

RF EXPOSURE

FCC ID : 2BO3L-TMCTAW5W

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	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 LE

- Frequency Range : 2402 MHz ~ 2480 MHz
- Measured RF Maximum Output Power : 12.03 dBm
- Target Power & Tolerance 12.00 dBm & $\pm$ 2.00 dB
(Maximum : 14.00 dBm & Minimum : 10.00 dBm)
- Maximum Peak Antenna Gain : 1.07 dBi
- Maximum Output Power for the Calculation : 14.00 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.

- EIRP = P + G = <u>14.00</u> dBm + <u>1.07</u> dBi = <u>15.07</u> dBm = <u>32.14</u> mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R²π) = <u>32.14</u> / (4 X 20² X π) = <u>0.006 393</u> mW/cm² (Limit : 1.00)	- NOTE S : Maximum Power Density (mW/cm²) EIRP : Equivalent Isotropic Radiated Power (mW) R : Distance to the center of the radiation of the antenna (<u>20</u> cm)
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MPE Calculations : Thread

- Frequency Range : 2405 MHz ~ 2480 MHz
- Measured RF Maximum Output Power : 10.00 dBm
- Target Power & Tolerance 10.00 dBm & $\pm$ 2.00 dB
(Maximum : 12.00 dBm & Minimum : 8.00 dBm)
- Maximum Peak Antenna Gain : 1.07 dBi
- Maximum Output Power for the Calculation : 12.00 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.

- EIRP = P + G = <u>12.00</u> dBm + <u>1.07</u> dBi = <u>13.07</u> dBm = <u>20.28</u> mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R²π) = <u>20.28</u> / (4 X 20² X π) = <u>0.004 034</u> mW/cm² (Limit : 1.00)	- NOTE S : Maximum Power Density (mW/cm²) EIRP : Equivalent Isotropic Radiated Power (mW) R : Distance to the center of the radiation of the antenna (<u>20</u> cm)
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MPE Calculations : WLAN 2.4G

- Frequency Range : 2412 MHz ~ 2462 MHz
- Measured RF Maximum Output Power : 18.37 dBm
- Target Power & Tolerance 18.00 dBm & $\pm$ 2.00 dB
(Maximum : 20.00 dBm & Minimum : 16.00 dBm)
- Maximum Peak Antenna Gain : 1.07 dBi
- Maximum Output Power for the Calculation : 20.00 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.

- EIRP = P + G = <u>20.00</u> dBm + <u>1.07</u> dBi = <u>21.07</u> dBm = <u>127.94</u> mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R ² π) = 127.94 / (4 X 20 ² X π) = <u>0.025 452</u> mW/cm ² (Limit : 1.00)	- 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 (<u>20</u> cm)
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MPE Calculations : WLAN 5G

- Frequency Range : 5180 MHz ~ 5825 MHz
- Measured RF Maximum Output Power : 18.82 dBm
- Target Power & Tolerance 18.00 dBm & $\pm$ 2.00 dB
(Maximum : 20.00 dBm & Minimum : 16.00 dBm)
- Maximum Peak Antenna Gain : 3.09 dBi
- Maximum Output Power for the Calculation : 20.00 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.

- EIRP = P + G = <u>20.00</u> dBm + <u>3.09</u> dBi = <u>23.09</u> dBm = <u>203.70</u> mW	- NOTE P : Max tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Power Density at the specific separation

- S = EIRP / (4 X R²π) = 203.70 / (4 X 20² X π) = <u>0.040 526</u> mW/cm² (Limit : 1.00)	- NOTE S : Maximum Power Density (mW/cm²) EIRP : Equivalent Isotropic Radiated Power (mW) R : Distance to the center of the radiation of the antenna (<u>20</u> cm)
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MPE Calculations : Bluetooth LE + WLAN 5G + 60 GHz Radar

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

Bluetooth LE + WLAN 5G + 60 GHz Radar

- Total (%) = [Bluetooth LE Result(mW/cm2) / Limit(mW/cm2)] + [WLAN 5G Result(mW/cm2) / Limit(mW/cm2)] + [60 GHz Radar Result(mW/cm2) / Limit(mW/cm2)] * 100 = [<u>0.006 393</u> / 1] + [<u>0.040 526</u> / 1] + [<u>0.008 900</u> / 1] * 100 = <u>5.582</u> %	- NOTE Bluetooth LE + WLAN 5G + 60 GHz Radar Bluetooth LE = <u>0.006 393</u> mW/cm2 WLAN 5G = <u>0.040 526</u> mW/cm2 60 GHz Radar = <u>0.008 900</u> mW/cm2 Note1 Distance to the center of the radiation of the antenna (<u>20</u> cm) Limit : ≤ 100 %
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Note 1: EIRP value of the certified module report was used
Report No. : HCT-RF-2607-FC004

MPE Calculations : Thread + WLAN 5G + 60 GHz Radar

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

Thread + WLAN 5G + 60 GHz Radar

- Total (%) = [Thread Result(mW/cm2) / Limit(mW/cm2)] + [WLAN 5G Result(mW/cm2) / Limit(mW/cm2)] + [60 GHz Radar Result(mW/cm2) / Limit(mW/cm2)] * 100 = [<u>0.004 034</u> / 1] + [<u>0.040 526</u> / 1] + [<u>0.008 900</u> / 1] * 100 = <u>5.346</u> %	- NOTE Thread + WLAN 5G + 60 GHz Radar Thread = <u>0.004 034</u> mW/cm2 WLAN 5G = <u>0.040 526</u> mW/cm2 60 GHz Radar = <u>0.008 900</u> mW/cm2 Note1 Distance to the center of the radiation of the antenna (<u>20</u> cm) Limit : ≤ 100 %
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Note 1: EIRP value of the certified module report was used
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