



SAR TEST REPORT

Report No.: 20250317G04610X-W2
Product Name: Multi-function Thermal Imager
Model Name: HCH50R
Trade Name: InfiRay Outdoor
FCC ID: 2AY3N-COMPACT
Applicant: InfiRay Technologies Co., Ltd.
Address: Room 1705, Building A2, Phase 3, Innovation Industrial Park, High-tech Zone, Hefei City, Anhui Province, China.
Test Date: 2025/04/21–2025/04/21
Issued by: CCIC Southern Testing Co., Ltd.
Lab Location: Electronic Testing Building, No.43, Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China
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Test Report

Applicant: InfiRay Technologies Co., Ltd.

Applicant Address: Room 1705, Building A2, Phase 3, Innovation Industrial Park, High-tech Zone, Hefei City, Anhui Province, China.

Manufacturer: InfiRay Technologies Co., Ltd.

Manufacturer Address: Room 1705, Building A2, Phase 3, Innovation Industrial Park, High-tech Zone, Hefei City, Anhui Province, China.

FCC 47 CFR Part 2(2.1093): Radiofrequency Radiation Exposure Evaluation: Portable Devices

ANSI/IEEE C95.1–2019: Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz

IEEE 1528–2013: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

Test Result: Pass

Tested by: Carl Wei 2025-04-25

Carl Wei, Test Engineer

Reviewed by: Sun Jiaohui 2025-04-25

Sun Jiaohui, Senior Engineer

Approved by: Chris You 2025-04-25

Chris You, Manager

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1. Administrative Data

1.1 Testing Laboratory

Test Site:	CCIC Southern Testing Co., Ltd.
Address:	Electronic Testing Building, No.43, Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China
Accreditation:	<p><input checked="" type="checkbox"/> CCIC-SET Lab 1 Address: Electronic Testing Building, No.43, Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China</p> <p>FCC-Registration No.: CN1283 CCIC Southern Testing Co., Ltd EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN1283, valid time is until Jun. 30th, 2025.</p> <p>ISED Registration: 11185A, CAB number: CN0064 CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A on Aug. 04, 2016, valid time is until Jun. 30th, 2025.</p> <p>A2LA Code: 5721.01 CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.</p> <p>CNAS L1659 CCIC Southern Testing Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.</p> <p><input type="checkbox"/> CCIC-SET Lab 4 Address: No.125, Hongmei Section, Wangsha Road, Hongmei Town, Dongguan City, Guangdong Province, China</p> <p>CNAS L1659 CCIC Southern Testing Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.</p>
Test Environment Condition:	Temperature (°C): 18 °C – 25 °C Relative Humidity (%): 35% – 75% RH Atmospheric Pressure (kPa): 86 KPa – 106 KPa

1.2 List of test Equipment

This table is a complete overview of the SAR measurement equipment. Devices used during the test described are marked .

	EQUIPMENT	Model	Serial number	Calibration Date	Due Date
<input checked="" type="checkbox"/>	SAR Probe	SSE2	3223-EPGO-422	2025/04/15	2026/04/14
<input checked="" type="checkbox"/>	Dipole	SID2450	SN 09/13 DIP2G450-220	2023/05/24	2026/05/23
<input checked="" type="checkbox"/>	Multimeter	Keithley-2000	4014020	2025/01/14	2026/01/13
<input checked="" type="checkbox"/>	Network Analyzer	ZVB8	100343	2024/10/22	2025/10/21
<input checked="" type="checkbox"/>	Signal Generator	SMB 100A	177649	2025/01/06	2026/01/05
<input checked="" type="checkbox"/>	Power Meter	NRP2	103434	2024/06/19	2025/06/18

2. Equipment Under Test (EUT)

Identification of the Equipment under Test

Device type :	portable device
Exposure category:	uncontrolled environment / general population
Product Name:	Multi-function Thermal Imager
Trade Name :	InfiRay Outdoor
Model Name:	HCH50R
Operating Band(s):	WIFI2.4G, Bluetooth
Test Band(s):	WIFI2.4G, Bluetooth
Test modulation:	WIFI 2.4G (DSSS, OFDM), Bluetooth(GFSK/ π /4-DQPSK/8-DPSK)
WIFI:	2412 – 2462 MHz
Bluetooth:	2402 – 2480 MHz
Hardware version :	V2.40
Software version :	V1.0
Antenna type :	Internal antenna
Battery options :	Model No: HRB-18650C-1 Typical Capacity: 3650 mAh Rated Voltage: 3.6 V Manufacturer: Jinqu New Energy (Zhejiang) Co.,Ltd.
MAX. SAR Value:	Body: 0.415 W/Kg (1g SAR-0 mm, Limit: 1.6 W/Kg)

Note:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3. SAR Summary

Highest Standalone SAR Summary

Exposure Position	Frequency Band	Scaled 1g-SAR (W/kg)	Highest Scaled 1g-SAR (W/kg)
Body(0mm)	WIFI 2.4G	0.415	0.415

4. Specific Absorption Rate (SAR)

4.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental 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 ($d\rho$). The equation description is as below:

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

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

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

$$\text{SAR} = C \frac{\delta T}{\delta t}$$

where C is the specific heat capacity, δT is the temperature rise and δt the exposure duration, or related to the electrical field in the tissue by

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

where σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the rms electrical field strength.

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

4.2 Applicable Standards and Limits

4.2.1 Applicable Standards

FCC 47 CFR Part 2 (2.1093)	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-2019	Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
KDB 248227 D01	v02r02 802.11 WIFI SAR
KDB 447498 D01	v06 General RF Exposure Guidance
KDB 865664 D01	v01r04 SAR Measurement 100 MHz to 6 GHz

4.2.2 RF exposure Limits

Human Exposure	Uncontrolled Environment General Population
Spatial Peak SAR* (Brain/Body)	1.60 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g
Spatial Peak SAR*** (Limbs)	4.00 mW/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 grams 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.

4.3 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed “SAM Phantom”, manufactured by SATIMO. The SAM twin phantom is a fiberglass shell phantom with 2 mm shell thickness (except the ear region, where shell thickness increases to 6 mm).

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.



SAM Twin Phantom

4.4 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SATIMO as an integral part of the COMOSAR test system.

The device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder

4.5 Probe Specification



Construction:

Symmetrical design with triangular core
Interleaved sensors
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

Calibration ISO/IEC 17025 calibration service available.

Frequency 700 MHz to 3 GHz;
Linearity: ± 0.5 dB (700 MHz to 3 GHz)

Directivity ± 0.25 dB in HSL (rotation around probe axis)
 ± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range 1.5 μ W/g to 100 mW/g;
Linearity: ± 0.5 dB

Dimensions Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 5 mm
Distance from probe tip to dipole centers: <2.7 mm

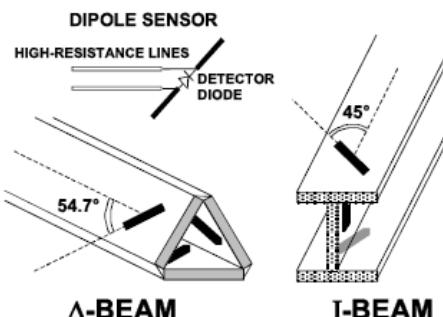
Application General dosimetry up to 3 GHz
Dosimetry in strong gradient fields
Compliance tests of mobile phones

Compatibility COMOSAR

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



5. Tissue check and recommend Dielectric Parameters

5.1 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness Power drifts in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

Table 1: Recommended Dielectric Performance of Tissue

Ingredients (% by weight)	Frequency (MHz)											
	450		835		915		1900		2450		2600	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.46	52.4	41.05	56.0	54.9	40.4	62.7	73.2	55.24	64.49
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.5	0.024
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	44.45	32.25
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.2	52.5	39.0	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.80	1.78	1.96	2.16

MSL/HSL750 (Body and Head liquid for 650 – 850 MHz)

Item	Head Tissue Simulation Liquid HSL750 Muscle(body)Tissue Simulation Liquid MSL750
H2O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40 – 60%
NaCl	Sodium Chloride, 0 – 6%
Hydroxyethyl-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1 – 0.7%
Frequency (MHz)	Head ϵ r
750	41.9
	Head σ (S/m)
	0.89
	Body ϵ r
	55.2
	Body σ (S/m)
	0.97

Note: The liquid of 700 MHz & 2600 MHz typical liquid composition is provided by SATIMO.

Frequency: 5200/5400/5600/5800 MHz	
Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

Table 2 Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue	
	ϵ_r	σ (S/m)
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
915	41.5	0.98
1450	40.5	1.20
1610	40.3	1.29
1800 – 2000	40.0	1.40
2450	39.2	1.80
3000	38.5	2.40
5800	35.3	5.27

5.2 Simulate liquid

Liquid check results:

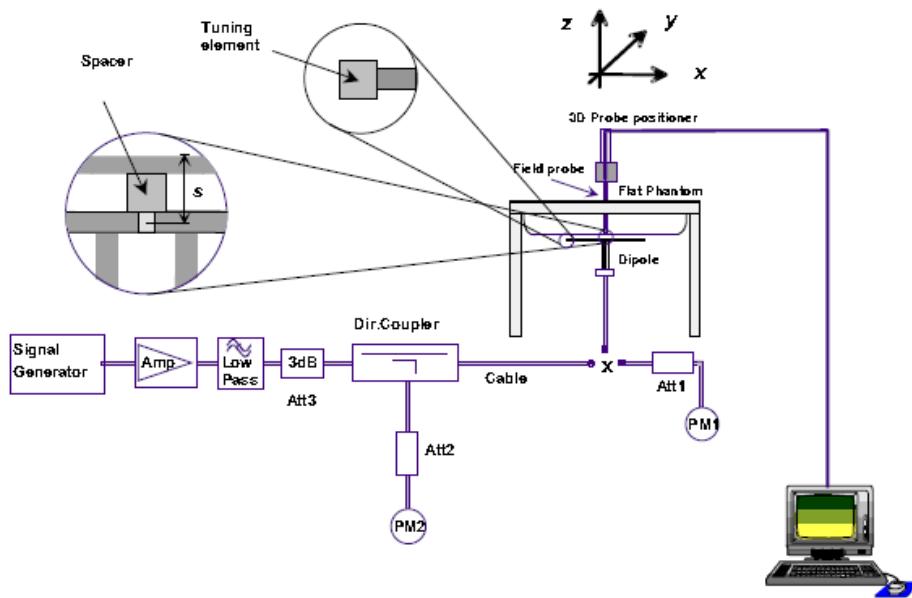
Table 3: Dielectric Performance of Tissue Simulating Liquid

/	Frequency	Permittivity ϵ	Conductivity σ (S/m)	Liquid Temp. (°C)	Test Date
Target value	2450MHz	$39.2 \pm 5\%$ (37.24~41.16)	$1.80 \pm 5\%$ (1.71~1.89)	21.8	2025/04/21
Validation value		38.62	1.77		

SAR System validation

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of $\pm 10\%$. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The following procedure, recommended for performing validation tests using box phantoms is based on the procedures described in the IEEE standard P1528. Setup according to the setup diagram below:



With the SG and Amp and with directional coupler in place, set up the source signal at the relevant frequency and use a power meter to measure the power at the end of the SMA cable that you intend to connect to the balanced dipole. Adjust the SG to make this, say, 0.01 W (10 dBm). If this level is too high to read directly with the power meter sensor, insert a calibrated attenuator (e.g. 10 or 20 dB) and make a suitable correction to the power meter reading.

Note 1: In this method, the directional coupler is used for monitoring rather than setting the exact feed power level.

If, however, the directional coupler is used for power measurement, you should check the frequency range and power rating of the coupler and measure the coupling factor (referred to output) at the test frequency using a VNA.

Note 2: Remember that the use of a 3 dB attenuator (as shown in Figure 8.1 of P1528) means that you need an RF amplifier of 2 times greater power for the same feed power. The other issue is the cable length. You might get up to 1 dB of loss per meter of cable, so the cable length after the coupler needs to be quite short.

Note 3: For the validation testing done using CW signals, most power meters are suitable. However, if you are measuring the output of a modulated signal from either a signal generator or a handset, you must ensure that the power meter correctly reads the modulated signals.

The measured 1-gram averaged SAR values of the device against the phantom are provided in Tables 5 and Table 6. The body phantom were full of the body tissue simulating liquid. The EUT was supplied with full-charged battery for each measurement.

The distance between the back of the EUT and the bottom of the flat phantom is 10 mm (taking into account of the IEEE 1528 and the place of the antenna).

Table 4: system validation (1g)
System Check Results

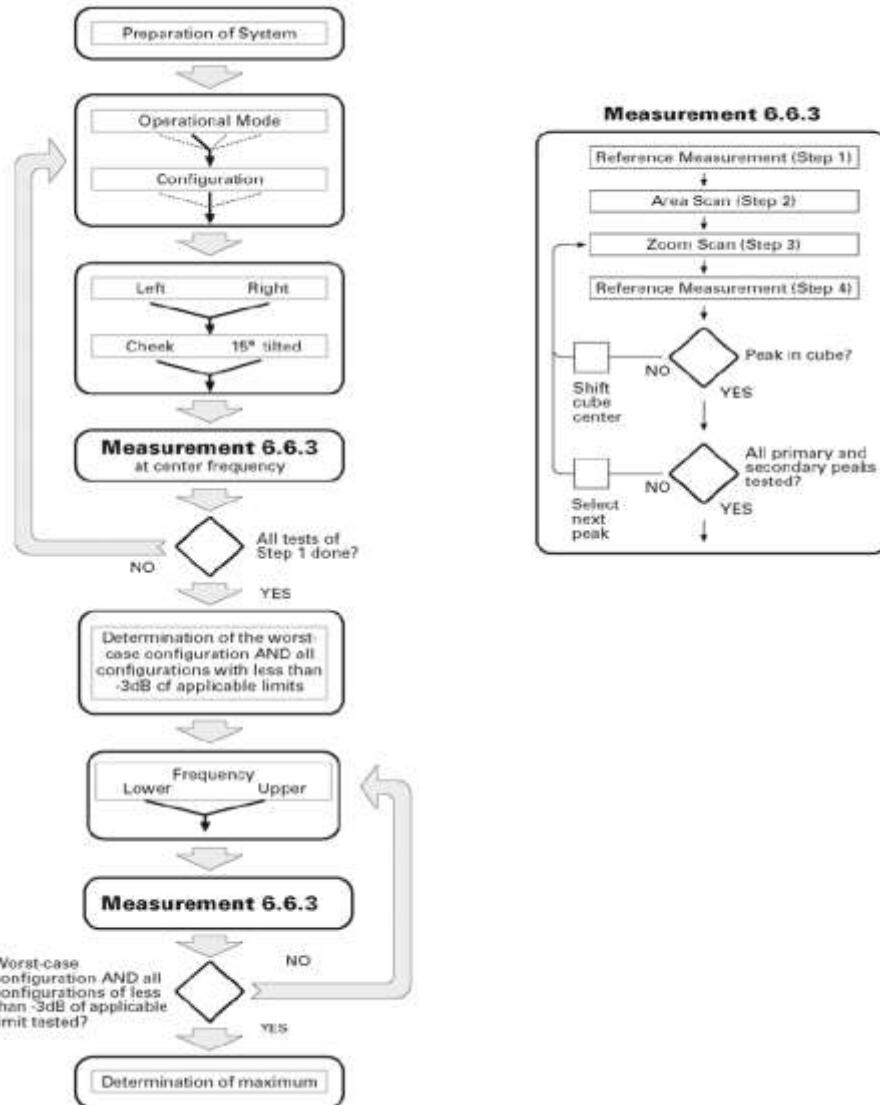
Frequency	Duty cycle	Target value (1-g) (W/Kg)	10 mW Test value (1-g) (W/Kg)	Test SAR Normalized to 1 W (W/Kg)	Test Date
2450 MHz	1:1	51.74 W/kg \pm 10% (46.566–56.914)	0.5332	53.32	2025/04/21

Note:

1. Target value was referring to the measured value in the calibration certificate of reference dipole.
2. All SAR values are normalized to 1 W forward power.

6. SAR measurement procedure

The SAR test against the head phantom was carried out as follow:



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

After an area scan has been done at a fixed distance of 2 mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEEp1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

7. Conducted RF Output Power

7.1 WIFI Conducted Power

WIFI 2.4G Output power

2.4G WIFI Channel/Freq.(MHz)	Output Power (dBm)		
	802.11b	802.11g	802.11n(HT20)
1/2412.0	6.43	7.85	7.42
6/2437.0	8.29	8.56	8.11
11/2462.0	8.53	8.45	8.26

Note:

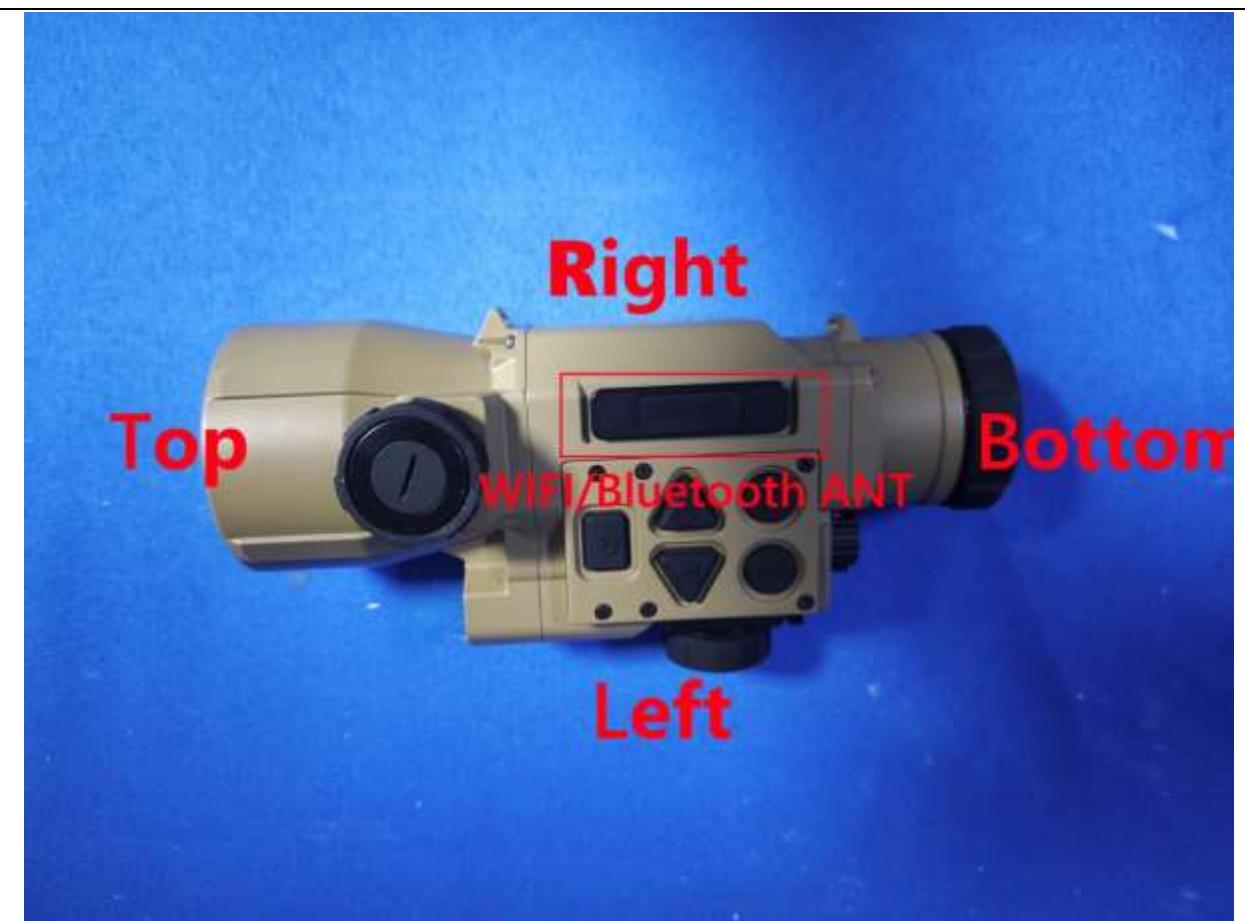
1. Per KDB 248227 D01 v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at lowest data rate

7.2 Bluetooth Conducted Power

Bluetooth Output power

Channel	Frequency (MHz)	Bluetooth Output Power(dBm)		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
CH 0	2402	7.40	5.13	5.70
CH 39	2441	8.23	5.98	6.41
CH 78	2480	7.75	5.78	6.18

8. Antenna Location:



9. Test Results

Results overview of WIFI 2.4G

Body(0mm)	Channel /Frequency	Mode	Measured Power (dBm)	Tune-up Limit (dBm)	Scaling Factor	Measured SAR 1g (W/kg)	Power Drift (dB)	Reported SAR 1g (W/kg)	Limit (W/kg)	Plot No
Front Upward	6/2437.0	802.11g	8.56	10.00	1.393	0.291	0.43	0.405	1.6	1
Back Upward	6/2437.0	802.11g	8.56	10.00	1.393	<0.001	/	/	1.6	/
Left	6/2437.0	802.11g	8.56	10.00	1.393	<0.001	/	/	1.6	/
Right	6/2437.0	802.11g	8.56	10.00	1.393	<0.001	/	/	1.6	/
Top	6/2437.0	802.11g	8.56	10.00	1.393	<0.001	/	/	1.6	/
Bottom	6/2437.0	802.11g	8.56	10.00	1.393	<0.001	/	/	1.6	/
Front Upward	1/2412.0	802.11g	7.85	10.00	1.641	0.253	-0.12	0.415	1.6	/
Front Upward	11/2462.0	802.11g	8.45	10.00	1.429	0.200	1.10	0.286	1.6	/

Results overview of Bluetooth

Body(0mm)	Channel /Frequency	Mode	Measured Power (dBm)	Tune-up Limit (dBm)	Scaling Factor	Measured SAR 1g (W/kg)	Power Drift (%)	Reported SAR 1g (W/kg)	Limit (W/kg)	Plot No
Front Upward	39/2441.0	GFSK	8.23	10.00	1.503	0.232	0.78	0.349	1.6	2
Back Upward	39/2441.0	GFSK	8.23	10.00	1.503	<0.001	/	/	1.6	/
Left	39/2441.0	GFSK	8.23	10.00	1.503	<0.001	/	/	1.6	/
Right	39/2441.0	GFSK	8.23	10.00	1.503	<0.001	/	/	1.6	/
Top	39/2441.0	GFSK	8.23	10.00	1.503	<0.001	/	/	1.6	/
Bottom	39/2441.0	GFSK	8.23	10.00	1.503	<0.001	/	/	1.6	/
Front Upward	0/2402.0	GFSK	7.40	10.00	1.820	0.177	-1.44	0.322	1.6	/
Front Upward	78/2480.0	GFSK	7.75	10.00	1.679	0.194	0.51	0.326	1.6	/

Note:

1. The maximum SAR value of each test band is marked bold.
2. When the 1-g SAR for the mid-band channel or the channel with the highest output power satisfy the following conditions, testing of the other channels in the band is not required. (Per KDB 447498 D01 General RF Exposure Guidance v06)
 - ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg, when the transmission band is ≥ 200 MHz
3. *: Due to the antenna location and antenna performance results the SAR value lower than the lowest system limit, then we show “ <0.001 W/Kg” in the report.

10. Measurement Uncertainty

COMOSAR SAR measurement uncertainty											
Ambiente temperature: 18 – 25 °C & $\Delta T \leq 2$ °C											
Humidity: 30 – 70%											
Frequency range: 150 MHz – 7500 MHz											
Symbol	Input quantity X_i (source of uncertainty)	PDF _i	Unc. $a(x_i)$ [±%]	Div. q_i	$u(x_i) =$ $a(x_i)/q_i$	c_i	c_i	$u(y) =$ $c_i^*u(x_i)$ 1g [± %]	$u(y) =$ $c_i^*u(x_i)$ 10g [± %]	v_i	Frequency range [MHz]
Measurement System errors											
CF	Probe calibration	N (k=2)	11.00 14.00	2.00 2.00	5.50 7.00	1.00 1.00	1.00 1.00	5.50 7.00	5.50 7.00	∞	150 – 450
CF _{drift}	Probe calibration drift	R	2.30	1.73	1.33	1.00	1.00	1.33	1.33	∞	150 – 450
			4.00	1.73	2.31	1.00	1.00	2.31	2.31	∞	600 – 7500
LIN	Probe linearity	R	4.70	1.73	2.71	1.00	1.00	2.71	2.71	∞	150 – 7500
	Detection limit	R	1.00	1.73	0.58	1.00	1.00	0.58	0.58	∞	
BBS	Broadband signal	R	0.00	1.73	0.00	1.00	1.00	0.00	0.00	∞	
ISO	Axial Isotropy	R	3.50	1.73	2.02	0.71	0.71	1.43	1.43	∞	
	Hemispherical Isotropy	R	5.90	1.73	3.41	0.71	0.71	2.41	2.41	∞	
DAE	Boundary effect	R	1.00	1.73	0.58	1.00	1.00	0.58	0.58	∞	
	Integration time	R	1.40	1.73	0.81	1.00	1.00	0.81	0.81	∞	
	Response time	R	0.00	1.73	0.00	1.00	1.00	0.00	0.00	∞	
	Readout electronics	N	0.50	1.00	0.50	1.00	1.00	0.50	0.50	∞	
AMB	Noise	R	3.00	1.73	1.73	1.00	1.00	1.73	1.73	∞	150 – 7500
	Reflections	R	3.00	1.73	1.73	1.00	1.00	1.73	1.73	∞	
Δxyz	Positioner Mechanical Tolerance	R	1.40	1.73	0.81	0.14	0.14	0.12	0.12	∞	≥150 & ≤3000
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	>3000 & ≤6000
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	>6000 & ≤10000
Δxyz	Positioning with respect to PhantomShell	R	1.40	1.73	0.81	0.14	0.14	0.12	0.12	∞	≥150 & ≤3000
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	>3000 & ≤6000
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	>6000 & ≤10000
DAT	Data processing errors	R	2.30	1.73	1.33	1.00	1.00	1.33	1.33	∞	150 – 7500
Phantom and Dipoles errors											
LIQ(σ,ε)	Conductivity measurement	N	4.07	1.00	4.07	0.79	0.77	3.22	3.13	9	150 – 7500
	Permitivity measurement	N	5.06	1.00	5.06	0.23	0.26	1.16	1.32	9	
LIQ(T _c)	Liquid Conductivity - Temperature Uncertainty	R	2.50	1.73	1.44	0.79	0.77	1.14	1.11	∞	
	Liquid Permitivity - Temperature Uncertainty	R	2.50	1.73	1.44	0.23	0.26	0.33	0.38	∞	
EPS	Shell permittivity	R	2.90	1.73	1.67	0.00	0.00	0.00	0.00	∞	≥150 & ≤3000
			2.90	1.73	1.67	0.25	0.25	0.42	0.42	∞	>3000 & ≤6000
			2.90	1.73	1.67	0.50	0.50	0.84	0.84	∞	>6000 & ≤10000
DIS	Distance between the radiating element of the DUT and the phantom medium	N	2.70	1.00	2.70	2.00	2.00	5.40	5.40	∞	≥150 & ≤3000
			2.70	1.00	2.70	2.00	2.00	5.40	5.40	∞	>3000 & ≤6000
			3.20	1.00	3.20	2.00	2.00	6.40	6.40	∞	>6000 & ≤10000
D _{xyz}	Repeatability of positioning the DUT or source against the phantom	N	2.60	1.00	2.60	1.00	1.00	2.60	2.60	13	150 – 7500
H	Device holder effects	N	3.00	1.00	3.00	1.00	1.00	3.00	3.00	23	
MOD	Effect of operating mode on probe sensitivity	R	8.20	1.73	4.73	1.00	1.00	4.73	4.73	∞	



RF_{drift}	Variation in SAR due to drift in output of DUT	R	5.00	1.73	2.89	1.00	1.00	2.89	2.89		
Corrections to the SAR result											
C(ε', σ)	Phantom deviation from target (ε', σ)	N	1.90	1.00	1.90	1.00	1.00	1.90	1.90		150 – 7500
C(R)	SAR scaling	R	5.00	1.73	2.89	1.00	1.00	2.89	2.89		
u(ΔSAR)	Combined uncertainty								12.54	12.53	
									13.40	13.40	$\geq 600 \text{ & } \leq 3000$
									13.44	13.43	$> 3000 \text{ & } \leq 6000$
									13.89	13.88	$> 6000 \text{ & } \leq 7500$
U	Expanded uncertainty (95% confidence interval)								25.08	25.07	150 – 450
									26.80	26.79	$\geq 600 \text{ & } \leq 3000$
									26.87	26.86	$> 3000 \text{ & } \leq 6000$
									27.77	27.76	$> 6000 \text{ & } \leq 7500$

11. System Check Uncertainty

COMOSAR System validation uncertainty

Ambiente temperature: 18 – 25 °C & $\Delta T \leq 2$ °C

Humidity: 30 – 70%

Frequency range: 150 MHz – 7500 MHz

Symbol	Input quantity X_i (source of uncertainty)	PDF _i	Unc. $a(x_i)$ [± %]	Div. q_i	$u(x_i) =$ $a(x_i)/q_i$	c_i	c_i	$u(y) =$ $c_i^* u(x_i)$ 1g [± %]	$u(y) =$ $c_i^* u(x_i)$ 10g [± %]	v_i	Frequency range [MHz]
Measurement System errors											
CF	Probe calibration	N (k=2)	11.00 14.00	2.00 2.00	5.50 7.00	1.00 1.00	1.00 1.00	5.50 7.00	5.50 7.00	∞	150 – 450
CF _{drift}	Probe calibration drift	R	2.30 4.00	1.73 1.73	1.33 2.31	1.00 1.00	1.00 1.00	1.33 2.31	1.33 2.31	∞	150 – 450
LIN	Probe linearity	R	4.70	1.73	2.71	1.00	1.00	2.71	2.71	∞	150 – 7500
LIN	Detection limit	R	1.00	1.73	0.58	1.00	1.00	0.58	0.58	∞	
ISO	Axial Isotropy	R	3.50	1.73	2.02	0.71	0.71	1.43	1.43	∞	
ISO	Hemispherical Isotropy	R	5.90	1.73	3.41	0.71	0.71	2.41	2.41	∞	
DAE	Boundary effect	R	1.00	1.73	0.58	1.00	1.00	0.58	0.58	∞	
DAE	Integration time	R	1.40	1.73	0.81	1.00	1.00	0.81	0.81	∞	
DAE	Response time	R	0.00	1.73	0.00	1.00	1.00	0.00	0.00	∞	
DAE	Readout electronics	N	0.50	1.00	0.50	1.00	1.00	0.50	0.50	∞	
AMB	Noise	R	3.00	1.73	1.73	1.00	1.00	1.73	1.73	∞	
AMB	Reflections	R	3.00	1.73	1.73	1.00	1.00	1.73	1.73	∞	
Δxyz	Positioner Mechanical Tolerance	R	1.40	1.73	0.81	0.14	0.14	0.12	0.12	∞	$\geq 150 \& \leq 3000$
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	$> 3000 \& \leq 6000$
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	$> 6000 \& \leq 10000$
Δxyz	Positioning with respect to PhantomShell	R	1.40	1.73	0.81	0.14	0.14	0.12	0.12	∞	$\geq 150 \& \leq 3000$
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	$> 3000 \& \leq 6000$
			3.28	1.73	1.89	0.33	0.33	0.62	0.62	∞	$> 6000 \& \leq 10000$
DAT	Data processing errors	R	2.30	1.73	1.33	1.00	1.00	1.33	1.33	∞	150 – 7500
Phantom and Dipoles errors											
LIQ(σ, ϵ)	Conductivity measurement	N	4.07	1.00	4.07	0.79	0.77	3.22	3.13	9	150 – 7500
	Permitivity measurement	N	5.06	1.00	5.06	0.23	0.26	1.16	1.32	9	
LIQ(T_c)	Liquid Conductivity - Temperature Uncertainty	R	2.50	1.73	1.44	0.79	0.77	1.14	1.11	∞	
	Liquid Permitivity - Temperature Uncertainty	R	2.50	1.73	1.44	0.23	0.26	0.33	0.38	∞	
EPS	Shell permittivity	R	2.90	1.73	1.67	0.00	0.00	0.00	0.00	∞	$\geq 150 \& \leq 3000$
			2.90	1.73	1.67	0.25	0.25	0.42	0.42	∞	$> 3000 \& \leq 6000$
			2.90	1.73	1.67	0.50	0.50	0.84	0.84	∞	$> 6000 \& \leq 10000$
DIS	Distance between the radiating element of the DUT and the phantom medium	N	2.70	1.00	2.70	2.00	2.00	5.40	5.40	∞	$\geq 150 \& \leq 3000$
			2.70	1.00	2.70	2.00	2.00	5.40	5.40	∞	$> 3000 \& \leq 6000$
			3.20	1.00	3.20	2.00	2.00	6.40	6.40	∞	$> 6000 \& \leq 10000$
VAL	Deviation of experimental antennas	N	10.00	1.73	5.77	1.00	1.00	5.77	5.77		
	Other uncertainty contributions	R	2.00	1.00	2.00	1.00	1.00	2.00	2.00		
P _{in}	Uncertainty in accepted power	R	3.00	1.73	1.73	1.00	1.00	1.73	1.73		
Corrections to the SAR result											
C(ϵ', σ)	Phantom deviation from target (ϵ', σ)	N	1.90	1.00	1.90	1.00	1.00	1.90	1.90		150 – 7500
u(ΔSAR)	Combined uncertainty							11.95	11.94		150 – 450



		12.85	12.84	<table border="1"><tr><td>$\geq 600 \text{ & } \leq 3000$</td></tr><tr><td>$> 3000 \text{ & } \leq 6000$</td></tr><tr><td>$> 6000 \text{ & } \leq 7500$</td></tr><tr><td>150 – 450</td></tr><tr><td>$\geq 600 \text{ & } \leq 3000$</td></tr><tr><td>$> 3000 \text{ & } \leq 6000$</td></tr></table>	$\geq 600 \text{ & } \leq 3000$	$> 3000 \text{ & } \leq 6000$	$> 6000 \text{ & } \leq 7500$	150 – 450	$\geq 600 \text{ & } \leq 3000$	$> 3000 \text{ & } \leq 6000$	$\geq 600 \text{ & } \leq 3000$
$\geq 600 \text{ & } \leq 3000$											
$> 3000 \text{ & } \leq 6000$											
$> 6000 \text{ & } \leq 7500$											
150 – 450											
$\geq 600 \text{ & } \leq 3000$											
$> 3000 \text{ & } \leq 6000$											
U	Expanded uncertainty (95% confidence interval)	12.89	12.88	$> 3000 \text{ & } \leq 6000$							
		13.35	13.35	$> 6000 \text{ & } \leq 7500$							
		23.90	23.88	150 – 450							
		25.70	25.69	$\geq 600 \text{ & } \leq 3000$							
		25.77	25.76	$> 3000 \text{ & } \leq 6000$							
		26.71	26.70	$> 6000 \text{ & } \leq 7500$							



ANNEX A: Appendix A: SAR System performance Check Plots

(Please See Appendix A)

ANNEX B: Appendix B: SAR Measurement results Plots

(Please See Appendix B)

ANNEX C: Appendix C: Calibration reports

(Please See Appendix C)

ANNEX D: Appendix D: SAR Test Setup

(Please See Appendix D)

—End of the Report—