FCC §15.247 (i), §2.1091 – RF Exposure

FCC ID: 2BQFN-FKW56152556

Applied procedures / limit

According to FCC §15.247(i) and §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.

Limits for Occupational / Controlled 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)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

Note: f is frequency in MHz

* = Power density limit is applicable at frequencies greater than 100 MHz

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

Note: f = frequency in MHz

* = Plane-wave equivalent power density

MPE PREDICTION

Predication of MPE limit at a given distance, Equation from 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,R=20cm

Test Result of RF Exposure Evaluation

	Modes& Channel Freq. (MHz)	Tune up Produce power	Maximum peak output power (dBm)	Output power to antenna (mW)	Antenna Gain (numeric)	Power Density (S) (mW/ cm2)	Limit (mW / cm2)	Result
BLE	GFSK&MCH	2±1	3	1.9953	1.6596 (2.2dBi)	0.0007	1	Pass
2.4G WIFI ANT1	802.11g&2437	14±1	15	31.6228	1.6596 (2.2dBi)	0.0104	1	Pass
2.4G WIFI ANT2	802.11g&2437	16±1	17	50.1187	1.6596 (2.2dBi)	0.0166	1	Pass
5.2GWIFI ANT1	802.11n(HT40)&5230	13±1	14	25.1189	0.6209 (-2.07dBi)	0.0031	1	Pass
5.2GWIFI ANT2	802.11a&5240	13±1	14	25.1189	0.6209 (-2.07dBi)	0.0031	1	Pass
5.8GWIFI ANT1	802.11a&5825	15±1	16	39.8107	12942 (1.12dBi)	0.0103	1	Pass
5.8GWIFI ANT2	802.11a&5825	15±1	16	39.8107	12942 (1.12dBi)	0.0103	1	Pass

For the Max simultaneous transmission MPE:

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table (A) and Table (B). To comply with the MPE, the fraction of the MPE in terms of E2, H2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i}$$

Technology	Tune up Produce power(dBm)		Maximum Tune-up (dBm)		Antenna Gain(ANT 1/ANT 2) (numeric)	Power Density (S) (mW/ cm2)		MPE Limit (mW/ cm2)	∑ MPE Ratio	∑ MPE Ratio Limit	Result
	ANT 1	ANT 2	ANT 1	ANT 2		ANT 1	ANT 2				
2.4G WIFI MIMO	14 ±1	16 ±1	15	17	1.6596 (2.2dBi)	0.0104	0.0166	1	0.027	1	Pass

Technology	Tune up Produce power(dBm)		Maximum Tune-up (dBm)		Antenna Gain(ANT 1/ANT 2) (numeric)	Power Density (S) (mW/ cm2)		MPE Limit (mW/ cm2)	∑ MPE Ratio	∑ MPE Ratio Limit	Result
	ANT 1	ANT 2	ANT 1	ANT 2		ANT 1	ANT 2				
5G WIFI MIMO	15 ±1	15 ±1	16	16	12942 (1.12dBi)	0.0103	0.0103	1	0.0206	1	Pass

BT+WIFI supported simultaneous transmission:

BLE+2.4GWIFI MIMO: ∑MPE Ratio =0.0007/1+0.027/1=0.0277≤1, So passed.

BLE +5GWIFI MIMO: ∑MPE Ratio =0.0007/1+0.0206/1=0.0213≤1, So passed.

BLE+2.4GWIFI MIMO+5GWIFI MIMO: ∑MPE Ratio

=0.0007/1+0.027/1+0.0206/1=0.0483≤1, So passed.