



FCC SAR Test Report

FCC ID: LDKJ98213058

Project No. : 2601H016
Equipment : Wireless Phone
Brand Name : CISCO
Model Name : WP-9821
Date of Receipt : Jan. 19, 2026
Date of Test : Feb. 24, 2026 ~ Apr. 21, 2026
Issued Date : Apr. 24, 2026
Test Sample : Engineering Sample No.: SH920260119341, SH920260408297, SH920260119340
Standard(s) : Please refer to page 2.
Applicant : Cisco Systems, Inc.
Address : 125 West Tasman Dr. Bldg. P ,San Jose CA 95134
Manufacturer : Cisco Systems, Inc.
Address : 125 West Tasman Dr. Bldg. P ,San Jose CA 95134
Factory : Fuyu Precision Component Company Limited
Address : Lot M1, LOT F and LOT T1, Quang Chau Industrial Zone, Nenh Ward, Bac Ninh Province, Viet Nam

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc. (Dongguan)

Prepared by : Dana Chen
 Dana Chen

Approved by : Herbert Liu
 Herbert Liu

No.3, Jinshagang 1st Road, Dalang, Dongguan, Guangdong People's Republic of China.
 Tel: +86-769-8318-3000 Web: www.newbtl.com Service mail: btl_qa@newbtl.com

Standard(s)	: IEEE Std C95.1:2019 IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 kHz to 300 GHz IEEE Std 1528™-2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques 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) KDB447498 D04 Interim General RF Exposure Guidance v01 KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
Test method	: KDB865664 D02 SAR Reporting v01r02 KDB248227 D01 802.11 Wi-Fi SAR v02r02 KDB648474 D04 Handset SAR v01r03 KDB690783 D01 SAR Listings on Grants v01r03

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. BTL assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.

The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents	Page
REVISION HISTORY	6
1 . GENERAL INFORMATION	7
1.1 STATEMENT OF COMPLIANCE	7
1.2 LABORATORY ENVIRONMENT	7
1.3 GENERAL DESCRIPTION OF EUT	8
1.4 MAIN TEST INSTRUMENTS	9
2 . RF EMISSIONS MEASUREMENT	10
2.1 TEST FACILITY	10
2.2 MEASUREMENT UNCERTAINTY	10
3 . SAR MEASUREMENTS SYSTEM CONFIGURATION	13
3.1 SAR MEASUREMENT SET-UP	13
3.1.1 TEST SETUP LAYOUT	13
3.2 DASY E-FIELD PROBE SYSTEM	14
3.2.1 PROBE SPECIFICATION	14
3.2.2 E-FIELD PROBE CALIBRATION	15
3.2.3 OTHER TEST EQUIPMENT	16
3.2.4 SCANNING PROCEDURE	17
3.2.5 SPATIAL PEAK SAR EVALUATION	18
3.2.6 DATA STORAGE AND EVALUATION	19
3.2.7 DATA EVALUATION BY SEMCAD	20
3.2.8 INCIDENT POWER DENSITY (IPD)MEASUREMENTS SYSTEM CONFTGTIRATTON22	22
4 . SYSTEM VERIFICATION PROCEDURE	23
4.1 TISSUE VERIFICATION	23
4.2 SYSTEM CHECK	24
4.2.1 POWER DENSITY SYSTEM CHECK	25
4.3 SYSTEM CHECK PROCEDURE	26
5 . SAR MEASUREMENT VARIABILITY AND UNCERTAINTY	27
5.1 SAR MEASUREMENT VARIABILITY	27
6 . OPERATIONAL CONDITIONS DURING TEST	28
6.1 SAR TEST CONFIGURATION	28
6.1.1 WIFI TEST CONFIGURATION	28
6.2 TEST POSITION	31
6.2.1 HEAD TEST CONFIGURATION	31
6.2.2 BODY-WORN TEST CONFIGURATION	32
7 . TEST RESULT	33

Table of Contents	Page
7.1 CONDUCTED POWER RESULTS	33
7.2 SAR TEST RESULTS	39
7.2.1 SAR MEASUREMENT RESULT OF HEAD	40
7.2.2 SAR MEASUREMENT RESULT OF BODY-WORN	42
APPENDIX	47
1. TEST LAYOUT	47
Appendix A. SAR Plots of System Verification	
Appendix B. SAR Plots of SAR Measurement	
Appendix C. Calibration Certificate	
Appendix D. Photographs of the Test Set-Up	

REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCC SAR-1-2601H016	R00	Original Report.	Apr. 24, 2026	Valid

1. GENERAL INFORMATION

1.1 STATEMENT OF COMPLIANCE

Mode	Highest Head SAR-1g (W/kg)	Highest Bodyworn SAR-1g (W/kg)
2.4G WLAN	1.371	0.875
5.2G WLAN	0.252	1.165
5.6G WLAN	0.307	1.259
5.8G WLAN	0.301	1.308
6.2G WLAN	0.104	0.335
6.5G WLAN	0.105	0.292
6.7G WLAN	0.107	0.378
7G WLAN	0.124	0.349
Bluetooth	0.165	0.117

Frequency Band	Highest Averaged Power Density (mW/cm ²)
WIFI 6E	0.8959

Note:

- 1) The device is in compliance with Specific Absorption Rate (SAR) for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods.
- 2) According to standard 47 CFR part 2.1093, the MPE limits specified in part 1.1310 apply to portable devices that transmit at frequencies above 6 GHz. The localized power density limit for general population exposure is 1.0 mW/cm² (equal to 10 W/m²) for frequency up to 100 GHz.

1.2 LABORATORY ENVIRONMENT

Temperature	Min. = 18°C, Max. = 25°C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
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.	

1.3 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Phone					
Brand Name	CISCO					
Test Model	WP-9821					
Model Name	WP-9821					
Model Difference(s)	N/A					
Hardware Version	WP-9821					
Software Version	PhoneOS-9821.4-1-1					
Modulation	BT(GFSK/π/4-DQPSK/8-DPSK) WiFi(DSSS/OFDM/OFDMA)					
Operation Frequency Range(s)	Band	TX (MHz)		RX (MHz)		
	Bluetooth	2400~2483.5				
	WLAN 2.4G	2400~2483.5				
	WLAN 5G	5150-5250				
		5250-5350				
		5470-5725				
		5725-5850				
	WLAN 6G	5955-6415				
		6425-6515				
		6525-6875				
		6895-7115				
Test Channels (low-mid-high)	0-39-78 (BT)					
	0-19-39 (BLE)					
	1-7-13 (2.4G WiFi 802.11b/g/ax HE20)					
	Band	WiFi 5.2G&5.3G	WiFi 5.6G	WiFi 5.8G		
	802.11a/n HT20/ ac VHT20/ ax HE20	36-40-48- 52-60-64	104-116-136	149-157-165		
	802.11n HT40/ ac VHT40/ ax HE40	38-46- 54-62	102-110-134-142	151-159		
	802.11ac VHT80/ ax HE80	42-58	106-138	155		
	1-45-93 (6G WiFi 802.11ax HE20)					
	3-43-91 (6G WiFi 802.11ax HE40)					
	7-39-87 (6G WiFi 802.11ax HE80)					
	Antenna Information	Brand	Model Name	Antenna Type	Connector	Gain(dBi)
N/A		N/A	Monopole	N/A	1.9	BT
N/A		N/A	Monopole	N/A	1.9	2.4G WiFi
N/A		N/A	Monopole	N/A	3.5	5G WiFi
N/A		N/A	Monopole	N/A	3.2	6G WiFi
Other Information						
Battery	Manufacturer	Amperex				
	Model Name	GP-S10-374192-020H				
	Power Rating	3.8VDC, 2000mAh, 7.6Wh				
Adapter	Brand	Phihong				
	Model Name	PSAF10R-050Q				
	Power Rating	I/P: 100-240V~ 0.3A 50/60Hz		O/P: 5.0V  2.0A 10.0W		

Note: The antenna gain is provided by the manufacturer.

1.4 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	DASY5 System	Speag	DASY 5	N/A	N/A	N/A
2	DASY8 System	Speag	DASY 8	N/A	N/A	N/A
3	Data Acquisition Electronics	Speag	DAE4	420	Apr. 08, 2025	1 Year
4	Data Acquisition Electronics	Speag	DAE4	1717	Jun. 19, 2025	1 Year
5	Data Acquisition Electronics	Speag	DAE4	1390	Nov. 19, 2025	1 Year
6	E-field Probe	Speag	EX3DV4	7544	Jun. 19, 2025	1 Year
7	E-field Probe	Speag	EX3DV4	7693	Nov. 26, 2025	1 Year
8	EUmmWV4 Probe	Speag	EUmmWV4	9561	Jun. 18, 2025	1 Year
9	System Validation Dipole	Speag	D2450V2	919	Apr. 22, 2024	3 Years
10	System Validation Dipole	Speag	D5GHzV2	1160	Apr. 25, 2024	3 Years
11	System Validation Dipole	Speag	D6.5GHzV2	1052	Nov. 13, 2024	3 Years
12	System Validation Source	Speag	5G Verification Source 10GHz	1041	May. 27, 2025	1 Year
13	Twin Sam Phantom	Speag	SAM-Twim V8.0	2081	N/A	N/A
14	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1469	N/A	N/A
15	Twin Sam Phantom	Speag	Twin Sam Phantom V5.0	1896	N/A	N/A
16	Power Amplifier	Mini-Circuits	ZVE-8G+	520701341	Dec. 20, 2025	1 Year
17	DC Source metter	Iteck	IT6154	0061041267682 01001	May. 29, 2025	1 Year
18	Vector Network Analyzer	Agilent	E5071C	MY46102965	Dec. 20, 2025	1 Year
19	Signal Generator	Keysight	N5173B	MY59101420	Dec. 20, 2025	1 Year
20	Smart Power Sensor	R&S	NRP-Z21	102209	Dec. 20, 2025	1 Year
21	3.5mm Economy Calibration Kit	Agilent	85052D	MY43252246	Nov. 20, 2025	1 Year
22	Directional Coupler	Talent Microwave	TC-05180-20S	210628013	Dec. 20, 2025	1 Year
23	Liquid Thermometer	Nscing Es	YZ6021S	/	Nov. 13, 2025	1 Year

Remark: "N/A" denotes no model name, serial No. or calibration specified.

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is SAR room at the location of No.3, Jinshagang 1st Road, Dalang, Dongguan, Guangdong People's Republic of China.

BTL's Registration Number for FCC: 747969

BTL's Designation Number for FCC: CN1377

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Budget for Frequency range of 300 MHz to 3 GHz

SAR Uncertainty Budget According to IEC/IEEE 62209-1528 (Frequency band: 300MHz - 3GHz range)									
Symbol	Input quantity X_i (source of uncertainty)	Unc. Value (±%)	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)	Ref.
Measurement system errors									
<i>CF</i>	Probe calibration(±%)	13.0	N	2	1	1	6.5	6.5	8.4.1.1
<i>CF drift</i>	Probe calibration drift(±%)	1.7	R	√3	1	1	1.0	1.0	8.4.1.2
<i>LIN</i>	Probe linearity and detection limit(±%)	4.7	R	√3	1	1	2.7	2.7	8.4.1.3
<i>BBS</i>	Broadband signal(±%)	3.0	R	√3	1	1	1.7	1.7	8.4.1.4
<i>ISO</i>	Probe isotropy(±%)	7.6	R	√3	1	1	4.4	4.4	8.4.1.5
<i>DAE</i>	Other probe and data acquisition errors(±%)	0.7	N	1	1	1	0.7	0.7	8.4.1.6
<i>AMB</i>	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8	8.4.1.7
Δ_{xyz}	Probe positioning errors(±mm)	0.006	N	1	0.14	0.14	0.08	0.08	8.4.1.8
<i>DAT</i>	Data processing errors(±%)	1.2	N	1	1	1	1.2	1.2	8.4.1.9
Phantom and device (DUT or validation antenna) errors									
<i>LIQ(σ)</i>	Conductivity (meas.)(±%)	0.8	N	1	0.78	0.71	0.7	0.6	8.4.2.1
<i>LIQ(Tc)</i>	Conductivity (temp.)(±%)	4.16	R	√3	0.78	0.71	1.9	1.7	8.4.2.2
<i>EPS</i>	Phantom Permittivity(±%)	14	R	√3	0	0	0.0	0.0	8.4.2.3
<i>DIS</i>	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0	8.4.2.4
<i>Dxyz</i>	Device Positioning(±%)	0.1	N	1	1	1	0.1	0.1	8.4.2.5
<i>H</i>	Device Holder(±%)	2.1	N	1	1	1	2.1	2.1	8.4.2.6
<i>MOD</i>	DUT Modulationm(±%)	2.4	R	√3	1	1	1.4	1.4	8.4.2.7
<i>TAS</i>	Time-average SAR(±%)	1.7	R	√3	1	1	1.0	1.0	8.4.2.8
<i>RF drift</i>	DUT drift(±%)	1.3	N	1	1	1	1.3	1.3	8.4.2.9
<i>VAL</i>	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0	8.4.2.10
<i>P_{in}</i>	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0	8.4.2.11
Corrections to the SAR result									
<i>C(e',σ)</i>	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6	8.4.3.1
<i>C(R)</i>	SAR scaling(±%)	0	R	√3	1	1	0.0	0.0	8.4.3.2
<i>u(ΔSAR)</i>	Combined uncertainty						10.5	10.4	
	Coverage Factor for 95%						k=2	k=2	
<i>U</i>	Expanded uncertainty					<i>U</i> =	21.0	20.9	
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.									

Uncertainty Budget for Frequency range of 3 GHz to 6 GHz

SAR Uncertainty Budget According to IEC/IEEE 62209-1528 (Frequency band: 3GHz - 6GHz range)									
Symbol	Input quantity X_i (source of uncertainty)	Unc. Value	Prob. Dist.	Div.	ci (1g)	ci (10g)	Std.Unc. (1g) (±%)	Std.Unc. (10g) (±%)	Ref.
Measurement system errors									
<i>CF</i>	Probe calibration(±%)	14.0	N	2	1	1	7.0	7.0	8.4.1.1
<i>CF drift</i>	Probe calibration drift(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.1.2
<i>LIN</i>	Probe linearity and detection limit(±%)	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	8.4.1.3
<i>BBS</i>	Broadband signal(±%)	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	8.4.1.4
<i>ISO</i>	Probe isotropy(±%)	7.6	R	$\sqrt{3}$	1	1	4.4	4.4	8.4.1.5
<i>DAE</i>	Other probe and data acquisition errors(±%)	1.2	N	1	1	1	1.2	1.2	8.4.1.6
<i>AMB</i>	RF ambient and noise(±%)	1.8	N	1	1	1	1.8	1.8	8.4.1.7
Δ_{xyz}	Probe positioning errors(±mm)	0.005	N	1	0.29	0.29	0.15	0.15	8.4.1.8
<i>DAT</i>	Data processing errors(±%)	2.3	N	1	1	1	2.3	2.3	8.4.1.9
Phantom and device (DUT or validation antenna) errors									
<i>LIQ(σ)</i>	Conductivity (meas.)(±%)	0.7	N	1	0.78	0.71	0.6	0.5	8.4.2.1
<i>LIQ(Tc)</i>	Conductivity (temp.)(±%)	2.45	R	$\sqrt{3}$	0.78	0.71	1.1	1.0	8.4.2.2
<i>EPS</i>	Phantom Permittivity(±%)	14	R	$\sqrt{3}$	0.25	0.25	2.0	2.0	8.4.2.3
<i>DIS</i>	Distance DUT - TSL(±%)	2	N	1	2	2	4.0	4.0	8.4.2.4
<i>Dxyz</i>	Device Positioning(±%)	0.5	N	1	1	1	0.5	0.5	8.4.2.5
<i>H</i>	Device Holder(±%)	1.9	N	1	1	1	1.9	1.9	8.4.2.6
<i>MOD</i>	DUT Modulationm(±%)	2.4	R	$\sqrt{3}$	1	1	1.4	1.4	8.4.2.7
<i>TAS</i>	Time-average SAR(±%)	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	8.4.2.8
<i>RF drift</i>	DUT drift(±%)	1.1	N	1	1	1	1.1	1.1	8.4.2.9
<i>VAL</i>	Val Antenna Unc.(±%)	0	N	1	1	1	0.0	0.0	8.4.2.10
<i>P in</i>	Unc. Input Power(±%)	0	N	1	1	1	0.0	0.0	8.4.2.11
Corrections to the SAR result									
<i>C(ε', σ)</i>	Deviation to Target(±%)	1.9	N	1	1	0.84	1.9	1.6	8.4.3.1
<i>C(R)</i>	SAR scaling(±%)	0	R	$\sqrt{3}$	1	1	0.0	0.0	8.4.3.2
<i>u(ΔSAR)</i>	Combined uncertainty						11.0	11.0	
	Coverage Factor for 95%						k=2	k=2	
<i>U</i>	Expanded uncertainty					<i>U</i> =	22.1	22.0	
a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned.									

Uncertainty Budget for PD

cDASY6 Module mmWave Uncertainty Budget Evaluation Distances to the Antennas > $\lambda/2\pi$ In Compliance with IEC/IEEE 63195							
Error Description	Uncertainty Value ($\pm$ dB)	Probability	Divisor	(Ci)	(Ci) 10g	Standard Uncertainty ($\pm$ dB)	Standard Uncertainty (10g) ($\pm$ %)
Uncertainty terms dependent on the measurement system							
Probe Calibration	0.98	N	1	1	1	0.98	1.0
Probe correction	0.00	R	1.732	1	0.7	0.00	0.0
Frequency response (BW $\leq$ 1 GHz)	0.20	R	1.732	1	0.7	0.12	0.1
Sensor cross coupling	0.00	R	1.732	1	1	0.00	0.0
Isotropy	0.50	R	1.732	1	1	0.29	0.3
Linearity	0.20	R	1.732	1	1	0.12	0.1
Probe scattering	0.00	R	1.732	1	1	0.00	0.0
Probe positioning offset	0.30	R	1.732	1	1	0.17	0.2
Probe positioning repeatability	0.04	R	1.732	1	1	0.02	0.0
Sensor mechanical offset	0.00	R	1.732	1	1	0.00	0.0
Probe spatial resolution	0.00	R	1.732	1	1	0.00	0.0
Field impedance dependence	0.00	R	1.732	1	1	0.00	0.0
Amplitude and phase drift	0.00	R	1.732	1	1	0.00	0.0
Amplitude and phase noise	0.04	R	1.732	1	1	0.02	0.0
Measurement area truncation	0.00	R	1.732	1	1	0.00	0.0
Data acquisition	0.03	N	1	1	1	0.03	0.0
Sampling	0.00	R	1.732	1	1	0.00	0.0
Field reconstruction	2.00	R	1.732	1	1	1.15	1.2
Forward transformation	0.00	R	1.732	1	1	0.00	0.0
Power density scaling	0.00	R	1.732	1	1	0.00	0.0
Spatial averaging	0.10	R	1.732	1	1	0.06	0.1
System detection limit	0.04	R	1.732	1	1	0.02	0.0
Uncertainty terms dependent on the DUT and environmental factors							
Probe coupling with DUT	0.00	R	1.732	1	1	0.0	0.0
Modulation response	0.40	R	1.732	1	0.84	0.2	0.2
Integration time	0.00	R	1.732	1	0.71	0.0	0.0
Response time	0.00	R	1.732	1	0.71	0.0	0.0
Device holder influence	0.10	R	1.732	1	0.71	0.1	0.0
DUT alignment	0.00	R	1.732	1	0.71	0.0	0.0
RF ambient conditions	0.04	R	1.732	1	0.26	0.0	0.0
Ambient reflections	0.04	R	1.732	1	0.26	0.0	0.0
Immunity / secondary reception	0.00	R	1.732	1	0.26	0.0	0.0
Drift of the DUT	0.00	R	1.732	1	0.26	0.0	0.0
Combined Std. Uncertainty						1.59	1.6%
Coverage Factor for 95 %						k=2	k=2
Expanded STD Uncertainty (95%)						3.18	3.1%

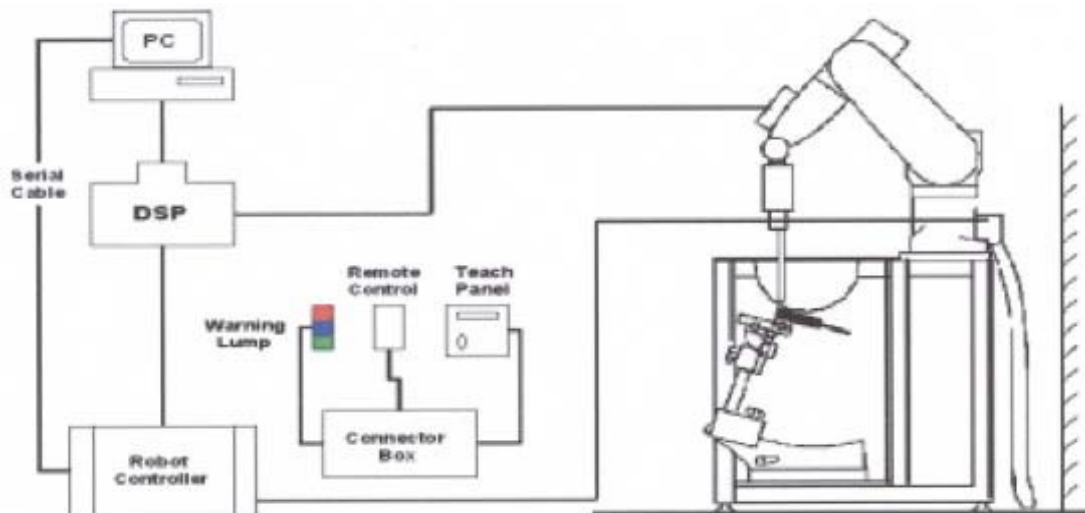
3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SET-UP

The DASY system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. 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.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY measurement server.
6. The DASY measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7
7. DASY software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

3.1.1 TEST SETUP LAYOUT



3.2 DASY E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1 PROBE SPECIFICATION

EX3DV4

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm



E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than $\pm 0.25\text{dB}$. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

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

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

3.2.3 OTHER TEST EQUIPMENT

3.2.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI and SAM v6.0 Phantoms.

Material: POM, Acrylic glass, Foam

3.2.3.2 Phantom

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEC/IEEE 62209-1528 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.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length:1000mm; Width: 500mm Height: adjustable feet	
Available	Special	

3.2.4 SCANNING PROCEDURE

The DASY installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

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. The indicated drift is mainly the variation of the DUT’s output power and should vary max. $\pm 5\%$.

The “surface check” measurement tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension ($\leq 2\text{GHz}$), 12 mm in x- and y- dimension (2-4 GHz) and 10mm in x- and y- dimension (4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution: $\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}} \leq 2\text{GHz} \leq 8\text{mm}$, 2-4GHz $\leq 5\text{mm}$ and 4-6 GHz $\leq 4\text{mm}$; $\Delta z_{\text{zoom}} \leq 3\text{GHz} \leq 5\text{mm}$, 3-4 GHz $\leq 4\text{mm}$ and 4-6GHz $\leq 2\text{mm}$ where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

Frequency	Maximun Area Scan resolution ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximun Zoom Scan spatial resolution ($\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$)	Maximun Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			$\Delta z_{\text{Zoom}}(n)$	$\Delta z_{\text{Zoom}}(1)^*$	$\Delta z_{\text{Zoom}}(n>1)^*$	
$\leq 2\text{GHz}$	$\leq 15\text{mm}$	$\leq 8\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 1.5^* \Delta z_{\text{Zoom}}(n-1)$	$\geq 30\text{mm}$
2-3GHz	$\leq 12\text{mm}$	$\leq 5\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 1.5^* \Delta z_{\text{Zoom}}(n-1)$	$\geq 30\text{mm}$
3-4GHz	$\leq 12\text{mm}$	$\leq 5\text{mm}$	$\leq 4\text{mm}$	$\leq 3\text{mm}$	$\leq 1.5^* \Delta z_{\text{Zoom}}(n-1)$	$\geq 28\text{mm}$
4-5GHz	$\leq 10\text{mm}$	$\leq 4\text{mm}$	$\leq 3\text{mm}$	$\leq 2.5\text{mm}$	$\leq 1.5^* \Delta z_{\text{Zoom}}(n-1)$	$\geq 25\text{mm}$
5-6GHz	$\leq 10\text{mm}$	$\leq 4\text{mm}$	$\leq 2\text{mm}$	$\leq 2\text{mm}$	$\leq 1.5^* \Delta z_{\text{Zoom}}(n-1)$	$\geq 22\text{mm}$

3.2.5 SPATIAL PEAK SAR EVALUATION

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution) or 8 x 8 x 7 points (with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting "Graph Evaluated".
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computer mathematic, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computer mathematic, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

3.2.6 DATA STORAGE AND EVALUATION

3.2.6.1 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 “DAE”. 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], [mW/g], [mW/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.

3.2.7 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	Dcpj
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

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 multi meter 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	V_i = compensated signal of channel i	(i = x, y, z)
	U_i = 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:

$$\text{E-field probes: } E_i = (V_i / \text{Norm}_i \cdot \text{ConvF})^{1/2}$$

$$\text{H-field probes: } H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With V_i = compensated signal of channel i (i = x, y, z)

Norm_i = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)²] for E-field Probes

ConvF = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

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

$$E_{\text{tot}} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

$$\text{SAR} = (E_{\text{tot}})^2 \cdot \sigma / (\rho \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= 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.

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm²

E_{tot} = total field strength in V/m

H_{tot} = total magnetic field strength in A/m

3.2.8 INCIDENT POWER DENSITY (IPD) MEASUREMENTS SYSTEM CONFIGURATION

System Description and Operation

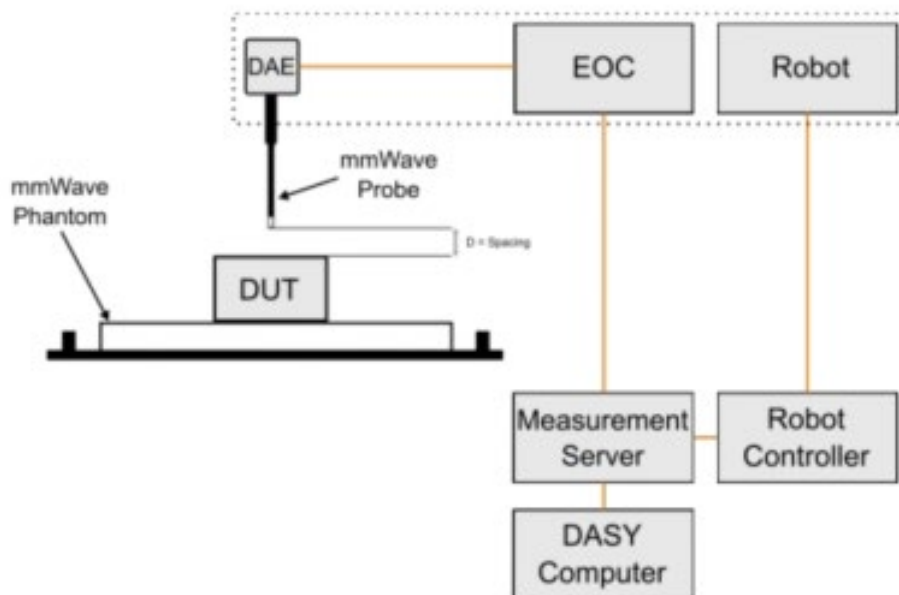
The DASY8 system combines a sophisticated measurement system with a variety of probes (SAR, E1 field, H-field, temperature, etc.) and a high-precision 6-axis robot positioner. The combination allows for completely automated measurement scans and evaluations with both field and position information, e.g., volume averages, peak search, and extrapolations. The main purpose is to perform near-field measurements of radiators of highly non-isotropic fields for which the exact measurement location is critical.

The special application area described in this system handbook is PD measurement in the 6 GHz– 110 GHz frequency range.

System Components

A typical DASY8 system for PD measurements consists of:

- 6-axis robotic arm (Stäubli TX2-60L/ TX2-90XL) for positioning the probe
- Mounting Platform for maintaining the phantoms at a fixed location relative to the robot
- Measurement Server that handles all time-critical tasks, such as measurement data acquisition and supervision of safety features
- Electrical to Optical Converter (EOC) for converting the optical signal from the DAE to electrical before being transmitted to the measurement server
- Light Beam unit for probe alignment (measurement of the exact probe length and eccentricity)
- millimeter Wave (mmWave) probe (EummmWVx) for measuring the E-field magnitude. The polarization ellipses and the power density are then derived.
- mmWave phantom used as the test bed
- DAE that reads the probe voltages and transmits it to the DASY8 PC
- mmWave Device Holder for positioning the EUT on top of the phantom
- operator PC that runs the DASY8 software for defining/executing the measurements
- verification sources for system performance checks.



4. SYSTEM VERIFICATION PROCEDURE

4.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

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

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
Head 2450	-	45.0	-	0.1	-	-	54.9	-
Head 2600	-	45.1	-	0.1	-	-	54.8	-
Head 5G	-	-	-	-	-	17.2	65.5	17.3

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M + resistivity
HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Tissue Verification									
Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Targeted Conductivity (σ)	Targeted Permittivity (ϵ_r)	Deviation Conductivity (σ) (%)	Deviation Permittivity (ϵ_r) (%)	Date
Head	2450	22.4	1.834	38.048	1.80	39.2	1.89	-2.94	Mar. 06, 2026
Head	2450	22.9	1.846	38.801	1.80	39.2	2.56	-1.02	Apr. 15, 2026
Head	2450	23.1	1.800	37.900	1.80	39.2	0.00	-3.32	Apr. 19, 2026
Head	5250	23.2	4.710	35.900	4.71	36.0	0.00	-0.14	Apr. 20, 2026
Head	5600	23.2	5.110	35.100	5.07	35.5	0.79	-1.13	Apr. 20, 2026
Head	5750	23.2	5.290	34.800	5.22	35.4	1.34	-1.56	Apr. 20, 2026
Head	6500	22.3	5.980	35.000	6.07	34.5	-1.48	1.45	Mar. 14, 2026
Head	6500	22.5	6.040	34.400	6.07	34.5	-0.49	-0.29	Apr. 17, 2026

Note:

- 1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
- 2) KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
- 3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

4.2 SYSTEM CHECK

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

System Check	Date	Frequency (MHz)	Targeted SAR 1g (W/kg)	Measured SAR 1g (W/kg)	normalized SAR 1g (W/kg)	Deviation 1g (%)	Dipole S/N
Head	Mar. 06, 2026	2450	53.10	5.28	52.80	-0.56	919
Head	Apr. 15, 2026	2450	53.10	5.18	51.80	-2.45	919
Head	Apr. 19, 2026	2450	53.10	5.07	50.70	-4.52	919
Head	Apr. 20, 2026	5250	78.70	7.71	77.10	-2.03	1160
Head	Apr. 20, 2026	5600	81.80	8.14	81.40	-0.49	1160
Head	Apr. 20, 2026	5750	78.70	7.61	76.10	-3.30	1160
Head	Mar. 14, 2026	6500	291.00	28.40	284.00	-2.41	1052
Head	Apr. 17, 2026	6500	291.00	28.20	282.00	-3.09	1052

4.2.1 POWER DENSITY SYSTEM CHECK

System check provides a fast and reliable method to routinely verify that the measurement system is operational with no system component failures, including probe defects, drifts or deviation from target performance requirements. A system check also verifies the repeatability of the measurement system before compliance testing.

The measurement of a verification source is started from 5G probe installed and the phantom taught. The verification source is placed on the 5G phantom. Due to the internal distance from the horn to the outer surface of the verification source, the measurement distance set in the software should be offset by -4.45 mm; e.g, for measurement of the verification source at 10 mm, the measurement distance set in the software should be 5.55mm (10mm -4.45 mm).

The system check is a complete measurement using simple well-defined reference sources. According to the description of "Relative system check" in Section A.3 of Annex A to the IEC IEEE 63195-1 test standard, the uncertainty tolerance range of the system performance check can be converted to a percentage by referring to the uncertainty $K=1$ of the source calibration certificate. Here are some examples of A.5 and A.6 formulas! The uncertainty tolerance range of this calibration certificate is $\pm 15.88\%$. According to the measured $psPD$ $4cm^2$ result, within the tolerance of the calibration certificate standard uncertainty, the system verification is successful. The instruments and procedures used for system inspection shall ensure that the system is ready to perform compliance tests.

Before starting DUT PD testing in any configuration, the acceptance criteria shall be met. The relative system check is successful if a) or b) is met:

- a) All absolute differences between the measured values, $psPD_{meas}$ and target values $psPD_{tgt}$, with $psPD$ values averaged over $1cm^2$ and/or $4cm^2$, shall be within the combined uncertainty u_c of the measurement system and the source antenna, according to Formula (A.4) if the uncertainty is expressed in decibel, or according to Formula (A.5) if the uncertainty is expressed in percent, along with Formula (A.6).

$$\Delta psPD_{tgt} = \left| 10 \times \lg \left(\frac{psPD_{meas}}{psPD_{tgt}} \right) \right| < \min(2 \times |u_c|, 2 \text{ dB}) \quad (A.4)$$

or

$$\Delta psPD_{tgt} = \left| \frac{psPD_{meas} - psPD_{tgt}}{psPD_{tgt}} \right| < \min(2 \times |u_c|, 58\%) \quad (A.5)$$

$$u_c = \sqrt{u_{antenna_cal}^2 + u_{power}^2 + u_{meas}^2} \quad (A.6)$$

where

- $psPD_{tgt}$ is the target value, derived from repeated measurement of source antenna, normalized to 0 dBm TRP;
- $u_{antenna_cal}$ is the standard uncertainty ($k = 1$) of the $psPD$ of the antenna model;
- u_{power} is the standard uncertainty ($k = 1$) of the measured TRP (see Clause A.2);
- u_{meas} is the standard uncertainty ($k = 1$) of the $psPD$ measurement (probe calibration, electronics, and positioning).

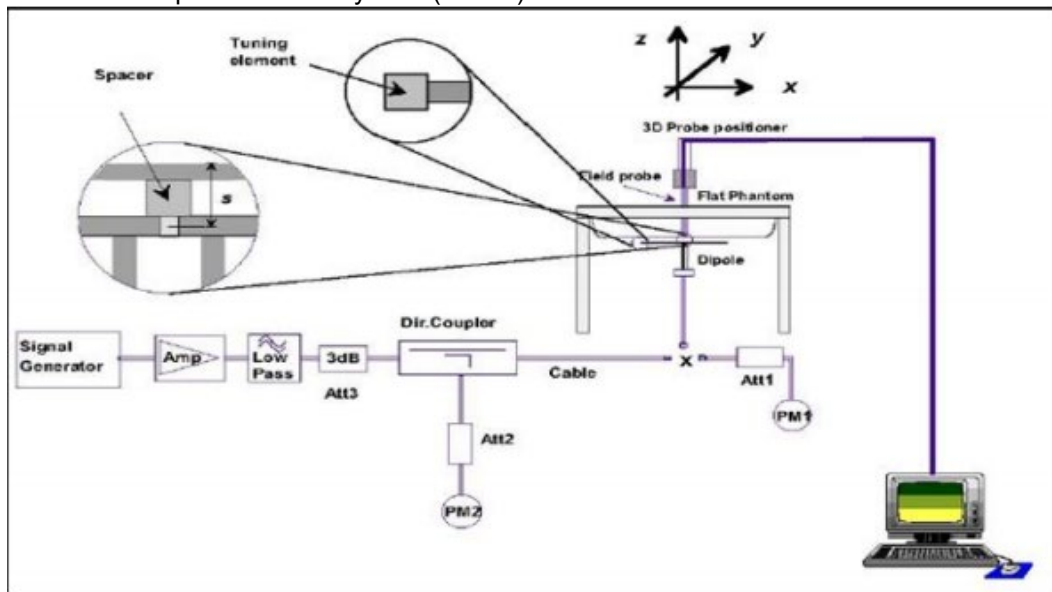
System Check	Date	Frequency (GHz)	Distance (mm)	Targeted $4cm^2$ (W/m ²)	Measured $4cm^2$ (W/m ²)	Deviation For $4cm^2$ (%)	Dipole S/N
Power Density	Mar. 09, 2026	10G $\pm$ 10MHz	10	57.5	53.4	-7.13	1041

4.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250mW (below 3GHz) or 100mW (3-6GHz). To adjust this power a power meter is used.

The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system ($\pm 10\%$).



5. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

5.1 SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, 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 ($\sim 10\%$ 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.

The detailed repeated measurement results are shown in Section 7.2.

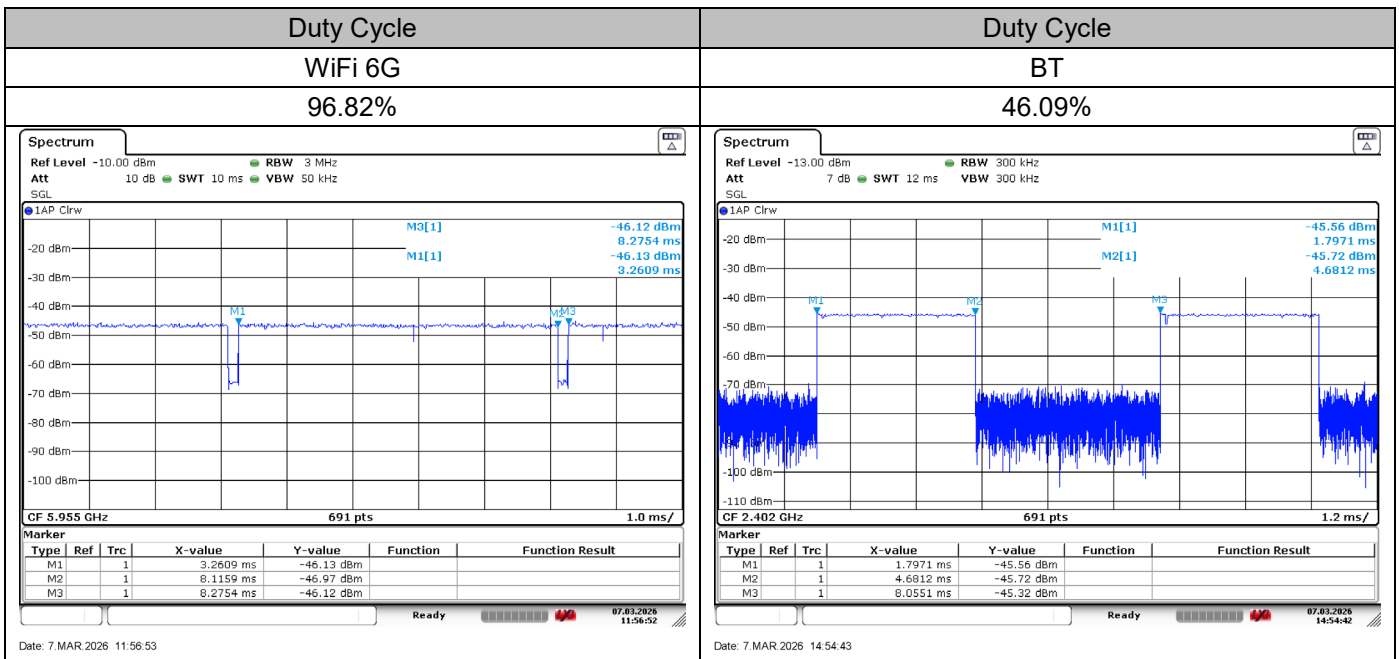
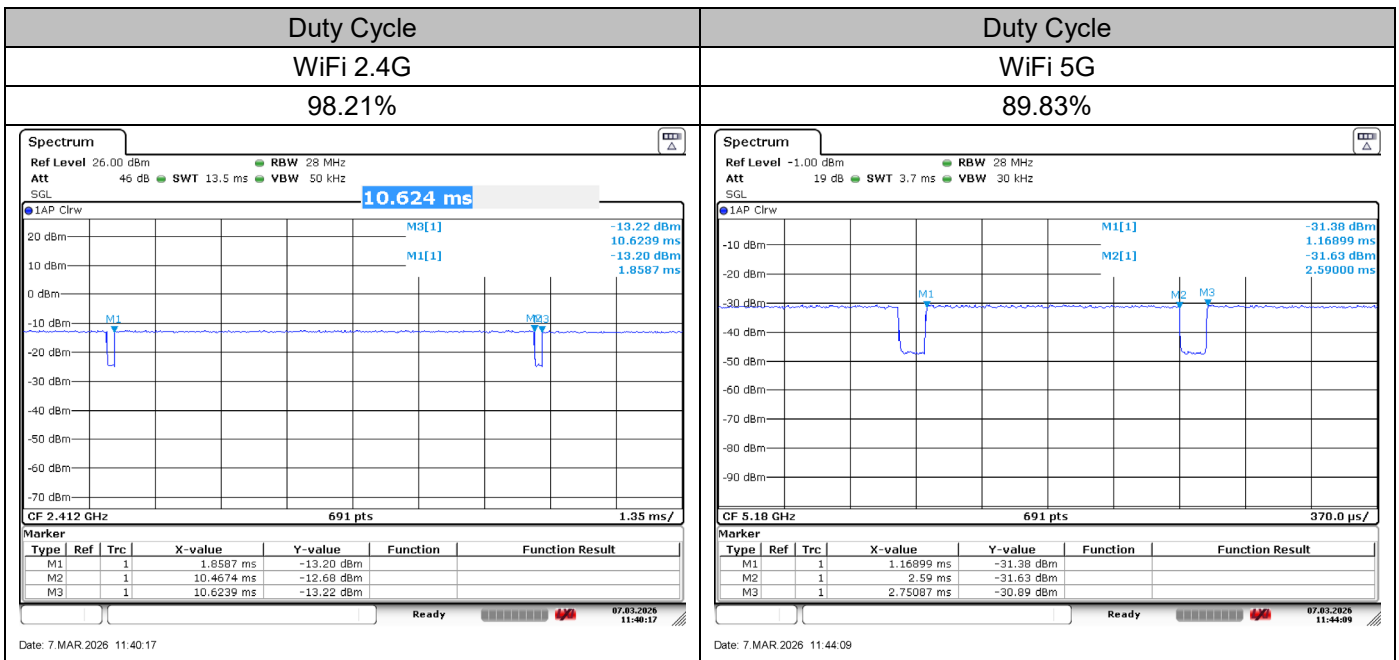
6. OPERATIONAL CONDITIONS DURING TEST

6.1 SAR TEST CONFIGURATION

6.1.1 WIFI TEST CONFIGURATION

For BT / WLAN SAR testing, BT/ WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal.

For WiFi SAR testing, a communication link is set up with the test mode software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 are applied.



6.1.4.1 2.4G SAR Test Requirements

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 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.

2.4 GHz 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. 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.

SAR Test Requirements for OFDM configurations

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. 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.

6.1.4.2 5G SAR Test Requirements

✧ U-NII-1 and U-NII-2A Band

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR. When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

✧ U-NII-2C, U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification.

Unless band gap channels are permanently disabled, they must be considered for SAR testing.

To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels.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.

6.1.4.3 OFDM transmission mode and SAR test channel selection

For the 2.4GHz and 5GHz 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 then 802.11n and 802.11ac, or 802.11g then 802.11n) is used for SAR measurement. When the maximum output power is the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

6.1.4.4 Initial test configuration procedure

For OFDM, in both 2.4GHz and 5GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output powers is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurement.

6.2 TEST POSITION

6.2.1 HEAD TEST CONFIGURATION

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

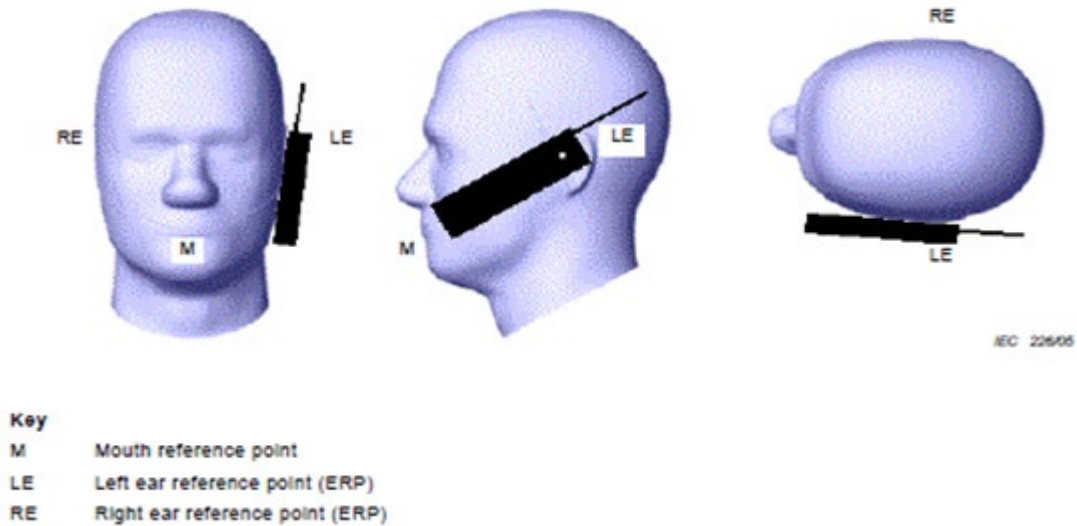


Figure 1 Cheek position of the wireless device on the left side of SAM

Note1: Cheek position of the wireless device on Right side of SAM also is similar to the left side represented above.

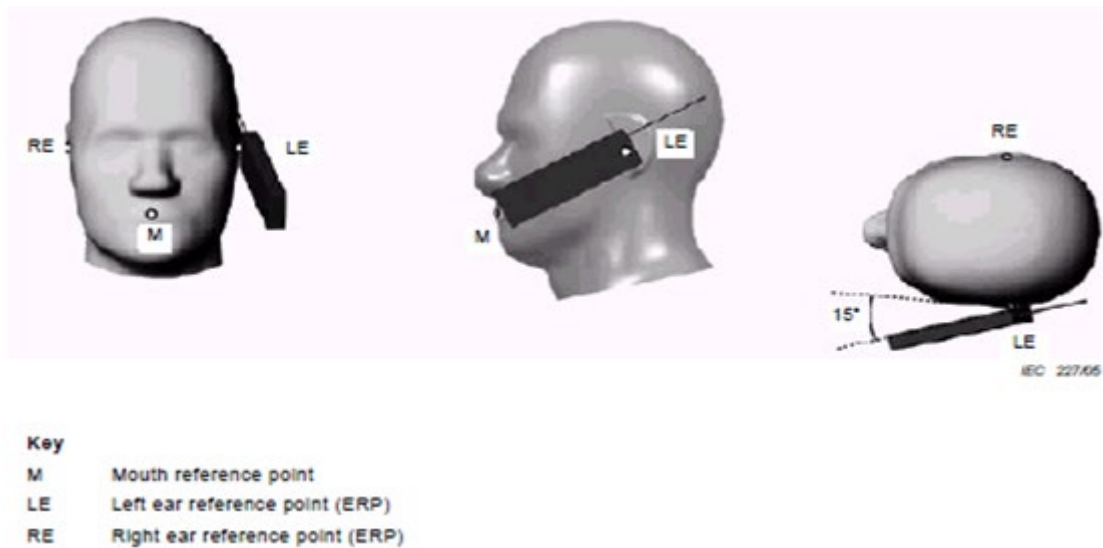


Figure 2 Tilt position of the wireless device on the left side of SAM

Note2: Tilt position of the wireless device on Right side of SAM also is similar to the left side represented above.

6.2.2 BODY-WORN TEST CONFIGURATION

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. The distance between the device and the phantom was kept 5mm.

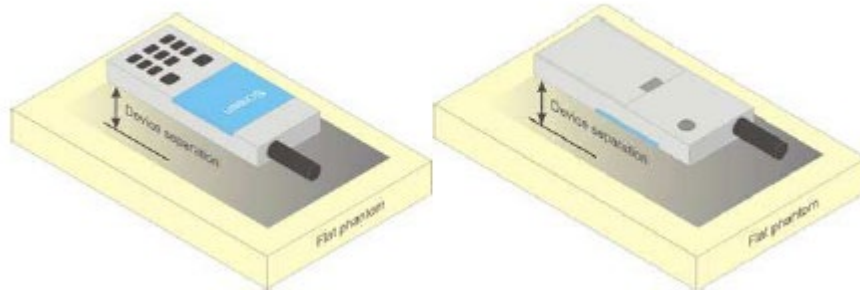


Figure 3 Test positions for body-worn device

The location of the antenna inside EUT is as below:

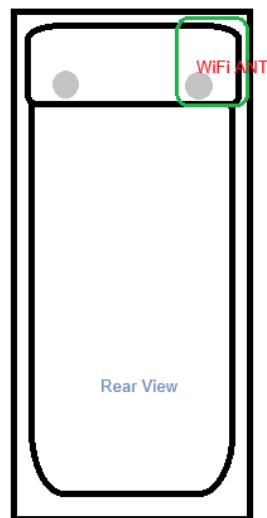


Figure: The location of the antennas

7. TEST RESULT

7.1 CONDUCTED POWER RESULTS

1. Conducted power results for BT

BT	Average Conducted Power(dBm)			
	Max.	CH0	CH39	CH78
	Tune up	2402MHz	2441MHz	2480MHz
DH5	7.00	5.65	6.30	5.98
2DH5	7.50	6.23	7.31	7.08
3DH5	7.50	6.26	7.33	7.16
BT	Average Conducted Power(dBm)			
	Max.	CH0	CH19	CH39
	Tune up	2402MHz	2440MHz	2480MHz
BLE(1M)	7.00	6.14	6.82	6.74
BLE(2M)	7.00	6.18	6.86	6.79
125KHz	7.00	6.25	6.56	6.71
500KHz	7.00	6.22	6.71	6.74

Note: The tested channel results are marks in bold.

2. Conducted power results for Wi-Fi 2.4G

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power (dBm)
802.11b	1	2412	1	20.50	19.17
	6	2437		20.50	18.99
	11	2462		20.50	19.18
802.11g	1	2412	6	18.00	16.78
	6	2437		20.50	18.65
	11	2462		18.00	17.09
802.11 n20	1	2412	HT0	18.00	17.10
	6	2437		20.00	18.81
	11	2462		17.00	16.20
802.11 ax20	1	2412	HE0	18.00	17.00
	6	2437		20.00	19.03
	11	2462		17.00	16.35

Note: The tested channel results are marks in bold.

3. Conducted power results for Wi-Fi 5G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.2G UNII_1	802.11a	36	5180	6	15.00	14.09
		40	5200		16.00	15.03
		48	5240		16.00	15.01
	802.11n HT20	36	5180	HT0	15.50	No Required
		40	5200		15.50	
		48	5240		15.50	
	802.11ac VHT20	36	5180	VHT0	15.50	
		40	5200		15.50	
		48	5240		15.50	
	802.11ax HE20	36	5180	HE0	15.50	
		40	5200		15.50	
		48	5240		15.50	
	802.11n HT40	38	5190	HT0	13.50	
		46	5230		15.50	
	802.11ac VHT40	38	5190	VHT0	13.50	
		46	5230		15.50	
	802.11ax HE40	38	5190	HE0	13.50	
		46	5230		15.50	
	802.11ac VHT80	42	5210	VHT0	13.00	
	802.11ax HE80	42	5210	HE0	13.00	

Note: The tested channel results are marks in bold.

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.3G UNII_2A	802.11a	52	5260	6	15.50	14.43
		60	5300		15.50	14.37
		64	5320		15.50	14.57
	802.11n HT20	52	5260	VHT0	15.00	No Required
		60	5300		15.00	
		64	5320		15.00	
	802.11ac VHT20	52	5260	HT0	15.00	
		60	5300		15.00	
		64	5320		15.00	
	802.11ax HE20	52	5260	HE0	15.00	
		60	5300		15.00	
		64	5320		15.00	
	802.11n HT40	54	5270	HT0	15.00	
		62	5310		15.00	
	802.11ac VHT40	54	5270	VHT0	15.00	
		62	5310		15.00	
	802.11ax HE40	54	5270	HE0	15.00	
		62	5310		15.00	
	802.11ac VHT80	58	5290	VHT0	13.50	
	802.11ax HE80	58	5290	HE0	13.50	

Note: The tested channel results are marks in bold.

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune-up	Average Power(dBm)
5.6G UNII_2C	802.11a	104	5520	6	15.50	14.06
		116	5580		15.50	14.25
		136	5680		15.50	14.54
	802.11n HT20	104	5520	HT0	15.00	No Required
		116	5580		15.00	
		136	5680		15.00	
	802.11ac VHT20	104	5520	VHT0	15.00	
		116	5580		15.00	
		136	5680		15.00	
	802.11ax HE20	104	5520	HE0	15.00	
		116	5580		15.00	
		136	5680		15.00	
	802.11n HT40	102	5510	HT0	12.00	
		110	5550		15.00	
		134	5670		15.00	
		142	5710		15.00	
	802.11ac VHT40	102	5510	VHT0	12.00	
		110	5550		15.00	
		134	5670		15.00	
		142	5710		15.00	
	802.11ax HE40	102	5510	HE0	12.00	
		110	5550		15.00	
		134	5670		15.00	
		142	5710		15.00	
	802.11ac VHT80	106	5530	VHT0	11.50	
		138	5690		15.00	
	802.11ax HE80	106	5530	HE0	11.50	
		138	5690		15.00	

Note: The tested channel results are marks in bold.

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.8G UNII_3	802.11a	149	5745	6	15.50	14.03
		157	5785		15.50	13.96
		165	5825		15.50	14.01
	802.11n HT20	149	5745	HT0	15.00	No Required
		157	5785		15.00	
		165	5825		15.00	
	802.11ac VHT20	149	5745	VHT0	15.00	
		157	5785		15.00	
		165	5825		15.00	
	802.11ax HE20	149	5745	HE0	15.00	
		157	5785		15.00	
		165	5825		15.00	
	802.11n HT40	151	5755	HT0	15.00	
		159	5795		15.00	
	802.11ac VHT40	151	5755	VHT0	15.00	
		159	5795		15.00	
	802.11ax HE40	151	5755	HE0	15.00	
		159	5795		15.00	
	802.11ac VHT80	155	5775	VHT0	15.00	
	802.11ax HE80	155	5775	HE0	15.00	

Note: The tested channel results are marks in bold.

4. Conducted power results for Wi-Fi 6G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
UNII-5	802.11ax HE20	1	5955	HE0	5.00	4.30
		45	6175		5.00	3.65
		93	6415		5.00	4.36
	802.11ax HE40	3	5965	HE0	6.00	5.67
		43	6165		6.00	5.59
		91	6405		6.00	5.61
	802.11ax HE80	7	5985	HE0	10.00	8.63
		39	6145		10.00	8.66
		87	6385		10.00	8.56
UNII-6	802.11ax HE20	97	6435	HE0	4.00	3.00
		105	6475		4.00	2.98
		113	6515		4.00	2.95
	802.11ax HE40	99	6445	HE0	6.50	5.60
		107	6485		6.50	6.14
		115	6525		6.50	5.95
	802.11ax HE80	103	6465	HE0	10.00	8.61
UNII-7	802.11ax HE20	117	6535	HE0	5.00	2.94
		149	6695		5.00	4.41
		181	6855		5.00	2.94
	802.11ax HE40	123	6565	HE0	6.00	5.20
		135	6725		6.00	5.25
		179	6845		6.00	4.28
	802.11ax HE80	119	6545	HE0	10.00	8.51
		151	6705		10.00	8.47
		183	6865		10.00	8.53
UNII-8	802.11ax HE20	185	6875	HE0	5.00	2.94
		209	6995		5.00	4.40
		233	7115		-5.00	-5.35
	802.11ax HE40	187	6885	HE0	6.00	4.37
		211	7005		6.00	5.00
		227	7085		6.00	5.91
	802.11ax HE80	199	6945	HE0	10.00	8.41
		215	7025		10.00	8.43

Note: The tested channel results are marks in bold.

7.2 SAR TEST RESULTS

General Notes:

- 1) Per KDB447498 D04, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
- 2) Per KDB447498 D04, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz. When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel must be used.
- 3) Per KDB865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR < 1.45 W/kg, only one repeated measurement is required.
- 4) Per KDB941225 D06, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
- 5) Per KDB648474 D04, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤ 1.2 W/kg, no additional SAR evaluations using a headset are required.
- 6) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

WLAN Notes:

- 1) For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, 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 positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
- 2) Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHz WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.5 for more information.
- 3) Justification for test configurations for WLAN per KDB Publication 248227 for 5GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2W/kg. See Section 7.1.5 for more information.

7.2.1 SAR MEASUREMENT RESULT OF HEAD

1. Head SAR test results of Wi-Fi 2.4G

Test No.	Band	Mode	Channel	Test Position	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W01	WiFi 2.4G	802.11b	11	Right Cheek	1M	98.21	20.5	19.18	0.1	0.961	0.504	1.326
W02	WiFi 2.4G	802.11b	11	Right Tilted	1M	98.21	20.5	19.18	0.05	0.516	0.279	0.712
W03	WiFi 2.4G	802.11b	11	Left Cheek	1M	98.21	20.5	19.18	-0.08	0.818	0.442	1.129
W04	WiFi 2.4G	802.11b	11	Left Tilted	1M	98.21	20.5	19.18	0.01	0.724	0.371	0.999
W05	WiFi 2.4G	802.11b	1	Right Cheek	1M	98.21	20.5	19.17	-0.04	0.991	0.513	1.371
W06	WiFi 2.4G	802.11b	6	Right Cheek	1M	98.21	20.5	18.99	0	0.889	0.464	1.282

Note: The value with boldface is the maximum SAR Value of each test band.

2. Head SAR test results of BT

Test No.	Band	Mode	Channel	Test Position	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
B01	BT	DH5	39	Right Cheek	3M	46.09	7.5	7.33	0.09	0.067	0.036	0.152
B02	BT	DH5	39	Right Tilted	3M	46.09	7.5	7.33	-0.04	0.053	0.029	0.120
B03	BT	DH5	39	Left Cheek	3M	46.09	7.5	7.33	-0.15	0.053	0.030	0.120
B04	BT	DH5	39	Left Tilted	3M	46.09	7.5	7.33	0.1	0.051	0.028	0.116
B05	BT	DH5	0	Right Cheek	3M	46.09	7.5	6.26	0.03	0.050	0.026	0.145
B06	BT	DH5	78	Right Cheek	3M	46.09	7.5	7.16	0.12	0.071	0.036	0.165

Note: The value with boldface is the maximum SAR Value of each test band.

3. Head SAR test results of Wi-Fi 5G

Test No.	Band	Mode	Channel	Test Position	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W07	WiFi 5.2G UNII_1	802.11a	40	Right Cheek	6M	89.83%	16	15.03	-0.05	0.181	0.058	0.252
W08	WiFi 5.2G UNII_1	802.11a	40	Right Tilted	6M	89.83%	16	15.03	0.02	0.137	0.0467	0.191
W09	WiFi 5.2G UNII_1	802.11a	40	Left Cheek	6M	89.83%	16	15.03	0.04	0.112	0.0338	0.156
W10	WiFi 5.2G UNII_1	802.11a	40	Left Tilted	6M	89.83%	16	15.03	-0.11	0.113	0.0426	0.157
W11	WiFi 5.2G UNII_1	802.11a	36	Right Cheek	6M	89.83%	15	14.09	-0.1	0.152	0.0483	0.209
W12	WiFi 5.2G UNII_1	802.11a	48	Right Cheek	6M	89.83%	16	15.01	0.07	0.165	0.0555	0.231
W13	WiFi 5.6G UNII_2C	802.11a	136	Right Cheek	6M	89.83%	15.5	14.54	0.07	0.221	0.076	0.307
W14	WiFi 5.6G UNII_2C	802.11a	136	Right Tilted	6M	89.83%	15.5	14.54	-0.05	0.198	0.0739	0.275
W15	WiFi 5.6G UNII_2C	802.11a	136	Left Cheek	6M	89.83%	15.5	14.54	0.01	0.147	0.0554	0.204
W16	WiFi 5.6G UNII_2C	802.11a	136	Left Tilted	6M	89.83%	15.5	14.54	-0.06	0.141	0.0523	0.196
W17	WiFi 5.6G UNII_2C	802.11a	104	Right Cheek	6M	89.83%	15.5	14.06	0.01	0.138	0.0482	0.214
W18	WiFi 5.6G UNII_2C	802.11a	116	Right Cheek	6M	89.83%	15.5	14.25	-0.06	0.159	0.0544	0.236
W19	WiFi 5.8G UNII_3	802.11a	149	Right Cheek	6M	89.83%	15.5	14.03	0.08	0.193	0.066	0.301
W20	WiFi 5.8G UNII_3	802.11a	149	Right Tilted	6M	89.83%	15.5	14.03	0.02	0.141	0.0511	0.220
W21	WiFi 5.8G UNII_3	802.11a	149	Left Cheek	6M	89.83%	15.5	14.03	-0.11	0.102	0.0354	0.159
W22	WiFi 5.8G UNII_3	802.11a	149	Left Tilted	6M	89.83%	15.5	14.03	0.01	0.112	0.0403	0.175
W23	WiFi 5.8G UNII_3	802.11a	157	Right Cheek	6M	89.83%	15.5	13.96	0.13	0.087	0.016	0.139
W24	WiFi 5.8G UNII_3	802.11a	165	Right Cheek	6M	89.83%	15.5	14.01	0.06	0.0405	0.0098	0.064

Note: The value with boldface is the maximum SAR Value of each test band.

4. Head SAR test results of Wi-Fi 6G

Test No.	Band	Mode	Channel	Test Position	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W25	WiFi6E UNII-5	802.11ax HE80	39	Right Cheek	HE0	96.82	10	8.66	0.09	0.043	0.012	0.060
W26	WiFi6E UNII-5	802.11ax HE80	39	Right Tilted	HE0	96.82	10	8.66	-0.03	0.056	0.020	0.079
W27	WiFi6E UNII-5	802.11ax HE80	39	Left Cheek	HE0	96.82	10	8.66	0.08	0.055	0.017	0.077
W28	WiFi6E UNII-5	802.11ax HE80	39	Left Tilted	HE0	96.82	10	8.66	0	0.044	0.011	0.062
W29	WiFi6E UNII-5	802.11ax HE80	7	Right Tilted	HE0	96.82	10	8.63	0	0.058	0.018	0.082
W30	WiFi6E UNII-5	802.11ax HE80	87	Right Tilted	HE0	96.82	10	8.56	0	0.072	0.024	0.104
W31	WiFi6E UNII-6	802.11ax HE80	103	Right Cheek	HE0	96.82	10	8.61	0	0.049	0.017	0.070
W32	WiFi6E UNII-6	802.11ax HE80	103	Right Tilted	HE0	96.82	10	8.61	0	0.074	0.026	0.105
W33	WiFi6E UNII-6	802.11ax HE80	103	Left Cheek	HE0	96.82	10	8.61	0.04	0.051	0.013	0.073
W34	WiFi6E UNII-6	802.11ax HE80	103	Left Tilted	HE0	96.82	10	8.61	-0.06	0.037	0.008	0.053
W35	WiFi6E UNII-7	802.11ax HE80	183	Right Cheek	HE0	96.82	10	8.53	0	0.064	0.023	0.093
W36	WiFi6E UNII-7	802.11ax HE80	183	Right Tilted	HE0	96.82	10	8.53	0	0.074	0.026	0.107
W37	WiFi6E UNII-7	802.11ax HE80	183	Left Cheek	HE0	96.82	10	8.53	0	0.053	0.020	0.077
W38	WiFi6E UNII-7	802.11ax HE80	183	Left Tilted	HE0	96.82	10	8.53	0	0.048	0.011	0.070
W39	WiFi6E UNII-7	802.11ax HE80	119	Right Tilted	HE0	96.82	10	8.51	-0.07	0.071	0.024	0.103
W40	WiFi6E UNII-7	802.11ax HE80	151	Right Tilted	HE0	96.82	10	8.47	-0.15	0.071	0.025	0.104
W41	WiFi6E UNII-8	802.11ax HE80	215	Right Cheek	HE0	96.82	10	8.43	0.01	0.074	0.027	0.110
W42	WiFi6E UNII-8	802.11ax HE80	215	Right Tilted	HE0	96.82	10	8.43	0.09	0.076	0.026	0.113
W43	WiFi6E UNII-8	802.11ax HE80	215	Left Cheek	HE0	96.82	10	8.43	0	0.060	0.016	0.089
W44	WiFi6E UNII-8	802.11ax HE80	215	Left Tilted	HE0	96.82	10	8.43	0	0.045	0.018	0.067
W45	WiFi6E UNII-8	802.11ax HE80	199	Right Tilted	HE0	96.82	10	8.41	0	0.083	0.029	0.124

Note: The value with boldface is the maximum SAR Value of each test band.

7.2.2 SAR MEASUREMENT RESULT OF BODY-WORN

1. Body-worn SAR test results of WiFi 2.4G

Test No.	Band	Mode	Channel	Test Position	Separation Distance (mm)	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W75	WiFi 2.4G	802.11b	11	Front Side	5	1M	98.21	20.5	19.18	0.02	0.518	0.302	0.715
W76	WiFi 2.4G	802.11b	11	Back Side	5	1M	98.21	20.5	19.18	0.11	0.515	0.273	0.711
W77	WiFi 2.4G	802.11b	11	Left Side	5	1M	98.21	20.5	19.18	0.06	0.339	0.172	0.468
W78	WiFi 2.4G	802.11b	11	Right Side	5	1M	98.21	20.5	19.18	-0.07	0.081	0.048	0.112
W79	WiFi 2.4G	802.11b	11	Top Side	5	1M	98.21	20.5	19.18	0.09	0.616	0.307	0.850
W80	WiFi 2.4G	802.11b	11	Bottom Side	5	1M	98.21	20.5	19.18	0.13	0.044	0.022	0.061
W81	WiFi 2.4G	802.11b	1	Top Side	5	1M	98.21	20.5	19.17	-0.03	0.633	0.323	0.875
W82	WiFi 2.4G	802.11b	6	Top Side	5	1M	98.21	20.5	18.99	0.18	0.500	0.256	0.721

Note: The value with boldface is the maximum SAR Value of each test band.

2. Body-worn SAR test results of BT

Test No.	Band	Mode	Channel	Test Position	Separation Distance (mm)	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
B11	BT	DH5	39	Front Side	5	3M	46.09	7.5	7.33	0.01	0.039	0.023	0.087
B12	BT	DH5	39	Back Side	5	3M	46.09	7.5	7.33	0.04	0.040	0.024	0.091
B13	BT	DH5	39	Left Side	5	3M	46.09	7.5	7.33	-0.09	0.045	0.003	0.101
B14	BT	DH5	39	Right Side	5	3M	46.09	7.5	7.33	0.01	0.038	0.020	0.085
B15	BT	DH5	39	Top Side	5	3M	46.09	7.5	7.33	0.15	0.050	0.025	0.113
B16	BT	DH5	39	Bottom Side	5	3M	46.09	7.5	7.33	0	<0.001	<0.001	<0.001
B17	BT	DH5	0	Top Side	5	3M	46.09	7.5	6.26	-0.03	0.023	0.011	0.066
B18	BT	DH5	78	Top Side	5	3M	46.09	7.5	7.16	-0.06	0.050	0.025	0.117

Note: The value with boldface is the maximum SAR Value of each test band.

3. Body-worn SAR test results of Wi-Fi 5G

Test No.	Band	Mode	Channel	Test Position	Separation Distance (mm)	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)
W83	WiFi 5.2G UNII 1	802.11a	40	Front Side	5	6M	89.83	16	15.03	0.01	0.123	0.052	0.171
W84	WiFi 5.2G UNII 1	802.11a	40	Back Side	5	6M	89.83	16	15.03	-0.02	0.837	0.298	1.165
W85	WiFi 5.2G UNII 1	802.11a	40	Left Side	5	6M	89.83	16	15.03	0.09	0.507	0.196	0.706
W86	WiFi 5.2G UNII 1	802.11a	40	Right Side	5	6M	89.83	16	15.03	-0.01	0.091	0.036	0.127
W87	WiFi 5.2G UNII 1	802.11a	40	Top Side	5	6M	89.83	16	15.03	0.02	0.222	0.093	0.309
W88	WiFi 5.2G UNII 1	802.11a	40	Bottom Side	5	6M	89.83	16	15.03	-0.11	0.044	0.011	0.061
W89	WiFi 5.2G UNII 1	802.11a	36	Back Side	5	6M	89.83	15	14.09	-0.17	0.619	0.238	0.850
W90	WiFi 5.2G UNII 1	802.11a	48	Back Side	5	6M	89.83	16	15.01	0.03	0.748	0.268	1.046
						-							
W92	WiFi 5.6G UNII 2C	802.11a	136	Front Side	5	6M	89.83	15.5	14.54	0.03	0.088	0.037	0.122
W93	WiFi 5.6G UNII 2C	802.11a	136	Back Side	5	6M	89.83	15.5	14.54	-0.04	0.907	0.346	1.259
W94	WiFi 5.6G UNII 2C	802.11a	136	Left Side	5	6M	89.83	15.5	14.54	0.07	0.515	0.198	0.715
W95	WiFi 5.6G UNII 2C	802.11a	136	Right Side	5	6M	89.83	15.5	14.54	-0.01	0.094	0.038	0.130
W96	WiFi 5.6G UNII 2C	802.11a	136	Top Side	5	6M	89.83	15.5	14.54	0.11	0.386	0.149	0.536
W97	WiFi 5.6G UNII 2C	802.11a	136	Bottom Side	5	6M	89.83	15.5	14.54	-0.16	0.052	0.012	0.073
W98	WiFi 5.6G UNII 2C	802.11a	104	Back Side	5	6M	89.83	15.5	14.06	0.02	0.444	0.168	0.689
W99	WiFi 5.6G UNII 2C	802.11a	116	Back Side	5	6M	89.83	15.5	14.25	-0.05	0.587	0.224	0.871
						-							
W101	WiFi 5.8G UNII 3	802.11a	149	Front Side	5	6M	89.83	15.5	14.03	-0.13	0.097	0.042	0.152
W102	WiFi 5.8G UNII 3	802.11a	149	Back Side	5	6M	89.83	15.5	14.03	0.04	0.724	0.287	1.131
W103	WiFi 5.8G UNII 3	802.11a	149	Left Side	5	6M	89.83	15.5	14.03	0.07	0.280	0.113	0.437
W104	WiFi 5.8G UNII 3	802.11a	149	Right Side	5	6M	89.83	15.5	14.03	-0.11	0.069	0.029	0.108
W105	WiFi 5.8G UNII 3	802.11a	149	Top Side	5	6M	89.83	15.5	14.03	0.01	0.382	0.145	0.597
W106	WiFi 5.8G UNII 3	802.11a	149	Bottom Side	5	6M	89.83	15.5	14.03	-0.03	0.068	0.014	0.106
W107	WiFi 5.8G UNII 3	802.11a	157	Back Side	5	6M	89.83	15.5	13.96	-0.14	0.824	0.321	1.308
W108	WiFi 5.8G UNII 3	802.11a	165	Back Side	5	6M	89.83	15.5	14.01	0.02	0.761	0.282	1.194

Note: The value with boldface is the maximum SAR Value of each test band.

4. Body-worn SAR test results of Wi-Fi 6G

Test No.	Band	Mode	Channel	Test Position	Separation Distance (mm)	Data Rate	Duty Cycle (%)	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR (W/kg)	APD W/m ² (4c m ²)
W110	WiFi6E UNII-5	802.11ax HE80	39	Front Side	5	HE0	96.82	10	8.66	0.01	0.036	0.014	0.051	0.314
W111	WiFi6E UNII-5	802.11ax HE80	39	Back Side	5	HE0	96.82	10	8.66	0.05	0.189	0.072	0.266	1.600
W112	WiFi6E UNII-5	802.11ax HE80	39	Left Side	5	HE0	96.82	10	8.66	0.04	0.121	0.041	0.170	0.932
W113	WiFi6E UNII-5	802.11ax HE80	39	Right Side	5	HE0	96.82	10	8.66	0.08	0.022	0.008	0.031	0.183
W114	WiFi6E UNII-5	802.11ax HE80	39	Top Side	5	HE0	96.82	10	8.66	-0.03	0.096	0.034	0.135	0.765
W115	WiFi6E UNII-5	802.11ax HE80	39	Bottom Side	5	HE0	96.82	10	8.66	0	<0.001	<0.001	<0.001	<0.001
W116	WiFi6E UNII-5	802.11ax HE80	7	Back Side	5	HE0	96.82	10	8.63	0.01	0.208	0.055	0.295	1.280
W117	WiFi6E UNII-5	802.11ax HE80	87	Back Side	5	HE0	96.82	10	8.56	0	0.233	0.087	0.335	1.940
W119	WiFi6E UNII-6	802.11ax HE80	103	Front Side	5	HE0	96.82	10	8.61	-0.04	0.015	0.005	0.021	0.124
W120	WiFi6E UNII-6	802.11ax HE80	103	Back Side	5	HE0	96.82	10	8.61	0.09	0.205	0.077	0.292	1.720
W121	WiFi6E UNII-6	802.11ax HE80	103	Left Side	5	HE0	96.82	10	8.61	0.03	0.113	0.039	0.161	0.884
W122	WiFi6E UNII-6	802.11ax HE80	103	Right Side	5	HE0	96.82	10	8.61	0.05	0.021	0.008	0.030	0.172
W123	WiFi6E UNII-6	802.11ax HE80	103	Top Side	5	HE0	96.82	10	8.61	-0.09	0.109	0.039	0.155	0.875
W124	WiFi6E UNII-6	802.11ax HE80	103	Bottom Side	5	HE0	96.82	10	8.61	0	<0.001	<0.001	<0.001	<0.001
W126	WiFi6E UNII-7	802.11ax HE80	183	Front Side	5	HE0	96.82	10	8.53	0	0.023	0.009	0.033	0.205
W127	WiFi6E UNII-7	802.11ax HE80	183	Back Side	5	HE0	96.82	10	8.53	0	0.261	0.097	0.378	2.170
W128	WiFi6E UNII-7	802.11ax HE80	183	Left Side	5	HE0	96.82	10	8.53	0.04	0.128	0.044	0.185	0.987
W129	WiFi6E UNII-7	802.11ax HE80	183	Right Side	5	HE0	96.82	10	8.53	0.07	0.022	0.008	0.032	0.184
W130	WiFi6E UNII-7	802.11ax HE80	183	Top Side	5	HE0	96.82	10	8.53	-0.02	0.086	0.031	0.125	0.692
W131	WiFi6E UNII-7	802.11ax HE80	183	Bottom Side	5	HE0	96.82	10	8.53	0	<0.001	<0.001	<0.001	<0.001
W132	WiFi6E UNII-7	802.11ax HE80	119	Back Side	5	HE0	96.82	10	8.51	0	0.202	0.075	0.294	1.680
W133	WiFi6E UNII-7	802.11ax HE80	151	Back Side	5	HE0	96.82	10	8.47	0	0.207	0.078	0.304	1.730
W135	WiFi6E UNII-8	802.11ax HE80	215	Front Side	5	HE0	96.82	10	8.43	0.02	0.017	0.007	0.025	0.152
W136	WiFi6E UNII-8	802.11ax HE80	215	Back Side	5	HE0	96.82	10	8.43	0	0.224	0.083	0.332	1.850
W137	WiFi6E UNII-8	802.11ax HE80	215	Left Side	5	HE0	96.82	10	8.43	0	0.135	0.048	0.200	1.080
W138	WiFi6E UNII-8	802.11ax HE80	215	Right Side	5	HE0	96.82	10	8.43	-0.08	0.026	0.010	0.039	0.217
W139	WiFi6E UNII-8	802.11ax HE80	215	Top Side	5	HE0	96.82	10	8.43	-0.02	0.111	0.041	0.165	0.906
W140	WiFi6E UNII-8	802.11ax HE80	215	Bottom Side	5	HE0	96.82	10	8.43	0	<0.001	<0.001	<0.001	<0.001
W141	WiFi6E UNII-8	802.11ax HE80	199	Back Side	5	HE0	96.82	10	8.41	-0.03	0.234	0.090	0.349	2.000

Note: The value with boldface is the maximum SAR Value of each test band.

Power Density results of Wi-Fi 6G

System&Position						SAR								Power Density									
Test No.	Band	Mode	Channel	Test Position	Separation Distance (mm)	Data Rate	Duty Cycle %	Maximum Tune-up (dBm)	Conducted Power (dBm)	Power Drift (dB)	SAR 1g (W/kg)	SAR 10g (W/kg)	Reported 1g SAR	APD W/m² (μW/cm²)	Separation Distance (mm)	Grid Step (λ)	Scaling Factor for Measurement Uncertainty	Averaging Area (cm²)	Power Drift (dB)	Normal PaPD (W/m²)	Scaling Normal PaPD (W/m²)	Total PaPD (W/m²)	Scaling Total PaPD (W/m²)
W127	WiFi6E UNIL-7	802.11ax HE80	183	Back Side	5	HE0	96.82%	10	8.53	0	0.261	0.097	0.378	2.170	2	0.125	1.55	4	0.07	2.89	6.055	3.98	8.959

Note:

- 1) Chose the worst case of WiFi 6E to test power density.
- 2) This device is in compliance with power density for general population or uncontrolled exposure limits, and has been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 63195-1.
- 3) When scaling the IPD, the extrapolation of the work cycle and the tuning tolerance has been taken into account. The data includes the formula for the extrapolation calculation.

The location of the antenna inside EUT is as below:

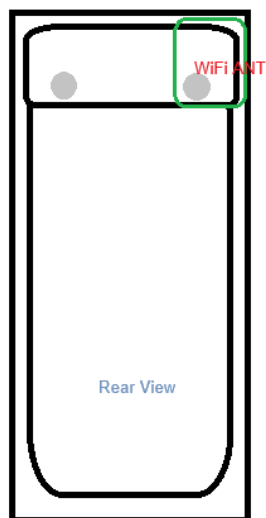


Figure: The location of the antennas

Note: This product has only one transmitting antenna, so it does not involve simultaneous transmission.

APPENDIX

1. TEST LAYOUT

Specific Absorption Rate Test Layout



Liquid depth in the flat Phantom ($\geq 15\text{cm}$ depth)

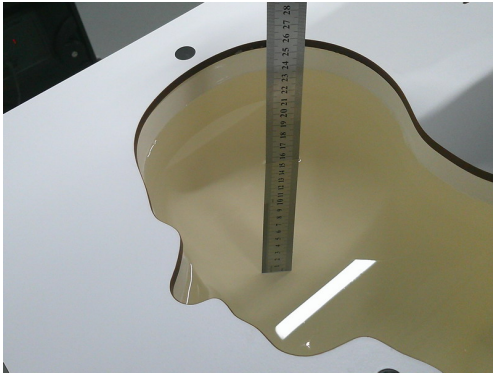
Head_H600-10000_17.1cm



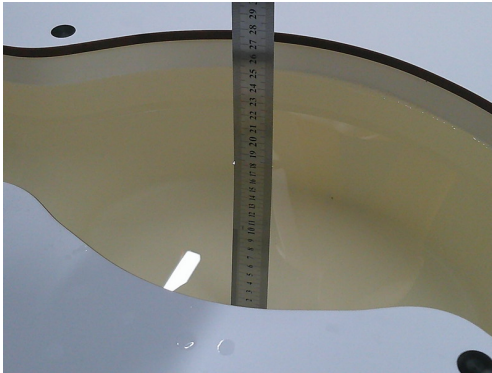
Body_H600-10000_20.1cm



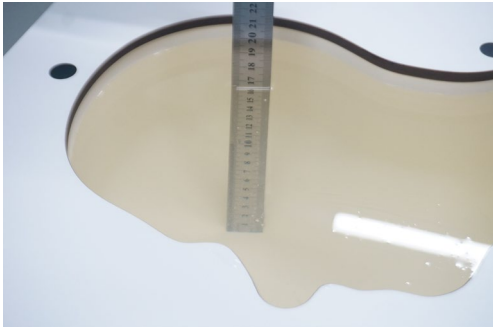
Head_H2300-2700_15.5cm



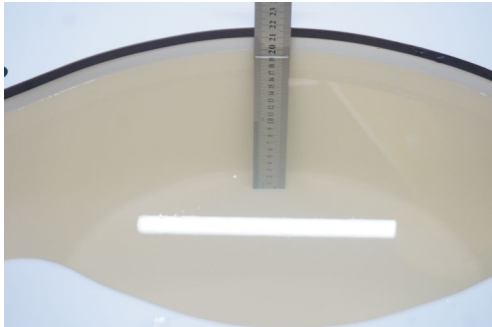
Body_H2300-2700_18.5cm



Head_H4500-6000_16.5cm



Body_H4500-6000_19.5cm



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-2601H016_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-2601H016_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-2601H016_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-2601H016_Appendix D.)

End of Test Report