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1.0 Maximum Permissible Exposure Evaluation (Supplements the test report.)

The measured power is considered for the intended use of the device and resulting RF exposure to the user.

1.2 Criteria

Section Reference	Date
447498 D01 General RF Exposure Guidance v06 // RSS-102 Issue 5	22 Aug 2019

1.3 Procedure

Using measurement of peak power and considering the intended application, determine the permissible exposure level, applicability of exclusion, or whether additional exposure tests (SAR) are indicated. When applicable justify conclusion for selected exposure level and separation distance.

$$\text{Maximum exposure (uncontrolled)} = f/1500 = 902 \text{ MHz} / 1500 = 0.601 \text{ mW/cm}^2$$

The GPS aligned transmit frames are a maximum of 22.5 ms of time. The next opportunity for another transmit frame is 50 ms after the previous frame started. The duty cycle is then $22.5 / 50 \text{ ms} = 0.45$ for a source duty cycle factor of -3.47 dB.

1.4 FCC Safe Distance Calculation

$$S = \frac{Pwr_{avg} * Gain_{Antenna}}{4 * \pi * Distance_{Antenna}^2}$$

Conducted Peak Power mW	Calculated EIRP Peak Power dBm	Source Duty Cycle Factor dB	Maximum Antenna Gain dBi	Calculated EIRP dBm	EIRP In Linear Terms mW
741	28.7	-3.47	2.1	27.33	541

$$Distance_{antenna} = \sqrt{(P \cdot G / 4 \cdot \pi \cdot S)} \text{ given } Pwr_{avg} = 541 \text{ mW, Gain} = 1^*, S = 0.601 \text{ mW/cm}^2.$$

**Gain of 2.1dBi included in term P.*

$$Distance_{safe} = \sqrt{(541 / 4 \cdot \pi \cdot 0.601)} = 8.4 \text{ cm}$$

Exposure limit is satisfied for distance of 8.4 cm.

Therefore, the device meets the applicable FCC permissible exposure requirements.

1.5 SAR Exemption Calculation – ISED/IC

Applicable requirement: RSS-102 Table 4 General Public (uncontrolled environment)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.
 *Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR).

Calculated limit based on row 300-6000 MHz, Power Density for *f* = 902 MHz

$$0.02619 f^{0.6834} = 2.74 \text{ W/m}^2 \text{ or } 0.274 \text{ mW/cm}^2$$

Find field density at 20 cm for Uncontrolled Use Devices exposure for worse-case frequency:

$$S = (P \cdot G) / (4 \cdot \pi \cdot [\text{Distance}]^2) = \text{given } P_{\text{wr,avg}} = 541 \text{ mW, Gain} = 1^*, \text{Distance} = 20 \text{ cm.}$$

*Power term includes antenna gain of 2.1 dBi.

$$S = (541) / (4 \cdot \pi \cdot [20 \text{ cm}]^2) = 0.108 \text{ mW/cm}^2$$

$$0.108 \text{ mW/cm}^2 \leq 0.274 \text{ mW/cm}^2$$

This device meets the MPE criteria in RSS-102 Table 4.

The device meets the applicable ISED/RSS permissible exposure requirements.

Signed:

A handwritten signature in black ink, appearing to read "Eric Lifsey". The signature is written in a cursive style with a large, looping "E" and "L".

Eric Lifsey
