RF Exposure Considerations for Itron 900 MHz FHSS Radio Module

The following radio modules will be used in product that will result in co-location of the antennas for the modules:

Company	FCC ID	Description	Pout Max dBm	Antenna Gain Max dBi		
Tropos Networks	P9J-2411	2.4 GHz module	28.5	7.4		
Tropos Networks	P9J-5805	5.8 GHz module	26.4	19		
Itron Electricity Meters	SK9ITR900-1	902 MHz module	26.2	3		

RFx CALCULATION FOR MULTIPLE CO-LOCATED TX SOURCES

The following relationships between power density (S), distance from antenna (d meters), transmitter field strength (E v/m), transmitter power (P, watts) and antenna gain (G, numeric) are used to determine MPE for each transmitter:

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E^2/3770 = S, mW/cm^2

E, V/m = (Pwatts*Ggain*30)^.5/d, meters

MPE d, m = ((Pwatts*G*30)/3770*S))^{0.5}

Pwatts*Ggain = 10^{(PdBm-30+GdBi)/10)}

S@dist2 = S@dist1*(dist1/dist2)^2
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Per OET 65, the allowed cumulative exposure limit at a given point from three transmitters operating at different frequencies is

$$S_{fl}/S_{f1 limit} + S_{f2}/S_{f2 limit} + S_{f3}/S_{f3 limit} \le 1$$
, where

 S_{fl} = power density at a given point for transmitter operating at F1 MHz

 S_{f2} = power density at a given point for transmitter operating at F2 MHz

 S_{f3} = power density at a given point for transmitter operating at F3 MHz

S_{fllimit} = power density limit at frequency F1 (from Table 1 in Appendix A of OET 65)

S_{f2limit} = power density limit at frequency F2 (from Table 1 in Appendix A of OET 65)

 $S_{f3limit}$ = power density limit at frequency F3 (from Table 1 in Appendix A of OET 65)

At a distance of 56.4 cm, the weighted cumulative RF exposure is 99.9% of the allowed maximum. The MPE distance that will be reported in final product manuals that use the above listed combination of radios and maximum antenna gains will be 57 cm.

The spreadsheet with the calculations is attached.

Tropos/Itron											
110pos/100H	Module Mfr	FCC ID	IC Certification		+						
2.4 GHz	Tropos	P9J-2411	4751A-2411								
5.8 GHz	Tropos	P9J-5805	4751A-5805								
902 MHz	Itron	SK9ITR900-1	864G-ITR9001								
902 MITZ	Tuon	3K911K900-1	0040-1189001								
							0.1.1.				
							Calculate mW/cm	Z here. Enter f	requency in MHz	:	
							0 1 1 1 1 1 1 1				
01.6.0.4.00	•	1.00			50.4		Calculation of Limi	ts from 1.1310 1	able I	0 . " .	
S1 for 2.4 GH		1.00	maximum	Manual RFx Dist:	56.4	cm				Controlled	Uncontrolled
S2 for 902 M		0.60	maximum							Ave 6 min	Ave 30 min
S3 for 5805 I	MHZ	1.00	maximum				F(MHz)	Actual F, MHz			Gen, mW/cm2
							0.3-3	0.5		100.0	100.0
Max RF Power		MPE distance		S, mW/cm2 at	Comment 1	Comment 2	3.0 - 30.0	5		180.0	36.0
P, dBm	G, dBi	cm	at 20 cm dist	56.4			30.0-300	55		1.0	0.2
				cm			300-1500	902		3.0	0.60
					2.4 GHz Duty						
28.5	7.40	17.6	0.77	0.10	Cycle = 100%	Max eirp = 36 dBm	1500-100000	5805		5.0	1.0
					902MHz Duty						
26.2	3.0	10.4	0.16	0.02	Cycle = 100%						
					5805MHz Duty						
26.4	19.0	52.5	6.90	0.87	Cycle 100%						
							Enter P(mW)	Equivalent dBm	Enter dBm	Equivalent Wat	ts
				% 2.4 GHx RFx	10%						
				% 902 MHz RFx	3%						
				%5.8 GHz RFx	87%						
				Total RFx	99.9%						
Basis of Calcu	ılations:						555	27.44	29.52	895.4	
E^2/3770 = S											
E, V/m = (Pwa)	atts*Ggain*30)^	.5/d, meters									
d = ((Pwatts*0	G*30)/3770*S))	^0.5	Pwatts*Ggain = 1	0^(PdBm-30+GdBi	i)/10)						
	MPEdist(MPE/dis										
				aration distance is	for FCC compliance	is 20 cm,					
ever	n if calculations	indicate MPE dis	stance is less								