

**RF Exposure Evaluation**

**Limit**

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 1.1310 & 2.1091

Table 1-Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300	61.4	0.163	1.0	6
300–1500	-	-	f/300	6
1500–100,000	-	-	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	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

**Evaluation Method**

Transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>,  $P_{out}$  = output power to antenna in mW,  $G$  = gain of antenna in linear scale;  $P_i = 3.1416$ ,  $R$  = distance between observation point and center of the radiator in cm

**Conducted Power Results & Manufacturing tolerance**

Specification	Operating Mode	Conducted Peak Output Power (dBm)	Target (dBm)	Tolerance ±(dB)
2.4GWIFI	802.11b	16.88	16	1
	802.11g	15.34	14.5	1
	802.11n(HT20)	13.86	13	1
	802.11n(HT40)	14.44	13.5	1
BLE	GFSK	8.07	7.5	1
BT+EDR	GFSK	8.05	7.5	1
	π/4DQPSK	9.25	8.5	1
	8DPSK	9.62	9	1

**Evaluation Results**

Spec.	Operating Mode	Antenna Distance (cm)	Conducted Output Power		Gain of antenna in linear scale	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
			dBm	mW				
2.4GWIFI	802.11b	20	17	50.12	2.63	0.0262	1	PASS
	802.11g	20	15.5	35.48	2.63	0.0186	1	PASS
	802.11n(HT20)	20	14	25.12	2.63	0.0131	1	PASS
	802.11n(HT40)	20	14.5	28.18	2.63	0.0147	1	PASS
BLE	GFSK	20	8.5	7.08	2.63	0.0037	1	PASS
BT+EDR	GFSK	20	8.5	7.08	2.63	0.0037	1	PASS
	$\pi/4$ DQPSK	20	9.5	8.91	2.63	0.0047	1	PASS
	8DPSK	20	10	10.00	2.63	0.0052	1	PASS

Remark:

1. Output power including tune up tolerance;
2. The maximum 2.4G antenna gain is 4.2dBi
3. The exposure safety distance is 20cm.

**Simulation Transmission**

EUT can only work in 2.4GWIFI+BT mode

The formula of calculated the Simulation Transmission MPE is:

$$CPD1/LPD1+CPD2/LPD2+\dots\text{etc.} < 1$$

CPD=Calculation Maximum Power Denisty

Mode	Calculate	Limit	Result
2.4GWIFI+BT mode	0.0314	1	Pass

**Conclusion**

The measurement results comply with the FCC Limit per 47 CFR 1.1310 & 2.1091 for the uncontrolled RF Exposure and MPE comppliance per KDB 447498 v06.