

## FCC §1.1307 (b) – RF EXPOSURE

### Applicable Standard

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.4 - MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

| RF Source frequency (MHz) | Threshold ERP (watts) |
|---------------------------|-----------------------|
| 0.3-1.34                  | $1,920 R^2$ .         |
| 1.34-30                   | $3,450 R^2/f^2$ .     |
| 30-300                    | $3.83 R^2$ .          |
| 300-1,500                 | $0.0128 R^2f$ .       |
| 1,500-100,000             | $19.2R^2$ .           |

f = frequency in MHz;

R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

## Test Result

For worst case:

| Mode | Frequency Range (MHz) | Tune-up Output Power |       | Antenna Gain |       | ERP   |       | Evaluation Distance (cm) | MPE-Based Exemption Limit (mW) |
|------|-----------------------|----------------------|-------|--------------|-------|-------|-------|--------------------------|--------------------------------|
|      |                       | (dBm)                | (mW)  | (dBi)        | (dBd) | (dBm) | (mW)  |                          |                                |
| Lora | 903.9-908.3           | 14.0                 | 25.12 | -0.7         | -2.85 | 11.15 | 13.03 | 20                       | 462.8                          |
| FSK  | 903.9-908.3           | 14.0                 | 25.12 | -0.7         | -2.85 | 11.15 | 13.03 | 20                       | 462.8                          |
| BLE  | 2402-2480             | 3.0                  | 2.0   | -4.3         | -6.45 | -3.45 | 0.45  | 20                       | 768                            |
| UWB  | 4493-6490             | -0.8                 | 0.83  | 0.8          | -1.35 | -2.15 | 0.61  | 20                       | 768                            |

Note 1: The tune-up power was declared by the applicant.

Note 2: 0dBd=2.15dBi.

Note 3: The tune-up power of Lora and FSK, please refer to report number: 12522-FCC-IC-1 for the module (model: WM205X, FCC ID: 2ARZVWM).

Note 4: The tune-up power of BLE and UWB, please refer to report number: SZNS211102-56246E-RFA and SZNS211102-56246E-RF-00 for the Module (model: UM-1, FCC ID:2ARZVUM-1).

Note 5: The BLE function and UWB function can not transmit at same time.

Note 6: The BLE antenna or UWB antenna can transmit at the same time with the Sub-GHz antenna.

Worst case for Simultaneous transmitting consideration:

$$\text{The ratio} = \text{MPE}_{\text{FSK}}/\text{limit} + \text{MPE}_{\text{BLE}}/\text{limit} = 13.03/462.8 + 0.61/768 = 0.029 < 1.0$$

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

**Result:** Compliant.