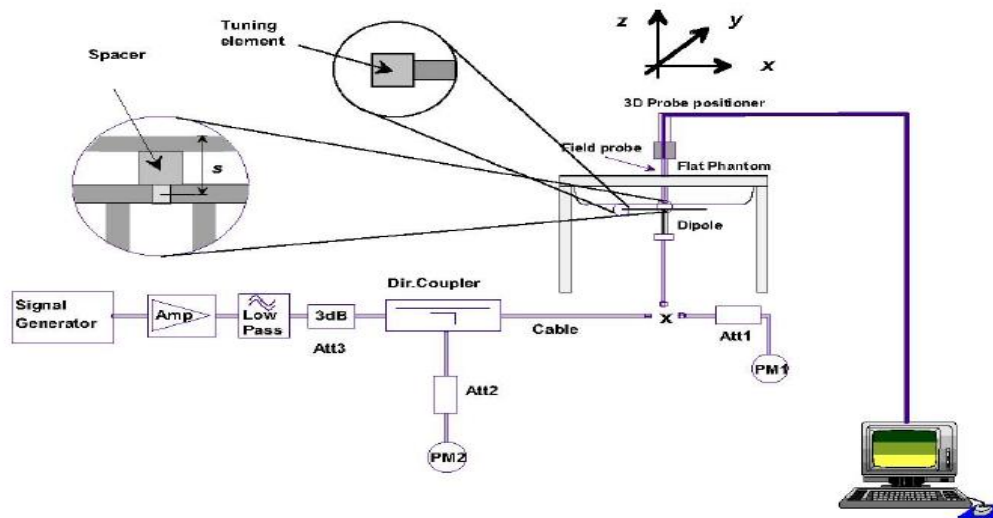
Frequency (MHz)	Test Date	Temp °C	$\epsilon_r$	$\sigma(\text{s/m})$
750	03/28/2025	22	42.99	0.88
900	03/26/2025	22	41.54	0.95
1800	03/26/2025	22	39.74	1.38
2000	04/07/2025	22	39.95	1.42
2450	03/25/2025	22	37.82	1.85
2600	04/07/2025	22	38.34	1.92
5200	03/25/2025	22	36.89	4.73
5400	03/25/2025	22	36.08	4.69
5600	03/25/2025	22	35.34	4.95
5800	03/25/2025	22	34.42	5.03

## 6.9. System Check

The SAR system must be validated against its performance specifications before it is deployed. When SAR probe and system component or software are changed, upgraded or recalibrated, these must be validated with the SAR system(s) that operates with such component. Reference dipoles are used with the required tissue-equivalent media for system validation.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system ( $\pm 10\%$ ).

System check is performed regularly on all frequency bands where tests are performed with the OPENSAR system.



**System Check Set-up**

Verification Results:

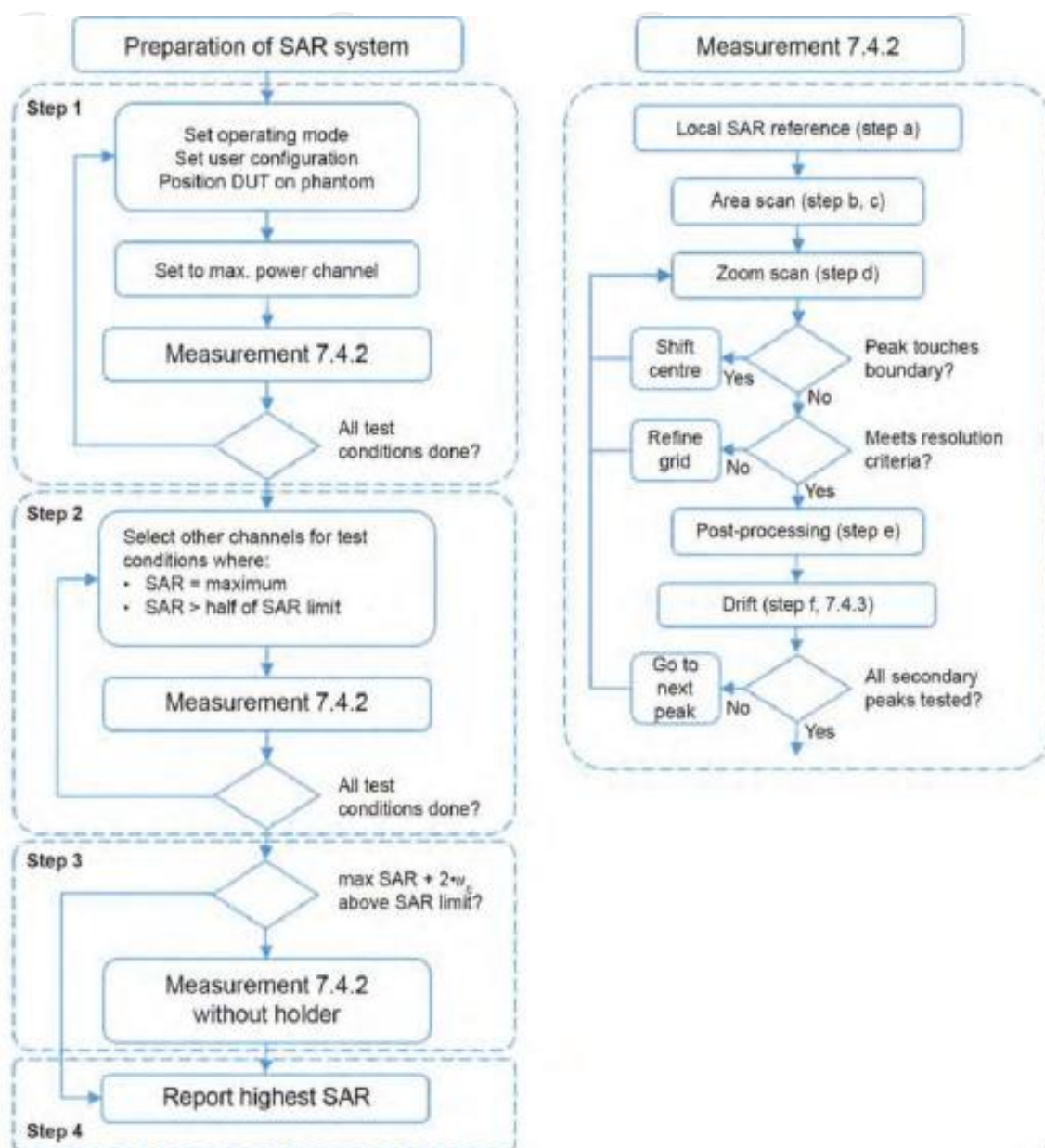
Data	Frequency (MHz)	Measured Value in 100mW (W/kg)		Normalized to 1W (W/kg)		Target Value (W/kg)		Deviation (%)	
		1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average	10 g Average
03/28/2025	750	0.76	0.54	7.60	5.40	8.31	5.71	-8.54	-5.43
03/26/2025	900	1.23	0.69	12.30	6.90	10.63	6.81	1.57	1.32
03/26/2025	1800	3.82	2.15	38.20	21.50	37.67	20.23	1.41	6.28
04/07/2025	2000	4.21	2.26	42.10	22.60	42.16	21.18	-0.14	6.70
03/25/2025	2450	5.57	2.62	55.70	26.20	53.26	24.15	4.58	8.49
04/07/2025	2600	5.00	2.20	50.00	22.00	54.31	24.14	-7.94	-8.86
03/25/2025	5200	15.16	5.26	151.60	52.6	163.88	57.29	-7.49	-8.19
03/25/2025	5400	15.70	5.40	157.00	5.40	172.23	59.16	-8.84	-8.72
03/25/2025	5600	16.69	5.64	166.90	56.40	181.28	61.57	-7.93	-8.40
03/25/2025	5800	17.22	5.83	172.20	58.30	188.95	63.45	-8.86	-8.11

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



## 7. Measurement Procedure

### 7.1. Measurement Process Diagram



The Block diagram 7.4.2 can be found on page 60 of IEC/IEEE 62209-1528: 2020



## 7.2. Measurement Procedure

### Setup a Call Connection

Establish a call in handset at the maximum power level with a base station simulator via air interface, or make the EUT estimate by itself in testing band.

### Power Reference Measurement

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

### Area Scan

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm<sup>2</sup> step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard.

### Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 4 points within a cube whose base faces are cantered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

### Power Drift measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have OPENSAR software stop the measurements if this limit is exceeded. If the power drifts more than 5%, the SAR will be retested.

## 8. Conducted Output Power

Band: GSM 900	Measured Power (dBm)			Calculation (dB)	Averaged Power (dBm)		
Channel	975	60	124		975	60	124
Frequency	880.2	902	914.8		880.2	902	914.8
GSM (GMSK, Voice)	32.98	32.65	32.48	-9.03	<b>23.95</b>	23.62	23.45
GPRS (GMSK, 1-slot)	32.83	32.51	32.39	-9.03	23.80	23.48	23.36
GPRS (GMSK, 2-slot)	31.89	31.57	31.39	-6.02	25.87	25.55	25.37
GPRS (GMSK, 3-slot)	30.26	29.71	29.45	-4.26	<b>26.00</b>	25.45	25.19
GPRS (GMSK, 4-slot)	28.64	28.31	28.05	-3.01	25.63	25.30	25.04
EGPRS (GMSK, 1-slot)	27.45	27.16	27.03	-9.03	18.42	18.13	18.00
EGPRS (GMSK, 2-slot)	25.91	25.59	25.39	-6.02	19.89	19.57	19.37
EGPRS (GMSK, 3-slot)	23.47	23.10	22.89	-4.26	19.21	18.84	18.63
EGPRS (GMSK, 4-slot)	21.72	21.56	21.42	-3.01	18.71	18.55	18.41
Band: GSM 1800	Measured Power (dBm)			Calculation (dB)	Averaged Power (dBm)		
Channel	512	700	885		512	700	885
Frequency	1710.2	1747.8	1784.8		1710.2	1747.8	1784.8
GSM (GMSK, Voice)	30.47	30.54	29.91	-9.03	21.44	<b>21.51</b>	20.88
GPRS (GMSK, 1-slot)	30.56	30.62	30.05	-9.03	21.53	21.59	21.02
GPRS (GMSK, 2-slot)	29.64	29.71	29.18	-6.02	23.62	23.69	23.16
GPRS (GMSK, 3-slot)	27.93	28.04	27.46	-4.26	23.67	23.78	23.20
GPRS (GMSK, 4-slot)	26.82	26.97	26.52	-3.01	23.81	<b>23.96</b>	23.51
EGPRS (GMSK, 1-slot)	26.49	26.58	26.36	-9.03	17.46	17.55	17.33
EGPRS (GMSK, 2-slot)	25.12	25.29	25.05	-6.02	19.10	19.27	19.03
EGPRS (GMSK, 3-slot)	22.76	22.90	22.57	-4.26	18.50	18.64	18.31
EGPRS (GMSK, 4-slot)	20.98	21.20	21.23	-3.01	17.97	18.19	18.22

### Note:

#### 1. Division Factors

To average the power, the division factor is as follows:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

#### 2. According to the conducted power as above, the body measurements are performed with 4Txslots for 900MHz and 1800 MHz for GPRS.

Band	WCDMA Band I			WCDMA Band VIII		
Channel	9612	9750	9888	2712	2788	2863
Frequency	1922.4	1950	1977.6	882.4	897.6	912.6
RMC 12.2Kbps	22.43	<b>22.52</b>	22.48	23.52	23.17	<b>23.64</b>
HSDPA Subtest-1	21.92	22.01	22.02	22.96	22.56	23.05
HSDPA Subtest-2	21.76	21.79	21.79	22.63	22.34	22.78
HSDPA Subtest-3	21.49	21.33	21.37	22.38	22.19	22.52
HSDPA Subtest-4	21.13	21.24	21.26	22.15	21.84	22.27
HSUPA Subtest-1	21.49	21.59	21.56	22.57	22.17	22.56
HSUPA Subtest-2	21.43	21.50	21.48	22.50	22.13	22.43
HSUPA Subtest-3	21.25	21.38	21.34	22.33	21.82	22.26
HSUPA Subtest-4	21.07	21.26	21.19	22.04	21.69	22.04
HSUPA Subtest-5	20.72	20.84	20.78	21.78	21.36	20.73

**Note:**

1. According to the power listed above, the HSDPA and HSUPA were not determined for SAR testing.
2. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2kbps RMC(reference measurement channel) configuration in test loop mode

WLAN 2.4G						
Mode	802.11b			802.11g		
Channel	1	7	13	1	7	13
Frequency	2412	2442	2472	2412	2442	2472
Average Power (dBm)	17.15	<b>17.87</b>	17.75	15.01	15.59	15.62
Mode	802.11n(HT20)			802.11n(HT40)		
Channel	1	7	13	3	7	11
Frequency	2412	2442	2472	2422	2442	2462
Average Power (dBm)	14.87	15.46	15.51	14.32	14.45	14.45
BDR+EDR						
Mode	GFSK		Pi/4DQPSK		8DPSK	
Average Power (dBm)	<b>9.81</b>		7.28		7.00	
Mode	BLE(1M)					
Frequency	2402		2440		2480	
Average Power (dBm)	-1.95		-0.89		-0.39	
Mode	BLE(2M)					
Frequency	2402		2440		2480	
Average Power (dBm)	-1.93		-0.89		-0.46	

**Note:**

1. Because the output power(eirp) of Bluetooth of the EUT is less than 20mW(13dBm), so standalone SAR are exempt according to EN62479.

WLAN 5.2G		
Mode	IEEE 802.11a	IEEE 802.11n HT20
Channel	36	36
Frequency	5180	5180
Average Power (dBm)	11.73	<b>12.20</b>
Mode	IEEE 802.11n HT40	IEEE 802.11ac VHT20
Channel	38	36
Frequency	5190	5180
Average Power (dBm)	11.74	12.20
Mode	IEEE 802.11ac VHT40	IEEE 802.11ac VHT80
Channel	38	42
Frequency	5190	5210
Average Power (dBm)	11.84	11.64
WLAN 5.3G		
Mode	IEEE 802.11a	IEEE 802.11n HT20
Channel	64	64
Frequency	5320	5320
Average Power (dBm)	<b>11.61</b>	11.54
Mode	IEEE 802.11n HT40	IEEE 802.11ac VHT20
Channel	62	64
Frequency	5310	5320
Average Power (dBm)	11.23	11.50
Mode	IEEE 802.11ac VHT40	IEEE 802.11ac VHT80
Channel	62	58
Frequency	5310	5290
Average Power (dBm)	11.27	11.28

WLAN 5.6G						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	100	140		100	140	
Frequency	5500	5700		5500	5700	
Average Power (dBm)	6.58	5.50		6.73	5.38	
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	102	134		100	140	
Frequency	5510	5670		5500	5700	
Average Power (dBm)	6.39	4.29		<b>6.90</b>	5.21	
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	102	134		106	122	
Frequency	5510	5670		5530	5610	
Average Power (dBm)	6.41	4.02		5.71	4.07	
WLAN 5.8G						
Mode	IEEE 802.11a6m			IEEE 802.11n HT20		
Channel	149	157	165	149	157	165
Frequency	5745	5785	5825	5745	5785	5825
Average Power (dBm)	7.59	9.25	10.71	7.66	8.96	10.26
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	151	159		149	157	165
Frequency	5755	5795		5745	5785	5825
Average Power (dBm)	7.30	8.86		7.84	9.02	<b>10.57</b>
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	151	159		155		
Frequency	5755	5795		5775		
Average Power (dBm)	7.80	8.83		7.71		

## NFC

About NFC reference to Reference levels for electric, magnetic and electromagnetic fields ( 0Hz to 300GHz,unperturbed ms values)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (uT)	Equivalent plane wave power density Seq(W/m2)
0-1Hz	--	$3.2 \times 10^4$	$4 \times 10^4$	--
1-8Hz	10000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	--
8-25Hz	10000	$4000/f$	$5000/f$	--
0.025-0.8KHz	$250/f$	$4/f$	$5/f$	--
0.8-3KHz	$250/f$	5	6.25	--
3-150KHz	87	5	6.25	--
0.15-1MHz	87	$0.73/f$	$0.92/f$	--
1-10MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	--
10-400MHz	28	0.073	0.092	2
400-2000MHz	$1.375f^{1/2}$	$0.0037f^{1/2}$	$0.0046f^{1/2}$	$f/200$
2-300GHz	61	0.16	0.20	10

Reference to TCT250320E084 en 62311

H-Filed Strength at 10 cm from the edges surrounding the EUT (A/m)

Frequency Range (MHz)	Test Position A (A/m)	Test Position B (A/m)	Test Position C (A/m)	Result (A/m)	Limits Test (A/m)
13.56	0.03	0.04	0.05	0.071	0.073

$$H = \sqrt{A^2 + B^2 + C^2} = \sqrt{0.03^2 + 0.04^2 + 0.05^2} \text{ A/m} = 0.071 \text{ A/m}$$

Limit = 0.073 A/m

So the SAR measurement for the of NFC is not necessary



The conducted power measurement results for LTE

## LTE-BAND 1

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	5MHz	Low range	1	0	23.63	23.45
				max	23.65	23.47
			Partial	0	24.08	23.90
				max	24.09	23.91
		Mid range	1	0	23.58	23.40
				max	23.66	23.48
			Partial	0	24.10	23.92
				max	24.11	23.93
		High range	1	0	23.72	23.54
				max	23.71	23.53
			Partial	0	24.09	23.91
				max	24.10	23.91
	20MHz	Low range	1	0	23.49	23.30
				max	23.52	23.34
			Partial	0	23.89	23.71
				max	23.93	23.75
		Mid range	1	0	23.37	23.19
				max	23.45	23.27
			Partial	0	23.88	23.70
				max	23.97	23.79
		High range	1	0	23.27	23.09
				max	23.38	23.20
			Partial	0	<b>24.05</b>	23.87
				max	23.93	23.75

## LTE-BAND 3

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	1.4MHz	Low range	1	0	24.13	23.95
				max	24.09	23.91
			Partial	0	24.52	24.34
				max	24.56	24.38
		Mid range	1	0	23.89	23.71
				max	23.84	23.66
			Partial	0	24.44	24.26
				max	24.42	24.24
		High range	1	0	23.61	23.43
				max	23.59	23.41
			Partial	0	24.31	24.13
				max	24.29	24.10
	5 MHz	Low range	1	0	24.29	24.10
				max	24.30	24.12
			Partial	0	24.72	24.54
				max	24.64	24.46
		Mid range	1	0	24.08	23.90
				max	24.00	23.82
			Partial	0	24.56	24.38
				max	24.49	24.31
		High range	1	0	23.91	23.73
				max	23.91	23.73
			Partial	0	24.30	24.12
				max	24.29	24.11
	20 MHz	Low range	1	0	24.07	23.89
				max	24.14	23.96
			Partial	0	<b>24.46</b>	24.28
				max	24.45	24.27
		Mid range	1	0	23.86	23.68
				max	23.81	23.64
			Partial	0	24.40	24.21
				max	24.35	24.18
		High range	1	0	23.55	23.37
				max	23.55	23.37
			Partial	0	24.24	24.12
				max	24.24	24.12

## LTE-BAND 7

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	5MHz	Low range	1	0	23.78	23.60
				max	23.91	23.73
			Partial	0	23.71	23.53
				max	23.82	23.64
		Mid range	1	0	24.34	24.16
				max	24.35	24.17
			Partial	0	24.32	24.14
				max	24.31	24.13
		High range	1	0	23.98	23.80
				max	23.88	23.70
			Partial	0	23.88	23.70
				max	23.79	23.60
	20MHz	Low range	1	0	23.68	23.49
				max	24.06	23.88
			Partial	0	23.57	23.39
				max	23.89	23.71
		Mid range	1	0	24.04	23.86
				max	24.12	23.94
			Partial	0	<b>24.16</b>	23.98
				max	24.10	23.92
		High range	1	0	23.87	23.69
				max	23.48	23.30
			Partial	0	24.07	23.89
				max	23.70	23.52

## LTE-BAND 8

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	1.4MHz	Low range	1	0	24.02	23.84
				max	24.04	23.86
			Partial	0	24.46	24.28
				max	24.51	24.33
		Mid range	1	0	24.28	24.10
				max	24.36	24.18
			Partial	0	24.92	24.74
				max	24.88	24.70
		High range	1	0	24.22	24.04
				max	24.53	24.35
			Partial	0	24.99	24.81
				max	25.08	24.89
	5MHz	Low range	1	0	24.23	24.04
				max	24.30	24.12
			Partial	0	24.61	24.43
				max	24.69	24.51
		Mid range	1	0	24.46	24.28
				max	24.46	24.28
			Partial	0	24.96	24.78
				max	24.88	24.70
		High range	1	0	24.29	24.11
				max	24.72	24.54
			Partial	0	24.73	24.55
				max	24.87	24.69
	10MHz	Low range	1	0	24.06	23.88
				max	24.06	23.88
			Partial	0	24.59	24.41
				max	24.78	24.60
		Mid range	1	0	24.29	24.11
				max	24.28	24.11
			Partial	0	<b>24.91</b>	24.72
				max	24.85	24.68
		High range	1	0	24.12	23.94
				max	24.12	23.94
			Partial	0	24.59	24.47
				max	24.75	24.63

## LTE-BAND 20

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	5MHz	Low range	1	0	24.92	24.74
				max	24.61	24.43
			Partial	0	25.34	25.16
				max	25.04	24.86
		Mid range	1	0	24.64	24.46
				max	24.69	24.51
			Partial	0	25.03	24.85
				max	25.09	24.91
		High range	1	0	24.63	24.45
				max	24.48	24.30
			Partial	0	25.06	24.88
				max	24.96	24.77
	20MHz	Low range	1	0	24.77	24.58
				max	24.61	24.43
			Partial	0	<b>25.05</b>	24.87
				max	24.99	24.81
		Mid range	1	0	24.51	24.33
				max	24.45	24.27
			Partial	0	24.94	24.76
				max	24.97	24.79
		High range	1	0	24.29	24.11
				max	24.21	24.03
			Partial	0	24.92	24.74
				max	24.93	24.75

## LTE-BAND 28

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	3MHz	Low range	1	0	24.76	24.58
				max	24.75	24.57
			Partial	0	25.28	25.10
				max	25.23	25.05
		Mid range	1	0	24.44	24.26
				max	24.35	24.17
			Partial	0	24.97	24.79
				max	24.94	24.76
		High range	1	0	24.39	24.21
				max	24.14	23.96
			Partial	0	24.87	24.69
				max	24.71	24.52
	5MHz	Low range	1	0	24.97	24.78
				max	24.90	24.72
			Partial	0	25.46	25.28
				max	25.37	25.19
		Mid range	1	0	24.57	24.39
				max	24.52	24.34
			Partial	0	25.04	24.86
				max	25.04	24.86
		High range	1	0	24.45	24.27
				max	24.36	24.18
			Partial	0	24.94	24.76
				max	24.81	24.63
	20MHz	Low range	1	0	<b>25.32</b>	25.14
				max	24.97	24.79
			Partial	0	25.18	25.00
				max	24.93	24.75
		Mid range	1	0	24.86	24.68
				max	24.65	24.48
			Partial	0	24.85	24.66
				max	24.65	24.48
		High range	1	0	24.64	24.46
				max	24.58	24.40
			Partial	0	24.65	24.53
				max	24.63	24.51

## LTE-BAND 38

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	5MHz	Low range	1	0	23.82	23.64
				max	23.77	23.59
			Partial	0	23.89	23.71
				max	23.86	23.68
		Mid range	1	0	23.79	23.61
				max	23.77	23.59
			Partial	0	23.87	23.69
				max	23.78	23.60
		High range	1	0	24.05	23.87
				max	24.03	23.85
			Partial	0	23.79	23.61
				max	23.74	23.55
	20MHz	Low range	1	0	23.69	23.50
				max	23.69	23.51
			Partial	0	23.76	23.58
				max	23.76	23.58
		Mid range	1	0	23.69	23.51
				max	23.68	23.50
			Partial	0	<b>23.78</b>	23.60
				max	23.68	23.50
		High range	1	0	23.74	23.56
				max	23.67	23.49
			Partial	0	23.71	23.53
				max	23.65	23.47



## LTE-BAND 40

Condition	Channel Bandwidth	Channel	RB allocation		Average Power (dBm) QPSK	Average Power (dBm) 16-QAM
			RB Size	RB Offset		
Normal	5MHz	Low range	1	0	24.00	23.82
				max	23.99	23.81
			Partial	0	24.11	23.93
				max	24.08	23.90
		Mid range	1	0	24.00	23.82
				max	24.00	23.82
			Partial	0	24.02	23.84
				max	24.05	23.87
		High range	1	0	24.21	24.03
				max	24.32	24.14
			Partial	0	24.17	23.99
				max	24.17	23.98
	20MHz	Low range	1	0	23.87	23.68
				max	23.91	23.73
			Partial	0	23.97	23.79
				max	23.91	23.73
		Mid range	1	0	23.88	23.70
				max	23.86	23.68
			Partial	0	23.88	23.70
				max	23.96	23.78
		High range	1	0	<b>24.05</b>	23.87
				max	23.94	23.76
			Partial	0	23.93	23.75
				max	23.99	23.81

## 5G NR N1

Condition	Channel Bandwidth	Channel	RB allocation	Average Power (dBm) CP-QPSK
Normal	5MHz	Low range	13@6	22.40
			1@1	22.42
			1@23	22.49
		Mid range	13@6	22.00
			1@1	22.06
			1@23	22.02
		High range	13@6	22.12
			1@1	22.15
			1@23	22.29
	20MHz	Low range	53@26	22.23
			1@1	22.14
			1@104	21.97
		Mid range	53@26	21.94
			1@1	22.11
			1@104	22.09
		High range	53@26	22.10
			1@1	21.92
			1@104	21.99
	40MHz	Low range	108@54	22.09
			1@1	22.24
			1@214	22.22
		Mid range	108@54	22.02
			1@1	<b>22.24</b>
			1@214	22.01
		High range	108@54	21.99
			1@1	22.15
			1@214	22.11

## 5G NR N3

Condition	Channel Bandwidth	Channel	RB allocation	Average Power (dBm) CP-QPSK
Normal	5MHz	Low range	13@6	22.21
			1@1	22.16
			1@23	22.15
		Mid range	13@6	22.02
			1@1	22.04
			1@23	22.01
		High range	13@6	21.95
			1@1	22.01
			1@23	22.09
	10MHz	Low range	26@13	22.22
			1@1	22.04
			1@50	22.01
		Mid range	26@13	22.08
			1@1	22.12
			1@50	21.98
		High range	26@13	21.95
			1@1	21.68
			1@50	21.72
	20MHz	Low range	53@26	20.59
			1@1	<b>22.10</b>
			1@104	20.41
		Mid range	53@26	22.02
			1@1	21.94
			1@104	21.91
		High range	53@26	21.96
			1@1	21.75
			1@104	21.67

## 5G NR N7

Condition	Channel Bandwidth	Channel	RB allocation	Average Power (dBm) CP-QPSK
Normal	5MHz	Low range	13@6	22.22
			1@1	22.27
			1@23	22.30
		Mid range	13@6	22.28
			1@1	22.25
			1@23	22.34
		High range	13@6	22.34
			1@1	22.37
			1@23	22.31
	10MHz	Low range	39@19	22.11
			1@1	23.19
			1@77	23.52
		Mid range	39@19	21.60
			1@1	22.49
			1@77	22.63
		High range	39@19	21.61
			1@1	22.75
			1@77	21.12
	20MHz	Low range	53@26	22.20
			1@1	22.69
			1@104	<b>23.21</b>
		Mid range	53@26	21.57
			1@1	22.77
			1@104	22.93
		High range	53@26	21.71
			1@1	23.05
			1@104	20.43

## 9. SAR Test Results Summary

### 9.1. Head SAR 10g Value

Band	Mode	Position	CH.	Freq. (MHz)	Meas. Power (dBm)	Max. Tune-Up Power (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)	Limit (W/Kg)
GSM900	voice	Right Cheek	975	880.2	32.98	33.00	-1.80	0.11	1.005	0.11	2.00
		Right Tilt	975	880.2	32.98	33.00	1.62	0.07	1.005	0.07	
		Left Cheek	975	880.2	32.98	33.00	1.84	0.14	1.005	<b>0.14</b>	
		Left Tilt	975	880.2	32.98	33.00	0.85	0.07	1.005	0.07	
GSM1800	voice	Right Cheek	700	1747.8	30.54	31.00	2.08	0.10	1.112	0.11	
		Right Tilt	700	1747.8	30.54	31.00	1.63	0.07	1.112	0.08	
		Left Cheek	700	1747.8	30.54	31.00	1.48	0.11	1.112	<b>0.12</b>	
		Left Tilt	700	1747.8	30.54	31.00	-1.75	0.05	1.112	0.06	
WCDMA Band I	RMC	Right Cheek	9750	1950	22.52	23.00	1.59	0.07	1.117	0.08	
		Right Tilt	9750	1950	22.52	23.00	1.56	0.05	1.117	0.06	
		Left Cheek	9750	1950	22.52	23.00	0.15	0.11	1.117	<b>0.12</b>	
		Left Tilt	9750	1950	22.52	23.00	-1.92	0.06	1.117	0.07	
WCDMA Band VIII	RMC	Right Cheek	2863	912.6	23.64	24.00	3.87	0.07	1.086	0.08	
		Right Tilt	2863	912.6	23.64	24.00	1.62	0.06	1.086	0.07	
		Left Cheek	2863	912.6	23.64	24.00	1.50	0.12	1.086	<b>0.13</b>	
		Left Tilt	2863	912.6	23.64	24.00	-1.28	0.06	1.086	0.07	
802.11b	DATA	Right Cheek	7	2442	17.87	18.00	-1.08	0.20	1.030	0.21	
		Right Tilt	7	2442	17.87	18.00	-1.62	0.12	1.030	0.12	
		Left Cheek	7	2442	17.87	18.00	0.19	0.21	1.030	<b>0.22</b>	
		Left Tilt	7	2442	17.87	18.00	2.70	0.14	1.030	0.14	
802.11n	DATA	Right Cheek	36	5180	12.20	12.50	3.87	0.12	1.072	0.13	
		Right Tilt	36	5180	12.20	12.50	1.62	0.06	1.072	0.06	
		Left Cheek	36	5180	12.20	12.50	1.25	0.14	1.072	<b>0.15</b>	
		Left Tilt	36	5180	12.20	12.50	-1.08	0.09	1.072	0.10	

802.11a	DATA	Right Cheek	64	5320	11.61	12.00	0.97	0.08	1.094	0.09	2.00
		Right Tilt	64	5320	11.61	12.00	-1.53	0.04	1.094	0.04	
		Left Cheek	64	5320	11.61	12.00	-0.05	0.09	1.094	<b>0.10</b>	
		Left Tilt	64	5320	11.61	12.00	-2.09	0.05	1.094	0.05	
802.11ac	DATA	Right Cheek	100	5500	6.90	7.00	-1.59	0.05	1.023	0.05	
		Right Tilt	100	5500	6.90	7.00	-2.61	0.03	1.023	0.03	
		Left Cheek	100	5500	6.90	7.00	1.90	0.08	1.023	<b>0.08</b>	
		Left Tilt	100	5500	6.90	7.00	1.02	0.05	1.023	0.05	
802.11ac	DATA	Right Cheek	165	5825	10.57	11.00	-3.91	0.10	1.104	0.11	
		Right Tilt	165	5825	10.57	11.00	1.25	0.06	1.104	0.07	
		Left Cheek	165	5825	10.57	11.00	1.09	0.12	1.104	<b>0.13</b>	
		Left Tilt	165	5825	10.57	11.00	-0.60	0.09	1.104	0.10	

Band	Mode	Test Position with 5mm	CH.	Freq. (MHz)	RB allocation	RB offset	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
LTE Band 1	QPSK	Right Cheek	18500	1970	18	0	24.05	24.50	-0.84	0.15	1.109	0.17
		Right Tilt	18500	1970	18	0	24.05	24.50	1.62	0.11	1.109	0.12
		Left Cheek	18500	1970	18	0	24.05	24.50	1.26	0.18	1.109	<b>0.20</b>
		Left Tilt	18500	1970	18	0	24.05	24.50	-0.58	0.13	1.109	0.14
LTE Band 3	QPSK	Right Cheek	19300	1720	18	0	24.46	24.50	-3.80	0.23	1.009	0.23
		Right Tilt	19300	1720	18	0	24.46	24.50	1.62	0.13	1.009	0.13
		Left Cheek	19300	1720	18	0	24.46	24.50	-0.84	0.27	1.009	<b>0.27</b>
		Left Tilt	19300	1720	18	0	24.46	24.50	-1.58	0.14	1.009	0.14
LTE Band 7	QPSK	Right Cheek	21100	2535	18	0	24.16	24.50	0.80	0.15	1.081	0.16
		Right Tilt	21100	2535	18	0	24.16	24.50	1.62	0.07	1.081	0.08
		Left Cheek	21100	2535	18	0	24.16	24.50	-1.59	0.18	1.081	<b>0.19</b>
		Left Tilt	21100	2535	18	0	24.16	24.50	0.15	0.12	1.081	0.13
LTE Band 8	QPSK	Right Cheek	21625	897.5	12	0	21.91	22.00	-3.84	0.07	1.021	0.07
		Right Tilt	21625	897.5	12	0	21.91	22.00	1.50	0.05	1.021	0.05
		Left Cheek	21625	897.5	12	0	21.91	22.00	0.15	0.10	1.021	<b>0.10</b>
		Left Tilt	21625	897.5	12	0	21.91	22.00	0.15	0.06	1.021	0.06
LTE Band 20	QPSK	Right Cheek	24250	842	18	0	25.05	25.50	-3.81	0.05	1.109	0.06
		Right Tilt	24250	842	18	0	25.05	25.50	1.62	0.03	1.109	0.03
		Left Cheek	24250	842	18	0	25.05	25.50	-1.05	0.08	1.109	<b>0.09</b>
		Left Tilt	24250	842	18	0	25.05	25.50	-1.05	0.04	1.109	0.04

LTE Band 28	QPSK	Right Cheek	27310	713	1	0	25.32	25.50	-0.75	0.09	1.042	0.09
		Right Tilt	27310	713	1	0	25.32	25.50	1.62	0.04	1.042	0.04
		Left Cheek	27310	713	1	0	25.32	25.50	-2.61	0.11	1.042	<b>0.11</b>
		Left Tilt	27310	713	1	0	25.32	25.50	0.15	0.06	1.042	0.06
LTE Band 38	QPSK	Right Cheek	38000	2595	18	0	23.78	24.00	1.80	0.07	1.052	0.07
		Right Tilt	38000	2595	18	0	23.78	24.00	1.62	0.04	1.052	0.04
		Left Cheek	38000	2595	18	0	23.78	24.00	1.52	0.10	1.052	<b>0.11</b>
		Left Tilt	38000	2595	18	0	23.78	24.00	-2.15	0.05	1.052	0.05
LTE Band 40	QPSK	Right Cheek	39550	2390	1	0	24.05	24.50	0.10	0.06	1.109	0.07
		Right Tilt	39550	2390	1	0	24.05	24.50	-1.85	0.03	1.109	0.03
		Left Cheek	39550	2390	1	0	24.05	24.50	-1.90	0.07	1.109	<b>0.08</b>
		Left Tilt	39550	2390	1	0	24.05	24.50	0.91	0.04	1.109	0.04

Band	Mode	Test Position with 5mm	CH.	Freq. (MHz)	RB allocation	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
5G NR N1	CP-Q PSK	Right Cheek	390000	1950	1@1	22.24	22.50	2.17	0.15	1.062	<b>0.16</b>
		Right Tilt	390000	1950	1@1	22.24	22.50	1.62	0.07	1.062	0.07
		Left Cheek	390000	1950	1@1	22.24	22.50	-1.59	0.17	1.062	0.18
		Left Tilt	390000	1950	1@1	22.24	22.50	-0.15	0.12	1.062	0.13
5G NR N3	CP-Q PSK	Right Cheek	344000	1720	1@1	22.10	22.50	-3.18	0.15	1.096	0.16
		Right Tilt	344000	1720	1@1	22.10	22.50	-1.28	0.10	1.096	0.11
		Left Cheek	344000	1720	1@1	22.10	22.50	1.95	0.17	1.096	<b>0.19</b>
		Left Tilt	344000	1720	1@1	22.10	22.50	-1.62	0.12	1.096	0.13
5G NR N7	CP-Q PSK	Right Cheek	502000	2510	1@104	23.21	23.50	-3.18	0.10	1.069	0.11
		Right Tilt	502000	2510	1@104	23.21	23.50	1.62	0.06	1.069	0.06
		Left Cheek	502000	2510	1@104	23.21	23.50	-1.26	0.11	1.069	<b>0.12</b>
		Left Tilt	502000	2510	1@104	23.21	23.50	0.15	0.04	1.069	0.04



## 9.2. Body-Worn 10g SAR Value

Band	Mode	Position	CH.	Freq. (MHz)	Meas. Power (dBm)	Max. Tune-Up Power (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)	Limit (W/Kg)
GSM900	voice	Back	975	880.2	32.98	33.00	-2.93	0.11	1.005	0.11	2.00
		Front	975	880.2	32.98	33.00	-2.61	0.04	1.005	0.04	
	GPRS 3 slots	Back	975	880.2	30.26	30.50	-4.41	0.12	1.057	0.13	
		Front	975	880.2	30.26	30.50	1.28	0.07	1.057	0.07	
		Left	975	880.2	30.26	30.50	-3.17	0.04	1.057	0.04	
		Right	975	880.2	30.26	30.50	1.30	0.02	1.057	0.02	
		Bottom	975	880.2	30.26	30.50	-1.95	0.03	1.057	0.03	
		Top	975	880.2	30.26	30.50	/	<0.01	/	<0.01	
GSM1800	voice	Back	700	1747.8	30.54	31.00	-2.61	0.15	1.112	0.17	
		Front	700	1747.8	30.54	31.00	-3.78	0.07	1.112	0.08	
	GPRS 4 slots	Back	700	1747.8	26.97	27.00	-1.30	0.16	1.007	0.16	
		Front	700	1747.8	26.97	27.00	-2.84	0.09	1.007	0.09	
		Left	700	1747.8	26.97	27.00	1.02	0.03	1.007	0.03	
		Right	700	1747.8	26.97	27.00	-1.70	0.02	1.007	0.02	
		Bottom	700	1747.8	26.97	27.00	0.15	0.02	1.007	0.02	
		Top	700	1747.8	26.97	27.00	/	<0.01	/	<0.01	
WCDMA Band I	RMC	Back	9750	1950	22.52	23.00	-0.99	0.19	1.117	0.21	
		Front	9750	1950	22.52	23.00	-1.95	0.10	1.117	0.11	
		Left	9750	1950	22.52	23.00	1.32	0.05	1.117	0.06	
		Right	9750	1950	22.52	23.00	-2.18	0.03	1.117	0.03	
		Bottom	9750	1950	22.52	23.00	0.15	0.04	1.117	0.04	
		Top	9750	1950	22.52	23.00	1.45	0.02	1.117	0.02	

WCDMA Band VIII	RMC	Back	2863	912.6	23.64	24.00	-4.69	0.12	1.086	<b>0.13</b>
		Front	2863	912.6	23.64	24.00	-2.84	0.08	1.086	0.09
		Left	2863	912.6	23.64	24.00	1.62	0.02	1.086	0.02
		Right	2863	912.6	23.64	24.00	-1.05	0.02	1.086	0.02
		Bottom	2863	912.6	23.64	24.00	1.30	0.02	1.086	0.02
		Top	2863	912.6	23.64	24.00	/	<0.01	/	<0.01
802.11b	DATA	Back	7	2442	17.87	18.00	-1.45	0.09	1.030	<b>0.09</b>
		Front	7	2442	17.87	18.00	-1.87	0.04	1.030	0.04
		Left	7	2442	17.87	18.00	1.62	0.01	1.030	0.01
		Right	7	2442	17.87	18.00	/	<0.01	/	<0.01
		Bottom	7	2442	17.87	18.00	/	<0.01	/	<0.01
		Top	7	2442	17.87	18.00	/	<0.01	/	<0.01
802.11n	DATA	Back	36	5180	12.20	12.50	-4.47	0.09	1.072	<b>0.10</b>
		Front	36	5180	12.20	12.50	-3.78	0.06	1.072	0.06
		Left	36	5180	12.20	12.50	1.59	0.02	1.072	0.02
		Right	36	5180	12.20	12.50	/	<0.01	/	<0.01
		Bottom	36	5180	12.20	12.50	0.15	0.02	1.072	0.02
		Top	36	5180	12.20	12.50	/	<0.01	/	<0.01
802.11a	DATA	Back	64	5320	11.61	12.00	-1.09	0.10	1.094	<b>0.11</b>
		Front	64	5320	11.61	12.00	1.28	0.06	1.094	0.07
		Left	64	5320	11.61	12.00	1.62	0.02	1.094	0.02
		Right	64	5320	11.61	12.00	1.95	0.02	1.094	0.02
		Bottom	64	5320	11.61	12.00	-0.17	0.02	1.094	0.02
		Top	64	5320	11.61	12.00	/	<0.01	/	<0.01

2.00

802.11ac	DATA	Back	100	5500	6.90	7.00	-2.84	0.08	1.023	<b>0.08</b>	<b>2.00</b>
		Front	100	5500	6.90	7.00	-3.78	0.03	1.023	0.03	
		Left	100	5500	6.90	7.00	1.25	0.02	1.023	0.02	
		Right	100	5500	6.90	7.00	/	<0.01	/	<0.01	
		Bottom	100	5500	6.90	7.00	/	<0.01	/	<0.01	
		Top	100	5500	6.90	7.00	/	<0.01	/	<0.01	
802.11ac	DATA	Back	165	5825	10.57	11.00	-0.31	0.06	1.104	<b>0.07</b>	
		Front	165	5825	10.57	11.00	3.94	0.03	1.104	0.03	
		Left	165	5825	10.57	11.00	1.28	0.02	1.104	0.02	
		Right	165	5825	10.57	11.00	0.28	0.02	1.104	0.02	
		Bottom	165	5825	10.57	11.00	1.21	0.02	1.104	0.02	
		Top	165	5825	10.57	11.00	/	<0.01	/	<0.01	

Band	Mode	Test Position with 5mm	CH.	Freq. (MHz)	RB allocation	RB offset	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
LTE Band 1	QPSK	Back	18500	1970	18	0	24.05	24.50	-1.32	0.16	1.109	<b>0.18</b>
		Front	18500	1970	18	0	24.05	24.50	-1.87	0.09	1.109	0.10
		Left	18500	1970	18	0	24.05	24.50	-1.26	0.04	1.109	0.04
		Right	18500	1970	18	0	24.05	24.50	0.17	0.02	1.109	0.02
		Bottom	18500	1970	18	0	24.05	24.50	1.30	0.03	1.109	0.03
		Top	18500	1970	18	0	24.05	24.50	0.87	0.02	1.109	0.02
LTE Band 3	QPSK	Back	19300	1720	18	0	24.46	24.50	-0.79	0.33	1.009	<b>0.33</b>
		Front	19300	1720	18	0	24.46	24.50	-3.78	0.20	1.009	0.20
		Left	19300	1720	18	0	24.46	24.50	1.59	0.06	1.009	0.06
		Right	19300	1720	18	0	24.46	24.50	0.17	0.03	1.009	0.03
		Bottom	19300	1720	18	0	24.46	24.50	-1.74	0.04	1.009	0.04
		Top	19300	1720	18	0	24.46	24.50	0.12	0.02	1.009	0.02

LTE Band 7	QPSK	Back	21100	2535	18	0	24.16	24.50	-1.10	0.10	1.081	<b>0.11</b>
		Front	21100	2535	18	0	24.16	24.50	-3.79	0.05	1.081	0.05
		Left	21100	2535	18	0	24.16	24.50	1.56	0.03	1.081	0.03
		Right	21100	2535	18	0	24.16	24.50	0.15	0.02	1.081	0.02
		Bottom	21100	2535	18	0	24.16	24.50	2.74	0.02	1.081	0.02
		Top	21100	2535	18	0	24.16	24.50	0.10	0.02	1.081	0.02
LTE Band 8	QPSK	Back	21625	897.5	12	0	21.91	22.00	-1.27	0.13	1.021	<b>0.13</b>
		Front	21625	897.5	12	0	21.91	22.00	-3.79	0.08	1.021	0.08
		Left	21625	897.5	12	0	21.91	22.00	1.56	0.04	1.021	0.04
		Right	21625	897.5	12	0	21.91	22.00	0.58	0.02	1.021	0.02
		Bottom	21625	897.5	12	0	21.91	22.00	1.30	0.03	1.021	0.03
		Top	21625	897.5	12	0	21.91	22.00	/	<0.01	/	<0.01
LTE Band 20	QPSK	Back	24250	842	18	0	25.05	25.50	-1.59	0.14	1.109	<b>0.16</b>
		Front	24250	842	18	0	25.05	25.50	-1.79	0.08	1.109	0.09
		Left	24250	842	18	0	25.05	25.50	1.30	0.04	1.109	0.04
		Right	24250	842	18	0	25.05	25.50	0.18	0.02	1.109	0.02
		Bottom	24250	842	18	0	25.05	25.50	1.54	0.03	1.109	0.03
		Top	24250	842	18	0	25.05	25.50	-0.79	0.02	1.109	0.02
LTE Band 28	QPSK	Back	27310	713	1	0	25.32	25.50	1.62	0.15	1.042	<b>0.16</b>
		Front	27310	713	1	0	25.32	25.50	0.79	0.09	1.042	0.09
		Left	27310	713	1	0	25.32	25.50	1.62	0.05	1.042	0.05
		Right	27310	713	1	0	25.32	25.50	0.15	0.03	1.042	0.03
		Bottom	27310	713	1	0	25.32	25.50	1.78	0.05	1.042	0.05
		Top	27310	713	1	0	25.32	25.50	0.62	0.02	1.042	0.02

LTE Band 38	QPSK	Back	38000	2595	18	0	23.78	24.00	-2.90	0.07	1.052	<b>0.07</b>
		Front	38000	2595	18	0	23.78	24.00	0.79	0.04	1.052	0.04
		Left	38000	2595	18	0	23.78	24.00	1.62	0.02	1.052	0.02
		Right	38000	2595	18	0	23.78	24.00	1.87	0.02	1.052	0.02
		Bottom	38000	2595	18	0	23.78	24.00	-1.30	0.02	1.052	0.02
		Top	38000	2595	18	0	23.78	24.00	/	<0.01	/	<0.01
LTE Band 40	QPSK	Back	39550	2390	1	0	24.05	24.50	2.78	0.09	1.109	<b>0.10</b>
		Front	39550	2390	1	0	24.05	24.50	-3.78	0.04	1.109	0.04
		Left	39550	2390	1	0	24.05	24.50	1.59	0.02	1.109	0.02
		Right	39550	2390	1	0	24.05	24.50	/	<0.01	/	<0.01
		Bottom	39550	2390	1	0	24.05	24.50	/	<0.01	/	<0.01
		Top	39550	2390	1	0	24.05	24.50	/	<0.01	/	<0.01

**Note:**

1. Body-worn SAR testing was performed at 0mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Determination of the worst-case configuration and all configurations with less than 3 dB of applicable limits.
3. When  $10g \text{ SAR} \leq 1.0 \text{ W/kg}$ , testing for low and high channel is optional.

Band	Mode	Test Position with 5mm	CH.	Freq. (MHz)	RB allocation	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
5G NR N1	CP-Q PSK	Back	390000	1950	1@1	22.24	22.50	-3.02	0.28	1.062	<b>0.30</b>
		Front	390000	1950	1@1	22.24	22.50	-1.78	0.18	1.062	0.19
		Left	390000	1950	1@1	22.24	22.50	1.62	0.07	1.062	0.07
		Right	390000	1950	1@1	22.24	22.50	0.17	0.04	1.062	0.04
		Bottom	390000	1950	1@1	22.24	22.50	1.62	0.05	1.062	0.05
		Top	390000	1950	1@1	22.24	22.50	-1.95	0.02	1.062	0.02
5G NR N3	CP-Q PSK	Back	344000	1720	1@1	22.10	22.50	-0.49	0.33	1.096	<b>0.36</b>
		Front	344000	1720	1@1	22.10	22.50	0.62	0.21	1.096	0.23
		Left	344000	1720	1@1	22.10	22.50	2.78	0.07	1.096	0.08
		Right	344000	1720	1@1	22.10	22.50	1.60	0.04	1.096	0.04
		Bottom	344000	1720	1@1	22.10	22.50	0.17	0.06	1.096	0.07
		Top	344000	1720	1@1	22.10	22.50	-1.78	0.03	1.096	0.03
5G NR N7	CP-Q PSK	Back	502000	2510	1@104	23.21	23.50	2.18	0.21	1.069	<b>0.22</b>
		Front	502000	2510	1@104	23.21	23.50	-3.79	0.12	1.069	0.13
		Left	502000	2510	1@104	23.21	23.50	1.52	0.05	1.069	0.05
		Right	502000	2510	1@104	23.21	23.50	0.17	0.02	1.069	0.02
		Bottom	502000	2510	1@104	23.21	23.50	1.62	0.04	1.069	0.04
		Top	502000	2510	1@104	23.21	23.50	/	<0.01	/	<0.01

## 9.3. Wrist Worn 10g SAR

Band	Mode	Test Position with 0mm	CH.	Freq. (MHz)	Meas. Power (dBm)	Max. Tune-Up Power (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)	Limit (W/Kg)
GSM900	voice	Back	975	880.2	32.98	33.00	-1.26	0.28	1.005	0.28	<b>4.00</b>
	GPRS 3 slots	Back	975	880.2	30.26	30.50	-3.17	0.26	1.057	0.27	
GSM1800	voice	Back	700	1747.8	30.54	31.00	-0.27	0.32	1.112	0.36	
	GPRS 4 slots	Back	700	1747.8	26.97	27.00	0.72	0.33	1.007	0.33	
WCDMA Band I	RMC	Back	9750	1950	22.52	23.00	-0.70	0.51	1.117	0.57	
WCDMA Band VIII	RMC	Back	2863	912.6	23.64	24.00	-1.60	0.30	1.086	0.33	
802.11b	DATA	Back	7	2442	17.87	18.00	-0.22	0.27	1.030	0.28	
802.11n	DATA	Back	36	5180	12.20	12.50	-2.39	0.15	1.072	0.16	
802.11a	DATA	Back	64	5320	11.61	12.00	-2.76	0.18	1.094	0.20	
802.11ac	DATA	Back	100	5500	6.90	7.00	2.73	0.12	1.023	0.12	
802.11ac	DATA	Back	165	5825	10.57	11.00	1.47	0.11	1.104	0.12	

Band	Mode	Test Position with 0mm	CH.	Freq. (MHz)	RB allocation	RB offset	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
LTE Band 1	QPSK (20MHz)	Back	18500	1970	18	0	24.05	24.50	-2.31	0.39	1.109	0.43
LTE Band 3	QPSK (20MHz)	Back	19300	1720	18	0	24.46	24.50	-1.48	0.68	1.009	<b>0.69</b>
LTE Band 7	QPSK (20MHz)	Back	21100	2535	18	0	24.16	24.50	-4.51	0.39	1.081	0.42
LTE Band 8	QPSK (20MHz)	Back	21625	897.5	12	0	21.91	22.00	-2.90	0.32	1.021	0.33
LTE Band 20	QPSK (20MHz)	Back	24250	842	18	0	25.05	25.50	0.95	0.41	1.109	0.45
LTE Band 28	QPSK (20MHz)	Back	27310	713	1	0	25.32	25.50	-0.09	0.51	1.042	0.53
LTE Band 38	QPSK (20MHz)	Back	38000	2595	18	0	23.78	24.00	-1.59	0.19	1.052	0.20
LTE Band 40	QPSK (20MHz)	Back	39550	2390	1	0	24.05	24.50	-0.74	0.15	1.109	0.17

### Note:

1. Wrist Worn SAR testing was performed at 0mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Determination of the worst-case configuration and all configurations with less than 3 dB of applicable limits.
3. When  $10g\ SAR \leq 2.0\ W/kg$  for wrist worn, testing for low and high channel is optional.



Band	Mode	Test Position with 5mm	CH.	Freq. (MHz)	RB allocation	Ave. Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR10g (W/kg)	Scaling Factor	Reported SAR10g (W/kg)
5G NR N1	CP-Q PSK	Back	390000	1950	1@1	22.24	22.50	0.19	0.50	1.062	0.53
5G NR N3	CP-Q PSK	Back	344000	1720	1@1	22.10	22.50	-0.40	0.41	1.096	0.45
5G NR N7	CP-Q PSK	Back	502000	2510	1@104	23.21	23.50	-1.59	0.54	1.069	0.58

#### 9.4. Simultaneous Transmission Considerations

The device contain transmitters (GSM & WIFI, GPRS & WIFI, RMC & WIFI, HSDPA & WIFI, HSUPA & WIFI, LTE & WIFI, GSM & Bluetooth, LTE & Bluetooth, GPRS & Bluetooth, RMC & Bluetooth, HSDPA & Bluetooth, HSUPA & Bluetooth) can transmit multiple transmission modes at the same time, determining the threshold power level available to the secondary transmitter ( $P_{available}$ ) is to calculate it from the measured peak spatial-average SAR of the primary transmitter ( $SAR_1$ ) according to the equation:

$$P_{available} = P_{th,m} \cdot (SAR_{lim} - SAR_1) / SAR_{lim}$$

where  $P_{th,m}$  is the threshold exclusion power level taken from Annex B of IEC 62479 for the frequency of the secondary transmitter at the separation distance used in the testing.

The maximum  $SAR_1$  of head is **0.27W/Kg**, so

$$P_{available} = 20mW \times (2.0 - 0.27)/2.0 = 17.30mW$$

The maximum power of 2.4GWIFI is 17.87 dBm = 61.24mw >  $P_{available1}$

So the SAR measurement for the secondary transmitter of 2.4Gwifi is necessary

The maximum power of 5GWIFI is 12.20 dBm = 16.60mw >  $P_{available1}$

So the SAR measurement for the secondary transmitter of 5Gwifi is necessary

The maximum power of BT is 9.81dBm=9.57mw <  $P_{available1}$

So the SAR measurement for the secondary transmitter of BT is not necessary

The maximum  $SAR_2$  of body-worn is **0.36W/Kg**, so

$$P_{available} = 20mW \times (2.0 - 0.36)/2.0 = 16.40mW$$

The maximum power of 2.4GWIFI is 17.87 dBm = 61.24mw >  $P_{available2}$

So the SAR measurement for the secondary transmitter of 2.4Gwifi is necessary

The maximum power of 5GWIFI is 12.20dBm = 16.60mw >  $P_{available2}$

So the SAR measurement for the secondary transmitter of 5Gwifi is necessary

The maximum power of BT is 9.81 dBm=9.57mw <  $P_{available2}$

So the SAR measurement for the secondary transmitter of BT is not necessary

So highest simultaneous Transmission Procedures as below:

The maximum  $SAR_4$  of Wrist Worn is **0.69W/Kg**, so

$$P_{available} = 20mW \times (4.0 - 0.69)/4.0 = 16.55mW$$

The maximum power of 2.4GWIFI is 17.87 dBm = 61.24mw <  $P_{available3}$

So the SAR measurement for the secondary transmitter of 2.4Gwifi is not necessary

he maximum power of 5GWIFI is 12.20dBm = 16.60mw >  $P_{available3}$

So the SAR measurement for the secondary transmitter of 5Gwifi is necessary

The maximum power of BT is 9.81 dBm=9.57mw <  $P_{available3}$

So the SAR measurement for the secondary transmitter of BT is not necessary

NFC power is less than  $p_{available1}$  and can be exempted from evaluation

Head Mode	Position WWAN SAR10g (W/kg)		Position WLAN-2.4G SAR10g (W/kg)		Position WLAN -5G SAR10g (W/kg)		$\Sigma$ SAR <sub>1</sub> (W/kg)	Limit (W/Kg)
	Right Cheek	Left Cheek	Right Cheek	Left Cheek	Right Cheek	Left Cheek		
GSM 900	0.11	0.14	0.21	0.22	0.13	0.15	0.36	2.00
GSM1800	0.11	0.12	0.21	0.22	0.13	0.15	0.34	
WCDMA Band I	0.08	0.12	0.21	0.22	0.13	0.15	0.34	
WCDMA Band VIII	0.08	0.13	0.21	0.22	0.13	0.15	0.35	
LTE Band 1	0.17	0.20	0.21	0.22	0.13	0.15	0.42	
LTE Band 3	0.23	0.27	0.21	0.22	0.13	0.15	<b>0.49</b>	
LTE Band 7	0.16	0.19	0.21	0.22	0.13	0.15	0.41	
LTE Band 8	0.07	0.10	0.21	0.22	0.13	0.15	0.32	
LTE Band 20	0.06	0.09	0.21	0.22	0.13	0.15	0.31	
LTE Band 28	0.09	0.11	0.21	0.22	0.13	0.15	0.33	
LTE Band 38	0.07	0.11	0.21	0.22	0.13	0.15	0.33	
LTE Band 40	0.07	0.08	0.21	0.22	0.13	0.15	0.30	
5G NR N1	0.16	0.18	0.21	0.22	0.13	0.15	0.40	
5G NR N3	0.16	0.19	0.21	0.22	0.13	0.15	0.41	
5G NR N7	0.1	0.12	0.21	0.22	0.13	0.15	0.34	

Note:  $\Sigma$  SAR<sub>1</sub> is equal to the maximum value of the sum of Right Cheek or Left Cheek

Body Mode	Position	WWAN SAR10g (W/kg)	WLAN -2.4G SAR10g (W/kg)	WLAN -5G SAR10g (W/kg)	$\Sigma$ SAR <sub>2</sub> (W/kg)	Limit (W/Kg)
GSM 900 (GPRS)	Back	0.13	0.09	0.11	0.24	2.00
GSM1800(GPRS)	Back	0.17	0.09	0.11	0.28	
WCDMA Band I	Back	0.21	0.09	0.11	0.32	
WCDMA Band VIII	Back	0.13	0.09	0.11	0.24	
LTE Band 1	Back	0.18	0.09	0.11	0.29	
LTE Band 3	Back	0.33	0.09	0.11	0.44	
LTE Band 7	Back	0.11	0.09	0.11	0.22	
LTE Band 8	Back	0.13	0.09	0.11	0.24	
LTE Band 20	Back	0.16	0.09	0.11	0.27	
LTE Band 28	Back	0.16	0.09	0.11	0.27	
LTE Band 38	Back	0.07	0.09	0.11	0.18	
LTE Band 40	Back	0.10	0.09	0.11	0.21	
5G NR N1	Back	0.30	0.09	0.11	0.41	
5G NR N3	Back	0.36	0.09	0.11	<b>0.47</b>	
5G NR N7	Back	0.22	0.09	0.11	0.33	

Limbs Mode	Position	WWAN SAR10g (W/kg)	WLAN -2.4G SAR10g (W/kg)	WLAN -5G SAR10g (W/kg)	Σ SAR2 (W/kg)	(W/Kg)Limit
GSM 900 (Voice)	Back	0.28	0.28	0.20	0.56	2.00
GSM1800(Voice)	Back	0.36	0.28	0.20	0.64	
WCDMA Band I	Back	0.57	0.28	0.20	0.85	
WCDMA Band VIII	Back	0.33	0.28	0.20	0.61	
LTE Band 1	Back	0.43	0.28	0.20	0.71	
LTE Band 3	Back	0.69	0.28	0.20	<b>0.97</b>	
LTE Band 7	Back	0.42	0.28	0.20	0.70	
LTE Band 8	Back	0.33	0.28	0.20	0.61	
LTE Band 20	Back	0.45	0.28	0.20	0.73	
LTE Band 28	Back	0.53	0.28	0.20	0.81	
LTE Band 38	Back	0.20	0.28	0.20	0.48	
LTE Band 40	Back	0.17	0.28	0.20	0.45	
5G NR N1	Back	0.53	0.28	0.20	0.81	
5G NR N3	Back	0.45	0.28	0.20	0.73	
5G NR N7	Back	0.58	0.28	0.20	0.86	

## 9.5. Measurement Uncertainty (150MHz-6GHz)

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in IEC/IEEE 62209-1528: 2020. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Symbol	Input quantity Xi (source of uncertainty)	Prob. Dist.	Unc. a(xi)	Div. qi	u(xi) = a(xi)/qi	Ci	u(y) = Ci *u(xi)	vi
<b>Measurement system errors</b>								
CF	Probe calibration	N ( $k = 2$ )	5.8	2	2.90	1	2.90	$\infty$
CFdrift	Probe calibration drift	R	0.14	$\sqrt{3}$	0.08	1	0.08	$\infty$
LIN	Probe linearity and detection limit	R	1.98	$\sqrt{3}$	1.14	1	1.14	$\infty$
BBS	Broadband signal	R	0.18	$\sqrt{3}$	0.10	1	0.10	$\infty$
ISO	Probe isotropy	R	4.85	$\sqrt{3}$	2.80	1	2.80	$\infty$
DAE	Other probe and data acquisition errors	N	2.7	1	2.70	1	2.70	$\infty$
AMB	RF ambient and noise	N	1.73	1	1.73	1	1.73	$\infty$
$\Delta_{xyz}$	Probe positioning errors	N	0.81	1	0.81	$2/\delta$	0.81	$\infty$
DAT	Data processing errors	N	2.3	1	2.30	1	2.30	$\infty$
<b>Phantom and device (DUT or validation antenna) errors</b>								
LIQ( $\sigma$ )	Measurement of phantom conductivity( $\sigma$ )	N	4.4	1	4.4	$c\epsilon, c\sigma$	4.40	$\infty$
LIQ( $T_c$ )	Temperature effects (medium)	R	2.5	$\sqrt{3}$	1.44	$c\epsilon, c\sigma$	1.44	$\infty$
EPS	Shell permittivity	R	3.4	$\sqrt{3}$	1.96	See 8.4.2.3	0.49	$\infty$
DIS	Distance between the radiating element of the DUT and the phantom medium	N	0.8	1	0.8	2	1.60	$\infty$
Dxyz	Repeatability of positioning the DUT or source against the phantom	N	4	1	4	1	4	5
H	Device holder effects	N	3	1	3	1	3.00	
MOD	Effect of operating mode on probe sensitivity	R	3	$\sqrt{3}$	1.73	1	1.73	$\infty$
TAS	Time-average SAR	R	1.73	$\sqrt{3}$	1.00	1	1.00	$\infty$
RFdrift	Variation in SAR due to drift in output of DUT	N	2.89	1	2.89	1	2.89	
VAL	Validation antenna uncertainty (validation measurement only)	N	4.16	1	4.16	1	4.16	
Pin	Uncertainty in accepted power (validation measurement only)	N	2.89	1	2.89	1	2.89	
<b>Corrections to the SAR result (if applied)</b>								
$C(\epsilon', \sigma)$	Phantom deviation from target ( $\epsilon', \sigma$ )	N	2.31	1	2.31	1	2.31	
C(R)	SAR scaling	R	1.15	$\sqrt{3}$	0.66	1	0.66	
u( $\Delta$ SAR)	Combined uncertainty						11.26	
U	Expanded uncertainty and effective degrees of freedom					U =	22.52	

## UNCERTAINTY FOR PERFORMANCE CHECK

Uncertainty Component	Description	Uncertainty Value(%)	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. 1g(%)	Std. Unc. 10g(%)	v
<b>Measurement system</b>									
Probe calibration	7.2.1	5.8	N	1	1	1	5.8	5.8	$\infty$
Axial isotropy	7.2.1.1	3.5	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.43	1.43	$\infty$
Hemispherical isotropy	7.2.1.1	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	$\infty$
Boundary Effects	7.2.1.4	1.00	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Linearity	7.2.1.2	4.70	R	$\sqrt{3}$	1	1	2.71	2.71	$\infty$
System detection limits	7.2.1.2	1	R	$\sqrt{3}$	1	1	0.58	0.58	$\infty$
Modulation Response	7.2.1.3	3	N	1	1	1	0.00	0.00	$\infty$
Readout Electronics	7.2.1.5	0.5	N	1	1	1	0.50	0.50	$\infty$
Response Time	7.2.1.6	0	R	$\sqrt{3}$	1	1	0.00	0.00	$\infty$
Integration Time	7.2.1.7	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
RF Ambient Conditions-Noise	7.2.3.7	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
RF Ambient Conditions-Reflection	7.2.3.7	3	R	$\sqrt{3}$	1	1	1.73	1.73	$\infty$
Probe positioned mechanical Tolerance	7.2.2.1	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Probe positioning with respect to phantom shell	7.2.2.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	$\infty$
Extrapolation interpolation and integration algorithms for Max.SAR evaluation	7.2.4	2.3	R	1	1	1	1.33	1.33	$\infty$
<b>Dipole</b>									
Deviation of experimental source from numerical source		4	N	1	1	1	4.00	4.00	$\infty$
Input power and SAR drift measurement	7.2.3.6	5	R	$\sqrt{3}$	1	1	2.89	2.89	$\infty$
Dipole axis to liquid distance		2	R	$\sqrt{3}$	1	1			$\infty$
<b>Phantom and tissue parameters</b>									
Phantom uncertainty (shape and thickness tolerances)	7.2.2.2	4	R	$\sqrt{3}$	1	1	2.31	2.31	$\infty$
uncertainty in SAR correction for deviation (in permittivity and conductivity)	7.2.6	2	N	1	1	0.84	2.00	1.68	$\infty$
Liquid conductivity (temperature uncertainty)	7.2.3.5	2.5	N	1	0.78	0.71	1.95	1.78	$\infty$
Liquid conductivity -measurement uncertainty	7.2.3.3	4	N	1	0.23	0.26	0.92	1.04	$\infty$
Liquid permittivity (temperature uncertainty)	7.2.3.5	2.5	N	1	0.78	0.71	1.95	1.78	$\infty$
Liquid permittivity measurement uncertainty	7.2.3.4	5	N	1	0.23	0.26	1.15	1.30	$\infty$
Combined standard uncertainty			RSS				10.15	10.05	
Expanded uncertainty (95%CONFIDENCEINTE RVAL			k				20.29	20.10	



## 9.6. Test Equipment List

Test Equipment	Manufacturer	Model	Serial Number	Calibration	
				Calibration Date	Calibration Due
PC	Lenovo	H3050	N/A	N/A	N/A
Signal Generator	Agilent	N5182A	MY47070282	Jun. 27, 2024	Jun. 26, 2025
Multimeter	Keithley	Multimeter 2000	4078275	Jun. 27, 2024	Jun. 26, 2025
Network Analyzer	Agilent	8753E	US38432457	Jun. 27, 2024	Jun. 26, 2025
Wideband Radio Communication Tester	R & S	CMW500	114220	Jun. 27, 2024	Jun. 26, 2025
Power Meter	Agilent	E4418B	GB43312526	Jun. 27, 2024	Jun. 26, 2025
Power Meter	Agilent	E4416A	MY45101555	Jun. 27, 2024	Jun. 26, 2025
Power Meter	Agilent	N1912A	MY50001018	Jun. 27, 2024	Jun. 26, 2025
Power Sensor	Agilent	E9301A	MY41497725	Jun. 27, 2024	Jun. 26, 2025
Power Sensor	Agilent	E9327A	MY44421198	Jun. 27, 2024	Jun. 26, 2025
Power Sensor	Agilent	E9323A	MY53070005	Jun. 27, 2024	Jun. 26, 2025
Power Amplifier	PE	PE15A4019	112342	N/A	N/A
Directional Coupler	Agilent	722D	MY52180104	N/A	N/A
Attenuator	Chensheng	FF779	134251	N/A	N/A
E-Field PROBE	MVG	SSE2	SN 25/22 EPGO375	Jun. 29, 2024	Jun. 28, 2025
DIPOLE 750	MVG	SID 750	SN 16/15 DIP 0G750-368	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 900	MVG	SID 900	SN 16/15 DIP 0G900-370	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 1800	MVG	SID 1800	SN 16/15 DIP 1G800-371	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 2000	MVG	SID 2000	SN 16/15 DIP 2G000-373	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 2450	MVG	SID2450	SN 16/15 DIP 2G450-374	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 2600	MVG	SID2600	SN 16/15 DIP 2G600-375	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 5G	MVG	SID 5G	SN 13/14 WGA32	May 15, 2024	May 14, 2025
Communication Antenna	MVG	ANTA59	SN 39/14 ANTA59	N/A	N/A
Mobile Phone Position Device	MVG	MSH101	SN 19/15 MSH101	N/A	N/A
SAM PHANTOM	MVG	SAM120	SN 19/15 SAM120	N/A	N/A
PHANTOM TABLE	MVG	TABP101	SN 19/15 TABP101	N/A	N/A
Robot TABLE	MVG	TABP61	SN 19/15 TABP61	N/A	N/A
6 AXIS ROBOT	KUKA	KR6-R900	501822	N/A	N/A

**Note:**

1.N/A means this equipment no need to calibrate

2.Each Time means this device need to calibrate every use time

## 10. System Check Results

Date of measurement: 03/28/2025 Test mode: 750MHz (Head)

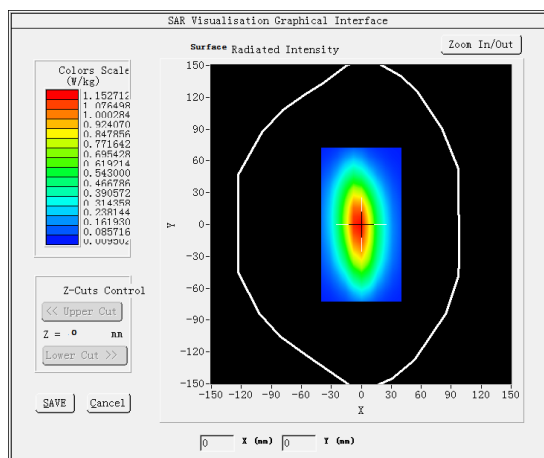
Product Description: Validation

Dipole Model: SID750

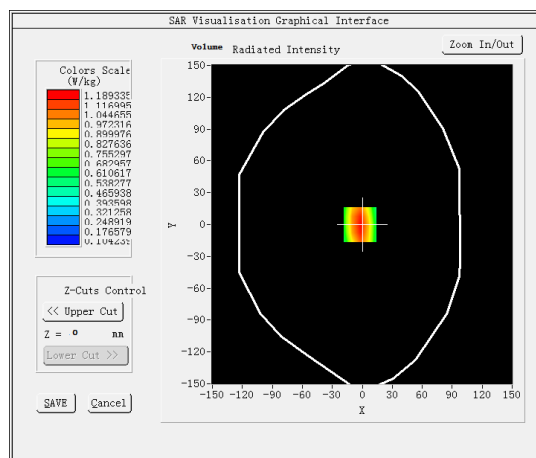
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.44
Relative permittivity (real part)	42.991584
Relative permittivity (imaginary part)	21.315845
Conductivity (S/m)	0.883089
Variation (%)	-0.300000

### SURFACE SAR



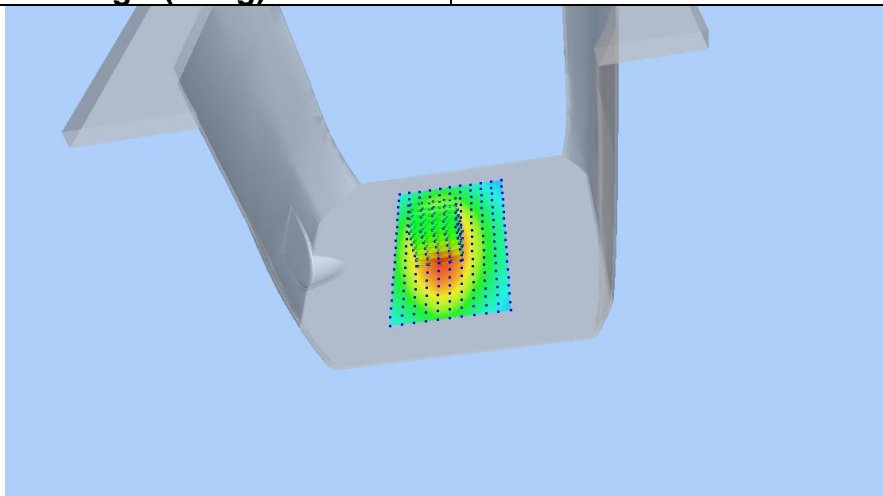
### VOLUME SAR



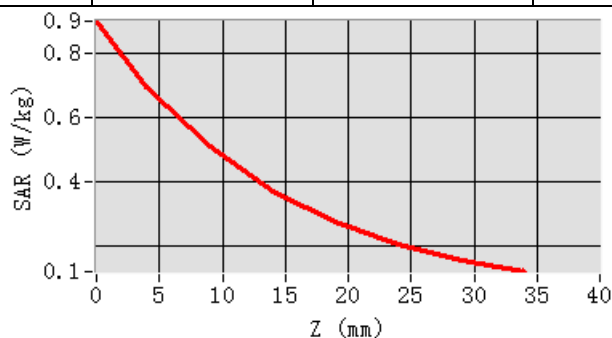
Maximum location: X=1.00, Y=2.00

SAR Peak: 0.90W/kg

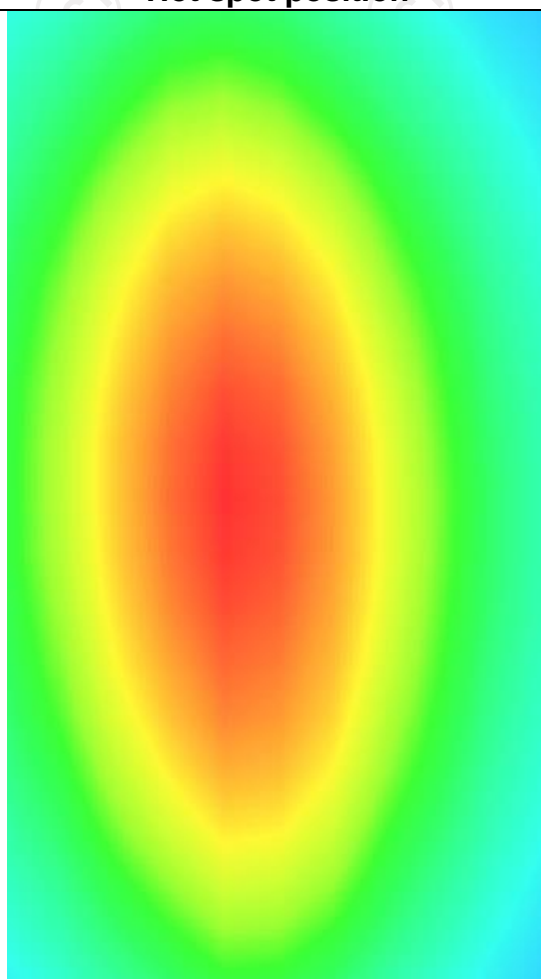
SAR 10g (W/Kg)	0.536915
SAR 1g (W/Kg)	0.756529



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.9045	0.7210	0.5511	0.3713	0.2785



Hot spot position



Date of measurement: 03/26/2025 Test mode: 900MHz (Head)

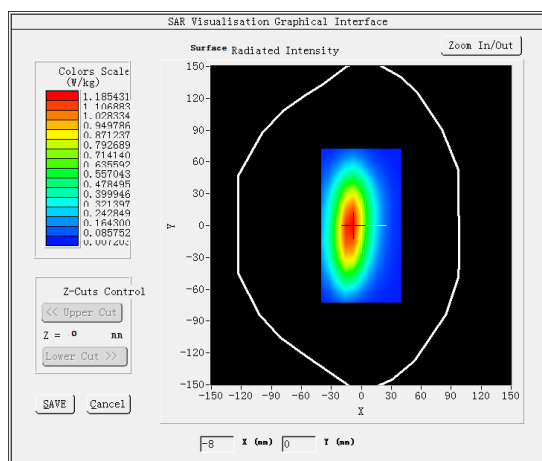
Product Description: Validation

Dipole Model: SID900

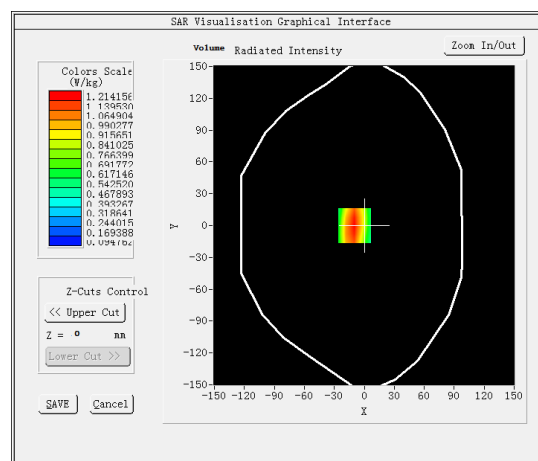
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.55
Relative permittivity (real part)	41.541254
Relative permittivity (imaginary part)	18.331254
Conductivity (S/m)	0.947158
Variation (%)	-1.260000

## SURFACE SAR



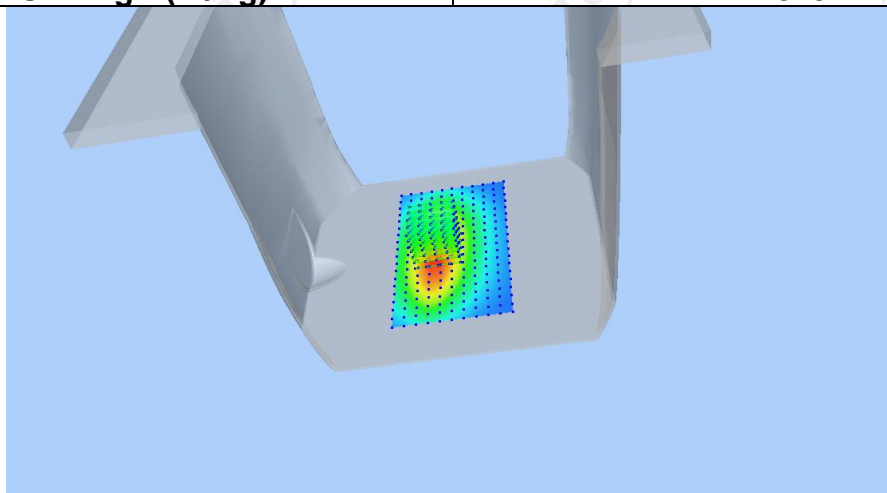
## VOLUME SAR



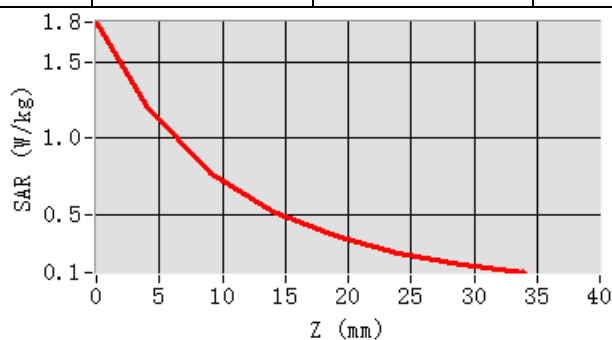
Maximum location: X=-10.00, Y=0.00

SAR Peak: 1.75W/kg

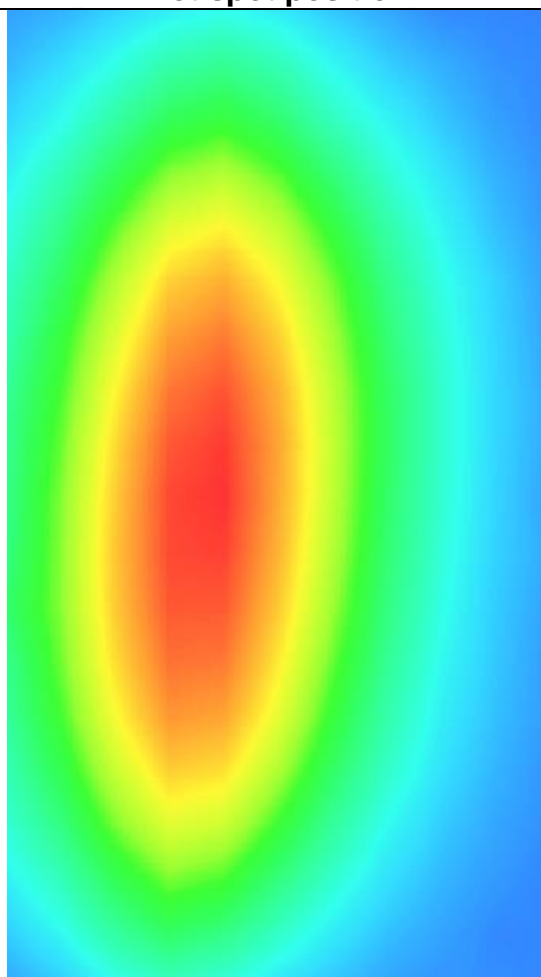
SAR 10g (W/Kg)	0.692098
SAR 1g (W/Kg)	1.227375



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.7576	1.2142	0.7759	0.5245	0.3629



Hot spot position



Date of measurement: 03/26/2025 Test mode: 1800MHz (Head)

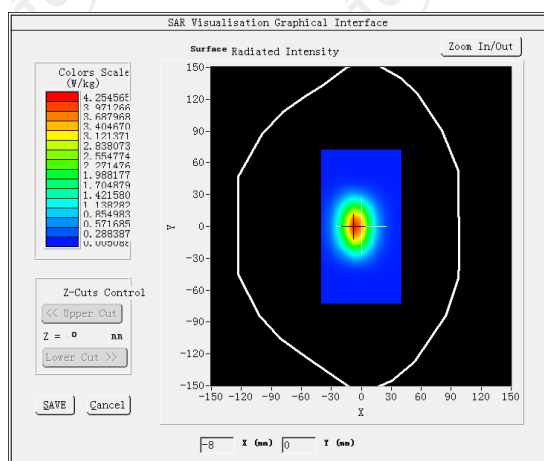
Product Description: Validation

Dipole Model: SID1800

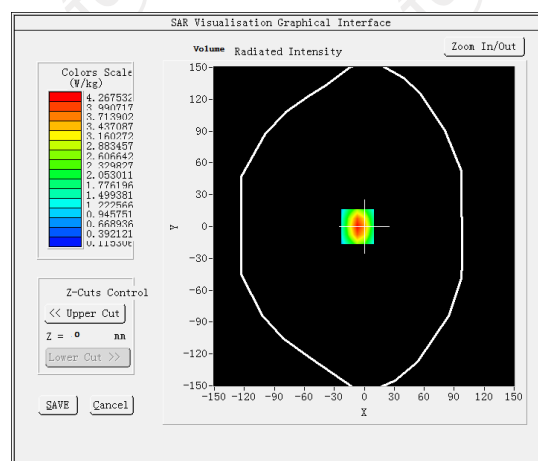
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.99
Relative permittivity (real part)	39.741251
Relative permittivity (imaginary part)	13.751846
Conductivity (S/m)	1.375125
Variation (%)	-1.620000

## SURFACE SAR



## VOLUME SAR



Maximum location: X=-6.00, Y=1.00

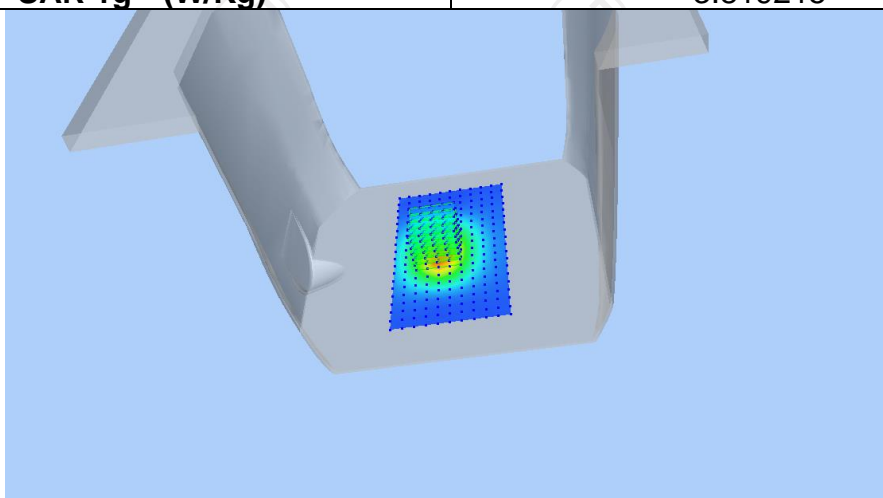
SAR Peak: 6.55W/kg

SAR 10g (W/Kg)

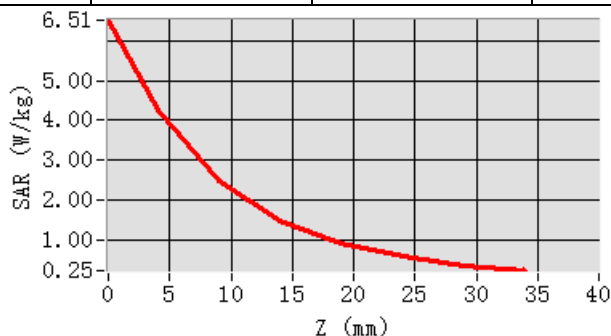
2.152695

SAR 1g (W/Kg)

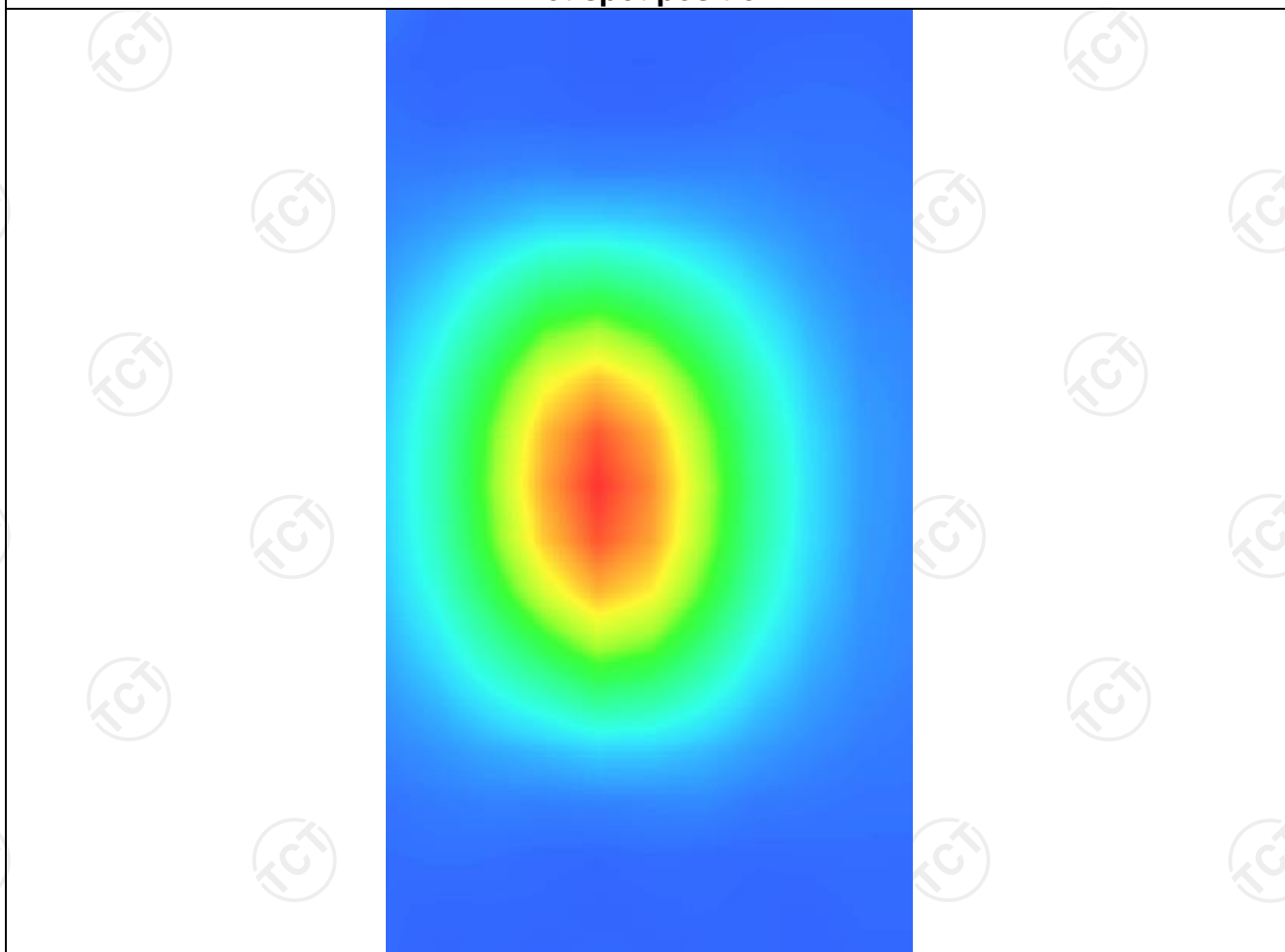
3.819215



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	6.5063	4.2675	2.4950	1.4860	0.9347



Hot spot position





Date of measurement: 04/07/2025 Test mode: 2000MHz (Head)

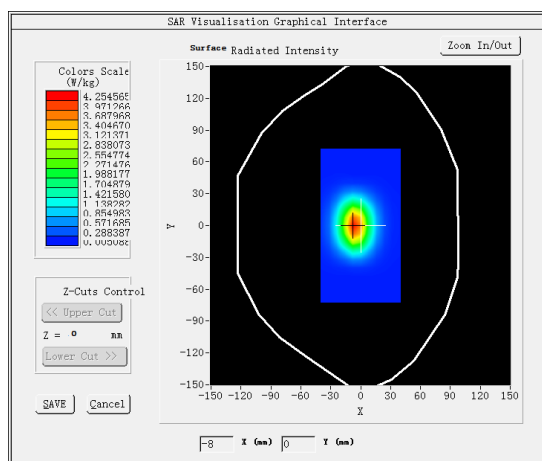
Product Description: Validation

Dipole Model: SID2000

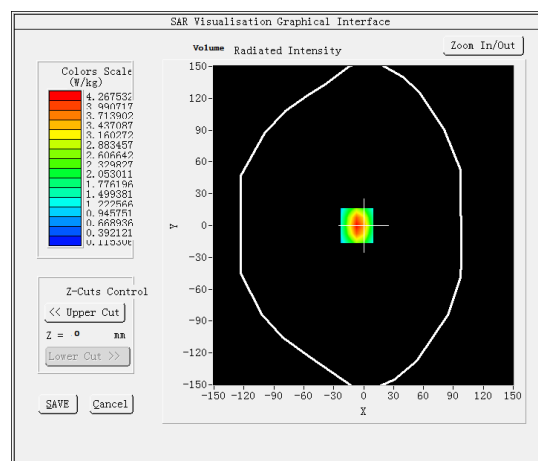
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Relative permittivity (real part)	39.951254
Relative permittivity (imaginary part)	12.495218
Conductivity (S/m)	1.421695
Variation (%)	-0.120000

## SURFACE SAR



## VOLUME SAR



Maximum location: X=-5.00, Y=1.00

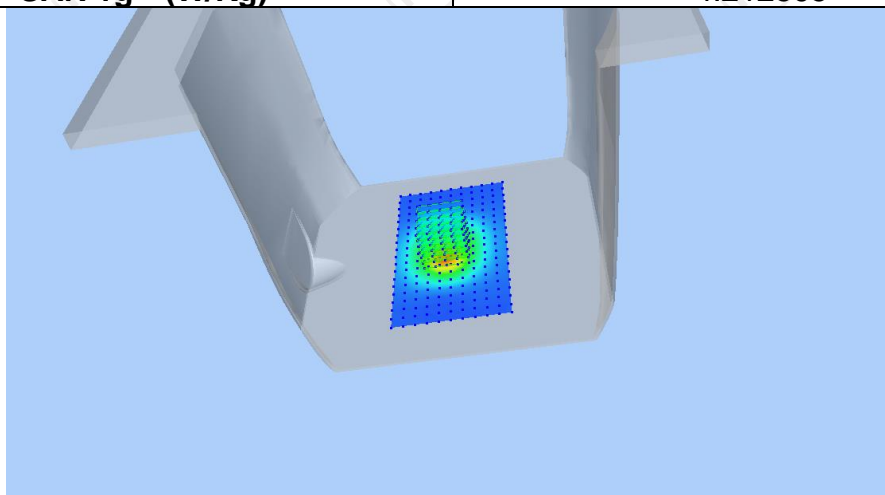
SAR Peak: 6.55W/kg

SAR 10g (W/Kg)

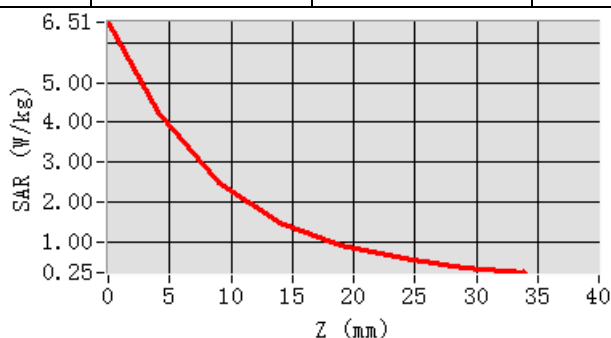
2.264125

SAR 1g (W/Kg)

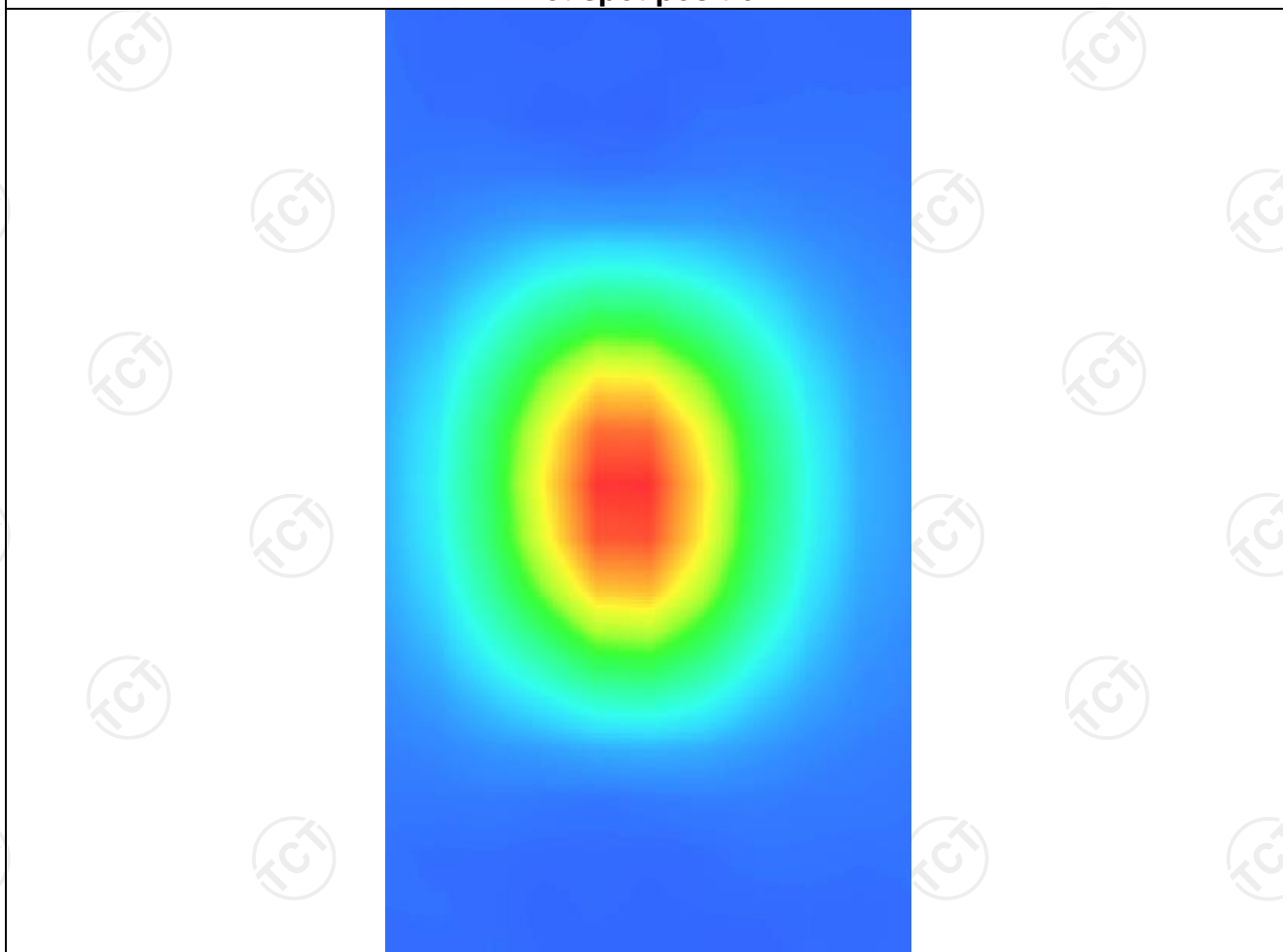
4.212595



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	6.5063	4.2675	2.4950	1.4860	0.9347



Hot spot position



Date of measurement: 03/25/2025 Test mode: 2450MHz (Head)

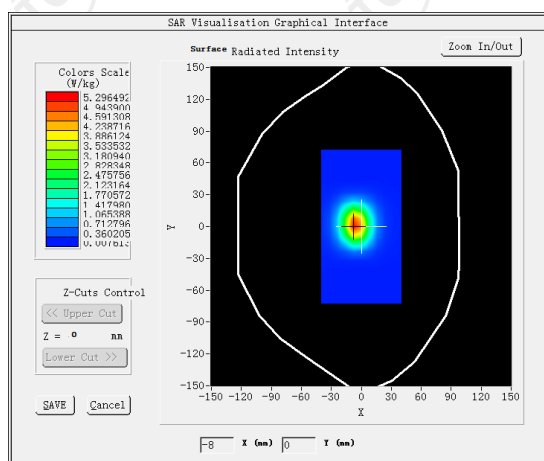
Product Description: Validation

Dipole Model: SID2450

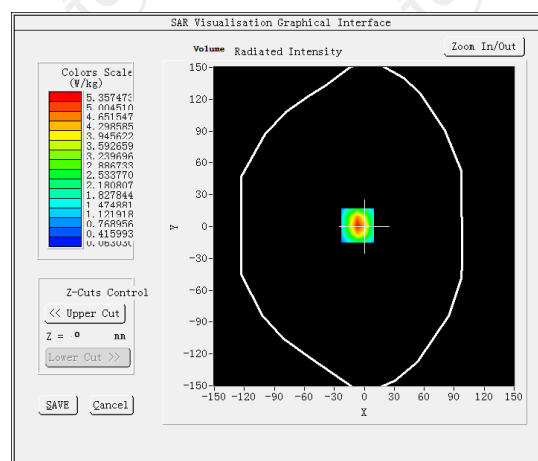
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	3.70
Relative permittivity (real part)	37.821592
Relative permittivity (imaginary part)	13.235125
Conductivity (S/m)	1.846182
Variation (%)	-1.690000

## SURFACE SAR



## VOLUME SAR



Maximum location: X=-3.00, Y=5.00

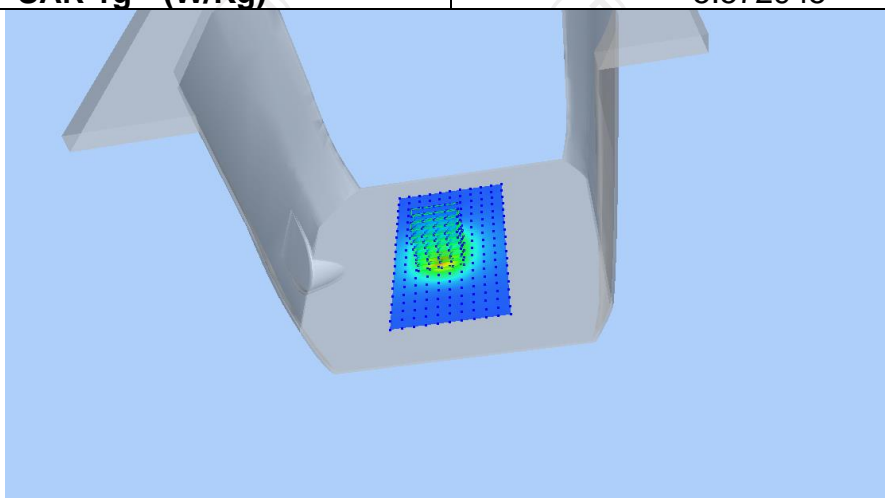
SAR Peak: 10.94W/kg

SAR 10g (W/Kg)

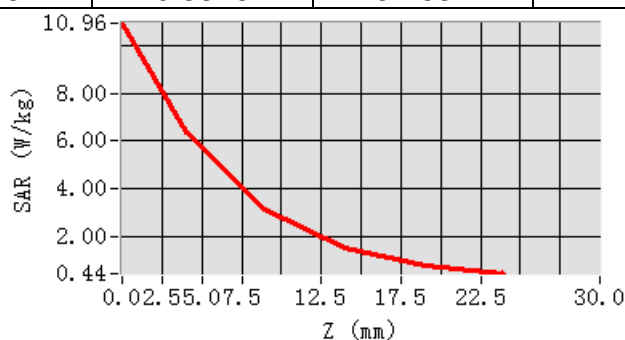
2.624269

SAR 1g (W/Kg)

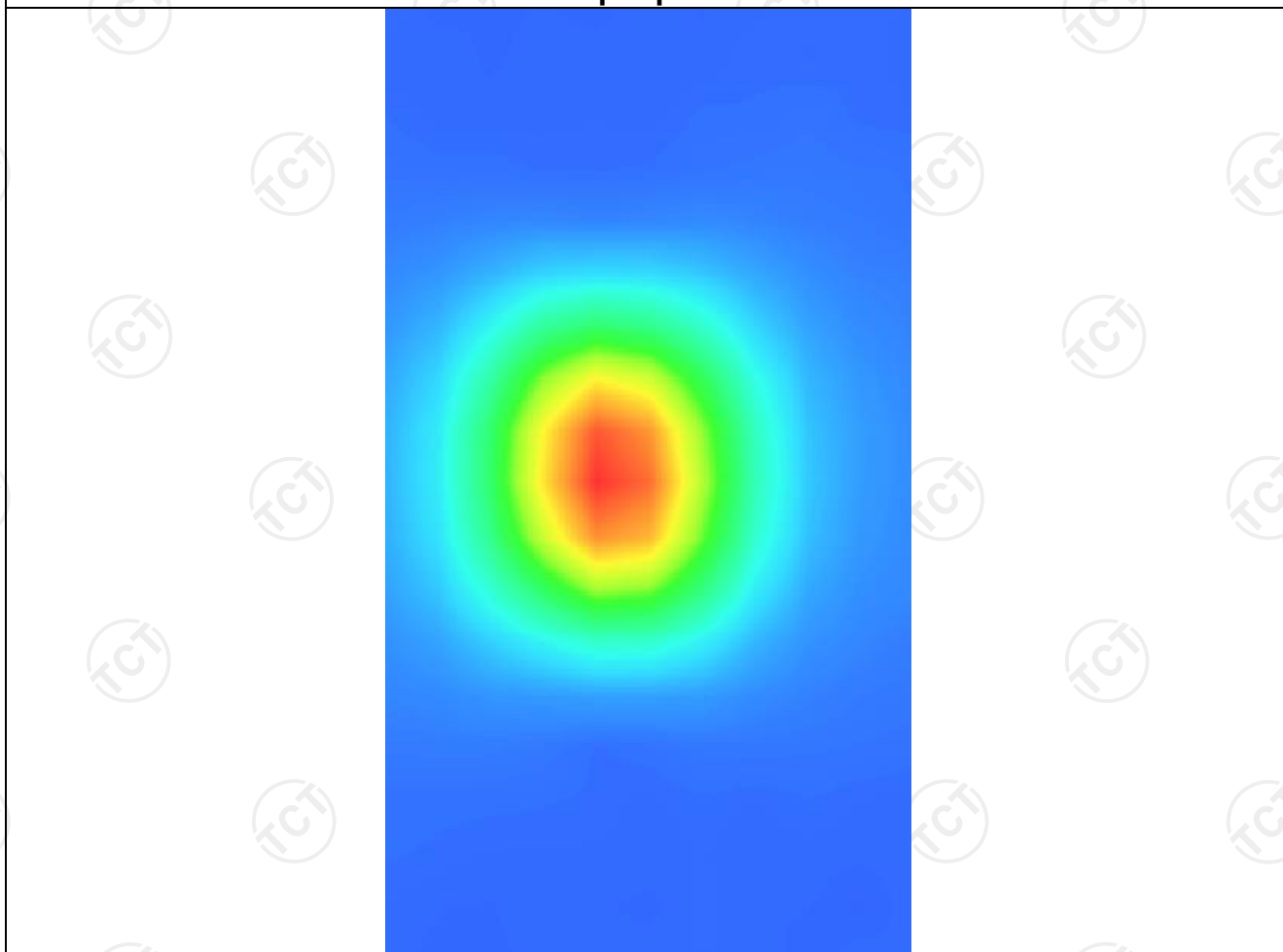
5.572945



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	10.9552	6.3925	3.1032	1.5079	0.7997



Hot spot position



Date of measurement: 04/07/2025 Test mode: 2600MHz (Head)

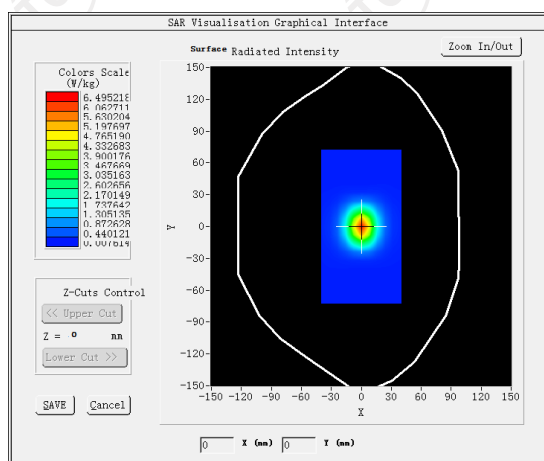
Product Description: Validation

Dipole Model: SID2600

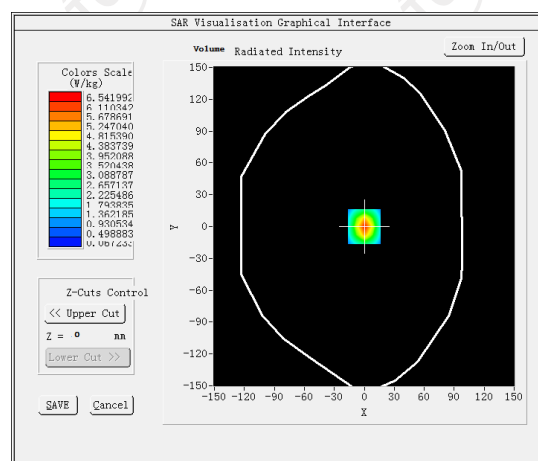
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	3.43
Relative permittivity (real part)	38.341592
Relative permittivity (imaginary part)	13.565124
Conductivity (S/m)	1.920354
Variation (%)	-1.890000

## SURFACE SAR



## VOLUME SAR



Maximum location: X=-1.00, Y=4.00

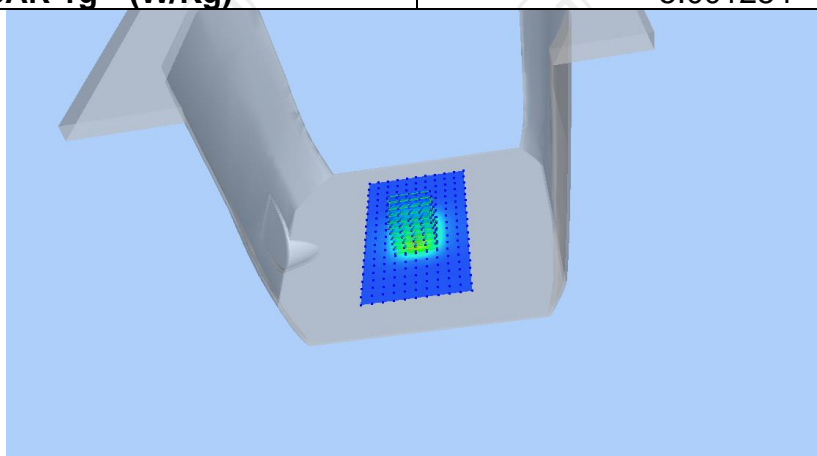
SAR Peak: 7.58W/kg

SAR 10g (W/Kg)

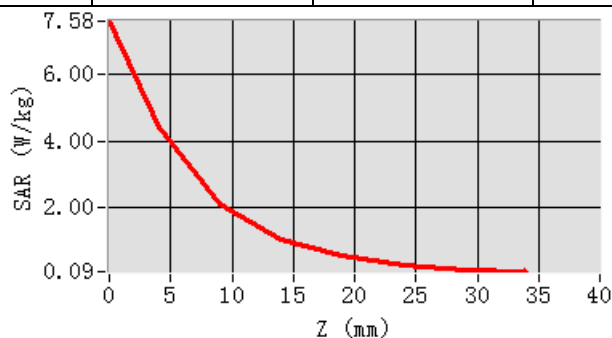
2.203285

SAR 1g (W/Kg)

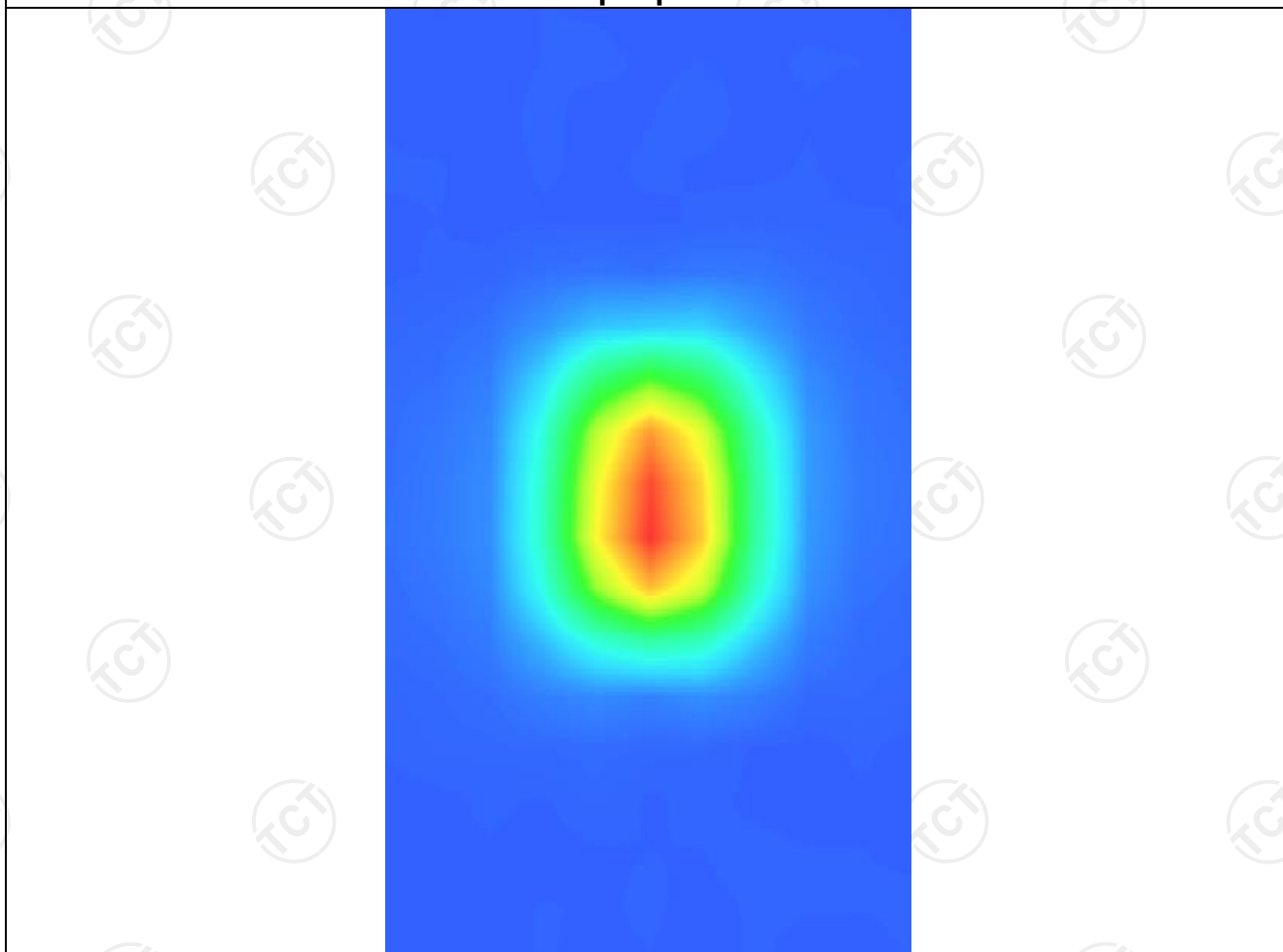
5.001254



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	7.5812	4.8512	2.1029	1.0631	0.5483



Hot spot position



Date of measurement: 03/25/2025 Test mode: 5200MHz (Head)

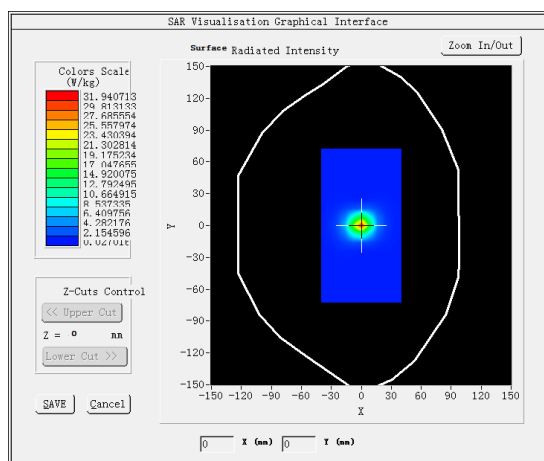
Product Description: Validation

Dipole Model: SID5000

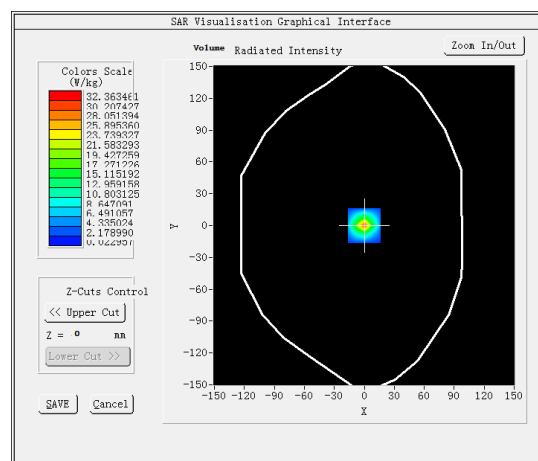
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.48
Relative permittivity (real part)	36.886281
Relative permittivity (imaginary part)	16.112592
Conductivity (S/m)	4.727158
Variation (%)	1.290000

## SURFACE SAR



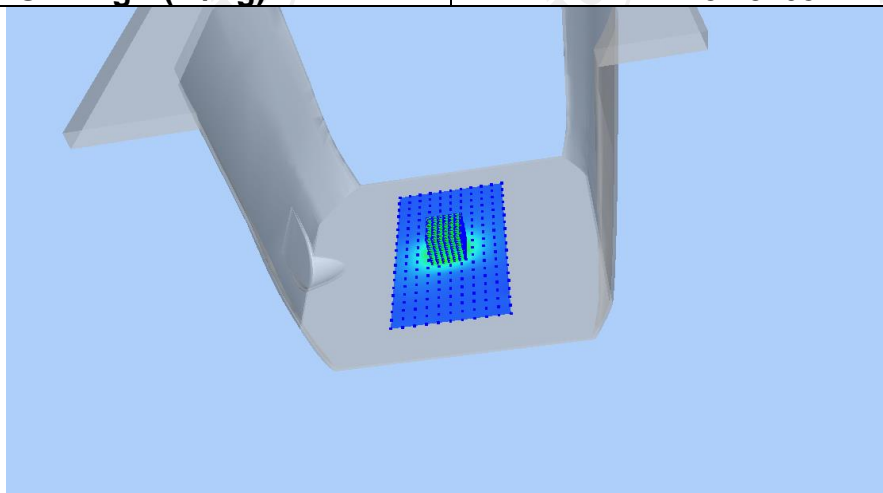
## VOLUME SAR



Maximum location: X=0.00, Y=0.00

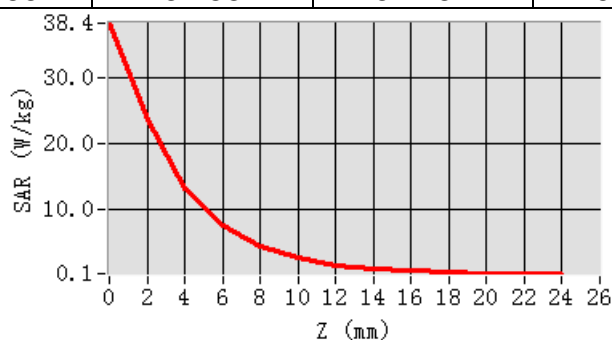
SAR Peak: 38.39W/kg

SAR 10g (W/Kg)	5.259125
SAR 1g (W/Kg)	15.162051

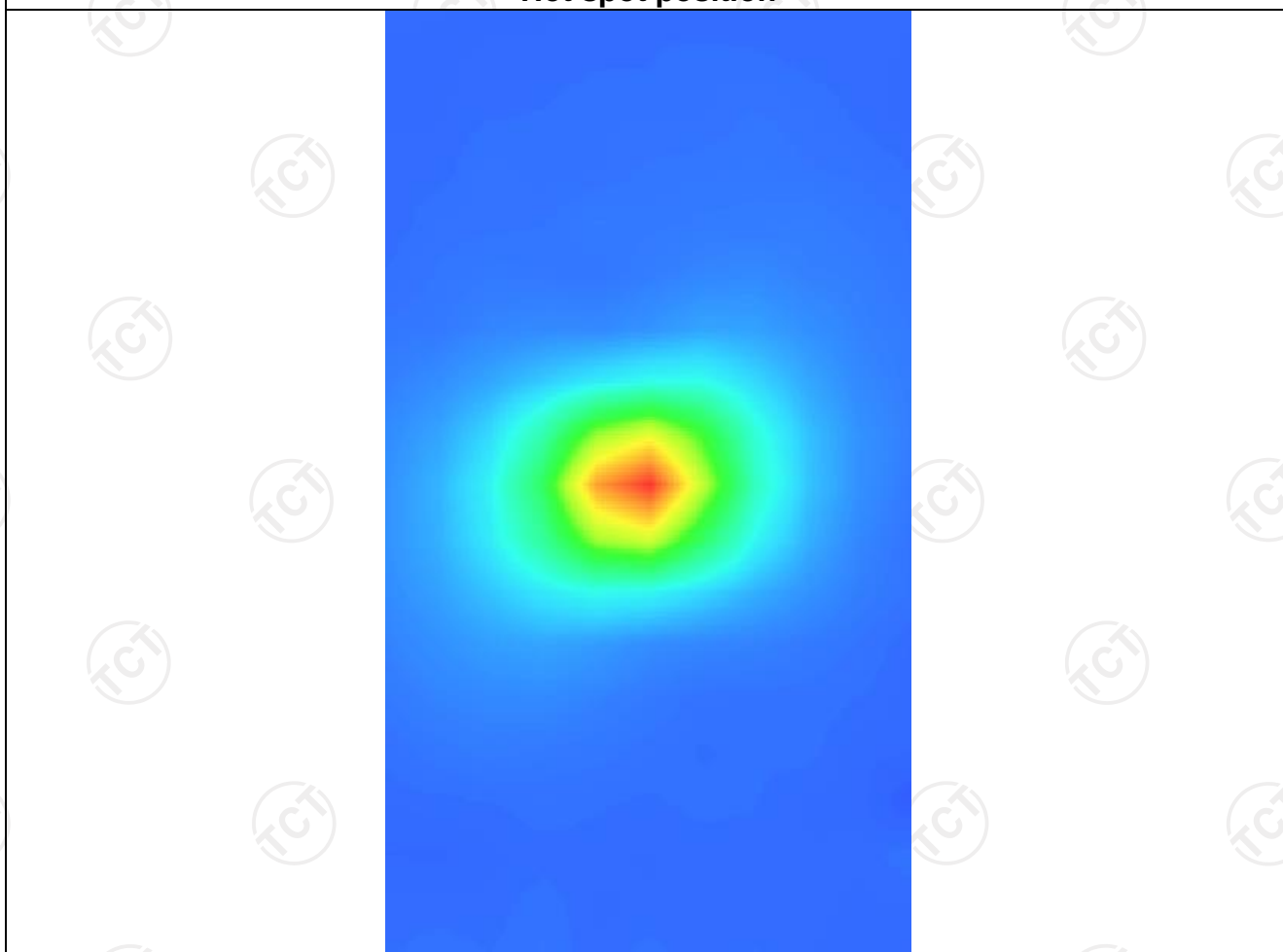




Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	38.3895	15.2384	5.2492	0.7765	0.1547



Hot spot position



Date of measurement: 03/25/2025 Test mode: 5400MHz (Head)

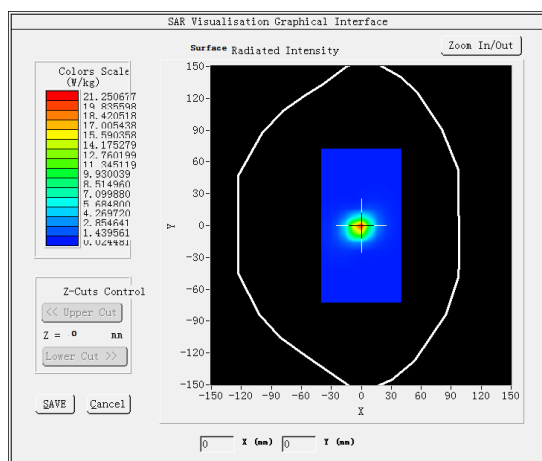
Product Description: Validation

Dipole Model: SID5000

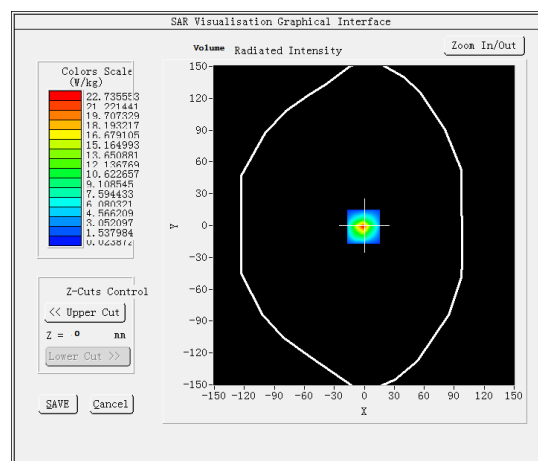
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.48
Relative permittivity (real part)	36.082489
Relative permittivity (imaginary part)	16.102541
Conductivity (S/m)	4.689520
Variation (%)	1.090000

## SURFACE SAR



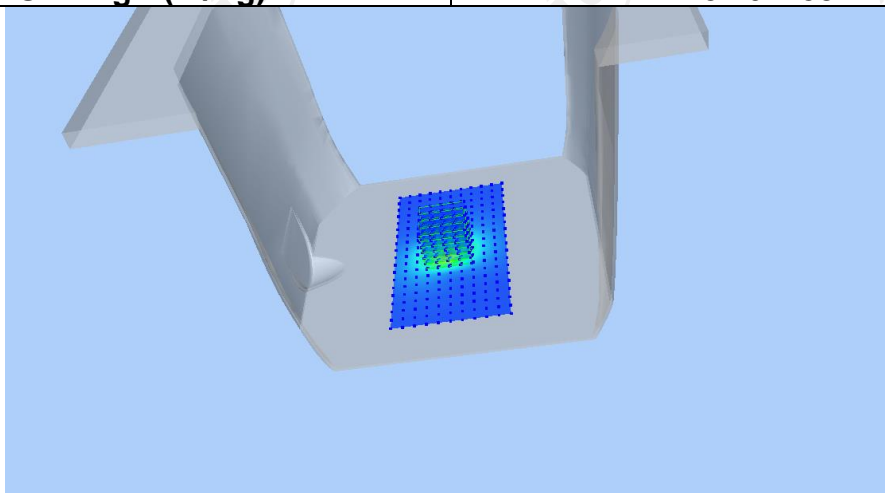
## VOLUME SAR



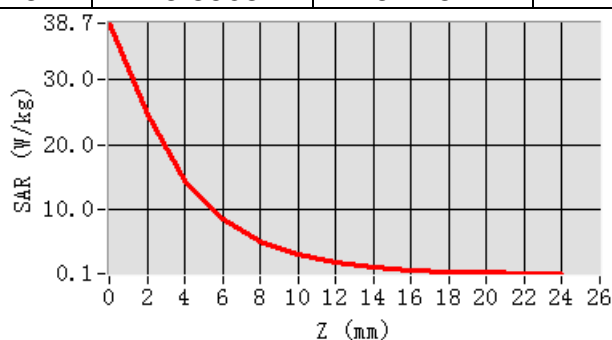
Maximum location: X=0.00, Y=0.00

SAR Peak: 38.71W/kg

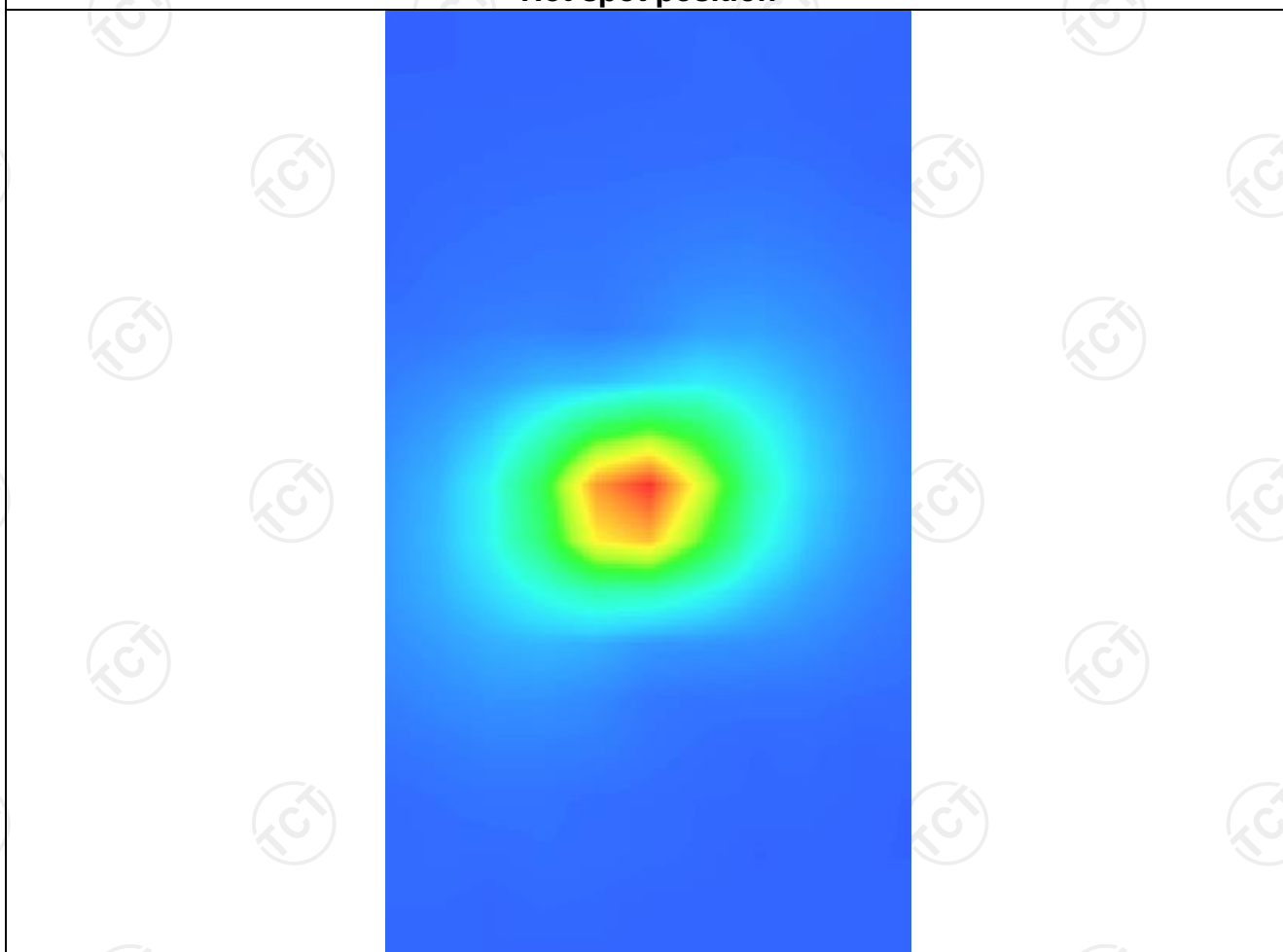
SAR 10g (W/Kg)	5.395416
SAR 1g (W/Kg)	15.702158



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	38.7015	15.8068	5.4257	1.0060	0.3006



Hot spot position



Date of measurement: 03/25/2025 Test mode: 5600MHz (Head)

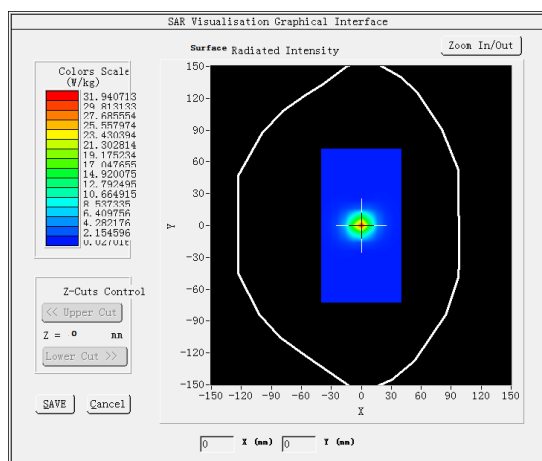
Product Description: Validation

Dipole Model: SID5000

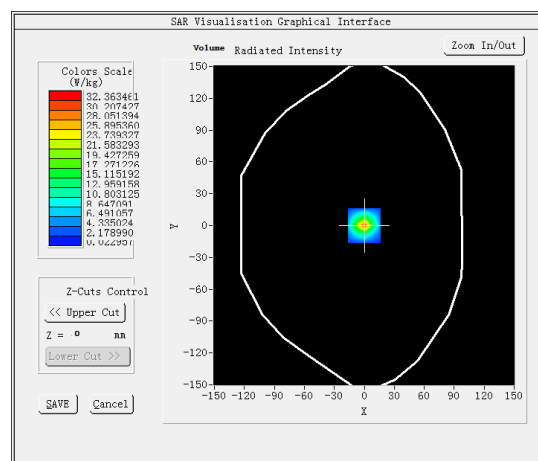
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.77
Relative permittivity (real part)	35.349525
Relative permittivity (imaginary part)	16.236528
Conductivity (S/m)	4.952682
Variation (%)	-1.580000

## SURFACE SAR



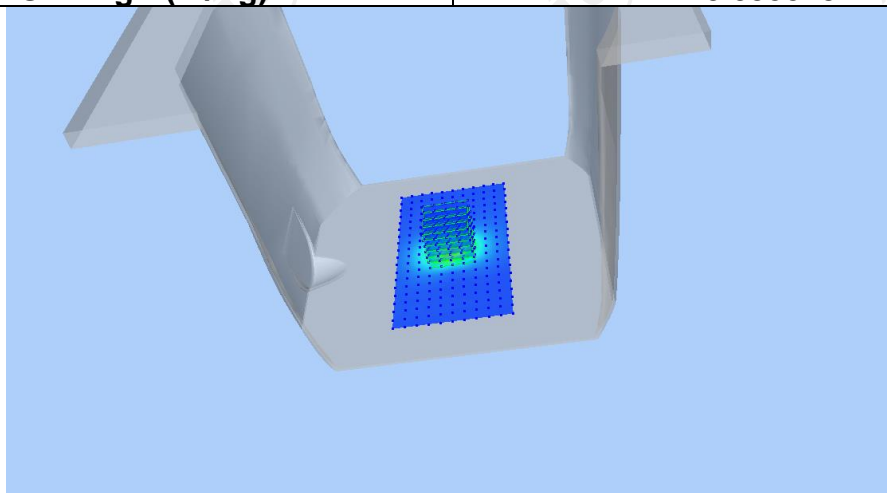
## VOLUME SAR



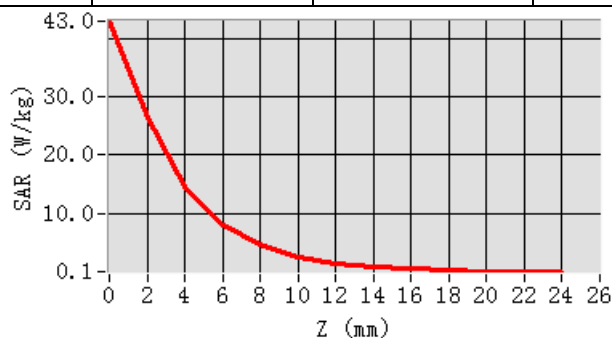
Maximum location: X=-1.00, Y=0.00

SAR Peak: 44.00W/kg

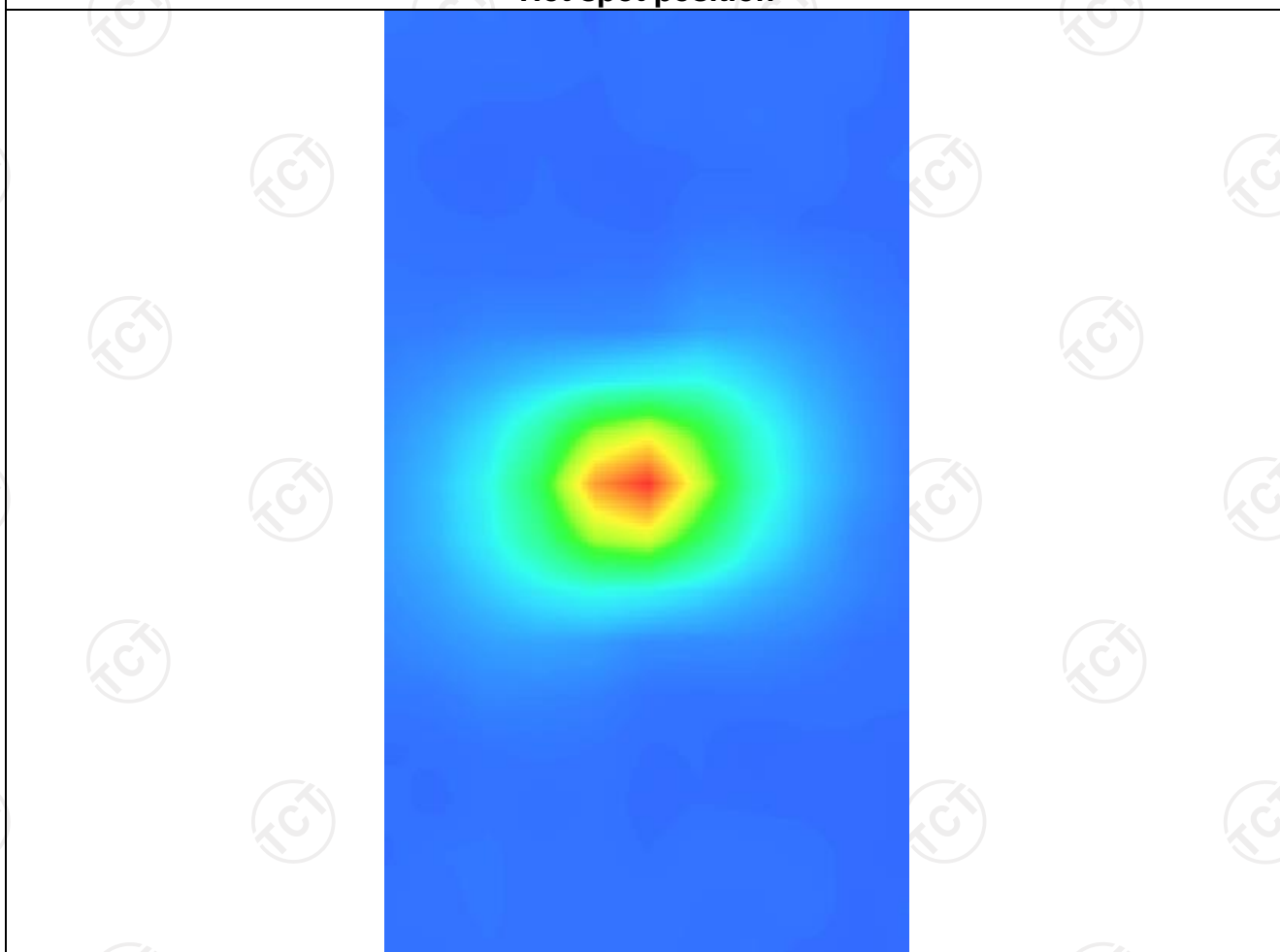
SAR 10g (W/Kg)	5.644528
SAR 1g (W/Kg)	16.685528



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	43.1052	16.8065	5.4985	0.9006	0.1712



Hot spot position



Date of measurement: 03/25/2025 Test mode: 5800MHz (Head)

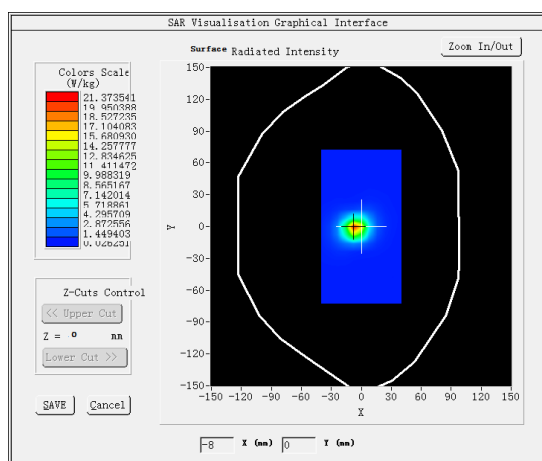
Product Description: Validation

Dipole Model: SID5000

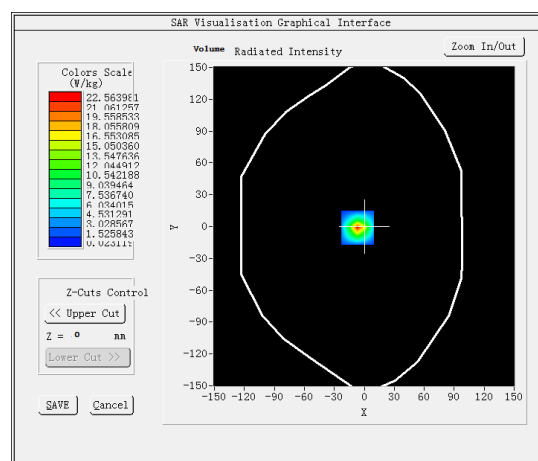
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.63
Relative permittivity (real part)	34.761254
Relative permittivity (imaginary part)	16.281521
Conductivity (S/m)	5.381547
Variation (%)	1.620000

## SURFACE SAR



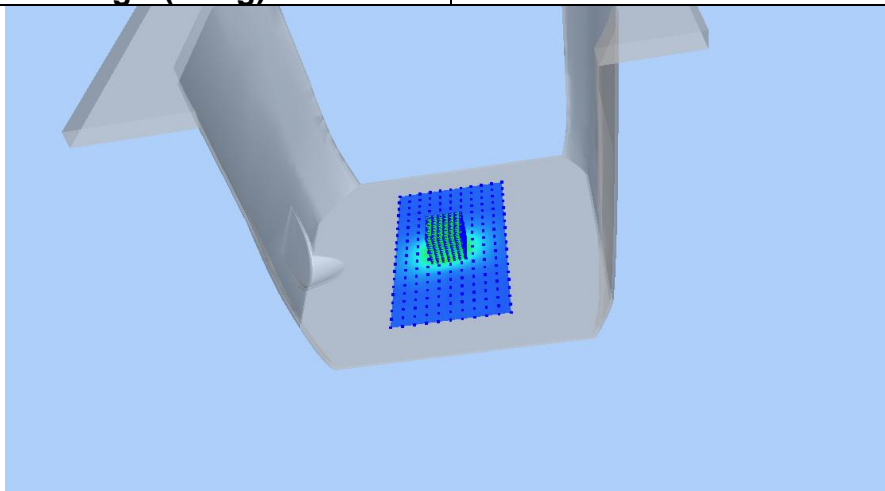
## VOLUME SAR



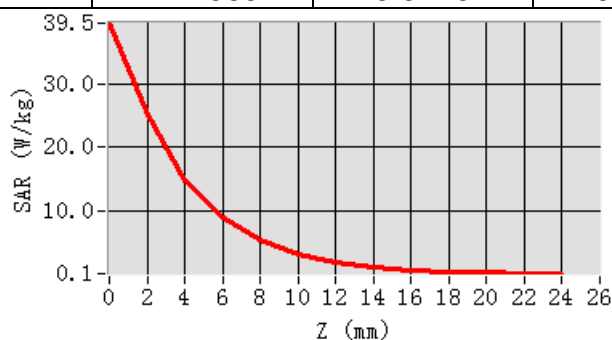
Maximum location: X=-2.00, Y=1.00

SAR Peak: 39.47W/kg

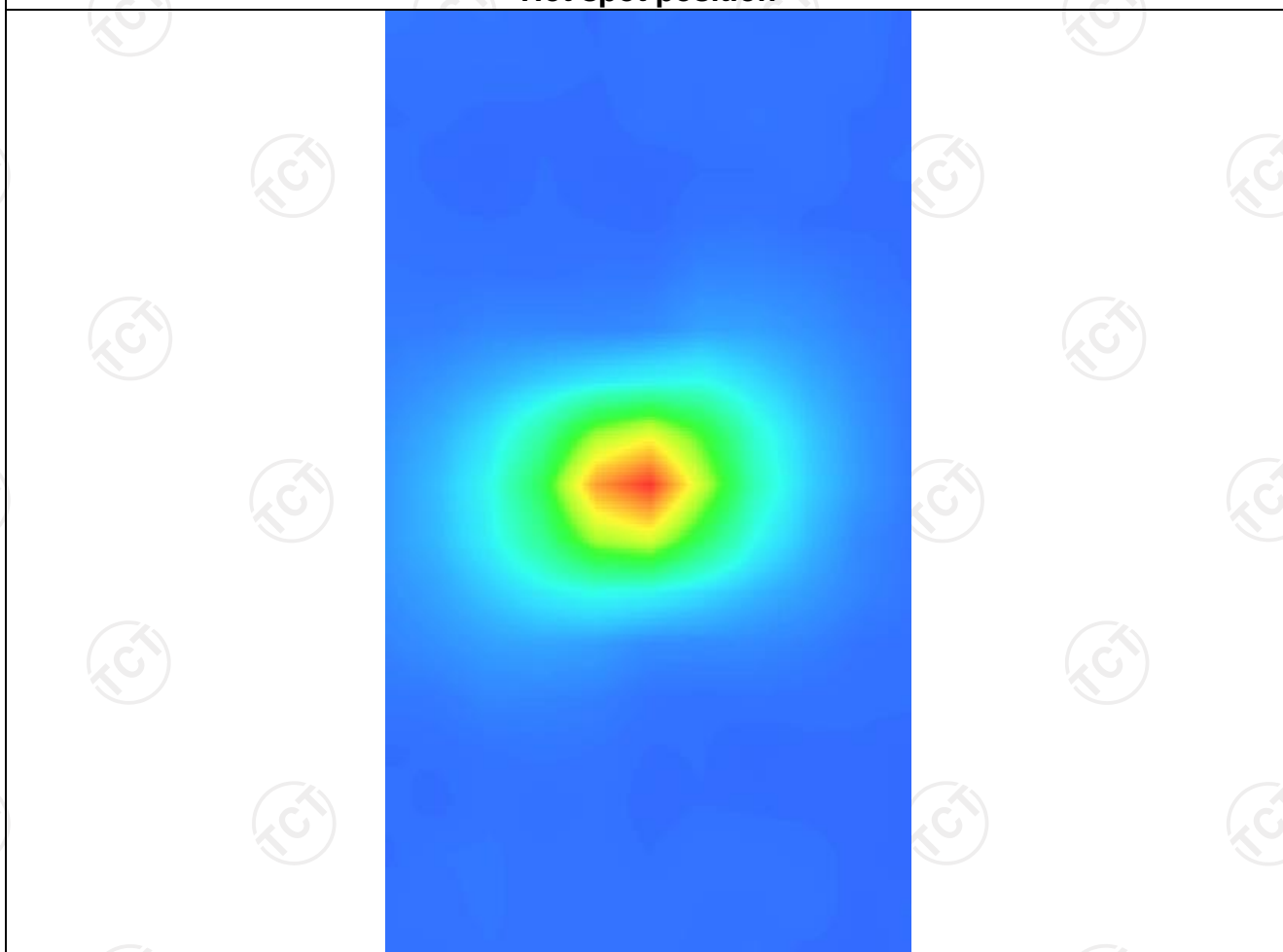
SAR 10g (W/Kg)	5.827156
SAR 1g (W/Kg)	17.220125



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	34.2617	17.2389	5.9125	0.7058	0.1814



Hot spot position





## 11. SAR Test Data

GSM900

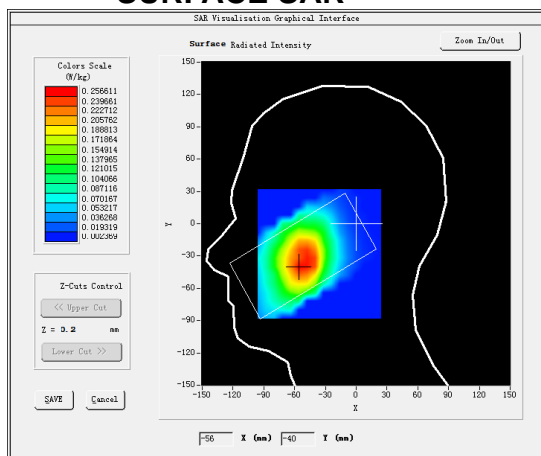
### MEASUREMENT 1

Low Band SAR (Channel 975):

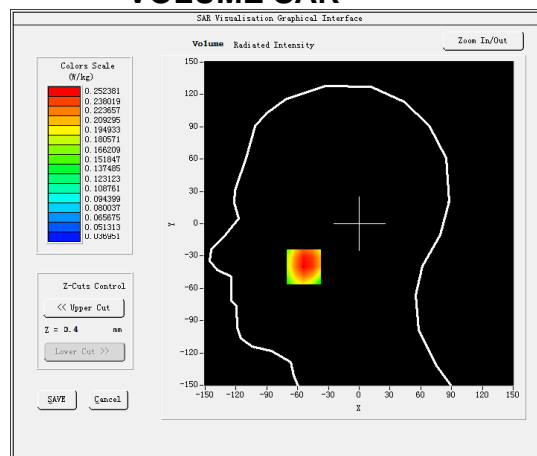
Date: 03/26/2025

Frequency (MHz)	880.200000
Relative permittivity (real part)	40.715241
Relative permittivity (imaginary part)	18.305478
Conductivity (S/m)	0.991528
Variation (%)	1.840000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	GSM900

#### SURFACE SAR



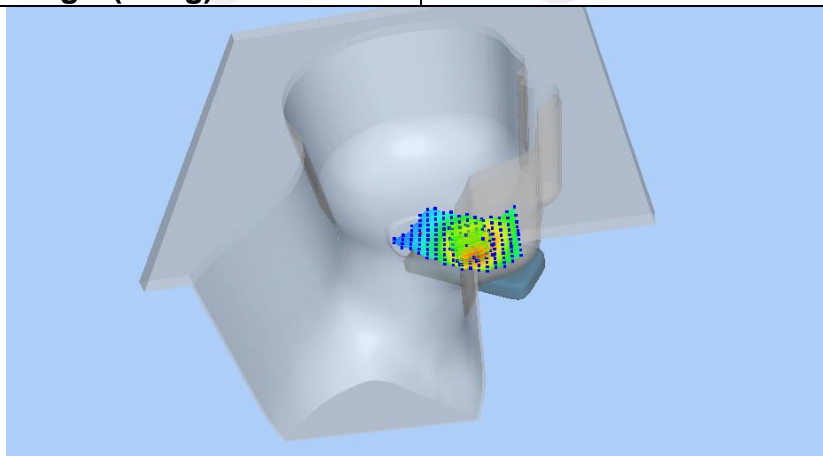
#### VOLUME SAR



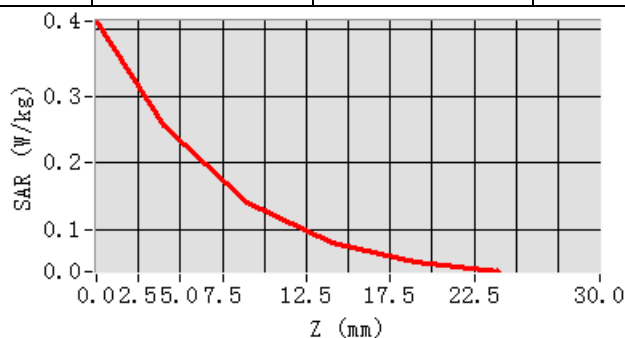
Maximum location: X=-54.00, Y=-40.00

SAR Peak: 0.41 W/kg

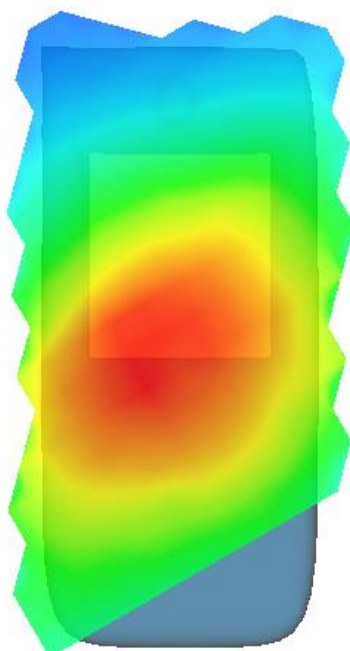
SAR 10g (W/Kg)	0.137154
SAR 1g (W/Kg)	0.251685



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4111	0.2565	0.1407	0.0816	0.0540



## Hot spot position



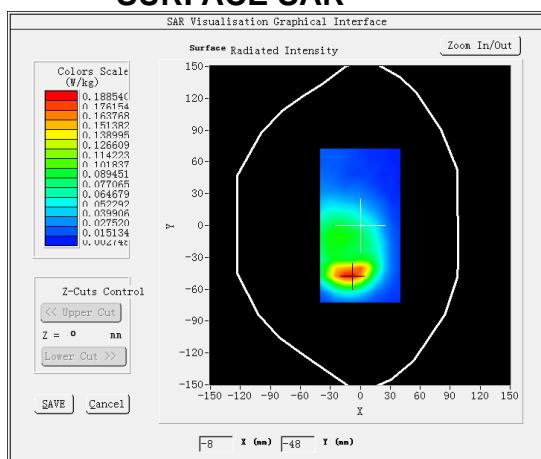
## MEASUREMENT 2

Low Band SAR (Channel 975):

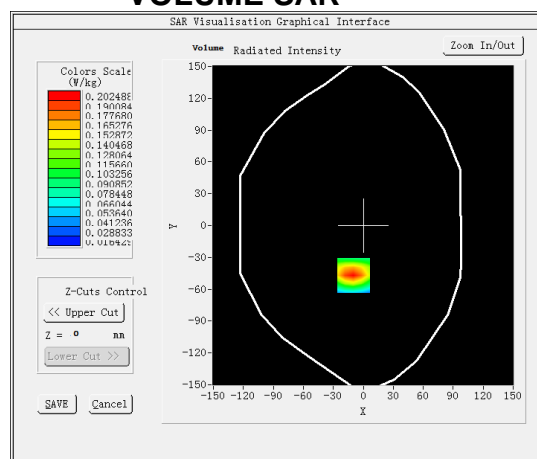
Date: 03/26/2025

Frequency (MHz)	880.200000
Relative permittivity (real part)	40.715241
Relative permittivity (imaginary part)	18.305478
Conductivity (S/m)	0.991528
Variation (%)	-2.930000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm dz=5mm,Complete</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back</u>
Band	<u>GSM900(voice)</u>

### SURFACE SAR



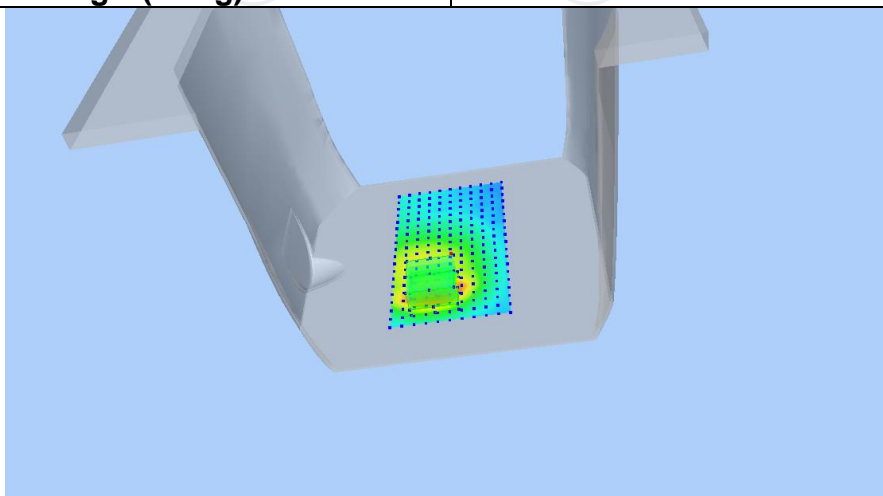
### VOLUME SAR



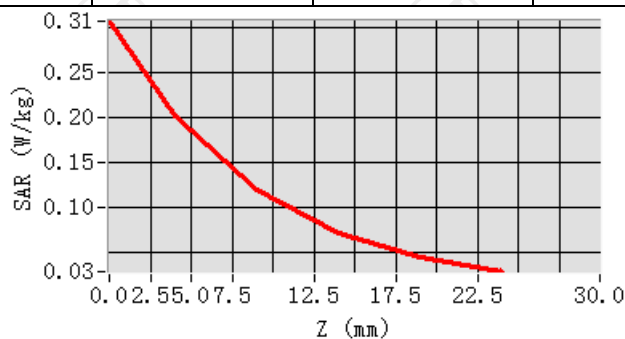
Maximum location: X=-10.00, Y=-47.00

SAR Peak: 0.31W/kg

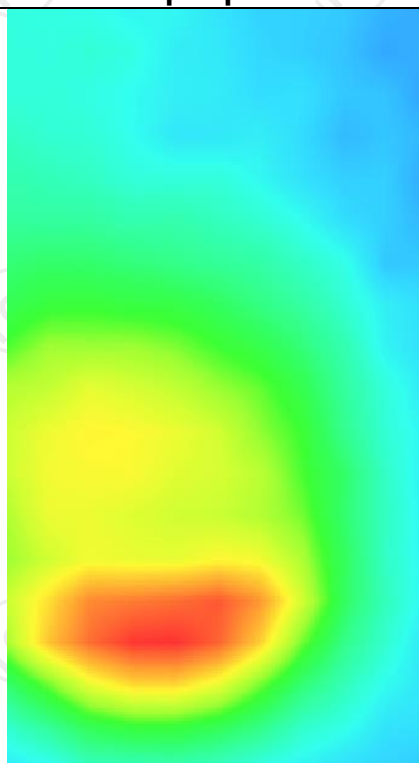
SAR 10g (W/Kg)	0.106768
SAR 1g (W/Kg)	0.189635



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3063	0.2025	0.1192	0.0717	0.0457



Hot spot position



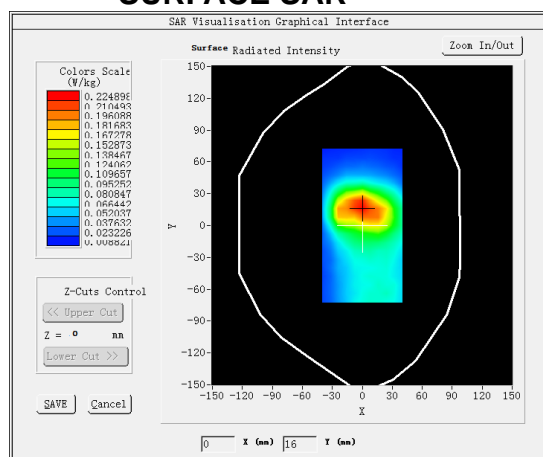
## MEASUREMENT 3

Low Band SAR (Channel 975):

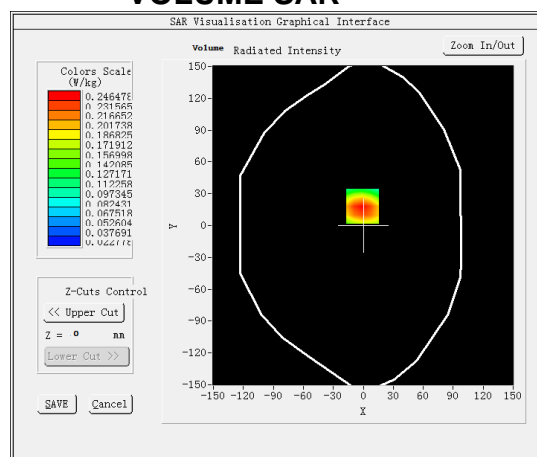
Date: 03/26/2025

Frequency (MHz)	880.200000
Relative permittivity (real part)	40.715241
Relative permittivity (imaginary part)	18.305478
Conductivity (S/m)	0.991528
Variation (%)	-4.410000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM900(GPRS 3slot)

### SURFACE SAR



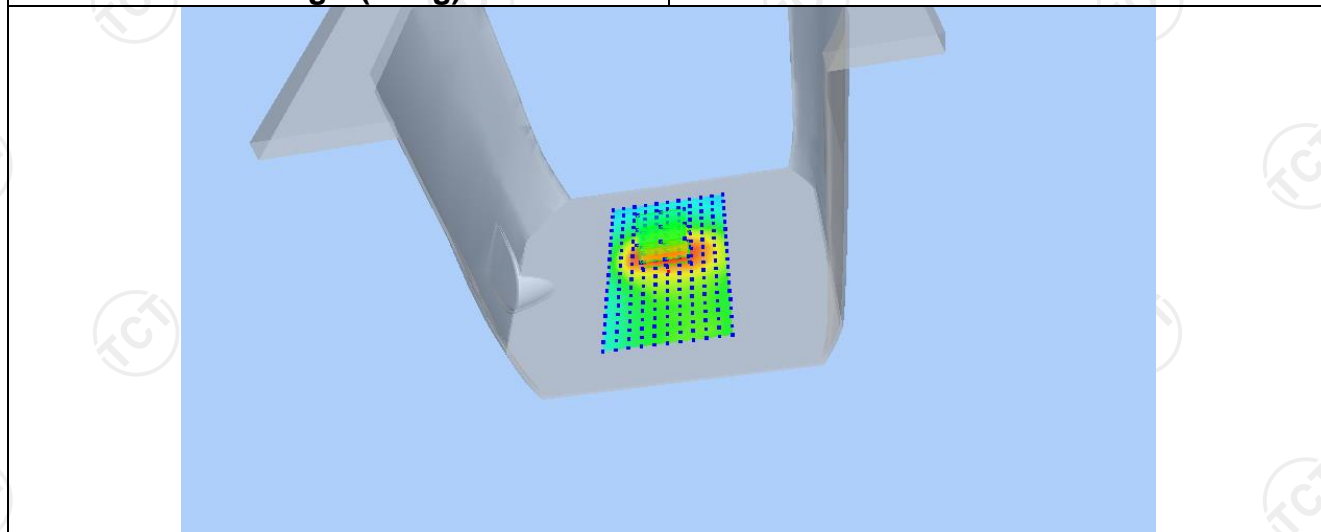
### VOLUME SAR



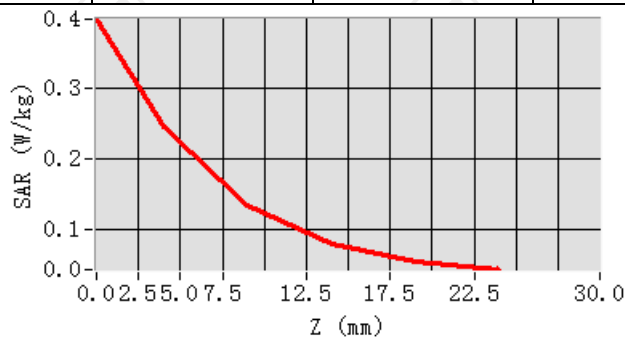
Maximum location: X=-1.00, Y=17.00

SAR Peak: 0.40 W/kg

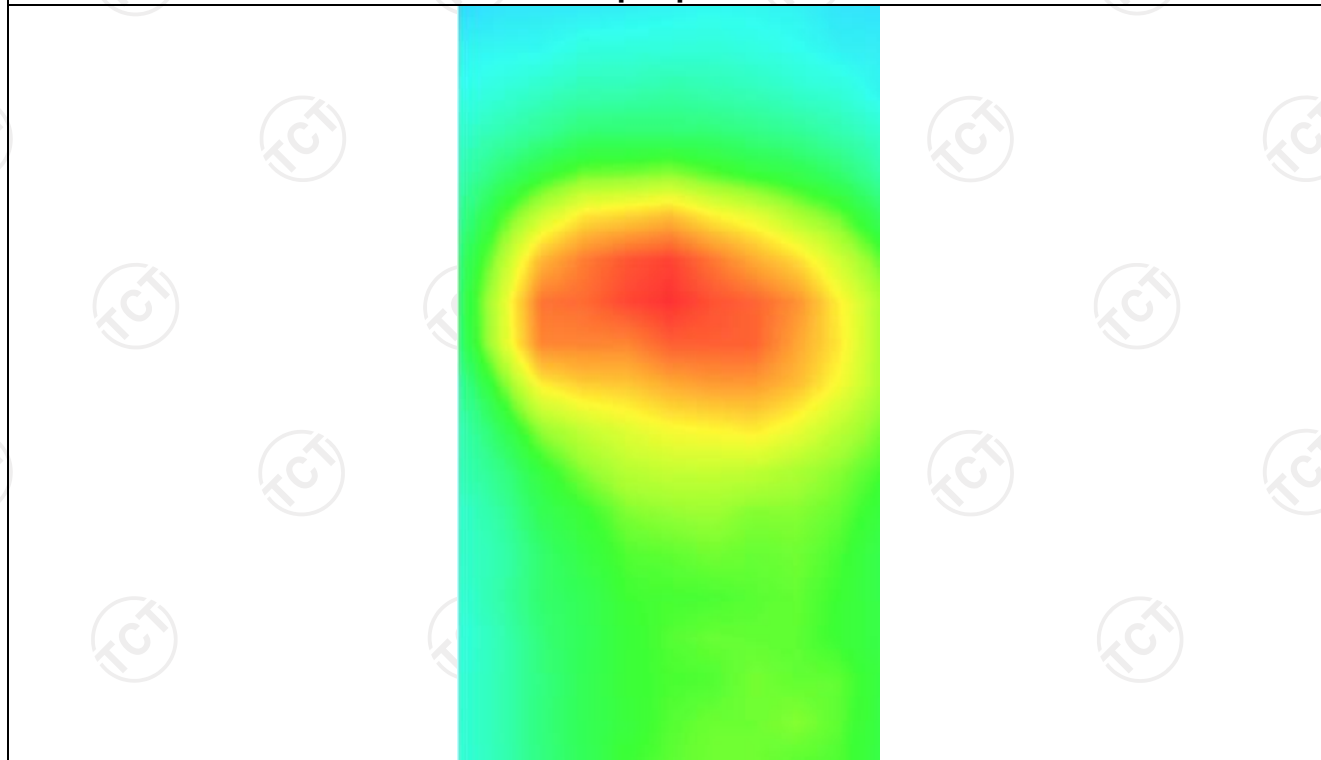
SAR 10g (W/Kg)	0.120584
SAR 1g (W/Kg)	0.215892



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3993	0.2465	0.1341	0.0788	0.0546



Hot spot position



## GSM1800

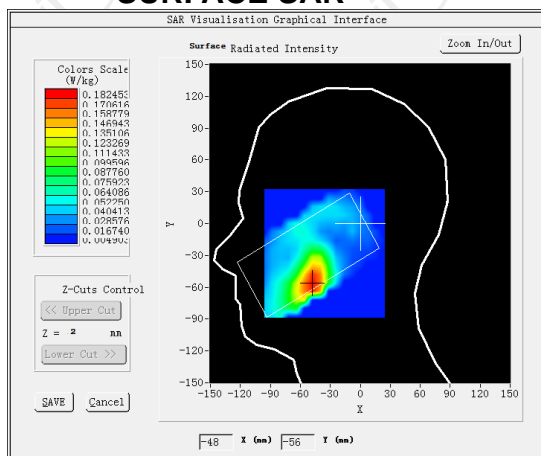
### MEASUREMENT 1

Middle Band SAR (Channel 700):

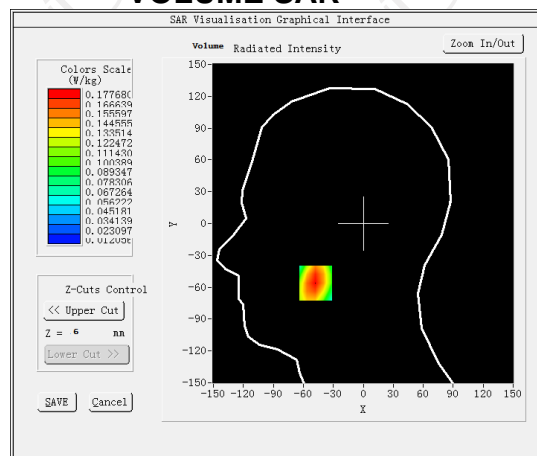
Date: 03/26/2025

Frequency (MHz)	1747.800049
Relative permittivity (real part)	39.051262
Relative permittivity (imaginary part)	13.815254
Conductivity (S/m)	1.378912
Variation (%)	1.480000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	GSM1800

### SURFACE SAR



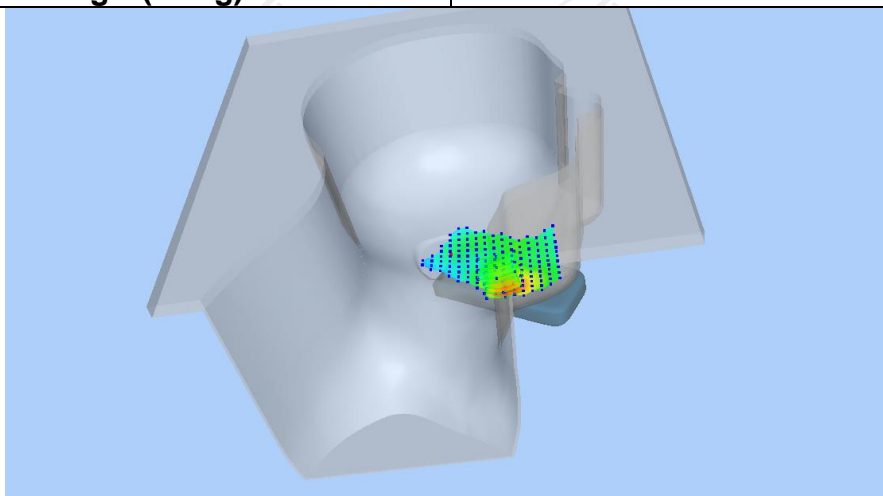
### VOLUME SAR



Maximum location: X=-48.00, Y=-56.00

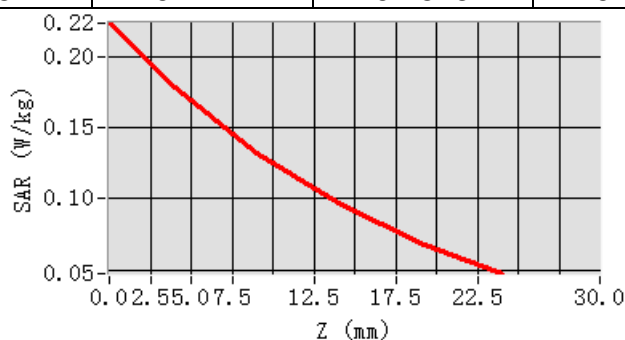
SAR Peak: 0.23W/kg

SAR 10g (W/Kg)	0.110847
SAR 1g (W/Kg)	0.168837

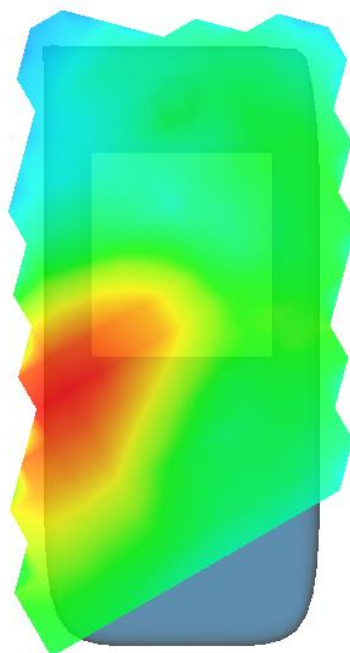




Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2231	0.1777	0.1319	0.0965	0.0692



## Hot spot position



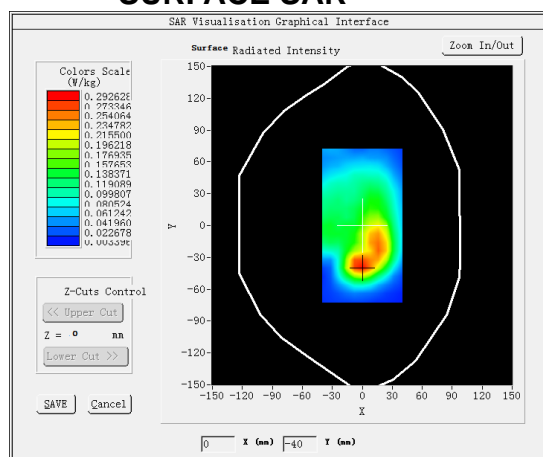
## MEASUREMENT 2

Middle Band SAR (Channel 700):

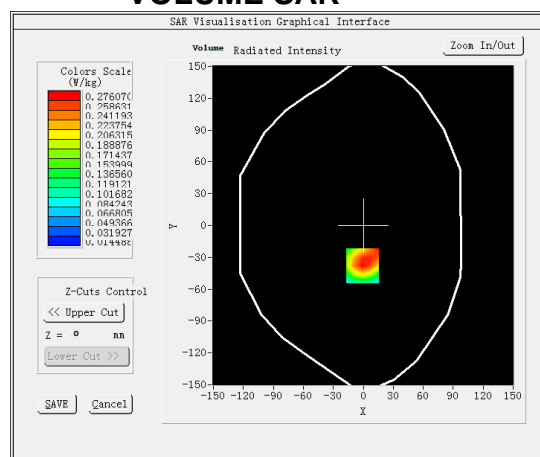
Date: 03/26/2025

Frequency (MHz)	1747.800049
Relative permittivity (real part)	39.051262
Relative permittivity (imaginary part)	13.815254
Conductivity (S/m)	1.378912
Variation (%)	-2.610000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM1800(voice)

### SURFACE SAR



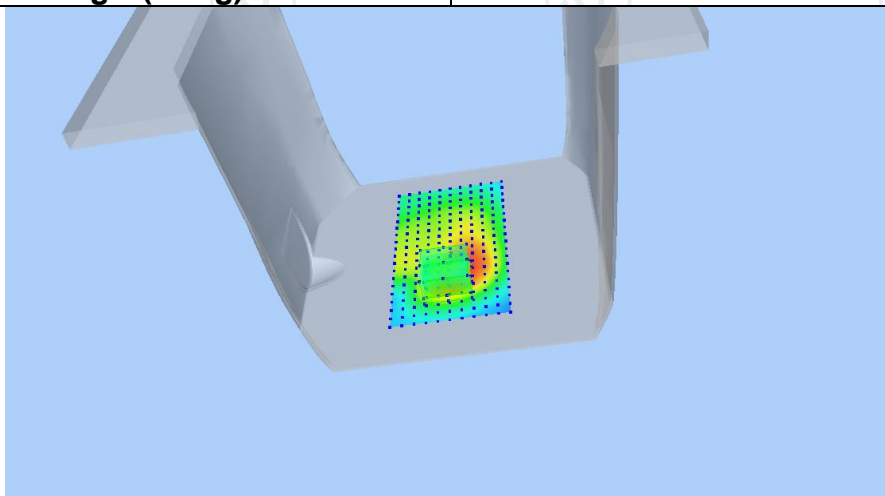
### VOLUME SAR



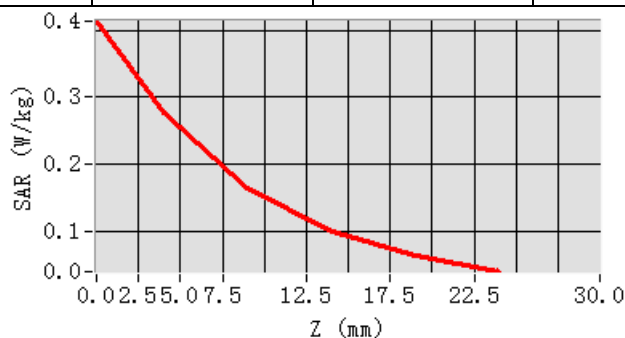
Maximum location: X=-1.00, Y=-38.00

SAR Peak: 0.43 W/kg

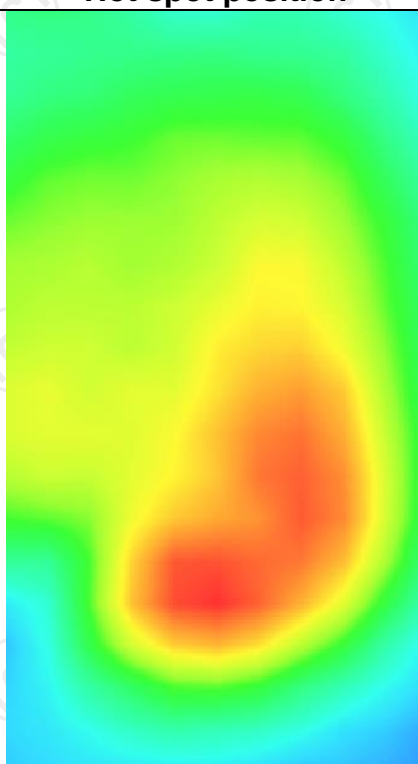
SAR 10g (W/Kg)	0.153596
SAR 1g (W/Kg)	0.265629



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4138	0.2761	0.1643	0.0995	0.0632



**Hot spot position**



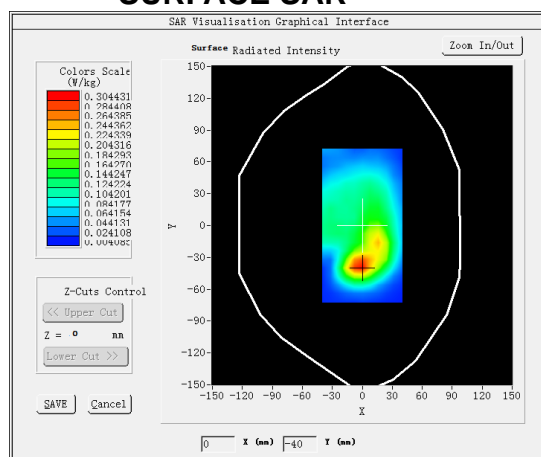
## MEASUREMENT 3

Middle Band SAR (Channel 700):

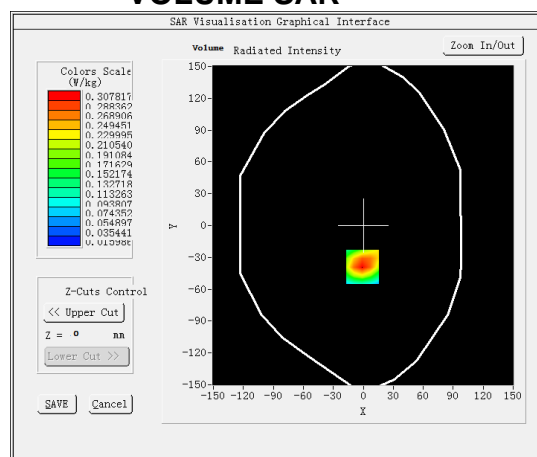
Date: 03/26/2025

Frequency (MHz)	1747.800049
Relative permittivity (real part)	39.051262
Relative permittivity (imaginary part)	13.815254
Conductivity (S/m)	1.378912
Variation (%)	-1.300000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM1800(GPRS 4slot)

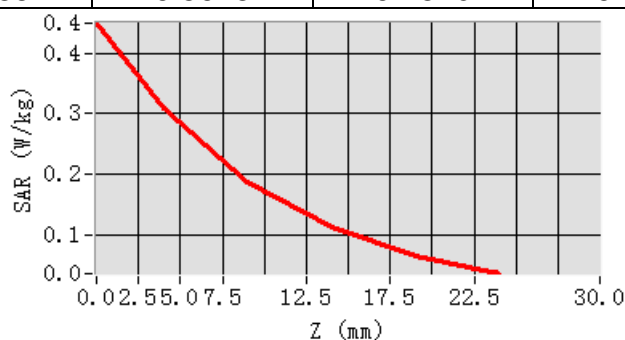
### SURFACE SAR



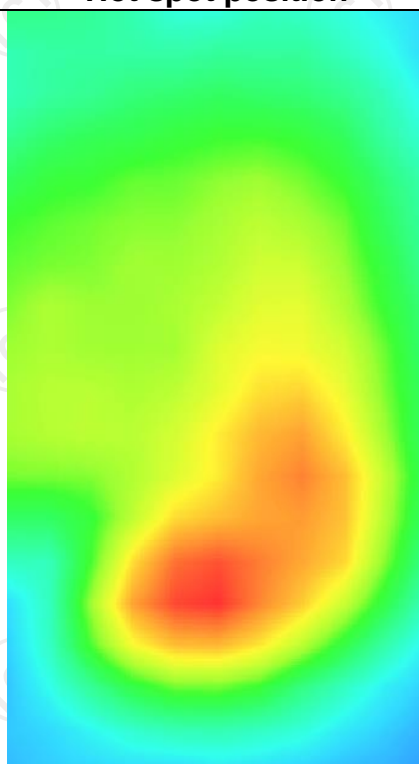
### VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4489	0.3078	0.1876	0.1127	0.0672



### Hot spot position



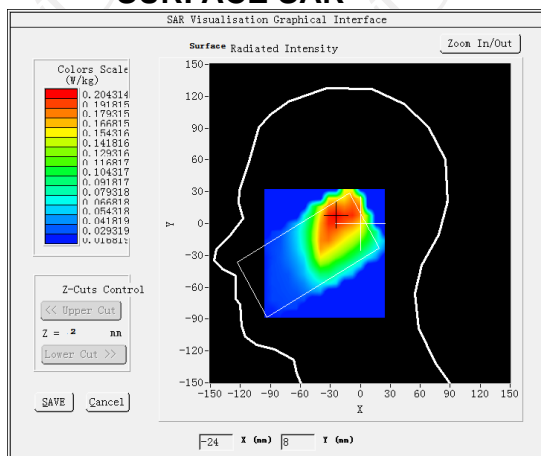
## WCDMA Band I MEASUREMENT 1

Middle Band SAR (Channel 9750):

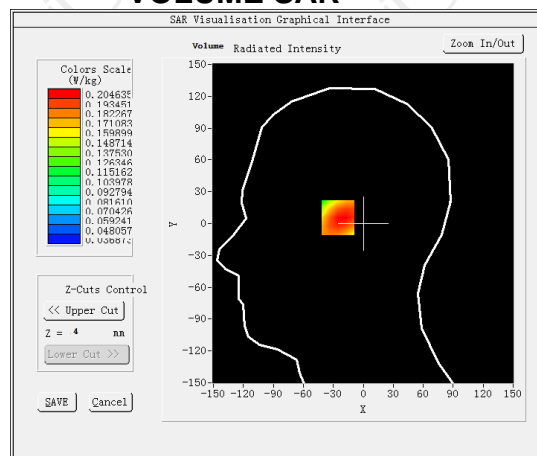
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	41.261547
Relative permittivity (imaginary part)	12.512581
Conductivity (S/m)	1.366285
Variation (%)	0.150000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	Band1 UMTS

### SURFACE SAR

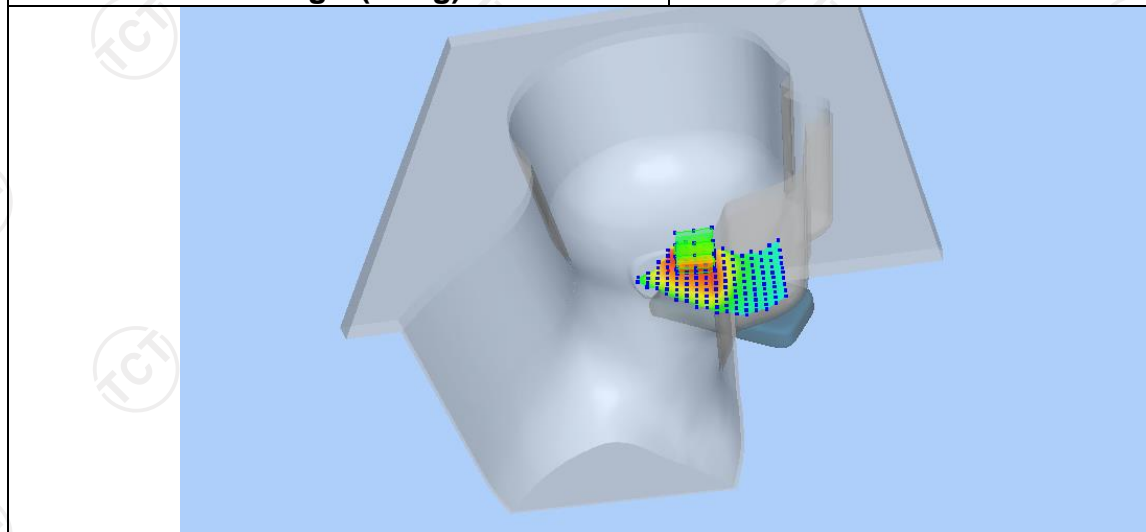


### VOLUME SAR

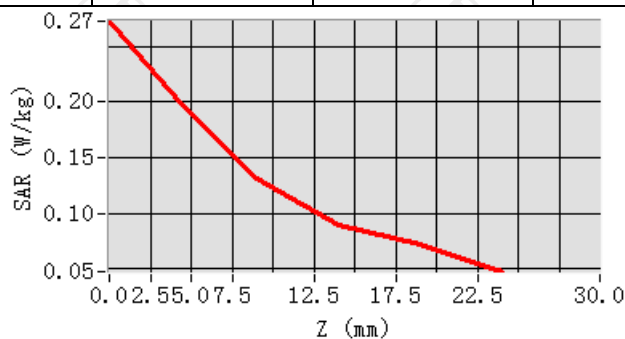


Maximum location: X=-24.00, Y=7.00  
SAR Peak: 0.30 W/kg

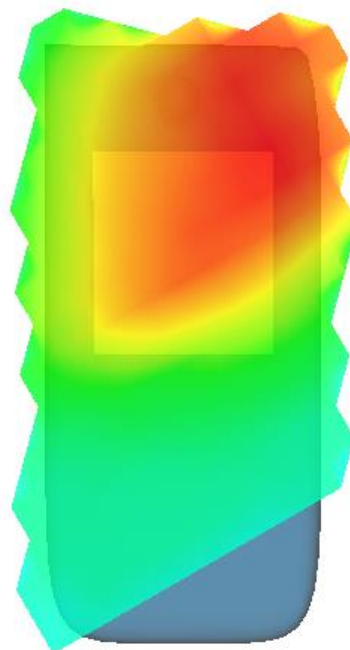
SAR 10g (W/Kg)	0.112089
SAR 1g (W/Kg)	0.191572



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2726	0.2046	0.1318	0.0897	0.0723



### Hot spot position





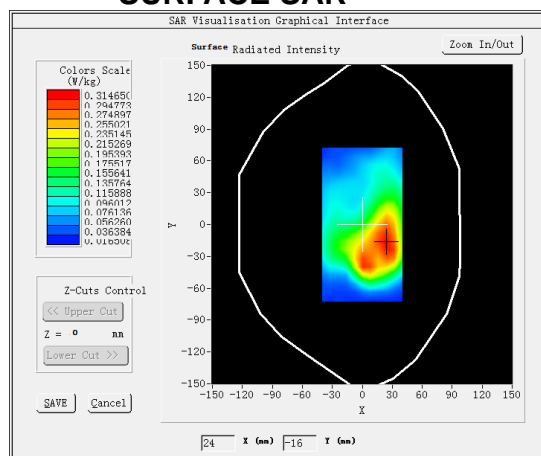
## MEASUREMENT 2

Middle Band SAR (Channel 9750):

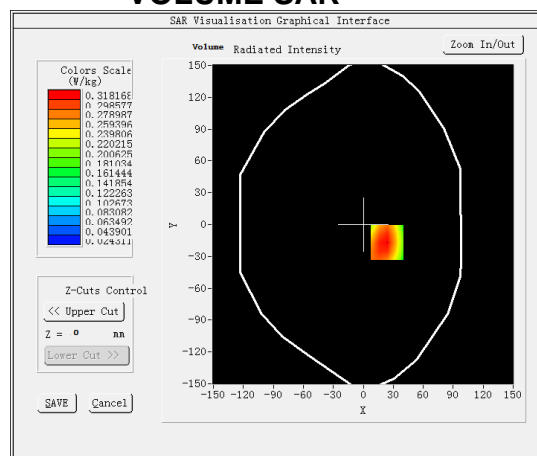
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	41.261547
Relative permittivity (imaginary part)	12.512581
Conductivity (S/m)	1.366285
Variation (%)	-0.990000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	BAND1_WCDMA2100

### SURFACE SAR



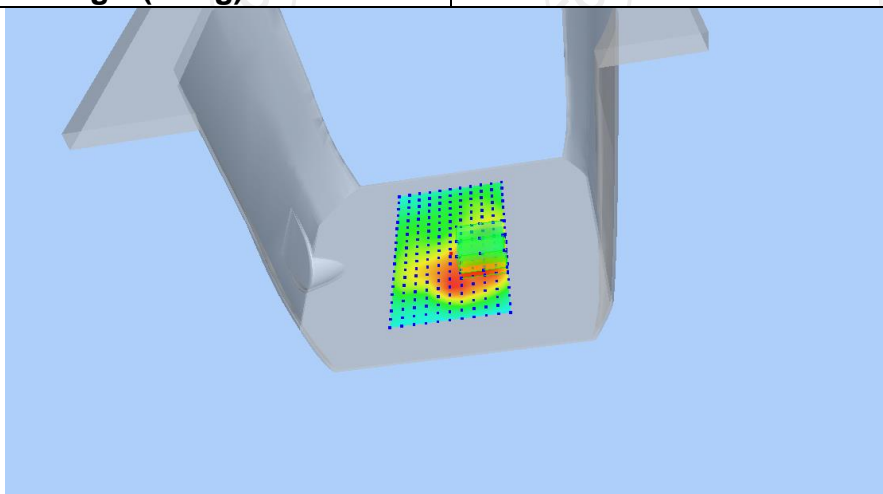
### VOLUME SAR



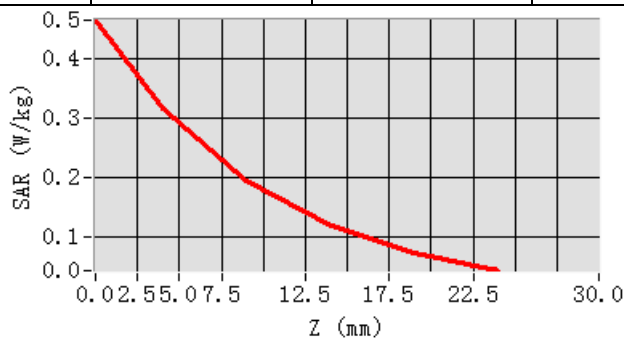
Maximum location: X=24.00, Y=-17.00

SAR Peak: 0.47 W/kg

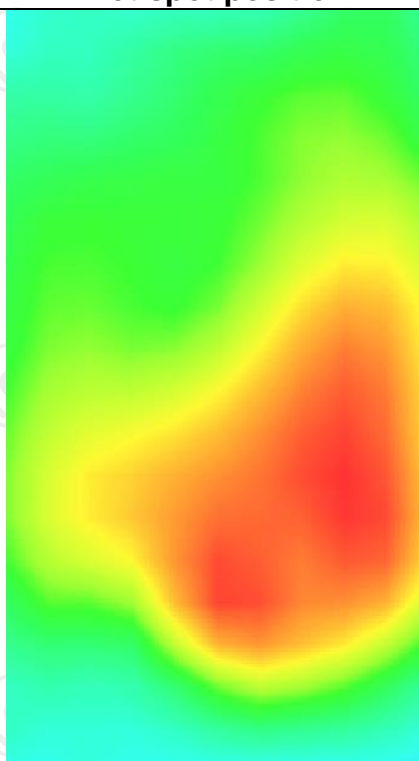
SAR 10g (W/Kg)	0.187252
SAR 1g (W/Kg)	0.305853



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4656	0.3182	0.1942	0.1186	0.0736



**Hot spot position**



## WCDMA Band VIII

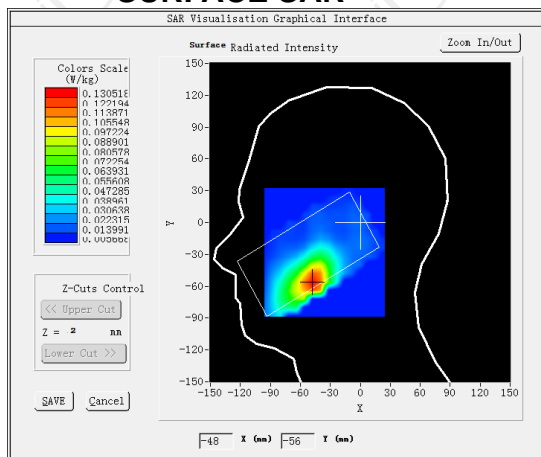
### MEASUREMENT 1

High Band SAR (Channel 2863):

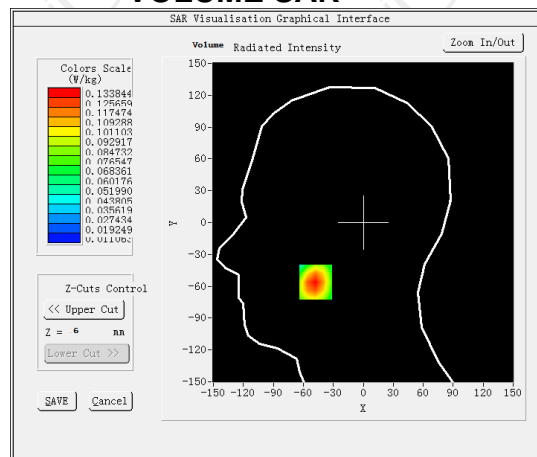
Date: 03/26/2025

Frequency (MHz)	912.600000
Relative permittivity (real part)	42.152015
Relative permittivity (imaginary part)	18.515895
Conductivity (S/m)	0.929515
Variation (%)	1.500000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	BAND8 WCDMA900

### SURFACE SAR



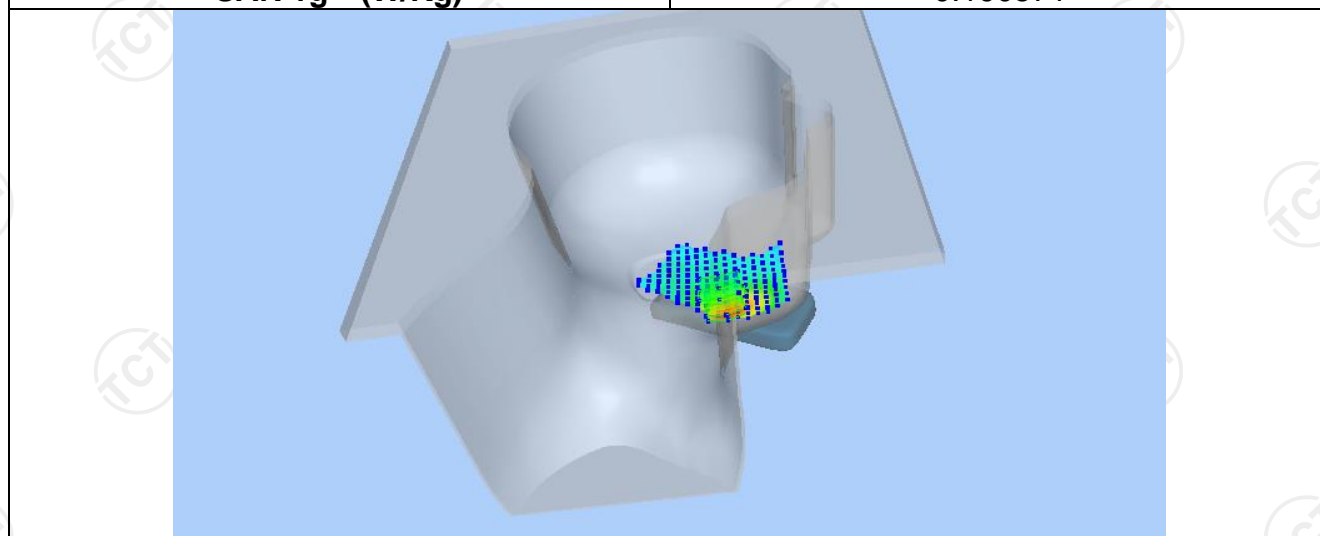
### VOLUME SAR



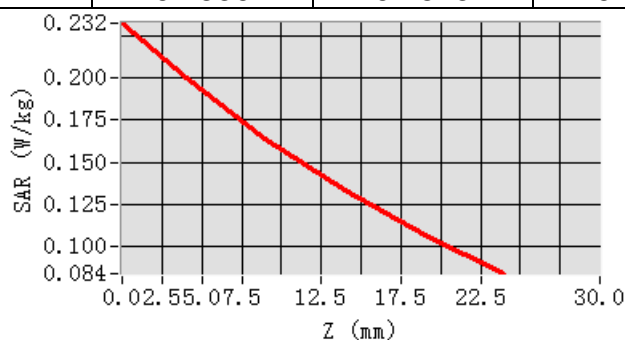
Maximum location: X=-49.00, Y=-53.00

SAR Peak: 0.23 W/kg

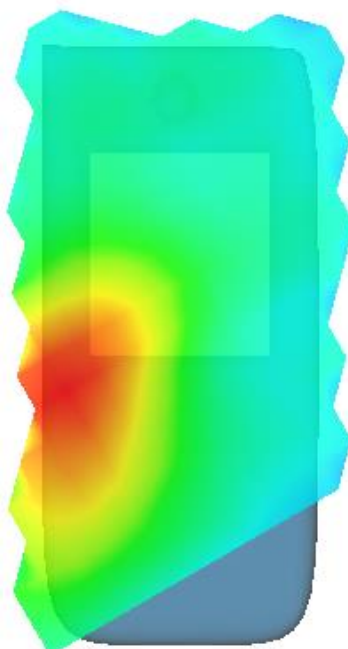
SAR 10g (W/Kg)	0.116521
SAR 1g (W/Kg)	0.190571



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2324	0.1950	0.1325	0.1102	0.0975



## Hot spot position



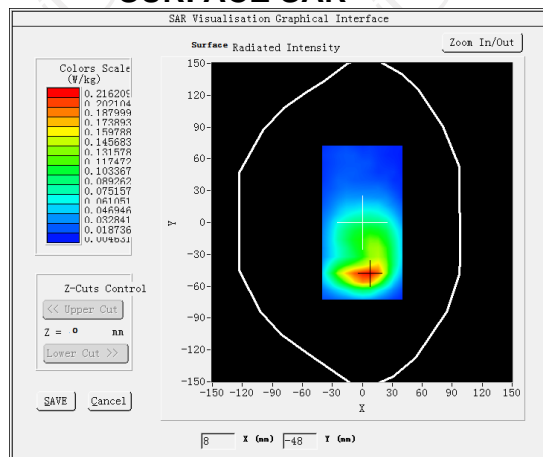
## MEASUREMENT 2

High Band SAR (Channel 2863):

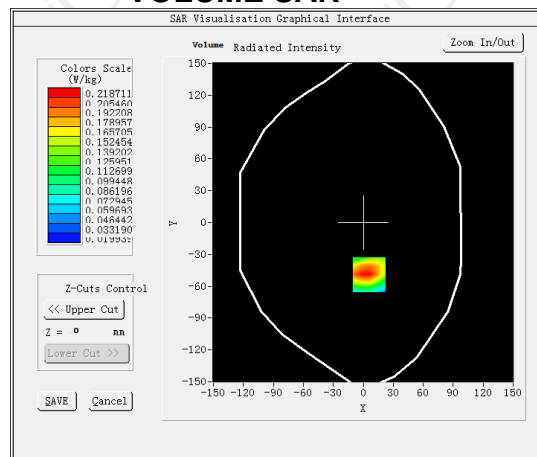
Date: 03/26/2025

Frequency (MHz)	912.600000
Relative permittivity (real part)	42.152015
Relative permittivity (imaginary part)	18.515895
Conductivity (S/m)	0.929515
Variation (%)	-4.690000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	BAND8 WCDMA900

### SURFACE SAR



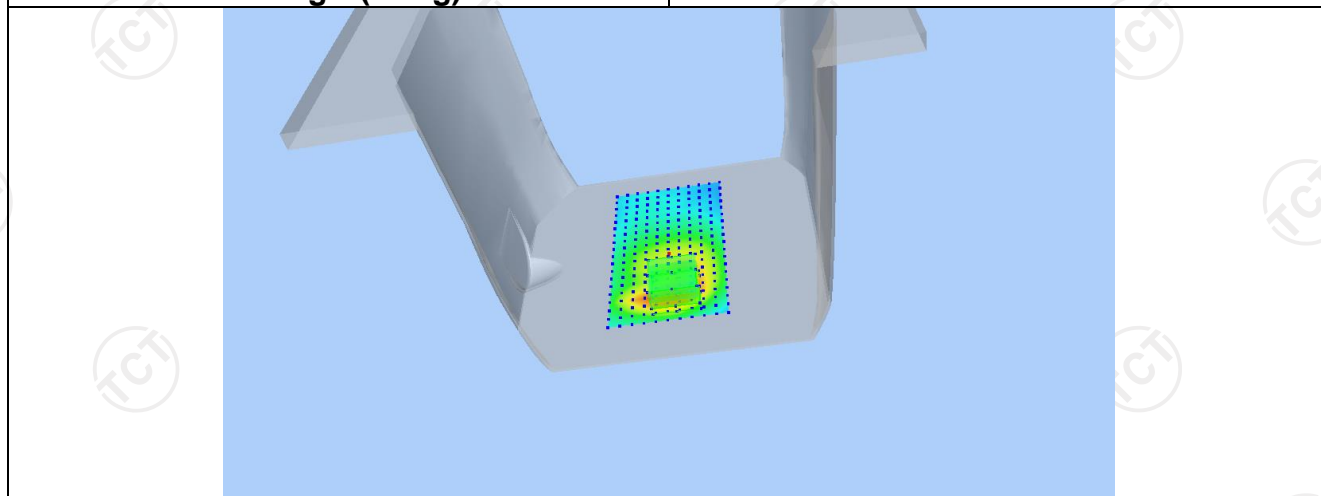
### VOLUME SAR



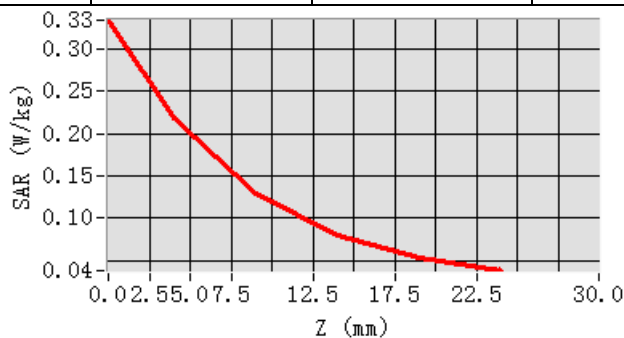
Maximum location: X=6.00, Y=-49.00

SAR Peak: 0.34 W/kg

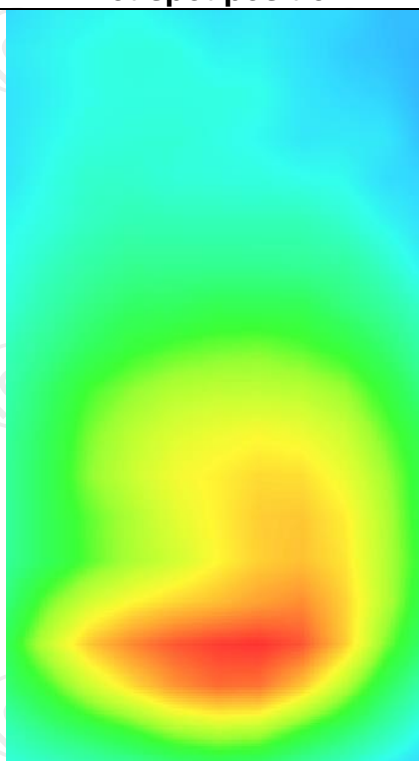
SAR 10g (W/Kg)	0.121502
SAR 1g (W/Kg)	0.208579



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3335	0.2187	0.1286	0.0793	0.0538



**Hot spot position**



## LTE Band 1

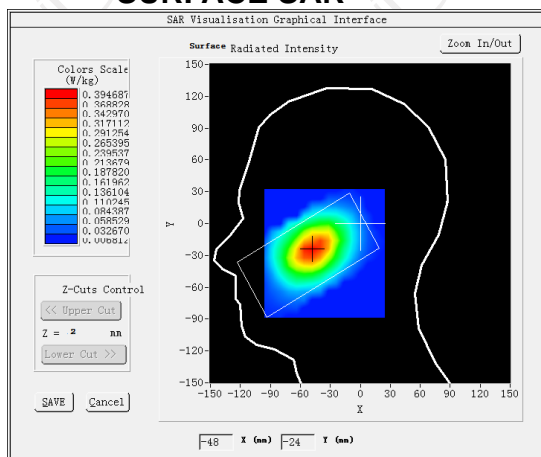
### MEASUREMENT 1

High Band SAR (Channel 18500):

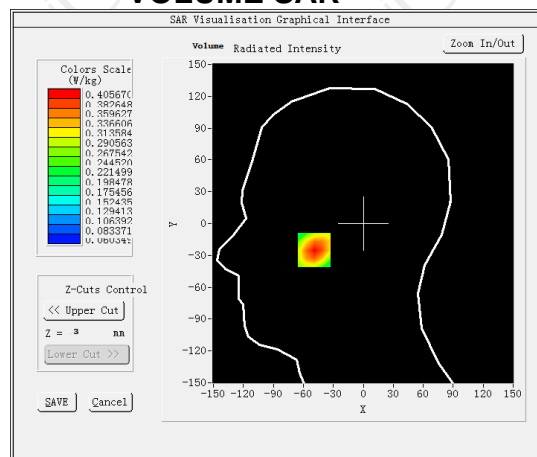
Date: 04/07/2025

Frequency (MHz)	1970.000000
Relative permittivity (real part)	39.751526
Relative permittivity (imaginary part)	12.491520
Conductivity (S/m)	1.381526
Variation (%)	1.260000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 1

### SURFACE SAR



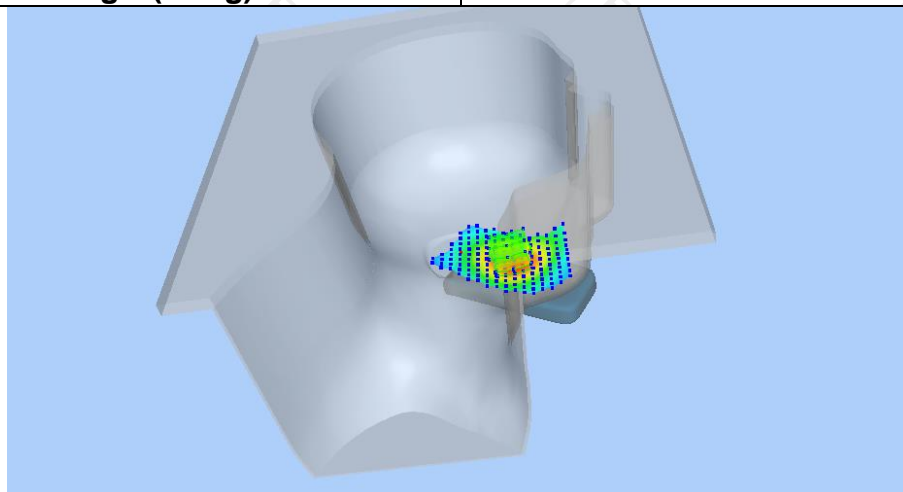
### VOLUME SAR



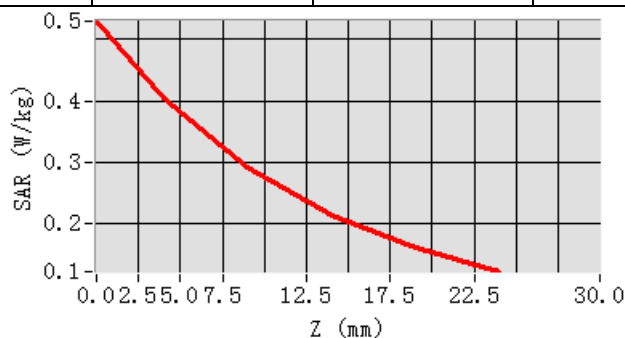
Maximum location: X=-49.00, Y=-25.00

SAR Peak: 0.53 W/kg

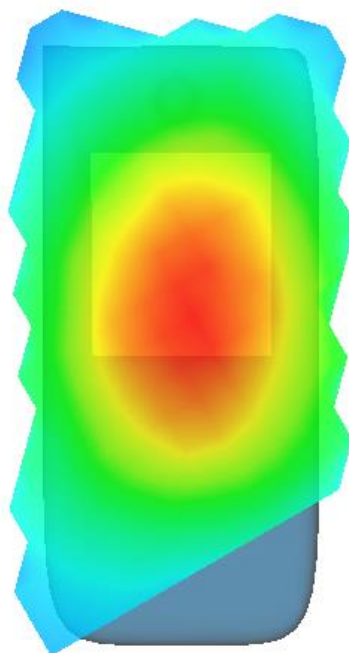
SAR 10g (W/Kg)	0.184521
SAR 1g (W/Kg)	0.352892



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5300	0.4057	0.2756	0.2144	0.1619



## Hot spot position





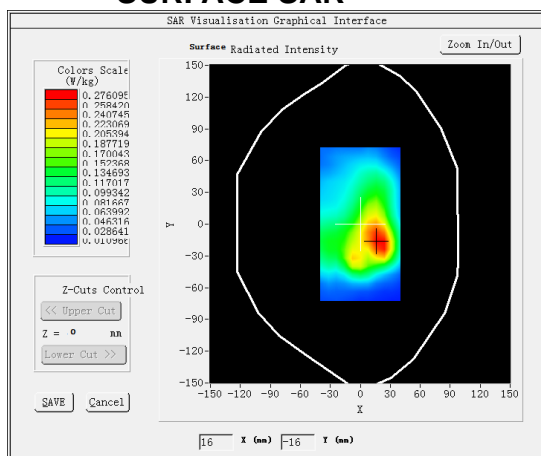
## MEASUREMENT 2

High Band SAR (Channel 18500):

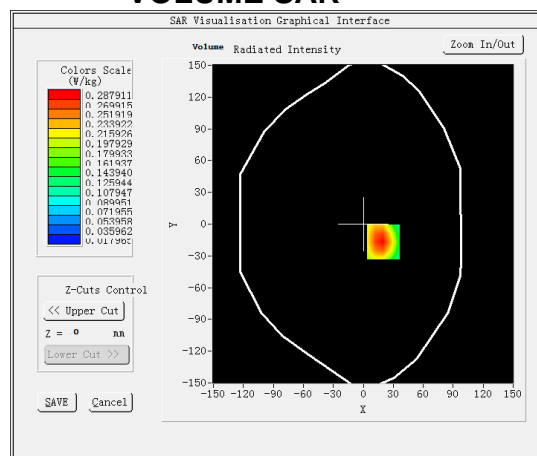
Date: 04/07/2025

Frequency (MHz)	1970.000000
Relative permittivity (real part)	39.751526
Relative permittivity (imaginary part)	12.491520
Conductivity (S/m)	1.381526
Variation (%)	-1.320000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 1

### SURFACE SAR



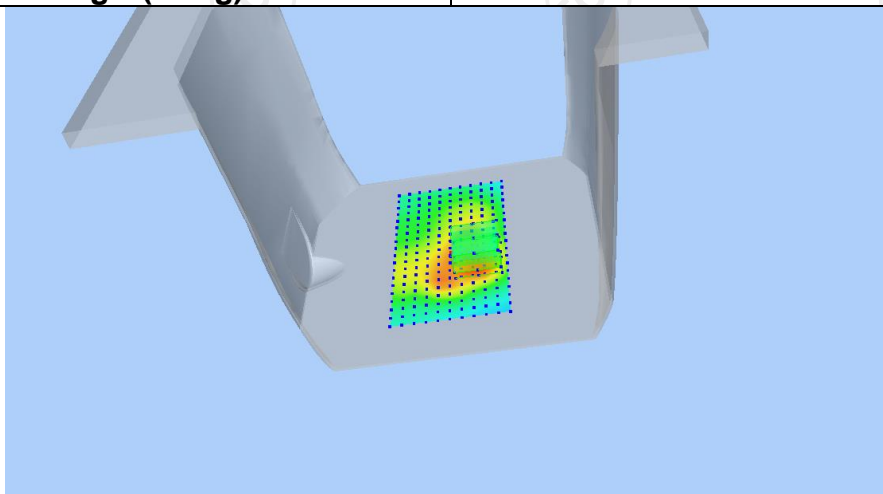
### VOLUME SAR



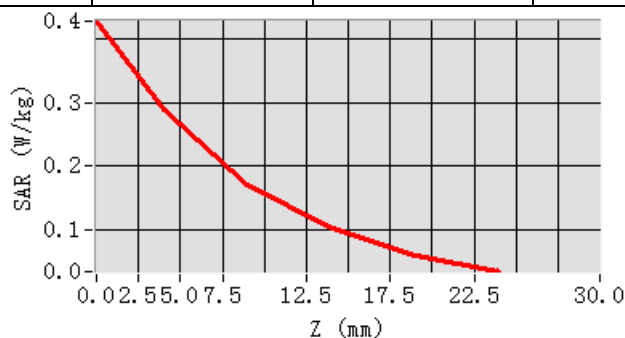
Maximum location: X=20.00, Y=-17.00

SAR Peak: 0.43W/kg

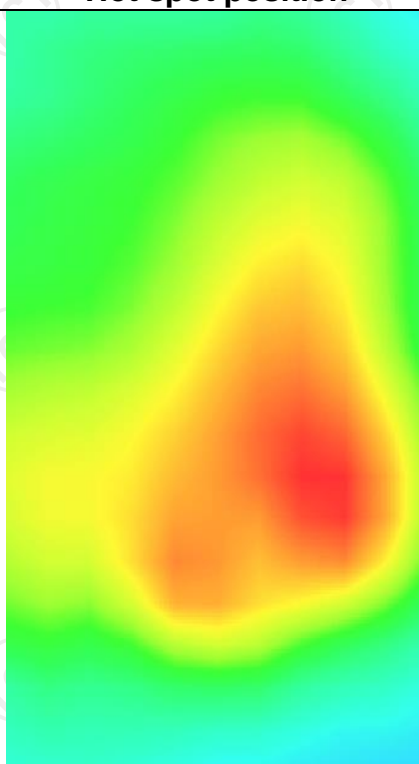
SAR 10g (W/Kg)	0.161061
SAR 1g (W/Kg)	0.274439



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4277	0.2879	0.1716	0.1015	0.0605



## Hot spot position



## LTE Band 3

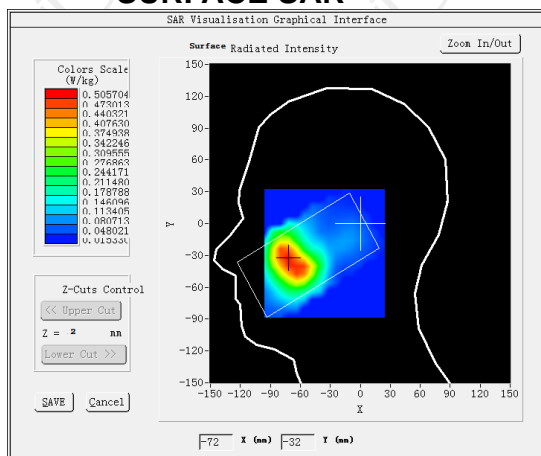
### MEASUREMENT 1

Low Band SAR (Channel 19300):

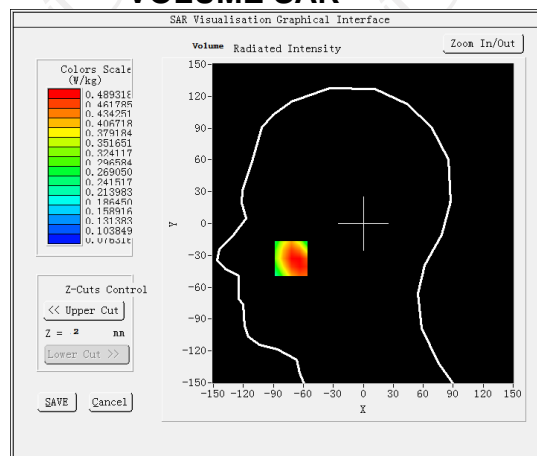
Date: 03/26/2025

Frequency (MHz)	1720.000000
Relative permittivity (real part)	39.578152
Relative permittivity (imaginary part)	13.821695
Conductivity (S/m)	1.422602
Variation (%)	-0.840000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 3

### SURFACE SAR



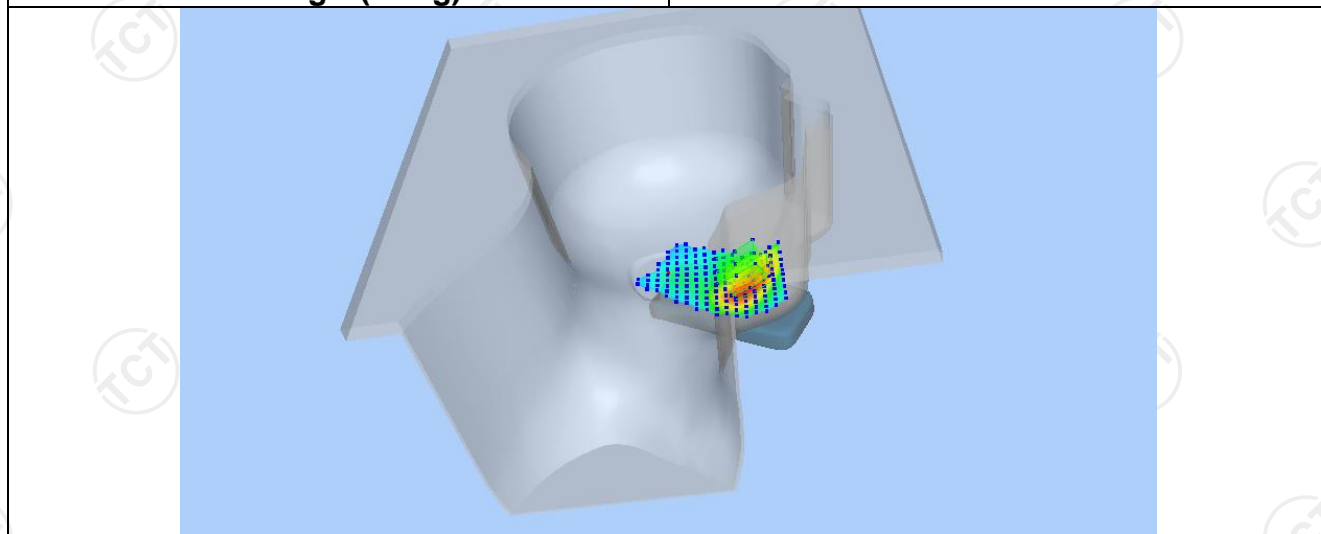
### VOLUME SAR



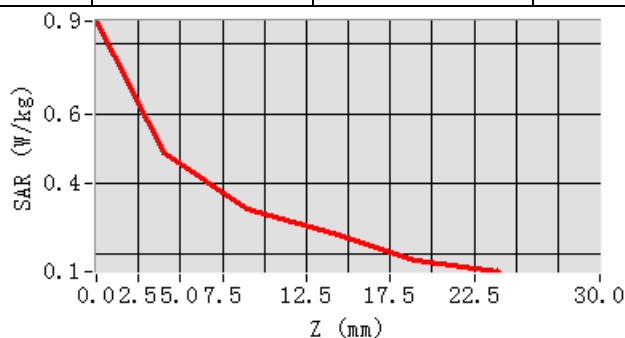
Maximum location: X=-72.00, Y=-33.00

SAR Peak: 0.64 W/kg

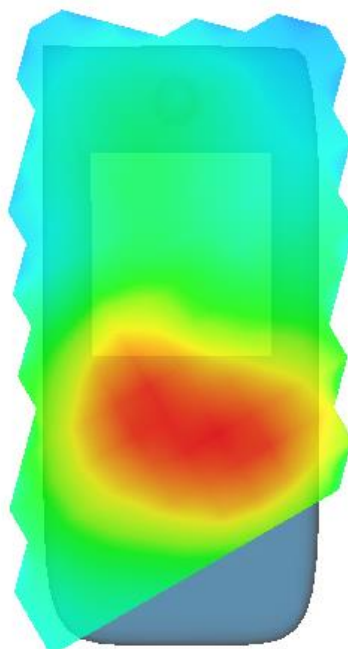
SAR 10g (W/Kg)	0.267458
SAR 1g (W/Kg)	0.462581



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8654	0.4893	0.3274	0.2611	0.1826



## Hot spot position



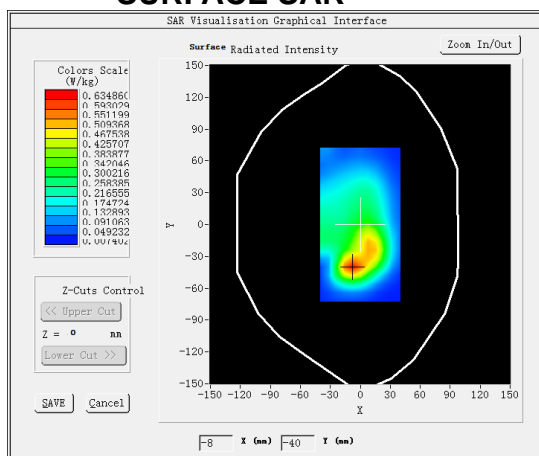
## MEASUREMENT 2

Low Band SAR (Channel 19300):

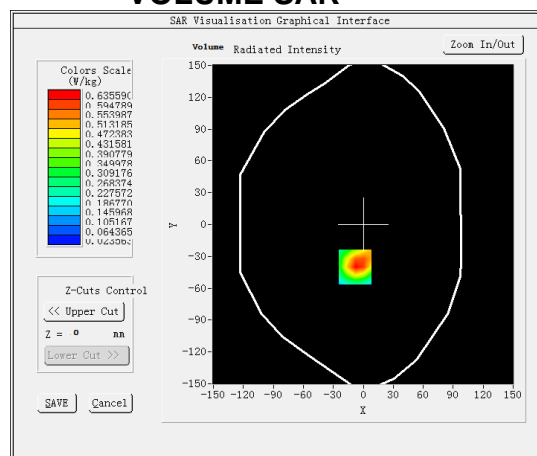
Date: 03/26/2025

Frequency (MHz)	1720.000000
Relative permittivity (real part)	39.578152
Relative permittivity (imaginary part)	13.821695
Conductivity (S/m)	1.422602
Variation (%)	-0.790000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 3

### SURFACE SAR



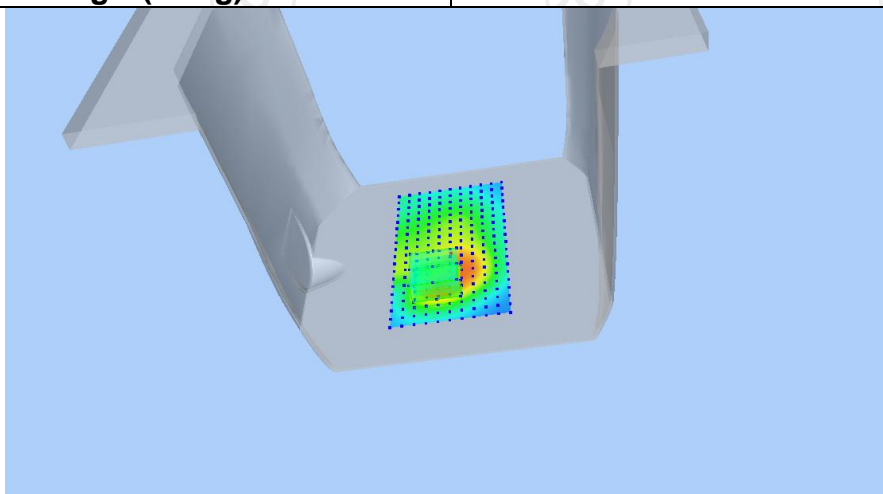
### VOLUME SAR



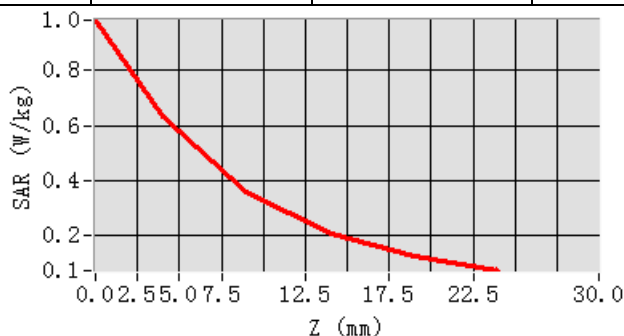
Maximum location: X=-8.00, Y=-40.00

SAR Peak: 1.01 W/kg

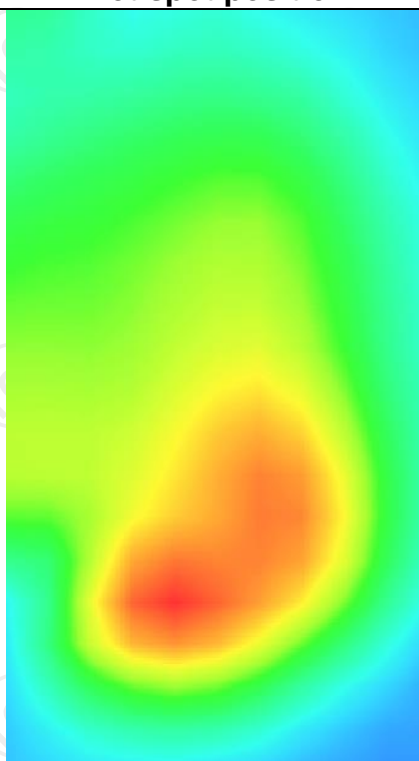
SAR 10g (W/Kg)	0.330585
SAR 1g (W/Kg)	0.605166



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.9820	0.6356	0.3610	0.2071	0.1243



**Hot spot position**



## LTE Band 7

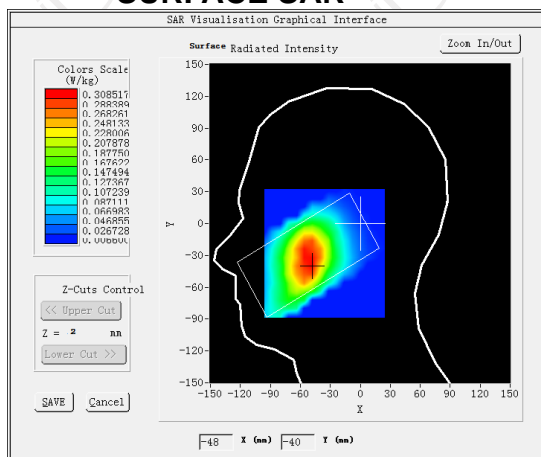
### MEASUREMENT 1

Middle Band SAR (Channel 21100):

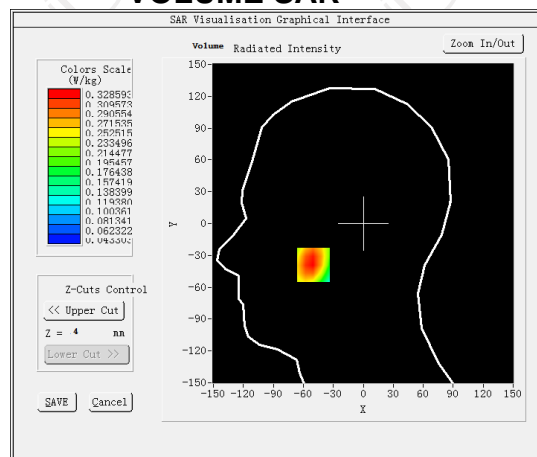
Date: 04/07/2025

Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.692518
Relative permittivity (imaginary part)	13.661258
Conductivity (S/m)	1.905162
Variation (%)	-1.590000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 7

### SURFACE SAR



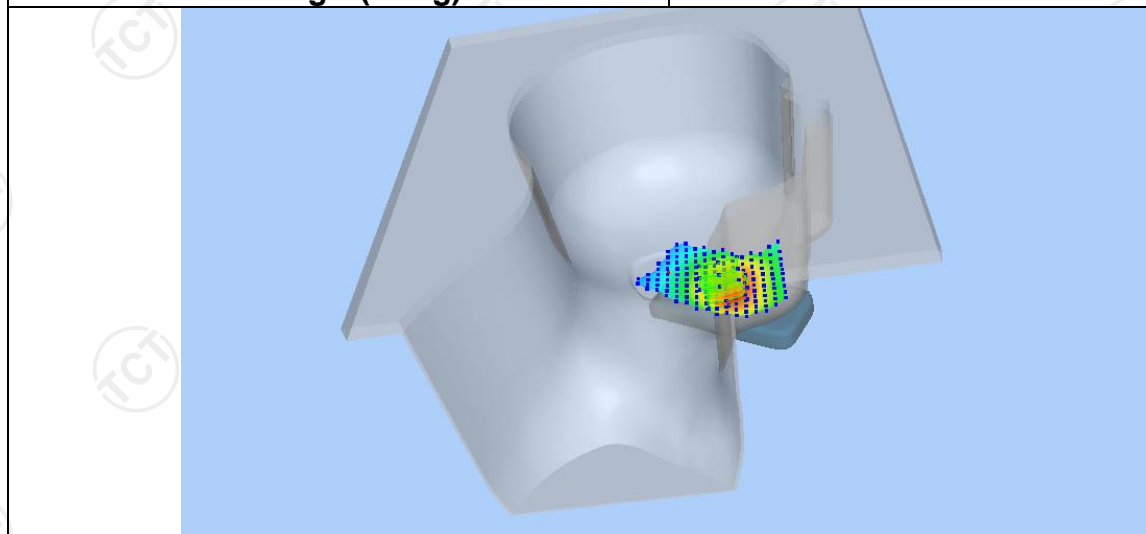
### VOLUME SAR



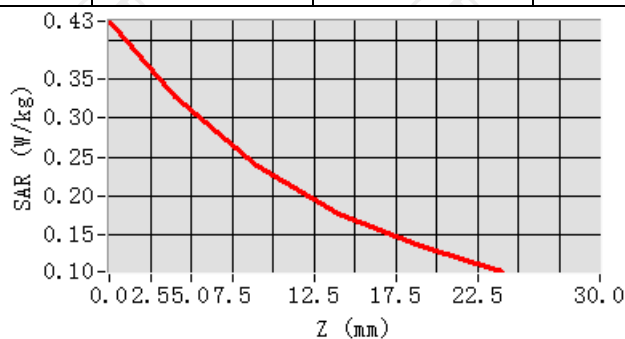
Maximum location: X=-52.00, Y=-40.00

SAR Peak: 0.43 W/kg

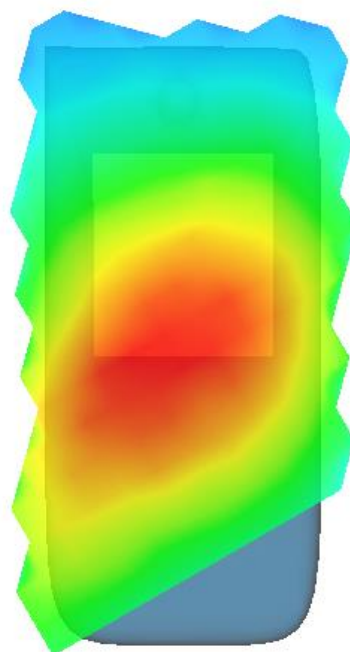
SAR 10g (W/Kg)	0.181524
SAR 1g (W/Kg)	0.302154



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4301	0.3270	0.2390	0.1762	0.1350



### Hot spot position





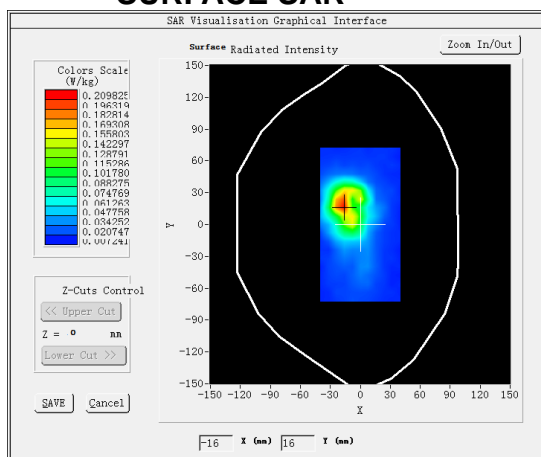
## MEASUREMENT 2

Middle Band SAR (Channel 21100):

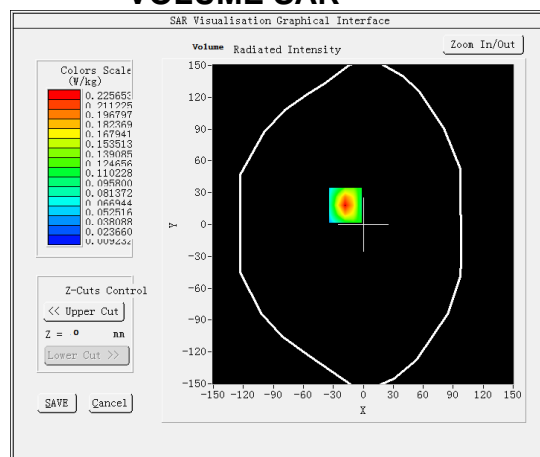
Date: 04/07/2025

Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.692518
Relative permittivity (imaginary part)	13.661258
Conductivity (S/m)	1.905162
Variation (%)	-1.100000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 7

### SURFACE SAR



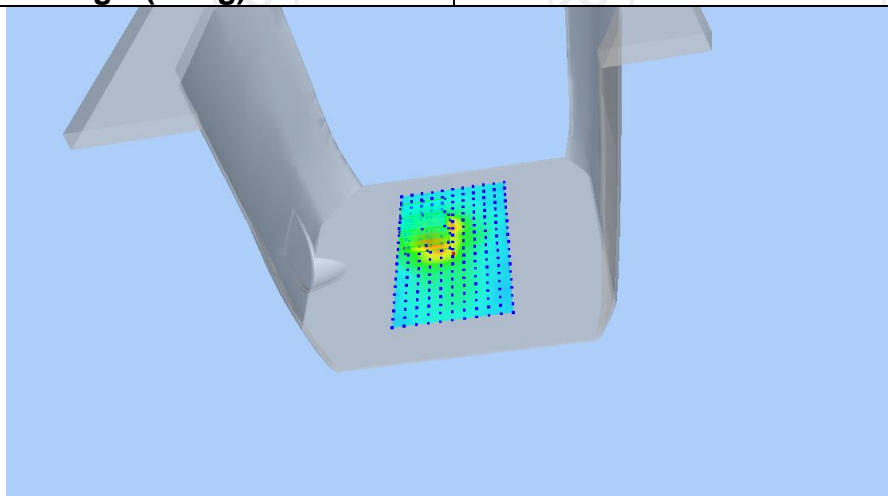
### VOLUME SAR



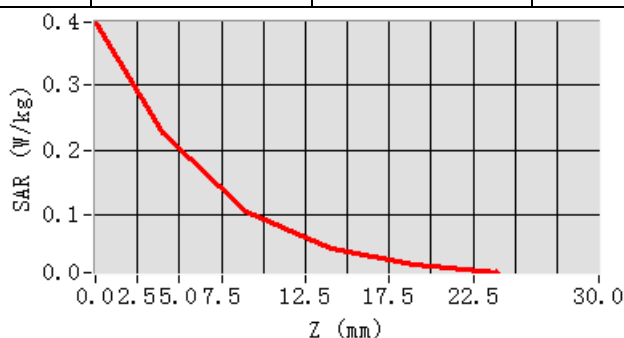
Maximum location: X=-18.00, Y=18.00

SAR Peak: 0.40 W/kg

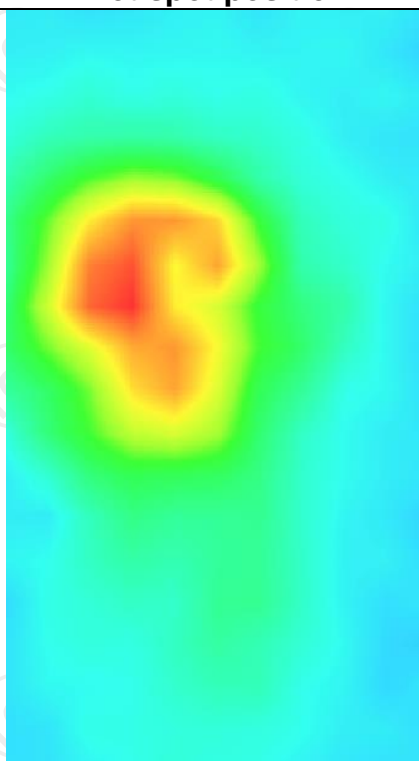
SAR 10g (W/Kg)	0.101933
SAR 1g (W/Kg)	0.212544



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3955	0.2257	0.1053	0.0485	0.0242



**Hot spot position**



## LTE Band 8

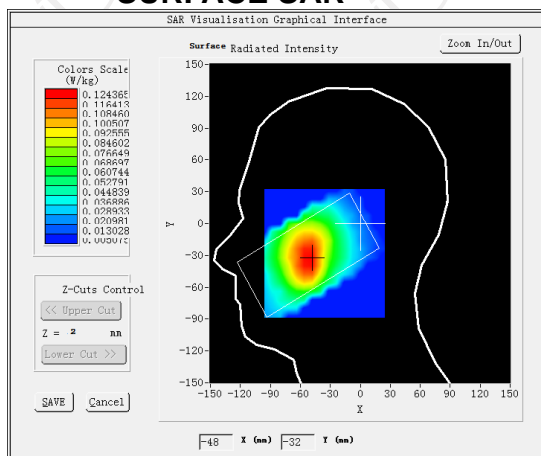
### MEASUREMENT 1

Middle Band SAR (Channel 21625):

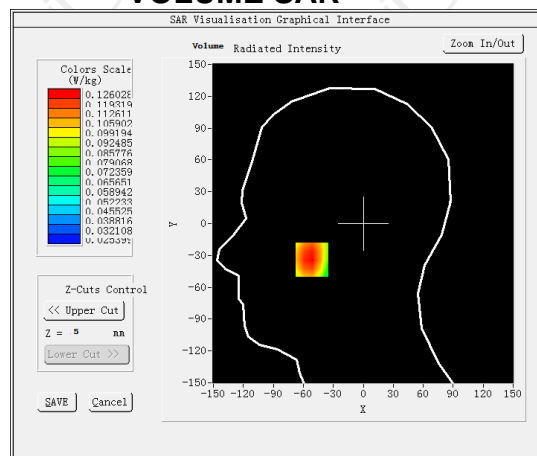
Date: 03/26/2025

Frequency (MHz)	897.500000
Relative permittivity (real part)	41.732054
Relative permittivity (imaginary part)	19.351254
Conductivity (S/m)	0.957485
Variation (%)	0.150000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 8

### SURFACE SAR



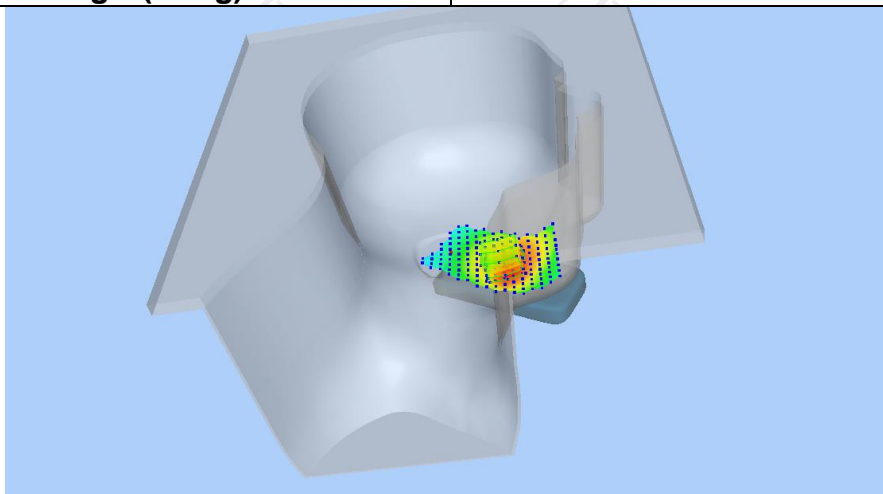
### VOLUME SAR



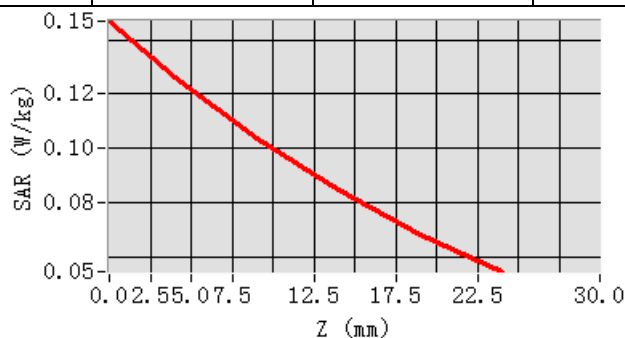
Maximum location: X=-50.00, Y=-37.00

SAR Peak: 0.15 W/kg

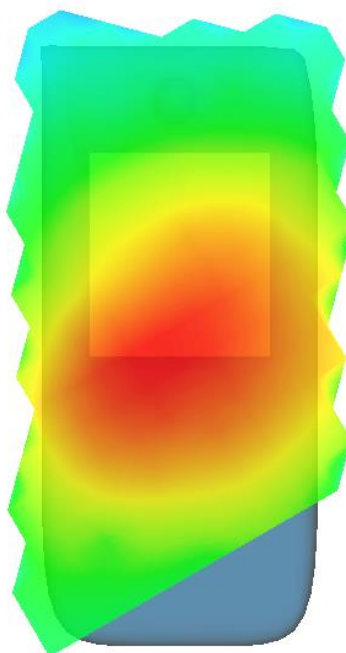
SAR 10g (W/Kg)	0.100254
SAR 1g (W/Kg)	0.121595



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1512	0.1251	0.1042	0.0820	0.0674



## Hot spot position



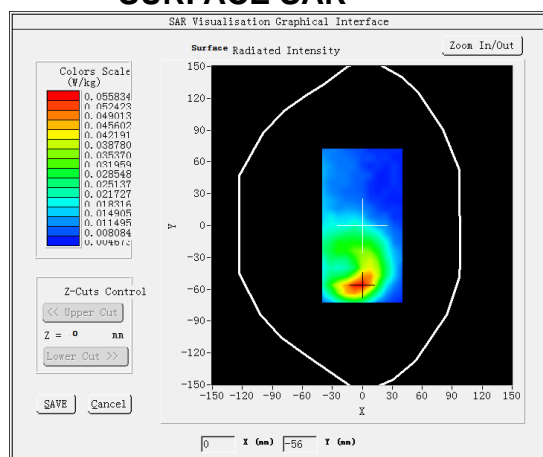
## MEASUREMENT 2

Middle Band SAR (Channel 21625):

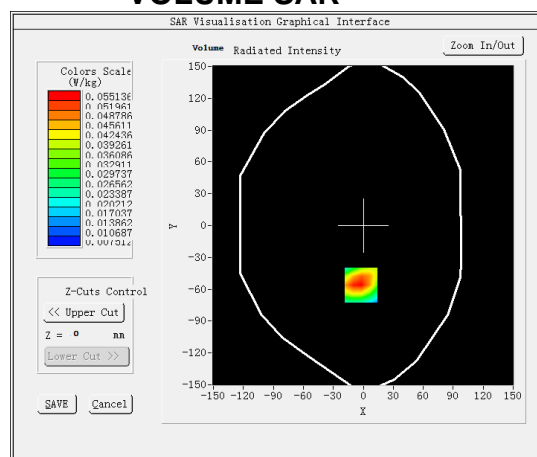
Date: 03/26/2025

Frequency (MHz)	897.500000
Relative permittivity (real part)	41.732054
Relative permittivity (imaginary part)	19.351254
Conductivity (S/m)	0.957485
Variation (%)	-1.270000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 8

### SURFACE SAR



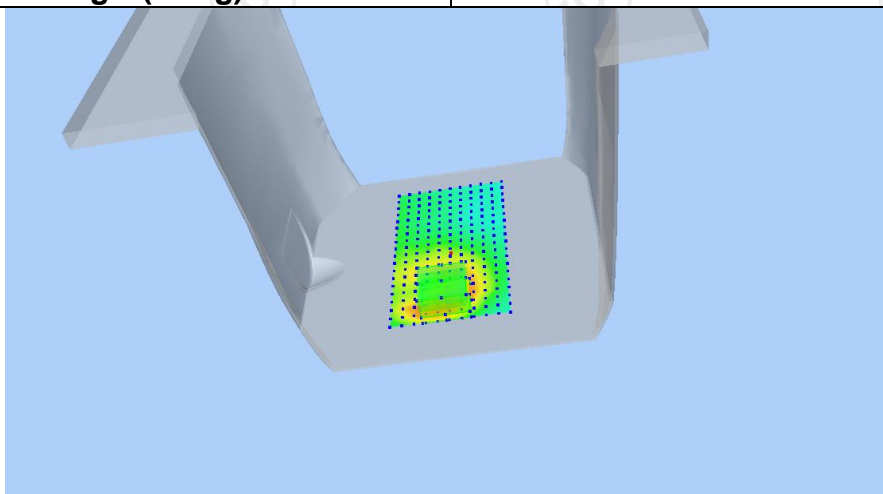
### VOLUME SAR



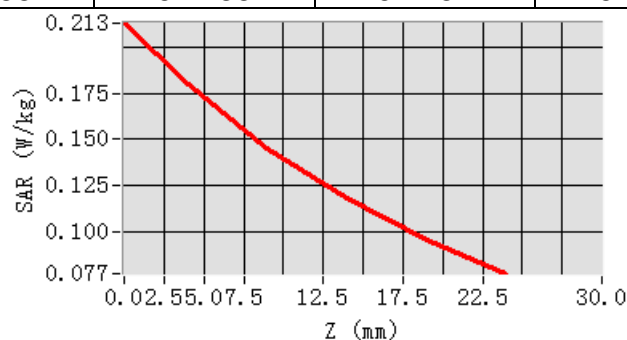
Maximum location: X=-16.00, Y=-48.00

SAR Peak: 0.91W/kg

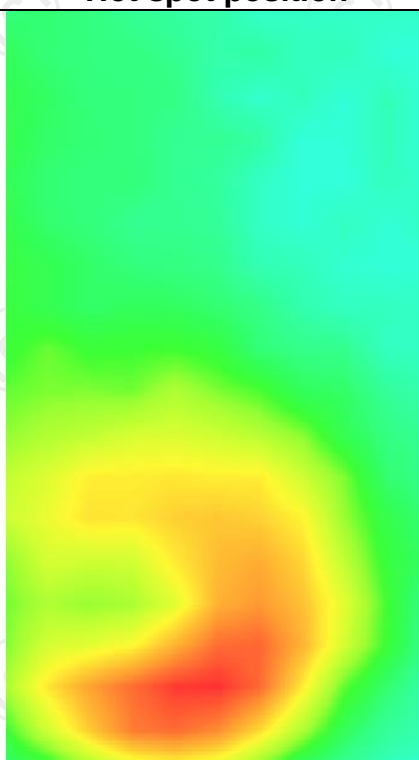
SAR 10g (W/Kg)	0.125271
SAR 1g (W/Kg)	0.156284



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2133	0.1799	0.1454	0.1179	0.0957



Hot spot position



## LTE Band 20

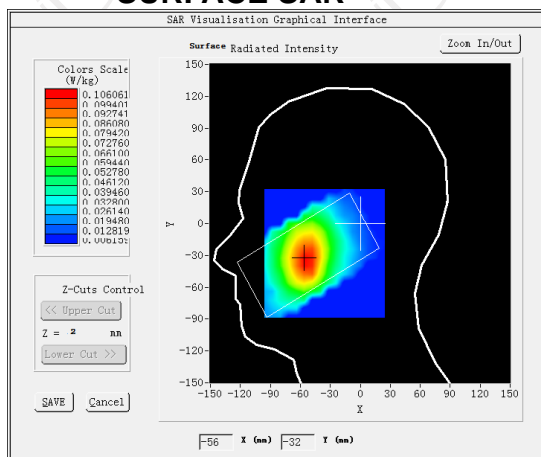
### MEASUREMENT 1

Low Band SAR (Channel 24250):

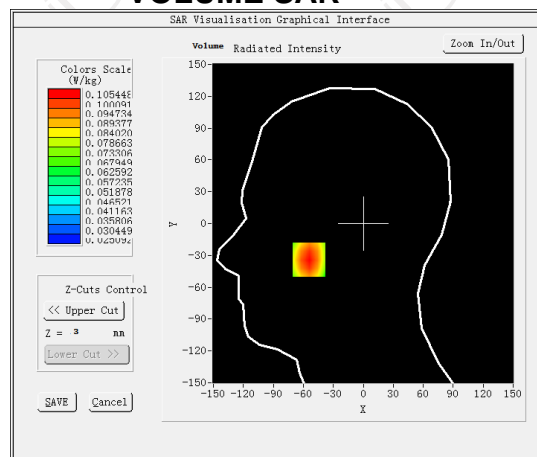
Date: 03/26/2025

Frequency (MHz)	842.000000
Relative permittivity (real part)	42.060652
Relative permittivity (imaginary part)	19.326125
Conductivity (S/m)	0.940625
Variation (%)	-1.050000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 20

### SURFACE SAR



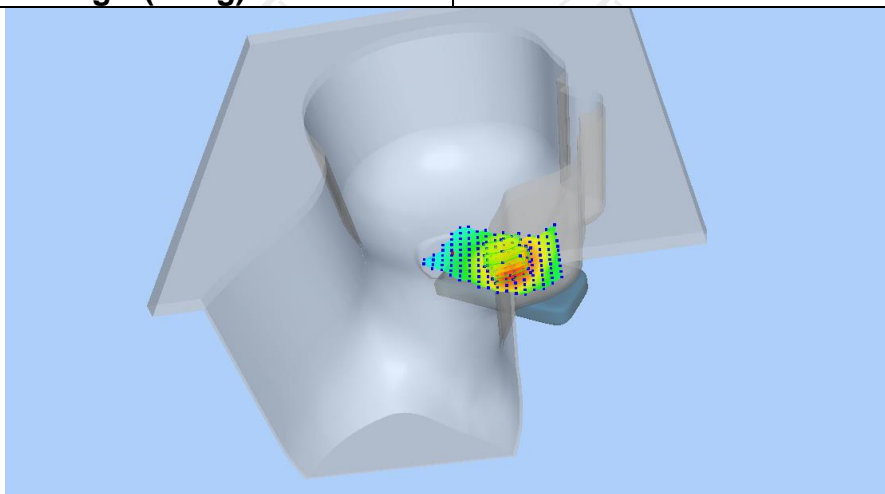
### VOLUME SAR



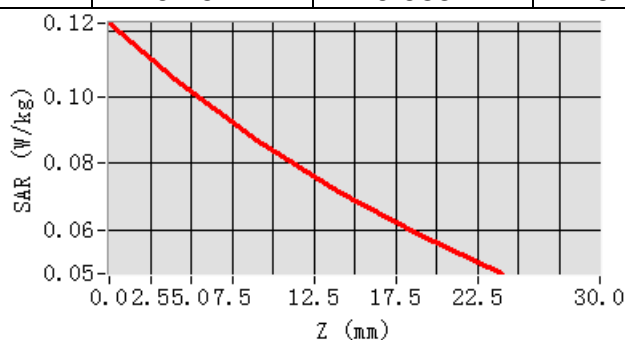
Maximum location: X=-54.00, Y=-34.00

SAR Peak: 0.12 W/kg

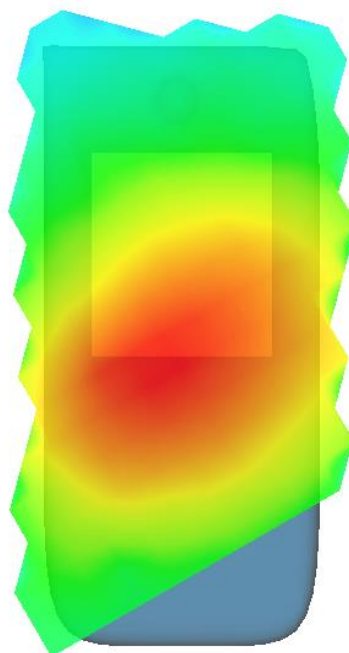
SAR 10g (W/Kg)	0.078154
SAR 1g (W/Kg)	0.103621



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1212	0.1041	0.0891	0.0706	0.0580



### Hot spot position





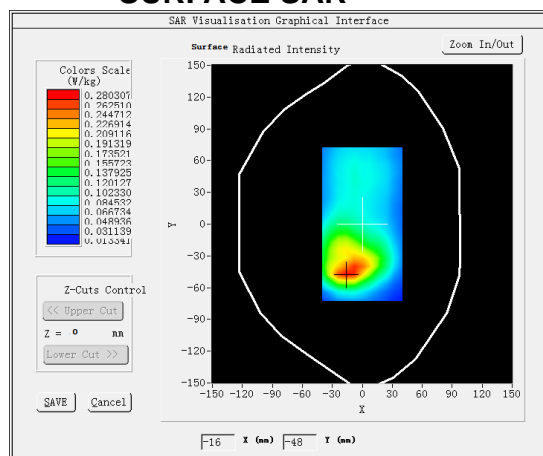
## MEASUREMENT 2

Low Band SAR (Channel 24250):

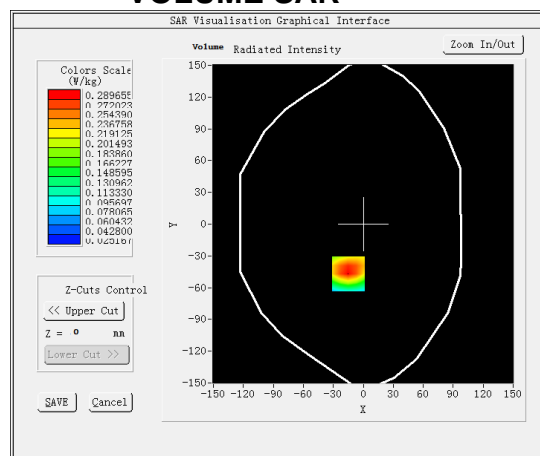
Date: 03/26/2025

Frequency (MHz)	842.000000
Relative permittivity (real part)	42.060652
Relative permittivity (imaginary part)	19.326125
Conductivity (S/m)	0.940625
Variation (%)	-1.590000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 20

### SURFACE SAR



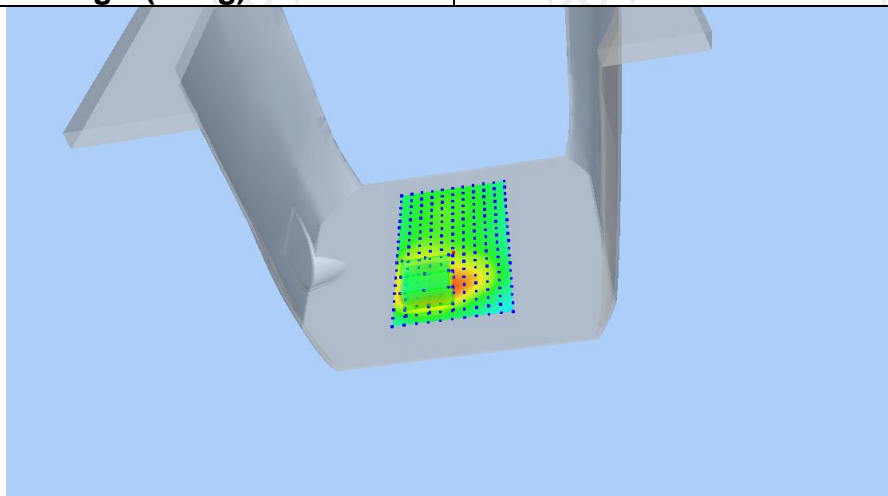
### VOLUME SAR



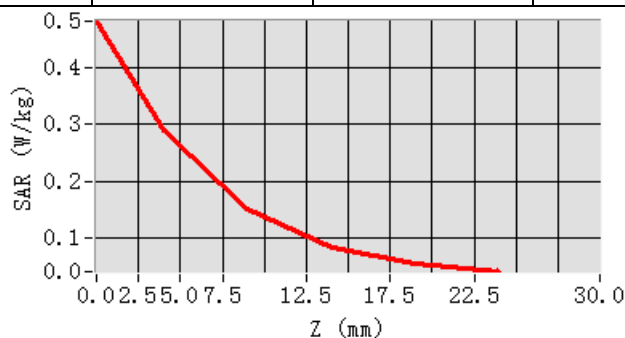
Maximum location: X=-15.00, Y=-47.00

SAR Peak: 0.49 W/kg

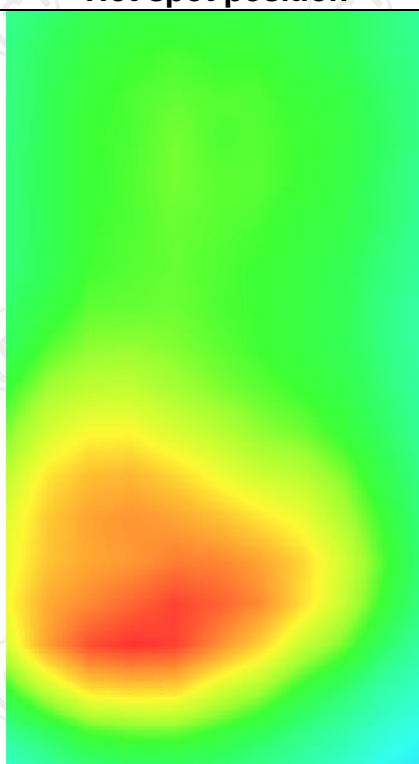
SAR 10g (W/Kg)	0.142669
SAR 1g (W/Kg)	0.262587



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4802	0.2897	0.1517	0.0851	0.0565



## Hot spot position



## LTE Band 28

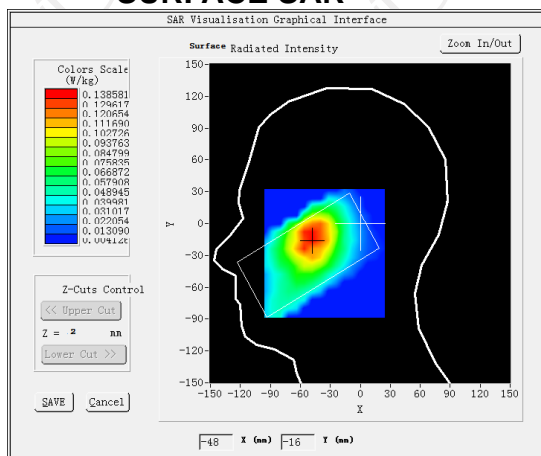
### MEASUREMENT 1

Low Band SAR (Channel 27310):

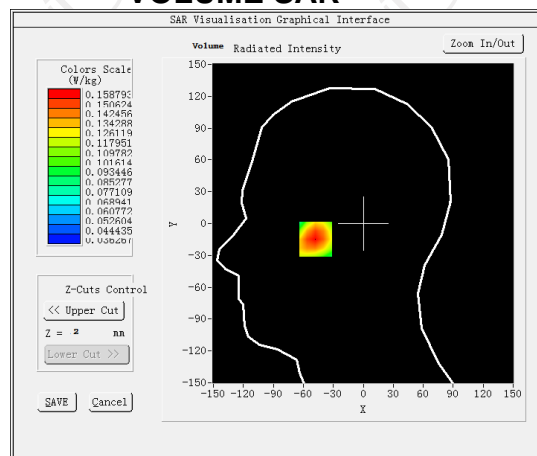
Date: 03/28/2025

Frequency (MHz)	713.000000
Relative permittivity (real part)	42.089254
Relative permittivity (imaginary part)	21.381574
Conductivity (S/m)	0.884251
Variation (%)	-2.610000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 28

### SURFACE SAR



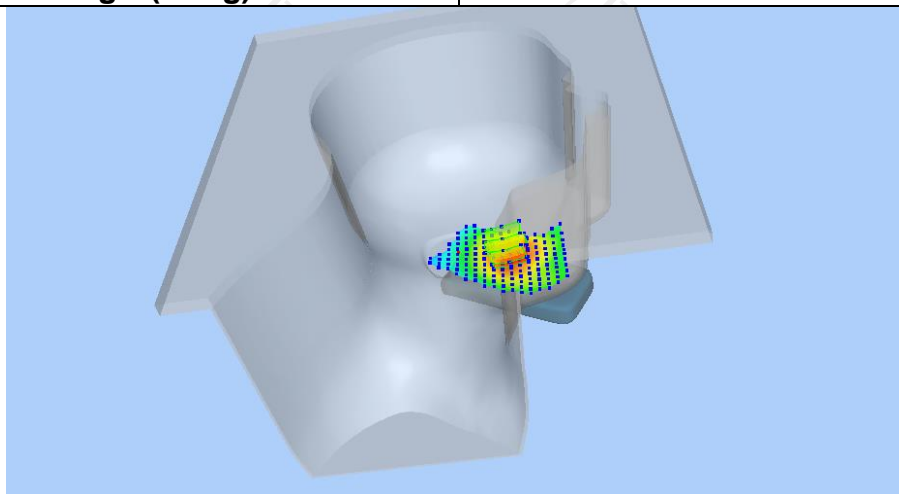
### VOLUME SAR



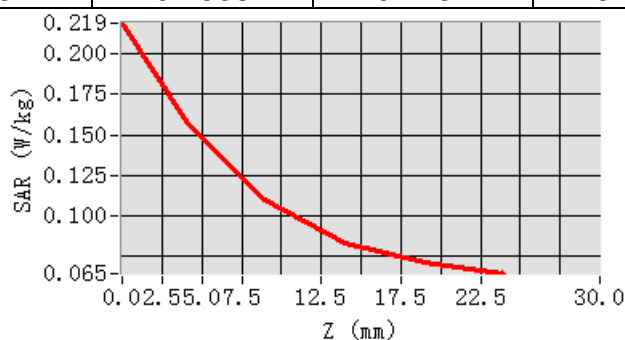
Maximum location: X=-48.00, Y=-14.00

SAR Peak: 0.22 W/kg

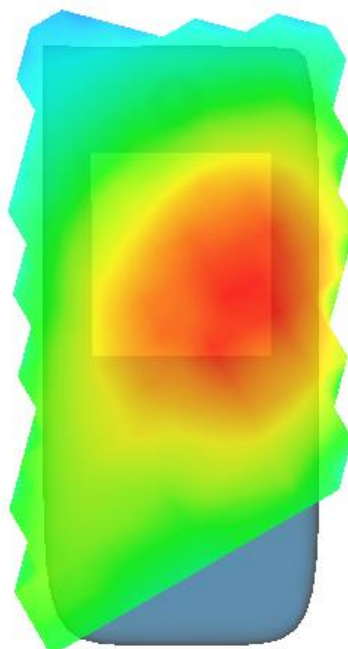
SAR 10g (W/Kg)	0.110256
SAR 1g (W/Kg)	0.165214



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2187	0.1588	0.1102	0.0836	0.0711



## Hot spot position



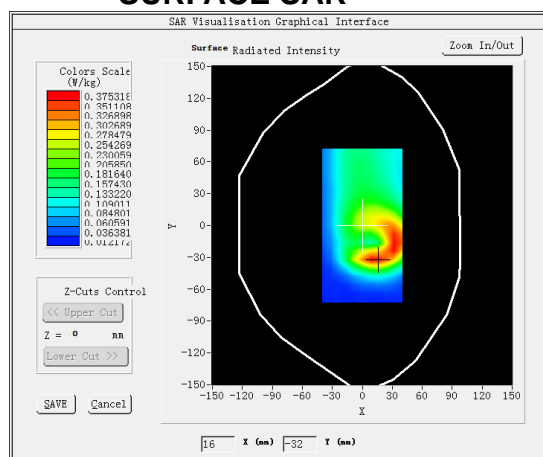
## MEASUREMENT 2

Low Band SAR (Channel 27310):

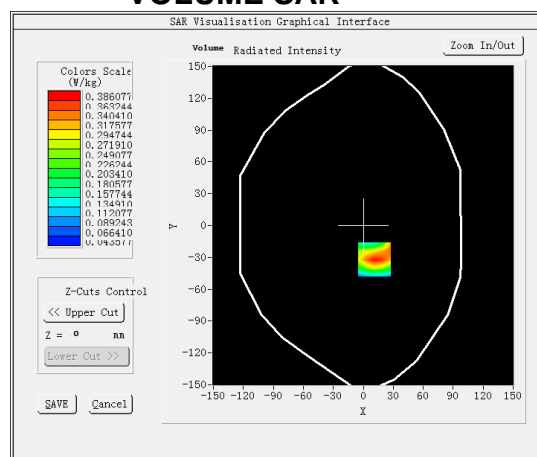
Date: 03/28/2025

Frequency (MHz)	713.000000
Relative permittivity (real part)	42.089254
Relative permittivity (imaginary part)	21.381574
Conductivity (S/m)	0.884251
Variation (%)	1.620000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7, dx=8mm dy=8mm dz=5mm, Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 28

### SURFACE SAR



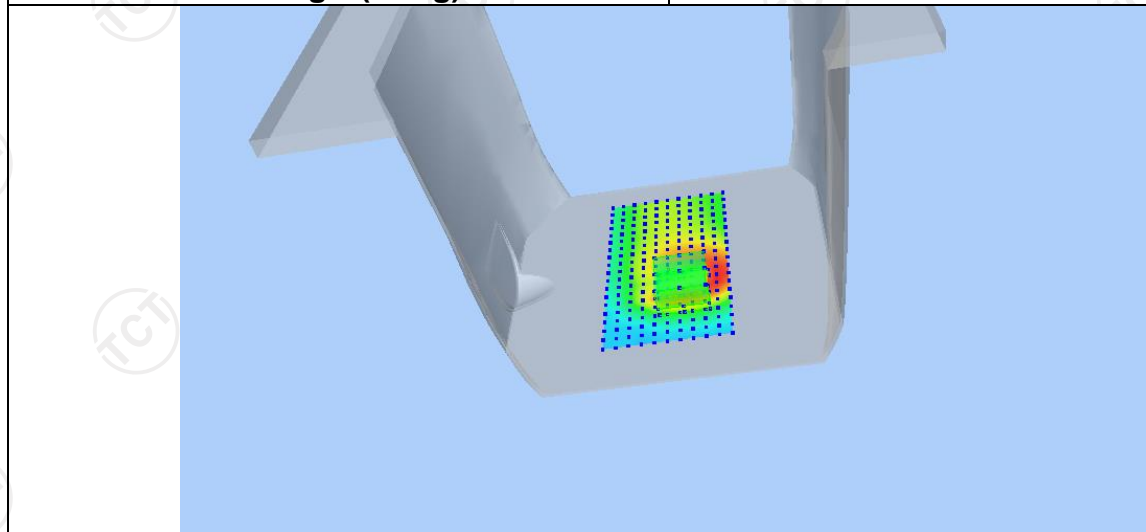
### VOLUME SAR



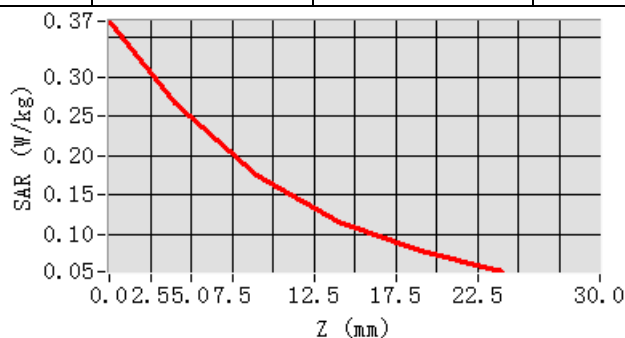
Maximum location: X=11.00, Y=-32.00

SAR Peak: 0.37 W/kg

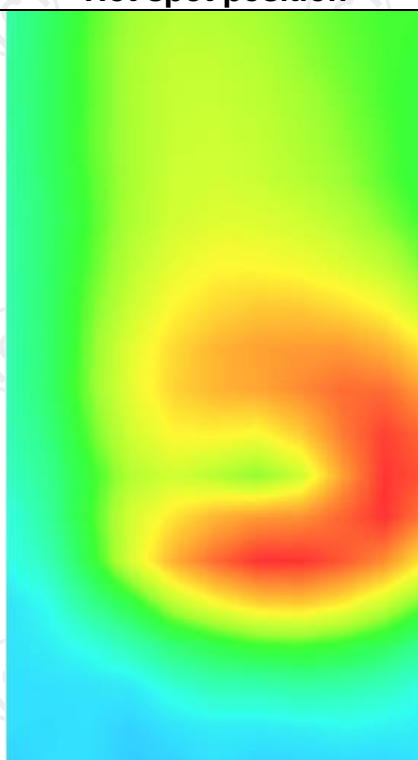
SAR 10g (W/Kg)	0.145925
SAR 1g (W/Kg)	0.241528



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3712	0.2667	0.1751	0.1160	0.0784



Hot spot position



## LTE Band 38

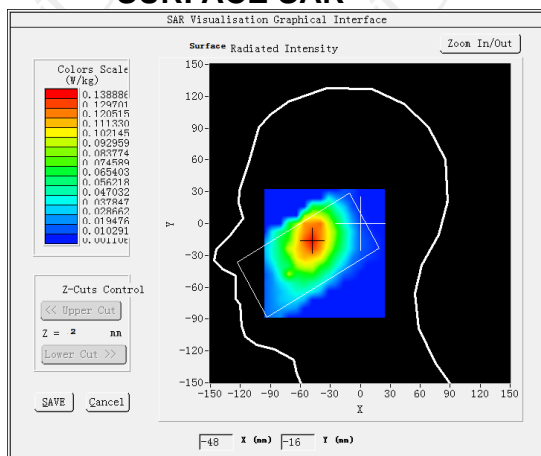
### MEASUREMENT 1

Middle Band SAR (Channel 38000)

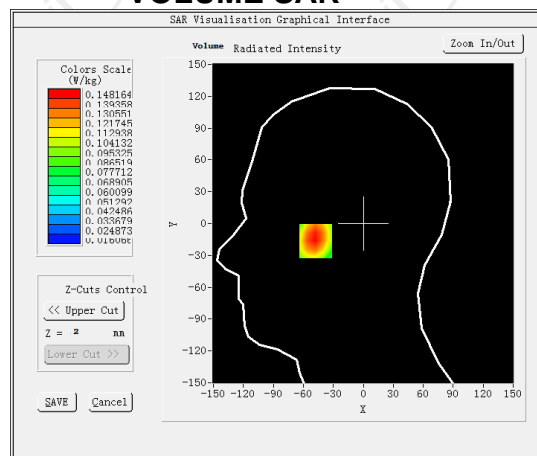
Date: 04/07/2025

Frequency (MHz)	2595.000000
Relative permittivity (real part)	37.849521
Relative permittivity (imaginary part)	13.512547
Conductivity (S/m)	1.894152
Variation (%)	1.520000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 38

### SURFACE SAR



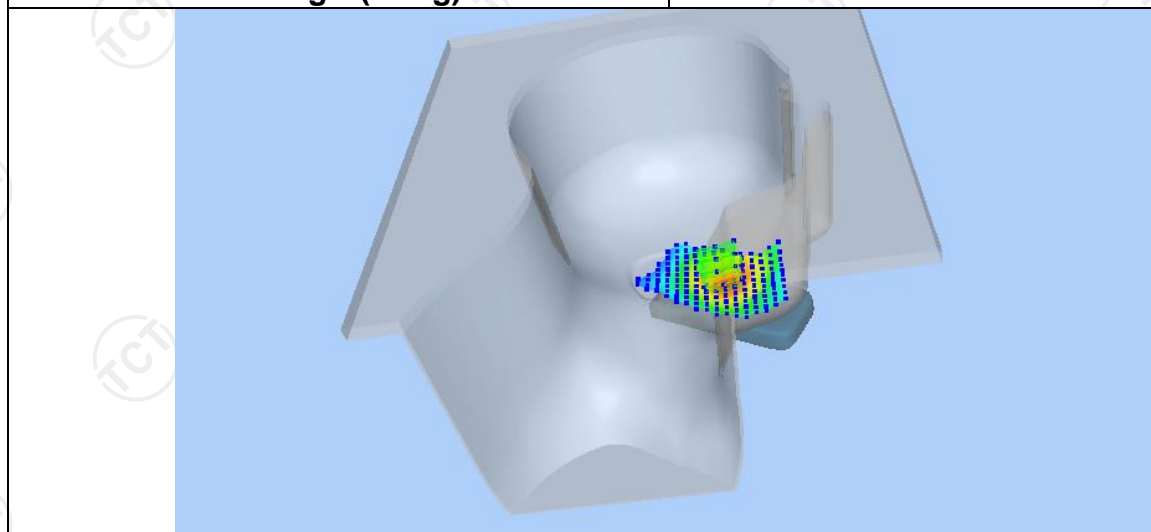
### VOLUME SAR



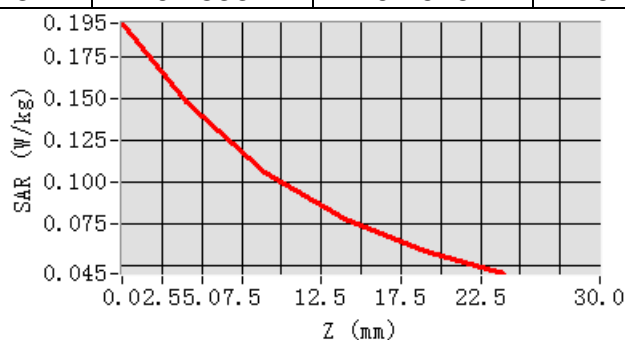
Maximum location: X=-46.00, Y=-17.00

SAR Peak: 0.19 W/kg

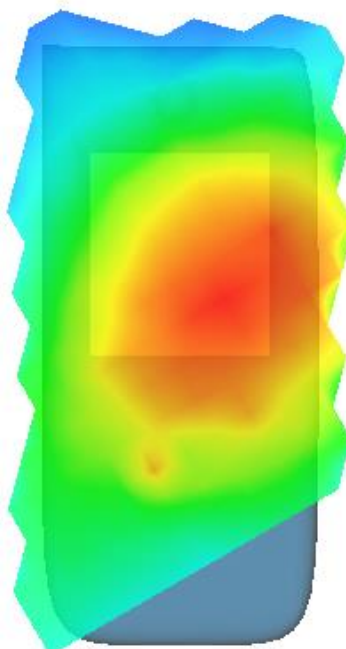
SAR 10g (W/Kg)	0.101054
SAR 1g (W/Kg)	0.149541



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1948	0.1395	0.1025	0.0790	0.0652



### Hot spot position





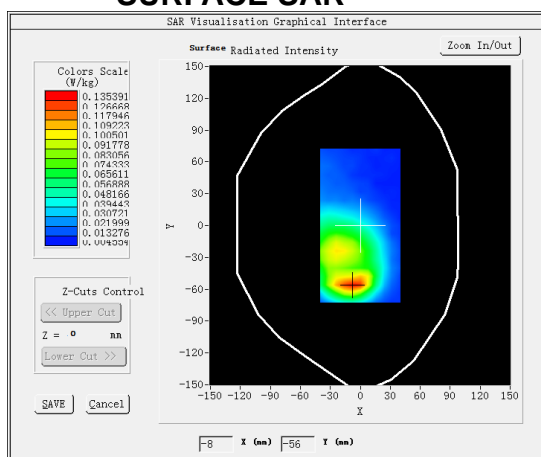
## MEASUREMENT 2

Middle Band SAR (Channel 38000)

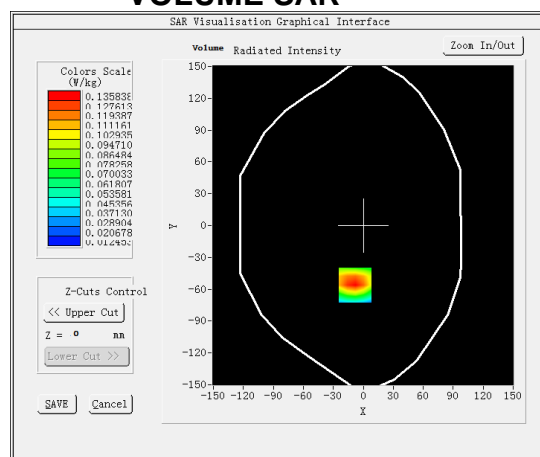
Date: 04/07/2025

Frequency (MHz)	2595.000000
Relative permittivity (real part)	37.849521
Relative permittivity (imaginary part)	13.512547
Conductivity (S/m)	1.894152
Variation (%)	-2.900000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm dz=5mm,Complete</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back</u>
Band	<u>LTE band 38</u>

### SURFACE SAR



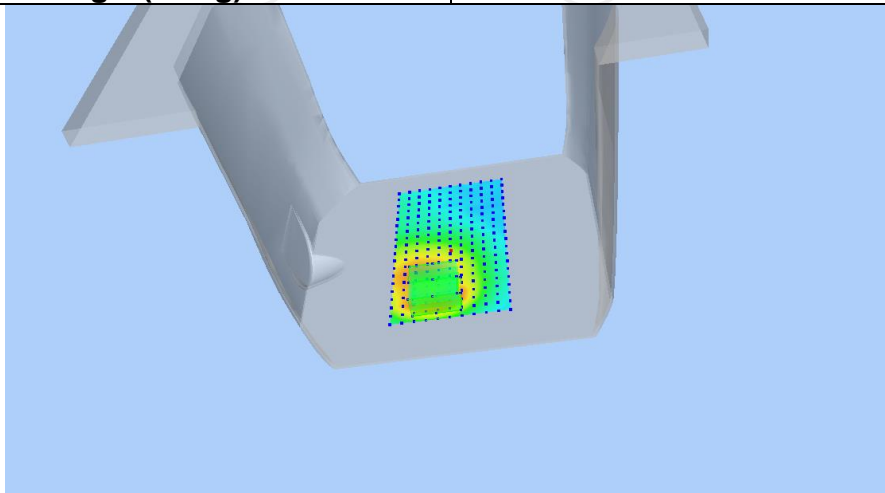
### VOLUME SAR



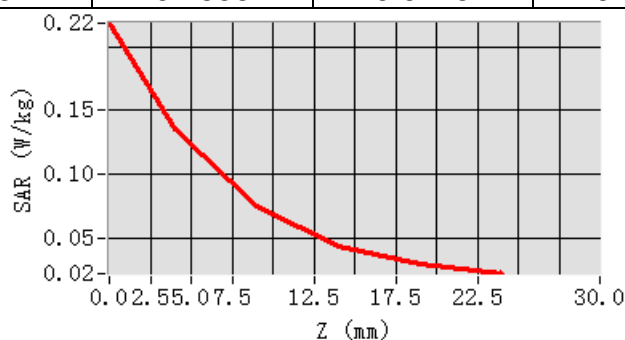
Maximum location: X=-8.00, Y=-56.00

SAR Peak:0.22 W/kg

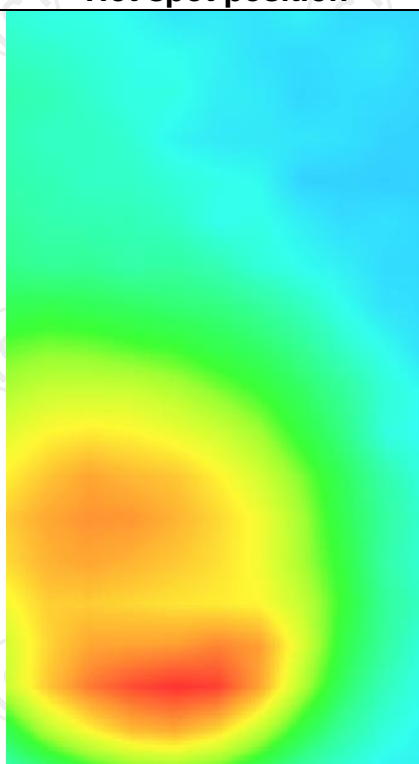
SAR 10g (W/Kg)	0.072923
SAR 1g (W/Kg)	0.129230



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2184	0.1358	0.0745	0.0437	0.0297



Hot spot position



## LTE Band 40

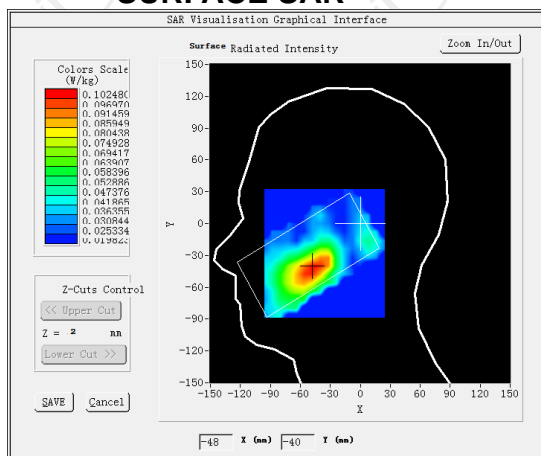
### MEASUREMENT 1

High Band SAR (Channel 39550)

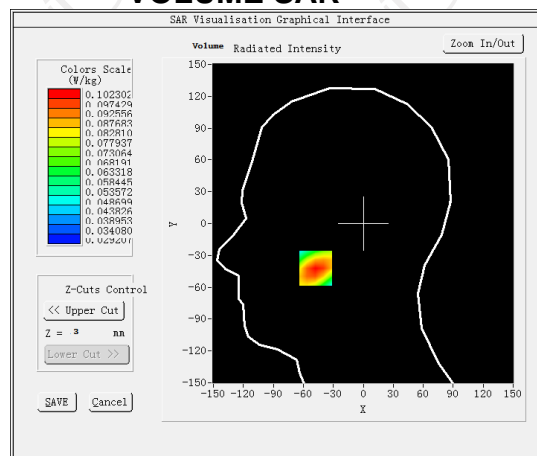
Date: 03/25/2025

Frequency (MHz)	2390.000000
Relative permittivity (real part)	38.902158
Relative permittivity (imaginary part)	13.120547
Conductivity (S/m)	1.781595
Variation (%)	-1.900000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	LTE band 40

### SURFACE SAR



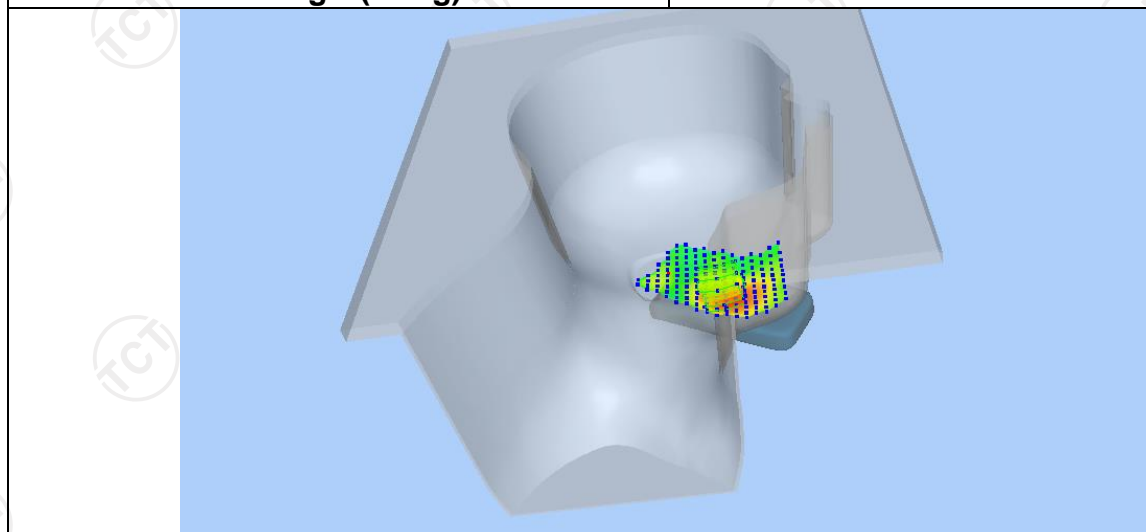
### VOLUME SAR



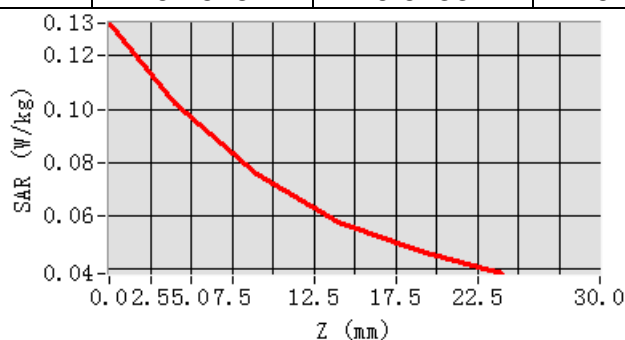
Maximum location: X=-48.00, Y=-42.00

SAR Peak: 0.13 W/kg

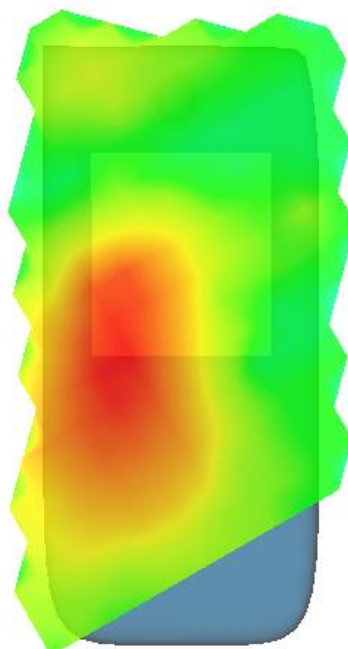
SAR 10g (W/Kg)	0.067154
SAR 1g (W/Kg)	0.102621



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1322	0.1023	0.0755	0.0579	0.0467



## Hot spot position



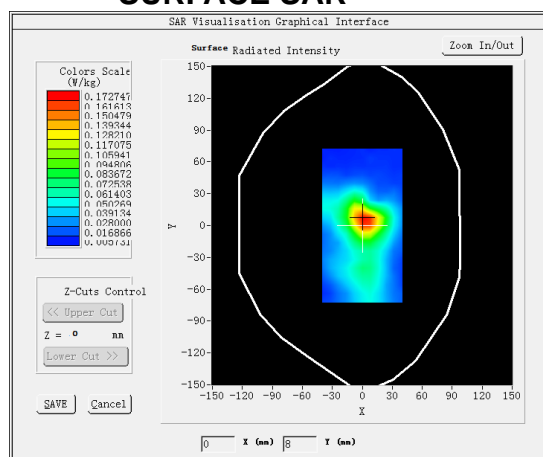
## MEASUREMENT 2

High Band SAR (Channel 39550)

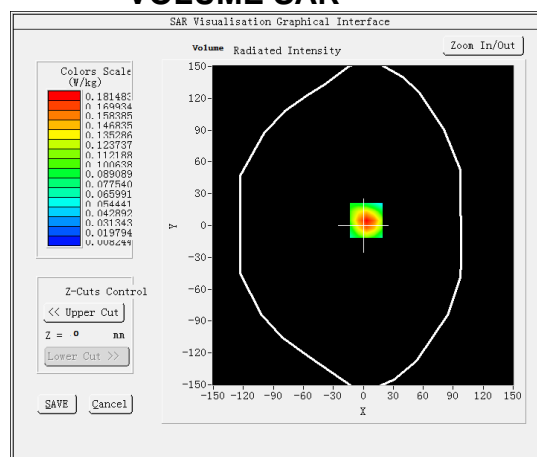
Date: 03/25/2025

Frequency (MHz)	2390.000000
Relative permittivity (real part)	38.902158
Relative permittivity (imaginary part)	13.120547
Conductivity (S/m)	1.781595
Variation (%)	2.780000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 40

### SURFACE SAR



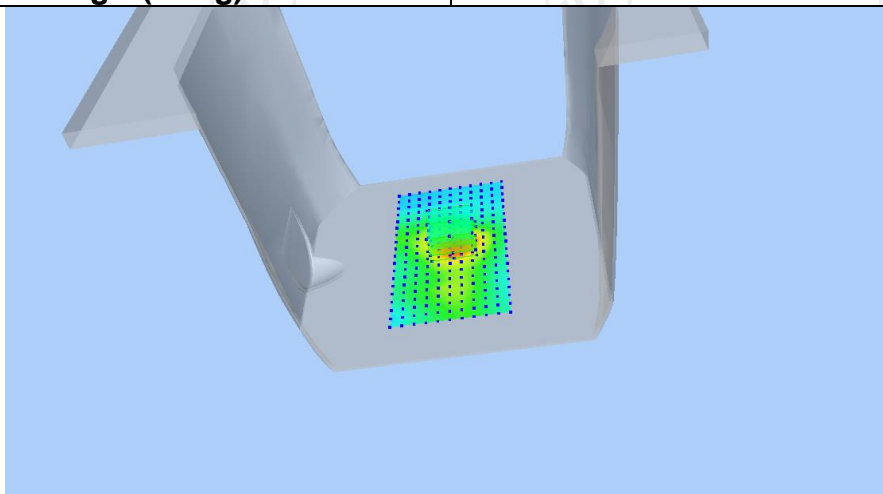
### VOLUME SAR



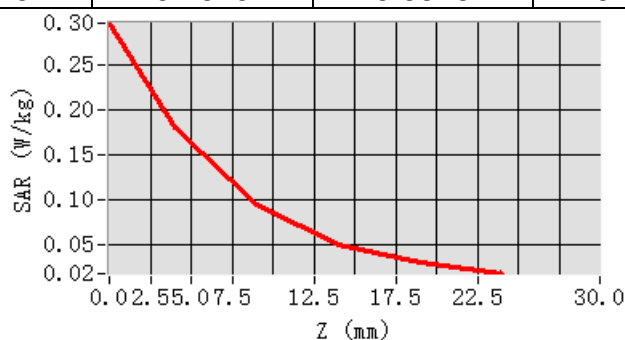
Maximum location: X=3.00, Y=5.00

SAR Peak: 0.30W/kg

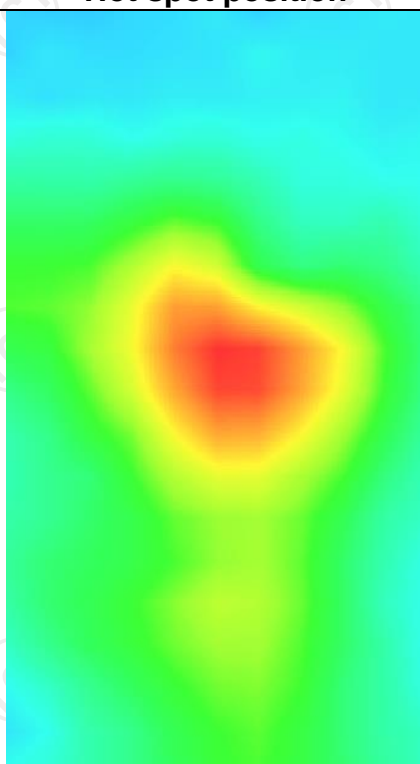
SAR 10g (W/Kg)	0.089743
SAR 1g (W/Kg)	0.170332



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2975	0.1815	0.0948	0.0503	0.0290



Hot spot position



## 5G NR N1

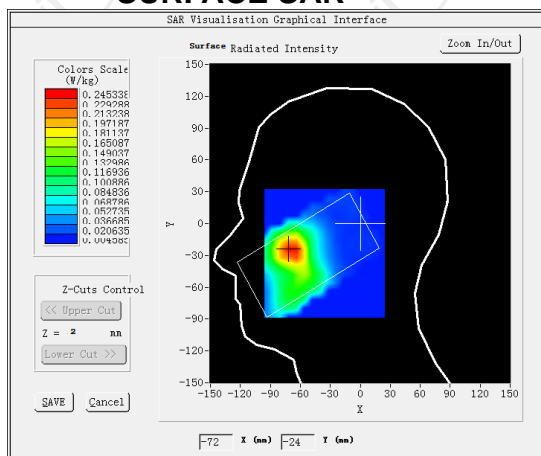
### MEASUREMENT 1

Middle Band SAR (Channel 390000):

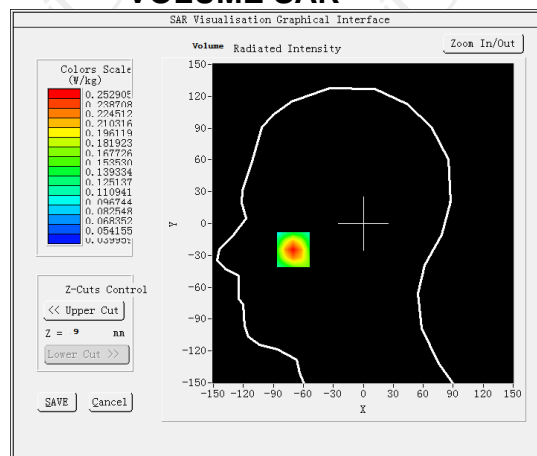
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	39.802156
Relative permittivity (imaginary part)	12.481695
Conductivity (S/m)	1.390654
Variation (%)	-1.590000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	5G NR N1

### SURFACE SAR



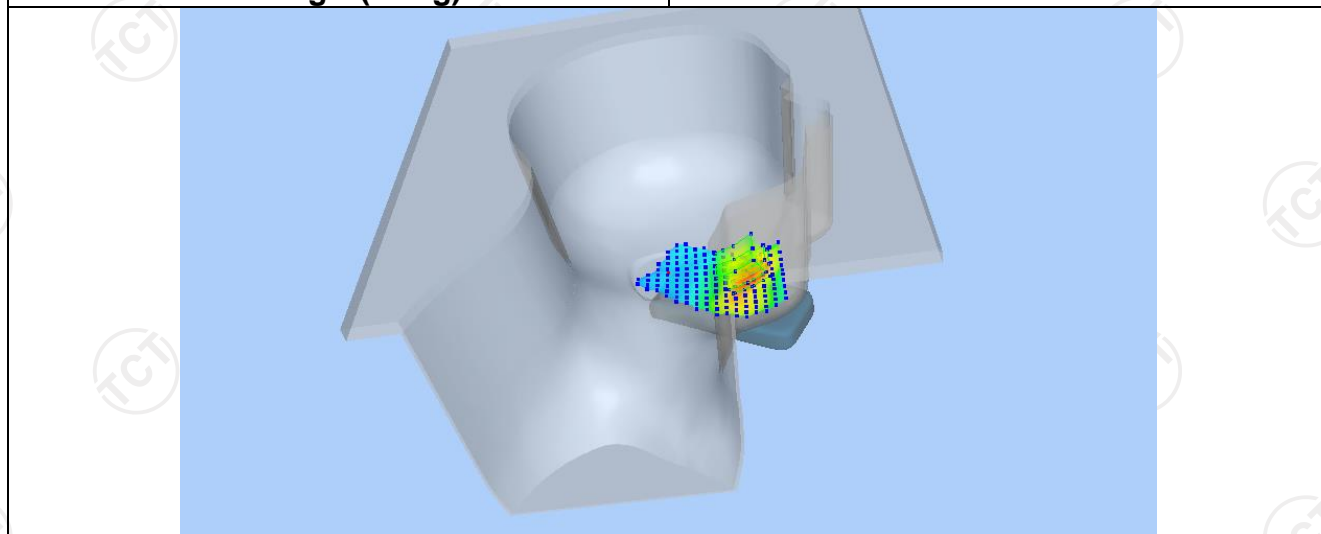
### VOLUME SAR



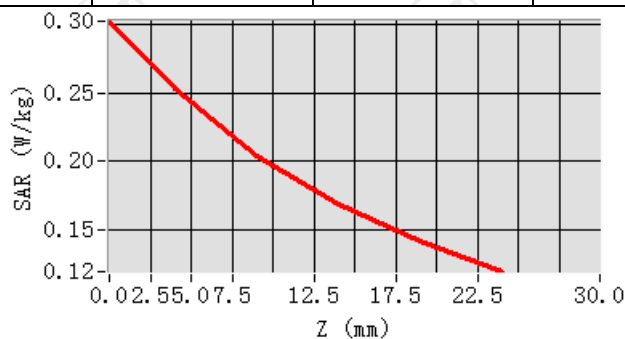
Maximum location: X=-70.00, Y=-24.00

SAR Peak: 0.30 W/kg

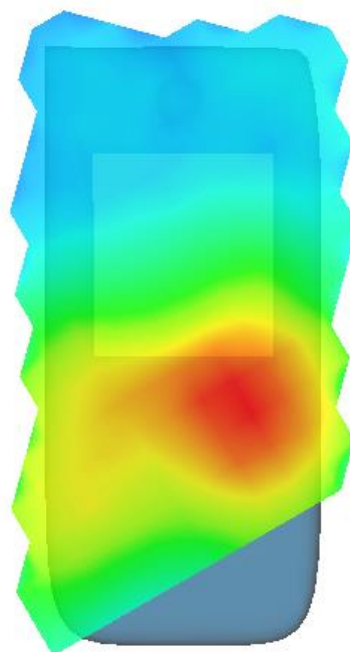
SAR 10g (W/Kg)	0.165247
SAR 1g (W/Kg)	0.215247



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3025	0.2529	0.2041	0.1679	0.1410



### Hot spot position





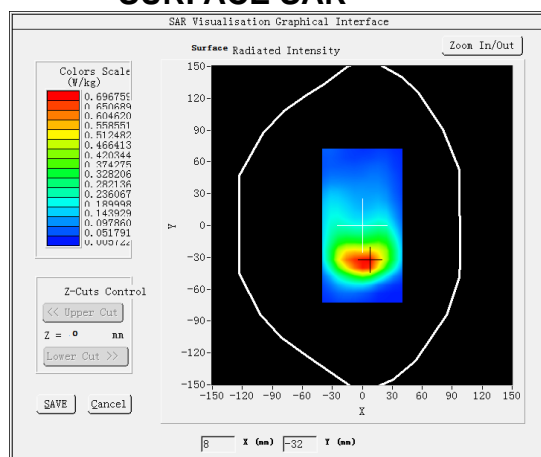
## MEASUREMENT 2

Middle Band SAR (Channel 390000):

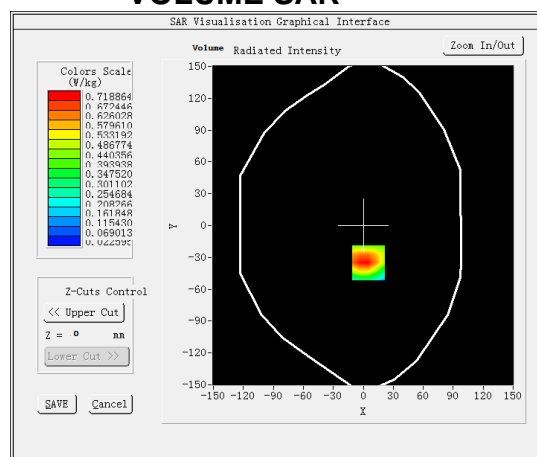
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	39.802156
Relative permittivity (imaginary part)	12.481695
Conductivity (S/m)	1.390654
Variation (%)	-3.020000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	5G NR N1

### SURFACE SAR



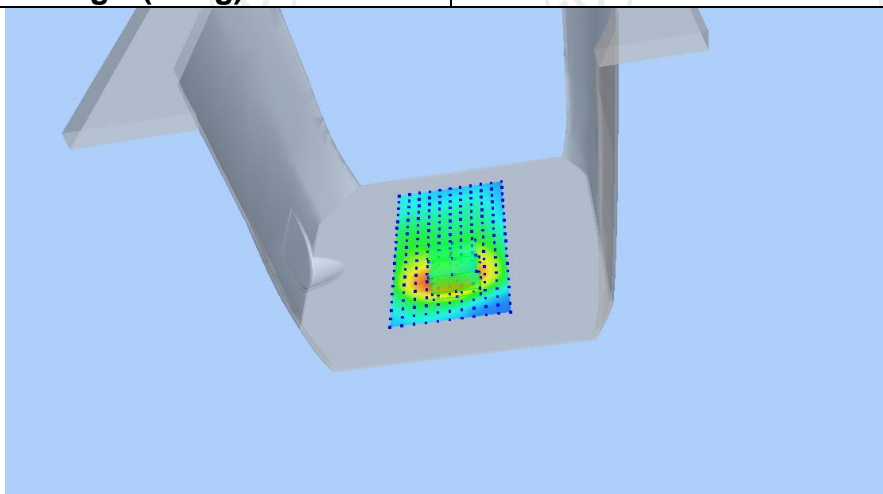
### VOLUME SAR



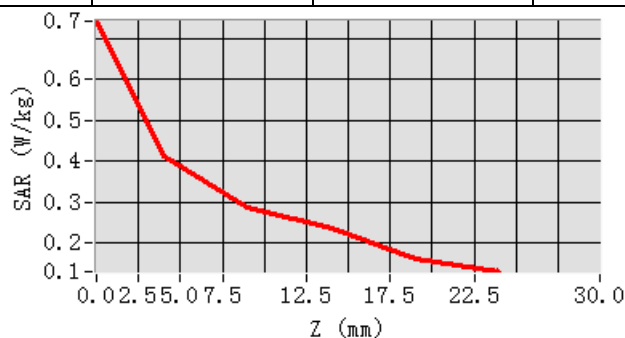
Maximum location: X=5.00, Y=-35.00

SAR Peak: 0.74 W/kg

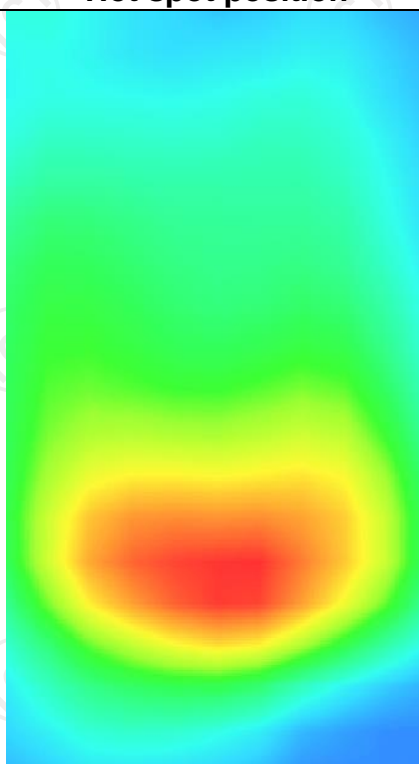
SAR 10g (W/Kg)	0.275125
SAR 1g (W/Kg)	0.405123



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.7416	0.4141	0.2869	0.2366	0.1636



Hot spot position



5G NR N3

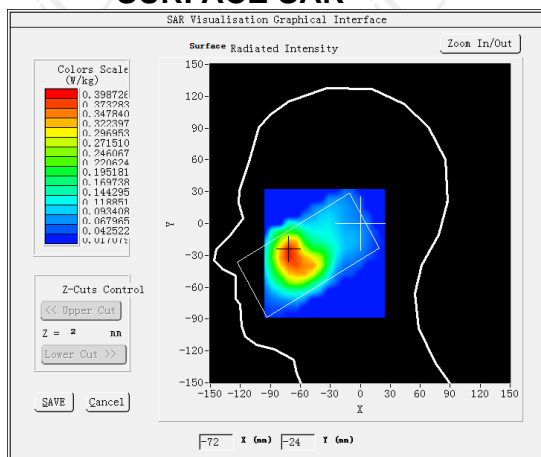
MEASUREMENT 1

Low Band SAR (Channel 344000):

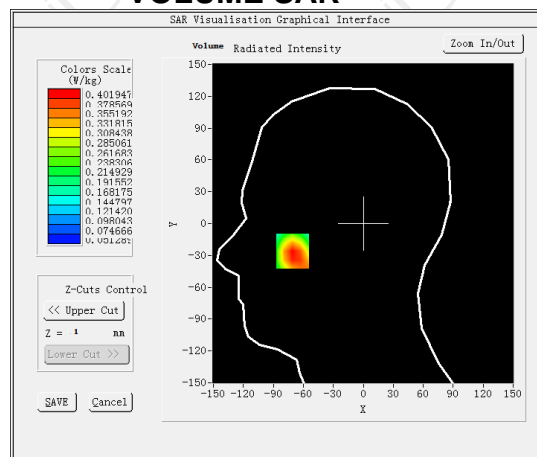
Date: 03/26/2025

Frequency (MHz)	1720.000049
Relative permittivity (real part)	39.325174
Relative permittivity (imaginary part)	13.815292
Conductivity (S/m)	1.409512
Variation (%)	1.950000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	5G NR N3

SURFACE SAR



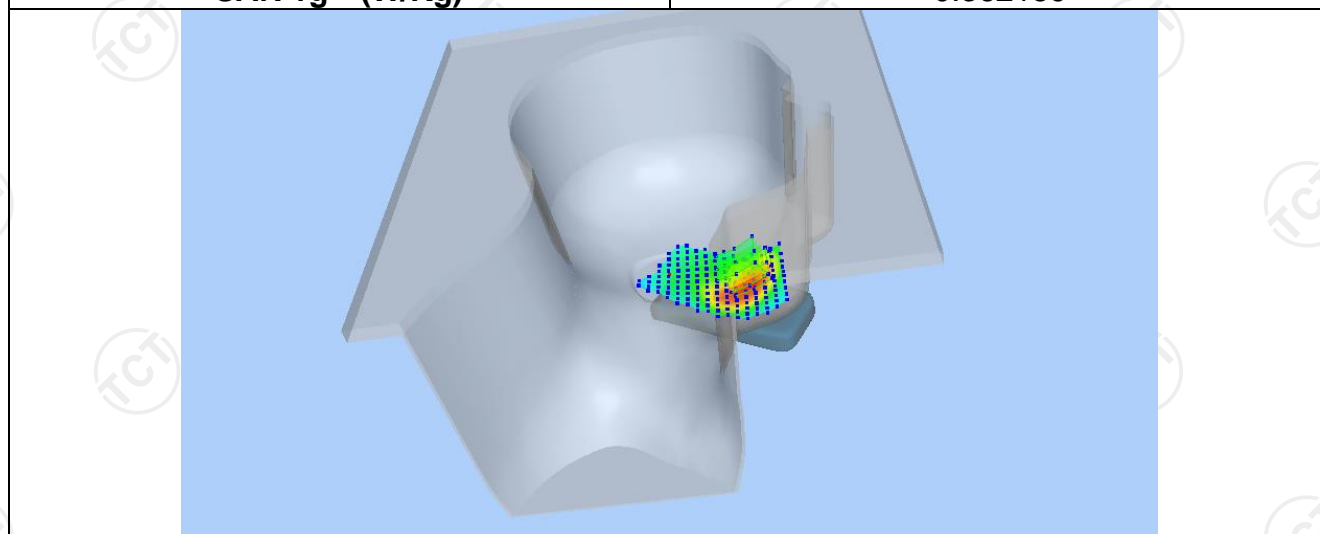
VOLUME SAR



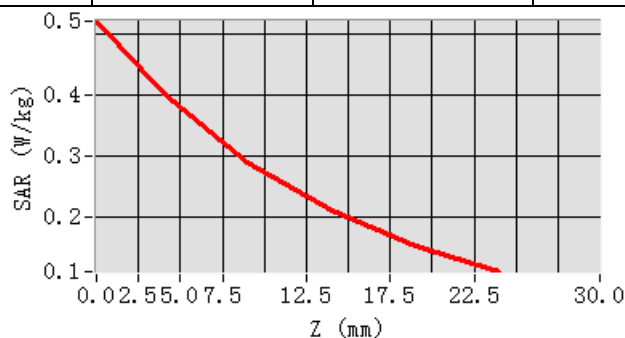
Maximum location: X=-71.00, Y=-26.00

SAR Peak: 0.53 W/kg

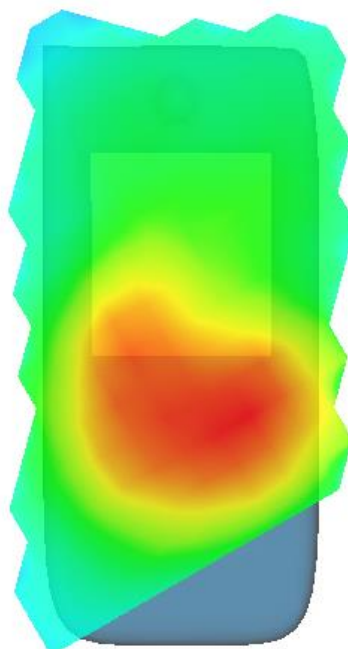
SAR 10g (W/Kg)	0.172592
SAR 1g (W/Kg)	0.362159



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5202	0.4019	0.2904	0.2110	0.1547



### Hot spot position



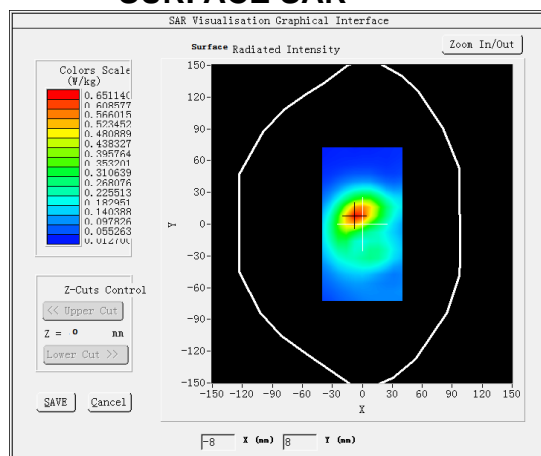
## MEASUREMENT 2

Low Band SAR (Channel 344000):

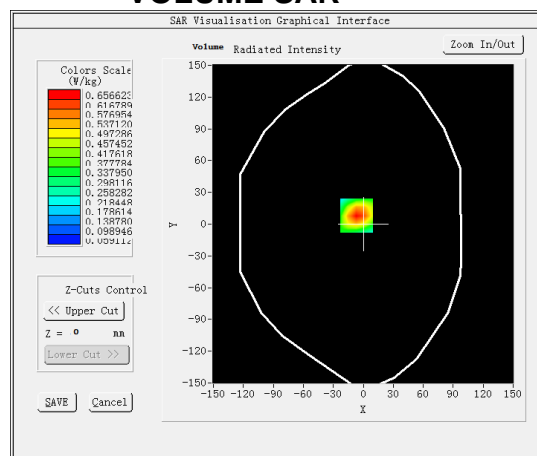
Date: 03/26/2025

Frequency (MHz)	1720.000049
Relative permittivity (real part)	39.325174
Relative permittivity (imaginary part)	13.815292
Conductivity (S/m)	1.409512
Variation (%)	-0.490000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	5G NR N3

### SURFACE SAR



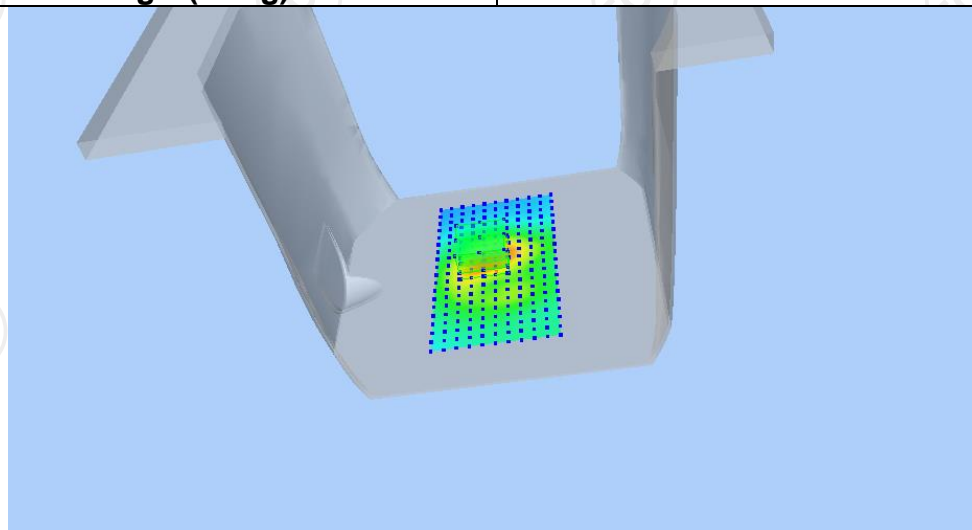
### VOLUME SAR



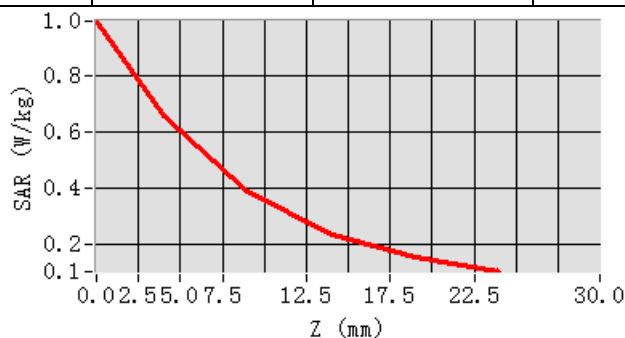
Maximum location: X=-7.00, Y=8.00

SAR Peak: 0.99 W/kg

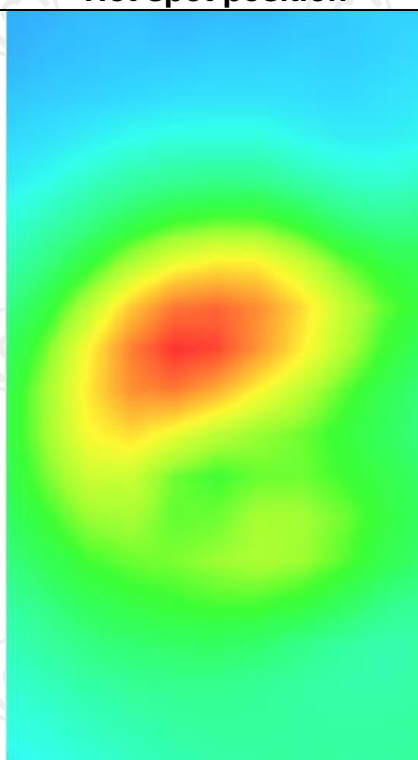
SAR 10g (W/Kg)	0.325941
SAR 1g (W/Kg)	0.574185



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.9925	0.6566	0.3881	0.2363	0.1540



Hot spot position



## 5G NR N7

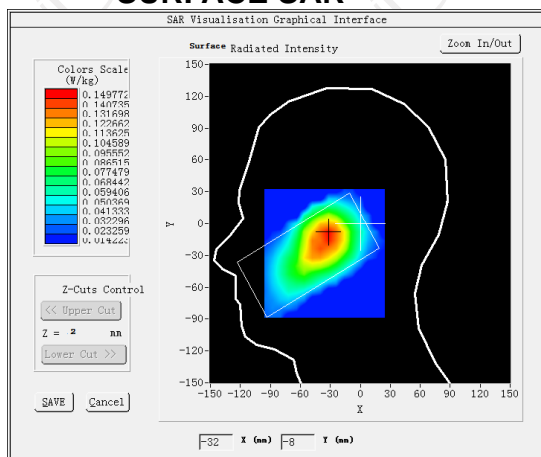
### MEASUREMENT 1

Low Band SAR (Channel 502000)

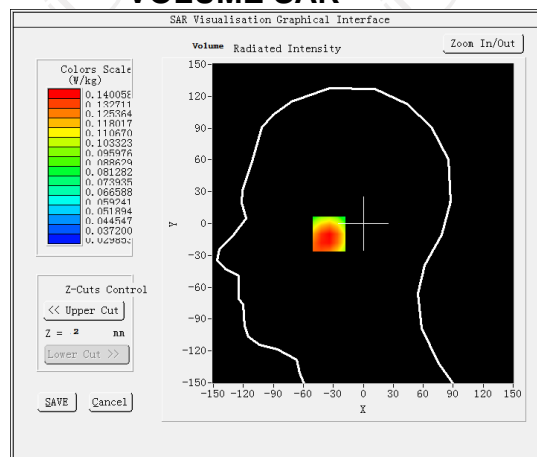
Date: 04/07/2025

Frequency (MHz)	2510.000000
Relative permittivity (real part)	39.261571
Relative permittivity (imaginary part)	13.659521
Conductivity (S/m)	1.937451
Variation (%)	-1.260000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	5G NR N7

### SURFACE SAR



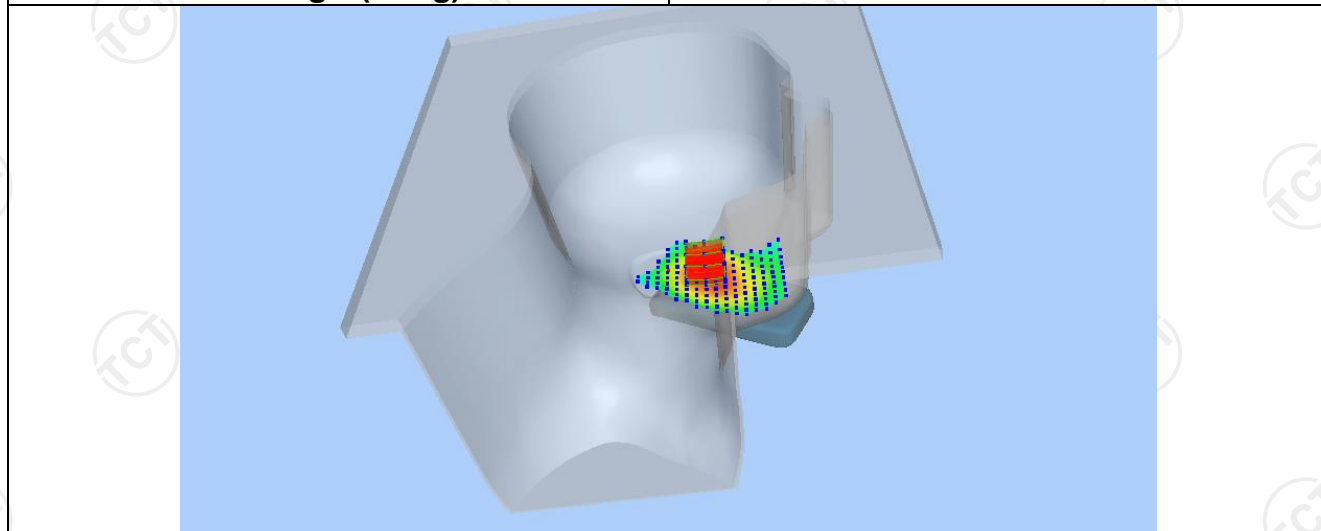
### VOLUME SAR



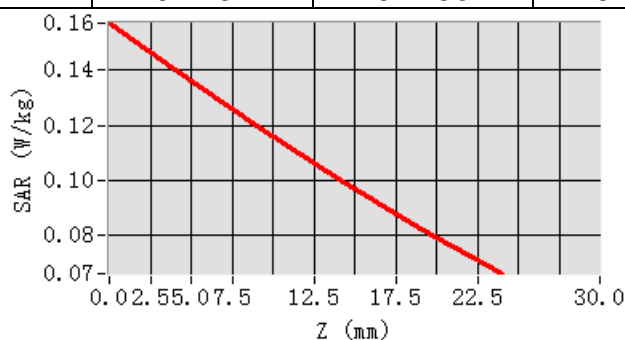
Maximum location: X=-28.00, Y=-07.00

SAR Peak: 0.16 W/kg

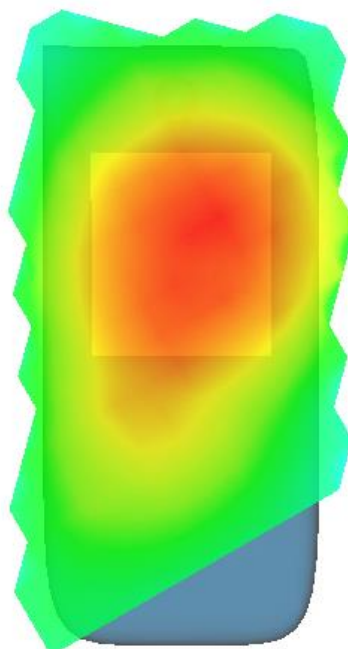
SAR 10g (W/Kg)	0.105612
SAR 1g (W/Kg)	0.135427



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.1572	0.1401	0.1196	0.1003	0.0824



### Hot spot position





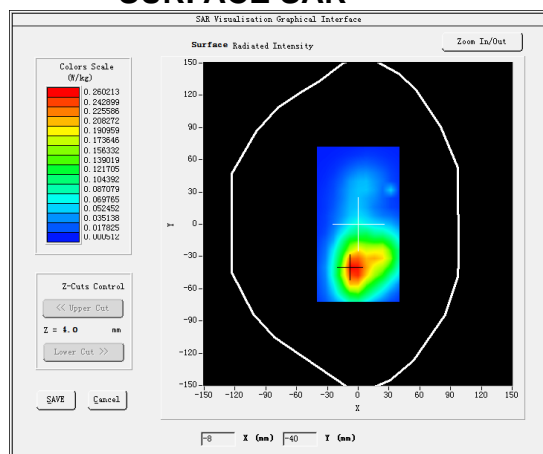
## MEASUREMENT 2

Low Band SAR (Channel 502000)

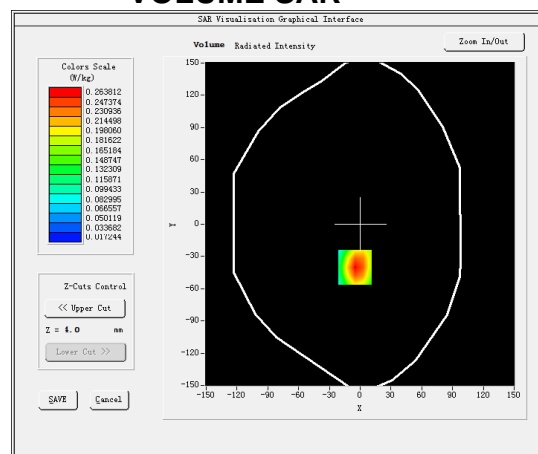
Date: 04/07/2025

Frequency (MHz)	2510.000000
Relative permittivity (real part)	39.261571
Relative permittivity (imaginary part)	13.659521
Conductivity (S/m)	1.937451
Variation (%)	2.180000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	5G NR N7

### SURFACE SAR



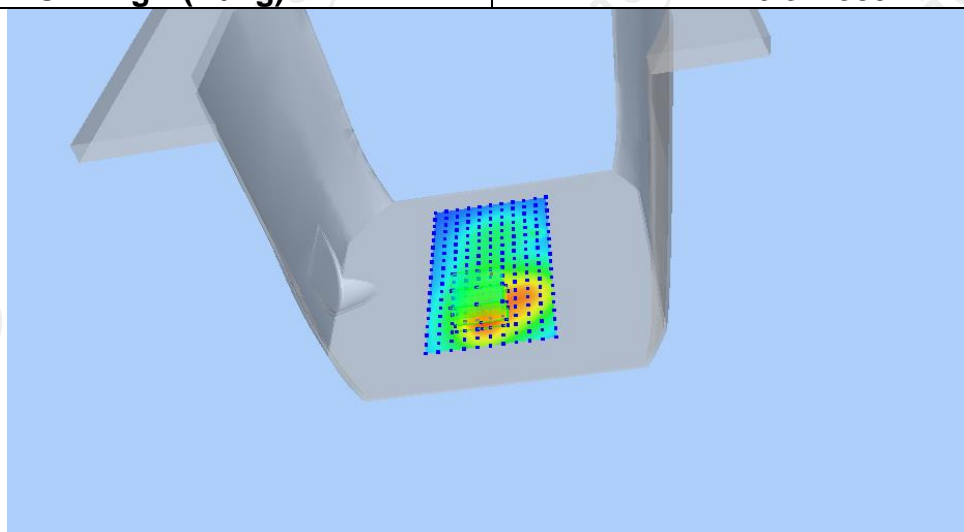
### VOLUME SAR



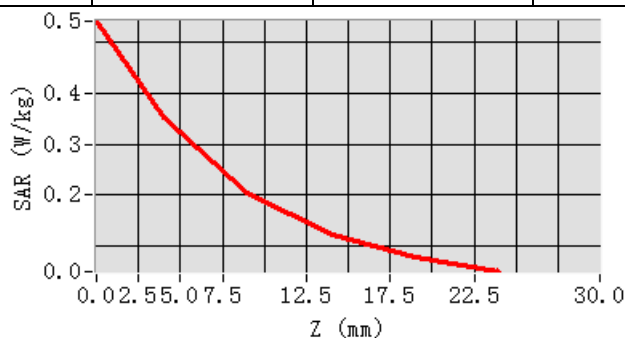
Maximum location: X=-5.00, Y=-40.00

SAR Peak: 0.56 W/kg

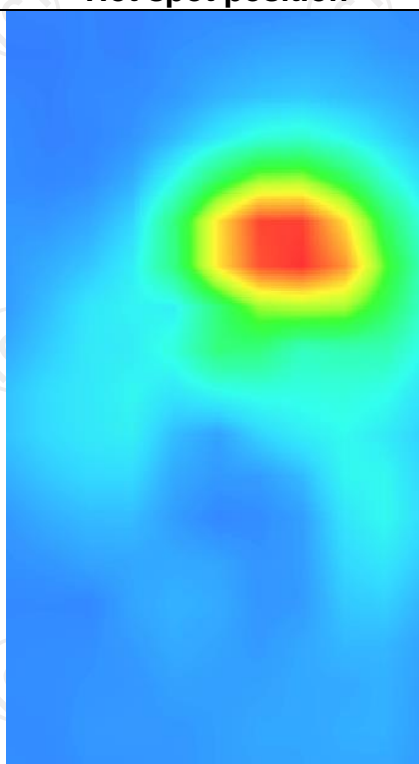
SAR 10g (W/Kg)	0.205745
SAR 1g (W/Kg)	0.321589



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5426	0.3543	0.2051	0.1217	0.0771



**Hot spot position**



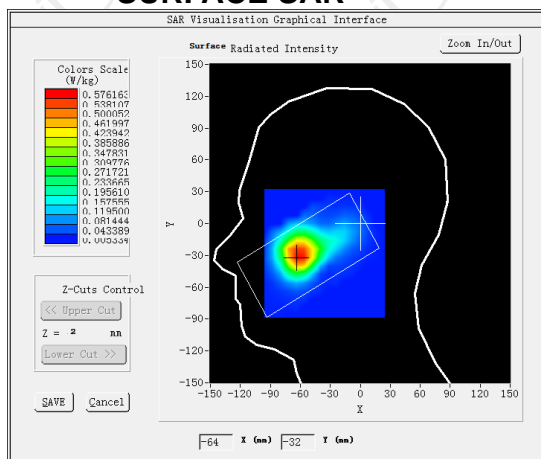
## 2.4G WLAN MEASUREMENT 1

Middle Band SAR (Channel 07):

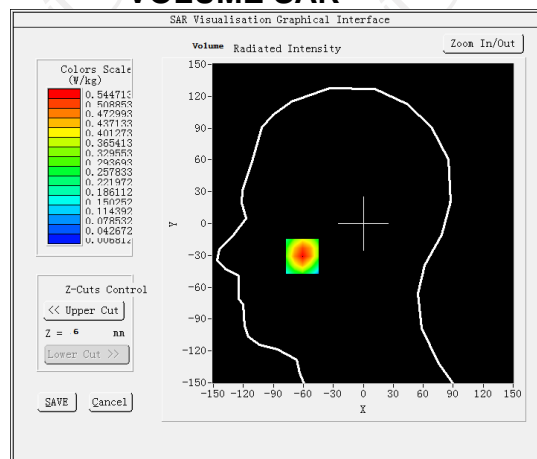
Date: 03/25/2025

Frequency (MHz)	2442.000000
Relative permittivity (real part)	40.462571
Relative permittivity (imaginary part)	13.236258
Conductivity (S/m)	1.851254
Variation (%)	0.190000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11b ISM

### SURFACE SAR



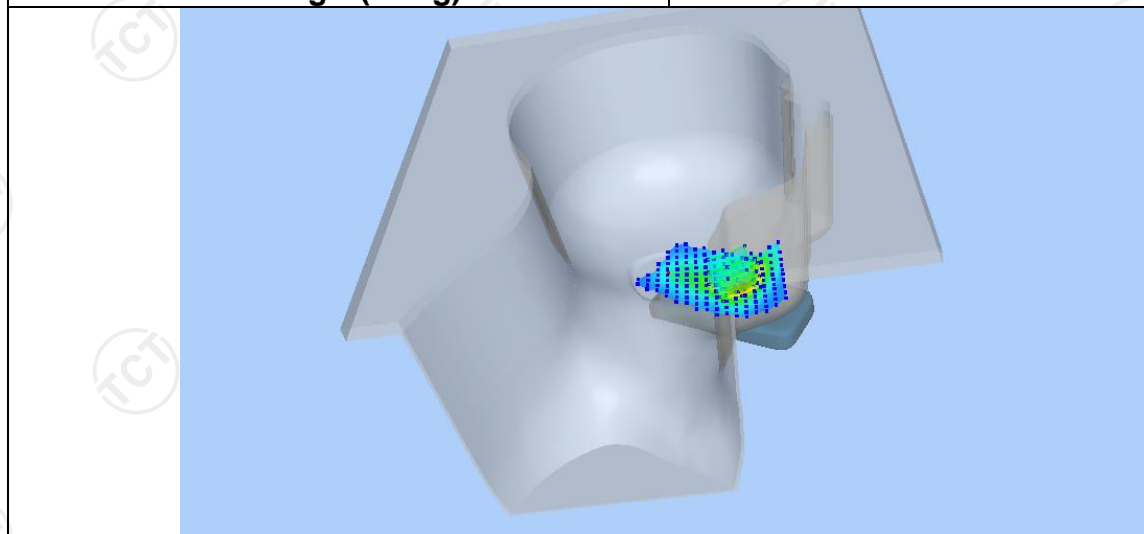
### VOLUME SAR



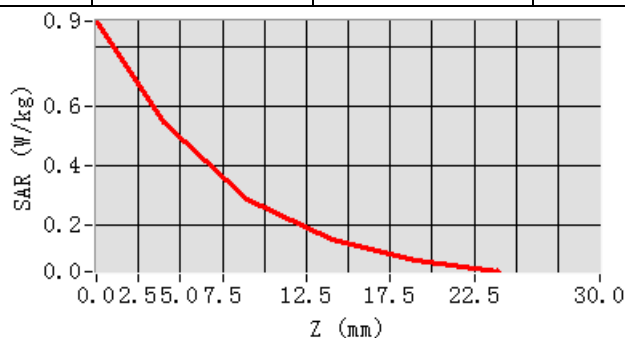
Maximum location: X=-60.00, Y=-32.00

SAR Peak: 0.89 W/kg

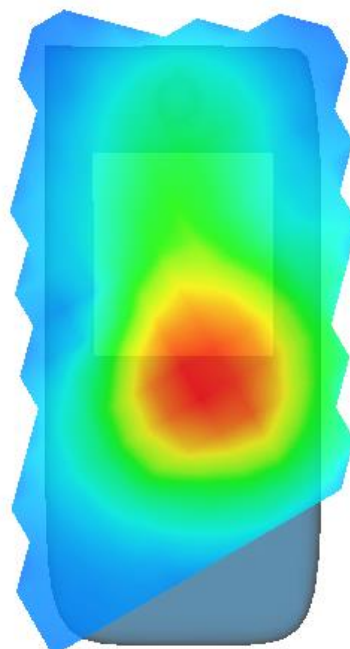
SAR 10g (W/Kg)	0.210512
SAR 1g (W/Kg)	0.512415



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8888	0.5447	0.2834	0.1457	0.0775



## Hot spot position



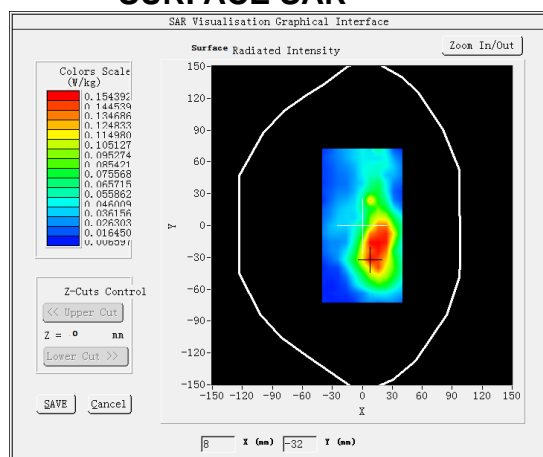
## MEASUREMENT 2

Middle Band SAR (Channel 07):

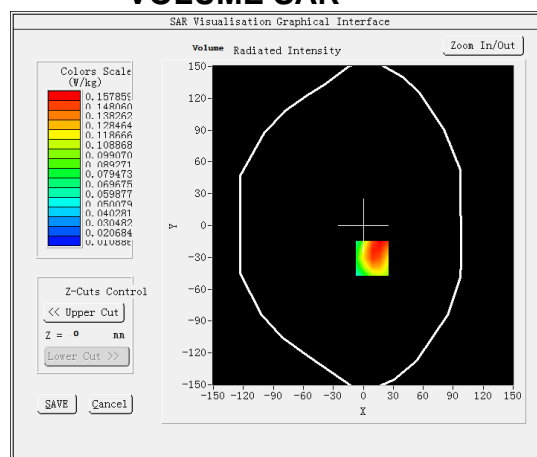
Date: 03/25/2025

Frequency (MHz)	2442.000000
Relative permittivity (real part)	40.462571
Relative permittivity (imaginary part)	13.236258
Conductivity (S/m)	1.851254
Variation (%)	-1.450000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	IEEE 802.11b ISM

### SURFACE SAR



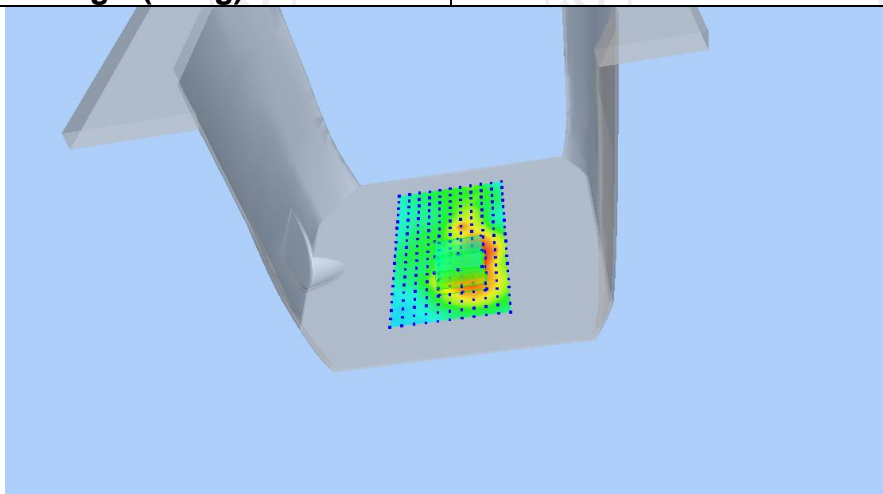
### VOLUME SAR



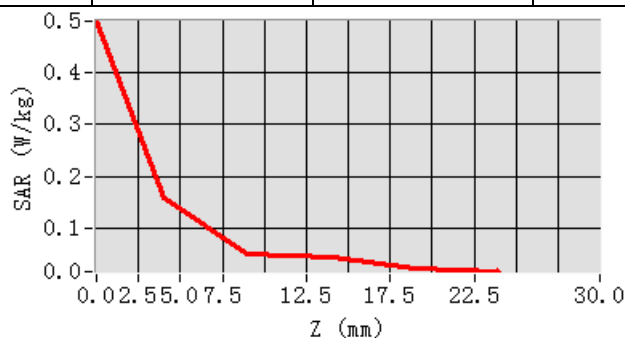
Maximum location: X=9.00, Y=-31.00

SAR Peak: 0.26 W/kg

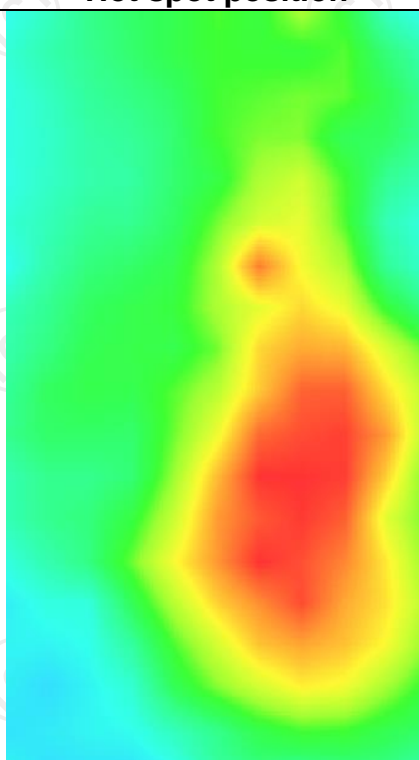
SAR 10g (W/Kg)	0.085475
SAR 1g (W/Kg)	0.149249



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5008	0.1579	0.0495	0.0442	0.0207



Hot spot position



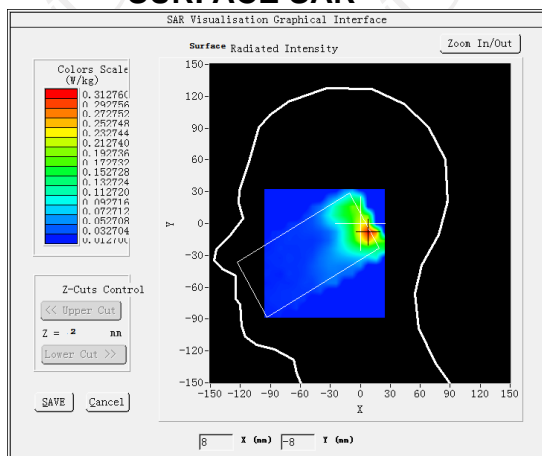
## 5.2G WLAN MEASUREMENT 1

SAR (Channel 36):

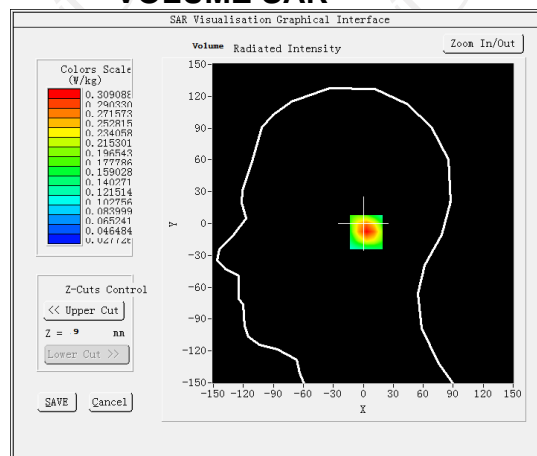
Date: 03/25/2025

Frequency (MHz)	5180.000000
Relative permittivity (real part)	35.991254
Relative permittivity (imaginary part)	16.162587
Conductivity (S/m)	4.701257
Variation (%)	1.250000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm,Complete</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11n ISM</u>

### SURFACE SAR

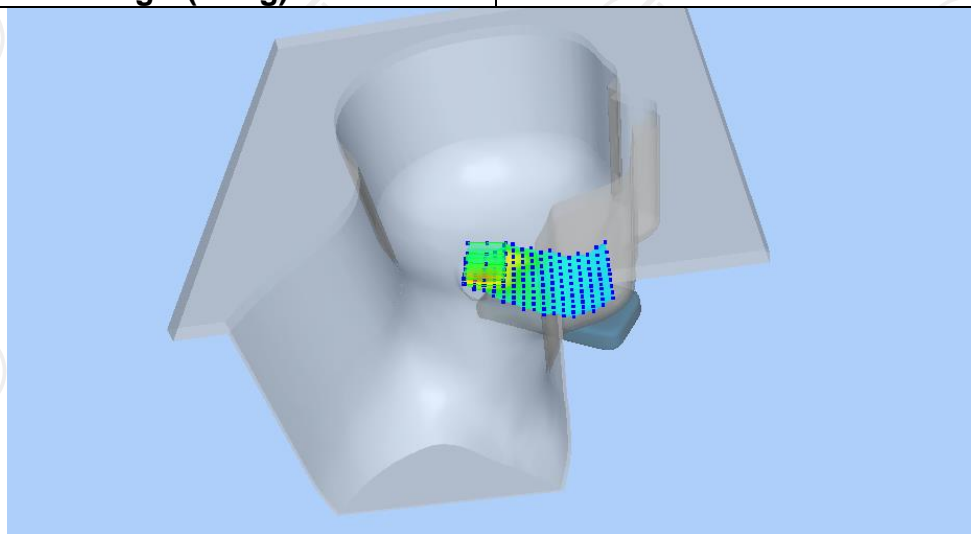


### VOLUME SAR

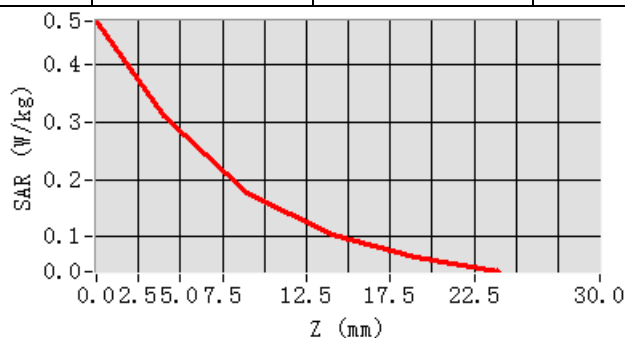


Maximum location: X=9.00, Y=-8.00  
SAR Peak: 0.48 W/kg

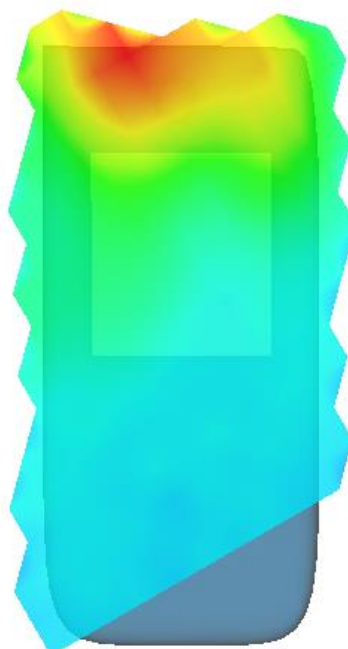
SAR 10g (W/Kg)	0.142015
SAR 1g (W/Kg)	0.302515



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4749	0.3091	0.1775	0.1037	0.0640



## Hot spot position





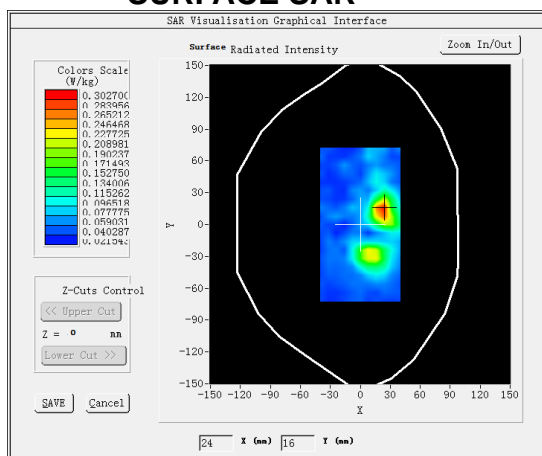
## MEASUREMENT 2

SAR (Channel 36):

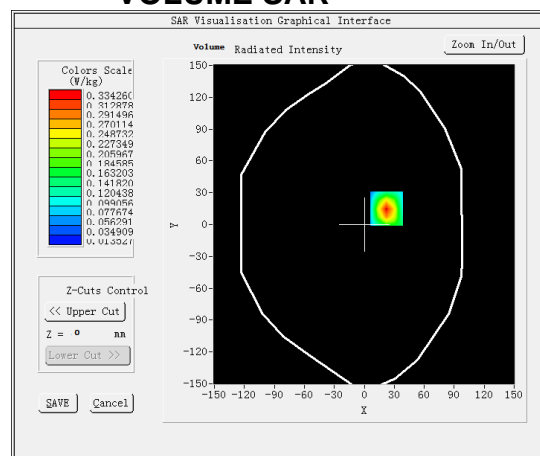
Date: 03/25/2025

Frequency (MHz)	5180.000000
Relative permittivity (real part)	35.991254
Relative permittivity (imaginary part)	16.162587
Conductivity (S/m)	4.701257
Variation (%)	-4.470000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm,Complete</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body back</u>
Band	<u>IEEE 802.11n ISM</u>

### SURFACE SAR



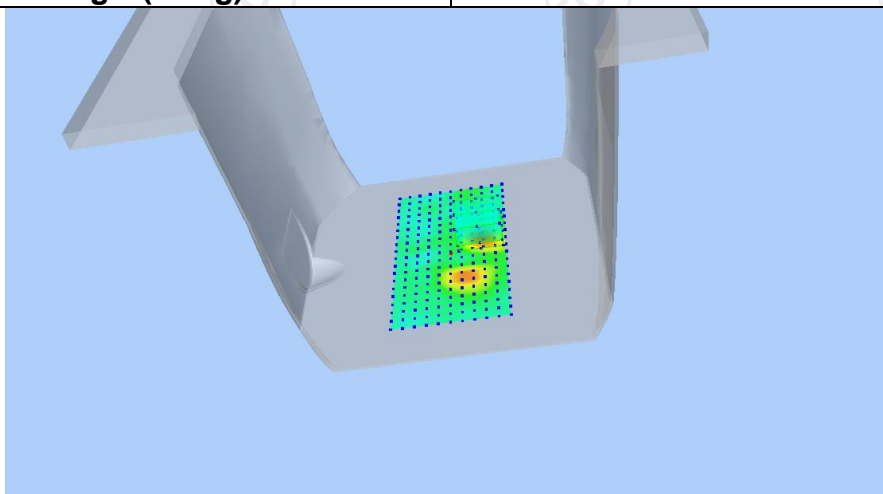
### VOLUME SAR



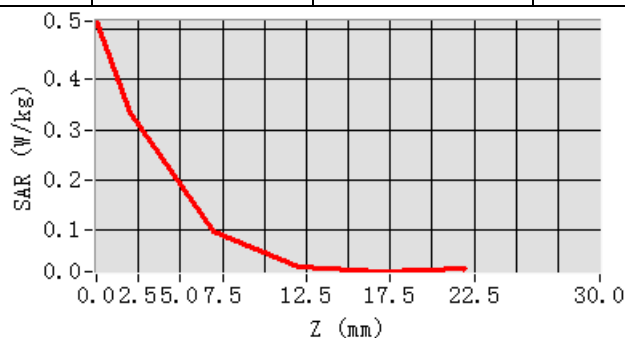
Maximum location: X=22.00, Y=15.00

SAR Peak: 0.53 W/kg

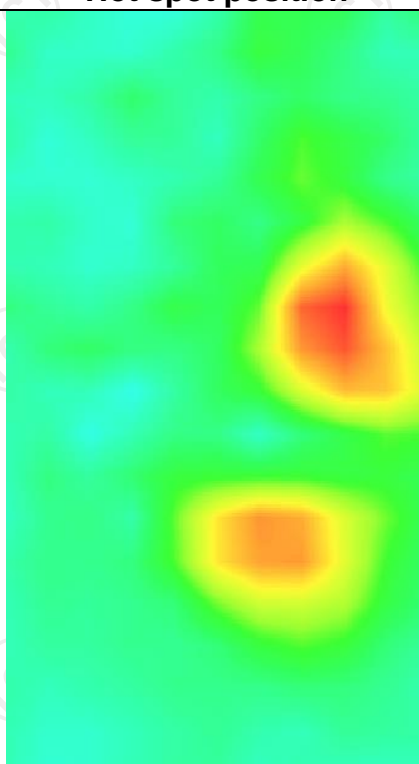
SAR 10g (W/Kg)	0.088532
SAR 1g (W/Kg)	0.203148



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5156	0.3201	0.1102	0.0283	0.0179



## Hot spot position



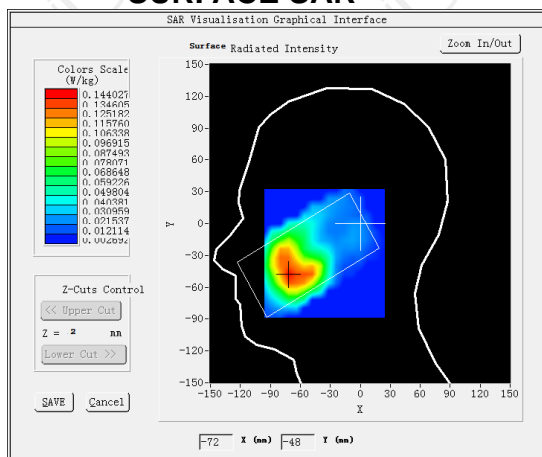
## 5.3G WLAN MEASUREMENT 1

SAR (Channel 64):

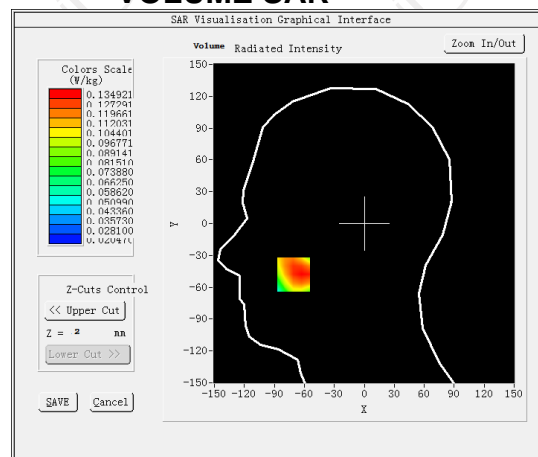
Date: 03/25/2025

Frequency (MHz)	5320.000000
Relative permittivity (real part)	36.102514
Relative permittivity (imaginary part)	16.201257
Conductivity (S/m)	4.701524
Variation (%)	-0.050000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11a ISM

### SURFACE SAR

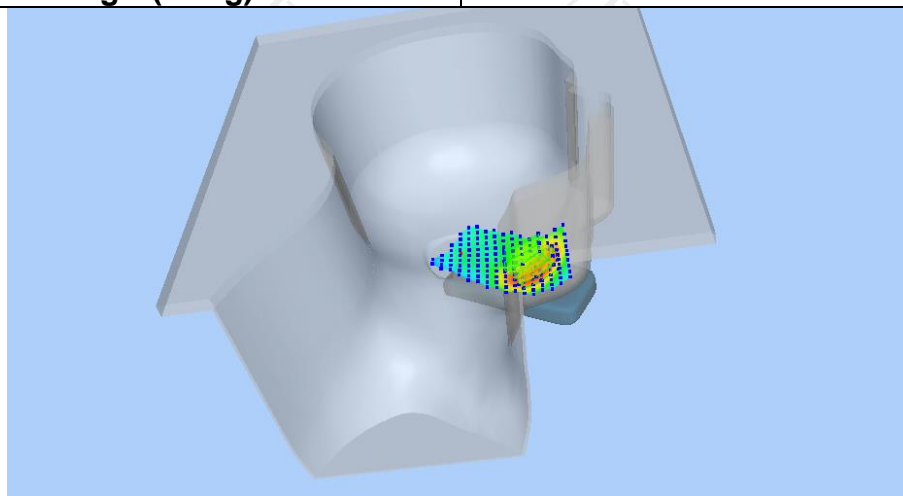


### VOLUME SAR

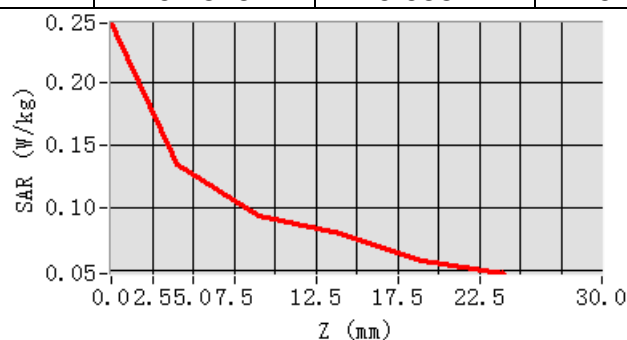


Maximum location: X=-68.00, Y=-46.00  
SAR Peak: 0.25 W/kg

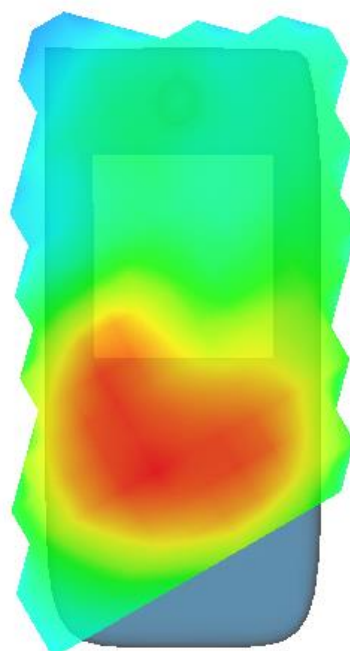
SAR 10g (W/Kg)	0.090592
SAR 1g (W/Kg)	0.132015



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2474	0.1349	0.0931	0.0790	0.0571



## Hot spot position



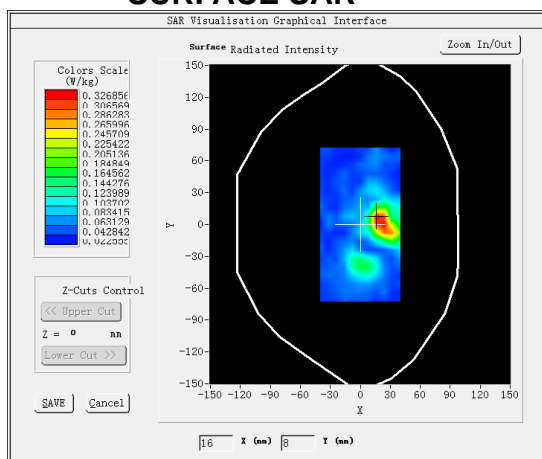
## MEASUREMENT 2

SAR (Channel 64):

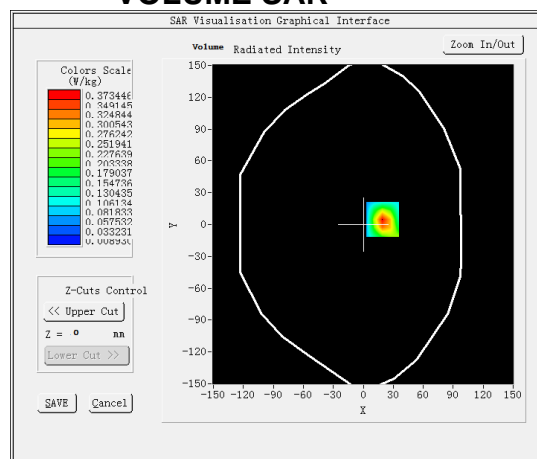
Date: 03/25/2025

Frequency (MHz)	5320.000000
Relative permittivity (real part)	36.102514
Relative permittivity (imaginary part)	16.201257
Conductivity (S/m)	4.701524
Variation (%)	-1.090000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm,Complete</u>
Phantom	<u>Validation plane</u>
Device Position	<u>Body Back</u>
Band	<u>IEEE 802.11a ISM</u>

### SURFACE SAR



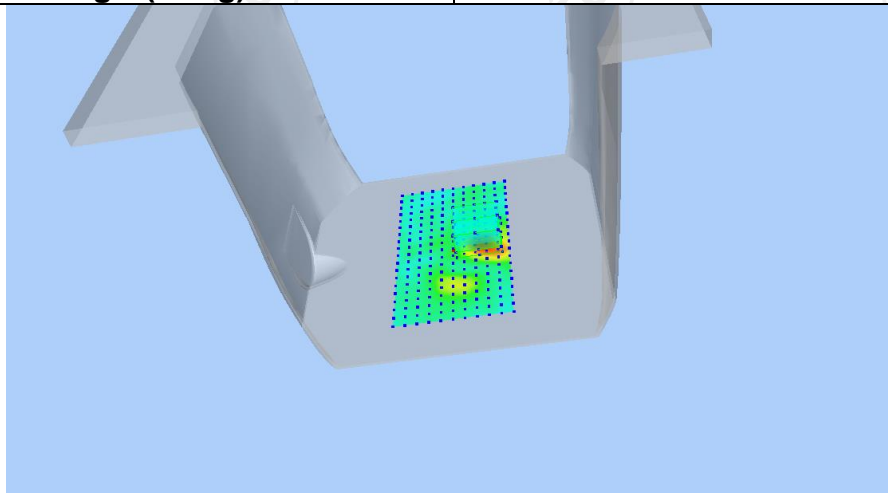
### VOLUME SAR



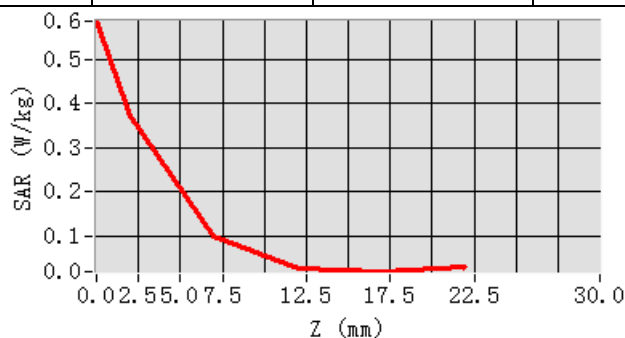
Maximum location: X=19.00, Y=5.00

SAR Peak: 0.62 W/kg

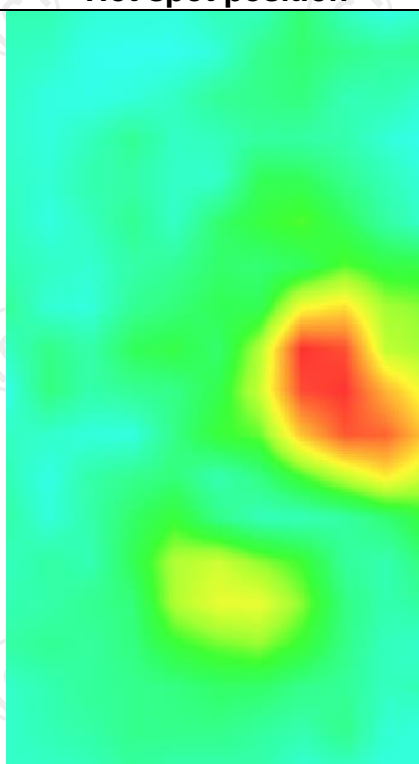
SAR 10g (W/Kg)	0.097065
SAR 1g (W/Kg)	0.227125



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5874	0.3305	0.0995	0.0268	0.0183



## Hot spot position



## 5.6G WLAN

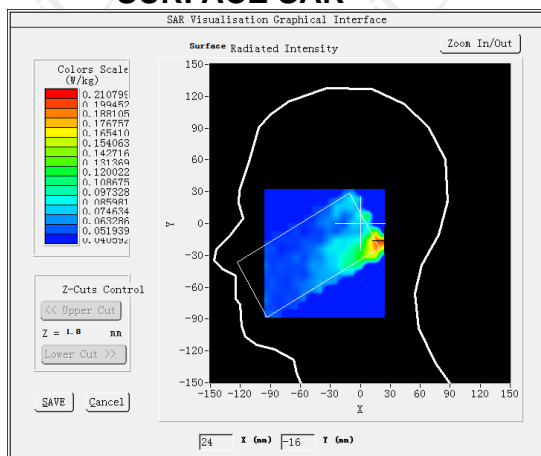
### MEASUREMENT 1

SAR (Channel 100):

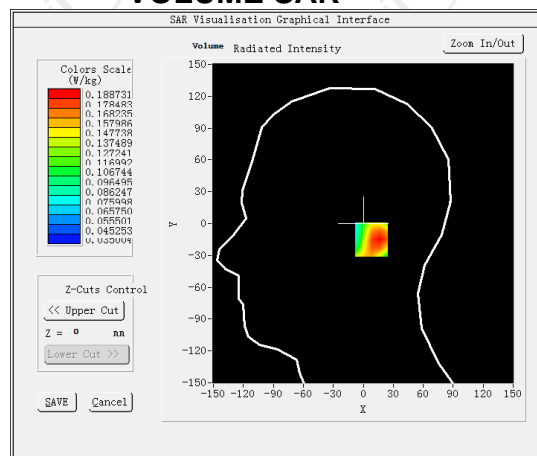
Date: 03/25/2025

Frequency (MHz)	5500.000000
Relative permittivity (real part)	35.581523
Relative permittivity (imaginary part)	16.392015
Conductivity (S/m)	5.152062
Variation (%)	1.900000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm z=2mm,Complete
Phantom	Left head
Device Position	Cheek
Band	IEEE 802.11ac

#### SURFACE SAR



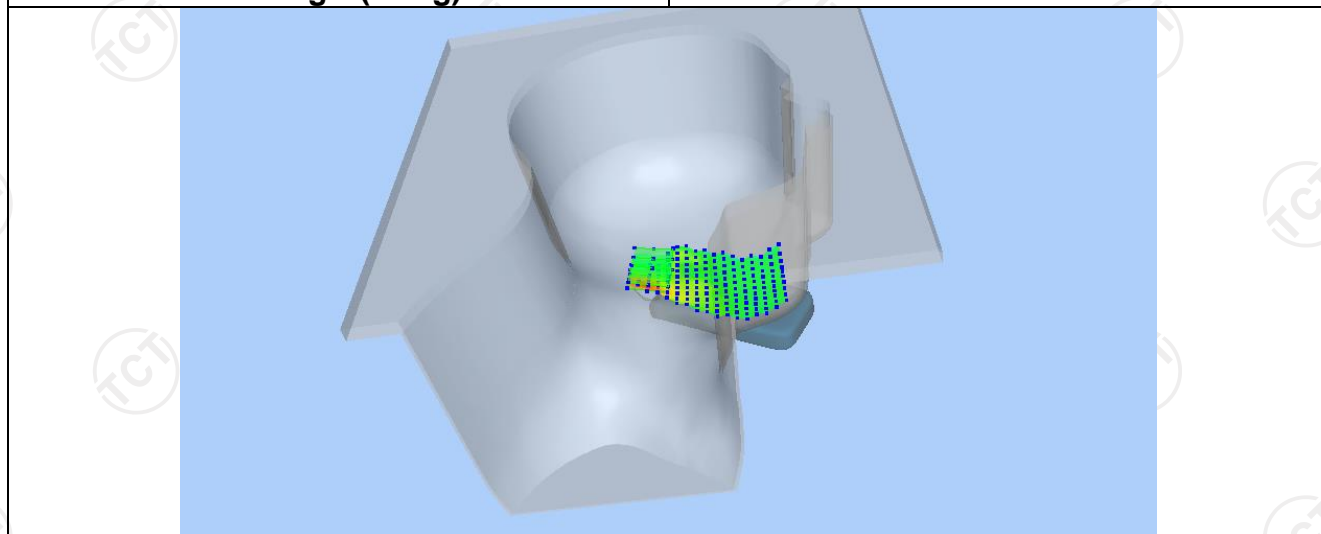
#### VOLUME SAR



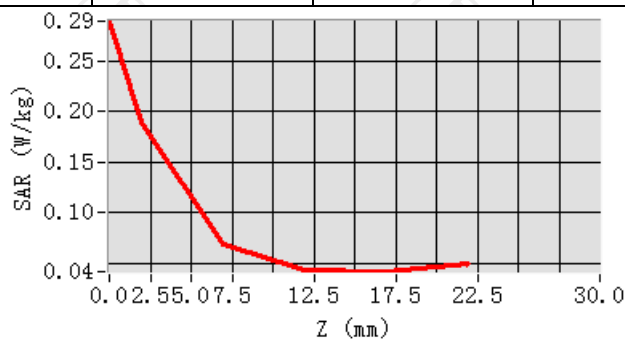
Maximum location: X=16.00, Y=-15.00

SAR Peak: 0.39 W/kg

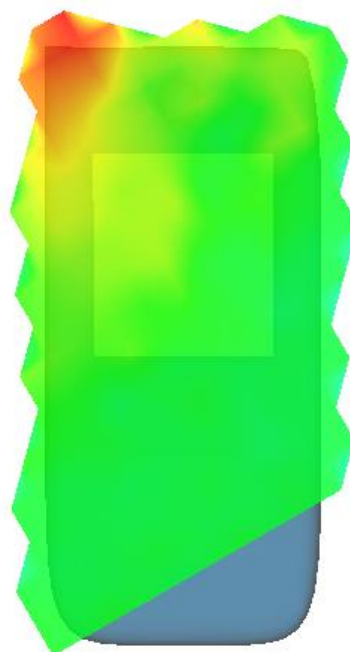
SAR 10g (W/Kg)	0.075262
SAR 1g (W/Kg)	0.175213



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.2895	0.1887	0.0686	0.0429	0.0414



### Hot spot position





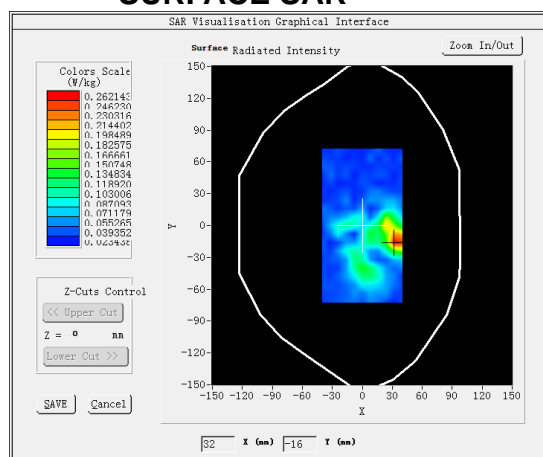
## MEASUREMENT 2

SAR (Channel 100):

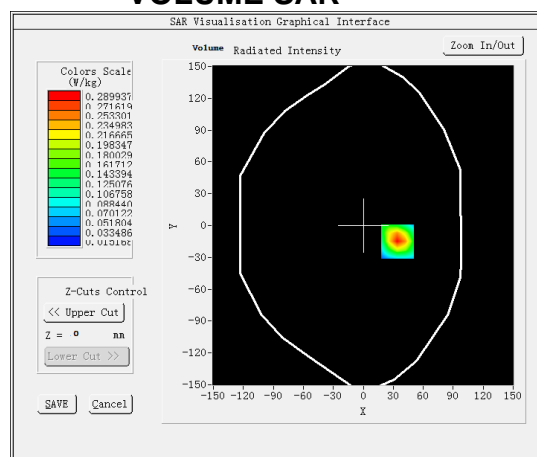
Date: 03/25/2025

Frequency (MHz)	5500.000000
Relative permittivity (real part)	35.581523
Relative permittivity (imaginary part)	16.392015
Conductivity (S/m)	5.152062
Variation (%)	-2.840000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm z=2mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	IEEE 802.11ac

### SURFACE SAR



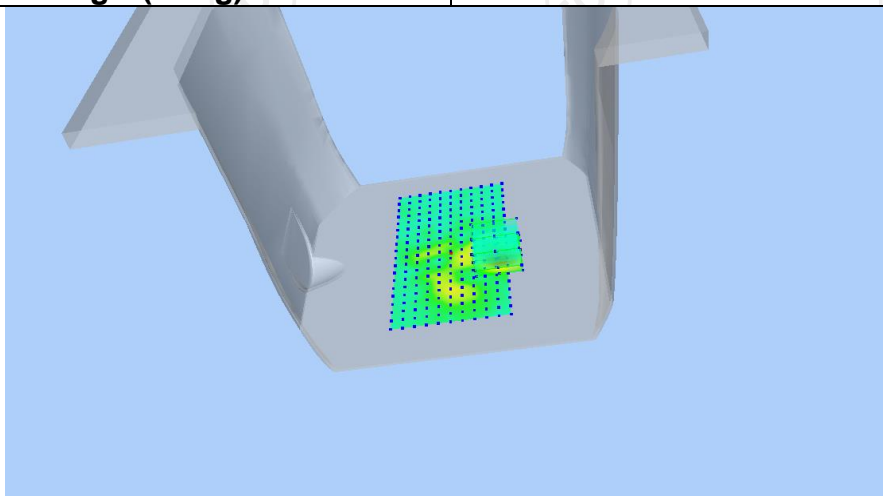
### VOLUME SAR



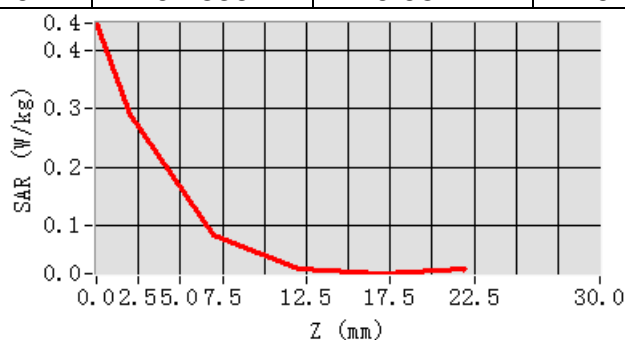
Maximum location: X=34.00, Y=-15.00

SAR Peak:0.46 W/kg

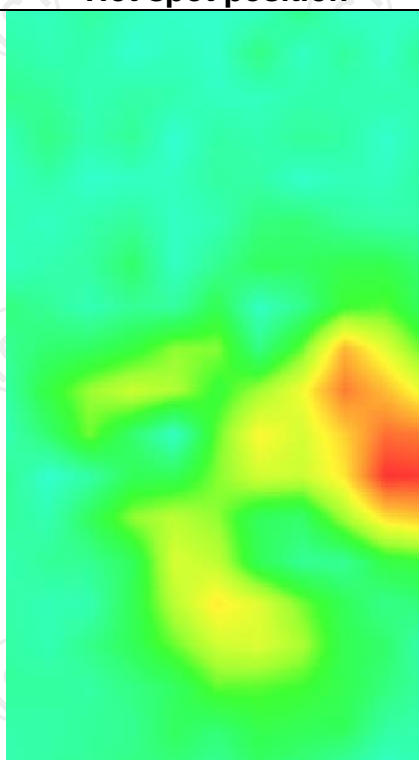
SAR 10g (W/Kg)	0.081360
SAR 1g (W/Kg)	0.179297



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4470	0.2899	0.0842	0.0259	0.0179



Hot spot position



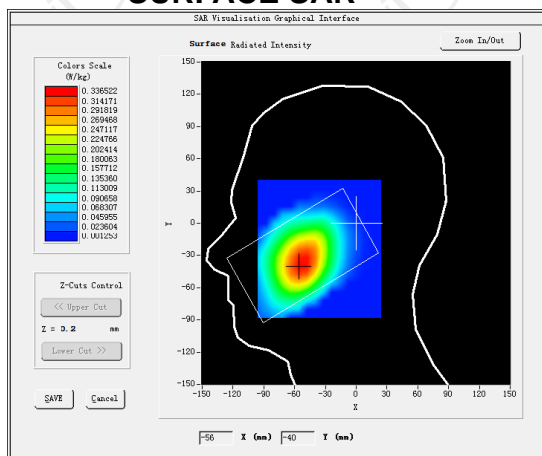
## 5.8G WLAN MEASUREMENT 1

SAR (Channel 165):

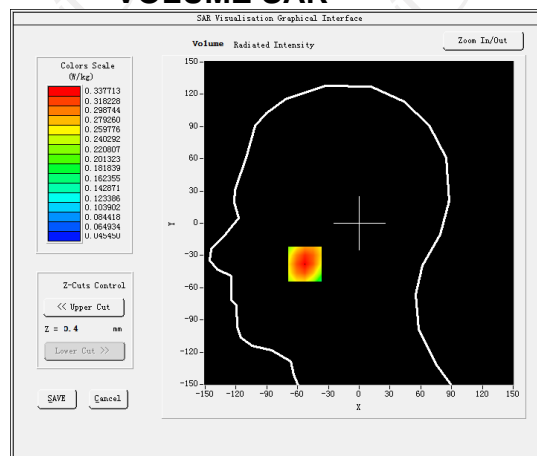
Date: 03/25/2025

Frequency (MHz)	5825.000000
Relative permittivity (real part)	35.607415
Relative permittivity (imaginary part)	16.368152
Conductivity (S/m)	5.465215
Variation (%)	1.090000
Area Scan	<u>dx=8mm dy=8mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm dz=2mm,Complete</u>
Phantom	<u>Left head</u>
Device Position	<u>Cheek</u>
Band	<u>IEEE 802.11ac ISM</u>

### SURFACE SAR



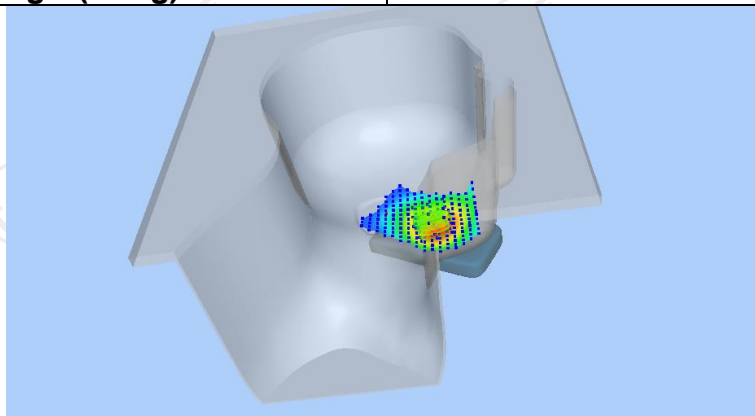
### VOLUME SAR



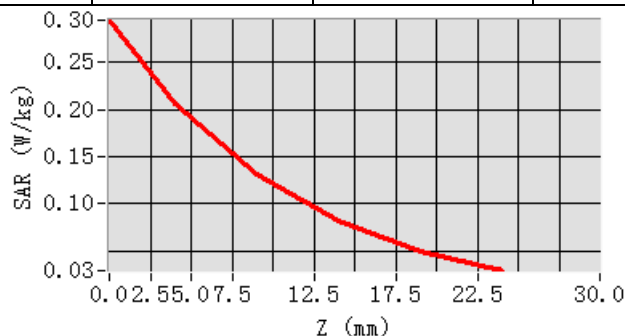
Maximum location: X=-52.00, Y=-36.00

SAR Peak: 0.29 W/kg

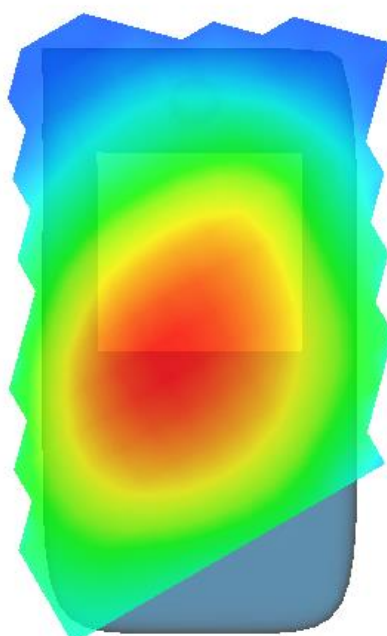
SAR 10g (W/Kg)	0.120541
SAR 1g (W/Kg)	0.195267



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3021	0.2069	0.1295	0.0795	0.0526



### Hot spot position



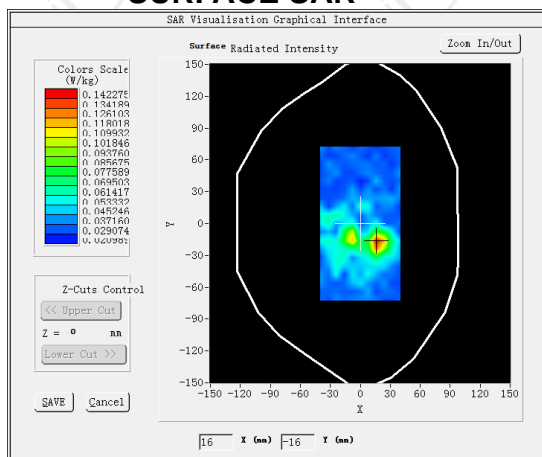
## MEASUREMENT 2

SAR (Channel 165):

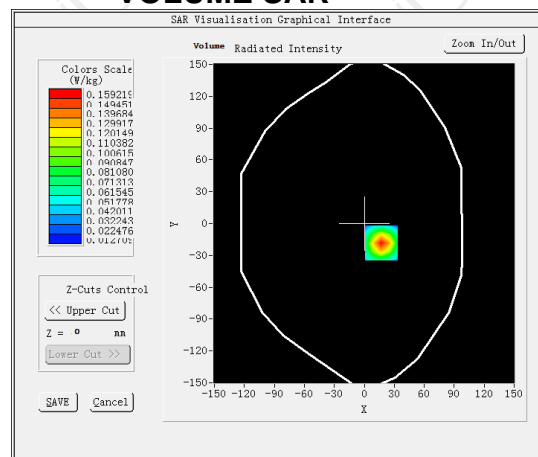
Date: 03/25/2025

Frequency (MHz)	5825.000000
Relative permittivity (real part)	35.607415
Relative permittivity (imaginary part)	16.368152
Conductivity (S/m)	5.465215
Variation (%)	-0.310000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	IEEE 802.11ac ISM

### SURFACE SAR



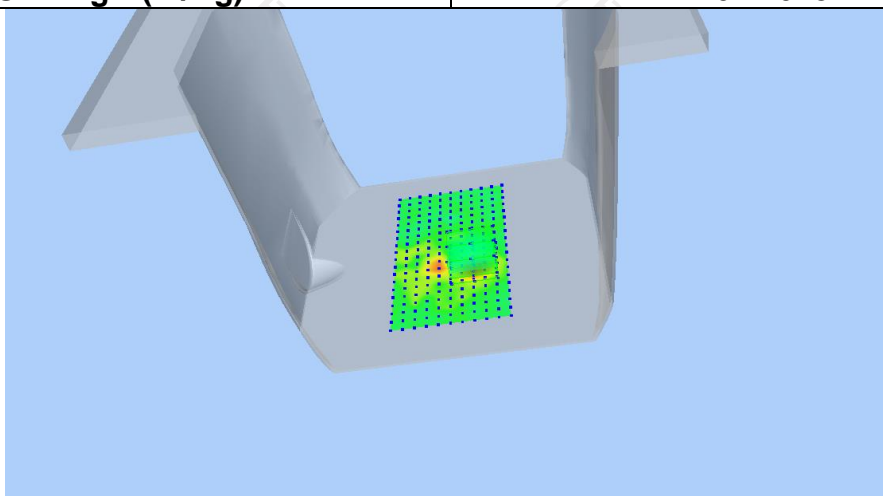
### VOLUME SAR



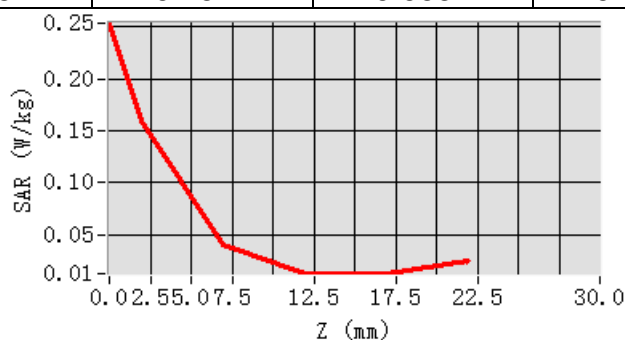
Maximum location: X=17.00, Y=-18.00

SAR Peak: 0.26 W/kg

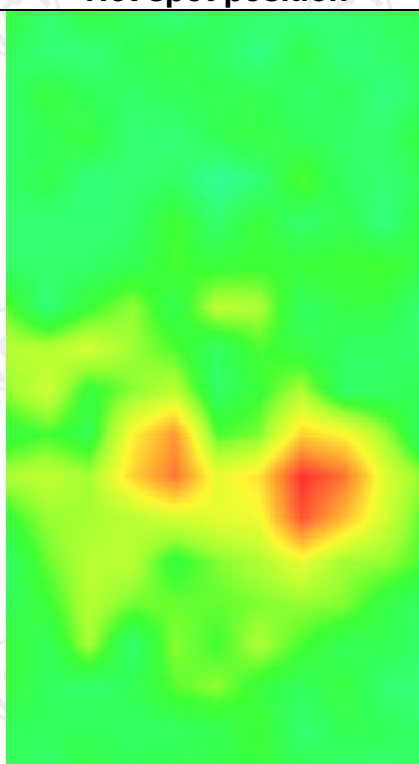
SAR 10g (W/Kg)	0.061852
SAR 1g (W/Kg)	0.120251



Z (mm)	0.00	2.00	7.00	12.00	17.00
SAR (W/Kg)	0.2537	0.1512	0.0592	0.0127	0.0128



Hot spot position



Body wearing equipment  
GSM900

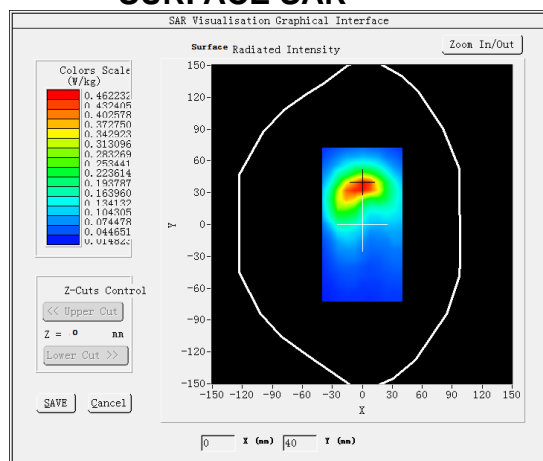
## MEASUREMENT 1

Low Band SAR (Channel 975):

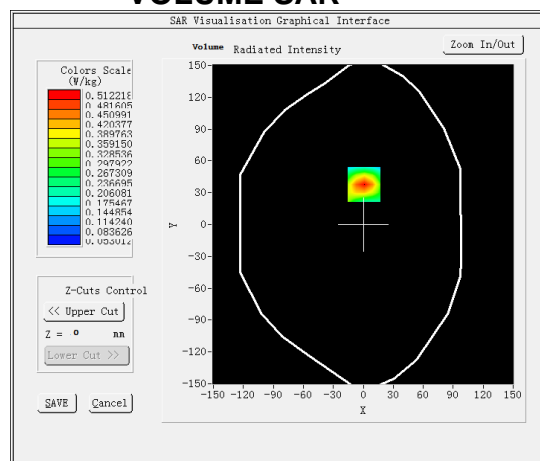
Date: 03/26/2025

Frequency (MHz)	880.200000
Relative permittivity (real part)	40.715241
Relative permittivity (imaginary part)	18.305478
Conductivity (S/m)	0.991528
Variation (%)	-1.260000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM900(voice)

### SURFACE SAR



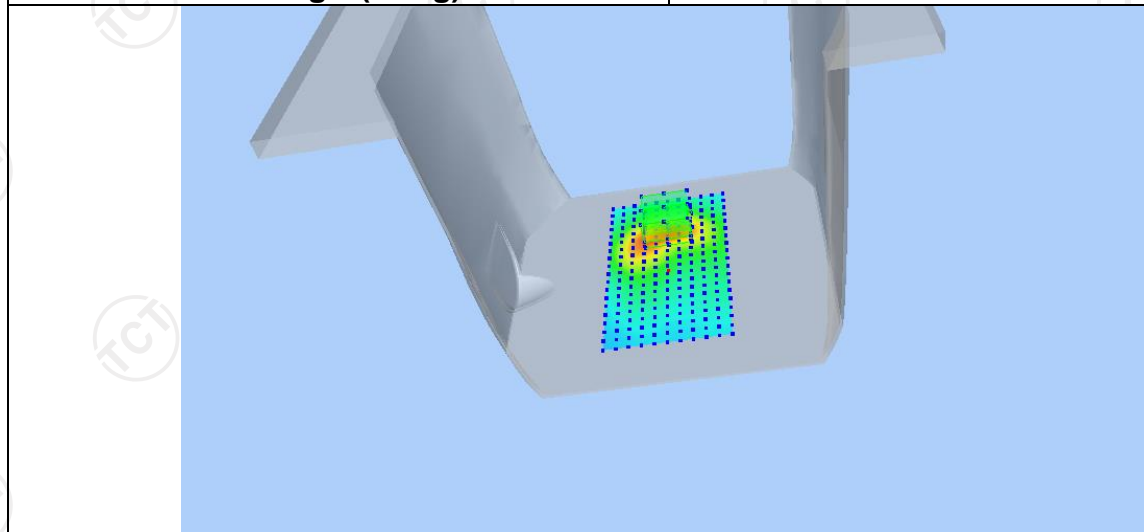
### VOLUME SAR



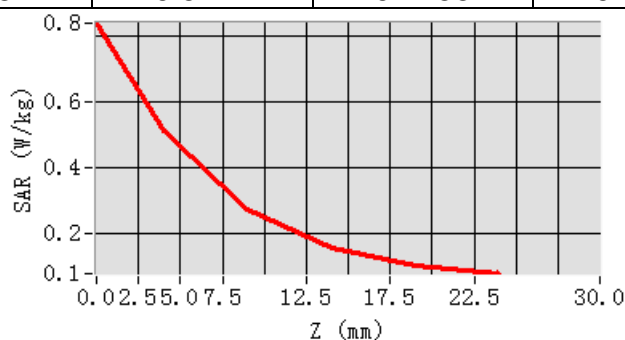
Maximum location: X=1.00, Y=38.00

SAR Peak: 0.84 W/kg

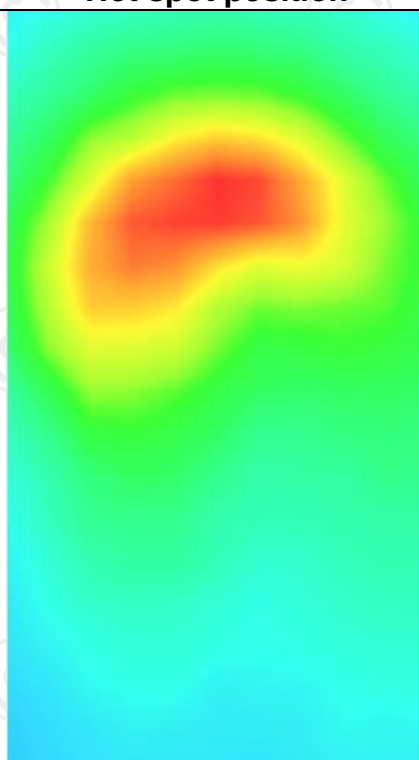
SAR 10g (W/Kg)	0.275182
SAR 1g (W/Kg)	0.512415



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8381	0.5122	0.2738	0.1570	0.1058



Hot spot position





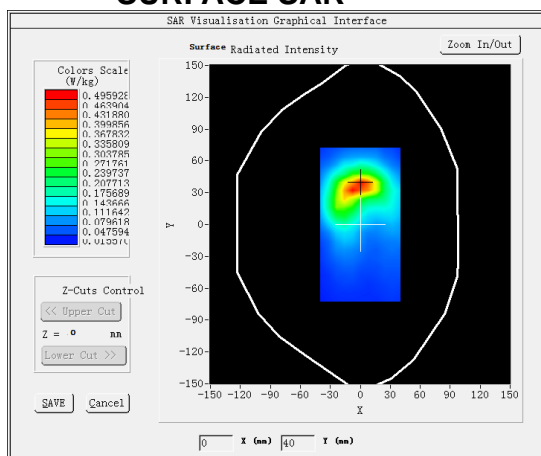
## MEASUREMENT 2

Low Band SAR (Channel 975):

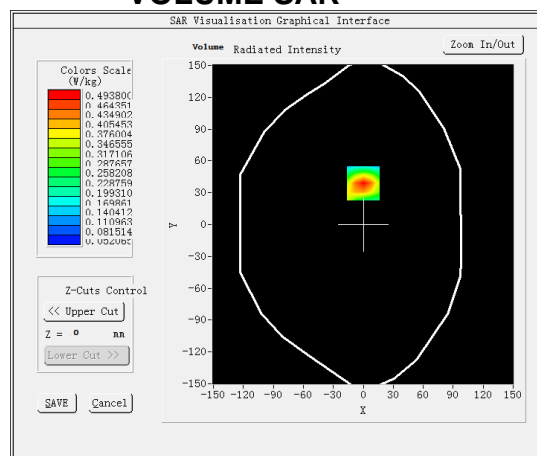
Date: 03/26/2025

Frequency (MHz)	880.200000
Relative permittivity (real part)	40.715241
Relative permittivity (imaginary part)	18.305478
Conductivity (S/m)	0.991528
Variation (%)	-3.170000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM900(GPRS 3slot)

### SURFACE SAR



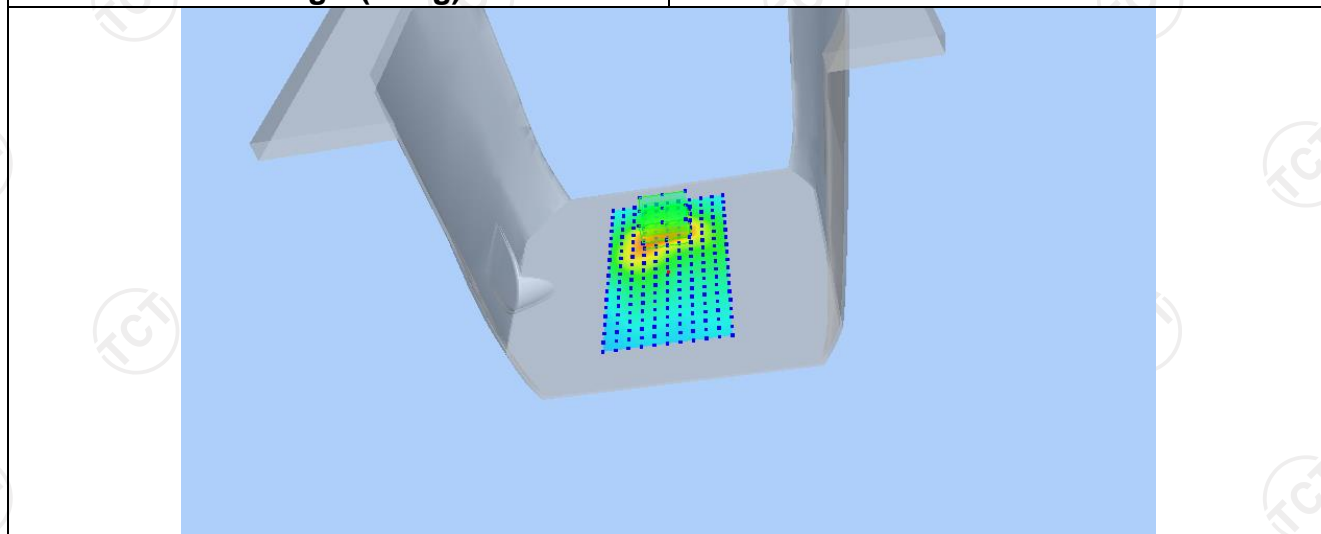
### VOLUME SAR



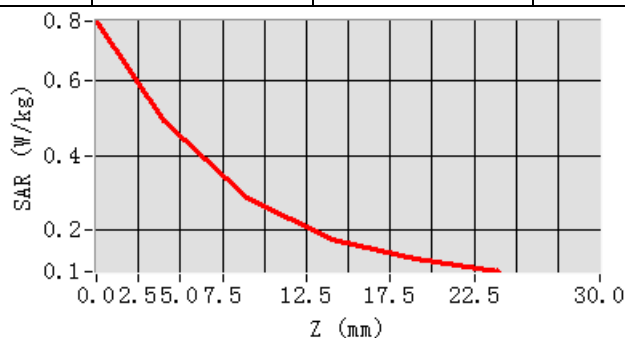
Maximum location: X=0.00, Y=39.00

SAR Peak: 0.77 W/kg

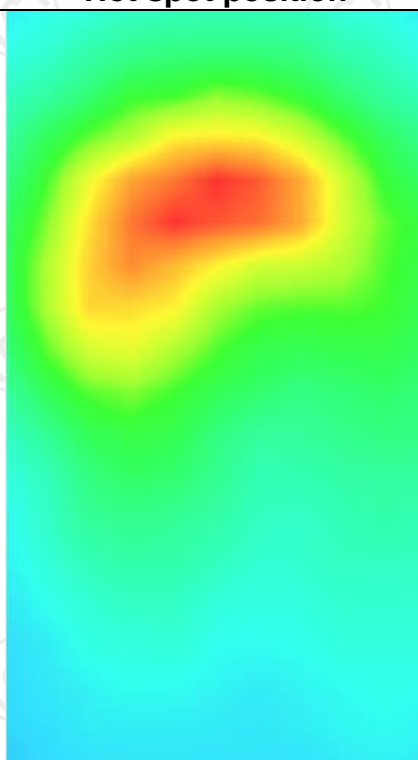
SAR 10g (W/Kg)	0.261589
SAR 1g (W/Kg)	0.462589



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.7617	0.4938	0.2864	0.1752	0.1194



**Hot spot position**



## GSM1800

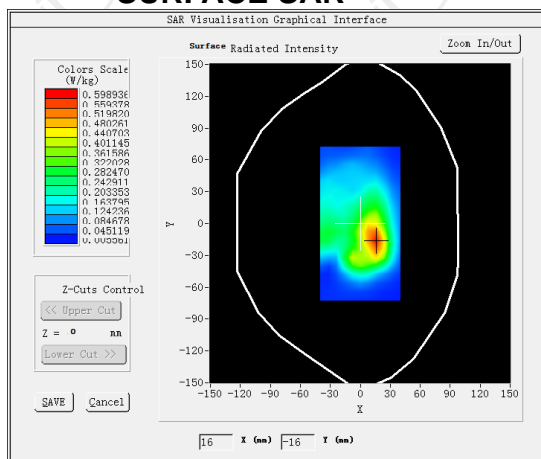
### MEASUREMENT 1

Middle Band SAR (Channel 700):

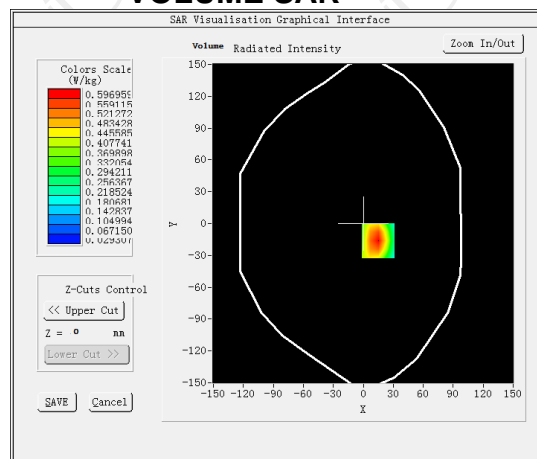
Date: 03/26/2025

Frequency (MHz)	1747.800049
Relative permittivity (real part)	39.051262
Relative permittivity (imaginary part)	13.815254
Conductivity (S/m)	1.378912
Variation (%)	-0.270000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM1800(voice)

### SURFACE SAR



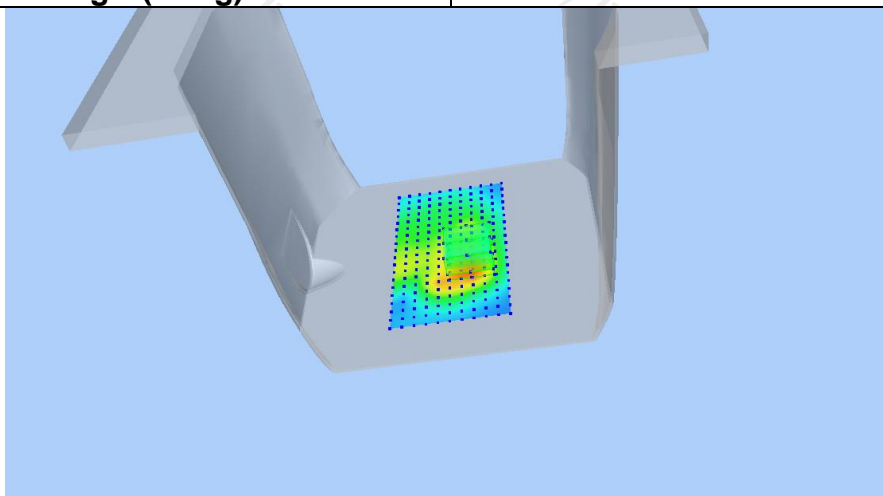
### VOLUME SAR



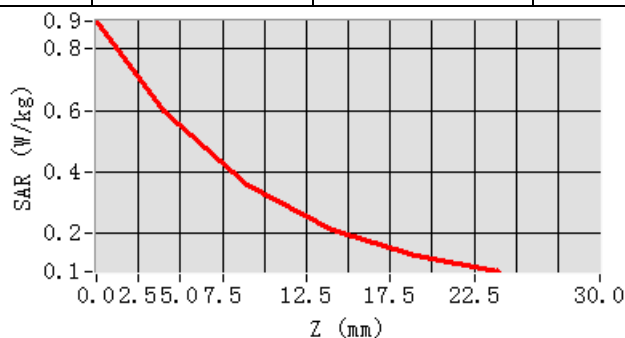
Maximum location: X=15.00, Y=-16.00

SAR Peak: 0.90W/kg

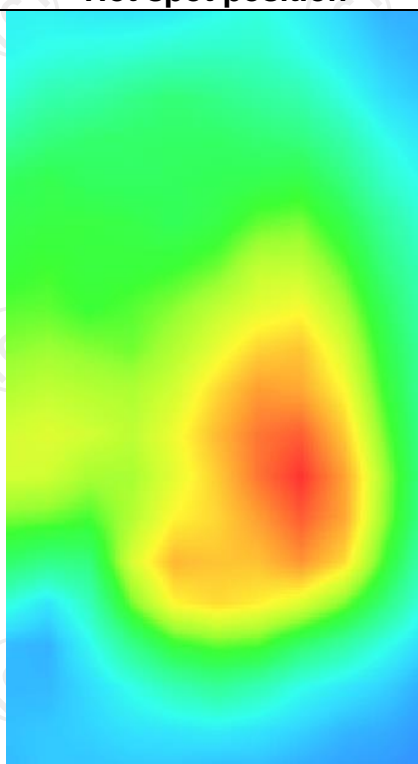
SAR 10g (W/Kg)	0.324066
SAR 1g (W/Kg)	0.563941



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8896	0.5970	0.3554	0.2118	0.1289



## Hot spot position



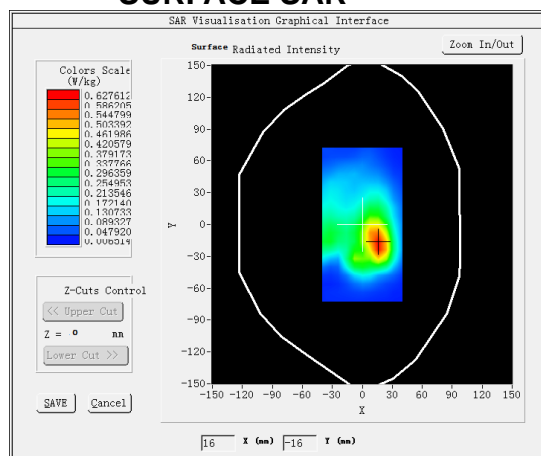
## MEASUREMENT 2

Middle Band SAR (Channel 700):

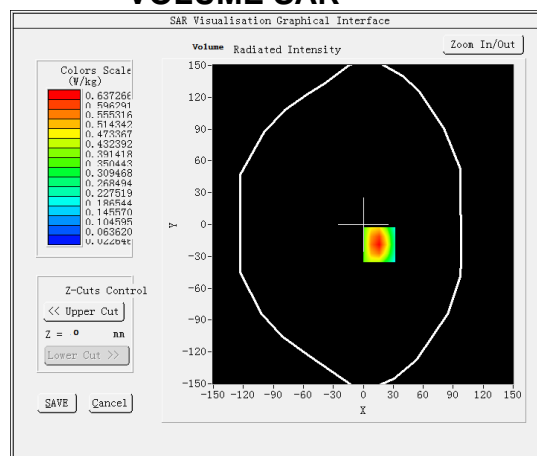
Date: 03/26/2025

Frequency (MHz)	1747.800049
Relative permittivity (real part)	39.051262
Relative permittivity (imaginary part)	13.815254
Conductivity (S/m)	1.378912
Variation (%)	0.720000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	GSM1800(GPRS 4slot)

### SURFACE SAR



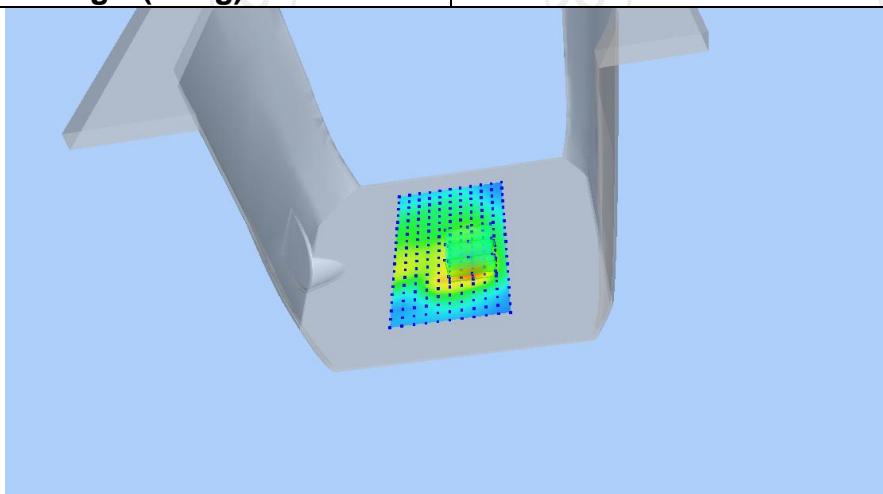
### VOLUME SAR



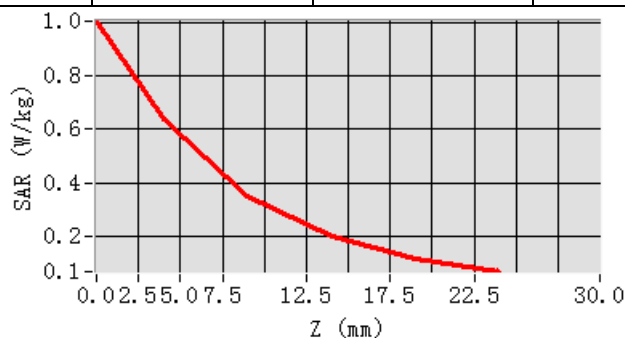
M Maximum location: X=16.00, Y=-19.00

SAR Peak: 1.01 W/kg

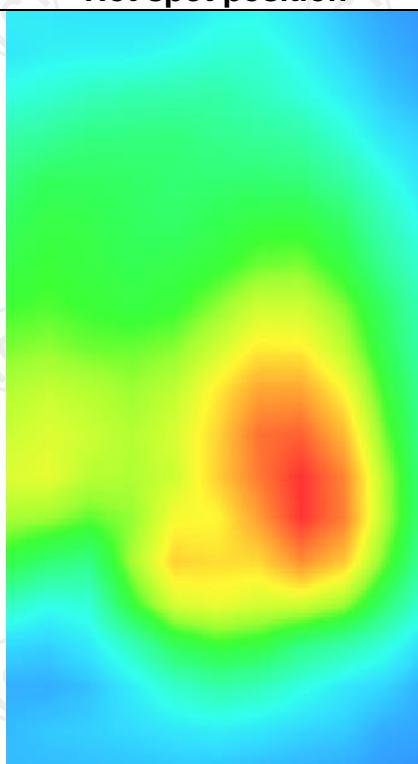
SAR 10g (W/Kg)	0.334813
SAR 1g (W/Kg)	0.602467



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.0036	0.6373	0.3519	0.1960	0.1149



Hot spot position



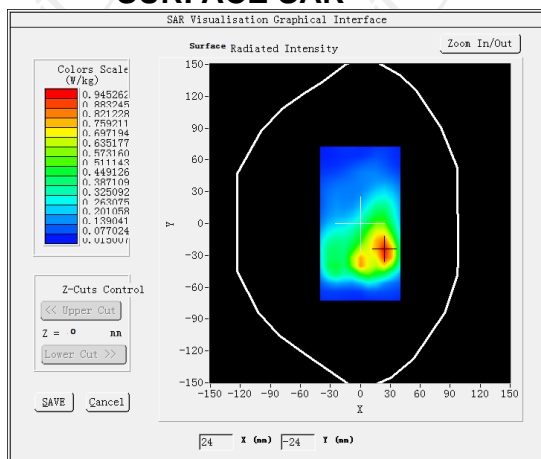
## WCDMA Band I MEASUREMENT 1

Middle Band SAR (Channel 9750):

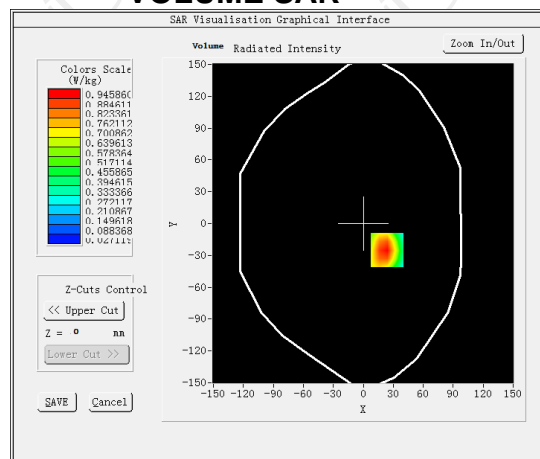
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	41.261547
Relative permittivity (imaginary part)	12.512581
Conductivity (S/m)	1.366285
Variation (%)	-0.700000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	BAND1_WCDMA2100

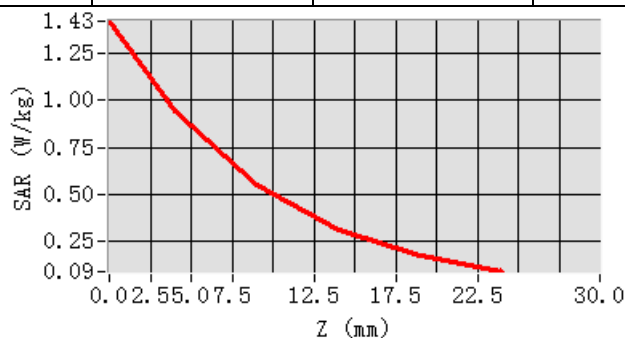
### SURFACE SAR



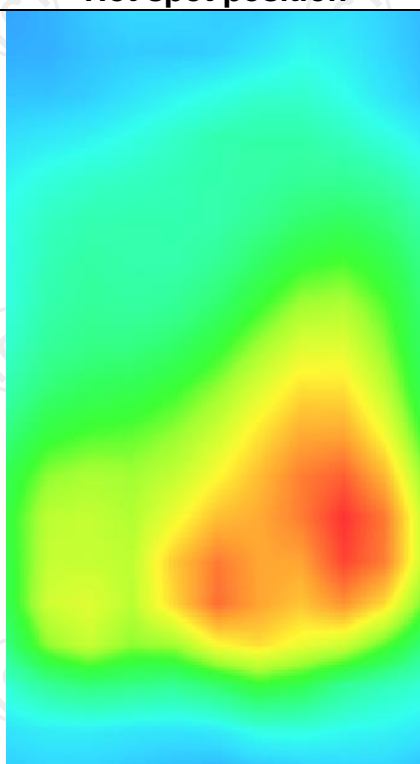
### VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.4250	0.9459	0.5483	0.3098	0.1714



Hot spot position





## WCDMA Band VIII

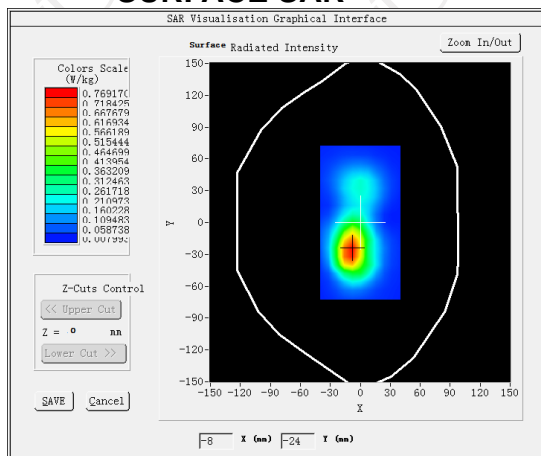
### MEASUREMENT 1

High Band SAR (Channel 2863):

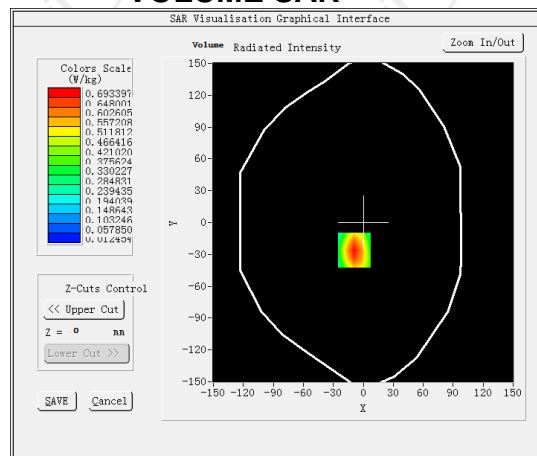
Date: 03/26/2025

Frequency (MHz)	912.600000
Relative permittivity (real part)	42.152015
Relative permittivity (imaginary part)	18.515895
Conductivity (S/m)	0.929515
Variation (%)	-1.600000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	BAND8 WCDMA900

### SURFACE SAR



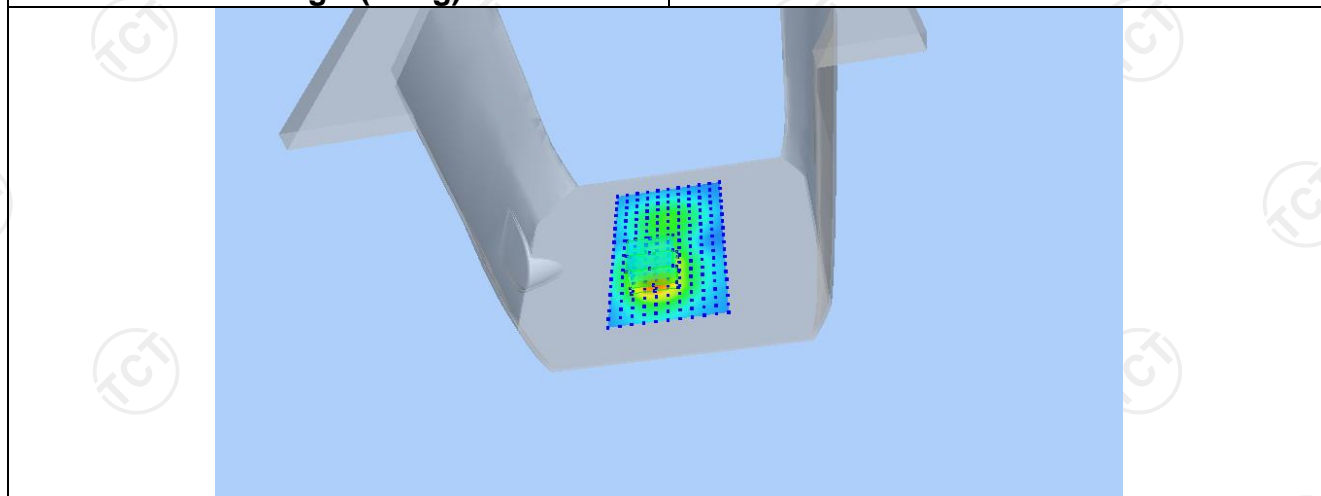
### VOLUME SAR



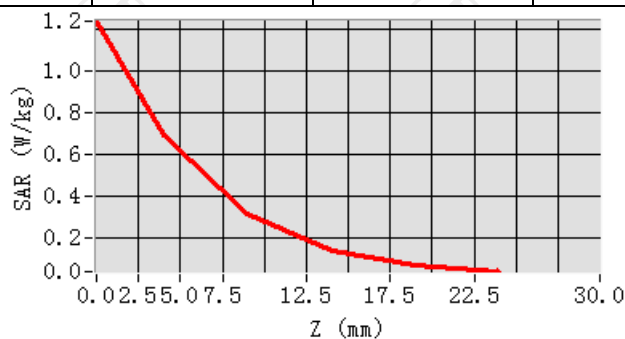
Maximum location: X=-9.00, Y=-26.00

SAR Peak: 1.24 W/kg

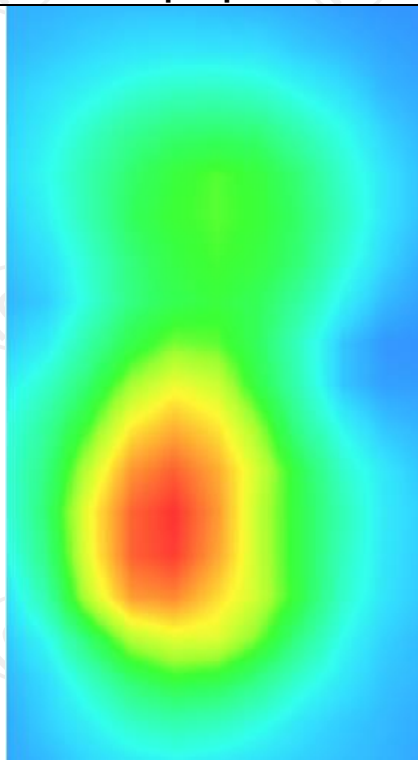
SAR 10g (W/Kg)	0.302514
SAR 1g (W/Kg)	0.641578



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.2395	0.6934	0.3143	0.1414	0.0710



Hot spot position



## LTE Band 1

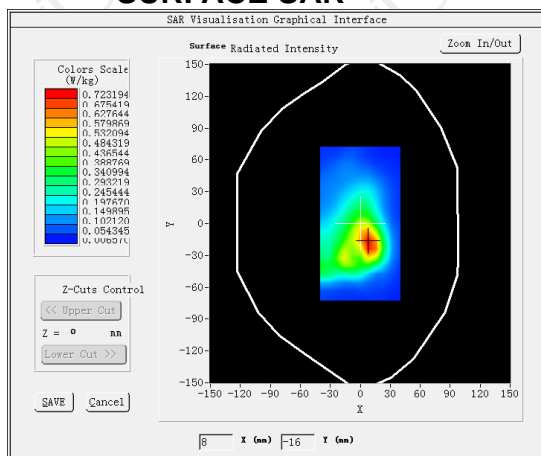
### MEASUREMENT 1

High Band SAR (Channel 18500):

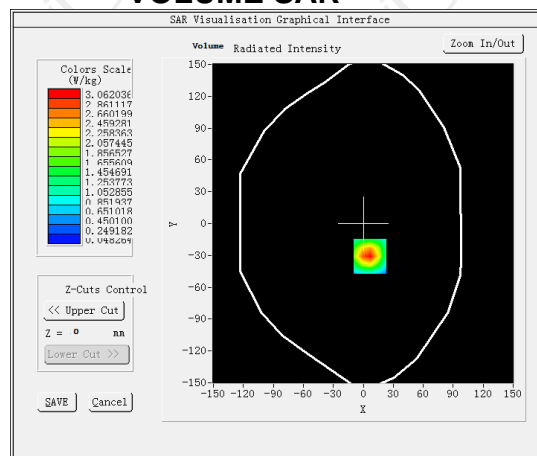
Date: 04/07/2025

Frequency (MHz)	1970.000000
Relative permittivity (real part)	39.751526
Relative permittivity (imaginary part)	12.491520
Conductivity (S/m)	1.381526
Variation (%)	-2.310000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 1

### SURFACE SAR



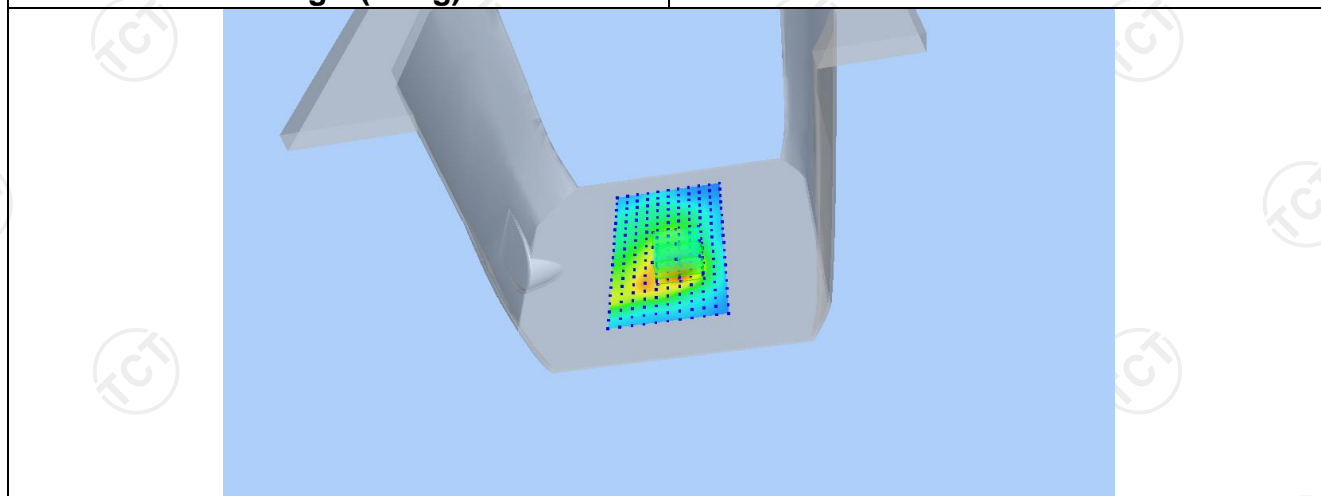
### VOLUME SAR



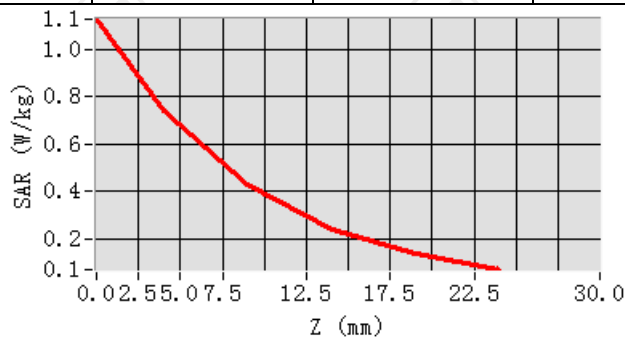
Maximum location: X=9.00, Y=-19.00

SAR Peak: 1.15 W/kg

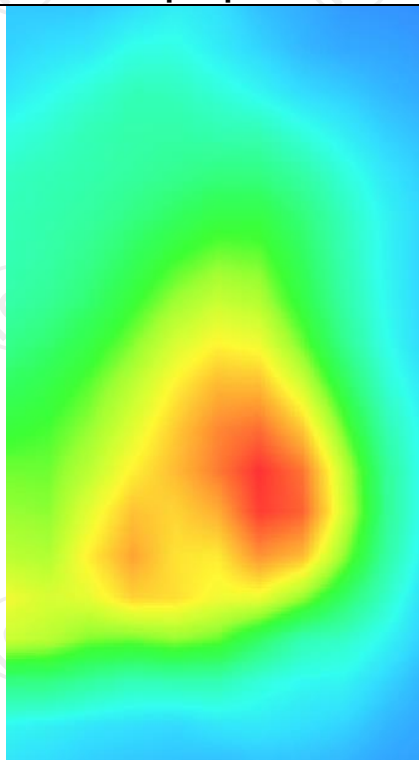
SAR 10g (W/Kg)	0.386931
SAR 1g (W/Kg)	0.702253



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.1279	0.7434	0.4275	0.2405	0.1337



Hot spot position



## LTE Band 3

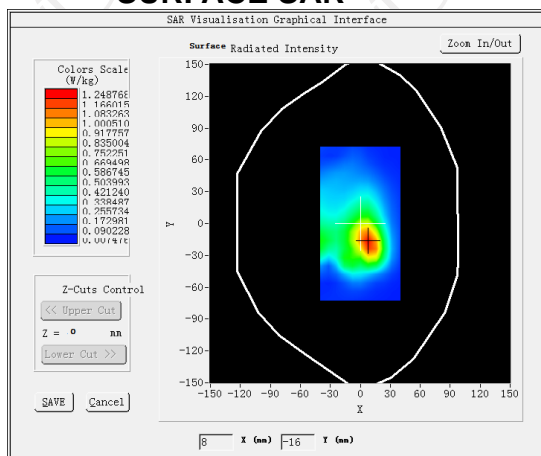
### MEASUREMENT 1

Low Band SAR (Channel 19300):

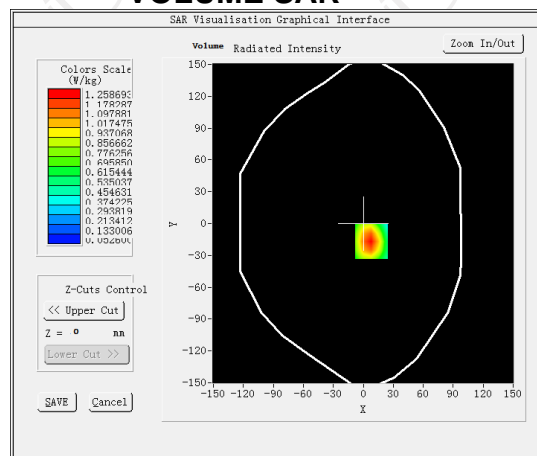
Date: 03/26/2025

Frequency (MHz)	1720.000000
Relative permittivity (real part)	39.578152
Relative permittivity (imaginary part)	13.821695
Conductivity (S/m)	1.422602
Variation (%)	-1.480000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 3

### SURFACE SAR



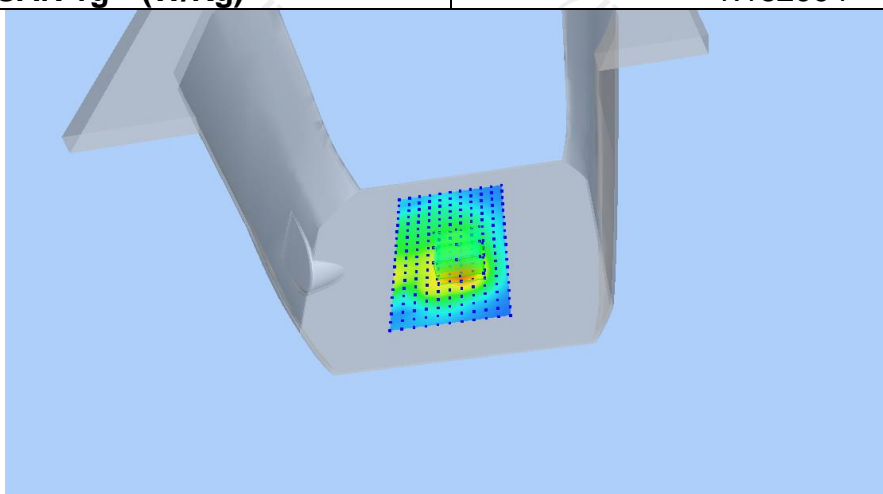
### VOLUME SAR



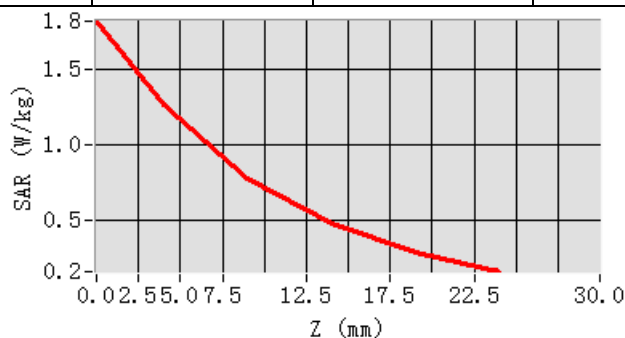
Maximum location: X=8.00, Y=-17.00

SAR Peak: 1.83 W/kg

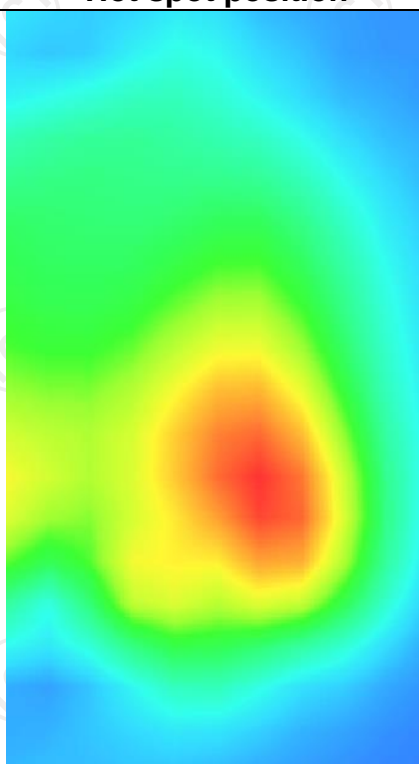
SAR 10g (W/Kg)	0.680155
SAR 1g (W/Kg)	1.182994



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.8140	1.2587	0.7790	0.4746	0.2855



**Hot spot position**



## LTE Band 7

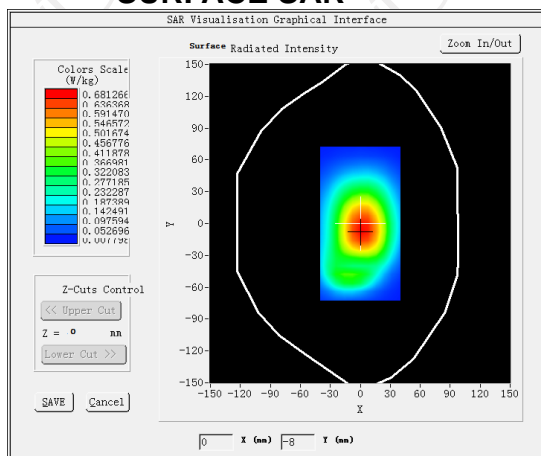
### MEASUREMENT 1

Middle Band SAR (Channel 21100):

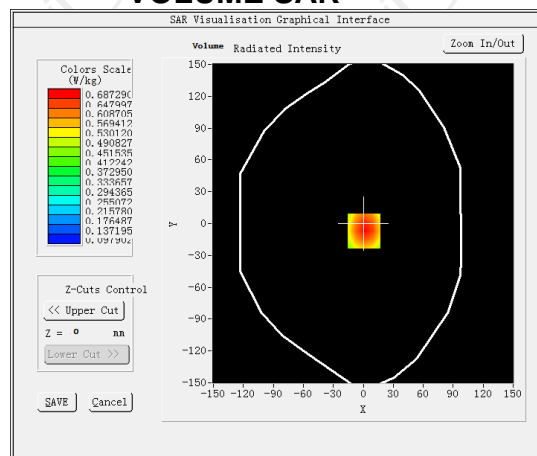
Date: 04/07/2025

Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.692518
Relative permittivity (imaginary part)	13.661258
Conductivity (S/m)	1.905162
Variation (%)	-4.510000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 7

### SURFACE SAR



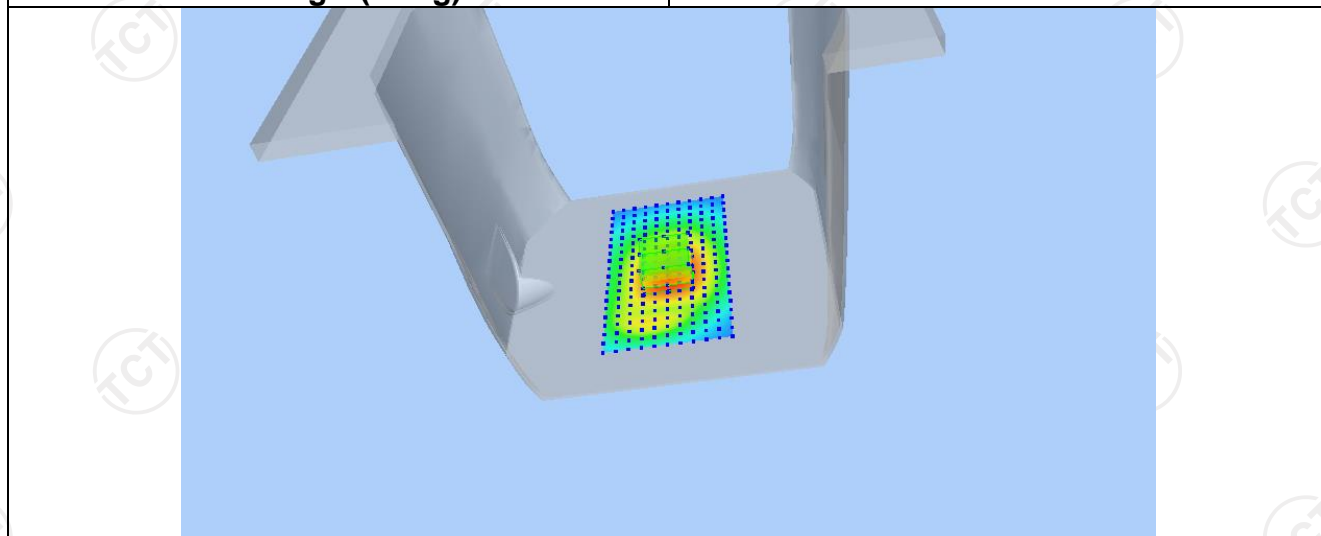
### VOLUME SAR



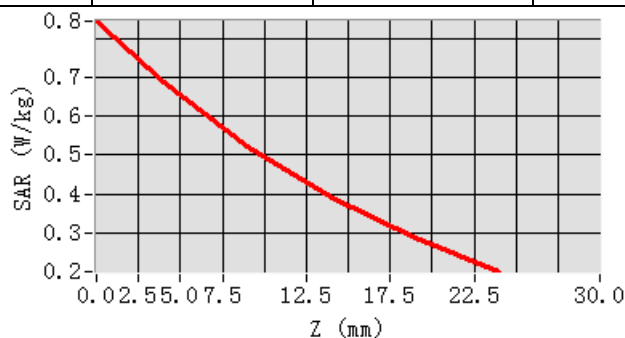
Maximum location: X=1.00, Y=-7.00

SAR Peak: 0.85W/kg

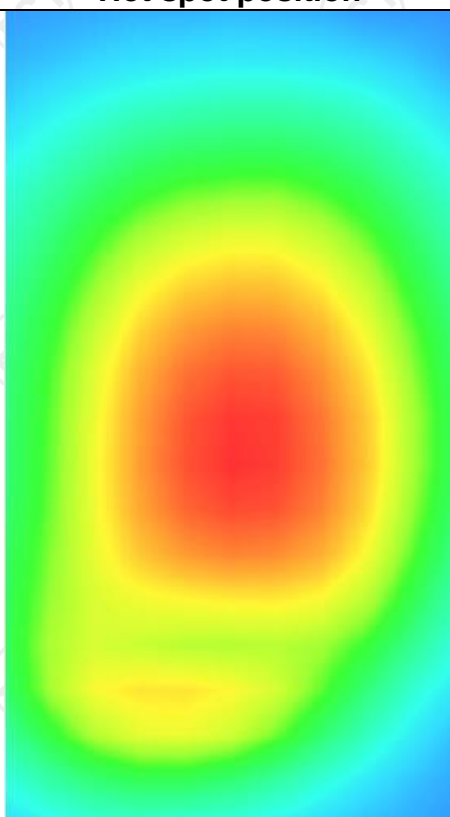
SAR 10g (W/Kg)	0.394582
SAR 1g (W/Kg)	0.612584



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8459	0.6873	0.5227	0.3908	0.2854



Hot spot position





## LTE Band 8

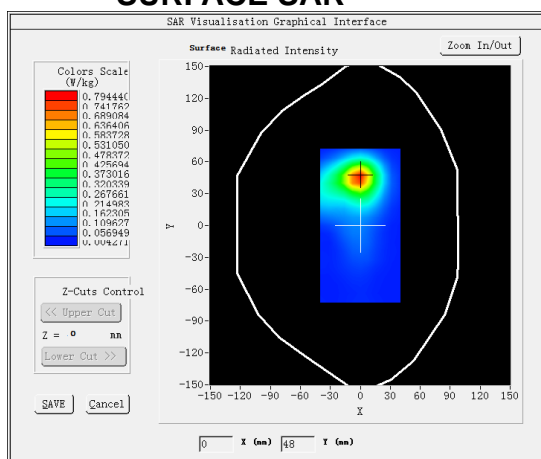
### MEASUREMENT 1

Middle Band SAR (Channel 21625):

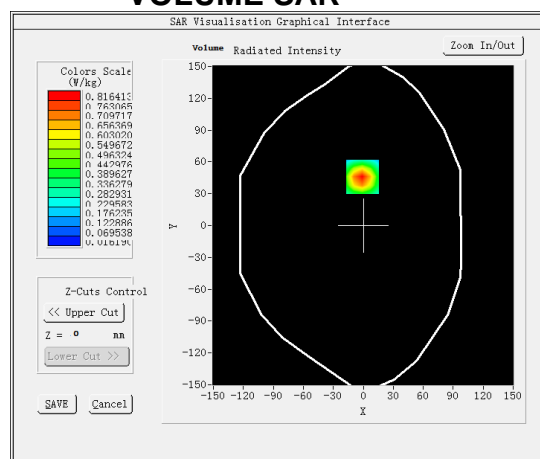
Date: 03/26/2025

Frequency (MHz)	897.500000
Relative permittivity (real part)	41.732054
Relative permittivity (imaginary part)	19.351254
Conductivity (S/m)	0.957485
Variation (%)	-2.900000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 8

### SURFACE SAR



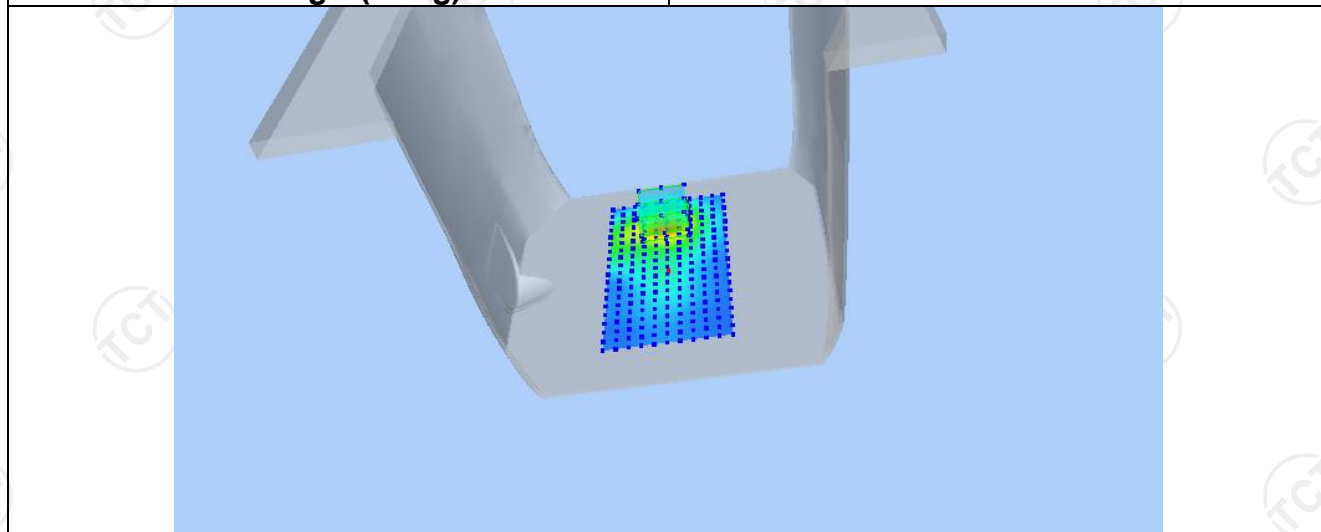
### VOLUME SAR



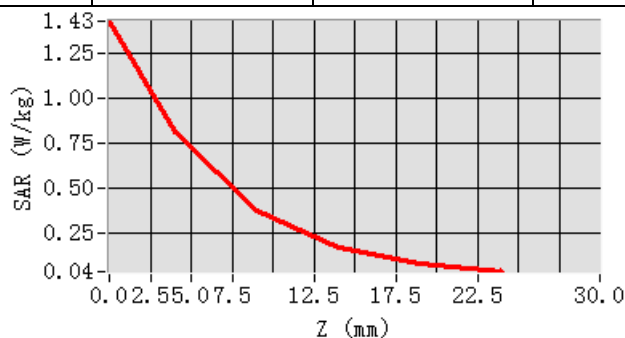
Maximum location: X=-1.00, Y=46.00

SAR Peak: 1.44W/kg

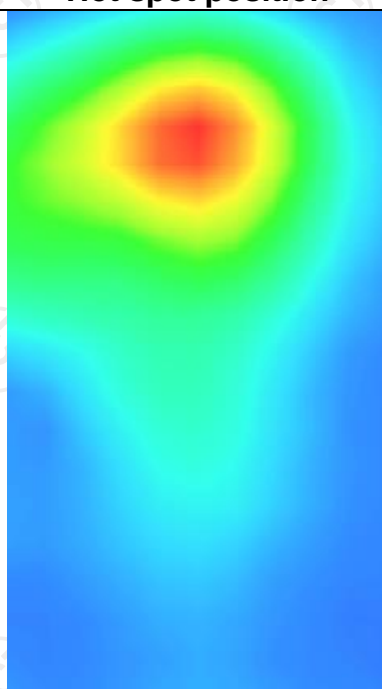
SAR 10g (W/Kg)	0.320125
SAR 1g (W/Kg)	0.751258



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.4331	0.8164	0.3783	0.1706	0.0813



**Hot spot position**



## LTE Band 20

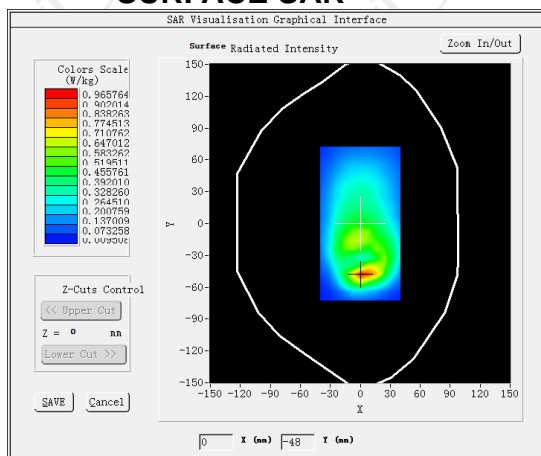
### MEASUREMENT 1

Low Band SAR (Channel 24250):

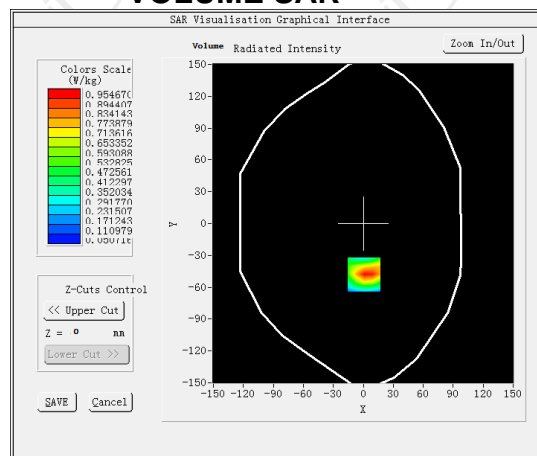
Date: 03/26/2025

Frequency (MHz)	842.000000
Relative permittivity (real part)	42.060652
Relative permittivity (imaginary part)	19.326125
Conductivity (S/m)	0.940625
Variation (%)	0.950000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 20

### SURFACE SAR



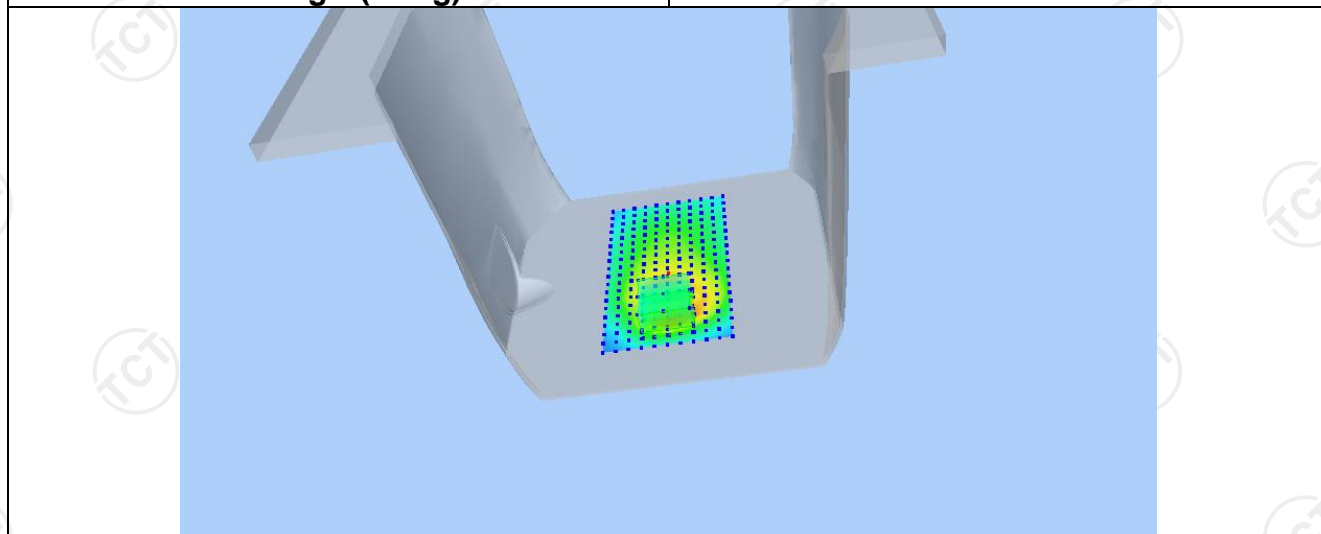
### VOLUME SAR



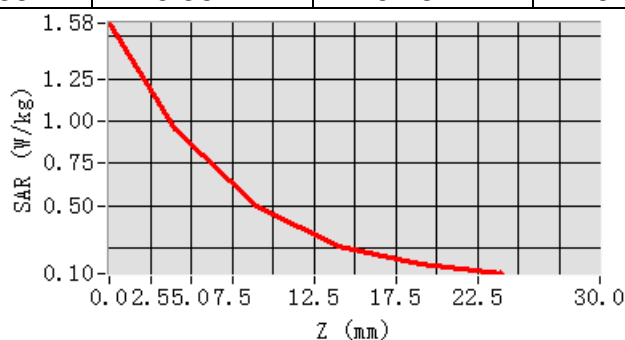
Maximum location: X=1.00, Y=-48.00

SAR Peak: 1.60 W/kg

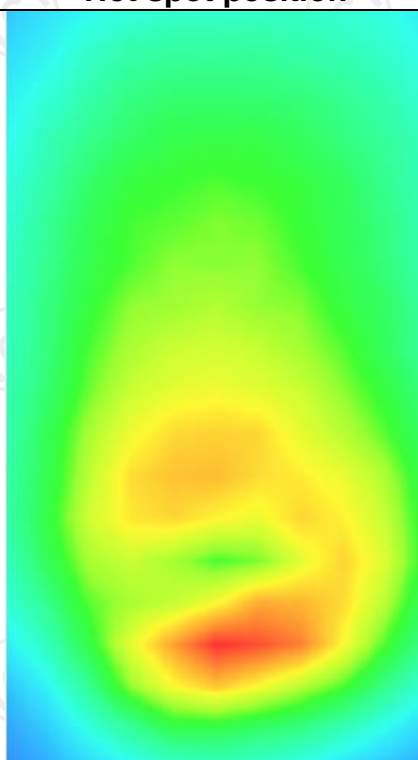
SAR 10g (W/Kg)	0.412589
SAR 1g (W/Kg)	0.912574



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.5789	0.9547	0.4941	0.2631	0.1561



**Hot spot position**



## LTE Band 28

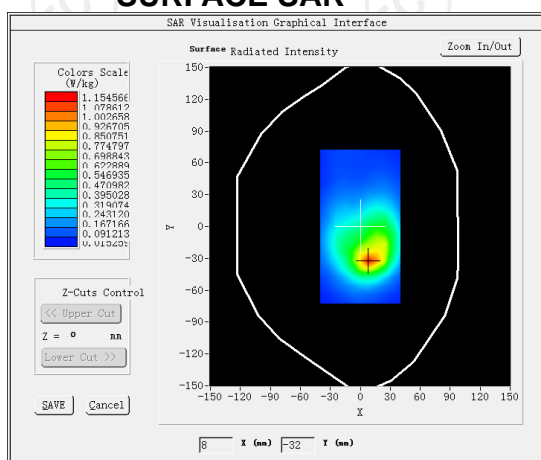
### MEASUREMENT 1

Low Band SAR (Channel 27310):

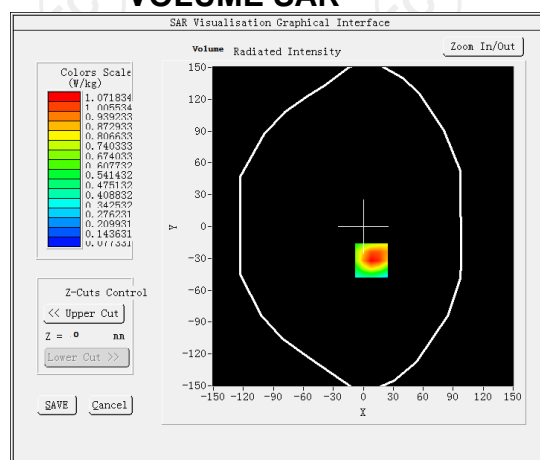
Date: 03/28/2025

Frequency (MHz)	713.000000
Relative permittivity (real part)	42.089254
Relative permittivity (imaginary part)	21.381574
Conductivity (S/m)	0.884251
Variation (%)	-0.090000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 28

### SURFACE SAR



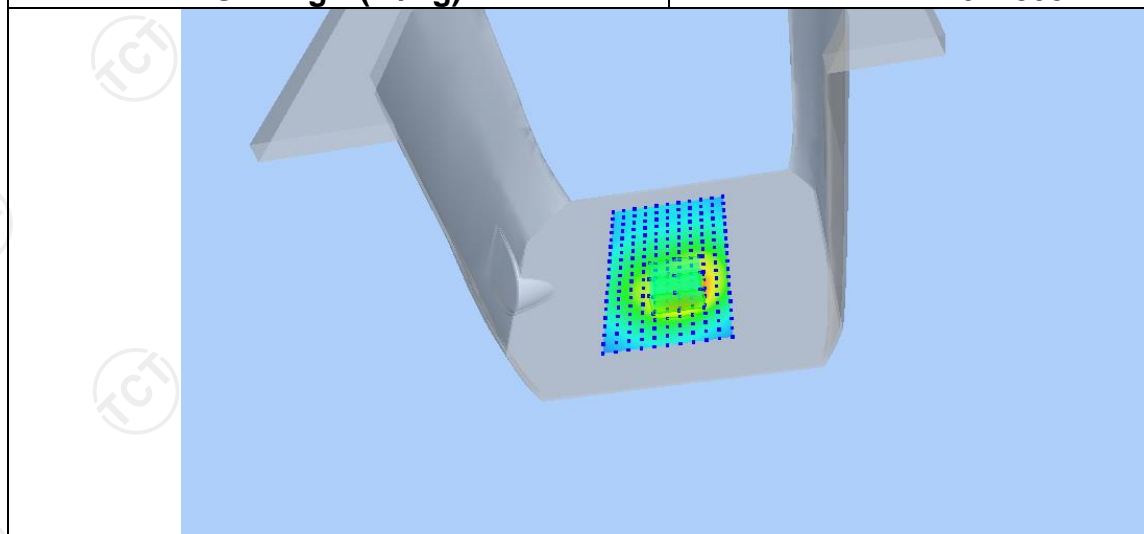
### VOLUME SAR



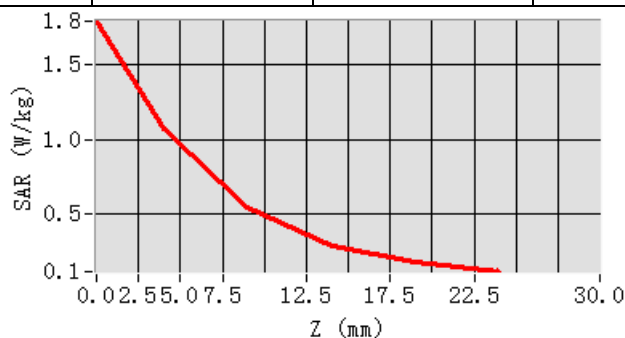
Maximum location: X=8.00, Y=-32.00

SAR Peak: 1.84 W/kg

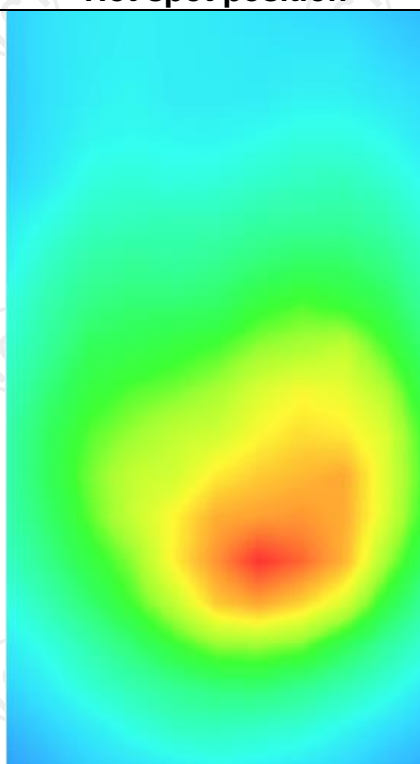
SAR 10g (W/Kg)	0.512015
SAR 1g (W/Kg)	1.041895



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.7949	1.0718	0.5462	0.2891	0.1744



Hot spot position



## LTE Band 38

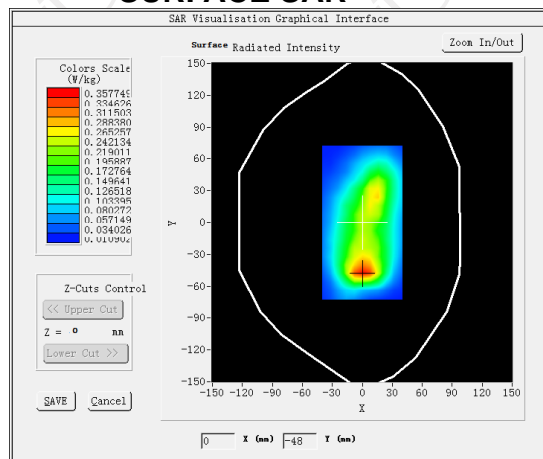
### MEASUREMENT 1

Middle Band SAR (Channel 38000)

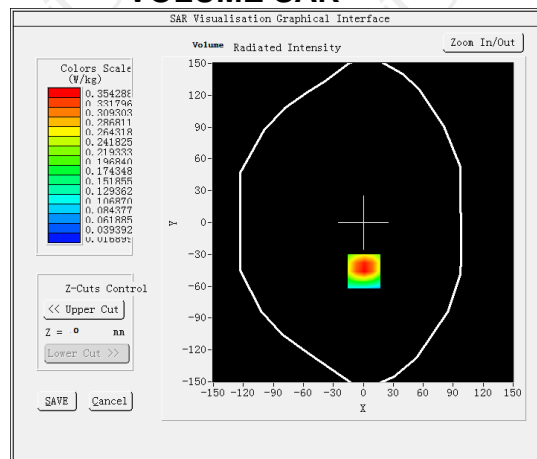
Date: 04/07/2025

Frequency (MHz)	2595.000000
Relative permittivity (real part)	37.849521
Relative permittivity (imaginary part)	13.512547
Conductivity (S/m)	1.894152
Variation (%)	-1.590000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 38

### SURFACE SAR



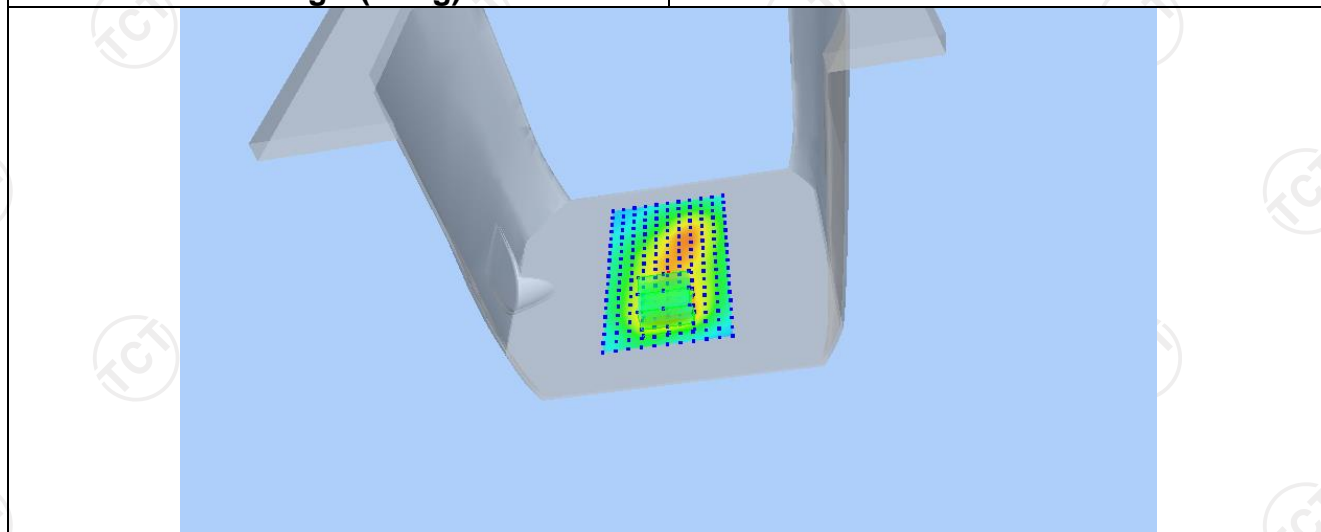
### VOLUME SAR



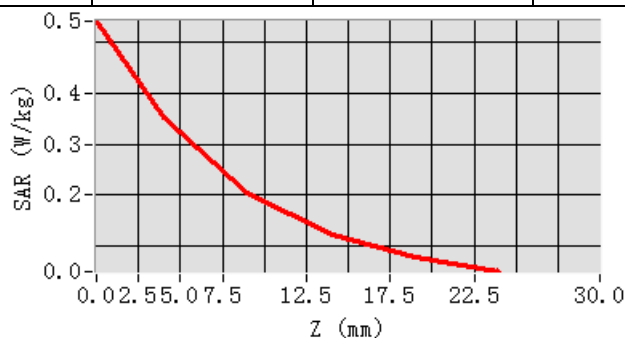
Maximum location: X=1.00, Y=-46.00

SAR Peak:0.56 W/kg

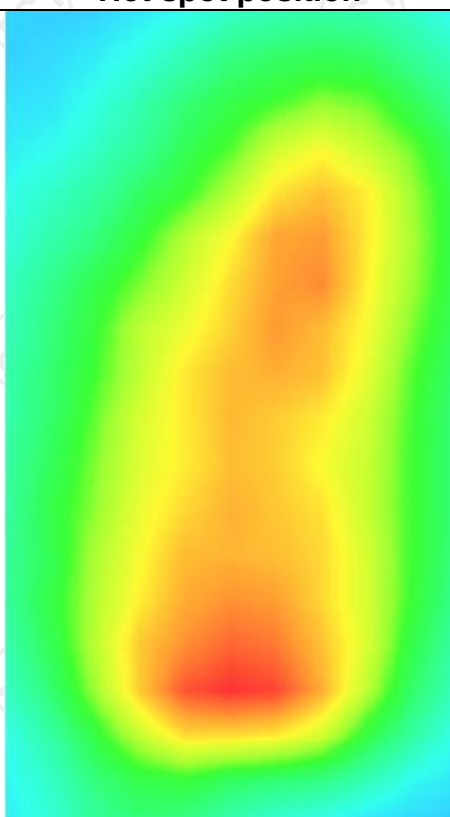
SAR 10g (W/Kg)	0.189501
SAR 1g (W/Kg)	0.331547



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5426	0.3543	0.2051	0.1217	0.0771



Hot spot position





## LTE Band 40

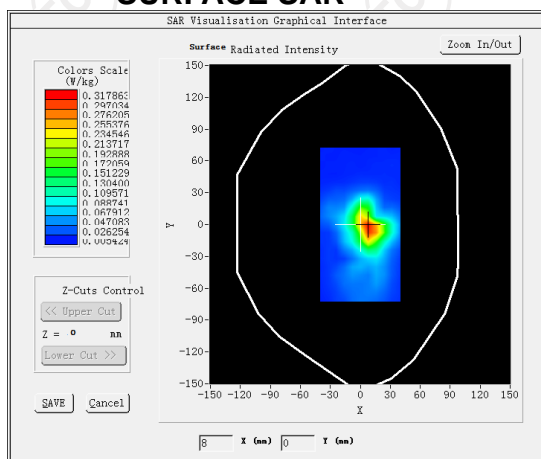
### MEASUREMENT 1

High Band SAR (Channel 39550)

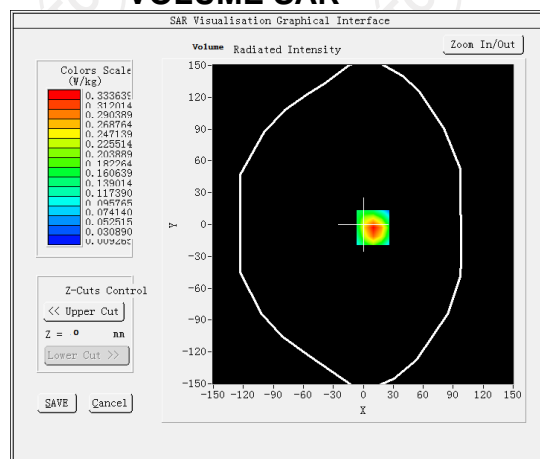
Date: 03/25/2025

Frequency (MHz)	2390.000000
Relative permittivity (real part)	38.902158
Relative permittivity (imaginary part)	13.120547
Conductivity (S/m)	1.781595
Variation (%)	-0.740000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	LTE band 40

### SURFACE SAR

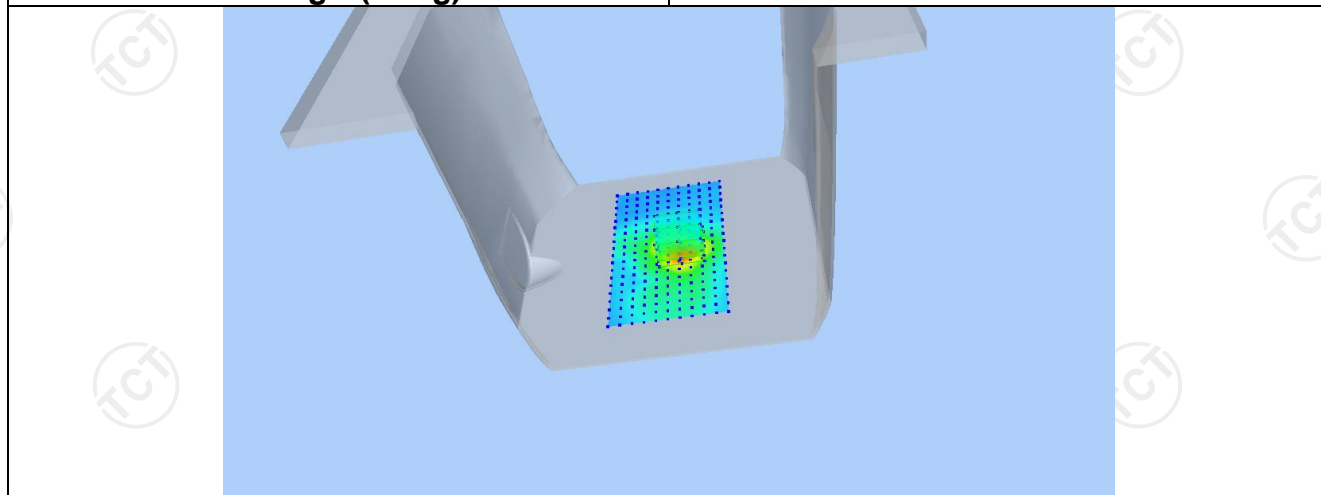


### VOLUME SAR

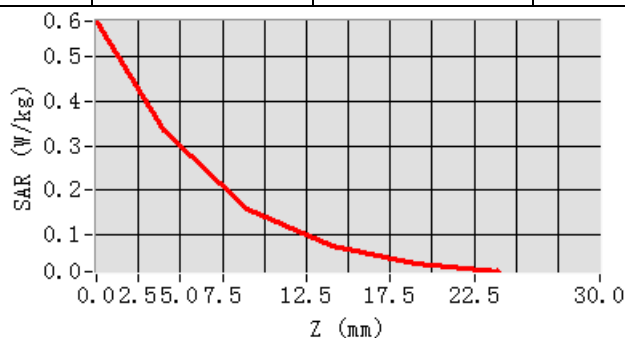


Maximum location: X=10.00, Y=-3.00  
SAR Peak: 0.58 W/kg

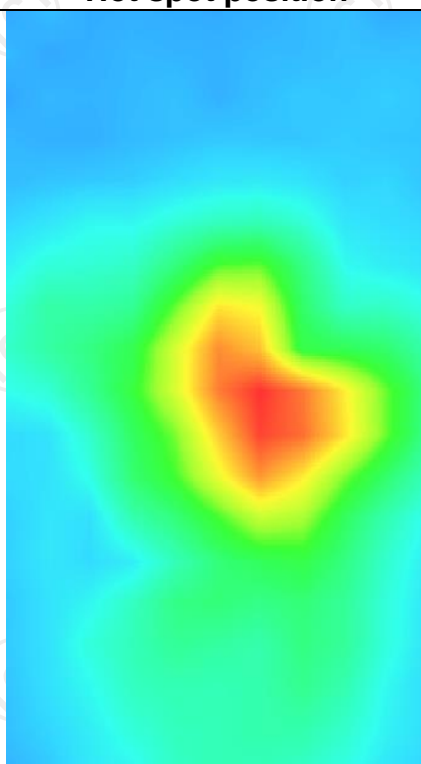
SAR 10g (W/Kg)	0.152958
SAR 1g (W/Kg)	0.311960



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5779	0.3336	0.1585	0.0742	0.0372



Hot spot position



## 5G NR N1

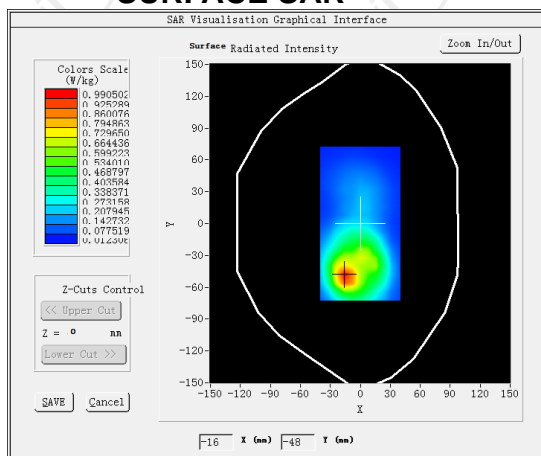
### MEASUREMENT 1

Middle Band SAR (Channel 390000):

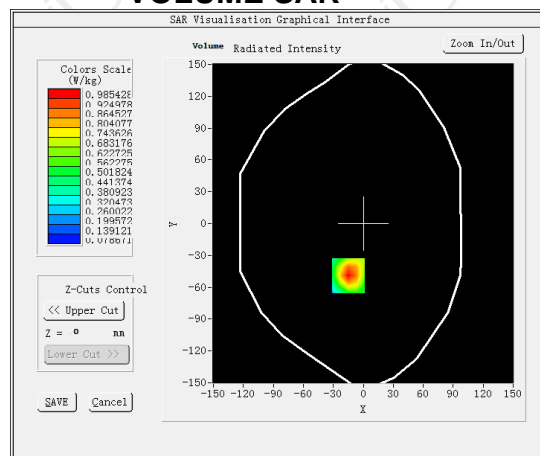
Date: 04/07/2025

Frequency (MHz)	1950.000000
Relative permittivity (real part)	39.802156
Relative permittivity (imaginary part)	12.481695
Conductivity (S/m)	1.390654
Variation (%)	0.190000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	5G NR N1

### SURFACE SAR



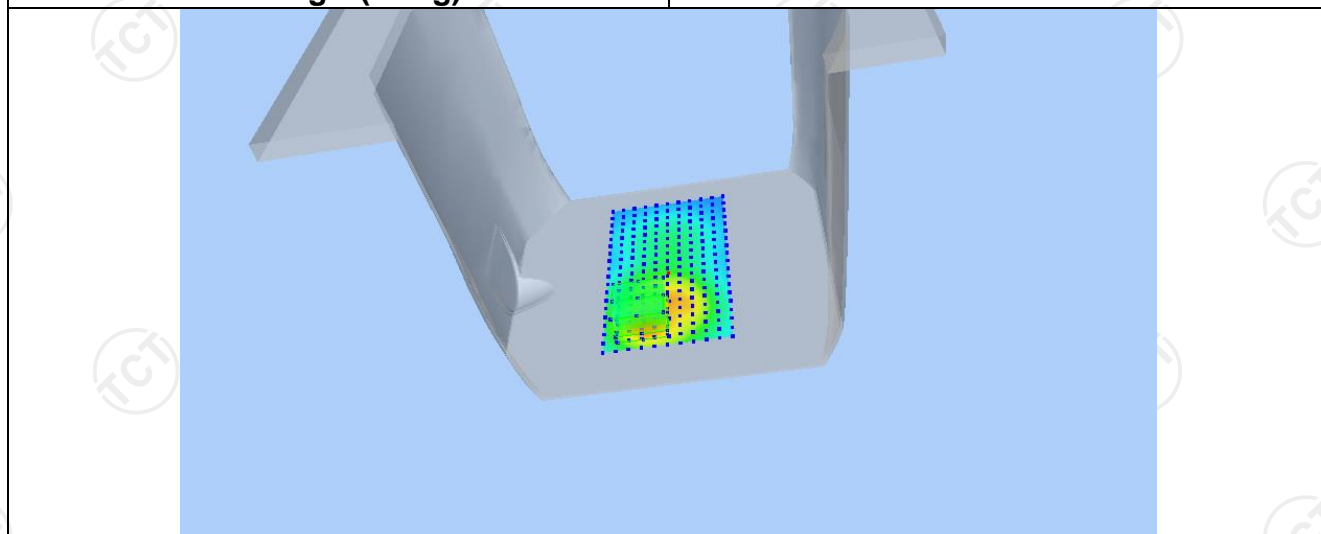
### VOLUME SAR



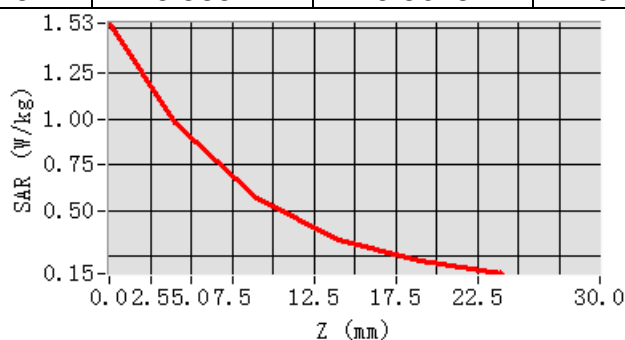
Maximum location: X=-15.00, Y=-49.00

SAR Peak: 1.53 W/kg

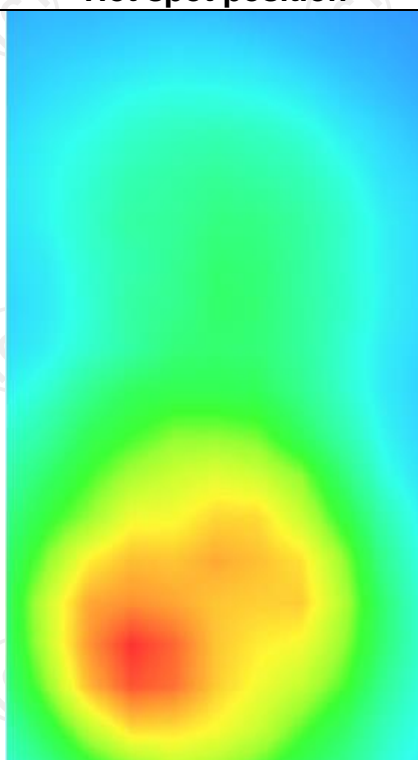
SAR 10g (W/Kg)	0.501892
SAR 1g (W/Kg)	0.954729



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.5273	0.9854	0.5648	0.3377	0.2221



Hot spot position



## 5G NR N3

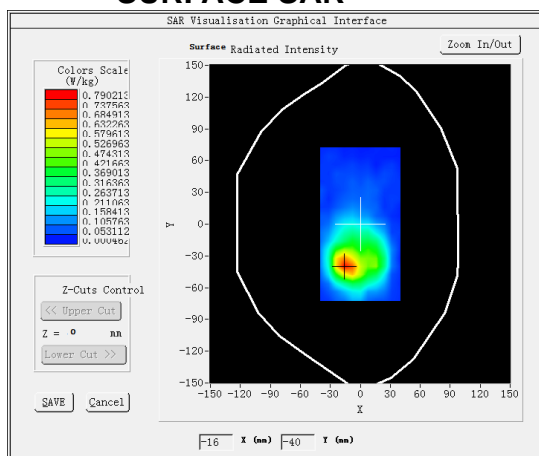
### MEASUREMENT 1

Low Band SAR (Channel 344000):

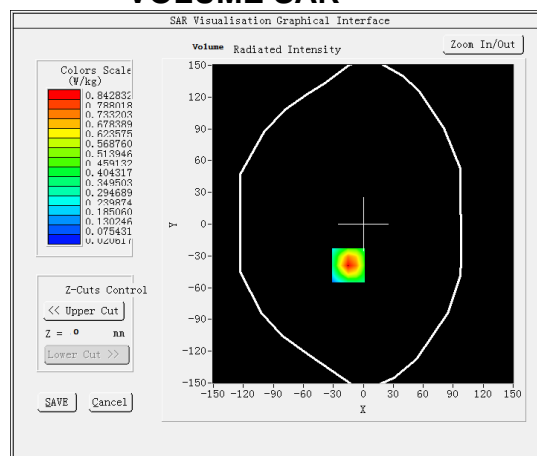
Date: 03/26/2025

Frequency (MHz)	1720.000049
Relative permittivity (real part)	39.325174
Relative permittivity (imaginary part)	13.815292
Conductivity (S/m)	1.409512
Variation (%)	-0.400000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	5G NR N3

### SURFACE SAR



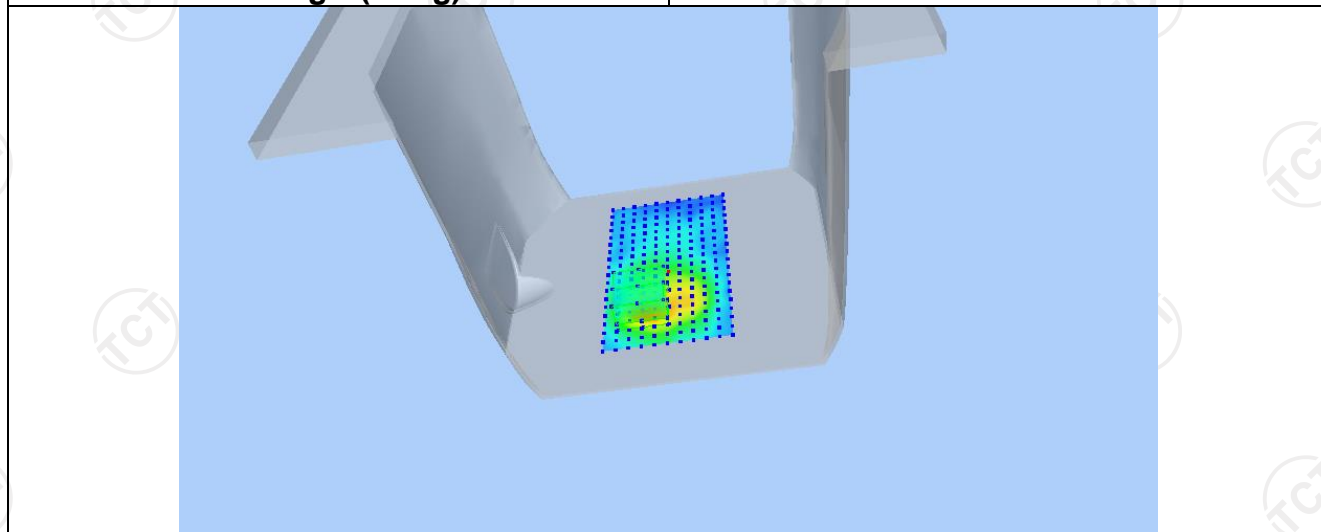
### VOLUME SAR



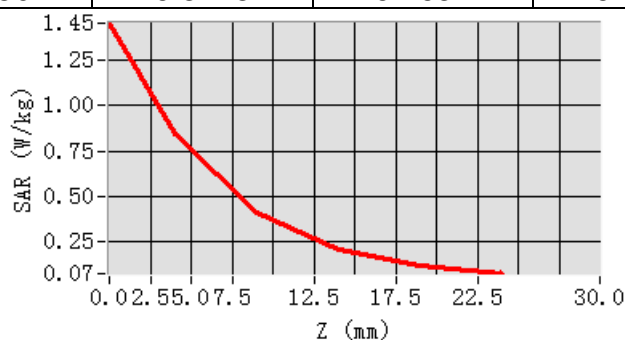
Maximum location: X=-15.00, Y=-38.00

SAR Peak: 1.46 W/kg

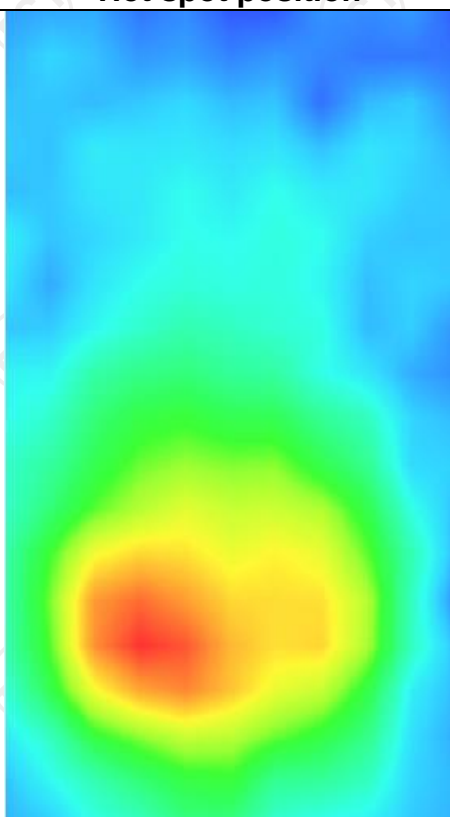
SAR 10g (W/Kg)	0.405127
SAR 1g (W/Kg)	0.795214



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.4536	0.8428	0.4092	0.2048	0.1181



Hot spot position



## 5G NR N7

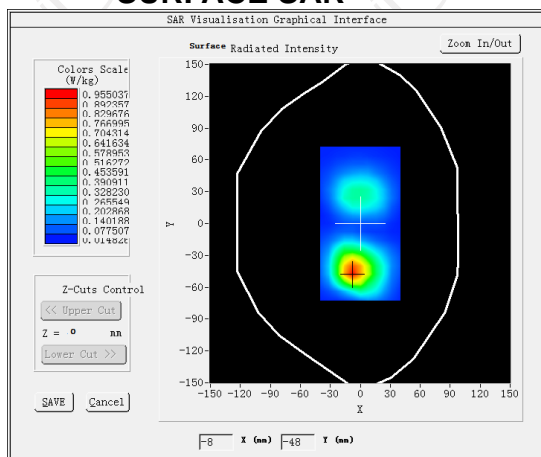
### MEASUREMENT 1

Low Band SAR (Channel 502000)

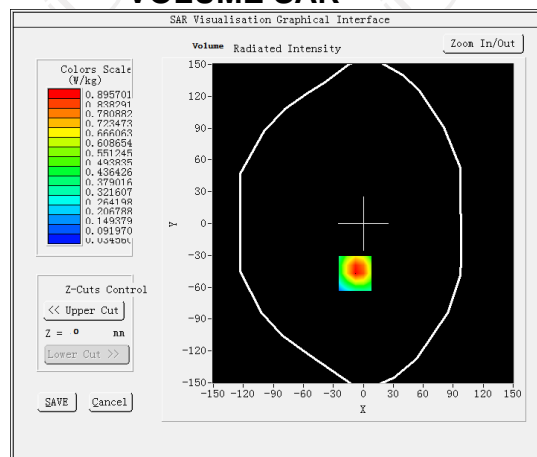
Date: 04/07/2025

Frequency (MHz)	2510.000000
Relative permittivity (real part)	39.261571
Relative permittivity (imaginary part)	13.659521
Conductivity (S/m)	1.937451
Variation (%)	-1.590000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	5G NR N7

### SURFACE SAR



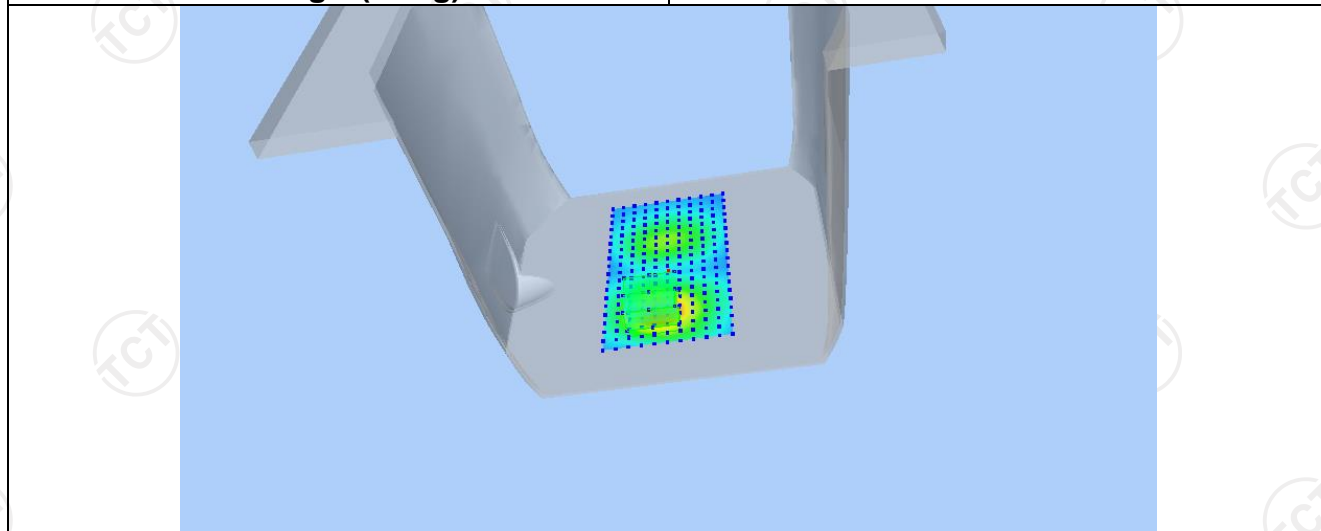
### VOLUME SAR



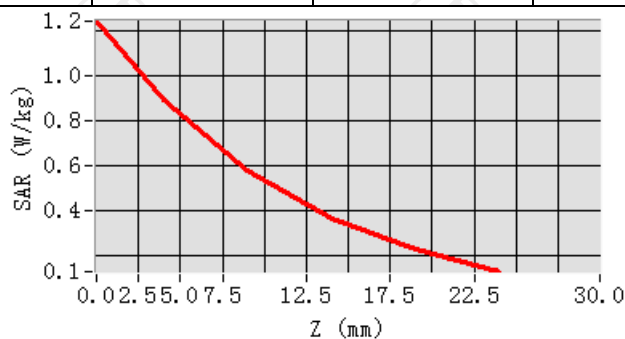
Maximum location: X=-8.00, Y=-47.00

SAR Peak: 1.29 W/kg

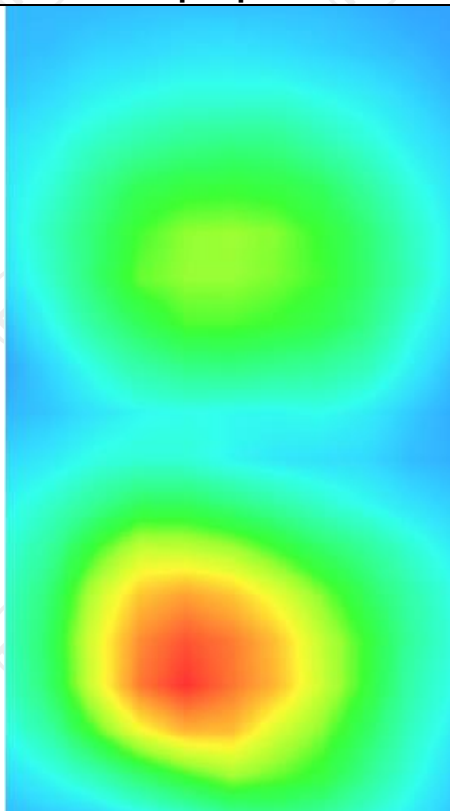
SAR 10g (W/Kg)	0.542895
SAR 1g (W/Kg)	0.815595



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.2459	0.8957	0.5799	0.3677	0.2273



Hot spot position

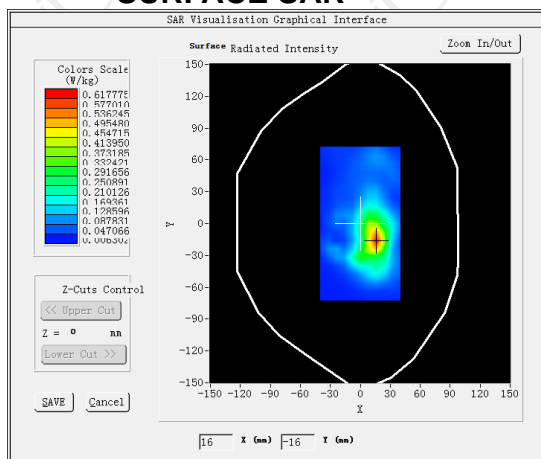




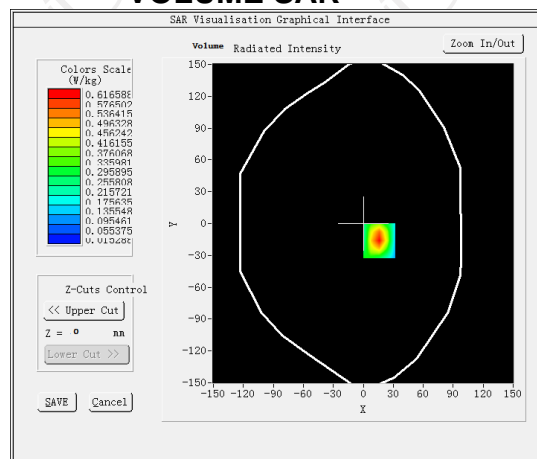
## 2.4G WLAN MEASUREMENT 2

Middle Band SAR (Channel 07):		Date: 03/25/2025
Frequency (MHz)	2442.000000	
Relative permittivity (real part)	40.462571	
Relative permittivity (imaginary part)	13.236258	
Conductivity (S/m)	1.851254	
Variation (%)	-0.220000	
Area Scan	dx=8mm dy=8mm, h= 5.00 mm	
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Complete	
Phantom	Validation plane	
Device Position	Body Back	
Band	IEEE 802.11b ISM	

### SURFACE SAR



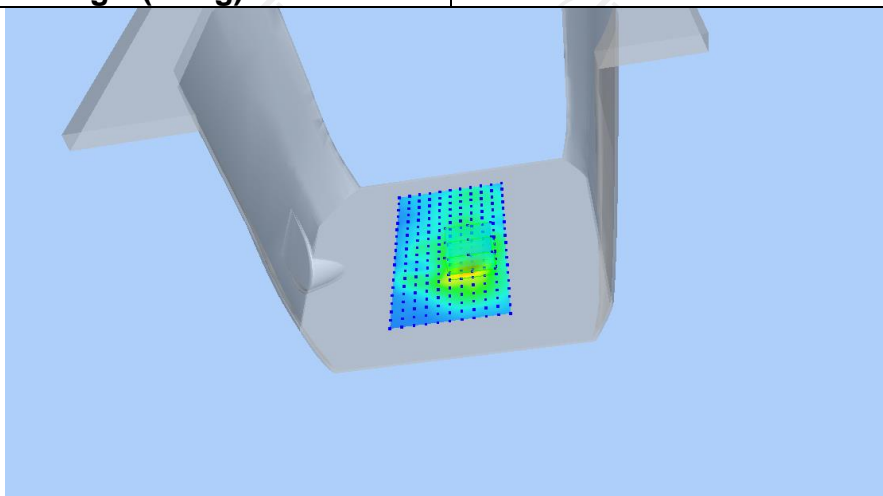
### VOLUME SAR



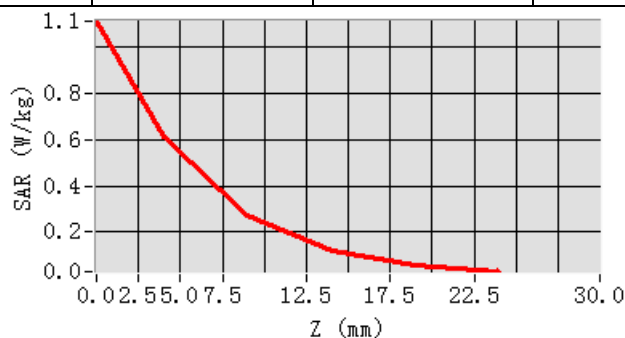
Maximum location: X=16.00, Y=-16.00  
SAR Peak: 1.11 W/kg

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

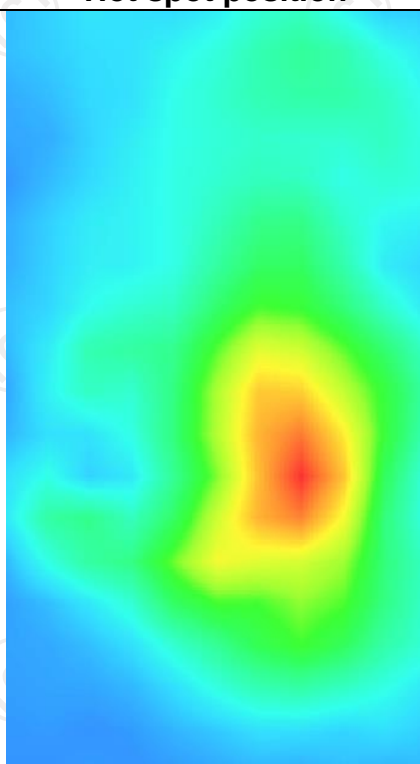
0.267814  
0.570243



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.1149	0.6166	0.2731	0.1182	0.0562



Hot spot position



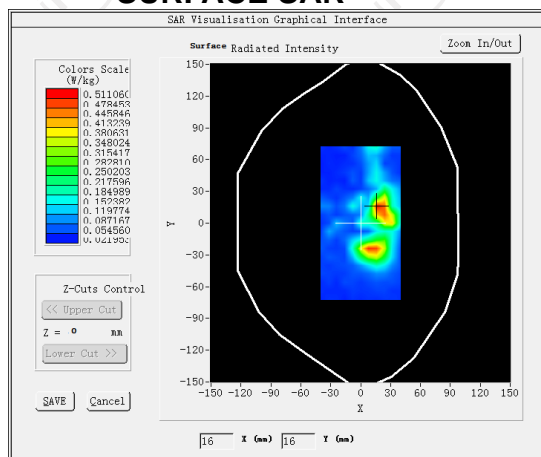
## 5.2G WLAN MEASUREMENT 1

SAR (Channel 36):

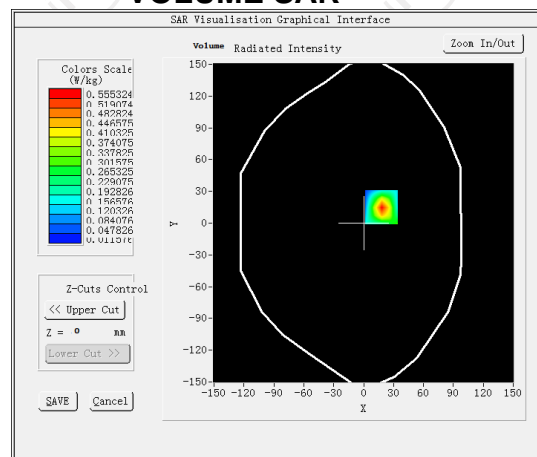
Date: 03/25/2025

Frequency (MHz)	5180.000000
Relative permittivity (real part)	35.991254
Relative permittivity (imaginary part)	16.162587
Conductivity (S/m)	4.701257
Variation (%)	-2.390000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm z=2mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11n ISM

### SURFACE SAR



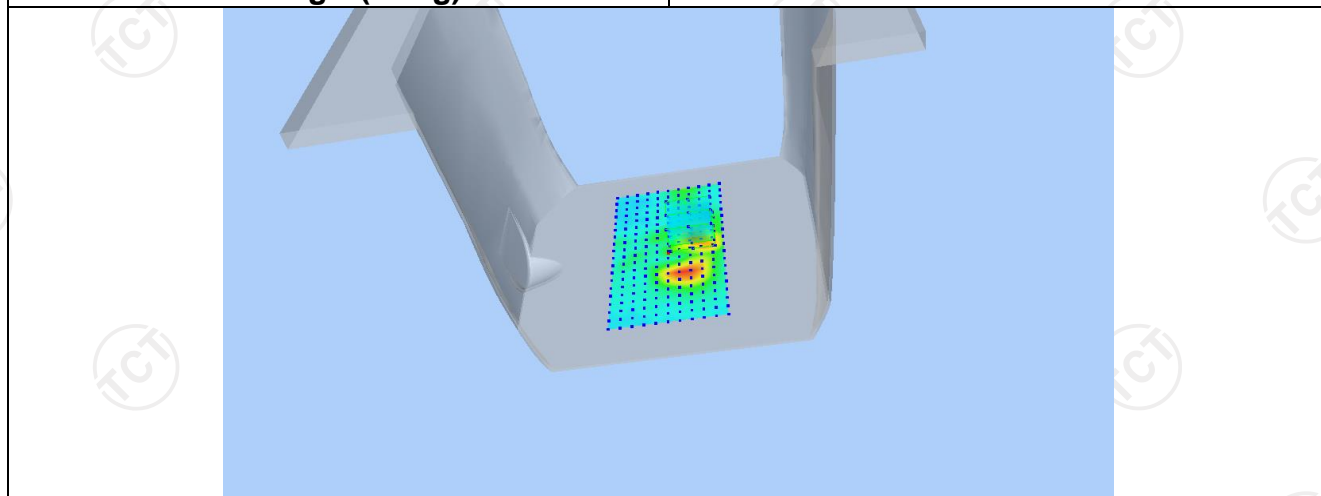
### VOLUME SAR



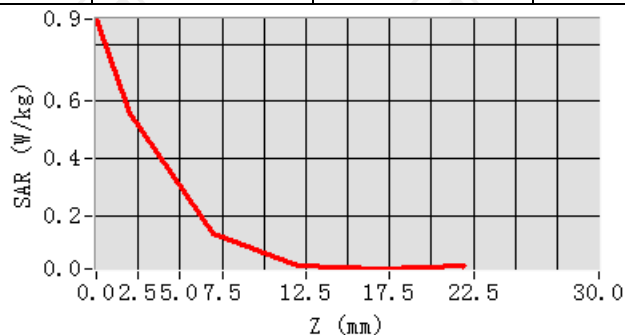
Maximum location: X=18.00, Y=15.00

SAR Peak: 0.92 W/kg

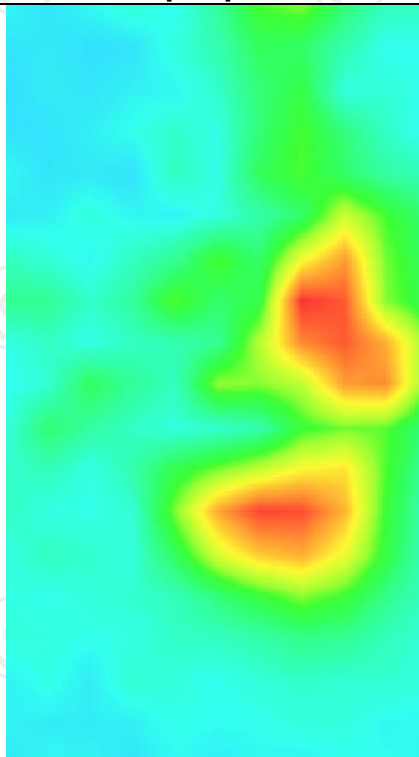
SAR 10g (W/Kg)	0.151283
SAR 1g (W/Kg)	0.324964



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.8869	0.5553	0.1669	0.0298	0.0164



Hot spot position



## 5.3G WLAN

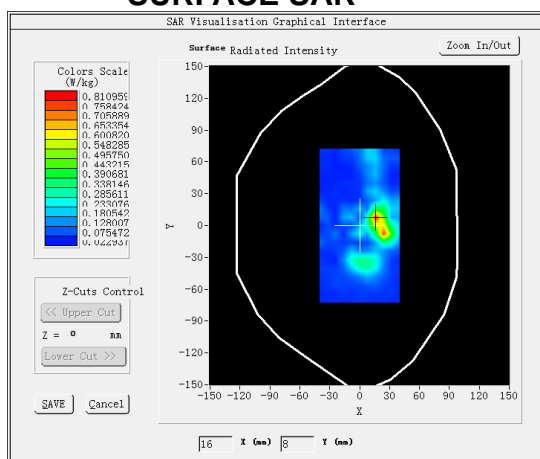
### MEASUREMENT 1

SAR (Channel 64):

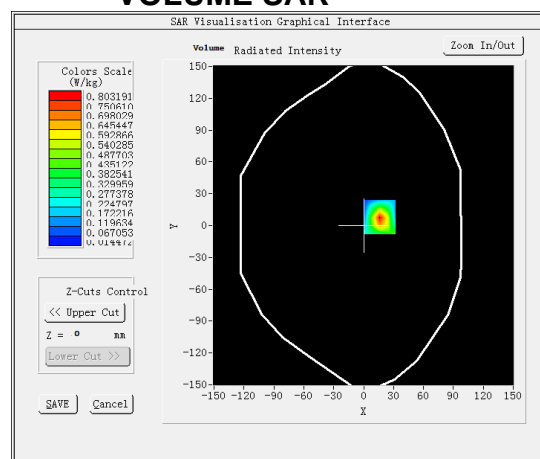
Date: 03/25/2025

Frequency (MHz)	5320.000000
Relative permittivity (real part)	36.102514
Relative permittivity (imaginary part)	16.201257
Conductivity (S/m)	4.701524
Variation (%)	-2.760000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm,Complete
Phantom	Validation plane
Device Position	Body Back
Band	IEEE 802.11a ISM

### SURFACE SAR



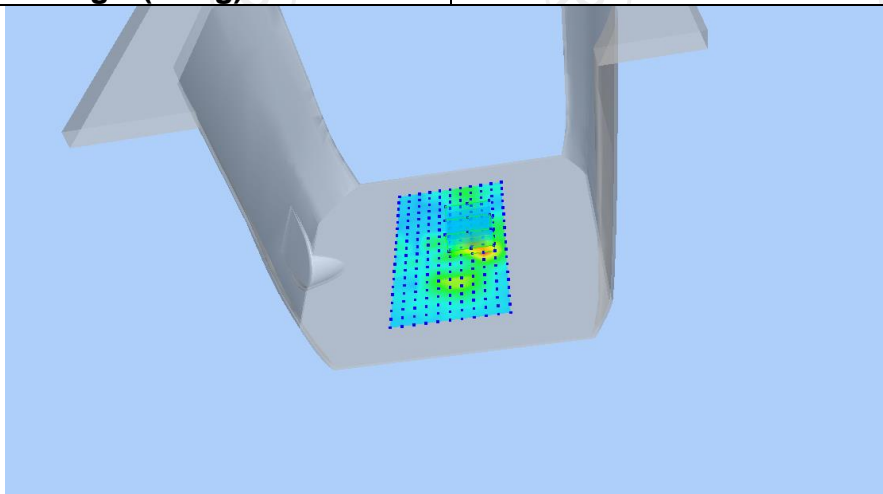
### VOLUME SAR



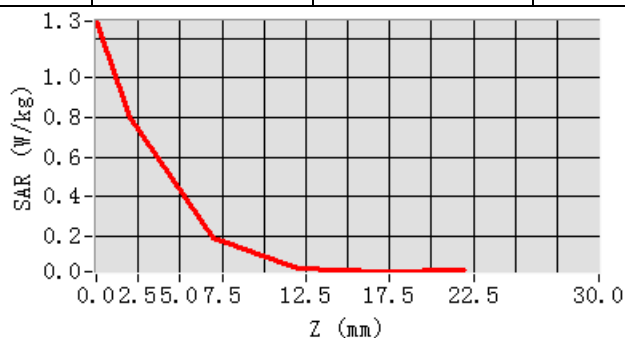
Maximum location: X=16.00, Y=8.00

SAR Peak: 1.35W/kg

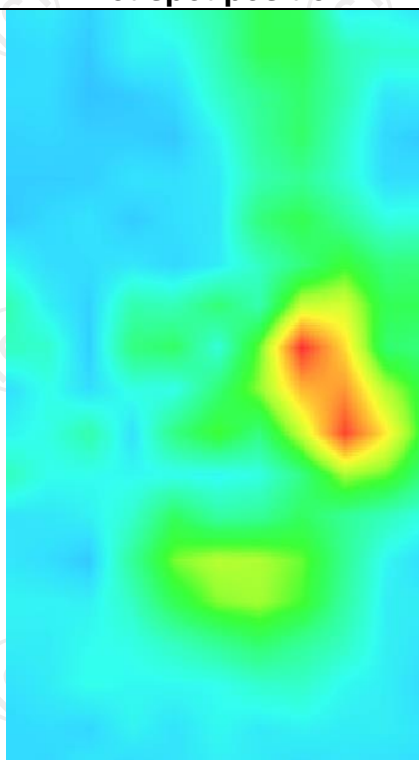
SAR 10g (W/Kg)	0.180540
SAR 1g (W/Kg)	0.467833



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.2887	0.7702	0.2415	0.0377	0.0176



Hot spot position



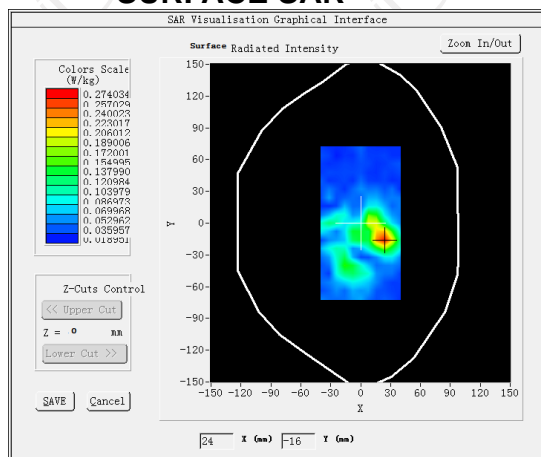
## 5.6G WLAN MEASUREMENT 1

SAR (Channel 100):

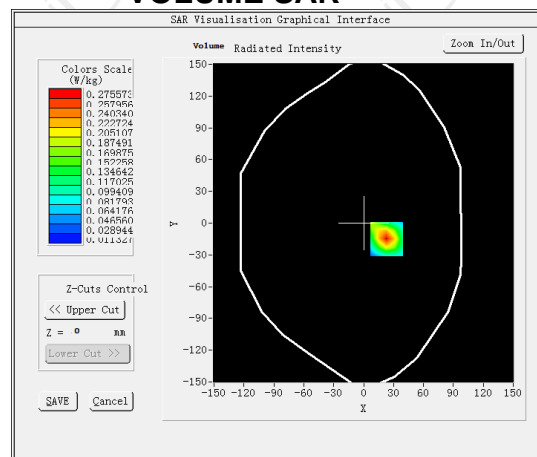
Date: 03/25/2025

Frequency (MHz)	5500.000000
Relative permittivity (real part)	35.581523
Relative permittivity (imaginary part)	16.392015
Conductivity (S/m)	5.152062
Variation (%)	2.730000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm z=2mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11ac ISM

### SURFACE SAR



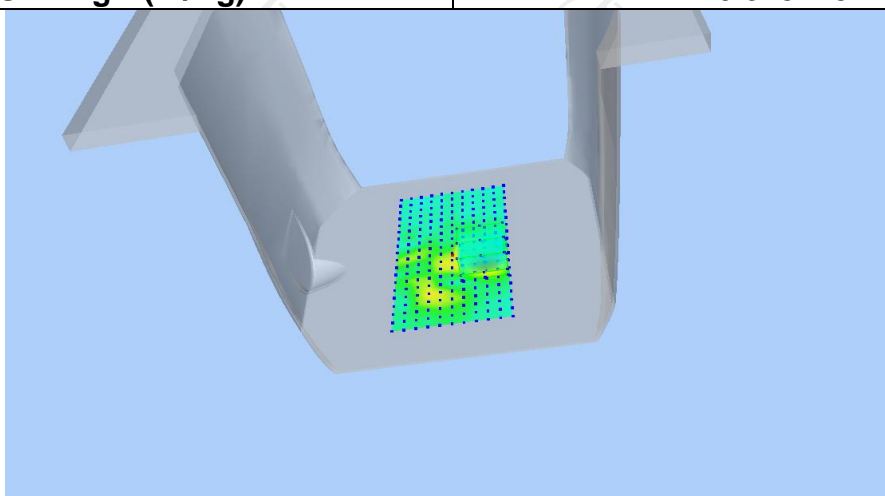
### VOLUME SAR



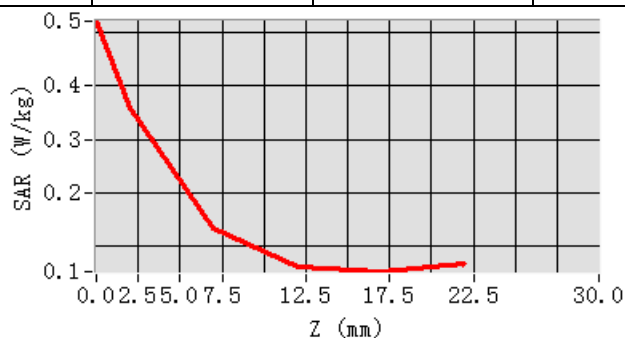
Maximum location: X=23.00, Y=-15.00

SAR Peak: 0.46W/kg

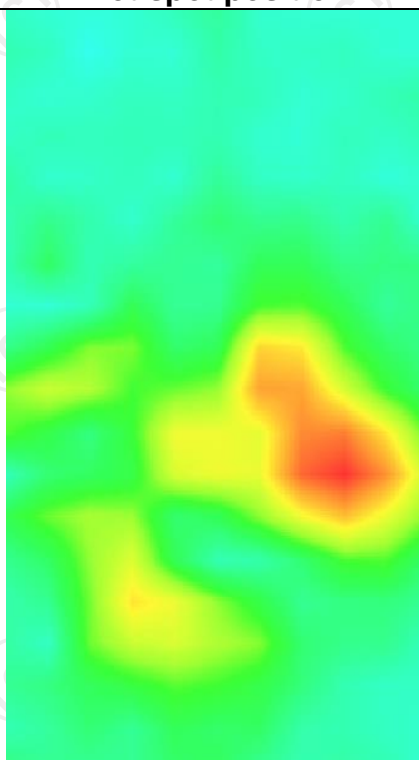
SAR 10g (W/Kg)	0.120581
SAR 1g (W/Kg)	0.325175



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5214	0.3580	0.1324	0.0606	0.0522



## Hot spot position





## 5.8G WLAN

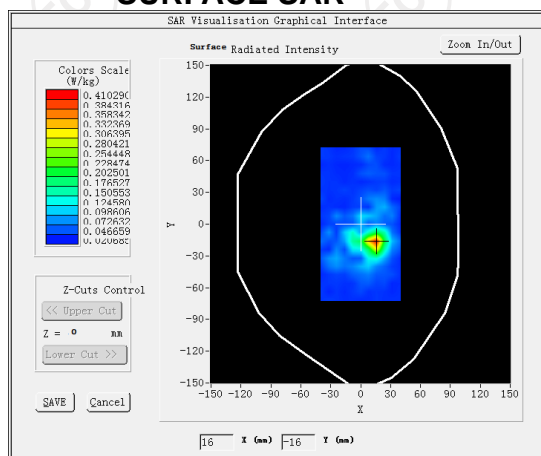
### MEASUREMENT 1

SAR (Channel 165):

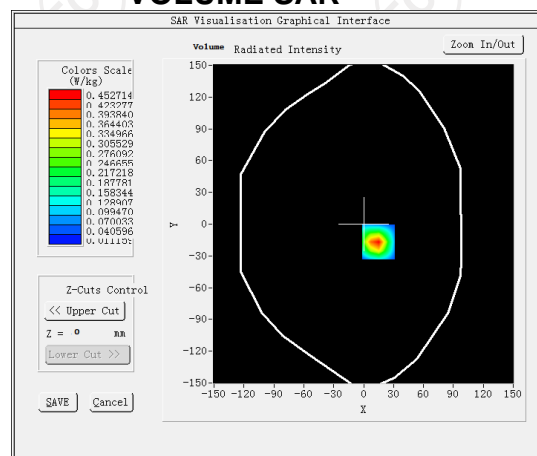
Date: 03/25/2025

Frequency (MHz)	5825.000000
Relative permittivity (real part)	35.607415
Relative permittivity (imaginary part)	16.368152
Conductivity (S/m)	5.465215
Variation (%)	1.470000
Area Scan	dx=8mm dy=8mm, h= 5.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm z=2mm,Complete
Phantom	Validation plane
Device Position	Body back
Band	IEEE 802.11ac ISM

### SURFACE SAR



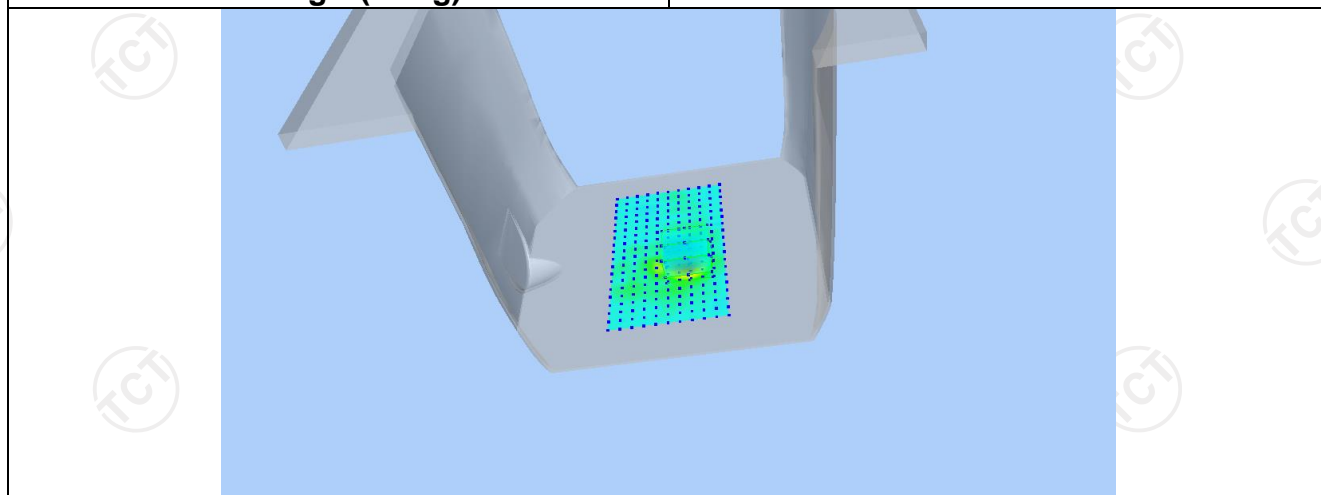
### VOLUME SAR



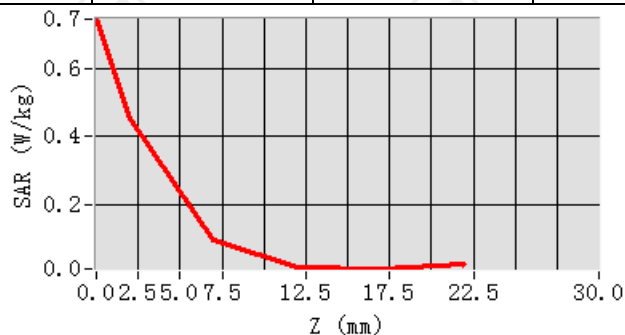
Maximum location: X=15.00, Y=-17.00

SAR Peak: 0.79 W/kg

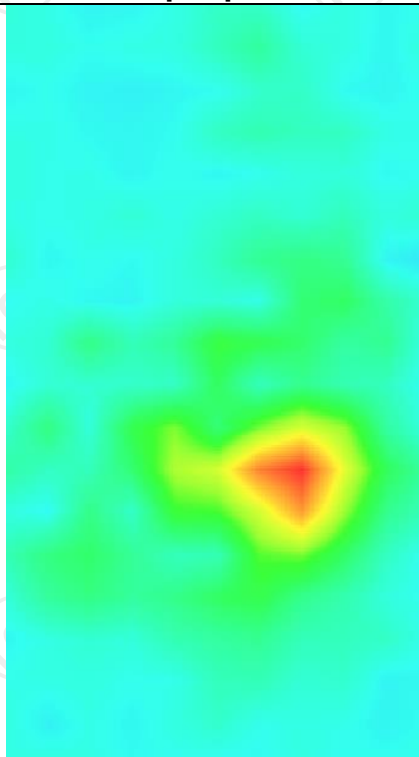
SAR 10g (W/Kg)	0.106824
SAR 1g (W/Kg)	0.265155



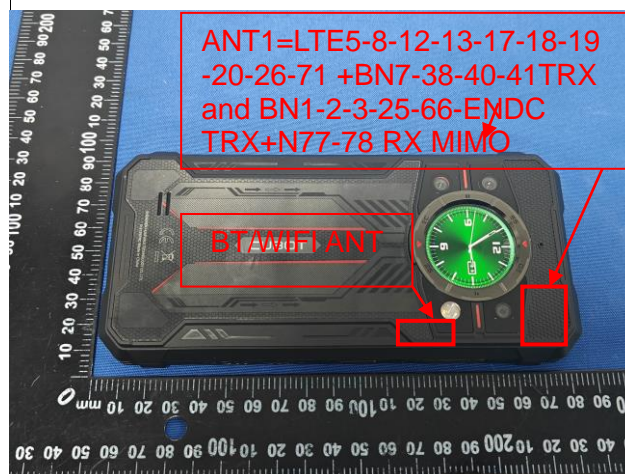
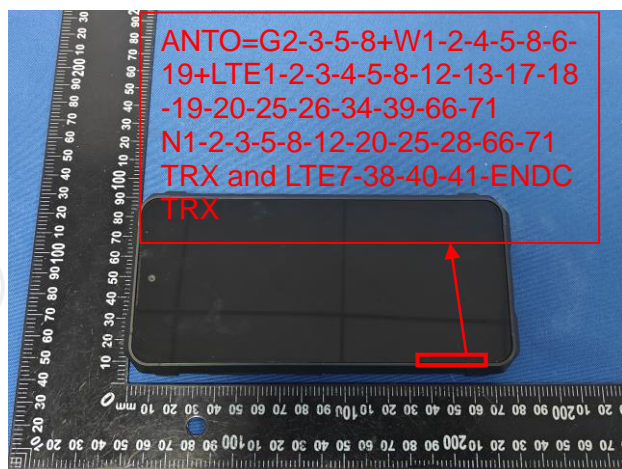
Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.7458	0.4215	0.1325	0.0173	0.0115



Hot spot position



## Appendix A: EUT Photos



### Note:

1. Diversity antenna is used to improve the acceptance of the main antenna. It does not have a transmitter function.

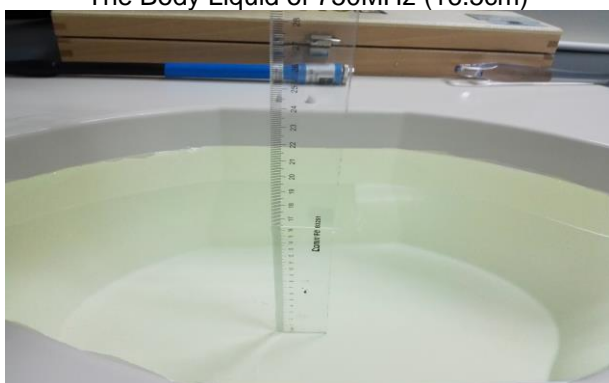
## Liquid Setup Photos



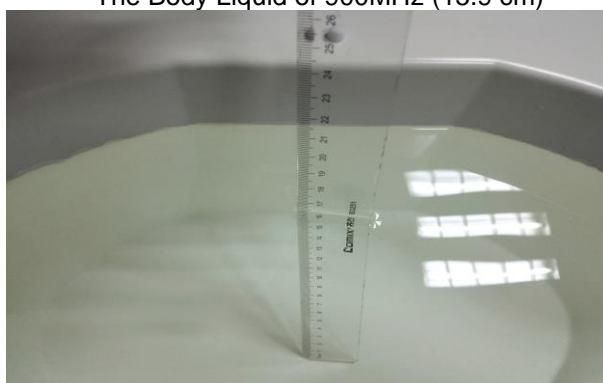
The Body Liquid of 750MHz (16.5cm)



The Body Liquid of 900MHz (15.9 cm)



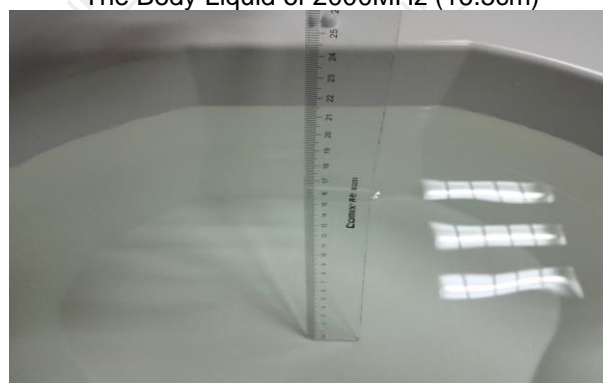
The Body Liquid of 1800MHz (16.3cm)



The Body Liquid of 2000MHz (16.5cm)



The Body Liquid 2450MHz (16.4cm)



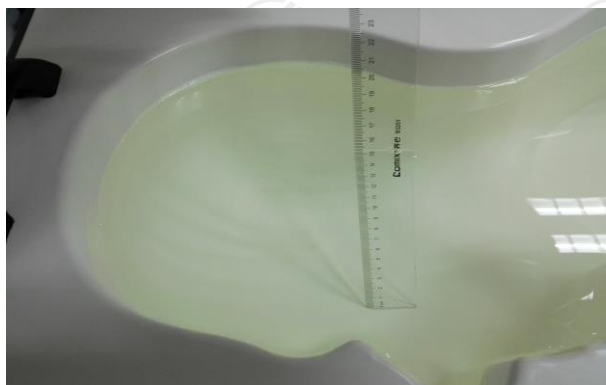
The Body Liquid of 2600MHz (16.6cm)



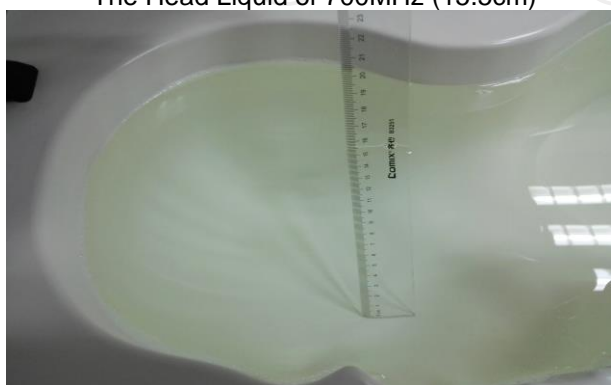
The Body Liquid of 5000-6000MHz (15.2 cm)



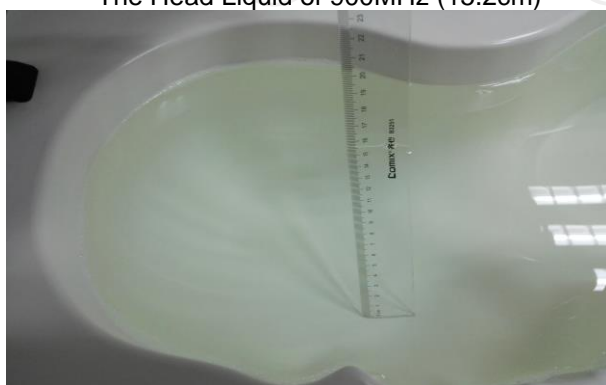
The Head Liquid of 700MHz (15.5cm)



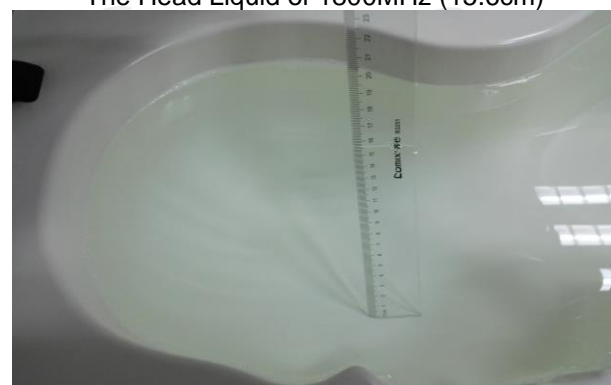
The Head Liquid of 900MHz (15.2cm)



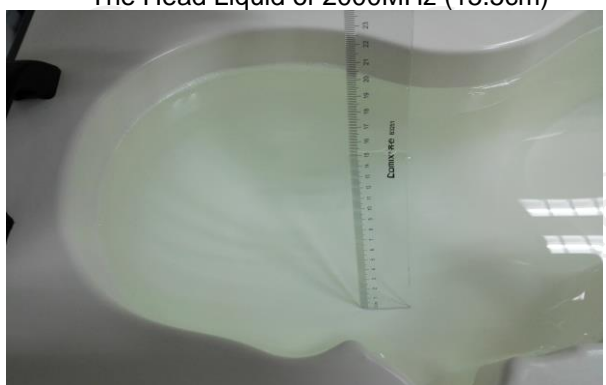
The Head Liquid of 1800MHz (15.6cm)



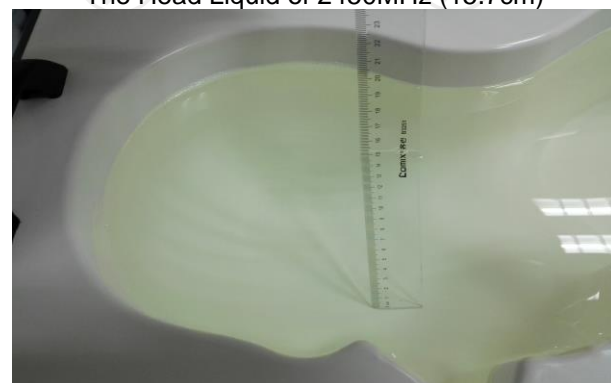
The Head Liquid of 2000MHz (15.5cm)



The Head Liquid of 2450MHz (15.7cm)



The Head Liquid of 2600MHz (15.1cm)



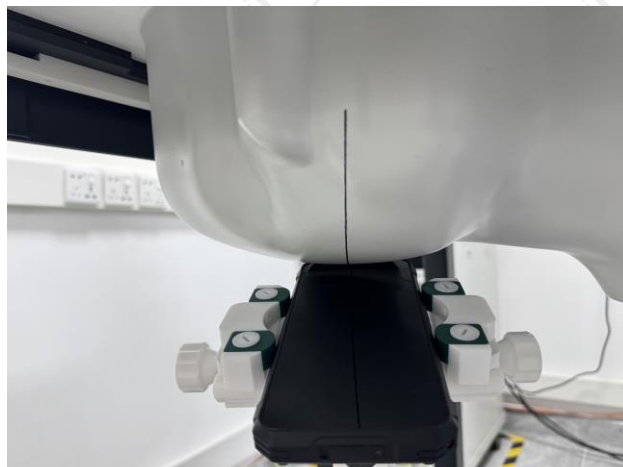
The Head Liquid of 5000-6000MHz (15.3cm)



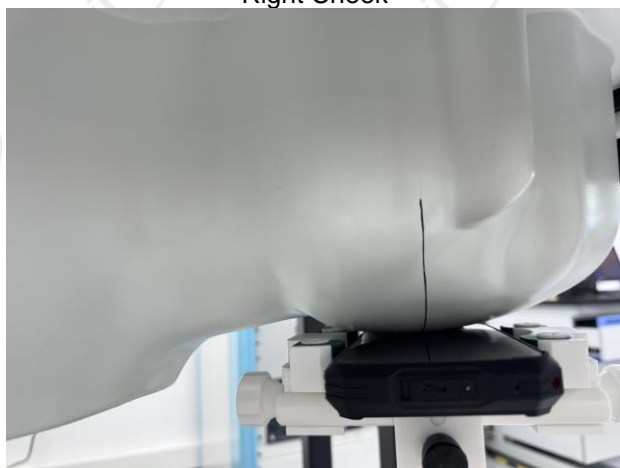
## Appendix B: Test Setup Photos



Right Cheek



Right Tilted



Left Cheek



Left Tilted



Body worn – Front(5 mm)



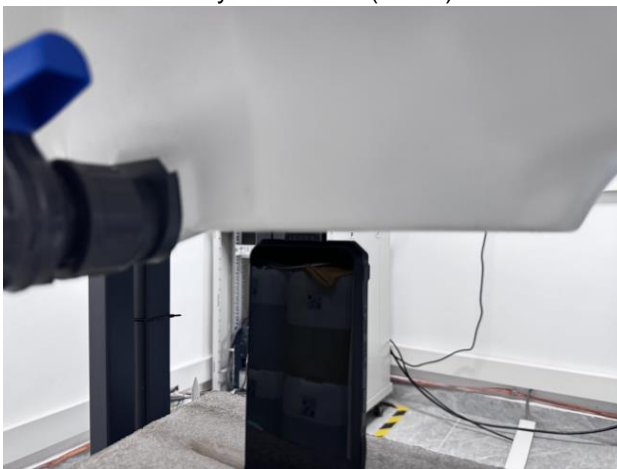
Body worn – Back(5 mm)



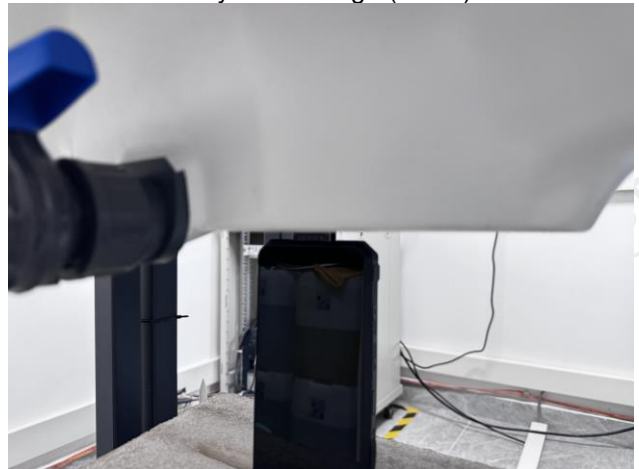
Body worn – Left(5 mm)



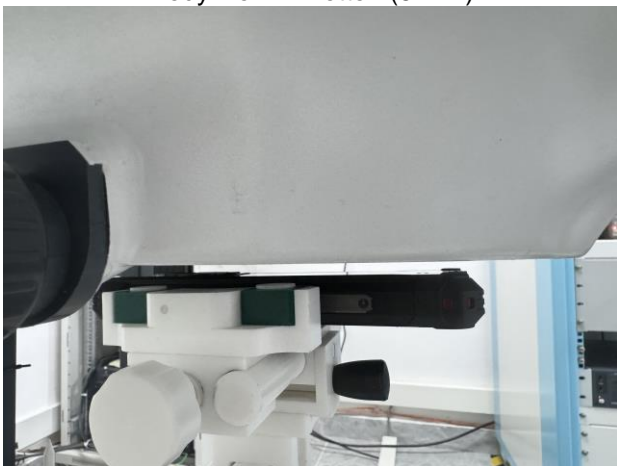
Body worn – Right(5 mm)



Body worn – Bottom(5 mm)



Body worn – Top(5 mm)



Wrist Worn –Back (0 mm)

## Appendix C: Probe Calibration Certificate



### COMOSAR E-Field Probe Calibration Report

Ref : ACR.180.7.22.BES.B

**SHENZHEN TCT TESTING TECHNOLOGY CO.,LTD**  
2101 & 2201, ZHENCHANG FACTORY RENSHAN INDUSTRIAL  
ZONE, FUHAI SUBDISTRICT, BAO'AN DISTRICT SHENZHEN,  
GUANGDONG, CHINA

**MVG COMOSAR DOSIMETRIC E-FIELD PROBE**  
SERIAL NO.: SN 25/22 EPG0375

Calibrated at MVG  
Z.I. de la pointe du diable  
Technopôle Brest Iroise – 295 avenue Alexis de Rochon  
29280 PLOUZANE - FRANCE

Calibration date: 06/29/2024



Accreditations #2-6789  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

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#### Summary:

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





## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

	Name	Function	Date	Signature
Prepared by :	Jérôme Le Gall	Measurement Responsible	6/30/2024	
Checked & approved by:	Jérôme Luc	Technical Manager	6/30/2024	
Authorized by:	Yann Toutain	Laboratory Director	6/30/2024	

	Customer Name
Distribution :	Shenzhen TCT Testing Technology Co.,Ltd

Issue	Name	Date	Modifications
A	Jérôme Le Gall	6/30/2024	Initial release



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

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## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

**1 DEVICE UNDER TEST**

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 25/22 EPG0375
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.197 MΩ Dipole 2: R2=0.230 MΩ Dipole 3: R3=0.208 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 affect. All calibrations / measurements performed meet the fore mentioned standards.

**3.1 LINEARITY**

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

**3.2 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.

Page: 4/11

**Template\_ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK**

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### 3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

### 3.4 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°).

### 3.1 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
$\Delta_{step}$	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
$\delta$	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;
$\Delta SAR_{be}$	in percent of SAR is the deviation between the measured SAR value, at the distance $d_{be}$ from the boundary, and the analytical SAR value.

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



## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

### 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 an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Expanded uncertainty 95 % confidence level $k = 2$					14 %

### 5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

#### 5.1 SENSITIVITY IN AIR

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 ( $\mu\text{V}/(\text{V}/\text{m})^2$ )
0.64	0.53	0.44

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
106	108	109

Calibration curves  $e_i=f(V)$  ( $i=1,2,3$ ) allow to obtain E-field value using the formula:

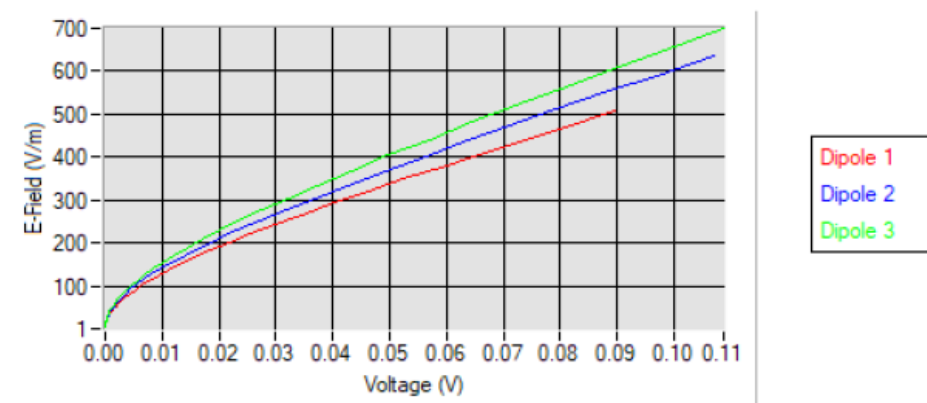
$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



## COMOSAR E-FIELD PROBE CALIBRATION REPORT

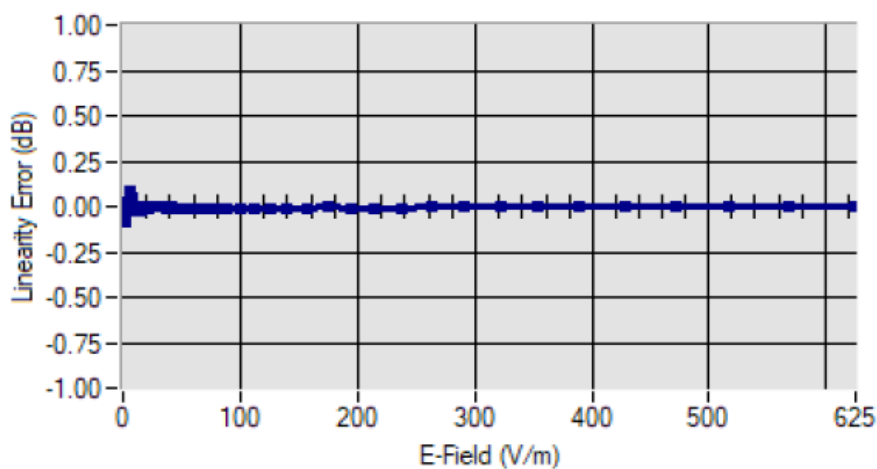
Ref: ACR.180.7.22.BES.B

### Calibration curves



### 5.2 LINEARITY

#### Linearity



Linearity: +/- 1.94% (+/- 0.09dB)

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## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

### 5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL750	750	2.44
BL750	750	2.47
HL900	900	2.55
BL900	900	2.64
HL1800	1800	2.99
BL1800	1800	3.05
HL2000	2000	3.33
BL2000	2000	3.47
HL2450	2450	3.70
BL2450	2450	3.83
HL2600	2600	3.43
BL2600	2600	3.53
HL3500	3500	3.22
BL3500	3500	3.09
HL3700	3700	3.45
BL3700	3700	3.15
HL4600	4600	3.30
BL4600	4600	3.70
HL5200	5200	2.48
BL5200	5200	2.39
HL5600	5600	2.91
BL5600	5600	2.77
HL5800	5800	2.63
BL5800	5800	2.56

LOWER DETECTION LIMIT: 7mW/kg



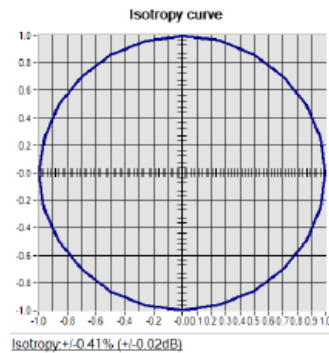


COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

5.4 ISOTROPY

**HL1800 MHz**







## COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

### 6 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	08/2024	08/2027
Network Analyzer	Agilent 8753ES	MY40003210	10/2023	10/2026
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Multimeter	Keithley 2000	1160271	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	03/2025	03/2028
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	06/2024	06/2027
Power Meter	Rohde & Schwarz NRVD	832839-056	11/2023	11/2026
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22.BES.B

Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2024	06/2027

## Appendix D: Dipole Calibration Report

SID750



### SAR Reference Dipole Calibration Report

Ref : ACR.156.3.15.SATU.A

**SHENZHEN TCT TESTING TECHNOLOGY CO., LTD**  
2101&2201, ZHENCHANG FACTORY, RENSHAN  
INDUSTRIAL ZONE, FUHAI SUBDISTRICT, BAOAN  
DISTRICT, SHENZHEN, GUANGDONG, CHINA

**COMOSAR REFERENCE DIPOLE**  
**FREQUENCY: 750 MHZ**  
**SERIAL NO.: SN 16/15 DIP 0G750-368**

**Calibrated at MVG US**  
2105 Barrett Park Dr. - Kennesaw, GA 30144



**Calibration Date: 06/05/2024**

#### Summary:

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.3.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	
Checked by :	Jérôme LUC	Product Manager	06/05/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	

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

Issue	Date	Modifications
A	06/05/2024	Initial release

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.3.15.SATU.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 0G750-368
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole

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#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

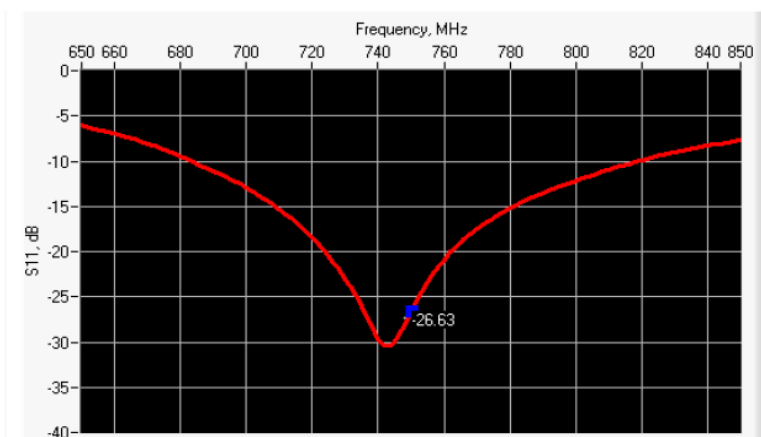
Ref: ACR.156.3.15.SATU.A

10 g

20.1 %

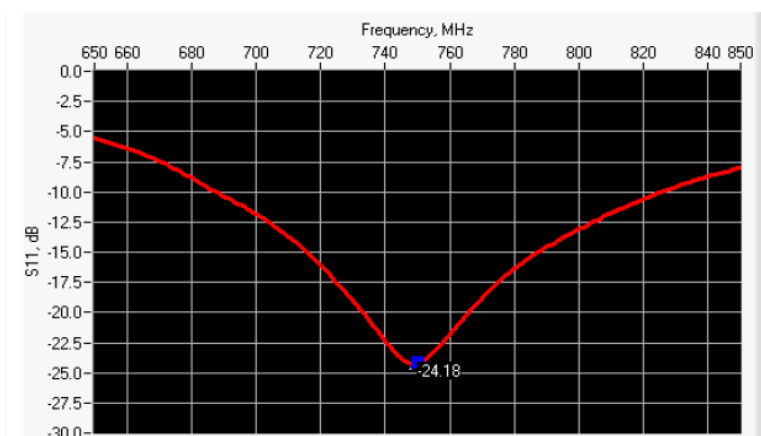
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
750	-26.63	-20	54.1 $\Omega$ + 1.4 j $\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
750	-24.18	-20	52.4 $\Omega$ + 5.8 j $\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 $\pm$ 1 %		250.0 $\pm$ 1 %		6.35 $\pm$ 1 %	

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SAR REFERENCE DIPOLE CALIBRATION REPORT

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450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.	PASS	100.0 ±1 %.	PASS	6.35 ±1 %.	PASS
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %	PASS	0.89 ±5 %	PASS
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

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1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: $\epsilon_{ps}$ : 41.8 $\sigma$ : 0.90
Distance between dipole center and liquid	15.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	750 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49	8.31 (0.73)	5.55	5.71 (0.54)
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

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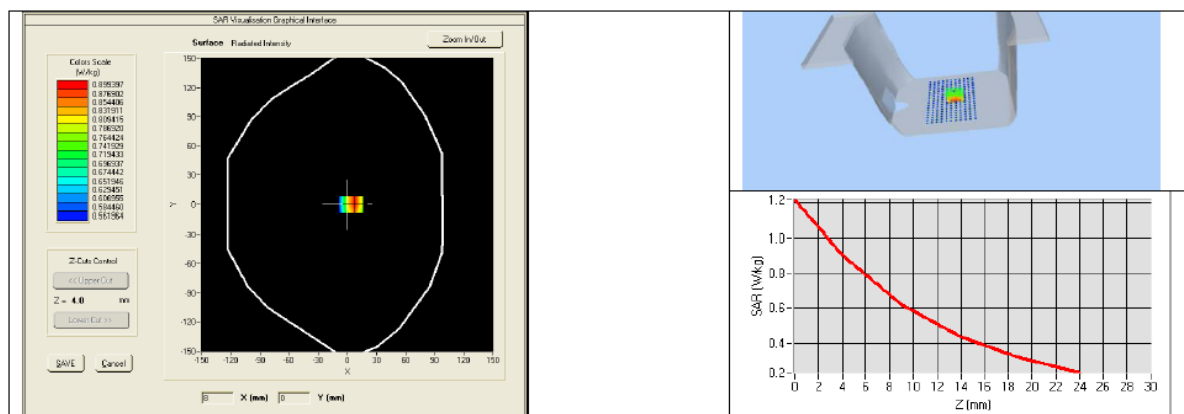
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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.3.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %	PASS	0.96 $\pm$ 5 %	PASS
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %		1.05 $\pm$ 5 %	
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %		1.95 $\pm$ 5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

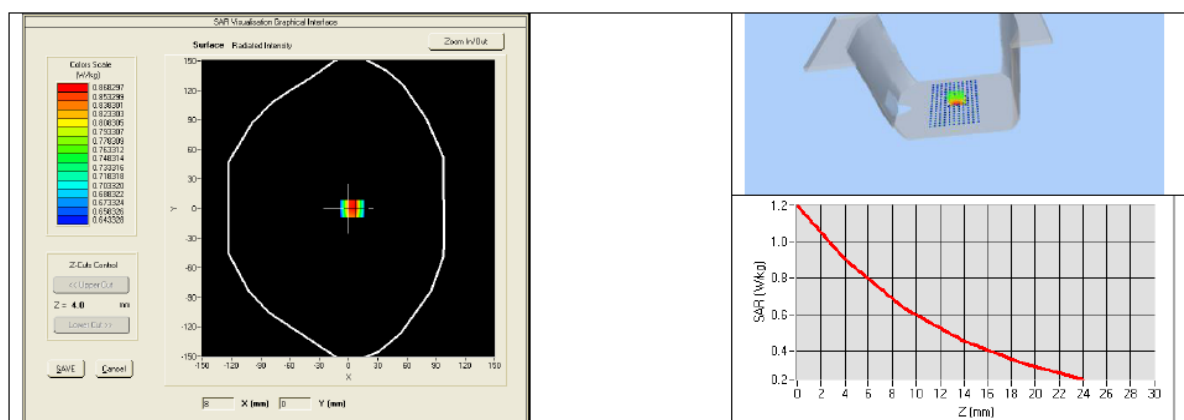
Ref: ACR.156.3.15.SATUA

2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: $\epsilon_{ps}$ : 56.3 $\sigma$ : 0.98
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
750	8.46 (0.77)	5.81 (0.45)



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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.3.15.SATU.A

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2025	02/2026
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	02/2024	02/2027

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## SAR Reference Dipole Calibration Report

Ref : ACR.156.5.15.SATU.A

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

**2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL ZONE,  
FUHAI SUBDISTRICT, BAOAN DISTRICT, SHENZHEN, GUANGDONG, CHINA**

**MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 900 MHZ**

**SERIAL NO.: SN 16/15 DIP 0G900-370**

**Calibrated at MVG US**

**2105 Barrett Park Dr. - Kennesaw, GA 30144**



**Calibration Date: 06/05/2024**

### *Summary:*

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.5.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	<i>JL</i>
Checked by :	Jérôme LUC	Product Manager	06/05/2024	<i>JL</i>
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	<i>Kim Rutkowski</i>

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

Issue	Date	Modifications
A	06/05/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.172.5.15.SATU.A

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.172.5.15.SATU.A

**1 INTRODUCTION**

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 0G900-370
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

**3 PRODUCT DESCRIPTION****3.1 GENERAL INFORMATION**

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



**Figure 1 – MVG COMOSAR Validation Dipole**

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#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

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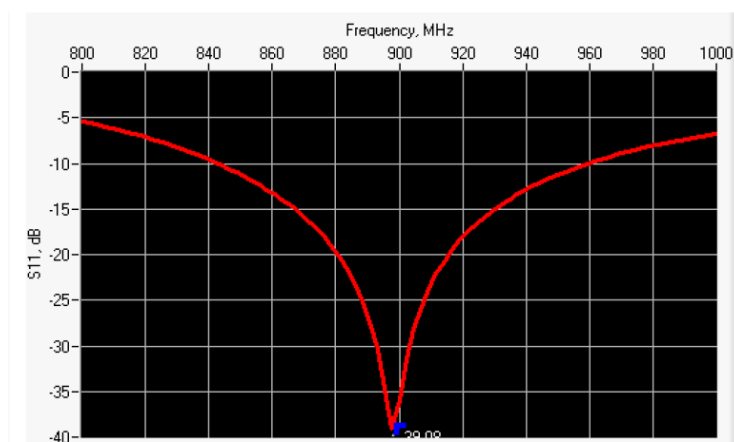
## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.5.15.SATU.A

10 g	20.1 %
------	--------

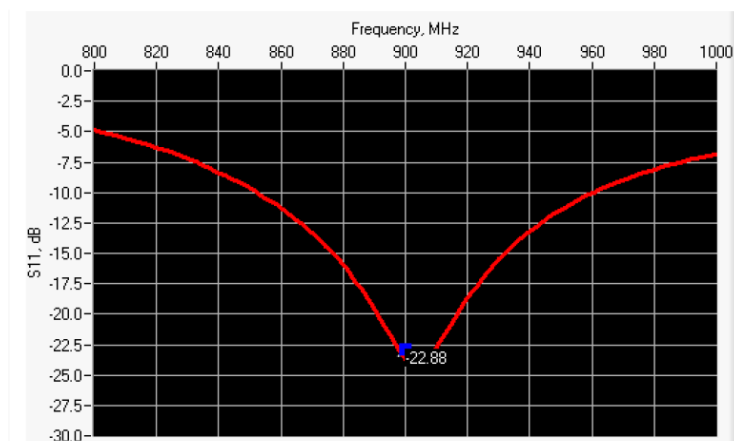
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
900	-39.08	-20	$51.7 \Omega + 0.6 j\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
900	-22.88	-20	$53.2 \Omega + 6.2 j\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.5.15.SATU.A

450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.	PASS	83.3 ±1 %.	PASS	3.6 ±1 %.	PASS
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %	PASS	0.97 ±5 %	PASS
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

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1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: $\epsilon_{ps}' : 42.1$ $\sigma : 0.98$
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9	10.63 (1.14)	6.99	6.81 (0.64)
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

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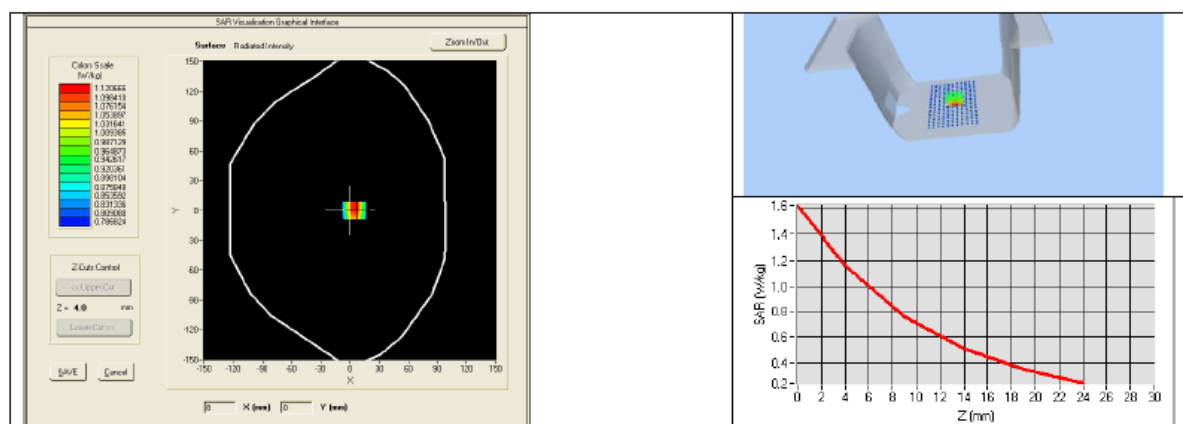
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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.5.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %		0.96 $\pm$ 5 %	
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %	PASS	1.05 $\pm$ 5 %	PASS
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %		1.95 $\pm$ 5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

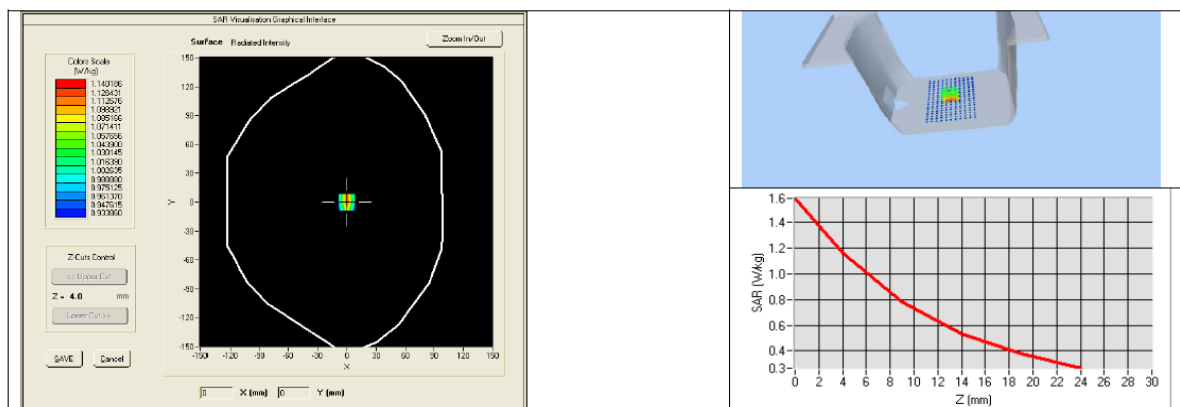
Ref: ACR.156.5.15.SATU.A

2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: $\epsilon_r$ : 56.4 $\sigma$ : 1.08
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
900	10.84(1.16)	6.86 (0.73)



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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.5.15.SATU.A

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2024	02/2027
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	02/2024	02/2027

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## SAR Reference Dipole Calibration Report

Ref : ACR.156.6.15.SATU.A

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

2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL  
ZONE, FUHAI SUBDISTRICT, BAOAN DISTRICT, SHENZHEN,  
GUANGDONG, CHINA

**MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 1800 MHZ**

**SERIAL NO.: SN 16/15 DIP 1G800-371**

**Calibrated at MVG US**

2105 Barrett Park Dr. - Kennesaw, GA 30144



**Calibration Date: 06/05/2024**

### Summary:

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	<i>JS</i>
Checked by :	Jérôme LUC	Product Manager	06/05/2024	<i>JS</i>
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	<i>Kim Rutkowski</i>

	Customer Name
Distribution :	SSHENZHEN TCT TESTING TECHNOLOGY CO., LTD

Issue	Date	Modifications
A	06/05/2024	Initial release

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

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8	List of Equipment .....	11

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

### 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 1G800-371
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

### 3 PRODUCT DESCRIPTION

#### 3.1 GENERAL INFORMATION

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



**Figure 1** – MVG COMOSAR Validation Dipole

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#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

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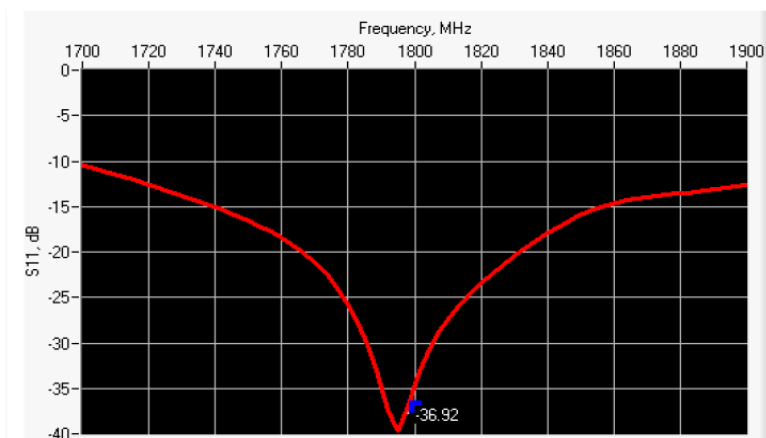
## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

10 g	20.1 %
------	--------

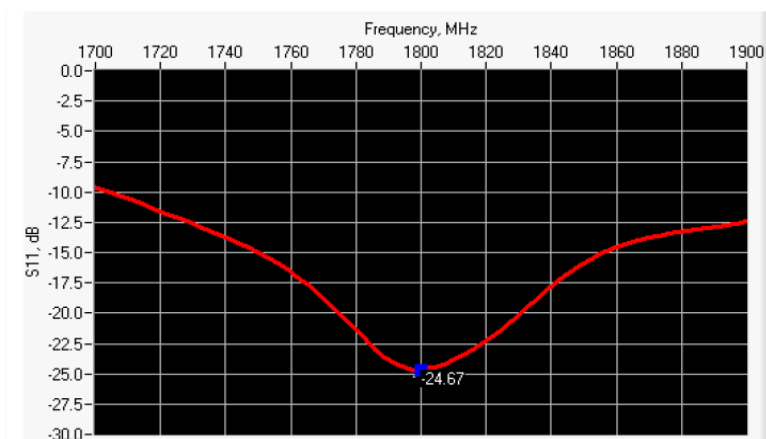
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1800	-36.92	-20	48.3 $\Omega$ - 0.5 j $\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
1800	-24.67	-20	47.6 $\Omega$ - 5.1 j $\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 $\pm$ 1 %		250.0 $\pm$ 1 %		6.35 $\pm$ 1 %	

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Ref: ACR.156.6.15.SATU.A

450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.	PASS	41.7 ±1 %.	PASS	3.6 ±1 %.	PASS
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

1800	40.0 ±5 %	PASS	1.40 ±5 %	PASS
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: $\epsilon_p$ : 41.8 $\sigma$ : 1.38
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4	37.67(3.60)	20.1	20.23 (2.15)

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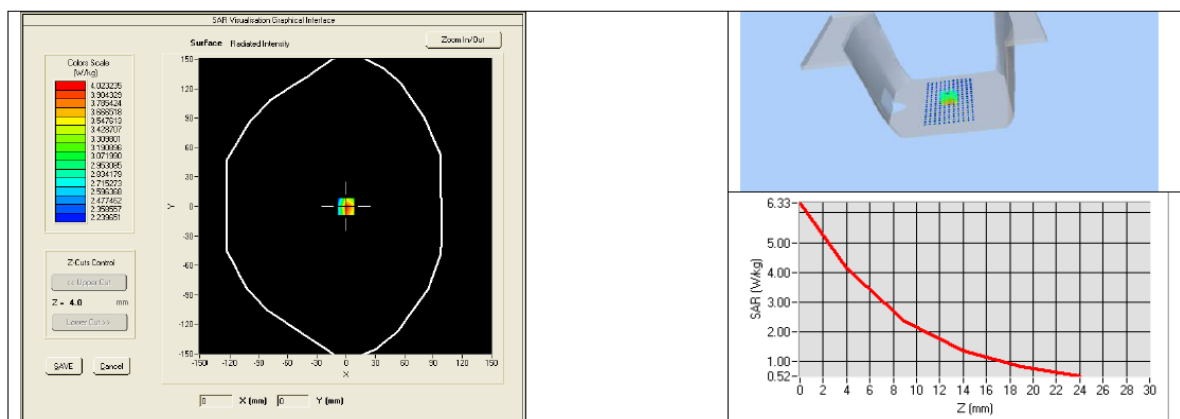




## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %		0.96 $\pm$ 5 %	
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %		1.05 $\pm$ 5 %	
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %	PASS	1.52 $\pm$ 5 %	PASS
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %		1.95 $\pm$ 5 %	

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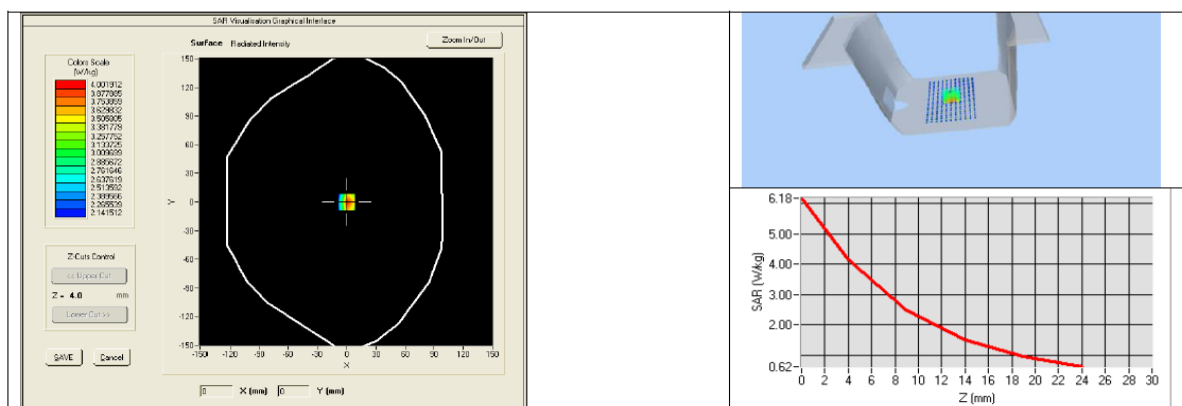
Ref: ACR.156.6.15.SATU.A

2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: $\epsilon_p'$ : 53.0 sigma : 1.52
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
1800	37.69 (3.65)	20.57 (2.00)



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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.6.15.SATU.A

### 8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2024	02/2027
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	02/2024	02/2027

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## SAR Reference Dipole Calibration Report

Ref : ACR.156.8.15.SATU.A

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

2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL  
FUHAI SUBDISTRICT, BAOAN DISTRICT, SHENZHEN,  
GUANGDONG, CHINA

**MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2000 MHZ**

**SERIAL NO.: SN 16/15 DIP 2G000-373**

**Calibrated at MVG US**

2105 Barrett Park Dr. - Kennesaw, GA 30144



**Calibration Date: 06/05/2024**

### Summary:

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.8.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	
Checked by :	Jérôme LUC	Product Manager	06/05/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	

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

Issue	Date	Modifications
A	06/05/2024	Initial release

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.8.15.SATU.A

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.8.15.SATU.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 2G000-373
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

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



**Figure 1** – MVG COMOSAR Validation Dipole

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#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000 MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

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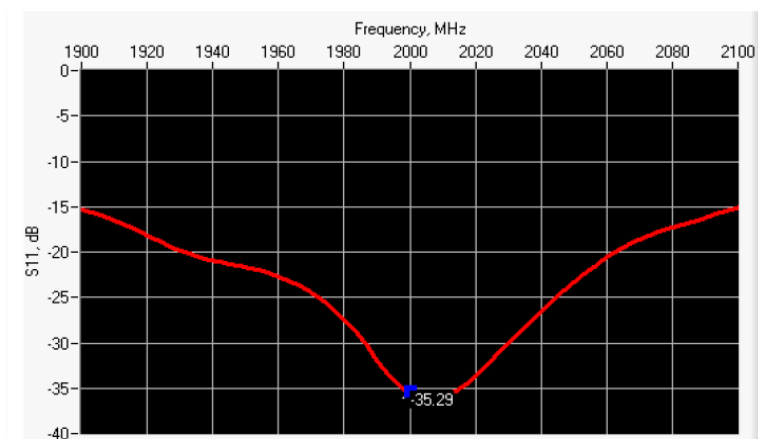
## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.8.15.SATU.A

10 g	20.1 %
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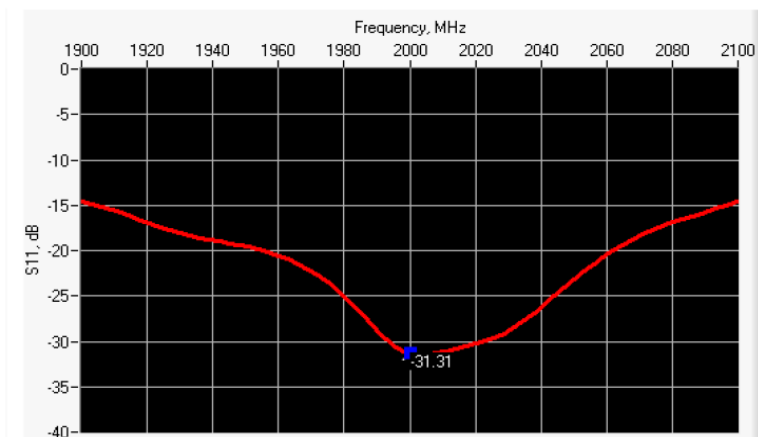
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2000	-35.29	-20	48.4 $\Omega$ - 0.6 j $\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2000	-31.31	-20	51.3 $\Omega$ + 2.2 j $\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 $\pm$ 1 %		250.0 $\pm$ 1 %		6.35 $\pm$ 1 %	

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450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.	PASS	37.5 ±1 %.	PASS	3.6 ±1 %.	PASS
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %	PASS	1.40 ±5 %	PASS
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 40.1 sigma: 1.43
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

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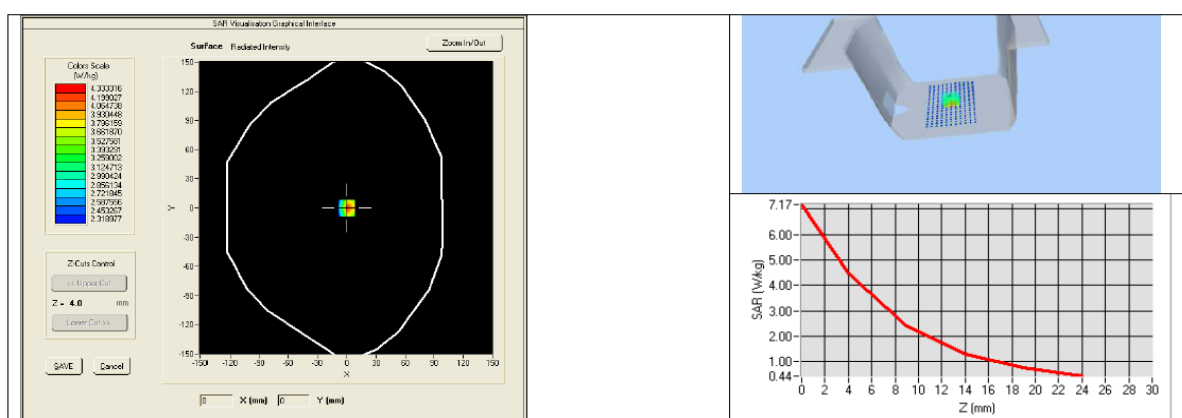
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Ref: ACR.156.8.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1	42.16 (4.34)	21.1	21.18 (2.07)
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %		0.96 $\pm$ 5 %	
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %		1.05 $\pm$ 5 %	
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %	PASS	1.52 $\pm$ 5 %	PASS
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %		1.95 $\pm$ 5 %	

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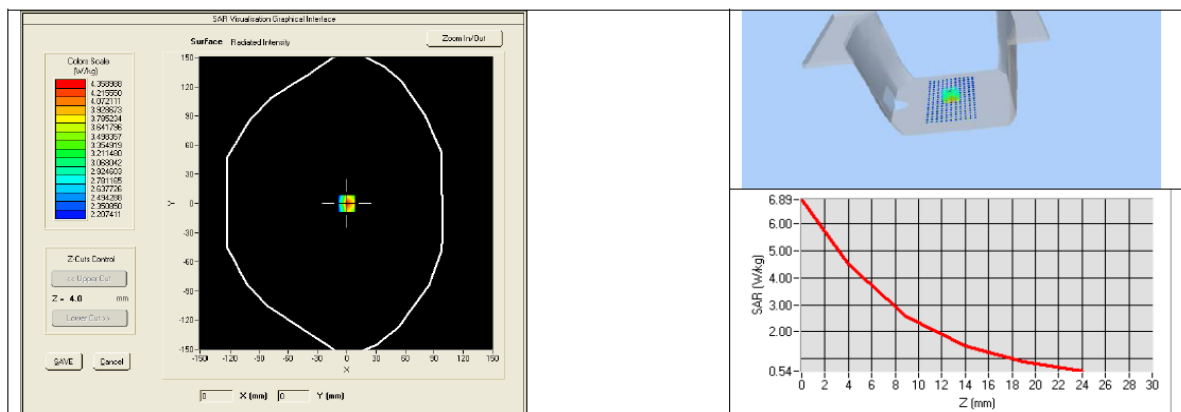
Ref: ACR.156.8.15.SATU.A

2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: $\epsilon_p$ : 53.6 $\sigma$ : 1.54
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2000	41.51 (4.13)	21.32 (2.19)



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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.8.15.SATU.A

### 8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2024	02/2027
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	02/2024	02/2027



## SAR Reference Dipole Calibration Report

Ref: ACR.156.9.15.SATU.A

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

2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL  
FUHAI SUBDISTRICT, BAOAN DISTRICT, SHENZHEN,  
GUANGDONG, CHINA

**MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2450 MHZ**

**SERIAL NO.: SN 16/15 DIP 2G450-374**

**Calibrated at MVG US**

2105 Barrett Park Dr. - Kennesaw, GA 30144



**Calibration Date: 06/05/2024**

### Summary:

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	
Checked by :	Jérôme LUC	Product Manager	06/05/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	

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

Issue	Date	Modifications
A	06/05/2024	Initial release





## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 2G450-374
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

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



**Figure 1** – MVG COMOSAR Validation Dipole

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#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

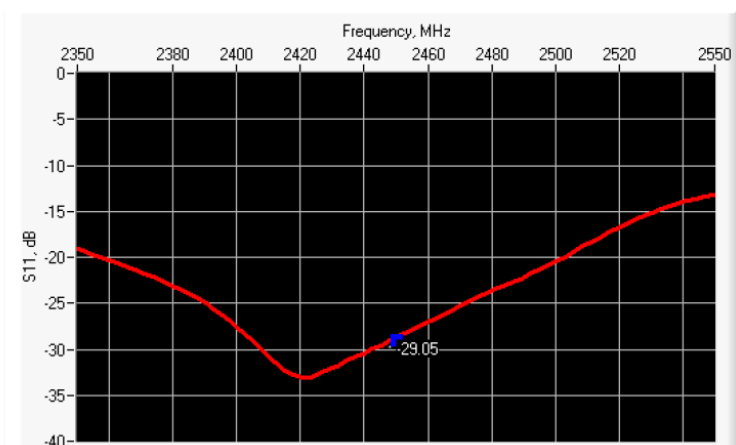
Ref: ACR.156.9.15.SATU.A

10 g

20.1 %

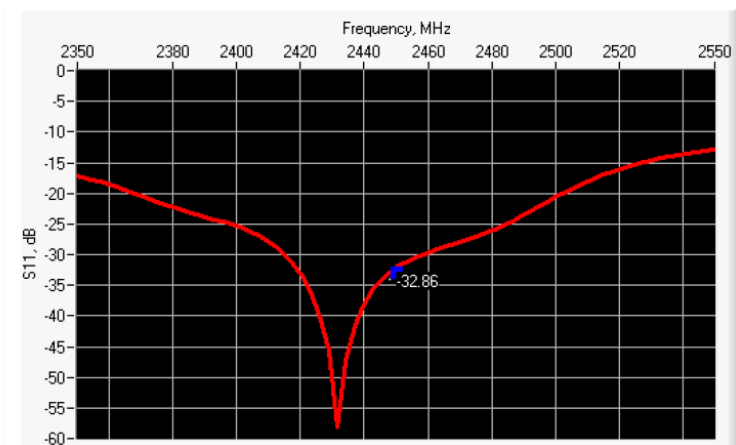
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-29.05	-20	46.7 $\Omega$ - 0.2 j $\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-32.86	-20	48.6 $\Omega$ - 1.9 j $\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 $\pm$ 1 %		250.0 $\pm$ 1 %		6.35 $\pm$ 1 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.1569.15.SATU.A

450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.	PASS	30.4 ±1 %.	PASS	3.6 ±1 %.	PASS
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %	PASS	1.80 ±5 %	PASS
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: $\epsilon_{ps}' : 38.3$ $\sigma : 1.80$
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	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

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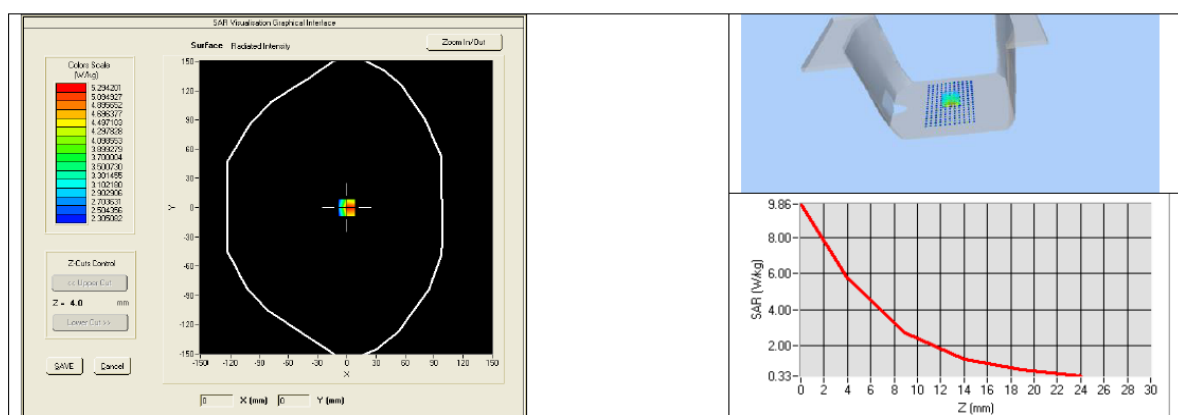
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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4	53.26 (5.38)	24	24.15 (2.49)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %		0.96 $\pm$ 5 %	
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %		1.05 $\pm$ 5 %	
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %	PASS	1.95 $\pm$ 5 %	PASS

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

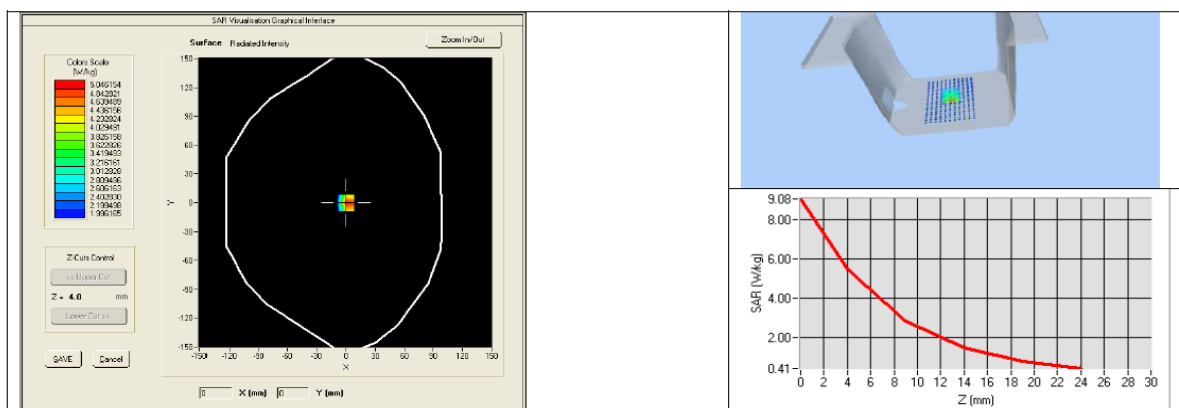
Ref: ACR.156.9.15.SATU.A

2600	52.5 ±5 %		2.16 ±5 %	
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: $\epsilon_{ps}'$ : 52.7 sigma : 1.94
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	50.63 (5.01)	23.40 (2.37)



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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.9.15.SATU.A

### 8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2024	02/2027
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	02/2024	02/2027

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## SAR Reference Dipole Calibration Report

Ref : ACR.156.10.15.SATU.A

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

**2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL  
ZONE, FUHAI SUBDISTRICT, BAOAN DISTRICT,**

**SHENZHEN, GUANGDONG, CHINA**

**MVG COMOSAR REFERENCE DIPOLE**

**FREQUENCY: 2600 MHZ**

**SERIAL NO.: SN 16/15 DIP 2G600-375**

**Calibrated at MVG US**

**2105 Barrett Park Dr. - Kennesaw, GA 30144**



Calibration CERT #2246-02

**Calibration Date: 06/05/2024**

### *Summary:*

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



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	06/05/2024	<i>JS</i>
Checked by :	Jérôme LUC	Product Manager	06/05/2024	<i>JS</i>
Approved by :	Kim RUTKOWSKI	Quality Manager	06/05/2024	<i>Kim Rutkowski</i>

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

Issue	Date	Modifications
A	06/05/2024	Initial release



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

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6.2	Return Loss and Impedance In Body Liquid .....	6
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8	List of Equipment .....	11



## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

### 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 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 16/15 DIP 2G600-375
Product Condition (new / used)	Used

A yearly calibration interval is recommended.

### 3 PRODUCT DESCRIPTION

#### 3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



#### 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 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.

##### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards.

##### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions 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.

#### 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

##### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

##### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

##### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

Scan Volume	Expanded Uncertainty
1 g	20.3 %





## SAR REFERENCE DIPOLE CALIBRATION REPORT

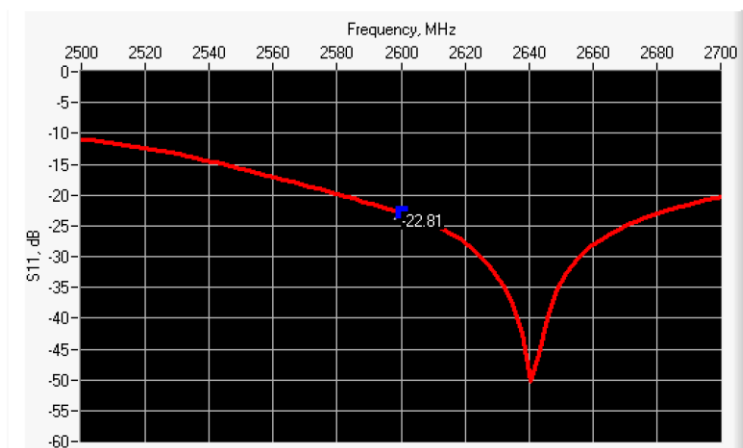
Ref: ACR.156.10.15.SATU.A

10 g

20.1 %

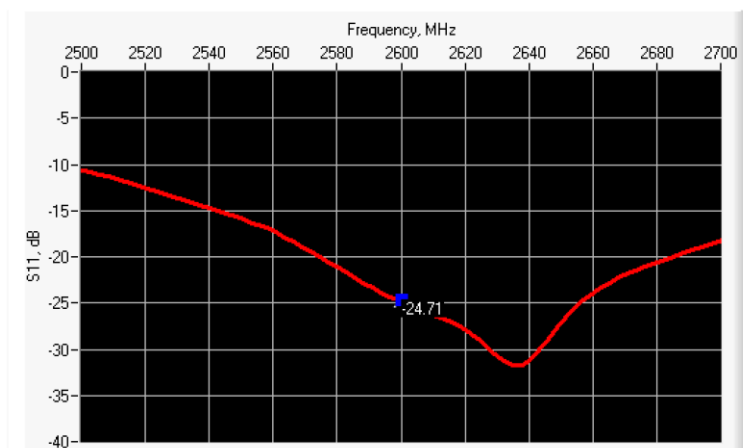
### 6 CALIBRATION MEASUREMENT RESULTS

#### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2600	-22.81	-20	55.3 $\Omega$ - 5.1 j $\Omega$

#### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2600	-24.71	-20	51.5 $\Omega$ - 5.5 j $\Omega$

#### 6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 $\pm$ 1 %.		250.0 $\pm$ 1 %.		6.35 $\pm$ 1 %.	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.		30.4 ±1 %.		3.6 ±1 %.	
2600	48.5 ±1 %.	PASS	28.8 ±1 %.	PASS	3.6 ±1 %.	PASS
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7 ±1 %.		26.4 ±1 %.		3.6 ±1 %.	

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 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.

### 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	

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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	
2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %		1.80 ±5 %	
2600	39.0 ±5 %	PASS	1.96 ±5 %	PASS
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

### 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: $\epsilon_{ps}$ : 38.2 $\sigma$ : 1.93
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	

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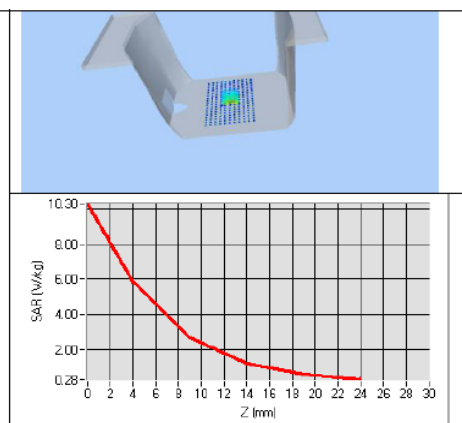
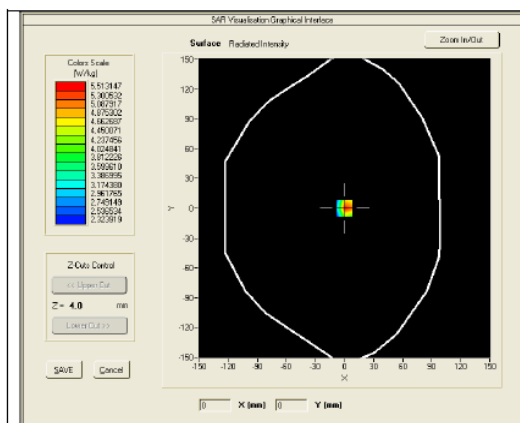
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## SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4		24	
2600	55.3	54.31 (5.36)	24.6	24.14 (2.42)
3000	63.8		25.7	
3500	67.1		25	



### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
150	61.9 $\pm$ 5 %		0.80 $\pm$ 5 %	
300	58.2 $\pm$ 5 %		0.92 $\pm$ 5 %	
450	56.7 $\pm$ 5 %		0.94 $\pm$ 5 %	
750	55.5 $\pm$ 5 %		0.96 $\pm$ 5 %	
835	55.2 $\pm$ 5 %		0.97 $\pm$ 5 %	
900	55.0 $\pm$ 5 %		1.05 $\pm$ 5 %	
915	55.0 $\pm$ 5 %		1.06 $\pm$ 5 %	
1450	54.0 $\pm$ 5 %		1.30 $\pm$ 5 %	
1610	53.8 $\pm$ 5 %		1.40 $\pm$ 5 %	
1800	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
1900	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2000	53.3 $\pm$ 5 %		1.52 $\pm$ 5 %	
2100	53.2 $\pm$ 5 %		1.62 $\pm$ 5 %	
2450	52.7 $\pm$ 5 %		1.95 $\pm$ 5 %	

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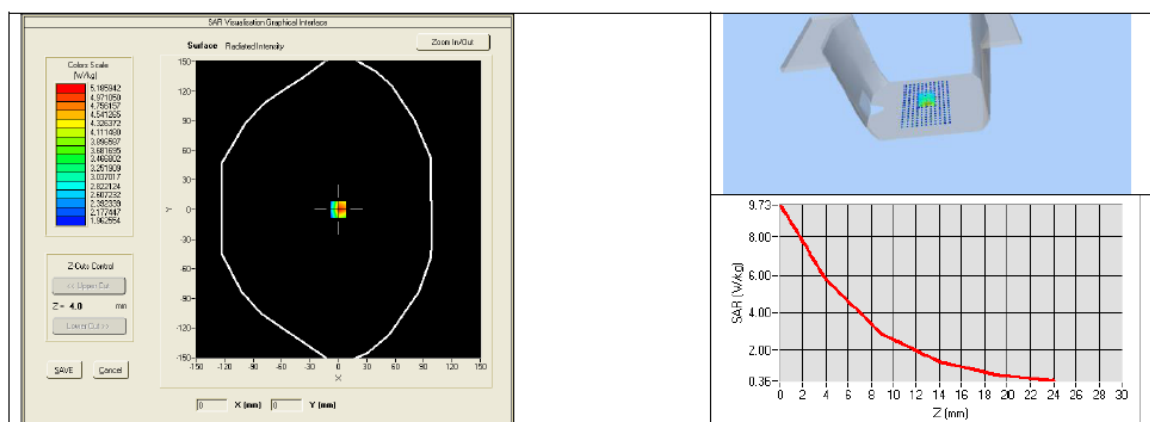
Ref: ACR.156.10.15.SATU.A

2600	52.5 ±5 %	PASS	2.16 ±5 %	PASS
3000	52.0 ±5 %		2.73 ±5 %	
3500	51.3 ±5 %		3.31 ±5 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values: eps' : 51.6 sigma : 2.21
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2600	53.26 (5.12)	23.89 (2.30)



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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.156.10.15.SATU.A

8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
SAM Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2024	02/2027
Calipers	Carrera	CALIPER-01	02/2024	02/2027
Reference Probe	MVG	EPG122 SN 18/11	02/2025	02/2026
Multimeter	Keithley 2000	1188656	02/2024	02/2027
Signal Generator	Agilent E4438C	MY49070581	02/2024	02/2027
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	02/2024	02/2027
Power Sensor	HP ECP-E26A	US37181460	02/2024	02/2027
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	09/2024	09/2025

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SID5G



## SAR Reference Waveguide Calibration Report

Ref : ACR.256.12.15.SATU.A

**SHENZHEN TCT TESTING TECHNOLOGY CO., LTD**  
2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL  
ZONE, FUHAI SUBDISTRICT, BAOAN DISTRICT,  
SHENZHEN, GUANGDONG, CHINA

**MVG COMOSAR REFERENCE WAVEGUIDE**

**FREQUENCY: 5000-6000 MHZ**

**SERIAL NO.: SN 13/14 WGA32**

**Calibrated at MVG US**  
2105 Barrett Park Dr. - Kennesaw, GA 30144



**Calibration Date: 05/15/2024**

### *Summary:*

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



## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.256.12.15.SATU.A

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	5/15/2024	
Checked by :	Jérôme LUC	Product Manager	5/15/2024	
Approved by :	Kim RUTKOWSKI	Quality Manager	5/15/2024	

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

Issue	Date	Modifications
A	5/15/2024	Initial release



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## 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528 and CEI/IEC 62209 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 WGA32
Product Condition (new / used)	New

A yearly calibration interval is recommended.

## 3 PRODUCT DESCRIPTION

### 3.1 GENERAL INFORMATION

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

## 4 MEASUREMENT METHOD

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

### 4.1 RETURN LOSS REQUIREMENTS

The waveguide used for SAR system validation measurements and checks must have a return loss of -8 dB or better. The return loss measurement shall be performed with matching layer placed in the open end of the waveguide, with the waveguide and matching layer in direct contact with the phantom shell as outlined in the fore mentioned standards.

### 4.2 MECHANICAL REQUIREMENTS

The IEEE 1528 and CEI/IEC 62209 standards specify the mechanical dimensions of the validation waveguide, the specified dimensions are as shown in Section 6.2. Figure 1 shows how the dimensions relate to the physical construction of the waveguide.

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## 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ , traceable to the Internationally Accepted Guides to Measurement Uncertainty.

### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

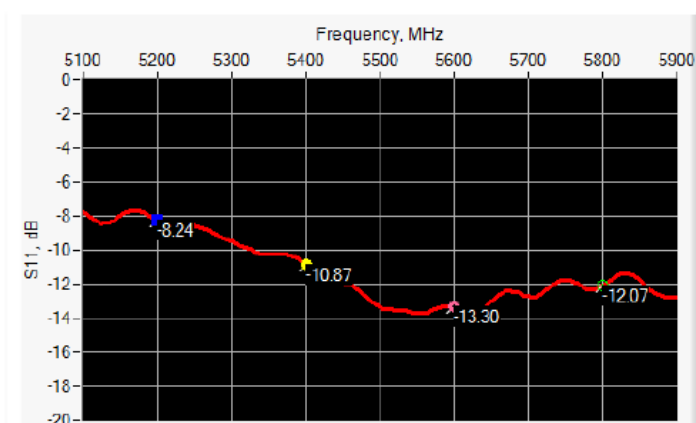
### 5.3 VALIDATION MEASUREMENT

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

Scan Volume	Expanded Uncertainty
1 g	20.3 %
10 g	20.1 %

## 6 CALIBRATION MEASUREMENT RESULTS

### 6.1 RETURN LOSS IN HEAD LIQUID



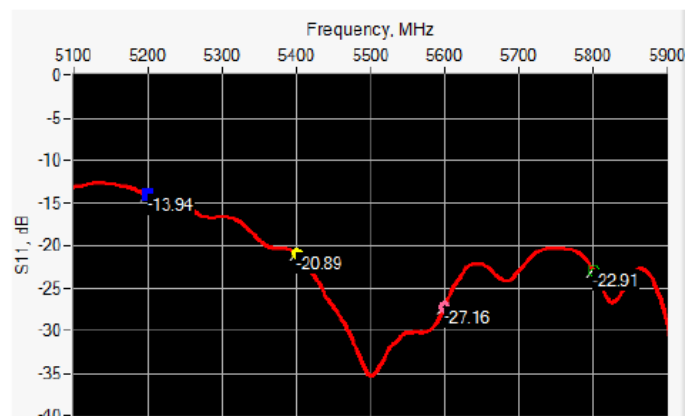
Frequency (MHz)	Return Loss (dB)	Requirement (dB)
5000-6000	< -8.24	-8

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## 6.2 RETURN LOSS IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
5000-6000	< -13.94	-8

## 6.3 MECHANICAL DIMENSIONS

Frequency (MHz)	L (mm)		W (mm)		L <sub>f</sub> (mm)		W <sub>f</sub> (mm)		T (mm)	
	Requirement	Measured	Requirement	Measured	Requirement	Measured	Requirement	Measured	Requirement	Measured
5200	40.39 ± 0.13	PASS	20.19 ± 0.13	PASS	81.03 ± 0.13	PASS	61.98 ± 0.13	PASS	5.3*	PASS
5800	40.39 ± 0.13	PASS	20.19 ± 0.13	PASS	81.03 ± 0.13	PASS	61.98 ± 0.13	PASS	4.3*	PASS

\* The tolerance for the matching layer is included in the return loss measurement.

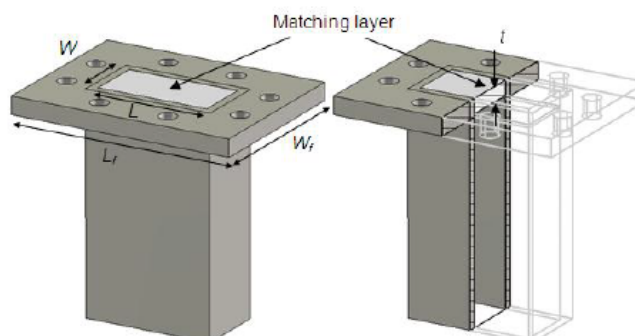


Figure 1: Validation Waveguide Dimensions

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528 and CEI/IEC 62209 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.

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## 7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
5000	36.2 $\pm$ 10 %		4.45 $\pm$ 10 %	
5100	36.1 $\pm$ 10 %		4.56 $\pm$ 10 %	
5200	36.0 $\pm$ 10 %	PASS	4.66 $\pm$ 10 %	PASS
5300	35.9 $\pm$ 10 %		4.76 $\pm$ 10 %	
5400	35.8 $\pm$ 10 %	PASS	4.86 $\pm$ 10 %	PASS
5500	35.6 $\pm$ 10 %		4.97 $\pm$ 10 %	
5600	35.5 $\pm$ 10 %	PASS	5.07 $\pm$ 10 %	PASS
5700	35.4 $\pm$ 10 %		5.17 $\pm$ 10 %	
5800	35.3 $\pm$ 10 %	PASS	5.27 $\pm$ 10 %	PASS
5900	35.2 $\pm$ 10 %		5.38 $\pm$ 10 %	
6000	35.1 $\pm$ 10 %		5.48 $\pm$ 10 %	

## 7.2 SAR MEASUREMENT RESULT 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.

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values 5200 MHz: $\epsilon_r'$ :36.62 sigma : 4.93 Head Liquid Values 5400 MHz: $\epsilon_r'$ :35.95 sigma : 5.18 Head Liquid Values 5600 MHz: $\epsilon_r'$ :36.08 sigma : 5.60 Head Liquid Values 5800 MHz: $\epsilon_r'$ :34.73 sigma : 5.74
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

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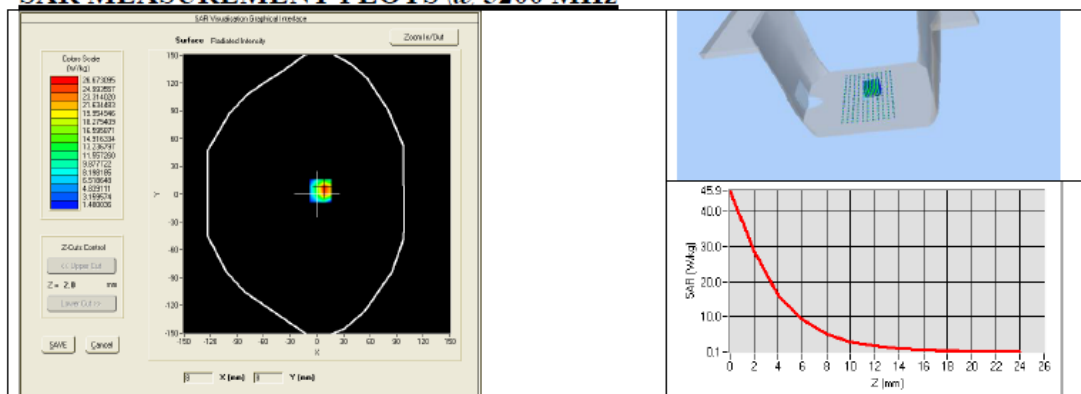


## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

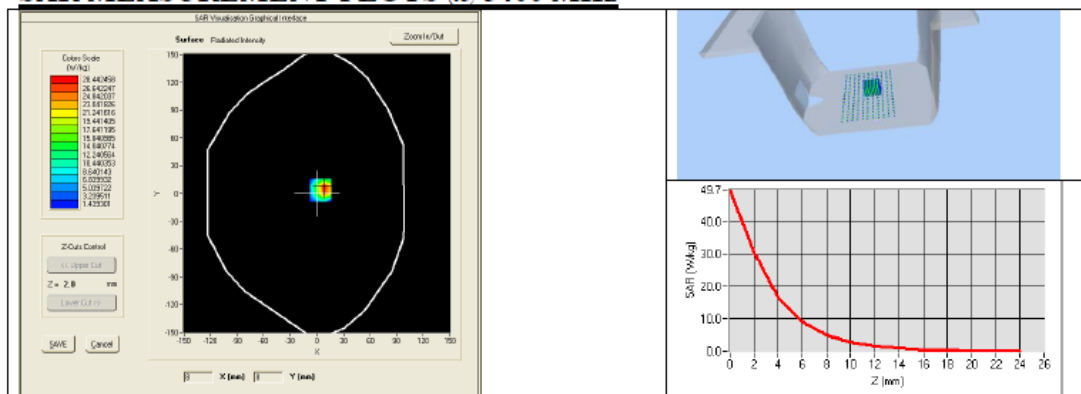
Ref: ACR.262.12.17.SATU.A

Frequency (MHz)	1 g SAR (W/kg)		10 g SAR (W/kg)	
	required	measured	required	measured
5200	159.00	163.88 (16.39)	56.90	57.29 (5.73)
5400	166.40	172.23 (17.22)	58.43	59.16 (5.92)
5600	173.80	181.28 (18.13)	59.97	61.57 (6.16)
5800	181.20	188.95 (18.90)	61.50	63.45 (6.35)

### SAR MEASUREMENT PLOTS @ 5200 MHz



### SAR MEASUREMENT PLOTS @ 5400 MHz



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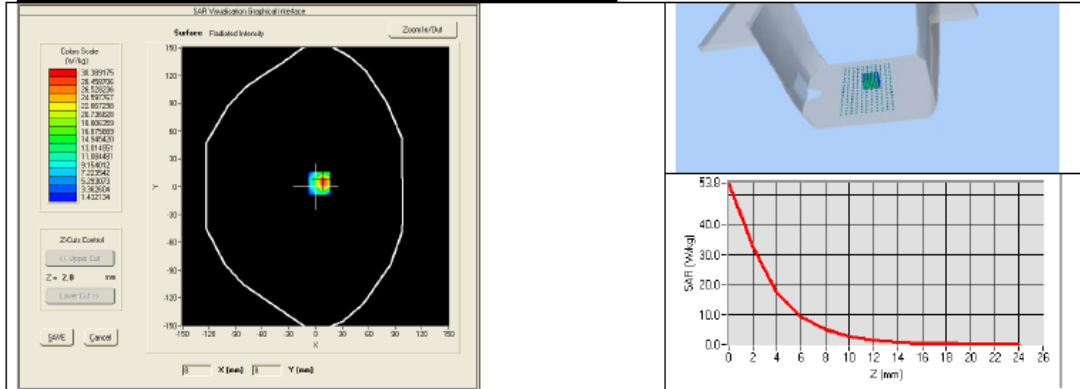
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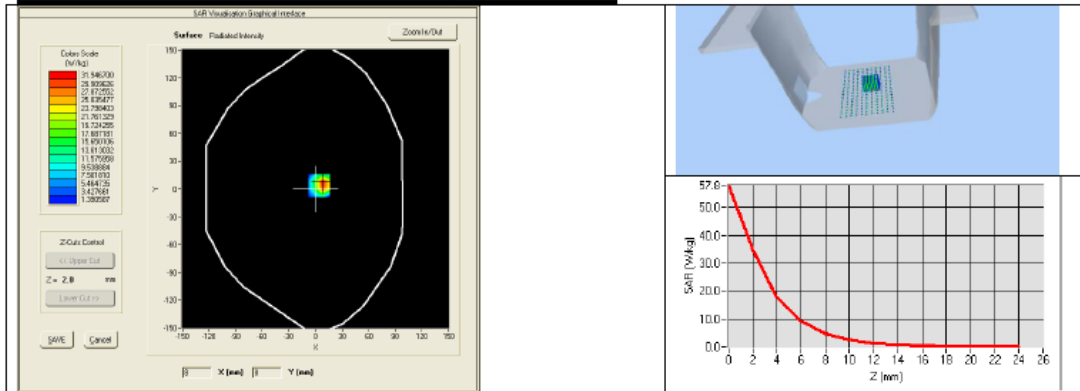
## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.262.12.17.SATU.A

### SAR MEASUREMENT PLOTS @ 5600 MHz



### SAR MEASUREMENT PLOTS @ 5800 MHz



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## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.262.12.17.SATU.A

### 7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity ( $\epsilon_r'$ )		Conductivity ( $\sigma$ ) S/m	
	required	measured	required	measured
5200	49.0 $\pm$ 10 %	PASS	5.30 $\pm$ 10 %	PASS
5300	48.9 $\pm$ 10 %		5.42 $\pm$ 10 %	
5400	48.7 $\pm$ 10 %	PASS	5.53 $\pm$ 10 %	PASS
5500	48.6 $\pm$ 10 %		5.65 $\pm$ 10 %	
5600	48.5 $\pm$ 10 %	PASS	5.77 $\pm$ 10 %	PASS
5800	48.2 $\pm$ 10 %	PASS	6.00 $\pm$ 10 %	PASS

### 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Body Liquid Values 5200 MHz: $\epsilon_r'$ :50.69 sigma : 4.98 Body Liquid Values 5400 MHz: $\epsilon_r'$ :48.45 sigma : 5.82 Body Liquid Values 5600 MHz: $\epsilon_r'$ :50.57 sigma : 6.37 Body Liquid Values 5800 MHz: $\epsilon_r'$ :48.19 sigma : 6.45
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	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency (MHz)	1 g SAR (W/kg)	10 g SAR (W/kg)
	measured	measured
5200	158.49 (15.85)	55.40 (5.54)
5400	167.20 (16.72)	57.39 (5.74)
5600	175.65 (17.57)	59.48 (5.95)
5800	183.06 (18.31)	61.62 (6.16)

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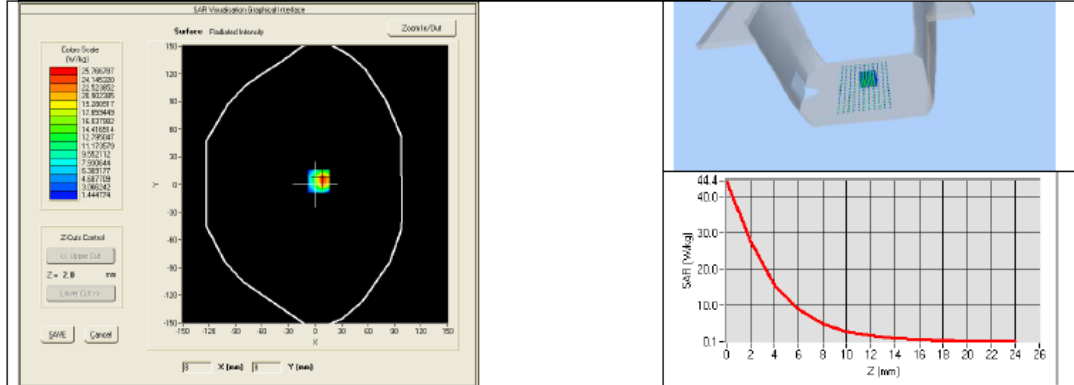
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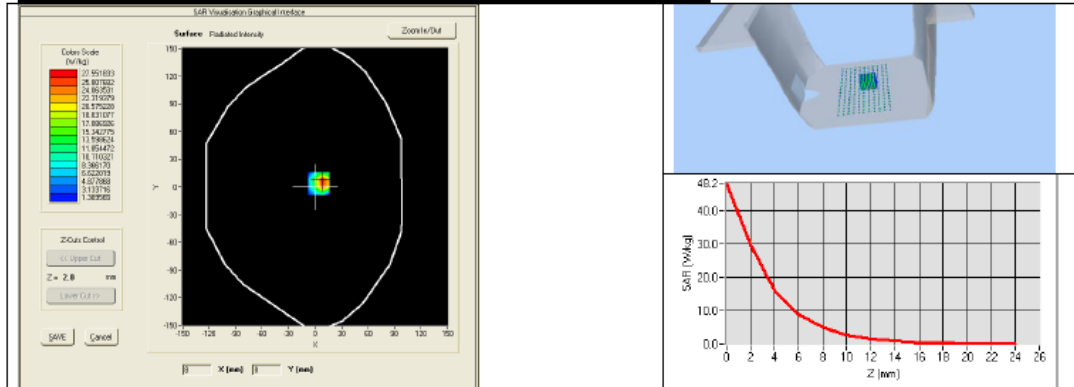
## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.262.12.17.SATU.A

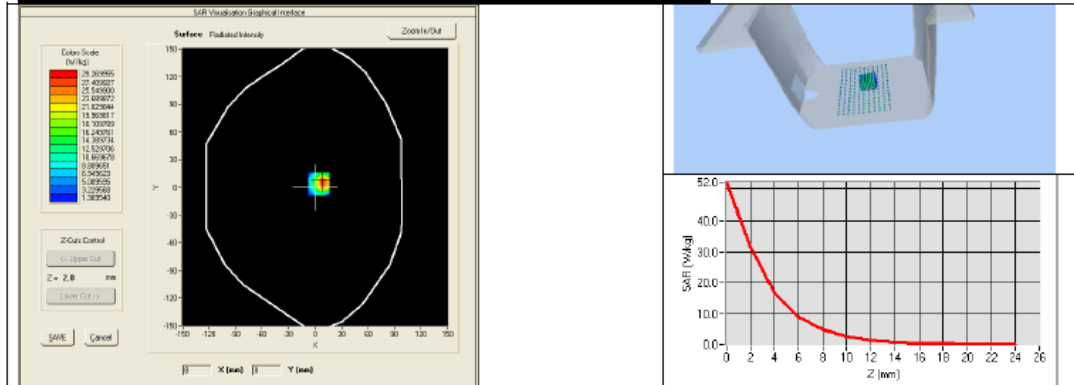
### BODY SAR MEASUREMENT PLOTS @ 5200 MHz



### BODY SAR MEASUREMENT PLOTS @ 5400 MHz



### BODY SAR MEASUREMENT PLOTS @ 5600 MHz



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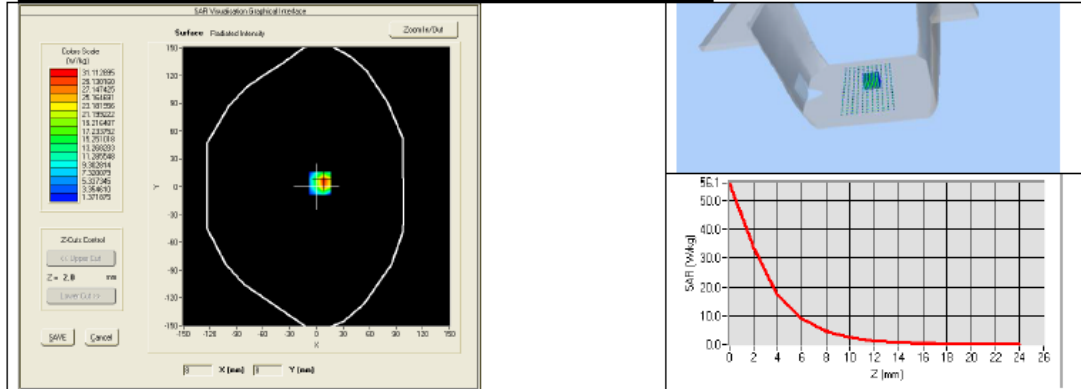




## SAR REFERENCE WAVEGUIDE CALIBRATION REPORT

Ref: ACR.262.12.17.SATU.A

### BODY SAR MEASUREMENT PLOTS @ 5800 MHz



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Ref: ACR.256.12.15.SATU.A

### 8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
Flat Phantom	MVG	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2025	02/2026
Calipers	Carrera	CALIPER-01	01/2025	01/2026
Reference Probe	MVG	EPG122 SN 18/11	10/2025	10/2026
Multimeter	Keithley 2000	1188656	01/2025	01/2026
Signal Generator	Agilent E4438C	MY49070581	01/2025	01/2026
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	01/2026	01/2026
Power Sensor	HP ECP-E26A	US37181460	01/2025	01/2026
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	150798832	10/2024	10/2025

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**\*\*\*\*\*END OF REPORT\*\*\*\*\***

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