

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)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

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

MAX OUTPUT POWER

BT

Test Channel	Frequency	Power Setting	Peak Output Power	LIMIT	Verdict
	(MHz)		(dBm)	(dBm)	
1Mbps					
0	2402	Default	2.71	20.97	PASS
39	2441	Default	3.35	20.97	PASS
78	2480	Default	3.85	20.97	PASS
2Mbps					
0	2402	Default	1.3	20.97	PASS
39	2441	Default	1.73	20.97	PASS
78	2480	Default	2.57	20.97	PASS
3Mbps					
0	2402	Default	1.77	20.97	PASS
39	2441	Default	2.08	20.97	PASS
78	2480	Default	2.77	20.97	PASS

BLE

Test Channel	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	LIMIT (dBm)	Verdict
1Mbps					
00	2402	Default	-1.65	30	PASS
19	2440	Default	-1.23	30	PASS
39	2480	Default	-0.60	30	PASS

Measurement Result

Operation Frequency: BT: 2402-2480MHz

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: Meander Line PCB Antenna

Antenna gain: 0.3dBi,

R=20cm

BT:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power	Max		Antenna	Evaluation result at 20cm	Power density Limits
		(dBm)	(dBm)	tune-up power		Gain	Power density(mW/cm2)	(mW/cm2)
				(dBm)	(mW)	Numeric		
2402	(BLE)GFSK	-1.65	-1±1	0	1	0.3	0.00006	1
2440		-1.23	-1±1	0	1	0.3	0.00006	1
2480		-0.6	-1±1	0	1	0.3	0.00006	1
2402	GFSK	2.71	3±1	4	2.511886	0.3	0.00015	1
2441		3.35	3±1	4	2.511886	0.3	0.00015	1
2480		3.85	3±1	4	2.511886	0.3	0.00015	1
2402	π/4-DQPSK	1.3	2±1	3	1.995262	0.3	0.00012	1
2441		1.73	2±1	3	1.995262	0.3	0.00012	1
2480		2.57	2±1	3	1.995262	0.3	0.00012	1
2402	8DPSK,	1.77	2±1	3	1.995262	0.3	0.00012	1
2441		2.08	2±1	3	1.995262	0.3	0.00012	1
2480		2.77	2±1	3	1.995262	0.3	0.00012	1

Conclusion:

For the max result : $0.00015 \leq 1.0$ for Max Power Density, compliance RF exposure..

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Signature:

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