FCC SAR Test Report

FCC ID: RWO-RZ090510

Project No.	:	2309C137
Equipment	:	Notebook PC
Brand Name	:	RAZER
Test Model	:	RZ09-0509
Series Model	:	N/A
Date of Receipt	:	Dec. 07, 2023
Date of Test	:	Dec. 18, 2023 ~ Dec. 19, 2023
Issued Date	:	Feb. 01, 2024
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2023120776
Standard(s)	:	Please refer to page 2.
Applicant	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA.
Manufacturer	:	Razer Inc.
Address	:	9 Pasteur, Suite 100, Irvine, CA92618, USA.

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

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Standard(s) : **ANSI C95.1 (1992)** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields (3 kHz to 300 GHz)

IEEE 1528:2013 Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques; FCC requirements for RF Exposure- Devices subject to SAR requirements

FCC KDB 616217 D04 (October 23, 2015) SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers

FCC KDB 447498 D04 (November 29, 2021) Interim RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices

FCC KDB 248227 D01 (October 23, 2015) SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters

FCC KDB 865664 D01 (August 7, 2015) SAR MEASUREMENT REQUIREMENTS FOR 100 MHz TO 6 GHz

FCC KDB 865664 D02 (October 23, 2015) RF Exposure Compliance Reporting and Documentation Considerations

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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, 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.

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCC SAR-1-2309C137	R00	Original Report.	Feb. 01, 2024	Valid

1. GENERAL INFORMATION

1.1 STATEMENT OF COMPLIANCE

Mode	Highest Reported Body SAR-1g (W/kg)
WLAN 2.4G	0.945
WLAN 5.2G	1.070
WLAN 5.6G	0.858
WLAN 5.8G	0.791
WLAN 5.9G	0.893
WLAN 6E	0.335
Bluetooth	0.219

Frequency Band	Highest Averaged Power Density (mW/cm^2)
WLAN 6E	0.766

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 and procedures specified in IEEE Std 1528-2013.
2) According to 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/cm^2 (equal to 10 W/m^2) for frequency up to100 GHz.

1.2 LABORATORY ENVIRONMENT

Temperature	Min. = 20ºC, Max. = 24ºC
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	Notebook PC					
Brand Name	RAZER					
Test Model	RZ09-0509					
Series Model	N/A					
Model Difference(s)	N/A					
Hardware Version	APF23004_MB1 APF23004_MB2					
Firmware Version	Windows 11 Home					
Module Card	BE200NGW					
Modulation	WiFi(DSSS/OFDM/OFDMA), BT(GFSK/π/4-DQPSK/8-DPSK)					
Operation Frequency Range(s)	Band			TX (MHz)	RX (MHz)	
	Bluetooth			2400~2483.5		
	WiFi	2.4G		2400~2483.5		
		5G	UNII 1	5150~5250		
			UNII 2c	5470~5725		
			UNII 3	5725~5850		
			UNII 4	5850~5895		
		6E	UNII 5	5925~6425		
			UNII 6	6425~6525		
			UNII 7	6525~6875		
			UNII 8	6875~7125		
Test Channels (low-mid-high)	0-39-78 (BT)					
	0-19-39 (BLE)					
	1-7-11-12-13 (2.4G WIFI 802.11b/g/n HT20/ax HE20/be EHT20)					
	3-7-9-10-11 (2.4G WIFI 802.11n HT40/ax HE40/be EHT40)					
	Band	WLAN 5.2G	WLAN 5.6G	WLAN 5.8G	WLAN 5.9G	WLAN 6.2G
	802.11a	36-40-48	100-120-140	149-157-165	169-173-177	/
	802.11n HT20	36-40-48	100-120-140	149-157-165	169-173-177	/
	802.11ax HE20	36-40-48	100-120-140	149-157-165	169-173-177	1-45-93-97 -105-113-117 -149-181-185 -209-229-233
	802.11be EHT20	36-40-48	100-120-140	149-157-165	169-173-177	/
	802.11n HT40	38-46	102-118-134	151-159	167-175	/
	802.11ax HE40	38-46	102-118-134	151-159	167-175	3-43-91-99 -107-115-147 -179-187-227
	802.11be EHT40	38-46	102-118-134	151-159	167-175	/
	802.11ac VHT80	42	106-122	155	171	/
	802.11ax HE80	42	106-122	155	171	7-39-87-103 -119-135-167 -183-199-215
	802.11be EHT80	42	106-122	155	171	/
	802.11ac VHT160	50	114	/	163	/
	802.11ax HE160	50	114	/	163	15-79-111 -143-207
	802.11be EHT160	50	114	/	163	/
	802.11be EHT320	/	/	/	/	31-95-127 -159-191

	Ant.	Manufacturer	Ant. Part number	Type	Band	Gain (dBi)
Antenna Information	Main Ant	Amphenol Taiwan Corporation	BY515A-16-001-C	PIFA	2400-2483.5	2.47
					5150-5250	2.65
					5470-5725	1.63
					5725-5850	2.12
					5850-5895	1.98
					5925-6425	2.82
					6425-6525	3.73
					6525-6875	3.96
					6875-7125	3.20
	Aux Ant	Amphenol Taiwan Corporation	BY515A-16-002-C	PIFA	2400-2483.5	2.46
					5150-5250	2.25
					5470-5725	2.40
					5725-5850	3.41
					5850-5895	3.80
					5925-6425	3.28
					6425-6525	3.36
					6525-6875	3.67
					6875-7125	2.04

Other Information		
Battery Information	Model Name	RC30-0484
	Power Rating	DC 15.4V 5955mAh 91.7Wh
	Manufacturer	BYD

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	Data Acquisition Electronics	Speag	DAE4	1423	Mar. 17, 2023	1 Year
2	Data Acquisition Electronics	Speag	DAE4	1717	Apr. 10, 2023	1 Year
3	E-field Probe	Speag	EX3DV4	7544	Feb. 16, 2023	1 Year
4	E-field Probe	Speag	EX3DV4	7693	Oct. 31, 2023	1 Year
5	E-field Probe	Speag	EUmmWV4	9626	May 17, 2023	1 Year
6	System Validation Dipole	Speag	D2450V2	919	May 28, 2021	3 Years
7	System Validation Dipole	Speag	D5GHzV2	1160	May 27, 2021	3 Years
8	System Validation Dipole	Speag	D6.5GHzV2	1052	Nov. 01, 2021	3 Years
9	System Validation Source	Speag	5G Verification Source 10GHz	1041	May 02, 2023	1 Years
10	ELI Phantom	Speag	ELI Phantom V5.0	1222	N/A	N/A
11	ELI Phantom	Speag	ELI Phantom V5.0	1128	N/A	N/A
12	Twin Sam Phantom	Speag	SAM-Twim V8.0	2081	N/A	N/A
13	Power Amplifier	Talent Microwave	TLPA1G18G-40-33-HS	220330003	Feb. 11, 2023	1 Year
14	DC Source metter	Iteck	IT6154	006104126768201001	Jul. 08, 2023	1 Year
15	Vector Network Analyzer	Agilent	E5071C	MY46102965	Feb. 11, 2023	1 Year
16	Signal Generator	Keysight	N5173B	MY59101420	Feb. 11, 2023	1 Year
17	Smart Power Sensor	R&S	NRP-Z21	102209	May 25, 2023	1 Year
18	Smart Power Sensor	R&S	NRP18S	726174	Jun. 12, 2023	1 Year
19	3.5mm Economy Calibration Kit	Agilent	85052D	MY43252246	Nov. 10, 2023	1 Year
20	Dielectric Assessment Kit	Speag	DAK-3.5	1226	Jan. 24, 2022	3 Years
21	Coupler	Woken	ATD10-400M-6G-A2	2021008	Jul. 08, 2023	1 Year
22	Coupler	Woken	0110A05601O-10	COM5BNW1A2	Feb. 11, 2023	1 Year
23	Digital Themometer	TES	TES-1310	210706071	Nov. 03, 2023	1 Year

Note:
1. “N/A” denotes no model name, serial No. or calibration specified.
2.
1) Per KDB865664 D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement;
d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.
2) Network analyzer probe calibration against air, distilled water and a short block performed before measuring liquid parameters.

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 Room 108, Building 2, No. 1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong 523000.
BTL's Registration Number for FCC: 568794
BTL's Designation Number for FCC: CN5041

2.2 MEASUREMENT UNCERTAINTY

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

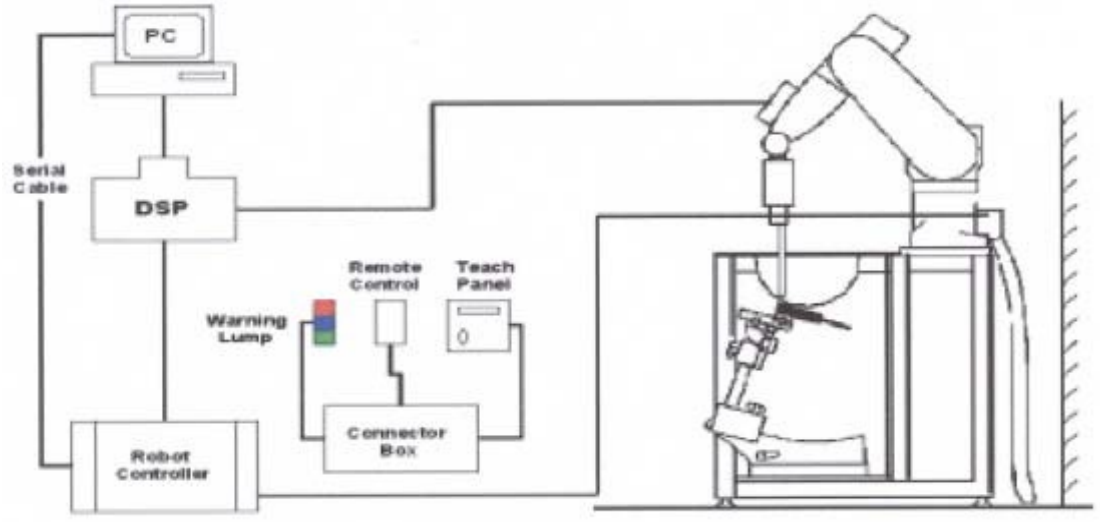
3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SET-UP

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. TheDASY5 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 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 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

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 thermostat-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).

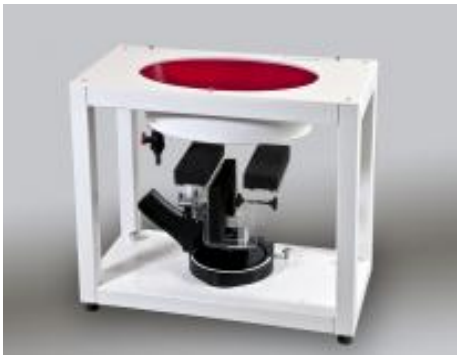
3.2.3 OTHER TEST EQUIPMENT

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 (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 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	

Model	ELI 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	

3.2.4 SCANNING PROCEDURE

The DASY5 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. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 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 ± 0.1mm). 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 ± 30°.)

- 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 (≤2GHz) · 12 mm inx- 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: Δx_{zoom}, Δy_{zoom}≤ 2GHz -≤8mm, 2-4GHz -≤ 5 mm and 4-6 GHz-≤ 4mm; Δz_{zoom}≤ 3GHz -≤ 5 mm, 3-4 GHz-≤ 4mm and 4-6GHz-≤ 2mm 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 (Δx_{area}, Δy_{area})	Maximun Zoom Scan spatial resolution (Δx_{Zoom}, Δy_{Zoom})	Maximun Zoom Scan spatial resolution			Minimum zoom scan volume (x,y,z)
			Uniform Grid	Graded Grad		
			$\Delta z_{Zoom}(n)$	$\Delta z_{Zoom}(1)$*	$\Delta z_{Zoom}(n>1)$*	
≤2GHz	≤15mm	≤8mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
2-3GHz	≤12mm	≤5mm	≤5mm	≤4mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥30mm
3-4GHz	≤12mm	≤5mm	≤4mm	≤3mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥28mm
4-5GHz	≤10mm	≤4mm	≤3mm	≤2.5mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥25mm
5-6GHz	≤10mm	≤4mm	≤2mm	≤2mm	≤1.5*$\Delta z_{Zoom}(n-1)$	≥22mm

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

DASY5 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 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 “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, 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 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:

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]

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):

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

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

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

With SAR = local specific absorption rate in mW/g

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

σ = conductivity in [mho/m] or [Siemens/m]

ρ = 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. SYSTEM VERIFICATION PROCEDURE

4.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 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 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. (℃)	Conductivity (σ)	Permittivity (εr)	Targeted Conductivity (σ)	Targeted Permittivity (εr)	Deviation Conductivity (σ) (%)	Deviation Permittivity (εr) (%)	Date
Head	2450	22.3	1.845	39.737	1.80	39.2	2.50	1.37	Dec. 18, 2023
Head	5250	22.2	4.763	36.373	4.71	36.0	1.13	1.18	Dec. 19, 2023
Head	5600	22.2	5.173	35.555	5.07	35.5	2.03	0.15	Dec. 19, 2023
Head	5750	22.2	5.363	35.226	5.22	35.4	2.74	-0.35	Dec. 19, 2023
Head	5800	22.2	5.415	35.096	5.27	35.3	2.75	-0.58	Dec. 19, 2023
Head	6500	22.7	5.91	33.40	6.07	34.5	-2.64	-3.19	Dec. 18, 2023

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 (%)	Dipole S/N
Head	Dec. 18, 2023	2450	52.10	13.10	52.40	0.58	919
Head	Dec. 19, 2023	5250	78.00	7.82	78.20	0.26	1160
Head	Dec. 19, 2023	5600	80.60	8.15	81.50	1.12	1160
Head	Dec. 19, 2023	5750	76.50	7.95	79.50	3.92	1160
Head	Dec. 19, 2023	5800	78.60	8.11	81.10	3.18	1160
Head	Dec. 18, 2023	6500	290.00	28.30	283.00	-2.41	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 ±15.88%. According to the measured psPD 4cm² 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 1 cm² and/or 4 cm², 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).

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

or

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

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

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);

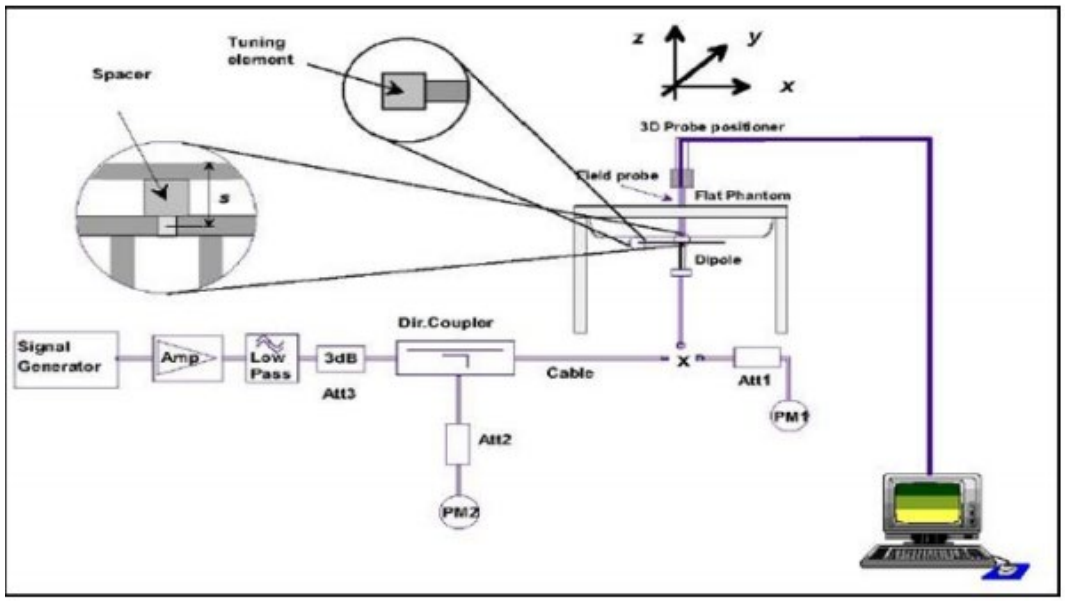
u_{meas} is the standard uncertainty (k = 1) of the $psPD$ measurement (probe calibration, electronics, and positioning).

System Check	Date	Frequency (GHz)	Distance (mm)	Targeted 4cm² (W/m²)	Measured 4cm² (W/m²)	Deviation For 4cm² (%)	Dipole S/N
Power Density	Dec. 18, 2023	10	10	51.4	48	-6.61	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 (±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 (~ 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.

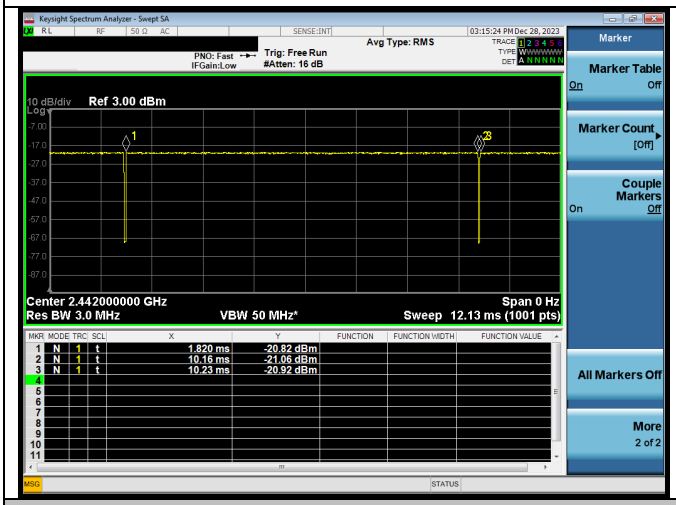
6. OPERATIONAL CONDITIONS DURING TEST

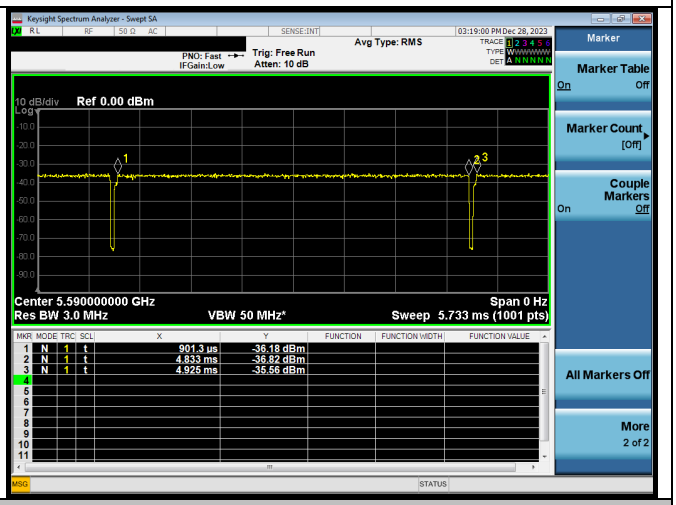
6.1 SAR TEST CONFIGURATION

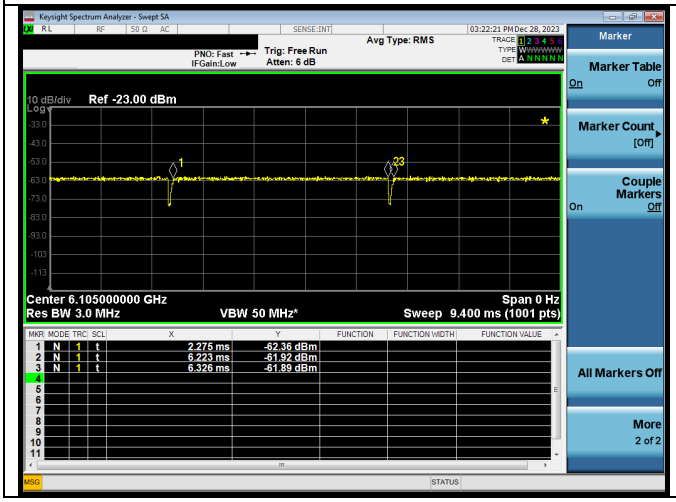
6.1.1 WIFI TEST CONFIGURATION

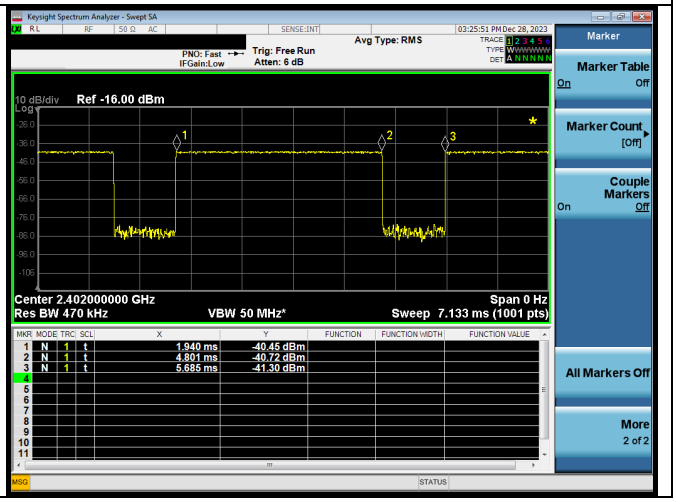
For WLAN / BT SAR testing, WLAN / BT engineering testing software installed on the DUT can provide continuous transmitting RF signal.

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 test procedures in KDB 248227 D01 are applied.

Duty Cycle
WiFi 2.4G
99.17%


Duty Cycle
WiFi 5G
97.71%


Duty Cycle
WiFi 6E
97.46%


Duty Cycle
BT
76.40%


6.1.1.1 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 stand alone. 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.

6.1.1.2 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.

6.1.1.3 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 are 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.

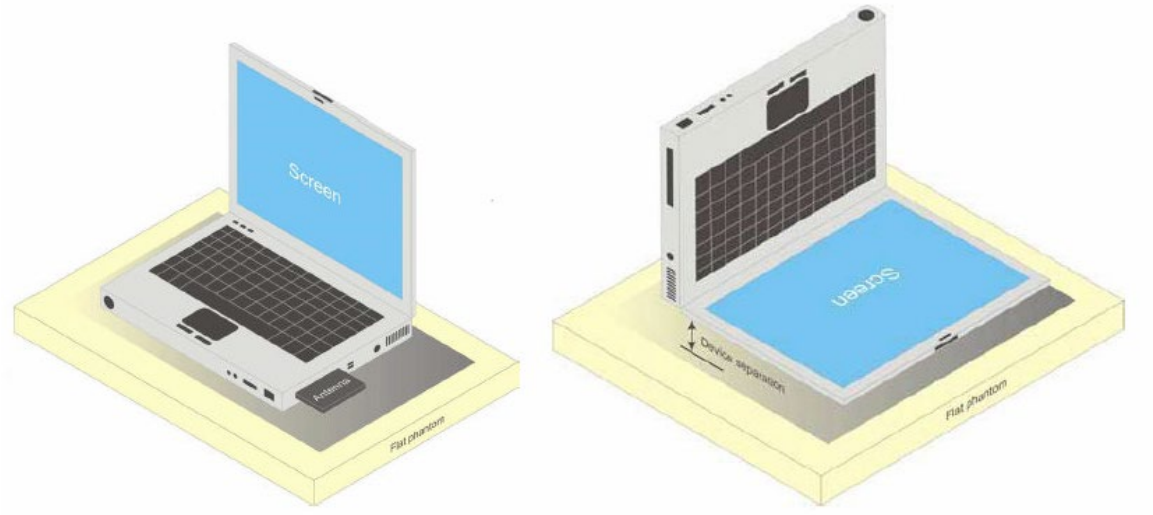
6.1.1.4 Initial test configuration procedure

For OFDM, in both 2.4G 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 NOTEBOOK MODE

This DUT was tested in 2 different positions. They are back of keyboard and back of screen as illustrated below:



a) Portable computer with back of keyboard and back of screen.

When antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required. However, when edge testing is necessary, the similar concerns for simultaneous transmission on adjacent or multiple edges described for tablets near the end of 4.3 also apply.
When the modular approach is applied, transmitters and modules must be tested initially without using a representative host for incorporation in the display and/or keyboard of qualified laptop computers for standalone use according to the following minimum test separation distance and antenna installation requirements. The separation distance required for incorporation in qualified hosts is described in KDB Publication 447498 D04; item e) of 4.1 and item a) of 5.2.2 etc.
a) ≤ 25 mm between the antenna and user for incorporation in laptop display screens15
b) ≤ 5 mm between the antenna and user; only when incorporation in the keyboard compartment is required by the hosts, for bottom surface and edge exposure conditions
c) the antennas used by the host must have been tested for equipment approval or qualify for SAR test exclusion
d) the antenna polarization, physical orientation, rotation and installation configurations used by the host must have been tested for compliance for the required display and/or keyboard installation conditions and test separation distance(s) or qualify for SAR test exclusion
e) when the SAR Test Exclusion Threshold in KDB Publication 447498 D04 applies, a minimum test separation distance of 25 mm is required to determine test exclusion for the display, and 5 mm for the keyboard compartment.

The location of the antenna for notebook mode is as below:

The SAR measurement positions of each band are as below:

Antenna	Back of Keyboard	Back of Screen
Main Ant	Yes	Yes
Aux Ant	Yes	Yes

Note: According to the antenna location shown as above, particular DUT edges were not required to be evaluated for SAR if the antenna-to-edge distance is greater than 50mm.

7. TEST RESULT

7.1 CONDUCTED POWER RESULTS

1. Conducted power measurements of BT

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402MHz	CH39 2441MHz	CH78 2480MHz
DH5	15.00	**14.26**	**14.34**	**14.52**
2DH5	14.50	13.51	13.57	13.74
3DH5	14.50	13.52	13.66	13.82

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402	CH19 2440	CH39 2480MHz
BLE(1M)	9.50	9.03	9.09	9.29
BLE(2M)	9.50	8.86	8.97	9.01

Note:
1) The Average conducted power of Bluetooth is measured with RMS detector.
2) The tested channel results are marks in bold.

2. Conducted power measurements of WiFi 2.4G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _Main Ant	802.11b	1	2412	1	-	22.00	**21.51**
		7	2442		-	23.00	**22.75**
		11	2462		-	22.00	**21.47**
		12	2467		-	21.00	**19.38**
		13	2472		-	17.50	**17.40**
	802.11g	1	2412	6	-	21.00	No Require
		7	2442		-	21.50	
		11	2462		-	21.00	
		12	2467		-	17.00	
		13	2472		-	13.00	
	802.11n HT20	1	2412	HT0	-	20.50	
		7	2442		-	21.00	
		11	2462		-	20.50	
		12	2467		-	17.00	
		13	2472		-	13.00	
	802.11n HT40	3	2422	HT0	-	19.50	
		7	2442		-	20.00	
		9	2452		-	20.00	
		10	2457		-	15.50	
		11	2462		-	12.00	
	802.11ax HE20	1	2412	HE0	Full	20.50	
					26/0	21.00	
					52/37	21.00	
					106/53	21.00	
		7	2442		Full	21.00	
		11	2462		Full	21.00	
		12	2467		Full	17.00	
		13	2472		Full	13.00	
					26/8	12.00	
					52/40	12.00	
					106/54	12.50	
	802.11be EHT20	1	2412	EHT0	Full	20.50	
					26/0	21.00	
					52/37	21.00	
					106/53	21.00	
		7	2442		Full	21.00	
		11	2462		Full	21.00	
		12	2467		Full	17.00	
		13	2472		Full	13.00	
					26/8	12.00	
					52/40	12.00	
					106/54	12.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _Main Ant	802.11ax HE40	3	2422	HE0	Full	19.50	No Require
					242/61	20.00	
		7	2442		Full	20.00	
		9	2452		Full	20.00	
		10	2457		Full	15.50	
		11	2462		Full	12.50	
					242/62	12.00	
	802.11be EHT40	3	2422	EHT0	Full	19.50	
					242/61	20.00	
		7	2442		Full	20.00	
		9	2452		Full	20.00	
		10	2457		Full	15.50	
		11	2462		Full	12.50	
					242/62	12.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _Aux Ant	802.11b	1	2412	1	-	21.50	**21.47**
		7	2442		-	23.00	**22.65**
		11	2462		-	23.00	**22.63**
		12	2467		-	21.00	**20.65**
		13	2472		-	18.50	**18.06**
	802.11g	1	2412	6	-	21.50	No Require
		7	2442		-	22.00	
		11	2462		-	22.00	
		12	2467		-	17.00	
		13	2472		-	14.50	
	802.11n HT20	1	2412	HT0	-	21.50	
		7	2442		-	22.00	
		11	2462		-	22.00	
		12	2467		-	17.00	
		13	2472		-	15.00	
	802.11n HT40	3	2422	HT0	-	20.50	
		7	2442		-	21.00	
		9	2452		-	20.50	
		10	2457		-	15.50	
		11	2462		-	12.50	
	802.11ax HE20	1	2412	HE0	Full	21.50	
					26/0	17.00	
					52/37	17.50	
					106/53	21.00	
		7	2442		Full	22.00	
		11	2462		Full	22.00	
		12	2467		Full	17.00	
		13	2472		Full	15.00	
					26/8	13.50	
					52/40	13.00	
					106/54	14.00	
	802.11be EHT20	1	2412	EHT0	Full	21.50	
					26/0	17.00	
					52/37	17.50	
					106/53	21.00	
		7	2442		Full	22.00	
		11	2462		Full	22.00	
		12	2467		Full	17.00	
		13	2472		Full	15.00	
					26/8	13.50	
					52/40	13.00	
					106/54	14.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _Aux Ant	802.11ax HE40	3	2422	HE0	Full	20.00	No Require
					242/61	21.50	
		7	2442		Full	21.00	
		9	2452		Full	20.50	
		10	2457		Full	15.50	
		11	2462		Full	12.50	
					242/62	14.50	
	802.11be EHT40	3	2422	EHT0	Full	20.00	
					242/61	21.50	
		7	2442		Full	21.00	
		9	2452		Full	20.50	
		10	2457		Full	15.50	
		11	2462		Full	12.50	
					242/62	14.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	ANT Main Average Power (dBm)	ANT Aux Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
2.4G WIFI _2TX _Main Ant + Aux Ant	802.11n HT20	1	2412	HT8	-	19.16	19.44	22.50	22.31
		7	2442		-	18.82	19.26	23.50	22.06
		11	2462		-	18.69	19.13	23.50	21.93
		12	2467		-	13.76	14.13	17.50	16.96
		13	2472		-	12.01	12.23	15.50	15.13
	802.11n HT40	3	2422	HT8	-	-	-	21.50	No Require
		7	2442		-	-	-	21.50	
		9	2452		-	-	-	21.00	
		10	2457		-	-	-	15.50	
		11	2462		-	-	-	12.50	
	802.11ax HE20	1	2412	HE8	Full	15.22	15.35	22.00	18.30
					26/0	13.82	14.10	23.00	16.97
					52/37	14.29	14.73	23.00	17.53
					106/53	16.20	16.54	23.00	19.38
		7	2442		Full	20.24	20.38	23.50	23.32
		11	2462		Full	15.16	15.61	23.00	18.40
		12	2467		Full	-	-	17.50	No Require
		13	2472		Full	-	-	15.50	
					26/8	-	-	13.00	
					52/40	-	-	12.50	
					106/54	-	-	14.00	
	802.11be EHT20	1	2412	EHT8	Full	15.13	15.43	22.00	18.29
					26/0	13.69	13.93	23.00	16.82
					52/37	14.20	14.55	23.00	17.39
					106/53	16.20	16.38	23.00	19.30
		7	2442		Full	20.45	20.67	23.50	23.57
		11	2462		Full	15.24	15.71	23.00	18.49
		12	2467		Full	-	-	17.50	No Require
		13	2472		Full	-	-	15.50	
					26/8	-	-	13.00	
					52/40	-	-	12.50	
					106/54	-	-	14.00	
	802.11ax HE40	3	2422	HE8	Full	-	-	21.00	No Require
					242/61	-	-	22.00	
		7	2442		Full	-	-	21.50	
		9	2452		Full	-	-	21.00	
		10	2457		Full	-	-	15.50	
		11	2462		Full	-	-	12.50	
					242/62	-	-	15.50	
	802.11be EHT40	3	2422	EHT8	Full	-	-	21.00	
					242/61	-	-	22.00	
		7	2442		Full	-	-	21.50	
		9	2452		Full	-	-	21.00	
		10	2457		Full	-	-	15.50	
		11	2462		Full	-	-	12.50	
					242/62	-	-	15.50	

Note:
1) The Average conducted power of WiFi 2.4G is measured with RMS detector.
2) Per KDB248227 D01, for WiFi 2.4G, the highest measured maximum output power Channel for DSSS modes (802.11b) was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes (802.11g/n) to DSSS modes (802.11b) specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
3) The tested channel results are marks in bold.

3. Conducted power measurements of WiFi 5.2G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _Main Ant	802.11a	36	5180	6	-	18.50	No Require
		40	5200		-	18.50	
		48	5240		-	18.50	
	802.11n HT20	36	5180	HT0	-	19.00	**18.40**
		40	5200		-	19.00	**18.41**
		48	5240		-	19.00	**18.34**
	802.11ax HE20	36	5180	HE0	Full	18.50	No Require
					26/0	13.50	
					52/37	16.50	
					106/53	18.50	
		40	5200		Full	18.50	
		48	5240		Full	18.50	
	802.11be EHT20	36	5180	EHT0	Full	18.50	
					26/0	13.50	
					52/37	16.50	
					106/53	18.50	
		40	5200		Full	18.50	
		48	5240		Full	18.50	
	802.11n HT40	38	5190	HT0	-	18.50	
		46	5230		-	18.50	
	802.11ax HE40	38	5190	HE0	Full	18.50	
					242/61	18.50	
		46	5230		Full	18.50	
	802.11be EHT40	38	5190	HE0	Full	18.50	
					242/61	18.50	
		46	5230		Full	18.50	
	802.11ac VHT80	42	5210	VHT0	-	18.50	
	802.11ax HE80	42	5210	HE0	Full	18.50	
					484/65	18.50	
	802.11be EHT80	42	5210	EHT0	Full	18.50	
					484/65	18.50	
	802.11ac VHT160	50	5250	VHT0	-	17.50	
	802.11ax HE160	50	5250	HE0	Full	17.50	
					996/67	18.50	
					996/S67	18.50	
	802.11be EHT160	50	5250	HE0	Full	18.00	
					996/67	18.50	
					996/S67	18.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _Aux Ant	802.11a	36	5180	6	-	18.50	No Require
		40	5200		-	18.50	
		48	5240		-	18.50	
	802.11n HT20	36	5180	HT0	-	19.00	**18.52**
		40	5200		-	19.00	**18.51**
		48	5240		-	19.00	**18.45**
	802.11ax HE20	36	5180	HE0	Full	18.50	No Require
					26/0	13.00	
					52/37	16.00	
					106/53	18.50	
		40	5200		Full	18.50	
		48	5240		Full	18.50	
	802.11be EHT20	36	5180	EHT0	Full	18.50	
					26/0	13.00	
					52/37	16.00	
					106/53	18.50	
		40	5200		Full	18.50	
		48	5240		Full	18.50	
	802.11n HT40	38	5190	HT0	-	18.50	
		46	5230		-	18.50	
	802.11ax HE40	38	5190	HE0	Full	18.50	
					242/61	18.50	
		46	5230		Full	18.50	
	802.11be EHT40	38	5190	HE0	Full	18.50	
					242/61	18.50	
		46	5230		Full	18.50	
	802.11ac VHT80	42	5210	VHT0	-	18.50	
	802.11ax HE80	42	5210	HE0	Full	18.50	
					484/65	18.50	
	802.11be EHT80	42	5210	EHT0	Full	18.50	
					484/65	18.50	
	802.11ac VHT160	50	5250	VHT0	-	18.00	
	802.11ax HE160	50	5250	HE0	Full	18.00	
					996/67	18.00	
					996/S67	17.50	
	802.11be EHT160	50	5250	HE0	Full	18.00	
					996/67	18.00	
					996/S67	17.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	ANT Main Average Power (dBm)	ANT Aux Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.2G WIFI _2TX _Main Ant + Aux Ant	802.11n HT20	36	5180	HT8	-	-	-	21.50	No Require
		40	5200		-	-	-	21.50	
		48	5240		-	-	-	21.50	
	802.11ax HE20	36	5180	HE8	Full	-	-	21.50	
					26/0	-	-	13.50	
					52/37	-	-	16.00	
					106/53	-	-	19.00	
		40	5200		Full	-	-	21.50	
		48	5240		Full	-	-	21.50	
	802.11be EHT20	36	5180	EHT8	Full	-	-	21.50	
					26/0	-	-	13.50	
					52/37	-	-	16.00	
					106/53	-	-	19.00	
		40	5200		Full	-	-	21.50	
		48	5240		Full	-	-	21.50	
	802.11n HT40	38	5190	HT8	-	17.56	17.91	22.00	20.75
		46	5230		-	18.57	19.08	22.00	21.84
	802.11ax HE40	38	5190	HE8	Full	16.28	16.69	20.00	19.50
					242/61	15.95	16.53	20.00	19.26
		46	5230		Full	18.25	18.75	22.00	21.52
	802.11be EHT40	38	5190	EHT8	Full	16.51	16.91	20.00	19.72
					242/61	15.98	16.38	20.00	19.19
		46	5230		Full	18.56	18.94	22.00	21.76
	802.11ac VHT80	42	5210	VHT8	-	-	-	21.50	No Require
	802.11ax HE80	42	5210	HE8	Full	-	-	21.00	
					484/65	-	-	21.00	
	802.11be EHT80	42	5210	EHT8	Full	-	-	21.00	
					484/65	-	-	21.00	
	802.11ac VHT160	50	5250	VHT8	-	-	-	20.00	
	802.11ax HE160	50	5250	HE8	Full	-	-	20.00	
					996/67	-	-	20.00	
					996/S67	-	-	20.00	
	802.11be EHT160	50	5250	HE8	Full	-	-	20.00	
					996/67	-	-	20.00	
					996/S67	-	-	20.00	

Note:
1) The Average conducted power of WiFi 5.2G is measured with RMS detector.
2) The tested channel results are marks in bold.

4. Conducted power measurements of WiFi 5.6G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _Main Ant	802.11a	100	5500	6	-	18.00	No Require
		120	5600		-	18.00	
		140	5700		-	18.00	
	802.11n HT20	100	5500	HT0	-	18.00	
		120	5600		-	18.00	
		140	5700		-	18.00	
	802.11ax HE20	100	5500	HE0	Full	18.00	
					26/0	12.00	
					52/37	16.50	
					106/53	18.00	
		120	5600		Full	18.00	
		140	5700		Full	18.00	
					26/8	13.50	
					52/40	16.50	
					106/54	18.00	
	802.11be EHT20	100	5500	EHT0	Full	18.00	
					26/0	12.00	
					52/37	16.50	
					106/53	18.00	
		120	5600		Full	18.00	
		140	5700		Full	18.50	
					26/8	13.50	
					52/40	16.50	
					106/54	18.00	
	802.11n HT40	102	5510	HT0	-	18.50	**18.48**
		118	5590		-	18.50	**18.29**
		134	5670		-	18.50	**18.16**
	802.11ax HE40	102	5510	HE0	Full	18.00	No Require
					242/62	18.00	
		118	5590		Full	18.00	
		134	5670		Full	18.00	
					242/62	18.00	
	802.11be EHT40	102	5510	EHT0	Full	18.00	
					242/62	18.00	
		118	5590		Full	18.00	
		134	5670		Full	18.00	
					242/62	18.00	
	802.11ac VHT80	106	5530	VHT0	-	18.00	
		122	5610		-	18.00	
	802.11ax HE80	106	5530	HE0	Full	18.00	
					484/65	18.00	
		122	5610		Full	18.00	
	802.11be EHT80	106	5530	EHT0	Full	18.00	
					484/65	18.00	
		122	5610		Full	18.00	
	802.11ac VHT160	114	5570	VHT0	-	18.00	
	802.11ax HE160	114	5570	HE0	Full	18.00	
					996/67	18.00	
					996/S67	18.00	
	802.11be EHT160	114	5570	EHT0	Full	18.00	
					996/67	18.00	
					996/S67	18.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _Aux Ant	802.11a	100	5500	6	-	17.00	No Require
		120	5600		-	17.00	
		140	5700		-	17.00	
	802.11n HT20	100	5500	HT0	-	17.00	
		120	5600		-	17.00	
		140	5700		-	17.00	
	802.11ax HE20	100	5500	HE0	Full	17.00	
					26/0	13.50	
					52/37	16.00	
					106/53	17.00	
		120	5600		Full	17.00	
		140	5700		Full	17.00	
					26/8	13.00	
					52/40	16.00	
					106/54	17.00	
	802.11be EHT20	100	5500	EHT0	Full	17.00	
					26/0	13.50	
					52/37	16.00	
					106/53	17.00	
		120	5600		Full	17.00	
		140	5700		Full	17.00	
					26/8	13.00	
					52/40	16.00	
					106/54	17.00	
	802.11n HT40	102	5510	HT0	-	17.50	**17.45**
		118	5590		-	17.50	**17.22**
		134	5670		-	17.50	**17.27**
	802.11ax HE40	102	5510	HE0	Full	17.00	No Require
					242/62	17.00	
		118	5590		Full	17.00	
		134	5670		Full	17.00	
					242/62	17.00	
	802.11be EHT40	102	5510	EHT0	Full	17.00	
					242/62	17.00	
		118	5590		Full	17.00	
		134	5670		Full	17.00	
					242/62	17.00	
	802.11ac VHT80	106	5530	VHT0	-	17.00	
		122	5610		-	17.00	
	802.11ax HE80	106	5530	HE0	Full	17.00	
					484/65	17.00	
		122	5610		Full	17.00	
	802.11be EHT80	106	5530	EHT0	Full	17.00	
					484/65	17.00	
		122	5610		Full	17.00	
	802.11ac VHT160	114	5570	VHT0	-	17.00	
	802.11ax HE160	114	5570	HE0	Full	17.00	
					996/67	17.00	
					996/S67	17.00	
	802.11be EHT160	114	5570	EHT0	Full	17.00	
					996/67	17.00	
					996/S67	17.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	ANT Main Average Power (dBm)	ANT Aux Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.6G WIFI _2TX _Main Ant + Aux Ant	802.11n HT20	100	5500	HT8	-	-	-	19.50	No Require
		120	5600		-	-	-	19.50	
		140	5700		-	-	-	19.50	
	802.11ax HE20	100	5500	HE8	Full	-	-	19.50	
					26/0	-	-	13.00	
					52/37	-	-	16.00	
					106/53	-	-	19.00	
		120	5600		Full	-	-	19.50	
		140	5700		Full	-	-	19.50	
					26/8	-	-	13.00	
					52/40	-	-	16.00	
					106/54	-	-	19.00	
	802.11be EHT20	100	5500	EHT8	Full	-	-	19.50	
					26/0	-	-	13.00	
					52/37	-	-	16.00	
					106/53	-	-	19.00	
		120	5600		Full	-	-	19.50	
		140	5700		Full	-	-	19.50	
					26/8	-	-	13.00	
					52/40	-	-	16.00	
					106/54	-	-	19.00	
	802.11n HT40	102	5510	HT8	-	16.93	16.68	20.00	19.82
		118	5590		-	16.95	16.64	20.00	19.81
		134	5670		-	16.86	16.58	20.00	19.73
	802.11ax HE40	102	5510	HE8	Full	16.37	15.92	20.00	19.16
					242/62	16.50	16.06	20.00	19.30
		118	5590		Full	16.34	15.88	20.00	19.13
		134	5670		Full	15.93	15.55	20.00	18.75
					242/62	16.21	16.97	20.00	19.62
	802.11be EHT40	102	5510	EHT8	Full	16.55	16.00	20.00	19.29
					242/62	17.15	15.91	20.00	19.58
		118	5590		Full	16.31	15.92	20.00	19.13
		134	5670		Full	16.06	15.59	20.00	18.84
					242/62	16.01	16.87	20.00	19.47
	802.11ac VHT80	106	5530	VHT8	-	16.95	16.37	20.00	19.68
		122	5610		-	16.40	16.14	20.00	19.28
	802.11ax HE80	106	5530	HE8	Full	16.74	16.33	20.00	19.55
					484/65	16.95	16.48	20.00	19.73
		122	5610		Full	16.37	16.08	20.00	19.24
	802.11be EHT80	106	5530	EHT8	Full	17.13	16.68	20.00	19.92
					484/65	16.77	16.35	20.00	19.58
		122	5610		Full	16.67	16.43	20.00	19.56
	802.11ac VHT160	114	5570	VHT8	-	-	-	19.50	No Require
	802.11ax HE160	114	5570	HE8	Full	-	-	19.50	
					996/67	-	-	19.50	
					996/S67	-	-	19.50	
	802.11be EHT160	114	5570	EHT8	Full	-	-	19.50	
					996/67	-	-	19.50	
					996/S67	-	-	19.50	

Note:
1) The Average conducted power of WiFi 5.6G is measured with RMS detector.
2) The tested channel results are marks in bold.

5. Conducted power measurements of WiFi 5.8G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _Main Ant	802.11a	149	5745	6	-	19.50	**19.26**
		157	5785		-	19.50	**19.25**
		165	5825		-	19.50	**19.38**
	802.11n HT20	149	5745	HT0	-	19.00	No Require
		157	5785		-	19.00	
		165	5825		-	19.00	
	802.11n HT40	151	5755	HT0	-	19.00	
		159	5795		-	19.00	
	802.11ac VHT80	155	5775	VHT0	-	19.00	
	802.11ax HE20	149	5745	HE0	Full	19.00	
					26/0	19.00	
					52/37	19.00	
					106/53	19.00	
		157	5785		Full	19.00	
		165	5825		Full	19.00	
	802.11be EHT20	149	5745	EHT0	Full	19.00	
					26/0	19.00	
					52/37	19.00	
					106/53	19.00	
		157	5785		Full	19.00	
		165	5825		Full	19.00	
	802.11ax HE40	151	5755	HE0	Full	19.00	
					242/61	19.00	
		159	5795		Full	19.00	
	802.11be EHT40	151	5755	EHT0	Full	19.00	
					242/61	19.00	
		159	5795		Full	19.00	
	802.11ax HE80	155	5775	HE0	Full	19.00	
					484/65	19.00	
	802.11be EHT80	155	5775	EHT0	Full	19.00	
					484/65	19.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _Aux Ant	802.11a	149	5745	6	-	18.00	**17.61**
		157	5785		-	18.00	**17.70**
		165	5825		-	18.00	**17.66**
	802.11n HT20	149	5745	HT0	-	17.50	No Require
		157	5785		-	17.50	
		165	5825		-	17.50	
	802.11n HT40	151	5755	HT0	-	17.50	
		159	5795		-	17.50	
	802.11ac VHT80	155	5775	VHT0	-	17.50	
	802.11ax HE20	149	5745	HE0	Full	17.50	
					26/0	17.50	
					52/37	17.50	
					106/53	17.50	
		157	5785		Full	17.50	
		165	5825		Full	17.50	
	802.11be EHT20	149	5745	EHT0	Full	17.50	
					26/0	17.50	
					52/37	17.50	
					106/53	17.50	
		157	5785		Full	17.50	
		165	5825		Full	17.50	
	802.11ax HE40	151	5755	HE0	Full	17.50	
					242/61	17.50	
		159	5795		Full	17.50	
	802.11be EHT40	151	5755	EHT0	Full	17.50	
					242/61	17.50	
		159	5795		Full	17.50	
	802.11ax HE80	155	5775	HE0	Full	17.50	
					484/65	17.50	
	802.11be EHT80	155	5775	EHT0	Full	17.50	
					484/65	17.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU config.	ANT Main Average Power (dBm)	ANT Aux Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.8G WIFI _2TX _Main Ant + Aux Ant	802.11n HT20	149	5745	HT8	-	18.11	17.72	21.00	20.93
		157	5785		-	18.06	17.58	21.00	20.84
		165	5825		-	18.14	17.42	21.00	20.81
	802.11n HT40	151	5755	HT8	-	-	-	20.50	No Require
		159	5795		-	-	-	20.50	
	802.11ac VHT80	155	5775	VHT8	-	-	-	20.50	
	802.11ax HE20	149	5745	HE8	Full	17.51	17.01	21.00	20.28
					26/0	17.50	17.04	21.00	20.29
					52/37	17.54	17.06	21.00	20.32
					106/53	17.96	17.47	21.00	20.73
		157	5785		Full	18.13	17.61	21.00	20.89
		165	5825		Full	18.11	17.43	21.00	20.79
	802.11be EHT20	149	5745	EHT8	Full	17.49	17.05	21.00	20.29
					26/0	17.41	16.90	21.00	20.17
					52/37	17.46	16.94	21.00	20.22
					106/53	16.81	16.34	21.00	19.59
		157	5785		Full	18.19	17.64	21.00	20.93
		165	5825		Full	18.22	17.65	21.00	20.95
	802.11ax HE40	151	5755	HE8	Full	17.92	17.33	21.00	20.65
					242/61	17.48	17.02	21.00	20.27
		159	5795		Full	16.83	17.13	21.00	19.99
	802.11be EHT40	151	5755	EHT8	Full	18.13	17.55	21.00	20.86
					242/61	16.84	16.80	21.00	19.83
		159	5795		Full	16.71	16.56	21.00	19.65
	802.11ax HE80	155	5775	HE8	Full	-	-	20.50	No Require
					484/65	-	-	20.50	
	802.11be EHT80	155	5775	EHT8	Full	-	-	20.50	
					484/65	-	-	20.50	

Note:
1) The Average conducted power of WiFi 5.8G is measured with RMS detector.
2) The tested channel results are marks in bold.

6. Conducted power measurements of WiFi 5.9G

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.9G WIFI _1TX _Main Ant	802.11a	169	5845	6	19.00	No Require
		173	5865		19.00	
		177	5885		19.00	
	802.11n HT20	169	5845	HT0	19.00	
		173	5865		19.00	
		177	5885		19.00	
	802.11n HT40	167	5835	HT0	19.00	
		175	5875		19.00	
	802.11ac VHT80	171	5855	VHT0	19.00	
	802.11ac VHT160	163	5815	VHT0	19.00	
	802.11ax HE20	169	5845	HE0	19.00	
		173	5865		19.00	
		177	5885		18.50	
	802.11be EHT20	169	5845	EHT0	19.00	
		173	5865		19.00	
		177	5885		18.50	
	802.11ax HE40	167	5835	HE0	19.50	**19.15**
		175	5875		19.50	**18.91**
	802.11be EHT40	167	5835	EHT0	19.00	No Require
		175	5875		19.00	
	802.11ax HE80	171	5855	HE0	19.00	
	802.11be EHT80	171	5855	EHT0	19.00	
	802.11ax HE160	163	5815	HE0	18.50	
	802.11be EHT160	163	5815	EHT0	18.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.9G WIFI _1TX _Aux Ant	802.11a	169	5845	6	17.50	No Require
		173	5865		17.50	
		177	5885		17.50	
	802.11n HT20	169	5845	HT0	17.50	
		173	5865		17.50	
		177	5885		17.50	
	802.11n HT40	167	5835	HT0	17.50	
		175	5875		17.50	
	802.11ac VHT80	171	5855	VHT0	17.50	
	802.11ac VHT160	163	5815	VHT0	17.50	
	802.11ax HE20	169	5845	HE0	17.50	
		173	5865		17.50	
		177	5885		17.50	
	802.11be EHT20	169	5845	EHT0	17.50	
		173	5865		17.50	
		177	5885		17.50	
	802.11ax HE40	167	5835	HE0	18.00	**17.45**
		175	5875		18.00	**17.33**
	802.11be EHT40	167	5835	EHT0	17.50	No Require
		175	5875		17.50	
	802.11ax HE80	171	5855	HE0	17.50	
	802.11be EHT80	171	5855	EHT0	17.50	
	802.11ax HE160	163	5815	HE0	17.50	
	802.11be EHT160	163	5815	EHT0	17.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	ANT Main Average Power(dBm)	ANT Aux Average Power(dBm)	Max. Tune up	Total Average Power(dBm)
5.9G WIFI _2TX _Main Ant + Aux Ant	802.11n HT20	169	5845	HT8	-	-	20.50	No Require
		173	5865		-	-	20.50	
		177	5885		-	-	20.50	
	802.11n HT40	167	5835	HT8	17.36	17.63	21.00	20.51
		175	5875		17.29	17.59	21.00	20.45
	802.11ac VHT80	171	5855	VHT8	17.06	17.68	21.00	20.39
	802.11ac VHT160	163	5815	VHT8	16.37	18.11	21.00	20.34
	802.11ax HE20	169	5845	HE8	-	-	20.50	No Require
		173	5865		-	-	20.50	
		177	5885		-	-	20.00	
	802.11be EHT20	169	5845	EHT8	-	-	20.50	
		173	5865		-	-	20.50	
		177	5885		-	-	20.00	
	802.11ax HE40	167	5835	HE8	17.73	17.81	21.00	20.78
		175	5875		17.91	17.13	21.00	20.55
	802.11be EHT40	167	5835	EHT8	16.82	17.92	21.00	20.42
		175	5875		18.01	17.21	21.00	20.64
	802.11ax HE80	171	5855	HE8	17.96	17.19	21.00	20.60
	802.11be EHT80	171	5855	EHT8	18.26	17.51	21.00	20.91
	802.11ax HE160	163	5815	HE8	-	-	20.50	No Require
	802.11be EHT160	163	5815	EHT8	-	-	20.50	

Note:
1) The Average conducted power of WiFi 5.9G is measured with RMS detector.
2) The tested channel results are marks in bold.

7. Conducted power measurements of WiFi 6E

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
6E WIFI _1TX _Main Ant	802.11ax HE20	1	5955	HE0	6.00	No Require
		45	6175		6.00	
		93	6415		5.50	
	802.11ax HE40	3	5965	HE0	9.00	
		43	6165		8.50	
		91	6405		8.50	
	802.11ax HE80	7	5985	HE0	11.50	
		39	6145		11.50	
		87	6385		12.00	
	802.11ax HE160	15	6025	HE0	14.00	
		79	6345		14.00	
	802.11be EHT320	31	6105	HE0	14.50	**14.14**
		95	6425		14.50	**14.37**
	802.11ax HE20	97	6435	HE0	5.50	No Require
		105	6475		5.50	
		113	6515		5.50	
	802.11ax HE40	99	6445	HE0	8.50	
		107	6485		8.50	
	802.11ax HE80	103	6465	HE0	12.00	
		119	6545		12.00	
	802.11ax HE160	111	6505	HE0	14.00	
	802.11ax HE20	117	6535	HE0	5.50	
		149	6695		5.50	
		181	6855		5.50	
	802.11ax HE40	115	6525	HE0	8.50	
		147	6685		8.50	
		179	6845		9.00	
	802.11ax HE80	135	6625	HE0	11.50	
		167	6785		12.00	
	802.11ax HE160	143	6665	HE0	14.00	
	802.11be EHT320	127	6585	EHT0	14.50	13.78
		159	6745		14.50	13.73
	802.11ax HE20	185	6875	HE0	5.50	No Require
		209	6995		6.00	
		229	7095		6.00	
		233	7115		1.10	
	802.11ax HE40	187	6885	HE0	9.00	
		227	7085		9.00	
	802.11ax HE80	183	6865	HE0	11.50	
		199	6945		12.00	
		215	7025		12.00	
	802.11ax HE160	207	6985	HE0	14.00	
	802.11be EHT320	191	6905	EHT0	14.50	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
6E WIFI _1TX _Aux Ant	802.11ax HE20	1	5955	HE0	5.50	No Require
		45	6175		5.50	
		93	6415		6.00	
	802.11ax HE40	3	5965	HE0	8.50	
		43	6165		9.00	
		91	6405		8.50	
	802.11ax HE80	7	5985	HE0	11.50	
		39	6145		11.50	
		87	6385		12.00	
	802.11ax HE160	15	6025	HE0	14.50	
		79	6345		14.50	
	802.11be EHT320	31	6105	HE0	15.00	**14.82**
		95	6425		15.00	**14.73**
	802.11ax HE20	97	6435	HE0	5.50	No Require
		105	6475		5.50	
		113	6515		5.50	
	802.11ax HE40	99	6445	HE0	8.50	
		107	6485		8.50	
	802.11ax HE80	103	6465	HE0	12.00	
		119	6545		12.00	
	802.11ax HE160	111	6505	HE0	15.00	
	802.11ax HE20	117	6535	HE0	6.00	
		149	6695		5.50	
		181	6855		5.50	
	802.11ax HE40	115	6525	HE0	9.00	
		147	6685		8.50	
		179	6845		8.50	
	802.11ax HE80	135	6625	HE0	12.00	
		167	6785		12.00	
	802.11ax HE160	143	6665	HE0	14.50	
	802.11be EHT320	127	6585	EHT0	15.00	14.76
		159	6745		15.00	14.69
	802.11ax HE20	185	6875	HE0	5.50	No Require
		209	6995		6.00	
		229	7095		6.00	
		233	7115		1.10	
	802.11ax HE40	187	6885	HE0	9.00	
		227	7085		9.00	
	802.11ax HE80	183	6865	HE0	12.00	
		199	6945		12.00	
		215	7025		12.00	
	802.11ax HE160	207	6985	HE0	14.50	
	802.11be EHT320	191	6905	EHT0	15.00	

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	ANT Main Average Power (dBm)	ANT Aux Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
6E WIFI _2TX _Main Ant + Aux Ant	802.11ax HE20	1	5955	HE8	-	-	6.00	No Require
		45	6175		-	-	6.00	
		93	6415		-	-	5.50	
	802.11ax HE40	3	5965	HE8	-	-	9.00	
		43	6165		-	-	8.50	
		91	6405		-	-	8.50	
	802.11ax HE80	7	5985	HE8	-	-	11.50	
		39	6145		-	-	11.50	
		87	6385		-	-	12.00	
	802.11ax HE160	15	6025	HE8	-	-	14.50	
		79	6345		-	-	14.50	
	802.11be HE320	31	6105	EHT8	11.93	11.75	15.00	14.85
		95	6425		11.69	11.54	15.00	14.63
	802.11ax HE20	97	6435	HE8	-	-	5.50	No Require
		105	6475		-	-	5.50	
		113	6515		-	-	5.50	
	802.11ax HE40	99	6445	HE8	-	-	8.50	
		107	6485		-	-	8.50	
	802.11ax HE80	103	6465	HE8	-	-	12.00	
		119	6545		-	-	12.00	
	802.11ax HE160	111	6505	HE8	-	-	15.00	
	802.11ax HE20	117	6535	HE8	-	-	5.50	
		149	6695		-	-	5.50	
		181	6855		-	-	5.50	
	802.11ax HE40	115	6525	HE8	-	-	8.50	
		147	6685		-	-	8.50	
		179	6845		-	-	9.00	
	802.11ax HE80	135	6625	HE8	-	-	11.50	
		167	6785		-	-	12.00	
	802.11ax HE160	143	6665	HE8	-	-	15.00	
	802.11be EHT320	127	6585	EHT8	11.94	11.93	15.00	14.95
		159	6745		11.89	11.97	15.00	14.94
	802.11ax HE20	185	6875	HE8	-	-	5.50	No Require
		209	6995		-	-	6.00	
		229	7095		-	-	6.00	
		233	7115		-	-	1.10	
	802.11ax HE40	187	6885	HE8	-	-	9.00	
		227	7085		-	-	9.00	
	802.11ax HE80	183	6865	HE8	-	-	11.50	
		199	6945		-	-	12.00	
		215	7025		-	-	12.00	
	802.11ax HE160	207	6985	HE8	-	-	15.00	
	802.11be EHT320	191	6905	EHT8	11.83	11.60	15.00	14.73

Note:
1) The Average conducted power of WiFi 6E is measured with RMS detector.
2) 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 > 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.
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 Section7.1 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 for more information.

7.2.1 SAR MEASUREMENT RESULT

1. SAR test results of WiFi 2.4G

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	MB	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	802.11b	7	Back of Screen	2.5	Main	MB1	1	99.17	23.00	22.75	-0.08	0.024	0.013	0.026
W02	802.11b	7	Back of Keyboard	0	Main	MB1	1	99.17	23.00	22.75	0	0.774	0.356	0.827
W03	802.11b	1	Back of Keyboard	0	Main	MB1	1	99.17	22.00	21.51	0	0.725	0.346	0.818
W04	802.11b	11	Back of Keyboard	0	Main	MB1	1	99.17	22.00	21.47	0	0.576	0.272	0.656
W05	802.11b	12	Back of Keyboard	0	Main	MB1	1	99.17	21.00	19.38	0	0.340	0.159	0.498
W06	802.11b	13	Back of Keyboard	0	Main	MB1	1	99.17	17.50	17.4	0	0.197	0.091	0.203
W07	802.11b	7	Back of Keyboard	0	Main	MB2	1	99.17	23.00	22.75	0	**0.885**	**0.409**	**0.945**
W09	802.11b	7	Back of Screen	2.5	Aux	MB1	1	99.17	23.00	22.65	0.02	0.024	0.014	0.027
W10	802.11b	7	Back of Keyboard	0	Aux	MB1	1	99.17	23.00	22.65	0	0.733	0.343	0.801
W11	802.11b	1	Back of Keyboard	0	Aux	MB1	1	99.17	21.50	21.47	0	0.474	0.225	0.481
W12	802.11b	11	Back of Keyboard	0	Aux	MB1	1	99.17	23.00	22.63	0	0.754	0.353	0.828
W13	802.11b	12	Back of Keyboard	0	Aux	MB1	1	99.17	21.00	20.65	0	0.454	0.212	0.496
W14	802.11b	13	Back of Keyboard	0	Aux	MB1	1	99.17	18.50	18.06	0	0.245	0.114	0.273
W15	802.11b	11	Back of Keyboard	0	Aux	MB2	1	99.17	23.00	22.63	0	**0.757**	**0.347**	**0.831**

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

2. SAR test results of BT

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	MB	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	78	Back of Screen	2.5	Main	MB1	1	76.40	15.00	14.52	0	0.002	0.001	0.003
B02	BT DH5	78	Back of Keyboard	0	Main	MB1	1	76.40	15.00	14.52	0	0.086	0.039	0.126
B03	BT DH5	0	Back of Keyboard	0	Main	MB1	1	76.40	15.00	14.26	0	0.116	0.054	0.180
B04	BT DH5	39	Back of Keyboard	0	Main	MB1	1	76.40	15.00	14.34	0	0.095	0.044	0.144
B05	BT DH5	0	Back of Keyboard	0	Main	MB2	1	76.40	15.00	14.26	0	**0.141**	**0.065**	**0.219**

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

3. SAR test results of WiFi 5G

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	MB	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)
W16	802.11n HT20	40	Back of Screen	2.5	Main	MB1	HT0	97.71	19.00	18.41	0	0.078	0.030	0.091
W17	802.11n HT20	40	Back of Keyboard	0	Main	MB1	HT0	97.71	19.00	18.41	0	0.722	0.262	0.846
W18	802.11n HT20	36	Back of Keyboard	0	Main	MB1	HT0	97.71	19.00	18.4	0	0.740	0.264	0.870
W19	802.11n HT20	48	Back of Keyboard	0	Main	MB1	HT0	97.71	19.00	18.34	0	0.702	0.256	0.836
W20	802.11n HT20	36	Back of Keyboard	0	Main	MB2	HT0	97.71	19.00	18.4	0	**0.911**	**0.316**	**1.070**
W22	802.11n HT20	36	Back of Screen	2.5	Aux	MB1	HT0	97.71	19.00	18.52	0	0.050	0.020	0.057
W23	802.11n HT20	36	Back of Keyboard	0	Aux	MB1	HT0	97.71	19.00	18.52	0	0.620	0.228	0.709
W24	802.11n HT20	40	Back of Keyboard	0	Aux	MB1	HT0	97.71	19.00	18.51	0	0.704		0.807
W25	802.11n HT20	48	Back of Keyboard	0	Aux	MB1	HT0	97.71	19.00	18.45	0	0.726	0.242	0.843
W26	802.11n HT20	48	Back of Keyboard	0	Aux	MB2	HT0	97.71	19.00	18.45	0	**0.848**	**0.294**	**0.985**
W28	802.11n HT40	102	Back of Screen	2.5	Main	MB1	HT0	97.71	18.50	18.48	0	0.062	0.034	0.064
W29	802.11n HT40	102	Back of Keyboard	0	Main	MB1	HT0	97.71	18.50	18.48	0	0.706	0.246	0.726
W30	802.11n HT40	118	Back of Keyboard	0	Main	MB1	HT0	97.71	18.50	18.29	0	0.720	0.255	0.773
W31	802.11n HT40	134	Back of Keyboard	0	Main	MB1	HT0	97.71	18.50	18.16	0	0.551	0.185	0.610
W32	802.11n HT40	118	Back of Keyboard	0	Main	MB2	HT0	97.71	18.50	18.29	0	**0.799**	**0.279**	**0.858**
W34	802.11n HT40	102	Back of Screen	2.5	Aux	MB1	HT0	97.71	17.50	17.45	0	0.010	0.003	0.011
W35	802.11n HT40	102	Back of Keyboard	0	Aux	MB1	HT0	97.71	17.50	17.45	0	0.561	0.192	0.581
W36	802.11n HT40	118	Back of Keyboard	0	Aux	MB1	HT0	97.71	17.50	17.22	0	0.625	0.207	0.682
W37	802.11n HT40	134	Back of Keyboard	0	Aux	MB1	HT0	97.71	17.50	17.27	0	0.584	0.194	0.630
W38	802.11n HT40	118	Back of Keyboard	0	Aux	MB2	HT0	97.71	17.50	17.22	0	**0.712**	**0.241**	**0.777**
W40	802.11a	165	Back of Screen	2.5	Main	MB1	6	97.71	19.50	19.38	0	0.064	0.033	0.067
W41	802.11a	165	Back of Keyboard	0	Main	MB1	6	97.71	19.50	19.38	0	0.604	0.206	0.635
W42	802.11a	149	Back of Keyboard	0	Main	MB1	6	97.71	19.50	19.26	0	0.587	0.205	0.635
W43	802.11a	157	Back of Keyboard	0	Main	MB1	6	97.71	19.50	19.25	0	0.605	0.222	0.656
W44	802.11a	157	Back of Keyboard	0	Main	MB2	6	97.71	19.50	19.25	0	**0.730**	**0.258**	**0.791**
W46	802.11a	157	Back of Screen	2.5	Aux	MB1	6	97.71	18.00	17.7	0	0.012	0.005	0.013
W47	802.11a	157	Back of Keyboard	0	Aux	MB1	6	97.71	18.00	17.7	0	0.644	0.209	0.706
W48	802.11a	149	Back of Keyboard	0	Aux	MB1	6	97.71	18.00	17.61	0	0.635	0.211	0.711
W49	802.11a	165	Back of Keyboard	0	Aux	MB1	6	97.71	18.00	17.66	0	0.642	0.210	0.711
W50	802.11a	165	Back of Keyboard	0	Aux	MB2	6	97.71	18.00	17.66	0	**0.699**	**0.223**	**0.774**
W52	802.11ax HE40	167	Back of Screen	2.5	Main	MB1	HE0	97.71	19.50	19.15	0	0.054	0.020	0.059
W53	802.11ax HE40	167	Back of Keyboard	0	Main	MB1	HE0	97.71	19.50	19.15	0	0.588	0.202	0.652
W54	802.11ax HE40	175	Back of Keyboard	0	Main	MB1	HE0	97.71	19.50	18.91	0	0.514	0.174	0.603
W55	802.11ax HE40	167	Back of Keyboard	0	Main	MB2	HE0	97.71	19.50	19.15	0	**0.805**	**0.290**	**0.893**
W57	802.11ax HE40	167	Back of Screen	2.5	Aux	MB1	HE0	97.71	18.00	17.45	0	0.006	0.001	0.007
W58	802.11ax HE40	167	Back of Keyboard	0	Aux	MB1	HE0	97.71	18.00	17.45	0	0.650	0.210	0.755
W59	802.11ax HE40	175	Back of Keyboard	0	Aux	MB1	HE0	97.71	18.00	17.33	0	**0.679**	**0.221**	**0.811**
W60	802.11ax HE40	175	Back of Keyboard	0	Aux	MB2	HE0	97.71	18.00	17.33	0	0.658	0.205	0.786

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

4. SAR test results of WiFi 6E

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	MB	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)
W62	802.11be EHT320	95	Back of Screen	2.5	Main	MB1	EHT0	97.46	14.50	14.37	0.03	0.005	0.000	0.005
W63	802.11be EHT320	95	Back of Keyboard	0	Main	MB1	EHT0	97.46	14.50	14.37	-0.08	0.263	0.085	0.278
W64	802.11be EHT320	31	Back of Keyboard	0	Main	MB1	EHT0	97.46	14.50	14.14	0.08	0.240	0.080	0.268
W65	802.11be EHT320	95	Back of Keyboard	0	Main	MB2	EHT0	97.46	14.50	14.37	-0.07	**0.317**	**0.105**	**0.335**
W67	802.11be EHT320	31	Back of Screen	2.5	Aux	MB1	EHT0	97.46	15.00	14.82	-0.08	0.002	0.000	0.002
W68	802.11be EHT320	31	Back of Keyboard	0	Aux	MB1	EHT0	97.46	15.00	14.82	0.09	**0.265**	**0.082**	**0.283**
W69	802.11be EHT320	95	Back of Keyboard	0	Aux	MB1	EHT0	97.46	15.00	14.73	-0.09	0.193	0.063	0.211
W70	802.11be EHT320	31	Back of Keyboard	0	Aux	MB2	EHT0	97.46	15.00	14.82	0	0.219	0.063	0.234

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

5. SAR test results of Power Density

System&Posistion					DUT& Accessory		SAR								Power Density							
Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	MB	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	Grid Step (λ)	Scaling Factor for Measurement Uncertainty	Averaging Area (cm^2)	Power Drift (dB)	Normal PsPD (W/m^2)	Scaling Normal PsPD (W/m^2)	Total PsPD (W/m^2)	Scaling Total PsPD (W/m^2)
W65	802.11be EHT320	95	Back of Keyboard	0	Main	MB2	EHT0	97.46	14.50	14.37	-0.07	0.317	0.105	0.335	0.0625	1.55	4	-0.05	3.31	5.42	4.2	6.88
W68	802.11be EHT320	31	Back of Keyboard	0	Aux	MB1	EHT0	97.46	15.00	14.82	0.09	0.265	0.082	0.283	0.0625	1.55	4	0.03	3.09	5.12	4.62	7.66

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 TCBC workshop notes and IEC TR 63170.

7.3 MULTIPLE TRANSMITTER EVALUATION

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB447498 D04 Interim General RF Exposure Guidance v01.

The location of the antennas inside the EUT is shown as below picture:

7.3.1 SIMULTANEOUS TRANSMISSION CONDITIONS

Per FCC KDB447498 D04, 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	Body
1	WLAN 2.4G / 5G / 6.2G Main Ant + WLAN 2.4G / 5G / 6.2G Aux Ant	Yes
2	BT Main Ant + WLAN 2.4G / 5G / 6.2G Aux Ant	Yes

Note: Only the Main Ant supports BT function.

7.3.2 SAR UMMATION SCENARIO

About WIFI and Bluetooth transmit simultaneously

Band \ Position		Back of Screen (2.5cm)	Back of Keyboard (0cm)
Main Ant	WiFi 2.4G	0.026	0.945
	WiFi 5.2G	0.091	1.070
	WiFi 5.6G	0.064	0.858
	WiFi 5.8G	0.067	0.791
	WiFi 5.9G	0.059	0.893
	WiFi 6E	0.005	0.335
	BT	0.003	0.219
Aux Ant	WiFi 2.4G	0.027	0.831
	WiFi 5.2G	0.057	0.985
	WiFi 5.6G	0.011	0.777
	WiFi 5.8G	0.013	0.774
	WiFi 5.9G	0.007	0.811
	WiFi 6E	0.002	0.283

Test Position \ Reported SAR_{1g}		MAIN WiFi 2.4G	MAIN WiFi 5.2G	MAIN WiFi 5.6G	MAIN WiFi 5.8G	MAIN WiFi 5.9G	MAIN WiFi 6E	MAIN BT	MAX $\sum SAR_{1g}$
Back of Screen	AUX WiFi 2.4G	0.053	/	/	/	/	/	0.030	0.053
	AUX WiFi 5.2G	/	0.148	/	/	/	/	0.060	0.148
	AUX WiFi 5.6G	/	/	0.075	/	/	/	0.014	0.075
	AUX WiFi 5.8G	/	/	/	0.080	/	/	0.016	0.080
	AUX WiFi 5.9G	/	/	/	/	0.066	/	0.010	0.066
	AUX WiFi 6E	/	/	/	/	/	0.007	0.005	0.007

Test Position \ Reported SAR_{1g}		MAIN WiFi 2.4G	MAIN WiFi 5.2G	MAIN WiFi 5.6G	MAIN WiFi 5.8G	MAIN WiFi 5.9G	MAIN WiFi 6E	MAIN BT	MAX $\sum SAR_{1g}$
Back of Keyboard	AUX WiFi 2.4G	1.776	/	/	/	/	/	1.050	**Refer to SPLSR results (1)**
	AUX WiFi 5.2G	/	2.055	/	/	/	/	1.204	**Refer to SPLSR results (2)**
	AUX WiFi 5.6G	/	/	1.635	/	/	/	0.996	**Refer to SPLSR results (3)**
	AUX WiFi 5.8G	/	/	/	1.565	/	/	0.993	1.565
	AUX WiFi 5.9G	/	/	/	/	1.704	/	1.030	**Refer to SPLSR results (4)**
	AUX WiFi 6E	/	/	/	/	/	0.618	0.502	0.618

Note:
1) MAX. $\sum SAR_{1g}$<1.6 W/Kg, the SAR to peak location separation ratio should not be considered, otherwise, see section 7.3.3 for more information.
2) The highest simultaneous SAR value = 1.565 W/Kg, per KDB690783 D01.

Highest Simultaneous Transmission with Multiple transmitters	Total Exposure Radio		Total Exposure Radio		Total Exposure Radio
6E Main+PD Aux	Main	0.335	Aux	0.766	0.975
6E Aux+PD Main	Aux	0.283	Main	0.742	0.919
Max SAR&Power Density					**0.975**

Note:
1) 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 TCBC workshop notes and IEC TR 63170.
2) When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

7.3.3 SIMULTANEOUS TRANSMISSION CONLCUSION

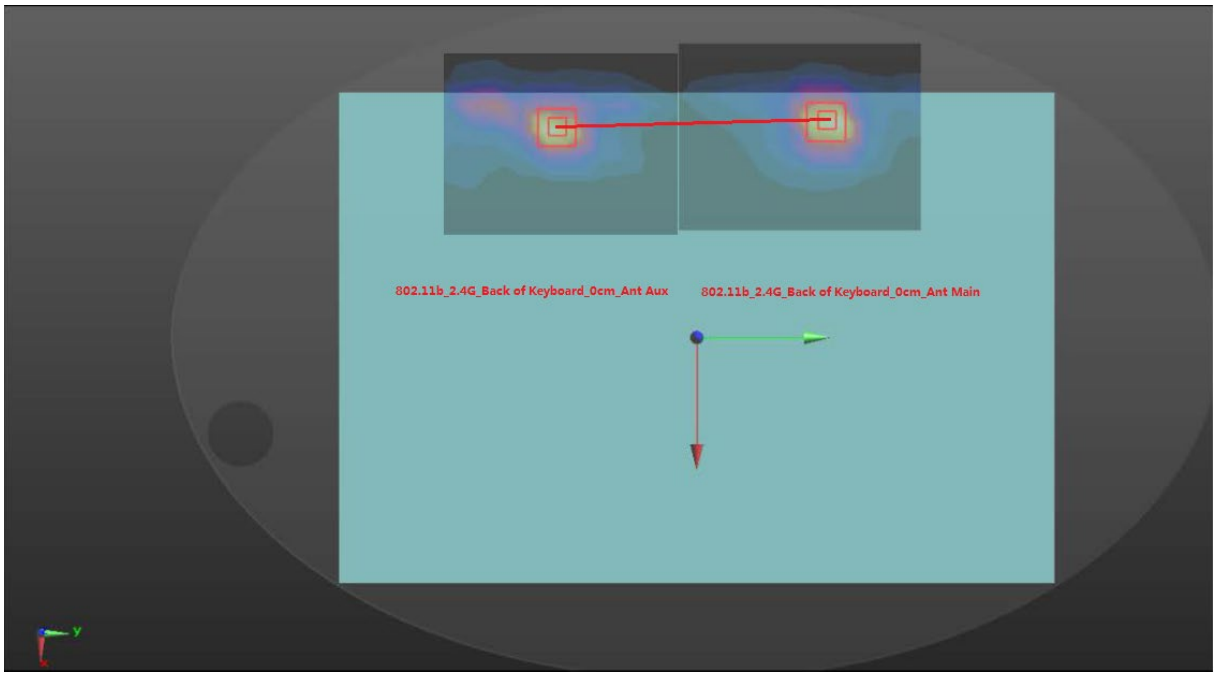
According to KDB447498 D04, When the sum of SAR is larger than limit, SAR test exclusion is determined by the SAR to peak location separation ratio (SPLSR). When the SAR to peak location ratio for each pair of antennas is 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion. When 10-g SAR applies, the ratio must be ≤ 0.10.
When SAR is measured for both antennas in the pair the peak location separation distance is computed by the following formula:

$$\text{Distance}_{\text{Tx1-Tx2}} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$\text{SPLS Ratio} = (SAR_1 + SAR_2)^{1.5}/R_i$$

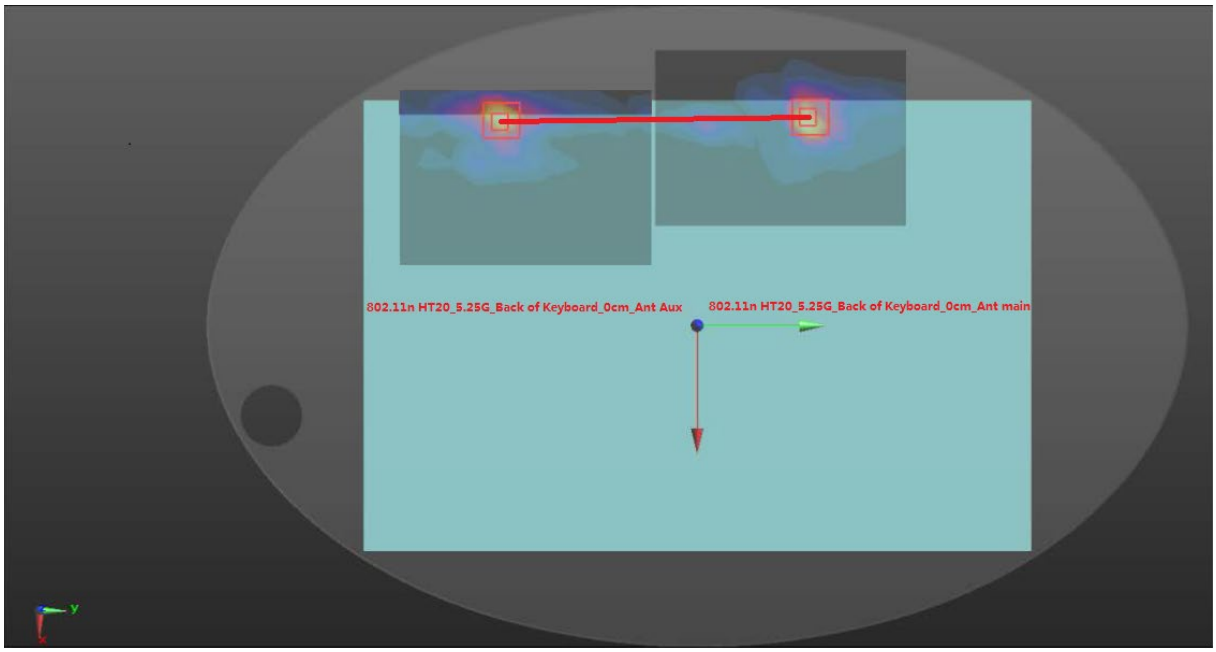
When standalone test exclusion applies, SAR is estimated; the peak location is assumed to be at the feed-point or geometric center of the antenna. Due to curvatures on the SAM phantom, when SAR is estimated for one of the antennas in an antenna pair, the measured peak SAR location should be translated onto the test device to determine the peak location separation for the antenna pair. The ERP location on the phantom is aligned with the ERP location on the handset, with 6mm separation in the z coordinate due to the ear spacer. A measured peak location can be translated onto the handset, with respect to the ERP location, by ignoring the 6 mm offset in the z coordinate. The assumed peak location of the antenna with estimated SAR can also be determined with respect to the ERP location on the handset. The peak location separation distance is estimated by the x and y coordinated of the peaks, referenced to the ERP location. While flat phantoms are not expected to have these issues, the same peak translation approach should be applied to determine peak location separation.

(1) The sum of aggregate 1g SAR was above 1.6 W/kg for Back of Keyboard configuration with WiFi 2.4G Main Ant and WiFi 2.4G Aux Ant.
The Peak SAR location is as below:



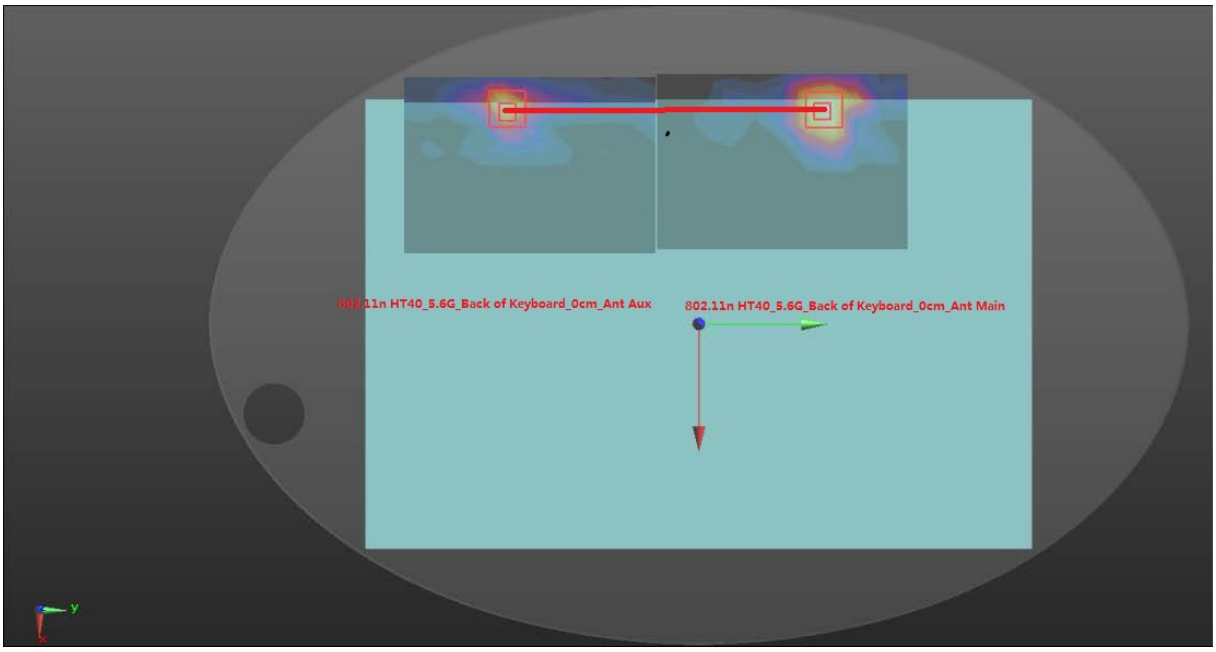
Mode	Reported SAR_{1g}	Peak SAR_{1g}	X	Y	Z	D (mm)	SPLSR	Ratio Limit	Simultaneous SAR
	mW/g	mW/g	m	m	m				
Main Ant WiFi 2.4G	0.945	1.51	-0.12	0.074	-0.178	149.5	0.016	0.04	No
Aux Ant WiFi 2.4G	0.831	1.32	-0.117	-0.0755	-0.178				

(2) The sum of aggregate 1g SAR was above 1.6 W/kg for Back of Keyboard configuration with WiFi 5.2G Main Ant and WiFi 5.2G Aux Ant.
The Peak SAR location is as below:



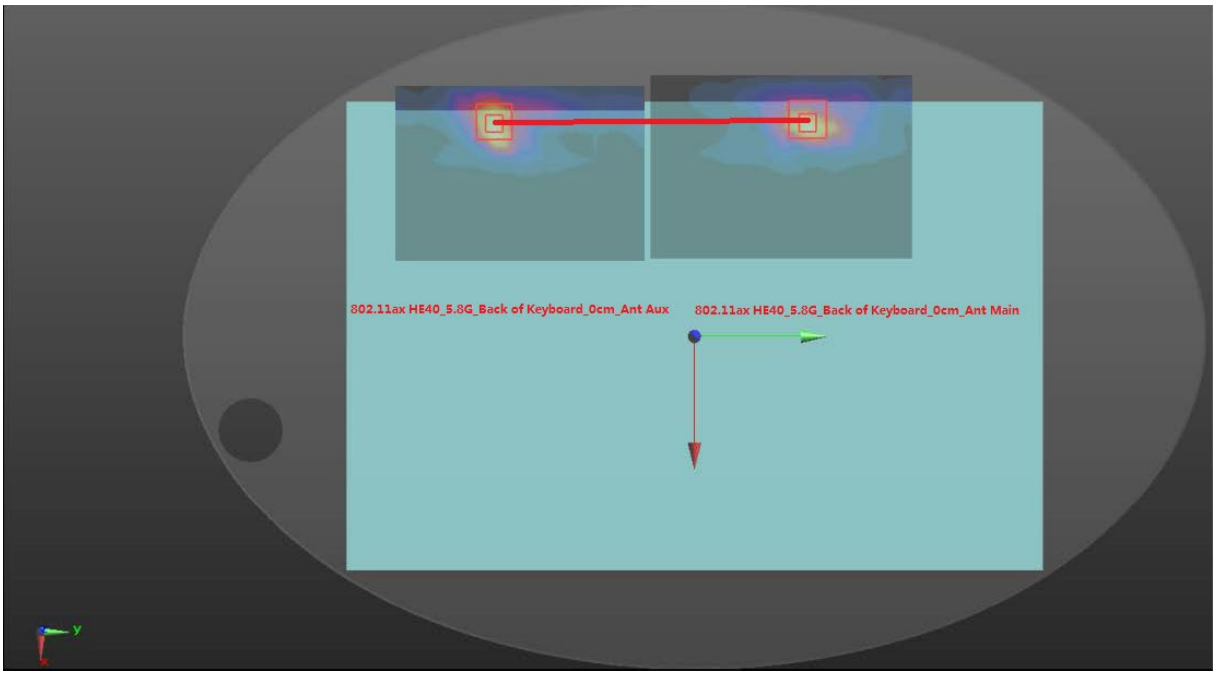
Mode	Reported SAR_{1g}	Peak SAR_{1g}	X	Y	Z	D (mm)	SPLSR	Ratio Limit	Simultaneous SAR
	mW/g	mW/g	m	m	m				
Main Ant WiFi 5.2G	1.070	2.04	-0.123	0.068	-0.179	146.9	0.020	0.04	No
Aux Ant WiFi 5.2G	0.985	1.74	-0.134	-0.0785	-0.179				

(3) The sum of aggregate 1g SAR was above 1.6 W/kg for Back of Keyboard configuration with WiFi 5.6G Main Ant and WiFi 5.6G Aux Ant.
The Peak SAR location is as below:



Mode	Reported SAR_{1g}	Peak SAR_{1g}	X	Y	Z	D (mm)	SPLSR	Ratio Limit	Simultaneous SAR
	mW/g	mW/g	m	m	m				
Main Ant WiFi 5.6G	0.858	1.95	-0.128	0.074	-0.179	152.6	0.014	0.04	No
Aux Ant WiFi 5.6G	0.777	1.56	-0.132	-0.0785	-0.179				

(4) The sum of aggregate 1g SAR was above 1.6 W/kg for Back of Keyboard configuration with WiFi 5.9G Main Ant and WiFi 5.9G Aux Ant.
The Peak SAR location is as below:



Mode	Reported SAR_{1g}	Peak SAR_{1g}	X	Y	Z	D (mm)	SPLSR	Ratio Limit	Simultaneous SAR
	mW/g	mW/g	m	m	m				
Main Ant WiFi 5.9G	0.893	1.940	-0.123	0.065	-0.18	143.5	0.015	0.04	No
Aux Ant WiFi 5.9G	0.219	1.640	-0.125	-0.0785	-0.179				

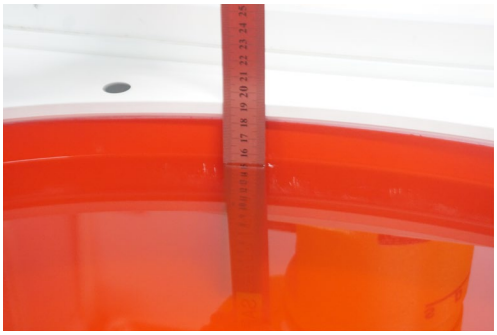
APPENDIX

1. TEST LAYOUT

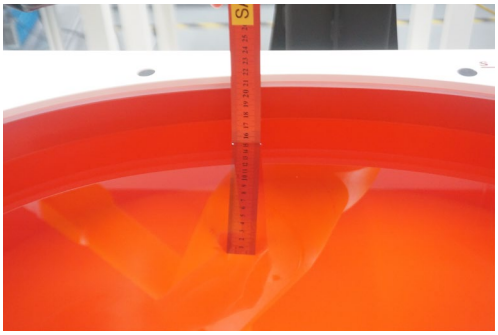
Specific Absorption Rate Test Layout

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

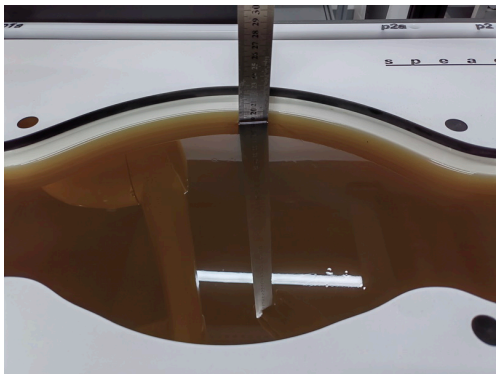
HSL_2300MHz-2700MHz_Body_15.3cm



HSL_4500MHz-6000MHz_Body_15.4cm



HSL_600MHz-10000MHz_Body_19.1cm



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-2309C137_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1-2309C137_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1-2309C137_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1-2309C137_Appendix D.)

End of Test Report