- RF Exposure

1. Regulation

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: RF exposure is calculated.

Frequency Range	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [㎽/㎠]	Averaging Time [minute]
Limits for General Population / Uncontrolled Exposure				
0.3 ~ 1.34	614	1.63	*(100)	30
1.34 ~ 30	824/f	2.19/f	*(180/f²)	30
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

*f=frequency in ㎒, *= plane-wave equivalent power density*

MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

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 [㎝]

2. RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

3. Calculation Result of RF Exposure

Mode	Target power [dBm]	Tune up tolerance [dB]	Max tune up power [dBm]	Max tune up power [㎽]	Ant Gain [dBi]	Ant Gain [㎽]	Power Density at 20 ㎝ [㎽/㎠]	Limit [㎽/㎠]
Bluetooth_GFSK	7.00	±2.00	9.00	7.94	3.69	2.34	0.003 70	1.000 00
RF4CE_ANT 2	6.00	±2.00	8.00	6.31	3.20	2.09	0.002 62	1.000 00
Total	Bluetooth + RF4CE						0.006 32	1.000 00

4. Target power and tolerance, Max tuneup power

- Bluetooth

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
Bluetooth_GFSK Lowest	7.00	±2.00	9.00	8.31
Bluetooth_GFSK Middle	7.00	±2.00	9.00	7.10
Bluetooth_GFSK Highest	7.00	±2.00	9.00	7.28
Bluetooth_π/4DQPSK Lowest	5.50	±2.00	7.50	6.98
Bluetooth_π/4DQPSK Middle	5.50	±2.00	7.50	5.78
Bluetooth_π/4DQPSK Highest	5.50	±2.00	7.50	5.98
Bluetooth_8DPSK Lowest	5.50	±2.00	7.50	7.26
Bluetooth_8DPSK Middle	5.50	±2.00	7.50	6.10
Bluetooth_8DPSK Highest	5.50	±2.00	7.50	6.25

- RF4CE

Mode	Target power [dBm]	Tolerance [dB]	Max tuneup power [dBm]	Average Power [dBm]
RF4CE_Lowest ANT 1	6.00	±2.00	8.00	6.63
RF4CE_Middle ANT 1	6.00	±2.00	8.00	6.51
RF4CE_Highest ANT 1	6.00	±2.00	8.00	6.34
RF4CE_Lowest ANT 2	5.00	±2.00	7.00	5.99
RF4CE_Middle ANT 2	5.00	±2.00	7.00	5.97
RF4CE_Highest ANT 2	5.00	±2.00	7.00	5.95