TEST REPORT

Report No.:	BCTC2404260018E
Applicant:	Hypertechnologie Ciara Inc. Ciara Technologies Inc
Product Name:	Notebook PC
Test Model:	CRIUS CO100-G1
Tested Date:	2024-04-24 to 2024-04-28
Issued Date:	2024-06-28

Shenzhen BCTC Testing Co., Ltd.

SHENZHEN BCTC TESTING CO.,LTD
BCTC
APPROVED
Report Seal

FCC ID: 2BDS2-CO100G1

Product Name:	Notebook PC
Trademark:	CIARA
Model/Type Ref.:	CRIUS CO100-G1
Applicant:	Hypertechnologie Ciara Inc. Ciara Technologies Inc
Address:	9300 Transcanadienne St-Laurent, Quebec H4S 1K5 Canada
Manufacturer:	Hypertechnologie Ciara Inc. Ciara Technologies Inc
Address:	9300 Transcanadienne St-Laurent, Quebec H4S 1K5 Canada
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng , Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2024-04-24
Sample tested Date:	2024-04-24 to 2024-04-28
Issue Date:	2024-06-28
Test Standards:	IEEE Std C95.1, 2019/ IEEE Std 1528™-2013/FCC Part 2.1093
Test Results:	PASS
Remark:	This is SAR test report

Tested by:	Approved by:
Min zhi Cheng	
Min Zhi Cheng/ Project Handler	Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

Table Of Content

(Note: N/A Means Not Applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2404260018E	2024-06-28	Original	Valid

2. Test Standards

IEEE Std C95.1-2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.
IEEE Std 1528™-2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.
FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices
KDB 447498 D01 General RF Exposure Guidance v06: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations
KDB 616217 D04 SAR for laptop and tablets v01r02& 248227 D01 802.11 Wi-Fi SAR v02r02.

3. Test Summary

The maximum results of Specific Absorption Rate (SAR) have found during testing are as follows:

Frequency Band	Report SAR_{1g} (W/kg)	SAR_{1g} Limit (W/kg)
	Body (0mm Gap)	
Bluetooth	0.230	1.6
WIFI2.4G (ANT-A)	0.778	1.6
WIFI2.4G (ANT-B)	0.556	1.6
WIFI5G (ANT-A)	0.703	1.6
WIFI5G (ANT-B)	0.704	1.6
Simultaneous Transmission	1.407	1.6

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2019, and had been tested in accordance with the measurement methods and procedure specified in IEEE 1528-2013.

4. SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average(averaged over the whole body)	0.08	0.4
Spatial Peak(averaged over any 1 g of tissue)	1.6	8.0
Spatial Peak(hands/wrists/ feet/anklesaveraged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.
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).

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is <3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k=2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. Product Information and Test Setup

6.1 Product Information

Model/Type reference:	CRIUS CO100-G1
Model Differences:	N/A
Hardware Version:	N/A
Software Version:	N/A
Battery:	DC 7.7V 7500mAh 57.75Wh
Adapter:	Model: JHD-AP030U-PD-CF501 Input: AC 100-240V 50/60Hz 1.0A Output: DC 5V3A/9V3A/12V2.5A/15V2A/20V1.5A

Bluetooth

Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK, π/4DQPSK, 8DPSK
Number Of Channel	79CH
Antenna installation:	Internal antenna
Antenna Gain:	2.16 dBi

Remark:

☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information.

☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.

BLE

Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK
Number Of Channel	40CH
Antenna installation:	Internal antenna
Antenna Gain:	2.16 dBi

Remark:

☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information.

☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.

WIFI 2.4G

Operation Frequency:	802.11b/g/n20/ax20MHz:2412~2462 MHz 802.11n40/ax40MHz:2422~2452 MHz
Type of Modulation:	OFDM/DSSS/OFDMA
Number Of Channel	802.11b/g/n20/ax20MHz:11 CH 802.11n40/ax40MHz: 7 CH
Antenna installation:	Internal antenna*2
Antenna Gain:	A: 2.16 dBi, B: 3.46 dBi Remark: ☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. ☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.

WIFI 5G

Operation Frequency:	5180-5240MHz for 802.11a/n/ac/ax(HT20) 5190-5230MHz for 802.11n/ac/ax(HT40) 5210MHz for 802.11ac/ax(HT80) 5250Mhz for 802.11ac/ax(HT160) 5260-5320MHz for 802.11a/n/ac/ax(HT20) 5270-5310MHz for 802.11n/ac/ax(HT40) 5290MHz for 802.11ac/ax(HT80) 5500-5700MHz for 802.11a/n/ac/ax(HT20) 5510-5670MHz for 802.11n/ac/ax(HT40) 5530MHz for 802.11ac/ax(HT80) 5570MHz for 802.11ac/ax(HT160) 5745-5825 MHz for 802.11a/ n/ac/ax(HT20) 5755-5795 MHz for 802.11 n/ac/ax(HT40) 5775MHz for 802.11 ac/ax(HT80)
Type of Modulation:	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11ac OFDMA with 1024QAM for 802.11ax
Number Of Channel	4 channels for 802.11a/n20/ac20/ax20 in the 5180-5240MHz band 2 channels for 802.11n40/ac40/ax40 in the 5190-5230MHz band 1 channels for 802.11ac80/ax80 in the 5210MHz band 1 channels for 802.11ac160/ax160 in the 5250MHz band 4 channels for 802.11a/n20/ac20/ax20 in the 5260-5320MHz band 2 channels for 802.11n40/ac40/ax40 in the 5270-5310MHz band 1 channels for 802.11ac80/ax80 in the 5290MHz band 4 channels for 802.11a/n20/ac20/ax20 in the 5500-5700MHz band 2 channels for 802.11n40/ac40/ax40 in the 5510-5670MHz band 1 channels for 802.11ac80/ax80 in the 5530MHz band 1 channels for 802.11ac160/ax160 in the 5570MHz band 5 channels for 802.11a/n20/ax20 in the 5745-5825MHz band 2 channels for 802.11n40/ax40 in the 5755-5795MHz band 1 channels for 802.11ac80/ax80 in the 5775MHz band
Antenna installation:	Internal antenna*2
Antenna Gain:	5.2G: A: 2.10 dBi, B: 1.57 dBi 5.3G: A: 1.73 dBi, B: 0.52 dBi 5.6G: A: 2.03 dBi, B: 1.87 dBi 5.8G: A: 2.27 dBi, B: 1.82 dBi Remark: ☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. ☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.

6.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

6.3 Support Equipment

Cable of Product

No.	Cable Type	Quantity	Provider	Length (m)	Shielded	Note
1	--	--	Applicant	---	Yes/No	--
2	--	--	BCTC	--	Yes/No	--

No.	Device Type	Brand	Model	Series No.	Note
1.	---	---	---	---	---
2.	--	--	--	--	--

Notes:
1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

6.4 Test Environment

1. Normal Test Conditions:

Humidity(%):	35-75
Atmospheric Pressure(kPa):	95-105
Temperature(℃):	18-25

2. Extreme Test Conditions:
N/A

7. Test Facility and Test Instrument Used

7.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

FCC Test Firm Registration Number: 712850
A2LA certificate registration number is: CN1212
ISED Registered No.: 23583
ISED CAB identifier: CN0017

7.2 Test Instrument Used

Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
PC	DELL	\	\	N/A	N/A
SAR Measurement system	SATIMO	\	\	N/A	N/A
Signal Generator	Keysight	83711B	US37100131	Aug. 29, 2023	Aug. 28, 2024
Multimeter	Keithley	1160271	\	Nov. 10, 2023	Nov 09, 2024
S-parameter Network Analyzer	R&S	ZVB 8	101353	Dec. 07, 2023	Dec. 06, 2024
Wideband Radio Communication Tester	R&S	CMW500	\	Nov. 10, 2023	Nov 09, 2024
E SAR PROBE 6GHz	MVG	SSE2	2623-EPGO-420	July 18, 2023	July 17, 2024
DIPOLE 2450	SATIMO	SID 2450	SN 47/21 DIP 2G450-627	Nov. 25, 2021	Nov. 24, 2024
DIPOLE 5000	SATIMO	SID5000	SN 47/21 DIP 2G450-629	Nov. 25, 2021	Nov. 24, 2024
COMOSAR OPENCoaxial Probe	SATIMO	\	\	Nov. 18, 2023	Nov. 17, 2024
SAR Locator	SATIMO	\	\	Nov. 18, 2023	Nov. 17, 2024
Communication Antenna	SATIMO	\	\	Nov. 18, 2023	Nov. 17, 2024
FEATURE PHONEPOSITIONING DEVICE	SATIMO	\	\	N/A	N/A
DUMMY PROBE	SATIMO	\	\	N/A	N/A
SAM Phantom	MVG	\	SN 13/09 SAM68	N/A	N/A
Liquid measurement Kit	HP	85033D	3423A08186	N/A	N/A
Power meter	Agilent	E4419	\	May 15, 2023	May 14, 2024
Power meter	Agilent	E4419	\	May 15, 2023	May 14, 2024
Power sensor	Agilent	E9300A	\	May 15, 2023	May 14, 2024
Power sensor	Agilent	E9300A	\	May 15, 2023	May 14, 2024
Directional Coupler	Krytar 158020	131467	\	Nov. 10, 2023	Nov 09, 2024
Thermometer	BTE	\	\	Dec. 02, 2023	Dec. 01, 2024
Broad Band Tissue Simulation Liquid	Schmid	\	\	N/A	N/A

Note:

Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three year extended calibration interval. Each measured dipole is expected to evalute with following criteria at least on annual interval.

1. There is no physical damage on the dipole;
2. System check with specific dipole is within 10% of calibrated values;
3. The most recent return-loss results, measued at least annually, deviates by no more than 20% from the previous measurement;
4. The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the provious measurement.

Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

8. Specific Absorption Rate (SAR)

8.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techiques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

8.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the

electrical field in the tissue by

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

9. SAR Measurement System

9.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.

The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

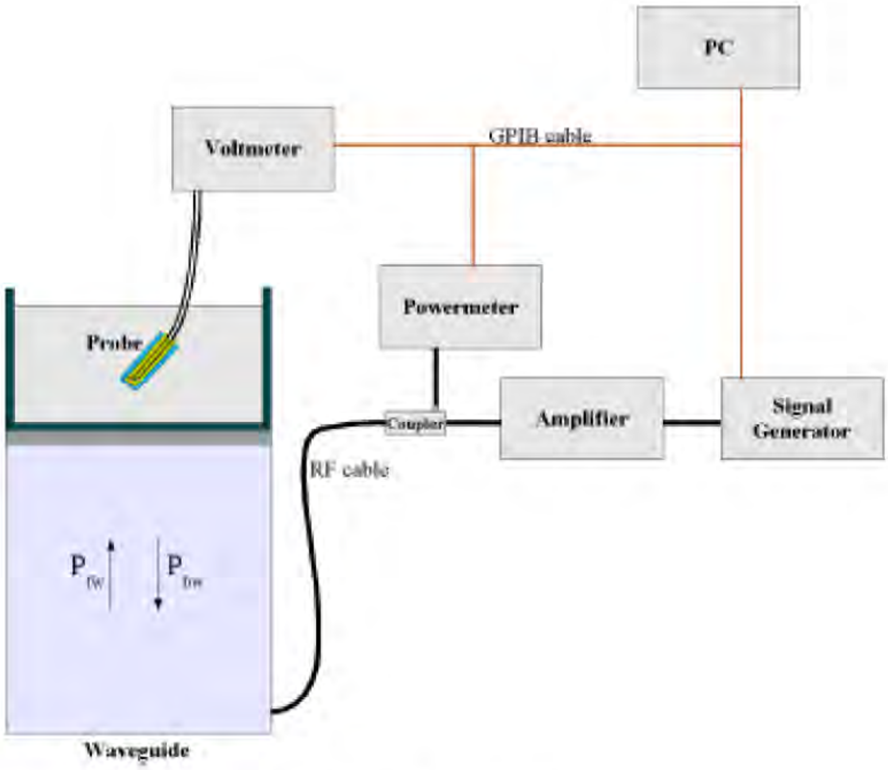
9.2 Probe

For the measurements the Specific Dosimetric E-Field Probe SN 46/21 EPGO362 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 5 mm
- Distance between probe tip and sensor center: 2.10mm
- Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than +/- 1mm)
- Probe linearity: ＜0.25 dB
- Axial Isotropy: ＜0.25 dB
- Spherical Isotropy: ＜0.50 dB
- Calibration range: 835 to 2500MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line:1ess than 30°

Probe calibration is realized, in compliance with EN 62209-1 and IEEE 1528 STD, with CALISAR, Antennessa proprietary calibration system. The calibration is performed with the EN 62209-1 annex technique using reference guide at the five frequencies.



$$SAR = \frac{4(p_{fw} - p_{Pbw})}{ab\delta} cos^2 \left(\pi \frac{y}{a}\right) c^{(2\pi/\delta)}$$

Where :
Pfw = Forward Power
Pbw = Backward Power
a and b =Waveguide dimensions
l = Skin depth

Keithley configuration:
Rate = Medium; Filter = ON; RDGS = 10; Filter type = Moving Average; Range auto after each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

CF(N)=SAR(N)/Vlin(N) (N=1,2,3)

The linearised output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

Vlin(N)=V(N)*(1+V(N)/DCP(N)) (N=1,2,3)

where DCP is the diode compression point in mV.

9.3 Probe Calibration Process

Dosimetric Assessment Procedure
Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm2) using an with CALISAR, Antenna proprietary calibration system.

Free Space Assessment Procedure
The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1mW/cm2.

Temperature Assessment Procedure
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.

SAR is proportional to ΔT/Δt, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

$$SAR = \frac{|E|^2 \cdot \sigma}{\rho}$$

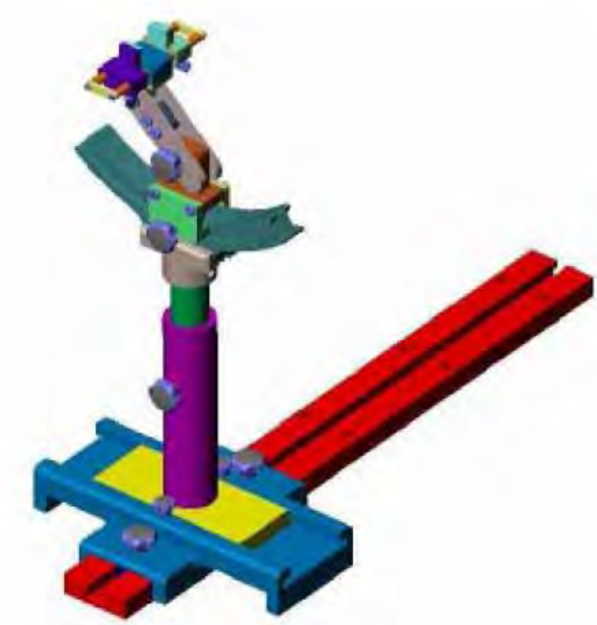
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

9.4 Phantom

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.

9.5 Device Holder

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



System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

10. Tissue Simulating Liquids

10.1 Composition of Tissue Simulating Liquid

For the measurement of the field distribution inside the SAM phantom with SMTIMO, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. Please see the following photos for the liquid height.

Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

Frequency (MHz)	Water (%)	Salt (%)	1,2-Propane diol (%)	HEC (%)	Preventol (%)	DGBE (%)
Head/Body						
835	40.3	1.4	57.9	0.2	0.2	0
900	40.3	1.4	57.9	0.2	0.2	0
1800-2000	55.2	0.3	0	0	0	44.5
2450	55.0	0.1	0	0	0	44.9
2600	54.9	0.1	0	0	0	45.0

Frequency (MHz)	Water (%)	Hexyl Carbitol (%)	Triton X-100 (%)
Head/Body			
5000-6000	65.52	17.24	17.24

10.2 Limit

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters

computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Target Frequency (MHz)	**Head**	
	Conductivity (σ)	**Permittivity** (ε_r)
150	0.76	52.3
300	0.87	45.3
450	0.87	43.5
750	0.89	41.9
835	0.90	41.5
900	0.97	41.5
915	0.98	41.5
1450	1.20	40.5
1610	1.29	40.3
1800-2000	1.40	40.0
2450	1.80	39.2
2600	1.96	39.0
3000	2.40	38.5
5200	4.66	36.0
5400	4.86	35.8
5600	5.07	35.5
5800	5.27	35.3

10.3 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an R&S ZVB 8. Dielectric Probe Kit and an Agilent Network Analyzer.

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

Frequency (MHz)	Liquid	Target (σ)	Target (εr)	Measured (σ)	Measured (εr)	Delta (σ)%	Delta (εr)%	Limit (%)	Temp . TSL (°C)	Date
2402	Head	1.80	39.20	1.849	38.539	2.72	-1.69	±5	23.0	24/04/2024
2412	Head	1.80	39.20	1.869	40.587	3.83	3.54	±5	23.0	24/04/2024
2437	Head	1.80	39.20	1.750	41.031	-2.78	4.67	±5	23.0	24/04/2024
2440	Head	1.80	39.20	1.756	40.054	-2.44	2.18	±5	23.0	24/04/2024
2450	Head	1.80	39.20	1.749	40.548	-2.83	3.44	±5	23.0	24/04/2024
2462	Head	1.80	39.20	1.813	41.063	0.72	4.75	±5	23.0	24/04/2024
2480	Head	1.80	39.20	1.879	38.208	4.39	-2.53	±5	23.0	24/04/2024
5190	Head	4.66	36.00	4.801	36.073	3.03	0.20	±5	22.8	26/04/2024
5200	Head	4.66	36.00	4.610	36.203	-1.07	0.56	±5	22.8	26/04/2024
5230	Head	4.66	36.00	4.518	36.661	-3.05	1.84	±5	22.8	26/04/2024
5270	Head	4.86	35.80	4.903	36.398	0.88	1.67	±5	22.8	26/04/2024
5310	Head	4.86	35.80	4.995	36.293	2.78	1.38	±5	22.8	26/04/2024
5400	Head	4.86	35.80	4.713	34.278	-3.02	-4.25	±5	22.8	26/04/2024
5530	Head	5.07	35.50	4.888	36.791	-3.59	3.64	±5	22.8	26/04/2024
5600	Head	5.07	35.50	4.938	35.808	-2.60	0.87	±5	23.0	27/04/2024
5610	Head	5.07	35.50	4.906	35.111	-3.23	-1.10	±5	23.0	27/04/2024
5755	Head	5.27	35.30	5.448	34.636	3.38	-1.88	±5	23.0	27/04/2024
5795	Head	5.27	35.30	5.188	33.668	-1.56	-4.62	±5	23.0	27/04/2024
5800	Head	5.27	35.30	5.226	35.712	-0.83	1.17	±5	23.0	27/04/2024

Remark:

1. The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
2. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

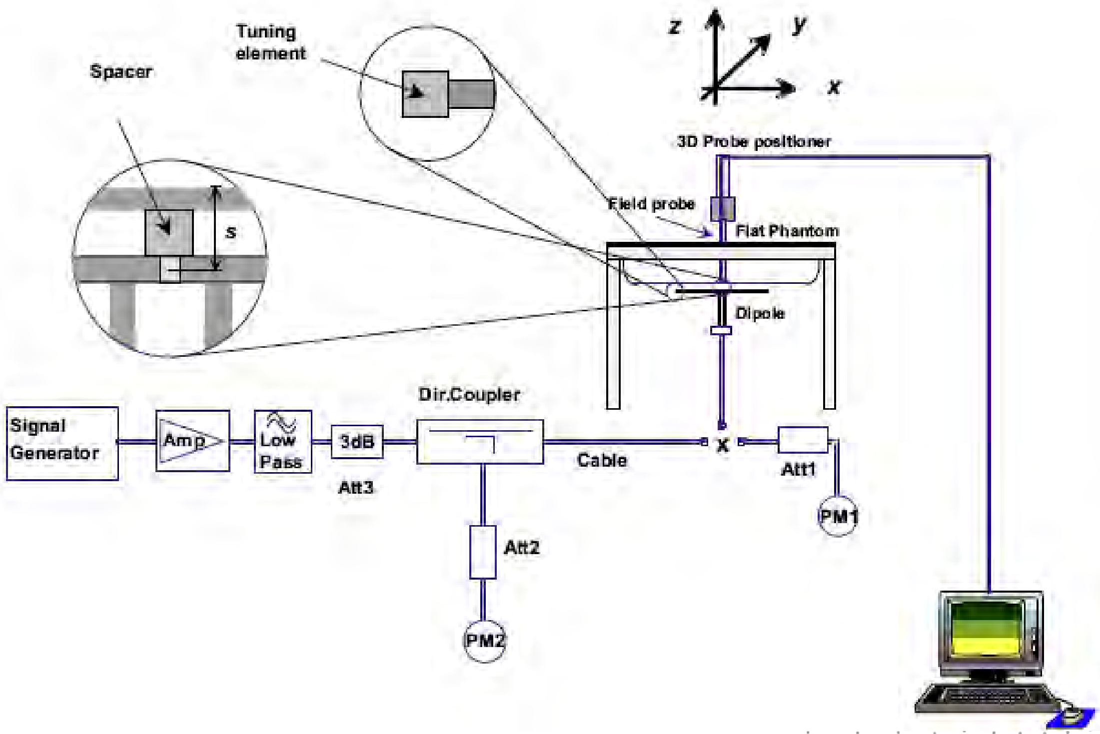
11. System Check

11.1 Purpose of System Performance Check

At the device test frequencies. System check verifies the measurement repeatability of a SAR system before compliance testing and is not a validation of all system specifications. The latter is not required for testing a device but is mandatory before the system is deployed. The system check detects possible short-term drift and unacceptable measurement errors or uncertainties in the system.

11.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator at frequency 600MHz-6000MHz. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The output power on dipole port must be calibrated to 20 dBm (100 mW) before dipole is connected.



System Verification Setup Block Diagram

Setup Photo of Dipole Antenna

11.3 Validation Results

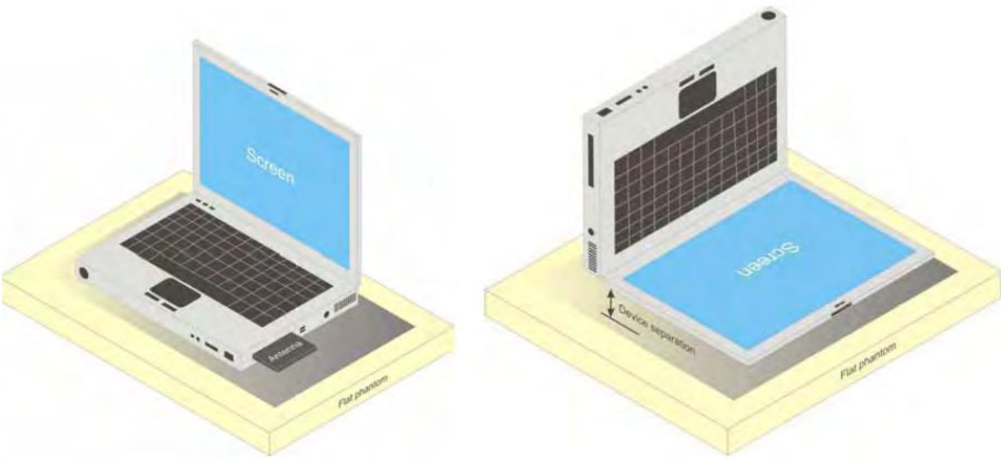
Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10 %. The following table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion.

Frequency (MHz)	Power	Measured SAR_{1g} (W/Kg)	Normalize to 1 Watt	Drift (%)	1W Target SAR_{1g} (W/Kg)	Difference Percentage (%)	Limit (%)	Liquid Temp	Date
2450	250mW	14.097	56.387	-3.535	55.16	2.224	±10	23.0	24/04/2024
5200	250mW	19.846	79.384	3.884	76.41	3.892	±10	22.8	26/04/2024
5400	250mW	19.724	78.897	-2.942	80.52	-2.016	±10	22.8	26/04/2024
5600	250mW	20.112	80.448	-2.413	79.08	1.730	±10	23.0	27/04/2024
5800	250mW	18.872	75.487	-4.260	76.49	-1.311	±10	23.0	27/04/2024

12. EUT Testing Position

Body Position

A typical example of a body supported device is a wireless enabled laptop device that among other orientations may be supported on the thighs of a sitting user. To represent this orientation, the device shall be positioned with its base against the flat phantom. Other orientations may be specified by the manufacturer in the user instructions. If the intended use is not specified, the device shall be tested directly against the flat phantom in all usable orientations.



Test positions for Body-supported Device

13. SAR Measurement Procedures

13.1 Measurement Procedures

The measurement procedures are as follows:
(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.
(b) Keep EUT to radiate maximum output power or 100% factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the EUT in the positions as Annex D demonstrates.
(e) Set scan area, grid size and other setting on the SATIMO software.
(f) Measure SAR results for the highest power channel on each testing position.
(g) Find out the largest SAR result on these testing positions of each band
(h) Measure SAR results for other channels in worst SAR testing position if the 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

13.2 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The SATIMO software includes all numerical procedures necessary to evaluate the spatial peak SAR value.
The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.
The entire evaluation of the spatial peak values is performed within the post-processing engine. The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:
(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

13.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

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

13.4 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software can combine and subsequently superpose these measurement data to calculating the multiband SAR.

13.5 SAR Averaged Methods

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 minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm 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 10g and 1 g requires a very fine resolution in the three dimensional scanned data array.

13.6 Power Drift Monitoring

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

14. SAR Test Result

14.1 Conducted RF Output Power

BDR, EDR				
Mode	**Channel**	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
GFSK	0	2402	9.164	10.0
	39	2441	8.895	
	78	2480	9.373	
π /4-DQPSK	0	2402	7.001	7.5
	39	2441	6.870	
	78	2480	7.166	
8DPSK	0	2402	7.156	7.5
	39	2441	7.062	
	78	2480	7.256	

BLE				
Mode	**Channel**	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
GFSK	0	2402	9.330	10.0
	19	2440	9.210	
	39	2480	**9.700**	

WIFI 2.4G						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Tune-up power (dBm)	
			Ant A	Ant B	Ant A	Ant B
11b	1	2412	23.080	22.610	23.5	23.0
11b	6	2437	22.690	22.370		
11b	11	2462	22.490	22.380		
11g	1	2412	22.610	22.260	27.5	26.5
11g	6	2437	**26.870**	26.150		
11g	11	2462	22.190	22.060		
11n HT20	1	2412	22.340	22.220	27.0	26.5
11n HT20	6	2437	26.630	26.090		
11n HT20	11	2462	21.850	22.050		
11n HT40	3	2422	21.660	21.730	23.0	23.0
11n HT40	6	2437	22.490	22.490		
11n HT40	9	2452	21.580	21.260		
11ax HE20	1	2412	22.890	22.210	27.0	27.0
11ax HE20	6	2437	26.500	**26.490**		
11ax HE20	11	2462	22.850	22.440		
11ax HE40	3	2422	22.410	22.050	24.0	23.5
11ax HE40	6	2437	23.470	22.950		
11ax HE40	9	2452	22.040	21.920		

WIFI 5.2G						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Tune-up power (dBm)	
			Ant A	Ant B	Ant A	Ant B
11a	36	5180	13.110	13.330	14.0	14.0
11a	44	5220	13.430	13.500		
11a	48	5240	13.450	13.470		
11n HT20	36	5180	13.790	13.710	14.5	14.0
11n HT20	44	5220	13.860	13.710		
11n HT20	48	5240	13.830	13.810		
11n HT40	38	5190	16.780	16.750	17.5	17.0
11n HT40	46	5230	16.910	16.760		
11ac VHT20	36	5180	13.820	13.840	14.5	14.5
11ac VHT20	44	5220	13.960	13.930		
11ac VHT20	48	5240	13.970	13.900		
11ac VHT40	38	5190	16.920	**16.870**	17.5	17.5
11ac VHT40	46	5230	**16.960**	16.800		
11ac VHT80	42	5210	13.620	13.500	14.0	14.0
11ac VHT160	50	5250	10.720	10.660	11.0	11.0
11ax HE20	36	5180	14.250	14.230	15.0	15.0
11ax HE20	40	5200	14.390	14.300		
11ax HE20	48	5240	14.370	14.310		
11ax HE40	38	5190	16.680	16.590	17.0	17.0
11ax HE40	46	5230	16.670	16.480		
11ax HE80	42	5210	13.190	13.210	13.5	13.5
11ax HE160	50	5250	10.530	10.450	11.0	11.0

WIFI 5.4G						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Tune-up power (dBm)	
			Ant A	Ant B	Ant A	Ant B
11a	52	5260	15.970	15.900	16.5	16.5
11a	60	5300	16.050	15.960		
11a	64	5320	15.530	15.330		
11n HT20	52	5260	16.360	16.280	17.0	17.0
11n HT20	60	5300	16.420	16.320		
11n HT20	64	5320	15.800	15.750		
11n HT40	54	5270	18.860	18.720	19.5	19.0
11n HT40	62	5310	13.920	13.620		
11ac VHT20	52	5260	16.420	16.310	17.0	17.0
11ac VHT20	60	5300	16.490	16.410		
11ac VHT20	64	5320	15.840	15.810		
11ac VHT40	54	5270	**18.910**	**18.840**	19.5	19.5
11ac VHT40	62	5310	14.060	13.690		
11ac VHT80	58	5290	14.240	14.050	14.5	14.5
11ax HE20	52	5260	16.730	16.670	17.5	17.0
11ax HE20	60	5300	16.810	16.770		
11ax HE20	64	5320	16.340	16.200		
11ax HE40	54	5270	18.660	18.630	19.0	19.0
11ax HE40	62	5310	13.540	13.450		
11ax HE80	58	5290	13.720	13.600	14.0	14.0

WIFI 5.6G						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Tune-up power (dBm)	
			Ant A	Ant B	Ant A	Ant B
11a	100	5500	16.260	16.110	17.0	16.5
11a	116	5580	16.740	16.750		
11a	140	5700	15.960	15.820		
11n HT20	100	5500	16.680	16.580	17.5	17.5
11n HT20	116	5580	17.100	17.050		
11n HT20	140	5700	16.210	16.180		
11n HT40	102	5510	15.130	14.830	20.0	19.5
11n HT40	110	5550	19.360	19.250		
11n HT40	134	5670	18.080	18.010		
11ac VHT20	100	5500	16.700	16.620	17.5	17.5
11ac VHT20	116	5580	17.130	17.180		
11ac VHT20	140	5700	16.250	16.240		
11ac VHT40	102	5510	15.150	14.980	20.0	20.0
11ac VHT40	110	5550	19.600	19.550		
11ac VHT40	134	5670	18.160	18.070		
11ac VHT80	106	5530	14.560	14.530	20.0	20.0
11ac VHT80	122	5610	**19.730**	**19.640**		
11ac VHT160	114	5570	13.940	13.880	14.5	14.5
11ax HE20	100	5500	17.110	17.010	18.0	18.0
11ax HE20	116	5580	17.550	17.600		
11ax HE20	140	5700	16.630	16.620		
11ax HE40	102	5510	14.920	14.790	19.5	19.5
11ax HE40	110	5550	19.290	19.270		
11ax HE40	134	5670	17.690	17.780		
11ax HE80	106	5530	14.300	14.190	20.0	20.0
11ax HE80	122	5610	19.390	19.320		
11ax HE160	114	5570	13.780	13.630	14.0	14.0

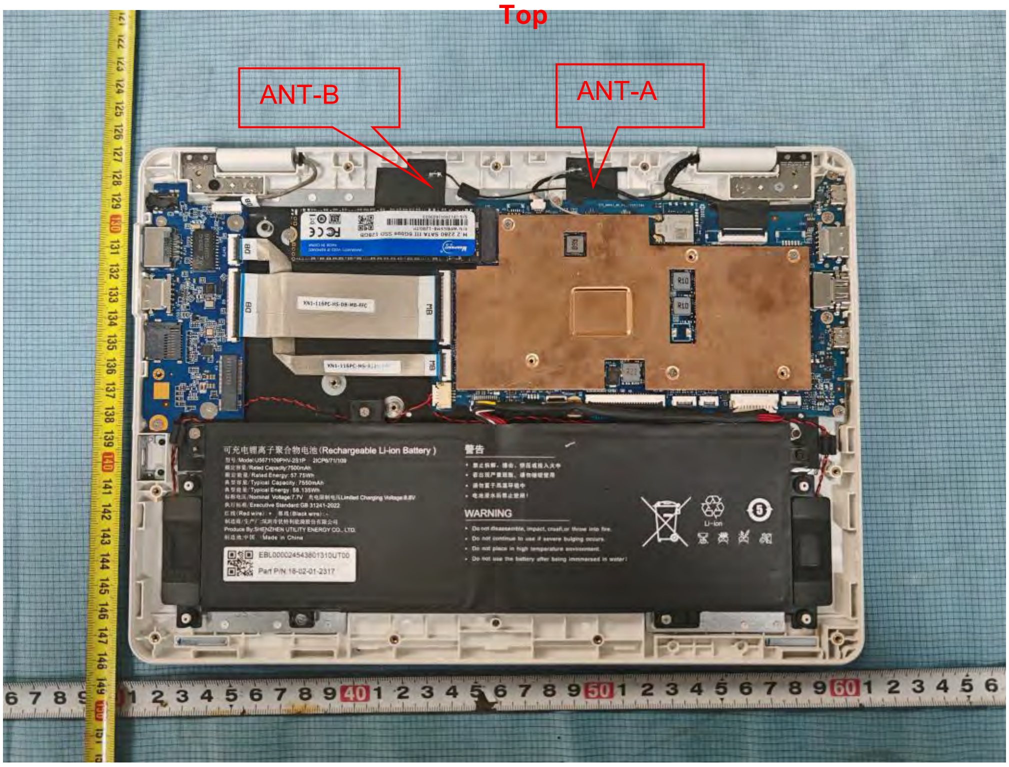
WIFI 5.8G						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)		Tune-up power (dBm)	
			Ant A	Ant B	Ant A	Ant B
11a	149	5745	18.730	18.690	19.5	19.5
11a	157	5785	18.880	18.630		
11a	165	5825	18.900	18.880		
11n HT20	149	5745	18.960	18.860	19.5	19.5
11n HT20	157	5785	19.150	18.880		
11n HT20	165	5825	19.220	19.150		
11n HT40	151	5755	19.510	19.350	20.0	20.0
11n HT40	159	5795	19.560	19.480		
11ac VHT20	149	5745	19.160	19.060	19.5	19.5
11ac VHT20	157	5785	19.200	19.040		
11ac VHT20	165	5825	19.290	19.270		
11ac VHT40	151	5755	19.730	19.590	20.0	20.0
11ac VHT40	159	5795	**19.780**	**19.710**		
11ac VHT80	155	5775	18.810	18.710	19.5	19.0
11ax HE20	149	5745	19.490	19.380	20.0	20.0
11ax HE20	157	5785	19.570	19.440		
11ax HE20	165	5825	19.700	19.620		
11ax HE40	151	5755	19.460	19.270	20.0	20.0
11ax HE40	159	5795	19.500	19.350		
11ax HE80	155	5775	18.570	18.470	19.0	19.0

Straddle Channels 5470-5725MHz						
Mode	Channel	**Frequency (MHz)**	**Conducted Power (dBm)**		**Tune-up power (dBm)**	
			Ant A	**Ant B**	**Ant A**	**Ant B**
11a	144	5720	13.11	13.23	13.5	13.5
11n HT20	144	5720	12.89	13.16	13.5	13.5
11n HT40	142	5710	14.06	13.95	14.5	14.5
11ac VHT20	144	5720	12.96	13.23	13.5	13.5
11ac VHT40	142	5710	14.15	14.00	14.5	14.5
11ac VHT80	138	5690	15.20	15.17	15.5	15.5
11ax HE20	144	5720	13.00	13.20	13.5	13.5
11ax HE40	142	5710	13.79	13.64	14.0	14.0
11ax HE80	138	5690	14.91	14.94	15.5	15.5

Straddle Channels 5725MHz						
Mode	**Channel**	**Frequency (MHz)**	**Conducted Power (dBm)**		**Tune-up power (dBm)**	
			Ant A	**Ant B**	**Ant A**	**Ant B**
11a	144	5720	4.74	4.91	5.0	5.5
11n HT20	144	5720	5.02	5.11	5.5	5.5
11n HT40	142	5710	1.38	1.15	2.0	1.5
11ac VHT20	144	5720	5.17	5.27	5.5	5.5
11ac VHT40	142	5710	1.50	1.21	2.0	1.5
11ac VHT80	138	5690	-1.40	-1.62	-1.0	-1.0
11ax HE20	144	5720	5.92	5.99	6.5	6.5
11ax HE40	142	5710	1.99	1.67	2.5	2.0
11ax HE80	138	5690	-0.56	-0.72	0.0	-0.5

14.2 Transmit Antennas and SAR Measurement Position

EUT Antenna Location:



Antenna information	
Antenna	**Function**
ANT-A	WIFI+ Bluetooth
ANT-B	WIFI

Distance of The Antenna to the EUT surface and edge (mm)						
Antennas	Front	Back	Top Side	Bottom Side	Left Side	Right Side
ANT-A	N/A	<25	<25	200	160	110
ANT-B	N/A	<25	<25	200	100	170

Body mode: Positions for SAR tests; Test distance: 0mm						
Mode	**Front**	**Back**	**Top Side**	**Bottom Side**	**Left Side**	**Right Side**
ANT-A	N/A	Yes	Yes	No	No	No
ANT-B	N/A	Yes	Yes	No	No	No

Note:

1. Referring to KDB 616217 D04 v01r02, KDB 248227 D01 v02r02 and KDB 447498 D01 v06, this device is overall diagonal dimension (>20cm) tablet, tested in direct contact (no gap) with flat phantom.
2. According to the KDB 616217 D04 SAR for laptop and tablets v01r02, When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required.

14.3 Measured and Reported (Scaled) SAR Results

The calculated SAR is obtained by the following formula:
1. Reported SAR for WWAN=Measured SAR * Tune-up Scaling factor
2. Reported SAR for WLAN and Bluetooth=Measured SAR * Tune-up Scaling factor * Duty Cycle Scaling factor
3. Duty Cycle Scaling factor=1/ Duty Cycle (%)

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 248227 D01 802.11 Wi-Fi SAR
SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements.
For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions.

DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.16 The initial test position procedure is described in the following:

a) When the *reported* SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band. SAR is also not required for that exposure configuration in the subsequent test configuration(s).
b) When the *reported* SAR of the initial test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position using subsequent highest extrapolated or estimated 1-g SAR conditions determined by area scans or next closest/smallest test separation distance and maximum RF coupling test positions based on manufacturer justification, on the highest maximum output power channel, until the *reported* SAR is ≤ 0.8 W/kg or all required test positions (left, right, touch, tilt or subsequent surfaces and edges) are tested.
c) For all positions/configurations tested using the initial test position and subsequent test positions, when the *reported* SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the *reported* SAR is ≤ 1.2 W/kg or all required channels are tested.

Additional power measurements may be required for this step, which should be limited to those necessary for identifying the subsequent highest output power channels.

When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR

Bluetooth										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	GFSK	Back	39	2480	9.700	10.0	1.072	0.123	0.132	
		Top	39	2480	9.700	10.0	1.072	0.134	0.144	
		Top	0	2402	9.330	10.0	1.167	0.197	**0.230**	1
		Top	19	2440	9.210	10.0	1.199	0.121	0.145	

WIFI 2.4G (ANT-A)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11g	Back	6	2437	26.870	27.5	1.156	0.171	0.198	
		Top	6	2437	26.870	27.5	1.156	0.136	0.157	
		Back	1	2412	22.610	27.5	3.083	0.210	0.647	
		Back	11	2462	22.190	27.5	3.396	0.229	**0.778**	2

WIFI 2.4G (ANT-B)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ax HE20	Back	6	2437	26.490	26.5	1.002	0.238	0.239	
		Top	6	2437	26.490	26.5	1.002	0.320	0.321	
		Top	1	2412	22.210	26.5	2.685	0.207	**0.556**	3
		Top	11	2462	22.440	26.5	2.547	0.204	0.520	

WIFI 5.2G (ANT-A)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	46	5230	16.960	17.5	1.132	0.416	0.471	
		Top	46	5230	16.960	17.5	1.132	0.593	**0.672**	4
		Top	38	5190	16.920	17.5	1.143	0.493	0.563	

WIFI 5.2G (ANT-B)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	38	5190	16.870	17.5	1.156	0.483	0.558	
		Top	38	5190	16.870	17.5	1.156	0.533	0.616	
		Top	46	5230	16.800	17.5	1.175	0.599	**0.704**	5

WIFI 5.4G (ANT-A)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	54	5270	18.910	19.0	1.021	0.486	0.496	
		Top	54	5270	18.910	19.0	1.021	0.593	**0.605**	6
		Top	62	5310	14.060	19.0	3.119	0.146	0.455	

WIFI 5.4G (ANT-B)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	54	5270	18.840	19.0	1.038	0.443	0.460	
		Top	54	5270	18.840	19.0	1.038	0.597	0.619	
		Top	62	5310	13.690	19.0	3.396	0.206	**0.700**	7

WIFI 5.6G (ANT-A)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT80	Back	122	5610	19.730	20.0	1.064	0.393	0.418	
		Top	122	5610	19.730	20.0	1.064	0.493	0.525	
		Back	106	5530	14.560	20.0	3.499	0.172	**0.602**	8

WIFI 5.6G (ANT-B)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT80	Back	122	5610	19.640	20.0	1.086	0.370	0.402	
		Top	122	5610	19.640	20.0	1.086	0.457	0.496	
		Top	106	5530	14.530	20.0	3.524	0.146	**0.514**	9

WIFI 5.8G (ANT-A)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	159	5795	19.780	20.0	1.052	0.592	0.623	
		Top	159	5795	19.780	20.0	1.052	0.668	**0.703**	10
		Top	151	5755	19.730	20.0	1.064	0.627	0.667	

WIFI 5.8G (ANT-B)										
RF Exposure Conditions	Mode	Test Position	CH.	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
								Meas.	Scaled	
Body (0mm)	11ac VHT40	Back	159	5795	19.710	20.0	1.069	0.567	0.606	
		Top	159	5795	19.710	20.0	1.069	0.641	0.685	
		Top	151	5755	19.590	20.0	1.099	0.632	**0.695**	11

14.4 SAR Measurement Variability

According to KDB865664, Repeated measurements are required only when the measured SAR is ≥ 0.80 W/kg. If the measured SAR value of the initial repeated measurement is < 1.45 W/kg with ≤ 20% variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within 10% of the SAR limit and vary by more than 20%, which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required. The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.19 The repeated measurement results must be clearly identified in the SAR report. All measured SAR, including the repeated results, must be considered to determine compliance and for reporting according to KDB 690783.Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

1) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
2) 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).
3) 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.
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

Test Mode	Frequency Band (MHz)	RF Exposure Configuration	Test Position	Repeated SAR (yes/no)	Highest Measured SAR1-g (W/Kg)	First Repeated	
						Measured SAR1-g (W/Kg)	Largest to Smallest SAR Ratio
/	/	/	/	/	/	/	/

14.5 Simultaneous Transmission Evaluation

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmiting antenna.

Application Simultaneous Transmission information:

No.	Configurations	Body SAR
1	WIFI(ANT-A) + WIFI(ANT-B)	Yes
2	WIFI(ANT-A) + Bluetooth	No
3	WIFI(ANT-B) + Bluetooth	Yes

Remark:
1. Wi-Fi 2.4GHz and Wi-Fi 5GHz cannot transmit simultaneously.
2. WIFI(ANT-A) and Bluetooth are the same antenna and cannot be sent at the same time.
3. According to the KDB 447498 D01 v06, 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:
● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

Estimated stand alone SAR						
Communication system	Frequency (MHz)	Maximum Power (dBm)	Maximum Power (mW)	Separation Distance (mm)	X	Estimated SAR1-g (W/kg)
/	/	/	/	5	3.0	/
/	/	/	/	10	7.5	/

Note:
1. Maximum average power including tune-up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

4. Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg. When the sum is greater than the SAR limit, SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio}=\frac{(\text{SAR}_1+\text{SAR}_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

5. Simultaneous transmission of maximum SAR sum calculation.

RF Exposure Conditions	Test Position	Standalone SAR (W/kg)			Summed SAR (W/kg)	
		1	2	3	1+2	2+3
		WIFI (ANT-A)	WIFI (ANT-B)	Bluetooth		
Body	Front	/	/	/	/	/
	Back	0.778	0.606	0.132	1.384	0.738
	Top	0.703	0.704	0.230	1.407	0.934
	Bottom	/	/	/	/	/
	Left	/	/	/	/	/
	Right	/	/	/	/	/

15. Test Plots

15.1 System Performance Check

System check at 2450 MHz

Date of measurement: 24/04/2024

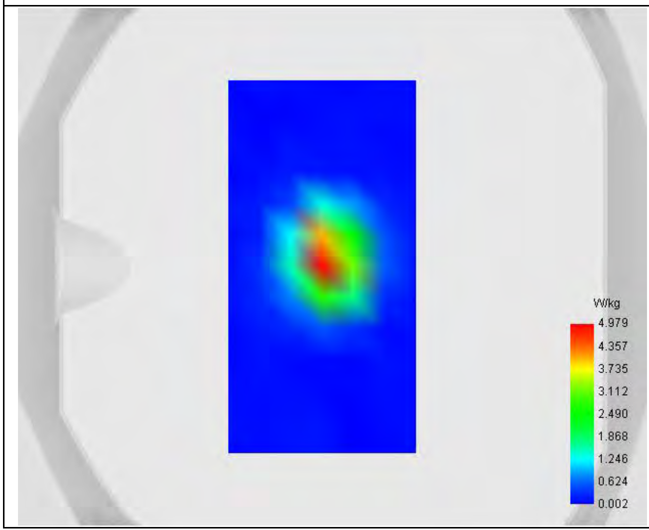
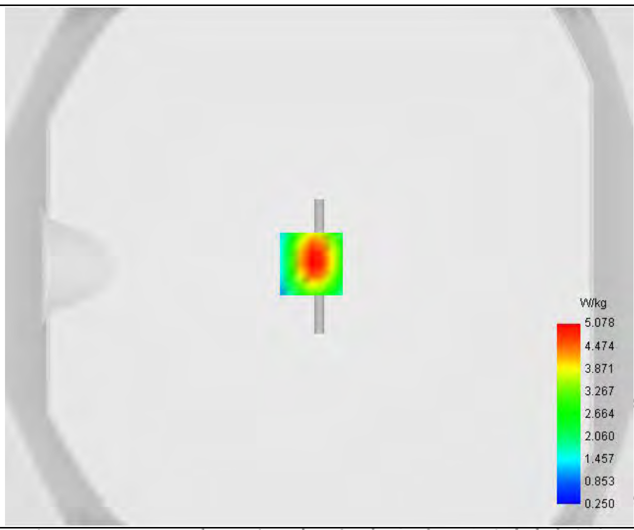
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.32
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW

B. Permitivity

Frequency (MHz)	2450.000
Relative permitivity (real part)	40.548
Relative permitivity (imaginary part)	14.330
Conductivity (S/m)	1.749

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

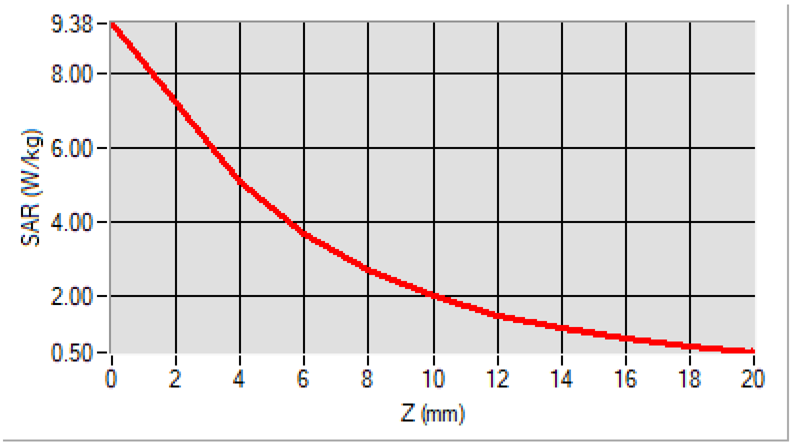
Maximum location: X=-3.00, Y=1.00 ; SAR Peak: 9.50 W/kg

D. SAR 1g & 10g

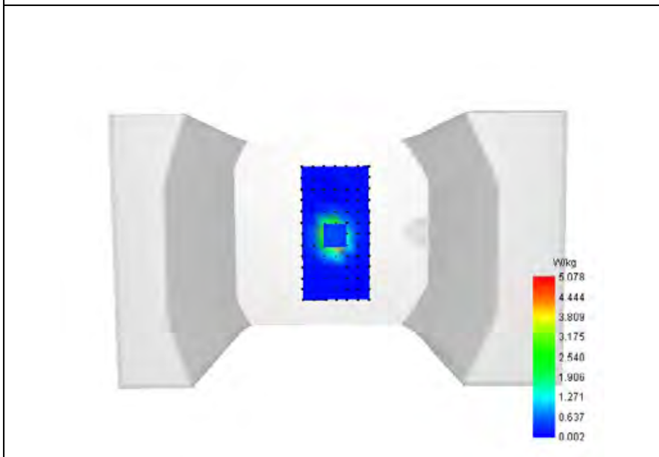
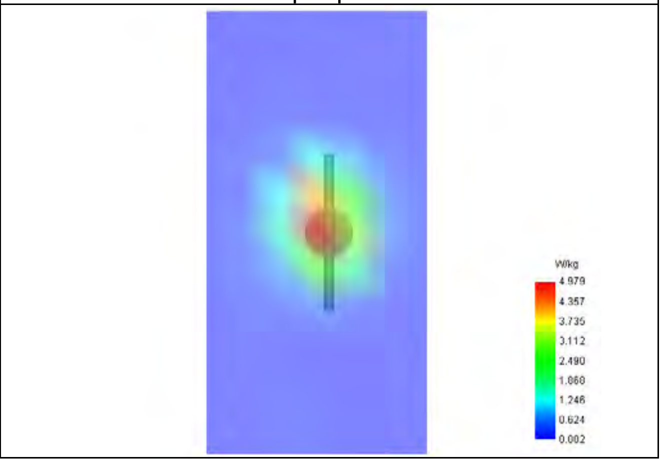
SAR 10g (W/Kg)	6.686
SAR 1g (W/Kg)	14.097
Variation (%)	-3.535
Horizontal validation criteria: minimum distance (mm)	4.431052
Vertical validation criteria: SAR ratio M2/M1 (%)	54.096607

E. Z Axis Scan

Z (mm)	0.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00
SAR (W/Kg)	9.380	5.078	3.712	2.709	2.001	1.499	1.138	0.871	0.667



F. 3D Image

3D screen shot	Hot spot position
	

System check at 5200 MHz

Date of measurement: 26/04/2024

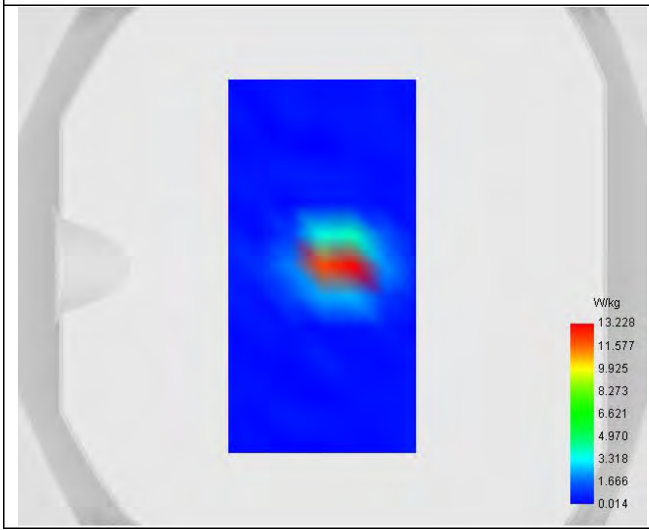
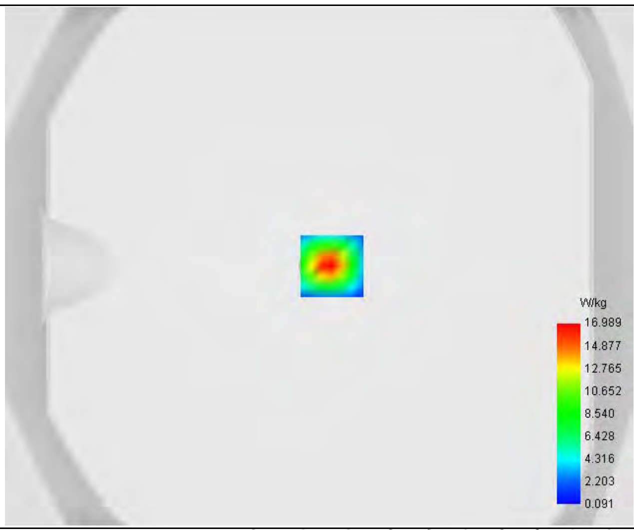
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.97
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5200
Channels	Middle
Signal	CW

B. Permitivity

Frequency (MHz)	5200.000
Relative permitivity (real part)	36.203
Relative permitivity (imaginary part)	18.140
Conductivity (S/m)	4.610

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

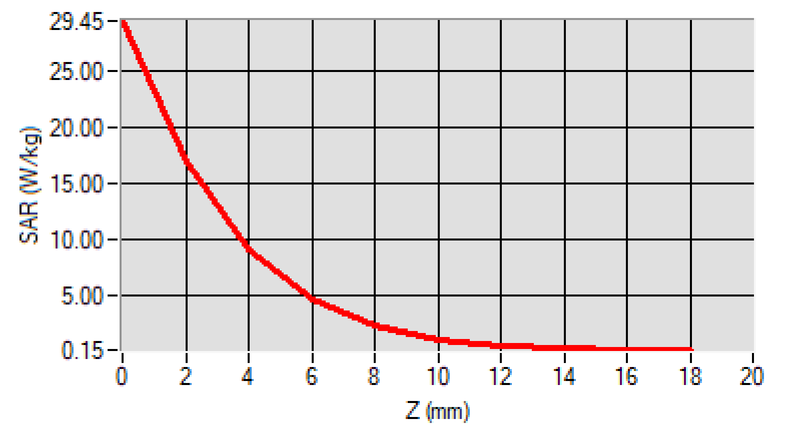
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 30.79 W/kg

D. SAR 1g & 10g

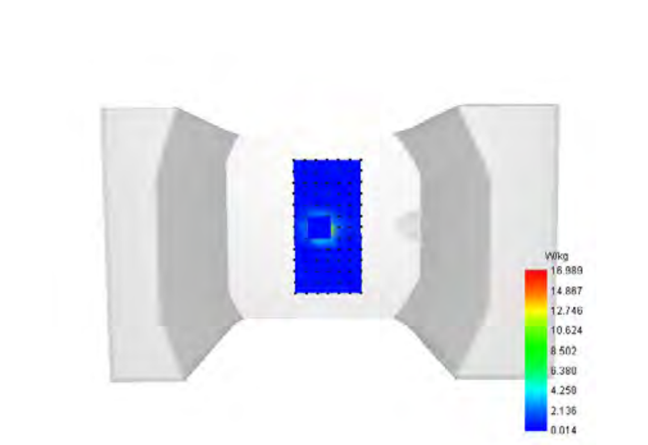
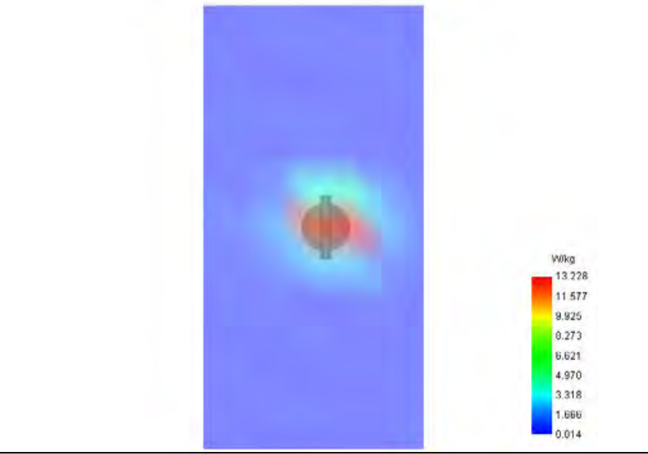
SAR 10g (W/Kg)	8.170
SAR 1g (W/Kg)	19.846
Variation (%)	3.884
Horizontal validation criteria: minimum distance (mm)	4.431396
Vertical validation criteria: SAR ratio M2/M1 (%)	50.961641

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	29.452	16.989	9.130	4.585	2.232	1.083	0.552	0.315	0.209



F. 3D Image

3D screen shot	Hot spot position
	

System check at 5400 MHz

Date of measurement: 26/04/2024

A. Experimental conditions.

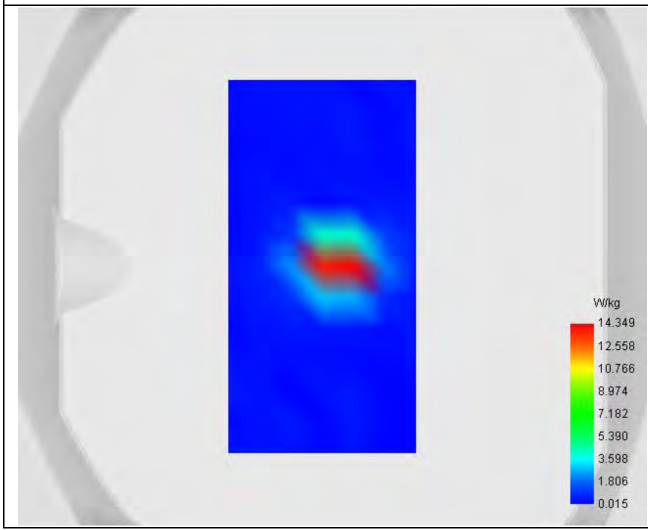
Probe	SN 26/23 EPGO420
ConvF	1.00
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5400
Channels	Middle
Signal	CW

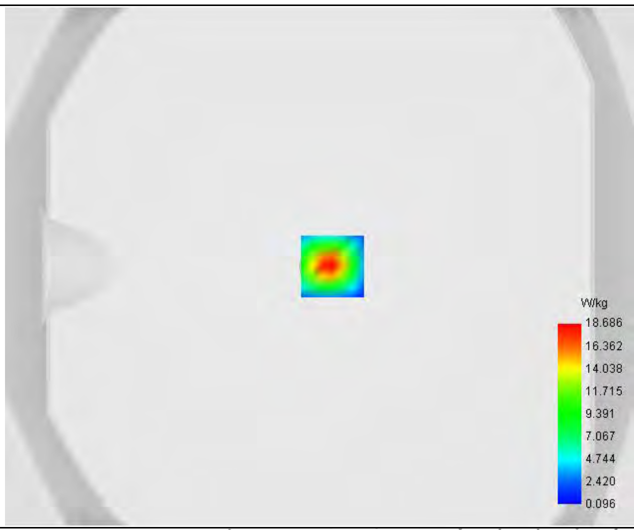
B. Permitivity

Frequency (MHz)	5400.000
Relative permitivity (real part)	34.278
Relative permitivity (imaginary part)	18.300
Conductivity (S/m)	4.713

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





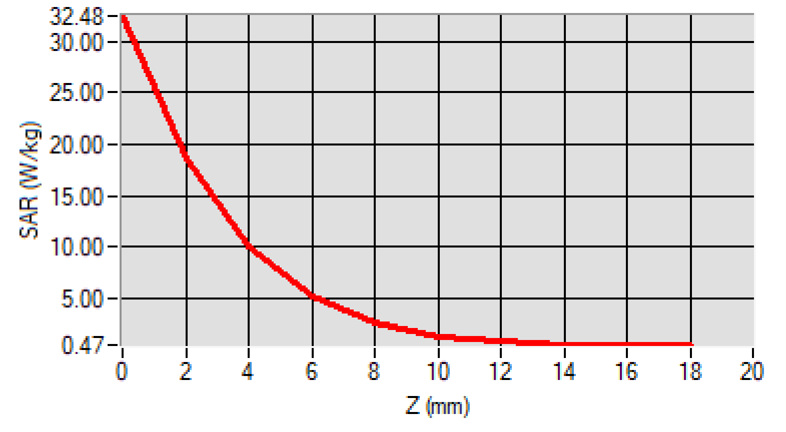
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 34.04 W/kg

D. SAR 1g & 10g

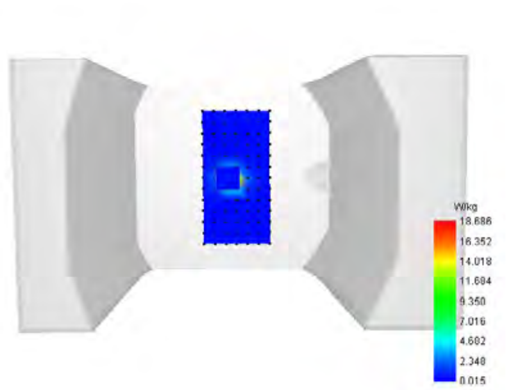
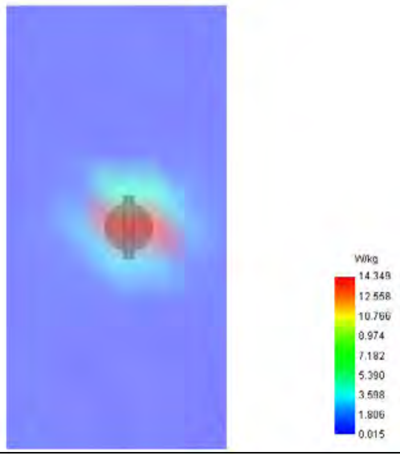
SAR 10g (W/Kg)	9.061
SAR 1g (W/Kg)	19.724
Variation (%)	-2.942
Horizontal validation criteria: minimum distance (mm)	4.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	33.006512

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	32.476	18.686	10.034	5.088	2.563	1.347	0.796	0.566	0.487



F. 3D Image

3D screen shot	Hot spot position
	

System check at 5600 MHz

Date of measurement: 27/04/2024

A. Experimental conditions.

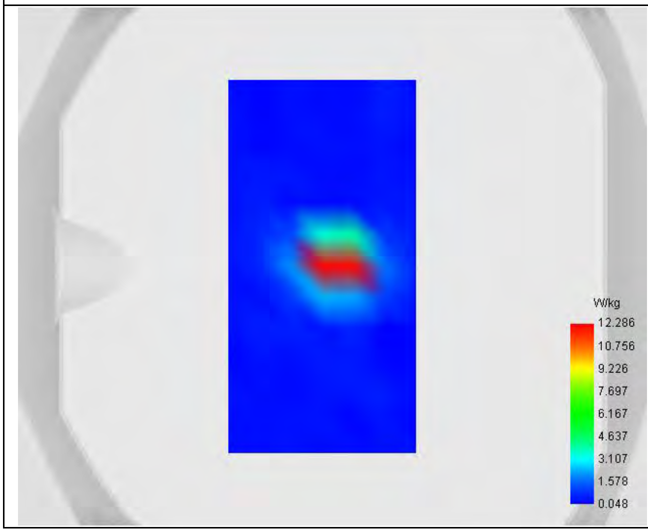
Probe	SN 26/23 EPGO420
ConvF	0.95
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5600
Channels	Middle
Signal	CW

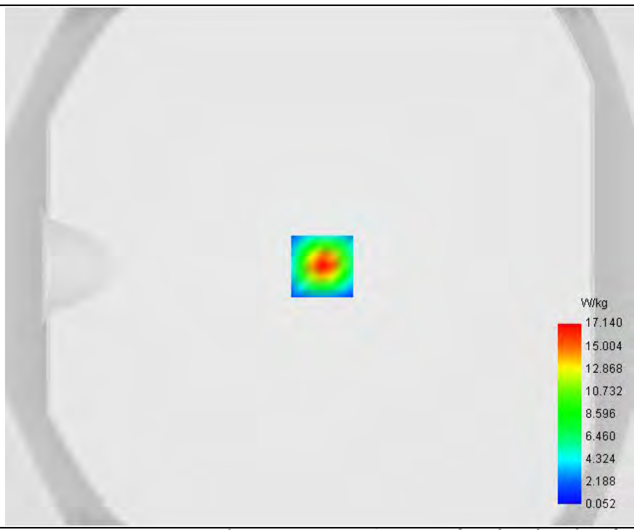
B. Permitivity

Frequency (MHz)	5600.000
Relative permitivity (real part)	35.808
Relative permitivity (imaginary part)	18.460
Conductivity (S/m)	4.938

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**





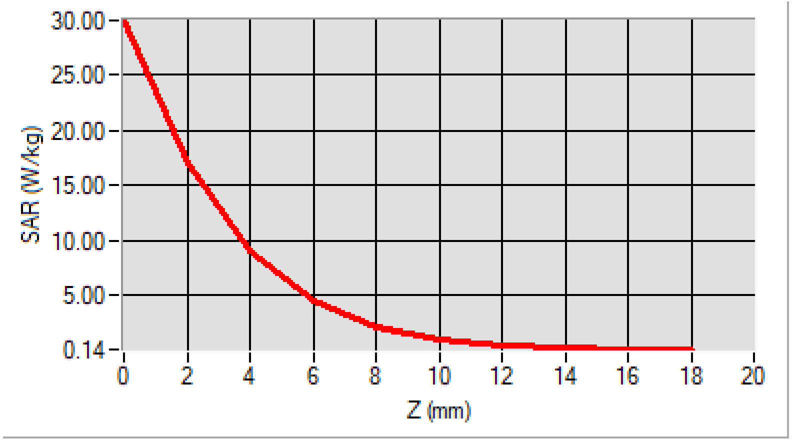
Maximum location: X=1.00, Y=0.00 ; SAR Peak: 31.08 W/kg

D. SAR 1g & 10g

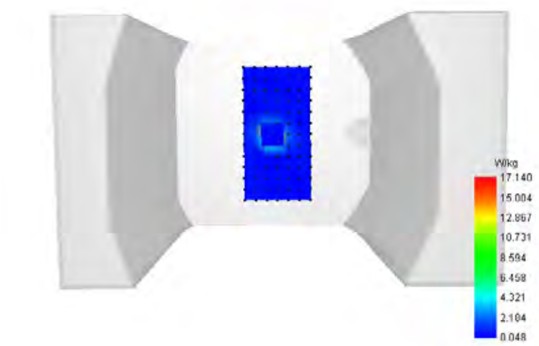
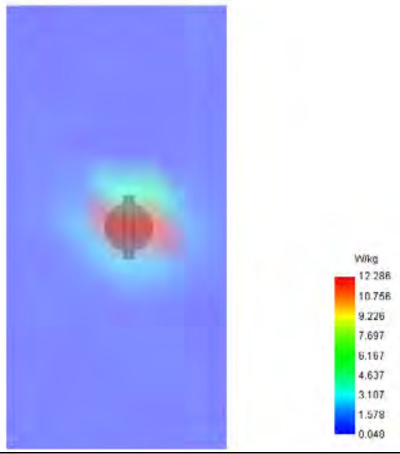
SAR 10g (W/Kg)	9.608
SAR 1g (W/Kg)	20.112
Variation (%)	-2.413
Horizontal validation criteria: minimum distance (mm)	3.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	28.651790

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	30.005	17.140	9.077	4.467	2.119	0.999	0.495	0.280	0.189



F. 3D Image

3D screen shot	Hot spot position
	

System check at 5800 MHz

Date of measurement: 27/04/2024

A. Experimental conditions.

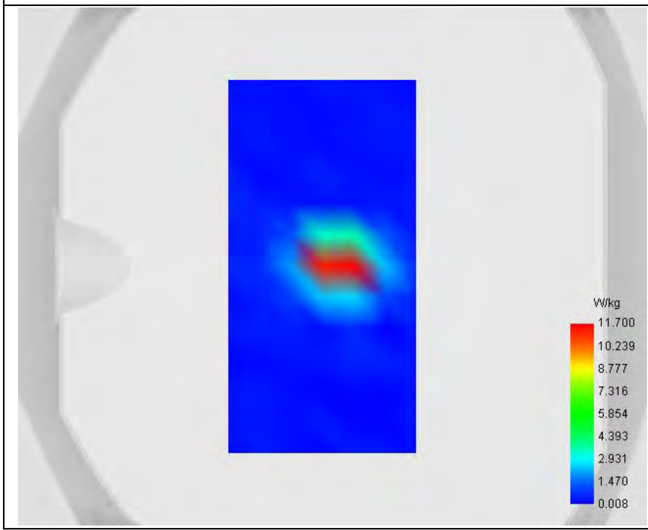
Probe	SN 26/23 EPGO420
ConvF	1.05
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5800
Channels	Middle
Signal	CW

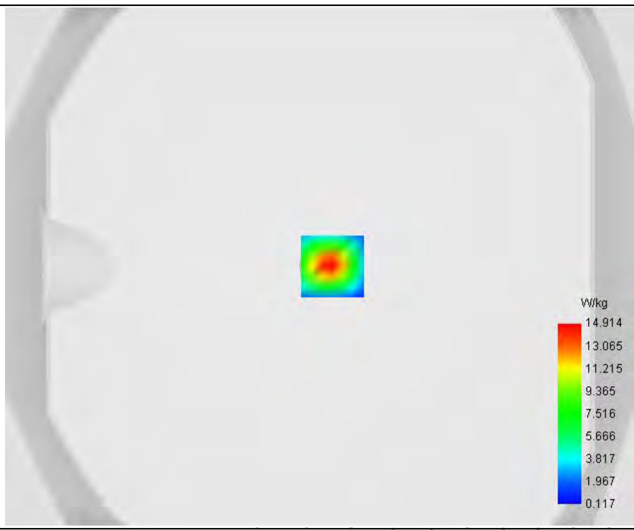
B. Permitivity

Frequency (MHz)	5800.000
Relative permitivity (real part)	35.712
Relative permitivity (imaginary part)	18.620
Conductivity (S/m)	5.226

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





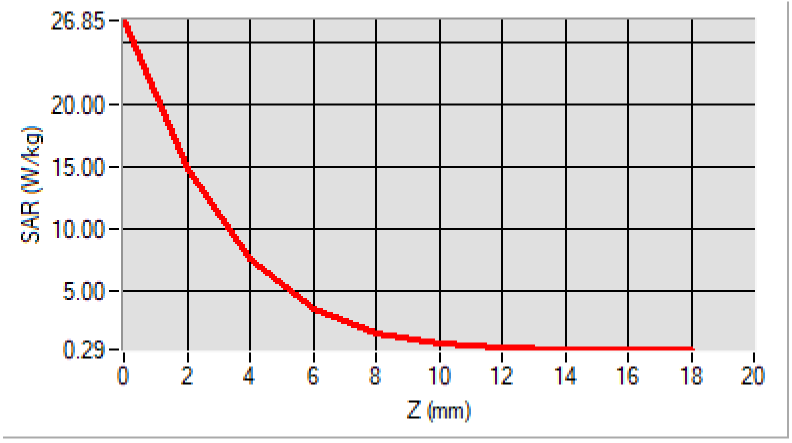
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 28.22 W/kg

D. SAR 1g & 10g

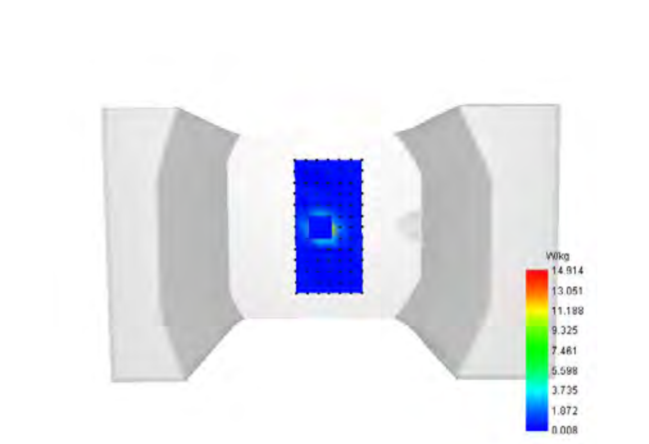
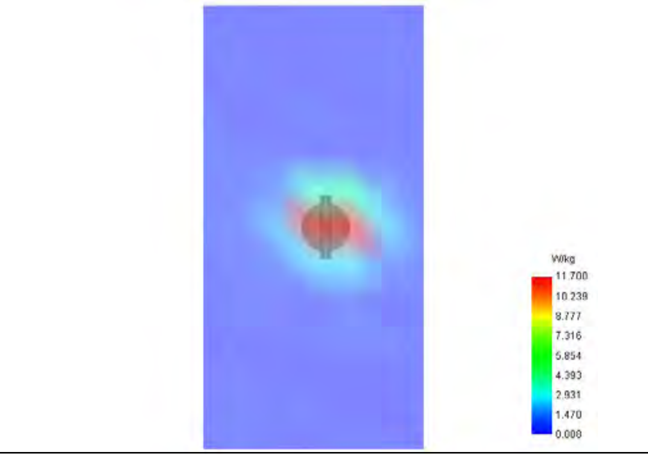
SAR 10g (W/Kg)	8.546
SAR 1g (W/Kg)	18.872
Variation (%)	-4.260
Horizontal validation criteria: minimum distance (mm)	5.846848
Vertical validation criteria: SAR ratio M2/M1 (%)	22.459834

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	26.852	14.914	7.581	3.559	1.627	0.770	0.423	0.303	0.288



F. 3D Image

3D screen shot	Hot spot position
	

15.2 SAR Test Graph Results

Plot 1

Date of measurement: 24/04/2024

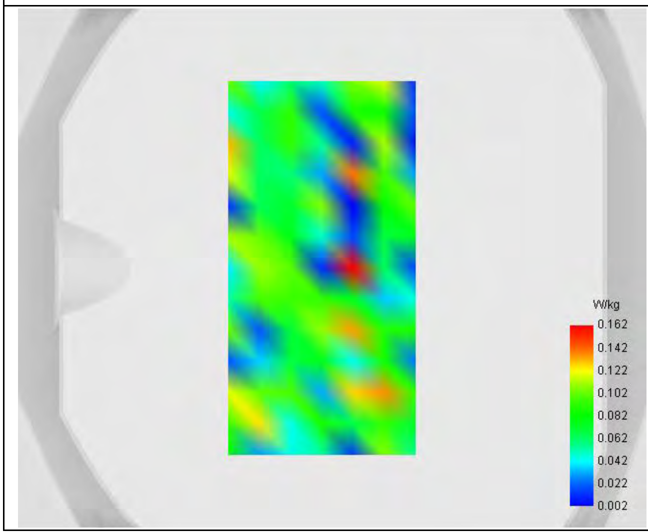
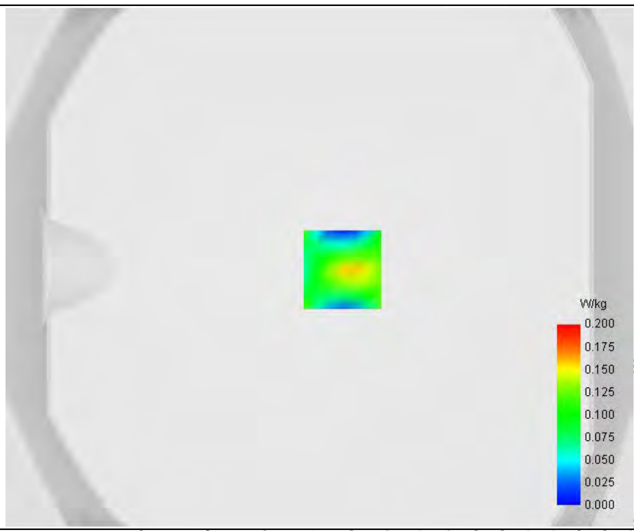
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Bluetooth
Channels	Lower (0)
Signal	Bluetooth

B. Permitivity

Frequency (MHz)	2402.000
Relative permittivity (real part)	38.539
Relative permittivity (imaginary part)	13.172
Conductivity (S/m)	1.849

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

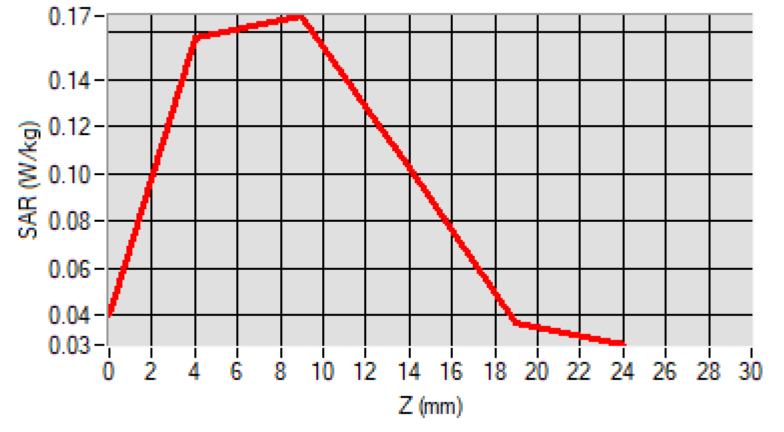
Maximum location: X=9.00, Y=-1.00 ; SAR Peak: 0.49 W/kg

D. SAR 1g & 10g

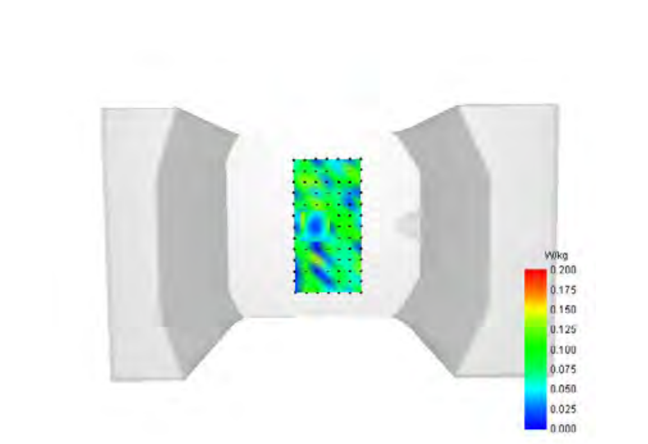
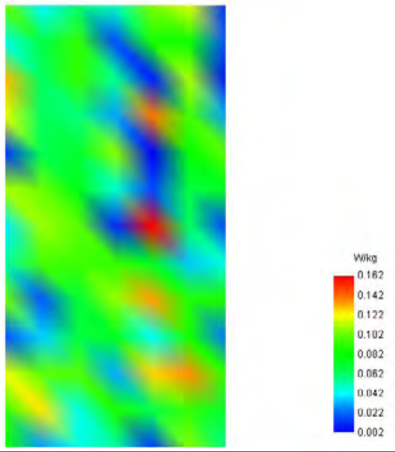
SAR 10g (W/Kg)	0.111
SAR 1g (W/Kg)	0.197
Variation (%)	-1.000
Horizontal validation criteria: minimum distance (mm)	6.700023
Vertical validation criteria: SAR ratio M2/M1 (%)	64.065481

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.040	0.158	0.167	0.103	0.037



F. 3D Image

3D screen shot	Hot spot position
	

Report No：BCTC2404260018E

Plot 2

Date of measurement: 24/04/2024

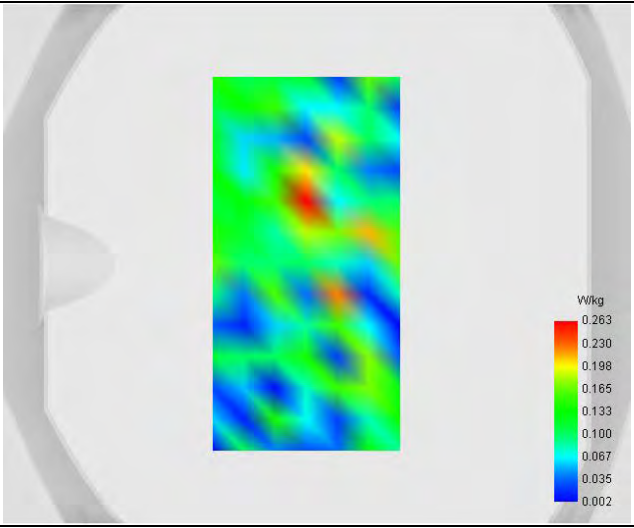
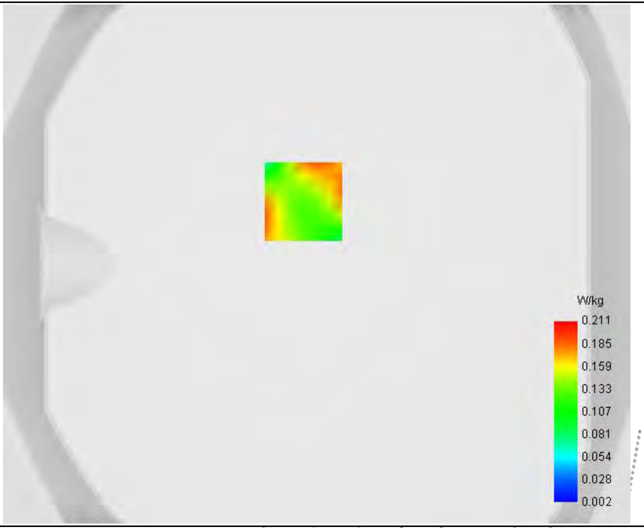
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	ISM
Channels	Higher (11)
Signal	IEEE 802.11 g

B. Permitivity

Frequency (MHz)	2462.000
Relative permitivity (real part)	41.063
Relative permitivity (imaginary part)	13.248
Conductivity (S/m)	1.813

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

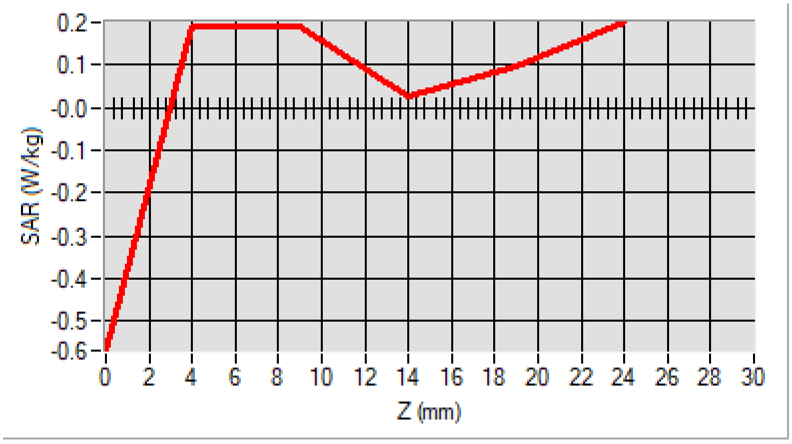
Maximum location: X=-5.00, Y=24.00 ; SAR Peak: 0.61 W/kg

D. SAR 1g & 10g

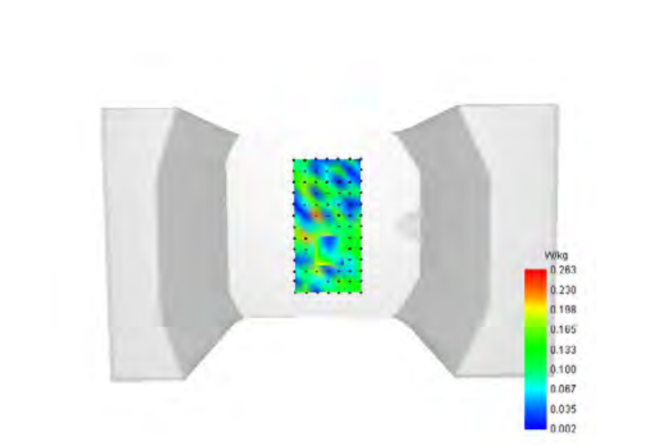
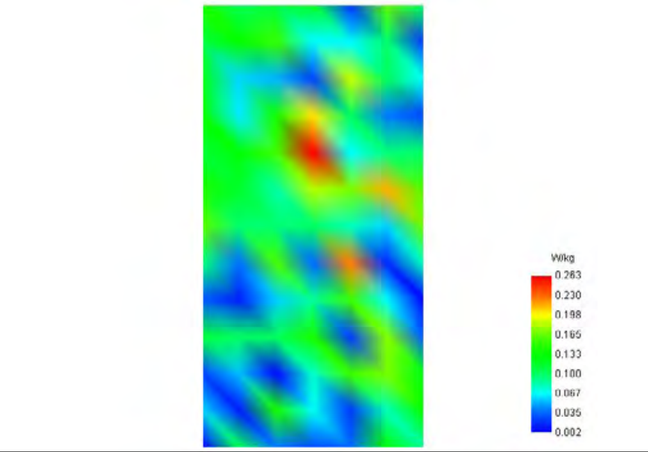
SAR 10g (W/Kg)	0.100
SAR 1g (W/Kg)	0.229
Variation (%)	-2.990
Horizontal validation criteria: minimum distance (mm)	8.198064
Vertical validation criteria: SAR ratio M2/M1 (%)	63.546355

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	-0.568	0.190	0.190	0.028	0.096



F. 3D Image

3D screen shot	Hot spot position
	

Plot 3

Date of measurement: 24/04/2024

A. Experimental conditions.

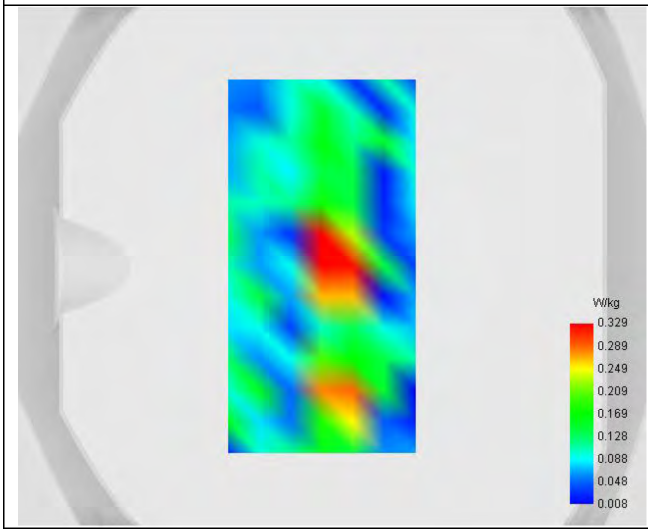
Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	ISM
Channels	Lower (1)
Signal	IEEE 802.11 g

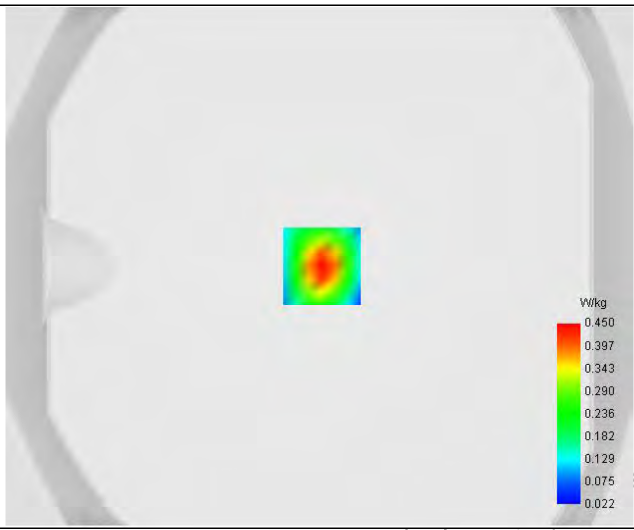
B. Permitivity

Frequency (MHz)	2412.000
Relative permitivity (real part)	40.587
Relative permitivity (imaginary part)	13.182
Conductivity (S/m)	1.869

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





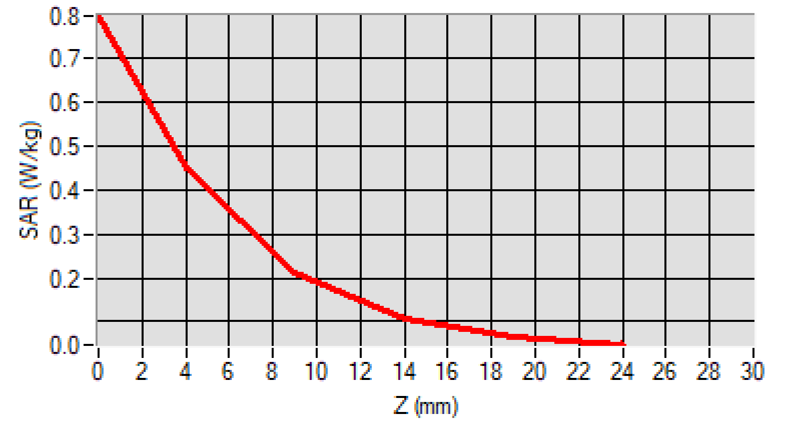
Maximum location: X=1.00, Y=0.00 ; SAR Peak: 0.79 W/kg

D. SAR 1g & 10g

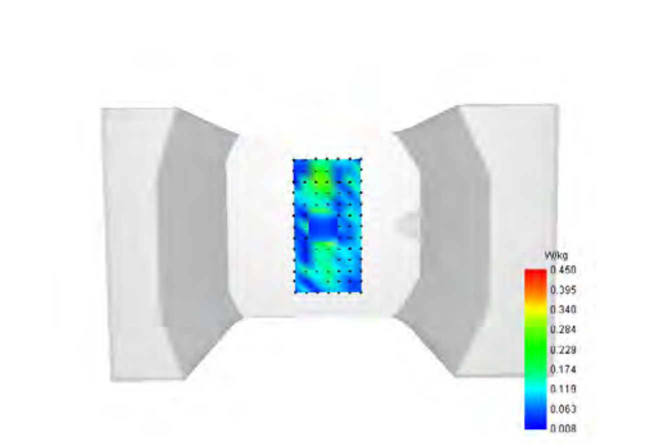
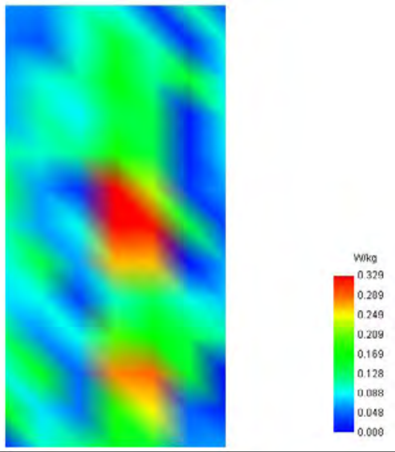
SAR 10g (W/Kg)	0.125
SAR 1g (W/Kg)	0.207
Variation (%)	-4.260
Horizontal validation criteria: minimum distance (mm)	6.415452
Vertical validation criteria: SAR ratio M2/M1 (%)	31.808642

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.797	0.450	0.212	0.106	0.065



F. 3D Image

3D screen shot	Hot spot position
	

Plot 4

Date of measurement: 26/04/2024

A. Experimental conditions.

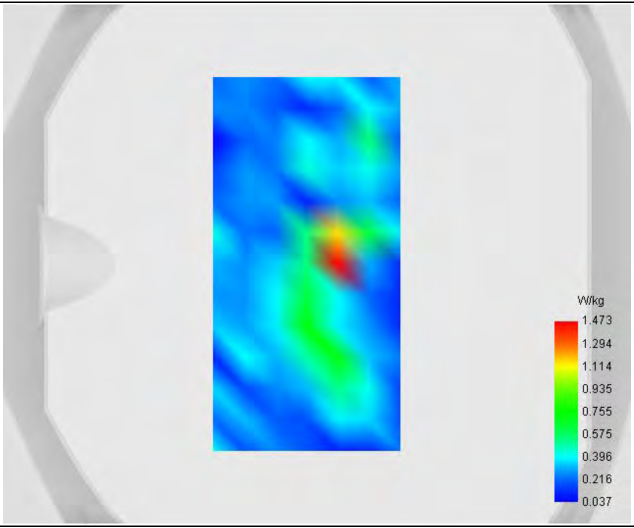
Probe	SN 26/23 EPGO420
ConvF	1.18
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-1
Channels	46
Signal	IEEE 802.11 ac

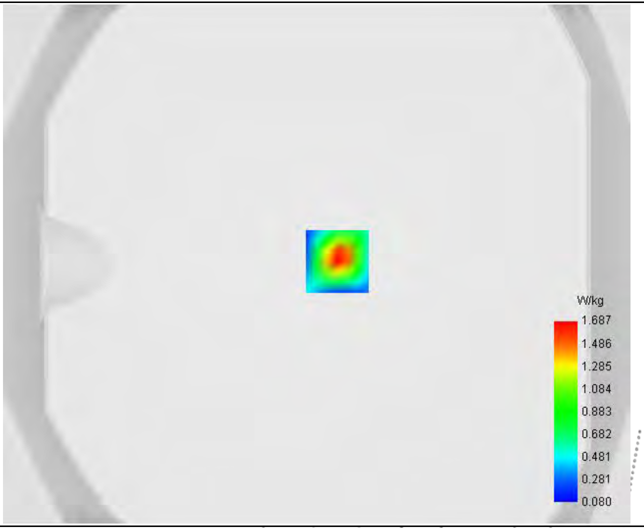
B. Permitivity

Frequency (MHz)	5230.000
Relative permitivity (real part)	36.661
Relative permitivity (imaginary part)	16.125
Conductivity (S/m)	4.518

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





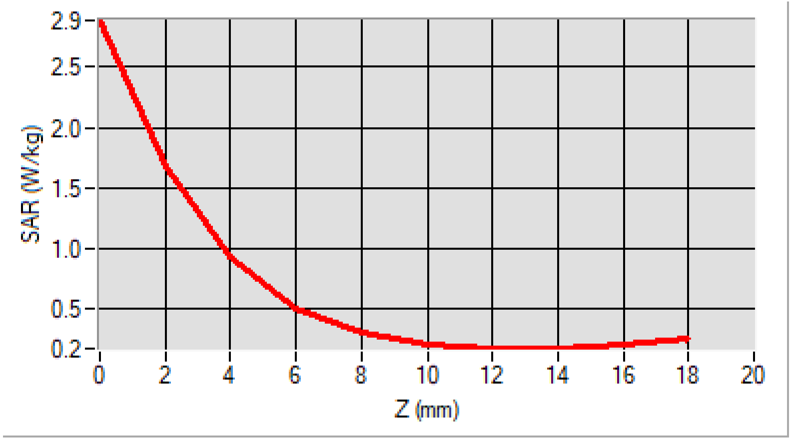
Maximum location: X=8.00, Y=1.00 ; SAR Peak: 3.06 W/kg

D. SAR 1g & 10g

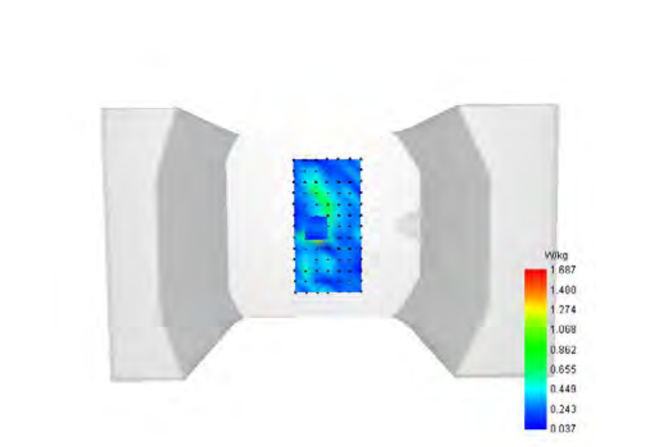
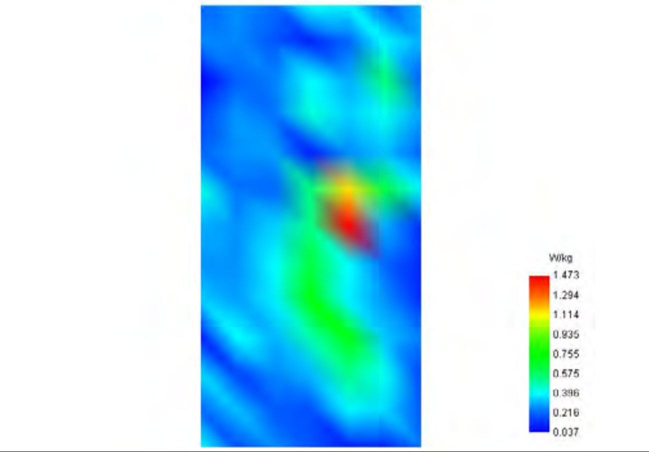
SAR 10g (W/Kg)	0.380
SAR 1g (W/Kg)	0.593
Variation (%)	-1.750
Horizontal validation criteria: minimum distance (mm)	5.654655
Vertical validation criteria: SAR ratio M2/M1 (%)	34.084189

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	2.887	1.687	0.935	0.513	0.303	0.208	0.175	0.179	0.208



F. 3D Image

3D screen shot	Hot spot position
	

Plot 5

Date of measurement: 26/04/2024

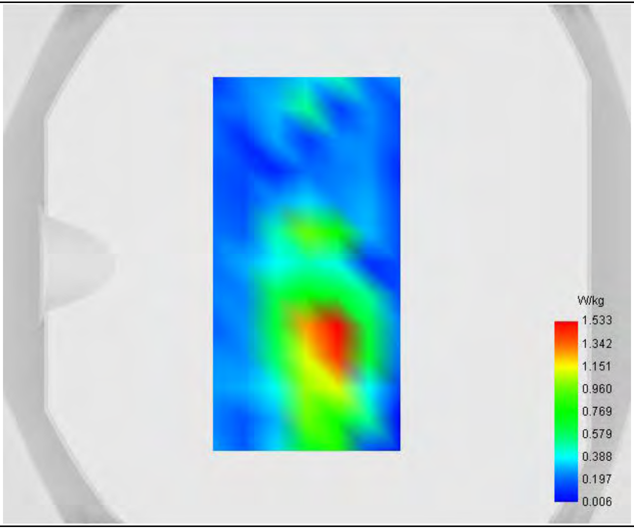
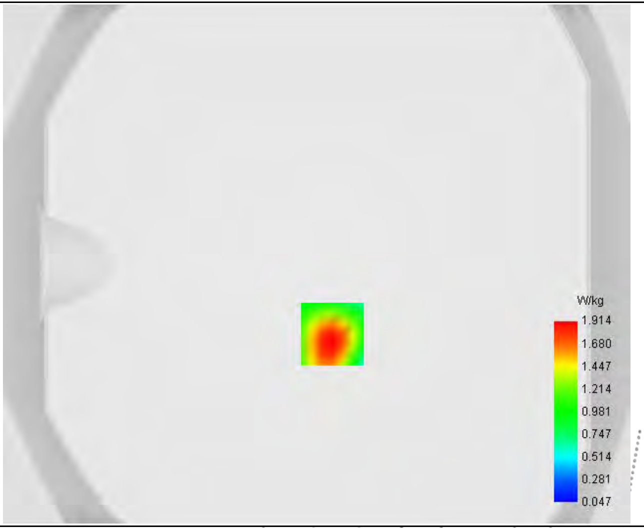
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.18
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-1
Channels	Higher (46)
Signal	IEEE 802.11 ac

B. Permitivity

Frequency (MHz)	5230.000
Relative permitivity (real part)	36.661
Relative permitivity (imaginary part)	16.140
Conductivity (S/m)	4.518

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

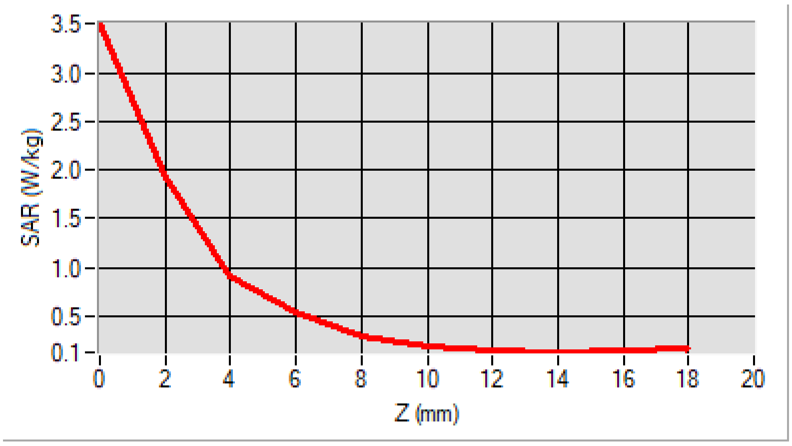
Maximum location: X=6.00, Y=-27.00 ; SAR Peak: 3.27 W/kg

D. SAR 1g & 10g

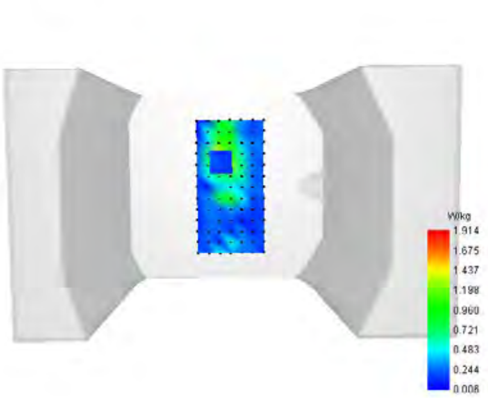
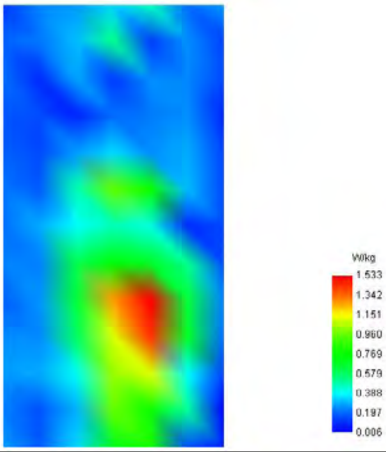
SAR 10g (W/Kg)	0.348
SAR 1g (W/Kg)	0.599
Variation (%)	-4.340
Horizontal validation criteria: minimum distance (mm)	6.113556
Vertical validation criteria: SAR ratio M2/M1 (%)	42.656955

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	3.505	1.914	0.911	0.541	0.288	0.181	0.148	0.126	0.138



F. 3D Image

3D screen shot	Hot spot position
	

Plot 6

Date of measurement: 26/04/2024

A. Experimental conditions.

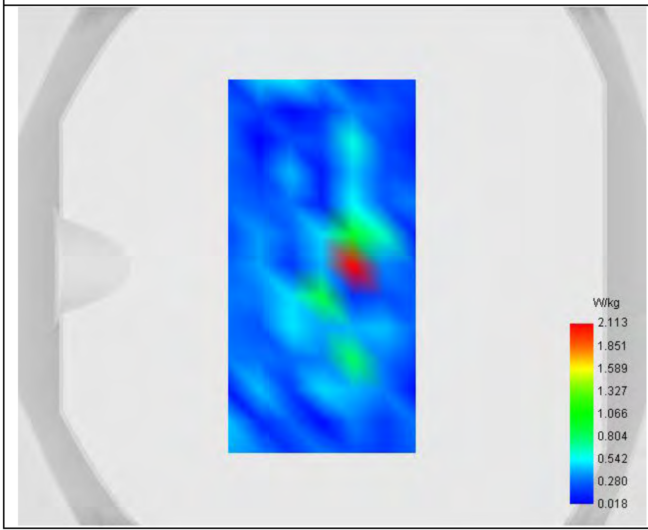
Probe	SN 26/23 EPGO420
ConvF	1.18
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-2a
Channels	Lower (54)
Signal	IEEE 802.11 ac

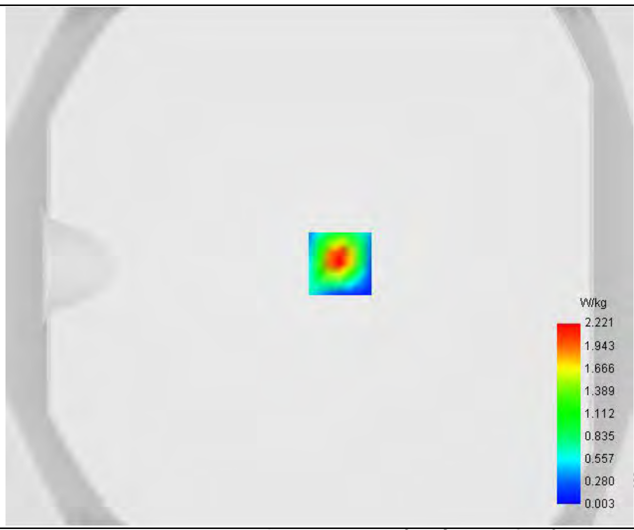
B. Permitivity

Frequency (MHz)	5270.000
Relative permitivity (real part)	36.398
Relative permitivity (imaginary part)	16.154
Conductivity (S/m)	4.903

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





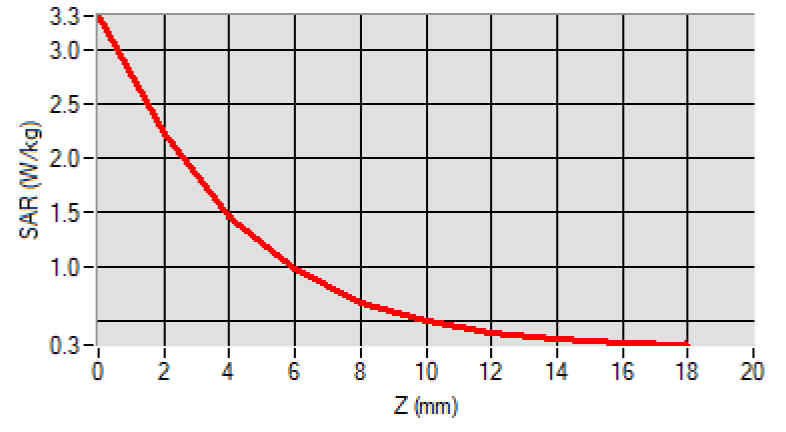
Maximum location: X=8.00, Y=1.00 ; SAR Peak: 3.52 W/kg

D. SAR 1g & 10g

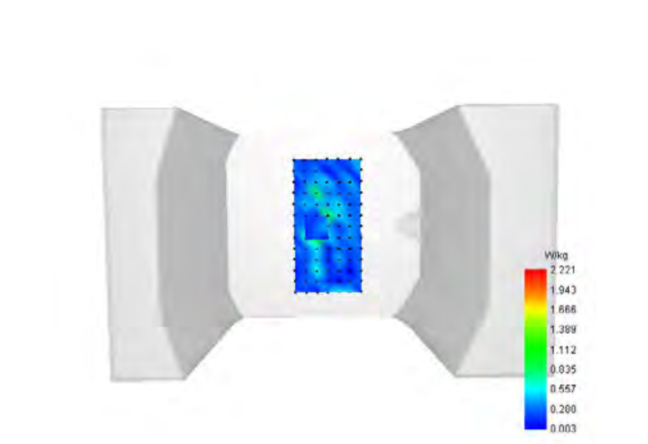
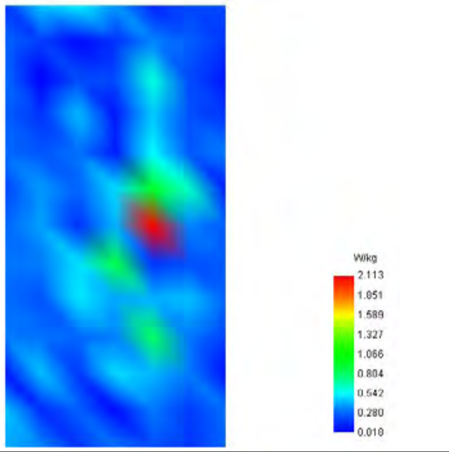
SAR 10g (W/Kg)	0.349
SAR 1g (W/Kg)	0.593
Variation (%)	3.200
Horizontal validation criteria: minimum distance (mm)	6.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	40.000000

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	3.322	2.221	1.471	0.981	0.682	0.503	0.399	0.340	0.306



F. 3D Image

3D screen shot	Hot spot position
	

Plot 7

Date of measurement: 26/04/2024

A. Experimental conditions.

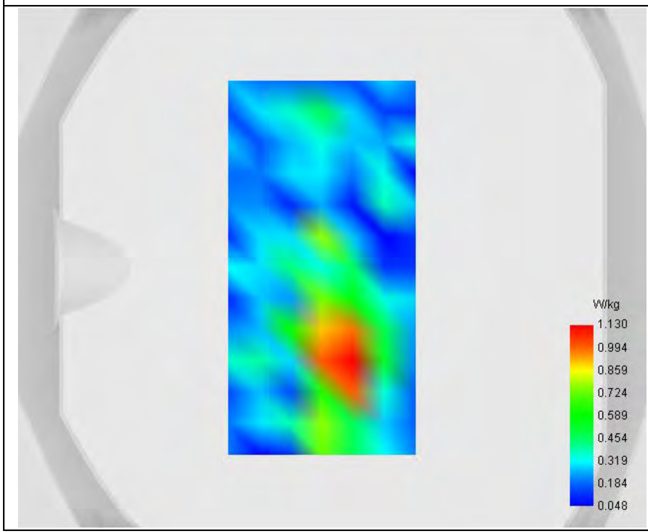
Probe	SN 26/23 EPGO420
ConvF	1.17
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-2a
Channels	Higher (62)
Signal	IEEE 802.11 ac

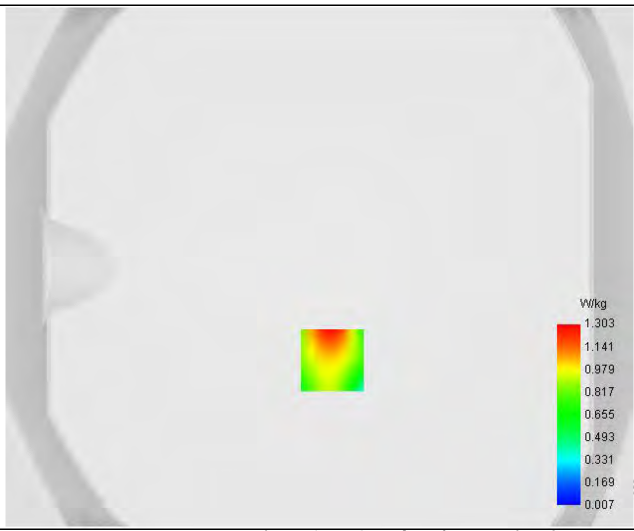
B. Permitivity

Frequency (MHz)	5310.000
Relative permitivity (real part)	36.791
Relative permitivity (imaginary part)	16.169
Conductivity (S/m)	4.888

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





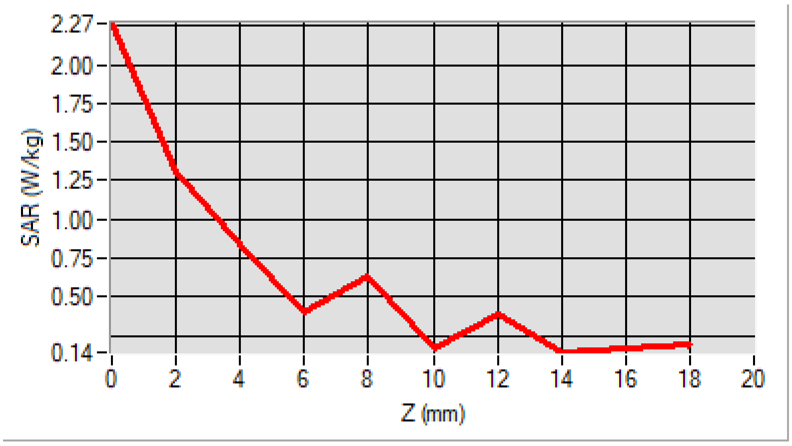
Maximum location: X=5.00, Y=-36.00 ; SAR Peak: 2.20 W/kg

D. SAR 1g & 10g

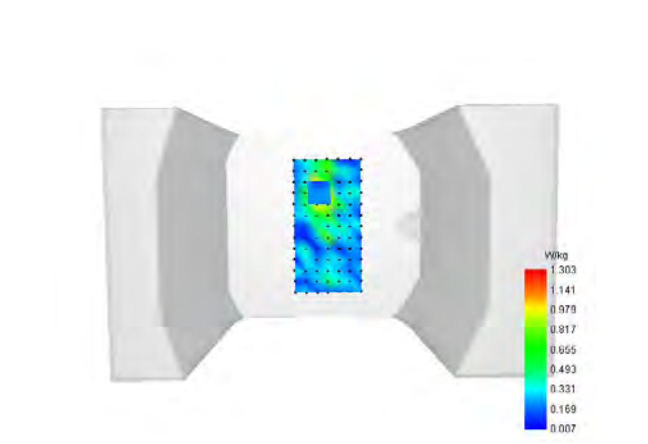
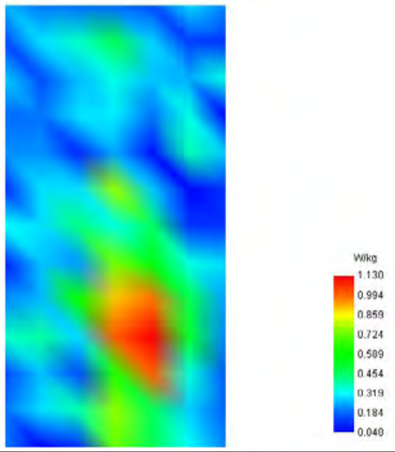
SAR 10g (W/Kg)	0.144
SAR 1g (W/Kg)	0.206
Variation (%)	-4.020
Horizontal validation criteria: minimum distance (mm)	6.975499
Vertical validation criteria: SAR ratio M2/M1 (%)	33.897400

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	2.266	1.303	0.847	0.401	0.634	0.165	0.392	0.143	0.165



F. 3D Image

3D screen shot	Hot spot position
	

Plot 8

Date of measurement: 27/04/2024

A. Experimental conditions.

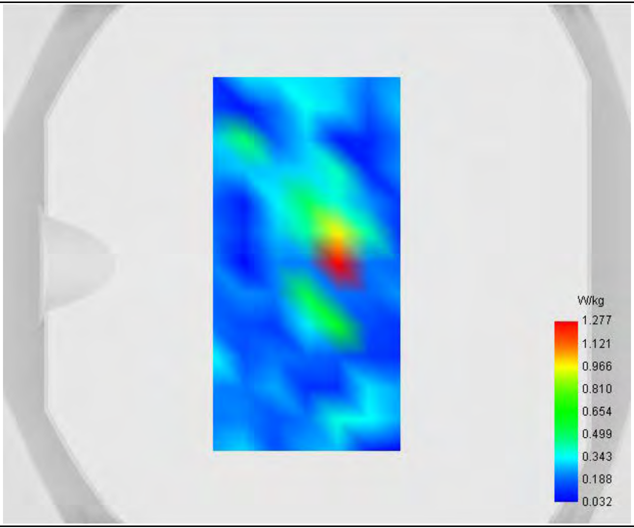
Probe	SN 26/23 EPGO420
ConvF	1.20
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-2c
Channels	106
Signal	IEEE 802.11 ac

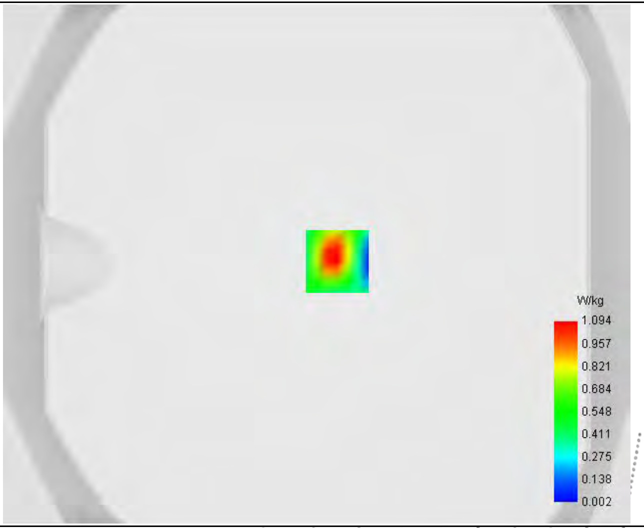
B. Permitivity

Frequency (MHz)	5530.000
Relative permitivity (real part)	36.791
Relative permitivity (imaginary part)	16.303
Conductivity (S/m)	4.888

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**





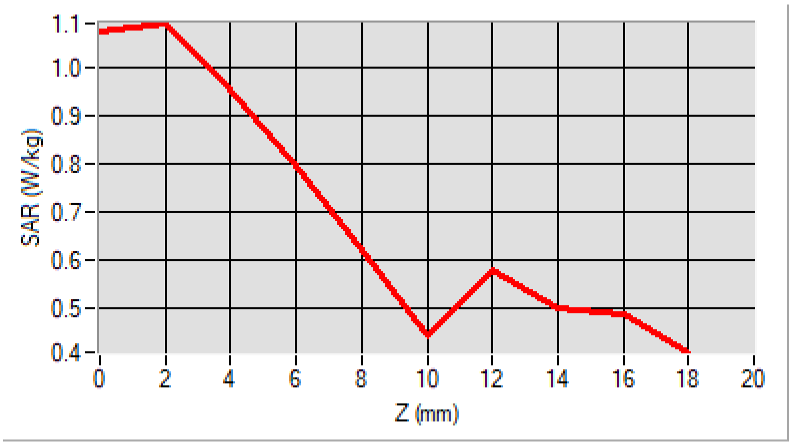
Maximum location: X=8.00, Y=1.00 ; SAR Peak: 1.32 W/kg

D. SAR 1g & 10g

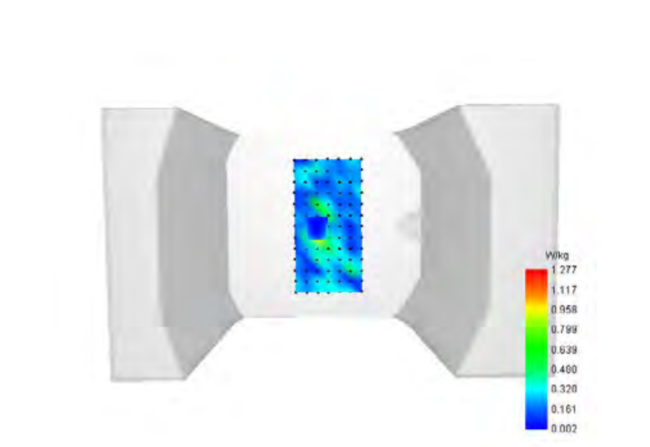
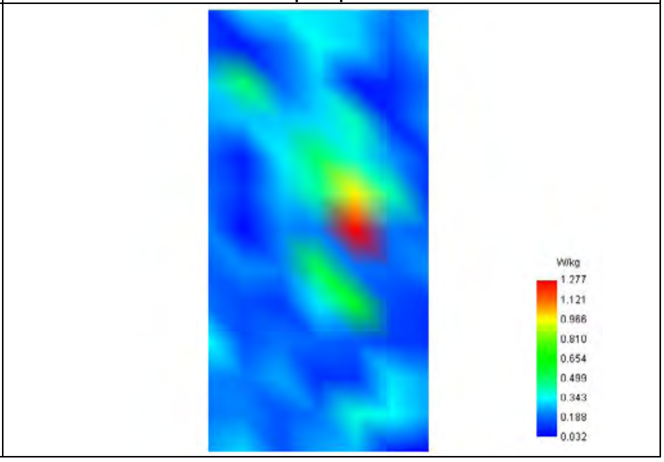
SAR 10g (W/Kg)	0.094
SAR 1g (W/Kg)	0.172
Variation (%)	-3.270
Horizontal validation criteria: minimum distance (mm)	6.008460
Vertical validation criteria: SAR ratio M2/M1 (%)	19.185056

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	1.075	1.094	0.957	0.796	0.618	0.440	0.579	0.499	0.484



F. 3D Image

3D screen shot	Hot spot position
	

Plot 9

Date of measurement: 27/04/2024

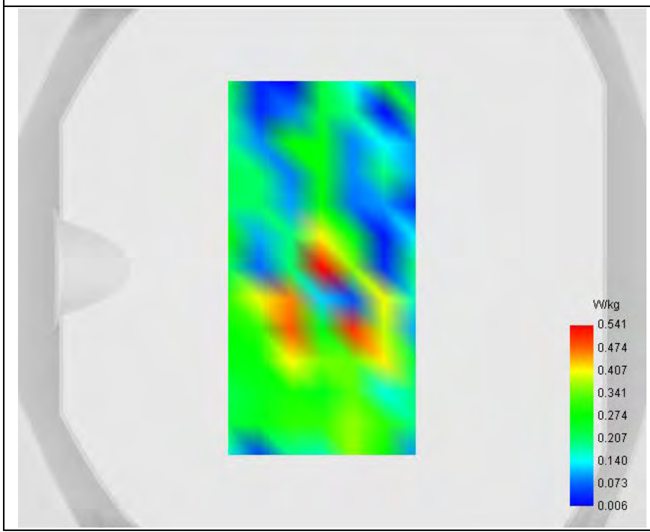
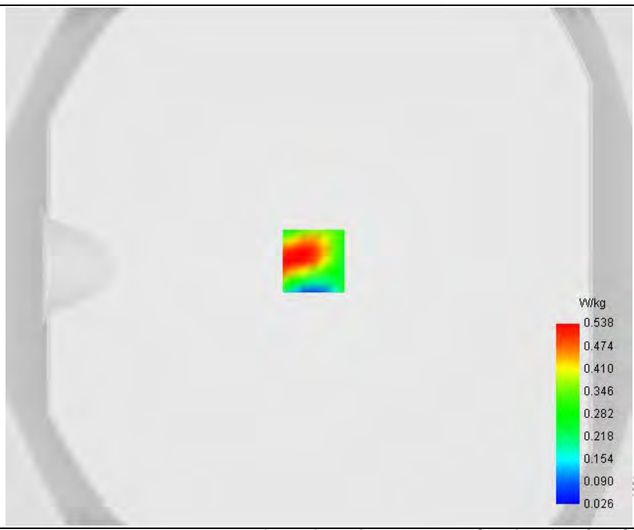
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.20
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	U-NII-2c
Channels	Lower (106)
Signal	IEEE 802.11 ac

B. Permitivity

Frequency (MHz)	5530.000
Relative permitivity (real part)	36.791
Relative permitivity (imaginary part)	16.265
Conductivity (S/m)	4.888

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

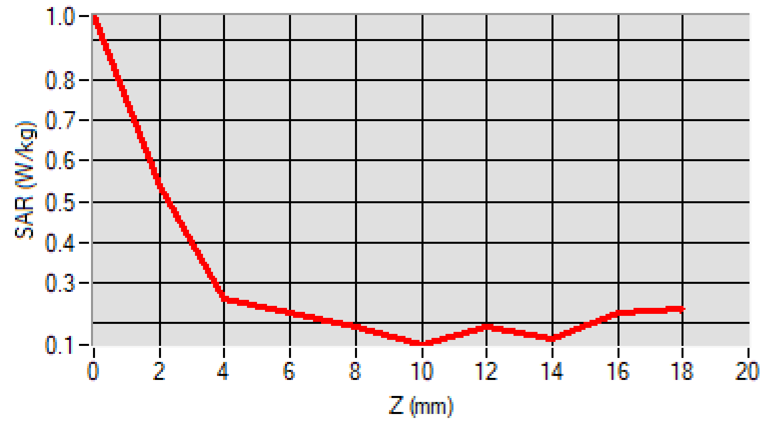
Maximum location: X=-2.00, Y=2.00 ; SAR Peak: 1.10 W/kg

D. SAR 1g & 10g

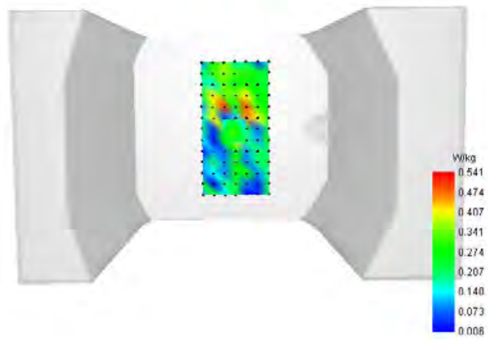
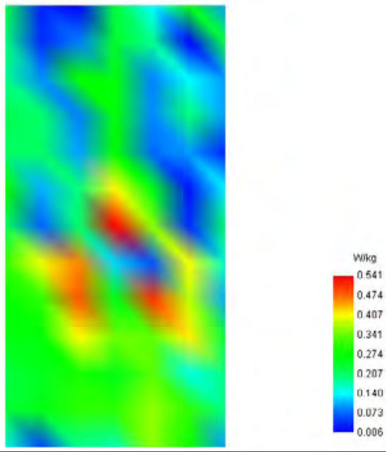
SAR 10g (W/Kg)	0.128
SAR 1g (W/Kg)	0.146
Variation (%)	2.740
Horizontal validation criteria: minimum distance (mm)	3.461561
Vertical validation criteria: SAR ratio M2/M1 (%)	20.548960

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	0.960	0.538	0.259	0.226	0.192	0.146	0.189	0.163	0.223



F. 3D Image

3D screen shot	Hot spot position
	

Plot 10

Date of measurement: 27/04/2024

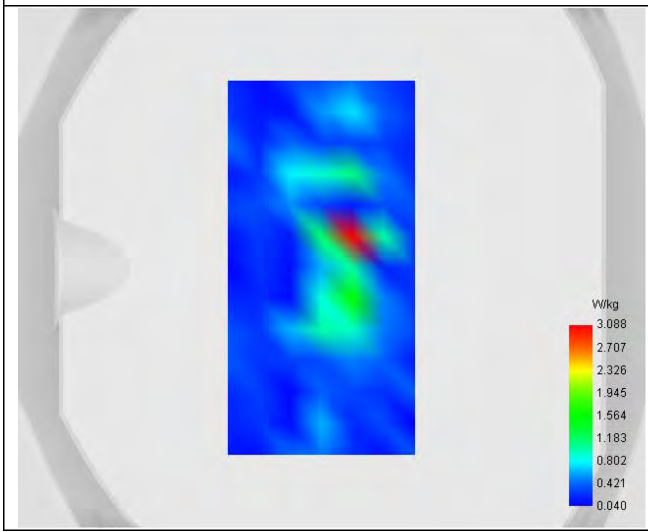
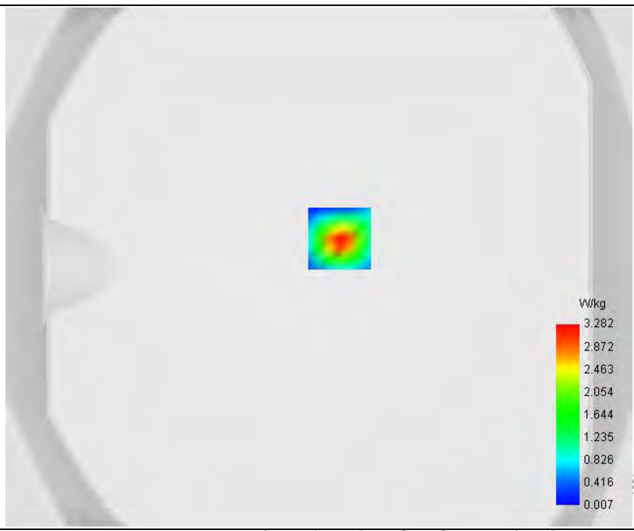
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.15
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	5800
Channels	Middle (1)
Signal	--

B. Permitivity

Frequency (MHz)	5795.000
Relative permitivity (real part)	33.668
Relative permitivity (imaginary part)	16.358
Conductivity (S/m)	5.188

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

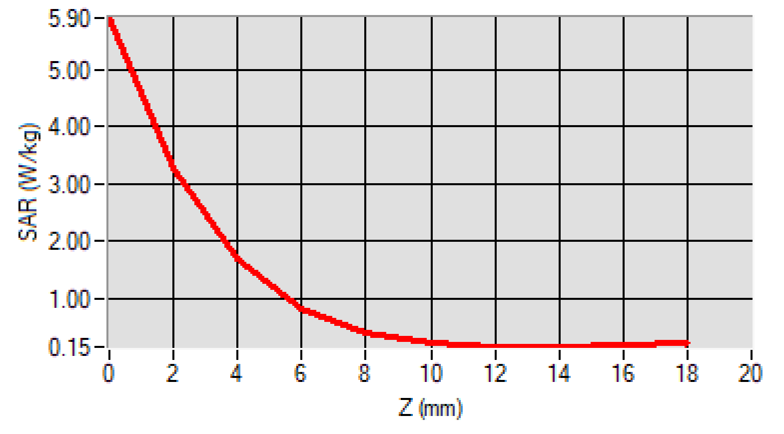
Maximum location: X=8.00, Y=11.00 ; SAR Peak: 6.21 W/kg

D. SAR 1g & 10g

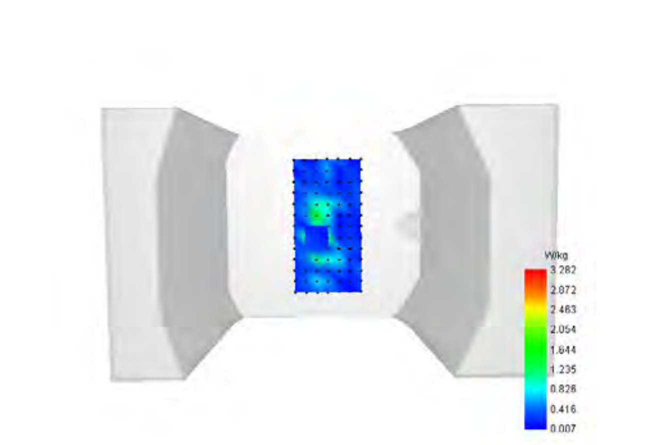
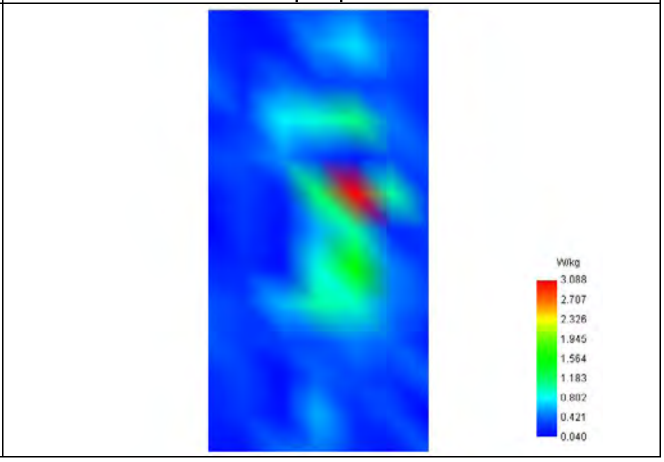
SAR 10g (W/Kg)	0.330
SAR 1g (W/Kg)	0.668
Variation (%)	-1.600
Horizontal validation criteria: minimum distance (mm)	3.651150
Vertical validation criteria: SAR ratio M2/M1 (%)	51.000000

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	5.905	3.282	1.677	0.808	0.398	0.220	0.155	0.145	0.169



F. 3D Image

3D screen shot	Hot spot position
	

Plot 11

Date of measurement: 27/04/2024

A. Experimental conditions.

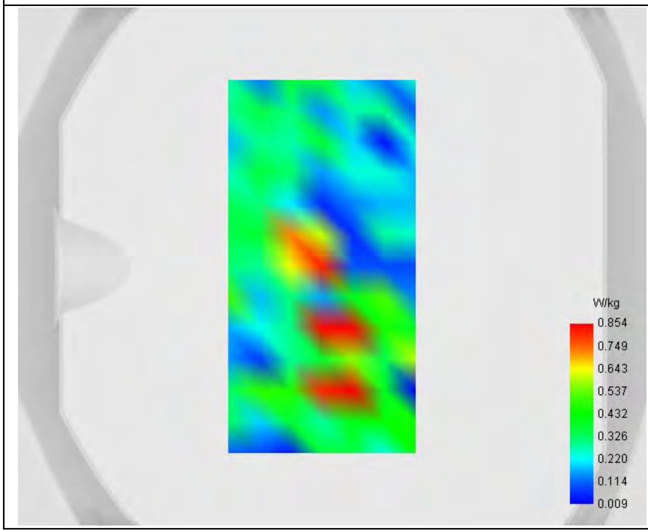
Probe	SN 26/23 EPGO420
ConvF	1.15
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	5800
Channels	Middle (1)
Signal	--

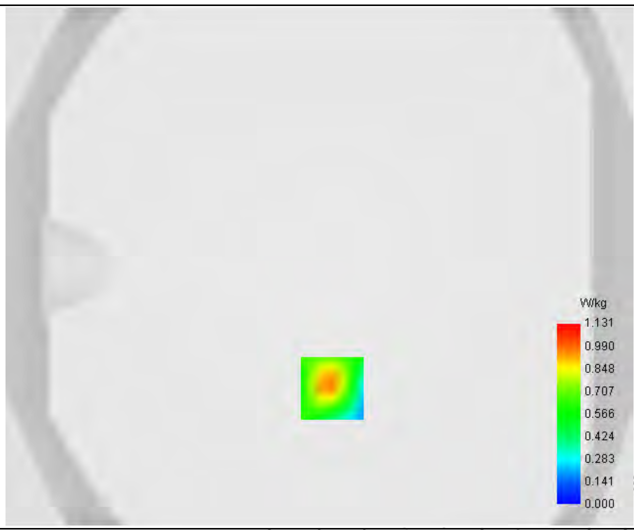
B. Permitivity

Frequency (MHz)	5755.000
Relative permitivity (real part)	34.636
Relative permitivity (imaginary part)	16.358
Conductivity (S/m)	5.448

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR





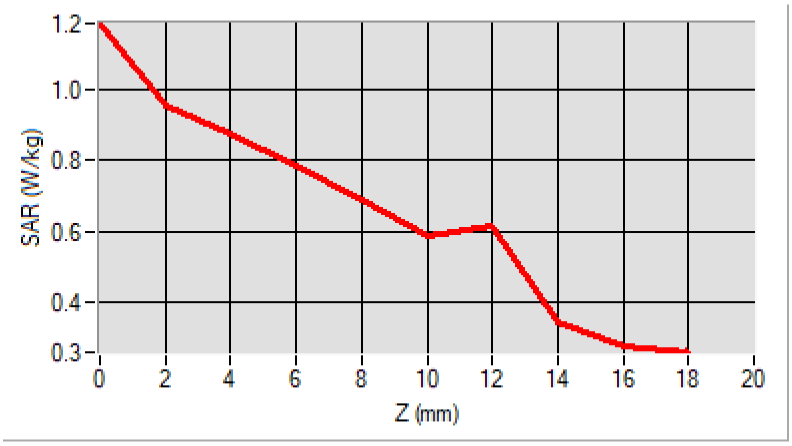
Maximum location: X=5.00, Y=-47.00 ; SAR Peak: 1.58 W/kg

D. SAR 1g & 10g

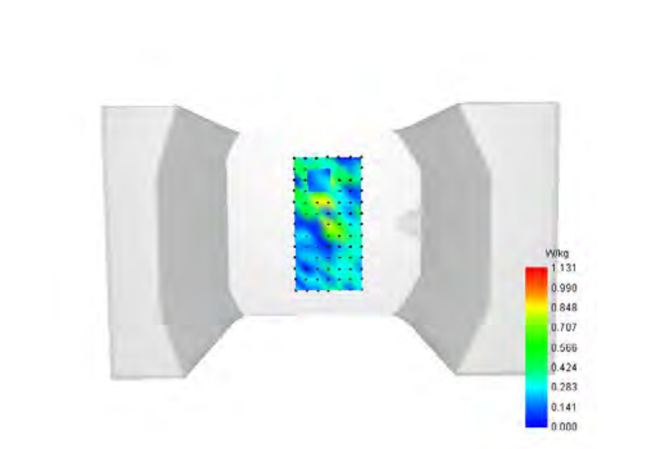
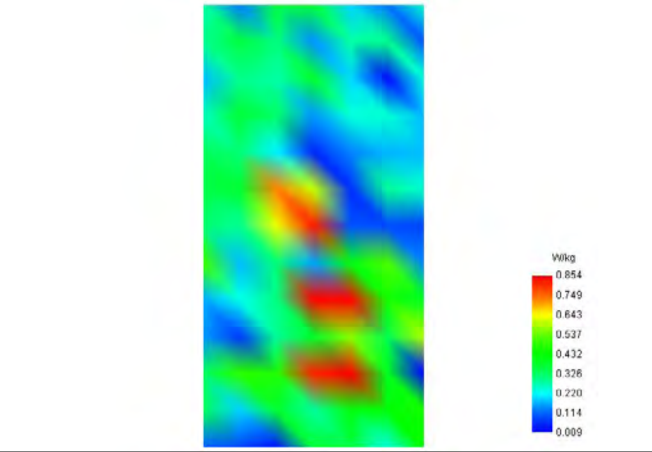
SAR 10g (W/Kg)	0.335
SAR 1g (W/Kg)	0.632
Variation (%)	1.560
Horizontal validation criteria: minimum distance (mm)	5.451569
Vertical validation criteria: SAR ratio M2/M1 (%)	65.569608

E. Z Axis Scan

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00
SAR (W/Kg)	1.188	0.957	0.877	0.788	0.689	0.587	0.612	0.344	0.273



F. 3D Image

3D screen shot	Hot spot position
	

16 CALIBRATION CERTIFICATES

Probe-EPGO420 Calibration Certificate
SID2450Dipole Calibration Ceriticate
SID5000Dipole Calibration Ceriticate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.199.1.23.BES.A

SHENZHEN BCTC TECHNOLOGY CO., LTD.
1 ~2/ F, NO. B FACTORY BUILDING, PENGZHOU INDUSTRIAL PARK, FUYUAN 1ST ROAD, TANGWEI COMMUNITY, FUHAI STREET, BAO'AN DISTRICT, SHENZHEN, GUANGDONG,CHINA
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: 2623-EPGO-420

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

Calibration date: 7/18/2023

ETALONNAGE

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

Summary:

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

Page: 1/11

	Name	Function	Date	Signature
Prepared by :	Cyrille ONNEE	Measurement Responsible	7/18/2023	
Checked & approved by:	Jérôme Luc	Technical Manager	7/18/2023	
Authorized by:	Yann Toutain	Laboratory Director	7/18/2023	Yann TOUTAIN

Yann Toutain ID

Signature numérique de Yann Toutain ID
Date : 2023.07.18 10:38:49 +02'00'

	Customer Name
Distribution :	Shenzhen BCTC Technology Co., Ltd.

Issue	Name	Date	Modifications
A	Cyrille ONNEE	7/18/2023	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	2623-EPGO-420
Product Condition (new / used)	New
Frequency Range of Probe	0.15 GHz-7.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.228 MΩ Dipole 2: R2=0.238 MΩ Dipole 3: R3=0.230 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	24.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	2.55 mm
Distance between dipoles / probe extremity	12.7 mm

3 MEASUREMENT METHOD

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

3.1 SENSITIVITY

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

3.2 LINEARITY

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

3.3 ISOTROPY

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

3.4 BOUNDARY EFFECT

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

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

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

where

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

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

4 MEASUREMENT UNCERTAINTY

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

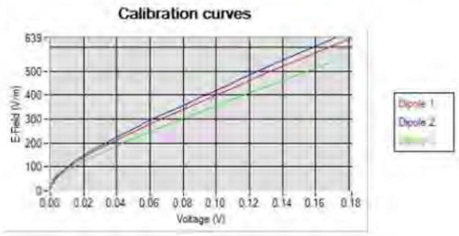
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

5 CALIBRATION RESULTS

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

5.1 CALIBRATION IN AIR

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



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

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

where
Vi=voltage readings on the 3 channels of the probe
DCPi=diode compression point given below for the 3 channels of the probe
Normi=dipole sensitivity given below for the 3 channels of the probe

Normx dipole 1 (μV/(V/m)²)	Normy dipole 2 (μV/(V/m)²)	Normz dipole 3 (μV/(V/m)²)
1.21	1.09	1.56

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
106	109	103

5.2 CALIBRATION IN LIQUID

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

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

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

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

where
σ=the conductivity of the liquid
ρ=the volumetric density of the liquid
SAR=the SAR measured from the formula that depends on the setup used. The SAR formulas are given below

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

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

where
c=the specific heat for the liquid
dT/dt=the temperature rises over the time

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

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

where
a=the larger cross-sectional of the waveguide
b=the smaller cross-sectional of the waveguide
δ=the skin depth for the liquid in the waveguide
Pw=the power delivered to the liquid

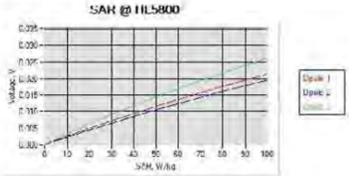
The below table summarize the ConvF for the calibrated liquid. The curves give examples for the measured SAR depending on the voltage in some liquid.

Liquid	Frequency (MHz*)	ConvF
HL450	450	0.86
BL450	450	0.78
HL750	750	0.80
BL750	750	0.87
HL850	835	0.81
BL850	835	0.80
HL900	900	0.76
BL900	900	0.87
HL1800	1800	0.96
BL1800	1800	1.01
HL1900	1900	1.04
BL1900	1900	1.11
HL2100	2100	1.00
BL2100	2100	1.16
HL2300	2300	1.11
BL2300	2300	1.23
HL2450	2450	1.11
BL2450	2450	1.32
HL2600	2600	1.03
BL2600	2600	1.19
HL5200	5200	1.18
BL5200	5200	0.97
HL5400	5400	1.17
BL5400	5400	1.00
HL5600	5600	1.20
BL5600	5600	0.95
HL5800	5800	1.15
BL5800	5800	1.05

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

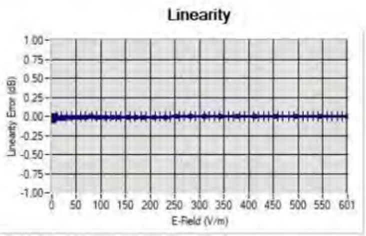
SAR @ HL450

SAR @ HL5800

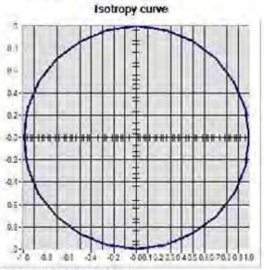


6 VERIFICATION RESULTS

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



Linearity:+/-1.48% (+/-0.06dB)



Isotropy:+/-0.25% (+/-0.01dB)

7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
CALIPROBE Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2019	10/2023
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	07/2022	07/2025
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.
Fluoroptic Thermometer	LumaSense Luxtron 812	94264	09/2022	09/2025
Coaxial cell	MVG	SN 32/16 COAXCELL_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG2_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G600_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG4_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_0G900_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG6_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG8_1	Validated. No cal required.	Validated. No cal required.

Liquid transition	MVG	SN 32/16 WGLIQ_1G800B_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_1G800H_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG10_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_3G500_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG12_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_5G000_1	Validated. No cal required.	Validated. No cal required.
Waveguide	MVG	SN 32/16 WG14_1	Validated. No cal required.	Validated. No cal required.
Liquid transition	MVG	SN 32/16 WGLIQ_7G000_1	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

SAR Reference Dipole Calibration Report

Ref : ACR.329.15.21.BES.A

SHENZHEN BCTC TECHNOLOGY CO., LTD.
1 ~2/ F, NO. B FACTORY BUILDING, PENGZHOU INDUSTRIAL PARK, FUYUAN 1ST ROAD, TANGWEI COMMUNITY, FUHAI STREET, BAO'AN DISTRICT, SHENZHEN, GUANGDONG,CHINA
MVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 2450 MHZ
SERIAL NO.: SN 47/21 DIP 2G450-627

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

Calibration date: 11/25/2021

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

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.

	Name	Function	Date	Signature
Prepared by :	Jérôme Luc	Technical Manager	11/25/2021	
Checked by :	Jérôme Luc	Technical Manager	11/25/2021	
Approved by :	Yann Toutain	Laboratory Director	11/25/2021	Yann TOUTAIN 2021.11.25 11:56:55 +01'00'

	Customer Name
Distribution :	Shenzhen BCTC Technology Co., Ltd.

Issue	Name	Date	Modifications
A	Jérôme Luc	11/25/2021	Initial release

TABLE OF CONTENTS

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 2450 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2450
Serial Number	SN 47/21 DIP 2G450-627
Product Condition (new / used)	New

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

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.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss 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.

4.2 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.

5 MEASUREMENT UNCERTAINTY

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.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.08 LIN

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
0 - 300	0.20 mm
300 - 450	0.44 mm

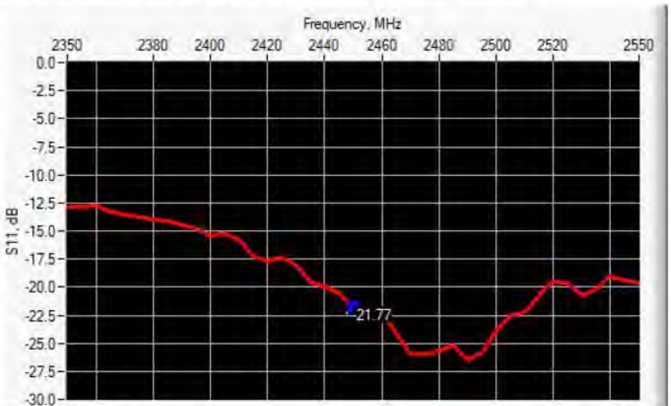
5.3 VALIDATION MEASUREMENT

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

Scan Volume	Expanded Uncertainty
1 g	19 % (SAR)
10 g	19 % (SAR)

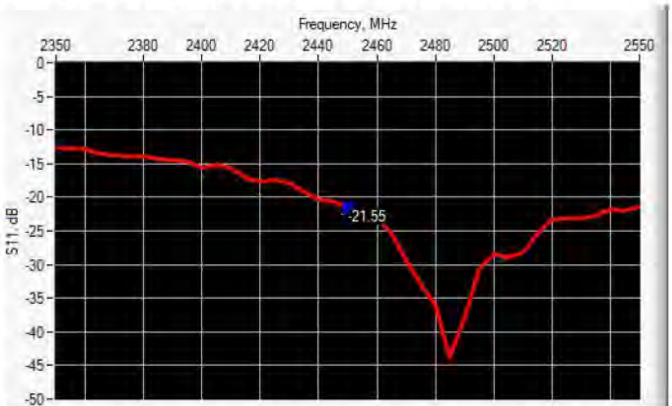
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-21.77	-20	49.1 Ω + 8.1 jΩ

6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
2450	-21.55	-20	54.7 Ω + 6.8 jΩ

6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	86.2 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	
2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.	51.37	30.4 ±1 %.	30.45	3.6 ±1 %.	3.60
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3300	-		-		-	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3900	-		-		-	
4200	-		-		-	
4600	-		-		-	
4900	-		-		-	

7 VALIDATION MEASUREMENT

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.

7.1 HEAD LIQUID MEASUREMENT

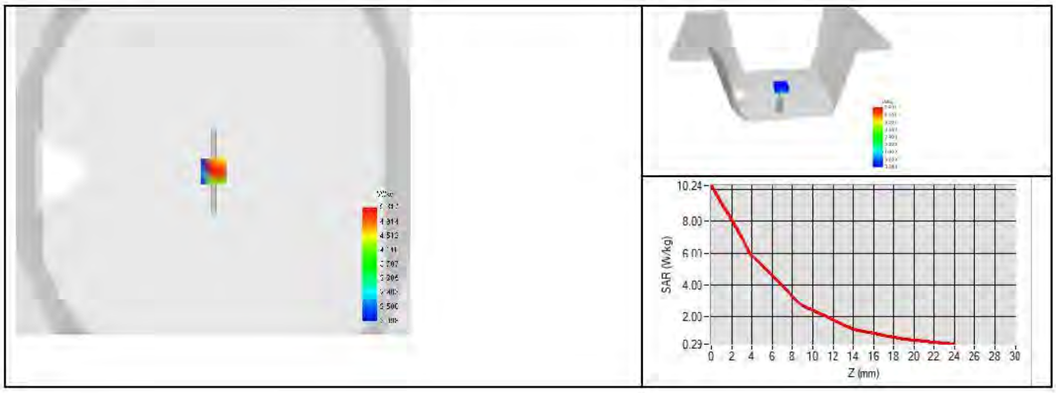
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±10 %		0.87 ±10 %	
450	43.5 ±10 %		0.87 ±10 %	
750	41.9 ±10 %		0.89 ±10 %	
835	41.5 ±10 %		0.90 ±10 %	
900	41.5 ±10 %		0.97 ±10 %	
1450	40.5 ±10 %		1.20 ±10 %	
1500	40.4 ±10 %		1.23 ±10 %	
1640	40.2 ±10 %		1.31 ±10 %	
1750	40.1 ±10 %		1.37 ±10 %	
1800	40.0 ±10 %		1.40 ±10 %	
1900	40.0 ±10 %		1.40 ±10 %	
1950	40.0 ±10 %		1.40 ±10 %	
2000	40.0 ±10 %		1.40 ±10 %	
2100	39.8 ±10 %		1.49 ±10 %	
2300	39.5 ±10 %		1.67 ±10 %	
2450	39.2 ±10 %	36.4	1.80 ±10 %	1.96
2600	39.0 ±10 %		1.96 ±10 %	
3000	38.5 ±10 %		2.40 ±10 %	
3300	38.2 ±10 %		2.71 ±10 %	
3500	37.9 ±10 %		2.91 ±10 %	
3700	37.7 ±10 %		3.12 ±10 %	
3900	37.5 ±10 %		3.32 ±10 %	
4200	37.1 ±10 %		3.63 ±10 %	
4600	36.7 ±10 %		4.04 ±10 %	
4900	36.3 ±10 %		4.35 ±10 %	

7.2 SAR MEASUREMENT RESULT 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.

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values: eps' : 36.4 sigma : 1.96
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	2450 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4	55.16 (5.52)	24	24.15 (2.41)
2600	55.3		24.6	
3000	63.8		25.7	
3300	-		-	
3500	67.1		25	
3700	67.4		24.2	
3900	-		-	
4200	-		-	
4600	-		-	
4900	-		-	


10.24
8.00
6.00
4.00
2.00
0.29
SAR (W/kg)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Z (mm)

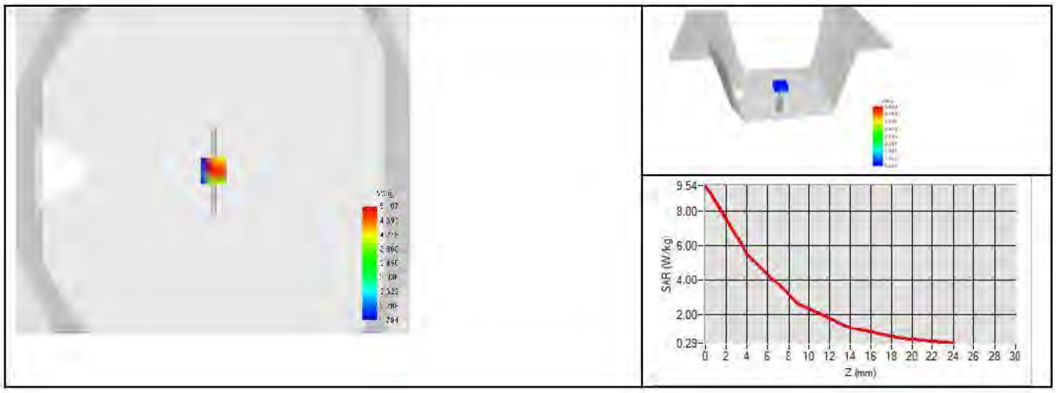
7.3 BODY LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
150	61.9 ±10 %		0.80 ±10 %	
300	58.2 ±10 %		0.92 ±10 %	
450	56.7 ±10 %		0.94 ±10 %	
750	55.5 ±10 %		0.96 ±10 %	
835	55.2 ±10 %		0.97 ±10 %	
900	55.0 ±10 %		1.05 ±10 %	
915	55.0 ±10 %		1.06 ±10 %	
1450	54.0 ±10 %		1.30 ±10 %	
1610	53.8 ±10 %		1.40 ±10 %	
1800	53.3 ±10 %		1.52 ±10 %	
1900	53.3 ±10 %		1.52 ±10 %	
2000	53.3 ±10 %		1.52 ±10 %	
2100	53.2 ±10 %		1.62 ±10 %	
2300	52.9 ±10 %		1.81 ±10 %	
2450	52.7 ±10 %	53.4	1.95 ±10 %	2.14
2600	52.5 ±10 %		2.16 ±10 %	
3000	52.0 ±10 %		2.73 ±10 %	
3300	51.6 ±10 %		3.08 ±10 %	
3500	51.3 ±10 %		3.31 ±10 %	
3700	51.0 ±10 %		3.55 ±10 %	
3900	50.8 ±10 %		3.78 ±10 %	
4200	50.4 ±10 %		4.13 ±10 %	
4600	49.8 ±10 %		4.60 ±10 %	
4900	49.4 ±10 %		4.95 ±10 %	
5200	49.0 ±10 %		5.30 ±10 %	
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %		5.53 ±10 %	
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %		5.77 ±10 %	
5800	48.2 ±10 %		6.00 ±10 %	

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Body Liquid Values: eps' : 53.4 sigma : 2.14
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	2450 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	52.28 (5.23)	22.68 (2.27)



8 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	Agilent 8753ES	MY40003210	10/2022	10/2025
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2012	05/2025
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Calipers	Mitutoyo	SN 0009732	10/2022	10/2025
Reference Probe	MVG	SN 41/18 EPGO333	10/2022	10/2025
Multimeter	Keithley 2000	1160271	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	04/2022	04/2025
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	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.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

mvg

SAR Reference Dipole Calibration Report

Ref : ACR.329.17.21.BES.A

SHENZHEN BCTC TECHNOLOGY CO., LTD.
1 ~2/ F, NO. B FACTORY BUILDING, PENGZHOU INDUSTRIAL PARK, FUYUAN 1ST ROAD,TANGWEI COMMUNITY, FUHAI STREET, BAO'AN DISTRICT, SHENZHEN, GUANGDONG,CHINAMVG COMOSAR REFERENCE DIPOLE
FREQUENCY: 5200-5800 MHZ
SERIAL NO.: SN 47/21 DIP 5G000-629

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

Calibration date: 11/25/2021

ilac-MRA | cofrac ETALONNAGE

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

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed at MVG, using the COMOSAR test bench. The test results covered by accreditation are traceable to the International System of Units (SI).

	Name	Function	Date	Signature
Prepared by :	Jérôme Luc	Technical Manager	11/25/2021	JES
Checked by :	Jérôme Luc	Technical Manager	11/25/2021	JES
Approved by :	Yann Toutain	Laboratory Director	11/25/2021	Yann TOUTAIN 2021.11.25 11:58:11 +01'00'

	Customer Name
Distribution :	Shenzhen BCTC Technology Co., Ltd.

Issue	Name	Date	Modifications
A	Jérôme Luc	11/25/2021	Initial release

TABLE OF CONTENTS

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 5200-5800 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID5000
Serial Number	SN 47/21 DIP 5G000-629
Product Condition (new / used)	New

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

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.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss 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.

4.2 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.

5 MEASUREMENT UNCERTAINTY

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.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.08 LIN

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
0 - 300	0.20 mm

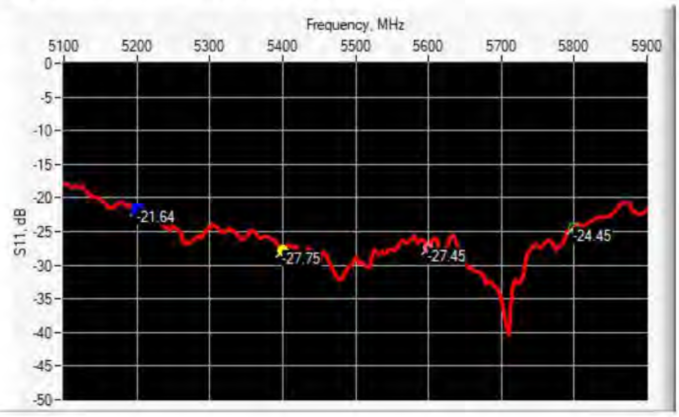
5.3 VALIDATION MEASUREMENT

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

Scan Volume	Expanded Uncertainty
1 g	19 % (SAR)
10 g	19 % (SAR)

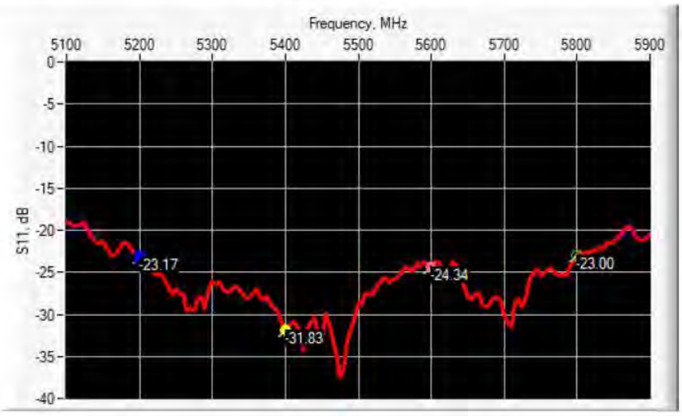
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS IN HEAD LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
5200	-21.64	-20	54.48 Ω - 6.92 jΩ
5400	-27.75	-20	50.97 Ω + 3.98 jΩ
5600	-27.45	-20	54.05 Ω + 1.24 jΩ
5800	-24.45	-20	45.31 Ω + 3.71 jΩ

6.2 RETURN LOSS IN BODY LIQUID



Frequency (MHz)	Return Loss (dB)	Requirement (dB)	Impedance
5200	-23.17	-20	54.03 Ω - 5.62 jΩ
5400	-31.83	-20	51.01 Ω + 2.35 jΩ
5600	-24.34	-20	55.50 Ω + 2.51 jΩ
5800	-23.00	-20	43.65 Ω + 3.06 jΩ

6.3 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
5000 to 6000	20.6±1 %.	20.62	40.3 ±1 %.	40.45	3.6 ±1 %.	3.61

7 VALIDATION MEASUREMENT

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.

7.1 HEAD LIQUID MEASUREMENT

Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
5000	36.2 ±10 %		4.45 ±10 %	
5100	36.1 ±10 %		4.56 ±10 %	
5200	36.0 ±10 %	34.44	4.66 ±10 %	4.64
5300	35.9 ±10 %		4.76 ±10 %	
5400	35.8 ±10 %	33.63	4.86 ±10 %	4.88
5500	35.6 ±10 %		4.97 ±10 %	
5600	35.5 ±10 %	32.80	5.07 ±10 %	5.12
5700	35.4 ±10 %		5.17 ±10 %	
5800	35.3 ±10 %	32.63	5.27 ±10 %	5.31
5900	35.2 ±10 %		5.38 ±10 %	
6000	35.1 ±10 %		5.48 ±10 %	

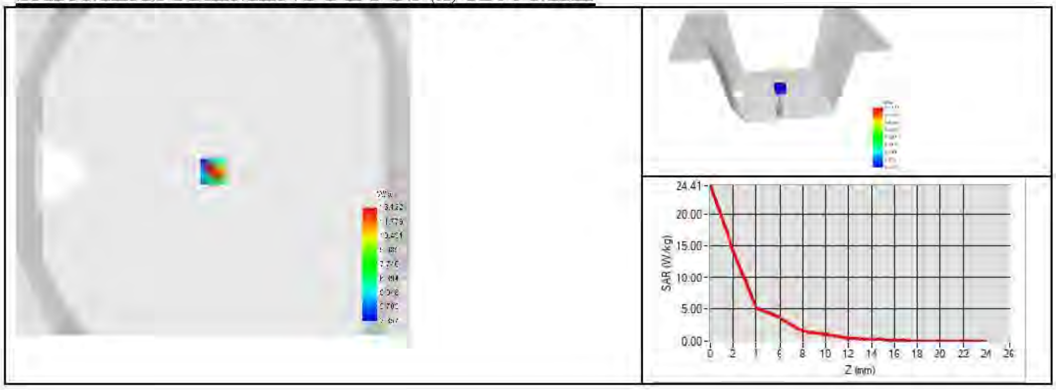
7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

At those frequencies, the target SAR value can not be generic. Hereunder is the target SAR value defined by MVG, within the uncertainty for the system validation. All SAR values are normalized to 1 W net power. In bracket, the measured SAR is given with the used input power.

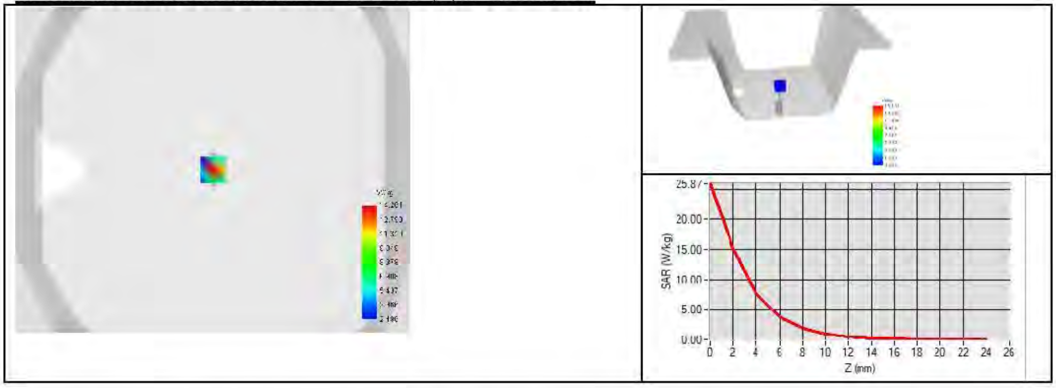
Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Head Liquid Values 5200 MHz: eps' :34.44 sigma : 4.64 Head Liquid Values 5400 MHz: eps' :33.63 sigma : 4.88 Head Liquid Values 5600 MHz: eps' :32.80 sigma : 5.12 Head Liquid Values 5800 MHz: eps' :32.63 sigma : 5.31
Distance between dipole and liquid	10 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5200 MHz 5400 MHz 5600 MHz 5800 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency (MHz)	1 g SAR (W/kg)		10 g SAR (W/kg)	
	required	measured	required	measured
5200	76.50	76.41 (7.64)	21.60	21.86 (2.19)
5400	-	80.52 (8.05)	-	22.91 (2.29)
5600	-	79.08 (7.91)	-	22.73 (2.27)
5800	78.00	76.49 (7.65)	21.90	22.03 (2.20)

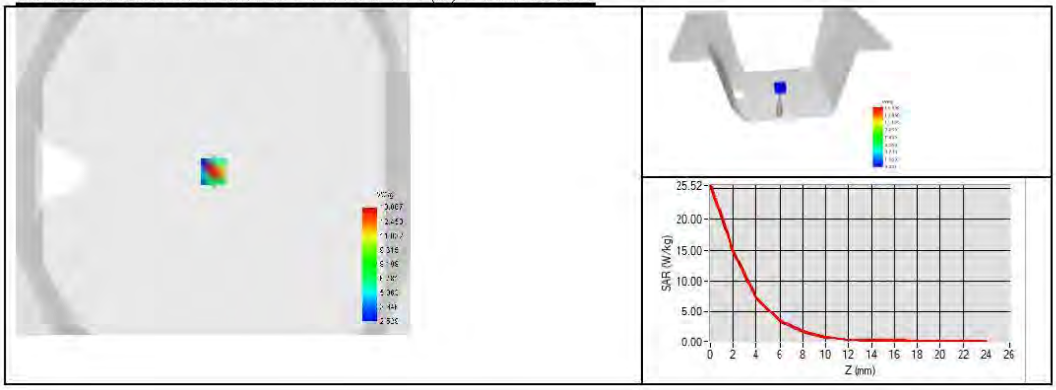
SAR MEASUREMENT PLOTS @ 5200 MHz



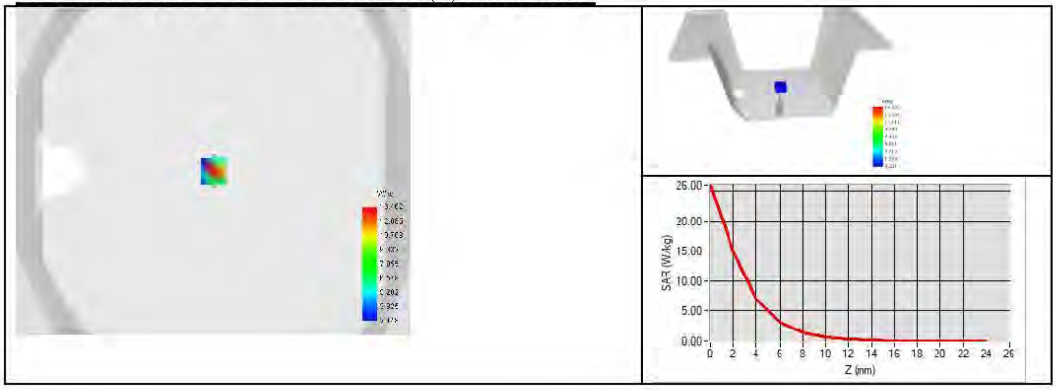
SAR MEASUREMENT PLOTS @ 5400 MHz



SAR MEASUREMENT PLOTS @ 5600 MHz



SAR MEASUREMENT PLOTS @ 5800 MHz



7.3 BODY LIQUID MEASUREMENT

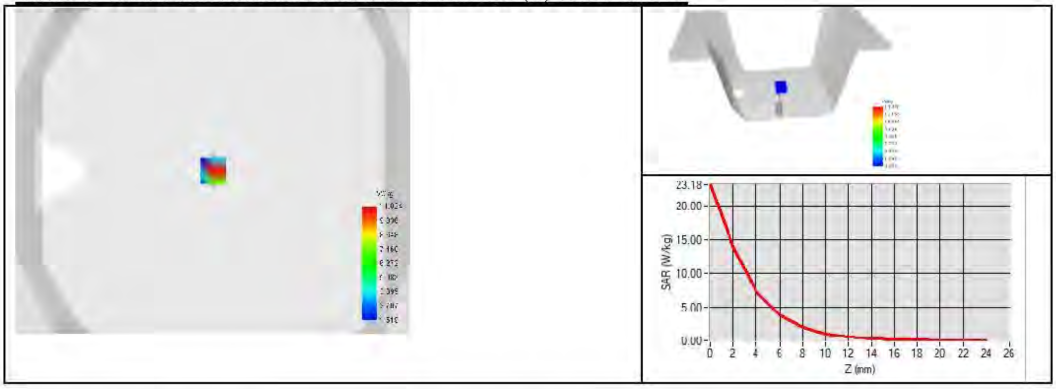
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
5200	49.0 ±10 %	45.50	5.30 ±10 %	5.63
5300	48.9 ±10 %		5.42 ±10 %	
5400	48.7 ±10 %	44.78	5.53 ±10 %	5.95
5500	48.6 ±10 %		5.65 ±10 %	
5600	48.5 ±10 %	44.85	5.77 ±10 %	6.26
5800	48.2 ±10 %	44.45	6.00 ±10 %	6.58

7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

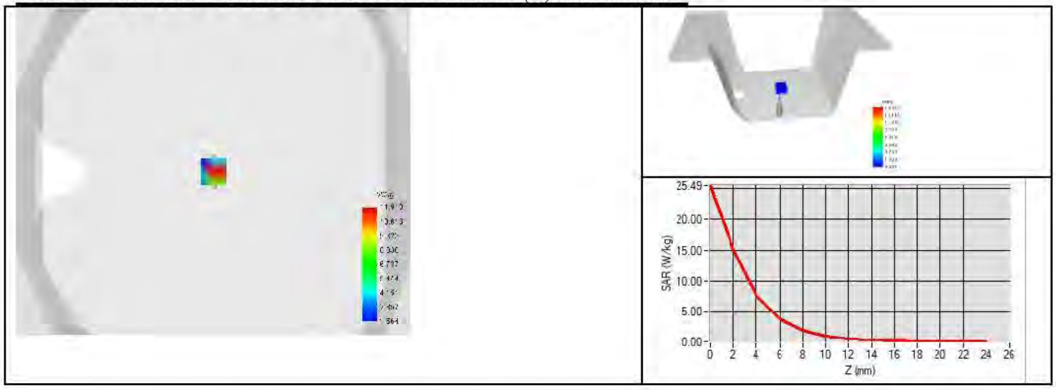
Software	OPENSAR V5
Phantom	SN 13/09 SAM68
Probe	SN 41/18 EPGO333
Liquid	Body Liquid Values 5200 MHz: eps' :45.50 sigma : 5.63 Body Liquid Values 5400 MHz: eps' :44.78 sigma : 5.95 Body Liquid Values 5600 MHz: eps' :44.85 sigma : 6.26 Body Liquid Values 5800 MHz: eps' :44.45 sigma : 6.58
Distance between dipole and liquid	10 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=4mm/dy=4m/dz=2mm
Frequency	5200 MHz 5400 MHz 5600 MHz 5800 MHz
Input power	20 dBm
Liquid Temperature	20 +/- 1 °C
Lab Temperature	20 +/- 1 °C
Lab Humidity	30-70 %

Frequency (MHz)	1 g SAR (W/kg)	10 g SAR (W/kg)
	measured	measured
5200	73.02 (7.30)	20.58 (2.06)
5400	77.86 (7.79)	21.85 (2.19)
5600	79.90 (7.99)	22.73 (2.27)
5800	71.90 (7.19)	20.50 (2.05)

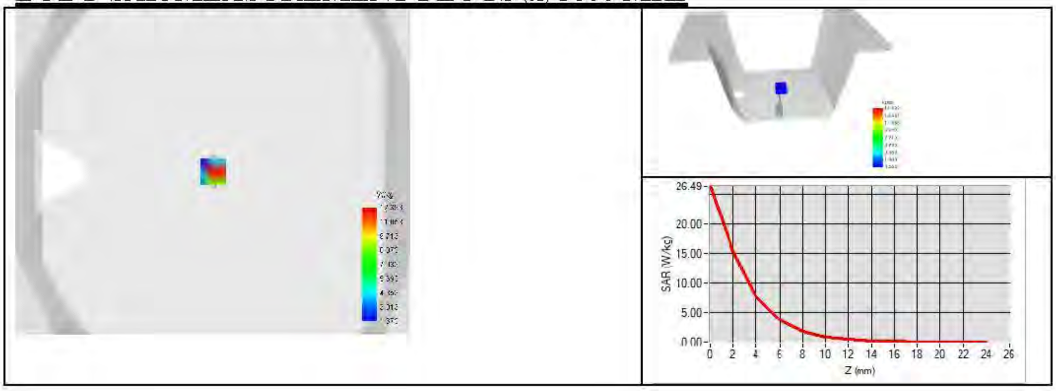
BODY SAR MEASUREMENT PLOTS @ 5200 MHz



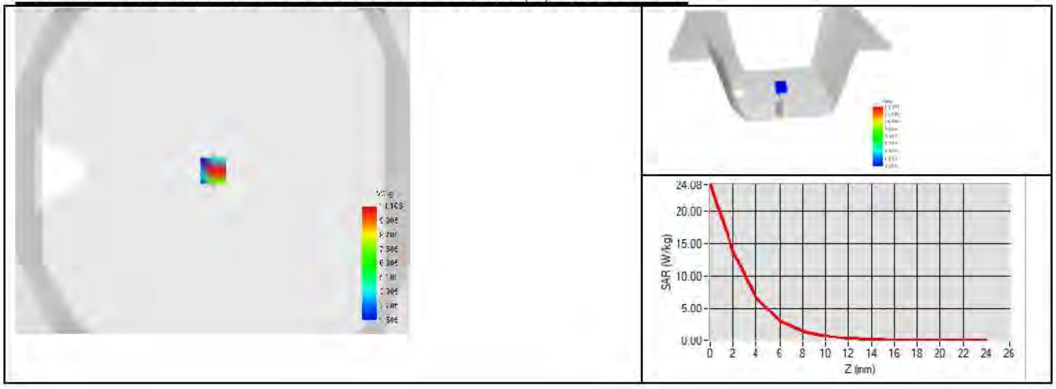
BODY SAR MEASUREMENT PLOTS @ 5400 MHz



BODY SAR MEASUREMENT PLOTS @ 5600 MHz



BODY SAR MEASUREMENT PLOTS @ 5800 MHz

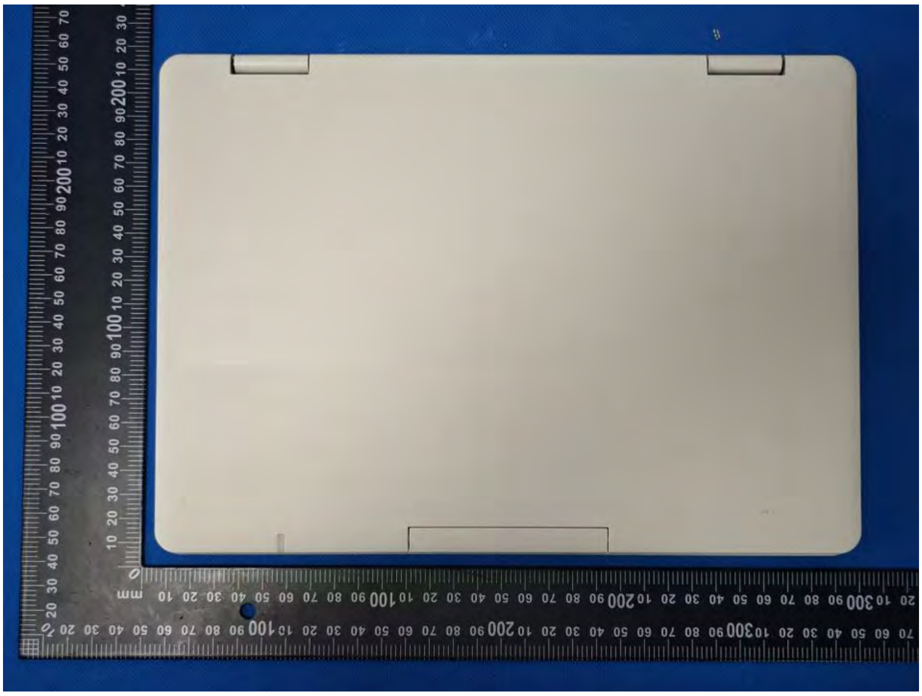


8 LIST OF EQUIPMENT

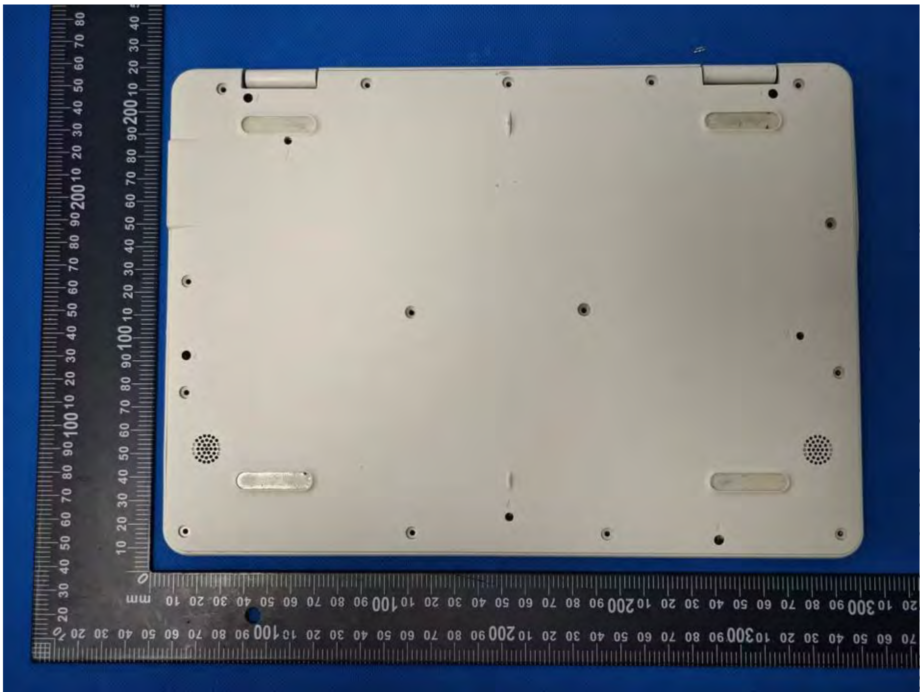
Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	MVG	SN 13/09 SAM68	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rohde & Schwarz ZVM	100203	08/2021	08/2024
Network Analyzer	Agilent 8753ES	MY40003210	10/2022	10/2025
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2012	05/2025
Network Analyzer – Calibration kit	HP 85033D	3423A08186	06/2021	06/2027
Calipers	Mitutoyo	SN 0009732	10/2022	10/2025
Reference Probe	MVG	SN 41/18 EPGO333	10/2022	10/2025
Multimeter	Keithley 2000	1160271	02/2023	02/2026
Signal Generator	Rohde & Schwarz SMB	106589	04/2022	04/2025
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	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.
Temperature / Humidity Sensor	Testo 184 H1	44225320	06/2021	06/2024

17. EUT Photographs

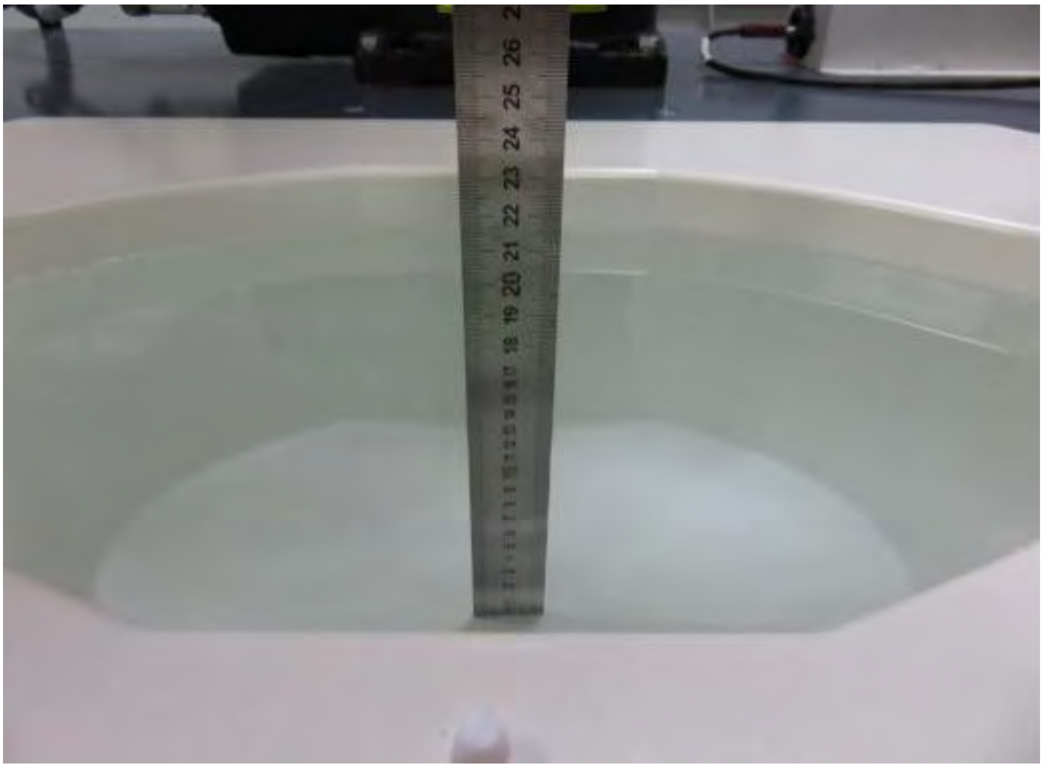
EUT Front View



EUT Back View



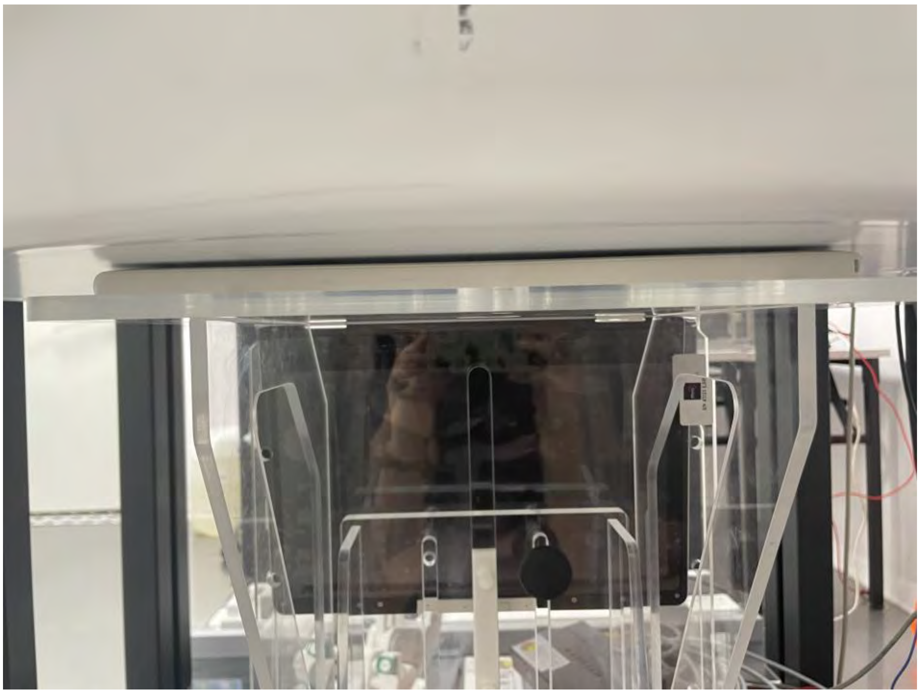
18. Photographs Of The Liquid



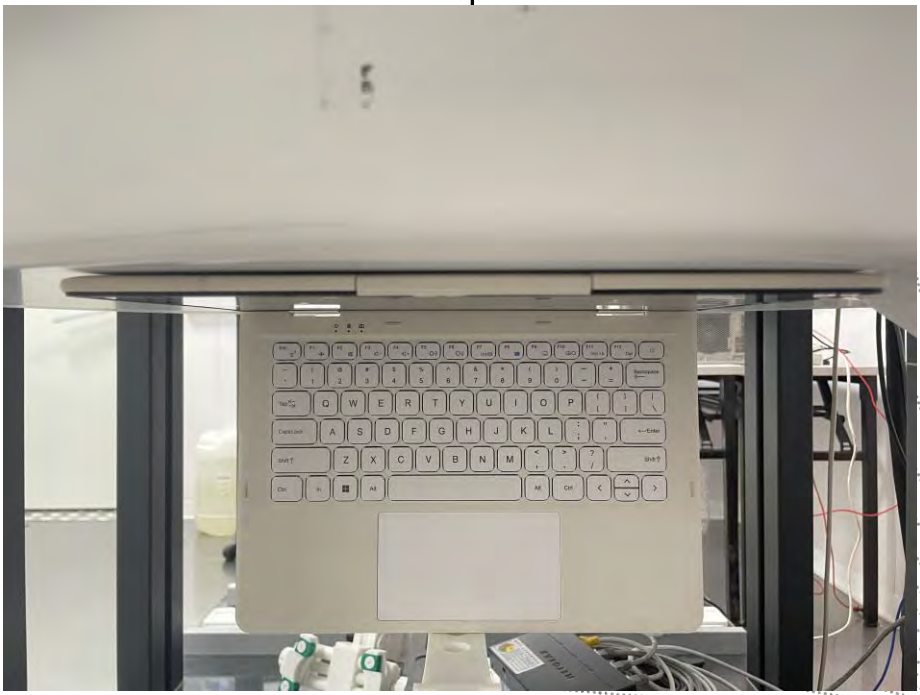
Photograph of the depth in the Body Phantom (600-10000MHz, depth >15cm)

19. EUT Test Setup Photographs

Back



Top



STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC17025.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

Consultation E-mail: bctc@bctc-lab.com.cn

Complaint/Advice E-mail: advice@bctc-lab.com.cn

※※※※※ END ※※※※※