SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std. 1528-2013

For
Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2 Type Card

FCC ID: PPD-QCNFA435
Model Name: QCNFA435

Report Number: 4788397884.1-1-11

Issue Date: April 20, 2018

Prepared for
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Revision History

Rev.	Date	Revisions	Revised By
V1.0	April 20, 2018	Initial Issue	\

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1. Attestation of Test Results

Applicant Name	Qualcomm Atheros, Inc.	
Address	1700 Technology Drive, San Jose, CA 95110	
Manufacturer	Qualcomm Atheros, Inc.	
Address	1700 Technology Drive, San Jose, CA 95110	
EUT Name	Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2 Type Card	
Model Name	QCNFA435	
Sample Status	Normal	
Brand	Qualcomm Atheros	
Host Equipment	Laptop PC	
Band Name	Lenovo	
Host Model	Lenovo Legion Y530-15ICH	
Power Adapter	Input: AC 100~240V, 2.5A, 50~60Hz Output: DC 20V, 6.75A	
Battery	11.25V, 4535mAh	
Sample Received Date	March 14, 2018	
Date of Tested	April 4, 2018 to April 7, 2018	
Applicable Standards	FCC 47 CFR § 2.1093 IEEE Std. 1528-2013 KDB publication	
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**	**DSS**
Body (1-g)	1.380	0.781	\
Test Results	Pass	
Tested By: James Qin Engineer Project Associate	Reviewed By: Shawn Wen Laboratory Leader	Approved By: 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
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 616217 D04 SAR for laptop and tablets

3. Facilities and Accreditation

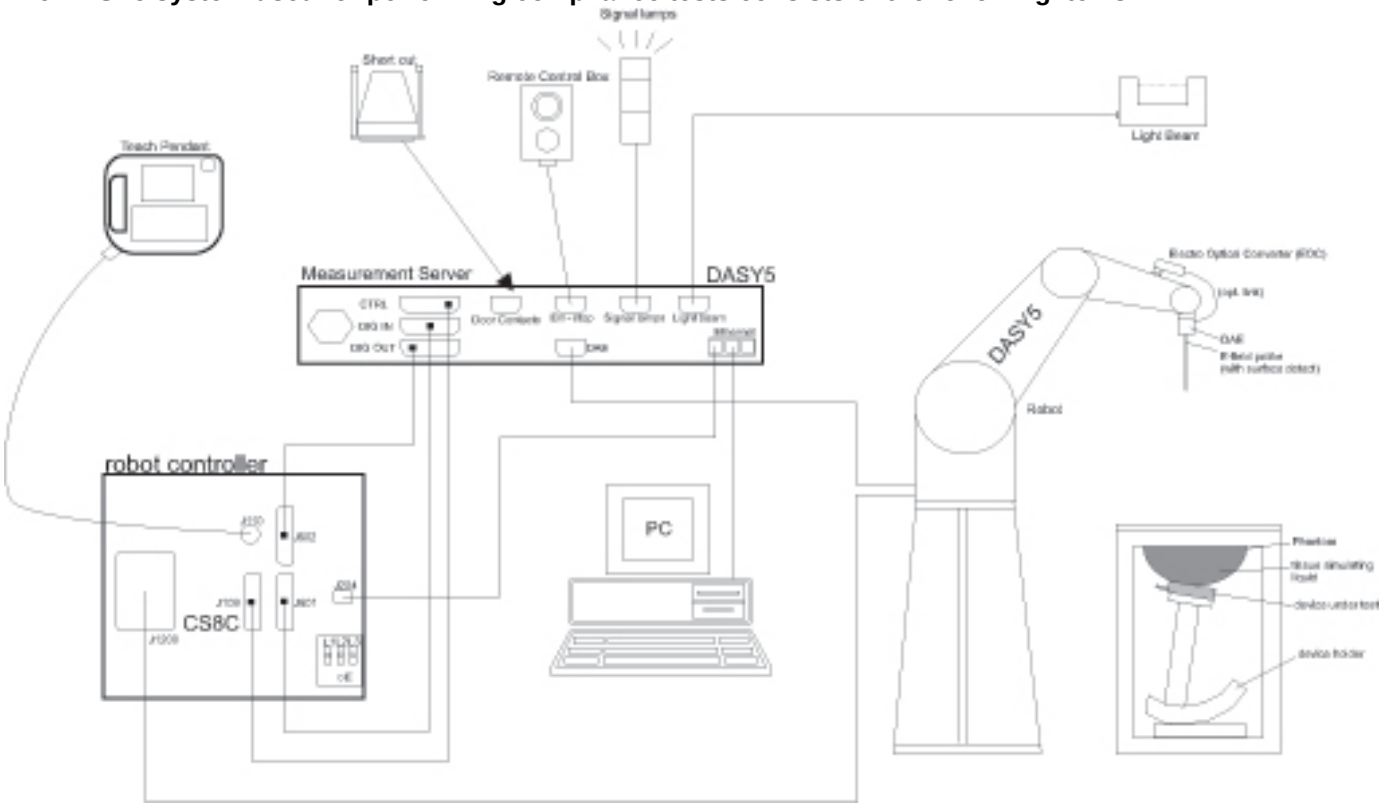
The test site and measurement facilities used to collect data are located at

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	The Laboratory has been assessed and proved to be in compliance with IAS & A2LA. Laboratory code is TL-702 & 4102.01 respectively.
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 DASY5 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 Win7 and the DASY52 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 ± 1 mm	½·δ·ln(2) ± 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

			≤ 3 GHz	> 3 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·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the *reported* SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

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
ENA Network Analyzer	Keysight	E5080A	MY55100583	December 11, 2018
Dielectric Probe kit	SPEAG	SM DAK 040 SA	1155	NCR
DC power supply	Keysight	E36103A	MY55350020	December 11, 2018
Signal Generator	Rohde & Schwarz	SME06	837633\001	March 23, 2019
BI-Directional Coupler	WERLATONE	C8060-102	3423	December 11, 2018
Peak and Average Power Sensor	Keysight	E9323A	MY55440013	December 11, 2018
Peak and Average Power Sensor	Keysight	E9323A	MY55420006	December 11, 2018
Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	December 11, 2018
Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600-50-30P	1983561	NCR
Dosimetric E-Field Probe	SPEAG	EX3DV4	7383	December 13, 2018
Data Acquisition Electronic	SPEAG	DAE3	427	December 3, 2018
Dipole Kit 2450 MHz	SPEAG	D2450V2	977	January 13, 2019
Dipole Kit 5 GHz	SPEAG	D5GHzV2	1231	January 12, 2019
Software	SPEAG	DASY52	N/A	NCR
Twin Phantom	SPEAG	SAM V5.0	1805	NCR
ELI Phantom	SPEAG	ELI V5.0	1235	NCR
Thermometer	Control Company	4242	150709653	December 11, 2018
Thermometer	VICTOR	VC230	/	December 11, 2018

Note:
1) Per KDB865664D01 v01r04 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
a) There is no physical damage on the dipole;
b) System check with specific dipole is within 10% of calibrated value;
c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.
2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

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, the extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

6. Device Under Test (DUT) Information

6.1. DUT Description

The EUT is a wireless module with IEEE 802.11a/b/g/n/ac, and BT radio.	
Device Dimension	Overall (Length x Width x Height): 30 mm x 12 mm x 3 mm
Host Dimension	Overall (Length x Width x Height): 360 mm x 265 mm x 25 mm

6.2. Wireless Technology

Wireless technology	Frequency band
Wi-Fi	2.4 GHz
Wi-Fi	5 GHz
BT	2.4 GHz

7. SAR Test Configuration

As per KDB 616217 D04, when antennas are incorporated in the keyboard section of a laptop computer, SAR is required for the bottom surface of the keyboard. Provided tablet use conditions are not supported by the laptop computer, SAR tests for bystander exposure from the edges of the keyboard and display screen of laptop computers are generally not required.

8. Conducted Output Power Measurement and tune-up tolerance

8.1. 2.4GHz Wi-Fi

Band	Antenna	Mode	Ch.#	Rate(Mbps)	Freq.(MHz)	Meas. Avg. Pwr.(dBm)	Tune-up(dBm)
2.4G	Main	b	1	1	2412	20.07	20.5
			6		2437	20.32	20.5
			11		2462	20.23	20.5
		g	1	6	2412	16.27	17.5
			6		2437	18.26	19.5
			11		2462	16.30	18.0
		n20	1	6.5	2412	16.43	17.5
			6		2437	18.21	19.5
			11		2462	15.11	17.0
		n40	3	7.2	2422	15.40	16.5
			6		2437	17.27	18.5
			9		2452	13.31	15.0
	Aux	b	1	1	2412	20.21	20.5
			6		2437	20.35	20.5
			11		2462	20.24	20.5
		g	1	6	2412	16.73	17.5
			6		2437	18.56	19.5
			11		2462	16.65	18.0
		n20	1	6.5	2412	16.49	17.5
			6		2437	18.36	19.5
			11		2462	15.24	17.0
		n40	3	7.2	2422	15.34	16.5
			6		2437	17.56	18.5
			9		2452	13.52	15.0

8.1. 5GHz Wi-Fi (U-NII-1)

Band	Antenna	Mode	Ch.#	Rate(Mbps)	Freq.(MHz)	Meas. Avg. Pwr.(dBm)	Tune-up(dBm)
5.2G	Main	a	36	6	5180	15.11	15.5
			40		5200	16.84	17.0
			44		5220	16.75	17.0
			48		5240	16.93	17.0
		n20	36	MCS0	5180	14.59	15.5
			40		5200	15.06	17.0
			44		5220	15.32	17.0
			48		5240	15.61	17.0
		n40	38	MCS0	5190	11.45	12.0
			46		5230	15.34	16.0
		ac	36	6	5180	14.67	15.5
			40		5200	15.55	17.0
			44		5220	15.68	17.0
			48		5240	15.91	17.0
		ac40	38	MCS0	5190	11.37	12.0
			46		5230	14.86	16.0
		ac80	42	MCS0	5210	12.17	14.0
	Aux	a	36	6	5180	15.10	15.5
			40		5200	16.76	17.0
			44		5220	16.67	17.0
			48		5240	16.79	17.0
		n20	36	MCS0	5180	13.76	15.5
			40		5200	15.31	17.0
			44		5220	15.72	17.0
			48		5240	15.80	17.0
		n40	38	MCS0	5190	11.17	12.0
			46		5230	14.79	16.0
		ac	36	6	5180	14.35	15.5
			40		5200	15.21	17.0
			44		5220	15.08	17.0
			48		5240	15.25	17.0
		ac40	38	MCS0	5190	11.35	12.0
			46		5230	14.72	16.0
		ac80	42	MCS0	5210	12.39	14.0

8.2. 5GHz Wi-Fi (U-NII-2A)

Band	Antenna	Mode	Ch.#	Rate(Mbps)	Freq.(MHz)	Meas. Avg. Pwr.(dBm)	Tune-up(dBm)
5.3G	Main	a	52	6	5260	16.76	17.0
			56		5280	16.77	17.0
			60		5300	16.51	17.0
			64		5320	14.37	16.0
		n20	52	MCS0	5260	15.46	17.0
			56		5280	14.95	16.0
			60		5300	15.07	17.0
			64		5320	13.60	15.0
		n40	54	MCS0	5270	14.18	16.0
			62		5310	11.80	13.0
		ac	52	6	5260	15.59	17.0
			56		5280	15.46	16.0
			60		5300	15.18	17.0
			64		5320	13.30	15.0
		ac40	54	MCS0	5270	14.24	16.0
			62		5310	11.34	13.0
		ac80	58	MCS0	5290	11.26	12.0
	Aux	a	52	6	5260	16.78	17.0
			56		5280	16.67	17.0
			60		5300	16.82	17.0
			64		5320	14.42	16.0
		n20	52	MCS0	5260	15.61	17.0
			56		5280	15.42	16.0
			60		5300	15.24	17.0
			64		5320	13.38	15.0
		n40	54	MCS0	5270	14.06	16.0
			62		5310	11.36	13.0
		ac	52	6	5260	15.49	17.0
			56		5280	15.34	16.0
			60		5300	15.13	17.0
			64		5320	13.37	15.0
		ac40	54	MCS0	5270	14.06	16.0
			62		5310	11.82	13.0
		ac80	58	MCS0	5290	10.54	12.0

8.3. 5GHz Wi-Fi (U-NII-2C)

Band	Antenna	Mode	Ch.#	Rate(Mbps)	Freq.(MHz)	Meas. Avg. Pwr.(dBm)	Tune-up(dBm)
5.5G	Main	a	100	6	5500	14.83	15.0
			104		5520	16.38	17.0
			108		5540	16.97	17.0
			112		5560	16.31	17.0
			116		5580	16.92	17.0
			120		5600	16.35	17.0
			124		5620	16.61	17.0
			128		5640	16.58	17.0
			132		5660	16.03	17.0
			136		5680	16.58	17.0
			140		5700	14.28	14.5
			144		5720	16.59	17.0
		n20	100	MCS0	5500	13.34	15.0
			104		5520	15.25	17.0
			108		5540	15.19	17.0
			112		5560	15.30	17.0
			116		5580	15.65	17.0
			120		5600	15.39	17.0
			124		5620	15.52	17.0
			128		5640	16.17	17.0
			132		5660	16.35	17.0
			136		5680	16.69	17.0
			140		5700	14.94	15.0
			144		5720	16.23	17.0
		n40	102	MCS0	5510	12.12	13.0
			110		5550	14.42	16.0
			118		5590	14.87	16.0
			126		5630	15.82	16.0
			134		5670	15.35	15.5
			142		5710	15.70	16.0
		ac	100	6	5500	13.52	15.0
			104		5520	15.45	17.0
			108		5540	15.55	17.0
			112		5560	15.43	17.0
			116		5580	15.72	17.0
			120		5600	15.36	17.0
			124		5620	15.58	17.0
			128		5640	16.50	17.0
			132		5660	16.48	17.0
			136		5680	16.53	17.0
			140		5700	16.56	15.0
			144		5720	16.32	17.0
		ac40	102	MCS0	5510	12.89	13.0
			110		5550	14.94	16.0
			118		5590	15.35	16.0
			126		5630	15.71	16.0

			134		5670	15.81	15.5
			142		5710	15.74	16.0
		ac80	106	MCS0	5530	11.73	12.0
			122		5610	14.28	16.0
			138		5690	15.29	16.0
	Aux	a	100	6	5500	14.71	15.0
			104		5520	16.23	17.0
			108		5540	16.80	17.0
			112		5560	16.39	17.0
			116		5580	16.85	17.0
			120		5600	16.21	17.0
			124		5620	16.35	17.0
			128		5640	16.44	17.0
			132		5660	16.17	17.0
			136		5680	16.67	17.0
			140		5700	14.24	14.5
			144		5720	16.64	17.0
		n20	100	MCS0	5500	14.16	15.0
			104		5520	15.38	17.0
			108		5540	15.67	17.0
			112		5560	15.36	17.0
			116		5580	15.50	17.0
			120		5600	15.39	17.0
			124		5620	15.42	17.0
			128		5640	16.46	17.0
			132		5660	16.30	17.0
			136		5680	16.33	17.0
			140		5700	16.66	15.0
			144		5720	16.11	17.0
		n40	102	MCS0	5510	12.49	13.0
			110		5550	14.81	16.0
			118		5590	15.08	16.0
			126		5630	15.69	16.0
			134		5670	14.95	15.5
			142		5710	15.27	16.0
		ac	100	6	5500	14.71	15.0
			104		5520	15.63	17.0
			108		5540	15.32	17.0
			112		5560	15.29	17.0
			116		5580	15.72	17.0
			120		5600	15.76	17.0
			124		5620	15.55	17.0
			128		5640	15.78	17.0
			132		5660	15.96	17.0
			136		5680	16.04	17.0
			140		5700	14.56	15.0
			144		5720	15.75	17.0
		ac40	102	MCS0	5510	12.50	13.0
			110		5550	14.82	16.0

			118		5590	15.21	16.0
			126		5630	15.58	16.0
			134		5670	15.14	15.5
			142		5710	15.25	16.0
		ac80	106	MCS0	5530	11.34	12.0
			122		5610	14.67	16.0
			138		5690	14.96	16.0

8.4. 5GHz Wi-Fi (U-NII-3)

Band	Antenna	Mode	Ch.#	Rate(Mbps)	Freq.(MHz)	Meas. Avg. Pwr.(dBm)	Tune-up(dBm)
5.8G	Main	a	149	6	5745	16.78	17.0
			153		5765	16.65	17.0
			157		5785	16.83	17.0
			161		5805	16.14	17.0
			165		5825	16.32	17.0
		n20	149	MCS0	5745	15.58	17.0
			153		5765	15.20	17.0
			157		5785	15.29	17.0
			161		5805	15.64	17.0
			165		5825	15.28	17.0
		n40	151	MCS0	5755	14.17	15.0
			159		5795	14.65	16.0
		ac20	149	6	5745	15.62	17.0
			153		5765	15.42	17.0
			157		5785	15.22	17.0
			161		5805	15.73	17.0
			165		5825	15.46	17.0
		ac40	151	MCS0	5755	14.23	15.0
			159		5795	14.32	16.0
		ac80	155	MCS0	5775	12.68	14.5
	Aux	a	149	6	5745	16.58	17.0
			153		5765	16.75	17.0
			157		5785	16.61	17.0
			161		5805	16.29	17.0
			165		5825	16.20	17.0
		n20	149	MCS0	5745	15.50	17.0
			153		5765	15.09	17.0
			157		5785	15.18	17.0
			161		5805	15.06	17.0
			165		5825	15.08	17.0
		n40	151	MCS0	5755	14.16	15.0
			159		5795	14.33	16.0
		ac20	149	6	5745	15.69	17.0
			153		5765	15.39	17.0
			157		5785	15.15	17.0
			161		5805	15.24	17.0

			165		5825	15.28	17.0
		ac40	151	MCS0	5755	14.02	15.0
			159		5795	14.46	16.0
		ac80	155	MCS0	5775	12.93	14.5

8.5. BT

Band	Mode	Antenna	Average Conducted Power (dBm)			Tune-up
			0CH	39CH	78CH	
2.4G	DH5	Main	2.35	2.86	3.21	6.0
		Aux	2.23	2.85	3.06	6.0
	3DH5	Main	-0.04	0.55	0.84	6.0
		Aux	-1.28	-0.65	-0.44	6.0

Band	Mode	Antenna	Average Conducted Power (dBm)			Tune-up
			0CH	19CH	39CH	
2.4G	BLE	Main	-4.45	-3.95	-3.76	6.0
		Aux	-1.92	-1.64	-1.66	6.0

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.

9. RF Exposure Conditions

The antenna location diagram inside the device can be found in App A.

Per FCC KDB 447498D01:
1. The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for product specific 10-g SAR, where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. The SAR exclusion threshold for distances >50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:
a) at 100 MHz to 1500 MHz
[Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW
b) at > 1500 MHz and ≤ 6 GHz
[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW

For BT 1-g SAR

Mode	Frequency	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculated Result	Threshold	SAR Test
2.4G	2480	6.0	3.98	13.20	0.5	3.0	Excluded

Note:
Because the calculated result is less than the threshold, so SAR evaluation for BT 1-g SAR is not required.

10. Dielectric Property Measurements & System Check

10.1. 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				Delta(%)		Limit (%)	Temp. (℃)	Test Date
		Measured		Target						
		ϵ_r	σ	ϵ_r	σ	ϵ_r	σ			
Body 2450	2360	53.06	1.89	52.82	1.86	-0.02	2.96	±5	21.8	April 4, 2018
	2450	52.78	1.98	52.70	1.95	-0.32	3.18	±5		
	2540	52.53	2.08	52.59	2.08	-0.59	1.54	±5		
Body 5250	5160	50.25	5.43	49.07	5.25	1.69	2.88	±5	22.3	April 6, 2018
	5250	49.96	5.48	48.95	5.36	1.35	1.66	±5		
	5340	49.90	5.66	48.96	5.46	1.21	2.99	±5		
Body 5600	5500	48.53	5.59	48.59	5.66	0.35	-0.64	±5	21.7	April 7, 2018
	5600	48.54	5.74	48.47	5.77	0.62	0.16	±5		
	5700	48.33	5.89	48.35	5.87	0.43	0.92	±5		
Body 5750	5660	48.98	5.87	48.39	5.84	0.17	-0.29	±5	21.7	April 7, 2018
	5750	48.90	5.99	48.27	5.94	0.23	0.12	±5		
	5840	48.65	6.11	48.16	6.03	-0.04	0.55	±5		

10.2. 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)					
Body 2450	1g	12.600	50.40	51.70	2.13	±10	21.8	April 4, 2018
	10g	5.980	23.92	24.30	2.55			
Body 5250	1g	7.270	72.70	76.10	1.97	±10	22.1	April 6, 2018
	10g	2.050	20.50	21.40	2.80			
Body 5600	1g	8.290	82.90	80.40	0.50	±10	21.8	April 7, 2018
	10g	2.330	23.30	22.50	-0.44			
Body 5750	1g	8.270	82.70	77.00	0.13	±10	21.8	April 7, 2018
	10g	2.340	23.40	21.50	0.00			

11. 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 the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 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.

11.1. SAR Test Results of 2.4G Wi-Fi with ICT antenna platform

Test Position (Body 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Zoom Scan)			
Main ANT								
Bottom Surface	802.11 b	6/2437	20.50	20.32	1.040	0.14	100.0	1.084
Bottom Surface	802.11 b	1/2412	20.50	20.07	0.937	-0.09	100.0	1.035
Bottom Surface	802.11 b	11/2462	20.50	20.23	0.833	-0.01	100.0	0.886
Bottom Surface-repeated	802.11 b	6/2437	20.50	20.32	1.070	0.08	100.0	1.115
Aux ANT								
Bottom Surface	802.11 b	6/2437	20.50	20.35	1.070	-0.05	100.0	1.108
Bottom Surface	802.11 b	1/2412	20.50	20.21	1.010	0.10	100.0	1.080
Bottom Surface	802.11 b	11/2462	20.50	20.24	1.300	-0.02	100.0	1.380
Bottom Surface-repeated	802.11 b	11/2462	20.50	20.24	1.260	0.01	100.0	1.338

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for main ANT

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11b	20.5	112.20	1.115	\	\
802.11g	19.5	89.13	\	0.886	Excluded
802.11n (20M)	19.5	89.13	\	0.886	Excluded
802.11n (40M)	18.5	70.79	\	0.704	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for aux ANT

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11b	20.5	112.20	1.380	\	\
802.11g	19.5	89.13	\	1.096	Excluded
802.11n (20M)	19.5	89.13	\	1.096	Excluded
802.11n (40M)	18.5	70.79	\	0.871	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

11.2. SAR Test Results of 2.4G Wi-Fi with SPD antenna platform

Test Position (Body 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Zoom Scan)			
Main ANT								
Bottom Surface	802.11 b	6/2437	20.50	20.32	0.860	-0.07	100.0	0.896
Bottom Surface	802.11 b	1/2412	20.50	20.07	0.868	0.15	100.0	0.958
Bottom Surface	802.11 b	11/2462	20.50	20.23	0.661	0.09	100.0	0.703
Bottom Surface-repeated	802.11 b	1/2412	20.50	20.07	0.896	0.17	100.0	0.989
Aux ANT								
Bottom Surface	802.11 b	6/2437	20.50	20.35	1.010	-0.14	100.0	1.045
Bottom Surface	802.11 b	1/2412	20.50	20.21	0.883	-0.05	100.0	0.944
Bottom Surface	802.11 b	11/2462	20.50	20.24	0.909	-0.04	100.0	0.965
Bottom Surface-repeated	802.11 b	6/2437	20.50	20.35	0.842	-0.03	100.0	0.872

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for main ANT

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11b	20.5	112.20	0.989	\	\
802.11g	19.5	89.13	\	0.786	Excluded
802.11n (20M)	19.5	89.13	\	0.786	Excluded
802.11n (40M)	18.5	70.79	\	0.624	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for aux ANT

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11b	20.5	112.20	1.045	\	\
802.11g	19.5	89.13	\	0.830	Excluded
802.11n (20M)	19.5	89.13	\	0.830	Excluded
802.11n (40M)	18.5	70.79	\	0.659	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

11.3. SAR Test Results of 5G Wi-Fi with ICT antenna platform

Test Position (Body 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Zoom Scan)			
Main ANT								
U-NII-2A								
Bottom Surface	802.11 a	56/5280	17.00	16.77	0.646	-0.09	99.4	0.681
U-NII-2C								
Bottom Surface	802.11 a	108/5540	17.00	16.97	0.776	-0.15	99.4	0.781
U-NII-3								
Bottom Surface	802.11 a	157/5785	17.00	16.83	0.366	-0.19	99.4	0.381
Aux ANT								
U-NII-2A								
Bottom Surface	802.11 a	60/5300	17.00	16.82	0.403	0.18	99.4	0.420
U-NII-2C								
Bottom Surface	802.11 a	116/5580	17.00	16.85	0.472	-0.15	99.4	0.489
U-NII-3								
Bottom Surface	802.11 a	153/5765	17.00	16.75	0.364	-0.19	99.4	0.386

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.681	\	\
802.11n 20M	17	50.12	\	0.681	Excluded
802.11n 40M	16	39.81	\	0.541	Excluded
802.11ac 20M	17	50.12	\	0.681	Excluded
802.11ac 40M	16	39.81	\	0.541	Excluded
802.11ac 80M	12	15.85	\	0.215	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.781	\	\
802.11n 20M	17	50.12	\	0.781	Excluded
802.11n 40M	16	39.81	\	0.620	Excluded
802.11ac 20M	17	50.12	\	0.781	Excluded
802.11ac 40M	16	39.81	\	0.620	Excluded
802.11ac 80M	16	39.81	\	0.620	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.381	\	\
802.11n 20M	17	50.12	\	0.381	Excluded
802.11n 40M	16	39.81	\	0.303	Excluded
802.11ac 20M	17	50.12	\	0.381	Excluded
802.11ac 40M	16	39.81	\	0.303	Excluded
802.11ac 80M	14.5	28.18	\	0.214	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.420	\	\
802.11n 20M	17	50.12	\	0.420	Excluded
802.11n 40M	16	39.81	\	0.334	Excluded
802.11ac 20M	17	50.12	\	0.420	Excluded
802.11ac 40M	16	39.81	\	0.334	Excluded
802.11ac 80M	12	15.85	\	0.133	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.489	\	\
802.11n 20M	17	50.12	\	0.489	Excluded
802.11n 40M	16	39.81	\	0.388	Excluded
802.11ac 20M	17	50.12	\	0.489	Excluded
802.11ac 40M	16	39.81	\	0.388	Excluded
802.11ac 80M	16	39.81	\	0.388	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.386	\	\
802.11n 20M	17	50.12	\	0.386	Excluded
802.11n 40M	16	39.81	\	0.307	Excluded
802.11ac 20M	17	50.12	\	0.386	Excluded
802.11ac 40M	16	39.81	\	0.307	Excluded
802.11ac 80M	14.5	28.18	\	0.217	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

11.1. SAR Test Results of 5G Wi-Fi with SPD antenna platform

Test Position (Body 0mm)	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value	Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Zoom Scan)			
Main ANT.								
U-NII-2A								
Bottom Surface	802.11 a	56/5280	17.00	16.77	0.286	-0.18	99.4	0.302
U-NII-2C								
Bottom Surface	802.11 a	108/5540	17.00	16.97	0.233	-0.14	99.4	0.235
U-NII-3								
Bottom Surface	802.11 a	157/5785	17.00	16.83	0.264	-0.05	99.4	0.275
Aux ANT.								
U-NII-2A								
Bottom Surface	802.11 a	60/5300	17.00	16.82	0.302	-0.03	99.4	0.315
U-NII-2C								
Bottom Surface	802.11 a	116/5580	17.00	16.85	0.292	-0.09	99.4	0.302
U-NII-3								
Bottom Surface	802.11 a	153/5765	17.00	16.75	0.254	-0.17	99.4	0.269

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.302	\	\
802.11n 20M	17	50.12	\	0.302	Excluded
802.11n 40M	16	39.81	\	0.240	Excluded
802.11ac 20M	17	50.12	\	0.302	Excluded
802.11ac 40M	16	39.81	\	0.240	Excluded
802.11ac 80M	12	15.85	\	0.096	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.235	\	\
802.11n 20M	17	50.12	\	0.235	Excluded
802.11n 40M	16	39.81	\	0.187	Excluded
802.11ac 20M	17	50.12	\	0.235	Excluded
802.11ac 40M	16	39.81	\	0.187	Excluded
802.11ac 80M	16	39.81	\	0.187	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for main ANT (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.275	\	\
802.11n 20M	17	50.12	\	0.275	Excluded
802.11n 40M	16	39.81	\	0.218	Excluded
802.11ac 20M	17	50.12	\	0.275	Excluded
802.11ac 40M	16	39.81	\	0.218	Excluded
802.11ac 80M	14.5	28.18	\	0.155	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.315	\	\
802.11n 20M	17	50.12	\	0.315	Excluded
802.11n 40M	16	39.81	\	0.250	Excluded
802.11ac 20M	17	50.12	\	0.315	Excluded
802.11ac 40M	16	39.81	\	0.250	Excluded
802.11ac 80M	12	15.85	\	0.100	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.302	\	\
802.11n 20M	17	50.12	\	0.302	Excluded
802.11n 40M	16	39.81	\	0.240	Excluded
802.11ac 20M	17	50.12	\	0.302	Excluded
802.11ac 40M	16	39.81	\	0.240	Excluded
802.11ac 80M	16	39.81	\	0.240	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for aux ANT (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR 1-g (W/Kg)	Adjusted SAR 1-g (W/Kg)	SAR test
802.11a	17	50.12	0.269	\	\
802.11n 20M	17	50.12	\	0.269	Excluded
802.11n 40M	16	39.81	\	0.214	Excluded
802.11ac 20M	17	50.12	\	0.269	Excluded
802.11ac 40M	16	39.81	\	0.214	Excluded
802.11ac 80M	14.5	28.18	\	0.151	Excluded

Note:

The 802.11a mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration 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 test for the other 802.11 modes are not required.

12. 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 main ANT and aux ANT both supports 2.4G Wi-Fi, 5G Wi-Fi and BT, but they can't both work at the same time, and 2.4G Wi-Fi, 5G Wi-Fi and BT share a same antenna, so simultaneous transmission doesn't exist.

Appendixes

Refer to separated files for the following appendixes.

4788397884.1-1-11 _App A Photo

4788397884.1-1-11_App B System Check Plots

4788397884.1-1-11_App C Highest Test Plots

4788397884.1-1-11_App D Cal. Certificates

---------End of Report----------