APPENDIX A: RF EXPOSURE COMPLIANCE

FCC Rules and Regulations Part 1.1307, 1.1310, 2.1091, 2.1093:

1. General Information:
FCCID: O6YUTS-600FSU
Environment: General Population/Uncontrolled Exposure
Device category: Mobile per Part 2.1091
Modulation Type/Mode: PHS (TDMA-TDD)

2. Operating Configurations and Test Conditions:

2.1 Antenna Type(s):

Antenna	Type	Gain (dBi)	Numeric Gain
QXX0318900	Patch	10.0	10.0
Whip	Omni	2.0	1.59

Frequency Range	**Freq. Tolerance (ppm)**	**Emission Designator**
1893.65-1909.85	1.4	289KDXW

10 dBi Antenna

Output Power (Worst Case)	**Time averaging as an inherent property (100 % Duty Cycle) (W)**	**Time averaging as an inherent property (12.8 % Duty Cycle, -8.9 dB) (W)**
ERP	0.01862 (12.7 dBm)	0.0024 (3.8 dBm)
EIRP	0.1862 (22.7 dBm)	0.024 (13.8 dBm)
Conducted	0.055 (17.4 dBm)	0.0071 (8.5 dBm)
Rated	0.010 (10.0 dBm)	0.0013 (1.1 dBm)

2 dBi Antenna

Output Power (Worst Case)	**Time averaging as an inherent property (100 % Duty Cycle) (W)**	**Time averaging as an inherent property (12.8 % Duty Cycle, -8.9 dB) (W)**
ERP	0.1096 (18.38 dBm)	.0089 (9.48 dBm)
EIRP	0.0689 (20.4 dBm)	.0141 (11.5 dBm)
Conducted	0.055 (17.4 dBm)	0.0071 (8.5 dBm)
Rated	0.010 (10.0 dBm)	0.0013 (1.1 dBm)

3. MPE Calculation:

The maximum distance, from the antenna at which MPE is met or exceeded, is calculated from the equation relating field strength E in V/m, transmit power P in Watts, transmit antenna numeric gain G, and separation distance in meters:

The Electric field generated for a 1mW/cm^2 exposure (S) is calculated as follows:

$$S = \frac{E^2}{Z}$$

where: S = Power density
E = Electric field
Z = Impedance.

$$E(V/m) = \sqrt{S \times Z} \qquad 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

The impedance of free space is 337 ohms, where E and H fields are perpendicular.

Thus:

$$E(V/m) = \sqrt{10 \times 377} = 64.1 \text{ V/m}$$

MPE Calculation:
The maximum distance, from the antenna at which MPE is met or exceeded, is calculated from the equation relating field strength E in V/m, transmit power P in Watts, transmit antenna numeric gain G, and separation distance in meters above and solving for d below:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{and} \quad d = \frac{\sqrt{30 \times P \times G}}{E(V/m)}$$

Power density:

$$P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for general population/uncontrolled exposure environment above 1500MHz is 1 mW/cm^2.

SEPARATION DISTANCE:

Separation Distance [A]	Antenna Gain (dBi)		Duty Cycle (%)
	10.0		
Power[B] (Watt)	(in)	(cm)	
0.0024	0.5	1.4	12.8
0.01862	1.5	3.8	100.0

Calculations:

$$12.8\% \text{ duty cycle} = 0.014m = \frac{\sqrt{30 \times 0.0024 \times 10}}{61.4}$$

$$100\% \text{ duty cycle} = 0.038m = \frac{\sqrt{30 \times 0.01862 \times 10}}{61.4}$$

Separation Distance [A]	Antenna Gain (dBi)		Duty Cycle (%)
	2.0		
Power[B] (Watt)	(in)	(cm)	
.0089	0.4	1.1	12.8
.0689	1.2	3.0	100.0

Calculations:

$$12.8\%\ \text{duty cycle} = 0.011m = \frac{\sqrt{30 \times 0.0089 \times 1.58}}{61.4}$$

$$100\%\ \text{duty cycle} = 0.03m = \frac{\sqrt{30 \times 0.0689 \times 1.58}}{61.4}$$

Notes:
[A] = Distances are calculated for the largest (worst-case) separation distance as applicable
[B] = Measured radiated output power ERP

CONCLUSION:
The device complies with the MPE requirements by providing a safe separation distance between the antenna, including any radiating structure, and any persons.

Proposed RF exposure safety information to include in User's Manual:

CAUTION: Antenna Installation Requirement
The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.