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## **RF Exposure Analysis – SAR Test Exemption**

### **FCC ID: 2AZD2-261ACNBT**

The device operates in the 2.4GHz band (802.11 n).

**The following FCC Rule Parts are applicable:**

Part 2.1093 – Radiofrequency radiation exposure evaluation: portable devices (i)

Part 1.1307(b)(3)(i)(C) - SAR test exemption (ii)

Part 1.1307(b)(3)(i)(B) - SAR test exemption (iii)

### For module FCC ID: 2AZD2-261ACNBT

Operating Frequency: 2412 – 2462MHz

Tx Power: +2.0dBm max. conducted (1.58mW)

Antenna R3410110203 gain = +2.02dBi

EIRP = 2 +2.02 = 4.02dBm

ERP = EIRP-2.15dBm = +1.87dBm (1.54mW)

Minimum separation distance (R) = 5mm (0.005m)

### Evaluation

From Part 2.1093(c)(1). RF exemption applies if the maximum transmitted power is less than the maximum of the following three criteria:

- i) No more than 1 mw Blanket exemption.  $P_{TH} = 1.0\text{mW}$  – (the module is not compliant)
- ii) determination of exemption under the MPE-based §1.1307(b)(3)(i)(C), if i) not met
- iii) determination of exemption under the SAR-based §1.1307(b)(3)(i)(B) if both i) and ii) are not met;

Determination of threshold power ( $P_{TH}$ ) under the MPE-based §1.1307(b)(3)(i)(C) :

This is only applicable at a separation distance greater than  $\lambda/2\pi$

For module FCC ID: 2AZD2-261ACNBT:

2.4 GHz operation -  $\lambda/2\pi = 0.02\text{m}$

Separation distance equals 0.005m therefore this clause is not applicable.

Determination of threshold power ( $P_{th}$ ) under §1.1307(b)(3)(i)(B) as the transmitter power threshold for SAR test exemption:

$$P_{th} (\text{mW}) = \begin{cases} ERP_{20\text{ cm}}(d/20\text{ cm})^x & d \leq 20\text{ cm} \\ ERP_{20\text{ cm}} & 20\text{ cm} < d \leq 40\text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20\text{ cm}}\sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\text{ cm}} (\text{mW}) = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

For 2.4GHz Operation:

For SAR test exemption (iii):

§1.1307(b)(3)(B) :

$$\text{ERP}_{20\text{ cm}} = 3060 \text{ mW}$$

$$\begin{aligned} x &= -\log_{10} (60/(3060 \sqrt{2.4})) \\ &= -\log_{10} (0.0127) = 1.9 \end{aligned}$$

$$\text{Threshold Power } P_{\text{th}} = \text{ERP}_{20\text{ cm}} (d/20\text{ cm})^x$$

$$= 3060 (0.5/20)^{1.9}$$

$$= 2.76\text{mW (4.4dBm)}$$

( $P_{\text{th}}$  = device transmitter power ERP or conducted time averaged, whichever is greater)

The max. module conducted transmitter power (2.0dBm) is greater than the ERP (1.87dBm).

The max. module conducted transmitter power does not exceed  $P_{\text{th}}$  (4.4dBm), so the module is therefore exempt from SAR evaluation.

Sincerely,



Shaun Stone – Head of Hardware Development, GeoSLAM