



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: 2ATBXK140L1

EUT Specification

EUT	MAVPSG1
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input checked="" type="checkbox"/> WLAN: 5.18GHz ~ 5.240GHz <input checked="" type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input checked="" type="checkbox"/> BT: 2.402GHz ~ 2.4805GHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	27.52 dBm for WIFI 2.4G Band; 18.12 dBm for UNII Band I; 16.38 dBm for UNII Band III -2.46 dBm for BLE 9.28 dBm for BR+EDR
Antenna gain (Max)	2.17 dBi for WIFI 2.4 Band, BR+EDR and BLE 3.18 dBi for WIFI 5G Band I 3.18 dBi for WIFI 5G Band III
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> 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: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

P_d = Power density in mW/cm², P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale, $\pi = 3.1416$

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

For 5GHz WIFI Band:

Antenna 1:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power (dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11a	CH36	17 ± 1	18	63.0957	3.18	2.080	0.026105	1
	CH40	17 ± 1	18	63.0957	3.18	2.080	0.026105	1
	CH48	17 ± 1	18	63.0957	3.18	2.080	0.026105	1
	CH149	14 ± 1	15	31.6228	3.18	2.080	0.013084	1
	CH157	14 ± 1	15	31.6228	3.18	2.080	0.013084	1
	CH165	14 ± 1	15	31.6228	3.18	2.080	0.013084	1
802.11n (VHT20)	CH36	15 ± 1	16	39.8107	3.18	2.080	0.016471	1
	CH40	15 ± 1	16	39.8107	3.18	2.080	0.016471	1
	CH48	15 ± 1	16	39.8107	3.18	2.080	0.016471	1
	CH149	13 ± 1	14	25.1189	3.18	2.080	0.010393	1
	CH157	13 ± 1	14	25.1189	3.18	2.080	0.010393	1
	CH165	12 ± 1	13	19.9526	3.18	2.080	0.008255	1
802.11n (VHT40)	CH38	15 ± 1	16	39.8107	3.18	2.080	0.016471	1
	CH46	15 ± 1	16	39.8107	3.18	2.080	0.016471	1
	CH151	12 ± 1	13	19.9526	3.18	2.080	0.008255	1
	CH159	12 ± 1	13	19.9526	3.18	2.080	0.008255	1



Antenna 2:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11a	CH36	16±1	17	50.1187	3.18	2.080	0.020736	1
	CH40	16±1	17	50.1187	3.18	2.080	0.020736	1
	CH48	16±1	17	50.1187	3.18	2.080	0.020736	1
	CH149	15±1	16	39.8107	3.18	2.080	0.016471	1
	CH157	15±1	16	39.8107	3.18	2.080	0.016471	1
	CH165	15±1	16	39.8107	3.18	2.080	0.016471	1
802.11n (VHT20)	CH36	15±1	16	39.8107	3.18	2.080	0.016471	1
	CH40	15±1	16	39.8107	3.18	2.080	0.016471	1
	CH48	15±1	16	39.8107	3.18	2.080	0.016471	1
	CH149	13±1	14	25.1189	3.18	2.080	0.010393	1
	CH157	14±1	15	31.6228	3.18	2.080	0.013084	1
	CH165	13±1	14	25.1189	3.18	2.080	0.010393	1
802.11n (VHT40)	CH38	14±1	15	31.6228	3.18	2.080	0.013084	1
	CH46	14±1	15	31.6228	3.18	2.080	0.013084	1
	CH151	13±1	14	25.1189	3.18	2.080	0.010393	1
	CH159	13±1	14	25.1189	3.18	2.080	0.010393	1



MPE Result:

Operation Mode	Channel Number	Channel Frequency (MHz)	Power density at 20cm (mW/ cm ²)			Power density Limits (mW/c m ²)	Verdict
			Ant1	Ant2	Sum		
802.11a	CH36	5180	0.026105	0.020736		1	PASS
	CH40	5200	0.026105	0.020736		1	PASS
	CH48	5240	0.026105	0.020736		1	PASS
	CH149	5745	0.013084	0.016471		1	PASS
	CH157	5785	0.013084	0.016471		1	PASS
	CH165	5825	0.013084	0.016471		1	PASS
802.11n (VHT20)	CH36	5180	0.016471	0.016471	0.029555	1	Pass
	CH40	5200	0.016471	0.016471	0.029555	1	Pass
	CH48	5240	0.016471	0.016471	0.018648	1	Pass
	CH149	5745	0.010393	0.010393	0.018648	1	Pass
	CH157	5785	0.010393	0.013084	0.018605	1	Pass
	CH165	5825	0.008255	0.010393	0.014778	1	Pass
802.11n (VHT40)	CH38	5190	0.016471	0.013084	0.020738	1	Pass
	CH46	5230	0.016471	0.013084	0.020738	1	Pass
	CH151	5755	0.008255	0.010393	0.016472	1	Pass
	CH159	5795	0.008255	0.010393	0.016472	1	Pass



For 2.4GHz WIFI Band:

Antenna 1

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11b	1	21±1	22	158.489	2.17	1.648	0.051967	1
	6	20±1	21	125.893	2.17	1.648	0.041279	1
	11	19±1	20	100.000	2.17	1.648	0.032789	1
802.11g	1	23±1	24	251.189	2.17	1.648	0.082362	1
	6	24±1	25	316.228	2.17	1.648	0.103688	1
	11	24±1	25	316.228	2.17	1.648	0.103688	1
802.11n (HT20)	1	24±1	25	316.228	2.17	1.648	0.103688	1
	6	25±1	26	398.107	2.17	1.648	0.130536	1
	11	22±1	23	199.526	2.17	1.648	0.065423	1
802.11n (HT40)	3	24±1	25	316.228	2.17	1.648	0.103688	1
	6	24±1	25	316.228	2.17	1.648	0.103688	1
	9	24±1	25	316.228	2.17	1.648	0.103688	1

Antenna 2:

Operating Mode	Test Channel	Tune up tolerance (dBm)	Max tune up conducted power(dBm)	Output Peak power (mW)	Ant. Gain (dBi)	Ant. Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
802.11b	1	18±1	15	31.623	3.18	2.080	0.013084	1
	6	17±1	15	31.623	3.18	2.080	0.013084	1
	11	17±1	14	25.119	3.18	2.080	0.010393	1
802.11g	1	22±1	14	25.119	3.18	2.080	0.010393	1
	6	21±1	16	39.811	3.18	2.080	0.016471	1
	11	22±1	16	39.811	3.18	2.080	0.016471	1
802.11n (HT20)	1	22±1	16	39.811	3.18	2.080	0.016471	1
	6	23±1	16	39.811	3.18	2.080	0.016471	1
	11	22±1	16	39.811	3.18	2.080	0.016471	1
802.11n (HT40)	3	24±1	14	25.119	3.18	2.080	0.010393	1
	6	23±1	15	31.623	3.18	2.080	0.013084	1
	9	22±1	14	25.119	3.18	2.080	0.010393	1



MPE Result:

Operation Mode	Channel Number	Channel Frequency (MHz)	Power density at 20cm (mW/ cm ²)			Power density Limits (mW/cm ²)
			Ant1	Ant2	Sum	
802.11b	1	2412	0.010369	0.026045	--	1
	6	2437	0.010369	0.020689	--	1
	11	2462	0.008236	0.020689	--	1
802.11g	1	2412	0.008236	0.065423	--	1
	6	2437	0.010369	0.051967	--	1
	11	2462	0.008236	0.065423	--	1
802.11n (HT20)	1	2412	0.103688	0.065423	0.169111	1
	6	2437	0.130536	0.082362	0.212898	1
	11	2462	0.065423	0.065423	0.130846	1
802.11n (HT40)	3	2422	0.103688	0.103688	0.207376	1
	6	2437	0.103688	0.082362	0.186051	1
	9	2452	0.103688	0.065423	0.169111	1

For BR+EDR MPE Result:

Mode	Channel Freq. (MHz)	Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain (Numeric)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
GFSK	2402	5.97	6±1	7	1.648	0.001643	1
GFSK	2441	5.58	6±1	7	1.648	0.001643	1
GFSK	2480	5.47	5±1	6	1.648	0.001305	1
π/4-DQPSK	2402	6.81	7±1	8	1.648	0.002611	1
π/4-DQPSK	2441	9.12	9±1	10	1.648	0.004137	1
π/4-DQPSK	2480	6.98	7±1	8	1.648	0.002611	1
8DPSK	2402	6.98	7±1	8	1.648	0.002611	1
8DPSK	2441	9.28	9±1	10	1.648	0.004137	1
8DPSK	2480	7.62	8±1	9	1.648	0.001643	1



For BLE MPE Result:

Mode	Channel Freq. (MHz)	Measured power (dBm)	Tune-up power (dBm)	Max tune-up power (dBm)	Antenna Gain (Numeric)	Evaluation result (mW/cm ²)	Power density Limits (mW/cm ²)
GFSK	2402	-4.18	-4±1	-3	1.648	0.000164	1
GFSK	2441	-3.57	-3±1	-2	1.648	0.000207	1
GFSK	2480	-2.46	-2±1	-1	1.648	0.000260	1

Signature:

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