FCC SAR Test Report

FCC ID:RWO-RZ090508

Report No.	:	BTL-FCC SAR-1-2309C037A
Equipment	:	Notebook PC
Model Name	:	RZ09-0508
Brand Name	:	RAZER
Applicant	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA.
Radio Function	:	WLAN 6G
Standard(s)	:	**KDB447498 D04** Interim General RF Exposure Guidance v01 **KDB248227 D01** 802.11 Wi-Fi SAR v02r02 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** SAR Reporting v01r02 **KDB616217 D04** SAR for laptop and Tablets v01r02 **FCC§2.1093** Radiofrequency radiation exposure evaluation: portable devices **IEEE C95.1:2019** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. **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)
Date of Receipt	:	Sep. 21, 2023
Date of Test	:	Nov. 23, 2023 ~ Nov. 25, 2023
Issued Date	:	Dec. 19, 2023

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by :

Jerry Chuang, Supervisor

Approved by :

Peter Chen, Assistant Manager

BTL Inc.

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan

Tel: +886-2-2657-3299 Fax: +886-2-2657-3331 Web: www.newbtl.com

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** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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** 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

REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2023/12/19

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

Equipment	Notebook PC		
Model Name	RZ09-0508		
Brand Name	RAZER		
Power Rating	Brand : RAZER Model : RC30-024801 Input : 100V-240V~3.6A 50/60Hz Output : 19.5V 11.8A		
Battery Information	Brand Name : RAZER Model Name : RC30-0482 Rated Capacity : 4422mAn/68.1Wh Rated Voltage : 15.4V Limited Charge Voltage : 17.6V		
WIFI+BT Module	QCNCM865		
Operation Frequency	Function	Band	Frequency (MHz)
	WiFi	6G_UNII 5	TX:5945 – 6425MHz
		6G_UNII 6	TX:6425 – 6525MHz
		6G_UNII 7	TX:6525 – 6875MHz
		6G_UNII 8	TX:6875 – 7125MHz
Sample Status	Engineering Sample		
EUT Modification(s)	N/A		

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc. The test data, data evaluation, and equipment configuration contained in our test report were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2 RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test locations stated below are under the TAF Accreditation Number 0659.
The test facilities used to collect the test data in this report is **SAR Test room** at the location of No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan.
(FCC DN: TW0659)

☒ SAR 01 ☐ SAR 02 ☐ SAR 03

2.2. MEASUREMENT UNCERTAINTY

Uncertainty Budget for Frequency range of 6 GHz to 10 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System								
Probe Calibration	18.6	Normal	2	1	1	± 9.3 %	± 9.3 %	∞
Probe Calibration Drift	1.7	Rectangular	$\sqrt{3}$	1	1	± 1.0 %	± 1.0 %	∞
Probe Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Broadband Signal	2.8	Rectangular	$\sqrt{3}$	1	1	± 1.6 %	± 1.6 %	∞
Probe Isotropy	7.6	Rectangular	$\sqrt{3}$	1	1	± 4.4 %	± 4.4 %	∞
Other Probe+Electronic	2.4	Normal	1	1	1	± 2.4%	± 2.4%	∞
RF Ambient	1.8	Normal	1	1	1	± 1.8 %	± 1.8 %	∞
Probe Positioning	±0.005mm	Normal	1	0.5	0.5	± 0.25 %	± 0.25 %	∞
Data Processing	3.5	Normal	1	1	1	± 3.5 %	± 3.5 %	∞
Phantom and Device Errors								
Conductivity(meas.)	2.5	Normal	1	0.78	0.71	± 2.0 %	± 1.8 %	∞
Conductivity(temp.)	2.4	Rectangular	$\sqrt{3}$	0.78	0.71	± 1.1 %	± 1.0 %	∞
PhantomPermittivity	14.0	Rectangular	$\sqrt{3}$	0.5	0.5	± 4.0 %	± 4.0 %	∞
Distance DUT - TSL	2.0	Normal	1	2	2	± 4.0 %	± 4.0 %	∞
Device Positioning	1.0	Normal	1	1	1	± 1.0 %	± 1.0 %	145
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %	5
DUT Modulation	2.4	Rectangular	$\sqrt{3}$	1	1	± 1.4 %	± 1.4 %	∞
Time-average SAR	1.7	Rectangular	$\sqrt{3}$	1	1	± 1.0 %	± 1.0 %	∞
DUT drift	2.5	Normal	1	1	1	± 2.5 %	± 2.5 %	∞
Val Antenna Unc.	0	Normal	1	1	1	± 0 %	± 0 %	∞
Unc. Input Power	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	0	Rectangular	$\sqrt{3}$	1	1	± 0 %	± 0 %	∞
Combined Standard Uncertainty (K = 1)						± 14.23%	± 14.16%	361
Expanded Uncertainty (K = 2)						**± 28.46 %**	**± 28.32 %**	

Uncertainty Budget for psSAR / psAPD Assessments

UncertaintyBudgetforpsSAR/psAPDAssessments

(Frequency band: 6 – 10 GHz range)

Symbol	Error Description	Uncert.	Prob. Dist.	Div.	ci (1g) / (1 cm2)	ci (8 g/10 g) / (4 cm2)	Std. Unc.0(1 g)/ (1 cm2)	Std. Unc. (8 g/10 g) / (4 cm2)
psSAR	Module SAR V16.0 (Table 6.3.3)	±14.23/14.16%	N	1	1	1	±14.23%	±14.16%
PDC	Power Density Conversion	±13.5%	R	$\sqrt{3}$	1	1	±7.8%	±7.8%
u(Δ SAR)	Combined Uncertainty						±15.6%	±15.5 %
U	**Expanded Uncertainty** in dB						±31.2% ±1.2 dB	±31.0% ±1.2 dB

Uncertainty Budget for mmWave

Error Description	Uncertainty Value (±dB)	Probability Distribution	Divisor	Ci	Standard Uncertainty	Vi V_{eff}
Uncertainty terms dependent on the measurement system						
Probe Calibration	0.49	Normal	1	1	±0.49dB	∞
Probe correction	0	Rectangular	$\sqrt{3}$	1	±0dB	∞
Frequency response(BW≤1GHz)	0.20	Rectangular	$\sqrt{3}$	1	±0.12 dB	∞
Sensor cross coupling	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Isotropy	0.50	Rectangular	$\sqrt{3}$	1	±0.29 dB	∞
Linearity	0.20	Rectangular	$\sqrt{3}$	1	±0.12 dB	∞
Probe scattering	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Probe Positioning offset	0.30	Rectangular	$\sqrt{3}$	1	±0.17 dB	∞
Probe Positioning repeatability	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Sensor mechanical offset	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Probe spatial resolution	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Field impedance dependance	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Amplitude and phase drift	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Amplitude and phase noise	0.04	Rectangular	$\sqrt{3}$	1	± 0.02 dB	∞
Measurement area truncation	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Data acquisition	0.03	Normal	1	1	±0.03 dB	∞
Sampling	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Field reconstruction	2.00	Rectangular	$\sqrt{3}$	1	±1.15 dB	∞
Forward transformation	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Power density scaling	-	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Spatial averaging	0.10	Rectangular	$\sqrt{3}$	1	±0.06 dB	∞
System detection limit	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Uncertainty terms dependent on the DUT and environmental factors						
Probe coupling with DUT	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Modulation response	0.40	Rectangular	$\sqrt{3}$	1	± 0.2 dB	∞
Integration time	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Response time	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Device holder influence	0.10	Rectangular	$\sqrt{3}$	1	± 0.1 dB	∞
DUT alignment	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
RF ambient conditions	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Ambient Reflections	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Immunity / secondary reception	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Drift of the DUT	0.10	Rectangular	$\sqrt{3}$	1	±0.06 dB	∞
Combined Standard Uncertainty (K = 1)					± 1.34dB	∞
Expanded Uncertainty (K = 2)					**± 2.68dB**	

2.3. WLAN ANTENNA INFORMATION:

Ant.	Brand	Model	Type	Frequency Range (MHz)	Gain (dBi)
Main	Amphenol Taiwan Corporation	BY507A-16-001-C	PIFA	5925 - 6425	4.38
				6425 - 6525	3.92
				6525 - 6875	4.29
				6875 - 7125	4.29
Aux	Amphenol Taiwan Corporation	BY507A-16-002-C	PIFA	5925 - 6425	3.39
				6425 - 6525	3.68
				6525 - 6875	4.46
				6875 - 7125	4.46

Note:
The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.4. THE MAXIMUM SAR-1G & POWER DENSITY VALUES

Band	Mode	Highest Body Reported SAR-1g(W/kg)
UNII	6G UNII 5	0.295
	6G UNII 6	0.307
	6G UNII 7	0.336
	6G UNII 8	0.322

Band	Mode	4cm^2 APD (W/m^2)
6G	6G UNII 7	2.33

Band	Mode	Highest Reported Power Density(W/m^2)
6G	6G UNII 5	8.295

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 C95.1:2019/IEEE C95.1:2019, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020 .

2.5. LABORATORY ENVIRONMENT

Temperature	Min. = 18ºC, Max. = 25ºC
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.	

2.6. MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	DASY6	Speag	cDASY6 Module SAR (Version 16.2.4.2524)	N/A	N/A	N/A
2	mm Wave	Speag	cDASY 6 Module mm Wave(Version 3.2.2.2358)	N/A	N/A	N/A
3	Data Acquisition Electronics	Speag	DAE4	1486	Jun. 16, 2023	1 Year
4	E-field Probe	Speag	EX3DV4	7369	May. 22, 2023	1 Year
5	System Validation Dipole	Speag	D6.5GHzV2	1041	Sep 02, 2021	3 Year
6	ELI4 Phantom	Speag	ELI4 Phantom V5.0	1240	N/A	N/A
7	E-Field probe	Speag	EUmmWV4	9583	Apr 18, 2023	1 Year
8	5G Verification Source	Speag	5G Verification Source 10GHz	2011	Apr 20, 2023	1 Year
9	mmWave Phantom	Speag	QD 015 025 CA	1085	N/A	N/A
10	ENA Network Analyzer	Agilent	E5071C	MY46524658	Mar. 17, 2023	1 Year
11	Signal Generator	R&S	SMR40	100502	Feb. 23, 2023	1 Year
12	Spectrum Analyzer	R&S	FSV7	103032	Aug. 10, 2023	1 Year
13	Power Meter	Anritsu	ML2495A	1128008	May. 12, 2023	1 Year
14	Power Sensor	Anritsu	MA2411B	1126001	May. 12, 2023	1 Year
15	Dielectric Probe Kit	Agilent	85070E	2593	N/A	N/A
16	Low pass filter	Mini-Circuits	SLP-2950+	M108294	N/A	N/A
17	Power Amplifier	Mini-Circuits	ZVE-2W-272+	N650001538	N/A	N/A
18	Power Amplifier	Mini-Circuits	ZVE-8G+	N628801631	N/A	N/A
19	Power Amplifier	EMCI	EMC053035	980869	N/A	N/A
20	Thermometer	PA	TA298	h001	Mar. 21, 2023	1 Year
21	Directional Coupler	Woken	50W Coupler	DOM5CIW3E2	N/A	N/A
22	Attenuator	Woken	WATT-518FS-10	N/A	N/A	N/A

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

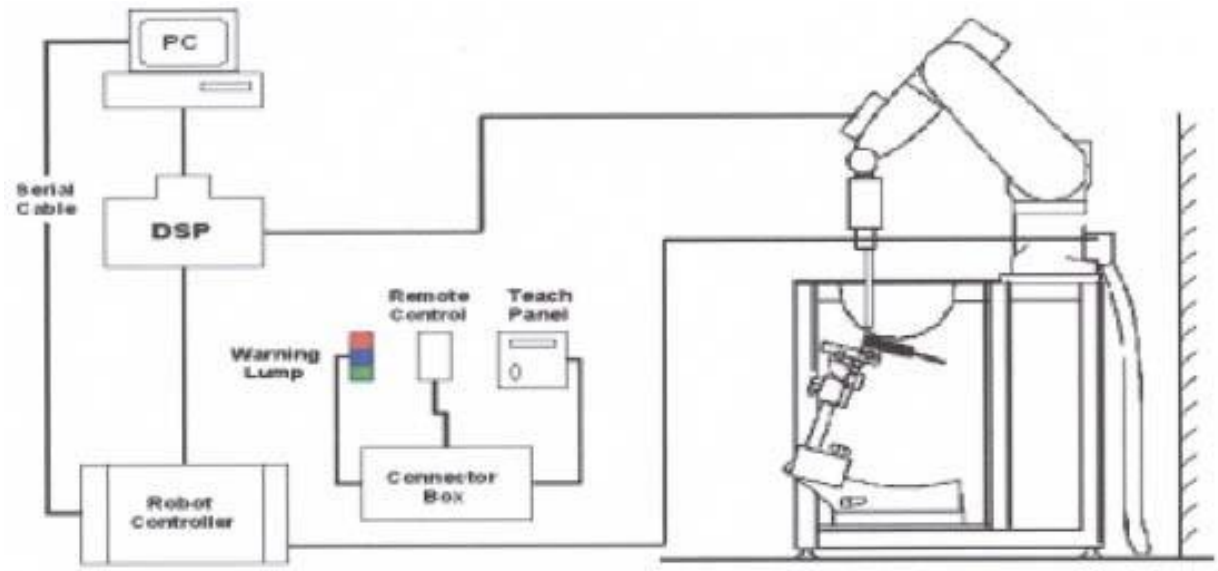
3 SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SETUP

The DASY5 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 DASY5 measurement server.
6. The DASY5 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. DASY5 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

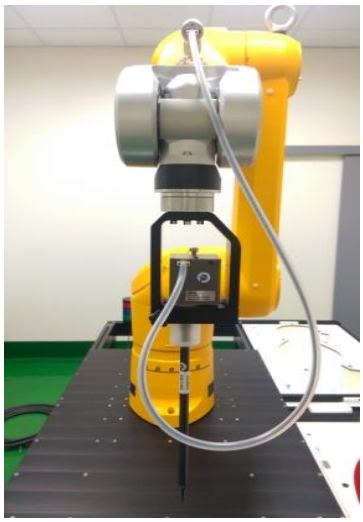


3.2 DASY5 E-FIELD PROBE SYSTEM

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 EX3DV4 PROBE SPECIFICATION

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	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 µW/g to > 100 mW/g Linearity: ± 0.2dB
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



EX3DV4 E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. 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 bellow 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.

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

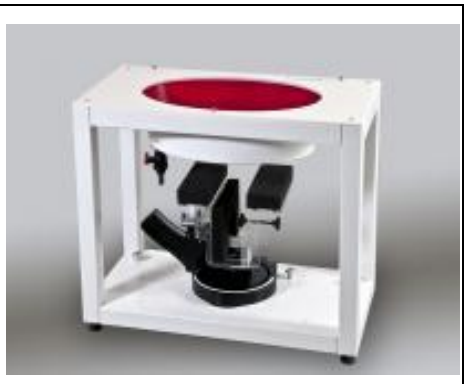
ρ = Tissue density (kg/m3).

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 according to IEC 62209-2 (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. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

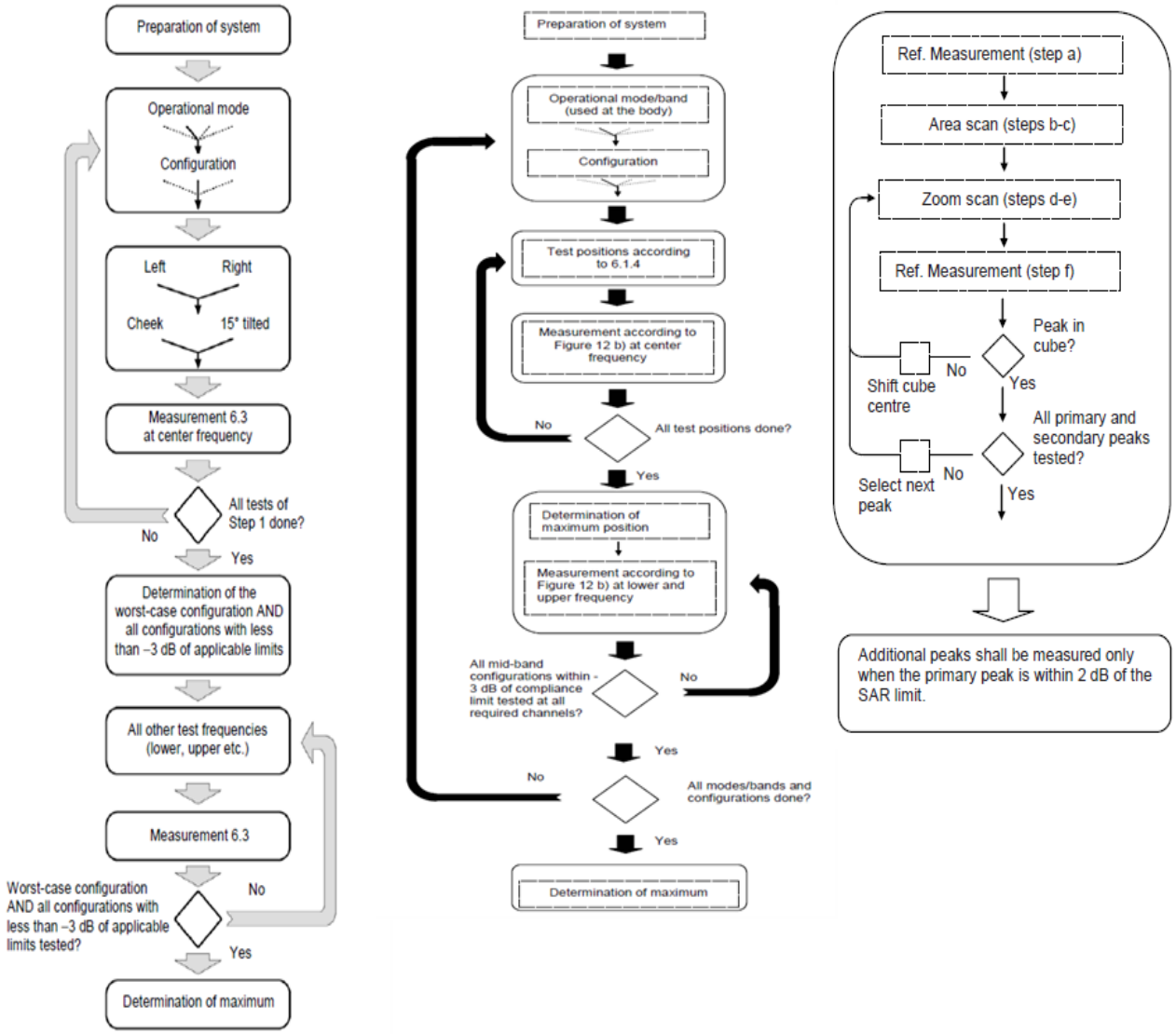
3.2.3.2. PHANTOM

Model	ELI4 Phantom	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Shell Thickness	2±0.1 mm	
Filling Volume	Approx. 30 liters	
Dimensions	Length: 600 mm ; Width: 190mm Height: adjustable feet	
Aailable	Special	

Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length:1000mm; Width: 500mm Height: adjustable feet	
Aailable	Special	

3.2.4 SCANNING PROCEDURE

The SAR test against the head and body-worn phantom was carried out as follow:



After an area scan has been done at a fixed distance of 1.4mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

Above is the scanning procedure flow chart and table from the IEEE1528 standard.

This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

3.2.5 DATA STORAGE AND EVALUATION

3.2.5.1. DATA STORAGE

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “DAE4”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [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.

3.2.6 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, a_{i0}, a_{i1}, a_{i2}
	Conversion factor	$ConvF_i$
	Diode compression point	Dcp_i
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 DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

With	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:

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

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

With 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

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

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

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

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

$$E_{tot} = (EX^2 + EY^2 + EZ^2)^{1/2}$$

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

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

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/cm^3

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

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

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

4 TISSUE-EQUIVALENT LIQUID

4.1 TISSUE-EQUIVALENT LIQUID INGREDIENTS

The liquid is consisted of water, salt and Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The measured conductivity and relative permittivity should be within ±5% of the target values. The below table shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the IEC 62209.

Composition of the Tissue Equivalent Matter

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether	Oxidized Mineral Oil
Head 6G	-	-	-	-	-	-	56.0	-	44.0

4.2 TISSUE-EQUIVALENT LIQUID PROPERTIES

Dielectric Performance of Tissue Simulating Liquid

Tissue Verification									
Date	Tissue Type	Frequency (MHz)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Limit (%) ±5
2023/11/23	Head	6000	5.36	34.63	5.48	35.07	-2.14	-1.25	±5
2023/11/23	Head	6050	5.42	34.57	5.54	35.01	-2.19	-1.26	±5
2023/11/23	Head	6100	5.49	34.42	5.59	34.95	-1.83	-1.51	±5
2023/11/23	Head	6150	5.55	34.39	5.65	34.89	-1.69	-1.44	±5
2023/11/23	Head	6200	5.61	34.28	5.71	34.83	-1.79	-1.57	±5
2023/11/23	Head	6250	5.67	34.23	5.77	34.77	-1.70	-1.55	±5
2023/11/23	Head	6300	5.72	34.08	5.83	34.70	-1.97	-1.78	±5
2023/11/23	Head	6350	5.81	34.05	5.89	34.64	-1.40	-1.70	±5
2023/11/23	Head	6400	5.82	33.98	5.95	34.58	-2.16	-1.74	±5
2023/11/23	Head	6450	5.91	33.85	6.01	34.52	-1.64	-1.93	±5
2023/11/23	Head	6500	5.94	33.84	6.07	34.46	-2.15	-1.81	±5
2023/11/23	Head	6550	6.02	33.67	6.13	34.40	-1.74	-2.12	±5
2023/11/23	Head	6600	6.06	33.68	6.19	34.34	-2.06	-1.92	±5
2023/11/23	Head	6650	6.13	33.48	6.25	34.29	-1.96	-2.37	±5
2023/11/23	Head	6700	6.19	33.50	6.30	34.23	-1.67	-2.14	±5
2023/11/23	Head	6750	6.24	33.33	6.36	34.17	-1.89	-2.46	±5
2023/11/23	Head	6800	6.30	33.31	6.42	34.11	-1.79	-2.33	±5
2023/11/23	Head	6850	6.34	33.16	6.48	34.05	-2.11	-2.60	±5
2023/11/23	Head	6900	6.42	33.14	6.53	33.99	-1.68	-2.51	±5
2023/11/23	Head	6950	6.45	33.02	6.59	33.94	-2.10	-2.70	±5
2023/11/23	Head	7000	6.53	32.99	6.65	33.88	-1.88	-2.62	±5

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) According to FCC TCB workshop April, 2019 RF Exposure Procedures Update(Effective February 19,2019, FCC has permitted the use of single head-tissue simulating liquid specified in IEEE 62209-1- for all SAR tests.

5 SYSTEM CHECK

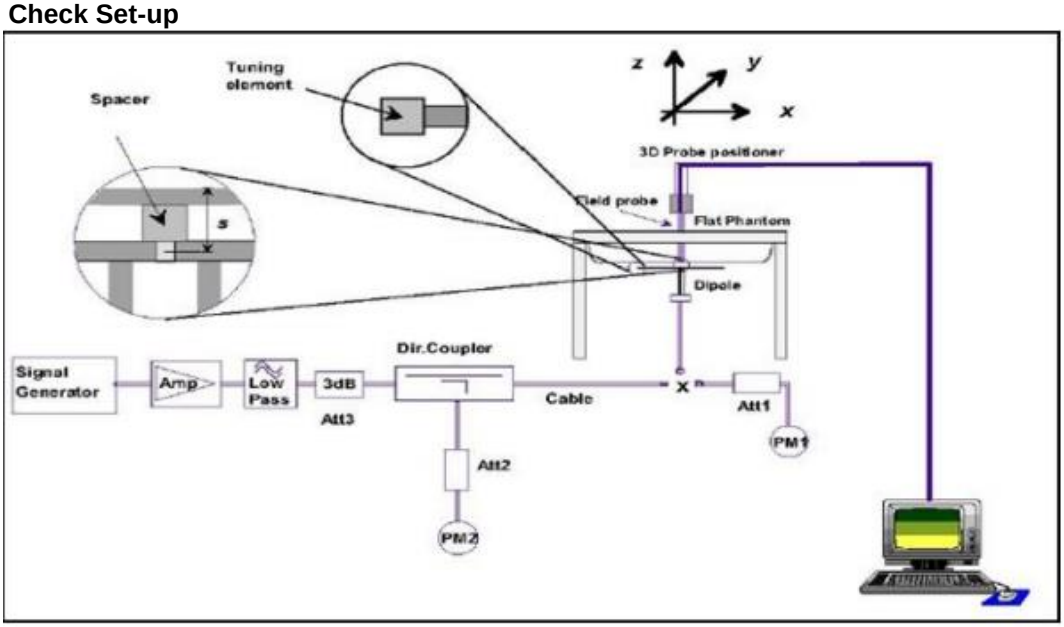
5.1 DESCRIPTION OF SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW(below 3GHz) or 100mW(3-6GHz), which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.

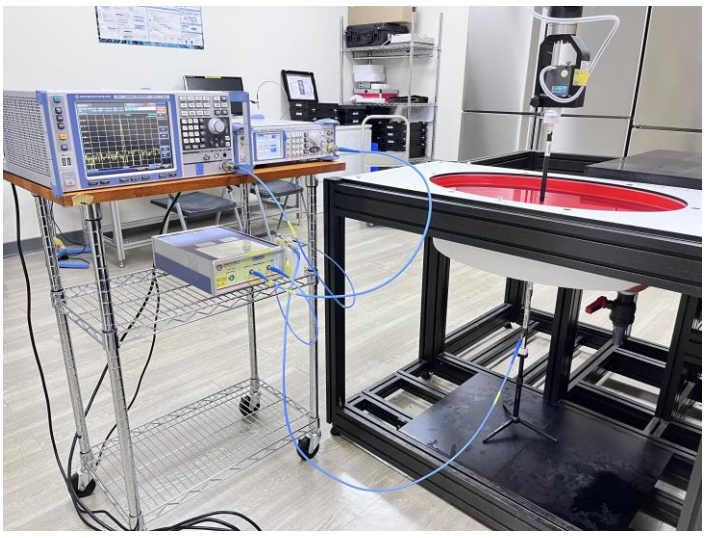
System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.

System Check Set-up



System Check photo



5.2 DESCRIPTION OF SYSTEM CHECK

System Check in Tissue Simulating Liquid

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.

Date	System Dipole			Parameters	Target [W/kg]	Measured [W/kg]	Normalized to 1W [W/kg]	Deviation [%]	Limited [%]
	Type	Serial No.	Liquid						
2023/11/23	D6.5GHzV2 (6.5GHz)	1041	Head	1g SAR	289.0	26.50	265.0	-8.30	± 10

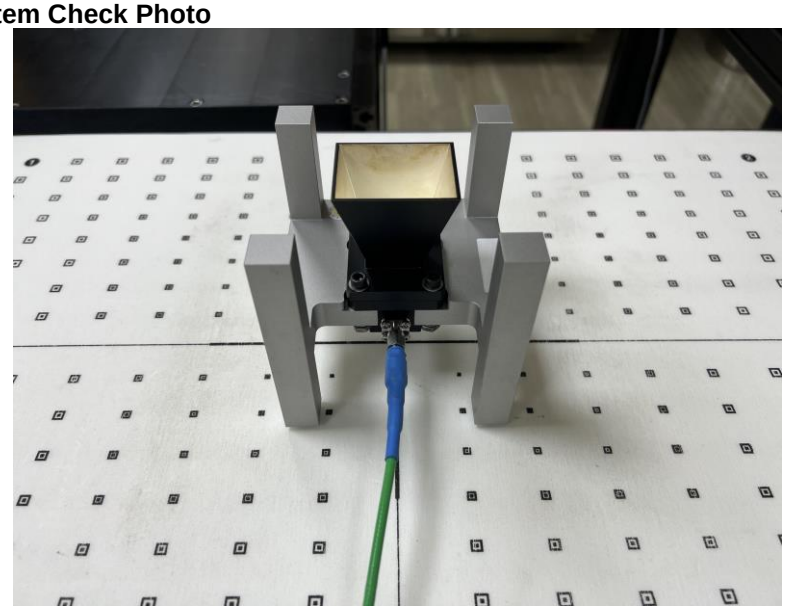
5.3 POWER DENSITY SYSTEM CHECK

System check provides a fast and reliable method to routinely verify that the measurementsystem is operational with no system component failures, including probe defects, drifts ordeviation from target performance requirements. A system check also verifies the repeatabilityof 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 thehorn to the outer surface of the verification source, the measurement distance set in the software should be offsetby -4.45 mm; e.g., for measurement of the verification source at 10 mm, the measurement distance set in thesoftware should be 5.55mm (10mm -4.45 mm).

The system check is a complete measurement using simple well-defined reference sources. According to the DASY6 specification in the user's manual and SPEAG's recommendation, the deviation threshold of ±0.66 dB represents the expanded standard uncertainty for system performance check.The system check is successful if the measured results are within±0.66 dB tolerancesto the target value shown in the calibration certificate of the verification source. The instrumentation and procedures usedfor system checkshould ensure the system is ready for performing compliance tests.

Power Density System Check Photo



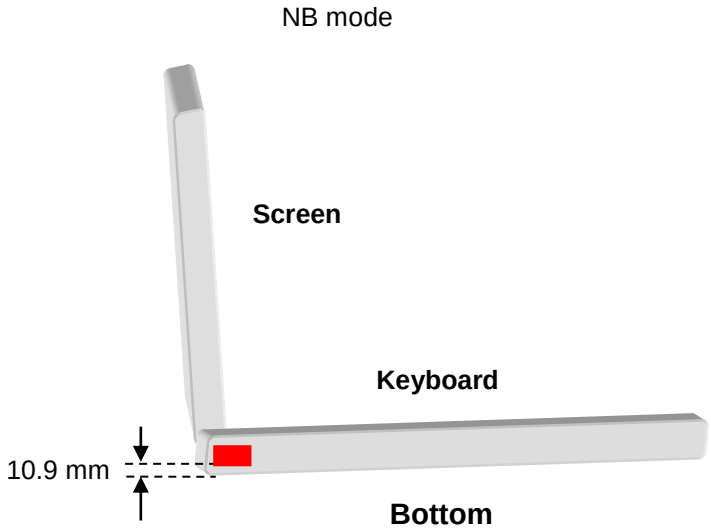
Date	5G Verification Souse			Parameters	Target [W/m^2]	Measured [W/m^2]	Deviation [dB]
	Type	Serial No.	Medium				
2023/11/25	10G	2011	Air	Avg Power Densuty 4cm^2	171.0	157.0	0.38

6 OPERATIONAL CONDITIONS DURING TEST

6.1 GENERAL DESCRIPTION OF TEST PROCEDURES

Connection to the EUT is established via air interface with base station An, and the EUT is Set to maximum output power by base station. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

6.2 TEST POSITION ANTENNA LOCATION



6.3 TEST POSITION OF PORTABLE DEVICES

Minimum Separation Distance				
Mode	**Antenna**	**Position**	**Distance (mm)**	**Evaluation Test**
WiFi	Main	Bottom	10.9	Yes
	Aux	Bottom	10.9	Yes

6.4 TEST POSITION

6.4.1 BODY TEST CONFIGURATION

The SAR Exclusion Threshold in KDB 447498 D04 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an EUT edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned adjacent the phantom and the edge containing the antenna positioned perpendicular to the phantom.

SAR test reduction and exclusion guidance

(1)The SAR exclusion threshold for is defined by the following equation:

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Mode	Ant	Position	Distance (mm)	f (MHz)	Max Power (dBm)	Max Power (mW)	SAR Exclusion threshold(mW)	Test required
6.2GHz	Main	Bottom	10.90	6105	11.50	14.13	6	Yes
6.2GHz	Aux	Bottom	10.90	6105	11.50	14.13	6	Yes
6.5GHz	Main	Bottom	10.90	6425	11.50	14.13	6	Yes
6.5GHz	Aux	Bottom	10.90	6425	11.50	14.13	6	Yes
6.7GHz	Main	Bottom	10.90	6585	11.50	14.13	6	Yes
6.7GHz	Aux	Bottom	10.90	6585	11.50	14.13	6	Yes
7.0GHz	Main	Bottom	10.90	6905	11.50	14.13	6	Yes
7.0GHz	Aux	Bottom	10.90	6905	11.50	14.13	6	Yes

7 SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

7.1 SAR MEASUREMENT VARIABILITY

Per IEC/IEEE 62209-1528:2020 SAR measurement 4 MHz to 10 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 (~ 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 9.

7.2 TEST CONFIGURATION

7.2.1 WIFI Test Configuration

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

Wi-Fi 6GHz Band

Mode	802.11a	802.11 be20	802.11 be40	802.11 be80	802.11 be160	802.11 be320
Duty cycle	100%					
Crest factor	1					

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.

8 CONDUCTED POWER RESULTS

8.1 CONDUCTED POWER MEASUREMENTS OF 6G UNII_5

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
6.2G UNII_5	802.11 a	1-93	5955-6415	6	-0.50	Not Required	
	802.11 be20	1-93	5955-6415	EHT	0.00		
	802.11 be40	3-91	5965-6405	EHT	3.00		
	802.11 be80	7-87	5985-6385	EHT	5.50		
	802.11 be160	15-79	6025-6345	EHT	8.50		
	802.11 be320	31	6105	EHT	11.50	11.43	
	802.11 be320	63	6265	EHT	11.50	11.48	
	802.11 a	1-93	5955-6415	6	-1.50	Not Required	
	802.11 be20	1-93	5955-6415	EHT	-1.00		
	802.11 be40	3-91	5965-6405	EHT	3.00		
	802.11 be80	7-87	5985-6385	EHT	5.00		
	802.11 be160	15-79	6025-6345	EHT	8.50		
	802.11 be320	31	6105	EHT	11.50		11.41
	802.11 be320	63	6265	EHT	11.50		11.40

8.2 CONDUCTED POWER MEASUREMENTS OF 6G UNII_6

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
6.5G UNII 6	802.11 a	97-117	6435-6535	6	-0.50	Not Required	
	802.11 be20	97-117	6435-6535	EHT	-1.00		
	802.11 be40	99-115	6445-6525	EHT	3.00		
	802.11 be80	103-119	6465-6545	EHT	6.00		
	802.11 be160	111-143	6505-6665	EHT	9.00		
	802.11 be320	95	6425	EHT	11.50	11.36	
	802.11 a	97-117	6435-6535	6	-1.50	Not Required	
	802.11 be20	97-117	6435-6535	EHT	-0.50		
	802.11 be40	99-115	6445-6525	EHT	2.50		
	802.11 be80	103-119	6465-6545	EHT	5.00		
	802.11 be160	111-143	6505-6665	EHT	8.50		
	802.11 be320	95	6425	EHT	11.50		11.44

8.3 CONDUCTED POWER MEASUREMENTS OF 6G UNII_7

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
6.7G UNII 7	802.11 a20	121-185	6555-6875	6	-1.00	Not Required	
	802.11 be20	121-185	6555-6875	ETH	-0.50		
	802.11 be40	123-187	6565-6885	ETH	3.50		
	802.11 be80	135-183	6625-6865	ETH	5.00		
	802.11 be160	143-175	6665-6825	ETH	8.50		
	802.11 be320	127	6585	ETH	11.50	11.38	
	802.11 be320	159	6745	ETH	11.50	11.42	
	802.11 a20	121-185	6555-6875	6	-1.00	Not Required	
	802.11 be20	121-185	6555-6875	ETH	-0.50		
	802.11 be40	123-187	6565-6885	ETH	3.00		
	802.11 be80	135-183	6625-6865	ETH	5.50		
	802.11 be160	143-175	6665-6825	ETH	8.50		
	802.11 be320	127	6585	ETH	11.50		11.43
	802.11 be320	159	6745	ETH	11.50		11.48

8.4 CONDUCTED POWER MEASUREMENTS OF 6G UNII_8

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
7.0G UNII 8	802.11 a20	189-233	6895-7115	6	-2.00	Not Required	
	802.11 be20	189-233	6895-7115	EHT	-1.00		
	802.11 be40	195-227	6925-7085	EHT	3.50		
	802.11 be80	199-215	6945-7025	EHT	5.50		
	802.11 be160	175-207	6825-6985	EHT	9.00		
	802.11 be320	191	6905	EHT	11.50	11.45	
	802.11 a20	189-233	6895-7115	6	-1.50	Not Required	
	802.11 be20	189-233	6895-7115	EHT	-0.50		
	802.11 be40	195-227	6925-7085	EHT	2.50		
	802.11 be80	199-215	6945-7025	EHT	5.00		
	802.11 be160	175-207	6825-6985	EHT	9.00		
	802.11 be320	191	6905	EHT	11.50		11.40

8.5. 6G RU POWER

Mode A

802.11be(EHT20) 26-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	1-93	5955-6415	EHT	-9.50	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-9.50		
Band 7	802.11 be20	121-185	6555-6875	EHT	-9.00		
Band 8	802.11 be20	189-233	6895-7115	EHT	-9.50		
Band 5	802.11 be20	1-93	5955-6415	EHT	-8.50	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-10.00		
Band 7	802.11 be20	121-185	6555-6875	EHT	-10.00		
Band 8	802.11 be20	189-233	6895-7115	EHT	-10.00		

802.11be(EHT20) 52-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	1-93	5955-6415	EHT	-7.00	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-6.50		
Band 7	802.11 be20	121-185	6555-6875	EHT	-6.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	-7.00		
Band 5	802.11 be20	1-93	5955-6415	EHT	-6.00	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-7.00		
Band 7	802.11 be20	121-185	6555-6875	EHT	-7.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	-7.00		

802.11be(EHT20) 106-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	1-93	5955-6415	EHT	-3.50	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-3.00		
Band 7	802.11 be20	121-185	6555-6875	EHT	-2.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	-3.00		
Band 5	802.11 be20	1-93	5955-6415	EHT	-2.50	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-3.50		
Band 7	802.11 be20	121-185	6555-6875	EHT	-3.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	-3.50		

802.11be(EHT20) 242-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	1-93	5955-6415	EHT	-0.50	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	0.00		
Band 7	802.11 be20	121-185	6555-6875	EHT	0.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	0.50		
Band 5	802.11 be20	1-93	5955-6415	EHT	0.00	Not Required	
Band 6	802.11 be20	97-117	6435-6535	EHT	-0.50		
Band 7	802.11 be20	121-185	6555-6875	EHT	-0.50		
Band 8	802.11 be20	189-233	6895-7115	EHT	-0.50		

802.11be(EHT40) 484-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be40	3-91	5965-6405	EHT	4.00	Not Required	
Band 6	802.11 be40	99-115	6445-6525	EHT	4.00		
Band 7	802.11 be40	123-187	6565-6885	EHT	4.00		
Band 8	802.11 be40	195-227	6925-7085	EHT	4.00		
Band 5	802.11 be40	3-91	5965-6405	EHT	3.00	Not Required	
Band 6	802.11 be40	99-115	6445-6525	EHT	2.50		
Band 7	802.11 be40	123-187	6565-6885	EHT	2.00		
Band 8	802.11 be40	195-227	6925-7085	EHT	1.50		

802.11be(EHT80) 996-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be80	7-87	5985-6385	EHT	6.50	Not Required	
Band 6	802.11 be80	103-119	6465-6545	EHT	6.50		
Band 7	802.11 be80	135-183	6625-6865	EHT	6.00		
Band 8	802.11 be80	199-215	6945-7025	EHT	6.50		
Band 5	802.11 be80	7-87	5985-6385	EHT	6.00	Not Required	
Band 6	802.11 be80	103-119	6465-6545	EHT	5.00		
Band 7	802.11 be80	135-183	6625-6865	EHT	5.50		
Band 8	802.11 be80	199-215	6945-7025	EHT	5.00		

802.11be(EHT160) 2*996-tone RU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be160	15-79	6025-6345	EHT	8.00	Not Required	
Band 6	802.11 be160	111-143	6505-6665	EHT	8.50		
Band 7	802.11 be160	143-175	6665-6825	EHT	8.00		
Band 8	802.11 be160	175-207	6825-6985	EHT	8.50		
Band 5	802.11 be160	15-79	6025-6345	EHT	7.00	Not Required	
Band 6	802.11 be160	111-143	6505-6665	EHT	6.50		
Band 7	802.11 be160	143-175	6665-6825	EHT	6.50		
Band 8	802.11 be160	175-207	6825-6985	EHT	6.50		

802.11be(EHT20) 52+26-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	45	6175	EHT	-5.00	Not Required	
Band 6	802.11 be20	105	6475	EHT	-6.00		
Band 8	802.11 be20	185-209	6875-6995	EHT	-5.50		
Band 5	802.11 be20	45	6175	EHT	-6.50	Not Required	
Band 6	802.11 be20	105	6475	EHT	-7.00		
Band 8	802.11 be20	185-209	6875-6995	EHT	-6.50		

802.11be(EHT20) 106+26-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be20	45	6175	EHT	-3.00	Not Required	
Band 6	802.11 be20	105	6475	EHT	-2.50		
Band 8	802.11 be20	185-209	6875-6995	EHT	-2.00		
Band 5	802.11 be20	45	6175	EHT	-4.50	Not Required	
Band 6	802.11 be20	105	6475	EHT	-3.50		
Band 8	802.11 be20	185-209	6875-6995	EHT	-3.00		

802.11be(EHT80) 484+242-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be80	7	5985	EHT	4.50	Not Required	
Band 6	802.11 be80	103-119	6465-6545	EHT	4.00		
Band 8	802.11 be80	199	6945	EHT	4.00		
Band 5	802.11 be80	7	5985	EHT	3.50	Not Required	
Band 6	802.11 be80	103-119	6465-6545	EHT	2.00		
Band 8	802.11 be80	199	6945	EHT	1.50		

802.11be(EHT160) 996+484-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be160	47	6185	EHT	7.00	Not Required	
Band 6	802.11 be160	111	6505	EHT	7.50		
Band 7	802.11 be160	143	6665	EHT	7.50		
Band 8	802.11 be160	207	6985	EHT	8.00		
Band 5	802.11 be160	47	6185	EHT	6.00	Not Required	
Band 6	802.11 be160	111	6505	EHT	6.00		
Band 7	802.11 be160	143	6665	EHT	6.00		
Band 8	802.11 be160	207	6985	EHT	5.50		

802.11be(EHT320) 2*996+484-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	10.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	10.00		
Band 8	802.11 be320	191	6905	EHT	10.00		
Band 5	802.11 be320	63	6265	EHT	9.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	8.50		
Band 8	802.11 be320	191	6905	EHT	8.50		

802.11be(EHT320) 3*996-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	9.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	9.00		
Band 8	802.11 be320	191	6905	EHT	9.00		
Band 5	802.11 be320	63	6265	EHT	8.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	8.00		
Band 8	802.11 be320	191	6905	EHT	7.50		

802.11be(EHT320) 3*996+484-tone MRU

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	9.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	8.50		
Band 8	802.11 be320	191	6905	EHT	8.50		
Band 5	802.11 be320	63	6265	EHT	8.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	7.00		
Band 8	802.11 be320	191	6905	EHT	7.00		

802.11be(EHT80) Punctured by 20MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be80	47	5985	EHT	4.00	Not Required	
Band 6	802.11 be80	111-143	6465-6545	EHT	4.50		
Band 8	802.11 be80	207	6945	EHT	4.50		
Band 5	802.11 be80	47	5985	EHT	4.50	Not Required	
Band 6	802.11 be80	111-143	6465-6545	EHT	3.50		
Band 8	802.11 be80	207	6945	EHT	2.50		

802.11be(EHT160) Punctured by 20MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be160	47	6185	EHT	7.50	Not Required	
Band 6	802.11 be160	111	6505	EHT	7.50		
Band 7	802.11 be160	143	6665	EHT	7.50		
Band 8	802.11 be160	207	6985	EHT	8.00		
Band 5	802.11 be160	47	6185	EHT	7.50	Not Required	
Band 6	802.11 be160	111	6505	EHT	6.50		
Band 7	802.11 be160	143	6665	EHT	7.00		
Band 8	802.11 be160	207	6985	EHT	7.00		

802.11be(EHT160) Punctured by 40MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be160	47	6185	EHT	7.50	Not Required	
Band 6	802.11 be160	111	6505	EHT	8.00		
Band 7	802.11 be160	143	6665	EHT	7.50		
Band 8	802.11 be160	207	6985	EHT	8.00		
Band 5	802.11 be160	47	6185	EHT	7.50	Not Required	
Band 6	802.11 be160	111	6505	EHT	7.00		
Band 7	802.11 be160	143	6665	EHT	7.00		
Band 8	802.11 be160	207	6985	EHT	7.00		

802.11be(EHT320) Punctured by 40MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	10.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	10.00		
Band 8	802.11 be320	191	6905	EHT	10.50		
Band 5	802.11 be320	63	6265	EHT	10.50	Not Required	
Band 7	802.11 be320	159	6745	EHT	10.50		
Band 8	802.11 be320	191	6905	EHT	10.00		

802.11be(EHT320) Punctured by 80MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	9.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	8.50		
Band 8	802.11 be320	191	6905	EHT	9.00		
Band 5	802.11 be320	63	6265	EHT	9.50	Not Required	
Band 7	802.11 be320	159	6745	EHT	9.00		
Band 8	802.11 be320	191	6905	EHT	8.50		

802.11be(EHT320) Punctured by 80+40MHz

Band	Mode	Channel	Frequency (MHz)	Data Rate	Max Tune-Up Power (dBm)	AVG Power (dBm)	
						Main	Aux
Band 5	802.11 be320	63	6265	EHT	7.50	Not Required	
Band 7	802.11 be320	159	6745	EHT	7.50		
Band 8	802.11 be320	191	6905	EHT	7.50		
Band 5	802.11 be320	63	6265	EHT	8.00	Not Required	
Band 7	802.11 be320	159	6745	EHT	8.00		
Band 8	802.11 be320	191	6905	EHT	7.00		

8.6. 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 > ½ 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 ≥0.8W/kg; if the deviation among the repeated measurement is ≤20%,and the measured SAR <1.45W/kg, only one repeated measurement is required.

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 Section7.1.4 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 mode was not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than1.2W/kg. See Section 7.1.4 for more information.

9 SAR TEST RESULTS

9.1 BODY SAR TEST RESULTS

SAR test results of WiFi 7

Band	Mode	Channel	Test Position	Ant	Distance (mm)	Max une-up (dBm)	AVG Power (dBm)	SAR 1g	Reported SAR 1g	4cm^2 APD (W/m^2)	Reported 4cm^2 APD (W/m^2)
6G UNII 5	802.11 be320	31	Bottom	Main	0	11.50	11.43	0.281	**0.286**	1.89	**1.92**
		63	Bottom	Main	0	11.50	11.48	0.267	0.268	1.91	1.92
		31	LCD Back	Main	25	11.50	11.43	0.051	0.052	0.39	0.40
		31	Bottom	Aux	0	11.50	11.41	0.289	**0.295**	2.05	**2.10**
		63	Bottom	Aux	0	11.50	11.40	0.288	0.295	2.05	2.10
		31	LCD Back	Aux	25	11.50	11.41	0.026	0.027	0.20	0.21
6G UNII 6	802.11 be320	95	Bottom	Main	0	11.50	11.36	0.297	**0.307**	2.03	**2.10**
		95	LCD Back	Main	25	11.50	11.36	0.052	0.054	0.41	0.42
		95	Bottom	Aux	0	11.50	11.44	0.237	**0.240**	1.61	**1.63**
		95	LCD Back	Aux	25	11.50	11.44	0.021	0.021	0.15	0.15
6G UNII 7	802.11 be320	127	Bottom	Main	0	11.50	11.38	0.327	**0.336**	2.27	**2.33**
		159	Bottom	Main	0	11.50	11.42	0.328	0.334	2.30	2.33
		159	LCD Back	Main	25	11.50	11.42	0.044	0.045	0.34	0.35
		127	Bottom	Aux	0	11.50	11.43	0.265	0.269	1.80	1.83
		159	Bottom	Aux	0	11.50	11.48	0.319	**0.320**	2.26	**2.27**
		159	LCD Back	Aux	25	11.50	11.48	0.040	0.040	0.29	0.29
6G UNII 8	802.11 be320	191	Bottom	Main	0	11.50	11.45	0.305	**0.309**	2.11	**2.13**
		191	LCD Back	Main	25	11.50	11.45	0.036	0.036	0.27	0.27
		191	Bottom	Aux	0	11.50	11.40	0.315	**0.322**	2.17	**2.22**
		191	LCD Back	Aux	25	11.50	11.40	0.035	0.036	0.29	0.29

Power Density results of WiFi 7

Band	Mode	Channel	Test Position	Gap (mm)	Ant	Max une-up (dBm)	AVG Power (dBm)	Grid Step	Scaling Factor for Measurement Uncertain	Averaging Area cm^2	Avg-Tot Power Density W/m^2	Scaling Total Power Density	PD Limit W/m^2
6G UNII 5	802.11 ax320	31	Bottom	2mm	Aux	11.50	11.41	0.0625	1.5535	4.000	5.230	**8.295**	10
6G UNII 6	802.11 ax320	95	Bottom	2mm	Main	11.50	11.36	0.0625	1.5535	4.000	3.840	**6.161**	10
6G UNII 7	802.11 ax320	127	Bottom	2mm	Main	11.50	11.38	0.0625	1.5535	4.000	3.560	**5.685**	10
6G UNII 7	802.11 ax320	159	Bottom	2mm	Main	11.50	11.42	0.0625	1.5535	4.000	3.610	**5.712**	10
6G UNII 8	802.11 ax320	191	Bottom	2mm	Aux	11.50	11.40	0.0625	1.5535	4.000	4.510	**7.169**	10

10. SIMULTANEOUS TRANSMISSION CONDITIONS

10.1. STAND-ALONE SAR TEST EXCLUSION

SAR compliance for simultaneous transmission must be considered when the maximum duration of overlapping transmissions, including network hand-offs, is greater than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis.

The Simultaneous Transmission Possibilities of this device are as below:

No.	Configuration
1	WLAN 2.4G(Main)+BT
2	RLAN 5G(Main)+BT
3	WLAN 6G(Main)+BT
4	WLAN 2.4G(Main)+ WLAN 2.4G(Aux)
5	RLAN 5G(Main)+ RLAN 5G(Aux)
6	WLAN 6G(Main)+ WLAN 6G(Aux)

10.2. SIMULTANEOUS TRANSMISSION CONDITIONS

KDB 447498 D04 General RF Exposure Guidance v01, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$SPLSR = (SAR_1 + SAR_2)^{1.5} / R_i$
Where:

SAR_1 is the highest Reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest Reported or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

R_i is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:
$(SAR_1 + SAR_2)^{1.5} / R_i \leq 0.04$

10.3. ABOUT BT/WIFI

Test Position / SAR1g(W/kg)	Bottom	LCD Back
WLAN 2.4G WiFi_Main	0.542	0.018
WLAN 2.4G WiFi_Aux	0.341	0.009
UNII_1 & 2a WiFi_Main	0.588	0.027
UNII_1 & 2a WiFi_Aux	0.612	0.023
UNII_2c WiFi_Main	0.860	0.058
UNII_2c WiFi_Aux	0.759	0.048
UNII_3 WiFi_Main	0.889	0.098
UNII_3 WiFi_Aux	0.842	0.066
UNII_4 WiFi_Main	0.686	0.087
UNII_4 WiFi_Aux	0.677	0.026
UNII_5 WiFi_Main	0.286	0.052
UNII_5 WiFi_Aux	0.295	0.027
UNII_6 WiFi_Main	0.307	0.054
UNII_6 WiFi_Aux	0.240	0.021
UNII_7 WiFi_Main	0.336	0.045
UNII_7 WiFi_Aux	0.320	0.040
UNII_8 WiFi_Main	0.309	0.036
UNII_8 WiFi_Aux	0.322	0.036
BLE_Main	0.143	0.076
BLE_Aux	0.126	0.079

WLAN2.4G_Main+WLAN 2.4G_Aux MAX∑SAR1g	0.883	0.027
WLAN_Main+BLE_Aux MAX∑SAR1g	1.015	0.177
WLAN_Aux+BLE_Main MAX∑SAR1g	0.985	0.142
RLAN 5G_Main+ RLAN 5G_Aux MAX∑SAR1g	1.731	0.164
Wi-Fi 6G_Main+ Wi-Fi 6G_Aux MAX∑SAR1g	0.658	0.094

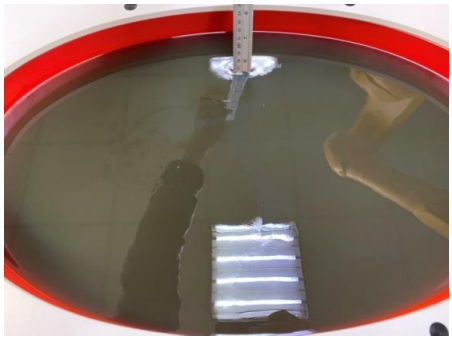
Note:
1. MAX. ΣSAR_{1g} = 1.731 W/Kg>1.6 W/Kg, so Peak location SAR are required.
2. Peak location SAR are 0.02 that refer Appendix E.
3. For the WiFi 2.4G, 5G, BT test result that we reference test report : BTL-FCC SAR-1-2309C037 R00.

11. TEST LAYOUT

Specific Absorption Rate Test Layout

Liquid depth in the flat Phantom (≥15cm depth)

HSL(6.5GHz)



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-2309C037A_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-2309C037A_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-2309C037A_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-2309C037A_Appendix D.)

End of Test Report