

FCC SAR EVALUATION REPORT

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

Product Name : Automotive Diagnostic Scan Tool

Trademark : 

Model Name : MAXPLUS2.0

Family Model : N/A

Report No. : N26032801106E

FCC ID : 2AUKMMTMAXPLUS2

Prepared for

Matco Tools

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name Matco Tools

Address..... 4403 Allen Rd. Stow, OH 44224 USA

Manufacturer's Name..... Matco Tools

Address..... 4403 Allen Rd. Stow, OH 44224 USA

Product description

Product name Automotive Diagnostic Scan Tool

Trademark 

Model Name MAXPLUS2.0

Family Model..... N/A

FCC 47 CFR Part 2(2.1093)

ANSI/IEEE C95.1-1992

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) and ANSI/IEEE C95.1-1992. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

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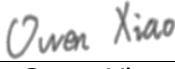
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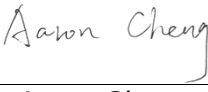
Date of Test

Date (s) of performance of tests . Apr. 09, 2026~ Apr. 13, 2026

Date of Issue Apr. 24, 2026

Test Result..... Pass

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※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Apr. 24, 2026	Owen Xiao

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1. General Information

1.1. RF exposure limits

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

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

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

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

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

Occupational/Controlled Environments:

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

General Population/Uncontrolled Environments:

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

NOTE
Trunk Limit
1.6 W/kg
APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for MAXPLUS2.0 are as follows.

Band	Max Reported SAR Value(W/kg)
	1-g Body (Separation distance of 0mm)
WLAN 2.4G	1.234
WLAN 5.2G	1.293
WLAN 5.3G	1.082
WLAN 5.6G	1.271
WLAN 5.8G	0.749

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

1.3. EUT Description

Device Information			
Product Name	Automotive Diagnostic Scan Tool		
Trade Name			
Model Name	MAXPLUS2.0		
Family Model	N/A		
Model Difference	N/A		
FCC ID	2AUKMMTMAXPLUS2		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna Type	FPC		
Battery Information	DC 7.6V, 6300mAh, 47.88Wh		
Hardware version	V1A		
Software version	N/A		
Device Operating Configurations			
Supporting Mode(s)	WLAN 2.4G/5G, Bluetooth		
Test Modulation	WLAN(DSSS/OFDM), Bluetooth(GFSK, $\pi/4$ -DQPSK, 8DPSK),SRD 2.4G(OQPSK).		
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

1.4. Test specification(s)

FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02 RF Exposure Reporting v01r02;
KDB 447498 D01 General RF Exposure Guidance v06;
KDB 248227 D01 802.11 Wi-Fi SAR v02r02;

1.5. Ambient Condition

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

1.6. Facilities And Accreditations

1.6.1. Facilities

All measurement facilities used to collect the measurement data are located at Building 1, No. 24 Xinfu East Road, Xiangshan Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of IEC/IEEE Std 1528-2013

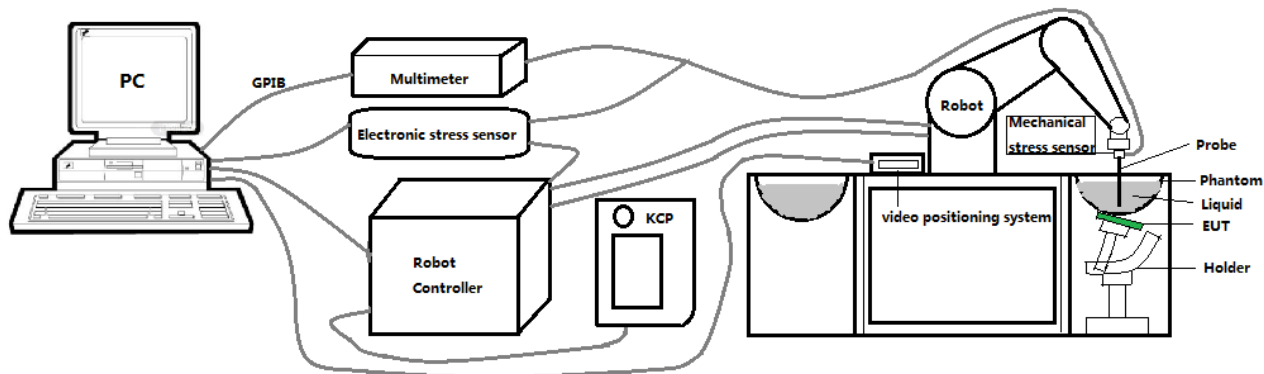
1.6.2. Laboratory Accreditations And Listings

Site Description

CNAS Lab. : The Certificate Registration Number is L5516
 A2LA Lab. : The Certificate Registration Number is 4298.01
 FCC Accredited : Test Firm Registration Number: 463705
 Designation Number: CN1184
 ISED Registration : Company Number: 9270A
 CAB identifier: CN0074

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

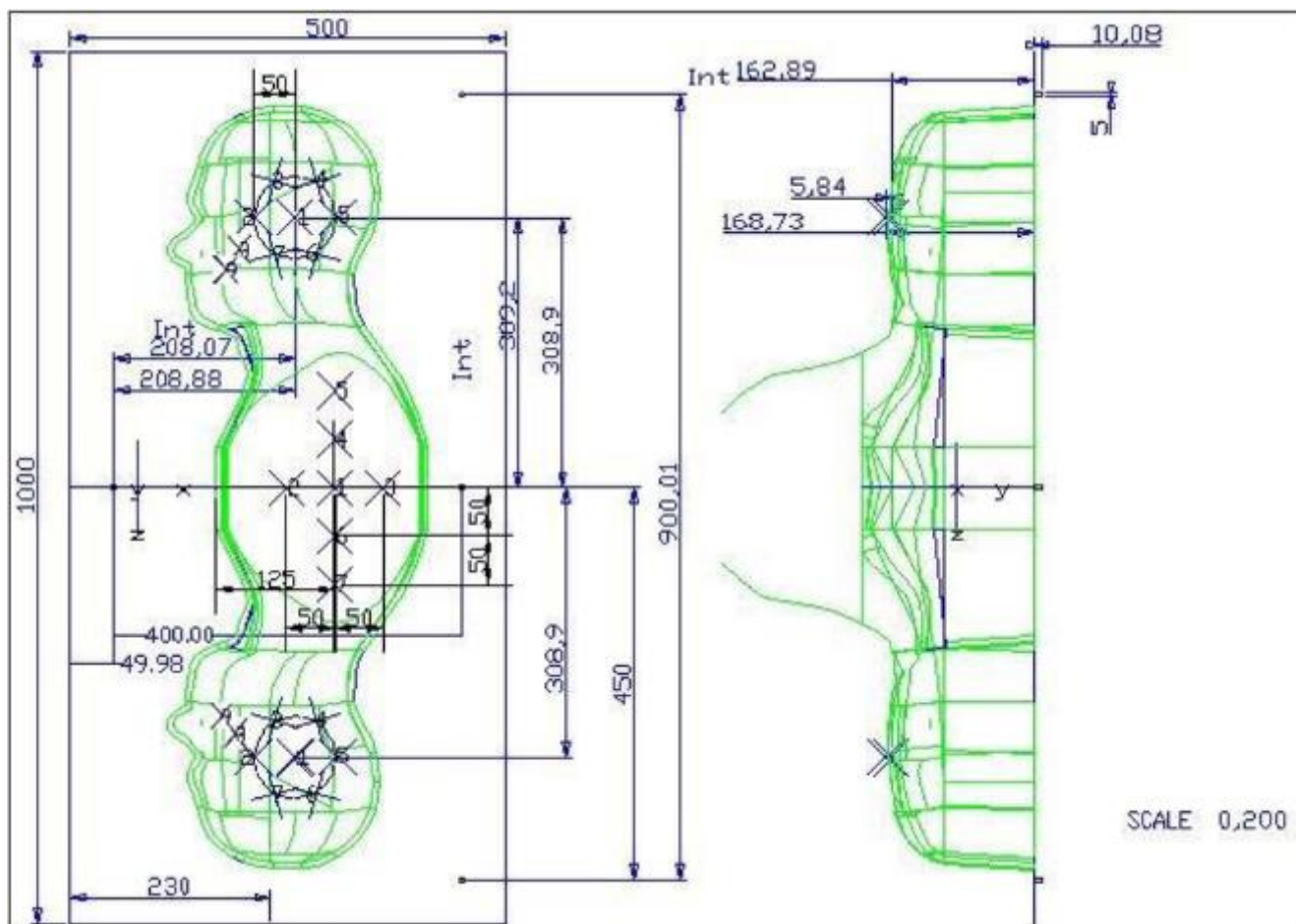
Photo of SAM phantom SN 16/15 SAM119



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

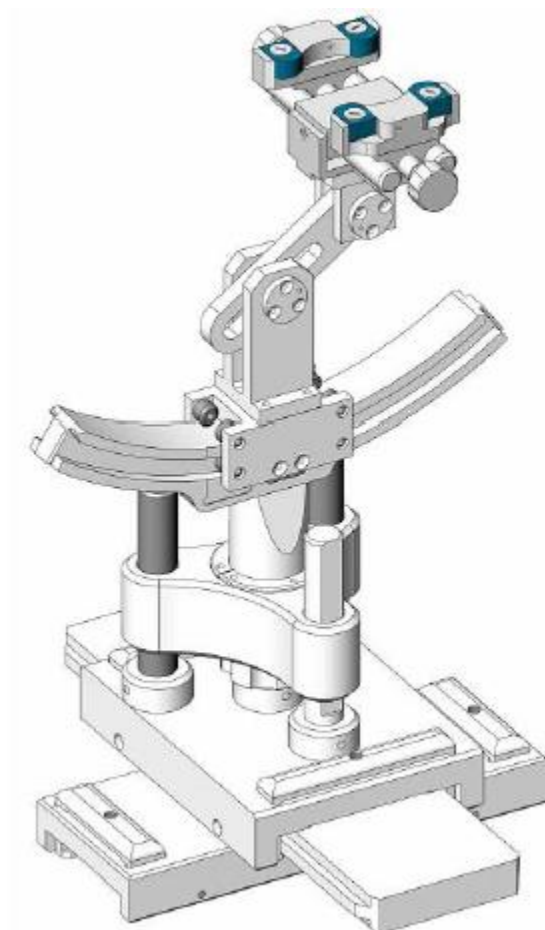


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

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	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	May. 12 2025	May. 11 2026
☐	R&S	Universal radio communication tester	CMU200	105747	Apr. 17, 2025	Apr. 16, 2026
☒	R&S	Wideband radio	CMW500	103917	May. 12, 2025	May. 11, 2026

		communication tester				
☐	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. 31, 2026	Mar. 30, 2027
☒	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 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									
	750	835	900	1800	1900	2000	2450	2600	5200	5800
Frequency Band (MHz)										
Water	34.40	34.40	34.40	55.36	55.36	57.87	57.87	57.87	65.53	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	24.24	24.24
DGBE	0.00	0.00	0.00	13.84	13.84	22.00	22.00	22.00	10.23	10.23

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

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

4.1.1. Tissue Dielectric Parameter Check Results

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine 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	40.80	1.83	4.08	1.67	21.4 °C	Apr. 10, 2026
Head 5200	5200	36.00	4.66	36.02	4.75	0.06	1.93	21.6 °C	Apr. 11, 2026
Head 5400	5400	35.80	4.86	35.71	4.91	-0.25	1.03	21.9 °C	Apr. 12, 2026
Head 5600	5600	35.50	5.07	36.03	5.18	1.49	2.17	21.0 °C	Apr. 13, 2026
Head 5800	5800	35.30	5.27	36.74	5.10	4.08	-3.23	21.5 °C	Apr. 09, 2026

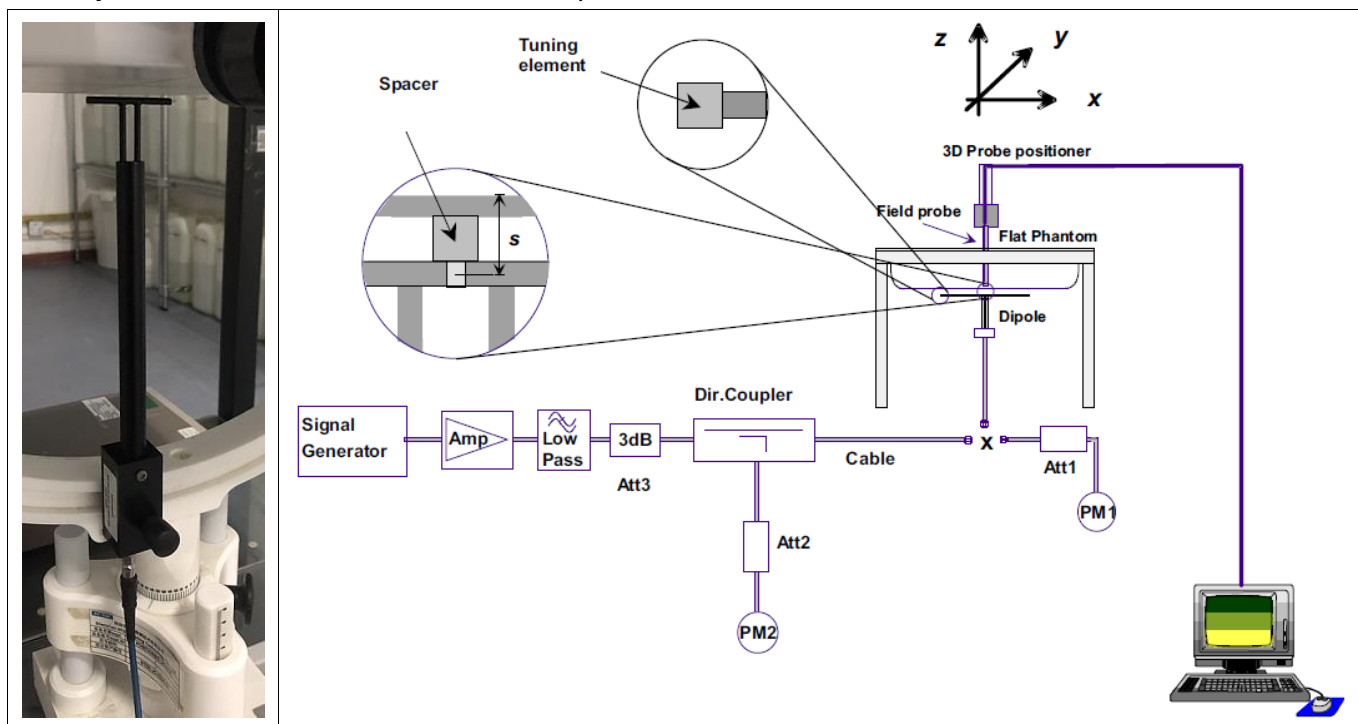
NOTE: 1. The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

NOTE: 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. It is fed with a power of 100mW (below 5GHz) or 10mW (above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system verification to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system verification to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

The system verification is shown as below picture:



4.2.1. System Verification Results

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

System Verification	Target SAR (1W)		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	4.77	2.23	47.68	22.28	-4.74	-6.39	21.4 °C	Apr. 10, 2026
5200MHz	162.59	56.21	10.00	1.63	0.55	163.30	55.10	0.44	-1.97	21.6 °C	Apr. 11, 2026
5400MHz	159.81	55.00	10.00	1.51	0.53	151.30	53.10	-5.33	-3.45	21.9 °C	Apr. 12, 2026
5600MHz	179.15	61.01	10.00	1.72	0.58	171.50	58.30	-4.27	-4.44	21.0 °C	Apr. 13, 2026
5800MHz	182.20	61.32	10.00	1.78	0.63	177.90	63.00	-2.36	2.74	21.5 °C	Apr. 09, 2026

NOTE: Tested by : Max Zhou, Jack Peng

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

Per IEC/IEEE 62209-1528 SAR measurement 4 MHz to 10 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. Uncertainty Evaluation For System Performance Check

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

Uncertainty Component	Tol. ($\pm\%$)	Prob. Dist.	Div.	Ci (1 g)	Ci (10 g)	1 g Ui ($\pm\%$)	10 g Ui ($\pm\%$)	Vi
Measurement System								
Probe Calibration	7	N	1	1	1	7	7	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	1	1	2.02	2.02	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	0	0	0	0	∞
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
System Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	0	R	$\sqrt{3}$	0	0	0	0	∞
Readout Electronics	0.5	N	1	1	1	0.5	0.5	∞
Response Time	0	R	$\sqrt{3}$	0	0	0	0	∞
Integration Time	1.4	R	$\sqrt{3}$	0	0	0	0	∞
RF Ambient Conditions - Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞

RF Ambient Conditions - Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe Positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Dipole								
Deviation of experimental source from numerical source	5	N	1	1	1	5	5	∞
Input power and SAR drift measurement	0.5	N	1	1	1	0.5	0.5	∞
Dipole axis to liquid Distance	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Phantom and Tissue Parameters								
Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2	1.68	∞
Liquid Conductivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	∞
Liquid conductivity - measurement uncertainty	1.59	N	1	0.23	0.26	0.37	0.41	99
Liquid permittivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	∞
Liquid permittivity - measurement uncertainty	1.65	N	1	0.23	0.26	0.38	0.43	99
Combined Standard Uncertainty		RSS				10.35	10.24	
Expanded Uncertainty (95% Confidence interval)		k				20.70	20.48	

5.3. Uncertainty Evaluation For EUT SAR Test

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

Uncertainty Component	Tol. ($\pm\%$)	Prob. Dist.	Div.	Ci (1 g)	Ci (10 g)	1 g Ui ($\pm\%$)	10 g Ui ($\pm\%$)	Vi
Measurement System								
Probe Calibration	7	N	1	1	1	7	7	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	0.71	0.71	1.43	1.43	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	0.71	0.71	2.41	2.41	∞
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞

Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
System Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	10	R	$\sqrt{3}$	1	1	5.77	5.77	∞
Readout Electronics	0.5	N	1	1	1	0.5	0.5	∞
Response Time	0	R	$\sqrt{3}$	1	1	0	0	∞
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF Ambient Conditions - Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Conditions - Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe Positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related								
Test Sample Positioning	2.6	N	1	1	1	2.6	2.6	11
Device Holder Uncertainty	3	N	1	1	1	3	3	7
Output Power Variation - SAR drift measurement	5	N	1	1	1	5	5	∞
SAR scaling	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Phantom and Tissue Parameters								
Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2	1.68	∞
Liquid Conductivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.78	0.71	1.13	1.02	∞
Liquid conductivity - measurement uncertainty	1.59	N	1	0.23	0.26	0.37	0.41	99
Liquid permittivity (temperature uncertainty)	2.5	R	$\sqrt{3}$	0.23	0.26	0.33	0.38	∞
Liquid permittivity - measurement uncertainty	1.65	N	1	0.23	0.26	0.38	0.43	99
Combined Standard Uncertainty		RSS				12.51	12.42	
Expanded Uncertainty (95% Confidence interval)		k				25.02	24.84	

6. RF Exposure Positions

6.1. Generic device

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

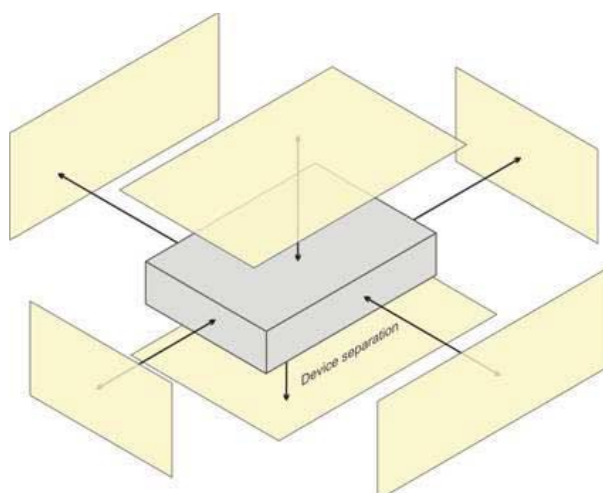


Figure 6.1 – Test positions for generic device

7. RF Output Power

7.1. WLAN & Bluetooth Output Power

7.1.1. Output Power Results Of WLAN

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11b	1	2412	13.00	12.58
	6	2437	13.00	12.81
	11	2462	13.00	12.94
802.11g	1	2412	12.00	11.64
	6	2437	12.00	11.74
	11	2462	12.00	11.93
802.11n HT20	1	2412	12.00	11.64
	6	2437	12.00	11.60
	11	2462	12.00	11.93
802.11n HT40	3	2422	12.50	11.97
	6	2437	12.50	12.02
	9	2452	12.50	11.98

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	36	5180	11.00	10.67
	40	5200	11.00	10.44
	48	5240	11.00	10.91
802.11n HT20	36	5180	10.00	9.56
	40	5200	10.00	8.74
	48	5240	10.00	9.09
802.11n HT40	38	5190	9.00	8.79
	46	5230	9.00	8.96
802.11ac VHT20	36	5180	9.00	8.74
	40	5200	9.00	8.62
	48	5240	9.00	8.96
802.11ac VHT40	38	5190	9.00	8.88
	46	5230	9.00	8.80
802.11ac VHT80	42	5210	9.00	8.86

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	52	5260	10.50	10.24
	56	5280	10.50	10.14
	64	5320	10.50	10.31
802.11n HT20	52	5260	9.50	9.27
	56	5280	9.50	9.09
	64	5320	9.50	9.01
802.11n HT40	54	5270	9.50	9.34
	62	5310	9.50	9.21
802.11ac VHT20	52	5260	9.50	9.08
	56	5280	9.50	9.08
	64	5320	9.50	9.17
802.11ac VHT40	54	5270	9.50	9.49
	62	5310	9.50	9.32
802.11ac VHT80	58	5290	9.50	9.37

NOTE: Power measurement results of WLAN 5.3G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	100	5500	10.50	10.39
	120	5600	10.50	9.32
	140	5700	10.50	9.11
802.11n	100	5500	8.50	8.41
	120	5600	8.50	7.73
	140	5700	8.50	7.31
802.11n	102	5510	9.00	8.61
	118	5590	9.00	7.76
	134	5670	9.00	7.45
802.11ac VHT20	100	5500	9.00	8.65
	120	5600	9.00	7.93
	140	5700	9.00	7.56
802.11ac VHT40	102	5510	9.00	8.93
	118	5590	9.00	8.02
	134	5670	9.00	7.54
802.11ac VHT80	106	5530	7.00	6.87
	122	5610	7.00	5.79

NOTE: Power measurement results of WLAN 5.6G.

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	149	5745	10.00	8.83
	157	5785	10.00	9.42
	165	5825	10.00	9.78
802.11n HT20	149	5745	8.50	7.80
	157	5785	8.50	8.47
	165	5825	8.50	8.43
802.11n HT40	151	5755	9.00	7.46
	159	5795	9.00	8.50
802.11ac VHT20	149	5745	9.00	7.80
	157	5785	9.00	8.33
	165	5825	9.00	8.53
802.11ac VHT40	151	5755	8.50	7.58
	159	5795	8.50	8.40
802.11ac VHT80	155	5775	8.00	7.99

NOTE: Power measurement results of WLAN 5.8G.

7.1.2. Output Power Results Of Bluetooth

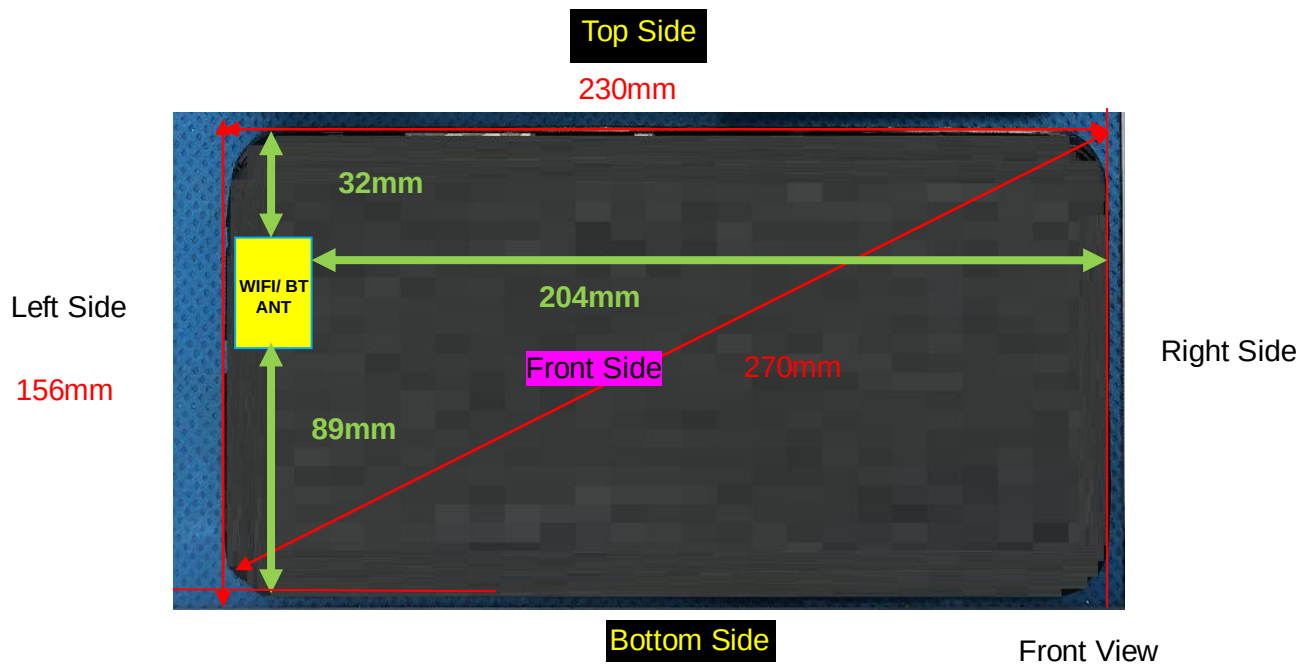
BR+EDR	Output Power (dBm)				
	Data Rates	Tune-up(EIRP) (dBm)	Channel		
			0CH	39CH	78CH
	1M	9.00	8.71	7.52	8.94
	2M	9.00	8.32	7.52	8.61
	3M	9.00	8.32	7.65	8.63

NOTE: Power measurement results of Bluetooth.

BLE	Output Power (dBm)				
	Data Rates	Tune-up(EIRP) (dBm)	Channe		
			0CH	19CH	39CH
	1M	4.00	3.48	3.75	3.26
	2M	4.00	3.62	3.62	3.16

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	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WLAN & Bluetooth	5	5	5	204	32	89

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

Positions for WLAN & Bluetooth Ant SAR tests		
Test separation distances $\leq$ 50 mm		
Exposure Positions	Tune-up Maximum power of WLAN 2.4G	
	13.00dBm	19.95mW
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	10
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	10
	SAR testing required?	YES
Left Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	10
	SAR testing required?	YES
Top Side	Antenna to user(mm)	32
	SAR exclusion threshold (mW)	57
	SAR testing required?	NO

Exposure Positions	Tune-up Maximum power of WLAN 5.2G	
	11.00dBm	11.59mW
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Left Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Top Side	Antenna to user(mm)	32
	SAR exclusion threshold (mW)	39
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.3G	
	10.50dBm	11.22mW
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Left Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	7
	SAR testing required?	YES
Top Side	Antenna to user(mm)	32
	SAR exclusion threshold (mW)	39
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.6G	
	10.50dBm	11.22mW
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Left Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Top Side	Antenna to user(mm)	32

	SAR exclusion threshold (mW)	39
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.8G	
	10.00dBm	10.00mW
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Left Side	Antenna to user(mm)	5
	SAR exclusion threshold (mW)	6
	SAR testing required?	YES
Top Side	Antenna to user(mm)	32
	SAR exclusion threshold (mW)	37
	SAR testing required?	NO

Positions for WLAN & Bluetooth SAR tests		
Test separation distances > 50 mm		
Exposure Positions	Tune-up Maximum power of WLAN 2.4G	
	13.00dBm	19.95mW
Right Side	Antenna to user(mm)	204
	SAR exclusion threshold (mW)	1636
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	89
	SAR exclusion threshold (mW)	486
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.2G	
	11.00dBm	12.59mW
Right Side	Antenna to user(mm)	204
	SAR exclusion threshold (mW)	1606
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	89
	SAR exclusion threshold (mW)	456
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.3G	
	10.50dBm	11.22mW
Right Side	Antenna to user(mm)	204
	SAR exclusion threshold (mW)	1605
	SAR testing required?	NO

Bottom Side	Antenna to user(mm)	89
	SAR exclusion threshold (mW)	455
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.6G	
	10.50dBm	11.22mW
Right Side	Antenna to user(mm)	204
	SAR exclusion threshold (mW)	1602
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	89
	SAR exclusion threshold (mW)	452
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.8G	
	10.00dBm	10.00mW
Right Side	Antenna to user(mm)	204
	SAR exclusion threshold (mW)	1602
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	89
	SAR exclusion threshold (mW)	452
	SAR testing required?	NO

9. Stand-alone SAR test exclusion

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)	Calculation Result	SAR exclusion threshold (mW)	SAR test exclusion
Bluetooth	9.00	7.943	5	2.480	2.502	3	Yes

NOTE: Standalone SAR test exclusion for Bluetooth.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}/x] \text{ W/kg}$ for test separation distances $\leq 50\text{mm}$, where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

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

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/Kg)
Bluetooth	Body	9.00	7.943	5	2.48	7.5	0.334
Bluetooth	Hotspot	9.00	7.943	5	2.48	7.5	0.334

NOTE: Estimated SAR calculation for Bluetooth

10. SAR Results

10.1. SAR measurement results

10.1.1. SAR measurement Result of WLAN 2.4G

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						
Front Side	6/2437	802.11b	1.173	0.497	-4.81	12.81	13.00	1.225	2026/4/10	
Back Side	6/2437	802.11b	0.098	0.039	-0.31	12.81	13.00	0.102	2026/4/10	
Left Side	6/2437	802.11b	1.071	0.436	3.23	12.81	13.00	1.119	2026/4/10	
Front Side	1/2412	802.11b	0.981	0.415	-0.67	12.58	13.00	1.081	2026/4/10	
Front Side	11/2462	802.11b	1.217	0.512	2.03	12.94	13.00	1.234	2026/4/10	5#
Front Side Repeated	1/2412	802.11b	0.974	0.397	-1.51	12.58	13.00	1.073	2026/4/10	
Front Side Repeated	6/2437	802.11b	1.217	0.512	2.03	12.81	13.00	1.271	2026/4/10	
Front Side Repeated	11/2462	802.11b	1.201	0.502	-4.81	12.94	13.00	1.218	2026/4/10	
Left Side	1/2412	802.11b	1.012	0.413	2.51	12.58	13.00	1.115	2026/4/10	
Left Side	11/2462	802.11b	1.054	0.428	1.63	12.94	13.00	1.069	2026/4/10	
Left Side Repeated	1/2412	802.11b	0.987	0.391	1.84	12.58	13.00	1.087	2026/4/10	
Left Side Repeated	6/2437	802.11b	0.994	0.415	2.95	12.81	13.00	1.038	2026/4/10	
Left Side Repeated	11/2462	802.11b	0.974	0.388	0.54	12.94	13.00	0.988	2026/4/10	

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

NOTE: 2. Tested by : Max Zhou

10.1.2. SAR measurement Result of WLAN 5.2G

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						
Front Side	40/5200	802.11a	1.057	0.324	2.22	10.44	11.00	1.202	2026/4/11	
Back Side	40/5200	802.11a	0.148	0.045	-3.28	10.44	11.00	0.168	2026/4/11	
Left Side	40/5200	802.11a	1.089	0.335	2.60	10.44	11.00	1.239	2026/4/11	
Front Side	36/5180	802.11a	1.198	0.385	1.44	10.67	11.00	1.293	2026/4/11	1#
Front Side	48/5240	802.11a	1.038	0.337	0.70	10.91	11.00	1.060	2026/4/11	
Front Side Repeated	36/5180	802.11a	1.193	0.374	1.54	10.67	11.00	1.287	2026/4/11	
Front Side Repeated	40/5200	802.11a	1.014	0.314	2.64	10.44	11.00	1.154	2026/4/11	
Front Side Repeated	48/5240	802.11a	0.997	0.318	1.87	10.91	11.00	1.018	2026/4/11	
Left Side	36/5180	802.11a	0.984	0.305	2.98	10.67	11.00	1.062	2026/4/11	
Left Side	48/5240	802.11a	0.998	0.319	1.71	10.91	11.00	1.019	2026/4/11	
Left Side Repeated	36/5180	802.11a	0.985	0.302	0.98	10.67	11.00	1.063	2026/4/11	
Left Side Repeated	40/5200	802.11a	1.052	0.327	2.11	10.44	11.00	1.197	2026/4/11	
Left Side Repeated	48/5240	802.11a	0.975	0.291	1.59	10.91	11.00	0.995	2026/4/11	

NOTE: Body SAR test results of WLAN 5.2G

10.1.3. SAR measurement Result of WLAN 5.3G

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						
Front Side	56/5280	802.11a	0.996	0.313	2.82	10.14	10.50	1.082	2026/4/12	2#
Back Side	56/5280	802.11a	0.120	0.037	2.41	10.14	10.50	0.130	2026/4/12	
Left Side	56/5280	802.11a	0.900	0.277	-0.26	10.14	10.50	0.978	2026/4/12	
Front Side	52/5260	802.11a	0.927	0.303	0.03	10.24	10.50	0.984	2026/4/12	
Front Side	64/5320	802.11a	0.808	0.263	4.65	10.31	10.50	0.844	2026/4/12	
Front Side Repeated	52/5260	802.11a	0.912	0.287	1.41	10.24	10.50	0.968	2026/4/12	
Front Side Repeated	56/5280	802.11a	0.889	0.261	2.14	10.14	10.50	0.966	2026/4/12	
Front Side Repeated	64/5320	802.11a	0.901	0.274	0.89	10.31	10.50	0.941	2026/4/12	
Left Side	52/5260	802.11a	0.841	0.227	-0.57	10.24	10.50	0.893	2026/4/12	
Left Side	64/5320	802.11a	0.867	0.252	-1.41	10.31	10.50	0.906	2026/4/12	
Left Side Repeated	52/5260	802.11a	0.831	0.212	-0.85	10.24	10.50	0.882	2026/4/12	
Left Side Repeated	56/5280	802.11a	0.889	0.264	-1.74	10.14	10.50	0.966	2026/4/12	
Left Side Repeated	64/5320	802.11a	0.859	0.232	-0.38	10.31	10.50	0.897	2026/4/12	

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

NOTE: 2. Tested by : Max Zhou, Jack Peng

10.1.4. SAR measurement Result of WLAN 5.6G

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						
Front Side	120/5600	802.11a	0.835	0.276	4.33	9.32	10.50	1.096	2026/4/13	
Back Side	120/5600	802.11a	0.106	0.035	1.97	9.32	10.50	0.139	2026/4/13	
Left Side	120/5600	802.11a	0.792	0.249	3.14	9.32	10.50	1.039	2026/4/13	
Front Side	100/5500	802.11a	1.239	0.401	2.28	10.39	10.50	1.271	2026/4/13	3#
Front Side	140/5700	802.11a	0.815	0.219	-0.01	9.11	10.50	1.122	2026/4/13	
Front Side Repeated	100/5500	802.11a	1.175	0.385	3.15	10.39	10.50	1.205	2026/4/13	
Front Side Repeated	120/5600	802.11a	0.821	0.259	1.87	9.32	10.50	1.077	2026/4/13	
Front Side Repeated	140/5700	802.11a	0.802	0.203	2.62	9.11	10.50	1.105	2026/4/13	
Left Side	100/5500	802.11a	0.765	0.221	1.74	10.39	10.50	0.785	2026/4/13	
Left Side	140/5700	802.11a	0.751	0.197	2.61	9.11	10.50	1.034	2026/4/13	
Left Side Repeated	100/5500	802.11a	0.758	0.202	2.54	10.39	10.50	0.777	2026/4/13	
Left Side Repeated	100/5500	802.11a	0.780	0.227	1.96	9.32	10.50	1.024	2026/4/13	
Left Side Repeated	140/5700	802.11a	0.742	0.193	1.77	9.11	10.50	1.022	2026/4/13	

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

NOTE: 2. Tested by : Tested by : Max Zhou, Jack Peng

10.1.5. SAR measurement Result of WLAN 5.8G

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						
Front Side	157/5785	802.11a	0.655	0.207	3.82	9.42	10.00	0.749	2026/4/09	4#
Back Side	157/5785	802.11a	0.085	0.026	-0.66	9.42	10.00	0.097	2026/4/09	
Left Side	157/5785	802.11a	0.621	0.193	3.32	9.42	10.00	0.710	2026/4/09	

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

NOTE: 2. Tested by : Max Zhou

10.2. Simultaneous Transmission Analysis

This device has only one antenna. Bluetooth, 2.4G Wi-Fi and 5G Wi-Fi cannot transmit simultaneously.

11. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

12. Appendix B. System Check Plots

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MEASUREMENT 1 System Performance Check - 2450MHz
MEASUREMENT 2 System Performance Check - 5200MHz
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MEASUREMENT 5 System Performance Check - 5600MHz
MEASUREMENT 6 System Performance Check - 5800MHz

1# System check at 2450 MHz
Date of measurement: 10/4/2026

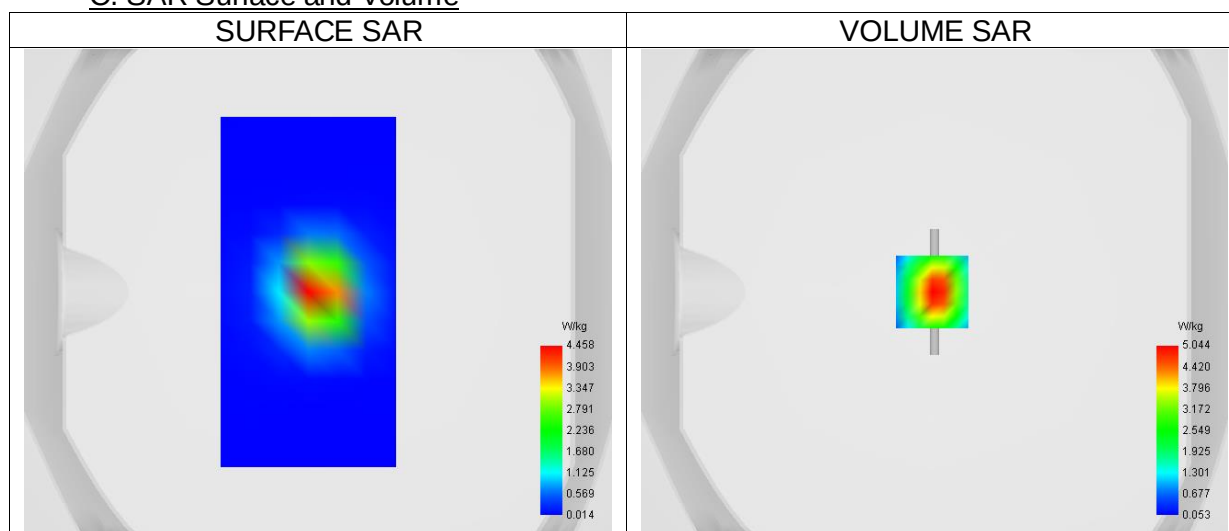
A. Experimental conditions.

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)	40.80
Relative permittivity (imaginary part)	13.43
Conductivity (S/m)	1.83

C. SAR Surface and Volume



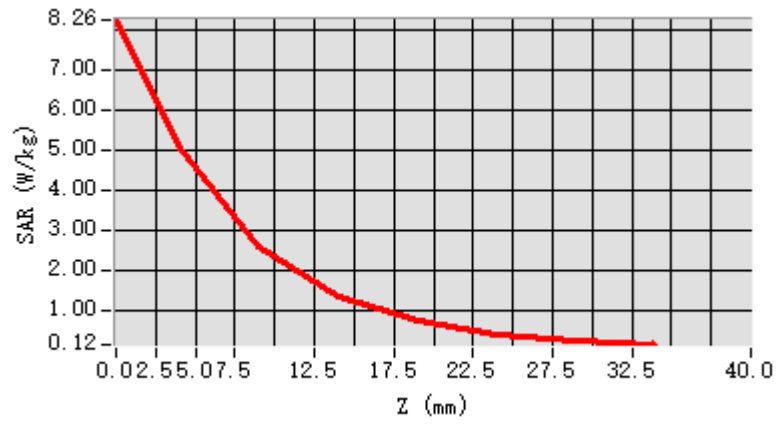
Maximum location: X=-1.00, Y=0.00 ; SAR Peak: 8.30 W/kg

D. SAR 1g & 10g

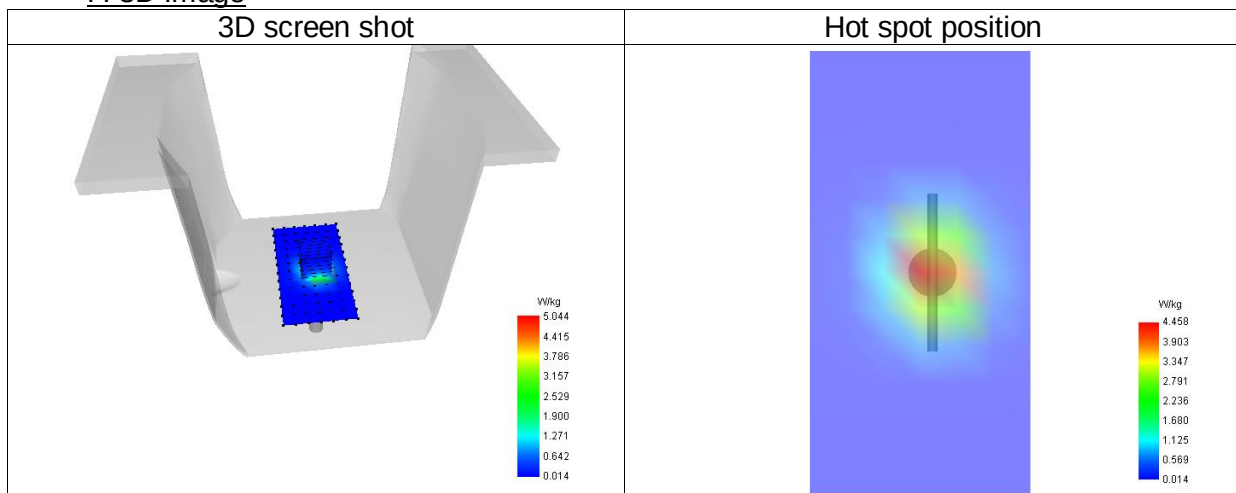
SAR 10g (W/Kg)	2.228
SAR 1g (W/Kg)	4.768
Variation (%)	0.07
Horizontal validation criteria: minimum distance (mm)	10.00
Vertical validation criteria: SAR ratio M2/M1 (%)	51.66

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.259	5.044	2.605	1.341	0.708	0.385	0.210



F. 3D Image



2# System check at 5200 MHz
Date of measurement: 11/4/2026

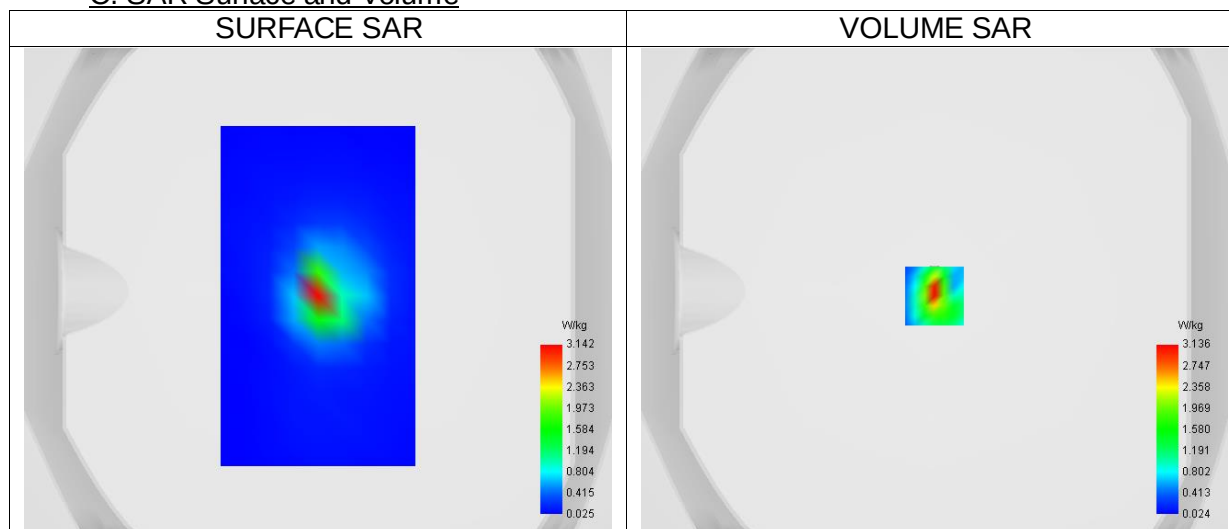
A. Experimental conditions.

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	CW5200
Signal	CW
Channels/Frequency	Middle

B. Permittivity

Middle TX Frequency (MHz)	5200.00
Relative permittivity (real part)	36.02
Relative permittivity (imaginary part)	16.44
Conductivity (S/m)	4.75

C. SAR Surface and Volume



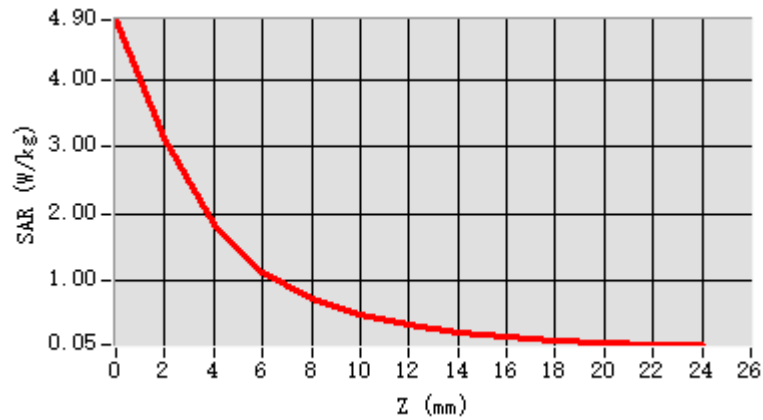
Maximum location: X=0.00, Y=-2.00 ; SAR Peak: 5.27 W/kg

D. SAR 1g & 10g

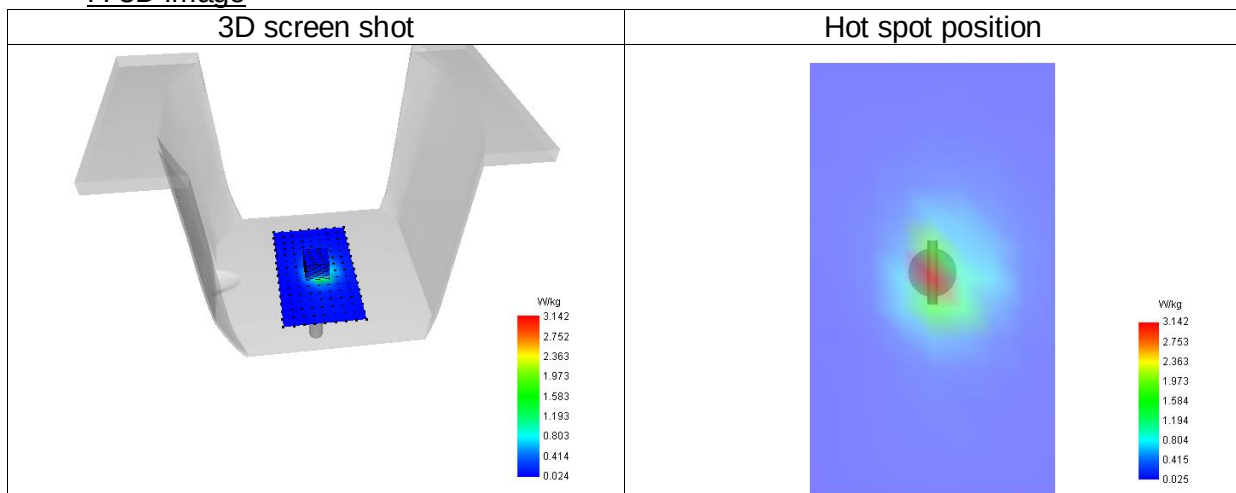
SAR 10g (W/Kg)	0.551
SAR 1g (W/Kg)	1.633
Variation (%)	0.26
Horizontal validation criteria: minimum distance (mm)	8.00
Vertical validation criteria: SAR ratio M2/M1 (%)	59.24

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	22.0
SAR (W/Kg)	4.90	3.13	1.85	1.13	0.72	0.48	0.33	0.22	0.15	0.10	0.08	0.06
	4	6	8	7	3	3	2	9	5	8	0	1



F. 3D Image



3# System check at 5400 MHz
Date of measurement: 12/4/2026

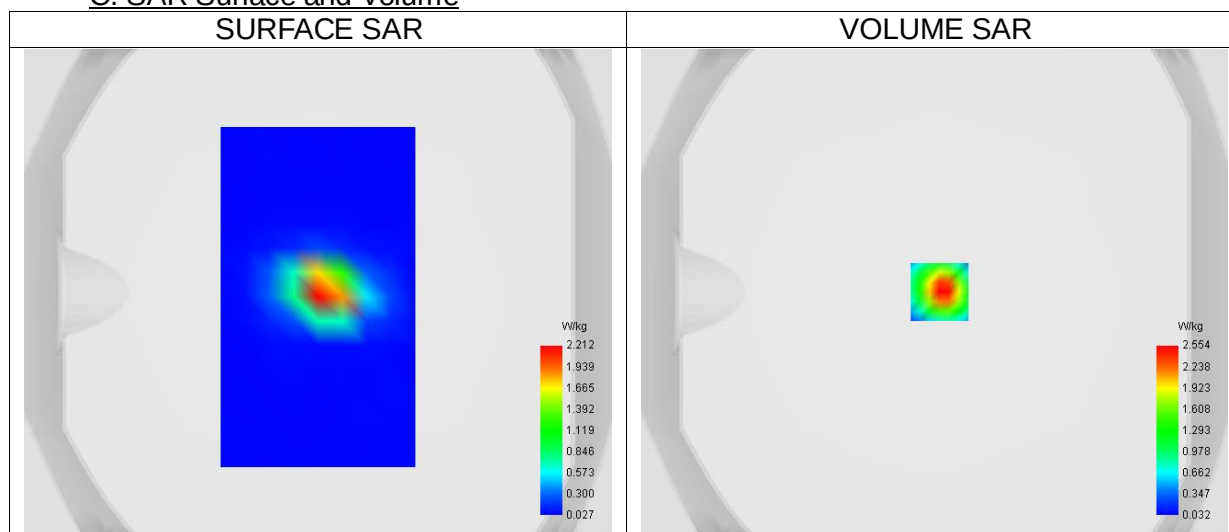
A. Experimental conditions.

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)	35.71
Relative permittivity (imaginary part)	16.37
Conductivity (S/m)	4.91

C. SAR Surface and Volume



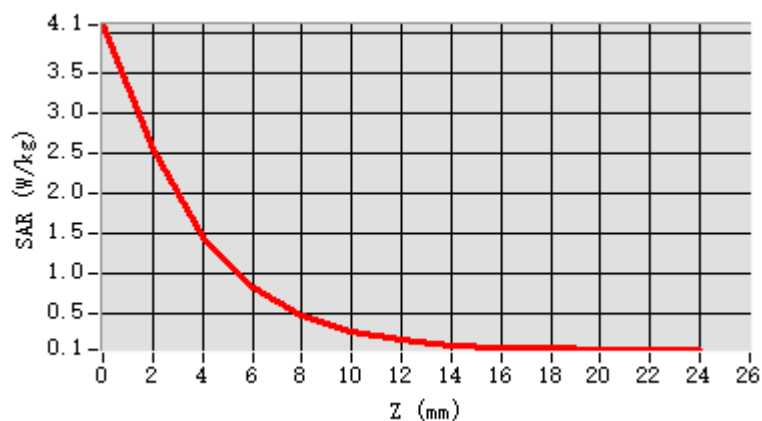
Maximum location: X=2.00, Y=0.00 ; SAR Peak: 4.32 W/kg

D. SAR 1g & 10g

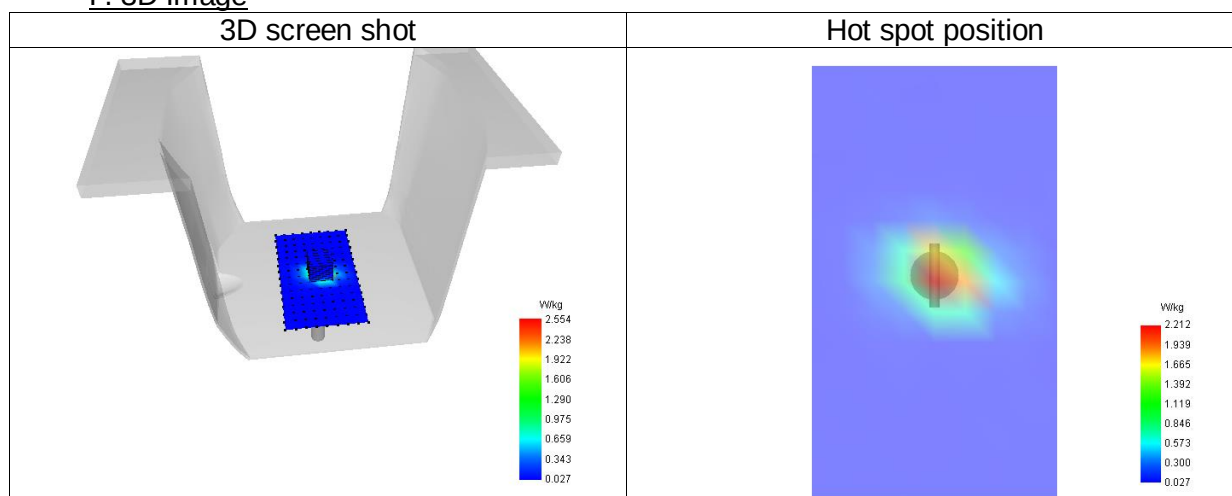
SAR 10g (W/Kg)	0.531
SAR 1g (W/Kg)	1.513
Variation (%)	0.49
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	56.28

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)	4.09	2.55	1.43	0.83	0.47	0.28	0.17	0.11	0.07	0.06	0.05	0.05
	1	4	7	1	4	4	3	0	5	7	6	4



F. 3D Image



4# System check at 5600 MHz
Date of measurement: 13/4/2026

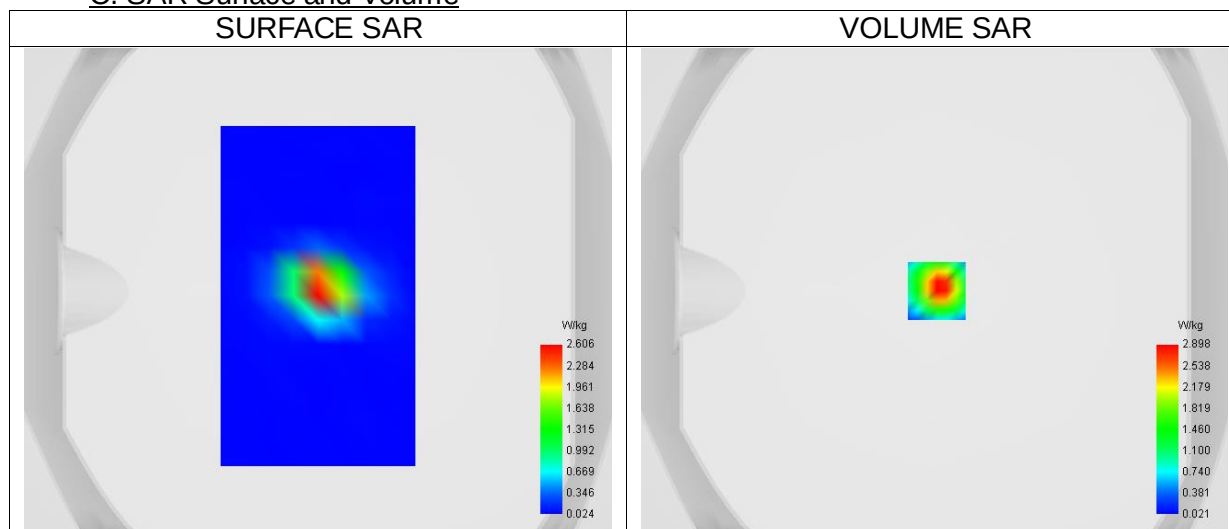
A. Experimental conditions.

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)	36.03
Relative permittivity (imaginary part)	16.64
Conductivity (S/m)	5.18

C. SAR Surface and Volume



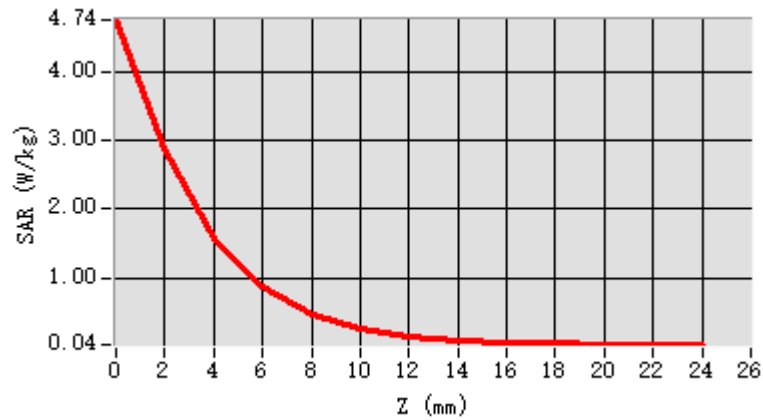
Maximum location: X=1.00, Y=0.00 ; SAR Peak: 5.08 W/kg

D. SAR 1g & 10g

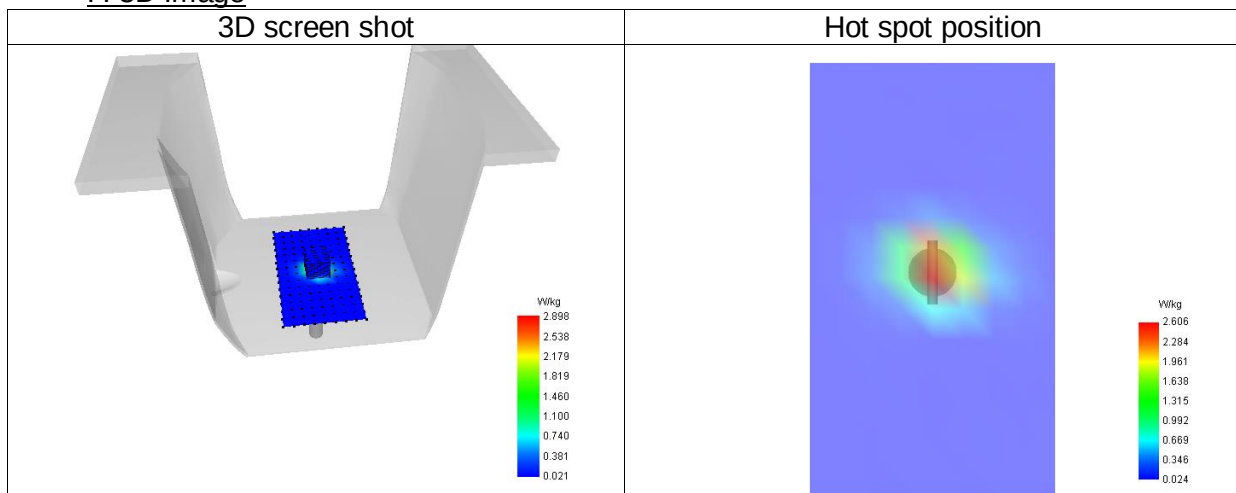
SAR 10g (W/Kg)	0.583
SAR 1g (W/Kg)	1.715
Variation (%)	-0.52
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	54.59

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
SAR (W/Kg)	4.74	2.89	1.58	0.87	0.47	0.27	0.16	0.09	0.07	0.05	0.04	0.03
	3	8	2	0	8	3	3	6	2	4	9	6



F. 3D Image



5# System check at 5800 MHz
Date of measurement: 09/4/2026

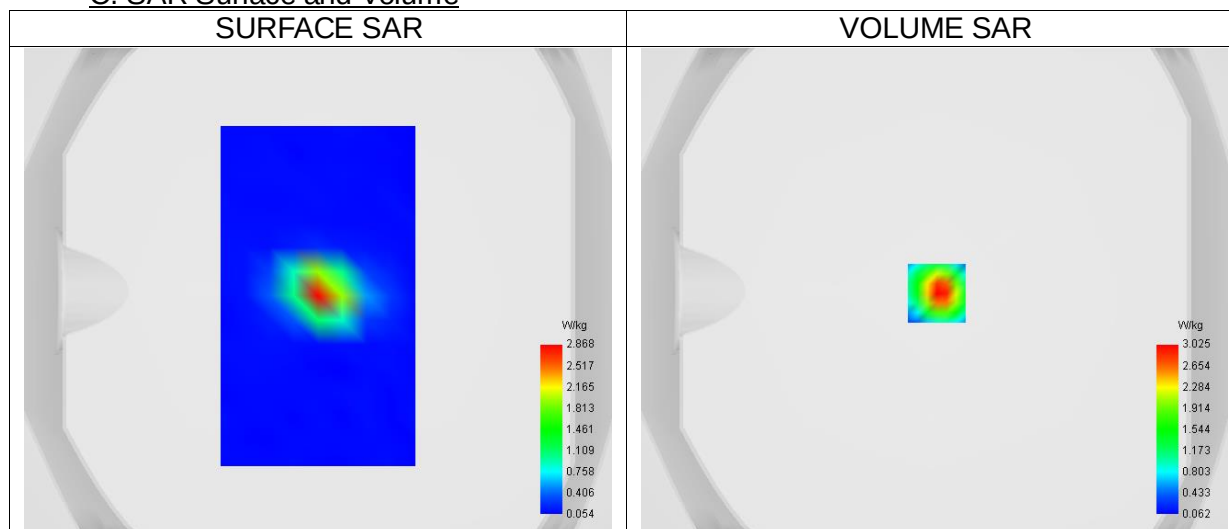
A. Experimental conditions.

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	Dipole
Band	CW5800
Signal	CW
Channels/Frequency	Middle

B. Permittivity

Middle TX Frequency (MHz)	5800.00
Relative permittivity (real part)	36.74
Relative permittivity (imaginary part)	15.82
Conductivity (S/m)	5.10

C. SAR Surface and Volume



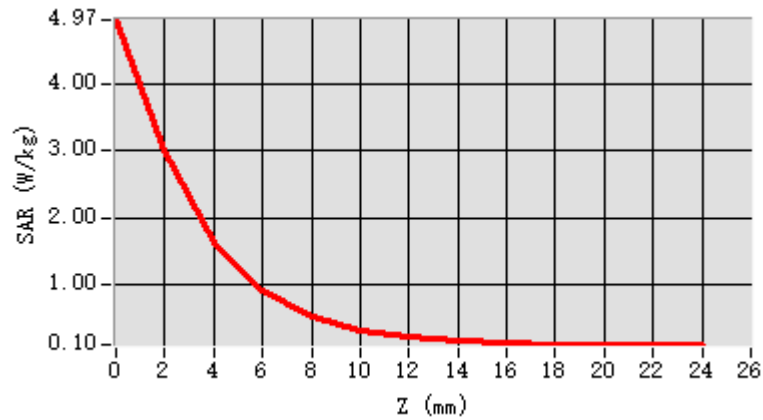
Maximum location: X=1.00, Y=-1.00 ; SAR Peak: 5.21 W/kg

D. SAR 1g & 10g

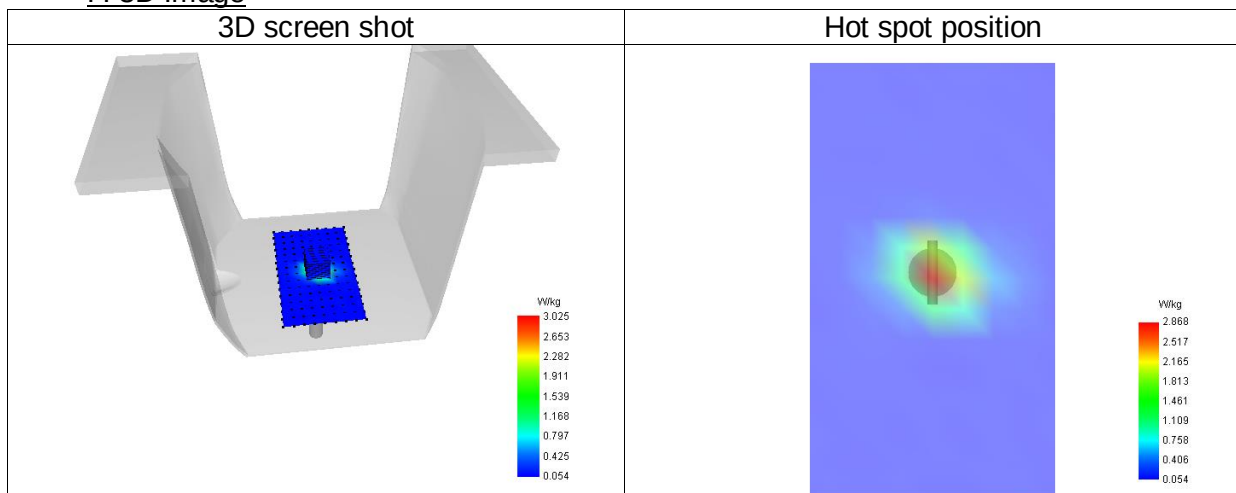
SAR 10g (W/Kg)	0.630
SAR 1g (W/Kg)	1.779
Variation (%)	-0.46
Horizontal validation criteria: minimum distance (mm)	8.00
Vertical validation criteria: SAR ratio M2/M1 (%)	54.25

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
SAR (W/Kg)	4.96	3.02	1.64	0.90	0.51	0.31	0.22	0.14	0.11	0.10	0.10	0.10
	8	5	1	7	9	5	9	9	6	3	0	0



F. 3D Image



13. Appendix C. SAR Measurement Plots

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

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

Date of measurement: 11/4/2026

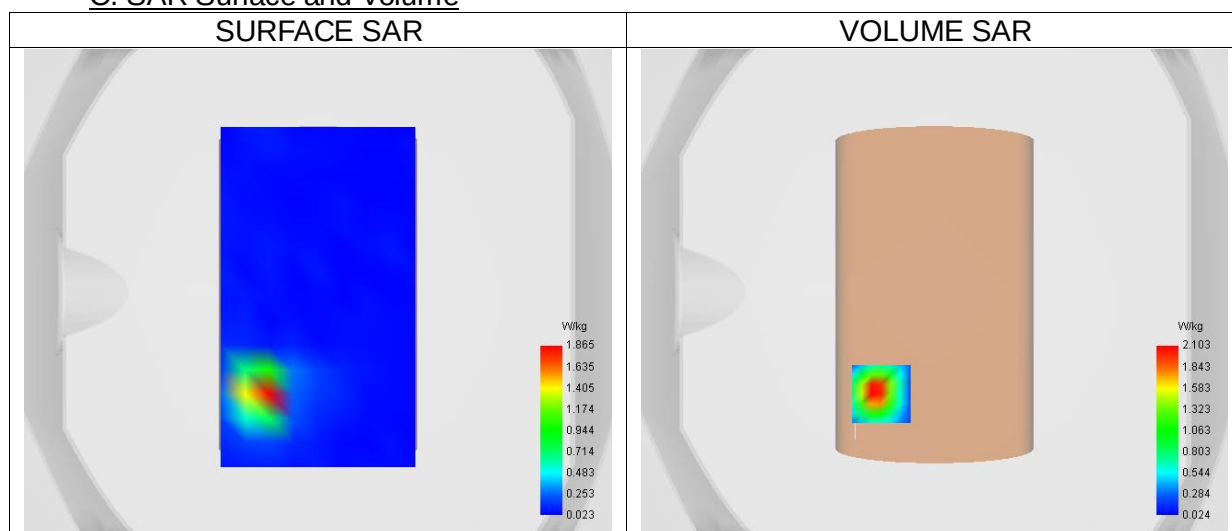
A. Experimental conditions.

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	Lower (36)/ frequency 5180.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5180.00
Relative permittivity (real part)	36.09
Relative permittivity (imaginary part)	16.45
Conductivity (S/m)	4.73

C. SAR Surface and Volume



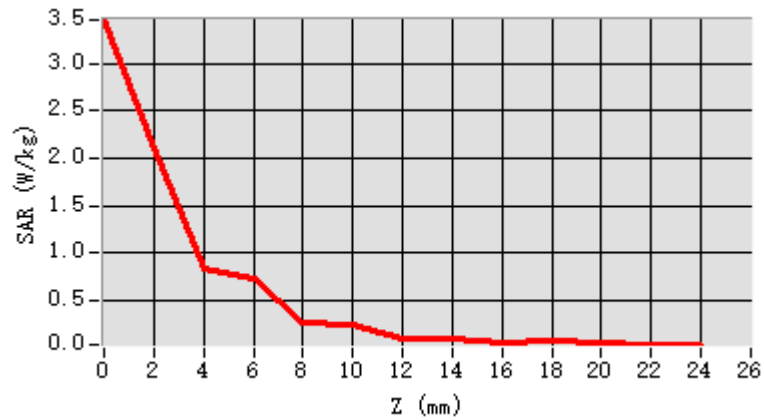
Maximum location: X=-22.00, Y=-42.00 ; SAR Peak: 3.50 W/kg

D. SAR 1g & 10g

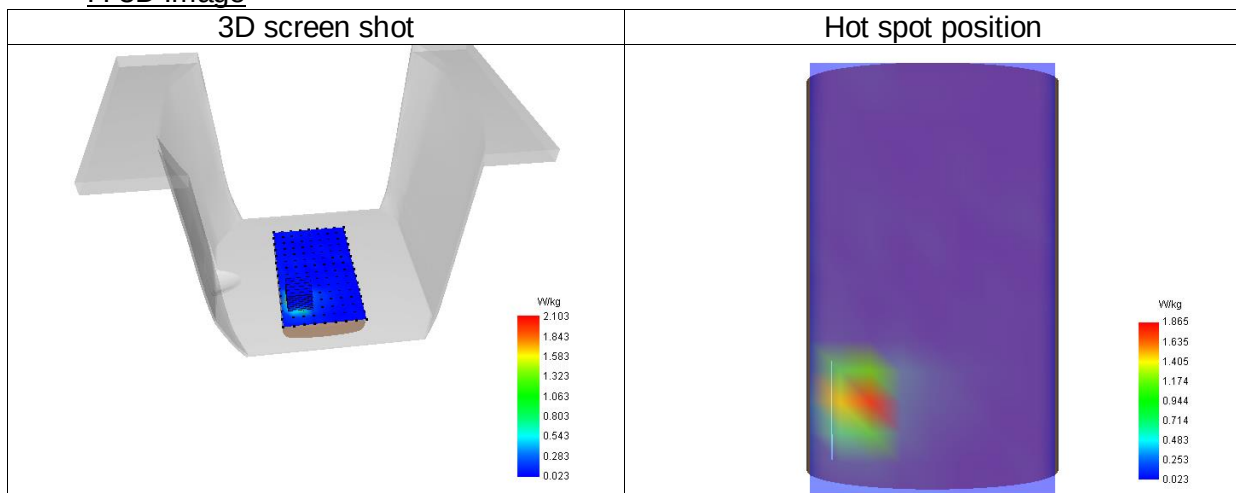
SAR 10g (W/Kg)	0.385
SAR 1g (W/Kg)	1.198
Variation (%)	1.44
Horizontal validation criteria: minimum distance (mm)	8.00
Vertical validation criteria: SAR ratio M2/M1 (%)	59.24

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	22.0
SAR (W/Kg)	3.46	2.10	0.83	0.73	0.26	0.24	0.11	0.10	0.05	0.07	0.05	0.03
	2	3	7	8	9	6	0	5	7	5	8	7



F. 3D Image



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

Date of measurement: 12/4/2026

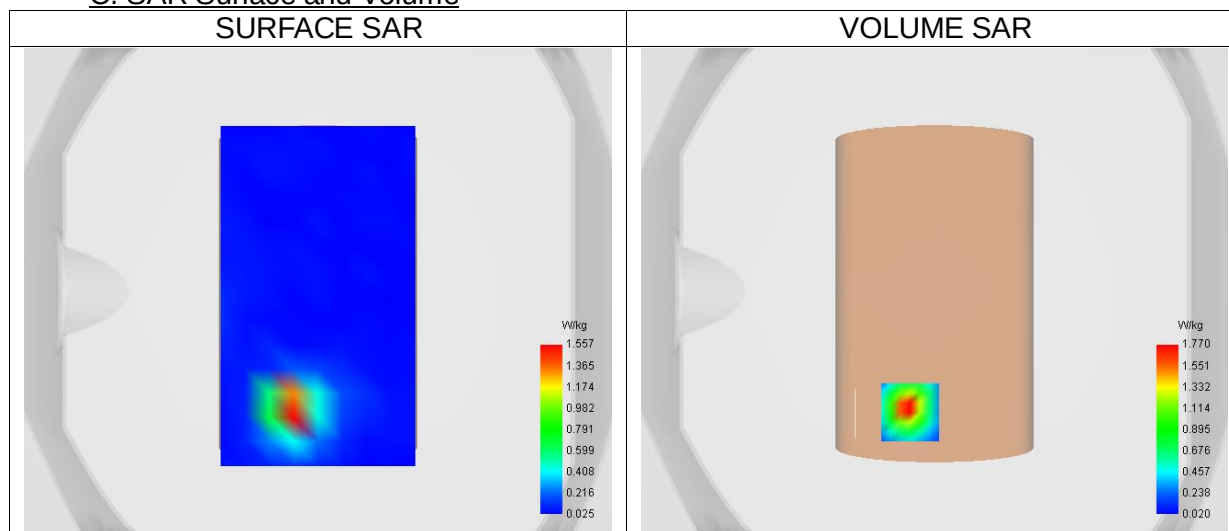
A. Experimental conditions.

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)	36.06
Relative permittivity (imaginary part)	16.12
Conductivity (S/m)	4.73

C. SAR Surface and Volume



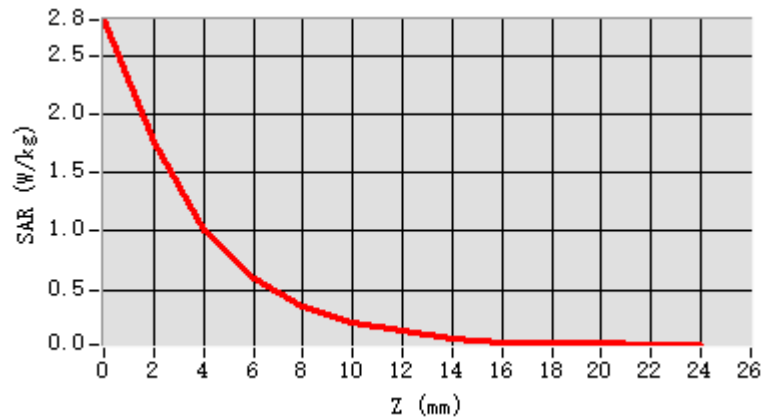
Maximum location: X=-10.00, Y=-50.00 ; SAR Peak: 3.11 W/kg

D. SAR 1g & 10g

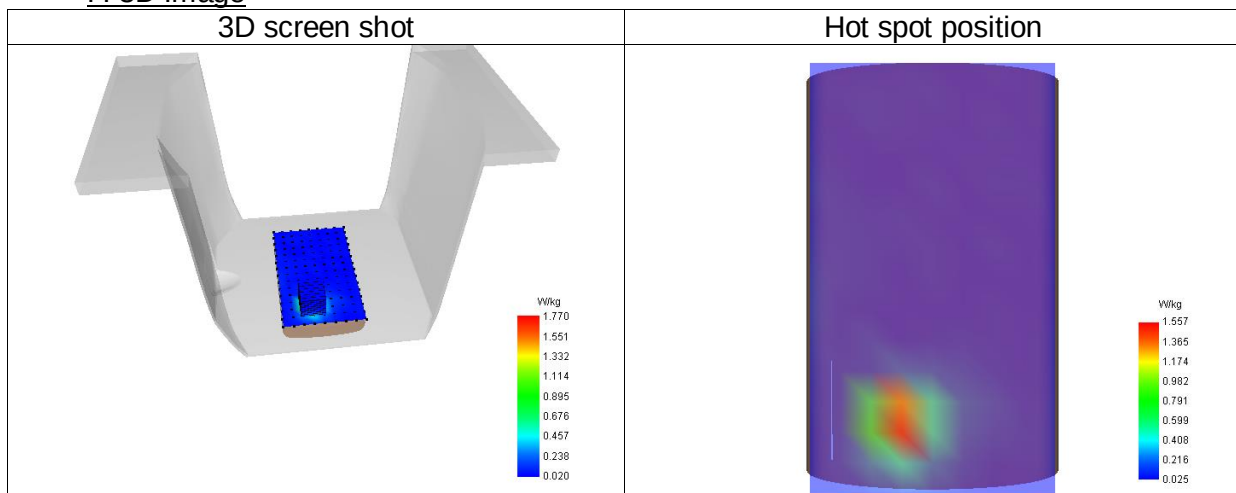
SAR 10g (W/Kg)	0.313
SAR 1g (W/Kg)	0.996
Variation (%)	2.82
Horizontal validation criteria: minimum distance (mm)	8.00
Vertical validation criteria: SAR ratio M2/M1 (%)	57.17

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
SAR (W/Kg)	2.81	1.77	1.01	0.59	0.35	0.21	0.13	0.08	0.04	0.04	0.03	0.02
	5	0	0	0	0	1	9	4	6	7	8	7



F. 3D Image



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

Date of measurement: 13/4/2026

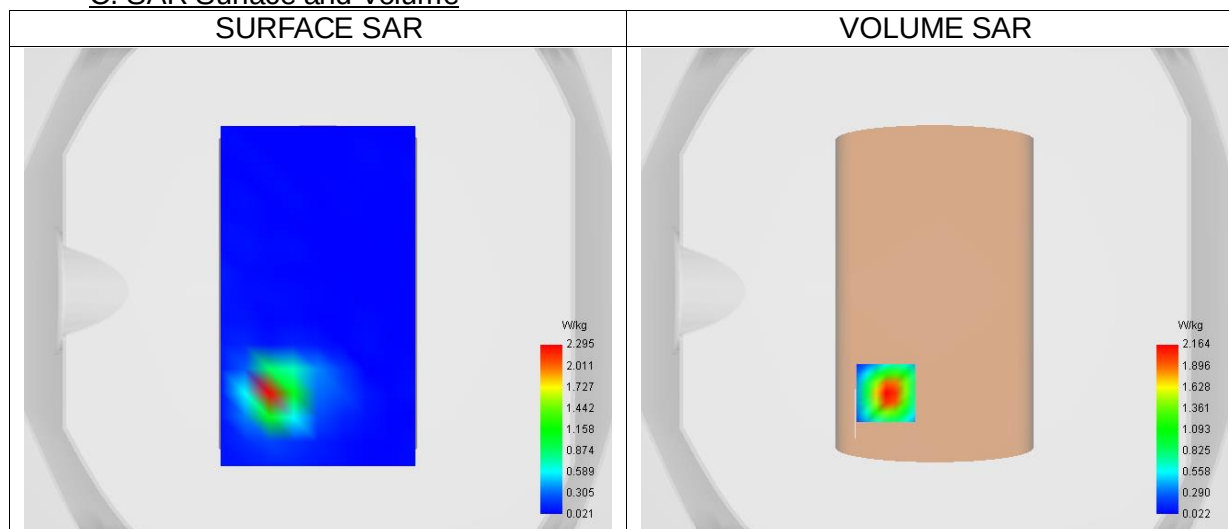
A. Experimental conditions.

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	Lower (100)/ frequency 5500.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	5500.00
Relative permittivity (real part)	36.33
Relative permittivity (imaginary part)	16.56
Conductivity (S/m)	5.06

C. SAR Surface and Volume



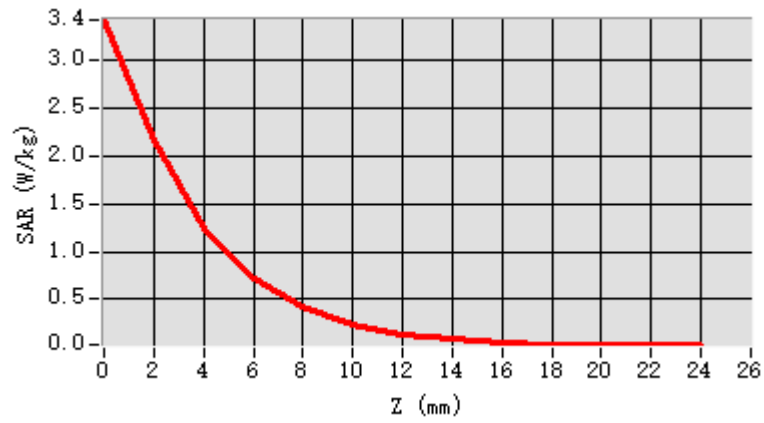
Maximum location: X=-20.00, Y=-42.00 ; SAR Peak: 3.51 W/kg

D. SAR 1g & 10g

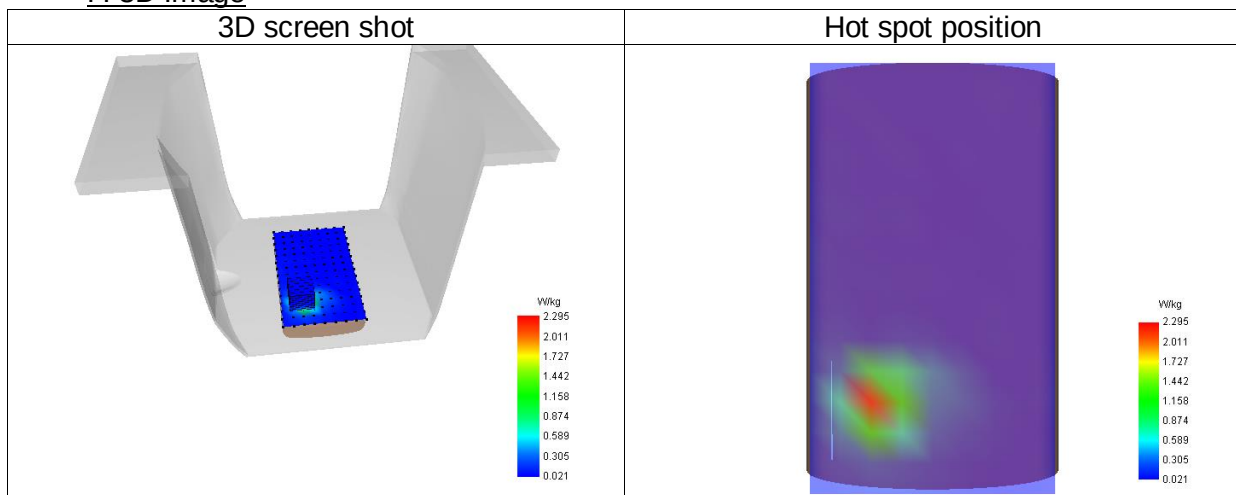
SAR 10g (W/Kg)	0.401
SAR 1g (W/Kg)	1.239
Variation (%)	2.28
Horizontal validation criteria: minimum distance (mm)	8.00
Vertical validation criteria: SAR ratio M2/M1 (%)	57.66

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
SAR (W/Kg)	3.42	2.16	1.24	0.72	0.42	0.23	0.13	0.08	0.05	0.03	0.02	0.03
	8	4	8	3	2	3	9	2	8	4	7	7



F. 3D Image



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

Date of measurement: 09/4/2026

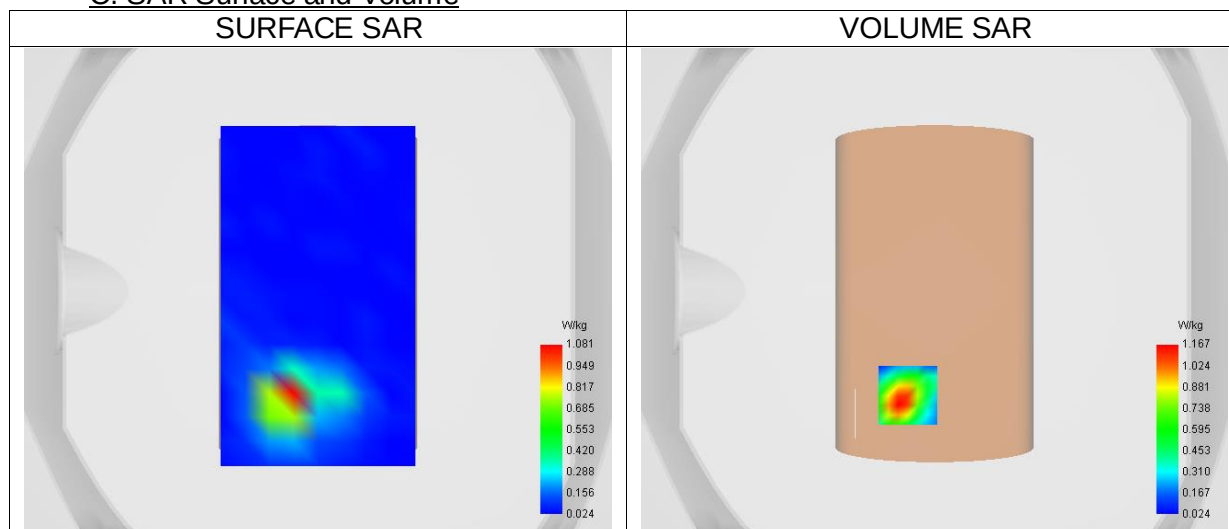
A. Experimental conditions.

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)	36.82
Relative permittivity (imaginary part)	15.69
Conductivity (S/m)	5.04

C. SAR Surface and Volume



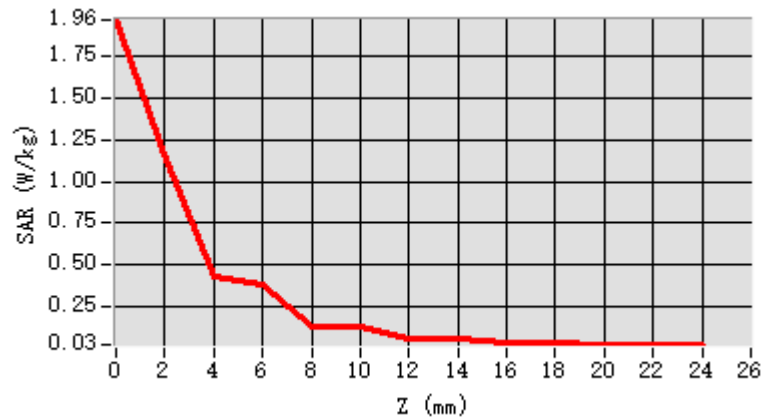
Maximum location: X=-11.00, Y=-43.00 ; SAR Peak: 1.90 W/kg

D. SAR 1g & 10g

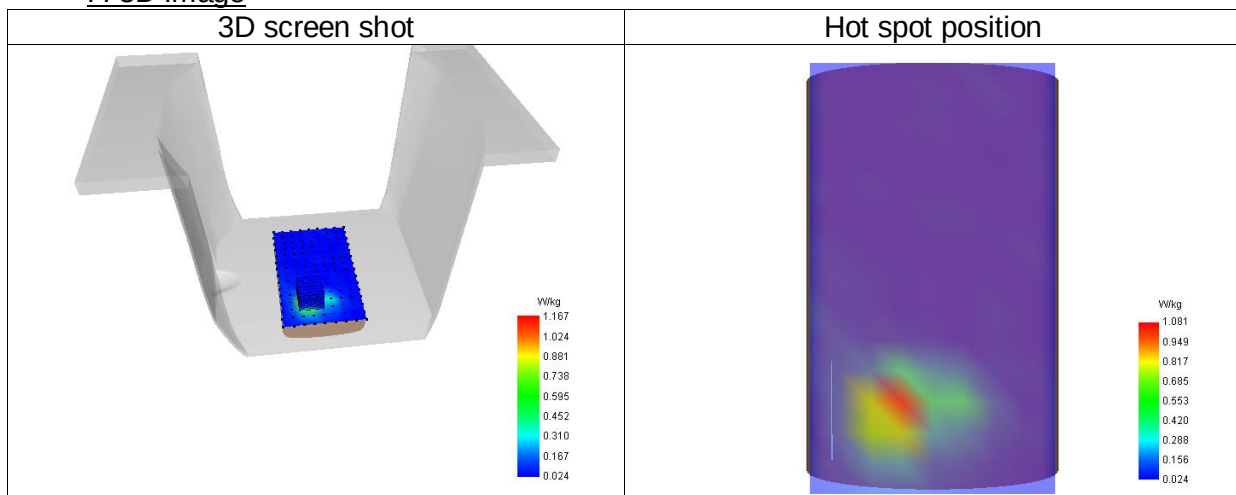
SAR 10g (W/Kg)	0.207
SAR 1g (W/Kg)	0.655
Variation (%)	3.82
Horizontal validation criteria: minimum distance (mm)	8.94
Vertical validation criteria: SAR ratio M2/M1 (%)	56.91

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
SAR (W/Kg)	1.96 3	1.16 7	0.43 5	0.38 1	0.13 3	0.13 8	0.06 1	0.05 8	0.03 8	0.03 7	0.02 9	0.02 8



F. 3D Image



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

Date of measurement: 10/4/2026

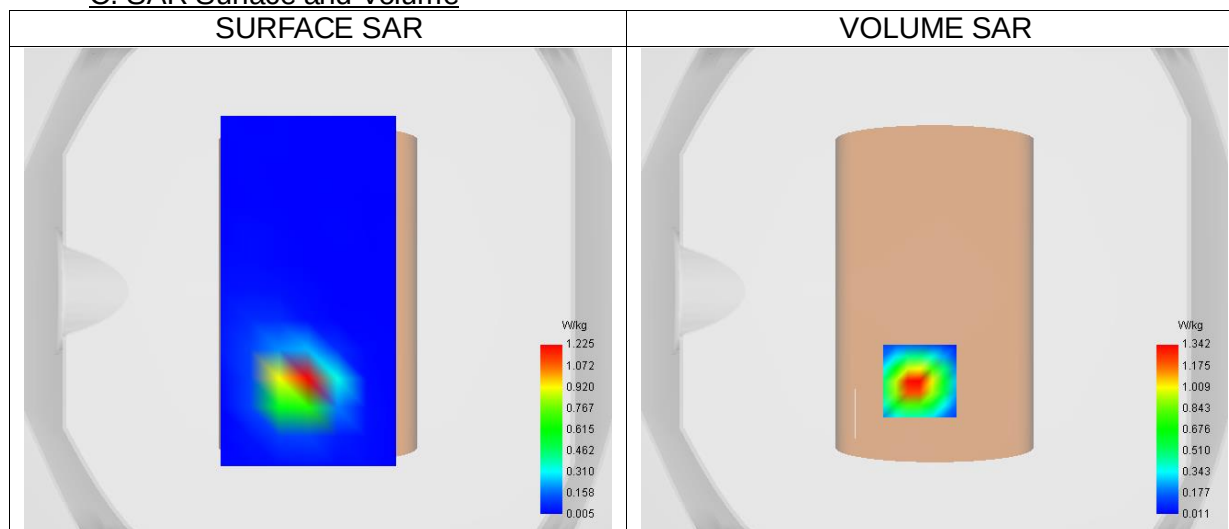
A. Experimental conditions.

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	Higher (11)/ frequency 2462.00 Mhz

B. Permittivity

Middle TX Frequency (MHz)	2462.00
Relative permittivity (real part)	40.78
Relative permittivity (imaginary part)	13.49
Conductivity (S/m)	1.84

C. SAR Surface and Volume



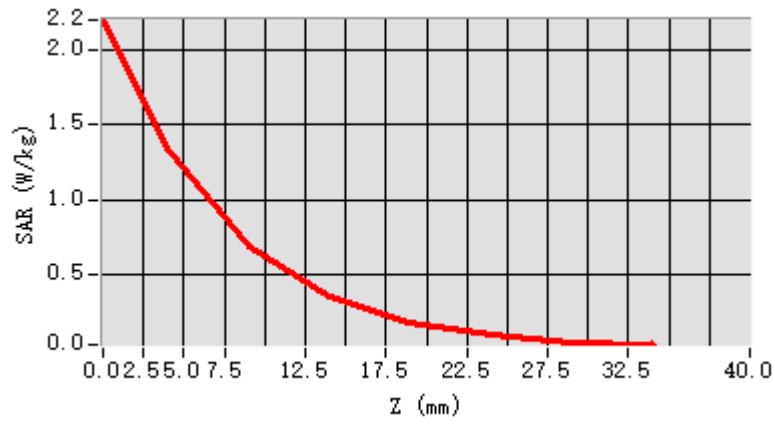
Maximum location: X=-6.00, Y=-37.00 ; SAR Peak: 2.29 W/kg

D. SAR 1g & 10g

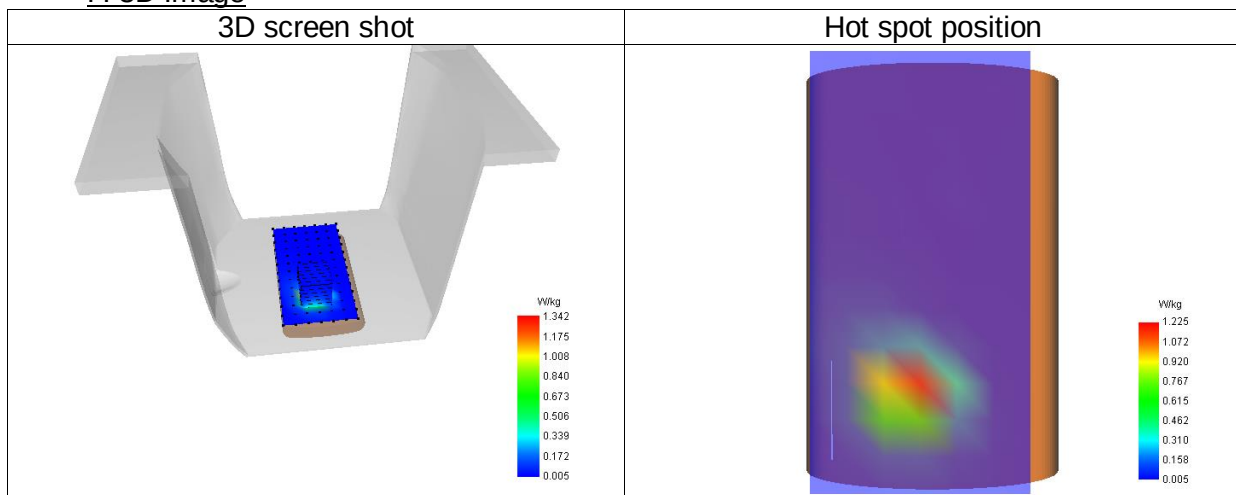
SAR 10g (W/Kg)	0.512
SAR 1g (W/Kg)	1.217
Variation (%)	2.03
Horizontal validation criteria: minimum distance (mm)	10.00
Vertical validation criteria: SAR ratio M2/M1 (%)	51.18

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	2.199	1.342	0.687	0.355	0.178	0.095	0.051



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 2B88547AD1743* ...

	<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 0.01 W/kg to 100 W/kg.

3.3 ISOTROPY

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

3.4 BOUNDARY EFFECT

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

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

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

where

$SAR_{uncertainty}$ is the uncertainty in percent of the probe boundary effect

d_{be} is the distance between the surface and the closest *zoom-scan* measurement point, in millimetre

Δ_{step} is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible

δ is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx 14$ mm at 3 GHz;

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.

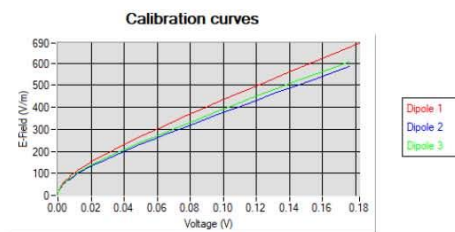
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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.

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

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

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

where

σ =the conductivity of the liquid

ρ =the volumetric density of the liquid

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

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

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

where

c =the specific heat for the liquid

dT/dt =the temperature rises over the time

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

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

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where

a=the larger cross-sectional of the waveguide

b=the smaller cross-sectional of the waveguide

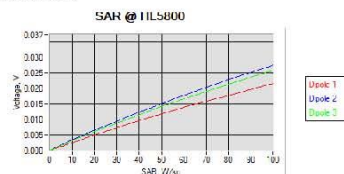
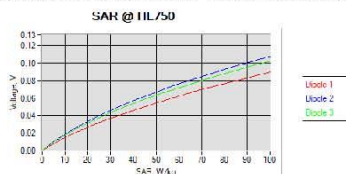
δ =the skin depth for the liquid in the waveguide

Pw=the power delivered to the liquid

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

Liquid	Frequency (MHz*)	ConvF
HL750	750	1.39
HL850	850	1.32
HL900	900	1.33
HL1800	1800	1.50
HL1900	1900	1.58
HL2000	2000	1.63
HL2300	2300	1.64
HL2450	2450	1.63
HL2600	2600	1.52
HL3300	3300	1.36
HL3500	3500	1.39
HL3700	3700	1.35
HL3900	3900	1.41
HL4200	4200	1.58
HL4600	4600	1.61
HL4900	4900	1.38
HL5200	5200	1.37
HL5400	5400	1.37
HL5600	5600	1.36
HL5800	5800	1.35

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



6 VERIFICATION RESULTS

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

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