

## **Duty-Cycle Calculation and Justification:**

### **2.4 GHz SRRF RADIO Justification for Duty Cycle Averaging**

This Short-Range Radio Frequency (SRRF) transceiver module is used in conjunction with Manchester Encoding of the digital data that it transmits. Manchester Encoding is required for optimum operation of the RF Monolithics TR-1000 transceiver IC that is used in this design. Manchester encoding ensures a 50% ones density in the data stream by converting each bit into two bits, one of which is a 1 and the other a 0.

This radio use ON-OFF keying modulation. The transmitter (carrier) is on when the radio is transmitting a 1 and off when the radio is transmitting a 0. Combining the modulation scheme with the Manchester Encoding, the transmitter will only be on 50% of the time during any transmission.

According to 47 CFR Part 15.35, we are allowed to average our transmission over a pulse train up to 100 milliseconds in length. The averaging factor is based on the 50% on time of the transmitter:

$$20 \log (.5) = -6.02 \text{ dB}$$

All intentional emissions from the transmitter will be averaged with this factor.