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 [mW/cm^2]	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	30

f=frequency in MHz, *= 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 [mW/cm^2]
P = Power input to antenna [mW]
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 [cm]

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 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

MPE Calculations : Bluetooth LE

- Frequency Range : 2402 MHz ~ 2480 MHz

- Measured RF Maximum Output Power : -7.91 dBm

- Target Power & Tolerance : -8.90 dBm & ± 1.00 dB

(Maximum : -7.90 dBm & Minimum : -9.90 dBm)

- Maximum Peak Antenna Gain : -20.55 dBi

- Maximum Output Power for the Calculation : -7.90 dBm

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the The MPE Calculations for this exposure is shown below.

- EIRP = P + G = -7.90 dBm + -20.55 dBi = -28.45 dBm = 0.001 4 mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)

Power Density at the specific separation

- S = EIRP / (4 X $R^2\pi$) = 0.001 4 / (4 X 20^2 X π) = **0.000 000 3** mW/cm^2	- NOTE S : Maximum Power Density (mW/cm^2) EIRP : Equivalent Isotropic Radiated Power (mW) R : Distance to the center of the radiation of the antenna (20 cm)

MPE Calculations : WPT+Bluetooth LE

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the
The MPE Calculations for this exposure is shown below.

simultaneous MPE for WPT and Bluetooth LE

WPT+Bluetooth LE

- Total (%) = [WPT Result(mW/cm2) / Limit(mW/cm2)] + [Bluetooth LE Result(mW/cm2) / Limit(mW/cm2)] * 100 = [**0.000 003 8** / 1] + [**0.000 000 3** / 1] * 100 = **0.000 41** %	- NOTE WPT+Bluetooth LE WPT = 0.000 003 8 mW/cm2 Bluetooth LE = 0.000 000 3 mW/cm2 Distance to the center of the radiation of the antenna (20 cm) Limit : ≤ 100 %