

SAR TEST REPORT

FCC ID.....	2A9LJ-CIAO	
Test Report No.....	TCT240619E009-1	
Date of issue.....	Jan. 03, 2025	
Testing laboratory	SHENZHEN TONGCE TESTING LAB	
Testing location/ address:	2101 & 2201, Zhenchang Factory Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China	
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Manufacturer's name ...	Meferi Technologies Co., Ltd.	
Address.....	4F, A6, Tianfu Software Park, No. 1129, Century City Road, High-tech Zone, 610041, Chengdu, Sichuan, 610041 China	
Product Name.....	INTELLIGENT SHOPPER ASSISTANT	
Trade Mark	MEFERI	
Model/Type reference.....	CIAO, MS35, MS35P, MS35T, MS35H, MS35L, MS35S, CIAO plus	
SAR Max. Values.....	0.45W/Kg (1g) for Body-worn	
Simultaneous Reported SAR.....	0.66W/Kg (1g) for Body-worn	
Date of receipt of test item	Jun. 19, 2024	
Date (s) of performance of test.....	Jun. 19, 2024 - Oct. 12, 2024	
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

Product Name.....:	INTELLIGENT SHOPPER ASSISTANT
Model/Type reference.....:	CIAO
SampleNumber.....:	TCT240619E009-0101/01
Rating(s).....:	Rechargeable Li-ion Battery DC 3.7V
Wi-Fi 2.4G	
Supported type.....:	802.11b/802.11g/802.11n/802.11ax
Modulation Type.....:	802.11b: DSSS 802.11g/802.11n/802.11ax: OFDM
Operation Frequency.....:	802.11b/802.11g/802.11n(HT20)/ 802.11ax(HE20):2412MHz~2462MHz; 802.11n(HT40)/ 802.11ax(HE40):2422MHz~2452MHz
Channel number.....:	802.11b/802.11g/802.11n(HT20)/ 802.11ax(HE20):11; 802.11n(HT40)/ 802.11ax(HE40):7
Channel separation.....:	5MHz
Bluetooth	
Bluetooth Version.....:	Supported 5.0
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: 5180 MHz~5240 MHz Band 2A: 5260 MHz~5320 MHz Band 2C: 5500 MHz~5700 MHz Band 3: 5745 MHz~5825 MHz
Channel Bandwidth.....:	802.11a: 20MHz 802.11n: 20MHz, 40MHz 802.11ac: 20MHz, 40MHz, 80MHz 802.11ax: 20MHz, 40MHz, 80MHz, 160MHz
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

No.	Model No.	Tested with
1	CIAO	☒
Other models	MS35, MS35P, MS35T, MS35H, MS35L, MS35S, CIAO plus	☐

Note: CIAO is tested model, other models are derivative models. The models are identical in circuit and PCB layout, only different on the model names. So the test data of CIAO can represent the remaining models.

2. Test standard

The tests were performed according to following standards:

FCC 47 CFR §2.1093

IEC-IEEE 62209-1528-2020: Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices

KDB447498 D01:General RF Exposure Guidance v06

KDB865664 D01:SAR measurement 100MHz to 6GHz v01r04

KDB865664 D02:RF Exposure Reporting v01r02.

KDB248227 D01:802.11 wi-fi SAR v02r02

KDB941225 D07:UMPC Mini Tablet v01r02

KDB690783 D01:SAR Listings on Grant v01r03

3. Facilities and Accreditations

3.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 645098

SHENZHEN TONGCE TESTING LAB

Designation Number: CN1205

The testing lab has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A

SHENZHEN TONGCE TESTING LAB

CAB identifier: CN0031

The testing lab has been registered by Innovation, Science and Economic Development Canada for radio equipment testing.

3.2. Location

SHENZHEN TONGCE TESTING LAB

Address: 2101 & 2201, Zhenchang Factory Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, 518103, People's Republic of China

3.3. 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>

Exposure Position	Frequency Band	Reported SAR (W/kg)	Equipment Class	Highest Reported SAR (W/kg)
Body-worn 1-g SAR (10 mm Gap)	WLAN 2.4 GHz-0	0.39	DTS	0.45
	WLAN 2.4 GHz-1	0.27		
	WLAN 2.4 GHz-T	0.45		
	UNII 1 -0	0.20	NII	
	UNII 2A -0	0.24		
	UNII 2C-0	0.28		
	UNII 3 -0	0.23		
	UNII 1 -1	0.19		
	UNII 2A -1	0.18		
	UNII 2C-1	0.21		
	UNII 3 -1	0.23		
	UNII 1 -T	0.27		
	UNII 2A -T	0.33		
	UNII 2C-T	0.25		
	UNII 3 -T	0.39		

<Highest Reported simultaneous SAR Summary>

Exposure Position	Frequency Band	Highest Reported Simultaneous Transmission SAR (W/kg)
Body 1-g SAR (10 mm Gap)	WIFI 2.4G-0 + WIFI 2.4G-1	0.66

<Highest Reported simultaneous SAR and PD Summary>

Exposure Position	Frequency Band	Highest Reported Simultaneous Transmission SAR (W/kg)
Body	WIFI 2.4G + PD	5.955

Note:

1. The highest simultaneous transmission is scalar summation of Reported standalone SAR per FCC KDB 690783 D01 v01r03, and scalar SAR summation of all possible simultaneous transmission scenarios are < 1.6W/kg.
2. This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.
3. This EUT owns four cards, after we perform the pretest for these two SIM card; we found the SIM 1 is the worst case, so its result is recorded in this report.

WIFI 6E data reference TCWA24060010403_ FCC SAR Test Report

5. RF Exposure Limit

Type Exposure	SAR (W/kg)
	Uncontrolled Exposure Limit
Spatial Peak SAR (averaged over any 1 g of tissue)	1.60
Spatial Peak SAR (hands/wrists/feet/ankles averaged over 10g)	4.00
Spatial Peak SAR (averaged over the whole body)	0.08
Note: 1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time. 2. The Spatial Average value of the SAR averaged over the whole body. 3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.	

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.

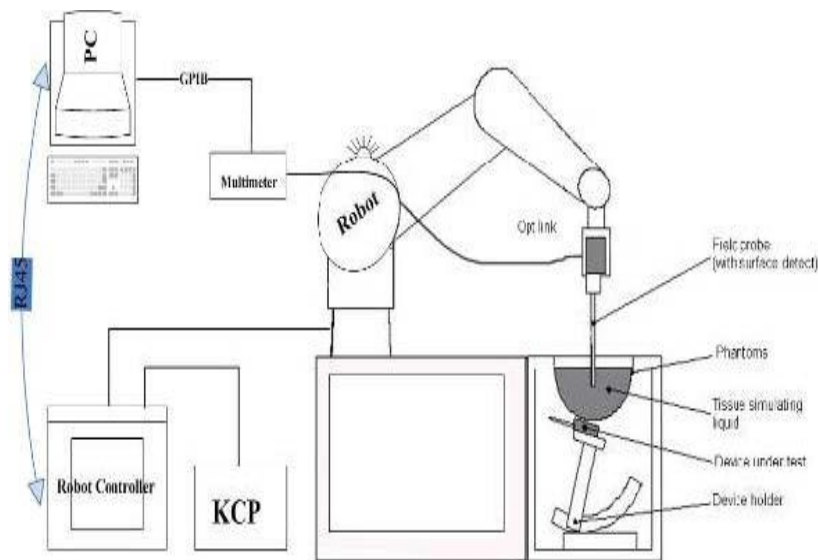
OPENSAR software Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

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=0.197MΩ Dipole 2:R3=0.230MΩ Dipole 3:R3=0.208MΩ

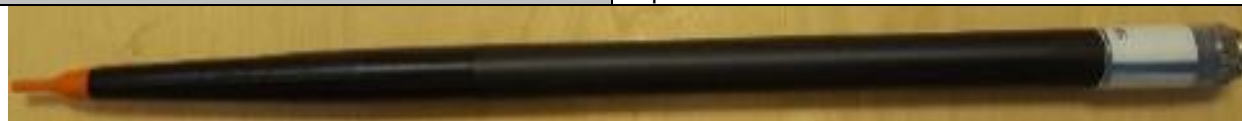


Photo of E-Field Probe

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 IEEE P1528 and CENELEC IEC-IEEE 62209-1528-2020.

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

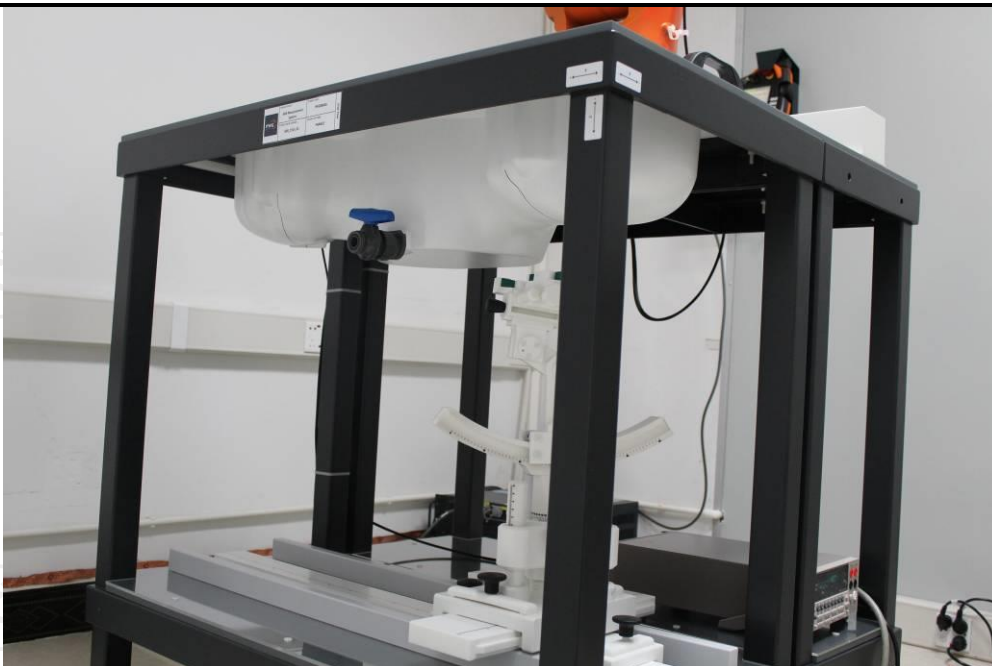
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections.

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



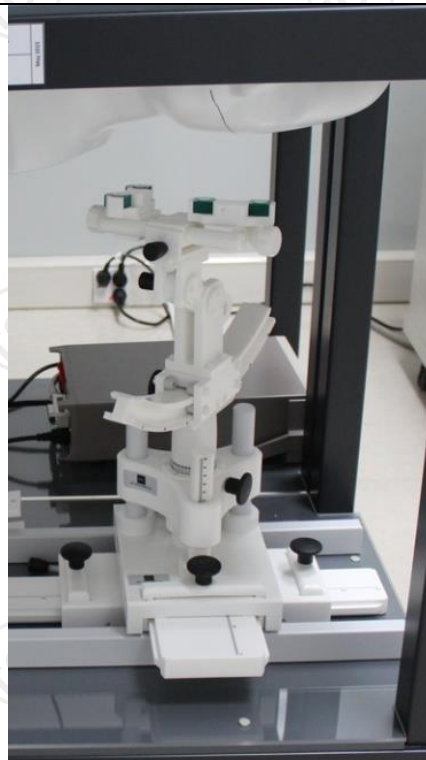
SAM Twin Phantom

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	Normi, ai0, ai1, ai2
	- Conversion factor	ConvFi
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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 millimeter 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:

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

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:

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

$$\text{H-field probes: } H_i = (V_i)^{1/2} \cdot (ai0 + ai1 \cdot f + ai2 \cdot f^2) / f$$

With	V_i	= compensated signal of channel i	(i = x, y, z)
	Normi	= sensor sensitivity of channel i	(i = x, y, z)
		[mV/(V/m)²] for E-field Probes	
	ConvF	= sensitivity enhancement in solution	
	aij	= 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):

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

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

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

with	SAR	= local specific absorption rate in mW/g
	E_{tot}	= total field strength in V/m
	σ	= conductivity in [mho/m] or [Siemens/m]
	ρ	= equivalent tissue density in g/cm ³

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

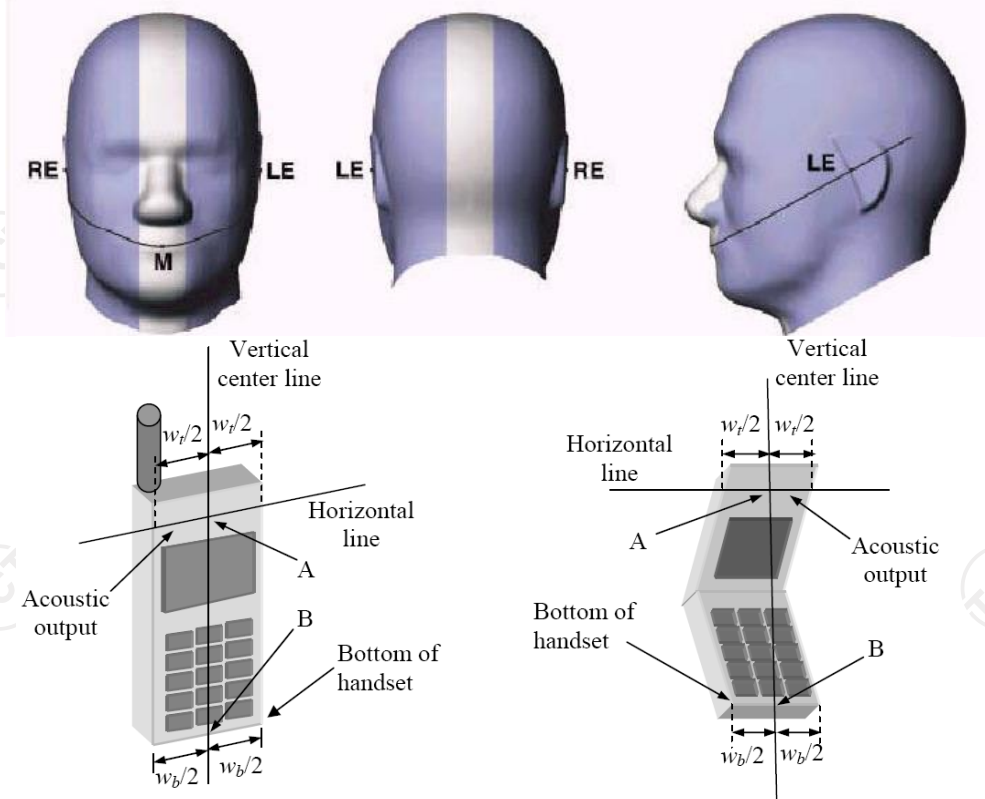
Handset Reference Points

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm²

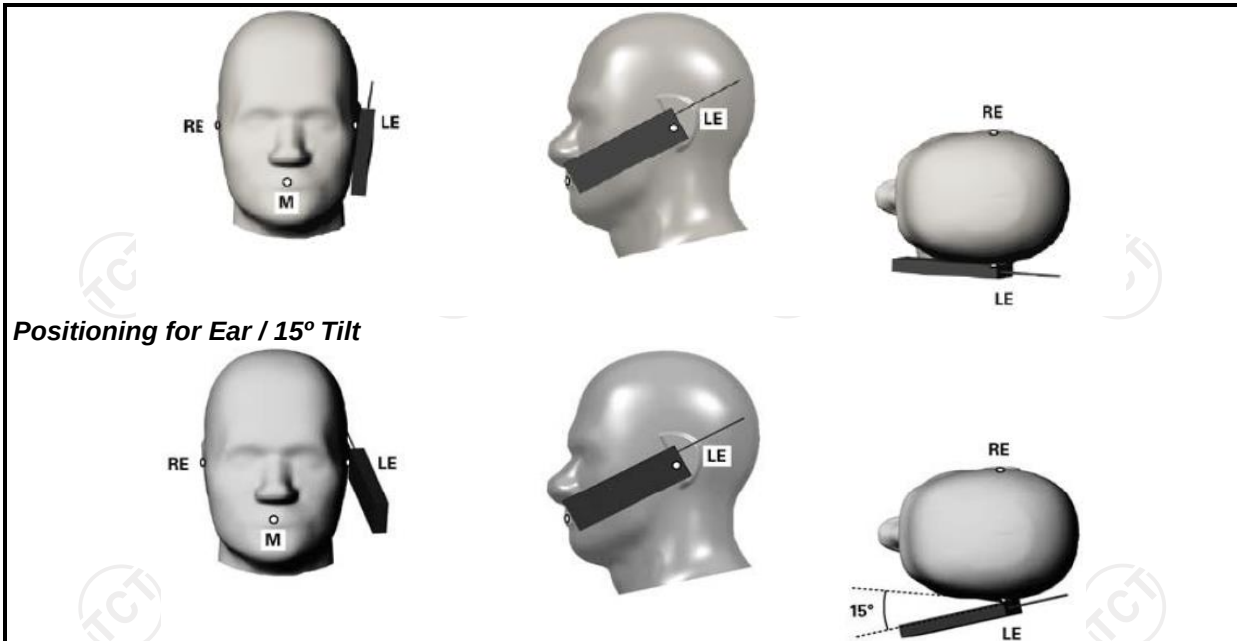
E_{tot} = total electric field strength in V/m

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



- Wt Width of the handset at the level of the acoustic
- Wb 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 15mm or holster surface and the flat phantom to 0 mm.

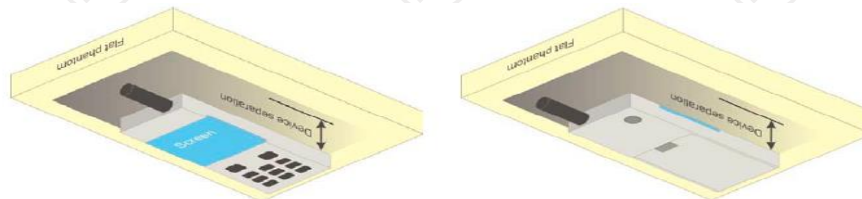


Illustration for Body Worn Position

Wireless Router (Hotspot) Configurations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥

9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

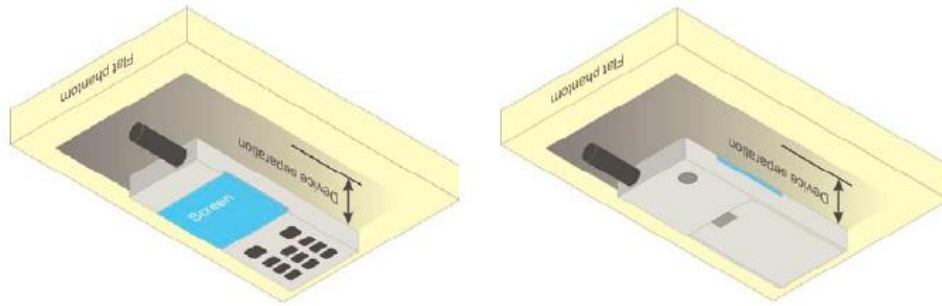
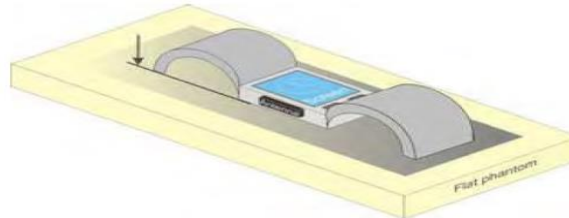


Illustration for Hotspot Position

Limb-worn device

A limb-worn device is a unit whose intended use includes being strapped to the arm or leg of the user while transmitting (except in idle mode). It is similar to a body-worn device. Therefore, the test positions of 6.1.4.4 also apply. The strap shall be opened so that it is divided into two parts as shown in Figure 9. The device shall be positioned directly against the phantom surface with the strap straightened as much as possible and the back of the device towards the phantom.

If the strap cannot normally be opened to allow placing in direct contact with the phantom surface, it may be necessary to break the strap of the device but ensuring to not damage the antenna.



Test position for limb-worn devices

6.7. Tissue Dielectric Parameters

The liquid used for the frequency range of 100MHz-6G consisted of water, sugar, salt and Cellulose. The liquid has been previously proven to be suited for worst-case. The following Table shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEEE 1528 and IEC 62209. The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the determine of the dielectric parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

The following materials are used for producing the tissue-equivalent materials

Targets for tissue simulating liquid

Frequency (MHz)	Liquid Type	Liquid Type (σ)	$\pm 5\%$ Range	Permittivity (ϵ)	$\pm 5\%$ Range
300	Head	0.87	0.83~0.91	45.3	43.04~47.57
450	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
5800	Head	5.27	5.01~5.53	35.3	33.54~37.07

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

6.8. Tissue-equivalent Liquid Properties

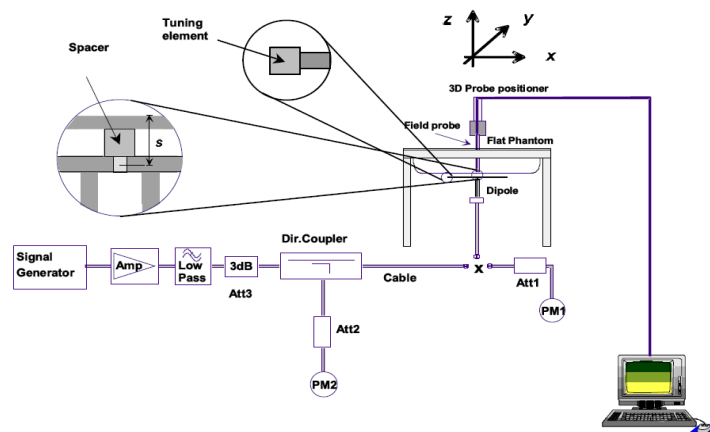
Test Date dd/mm/yy	Temp °C	Tissue Type	Measured Frequency (MHz)	ϵ_r	σ (s/m)	Dev ϵ_r (%)	Dev σ (%)
06/20/2024	22°C	2450H	2410	37.84	1.79	-3.47	-0.56
			2435	37.85	1.81	-3.44	0.56
			2450	37.82	1.83	-3.52	1.67
			2460	37.80	1.84	-3.57	2.22
06/20/2024	22°C	5200H	5200	36.68	4.45	-3.32	-4.04
06/25/2024	22°C	5300H	5300	36.08	4.69	2.16	-4.48
06/28/2024	22°C	5600H	5600	35.34	4.95	0.11	-1.21
07/05/2024	22°C	5800H	5800	34.81	5.08	-3.49	-4.14

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

Frequency (MHz)	Liquid Type	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
2450	Head	4.99	2.36	49.90	23.60	53.26	24.15	-6.31	-2.28
5200	Head	15.90	5.21	159.00	52.10	163.88	57.29	-2.98	-9.06
5300	Head	17.22	5.92	172.20	59.20	166.40	59.16	3.49	0.00
5600	Head	18.13	6.16	181.30	61.60	181.28	61.57	0.00	0.00
5800	Head	18.20	5.55	182.00	55.50	188.95	63.45	-3.68	-9.91

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

Conducted power measurement

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

Read the WWAN RF power level from the base station simulator.

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

Connect EUT RF port through RF cable to the power meter or spectrum analyser, and measure WLAN/BT output power.

Conducted power measurement

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

Place the EUT in positions as Appendix B demonstrates.

Set scan area, grid size and other setting on the MVG software.

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

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

Measure SAR results for other channels in worst SAR testing position if the Reported SAR or highest power channel is larger than 0.8 W/kg.

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

Power reference measurement

Area scan

Zoom scan

Power drift measurement

Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The MVG software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a “cube” measurement. The measured volume must include the 1g and 10 g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

Extraction of the measured data (grid and values) from the Zoom Scan.

Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).

Generation of a high-resolution mesh within the measured volume.

Interpolation of all measured values from the measurement grid to the high-resolution grid

Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface

Calculation of the averaged SAR within masses of 1g and 10g.

Power Reference Measurement

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

Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r03 quoted below.

			$\leq 3\text{ GHz}$	$> 3\text{ GHz}$
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			$5\text{ mm} \pm 1\text{ mm}$	$\frac{1}{2} \cdot \delta \cdot \ln(2)\text{ mm} \pm 0.5\text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$			$\leq 2\text{ GHz}: \leq 15\text{ mm}$ $2 - 3\text{ GHz}: \leq 12\text{ mm}$	$3 - 4\text{ GHz}: \leq 12\text{ mm}$ $4 - 6\text{ GHz}: \leq 10\text{ mm}$
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2\text{ GHz}: \leq 8\text{ mm}$ $2 - 3\text{ GHz}: \leq 5\text{ mm}^*$	$3 - 4\text{ GHz}: \leq 5\text{ mm}^*$ $4 - 6\text{ GHz}: \leq 4\text{ mm}^*$
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5\text{ mm}$	$3 - 4\text{ GHz}: \leq 4\text{ mm}$ $4 - 5\text{ GHz}: \leq 3\text{ mm}$ $5 - 6\text{ GHz}: \leq 2\text{ mm}$
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	$\leq 4\text{ mm}$	$3 - 4\text{ GHz}: \leq 3\text{ mm}$ $4 - 5\text{ GHz}: \leq 2.5\text{ mm}$ $5 - 6\text{ GHz}: \leq 2\text{ mm}$
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)\text{ mm}$	
Minimum zoom scan volume	x, y, z		$\geq 30\text{ mm}$	$3 - 4\text{ GHz}: \geq 28\text{ mm}$ $4 - 5\text{ GHz}: \geq 25\text{ mm}$ $5 - 6\text{ GHz}: \geq 22\text{ mm}$
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <u>area scan based 1-g SAR estimation</u> procedures of KDB Publication 447498 is $\leq 1.4\text{ W/kg}$, $\leq 8\text{ mm}$, $\leq 7\text{ mm}$ and $\leq 5\text{ mm}$ zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD post-processor scan combine and subsequently superpose these measurement data to calculating the multiband SAR.

SAR Averaged Methods

In MVG, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

Power Drift Monitoring

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

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

Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100KHz to 6GHz ,when the highest measurement 1-g SAR within a frequency band is <1.5W/kg, the extensive SAR measurement uncertainty analysis described IEEE Std 1528-2013 is not required in SAR report submitted for equipment approval.

8. Conducted Output Power

WLAN 2.4G-0						
Mode	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency	2412	2437	2462	2412	2437	2462
Average Power (dBm)	14.05	14.14	14.54	13.98	13.94	14.31
Mode	802.11n(HT20)			802.11n(HT40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	13.93	13.81	14.08	13.84	13.90	14.18
Mode	802.11ax(HE20)			802.11ax(HE40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	14.40	13.96	14.13	13.84	13.90	14.18
WLAN 2.4G-1						
Mode	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency	2412	2437	2462	2412	2437	2462
Average Power (dBm)	13.37	13.88	13.80	13.19	13.69	13.70
Mode	802.11n(HT20)			802.11n(HT40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	12.73	13.12	13.51	13.76	13.61	13.58
Mode	802.11ax(HE20)			802.11ax(HE40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	13.33	13.75	13.73	13.82	13.62	13.57

WLAN 2.4G-Total						
Mode	802.11n(HT20)			802.11n(HT40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	16.38	16.49	16.81	16.81	16.77	16.90
Mode	802.11ax(HE20)			802.11ax(HE40)		
Channel	1	6	11	3	6	9
Frequency	2412	2437	2462	2422	2437	2452
Average Power (dBm)	16.91	16.87	16.94	16.84	16.77	16.90

WLAN 5.2G-0						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	36	40	48	36	40	48
Frequency	5180	5200	5240	5180	5200	5240
100% Duty cyclePower (dBm)	9.21	8.99	9.90	9.16	8.80	9.68
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	38	46		36	40	48
Frequency	5190	5230		5180	5200	5240
100% Duty cyclePower (dBm)	9.14	9.15		9.19	8.82	9.70
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	38	46		42		
Frequency	5190	5230		5210		
100% Duty cyclePower (dBm)	9.23	9.30		8.96		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	36	40	48	38	46	
Frequency	5180	5200	5240	5190	5230	
100% Duty cyclePower (dBm)	9.29	8.89	9.71	8.97	9.00	
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	42			50		
Frequency	5210			5250		
100% Duty cyclePower (dBm)	8.58			8.06		

WLAN 5.3G-0						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	52	60	64	52	60	64
Frequency	5260	5300	5320	5260	5300	5320
100% Duty cyclePower (dBm)	10.64	10.58	10.17	10.36	10.36	10.00
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	54		62	52	60	64
Frequency	5270		5310	5260	5300	5320
100% Duty cyclePower (dBm)	10.46		10.29	10.34	10.38	10.04
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	54		62	58		
Frequency	5270		5310	5290		
100% Duty cyclePower (dBm)	10.55		10.42	10.07		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	52	60	64	54		62
Frequency	5260	5300	5320	5270		5310
100% Duty cyclePower (dBm)	10.47	10.49	10.11	10.32		10.18
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	58			50		
Frequency	5290			5250		
100% Duty cyclePower (dBm)	9.92			8.06		

WLAN 5.6G-0						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	100	120	140	100	120	140
Frequency	5500	5600	5700	5500	5600	5700
100% Duty cyclePower (dBm)	9.33	9.05	9.11	8.98	8.81	8.88
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	102	118	134	100	120	140
Frequency	5510	5590	5670	5500	5600	5700
100% Duty cyclePower (dBm)	9.13	9.02	8.98	9.02	8.85	8.93
Mode	EEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	102	118	134	106		122
Frequency	5510	5590	5670	5530		5610
100% Duty cyclePower (dBm)	8.95	9.03	9.04	8.84		8.84
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	100	120	140	102	118	134
Frequency	5500	5600	5700	5510	5590	5670
100% Duty cyclePower (dBm)	8.91	8.88	8.92	8.82	8.79	8.68
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	106		122	114		
Frequency	5530		5610	5570		
100% Duty cyclePower (dBm)	8.89		8.56	7.56		

WLAN 5.8G-0						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	149	157	165	149	157	165
Frequency	5745	5785	5825	5745	5785	5825
100% Duty cyclePower (dBm)	9.56	9.48	9.12	9.39	9.32	8.94
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	151	159		149	157	165
Frequency	5755	5795		5745	5785	5825
100% Duty cyclePower (dBm)	9.24	9.32		9.40	9.31	8.96
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	151	159		155		
Frequency	5755	5795		5775		
100% Duty cyclePower (dBm)	9.24	9.21		9.37		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	149	157	165	151	159	
Frequency	5745	5785	5825	5755	5795	
100% Duty cyclePower (dBm)	9.52	9.47	9.23	9.29	9.31	
Mode	IEEE 802.11ax HE80					
Channel	155					
Frequency	5775					
100% Duty cyclePower (dBm)	9.04					

Note

1. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
2. The output power of all data rate were prescan , just the worst case (the lowest data rate) of all mode were shown in report

WLAN 5.2G-1						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	36	40	48	36	40	48
Frequency	5180	5200	5240	5180	5200	5240
100% Duty cyclePower (dBm)	7.28	7.34	7.39	7.24	7.38	7.42
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	38		46	36	40	48
Frequency	5190		5230	5180	5200	5240
100% Duty cyclePower (dBm)	7.68		8.10	7.17	7.31	7.74
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	38		46	42		
Frequency	5190		5230	5210		
100% Duty cyclePower (dBm)	7.75		8.23	7.73		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	36	40	48	38		46
Frequency	5180	5200	5240	5190		5230
100% Duty cyclePower (dBm)	7.51	7.89	7.85	7.75		8.13
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	42			50		
Frequency	5210			5250		
100% Duty cyclePower (dBm)	7.90			8.06		

WLAN 5.3G-1						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	52	60	64	52	60	64
Frequency	5260	5300	5320	5260	5300	5320
100% Duty cyclePower (dBm)	8.04	8.47	8.42	7.85	8.31	8.27
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	54	62		52	60	64
Frequency	5270	5310		5260	5300	5320
100% Duty cyclePower (dBm)	8.01	8.36		7.90	8.35	8.30
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	54	62		58		
Frequency	5270	5310		5290		
100% Duty cyclePower (dBm)	8.04	8.45		7.95		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	52	60	64	54	62	
Frequency	5260	5300	5320	5270	5310	
100% Duty cyclePower (dBm)	7.90	8.35	8.33	7.93	8.31	
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	58			50		
Frequency	5290			5250		
100% Duty cyclePower (dBm)	8.07			8.02		

WLAN 5.6G-1						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	100	120	140	100	120	140
Frequency	5500	5600	5700	5500	5600	5700
100% Duty cyclePower (dBm)	7.66	7.89	7.82	7.55	7.74	7.67
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	102	118	134	100	120	140
Frequency	5510	5590	5670	5500	5600	5700
100% Duty cyclePower (dBm)	7.65	7.90	7.96	7.56	7.78	7.71
Mode	EEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	102	118	134	106		122
Frequency	5510	5590	5670	5530		5610
100% Duty cyclePower (dBm)	7.76	7.96	8.05	7.54		7.67
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	100	120	140	102	118	134
Frequency	5500	5600	5700	5510	5590	5670
100% Duty cyclePower (dBm)	7.58	7.75	7.71	7.59	7.88	7.99
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	106		122	114		
Frequency	5530		5610	5570		
100% Duty cyclePower (dBm)	7.67		7.78	7.68		

WLAN 5.8G-1						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	149	157	165	149	157	165
Frequency	5745	5785	5825	5745	5785	5825
100% Duty cyclePower (dBm)	8.32	8.79	8.65	8.17	8.60	8.45
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	151	159		149	157	165
Frequency	5755	5795		5745	5785	5825
100% Duty cyclePower (dBm)	8.33	8.77		8.20	8.64	8.52
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	151	159		155		
Frequency	5755	5795		5775		
100% Duty cyclePower (dBm)	8.39	8.82		8.46		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	149	157	165	151	159	
Frequency	5745	5785	5825	5755	5795	
100% Duty cyclePower (dBm)	8.16	8.57	8.47	8.27	8.71	
Mode	IEEE 802.11ax HE80					
Channel	155					
Frequency	5775					
100% Duty cyclePower (dBm)	8.64					

WLAN 5.2G-Total						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	36	40	48	36	40	48
Frequency	5180	5200	5240	5180	5200	5240
100% Duty cyclePower (dBm)	/	/	/	11.32	11.16	11.71
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	38		46	36	40	48
Frequency	5190		5230	5180	5200	5240
100% Duty cyclePower (dBm)	11.48		11.67	11.31	11.14	11.84
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	38		46	42		
Frequency	5190		5230	5210		
100% Duty cyclePower (dBm)	11.56		11.81	11.40		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	36	40	48	38		46
Frequency	5180	5200	5240	5190		5230
100% Duty cyclePower (dBm)	11.50	11.43	11.89	11.41		11.60
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	42			50		
Frequency	5210			5250		
100% Duty cyclePower (dBm)	11.26			11.07		

WLAN 5.3G-Total						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	52	60	64	52	60	64
Frequency	5260	5300	5320	5260	5300	5320
100% Duty cyclePower (dBm)	/	/	/	12.29	12.47	12.23
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	54	62		52	60	64
Frequency	5270	5310		5260	5300	5320
100% Duty cyclePower (dBm)	12.42	12.44		12.30	12.49	12.27
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	54	62		58		
Frequency	5270	5310		5290		
100% Duty cyclePower (dBm)	12.48	12.56		12.15		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	52	60	64	54	62	
Frequency	5260	5300	5320	5270	5310	
100% Duty cyclePower (dBm)	12.38	12.56	12.32	12.30	12.36	
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	58			50		
Frequency	5290			5250		
100% Duty cyclePower (dBm)	12.10			11.05		

WLAN 5.6G-Total						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	100	120	140	100	120	140
Frequency	5500	5600	5700	5500	5600	5700
100% Duty cyclePower (dBm)	/	/	/	11.33	11.32	11.33
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	102	118	134	100	120	140
Frequency	5510	5590	5670	5500	5600	5700
100% Duty cyclePower (dBm)	11.46	11.51	11.51	11.36	11.36	11.37
Mode	EEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	102	118	134	106		122
Frequency	5510	5590	5670	5530		5610
100% Duty cyclePower (dBm)	11.41	11.54	11.58	11.25		11.30
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	100	120	140	102	118	134
Frequency	5500	5600	5700	5510	5590	5670
100% Duty cyclePower (dBm)	11.31	11.36	11.37	11.26	11.37	11.36
Mode	IEEE 802.11ax HE80			IEEE 802.11ax HE160		
Channel	106		122	114		
Frequency	5530		5610	5570		
100% Duty cyclePower (dBm)	11.33		11.20	10.63		

WLAN 5.8G-Total						
Mode	IEEE 802.11a			IEEE 802.11n HT20		
Channel	149	157	165	149	157	165
Frequency	5745	5785	5825	5745	5785	5825
100% Duty cyclePower (dBm)	/	/	/	11.83	11.99	11.71
Mode	IEEE 802.11n HT40			IEEE 802.11ac VHT20		
Channel	151		159	149	157	165
Frequency	5755		5795	5745	5785	5825
100% Duty cyclePower (dBm)	11.82		12.06	11.85	12.00	11.76
Mode	IEEE 802.11ac VHT40			IEEE 802.11ac VHT80		
Channel	151		159	155		
Frequency	5755		5795	5775		
100% Duty cyclePower (dBm)	11.85		12.03	11.95		
Mode	IEEE 802.11ax HE20			IEEE 802.11ax HE40		
Channel	149	157	165	151		159
Frequency	5745	5785	5825	5755		5795
100% Duty cyclePower (dBm)	11.90	12.05	11.88	11.82		12.03
Mode	IEEE 802.11ax HE80					
Channel	155					
Frequency	5775					
100% Duty cyclePower (dBm)	11.85					

Note

- Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
- The output power of all data rate were prescan , just the worst case (the lowest data rate) of all mode were shown in report

Bluetooth						
Mode	GFSK			Pi/4DQPSK		
Channel	0	39	78	0	39	78
Frequency	2402	2441	2480	2402	2441	2480
Average Power (dBm)	6.29	6.03	4.88	5.67	5.36	4.18
Mode	8DPSK			BLE(1M)		
Channel	0	39	78	0	20	39
Frequency	2402	2441	2480	2402	2440	2480
Average Power (dBm)	6.06	5.75	4.57	6.06	5.99	4.63
Mode	BLE(2M)					
Channel	0	20	39			
Frequency	2402	2440	2480			
Average Power (dBm)	6.10	6.24	4.81			

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Result	Exclusion thresholds for 1-g SAR	Exclusion thresholds for 10-g SAR
20	2.402	6.50	4.47	5	2.14	3.0	7.5

Note

- Per KDB 447498 D01v06, the 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

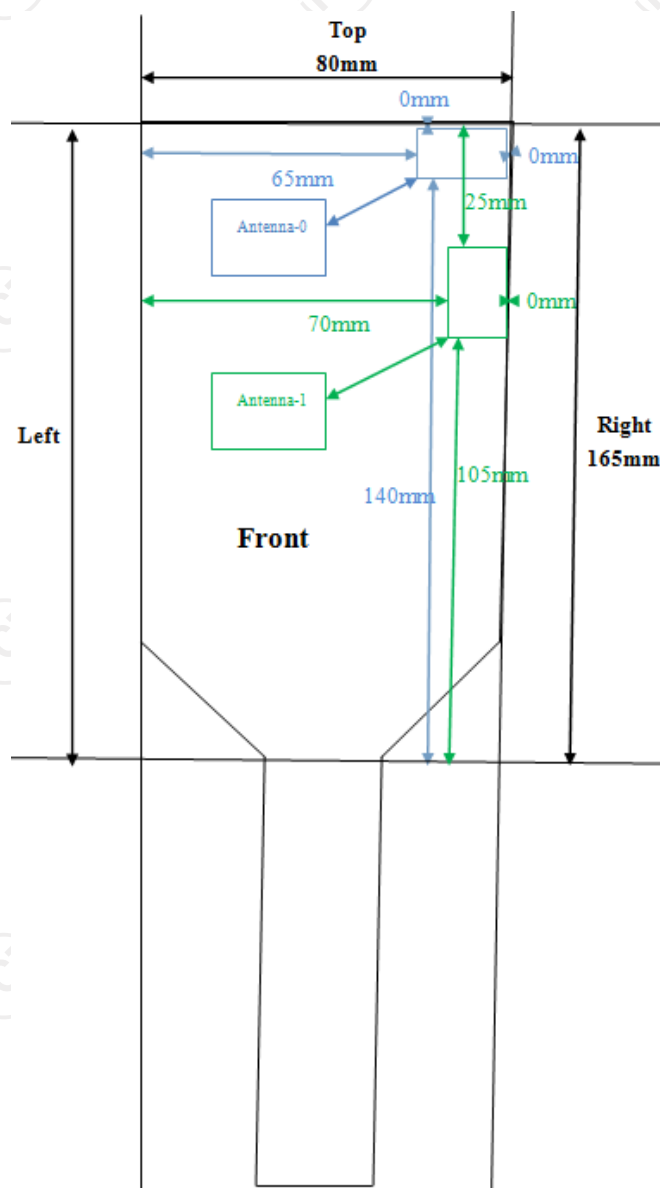
$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
for 1-g SAR, where
 ·f(GHz) is the RF channel transmit frequency in GHz
 ·Power and distance are rounded to the nearest mW and mm before calculation
 ·The result is rounded to one decimal place for comparison
- Base on the result of note1, RF exposure evaluation of BT is not required.
- Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
- The output power of all data rate were prescan, just the worst case (the lowest data rate) of all mode were shown in report.

NFC

The frequency of NFC is below 100 MHz. So the SAR measurement is not necessary

9. Exposure Position Consideration

9.1. EUT Antenna Location



9.2. Test Position Consideration

Test Positions						
Mode	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WIFI/BT	Yes	Yes	Yes	No	Yes	No

Note:

1. KDB447498 D04, particular DUT edges were not required to be evaluated for SAR if the antenna-to-edge distance is greater than 2.5cm.
2. The product only supports public address and no earpiece, so only the front and bottom need to be tested.
3. WWAN diversity antenna is RX only.

10. SAR Test Results Summary

10.1. Body-Worn 1g SAR Data

Band	Mode	Test Position with 10mm	CH.	Freq. (MHz)	100% Duty cycle Power (dBm)	Tune-Up Limit (dBm)	Power Drift (%)	Meas. SAR1g (W/kg)	Duty cycle (%)	Duty cycle Factor	Scaling Factor	Reported SAR1g (W/kg)	Limit (W/Kg)
2.4G-0	802.11b	Front	11	2462	14.54	15.00	-1.84	0.18	100	0.00	1.112	0.20	1.60
		Back	11	2462	14.54	15.00	-1.53	0.35	100	0.00	1.112	0.39	
		Right	11	2462	14.54	15.00	2.63	0.02	100	0.00	1.112	0.02	
		Top	11	2462	14.54	15.00	-0.75	0.02	100	0.00	1.112	0.02	
2.4G-1	802.11b	Front	6	2437	13.88	14.00	0.62	0.13	100	0.00	1.028	0.13	
		Back	6	2437	13.88	14.00	-1.09	0.26	100	0.00	1.028	0.27	
		Right	6	2437	13.88	14.00	-1.89	0.02	100	0.00	1.028	0.02	
		Top	6	2437	13.88	14.00	0.67	0.02	100	0.00	1.028	0.02	
2.4G-T	802.11ax	Front	11	2462	16.94	17.00	0.71	0.25	100	0.00	1.014	0.25	
		Back	11	2462	16.94	17.00	1.24	0.44	100	0.00	1.014	0.45	
		Right	11	2462	16.94	17.00	-1.51	0.04	100	0.00	1.014	0.04	
		Top	11	2462	16.94	17.00	0.99	0.03	100	0.00	1.014	0.03	
5.2G-0	802.11a	Front	48	5240	9.90	10.00	0.60	0.11	99.68	0.01	1.023	0.11	
		Back	48	5240	9.90	10.00	-1.05	0.20	99.68	0.01	1.023	0.20	
		Right	48	5240	9.90	10.00	1.15	0.02	99.68	0.01	1.023	0.02	
		Top	48	5240	9.90	10.00	-2.72	0.02	99.68	0.01	1.023	0.02	
5.3G-0	802.11a	Front	52	5260	10.64	11.00	0.15	0.12	99.69	0.01	1.086	0.13	
		Back	52	5260	10.64	11.00	-0.15	0.22	99.69	0.01	1.086	0.24	
		Right	52	5260	10.64	11.00	1.53	0.02	99.69	0.01	1.086	0.02	
		Top	52	5260	10.64	11.00	0.30	0.02	99.69	0.01	1.086	0.02	
5.6G-0	802.11a	Front	100	5500	9.33	9.50	0.15	0.15	99.67	0.01	1.040	0.16	
		Back	100	5500	9.33	9.50	1.30	0.27	99.67	0.01	1.040	0.28	
		Right	100	5500	9.33	9.50	-1.57	0.02	99.67	0.01	1.040	0.02	
		Top	100	5500	9.33	9.50	0.28	0.02	99.67	0.01	1.040	0.02	
5.8G-0	802.11a	Front	149	5745	9.56	10.00	1.63	0.12	99.67	0.01	1.107	0.13	
		Back	149	5745	9.56	10.00	-2.15	0.21	99.67	0.01	1.107	0.23	
		Right	149	5745	9.56	10.00	2.63	0.02	99.67	0.01	1.107	0.02	
		Top	149	5745	9.56	10.00	-1.24	0.02	99.67	0.01	1.107	0.02	

5.2G-1	802.11ac	Front	46	5230	8.23	8.50	-1.53	0.10	99.25	0.03	1.064	0.11	1.60
		Back	46	5230	8.23	8.50	-1.62	0.18	99.25	0.03	1.064	0.19	
		Right	46	5230	8.23	8.50	-0.60	0.02	99.25	0.03	1.064	0.02	
		Top	46	5230	8.23	8.50	0.91	0.02	99.25	0.03	1.064	0.02	
5.3G-1	802.11a	Front	60	5300	8.47	8.50	-1.50	0.10	99.69	0.01	1.007	0.10	
		Back	60	5300	8.47	8.50	-2.47	0.18	99.69	0.01	1.007	0.18	
		Right	60	5300	8.47	8.50	2.72	0.02	99.69	0.01	1.007	0.02	
		Top	60	5300	8.47	8.50	-0.55	0.02	99.69	0.01	1.007	0.02	
5.6G-1	802.11ax	Front	134	5670	7.99	8.00	-0.69	0.12	99.11	0.04	1.002	0.12	
		Back	134	5670	7.99	8.00	0.10	0.21	99.11	0.04	1.002	0.21	
		Right	134	5670	7.99	8.00	0.72	0.02	99.11	0.04	1.002	0.02	
		Top	134	5670	7.99	8.00	-0.71	0.02	99.11	0.04	1.002	0.02	
5.8G-1	802.11ac	Front	159	5795	8.82	9.00	0.10	0.12	99.30	0.03	1.042	0.13	
		Back	159	5795	8.82	9.00	0.30	0.22	99.30	0.03	1.042	0.23	
		Right	159	5795	8.82	9.00	-1.53	0.02	99.30	0.03	1.042	0.02	
		Top	159	5795	8.82	9.00	2.78	0.02	99.30	0.03	1.042	0.02	
5.2G-T	802.11ac	Front	48	5240	11.84	12.00	-1.95	0.14	99.24	0.03	1.038	0.15	
		Back	48	5240	11.84	12.00	0.31	0.26	99.24	0.03	1.038	0.27	
		Right	48	5240	11.84	12.00	2.75	0.02	99.24	0.03	1.038	0.02	
		Top	48	5240	11.84	12.00	1.90	0.02	99.24	0.03	1.038	0.02	
5.3G-T	802.11ac	Front	62	5310	12.56	13.00	-1.41	0.18	99.26	0.03	1.107	0.20	
		Back	62	5310	12.56	13.00	0.77	0.30	99.26	0.03	1.107	0.33	
		Right	62	5310	12.56	13.00	2.63	0.02	99.26	0.03	1.107	0.02	
		Top	62	5310	12.56	13.00	0.79	0.02	99.26	0.03	1.107	0.02	
5.6G-T	802.11n	Front	118	5590	11.51	12.00	-1.79	0.12	98.59	0.06	1.119	0.13	
		Back	118	5590	11.51	12.00	1.41	0.22	98.59	0.06	1.119	0.25	
		Right	118	5590	11.51	12.00	2.02	0.02	98.59	0.06	1.119	0.02	
		Top	118	5590	11.51	12.00	-1.85	0.02	98.59	0.06	1.119	0.02	

5.8G-T	802.11n	Front	159	5795	12.06	12.50	1.15	159	98.60	0.06	1.107	0.17	1.60
		Back	159	5795	12.06	12.50	1.52	159	98.60	0.06	1.107	0.39	
		Right	159	5795	12.06	12.50	-0.96	159	98.60	0.06	1.107	0.02	
		Top	159	5795	12.06	12.50	1.05	159	98.60	0.06	1.107	0.02	

Note:

1. Per KDB447498 D04, for each exposure position, if the highest output power channel Reported SAR $\leq 0.8\text{W/kg}$, other channels SAR testing is not necessary.
2. Per KDB447498 D04, body-worn use is evaluated with the device positioned at 0 mm from a flat phantom filled with head tissue-equivalent medium.
3. Per KDB447498 D04, the report SAR is measured SAR value adjusted for maximum tune-up tolerance. Scaling Factor = $10^{[(\text{tune-up limit power(dBm)} - \text{Ave.power power (dBm)})/10]}$, where tune-up limit is the maximum rated power among all production units.
4. Per KDB865664D01 v01r04 perform a second repeated measurement only the ratio of largest to smallest SAR for the original and first repeated measurement is >1.20 or when the original or repeated measurement is $\geq 1.45\text{W/kg}$.
5. Perform a second measurement only if the original, first and second repeated measurement is $\geq 1.5\text{w/kg}$ and the ratio of largest to smallest SAR for the original, first and second repeated measurement is >1.20 .
6. 100% Duty cycle Power = Ave.Power + Duty cycle Factor, 1g SAR (W/kg) for 100% Duty cycle = $((100\% \text{ Duty cycle Power(mw)} / \text{Ave.Power (mw)}) * 1\text{g Meas SAR})$
Reported SAR(W/kg) = 1g SAR (W/kg) for 100% Duty cycle * Scaling Factor

10.2. Simultaneous Transmission Conclusion

Multi-Band Simultaneous Transmission Considerations

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the EUT are shown in below Figure and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.



Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v06, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤ 1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06, the following equation must be used to estimate the standalone 1g SAR and 10g extremity SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5(18.75)} \cdot \frac{\text{Max. power of channel, mW}}{\text{Min. Separation Distance, mm}}$$

Mode	Max. tune-up Power (dBm)	Exposure Position	Head	Body -worn
		Test Distance (mm)	5	5
BT	-0.50	Estimated SAR (W/kg)	/	0.17

Note:

- When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according is applied to determine estimated SAR.
- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x]$ W/kg for test separation distances ≤ 5 mm; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
- Next to the mouth exposure requires 1-g SAR, and the wrist-worn condition requires 10-g extremity SAR.

Simultaneous Transmission Possibilities

The Simultaneous Transmission Possibilities of this device are as below:

NO.	Configuration	Head	Body-Worn	Hotspot
1	BT+WIFI-0	NO	YES	NO
2	BLE+WIFI-0	NO	YES	NO
3	WIFI-0+WIFI-1	NO	YES	NO

10.3. SAR Simultaneous Transmission Analysis

Band	Test Position	Scaled SAR						Σ SAR (W/kg)	SPLSR	Remark
		WIFI (2.4G) -0	WIFI (5G) -0	BT	WIFI (2.4G) -1	WIFI (5G) -1	WIFI6E			
Body-Worn	Front	0.20	0.16	0.17	0.13	0.13	0.024	0.37	N/A	N/A
	Back	0.39	0.28	0.17	0.27	0.23	0.127	0.66	N/A	N/A
	Right	0.02	0.02	0.17	0.02	0.02	0.093	0.19	N/A	N/A
	Top	0.02	0.02	0.17	0.02	0.02	0.028	0.19	N/A	N/A

10.4. SAR and PD Simultaneous Transmission Analysis

Band	Test Position	Scaled SAR						Σ	SPLSR	Remark
		WIFI (2.4G) -0	WIFI (5G) -0	BT	WIFI (2.4G) -1	WIFI (5G) -1	PD			
Body-Worn	Front	0.20	0.16	0.17	0.13	0.13	2.358	2.558	N/A	N/A
	Back	0.39	0.28	0.17	0.27	0.23	5.565	5.955	N/A	N/A
	Right	0.02	0.02	0.17	0.02	0.02	3.897	4.067	N/A	N/A
	Top	0.02	0.02	0.17	0.02	0.02	3.440	3.610	N/A	N/A

Note : WIFI 6E data reference TCWA24060010403_ FCC SAR Test Report

10.5. 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 X_i (source of uncertainty)	Prob. Dist.	Unc. $a(x_i)$	Div. q_i	$u(x_i) =$ $a(x_i)/q_i$	C_i	$u(y) =$ C_i $*u(x_i)$	V_i
Measurement system errors								
CF	Probe calibration	N ($k = 2$)	5.8	2	2.90	1	2.90	∞
CF _{drift}	Probe calibration drift	R	0.14	$\sqrt{3}$	0.08	1	0.08	∞
LIN	Probe linearity and detection limit	R	1.98	$\sqrt{3}$	1.14	1	1.14	∞
BBS	Broadband signal	R	0.18	$\sqrt{3}$	0.10	1	0.10	∞
ISO	Probe isotropy	R	4.85	$\sqrt{3}$	2.80	1	2.80	∞
DAE	Other probe and data acquisition errors	N	2.7	1	2.70	1	2.70	∞
AMB	RF ambient and noise	N	1.73	1	1.73	1	1.73	∞
Δ_{xyz}	Probe positioning errors	N	0.81	1	0.81	$2/\delta$	0.81	
DAT	Data processing errors	N	2.3	1	2.30	1	2.30	∞
Phantom and device (DUT or validation antenna) errors								
LIQ(σ)	Measurement of phantom conductivity(σ)	N	4.4	1	4.4	C_ϵ, C_σ	4.40	∞
LIQ(T_c)	Temperature effects (medium)	R	2.5	$\sqrt{3}$	1.44	C_ϵ, C_σ	1.44	∞
EPS	Shell permittivity	R	3.4	$\sqrt{3}$	1.96	See 8.4.2.3	0.49	∞
DIS	Distance between the radiating element of the DUT and the phantom medium	N	0.8	1	0.8	2	1.60	∞
D _{xyz}	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	∞
TAS	Time-average SAR	R	1.73	$\sqrt{3}$	1.00	1	1.00	∞
RF _{drift}	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	
P _{in}	Uncertainty in accepted power (validation measurement only)	N	2.89	1	2.89	1	2.89	
Corrections to the SAR result (if applied)								
$C(\epsilon', \sigma)$	Phantom deviation from target (ϵ', σ)	N	2.31	1	2.31	1	2.31	
C(R)	SAR scaling	R	1.15	$\sqrt{3}$	0.66	1	0.66	
u(Δ SAR)	Combined uncertainty						11.26	
U	Expanded uncertainty and effective degrees of freedom					U =	22.52	

10.6. Test Equipment List

Test Equipment	Manufacturer	Model	Serial Number	Calibration	
				Calibration Date (D.M.Y)	Calibration Due (D.M.Y)
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 2450	MVG	SID 2450	SN 16/15 DIP 2G450-374	Jun. 05, 2024	Jun. 04, 2027
DIPOLE 5G	MVG	SID 5G	SN 13/14 WGA32	May. 15, 2024	May. 14, 2025
Limesar Dielectric Probe	MVG	SCLMP	SN 19/15 OCPG71	Jun. 05, 2024	Jun. 04, 2027
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
Dummy Probe	MVG	DP66	SN 13/15 DP66	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

3. The dipole was not damaged properly repaired.

4. The measured SAR deviates from the calibrated SAR value by less than 10%

5. The most recent return-loss result meets the required 20 dB minimum return-loss requirement

6. The most recent measurement of the real or imaginary parts of the impedance deviates by less than 5 Ω from the previous measurement.

11. System Check Results

Date of measurement: 06/13/2024 Test mode: 2450MHz (Head)

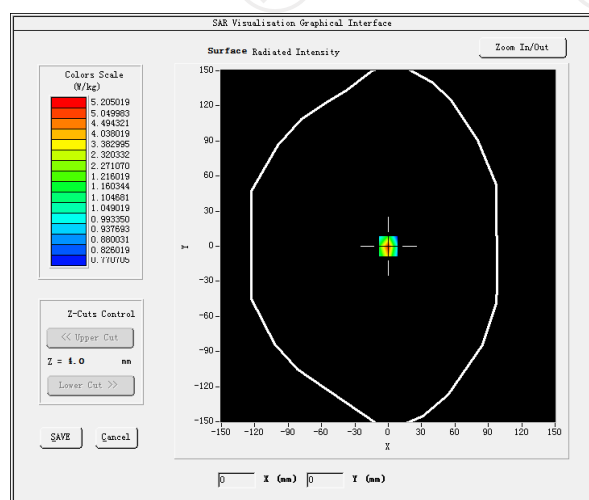
Product Description: Validation

Dipole Model: SID2450

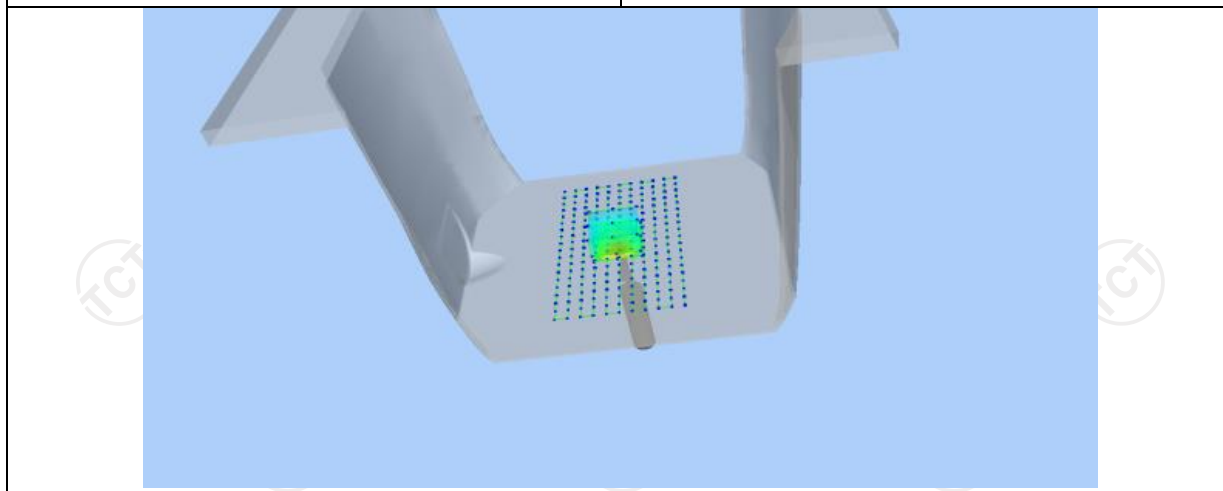
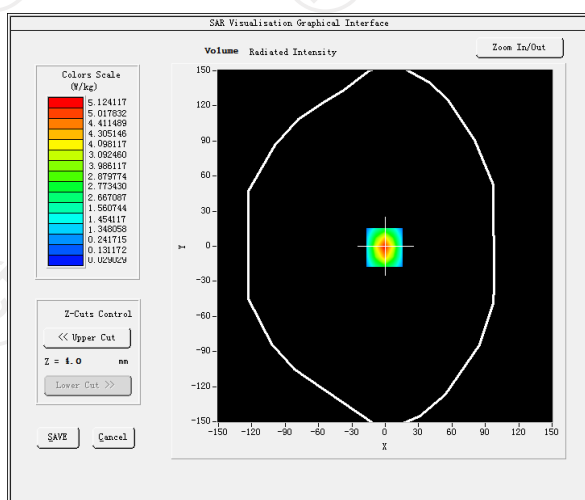
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.31
Frequency (MHz)	2450.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-0.470000
SAR 10g (W/Kg)	2.364445
SAR 1g (W/Kg)	4.994244

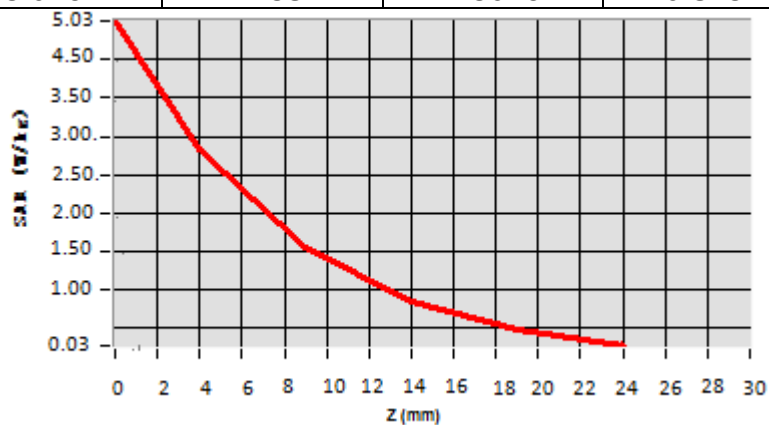
SURFACE SAR



VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	5.0262	2.7584	1.5026	0.8252	0.4125



Hot spot position



Date of measurement: 06/20/2024 Test mode: 5200MHz (Head)

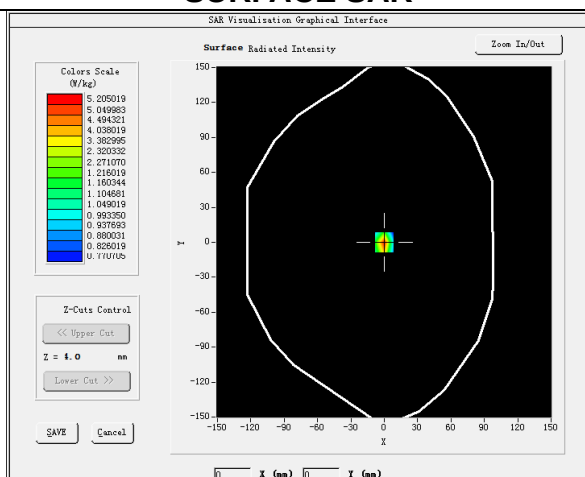
Product Description: Validation

Dipole Model: SID5200

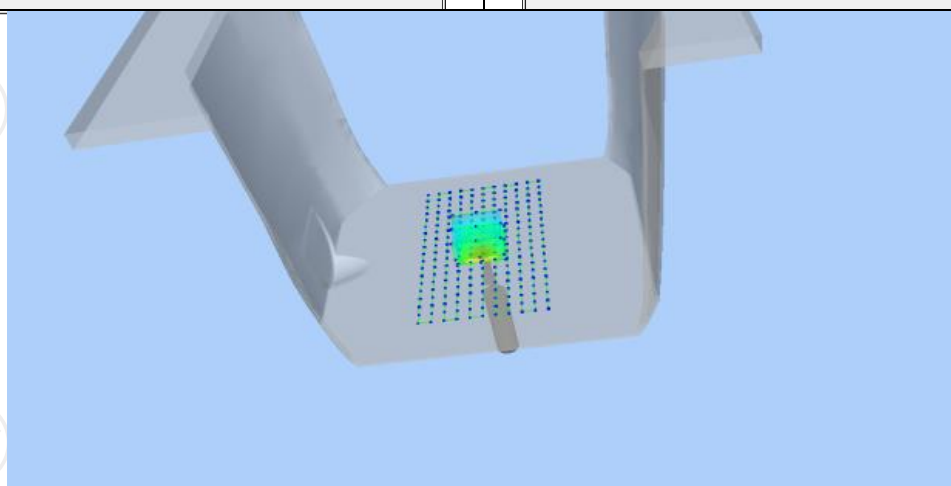
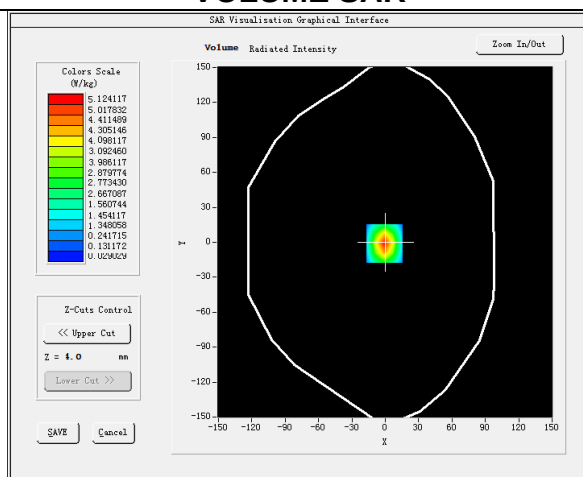
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.01
Frequency (MHz)	5200.000000
Relative permittivity (real part)	36.678832
Relative permittivity (imaginary part)	13.679428
Conductivity (S/m)	4.450788
Variation (%)	-0.820000
SAR 10g (W/Kg)	5.207521
SAR 1g (W/Kg)	15.902481

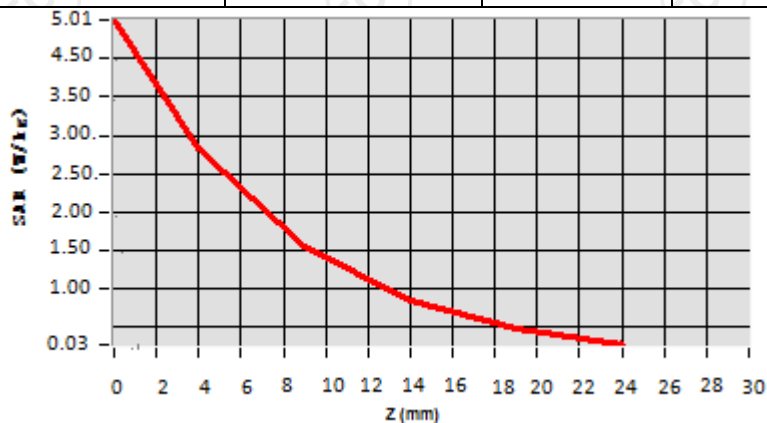
SURFACE SAR



VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	5.0132	2.7584	1.5026	0.8252	0.4125



Hot spot position



Date of measurement: 06/25/2024 Test mode: 5300MHz (Head)

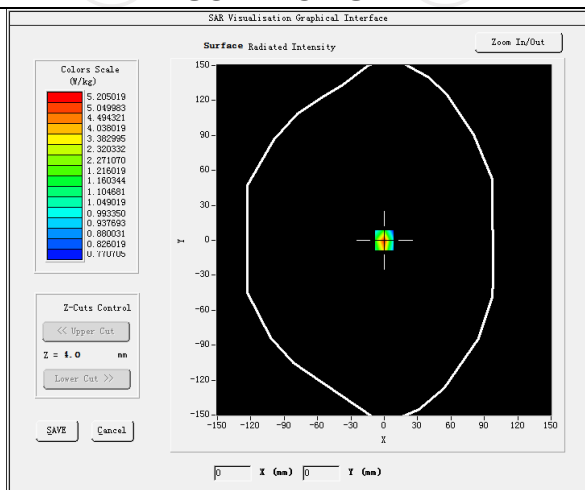
Product Description: Validation

Dipole Model: SID5300

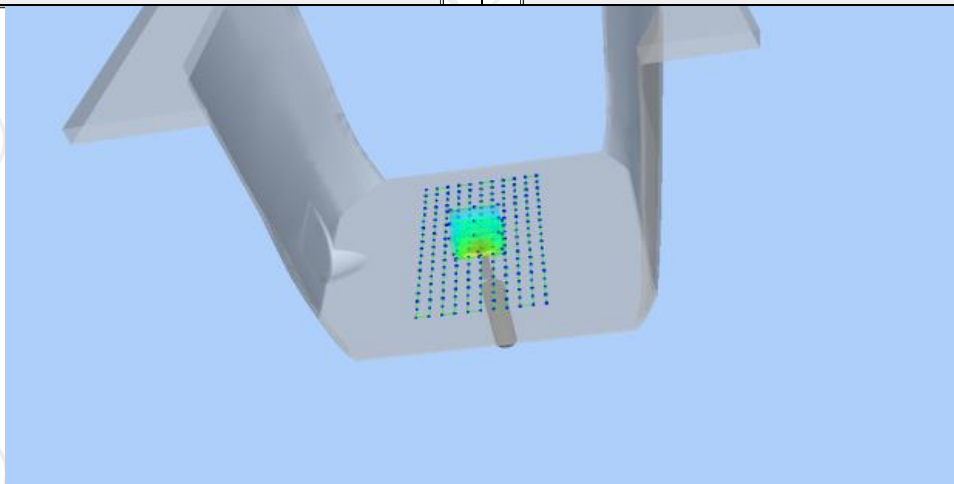
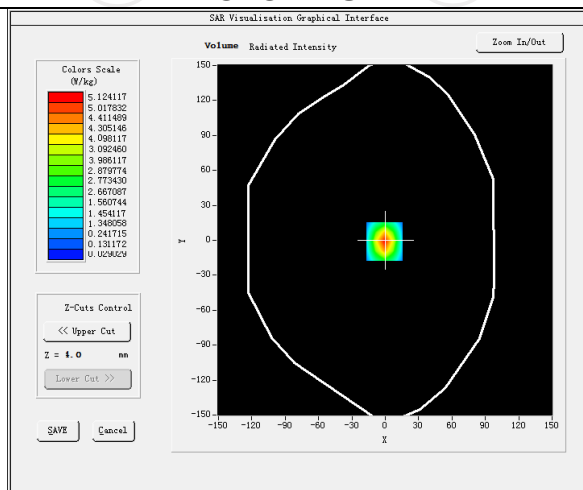
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	1.94
Frequency (MHz)	5300.000000
Relative permittivity (real part)	36.078832
Relative permittivity (imaginary part)	13.680430
Conductivity (S/m)	4.690788
Variation (%)	-0.820000
SAR 10g (W/Kg)	17.217521
SAR 1g (W/Kg)	5.922481

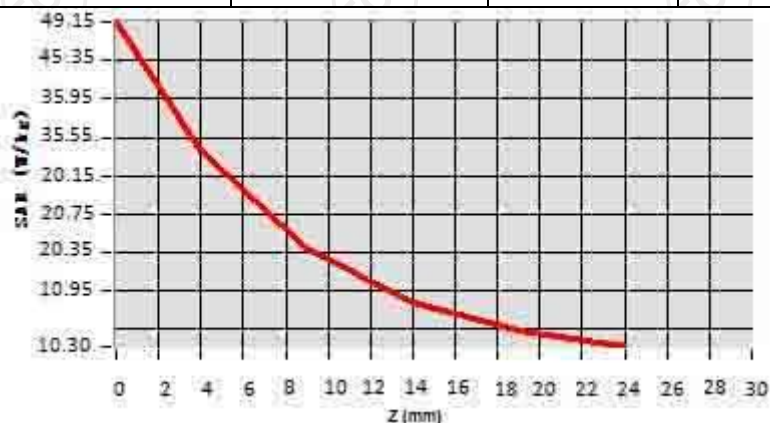
SURFACE SAR



VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	49.15	27.584	20.346	11.252	5.4125



Hot spot position



Date of measurement: 06/28/2024 Test mode: 5600MHz (Head)

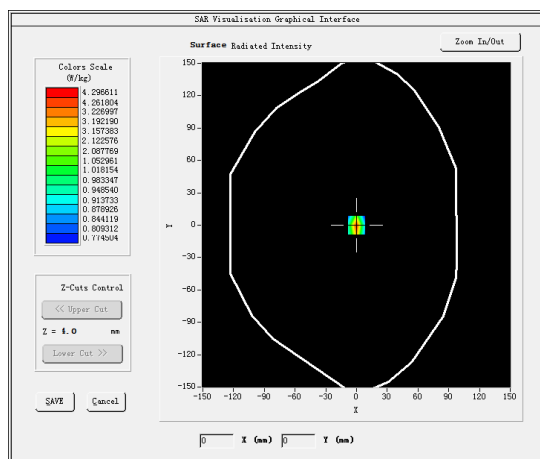
Product Description: Validation

Dipole Model: SID5000

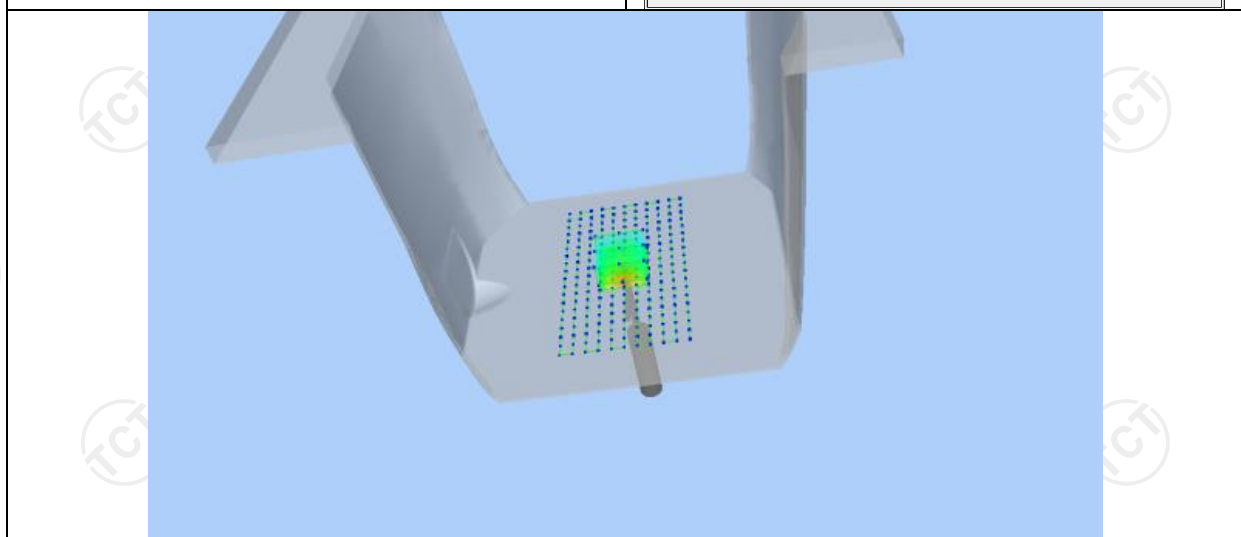
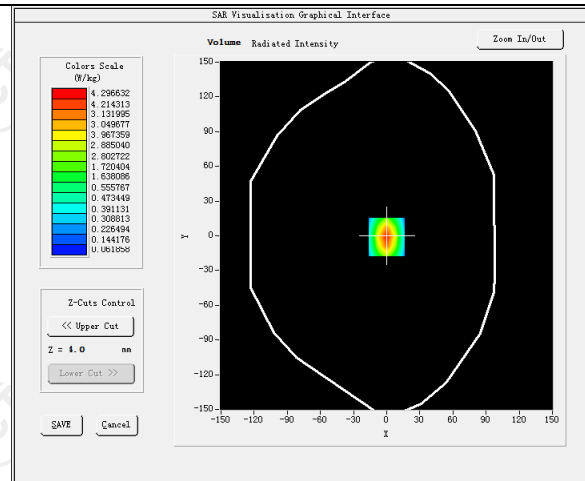
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.12
Frequency (MHz)	5600.000000
Relative permittivity (real part)	35.344129
Relative permittivity (imaginary part)	13.329440
Conductivity (S/m)	4.951484
Variation (%)	1.410000
SAR 10g (W/Kg)	6.164105
SAR 1g (W/Kg)	18.130472

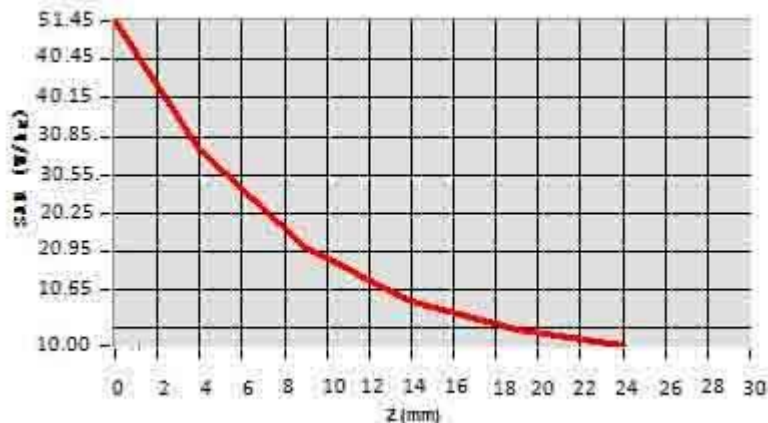
SURFACE SAR



VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	51.4532	30.7154	20.9525	10.5194	10.3514



Hot spot position



Date of measurement: 07/05/2024 Test mode: 5800MHz (Head)

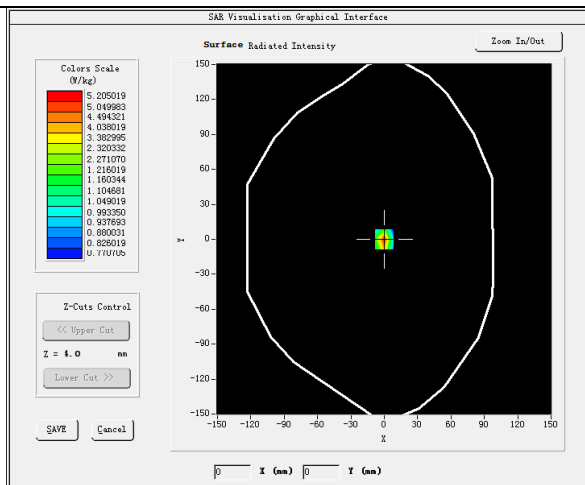
Product Description: Validation

Dipole Model: SID5800

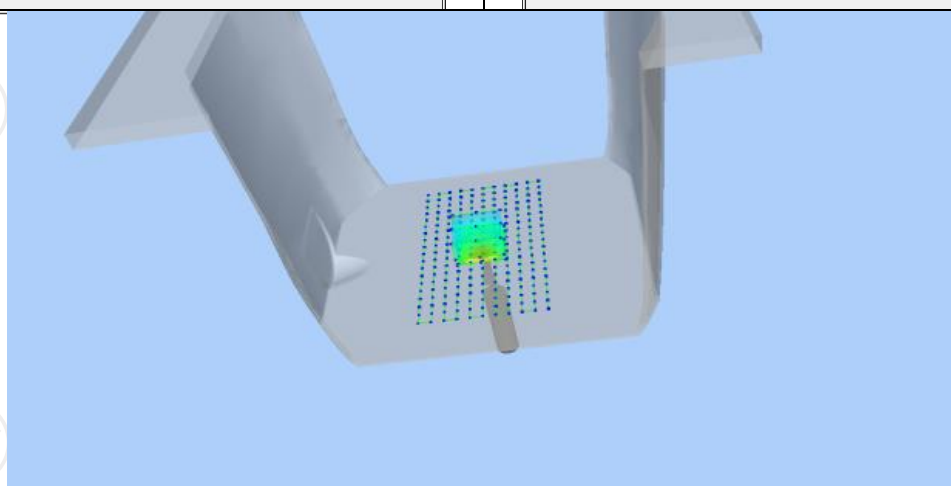
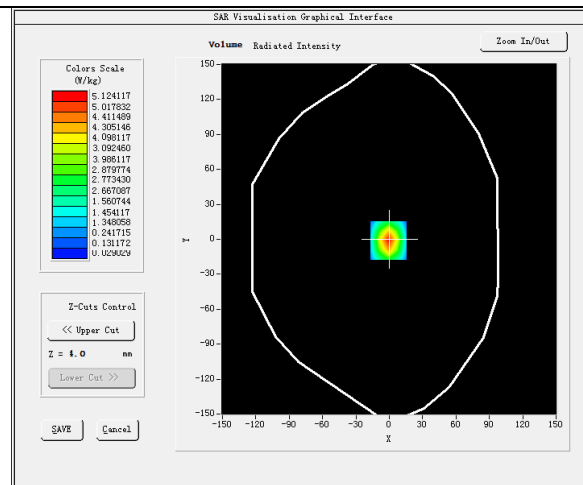
E-Field Probe: SSE2 (SN 25/22 EPGO375)

Phantom	Validation plane
Input Power	100mW
Crest Factor	1.0
Probe Conversion factor	2.06
Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.812823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.080828
Variation (%)	-2.800000
SAR 10g (W/Kg)	5.545121
SAR 1g (W/Kg)	18.203573

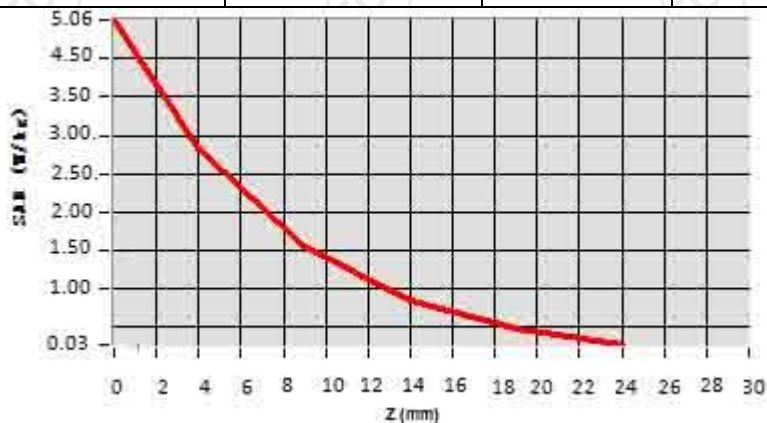
SURFACE SAR



VOLUME SAR



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	5.0622	2.8054	1.5421	0.8321	0.4130



Hot spot position



12. SAR Test Data

WLAN 2.4G-0

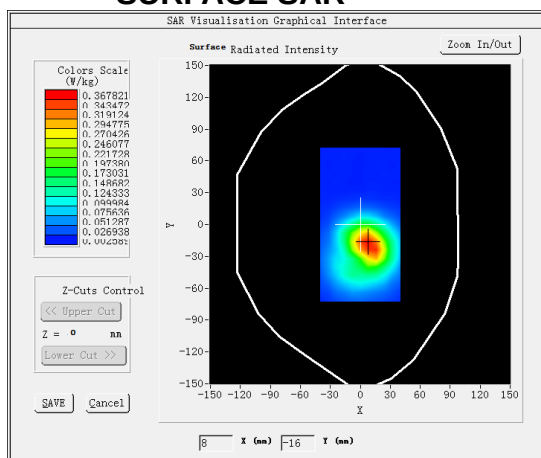
MEASUREMENT 1

High Band SAR (Channel 11):

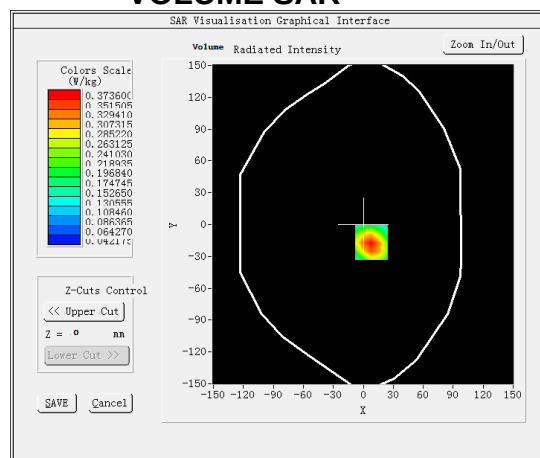
Date: 06/20/2024

Frequency (MHz)	2462.000000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-1.530000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPGO375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11b ISM</u>

SURFACE SAR

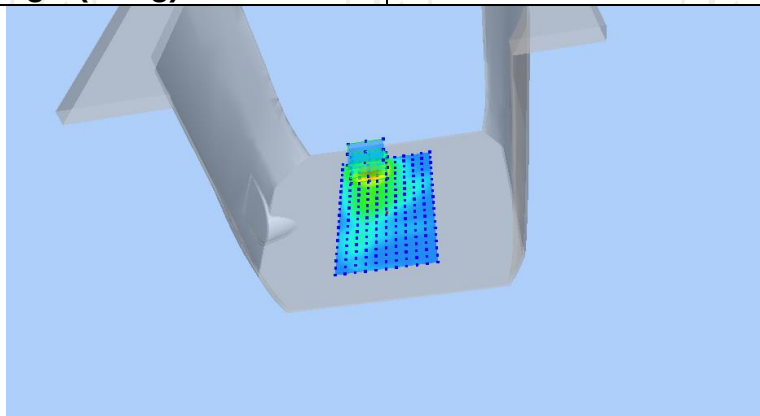


VOLUME SAR

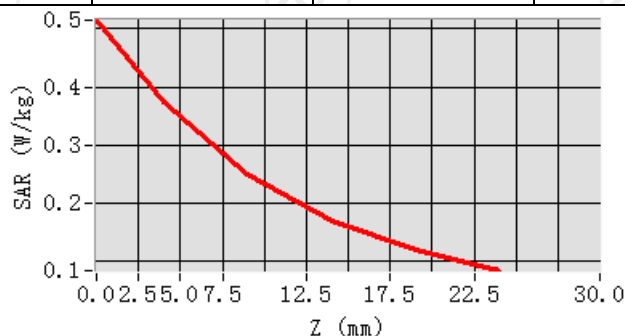


Maximum location: X=8.00, Y=-17.00 SAR Peak: 0.52 W/kg

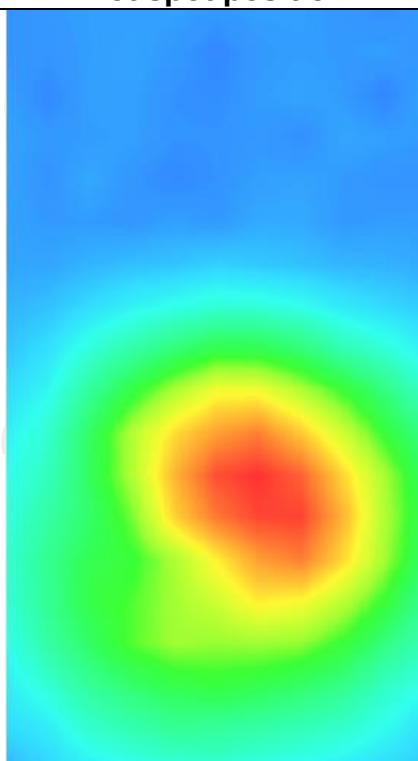
SAR 10g (W/Kg)	0.217980
SAR 1g (W/Kg)	0.353545



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5152	0.3736	0.2494	0.1693	0.1184



Hot spot position



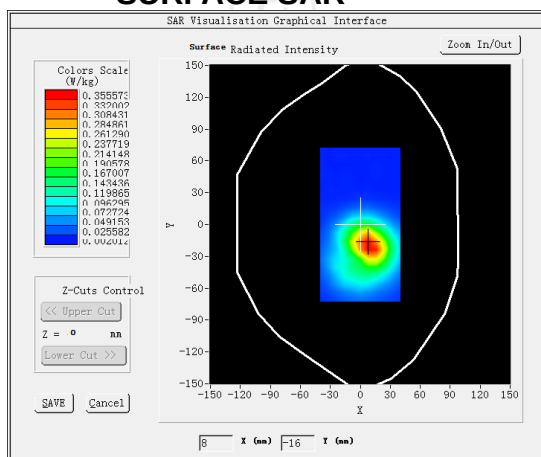
WLAN 2.4G-1

MEASUREMENT 1

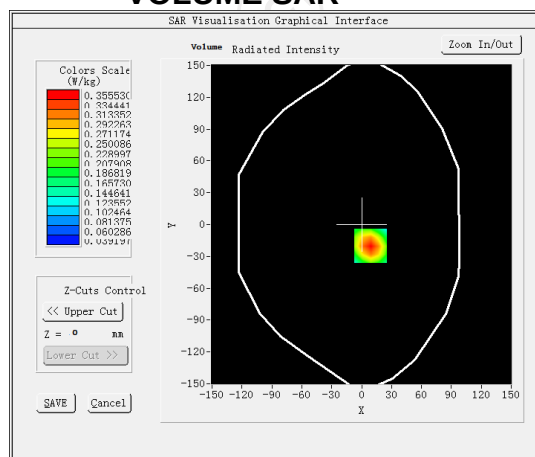
Middle Band SAR (Channel 06): Date: 06/20/2024

Frequency (MHz)	2437.00000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	-1.090000
Crest Factor	1.0
Probe Conversion factor	2.31
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11b ISM</u>

SURFACE SAR

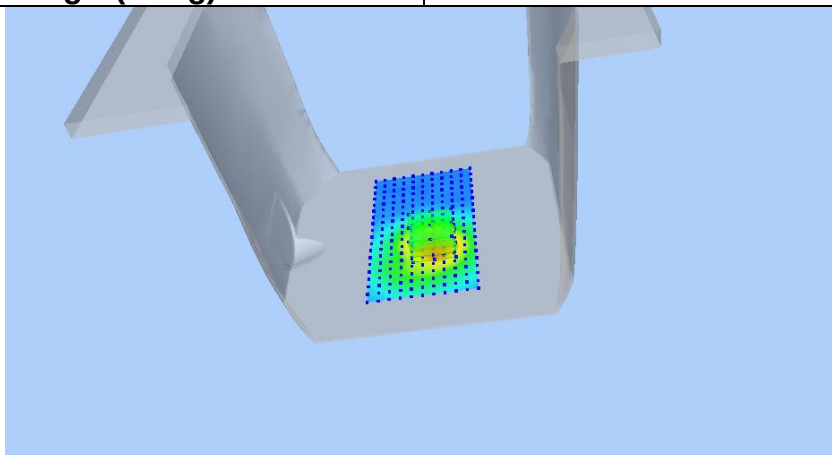


VOLUME SAR

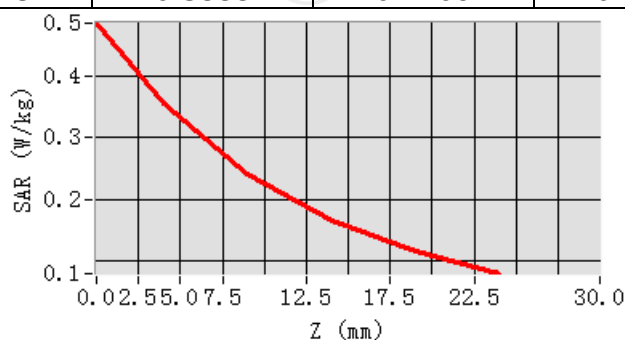


Maximum location: X=9.00, Y=-20.00 SAR Peak: 0.49 W/kg

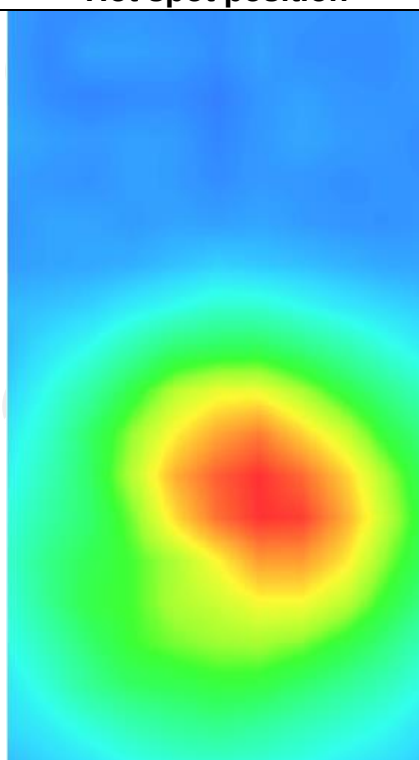
SAR 10g (W/Kg)	0.168909
SAR 1g (W/Kg)	0.261047



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4843	0.3555	0.2409	0.1653	0.1160



Hot spot position



WLAN 2.4G-T

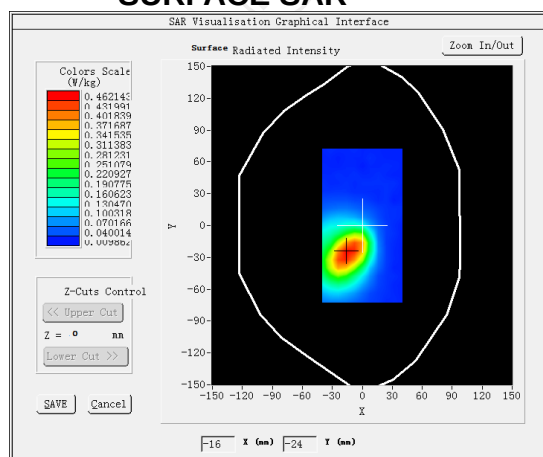
MEASUREMENT 1

High Band SAR (Channel 11):

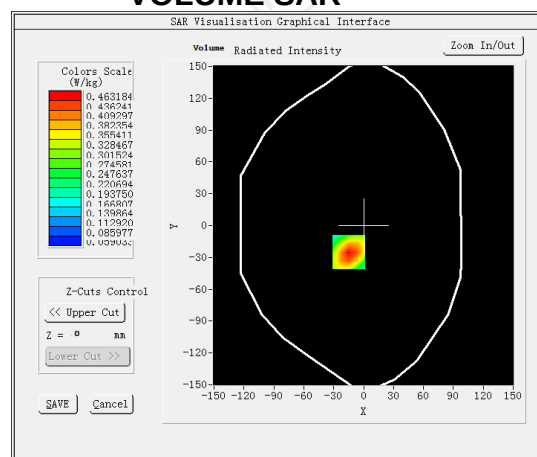
Date: 06/20/2024

Frequency (MHz)	2462.00000
Relative permittivity (real part)	37.821613
Relative permittivity (imaginary part)	13.546980
Conductivity (S/m)	1.834111
Variation (%)	1.240000
Crest Factor	1.0
Probe Conversion factor	4.70
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
ZoomScan	<u>5x5x7,dx=8mm dy=8mm</u> <u>dz=5mm,Complete/ndx=8mm dy=8mm, h=</u> <u>5.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ax ISM</u>

SURFACE SAR

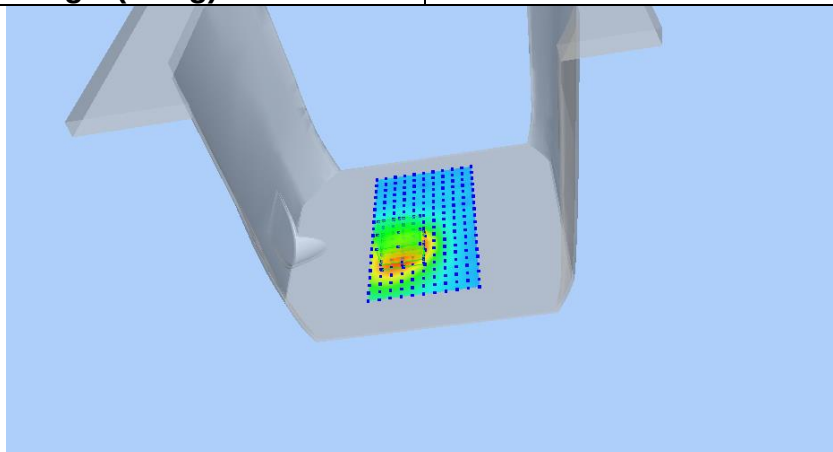


VOLUME SAR

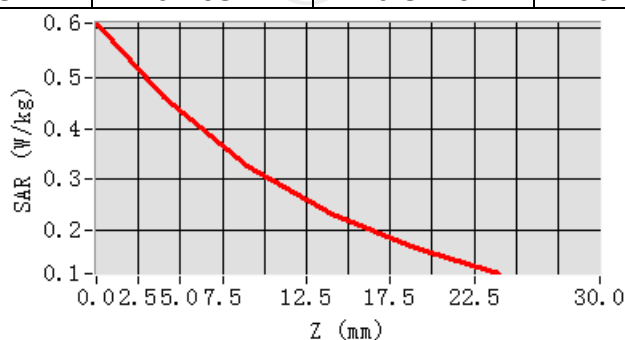


Maximum location: X=-15.00, Y=-25.00 SAR Peak: 0.61 W/kg

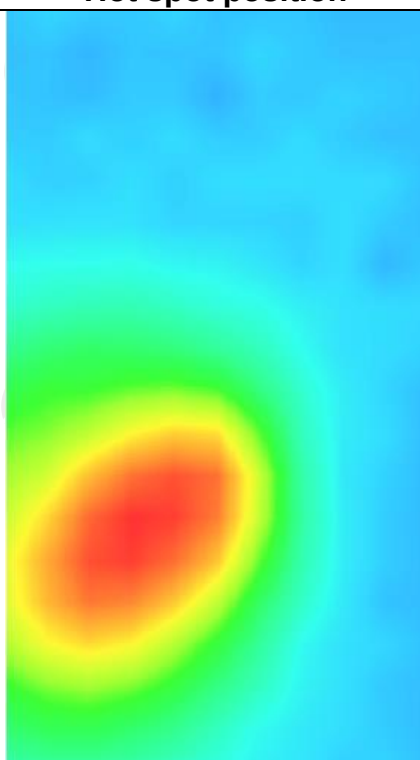
SAR 10g (W/Kg)	0.285834
SAR 1g (W/Kg)	0.439873



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.6082	0.4632	0.3276	0.2322	0.1654



Hot spot position



WLAN 5.2G-0

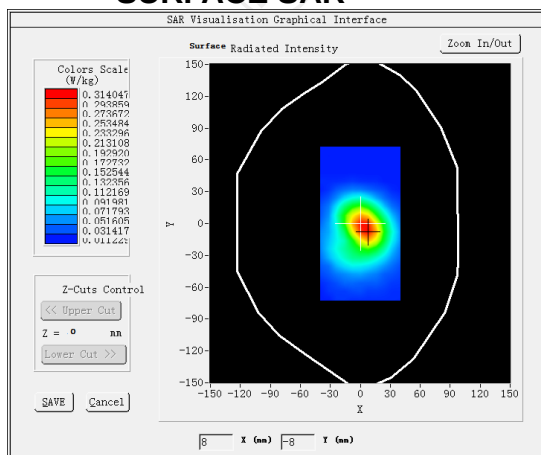
MEASUREMENT 1

SAR (Channel 48):

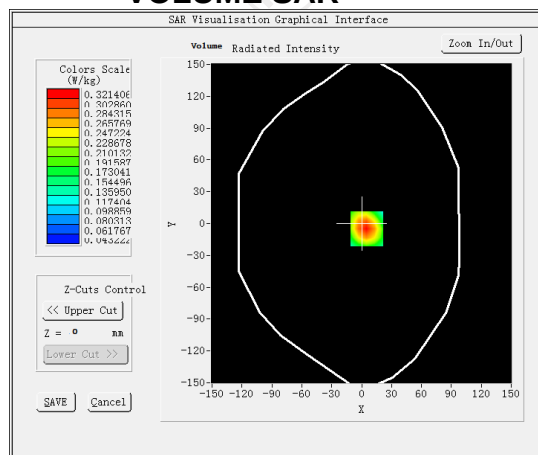
Date: 06/20/2024

Frequency (MHz)	5240.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.679428
Conductivity (S/m)	4.420788
Variation (%)	-1.050000
Crest Factor	1.0
Probe Conversion factor	2.01
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11a ISM</u>

SURFACE SAR

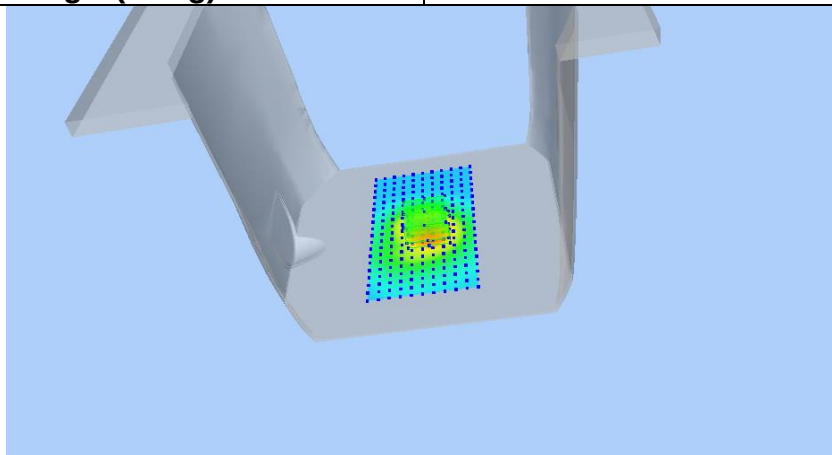


VOLUME SAR

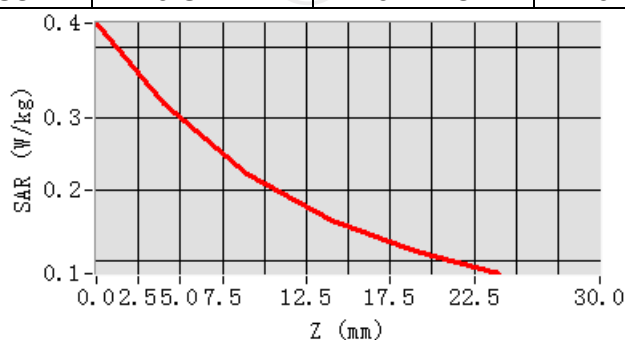


Maximum location: X=5.00, Y=-5.00 SAR Peak: 0.43 W/kg

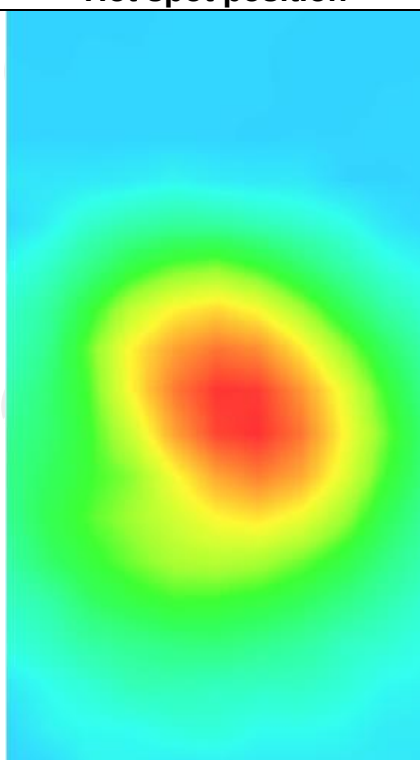
SAR 10g (W/Kg)	0.134024
SAR 1g (W/Kg)	0.203224



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4335	0.3214	0.2215	0.1557	0.1129



Hot spot position



WLAN 5.3G-0

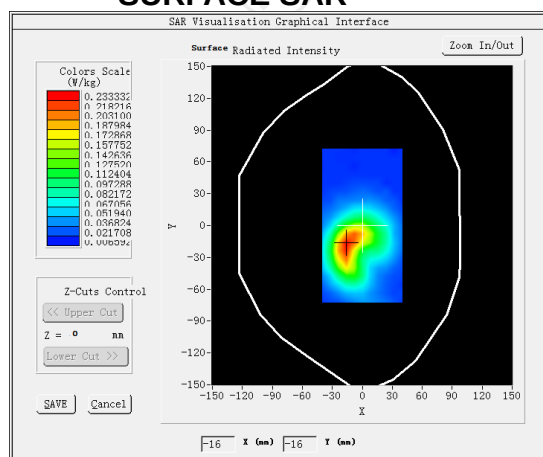
MEASUREMENT 1

SAR (Channel 52):

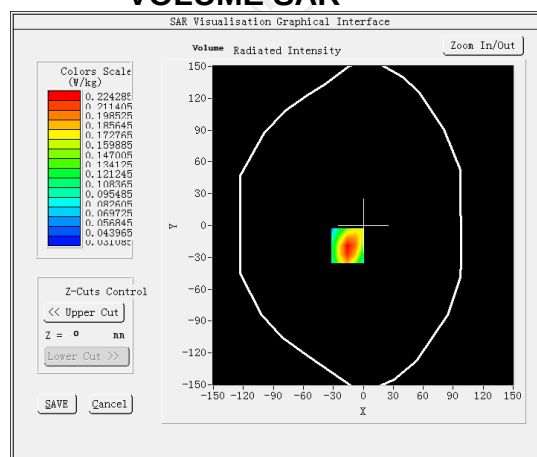
Date: 06/25/2024

Frequency (MHz)	5260.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.680430
Conductivity (S/m)	4.690788
Variation (%)	-0.150000
Crest Factor	1.0
Probe Conversion factor	1.94
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11a ISM</u>

SURFACE SAR

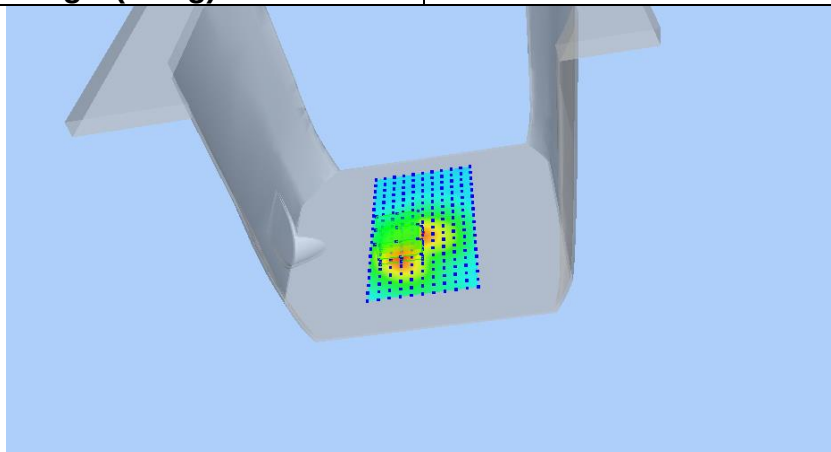


VOLUME SAR

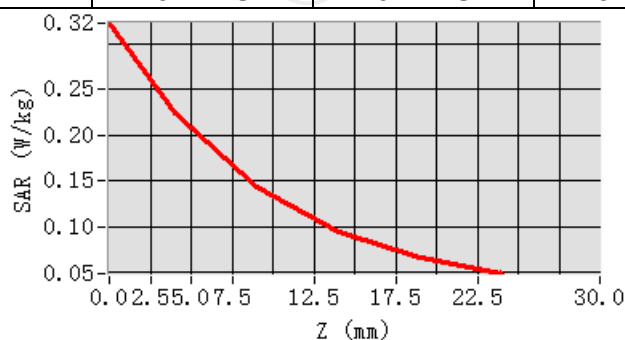


Maximum location: X=-16.00, Y=-19.00 SAR Peak: 0.33 W/kg

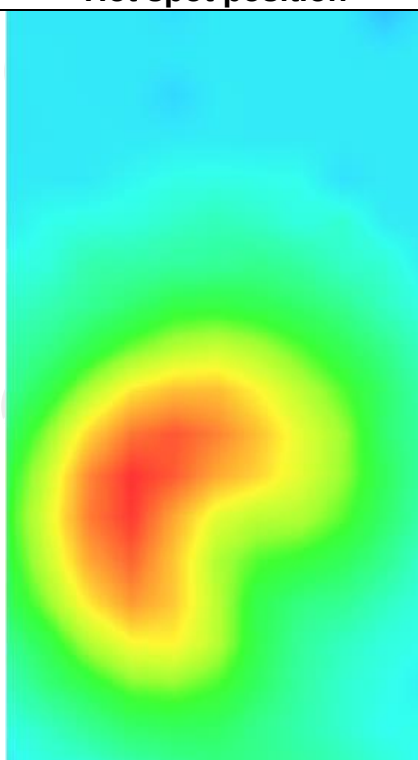
SAR 10g (W/Kg)	0.133139
SAR 1g (W/Kg)	0.217636



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3227	0.2243	0.1428	0.0944	0.0668



Hot spot position



WLAN 5.6G-0

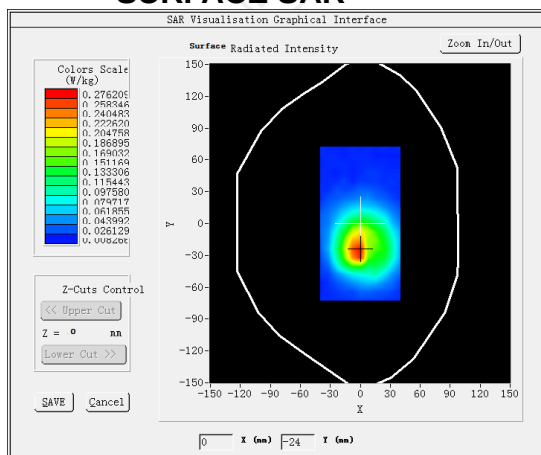
MEASUREMENT 1

SAR (Channel 100):

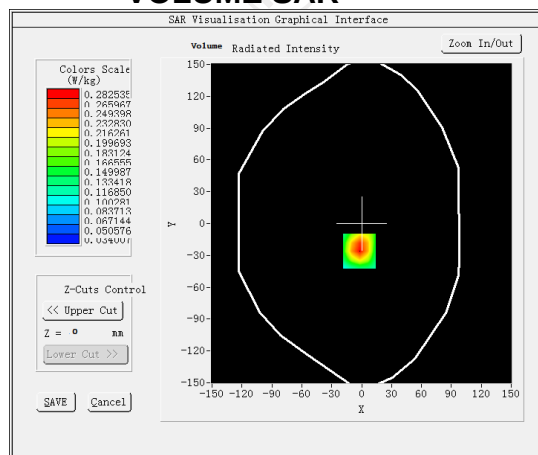
Date: 06/28/2024

Frequency (MHz)	5500.00000
Relative permittivity (real part)	35.599999
Relative permittivity (imaginary part)	13.329440
Conductivity (S/m)	4.870354
Variation (%)	1.300000
Crest Factor	1.0
Probe Conversion factor	2.12
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(10mm)
Band	<u>IEEE 802.11a ISM</u>

SURFACE SAR

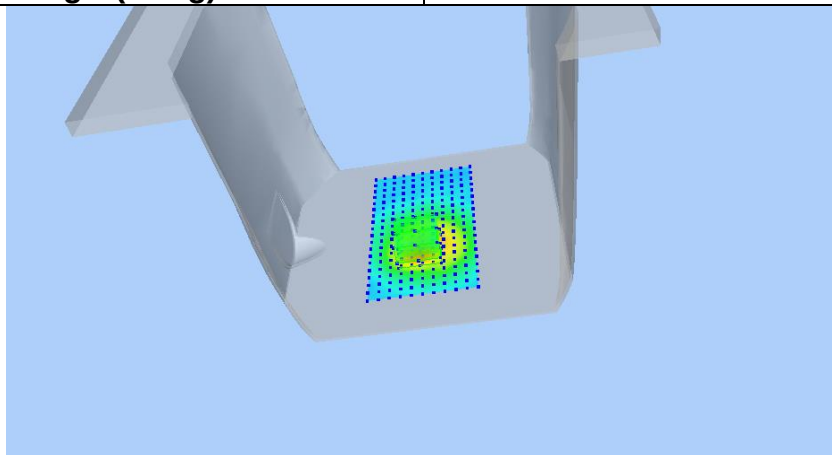


VOLUME SAR

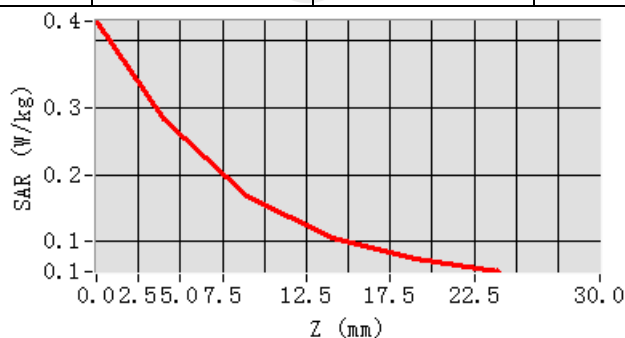


Maximum location: X=-2.00, Y=-26.00 SAR Peak: 0.40 W/kg

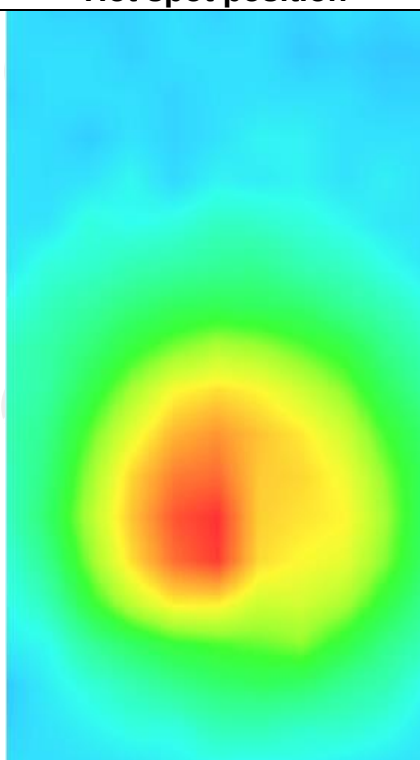
SAR 10g (W/Kg)	0.160829
SAR 1g (W/Kg)	0.273561



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4288	0.2825	0.1681	0.1060	0.0745



Hot spot position



WLAN 5.8G-0

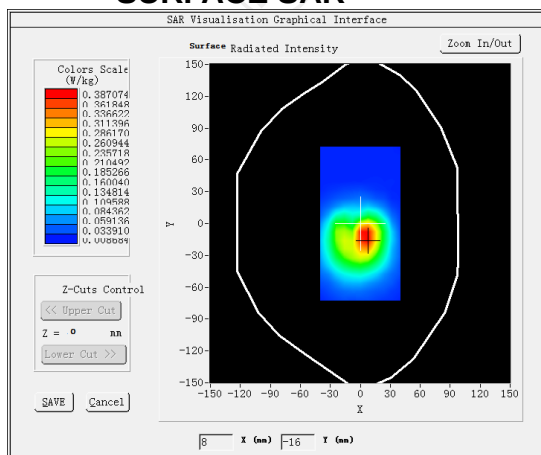
MEASUREMENT 1

SAR (Channel 149):

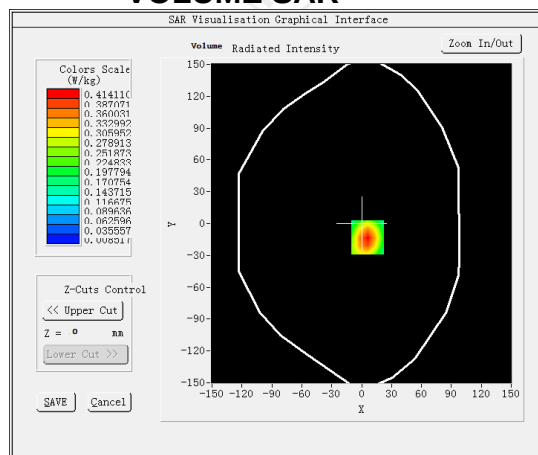
Date: 07/05/2024

Frequency (MHz)	5745.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	-2.150000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11a ISM</u>

SURFACE SAR

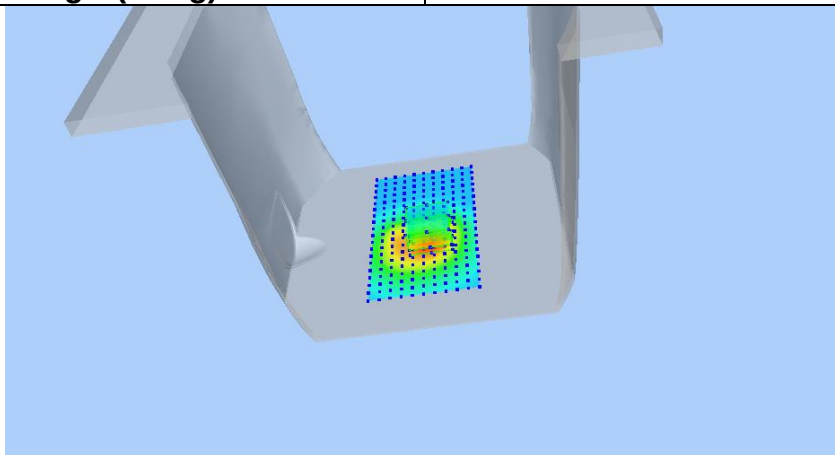


VOLUME SAR

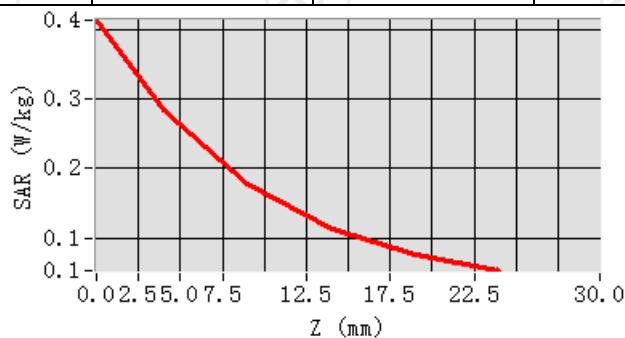


Maximum location: X=15.00, Y=60.00 SAR Peak: 0.40 W/kg

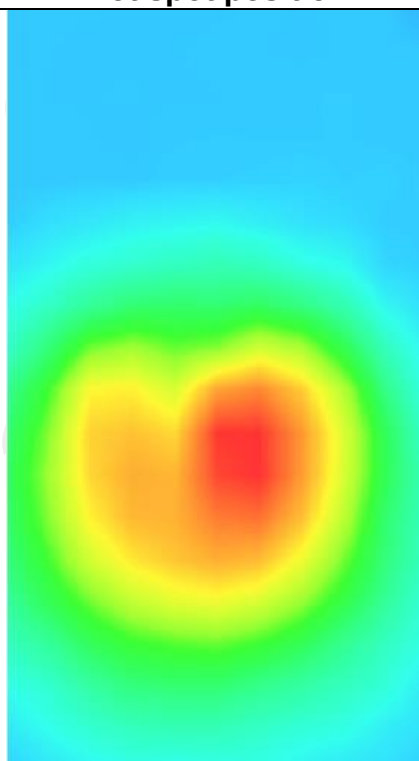
SAR 10g (W/Kg)	0.132152
SAR 1g (W/Kg)	0.208614



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4131	0.2842	0.1773	0.1137	0.0770



Hot spot position



WLAN 5.2G-1

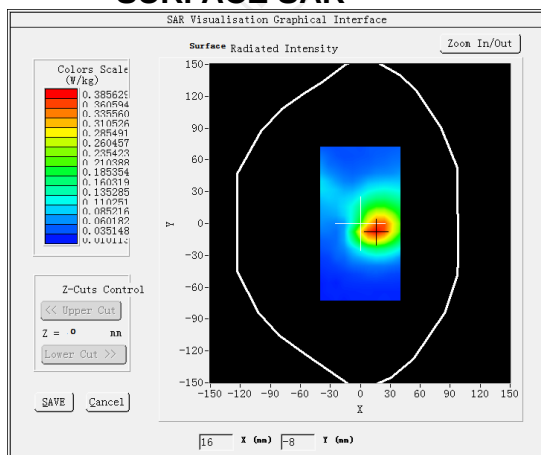
MEASUREMENT 1

SAR (Channel 46):

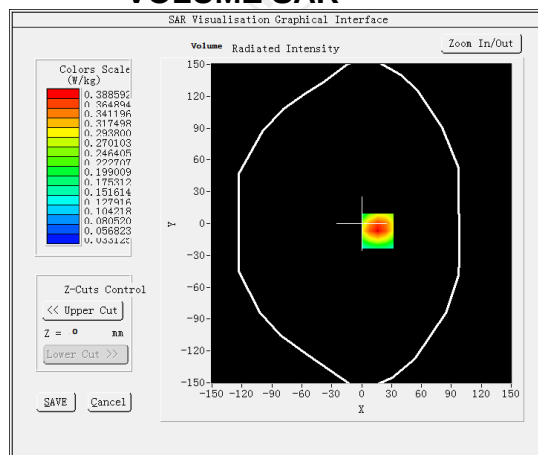
Date: 06/20/2024

Frequency (MHz)	5130.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.679428
Conductivity (S/m)	4.420788
Variation (%)	-1.620000
Crest Factor	1.0
Probe Conversion factor	2.01
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR

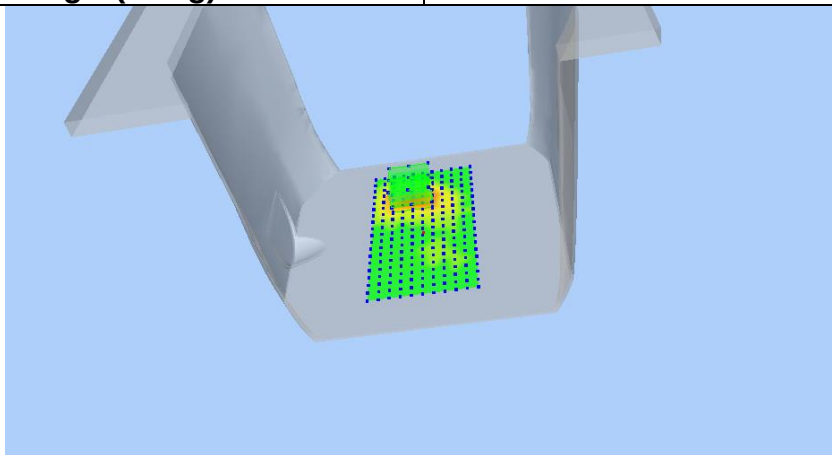


VOLUME SAR

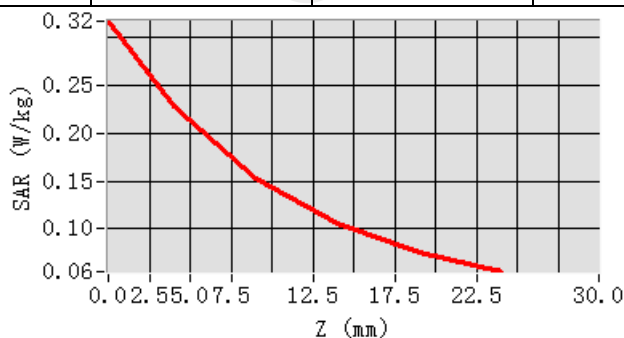


Maximum location: X=16.00, Y=-7.00 SAR Peak: 0.32 W/kg

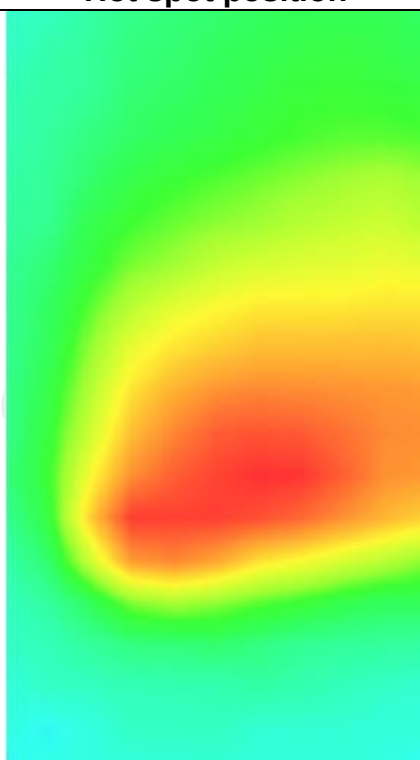
SAR 10g (W/Kg)	0.120124
SAR 1g (W/Kg)	0.181201



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3164	0.2283	0.1524	0.1049	0.0758



Hot spot position



WLAN 5.3G-1

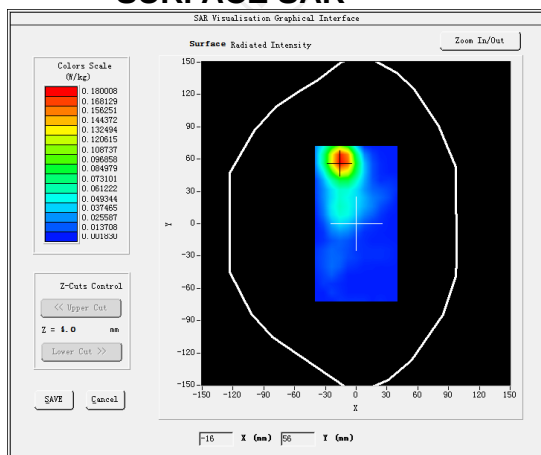
MEASUREMENT 1

SAR (Channel 60):

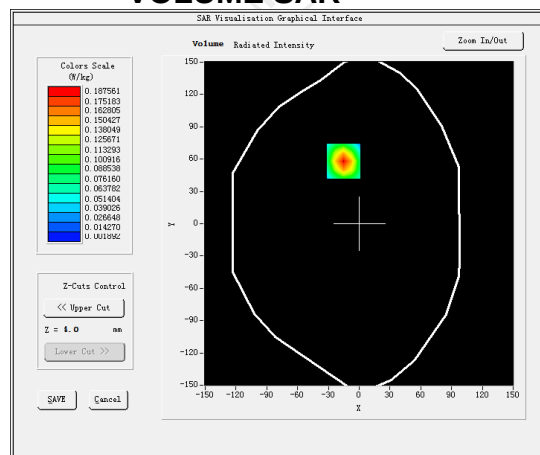
Date: 06/25/2024

Frequency (MHz)	5300.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.680430
Conductivity (S/m)	4.690788
Variation (%)	-2.470000
Crest Factor	1.0
Probe Conversion factor	1.94
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11a ISM</u>

SURFACE SAR

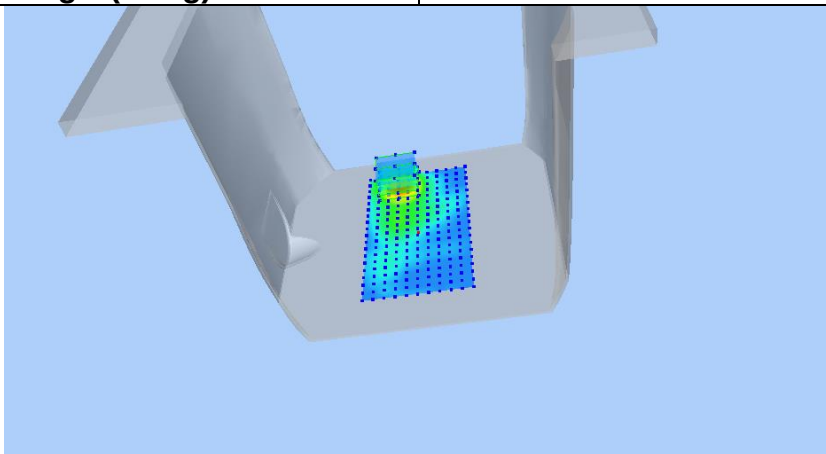


VOLUME SAR

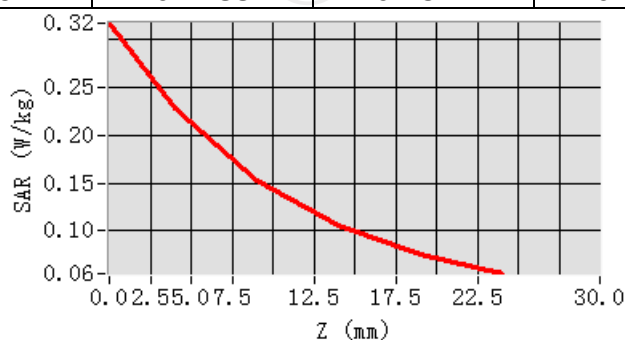


Maximum location: X=-11.00, Y=57.00 SAR Peak: 0.34 W/kg

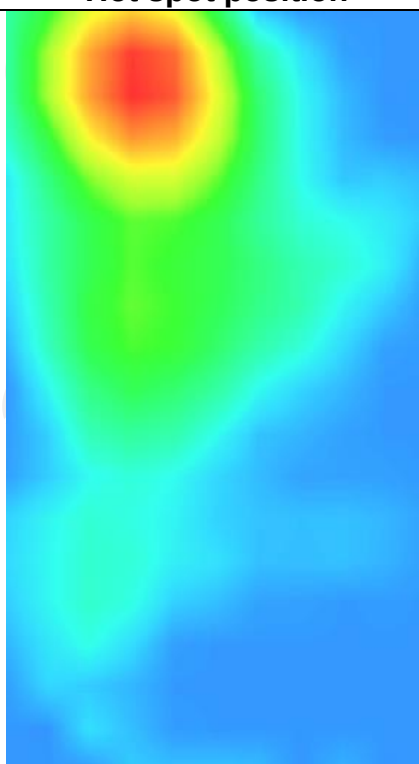
SAR 10g (W/Kg)	0.128131
SAR 1g (W/Kg)	0.184304



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3164	0.2283	0.1524	0.1049	0.0758



Hot spot position



WLAN 5.6G-1

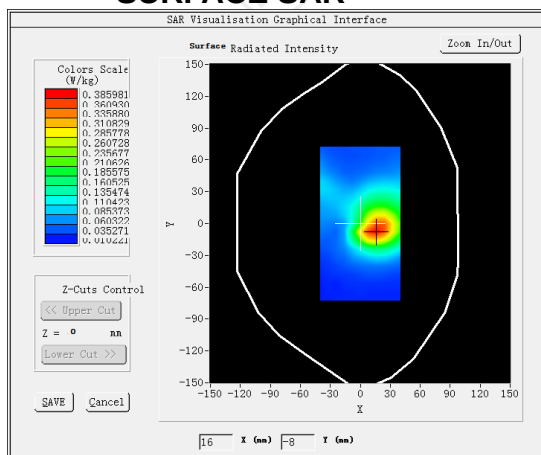
MEASUREMENT 1

SAR (Channel 134):

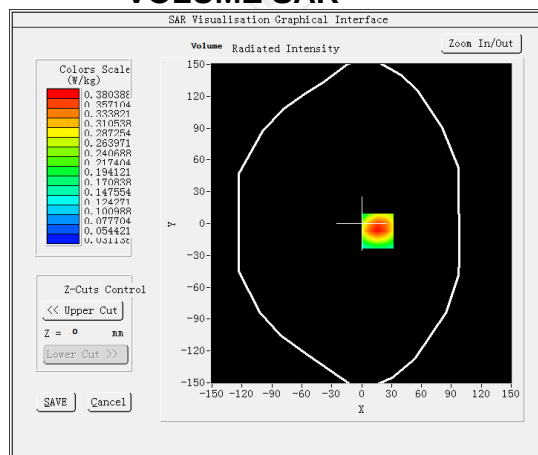
Date: 06/28/2024

Frequency (MHz)	5670.00000
Relative permittivity (real part)	35.599999
Relative permittivity (imaginary part)	13.329440
Conductivity (S/m)	4.870354
Variation (%)	0.100000
Crest Factor	1.0
Probe Conversion factor	2.12
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ax ISM</u>

SURFACE SAR

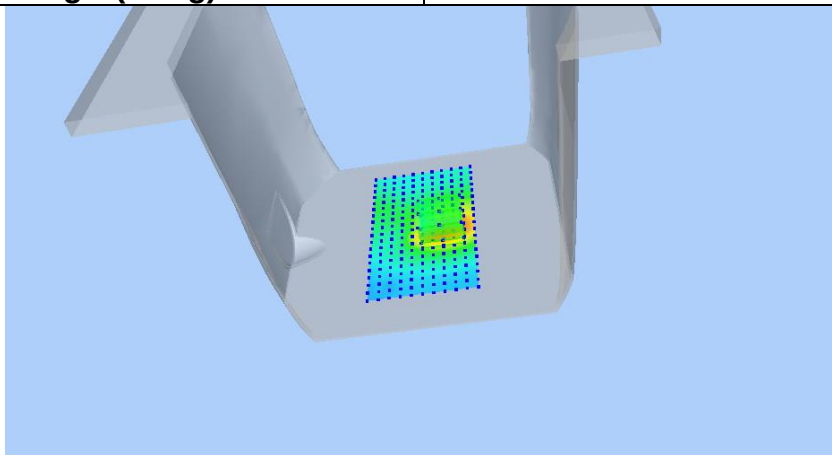


VOLUME SAR

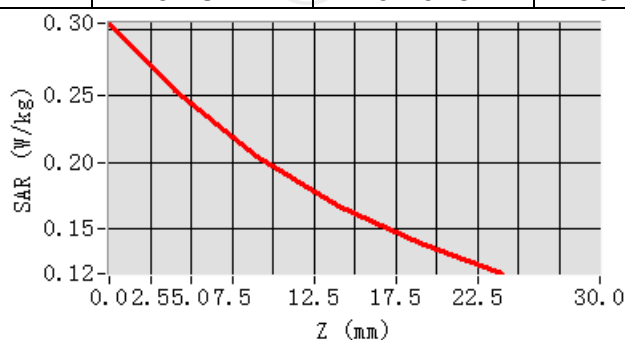


Maximum location: X=19.00, Y=5.00 SAR Peak: 0.31 W/kg

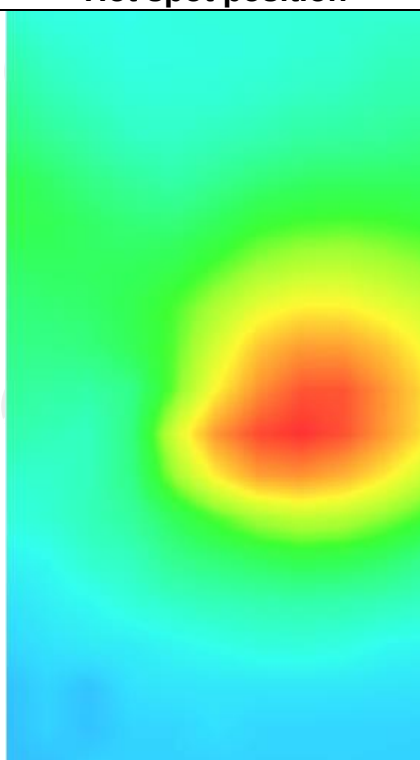
SAR 10g (W/Kg)	0.113057
SAR 1g (W/Kg)	0.210254



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3047	0.2544	0.2046	0.1672	0.1390



Hot spot position



WLAN 5.8G-1

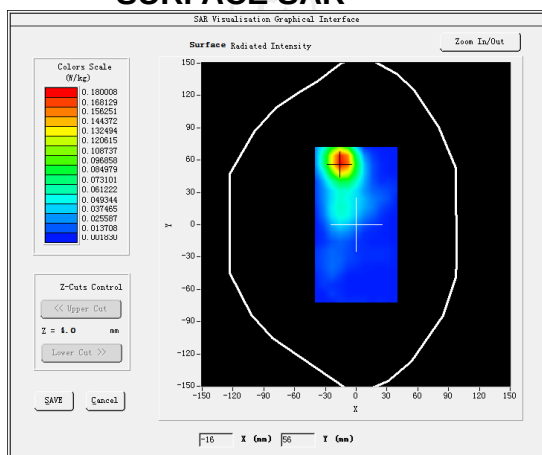
MEASUREMENT 1

SAR (Channel 159):

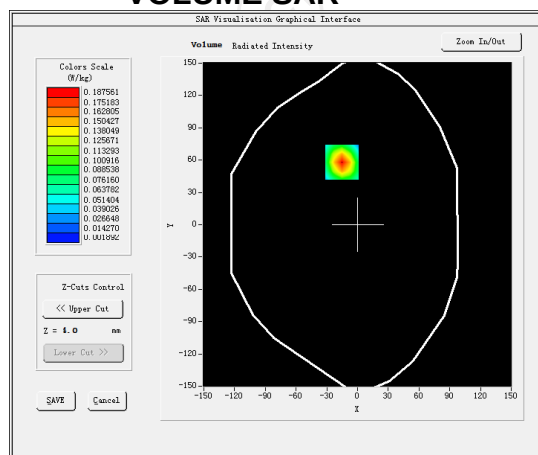
Date: 07/05/2024

Frequency (MHz)	5795.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	0.300000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPGO375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR

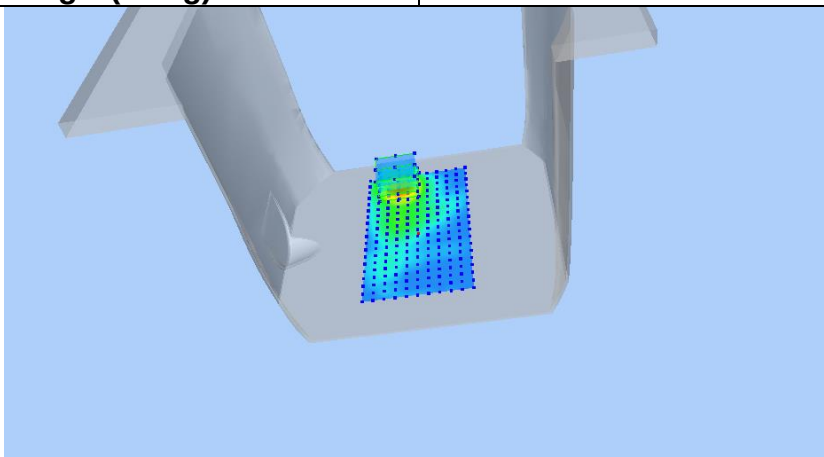


VOLUME SAR

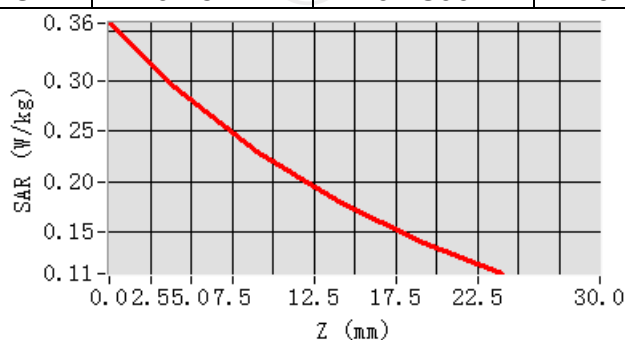


Maximum location: X=0.00, Y=34.00 SAR Peak: 0.36 W/kg

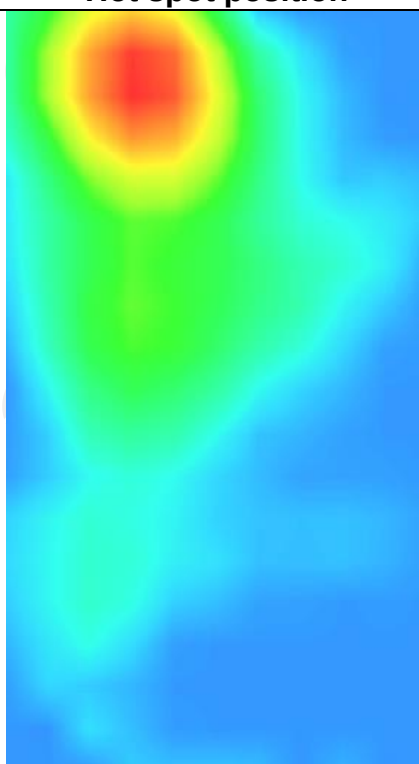
SAR 10g (W/Kg)	0.135431
SAR 1g (W/Kg)	0.218746



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3573	0.2941	0.2300	0.1801	0.1411



Hot spot position



WLAN 5.2G-T

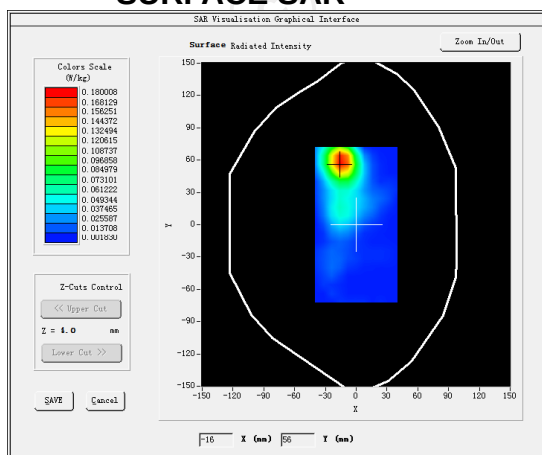
MEASUREMENT 1

SAR (Channel 159):

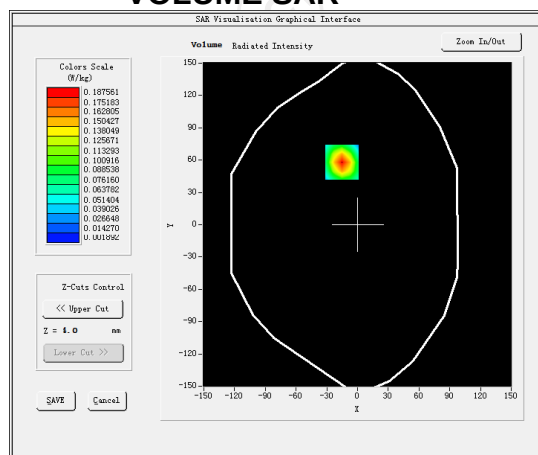
Date: 07/05/2024

Frequency (MHz)	5795.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	0.300000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPGO375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR

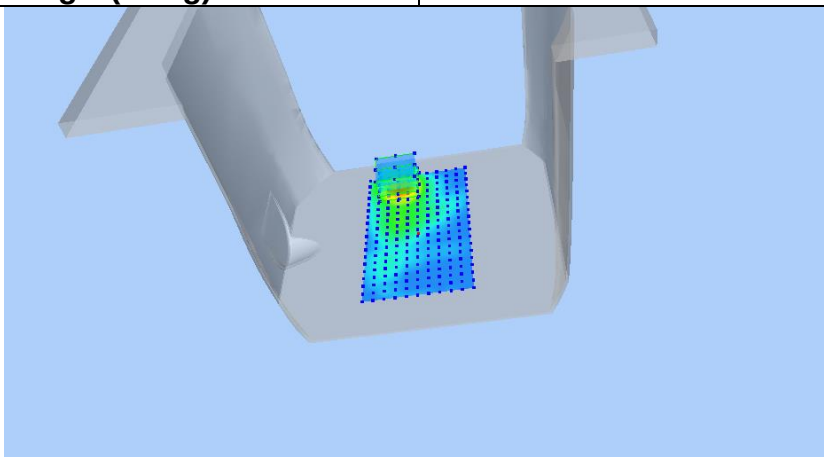


VOLUME SAR

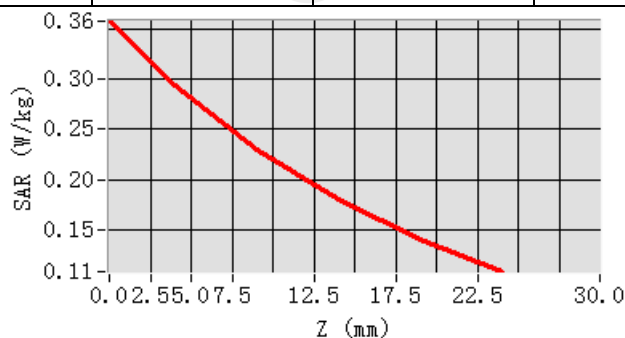


Maximum location: X=0.00, Y=34.00 SAR Peak: 0.36 W/kg

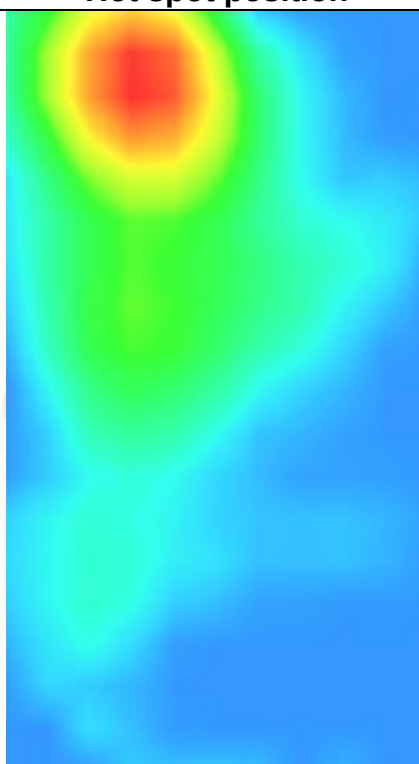
SAR 10g (W/Kg)	0.135431
SAR 1g (W/Kg)	0.218746



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3573	0.2941	0.2300	0.1801	0.1411



Hot spot position



WLAN 5.3G-T

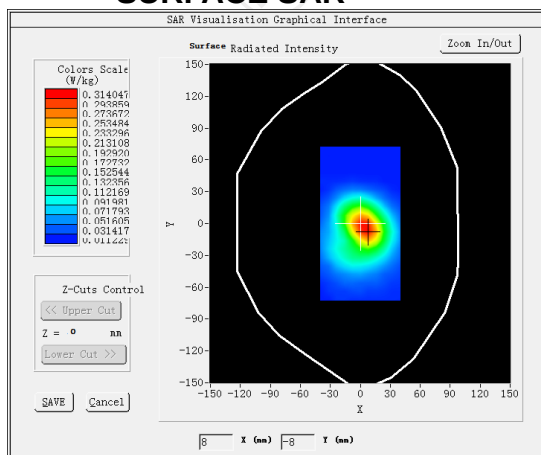
MEASUREMENT 1

SAR (Channel 62):

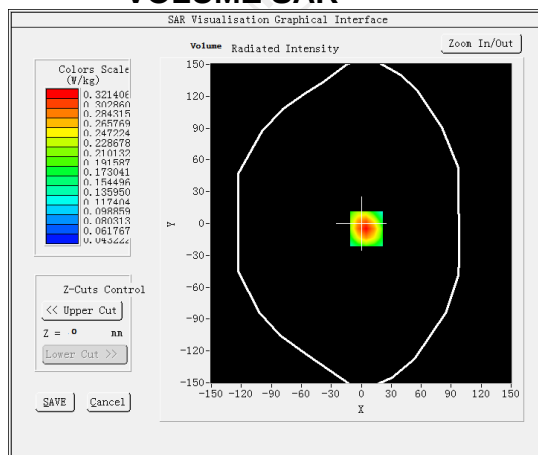
Date: 06/25/2024

Frequency (MHz)	5310.000000
Relative permittivity (real part)	36.068832
Relative permittivity (imaginary part)	13.680430
Conductivity (S/m)	4.690788
Variation (%)	0.770000
Crest Factor	1.0
Probe Conversion factor	1.94
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11ac ISM</u>

SURFACE SAR

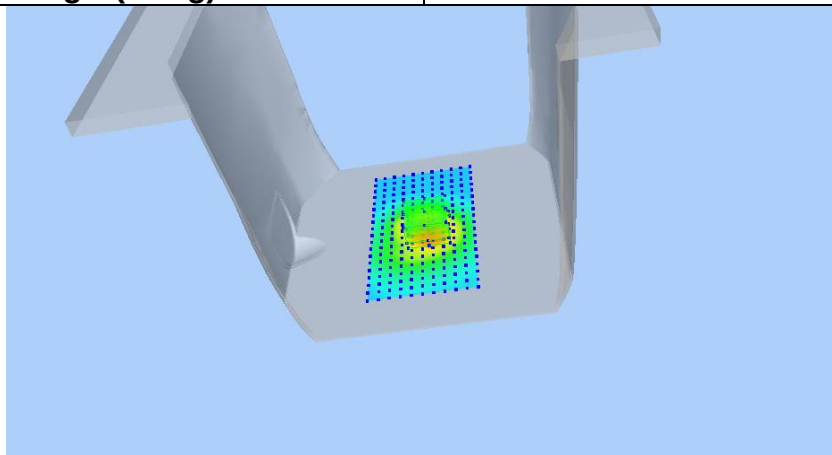


VOLUME SAR

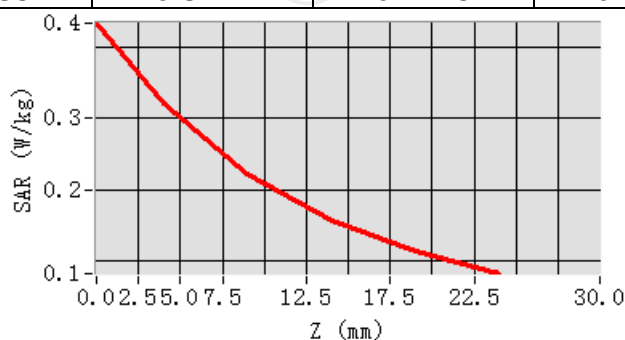


Maximum location: X=5.00, Y=-5.00 SAR Peak: 0.43 W/kg

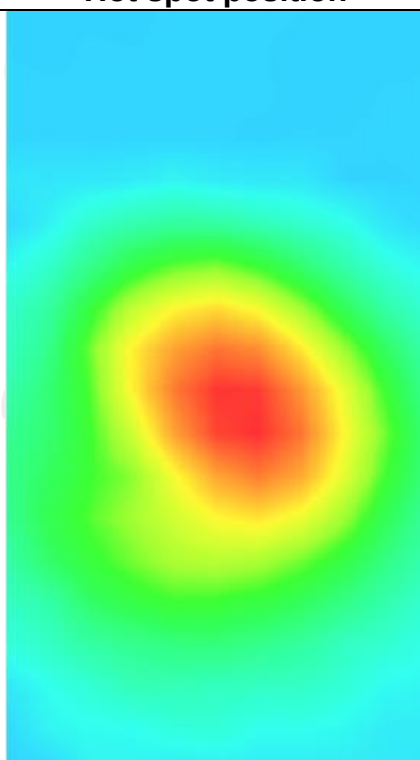
SAR 10g (W/Kg)	0.187462
SAR 1g (W/Kg)	0.303201



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.4335	0.3214	0.2215	0.1557	0.1129



Hot spot position



WLAN 5.6G-T

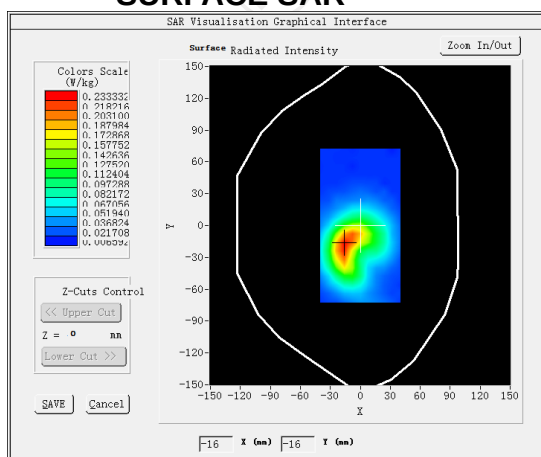
MEASUREMENT 1

SAR (Channel 140):

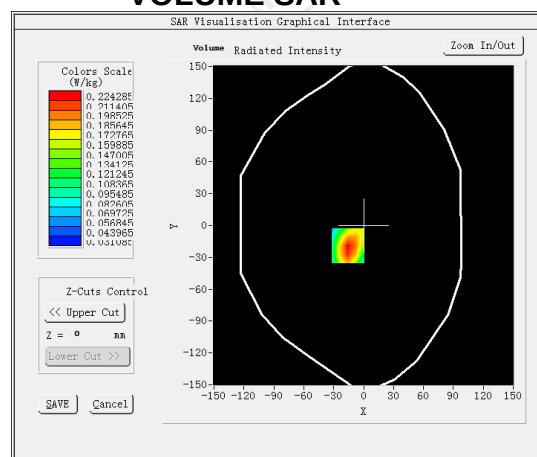
Date: 06/28/2024

Frequency (MHz)	5590.000000
Relative permittivity (real part)	35.599999
Relative permittivity (imaginary part)	13.329440
Conductivity (S/m)	4.870354
Variation (%)	1.410000
Crest Factor	1.0
Probe Conversion factor	2.12
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11n ISM</u>

SURFACE SAR

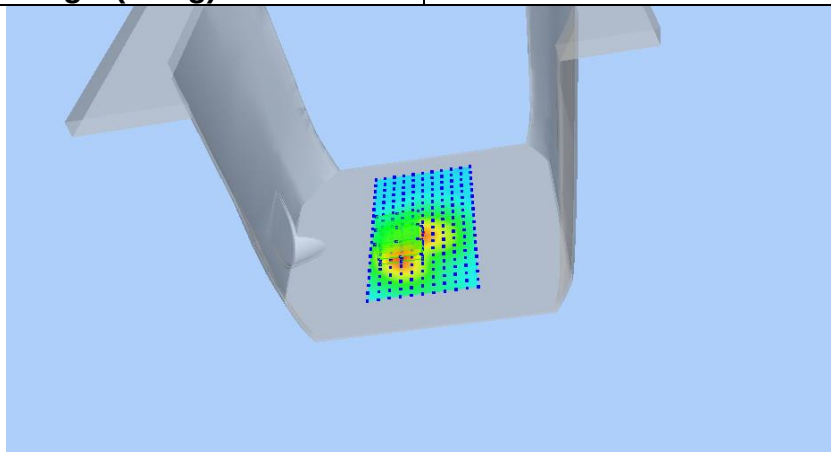


VOLUME SAR

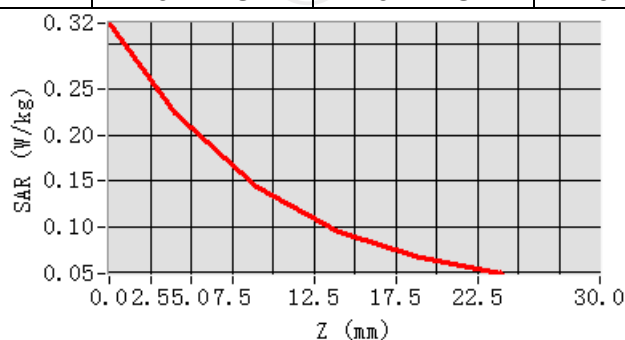


Maximum location: X=-16.00, Y=-19.00 SAR Peak: 0.33 W/kg

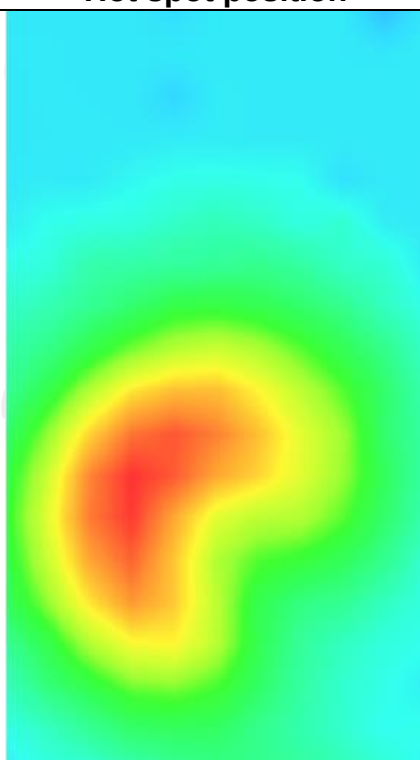
SAR 10g (W/Kg)	0.133139
SAR 1g (W/Kg)	0.217636



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.3227	0.2243	0.1428	0.0944	0.0668



Hot spot position



WLAN 5.8G-T

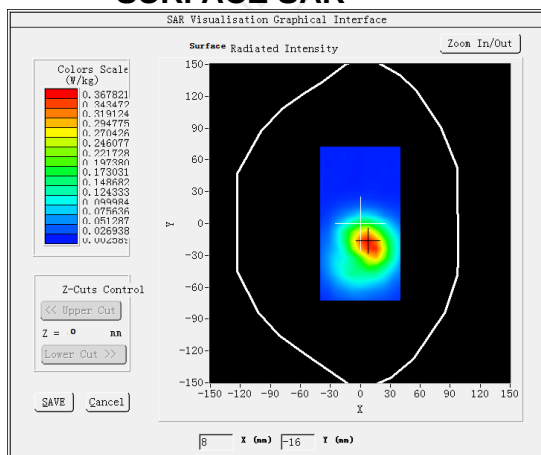
MEASUREMENT 1

SAR (Channel 159):

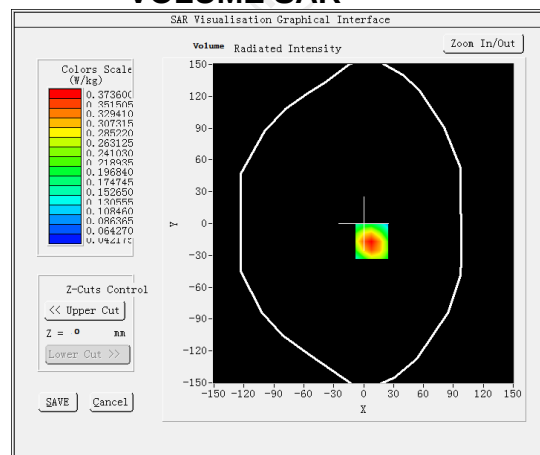
Date: 07/05/2024

Frequency (MHz)	5795.000000
Relative permittivity (real part)	34.352823
Relative permittivity (imaginary part)	13.671675
Conductivity (S/m)	5.030828
Variation (%)	1.520000
Crest Factor	1.0
Probe Conversion factor	2.06
E-Field Probe:	SSE2 (SN 25/22 EPG0375)
Area Scan	<u>dx=10mm dy=10mm, h= 5.00 mm</u>
ZoomScan	<u>7x7x12,dx=4mm dy=4mm</u> <u>dz=2mm,Complete/ndx=4mm dy=4mm, h=</u> <u>2.00 mm</u>
Phantom	Validation plane
Device Position	Body back(0mm)
Band	<u>IEEE 802.11n ISM</u>

SURFACE SAR

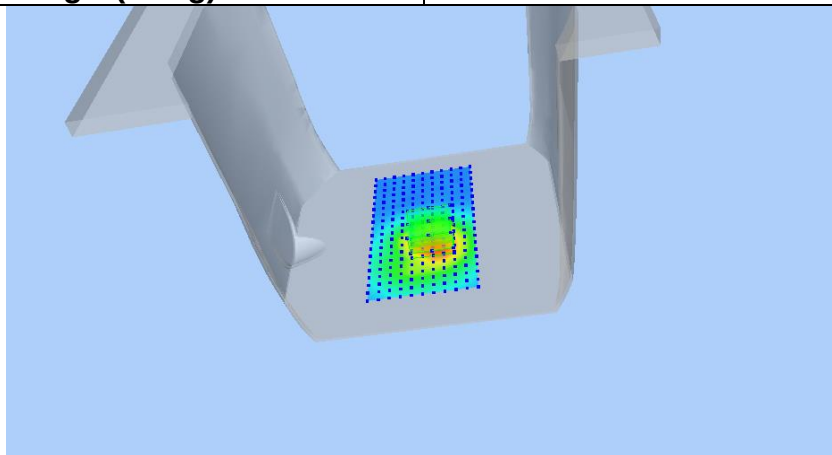


VOLUME SAR

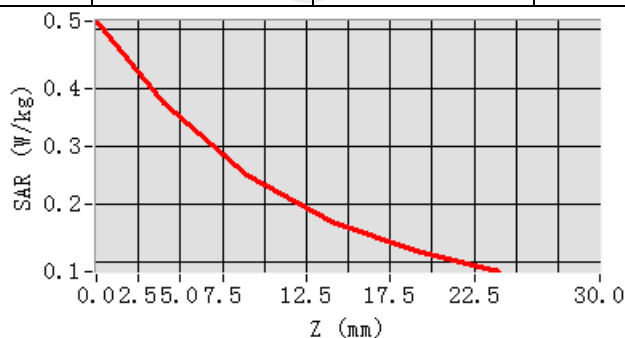


Maximum location: X=8.00, Y=-17.00 SAR Peak: 0.52 W/kg

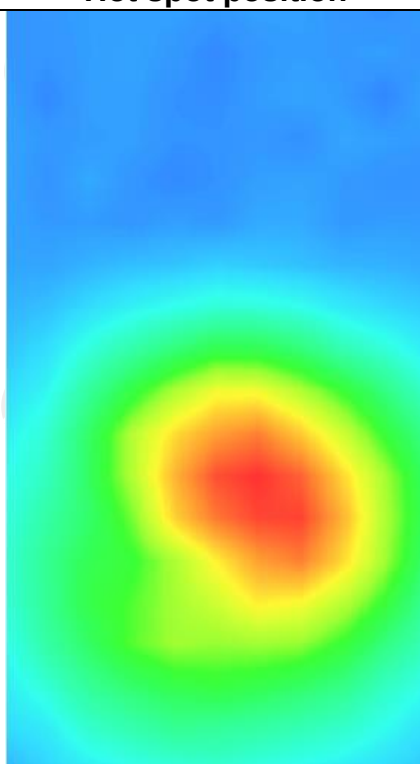
SAR 10g (W/Kg)	0.217980
SAR 1g (W/Kg)	0.353545



Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.5152	0.3736	0.2494	0.1693	0.1184



Hot spot position



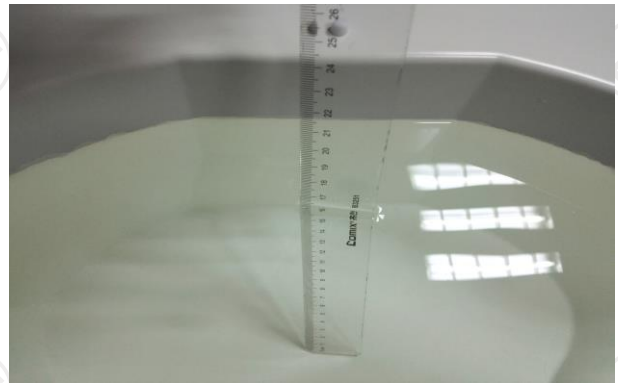
Appendix A: EUT Photos



Liquid depth



The Body Liquid of 2450MHz (15.3cm)



The Body Liquid of 5000-6000MHz (16.5cm)



The Head Liquid of 2450MHz (15.6cm)



The Head Liquid of 5000-6000MHz (15.8cm)

Appendix B: Test Setup Photos



Body worn – Front (0mm)



Body worn – Back (0mm)



Body worn – Right (0mm)



Body worn – Top (0mm)

Appendix C: Probe Calibration Certificate

COMOSAR E-FIELD Probe



COMOSAR E-Field Probe Calibration Report

Ref : ACR.180.7.22.BES.B

SHENZHEN TONGCE TESTING LAB

2101 & 2201, ZHENCHANG FACTORY RENSHAN INDUSTRIAL
ZONE, FUHAI SUBDISTRICT, BAO'AN DISTRICT SHENZHEN,
GUANGDONG, 518103, PEOPLE'S REPUBLIC OF 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

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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	7/05/2024	

	Customer Name
Distribution :	Shenzhen Tongce Testing Lab

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

Page: 2/11

Template_ACR.DDD.N.YY.MVGB.ISSUE_COMOSAR Probe vK

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.180.7.22 BES.B

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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.

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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:

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

where

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

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



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:

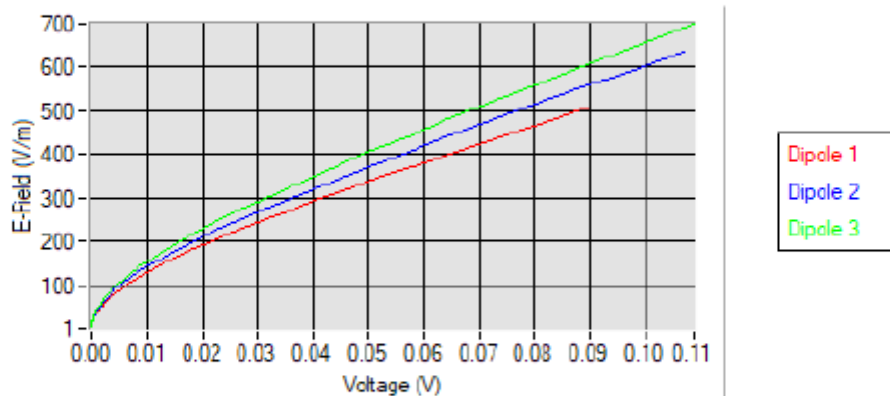
$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



COMOSAR E-FIELD PROBE CALIBRATION REPORT

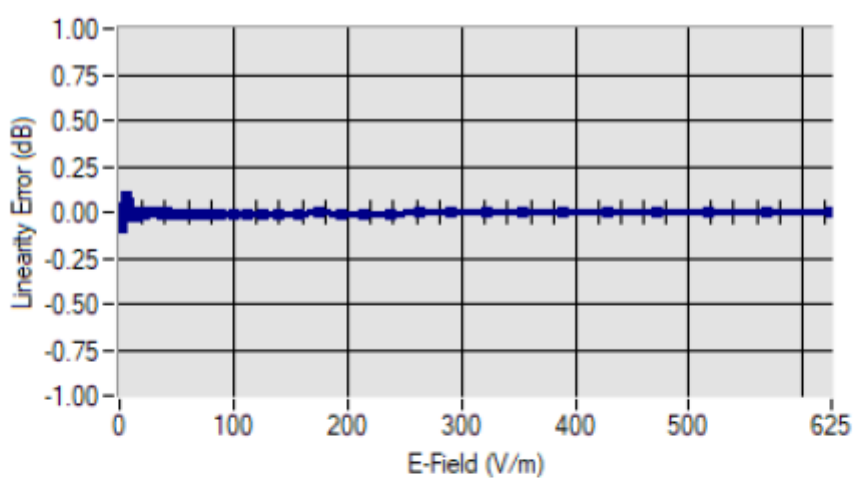
Ref: ACR.180.7.22.BES.B

Calibration curves



5.2 LINEARITY

Linearity



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



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	1.71
BL750	750	1.78
HL900	900	1.91
BL900	900	1.96
HL1800	1800	2.08
BL1800	1800	2.16
HL2000	2000	2.03
BL2000	2000	2.10
HL2450	2450	2.31
BL2450	2450	2.37
HL2600	2600	2.16
BL2600	2600	2.23
HL3500	3500	2.21
BL3500	3500	2.28
HL3700	3700	3.45
BL3700	3700	3.15
HL4600	4600	3.30
BL4600	4600	3.70
HL5200	5200	2.01
BL5200	5200	2.08
HL5600	5600	2.07
BL5600	5600	2.12
HL5800	5800	2.06
BL5800	5800	2.13

LOWER DETECTION LIMIT: 7mW/kg

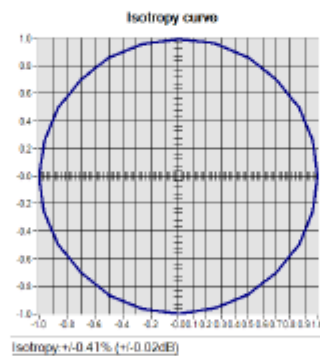


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5.4 ISOTROPY

HL1800 MHz





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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	08/2021	08/2024
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	03/2022	03/2025
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2024	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

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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

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