



## 12. Radio Frequency Exposure

### 12.1 Applicable Standards

<input type="checkbox"/> §1.1307(b)(3)(i)(A)	The available maximum time-averaged power is no more than 1 mW, regardless of separation distance.																																																	
<input type="checkbox"/> §1.1307(b)(3)(i)(c)	ERP is below a threshold calculated based on the distance , R between the person and t antenna / radiating structure, where $R > \lambda / 2 \pi$ .  <p style="text-align: center;">TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">RF Source Frequency</th> <th colspan="3">Minimum Distance</th> <th>Threshold ERP</th> </tr> <tr> <th><math>f_L</math> MHz</th> <th></th> <th><math>f_H</math> MHz</th> <th><math>\lambda_L / 2\pi</math></th> <th></th> <th><math>\lambda_H / 2\pi</math></th> <th>W</th> </tr> </thead> <tbody> <tr> <td>0.3</td> <td>–</td> <td>1.34</td> <td>159 m</td> <td>–</td> <td>35.6 m</td> <td>1,920 R<sup>2</sup></td> </tr> <tr> <td>1.34</td> <td>–</td> <td>30</td> <td>35.6 m</td> <td>–</td> <td>1.6 m</td> <td>3,450 R<sup>2</sup>/f<sup>2</sup></td> </tr> <tr> <td>30</td> <td>–</td> <td>300</td> <td>1.6 m</td> <td>–</td> <td>159 mm</td> <td>3.83 R<sup>2</sup></td> </tr> <tr> <td>300</td> <td>–</td> <td>1,500</td> <td>159 mm</td> <td>–</td> <td>31.8 mm</td> <td>0.0128 R<sup>2</sup>f</td> </tr> <tr> <td>1,500</td> <td>–</td> <td>100,000</td> <td>31.8 mm</td> <td>–</td> <td>0.5 mm</td> <td>19.2R<sup>2</sup></td> </tr> </tbody> </table> <p style="font-size: small;">Subscripts L and H are low and high; <math>\lambda</math> is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.</p>	RF Source Frequency			Minimum Distance			Threshold ERP	$f_L$ MHz		$f_H$ MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W	0.3	–	1.34	159 m	–	35.6 m	1,920 R <sup>2</sup>	1.34	–	30	35.6 m	–	1.6 m	3,450 R <sup>2</sup> /f <sup>2</sup>	30	–	300	1.6 m	–	159 mm	3.83 R <sup>2</sup>	300	–	1,500	159 mm	–	31.8 mm	0.0128 R <sup>2</sup> f	1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R <sup>2</sup>
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<input checked="" type="checkbox"/> § 1.1307(b)(3)(i)(B).	Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, $\leq P_{th}$  $P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$ <p style="text-align: center;">Where</p> $x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$ <p style="text-align: center;">and</p> $ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$ <p style="text-align: center;"><math>d = \text{the separation distance (cm);}</math></p>																																																	



**12.2 EUT Specification**

<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2412MHz ~ 2462MHz <input type="checkbox"/> WLAN: 5150MHz ~ 5250MHz <input type="checkbox"/> WLAN: 5250MHz ~ 5350MHz <input type="checkbox"/> WLAN: 5470MHz ~ 5725MHz <input type="checkbox"/> WLAN: 5725MHz ~ 5850MHz <input type="checkbox"/> Bluetooth: 2402MHz ~ 2480MHz
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Evaluation applied</b>	<input type="checkbox"/> Blanket 1 mW Blanket Exemption <input checked="" type="checkbox"/> MPE-based Exemption <input type="checkbox"/> SAR-based Exemption
<b>Remark:</b>	
The maximum conducted output power is <u>22.65dBm (184.077mW)</u> at 2437MHz (with 2.935dBi antenna gain.)	

**12.3 Result**

**Maximum Permissible Exposure**

Channel Frequency (MHz)	Max. Conducted output power (dBm)	Max. Tune up power (dBm)	Antenna Gain (dBi)	Max. Tune up e.r.p. Power (dBm)	Max. Tune up e.r.p power (mW)	Limit (mW)
2437	22.65	23.15	2.935	23.94	247.46	3060

**Maximum Permissible Exposure (Co-location)**

BLE+2.4G

Modulation Type	Channel Frequency (MHz)	Max. Conducted output power (dBm)	Max. Tune up power (dBm)	Antenna Gain(dBi)	Distance (cm)	Max. Tune up e.r.p power (mW)	Limit (mW)	MPE Ratio
GFSK(1Mbps)	2402	18.29	18.79	2.935	20	90.68	3060	0.030
11b	2437	22.65	23.15	2.935	20	247.46	3060	0.081
Co-location Total								0.111
Σ MPE ratios Limit								1

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