SAR Test Report

For

Applicant Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District, Shenzhen, China
EUT Name:	Personal Mobile Alarm System
Model Number:	EV-12X-V

Issued By

Company Name:	**BTF Testing Lab (Shenzhen) Co., Ltd.**
Address:	Plant 101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China
Report Number:	BTF251125R00401
Test Standards:	47 CFR Part 2.1093 IEEE Std. 1528-2013 IEEE C95.1-2019
FCC ID:	2AUMJEV-12X-V
Test Conclusion:	Pass
Test Date:	2025-12-08 to 2025-12-09
Date of Issue:	2025-12-16
Tested By:	Kris Li Kris Li / Tester
Date:	2025-12-16
Prepared By:	Amenda Zhong Amenda Zhong / Project Engineer
Date:	2025-12-16
Approved By:	Ryan.CJ Ryan.CJ / EMC Manager
Date:	2025-12-16

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2025-12-16	Original
Note:	*Once the revision has been made, then previous versions reports are invalid.*	

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1. Introduction

1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	Plant 101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

1.2 Identification of the Responsible Testing Location

Test Location:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	Plant 101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China
Description:	All measurement facilities used to collect the measurement data are located at Plant 101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China
FCC Registration Number	518915
Designation Number	CN1409

1.3 Laboratory Condition

Ambient Temperature:	21℃ to 25℃
Ambient Relative Humidity:	48% to 59%
Ambient Pressure:	100 kPa to 102 kPa

1.4 Announcement

(1) The test report reference to the report template version v0.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

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2. Product Information

2.1 Application Information

Company Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District, Shenzhen, China

2.2 Manufacturer Information

Company Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District, Shenzhen, China

2.3 Factory Information

Company Name:	Shenzhen Eview GPS Technology
Address:	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District, Shenzhen, China

2.4 General Description of Equipment under Test (EUT)

EUT Name	Personal Mobile Alarm System
Under Test Model Name	EV-12X-V
Hardware Version	EV-12X-A_V1.3
Software Version	EV12X_8601_V1.0.44.15
Sample No.	BTFSN251125002

2.5 Equipment under Test Ancillary Equipment

Ancillary Equipment 1	Rechargeable Li-ion Battery	
	Capacity	720mAh
	Rated Voltage	3.85V

2.6 Technical Information

Network and Wireless connectivity	4G Network FDD LTE Band 4/13 2.4G WIFI 802.11b, 802.11g, 802.11n(HT20) BT (BLE) LORA NFC

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The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	LTE, WLAN, Bluetooth, LORA, NFC		
Frequency Range	LTE Band 4	TX: 1710 ~ 1755 MHz	RX: 2110 ~ 2155 MHz
	LTE Band 13	TX: 777 ~ 787 MHz	RX: 746 ~ 756 MHz
	802.11b/g/n(HT20)	2412 ~ 2462 MHz	
	Bluetooth	2402 ~ 2480 MHz	
	LORA	906 MHz	
	NFC	13.56 MHz	
Antenna Type	WWAN: LDS Antenna WIFI: LDS Antenna BT: LDS Antenna LORA: LDS Antenna NFC: LDS Antenna		
Hotspot Function	Not Support		
Power Reduction	Not Support		
Exposure Category	General Population/Uncontrolled exposure		
EUT Stage	Portable Device		
Product	Type		
	☒ Production unit	☐ Identical prototype	

3. Summary of Test Results

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2.1093	Radiofrequency radiation exposure evaluation: portable devices
2	IEEE Std. 1528-2013	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
3	IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
4	KDB447498 D04	Interim General RF Exposure Guidance v01
5	KDB865664 D01	SAR measurement 100MHz to 6GHz v01r04
6	KDB941225 D05	SAR for LTE Devices v02r05
7	KDB 248227 D01	802.11 Wi-Fi SAR v02r02
8	KDB648474 D04	Handset SAR v01r03
9	KDB690783 D01	SAR Listings on Grant v01r03

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3.2 Device Category and SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

Body Position	SAR Value (W/Kg)	
	General Population/ Uncontrolled Exposure	Occupational/ Controlled Exposure
Whole-Body SAR (averaged over the entire body)	0.08	0.4
Partial-Body SAR (averaged over any 1 gram of tissue)	1.60	8.0
SAR for hands, wrists, feet and ankles (averaged over any 10 grams of tissue)	4.0	20.0

NOTE:
General Population/Uncontrolled Exposure: Locations where there is the exposure of individuals who have no knowledge or control of their exposure. General population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment- related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Occupational/Controlled Exposure: Locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

3.3 Test Result Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:

<Highest Reported standalone SAR Summary>

Exposure Position	Frequency Band	Reported SAR (W/kg)	Equipment Class	Highest Reported SAR (W/kg)
Body 1-g SAR (10 mm Gap)	LTE Band 4	**1.419**	TNB	**1.419**
	LTE Band 13	0.373		
	WLAN 2.4 GHz	0.109	DTS	
	BLE	0.008	DTS	

This device is in compliance with Specific Absorption Rate(SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC47 CFR part 2(2.1093) and ANSI/IEEE C95.1-2019, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std. 1528-2013.

<Highest Reported Simultaneous SAR>

Exposure Position	Simultaneous Configuration	Highest Reported Simultaneous Transmission SAR (W/kg)	Limit (W/kg)	Verdict
Body 1-g SAR (10 mm Gap)	LTE Band 4 + 2.4G WIFI	1.528	1.6	Pass

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3.4 Test Uncertainty

3.4.1 Measurement uncertainly evaluation for SAR test (450MHz to 6GHz)

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Unc. u(xi)=a(xi)/qi	Ci (1g)	Ci (10g)	1g Ui (+-%)	10 g Ui (+-%)	Vi veff
Measurement System									
Probe calibration	14	N (k = 2)	2	7.00	1	1	7.00	7.00	∞
Probe calibration drift	4	R	√3	2.31	1	1	2.31	2.31	∞
Probe linearity	4.7	R	√3	2.71	1	1	2.71	2.71	∞
detection limit	1	R	√3	0.58	1	1	0.58	0.58	∞
Probe isotropy	3.5	R	√3	2.02	0.71	0.71	1.43	1.43	∞
Hemispherical Isotropy	5.9	N	1	5.90	0.71	0.71	4.19	4.19	∞
Boundary effect	1	R	1.73	0.58	1	1	0.58	0.58	∞
Integration time	1.4	R	1.73	0.81	1	1	0.81	0.81	∞
Response time	0	R	1.73	0.00	1	1	0.00	0.00	∞
Readout electronics	0.5	N	1	0.50	1	1	0.50	0.50	∞
RF ambient and noise	3	R	√3	1.73	1	1	1.73	1.73	∞
Probe positioning errors	3.28	N	1	3.28	0.33	0.33	1.08	1.08	∞
Data processing errors	2.3	R	1	1.33	1	1	1.33	1.33	∞
Conductivity measurement	4.07	N	1	2.35	0.79	0.77	1.86	1.81	∞
Permitivity measurement	5.06	N	1	2.92	0.23	0.26	0.67	0.76	∞
Liquid Conductivity - Temperature Uncertainty	2.5	R	1	1.44	0.79	0.77	1.14	1.11	∞
Liquid Permittivity - Temperature Uncertainty	2.5	R	√3	1.44	0.23	0.26	0.33	0.38	∞
Shell permittivity	2.9	R	√3	1.67	0.25	0.25	0.42	0.42	∞
Repeatability of positioning the DUT or source against the phantom	2.7	N	1	2.70	2	2	5.40	5.40	∞
Uncertainty in accepted power	3	R	1	3.00	1	1	3.00	3.00	∞
Effect of operating mode on probe sensitivity	2.3	R	√3	1.33	1	1	1.33	1.33	∞
Variation in SAR due to drift in output of DUT	2.2	N	1	2.20	1	1	2.20	2.20	∞
Phantom deviation from target (ε',σ)	1.9	N	1	1.90	1	1	1.90	1.90	∞
SAR scaling	0	R	√3	0.00	1	1	0.00	0.00	∞
Probe calibration	14	N (k = 2)	2	7.00	1	1	7.00	7.00	∞
Combined uncertainty	/						11.94	11.94	
Expanded Uncertainty (95% Confidence interval)	/						23.89	23.88	

* This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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3.4.2 Measurement uncertainly evaluation for system check

Uncertainty Component	Tol (+- %)	Prob. Dist.	Div.	Unc. u(xi)=a(xi)/qi	Ci (1g)	Ci (10 g)	1g Ui (+-%)	10 g Ui (+-%)	Vi veff
Measurement System									
Probe calibration	14	N (k = 2)	2	7.00	1	1	7.00	7.00	∞
Probe calibration drift	4	R	1.73	2.31	1	1	2.31	2.31	∞
Probe linearity	4.7	R	1.73	2.72	1	1	2.72	2.72	∞
Detection limit	1	R	1.73	0.58	1	1	0.58	0.58	∞
Axial Isotropy	3.5	R	1.73	2.02	1	1	2.02	2.02	∞
Hemispherical Isotropy	5.9	R	1.73	3.41	0.71	0.71	2.42	2.42	∞
Boundary effect	1	R	1.73	0.58	0.71	0.71	0.41	0.41	∞
Integration time	1.4	R	1.73	0.81	1	1	0.81	0.81	∞
Response time	0	R	1.73	0.00	1	1	0.00	0.00	∞
Readout electronics	0.5	N	1	0.50	1	1	0.50	0.50	∞
Noise	3	R	1.73	1.73	1	1	1.73	1.73	∞
Reflections	3	R	1.73	1.73	1	1	1.73	1.73	∞
Positioner Mechanical Tolerance	3.28	R	1.73	1.90	0.33	0.33	0.63	0.63	∞
Positioning with respect to Phantom Shell	3.28	R	1.73	1.90	0.33	0.33	0.63	0.63	∞
Data processing errors	2.3	R	1.73	1.33	1	1	1.33	1.33	∞
Conductivity measurement	4.07	N	1	4.07	0.79	0.77	3.22	3.13	∞
Permitivity measurement	5.06	N	1	5.06	0.23	0.26	1.16	1.32	∞
Liquid Conductivity - Temperature Uncertainty	2.5	R	1.73	1.45	0.79	0.77	1.14	1.11	∞
Liquid Permittivity - Temperature Uncertainty	2.5	R	1.73	1.45	0.23	0.26	0.33	0.38	∞
Shell permittivity	2.9	R	1.73	1.68	0.25	0.25	0.42	0.42	∞
Distance between the radiating element of the DUT and the phantom medium	2.7	N	1	2.70	2	2	5.40	5.40	∞
Deviation of experimental antennas	4.5	N	1.73	2.60	1	1	2.60	2.60	∞
Other uncertainty contributions	2	R	1	2.00	1	1	2.00	2.00	∞
Uncertainty in accepted power	3	R	1.73	1.73	1	1	1.73	1.73	∞
Phantom deviation from target (ε',σ)	1.9	N	1	1.90	1	0.87	1.90	1.65	∞
u(ΔSAR)	/						11.89	11.85	
Expanded uncertainty (95% confidence interval)	/						23.79	23.70	

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4. Measurement System

4.1 Specific Absorption Rate (SAR) Definition

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 techniques 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.

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:

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

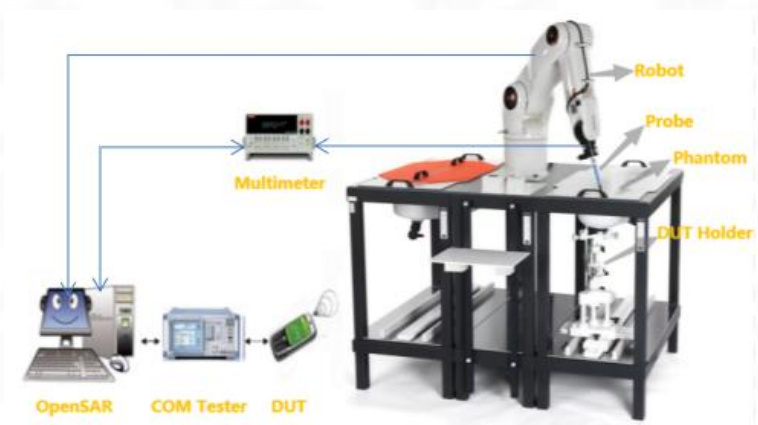
SAR is expressed in units of Watts per kilogram (W/kg) SAR measurement can be related to the electrical field in the tissue by

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

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

4.2 MVG SAR System

4.2.1 SAR system diagram



4.2.2 Robot

A standard high precision 6-axis robot (Denso) with teaches pendant with Scanning System
· It must be able to scan all the volume of the phantom to evaluate the tridimensional distribution of SAR.
· Must be able to set the probe orthogonal of the surface of the phantom (±30°).
· Detects stresses on the probe and stop itself if necessary to keep the integrity of the probe.

4.2.3 E-Field Probe

For the measurements, the Specific Dosimetric SSE2 E-Field Probe with following specifications is used:

- Dynamic range: 0.01-100 W/kg
- Tip diameter: 2mm for SSE2
- Distance between probe tip and sensor centre: 1mm for SSE2
- Distance between sensor centre and the inner phantom surface: 2mm for f>=4GHz.
- Probe linearity: <0.25dB.
- Axial Isotropy: <0.25dB.
- Spherical Isotropy: <0.50dB.
- Calibration range: 150 to 6000 MHz for head & body simulating liquid
- Angle between probe axis (evaluation axis) and surface normal line: less than 20°.

4.2.4 Phantoms

SAM Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The probe scanning of the E-Field is done in the 2 halves of the normalized head. The normalized shape of the phantom corresponds to the dimensions of 90% of an adult head size. It enables the dosimetric evaluation of left and right-hand phone usage and includes an additional flat phantom part for the simplified body performance check.The phantom set-up includes a cover, which prevents the evaporation of the liquid.

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SAM Phantom

The thickness of the phantom amounts to 2 mm±0.2 mm. The materials for the phantom do not affect the radiation of the device under test (DUT) : εr' <5
The head is filled with tissue simulating liquid. The hand do not have to be modeled.

TWIN SAM phantom			
	Mechanical	Electrical	
Overall thickness	2±0.2 mm(except ear area)	Relative permittivity	3.4
Dimensions	1000 mm(L) x 500 mm(W) x 200 mm(H)	Loss tangent	0.02
Maximum volume	27 L		
Material	Fiberglass based		

ELLIPTICAL Phantom

The phantom is for Body performance check filled with tissue-equivalent liquid to a depth of at least 150 mm, whose shell material is resistant to damage or reaction with tissue-equivalent liquid chemicals.

ELLI Phantom

The shape of the phantom is an ellipse with length 600mm±5mm and width 400mm±5mm.
The phantom shell is made of low-loss and low-permittivity material, having loss tangent tanδ ≤ 0.05 and relative permittivity:
εr' ≤ 5 for f ≤ 3 GHz
3 ≤εr' ≤ 5 for f > 3 GHz
The thickness of the bottom-wall of the flat phantom is 2.0 mm with a tolerance of ± 0.2 mm.

Technical & mechanical characteristics	
Shell thickness	2 mm ± 0.2 mm
Filling volume	25 L
Dimensions	600 mm x 400 mm x 200mm
Permittivity	4.4
Loss tangent	0.017

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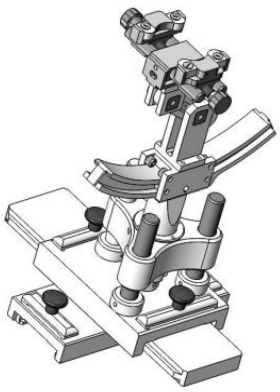
4.2.5 Device Holder



System Material	Permittivity	Loss tangent
Delrin	3.7	0.005

(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
PMMA	2.9	0.028

4.2.6 Simulating Liquid

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid 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. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5%.

Head Liquid Depth	Body Liquid Depth

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The following table gives the recipes for tissue simulating liquid and the theoretical Conductivity/Permittivity.

Head (Reference IEEE1528)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity σ (S/m)	Permittivity ε
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.4	40.0
2450	55.0	0	0	0.1	0	44.9	1.80	39.2
2600	54.9	0	0	0.1	0	45.0	1.96	39.0
Frequency (MHz)	Water (%)	Hexyl Carbitol (%)			Triton X-100 (%)		Conductivity σ (S/m)	Permittivity ε
5200	62.52	17.24			17.24		4.66	36.0
5800	62.52	17.24			17.24		5.27	35.3
Body (From instrument manufacturer)								
Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity σ (S/m)	Permittivity ε
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0.1	0	31.3	1.95	52.7
2600	68.2	0	0	0.1	0	31.7	2.16	52.5
Frequency(MHz)	Water	DGBE (%)			Salt (%)		Conductivity σ (S/m)	Permittivity ε
5200	78.60	21.40			/		5.30	49.00
5800	78.50	21.40			0.1		6.00	48.20

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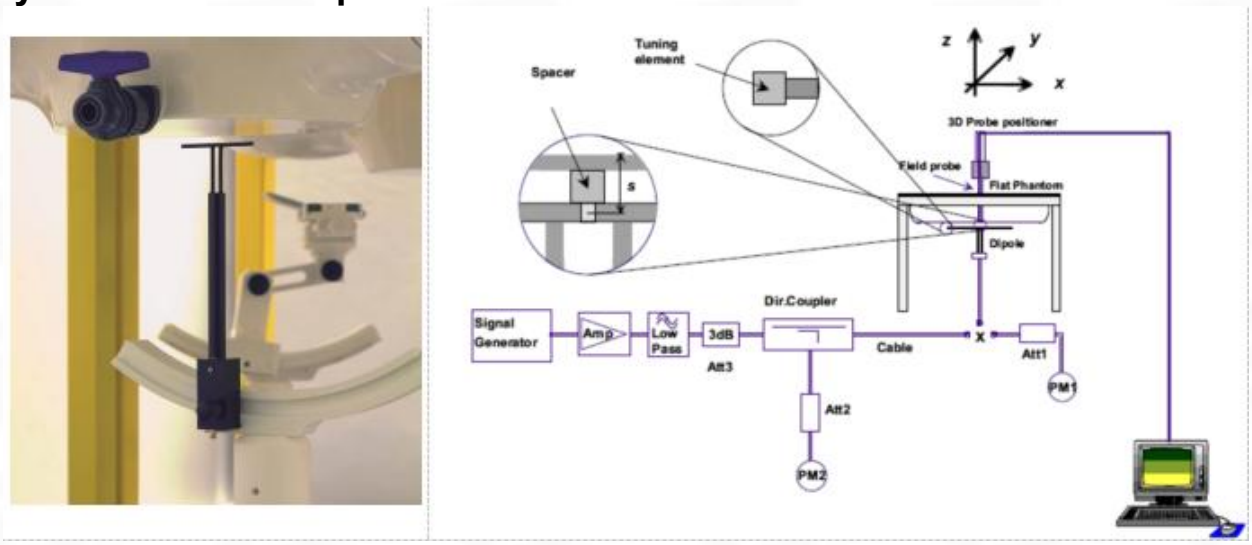
5. System Verification

5.1 Purpose of System Check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. The setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

5.2 System Check Setup



6. TEST POSITION CONFIGURATIONS

According to KDB 648474 D04 Handset, handsets are tested for SAR compliance in head, body-worn accessory and other use configurations described in the following subsections.

6.1 Head Exposure Conditions

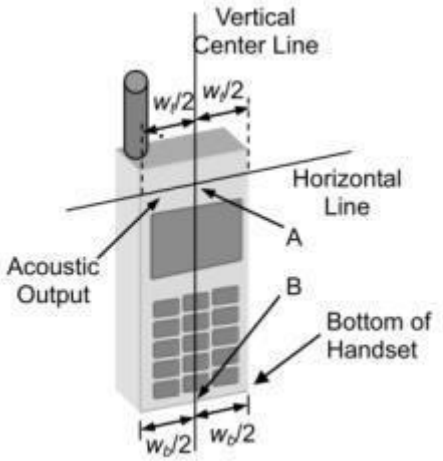
Head exposure is limited to next to the ear voice mode operations. Head SAR compliance is tested according to the test positions defined in IEEE Std 1528-2013 using the SAM phantom illustrated as below.

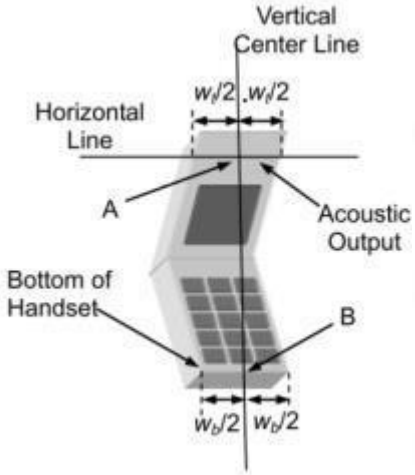
6.1.1 Two Imaginary Lines on the Handset

(a) The vertical center line passes through two points on the front side of the handset - the midpoint of the width w t of the handset at the level of the acoustic output, and the midpoint of the width w b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical center line and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical center line is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

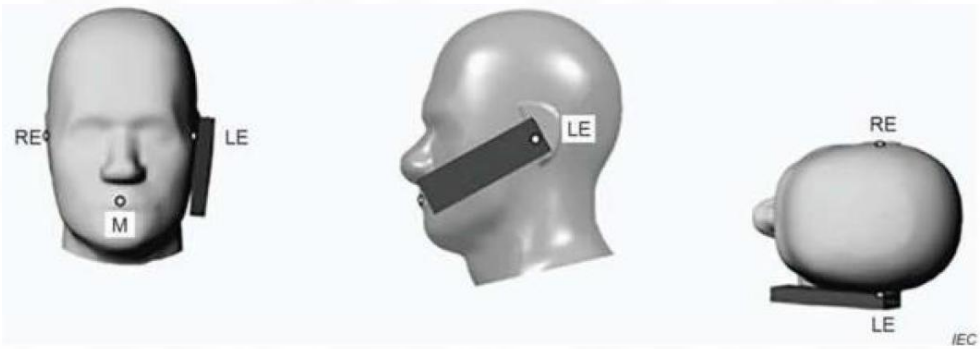




6.1.2 Two Imaginary Lines on the Handset

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

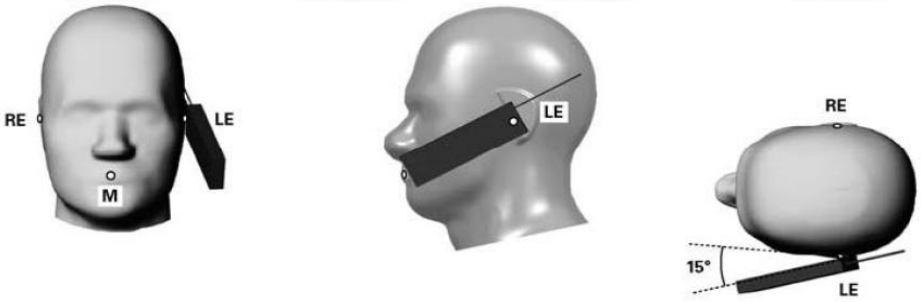
(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.



6.1.3 Titled Position

(a) To position the device in the “cheek” position described above.

(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



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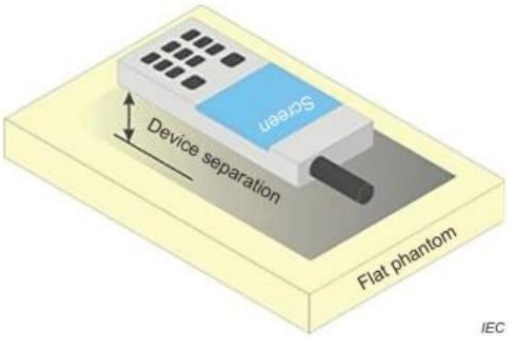
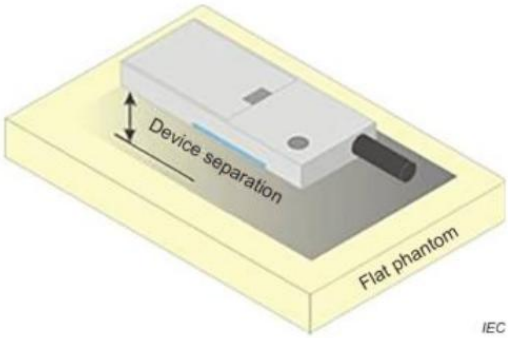
6.2 Body-worn Position Conditions

Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in KDB 447498 are used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode. When the reported SAR for a body-worn accessory.

Body-worn accessories that do not contain metallic or conductive components may be tested according to worst-case exposure configurations, typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. All body-worn accessories containing metallic components are tested in conjunction with the host device.

Body-worn accessory SAR compliance is based on a single minimum test separation distance for all wireless and operating modes applicable to each body-worn accessory used by the host, and according to the relevant voice and/or data mode transmissions and operations. If a body-worn accessory supports voice only operations in its normal and expected use conditions, testing of data mode for body-worn compliance is not required. A conservative minimum test separation distance for supporting off-the-shelf body-worn accessories that may be acquired by users of consumer handsets is used to test for body-worn accessory SAR compliance. This distance is determined by the handset manufacturer, according to the requirements of Supplement C 01-01. Devices that are designed to operate on the body of users using lanyards and straps, or without requiring additional body-worn accessories, will be tested using a conservative minimum test separation distance <= 5 mm to support compliance.





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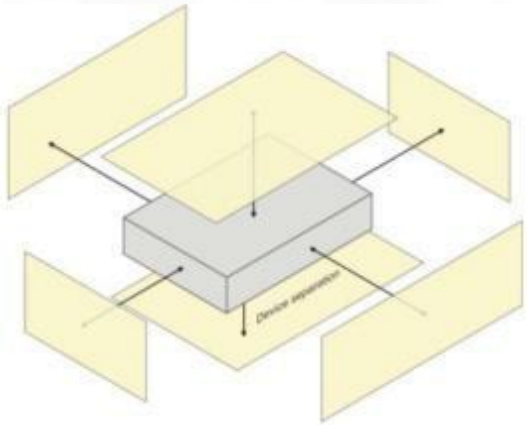
6.3 Hotspot Mode Exposure Position Conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode 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).



6.4 Product Specific 10g Exposure Consideration

According with FCC KDB 648474 D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance;

The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. 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.

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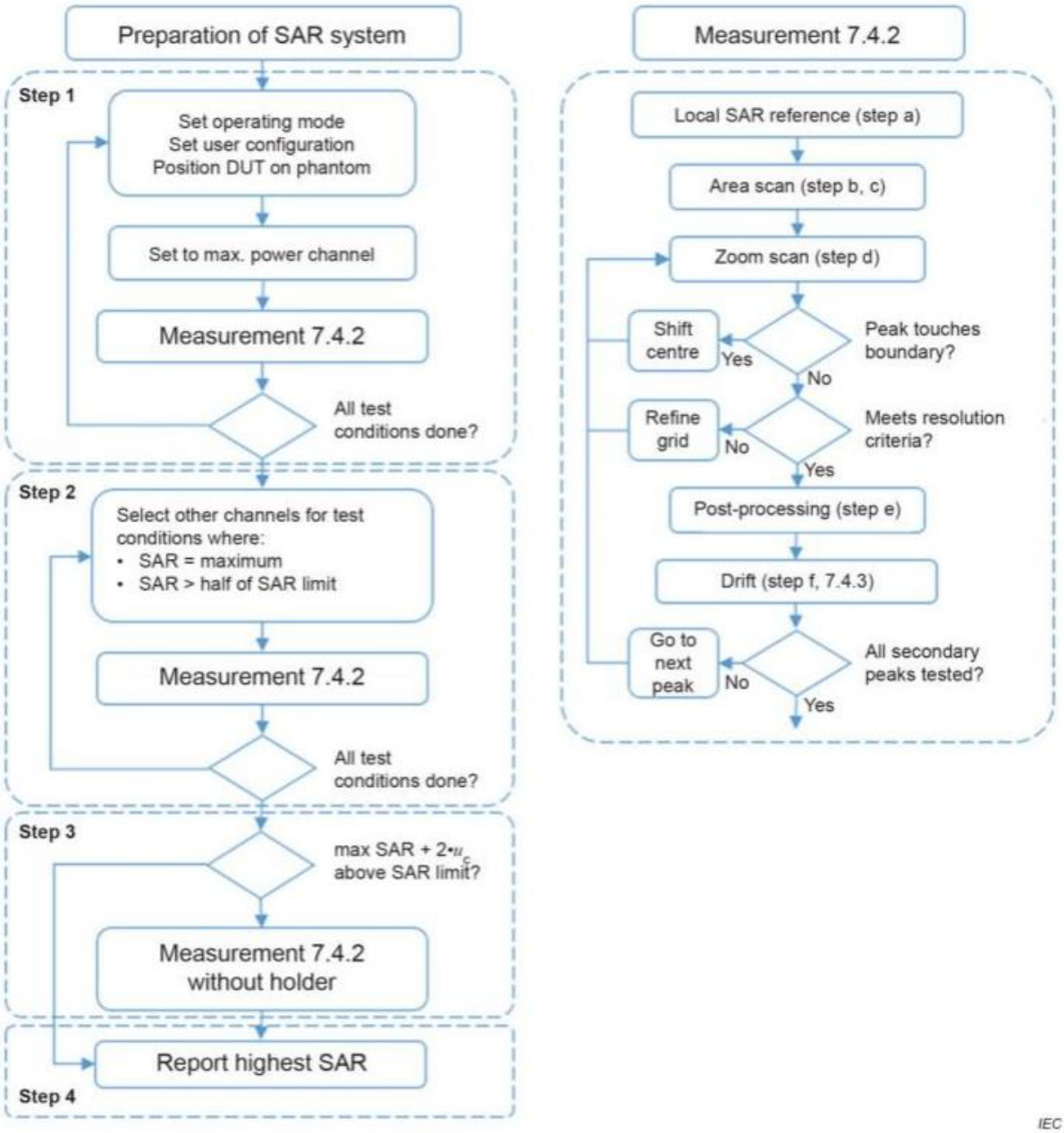
7. Measurement Procedure

7.1 Measurement Process Diagram

Body SAR



7.2 SAR Scan General Requirement

Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1 g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std 1528-2013.

			≤3GHz	>3GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5±1 mm	½·δ·ln(2)±0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30°±1°	20°±1°
Maximum area scan spatial resolution: Δx Area , Δy Area			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3–4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	
Maximum zoom scan spatial resolution: Δx Zoom , Δy Zoom			≤ 2 GHz: ≤ 8 mm 2 –3 GHz: ≤ 5 mm*	3–4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: Δz Zoom (n)		≤ 5 mm	3–4 GHz: ≤ 4 mm
				4–5 GHz: ≤ 3 mm
				5–6 GHz: ≤ 2 mm
	graded grid	Δz Zoom (1): between 1st two points closest to phantom surface	≤ 4 mm	3–4 GHz: ≤ 3 mm
				4–5 GHz: ≤ 2.5 mm
				5–6 GHz: ≤ 2 mm
		Δz Zoom (n>1): between subsequent points	≤ 1.5·Δz Zoom (n-1)	
Minimum zoom scan volume	x, y, z		≥30 mm	3–4 GHz: ≥ 28 mm
				4–5 GHz: ≥ 25 mm
				5–6 GHz: ≥ 22 mm

Note:

1. δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528- 2011 for details.
2. * When zoom scan is required and the reported SAR from the area scan based 1 g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

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7.3 Measurement Procedure

The following steps are used for each test position

a. Establish a call with the maximum output power with a base station simulator. The connection between the mobile and the base station simulator is established via air interface

b. Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.

c. Measurement of the SAR distribution with a grid of 8 to 16mm * 8 to16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.

d. Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 *32 mm is assessed by measuring 5 or 8 * 5 or 8*4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.4 Area & Zoom Scan Procedure

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 is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

When the 1 g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

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8. Conducted RF Output Power

8.1 LTE

Band 4

LTE-FDD Band 4				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		19957	20175	20393
					1710.7MHz	1732.5MHz	1754.3MHz
1.4MHz	QPSK	1	0	21.00	20.56	19.88	19.88
			2	21.00	20.58	19.90	20.03
			5	21.00	20.65	19.85	20.01
		3	0	21.00	20.71	19.73	19.85
			2	21.00	20.61	19.89	20.01
			3	21.00	20.61	19.72	19.89
		6	0	20.00	19.63	18.72	18.78
	16QAM	1	0	20.50	20.21	18.74	18.35
			2	20.50	20.28	19.24	18.62
			5	20.00	19.64	18.76	18.57
		3	0	19.50	19.46	18.77	18.76
			2	19.50	19.27	18.82	18.83
			3	20.00	19.89	18.77	18.87
		6	0	19.00	18.60	17.56	17.91
Bandwidth	Modulation	RB allocation	RB offset	Maximum Tune-up(dBm)	19965	20175	20385
					1711.5MHz	1732.5MHz	1753.5MHz
3MHz	QPSK	1	0	21.00	20.63	19.55	19.88
			7	21.00	20.78	19.84	20.12
			14	20.50	20.25	19.71	20.09
		8	0	19.50	19.13	18.60	19.06
			4	19.50	19.29	18.61	19.04
			7	19.50	19.23	18.58	19.05
		15	0	19.50	19.20	18.59	19.11
	16QAM	1	0	19.50	18.79	18.18	19.27
			7	19.50	19.06	19.48	19.30
			14	19.50	19.09	19.09	19.02
		8	0	18.50	18.22	17.50	17.95
			4	18.50	18.30	17.43	18.28
			7	18.50	18.35	17.57	18.31
		15	0	18.50	18.30	17.50	18.10
Bandwidth	Modulation	RB allocation	RB offset	Maximum Tune-up(dBm)	19976	20175	20375
					1712.5MHz	1732.5MHz	1752.5MHz
5MHz	QPSK	1	0	21.00	20.73	19.49	19.41
			13	21.00	20.77	19.14	19.27
			24	20.50	20.26	19.50	19.45
		12	0	20.00	19.52	18.31	18.42
			6	20.00	19.80	18.31	18.37
			13	20.00	19.71	18.26	18.64
		25	0	20.00	19.53	18.28	18.48
	16QAM	1	0	19.50	19.30	18.84	18.12
			13	19.50	19.44	18.57	17.86
			24	19.50	19.18	18.77	17.84
		12	0	18.50	18.44	16.98	17.43
			6	19.00	18.53	17.17	17.30
			13	19.00	18.66	17.53	17.48
		25	0	19.00	18.51	17.21	17.45

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LTE-FDD Band 4				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		20000	20175	20350
					1715.0MHz	1732.5MHz	1750.0MHz
10MHz	QPSK	1	0	20.50	20.15	20.06	20.39
			25	21.00	20.65	20.42	20.05
			49	20.50	19.91	19.89	20.13
		25	0	19.50	19.40	19.06	19.12
			13	19.50	19.28	19.11	19.14
			25	19.50	19.11	19.08	19.16
		50	0	19.50	19.29	19.00	19.09
	16QAM	1	0	20.50	19.02	20.07	20.14
			25	20.00	19.11	19.44	19.76
			49	20.00	18.49	19.97	19.46
		12	0	19.50	19.44	18.99	19.28
			19	19.50	19.26	18.78	19.34
			38	19.50	18.91	19.08	19.08
		27	0	19.00	18.56	18.14	18.03
Bandwidth	Modulation	RB allocation	RB offset	Maximum Tune-up(dBm)	20025	20175	20325
					1717.5MHz	1732.5MHz	1747.5MHz
15MHz	QPSK	1	0	20.50	20.26	20.02	20.40
			38	21.00	19.97	19.73	20.57
			74	20.50	20.19	19.81	19.57
		36	0	19.50	19.23	18.65	18.83
			18	19.50	19.10	18.67	18.72
			39	19.00	18.75	18.79	18.70
		75	0	19.00	18.75	18.54	18.68
	16QAM	1	0	19.50	19.19	19.15	19.44
			38	20.00	19.75	19.12	19.91
			74	20.00	19.62	19.06	19.29
		12	0	20.00	19.66	18.37	18.47
			31	19.50	19.28	18.57	18.42
			63	19.50	19.07	18.66	18.64
		27	0	18.50	18.45	17.66	17.79
Bandwidth	Modulation	RB allocation	RB offset	Maximum Tune-up(dBm)	20050	20175	20300
					1720.0MHz	1732.5MHz	1745.0MHz
20MHz	QPSK	1	0	**20.50**	**20.29**	19.86	20.09
			50	20.50	20.27	20.01	19.82
			99	20.50	19.94	19.63	20.03
		50	0	19.50	**19.38**	18.48	19.18
			25	19.50	19.16	18.55	18.98
			50	19.50	19.04	18.60	18.96
		100	0	19.50	19.00	18.47	19.10
	16QAM	1	0	20.50	20.44	18.40	19.18
			50	20.00	19.67	18.45	19.65
			99	20.50	19.37	18.37	20.05
		12	0	20.00	19.15	18.54	19.70
			44	19.50	19.05	18.20	19.40
			88	19.00	18.67	18.29	18.59
		27	0	18.50	18.46	17.44	17.95

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Band 13

LTE-FDD Band 13				Maximum Tune-up(dBm)	Conducted Power(dBm)		
Bandwidth	Modulation	RB allocation	RB offset		23205	23230	23255
					779.5MHz	782.0MHz	784.5MHz
5MHz	QPSK	1	0	22.00	21.60	21.65	21.61
			13	22.00	21.61	21.83	21.83
			24	22.00	21.40	21.73	21.83
		12	0	21.00	20.80	20.94	20.65
			6	21.00	20.81	20.89	20.73
			13	21.00	20.74	20.83	20.77
		25	0	21.00	20.76	20.95	20.75
	16QAM	1	0	21.50	20.11	20.55	21.06
			13	21.50	20.25	20.67	21.24
			24	21.50	20.15	20.77	21.24
		12	0	20.00	19.69	19.69	19.59
			6	20.00	19.81	19.94	19.69
			13	20.00	19.75	19.70	19.64
		25	0	20.00	19.82	19.85	19.56
Bandwidth	Modulation	RB allocation	RB offset	Maximum Tune-up(dBm)	23230		
					782.0MHz		
10MHz	QPSK	1	0	**22.00**	**21.87**		
			25	22.00	21.78		
			49	22.00	21.56		
		25	0	21.00	**20.75**		
			13	21.00	20.75		
			25	21.00	20.66		
		50	0	21.00	20.83		
	16QAM	1	0	21.00	20.82		
			25	21.50	21.44		
			49	20.50	20.37		
		25	0	21.00	20.93		
			13	21.00	20.95		
			25	21.00	20.78		
		50	0	20.00	19.76		

8.2 Wi-Fi

Band (GHz)	Mode	Channel	Freq. (MHz)	Average Power (dBm)	Maximum Tune-up(dBm)	SAR Test Require.
2.4g Wifi (2.4~2.4835)	802.11b	1	2412	12.70	13.00	No
		6	2437	12.89	13.00	No
		11	2462	**13.07**	**13.50**	Yes
	802.11g	1	2412	12.36	12.50	No
		6	2437	12.57	13.00	No
		11	2462	12.91	13.00	No
	802.11n(HT20)	1	2412	11.78	12.00	No
		6	2437	12.16	12.50	No
		11	2462	12.57	13.00	No
Note: SAR is not required for the following 2.4 GHz OFDM conditions as the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2W/kg.						

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8.3 Bluetooth

BLE	Mode	Maximum Tune-up(dBm)	Average Conducted Output Power (dBm)		
			0	20	39
			2402MHz	2440MHz	2480MHz
	1Mbps	**6.50**	5.39	5.85	**6.08**
	2Mbps	6.50	5.38	5.86	6.07

8.4 LORA

Maximum Tune-up(dBm)	Conducted Output Power(dBm)	$E_{dB\mu}$V/m
	906MHz	906MHz
-9.00	-9.29	85.91
Note: Nominal rated field strength: 85.91 dBuV/m at 3 meter. $P_{dBm}=E_{dB\mu}V/m-95.2$		

8.5 NFC

Maximum Tune-up(dBm)	Conducted Output Power(dBm)	$E_{dB\mu}$V/m
	13.56MHz	13.56MHz
-12.50	-12.56	82.64
Note: Nominal rated field strength: 82.64 dBuV/m at 3 meter. $P_{dBm}=E_{dB\mu}V/m-95.2$		

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power (mW)	Test distance (mm)	Exclusion thresholds for 1-g SAR(mW)	RF exposure evaluation required
/	0.01356	-12.00	0.063	10	443	No
/	0.906	-11.00	0.079	10	19.56	No

Note

1. Per KDB 447498 D04 Interim General RF Exposure Guidance v01, the 1-g SAR test exclusion thresholds for 300 MHz to 6 GHz at *test separation distances* ≤ 40 cm are determined by:

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad (\text{B.2})$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad (\text{B.1})$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

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

2. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
3. The output power of all data rate were prescan, just the worst case (the lowest data rate) of all mode were shown in report.
4. Conducted Power=0.063 mV.
   The SAR Exclusion Threshold Level for 13.56MHz when the minimum test separation distance is < 50mm.
   =[474*(1 +log100/f(MHz))]/2
   =443mW
5. Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.
6. Per KDB 447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following format 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

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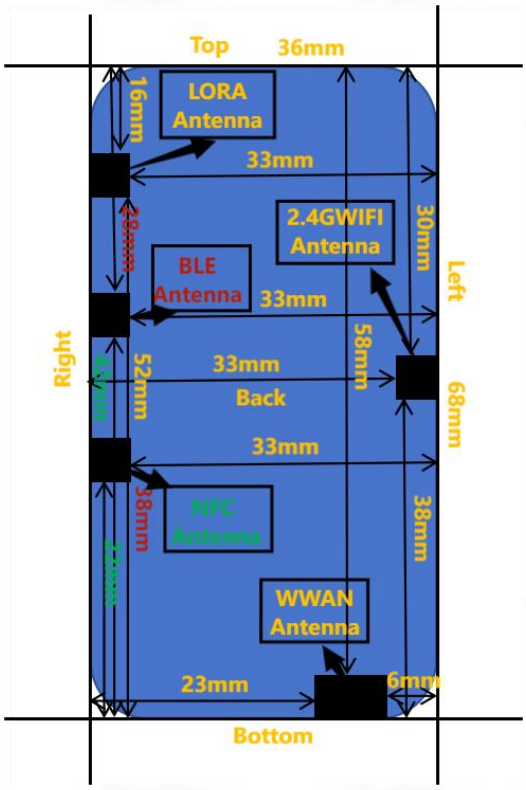
9. Test Exclusion Consideration

Antenna information:



LTE Antenna	LTE TX/RX
WLAN Antenna	WLAN TX/RX
BLE Antenna	BLE TX/RX
Note: Per KDB 447498 D01 General RF Exposure Guidance v06, the device belongs to body-worn device, and it's always worn with a lanyard. So we test it in dist. 10mm.	

Distance of The Antenna to the EUT surface and edge (mm)						
Antenna	Front Side (mm)	Back Side (mm)	Left Edge (mm)	Right Edge (mm)	Top Edge (mm)	Bottom Edge (mm)
LTE	<25	<25	<25	26	58	<25
Wifi	<25	<25	<25	33	30	34
BLE	<25	<25	33	<25	<25	38
Positions for SAR tests: Hotspot mode						
Antenna	Front Side (mm)	Back Side (mm)	Left Edge (mm)	Right Edge (mm)	Top Edge (mm)	Bottom Edge (mm)
LTE	Yes	Yes	Yes	No	No	Yes
Wifi	Yes	Yes	Yes	No	No	No
BLE	Yes	Yes	No	Yes	Yes	No

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10. Test Result

LTE

Body-worn(10mm Gap)													
Mode	Channel Type	Position	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Reported SAR (W/kg)	Meas. No.
Band 4 (BW: 20MHz)	1RB	Front	20050	1720.0	-3.800	1.351	100.00	1.000	20.29	20.50	1.050	**1.419**	1#
		Front-repeat	20050	1720.0	3.560	1.348	100.00	1.000	20.29	20.50	1.050	1.415	/
		Front	20175	1732.5	2.110	1.198	100.00	1.000	19.86	20.00	1.033	1.238	/
		Front	20300	1745.0	-0.260	1.254	100.00	1.000	20.09	20.50	1.099	1.378	/
		Back	20050	1720.0	-2.030	1.314	100.00	1.000	20.29	20.50	1.050	1.371	/
		Left	20050	1720.0	1.030	0.725	100.00	1.000	20.29	20.50	1.050	0.761	/
		Bottom	20050	1720.0	-2.690	1.039	100.00	1.000	20.29	20.50	1.050	1.091	/
	50%RB	Front	20050	1720.0	-0.750	0.928	100.00	1.000	19.38	19.50	1.028	0.954	/
		Back	20050	1720.0	3.630	0.905	100.00	1.000	19.38	19.50	1.028	0.930	/
		Left	20050	1720.0	-0.040	0.412	100.00	1.000	19.38	19.50	1.028	0.424	/
		Bottom	20050	1720.0	-0.360	0.637	100.00	1.000	19.38	19.50	1.028	0.655	/

Body-worn(10mm Gap)													
Mode	Channel Type	Position	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Reported SAR (W/kg)	Meas. No.
Band 13 (BW: 10MHz)	1RB	Front	23230	782.0	-2.440	0.362	100.00	1.000	21.87	22.00	1.030	**0.373**	2#
		Back	23230	782.0	3.970	0.341	100.00	1.000	21.87	22.00	1.030	0.351	/
		Left	23230	782.0	0.110	0.243	100.00	1.000	21.87	22.00	1.030	0.250	/
		Bottom	23230	782.0	-2.020	0.297	100.00	1.000	21.87	22.00	1.030	0.306	/
	50%RB	Front	23230	782.0	-1.280	0.224	100.00	1.000	20.75	21.00	1.059	0.237	/
		Back	23230	782.0	-0.240	0.219	100.00	1.000	20.75	21.00	1.059	0.232	/
		Left	23230	782.0	3.970	0.105	100.00	1.000	20.75	21.00	1.059	0.111	/
		Bottom	23230	782.0	-2.570	0.181	100.00	1.000	20.75	21.00	1.059	0.192	/

WIFI

Body-worn(10mm Gap)												
Mode	Position	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Reported SAR (W/kg)	Meas. No.
2.4g WIFI 802.11b	Front	11	2462.0	-2.470	0.099	100.00	1.000	13.07	13.50	1.104	**0.109**	3#
	Back	11	2462.0	3.020	0.088	100.00	1.000	13.07	13.50	1.104	0.097	/
	Left	11	2462.0	0.290	0.072	100.00	1.000	13.07	13.50	1.104	0.079	/

BT

Body-worn(10mm Gap)												
Mode	Position	Ch.	Freq. (MHz)	Power Drift (%)	1g Meas. SAR (W/kg)	Duty cycle (%)	Duty cycle Factor	Meas. Power (dBm)	Max. tune-up power (dBm)	Scaling Factor	1g Reported SAR (W/kg)	Meas. No.
BLE	Front	39	2480.0	0.230	0.007	100.00	1.000	6.08	6.50	1.102	**0.008**	4#
	Back	39	2480.0	0.340	0.005	100.00	1.000	6.08	6.50	1.102	0.006	/
	Right	39	2480.0	1.380	0.004	100.00	1.000	6.08	6.50	1.102	0.004	/
	Top	39	2480.0	-4.030	0.001	100.00	1.000	6.08	6.50	1.102	0.001	/

Note:

1. The maximum SAR Value of each test band is marked bold.
2. SAR plot is provided only for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
3. Per KDB 447498 D04 v01, for each exposure position, if the highest output power channel Reported SAR ≤ 0.8W/kg, other channels SAR testing is not necessary.
4. Per KDB 447498 D04 v01, next-to-mouth/wrist-worn use is evaluated with the device positioned at 10/0mm from a flat phantom respectively filled with head tissue-equivalent medium.
5. Per KDB 447498 D04 v01, the report SAR is measured SAR value adjusted for maximum tune-up tolerance. Scaling Factor=10^[(tune-up limit power(dBm) - Ave.power power (dBm))/10], where tune-up limit is the maximum rated power among all production units.
   Reported SAR(W/kg)=Measured SAR (W/kg)*Scaling Factor.

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11. SAR Measurement Variability

According to KDB 865664 D01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. 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, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

As the above result shows, the highest measured 1g SAR is 1.351 > 0.8 W/kg, repeated measurement is as below.

Body-worn

Mode	Position	Ch.	Freq. (MHz)	1g Meas SAR (W/kg)	the ratio of largest to smallest SAR for the original and first repeated measurements
LTE Band 4	Front	20050	1720.0	1.351	1.002
	Front-repeat	20050	1720.0	1.348	

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12. Simultaneous Transmission

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR 1g of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR 1g 1.6 W/kg/SAR 10g 4.0 W/kg), the simultaneous transmission SAR is not required.When the sum of SAR 1g is greater than the SAR limit (SAR 1g 1.6 W/kg/SAR 10g 4.0 W/kg), SAR test exclusion is determined by the SAR to Peak Location Ratio (SPLSR)

12.1 Simultaneous Transmission Mode Considerations

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.
The device has 3 Tx antennas, WWAN main antenna, Wi-Fi Ant. supporting 2.4G Wi-Fi and BT Ant. supporting BT Among that, 2x antennas can always transmit simultaneously. The work mode combination is showed as below table.

Simultaneous Transmission information:

NO.	Configuration	Body-worn
1	WWAN+WIFI(2.4g)	Yes
2	WWAN+BLE	Yes
3	WWAN+LORA	Yes
4	WWAN+NFC	Yes

12.2 Sum SAR of Simultaneous Transmission

Body-worn

Band	Test Position	RB allocation	Scaled SAR					Σ SAR (W/kg) WWAN + WIFI 2.4G	Σ SAR (W/kg) WWAN + BT	Σ SAR (W/kg) WWAN + LORA	Σ SAR (W/kg) WWAN +NFC	SPLSR	Remark
			WWAN	WIFI 2.4G	BLE	LORA	NFC						
Band 4 (BW: 20MHz)	Front	1RB	**1.419**	**0.109**	**0.008**	0.000	0.000	**1.528**	1.427	1.419	1.419	N/A	N/A
	Back		1.371	0.097	0.006	0.000	0.000	1.468	1.377	1.371	1.371	N/A	N/A
	Left		0.761	0.079	/	0.000	0.000	0.840	0.761	0.761	0.761	N/A	N/A
	Right		/	/	0.004	0.000	0.000	/	0.004	0.000	0.000	N/A	N/A
	Top		/	/	0.001	0.000	0.000	/	0.001	0.000	0.000	N/A	N/A
	Bottom		1.091	/	/	0.000	0.000	1.091	1.091	1.091	1.091	N/A	N/A
	Front	50%RB	0.954	0.109	0.008	0.000	0.000	1.063	0.962	0.954	0.954	N/A	N/A
	Back		0.930	0.097	0.006	0.000	0.000	1.027	0.936	0.930	0.930	N/A	N/A
	Left		0.424	0.079	/	0.000	0.000	0.503	0.424	0.424	0.424	N/A	N/A
	Right		/	/	0.004	0.000	0.000	/	0.004	0.000	0.000	N/A	N/A
	Top		/	/	0.001	0.000	0.000	/	0.001	0.000	0.000	N/A	N/A
	Bottom		0.655	/	/	0.000	0.000	0.655	0.655	0.655	0.655	N/A	N/A

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13. Test Equipment List

Description	Manufacturer	Model	Serial No./Version	Cal. Date	Cal. Due
E-Field Probe	MVG	SSE2	0125-EPGO-445	2025/02/01	2026/01/31
6 1/2 Digital Multimeter	Keithley	DMM6500	4527164	2025/10/20	2026/10/19
Wideband Radio Communication Tester	ROHDE & SCHWARZ	CMW500	161997	2025/10/17	2026/10/16
MXG Vector Signal Generator	Agilent	N5182A	MY46240163	2025/10/17	2026/10/16
E-Series Avg. Power Sensor	KEYSIGHT	E9300A	MY55050017	2025/04/02	2026/04/01
EPM Series Power Meter	KEYSIGHT	E4418B	MY41293435	2025/04/02	2026/04/01
10dB Attenuator	MIDWEST MICROWAVE	263-10dB	N/A	2025/04/02	2026/04/01
Coupler	MERRIMAC	CWM-10R-10.8G	LOT-83391	N/A	N/A
750MHz Validation Dipole	MVG	SID750	07/22 DIP 0G835-655	2025/05/26	2028/05/25
1800MHz Validation Dipole	MVG	SID1800	07/22 DIP 1G800-657	2025/05/26	2028/05/25
2450MHz Validation Dipole	MVG	SID2450	07/22 DIP 2G450-662	2025/05/26	2028/05/25
LIMESAR Dielectric Probe	MVG	SCLMP	06/22 OCPG88	2025/02/05	2026/02/04
ENA Series Network Analyzer	Agilent	E5071B	MY42301221	2025/10/17	2026/10/16
Thermometer	Riters	DT-232	21A11	2025/10/24	2026/10/23
Antenna network emulator	MVG	ANTA 74	07/22 ANTA 74	N/A	N/A
SAM Phantom	MVG	SAM	07/22 SAM149	N/A	N/A
Mobile Phone Positioning System	MVG	MSH 118	07/22 MSH 118	N/A	N/A
Mechanical Calibration Kit	PNA	N/A	N/A	2025/10/21	2026/10/20
Open SAR test software	MVG	N/A	V5.3.5	N/A	N/A

Note: For dipole antennas, BTF has adopted 3 years as calibration intervals, and on annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss in within 20% of calibrated measurement.
4. Impedance (real or imaginary parts) in within 5 Ohms of calibrated measurement.

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ANNEX A Simulating Liquid Verification Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SCLMP Dielectric Probe Kit.

Dielectric performance of tissue simulating liquid									
Frequency (MHz)	εr		σ(s/m)		Delta (εr)	Delta (σ)	Limit	Temp (℃)	Date
	Target	Measured	Target	Measured					
750	41.90	42.01	0.89	0.88	0.26%	-1.12%	±5%	21.6	8/12/2025
1800	40.00	40.32	1.40	1.36	0.80%	-2.86%	±5%	21.6	8/12/2025
2450	39.20	38.76	1.80	1.85	-1.12%	2.78%	±5%	21.9	9/12/2025
NOTE: The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 ℃ of the conditions expected during the SAR evaluation to satisfy protocol requirements.									

ANNEX B System Check Result

Comparing to the original SAR value provided by MVG, the validation data should be within its specification of 10 %(for 10 g).

Frequency (MHz)	Input Power (mW)	10g SAR (W/Kg)	1g SAR (W/Kg)	10g SAR 1W input power normalized (W/Kg)	1g SAR 1W input power normalized (W/Kg)	10g SAR Standard target (1W) (W/Kg)	1g SAR Standard target (1W) (W/Kg)	10g SAR Deviation	1g SAR Deviation
750	100	0.573	0.864	5.73	8.64	5.55	8.41	3.24%	2.73%
1800	100	2.042	3.661	20.42	36.61	19.83	37.93	2.98%	-3.48%
2450	100	2.432	5.062	24.32	50.62	24.55	52.72	-0.94%	-3.98%

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System Performance Check Data (750 MHz)

System check at 750 MHz

Date of measurement: 8/12/2025

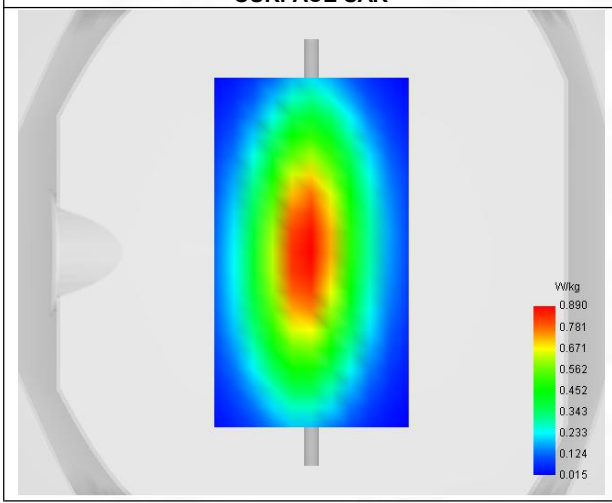
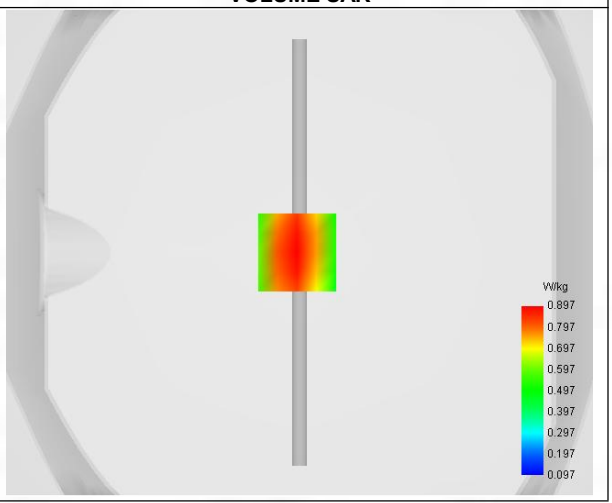
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.24
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW750
Channels/Frequency	Middle
Signal	CW

B. Permitivity

Middle TX Frequency (MHz)	750.000
Relative permitivity (real part)	42.012
Relative permitivity (imaginary part)	21.356
Conductivity (S/m)	0.883

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-1.00, Y=0.00 ; SAR Peak: 1.21 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.573
SAR 1g (W/Kg)	0.864
Variation (%)	-1.090
Horizontal validation criteria: minimum distance (mm)	22.627417
Vertical validation criteria: SAR ratio M2/M1 (%)	69.342750

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.213	0.897	0.622	0.443	0.321	0.231	0.171

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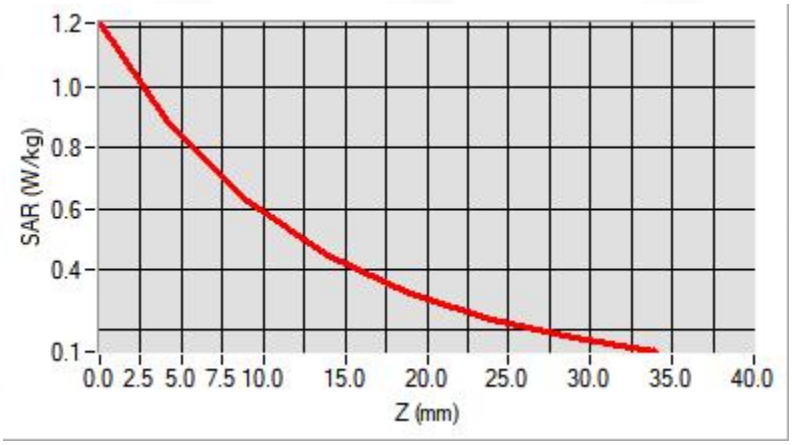
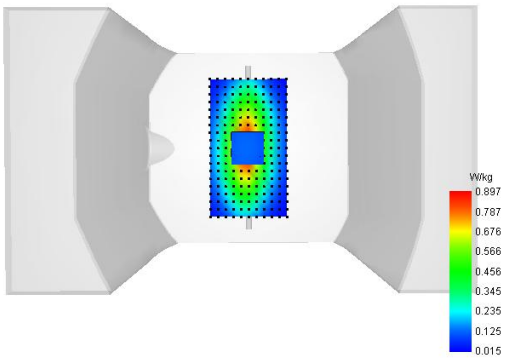
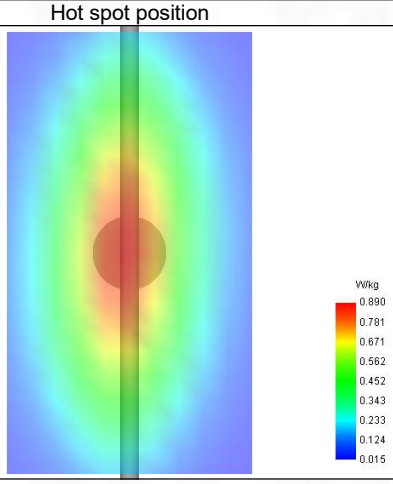


F. 3D Image

3D screen shot	Hot spot position
	

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System Performance Check Data (1800 MHz)

System check at 1800 MHz

Date of measurement: 8/12/2025

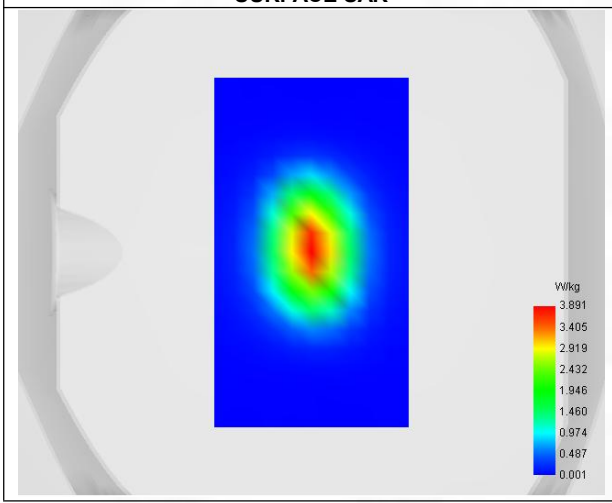
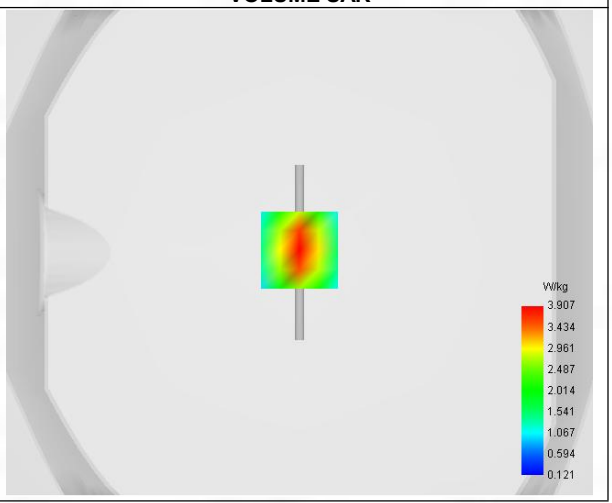
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.20
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW1800
Channels/Frequency	Middle
Signal	CW

B. Permitivity

Middle TX Frequency (MHz)	1800.000
Relative permitivity (real part)	40.321
Relative permitivity (imaginary part)	14.645
Conductivity (S/m)	1.363

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=1.00 ; SAR Peak: 5.75 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	2.042
SAR 1g (W/Kg)	3.661
Variation (%)	0.570
Horizontal validation criteria: minimum distance (mm)	16.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	60.806303

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	5.787	3.907	2.376	1.470	0.929	0.590	0.373

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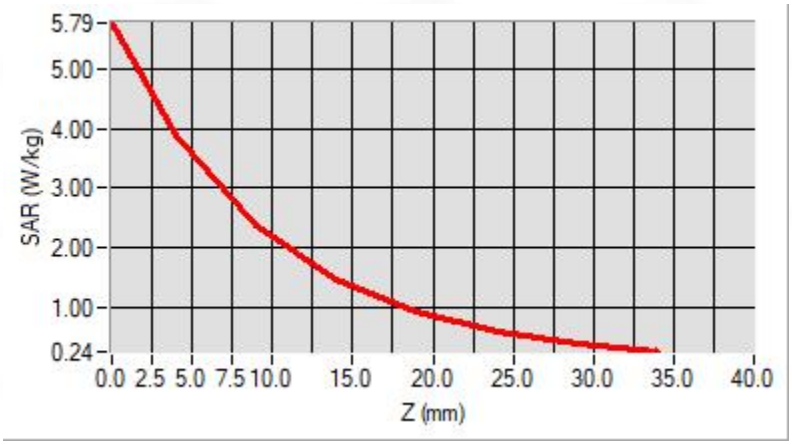
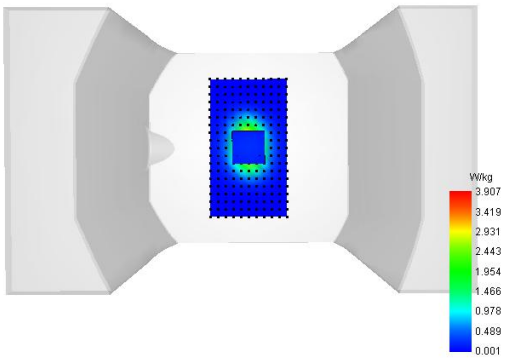
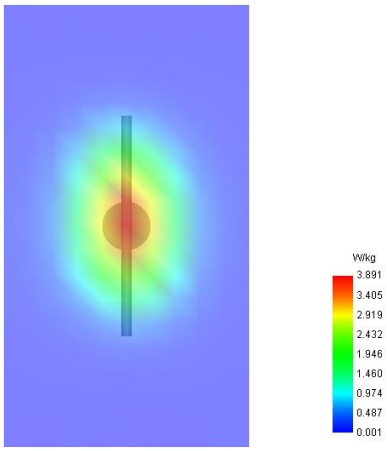


F. 3D Image

3D screen shot	Hot spot position
	

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System Performance Check Data (2450 MHz)

System check at 2450 MHz

Date of measurement: 9/12/2025

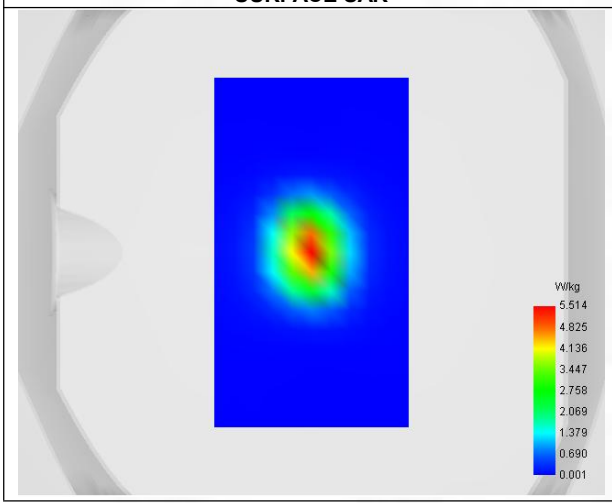
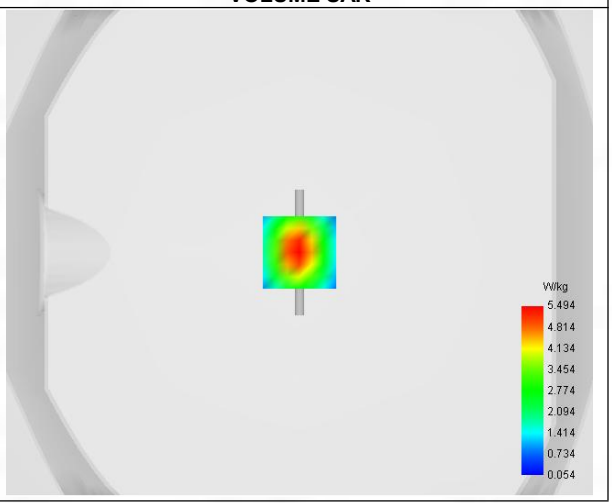
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.40
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels/Frequency	Middle
Signal	CW

B. Permitivity

Middle TX Frequency (MHz)	2450.000
Relative permitivity (real part)	38.761
Relative permitivity (imaginary part)	13.640
Conductivity (S/m)	1.852

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=0.00 ; SAR Peak: 8.82 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	2.432
SAR 1g (W/Kg)	5.062
Variation (%)	-2.570
Horizontal validation criteria: minimum distance (mm)	11.180340
Vertical validation criteria: SAR ratio M2/M1 (%)	52.916579

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.893	5.494	2.907	1.575	0.867	0.476	0.264

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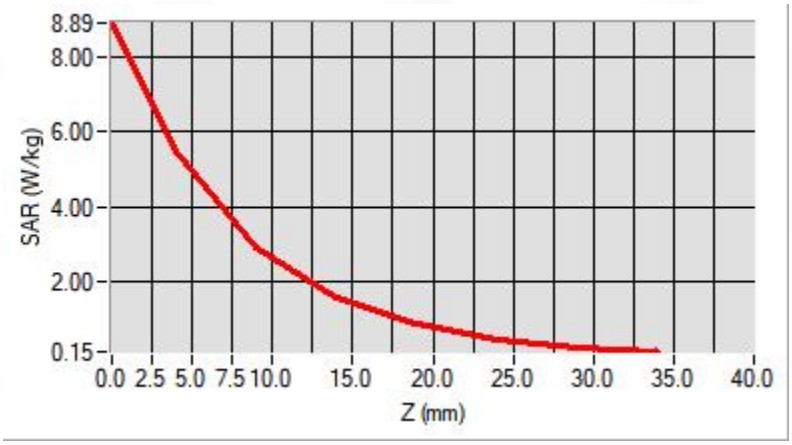
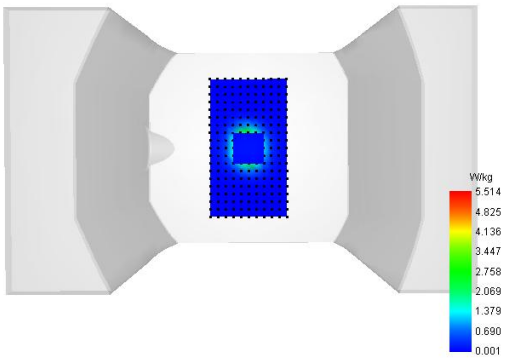
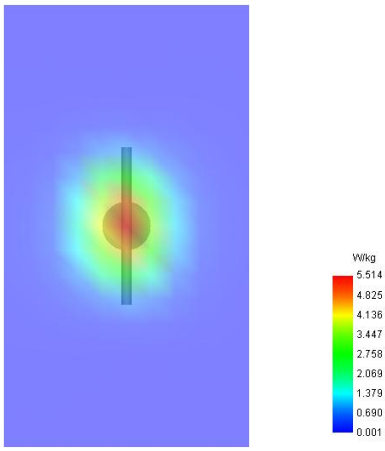


F. 3D Image

3D screen shot	Hot spot position
	

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ANNEX C Test Data

1-Body-worn: front position in dist. 10mm Channel 20050 in LTE Band 4

SAR Measurement at LTE band 4 (Body, Validation Plane)

Date of measurement: 8/12/2025

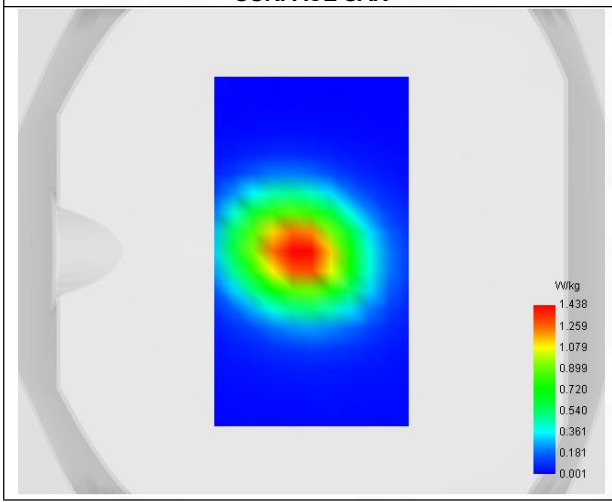
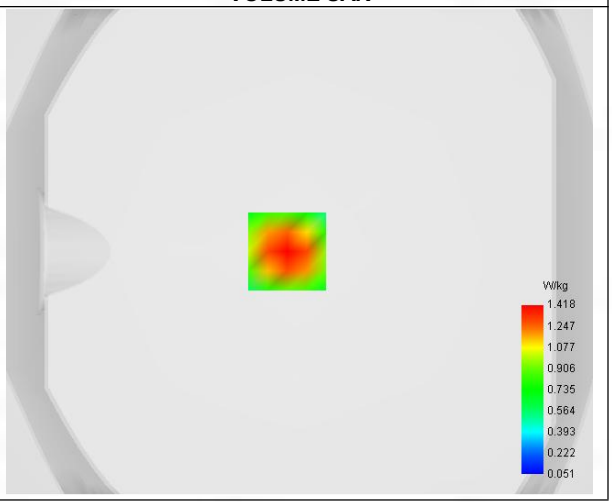
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.20
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	LTE band 4
Channels/Frequency	Lower (20050)/ frequency 1720.000 Mhz
Signal	LTE FDD
Cell Bandwidth	20 Mhz
Modulation	SC-OFDM - QPSK
RB offset	0
RB size	1

B. Permitivity

Middle TX Frequency (MHz)	1711.090
Relative permitivity (real part)	40.445
Relative permitivity (imaginary part)	15.086
Conductivity (S/m)	1.321

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=0.00 ; SAR Peak: 1.94 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.832
SAR 1g (W/Kg)	1.351
Variation (%)	-3.800
Horizontal validation criteria: minimum distance (mm)	22.627417
Vertical validation criteria: SAR ratio M2/M1 (%)	67.109639

E. Z Axis Scan

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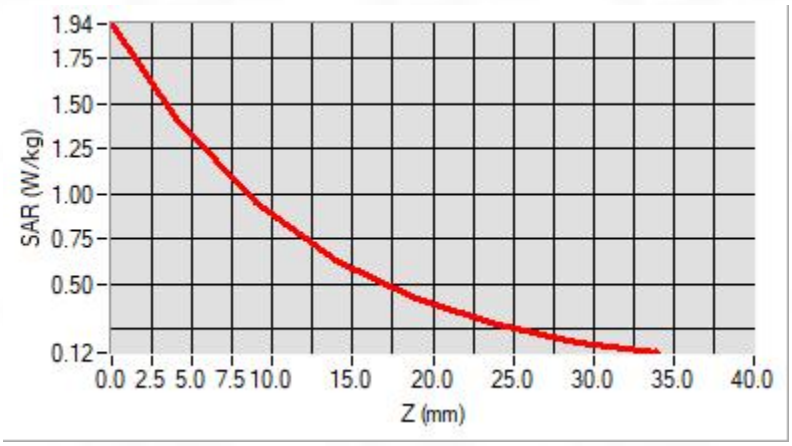
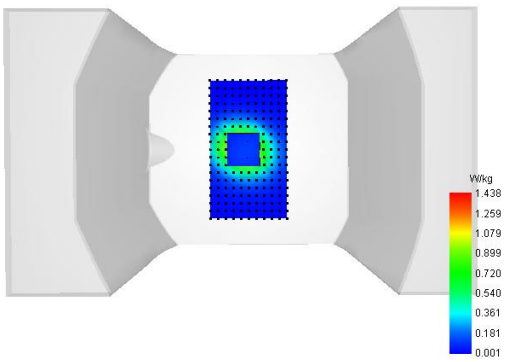
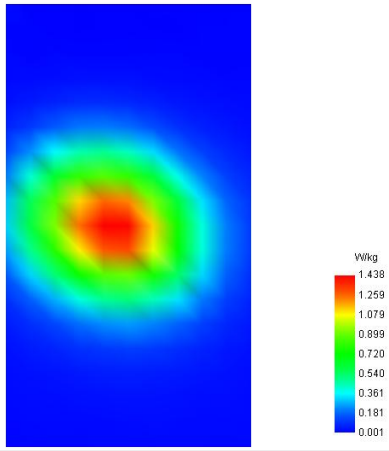
Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.945	1.418	0.952	0.628	0.420	0.275	0.176



F. 3D Image

3D screen shot	Hot spot position
	

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2-Body-worn: front position in dist. 10mm Channel 23230 in LTE Band 13

SAR Measurement at LTE band 13 (Body, Validation Plane)

Date of measurement: 8/12/2025

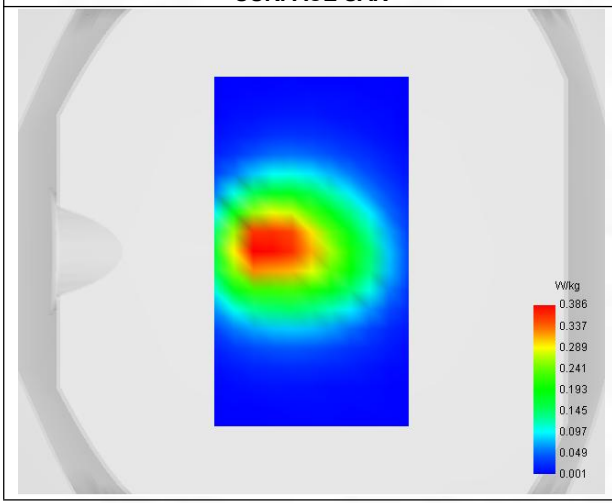
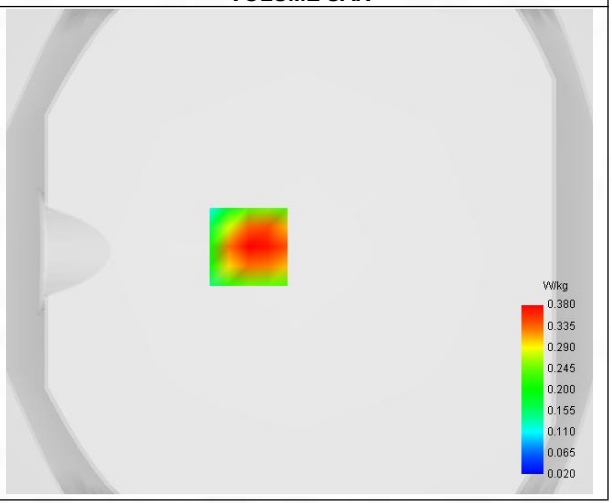
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.24
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	5x5x7,dx=8mm dy=8mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	LTE band 13
Channels/Frequency	Middle (23230)/ frequency 782.000 Mhz
Signal	LTE FDD
Cell Bandwidth	10 Mhz
Modulation	SC-OFDM - QPSK
RB offset	0
RB size	1

B. Permitivity

Middle TX Frequency (MHz)	777.590
Relative permitivity (real part)	41.899
Relative permitivity (imaginary part)	20.732
Conductivity (S/m)	0.889

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-21.00, Y=2.00 ; SAR Peak: 0.51 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.232
SAR 1g (W/Kg)	0.362
Variation (%)	-2.440
Horizontal validation criteria: minimum distance (mm)	17.888544
Vertical validation criteria: SAR ratio M2/M1 (%)	68.323559

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.509	0.380	0.260	0.177	0.120	0.083	0.060

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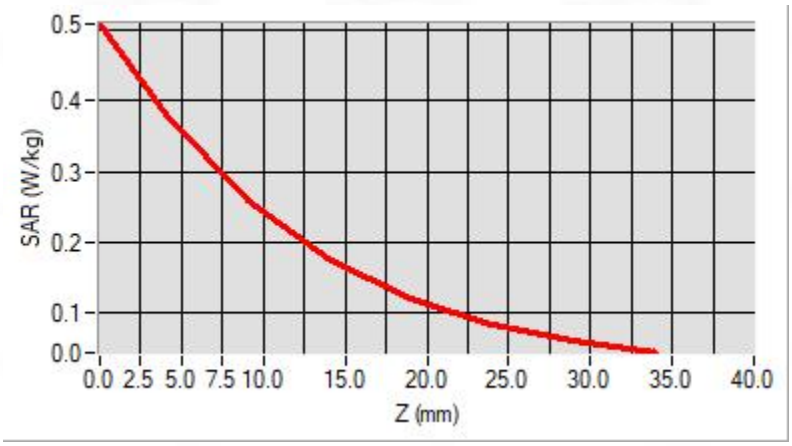
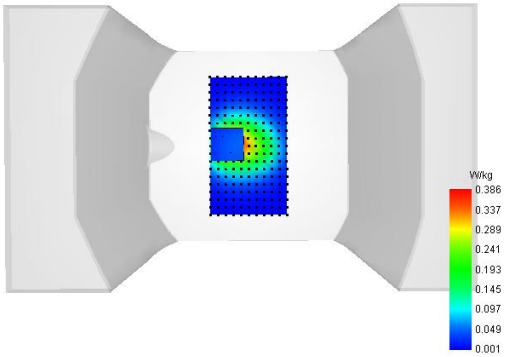
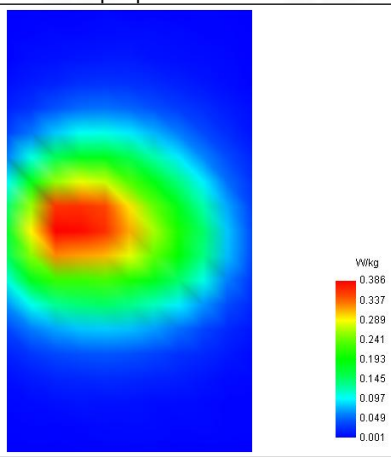


F. 3D Image

3D screen shot	Hot spot position
	

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3-Body-worn: front position in dist. 10mm Channel 11 in IEEE 802.11b ISM

SAR Measurement at ISM (Body, Validation Plane)

Date of measurement: 9/12/2025

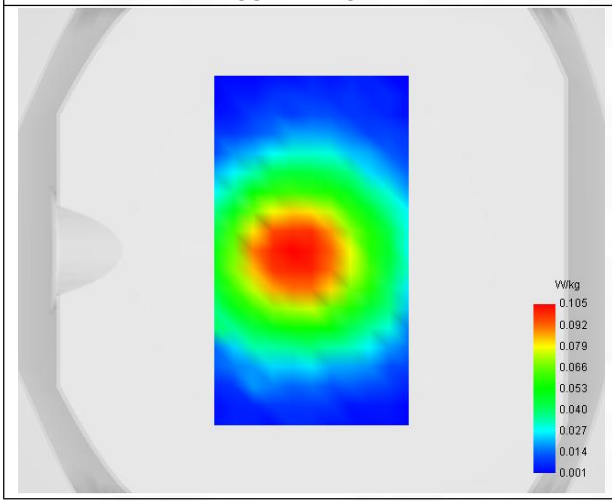
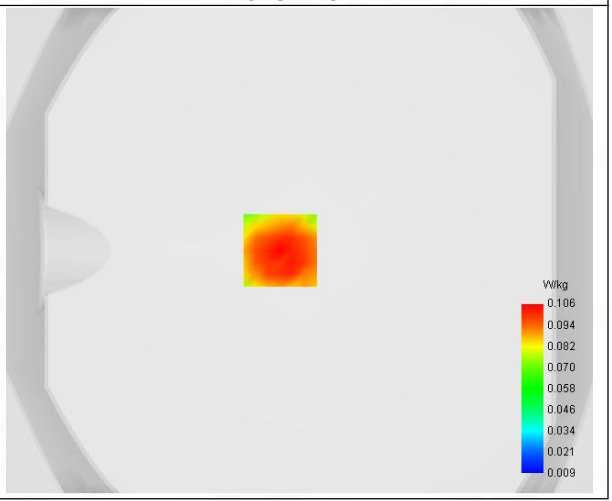
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.40
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	ISM
Channels/Frequency	Higher(11)/ frequency 2462.000 Mhz
Signal	IEEE 802.11 b

B. Permitivity

Middle TX Frequency (MHz)	2462.000
Relative permitivity (real part)	38.749
Relative permitivity (imaginary part)	13.536
Conductivity (S/m)	1.863

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=0.00 ; SAR Peak: 0.14 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.070
SAR 1g (W/Kg)	0.099
Variation (%)	-2.470
Horizontal validation criteria: minimum distance (mm)	10.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	73.466446

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.138	0.106	0.078	0.055	0.042	0.033	0.024

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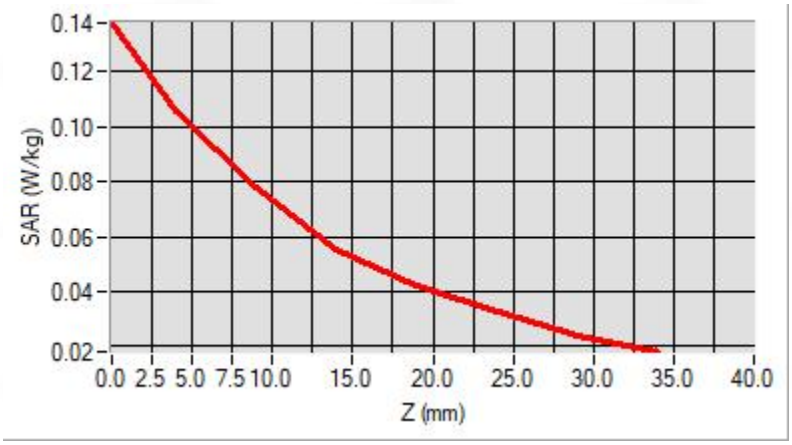
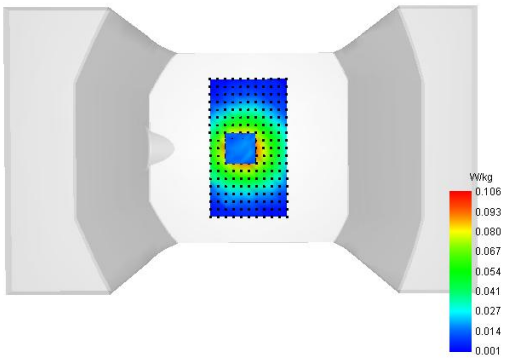
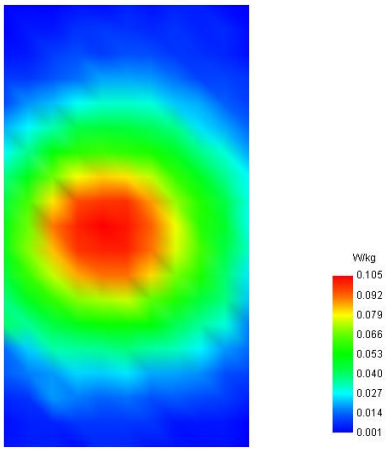


F. 3D Image

3D screen shot	Hot spot position
	

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4-Body-worn: front position in dist. 10mm Channel 39 in BLE

SAR Measurement at Bluetooth (Body, Validation Plane)

Date of measurement: 9/12/2025

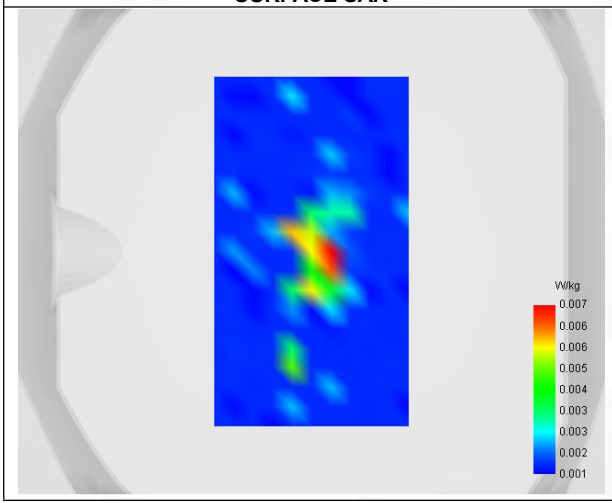
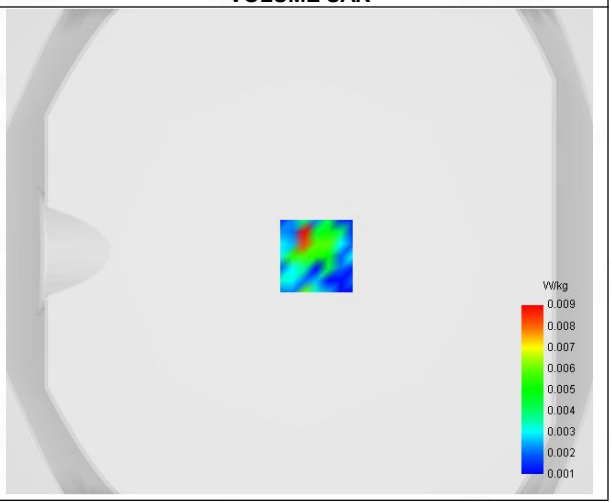
A. Experimental conditions.

Probe	0125-EPGO-445
ConvF	1.40
Area Scan	dx=8mm dy=8mm, Complete
Zoom Scan	7x7x7,dx=5mm dy=5mm dz=5.0mm,Complete
Phantom	Validation plane
Device Position	Body
Band	Bluetooth
Channels/Frequency	Middle (39)/ frequency 2480.000 Mhz
Signal	Bluetooth

B. Permitivity

Middle TX Frequency (MHz)	2480.000
Relative permitivity (real part)	38.731
Relative permitivity (imaginary part)	13.380
Conductivity (S/m)	1.880

C. SAR Surface and Volume

SURFACE SAR	VOLUME SAR
	

Maximum location: X=7.00, Y=-2.00 ; SAR Peak: 0.02 W/kg

D. SAR 1g & 10g

SAR 10g (W/Kg)	0.003
SAR 1g (W/Kg)	0.007
Variation (%)	0.230
Horizontal validation criteria: minimum distance (mm)	10.000000
Vertical validation criteria: SAR ratio M2/M1 (%)	25.992208

E. Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.024	0.009	0.002	0.002	0.002	0.002	0.002

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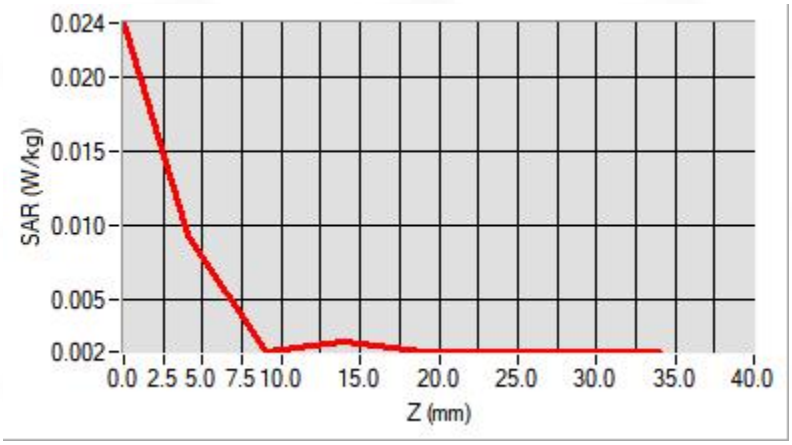
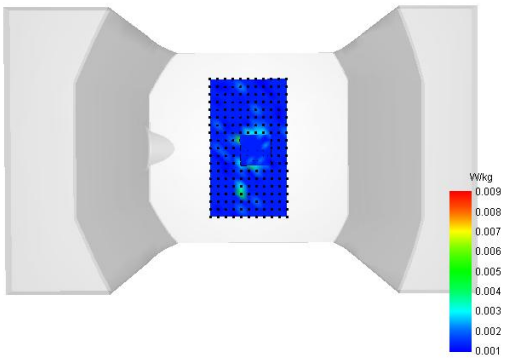
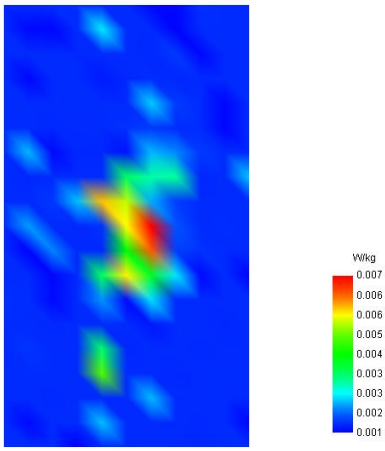


F. 3D Image

3D screen shot	Hot spot position
	

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ANNEX D SAR Test Setup Photos

Reference Photo: simulation liquid depth 15.9cm
Please refer to the document “ANNEX D SAR Test Setup Photos.pdf”.

ANNEX E EUT External and Internal Photos

Please refer to RF Report.

ANNEX F Calibration Information

Please refer to the document “Calibration.pdf”.

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