

FCC SAR Compliance Test Report

For

TECNO MOBILE LIMITED

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET

FOTAN NT HONGKONG

Model: K16SAA

Test Engineer: Zeng Longhao *Zeng Longhao*

Report Number: WSCT-ANAB-R&E240700030A-SAR

Report Date: 28 November 2024

FCC ID: 2ADYY-K16SAA

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Modified History

REV.	Modification Description	Issued Date	Remark
REV.1.0	Initial Test Report Release	28 November 2024	Li Huaibi

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in this test report. QTC Certification & Testing Co., Ltd. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report is not to be reproduced or published in full, without the prior written permission.

1.2 Application details

Date of receipt of test item: 2024-07-10
Start of test: 2024-07-12
End of test: 2024-12-20

1.3 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for K16SAA is as below:

Band	Position	MAX ReportedSAR _{1g} (W/kg)	Limit (W/kg)
2.4G WIFI	Body-Worn 0mm	0.222	1.6
5.2G WIFI	Body-Worn 0mm	0.835	
5.4G WIFI	Body-Worn 0mm	0.688	
5.6G WIFI	Body-Worn 0mm	0.622	
5.8G WIFI	Body-Worn 0mm	0.352	
WIFI6E	Body-Worn 0mm	0.191	
BT	Body-Worn 0mm	0.102	
Max.Simultaneous Transmission SAR(W/kg)			
Items	Body SAR (Gap 0mm)		1.6
Sum SAR	0.937		

The device is in compliance with Specific Absorption Rate(SAR) for general population/uncontrolled exposure limits of 1.6W/Kg as averaged over any 1g tissue according to the FCC rule§2.1093,the

ANSI/IEEEC95.1:2005,the NCRP Report Number 86 forun controlled environment,according to the Industry Canada Radio Standards Specification RSS-102 for General Population/ Uncontrolled exposure, and had been tested in accordance with the measurement methods and proceduresspecified in IEEE Std1528-2013.

1.4 EUT Information

Device Information:			
Product Type:	Laptop Computer		
Model:	K16SAA		
Brand Name:	TECNO		
Device Type:	Portable device		
Exposure Category:	uncontrolled environment / general population		
Production Unit or Identical Prototype:	Production Unit		
Antenna Type :	BT: Integral Antenna 2.4G,5GWIFI: Integral Antenna WIFI6E: FIPA Antenna		
Antenna Gain:	BT: 3.46dBi 2.4GWIFI: MAIN ANT: 3.46dBi /AUX ANT: 3.01 dBi 5GWIFI: MAIN ANT: 2.02dBi /AUX ANT: 2.14 dBi WIFI6E: MAIN ANT: 0.65dBi /AUX ANT: 0.21 dBi		
Device Operating Configurations:			
Supporting Mode(s) :	Wi-Fi , BT		
Modulation:	DSSS, OFDM/OFDMA GFSK/π/4-DQPSK/ 8-DPSK, GFSK		
Device Class :	Class B, No DTM Mode		
Operating Frequency Range(s):	Band	TX(MHz)	RX(MHz)
	Wi-Fi	2412~2462	
	Wi-Fi (5G)	Band 1: 5180-5240 MHz	
		Band 2: 5260-5320 MHz	
		Band 3: 5500-5700 MHz	
		Band 4: 5745-5825 MHz	
Wi-Fi6E	U-NII-5: 5925-6425MHz		
	U-NII-6: 6425-6525MHz		
	U-NII-7: 6525-6875MHz		
	U-NII-8: 6875-7125MHz		
BT	2402~2480	2402~2480	
Power Source:	Rechargeable Li-ion Polymer Battery: K16S Nominal Voltage: 11.55V Rated Capacity: 6060mAh Rated nergy:70.00Wh Limited Charge Voltage: 13.2V		

Note:

- The test results of this test report relate exclusively to the test item specified in this test report. World Standardization Certification & Testing Group (Shenzhen) Co., Ltd does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report is not to be reproduced or published in full without the prior written permission.
- Per KDB 616217 D04 SAR for laptop and tablets, The standalone and simultaneous transmission SAR tests required for tablets are more conservative than the hotspot mode use configurations; therefore, additional testing for hotspot SAR is not required.

2 Testing laboratory

Test Site	World Standardization Certification & Testing Group (Shenzhen) Co., Ltd.
Test Location	Building A-B, Baoli'an Industrial Park, No.58 and 60, Tangtou Avenue, Shiyan Street, Bao'an District, Shenzhen City, Guangdong Province, China
Telephone	+86-755-26996192
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3 ACCREDITATIONS

ANAB - Certificate Number: AT-3951

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (ANAB). Certification Number: AT-3951

4 Test Environment

	Required	Actual
Ambient temperature:	18 – 25 °C	22 ± 2 °C
Tissue Simulating liquid:	22 ± 2 °C	22 ± 2 °C
Relative humidity content:	30 – 70 %	30 – 70 %

5 Applicant and Manufacturer

Applicant/Client Name:	TECNO MOBILE LIMITED
Applicant Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG
Manufacturer Name:	TECNO MOBILE LIMITED
Manufacturer Address:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG

6 Test standard/s:

IEC/IEEE 62209-1528	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate(SAR) in the Human Head from Wireless Communications Devices:Measurement Techniques
RSS-102	Radio Frequency Exposure Compliance of Radio communication Apparatus (All Frequency Bands(Issue 5 March 2015)
KDB447498 D01	General RF Exposure Guidance v06
KDB616217 D04	SAR for laptop and tabletsv01r03
KDB248227D01	SARmeas for 802.11a/b/g v02r02
KDB865664D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB865664D02	RF Exposure Reporting v01r02

6.1 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain/Body/Arms/Legs)	1.60mW/g	8.00mW/g
Spatial Average SAR** (Whole Body)	0.08mW/g	0.40mW/g
Spatial Peak SAR*** (Heads/Feet/Ankle/Wrist)	4.00mW/g	20.00mW/g

The limit applied in this test report is shown in bold letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

6.2 SAR Definition

Specific Absorption Rate is defined as 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).

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

SAR is expressed in units of watts per kilogram (W/kg). SAR can be related to the electric field at a point by

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

where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m³)

E = rms electric field strength (V/m)

7 SAR Measurement System

7.1 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
- Device 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.

7.2 Robot

The COMOSAR system uses the high precision robots KR 6 R900 sixx type out of the newer series from Satimo SA (France). Forthe 6-axis controller COMOSAR system, the KUKA robot controller version from Satimo is used. The KR 6 R900 sixx robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

7.3 Probe

For themeasurements the Specific Dosimetric E-Field Probe SSE 5 with following specifications is used



Figure 1 – MVG COMOSAR Dosimetric E field Dipole

- Dynamic range: 0.01-100W/kg

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles/ probe extremity	2.7 mm

- Calibration range: 300MHz to 3GHz for head & body simulating liquid.

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



Figure 2 – MVG COMOSAR Dosimetric E field Dipole

- Dynamic range: 0.01-100W/kg

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

- Calibration range: 0.15GHz to 7.5GHz for head & body simulating liquid.

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

7.4 Measurement procedure

The following steps are used for each test position

- 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.
- Measurement of the local E-field value at a fixed location. This value serves as a reference value for calculating a possible power drift.
- Measurement of the SAR distribution with a grid of 8 to 16 mm * 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors can not directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme.
- Around this point, a cube of 30 * 30 * 30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8 * 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

7.5 Description of interpolation/extrapolation scheme

- The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.
- An extrapolation is used to 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 1 mm step.
- The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR average over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

7.6 Phantom

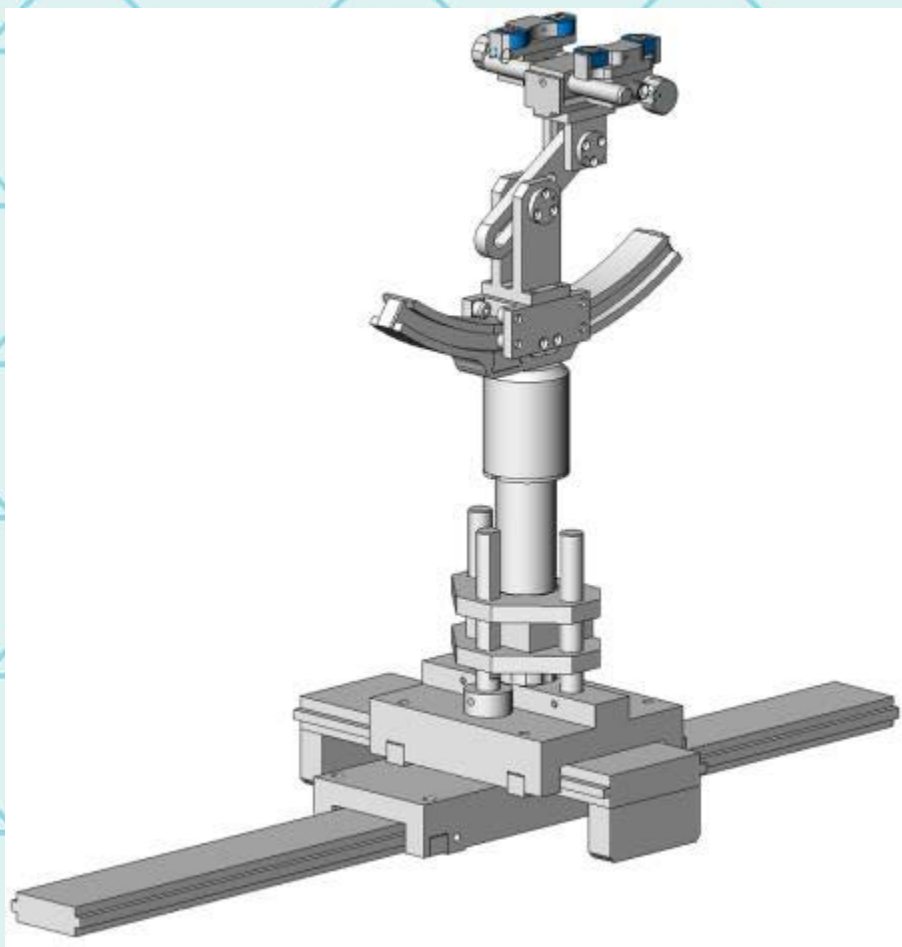
For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a woodentable. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and 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.



System Material	Permittivity	Loss Tangent
Delrin	3.7	0.005

7.7 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°.



Deviceholder

SystemMaterial	Permittivity	LossTangent
Delrin	3.7	0.005

7.8 Video Positioning System

- The video positioning system is used in OpenSAR to check the probe. Which is composed of a camera, LED, mirror and mechanical parts. The camera is piloted by the main computer with firewire link.
- During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
- The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.



7.9 Tissue simulating liquids: dielectric properties

The following materials are used for producing the tissue-equivalent materials.

(Liquids used for tests are marked with ☒):

Ingredients(% of weight)	Frequency (MHz)				
frequency band	☐ 450	☐ 835	☐ 1800	☐ 1900	☐ 2450
Tissue Type	Head	Head	Head	Head	Head
Water	38.56	41.45	52.64	55.242	62.7
Salt (NaCl)	3.95	1.45	0.36	0.306	0.5
Sugar	56.32	56.0	0.0	0.0	0.0
HEC	0.98	1.0	0.0	0.0	0.0
Bactericide	0.19	0.1	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	36.8
DGBE	0.0	0.0	47.0	44.542	0.0
Ingredients(% of weight)	Frequency (MHz)				
frequency band	☐ 450	☒ 835	☐ 1800	☐ 1900	☒ 2450
Tissue Type	Body	Body	Body	Body	Body
Water	51.16	52.4	69.91	69.91	73.2
Salt (NaCl)	1.49	1.40	0.13	0.13	0.04
Sugar	46.78	45.0	0.0	0.0	0.0
HEC	0.52	1.0	0.0	0.0	0.0
Bactericide	0.05	0.1	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	29.96	29.96	26.7

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

☐ Simulating Head Liquid for 5G(HBBL3500-5800MHz), Manufactured by SPEAG:

Ingredients	(% by weight)
Water	50-65%
Mineral oil	10-30%
Emulsifiers	8-25%
Sodium salt	0-1.5%

☒ Simulating Body Liquid for 5G(MBBL3500-5800MHz), Manufactured by SPEAG:

Ingredients	(% by weight)
Water	60-80%
Esters, Emulsifiers, Inhibitors	20-40%
Sodium salt	0-1.5%

7.10 Tissue simulating liquids: parameters

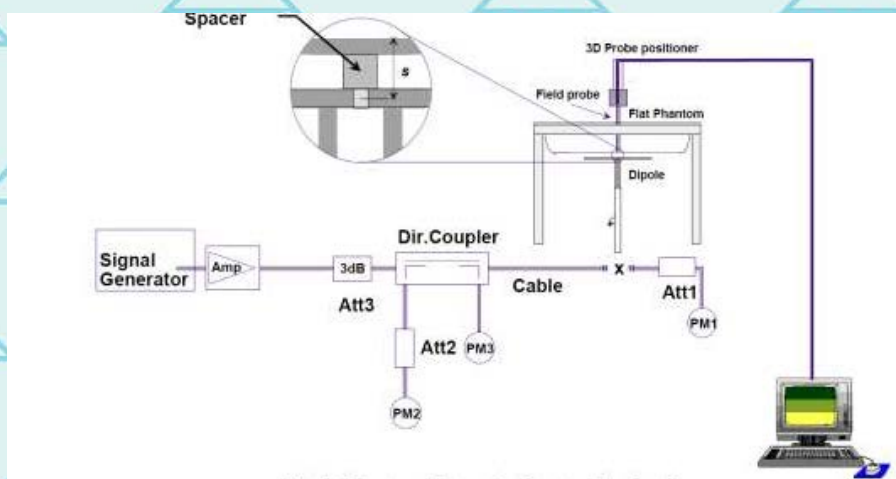
Used Target Frequency	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
	ϵ_r (+/-5%)	σ (S/m) (+/-5%)	ϵ_r	σ (S/m)		
2450MHz Head	39.20 (37.24~41.16)	1.80 (1.71~1.89)	40.27	1.82	21.6°C	2024-09-02
5200MHz Head	36.00 (34.20~37.80)	4.66 (4.43~4.89)	35.62	4.52	21.6°C	2024-09-02
5500MHz Head	35.60 (33.82~37.38)	4.96 (4.71~5.20)	36.11	5.02	21.6°C	2024-09-02
5800MHz Head	35.30 (33.54~37.06)	5.27 (5.01~5.53)	34.63	5.16	21.6°C	2024-09-02
6500MHz Head	34.50 (32.78~36.22)	6.07 (5.77~6.37)	34.00	6.08	21.6°C	2024-11-28
ϵ_r = Relative permittivity, σ = Conductivity						

8 System Check

8.1 System check procedure

The System check is performed by using a System check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 100 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the System check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



8.2 System check results

The system Check is performed for verifying the accuracy of the complete measurement system and performance of the software. The following table shows System check results for all frequency bands and tissue liquids used during the tests (plot(s) see annex A).

System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
D2450V2 Body	52.40 (47.16~57.64)	24.00 (21.60~26.40)	54.33	23.33	21.6°C	2024-09-02
D5200V2 Body	76.50 (68.85~84.15)	21.60 (19.44~23.76)	77.18	22.64	21.6°C	2024-09-02
D5500V2 Body	83.30 (74.97~91.63)	23.40 (21.06~25.74)	83.37	22.82	21.6°C	2024-09-02
D5800V2 Body	78.00 (70.20~85.50)	21.90 (19.71~24.09)	79.66	20.80	21.6°C	2024-09-02
D6.5GHzV2 Body	289.00 (260.10~317.90)	53.40 (48.06~58.74)	297.00	55.80	21.6°C	2024-11-28

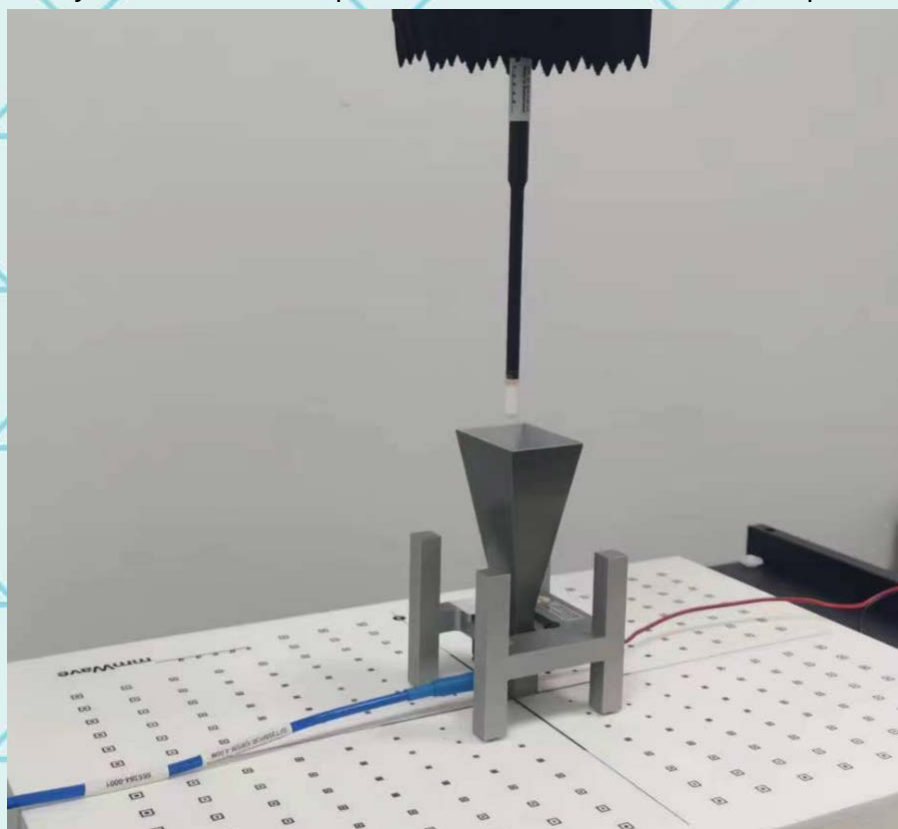
Note:

1. All SAR values are normalized to 1W forward power.
2. The forward power of Dipole antenna is actually 20db (100mw), so the actual measured value differs from the table data by 10 times

8.3 Power Density Test System Verification

The system was verified to be within ± 0.66 dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes



System Verification Setup Photo

Frequency (GHz)	5G Verification Source	Test Date	Distance (mm)	Measured 4cm ² (W/m ²)	Targeted 4cm ² (W/m ²)	Deviation (dB)
10	10GHz-	2024/11/28	10	51.6	50	0.03

Detailed System Check Results Please see the annex D.

9 SAR Test Test Configuration

9.1 Wi-Fi Test Configuration

For the 802.11b/g SAR tests, a communication link is set up with the test mode software for Wi-Fi mode test. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1, 6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. 802.11b/g operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g modes are tested on channel 1, 6, 11; however, if output power reduction is necessary for channels 1 and/or 11 to meet restricted band requirements the highest output channel closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	2412	1#	√	△
		2437	6	√	△
		2462	11#	√	△

Notes:

√ = "default test channels"

△ = possible 802.11g channels with maximum average output ¼ dB the "default test channels"

= when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

802.11 Test Channels per FCC Requirements

9.2 WiFi 5G SAR Test Procedures

A) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.

2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50.

Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

B) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

C) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

- 1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
- 2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
- 3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
- 4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n. After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement procedures or additional power measurements required for further SAR test reduction. The same procedures also apply to subsequent highest output power channel(s) selection.

- 1) The channel closest to mid-band frequency is selected for SAR measurement.
- 2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

D) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/n/ac OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

9.3 RF Exposure Limits for Frequencies Above 6 GHz

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of W/m^2 or mW/cm^2 .

Peak Spatially Averaged Power Density was evaluated over a circular area of 4 cm^2 per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

Human Exposure Limits Specified in FCC 47 CFR §1.1310

Human Exposure to Radiofrequency (RF) Radiation Limits		
Frequency Range [MHz]	Power Density [mW/cm^2]	Average Time [Minutes]
(A) Limits For Occupational / Controlled Environments		
1,500 – 100,000	5.0	6
(B) Limits For General Population / Uncontrolled Environments		
1,500 – 100,000	1.0	30

Note: 1.0 mW/cm^2 is 10 W/m^2

9.4 Miscellaneous Testing Considerations

Per FCC guidance, SAR was performed using 6.5 GHz SAR probe calibration factors. FCC KDB 648474 and FCC KDB 248227 were followed for test positions, distances, and modes. Per TCB workshop October 2020 notes, 5 channels were tested. Absorbed power density (APD) using a 4 cm^2 averaging area is reported based on SAR measurements. Incident power density is evaluated at 2 mm ensuring that the resolution is sufficient such that integrated power density (iPD) between $d=2\text{ mm}$ and $d=15\text{ mm}$ varies by $< 1\text{ dB}$ per equipment manufacturer guidance. Power density results are scaled up for uncertainty above 30%.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160 mm and less than 200 mm . Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router $1\text{ g SAR} > 1.2\text{ W/kg}$.

6 GHz WIFI SAR results are used for simultaneous transmission analysis with the other transmitters and total exposure ratio (TER). Analysis can be found in SAR report and Near Field PD Report.

10 Detailed Test Results

10.1 Conducted Power measurements

The measuring conducted average power (Unit: dBm) is shown as below.

10.1.1 Conducted Power of Wi-Fi 2.4G

MAIN ANT1

Mode	802.11b		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	18.13	18.13	17.25
Mode	802.11g		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	20.52	20.53	19.77
Mode	802.11n(HT20)		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	19.63	17.13	16.23
Mode	802.11n(HT40)		
Channel/Frequency(MHz)	3(2422)	6(2437)	9(2452)
Average Power(dBm)	14.00	14.38	15.52
Mode	802.11ax 20		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	17.20	16.39	17.62
Mode	802.11ax40		
Channel/Frequency(MHz)	3(2422)	6(2437)	9(2452)
Average Power(dBm)	16.90	16.94	16.31

AUX ANT2

Mode	802.11b		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	16.22	15.89	15.79
Mode	802.11g		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	18.76	18.95	18.77
Mode	802.11n(HT20)		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	17.72	17.78	17.63
Mode	802.11n(HT40)		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	18.14	18.17	18.03
Mode	802.11ax 20		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	17.87	16.75	16.74
Mode	802.11ax 40		
Channel/Frequency(MHz)	3(2422)	6(2437)	9(2452)
Average Power(dBm)	17.17	16.90	17.15

MIMO Mode

Mode	802.11n(HT20)		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	21.79	20.48	20.00
Mode	802.11n(HT40)		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	19.56	19.69	19.96
Mode	802.11ax 20		
Channel/Frequency(MHz)	1(2412)	6(2437)	11(2462)
Average Power(dBm)	20.56	19.58	20.21
Mode	802.11ax 40		
Channel/Frequency(MHz)	3(2422)	6(2437)	9(2452)
Average Power(dBm)	20.05	19.93	19.76

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

(1) For handsets operating next to ear, hotspot mode or mini-tablet configurations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When the reported SAR of initial test position is ≤ 0.4 W/kg, SAR testing for remaining test positions is not required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

(2) For Wi-Fi 2.4 GHz, the highest measured maximum output power channel for DSSS was selected for SAR measurement. When the reported SAR is ≤ 0.8 W/kg, no further SAR testing is required. Otherwise, SAR is evaluated at the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel. For OFDM modes (802.11g/n), SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and it is ≤ 1.2 W/kg.

10.1.2 Conducted Power of Wi-Fi 5G

Ant 1						
Band	Mode	Channel	Frequency(MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-1 (5150-5250)	802.11a	36	5180	14.00 ± 1.0	13.93	No
		48	5240	13.50 ± 1.0	13.30	No
	802.11n-HT20	36	5180	14.50 ± 1.0	14.41	Yes
		48	5240	14.00 ± 1.0	13.62	No
	802.11n-HT40	38	5190	12.00 ± 1.0	11.74	No
		46	5230	11.50 ± 1.0	11.07	No
	802.11ac-VHT20	36	5180	12.50 ± 1.0	12.42	No
		48	5240	12.50 ± 1.0	12.10	No
	802.11ac-VHT40	38	5190	11.50 ± 1.0	11.05	No
		46	5230	10.00 ± 1.0	9.69	No
	802.11ac-VHT80	42	5210	9.50 ± 1.0	9.38	No
		36	5180	13.00 ± 1.0	12.91	No
	802.11ax-HT20	48	5240	12.50 ± 1.0	12.30	No
		38	5190	13.50 ± 1.0	13.06	No
	802.11ax-HT40	46	5230	13.00 ± 1.0	12.63	No
		42	5210	12.50 ± 1.0	12.37	No
	802.11ax-HT160	50	5250	9.50 ± 1.0	9.08	No
Ant 2						
Band	Mode	Channel	Frequency(MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-1 (5150-5250)	802.11a	36	5180	11.00 ± 1.0	10.87	No
		48	5240	11.50 ± 1.0	11.22	No
	802.11n-HT20	36	5180	10.50 ± 1.0	10.22	No
		48	5240	10.00 ± 1.0	9.95	No
	802.11n-HT40	38	5190	9.50 ± 1.0	9.07	No
		46	5230	8.50 ± 1.0	8.28	No
	802.11ac-VHT20	36	5180	10.50 ± 1.0	10.3	No
		48	5240	11.00 ± 1.0	10.8	No
	802.11ac-VHT40	38	5190	9.50 ± 1.0	9.18	No
		46	5230	9.50 ± 1.0	9.18	No
	802.11ac-VHT80	42	5210	15.00 ± 1.0	14.74	Yes
		36	5180	10.00 ± 1.0	9.86	No
	802.11ax-HT20	48	5240	10.00 ± 1.0	9.88	No
		38	5190	10.00 ± 1.0	9.97	No
	802.11ax-HT40	46	5230	10.50 ± 1.0	10.43	No
		42	5210	9.50 ± 1.0	9.19	No
	802.11ax-HT160	50	5250	14.00 ± 1.0	13.80	No
MIMO						
Band	Mode	Channel	Frequency(MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-1 (5150-5250)	802.11n-HT20	36	5180	16.00 ± 1.0	15.81	No
		48	5240	15.50 ± 1.0	15.17	No
	802.11n-HT40	38	5190	14.00 ± 1.0	13.62	No
		46	5230	13.00 ± 1.0	12.91	No
	802.11ac-VHT20	36	5180	14.50 ± 1.0	14.50	No
		48	5240	15.00 ± 1.0	14.51	No
	802.11ac-VHT40	38	5190	13.50 ± 1.0	13.23	No
		46	5230	12.50 ± 1.0	12.45	No
	802.11ac-VHT80	42	5210	16.00 ± 1.0	15.85	Yes
		36	5180	15.00 ± 1.0	14.66	No
	802.11ax-HT20	48	5240	14.50 ± 1.0	14.27	No
		38	5190	15.00 ± 1.0	14.79	No
	802.11ax-HT40	46	5230	15.00 ± 1.0	14.68	No
		42	5210	14.50 ± 1.0	14.08	No
	802.11ax-HT160	50	5250	15.50 ± 1.0	15.06	No

Ant 1						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-2a (5250-5350)	802.11a	52	5260	14.00 ±1.0	13.66	No
		64	5320	14.50 ±1.0	14.28	No
	802.11n-HT20	52	5260	14.00 ±1.0	13.72	No
		64	5320	14.50 ±1.0	14.43	Yes
	802.11n-HT40	54	5270	11.50 ±1.0	11.18	No
		62	5310	11.50 ±1.0	11.11	No
	802.11ac-VHT20	52	5260	13.00 ±1.0	12.82	No
		64	5320	13.50 ±1.0	13.23	No
	802.11ac-VHT40	54	5270	11.00 ±1.0	10.78	No
		62	5310	11.50 ±1.0	11.03	No
	802.11ac-VHT80	58	5290	9.50 ±1.0	9.47	No
	802.11ax-HT20	52	5260	13.00 ±1.0	12.63	No
		64	5320	13.50 ±1.0	13.26	No
	802.11ax-HT40	54	5270	13.00 ±1.0	12.97	No
62		5310	14.00 ±1.0	13.51	No	
802.11ax-HT80	58	5290	12.50 ±1.0	12.41	No	
Ant 2						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-2a (5250-5350)	802.11a	52	5260	11.50 ±1.0	11.29	No
		64	5320	11.00 ±1.0	10.81	No
	802.11n-HT20	52	5260	10.50 ±1.0	10.30	No
		64	5320	10.00 ±1.0	9.70	No
	802.11n-HT40	54	5270	9.00 ±1.0	8.91	No
		62	5310	9.00 ±1.0	8.99	No
	802.11ac-VHT20	52	5260	11.00 ±1.0	10.89	No
		64	5320	11.00 ±1.0	10.64	No
	802.11ac-VHT40	54	5270	10.50 ±1.0	10.30	No
		62	5310	9.50 ±1.0	9.33	No
	802.11ac-VHT80	58	5290	17.00 ±1.0	16.59	Yes
	802.11ax-HT20	52	5260	10.50 ±1.0	10.18	No
		64	5320	10.00 ±1.0	9.70	No
	802.11ax-HT40	54	5270	11.00 ±1.0	10.84	No
62		5310	10.00 ±1.0	9.78	No	
802.11ax-HT80	58	5290	9.50 ±1.0	9.44	No	
MIMO						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
	802.11n-HT20	52	5260	15.50 ±1.0	15.35	No
		64	5320	16.00 ±1.0	15.69	No
	802.11n-HT40	54	5270	13.50 ±1.0	13.20	No
		62	5310	13.50 ±1.0	13.19	No
U-NII-2a (5250-5350)	802.11ac-VHT20	52	5260	15.00 ±1.0	14.97	No
		64	5320	15.50 ±1.0	15.14	No
	802.11ac-VHT40	54	5270	14.00 ±1.0	13.56	No
		62	5310	13.50 ±1.0	13.27	No
	802.11ac-VHT80	58	5290	17.50 ±1.0	17.36	Yes
	802.11ax-HT20	52	5260	15.00 ±1.0	14.59	No
		64	5320	15.00 ±1.0	14.85	No
	802.11ax-HT40	54	5270	15.50 ±1.0	15.04	No
		62	5310	15.50 ±1.0	15.04	No
	802.11ax-HT80	58	5290	14.50 ±1.0	14.18	No

Ant 1						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-2c (5470-5725)	802.11a	100	5500	12.50 ± 1.0	12.13	No
		140	5700	13.00 ± 1.0	12.70	No
	802.11n-HT20	100	5500	12.50 ± 1.0	12.22	No
		140	5700	13.00 ± 1.0	12.91	No
	802.11n-HT40	102	5510	12.00 ± 1.0	12.00	No
		134	5670	12.50 ± 1.0	12.34	No
	802.11ac-VHT20	100	5500	11.50 ± 1.0	11.24	No
		140	5700	11.50 ± 1.0	11.05	No
	802.11ac-VHT40	102	5510	10.50 ± 1.0	10.05	No
		134	5670	10.50 ± 1.0	10.02	No
	802.11ac-VHT80	106	5530	9.00 ± 1.0	8.89	No
		122	5610	9.50 ± 1.0	9.06	No
	802.11ax-HT20	100	5500	12.00 ± 1.0	11.88	No
		140	5700	12.00 ± 1.0	11.81	No
	802.11ax-HT40	102	5510	12.50 ± 1.0	12.41	No
		134	5670	13.00 ± 1.0	12.90	No
	802.11ax-HT80	106	5530	13.00 ± 1.0	12.94	Yes
		122	5610	12.50 ± 1.0	12.15	No
	802.11ax- HT160	114	5570	10.50 ± 1.0	10.29	No
Ant 2						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-2c (5470-5725)	802.11a	100	5500	10.00 ± 1.0	9.61	No
		140	5700	10.50 ± 1.0	10.07	No
	802.11n-HT20	100	5500	9.00 ± 1.0	8.52	No
		140	5700	9.00 ± 1.0	8.81	No
	802.11n-HT40	102	5510	9.50 ± 1.0	9.08	No
		134	5670	10.00 ± 1.0	9.98	No
	802.11ac-VHT20	100	5500	9.00 ± 1.0	8.92	No
		140	5700	9.00 ± 1.0	8.88	No
	802.11ac-VHT40	102	5510	9.00 ± 1.0	8.87	No
		134	5670	10.00 ± 1.0	9.99	No
	802.11ac-VHT80	106	5530	12.50 ± 1.0	12.28	No
		122	5610	16.00 ± 1.0	15.90	Yes
	802.11ax-HT20	100	5500	8.50 ± 1.0	8.45	No
		140	5700	9.00 ± 1.0	8.96	No
	802.11ax-HT40	102	5510	8.50 ± 1.0	8.42	No
		134	5670	9.50 ± 1.0	9.26	No
	802.11ax-HT80	106	5530	8.50 ± 1.0	8.43	No
		122	5610	9.50 ± 1.0	9.25	No
	802.11ax- HT160	114	5570	7.50 ± 1.0	7.12	No
MIMO						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)	SAR Test (Yes/No)
U-NII-2c (5470-5725)	802.11n-HT20	100	5500	14.00 ± 1.0	13.76	No
		140	5700	14.50 ± 1.0	14.34	No
	802.11n-HT40	102	5510	14.00 ± 1.0	13.79	No
		134	5670	14.50 ± 1.0	14.33	No
	802.11ac-VHT20	100	5500	13.50 ± 1.0	13.24	No
		140	5700	13.50 ± 1.0	13.11	No
	802.11ac-VHT40	102	5510	13.00 ± 1.0	12.51	No
		134	5670	13.50 ± 1.0	13.02	No
	802.11ac-VHT80	106	5530	14.00 ± 1.0	13.92	No
		122	5610	17.00 ± 1.0	16.72	Yes
	802.11ax-HT20	100	5500	14.00 ± 1.0	13.51	No
		140	5700	14.00 ± 1.0	13.63	No
	802.11ax-HT40	102	5510	14.00 ± 1.0	13.87	No
		134	5670	14.50 ± 1.0	14.46	No
	802.11ax-HT80	106	5530	14.50 ± 1.0	14.26	No
		122	5610	14.00 ± 1.0	13.95	No
	802.11ax- HT160	114	5570	12.50 ± 1.0	12.00	No

Ant 1						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Powe(dBm)	SAR Test (Yes/No)
U-NII-3 (5725-5825)	802.11a	149	5745	15.00 ±1.0	14.84	No
		165	5825	14.00 ±1.0	13.82	No
	802.11n-HT20	149	5745	13.00 ±1.0	12.97	No
		165	5825	14.50 ±1.0	14.11	No
	802.11n-HT40	151	5755	12.00 ±1.0	11.72	Yes
		159	5795	13.00 ±1.0	12.57	No
	802.11ac-VHT20	149	5745	13.00 ±1.0	12.76	No
		165	5825	12.50 ±1.0	12.46	No
	802.11ac-VHT40	151	5755	10.50 ±1.0	10.43	No
		159	5795	11.50 ±1.0	11.14	No
	802.11ac-VHT80	155	5775	9.00 ±1.0	8.90	No
		149	5745	12.50 ±1.0	12.43	No
802.11ax-HT20	165	5825	13.00 ±1.0	12.91	No	
	151	5755	12.50 ±1.0	12.36	No	
802.11ax-HT40	159	5795	14.00 ±1.0	13.60	No	
	155	5775	12.50 ±1.0	12.43	No	
Ant 2						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Powe(dBm)	SAR Test (Yes/No)
U-NII-3 (5725-5825)	802.11a	149	5745	10.00 ±1.0	9.98	No
		165	5825	10.50 ±1.0	10.18	No
	802.11n-HT20	149	5745	9.00 ±1.0	8.55	No
		165	5825	9.50 ±1.0	9.39	No
	802.11n-HT40	151	5755	9.50 ±1.0	9.36	Yes
		159	5795	10.00 ±1.0	9.67	No
	802.11ac-VHT20	149	5745	9.50 ±1.0	9.48	No
		165	5825	9.50 ±1.0	9.43	No
	802.11ac-VHT40	151	5755	9.00 ±1.0	8.84	No
		159	5795	9.50 ±1.0	9.25	No
	802.11ac-VHT80	155	5775	11.50 ±1.0	11.26	No
		149	5745	9.00 ±1.0	8.65	No
802.11ax-HT20	165	5825	9.50 ±1.0	9.12	No	
	151	5755	9.50 ±1.0	9.06	No	
802.11ax-HT40	159	5795	9.50 ±1.0	9.24	No	
	155	5775	8.50 ±1.0	8.27	No	
MIMO						
Band	Mode	Channel	Frequency (MHz)	Tune-up	Average Powe(dBm)	SAR Test (Yes/No)
U-NII-3 (5725-5825)	802.11n-HT20	149	5745	14.50 ±1.0	14.31	No
		165	5825	15.50 ±1.0	15.37	Yes
	802.11n-HT40	151	5755	14.00 ±1.0	13.71	Yes
		159	5795	14.50 ±1.0	14.37	No
	802.11ac-VHT20	149	5745	14.50 ±1.0	14.43	No
		165	5825	14.50 ±1.0	14.21	No
	802.11ac-VHT40	151	5755	13.00 ±1.0	12.72	No
		159	5795	13.50 ±1.0	13.31	No
	802.11ac-VHT80	155	5775	13.50 ±1.0	13.25	No
		149	5745	14.00 ±1.0	13.95	No
	802.11ax-HT20	165	5825	14.50 ±1.0	14.43	No
		151	5755	14.50 ±1.0	14.03	No
802.11ax-HT40	159	5795	15.00 ±1.0	14.96	No	
	155	5775	14.00 ±1.0	13.84	No	

<KDB 248227 D01, SAR Guidance for Wi-Fi Transmitters>

For WLAN 5 GHz, the initial test configuration was selected according to the transmission mode with the highest maximum output power. When the reported SAR of initial test configuration is > 0.8 W/kg, SAR is required for the subsequent highest measured output power channel until the reported SAR result is ≤ 1.2 W/kg or all required channels are measured. For other transmission modes, SAR is not required when the highest reported SAR for initial test configuration is adjusted by the ratio of subsequent test configuration to initial test configuration specified maximum output power and it is ≤ 1.2 W/kg.

10.1.3 Conducted Power of Wi-Fi 6E

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

6GHz Wi-Fi U-NII-5 Ant1	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE2	1/5955	10.00	9.48
	45/6175	10.00	9.02
	93/6415	11.00	9.71
802.11ax-HE4	3/5965	10.00	9.44
	43/6165	10.00	9.38
	91/6405	11.00	10.61
802.11ax-HE80	7/5985	12.00	11.29
	39/6145	10.00	8.98
	87/6385	10.00	9.18
802.11ax-HE160	15/6025	10.00	8.05
	47/6185	10.00	8.14
	79/6345	10.00	8.37

Note. Initial test configuration is 802.11ax-HE80 mode.

6GHz Wi-Fi U-NII-5 Ant2	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	1/5955	13.00	12.02
	45/6175	12.50	10.84
	93/6415	13.00	11.54
802.11ax-HE40	3/5965	13.00	12.23
	43/6165	13.00	12.09
	91/6405	14.00	13.25
802.11ax-HE80	7/5985	13.00	11.88
	39/6145	13.00	11.88
	87/6385	13.00	12.76
802.11ax-HE160	15/6025	13.00	11.10
	47/6185	13.00	11.16
	79/6345	13.00	12.37

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-5 MIMO	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	1/5955	15.00	13.94
	45/6175	15.00	13.03
	93/6415	15.00	13.73
802.11ax-HE40	3/5965	15.00	14.07
	43/6165	15.00	13.95
	91/6405	16.00	15.14
802.11ax-HE80	7/5985	15.00	14.61
	39/6145	15.00	13.68
	87/6385	15.00	14.34
802.11ax-HE160	15/6025	14.50	12.85
	47/6185	14.50	12.88
	79/6345	15.00	13.83

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-6 Ant1	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	97/6435	10.50	10.17
	105/6475	9.50	8.13
	113/6515	9.50	8.15
802.11ax-HE4	99/6445	10.50	9.86
	107/6485	10.00	8.40
	115/6525	10.00	9.16
802.11ax-HE80	103/6465	9.50	8.28
	119/6545	9.50	8.03
802.11ax-HE160	111/6505	9.50	8.88

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-6 Ant2	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	97/6435	12.00	10.67
	105/6475	12.00	10.25
	113/6515	12.00	10.45
802.11ax-HE40	99/6445	12.00	11.77
	107/6485	12.00	10.73
	115/6525	12.00	11.38
802.11ax-HE80	103/6465	11.50	11.03
	119/6545	11.50	11.16
802.11ax-HE160	111/6505	11.50	10.24

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-6 MIMO	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	97/6435	14.00	13.44
	105/6475	14.00	12.33
	113/6515	14.00	12.46
802.11ax-HE40	99/6445	15.00	13.93
	107/6485	14.00	12.73
	115/6525	14.00	13.42
802.11ax-HE80	103/6465	14.00	12.88
	119/6545	14.00	12.88
802.11ax-HE160	111/6505	14.00	12.62

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-7 Ant1	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20(MCS0)	117/6535	10.00	8.81
	149/6695	10.00	9.21
	185/6875	10.00	8.63
802.11ax-HE40(MCS0)	123/6565	10.50	9.93
	147/6685	10.00	9.42
	179/6845	10.00	9.51
	187/6885	10.00	9.28
802.11ax-HE80(MCS0)	135/6625	10.50	10.23
	151/6705	10.00	8.85
	183/6865	10.00	8.55
802.11ax-HE160(MCS0)	143/6665	10.00	8.15
	175/6825	10.00	9.20

Note. Initial test configuration is 802.11ax-HE80 mode.

6GHz Wi-Fi U-NII-7 Ant2	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	117/6535	12.00	10.94
	149/6695	12.00	11.73
	185/6875	12.00	11.61
802.11ax-HE40	123/6565	12.00	11.71
	147/6685	12.00	11.90
	179/6845	12.00	11.67
	187/6885	13.00	12.11
802.11ax-HE80	135/6625	13.00	12.28
	151/6705	12.00	11.47
	183/6865	12.00	11.65
802.11ax-HE160	143/6665	12.00	11.83
	175/6825	12.00	10.93

Note. Initial test configuration is 802.11ax-HE80 mode.

6GHz Wi-Fi U-NII-7 MIMO	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20	117/6535	14.00	13.01
	149/6695	14.00	13.66
	185/6875	14.00	13.38
802.11ax-HE40	123/6565	15.00	13.92
	147/6685	15.00	13.84
	179/6845	15.00	13.73
	187/6885	15.00	13.93
802.11ax-HE80	135/6625	15.00	14.39
	151/6705	15.00	13.36
	183/6865	15.00	13.38
802.11ax-HE160	143/6665	14.00	13.38
	175/6825	14.00	13.16

Note. Initial test configuration is 802.11ax-HE80 mode.

6GHz Wi-Fi U-NII-8 Ant1	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20(MCS0)	189/6895	10.00	8.93
	209/6995	10.00	8.17
	229/7095	10.00	9.70
802.11ax-HE40(MCS0)	203/6965	11.00	10.00
	227/7085	11.00	10.78
802.11ax-HE80(MCS0)	199/6945	10.00	9.29
	215/7025	10.00	8.41
802.11ax-HE160(MCS0)	207/6985	10.00	8.47

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-8 Ant2	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20(MCS0)	189/6895	13.00	11.69
	209/6995	13.00	11.24
	229/7095	13.00	12.00
802.11ax-HE40(MCS0)	203/6965	13.00	11.66
	227/7085	14.00	12.87
802.11ax-HE80(MCS0)	199/6945	13.00	11.16
	215/7025	13.00	11.38
802.11ax-HE160(MCS0)	207/6985	13.00	11.26

Note. Initial test configuration is 802.11ax-HE40 mode.

6GHz Wi-Fi U-NII-8 MIMO	Channel /Freq.(MHz)	Maximum Output Power (dBm)	
		Tune-up	Meas.
802.11ax-HE20(MCS0)	189/6895	15.00	13.54
	209/6995	15.00	12.98
	229/7095	15.00	14.01
802.11ax-HE40(MCS0)	203/6965	15.00	13.92
	227/7085	16.00	14.96
802.11ax-HE80(MCS0)	199/6945	15.00	13.34
	215/7025	15.00	13.15
802.11ax-HE160(MCS0)	207/6985	15.00	13.10

Note. Initial test configuration is 802.11ax-HE40 mode.

10.2 Conducted Power of BT

The maximum output power of BT is:

Mode	GFSK mode		
Channel/Frequency(MHz)	0(2402)	39(2441)	78(2480)
Peak Power(dBm)	8.80	8.94	8.23
Mode	Pi/4DQPSK mode		
Channel/Frequency(MHz)	0(2402)	39(2441)	78(2480)
Peak Power(dBm)	9.44	9.91	8.79
Mode	8DPSK mode		
Channel/Frequency(MHz)	0(2402)	39(2441)	78(2480)
Peak Power(dBm)	9.71	9.27	9.04

The maximum output power of BLE is:

Mode	1Mbps		
Channel/Frequency(MHz)	0(2402)	19(2440)	39(2480)
Peak Power(dBm)	4.36	4.22	3.85
Mode	2Mbps		
Channel/Frequency(MHz)	0(2402)	19(2440)	39(2480)
Peak Power(dBm)	4.18	4.06	3.72

10.3 Tune-up powertolerance

Band	Tune-up power tolerance(dBm)		
WIFI	2.4G (MAIN ANT1)	802.11b	Max output power =18.50
		802.11g	Max output power =21.00
		802.11n (HT20)	Max output power =20.00
		802.11n (HT40)	Max output power =16.00
		802.11ax20	Max output power =18.00
		802.11ax40	Max output power =17.00
	2.4G (AUX ANT2)	802.11b	Max output power =16.50
		802.11g	Max output power =19.00
		802.11n (HT20)	Max output power =18.00
		802.11n (HT40)	Max output power =18.50
		802.11ax20	Max output power =18.00
		802.11ax40	Max output power =17.50
	2.4G (MIMOMode)	802.11n (HT20)	Max output power =22.00
		802.11n (HT40)	Max output power =20.00
		802.11ax20	Max output power =21.00
		802.11ax40	Max output power =20.50
	U-NII-1 (5150-5250)	Ant 1	802.11n (HT20)
		Ant 2	802.11ac (VHT80)
		MIMO	802.11ac (VHT80)
	U-NII-2 (5250-5350)	Ant 1	802.11n(HT40)
		Ant 2	802.11n(HT40)
		MIMO	802.11n(HT40)
	U-NII-3 (5470-5725)	Ant 1	802.11n(HT20)
		Ant 2	802.11ac(VHT80)
		MIMO	802.11ac(VHT80)
	U-NII-4 (5725-5825)	Ant 1	802.11a
		Ant 2	802.11ac(VHT80)
		MIMO	802.11n(HT20)
WIFI 6E	U-NII-5 (5925-6425)	Ant 1	802.11ax-HE80
		Ant 2	802.11ax-HE40
		MIMO	802.11ax-HE40
	U-NII-6 (6425-6525)	Ant 1	802.11ax-HE20
		Ant 2	802.11ax-HE40
		MIMO	802.11ax-HE40
	U-NII-7 (6525-6875)	Ant 1	802.11ax-HE80
		Ant 2	802.11ax-HE80
		MIMO	802.11ax-HE80
	U-NII-8 (6875-7125)	Ant 1	802.11ax-HE40
		Ant 2	802.11ax-HE40
		MIMO	802.11ax-HE40
BT	GFSK mode		Max output power =9.0±1.0dbm
	Pi/4DQPSK mode		Max output power =10.0±1.0dbm
	8DPSK mode		Max output power =10.0±1.0dbm
BLE	1Mbps Power		Max output power =4.5±1.0dbm
	2Mbps Power		Max output power =4.5±1.0dbm

11 SAR test results

Notes:

1) Per KDB447498 D01v05 r02, the SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the scaled SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit ($< 0.8 \text{ W/kg}$), testing at the high and low channels is optional.

2) Per KDB447498 D01v05r02, 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: $\leq 0.8 \text{ W/kg}$ or 2.0 W/kg , for 1-g or 10-g respectively, when the transmission band is $\leq 100 \text{ MHz}$. When the maximum output power variation across the required test channels is $> \frac{1}{2} \text{ dB}$, instead of the middle channel, the highest output power channel must be used.

3) Per KDB447498 D01v06, All measurement SAR result is scaled-up to account for tune-up tolerance is compliant.

4) Per KDB648474 D04v01r03, body-worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn with headset SAR.

5) Per KDB248227 D01v02r02, the procedures required to establish specific device operating configurations for testing the SAR of 802.11 a/b/g transmitters.

6) Per KDB865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8 \text{ W/Kg}$; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR $< 1.45 \text{ W/Kg}$, only one repeated measurement is required.

7) Per KDB865664 D02v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is $> 1.5 \text{ W/kg}$, or $> 7.0 \text{ W/kg}$ for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing (Refer to appendix B for details).

8) Per KDB6162147 D04v01r02, the SAR requirements for laptop and tablet computers, and its to determine the minimum test separation distance .

11.1 Results overview of Wi-Fi 2.4G

Mode	Test Position of Body with 0mm	Test channel /Freq.(MHz)	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR1-g (W/kg)	Scaling Factor
			1-g	10-g					
WLAN2.4g(gap 0mm)									
802.11n (HT40) MAIN ANT1	Front	6/2437	0.145	0.064	0.310	20.53	21.00	0.162	1.114
	Back	6/2437	0.186	0.073	-0.250	20.53	21.00	0.207	1.114
802.11ax 40 AUX ANT2	Front	6/2437	0.100	0.043	1.200	18.95	19.00	0.101	1.012
	Back	6/2437	0.171	0.065	2.400	18.95	19.00	0.173	1.012
802.11ax 40 MIMO	Front	1/2412	0.114	0.063	-1.210	21.79	22.00	0.120	1.050
	Back	1/2412	0.212	0.100	4.260	21.79	22.00	0.222	1.050

11.2 Results overview of Wi-Fi 5G

Mode	Test Position of Body with 0mm	Test channel /Freq.(MHz)	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR1-g (W/kg)	Scaling Factor
			1-g	10-g					
WLAN5.2g(gap 0mm)									
802.11n-HT40 ANT1	Front	36/5180	0.516	0.164	-1.010	0.526	1.020	0.526	1.020
	Back	36/5180	0.630	0.201	-4.320	0.643	1.021	0.643	1.021
802.11n-HT40 ANT2	Front	42/5210	0.448	0.076	4.850	14.74	15.00	0.476	1.062
	Back	42/5210	0.525	0.150	-0.800	14.74	15.00	0.557	1.062
802.11n-HT40 MIMO-ANT	Front	42/5210	0.558	0.183	0.300	15.85	16.00	0.578	1.035
	Back	42/5210	0.807	0.297	1.460	15.85	16.00	0.835	1.035
Mode	Test Position of Body with 0mm	Test channel /Freq.(MHz)	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit (dBm)	Scaled SAR1-g (W/kg)	Scaling Factor
			1-g	10-g					
WLAN5.4g(gap 0mm)									
802.11n-HT40 ANT1	Front	64/5320	0.425	0.133	-0.490	14.43	14.50	0.432	1.016
	Back	64/5320	0.477	0.164	-1.170	14.43	14.50	0.485	1.016
802.11n-HT40 ANT2	Front	58/5290	0.245	0.071	0.050	16.59	17.00	0.269	1.099
	Back	58/5290	0.368	0.127	-2.280	16.59	17.00	0.404	1.099
802.11n-HT40 MIMO-ANT	Front	58/5290	0.458	0.162	0.400	17.36	17.50	0.473	1.033
	Back	58/5290	0.666	0.254	0.580	17.36	17.50	0.688	1.033
WLAN5.6g(gap 0mm)									
802.11ac-VHT80 ANT1	Front	106/5530	0.234	0.076	1.070	12.94	13.00	0.237	1.014
	Back	106/5530	0.460	0.107	-1.140	12.94	13.00	0.466	1.014
802.11ac(VHT80) ANT2	Front	122/5610	0.227	0.088	-0.300	15.90	16.00	0.232	1.023
	Back	122/5610	0.420	0.111	3.900	15.90	16.00	0.430	1.023
802.11ac(VHT80) MIMO-ANT	Front	122/5610	0.259	0.094	2.850	16.72	17.00	0.276	1.067
	Back	122/5610	0.583	0.193	3.650	16.72	17.00	0.622	1.067
WLAN5.8g(gap 0mm)									
802.11n-HT40 ANT1	Front	149/5745	0.212	0.030	-2.340	14.84	15.00	0.220	1.038
	Back	149/5745	0.258	0.051	-0.470	14.84	15.00	0.268	1.038
802.11n-HT40 ANT2	Front	155/5775	0.238	0.033	0.750	11.26	11.50	0.252	1.057
	Back	155/5775	0.254	0.048	-3.890	11.26	11.50	0.268	1.057
802.11n-HT40 MIMO-ANT1	Front	165/5825	0.195	0.071	-4.370	15.37	15.50	0.201	1.030
	Back	165/5825	0.342	0.145	-2.770	15.37	15.50	0.352	1.030

11.3 Results overview of Wi-Fi6E & APD

Band	Antenna	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Measured SAR1g (W/Kg)	Measured APD (W/m ²)	Power Drift (dB)	Scaling Factor	Report SAR1g (W/kg)	Report APD (W/m ²)
Wi-Fi 6G	Ant 1	Back Side	0	802.11ax-HE80	100%	7/5985	12.00	11.29	0.056	0.152	-0.160	1.18	0.066	0.179
U-NII-5	Ant 2	Back Side	0	802.11ax-HE40	100%	91/6405	14.00	13.25	0.085	0.450	-0.055	1.19	0.101	0.535
Wi-Fi 6G	Ant 1	Back Side	0	802.11ax-HE40	100%	99/6445	10.50	9.86	0.142	0.604	0.035	1.16	0.165	0.700
U-NII-6	Ant 2	Back Side	0	802.11ax-HE40	100%	99/6445	12.00	11.77	0.102	0.617	-0.187	1.05	0.108	0.651
Wi-Fi 6G	Ant 1	Back Side	0	802.11ax-HE80	100%	135/6625	10.50	10.23	0.167	1.190	0.047	1.06	0.165	1.266
U-NII-7	Ant 2	Back Side	0	802.11ax-HE80	100%	135/6625	13.00	12.28	0.155	1.020	-0.160	1.18	0.108	1.204
Wi-Fi 6G	Ant 1	Back Side	0	802.11ax-HE40	100%	227/7085	11.00	10.78	0.093	0.358	0.046	1.05	0.098	0.377
U-NII-8	Ant 2	Back Side	0	802.11ax-HE40	100%	227/7085	14.00	12.87	0.147	0.575	0.150	1.30	0.191	0.746

11.4 Results overview of PD

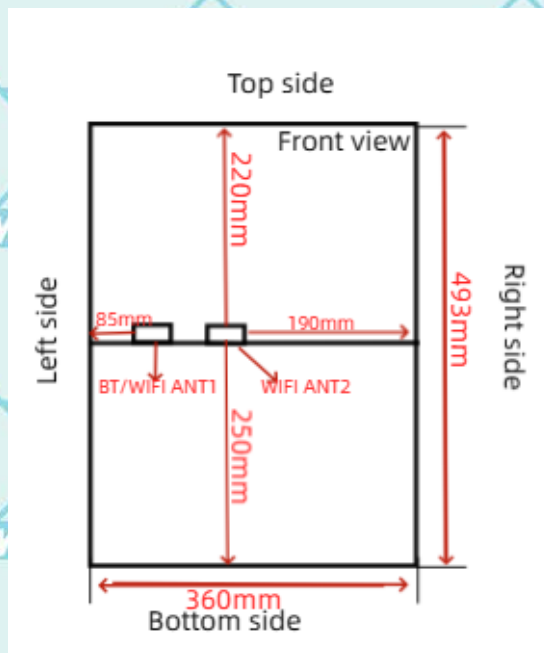
Band	Antenna	Test Position	Dist. (mm)	Mode	Duty Cycle	Ch./Freq. (MHz)	Tune-up (dBm)	Measured power (dBm)	Normal psPD (W/m ²)	Total psPD (W/m ²)	Power Drift [dB]	Measurement Uncertainty Scaling Factor	Tune up Scaling Factor	Scaled Normal psPD (W/m ²)	Scaled Total psPD (W/m ²)
U-NII-5	ANT2	Back Side	2	802.11ax-HE40	100%	91/6405	14.00	13.25	0.846	1.950	0.030	1.280	1.19	1.287	2.967
	ANT2	Back Side	9.3	802.11ax-HE40	100%	91/6405	14.00	13.25	0.176	0.288	0.068	1.280	1.19	0.268	0.438
U-NII-6	ANT1	Back Side	2	802.11ax-HE40	100%	99/6445	10.50	9.86	1.280	3.300	-0.027	1.280	1.16	1.899	4.895
	ANT1	Back Side	9.3	802.11ax-HE40	100%	99/6445	10.50	9.86	0.153	0.208	0.050	1.280	1.16	0.227	0.309
U-NII-7	ANT1	Back Side	2	802.11ax-HE80	100%	135/6625	10.50	10.23	2.400	6.360	-0.140	1.280	1.06	3.269	8.663
	ANT1	Back Side	9	802.11ax-HE80	100%	135/6625	10.50	10.23	0.153	0.344	0.138	1.280	1.06	0.208	0.469
U-NII-8	ANT2	Back Side	2	802.11ax-HE40	100%	227/7085	14.00	12.87	1.210	2.830	0.100	1.280	1.30	2.009	4.699
	ANT2	Back Side	8.4	802.11ax-HE40	100%	227/7085	14.00	12.87	0.168	0.325	0.020	1.280	1.30	0.279	0.540

11.5 Results overview of BT

Test Position of Body with 0mm	Test channel /Freq.(MHz)	Test Mode	SAR Value (W/kg)		Power Drift (%)	Conducted Power (dBm)	Tune-up Limit(dBm)	Scaled SAR _{1-g} (W/kg)	Scalig factor
			1-g	10-g					
BTantenna to side									
Front side	39/2441	GFSK	0.060	0.028	4.070	9.91	10.00	0.071	1.047
Rear side	39/2441	GFSK	0.099	0.052	0.410	9.91	10.00	0.102	1.047
Left side	39/2441	GFSK	0.064	0.031	0.230	9.91	10.00	0.089	1.047
Top side	39/2441	GFSK	0.055	0.022	-2.140	9.91	10.00	0.081	1.047

12 Multiple Transmitter Information

The SAR measurement positions of each side are as below:



<Rear Side>

Side	Wi-Fi/BT antenna (0 degree) to Side
	SAR Consideration
Front Side	Yes
Rear Side	Yes
Left Side	Yes
Right Side	Yes
Top Side	Yes
Bottom Side	No

Note: According to section 6.1.4.5 device with swivel antennas, if the antennas can be rotated to two planes, an evaluation should be performed and documented on the report to decide the highest exposure conditions, and only that position need consideration.

In addition, in case of this antenna, the two representative positions 0degree and 90degree shall be evaluated independently for each required EUT edge. When evaluating the test surfaces, the nearest distance between the antenna and the edges is applicable.

12.1.1 Stand-alone SAR test exclusion

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances $\leq$ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

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

Body-Worn position

Mode	Pmax(dBm)	Pmax(mW)	Distance(mm)	f(GHz)	Calculation Result	exclusion Threshold	SAR test exclusion
BT	9.91	9.79	5.00	2.45	3.07	7.50	Yes

12.1.2 Simultaneous Transmission SAR Summation Scenario

Mode	Position	Ant 1WIFI 1g(W/kg)	Ant 1 BT 1g(W/kg)	Ant 1 WIFI+ BT 1g(W/kg)
2.4Gwifi (MIMO)	Front	0.120	0.071	0.191
	Back	0.222	0.102	0.324
5.2Gwifi (MIMO)	Front	0.578	0.071	0.649
	Back	0.835	0.102	0.937
5.4Gwifi (MIMO)	Front	0.473	0.071	0.544
	Back	0.688	0.102	0.790
5.6Gwifi (MIMO)	Front	0.276	0.071	0.347
	Back	0.622	0.102	0.724
5.8Gwifi (MIMO)	Front	0.201	0.071	0.272
	Back	0.352	0.102	0.454
WIFI6E (U-NII-7 Ant 1)	Back	0.165	0.071	0.236
WIFI6E (U-NII-8 Ant 2)	Back	0.191	0.102	0.293

12.2 Measurement uncertainty evaluation for SAR test

The following table includes the uncertainty table of the IEEE 1528. The values are determined by Satimo. The breakdown of the individual uncertainties is as follows:

Measurement Uncertainty evaluation for SAR test								
Uncertainty Component	Tol. (±%)	Prob. Dist.	Div.	C _i (1g)	C _i (10g)	1g U _i (±%)	10g U _i (±%)	V _i
measurement system								
Probe Calibration	5.8	N	1	1	1	5.8	5.8	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.43	1.43	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
system Detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	3	N	1	1	1	3.00	3.00	∞
Readout Electronics	0.5	N	1	1	1	0.50	0.50	∞
Response Time	0	R	$\sqrt{3}$	1	1	0.00	0.00	∞
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF Ambient Conditions-Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Conditions-Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and Integration Algorithms for Max.SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related								
Test Sample Positioning	2.6	N	1	1	1	2.60	2.60	11
Device Holder Uncertainty	3	N	1	1	1	3.00	3.00	7
Output Power Variation-SAR drift measurement	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
SAR scaling	2	R	$\sqrt{3}$	1	1	1.15	1.15	∞

Phantom and Tissue Parameters

Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2.00	1.68	∞
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.60	1.08	5
Liquid conductivity (target.)	5	R	$\sqrt{3}$	0.64	0.43	1.85	1.24	5
Liquid Permittivity (meas.)	2.5	N	1	0.60	0.49	1.50	1.23	∞
Liquid Permittivity (target.)	5	R	$\sqrt{3}$	0.60	0.49	1.73	1.42	∞
Combined Standard Uncertainty		Rss				10.63	10.54	
Expanded Uncertainty{95% CONFIDENCE INTERVAL}		k				21.26	21.08	

12.3 Measurement uncertainty evaluation for system check

The following table includes the uncertainty table of the IEEE 1528. The values are determined by Satimo. The breakdown of the individual uncertainties is as follows:

Uncertainty For System Performance Check								
Uncertainty Component	Tol. (±%)	Prob. Dist.	Div.	C _i 1g	C _i 10g	1g U _i (±%)	10g U _i (±%)	V _i
measurement system								
Probe Calibration	5.8	N	1	1	1	5.80	5.80	∞
Axial Isotropy	3.5	R	$\sqrt{3}$	$(1-C_p)^{1/2}$	$(1-C_p)^{1/2}$	1.43	1.43	∞
Hemispherical Isotropy	5.9	R	$\sqrt{3}$	$\sqrt{C_p}$	$\sqrt{C_p}$	2.41	2.41	∞
Boundary Effect	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
system detection Limits	1	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation response	0	N	1	1	1	0.00	0.00	∞
Readout Electronics	0.5	N	1	1	1	0.50	0.50	∞
Response Time	0	R	$\sqrt{3}$	1	1	0.00	0.00	∞
Integration Time	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF ambient Conditions - Noise	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
RF ambient Conditions – Reflections	3	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioned Mechanical Tolerance	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Dipole								
Deviation of experimental source from numerical source	4	N	1	1	1	4.00	4.00	∞
Input power and SAR drift measurement	5	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole axis to liquid Distance	2	R	$\sqrt{3}$	1	1	1.16	1.16	∞

Phantom and Tissue Parameters

Phantom Uncertainty (shape and thickness tolerances)	4	R	$\sqrt{3}$	1	1	2.31	2.31	∞
Uncertainty in SAR correction for deviation (in permittivity and conductivity)	2	N	1	1	0.84	2.00	1.68	∞
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.60	1.08	5
Liquid conductivity (target.)	5	R	$\sqrt{3}$	0.64	0.43	1.85	1.24	5
Liquid Permittivity (meas.)	2.5	N	1	0.60	0.49	1.50	1.23	∞
Liquid Permittivity (target.)	5	R	$\sqrt{3}$	0.60	0.49	1.73	1.41	∞
Combined Standard Uncertainty		Rss				10.28	9.98	
Expanded Uncertainty (95% Confidence interval)		k				20.57	19.95	

13 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

	Manufacturer	Device Type	Type(Model)	Serial number	calibration	
					Last Cal.	Due Date
☒	SATIMO	COMOSAR DOSIMETRIC E FIELD PROBE	SSE2	3523-EPGO-428	2024-06-18	2025-06-17
☒	SATIMO	COMOSAR 750 MHz REFERENCE DIPOLE	SID750	SN 48/16 DIP0G750-444	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 835 MHz REFERENCE DIPOLE	SID835	SN 14/13 DIP0G835-235	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 900 MHz REFERENCE DIPOLE	SID900	SN 14/13 DIP0G900-231	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 1800 MHz REFERENCE DIPOLE	SID1800	SN 14/13 DIP1G800-232	2023-06-25	2026-06-24
☐	SATIMO	COMOSAR 1900 MHz REFERENCE DIPOLE	SID1900	SN 14/13 DIP1G900-236	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 2000 MHz REFERENCE DIPOLE	SID2000	SN 14/13 DIP2G000-237	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 2450 MHz REFERENCE DIPOLE	SID2450	SN 14/13 DIP2G450-238	2023-06-25	2026-06-24
☒	SATIMO	COMOSAR 2600 MHz REFERENCE DIPOLE	SID2600	SN 28/14 DIP2G600-327	2023-06-25	2026-06-24
☒	SATIMO	Software	OPENSAR	N/A	N/A	N/A
☒	SATIMO	Phantom	COMOSAR IEEE SAM PHANTOM	SN 14/13 SAM99	N/A	N/A
☒	R & S	Universal Radio Communication Tester	CMU 200	119733	2023-11-02	2024-11-01
☒	R & S	Universal Radio Communication Tester	CMW500	144459	2023-11-02	2024-11-01
☒	R & S	Universal Radio Communication Tester	E7515B	MY60192341	2023-11-02	2024-11-01
☒	HP	Network Analyser	8753D	3410A08889	2023-11-02	2024-11-01
☒	HP	Signal Generator	E4421B	GB39340770	2023-11-02	2024-11-01
☒	Keithley	Multimeter	Keithley 2000	4014539	2023-11-02	2024-11-01
☒	SATIMO	Amplifier	Power Amplifier	MODU-023-A-0004	2023-11-02	2024-11-01
☒	Agilent	Power Meter	E4418B	GB43312909	2023-11-02	2024-11-01
☒	Agilent	Power Meter Sensor	E4412A	MY41500046	2023-11-02	2024-11-01

Annex A: System performance verification

(Please See the SAR Measurement Plots of annex A.)

Annex B: Measurement results

(Please See the SAR Measurement Plots of annex B.)

Annex C: Calibration reports

(Please See the Calibration reports of annex C.)

Annex D: Photographs

	Annex A: System Check
	Tested Model : K16SAA
	Report Number: WSCT-ANAB-R&E240700030A-SAR

MEASUREMENT 1

BODY

Type: Validation measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 10 minutes 43 seconds

A. Experimental conditions.

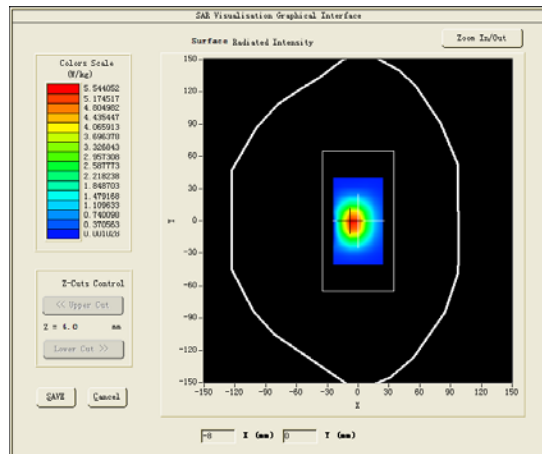
<u>Area Scan</u>	<u>dx=8mm dy=8mm</u>
<u>ZoomScan</u>	<u>5x5x7, dx=8mm dy=8mm</u> <u>dz=5mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW2450</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Crest factor: 1.0)</u>

B. SAR Measurement Results

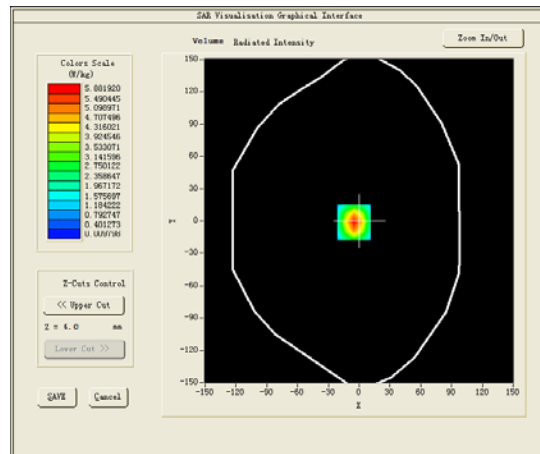
Middle Band SAR (Channel -1):

Frequency (MHz)	2450.000000
Relative permittivity (real part)	40.269142
Relative permittivity (imaginary part)	14.039240
Conductivity (S/m)	1.82349
Variation (%)	0.390000

SURFACE SAR



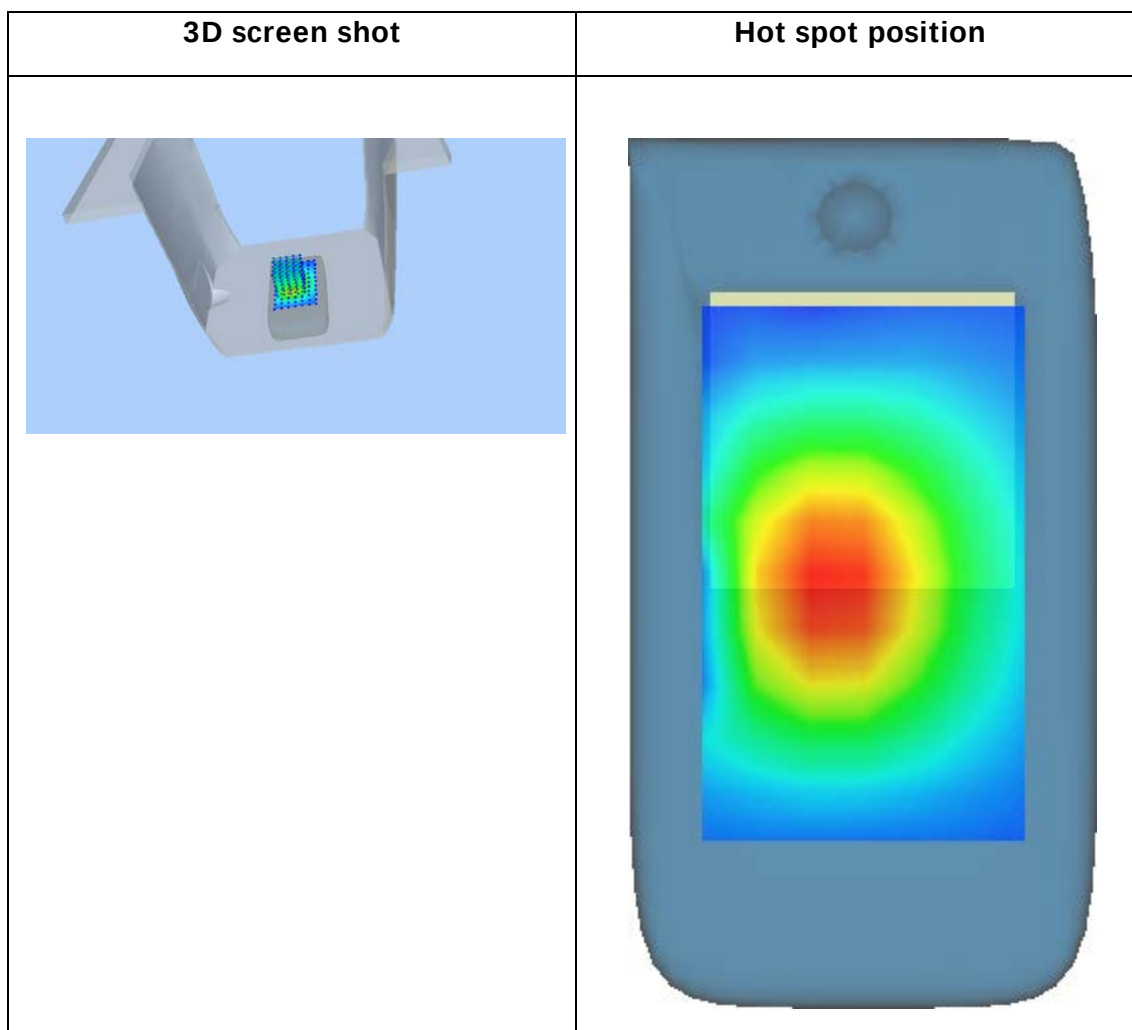
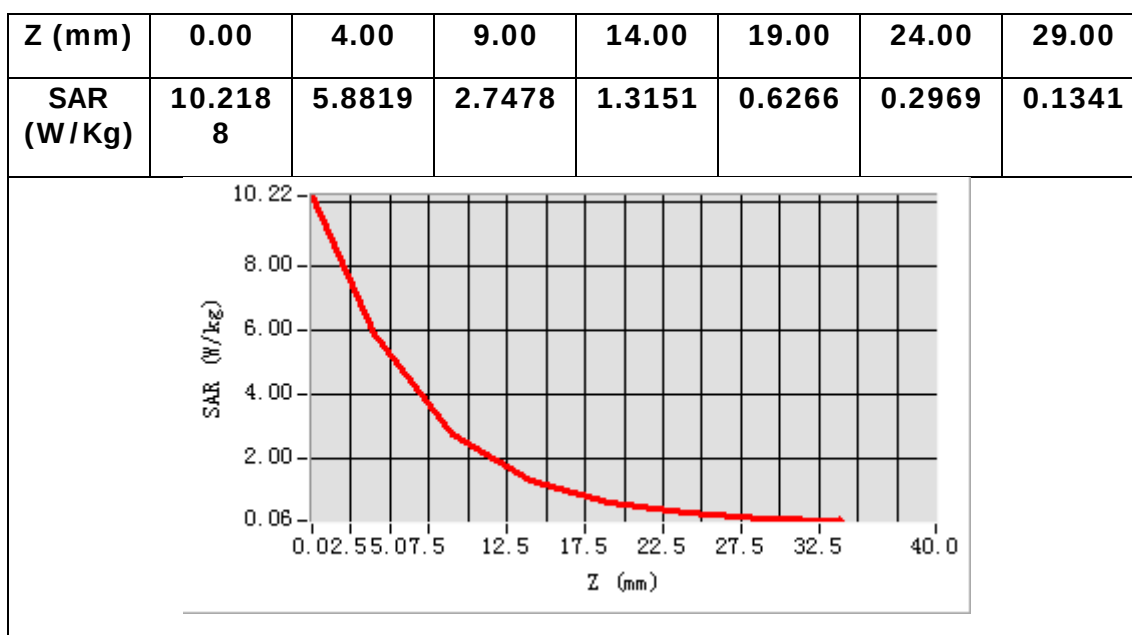
VOLUME SAR



Maximum location: X=-5.00, Y=-1.00

SAR Peak: 10.96 W/kg

SAR 10g (W/Kg)	2.333453
SAR 1g (W/Kg)	5.433343



MEASUREMENT 2

BODY

Type: Validation measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 27 minutes 45 seconds

A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>8x8x7, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5200</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Duty cycle:1:1)</u>

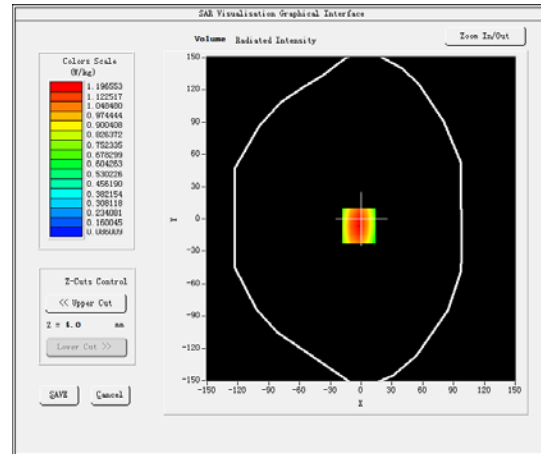
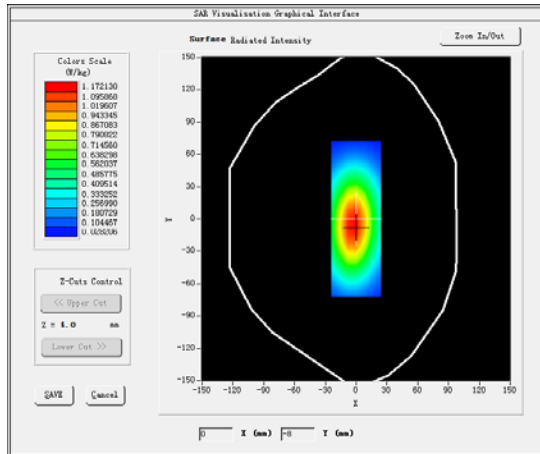
B. SAR Measurement Results

Middle Band SAR (Channel -1):

Frequency (MHz)	5200.000000
Relative permittivity (real part)	35.622599
Relative permittivity (imaginary part)	18.202492
Conductivity (S/m)	4.524169
Variation (%)	0.270000

SURFACE SAR

VOLUME SAR

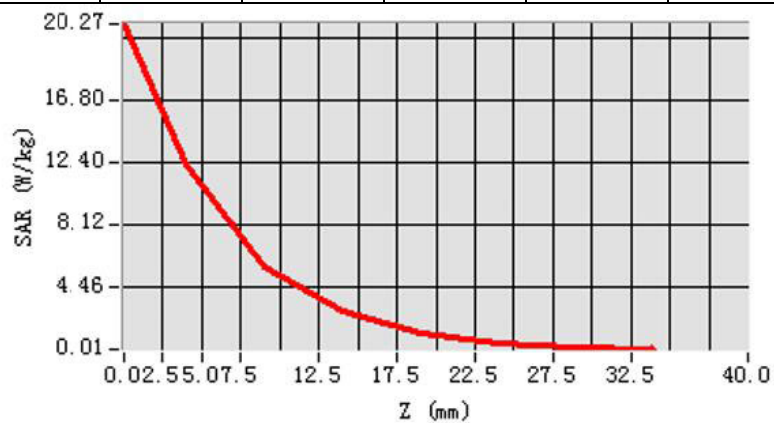


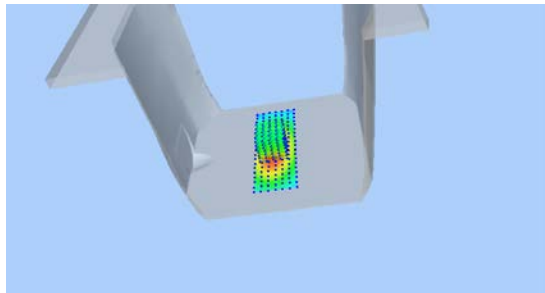
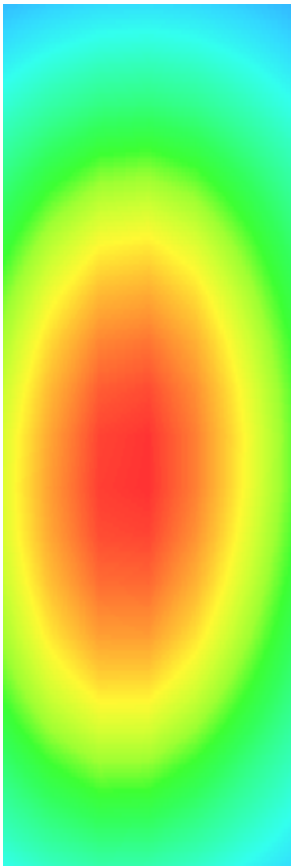
Maximum location: X=-2.00, Y=-1.00

SAR Peak: 10.27 W/kg

SAR 10g (W/Kg)	2.264061
SAR 1g (W/Kg)	7.718314

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	20.2711	16.1966	12.7784	10.5196	8.1218	4.2403	1.1660



3D screen shot	Hot spot position
	

MEASUREMENT 3

BODY

Type: Validation measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 29 minutes 31 seconds

A. Experimental conditions.

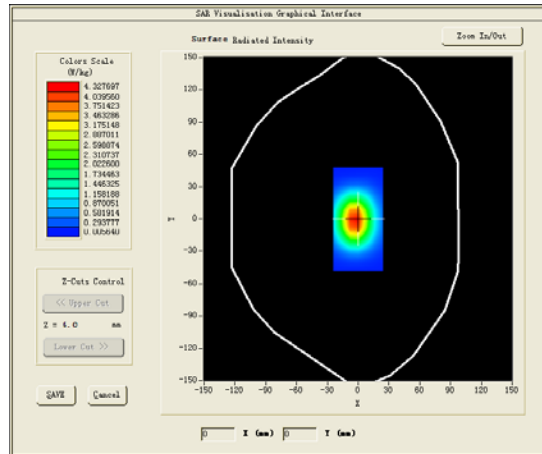
<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>8x8x7, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5500</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Duty cycle:1:1)</u>

B. SAR Measurement Results

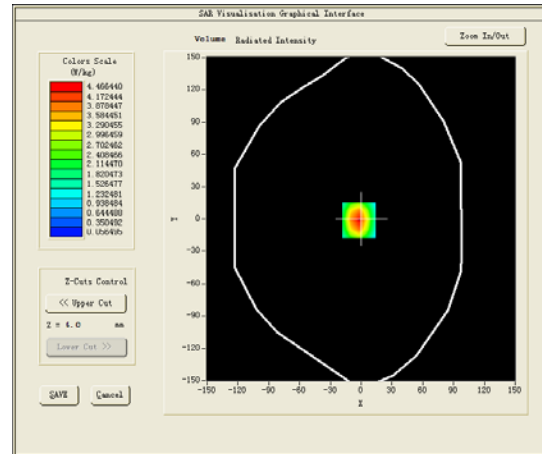
Middle Band SAR (Channel -1):

Frequency (MHz)	5500.000000
Relative permittivity (real part)	36.114300
Relative permittivity (imaginary part)	18.167566
Conductivity (S/m)	5.024104
Variation (%)	-0.350000

SURFACE SAR



VOLUME SAR

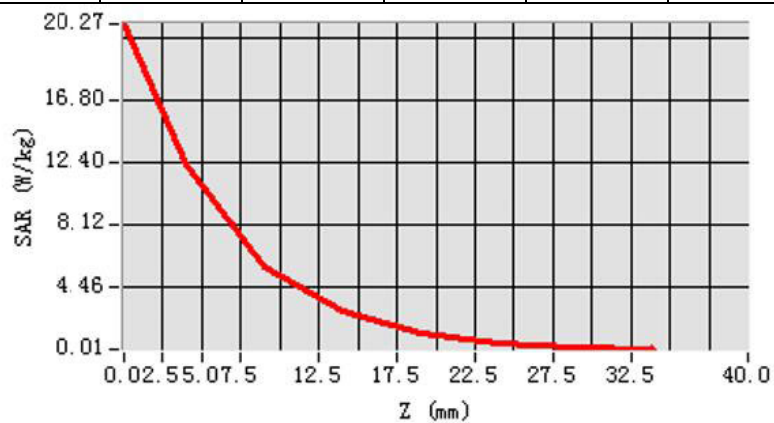


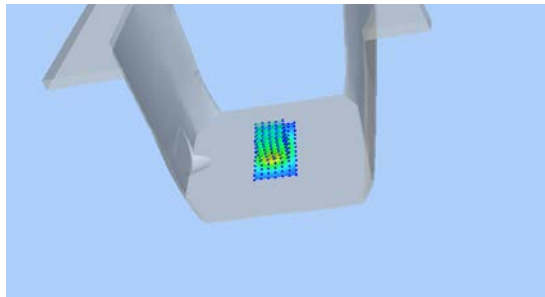
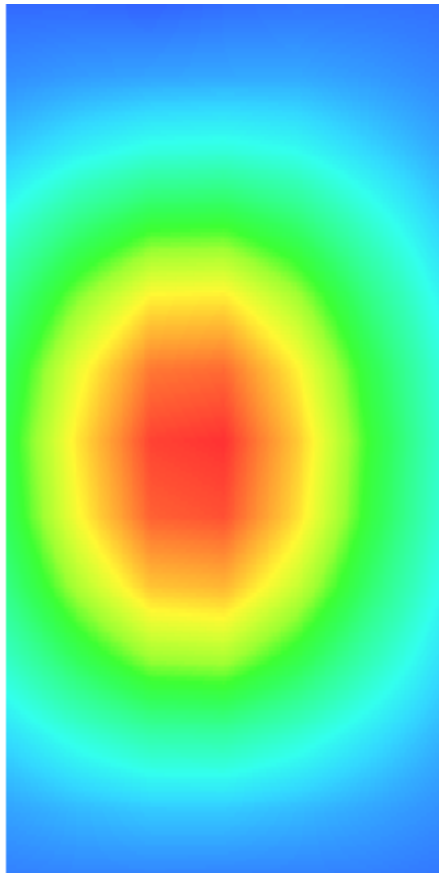
Maximum location: X=-2.00, Y=-1.00

SAR Peak: 10.87 W/kg

SAR 10g (W/Kg)	2.282155
SAR 1g (W/Kg)	8.537029

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	20.2697	16.4664	12.4603	10.3992	6.7963	4.4560	1.2601



3D screen shot	Hot spot position
	

MEASUREMENT 4

BODY

Type: Validation measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 31 minutes 30 seconds

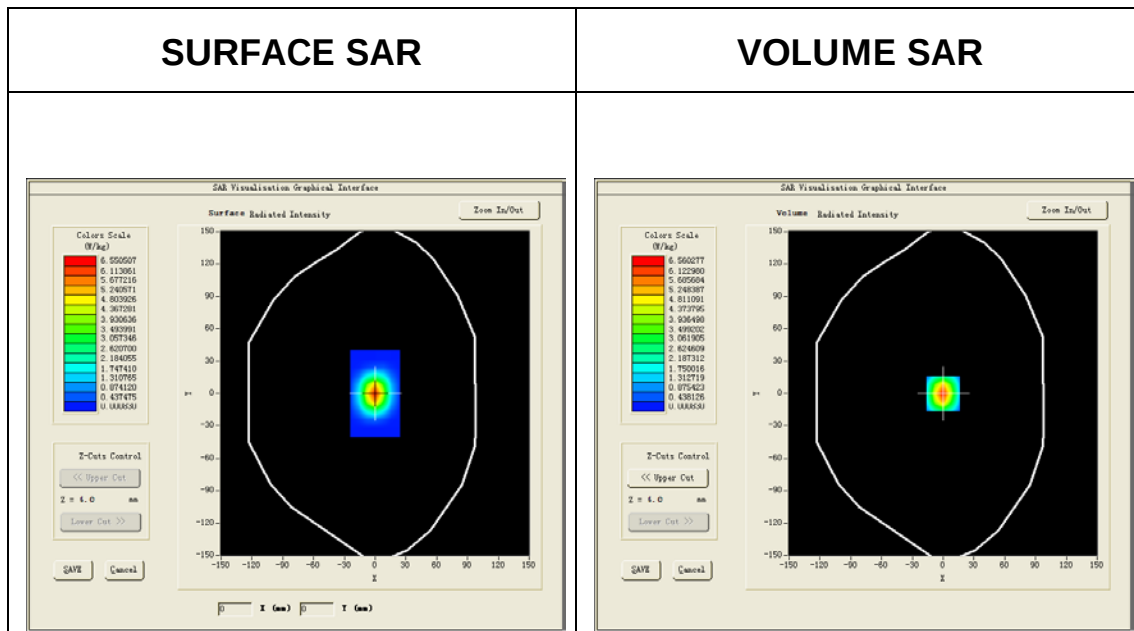
A. Experimental conditions.

<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>8x8x7, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Dipole</u>
<u>Band</u>	<u>CW5800</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>CW (Duty cycle:1:1)</u>

B. SAR Measurement Results

Middle Band SAR (Channel -1):

Frequency (MHz)	5800.000000
Relative permittivity (real part)	34.633851
Relative permittivity (imaginary part)	19.038417
Conductivity (S/m)	5.163402
Variation (%)	0.010000

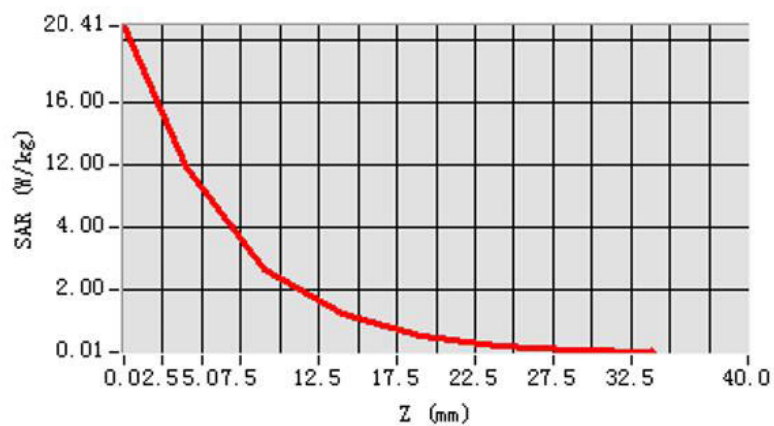


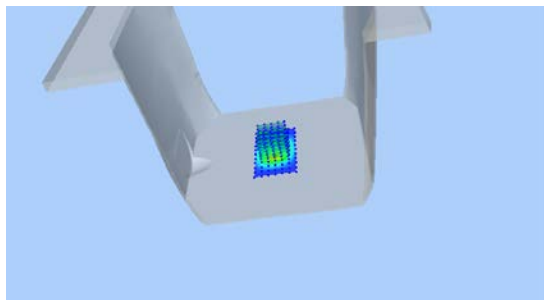
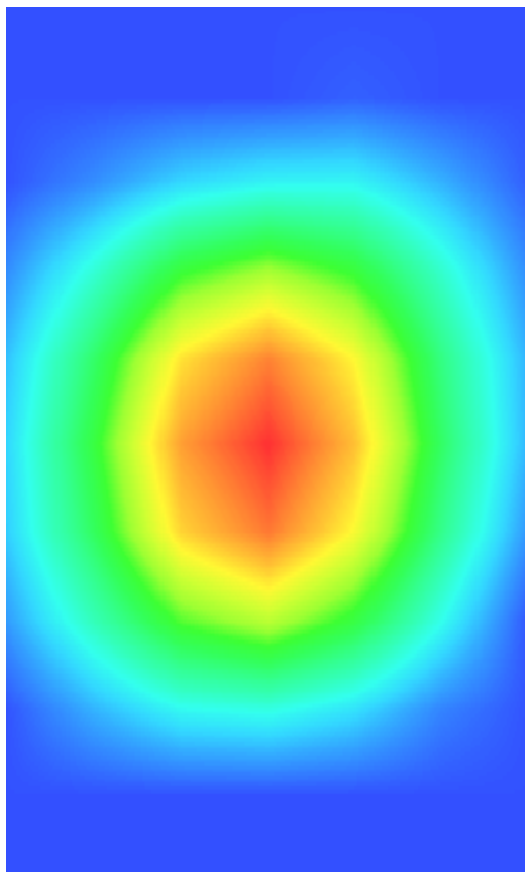
Maximum location: X=0.00, Y=0.00

SAR Peak: 9.41 W/kg

SAR 10g (W/Kg)	2.080196
SAR 1g (W/Kg)	7.965831

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	20.4140	16.5603	12.8797	8.2004	4.4226	2.1066	1.0008



3D screen shot	Hot spot position
	

	Annex B: Measurement Results
	Tested Model :K16SAA
	Report Number: WSCT-ANAB-R&E240700030A-SAR

MEASUREMENT 1

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 11 minutes 11 seconds

A. Experimental conditions.

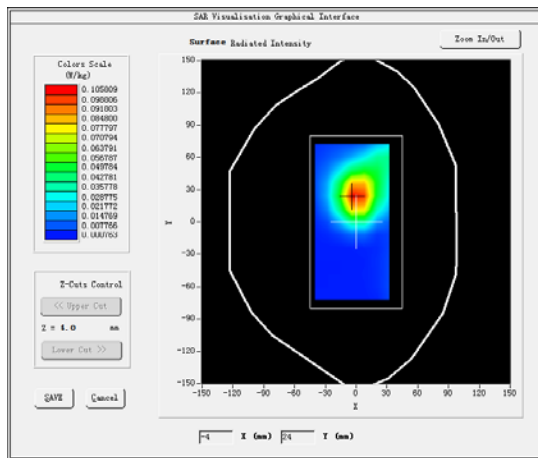
<u>Area Scan</u>	<u>dx=15mm dy=15mm</u>
<u>ZoomScan</u>	<u>7x7x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11b ISM</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>IEEE802.b (Crest factor: 1.0)</u>

B. SAR Measurement Results

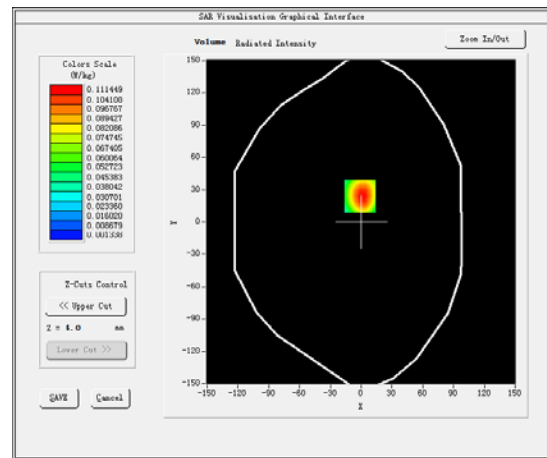
(Channel 1):

Frequency (MHz)	2412.000000
Relative permittivity (real part)	40.269142
Relative permittivity (imaginary part)	14.039240
Conductivity (S/m)	1.823490
Variation (%)	4.260000

SURFACE SAR



VOLUME SAR

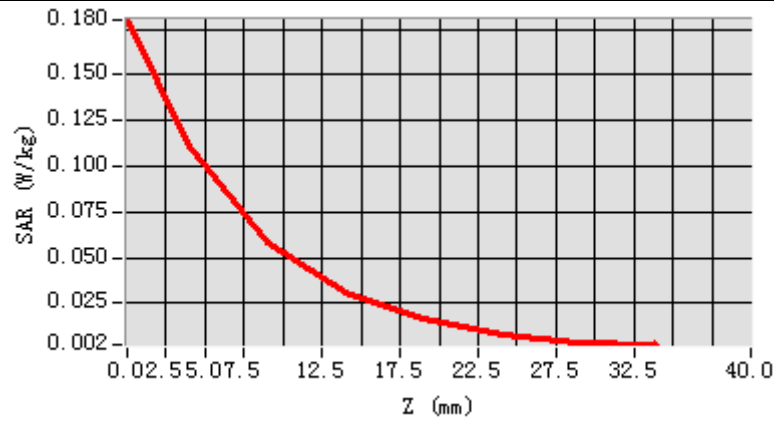


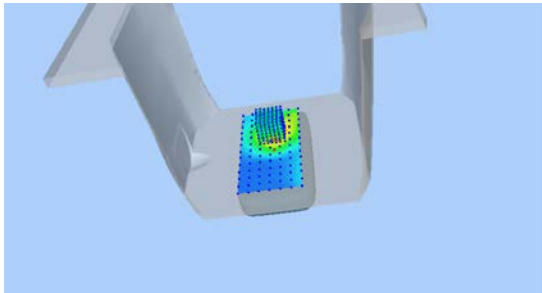
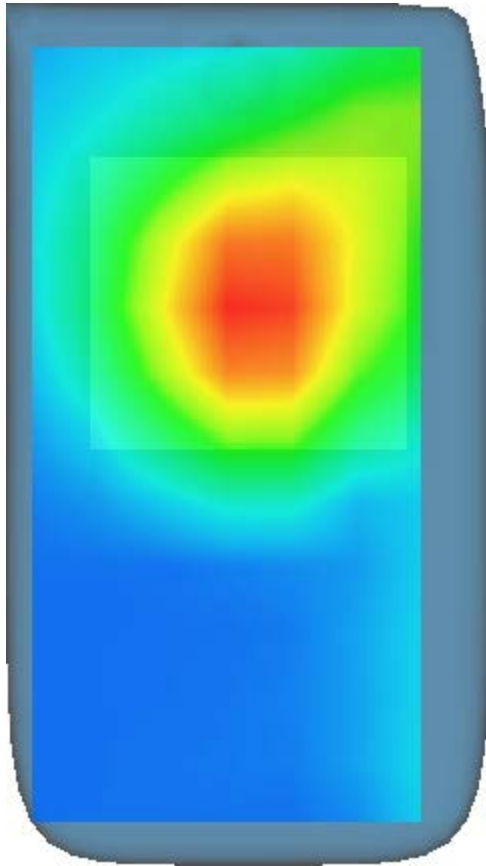
Maximum location: X=-1.00, Y=24.00

SAR Peak: 0.16 W/kg

SAR 10g (W/Kg)	0.099786
SAR 1g (W/Kg)	0.212360

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1801	0.1114	0.0587	0.0309	0.0161	0.0083	0.0040



3D screen shot	Hot spot position
	

MEASUREMENT 2

Rear-side-middle

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 10 minutes 44 seconds

A. Experimental conditions.

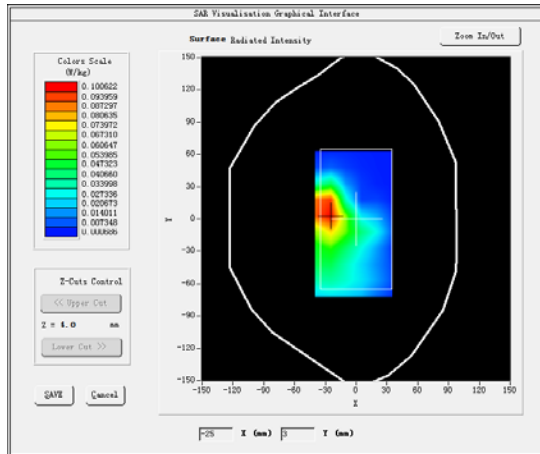
<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>7x7x12, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII-1</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>Duty cycle:1:1</u>

B. SAR Measurement Results

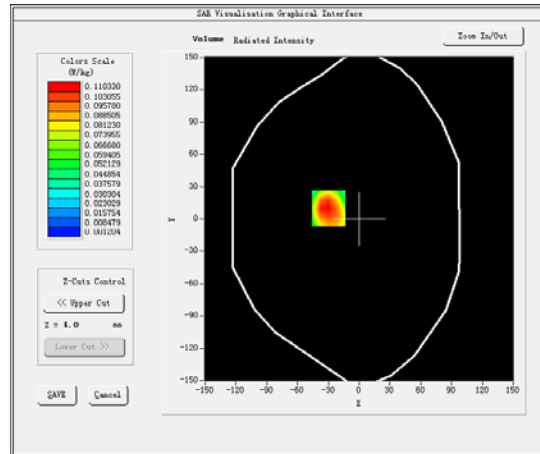
(Channel 42):

Frequency (MHz)	5210.000000
Relative permittivity (real part)	35.622599
Relative permittivity (imaginary part)	18.202492
Conductivity (S/m)	4.524196
Variation (%)	1.460000

SURFACE SAR



VOLUME SAR

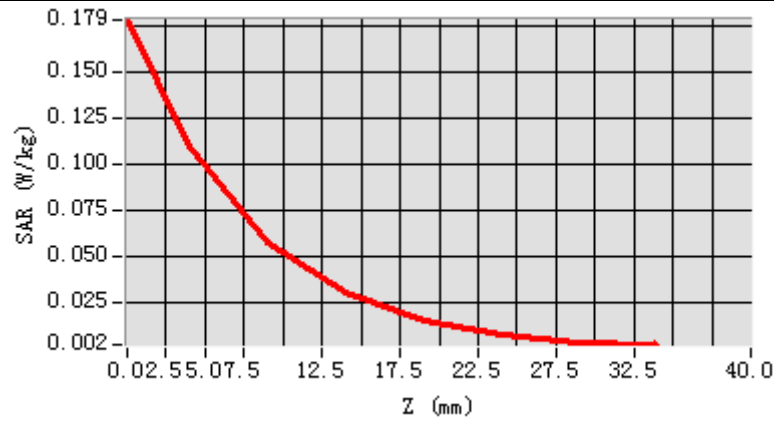


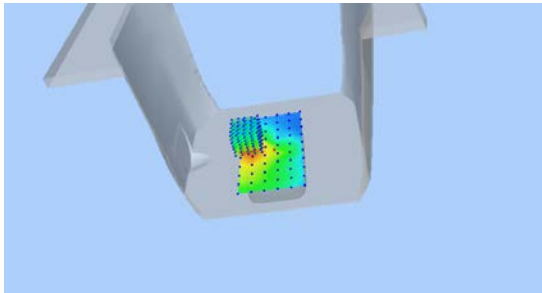
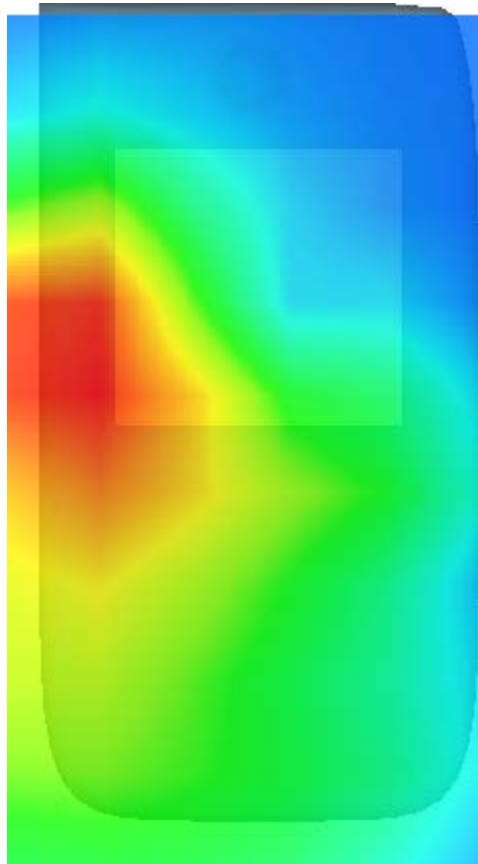
Maximum location: X=-30.00, Y=10.00

SAR Peak: 0.19 W/kg

SAR 10g (W/Kg)	0.297261
SAR 1g (W/Kg)	0.807132

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1788	0.1103	0.0576	0.0303	0.0156	0.0075	0.0040



3D screen shot	Hot spot position
	

MEASUREMENT 3

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 16 minutes 21 seconds

A. Experimental conditions.

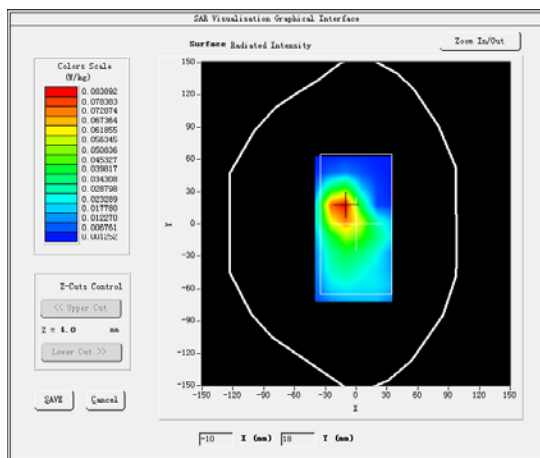
<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>7x7x12, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII-2a</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>Duty cycle:1:1</u>

B. SAR Measurement Results

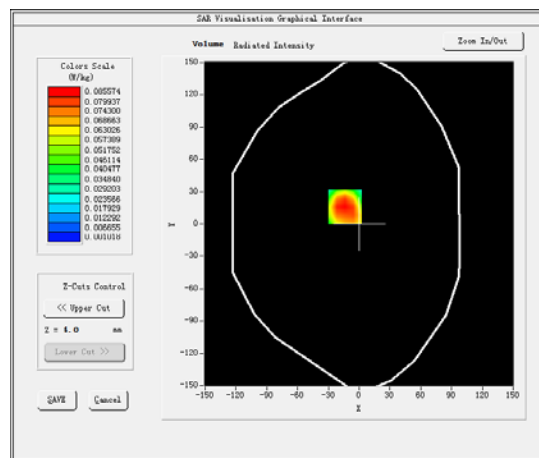
(Channel 58):

Frequency (MHz)	5290.000000
Relative permittivity (real part)	35.622599
Relative permittivity (imaginary part)	18.202492
Conductivity (S/m)	4.524169
Variation (%)	0.580000

SURFACE SAR



VOLUME SAR

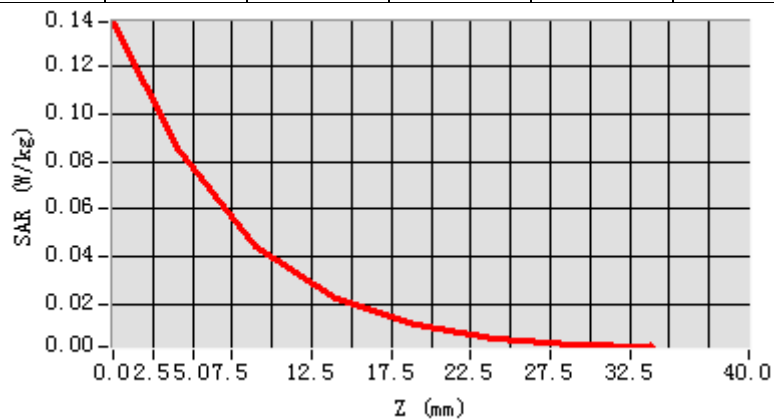


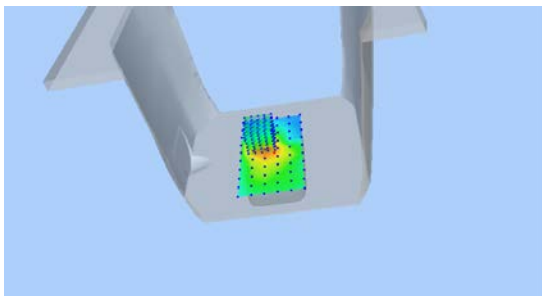
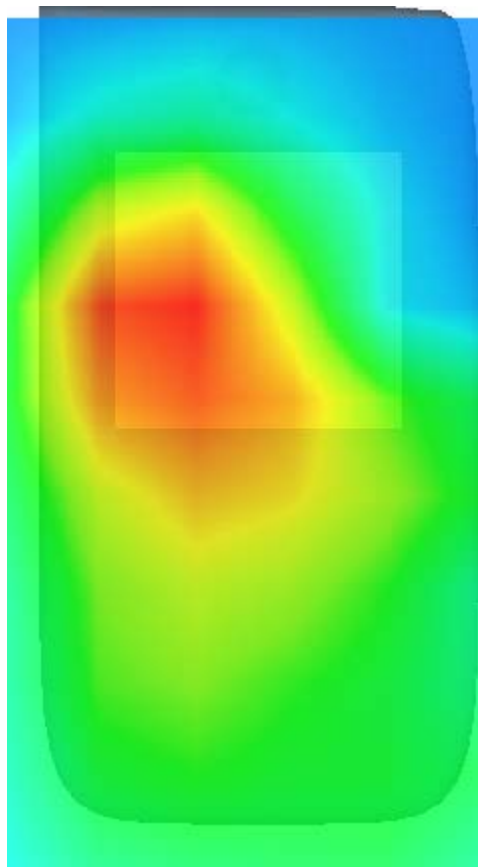
Maximum location: X=-14.00, Y=16.00

SAR Peak: 0.15 W/kg

SAR 10g (W/Kg)	0.254168
SAR 1g (W/Kg)	0.665431

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1388	0.0856	0.0441	0.0224	0.0109	0.0049	0.0027



3D screen shot	Hot spot position
	

MEASUREMENT 4

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 8 minutes 31 seconds

A. Experimental conditions.

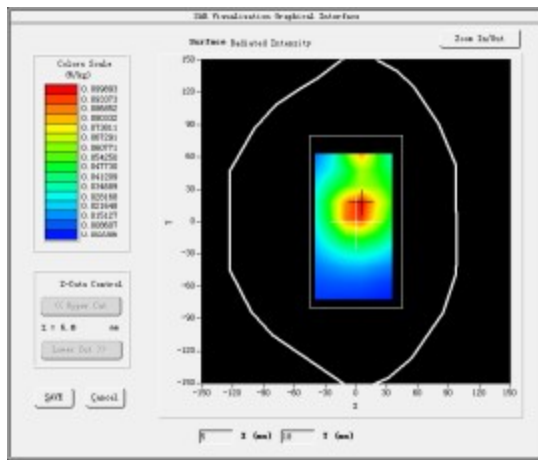
<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>7x7x12, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII-2c</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>Duty cycle:1:1</u>

B. SAR Measurement Results

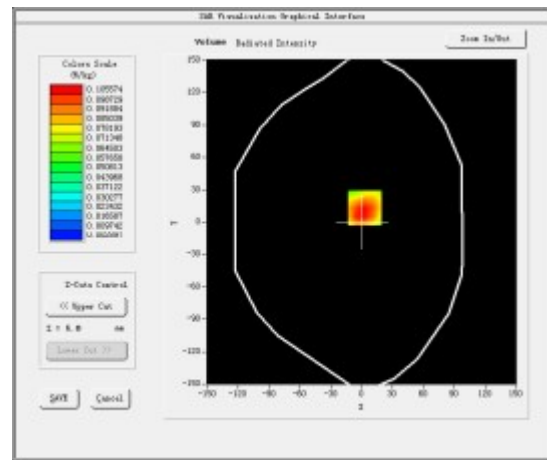
(Channel 122):

Frequency (MHz)	5610.000000
Relative permittivity (real part)	36.114300
Relative permittivity (imaginary part)	18.167566
Conductivity (S/m)	5.024104
Variation (%)	3.650000

SURFACE SAR



VOLUME SAR

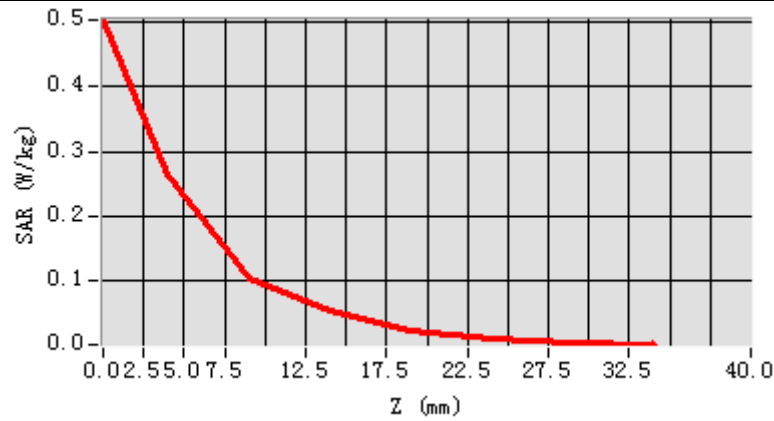


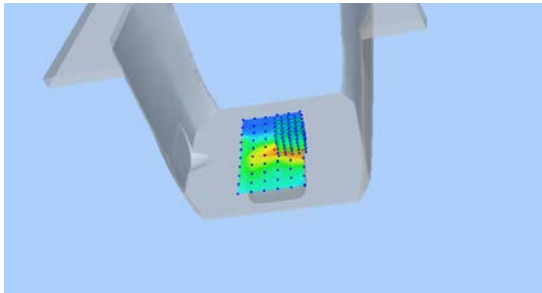
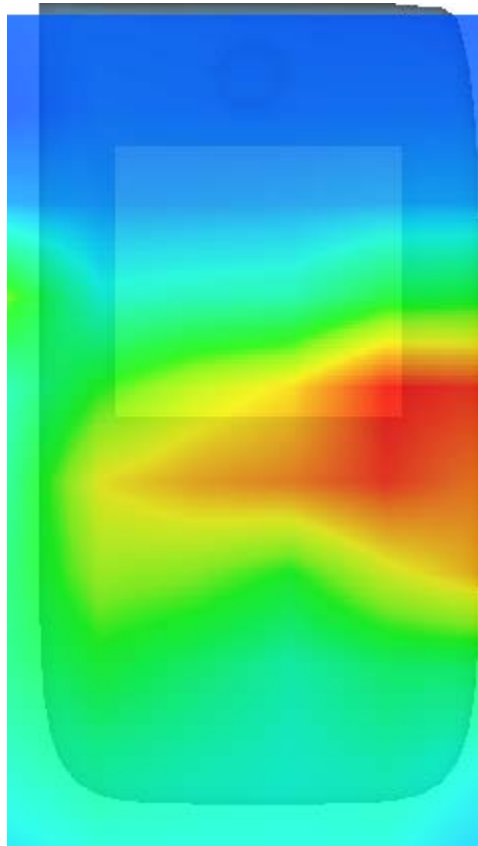
Maximum location: X=3.00, Y=13.00

SAR Peak: 0.17 W/kg

SAR 10g (W/Kg)	0.192765
SAR 1g (W/Kg)	0.582647

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5035	0.2644	0.1036	0.0539	0.0226	0.0107	0.0050



3D screen shot	Hot spot position
	

MEASUREMENT 5

Rear-side-middle

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 8 minutes 31 seconds

A. Experimental conditions.

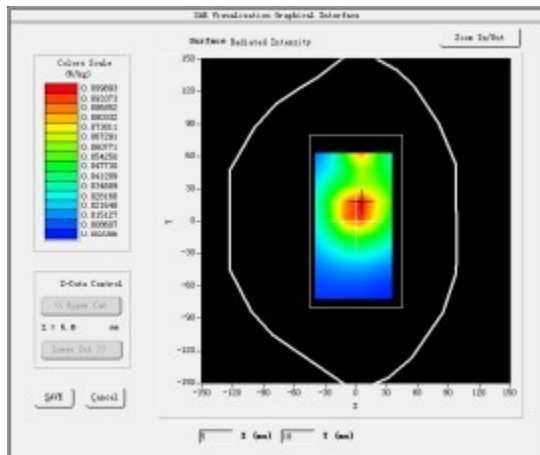
<u>Area Scan</u>	<u>dx=10mm dy=10mm</u>
<u>ZoomScan</u>	<u>7x7x12, dx=4mm dy=4mm</u> <u>dz=2mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>IEEE 802.11a U-NII-3</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>Duty cycle:1:1</u>

B. SAR Measurement Results

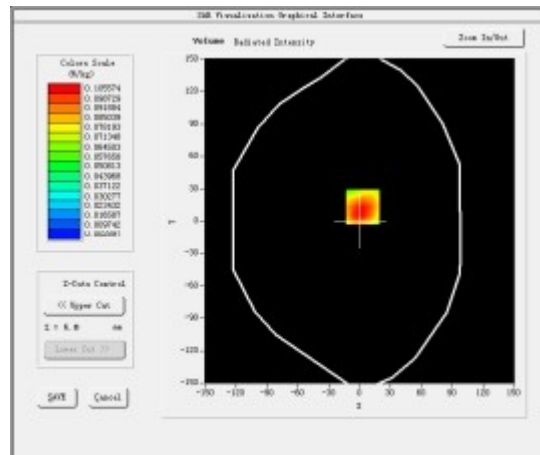
(Channel 165):

Frequency (MHz)	5825.000000
Relative permittivity (real part)	34.633851
Relative permittivity (imaginary part)	19.038417
Conductivity (S/m)	5.163402
Variation (%)	-2.770000

SURFACE SAR



VOLUME SAR

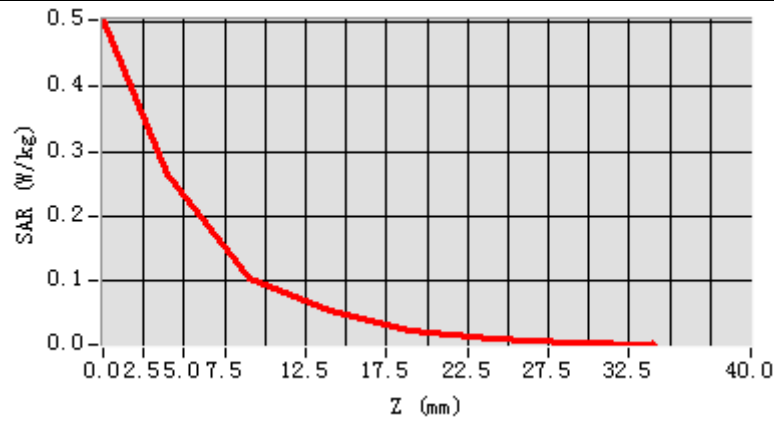


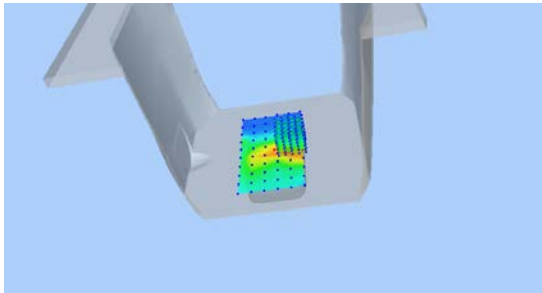
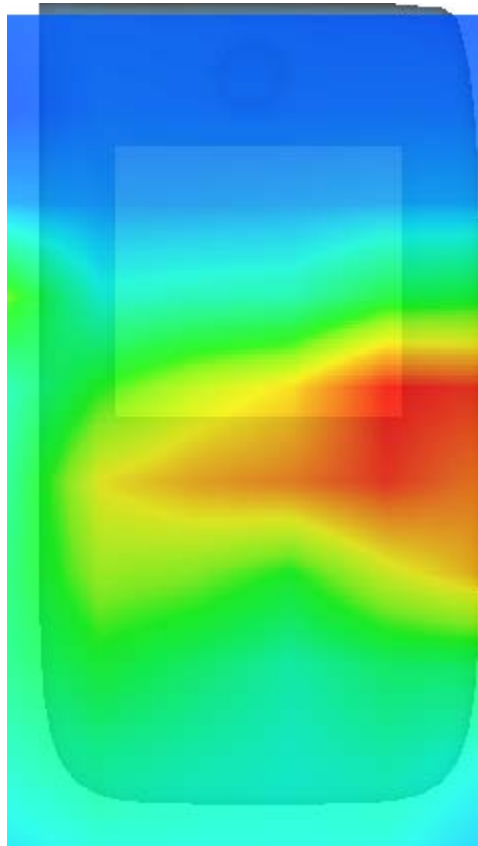
Maximum location: X=3.00, Y=13.00

SAR Peak: 0.17 W/kg

SAR 10g (W/Kg)	0.144628
SAR 1g (W/Kg)	0.341800

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5035	0.2644	0.1036	0.0539	0.0226	0.0107	0.0050



3D screen shot	Hot spot position
	

MEASUREMENT 7

Type: Phone measurement (Complete)

Date of measurement: 2/9/2024

Measurement duration: 11 minutes 11 seconds

A. Experimental conditions.

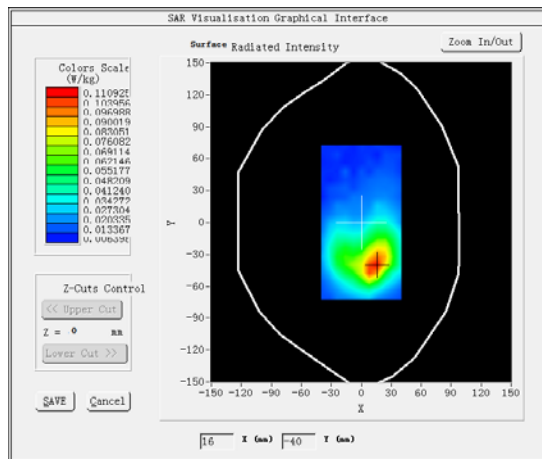
<u>Area Scan</u>	<u>dx=15mm dy=15mm</u>
<u>ZoomScan</u>	<u>7x7x7, dx=5mm dy=5mm</u> <u>dz=5mm, Complete</u>
<u>Phantom</u>	<u>Validation plane</u>
<u>Device Position</u>	<u>Body</u>
<u>Band</u>	<u>Bluetooth</u>
<u>Channels</u>	<u>Middle</u>
<u>Signal</u>	<u>Bluetooth (Crest factor: 1.0)</u>

B. SAR Measurement Results

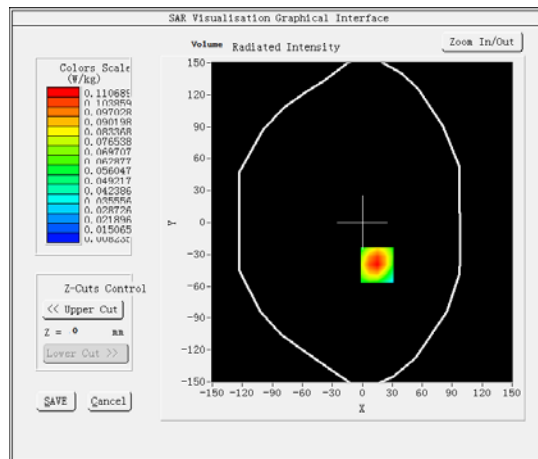
(Channel 39):

Frequency (MHz)	2441.000000
Relative permittivity (real part)	40.269142
Relative permittivity (imaginary part)	14.039240
Conductivity (S/m)	1.823490
Variation (%)	0.410000

SURFACE SAR



VOLUME SAR

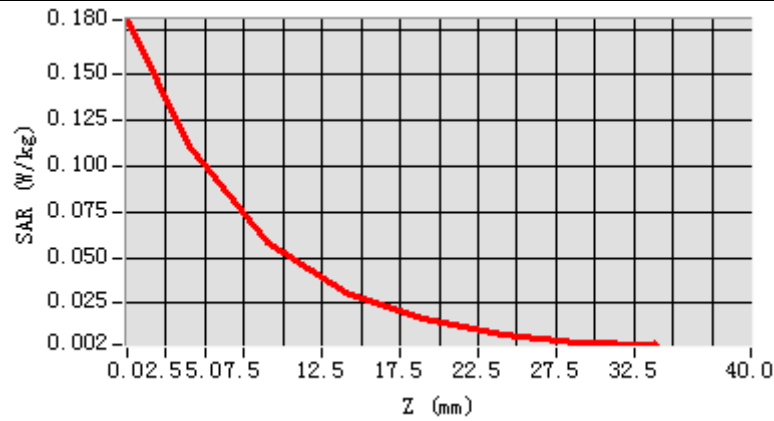


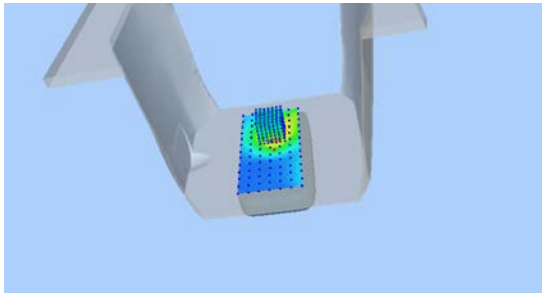
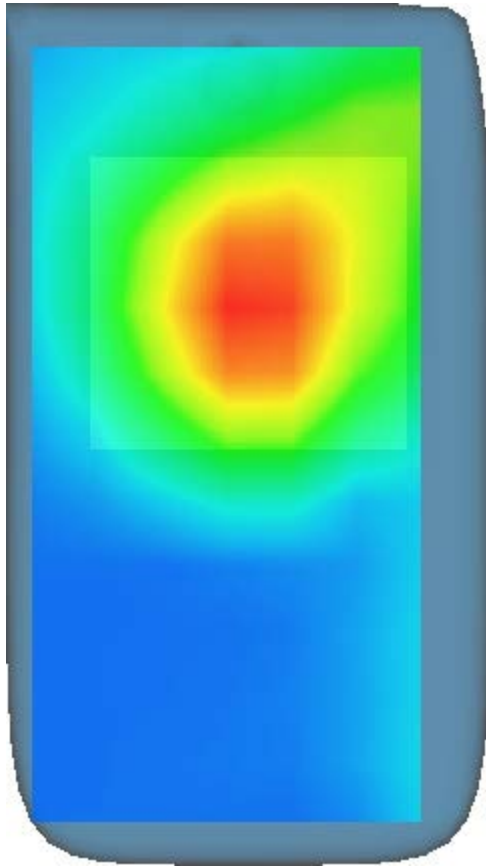
Maximum location: X=15.00, Y=-40.00

SAR Peak: 0.18 W/kg

SAR 10g (W/Kg)	0.052436
SAR 1g (W/Kg)	0.099142

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.1801	0.1114	0.0587	0.0309	0.0161	0.0083	0.0040



3D screen shot	Hot spot position
	



Annex C: Calibration Reports

Tested Model : K16SAA

Report Number:

WSCT-ANAB-R&E240700030A-SAR



SAR Reference Dipole Calibration Report

Ref : ACR.313.16.23.BES.A

WORLD STANDARDIZATION CERTIFICATION & TESTING GROUP CO.,LTD

BLOCK A, BAO SHI SCIENCE PARK, BAO SHI ROAD,
BAO'AN DISTRICT

SHENZHEN 518108, P.R. CHINA

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 2450 MHZ

SERIAL NO.: 3723-DIP2G450-738

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 09/11/2023



Accreditations #2-6789 and #2-6814

Scope available on www.cofrac.fr

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Summary:

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



	<i>Name</i>	<i>Function</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	Cyrille ONNEE	Measurement Responsible	11/9/2023	
<i>Checked & approved by:</i>	Jérôme Luc	Technical Manager	11/9/2023	
<i>Authorized by:</i>	Yann Toutain	Laboratory Director	11/9/2023	

Yann
Toutain ID

Signature
numérique de Yann
Toutain ID
Date : 2023.11.09
16:44:40 +01'00'

	<i>Customer Name</i>
<i>Distribution :</i>	World Standardization Certification & Testing Group Co ,Ltd

<i>Issue</i>	<i>Name</i>	<i>Date</i>	<i>Modifications</i>
A	Cyrille ONNEE	11/9/2023	Initial release



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1 INTRODUCTION

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

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	MVG
Model	SID2450
Serial Number	3723-DIP2G450-738
Product Condition (new / used)	New

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

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



Figure 1 – MVG COMOSAR Validation Dipole



4 MEASUREMENT METHOD

4.1 MECHANICAL REQUIREMENTS

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

4.2 S11 PARAMETER REQUIREMENTS

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

4.3 SAR REQUIREMENTS

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

5 MEASUREMENT UNCERTAINTY

5.1 MECHANICAL DIMENSIONS

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

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

5.2 S11 PARAMETER

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

5.3 SAR

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

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