

## **RF Exposure / SAR / Health Hazard Statement**

### **Requirement:**

According to USA CFR 15 §1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy level in excess of the Commission's guideline. For Canada, RSS-102 Tests out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radiocommunication apparatus designed to be used within the vicinity of the human body.

### **SAR Testing Exclusion:**

Per FCC 447498 General RF Exposure Guidance v05, Section 4.3.1, the 1-g (body) and 10-g (extremity) SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances 50 mm are determined by the following formula

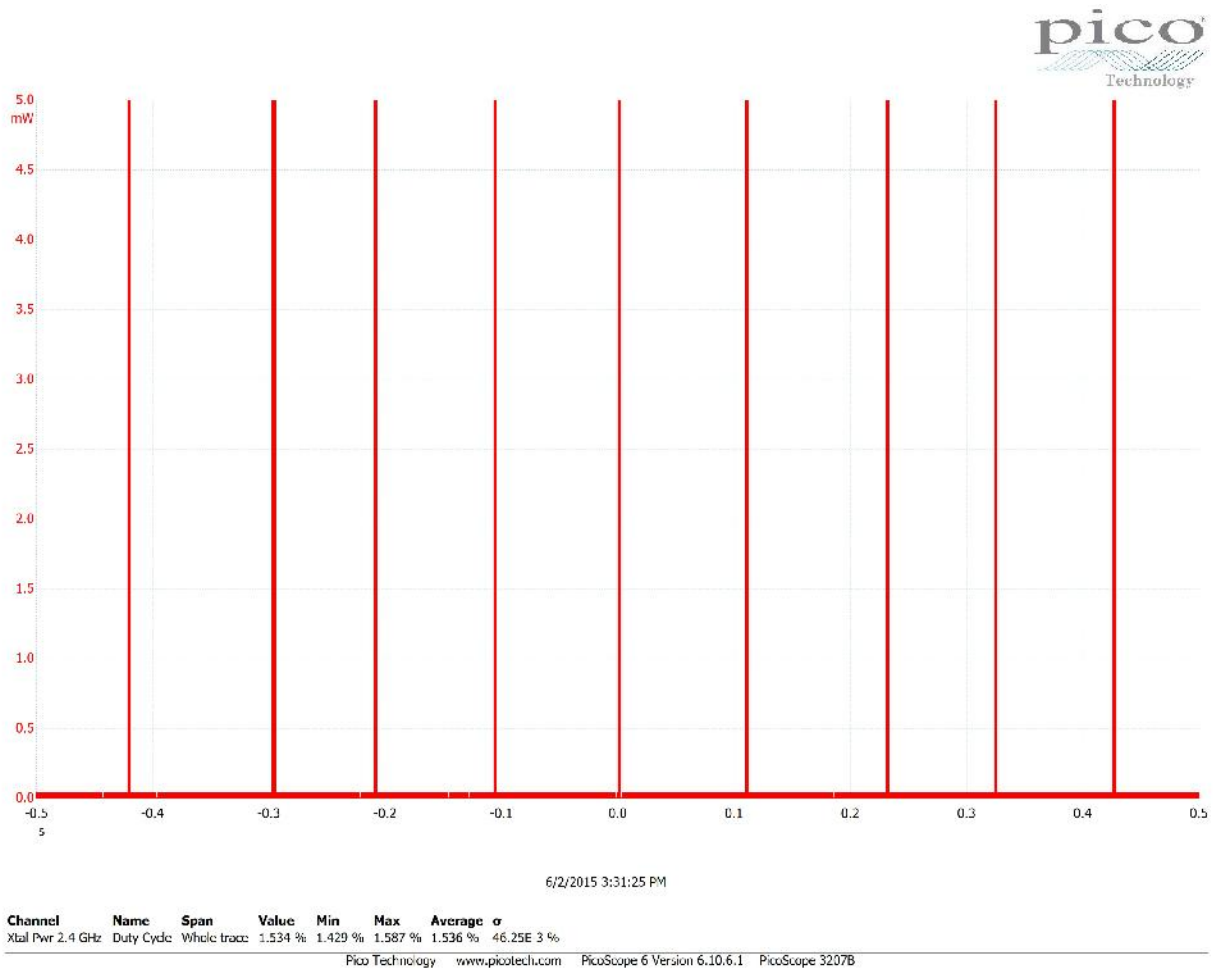
$$SAR = \frac{P_c}{d} \sqrt{f_{GHz}}$$

where d = minimum test distance and Pc is the source-based time-averaged maximum conducted output power, or EIRP for a device without a removable antenna.

For IC RSS-102, the SAR threshold is based on the higher of conducted output power and EIRP and is based on a power rating set for 1-g and 10-g SAR.

### Exposure Duty Cycle:

In the confidential Exposure Duty Cycle exhibit now submitted with this application, the manufacturer detailed that the worst-case on-time for their product based on the data sets and protocols employed will be very low. The manufacturer then prepared a test sample per the reviewer's request. This sample has been setup to send the maximum possible data payload at the minimum possible periodic rate possible for the EUT. The radio was set to operate at the lowest possible data rate by the manufacturer, and the duty cycle was measured using a HP 8472A wideband RF Crystal Detector (WRTL Asset XTAL1) and Picoscope 3207B Deep-Memory Oscilloscope (WRTL Asset PS3207B). The maximum power duty cycle was measured to be 1.587% over more than twenty, one second long intervals, as shown in the following oscilloscope plot. This measurement includes Bluetooth overhead in addition to the manufacturer's worst-case data packets.



Thus, power duty cycle is computed to be:

$$\text{Power Duty Cycle} = 10 * \text{Log}_{10}(0.01587) = -18.0 \text{ dB}$$

**This duty cycle is the worst case SOURCE-BASED TIME-AVERAGED duty cycle for this product.**

**Power Rating:**

The chipset manufacturer's most recent datasheet states a power rating for the product of 12 dBm +/- 0.3 dB. EUT manufacturer declared antenna gain is 2.2 dBi, implying a peak EIRP rating of 14.2 dBm, which is greater than that measured and is thus employed in the calculation below. Average power rating is computed from the peak value and the power duty cycle measured above.

**SAR Threshold:**

The SAR threshold at a minimum test distance of <5 mm are thus computed to be:

**SAR Threshold**

Freq. (GHz)	dmin (mm)	EIRP Po Pk (dBm)	EIRP Po Avg (dBm)	EIRP Po Avg (mW)	IC 1-g SAR Body Power Threshold Avg (mW)	IC 10-g SAR Extremity Power Threshold Avg (mW)	CALC FCC SAR Threshold (Avg)	FCC 1-g SAR Body Threshold (Avg)	FCC 10-g SAR Extremity Threshold (Avg)
2.402	5	14.2	-3.8	<b>0.4</b>	4	10	<b>0.1</b>	3	7.5
2.441	5	14.2	-3.8	<b>0.4</b>	4	10	<b>0.1</b>	3	7.5
2.480	5	14.2	-3.8	<b>0.4</b>	4	10	<b>0.1</b>	3	7.5

Thus the EUT meets the test exclusion thresholds for 1-g and 10-g SAR evaluation.