

5. RF EXPOSURE EVALUATION

5.1 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

5.1.1 Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
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
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

5.1.2 Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Mode	Frequency (MHz)	Tune Up Conducted Power (dBm)	Antenna Gain (dBi)	Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
Bluetooth	2402-2480	7.0	1.0	20	0.001	1.0
BLE	2402-2480	17.0	1.0	20	0.013	1.0
2.4G Wi-Fi	2412-2462	26.5	0	20	0.089	1.0
5G Wi-Fi	5180-5240	20.5	2.0	20	0.035	1.0
	5260-5320	20.0	2.0	20	0.032	1.0
	5500-5700	20.0	2.0	20	0.032	1.0
	5745-5825	21.5	2.0	20	0.045	1.0
DECT	1921.536 - 1928.448	20.0	0	20	0.020	1.0
NFC	13.56	/	/	20	<0.0001	0.98

Note:

- 1) The tune up conducted power was declared by the applicant.
- 2) NFC field strength is 67.49dBuV/m@3m= -27.7dBm (0.0017mW)
- 3) The Bluetooth, NFC, Wi-Fi and DECT can transmit simultaneously. The 2.4G Wi-Fi can't transmit with 5G Wi-Fi at the same time.

The ratio= $MPE_{Bluetooth}/limit + MPE_{2.4G\ Wi-Fi}/limit + MPE_{DECT}/limit$
 $=0.013+0.089+0.020=0.122 < 1.0$, simultaneous exposure is not required.

- 4) The power of the NFC and WPT is extreme low, which not affect the simultaneous exposure evaluation result.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance