RF EXPOSURE REPORT (Mobile Device)

MODEL NO.: Seagull Wireless Telemetry Transmitter Module

ACCORDING: FCC Guidelines for Human Exposure
                IEEE C95.1

APPLICANT: Eagle Tree Systems

ADDRESS: 4957 Lakemont Blvd SE Suite C-4 PMB 235, Bellevue, WA 98006

ISSUED BY: Apex Wireless, Inc.

LAB LOCATION: 2525 Frontier Ave, Suite 200, Boulder, CO 80301

FCC ID: R2I-ETSTX1

1. Introduction

In this document, we will show that our product presents no radiation safety hazard to the human body. The limit for Maximum Permissible Exposure (MPE) specified in FCC1.1310 is followed. The Antenna gain for the antenna used in this product is based on accepted published values for a monopole antenna. Conducted output power was measured directly from antenna port on EUT. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

2. RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE – General Population /Uncontrolled exposure (MPE):

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
300 - 1500	---	---	F/1500	6
1500 – 100,000	- - -	- - -	1.0	30

F=Frequency in MHz

3. Friis Formula

Friis transmission formula : $Pd = (Pout*G) / (4*pi*r_2)$
where
Pd = power density in mW/cm$_2$

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance r.
Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).

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4. EUT Operating condition

The software provided with device allows maximum output power to be measured at the EUT antenna output port. Power was measured at four frequencies (highest, lowest, and two middle) within band and maximum was used for calculations.

5. Classification

This transmitter module will be mounted within a remote control (R/C) un-piloted aircraft or car such that any human proximity would be limited to set up of the telemetry system before "take off" and after "landing", which would typically last less than two minutes. In addition even during brief human proximity, such proximity would occur at a distance greater than 20 cm, since transmitter is installed within remote aircraft or car.

6. Test Results

6.1 Antenna Gain:

The maximum gain for monopole antenna is less than 2.41 dBi for a dipole.

6.2 Test Results:

Freq	Output Power to Antenna (mW)	Power Density @ 20cm (mW/cm$^{2)}$	Power Density Limit (F/1500) (mW/cm^2)	
905.05	184	0.064	0.6034	
911.93	207	.0718	0.6079	
918.33	147	0.0508	0.6122	
924.85	192	0.066	0.6166	

7. Conclusion

Since transmitter module is operated at a distance greater than 20cm from humans, and exposure even at 20cm is well below limit, this device poses no exposure hazard.