

RF EXPOSURE

FCCID : 2AHUGSLX100H

1. FCC 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 Permissible 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/f ²)	< 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 MHz, *= plane-wave equivalent power density

MPE (Maximum Permissible Exposure) Prediction

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

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

S = power density [mW/cm²]

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 Classic

- Frequency Range: 2402 MHz ~ 2480 MHz
- Measured RF Maximum Output Power: 0.89 dBm
- Target Power & Tolerance: 0.50 dBm & $\pm$ 1.00 dB
(Maximum : 1.50 dBm & Minimum : -0.50 dBm)
- Maximum Peak Antenna Gain: 2.00 dBi
- Maximum Output Power for the Calculation: 1.50 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.

<p>- EIRP = P + G</p> <p>= <u>1.50</u> dBm + <u>2.00</u> dBi</p> <p>= <u>3.50</u> dBm</p> <p>= <u>2.24</u> mW</p>	<p>- NOTE</p> <p>P : Max tuneup Power (dBm)</p> <p>G : Maximum Peak Antenna Gain (dBi)</p>
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Power Density at the specific separation

<p>- S = EIRP / (4 X R² X π)</p> <p>= <u>2.24</u> / (4 X 20² X π)</p> <p>= <u>0.000 445</u> mW/cm² (Limit : 1.00)</p>	<p>- NOTE</p> <p>S : Maximum Power Density (mW/cm²)</p> <p>EIRP : Equivalent Isotropic Radiated Power (mW)</p> <p>R : Distance to the center of the radiation of the antenna (<u>20</u> cm)</p>
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MPE Calculations : Bluetooth Low Energy

- Frequency Range: 2402 MHz ~ 2480 MHz
- Measured RF Maximum Output Power: -2.98 dBm
- Target Power & Tolerance: -3.00 dBm & $\pm$ 1.00 dB
(Maximum : -2.00 dBm & Minimum : -4.00 dBm)
- Maximum Peak Antenna Gain: 2.50 dBi
- Maximum Output Power for the Calculation: -2.00 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.

<p>- EIRP = P + G</p> <p>= <u>-2.00</u> dBm + <u>2.50</u> dBi</p> <p>= <u>0.50</u> dBm</p> <p>= <u>1.12</u> mW</p>	<p>- NOTE</p> <p>P : Max tuneup Power (dBm)</p> <p>G : Maximum Peak Antenna Gain (dBi)</p>
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Power Density at the specific separation

<p>- S = EIRP / (4 X R² X π)</p> <p>= 1.12 / (4 X 20² X π)</p> <p>= <u>0.000 223</u> mW/cm² (Limit : 1.00)</p>	<p>- NOTE</p> <p>S : Maximum Power Density (mW/cm²)</p> <p>EIRP : Equivalent Isotropic Radiated Power (mW)</p> <p>R : Distance to the center of the radiation of the antenna (<u>20</u> cm)</p>
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MPE Calculations : 24 GHz Radar Sensor

- Frequency Range: 24150 MHz
- Measured RF Maximum Output Power: 10.00 dBm
- Target Power & Tolerance: 9.50 dBm & $\pm$ 1.00 dB
(Maximum : 10.50 dBm & Minimum : 8.50 dBm)
- Maximum Peak Antenna Gain: 9.23 dBi
- Maximum Output Power for the Calculation: 10.50 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.

<p>- EIRP = P + G</p> <p>= <u>10.50</u> dBm + <u>9.23</u> dBi</p> <p>= <u>19.73</u> dBm</p> <p>= <u>93.97</u> mW</p>	<p>- NOTE</p> <p>P : Max tuneup Power (dBm)</p> <p>G : Maximum Peak Antenna Gain (dBi)</p>
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Power Density at the specific separation

<p>- S = EIRP / (4 X R² X π)</p> <p>= 93.97 / (4 X 20² X π)</p> <p>= <u>0.018 695</u> mW/cm² (Limit : 1.00)</p>	<p>- NOTE</p> <p>S : Maximum Power Density (mW/cm²)</p> <p>EIRP : Equivalent Isotropic Radiated Power (mW)</p> <p>R : Distance to the center of the radiation of the antenna (<u>20</u> cm)</p>
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MPE Calculations :Bluetooth Classic + Low Energy + 24 GHz Radar Sensor

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 Bluetooth Classic + Low Energy + 24 GHz Radar Sensor

Bluetooth Classic + Low Energy + 24 GHz Radar Sensor

<p>- Total (%) =</p> $ \begin{aligned} & ([\text{Bluetooth Classic Result}(\text{mW}/\text{cm}^2) / \text{Limit}(\text{mW}/\text{cm}^2)] + \\ & [\text{Bluetooth Low Energy Result}(\text{mW}/\text{cm}^2) / \text{Limit}(\text{mW}/\text{cm}^2)] + \\ & [\text{24 GHz Radar Sensor Result}(\text{mW}/\text{cm}^2) / \text{Limit}(\text{mW}/\text{cm}^2)]) * 100 \\ & = ([\underline{0.000\ 445} / 1] + \\ & [\underline{0.000\ 223} / 1] + \\ & [\underline{0.018\ 695} / 1]) * 100 \\ & = \underline{1.914} \% \end{aligned} $	<p>- NOTE</p> <p>Bluetooth Classic + Low Energy + 24 GHz Radar Sensor</p> <p>Bluetooth Classic = <u>0.000 445</u> mW/cm²</p> <p>Bluetooth Low Energy = <u>0.000 223</u> mW/cm²</p> <p>24 GHz Radar Sensor = <u>0.018 695</u> mW/cm²</p> <p>Distance to the center of the radiation of the antenna (<u>20</u> cm)</p> <p>Limit : ≤ 100 %</p>
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