SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std. 1528-2013

For
CFV 100C

FCC ID: 2AEFA-CFV100C2209

MODEL NUMBER: CFV 100C

SERIES MODEL NUMBER: CFV-100C

Report Number: 4790686575.6-SAR-2

Issue Date: January 4, 2024

Prepared for

VICTOR HASSELBLAD AB

Utvecklingsgatan 2, Gothenburg SE-417 56, Sweden

Prepared by

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Revision History

Rev.	Date	Revisions	Revised By
V1.0	January 4, 2024	Initial Issue	\

Note:
1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

2. The measurement result for the sample received is <Pass> according to < IEEE Std. 1528>when <Accuracy Method> decision rule is applied.

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1. Attestation of Test Results

Applicant Name	VICTOR HASSELBLAD AB	
Address	Utvecklingsgatan 2, Gothenburg SE-417 56, Sweden	
Manufacturer	VICTOR HASSELBLAD AB	
Address	Utvecklingsgatan 2, Gothenburg SE-417 56, Sweden	
EUT Name	CFV 100C	
Model Name	CFV 100C	
Series Model	CFV-100C	
Model Difference	All the same except the model name	
Sample Status	Normal	
Brand	HASSELBLAD	
Sample Received Date	Jan. 10, 2023	
Date of Tested	February 19, 2023~January 4, 2024	
Applicable Standards	FCC 47 CFR § 2.1093 IEEE Std. 1528-2013 Published RF exposure KDB procedures	
SAR Limits (W/Kg)		
Exposure Category	Peak spatial-average(1g of tissue)	Extremities (hands, wrists, ankles, etc.) (10g of tissue)
General population / Uncontrolled exposure	1.6	4
The Highest Reported SAR (W/kg)		
RF Exposure Conditions	**Equipment Class**	
	DTS	**U-NII**
Body (1-g)	0.202	0.389
Extremity (10-g)	2.177	2.297
Test Results	Pass	
Prepared By: Burt Hu Burt Hu Laboratory Engineer	Reviewed By: Denny Huang Denny Huang Senior Project Engineer	Approved By: Stephen Guo Stephen Guo Laboratory Manager

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std. 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR
- 447498 D01 General RF Exposure Guidance v06
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 941225 D07 UMPC Mini Tablet

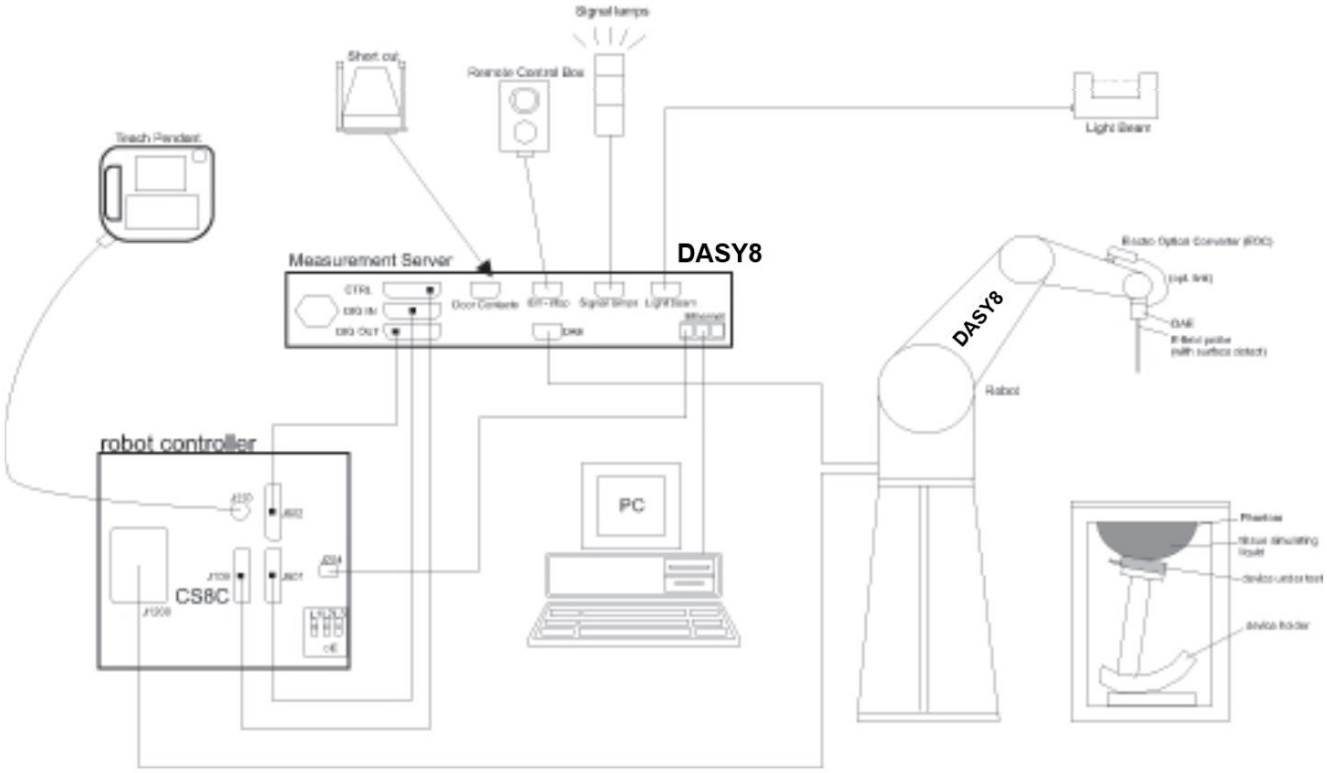
3. Facilities and Accreditation

Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with A2LA. **FCC (FCC Recognized No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. **VCCI (Registration No.: G-20192, C-20153, T-20155 and R-20202)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20192 and R-20202 Shielding Room B, the VCCI registration No. is C-20153 and T-20155
Description	All measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY8 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (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.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win10 and the DASY8 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 mm ± 1 mm	$\frac{1}{2}\cdot\delta\cdot\ln(2)$ mm ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be greater than the step size in Z-direction.

4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Name of equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date (Last Time)	Cal. Due Date (This Time)
ENA Network Analyzer	Keysight	E5080A	MY55100583	2023.10.16	2024.10.11
Dielectric Probe kit	SPEAG	SM DAK 040 SA	1155	2025.02.27	2025.02.27
DC power supply	Keysight	E36103A	MY55350020	2023.10.16	2024.10.11
Signal Generator	Rohde & Schwarz	SME06	837633\001	2023.08.14	2024.08.06
BI-Directional Coupler	KRYTAR	1850	54733	2023.10.16	2024.10.11
Peak and Average Power Sensor	Keysight	E9325A	MY62220002	2023.10.25	2024.10.11
Peak and Average Power Sensor	Keysight	E9325A	MY62220003	2023.10.25	2024.10.11
Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	2023.10.16	2024.10.11
Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600-50-30P	1983561	NCR	NCR
Dosimetric E-Field Probe	SPEAG	EX3DV4	7733	2023.08.01	/
Data Acquisition Electronic	SPEAG	DAE4	1739	2023.07.28	/
Dosimetric E-Field Probe	SPEAG	EX3DV4	7383	/	2024.06.04
Data Acquisition Electronic	SPEAG	DAE3	427	/	2024.05.16
Dipole Kit 2450 MHz	SPEAG	D2450V2	977	2024.12.16	2024.12.16
Dipole Kit 5 GHz	SPEAG	D5GHzV2	1231	2024.12.15	2024.12.15
Software	SPEAG	DASY8	N/A	NCR	NCR
ELI Phantom	SPEAG	ELI V8.0	2178	NCR	NCR
Thermometer	/	GX-138	150709653	2023.10.21	2024.10.18
Thermometer	VICTOR	ITHX-SD-5	18470005	2023.10.21	2024.10.18

Note:

1) As per KDB865664D01 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) Dielectric assessment kit is calibrated against air, distilled water and a shorting block performed before measuring liquid parameters.
3) NCR is short for "No Calibration Requirement".

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k =2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. Device Under Test (DUT) Information

6.1. DUT Description

The EUT is a CFV 100C with IEEE 802.11a/b/g/n/ac/ax, and BLE radio.	
Device Dimension	Overall (Length x Width x Height): 90.7 mm x 60.4 mm x 93.1 mm
Battery Options	DC 7.27V

6.2. Wireless Technology

Wireless technology	Frequency band
Wi-Fi	2.4 GHz
Wi-Fi	5.1/5.8 GHz
BT	2.4 GHz

6.3. Antenna Gain

Ant	band	Antenna Type	Antenna Gain (dBi)
ANT 0	2.4GHz	PCB antenna	0.8
	5.1GHz		4.2
	5.8GHz		1.5
ANT 1	2.4GHz	PCB antenna	3.0
	5.1GHz		0.7
	5.8GHz		2.5

7. SAR Test Configuration

The DUT is a hand held device, it may be very close to the human body and limb when used, so 1-g Body SAR and 10-g extremity SAR evaluation are considered. Per KDB941225 D07, The devices must be tested for 1-g SAR on all surfaces and side edges with a transmitting antenna located at ≤ 25 mm from that surface or edge, at 5 mm separation from a flat phantom, for the data modes, wireless technologies and frequency bands supported by the device to determine SAR compliance. When 1-g SAR is tested at 5 mm, 10-g SAR is not required.

8. Conducted Output Power Measurement and tune-up tolerance

8.1. Power measurement result of 2.4GHz Wi-Fi

Mode	Channel	Frequency (MHz)	Data Rate	ANT 0		ANT 1		MIMO		SAR Test	Duty Cycle (%)
				Average Power (dBm)	Tune-up Limit (dBm)	Average Power (dBm)	Tune-up Limit (dBm)	Average Power (dBm)	Tune-up Limit (dBm)		
802.11b	1	2412	1Mbps	17.47	18.5	16.77	17.5	/	/	Required	98.85
	6	2437		18.05		17.13		/	/		
	11	2462		18.11		16.87		/	/		
802.11g	1	2412	6Mbps	Not Required	17.0	Not Required	17.0	/	20.0	Excluded	\
	6	2437						/			
	11	2462						/			
802.11n20	1	2412	MCS0	Not Required	14.5	Not Required	14.5	/	17.5	Excluded	\
	6	2437						/			
	11	2462						/			
802.11n40	3	2422		14.96	15.5	14.9	15.5	17.9	18.5	Required	90.96
	6	2437		15.08		14.9		18.0			
	9	2452		13.9		14.02		17.0			
802.11ax20	1	2412	MCS0	Not Required	15.0	Not Required	15.0	/	18.0	Excluded	\
	6	2437						/			
	11	2462						/			
802.11ax40	3	2422			15.0		15.0	/	18.0		
	6	2437						/			
	9	2452						/			

Note:

1) As per KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

8.2. Power measurement result of 5GHz Wi-Fi (U-NII-1)

Mode	Channel	Frequency (MHz)	Data Rate	ANT 0		SAR Test	ANT 1		MIMO		SAR Test	Duty Cycle (%)
				Average Power (dBm)	Tune-up Limit (dBm)		Average Power (dBm)	Tune-up Limit (dBm)	Average Power (dBm)	Tune-up Limit (dBm)		
802.11a	36	5180	6Mbps	9.66	11.0	Required	12.69	13.0	/	/	Required	93.46
	40	5200		9.65			12.45		/	/		
	44	5220		9.22			12.03		/	/		
	48	5240		9.34			12.39		/	/		
802.11n20	36	5180	MCS0	Not Required	10.0	Excluded	Not Required	10.0	/	13.0	Excluded	\
	40	5200							/			
	44	5220							/			
	48	5240							/			
802.11ac20	36	5180	MCS0		10.0			10.0	/	13.0		
	40	5200							/			
	44	5220							/			
	48	5240							/			
802.11ax20	36	5180	MCS0		10.0			10.0	/	13.0		
	40	5200							/			
	44	5220							/			
	48	5240							/			
802.11n40	38	5190	MCS0		11.0			11.0	/	14.0		
	46	5230							/			
802.11ac40	38	5190	MCS0		11.0			11.0	/	14.0		
	46	5230							/			
802.11ax40	38	5190	MCS0		11.0			11.0	/	14.0		
	46	5230							/			
802.11ac80	42	5210	MCS0		16.0			16.0	/	19.0		
802.11ax80	42	5210	MCS0	16.11	16.5	Required	15.86	16.5	19.0	19.5	Required	64.29

Note:
As per KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

8.3. Power measurement result of 5GHz Wi-Fi (U-NII-3)

Mode	Channel	Frequency (MHz)	Data Rate	ANT 0		SAR Test	ANT 1		MIMO		SAR Test	Duty Cycle (%)
				Average Power (dBm)	Tune-up Limit (dBm)		Average Power (dBm	Tune-up Limit (dBm)	Average Power (dBm	Tune-up Limit (dBm)		
802.11a	149	5745	6Mbps	16.47	17.0	Required	16.43	17.0	/	/	Required	93.46
	153	5765		16.25			16.55		/	/		
	157	5785		16.46			16.85		/	/		
	161	5805		16.42			16.52		/	/		
	165	5825		16.66			16.72		/	/		
802.11n20	149	5745	MCS0	Not Required	17.0	Excluded	Not Required	16.5	/	19.8	Excluded	\
	153	5765							/			
	157	5785							/			
	161	5805							/			
	165	5825							/			
802.11ac20	149	5745	MCS0		17.0			16.5	/	19.8		
	153	5765							/			
	157	5785							/			
	161	5805							/			
	165	5825							/			
802.11ax20	149	5745	MCS0		17.5			16.5	/	19.8		
	153	5765							/			
	157	5785							/			
	161	5805							/			
	165	5825							/			
802.11n40	151	5755	MCS0	17.58	18.0	Required	16.00	16.6	19.9	20.4	Required	90.57
	159	5795		17.35			16.11		19.8	20.4		
802.11ac40	151	5755	MCS0	Not Required	18.0	Excluded	Not Required	16.6	/	20.4	Excluded	\
	159	5795							/			
802.11ax40	151	5755	MCS0		18.0			16.5	/	20.3		
	159	5795							/			
802.11ac80	155	5775	MCS0		16.5			16.5	/	20.3		
802.11ax80	155	5775	MCS0		16.0			16.0	/	19.0		

Note:
As per KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

8.4. Power measurement result of BT

Mode	Channel	Frequency (MHz)	ANT 1		SAR Test	Duty Cycle (%)
			Average Power (dBm)	Tune-up Limit (dBm)		
BLE 1M	0	2402	Not Required	6.0	Excluded	\
	19	2440				
	39	2480				
BLE 2M	0	2402		7.0	Excluded	\
	19	2440				
	39	2480				

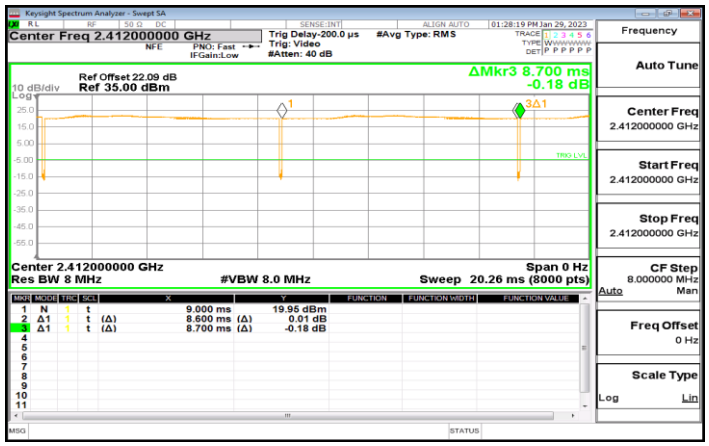
Test Mode	Frequency (MHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Threshold (mW)	SAR Test
BLE 2M	2450	7.00	5.01	5.00	10	Excluded

Note:
As per KDB 447498 D01 v06, BT meets the SAR exemption requirement, so SAR evaluation for BT is not required.

9. Duty Cycle

Test Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)
11B	8.60	8.70	0.9885	98.85
11N40	0.956	1.051	0.9096	90.96
11A	1.43	1.53	0.9346	93.46
11AX80	0.18	0.28	0.6429	64.29
11N40	0.961	1.061	0.9057	90.57

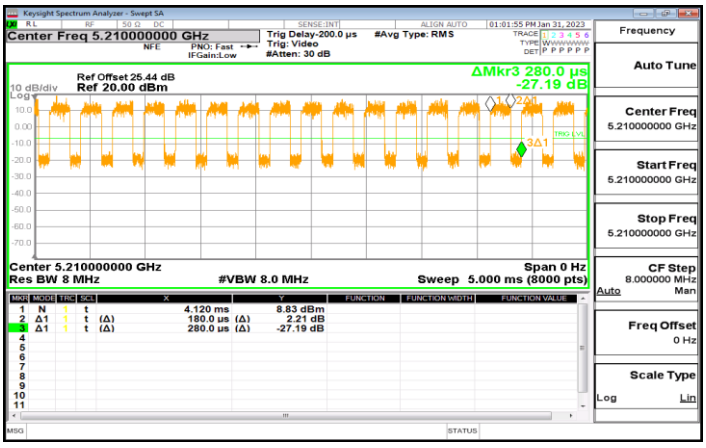
802.11B 2412MHz



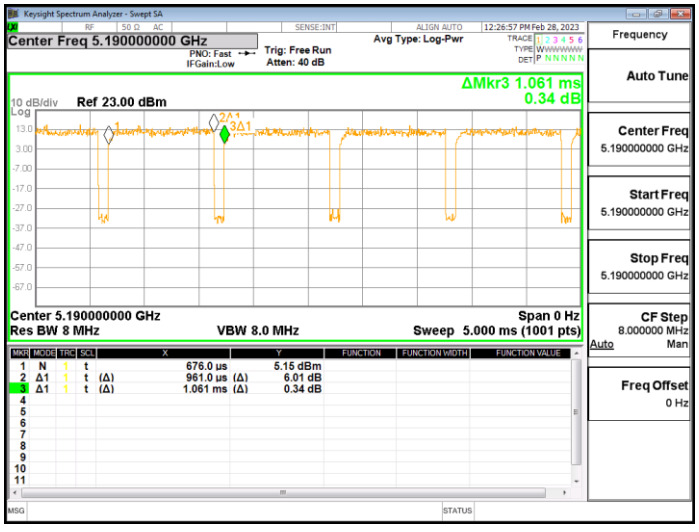
802.11N40 2422MHz

802.11A 5180MHz

802.11AX80 5210MHz



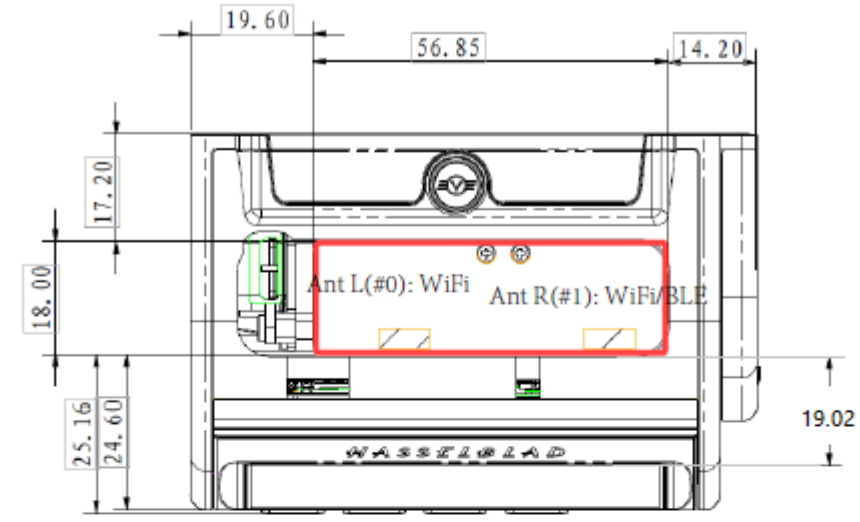
802.11N40 5190MHz

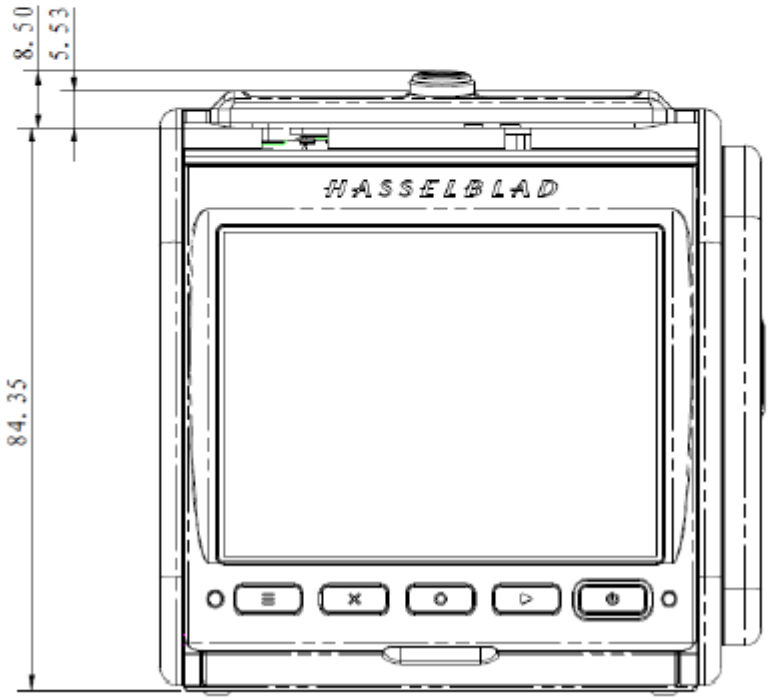


10. RF Exposure Conditions

Refer to the diagram inside the device which attached below for the specific details of the antenna-to-edges distances. As per KDB 941225 D06, when the antenna to-edge-distance is greater than 2.5 cm, SAR evaluation is not required for the corresponding position.

Antenna location map





Ant 0/1	Test Position	antenna to-edge-distance	Test required
	Front Edge	<25mm	Yes
	Back Edge	<25mm	Yes
	Left Edge	<25mm	Yes
	Right Edge	<25mm	Yes
	Top Edge	<25mm	Yes
	Bottom Edge	>25mm	No

Note:

1) The ANT 0 and ANT 1 overlap on the top surface.
2) Top edge will not get close to human body when operated, only human's hand will touch the top edge, so only extremity SAR is considered for top edge.

11. Dielectric Property Measurements & System Check

11.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

Liquid	Freq.	Liquid Parameters				Deviation(%)		Limit (%)	Temp. (℃)	Test Date
		Measured		Target						
		ϵ_r	σ	ϵ_r	σ	ϵ_r	σ			
Head 2450	2360	40.20	1.70	39.36	1.72	2.13	-1.16	±5	22.1	2023.2.19
	2450	40.10	1.81	39.20	1.80	2.30	0.56			
	2540	39.70	1.92	39.09	1.90	1.56	1.05			
Head 5250	5160	35.00	4.58	36.03	4.61	-2.86	-0.65	±5	22.5	2023.2.21
	5250	34.90	4.67	35.93	4.71	-2.87	-0.85			
	5340	34.80	4.75	35.83	4.80	-2.87	-1.04			
Head 5750	5660	35.50	5.06	35.46	5.13	0.11	-1.36	±5	21.8	2023.2.22
	5750	35.40	5.13	35.36	5.22	0.11	-1.72			
	5840	35.30	5.24	35.27	5.30	0.09	-1.13			

Head 5250	5160	36.40	4.51	36.03	4.61	1.03	-2.17	±5	22.3	2024.1.4
	5250	35.80	4.72	35.93	4.71	-0.36	0.21			
	5340	35.10	4.63	35.83	4.80	-2.04	-3.54			

11.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHZ) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz), 12 mm in x- and y-dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz).
- For zoom scan, 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.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.
-

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

T.S. Liquid		Measured Results		Target (Ref. value)	Delta (%)	Limit (%)	Temp. (℃)	Test Date
		Zoom Scan (W/Kg)	Normalize to 1W (W/Kg)					
Head 2450	1-g	13.500	54.00	53.20	1.50	±10	22.1	2023.2.19
	10-g	6.220	24.88	24.20	2.81			
Head 2450	1-g	13.100	52.40	53.20	-1.50	±10	21.6	2023.2.20
	10-g	6.270	25.08	24.20	3.64			
Head 5250	1-g	8.180	81.80	77.90	5.01	±10	21.9	2023.2.21
	10-g	2.260	22.60	22.60	0.00			
Head 5250	1-g	8.170	81.70	77.90	4.88	±10	22.7	2023.2.23
	10-g	2.240	22.40	22.60	-0.88			
Head 5750	1-g	7.750	77.50	78.30	-1.02	±10	21.8	2023.2.22
	10-g	2.270	22.70	22.40	1.34			
Head 5750	1-g	7.610	76.10	78.30	-2.81	±10	22.7	2023.2.23
	10-g	2.360	23.60	22.40	5.36			
Head 5250	1-g	8.050	80.50	77.90	3.34	±10	22.3	2024.1.4
	10-g	2.340	23.40	22.60	3.54			

12. Measured and Reported (Scaled) SAR Results

As per KDB 447498 sec.4.1.e), When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported.

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
A）Per KDB447498 D01 v06, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.
B）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.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

Per KDB865664 D01 v01r04:

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.

Per KDB 248227 D01 v02r02:

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 v02r02 are applied. (Refer to KDB 248227D01 v02r02 for more details)

Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet, 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 position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions /configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01 v02r02). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.
For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR

measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration. When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. When the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

2.4 GHz SAR Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions. When SAR measurement is required for an OFDM configuration, the initial test configuration, subsequent test configuration and initial test position procedures are applied. SAR is not required for the following 2.4 GHz OFDM conditions.
a) When KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.
b) 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.

12.1. SAR Test Results of 2.4G Wi-Fi

Test Position (Body 5mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
SISO ANT0								
Front Edge	802.11b	11/2462	18.5	18.11	0.144	0.07	98.85	0.159
Back Edge	802.11b	11/2462	18.5	18.11	0.033	-0.13	98.85	0.037
Left Edge	802.11b	11/2462	18.5	18.11	0.028	-0.15	98.85	0.031
Right Edge	802.11b	11/2462	18.5	18.11	0.020	-0.01	98.85	0.022
Front Edge	802.11b	1/2412	18.5	17.47	0.151	-0.17	98.85	0.194
Front Edge	802.11b	6/2437	18.5	18.05	0.180	-0.16	98.85	0.202
SISO ANT1								
Front Edge	802.11b	6/2437	17.5	17.13	0.098	-0.01	98.85	0.108
Back Edge	802.11b	6/2437	17.5	17.13	0.022	-0.15	98.85	0.024
Left Edge	802.11b	6/2437	17.5	17.13	<0.01	0.00	98.85	<0.01
Right Edge	802.11b	6/2437	17.5	17.13	0.038	-0.07	98.85	0.042
Front Edge	802.11b	1/2412	17.5	16.77	0.086	-0.09	98.85	0.103
Front Edge	802.11b	11/2462	17.5	16.87	0.072	-0.07	98.85	0.084
MIMO								
Front Edge	802.11N40	6/2437	15.5	14.90	0.066	-0.06	90.96	0.083
Back Edge	802.11N40	6/2437	15.5	14.90	0.020	-0.16	90.96	0.025
Left Edge	802.11N40	6/2437	15.5	14.90	0.032	-0.06	90.96	0.040
Right Edge	802.11N40	6/2437	15.5	14.90	0.011	-0.07	90.96	0.014
Front Edge	802.11N40	3/2422	15.5	14.90	0.065	-0.20	90.96	0.082
Front Edge	802.11N40	9/2452	15.5	13.90	0.066	-0.06	90.96	0.105

Test Position (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
SISO ANT0								
Top Edge	802.11b	11/2462	18.5	18.11	1.870	0.04	98.85	2.069
Top Edge	802.11b	1/2412	18.5	17.47	1.500	-0.06	98.85	1.924
Top Edge	802.11b	6/2437	18.5	18.05	1.940	0.08	98.85	2.177
SISO ANT1								
Top Edge	802.11b	6/2437	17.5	17.13	0.835	-0.03	98.85	0.920
Top Edge	802.11b	1/2412	17.5	16.77	0.739	-0.07	98.85	0.884
Top Edge	802.11b	11/2462	17.5	16.87	0.819	0.04	98.85	0.958
MIMO								
Top Edge	802.11N40	6/2437	15.5	15.08	0.694	0.05	90.96	0.840
Top Edge	802.11N40	3/2422	15.5	14.96	0.463	0.02	90.96	0.576
Top Edge	802.11N40	9/2452	15.5	13.90	0.689	0.04	90.96	1.095

Note:
the MIMO power listed above is the worst pair. Scaling factor will be using the individual ratio of maximum power / measured power for the applicable chain when hot spots are separated or the worst ratio when they are overlapping.

12.2. SAR Test Results of 5G Wi-Fi (U-NII-1)

Test Position (Body 5mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
SISO ANT0								
Front Edge	802.11A	36/5180	11.0	9.66	0.033	-0.13	93.46	0.048
Back Edge	802.11A	36/5180	11.0	9.66	0.016	-0.11	93.46	0.023
Left Edge	802.11A	36/5180	11.0	9.66	0.026	0.02	93.46	0.038
Right Edge	802.11A	36/5180	11.0	9.66	0.011	0.08	93.46	0.016
Front Edge	802.11A	40/5200	11.0	9.65	0.031	-0.03	93.46	0.045
Front Edge	802.11A	48/5240	11.0	9.34	0.030	-0.06	93.46	0.047
SISO ANT1								
Front Edge	802.11A	36/5180	13.0	12.69	0.106	-0.09	93.46	0.122
Back Edge	802.11A	36/5180	13.0	12.69	0.014	0.01	93.46	0.016
Left Edge	802.11A	36/5180	13.0	12.69	0.008	0.01	93.46	0.009
Right Edge	802.11A	36/5180	13.0	12.69	0.041	0.09	93.46	0.047
Front Edge	802.11A	40/5200	13.0	12.45	0.089	-0.01	93.46	0.108
Front Edge	802.11A	48/5240	13.0	12.39	0.095	0.05	93.46	0.117
MIMO								
Front Edge	802.11AX80	42/5210	16.5	15.86	0.180	-0.20	64.29	0.243
Back Edge	802.11AX80	42/5210	16.5	15.86	0.045	0.01	64.29	0.061
Left Edge	802.11AX80	42/5210	16.5	15.86	0.057	0.05	64.29	0.077
Right Edge	802.11AX80	42/5210	16.5	15.86	0.080	0.09	64.29	0.108

Test Position (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
SISO ANT0								
Top Edge	802.11A	36/5180	11.0	9.66	0.201	-0.07	93.46	0.293
Top Edge	802.11A	40/5200	11.0	9.65	0.194	-0.05	93.46	0.283
Top Edge	802.11A	48/5240	11.0	9.34	0.191	-0.01	93.46	0.300
SISO ANT1								
Top Edge	802.11A	36/5180	13.0	12.69	0.834	-0.05	93.46	0.958
Top Edge	802.11A	40/5200	13.0	12.45	0.868	-0.01	93.46	1.054
Top Edge	802.11A	48/5240	13.0	12.39	0.849	-0.18	93.46	1.045
MIMO								
Top Edge	802.11AX80	42/5210	16.5	16.11	0.955	0.00	64.29	1.219

Note:
the MIMO power listed above is the worst pair. Scaling factor will be using the individual ratio of maximum power / measured power for the applicable chain when hot spots are separated or the worst ratio when they are overlapping.

12.3. SAR Test Results of 5G Wi-Fi (U-NII-3)

Test Position (Body 5mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (W/Kg)			
SISO ANT0								
Front Edge	802.11A	165/5825	17.0	16.66	0.311	-0.15	93.46	0.360
Back Edge	802.11A	165/5825	17.0	16.66	0.099	0.04	93.46	0.115
Left Edge	802.11A	165/5825	17.0	16.66	0.068	0.01	93.46	0.079
Right Edge	802.11A	165/5825	17.0	16.66	0.049	0.01	93.46	0.057
Front Edge	802.11A	149/5745	17.0	16.47	0.244	-0.15	93.46	0.295
Front Edge	802.11A	157/5785	17.0	16.46	0.291	-0.05	93.46	0.353
SISO ANT1								
Front Edge	802.11A	157/5785	17.0	16.85	0.051	-0.04	93.46	0.056
Back Edge	802.11A	157/5785	17.0	16.85	0.044	0.04	93.46	0.049
Left Edge	802.11A	157/5785	17.0	16.85	0.050	0.11	93.46	0.055
Right Edge	802.11A	157/5785	17.0	16.85	0.094	0.14	93.46	0.104
Front Edge	802.11A	149/5745	17.0	16.43	0.110	-0.04	93.46	0.134
Front Edge	802.11A	165/5825	17.0	16.72	0.045	-0.03	93.46	0.051
MIMO								
Front Edge	802.11N40	151/5755	16.6	16.00	0.214	-0.09	90.57	0.271
Back Edge	802.11N40	151/5755	16.6	16.00	0.110	0.02	90.57	0.139
Left Edge	802.11N40	151/5755	16.6	16.00	0.110	0.05	90.57	0.139
Right Edge	802.11N40	151/5755	16.6	16.00	0.099	0.01	90.57	0.126
Front Edge	802.11N40	159/5795	18.0	17.35	0.303	-0.08	90.57	0.389

Test Position (Limb 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle (%)	Scaled (W/Kg)
			Tune-up	Meas.	10-g (W/Kg)			
SISO ANT0								
Top Edge	802.11A	165/5825	17.0	16.66	1.880	-0.02	93.46	2.175
Top Edge	802.11A	149/5745	17.0	16.47	1.900	-0.05	93.46	2.297
Top Edge	802.11A	157/5785	17.0	16.46	1.860	0.04	93.46	2.254
SISO ANT1								
Top Edge	802.11A	157/5785	17.0	16.85	1.290	-0.01	93.46	1.429
Top Edge	802.11A	149/5745	17.0	16.43	1.260	0.02	93.46	1.537
Top Edge	802.11A	165/5825	17.0	16.72	1.330	-0.03	93.46	1.518
MIMO								
Top Edge	802.11N40	151/5755	18.0	17.58	1.660	-0.07	90.57	2.019
Top Edge	802.11N40	159/5795	18.0	17.35	1.570	-0.01	90.57	2.013

Note:
the MIMO power listed above is the worst pair. Scaling factor will be using the individual ratio of maximum power / measured power for the applicable chain when hot spots are separated or the worst ratio when they are overlapping.

13. Simultaneous Transmission SAR Analysis

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.

The ANT 0 supports 2.4GHz, 5GHz Wi-Fi, ANT 1 supports 2.4GHz and 5GHz Wi-Fi and BT, they can’t work at the same time, so simultaneous transmission doesn’t exist.

Appendixes

Refer to separated files for the following appendixes.

4790686575.6-SAR-2_App A Photo

4790686575.6-SAR-2_App B System Check Plots

4790686575.6-SAR-2_App C Highest Test Plots

4790686575.6-SAR-2_App D Cal. Certificates

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