SAR TEST REPORT

For

SUPERSONIC INC

14.0 inch Notebook with Windows OS

Test Model: SC-5514WNB

Prepared for	:	SUPERSONIC INC
Address	:	6555 BANDINI BOULEVARD COMMERCE CA 90040-3119 USA
Prepared by	:	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
Tel	:	(86)755-82591330
Fax	:	(86)755-82591332
Web	:	www.LCS-cert.com
Mail	:	webmaster@LCS-cert.com

Date of receipt of test sample	:	January 30, 2024
Number of tested samples	:	1
Sample number	:	A01294074-1
Serial number	:	Prototype
Date of Test	:	January 30, 2024 ~ February 27, 2024
Date of Report	:	February 29, 2024

SAR TEST REPORT

Report Reference No.................:	**LCSA01294074EB**
Date Of Issue ....:	February 29, 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 .... :	**SUPERSONIC INC**
Address ....:	6555 BANDINI BOULEVARD COMMERCE CA 90040-3119 USA
Test Specification:	
Standard.....................................:	FCC 47CFR §2.1093, ANSI/IEEE C95.1-2019, IEEE 1528-2013
Test Report Form No. ....:	LCSEMC-1.0
TRF Originator............................:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF ....:	Dated 2014-09

Test Item Description. .... :	**14.0 inch Notebook with Windows OS**
Trade Mark ....:	SUPERSONIC
Model/Type Reference ....:	SC-5514WNB
Ratings ....:	Input: 12.0V⎓2.0A For AC Adapter Input: 100-240V~, 50/60Hz, 0.6A Adapter Output: 12.0V⎓2.0A DC 7.6V by Rechargeable Li-ion Battery, 5000mAh
Result .... :	**Positive**

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

SAR -- TEST REPORT

Test Report No. :	**LCSA01294074EB**	February 29, 2024 Date of issue

EUT..	:	14.0 inch Notebook with Windows OS
Type/Model............................	:	SC-5514WNB
Applicant..............................	**:**	**SUPERSONIC INC**
Address..................................	:	6555 BANDINI BOULEVARD COMMERCE CA 90040-3119 USA
Telephone.............................	:	/
Fax..	:	/
Manufacturer.......................	**:**	**SUPERSONIC INC**
Address..................................	:	6555 BANDINI BOULEVARD COMMERCE CA 90040-3119 USA
Telephone.............................	:	/
Fax..	:	/
Factory..................................	**:**	/
Address..................................	:	/
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	February 29, 2024	Initial Issue	---

TABLE OF CONTENTS

1. TEST STANDARDS AND TEST DESCRIPTION

1.1. Statement of Compliance

The maximum of results of SAR found during testing for SC-5514WNB are follows:

<Highest Reported standalone SAR Summary>

Classment Class	Frequency Band	Body (Report SAR1-g (W/kg) (Separation Distance 0mm)	
		ANT1	ANT2
DTS	WIFI2.4G	0.162	0.147
NII	WIFI5.2G	0.152	**0.231**
	WIFI5.8G	0.126	0.147

Note
1) This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in RSS-102 and IEEE Std C95.1, 2019, and had been tested in accordance with the measurement methods and procedures specified in IEC-IEEE 62209-1528-2020.

<Highest Reported simultaneous SAR Summary>

Exposure Position	Classment Class	Body (Report SAR1-g (W/kg)	Highest Reported Simultaneous Transmission SAR1-g (W/kg)
Body	DTS	0.162	**0.393**
	NII	0.231	

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

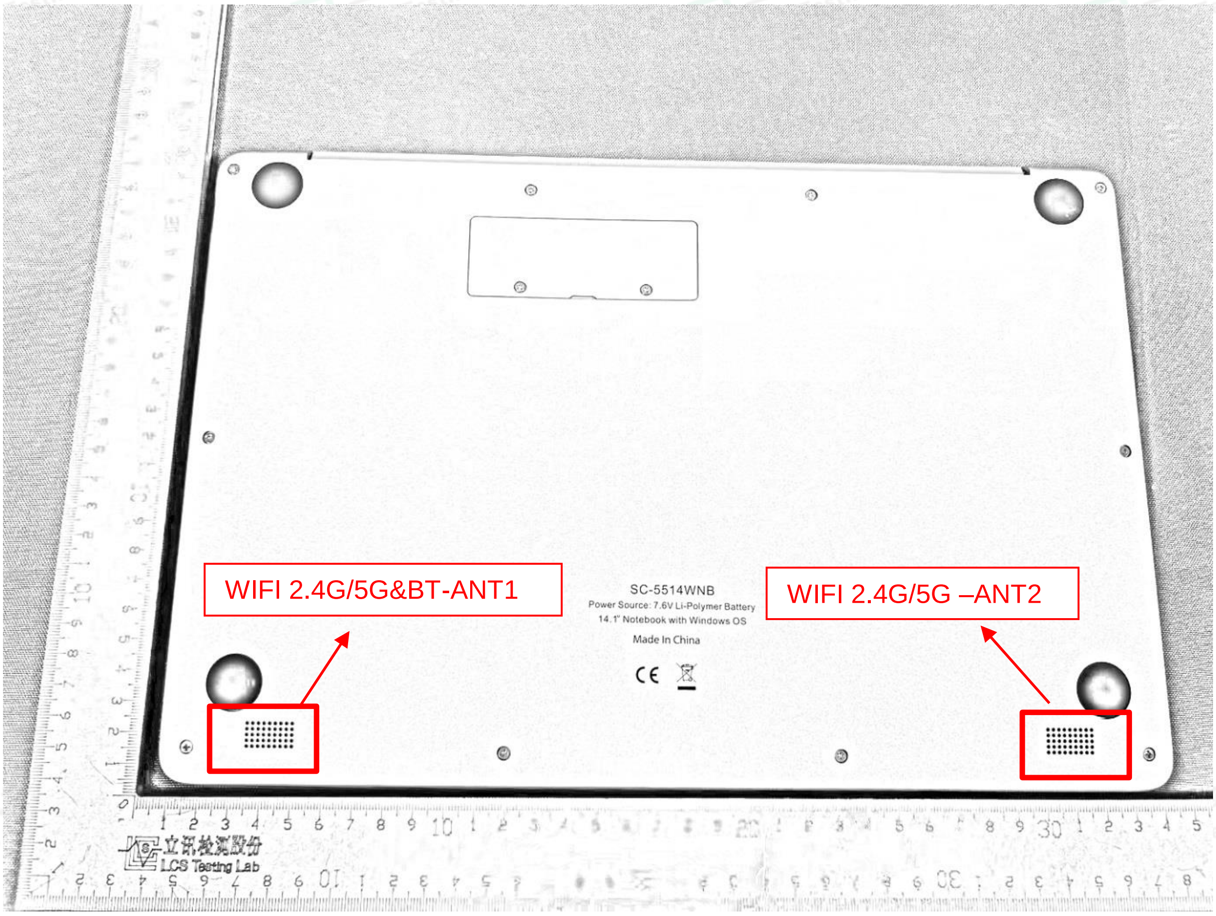
The **SUPERSONIC INC** 's Model: SC-5514WNB or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

General Description	
Product Name:	14.0 inch Notebook with Windows OS
Test Model:	SC-5514WNB
Power supply:	Input: 12.0V⎓2.0A For AC Adapter Input: 100-240V~, 50/60Hz, 0.6A Adapter Output: 12.0V⎓2.0A DC 7.6V by Rechargeable Li-ion Battery, 5000mAh
Hardware Version:	EM_IG218_200B_ENE_TI_V3.0
Software Version:	Windows 11 home

Technical Characteristics	
Bluetooth	
Frequency Range:	2402MHz~2480MHz
Bluetooth Channel Number:	79 channels for Bluetooth V4.2(DSS) 40 channels for Bluetooth V4.2 (DTS)
Bluetooth Channel Spacing:	1MHz for Bluetooth V4.2 (DSS) 2MHz for Bluetooth V4.2 (DTS)
Bluetooth Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK for Bluetooth V4.2(DSS) GFSK for Bluetooth V4.2 (DTS)
Bluetooth Version:	V4.2
Antenna Description:	Antenna1: FPC Antenna, -0.17dBi(Max.)
2.4G WLAN	
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)
Antenna Description:	Antenna1: FPC Antenna, -0.17dBi(Max.) Antenna2: FPC Antenna, -0.03dBi(Max.)
5.2G WLAN	
Frequency Range:	5180MHz~5240MHz
Channel Number	4 Channels for 20MHz bandwidth(5180MHz~5240MHz) 2 channels for 40MHz bandwidth(5190MHz~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
Modulation Type	IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Description	Antenna1: FPC Antenna, 0.66dBi(Max.) Antenna2: FPC Antenna, 1.49dBi(Max.)
5.8G WLAN	
Frequency Range:	5745MHz~5825MHz

Channel Number	5 channels for 20MHz bandwidth(5745MHz~5825MHz) 2 channels for 40MHz bandwidth(5755MHz~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Modulation Type	IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (256QAM, 64QAM, 16QAM, QPSK, BPSK)
Antenna Description	Antenna1: FPC Antenna, -2.56dBi(Max.) Antenna2: FPC Antenna, -0.02dBi(Max.)
Exposure category:	Uncontrolled Environment General Population

1.6. DUT Antenna Locations



Note:

1) Per KDB 616217 Laptop host platform test requirements: When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the rear surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required.

According to the WIFI&BT antennas we can draw the conclusion that:

EUT Sides for SAR Testing							
Mode	Exposure Condition	Front	Back	Left	Right	Top	Bottom
WIFI 2.4G/WIFI5G/BT Ant1	Body 1g SAR	No	Yes	No	No	No	No
WIFI 2.4G/WIFI5G Ant2	Body 1g SAR	No	Yes	No	No	No	No

EUT Sides for SAR Testing

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 616217 D04	SAR for Tablet and Laptop
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 690783 D01	SAR Listings on Grants 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	NA
☒	Twin Phantom	SPEAG	SAM V5.0	1850	NCR	NCR
☒	ELI Phantom	SPEAG	ELI V6.0	2010	NCR	NCR
☒	DAE	SPEAG	DAE3	373	2024/1/3	2025/1/2
☒	E-Field Probe	SPEAG	EX3DV4	3805	2023/11/23	2024/11/22
☒	Validation Kits	SPEAG	D2450V2	808	2023/10/23	2026/10/22
☒	Validation Kits	SPEAG	D5GHzV2	1046	2023/10/23	2026/10/22
☒	Agilent Network Analyzer	Agilent	8753E	SU38432944	2023/6/9	2024/6/8
☒	Dielectric Probe Kit	SPEAG	DAK3.5	1425	NCR	NCR
☒	Universal Radio Communication Tester	R&S	CMW500	42115	2023/10/29	2024/10/28
☒	Directional Coupler	MCLI/USA	4426-20	03746	2023/6/9	2024/6/8
☒	Power meter	Agilent	E4419B	MY45104493	2023/10/29	2024/10/28
☒	Power meter	Agilent	E4419B	MY45100308	2023/10/29	2024/10/28
☒	Power sensor	Agilent	E9301H	MY41495616	2023/10/29	2024/10/28
☒	Power sensor	Agilent	E9301H	MY41495234	2023/10/29	2024/10/28
☒	Signal Generator	Agilent	E4438C	MY49072627	2023/6/9	2024/6/8
☒	Broadband Preamplifier	/	BP-01M18G	P190501	2023/6/15	2024/6/14
☒	DC POWER SUPPLY	I-SHENG	SP-504	NA	NCR	NCR
☒	Speed reading thermometer	HTC-1	NA	LCS-E-138	2023/6/13	2024/6/12

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

2. SAR MEASUREMENTS SYSTEM CONFIGURATION

2.1. SAR Measurement System

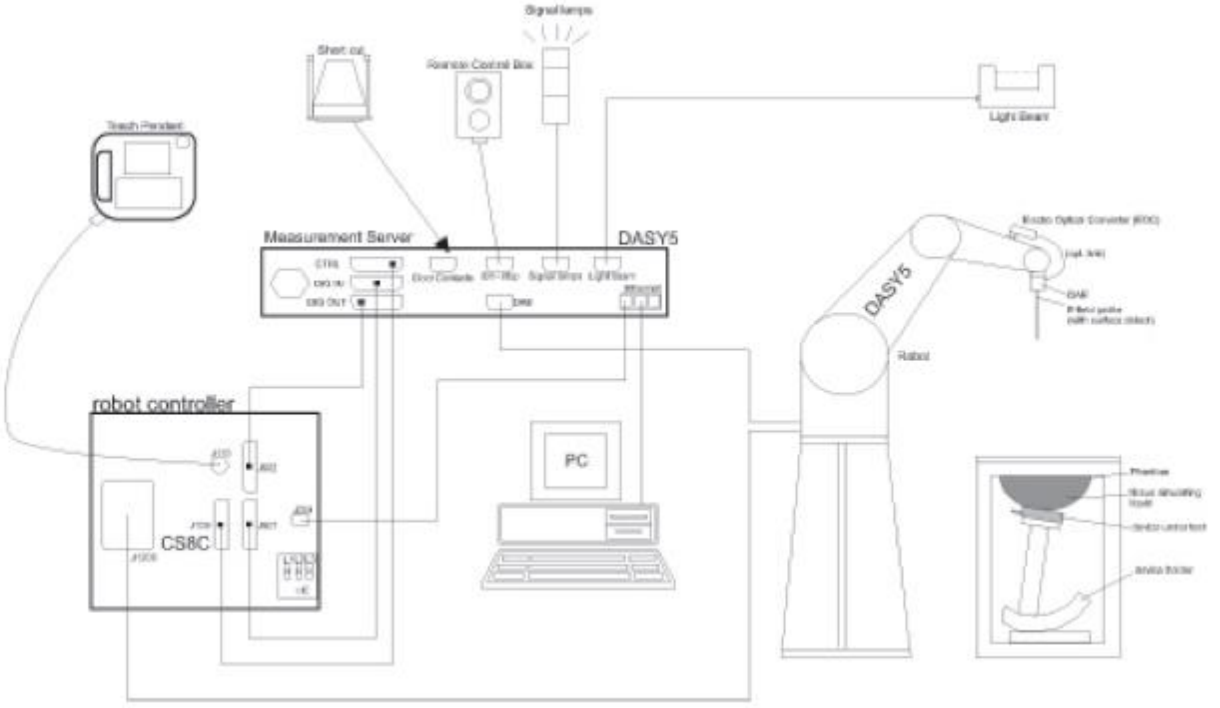
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY5 professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the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



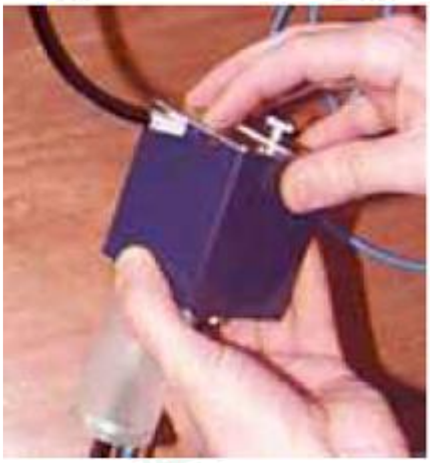
F-1. SAR Measurement System Configuration

- 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	

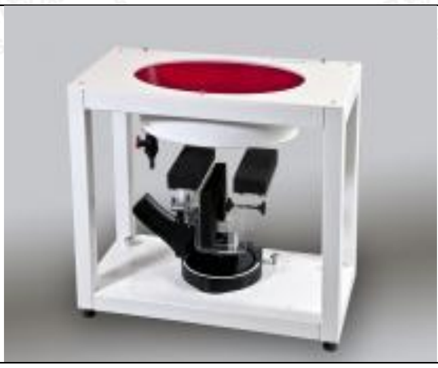
2.4. SAM Twin Phantom

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.

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

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. Test Positions Configuration

Per FCC KDB616217 D04, The required minimum test separation distance for incorporating transmitters and antennas into laptop, notebook and netbook computer displays is determined with the display screen opened at an angle of 90° to the keyboard compartment. If a computer has other operating configurations that require a different or more conservative display to keyboard angle for normal use, a KDB inquiry should be submitted to determine the test requirements. When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard.
Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required. However, when edge testing is necessary, the similar concerns for simultaneous transmission on adjacent or multiple edges described for tablets also apply.

For this device, the transmit antenna are located at the screen section.
Body operating configurations are tested with the device bottom side positioned against a flat phantom with test separation distance of 0mm in a normal use configuration.

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

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

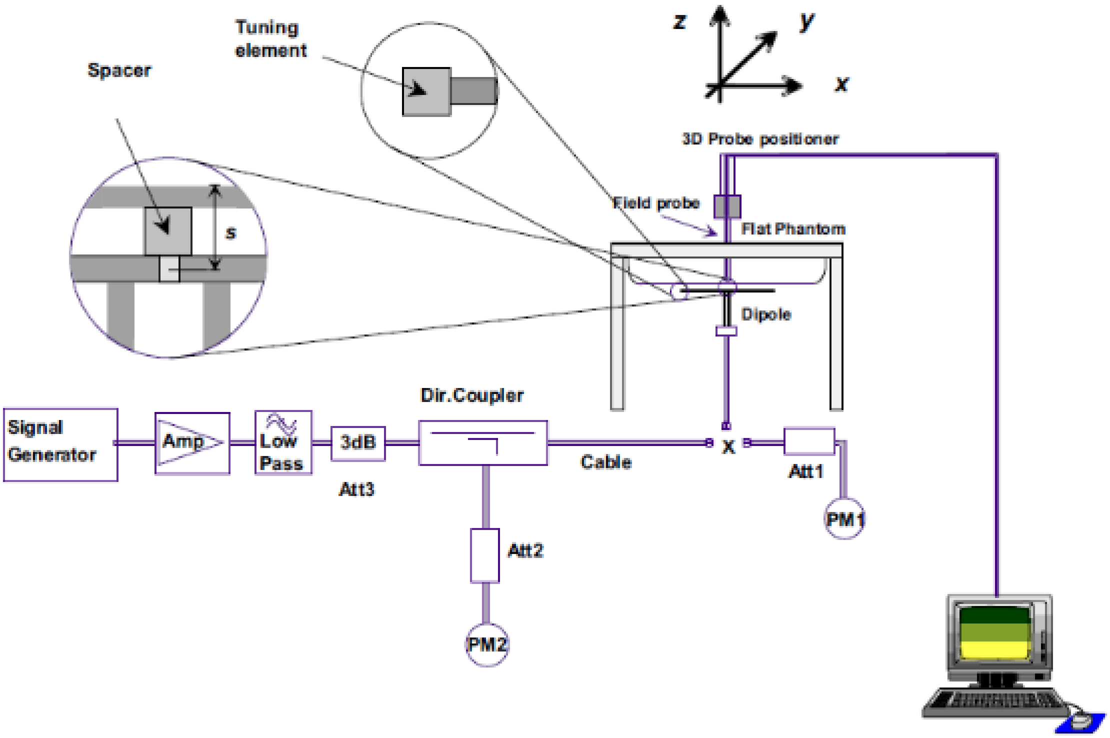
The dielectric properties for this Tissue Simulate Liquids were measured by using the DAKS. The Conductivity (σ) and Permittivity (ρ) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

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)	39.365	1.785	23.2	February 23, 2024
5250Head	5250	36.0 (34.20~37.80)	4.66 (4.43~4.89)	36.180	4.656	22.9	February 26, 2024
5750 Head	5750	35.3 (33.54~37.07)	5.27 (5.01~5.53)	35.502	5.184	23.1	February 27, 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.

5.2.2. Summary System Check Result(s)

Validation Kit		Measured SAR 250mW	Measured SAR 250mW	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	12.50	5.75	50.00	23.00	53.5 (48.15~58.85)	24.8 (22.32~27.28)	23.2	February 23, 2024
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)		
D5GHzV2	Head (5.25GHz)	7.65	2.24	76.50	22.40	78.1 (70.29~85.91)	22.2 (19.98~24.42)	22.9	February 26, 2024
	Head (5.75GHz)	8.04	2.22	80.40	22.20	77.4 (69.66~85.14)	21.6 (19.44~23.76)	23.1	February 27, 2024

Table 3： Please see the Appendx 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 5%.

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	Conducted Power (dBm)	Tune up
NVNT	b	2412	Ant1	**15.94**	**16.50**
NVNT	b	2437	Ant1	15.62	16.00
NVNT	b	2462	Ant1	15.85	16.50
NVNT	g	2412	Ant1	14.62	15.00
NVNT	g	2437	Ant1	14.58	15.00
NVNT	g	2462	Ant1	14.88	15.50
NVNT	n20	2412	Ant1	13.34	14.00
NVNT	n20	2437	Ant1	13.69	14.00
NVNT	n20	2462	Ant1	13.74	14.00
NVNT	n40	2422	Ant1	12.62	13.00
NVNT	n40	2437	Ant1	12.73	13.00
NVNT	n40	2452	Ant1	12.90	13.50

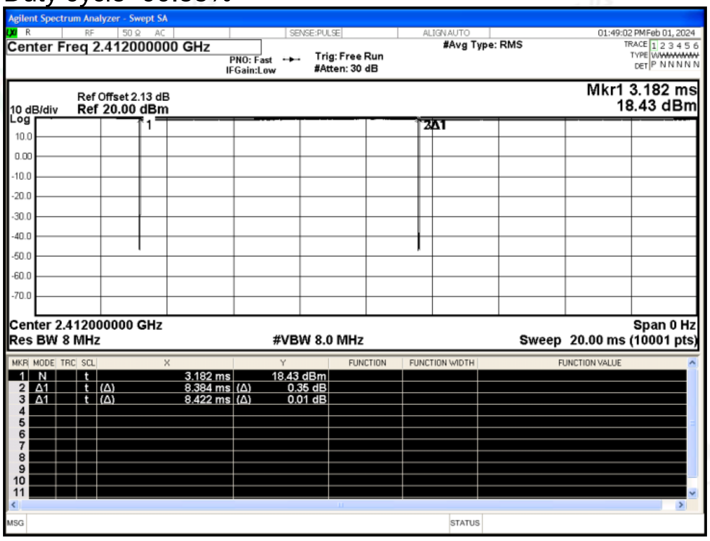
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Tune up
NVNT	b	2412	Ant2	**15.91**	**16.50**
NVNT	b	2437	Ant2	15.76	16.50
NVNT	b	2462	Ant2	15.85	16.50
NVNT	g	2412	Ant2	14.47	15.00
NVNT	g	2437	Ant2	14.76	15.50
NVNT	g	2462	Ant2	14.74	15.00
NVNT	n20	2412	Ant2	13.39	14.00
NVNT	n20	2437	Ant2	13.73	14.00
NVNT	n20	2462	Ant2	13.60	14.00
NVNT	n40	2422	Ant2	12.45	13.00
NVNT	n40	2437	Ant2	12.37	13.00
NVNT	n40	2452	Ant2	12.55	13.00

MIMO

Condition	Mode	Frequency (MHz)	Total Power (dBm)			Tune up
			ANT1	ANT2	ANT1+ANT2	
NVNT	n20	2412	13.34	13.39	16.38	17.00
NVNT	n20	2437	13.69	13.73	16.72	17.00
NVNT	n20	2462	13.74	13.60	16.68	17.00
NVNT	n40	2422	12.62	12.45	15.55	16.00
NVNT	n40	2437	12.73	12.37	15.56	16.00
NVNT	n40	2452	12.90	12.55	15.74	16.00

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.

WIFI 2.4G (802.11b):
Duty cycle=99.55%



7.1.2. Conducted Power Measurement Results(WIFI 5.2G)

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Tune up
NVNT	a	5180	Ant1	12.30	0.13	**12.43**	**13.00**
NVNT	a	5200	Ant1	12.16	0.13	12.29	13.00
NVNT	a	5240	Ant1	12.11	0.13	12.24	13.00
NVNT	n20	5180	Ant1	12.16	0.15	12.31	13.00
NVNT	n20	5200	Ant1	12.14	0.15	12.29	13.00
NVNT	n20	5240	Ant1	12.13	0.14	12.27	13.00
NVNT	n40	5190	Ant1	11.06	0.28	11.34	12.00
NVNT	n40	5230	Ant1	11.66	0.29	11.95	12.50
NVNT	ac20	5180	Ant1	12.34	0.15	12.49	13.00
NVNT	ac20	5200	Ant1	12.18	0.14	12.32	13.00
NVNT	ac20	5240	Ant1	12.10	0.14	12.24	12.50
NVNT	ac40	5190	Ant1	11.15	0.28	11.43	12.00
NVNT	ac40	5230	Ant1	11.63	0.28	11.91	12.50
NVNT	ac80	5210	Ant1	9.84	0.55	10.39	11.00

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Tune up
NVNT	a	5180	Ant2	12.29	0.13	**12.42**	**13.00**
NVNT	a	5200	Ant2	12.18	0.13	12.31	13.00
NVNT	a	5240	Ant2	12.25	0.13	12.38	13.00
NVNT	n20	5180	Ant2	12.24	0.14	12.38	13.00
NVNT	n20	5200	Ant2	12.10	0.15	12.25	13.00
NVNT	n20	5240	Ant2	11.94	0.14	12.08	12.50
NVNT	n40	5190	Ant2	11.10	0.29	11.39	12.00
NVNT	n40	5230	Ant2	11.60	0.28	11.88	12.50
NVNT	ac20	5180	Ant2	12.17	0.14	12.31	13.00
NVNT	ac20	5200	Ant2	12.03	0.14	12.17	12.50
NVNT	ac20	5240	Ant2	12.02	0.14	12.16	12.50
NVNT	ac40	5190	Ant2	10.98	0.28	11.26	12.00
NVNT	ac40	5230	Ant2	11.45	0.28	11.73	12.00
NVNT	ac80	5210	Ant2	9.76	0.55	10.31	11.00

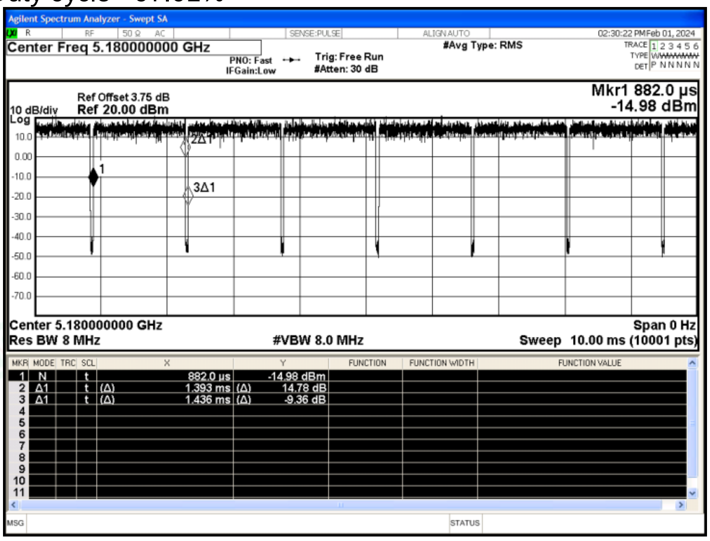
MIMO

Condition	Mode	Frequency (MHz)	Total Power (dBm)			Tune up
			Ant1	Ant2	Ant1+Ant2	
NVNT	n20	5180	12.31	12.38	15.36	16.00
NVNT	n20	5200	12.29	12.25	15.28	16.00
NVNT	n20	5240	12.27	12.08	15.19	15.50
NVNT	n40	5190	11.34	11.39	14.38	15.00
NVNT	n40	5230	11.95	11.88	14.93	15.50
NVNT	ac20	5180	12.49	12.31	15.41	16.00
NVNT	ac20	5200	12.32	12.17	15.26	16.00
NVNT	ac20	5240	12.24	12.16	15.21	15.50

NVNT	ac40	5190	11.43	11.26	14.36	15.00
NVNT	ac40	5230	11.91	11.73	14.83	15.50
NVNT	ac80	5210	10.39	10.31	13.36	14.00

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.

WIFI 5.2G (802.11a):
Duty cycle= 97.01%



7.1.3. Conducted Power Measurement Results(WIFI 5.8G)

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Tune up
NVNT	a	5745	Ant1	12.12	0.13	12.25	13.00
NVNT	a	5785	Ant1	12.28	0.13	**12.41**	**13.00**
NVNT	a	5825	Ant1	12.11	0.13	12.24	12.50
NVNT	n20	5745	Ant1	12.15	0.15	12.30	13.00
NVNT	n20	5785	Ant1	12.05	0.15	12.20	12.50
NVNT	n20	5825	Ant1	11.92	0.15	12.07	12.50
NVNT	n40	5755	Ant1	11.28	0.28	11.56	12.00
NVNT	n40	5795	Ant1	11.11	0.28	11.39	12.00
NVNT	ac20	5745	Ant1	12.24	0.14	12.38	13.00
NVNT	ac20	5785	Ant1	12.14	0.14	12.28	13.00
NVNT	ac20	5825	Ant1	12.18	0.14	12.32	13.00
NVNT	ac40	5755	Ant1	11.23	0.28	11.51	12.00
NVNT	ac40	5795	Ant1	11.12	0.28	11.40	12.00
NVNT	ac80	5775	Ant1	10.01	0.55	10.56	11.00

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Tune up
NVNT	a	5745	Ant2	12.35	0.13	**12.48**	**13.00**
NVNT	a	5785	Ant2	12.27	0.13	12.40	13.00
NVNT	a	5825	Ant2	12.32	0.13	12.45	13.00
NVNT	n20	5745	Ant2	12.27	0.15	12.42	13.00
NVNT	n20	5785	Ant2	12.12	0.15	12.27	13.00
NVNT	n20	5825	Ant2	12.20	0.15	12.35	13.00
NVNT	n40	5755	Ant2	11.30	0.29	11.59	12.00
NVNT	n40	5795	Ant2	11.28	0.29	11.57	12.00
NVNT	ac20	5745	Ant2	12.14	0.14	12.28	13.00
NVNT	ac20	5785	Ant2	12.23	0.14	12.37	13.00
NVNT	ac20	5825	Ant2	12.18	0.15	12.33	13.00
NVNT	ac40	5755	Ant2	11.32	0.28	11.60	12.00
NVNT	ac40	5795	Ant2	11.12	0.28	11.40	12.00
NVNT	ac80	5775	Ant2	10.31	0.55	10.86	11.50

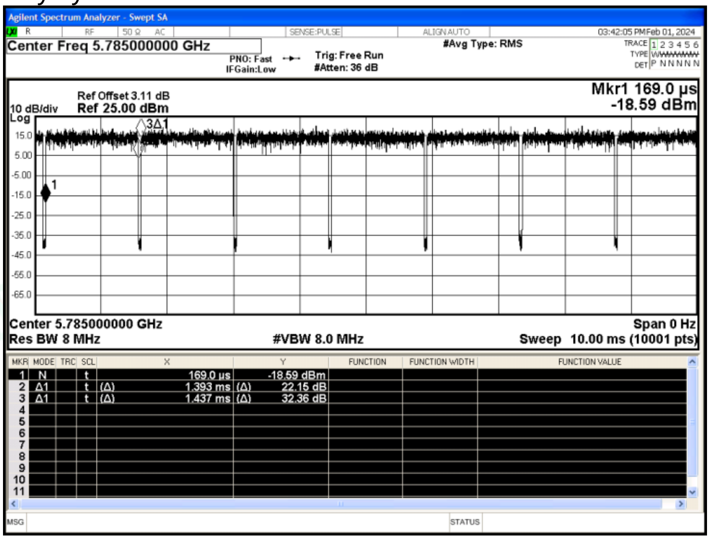
MIMO

Condition	Mode	Frequency (MHz)	Total Power (dBm)			Tune up
			Ant1	Ant2	Ant1+Ant2	
NVNT	n20	5745	12.30	12.42	15.37	16.00
NVNT	n20	5785	12.20	12.27	15.25	16.00
NVNT	n20	5825	12.07	12.35	15.22	15.50
NVNT	n40	5755	11.56	11.59	14.59	15.00
NVNT	n40	5795	11.39	11.57	14.49	15.00
NVNT	ac20	5745	12.38	12.28	15.34	16.00
NVNT	ac20	5785	12.28	12.37	15.34	16.00

NVNT	ac20	5825	12.32	12.33	15.34	16.00
NVNT	ac40	5755	11.51	11.60	14.57	15.00
NVNT	ac40	5795	11.40	11.40	14.41	15.00
NVNT	ac80	5775	10.56	10.86	13.72	14.00

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.

WIFI 5.8G (802.11a):
Duty cycle =96.94%



7.1.4. Conducted Power Measurement Results(Bluetooth)

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Tune up
NVNT	1-DH5	2402	Ant1	-0.12	0.50
NVNT	1-DH5	2441	Ant1	0.34	1.00
NVNT	1-DH5	2480	Ant1	0.55	1.00
NVNT	2-DH5	2402	Ant1	-0.92	-0.50
NVNT	2-DH5	2441	Ant1	-0.50	0.00
NVNT	2-DH5	2480	Ant1	-0.23	0.00
NVNT	3-DH5	2402	Ant1	-0.97	-0.50
NVNT	3-DH5	2441	Ant1	-0.52	0.00
NVNT	3-DH5	2480	Ant1	-0.27	0.00

BLE

TestMode	Antenna	Frequency (MHz)	Antenna	Conducted Power (dBm)	Tune up
BLE 1M	Ant1	2402	Ant1	0.90	1.50
		2440	Ant1	0.67	1.00
		2480	Ant1	-0.29	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.

Freq. Band	Frequency (GHz)	Position	Average Power		Test Separation (mm)	Calculate Value	Exclusion Threshold	Exclusion (Y/N)
			dBm	mW				
Bluetooth	2.48	Body	1.5	1.41	5	0.445	3	Y

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
• f(GHz) is the RF channel transmit frequency in GHz
• Power and distance are rounded to the nearest mW and mm before calculation
• The result is rounded to one decimal place for comparison

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

7.3. SAR Measurement Results

The calculated SAR is obtained by the following formula:

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

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

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]-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)									
1/2412	802.11b	Rear side	1.005	15.94	16.50	0.19	1.138	**0.142**	**0.162**

SAR Values [WIFI 2.4G]-ANT2									
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)									
1/2412	802.11b	Rear side	1.005	15.91	16.50	0.15	1.146	**0.128**	**0.147**

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.

7.3.2. SAR Results [WIFI 5.2G]

SAR Values [WIFI 5.2G]-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)									
36/5180	802.11a	Rear side	1.031	12.43	13.00	0.16	1.140	**0.129**	**0.152**

SAR Values [WIFI 5.2G]-ANT2									
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)									
40/5200	802.11a	Rear side	1.031	12.42	13.00	0.18	1.143	**0.196**	**0.231**

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

7.3.3. SAR Results [WIFI 5.8G]

SAR Values [WIFI 5.8G]-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)									
157/5785	802.11a	Rear side	1.032	12.41	13.00	0.20	1.146	**0.107**	**0.126**

SAR Values [WIFI 5.8G]-ANT2									
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)									
149/5745	802.11a	Rear side	1.032	12.48	13.00	-0.17	1.127	**0.126**	**0.147**

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

NO.	Simultaneous Tx Combination	Body
1	WiFi 2.4G Ant1+WiFi 2.4G Ant2	Yes
2	WiFi 5G Ant1+WiFi 5G Ant2	Yes
3	WiFi 2.4G Ant2+Bluetooth	Yes
4	WiFi 5G Ant2+Bluetooth	Yes
5	WiFi 2.4G Ant1+WiFi 5G Ant2	Yes
6	WiFi 5G Ant2+WiFi 2.4G Ant1	Yes

Note:
1) Wi-Fi 2.4G/5G ANT1 and Bluetooth share the same Tx antenna and can't transmit simultaneously.
2) 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)	max. power (dBm)	max. power (mw)	Test Separation (mm)	Estimated 1g SAR (W/kg)
Bluetooth	2.48	1.5	1.41	5	0.059

7.4.3. Simultaneous Transmission SAR Summation Scenario

Test position		Antenna SARmax (W/kg)						
		1	2	3	4	5	6	7
		WLAN 2.4G	WLAN 2.4G	WLAN 5.2G	WLAN 5.2G	WLAN 5.8G	WLAN 5.8G	BT
		Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1
Body	Rear side	0.162	0.147	0.152	0.231	0.126	0.147	0.059

Test position		Summed 1g SARmax (W/kg)									
		1+2	3+4	5+6	2+7	4+7	6+7	1+4	1+6	2+3	2+5
Body	Back side	0.309	0.383	0.273	0.206	0.290	0.206	**0.393**	0.309	0.299	0.273

APPENDIX A: DETAILED SYSTEM CHECK RESULTS

APPENDIX B: DETAILED TEST RESULTS

APPENDIX C: CALIBRATION CERTIFICATE

APPENDIX D: PHOTOGRAPHS

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