SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std. 1528-2013

For
USB Dongle

FCC ID: 2AMM6-8822BU
Model: EWN-8822BUN2AA

Report Number: 4789730758-SAR

Issue Date: January 20, 2021

Prepared for
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Prepared by
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Revision History

Rev.	Date	Revisions	Revised By
V1.0	January 20, 2021	Initial Issue	\

Note:

1. The Measurement result for the sample received is<Pass> according to < IEEE Std. 1528-2013> when <Accuracy Method> decision rule is applied.
2. This report is only published to and used by the applicant, and it is not for evidence purpose in China.

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1. Attestation of Test Results

Applicant Name	Earda Technologies Co.,Ltd		
Address	Block A, LianFeng Creative Industry Park,2 JiSheng Road., HuangGe Town, NanSha District, Guangzhou China		
Manufacturer	Earda Technologies Co.,Ltd		
Address	Block A, LianFeng Creative Industry Park,2 JiSheng Road., HuangGe Town, NanSha District, Guangzhou China		
EUT Name	USB Dongle		
Model	EWN-8822BUN2AA		
Sample Status	Normal		
Sample Received Date	January 05, 2021		
Date of Tested	January 06~ 16, 2020		
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**		
	DSS	**DTS**	**U-NII**
Body (1-g)	0.546	1.037	1.197
Simultaneous Transmission (1-g)	1.579		
Test Results	Pass		
Prepared By: Jacky Jiang 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
- 447498 D02 SAR Procedures for Dongle Xmtr
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting

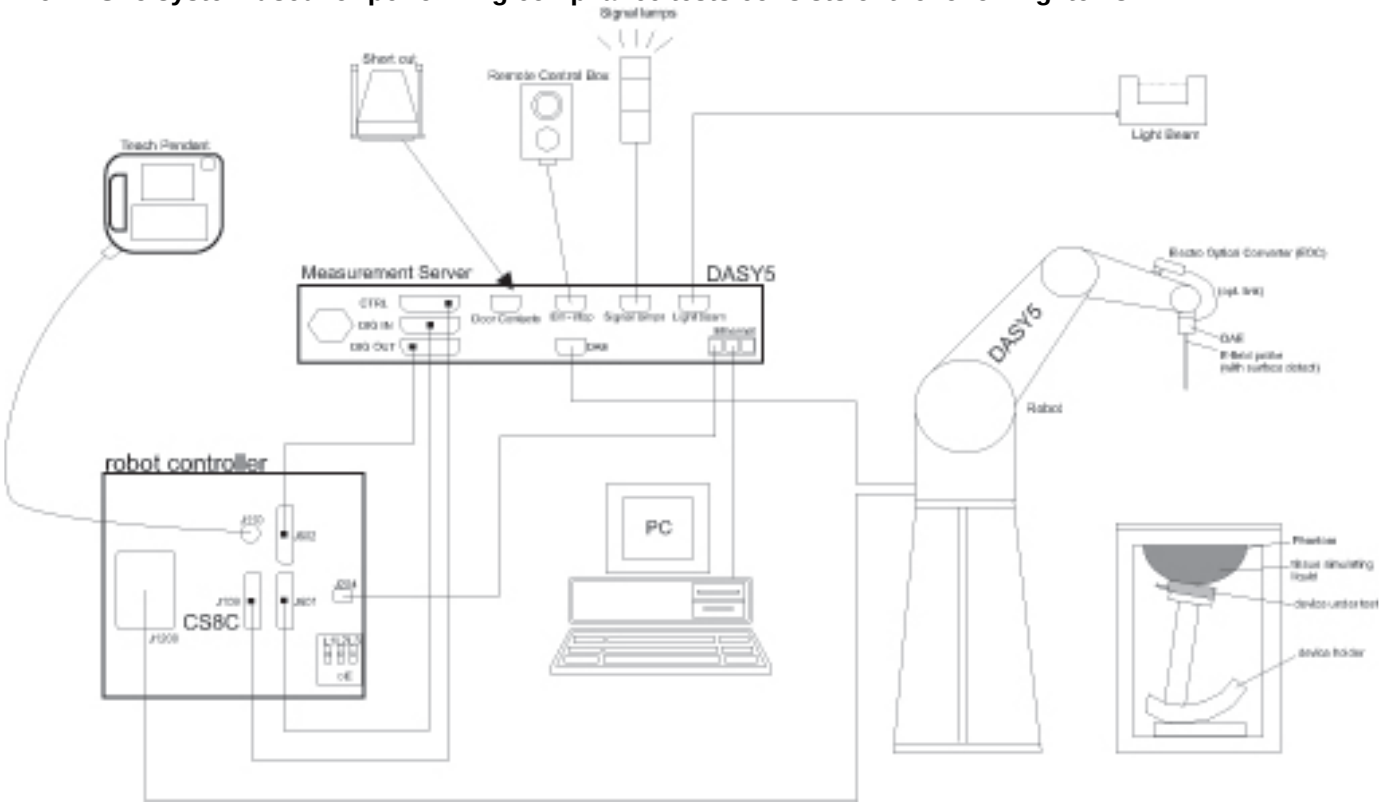
3. Facilities and Accreditation

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 **IC(Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** 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-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011
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

<table>
<tr><td></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

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	2021.12.04
Dielectric Probe kit	SPEAG	SM DAK 040 SA	1155	NCR
DC power supply	Keysight	E36103A	MY55350020	2021.12.04
Signal Generator	Rohde & Schwarz	SME06	837633\001	2021.12.04
BI-Directional Coupler	WERLATONE	C8060-102	3423	2021.12.04
Peak and Average Power Sensor	Keysight	E9323A	MY55440013	2021.12.05
Peak and Average Power Sensor	Keysight	E9323A	MY55420006	2021.12.05
Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	2021.12.05
Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600-50-30P	1983561	NCR
Dosimetric E-Field Probe	SPEAG	EX3DV4	7383	2021.11.30
Data Acquisition Electronic	SPEAG	DAE3	427	2021.3.30
Dipole Kit 2450 MHz	SPEAG	D2450V2	977	2021.12.04
Dipole Kit 5 GHz	SPEAG	D5GHzV2	1231	2021.12.07
Software	SPEAG	DASY52	N/A	NCR
Twin Phantom	SPEAG	SAM V5.0	1805	NCR
ELI Phantom	SPEAG	ELI V5.0	1235	NCR
Thermometer	/	GX-138	150709653	2021.12.09
Thermometer	VICTOR	ITHX-SD-5	18470005	2021.12.10

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 and 10-g SAR within a frequency band is < 3.75 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 DUT is a USB Dongle with IEEE 802.11a/b/g/n/ac radio and bluetooth	
Dimension	The device is with a rotating antenna

6.2. Wireless Technology

Wireless technology	Frequency band
Wi-Fi	2.4 GHz
Wi-Fi	5 GHz U-NII-1 and U-NII-3 Band
Bluetooth	2.4GHz

7. Conducted Output Power Measurement and tune-up tolerance

7.1. Power measurement result of 2.4GHz Wi-Fi.

Mode	Channel	Frequency (MHz)	Data Rate	ANT0		ANT1		SAR Test	Duty Cycle (%)
				Average Power (dBm)	Tune-up Limit (dBm)	Average Power (dBm)	Tune-up Limit (dBm)		
802.11b	1	2412	1Mbps	14.05	14.5	14.17	14.5	Required	99.27
	6	2437		12.56	14.5	13.85	14.5		
	11	2462		13.21	14.5	13.62	14.5		
802.11g	1	2412	6Mbps	NMR	11.0	NMR	11.5	Excluded	\
	6	2437							
	11	2462							
802.11n20	1	2412	HT0		8.0		11.0	Excluded	
	6	2437			10.0				
	11	2462							
802.11n40	3	2422	HT0		10.5		11.0	Excluded	
	6	2437							
	9	2452							

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

Mode	Channel	Frequency (MHz)	Data Rate	ANT0		ANT1		SAR Test	Duty Cycle %
				Average power (dBm)	Tune-up Limit	Average power (dBm)	Tune-up Limit		
802.11a-20	36	5180	6Mbps	16.40	16.5	15.15	15.5	Required	96.45
	40	5200		16.06		14.92			
	48	5240		15.92		14.82			
802.11n-HT20	36	5180	MCS0	NMR	10.0	NMR	10.5	Excluded	\
	40	5200							
	48	5240							
802.11n-HT40	38	5190	MCS0		12.5		12.5	Excluded	\
	46	5230							
802.11ac-VHT20	36	5180	MCS0		10.0		10.0	Excluded	\
	40	5200							
	48	5240							
802.11ac-VHT40	38	5190	MCS0		12.5		12.5	Excluded	\
	46	5230							
802.11ac-VHT80	42	5210	MCS0		10.5		10.5	Excluded	\

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

Mode	Channel	Frequency (MHz)	Data Rate	ANT0		ANT1		SAR Test	Duty Cycle %
				Average power (dBm)	Tune-up Limit	Average power (dBm)	Tune-up Limit		
802.11a-20	149	5745	6Mbps	15.35	16.0	16.57	17.0	Required	96.45
	153	5765		15.09		15.97			
	157	5785		15.57		16.60			
	161	5805		15.16		16.12			
	165	5825		15.55		16.50			
802.11n-HT20	149	5745	MCS0	Not Required	15.0	Not Required	16.0	Excluded	\
	153	5765							
	157	5785							
	161	5805							
	165	5825							
802.11n-HT40	151	5755	MCS0		14.5		16.0	Excluded	\
	159	5795							
802.11ac-VHT20	149	5745	MCS0		15.0		15.5	Excluded	\
	153	5765							
	157	5785							
	161	5805							
	165	5825							
802.11ac-VHT40	151	5755	MCS0		14.5		16.0	Excluded	\
	159	5795							
802.11ac-VHT80	155	5775	MCS0		15.5		15.5	Excluded	\

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.
2) Per KDB 248227 D01 When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11a mode is selected.

7.5. The maximum output verification with USB cable

A USB cable which is no longer than 12 inches was used when performed SAR testing for positions B,C D described in clause8. Per the below verification results, the cable didn't influence the output power of the transmitter.

Mode	Antenna	Frequency (MHz)	Data Rate	Output power	
				Without USB Cable	With USB Cable
2.4G Hz 802.11b	ANT0	2412	1Mbps	14.05	13.98
U-NII-1 Band 802.11a	ANT0	5180	6Mbps	16.40	16.41
U-NII-1 Band 802.11a	ANT1	5785	6Mbps	16.60	16.58

7.6. Power measurement result BT

Band	Mode	Average Conducted Power (dBm)			Tune-up
		0CH	39CH	78CH	
2.4G BT	GFSK	NMR	NMR	NMR	9.0
	∏/4-DQPSK	NMR	NMR	NMR	9.0
	8DPSK	8.91	9.45	8.99	9.5

Band	Mode	Average Conducted Power (dBm)			Tune-up
		0CH	19CH	39CH	
2.4G BLE	GFSK 1Mbps	NMR	NMR	NMR	7.5
	GFSK 2Mbps	NMR	NMR	NMR	

Note:
1) NMR is short for “No measurement requirement”.
2) The maximum output power mode 8DPSK was selected as the primary mode to test SAR for BT/BLE mode. SAR measurement is not required for the GFSK, ∏/4-DQPSK mode, when the secondary mode is ≤0.25 dB higher than the primary mode.

8. RF Exposure Conditions

Per FCC KDB 447498 D02, simple dongle tests all USB orientations (see figure below (A) Horizontal-Up,(B) Horizontal-Down,(C)Vertical-Front, and (D) Vertical-Back) with a device-to-phantom separation distance of 5 mm or less, according to KDB447498 requirements.

(A) Horizontal-Up **(B) Horizontal-Down** **(C) Vertical-Front** **(D) Vertical-Back**

Note:
1. These are the USB connector orientations on laptop computers; USB dongles have the reverse configuration for plugging into the corresponding laptop computers.
2. When the antenna is located near the tip of a dongle, it may operate at closer proximity to users in certain connector orientations where dongle tip testing may be required.
3. Per KDB 447498 D02, The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical-Back (D) USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.
4. Per Our PAG ,the position B,C and D was tested with a USB cable, which didn’t influence the radiating characteristics and output power of the device.

5. The DUT was tested in 4 different positions for 0 degree, 90 degree and 180 degree antenna angle They are Horizontal-Up, Horizontal-Down, Vertical-Front and Vertical-Back. Refer to Appendix A.

9. Dielectric Property Measurements & System Check

9.1. 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:

T.S. Liquid		Messured Results		Target (Ref. value)	Delta (%)	Limit (%)	Temp. (℃)	Test Date
		Zoom Scan (W/Kg)	Normalize to 1W (W/Kg)					
Head 2450	2360	40.00	1.69	39.36	1.72	1.63	-1.86	January 6, 2021
	2450	39.90	1.80	39.20	1.80	1.79	-0.06	
	2540	39.44	1.90	39.09	1.90	0.90	0.21	
Head 5250	5160	36.35	4.56	36.03	4.61	0.89	-1.04	January 15, 2021
	5250	36.21	4.69	35.93	4.71	0.78	-0.34	
	5340	36.02	4.78	35.83	4.80	0.53	-0.37	
Head 5750	5660	36.18	5.10	35.46	5.13	2.03	-0.55	January 15, 2021
	5750	35.80	5.28	35.36	5.22	1.24	1.09	
	5840	35.34	5.27	35.27	5.30	0.20	-0.58	

9.2. 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	13.360	53.44	53.70	-0.48	±10	21.9	January 6, 2021
	10-g	6.150	24.60	25.00	-1.60	±10		
Head 5250	1-g	7.990	79.90	78.60	1.65	±10	21.8	January 15, 2021
	10-g	2.320	23.20	22.50	3.11	±10		
Head 5750	1-g	8.300	83.00	80.00	3.75	±10	21.8	January 15, 2021
	10-g	2.410	24.10	22.80	5.70	±10		

10. 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.

Scaled SAR calculation formula:

Scaled SAR = Tune-up in mW / Conducted power in mW * Duty cycle (if available) * SAR value

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.

Note:

The same procedure is applied to extremity SAR evaluation, and the corresponding limitation is 2.5 times of 1-g SAR.

10.1. SAR Test Results of 2.4GHz Wi-Fi.

Scenario and Distance	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Area Scan)	10-g			
WIFI 2.4G									
ANT0 0° H-up 5mm	802.11 b	1/2412	14.5	14.05	0.330	0.139	0.06	99.27	0.369
ANT0 0° H-down 5mm	802.11 b	1/2412	14.5	14.05	0.318	0.133	-0.05	99.27	0.355
ANT0 0° V-front 5mm	802.11 b	1/2412	14.5	14.05	0.316	0.137	0.02	99.27	0.353
ANT0 0° V-back 5mm	802.11 b	1/2412	14.5	14.05	0.011	0.007	-0.11	99.27	0.012
ANT0 0° Tip 5mm	802.11 b	1/2412	14.5	14.05	0.033	0.018	0.02	99.27	0.037
ANT1 0° H-up 5mm	802.11 b	1/2412	14.5	14.17	0.500	0.219	0.07	99.27	0.543
ANT1 0° H-down 5mm	802.11 b	1/2412	14.5	14.17	0.538	0.236	0.07	99.27	0.585
ANT1 0° V-front 5mm	802.11 b	1/2412	14.5	14.17	0.629	0.286	0.01	99.27	0.684
ANT1 0° V-back 5mm	802.11 b	1/2412	14.5	14.17	0.015	0.009	0.06	99.27	0.016
ANT1 0° Tip 5mm	802.11 b	1/2412	14.5	14.17	0.032	0.020	0.09	99.27	0.035
ANT0 90° H-up 5mm	802.11 b	1/2412	14.5	14.05	0.034	0.019	0.03	99.27	0.038
ANT0 90° H-down 5mm	802.11 b	1/2412	14.5	14.05	0.019	0.010	-0.01	99.27	0.021
ANT0 90° V-front 5mm	802.11 b	1/2412	14.5	14.05	0.546	0.252	-0.02	99.27	0.610
ANT0 90° V-back 5mm	802.11 b	1/2412	14.5	14.05	0.022	0.012	0.03	99.27	0.024
ANT0 90° tip 5mm	802.11 b	1/2412	14.5	14.05	0.311	0.133	-0.03	99.27	0.347
ANT1 90° H-up 5mm	802.11 b	1/2412	14.5	14.17	0.035	0.020	0.09	99.27	0.038
ANT1 90° H-down 5mm	802.11 b	1/2412	14.5	14.17	0.022	0.013	-0.05	99.27	0.023
ANT1 90° V-front 5mm	802.11 b	1/2412	14.5	14.17	0.022	0.013	0.09	99.27	0.024
ANT1 90° V-back 5mm	802.11 b	1/2412	14.5	14.17	0.861	0.398	0.05	99.27	0.936
ANT1 90° V-back 5mm	802.11 b	11/2462	14.5	13.21	0.651	0.398	0.05	99.27	0.883
ANT1 90° tip 5mm	802.11 b	1/2412	14.5	14.17	0.508	0.236	0.01	99.27	0.552
ANT0 180° H-up 5mm	802.11 b	1/2412	14.5	14.05	0.490	0.233	0.09	99.27	0.547
ANT0 180° H-down 5mm	802.11 b	1/2412	14.5	14.05	0.687	0.343	0.14	99.27	0.768
ANT0 180° V-front 5mm	802.11 b	1/2412	14.5	14.05	0.572	0.269	-0.09	99.27	0.639
ANT0 180° V-back 5mm	802.11 b	1/2412	14.5	14.05	0.019	0.011	0.08	99.27	0.021
ANT0 180° tip 5mm	802.11 b	1/2412	14.5	14.05	0.018	0.008	-0.01	99.27	0.020
ANT1 180° H-up 5mm	802.11 b	1/2412	14.5	14.17	0.926	0.450	0.04	99.27	1.006
ANT1 180° H-up 5mm	802.11 b	11/2462	14.5	13.21	0.733	0.359	0.06	99.27	0.994
ANT1 180° H-down 5mm	802.11 b	1/2412	14.5	14.17	0.746	0.391	0.05	99.27	0.811
ANT1 180° H-down 5mm	802.11 b	11/2462	14.5	13.21	0.582	0.295	-0.12	99.27	0.789
ANT1 180° V-front 5mm	802.11 b	1/2412	14.5	14.17	0.027	0.015	0.08	99.27	0.029
ANT1 180° V-back 5mm	802.11 b	1/2412	14.5	14.17	0.954	0.438	0.05	99.27	**1.037**
ANT1 180° V-back 5mm	802.11 b	11/2462	14.5	13.21	0.737	0.305	0.05	99.27	0.999
ANT1 180° tip 5mm	802.11 b	1/2412	14.5	14.17	0.022	0.013	-0.11	99.27	0.024

Note: When the reported SAR of the initial test configuration is ＞0.8W/kg, SAR measurement is required for subsequent nest highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

OFDM mode SAR evaluation exclusion analysis for ANT0

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	14.5	28.18	0.768	\	\
802.11g	11	12.59	\	0.343	Excluded
802.11n20	10	10.00	\	0.272	Excluded
802.11n 40	11	12.59	\	0.343	Excluded

OFDM mode SAR evaluation exclusion analysis for ANT1

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	14.5	28.18	1.037	\	\
802.11g	11.5	14.13	\	0.463	Excluded
802.11n20	11	12.59	\	0.368	Excluded
802.11n 40	11	12.59	\	0.463	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.

10.2. SAR Test Results of 2.4GHz Bluetooth.

Scenario and Distance	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Area Scan)	10-g			
Bluetooth 2.4G									
ANT1 0° H-up 5mm	BT/8DPSK	39/2441	9.45	9.50	0.213	0.093	0.02	75.99	0.277
ANT1 0° H-down 5mm	BT/8DPSK	39/2441	9.45	9.50	0.229	0.100	-0.08	75.99	0.298
ANT1 0° V-front 5mm	BT/8DPSK	39/2441	9.45	9.50	0.268	0.122	0.12	75.99	0.348
ANT1 0° V-back 5mm	BT/8DPSK	39/2441	9.45	9.50	0.006	0.004	0.07	75.99	0.008
ANT1 0° Tip 5mm	BT/8DPSK	39/2441	9.45	9.50	0.014	0.009	-0.06	75.99	0.018
ANT1 90° H-up 5mm	BT/8DPSK	39/2441	9.45	9.50	0.015	0.009	0.11	75.99	0.019
ANT1 90° H-down 5mm	BT/8DPSK	39/2441	9.45	9.50	0.009	0.005	-0.02	75.99	0.012
ANT1 90° V-front 5mm	BT/8DPSK	39/2441	9.45	9.50	0.009	0.005	0.08	75.99	0.012
ANT1 90° V-back 5mm	BT/8DPSK	39/2441	9.45	9.50	0.367	0.169	0.04	75.99	0.477
ANT1 90° tip 5mm	BT/8DPSK	39/2441	9.45	9.50	0.216	0.100	-0.09	75.99	0.281
ANT1 180° H-up 5mm	BT/8DPSK	39/2441	9.45	9.50	0.420	0.192	0.03	75.99	**0.546**
ANT1 180° H-down 5mm	BT/8DPSK	39/2441	9.45	9.50	0.364	0.166	0.07	75.99	0.474
ANT1 180° V-front 5mm	BT/8DPSK	39/2441	9.45	9.50	0.011	0.007	0.02	75.99	0.015
ANT1 180° V-back 5mm	BT/8DPSK	39/2441	9.45	9.50	0.406	0.186	-0.16	75.99	0.528
ANT1 180° tip 5mm	BT/8DPSK	39/2441	9.45	9.50	0.009	0.005	0.11	75.99	0.012

Note:

1) The maximum output power mode 8DPSK was selected as the primary mode to test SAR for BT/BLE mode. SAR measurement is not required for the GFSK, ∏/4-DQPSK mode, when the secondary mode is ≤0.25 dB higher than the primary mode.
2) Only Antenna 1 can be used for BT/BLE

10.3. SAR Test Results of for U-NII-1 band Wi-Fi.

Scenario and Distance	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Area Scan)	10-g			
WIFI 5.2G									
ANT0 0° H-up 5mm	802.11 a	36/5180	16.5	16.40	0.322	0.088	0.01	96.45	0.342
ANT0 0° H-down 5mm	802.11 a	36/5180	16.5	16.40	0.381	0.110	0.03	96.45	0.404
ANT0 0° V-front 5mm	802.11 a	36/5180	16.5	16.40	0.384	0.138	0.18	96.45	0.407
ANT0 0° V-back 5mm	802.11 a	36/5180	16.5	16.40	0.000	0.000	0.00	96.45	0.000
ANT0 0° Tip 5mm	802.11 a	36/5180	16.5	16.40	0.006	0.002	0.00	96.45	0.006
ANT1 0° H-up 5mm	802.11 a	36/5180	15.5	15.15	0.428	0.122	0.04	96.45	0.481
ANT1 0° H-down 5mm	802.11 a	36/5180	15.5	15.15	0.350	0.100	0.08	96.45	0.393
ANT1 0° V-front 5mm	802.11 a	36/5180	15.5	15.15	0.002	0.000	0.00	96.45	0.002
ANT1 0° V-back 5mm	802.11 a	36/5180	15.5	15.15	0.411	0.155	-0.20	96.45	0.462
ANT1 0° Tip 5mm	802.11 a	36/5180	15.5	15.15	0.017	0.060	-0.11	96.45	0.019
ANT0 90° H-up 5mm	802.11 a	36/5180	16.5	16.40	0.007	0.002	0.00	96.45	0.008
ANT0 90° H-down 5mm	802.11 a	36/5180	16.5	16.40	0.043	0.020	0.19	96.45	0.045
ANT0 90° V-front 5mm	802.11 a	36/5180	16.5	16.40	0.238	0.082	0.00	96.45	0.253
ANT0 90° V-back 5mm	802.11 a	36/5180	16.5	16.40	0.030	0.012	-0.05	96.45	0.031
ANT0 90° tip 5mm	802.11 a	36/5180	16.5	16.40	0.172	0.069	0.13	96.45	0.182
ANT1 90° H-up 5mm	802.11 a	36/5180	15.5	15.15	0.030	0.010	0.13	96.45	0.034
ANT1 90° H-down 5mm	802.11 a	36/5180	15.5	15.15	0.050	0.023	0.06	96.45	0.056
ANT1 90° V-front 5mm	802.11 a	36/5180	15.5	15.15	0.227	0.074	0.00	96.45	0.255
ANT1 90° V-back 5mm	802.11 a	36/5180	15.5	15.15	0.240	0.089	0.00	96.45	0.270
ANT1 90° tip 5mm	802.11 a	36/5180	15.5	15.15	0.211	0.084	0.11	96.45	0.237
ANT0 180° H-up 5mm	802.11 a	36/5180	16.5	16.40	0.294	0.108	0.04	96.45	0.312
ANT0 180° H-down 5mm	802.11 a	36/5180	16.5	16.40	0.543	0.179	0.14	96.45	0.576
ANT0 180° V-front 5mm	802.11 a	36/5180	16.5	16.40	0.311	0.101	0.03	96.45	0.330
ANT0 180° V-back 5mm	802.11 a	36/5180	16.5	16.40	0.102	0.038	0.09	96.45	0.108
ANT0 180° tip 5mm	802.11 a	36/5180	16.5	16.40	0.040	0.019	0.13	96.45	0.042
ANT1 180° H-up 5mm	802.11 a	36/5180	15.5	15.15	0.338	0.125	0.02	96.45	0.380
ANT1 180° H-down 5mm	802.11 a	36/5180	15.5	15.15	0.370	0.128	0.07	96.45	0.416
ANT1 180° V-front 5mm	802.11 a	36/5180	15.5	15.15	0.044	0.019	0.08	96.45	0.049
ANT1 180° V-back 5mm	802.11 a	36/5180	15.5	15.15	1.065	0.282	0.02	96.45	**1.197**
ANT1 180° V-back 5mm	802.11 a	40/5200	15.5	14.92	0.935	0.282	0.02	96.45	1.108
ANT1 180° tip 5mm	802.11 a	36/5180	15.5	15.15	0.041	0.018	0.05	96.45	0.046

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-1 band ANT0

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a	16.5	44.67	0.576	\	\
802.11n 20M	10	10.00	\	0.129	Excluded
802.11n 40M	12.5	17.78	\	0.229	Excluded
802.11ac 20M	10	10.00	\	0.129	Excluded
802.11ac 40M	12.5	17.78	\	0.229	Excluded
802.11ac 80M	10.5	11.22	\	0.145	Excluded

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-1 band ANT1

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a	15.5	41.69	1.197	\	\
802.11n 20M	10.5	31.62	\	0.908	Excluded
802.11n 40M	12.5	31.62	\	0.908	Excluded
802.11ac 20M	10	31.62	\	0.908	Excluded
802.11ac 40M	12.5	31.62	\	0.908	Excluded
802.11ac 80M	10.5	31.62	\	0.908	Excluded

Note:

1) 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.

10.4. SAR Test Results of for 5G Wi-Fi U-NII-3 band.

Scenario and Distance	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Area Scan)	10-g			
WIFI 5.8G									
ANT0 0° H-up 5mm	802.11 a	157/5785	16.0	15.57	0.351	0.098	0.07	96.45	0.402
ANT0 0° H-down 5mm	802.11 a	157/5785	16.0	15.57	0.617	0.155	0.01	96.45	0.706
ANT0 0° V-front 5mm	802.11 a	157/5785	16.0	15.57	0.304	0.099	0.11	96.45	0.348
ANT0 0° V-back 5mm	802.11 a	157/5785	16.0	15.57	0.014	0.005	0.00	96.45	0.016
ANT0 0° Tip 5mm	802.11 a	157/5785	16.0	15.57	0.026	0.006	0.00	96.45	0.030
ANT1 0° H-up 5mm	802.11 a	157/5785	17.0	16.60	0.484	0.125	-0.05	96.45	0.550
ANT1 0° H-down 5mm	802.11 a	157/5785	17.0	16.60	0.383	0.098	0.04	96.45	0.435
ANT1 0° V-front 5mm	802.11 a	157/5785	17.0	16.60	0.024	0.008	0.00	96.45	0.027
ANT1 0° V-back 5mm	802.11 a	157/5785	17.0	16.60	0.356	0.113	0.05	96.45	0.405
ANT1 0° Tip 5mm	802.11 a	157/5785	17.0	16.60	0.034	0.008	0.00	96.45	0.039
ANT0 90° H-up 5mm	802.11 a	157/5785	16.0	15.57	0.088	0.033	0.12	96.45	0.101
ANT0 90° H-down 5mm	802.11 a	157/5785	16.0	15.57	0.091	0.040	0.09	96.45	0.104
ANT0 90° V-front 5mm	802.11 a	157/5785	16.0	15.57	0.382	0.120	0.00	96.45	0.437
ANT0 90° V-back 5mm	802.11 a	157/5785	16.0	15.57	0.034	0.011	0.09	96.45	0.039
ANT0 90° tip 5mm	802.11 a	157/5785	16.0	15.57	0.253	0.099	0.14	96.45	0.290
ANT1 90° H-up 5mm	802.11 a	157/5785	17.0	16.60	0.060	0.025	0.03	96.45	0.068
ANT1 90° H-down 5mm	802.11 a	157/5785	17.0	16.60	0.077	0.034	-0.14	96.45	0.088
ANT1 90° V-front 5mm	802.11 a	157/5785	17.0	16.60	0.070	0.029	0.10	96.45	0.079
ANT1 90° V-back 5mm	802.11 a	157/5785	17.0	16.60	0.348	0.105	0.02	96.45	0.396
ANT1 90° tip 5mm	802.11 a	157/5785	17.0	16.60	0.224	0.090	0.17	96.45	0.255
ANT0 180° H-up 5mm	802.11 a	157/5785	16.0	15.57	0.406	0.148	0.11	96.45	0.465
ANT0 180° H-down 5mm	802.11 a	157/5785	16.0	15.57	0.627	0.158	0.16	96.45	0.718
ANT0 180° V-front 5mm	802.11 a	157/5785	16.0	15.57	0.544	0.147	0.14	96.45	0.623
ANT0 180° V-back 5mm	802.11 a	157/5785	16.0	15.57	0.118	0.050	0.15	96.45	0.135
ANT0 180° Tip 5mm	802.11 a	157/5785	16.0	15.57	0.088	0.037	0.09	96.45	0.101
ANT1 180° H-up 5mm	802.11 a	157/5785	17.0	16.60	0.505	0.162	0.01	96.45	0.574
ANT1 180° H-down 5mm	802.11 a	157/5785	17.0	16.60	0.411	0.142	0.06	96.45	0.467
ANT1 180° V-front 5mm	802.11 a	157/5785	17.0	16.60	0.072	0.029	0.03	96.45	0.082
ANT1 180° V-back 5mm	802.11 a	157/5785	17.0	16.60	1.044	0.297	0.06	96.45	**1.187**
ANT1 180° V-back 5mm	802.11 a	149/5745	17.0	16.57	0.986	0.283	-0.07	96.45	1.129
ANT1 180° Tip 5mm	802.11 a	157/5785	17.0	16.60	0.081	0.037	-0.08	96.45	0.092

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-3 band ANT0

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a	16	39.81	0.718	\	\
802.11n 20M	15	31.62	\	0.570	Excluded
802.11n 40M	14.5	28.18	\	0.508	Excluded
802.11ac 20M	15	31.62	\	0.570	Excluded
802.11ac 40M	14.5	28.18	\	0.508	Excluded
802.11ac 80M	15.5	35.48	\	0.640	Excluded

Subsequent test configuration SAR evaluation exclusion analysis for U-NII-3 band ANT1

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11a	17	41.69	1.187	\	\
802.11n 20M	16	31.62	\	0.943	Excluded
802.11n 40M	16	31.62	\	0.943	Excluded
802.11ac 20M	15.5	31.62	\	0.840	Excluded
802.11ac 40M	16	31.62	\	0.943	Excluded
802.11ac 80M	15.5	31.62	\	0.840	Excluded

Note:

1) 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.

10.5. 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

Scenario and Distance	Test Mode	Channel/ Frequency	Power (dBm)		SAR Value		Power Drift	Duty Factor (%)	Scaled (W/Kg)
			Tune-up	Meas.	1-g (Area Scan)	10-g			
ANT1 180° V-back 5mm	802.11 b	1/2412	14.5	14.17	0.918	0.438	0.15	99.27	0.998
ANT1 180° V-back 5mm	802.11 a	36/5180	15.5	15.15	1.038	0.266	-0.07	96.45	1.167
ANT1 180° V-back 5mm	802.11 a	157/5785	17.0	16.60	1.035	0.273	0.05	96.45	1.177

11. Simultaneous Transmission SAR Analysis

Per FCC KDB 447498D01, 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:

Simultaneously transmission			
Condition	Antenna 0	Antenna 1	Support (YES/NO)
1	WLAN (2.4G)	WLAN (5G)	YES
2	WLAN (5G)	WLAN (2.4G)	YES
3	WLAN (2.4G)	BT/BLE	YES
4	WLAN (5G)	BT/BLE	YES

Note:
2) 2.4GHz 802.11n and 5GHz 802.11n,802.11ac support MIMO

11.1. Simultaneous Transmission calculation WLAN and BT&BLE antenna.

All the value stated in the table below are the worst case found for standalone measurement with disregard of the transmission mode or channel where the worst case was found.

Position / Mode	H-UP		H-Down		V-Front		V-Back		Tip	
	ANT0	ANT1	ANT0	ANT1	ANT0	ANT1	ANT0	ANT1	ANT0	ANT1
Wifi2.4G	0.547	1.006	0.768	0.811	0.639	0.684	0.024	1.037	0.347	0.552
WIFI 5G UNII-1	0.342	0.481	0.576	0.416	0.407	0.255	0.108	1.197	0.182	0.237
WIFI 5G UNII-3	0.465	0.574	0.718	0.467	0.623	0.082	0.135	1.187	0.290	0.255
Bluetooth	/	0.546	/	0.474	/	0.348	/	0.528	/	0.281
Max.Sum	1.553		1.579		1.323		1.221		0.899	
SPLSR Required	NO		NO		NO		NO		NO	

Note:
1) For 2.4G and 5G SAR was evaluated for SISO mode. The SAR distributions in MIMO mode were verified and the hot spots were sufficiently separated such that the two chains can be treated independently. So the highest SAR value across both chains in SISO mode represents the SAR value for MIMO mode.
2) For the maximum SUM 1-g SAR ≤ 1.6 W/Kg, the SPLSR analysis is not required.

Appendixes

Refer to separated files for the following appendixes.

4789730785-SAR_App A Photo(STC_180days)

4789730785-SAR_App B System Check Plots

4789730785-SAR_App C Highest Test Plots

4789730785-SAR_App D Cal. Certificates

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