5. SAR measurement variabilit

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 (~ 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. Generic device

The SAR evaluation shall be performed for surface of the DUT that are accessible during intended use, as indicated in Figure 7.1. Adjust the distance between the device surface and the flat phantom to 0mm.

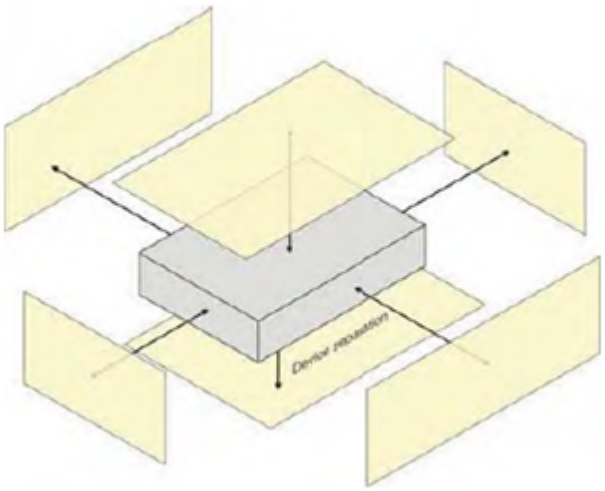


Figure 7.1 – Test positions for generic device

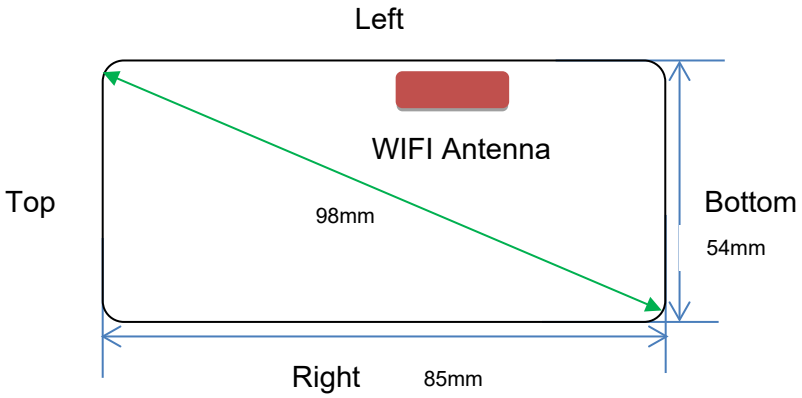
8. RF Output Power

8.1. Wi-Fi Output Power

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11b	1	2412	18.00	17.51
	6	2437	18.00	17.03
	11	2462	18.00	17.23
802.11g	1	2412	18.00	17.70
	6	2437	18.00	17.49
	11	2462	18.00	17.49
802.11n HT20	1	2412	18.00	17.60
	6	2437	18.00	17.32
	11	2462	18.00	17.47
802.11n HT40	3	2422	18.00	17.50
	6	2437	18.00	17.36
	9	2452	18.00	17.28

Mode	Channel	Frequency (MHz)	Tune-up (dBm)	Output Power (dBm)
802.11a	36	5180	15.50	14.99
	40	5200	15.50	15.38
	48	5240	15.50	15.04
802.11n HT20	36	5180	16.50	16.23
	40	5200	16.50	14.92
	48	5240	16.50	16.03
802.11n HT40	38	5190	13.00	12.48
	46	5230	13.00	12.80

9. Antenna Location



Rear View

Antenna information:

Distance of The Antenna to the EUT surface and edge (mm)						
Antennas	Front Side	Back Side	Top Side	Bottom Side	Left Side	Right Side
WLAN	5	5	37	28	5	42

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

10. SAR Measurement Results

< WLAN 2.4G >

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	1/2412	802.11b	0.168	0.099	0.28	17.51	18.00	0.188	2025/7/28	
Back Side	1/2412	802.11b	0.255	0.155	1.35	17.51	18.00	0.285	2025/7/28	2#
Back Side	1/2412	802.11g	0.250	0.151	0.28	17.70	18.00	0.268	2025/7/28	
Left Side	1/2412	802.11b	0.150	0.087	-1.22	17.51	18.00	0.168	2025/7/28	
Right Side	1/2412	802.11b	0.100	0.048	-2.44	17.51	18.00	0.112	2025/7/28	
Top Side	1/2412	802.11b	0.055	0.023	-1.89	17.51	18.00	0.062	2025/7/28	
Bottom Side	1/2412	802.11b	0.132	0.071	2.04	17.51	18.00	0.148	2025/7/28	

< WLAN 5.2G >

Test Position of Body with 0mm	Test channel /Freq.	Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date	Plot
			1g	10g						
Front Side	36/5180	802.11n HT20	0.198	0.110	-3.85	16.23	16.50	0.211	2025/7/29	
Back Side	36/5180	802.11n HT20	0.329	0.167	-1.39	16.23	16.50	0.350	2025/7/29	1#
Left Side	36/5180	802.11n HT20	0.168	0.095	2.12	16.23	16.50	0.179	2025/7/29	
Right Side	36/5180	802.11n HT20	0.113	0.055	2.67	16.23	16.50	0.120	2025/7/29	
Top Side	36/5180	802.11n HT20	0.068	0.032	-1.89	16.23	16.50	0.072	2025/7/29	
Bottom Side	36/5180	802.11n HT20	0.148	0.088	2.94	16.23	16.50	0.157	2025/7/29	

Appendix A. Photo documentation

Refer to appendix Test Setup photo-SAR

Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 2450MHz
MEASUREMENT 2 System Performance Check - 5200MHz

MEASUREMENT 1

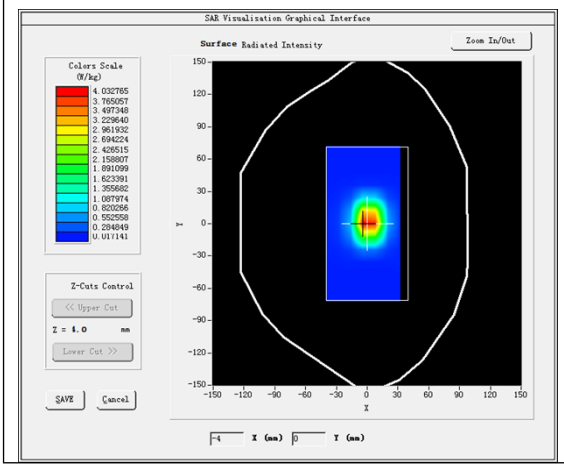
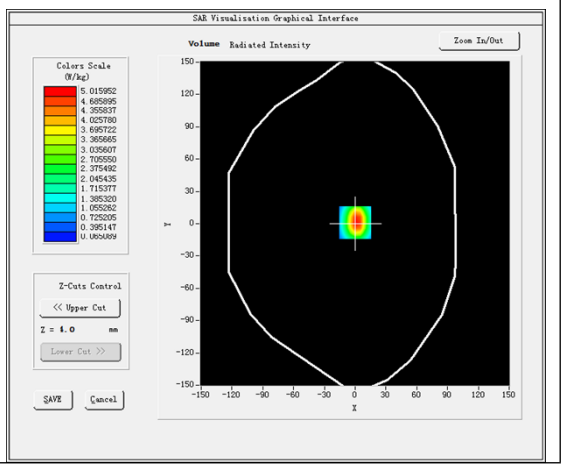
Date of measurement: 28/7/2025

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.38

B. SAR Measurement Results

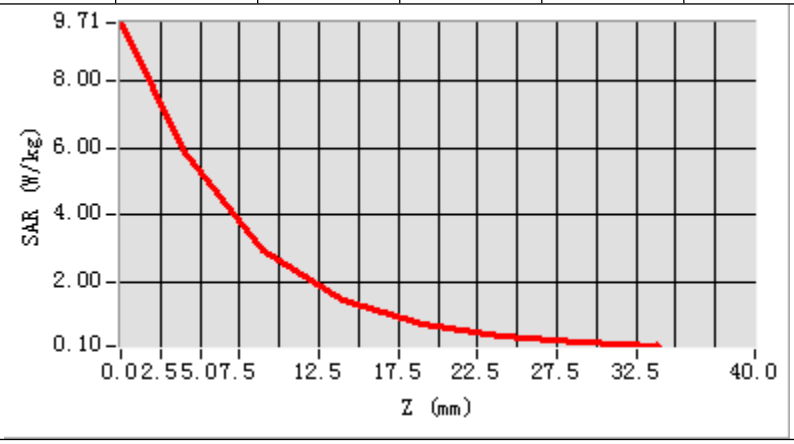
Frequency (MHz)	2450.000000
Relative permittivity (real part)	40.408511
Relative permittivity (imaginary part)	13.399264
Conductivity (S/m)	1.823789
Variation (%)	-1.250000

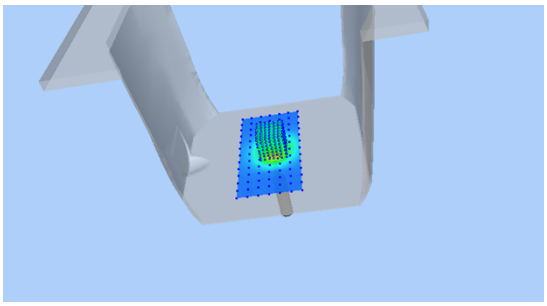
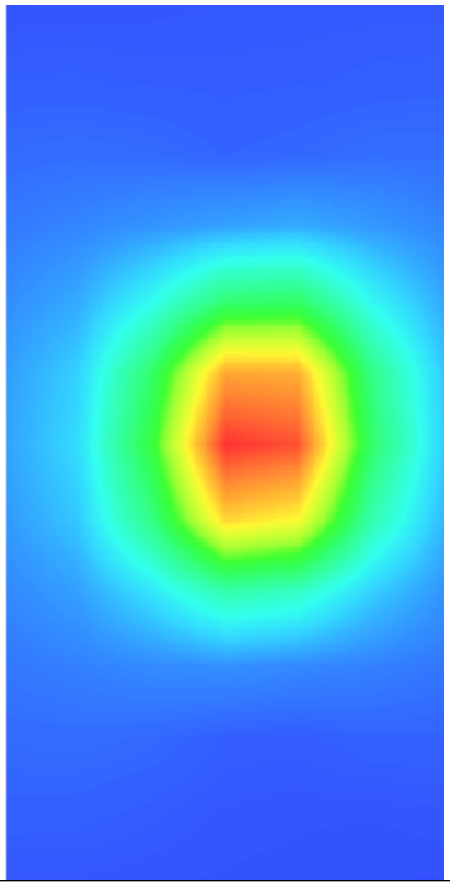
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=1.00
SAR Peak: 8.14 W/kg

SAR 10g (W/Kg)	2.359425
SAR 1g (W/Kg)	5.183642
Horizontal validation criteria: minimum distance (mm)	14.65
Vertical validation criteria: SAR ratio M2/M1 (%)	50.15

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	9.7199	5.8365	2.9272	1.4664	0.7453	0.3732	0.1948



3D screen shot	Hot spot position
	

MEASUREMENT 2

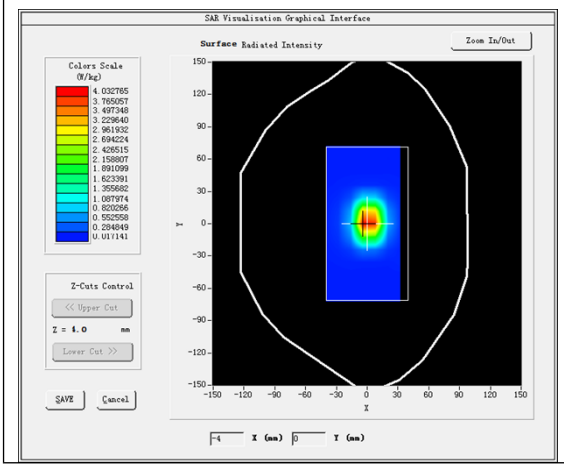
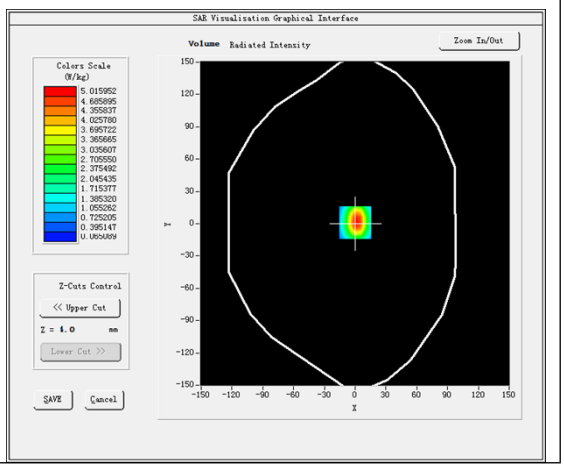
Date of measurement: 29/7/2025

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5200
Channels	Middle
Signal	CW (Crest factor: 1.0)
ConvF	2.30

B. SAR Measurement Results

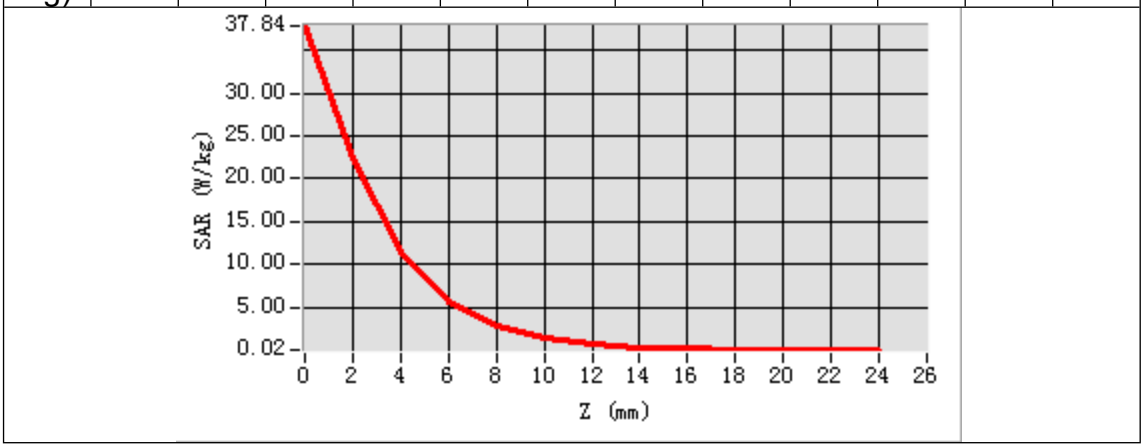
Frequency (MHz)	5200.000000
Relative permittivity (real part)	37.400000
Relative permittivity (imaginary part)	16.129999
Conductivity (S/m)	4.510778
Variation (%)	-4.570000

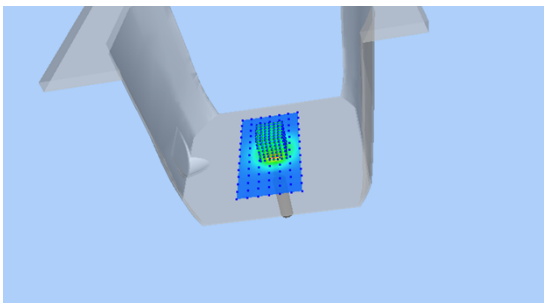
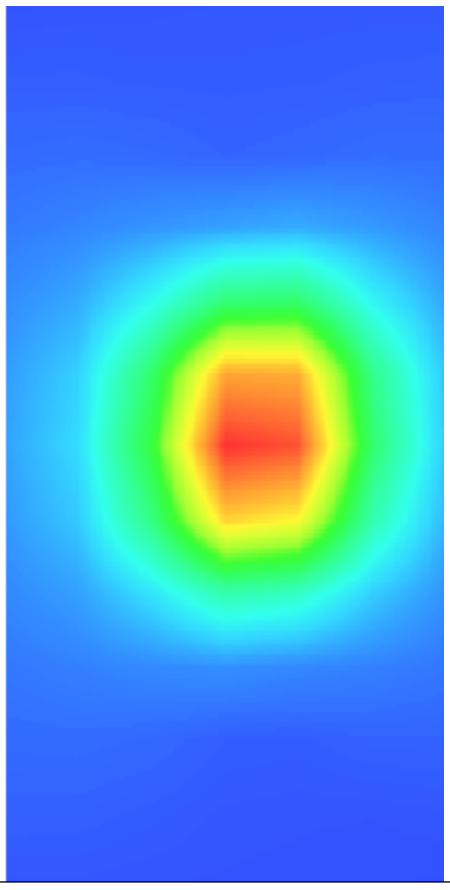
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=1.00
SAR Peak: 15.14 W/kg

SAR 10g (W/Kg)	5.212361
SAR 1g (W/Kg)	14.712032
Horizontal validation criteria: minimum distance (mm)	14.64
Vertical validation criteria: SAR ratio M2/M1 (%)	50.65

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	37.854	22.366	11.328	5.6635	2.8201	1.4084	0.7174	0.3602	0.1802	0.1035	0.0580	0.0366



3D screen shot	Hot spot position
	

Appendix C. SAR Test Plots

Table of contents
MEASUREMENT 1 WLAN 5.2G Body
MEASUREMENT 2 WLAN 2.4G Body

MEASUREMENT 1

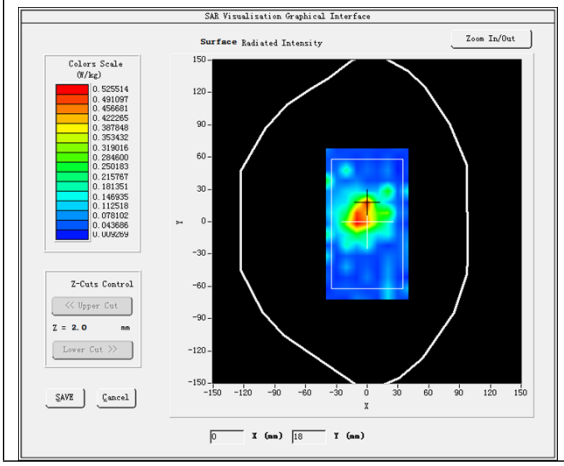
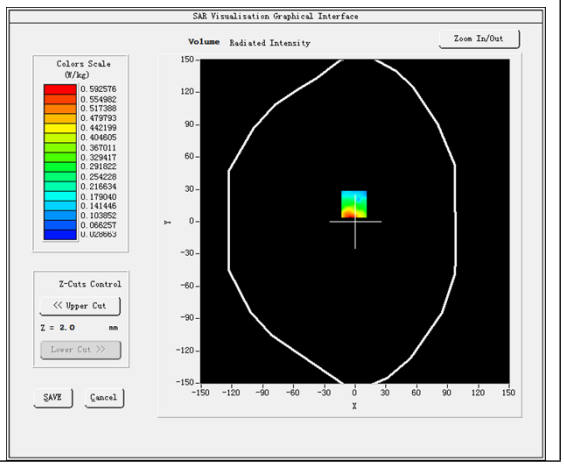
Date of measurement: 29/7/2025

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11n U-NII
Channels	Low
Signal	IEEE802.n (Crest factor: 1.0)
ConvF	2.30

B. SAR Measurement Results

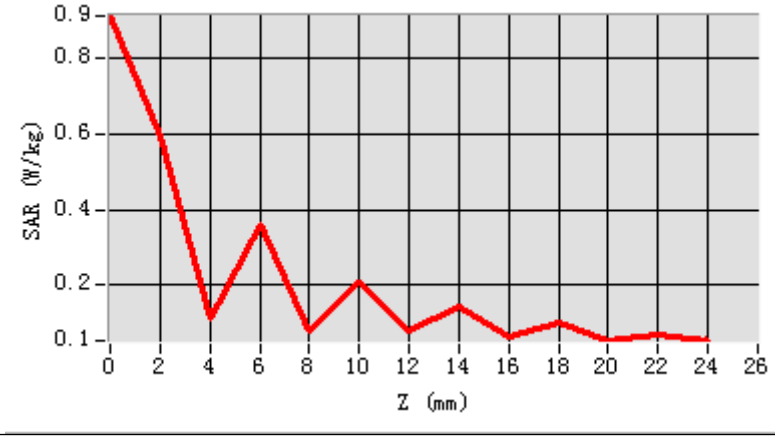
Frequency (MHz)	5180.000000
Relative permittivity (real part)	36.000000
Relative permittivity (imaginary part)	16.128888
Conductivity (S/m)	4.641536
Variation (%)	-1.390000

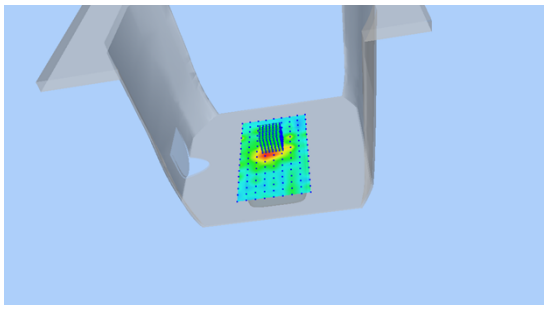
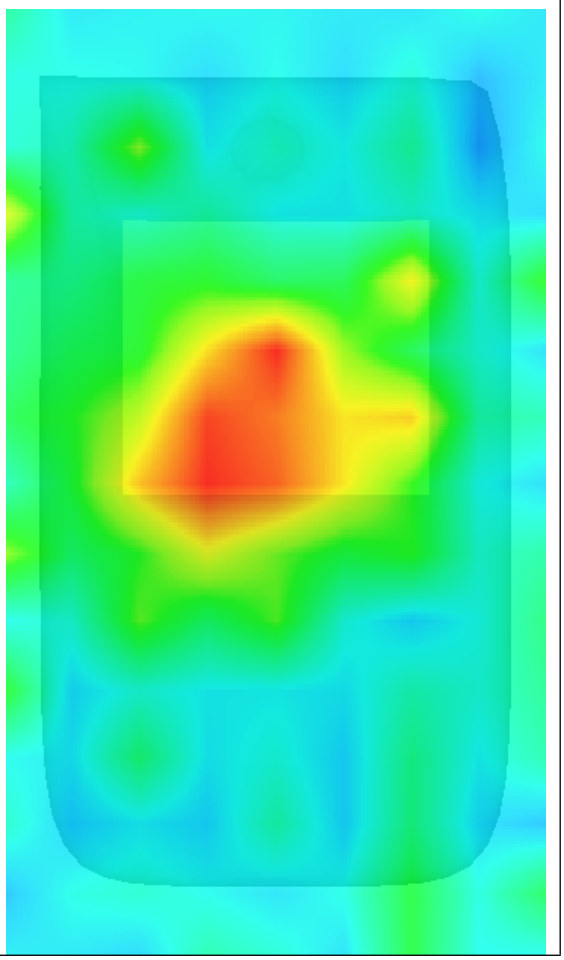
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-1.00, Y=16.00
SAR Peak: 0.78 W/kg

SAR 10g (W/Kg)	0.166659
SAR 1g (W/Kg)	0.328813
Horizontal validation criteria: minimum distance (mm)	14.60
Vertical validation criteria: SAR ratio M2/M1 (%)	31.36

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.9144	0.5998	0.1881	0.3605	0.0762	0.2057	0.0777	0.1395	0.0606	0.1009	0.0511	0.0697



3D screen shot	Hot spot position
	

MEASUREMENT 2

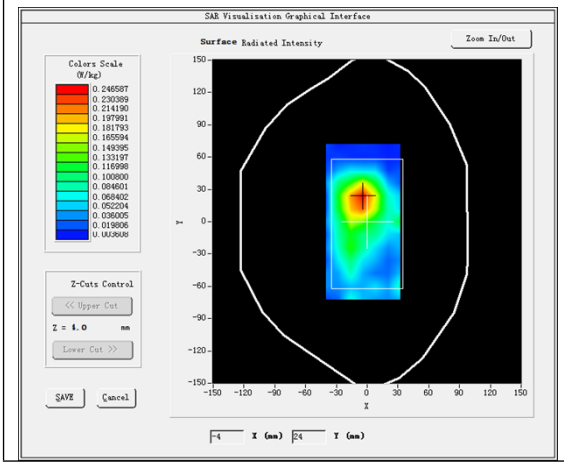
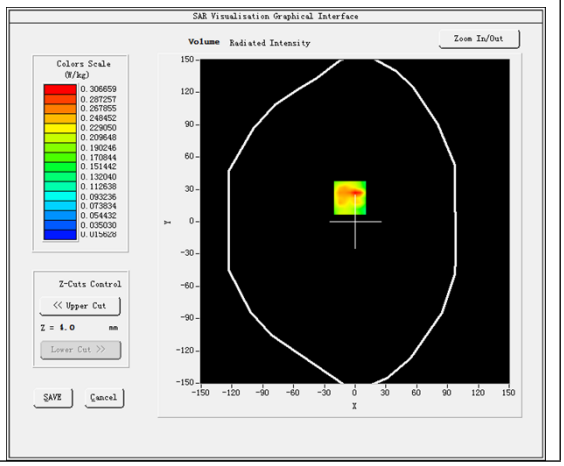
Date of measurement: 28/7/2025

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)
ConvF	2.38

B. SAR Measurement Results

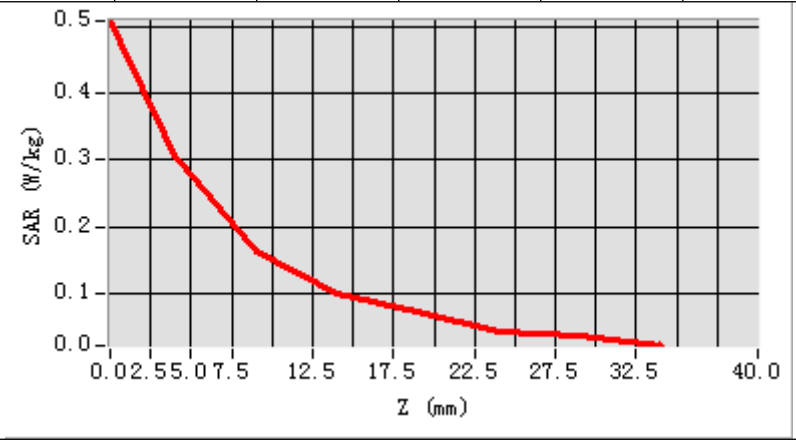
Frequency (MHz)	2412.000000
Relative permittivity (real part)	39.224000
Relative permittivity (imaginary part)	13.205000
Conductivity (S/m)	1.769470
Variation (%)	1.350000

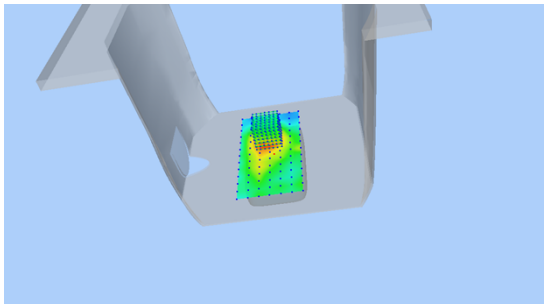
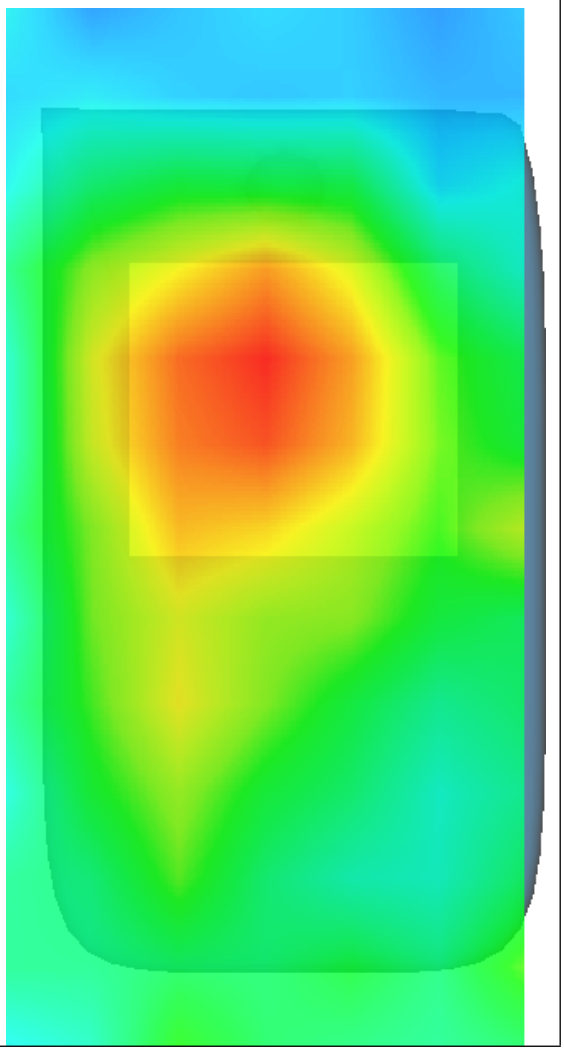
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=22.00
SAR Peak: 0.51 W/kg

SAR 10g (W/Kg)	0.155147
SAR 1g (W/Kg)	0.254811
Horizontal validation criteria: minimum distance (mm)	14.58
Vertical validation criteria: SAR ratio M2/M1 (%)	53.18

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5091	0.3067	0.1631	0.1010	0.0732	0.0428	0.0367



3D screen shot	Hot spot position
	

Appendix D. Calibration Certificate

Table of contents
E Field Probe - EPGO0523-403
2450 MHz Dipole - SN 03/15 DIP 2G450-352
5000-6000 MHz Dipole - SN 03/14 WGA33

COMOSAR E-Field Probe Calibration Report

Ref : ACR.307.3.24.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 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: 09/11/2024

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

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

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme Le Gall	Measurement Responsible	09/10/2024	
Checked by :	Jérôme Luc	Technical Manager	09/10/2024	
Approved by :	Yann Toutain	Laboratory Director	09/11/2024	Yann TOUTAIN

	Customer Name
Distribution :	Shenzhen Asia Hongke

Issue	*Name*	*Date*	*Modifications*
A	Jérôme Luc	9/11/2024	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 39/21 EPGO0523-403
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.199 MΩ Dipole 2: R2=0.218 MΩ Dipole 3: R3=0.210 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

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

Figure 1 – *MVG COMOSAR Dosimetric E field Probe*

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

3 MEASUREMENT METHOD

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

3.1 LINEARITY

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

3.2 SENSITIVITY

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

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:

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

where

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

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