

FCC RF Exposure Evaluation

1. Product Information

FCC ID:	2AATL-6222D-UUB
Product name	Wi-Fi Dual-band 2X2 11ac +Bluetooth V4.2 Module
Model number	6222D-UUB
Power supply	DC 3.3V AC 120V 60Hz(Adapter for DSP)
Modulation Type	GFSK,8-DPSK, $\pi/4$ -DQPSK(BT V4.2); IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20:OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40:OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac VHT20:OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11ac VHT40:OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11ac VHT80:OFDM (64QAM, 16QAM, QPSK,BPSK)
Antenna Type	PIFA Antenna
Antenna Gain	7.26dBi (maximum)
Hardware version	V1.0
Software version	V1.0
Bluetooth Operation frequency	2402MHz-2480MHz
WLANFCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz,5180-5240MHz,5745-5825MHz IEEE 802.11n HT40:2422-2452MHz,5190-5230MHz,5755-5795MHz IEEE 802.11a:5180-5240MHz, 5745-5825MHz IEEE 802.11ac VHT20:5180-5240MHz, 5745-5825MHz IEEE 802.11ac VHT40:5190-5230MHz, 5755-5795MHz IEEE 802.11ac VHT80:5210MHz,5775MHz
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile devices

2. Evaluation method and Limit

According to ANSI/IEEE C95.1-1992, the Criteria Listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

The MPE was calculated at **20 cm** to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

3. Antenna Information

Product can only use antennas certificated as follows provided by manufacturer;

Antenna Type:	Chain A	PIFA Antenna
	Chain B	PIFA Antenna
Antenna gain:	Chain A	BT & WiFi 2.4G: 3.15dBi WiFi 5G Band 1: 3.79dBi WiFi 5G Band 2A: 3.83dBi WiFi 5G Band 2C: 4.14dBi WiFi 5G Band 3: 4.25dBi
	Chain B	WiFi 2.4G: 3.15dBi WiFi 5G Band 1: 3.79dBi WiFi 5G Band 2A: 3.83dBi WiFi 5G Band 2C: 4.14dBi WiFi 5G Band 3: 4.25dBi
Directional gain	Chain A+B	WiFi 2.4G: 6.16dBi WiFi 5G Band 1: 6.80dBi WiFi 5G Band 2A: 6.84dBi WiFi 5G Band 2C: 7.15dBi WiFi 5G Band 3: 7.26dBi

Note: The product has two antenna ports, support MIMO, the antennas used for antenna ports are the same(Model number:2.4G-5.8G WIFI Antenna).

4. Conducted Power

4.1 Test Setup Block Diagram



4.2 Test Procedure

- 1) The EUT was directly connected to the power meter and antenna output port as show in the Block diagram;
- 2) Reading average power in RMS detector.

4.3 Measurement Equipment

Item	Equipment	Manufacturer	Model No.	Inventory No.	Last Cal.	Next Cal.
1	Power Meter	Anritsu	ML2495A	GTS540	June 28 2017	June 27 2018
2	Power Sensor	Anritsu	MA2411B	GTS541	June 28 2017	June 27 2018

Bluetooth

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
8DPSK	0	2402	7.255
	39	2441	6.038
	78	2480	4.599

Note:

- 1) Test GFSK, $\pi/4$ DQPSK and 8-DPSK for BT classic and GFSK for BT LE, only report 8-DPSK results to represents BT mode, as this is worst case .

2.4GHz WLAN

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
802.11g /MIMO	1	2412	17.14
	6	2437	17.24
	11	2462	17.39

Note:

- 1) Test IEEE 802.11b, IEEE 802.11g, IEEE 802.11n20 and IEEE 802.11n40 for 2.4GHz WLAN, only report IEEE 802.11b results to represents 2.4GHz WLAN mode, as this is worst case .

5GHz WLAN Band 1

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a/OFDM/MIMO	36	5180	13.96
	40	5200	13.61
	48	5240	14.43

Note:

- 1) Test IEEE 802.11a, IEEE 802.11n, and IEEE 802.11ac for 5GHz WLAN Band1, only report IEEE 802.11a results to represents 5GHz WLAN Band1 mode, as this is worst case .

5GHz WLAN Band 2-A

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a/OFDM/MIMO	52	5260	14.35
	60	5300	14.15
	64	5320	13.90

Note:

- 1) Test IEEE 802.11a, IEEE 802.11n, and IEEE 802.11ac for 5GHz WLAN Band 2-A, only report IEEE 802.11a results to represents 5GHz WLAN Band1 mode, as this is worst case .

5GHz WLAN Band 2-C

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a/OFDM/MIMO	100	5500	14.36
	116	5580	13.92
	140	5700	12.63

Note:

- 1) Test IEEE 802.11a, IEEE 802.11n, and IEEE 802.11ac for 5GHz WLAN Band 2-C, only report IEEE 802.11a results to represents 5GHz WLAN Band1 mode, as this is worst case .

5GHz WLAN Band 3

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)
IEEE 802.11a/OFDM/MIMO	149	5745	14.02
	157	5785	13.82
	165	5825	13.75

1) Test IEEE 802.11a, IEEE 802.11n, and IEEE 802.11ac for 5GHz WLAN Band3, only report IEEE 802.11a results to represents 5GHz WLAN Band3 mode, as this is worst case .

5. Manufacturing tolerance

8DPSK(Average)			
Channel	Channel 0	Channel 39	Channel 78
Target (dBm)	8	8	8
Tolerance ±(dB)	2.0	2.0	2.0

802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16	16	16
Tolerance ±(dB)	1.5	1.5	1.5

IEEE 802.11a (Average)			
Channel	Channel 36	Channel 40	Channel 48
Target (dBm)	13	13	13
Tolerance ±(dB)	1.5	1.5	1.5

IEEE 802.11a (Average)			
Channel	Channel 52	Channel 60	Channel 64
Target (dBm)	13	13	13
Tolerance ±(dB)	1.5	1.5	1.5

IEEE 802.11a (Average)			
Channel	Channel 100	Channel 116	Channel 140
Target (dBm)	13	13	13
Tolerance ±(dB)	1.5	1.5	1.5

IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	13	13	13
Tolerance ±(dB)	1.5	1.5	1.5

6. Evaluation Results

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Maximum Output Power Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
2.4GHz WLAN	2432	6.16	17.5	23.66	0.232	1.000	232.274	0.046	1.000
2.4GHz BT	2442	3.15	10.0	13.15	0.021	1.000	20.654	0.004	1.000
5.8GHz WLAN	5785	7.26	14.5	21.76	0.15	1.000	149.968	0.030	1.000
5.2GHz WLAN	5200	6.80	14.5	21.30	0.135	0.250	134.896	0.027	1.000
5.3GHz WLAN	5300	6.84	14.5	21.34	0.136	0.250	136.144	0.027	1.000
5.6GHz WLAN	5580	7.15	14.5	21.65	0.146	0.250	146.218	0.029	1.000

Remark:

1. Output power including tune up tolerance;

7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091for the uncontrolled RF Exposure.

.....THE END OF REPORT.....