

RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

FCC ID: 2AWJK-WMS-40

EUT Specification

EUT	Wireless Presentation System
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☒ WLAN: 5.18GHz ~ 5.24GHz ☒ WLAN: 5.745GHz ~ 5.825GHz ☐ Others: 2.402GHz~2.480GHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others ____
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	2.4G WiFi: 17.41 dBm (0.0551W) 5.1G WiFi: 16.10 dBm (0.0407W) 5.8G WiFi: 14.807 dBm (0.0304W)
Antenna gain (Max)	WiFi 2.4G: ANT A & ANT B 2 dBi WiFi 5.1G&WiFi 5.8G: ANT A & ANT B 3 dBi
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

Friis transmission formula: $P_d = \frac{P_{out} \cdot G}{4 \cdot \pi \cdot R^2}$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

2.4G WiFi ANT A:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm ²)	Power density Limits (mW/cm ²)
802.11b	2412	13.38	13.38±1	14.38	2	0.0086	1
	2437	13.18	13.18±1	14.18	2	0.0083	1
	2462	12.67	12.67±1	13.67	2	0.0073	1
802.11g	2412	10.80	10.80±1	11.80	2	0.0048	1
	2437	10.55	10.55±1	11.55	2	0.0045	1
	2462	10.26	10.26±1	11.26	2	0.0042	1
802.11n (HT20)	2412	11.59	11.59±1	12.59	2	0.0057	1
	2437	11.33	11.33±1	12.33	2	0.0054	1
	2462	10.92	10.92±1	11.92	2	0.0049	1
802.11n (HT40)	2422	12.90	12.90±1	13.90	2	0.0077	1
	2437	12.51	12.51±1	13.51	2	0.0071	1
	2452	12.32	12.32±1	13.32	2	0.0068	1

2.4G WiFi ANT B:

Operating Mode	Channel Frequency (MHz)	Measured Power (dBm)	Tune up tolerance (dBm)	Max. Tune up Power (dBm)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm ²)	Power density Limits (mW/cm ²)
802.11b	2412	13.29	13.29±1	14.29	2	0.0085	1
	2437	13.09	13.09±1	14.09	2	0.0081	1
	2462	12.72	12.72±1	13.72	2	0.0074	1
802.11g	2412	16.34	16.34±1	17.34	2	0.0171	1
	2437	16.03	16.03±1	17.03	2	0.0159	1
	2462	15.53	15.53±1	16.53	2	0.0142	1
802.11n (HT20)	2412	14.92	14.92±1	15.92	2	0.0123	1
	2437	14.96	14.96±1	15.96	2	0.0124	1
	2462	14.24	14.24±1	15.24	2	0.0105	1
802.11n (HT40)	2422	14.86	14.86±1	15.86	2	0.0122	1
	2437	14.64	14.64±1	15.64	2	0.0116	1
	2452	14.83	14.83±1	15.83	2	0.0121	1

ANT A+ANT B

Operating Mode	Channel Frequency (MHz)	ANT A Power density at 20cm (mW/ cm ²)	ANT B Power density at 20cm (mW/ cm ²)	ANT A+ANT B Power density at 20cm (mW/ cm ²)	Power density Limits (mW/cm ²)
802.11b	2412	0.0086	0.0085	0.0171	1
	2437	0.0083	0.0081	0.0164	1
	2462	0.0073	0.0074	0.0147	1
802.11g	2412	0.0048	0.0171	0.0219	1
	2437	0.0045	0.0159	0.0204	1
	2462	0.0042	0.0142	0.0184	1
802.11n (HT20)	2412	0.0057	0.0123	0.0180	1
	2437	0.0054	0.0124	0.0178	1
	2462	0.0049	0.0105	0.0154	1
802.11n (HT40)	2422	0.0077	0.0122	0.0199	1
	2437	0.0071	0.0116	0.0187	1
	2452	0.0068	0.0121	0.0189	1

5.1G WiFi ANT A:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	(mW/cm ²)
802.11a	5180	12.77	12.77±1	13.77	3	0.0095	1
	5200	11.77	11.77±1	12.77	3	0.0075	1
	5240	12.00	12.00±1	13.00	3	0.0079	1
802.11n20	5180	11.94	11.94±1	12.94	3	0.0078	1
	5200	11.15	11.15±1	12.15	3	0.0065	1
	5240	10.53	10.53±1	11.53	3	0.0056	1
802.11ac20	5180	11.90	11.90±1	12.90	3	0.0077	1
	5200	11.46	11.46±1	12.46	3	0.0070	1
	5240	10.48	10.48±1	11.48	3	0.0056	1
802.11n40	5190	11.39	11.39±1	12.39	3	0.0069	1
	5230	10.62	10.62±1	11.62	3	0.0058	1
802.11ac40	5190	11.21	11.21±1	12.21	3	0.0066	1
	5230	10.55	10.55±1	11.55	3	0.0057	1
802.11ac80	5210	13.85	13.85±1	14.85	3	0.0121	1

5.1G WiFi ANT B:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	(mW/cm ²)
802.11a	5180	13.38	13.38±1	14.38	3	0.0109	1
	5200	12.41	12.41±1	13.41	3	0.0087	1
	5240	11.65	11.65±1	12.65	3	0.0073	1
802.11n20	5180	12.53	12.53±1	13.53	3	0.0089	1
	5200	11.99	11.99±1	12.99	3	0.0079	1
	5240	11.15	11.15±1	12.15	3	0.0065	1
802.11ac20	5180	12.58	12.58±1	13.58	3	0.0091	1
	5200	12.06	12.06±1	13.06	3	0.0080	1
	5240	11.16	11.16±1	12.16	3	0.0065	1
802.11n40	5190	11.79	11.79±1	12.79	3	0.0075	1
	5230	11.37	11.37±1	12.37	3	0.0069	1
802.11ac40	5190	11.66	11.66±1	12.66	3	0.0073	1
	5230	10.89	10.89±1	11.89	3	0.0061	1
802.11ac80	5210	11.51	11.51±1	12.51	3	0.0071	1

ANT A+ANT B:

Operating Mode	Channel Frequency	ANT A Power density at 20cm	ANT B Power density at 20cm	ANT A+ANT B Power density at 20cm	Power density Limits
	(MHz)	(mW/ cm ²)	(mW/ cm ²)	(mW/ cm ²)	(mW/cm ²)
802.11a	5180	0.0095	0.0109	0.0204	1
	5200	0.0075	0.0087	0.0162	1
	5240	0.0079	0.0073	0.0152	1
802.11n20	5180	0.0078	0.0089	0.0167	1
	5200	0.0065	0.0079	0.0144	1
	5240	0.0056	0.0065	0.0121	1
802.11ac20	5180	0.0077	0.0091	0.0168	1
	5200	0.0070	0.0080	0.0150	1
	5240	0.0056	0.0065	0.0121	1
802.11n40	5190	0.0069	0.0075	0.0144	1
	5230	0.0058	0.0069	0.0127	1
802.11ac40	5190	0.0066	0.0073	0.0139	1
	5230	0.0057	0.0061	0.0118	1
802.11ac80	5210	0.0121	0.0071	0.0192	1

5.8G WiFi ANT A:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	(mW/cm ²)
802.11a	5745	11.91	11.91 ± 1	12.91	3	0.0078	1
	5785	11.33	11.33 ± 1	12.33	3	0.0068	1
	5825	11.19	11.19 ± 1	12.19	3	0.0066	1
802.11n20	5745	10.84	10.84 ± 1	11.84	3	0.0061	1
	5785	11.01	11.01 ± 1	12.01	3	0.0063	1
	5825	10.50	10.50 ± 1	11.50	3	0.0056	1
802.11ac20	5745	10.84	10.84 ± 1	11.84	3	0.0061	1
	5785	11.36	11.36 ± 1	12.36	3	0.0068	1
	5825	10.67	10.67 ± 1	11.67	3	0.0058	1
802.11n40	5755	10.51	10.51 ± 1	11.51	3	0.0056	1
	5795	10.29	10.29 ± 1	11.29	3	0.0053	1
802.11ac40	5755	11.19	11.19 ± 1	12.19	3	0.0066	1
	5795	10.52	10.52 ± 1	11.52	3	0.0056	1
802.11ac80	5775	10.44	10.44 ± 1	11.44	3	0.0055	1

5.8G WiFi ANT B:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	(mW/cm ²)
802.11a	5745	11.68	11.68 ± 1	12.68	3	0.0074	1
	5785	11.05	11.05 ± 1	12.05	3	0.0064	1
	5825	11.54	11.54 ± 1	12.54	3	0.0071	1
802.11n20	5745	10.90	10.90 ± 1	11.90	3	0.0061	1
	5785	10.76	10.76 ± 1	11.76	3	0.0060	1
	5825	10.33	10.33 ± 1	11.33	3	0.0054	1
802.11ac20	5745	10.97	10.97 ± 1	11.97	3	0.0062	1
	5785	11.06	11.06 ± 1	12.06	3	0.0064	1
	5825	10.92	10.92 ± 1	11.92	3	0.0062	1
802.11n40	5755	10.55	10.55 ± 1	11.55	3	0.0057	1
	5795	9.97	9.97 ± 1	10.97	3	0.0050	1
802.11ac40	5755	10.54	10.54 ± 1	11.54	3	0.0057	1
	5795	10.17	10.17 ± 1	11.17	3	0.0052	1
802.11ac80	5775	11.26	11.26 ± 1	12.26	3	0.0067	1

ANT A+ANT B:

Operating Mode	Channel Frequency	ANT A Power density at 20cm	ANT B Power density at 20cm	ANT A+ANT B Power density at 20cm	Power density Limits
	(MHz)	(mW/ cm ²)	(mW/ cm ²)	(mW/ cm ²)	(mW/cm ²)
802.11a	5745	0.0078	0.0074	0.0152	1
	5785	0.0068	0.0064	0.0132	1
	5825	0.0066	0.0071	0.0137	1
802.11n20	5745	0.0061	0.0061	0.0122	1
	5785	0.0063	0.0060	0.0123	1
	5825	0.0056	0.0054	0.0110	1
802.11ac20	5745	0.0061	0.0062	0.0123	1
	5785	0.0068	0.0064	0.0132	1
	5825	0.0058	0.0062	0.0120	1
802.11n40	5755	0.0056	0.0057	0.0113	1
	5795	0.0053	0.0050	0.0103	1
802.11ac40	5755	0.0066	0.0057	0.0123	1
	5795	0.0056	0.0052	0.0108	1
802.11ac80	5775	0.0055	0.0067	0.0122	1

Note:

2.4G WiFi(MIMO)+5.1G WiFi(MIMO) +5.8G WiFi(MIMO) simultaneous:

$0.0219+0.0204+0.0152=0.0575 < 1$