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

FCC ID: 2A9VX-X5PRO

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

	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	0.6457 (-1.9dBi)	0.0003	1	Pass
ANT1 2.4G WIFI 802.11g&2462	14±1	15	31.6228	1.0765 (0.32dBi)	0.0068	1	Pass
ANT2 2.4G WIFI 802.11g&2412	14±1	15	31.6228	1.0765 (0.32dBi)	0.0068	1	Pass
ANT1 5.2GWIFI 802.11n(HT20)& 5240	12±1	13	19.9526	1.888 (2.76dBi)	0.0075	1	Pass
ANT2 5.2GWIFI 802.11n(HT20)& 5240	12±1	13	19.9526	1.888 (2.76dBi)	0.0075	1	Pass
ANT1 5.8GWIFI 802.11n(HT40)& 5755	12±1	13	19.9526	0.7674 (-1.15dBi)	0.003	1	Pass
ANT2 5.8GWIFI 802.11a&5745	12±1	13	19.9526	0.7674 (-1.15dBi)	0.003	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)	Σ MPE Ratio	Σ MPE Ratio Limit	Result
	ANT 1	ANT 2	ANT 1	ANT 2		ANT 1	ANT 2				
2.4G WIFI MIMO	14 ±1	14 ±1	15	15	1.0765 (0.32dBi)	0.0068	0.0068	1	0.0136	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)	Σ MPE Ratio	Σ MPE Ratio Limit	Result
	ANT 1	ANT 2	ANT 1	ANT 2		ANT 1	ANT 2				
5G WIFI MIMO	12 ±1	12 ±1	13	13	1.888 (2.76dBi)	0.0075	0.0075	1	0.015	1	Pass

BT+WIFI supported simultaneous transmission:

BLE+2.4GWIFI MIMO: Σ MPE Ratio =0.0003+0.0068=0.0071,

BLE+5GWIFI MIMO: Σ MPE Ratio =0.0003+0.0075=0.0078,

BLE+2.4GWIFI MIMO+5GWIFI MIMO: Σ MPE Ratio =0.0003+0.0068+0.0075=0.0146≤1, so passed.