

FCC SAR EVALUATION REPORT

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

Product Name : Q-Book+, Notebook

Trademark : Compaq

Model Name : QL15R3HE16256

Family Model : S15W1P-3200U

Report No. : N25073001303E

FCC ID : 2BLU9-QL15R3HE

Prepared for

M&M Electronics, S.A.

Cocosolito, Colon Free Zone, Main Entrance Warehouse10D and 11D, PanamA. Zip Code:
03050.

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

No. 24 Xinfu East Road, Xiangshan Community, Xinqiao Street, Baoan District, Shenzhen
Guangdong, People's Republic of China

Tel. 0755-23200050 Website: <http://www.ntek.org.cn>

TEST RESULT CERTIFICATION

Applicant's name..... M&M Electronics, S.A.

Address Cocosolito, Colon Free Zone, Main Entrance Warehouse10D and 11D, Panama. Zip Code: 03050.

Manufacturer's Name Hena Digital Technology (Shenzhen) Co., Ltd.

Address 13F, Block B, Tairan Building Tairan 8th Road, Futian District, Shenzhen, China

Product description

Product name Q-Book+, Notebook

Trademark Compaq

Model Name QL15R3HE16256

Family Model S15W1P-3200U

FCC 47 CFR Part 2(2.1093)

Standards IEEE Std 1528-2013

Published RF exposure KDB procedures

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

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Test Sample Number S2507310046-1#

Date of Test

Date (s) of performance of tests Aug. 01, 2025~ Aug. 15, 2025

Date of Issue Aug. 20, 2025

Test Result **Pass**

Prepared By : Owen Xiao
Owen Xiao
(Project Engineer)

Reviewed By : Aaron Cheng
Aaron Cheng
(Supervisor)

Approved By : Alex Li
Alex Li
(Manager)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
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1. General Information

1.1. RF exposure limits

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

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

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

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

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

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

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

NOTE: This product is used for inlaying inside the cabinet and operating by hand

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for QL15R3HE16256 are as follows.

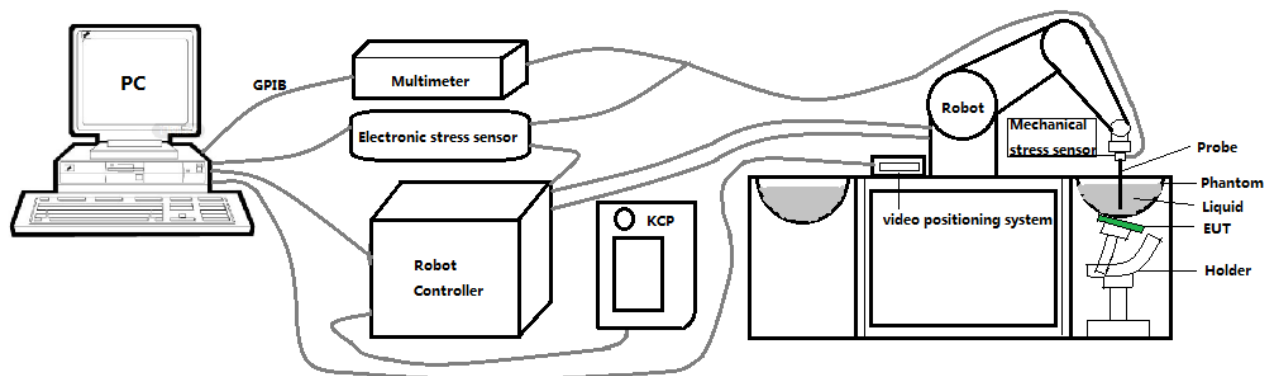
Band	Max Reported SAR Value(W/kg)
	1-g Body (Separation distance of 0mm)
WLAN 2.4G	0.219
WLAN 5.2G	0.362
WLAN 5.3G	0.441
WLAN 5.6G	0.649
WLAN 5.8G	0.567

1.3. EUT Description

Device Information			
Product Name	Q-Book+, Notebook		
Trade Name	Compaq		
Model Name	QL15R3HE16256		
Family Model	S15W1P-3200U		
Model Difference	All models are the same circuit and RF module, except for model names.		
FCC ID	2BLU9-QL15R3HE		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna Type	FPC Antenna		
Battery Information	DC 11.4V, 5100mAh, 58.14Wh		
Hardware version	A140PR200C		
Software version	Windows 11		
Device Operating Configurations			
Supporting Mode(s)	WLAN 2.4G/5G, Bluetooth		
Test Modulation	WLAN(DSSS/OFDM), Bluetooth(GFSK, $\pi/4$ -DQPSK, 8DPSK)		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	WLAN 2.4G	2412-2462	
	WLAN 5.2G	5180-5240	
	WLAN 5.3G	5260-5320	
	WLAN 5.6G	5500-5700	
	WLAN 5.8G	5745-5825	
	Bluetooth	2402-2480	

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



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

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

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

2.2. Robot

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



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

2.3. E-Field Probe

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

For the measurements the Specific Dosimetric E-Field Probe 0725-EPGO-448 with following specifications is used



- Dynamic range: 0.01-100 W/kg
 - Tip Diameter : 2.5 mm
 - Distance between probe tip and sensor center: 1 mm
 - Distance between sensor center and the inner phantom surface: 2 mm (repeatability better than ± 1 mm).
 - Probe linearity: ± 0.06 dB
 - Axial isotropy: ± 0.01 dB
 - Hemispherical Isotropy: ± 0.01 dB
 - Calibration range: 650MHz to 5900MHz for head & body simulating liquid.
 - Lower detection limit: 8mW/kg
- Angle between probe axis (evaluation axis) and surface normal line: less than 30° .

2.3.1. E-Field Probe Calibration

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

2.4. SAM phantoms

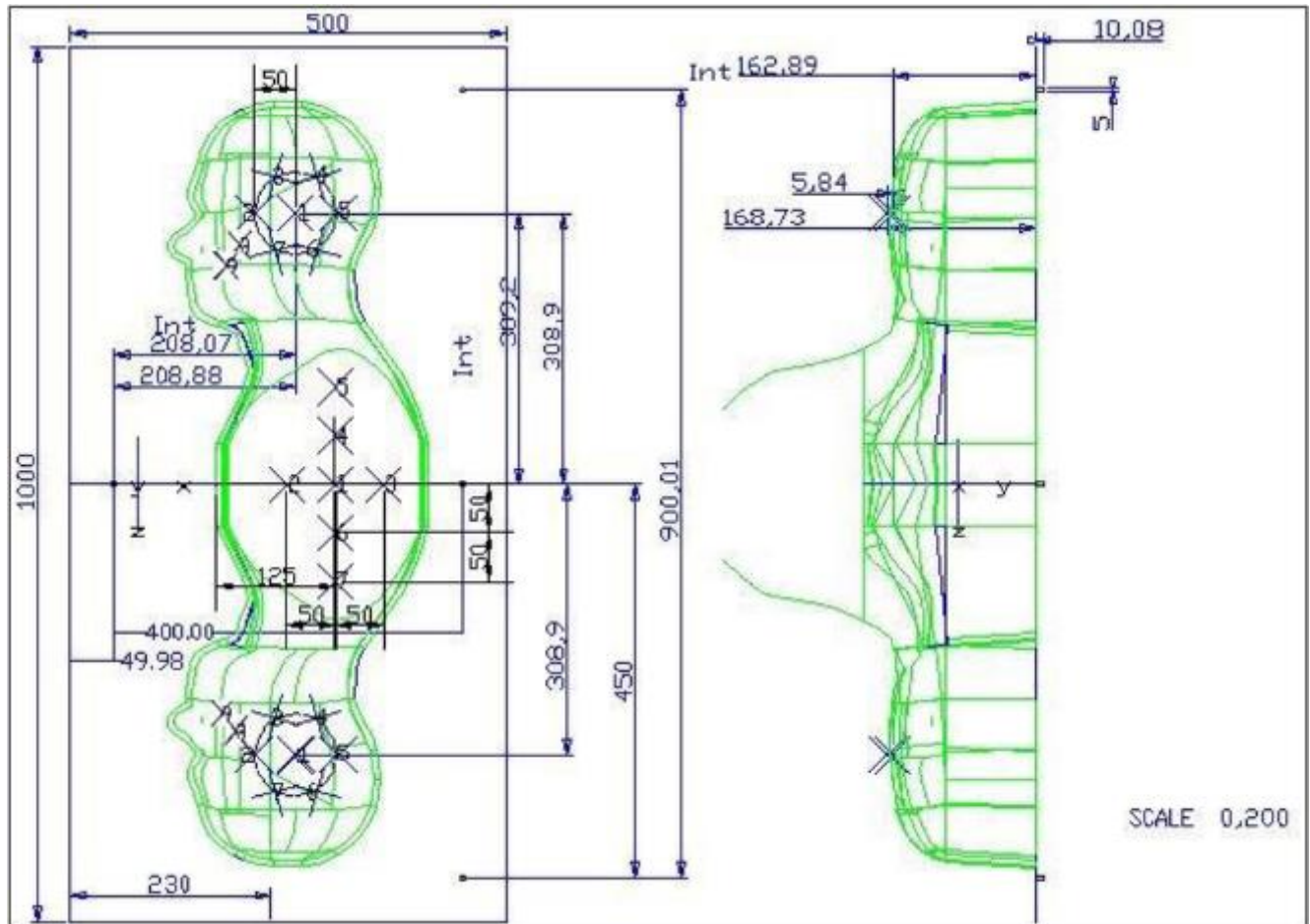
Photo of SAM phantom SN 16/15 SAM119



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

2.4.1. Technical Data

Serial Number	Shell thickness	Filling volume	Dimensions	Positionner Material	Permittivity	Loss Tangent
SN 16/15 SAM119	2 mm $\pm$ 0.2 mm	27 liters	Length:1000 mm Width:500 mm Height:200 mm	Gelcoat with fiberglass	3.4	0.02

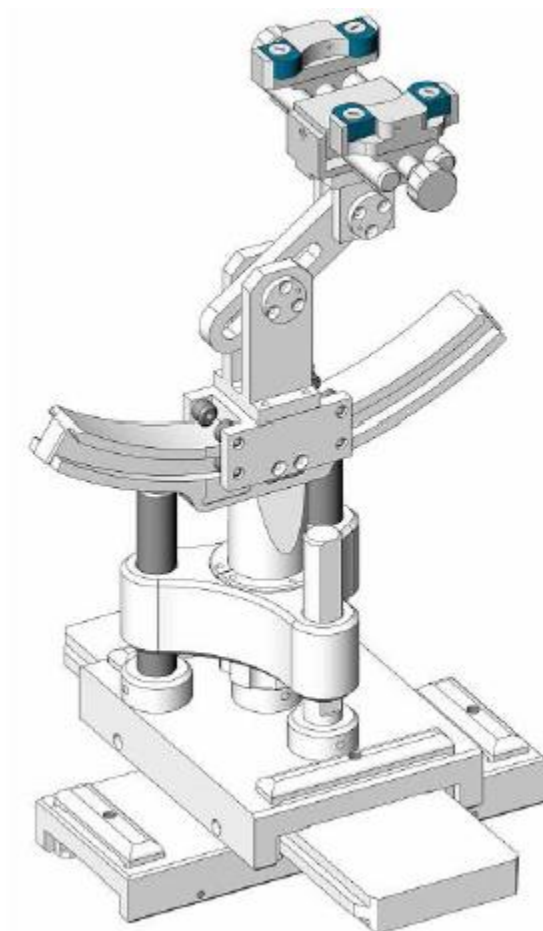


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

The test, based on ultrasonic system, allows measuring the thickness with an accuracy of 10 μ m.

2.5. Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1 degree.



Serial Number	Holder Material	Permittivity	Loss Tangent
SN 16/15 MSH100	Delrin	3.7	0.005

2.6. Test Equipment List

This table gives a complete overview of the SAR measurement equipment.

Devices used during the test described are marked ☒

	Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
					Last Cal.	Due Date
☒	MVG	E FIELD PROBE	SSE2	0725-EPGO-448	Apr. 15, 2025	Apr. 14, 2026
☐	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2300 MHz Dipole	SID2300	SN 03/16 DIP 2G300-358	Feb. 22, 2024	Feb. 21, 2027
☒	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Feb. 21, 2024	Feb. 20, 2027
☐	MVG	3500 MHz Dipole	SID3500	SN 09/12 DIP 3G500-360	Oct. 15, 2022	Oct. 14, 2025
☐	MVG	3700 MHz Dipole	SID3700	SN 09/12 DIP 3G/700-361	Oct. 15, 2022	Oct. 14, 2025
☒	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Feb. 21, 2024	Feb. 20, 2027
☒	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
☒	MVG	Power Amplifier	N/A	AMPLISAR_28/14_003	NCR	NCR
☒	KEITHLEY	Millivoltmeter	2000	4072790	Nov. 29, 2024	Nov. 28, 2025
☐	R&S	Universal radio	CMU200	105747	Apr. 17,	Apr. 16,

		communication tester			2025	2026
☒	R&S	Wideband radio communication tester	CMW500	103917	May. 12, 2025	May. 11, 2026
☐	Anritsu	4G LTE comprehensive tester	MT8821C	6262192315	Apr.16 2025	Apr.15 2026
☐	Anritsu	5G NR comprehensive tester	MT8000A	6262186364	Apr.16 2025	Apr.15 2026
☒	HP	Network Analyzer	E5071C	LPS-461	Oct. 15, 2024	Oct. 14, 2025
☒	Agilent	Calibration Kit	85033E	N/A	May. 31, 2024	May. 30, 2027
☒	Agilent	MXG Vector Signal Generator	N5182A	MY47070317	Apr. 17, 2025	Apr. 16, 2026
☒	Agilent	Power sensor	E9301A	LES-413-C	May. 6, 2025	May. 5, 2026
☒	Agilent	Power sensor	E9301A	US39212148	Apr. 17, 2025	Apr. 16, 2026
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Apr. 26, 2024	Apr. 25, 2027
☒	N/A	Thermometer	N/A	LES-085	Mar. 27, 2023	Mar. 26, 2026
☒	MVG	SAM Phantom	SSM2	SN 16/15 SAM119	NCR	NCR
☒	MVG	Device Holder	SMPPD	SN 16/15 MSH100	NCR	NCR

Measurement Software

Manufacturer	Software Name	Software Version
SATIMO	OpenSAR	V5.3.15.11

3. SAR Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/Bluetooth power measurement, use engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/Bluetooth output power.

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix A demonstrates.
- (c) Set scan area, grid size and other setting on the OPENSAR software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band.
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg.

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

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

3.1. Power Reference

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

3.2. Area scan & Zoom scan

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

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

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

From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that will not be within the zoom scan of other peaks; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR compliance limit (e.g., 1 W/kg for 1.6 W/kg 1 g limit, or 1.26 W/kg for 2 W/kg, 10 g limit).

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

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

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

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

3.3. Description of interpolation/extrapolation scheme

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

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

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

3.4. Volumetric Scan

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

3.5. Power Drift

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

4. System Verification Procedure

4.1. Tissue Verification

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

Ingredients (% of weight)	Head Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	34.40	34.40	34.40	55.36	55.36	57.87	57.87	57.87	65.53	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	24.24	24.24
DGBE	0.00	0.00	0.00	13.84	13.84	22.00	22.00	22.00	10.23	10.23
Ingredients (% of weight)	Body Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	50.30	50.30	50.30	69.91	69.91	71.88	71.88	71.88	79.54	79.54
NaCl	0.60	0.60	0.60	0.13	0.13	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	49.10	49.10	49.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	9.99	9.99	19.97	19.97	19.97	11.24	11.24
DGBE	0.00	0.00	0.00	19.97	19.97	7.99	7.99	7.99	9.22	9.22

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

Photo of Liquid depth for Head Position	Photo of Liquid depth for Body Position
	

4.1.1. Tissue Dielectric Parameter Check Results

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

Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Delta(%)		Liquid Temp.	Test Date
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)		
Head 2450	2450	39.20	1.80	38.32	1.83	-2.25	1.67	21.2 °C	Aug. 04, 2025
Head 5200	5200	36.00	4.66	34.14	4.52	-5.16	-2.96	21.1 °C	Aug. 01, 2025
Head 5400	5400	35.80	4.86	35.05	4.90	-2.09	0.82	21.9 °C	Aug. 03, 2025
Head 5600	5600	35.50	5.07	35.48	4.96	-0.05	-2.15	21.8 °C	Aug. 15, 2025
Head 5800	5800	35.30	5.27	35.75	5.12	1.27	-2.81	21.1 °C	Aug. 02, 2025

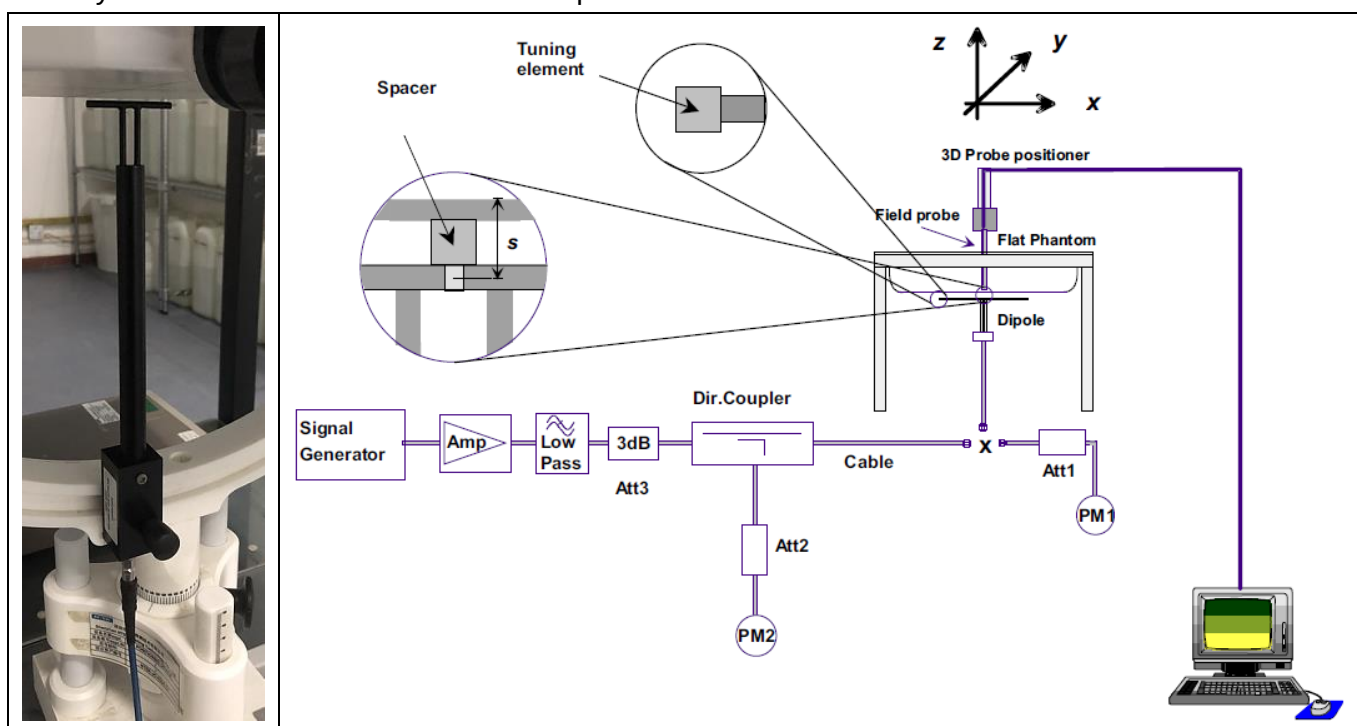
NOTE: 1. The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

2. Tested by : Max Zhou · Jack Peng

4.2. System Verification Procedure

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

The system verification is shown as below picture:



4.2.1. System Verification Results

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

System Verification	Target SAR (1W)		Measured SAR			Measured SAR		Delta (%)		Liquid Temp.	Test Date
						(Normalized to 1W)					
	1-g (W/Kg)	10-g (W/Kg)	Input Power (mW)	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)	1-g (%)	10-g (%)		
2450MHz	50.05	23.80	100.00	5.36	2.31	53.60	23.12	7.09	-2.86	21.2 °C	Aug. 04, 2025
5200MHz	162.59	56.21	10.00	1.62	0.56	161.90	56.00	-0.42	-0.37	21.1 °C	Aug. 01, 2025
5400MHz	159.81	55.00	10.00	1.62	0.54	161.90	54.40	1.31	-1.09	21.9 °C	Aug. 03, 2025
5600MHz	179.15	61.01	10.00	1.66	0.56	165.70	56.30	-7.51	-7.72	21.8 °C	Aug. 15, 2025
5800MHz	182.20	61.32	10.00	1.47	0.56	146.90	56.20	-19.37	-8.35	21.1 °C	Aug. 02, 2025

Tested by : Max Zhou · Jack Peng

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

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

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

5.2. SAR measurement uncertainty

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

6. RF Exposure Positions

6.1. Laptop host platform exposure conditions

The required minimum test separation distance for incorporating transmitters and antennas into laptop, notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. If a computer has other operating configurations that require a different or more conservative display to keyboard angle for normal use, a KDB inquiry should be submitted to determine the test requirements. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard.¹⁴ Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required. However, when edge testing is necessary, the similar concerns for simultaneous transmission on adjacent or multiple edges described for tablets near the end of 4.3 also apply.

When the modular approach is applied, transmitters and modules must be tested initially without using a representative host for incorporation in the display and/or keyboard of qualified laptop computers for standalone use according to the following minimum test separation distance and antenna installation requirements. The separation distance required for incorporation in qualified hosts is described in KDB Publication 447498 D01; item e) of 4.1 and item a) of 5.2.2 etc.

- a) ≤ 25 mm between the antenna and user for incorporation in laptop display screens¹⁵
- b) ≤ 5 mm between the antenna and user; only when incorporation in the keyboard compartment is required by the hosts, for bottom surface and edge exposure conditions
- c) the antennas used by the host must have been tested for equipment approval or qualify for SAR test exclusion
- d) the antenna polarization, physical orientation, rotation and installation configurations used by the host must have been tested for compliance for the required display and/or keyboard installation conditions and test separation distance(s) or qualify for SAR test exclusion
- e) when the SAR Test Exclusion Threshold in KDB Publication 447498 D01 applies, a minimum test separation distance of 25 mm is required to determine test exclusion for the display, and 5 mm for the keyboard compartment

The higher SAR conditions tested in representative host configurations are only applicable to hosts that satisfy such test configurations, with respect to the use conditions and restrictions approved for such host configurations.

7. RF Output Power

7.1. WLAN & Bluetooth Output Power

7.1.1. Output Power Results Of WLAN

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)	Tune-up (dBm)	Output Power (dBm)
			Ant1		Ant2	
802.11b	1	2412	15.00	14.47	15.00	14.81
	6	2437	15.00	14.90	15.00	14.84
	11	2462	15.00	14.46	15.00	14.38
802.11g	1	2412	14.50	14.03	14.50	14.25
	6	2437	14.50	14.36	14.50	14.23
	11	2462	14.50	14.36	14.50	14.24
802.11n HT20	1	2412	13.00	12.64	13.00	12.29
	6	2437	13.00	12.14	13.00	12.73
	11	2462	13.00	12.58	13.00	12.84
802.11n HT40	3	2422	13.00	12.26	13.00	12.21
	6	2437	13.00	12.73	13.00	12.80
	9	2452	13.00	12.27	13.00	12.60

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)	Tune-up (dBm)	Output Power (dBm)
			Ant1		Ant2	
802.11a	36	5180	15.00	14.17	16.00	14.92
	40	5200	15.00	14.07	16.00	15.13
	48	5240	15.00	14.53	16.00	15.58
802.11n HT20	36	5180	14.50	13.66	16.00	14.91
	40	5200	14.50	13.95	16.00	15.04
	48	5240	14.50	14.24	16.00	15.52
802.11n HT40	38	5190	12.50	11.66	13.50	12.87
	46	5230	12.50	12.01	13.50	13.41
802.11ac VHT20	36	5180	12.50	11.54	13.50	12.76
	40	5200	12.50	11.68	13.50	13.00
	48	5240	12.50	12.11	13.50	13.48
802.11ac VHT40	38	5190	12.50	11.73	13.50	12.95
	46	5230	12.50	12.10	13.50	13.43
802.11ac	42	5210	12.00	11.70	12.00	11.52

VHT80

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)	Tune-up (dBm)	Output Power (dBm)
			Ant1		Ant2	
802.11a	52	5260	15.50	14.25	16.00	15.37
	56	5280	15.50	14.63	16.00	15.54
	64	5320	15.50	15.36	16.00	15.76
802.11n HT20	52	5260	15.50	14.34	16.00	15.20
	56	5280	15.50	14.50	16.00	15.42
	64	5320	15.50	15.26	16.00	15.57
802.11n HT40	54	5270	13.50	12.12	14.00	13.28
	62	5310	13.50	13.04	14.00	13.61
802.11ac VHT20	52	5260	13.00	12.08	14.00	13.14
	56	5280	13.00	12.52	14.00	13.26
	64	5320	13.00	12.93	14.00	13.55
802.11ac VHT40	54	5270	13.00	12.29	14.00	13.19
	62	5310	13.00	12.79	14.00	13.51
802.11ac VHT80	58	5290	12.50	12.31	13.50	13.13

NOTE: Power measurement results of WLAN 5.3G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)	Tune-up (dBm)	Output Power (dBm)
			Ant1		Ant2	
802.11a	100	5500	13.00	11.83	12.50	12.16
	120	5600	13.00	11.41	12.50	11.70
	140	5700	13.00	12.62	12.50	12.20
802.11n HT20	100	5500	12.50	11.58	12.50	11.98
	120	5600	12.50	11.16	12.50	11.63
	140	5700	12.50	12.20	12.50	12.09
802.11n HT40	102	5510	12.00	11.71	12.00	11.91
	118	5590	12.00	11.08	12.00	11.59
	134	5670	12.00	11.78	12.00	11.98
802.11ac (VHT20)	100	5500	12.00	11.67	12.00	11.86
	120	5600	12.00	10.83	12.00	11.44
	140	5700	12.50	12.05	12.00	11.93

802.11ac (VHT40)	102	5510	12.50	11.52	12.00	11.88
	118	5590	11.50	11.01	11.50	11.49
	134	5670	12.50	12.03	12.00	11.87
802.11ac (VHT80)	106	5530	12.50	11.10	12.00	11.40
	122	5610	12.50	11.30	12.00	11.22

NOTE: Power measurement results of WLAN 5.6G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)	Tune-up (dBm)	Output Power (dBm)
			Ant1		Ant2	
802.11a	149	5745	17.00	16.06	17.50	16.35
	157	5785	17.00	16.92	17.50	16.97
	165	5825	17.00	16.95	17.50	17.44
802.11n HT20	149	5745	13.00	11.46	13.50	12.03
	157	5785	13.00	12.27	13.50	12.72
	165	5825	13.00	12.98	13.50	13.36
802.11n HT40	151	5755	13.00	11.93	13.50	12.35
	159	5795	13.00	12.87	13.50	13.04
802.11ac VHT20	149	5745	13.00	11.55	13.50	12.06
	157	5785	13.00	12.17	13.50	12.75
	165	5825	13.00	12.81	13.50	13.39
802.11ac VHT40	151	5755	13.00	12.03	13.50	12.42
	159	5795	13.00	12.61	13.50	13.09
802.11ac VHT80	155	5775	12.00	11.96	12.50	12.39

NOTE: Power measurement results of WLAN 5.8G.

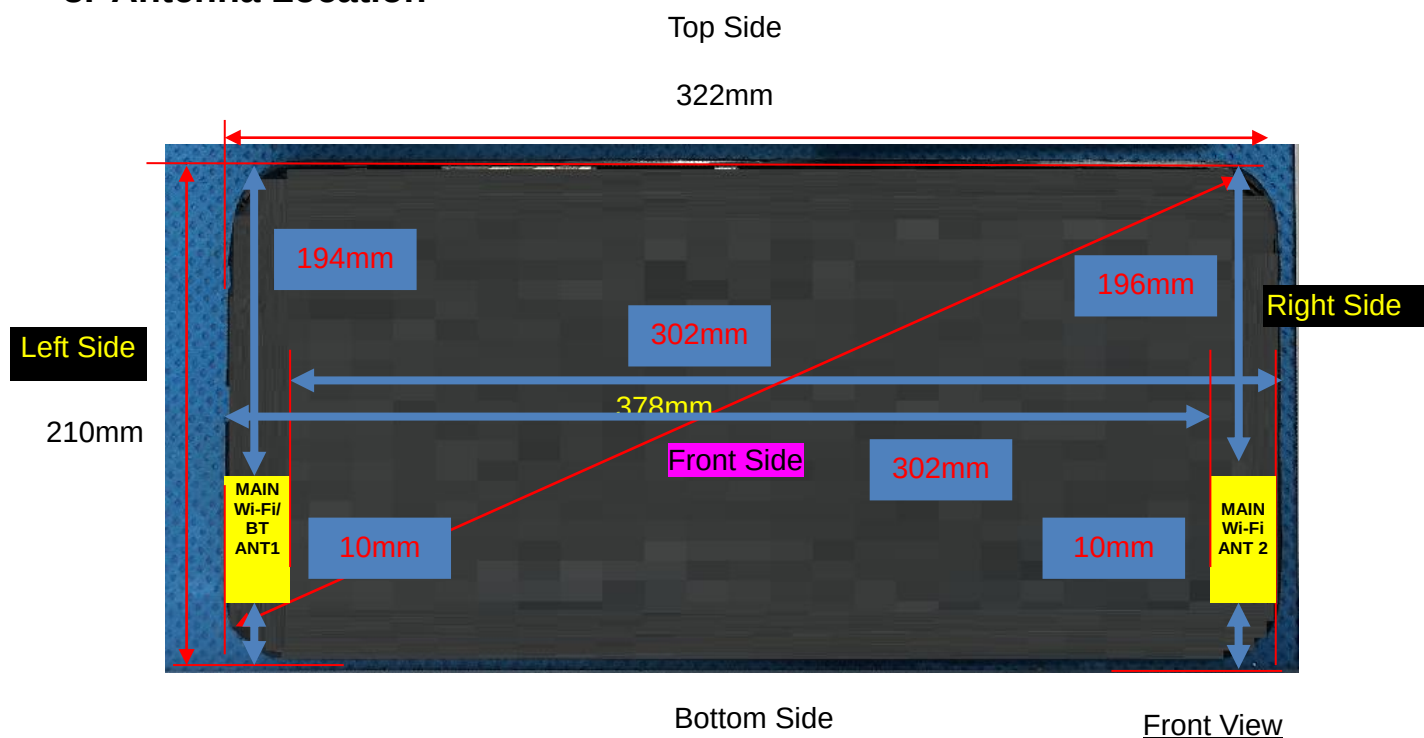
7.1.2. Output Power Results Of Bluetooth

BLE	Channel	Tune-up (dBm)	Output Power (dBm)
	0CH	7.50	7.43
	19CH	8.50	8.14
	39CH	9.00	8.57

BR+EDR	Output Power (dBm)				
	Data Rates	Tune-up (dBm)	Channel		
			0CH	39CH	78CH
	1M	8.00	6.93	7.58	7.95
	2M	8.50	6.90	7.63	8.01
	3M	8.50	7.30	8.03	8.45

NOTE: Power measurement results of Bluetooth.

8. Antenna Location



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

Distance of the Antenna to the EUT surface/edge					
Antennas	Back Side	Left Side	Right Side	Top Side	Bottom Side
2.4G&5G Ant 1	5	5	302	194	10
2.4G&5G/BT Ant 2	5	302	5	194	10

Note: When the minimum separation distance is < 5 mm, a distance of 5 mm is applied to determine

SAR test exclusion.

9. Stand-alone SAR test exemption

Re Refer to FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	SAR Exclusion threshold	SAR test exemption
Bluetooth BLE	9.00	7.943	5	2.48	3.0	YES

10. SAR Results

10.1. SAR measurement results

10.1.1. SAR measurement Result of WLAN 2.4G

Ant1

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	6/2437	802.11b	0.169	0.083	-4.45	14.90	15.00	0.173	2025/8/04	9#
Left Side	6/2437	802.11b	0.061	0.030	-1.41	14.90	15.00	0.062	2025/8/04	
Bottom Side	6/2437	802.11b	0.133	0.061	-2.63	14.90	15.00	0.136	2025/8/04	

NOTE:1. Body SAR test results of WLAN 2.4G

2. Tested by : Max Zhous

Ant2

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	6/2437	802.11b	0.211	0.111	1.65	14.84	15.00	0.219	2025/8/04	10#
Right Side	6/2437	802.11b	0.094	0.057	-1.36	14.84	15.00	0.098	2025/8/04	
Bottom Side	6/2437	802.11b	0.167	0.080	-2.84	14.84	15.00	0.173	2025/8/04	

NOTE:1. Body SAR test results of WLAN 2.4G

2. Tested by : Max Zhou

10.1.2. SAR measurement Result of WLAN 5.2G

Ant1

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	40/5200	802.11a	0.191	0.087	-0.90	14.07	15.00	0.237	2025/8/01	1#
Left Side	40/5200	802.11a	0.083	0.025	-1.64	14.07	15.00	0.103	2025/8/01	
Bottom Side	40/5200	802.11a	0.152	0.054	-2.87	14.07	15.00	0.188	2025/8/01	

NOTE: 1.Body SAR test results of WLAN 5.2G

2.Tested by : Max Zhou

Ant2

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	40/5200	802.11a	0.296	0.125	2.41	15.13	16.00	0.362	2025/8/01	2#
Right Side	40/5200	802.11a	0.132	0.048	1.55	15.13	16.00	0.161	2025/8/01	
Bottom Side	40/5200	802.11a	0.227	0.099	-1.69	15.13	16.00	0.277	2025/8/01	

NOTE: 1.Body SAR test results of WLAN 5.2G

2.Tested by : Max Zhou

10.1.3. SAR measurement Result of WLAN 5.3G

Ant1

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	64/5320	802.11a	0.333	0.143	2.79	15.36	15.50	0.344	2025/8/03	3#
Left Side	64/5320	802.11a	0.091	0.028	-2.64	15.36	15.50	0.094	2025/8/03	
Bottom Side	64/5320	802.11a	0.162	0.074	-1.83	15.36	15.50	0.167	2025/8/03	

NOTE: 1.Body SAR test results of WLAN 5.3G

2. Tested by : Max Zhou

Ant2

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	56/5280	802.11a	0.397	0.162	-2.07	15.54	16.00	0.441	2025/8/03	4#
Right Side	56/5280	802.11a	0.108	0.039	2.74	15.54	16.00	0.120	2025/8/03	
Bottom Side	56/5280	802.11a	0.183	0.087	-1.62	15.54	16.00	0.203	2025/8/03	

NOTE: 1.Body SAR test results of WLAN 5.3G

2. Tested by : Max Zhou

10.1.4. SAR measurement Result of WLAN 5.6G

Ant1

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	140/5700	802.11a	0.595	0.235	-1.96	12.62	13.00	0.649	2025/8/15	5#
Left Side	140/5700	802.11a	0.352	0.104	-2.47	12.62	13.00	0.384	2025/8/15	
Bottom Side	140/5700	802.11a	0.496	0.139	1.52	12.62	13.00	0.541	2025/8/15	

NOTE: 1.Body SAR test results of WLAN 5.6G

2. Tested by : Max Zhou

Ant2

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	140/5700	802.11a	0.392	0.179	4.93	12.20	12.50	0.420	2025/8/15	6#
Right Side	140/5700	802.11a	0.140	0.052	-2.63	12.20	12.50	0.150	2025/8/15	
Bottom Side	140/5700	802.11a	0.236	0.095	-1.78	12.20	12.50	0.253	2025/8/15	

NOTE: 1.Body SAR test results of WLAN 5.6G

2. Tested by : Max Zhou

10.1.5. SAR measurement Result of WLAN 5.8G

Ant1

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	157/5785	802.11a	0.423	0.180	-3.72	16.92	17.00	0.431	2025/8/02	7#
Left Side	157/5785	802.11a	0.227	0.051	-2.07	16.92	17.00	0.231	2025/8/02	
Bottom Side	157/5785	802.11a	0.360	0.103	1.23	16.92	17.00	0.367	2025/8/02	

NOTE: 1.Body SAR test results of WLAN 5.8G

2. Tested by : Max Zhou

Ant2

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift(%)	Conducted Power (dBm)	Tune-up Power (dBm)	Scaled SAR 1-g (W/Kg)	Date	Plot
			1-g	10-g						
Back Side	157/5785	802.11a	0.502	0.204	-3.44	16.97	17.50	0.567	2025/8/02	8#
Right Side	157/5785	802.11a	0.243	0.082	-3.51	16.97	17.50	0.275	2025/8/02	
Bottom Side	157/5785	802.11a	0.372	0.113	-1.69	16.97	17.50	0.420	2025/8/02	

NOTE: 1.Body SAR test results of WLAN 5.8G

2. Tested by : Max Zhou

10.2. Simultaneous Transmission Analysis

NO simultaneous transmissions are possible for this device of 5G and 2.4G Wi-Fi.

11. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

12. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 2450MHz
MEASUREMENT 2 System Performance Check - 5200MHz
MEASUREMENT 3 System Performance Check - 5400MHz
MEASUREMENT 4 System Performance Check - 5600MHz
MEASUREMENT 5 System Performance Check - 5800MHz

1# System check at 2450 MHz
Date of measurement: 4/8/2025

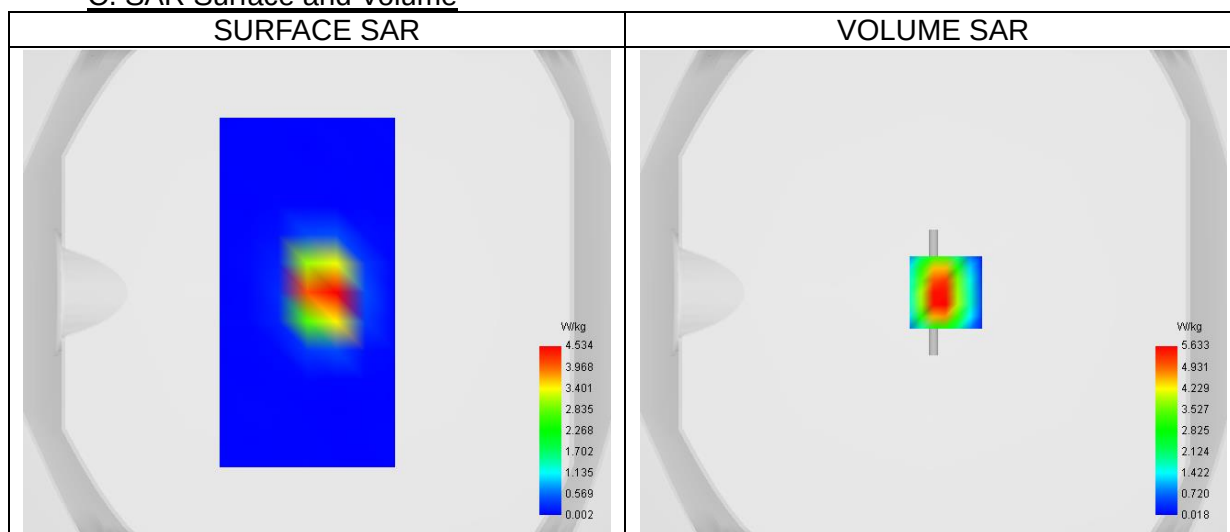
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.63
Area Scan	dx=12mm dy=12mm, Complete
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Signal	CW
Channels/Frequency	Middle

B. Permittivity

Middle TX Frequency (MHz)	2450.00
Relative permittivity (real part)	38.32
Relative permittivity (imaginary part)	13.44
Conductivity (S/m)	1.83

C. SAR Surface and Volume



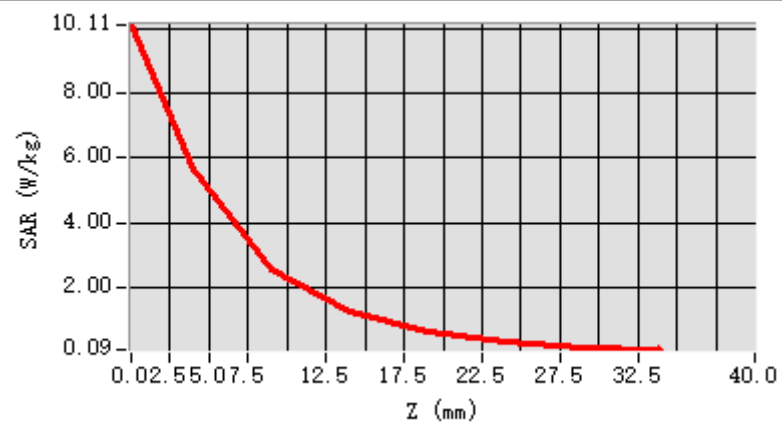
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 10.16 W/kg

D. SAR 1g & 10g

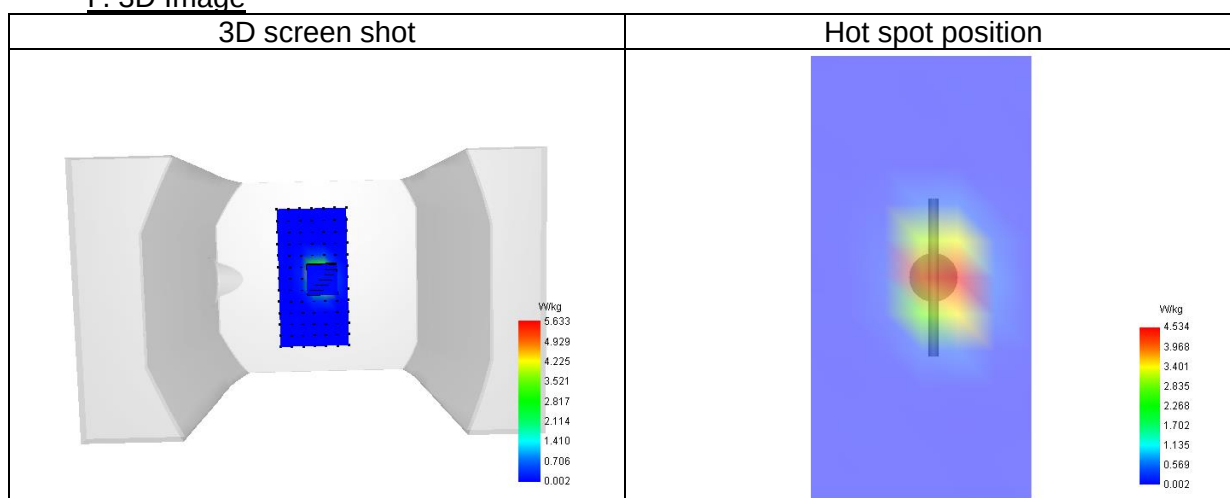
SAR 10g (W/Kg)	2.312
SAR 1g (W/Kg)	5.360
Variation (%)	-2.24
Horizontal validation criteria: minimum distance (mm)	10.00
Vertical validation criteria: SAR ratio M2/M1 (%)	47.95

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	10.109	5.633	2.538	1.267	0.666	0.340	0.172



F. 3D Image



2# System check at 5200 MHz
Date of measurement: 1/8/2025

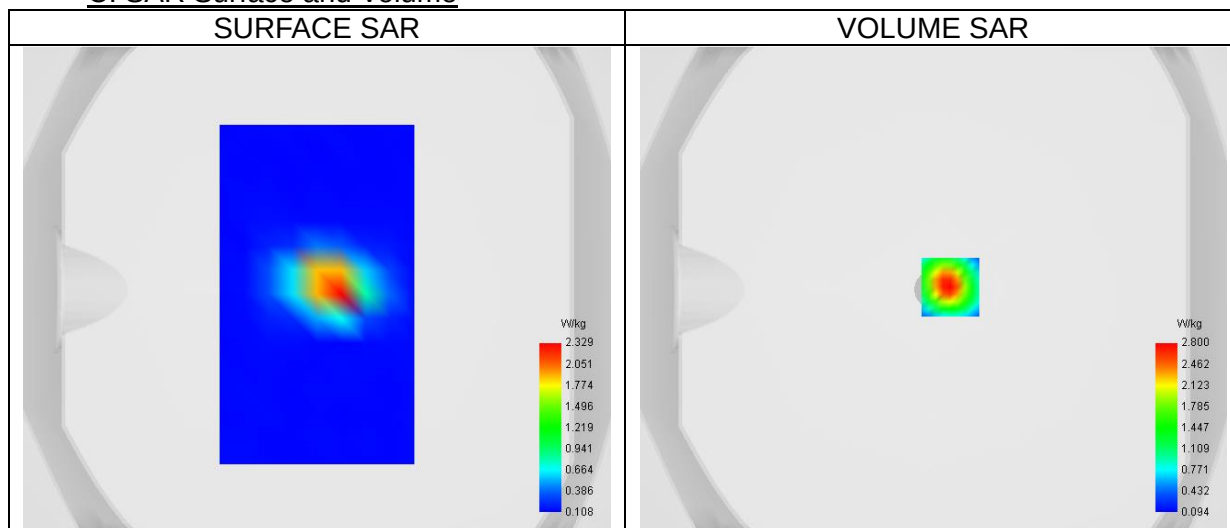
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	9x9x16,dx=3mm dy=3mm dz=1.5mm,Complete
Phantom	Validation plane
Device Position	Body
Band	CW5200
Channels/Frequency	Middle
Signal	CW

B. Permittivity

Middle TX Frequency (MHz)	5200.000
Relative permittivity (real part)	34.14
Relative permittivity (imaginary part)	15.65
Conductivity (S/m)	4.52

C. SAR Surface and Volume



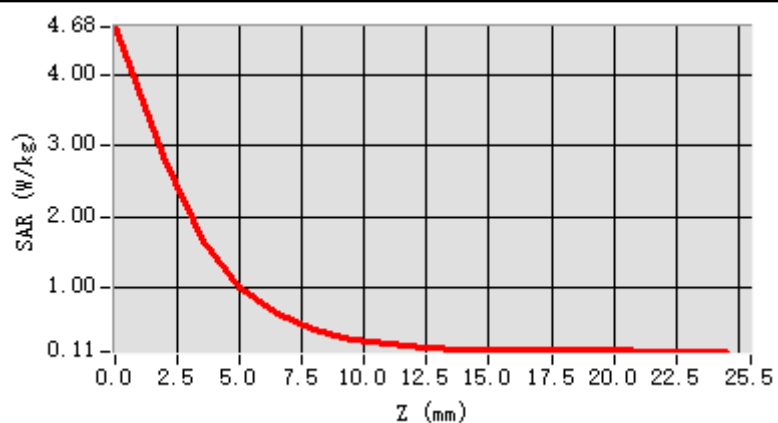
Maximum location: X=7.00, Y=1.00 ; SAR Peak: 5.04 W/kg

D. SAR 1g & 10g

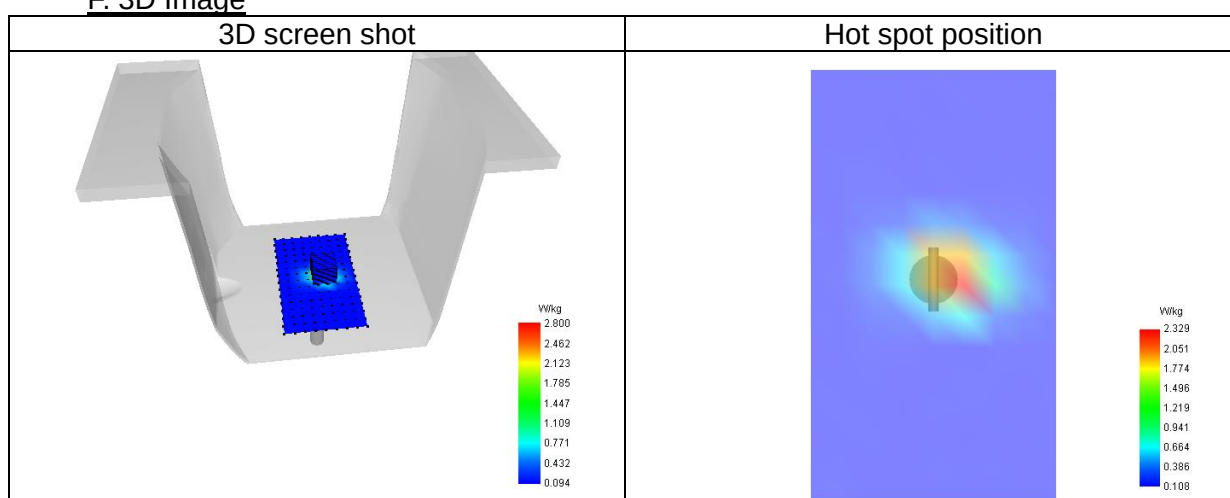
SAR 10g (W/Kg)	0.560
SAR 1g (W/Kg)	1.619
Variation (%)	2.25
Horizontal validation criteria: minimum distance (mm)	9.00
Vertical validation criteria: SAR ratio M2/M1 (%)	58.75

E. Z Axis Scan

Z (mm)	0.0	2.0	3.5	5.0	6.5	8.0	9.5	11.	12.	14.	15.	17.	18.	20.	21.	23.
	0	0	0	0	0	0	0	00	50	00	50	00	50	00	50	00
SAR (W/Kg)	4.6	2.8	1.6	1.0	0.6	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	75	00	45	12	41	12	86	15	78	39	40	30	27	25	08	15



F. 3D Image



3# System check at 5400 MHz
Date of measurement: 3/8/2025

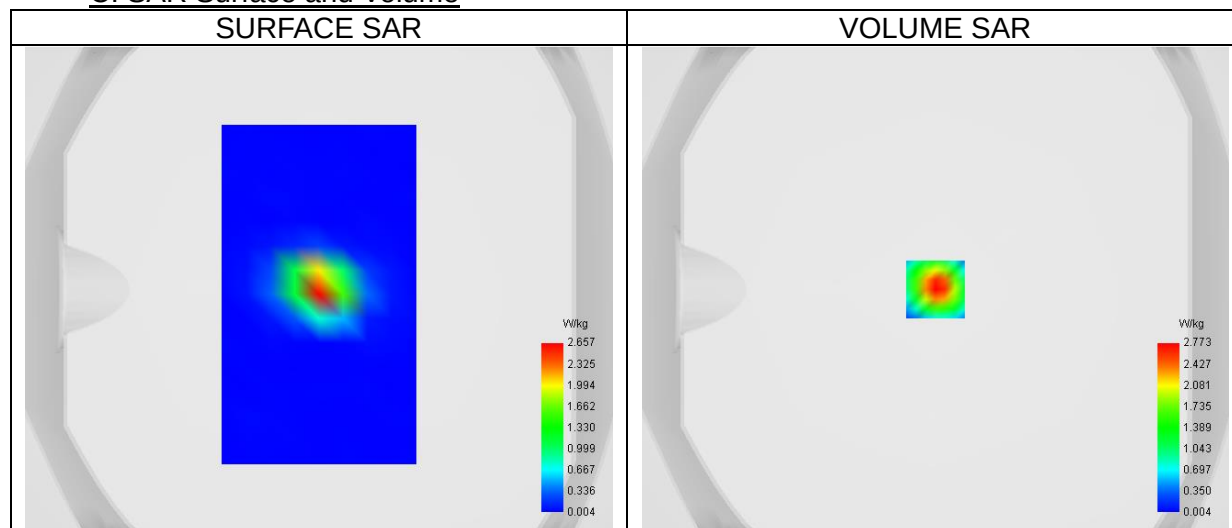
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW5400
Signal	CW
Channels/Frequency	Middle

B. Permittivity

Middle TX Frequency (MHz)	5400.00
Relative permittivity (real part)	35.05
Relative permittivity (imaginary part)	16.35
Conductivity (S/m)	4.90

C. SAR Surface and Volume



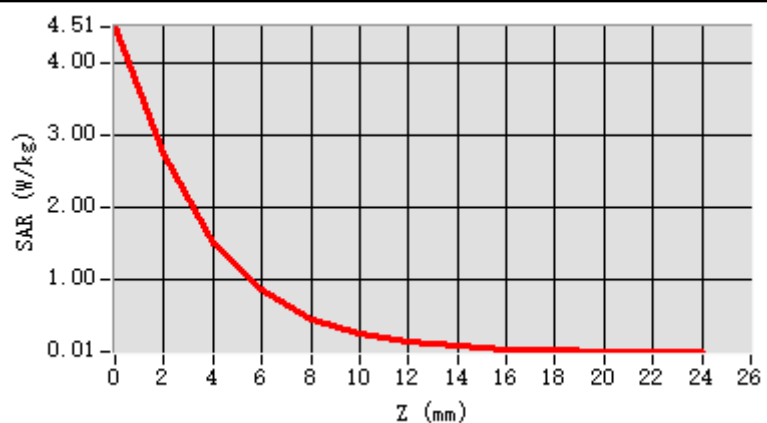
Maximum location: X=0.00, Y=0.00 ; SAR Peak: 4.83 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.544
SAR 1g (W/Kg)	1.619
Variation (%)	-1.29
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	54.24

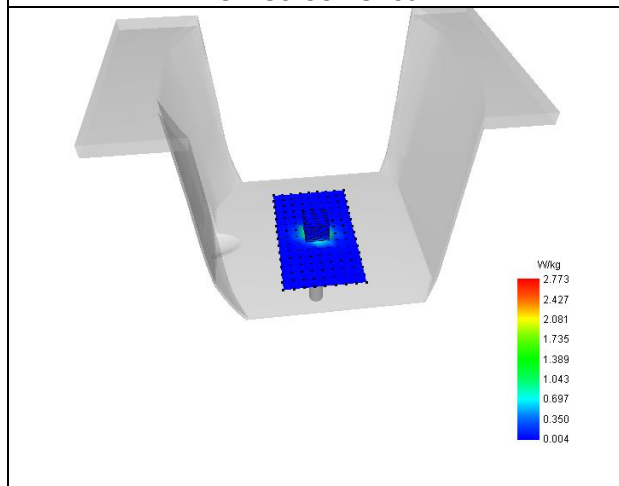
E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.00
SAR (W/Kg)	4.513	2.773	1.504	0.859	0.459	0.249	0.138	0.078	0.044	0.036	0.011	0.007

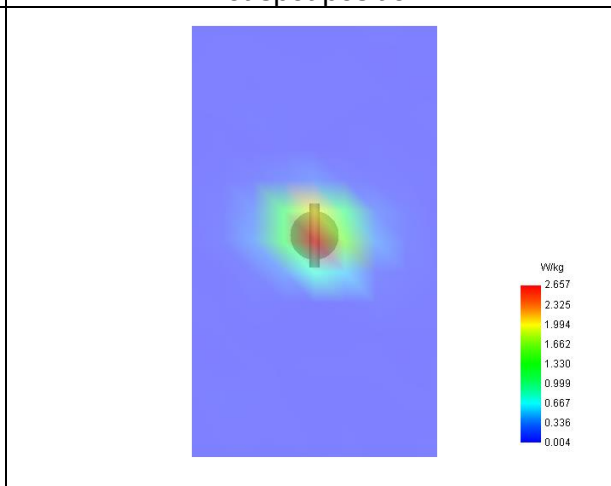


F. 3D Image

3D screen shot



Hot spot position



4# System check at 5600 MHz
Date of measurement: 15/8/2025

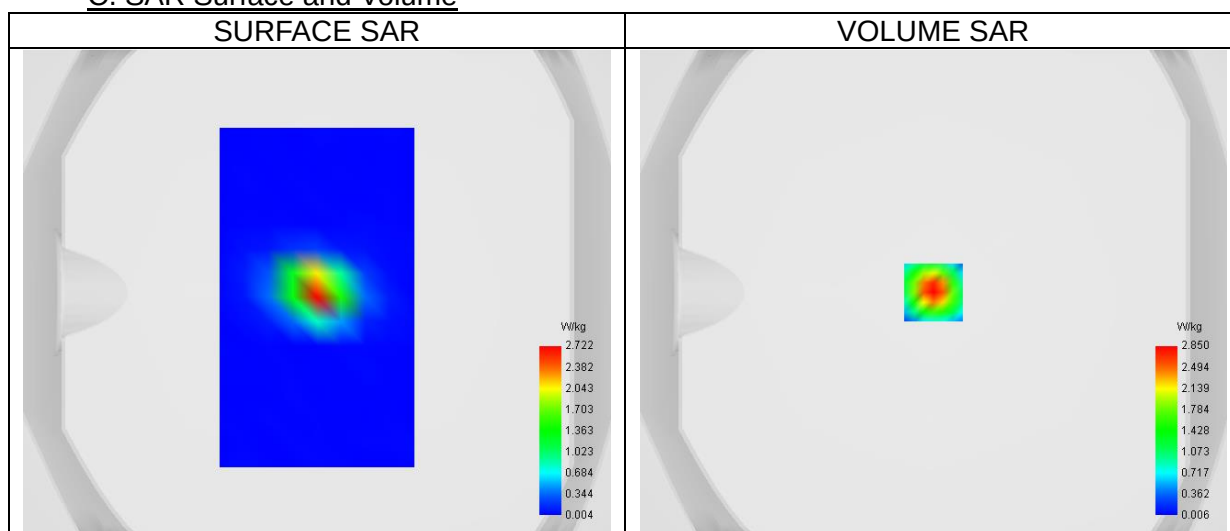
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.36
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW5600
Signal	CW
Channels/Frequency	Middle

B. Permittivity

Middle TX Frequency (MHz)	5600.00
Relative permittivity (real part)	35.48
Relative permittivity (imaginary part)	15.96
Conductivity (S/m)	4.96

C. SAR Surface and Volume



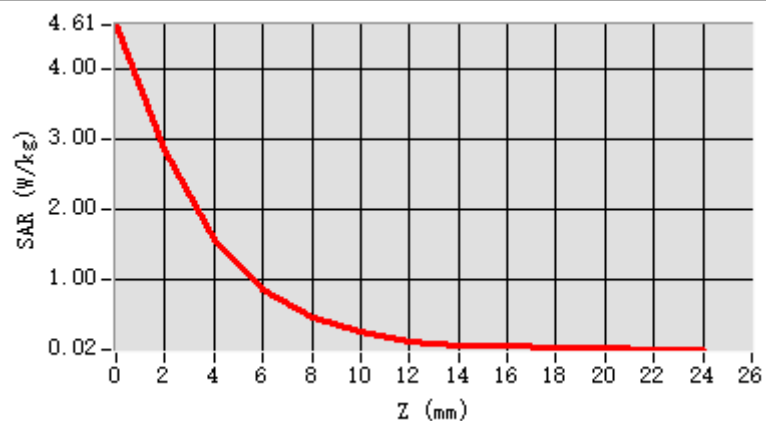
Maximum location: X=0.00, Y=0.00 ; SAR Peak: 4.91 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.563
SAR 1g (W/Kg)	1.657
Variation (%)	0.51
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	54.97

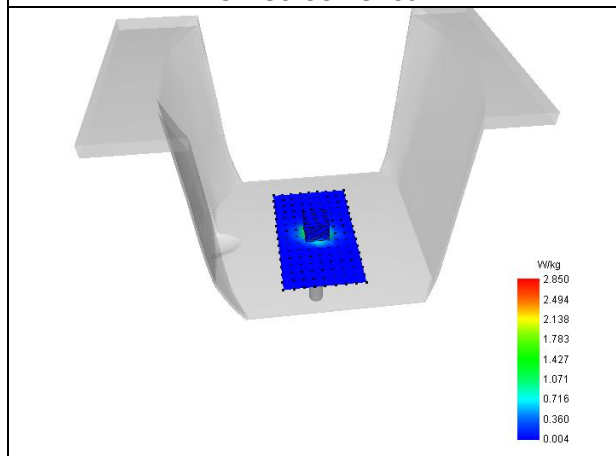
E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	4.61	2.85	1.56	0.88	0.47	0.26	0.12	0.07	0.06	0.04	0.04	0.02
	1	0	7	0	6	1	8	8	4	8	0	5

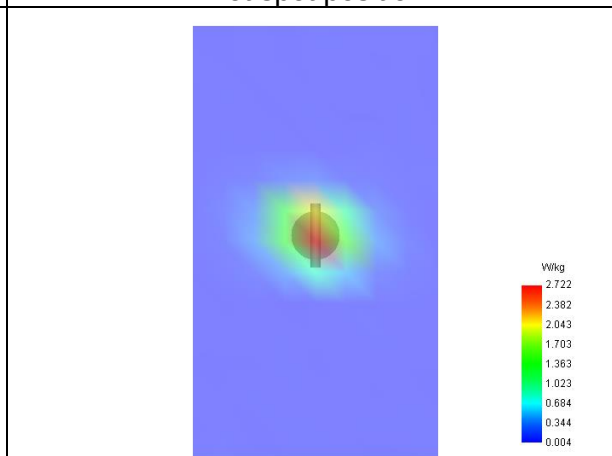


F. 3D Image

3D screen shot



Hot spot position



5# System check at 5800 MHz
Date of measurement: 2/8/2025

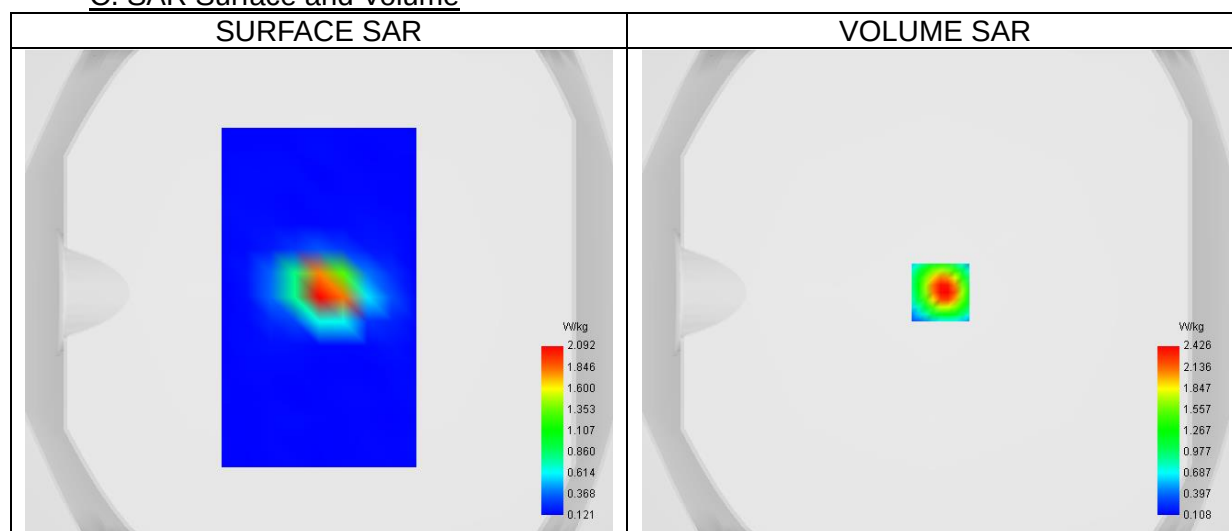
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.35
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	9x9x16,dx=3mm dy=3mm dz=1.5mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW5800
Channels/Frequency	Middle
Signal	CW

B. Permittivity

Middle TX Frequency (MHz)	5800.000
Relative permittivity (real part)	35.75
Relative permittivity (imaginary part)	15.90
Conductivity (S/m)	5.12

C. SAR Surface and Volume



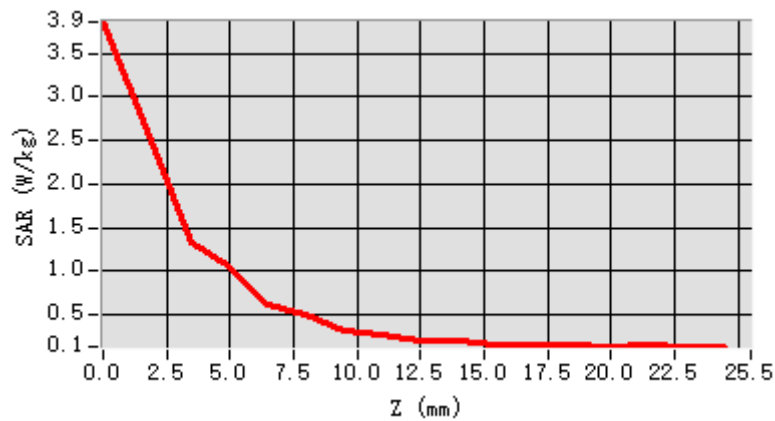
Maximum location: X=2.00, Y=0.00 ; SAR Peak: 4.14 W/kg

D. SAR 1g & 10g

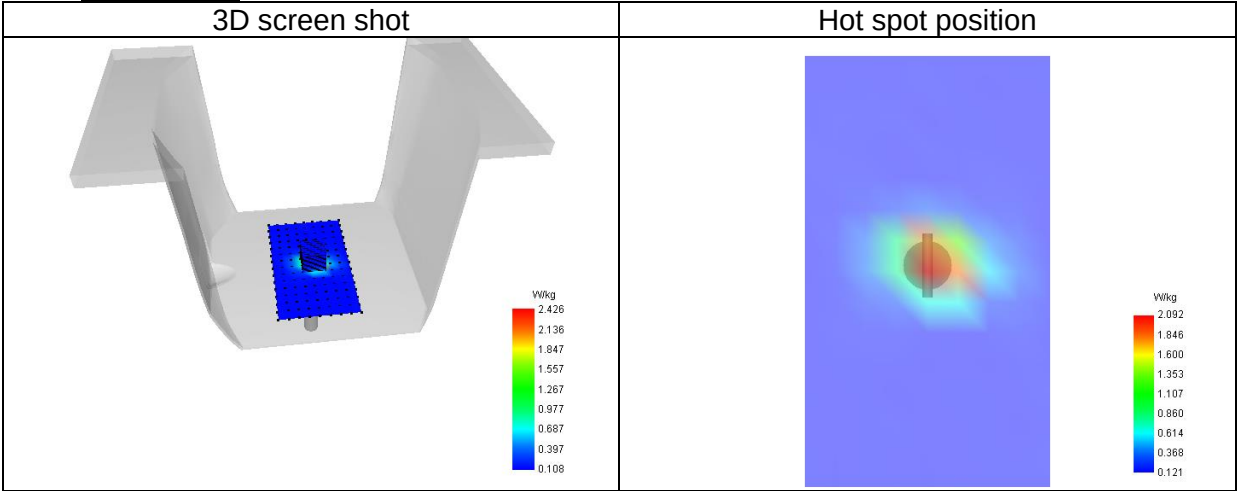
SAR 10g (W/Kg)	0.562
SAR 1g (W/Kg)	1.469
Variation (%)	0.70
Horizontal validation criteria: minimum distance (mm)	9.00
Vertical validation criteria: SAR ratio M2/M1 (%)	63.57

E. Z Axis Scan

Z (mm)	0.0	2.0	3.5	5.0	6.5	8.0	9.5	11.	12.	14.	15.	17.	18.	20.	21.	23.
	0	0	0	0	0	0	0	00	50	00	50	00	50	00	50	00
SAR (W/Kg)	3.8	2.4	1.3	1.0	0.6	0.4	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	60	26	19	46	07	99	21	61	10	98	66	53	47	42	45	33



F. 3D Image



13. Appendix C. SAR Measurement Plots

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MEASUREMENT 1 WLAN 5.2G Ant 1
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1# SAR Measurement at U-NII-1 (Body, Validation Plane)

Date of measurement: 1/8/2025

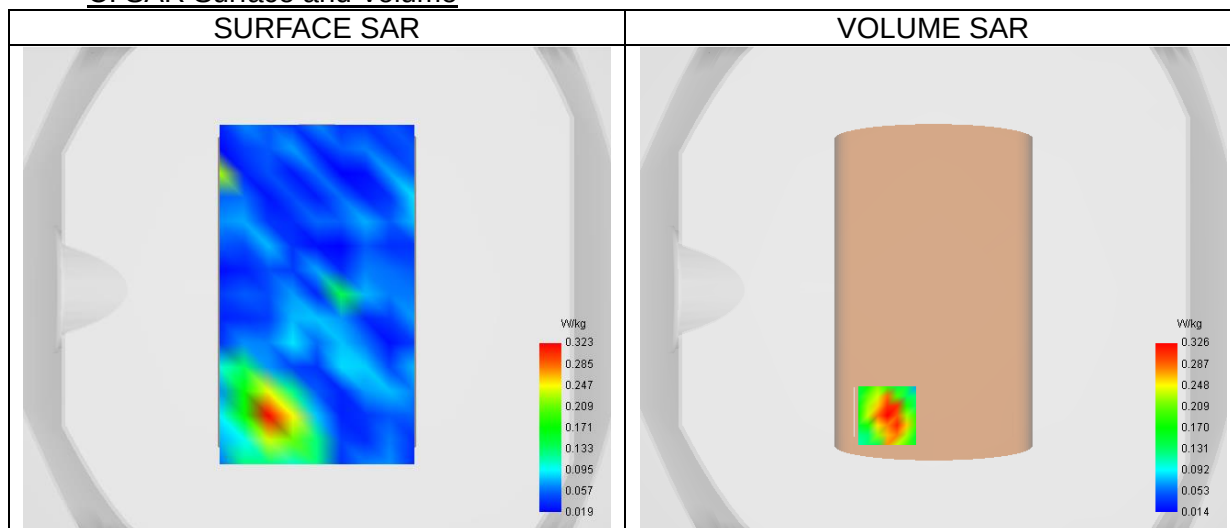
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-1
Signal	IEEE 802.11 a
Channels/Frequency	Middle (40)/ frequency 5200.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5200.00
Relative permittivity (real part)	37.14
Relative permittivity (imaginary part)	15.65
Conductivity (S/m)	4.52

C. SAR Surface and Volume



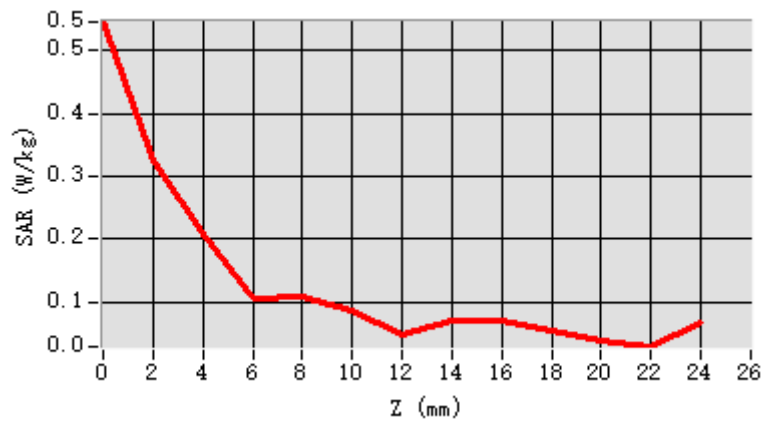
Maximum location: X=-19.00, Y=-52.00 ; SAR Peak: 0.71 W/kg

D. SAR 1g & 10g

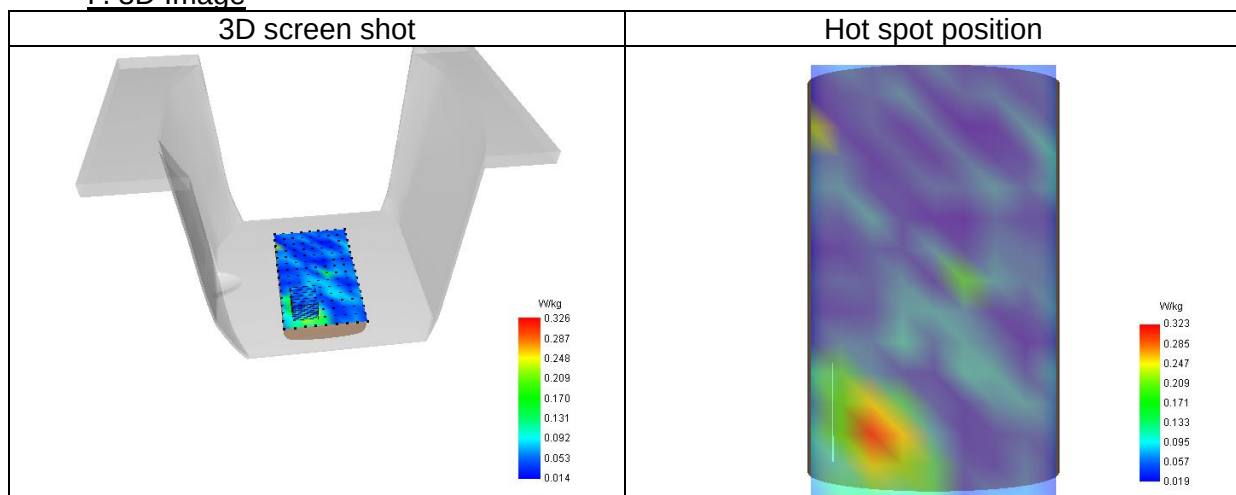
SAR 10g (W/Kg)	0.087
SAR 1g (W/Kg)	0.191
Variation (%)	-0.90
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	67.87

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	0.54	0.32	0.20	0.10	0.10	0.08	0.05	0.07	0.07	0.05	0.03	0.02
	5	6	8	5	8	7	0	1	0	5	9	9



F. 3D Image



2# SAR Measurement at U-NII-1 (Body, Validation Plane)

Date of measurement: 1/8/2025

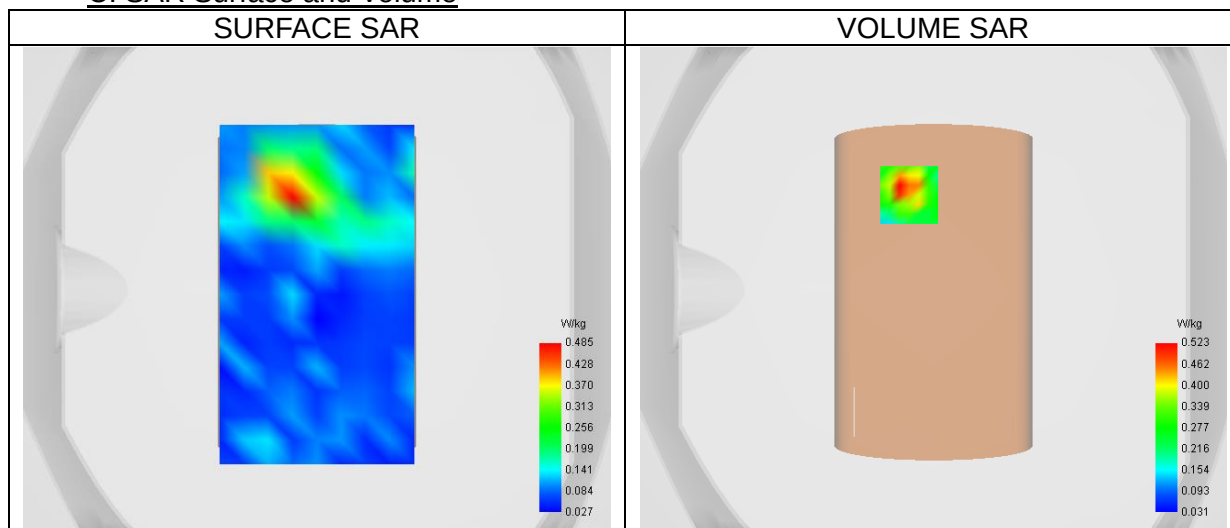
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-1
Signal	IEEE 802.11 a
Channels/Frequency	Middle (40)/ frequency 5200.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5200.00
Relative permittivity (real part)	37.14
Relative permittivity (imaginary part)	15.65
Conductivity (S/m)	4.52

C. SAR Surface and Volume



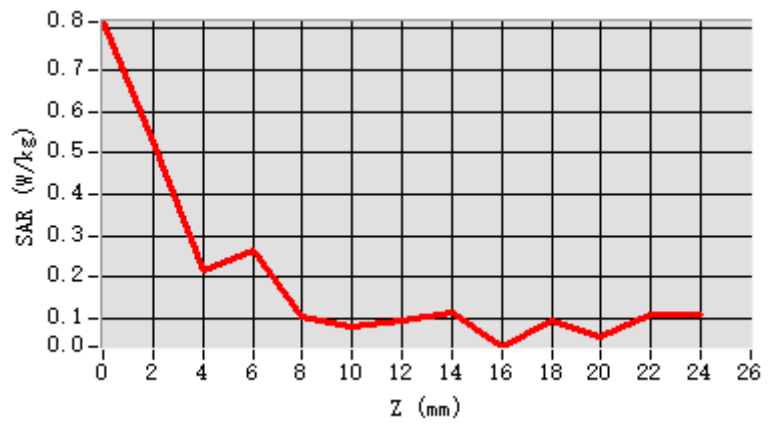
Maximum location: X=-10.00, Y=39.00 ; SAR Peak: 0.83 W/kg

D. SAR 1g & 10g

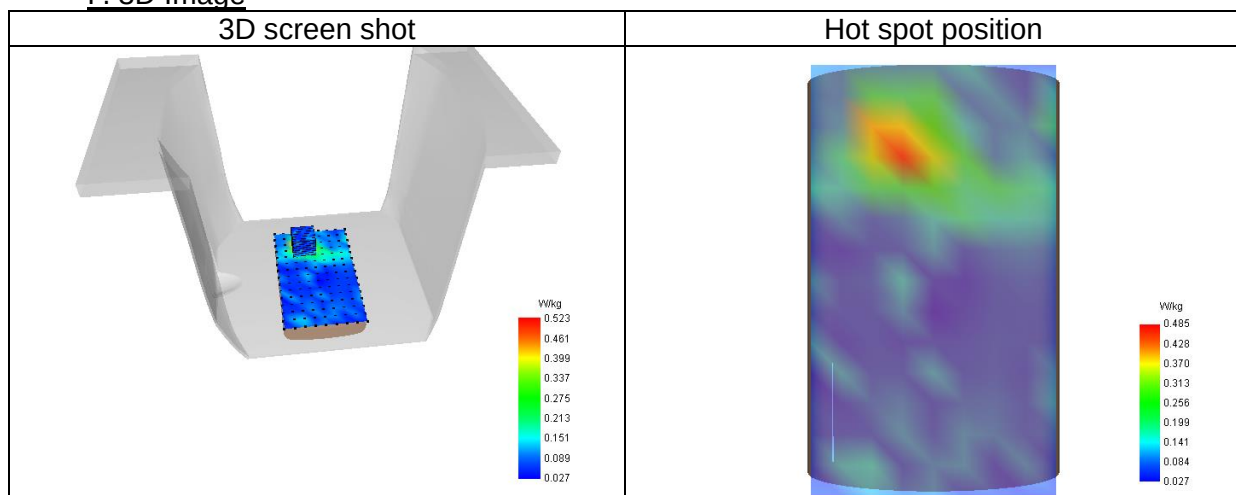
SAR 10g (W/Kg)	0.125
SAR 1g (W/Kg)	0.296
Variation (%)	2.41
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	62.18

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	0.81	0.52	0.21	0.26	0.10	0.08	0.09	0.11	0.03	0.09	0.05	0.11
	5	3	6	5	4	0	7	7	3	6	8	1



F. 3D Image



3# SAR Measurement at U-NII-2a (Body, Validation Plane)

Date of measurement: 3/8/2025

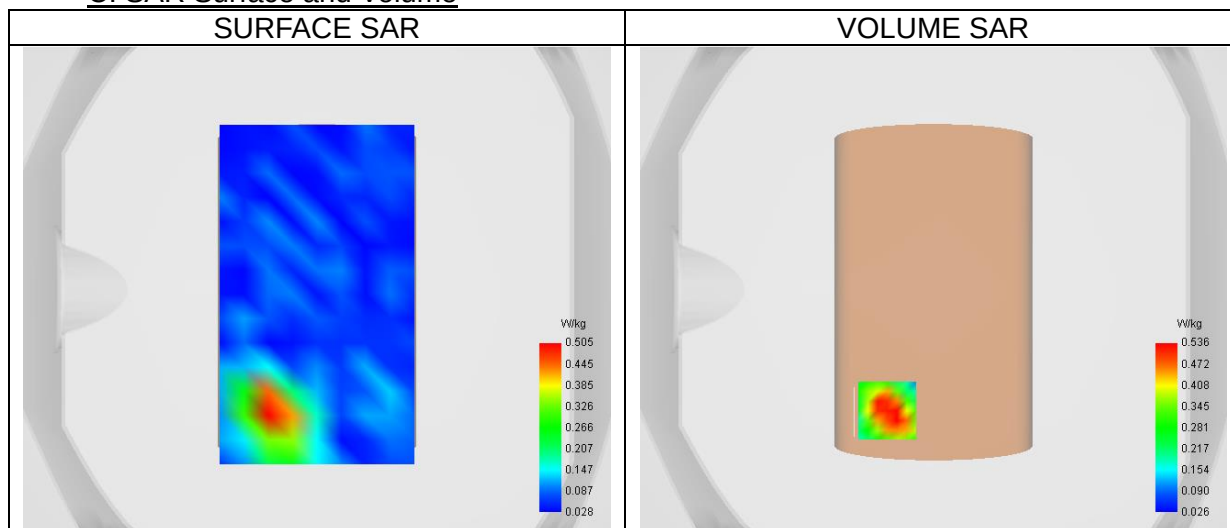
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-2a
Signal	IEEE 802.11 a
Channels/Frequency	Middle (56)/ frequency 5300.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5320.00
Relative permittivity (real part)	35.29
Relative permittivity (imaginary part)	16.27
Conductivity (S/m)	4.81

C. SAR Surface and Volume



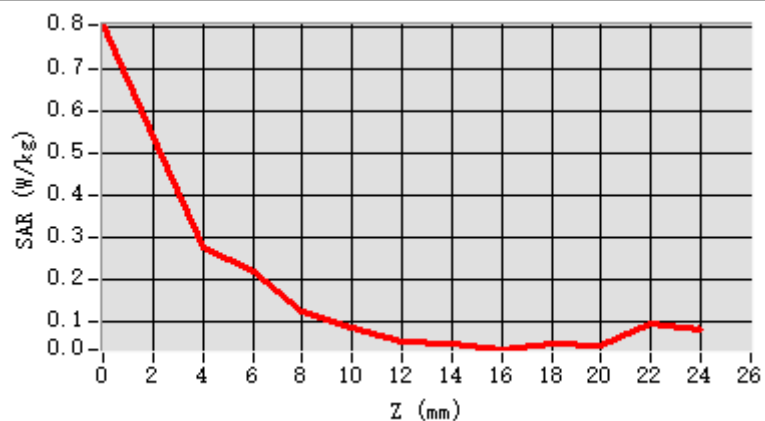
Maximum location: X=-19.00, Y=-50.00 ; SAR Peak: 1.10 W/kg

D. SAR 1g & 10g

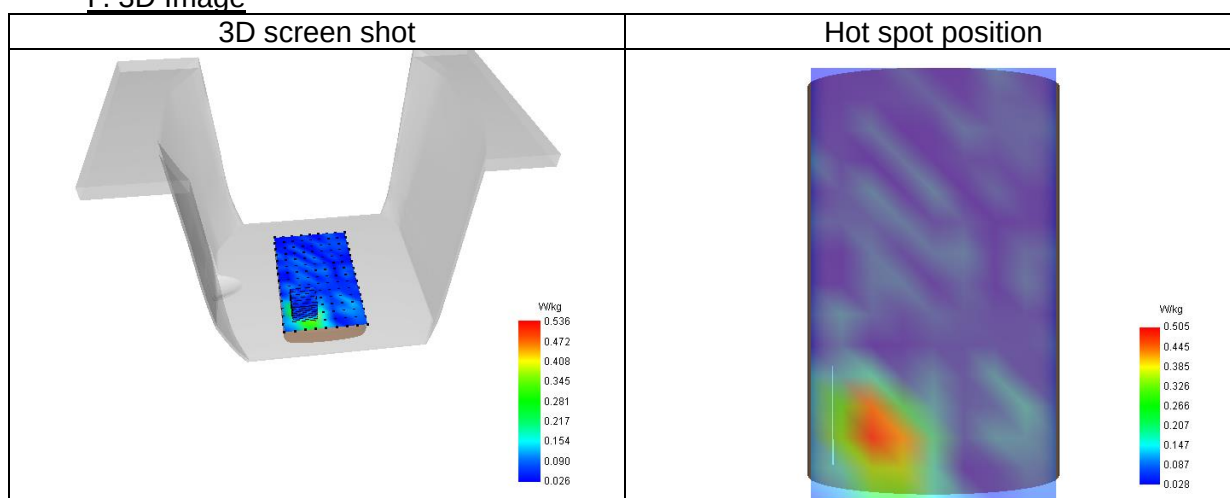
SAR 10g (W/Kg)	0.143
SAR 1g (W/Kg)	0.333
Variation (%)	2.79
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	65.26

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	0.80	0.53	0.27	0.22	0.12	0.08	0.05	0.05	0.03	0.05	0.04	0.09
	3	6	7	0	6	6	5	0	6	1	7	7



F. 3D Image



4# SAR Measurement at U-NII-2a (Body, Validation Plane)

Date of measurement: 3/8/2025

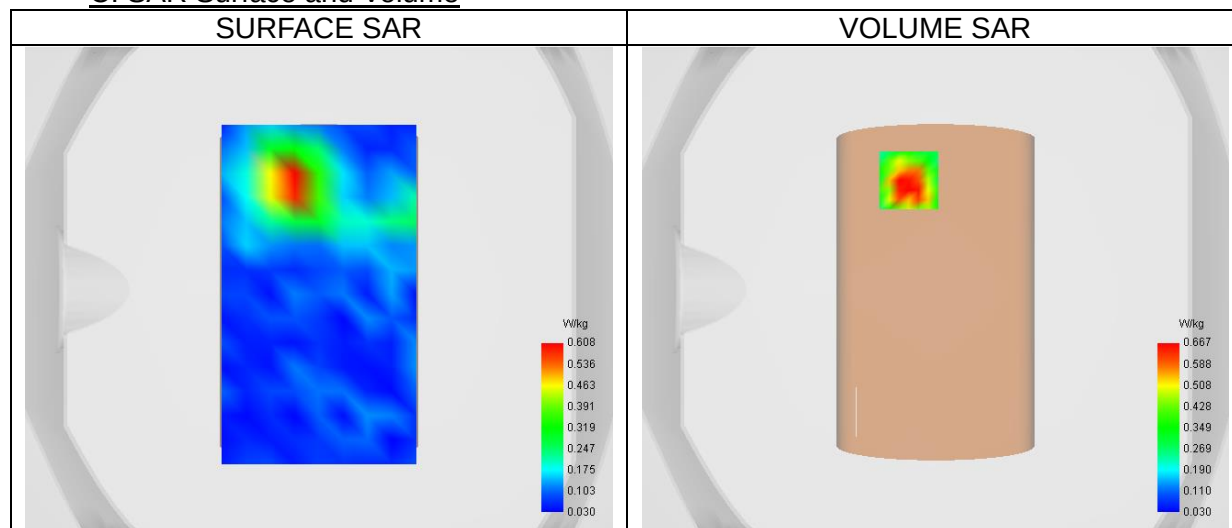
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.37
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-2a
Signal	IEEE 802.11 a
Channels/Frequency	Middle (56)/ frequency 5280.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5280.00
Relative permittivity (real part)	35.40
Relative permittivity (imaginary part)	16.10
Conductivity (S/m)	4.72

C. SAR Surface and Volume



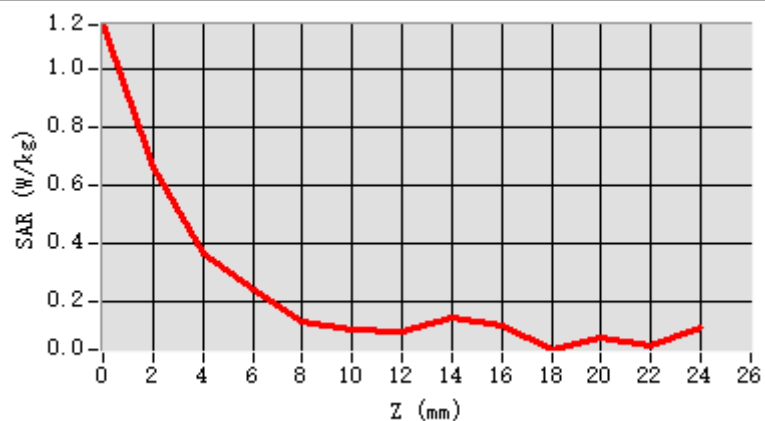
Maximum location: X=-11.00, Y=45.00 ; SAR Peak: 1.22 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.162
SAR 1g (W/Kg)	0.397
Variation (%)	-2.07
Horizontal validation criteria: minimum distance (mm)	12.65
Vertical validation criteria: SAR ratio M2/M1 (%)	68.53

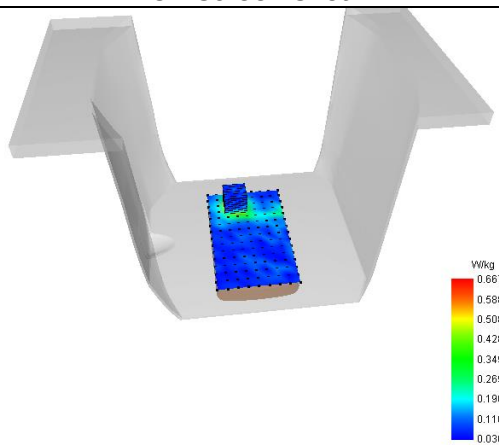
E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	1.15	0.66	0.37	0.24	0.13	0.10	0.10	0.14	0.11	0.03	0.07	0.04
	4	7	1	6	4	4	1	4	7	7	9	8

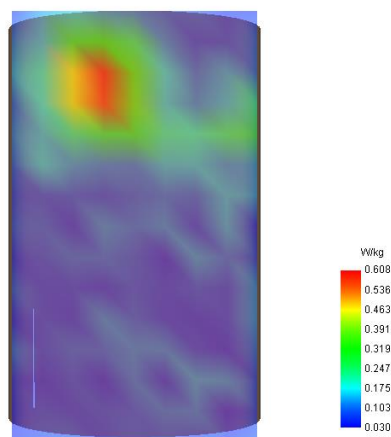


F. 3D Image

3D screen shot



Hot spot position



5# SAR Measurement at U-NII-2c (Body, Validation Plane)

Date of measurement: 15/8/2025

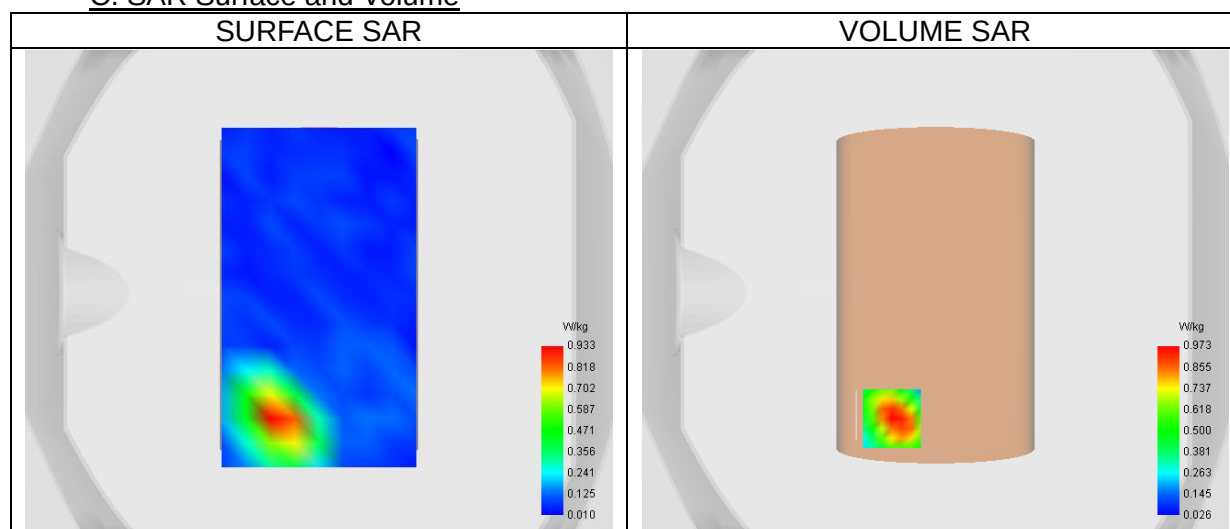
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.36
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-2c
Signal	IEEE 802.11 a
Channels/Frequency	Middle (120)/ frequency 5600.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5600.00
Relative permittivity (real part)	35.48
Relative permittivity (imaginary part)	15.96
Conductivity (S/m)	4.97

C. SAR Surface and Volume



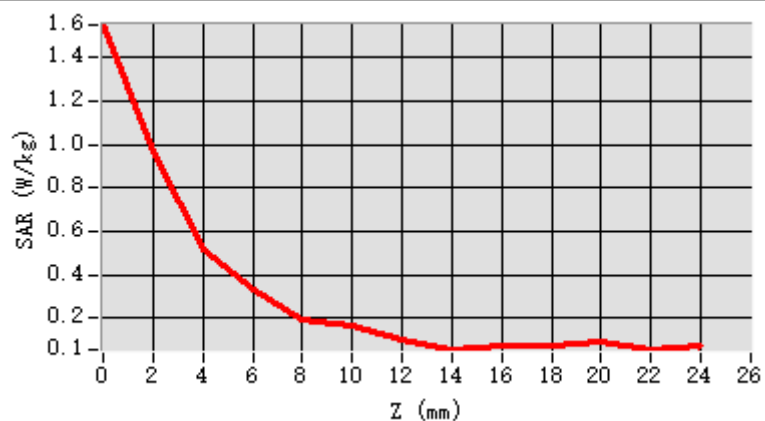
Maximum location: X=-18.00, Y=-52.00 ; SAR Peak: 1.82 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.235
SAR 1g (W/Kg)	0.595
Variation (%)	-1.96
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	55.47

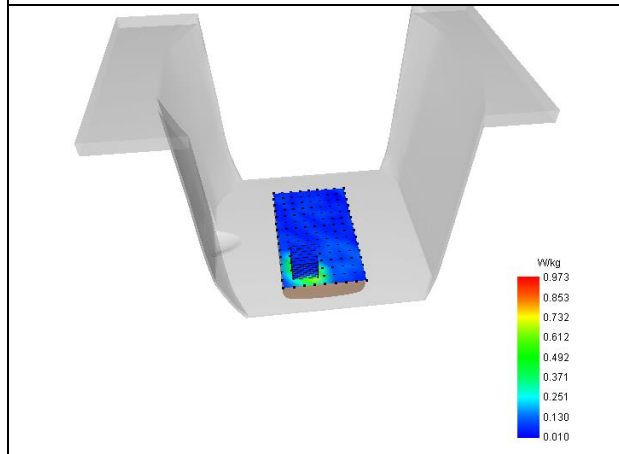
E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	1.55	0.97	0.52	0.32	0.19	0.16	0.10	0.06	0.07	0.07	0.09	0.05
	1	3	1	8	4	4	2	0	4	4	4	6

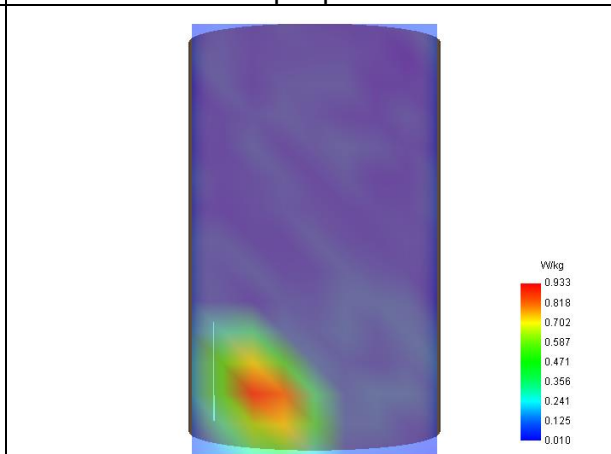


F. 3D Image

3D screen shot



Hot spot position



6# SAR Measurement at U-NII-2c (Body, Validation Plane)

Date of measurement: 15/8/2025

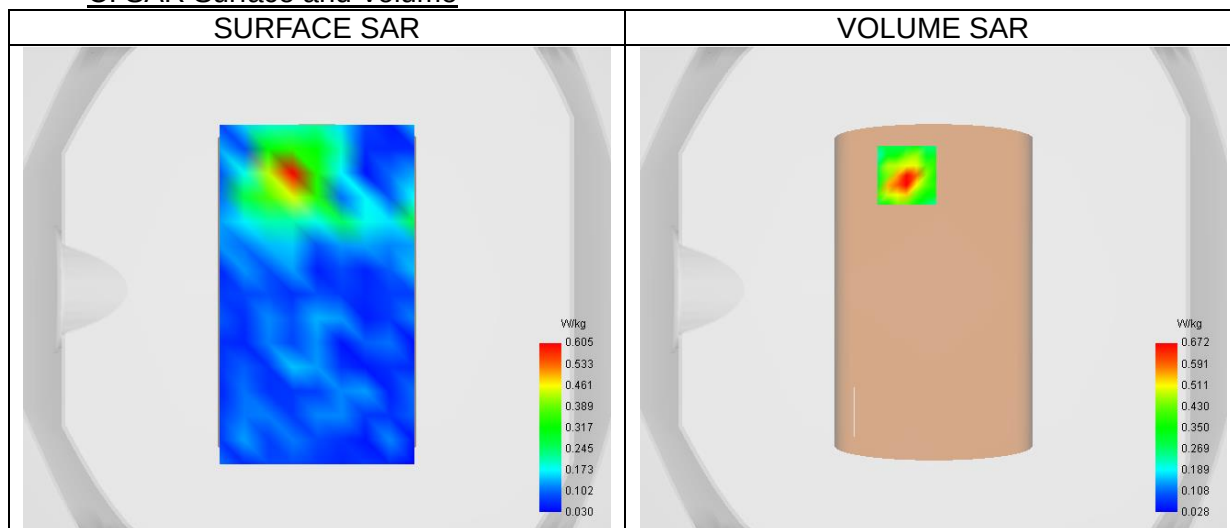
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.36
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-2c
Signal	IEEE 802.11 a
Channels/Frequency	Middle (120)/ frequency 5600.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5600.00
Relative permittivity (real part)	35.48
Relative permittivity (imaginary part)	15.96
Conductivity (S/m)	4.97

C. SAR Surface and Volume



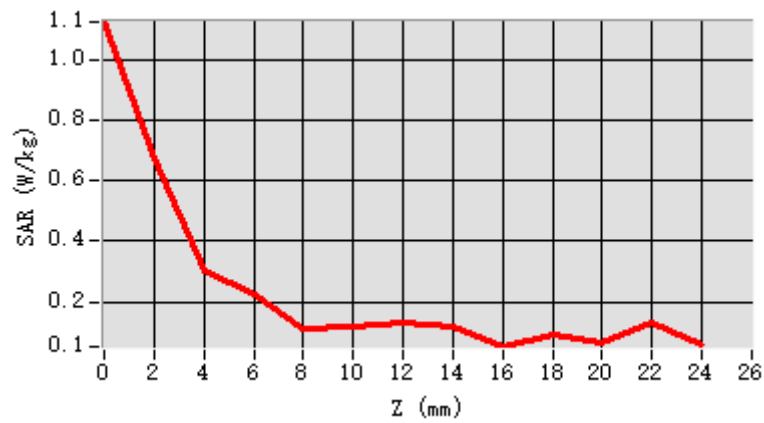
Maximum location: X=-11.00, Y=47.00 ; SAR Peak: 1.25 W/kg

D. SAR 1g & 10g

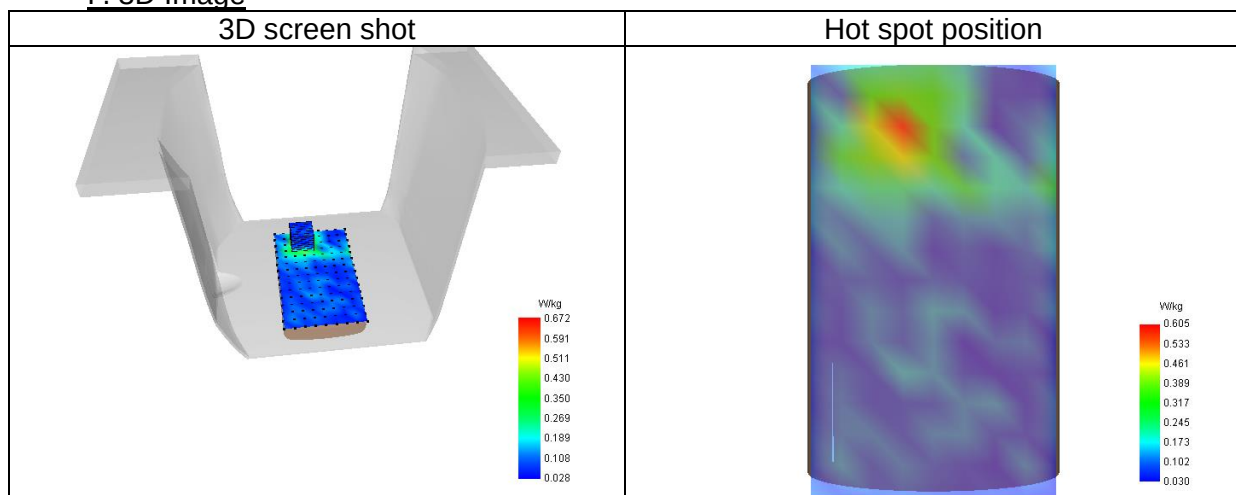
SAR 10g (W/Kg)	0.179
SAR 1g (W/Kg)	0.392
Variation (%)	4.93
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	61.63

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	1.12	0.67	0.30	0.22	0.11	0.11	0.13	0.12	0.05	0.09	0.06	0.13
	4	2	2	3	1	9	2	1	2	4	5	3



F. 3D Image



7# SAR Measurement at U-NII-3 (Body, Validation Plane)

Date of measurement: 2/8/2025

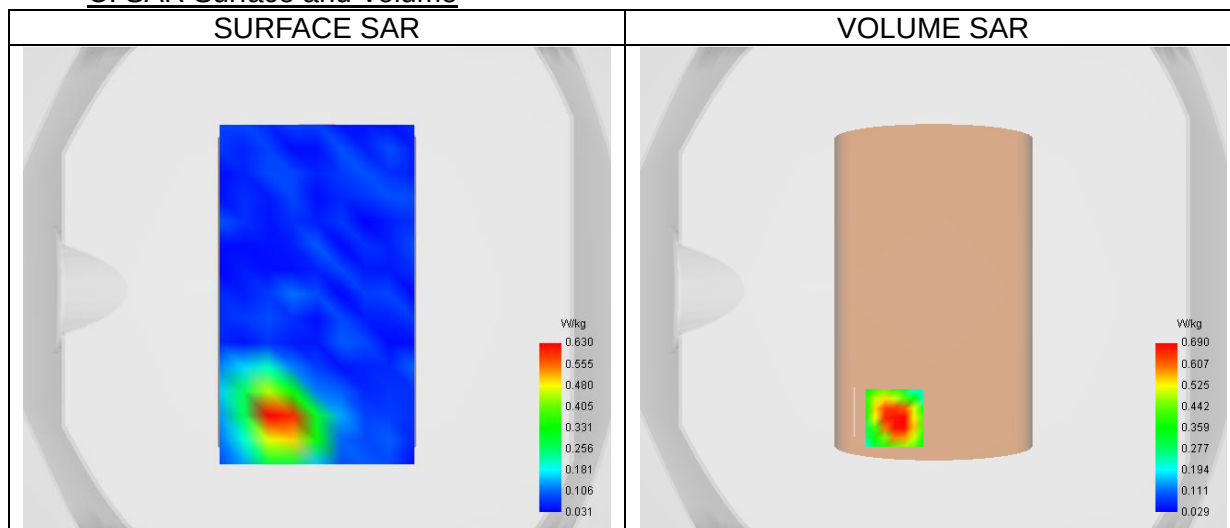
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.35
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-3
Signal	IEEE 802.11 a
Channels/Frequency	Middle (157)/ frequency 5785.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5785.00
Relative permittivity (real part)	35.83
Relative permittivity (imaginary part)	15.77
Conductivity (S/m)	5.07

C. SAR Surface and Volume



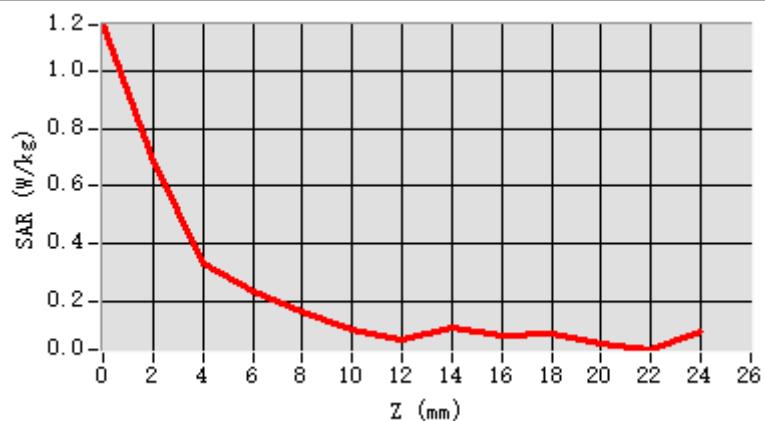
Maximum location: X=-16.00, Y=-53.00 ; SAR Peak: 1.34 W/kg

D. SAR 1g & 10g

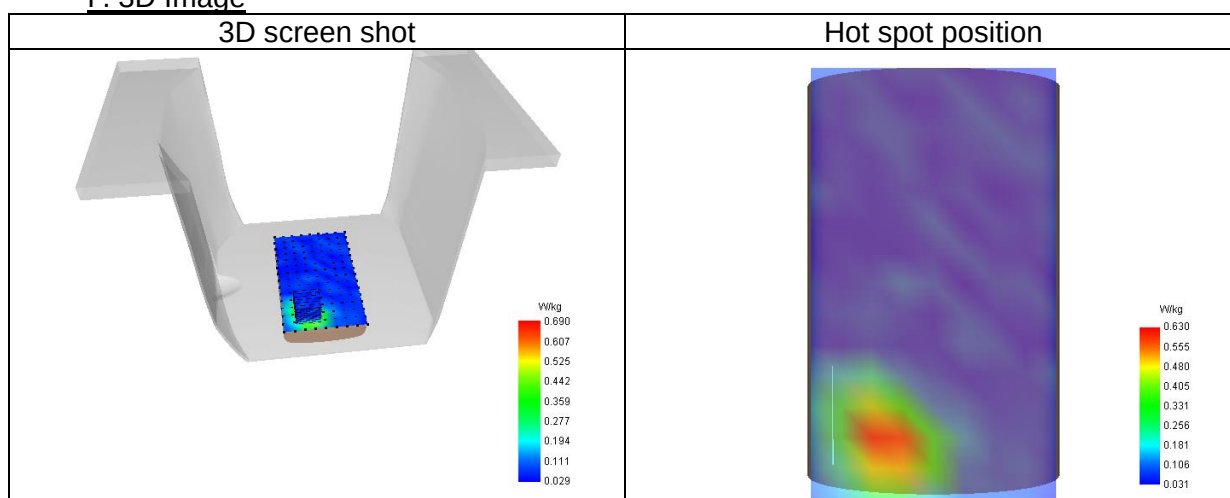
SAR 10g (W/Kg)	0.180
SAR 1g (W/Kg)	0.423
Variation (%)	-3.72
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	59.17

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	1.16	0.69	0.32	0.23	0.16	0.10	0.06	0.10	0.07	0.08	0.05	0.02
	4	0	9	2	3	0	4	7	8	6	1	9



F. 3D Image



8# SAR Measurement at U-NII-3 (Body, Validation Plane)

Date of measurement: 2/8/2025

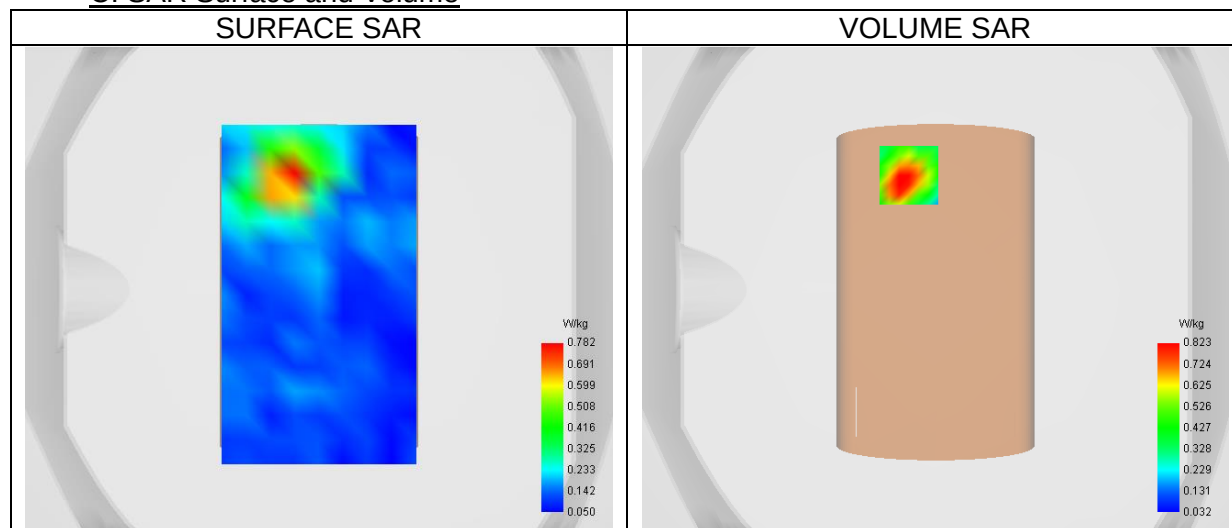
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.35
Area Scan	dx=10mm dy=10mm, Complete
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	U-NII-3
Signal	IEEE 802.11 a
Channels/Frequency	Middle (157)/ frequency 5785.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5785.00
Relative permittivity (real part)	35.83
Relative permittivity (imaginary part)	15.77
Conductivity (S/m)	5.07

C. SAR Surface and Volume



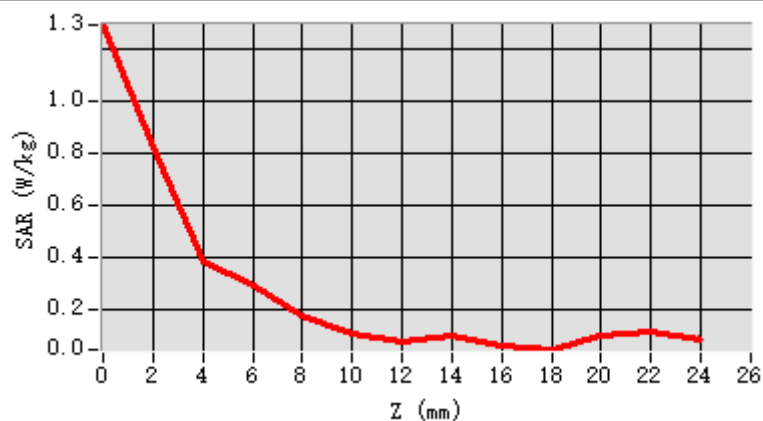
Maximum location: X=-11.00, Y=47.00 ; SAR Peak: 1.50 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.204
SAR 1g (W/Kg)	0.502
Variation (%)	-3.44
Horizontal validation criteria: minimum distance (mm)	11.31
Vertical validation criteria: SAR ratio M2/M1 (%)	62.49

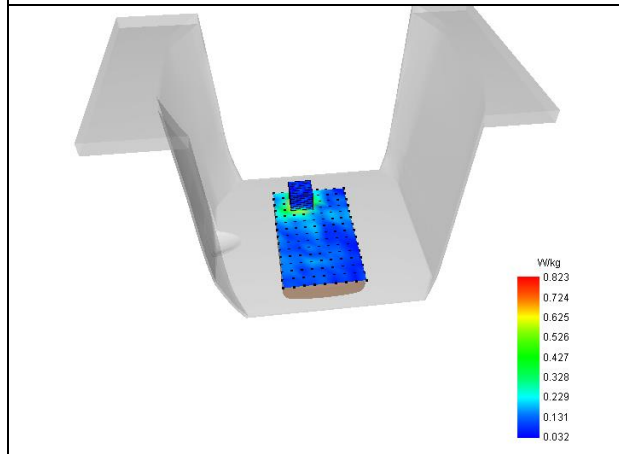
E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0
						0	0	0	0	0	0	0
SAR (W/Kg)	1.29	0.82	0.38	0.29	0.17	0.10	0.07	0.09	0.05	0.04	0.09	0.10
	4	3	5	0	5	8	3	6	8	2	7	9

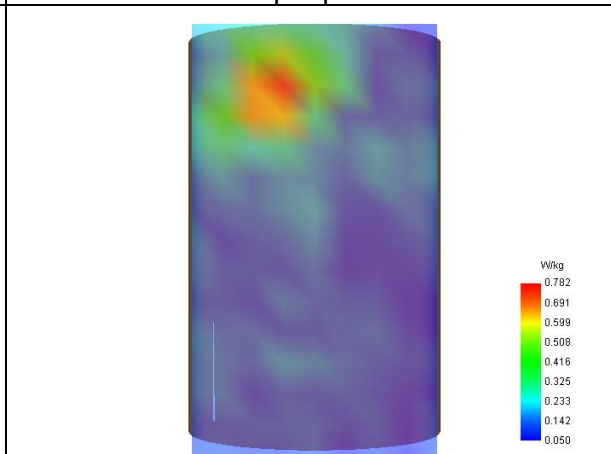


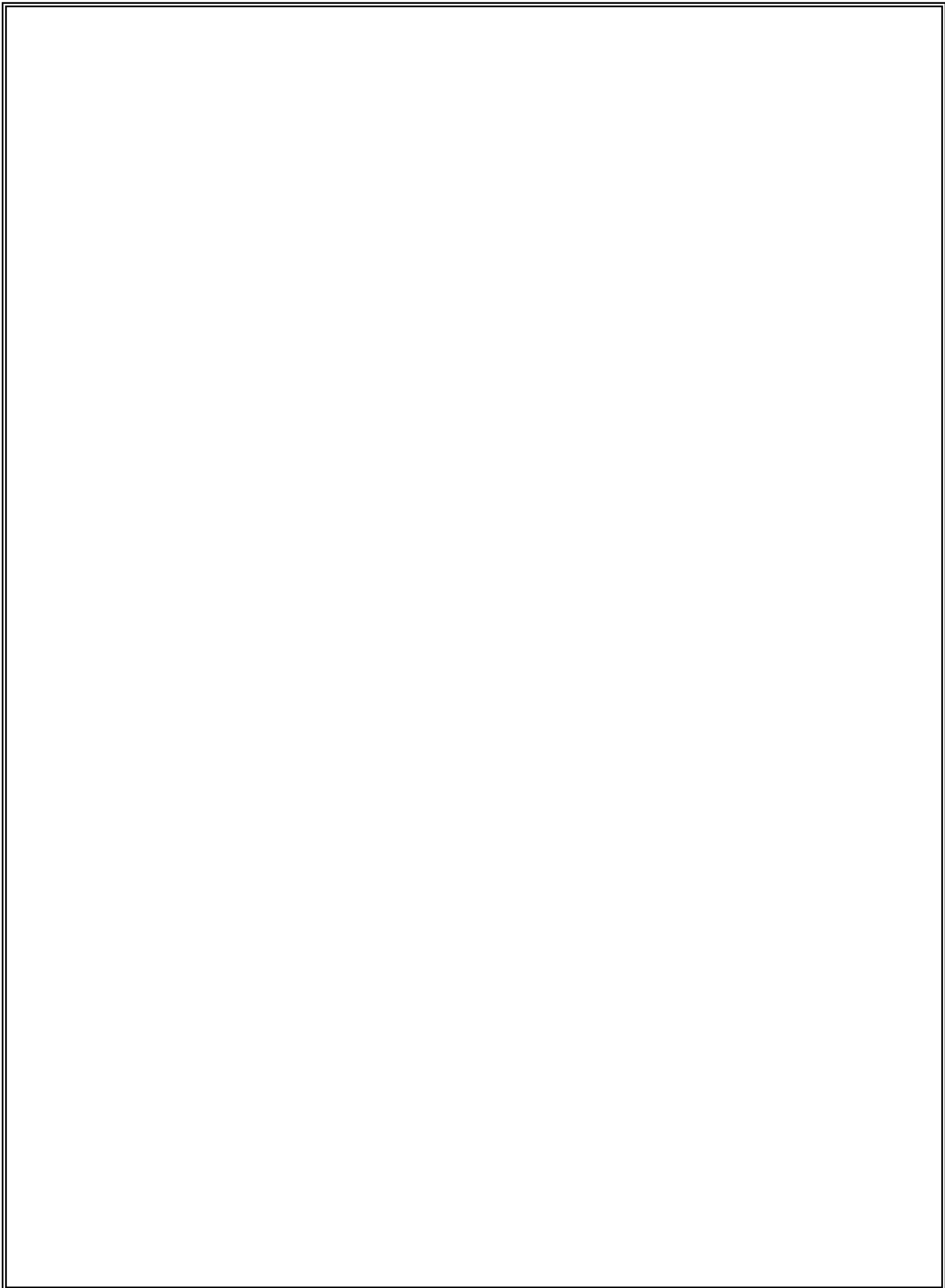
F. 3D Image

3D screen shot



Hot spot position





9# SAR Measurement at ISM (Body, Validation Plane)

Date of measurement: 4/8/2025

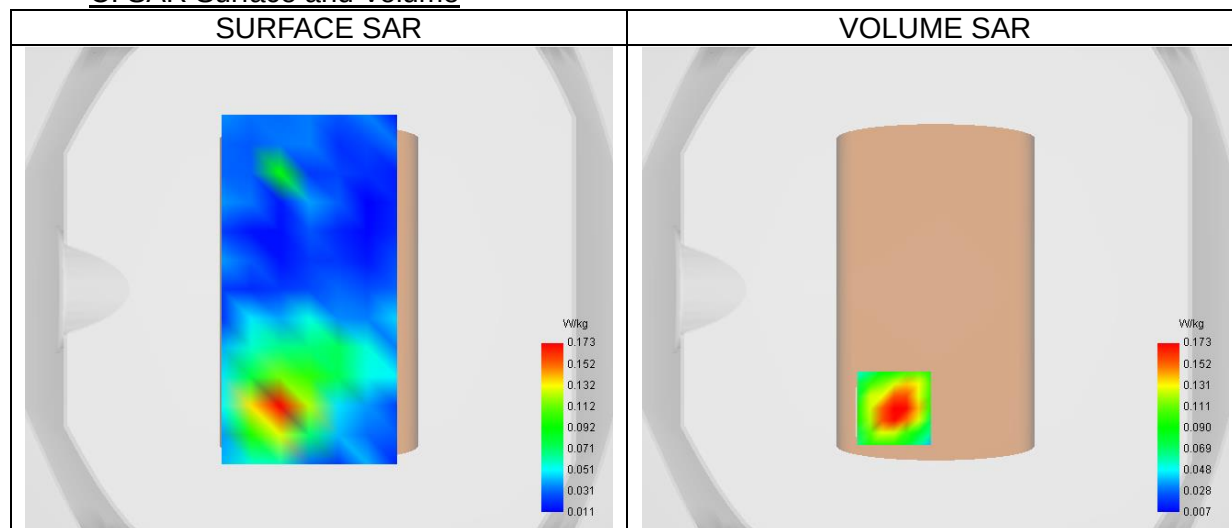
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.63
Area Scan	dx=12mm dy=12mm, Complete
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	ISM
Signal	IEEE 802.11 b
Channels/Frequency	Middle (6)/ frequency 2437.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	2437.00
Relative permittivity (real part)	38.37
Relative permittivity (imaginary part)	13.36
Conductivity (S/m)	1.81

C. SAR Surface and Volume



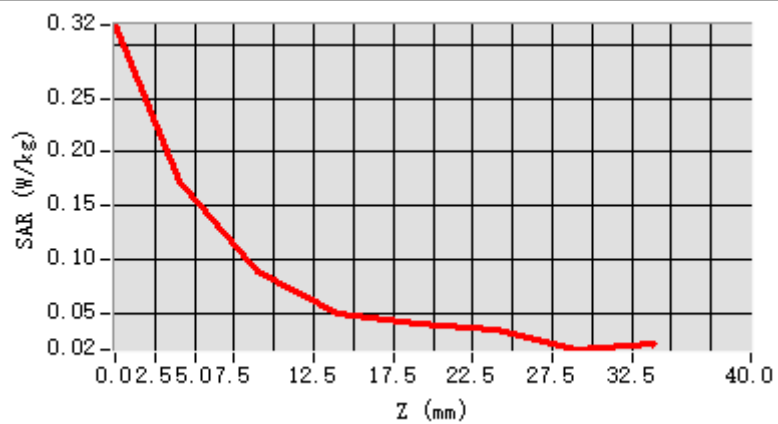
Maximum location: X=-17.00, Y=-49.00 ; SAR Peak: 0.32 W/kg

D. SAR 1g & 10g

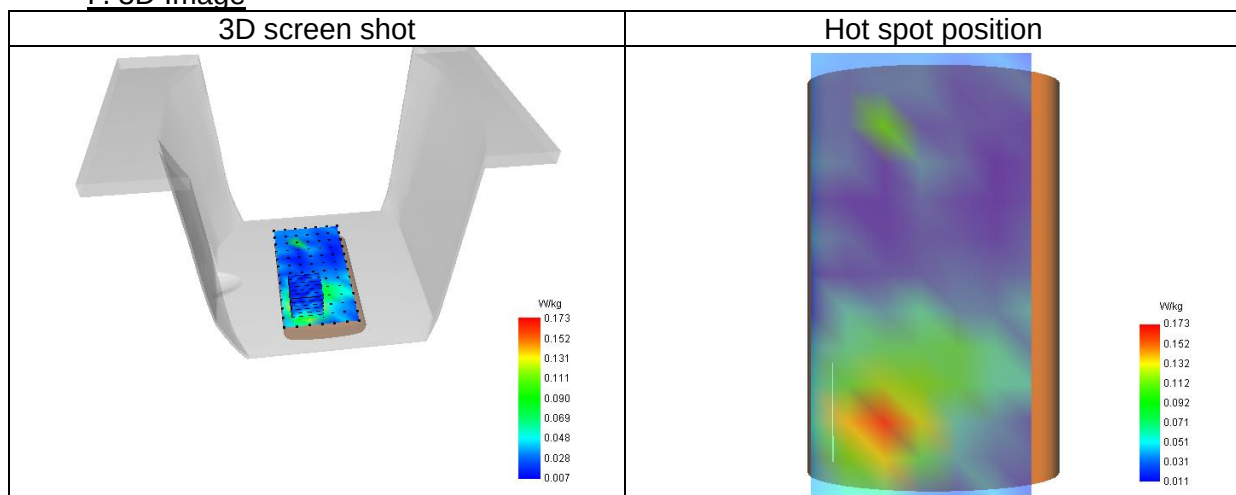
SAR 10g (W/Kg)	0.080
SAR 1g (W/Kg)	0.169
Variation (%)	-4.45
Horizontal validation criteria: minimum distance (mm)	14.14
Vertical validation criteria: SAR ratio M2/M1 (%)	52.55

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.318	0.173	0.089	0.049	0.041	0.035	0.016



F. 3D Image



10# SAR Measurement at ISM (Body, Validation Plane)

Date of measurement: 4/8/2025

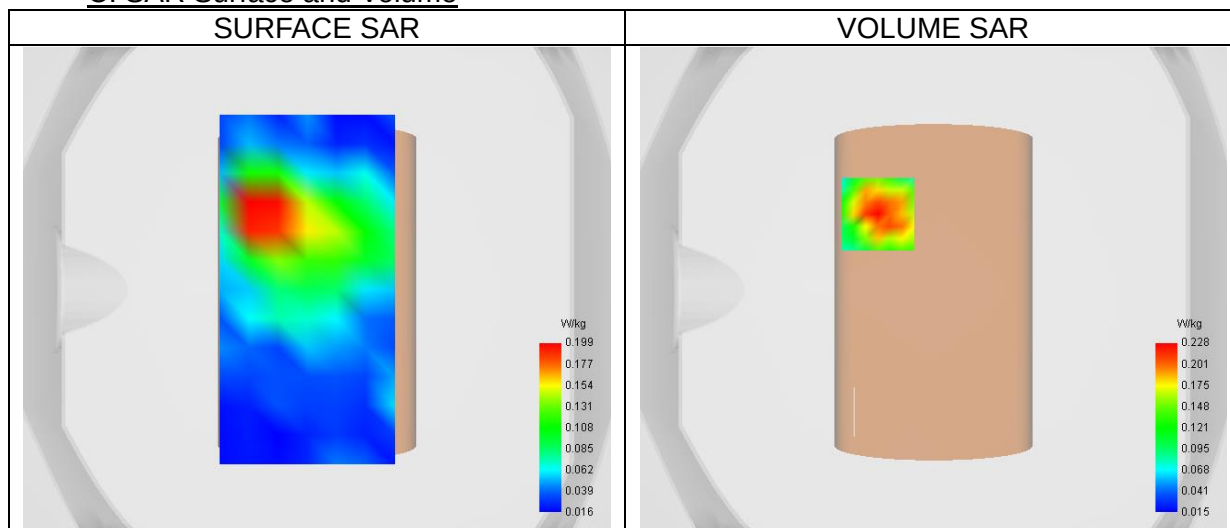
A. Experimental conditions.

Probe	0725-EPGO-448
ConvF	1.63
Area Scan	dx=12mm dy=12mm, Complete
Zoom Scan	7x7x7, dx=5mm dy=5mm dz=5.0mm, Complete
Phantom	Validation plane
Device Position	Body
Band	ISM
Signal	IEEE 802.11 b
Channels/Frequency	Middle (6)/ frequency 2437.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	2437.00
Relative permittivity (real part)	38.37
Relative permittivity (imaginary part)	13.36
Conductivity (S/m)	1.81

C. SAR Surface and Volume



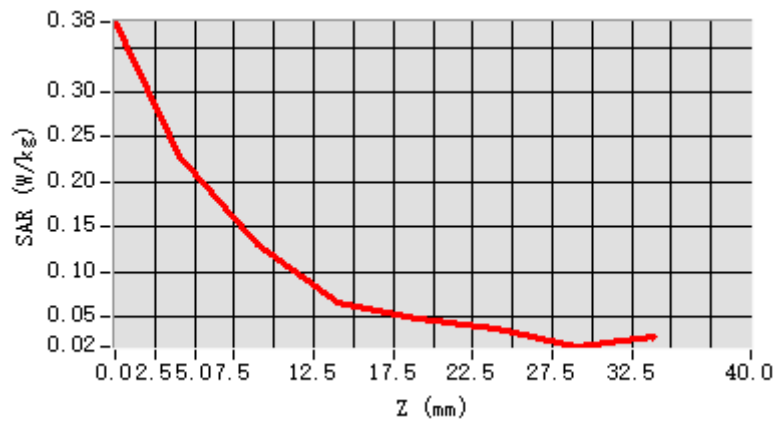
Maximum location: X=-23.00, Y=31.00 ; SAR Peak: 0.37 W/kg

D. SAR 1g & 10g

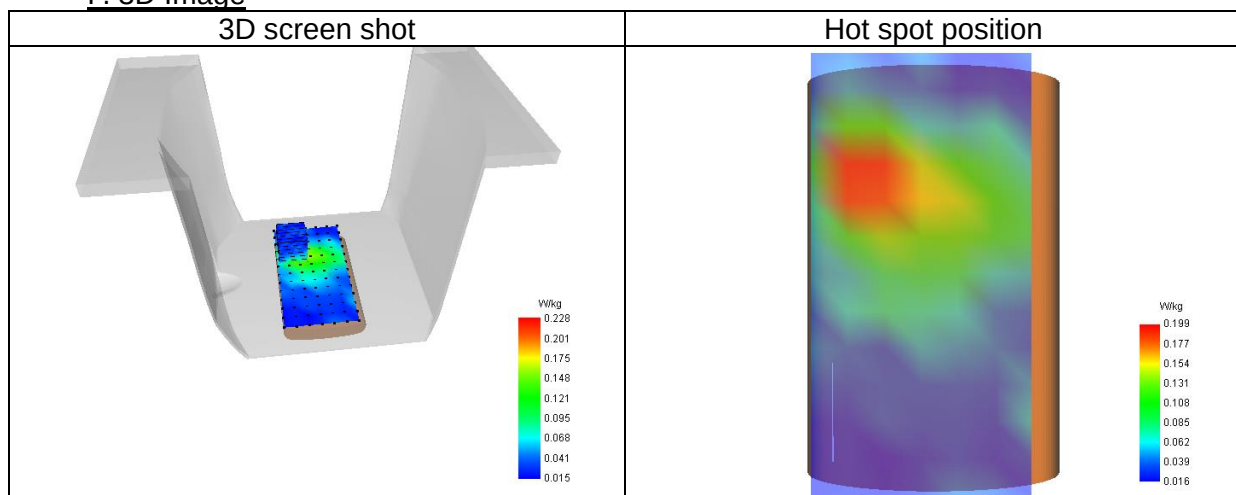
SAR 10g (W/Kg)	0.111
SAR 1g (W/Kg)	0.211
Variation (%)	1.65
Horizontal validation criteria: minimum distance (mm)	14.14
Vertical validation criteria: SAR ratio M2/M1 (%)	59.56

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.378	0.228	0.130	0.066	0.048	0.036	0.017



F. 3D Image



14. Appendix D. Calibration Certificate

Table of contents
E Field Probe - 0725-EPGO-448
2450 MHz Dipole - SN 03/15 DIP 2G450-352
5000-6000 MHz Dipole - SN 13/14 WGA 33
<Justification of the extended calibration>

Docusign Envelope ID: 8D8CB647-C2B4-4414-A550-C6E3F74EB7AD



COMOSAR E-Field Probe Calibration Report

Ref : ACR.108.1.25.BES.A

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

**BUILDING E, FENDA SCIENCE PARK, SANWEI
COMMUNITY, XIXIANG STREET,
BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: 0725-EPGO-448**

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 04/15/2025



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).

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.108.1.25.BES.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Pedro Ruiz	Technical Manager	4/18/2025	
<i>Checked & approved by:</i>	Pedro Ruiz	Technical Manager	4/18/2025	
<i>Authorized by:</i>	Kim Rutkowski	Quality Manager	4/23/2025	Signed by: Kimberly ROTKOWSKI 2B88B547AD17437...

	<i>Customer Name</i>
<i>Distribution :</i>	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Pedro Ruiz	4/18/2025	Initial release

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.108.1.25.BES.A

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.108.1.25.BES.A

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	0725-EPGO-448
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.191 MΩ Dipole 2: R2=0.212 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 effect. All calibrations / measurements performed meet the fore-mentioned standards.

3.1 SENSITIVITY

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

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3.2 LINEARITY

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

3.3 ISOTROPY

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

3.4 BOUNDARY EFFECT

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

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

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

where

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

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

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3.5 PROBE MODULATION RESPONSE

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

4 MEASUREMENT UNCERTAINTY

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

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

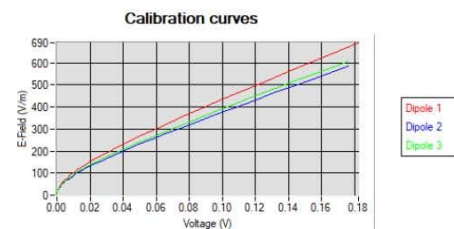
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

5 CALIBRATION RESULTS

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

5.1 CALIBRATION IN AIR

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



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

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

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where

V_i =voltage readings on the 3 channels of the probe

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

Normi=dipole sensitivity given below for the 3 channels of the probe

Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$)
1.03	1.37	1.26

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
109	107	108

5.2 CALIBRATION IN LIQUID

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

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

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

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

where

σ =the conductivity of the liquid

ρ =the volumetric density of the liquid

SAR=the SAR measured from the formula that depends on the setup used. The SAR formulas are given below

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

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

where

c =the specific heat for the liquid

dT/dt =the temperature rises over the time

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

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

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