

RF Exposure evaluation

FCC ID: 2AWDN-PJ92

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

1. Reference

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4. Antenna Information

The device can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Directional gain
WIFI 1	WIFI1	FPC antenna	2.4GHz – 2.5 GHz 5.1GHz – 5.8 GHz	2.99 dBi 2.88 dBi	6.00 dBi
WIFI 2	WIFI2	FPC antenna	2.4GHz – 2.5 GHz 5.1GHz – 5.8 GHz	2.82 dBi 4.56 dBi	7.57dBi
BT 1	BT 1	FPC antenna	2.4GHz – 2.5 GHz	3.83 dBi	N/A
BT 2	BT 2	FPC antenna	2.4GHz – 2.5 GHz	3.80 dBi	N/A

5. Conducted power and Manufacturing Tolerance

[2.4GHz BT]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune-Up	
			ANT1	ANT2	ANT1	ANT2
GFSK	SISO	2402	3.57	2.87	3.5±1	3.0±1
		2441	3.92	2.94	3.5±1	3.0±1
		2480	3.46	2.21	3.5±1	3.0±1
Pi/4DQPSK	SISO	2402	3.52	2.85	3.5±1	3.0±1
		2441	3.87	2.92	3.5±1	3.0±1
		2480	3.36	2.12	3.5±1	3.0±1
8DPSK	SISO	2402	3.52	2.75	3.5±1	3.0±1
		2441	3.87	2.83	3.5±1	3.0±1
		2480	3.36	2.24	3.5±1	3.0±1
BLE 1M	SISO	2402	3.83	2.51	3.5±1	3.0±1
		2440	3.99	2.79	3.5±1	3.0±1
		2480	3.19	2.35	3.5±1	3.0±1
BLE 2M	SISO	2402	3.85	2.49	3.5±1	3.0±1
		2440	4.04	2.68	3.5±1	3.0±1
		2480	3.26	2.40	3.5±1	3.0±1

[2.4GHz WLAN]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune-Up	
			ANT1	ANT2	ANT1	ANT2
802.11b	SISO	2412	16.28	14.82	16±1	15±1
		2437	16.70	15.22	16±1	15±1
		2462	16.51	14.99	16±1	15±1
802.11g	SISO	2412	16.07	14.94	16±1	15±1
		2437	16.33	15.27	16±1	15±1
		2462	16.19	15.39	16±1	15±1
802.11n (HT20)	SISO	2412	15.71	14.80	16±1	15±1
		2437	15.94	15.28	16±1	15±1
		2462	16.00	15.15	16±1	15±1
802.11n (HT40)	SISO	2422	16.01	15.09	16±1	15±1
		2437	16.18	15.21	16±1	15±1
		2452	16.15	15.11	16±1	15±1
802.11n (HT20)	MIMO	2412	15.77	15.23	16±1	15±1
		2437	16.19	15.68	16±1	15±1
		2462	16.26	15.45	16±1	15±1
802.11n (HT40)	MIMO	2422	16.35	15.36	16±1	15±1
		2437	16.56	15.47	16±1	15±1
		2452	16.67	15.43	16±1	15±1
802.11ax (HEW20)	SISO	2412	15.69	14.84	16±1	15±1
		2437	16.06	15.39	16±1	15±1
		2462	16.01	15.01	16±1	15±1
802.11ax (HEW40)	SISO	2422	16.00	14.97	16±1	15±1
		2437	16.07	15.30	16±1	15±1
		2452	16.04	14.93	16±1	15±1
802.11ax (HEW20)	MIMO	2412	15.85	14.88	16±1	15±1
		2437	16.10	15.49	16±1	15±1
		2462	15.92	15.03	16±1	15±1
802.11ax (HEW40)	MIMO	2422	16.13	15.46	16±1	15±1
		2437	16.37	15.46	16±1	15±1
		2452	16.51	15.56	16±1	15±1

[5GHz WLAN Band 1]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune-Up	
			ANT1	ANT2	ANT1	ANT2
802.11a	SISO	5180	3.24	3.11	3.0±1	3.0±1
		5200	3.50	3.14	3.0±1	3.0±1
		5240	4.04	4.15	4.0±1	4.0±1
802.11n (HT20)	SISO	5180	3.16	3.23	3.0±1	3.0±1
		5200	3.35	3.23	3.0±1	3.0±1
		5240	3.76	4.05	4.0±1	4.0±1
802.11n (HT40)	SISO	5190	2.77	3.09	3.0±1	3.0±1
		5230	2.91	3.89	3.0±1	3.0±1
802.11n (HT20)	MIMO	5180	3.06	3.29	3.0±1	3.0±1
		5200	3.34	3.54	3.0±1	3.0±1
		5240	3.72	4.37	4.0±1	4.0±1
802.11n (HT40)	MIMO	5190	2.73	6.14	3.0±1	6.0±1
		5230	2.60	4.01	3.0±1	5.0±1
802.11ac (VHT20)	SISO	5180	3.34	3.20	3.0±1	3.0±1
		5200	3.48	3.32	3.0±1	3.0±1
		5240	3.82	4.09	4.0±1	4.0±1
802.11ac (VHT40)	SISO	5190	2.09	3.04	3.0±1	3.0±1
		5230	3.30	3.97	3.0±1	3.0±1
802.11ac (VHT80)	SISO	5210	3.70	3.31	3.0±1	3.0±1
802.11ac (VHT20)	MIMO	5180	3.12	3.37	3.0±1	3.0±1
		5200	3.26	3.46	3.0±1	3.0±1
		5240	3.71	4.34	4.0±1	4.0±1
802.11ac (VHT40)	MIMO	5190	2.39	3.85	3.0±1	3.0±1
		5230	3.42	3.17	3.0±1	3.0±1
802.11ac (VHT80)	MIMO	5210	3.15	3.43	3.0±1	3.0±1
802.11ax (HEW20)	SISO	5180	3.35	3.25	3.0±1	3.0±1
		5200	3.40	3.76	3.0±1	3.0±1
		5240	4.22	4.48	4.0±1	4.0±1
802.11ax (HEW40)	SISO	5190	2.79	3.56	3.0±1	3.0±1
		5230	3.94	4.26	4.0±1	4.0±1
802.11ax (HEW80)	SISO	5210	3.63	3.89	3.0±1	3.0±1
802.11ax (HEW20)	MIMO	5180	3.19	3.32	3.0±1	3.0±1
		5200	3.68	3.67	3.0±1	3.0±1
		5240	3.88	4.27	4.0±1	4.0±1
802.11ax (HEW40)	MIMO	5190	3.14	3.39	3.0±1	3.0±1
		5230	3.78	5.02	3.0±1	5.0±1

802.11ax (HEW80)	MIMO	5210	3.42	3.69	3.0±1	3.0±1
---------------------	------	------	------	------	-------	-------

[5GHz WLAN Band 2A]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune Up	
			ANT1	ANT2	ANT1	ANT2
802.11a	SISO	5260	13.42	13.52	14.0±1	14.0±1
		5300	14.53	14.57	14.0±1	14.0±1
		5320	14.59	14.37	14.0±1	14.0±1
802.11n (HT20)	SISO	5260	13.67	13.86	14.0±1	14.0±1
		5300	14.67	14.31	14.0±1	14.0±1
		5320	14.74	14.68	14.0±1	14.0±1
802.11n (HT40)	SISO	5270	13.21	14.50	14.0±1	14.0±1
		5310	14.24	14.34	14.0±1	14.0±1
802.11n (HT20)	MIMO	5260	13.41	13.78	14.0±1	14.0±1
		5300	14.49	14.41	14.0±1	14.0±1
		5320	14.45	14.73	14.0±1	14.0±1
802.11n (HT40)	MIMO	5270	13.31	13.60	14.0±1	14.0±1
		5310	14.42	14.84	14.0±1	14.0±1
802.11ac (VHT20)	SISO	5260	13.11	13.53	14.0±1	14.0±1
		5300	14.13	14.17	14.0±1	14.0±1
		5320	14.45	14.65	14.0±1	14.0±1
802.11ac (VHT40)	SISO	5270	13.37	13.49	14.0±1	14.0±1
		5310	14.16	14.77	14.0±1	14.0±1
802.11ac (VHT80)	SISO	5290	13.94	14.63	14.0±1	14.0±1
802.11ac (VHT20)	MIMO	5260	13.26	13.68	14.0±1	14.0±1
		5300	14.56	14.51	14.0±1	14.0±1
		5320	14.61	14.45	14.0±1	14.0±1
802.11ac (VHT40)	MIMO	5270	13.53	14.05	14.0±1	14.0±1
		5310	14.54	14.94	14.0±1	14.0±1
802.11ac (VHT80)	MIMO	5290	14.05	14.27	14.0±1	14.0±1
802.11ax (HEW20)	SISO	5260	13.25	13.64	14.0±1	14.0±1
		5300	14.56	14.51	14.0±1	14.0±1
		5320	14.36	14.89	14.0±1	14.0±1
802.11ax (HEW40)	SISO	5270	13.41	14.15	14.0±1	14.0±1
		5310	14.49	14.90	14.0±1	14.0±1
802.11ax (HEW80)	SISO	5290	13.63	14.89	14.0±1	14.0±1
802.11ax	MIMO	5260	13.04	13.54	14.0±1	14.0±1

(HEW20)		5300	14.59	14.74	14.0±1	14.0±1
		5320	14.38	14.65	14.0±1	14.0±1
802.11ax (HEW40)	MIMO	5270	13.43	14.77	14.0±1	14.0±1
		5310	14.57	14.95	14.0±1	14.0±1
802.11ax (HEW80)	MIMO	5290	13.70	14.07	14.0±1	14.0±1

[5GHz WLAN Band 2C]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune Up	
			ANT1	ANT2	ANT1	ANT2
802.11a	SISO	5500	14.56	13.56	14.0±1	14.0±1
		5580	13.96	13.94	14.0±1	14.0±1
		5700	14.81	14.35	14.0±1	14.0±1
802.11n (HT20)	SISO	5500	14.01	13.53	14.0±1	14.0±1
		5580	14.04	13.79	14.0±1	14.0±1
		5700	14.52	14.45	14.0±1	14.0±1
802.11n (HT40)	SISO	5510	14.20	13.93	14.0±1	14.0±1
		5550	14.56	14.15	14.0±1	14.0±1
		5670	14.82	15.13	15.0±1	15.0±1
802.11n (HT20)	MIMO	5500	14.24	13.79	14.0±1	14.0±1
		5580	13.94	13.98	14.0±1	14.0±1
		5700	14.37	14.89	14.0±1	14.0±1
802.11n (HT40)	MIMO	5510	14.22	13.95	14.0±1	14.0±1
		5550	14.87	12.96	14.0±1	13.0±1
		5670	14.23	15.34	15.0±1	15.0±1
802.11ac (VHT20)	SISO	5500	14.11	13.47	14.0±1	14.0±1
		5580	13.82	13.86	14.0±1	14.0±1
		5700	14.60	14.74	14.0±1	14.0±1
802.11ac (VHT40)	SISO	5510	14.30	14.39	14.0±1	14.0±1
		5550	14.04	13.72	14.0±1	14.0±1
		5670	14.56	15.34	15.0±1	15.0±1
802.11ac (VHT80)	SISO	5530	13.96	13.62	14.0±1	14.0±1
		5610	13.44	14.12	14.0±1	14.0±1
802.11ac (VHT20)	MIMO	5500	14.28	14.03	14.0±1	14.0±1
		5580	14.21	14.18	14.0±1	14.0±1
		5700	14.47	14.88	14.0±1	14.0±1
802.11ac (VHT40)	MIMO	5510	14.09	13.59	14.0±1	14.0±1
		5550	14.14	13.84	14.0±1	14.0±1
		5670	14.86	15.09	15.0±1	15.0±1
802.11ac (VHT80)	MIMO	5530	14.33	14.15	14.0±1	14.0±1
		5610	13.62	14.20	14.0±1	14.0±1

802.11ax (HEW20)	SISO	5500	14.01	13.83	14.0±1	14.0±1
		5580	13.92	14.00	14.0±1	14.0±1
		5700	14.23	14.97	14.0±1	14.0±1
802.11ax (HEW40)	SISO	5510	14.23	14.18	14.0±1	14.0±1
		5550	14.05	13.53	14.0±1	14.0±1
		5670	13.72	15.75	14.0±1	14.0±1
802.11ax (HEW80)	SISO	5530	14.32	14.23	14.0±1	14.0±1
		5610	13.37	14.31	14.0±1	14.0±1
802.11ax (HEW20)	MIMO	5500	14.07	13.82	14.0±1	14.0±1
		5580	13.70	14.20	14.0±1	14.0±1
		5700	14.17	15.01	15.0±1	15.0±1
802.11ax (HEW40)	MIMO	5510	13.80	14.43	14.0±1	14.0±1
		5550	14.54	13.46	14.0±1	14.0±1
		5670	14.34	15.64	15.0±1	15.0±1
802.11ax (HEW80)	MIMO	5530	14.29	14.21	14.0±1	14.0±1
		5610	13.33	14.25	14.0±1	14.0±1

[5GHz WLAN Band 3]

Mode	TX Type	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)		Tune Up	
			ANT1	ANT2	ANT1	ANT2
802.11a	SISO	5745	13.73	13.87	14.0±1	14.0±1
		5785	13.35	14.07	14.0±1	14.0±1
		5825	13.04	13.76	14.0±1	14.0±1
802.11n (HT20)	SISO	5745	13.77	14.11	14.0±1	14.0±1
		5785	13.10	13.94	14.0±1	14.0±1
		5825	12.78	14.12	13.0±1	14.0±1
802.11n (HT40)	SISO	5755	13.10	14.23	14.0±1	14.0±1
		5795	12.58	14.19	13.0±1	14.0±1
802.11n (HT20)	MIMO	5745	13.95	14.33	14.0±1	14.0±1
		5785	12.67	13.58	13.0±1	14.0±1
		5825	13.19	14.71	14.0±1	14.0±1
802.11n (HT40)	MIMO	5755	13.29	13.49	14.0±1	14.0±1
		5795	12.77	14.94	13.0±1	14.0±1
802.11ac (VHT20)	SISO	5745	13.91	14.41	14.0±1	14.0±1
		5785	12.80	14.08	13.0±1	14.0±1
		5825	13.12	13.95	14.0±1	14.0±1
802.11ac (VHT40)	SISO	5755	13.81	14.90	14.0±1	14.0±1
		5795	13.25	13.69	14.0±1	14.0±1
802.11ac (VHT80)	SISO	5775	12.16	13.25	13.0±1	14.0±1
802.11ac (VHT20)	MIMO	5745	13.73	14.47	14.0±1	14.0±1
		5785	13.04	14.23	14.0±1	14.0±1

		5825	13.28	14.61	14.0±1	14.0±1
802.11ac (VHT40)	MIMO	5755	14.08	14.64	14.0±1	14.0±1
		5795	12.46	14.32	13.0±1	14.0±1
802.11ac (VHT80)	MIMO	5775	12.72	13.75	13.0±1	14.0±1
802.11ax (HEW20)	SISO	5745	16.31	15.16	16.0±1	15.0±1
		5785	15.21	14.74	16.0±1	15.0±1
		5825	13.98	14.62	14.0±1	14.0±1
802.11ax (HEW40)	SISO	5755	16.28	15.17	16.0±1	15.0±1
		5795	14.35	14.60	14.0±1	14.0±1
802.11ax (HEW80)	SISO	5775	15.71	15.22	16.0±1	15.0±1
802.11ax (HEW20)	MIMO	5745	15.49	15.00	16.0±1	15.0±1
		5785	15.00	14.76	16.0±1	15.0±1
		5825	13.83	14.58	14.0±1	14.0±1
802.11ax (HEW40)	MIMO	5755	15.36	15.13	16.0±1	15.0±1
		5795	14.92	14.29	14.0±1	14.0±1
802.11ax (HEW80)	MIMO	5775	15.42	15.06	16.0±1	15.0±1

6. Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain antenna, the RF power density can be obtained.

BT

Antenna 1

Modulation Type	Max. Output power with Tune_up		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
BR/EDR	4.50	2.8184	3.83	2.4155	100%	0.0014	1.0000
BLE	4.50	2.8184	3.83	2.4155	100%	0.0014	1.0000

Antenna 2

Modulation Type	Max. Output power with Tune_up		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
BR/EDR	4.00	2.5119	3.80	2.3988	100%	0.0012	1.0000
BLE	4.00	2.5119	3.80	2.3988	100%	0.0012	1.0000

2.4GHz WLAN SISO MODE

Antenna 1

Modulation Type	Max. Output power with Tune_up		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11b	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000
IEEE 802.11g	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000
IEEE 802.11n HT20	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000
IEEE 802.11n HT40	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000
IEEE 802.11ax HE20	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000
IEEE 802.11ax HE40	17.00	50.1187	2.99	1.9907	100%	0.0198	1.0000

Antenna 2

Modulation Type	Max. Output power with Tune_up		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11b	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000
IEEE 802.11g	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000
IEEE 802.11n HT20	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000
IEEE 802.11n HT40	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000
IEEE 802.11ax HE20	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000
IEEE 802.11ax HE40	16.00	39.8107	2.82	1.9143	100%	0.0152	1.0000

5GHz WLAN Band 1 SISO MODE

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	5.00	3.1623	2.88	1.9409	100%	0.0012	1.0000
IEEE 802.11n HT20	5.00	3.1623	2.88	1.9409	100%	0.0012	1.0000
IEEE 802.11n HT40	4.00	2.5119	2.88	1.9409	100%	0.0010	1.0000
IEEE 802.11ac VHT20	5.00	3.1623	2.88	1.9409	100%	0.0012	1.0000
IEEE 802.11ac VHT40	4.00	2.5119	2.88	1.9409	100%	0.0010	1.0000
IEEE 802.11ac VHT80	4.00	2.5119	2.88	1.9409	100%	0.0010	1.0000
IEEE 802.11ax HE20	5.00	3.1623	2.88	1.9409	100%	0.0012	1.0000
IEEE 802.11ax HE40	5.00	3.1623	2.88	1.9409	100%	0.0012	1.0000
IEEE 802.11ax HE80	4.00	2.5119	2.88	1.9409	100%	0.0010	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	5.00	3.1623	4.56	2.8576	100%	0.0018	1.0000
IEEE 802.11n HT20	5.00	3.1623	4.56	2.8576	100%	0.0018	1.0000
IEEE 802.11n HT40	4.00	2.5119	4.56	2.8576	100%	0.0014	1.0000
IEEE 802.11ac VHT20	5.00	3.1623	4.56	2.8576	100%	0.0018	1.0000
IEEE 802.11ac VHT40	4.00	2.5119	4.56	2.8576	100%	0.0014	1.0000
IEEE 802.11ac VHT80	4.00	2.5119	4.56	2.8576	100%	0.0014	1.0000
IEEE 802.11ax HE20	5.00	3.1623	4.56	2.8576	100%	0.0018	1.0000
IEEE 802.11ax HE40	5.00	3.1623	4.56	2.8576	100%	0.0018	1.0000
IEEE 802.11ax HE80	4.00	2.5119	4.56	2.8576	100%	0.0014	1.0000

5GHz WLAN Band 2A SISO MODE

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE80	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE80	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000

5GHz WLAN Band 2C SISO MODE

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT40	16.00	39.8107	2.88	1.9409	100%	0.0154	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT40	16.00	39.8107	2.88	1.9409	100%	0.0154	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ax HE80	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT40	16.00	39.8107	4.56	2.8576	100%	0.0226	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT40	16.00	39.8107	4.56	2.8576	100%	0.0226	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE80	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000

5GHz WLAN Band 3 SISO MODE

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11n HT40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	2.88	1.9409	100%	0.0122	1.0000
IEEE 802.11ac VHT80	14.00	25.1189	2.88	1.9409	100%	0.0097	1.0000
IEEE 802.11ax HE20	17.00	50.1187	2.88	1.9409	100%	0.0194	1.0000
IEEE 802.11ax HE40	17.00	50.1187	2.88	1.9409	100%	0.0194	1.0000
IEEE 802.11ax HE80	17.00	50.1187	2.88	1.9409	100%	0.0194	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11a	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11n HT40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	4.56	2.8576	100%	0.0180	1.0000
IEEE 802.11ax HE20	16.00	39.8107	4.56	2.8576	100%	0.0226	1.0000
IEEE 802.11ax HE40	16.00	39.8107	4.56	2.8576	100%	0.0226	1.0000
IEEE 802.11ax HE80	16.00	39.8107	4.56	2.8576	100%	0.0226	1.0000

Remark:

1. Output power (Average) including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

2.4GHz WLAN MIMO MODE

Antenna 1

Modulation Type	Max. Output power with Tune_up		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	17.00	50.1187	6.00	3.9811	100%	0.0397	1.0000
IEEE 802.11n HT40	17.00	50.1187	6.00	3.9811	100%	0.0397	1.0000
IEEE 802.11ax HE20	17.00	50.1187	6.00	3.9811	100%	0.0397	1.0000
IEEE 802.11ax HE40	17.00	50.1187	6.00	3.9811	100%	0.0397	1.0000

Antenna 2

Modulation Type	Max. Output power with Tune_up		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	16.00	39.8107	6.00	3.9811	100%	0.0315	1.0000
IEEE 802.11n HT40	16.00	39.8107	6.00	3.9811	100%	0.0315	1.0000
IEEE 802.11ax HE20	16.00	39.8107	6.00	3.9811	100%	0.0315	1.0000
IEEE 802.11ax HE40	16.00	39.8107	6.00	3.9811	100%	0.0315	1.0000

5GHz WLAN Band 1 MIMO MODE

Antenna 1

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11n HT40	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ac VHT20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11ac VHT40	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ac VHT80	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ax HE20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11ax HE40	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ax HE80	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000

Antenna 2

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11n HT40	7.00	5.0119	7.57	5.7148	100%	0.0057	1.0000
IEEE 802.11ac VHT20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11ac VHT40	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ac VHT80	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000
IEEE 802.11ax HE20	5.00	3.1623	7.57	5.7148	100%	0.0036	1.0000
IEEE 802.11ax HE40	6.00	3.9811	7.57	5.7148	100%	0.0045	1.0000
IEEE 802.11ax HE80	4.00	2.5119	7.57	5.7148	100%	0.0029	1.0000

5GHz WLAN Band 2A MIMO MODE

Antenna 1

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000

Antenna 2

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000

5GHz WLAN Band 2C MIMO MODE

Antenna 1

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE20	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000

Antenna 2

Modulation Type	Output power		Directional gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE20	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000

5GHz WLAN Band 3 MIMO MODE

Antenna 1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT80	14.00	25.1189	7.57	5.7148	100%	0.0286	1.0000
IEEE 802.11ax HE20	17.00	50.1187	7.57	5.7148	100%	0.0570	1.0000
IEEE 802.11ax HE40	17.00	50.1187	7.57	5.7148	100%	0.0570	1.0000
IEEE 802.11ax HE80	17.00	50.1187	7.57	5.7148	100%	0.0570	1.0000

Antenna 2

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
IEEE 802.11n HT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11n HT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT20	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT40	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ac VHT80	15.00	31.6228	7.57	5.7148	100%	0.0360	1.0000
IEEE 802.11ax HE20	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE40	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000
IEEE 802.11ax HE80	16.00	39.8107	7.57	5.7148	100%	0.0453	1.0000

Remark:

1. Output power (Average) including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

7. Summary simultaneous transmission information

The device two WIFI antenna and two BT antenna, WIFI Ant1 and Ant2 can transmit simultaneously in 802.11xx MIMO mode. BT and WIFI can transmit simultaneously. WIFI 2.4G and WIFI5G cannot transmit simultaneously. BT Ant1 and Ant2 cannot transmit simultaneously.

8. Summary simultaneous transmission results

WIFI Antenna 1 and Antenna 2 for 2.4GWLAN

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0397	0.0315	0.0712	1.0	PASS
IEEE 802.11n HT40	0.0397	0.0315	0.0712	1.0	PASS
IEEE 802.11ax HE20	0.0397	0.0315	0.0712	1.0	PASS
IEEE 802.11ax HE40	0.0397	0.0315	0.0712	1.0	PASS

Antenna 1 and Antenna 2 for 5GWLAN Band 1

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0036	0.0036	0.0072	1.0	PASS
IEEE 802.11n HT40	0.0029	0.0057	0.0086	1.0	PASS
IEEE 802.11ac VHT20	0.0036	0.0036	0.0072	1.0	PASS
IEEE 802.11ac VHT40	0.0029	0.0029	0.0058	1.0	PASS
IEEE 802.11ac VHT80	0.0029	0.0029	0.0058	1.0	PASS
IEEE 802.11ax HE20	0.0036	0.0036	0.0072	1.0	PASS
IEEE 802.11ax HE40	0.0029	0.0045	0.0074	1.0	PASS
IEEE 802.11ax HE80	0.0029	0.0029	0.0058	1.0	PASS

Antenna 1 and Antenna 2 for 5GWLAN Band 2A

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11n HT40	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ac VHT20	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ac VHT40	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ac VHT80	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ax HE20	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ax HE40	0.0360	0.0360	0.072	1.0	PASS
IEEE 802.11ax HE80	0.0360	0.0360	0.072	1.0	PASS

Antenna 1 and Antenna 2 for 5GWLAN Band 2C

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11n HT40	0.0453	0.0453	0.0906	1.0	PASS
IEEE 802.11ac VHT20	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11ac VHT40	0.0453	0.0453	0.0906	1.0	PASS
IEEE 802.11ac VHT80	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11ax HE20	0.0453	0.0453	0.0906	1.0	PASS
IEEE 802.11ax HE40	0.0453	0.0453	0.0906	1.0	PASS
IEEE 802.11ax HE80	0.0360	0.0360	0.0720	1.0	PASS

Antenna 1 and Antenna 2 for 5GWLAN Band 3

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11n HT40	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11ac VHT20	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11ac VHT40	0.0360	0.0360	0.0720	1.0	PASS
IEEE 802.11ac VHT80	0.0286	0.0360	0.0646	1.0	PASS
IEEE 802.11ax HE20	0.0570	0.0453	0.1023	1.0	PASS
IEEE 802.11ax HE40	0.0570	0.0453	0.1023	1.0	PASS
IEEE 802.11ax HE80	0.0570	0.0453	0.1023	1.0	PASS

Antenna 1 and Antenna 2 for 5GWLAN Band 3

Modulation Type	MPE _{Antenna1} (mW/cm ²)	MPE _{Antenna2} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT20	0.0100	0.0025	0.0125	1.0	PASS
IEEE 802.11ac VHT20	0.0100	0.0025	0.0125	1.0	PASS
IEEE 802.11n HT40	0.0100	0.0025	0.0125	1.0	PASS
IEEE 802.11ac VHT40	0.0100	0.0025	0.0125	1.0	PASS
IEEE 802.11ac VHT80	0.0100	0.0025	0.0125	1.0	PASS

WIFI +BT

Modulation Type	Max MPE _{WIFI} (mW/cm ²)	Max MPE _{BT} (mW/cm ²)	ΣMPE ratios	Limit	Results
WIFI+BT	0.1023	0.0014	0.1037	1.0	PASS

9. Conclusion

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

-----THE END OF REPORT-----