SAR TEST REPORT

For

Shenzhen Moorechip Technologies Co.,Ltd

Retroid pocket

Test Model:Retroid Pocket 5

Additional Model No.: Retroid Pocket mini

Prepared for	:	Shenzhen Moorechip Technologies Co.,Ltd
Address	:	5th Floor, Education Industry Building, Zone 71, Xingdong Community, Xin' an Street, Bao' an District, Shenzhen
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	December 06, 2024
Number of tested samples	:	1
Sample number	:	C241125014-1
Serial number	:	Prototype
Date of Test	:	December 06, 2024 ~ December 12, 2024
Date of Report	:	December 18, 2024

SAR TEST REPORT	
Report Reference No...................:	**LCSA11294166EB**
Date Of Issue ....:	December 18, 2024
Testing Laboratory Name........... :	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address .... :	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure .... :	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name .... :	**Shenzhen Moorechip Technologies Co.,Ltd**
Address ....:	5th Floor, Education Industry Building, Zone 71, Xingdong Community, Xin' an Street, Bao' an District, Shenzhen
Test Specification:	
Standard.....................................:	FCC 47CFR §2.1093, ANSI/IEEE C95.1-2019, IEEE 1528-2013,
Test Report Form No...................:	TRF-4-E-102 A/0
TRF Originator.............................:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ....:	Dated 2014-09
Test Item Description. .... :	**Retroid pocket**
Trade Mark.................................:	N/A
Model/Type Reference ....:	Retroid Pocket 5
Ratings ....:	Input: 9V⎓3A Battery: 5000mAh 3.85V 19.25Wh
Result .... :	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Jay Zhan/ File administrators	Cary Luo / Technique principal	Gavin Liang/ Manager

SAR -- TEST REPORT

Test Report No. :	**LCSA11294166EB**	December 18, 2024 Date of issue

EUT......................................	:	Retroid pocket
Type/Model...........................	:	Retroid Pocket 5
Applicant............................	**:**	**Shenzhen Moorechip Technologies Co.,Ltd**
Address.................................	:	5th Floor, Education Industry Building, Zone 71, Xingdong Community, Xin' an Street, Bao' an District, Shenzhen
Telephone.............................	:	/
Fax.......................................	:	/
Manufacturer......................	**:**	**Shenzhen Moorechip Technologies Co.,Ltd**
Address.................................	:	5th Floor, Education Industry Building, Zone 71, Xingdong Community, Xin' an Street, Bao' an District, Shenzhen
Telephone.............................	:	/
Fax.......................................	:	/
Factory................................	**:**	**Dongguan Chijing Electronics Co., Ltd**
Address.................................	:	Room 202, Building 1, No. 8, Chashan Section, Boyan Road, Chashan Town, Dongguan City, Guangdong Province
Telephone.............................	:	/
Fax.......................................	:	/

Test Result	**Positive**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revison History

Revision	Issue Date	Revision Content	Revised By
000	December 18, 2024	Initial Issue	---

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1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Statement of Compliance

The maximum of results of SAR found during testing for Retroid Pocket 5 are follows:

<Highest Reported standalone SAR Summary>

< Retroid Pocket 5>

Classment Class	Frequency Band	Body (Report SAR1-g (W/kg)
		(Separation Distance 0mm)
DTS	WIFI2.4G ANT0	0.479
	WIFI2.4G ANT1	0.363

< Retroid Pocket mini >

Classment Class	Frequency Band	Body (Report SAR1-g (W/kg)
		(Separation Distance 0mm)
DTS	WIFI2.4G ANT0	0.471
	WIFI2.4G ANT1	0.359

Note

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

<Highest Reported simultaneous SAR Summary>

< Retroid Pocket 5>

Exposure Position	Classment Class	Body (Report SAR1-g (W/kg)	Highest Reported Simultaneous Transmission SAR1-g (W/kg)
Body	DTS	0.479	**0.842**
		0.363	

< Retroid Pocket mini >

Exposure Position	Classment Class	Body (Report SAR1-g (W/kg)	Highest Reported Simultaneous Transmission SAR1-g (W/kg)
Body	DTS	0.471	**0.830**
		0.359	

1.2. Test Location

Company:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Telephone:	(+86)755-82591330
Fax:	(+86)755-82591330
Web:	www.LCS-cert.com
E-mail:	webmaster@LCS-cert.com

1.3. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

Site Description

SAR Lab. : NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

1.4. Test Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Atmospheric pressure:	950-1050mbar
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

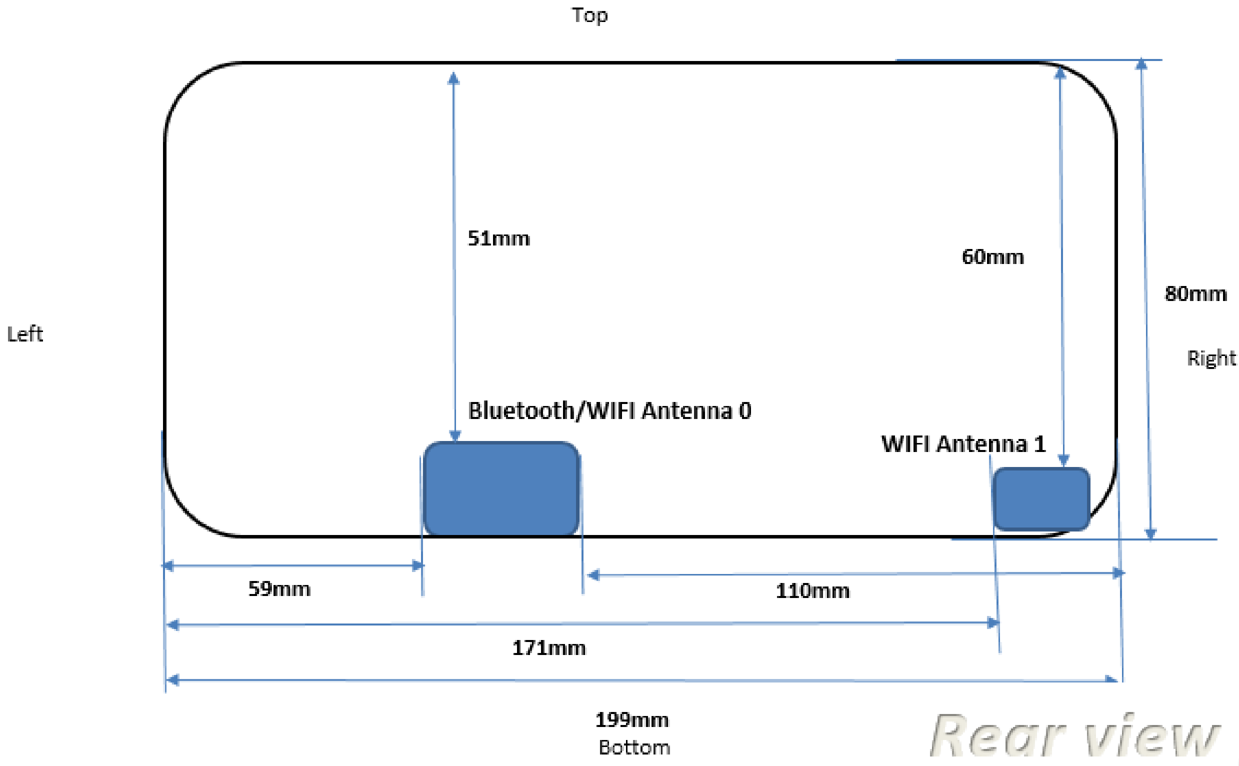
1.5. Product Description

The **Shenzhen Moorechip Technologies Co.,Ltd**'s Model: **Retroid Pocket 5** or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT	:	Retroid pocket
Test Model	:	Retroid Pocket 5
Additional Model No.	:	Retroid Pocket mini
Model Declaration	:	PCB board and internal of these model(s) are the same, only the size and appearance of the product are difference.
Ratings	:	Input: 9V⎓3A Battery: 5000mAh 3.85V 19.25Wh
Hardware Version	:	V1.2
Software Version	:	V1.0.0.51
Bluetooth	:	
Frequency Range	:	2402MHz~2480MHz
Channel Number	:	79 channels for Bluetooth V5.1 (DSS) 40 channels for Bluetooth V5.1 (DTS)
Channel Spacing	:	1MHz for Bluetooth V5.1 (DSS) 2MHz for Bluetooth V5.1 (DTS)
Modulation Type	:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V5.1 (DSS) GFSK for Bluetooth V5.1 (DTS)
Bluetooth Version	:	V5.1
Antenna Description	:	Ant 0: FPC Antenna, 1.3dBi(Max.)
WIFI(2.4G Band)	:	
Frequency Range	:	2412MHz~2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ax: OFDMA (1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Description	:	Ant 0: FPC Antenna, 1.3dBi(Max.) Ant 1: FPC Antenna, 0.1dBi(Max.)

1.6. DUT Antenna Locations

Model: Retroid Pocket 5

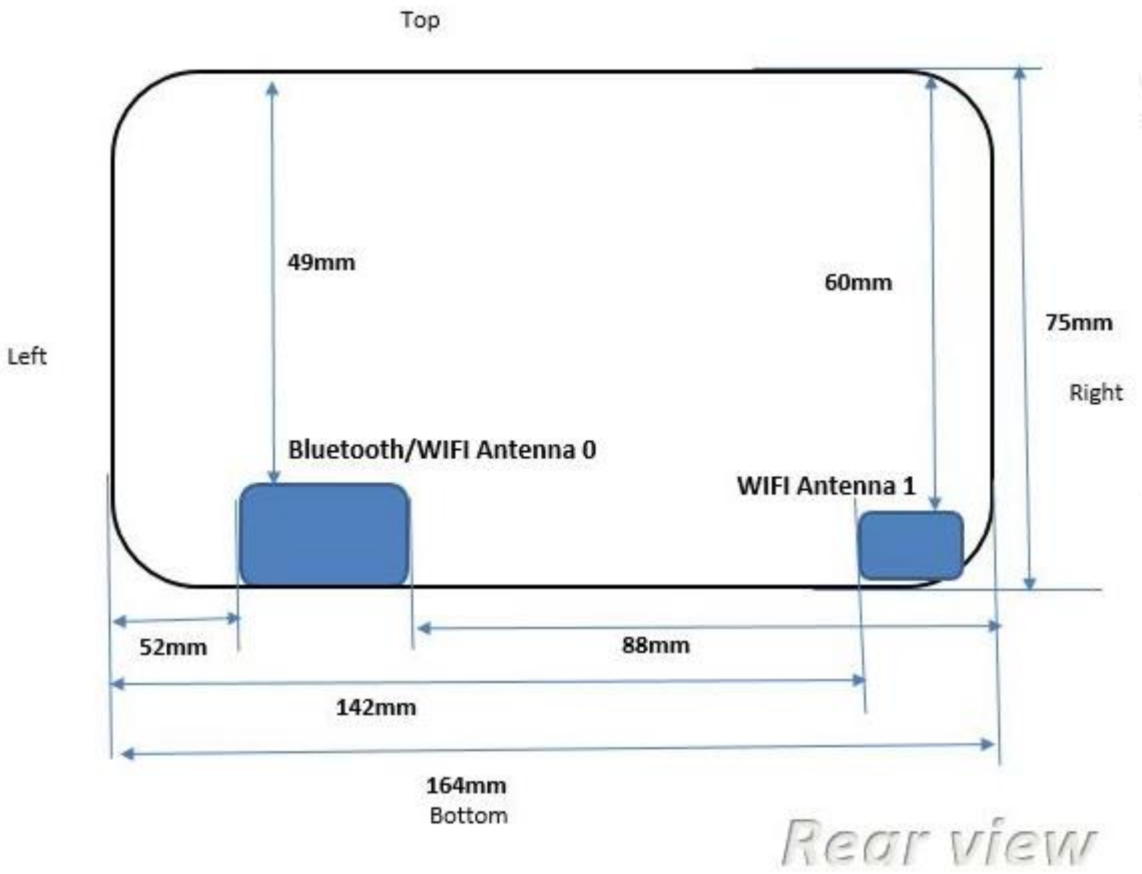


Note:

1) Antenna Ant0: WIFI2.4G,BT, Antenna Ant1: WIFI2.4G

Distance from the antenna to the EUT edge(mm)						
Mode	Front	Back	Left	Right	Top	Bottom
BT&WIFI Antenna 0	5	5	59	110	51	5
WIFI Antenna 1	5	5	171	5	60	5

Model: Retroid Pocket mini



Note:

1) Antenna Ant0: WIFI2.4G,BT, Antenna Ant1: WIFI2.4G

Distance from the antenna to the EUT edge(mm)						
Mode	Front	Back	Left	Right	Top	Bottom
BT&WIFI Antenna 0	5	5	52	85	49	5
WIFI Antenna 1	5	5	142	5	60	5

1.7. Test Specification

Identity	Document Title
FCC 47CFR §2.1093	Radiofrequency Radiation Exposure Evaluation: Portable Devices
ANSI/IEEE C95.1-2019	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2013	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	SAR Guidance for IEEE 802 11 Wi-Fi SAR v02r02
KDB 447498 D01	General RF Exposure Guidance v06
KDB 865664 D01	SAR Measurement 100 MHz to 6 GHz v01r04
KDB 865664 D02	RF Exposure Reporting v01r02
KDB 648474 D04	Handset SAR v01r03

1.8. RF exposure limits

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

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.)

1.9. Equipment list

Test Platform	SPEAG DASY5 Professional
Description	SAR Test System (Frequency range 300MHz-6GHz)
Software Reference	DASY52; SEMCAD X

Hardware Reference

	Equipment	Manufacturer	Model	Serial Number	Calibration Date	Due date of calibration
☒	PC	Lenovo	NA	NA	NA[1]	NA[1]
☒	Twin Phantom	SPEAG	SAM V5.0	1850	NA[1]	NA[1]
☒	ELI Phantom	SPEAG	ELI V6.0	2010	NA[1]	NA[1]
☒	DAE	SPEAG	DAE3	373	2024/1/3	2025/1/2
☒	E-Field Probe	SPEAG	EX3DV4	3805	2024/11/23	2025/11/22
☒	Validation Kits	SPEAG	D2450V2	808	2023/10/23	2026/10/22
☒	Agilent Network Analyzer	Agilent	8753E	SU38432944	2024/6/6	2025/6/5
☒	Dielectric Probe Kit	SPEAG	DAK3.5	1425	2024/6/6	2025/6/5
☒	Universal Radio Communication Tester	R&S	CMW500	42115	2024/10/8	2025/10/7
☒	Directional Coupler	MCLI/USA	4426-20	03746	2024/6/6	2025/6/5
☒	Power meter	Agilent	E4419B	MY45104493	2024/10/8	2025/10/7
☒	Power meter	Agilent	E4419B	MY45100308	2024/10/8	2025/10/7
☒	Power sensor	Agilent	E9301H	MY41495616	2024/10/8	2025/10/7
☒	Power sensor	Agilent	E9301H	MY41495234	2024/10/8	2025/10/7
☒	Signal Generator	Agilent	E4438C	MY49072627	2024/6/6	2025/6/5
☒	Broadband Preamplifier	/	BP-01M18G	P190501	2024/6/6	2025/6/5
☒	DC POWER SUPPLY	I-SHENG	SP-504	NA	2024/6/6	2025/6/5
☒	Speed reading thermometer	HTC-1	NA	LCS-E-138	2024/6/6	2025/6/5

Note: All the equipments are within the valid period when the tests are performed.

1" : NA as this is not measurement equipment.

2. SAR MEASUREMENTS SYSTEM CONFIGURATION

2.1. SAR Measurement System

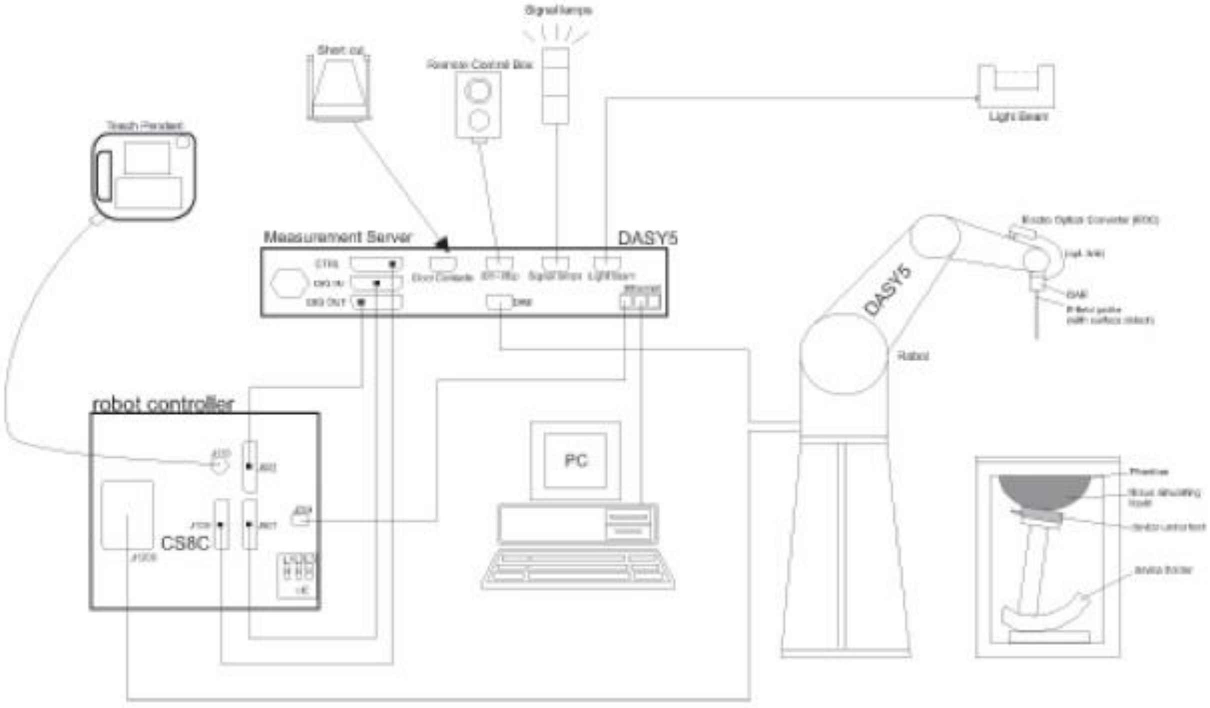
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY5 system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software .An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.



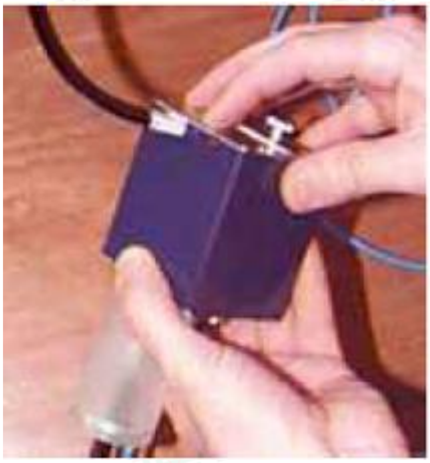
F-1. SAR Measurement System Configuration

- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validating the proper functioning of the system.

2.2. Isotropic E-field Probe EX3DV4

	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

2.3. Data Acquisition Electronics (DAE)

Model	DAE	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV,400mV)	
Input Offset Voltage	< 5μV (with auto zero)	
Input Bias Current	< 50 f A	
Dimensions	60 x 60 x 68 mm	

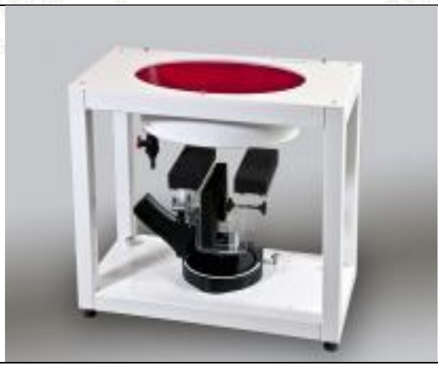
2.4. SAM Twin Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	
Wooden Support	SPEAG standard phantom table	

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0, but has reinforced top structure.

2.5. ELI Phantom

Material	Vinylester, glass fiber reinforced (VE-GF)	
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	
Wooden Support	SPEAG standard phantom table	

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure.

2.6. Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

- The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

2.7. Measurement procedure

2.7.1. Scanning procedure

Step 1: Power reference measurement

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.

Step 2: Area scan

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Zoom scan

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

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

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

Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %

2.7.2. Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

2.7.3. Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters: - Sensitivity Normi, ai0, ai1, ai2
- Conversion factor ConvFi
- Diode compression point Dcpi
Device parameters: - Frequency f
- Crest factor cf
Media parameters: - Conductivity ε
- Density ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel I (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ= conductivity in [mho/m] or [Siemens/m]
ε= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}{}^2{}_2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}{}^2 \cdot 37.7$$

with Ppwe = equivalent power density of a plane wave in mW/cm2
Etot = total electric field strength in V/m
Htot = total magnetic field strength in A/m

3. SAR measurement variability and uncertainty

3.1. SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

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

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

3.2. SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

4. Description of Test Position

4.1. Body Exposure Condition

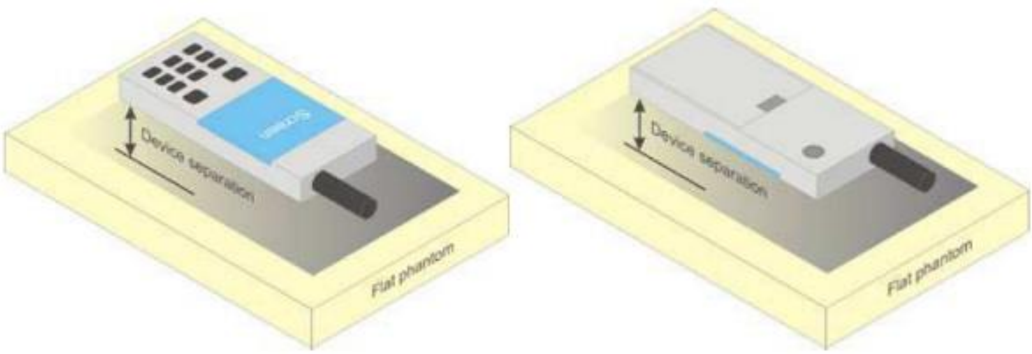
4.1.1. Body-worn accessory exposure conditions

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.



F-1. **Test positions for body-worn devices**

4.1.2. Wireless Router exposure conditions

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. For devices with form factors smaller than 9 cm x 5 cm, a test separation distance of 5 mm is required.

4.2. Extremity exposure conditions

Per FCC KDB 648474D04, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the device is marketed as “Phablet”.
The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for Product Specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

Due to the SAR result, the Main antenna frequency bands are not required to test with 0mm for the Product Specific 10 g SAR.

5. SAR System Verification Procedure

5.1. Tissue Simulate Liquid

5.1.1. Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands:

Ingredients (% by weight)	Frequency (MHz)				
	450	700-900	1750-2000	2300-2500	2500-2700
Water	38.56	40.30	55.24	55.00	54.92
Salt (NaCl)	3.95	1.38	0.31	0.2	0.23
Sucrose	56.32	57.90	0	0	0
HEC	0.98	0.24	0	0	0
Bactericide	0.19	0.18	0	0	0
Tween	0	0	44.45	44.80	44.85

Salt: 99⁺% Pure Sodium Chloride
Water: De-ionized, 16 MΩ⁺ resistivity
Tween: Polyoxyethylene (20) sorbitan monolaurate
Sucrose: 98⁺% Pure Sucrose
HEC: Hydroxyethyl Cellulose

HSL5GHz is composed of the following ingredients:
Water: 50-65%
Mineral oil: 10-30%
Emulsifiers: 8-25%
Sodium salt: 0-1.5%

Table 1: Recipe of Tissue Simulate Liquid

5.1.2. Measurement for Tissue Simulate Liquid

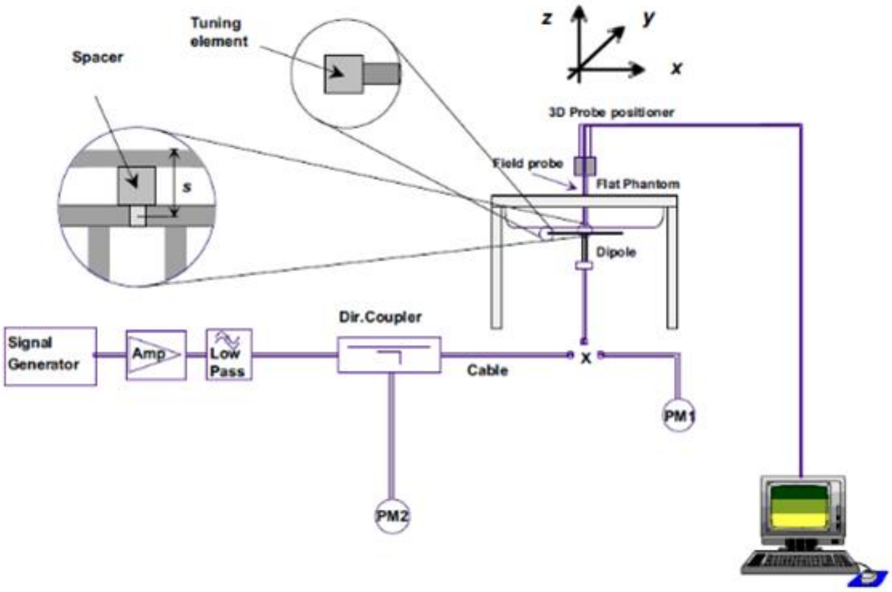
The dielectric properties for this Tissue Simulate Liquids were measured by using the DAKS. The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

Tissue Type	Measured Frequency （MHz）	Target Tissue (±5%)		Measured Tissue		Liquid Temp. (℃)	Measured Date
		ε_r	σ(S/m)	ε_r	σ(S/m)		
2450 Head	2450	39.2 (37.24~41.16)	1.8 (1.71~1.89)	38.845	1.832	22.5	December 10, 2024

Table 2： Measurement result of Tissue electric parameters

5.2. SAR System Check

The microwave circuit arrangement for system Check is sketched in F-1. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.



F-1. the microwave circuit arrangement used for SAR system check

5.2.1. Justification for Extended SAR Dipole Calibrations

1) Referring to KDB865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) Return-loss is within 20% of calibrated measurement;
d) Impedance is within 5Ω from the previous measurement.

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

D2450V2 SN 808 Extend Dipole Calibrations

Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2023-10-23	-26.3		51.4		4.73	
2024-10-22	-26.27	-0.11	51.2	-0.2	4.70	-0.03

5.2.2. Summary System Check Result(s)

Validation Kit		Measured SAR 100mW	Measured SAR 100mW	Measured SAR (normalized to 1W)	Measured SAR (normalized to 1W)	Target SAR (normalized to 1W) (±10%)	Target SAR (normalized to 1W) (±10%)	Liquid Temp. (℃)	Measured Date
		1g (W/kg)	10g (W/kg)	1g (W/kg)	10g (W/kg)	1-g(W/kg)	10-g(W/kg)		
D2450V2	Head	4.85	2.54	48.50	25.40	53.5 (48.15~58.85)	24.8 (22.32~27.28)	22.5	December 10, 2024

Table 3： Please see the Appendix A

6. SAR measurement procedure

The measurement procedures are as follows:

6.1. Conducted power measurement

a. For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously Transmission, at maximum RF power in each supported wireless interface and frequency band.
b. Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power.

6.2. WIFI Test Configuration

For WiFi SAR testing, a communication link is set up with the testing software for WiFi mode test. During the test,at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Per KDB 248227D01, a minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The repotted SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

6.2.1. Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or IJMPC mini-tablet , procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated(peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the repotted SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

6.2.2. Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.
For next to the ear, hotspot mode and CIMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the repotted SAR is ≤ 1.2 W/kg or all required channels are tested.

6.2.3. Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802 11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.
When the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

6.2.4. WiFi 2.4G SAR Test Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

a) 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel (section 3.1 of of KD8 248227D01) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0 8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

b) 2.4GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3 of of KD8 248227D01 SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

c) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/g/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-I and U-Nll-2A bands, additional SAR test reduction applies. When band gap channels between U-Nll-2C band and 5.8 GHz U-Nll-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.

6.2.5. U-NII-1 and U-NIl-2A Bands

For devices that operate in only one of the U-NII-1 and U-NIl-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 OFOM SAR requirements. If the highest repotted 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 specifiéd 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 independenty 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 cetified 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.

6.2.6. U-NII-2C and U-NIl-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 (TOWR) restriction applies, the channels at 5.60-5.65 GHz in U-NIl-2C band must be disabled with acceptable mechanisms and documented in the equipment certification to avoid SAR requirements. 10 TOWR restriction does not apply under the new rules; 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-NIl-2C band and U-NIl-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 bower 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 mihimum of at least two SAR probe calibration frequency points to suppott SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NIl-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NIl-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. 11 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.

6.2.7. OFDM Transmission Mode SAR Test Channel Selection Requirements

For 2.4 GHz and 5 GHz bands, When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth,lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations(for example 802.11a, 802.11n and 802.11ac, or 802.11g and 802.11n, with the same channel bandwidth, modulation, and data rate, etc), the lower order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac, or 802.11g is chosen over 802.11n) is used for SAR measurement.

When the maximum output power are the same for multiple test channel, either according to the default or additional power measurement requirement, SAR is measured using the channel closest to the middle of the frequency band or aggregted band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.3. Power Reduction

The product without any power reduction.

6.4. Power Drift

To control the output power stability during the SAR test, SAR system calculates the power drift by measuring the E-field at the same location at the beginning and at the end of the measurement for each test position. This ensures that the power drift during one measurement is within ±0.2dB.

7. TEST CONDITIONS AND RESULTS

7.1. Conducted Power Results

According KDB 447498 D01 General RF Exposure Guidance v06 Section 4.1 2) states that "Unless it is specified differently in the published RF exposure KDB procedures, these requirements also apply to test reduction and test exclusion considerations. Time-averaged maximum conducted output power applies to SAR and, as required by § 2.1091(c), time-averaged ERP applies to MPE. When an antenna port is not available on the device to support conducted power measurement, such as FRS and certain Part 15 transmitters with built-in integral antennas, the maximum output power allowed for production units should be used to determine RF exposure test exclusion and compliance."

7.1.1. Conducted Power Measurement Results(WIFI 2.4G)

Condition	Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Tune up(dBm)
NVNT	b	2412	Ant0	**15.72**	**16.00**
NVNT	b	2437	Ant0	15.60	16.00
NVNT	b	2462	Ant0	15.46	16.00
NVNT	g	2412	Ant0	14.42	15.00
NVNT	g	2437	Ant0	14.16	15.00
NVNT	g	2462	Ant0	14.07	15.00
NVNT	n20	2412	Ant0	13.92	14.00
NVNT	n20	2437	Ant0	13.49	14.00
NVNT	n20	2462	Ant0	13.57	14.00
NVNT	n40	2422	Ant0	12.17	13.00
NVNT	n40	2437	Ant0	12.45	13.00
NVNT	n40	2452	Ant0	12.14	13.00
NVNT	ax20	2412	Ant0	12.88	13.00
NVNT	ax20	2437	Ant0	13.89	14.00
NVNT	ax20	2462	Ant0	13.66	14.00
NVNT	ax40	2422	Ant0	12.91	13.00
NVNT	ax40	2437	Ant0	12.12	13.00
NVNT	ax40	2452	Ant0	12.79	13.00

Condition	Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Tune up(dBm)
NVNT	b	2412	Ant1	14.23	15.00
NVNT	b	2437	Ant1	**14.90**	**15.00**
NVNT	b	2462	Ant1	14.67	15.00
NVNT	g	2412	Ant1	13.66	14.00
NVNT	g	2437	Ant1	13.28	14.00
NVNT	g	2462	Ant1	13.26	14.00
NVNT	n20	2412	Ant1	13.17	14.00
NVNT	n20	2437	Ant1	12.78	13.00
NVNT	n20	2462	Ant1	12.76	13.00
NVNT	n40	2422	Ant1	12.29	13.00
NVNT	n40	2437	Ant1	11.55	12.00
NVNT	n40	2452	Ant1	11.22	12.00
NVNT	ax20	2412	Ant1	13.18	14.00
NVNT	ax20	2437	Ant1	12.80	13.00
NVNT	ax20	2462	Ant1	12.76	13.00
NVNT	ax40	2422	Ant1	12.35	13.00
NVNT	ax40	2437	Ant1	11.58	12.00
NVNT	ax40	2452	Ant1	11.17	12.00

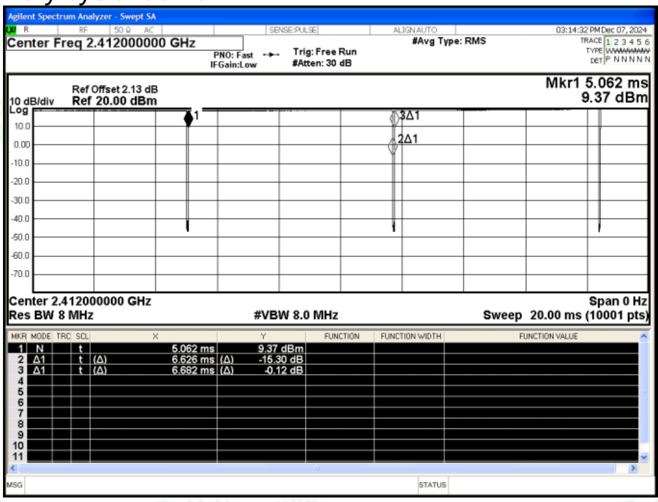
MIMO

Condition	Mode	Frequency (MHz)	Total Power (dBm)		
			Ant0	Ant1	Ant0+Ant1
NVNT	n20	2412	13.92	13.17	16.57

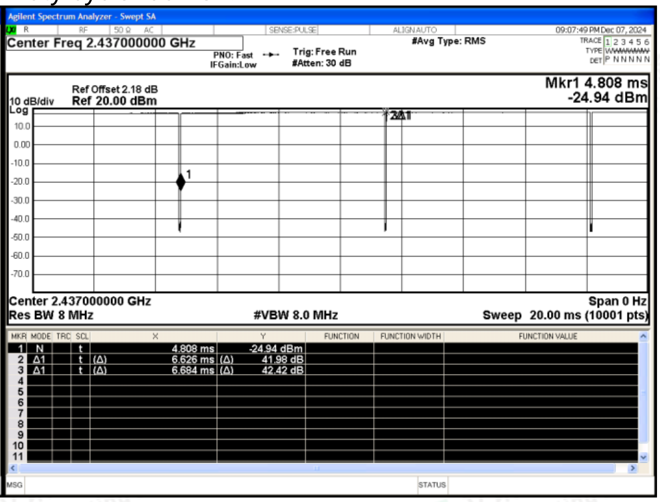
NVNT	n20	2437	13.49	12.78	16.16
NVNT	n20	2462	13.57	12.76	16.19
NVNT	n40	2422	12.17	12.29	15.24
NVNT	n40	2437	12.45	11.55	15.03
NVNT	n40	2452	12.14	11.22	14.71
NVNT	ax20	2412	12.88	13.18	16.04
NVNT	ax20	2437	13.89	12.80	16.39
NVNT	ax20	2462	13.66	12.76	16.24
NVNT	ax40	2422	12.91	12.35	15.65
NVNT	ax40	2437	12.12	11.58	14.87
NVNT	ax40	2452	12.79	11.17	15.07

Note:
a) Power must be measured at each transmit antenna port according to the DSSS and OFDM transmission configurations in each standalone and aggregated frequency band.
b) Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units.
1) When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.
2) When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent 802.11 configurations with the same maximum output power.
c) For each transmission mode configuration, power must be measured for the highest and lowest channels; and at the mid-band channel(s) when there are at least 3 channels. For configurations with multiple mid-band channels, due to an even number of channels, both channels should be measured.

Ant0:WIFI 2.4G (802.11b):
Duty cycle=99.16%



Ant1:WIFI 2.4G (802.11b):
Duty cycle=99.13%



7.1.2. Conducted Power Measurement Results(Bluetooth)

Condition	Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Tune up(dBm)
NVNT	1-DH5	2402	Ant0	0.41	1.00
NVNT	1-DH5	2441	Ant0	0.47	1.00
NVNT	1-DH5	2480	Ant0	0.48	1.00
NVNT	2-DH5	2402	Ant0	0.06	1.00
NVNT	2-DH5	2441	Ant0	0.59	1.00
NVNT	2-DH5	2480	Ant0	-0.24	0.00
NVNT	3-DH5	2402	Ant0	0.52	1.00
NVNT	3-DH5	2441	Ant0	0.93	1.00
NVNT	3-DH5	2480	Ant0	0.09	1.00

Condition	Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Tune up (dBm)
NVNT	BLE 1M	2402	Ant1	-0.32	0.00
NVNT	BLE 1M	2440	Ant1	0.13	1.00
NVNT	BLE 1M	2480	Ant1	-0.93	0.00
NVNT	BLE 2M	2402	Ant1	-0.04	0.00
NVNT	BLE 2M	2440	Ant1	-0.57	0.00
NVNT	BLE 2M	2480	Ant1	-0.65	0.00

7.2. Stand-alone SAR test evaluation

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and Product specific 10g SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

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

The test exclusions are applicable only when the minimum test separation distance is > 50 mm and for transmission frequencies between 100 MHz and 6 GHz.

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and > 50 mm

MHz	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
150	387	397	407	417	427	437	447	457	467	477	487	497	507	517	527	
300	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	
450	224	254	284	314	344	374	404	434	464	494	524	554	584	614	644	
835	164	220	275	331	387	442	498	554	609	665	721	776	832	888	943	
900	158	218	278	338	398	458	518	578	638	698	758	818	878	938	998	
1500	122	222	322	422	522	622	722	822	922	1022	1122	1222	1322	1422	1522	mW
1900	109	209	309	409	509	609	709	809	909	1009	1109	1209	1309	1409	1509	
2450	96	196	296	396	496	596	696	796	896	996	1096	1196	1296	1396	1496	
3600	79	179	279	379	479	579	679	779	879	979	1079	1179	1279	1379	1479	
5200	66	166	266	366	466	566	666	766	866	966	1066	1166	1266	1366	1466	
5400	65	165	265	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	
5800	62	162	262	362	462	562	662	762	862	962	1062	1162	1262	1362	1462	

According to the table above, Standalone SAR exclusion calculation for this device are as below:

< Model: Retroid Pocket >

	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT 0	BT	2480	Front side	5	1.00	1.26	10	Yes
		2480	Rear side	5	1.00	1.26	10	Yes
		2480	Left side	59	1.00	1.26	186	Yes
		2480	Right side	110	1.00	1.26	696	Yes
		2480	Top side	51	1.00	1.26	106	Yes
		2480	Bottom side	5	1.00	1.26	10	Yes
	Wi-Fi 2.4G	2412	Front side	5	16.00	39.81	10	No
		2412	Rear side	5	16.00	39.81	10	No
		2412	Left side	59	16.00	39.81	186	Yes
		2412	Right side	110	16.00	39.81	696	Yes
		2412	Top side	51	16.00	39.81	106	Yes
		2412	Bottom side	5	16.00	39.81	10	No

	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT 1	Wi-Fi 2.4G	2437	Front side	5	15.00	31.62	10	No
		2437	Rear side	5	15.00	31.62	10	No
		2437	Left side	171	15.00	31.62	1306	Yes
		2437	Right side	5	15.00	31.62	10	No

		2437	Top side	60	15.00	31.62	196	Yes
		2437	Bottom side	5	15.00	31.62	10	No

From what is shown in the table above, we can draw the conclusion that:

ANT0	EUT Sides for SAR Testing							
	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
	BT	Body	No	No	No	No	No	No
	WIFI 2.4G	Body	Yes	Yes	No	No	No	Yes

ANT1	EUT Sides for SAR Testing							
	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
	WIFI 2.4G	Body	Yes	Yes	No	Yes	No	Yes

EUT Sides for SAR Testing.

< Model: Retroid Pocket mini >

	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT 0	BT	2480	Front side	5	1.00	1.26	10	Yes
		2480	Rear side	5	1.00	1.26	10	Yes
		2480	Left side	52	1.00	1.26	96	Yes
		2480	Right side	85	1.00	1.26	396	Yes
		2480	Top side	49	1.00	1.26	86	Yes
		2480	Bottom side	5	1.00	1.26	10	Yes
	Wi-Fi 2.4G	2412	Front side	5	16.00	39.81	10	No
		2412	Rear side	5	16.00	39.81	10	No
		2412	Left side	59	16.00	39.81	96	Yes
		2412	Right side	110	16.00	39.81	396	Yes
		2412	Top side	51	16.00	39.81	86	Yes
		2412	Bottom side	5	16.00	39.81	10	No

	Freq. Band	Frequency (MHz)	Position	Test Separation (mm)	Max Power (dBm)	Max Power (mW)	Exclusion Threshold (mW)	Exclusion (Yes/No)
ANT 1	Wi-Fi 2.4G	2437	Front side	5	15.00	31.62	10	No
		2437	Rear side	5	15.00	31.62	10	No
		2437	Left side	142	15.00	31.62	996	Yes
		2437	Right side	5	15.00	31.62	10	No
		2437	Top side	60	15.00	31.62	196	Yes
		2437	Bottom side	5	15.00	31.62	10	No

From what is shown in the table above, we can draw the conclusion that:

ANT0	EUT Sides for SAR Testing							
	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
	BT	Body	No	No	No	No	No	No
	WIFI 2.4G	Body	Yes	Yes	No	No	No	Yes

ANT1	EUT Sides for SAR Testing							
	Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
	WIFI 2.4G	Body	Yes	Yes	No	Yes	No	Yes

EUT Sides for SAR Testing.

7.3. SAR Measurement Results

The calculated SAR is obtained by the following formula:

Reported SAR=Measured SAR*10$^{(\text{Ptarget-Pmeasured}))/10}$

Scaling factor=10$^{(\text{Ptarget-Pmeasured}))/10}$

Reported SAR= Measured SAR* Scaling factor

Where

P_{target} is the power of manufacturing upper limit;

$P_{measured}$ is the measured power;

Measured SAR is measured SAR at measured power which including power drift)

Reported SAR which including Power Drift and Scaling factor

7.3.1. SAR Results [WIFI 2.4G]

SAR Values [WIFI 2.4G] ANT0									
Ch/ Freq. (MHz)	Channel Type	Test Position	Duty Cycle Factor	Conducted Power (dBm)	Maximum Allowed Power (dBm)	PowerDrift (%)	Scaling Factor	SAR_{1-g} *results(W/kg)*	
								Measured	Reported
measured / reported SAR numbers - Body (distance 0mm)(Retroid Pocket 5)									
1/2412	802.11b	Front side	1.008	15.72	16.00	0.04	1.067	0.365	0.393
1/2412	802.11b	Rear side	1.008	15.72	16.00	-0.15	1.067	**0.445**	**0.479**
1/2412	802.11b	Bottom side	1.008	15.72	16.00	0.13	1.067	0.352	0.379
measured / reported SAR numbers - Body (distance 0mm)(Retroid Pocket mini)									
1/2412	802.11b	Front side	1.008	15.72	16.00	-0.17	1.067	0.344	0.370
1/2412	802.11b	Rear side	1.008	15.72	16.00	0.06	1.067	**0.438**	**0.471**
1/2412	802.11b	Bottom side	1.008	15.72	16.00	-0.05	1.067	0.341	0.367

SAR Values [WIFI 2.4G] ANT1									
Ch/ Freq. (MHz)	Channel Type	Test Position	Duty Cycle Factor	Conducted Power (dBm)	Maximum Allowed Power (dBm)	PowerDrift (%)	Scaling Factor	SAR_{1-g} *results(W/kg)*	
								Measured	Reported
measured / reported SAR numbers - Body (distance 0mm)(Retroid Pocket 5)									
6/2437	802.11b	Front side	1.009	14.90	15.00	0.02	1.023	0.302	0.312
6/2437	802.11b	Rear side	1.009	14.90	15.00	-0.14	1.023	**0.352**	**0.363**
6/2437	802.11b	Right side	1.009	14.90	15.00	0.05	1.023	0.237	0.245
6/2437	802.11b	Bottom side	1.009	14.90	15.00	0.03	1.023	0.245	0.253
measured / reported SAR numbers - Body (distance 0mm)(Retroid Pocket mini)									
6/2437	802.11b	Front side	1.009	14.90	15.00	-0.14	1.023	0.289	0.298
6/2437	802.11b	Rear side	1.009	14.90	15.00	-0.17	1.023	**0.348**	**0.359**
6/2437	802.11b	Right side	1.009	14.90	15.00	0.03	1.023	0.216	0.223
6/2437	802.11b	Bottom side	1.009	14.90	15.00	-0.15	1.023	0.236	0.244

Note:

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B.

2) When the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ⩽ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

7.4. Multiple Transmitter Evaluation

7.4.1. Simultaneous SAR SAR test evaluation

Simultaneous Transmission Possibilities

NO.	Simultaneous Tx Combination	Body
1	WiFi 2.4G ANT0 + WiFi 2.4G ANT1	Yes
2	WiFi 2.4G ANT1 + BT ANT0	Yes

Note:
1) The device does not support DTM function.

7.4.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:
• (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
Where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Estimated SAR Result

Freq. Band	Frequency (GHz)	Test Position	max. power (dBm)	max. power (mw)	Test Separation (mm)	Estimated 1g SAR (W/kg)
Bluetooth	2.48	Body	1.00	1.26	5	0.053

7.4.3. Simultaneous Transmission SAR Summation Scenario

< Model: Retroid Pocket 5 >

Test position		WiFi/BT Antenna SARmax (W/kg)			Summed 1g SARmax (W/kg)	
		WLAN 2.4G ANT0	WLAN 2.4G ANT1	BT ANT0		
		1	2	3	1+2	2+3
Body	Front side	0.393	0.312	0.053	0.705	0.365
	Rear side	0.479	0.363	0.053	0.842	0.416
	Left side	/	/	/	/	/
	Right side	/	0.245	/	0.245	0.245
	Top side	/	/	/	/	/
	Bottom side	0.379	0.253	0.053	0.632	0.306

< Model: Retroid Pocket mini >

Test position		WiFi/BT Antenna SARmax (W/kg)			Summed 1g SARmax (W/kg)	
		WLAN 2.4G ANT0	WLAN 2.4G ANT1	BT ANT0		
		1	2	3	1+2	2+3
Body	Front side	0.370	0.298	0.053	0.668	0.351
	Rear side	0.471	0.359	0.053	0.830	0.412
	Left side	/	/	/	/	/
	Right side	/	0.223	/	0.223	0.223
	Top side	/	/	/	/	/
	Bottom side	0.367	0.244	0.053	0.611	0.297

7.5. Measurement Uncertainty

When the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. to KDB 865664D01.

Appendix A: Detailed System Check Results

Appendix B: Detailed Test Results

Appendix C: Calibration certificate

Appendix D: Photographs

....................The End of Test Report........................