FCC ID : 2ADID-M632USA

1. RF EXPOSURE

1.1.The Requirement

System 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 levels in excess of the Commission's guidelines. See Section 15.247 and Section 15.407

1.2.Limit For Maximum Permissible Exposure (MPE)

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2, \|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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

1.3.MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

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

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the antenna is 2 dBi, the RF power density can be obtained.

1.4. TEST RESULTS

Maximum measured transmitter power

Directional gain= 2+10log2=5.01

For 2.4G WIFI

The test was performed with 802.11b							
Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	10log(1/ duty cycle) ANT 1	10log(1/ duty cycle) ANT 2	Final output power ANT 1 (dBm)	Final output power ANT 2 (dBm)	Limits dBm / W
2412	13.25	13.16	0.10	0.10	13.35	13.26	30dBm/1W
2437	13.36	13.52	0.10	0.10	13.46	13.62	30dBm/1W
2462	13.18	13.35	0.10	0.10	13.28	13.45	30dBm/1W

The test was performed with 802.11g							
Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	10log(1/ duty cycle) ANT 1	10log(1/ duty cycle) ANT 2	Final output power ANT 1 (dBm)	Final output power ANT 2 (dBm)	Limits dBm / W
2412	10.94	11.38	0.57	0.53	11.51	11.91	30dBm/1W
2437	10.74	11.15	0.57	0.53	11.31	11.68	30dBm/1W
2462	11.04	10.76	0.57	0.53	11.61	11.29	30dBm/1W

The test was performed with 802.11n20								
Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	10log(1/ duty cycle) ANT 1	10log(1/ duty cycle) ANT 2	Final output power ANT 1 (dBm)	Final output power ANT 2 (dBm)	Total output power (dBm)	Limits dBm
2412	10.21	10.51	0.60	0.60	10.81	11.11	13.97	30dBm
2437	9.98	10.19	0.60	0.60	10.58	10.79	13.70	30dBm
2462	10.69	10.07	0.60	0.60	11.29	10.67	14.00	30dBm

The test was performed with 802.11n40								
Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	10log(1/ duty cycle) ANT 1	10log(1/ duty cycle) ANT 2	Final output power ANT 1 (dBm)	Final output power ANT 2 (dBm)	Total output power (dBm)	Limits dBm
2422	10.33	9.66	1.25	1.35	11.58	11.01	14.31	30dBm
2437	10.36	10.91	1.25	1.35	11.61	12.26	14.96	30dBm
2452	10.05	9.87	1.25	1.35	11.30	11.22	14.27	30dBm

Operation Mode	Channel Number	Channel Frequency (MHz)	Antenna Gain (Numeric)	Power Density At 20cm (mW/cm^2)			Power Density Limit (mW/cm^2)	Test Results
				Ant 1	Ant 2	Sum		
802.11b	1	2412	1.585	0.0068	0.0067	--	1.000	Pass
	6	2437	1.585	0.0070	0.0073	--	1.000	Pass
	11	2462	1.585	0.0067	0.0070	--	1.000	Pass
802.11g	1	2412	1.585	0.0045	0.0049	--	1.000	Pass
	6	2437	1.585	0.0043	0.0046	--	1.000	Pass
	11	2462	1.585	0.0046	0.0043	--	1.000	Pass
802.11n 20M	1	2412	1.585	0.0038	0.0041	0.0079	1.000	Pass
	6	2437	1.585	0.0036	0.0038	0.0074	1.000	Pass
	11	2462	1.585	0.0042	0.0037	0.0079	1.000	Pass
802.11n 40M	3	2422	1.585	0.0045	0.0040	0.0085	1.000	Pass
	6	2437	1.585	0.0046	0.0053	0.0099	1.000	Pass
	9	2452	1.585	0.0042	0.0042	0.0084	1.000	Pass

For 5G WIFI

The test was performed with 802.11A						
Channel	Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	Ave output power ANT 1(mW)	Ave output power ANT 2 (mW)	Limits dBm / W
Low	5180	12.28	12.30	16.90	16.98	24 dBm/0.25 W
High	5240	12.56	12.61	18.03	18.24	24 dBm/0.25 W
Low	5745	12.21	12.30	16.63	16.98	30 dBm / 1 W
High	5825	12.58	12.66	18.11	18.45	30 dBm / 1 W

The test was performed with 802.11N20						
Channel	Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	Ave output Total power (dBm)	Ave output Total power (mW)	Limits dBm
Low	5180	12.41	12.36	15.40	34.64	24 dBm
High	5240	12.73	12.81	15.78	37.85	24 dBm
Low	5745	12.41	12.42	15.43	34.88	30 dBm
High	5825	13.17	13.03	16.11	40.84	30 dBm

The test was performed with 802.11 AC(20MHz)						
Channel	Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	Ave output Total power (dBm)	Ave output Total power (mW)	Limits dBm
Low	5180	12.03	12.01	15.03	31.85	24 dBm
High	5240	12.65	12.54	15.61	36.36	24 dBm
Low	5745	12.10	12.04	15.08	32.22	30 dBm
High	5825	13.00	12.79	15.91	38.96	30 dBm

The test was performed with 802.11N40						
Channel	Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	Ave output Total power (dBm)	Ave output Total power (mW)	Limits dBm
Low	5190	9.95	9.88	12.97	19.83	24 dBm
High	5230	10.31	10.38	13.16	20.69	24 dBm
Low	5755	9.70	10.09	12.96	19.79	30 dBm
High	5795	10.04	10.18	13.06	20.22	30 dBm

The test was performed with 802.11AC(40MHz)						
Channel	Frequency (MHz)	Ave output power ANT 1(dBm)	Ave output power ANT 2 (dBm)	Ave output Total power (dBm)	Ave output Total power (mW)	Limits dBm
Low	5190	9.60	9.37	12.78	18.97	24 dBm
High	5230	10.59	10.37	13.21	20.96	24 dBm
Low	5755	10.21	9.76	13.00	19.97	30 dBm
High	5795	9.78	10.03	12.97	19.81	30 dBm

Operation Mode	Channel Number	Channel Frequency (MHz)	Antenna Gain (Numeric)	Power Density At 20cm (mW/cm^2)			Power Density Limit (mW/cm^2)	Test Results
				Ant 1	Ant 2	Sum		
802.11a	38	5180	1.585	0.0055	0.0055	--	1.000	Pass
	46	5240	1.585	0.0055	0.0055	--	1.000	Pass
	149	5745	1.585	0.0050	0.0055	--	1.000	Pass
	165	5825	1.585	0.0055	0.0060	--	1.000	Pass
802.11ac 20M	38	5180	1.585	0.0050	0.0050	0.0100	1.000	Pass
	46	5240	1.585	0.0060	0.0055	0.0115	1.000	Pass
	149	5745	1.585	0.0050	0.0050	0.0100	1.000	Pass
	165	5825	1.585	0.0065	0.0060	0.0125	1.000	Pass
802.11ac 40M	36	5190	1.585	0.0030	0.0025	0.0055	1.000	Pass
	48	5230	1.585	0.0035	0.0035	0.0070	1.000	Pass
	151	5755	1.585	0.0035	0.0030	0.0065	1.000	Pass
	159	5795	1.585	0.0030	0.0030	0.0060	1.000	Pass
802.11n 20M	38	5180	1.585	0.0055	0.0055	0.0110	1.000	Pass
	46	5240	1.585	0.0060	0.0060	0.0120	1.000	Pass
	149	5745	1.585	0.0055	0.0055	0.0110	1.000	Pass
	165	5825	1.585	0.0065	0.0065	0.0130	1.000	Pass
802.11n 40M	36	5190	1.585	0.0030	0.0030	0.0060	1.000	Pass
	48	5230	1.585	0.0035	0.0035	0.0070	1.000	Pass
	151	5755	1.585	0.0030	0.0030	0.0060	1.000	Pass
	159	5795	1.585	0.0030	0.0035	0.0065	1.000	Pass

For BT 4.0 LE

GFSK mode

Test Frequency （MHz）	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Target power (dBm)	Antenna Gain (Numeric)	Power Density Limit (mW/cm^2)	Power Density At 20 cm (mW/cm^2)	Test Results
2402	20.00	-8.92	0.128	-8 ±1	1.585	1.000	0.00006	Pass
2440	20.00	-10.00	0.100	-10 ±1	1.585	1.000	0.00004	Pass
2480	20.00	-11.87	0.065	-11 ±1	1.585	1.000	0.00003	Pass

For BT classic mode

GFSK mode

Test Frequency （MHz）	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Target power (dBm)	Antenna Gain (Numeric)	Power Density Limit (mW/cm^2)	Power Density At 20 cm (mW/cm^2)	Test Results
2402	20.00	-8.64	0.137	-8 ±1	1.585	1.000	0.00006	Pass
2441	20.00	-9.59	0.110	-10 ±1	1.585	1.000	0.00004	Pass
2480	20.00	-11.31	0.074	-11 ±1	1.585	1.000	0.00003	Pass

Π/4-DQPSK Mode

Test Frequency （MHz）	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Target power (dBm)	Antenna Gain (Numeric)	Power Density Limit (mW/cm^2)	Power Density At 20 cm (mW/cm^2)	Test Results
2402	20.00	-9.95	0.101	-10±1	1.585	1.000	0.00004	Pass
2441	20.00	-10.92	0.081	-10±1	1.585	1.000	0.00004	Pass
2480	20.00	-13.17	0.048	-13±1	1.585	1.000	0.00002	Pass

8DPSK Mode

Test Frequency （MHz）	Minimum Separation Distance (cm)	Output Power (dBm)	Output Power (mW)	Target power (dBm)	Antenna Gain (Numeric)	Power Density Limit (mW/cm^2)	Power Density At 20 cm (mW/cm^2)	Test Results
2402	20.00	-9.69	0.107	-10±1	1.585	1.000	0.00004	Pass
2441	20.00	-11.08	0.078	-11±1	1.585	1.000	0.00003	Pass
2480	20.00	-12.82	0.052	-12±1	1.585	1.000	0.00003	Pass

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

The device could operate simultaneously in 2.4G and 5G band, RF exposure shall be evaluated in operation mode with 2.4 and 5G on simultaneously,

We took the maximum Power Density value from 2.4 and 5G bands and added the two values to obtain a maximum Power Density value.

The maximum Power Density value=0.0099+0.013+0.00006=0.02296<1.000

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

1.5.FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, Human proximity to the antenna shall not be less than 20cm(8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.