TEST REPORT

Report No.:	BCTC2408412550E
Applicant:	Acer India PVT Limited
Product Name:	Tablet
Test Model:	Acer Iconia Tab iM10-22
Tested Date:	2024-07-31 to 2024-09-13
Issued Date:	2024-09-13

Shenzhen BCTC Testing Co., Ltd.

FCC ID: 2A94K-IM10-22

Product Name:	Tablet
Trademark:	acer
Model/Type Ref.:	Acer Iconia Tab iM10-22 Acer One T10-22L
Applicant:	Acer India PVT Limited
Address:	Acer India PVT Limited, 6th Floor, Embassy Heights, No.13, Magrath Road, Bangalore, 560025, India
Manufacturer:	Acer India PVT Limited
Address:	Acer India PVT Limited, 6th Floor, Embassy Heights, No.13, Magrath Road, Bangalore, 560025, India
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:	2024-07-31
Sample tested Date:	2024-07-31 to 2024-09-13
Issue Date:	2024-09-13
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: Min zhi Cheng

Min Zhi Cheng/ Project Handler

Approved by:

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
BCTC2408412550E	2024-09-13	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.
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 248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS
KDB 941225 D01 3G SAR Procedures: 3G SAR MEAUREMENT PROCEDURES
KDB 941225 D05 SAR for LTE Devices: SAR EVALUATION CONSIDERATIONS FOR LTE DEVICES
KDB 941225 D06 Hotspot Mode v02r01: SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES
KDB 648474 D04 Handset SAR v01r03: SAR EVALUATION CONSIDERATIONS FOR WIRELESS HANDSETS
KDB 648474 D04 Handset SAR v01r03: SAR EVALUATION CONSIDERATIONS FOR WIRELESS HANDSETS

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)	Hotspot (0mm Gap)	
Bluetooth	0.058	/	1.6
WIFI 2.4G	0.292	0.216	1.6
WIFI 5G	0.366	0.280	1.6
GSM	0.706	0.467	1.6
LTE	0.457	0.758	1.6
Simultaneous Transmission	1.053	1.038	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:	Acer Iconia Tab iM10-22 Acer One T10-22L
Model Differences:	All the model are the same circuit and RF module, except model names.
Hardware Version:	N/A
Software Version:	N/A
Ratings:	DC 9V from adapter/DC 3.8V from battery
Adapter Information:	Model: TPD-203A120167VF01 Input: 100-240V~50/60Hz 0.6A USB-C Output: 5.0V⎓3.0A or 9.0V⎓2.22A or 12.0V⎓1.67A

Bluetooth

Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK, π/ 4 DQPSK, 8DPSK
Number Of Channel	79CH
Antenna Type:	Internal antenna
Antenna Gain:	1.18 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
Data Rate:	LE 1M PHY
Number Of Channel	40CH
Antenna Type:	Internal antenna
Antenna Gain:	1.18 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/n20MHz:2412~2462 MHz 802.11n40MHz:2422~2452 MHz
Bit Rate of Transmitter	802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6Mbps 802.11n Up to 150Mbps
Type of Modulation:	OFDM/DSSS
Number Of Channel	802.11b/g/n20MHz:11 CH 802.11n40MHz: 7 CH
Antenna Gain:	1.18 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

IEEE 802.11 WLAN Mode Supported	802.11a/n/ac(20MHz channel bandwidth) 802.11n/ac(40MHz channel bandwidth) 802.11ac(80MHz channel bandwidth)
Operation Frequency:	5180-5240MHz for 802.11a/n(HT20); 5190-5230MHz for 802.11n(HT40); 5210MHz for 802.11 ac80; 5745-5825 MHz for 802.11a/n(HT20); 5755-5795 MHz for 802.11n(HT40); 5775MHz for 802.11 ac80;
Data Rate	802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20/HT40):MCS0-MCS15; 802.11ac(VHT20): NSS1, MCS0-MCS8 802.11ac(VHT40/VHT80):NSS1, MCS0-MCS
Type of Modulation:	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n/ac;
Number Of Channel	4 channels for 802.11a/n20 in the 5180-5240MHz band ; 2 channels for 802.11 n40 in the 5190-5230MHz band ; 1 channels for 802.11 ac80 in the 5210MHz band ; 5 channels for 802.11a/n20 in the 5745-5825MHz band ; 2 channels for 802.11 n40 in the 5755-5795MHz band ; 1 channels for 802.11 ac80 in the 5775MHz band
Antenna Type:	Internal antenna
Antenna Gain:	5G: 2.06 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.

2G

Operation Frequency:	GSM/GPRS/EGPRS 850: TX: 824~849MHz; RX: 869~894MHz; GSM/GPRS/EGPRS 1900: TX:1850~1910MHz; RX:1930~1990MHz;
GPRS Class:	Class 12
Max RF Output Power:	GSM/GPRS/EGPRS 850: 32.71 dBm, GSM/GPRS/EGPRS 1900: 29.12 dBm
Type of Modulation:	GSM with GMSK Modulation
Type of Emission:	GSM/GPRS 850: 254GXW EGPRS 850:252G7W GSM/GPRS 1900: 249KGXW EGPRS 1900:244KG7W
Antenna installation:	Internal antenna
Antenna Gain:	GSM850: 1.86 dBi GSM1900: 0.11 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.

4G

Tx Frequency:	LTE Band 5: 824 MHz ~ 849 MHz LTE Band 41: 2455MHz~2655MHz
Rx Frequency:	LTE Band 5: 869 MHz ~ 894 MHz LTE Band 41: 2455MHz~2655MHz
Bandwidth:	LTE Band 5: 1.4MHz /3MHz /5MHz /10MHz LTE Band 41: 5MHz /10MHz /15MHz /20MHz
The Max RF Output Power (EIRP/ERP)	LTE Band 5: 23.41 dBm LTE Band 41: 24.61 dBm
99% Occupied Bandwidth:	LTE Band 5: 9M00G7D LTE Band 41: 18M0G7D
Type of Modulation:	QPSK/16QAM
Antenna Type:	Internal Antenna
Antenna Gain:	LTE Band 2: 1.86 dBi LTE Band 41: 2.14 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	June 29, 2023	June 28, 2024
DIPOLE 835	MVG	SID 835	SN 47/21 DIP 0G835-621	Nov. 25, 2021	Nov. 24, 2024
DIPOLE 1900	MVG	SID 1900	SN 47/21 DIP 2G100-624	Nov. 25, 2021	Nov. 24, 2024
DIPOLE 2450	MVG	SID 2450	SN 47/21 DIP 2G450-627	Nov. 25, 2021	Nov. 24, 2024
DIPOLE 2300	MVG	SID 2300	SN 47/21 DIP 2G300-628	Nov. 25, 2021	Nov. 24, 2024
DIPOLE 5000	MVG	SID 5000	SN 47/21 DIP 5G000-629	Nov. 25, 2021	Nov. 24, 2024
COMOSAR OPEN Coaxial Probe	SATIMO	\	\	N/A	N/A
SAR Locator	SATIMO	\	\	N/A	N/A
Communication Antenna	SATIMO	\	\	N/A	N/A
FEATURE PHONEPOSITIONING DEVICE	SATIMO	\	\	N/A	N/A
DUMMY PROBE	SATIMO	\	\	N/A	N/A
SAM Phantom	SATIMO	\	SN 13/09 SAM68	N/A	N/A
Liquid measurement Kit	HP	85033D	3423A08186	N/A	N/A
Power meter	Keysight	E4419	\	May 16, 2024	May 15, 2025
Power meter	Agilent	E4419	\	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211659	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211305	May 16, 2024	May 15, 2025
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

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, δ T is the temperature rise and δ t 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

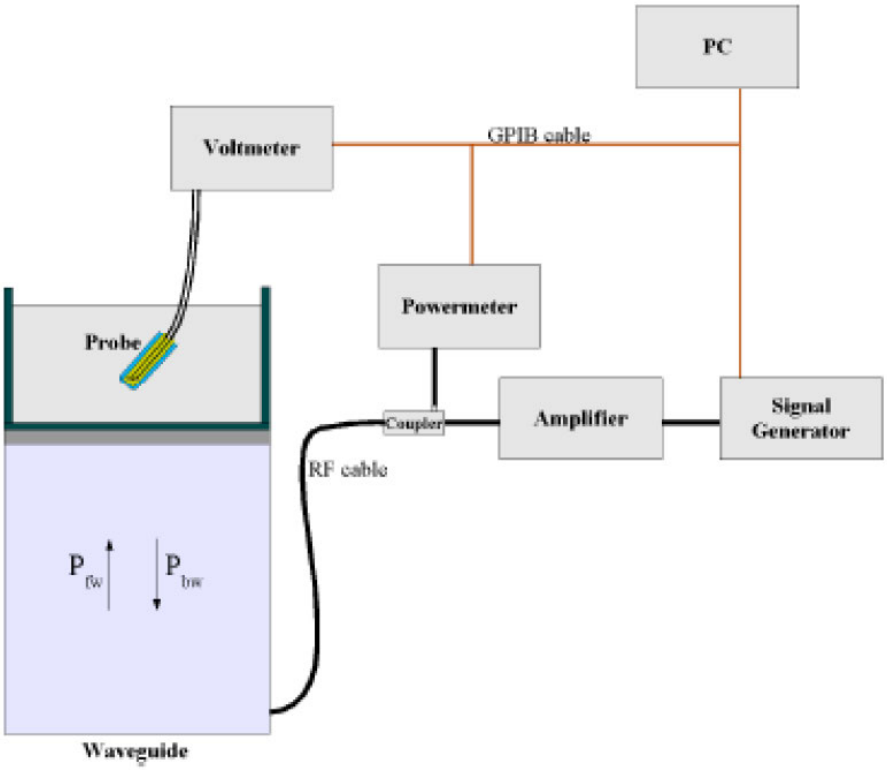
The following figure shows the system.

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.



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

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:
Δ t = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
Δ T = 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.

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

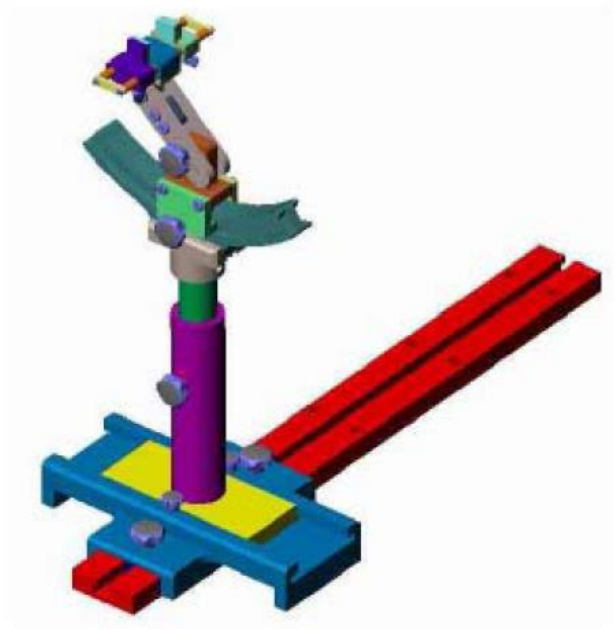
Where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm3 for brain tissue)

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 (ε_r)	Measured (σ)	Measured (ε_r)	Delta (σ)%	Delta (ε_r)%	Limit (%)	Temp. TSL (°C)	Date
835	Head	0.90	41.50	0.924	40.611	2.67	-2.14	±5	23.4	11/9/2024
1900	Head	1.40	40.00	1.451	39.854	3.64	-0.37	±5	23.0	3/9/2024
2450	Head	1.80	39.20	1.789	39.878	-0.61	1.73	±5	23.6	9/9/2024
2600	Head	1.96	39.00	1.947	37.980	-0.66	-2.62	±5	23.4	11/9/2024
5200	Head	4.45	36.20	4.422	34.862	-0.63	-3.70	±5	23.6	9/9/2024
5800	Head	5.27	35.30	5.255	36.564	-0.28	3.58	±5	23.6	9/9/2024

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.

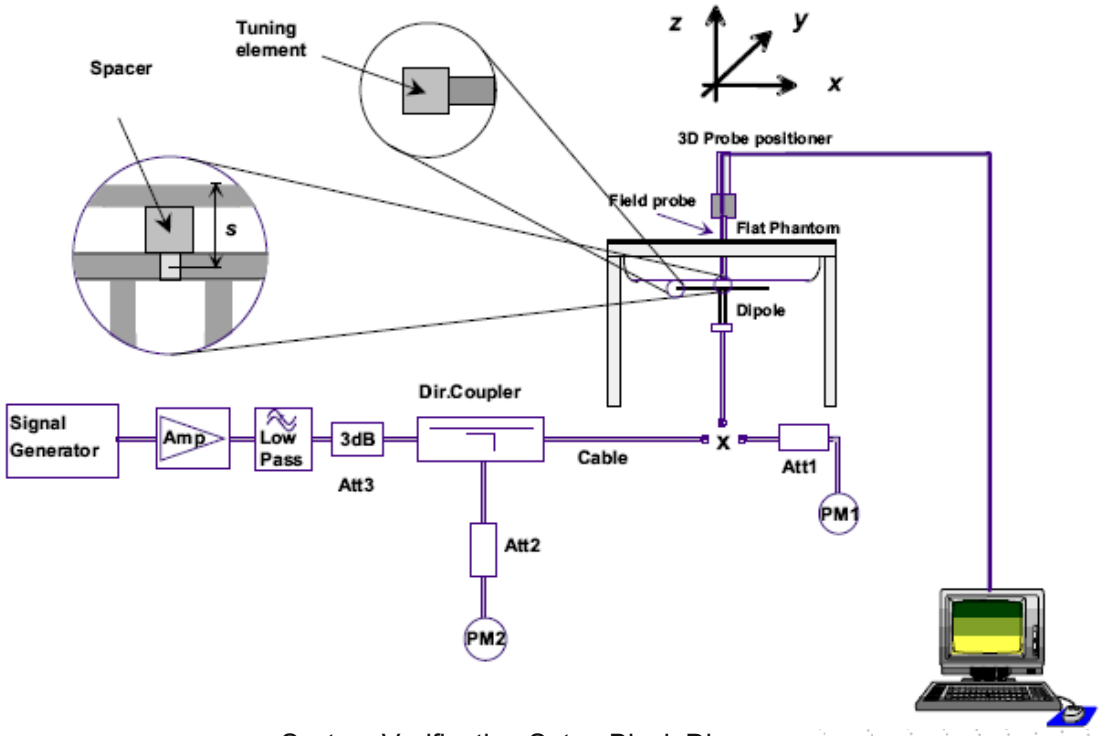
11. System Check

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
835	250mW	2.609	10.437	1.631	10.01	4.266	±10	23.3	11/9/2024
1900	250mW	10.543	42.173	-2.627	41.26	2.213	±10	23.2	3/9/2024
2450	250mW	13.299	53.197	3.362	55.16	-3.559	±10	23.4	9/9/2024
2600	250mW	14.521	58.083	0.010	56.50	2.802	±10	23.3	11/9/2024
5200	250mW	18.957	75.828	-2.778	76.41	-0.762	±10	23.4	9/9/2024
5800	250mW	19.408	77.630	-2.732	76.49	1.490	±10	23.4	9/9/2024

12. EUT Testing Position

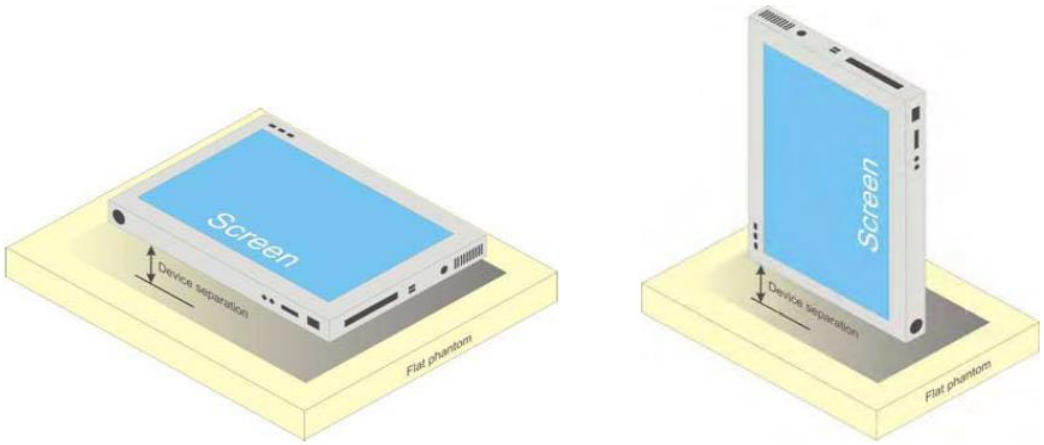
Body Position

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.

The example shows a tablet form factor portable computer for which SAR should be separately assessed with

a). each surface and

b). the separation distances



Tablet form factor portable computer

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>½·δ·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">≤ 1.5·$\Delta z_{Zoom}(n-1)$ 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 reported 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

Bluetooth			
Mode	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
1-DH1	2402	-1.48	-0.5
	2441	-0.72	
	2480	-1.09	
2-DH1	2402	-2.06	-1.0
	2441	-1.29	
	2480	-1.70	
3-DH1	2402	-2.03	-1.0
	2441	-1.26	
	2480	-1.62	

BLE			
Mode	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
GFSK BLE 1M	2402	0.42	1.5
	2440	1.11	
	2480	0.71	

Note:
Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for1-g SAR and ≤ 7.5 for 10-g extremity SAR

f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison

Bluetooth Turn up Power (dBm)	Bluetooth Turn up Power (mW)	Separation Distance (mm)	Frequency (GHz)	Result	Exclusion Thresholds
1.5	1.41	5	2.402	0.44	3.0

Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
According to the calculation results in the table above, Bluetooth SAR does not need to be tested.

WIFI 2.4G			
Mode	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
b	2412	12.16	12.5
	2437	11.81	
	2462	11.68	
g	2412	10.65	12.0
	2437	11.21	
	2462	11.92	
n20	2412	10.43	11.0
	2437	10.97	
	2462	10.92	
n40	2422	9.38	9.5
	2437	9.30	
	2452	9.34	

WIFI 5.1G			
Mode	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
a	5180	11.46	12.0
	5200	11.19	
	5240	11.59	
n20	5180	10.11	10.5
	5200	10.44	
	5240	9.67	
n40	5190	9.85	10.0
	5230	9.29	
ac20	5180	10.48	11.0
	5200	10.08	
	5240	10.50	
ac40	5190	10.05	10.5
	5230	9.30	
ac80	5210	8.77	9.0

WIFI 5.8G			
Mode	**Frequency (MHz)**	**Conducted Power (dBm)**	**Tune-up power (dBm)**
a	5745	11.43	12.0
	5785	11.78	
	5825	11.18	
n20	5745	10.99	11.0
	5785	10.66	
	5825	10.06	
n40	5755	9.88	10.0
	5795	9.72	
ac20	5745	9.96	10.0
	5785	9.74	
	5825	9.13	
ac40	5755	10.26	10.5
	5795	9.61	
ac80	5775	8.21	8.5

GSM - Burst Average Power (dBm)								
Band	**GSM850**			**Tune-up**	**GSM1900**			**Tune-up**
Channel	**128**	**190**	**251**		**512**	**661**	**810**	
Frequency (MHz)	**824.2**	**836.6**	**848.8**		**1850.2**	**1880**	**1909.8**	
GSM	32.50	32.55	32.69	33.0	29.02	29.11	28.89	29.5
GPRS Slot -1	32.52	32.56	32.71	33.0	29.03	29.12	28.90	29.5
GPRS Slot -2	31.63	31.67	31.80	32.0	28.08	28.17	28.00	28.5
GPRS Slot -3	29.67	29.72	29.89	30.0	26.07	26.17	26.09	26.5
GPRS Slot -4	28.52	28.59	28.73	29.0	24.94	25.08	24.99	25.5
EGPRS Slot -1	25.69	25.32	25.62	26.0	25.05	24.41	24.42	25.5
EGPRS Slot -2	24.70	24.20	24.42	25.0	23.74	23.24	22.87	24.0
EGPRS Slot -3	22.03	21.86	21.79	22.5	20.99	20.58	20.16	21.0
EGPRS Slot -4	20.53	20.24	20.33	21.0	19.61	19.36	18.77	20.0

GSM - Source-Based Time-Average Power (dBm)						
Band	**GSM850**			**GSM1900**		
Channel	**128**	**190**	**251**	**512**	**661**	**810**
Frequency (MHz)	**824.2**	**836.6**	**848.8**	**1850.2**	**1880**	**1909.8**
GSM	23.50	23.55	23.69	20.02	20.11	19.89
GPRS Slot -1	23.52	23.56	23.71	20.03	20.12	19.90
GPRS Slot -2	25.63	25.67	**25.80**	22.08	**22.17**	22.00
GPRS Slot -3	25.42	25.47	25.64	21.82	21.92	21.84
GPRS Slot -4	25.52	25.59	25.73	21.94	22.08	21.99
EGPRS Slot -1	16.69	16.32	16.62	16.05	15.41	15.42
EGPRS Slot -2	18.70	18.20	18.42	17.74	17.24	16.87
EGPRS Slot -3	17.78	17.61	17.54	16.74	16.33	15.91
EGPRS Slot -4	17.53	17.24	17.33	16.61	16.36	15.77

Notes:
1. Division Factors
To average the power, the division factor is as follows:
1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.00dB
2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.00dB
3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB
4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.00dB
.

Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Power (dBm)	Gain (dBm)	ERP (dBm)	Verdict
Band5	1.4	20407	1	#0	QPSK	23.35	1.86	23.06	PASS
Band5	1.4	20407	1	#Mid	QPSK	23.39	1.86	23.1	PASS
Band5	1.4	20407	1	#Max	QPSK	23.31	1.86	23.02	PASS
Band5	1.4	20407	3	#0	QPSK	23.40	1.86	23.11	PASS
Band5	1.4	20407	3	#Mid	QPSK	23.43	1.86	23.14	PASS
Band5	1.4	20407	3	#Max	QPSK	23.36	1.86	23.07	PASS
Band5	1.4	20407	6	#0	QPSK	22.44	1.86	22.15	PASS
Band5	1.4	20407	1	#0	16QAM	22.17	1.86	21.88	PASS
Band5	1.4	20407	1	#Mid	16QAM	22.25	1.86	21.96	PASS
Band5	1.4	20407	1	#Max	16QAM	22.18	1.86	21.89	PASS
Band5	1.4	20407	3	#0	16QAM	22.52	1.86	22.23	PASS
Band5	1.4	20407	3	#Mid	16QAM	22.57	1.86	22.28	PASS
Band5	1.4	20407	3	#Max	16QAM	22.53	1.86	22.24	PASS
Band5	1.4	20407	6	#0	16QAM	21.61	1.86	21.32	PASS
Band5	1.4	20525	1	#0	QPSK	23.38	1.86	23.09	PASS
Band5	1.4	20525	1	#Mid	QPSK	23.45	1.86	23.16	PASS
Band5	1.4	20525	1	#Max	QPSK	23.38	1.86	23.09	PASS
Band5	1.4	20525	3	#0	QPSK	23.33	1.86	23.04	PASS
Band5	1.4	20525	3	#Mid	QPSK	23.39	1.86	23.1	PASS
Band5	1.4	20525	3	#Max	QPSK	23.38	1.86	23.09	PASS
Band5	1.4	20525	6	#0	QPSK	22.43	1.86	22.14	PASS
Band5	1.4	20525	1	#0	16QAM	22.42	1.86	22.13	PASS
Band5	1.4	20525	1	#Mid	16QAM	22.51	1.86	22.22	PASS
Band5	1.4	20525	1	#Max	16QAM	22.49	1.86	22.2	PASS
Band5	1.4	20525	3	#0	16QAM	22.54	1.86	22.25	PASS
Band5	1.4	20525	3	#Mid	16QAM	22.58	1.86	22.29	PASS
Band5	1.4	20525	3	#Max	16QAM	22.55	1.86	22.26	PASS
Band5	1.4	20525	6	#0	16QAM	21.64	1.86	21.35	PASS
Band5	1.4	20643	1	#0	QPSK	23.39	1.86	23.1	PASS
Band5	1.4	20643	1	#Mid	QPSK	23.44	1.86	23.15	PASS
Band5	1.4	20643	1	#Max	QPSK	23.32	1.86	23.03	PASS
Band5	1.4	20643	3	#0	QPSK	23.51	1.86	23.22	PASS
Band5	1.4	20643	3	#Mid	QPSK	23.51	1.86	23.22	PASS
Band5	1.4	20643	3	#Max	QPSK	23.49	1.86	23.2	PASS
Band5	1.4	20643	6	#0	QPSK	22.56	1.86	22.27	PASS
Band5	1.4	20643	1	#0	16QAM	22.57	1.86	22.28	PASS
Band5	1.4	20643	1	#Mid	16QAM	22.58	1.86	22.29	PASS
Band5	1.4	20643	1	#Max	16QAM	22.55	1.86	22.26	PASS
Band5	1.4	20643	3	#0	16QAM	22.67	1.86	22.38	PASS
Band5	1.4	20643	3	#Mid	16QAM	22.72	1.86	22.43	PASS
Band5	1.4	20643	3	#Max	16QAM	22.66	1.86	22.37	PASS
Band5	1.4	20643	6	#0	16QAM	21.73	1.86	21.44	PASS
Band5	3	20415	1	#0	QPSK	23.02	1.86	22.73	PASS
Band5	3	20415	1	#Mid	QPSK	23.12	1.86	22.83	PASS
Band5	3	20415	1	#Max	QPSK	23.04	1.86	22.75	PASS
Band5	3	20415	8	#0	QPSK	22.25	1.86	21.96	PASS
Band5	3	20415	8	#Mid	QPSK	22.37	1.86	22.08	PASS
Band5	3	20415	8	#Max	QPSK	22.30	1.86	22.01	PASS
Band5	3	20415	15	#0	QPSK	22.28	1.86	21.99	PASS
Band5	3	20415	1	#0	16QAM	22.50	1.86	22.21	PASS
Band5	3	20415	1	#Mid	16QAM	22.58	1.86	22.29	PASS
Band5	3	20415	1	#Max	16QAM	22.49	1.86	22.2	PASS
Band5	3	20415	8	#0	16QAM	21.29	1.86	21	PASS
Band5	3	20415	8	#Mid	16QAM	21.35	1.86	21.06	PASS

Band5	3	20415	8	#Max	16QAM	21.34	1.86	21.05	PASS
Band5	3	20415	15	#0	16QAM	21.36	1.86	21.07	PASS
Band5	3	20525	1	#0	QPSK	23.10	1.86	22.81	PASS
Band5	3	20525	1	#Mid	QPSK	23.19	1.86	22.9	PASS
Band5	3	20525	1	#Max	QPSK	23.15	1.86	22.86	PASS
Band5	3	20525	8	#0	QPSK	22.34	1.86	22.05	PASS
Band5	3	20525	8	#Mid	QPSK	22.38	1.86	22.09	PASS
Band5	3	20525	8	#Max	QPSK	22.38	1.86	22.09	PASS
Band5	3	20525	15	#0	QPSK	22.40	1.86	22.11	PASS
Band5	3	20525	1	#0	16QAM	22.29	1.86	22	PASS
Band5	3	20525	1	#Mid	16QAM	22.39	1.86	22.1	PASS
Band5	3	20525	1	#Max	16QAM	22.37	1.86	22.08	PASS
Band5	3	20525	8	#0	16QAM	21.39	1.86	21.1	PASS
Band5	3	20525	8	#Mid	16QAM	21.45	1.86	21.16	PASS
Band5	3	20525	8	#Max	16QAM	21.36	1.86	21.07	PASS
Band5	3	20525	15	#0	16QAM	21.34	1.86	21.05	PASS
Band5	3	20635	1	#0	QPSK	23.28	1.86	22.99	PASS
Band5	3	20635	1	#Mid	QPSK	23.43	1.86	23.14	PASS
Band5	3	20635	1	#Max	QPSK	23.35	1.86	23.06	PASS
Band5	3	20635	8	#0	QPSK	22.50	1.86	22.21	PASS
Band5	3	20635	8	#Mid	QPSK	22.54	1.86	22.25	PASS
Band5	3	20635	8	#Max	QPSK	22.45	1.86	22.16	PASS
Band5	3	20635	15	#0	QPSK	22.50	1.86	22.21	PASS
Band5	3	20635	1	#0	16QAM	22.15	1.86	21.86	PASS
Band5	3	20635	1	#Mid	16QAM	22.20	1.86	21.91	PASS
Band5	3	20635	1	#Max	16QAM	22.07	1.86	21.78	PASS
Band5	3	20635	8	#0	16QAM	21.48	1.86	21.19	PASS
Band5	3	20635	8	#Mid	16QAM	21.52	1.86	21.23	PASS
Band5	3	20635	8	#Max	16QAM	21.45	1.86	21.16	PASS
Band5	3	20635	15	#0	16QAM	21.57	1.86	21.28	PASS
Band5	5	20425	1	#0	QPSK	23.37	1.86	23.08	PASS
Band5	5	20425	1	#Mid	QPSK	23.41	1.86	23.12	PASS
Band5	5	20425	1	#Max	QPSK	23.32	1.86	23.03	PASS
Band5	5	20425	12	#0	QPSK	22.34	1.86	22.05	PASS
Band5	5	20425	12	#Mid	QPSK	22.44	1.86	22.15	PASS
Band5	5	20425	12	#Max	QPSK	22.37	1.86	22.08	PASS
Band5	5	20425	25	#0	QPSK	22.32	1.86	22.03	PASS
Band5	5	20425	1	#0	16QAM	22.85	1.86	22.56	PASS
Band5	5	20425	1	#Mid	16QAM	22.95	1.86	22.66	PASS
Band5	5	20425	1	#Max	16QAM	22.87	1.86	22.58	PASS
Band5	5	20425	12	#0	16QAM	21.33	1.86	21.04	PASS
Band5	5	20425	12	#Mid	16QAM	21.46	1.86	21.17	PASS
Band5	5	20425	12	#Max	16QAM	21.36	1.86	21.07	PASS
Band5	5	20425	25	#0	16QAM	21.32	1.86	21.03	PASS
Band5	5	20525	1	#0	QPSK	23.35	1.86	23.06	PASS
Band5	5	20525	1	#Mid	QPSK	23.45	1.86	23.16	PASS
Band5	5	20525	1	#Max	QPSK	23.43	1.86	23.14	PASS
Band5	5	20525	12	#0	QPSK	22.45	1.86	22.16	PASS
Band5	5	20525	12	#Mid	QPSK	22.49	1.86	22.2	PASS
Band5	5	20525	12	#Max	QPSK	22.42	1.86	22.13	PASS
Band5	5	20525	25	#0	QPSK	22.46	1.86	22.17	PASS
Band5	5	20525	1	#0	16QAM	22.65	1.86	22.36	PASS
Band5	5	20525	1	#Mid	16QAM	22.79	1.86	22.5	PASS
Band5	5	20525	1	#Max	16QAM	22.76	1.86	22.47	PASS
Band5	5	20525	12	#0	16QAM	21.37	1.86	21.08	PASS
Band5	5	20525	12	#Mid	16QAM	21.42	1.86	21.13	PASS
Band5	5	20525	12	#Max	16QAM	21.40	1.86	21.11	PASS

Band5	5	20525	25	#0	16QAM	21.45	1.86	21.16	PASS
Band5	5	20625	1	#0	QPSK	23.46	1.86	23.17	PASS
Band5	5	20625	1	#Mid	QPSK	23.52	1.86	23.23	PASS
Band5	5	20625	1	#Max	QPSK	23.39	1.86	23.1	PASS
Band5	5	20625	12	#0	QPSK	22.55	1.86	22.26	PASS
Band5	5	20625	12	#Mid	QPSK	22.60	1.86	22.31	PASS
Band5	5	20625	12	#Max	QPSK	22.44	1.86	22.15	PASS
Band5	5	20625	25	#0	QPSK	22.50	1.86	22.21	PASS
Band5	5	20625	1	#0	16QAM	22.80	1.86	22.51	PASS
Band5	5	20625	1	#Mid	16QAM	22.83	1.86	22.54	PASS
Band5	5	20625	1	#Max	16QAM	22.72	1.86	22.43	PASS
Band5	5	20625	12	#0	16QAM	21.57	1.86	21.28	PASS
Band5	5	20625	12	#Mid	16QAM	21.61	1.86	21.32	PASS
Band5	5	20625	12	#Max	16QAM	21.45	1.86	21.16	PASS
Band5	5	20625	25	#0	16QAM	21.50	1.86	21.21	PASS
Band5	10	20450	1	#0	QPSK	23.37	1.86	23.08	PASS
Band5	10	20450	1	#Mid	QPSK	23.37	1.86	23.08	PASS
Band5	10	20450	1	#Max	QPSK	23.38	1.86	23.09	PASS
Band5	10	20450	25	#0	QPSK	22.23	1.86	21.94	PASS
Band5	10	20450	25	#Mid	QPSK	22.39	1.86	22.1	PASS
Band5	10	20450	25	#Max	QPSK	22.39	1.86	22.1	PASS
Band5	10	20450	50	#0	QPSK	22.32	1.86	22.03	PASS
Band5	10	20450	1	#0	16QAM	22.79	1.86	22.5	PASS
Band5	10	20450	1	#Mid	16QAM	22.80	1.86	22.51	PASS
Band5	10	20450	1	#Max	16QAM	22.82	1.86	22.53	PASS
Band5	10	20450	25	#0	16QAM	21.25	1.86	20.96	PASS
Band5	10	20450	25	#Mid	16QAM	21.46	1.86	21.17	PASS
Band5	10	20450	25	#Max	16QAM	21.42	1.86	21.13	PASS
Band5	10	20450	50	#0	16QAM	21.35	1.86	21.06	PASS
Band5	10	20525	1	#0	QPSK	23.34	1.86	23.05	PASS
Band5	10	20525	1	#Mid	QPSK	23.46	1.86	23.17	PASS
Band5	10	20525	1	#Max	QPSK	23.55	1.86	23.26	PASS
Band5	10	20525	25	#0	QPSK	22.38	1.86	22.09	PASS
Band5	10	20525	25	#Mid	QPSK	22.47	1.86	22.18	PASS
Band5	10	20525	25	#Max	QPSK	22.44	1.86	22.15	PASS
Band5	10	20525	50	#0	QPSK	22.44	1.86	22.15	PASS
Band5	10	20525	1	#0	16QAM	22.52	1.86	22.23	PASS
Band5	10	20525	1	#Mid	16QAM	22.67	1.86	22.38	PASS
Band5	10	20525	1	#Max	16QAM	22.74	1.86	22.45	PASS
Band5	10	20525	25	#0	16QAM	21.38	1.86	21.09	PASS
Band5	10	20525	25	#Mid	16QAM	21.49	1.86	21.2	PASS
Band5	10	20525	25	#Max	16QAM	21.49	1.86	21.2	PASS
Band5	10	20525	50	#0	16QAM	21.47	1.86	21.18	PASS
Band5	10	20600	1	#0	QPSK	23.57	1.86	23.28	PASS
Band5	10	20600	1	#Mid	QPSK	23.70	1.86	23.41	PASS
Band5	10	20600	1	#Max	QPSK	23.61	1.86	23.32	PASS
Band5	10	20600	25	#0	QPSK	22.49	1.86	22.2	PASS
Band5	10	20600	25	#Mid	QPSK	22.58	1.86	22.29	PASS
Band5	10	20600	25	#Max	QPSK	22.45	1.86	22.16	PASS
Band5	10	20600	50	#0	QPSK	22.48	1.86	22.19	PASS
Band5	10	20600	1	#0	16QAM	22.39	1.86	22.1	PASS
Band5	10	20600	1	#Mid	16QAM	22.48	1.86	22.19	PASS
Band5	10	20600	1	#Max	16QAM	22.40	1.86	22.11	PASS
Band5	10	20600	25	#0	16QAM	21.52	1.86	21.23	PASS
Band5	10	20600	25	#Mid	16QAM	21.60	1.86	21.31	PASS
Band5	10	20600	25	#Max	16QAM	21.46	1.86	21.17	PASS
Band5	10	20600	50	#0	16QAM	21.44	1.86	21.15	PASS

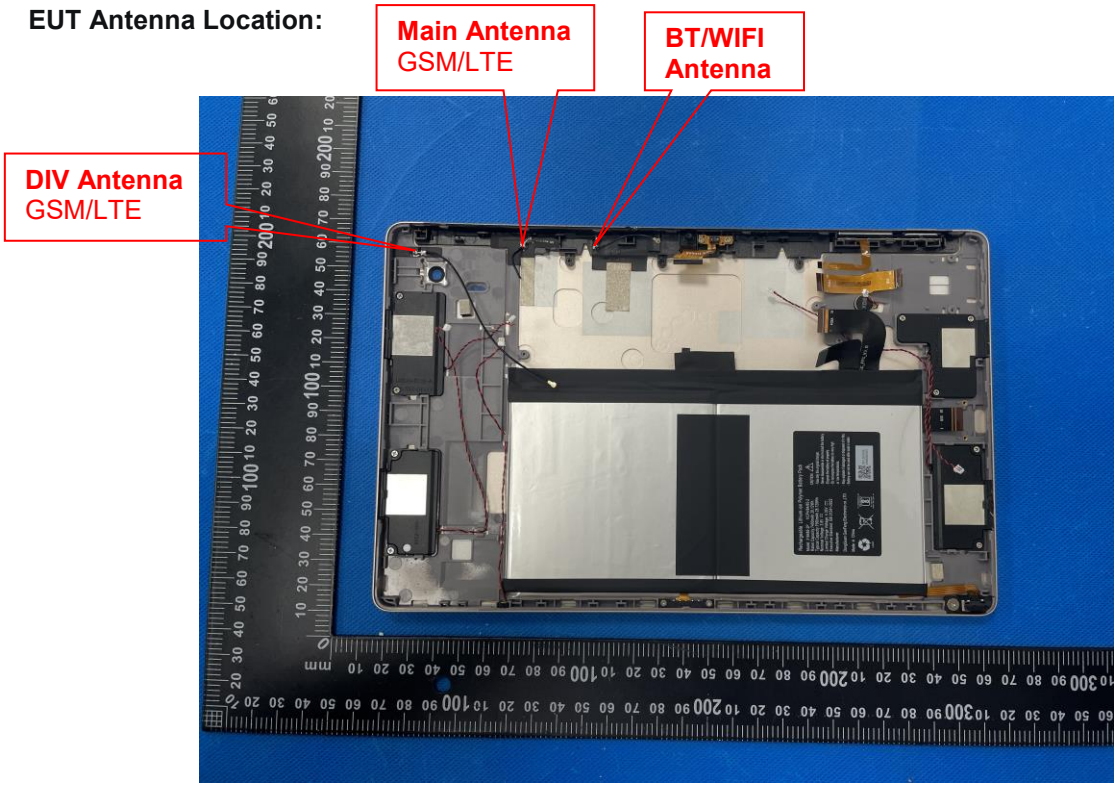
Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Power (dBm)	Gain (dBm)	EIRP (dBm)	Verdict
Band41	5	40065	1	#0	QPSK	22.35	2.14	24.49	PASS
Band41	5	40065	1	#Mid	QPSK	22.45	2.14	24.59	PASS
Band41	5	40065	1	#Max	QPSK	22.37	2.14	24.51	PASS
Band41	5	40065	12	#0	QPSK	21.32	2.14	23.46	PASS
Band41	5	40065	12	#Mid	QPSK	21.34	2.14	23.48	PASS
Band41	5	40065	12	#Max	QPSK	21.35	2.14	23.49	PASS
Band41	5	40065	25	#0	QPSK	21.32	2.14	23.46	PASS
Band41	5	40640	1	#0	QPSK	22.21	2.14	24.35	PASS
Band41	5	40640	1	#Mid	QPSK	22.36	2.14	24.5	PASS
Band41	5	40640	1	#Max	QPSK	22.23	2.14	24.37	PASS
Band41	5	40640	12	#0	QPSK	21.40	2.14	23.54	PASS
Band41	5	40640	12	#Mid	QPSK	21.45	2.14	23.59	PASS
Band41	5	40640	12	#Max	QPSK	21.40	2.14	23.54	PASS
Band41	5	40640	25	#0	QPSK	21.39	2.14	23.53	PASS
Band41	5	41215	1	#0	QPSK	22.01	2.14	24.15	PASS
Band41	5	41215	1	#Mid	QPSK	22.11	2.14	24.25	PASS
Band41	5	41215	1	#Max	QPSK	21.94	2.14	24.08	PASS
Band41	5	41215	12	#0	QPSK	21.02	2.14	23.16	PASS
Band41	5	41215	12	#Mid	QPSK	21.01	2.14	23.15	PASS
Band41	5	41215	12	#Max	QPSK	20.91	2.14	23.05	PASS
Band41	5	41215	25	#0	QPSK	20.99	2.14	23.13	PASS
Band41	10	40090	1	#0	QPSK	22.38	2.14	24.52	PASS
Band41	10	40090	1	#Mid	QPSK	22.40	2.14	24.54	PASS
Band41	10	40090	1	#Max	QPSK	22.30	2.14	24.44	PASS
Band41	10	40090	25	#0	QPSK	21.25	2.14	23.39	PASS
Band41	10	40090	25	#Mid	QPSK	21.33	2.14	23.47	PASS
Band41	10	40090	25	#Max	QPSK	21.34	2.14	23.48	PASS
Band41	10	40090	50	#0	QPSK	21.27	2.14	23.41	PASS
Band41	10	40640	1	#0	QPSK	22.30	2.14	24.44	PASS
Band41	10	40640	1	#Mid	QPSK	22.43	2.14	24.57	PASS
Band41	10	40640	1	#Max	QPSK	22.43	2.14	24.57	PASS
Band41	10	40640	25	#0	QPSK	21.38	2.14	23.52	PASS
Band41	10	40640	25	#Mid	QPSK	21.45	2.14	23.59	PASS
Band41	10	40640	25	#Max	QPSK	21.40	2.14	23.54	PASS
Band41	10	40640	50	#0	QPSK	21.39	2.14	23.53	PASS
Band41	10	41190	1	#0	QPSK	22.19	2.14	24.33	PASS
Band41	10	41190	1	#Mid	QPSK	22.15	2.14	24.29	PASS
Band41	10	41190	1	#Max	QPSK	21.97	2.14	24.11	PASS
Band41	10	41190	25	#0	QPSK	21.09	2.14	23.23	PASS
Band41	10	41190	25	#Mid	QPSK	21.04	2.14	23.18	PASS
Band41	10	41190	25	#Max	QPSK	20.90	2.14	23.04	PASS
Band41	10	41190	50	#0	QPSK	21.01	2.14	23.15	PASS
Band41	15	40115	1	#0	QPSK	22.26	2.14	24.4	PASS
Band41	15	40115	1	#Mid	QPSK	22.35	2.14	24.49	PASS
Band41	15	40115	1	#Max	QPSK	22.27	2.14	24.41	PASS
Band41	15	40115	36	#0	QPSK	21.35	2.14	23.49	PASS
Band41	15	40115	36	#Mid	QPSK	21.42	2.14	23.56	PASS
Band41	15	40115	36	#Max	QPSK	21.38	2.14	23.52	PASS
Band41	15	40115	75	#0	QPSK	21.40	2.14	23.54	PASS
Band41	15	40640	1	#0	QPSK	22.26	2.14	24.4	PASS
Band41	15	40640	1	#Mid	QPSK	22.42	2.14	24.56	PASS
Band41	15	40640	1	#Max	QPSK	22.37	2.14	24.51	PASS
Band41	15	40640	36	#0	QPSK	21.33	2.14	23.47	PASS
Band41	15	40640	36	#Mid	QPSK	21.40	2.14	23.54	PASS

Band41	15	40640	36	#Max	QPSK	21.38	2.14	23.52	PASS
Band41	15	40640	75	#0	QPSK	21.45	2.14	23.59	PASS
Band41	15	41165	1	#0	QPSK	22.24	2.14	24.38	PASS
Band41	15	41165	1	#Mid	QPSK	22.26	2.14	24.4	PASS
Band41	15	41165	1	#Max	QPSK	21.91	2.14	24.05	PASS
Band41	15	41165	36	#0	QPSK	21.17	2.14	23.31	PASS
Band41	15	41165	36	#Mid	QPSK	21.13	2.14	23.27	PASS
Band41	15	41165	36	#Max	QPSK	20.97	2.14	23.11	PASS
Band41	15	41165	75	#0	QPSK	21.11	2.14	23.25	PASS
Band41	20	40140	1	#0	QPSK	22.22	2.14	24.36	PASS
Band41	20	40140	1	#Mid	QPSK	22.41	2.14	24.55	PASS
Band41	20	40140	1	#Max	QPSK	22.27	2.14	24.41	PASS
Band41	20	40140	50	#0	QPSK	21.16	2.14	23.3	PASS
Band41	20	40140	50	#Mid	QPSK	21.30	2.14	23.44	PASS
Band41	20	40140	50	#Max	QPSK	21.31	2.14	23.45	PASS
Band41	20	40140	100	#0	QPSK	21.20	2.14	23.34	PASS
Band41	20	40640	1	#0	QPSK	22.18	2.14	24.32	PASS
Band41	20	40640	1	#Mid	QPSK	22.47	2.14	24.61	PASS
Band41	20	40640	1	#Max	QPSK	22.33	2.14	24.47	PASS
Band41	20	40640	50	#0	QPSK	21.37	2.14	23.51	PASS
Band41	20	40640	50	#Mid	QPSK	21.45	2.14	23.59	PASS
Band41	20	40640	50	#Max	QPSK	21.35	2.14	23.49	PASS
Band41	20	40640	100	#0	QPSK	21.37	2.14	23.51	PASS
Band41	20	41140	1	#0	QPSK	22.14	2.14	24.28	PASS
Band41	20	41140	1	#Mid	QPSK	22.26	2.14	24.4	PASS
Band41	20	41140	1	#Max	QPSK	21.88	2.14	24.02	PASS
Band41	20	41140	50	#0	QPSK	21.19	2.14	23.33	PASS
Band41	20	41140	50	#Mid	QPSK	21.23	2.14	23.37	PASS
Band41	20	41140	50	#Max	QPSK	21.03	2.14	23.17	PASS
Band41	20	41140	100	#0	QPSK	21.03	2.14	23.17	PASS
Band41	5	40065	1	#0	16QAM	21.61	2.14	23.75	PASS
Band41	5	40065	1	#Mid	16QAM	21.71	2.14	23.85	PASS
Band41	5	40065	1	#Max	16QAM	21.64	2.14	23.78	PASS
Band41	5	40065	12	#0	16QAM	20.14	2.14	22.28	PASS
Band41	5	40065	12	#Mid	16QAM	20.20	2.14	22.34	PASS
Band41	5	40065	12	#Max	16QAM	20.18	2.14	22.32	PASS
Band41	5	40065	25	#0	16QAM	20.12	2.14	22.26	PASS
Band41	5	40640	1	#0	16QAM	21.46	2.14	23.60	PASS
Band41	5	40640	1	#Mid	16QAM	21.60	2.14	23.74	PASS
Band41	5	40640	1	#Max	16QAM	21.48	2.14	23.62	PASS
Band41	5	40640	12	#0	16QAM	20.22	2.14	22.36	PASS
Band41	5	40640	12	#Mid	16QAM	20.31	2.14	22.45	PASS
Band41	5	40640	12	#Max	16QAM	20.22	2.14	22.36	PASS
Band41	5	40640	25	#0	16QAM	20.33	2.14	22.47	PASS
Band41	5	41215	1	#0	16QAM	21.22	2.14	23.36	PASS
Band41	5	41215	1	#Mid	16QAM	21.26	2.14	23.40	PASS
Band41	5	41215	1	#Max	16QAM	21.09	2.14	23.23	PASS
Band41	5	41215	12	#0	16QAM	19.92	2.14	22.06	PASS
Band41	5	41215	12	#Mid	16QAM	19.96	2.14	22.10	PASS
Band41	5	41215	12	#Max	16QAM	19.86	2.14	22.00	PASS
Band41	5	41215	25	#0	16QAM	19.89	2.14	22.03	PASS
Band41	10	40090	1	#0	16QAM	21.58	2.14	23.72	PASS
Band41	10	40090	1	#Mid	16QAM	21.63	2.14	23.77	PASS
Band41	10	40090	1	#Max	16QAM	21.58	2.14	23.72	PASS
Band41	10	40090	25	#0	16QAM	20.17	2.14	22.31	PASS
Band41	10	40090	25	#Mid	16QAM	20.23	2.14	22.37	PASS
Band41	10	40090	25	#Max	16QAM	20.24	2.14	22.38	PASS

Band41	10	40090	50	#0	16QAM	20.16	2.14	22.30	PASS
Band41	10	40640	1	#0	16QAM	21.40	2.14	23.54	PASS
Band41	10	40640	1	#Mid	16QAM	21.46	2.14	23.60	PASS
Band41	10	40640	1	#Max	16QAM	21.49	2.14	23.63	PASS
Band41	10	40640	25	#0	16QAM	20.28	2.14	22.42	PASS
Band41	10	40640	25	#Mid	16QAM	20.37	2.14	22.51	PASS
Band41	10	40640	25	#Max	16QAM	20.31	2.14	22.45	PASS
Band41	10	40640	50	#0	16QAM	20.33	2.14	22.47	PASS
Band41	10	41190	1	#0	16QAM	21.06	2.14	23.20	PASS
Band41	10	41190	1	#Mid	16QAM	20.97	2.14	23.11	PASS
Band41	10	41190	1	#Max	16QAM	20.83	2.14	22.97	PASS
Band41	10	41190	25	#0	16QAM	20.05	2.14	22.19	PASS
Band41	10	41190	25	#Mid	16QAM	20.00	2.14	22.14	PASS
Band41	10	41190	25	#Max	16QAM	19.89	2.14	22.03	PASS
Band41	10	41190	50	#0	16QAM	19.96	2.14	22.10	PASS
Band41	15	40115	1	#0	16QAM	21.54	2.14	23.68	PASS
Band41	15	40115	1	#Mid	16QAM	21.57	2.14	23.71	PASS
Band41	15	40115	1	#Max	16QAM	21.53	2.14	23.67	PASS
Band41	15	40115	36	#0	16QAM	20.15	2.14	22.29	PASS
Band41	15	40115	36	#Mid	16QAM	20.29	2.14	22.43	PASS
Band41	15	40115	36	#Max	16QAM	20.25	2.14	22.39	PASS
Band41	15	40115	75	#0	16QAM	20.22	2.14	22.36	PASS
Band41	15	40640	1	#0	16QAM	21.31	2.14	23.45	PASS
Band41	15	40640	1	#Mid	16QAM	21.47	2.14	23.61	PASS
Band41	15	40640	1	#Max	16QAM	21.41	2.14	23.55	PASS
Band41	15	40640	36	#0	16QAM	20.30	2.14	22.44	PASS
Band41	15	40640	36	#Mid	16QAM	20.39	2.14	22.53	PASS
Band41	15	40640	36	#Max	16QAM	20.38	2.14	22.52	PASS
Band41	15	40640	75	#0	16QAM	20.28	2.14	22.42	PASS
Band41	15	41165	1	#0	16QAM	21.31	2.14	23.45	PASS
Band41	15	41165	1	#Mid	16QAM	21.30	2.14	23.44	PASS
Band41	15	41165	1	#Max	16QAM	20.98	2.14	23.12	PASS
Band41	15	41165	36	#0	16QAM	20.03	2.14	22.17	PASS
Band41	15	41165	36	#Mid	16QAM	20.01	2.14	22.15	PASS
Band41	15	41165	36	#Max	16QAM	19.88	2.14	22.02	PASS
Band41	15	41165	75	#0	16QAM	20.04	2.14	22.18	PASS
Band41	20	40140	1	#0	16QAM	21.21	2.14	23.35	PASS
Band41	20	40140	1	#Mid	16QAM	21.41	2.14	23.55	PASS
Band41	20	40140	1	#Max	16QAM	21.30	2.14	23.44	PASS
Band41	20	40140	50	#0	16QAM	20.07	2.14	22.21	PASS
Band41	20	40140	50	#Mid	16QAM	20.28	2.14	22.42	PASS
Band41	20	40140	50	#Max	16QAM	20.23	2.14	22.37	PASS
Band41	20	40140	100	#0	16QAM	20.12	2.14	22.26	PASS
Band41	20	40640	1	#0	16QAM	21.25	2.14	23.39	PASS
Band41	20	40640	1	#Mid	16QAM	21.54	2.14	23.68	PASS
Band41	20	40640	1	#Max	16QAM	21.42	2.14	23.56	PASS
Band41	20	40640	50	#0	16QAM	20.25	2.14	22.39	PASS
Band41	20	40640	50	#Mid	16QAM	20.34	2.14	22.48	PASS
Band41	20	40640	50	#Max	16QAM	20.21	2.14	22.35	PASS
Band41	20	40640	100	#0	16QAM	20.24	2.14	22.38	PASS
Band41	20	41140	1	#0	16QAM	21.23	2.14	23.37	PASS
Band41	20	41140	1	#Mid	16QAM	21.36	2.14	23.50	PASS
Band41	20	41140	1	#Max	16QAM	20.95	2.14	23.09	PASS
Band41	20	41140	50	#0	16QAM	20.11	2.14	22.25	PASS
Band41	20	41140	50	#Mid	16QAM	20.17	2.14	22.31	PASS
Band41	20	41140	50	#Max	16QAM	19.92	2.14	22.06	PASS
Band41	20	41140	100	#0	16QAM	19.98	2.14	22.12	PASS

14.2 Transmit Antennas and SAR Measurement Position

EUT Antenna Location:



Antennas	Support Band
Main	GSM 850/1900 + LTE Band 5/40 TX
DIV	GSM 850/1900 + LTE Band 5/40 RX
BT/WIFI	Bluetooth + WIFI 2.4G + WIFI 5G

Distance of The Antenna to the EUT surface and edge (mm)						
Antennas	Front	Back	Top Side	Bottom Side	Left Side	Right Side
Main	<25	<25	<25	145	62	164
BT/WIFI	<25	<25	<25	145	168	60

Body mode: Positions for SAR tests						
Antennas	Front	Back	Top Side	Bottom Side	Left Side	Right Side
Main	Yes	Yes	Yes	No	No	No
BT/WIFI	Yes	Yes	Yes	No	No	No

Note:

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.

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 648474 D04 Handset SAR v01r03:
1. When the *reported* SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest *reported* SAR configuration for that wireless mode and frequency band should be repeated for the body-worn accessory with a headset attached to the handset.
2. when the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, using the same wireless mode test configuration for voice and data, such as UMTS, LTE and Wi-Fi, and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface)
3. For Smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

KDB 941225 D05 SAR for LTE Devices:
1. Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
2. When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
3. Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
4. SAR measurement is not required for the 16QAM and 64QAM. When the highest maximum output power for 16QAM and 64QAM is ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.
5. Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

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

WIFI 2.4G									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	b	Front Face	2412	12.16	12.5	1.081	0.270	**0.292**	1
	b	Back Face	2412	12.16	12.5	1.081	0.223	0.241	
Hotspot (0mm)	b	Top Side	2412	12.16	12.5	1.081	0.200	0.216	

WIFI 5.1G									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	a	Front Face	5240	11.59	12.0	1.099	0.316	**0.347**	2
	a	Back Face	5240	11.59	12.0	1.099	0.306	0.336	
Hotspot (0mm)	a	Top Side	5240	11.59	12.0	1.099	0.252	0.277	

WIFI 5.8G									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	a	Front Face	5785	11.78	12.0	1.052	0.255	0.268	
	a	Back Face	5785	11.78	12.0	1.052	0.348	**0.366**	3
Hotspot (0mm)	a	Top Side	5785	11.78	12.0	1.052	0.266	0.280	

GSM 850									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	GSM	Front Face	848.8	32.69	33.0	1.074	0.489	0.525	
	GSM	Back Face	848.8	32.69	33.0	1.074	0.079	0.085	
	GPRS	Front Face	848.8	31.80	32.0	1.047	0.674	**0.706**	4
	GPRS	Back Face	848.8	31.80	32.0	1.047	0.478	0.501	
Hotspot (0mm)	GPRS	Top Side	848.8	31.80	32.0	1.047	0.446	0.467	

GSM 1900									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	GSM	Front Face	1880	29.11	29.5	1.094	0.095	0.104	
	GSM	Back Face	1880	29.11	29.5	1.094	0.084	0.092	
	GPRS	Front Face	1880	28.17	28.5	1.079	0.149	0.161	
	GPRS	Back Face	1880	28.17	28.5	1.079	0.172	0.186	
Hotspot (0mm)	GPRS	Top Side	1880	28.17	28.5	1.079	0.261	**0.282**	5

LTE Band 5 (10MHz Bandwidth)									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	QPSK 1RB	Front Face	844	23.70	24.0	1.072	0.114	**0.122**	6
		Back Face	844	23.70	24.0	1.072	0.074	0.079	
	QPSK 50%RB	Front Face	844	22.58	23.0	1.102	0.062	0.068	
		Back Face	844	22.58	23.0	1.102	0.033	0.036	
Hotspot (0mm)	QPSK 1RB	Top Side	844	23.70	24.0	1.072	0.101	0.108	
	QPSK 50%RB	Top Side	844	22.58	23.0	1.102	0.051	0.056	

LTE Band 41 (20MHz Bandwidth)									
RF Exposure Conditions	Mode	Test Position	Freq. (MHz)	Output Power (dBm)	Turn up (dBm)	Turn-up Scaling Factor	SAR1g (W/kg)		Plot No.
							Meas.	Scaled	
Body (0mm)	QPSK 1RB	Front Face	2593	22.47	22.5	1.007	0.454	0.457	
		Back Face	2593	22.47	22.5	1.007	0.225	0.227	
	QPSK 50%RB	Front Face	2593	21.45	21.5	1.012	0.291	0.294	
		Back Face	2593	21.45	21.5	1.012	0.106	0.107	
Hotspot (0mm)	QPSK 1RB	Top Side	2593	22.47	22.5	1.007	0.753	**0.758**	7
	QPSK 50%RB	Top Side	2593	21.45	21.5	1.012	0.334	0.338	

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	WWAN + WIFI	Yes
2	WWAN + Bluetooth	Yes
3	WIFI 2.4G + WIFI 5G	No
4	WIFI + Bluetooth	No

Remark:

1. Wi-Fi 2.4GHz and Wi-Fi 5GHz cannot transmit simultaneously.
2. WIFI2.4G 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					
Mode	**Frequency (MHz)**	**Maximum Power (mW)**	**Separation Distance (mm)**	**X**	**Estimated SAR1-g (W/kg)**
Bluetooth	2480	1.41	5	3.0	0.058
Bluetooth	2480	1.41	10	7.5	0.029

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.

$$\text{Ratio}=\frac{(SAR_1+SAR_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

5. Simultaneous transmission of maximum SAR sum calculation.

RF Exposure Conditions	Test Position	Standalone SAR (W/kg)		Summed SAR (W/kg)
		WWAN	WIFI/BT	
Body	Front Face	0.706	0.347	1.053
	Back Face	0.501	0.366	0.867
Hotspot	Top Side	0.758	0.280	1.038
	Bottom Side	/	/	/
	Left Side	/	/	/
	Right Side	/	/	/

15. Test Plots

15.1 System Performance Check

System check at 835 MHz
Date of measurement: 11/9/2024

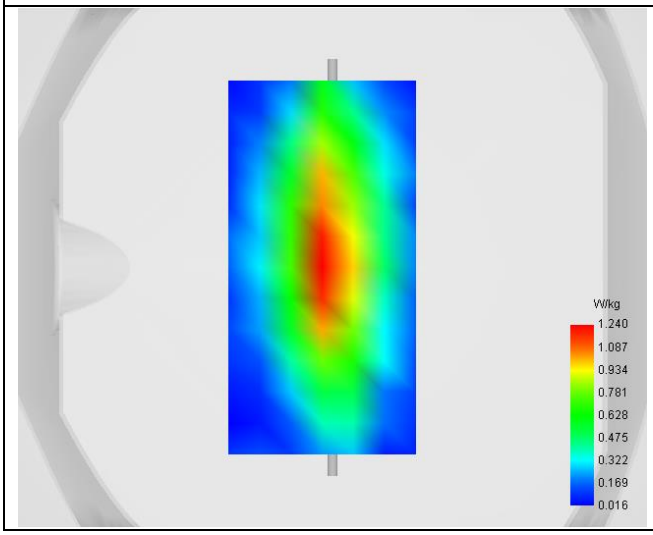
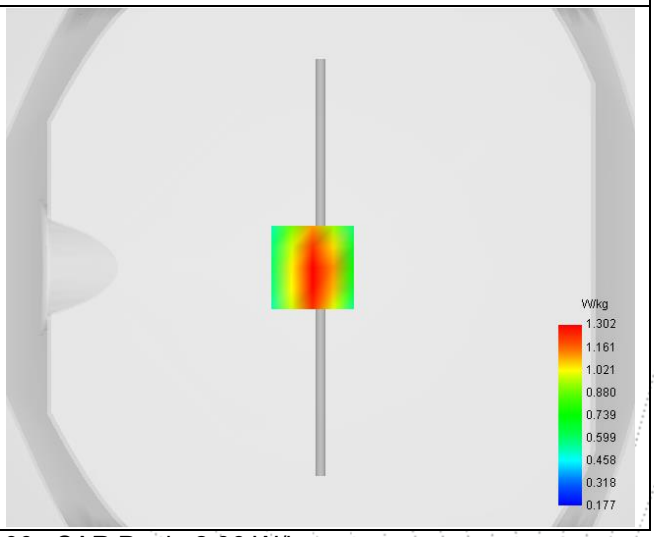
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.80
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Signal	CW

B. Permitivity

Frequency (MHz)	835.000
Relative permitivity (real part)	40.611
Relative permitivity (imaginary part)	20.910
Conductivity (S/m)	0.924

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

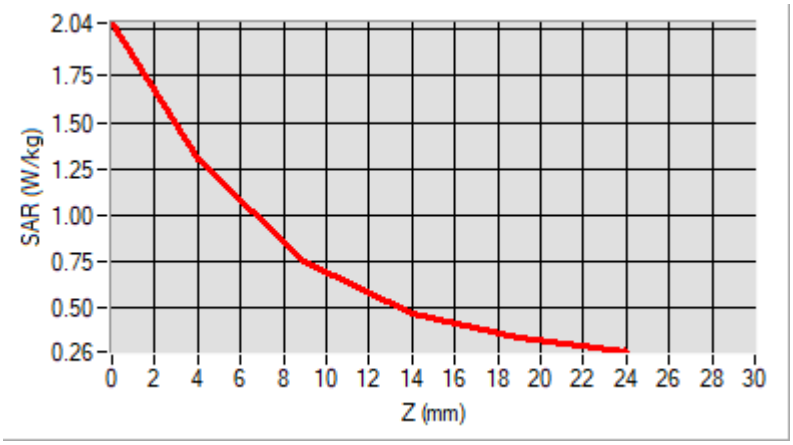
Maximum location: X=-3.00, Y=0.00 ; SAR Peak: 2.06 W/kg

D. SAR 1g & 10g

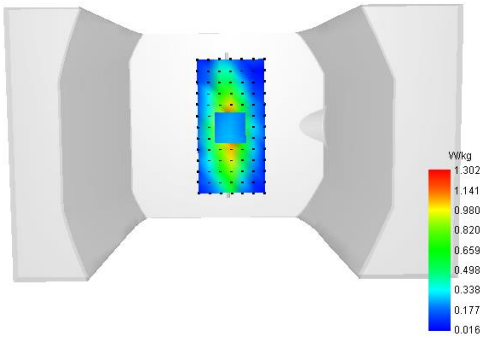
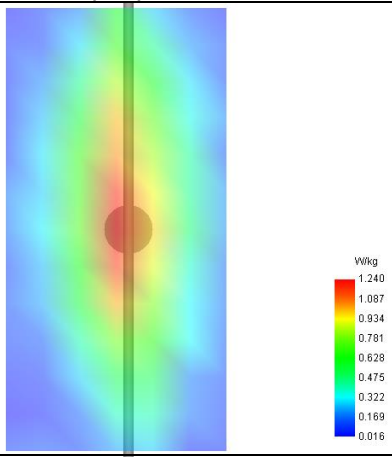
SAR 10g (W/Kg)	1.071
SAR 1g (W/Kg)	2.609
Variation (%)	1.631
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	2.036	1.302	0.747	0.462	0.331



F. 3D Image

3D screen shot	Hot spot position
	

System check at 1900 MHz

Date of measurement: 3/9/2024

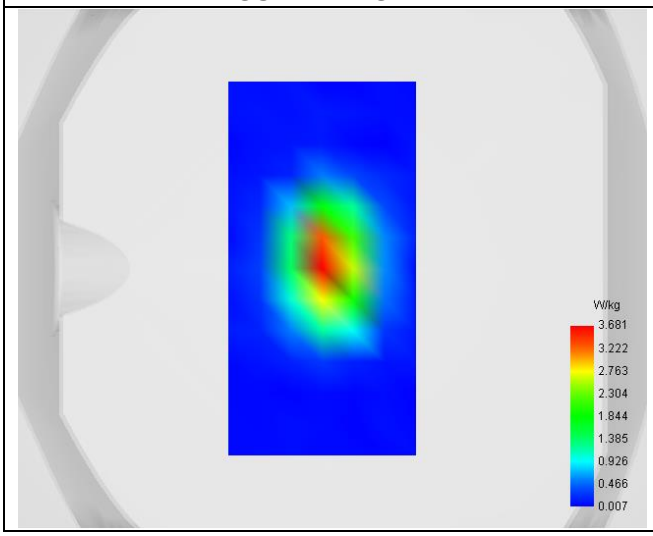
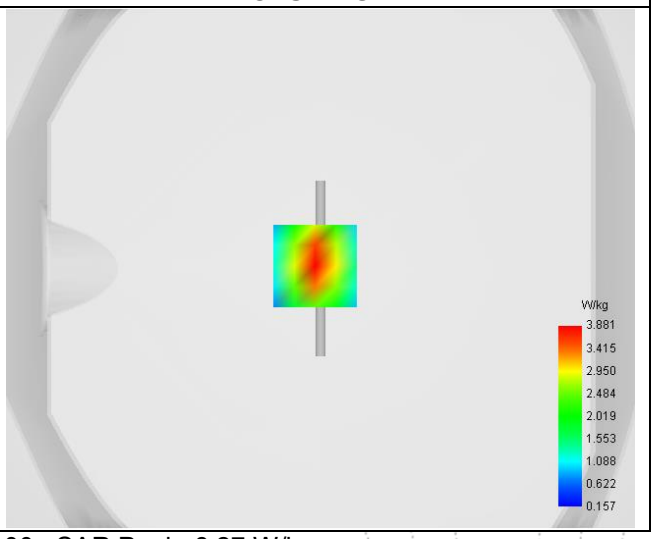
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Signal	CW

B. Permitivity

Frequency (MHz)	1900.000
Relative permitivity (real part)	39.854
Relative permitivity (imaginary part)	14.400
Conductivity (S/m)	1.451

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

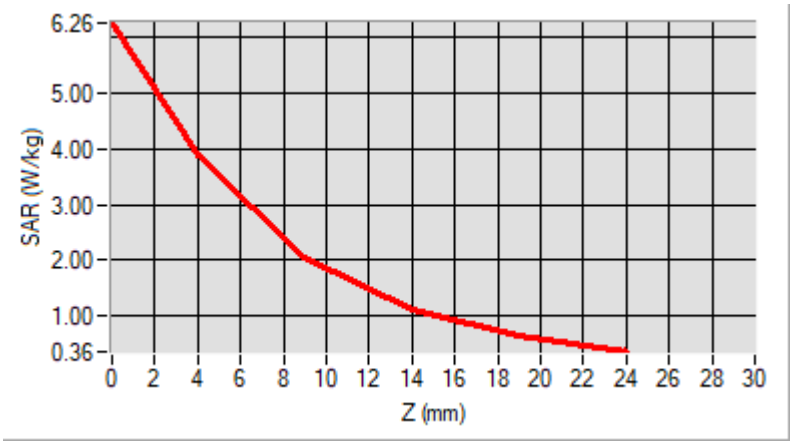
Maximum location: X=-2.00, Y=1.00 ; SAR Peak: 6.27 W/kg

D. SAR 1g & 10g

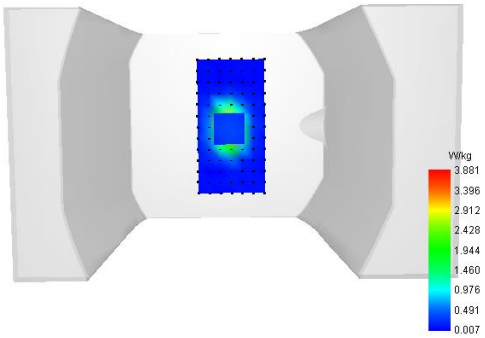
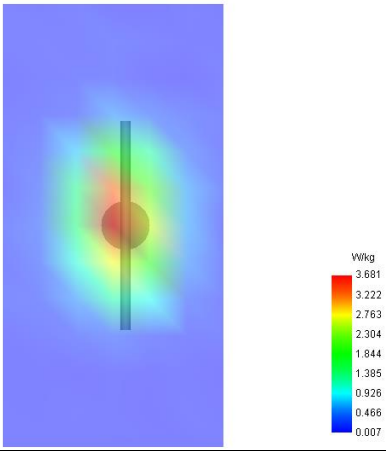
SAR 10g (W/Kg)	4.523
SAR 1g (W/Kg)	10.543
Variation (%)	-2.627
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	6.259	3.881	2.069	1.111	0.634



F. 3D Image

3D screen shot	Hot spot position
	

System check at 2450MHz
Date of measurement: 9/9/2024

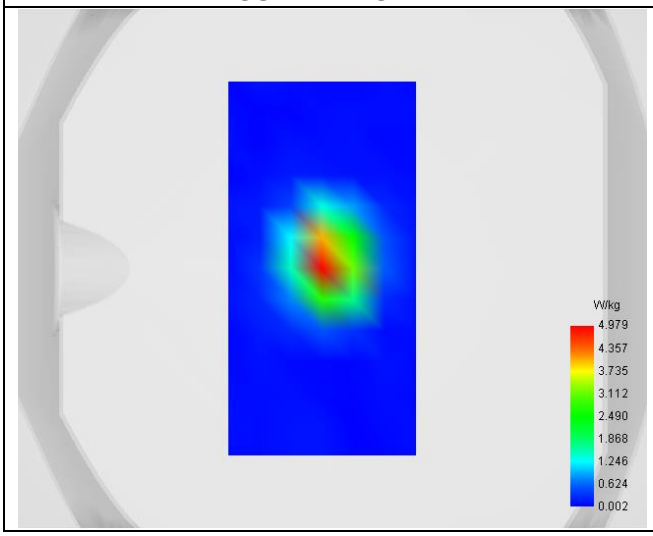
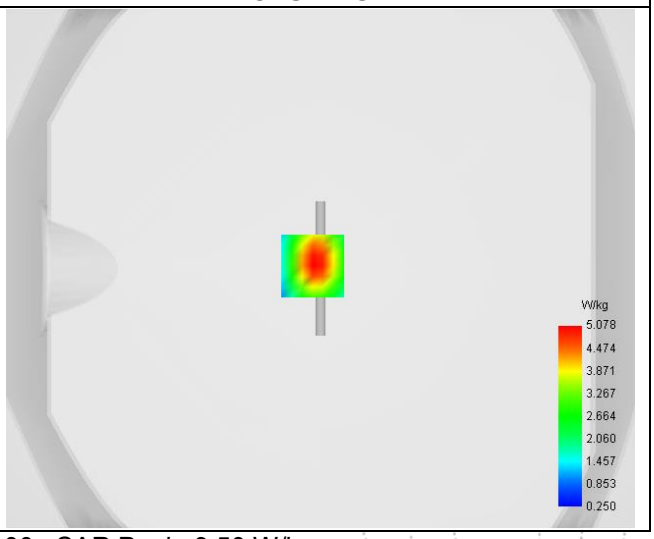
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.32
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Signal	CW

B. Permitivity

Frequency (MHz)	2450.000
Relative permitivity (real part)	39.878
Relative permitivity (imaginary part)	14.330
Conductivity (S/m)	1.789

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

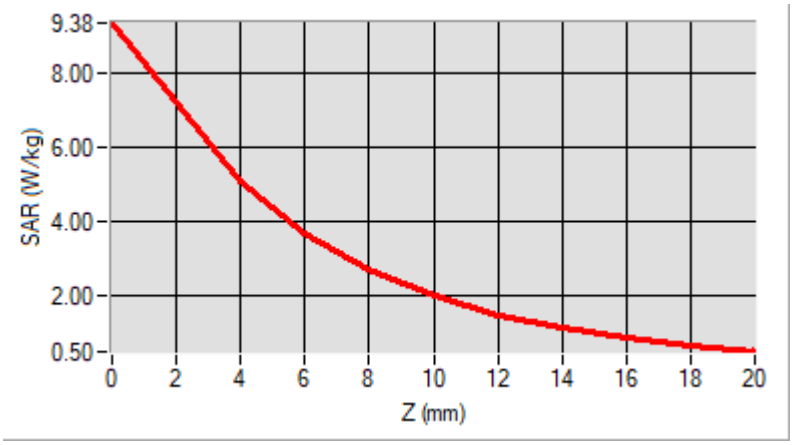
Maximum location: X=-3.00, Y=1.00 ; SAR Peak: 9.50 W/kg

D. SAR 1g & 10g

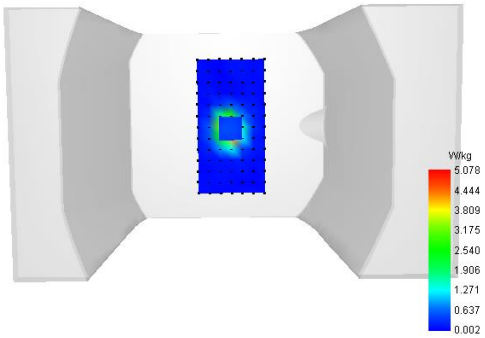
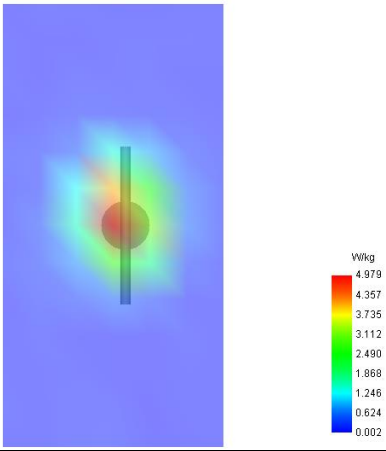
SAR 10g (W/Kg)	6.736
SAR 1g (W/Kg)	13.299
Variation (%)	3.362
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

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 2600MHz
Date of measurement: 11/9/2024

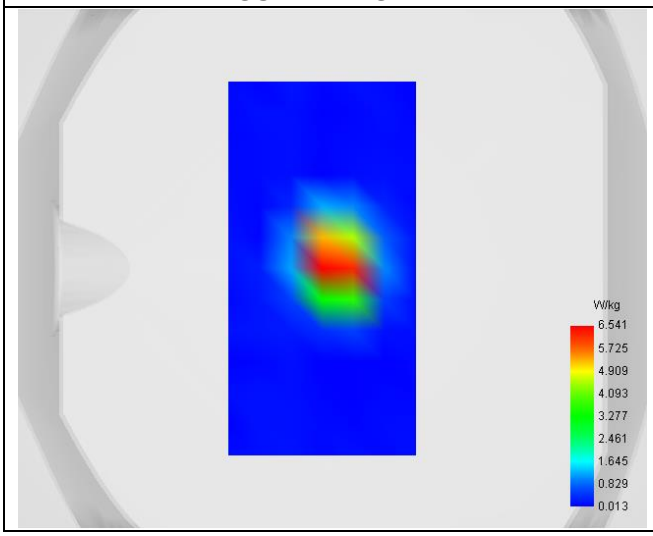
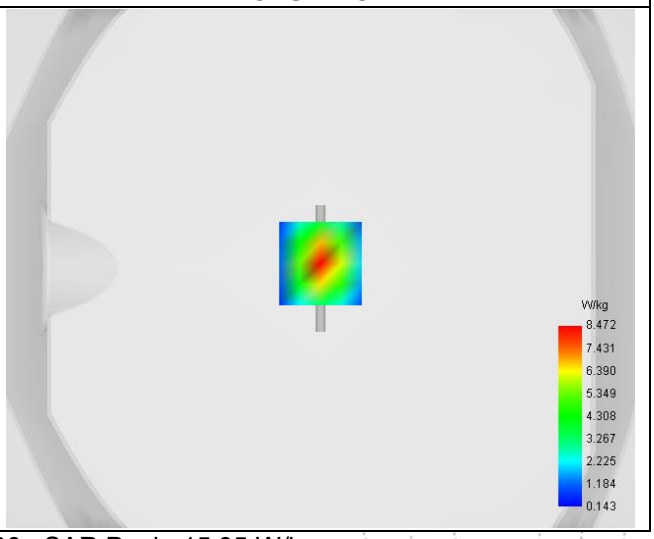
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.19
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Signal	CW

B. Permitivity

Frequency (MHz)	2600.000
Relative permitivity (real part)	37.980
Relative permitivity (imaginary part)	14.889
Conductivity (S/m)	1.947

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

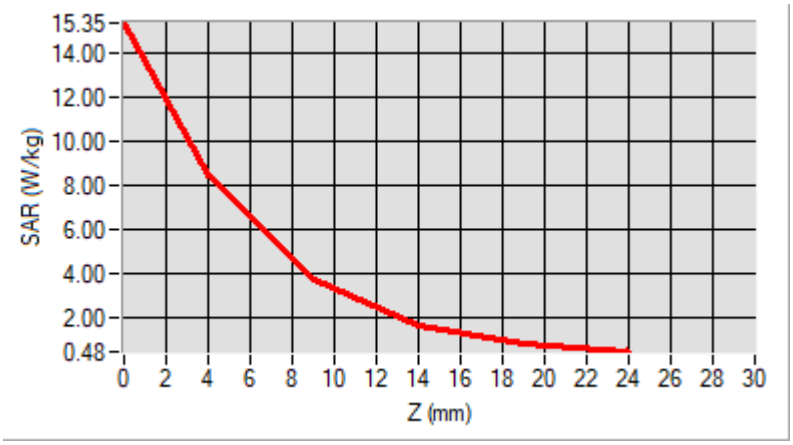
Maximum location: X=0.00, Y=2.00 ; SAR Peak: 15.35 W/kg

D. SAR 1g & 10g

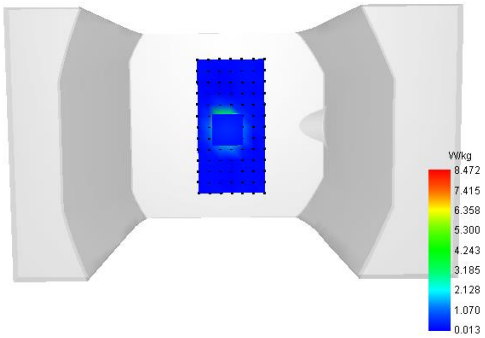
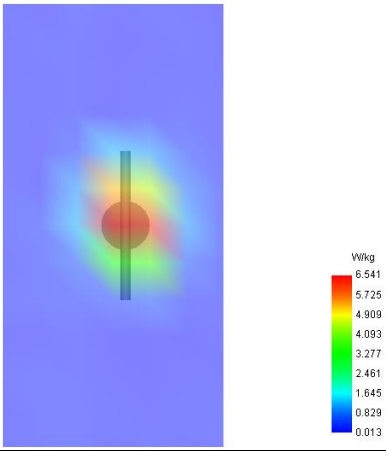
SAR 10g (W/Kg)	6.048
SAR 1g (W/Kg)	14.521
Variation (%)	0.010
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	15.347	8.472	3.768	1.677	0.856



F. 3D Image

3D screen shot	Hot spot position
	

System check at 5200 MHz
Date of measurement: 9/9/2024

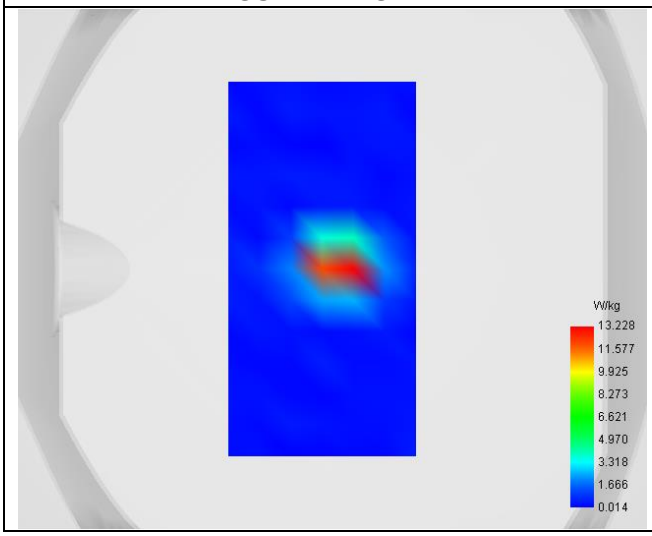
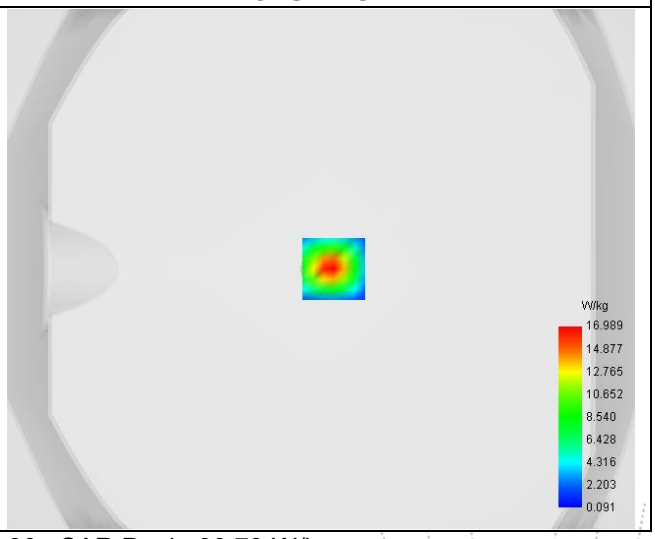
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.97
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5200
Signal	CW

B. Permitivity

Frequency (MHz)	5200.000
Relative permitivity (real part)	34.862
Relative permitivity (imaginary part)	18.140
Conductivity (S/m)	4.422

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

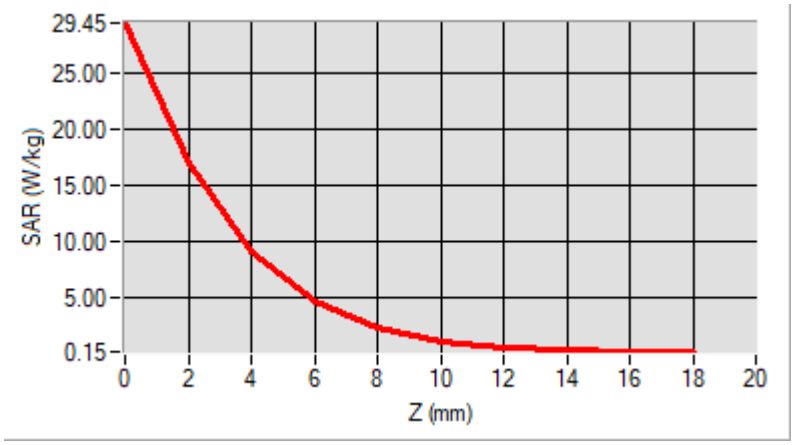
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 30.79 W/kg

D. SAR 1g & 10g

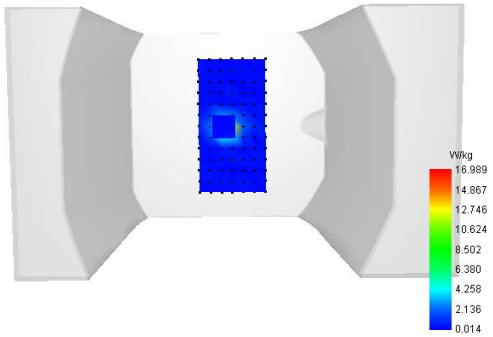
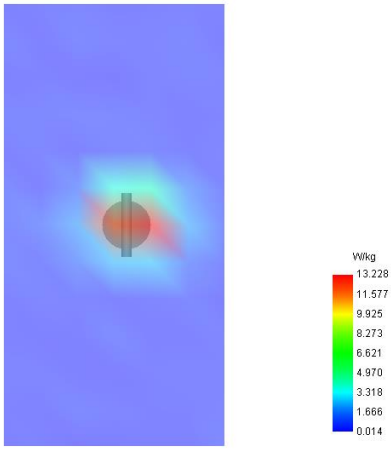
SAR 10g (W/Kg)	7.684
SAR 1g (W/Kg)	18.957
Variation (%)	-2.778
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

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)	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 5800 MHz
Date of measurement: 9/9/2024

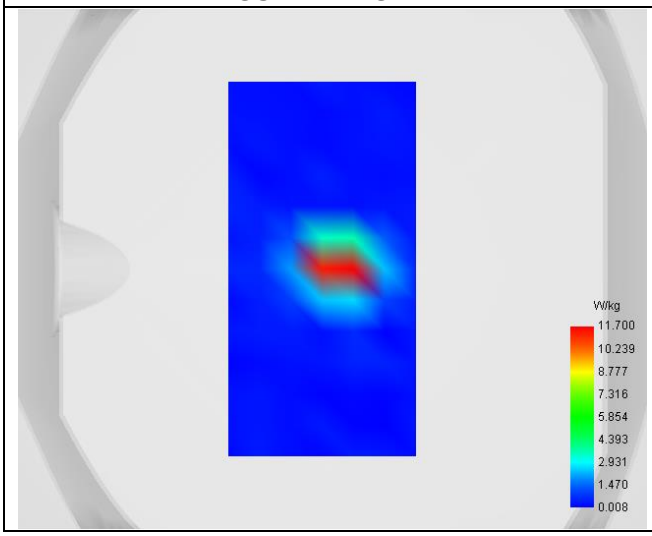
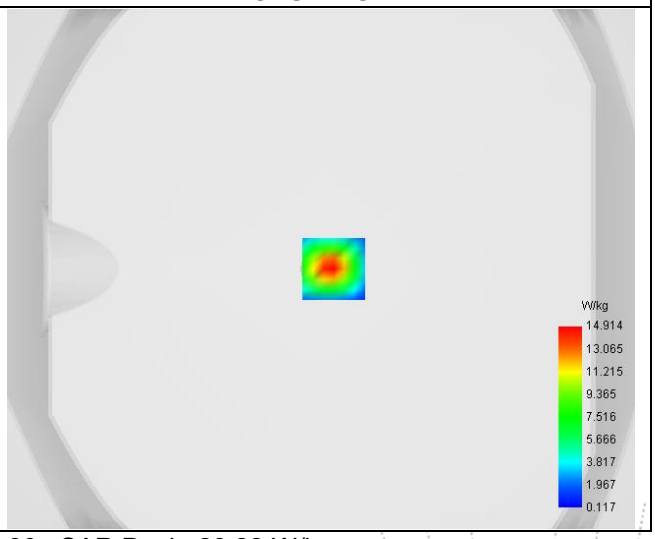
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.05
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5800
Signal	CW

B. Permitivity

Frequency (MHz)	5800.000
Relative permitivity (real part)	36.564
Relative permitivity (imaginary part)	18.620
Conductivity (S/m)	5.255

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

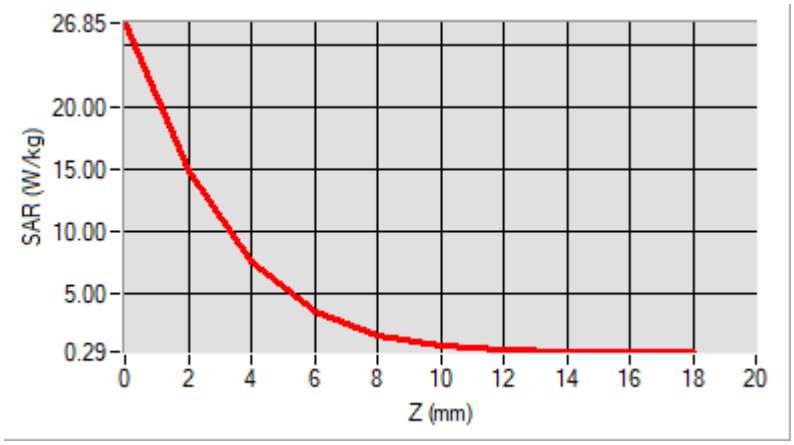
Maximum location: X=5.00, Y=0.00 ; SAR Peak: 28.22 W/kg

D. SAR 1g & 10g

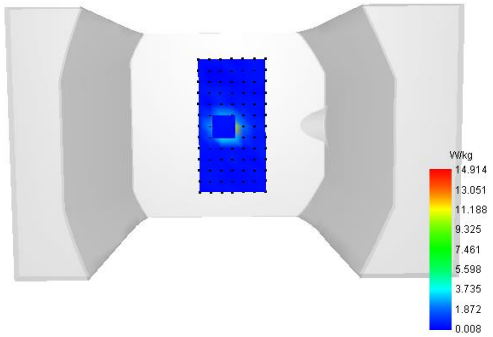
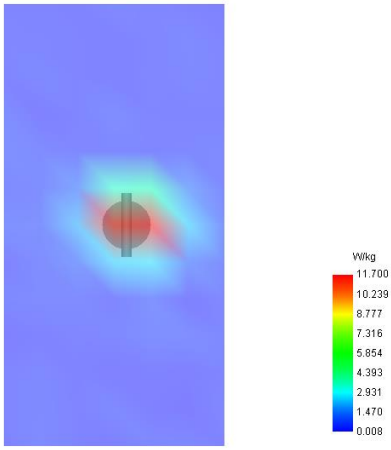
SAR 10g (W/Kg)	7.341
SAR 1g (W/Kg)	19.408
Variation (%)	-2.732
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

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)	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: 9/9/2024

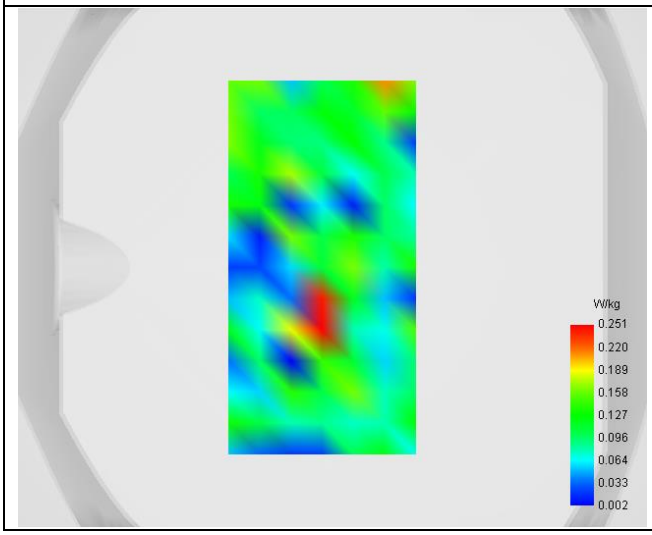
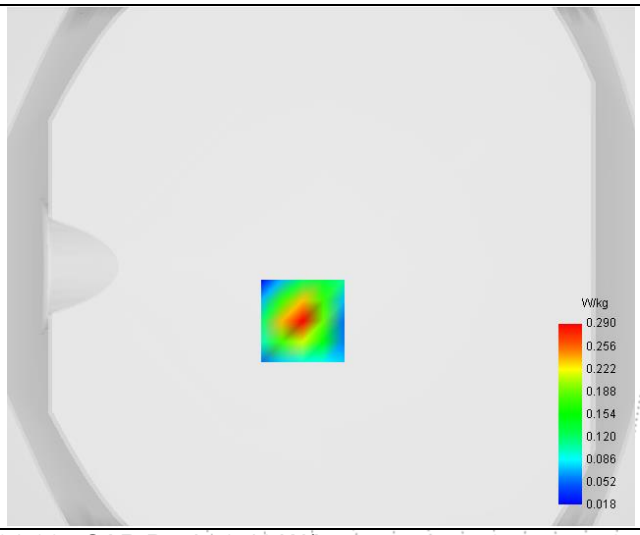
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.11
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm
Phantom	Validation plane
Device Position	Body
Band	ISM
Signal	IEEE 802.11 b

B. Permitivity

Frequency (MHz)	2412.000
Relative permitivity (real part)	39.878
Relative permitivity (imaginary part)	13.207
Conductivity (S/m)	1.789

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

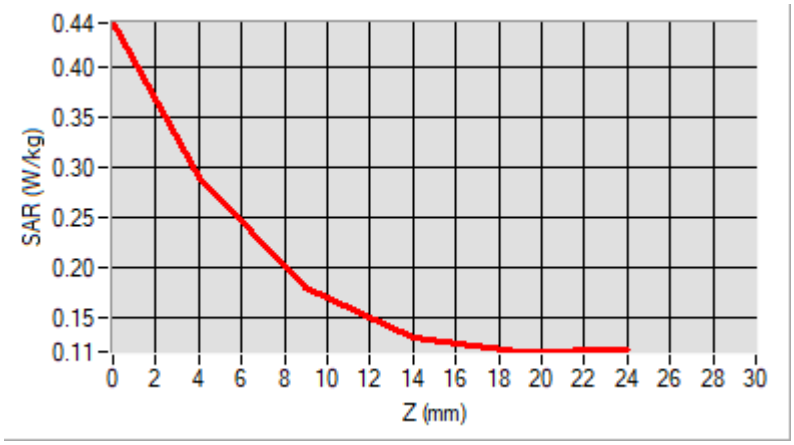
Maximum location: X=-7.00, Y=-21.00 ; SAR Peak: 0.46 W/kg

D. SAR 1g & 10g

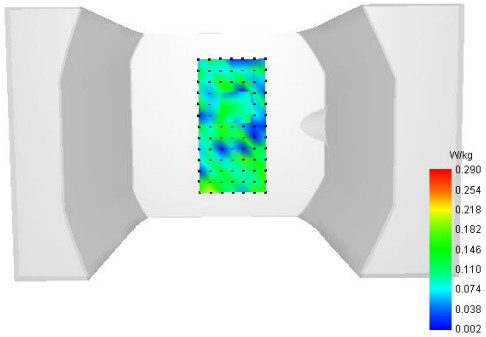
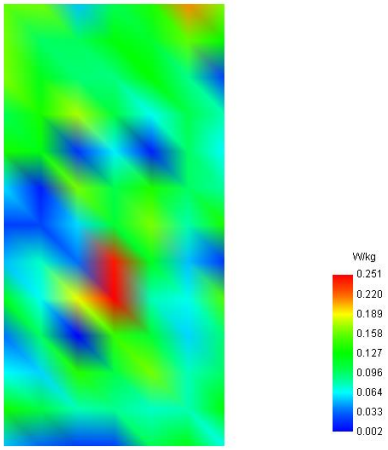
SAR 10g (W/Kg)	0.161
SAR 1g (W/Kg)	0.270
Variation (%)	-3.840
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.444	0.290	0.178	0.128	0.115



F. 3D Image

3D screen shot	Hot spot position
	

Plot 2
Date of measurement: 9/9/2024

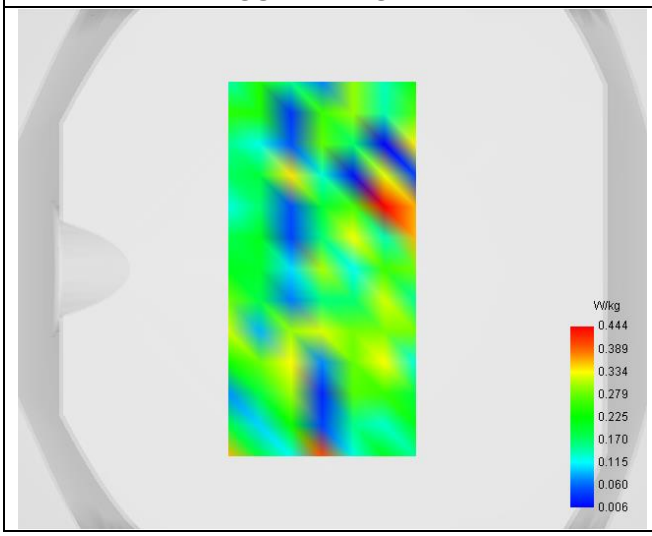
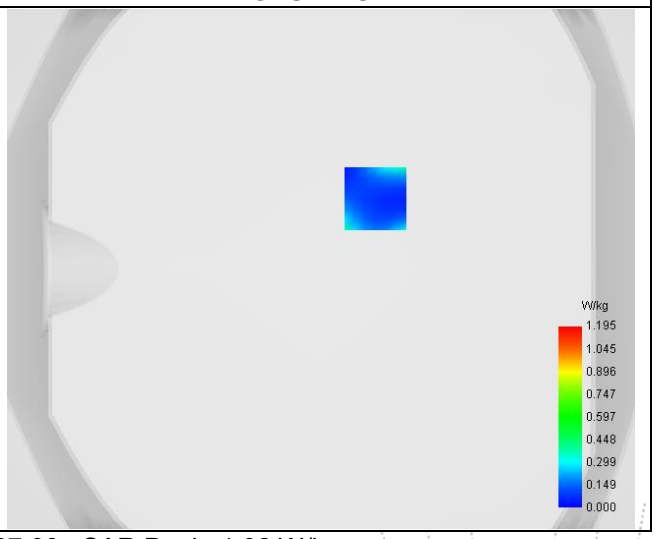
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.18
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm
Phantom	Validation plane
Device Position	Body
Band	5200
Signal	--

B. Permitivity

Frequency (MHz)	5240.000
Relative permitivity (real part)	34.862
Relative permitivity (imaginary part)	16.130
Conductivity (S/m)	4.422

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

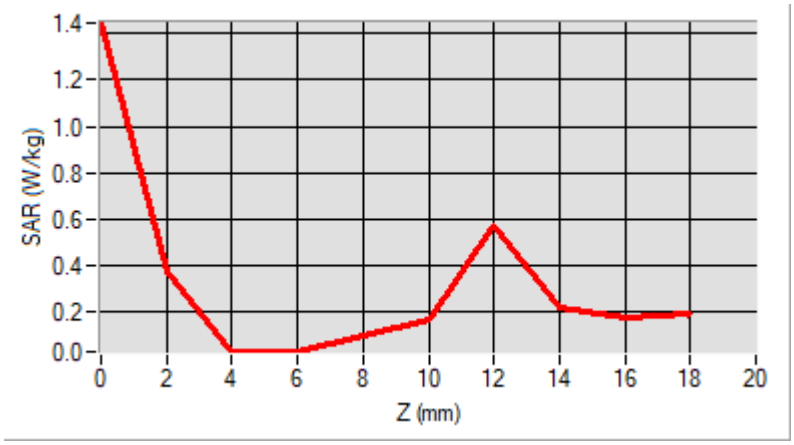
Maximum location: X=21.00, Y=27.00 ; SAR Peak: 1.02 W/kg

D. SAR 1g & 10g

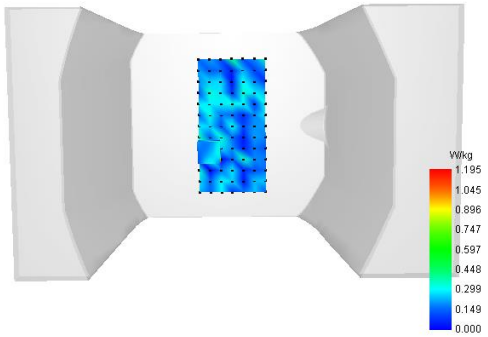
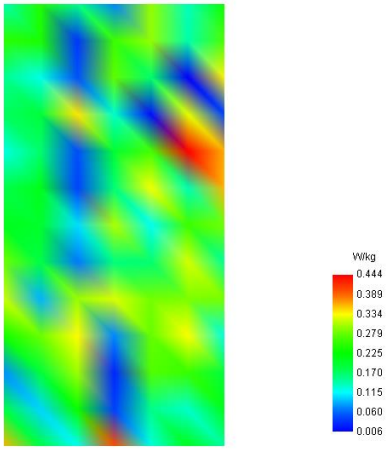
SAR 10g (W/Kg)	0.158
SAR 1g (W/Kg)	0.316
Variation (%)	-2.760
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

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)	1.447	0.370	0.025	0.028	0.095	0.160	0.573	0.216	0.174



F. 3D Image

3D screen shot	Hot spot position
	

Plot 3
Date of measurement: 9/9/2024

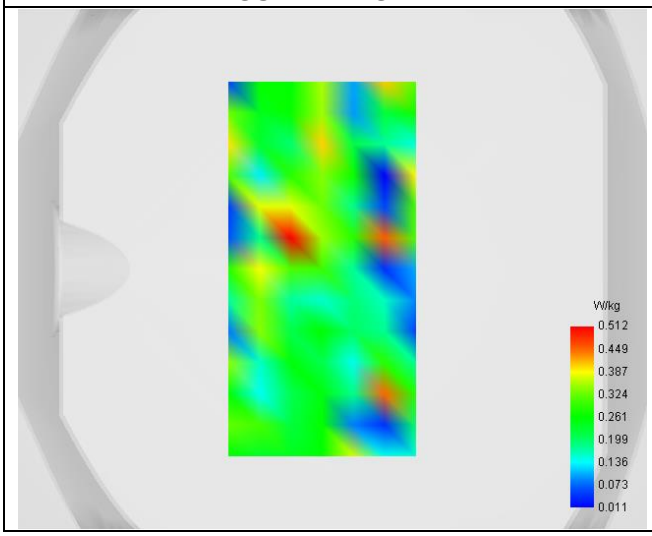
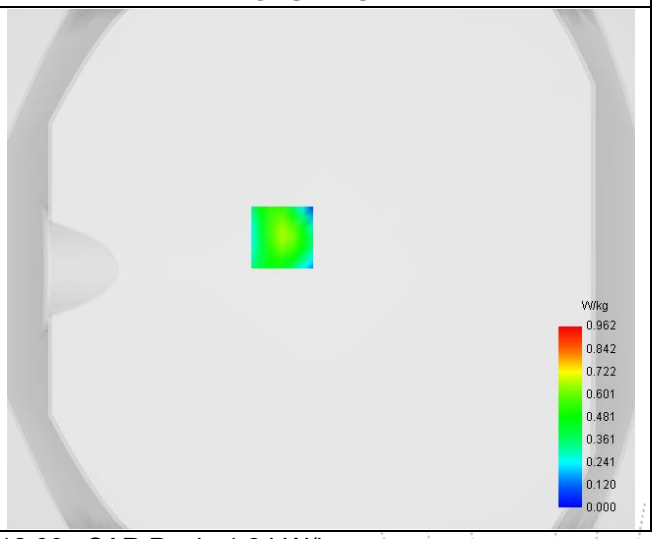
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.15
Area Scan	surf_sam_plan.txt
Zoom Scan	7x7x12,dx=4mm dy=4mm dz=2.0mm
Phantom	Validation plane
Device Position	Body
Band	5800
Signal	--

B. Permitivity

Frequency (MHz)	5785.000
Relative permitivity (real part)	36.564
Relative permitivity (imaginary part)	16.355
Conductivity (S/m)	5.255

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

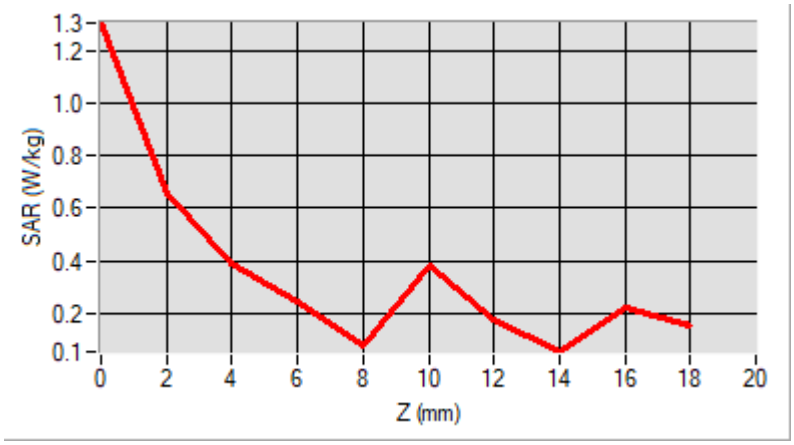
Maximum location: X=-15.00, Y=12.00 ; SAR Peak: 1.84 W/kg

D. SAR 1g & 10g

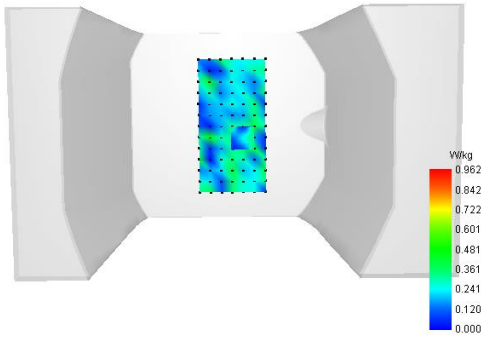
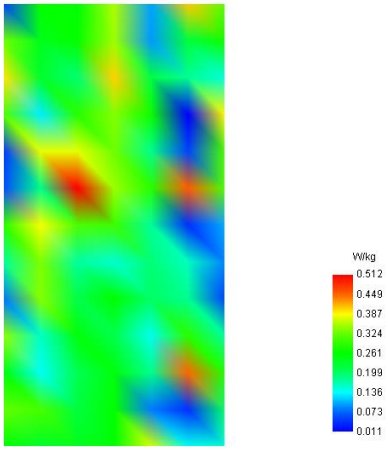
SAR 10g (W/Kg)	0.141
SAR 1g (W/Kg)	0.348
Variation (%)	-4.550
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

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)	1.306	0.659	0.392	0.242	0.076	0.385	0.177	0.054	0.222



F. 3D Image

3D screen shot	Hot spot position
	

Plot 4
Date of measurement: 11/9/2024

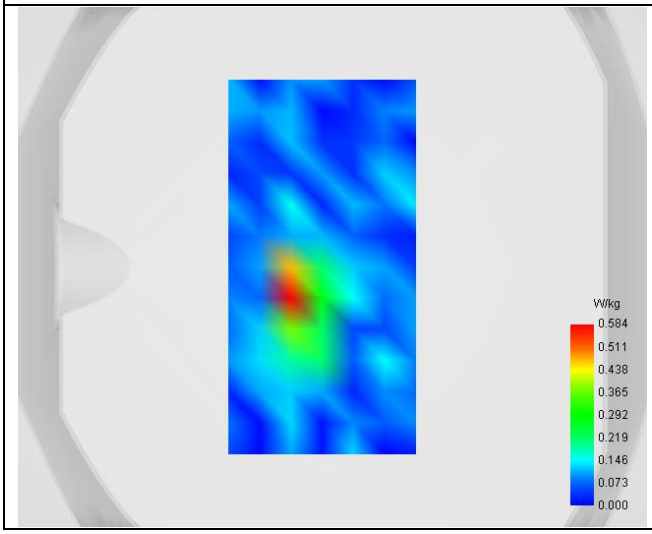
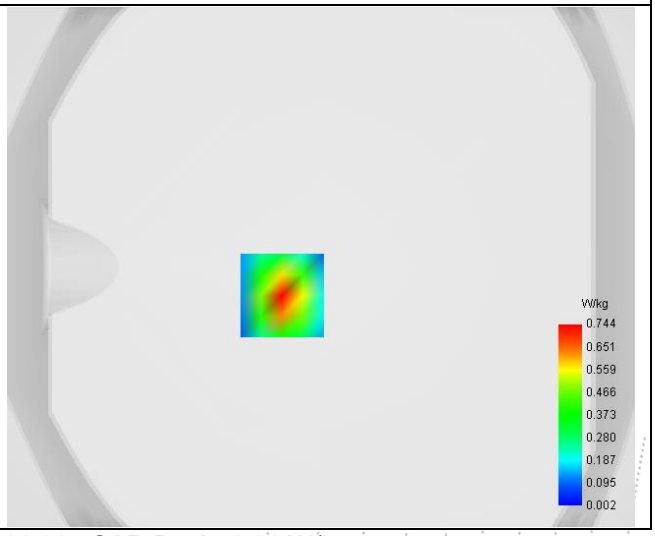
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm
Phantom	Validation plane
Device Position	Body
Band	GPRS850
Signal	TDMA (GPRS)
Modulation	GMSK (CS-1)
TX-slots	2

B. Permitivity

Frequency (MHz)	848.800
Relative permitivity (real part)	40.611
Relative permitivity (imaginary part)	19.400
Conductivity (S/m)	0.924

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

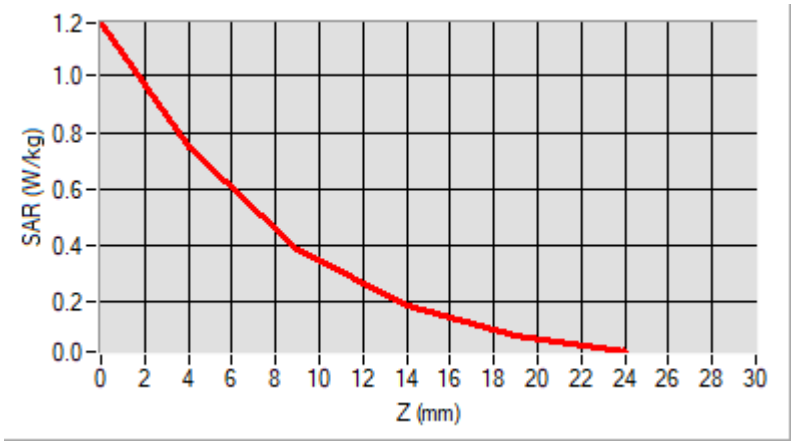
Maximum location: X=-15.00, Y=-11.00 ; SAR Peak: 1.21 W/kg

D. SAR 1g & 10g

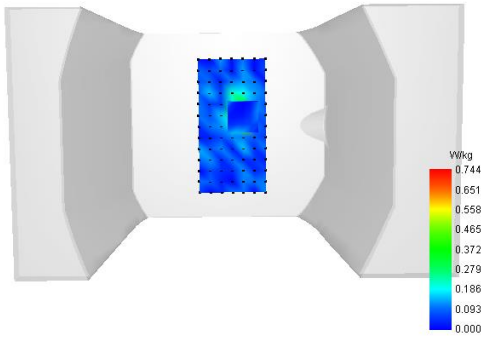
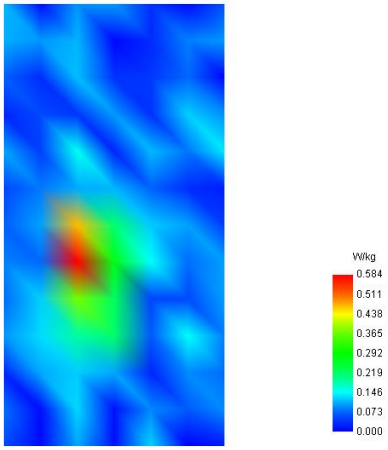
SAR 10g (W/Kg)	0.313
SAR 1g (W/Kg)	0.674
Variation (%)	-4.130
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.188	0.744	0.389	0.187	0.080



F. 3D Image

3D screen shot	Hot spot position
	

Plot 5
Date of measurement: 3/9/2024

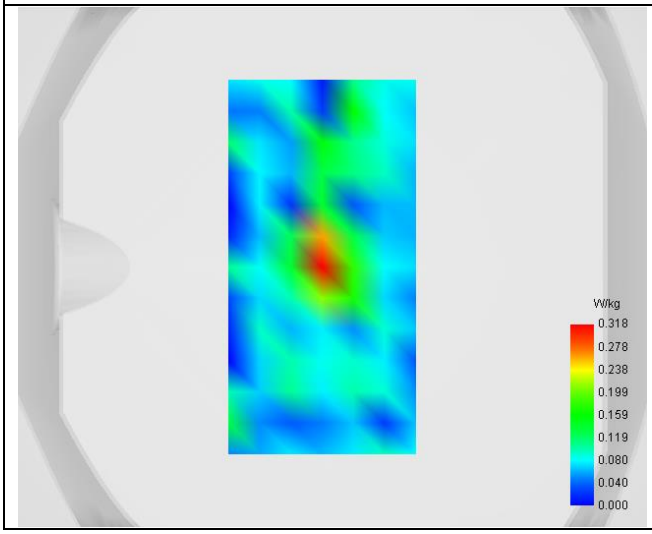
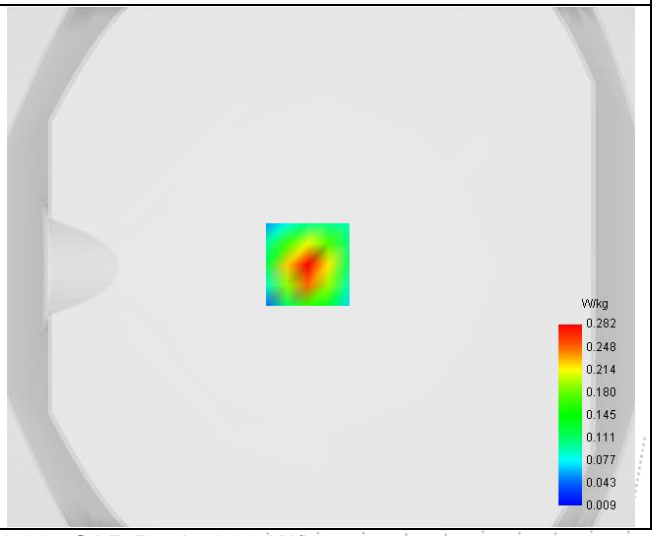
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.04
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm
Phantom	Validation plane
Device Position	Body
Band	GPRS1900
Signal	TDMA (GPRS)
Modulation	GMSK (CS-1)
TX-slots	2

B. Permitivity

Frequency (MHz)	1880.000
Relative permitivity (real part)	39.854
Relative permitivity (imaginary part)	13.408
Conductivity (S/m)	1.451

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

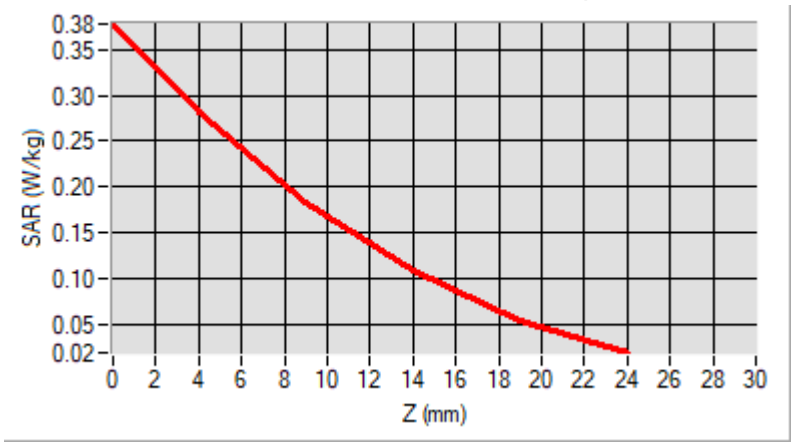
Maximum location: X=-5.00, Y=1.00 ; SAR Peak: 0.39 W/kg

D. SAR 1g & 10g

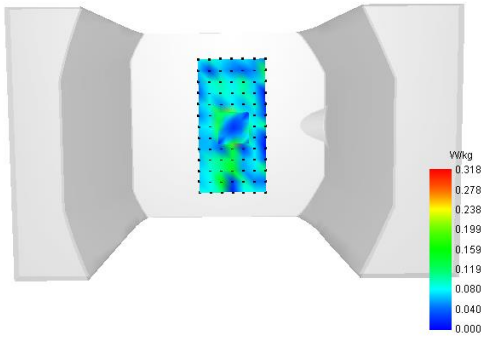
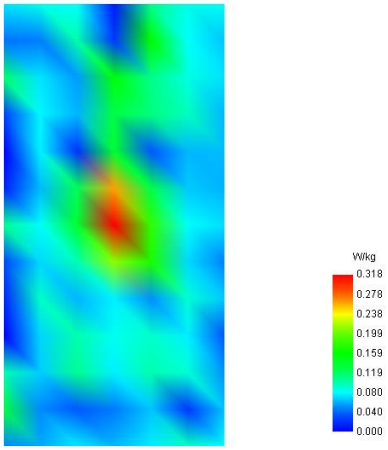
SAR 10g (W/Kg)	0.149
SAR 1g (W/Kg)	0.261
Variation (%)	-3.200
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.378	0.282	0.184	0.108	0.054



F. 3D Image

3D screen shot	Hot spot position
	

Plot 6
Date of measurement: 11/9/2024

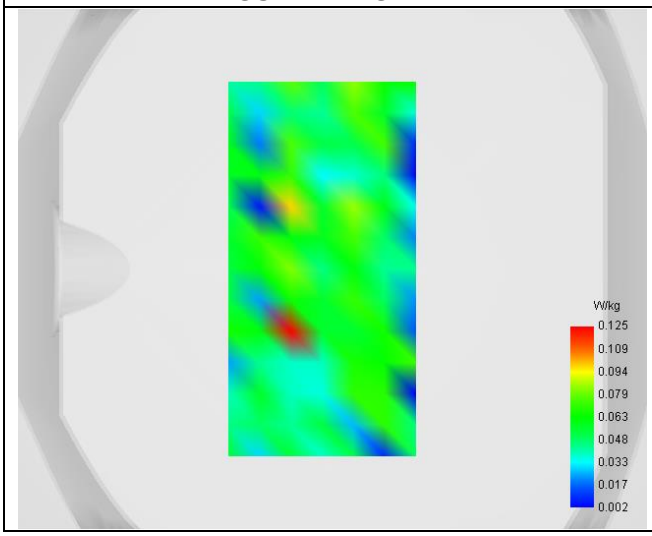
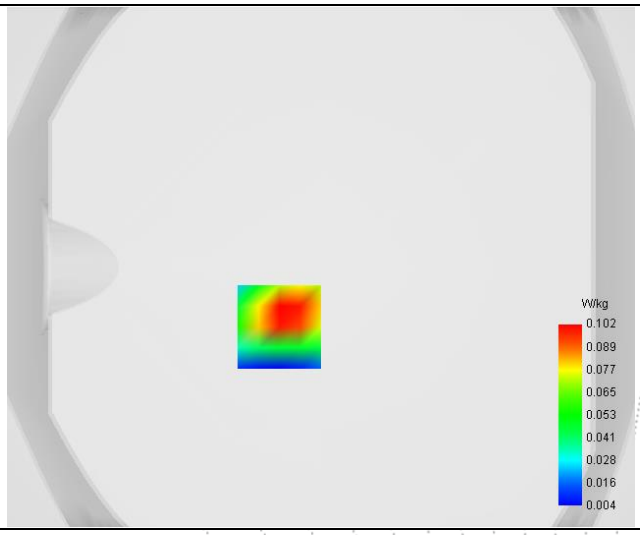
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	0.81
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 5
Signal	LTE FDD
Cell Bandwidth	10 Mhz
Modulation	SC-OFDM - QPSK
RB offset	5
RB size	20

B. Permitivity

Frequency (MHz)	844.000
Relative permitivity (real part)	40.611
Relative permitivity (imaginary part)	19.407
Conductivity (S/m)	0.924

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

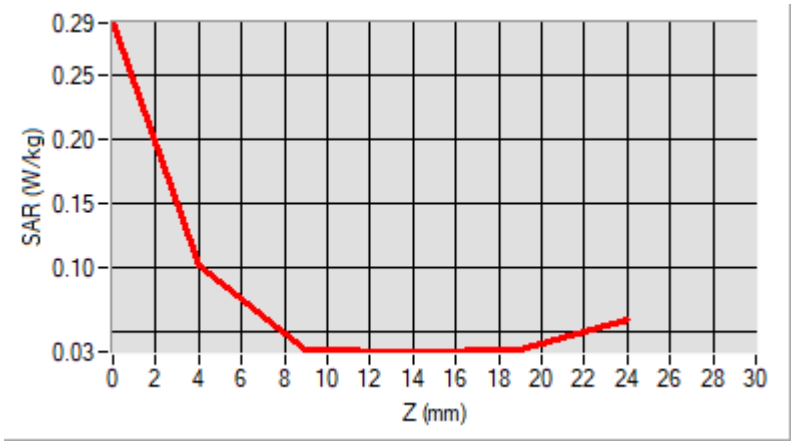
Maximum location: X=-16.00, Y=-23.00 ; SAR Peak: 0.24 W/kg

D. SAR 1g & 10g

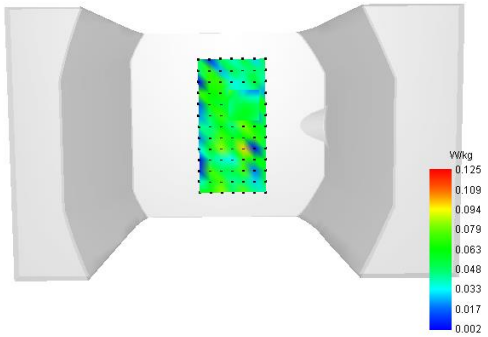
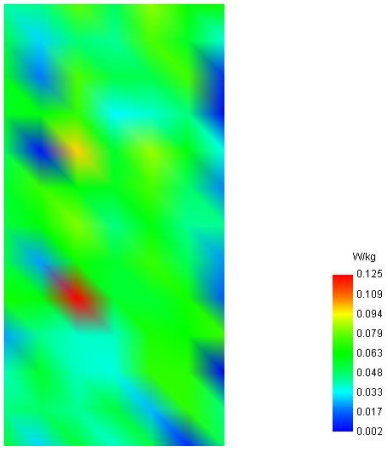
SAR 10g (W/Kg)	0.058
SAR 1g (W/Kg)	0.114
Variation (%)	2.670
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	0.290	0.101	0.036	0.034	0.036



F. 3D Image

3D screen shot	Hot spot position
	

Plot 7
Date of measurement: 9/9/2024

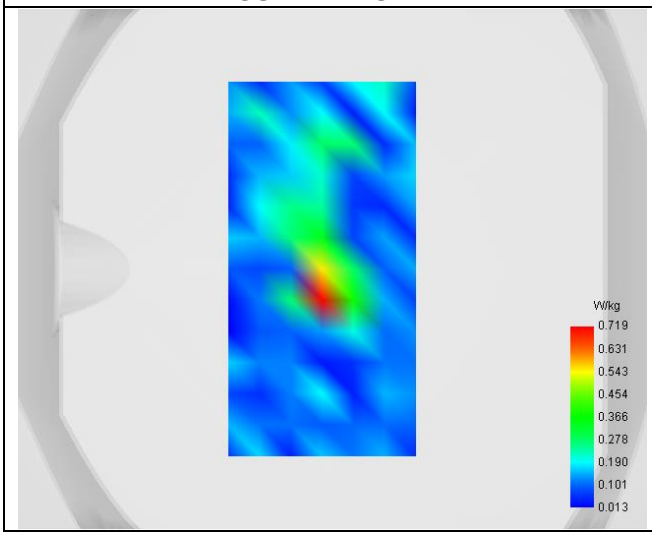
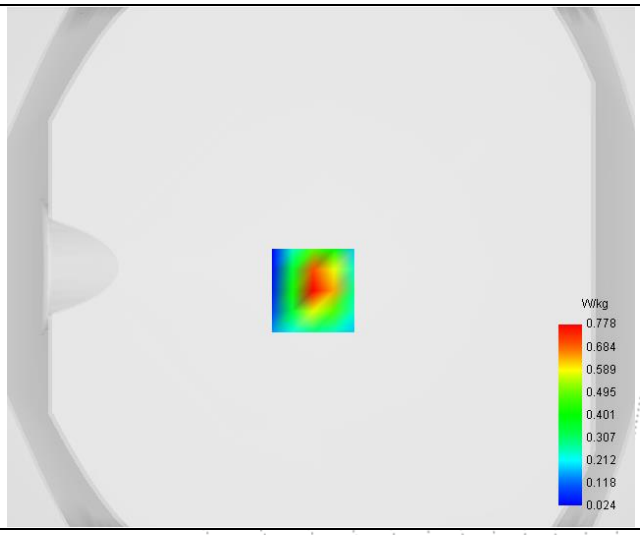
A. Experimental conditions.

Probe	SN 26/23 EPGO420
ConvF	1.03
Area Scan	surf_sam_plan.txt
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 41
Signal	LTE TDD
Cell Bandwidth	20 Mhz
Modulation	SC-OFDM - QPSK
RB offset	5
RB size	20

B. Permitivity

Frequency (MHz)	2593.000
Relative permitivity (real part)	39.018
Relative permitivity (imaginary part)	13.539
Conductivity (S/m)	1.946

C. SAR Surface and Volume

SURFACE SAR	**VOLUME SAR**
	

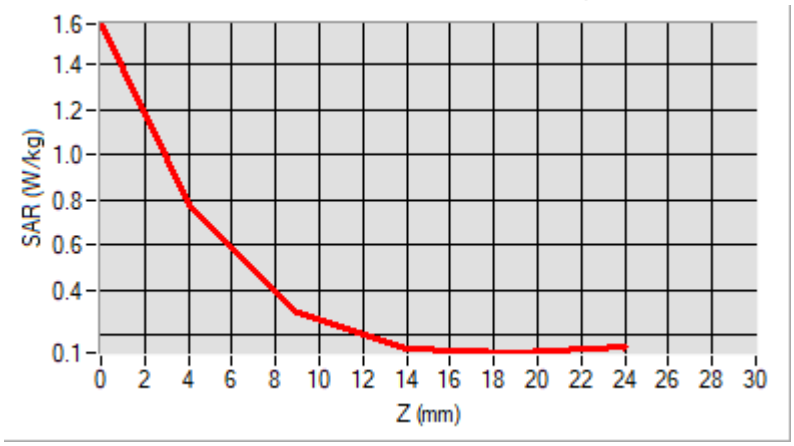
Maximum location: X=-3.00, Y=-9.00 ; SAR Peak: 1.69 W/kg

D. SAR 1g & 10g

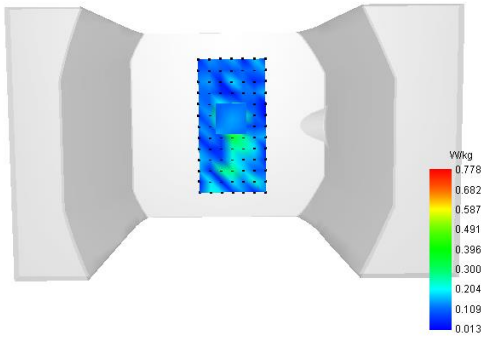
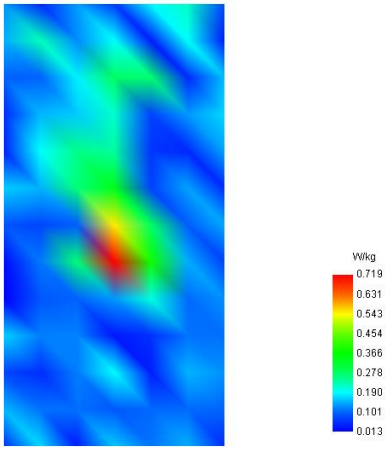
SAR 10g (W/Kg)	0.310
SAR 1g (W/Kg)	0.753
Variation (%)	-0.380
Horizontal validation criteria: minimum distance (mm)	0.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	0.000000

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	1.578	0.778	0.300	0.142	0.120



F. 3D Image

3D screen shot	Hot spot position
	

16 CALIBRATION CERTIFICATES

Probe-EPGO420 Calibration Certificate
SID8350Dipole Calibration Ceriticate
SID1900Dipole Calibration Ceriticate
SID2450Dipole Calibration Ceriticate
SID2600Dipole 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

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

COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.199.1.23.BES.A

	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 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:

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

where

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

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

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.

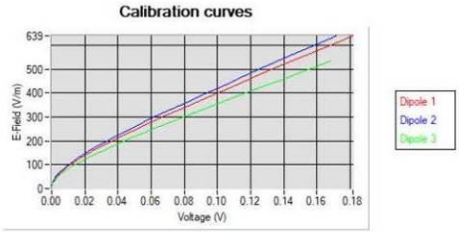
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-11% for the frequency range 150-450MHz.
The estimated expanded uncertainty (k=2) in calibration for SAR (W/kg) is +/-14% for the frequency range 600-7500MHz.

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.

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

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.

$$ConvF = \frac{E^2_{liquid}}{E^2_{air}}$$

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

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

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:

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

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

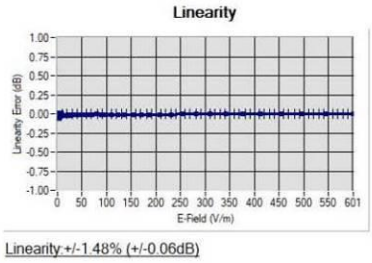
The below table summarize the ConvF for the calibrated liquid. The curves give examples for the measured SAR depending on the voltage in some liquid.

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

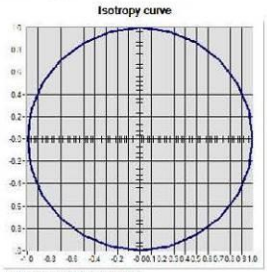
(*) Frequency validity is +/-50MHz below 600MHz, +/-100MHz from 600MHz to 6GHz and +/-700MHz above 6GHz

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.329.9.21.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: 835 MHZ
SERIAL NO.: SN 47/21 DIP 0G835-621

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.