



## 15. Radio Frequency Exposure

### 15.1 Applicable Standards

| <div><input type="checkbox"/></div> <div>§1.1307(b)(3)(i)(A)</div>              | <div>The available maximum time-averaged power is no more than 1 mW, regardless of separation distance.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                    |   |                    |                              |  |               |           |  |           |                    |  |                    |   |     |   |      |       |   |        |                      |      |   |    |        |   |       |                              |    |   |     |       |   |        |                     |     |   |       |        |   |         |                           |       |   |         |         |   |        |                    |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------|---|--------------------|------------------------------|--|---------------|-----------|--|-----------|--------------------|--|--------------------|---|-----|---|------|-------|---|--------|----------------------|------|---|----|--------|---|-------|------------------------------|----|---|-----|-------|---|--------|---------------------|-----|---|-------|--------|---|---------|---------------------------|-------|---|---------|---------|---|--------|--------------------|
| <div><input type="checkbox"/></div> <div>§1.1307(b)(3)(i)(c)</div>              | <div>ERP is below a threshold calculated based on the distance , R between the person and the antenna / radiating structure, where <math>R &gt; \lambda / 2 \pi</math>.</div> <div><div>TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES<br/>SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION</div><table><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><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>/<math>f^2</math></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><math>f</math></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></table><div>Subscripts L and H are low and high; <math>\lambda</math> is wavelength.<br/>From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.</div></div> | 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> / $f^2$ | 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> |
| 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> / $f^2$ |  |               |           |  |           |                    |  |                    |   |     |   |      |       |   |        |                      |      |   |    |        |   |       |                              |    |   |     |       |   |        |                     |     |   |       |        |   |         |                           |       |   |         |         |   |        |                    |
| 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>           |  |               |           |  |           |                    |  |                    |   |     |   |      |       |   |        |                      |      |   |    |        |   |       |                              |    |   |     |       |   |        |                     |     |   |       |        |   |         |                           |       |   |         |         |   |        |                    |
| <div><input checked="" type="checkbox"/></div> <div>§ 1.1307(b)(3)(i)(B).</div> | <div>Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, <math>\leq P_{th}</math></div> <div><math display="block">P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x &amp; d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} &amp; 20 \text{ cm} &lt; d \leq 40 \text{ cm} \end{cases}</math><div>Where</div><div><math display="block">x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}</math><div>and</div><div><math display="block">ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f &amp; 0.3 \text{ GHz} \leq f &lt; 1.5 \text{ GHz} \\ 3060 &amp; 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}</math><div><math>d</math> = the separation distance (cm);</div></div></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                    |   |                    |                              |  |               |           |  |           |                    |  |                    |   |     |   |      |       |   |        |                      |      |   |    |        |   |       |                              |    |   |     |       |   |        |                     |     |   |       |        |   |         |                           |       |   |         |         |   |        |                    |



## 15.2 EUT Specification

|                                                                                                                                                            |                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency band (Operating)</b>                                                                                                                          | 902MHz~928MHz                                                                                                                                                                                                                  |
| <b>Device category</b>                                                                                                                                     | <input type="checkbox"/> Portable (<20cm separation)<br><input checked="" type="checkbox"/> Mobile (>20cm separation)                                                                                                          |
| <b>Antenna diversity</b>                                                                                                                                   | <input checked="" type="checkbox"/> Single antenna<br><input type="checkbox"/> Multiple antennas<br><input type="checkbox"/> Tx diversity<br><input type="checkbox"/> Rx diversity<br><input type="checkbox"/> Tx/Rx diversity |
| <b>Evaluation applied</b>                                                                                                                                  | <input type="checkbox"/> Blanket 1 mW Blanket Exemption<br><input checked="" type="checkbox"/> MPE-based Exemption<br><input type="checkbox"/> SAR-based Exemption                                                             |
| <b>Remark:</b><br>1. The maximum conducted output power is <u>27.70 dBm (588.844 mW)</u> at <u>927.8MHz</u> (with <u>1.45dBi antenna gain.</u> ) Lora 125K |                                                                                                                                                                                                                                |

## 15.3 Results

Lora 125K

| 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) |
|-------------------------|----------------------------------|--------------------------|-------------------|--------------------------------|-------------------------------|------------|
| 927.8                   | 27.70                            | 28.20                    | 1.45              | 27.50                          | 562.34                        | 1892.71    |

No non-compliance noted.

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