FCC SAR Test Report

FCC ID: TX2-RTL8852BE

Report No.	:	BTL-FCC SAR-1-2208C121
Equipment	:	11ax RTL8852BE Combo module
Model Name	:	RTL8852BE
Applicant	:	Realtek Semiconductor Corp.
Address	:	No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Radio Function	:	WLAN 2.4G, WLAN 5G, Bluetooth
Standard(s)	:	**KDB447498 D04** Interim General RF Exposure Guidance v01 **KDB248227 D01** 802.11 Wi-Fi SAR v02r02 **KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04 **KDB865664 D02** SAR Reporting v01r02 **KDB616217 D04** SAR for laptop and Tablets v01r02 **FCC§2.1093** Radiofrequency radiation exposure evaluation: portable devices **IEEE C95.1:2019** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. **IEC/IEEE 62209-1528:2020** Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures(Frequency range of 4 MHz to 10 GHz)
Date of Receipt	:	Aug. 31, 2022
Date of Test	:	Oct. 31, 2022 ~ Nov. 01, 2022
Issued Date	:	Nov. 09, 2022

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

Prepared by :

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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.

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

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

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

Limitation

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

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

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Nov. 09, 2022

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

Equipment	11ax RTL8852BE Combo module		
Model Name	RTL8852BE		
Host device information			
Equipment	Notebook Computer		
Model Name	Yoga Slim 6 14IAP8, Yoga Slim 6 14IAP8xxxxxx, Yoga Slim 6 14IRP8, Yoga Slim 6 14IRP8xxxxxx, Lenovo Slim 7 14IRP8, Lenovo Slim 7 14IRP8xxxxxx (The "x" in the model name can be 0 to 9, A to Z, a to z, "-" or blank, it represents different sales customer code, all models only name difference)		
Brand Name	Lenovo		
Model Difference	Different model distribute to different area.		
Battery Information	Brand / Model	1# SIMPLO / L22M4PF0 2# CELXPERT / L22C4PF0 3# SUNWODA / L22D4PF0 4# SIMPLO / L22M4PF1 5# CELXPERT / L22C4PF1 6# SUNWODA / L22D4PF1	
	Power Rating	1# 2# 3# DC 15.44V, 3789mAh 4# 5# 6# DC 15.52V, 4124mAh	
WIFI+BT Module	RTL8852BE		
Operation Frequency	Function	Band	Frequency (MHz)
	WiFi	2.4G	TX : 2412 - 2472 MHz
		5G_UNII 1	TX : 5180 - 5250 MHz
		5G_UNII 2a	TX : 5250 - 5350 MHz
		5G_UNII 2c	TX : 5500 - 5700 MHz
		5G_UNII 3	TX : 5745 - 5825 MHz
	Bluetooth	Basic Rate (BR)	TX : 2402 - 2480 MHz
		Enhance Data Rate	TX : 2402 - 2480 MHz
		Bluetooth Low Energy	TX : 2402 - 2480 MHz
Sample Status	Engineering Sample: SSL2022081850, SSL2022081848.		
EUT Modification(s)	N/A		

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

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

2 RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is SAR Test room at the location of No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan.

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Budget for Frequency range of 300 MHz to 3 GHz

Error Description	Uncertainty Value (± %)		Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System									
Probe Calibration	6.05		Normal	1	1	1	± 6.05 %	± 6.05 %	∞
Axial Isotropy	4.7		Rectangular	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	9.6		Rectangular	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	1		Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Linearity	4.7		Rectangular	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Detection Limits	1		Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Modulation response	2.4		Rectangular	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	0.3		Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	0.8		Rectangular	$\sqrt{3}$	1	1	± 0.5%	± 0.5 %	∞
Integration Time	2.6		Rectangular	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient - Noise	3		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient - Reflections	3		Rectangula	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	0.4		Rectangular	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	2.9		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	±1.7 %	∞
Post-processing	4		Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Max.SAR Evaluation	2		Rectangular	$\sqrt{3}$	1	1	± 1.15 %	± 1.15 %	∞
Test Sample Related									
Device Positioning	1.6	1.8	Normal	1	1	1	± 1.6 %	± 1.8 %	145
Device Holder	1.5	1.7	Normal	1	1	1	± 1.5 %	± 1.7 %	5
Power Drift	5.0		Rectangular	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup									
Phantom Production Tolerances	6.1		Rectangular	$\sqrt{3}$	1	1	3.52	3.52	∞
SAR correction	1.9		Rectangular	$\sqrt{3}$	1	0.84	1.10	1.10	∞
Liquid Conductivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.08	1.08	∞
Liquid Permittivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.26	0.26	0.36	0.36	∞
Temp. unc. - Conductivity	3.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.53	1.53	∞
Temp. unc. - Permittivity	0.4		Rectangular	$\sqrt{3}$	0.23	0.26	0.05	0.05	∞
Combined Standard Uncertainty (K = 1)							± 10.42 %	± 10.48 %	361
Expanded Uncertainty (K = 2)							**± 20.84 %**	**± 20.97 %**	

Uncertainty Budget for Frequency range of 3 GHz to 6 GHz

Error Description	Uncertainty Value (± %)		Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System									
Probe Calibration	6.65		Normal	1	1	1	± 6.65 %	± 6.65 %	∞
Axial Isotropy	4.7		Rectangular	$\sqrt{3}$	0.7	0.7	± 1.9 %	± 1.9 %	∞
Hemispherical Isotropy	9.6		Rectangular	$\sqrt{3}$	0.7	0.7	± 3.9 %	± 3.9 %	∞
Boundary Effects	2		Rectangular	$\sqrt{3}$	1	1	± 1.2 %	± 1.2 %	∞
Linearity	4.7		Rectangular	$\sqrt{3}$	1	1	± 2.7 %	± 2.7 %	∞
Detection Limits	1		Rectangular	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Modulation response	2.4		Rectangular	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Readout Electronics	0.3		Normal	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	0.8		Rectangular	$\sqrt{3}$	1	1	± 0.5%	± 0.5 %	∞
Integration Time	2.6		Rectangular	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient - Noise	3		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient - Reflections	3		Rectangular	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	0.4		Rectangular	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	6.7		Rectangular	$\sqrt{3}$	1	1	± 3.9 %	±3.9 %	∞
Post-processing	4		Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Max.SAR Evaluation	4		Rectangular	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Test Sample Related									
Device Positioning	1.6	1.8	Normal	1	1	1	±1.6 %	± 1.8 %	145
Device Holder	1.5	1.7	Normal	1	1	1	± 1.5 %	± 1.7 %	5
Power Drift	5.0		Rectangular	$\sqrt{3}$	1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup									
Phantom Production Tolerances	6.6		Rectangular	$\sqrt{3}$	1	1	3.81	3.81	∞
SAR correction	1.9		Rectangular	$\sqrt{3}$	1	0.84	1.10	0.92	∞
Liquid Conductivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.08	0.98	∞
Liquid Permittivity (mea.)	2.4		Rectangular	$\sqrt{3}$	0.26	0.26	0.36	0.36	∞
Temp. unc. - Conductivity	3.4		Rectangular	$\sqrt{3}$	0.78	0.71	1.53	1.39	∞
Temp. unc. - Permittivity	0.4		Rectangular	$\sqrt{3}$	0.23	0.26	0.05	0.06	∞
Combined Standard Uncertainty (K = 1)							± 11.65 %	± 11.66 %	361
Expanded Uncertainty (K = 2)							**± 23.29 %**	**± 23.33 %**	

Uncertainty Budget for Frequency range of 6 GHz to 10 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)	Vi V_{eff}
Measurement System								
Probe Calibration	18.6	Normal	2	1	1	±9.3 %	±9.3 %	∞
Probe Calibration Drift	1.7	Rectangular	$\sqrt{3}$	1	1	±1.0 %	±1.0 %	∞
Probe Linearity	4.7	Rectangular	$\sqrt{3}$	1	1	±2.7 %	±2.7 %	∞
Broadband Signal	2.8	Rectangular	$\sqrt{3}$	1	1	±1.6 %	±1.6 %	∞
ProbeIsotropy	7.6	Rectangular	$\sqrt{3}$	1	1	±4.4 %	±4.4 %	∞
Data Acquisition	0.3	Normal	1	1	1	± 0.3%	± 0.3%	∞
RF Ambient	1.8	Normal	1	1	1	±1.8 %	±1.8 %	∞
Probe Positioning	0.2	Normal	1	0.5	0.5	±0.25 %	±0.25 %	∞
Data Processing	3.5	Normal	1	1	1	±3.5 %	±3.5 %	∞
Phantom and Device Errors								
Conductivity(meas.)	2.5	Normal	1	0.78	0.71	±2.0 %	±1.8 %	∞
Conductivity(temp.)	2.4	Rectangular	$\sqrt{3}$	0.78	0.71	±1.1 %	±1.0 %	∞
PhantomPermittivity	14.0	Rectangular	$\sqrt{3}$	0.5	0.5	±4.0 %	±4.0 %	∞
Distance DUT - TSL	2.0	Normal	1	2	2	±4.0 %	±4.0 %	∞
Device Positioning	1.0	Normal	1	1	1	±1.0 %	±1.0 %	145
Device Holder	3.6	Normal	1	1	1	±3.6 %	±3.6 %	5
DUT Modulation	2.4	Rectangular	$\sqrt{3}$	1	1	±1.4 %	±1.4 %	∞
Time-average SAR	1.7	Rectangular	$\sqrt{3}$	1	1	±1.0 %	±1.0 %	∞
DUT drift	2.5	Normal	1	1	1	±2.5 %	±2.5 %	∞
Val Antenna Unc.	0	Normal	1	1	1	±0 %	±0 %	∞
Unc. Input Power	0	Normal	1	1	1	±0 %	±0 %	∞
Correction to the SAR results								
Deviation to Target	1.9	Normal	1	1	0.84	±1.9 %	±1.6 %	∞
SAR scaling	0	Rectangular	$\sqrt{3}$	1	1	±0 %	±0 %	∞
Combined Standard Uncertainty (K = 1)						± 14.00%	± 13.90%	361
Expanded Uncertainty (K = 2)						**± 28.00 %**	**± 27.90 %**	

Uncertainty Budget for mmWave

Error Description	Uncertainty Value (±dB)	Probability Distribution	Divisor	Ci	Standard Uncertainty	Vi V_{eff}
Uncertainty terms dependent on the measurement system						
Calibration Repeatability	0.21	Normal	1	1	±0.21dB	∞
Probe correction	0	Rectangular	$\sqrt{3}$	1	±0dB	∞
Frequency response(BW≤1GHz)	0.20	Rectangular	$\sqrt{3}$	0	±0 dB	∞
Sensor cross coupling	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Isotropy	0.30	Rectangular	$\sqrt{3}$	1	±0.17 dB	∞
Linearity	0.20	Rectangular	$\sqrt{3}$	1	±0.12 dB	∞
Probe scattering	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Probe Positioning offset	0.11	Rectangular	$\sqrt{3}$	1	±0.06 dB	∞
Probe Positioning repeatability	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Sensor mechanical offset	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Probe spatial resolution	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Field impedance dependance	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Amplitude and phase drift	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Amplitude and phase noise	0.04	Rectangular	$\sqrt{3}$	0	± 0 dB	∞
Measurement area truncation	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Data acquisition	0.03	Normal	1	1	±0.03 dB	∞
Sampling	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Field reconstruction	0.60	Rectangular	$\sqrt{3}$	0.3	±0.3 dB	∞
Forward transformation	0	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Power density scaling	-	Rectangular	$\sqrt{3}$	1	±0 dB	∞
Spatial averaging	0.10	Rectangular	$\sqrt{3}$	0	±0 dB	∞
System detection limit	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Uncertainty terms dependent on the DUT and environmental factors						
Probe coupling with DUT	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Modulation response	0.40	Rectangular	$\sqrt{3}$	0	± 0 dB	∞
Integration time	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Response time	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
Device holder influence	0.10	Rectangular	$\sqrt{3}$	0	± 0 dB	∞
DUT alignment	0	Rectangular	$\sqrt{3}$	1	± 0 dB	∞
RF ambient conditions	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Ambient Reflections	0.04	Rectangular	$\sqrt{3}$	1	±0.02 dB	∞
Immunity / secondary reception	0	Rectangular	$\sqrt{3}$	0	±0 dB	∞
Drift of the DUT	0.10	Rectangular	$\sqrt{3}$	1	±0.06 dB	∞
Combined Standard Uncertainty (K = 1)					± 0.33dB	∞
Expanded Uncertainty (K = 2)					**± 0.66dB**	

Uncertainty Budget for psSAR / psAPD System Check

UncertaintyBudgetforpsSAR/psAPDSystemCheck (Frequency band: 6 – 10 GHz range)								
Symbol	Error Description	Uncert.	Prob. Dist.	Div.	ci (1g) / (1 cm2)	ci (8 g/10 g) / (4 cm2)	Std. Unc. (1 g) / (1 cm2)	Std. Unc. (8 g/10 g) / (4 cm2)
psSAR	Module SAR V16.0 (Table 6.2.3)	±13.1%	N	1	1	1	±13.1%	±13.0%
PDC	Power Density Conversion	±13.5%	R	$\sqrt{3}$	0.8 ^{D}	0.8 ^{D}	±6.2%	±6.2%
u(Δ SAR)	Combined Uncertainty						±14.5%	±14.4 %
U	**Expanded Uncertainty**						±29.0%	±28.8%

Uncertainty Budget for psSAR / psAPD Assessments

UncertaintyBudgetforpsSAR/psAPDAssessments (Frequency band: 6 – 10 GHz range)								
Symbol	Error Description	Uncert.	Prob. Dist.	Div.	ci (1g) / (1 cm2)	ci (8 g/10 g) / (4 cm2)	Std. Unc. (1 g) / (1 cm2)	Std. Unc. (8 g/10 g) / (4 cm2)
psSAR	Module SAR V16.0 (Table 6.3.3)	±14.2/13.9%	N	1	1	1	±14.2%	±13.9%
PDC	Power Density Conversion	±13.5%	R	$\sqrt{3}$	1	1	±7.8%	±7.8%
u(Δ SAR)	Combined Uncertainty						±16.2%	±15.9 %
U	**Expanded Uncertainty** in dB						±32.4% ±1.2 dB	±31.9% ±1.2 dB

2.3 WLAN ANTENNA INFORMATION

Ant.	Brand	Ant. P/N	Type	Frequency Range (MHz)	Gain (dBi)
Main	AWAN	AYP6Y-200053	PIFA	2400-2500	2.45
				5150-5350	1.12
				5470-5725	2.34
				5725-5850	1.72
Aux				2400-2500	1.95
				5150-5350	1.18
				5470-5725	1.57
				5725-5850	1.99
Main	INPAQ	WA-P-LELE-04-024	PIFA	2400-2500	2.31
				5150-5350	1.25
				5470-5725	2.21
				5725-5850	1.84
Aux				2400-2500	2.01
				5150-5350	1.12
				5470-5725	1.63
				5725-5850	1.75

2.4 THE MAXIMUM SAR-1G VALUES

Band	Mode	Highest Body Reported SAR-1g(W/kg)
FHSS	**Bluetooth**	0.045
DTS	**Wi-Fi 2.4G**	0.699
UNII	**Wi-Fi 5.2G**	0.458
	Wi-Fi 5.3G	0.554
	Wi-Fi 5.6G	0.694
	Wi-Fi 5.8G	0.668

Note:
1) The device is in compliance with Specific Absorption Rate (SAR) for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:2019/IEEE C95.1:2019, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020.

2.5 LABORATORY ENVIRONMENT

Temperature	Min. = 18ºC, Max. = 25ºC
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2.6 MAIN TEST INSTRUMENTS

Item	Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Interval
1	Data Acquisition Electronics	Speag	DAE4	1289	May 31, 2022	1 Year
2	E-field Probe	Speag	EX3DV4	7678	Aug. 30, 2022	1 Year
3	System Validation Dipole	Speag	D2450V2	973	Feb. 08, 2021	3 Years
4	System Validation Dipole	Speag	D5GHzV2	1221	Feb. 09, 2021	3 Years
5	ELI Phantom	Speag	ELI Phantom V8.0	2149	N/A	N/A
6	ENA Network Aanlyzer	Agilent	E5071C	MY46524658	Mar. 21,2022	1 Year
7	Signal Generator	R&S	SMR40	100502	Jan.10, 2022	1 Year
8	Spectrum Analyzer	Keysight	N9020A	MY57120120	Mar. 7, 2022	1 Year
9	Power Meter	Anritsu	ML2495A	1128008	Jun. 1, 2022	1 Year
10	Power Sensor	Anritsu	MA2411B	1126001	Jun. 1, 2022	1 Year
11	Dielectric Probe Kit	Agilent	85070E	2593	N/A	N/A
12	Low pass filter	Mini-Circuits	SLP-2950+	M108294	N/A	N/A
13	Power Amplifier	Mini-Circuits	ZVE-2W-272+	N65001538	N/A	N/A
14	Power Amplifier	Mini-Circuits	ZVE-8G+	N628801631	N/A	N/A
15	Thermometer	Kolin	KGM-DVB03	E-1093	Oct. 13 2022	1 Year

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

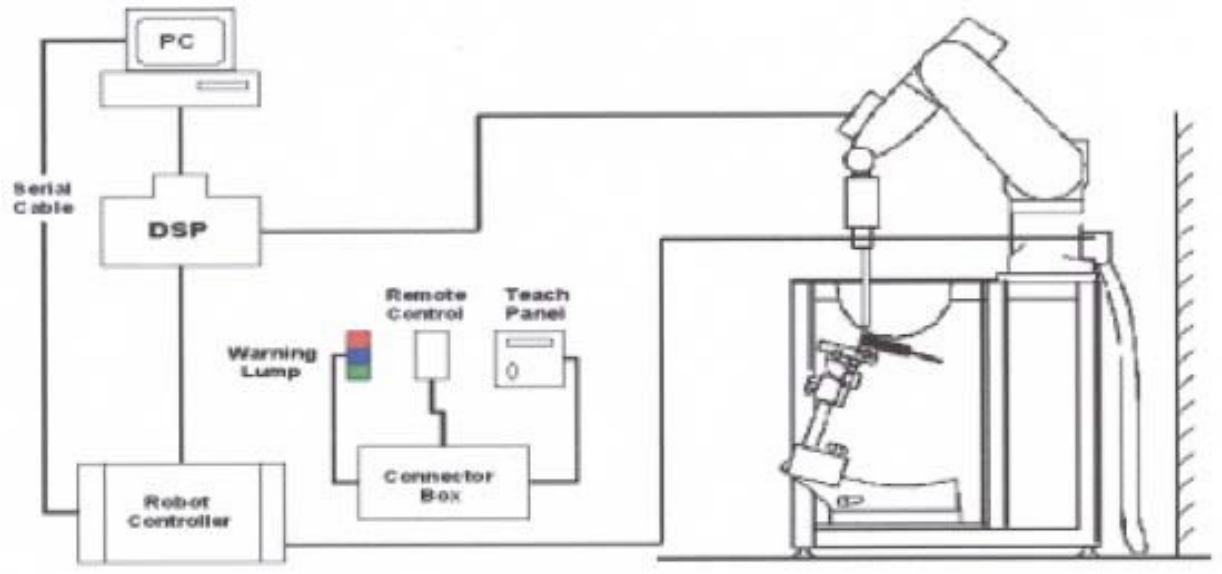
3 SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SETUP

The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows.
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

3.1.1 TEST SETUP LAYOUT

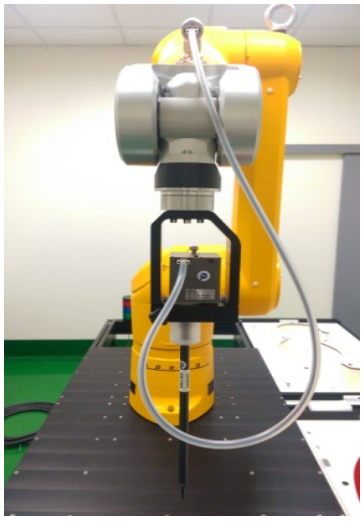


3.2 DASY5 E-FIELD PROBE SYSTEM

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

3.2.1 EX3DV4 PROBE SPECIFICATION

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



EX3DV4 E-field Probe

3.2.2 E-FIELD PROBE CALIBRATION

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

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

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

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

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

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

Where: σ = Simulated tissue conductivity,

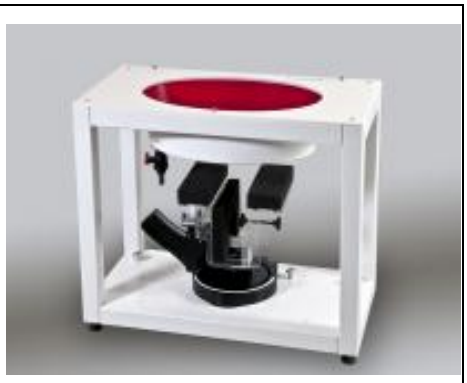
ρ = Tissue density (kg/m3).

3.2.3 OTHER TEST EQUIPMENT

3.2.3.1. DEVICE HOLDER FOR TRANSMITTERS

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.) It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

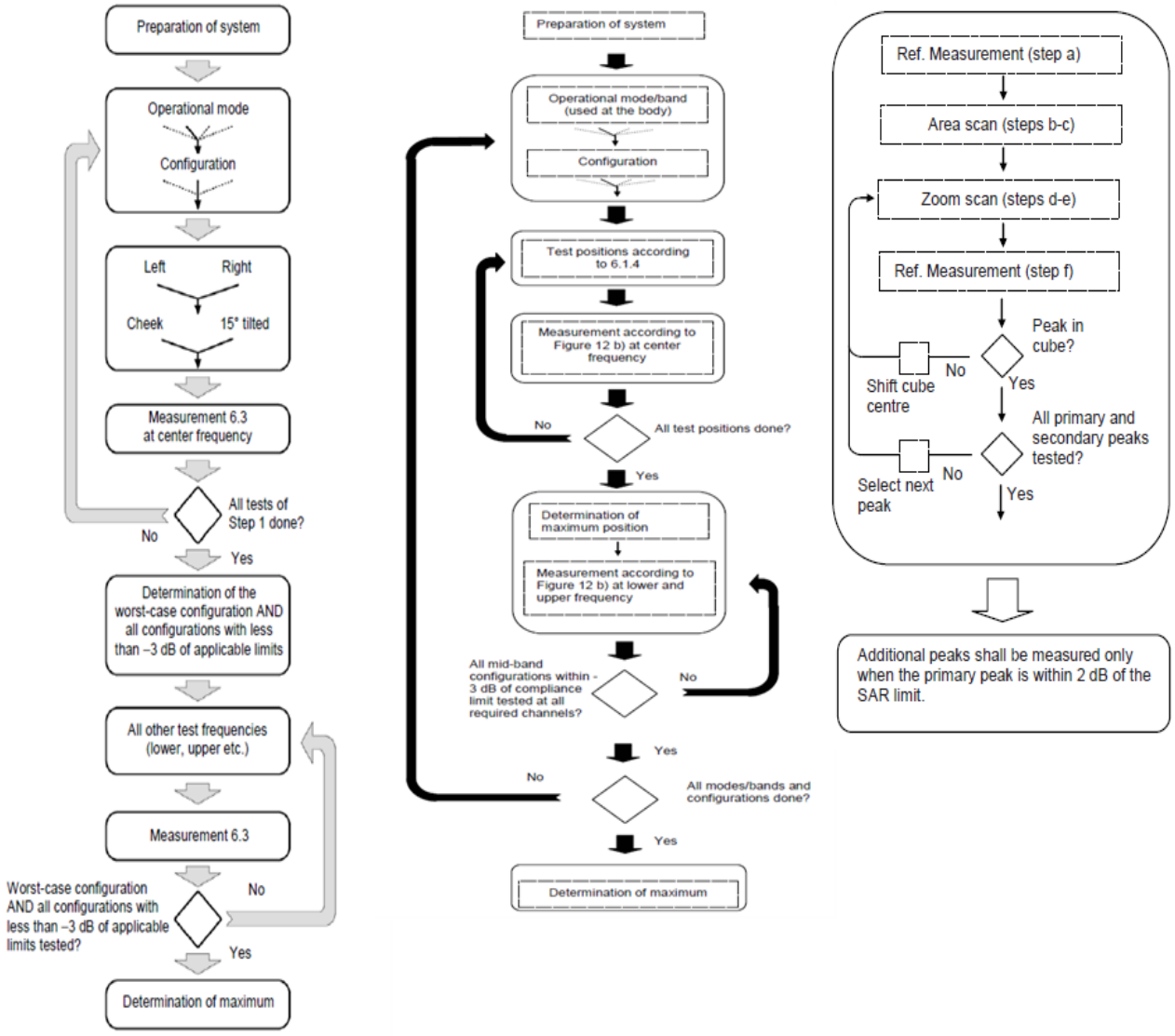
3.2.3.2 PHANTOM

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	

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

3.2.4 SCANNING PROCEDURE

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



After an area scan has been done at a fixed distance of 1.4mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.
Above is the scanning procedure flow chart and table from the IEEE1528 standard.
This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behavior are tested.

3.2.5 DATA STORAGE AND EVALUATION

3.2.5.1 DATA STORAGE

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

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.2.6 DATA EVALUATION BY SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	Sensitivity	Normi, a_{i0}, a_{i1}, a_{i2}
	Conversion factor	$ConvF_i$
	Diode compression point	Dcp_i
Device parameters:	Frequency	f
	Crest factor	cf
Media parameters:	Conductivity	
	Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

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

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

With	V_i = compensated signal of channel i	(i = x, y, z)
	U_i = input signal of channel i	(i = x, y, z)
	cf = crest factor of exciting field	(DASY parameter)
	dcp_i = diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

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

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

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

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

ConvF = sensitivity enhancement in solution

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

f = carrier frequency [GHz]

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

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

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

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

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

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

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= equivalent tissue density in g/cm^3

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

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

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

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

4 TISSUE-EQUIVALENT LIQUID

4.1 TISSUE-EQUIVALENT LIQUID INGREDIENTS

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

Composition of the Tissue Equivalent Matter

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

4.2 TISSUE-EQUIVALENT LIQUID PROPERTIES

Dielectric Performance of Tissue Simulating Liquid

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	22.4	1.731	38.200	1.80	39.2	-3.85	-2.55	Oct. 31, 2022
Head	5200	22.5	4.581	35.599	4.66	36.0	-1.68	-1.11	Nov. 01, 2022
Head	5300	22.5	4.692	35.408	4.76	35.9	-1.44	-1.37	Nov. 01, 2022
Head	5600	22.5	5.021	34.854	5.07	35.5	-0.97	-1.82	Nov. 01, 2022
Head	5800	22.5	5.243	34.499	5.27	35.3	-0.50	-2.27	Nov. 01, 2022

Note:
1)The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
2)KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
3)The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.
4) According to FCC TCB workshop April, 2019 RF Exposure Procedures Update (Effective February 19,2019, FCC has permitted the use of single head-tissue simulating liquid specified in IEEE 62209-1- for all SAR tests.

5 SYSTEM CHECK

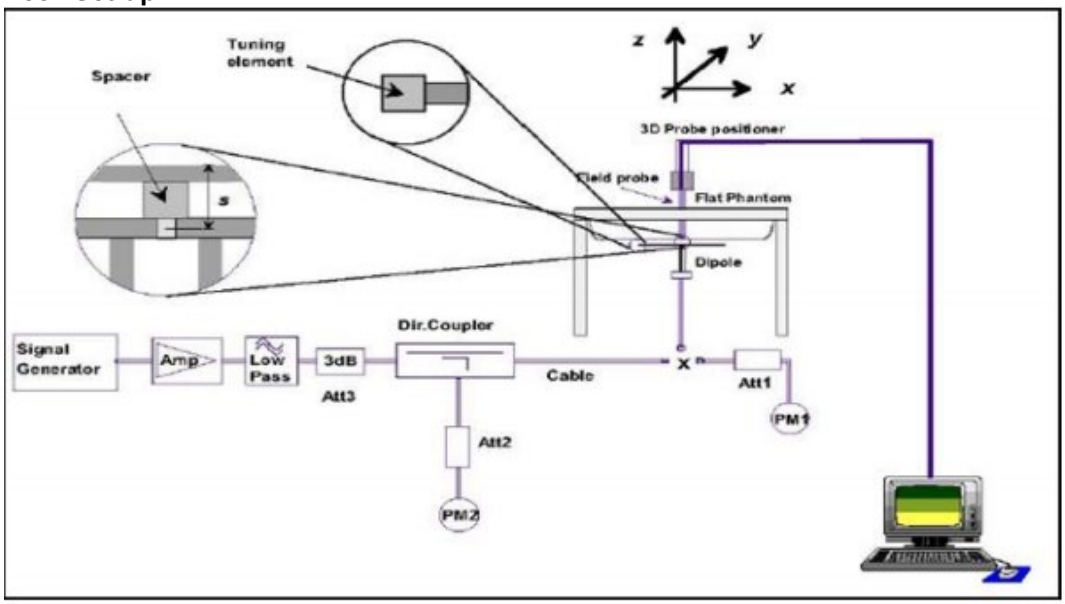
5.1 DESCRIPTION OF SYSTEM CHECK

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

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

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

System Check Set-up



5.2 DESCRIPTION OF SYSTEM CHECK

System Check in Tissue Simulating Liquid

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

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	Oct. 31, 2022	2450	52.10	12.40	49.60	-4.80	973
Head	Nov. 01, 2022	5200	79.80	8.14	81.40	2.01	1221
Head	Nov. 01, 2022	5300	81.90	8.20	82.00	0.12	1221
Head	Nov. 01, 2022	5600	84.50	8.87	88.70	4.97	1221
Head	Nov. 01, 2022	5800	81.70	7.84	78.40	-4.04	1221

6 SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

6.1 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 8.2.

7 OPERATIONAL CONDITIONS DURING TEST

7.1 SAR TEST CONFIGURATION

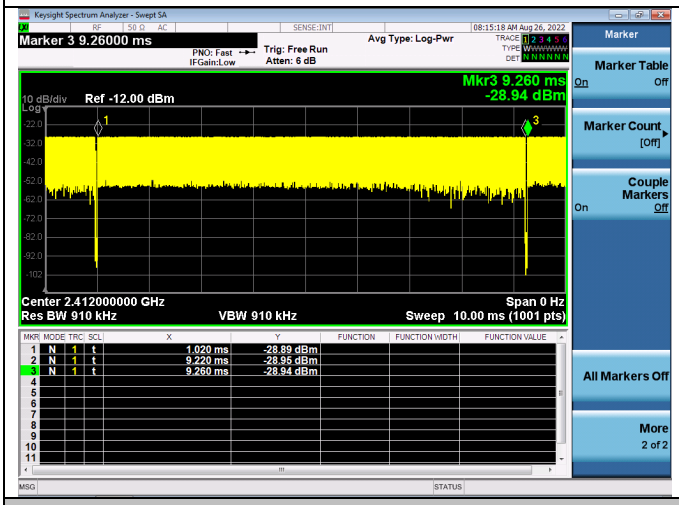
7.1.1 WIFI TEST CONFIGURATIN

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

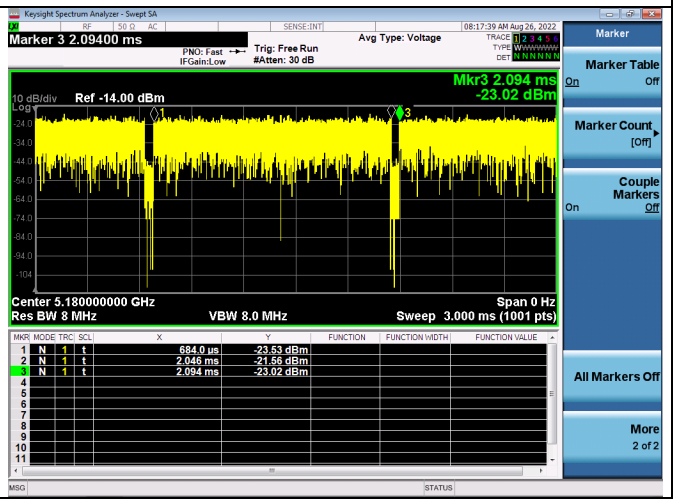
2.4G SAR Test Requirements
2.4G WLAN operating modes are tested independently according to the service requirements in each frequency band. 802.11b/g/n HT20/n HT40/ac VHT20/ac VHT40/ax HE20/ax HE40 modes are tested on the maximum average output power mode.

5G SAR Test Requirements
5G WLAN operating modes are tested independently according to the service requirements in each frequency band. 802.11a/n HT20/n HT40/ac VHT20/ac VHT40/ac VHT80/ax HE20/ax HE40/ax HE80 modes are tested on the maximum average output power mode.

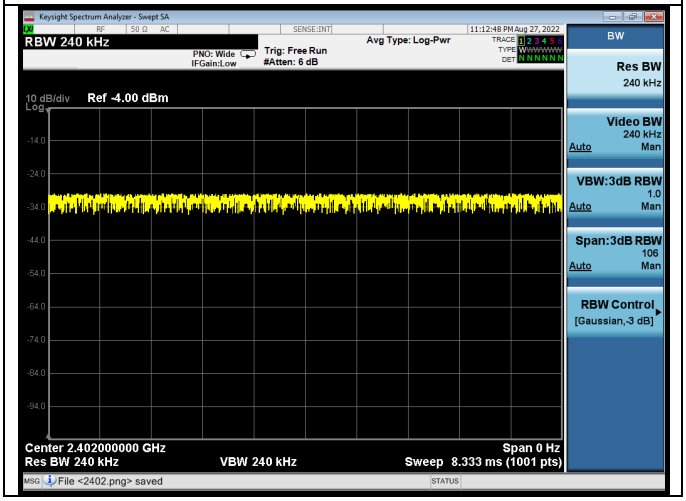
Duty Cycle
WiFi 2.4G
99.51%



Duty Cycle
WiFi 5G
96.60%



Duty Cycle
BT
100%



7.1.1.1 WLAN 2.4G SAR Test Requirements

802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.
1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

SAR Test Requirements for OFDM configurations

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

7.1.1.2 WLAN 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.

7.1.1.3 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 is the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

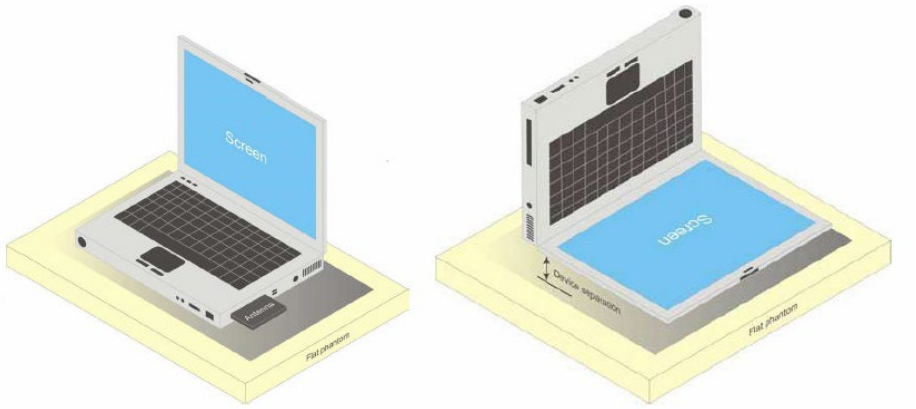
7.1.1.4 INITIAL TEST CONFIGURATION PROCEDURE

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.

7.2 TEST POSITION

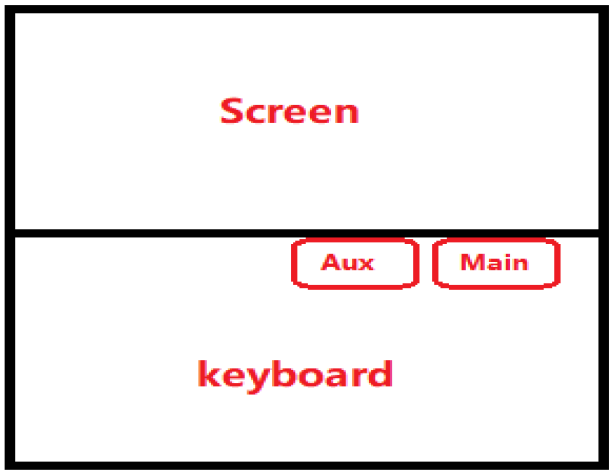
7.2.1 NOTEBOOK MODE

This DUT was tested in 2 different positions. They are back of keyboard and back of screen as illustrated below, which recommended by EN 62209-2:



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

7.3 TEST POSITION ANTENNA LOCATION



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.

8 CONDUCTED POWER RESULTS

8.1 CONDUCTED POWER MEASUREMENT RESULTS OF BLUETOOTH

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402MHz	CH39 2441MHz	CH78 2480MHz
DH5	12.50	**12.38**	12.05	11.44
2DH5	9.50	9.07	9.01	8.98
3DH5	9.50	9.29	9.08	9.17

BT	Average Conducted Power(dBm)			
	Max. Tune up	CH0 2402MHz	CH19 2440MHz	CH39 2480MHz
BLE(1M)	12.50	10.55	12.02	11.84
BLE(2M)	12.50	11.81	11.90	11.89

Note: The tested channel results are marks in bold.

8.2 CONDUCTED POWER MEASUREMENTS OF WI-FI 2.4GHZ BAND

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _MAIN ANT	802.11b	1	2412	1	18.00	17.67
		6	2437		18.00	17.86
		11	2462		18.00	17.78
		12	2467		18.00	17.75
		13	2472		18.00	17.68
	802.11g	1	2412	6	18.00	17.57
		6	2437		18.00	17.56
		11	2462		18.00	17.50
		12	2467		18.00	17.76
		13	2472		18.00	17.81
	802.11ac VHT20	1	2412	VHT0	18.00	17.58
		6	2437		18.00	17.59
		11	2462		18.00	17.72
		12	2467		18.00	17.74
		13	2472		18.00	17.59
	802.11ac VHT40	3	2422	VHT0	18.00	17.73
		6	2437		18.00	**17.91**
		9	2452		18.00	17.52
		10	2457		18.00	17.54
		11	2462		18.00	17.78
	802.11ax HE20	1	2412	MCS0	18.00	17.68
		6	2437		18.00	17.84
		11	2462		18.00	17.70
		12	2467		18.00	17.56
		13	2472		18.00	17.65
	802.11ax HE40	3	2422	MCS0	18.00	17.74
		6	2437		18.00	17.55
		9	2452		18.00	17.50
		10	2457		18.00	17.80
		11	2462		18.00	17.83

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _MAIN ANT	802.11ax HE20	1	2412	MCS0	26	18.00	17.04
					52	18.00	17.86
					106	18.00	17.52
		6	2437	MCS0	26	18.00	17.83
					52	18.00	17.82
					106	18.00	17.68
		11	2462	MCS0	26	18.00	17.60
					52	18.00	17.64
					106	18.00	17.89
		12	2467	MCS0	26	18.00	17.63
					52	18.00	17.66
					106	18.00	17.90
		13	2472	MCS0	26	18.00	17.60
					52	18.00	17.58
					106	18.00	17.83

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _AUX ANT	802.11b	1	2412	1	18.00	17.83
		6	2437		18.00	17.66
		11	2462		18.00	17.70
		12	2467		18.00	17.61
		13	2472		18.00	17.58
	802.11g	1	2412	6	18.00	17.80
		6	2437		18.00	17.73
		11	2462		18.00	17.19
		12	2467		18.00	17.46
		13	2472		18.00	17.59
	802.11ac VHT20	1	2412	VHT0	18.00	17.86
		6	2437		18.00	17.76
		11	2462		18.00	17.84
		12	2467		18.00	17.78
		13	2472		18.00	17.81
	802.11ac VHT40	3	2422	VHT0	18.00	**17.87**
		6	2437		18.00	17.86
		9	2452		18.00	17.78
		10	2457		18.00	17.67
		11	2462		18.00	17.67
	802.11ax HE20	1	2412	MCS0	18.00	17.71
		6	2437		18.00	17.56
		11	2462		18.00	17.03
		12	2467		18.00	17.54
		13	2472		18.00	17.78
	802.11ax HE40	3	2422	MCS0	18.00	17.54
		6	2437		18.00	17.74
		9	2452		18.00	17.55
		10	2457		18.00	17.71
		11	2462		18.00	17.69

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
2.4G WIFI _1TX _AUX ANT	802.11ax HE20	1	2412	MCS0	26	18.00	16.36
					52	18.00	17.65
					106	18.00	17.82
		6	2437	MCS0	26	18.00	17.56
					52	18.00	17.86
					106	18.00	17.85
		11	2462	MCS0	26	18.00	17.55
					52	18.00	16.90
					106	18.00	17.08
		12	2467	MCS0	26	18.00	17.21
					52	18.00	17.47
					106	18.00	17.66
		13	2472	MCS0	26	18.00	17.44
					52	18.00	17.72
					106	18.00	17.44

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
2.4G WIFI _2TX _MAIN +ANT AUX ANT	802.11b	1	2412	1	17.67	17.83	21.00	20.76
		6	2437		17.86	17.66	21.00	20.77
		11	2462		17.78	17.70	21.00	20.75
		12	2467		17.75	17.61	21.00	20.69
		13	2472		17.68	17.58	21.00	20.64
	802.11g	1	2412	6	17.57	17.80	21.00	20.70
		6	2437		17.56	17.73	21.00	20.66
		11	2462		17.50	17.19	21.00	20.36
		12	2467		17.76	17.46	21.00	20.62
		13	2472		17.81	17.59	21.00	20.71
	802.11ac VHT20	1	2412	VHT8	17.58	17.86	21.00	20.73
		6	2437		17.59	17.76	21.00	20.69
		11	2462		17.72	17.84	21.00	20.79
		12	2467		17.74	17.78	21.00	20.77
		13	2472		17.59	17.81	21.00	20.71
	802.11ac VHT40	3	2422	VHT8	17.73	17.87	21.00	20.81
		6	2437		17.58	17.86	21.00	20.73
		9	2452		17.52	17.78	21.00	20.66
		10	2457		17.54	17.67	21.00	20.62
		11	2462		17.91	17.67	21.00	20.80
	802.11ax HE20	1	2412	MCS8	17.68	17.71	21.00	20.71
		6	2437		17.84	17.56	21.00	20.71
		11	2462		17.70	17.03	21.00	20.39
		12	2467		17.56	17.54	21.00	20.56
		13	2472		17.65	17.78	21.00	20.73
	802.11ax HE40	3	2422	MCS8	17.74	17.54	21.00	20.65
		6	2437		17.55	17.74	21.00	20.66
		9	2452		17.50	17.55	21.00	20.54
		10	2457		17.80	17.71	21.00	20.77
		11	2462		17.83	17.69	21.00	20.77

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
2.4G WIFI _2TX _MAIN +ANT AUX ANT	**802.11ax HE20**	1	2412	MCS0	26	17.04	16.36	21.00	19.72
					52	17.86	17.65	21.00	20.77
					106	17.52	17.82	21.00	20.68
		6	2437	MCS0	26	17.83	17.56	21.00	20.71
					52	17.82	17.86	21.00	20.85
					106	17.68	17.85	21.00	20.78
		11	2462	MCS0	26	17.60	17.55	21.00	20.59
					52	17.64	16.90	21.00	20.30
					106	17.89	17.08	21.00	20.51
		12	2467	MCS0	26	17.63	17.21	21.00	20.44
					52	17.66	17.47	21.00	20.58
					106	17.90	17.66	21.00	20.79
		13	2472	MCS0	26	17.60	17.44	21.00	20.53
					52	17.58	17.72	21.00	20.66
					106	17.83	17.44	21.00	20.65

Note: The tested channel results are marks in bold.

8.3 CONDUCTED POWER MEASUREMENTS OF 5G UNII_1

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _MAIN ANT	802.11a	36	5180	6	16.00	15.73
		40	5200		16.00	15.60
		48	5240		16.00	15.71
	802.11ac VHT20	36	5180	VHT0	16.00	15.80
		40	5200		16.00	15.84
		48	5240		16.00	15.77
	802.11ac VHT40	38	5190	VHT0	16.00	15.90
		46	5230		16.00	15.87
	802.11ac VHT80	42	5210	VHT0	16.00	**15.92**
	802.11ax HE20	36	5180	MCS0	16.00	15.82
		40	5200		16.00	15.88
		48	5240		16.00	15.74
	802.11ax HE40	38	5190	MCS0	16.00	15.80
		46	5230		16.00	15.60
	802.11ax HE80	42	5210	MCS0	16.00	15.67

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _MAIN ANT	802.11ax HE20	36	5180	MCS0	26	16.00	15.84
					52	16.00	15.88
					106	16.00	15.63
		40	5200		26	16.00	15.78
					52	16.00	15.88
					106	16.00	15.70
		48	5240		26	16.00	15.86
					52	16.00	15.83
					106	16.00	15.74

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _AUX ANT	802.11a	36	5180	6	16.00	15.85
		40	5200		16.00	15.90
		48	5240		16.00	15.88
	802.11ac VHT20	36	5180	VHT0	16.00	15.89
		40	5200		16.00	15.86
		48	5240		16.00	15.89
	802.11ac VHT40	38	5190	VHT0	16.00	15.92
		46	5230		16.00	15.76
	802.11ac VHT80	42	5210	VHT0	16.00	**15.93**
	802.11ax HE20	36	5180	MCS0	16.00	15.91
		40	5200		16.00	15.80
		48	5240		16.00	15.77
	802.11ax HE40	38	5190	MCS0	16.00	15.90
		46	5230		16.00	15.83
	802.11ax HE80	42	5210	MCS0	16.00	15.89

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.2G WIFI _1TX _AUX ANT	802.11ax HE20	36	5180	MCS0	26	16.00	15.83
					52	16.00	15.79
					106	16.00	15.80
		40	5200		26	16.00	15.81
					52	16.00	15.82
					106	16.00	15.88
		48	5240		26	16.00	15.71
					52	16.00	15.66
					106	16.00	15.80

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.2G WIFI _2TX _MAIN +ANT AUX ANT	802.11a	36	5180	6	15.73	15.85	19.00	18.80
		40	5200		15.60	15.90	19.00	18.76
		48	5240		15.71	15.88	19.00	18.81
	802.11ac VHT20	36	5180	HT8	15.80	15.89	19.00	18.86
		40	5200		15.84	15.86	19.00	18.86
		48	5240		15.77	15.89	19.00	18.84
	802.11ac VHT40	38	5190	VHT8	15.90	15.92	19.00	18.92
		46	5230		15.87	15.76	19.00	18.83
	802.11ac VHT80	42	5210	VHT8	15.92	15.93	19.00	18.94
	802.11ax HE20	36	5180	MCS8	15.82	15.91	19.00	18.88
		40	5200		15.88	15.80	19.00	18.85
		48	5240		15.74	15.77	19.00	18.77
	802.11ax HE40	38	5190	MCS8	15.80	15.90	19.00	18.86
		46	5230		15.60	15.83	19.00	18.73
	802.11ax HE80	42	5210	MCS8	15.67	15.89	19.00	18.79

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.2G WIFI _2TX _MAIN +ANT AUX ANT	802.11ax HE20	36	5180	MCS0	26	15.84	15.83	19.00	18.85
					52	15.88	15.79	19.00	18.85
					106	15.63	15.80	19.00	18.73
		40	5200		26	15.78	15.81	19.00	18.81
					52	15.88	15.82	19.00	18.86
					106	15.70	15.88	19.00	18.80
		48	5240		26	15.86	15.71	19.00	18.80
					52	15.83	15.66	19.00	18.76
					106	15.74	15.80	19.00	18.78

Note: The tested channel results are marks in bold.

8.4 CONDUCTED POWER MEASUREMENTS OF 5G UNII_2A

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.3G WIFI _1TX _MAIN ANT	802.11a	52	5260	6	16.00	15.84
		60	5300		16.00	15.86
		64	5320		16.00	15.84
	802.11ac VHT20	52	5260	VHT0	16.00	15.83
		60	5300		16.00	15.88
		64	5320		16.00	15.84
	802.11ac VHT40	54	5270	VHT0	16.00	15.72
		62	5310		16.00	15.70
	802.11ac VHT80	58	5290	VHT0	16.00	**15.90**
	802.11ax HE20	52	5260	MCS0	16.00	15.71
		60	5300		16.00	15.86
		64	5320		16.00	15.64
	802.11ax HE40	54	5270	MCS0	16.00	15.80
		62	5310		16.00	15.89
	802.11ax HE80	58	5290	MCS0	16.00	15.70

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.3G WIFI _1TX _MAIN ANT	802.11ax HE20	52	5260	MCS0	26	16.00	15.77
					52	16.00	15.89
					106	16.00	15.86
		60	5300		26	16.00	15.87
					52	16.00	15.78
					106	16.00	15.66
		64	5320		26	16.00	15.86
					52	16.00	15.80
					106	16.00	15.84

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.3G WIFI _1TX _AUX ANT	802.11a	52	5260	6	16.00	15.81
		60	5300		16.00	15.79
		64	5320		16.00	15.75
	802.11ac VHT20	52	5260	VHT0	16.00	15.91
		60	5300		16.00	15.92
		64	5320		16.00	15.88
	802.11ac VHT40	54	5270	VHT0	16.00	15.80
		62	5310		16.00	15.87
	802.11ac VHT80	58	5290	VHT0	16.00	**15.93**
	802.11ax HE20	52	5260	MCS0	16.00	15.89
		60	5300		16.00	15.84
		64	5320		16.00	15.80
	802.11ax HE40	54	5270	MCS0	16.00	15.80
		62	5310		16.00	15.79
	802.11ax HE80	58	5290	MCS0	16.00	15.69

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.3G WIFI _1TX _AUX ANT	802.11ax HE20	52	5260	MCS0	26	16.00	15.56
					52	16.00	15.86
					106	16.00	15.63
		60	5300		26	16.00	15.87
					52	16.00	15.83
					106	16.00	15.59
		64	5320		26	16.00	15.81
					52	16.00	15.56
					106	16.00	15.84

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.3G WIFI _2TX _MAIN +ANT AUX ANT	802.11a	52	5260	6	15.84	15.81	19.00	18.84
		60	5300		15.86	15.79	19.00	18.84
		64	5320		15.84	15.75	19.00	18.81
	802.11ac VHT20	52	5260	VHT8	15.83	15.91	19.00	18.88
		60	5300		15.88	15.92	19.00	18.91
		64	5320		15.84	15.88	19.00	18.87
	802.11ac VHT40	54	5270	VHT8	15.72	15.80	19.00	18.77
		62	5310		15.70	15.87	19.00	18.80
	802.11ac VHT80	58	5290	VHT8	15.90	15.93	19.00	18.93
	802.11ax HE20	52	5260	MCS8	15.71	15.89	19.00	18.81
		60	5300		15.86	15.84	19.00	18.86
		64	5320		15.64	15.80	19.00	18.73
	802.11ax HE40	54	5270	MCS8	15.80	15.80	19.00	18.81
		62	5310		15.89	15.79	19.00	18.85
	802.11ax HE80	58	5290	MCS8	15.70	15.69	19.00	18.71

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.3G WIFI _2TX _MAIN +ANT AUX ANT	802.11ax HE20	52	5260	MCS0	26	15.77	15.56	19.00	18.68
					52	15.89	15.86	19.00	18.89
					106	15.86	15.63	19.00	18.76
		60	5300		26	15.87	15.87	19.00	18.88
					52	15.78	15.83	19.00	18.82
					106	15.66	15.59	19.00	18.64
		64	5320		26	15.86	15.81	19.00	18.85
					52	15.80	15.56	19.00	18.69
					106	15.84	15.84	19.00	18.85

Note: The tested channel results are marks in bold.

8.5 CONDUCTED POWER MEASUREMENTS OF 5G UNII_2C

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _MAIN ANT	802.11a	100	5500	6	16.00	15.81
		116	5580		16.00	15.90
		140	5700		16.00	15.66
		144	5720		16.00	15.84
	802.11ac VHT20	100	5500	VHT0	16.00	15.82
		116	5580		16.00	15.87
		140	5700		16.00	15.91
		144	5720		16.00	15.70
	802.11ac VHT40	102	5510	VHT0	16.00	15.89
		110	5550		16.00	15.79
		134	5670		16.00	15.70
		142	5710		16.00	15.88
	802.11ac VHT80	106	5530	VHT0	16.00	**15.91**
		122	5610		16.00	15.74
	802.11ax HE20	100	5500	MCS0	16.00	15.77
		116	5580		16.00	15.86
		140	5700		16.00	15.72
		144	5720		16.00	15.69
	802.11ax HE40	102	5510	MCS0	16.00	15.84
		110	5550		16.00	15.80
		134	5670		16.00	15.51
		142	5710		16.00	15.78
	802.11ax HE80	106	5530	MCS0	16.00	15.60
		122	5610		16.00	15.88

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _MAIN ANT	802.11ax HE20	100	5500	MCS0	26	16.00	15.80
					52	16.00	15.72
					106	16.00	15.50
		116	5580		26	16.00	15.90
					52	16.00	15.86
					106	16.00	15.77
		140	5700		26	16.00	15.78
					52	16.00	15.83
					106	16.00	15.87
		144	5720		26	16.00	15.74
					52	16.00	15.69
					106	16.00	15.88

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _AUX ANT	802.11a	100	5500	6	16.00	15.90
		116	5580		16.00	15.84
		140	5700		16.00	15.92
		144	5720		16.00	15.88
	802.11ac VHT20	100	5500	VHT0	16.00	15.89
		116	5580		16.00	15.81
		140	5700		16.00	15.82
		144	5720		16.00	15.79
	802.11ac VHT40	102	5510	VHT0	16.00	15.76
		110	5550		16.00	15.61
		134	5670		16.00	15.61
		142	5710		16.00	15.89
	802.11ac VHT80	106	5530	VHT0	16.00	15.88
		122	5610		16.00	**15.96**
	802.11ax HE20	100	5500	MCS0	16.00	15.86
		116	5580		16.00	15.84
		140	5700		16.00	15.87
		144	5720		16.00	15.83
	802.11ax HE40	102	5510	MCS0	16.00	15.83
		110	5550		16.00	15.78
		134	5670		16.00	15.93
		142	5710		16.00	15.92
	802.11ax HE80	106	5530	MCS0	16.00	15.46
		122	5610		16.00	15.88

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.6G WIFI _1TX _AUX ANT	802.11ax HE20	100	5500	MCS0	26	16.00	15.90
					52	16.00	15.90
					106	16.00	15.56
		116	5580		26	16.00	15.89
					52	16.00	15.90
					106	16.00	15.83
		140	5700		26	16.00	15.76
					52	16.00	15.79
					106	16.00	15.56
		144	5720		26	16.00	15.92
					52	16.00	15.86
					106	16.00	15.53

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.6G WIFI _2TX _MAIN +ANT AUX ANT	802.11a	100	5500	6	15.81	15.90	19.00	18.87
		116	5580		15.90	15.84	19.00	18.88
		140	5700		15.66	15.92	19.00	18.80
		144	5720		15.84	15.88	19.00	18.87
	802.11ac VHT20	100	5500	VHT0	15.82	15.89	19.00	18.87
		116	5580		15.87	15.81	19.00	18.85
		140	5700		15.91	15.82	19.00	18.88
		144	5720		15.70	15.79	19.00	18.76
	802.11ac VHT40	102	5510	VHT0	15.89	15.76	19.00	18.84
		110	5550		15.79	15.61	19.00	18.71
		134	5670		15.70	15.61	19.00	18.67
		142	5710		15.88	15.89	19.00	18.90
	802.11ac VHT80	106	5530	VHT0	15.91	15.88	19.00	18.91
		122	5610		15.74	15.96	19.00	18.86
	802.11ax HE20	100	5500	MCS0	15.77	15.86	19.00	18.83
		116	5580		15.86	15.84	19.00	18.86
		140	5700		15.72	15.87	19.00	18.81
		144	5720		15.69	15.83	19.00	18.77
	802.11ax HE40	102	5510	MCS0	15.84	15.83	19.00	18.85
		110	5550		15.80	15.78	19.00	18.80
		134	5670		15.51	15.93	19.00	18.74
		142	5710		15.78	15.92	19.00	18.86
	802.11ax HE80	106	5530	MCS0	15.60	15.46	19.00	18.54
		122	5610		15.88	15.88	19.00	18.89

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.6G WIFI _2TX _MAIN +ANT AUX ANT	**802.11ax HE20**	100	5500	MCS0	26	15.80	15.90	19.00	18.86
					52	15.72	15.90	19.00	18.82
					106	15.50	15.56	19.00	18.54
		116	5580		26	15.90	15.89	19.00	18.91
					52	15.86	15.90	19.00	18.89
					106	15.77	15.83	19.00	18.81
		140	5700		26	15.78	15.76	19.00	18.78
					52	15.83	15.79	19.00	18.82
					106	15.87	15.56	19.00	18.73
		144	5720		26	15.74	15.92	19.00	18.84
					52	15.69	15.86	19.00	18.79
					106	15.88	15.53	19.00	18.72

Note: The tested channel results are marks in bold.

8.6 CONDUCTED POWER MEASUREMENTS OF 5G UNII_3

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _MAIN ANT	802.11a	149	5745	6	16.00	15.79
		157	5785		16.00	15.80
		165	5825		16.00	15.74
	802.11ac VHT20	149	5745	VHT0	16.00	15.80
		157	5785		16.00	15.81
		165	5825		16.00	15.74
	802.11ac VHT40	151	5755	VHT0	16.00	15.61
		159	5795		16.00	15.77
	802.11ac VHT80	155	5775	VHT0	16.00	**15.86**
	802.11ax HE20	149	5745	MCS0	16.00	15.83
		157	5785		16.00	15.74
		165	5825		16.00	15.77
	802.11ax HE40	151	5755	MCS0	16.00	15.80
		159	5795		16.00	15.76
	802.11ax HE80	155	5775	MCS0	16.00	15.84

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _MAIN ANT	802.11ax HE20	149	5745	MCS0	26	16.00	15.70
					52	16.00	15.74
					106	16.00	15.80
		157	5785		26	16.00	15.82
					52	16.00	15.80
					106	16.00	15.81
		165	5825		26	16.00	15.80
					52	16.00	15.77
					106	16.00	15.79

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _AUX ANT	802.11a	149	5745	6	16.00	15.75
		157	5785		16.00	15.76
		165	5825		16.00	15.69
	802.11ac VHT20	149	5745	VHT0	16.00	15.75
		157	5785		16.00	15.72
		165	5825		16.00	15.86
	802.11ac VHT40	151	5755	VHT0	16.00	15.77
		159	5795		16.00	15.63
	802.11ac VHT80	155	5775	VHT0	16.00	**15.88**
	802.11ax HE20	149	5745	MCS0	16.00	15.86
		157	5785		16.00	15.54
		165	5825		16.00	15.84
	802.11ax HE40	151	5755	MCS0	16.00	15.86
		159	5795		16.00	15.52
	802.11ax HE80	155	5775	MCS0	16.00	15.60

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	Max. Tune up	Average Power(dBm)
5.8G WIFI _1TX _AUX ANT	802.11ax HE20	149	5745	MCS0	26	16.00	15.85
					52	16.00	15.71
					106	16.00	15.74
		157	5785		26	16.00	15.81
					52	16.00	15.84
					106	16.00	15.80
		165	5825		26	16.00	15.83
					52	16.00	15.64
					106	16.00	15.87

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.8G WIFI _2TX _MAIN +ANT AUX ANT	802.11a	149	5745	6	15.79	15.75	19.00	18.78
		157	5785		15.80	15.76	19.00	18.79
		165	5825		15.74	15.69	19.00	18.73
	802.11ac VHT20	149	5745	VHT8	15.80	15.75	19.00	18.79
		157	5785		15.81	15.72	19.00	18.78
		165	5825		15.74	15.86	19.00	18.81
	802.11ac VHT40	151	5755	VHT8	15.61	15.77	19.00	18.70
		159	5795		15.77	15.63	19.00	18.71
	802.11ac VHT80	155	5775	VHT8	15.86	15.88	19.00	18.88
	802.11ax HE20	149	5745	MCS8	15.83	15.86	19.00	18.86
		157	5785		15.74	15.54	19.00	18.65
		165	5825		15.77	15.84	19.00	18.82
	802.11ax HE40	151	5755	MCS8	15.80	15.86	19.00	18.84
		159	5795		15.76	15.52	19.00	18.65
	802.11ax HE80	155	5775	MCS8	15.84	15.60	19.00	18.73

Band	Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	RU Setting	MAIN Average Power (dBm)	AUX Average Power (dBm)	Max. Tune up	Total Average Power (dBm)
5.8G WIFI _2TX _MAIN +ANT AUX ANT	802.11ax HE20	149	5745	MCS0	26	15.70	15.85	19.00	18.79
					52	15.74	15.91	19.00	18.84
					106	15.80	15.74	19.00	18.78
		157	5785		26	15.82	15.81	19.00	18.83
					52	15.80	15.84	19.00	18.83
					106	15.81	15.80	19.00	18.82
		165	5825		26	15.80	15.83	19.00	18.83
					52	15.77	15.64	19.00	18.72
					106	15.79	15.87	19.00	18.84

Note: The tested channel results are marks in bold.

9 SAR TEST RESULTS

General Notes:

1. Per KDB447498 D01, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2. Per KDB447498 D01, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is≤100 MHz. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
3. Per KDB865664 D01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg; if the deviation among the repeated measurement is ≤20%, and the measured SAR <1.45W/kg, only one repeated measurement is required.

WLAN Notes:

1. For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated(peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHz WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section7.1.4 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 for 5GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission mode was not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than1.2W/kg. See Section 7.1.4 for more information.

9.1 SAR MEASUREMENT RESULT

9.1.1 BODY SAR TEST RESULTS

1. SAR test results of 2.4G WiFi

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	Ant Vendor	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	802.11ac VTH40	3	Back of Screen	2.5	Aux	INPAQ	VHT0	99.51	18.00	17.87	0	0.013	0.009	0.014
W02	802.11ac VTH40	3	Back of Keyboard	0	Aux	INPAQ	VHT0	99.51	18.00	17.87	0.05	**0.485**	**0.221**	**0.502**
W03	802.11ac VTH40	3	Back of Keyboard	0	Aux	AWAN	VHT0	99.51	18.00	17.87	0	0.411	0.187	0.426
W05	802.11ac VTH40	6	Back of Screen	2.5	Main	INPAQ	VHT0	99.51	18.00	17.91	0.01	0.009	0.006	0.009
W06	802.11ac VTH40	6	Back of Keyboard	0	Main	INPAQ	VHT0	99.51	18.00	17.91	0.05	**0.681**	**0.307**	**0.699**
W07	802.11ac VTH40	6	Back of Keyboard	0	Main	AWAN	VHT0	99.51	18.00	17.91	0.03	0.450	0.203	0.462

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

2. SAR test results of Bluetooth

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	Ant Vendor	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	0	Back of Screen	2.5	Aux	INPAQ	1M	100	12.50	12.38	0	<0.001	<0.001	<0.001
B02	BT	0	Back of Keyboard	0	Aux	INPAQ	1M	100	12.50	12.38	0	0.044	0.018	0.045
B03	BT	0	Back of Keyboard	0	Aux	AWAN	1M	100	12.50	12.38	0.01	**0.044**	**0.022**	**0.045**

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

3. SAR test results of 5G WiFi

Test No.	Band	Channel	Test Position	Separation Distance (cm)	Ant	Ant Vendor	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)
W08	80211ac VTH80	42	Back of Screen	2.5	Aux	INPAQ	VHT0	96.60	16.00	15.93	0	0.041	0.025	0.043
W09	80211ac VTH80	42	Back of Keyboard	0	Aux	INPAQ	VHT0	96.60	16.00	15.93	0.02	**0.435**	**0.171**	**0.458**
W10	80211ac VTH80	42	Back of Keyboard	0	Aux	AWAN	VHT0	96.60	16.00	15.93	0.02	0.391	0.148	0.411
W12	80211ac VTH80	42	Back of Screen	2.5	Main	INPAQ	VHT0	96.60	16.00	15.92	0.01	0.033	0.021	0.034
W13	80211ac VTH80	42	Back of Keyboard	0	Main	INPAQ	VHT0	96.60	16.00	15.92	0.16	**0.296**	**0.115**	**0.312**
W14	80211ac VTH80	42	Back of Keyboard	0	Main	AWAN	VHT0	96.60	16.00	15.92	0.03	0.268	0.090	0.283
W16	80211ac VTH80	58	Back of Screen	2.5	Aux	INPAQ	VHT0	96.60	16.00	15.93	0.15	0.072	0.038	0.076
W17	80211ac VTH80	58	Back of Keyboard	0	Aux	INPAQ	VHT0	96.60	16.00	15.93	0	**0.527**	**0.200**	**0.554**
W18	80211ac VTH80	58	Back of Keyboard	0	Aux	AWAN	VHT0	96.60	16.00	15.93	0.04	0.458	0.172	0.482
W20	80211ac VTH80	58	Back of Screen	2.5	Main	INPAQ	VHT0	96.60	16.00	15.90	0.08	0.033	0.021	0.035
W21	80211ac VTH80	58	Back of Keyboard	0	Main	INPAQ	VHT0	96.60	16.00	15.90	0	**0.330**	**0.104**	**0.350**
W22	80211ac VTH80	58	Back of Keyboard	0	Main	AWAN	VHT0	96.60	16.00	15.90	0.01	0.321	0.103	0.340
W24	802.11ax HE80	122	Back of Screen	2.5	Aux	INPAQ	MCS0	96.60	16.00	15.96	0.05	0.058	0.034	0.060
W25	802.11ax HE80	122	Back of Keyboard	0	Aux	INPAQ	MCS0	96.60	16.00	15.96	0	0.609	0.201	0.636
W26	802.11ax HE80	122	Back of Keyboard	0	Aux	AWAN	MCS0	96.60	16.00	15.96	0	**0.664**	**0.229**	**0.694**
W28	802.11ax HE80	106	Back of Screen	2.5	Main	INPAQ	MCS0	96.60	16.00	15.91	0.13	0.041	0.025	0.043
W29	802.11ax HE80	106	Back of Keyboard	0	Main	INPAQ	MCS0	96.60	16.00	15.91	0.06	**0.483**	**0.159**	**0.510**
W30	802.11ax HE80	106	Back of Keyboard	0	Main	AWAN	MCS0	96.60	16.00	15.91	0	0.450	0.146	0.476
W32	80211ac VTH80	155	Back of Screen	2.5	Aux	INPAQ	VHT0	96.60	16.00	15.88	0.13	0.058	0.033	0.061
W33	80211ac VTH80	155	Back of Keyboard	0	Aux	INPAQ	VHT0	96.60	16.00	15.88	0.08	**0.628**	**0.222**	**0.668**
W34	80211ac VTH80	155	Back of Keyboard	0	Aux	AWAN	VHT0	96.60	16.00	15.88	0.06	0.453	0.136	0.482
W36	80211ac VTH80	155	Back of Screen	2.5	Main	INPAQ	MCS0	96.60	16.00	15.86	0.14	0.045	0.028	0.048
W37	80211ac VTH80	155	Back of Keyboard	0	Main	INPAQ	MCS0	96.60	16.00	15.86	0.06	**0.421**	**0.136**	**0.450**
W38	80211ac VTH80	155	Back of Keyboard	0	Main	AWAN	MCS0	96.60	16.00	15.86	0	0.413	0.104	0.442

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

10 SIMULTANEOUS TRANSMISSION CONDITIONS

10.1 STAND-ALONE SAR TEST EXCLUSION

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
1	WLAN 2.4G(Main)+BT
2	RLAN 5G(Main)+BT
3	WLAN 2.4G(Main)+ WLAN 2.4G(Aux)
4	RLAN 5G(Main)+ RLAN 5G(Aux)

10.2 ABOUT BT AND WIFI

Band \ Position		Back of Screen	Back of Keyboard
Main Ant	WiFi 2.4G	0.009	0.699
	WiFi 5.2G	0.034	0.312
	WiFi 5.3G	0.035	0.350
	WiFi 5.6G	0.043	0.510
	WiFi 5.8G	0.048	0.450
Aux Ant	WiFi 2.4G	0.014	0.699
	WiFi 5.2G	0.043	0.458
	WiFi 5.3G	0.076	0.554
	WiFi 5.6G	0.060	0.694
	WiFi 5.8G	0.061	0.668
	BT	<0.001	0.045
MAX $\sum SAR_{1g}$		**0.124**	**1.397**

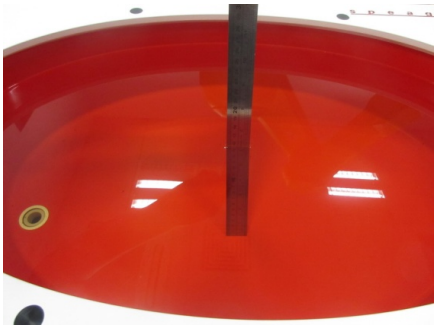
Note:
MAX. $\sum SAR_{1g}$= 1.397 W/Kg<1.6 W/Kg, so Peak location SAR are not required.

11 TEST LAYOUT

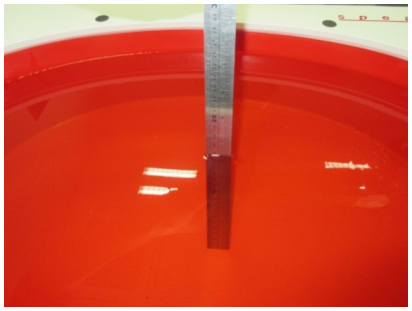
Specific Absorption Rate Test Layout

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

HSL(2450MHz)



HSL(5GHz)



Appendix A. SAR Plots of System Verification

(Pls See BTL-FCC SAR-1-2208C121_Appendix A.)

Appendix B. SAR Plots of SAR Measurement

(Pls See BTL-FCC SAR-1- 2208C121_Appendix B.)

Appendix C. Calibration Certificate

(Pls See BTL-FCC SAR-1- 2208C121_Appendix C.)

Appendix D. Photographs of the Test Set-Up

(Pls See BTL-FCC SAR-1- 2208C121_Appendix D.)

End of Test Report