Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.*:	**CN24I9CC 004**	**Auftrags-Nr.:** *Order no.*:	168501938	Seite 1 von 33 *Page 1 of 33*
Kunden-Referenz-Nr.: *Client reference no.*:	N/A	**Auftragsdatum:** *Order date:*	2024-08-27	
Auftraggeber: *Client*:	**Shining 3D Tech Co., Ltd.** No. 1398, Xiangbin Road, Wenyan, Xiaoshan, Hangzhou, Zhejiang, P.R. China			
Prüfgegenstand: *Test item*:	Wi-Fi & Bluetooth Module			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	FCE863R			
Auftrags-Inhalt: *Order content*:	Test Report			
Prüfgrundlage: *Test specification*:	FCC 47 CFR § 2.1093 IEEE Std 1528-2013 IC RSS-102 Issue 6: December 2023 IEC/62209-1528: 2020 Published RF exposure KDB procedures			
Wareneingangsdatum: *Date of sample receipt*:	2024-09-24	Please refer to Photo Document		
Prüfmuster-Nr.: *Test sample no:*	A003809605-001			
Prüfzeitraum: *Testing period*:	2024-09-25 - 2024-09-26			
Ort der Prüfung: *Place of testing*:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: *Test result**:	Pass			

geprüft von: tested by:	x Bell Hu Signed by: Bell Hu	**genehmigt von:** *authorized by*:	X Lin Lin Signed by: Lin Lin
Datum: *Date:* 2024-10-17		**Ausstellungsdatum:** *Issue date:* 2024-10-17	
Stellung / Position:	Sachverständige(r)/Expert	**Stellung** / Position:	Sachverständige(r)/Expert

Sonstiges / *Other*:
FCC ID: 2AMG4-EINSTAR3, IC: 24652-EINSTAR3, HVIN: FCE863R, PMN: FCE863R, HMN: 3D Scanner
This report is under FCC C2PC application and ISED C4PC for the module integrated into the Host (Product:3D Scanner, Model: EinScan Libre, Manufacturer: Shining 3D Tech Co., Ltd.), the antennas changed.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
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Remarks

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1. General Information

1.1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Operating Mode	Highest Reported Body SAR_{1g} (0 cm Gap) (W/kg)
2.4G WLAN	**1.19**
5.2G WLAN	**0.22**
5.8G WLAN	**0.42**

Note:

1. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg as averaged over any 1 gram of tissue; 10-gram SAR for Product Specific 10g SAR, limit: 4.0W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992/ IC RSS-102 Issue 6:2023, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.
2. The 2.4G WLAN and 5G WLAN cannot transmit simultaneously.
3. The 5250-5350MHz, 5470-5725MHz bands and Bluetooth functions were disabled when integrated into the 3D Scanner.

1.2. Equipment Under Test (EUT) Information

1.2.1. General Information

General Information of EUT	Value
Kind of Equipment:	Wi-Fi & Bluetooth Module
Type Designation:	FCE863R
FCC ID:	2AMG4-EINSTAR3
IC:	24652-EINSTAR3
PMN:	FCE863R
HVIN:	FCE863R
HMN:	3D Scanner
Operating Voltage:	3.3 V
Antenna Type:	Integral Antennas
Antenna Gain:	Antenna 1#: -3.0dBi (Provided by the Client) Antenna 2#: -3.0dBi (Provided by the Client)
Technical Specification of Wi-Fi 802.11 b/g/n/ax	
Operating Frequency:	2412 - 2462 MHz for 802.11b/g/n(HT20) 2422 - 2452 MHz for 802.11n(HT40)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM, OFDMA(BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0~MCS 7 for 802.11n(HT20/40) MCS0~MCS11 for 802.11ax(HE20/40) (All data rates considered, only the Worst-cases reported)
Channel Number:	11 channels for 802.11b/g/n(HT20)/ax(HE20) 7 channels for 802.11n(HT40)/ax(HE40)
Channel Separation:	5 MHz
Antenna Type:	Integral Antennas
Number of Antenna:	2 (SISO and MIMO supported), no beamforming
Antenna Gain:	Antenna 1#: -3.0dBi (Provided by the Client) Antenna 2#: -3.0dBi (Provided by the Client)
RU Mode for 802.11ax	☒Full RU, ☒ Partial RU (Single RU)
Technical Specification of Wi-Fi 802.11 a/n/ac/ax	
Operating Frequency:	5180-5240MHz, 5745-5825MHz* *(The DFS bands 5250-5350MHz and 5470-5725MHz were blocked when it integrated into the host 3D Scanner)
Type of Modulation:	OFDM, OFDMA
Protocol:	802.11 a/n20/n40/ac20/ac40/ac80/ ax20/ax40/ax80
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS 7 for 802.11n MCS0~MCS9 for 802.11ac MCS0~MCS11 for 802.11ax (All data rates considered, only the Worst-cases reported)
Antenna Type:	Integral Antennas
Number of Antenna:	2 (SISO and MIMO supported), no beamforming
Antenna Gain:	Antenna 1#: -3.0dBi (Provided by the Client) Antenna 2#: -3.0dBi (Provided by the Client)
RU Mode for 802.11ax	☒Full RU, ☒ Partial RU (Single RU)

General Information of Host	Description
Kind of Equipment:	3D Scanner
Type Designation:	EinScan Libre
Operating Voltage:	DC 14.4V Battery
Testing Voltage:	DC 14.4V Battery
Operating Temperature Range:	-10 °C ~ +40 °C

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

2. Test Sites

2.1. Test Facilities

Error! Reference source not found.

No. 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

A2LA Cert. No.: 5162.01

FCC Registration No.: 694916

IC Registration No.: 25069

2.2. Ambient Condition

Ambient Temperature	21.4°C – 22.2°C
Relative Humidity	50% - 63%

2.3. List of Test and Measurement Instruments

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Dipole	SPEAG	D2450V2	1014	Jun. 06, 2024	3 years
System Validation Dipole	SPEAG	D5GHzV2	1280	Jun. 06, 2024	3 years
Dosimetric E-Field Probe	SPEAG	EX3DV4	7738	Dec. 13, 2023	1 year
Data Acquisition Electronics	SPEAG	DAE4	1725	Oct. 26, 2023	1 year
Signal Analyzer	R&S	FSV 7	103665	Jul. 22, 2024	1 year
Vector Network Analyzer	R&S	ZNB 8	107040	Jul. 22, 2024	1 year
Signal Generator	R&S	SMB 100A	180840	Jul. 22, 2024	1 year
EPM Series Power Meter	Keysight	N1914A	MY58240005	Nov. 14, 2023	1 year
Power Sensor	Keysight	N8481H	MY58250002	Nov. 14, 2023	1 year
Power Sensor	Keysight	N8481H	MY58250006	Nov. 14, 2023	1 year
DC Power Supply	Topward	3303D	809332	Nov. 14, 2023	1 year
Coaxial Directional Couper	Keysight	773D	MY52180552	Nov. 14, 2023	1 year
Coaxial Directional Couper	shhuaxiang	DTO-0.4/3.9-10	18052101	Nov. 14, 2023	1 year
Coaxial attenuator	Keysight	8491A	MY52463219	Nov. 14, 2023	1 year
Coaxial attenuator	Keysight	8491A	MY52463210	Nov. 14, 2023	1 year
Coaxial attenuator	Keysight	8491A	MY52463222	Nov. 14, 2023	1 year
Digital Thermometer	LKM	DTM3000	3116	Nov. 14, 2023	1 year
Power Amplifier Mini circuit	mini-circuits	ZHL-42W	SN002101809	N/A	N/A
Power Amplifier Mini circuit	mini-circuits	ZVE-8G	SN070501814	N/A	N/A
PHANTOM	SPEAG	ELI V8.0	2094	N/A	N/A

3. Measurement Uncertainty

Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
Measurement System Errors								
Probe Calibration	±12.7%	Normal (k=2)	2	1	1	± 6.35 %	± 6.35 %	∞
Probe Calibration Drift	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
Probe Linearity	±4.7%	Rectangular	√3	1	1	±2.7%	±2.7%	∞
Broadband Signal	±3.0%	Rectangular	√3	1	1	±1.7%	±1.7%	∞
Probe Isotropy	±7.6%	Rectangular	√3	1	1	±4.4%	±4.4%	∞
Other Probe + Electronic	±0.7%	Normal	1	1	1	±0.7%	±0.7%	∞
RF Ambient	±1.8%	Normal	1	1	1	±1.8%	±1.8%	∞
Probe Positioning	±0.006mm	Normal	1	0.14	0.14	±0.10%	±0.10%	∞
Data Processing	±1.2%	Normal	1	1	1	±1.2%	±1.2%	∞
Phantom and Device Errors								
Conductivity (meas.)[DAK]	±2.5%	Normal	1	0.78	0.71	±2.0%	±1.8%	100
Conductivity (temp.)[BB]	±3.3%	Rectangular	√3	0.78	0.71	±1.5%	±1.4%	∞
Phantom Permittivity	±14.0%	Rectangular	√3	0	0	±0%	±0%	∞
Distance DUT – TSL	±2.0%	Normal	1	2	2	±4.0%	±4.0%	∞
Device Positioning	±2.4%/±2.8%	Normal	1	1	1	±2.8%	±2.8%	30
Device Holder	±3.4%/±3.5%	Normal	1	1	1	±3.5%	±3.5%	30
DUT Modulation[m]	±2.4%	Rectangular	√3	1	1	±1.4%	±1.4%	∞
Time-average SAR	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
DUT drift	±2.5%	Normal	1	1	1	±2.5%	±2.5%	30
Val Antenna Unc.[val]	±0.0%	Normal	1	1	1	±0%	±0%	
Unc. Input Power[val]	±0.0%	Normal	1	1	1	±0%	±0%	
Correction to the SAR results								
C(ε,σ)	±1.9%	Normal	1	1	0.84	±1.9%	±1.6%	
SAR scaling[p]	±0.0%	Rectangular	√3	1	1	±0%	±0%	
Combined Standard Uncertainty (K = 1)						±12.54%	±12.44%	
Expanded Uncertainty (K = 2)						**±25.1%**	**±24.9%**	

Uncertainty budget for frequency range 300 MHz to 3 GHz

Source of Uncertainty	Tolerance (± %)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi Veff
Measurement System Errors								
Probe Calibration	±13.9%	Normal (k=2)	2	1	1	± 6.95 %	± 6.95 %	∞
Probe Calibration Drift	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
Probe Linearity	±4.7%	Rectangular	√3	1	1	±2.7%	±2.7%	∞
Broadband Signal	±2.6%	Rectangular	√3	1	1	±1.5%	±1.5%	∞
Probe Isotropy	±7.6%	Rectangular	√3	1	1	±4.4%	±4.4%	∞
Other Probe + Electronic	±1.2%	Normal	1	1	1	±1.2%	±1.2%	∞
RF Ambient	±1.8%	Normal	1	1	1	±1.8%	±1.8%	∞
Probe Positioning	±0.005mm	Normal	1	0.29	0.29	±0.15%	±0.15%	∞
Data Processing	±2.3%	Normal	1	1	1	±2.3%	±2.3%	∞
Phantom and Device Errors								
Conductivity (meas.)[DAK]	±2.5%	Normal	1	0.78	0.71	±2.0%	±1.8%	60
Conductivity (temp.)[BB]	±3.3%	Rectangular	√3	0.78	0.71	±1.5%	±1.4%	∞
Phantom Permittivity	±14.0%	Rectangular	√3	0.25	0.25	±2%	±2%	∞
Distance DUT – TSL	±2.0%	Normal	1	2	2	±4.0%	±4.0%	∞
Device Positioning	±2.4%/±2.8%	Normal	1	1	1	±2.8%	±2.8%	30
Device Holder	±3.4%/±3.5%	Normal	1	1	1	±3.5%	±3.5%	30
DUT Modulation[m]	±2.4%	Rectangular	√3	1	1	±1.4%	±1.4%	∞
Time-average SAR	±1.7%	Rectangular	√3	1	1	±1.0%	±1.0%	∞
DUT drift	±2.5%	Normal	1	1	1	±2.5%	±2.5%	30
Val Antenna Unc.[val]	±0.0%	Normal	1	1	1	±0%	±0%	
Unc. Input Power[val]	±0.0%	Normal	1	1	1	±0%	±0%	
Correction to the SAR results								
Deviation to Target	±1.9%	Normal	1	1	0.84	±1.9%	±1.6%	
SAR scaling[p]	±0.0%	Rectangular	√3	1	1	±0%	±0%	
Combined Standard Uncertainty (K = 1)						±12.8%	±12.7%	
Expanded Uncertainty (K = 2)						**±25.6%**	**±25.4%**	

Uncertainty budget for frequency range 3 GHz to 6 GHz

4. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528- 2013, the following FCC Published RF exposure KDB procedures & manufacturer KDB inquiries:

- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 865664 D02 RF Exposure Reporting v01r02
- KDB 248227 D01 802 11 Wi-Fi SAR v02r02
- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 447498 D04 Interim General RF Exposure Guidance v01
- IC RSS-102 Issue 6: December 2023 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
- IEC/IEEE 62209-1528:2020 Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)

In addition to the above, the following information was used:

- TCB workshop April, 2019; Page 19, Tissue Simulating Liquids(TSL)

5. SAR Measurement System

5.1. Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

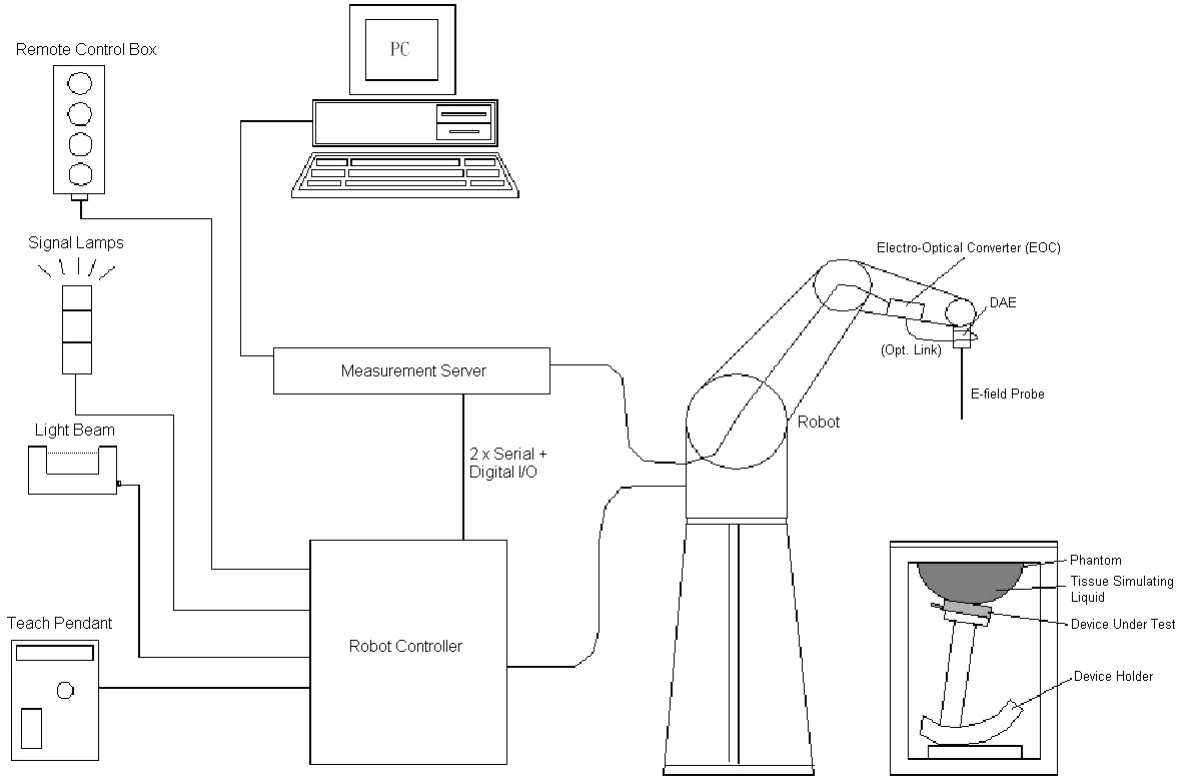
SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be related to the electrical field in the tissue by

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

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

5.2. SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

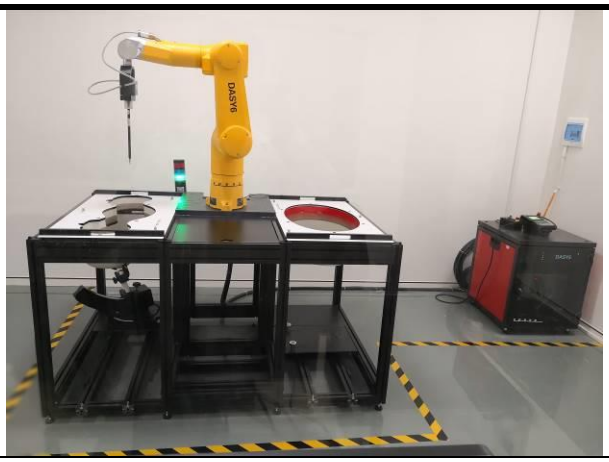


DASY System Setup

5.2.1.Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



DASY6

5.2.2. Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Model	EX3DV4	
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	4 MHz – 10 GHz Linearity: ±0.2 dB (30 MHz – 10 GHz)	
Directivity	±0.1 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >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	

5.2.3.Data Acquisition Electronics (DAE)

Model	DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY 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 fA	
Dimensions	60 x 60 x 68 mm	

5.2.4. Phantoms

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEC/IEEE 62209-1528. 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.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	

Model	ELI	
Construction	The ELI phantom is used for compliance testing of handheld and body-mounted wireless devices in the frequency range of 4 MHz to 10 GHz. ELI is fully compatible with the IEC/IEEE 62209-1528 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 of SPEAG's dosimetric probes and dipoles.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	

5.2.5. Device Holder

Model	Mounting Device	
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
Material	POM	

Model	Laptop Extensions Kit	
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-1528 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
Material	POM, Acrylic glass, Foam	

5.2.6.System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with l/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
Frequency	750 MHz to 5800 MHz	
Return Loss	> 20 dB	
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)	

5.2.7. Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed.

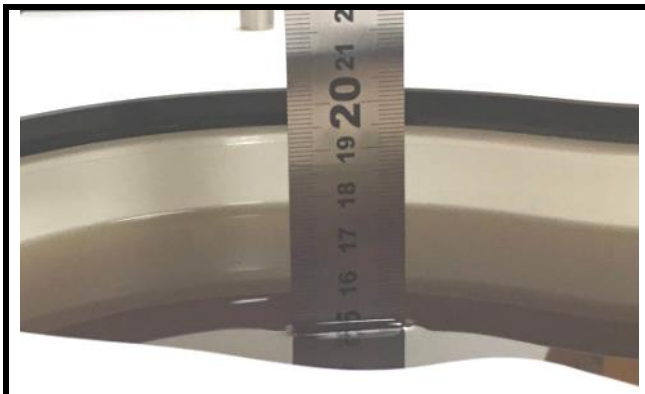
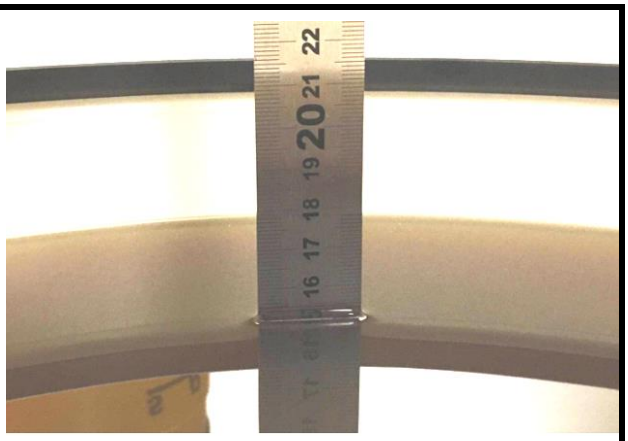
	

Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528, and KDB 865664 D01 Appendix A. For the body tissue simulating liquids, the dielectric properties are defined in KDB 865664 D01 Appendix A. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using a dielectric assessment kit and a network analyzer.

Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
For Head				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53

The following table gives the recipes for tissue simulating liquids.

Recipes of Tissue Simulating Liquid

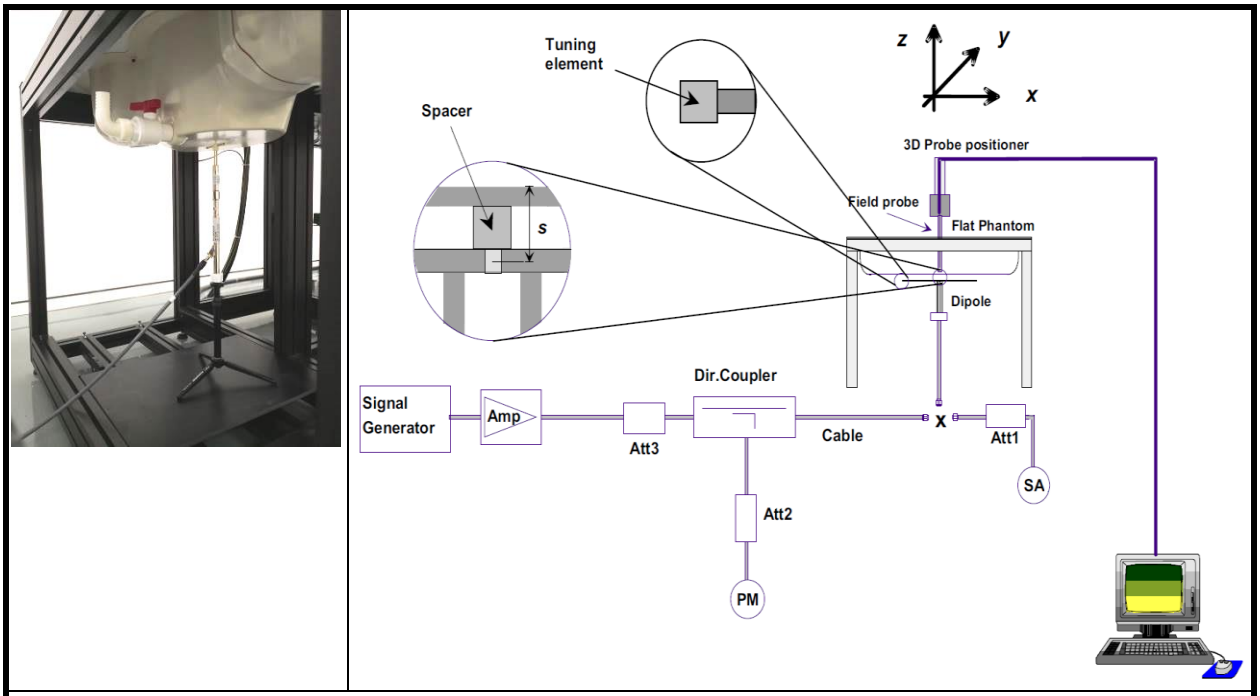
Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3

Simulating Head Liquid (HBBL600-6000MHz), Manufactured by SPEAG:

Water (% by weight)	Esters, Emulsifiers, Inhibitors (% by weight)	Sodium salt (% by weight)
50 - 65%	10 - 30%	8 - 25%

5.2.8.SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The spectrum analyzer measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

6. SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

(a) Make EUT to transmit maximum output power
(b) Measure conducted output power through RF cable
(c) Place the EUT in the specific position of phantom
(d) Perform SAR testing steps on the DASY system
(e) Record the SAR value

6.1. Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. According to KDB 865664 D01, the resolution for Area and Zoom scan is specified in the table below.

Items	<= 2 GHz	2-3 GHz	3-4 GHz	4-5 GHz	5-6 GHz
Area Scan (Δx, Δy)	<= 15 mm	<= 12 mm	<= 12 mm	<= 10 mm	<= 10 mm
Zoom Scan (Δx, Δy)	<= 8 mm	<= 5 mm	<= 5 mm	<= 4 mm	<= 4 mm
Zoom Scan (Δz)	<= 5 mm	<= 5 mm	<= 4 mm	<= 3 mm	<= 2 mm
Zoom Scan Volume	>= 30 mm	>= 30 mm	>= 28 mm	>= 25 mm	>= 22 mm

Note:
When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of Δx / Δy (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

6.2. Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

6.3. Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.

6.4. Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

6.5. SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard’s method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

7. SAR Measurement Evaluation

7.1. EUT Configuration and Setting

<Considerations Related to WLAN for Setup and Testing>

In general, various vendor specific external test software and chipset based internal test modes are typically used for SAR measurement. These chipset based test mode utilities are generally hardware and manufacturer dependent, and often include substantial flexibility to reconfigure or reprogram a device. A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

According to KDB 248227 D01, this device has installed WLAN engineering testing software which can provide continuous transmitting RF signal. During WLAN SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

Initial Test Configuration

An initial test configuration is determined for OFDM transmission modes in 2.4 GHz and 5 GHz bands 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. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band.

Subsequent Test Configuration

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. Additional power measurements may be required to determine if SAR measurements are required for subsequent highest output power channels in a subsequent test configuration. 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.

SAR Test Configuration and Channel Selection

When multiple channel bandwidth configurations in a frequency band have the same specified maximum output power, the initial test configuration is using largest channel bandwidth, lowest order modulation, lowest data rate, and lowest order 802.11 mode (i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is

chosen over 802.11n). After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following.
1) The channel closest to mid-band frequency is selected for SAR measurement.
2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

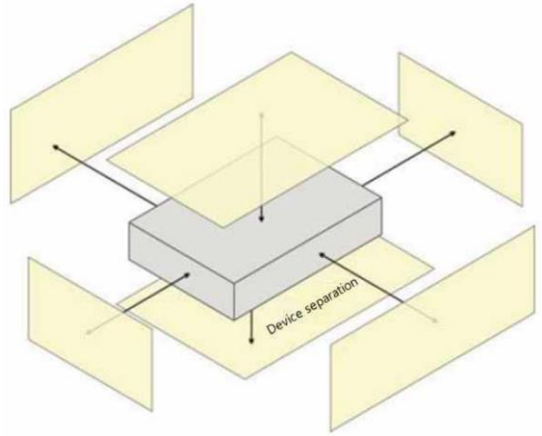
Test Reduction for U-NII-1 (5.2 GHz) and U-NII-2A (5.3 GHz) Bands
For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following.
1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition).
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

<Considerations Related to Bluetooth for Setup and Testing>
This device has installed Bluetooth engineering testing software which can provide continuous transmitting RF signal. During Bluetooth SAR testing, this device was operated to transmit continuously at the maximum transmission duty with specified transmission mode, operating frequency, lowest data rate, and maximum output power.

7.2. EUT Testing Position

7.2.1. Body Exposure Conditions

For this device,, SAR evaluation is required on all sides and edges with a transmitting antenna within 25 mm from that surface or edge, at 0 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance.



7.3. Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Test Date	Tissue Type	Frequency (MHz)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Sep. 25, 2024	H2450	2450	1.872	38.152	1.80	39.20	4.00	-2.67
		2402	1.835	38.243	1.76	39.29	4.38	-2.66
		2412	1.844	38.230	1.77	39.27	4.36	-2.65
		2437	1.862	38.180	1.79	39.22	4.14	-2.65
		2462	1.880	38.130	1.81	39.18	3.75	-2.68
		2480	1.895	38.095	1.83	39.16	3.44	-2.72
Sep. 25, 2024	H5G	5250	4.568	37.454	4.71	35.90	-3.01	4.33
		5210	4.520	37.466	4.67	35.99	-3.21	4.10
Sep. 26, 2024	H5G	5800	5.165	36.367	5.27	35.30	-1.99	3.02
		5775	5.135	36.473	5.25	35.32	-2.10	3.26

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

7.4. System Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01. The validation status in tabulated summary is as below.

Test Date	Probe S/N	Calibration Point		Measured Conductivity (σ)	Measured Permittivity (ε_r)	Validation for CW			Validation for Modulation		
						Sensitivity Range	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
Sep. 25, 2024	7738	Head	2450	1.872	38.152	Pass	Pass	Pass	DSSS	N/A	Pass
Sep. 25, 2024	7738	Head	5250	4.568	37.454	Pass	Pass	Pass	OFDM	N/A	Pass
Sep. 26, 2024	7738	Head	5800	5.165	36.367	Pass	Pass	Pass	OFDM	N/A	Pass

7.5. System Verification

The measuring result for system verification is tabulated as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Sep. 25, 2024	2450	53.40	12.90	51.60	-3.37	1014	7738	1725
Sep. 25, 2024	5250	79.30	8.36	83.60	5.42	1280	7738	1725
Sep. 26, 2024	5800	80.70	8.10	81.00	0.37	1280	7738	1725
Sep. 25, 2024	2450	53.40	12.90	51.60	-3.37	1014	7738	1725

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

8. SAR Measurement Evaluation

8.1. Maximum Conducted Power

All Rate have been tested, the Worst average power (Unit: dBm) is shown as below.

<WLAN 2.4G>

Mode	**802.11b (1Mbps)**		
Channel / Frequency (MHz)	**1 (2412)**	**6 (2437)**	**11 (2462)**
Average Power (Ant-0)	15.66	**18.59**	16.05
Tune-Up	16.0	**19.0**	16.5
Average Power (Ant-1)	15.17	**18.04**	15.52
Tune-Up	15.5	**18.5**	16.0
Average Power (Ant-0 + Ant-1)	18.43	**21.33**	18.80
Tune-Up	19.0	**21.5**	19.0
Mode	**802.11g (6Mbps)**		
Channel / Frequency (MHz)	**1 (2412)**	**6 (2437)**	**11 (2462)**
Average Power (Ant-0)	15.69	**18.72**	16.23
Tune-Up	16.0	**19.0**	16.5
Average Power (Ant-1)	15.27	**18.21**	15.75
Tune-Up	15.5	**18.5**	16.0
Average Power (Ant-0 + Ant-1)	18.5	**21.48**	19.01
Tune-Up	19.0	**22.0**	19.5
Mode	**802.11n (HT20) (MCS0)**		
Channel / Frequency (MHz)	**1 (2412)**	**6 (2437)**	**11 (2462)**
Average Power (Ant-0)	17.06	**19.01**	16.59
Tune-Up	17.5	**19.5**	17.0
Average Power (Ant-1)	16.71	**18.63**	16.11
Tune-Up	17.0	**19.0**	16.5
Average Power (Ant-0 + Ant-1)	19.90	**21.83**	19.37
Tune-Up	20.5	**22.0**	19.5
Mode	**802.11n (HT40) (MCS0)**		
Channel / Frequency (MHz)	**3 (2422)**	**6 (2437)**	**9 (2452)**
Average Power (Ant-0)	12.46	**12.59**	9.94
Tune-Up	13.0	**13.0**	10.5
Average Power (Ant-1)	11.78	**12.08**	9.42
Tune-Up	12.5	**12.5**	10.0
Average Power (Ant-0 + Ant-1)	15.14	**15.35**	12.70
Tune-Up	15.5	**15.5**	13.0

<WLAN 5.2G>

Mode	**802.11a (6Mbps)**			
Channel / Frequency (MHz)	**36 (5180)**	**40 (5200)**	**44 (5220)**	**48 (5240)**
Average Power (Ant-0)	**15.99**	/	15.94	15.49
Tune-Up	**16.5**			
Average Power (Ant-1)	15.07	/	**15.18**	14.75
Tune-Up	**15.5**			
Average Power (Ant-0 + Ant-1)	18.56	/	**18.58**	18.14
Tune-Up	**19.0**			
Mode	**802.11n (HT20) (MCS0)**			
Channel / Frequency (MHz)	**36 (5180)**	**40 (5200)**	**44 (5220)**	**48 (5240)**
Average Power (Ant-0)	16.21	/	**16.36**	15.39
Tune-Up	**16.5**			
Average Power (Ant-1)	15.39	/	**15.71**	14.76
Tune-Up	**16.0**			
Average Power (Ant-0 + Ant-1)	18.83	/	**19.06**	18.10
Tune-Up	**19.5**			
Mode	**802.11n (HT40) (MCS0)**			

Channel / Frequency (MHz)	38 (5190)	46 (5230)
Average Power (Ant-0)	17.80	**18.92**
Tune-Up	**19.5**	
Average Power (Ant-1)	17.07	**18.34**
Tune-Up	**18.5**	
Average Power (Ant-0 + Ant-1)	20.46	**21.65**
Tune-Up	**22.0**	
Mode	**802.11ac (VHT80) (MCS0)**	
Channel / Frequency (MHz)	**42 (5210)**	
Average Power (Ant-0)	**19.39**	
Tune-Up	**19.5**	
Average Power (Ant-1)	**18.69**	
Tune-Up	**19.0**	
Average Power (Ant-0 + Ant-1)	**22.07**	
Tune-Up	**22.5**	

<WLAN 5.8G>

Mode	802.11a (6Mbps)		
Channel / Frequency (MHz)	**149 (5745)**	**157 (5785)**	**165 (5825)**
Average Power (Ant-0)	17.26	**17.29**	16.65
Tune-Up	**17.5**		
Average Power (Ant-1)	17.28	**17.33**	16.71
Tune-Up	**17.5**		
Average Power (Ant-0 + Ant-1)	20.17	**20.32**	19.69
Tune-Up	**20.5**		
Mode	**802.11n (HT20) (MCS0)**		
Channel / Frequency (MHz)	**149 (5745)**	**157 (5785)**	**165 (5825)**
Average Power (Ant-0)	**17.74**	17.22	17.04
Tune-Up	**18.0**		
Average Power (Ant-1)	**17.67**	17.20	17.04
Tune-Up	**18.0**		
Average Power (Ant-0 + Ant-1)	**20.72**	20.22	20.05
Tune-Up	**21.0**		
Mode	**802.11n (HT40) (MCS0)**		
Channel / Frequency (MHz)	**151 (5755)**	**159 (5795)**	
Average Power (Ant-0)	17.12	**18.13**	
Tune-Up	**18.5**		
Average Power (Ant-1)	17.21	**18.34**	
Tune-Up	**18.5**		
Average Power (Ant-0 + Ant-1)	20.18	**21.25**	
Tune-Up	**21.5**		
Mode	**802.11ac (VHT80) (MCS0)**		
Channel / Frequency (MHz)	**155 (5775)**		
Average Power (Ant-0)	**20.16**		
Tune-Up	**20.5**		
Average Power (Ant-1)	**20.16**		
Tune-Up	**20.5**		
Average Power (Ant-0 + Ant-1)	**23.17**		
Tune-Up	**23.5**		

SAR Testing Results

8.1.1.SAR Test Reduction Considerations

<KDB 447498 D01, General RF Exposure Guidance>

Testing of other required channels within the operating mode of a frequency band is not required when the reported SAR for the mid-band or highest output power channel is:

(1) ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz

(2) ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz

(3) ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

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

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

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

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

(4) For WLAN MIMO mode, the power-based standalone SAR test exclusion or the sum of SAR provision in KDB 447498 to determine simultaneous transmission SAR test exclusion should be applied. Otherwise, SAR for MIMO mode will be measured with all applicable antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

8.1.3.SAR Results for Body Exposure Condition (Separation Distance is 0 cm Gap)

Plot No.	Band	Mode	Test Position	Ch.	Antenna	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	802.11b	-	Front Face	6	1	19.0	18.59	1.10	0.02	0.133	0.15
	802.11b	-	Left Side	6	1	19.0	18.59	1.10	-0.02	0.212	0.23
	802.11b	-	Left Side-1	6	1	19.0	18.59	1.10	-0.05	0.577	0.63
	802.11b	-	Top Side	6	1	19.0	18.59	1.10	-0.05	0.615	0.68
	802.11b	-	Front Face	6	2	18.5	18.04	1.11	0.08	0.185	0.21
	802.11b	-	Right Side	6	2	18.5	18.04	1.11	0.13	0.391	0.43
1	802.11b	-	Right Side-1	6	2	18.5	18.04	1.11	-0.06	1.07	**1.19**
	802.11b	-	Top Side	6	2	18.5	18.04	1.11	-0.10	0.404	0.45
	802.11n	HT20	Right Side-1	6	2	19.0	18.63	1.09	-0.03	1.05	1.14
	802.11b	-	Right Side-1	1	2	15.5	15.17	1.08	0.02	0.546	0.59
	802.11b	-	Right Side-1	11	2	16.0	15.52	1.12	0.08	0.529	0.59
	802.11b	-	Right Side-1	6	2	18.5	18.04	1.11	-0.06	1.04	1.16
	802.11ac	VHT80	Front Face	42	1	19.5	19.39	1.03	0.08	0.041	0.04
	802.11ac	VHT80	Left Side	42	1	19.5	19.39	1.03	0.00	0.069	0.07
2	802.11ac	VHT80	Left Side-1	42	1	19.5	19.39	1.03	-0.02	0.214	**0.22**
	802.11ac	VHT80	Top Side	42	1	19.5	19.39	1.03	0.00	0.12	0.12
	802.11ac	VHT80	Front Face	42	2	19.0	18.69	1.07	0.02	0.044	0.05
	802.11ac	VHT80	Right Side	42	2	19.0	18.69	1.07	0.00	0.088	0.09
	802.11ac	VHT80	Right Side-1	42	2	19.0	18.69	1.07	-0.01	0.131	0.14
	802.11ac	VHT80	Top Side	42	2	19.0	18.69	1.07	0.00	0.052	0.06
	802.11ac	VHT80	Front Face	155	1	20.5	20.16	1.08	0.03	0.039	0.04
	802.11ac	VHT80	Left Side	155	1	20.5	20.16	1.08	0.00	0.06	0.06
3	802.11ac	VHT80	Left Side-1	155	1	20.5	20.16	1.08	-0.07	0.391	**0.42**
	802.11ac	VHT80	Top Side	155	1	20.5	20.16	1.08	0.00	0.047	0.05
	802.11ac	VHT80	Front Face	155	2	20.5	20.16	1.08	0.06	0.027	0.03
	802.11ac	VHT80	Right Side	155	2	20.5	20.16	1.08	-0.08	0.043	0.05
	802.11ac	VHT80	Right Side-1	155	2	20.5	20.16	1.08	-0.05	0.264	0.29
	802.11ac	VHT80	Top Side	155	2	20.5	20.16	1.08	-0.06	0.127	0.14

Note:

1. SAR testing for WLAN was performed on the maximum power mode.
2. As for left side-1 and Right side-1, please refer to the appendix D for details (The antenna locations and external photos are listed on appendix D as a short-term confidential). They are the antenna areas locating on the left and right side. To find the most conservative SAR, we performed the additional SAR test on these sides with 0mm.

8.1.4. SAR Measurement Variability

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

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20, or when the original or repeated measurement is >= 1.45 W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

Band	Test Position	Ch.	Antenna	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio	2nd Repeated SAR-1g (W/kg)	L/S Ratio	3rd Repeated SAR-1g (W/kg)	L/S Ratio
802.11b	Right Side-1	6	2	1.07	1.04	1.03	N/A	N/A	N/A	N/A

8.1.5.Simultaneous Multi-band Transmission Evaluation
<SAR Summation Analysis>

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

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR-ANT.1	Max. SAR-ANT.2	SAR Summation	SPLSR Analysis
1	MIMO WLAN2.4G	Body	Front Face	0.15	0.21	0.36	Σ SAR < 1.6, Not required
			Rear Face				Σ SAR < 1.6, Not required
			Left Side	0.23		0.23	Σ SAR < 1.6, Not required
			Left Side-1	0.63		0.63	Σ SAR < 1.6, Not required
			Right Side		0.43	0.43	Σ SAR < 1.6, Not required
			Right Side-1		1.19	1.19	Σ SAR < 1.6, Not required
			Top Side	0.68	0.45	1.13	Σ SAR < 1.6, Not required
			Bottom Side				Σ SAR < 1.6, Not required
2	MIMO WLAN5.2G	Body	Front Face	0.04	0.05	0.09	Σ SAR < 1.6, Not required
			Rear Face				Σ SAR < 1.6, Not required
			Left Side	0.07		0.07	Σ SAR < 1.6, Not required
			Left Side-1	0.22		0.22	Σ SAR < 1.6, Not required
			Right Side		0.09	0.09	Σ SAR < 1.6, Not required
			Right Side-1		0.14	0.14	Σ SAR < 1.6, Not required
			Top Side	0.12	0.06	0.18	Σ SAR < 1.6, Not required
			Bottom Side				Σ SAR < 1.6, Not required
3	MIMO WLAN5.8G	Body	Front Face	0.04	0.03	0.07	Σ SAR < 1.6, Not required
			Rear Face				Σ SAR < 1.6, Not required
			Left Side	0.06		0.06	Σ SAR < 1.6, Not required
			Left Side-1	0.42		0.42	Σ SAR < 1.6, Not required
			Right Side		0.05	0.05	Σ SAR < 1.6, Not required
			Right Side-1		0.29	0.29	Σ SAR < 1.6, Not required
			Top Side	0.05	0.14	0.19	Σ SAR < 1.6, Not required
			Bottom Side				Σ SAR < 1.6, Not required

Test Engineer: Warren Xiong,

Appendixes

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Appendix B: SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

Appendix C: Calibration Certificate for probe and Dipole

Appendix D: Photographs of Antenna distributions, EUT external photos and setup