

7 SAR Test Configuration

7.1 WIFI 5G Test Configurations

1) U-NII-1 and U-NII-2A Bands

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR Procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

1.1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.

1.2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.

1.3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This Procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

2) U-NII-2C and U-NII-3 Bands

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR Probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement Procedures.

When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR Probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR Probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and Probe calibration frequency points requirements.

3) OFDM Transmission Mode SAR Test Configuration and Channel Selection Requirements

The initial test configuration for 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for Production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement Procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

3.1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.

3.2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.

3.3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.

3.4) When multiple transmission modes (802.11a/g/n/ac/ax) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

After an initial test configuration is determined, if multiple test channels have the same measured maximum output power, the channel chosen for SAR measurement is determined according to the following. These channel selection Procedures apply to both the initial test configuration and subsequent test configuration(s), with respect to the default power measurement Procedures or additional power measurements required for further SAR test reduction. The same Procedures also apply to subsequent highest output power channel(s) selection.

3.4.1) The channel closest to mid-band frequency is selected for SAR measurement.

3.4.2) For channels with equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.

4) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 a/n/ac/ax OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. When the same transmitter and antenna(s) are used for U-NII-1 and U-NII-2A bands, additional SAR test reduction applies. When band gap channels between U-NII-2C band and 5.8 GHz U-NII-3 or §15.247 band are supported, the highest maximum output power transmission mode configuration and maximum output power channel across the bands must be used to determine SAR test reduction, according to the initial test configuration and subsequent test configuration requirements. In applying the initial test configuration and subsequent test configuration Procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the Procedures.

7.2 WIFI 2.4G Test Configurations

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

Per KDB 248227 D01 802.11 Wi-Fi SAR v02r02, SAR Test Reduction criteria are as follows:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS Procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement Procedures in the required wireless mode test configuration(s). The relative SAR levels of multiple exposure test positions can be established by area scan measurements on the highest measured output power channel to determine the initial test position. The area scans must be measured using the same SAR measurement configurations, including test channel, maximum output power, Probe tip to phantom distance, scan resolution etc.

When the reported SAR for the initial test position is:

- 1) ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR Procedures.
- 2) > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
- 3) For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.

SAR is not required for the following 2.4 GHz OFDM conditions.

- 1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
- 2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

8 SAR Test Results

8.1 Conducted Power Measurements

8.1.1 Conducted power of Wi-Fi 5G

Antenna		ANT1				
Band	Mode	Channel	Frequency	Data Rate	Tune-up	Average Power
			(MHz)	(Mbps)		(dBm)
U-NII-1	802.11a	36	5180	6	5.00	4.48
		40	5200		5.00	4.63
		48	5240		5.00	4.87
	802.11n HT20	36	5180	6.5	4.00	3.32
		40	5200		4.00	3.60
		48	5240		4.00	3.85
	802.11n HT40	38	5190	13.5	4.00	3.20
		46	5230		4.00	3.66
	802.11ac VHT20	36	5180	6.5	4.00	3.37
		40	5200		4.00	3.59
		48	5240		4.00	3.83
	802.11ac VHT40	38	5190	13.5	4.00	3.23
		46	5230		4.00	3.69
	802.11ac VHT80	42	5210	29.3	4.00	3.49
	802.11ax HE20	36	5180	8	4.00	3.35
		40	5200		4.00	3.59
		48	5240		4.00	3.74
	802.11ax HE40	38	5190	16	4.00	3.24
		46	5230		4.00	3.67
	802.11ax HE80	42	5210	34	4.00	3.37
U-NII-2A	802.11a	52	5260	6	5.00	4.88
		60	5300		5.00	4.62
		64	5320		5.00	3.82
	802.11n HT20	52	5260	6.5	3.00	2.93
		60	5300		3.00	2.86
		64	5320		3.00	2.88

	802.11n HT40	54	5270	13.5	3.00	2.76
		62	5310		3.00	2.11
	802.11ac VHT20	52	5260	6.5	3.00	2.12
		60	5300		3.00	2.36
		64	5320		3.00	2.04
	802.11ac VHT40	54	5270	13.5	3.00	2.77
		62	5310		3.00	2.10
	802.11ac VHT80	58	5290	29.3	3.00	2.61
	802.11ax HE20	52	5260	8	3.00	2.87
		60	5300		3.00	2.73
		64	5320		3.00	2.85
	802.11ax HE40	54	5270	16	3.00	2.77
		62	5310		3.00	2.15
U-NII-2C	802.11a	100	5500	6	10.00	9.68
		116	5580		10.00	9.39
		140	5700		10.00	9.67
	802.11n HT20	100	5500	6.5	7.00	6.86
		116	5580		7.00	6.45
		140	5700		7.00	6.63
	802.11n HT40	102	5510	13.5	7.00	6.56
		110	5550		7.00	6.32
		134	5670		7.00	6.65
	802.11ac VHT20	100	5500	6.5	7.00	6.87
		116	5580		7.00	6.44
		140	5700		7.00	6.69
	802.11ac VHT40	102	5510	13.5	7.00	6.53
		110	5550		7.00	6.23
		134	5670		7.00	6.68
	802.11ac VHT80	106	5530	29.3	7.00	6.75
		122	5610		7.00	6.30
	802.11ax HE20	100	5500	8	7.00	6.85
		116	5580		7.00	6.41
		140	5700		7.00	6.69
	802.11ax HE40	102	5510	16	7.00	6.64
		110	5550		7.00	6.38
		134	5670		7.00	6.70
	802.11ax	106	5530	34	7.00	6.45

	HE80	122	5610		7.00	6.15
U-NII-3	802.11a	149	5745	6	8.50	8.32
		157	5785		8.50	8.00
		165	5825		8.50	7.94
	802.11n HT20	149	5745	6.5	6.00	5.41
		157	5785		6.00	5.16
		165	5825		6.00	5.87
	802.11n HT40	151	5755	13.5	6.00	5.44
		159	5795		6.00	5.78
	802.11ac VHT20	149	5745	6.5	6.00	5.38
		157	5785		6.00	5.20
		165	5825		6.00	5.89
	802.11ac VHT40	151	5755	13.5	6.00	5.42
		159	5795		6.00	5.81
	802.11ac VHT80	155	5775	29.3	6.00	5.27
	802.11ax HE20	149	5745	8	6.50	6.40
		157	5785		6.50	6.17
		165	5825		6.50	5.88
	802.11ax HE40	151	5755	16	6.00	5.39
		159	5795		6.00	5.77
	802.11ax HE80	155	5775	34	6.00	5.11

8.1.2 Conducted Power of Wi-Fi 2.4G

The output power of Wi-Fi 2.4G is as following:

Antenna		ANT1			
Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Tune-up	Peak Power(dBm)
802.11b	1	2412	1	13.50	12.51
	6	2437		13.50	12.94
	11	2462		13.50	13.06
802.11g	1	2412	6	11.00	10.28
	6	2437		11.00	10.85
	11	2462		11.00	10.22
802.11n (HT20)	1	2412	6.5	11.00	10.06
	6	2437		11.00	10.64
	11	2462		11.00	10.83
802.11n (HT40)	3	2422	13.5	11.00	10.33
	6	2437		11.00	10.57
	9	2452		11.00	10.74
802.11ax (HE20)	1	2412	8	11.00	10.98
	6	2437		11.00	10.59
	11	2462		11.00	10.79
802.11ax (HE40)	3	2422	16	11.00	10.29
	6	2437		11.00	10.53
	9	2452		11.00	10.72

8.1.3 Conducted Power of Bluetooth

The output power of BT is as following:

For BT 3.0:

Peak Conducted Power(dBm)				Tune-up Power(dBm)
Channel	0CH	39CH	78CH	
GFSK	-4.97	-5.41	-5.57	0.50
$\pi/4$ DQPSK	-5.54	-5.97	-6.10	
8DPSK	-5.16	-5.60	-5.73	

Note: channel /Frequency: 0/2402, 39/2441, 78/2480.

For BT (BLE):

Peak Conducted Power(dBm)				Tune-up Power(dBm)
Channel	0CH	19CH	39CH	
BLE_1M	-4.98	-5.39	-5.55	0.50
BLE_2M	-5.06	-5.47	-5.66	

Note: channel /Frequency: 0/2402, 19/2440, 39/2480.

8.2 SAR test results

Notes:

1) Per KDB447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz. When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel must be used.

2) Per KDB447498 D01v06, All measurement SAR result is scaled-up to account for tune-up tolerance is compliant.

3) Per KDB865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/Kg; if the deviation among the repeated measurement is $\leq 20\%$, and the measured SAR < 1.45 W/Kg, only one repeated measurement is required.

4) Per KDB865664 D02v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The same Procedures should be adapted for measurements according to extremity exposure limits by applying a factor of 2.5 for extremity exposure. The published RF exposure KDB Procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-Processing (Refer to appendix B for details).

8.2.1 Results overview of WiFi 5G

ANT1

Test Position With 0mm	Test channel /Freq. (MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conduc- ted Power (dBm)	Tune- up power (dBm)	Scaled SAR _{1-g} (W/kg)	Actual Duty Cycle	Reported SAR _{1-g} (W/kg)
			1-g	10-g						
5.2G WiFi (U-NII-1 Band)										
Front Side	48/5240	802.11a	0.609	0.173	0.09	4.87	5.00	0.628	88.05%	0.713
Back Side	48/5240	802.11a	0.593	0.156	-0.15	4.87	5.00	0.611	88.05%	0.694
Top Side	48/5240	802.11a	1.120	0.231	-0.03	4.87	5.00	1.154	88.05%	1.311
Top Side	36/5180	802.11a	0.929	0.188	0.14	4.48	5.00	1.047	85.37%	1.227
Top Side	40/5200	802.11a	0.993	0.201	0.02	4.63	5.00	1.081	85.28%	1.268
SAR1-g >0.8 (W/kg) Repeated										
Top Side	48/5240	802.11a	0.997	0.211	0.05	4.87	5.00	1.027	88.05%	1.167

Test Position With 0mm	Test channel /Freq. (MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conduc- ted Power (dBm)	Tune- up power (dBm)	Scaled SAR _{1-g} (W/kg)	Actual Duty Cycle	Reported SAR _{1-g} (W/kg)
			1-g	10-g						
5.3G WiFi (U-NII-2A Band)										
Front Side	52/5260	802.11a	0.629	0.176	0.04	4.88	5.00	0.647	86.88%	0.744
Back Side	52/5260	802.11a	0.567	0.154	-0.08	4.88	5.00	0.583	86.88%	0.671
Top Side	52/5260	802.11a	1.050	0.213	0.12	4.88	5.00	1.079	86.88%	1.242
Front Side	60/5300	802.11a	0.563	0.156	-0.13	4.62	5.00	0.614	89.74%	0.685
Front Side	64/5320	802.11a	0.528	0.148	0.11	3.82	5.00	0.693	89.74%	0.772
Top Side	60/5300	802.11a	0.942	0.191	0.04	4.62	5.00	1.028	89.74%	1.146
Top Side	64/5320	802.11a	0.882	0.179	0.19	3.82	5.00	1.157	89.74%	1.290
SAR1-g >0.8 (W/kg) Repeated										
Top Side	52/5260	802.11a	0.979	0.203	-0.13	4.88	5.00	1.178	86.88%	1.158

Test Position With 0mm	Test channel /Freq. (MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conduc- ted Power (dBm)	Tune- up power (dBm)	Scaled SAR _{1-g} (W/kg)	Actual Duty Cycle	Reported SAR _{1-g} (W/kg)
			1-g	10-g						
5.6G WiFi (U-NII-2C Band)										
Front Side	100/5500	802.11a	0.712	0.199	0.00	9.68	10.00	0.766	86.42%	0.887
Back Side	100/5500	802.11a	0.906	0.259	0.08	9.68	10.00	0.975	86.42%	1.129
Top Side	100/5500	802.11a	0.945	0.232	-0.04	9.68	10.00	1.017	86.42%	1.177
Front Side	120/5600	802.11a	0.747	0.206	0.03	9.39	10.00	0.860	86.96%	0.989
Front Side	140/5700	802.11a	0.798	0.211	0.15	9.67	10.00	0.861	89.74%	0.959
Back Side	120/5600	802.11a	0.885	0.231	-0.12	9.39	10.00	1.018	86.96%	1.171
Back Side	140/5700	802.11a	0.973	0.256	-0.08	9.67	10.00	1.050	89.74%	1.170
Top Side	120/5600	802.11a	0.991	0.243	0.02	9.39	10.00	1.140	86.96%	1.311
Top Side	140/5700	802.11a	1.090	0.239	-0.02	9.67	10.00	1.176	89.74%	1.311
SAR1-g >0.8 (W/kg) Repeated										
Back Side	140/5700	802.11a	0.946	0.238	0.15	9.67	10.00	1.021	89.74%	1.137
Top Side	140/5700	802.11a	0.987	0.228	-0.13	9.67	10.00	1.065	89.74%	1.187

Test Position With 0mm	Test channel /Freq. (MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Conduc ted Power (dBm)	Tune- up power (dBm)	Scaled SAR _{1-g} (W/kg)	Actual Duty Cycle	Reported SAR _{1-g} (W/kg)
			1-g	10-g						
5.8G WiFi (U-NII-3 Band)										
Front Side	149/5745	802.11a	0.443	0.150	0.06	8.32	8.50	0.462	89.68%	0.515
Back Side	149/5745	802.11a	0.530	0.162	0.05	8.32	8.50	0.552	89.68%	0.616
Top Side	149/5745	802.11a	1.100	0.231	0.11	8.32	8.50	1.147	89.68%	1.278
Top Side	157/5785	802.11a	0.951	0.214	0.02	8.00	8.50	1.067	86.42%	1.235
Top Side	165/5825	802.11a	1.090	0.215	0.09	7.94	8.50	1.240	88.61%	1.399
SAR1-g >0.8 (W/kg) Repeated										
Top Side	149/5745	802.11a	1.010	0.217	-0.03	8.32	8.50	1.053	89.68%	1.174

Note:

1) Scaled SAR = SAR Value * 10(0.1*(Tune up Power-Conducted Power))

Reported SAR = SAR Value * 10(0.1*(Tune up Power-Conducted Power))/ Duty factor * 100

8.2.2 Results overview of WiFi 2.4G

ANT1

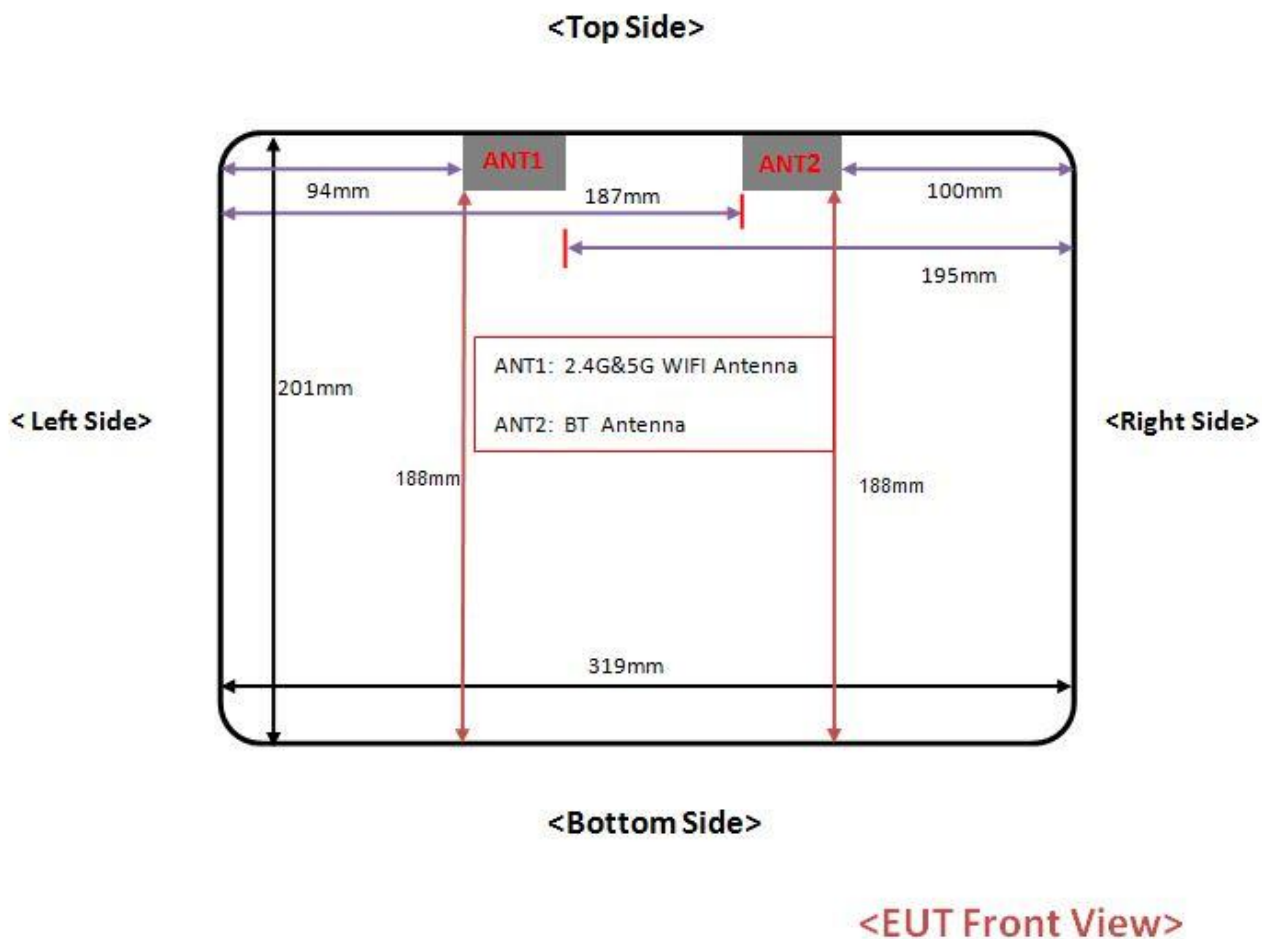
Test Position With 0mm	Test channel /Freq. (MHz)	Test Mode	SAR Value (W/kg)		Power Drift (dBm)	Conduc ted Power (dBm)	Tune- up power (dBm)	Scaled SAR _{1-g} (W/kg)	Actual Duty Cycle	Reported SAR _{1-g} (W/kg)
			1-g	10-g						
Front Side	11/2462	802.11b	1.030	0.454	0.08	13.06	13.50	1.140	97.54%	1.169
Back Side	11/2462	802.11b	0.592	0.232	0.00	13.15	13.50	0.642	97.54%	0.658
Top Side	11/2462	802.11b	0.672	0.245	-0.01	13.15	13.50	0.728	97.54%	0.747
Front Side	1/2412	802.11b	1.030	0.440	0.16	12.51	13.50	1.294	95.72%	1.352
Front Side	6/2437	802.11b	1.130	0.497	0.04	12.94	13.50	1.286	97.66%	1.316
SAR1-g >0.8 (W/kg) Repeated										
Front Side	6/2437	802.11b	1.050	0.462	0.11	12.94	13.50	1.195	97.66%	1.223

Note: Per KDB248227D01:

- 1) SAR is measured for 2.4 GHz 802.11b DSSS using initial test position Procedure.
- 2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, 802.11g/n/ax OFDM SAR Test is not required.
- 3) Scaled SAR = SAR Value * $10(0.1 * (\text{Tune up Power} - \text{Conducted Power}))$
Reported SAR = SAR Value * $10(0.1 * (\text{Tune up Power} - \text{Conducted Power})) / \text{Duty factor} * 100$

8.3 Multiple Transmitter Information

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



Note:1)Per KDB 616217, because the diagonal Length is $> 200\text{mm}$, it is considered a "tablet" device and need to test 0mm 1g Body SAR.

2) The device doesn't support telephone receiver, so additional Head SAR testing is not considered per KDB616217D04 and KDB648474D04.

8.4 Stand-alone SAR

Per FCC KDB 447498D01:

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right] \cdot \left[\sqrt{f(\text{GHz})} \right] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f(\text{GHz})$ 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) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

a) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)]\}$ mW, at 100 MHz to 1500 MHz

b) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW at > 1500 MHz and ≤ 6 GHz

WiFi Antenna:

ANT1

(Antennas < 50 mm to adjacent sides)

Band	Exposure Condition	f(GHz)	Pmax	Pmax	Seperation Distance(mm)						SAR Test (Yes or No)					
			dBm	mW	Front side	Back side	Left side	Right side	Top side	Bottom side	Front side	Back side	Left side	Right side	Top side	Bottom side
WiFi 2.4G	Body 0mm	2.45	13.50	22.39	5.00	5.00	94.00	195.00	5.00	188.00	Yes	Yes	>50mm	>50mm	Yes	>50mm
WiFi 5.2G	Body 0mm	5.20	5.00	3.16	5.00	5.00	94.00	195.00	5.00	188.00	Yes	Yes	>50mm	>50mm	Yes	>50mm
WiFi 5.3G	Body 0mm	5.30	5.00	3.16	5.00	5.00	94.00	195.00	5.00	188.00	Yes	Yes	>50mm	>50mm	Yes	>50mm
WiFi 5.6G	Body 0mm	5.60	10.00	10.00	5.00	5.00	94.00	195.00	5.00	188.00	Yes	Yes	>50mm	>50mm	Yes	>50mm
WiFi 5.8G	Body 0mm	5.80	8.50	7.08	5.00	5.00	94.00	195.00	5.00	188.00	Yes	Yes	>50mm	>50mm	Yes	>50mm

(Antennas > 50 mm to adjacent sides)

Band	Exposure Condition	f(GHz)	Pmax	Pmax	Seperation Distance(mm)						SAR Test (Yes or No)					
			dBm	mW	Front side	Back side	Left side	Right side	Top side	Bottom side	Front side	Back side	Left side	Right side	Top side	Bottom side
WIFI 2.4G	Body 0mm	2.45	13.50	22.39	5.00	5.00	94.00	195.00	5.00	188.00	<50mm	<50mm	No	No	<50mm	No
WIFI 5.2G	Body 0mm	5.20	5.00	3.16	5.00	5.00	94.00	195.00	5.00	188.00	<50mm	<50mm	No	No	<50mm	No
WIFI 5.3G	Body 0mm	5.30	5.00	3.16	5.00	5.00	94.00	195.00	5.00	188.00	<50mm	<50mm	No	No	<50mm	No
WIFI 5.6G	Body 0mm	5.60	10.00	10.00	5.00	5.00	94.00	195.00	5.00	188.00	<50mm	<50mm	No	No	<50mm	No
WIFI 5.8G	Body 0mm	5.80	8.50	7.08	5.00	5.00	94.00	195.00	5.00	188.00	<50mm	<50mm	No	No	<50mm	No

ANT2: BT Antenna

(Antennas <50mm to adjacent sides)

Band	Exposure Condition	f(GHz)	P _{max}	P _{max}	Seperation Distance(mm)						SAR Test (Yes or No)					
			dBm	mW	Front side	Back side	Left side	Right side	Top side	Bottom side	Front side	Back side	Left side	Right side	Top side	Bottom side
BT	Body 0mm	2.45	0.50	1.12	5.00	5.00	187.00	100.00	5.00	188.00	>50mm	>50mm	>50mm	>50mm	>50mm	>50mm

(Antennas >50mm to adjacent sides)

Band	Exposure Condition	f(GHz)	P _{max}	P _{max}	Seperation Distance(mm)						SAR Test (Yes or No)					
			dBm	mW	Front side	Back side	Left side	Right side	Top side	Bottom side	Front side	Back side	Left side	Right side	Top side	Bottom side
BT	Body 0mm	2.45	0.50	1.12	5.00	5.00	187.00	100.00	5.00	188.00	No	No	No	No	No	No

- 3) When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg.

For conditions where the estimated SAR is overly conservative for certain conditions, the test lab may choose to perform standalone SAR measurements and use the measured SAR to determine simultaneous transmission SAR test exclusion.

Per FCC KDB 447498D01:

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances $\leq$ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ 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 5mm is applied to determine SAR test exclusion.

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	F (GHz)	Calculation Result	SAR test exclusion Threshold	SAR test exclusion
BT	Body	0.50	1.12	5.00	2.450	0.35	3.00	Yes

- 1) When the standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:

$(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances ≤ 50 mm, where $x = 7.5$ for 1-g SAR and $x = 18.75$ for 10-g SAR.

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

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance(mm)	f(GHz)	X	Estimated SAR(W/Kg)
BT	Body	0.50	1.12	5.00	2.45	7.50	0.047

Note: 1) maximum possible output power (including tune-up tolerance) declared by manufacturer

2) Held to ear configurations are not applicable to Bluetooth for this device

8.5 Simultaneous Transmission Analysis

No.	Simultaneous Transmission Consideration	Required
1	2.4GHz WLAN + Bluetooth	Yes
2	5.2GHz WLAN + Bluetooth	Yes
3	5.3GHz WLAN + Bluetooth	Yes
4	5.5GHz WLAN + Bluetooth	Yes
5	5.8GHz WLAN + Bluetooth	Yes

Estimate SAR:

Mode	Max. tune-up Power (dBm)	Frequency (GHz)	Estimate 1-g SAR(W/kg)
BT	0.50	2.450	0.047

Simultaneous Transmission Max SAR:

Mode	Position	1g SAR (W/kg)	BT Estimate 1g SAR (W/kg)	Summed 1-g SAR(W/kg)
2.4GHz WLAN	Front Side	1.352	0.047	1.399
5.2GHz WLAN	Back Side	1.311	0.047	1.358
5.3GHz WLAN	Back Side	1.290	0.047	1.337
5.6GHz WLAN	Back Side	1.311	0.047	1.358
5.8GHz WLAN	Back Side	1.399	0.047	1.446

Note:

- 1) Per KDB 447498D01v06, Simultaneous Transmission SAR Evaluation procedures is as followed:
Step 1: If sum of 1 g SAR < 1.6 W/kg, Simultaneous SAR measurement is not required.
Step 2: If sum of 1 g SAR > 1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.
Step 3: If the ratio of SAR to peak separation distance is ≤ 0.04 , Simultaneous SAR measurement is not required.

2) Simultaneous Transmission SAR Evaluation is not required for 2.4GHz WLAN and 5GHz WLAN , because the software mechanism have been incorporated to guarantee that the 2.4GHz WLAN and 5GHz WLAN transmitters would not simultaneously operate.

8.6 Simultaneous Transmission Possibilities and Conclusion

The above SAR results are sufficient to determine that the simultaneous transmission case does not exceed the SAR limit, so simultaneous transmission of SAR and Volume Scans is not required according to KDB 447498 D04v01, so the tested results comply with the FCC limit.

Annex A: Appendix A: SAR System performance Check Plots

(Please See Appendix A)

Annex B: Appendix B: SAR Measurement results Plots

(Please See Appendix B)

Annex C: Appendix C: Calibration reports

(Please See Appendix C)

Annex D: Appendix D: Photo documentation

(Please See Appendix D)

Statement

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