

4 FCC §2.1091, FCC §15.247(i) & ISED RSS-102 – RF Exposure

4.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), 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 level in excess of the Commission's guidelines.

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)
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
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

According to ISED RSS-102 Issue 6:

6.6 Field reference level exposure exemption limits

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance)
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz
- at or above 6 GHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 5 W (adjusted for tune-up tolerance)
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In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

4.2 MPE Prediction

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

$$S = PG/4\pi R^2$$

Where: 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

4.3 MPE Result

Note: The BTC conducted output power data were obtained from *Test Report Number: FR0D2423A issued by Sporton International Inc. On 05/05/2021*.

Note: The BLE conducted output power data were obtained from *Test Report Number: FR0D2423B issued by Sporton International Inc. On 05/05/2021*.

Note: The 2.4 GHz Wi-Fi conducted output power data were obtained from *Test Report Number: FR0D2423C issued by Sporton International Inc. On 05/05/2021*.

Note: The 5 GHz Wi-Fi conducted output power data were obtained from *Test Report Number: FR0D2423D issued by Sporton International Inc. On 05/05/2021*

Note: The RFID conducted output power data were obtained from *Test Report Number: FR051819 issued by Sporton International Inc. On 07/15/2020*.

Bluetooth Classic (FCC ID: I28-WYSBHVDXP)

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>11.72</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>14.86</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2402</u>
<u>Maximum Directional Antenna Gain, typical (dBi):</u>	<u>3.0</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.0</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.00590</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 25 cm is 0.00590 mW/cm². Limit is 1 mW/cm².

Bluetooth Low Energy (FCC ID: I28-WYSBHVDXP)

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>8.60</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>7.24</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2402</u>
<u>Maximum Directional Antenna Gain, typical (dBi):</u>	<u>3.0</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.0</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.00288</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 25 cm is 0.00288 mW/cm². Limit is 1 mW/cm².

2.4 GHz WiFi (FCC ID: I28-WYSBHVDXP)

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>16.90</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>48.98</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>2437</u>
<u>Maximum Directional Antenna Gain, typical (dBi):</u>	<u>3.81</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>2.4</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0234</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0234 mW/cm². Limit is 1 mW/cm².

5 GHz WiFi (FCC ID: I28-WYSBHVDXP)

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>14.70</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>29.51</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>5180</u>
<u>Maximum Directional Antenna Gain, typical (dBi):</u>	<u>5.0</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>3.16</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0186</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>1.0</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0186 mW/cm². Limit is 1 mW/cm².

RFID (FCC ID: UZ7RE40)

<u>Maximum output power at antenna input terminal (dBm):</u>	<u>27.22</u>
<u>Maximum output power at antenna input terminal (mW):</u>	<u>527.23</u>
<u>Prediction distance (cm):</u>	<u>20</u>
<u>Prediction frequency (MHz):</u>	<u>902.75</u>
<u>Maximum Directional Antenna Gain, typical (dBi):</u>	<u>-30</u>
<u>Maximum Antenna Gain (numeric):</u>	<u>0.001</u>
<u>Power density of prediction frequency at 20.0 cm (mW/cm²):</u>	<u>0.0001</u>
<u>FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm²):</u>	<u>0.602</u>

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0001 mW/cm². Limit is 0.602 mW/cm².