

FCC SAR EVALUATION REPORT

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

Product Name: PoC Network Radio

Model: TD-M15

Serial Model: TD-G500, TD-G16, TD-G17, TD-G18, TD-G19,
TD-G20, TD-G21, TD-M15 plus, Tp-M15pro

Brand Name: TIDRADIO

Report No.: AiTSZ-250922091FW1-M1

FCC ID: 2A4FBTD-M15

Prepared for

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TEST RESULT CERTIFICATION

Applicant's name: Guangzhou TID Electronic Technology Co.,Ltd
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Product description

Product name: PoC Network Radio
Trademark: TIDRADIO
Model and/or type reference ..: TD-M15
Serial Model.....: TD-G500, TD-G16, TD-G17, TD-G18, TD-G19, TD-G20, TD-G21,
TD-M15 plus, Tp-M15pro
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 Guangdong Asia Hongke Test Technology Limited. 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: AiTSZ-250922091-1

Date of Test

Date (s) of performance of tests: Sep. 22, 2025 ~ Sep. 25, 2025

Date of Issue.....: Oct. 09, 2025

Test Result: **Pass**

Reviewed by: Ken Zou
Ken Zou

Approved by: Jack Li
Jack Li



※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Oct. 09, 2025	Jack Li
Rev.2.0	This derived SAR test report is based on the original master report [Master Report No. AiTSZ-250922091FW1]. The original report is invalidated. All technical test data remains unchanged from the original report.	Oct. 09, 2025	Jack Li

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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
HEAD AND 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 as follows.

Band	Max SAR Value Reported(W/kg)		
	1-g Head (Separation distance of 0mm)	1-g Body&Hotspot (Separation distance of 5mm)	Max SAR Summation
LTE band 2	0.493	0.669	N/A
LTE band 4	0.666	0.584	
LTE band 5	0.221	0.414	
LTE band 7	0.335	0.496	
LTE band 66	0.517	0.685	

NOTE: The Max SAR Summation is calculated based on the same configuration and test position.

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 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	PoC Network Radio		
Model Name	TD-M15		
Family Model	TD-G500, TD-G16, TD-G17, TD-G18, TD-G19, TD-G20, TD-G21, TD-M15 plus, Tp-M15pro		
Model Difference	All the model are the same circuit and RF module, except the model names.		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna Type	PIFA Antenna		
Power rating:	MODEL:RSF-DY101A-0501000EUU INPUT:100-240V-50/60Hz 0.2A OUTPUT:5.0V-1.0A 5.0W		
Hardware version	M15_08		
Software version	V1.0		
Device Operating Configurations			
Supporting Mode(s)	LTEBand2/4/5/7/66, Bluetooth		
Test Modulation	LTE(QPSK/16QAM) , Bluetooth(GFSK)		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	LTE Band 2	1850-1910	1930-1990
	LTE Band 4	1710-1755	2110-2155
	LTE Band 5	824-849	869-894
	LTE Band 7	2500-2570	2620-2690
	LTE Band 66	1710-1780	2110-2200
	Bluetooth	2402-2480	
Power Class	3, tested with power control all Max.(LTE Band 2)		
	3, tested with power control all Max.(LTE Band 4)		
	3, tested with power control all Max.(LTE Band 5)		
	3, tested with power control all Max.(LTE Band 7)		
	3, tested with power control all Max.(LTE Band 66)		

1.4. Test specification(s)

FCC 47 CFR Part 2(2.1093)
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
KDB 941225 D05 SAR for LTE Devices v02r05
KDB 941225 D06 Hotspot SAR v02r01
KDB 648474 D04 Handset SAR v01r03

1.5. Ambient Condition

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

1.6. Test Facility

Test Laboratory:

Guangdong Asia Hongke Test Technology Limited

B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

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

FCC-Registration No.: 251906 Designation Number: CN1376

Guangdong Asia Hongke Test Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 31737 CAB identifier: CN0165

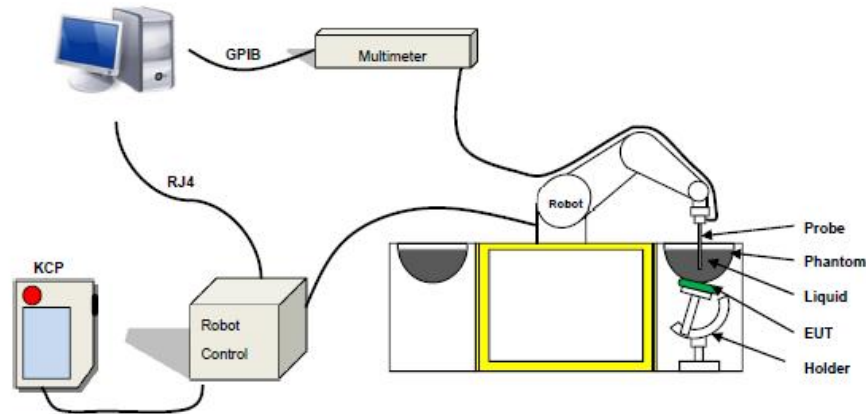
The 3m Semi-anechoic chamber of Guangdong Asia Hongke Test Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 31737

A2LA-Lab Cert. No.: 7133.01

Guangdong Asia Hongke Test Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

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. 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 EPGO 0523-403 with following specifications is used.



- Probe Length: 330 mm
- Length of Individual Dipoles: 2 mm
- Maximum external diameter: 8 mm
- Probe Tip External Diameter: 2.5 mm
- Distance between dipole/probe extremity: 1 mm
- Dynamic range: 0.01-100 W/kg
- Probe linearity: 3%
- Axial Isotropy: < 0.10 dB
- Spherical Isotropy: < 0.10 dB
- Calibration range: 150 MHz to 6 GHz for head & body simulating liquid.
- 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 $\pm 0.25\text{dB}$. 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. Phantoms

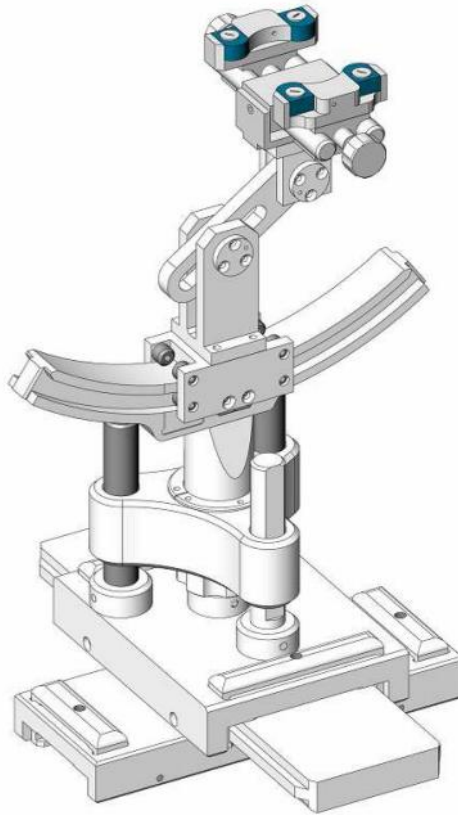
For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.



SAM

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

2.6. Device Holder



The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

2.7. 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	EPGO 0523-403	Sep. 09, 2025	Sep. 08, 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 DI P 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. 21, 2024	Feb. 20, 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	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
☒	KEITHLEY	Millivoltmeter	2000	4072790	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026

☒	R&S	Wideband radio communication tester	CMW500	116581	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	HP	Network Analyzer	8753D	3410J01136	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	PSG Analog Signal Generator	E8257D	MY51110112	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	Power meter	E4419B	MY45102538	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	Power meter	E4419B	MY45102140	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	Power meter	E4419B	MY45102215	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	JFW	attenuator	50FPE-006	4360846-494-4	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025

					Jun. 30, 2025	Jun. 29, 2026
☒	JFW	attenuator	50FPE-006	4360846-492-1	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	JFW	attenuator	50FPE-006	4360846-490-6	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	Power sensor	E9301A	MY41495644	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	Agilent	Power sensor	E9301A	US39212148	Jul. 02, 2023	Jul. 01, 2024
					Jul. 01, 2024	Jun. 30, 2025
					Jun. 30, 2025	Jun. 29, 2026
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Jul. 18, 2021	Jul. 17, 2024
					Jul. 17, 2024	Jul. 16, 2027
☒	N/A	Thermometer	N/A	LES-085	Sep. 23, 2024	Sep. 22, 2027
☒	MVG	SAR Phantom	SSM2	SN 24/11 SAM87	NCR	NCR
☒	MVG	Device Holder	SMPPD	SN 24/11 MSH73	NCR	NCR

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 Wi-Fi/BT power measurement, use engineering software to configure EUT Wi-Fi/BT 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 Wi-Fi/BT output power.

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT Wi-Fi/BT 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{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: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: 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
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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 used to determine 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 for 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 defined 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)	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

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



4.1.1. Tissue Dielectric Parameter Check Results

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

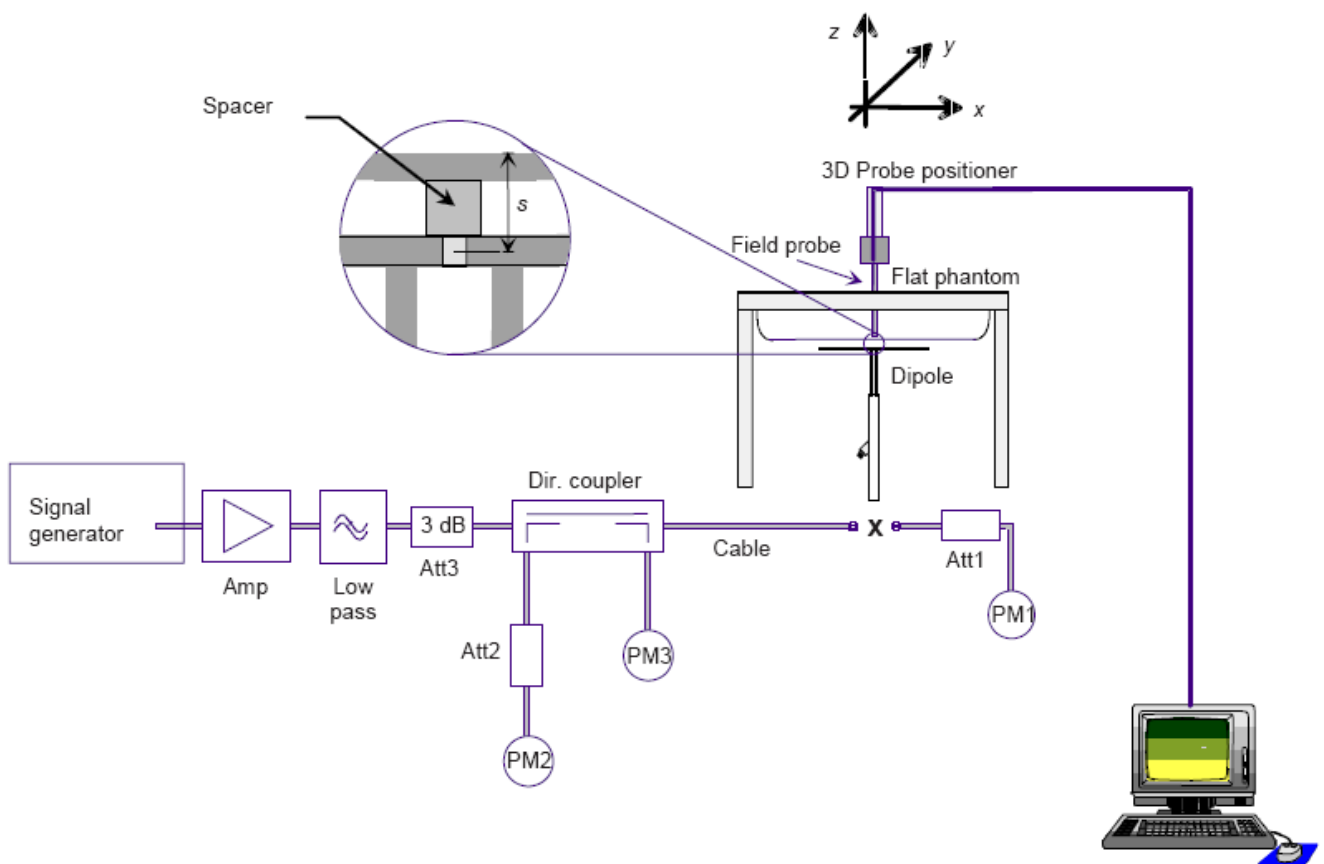
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		$\epsilon_r (\pm 5\%)$	$\sigma \text{ (S/m)} (\pm 5\%)$	ϵ_r	$\sigma \text{ (S/m)}$		
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	42.01	0.94	21.0 °C	Sep. 22, 2025
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	39.61	1.41	21.3 °C	Sep. 23, 2025
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	41.42	1.39	21.4 °C	Sep. 24, 2025
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	39.43	1.99	21.1 °C	Sep. 25, 2025

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

4.2. System Verification Procedure

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

The system verification is shown as below picture:



4.2.1. System Verification Results

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

System Verification	Power fed to reference dipole (mW)	Measured SAR Value		Measured SAR (Normalized to 1W)		Target SAR Value (1W)		Deviation (%)		Test Date
		1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)	
835MHz	100	1.011	0.612	10.11	6.12	9.40	6.28	7.55%	-2.55%	Sep. 22, 2025
1800MHz	100	3.832	2.025	38.32	20.25	37.06	20.01	3.40%	1.20%	Sep. 23, 2025
1900MHz	100	4.154	2.153	41.54	21.53	39.69	20.92	4.66%	2.92%	Sep. 24, 2025
2600MHz	100	5.433	2.523	54.33	25.23	54.16	24.85	0.31%	1.53%	Sep. 25, 2025

5. 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 .

6. 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.

7. RF Exposure Positions

7.1. Ear and handset reference point

Figure 7.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M”, the left ear reference point (ERP) is marked “LE”, and the right ERP is marked “RE”.



Fig 7.1.1 Front, back, and side views of SAM phantom

7.2. Definition of the cheek position

1. Define two imaginary lines on the handset, the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width w_t of the handset at the level of the acoustic output (point A in Figure 7.2.1 and Figure 7.2.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
2. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
3. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP
4. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
5. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
6. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line

passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 7.2.3. The actual rotation angles should be documented in the test report.

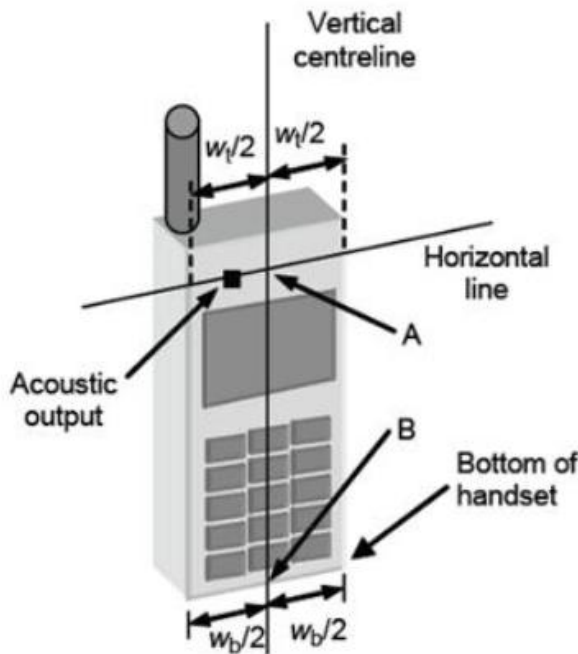


Fig 7.2.1 Handset vertical and horizontal reference lines—fixed case

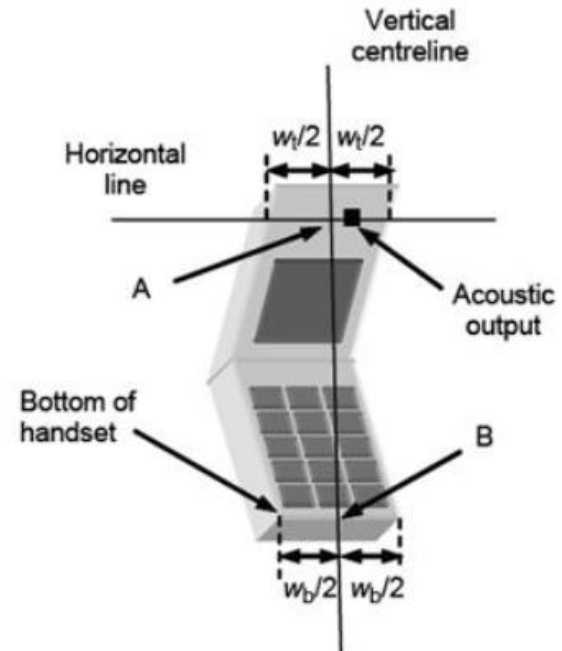


Fig 7.2.2 Handset vertical and horizontal reference lines—“clam-shell case”

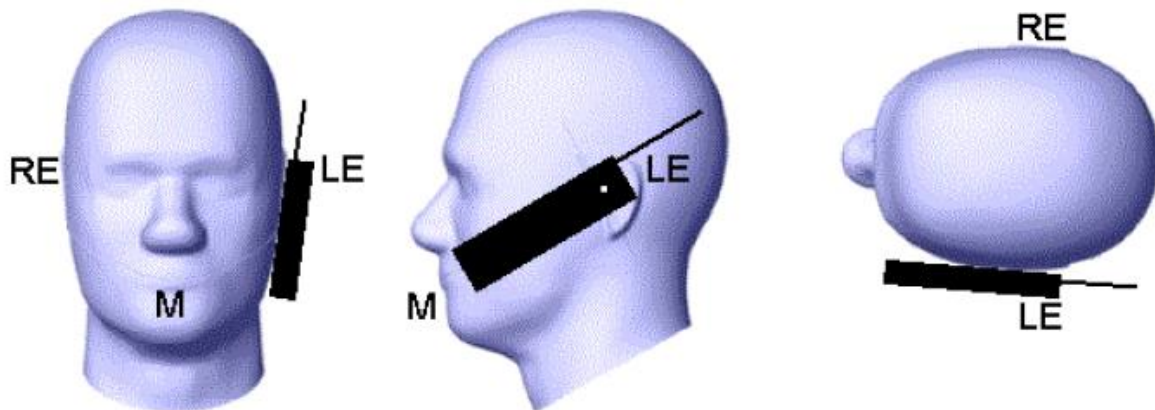


Fig 7.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

7.3. Definition of the tilt position

1. While maintaining the orientation of the handset, retract the handset parallel to the reference plane far enough away from the phantom to enable a rotation of the device by 15 degree.
2. Rotate the Handset around the horizontal line by 15 degree (see Figure 7.3.1).
3. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, e.g., the antenna with the back of the phantom head, the angle of the handset shall be reduced. In this case, the tilt position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is in contact with the phantom, e.g., the antenna with the back of the head.



Figure 7.3.1 – Tilt position of the wireless device on the left side of SAM

7.4. Body Worn Accessory

1. Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 7.4.1). Per KDB 648474 D04, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is $< 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.
2. Accessories for body-worn operation configurations are divided into two categories: those that do

not contain metallic components and those that do contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

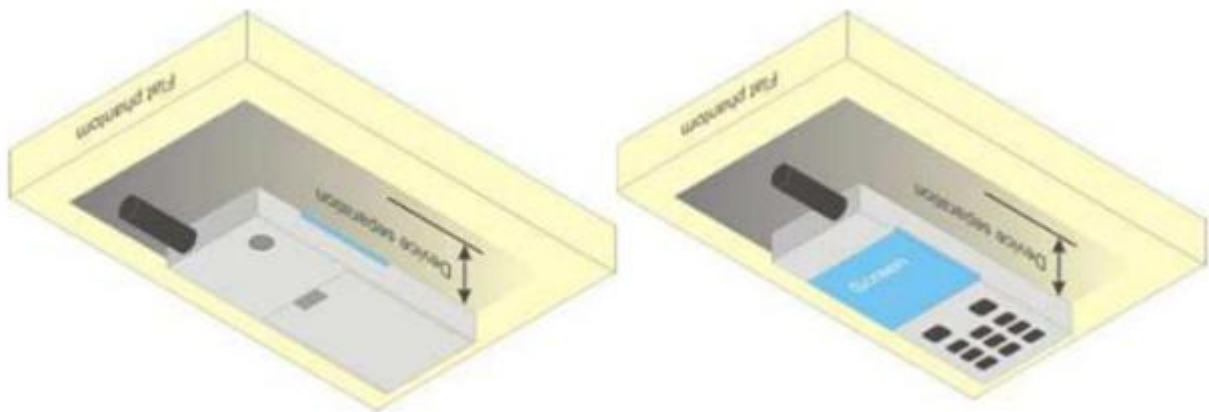


Figure 7.4.1 – Test positions for body-worn devices

7.5. Wireless Router Devices

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WLAN simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WLAN transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WLAN transmitter according to FCC KDB Publication 447498 D01 publication procedures. The —Portable Hotspot|| feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

8. RF Output Power

8.1. LTE Conducted Power

- The following tests were conducted according to the test requirements outlines in 3GPP TS 36.521-1 specification. A summary of these configurations are illustrated below:

Test Parameters for Channel Bandwidths				
Downlink Configuration		Uplink Configuration		
Ch BW	N/A for Max UE output power testing	Mod'n	RB allocation	
			FDD	TDD
1.4MHz		QPSK	1	1
1.4MHz		QPSK	5	5
3MHz		QPSK	1	1
3MHz		QPSK	4	4
5MHz		QPSK	1	1
5MHz		QPSK	8	8
10MHz		QPSK	1	1
10MHz		QPSK	12	12
15MHz		QPSK	1	1
15MHz		QPSK	16	16
20MHz		QPSK	1	1
20MHz		QPSK	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.				
Note 2: For E-UTRA bands not applied with Note 2 in Table 6.2.2.3-1:				
- The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.				
- The RBstart of non-1RB allocation shall be RB #0 for low and mid range, RB# (max +1 - RB allocation) for high range test frequency.				
Note 3: For E-UTRA bands applied with Note 2 in Table 6.2.2.3-1:				
- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.				
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.				
- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then only one frequency range shall be tested and the 1 RB allocation shall be tested at RB #0, RB # $\left\lceil N_{RB}^{UL} / 2 \right\rceil$ and RB #max.				
- For non-1RB allocation, test frequency is middle range, and the RBstart shall be RB #0.				

2. LTE Conducted Power Results

LTE output list

Band	Bandwidth (MHz)	Channel	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	Tune-up (dBm)
2	1.4	19193	1909.3	QPSK	1@0	23.12	24.00
2	1.4	19193	1909.3	QPSK	1@2	23.15	24.00
2	1.4	19193	1909.3	QPSK	1@5	22.54	23.00
2	1.4	19193	1909.3	QPSK	3@0	23.26	24.00
2	1.4	19193	1909.3	QPSK	3@1	21.54	22.00
2	1.4	19193	1909.3	QPSK	3@2	23.17	24.00
2	1.4	19193	1909.3	QPSK	6@0	23.01	24.00
2	1.4	19193	1909.3	16QAM	1@0	22.13	23.00
2	1.4	19193	1909.3	16QAM	1@2	22.58	23.00
2	1.4	19193	1909.3	16QAM	1@5	22.23	23.00
2	1.4	19193	1909.3	16QAM	3@0	22.1	23.00
2	1.4	19193	1909.3	16QAM	3@1	22.02	23.00
2	1.4	19193	1909.3	16QAM	3@2	21.85	22.00
2	1.4	19193	1909.3	16QAM	6@0	21.02	22.00
2	1.4	19193	1909.3	64QAM	6@0	24.34	25.00
2	1.4	18900	1880	QPSK	1@0	22.37	23.00
2	1.4	18900	1880	QPSK	1@2	21.54	22.00
2	1.4	18900	1880	QPSK	1@5	21.78	22.00
2	1.4	18900	1880	QPSK	3@0	23.41	24.00
2	1.4	18900	1880	QPSK	3@1	22.45	23.00
2	1.4	18900	1880	QPSK	3@2	23.41	24.00
2	1.4	18900	1880	QPSK	6@0	21.44	22.00
2	1.4	18900	1880	16QAM	1@0	21.19	22.00
2	1.4	18900	1880	16QAM	1@2	21.51	22.00
2	1.4	18900	1880	16QAM	1@5	21.33	22.00
2	1.4	18900	1880	16QAM	3@0	21.39	22.00
2	1.4	18900	1880	16QAM	3@1	22.47	23.00
2	1.4	18900	1880	16QAM	3@2	21.53	22.00
2	1.4	18900	1880	16QAM	6@0	24.05	25.00
2	1.4	18900	1880	64QAM	6@0	24.04	25.00
2	1.4	18607	1850.7	QPSK	1@0	23.61	24.00
2	1.4	18607	1850.7	QPSK	1@2	23.76	24.00
2	1.4	18607	1850.7	QPSK	1@5	23.48	24.00
2	1.4	18607	1850.7	QPSK	3@0	24.38	25.00
2	1.4	18607	1850.7	QPSK	3@1	23.51	24.00
2	1.4	18607	1850.7	QPSK	3@2	23.74	24.00
2	1.4	18607	1850.7	QPSK	6@0	22.68	23.00
2	1.4	18607	1850.7	16QAM	1@0	23.59	24.00
2	1.4	18607	1850.7	16QAM	1@2	22.73	23.00
2	1.4	18607	1850.7	16QAM	1@5	20.74	21.00
2	1.4	18607	1850.7	16QAM	3@0	22.79	23.00
2	1.4	18607	1850.7	16QAM	3@1	24.83	25.00
2	1.4	18607	1850.7	16QAM	3@2	22.71	23.00
2	1.4	18607	1850.7	16QAM	6@0	22.55	23.00

2	1.4	18607	1850.7	64QAM	6@0	22.51	23.00
2	3	19185	1908.5	QPSK	1@0	23.45	24.00
2	3	19185	1908.5	QPSK	1@7	22.92	23.00
2	3	19185	1908.5	QPSK	1@14	24.06	25.00
2	3	19185	1908.5	QPSK	8@0	22	22.00
2	3	19185	1908.5	QPSK	8@4	21.34	22.00
2	3	19185	1908.5	QPSK	8@7	21.86	22.00
2	3	19185	1908.5	QPSK	15@0	21.37	22.00
2	3	19185	1908.5	16QAM	1@0	23.01	24.00
2	3	19185	1908.5	16QAM	1@7	21.63	22.00
2	3	19185	1908.5	16QAM	1@14	21.85	22.00
2	3	19185	1908.5	16QAM	8@0	21.15	22.00
2	3	19185	1908.5	16QAM	8@4	21.63	22.00
2	3	19185	1908.5	16QAM	8@7	21.37	22.00
2	3	19185	1908.5	16QAM	15@0	21.45	22.00
2	3	19185	1908.5	64QAM	15@0	24.62	25.00
2	3	18900	1880	QPSK	1@0	22.11	23.00
2	3	18900	1880	QPSK	1@7	22.36	23.00
2	3	18900	1880	QPSK	1@14	21.62	22.00
2	3	18900	1880	QPSK	8@0	21.28	22.00
2	3	18900	1880	QPSK	8@4	21.81	22.00
2	3	18900	1880	QPSK	8@7	21.39	22.00
2	3	18900	1880	QPSK	15@0	21.82	22.00
2	3	18900	1880	16QAM	1@0	21.7	22.00
2	3	18900	1880	16QAM	1@7	21.29	22.00
2	3	18900	1880	16QAM	1@14	21.41	22.00
2	3	18900	1880	16QAM	8@0	21.12	22.00
2	3	18900	1880	16QAM	8@4	20.34	21.00
2	3	18900	1880	16QAM	8@7	21.19	22.00
2	3	18900	1880	16QAM	15@0	20.47	21.00
2	3	18900	1880	64QAM	15@0	20.55	21.00
2	3	18615	1851.5	QPSK	1@0	24.79	25.00
2	3	18615	1851.5	QPSK	1@7	23.5	24.00
2	3	18615	1851.5	QPSK	1@14	21.2	22.00
2	3	18615	1851.5	QPSK	8@0	22.72	23.00
2	3	18615	1851.5	QPSK	8@4	20.92	21.00
2	3	18615	1851.5	QPSK	8@7	22.51	23.00
2	3	18615	1851.5	QPSK	15@0	23.24	24.00
2	3	18615	1851.5	16QAM	1@0	22.86	23.00
2	3	18615	1851.5	16QAM	1@7	23.56	24.00
2	3	18615	1851.5	16QAM	1@14	22.85	23.00
2	3	18615	1851.5	16QAM	8@0	22.64	23.00
2	3	18615	1851.5	16QAM	8@4	21.65	22.00
2	3	18615	1851.5	16QAM	8@7	20.23	21.00
2	3	18615	1851.5	16QAM	15@0	21.45	22.00
2	3	18615	1851.5	64QAM	15@0	21.98	22.00
2	5	19175	1907.5	QPSK	1@0	22.72	23.00
2	5	19175	1907.5	QPSK	1@12	23.43	24.00
2	5	19175	1907.5	QPSK	1@24	23.14	24.00
2	5	19175	1907.5	QPSK	12@0	22.9	23.00

2	5	19175	1907.5	QPSK	12@6	22.12	23.00
2	5	19175	1907.5	QPSK	12@1 1	20.46	21.00
2	5	19175	1907.5	QPSK	25@0	22.35	23.00
2	5	19175	1907.5	16QAM	1@0	21.24	22.00
2	5	19175	1907.5	16QAM	1@12	22.17	23.00
2	5	19175	1907.5	16QAM	1@24	21.02	22.00
2	5	19175	1907.5	16QAM	12@0	21.11	22.00
2	5	19175	1907.5	16QAM	12@6	22.27	23.00
2	5	19175	1907.5	16QAM	12@1 1	21.07	22.00
2	5	19175	1907.5	16QAM	25@0	22.5	23.00
2	5	19175	1907.5	64QAM	25@0	21.34	22.00
2	5	18900	1880	QPSK	1@0	22.01	23.00
2	5	18900	1880	QPSK	1@12	23.44	24.00
2	5	18900	1880	QPSK	1@24	22.6	23.00
2	5	18900	1880	QPSK	12@0	21.34	22.00
2	5	18900	1880	QPSK	12@6	21.24	22.00
2	5	18900	1880	QPSK	12@1 1	22.35	23.00
2	5	18900	1880	QPSK	25@0	21.32	22.00
2	5	18900	1880	16QAM	1@0	22.29	23.00
2	5	18900	1880	16QAM	1@12	21.57	22.00
2	5	18900	1880	16QAM	1@24	24.98	25.00
2	5	18900	1880	16QAM	12@0	20.34	21.00
2	5	18900	1880	16QAM	12@6	23.93	24.00
2	5	18900	1880	16QAM	12@1 1	20.32	21.00
2	5	18900	1880	16QAM	25@0	21.86	22.00
2	5	18900	1880	64QAM	25@0	22.45	23.00
2	5	18625	1852.5	QPSK	1@0	23.81	24.00
2	5	18625	1852.5	QPSK	1@12	21.47	22.00
2	5	18625	1852.5	QPSK	1@24	22.96	23.00
2	5	18625	1852.5	QPSK	12@0	23.61	24.00
2	5	18625	1852.5	QPSK	12@6	22.65	23.00
2	5	18625	1852.5	QPSK	12@1 1	21.89	22.00
2	5	18625	1852.5	QPSK	25@0	22.46	23.00
2	5	18625	1852.5	16QAM	1@0	23.97	24.00
2	5	18625	1852.5	16QAM	1@12	22.84	23.00
2	5	18625	1852.5	16QAM	1@24	21.51	22.00
2	5	18625	1852.5	16QAM	12@0	21.6	22.00
2	5	18625	1852.5	16QAM	12@6	22.56	23.00
2	5	18625	1852.5	16QAM	12@1 1	21.52	22.00
2	5	18625	1852.5	16QAM	25@0	23.94	24.00
2	5	18625	1852.5	64QAM	25@0	24.72	25.00

Band	Bandwidth (MHz)	Channel	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	Tune- up (dBm)
4	1.4	20393	1754.3	QPSK	1@0	24.52	25.00
4	1.4	20393	1754.3	QPSK	1@2	22.04	23.00
4	1.4	20393	1754.3	QPSK	1@5	22.81	23.00

4	1.4	20393	1754.3	QPSK	3@0	22.12	23.00
4	1.4	20393	1754.3	QPSK	3@1	22.9	23.00
4	1.4	20393	1754.3	QPSK	3@2	22.14	23.00
4	1.4	20393	1754.3	QPSK	6@0	22.15	23.00
4	1.4	20393	1754.3	16QAM	1@0	20.95	21.00
4	1.4	20393	1754.3	16QAM	1@2	24.38	25.00
4	1.4	20393	1754.3	16QAM	1@5	20.98	21.00
4	1.4	20393	1754.3	16QAM	3@0	21.6	22.00
4	1.4	20393	1754.3	16QAM	3@1	21.14	22.00
4	1.4	20393	1754.3	16QAM	3@2	24.5	25.00
4	1.4	20393	1754.3	16QAM	6@0	20.14	21.00
4	1.4	20393	1754.3	64QAM	6@0	20.24	21.00
4	1.4	20175	1732.5	QPSK	1@0	22.49	23.00
4	1.4	20175	1732.5	QPSK	1@2	22.14	23.00
4	1.4	20175	1732.5	QPSK	1@5	22.42	23.00
4	1.4	20175	1732.5	QPSK	3@0	22.19	23.00
4	1.4	20175	1732.5	QPSK	3@1	22.17	23.00
4	1.4	20175	1732.5	QPSK	3@2	21.89	22.00
4	1.4	20175	1732.5	QPSK	6@0	21.04	22.00
4	1.4	20175	1732.5	16QAM	1@0	23.91	24.00
4	1.4	20175	1732.5	16QAM	1@2	23.32	24.00
4	1.4	20175	1732.5	16QAM	1@5	21	21.00
4	1.4	20175	1732.5	16QAM	3@0	22.23	23.00
4	1.4	20175	1732.5	16QAM	3@1	21.07	22.00
4	1.4	20175	1732.5	16QAM	3@2	22.33	23.00
4	1.4	20175	1732.5	16QAM	6@0	20.26	21.00
4	1.4	20175	1732.5	64QAM	6@0	23.15	24.00
4	1.4	19957	1710.7	QPSK	1@0	20.3	21.00
4	1.4	19957	1710.7	QPSK	1@2	22.41	23.00
4	1.4	19957	1710.7	QPSK	1@5	21.45	22.00
4	1.4	19957	1710.7	QPSK	3@0	23.23	24.00
4	1.4	19957	1710.7	QPSK	3@1	21.44	22.00
4	1.4	19957	1710.7	QPSK	3@2	23.25	24.00
4	1.4	19957	1710.7	QPSK	6@0	20.45	21.00
4	1.4	19957	1710.7	16QAM	1@0	22.66	23.00
4	1.4	19957	1710.7	16QAM	1@2	20.67	21.00
4	1.4	19957	1710.7	16QAM	1@5	24.18	25.00
4	1.4	19957	1710.7	16QAM	3@0	20.69	21.00
4	1.4	19957	1710.7	16QAM	3@1	23.83	24.00
4	1.4	19957	1710.7	16QAM	3@2	20.62	21.00
4	1.4	19957	1710.7	16QAM	6@0	21.27	22.00
4	1.4	19957	1710.7	64QAM	6@0	22.2	23.00
4	3.0	20385	1753.5	QPSK	1@0	22.5	23.00
4	3.0	20385	1753.5	QPSK	1@7	22.37	23.00
4	3.0	20385	1753.5	QPSK	1@14	23.88	24.00
4	3.0	20385	1753.5	QPSK	8@0	21.23	22.00
4	3.0	20385	1753.5	QPSK	8@4	21.13	22.00
4	3.0	20385	1753.5	QPSK	8@7	21.02	22.00
4	3.0	20385	1753.5	QPSK	15@0	22.29	23.00
4	3.0	20385	1753.5	16QAM	1@0	21.27	22.00
4	3.0	20385	1753.5	16QAM	1@7	23.34	24.00
4	3.0	20385	1753.5	16QAM	1@14	21.07	22.00
4	3.0	20385	1753.5	16QAM	8@0	21.87	22.00
4	3.0	20385	1753.5	16QAM	8@4	20.61	21.00
4	3.0	20385	1753.5	16QAM	8@7	23.07	24.00
4	3.0	20385	1753.5	16QAM	15@0	20.39	21.00
4	3.0	20385	1753.5	64QAM	15@0	21.11	22.00
4	3.0	20175	1732.5	QPSK	1@0	23.01	24.00
4	3.0	20175	1732.5	QPSK	1@7	22.3	23.00
4	3.0	20175	1732.5	QPSK	1@14	21.94	22.00
4	3.0	20175	1732.5	QPSK	8@0	21.23	22.00
4	3.0	20175	1732.5	QPSK	8@4	22.31	23.00
4	3.0	20175	1732.5	QPSK	8@7	21.08	22.00
4	3.0	20175	1732.5	QPSK	15@0	22.27	23.00
4	3.0	20175	1732.5	16QAM	1@0	21.28	22.00
4	3.0	20175	1732.5	16QAM	1@7	22.36	23.00
4	3.0	20175	1732.5	16QAM	1@14	21.13	22.00
4	3.0	20175	1732.5	16QAM	8@0	21.93	22.00

4	3.0	20175	1732.5	16QAM	8@4	20.58	21.00
4	3.0	20175	1732.5	16QAM	8@7	21.81	22.00
4	3.0	20175	1732.5	16QAM	15@0	20.41	21.00
4	3.0	20175	1732.5	64QAM	15@0	22.29	23.00
4	3.0	19965	1711.5	QPSK	1@0	21.33	22.00
4	3.0	19965	1711.5	QPSK	1@7	23.24	24.00
4	3.0	19965	1711.5	QPSK	1@14	21.57	22.00
4	3.0	19965	1711.5	QPSK	8@0	21.73	22.00
4	3.0	19965	1711.5	QPSK	8@4	20.49	21.00
4	3.0	19965	1711.5	QPSK	8@7	23.83	24.00
4	3.0	19965	1711.5	QPSK	15@0	20.58	21.00
4	3.0	19965	1711.5	16QAM	1@0	24.39	25.00
4	3.0	19965	1711.5	16QAM	1@7	21.29	22.00
4	3.0	19965	1711.5	16QAM	1@14	23.91	24.00
4	3.0	19965	1711.5	16QAM	8@0	19.54	20.00
4	3.0	19965	1711.5	16QAM	8@4	21.73	22.00
4	3.0	19965	1711.5	16QAM	8@7	19.52	20.00
4	3.0	19965	1711.5	16QAM	15@0	23.25	24.00
4	3.0	19965	1711.5	64QAM	15@0	19.45	20.00
4	5.0	20375	1752.5	QPSK	1@0	22.3	23.00
4	5.0	20375	1752.5	QPSK	1@12	23.12	24.00
4	5.0	20375	1752.5	QPSK	1@24	22.32	23.00
4	5.0	20375	1752.5	QPSK	12@0	23.94	24.00
4	5.0	20375	1752.5	QPSK	12@6	21.25	22.00
4	5.0	20375	1752.5	QPSK	12@1 1	23.14	24.00
4	5.0	20375	1752.5	QPSK	25@0	21.35	22.00
4	5.0	20375	1752.5	16QAM	1@0	22.42	23.00
4	5.0	20375	1752.5	16QAM	1@12	21.57	22.00
4	5.0	20375	1752.5	16QAM	1@24	23.51	24.00
4	5.0	20375	1752.5	16QAM	12@0	20.55	21.00
4	5.0	20375	1752.5	16QAM	12@6	23.37	24.00
4	5.0	20375	1752.5	16QAM	12@1 1	20.5	21.00
4	5.0	20375	1752.5	16QAM	25@0	20.57	21.00
4	5.0	20375	1752.5	64QAM	25@0	20.63	21.00
4	5.0	20175	1732.5	QPSK	1@0	23.57	24.00
4	5.0	20175	1732.5	QPSK	1@12	22.45	23.00
4	5.0	20175	1732.5	QPSK	1@24	22.24	23.00
4	5.0	20175	1732.5	QPSK	12@0	21.31	22.00
4	5.0	20175	1732.5	QPSK	12@6	23.62	24.00
4	5.0	20175	1732.5	QPSK	12@1 1	21.33	22.00
4	5.0	20175	1732.5	QPSK	25@0	21.54	22.00
4	5.0	20175	1732.5	16QAM	1@0	21.76	22.00
4	5.0	20175	1732.5	16QAM	1@12	20.29	21.00
4	5.0	20175	1732.5	16QAM	1@24	20.3	21.00
4	5.0	20175	1732.5	16QAM	12@0	23.06	24.00
4	5.0	20175	1732.5	16QAM	12@6	20.48	21.00
4	5.0	20175	1732.5	16QAM	12@1 1	21.65	22.00
4	5.0	20175	1732.5	16QAM	25@0	20.41	21.00
4	5.0	20175	1732.5	64QAM	25@0	20.43	21.00
4	5.0	19975	1712.5	QPSK	1@0	23.7	24.00
4	5.0	19975	1712.5	QPSK	1@12	21.71	22.00
4	5.0	19975	1712.5	QPSK	1@24	21.96	22.00
4	5.0	19975	1712.5	QPSK	12@0	20.56	21.00
4	5.0	19975	1712.5	QPSK	12@6	20.49	21.00
4	5.0	19975	1712.5	QPSK	12@1 1	24.12	25.00
4	5.0	19975	1712.5	QPSK	25@0	20.67	21.00
4	5.0	19975	1712.5	16QAM	1@0	23.76	24.00
4	5.0	19975	1712.5	16QAM	1@12	21.16	22.00
4	5.0	19975	1712.5	16QAM	1@24	21.59	22.00
4	5.0	19975	1712.5	16QAM	12@0	19.5	20.00
4	5.0	19975	1712.5	16QAM	12@6	23.74	24.00
4	5.0	19975	1712.5	16QAM	12@1 1	19.49	20.00
4	5.0	19975	1712.5	16QAM	25@0	21.19	22.00

4	5.0	19975	1712.5	64QAM	25@0	21.94	22.00
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Band	Bandwidth h (MHz)	Channel	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	Tune- up (dBm)
5	1.4	20643	848.3	QPSK	1@0	22.8	23.00
5	1.4	20643	848.3	QPSK	1@2	23.44	24.00
5	1.4	20643	848.3	QPSK	1@5	21.18	22.00
5	1.4	20643	848.3	QPSK	3@0	23.41	24.00
5	1.4	20643	848.3	QPSK	3@1	22.96	23.00
5	1.4	20643	848.3	QPSK	3@2	21.13	22.00
5	1.4	20643	848.3	QPSK	6@0	22.7	23.00
5	1.4	20643	848.3	16QAM	1@0	22.84	23.00
5	1.4	20643	848.3	16QAM	1@2	21.96	22.00
5	1.4	20643	848.3	16QAM	1@5	22.75	23.00
5	1.4	20643	848.3	16QAM	3@0	21.02	22.00
5	1.4	20643	848.3	16QAM	3@1	22.69	23.00
5	1.4	20643	848.3	16QAM	3@2	21.05	22.00
5	1.4	20643	848.3	16QAM	6@0	21.9	22.00
5	1.4	20643	848.3	64QAM	6@0	22.74	23.00
5	1.4	20525	836.5	QPSK	1@0	23.44	24.00
5	1.4	20525	836.5	QPSK	1@2	24.61	25.00
5	1.4	20525	836.5	QPSK	1@5	21.01	22.00
5	1.4	20525	836.5	QPSK	3@0	24.48	25.00
5	1.4	20525	836.5	QPSK	3@1	21.79	22.00
5	1.4	20525	836.5	QPSK	3@2	24.51	25.00
5	1.4	20525	836.5	QPSK	6@0	21.79	22.00
5	1.4	20525	836.5	16QAM	1@0	23.64	24.00
5	1.4	20525	836.5	16QAM	1@2	23.78	24.00
5	1.4	20525	836.5	16QAM	1@5	21.94	22.00
5	1.4	20525	836.5	16QAM	3@0	23.76	24.00
5	1.4	20525	836.5	16QAM	3@1	21.84	22.00
5	1.4	20525	836.5	16QAM	3@2	23.68	24.00
5	1.4	20525	836.5	16QAM	6@0	23.77	24.00
5	1.4	20525	836.5	64QAM	6@0	22.05	23.00
5	1.4	20407	824.7	QPSK	1@0	25.82	26.00
5	1.4	20407	824.7	QPSK	1@2	22.62	23.00
5	1.4	20407	824.7	QPSK	1@5	26.07	27.00
5	1.4	20407	824.7	QPSK	3@0	22.51	23.00
5	1.4	20407	824.7	QPSK	3@1	25.92	26.00
5	1.4	20407	824.7	QPSK	3@2	23.12	24.00
5	1.4	20407	824.7	QPSK	6@0	25.06	26.00
5	1.4	20407	824.7	16QAM	1@0	24.59	25.00
5	1.4	20407	824.7	16QAM	1@2	25.16	26.00
5	1.4	20407	824.7	16QAM	1@5	24.76	25.00
5	1.4	20407	824.7	16QAM	3@0	24.99	25.00
5	1.4	20407	824.7	16QAM	3@1	22.83	23.00
5	1.4	20407	824.7	16QAM	3@2	25.17	26.00
5	1.4	20407	824.7	16QAM	6@0	22.31	23.00
5	1.4	20407	824.7	64QAM	6@0	24.97	25.00
5	3	20635	847.5	QPSK	1@0	21.65	22.00
5	3	20635	847.5	QPSK	1@7	23.66	24.00
5	3	20635	847.5	QPSK	1@14	24.05	25.00
5	3	20635	847.5	QPSK	8@0	23.01	24.00
5	3	20635	847.5	QPSK	8@4	23.02	24.00
5	3	20635	847.5	QPSK	8@7	25.6	26.00
5	3	20635	847.5	QPSK	15@0	22.86	23.00
5	3	20635	847.5	16QAM	1@0	23.93	24.00
5	3	20635	847.5	16QAM	1@7	22.95	23.00
5	3	20635	847.5	16QAM	1@14	25.65	26.00
5	3	20635	847.5	16QAM	8@0	22.36	23.00
5	3	20635	847.5	16QAM	8@4	22.91	23.00
5	3	20635	847.5	16QAM	8@7	21.99	22.00
5	3	20635	847.5	16QAM	15@0	23.92	24.00
5	3	20635	847.5	64QAM	15@0	23.4	24.00
5	3	20525	836.5	QPSK	1@0	20.65	21.00

5	3	20525	836.5	QPSK	1@7	24.57	25.00
5	3	20525	836.5	QPSK	1@14	21.3	22.00
5	3	20525	836.5	QPSK	8@0	21.61	22.00
5	3	20525	836.5	QPSK	8@4	20.01	21.00
5	3	20525	836.5	QPSK	8@7	23.97	24.00
5	3	20525	836.5	QPSK	15@0	20.17	21.00
5	3	20525	836.5	16QAM	1@0	20.41	21.00
5	3	20525	836.5	16QAM	1@7	24.34	25.00
5	3	20525	836.5	16QAM	1@14	20.48	21.00
5	3	20525	836.5	16QAM	8@0	23.18	24.00
5	3	20525	836.5	16QAM	8@4	19.14	20.00
5	3	20525	836.5	16QAM	8@7	21.29	22.00
5	3	20525	836.5	16QAM	15@0	19.39	20.00
5	3	20525	836.5	64QAM	15@0	23.21	24.00
5	3	20415	825.5	QPSK	1@0	22.03	23.00
5	3	20415	825.5	QPSK	1@7	25.27	26.00
5	3	20415	825.5	QPSK	1@14	21.74	22.00
5	3	20415	825.5	QPSK	8@0	23.79	24.00
5	3	20415	825.5	QPSK	8@4	21.25	22.00
5	3	20415	825.5	QPSK	8@7	23.98	24.00
5	3	20415	825.5	QPSK	15@0	21.19	22.00
5	3	20415	825.5	16QAM	1@0	24.51	25.00
5	3	20415	825.5	16QAM	1@7	21.42	22.00
5	3	20415	825.5	16QAM	1@14	23.1	24.00
5	3	20415	825.5	16QAM	8@0	20.48	21.00
5	3	20415	825.5	16QAM	8@4	24	24.00
5	3	20415	825.5	16QAM	8@7	20.31	21.00
5	3	20415	825.5	16QAM	15@0	23.9	24.00
5	3	20415	825.5	64QAM	15@0	23.93	24.00
5	5	20625	846.5	QPSK	1@0	21.26	22.00
5	5	20625	846.5	QPSK	1@12	24.14	25.00
5	5	20625	846.5	QPSK	1@24	20.46	21.00
5	5	20625	846.5	QPSK	12@0	23.65	24.00
5	5	20625	846.5	QPSK	12@6	19.89	20.00
5	5	20625	846.5	QPSK	12@1 1	23.67	24.00
5	5	20625	846.5	QPSK	25@0	23.72	24.00
5	5	20625	846.5	16QAM	1@0	24.58	25.00
5	5	20625	846.5	16QAM	1@12	20	20.00
5	5	20625	846.5	16QAM	1@24	19.58	20.00
5	5	20625	846.5	16QAM	12@0	23.04	24.00
5	5	20625	846.5	16QAM	12@6	19.01	20.00
5	5	20625	846.5	16QAM	12@1 1	23.06	24.00
5	5	20625	846.5	16QAM	25@0	18.91	19.00
5	5	20625	846.5	64QAM	25@0	23.59	24.00
5	5	20525	836.5	QPSK	1@0	20.71	21.00
5	5	20525	836.5	QPSK	1@12	22.36	23.00
5	5	20525	836.5	QPSK	1@24	21.56	22.00
5	5	20525	836.5	QPSK	12@0	24.67	25.00
5	5	20525	836.5	QPSK	12@6	19.82	20.00
5	5	20525	836.5	QPSK	12@1 1	24.69	25.00
5	5	20525	836.5	QPSK	25@0	20.16	21.00
5	5	20525	836.5	16QAM	1@0	21.89	22.00
5	5	20525	836.5	16QAM	1@12	20.7	21.00
5	5	20525	836.5	16QAM	1@24	19.85	20.00
5	5	20525	836.5	16QAM	12@0	22.99	23.00
5	5	20525	836.5	16QAM	12@6	19.06	20.00
5	5	20525	836.5	16QAM	12@1 1	25.24	26.00
5	5	20525	836.5	16QAM	25@0	19.35	20.00
5	5	20525	836.5	64QAM	25@0	20.12	21.00
5	5	20425	826.5	QPSK	1@0	21.11	22.00
5	5	20425	826.5	QPSK	1@12	21.95	22.00
5	5	20425	826.5	QPSK	1@24	20.65	21.00
5	5	20425	826.5	QPSK	12@0	21.23	22.00
5	5	20425	826.5	QPSK	12@6	22.37	23.00

5	5	20425	826.5	QPSK	12@1 1	21.23	22.00
5	5	20425	826.5	QPSK	25@0	24.4	25.00
5	5	20425	826.5	16QAM	1@0	21.15	22.00
5	5	20425	826.5	16QAM	1@12	24.51	25.00
5	5	20425	826.5	16QAM	1@24	20.64	21.00
5	5	20425	826.5	16QAM	12@0	21.82	22.00
5	5	20425	826.5	16QAM	12@6	20.37	21.00
5	5	20425	826.5	16QAM	12@1 1	24.05	25.00
5	5	20425	826.5	16QAM	25@0	20.13	21.00
5	5	20425	826.5	64QAM	25@0	23.1	24.00

Band	Bandwidth h (MHz)	Channel	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	Tune- up (dBm)
7	5.0	21425	2567.5	QPSK	1@0	22.88	23.00
7	5.0	21425	2567.5	QPSK	1@12	23.34	24.00
7	5.0	21425	2567.5	QPSK	1@24	22.76	23.00
7	5.0	21425	2567.5	QPSK	12@0	22.56	23.00
7	5.0	21425	2567.5	QPSK	12@6	22.5	23.00
7	5.0	21425	2567.5	QPSK	12@1 1	22.48	23.00
7	5.0	21425	2567.5	QPSK	25@0	22.19	23.00
7	5.0	21425	2567.5	16QAM	1@0	22.55	23.00
7	5.0	21425	2567.5	16QAM	1@12	22.08	23.00
7	5.0	21425	2567.5	16QAM	1@24	21.63	22.00
7	5.0	21425	2567.5	16QAM	12@0	21.61	22.00
7	5.0	21425	2567.5	16QAM	12@6	21.61	22.00
7	5.0	21425	2567.5	16QAM	12@1 1	21.59	22.00
7	5.0	21425	2567.5	16QAM	25@0	21.39	22.00
7	5.0	21425	2567.5	64QAM	25@0	21.36	22.00
7	5.0	21100	2535.0	QPSK	1@0	21.98	22.00
7	5.0	21100	2535.0	QPSK	1@12	21.63	22.00
7	5.0	21100	2535.0	QPSK	1@24	21.33	22.00
7	5.0	21100	2535.0	QPSK	12@0	20.91	21.00
7	5.0	21100	2535.0	QPSK	12@6	20.92	21.00
7	5.0	21100	2535.0	QPSK	12@1 1	20.92	21.00
7	5.0	21100	2535.0	QPSK	25@0	20.77	21.00
7	5.0	21100	2535.0	16QAM	1@0	21.35	22.00
7	5.0	21100	2535.0	16QAM	1@12	21.09	22.00
7	5.0	21100	2535.0	16QAM	1@24	20.82	21.00
7	5.0	21100	2535.0	16QAM	12@0	20.15	21.00
7	5.0	21100	2535.0	16QAM	12@6	20.14	21.00
7	5.0	21100	2535.0	16QAM	12@1 1	20.15	21.00
7	5.0	21100	2535.0	16QAM	25@0	19.99	20.00
7	5.0	21100	2535.0	64QAM	25@0	20.02	21.00
7	5.0	20775	2502.5	QPSK	1@0	21.47	22.00
7	5.0	20775	2502.5	QPSK	1@12	21.63	22.00
7	5.0	20775	2502.5	QPSK	1@24	21.94	22.00
7	5.0	20775	2502.5	QPSK	12@0	20.76	21.00
7	5.0	20775	2502.5	QPSK	12@6	20.77	21.00
7	5.0	20775	2502.5	QPSK	12@1 1	20.77	21.00
7	5.0	20775	2502.5	QPSK	25@0	20.88	21.00
7	5.0	20775	2502.5	16QAM	1@0	20.86	21.00
7	5.0	20775	2502.5	16QAM	1@12	21.04	22.00
7	5.0	20775	2502.5	16QAM	1@24	21.25	22.00
7	5.0	20775	2502.5	16QAM	12@0	19.97	20.00
7	5.0	20775	2502.5	16QAM	12@6	19.98	20.00
7	5.0	20775	2502.5	16QAM	12@1 1	19.93	20.00
7	5.0	20775	2502.5	16QAM	25@0	20.1	21.00
7	5.0	20775	2502.5	64QAM	25@0	20.17	21.00

Band	Bandwidth h (MHz)	Channel	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	Tune- up (dBm)
66	3.0	132657	1778.5	QPSK	1@0	21.17	22.00
66	3.0	132657	1778.5	QPSK	1@7	20.73	21.00
66	3.0	132657	1778.5	QPSK	1@14	21.26	22.00
66	3.0	132657	1778.5	QPSK	8@0	19.51	20.00
66	3.0	132657	1778.5	QPSK	8@4	19.59	20.00
66	3.0	132657	1778.5	QPSK	8@7	20.07	21.00
66	3.0	132657	1778.5	QPSK	15@0	19.89	20.00
66	3.0	132657	1778.5	16QAM	1@0	19.63	20.00
66	3.0	132657	1778.5	16QAM	1@7	20.09	21.00
66	3.0	132657	1778.5	16QAM	1@14	20.41	21.00
66	3.0	132657	1778.5	16QAM	8@0	18.92	19.00
66	3.0	132657	1778.5	16QAM	8@4	18.91	19.00
66	3.0	132657	1778.5	16QAM	8@7	19.33	20.00
66	3.0	132657	1778.5	16QAM	15@0	19.1	20.00
66	3.0	132657	1778.5	64QAM	15@0	19.17	20.00
66	3.0	132322	1745.0	QPSK	1@0	21.78	22.00
66	3.0	132322	1745.0	QPSK	1@7	21.91	22.00
66	3.0	132322	1745.0	QPSK	1@14	22.01	23.00
66	3.0	132322	1745.0	QPSK	8@0	20.95	21.00
66	3.0	132322	1745.0	QPSK	8@4	20.96	21.00
66	3.0	132322	1745.0	QPSK	8@7	21.05	22.00
66	3.0	132322	1745.0	QPSK	15@0	21.01	22.00
66	3.0	132322	1745.0	16QAM	1@0	21.51	22.00
66	3.0	132322	1745.0	16QAM	1@7	21.66	22.00
66	3.0	132322	1745.0	16QAM	1@14	21.69	22.00
66	3.0	132322	1745.0	16QAM	8@0	20.3	21.00
66	3.0	132322	1745.0	16QAM	8@4	20.31	21.00
66	3.0	132322	1745.0	16QAM	8@7	20.39	21.00
66	3.0	132322	1745.0	16QAM	15@0	20.2	21.00
66	3.0	132322	1745.0	64QAM	15@0	20.25	21.00
66	3.0	131987	1711.5	QPSK	1@0	22.48	23.00
66	3.0	131987	1711.5	QPSK	1@7	21.85	22.00
66	3.0	131987	1711.5	QPSK	1@14	21.81	22.00
66	3.0	131987	1711.5	QPSK	8@0	20.74	21.00
66	3.0	131987	1711.5	QPSK	8@4	20.74	21.00
66	3.0	131987	1711.5	QPSK	8@7	20.87	21.00
66	3.0	131987	1711.5	QPSK	15@0	20.85	21.00
66	3.0	131987	1711.5	16QAM	1@0	21.36	22.00
66	3.0	131987	1711.5	16QAM	1@7	21.63	22.00
66	3.0	131987	1711.5	16QAM	1@14	21.55	22.00
66	3.0	131987	1711.5	16QAM	8@0	20.05	21.00
66	3.0	131987	1711.5	16QAM	8@4	20.05	21.00
66	3.0	131987	1711.5	16QAM	8@7	20.13	21.00
66	3.0	131987	1711.5	16QAM	15@0	19.98	20.00
66	3.0	131987	1711.5	64QAM	15@0	20	20.00
66	5.0	132647	1777.5	QPSK	1@0	20.55	21.00
66	5.0	132647	1777.5	QPSK	1@12	21.13	22.00
66	5.0	132647	1777.5	QPSK	1@24	21.97	22.00
66	5.0	132647	1777.5	QPSK	12@0	19.81	20.00
66	5.0	132647	1777.5	QPSK	12@6	19.81	20.00
66	5.0	132647	1777.5	QPSK	12@1 1	19.87	20.00
66	5.0	132647	1777.5	QPSK	25@0	20.14	21.00
66	5.0	132647	1777.5	16QAM	1@0	19.95	20.00
66	5.0	132647	1777.5	16QAM	1@12	20.39	21.00
66	5.0	132647	1777.5	16QAM	1@24	21.02	22.00
66	5.0	132647	1777.5	16QAM	12@0	18.96	19.00
66	5.0	132647	1777.5	16QAM	12@6	18.97	19.00
66	5.0	132647	1777.5	16QAM	12@1 1	18.93	19.00
66	5.0	132647	1777.5	16QAM	25@0	19.23	20.00
66	5.0	132647	1777.5	64QAM	25@0	19.28	20.00

66	5.0	132322	1745.0	QPSK	1@0	22.28	23.00
66	5.0	132322	1745.0	QPSK	1@12	22.42	23.00
66	5.0	132322	1745.0	QPSK	1@24	22.69	23.00
66	5.0	132322	1745.0	QPSK	12@0	21.22	22.00
66	5.0	132322	1745.0	QPSK	12@6	21.2	22.00
66	5.0	132322	1745.0	QPSK	12@1 1	21.18	22.00
66	5.0	132322	1745.0	QPSK	25@0	21.28	22.00
66	5.0	132322	1745.0	16QAM	1@0	21.19	22.00
66	5.0	132322	1745.0	16QAM	1@12	21.32	22.00
66	5.0	132322	1745.0	16QAM	1@24	21.58	22.00
66	5.0	132322	1745.0	16QAM	12@0	20.34	21.00
66	5.0	132322	1745.0	16QAM	12@6	20.29	21.00
66	5.0	132322	1745.0	16QAM	12@1 1	20.29	21.00
66	5.0	132322	1745.0	16QAM	25@0	20.39	21.00
66	5.0	132322	1745.0	64QAM	25@0	20.4	21.00
66	5.0	131997	1712.5	QPSK	1@0	22.26	23.00
66	5.0	131997	1712.5	QPSK	1@12	22.36	23.00
66	5.0	131997	1712.5	QPSK	1@24	22.54	23.00
66	5.0	131997	1712.5	QPSK	12@0	21.1	22.00
66	5.0	131997	1712.5	QPSK	12@6	21.1	22.00
66	5.0	131997	1712.5	QPSK	12@1 1	21.14	22.00
66	5.0	131997	1712.5	QPSK	25@0	21.18	22.00
66	5.0	131997	1712.5	16QAM	1@0	21.47	22.00
66	5.0	131997	1712.5	16QAM	1@12	21.61	22.00
66	5.0	131997	1712.5	16QAM	1@24	21.82	22.00
66	5.0	131997	1712.5	16QAM	12@0	20.12	21.00
66	5.0	131997	1712.5	16QAM	12@6	20.12	21.00
66	5.0	131997	1712.5	16QAM	12@1 1	20.13	21.00
66	5.0	131997	1712.5	16QAM	25@0	20.19	21.00
66	5.0	131997	1712.5	64QAM	25@0	20.19	21.00

8.2. BT Output Power

Mode	Channel	Tune-up (dBm)	Output Power (dBm)
BLE1M	CH00	-3.00	-3.56
	CH19	-5.00	-5.02
	CH39	-5.00	-5.79

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	Pmax (dBm)	Pmax (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
Bluetooth	-3.00	0.50	5	2.480	0.2	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:

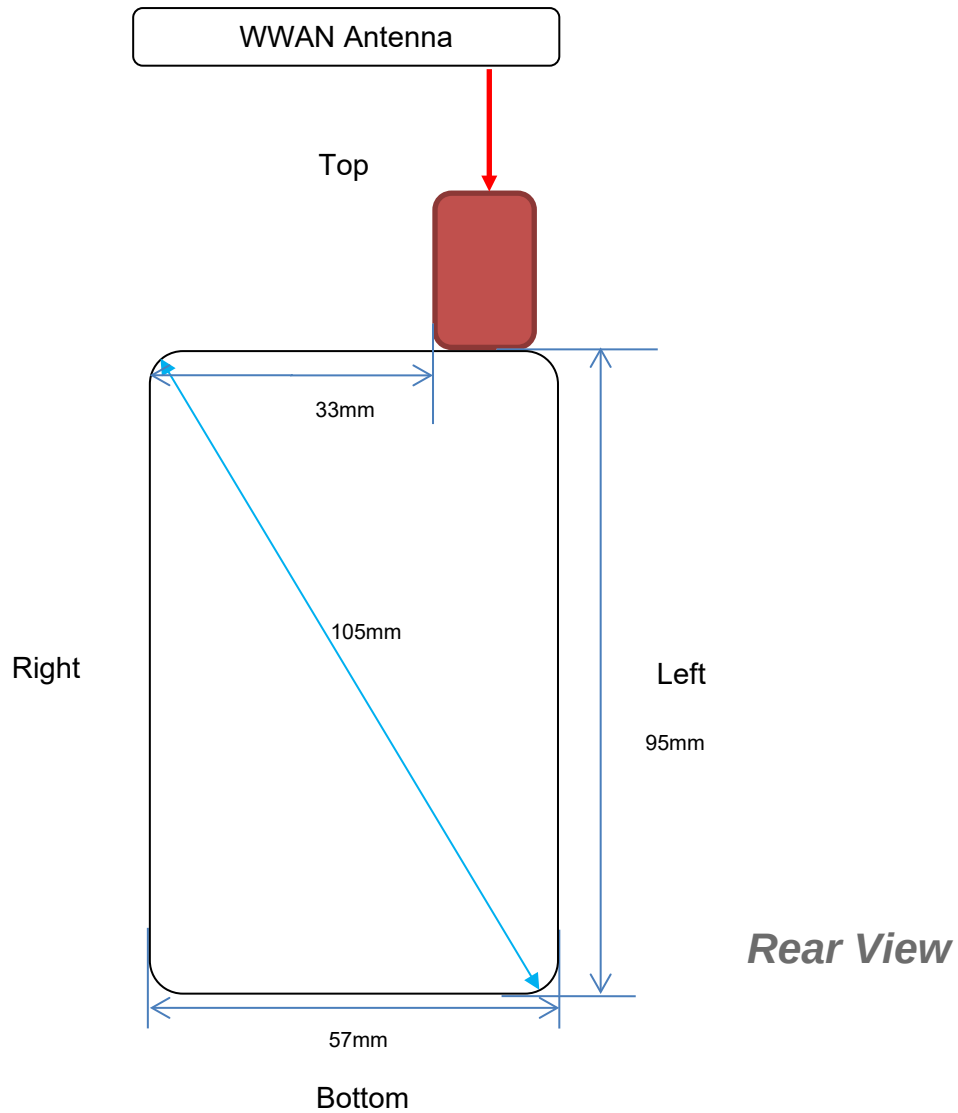
$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}/x] \text{ W/kg}$ for test separation distances ≤ 50 mm, where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

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

Mode	Position	Pmax (dBm)	Pmax (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/kg)
Bluetooth	Body	-3.00	0.50	5	2.48	7.5	0.021

NOTE: Estimated SAR calculation for Bluetooth

10. Antenna Location



Antenna information:

Distance of The Antenna to the EUT surface and edge (mm)						
Antennas	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WWAN	≤25mm	≤25mm	≤25mm	>25mm	≤25mm	>25mm

Positions for SAR tests						
Antennas	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WWAN	Yes	Yes	Yes	NO	Yes	NO

11. SAR Measurement Results

< LTE Band 2>

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Left Cheek	18900/1880	5M QPSK(1,12)	0.433	0.288	1.63	23.44	24.00	0.493	2025/9/24	1#
Left Tilt 15 Degree	18900/1880	5M QPSK(1,12)	0.228	0.147	2.34	23.44	24.00	0.259	2025/9/24	
Right Cheek	18900/1880	5M QPSK(1,12)	0.398	0.259	2.26	23.44	24.00	0.453	2025/9/24	
Right Tilt 15 Degree	18900/1880	5M QPSK(1,12)	0.212	0.140	3.42	23.44	24.00	0.241	2025/9/24	
50%RB										
Left Cheek	18900/1880	5M QPSK(12,11)	0.240	0.149	-1.05	22.35	23.00	0.279	2025/9/24	
Left Tilt 15 Degree	18900/1880	5M QPSK(12,11)	0.135	0.078	0.67	22.35	23.00	0.157	2025/9/24	
Right Cheek	18900/1880	5M QPSK(12,11)	0.237	0.148	0.05	22.35	23.00	0.275	2025/9/24	
Right Tilt 15 Degree	18900/1880	5M QPSK(12,11)	0.119	0.078	-4.27	22.35	23.00	0.138	2025/9/24	

Test Position of Hotspot with 5mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	18900/1880	5M QPSK(1,12)	0.372	0.241	3.57	23.44	24.00	0.423	2025/9/24	
Back	18900/1880	5M	0.588	0.385	-4.80	23.44	24.00	0.669	2025/9/24	2#

Side		QPSK(1,12)								
Left Side	18900/1880	5M QPSK(1,12)	0.183	0.120	2.81	23.44	24.00	0.208	2025/9/24	
Top Side	18900/1880	5M QPSK(1,12)	0.186	0.122	3.26	23.44	24.00	0.212	2025/9/24	
50%RB										
Front Side	18900/1880	5M QPSK(12,11)	0.222	0.139	-1.28	22.35	23.00	0.258	2025/9/24	
Back Side	18900/1880	5M QPSK(12,11)	0.304	0.200	-2.12	22.35	23.00	0.353	2025/9/24	
Left Side	18900/1880	5M QPSK(12,11)	0.109	0.065	4.63	22.35	23.00	0.127	2025/9/24	
Top Side	18900/1880	5M QPSK(12,11)	0.112	0.066	-2.48	22.35	23.00	0.130	2025/9/24	

< LTE Band 4 >

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Left Cheek	20175/1732.5	5M QPSK(1,0)	0.603	0.412	-1.54	23.57	24.00	0.666	2025/9/23	3#
Left Tilt 15 Degree	20175/1732.5	5M QPSK(1,0)	0.330	0.225	3.30	23.57	24.00	0.364	2025/9/23	
Right Cheek	20175/1732.5	5M QPSK(1,0)	0.530	0.359	0.92	23.57	24.00	0.585	2025/9/23	
Right Tilt 15 Degree	20175/1732.5	5M QPSK(1,0)	0.291	0.199	-1.95	23.57	24.00	0.321	2025/9/23	
50%RB										
Left Cheek	20175/1732.5	5M QPSK(12,6)	0.346	0.228	1.48	23.62	24.00	0.378	2025/9/23	
Left Tilt 15 Degree	20175/1732.5	5M QPSK(12,6)	0.189	0.117	-0.71	23.62	24.00	0.206	2025/9/23	
Right Cheek	20175/1732.5	5M QPSK(12,6)	0.315	0.190	4.76	23.62	24.00	0.344	2025/9/23	
Right	20175/1732.5	5M	0.151	0.119	4.06	23.62	24.00	0.165	2025/9/23	

Tilt 15 Degree		QPSK(12,6)								
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Test Position of Hotspot with 5mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	20175/1732.5	5M QPSK(1,0)	0.336	0.225	3.62	23.57	24.00	0.371	2025/9/23	
Back Side	20175/1732.5	5M QPSK(1,0)	0.529	0.361	-1.66	23.57	24.00	0.584	2025/9/23	4#
Left Side	20175/1732.5	5M QPSK(1,0)	0.159	0.109	2.65	23.57	24.00	0.176	2025/9/23	
Top Side	20175/1732.5	5M QPSK(1,0)	0.162	0.111	-3.38	23.57	24.00	0.179	2025/9/23	
50%RB										
Front Side	20175/1732.5	5M QPSK(12,6)	0.196	0.121	1.98	23.62	24.00	0.214	2025/9/23	
Back Side	20175/1732.5	5M QPSK(12,6)	0.295	0.186	-1.71	23.62	24.00	0.322	2025/9/23	
Left Side	20175/1732.5	5M QPSK(12,6)	0.080	0.060	2.03	23.62	24.00	0.087	2025/9/23	
Top Side	20175/1732.5	5M QPSK(12,6)	0.092	0.063	-4.04	23.62	24.00	0.100	2025/9/23	

< LTE Band 5>

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Left Cheek	20525/836.5	5M QPSK(1,12)	0.191	0.165	-0.31	22.36	23.00	0.221	2025/9/22	5#
Left Tilt 15 Degree	20525/836.5	5M QPSK(1,12)	0.112	0.097	-3.55	22.36	23.00	0.130	2025/9/22	
Right	20525/836.5	5M	0.169	0.142	2.22	22.36	23.00	0.196	2025/9/22	

Cheek		QPSK(1,12)								
Right Tilt 15 Degree	20525/836.5	5M QPSK(1,12)	0.091	0.075	-0.16	22.36	23.00	0.105	2025/9/22	
50%RB										
Left Cheek	20525/836.5	5M QPSK(12,11)	0.099	0.097	4.61	24.69	25.00	0.106	2025/9/22	
Left Tilt 15 Degree	20525/836.5	5M QPSK(12,11)	0.059	0.056	-0.58	24.69	25.00	0.063	2025/9/22	
Right Cheek	20525/836.5	5M QPSK(12,11)	0.091	0.071	-4.00	24.69	25.00	0.098	2025/9/22	
Right Tilt 15 Degree	20525/836.5	5M QPSK(12,11)	0.053	0.041	3.57	24.69	25.00	0.057	2025/9/22	

Test Position of Hotspot with 5mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	20525/836.5	5M QPSK(1,12)	0.240	0.152	-3.31	22.36	23.00	0.278	2025/9/22	
Back Side	20525/836.5	5M QPSK(1,12)	0.357	0.231	-0.23	22.36	23.00	0.414	2025/9/22	6#
Left Side	20525/836.5	5M QPSK(1,12)	0.114	0.073	1.96	22.36	23.00	0.132	2025/9/22	
Top Side	20525/836.5	5M QPSK(1,12)	0.120	0.074	3.68	22.36	23.00	0.139	2025/9/22	
50%RB										
Front Side	20525/836.5	5M QPSK(12,11)	0.133	0.081	4.35	24.69	25.00	0.143	2025/9/22	
Back Side	20525/836.5	5M QPSK(12,11)	0.204	0.129	1.43	24.69	25.00	0.219	2025/9/22	
Left Side	20525/836.5	5M QPSK(12,11)	0.059	0.039	-2.18	24.69	25.00	0.063	2025/9/22	
Top Side	20525/836.5	5M QPSK(12,11)	0.070	0.041	1.31	24.69	25.00	0.075	2025/9/22	

< LTE Band 7>

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Left Cheek	21100/2535	5M QPSK(1,0)	0.333	0.219	3.09	21.98	22.00	0.335	2025/9/25	7#
Left Tilt 15 Degree	21100/2535	5M QPSK(1,0)	0.196	0.128	-0.32	21.98	22.00	0.197	2025/9/25	
Right Cheek	21100/2535	5M QPSK(1,0)	0.311	0.205	-1.79	21.98	22.00	0.312	2025/9/25	
Right Tilt 15 Degree	21100/2535	5M QPSK(1,0)	0.169	0.109	-0.72	21.98	22.00	0.170	2025/9/25	
50%RB										
Left Cheek	21100/2535	5M QPSK(12,6)	0.191	0.112	-2.91	20.92	21.00	0.195	2025/9/25	
Left Tilt 15 Degree	21100/2535	5M QPSK(12,6)	0.100	0.076	2.94	20.92	21.00	0.102	2025/9/25	
Right Cheek	21100/2535	5M QPSK(12,6)	0.160	0.117	1.59	20.92	21.00	0.163	2025/9/25	
Right Tilt 15 Degree	21100/2535	5M QPSK(12,6)	0.098	0.060	4.59	20.92	21.00	0.100	2025/9/25	

Test Position of Hotspot with 5mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	21100/2535	5M QPSK(1,0)	0.318	0.198	-1.93	21.98	22.00	0.319	2025/9/25	
Back Side	21100/2535	5M QPSK(1,0)	0.494	0.321	-1.36	21.98	22.00	0.496	2025/9/25	8#
Left	21100/2535	5M QPSK(1,0)	0.159	0.101	0.14	21.98	22.00	0.160	2025/9/25	

Side										
Top Side	21100/2535	5M QPSK(1,0)	0.164	0.105	-2.05	21.98	22.00	0.165	2025/9/25	
50%RB										
Front Side	21100/2535	5M QPSK(12,6)	0.184	0.105	1.85	20.92	21.00	0.187	2025/9/25	
Back Side	21100/2535	5M QPSK(12,6)	0.272	0.188	1.52	20.92	21.00	0.277	2025/9/25	
Left Side	21100/2535	5M QPSK(12,6)	0.083	0.059	-4.84	20.92	21.00	0.085	2025/9/25	
Top Side	21100/2535	5M QPSK(12,6)	0.089	0.063	4.66	20.92	21.00	0.091	2025/9/25	

< LTE Band 66 >

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Left Cheek	132322/1745	5M QPSK(1,24)	0.481	0.318	1.98	22.69	23.00	0.517	2025/9/23	9#
Left Tilt 15 Degree	132322/1745	5M QPSK(1,24)	0.253	0.159	-2.25	22.69	23.00	0.272	2025/9/23	
Right Cheek	132322/1745	5M QPSK(1,24)	0.415	0.272	3.31	22.69	23.00	0.446	2025/9/23	
Right Tilt 15 Degree	132322/1745	5M QPSK(1,24)	0.199	0.132	-3.17	22.69	23.00	0.214	2025/9/23	
50%RB										
Left Cheek	132322/1745	5M QPSK(12,0)	0.253	0.163	2.48	21.22	22.00	0.303	2025/9/23	
Left Tilt 15 Degree	132322/1745	5M QPSK(12,0)	0.148	0.093	-3.13	21.22	22.00	0.177	2025/9/23	
Right Cheek	132322/1745	5M QPSK(12,0)	0.239	0.142	-1.26	21.22	22.00	0.286	2025/9/23	
Right Tilt 15 Degree	132322/1745	5M QPSK(12,0)	0.111	0.077	1.90	21.22	22.00	0.133	2025/9/23	

Test Position of Hotspot with 5mm	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
1RB										
Front Side	132322/1745	5M QPSK(1,24)	0.396	0.261	-2.15	22.69	23.00	0.425	2025/9/23	
Back Side	132322/1745	5M QPSK(1,24)	0.638	0.438	-0.94	22.69	23.00	0.685	2025/9/23	10#
Left Side	132322/1745	5M QPSK(1,24)	0.201	0.134	3.98	22.69	23.00	0.216	2025/9/23	
Top Side	132322/1745	5M QPSK(1,24)	0.205	0.137	3.51	22.69	23.00	0.220	2025/9/23	
50%RB										
Front Side	132322/1745	5M QPSK(12,0)	0.230	0.133	-4.93	21.22	22.00	0.275	2025/9/23	
Back Side	132322/1745	5M QPSK(12,0)	0.343	0.242	-3.18	21.22	22.00	0.410	2025/9/23	
Left Side	132322/1745	5M QPSK(12,0)	0.105	0.080	-0.01	21.22	22.00	0.126	2025/9/23	
Top Side	132322/1745	5M QPSK(12,0)	0.113	0.084	-3.27	21.22	22.00	0.135	2025/9/23	

12. Simultaneous Transmission Analysis

N/A

Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

Appendix B. System Check Plots

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MEASUREMENT 1 System Performance Check - 850MHz
MEASUREMENT 2 System Performance Check - 1800MHz
MEASUREMENT 3 System Performance Check - 1900MHz
MEASUREMENT 4 System Performance Check - 2600MHz

MEASUREMENT 1

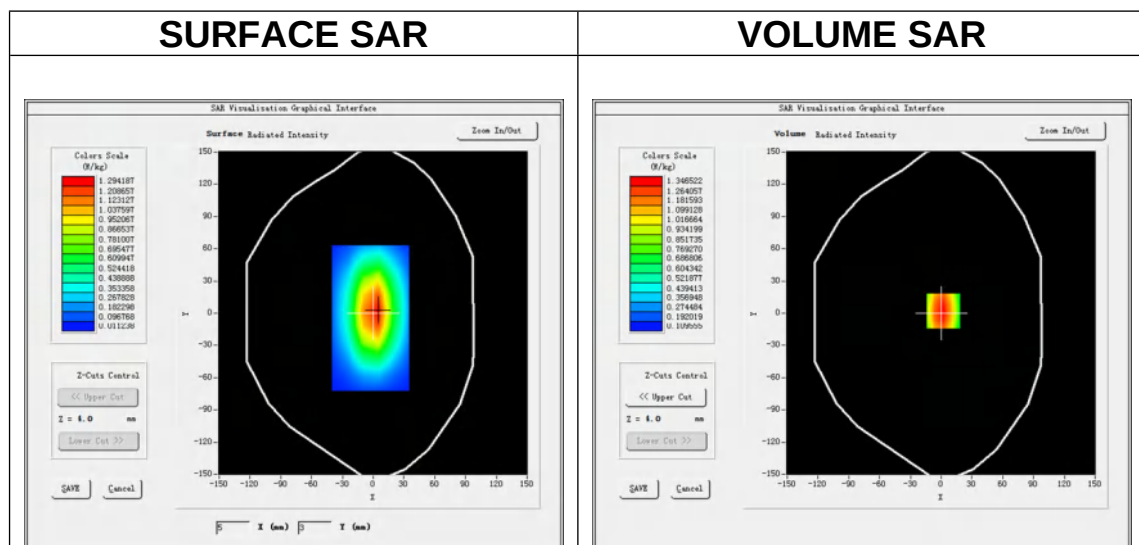
Date of measurement: 22/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW835</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>1.66</u>

B. SAR Measurement Results

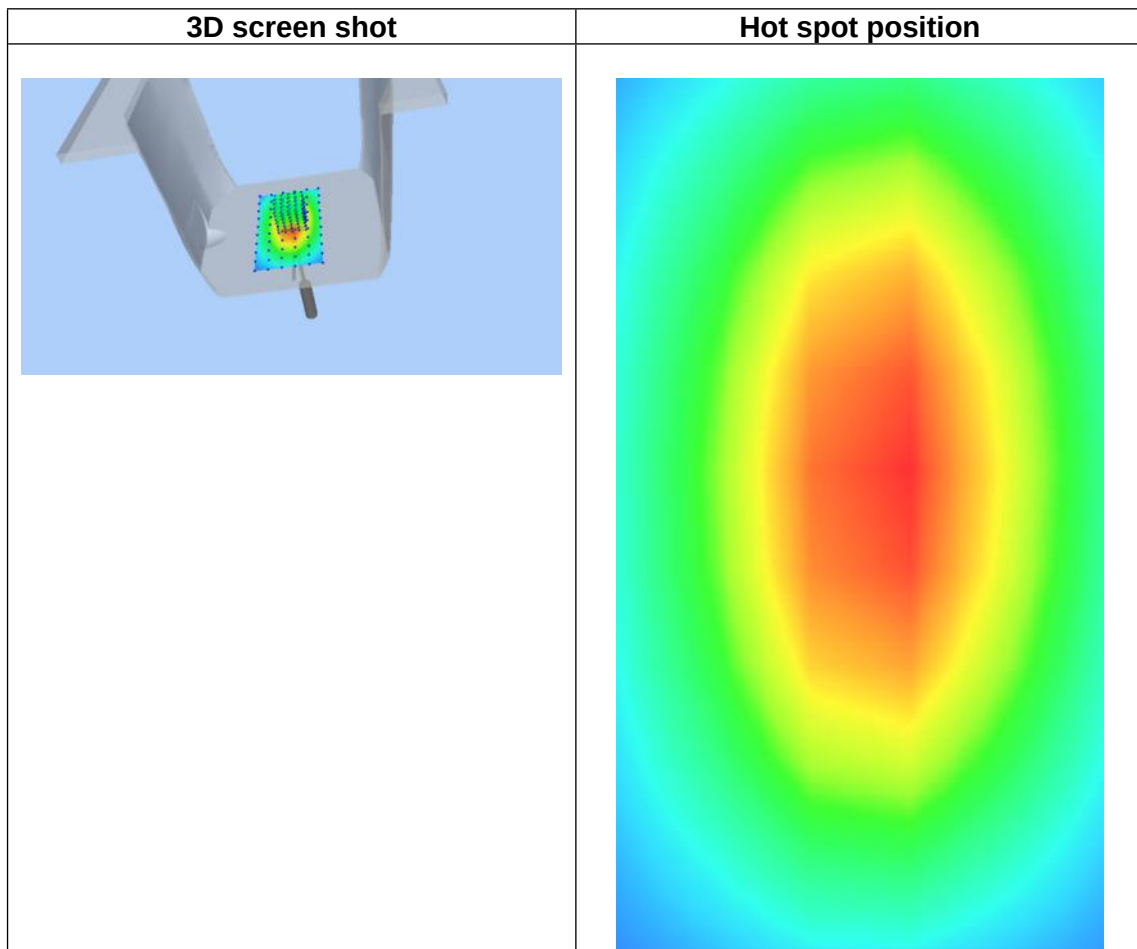
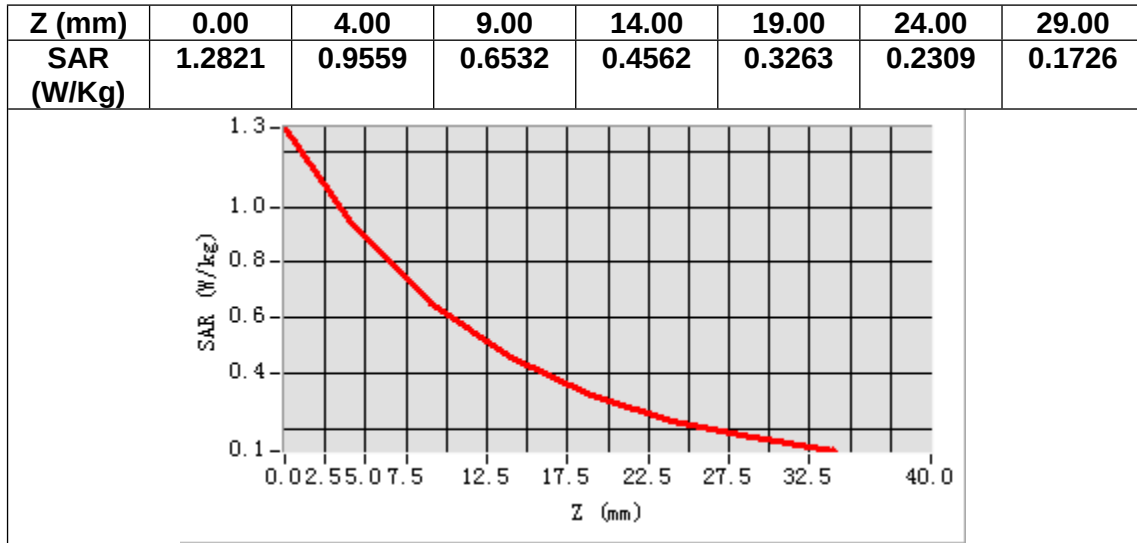
Frequency (MHz)	835.000000
Relative permittivity (real part)	42.012031
Relative permittivity (imaginary part)	19.131021
Conductivity (S/m)	0.941030
Variation (%)	0.310000



Maximum location: X=2.00, Y=2.00

SAR Peak: 1.87 W/kg

SAR 10g (W/Kg)	0.612031
SAR 1g (W/Kg)	1.011231



MEASUREMENT 2

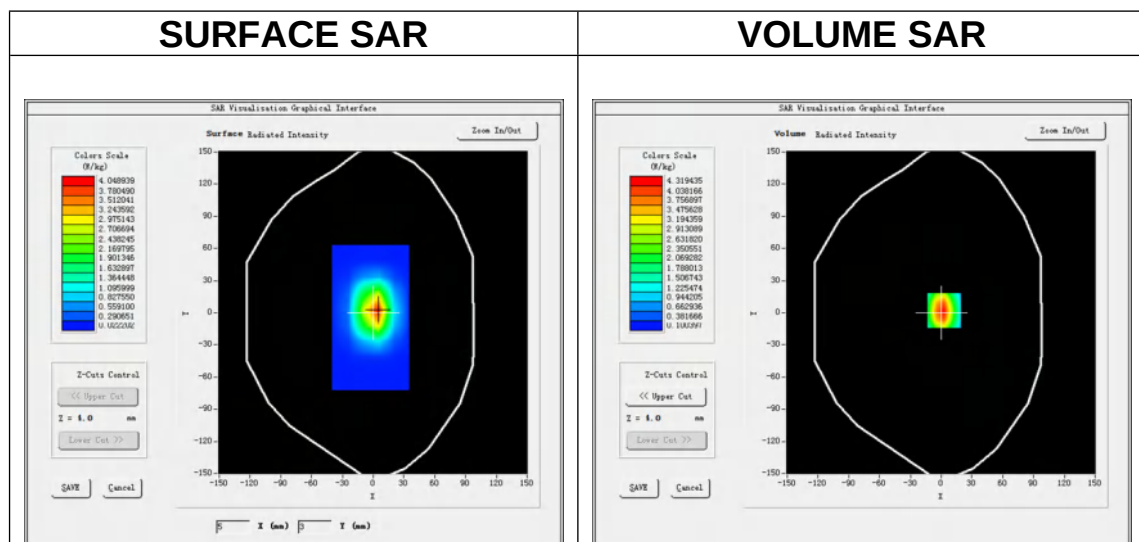
Date of measurement: 23/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW1800</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.05</u>

B. SAR Measurement Results

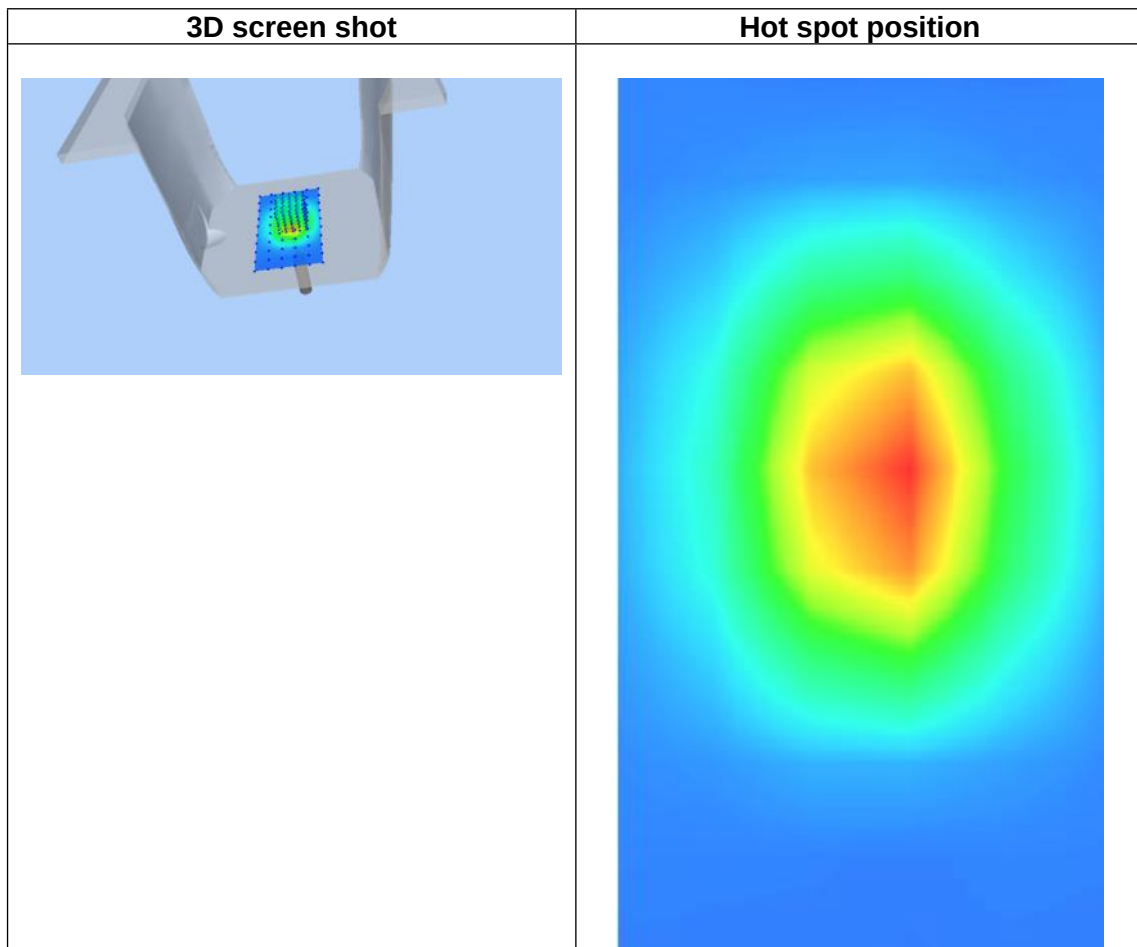
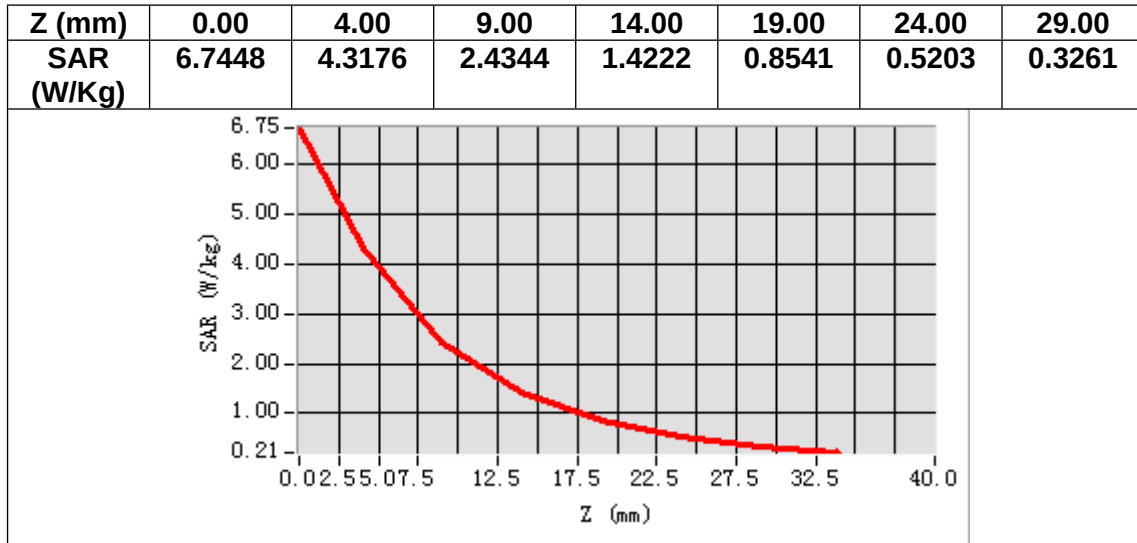
Frequency (MHz)	1800.000000
Relative permittivity (real part)	39.606403
Relative permittivity (imaginary part)	14.067180
Conductivity (S/m)	1.406718
Variation (%)	-0.140000



Maximum location: X=3.00, Y=2.00

SAR Peak: 6.82 W/kg

SAR 10g (W/Kg)	2.024557
SAR 1g (W/Kg)	3.832112



MEASUREMENT 3

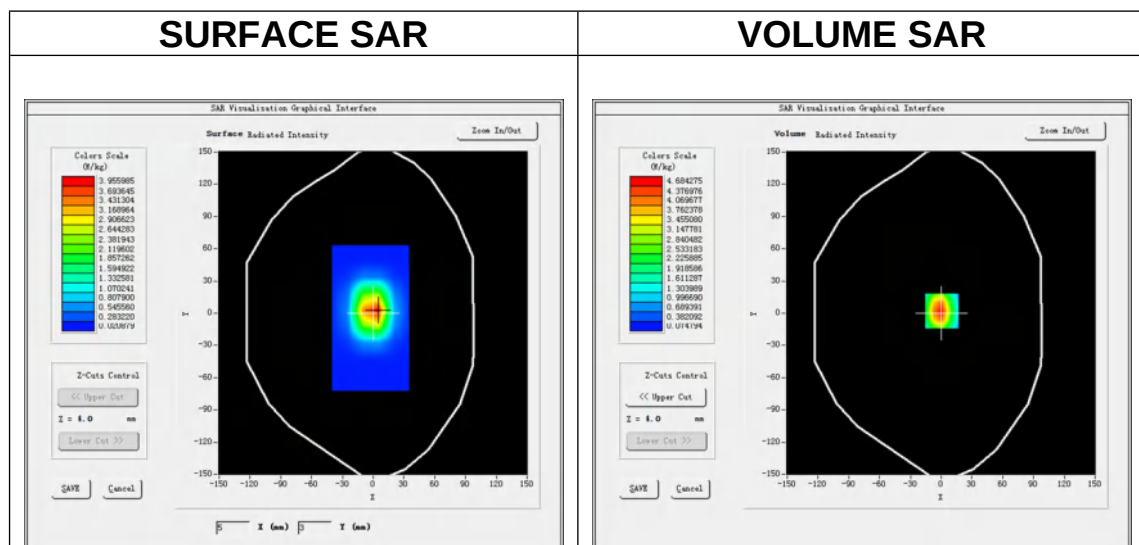
Date of measurement: 24/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW1900</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.05</u>

B. SAR Measurement Results

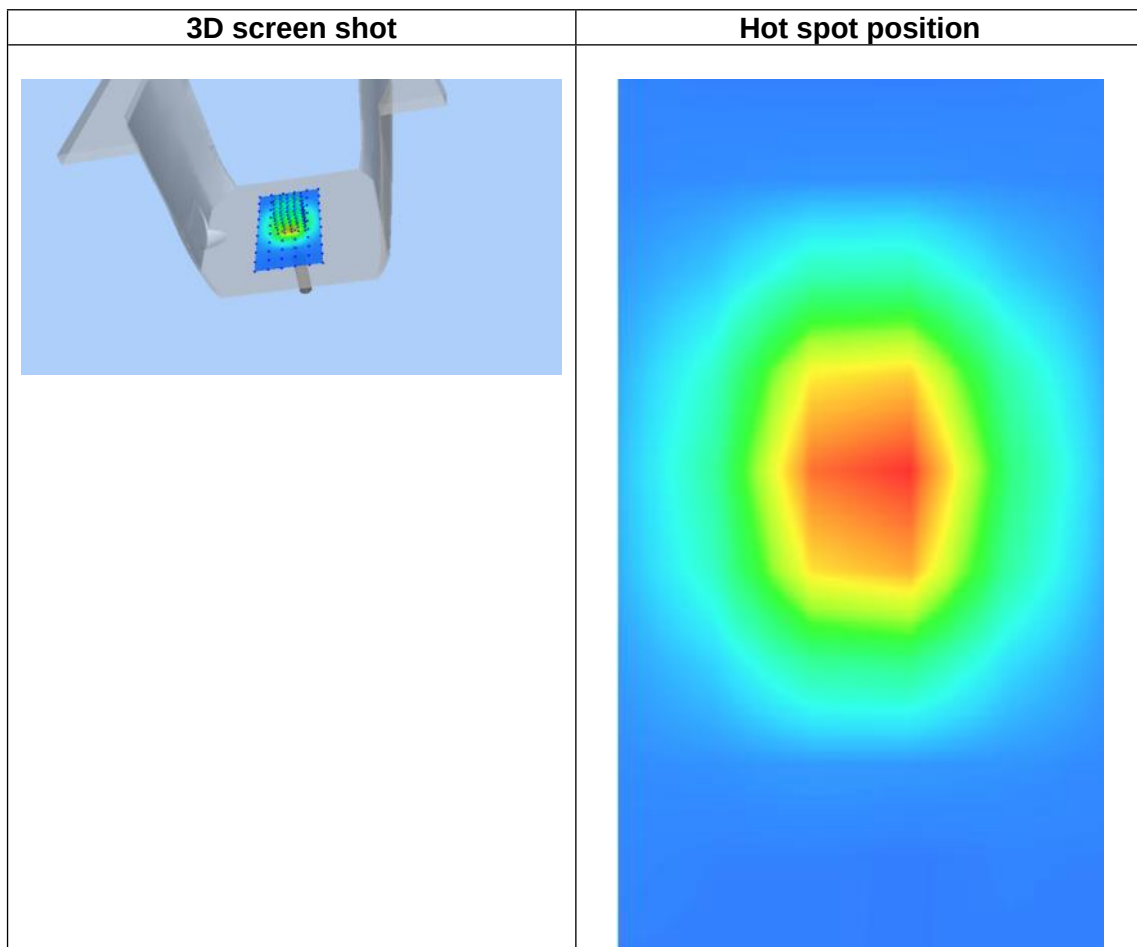
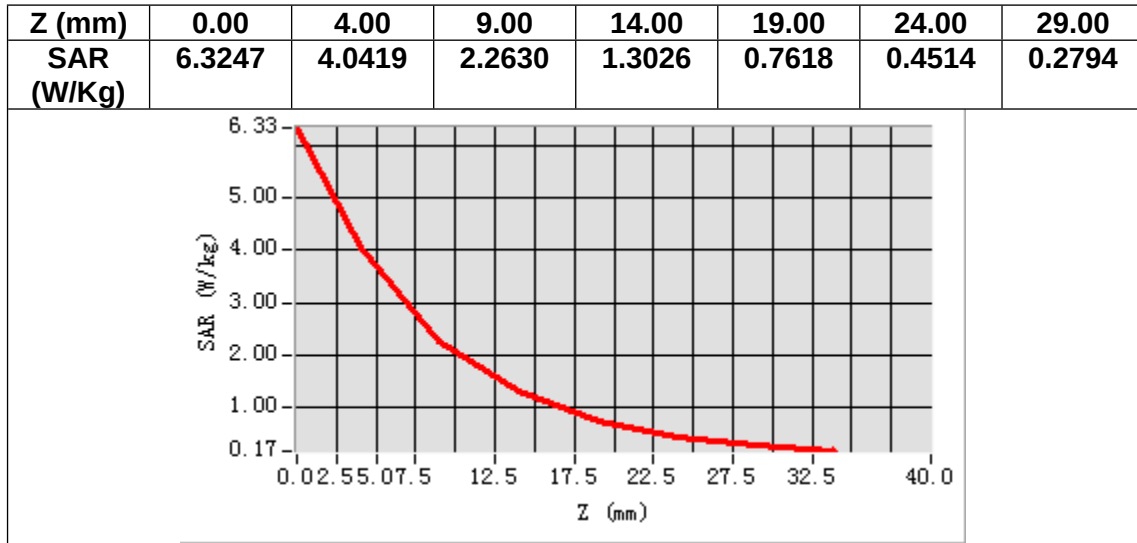
Frequency (MHz)	1900.000000
Relative permittivity (real part)	41.420140
Relative permittivity (imaginary part)	12.570123
Conductivity (S/m)	1.390503
Variation (%)	-0.440000



Maximum location: X=1.00, Y=2.00

SAR Peak: 7.65 W/kg

SAR 10g (W/Kg)	2.153165
SAR 1g (W/Kg)	4.153568



MEASUREMENT 4

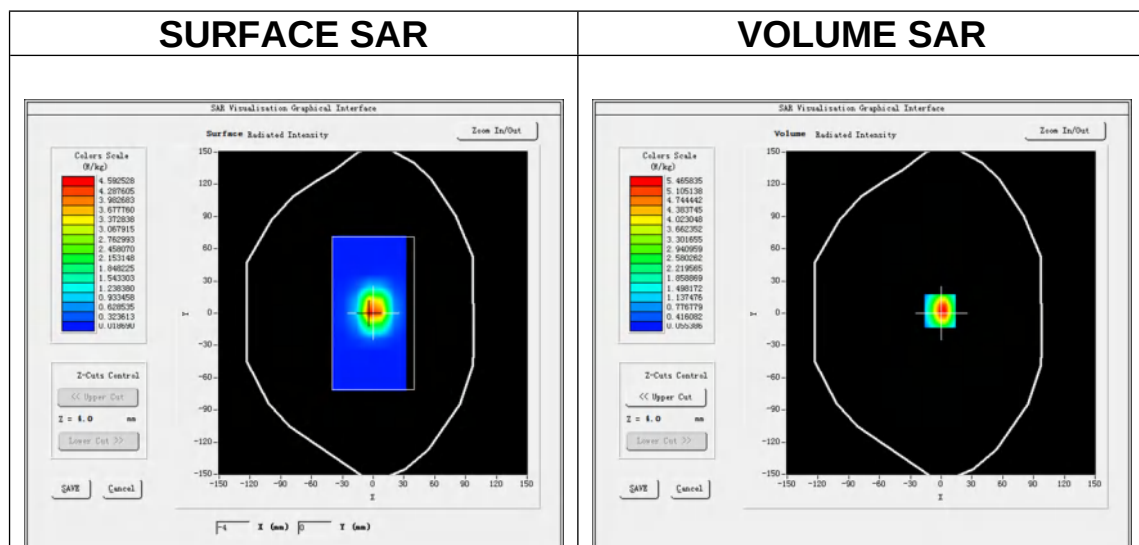
Date of measurement: 25/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW2600</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.35</u>

B. SAR Measurement Results

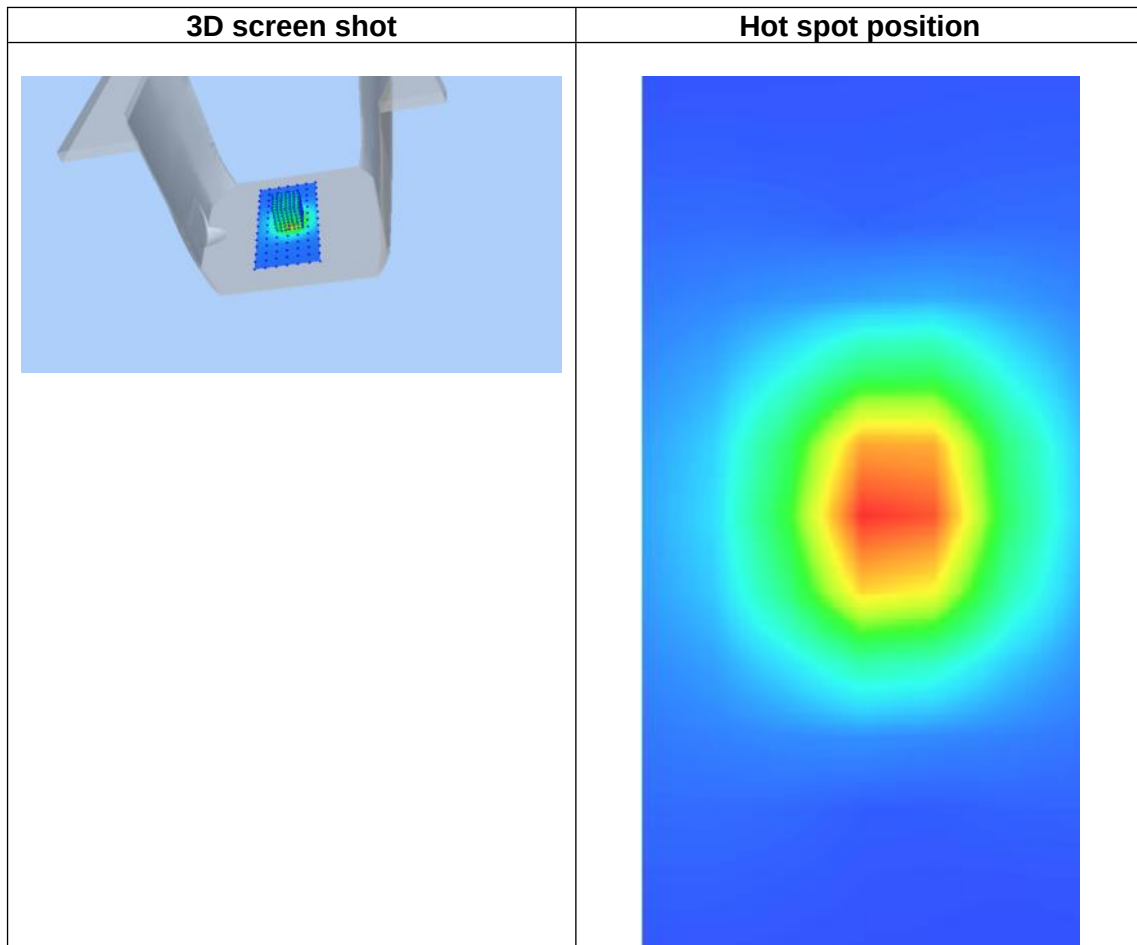
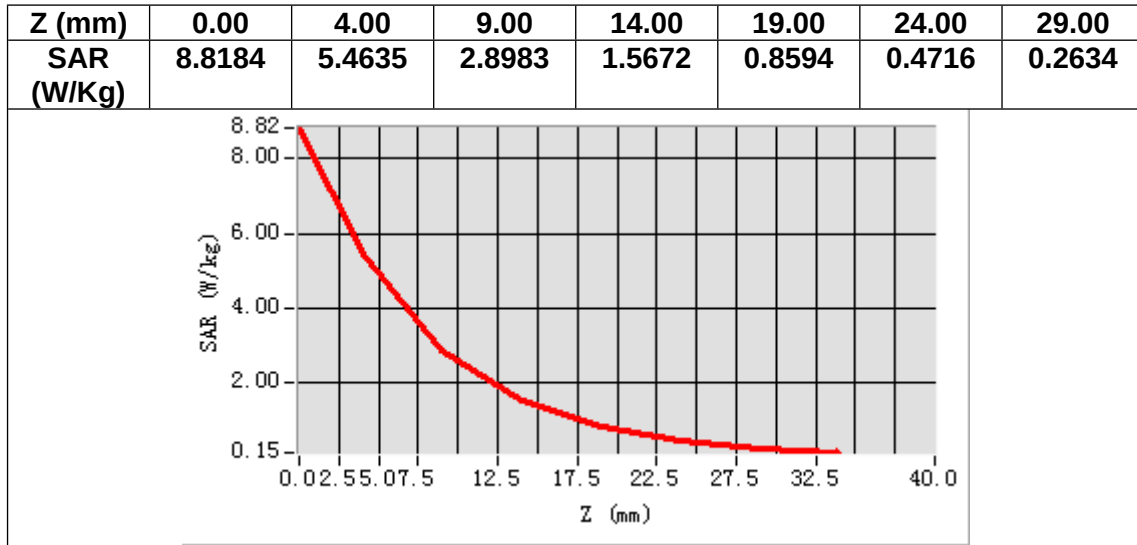
Frequency (MHz)	2600.000000
Relative permittivity (real part)	39.432362
Relative permittivity (imaginary part)	13.768602
Conductivity (S/m)	1.988798
Variation (%)	-3.980000



Maximum location: X=-1.00, Y=2.00

SAR Peak: 9.07 W/kg

SAR 10g (W/Kg)	2.523157
SAR 1g (W/Kg)	5.432595



Appendix C. SAR Test Plots

Table of contents
MEASUREMENT 1 LTE Band 2 Head
MEASUREMENT 2 LTE Band 2 Body
MEASUREMENT 3 LTE Band 4 Head
MEASUREMENT 4 LTE Band 4 Body
MEASUREMENT 5 LTE Band 5 Head
MEASUREMENT 6 LTE Band 5 Body
MEASUREMENT 7 LTE Band 7 Head
MEASUREMENT 8 LTE Band 7 Body
MEASUREMENT 9 LTE Band 66 Head
MEASUREMENT 10 LTE Band 66 Body

MEASUREMENT 1

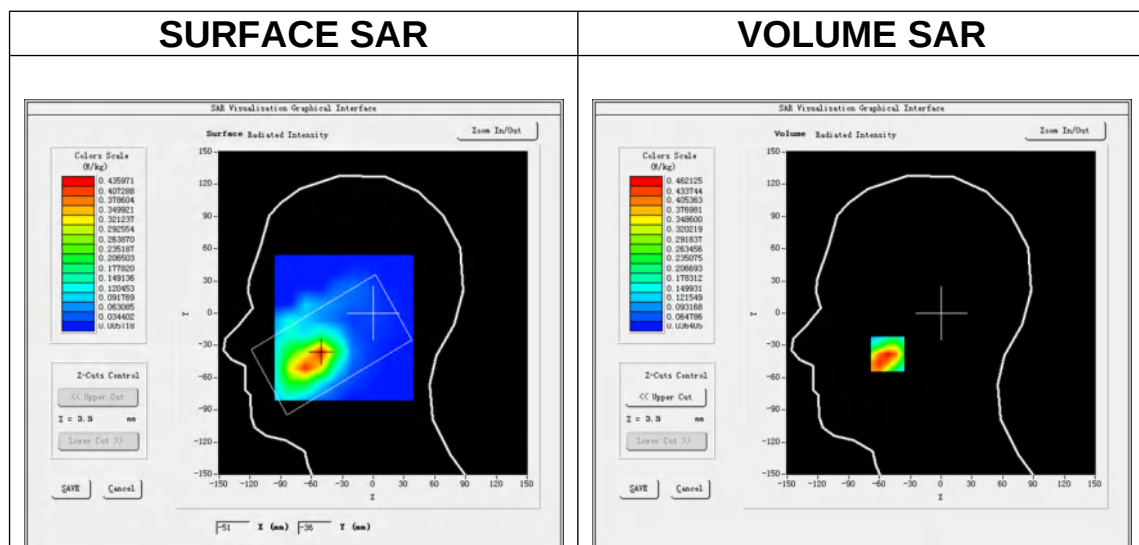
Date of measurement: 24/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 2</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.05</u>

B. SAR Measurement Results

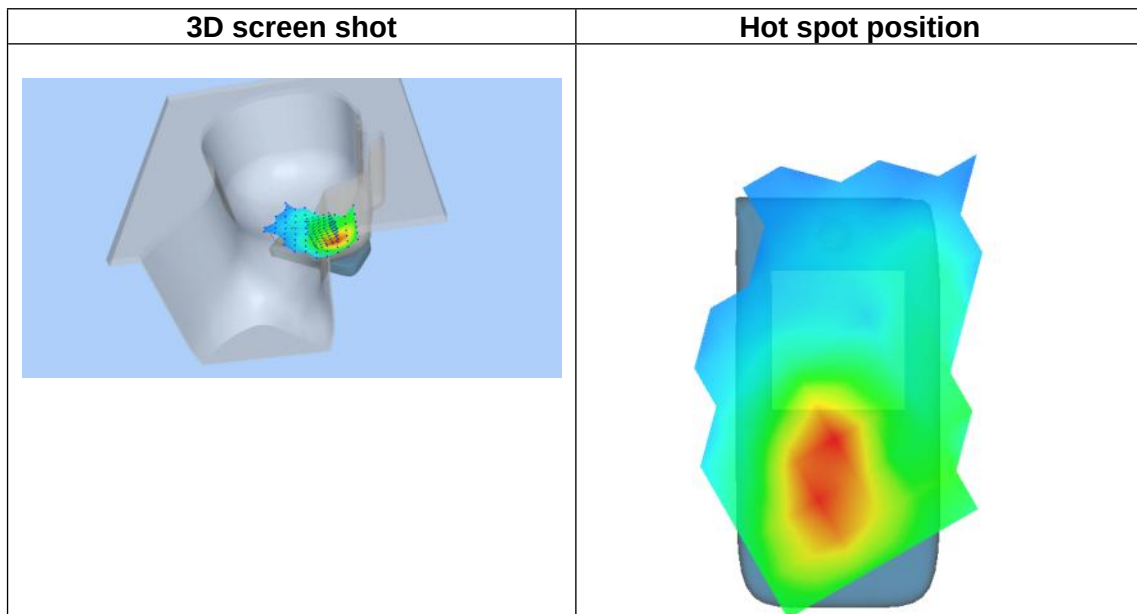
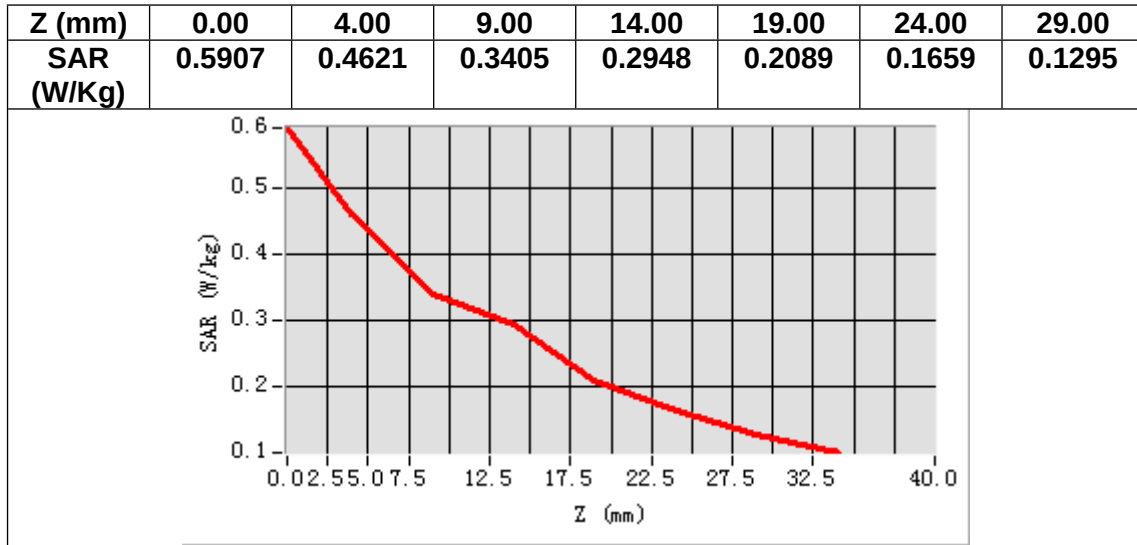
Frequency (MHz)	1879.500000
Relative permittivity (real part)	40.000000
Relative permittivity (imaginary part)	13.411700
Conductivity (S/m)	1.400405
Variation (%)	1.630000



Maximum location: X=-52.00, Y=-38.00

SAR Peak: 0.62 W/kg

SAR 10g (W/Kg)	0.288131
SAR 1g (W/Kg)	0.433365



MEASUREMENT 2

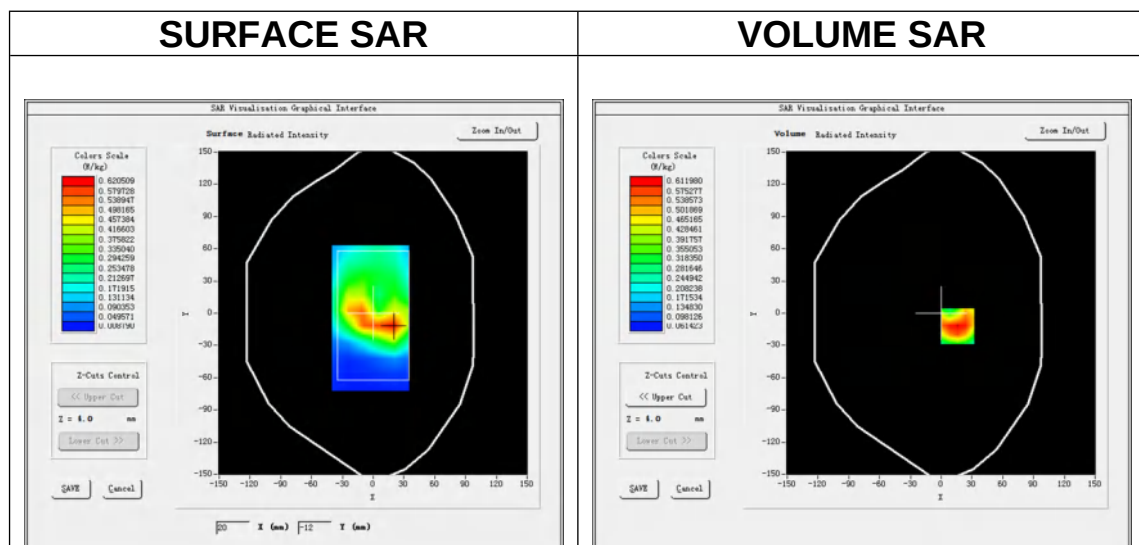
Date of measurement: 24/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 2</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.05</u>

B. SAR Measurement Results

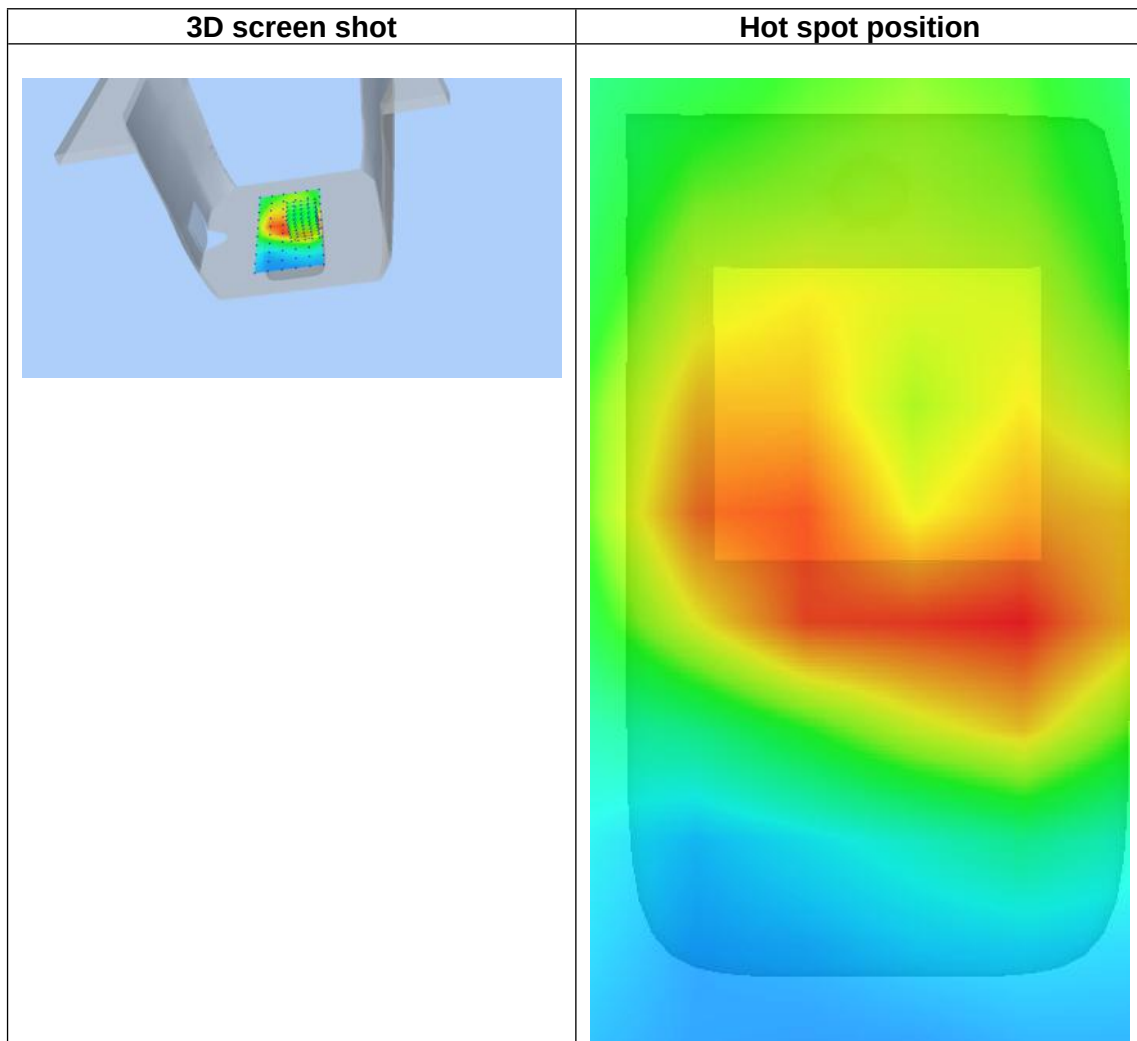
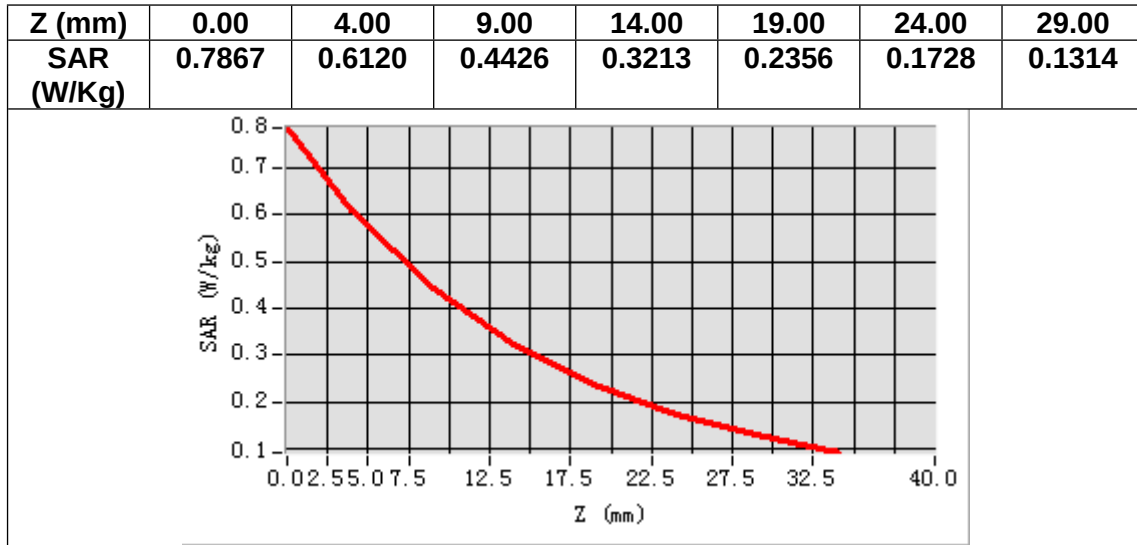
Frequency (MHz)	1879.500000
Relative permittivity (real part)	40.000000
Relative permittivity (imaginary part)	13.411700
Conductivity (S/m)	1.400405
Variation (%)	-4.800000



Maximum location: X=16.00, Y=-12.00

SAR Peak: 0.80 W/kg

SAR 10g (W/Kg)	0.385114
SAR 1g (W/Kg)	0.587623



MEASUREMENT 3

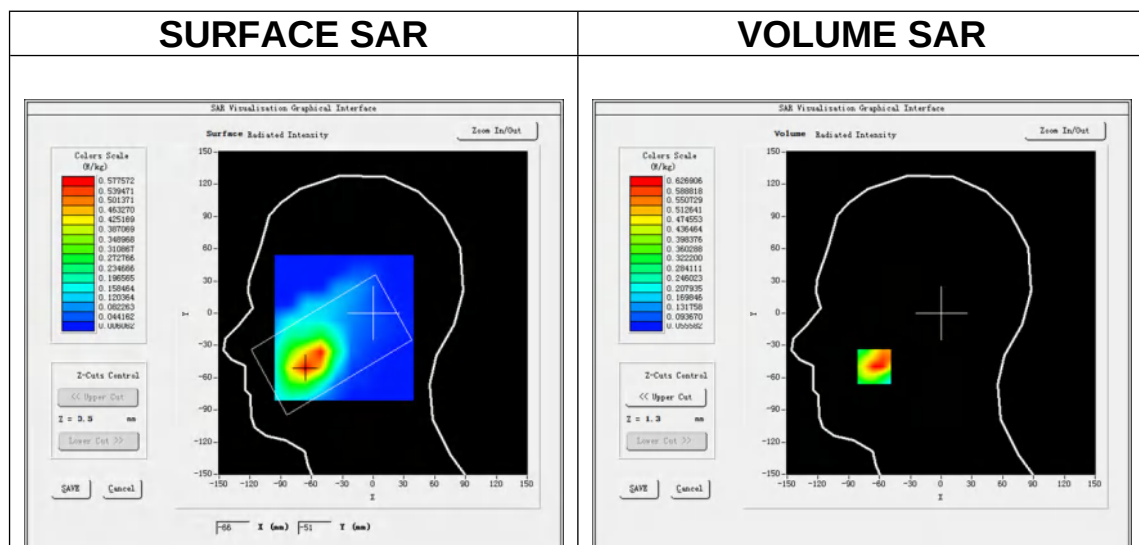
Date of measurement: 23/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 4</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.09</u>

B. SAR Measurement Results

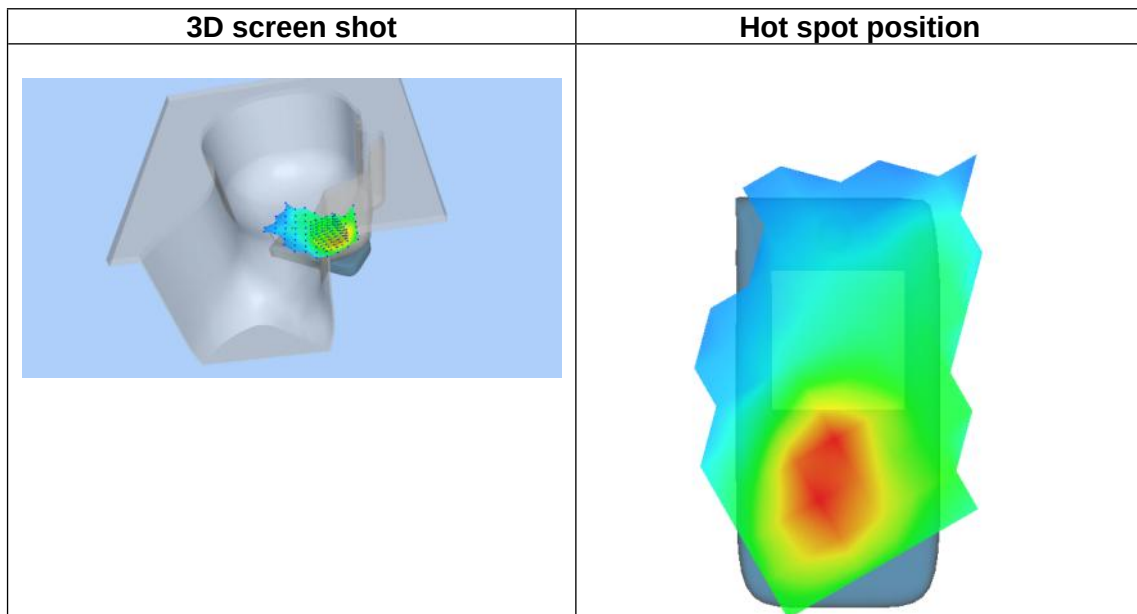
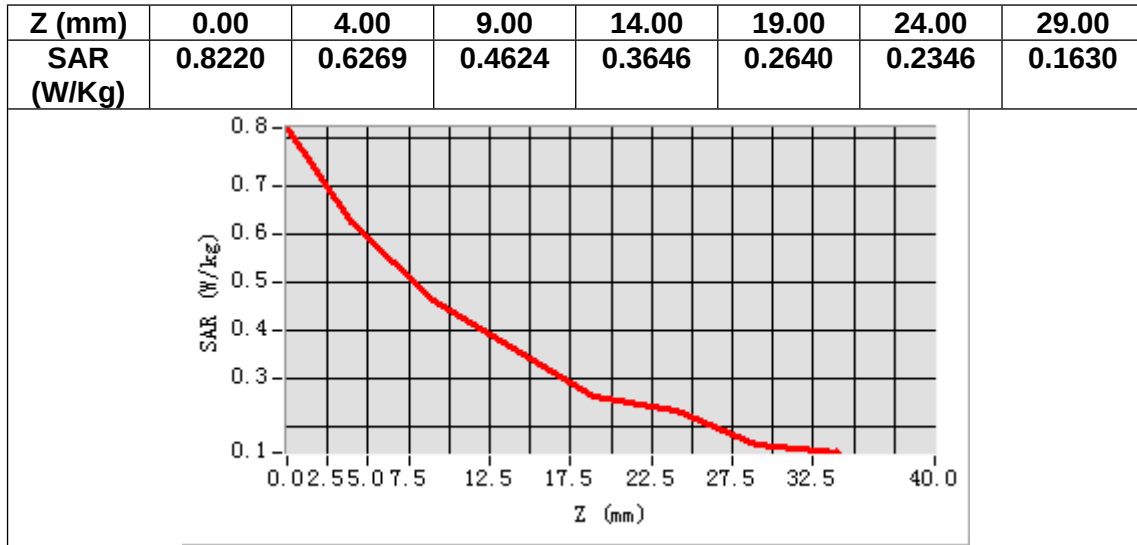
Frequency (MHz)	1732.500000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-1.540000



Maximum location: X=-65.00, Y=-50.00

SAR Peak: 0.88 W/kg

SAR 10g (W/Kg)	0.411679
SAR 1g (W/Kg)	0.603014



MEASUREMENT 4

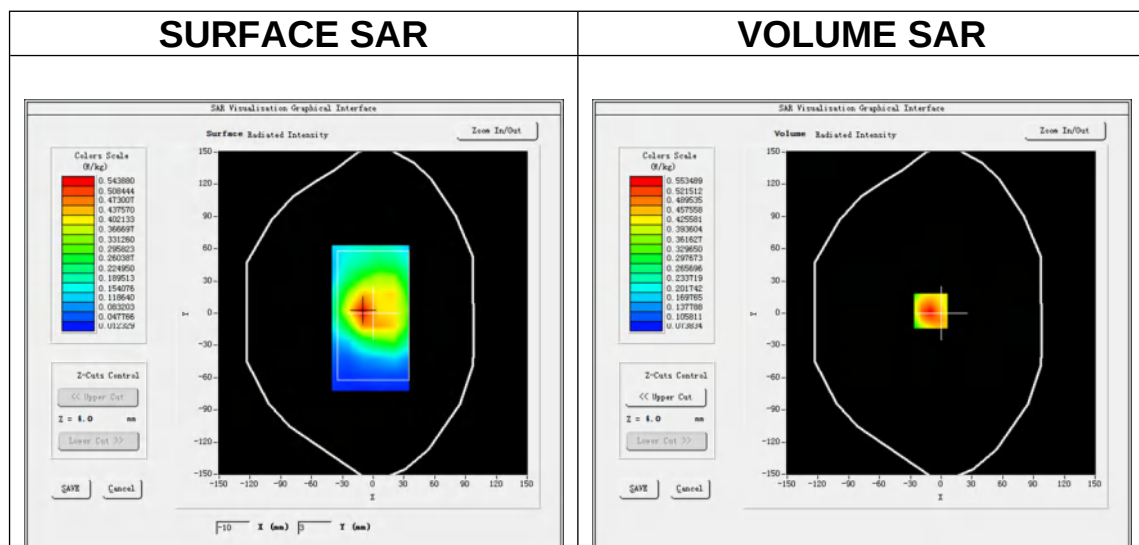
Date of measurement: 23/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 4</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.09</u>

B. SAR Measurement Results

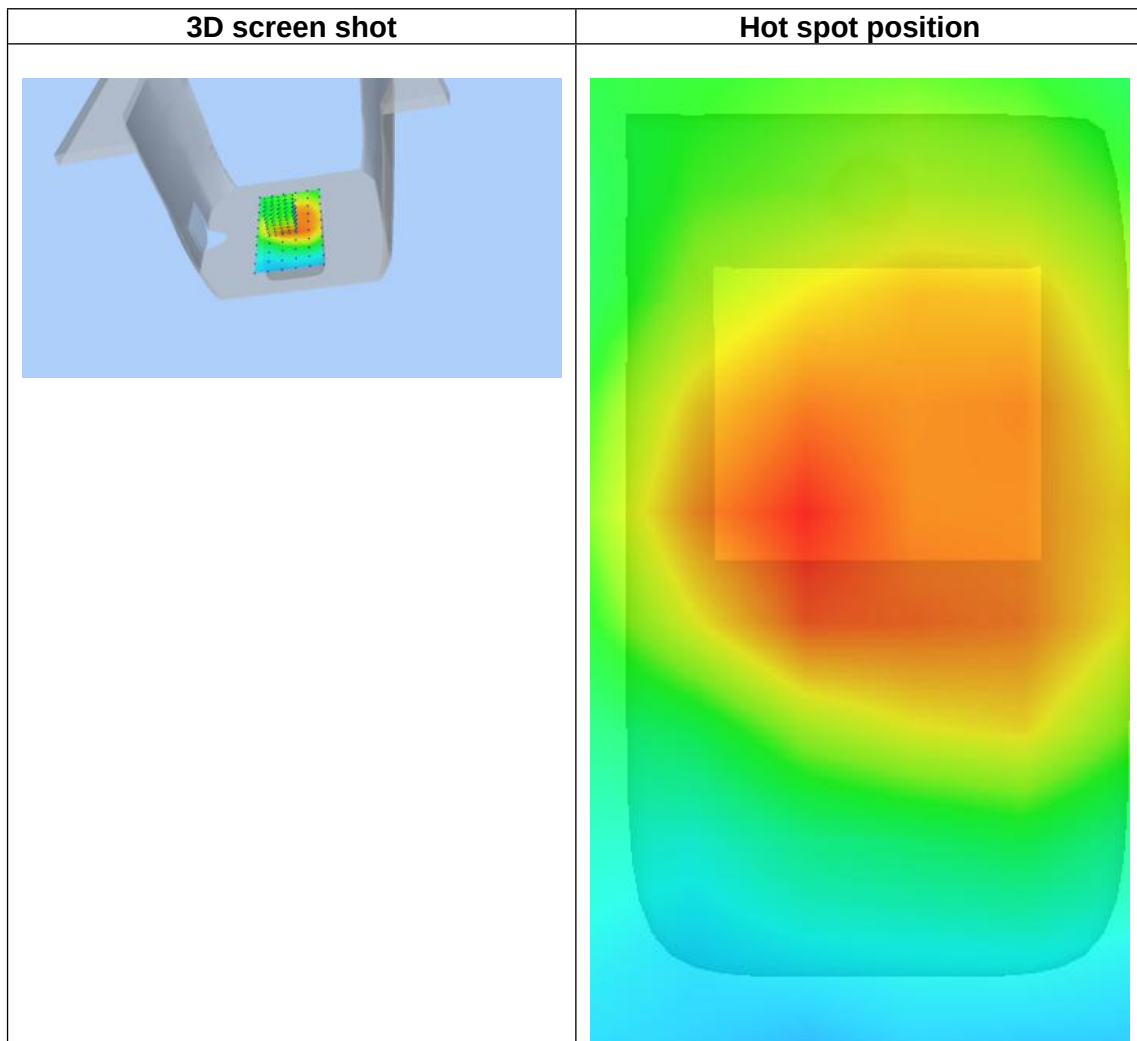
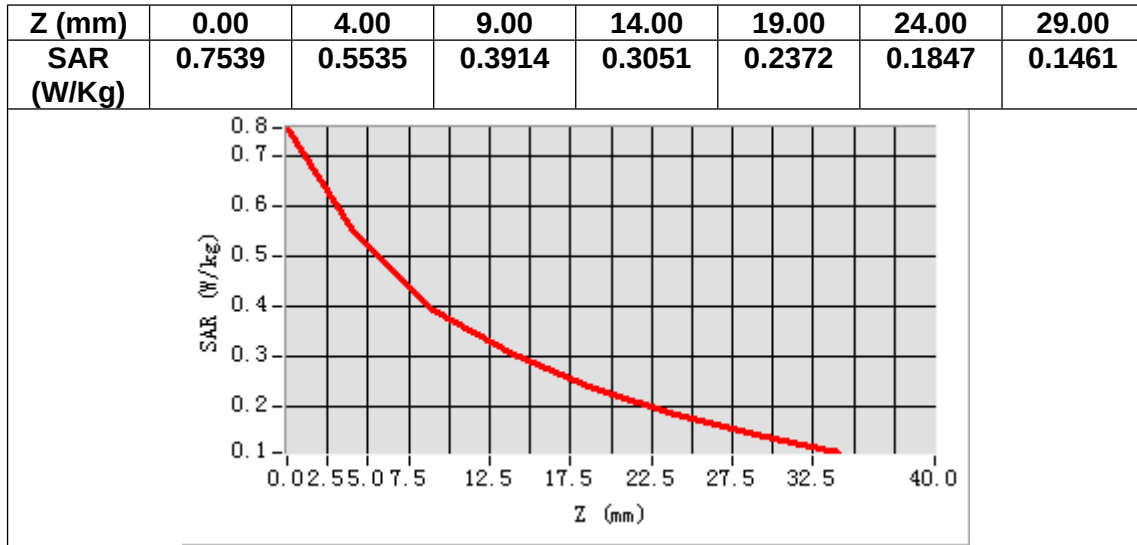
Frequency (MHz)	1732.500000
Relative permittivity (real part)	40.115910
Relative permittivity (imaginary part)	14.136136
Conductivity (S/m)	1.360603
Variation (%)	-1.660000



Maximum location: X=-10.00, Y=2.00

SAR Peak: 0.75 W/kg

SAR 10g (W/Kg)	0.361206
SAR 1g (W/Kg)	0.528810



MEASUREMENT 5

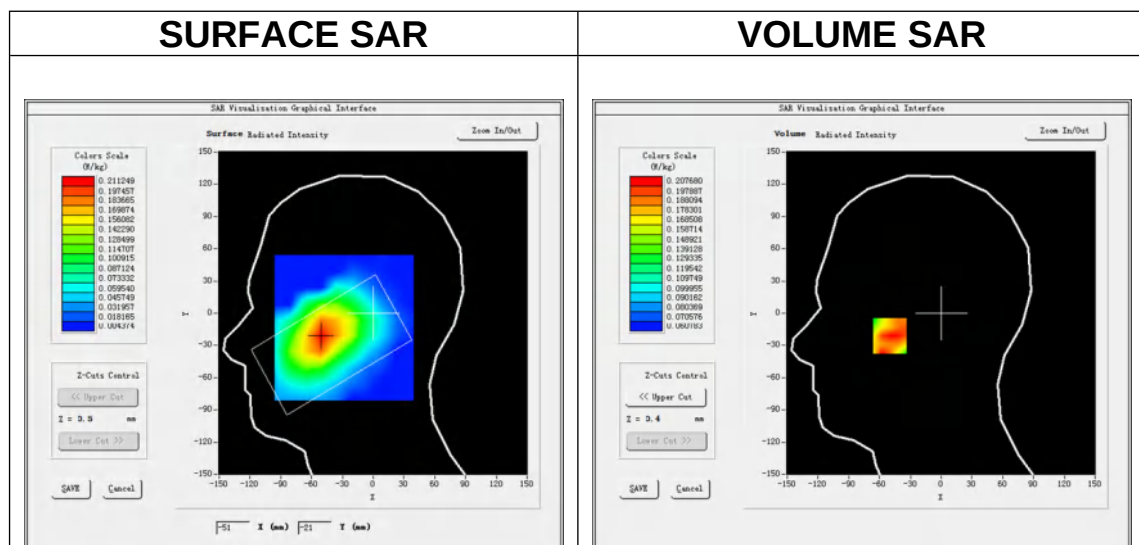
Date of measurement: 22/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 5</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>1.66</u>

B. SAR Measurement Results

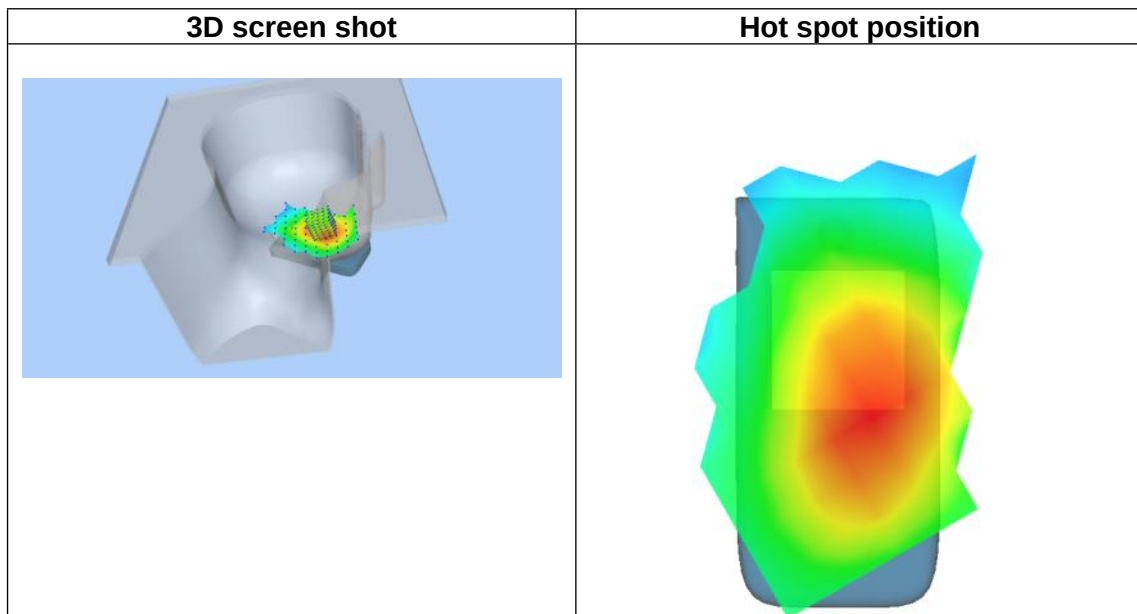
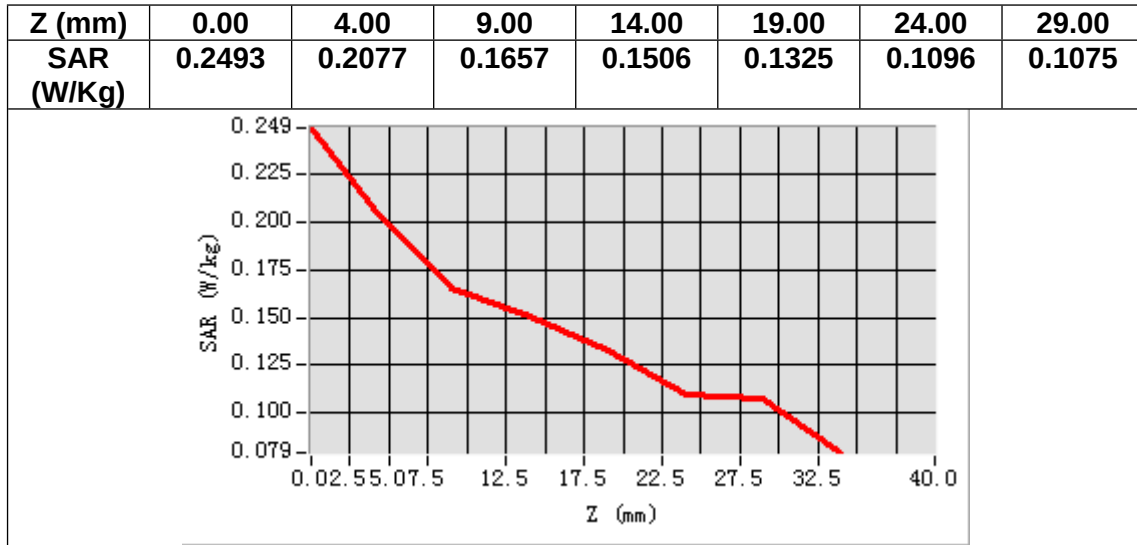
Frequency (MHz)	836.500000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901561
Variation (%)	-0.310000



Maximum location: X=-50.00, Y=-21.00

SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)	0.165465
SAR 1g (W/Kg)	0.191293



MEASUREMENT 6

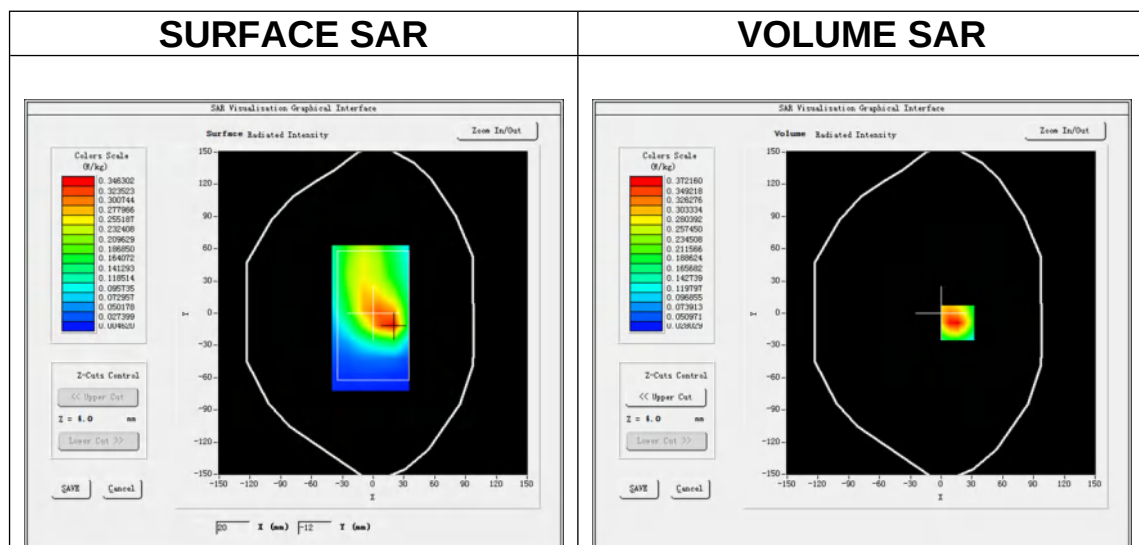
Date of measurement: 22/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 5</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>1.66</u>

B. SAR Measurement Results

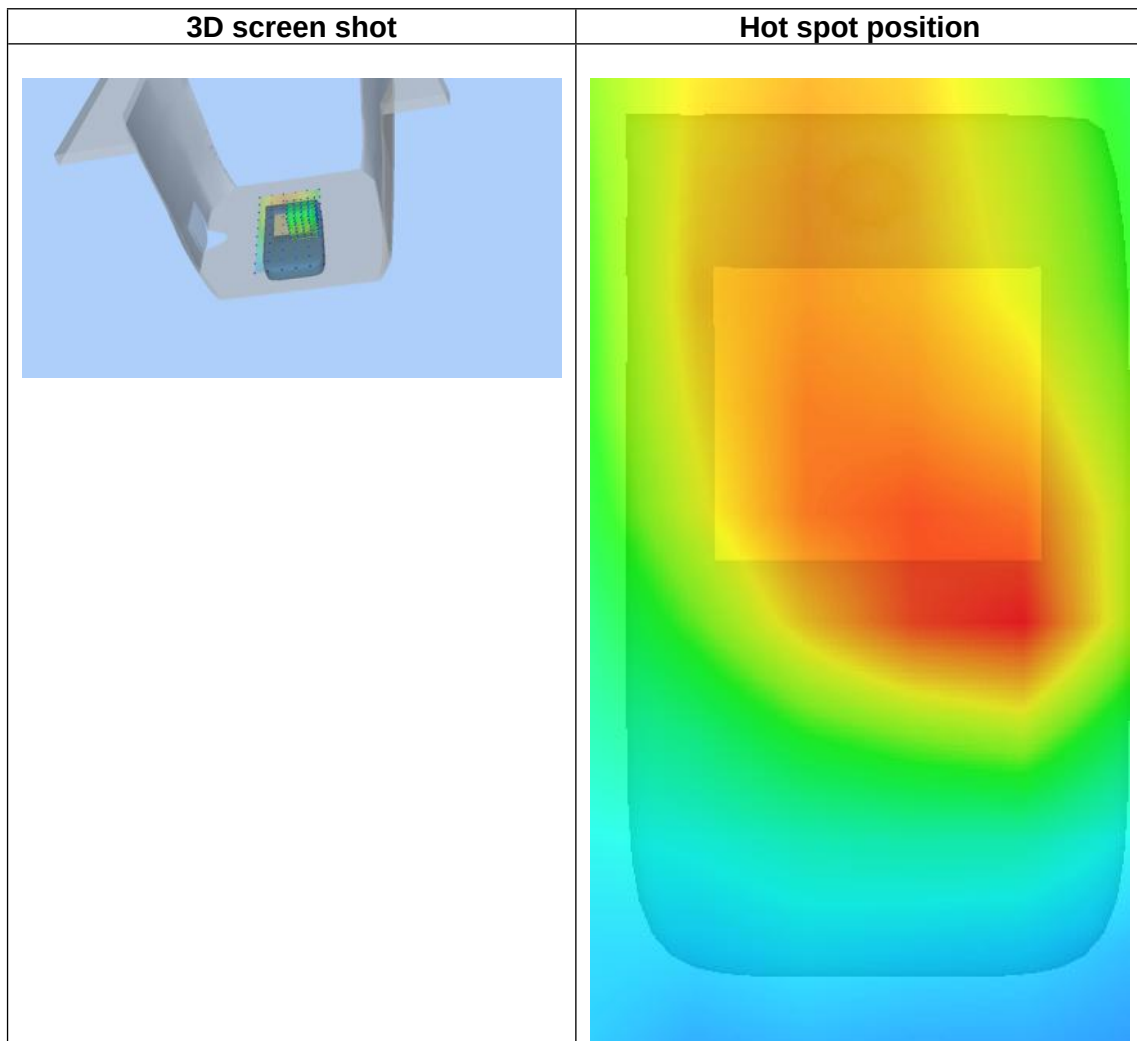
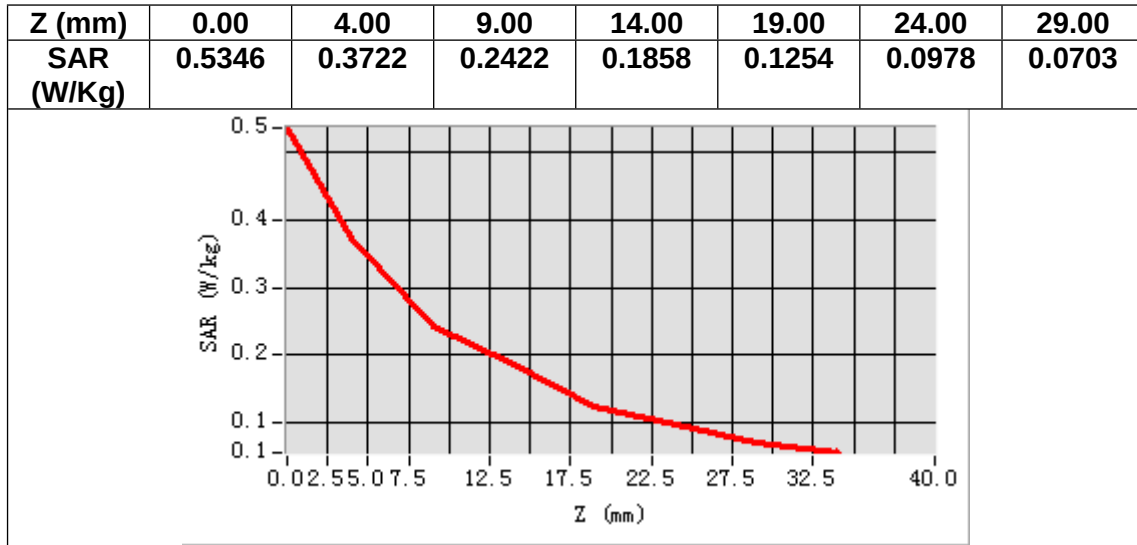
Frequency (MHz)	836.500000
Relative permittivity (real part)	41.500000
Relative permittivity (imaginary part)	19.400000
Conductivity (S/m)	0.901561
Variation (%)	-0.230000



Maximum location: X=16.00, Y=-9.00

SAR Peak: 0.54 W/kg

SAR 10g (W/Kg)	0.230917
SAR 1g (W/Kg)	0.357219



MEASUREMENT 7

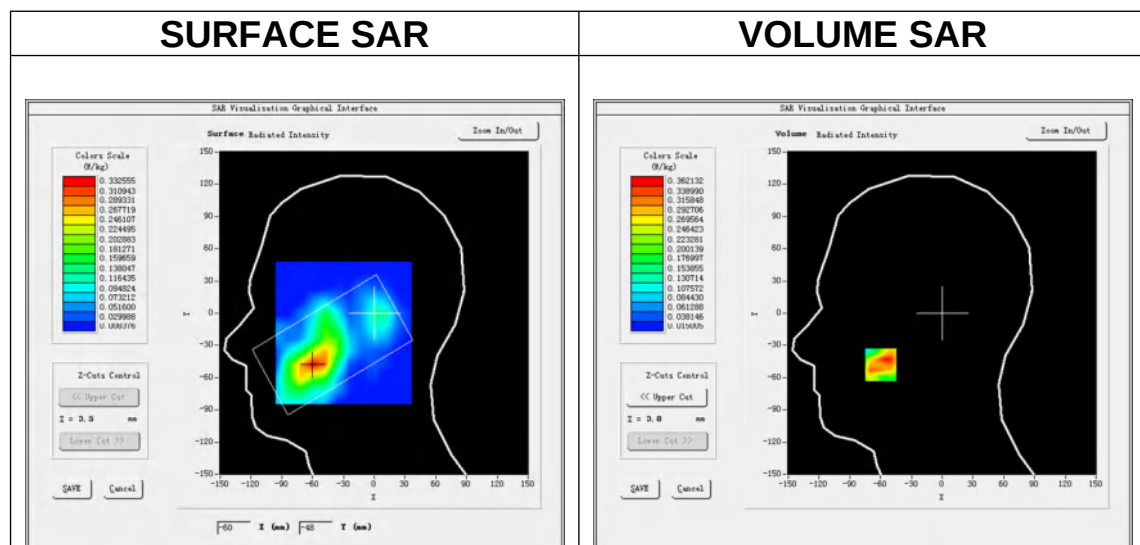
Date of measurement: 25/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>LTE band 7</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.35</u>

B. SAR Measurement Results

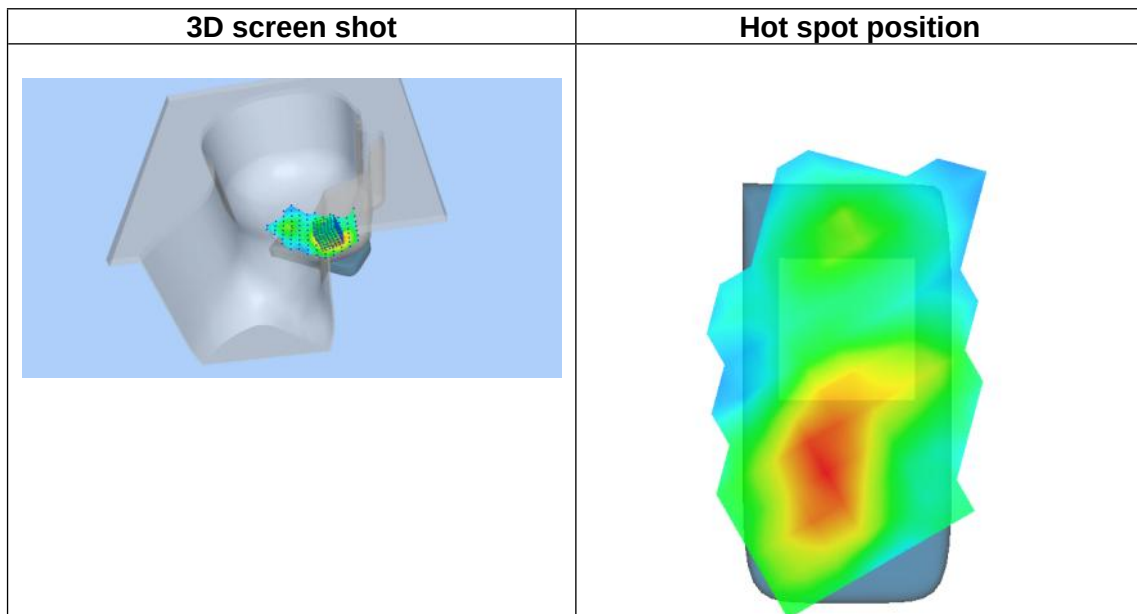
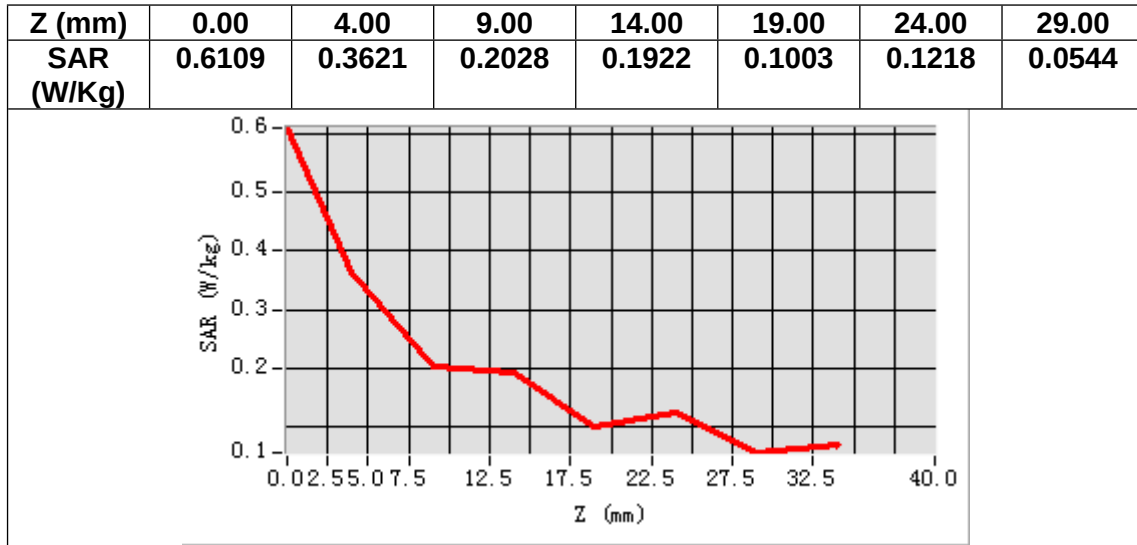
Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.086666
Relative permittivity (imaginary part)	13.418333
Conductivity (S/m)	1.889749
Variation (%)	3.090000



Maximum location: X=-60.00, Y=-48.00

SAR Peak: 0.54 W/kg

SAR 10g (W/Kg)	0.219163
SAR 1g (W/Kg)	0.332533



MEASUREMENT 8

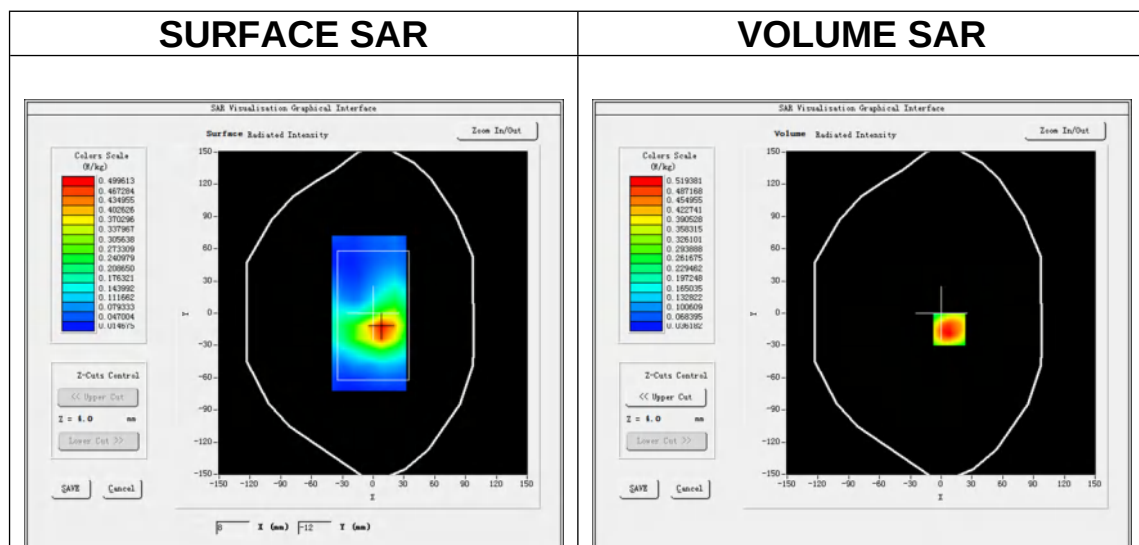
Date of measurement: 25/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=12mm dy=12mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>7x7x7,dx=5mm dy=5mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>LTE band 7</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>LTE (Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.35</u>

B. SAR Measurement Results

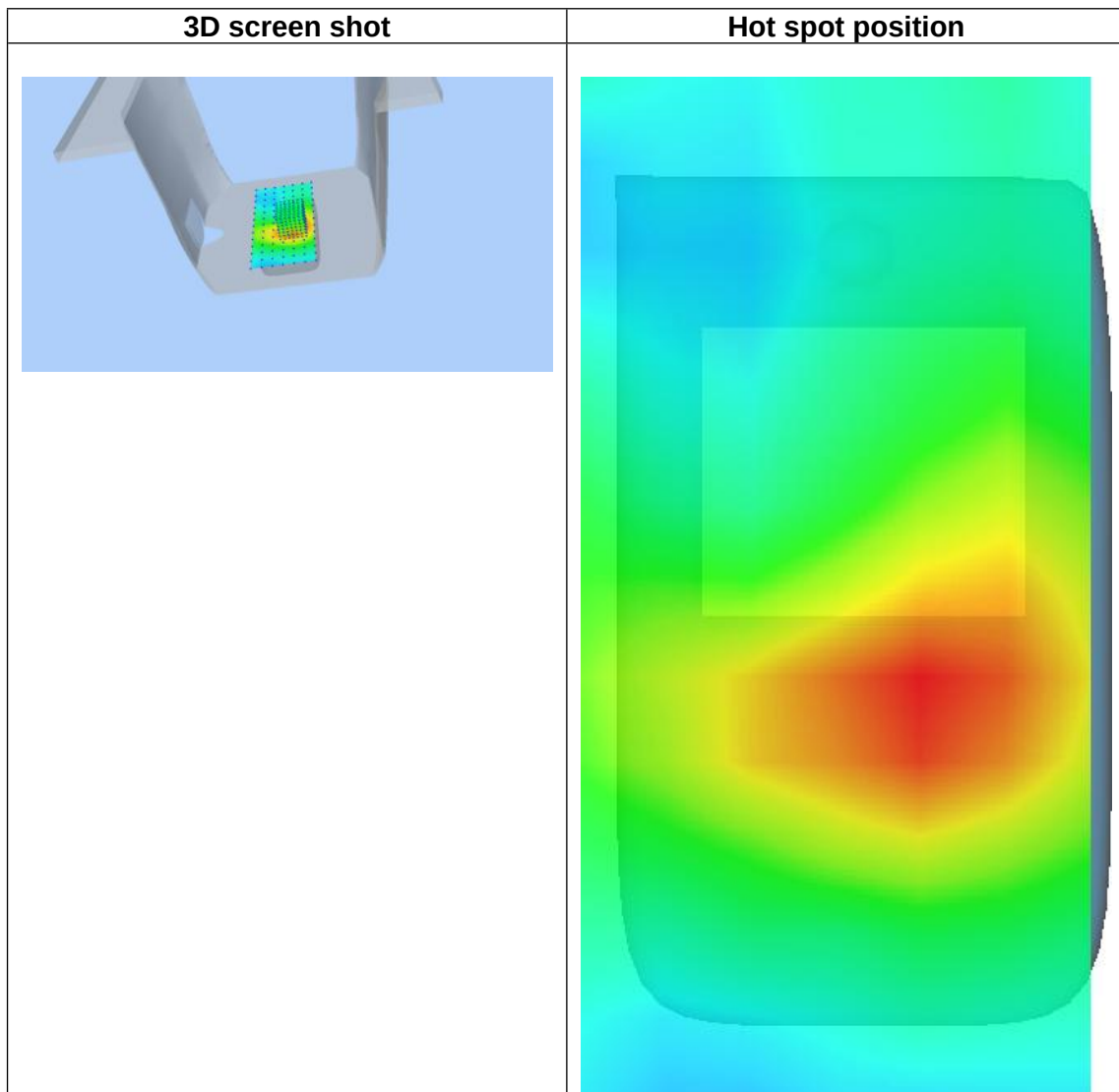
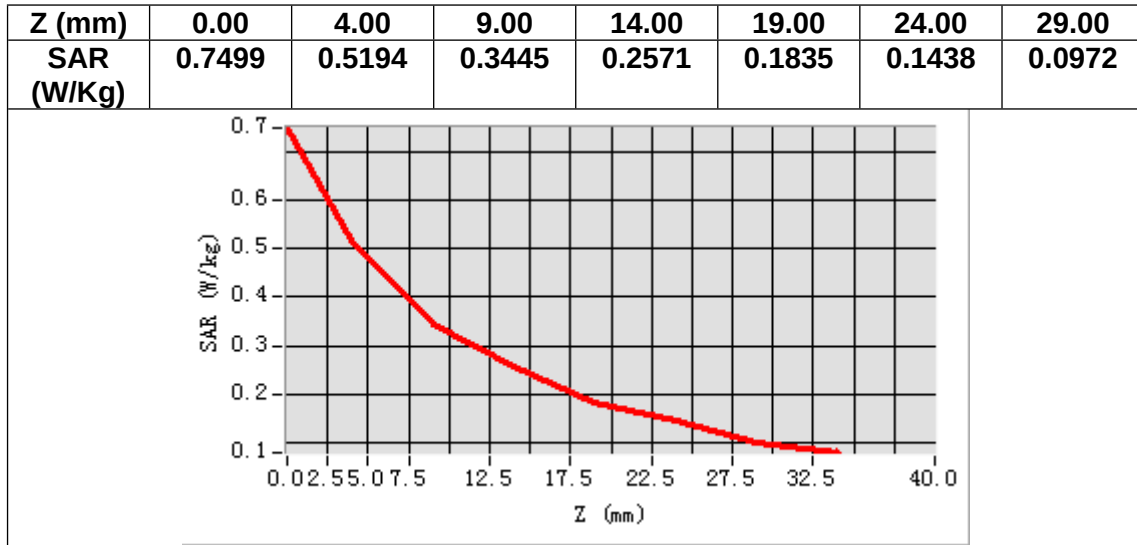
Frequency (MHz)	2535.000000
Relative permittivity (real part)	39.086666
Relative permittivity (imaginary part)	13.418333
Conductivity (S/m)	1.889749
Variation (%)	-1.360000



Maximum location: X=8.00, Y=-15.00

SAR Peak: 0.71 W/kg

SAR 10g (W/Kg)	0.321078
SAR 1g (W/Kg)	0.493592



MEASUREMENT 9

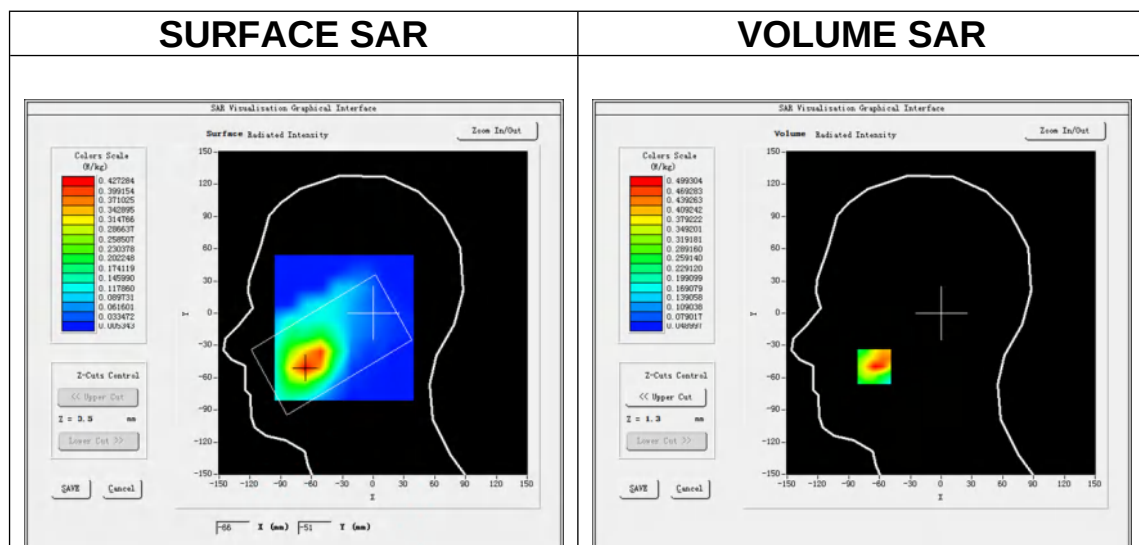
Date of measurement: 23/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7,dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Left head</u>
<u>Device Position</u>	<u>Cheek</u>
<u>Band</u>	<u>CUSTOM (LTEBand66)</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.09</u>

B. SAR Measurement Results

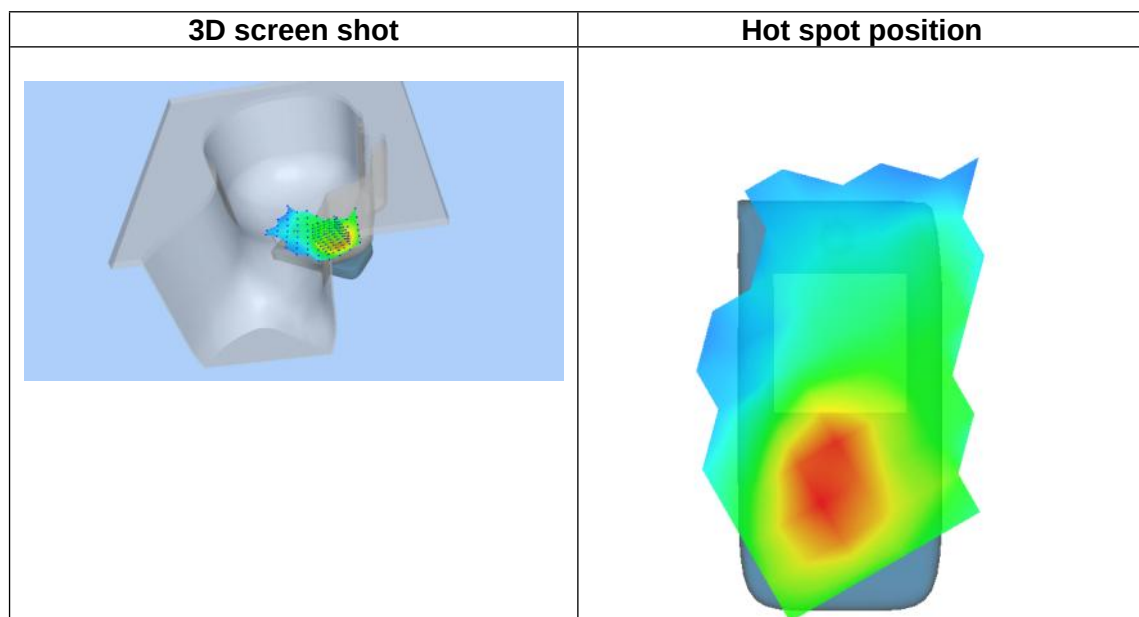
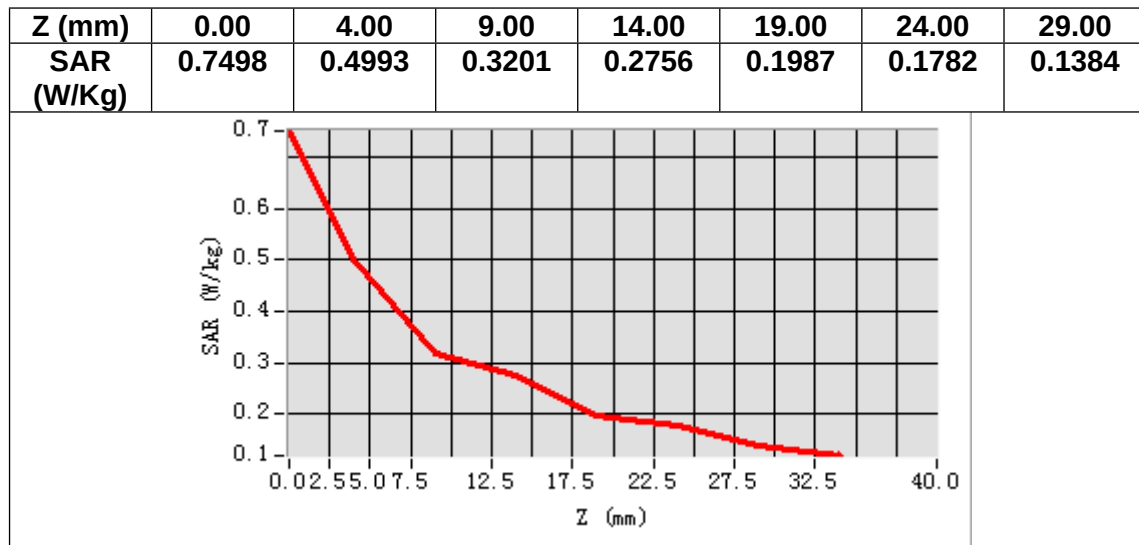
Frequency (MHz)	1745.000000
Relative permittivity (real part)	40.104546
Relative permittivity (imaginary part)	14.103182
Conductivity (S/m)	1.367225
Variation (%)	1.980000



Maximum location: X=-65.00, Y=-50.00

SAR Peak: 0.77 W/kg

SAR 10g (W/Kg)	0.318342
SAR 1g (W/Kg)	0.480786



MEASUREMENT 10

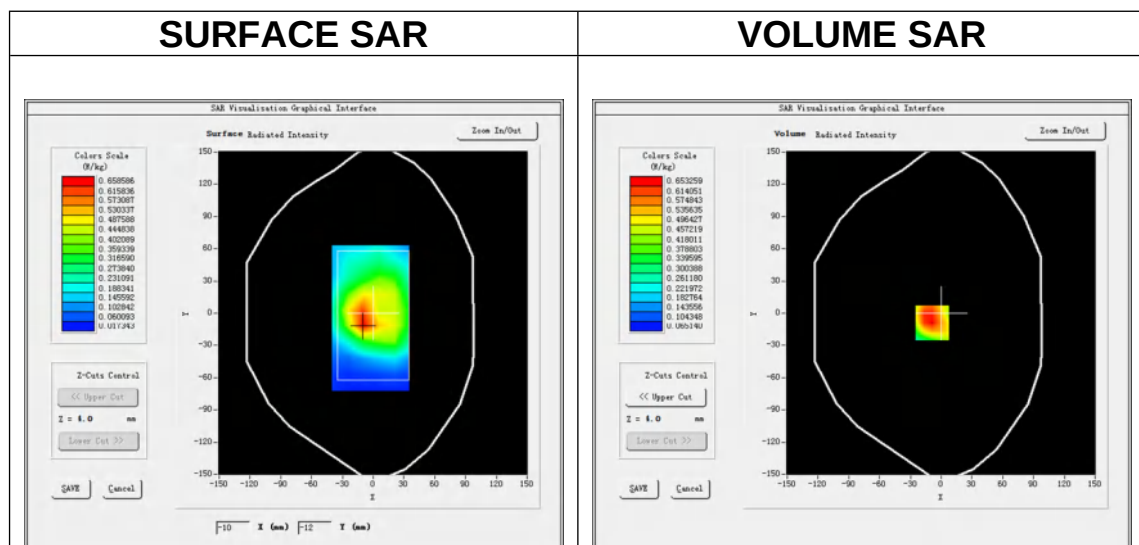
Date of measurement: 23/9/2025

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=15mm dy=15mm, h= 5.00 mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm dz=5mm</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>CUSTOM (LTEBand66)</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>(Crest factor: 1.0)</u>
<u>ConvF</u>	<u>2.09</u>

B. SAR Measurement Results

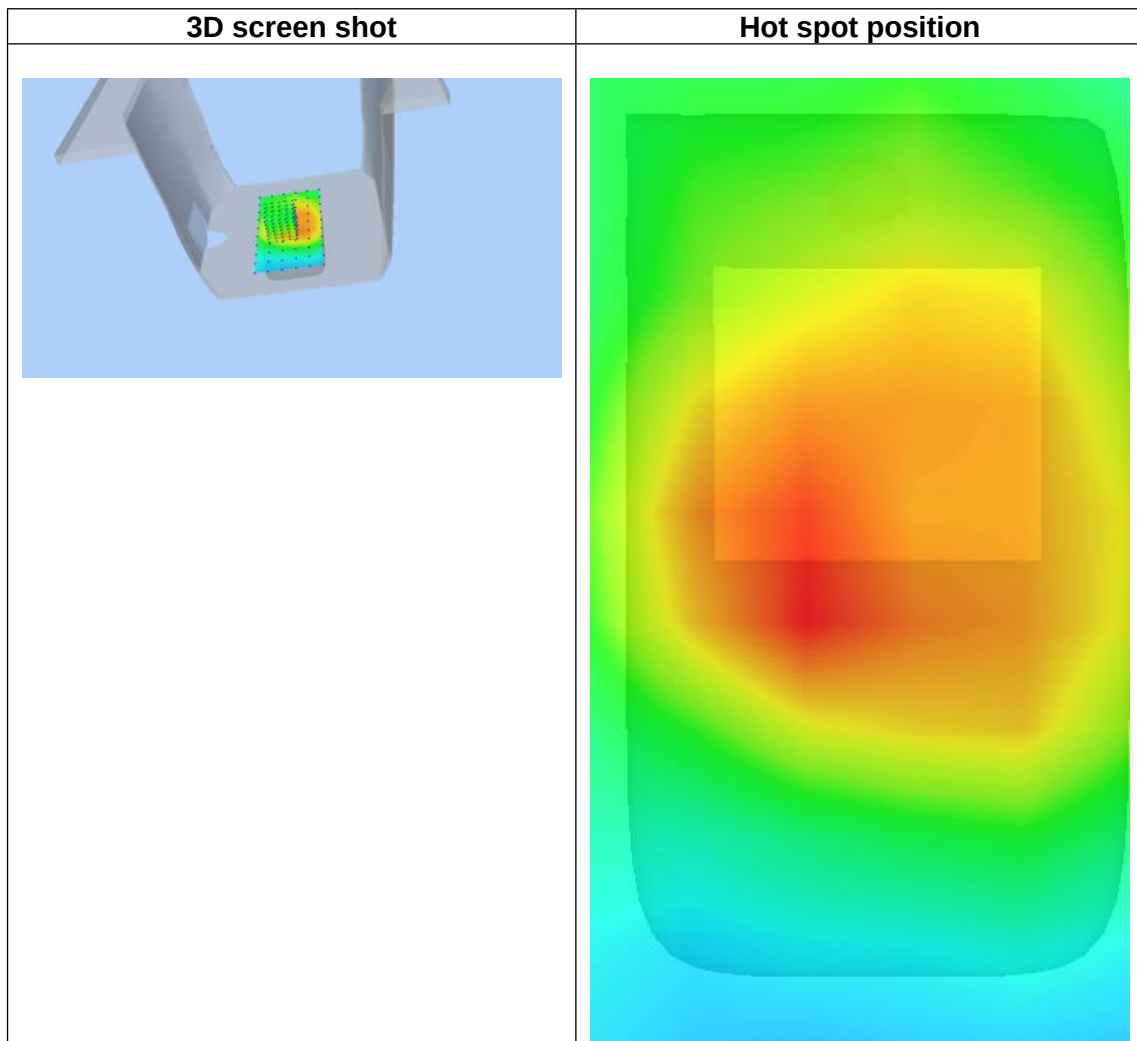
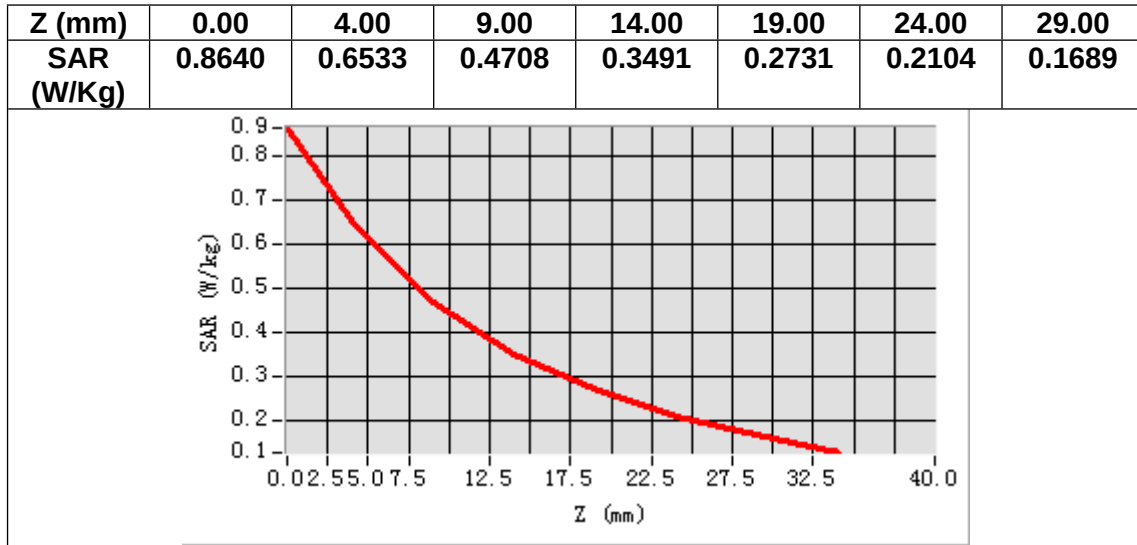
Frequency (MHz)	1745.000000
Relative permittivity (real part)	40.104546
Relative permittivity (imaginary part)	14.103182
Conductivity (S/m)	1.367225
Variation (%)	-0.940000



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

SAR Peak: 0.88 W/kg

SAR 10g (W/Kg)	0.437663
SAR 1g (W/Kg)	0.638469



Appendix D. Calibration Certificate

Table of contents
E Field Probe - EPGO0523-403
835 MHz Dipole - SN 03/15 DIP 0G835-347
1800 MHz Dipole - SN 03/15 DIP 1G800-349
1900 MHz Dipole - SN 03/15 DIP 1G900-350
2600 MHz Dipole - SN 03/15 DIP 2G600-356



COMOSAR E-Field Probe Calibration Report

Ref : ACR.307.3.25.BES.A

**GUANGDONG ASIA HONGKE TEST
TECHNOLOGY CO., LTD**
NO.1/F,BUILDING B1, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY,
FUHAIHAI STREET, BAO'AN DISTRICT,SHENZHEN,
GUANGDONG 518055, P.R.CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 39/21 EPGO0523-403

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 09/09/2025



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Summary:

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



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Jérôme Le Gall	Measurement Responsible	09/08/2025	
<i>Checked by :</i>	Jérôme Luc	Technical Manager	09/08/2025	
<i>Approved by :</i>	Yann Toutain	Laboratory Director	09/09/2025	

	<i>Customer Name</i>
<i>Distribution :</i>	Shenzhen Asia Hongke

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Jérôme Luc	9/09/2025	Initial release



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 39/21 EPG00523-403
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.199 M Ω Dipole 2: R2=0.218 M Ω Dipole 3: R3=0.210 M Ω

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Dosimetric E field Probe

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

3 MEASUREMENT METHOD

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

3.1 LINEARITY

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

3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

Page: 4/11

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3.3 LOWER DETECTION LIMIT

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

3.4 ISOTROPY

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

3.1 BOUNDARY EFFECT

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

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

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

where

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

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



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

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

5 CALIBRATION MEASUREMENT RESULTS

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

5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$)	Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$)
1.26	0.87	0.77

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
113	108	113

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

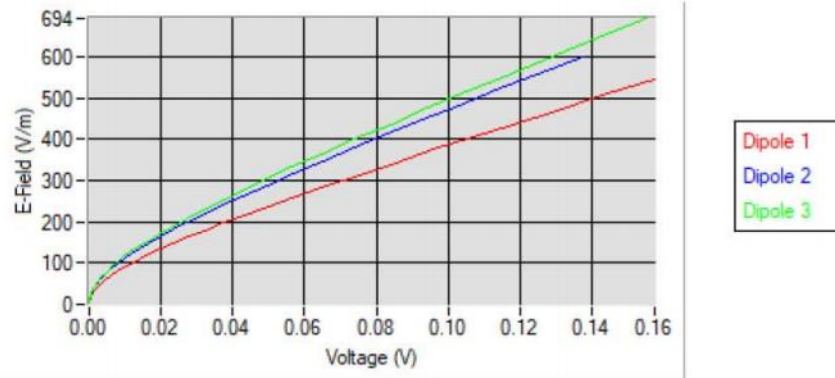
$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



COMOSAR E-FIELD PROBE CALIBRATION REPORT

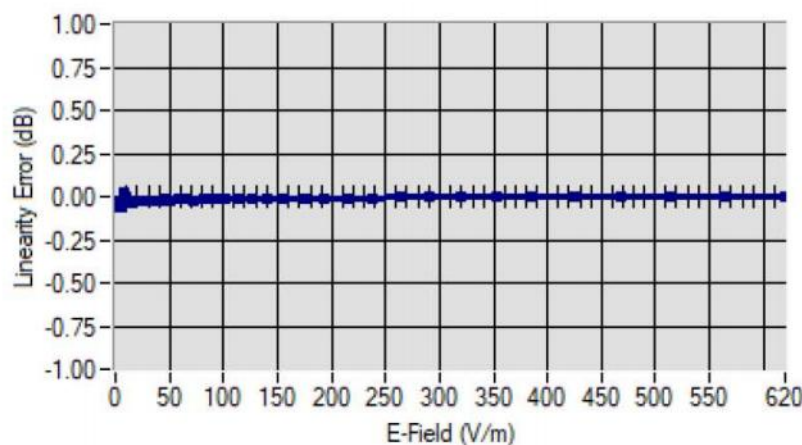
Ref: ACR.307.3.24.BES.A

Calibration curves



5.2 LINEARITY

Linearity



Linearity: +/-1.42% (+/-0.06dB)



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL600	600	1.62
HL750	750	1.65
HL850	835	1.66
HL900	900	1.77
HL1500	1500	2.09
HL1750	1750	2.09
HL1800	1800	2.05
HL1900	1900	2.05
HL2000	2000	2.41
HL2100	2100	2.36
HL2300	2300	2.55
HL2450	2450	2.38
HL2600	2600	2.35
HL3300	3300	2.04
HL3500	3500	1.98
HL3700	3700	2.11
HL3900	3900	2.54
HL4200	4200	2.22
HL4600	4600	2.40
HL4900	4900	2.33
HL5200	5200	2.30
HL5400	5400	2.30
HL5600	5600	2.29
HL5800	5800	2.27

LOWER DETECTION LIMIT: 8mW/kg

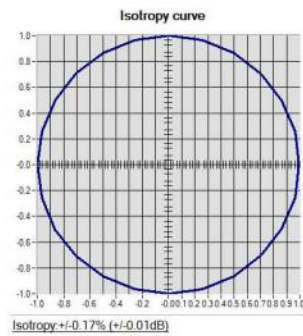


COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref. ACR.307.3.24.BES.A

5.4 ISOTROPY

HL1800 MHz





COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	Manufacturer / Model	Identification No.	Current Calibration Date	Next Calibration Date
CALIPROBE Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2024	08/2027
Network Analyzer	Agilent 8753ES	MY40003210	10/2022	10/2025
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2024	05/2027
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Multimeter	Keithley 2000	1160271	02/2024	02/2027
Signal Generator	Rohde & Schwarz SMB	106589	04/2024	04/2027
Amplifier	MVG	MODU-023-C-0002	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	06/2024	06/2027
Power Meter	Rohde & Schwarz NRVD	832839-056	11/2022	11/2025
Directional Coupler	Krytar 158020	131467	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.

Page: 10/11

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COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.307.3.24.BES.A

Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2024	06/2027



SAR Reference Dipole Calibration Report

Ref : ACR.53.24.24.BES.A

**GUANGDONG ASIA HONGKE TEST
TECHNOLOGY CO., LTD**
NO.1/F,BUILDING B1, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY ,
FUHAIHAI STREET, BAO'AN DISTRICT, SHENZHEN,
GUANGDONG 518055, P.R.CHINA
MVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 835MHZ
SERIAL NO.: SN 03/15 DIP0G835-347

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

Calibration date: 02/21/2024



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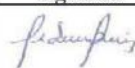
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.24.24.BES.A

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

Yann
Toutain ID

Signature numérique
de Yann Toutain ID
Date : 2024.02.27
08:55:11 +01'00'

	Customer Name
Distribution :	Shenzhen Asia Hongke

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.24.24.BES.A

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR 53.24.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 835 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID835
Serial Number	SN 03/15DIP0G835-347
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.24.24.BES.A

4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

Page: 5/8

Template_ACR.DDD.N.YY.MVGB.ISSUE_SAR Reference Dipole vL

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SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.24.24.BES.A

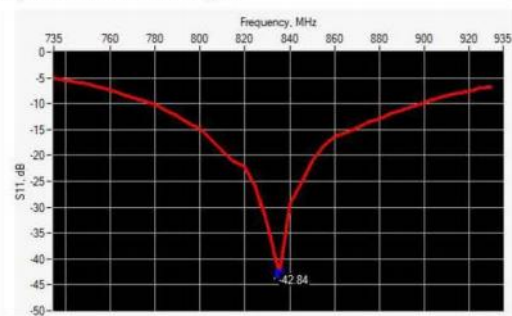
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	161.00 +/- 2%	-	89.80 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
835	-42.84	-20	50.5Ω + 0.5jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

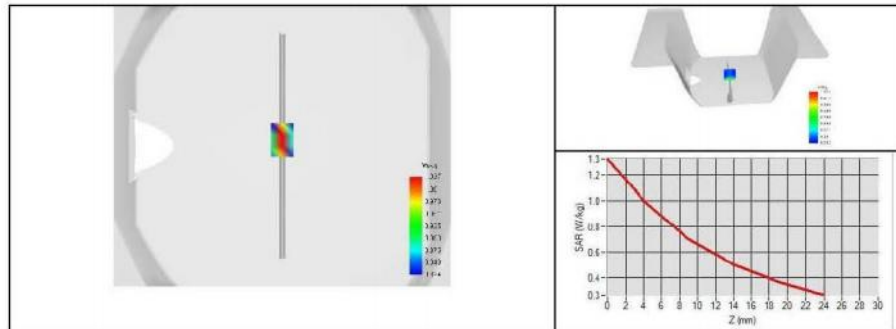


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR 53.24.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: ϵ_p' : 44.8 σ : 0.90
Distance between dipole center and liquid	15.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	835 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
835 MHz	0.94	9.40	9.56	0.63	6.28	6.22





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR 53.24.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.26.24.BES.A

GUANGDONG ASIA HONGKE TEST TECHNOLOGY CO., LTD

NO.1/F,BUILDING B1, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY ,
FUHAIHAI STREET, BAO'AN DISTRICT,SHENZHEN,
GUANGDONG 518055, P.R.CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 1800MHZ

SERIAL NO.: SN 03/15 DIP1G800-349

Calibrated at MVG

Z.I. de la pointe du diable

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

Calibration date: 02/21/2024



Accreditations #2-6789 and #2-6814
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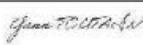
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref : ACR-53-2624-BES-A

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

Yann
Toutain ID

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

	Customer Name
Distribution :	Shenzhen Asia Hongke

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.2624.BES.A

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6.3	SAR	6
7	List of Equipment	8



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.2624.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.2624.BES.A

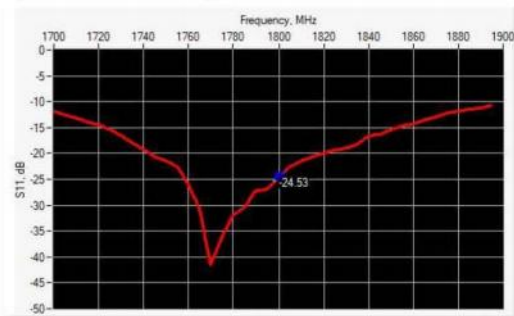
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
1800	-24.53	-20	44.8Ω + 2.0jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

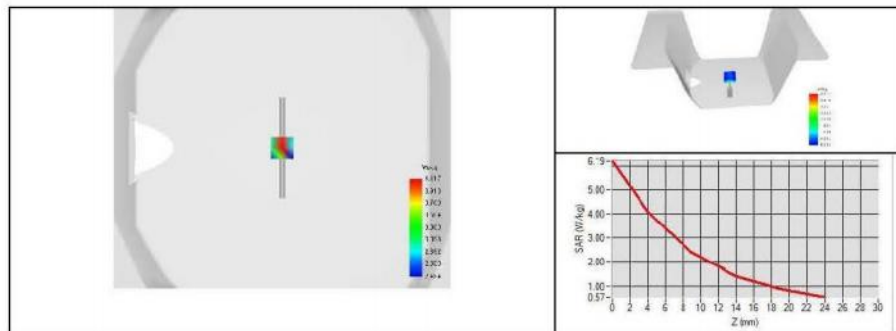


SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.2624.BES.A

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

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





SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.53.26.24.BES.A

7 LIST OF EQUIPMENT

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

Page: 8/8

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SAR Reference Dipole Calibration Report

Ref : ACR.53.27.24.BES.A

GUANGDONG ASIA HONGKE TEST TECHNOLOGY CO., LTD

NO.1/F,BUILDING B1, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY ,
FUHAIHAI STREET, BAO'AN DISTRICT,SHENZHEN,
GUANGDONG 518055, P.R.CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 1900MHZ

SERIAL NO.: SN 03/15 DIP1G900-350

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE – FRANCE

Calibration date: 02/21/2024



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

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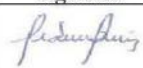
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR.53.27.24.BES.A

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

Yann
Toutain ID

Signature
numérique de
Yann Toutain ID
Date : 2024.02.27
08:56:45 +01'00'

	Customer Name
Distribution :	Shenzhen Asia Hongke

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF: ACR.53.27.24.BES.A

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SAR REFERENCE DIPOLE CALIBRATION REPORT

REF: ACR 53.27.24.BES.A

1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 1900 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID1900
Serial Number	SN 03/15DIP1G900-350
Product Condition (new / used)	Used

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

REF: ACR.53.27.24.BES.A

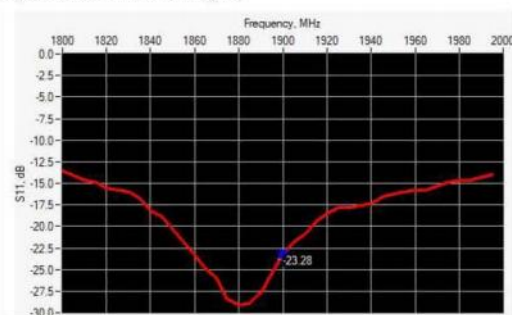
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

L mm		h mm		d mm	
Measured	Required	Measured	Required	Measured	Required
-	68.00 +/- 2%	-	39.50 +/- 2%	-	3.60 +/- 2%

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



Frequency (MHz)	S11 parameter (dB)	Requirement (dB)	Impedance
1900	-23.28	-20	46.2Ω + 5.4jΩ

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

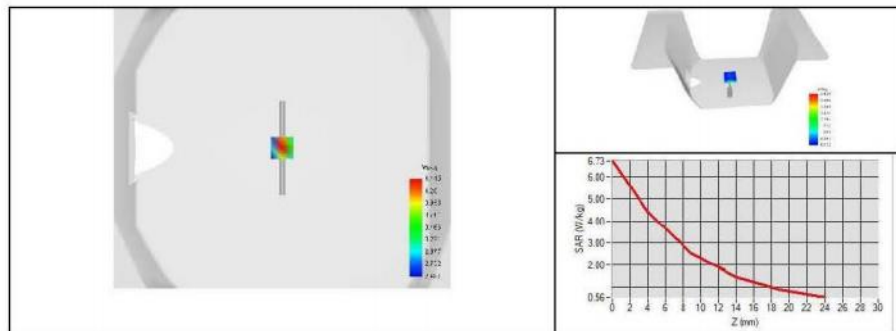


SAR REFERENCE DIPOLE CALIBRATION REPORT

REF : ACR 53.27.24.BES.A

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 42.5$ $\sigma : 1.39$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=8mm/dy=8mm/dz=5mm$
Frequency	1900 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency	1g SAR (W/kg)			10g SAR (W/kg)		
	Measured	Measured normalized to 1W	Target normalized to 1W	Measured	Measured normalized to 1W	Target normalized to 1W
1900 MHz	3.97	39.69	39.70	2.09	20.92	20.50





SAR REFERENCE DIPOLE CALIBRATION REPORT

REF: ACR 53.27.24.BES.A

7 LIST OF EQUIPMENT

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



SAR Reference Dipole Calibration Report

Ref : ACR.53.30.24.BES.A

**GUANGDONG ASIA HONGKE TEST
TECHNOLOGY CO., LTD**
NO.1/F,BUILDING B1, JUNFENG INDUSTRIAL PARK,
CHONGQING ROAD, HEPING COMMUNITY ,
FUHAIHAI STREET, BAO'AN DISTRICT,SHENZHEN,
GUANGDONG 518055, P.R.CHINA
MVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 2600MHZ
SERIAL NO.: SN 03/15 DIP2G600-356

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

Calibration date: 02/21/2024



Accreditations #2-6789 and #2-6814
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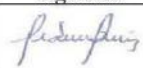
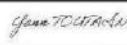
Summary:

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



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref.: ACR.53.30.24.BES.A

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1 INTRODUCTION

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

2 DEVICE UNDER TEST

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

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



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4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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

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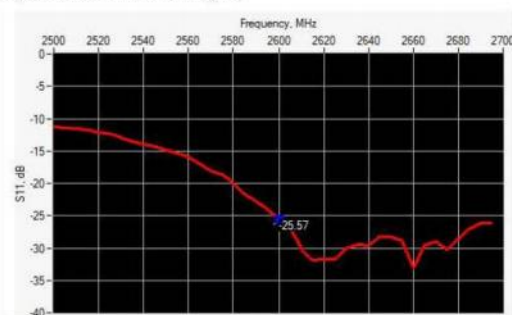
6 CALIBRATION RESULTS

6.1 MECHANICAL DIMENSIONS

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

6.2 S11 PARAMETER

6.2.1 S11 parameter in Head Liquid



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

6.3 SAR

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

6.3.1 SAR with Head Liquid

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

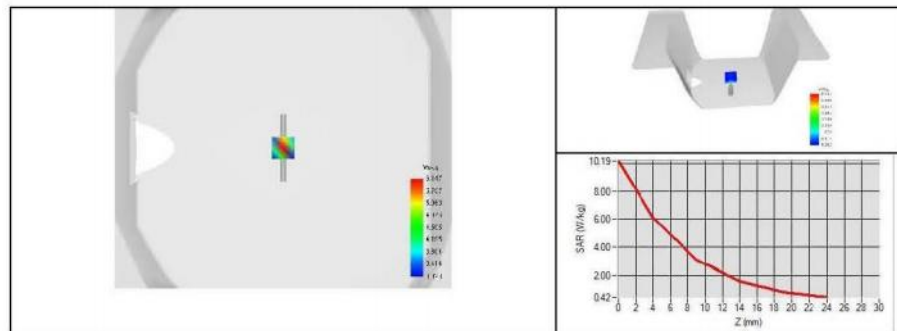


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Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	3523-EPGO-429
Liquid	Head Liquid Values: $\epsilon_{ps}' : 41.3$ $\sigma : 1.95$
Distance between dipole center and liquid	10.0 mm
Area scan resolution	$dx=8mm/dy=8mm$
Zoon Scan Resolution	$dx=5mm/dy=5mm/dz=5mm$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

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





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7 LIST OF EQUIPMENT

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

Appendix E. Justification of the extended calibration

If dipoles are verified in return loss ($<-20\text{dB}$, within 20% of prior calibration for below 3GHz, and $<-8\text{dB}$, within 20% of prior calibration for 5GHz to 6GHz), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

<Head 835MHz>

Return Loss (dB)	Delta (%)	Impedance	Delta(ohm)	Date of Measurement
-42.84	-	50.5	-	Feb. 21, 2024
-42.803	0.09	50.592	0.092	Feb. 20, 2025

The return loss is $<-20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Head 1800MHz>

Return Loss (dB)	Delta (%)	Impedance	Delta(ohm)	Date of Measurement
-24.53	-	44.8	-	Feb. 21, 2024
-24.545	0.06	44.809	0.009	Feb. 20, 2025

The return loss is $<-20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Head 1900MHz>

Return Loss (dB)	Delta (%)	Impedance	Delta(ohm)	Date of Measurement
-23.28	-	46.2	-	Feb. 21, 2024
-23.518	1.02	46.516	0.316	Feb. 20, 2025

The return loss is $<-20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

<Head 2600MHz>

Return Loss (dB)	Delta (%)	Impedance	Delta(ohm)	Date of Measurement
-25.57	-	54.5	-	Feb. 21, 2024
-25.248	1.26	54.653	0.153	Feb. 20, 2025

The return loss is $<-20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.