	Model:	4277	Test Number:	230405D					
MPE Calculator	RF Exposure uses EIRP for calculation. EIRP is based on TX power added to the antenna gain in dBi.								
	dBi = dB gain compared to an isotropic radiator.								
	S = power density in mW/cm^2								
	Peak Transmitter Output power (mW)		2						
	Peak Transmitter Output power (W)		0.002						
Output Power for 100% duty Cycle operation (Watts)		100	0.0022		Antenna Gain (dBi)	4.7			
	Output Power for 0.417% duty Cycle operation (Watts)		0.0022		Antenna Gain (Numeric)	2.95			
Tx Frequency (MHz)	2402	Calcualtion power (Watts)	0.0022		dBd + 2.17 = dBi	dBi to dBd	2.2		
					Antenna Gain (dBd)	2.53			
Cable Loss (dB)	0.0	Adjusted Power (dBm)	3.50		Antenna minus cable (dBi)	4.70			
					Antenna Gain (Numeric)	2.95			
	Calculated ERP (mw)	4.009			EIRP = Po(dBM) + Gain (dB)				
	Calculated EIRP (mw)	6.607			Radiated (EIRP) dBm	8.200			
					ERP = EIRP - 2.17 dB				
	Power density (S) mW/cm² = EIRP / 4 p r^2				Radiated (ERP) dBm	6.030			
	r (cm) EIRP (mW)								

	Occupational Limit	FCC radio frequency radiation exposure limits per 1.1310		
8.006666667	mW/cm²	Frequency (MHz)	Occupational Limit (mW/cm²)	Public Limit (mW/cm²)
80	W/m²	30-300	1	0.2
	General Public Limit	300-1,500	f/300	f/1500
1.601333333	mW/cm²	1,500-10,000	5	1
16	W/m²			

	Occupational Limit	IC radio frequency radiation exposure limits per RSS-102		
$0.6455f^{0.5}$	W/m²	Frequency (MHz)	Occupational Limit (W/m²)	Public Limit (W/m²)
39.4	W/m²	100-6,000	$0.6455f^{0.5}$	
	General Public Limit	6,000-15,000	50	
$0.02619f^{0.6834}$	W/m²	48-300		1.291
5.4	W/m²	300-6,000		$0.02619f^{0.6834}$
		6,000-15,000	50	10

f = Transmit Frequecny (MHz)		f (MHz) =	2402	MHz
P_T = Power Input to Antenna (mW)		P_T (mW) =	2.2387	mW
Duty cycle (percentage of operation)		% =	100	%
P_A = Adjusted Power due to Duty cycle or Cable Loss (mW)		P_A (mW) =	2.24	mW
G_N = Numeric Gain of the Antenna		GN (numeric) =	2.95	numeric
S_{20} = Power Density of device at 20cm (mW/m²)	$S_{20}=(P_AG_N)/(4\pi R_{20})^2$	S_{20} (mW/m²) =	0.00	mW/m²
S_{20} = Power Density of device at 20cm (W/m²)	$S_{20}=(P_AG_N)/(4\pi R_{20})^2$	S_{20} (W/m²) =	0.01	W/m²
S_L = Power Density Limit (W/m²)		S_L (W/m²)=	5.351	W/m²
R_C = Minimum distance to the Radiating Element for Compliance (cm)	$R_C=\sqrt{(P_AG_N/4\pi S_L)}$	R_C (cm) =	1.0	cm
S_C = Power Density of the device at the Compliance Distance R_C (W/m²)	$S_C=(P_AG_N)/(4\pi R_C)^2$	S_C (W/m²) =	5.35	W/m²
R_{20} = 20cm		R20=	20	cm
	For Complaince with Canada General Population Limits, User Manual must indicate a minimum seperation distance of		1.0	cm
	Or in Meters for Complaince with Canada General Population Limits, a minimum seperation distance of		0.01	Meters

Summary: Standalone MPE Calculations and Summary								
Band 1, (MHz)	Tx Duty Cycle (%)	Tx Frequeny (MHz)	Power Total (mW)	Antenna Gain (numeric)	S_L (W/m²)	S_{20} (W/m²)	R_C (cm)	S_C (W/m²)
2400-2483.5	100	2402	2.24	2.95	5.351	0.01	1.0	5.35
Band 2, (MHz)	Tx Duty Cycle (%)	Tx Frequeny (MHz)	Power Total (mW)	Antenna Gain (dBi)	SL (W/m2)	S20 (W/m2)	RC (cm)	SC (W/m2)
2400-2483.5	100	2402	3.48	1.00	5.412	0.01	0.7	5.41
Band 3, (MHz)	Tx Duty Cycle (%)	Tx Frequeny (MHz)	Power Total (mW)	Antenna Gain (dBi)	SL (W/m2)	S20 (W/m2)	RC (cm)	SC (W/m2)
2400-2483.5	100	2412	3.48	1.00	5.412	0.01	0.7	5.41
Band 4, (MHz)	Tx Duty Cycle (%)	Tx Frequeny (MHz)	Power Total (mW)	Antenna Gain (dBi)	SL (W/m2)	S20 (W/m2)	RC (cm)	SC (W/m2)

Simlutaneous MPE Calculation				
	Transmitter 1	Transmitter 2	Transmitter 3	Transmitter 4
Tx Frequeny (MHz)	2402	2402	2412	
S_{20} (W/m²)	0.01	0.07	0.09	
S_L (W/m²)	5.351	16.013	16.080	
Power Ratio (S_L / S_{20})	0.002	0.004	0.006	
Sum of Power Ratios at 20cm (0.002 + 0.004+0.006)				0.012
Requirement = Σ of MPE Ratio ≤ 1				Therefore the design is Exempt

	HVIN:	4277	Test Number: 230405D					
MPE Calculator	RF Exposure uses EIRP for calculation. EIRP is based on TX power added to the antenna gain in dBi.							
	dBi = dB gain compared to an isotropic radiator.							
	S = power density in mW/cm^2							
		Transmitter Output power (mW)	17.7					
		Transmitter Output power (W)	0.010					
Output Power for 100% duty Cycle operation (Watts)		100	0.010		Antenna Gain (dBi)	5.7		
	Output Power for 100% duty Cycle operation (Watts)		0.010		Antenna Gain (Numeric)	3.72		
Tx Frequency (MHz)	2402	Calculation power (Watts)	0.010	dBd + 2.17 = dBi	dBi to dBd	2.17		
					Antenna Gain (dBd)	3.53		
Cable Loss (dB)	0.0	Adjusted Power (dBm)	9.79		Antenna minus cable (dBi)	5.70		
					Antenna Gain (Numeric)	3.72		
	Calculated ERP (mw)	21.478			EIRP = Po(dBm) + Gain (dB)			
	Calculated EIRP (mw)	35.400			Radiated (EIRP) dBm	15.490		
					ERP = EIRP - 2.17 dB			
					Radiated (ERP) dBm	13.320		

Power density (S) mW/cm² = EIRP / (4 p r^2)

r (cm) EIRP (mW)

	Occupational Limit	FCC radio frequency radiation exposure limits per 1.1310		
8.006666667	mW/cm²	Frequency (MHz)	Occupational Limit (mW/cm²)	Public Limit (mW/cm²)
80.1	W/m²	30-300	1	0.2
	General Public Limit	300-1,500	f/300	f/1500
1.601333333	mW/cm²	1,500-10,000	5	1
16.0	W/m²			

	Occupational Limit			
$0.6455/f^{0.5}$	W/m²	IC radio frequency radiation exposure limits per RSS-102		
31.6	W/m²	Frequency (MHz)	Occupational Limit (W/m²)	Public Limit (W/m²)
	General Public Limit	100-6,000	$0.6455/f^{0.5}$	
$0.02619/f^{0.6834}$	W/m²	6,000-15,000	50	
5.35	W/m²	48-300		1.291
		300-6,000		$0.02619/f^{0.6834}$
		6,000-15,000	50	10

				General Public	Occupational	
f = Transmit Frequency (MHz)			f (MHz) =	2402	2402	MHz
P_T = Power Input to Antenna (mW)			P_T (mW) =	9.5280	9.5280	mW
Duty cycle (percentage of operation)			% =	100	100	%
P_A = Adjusted Power due to Duty cycle or Cable Loss (mW)			P_A (mW) =	9.53	9.53	mW
G_N = Numeric Gain of the Antenna			GN (numeric) =	3.72	3.72	numeric
S_{20} = Power Density of device at 20cm (mW/m²)		$S_{20}=(P_A G_N)/(4\pi R_{20})^2$	S_{20} (mW/m²) =	0.01	0.01	mW/m²
S_{20} = Power Density of device at 20cm (W/m²)		$S_{20}=(P_A G_N)/(4\pi R_{20})^2$	S_{20} (W/m²) =	0.07	0.07	W/m²
S_L = Power Density Limit (W/m²) FCC			S_L (W/m²)=	16.013	80.067	W/m²
S_L = Power Density Limit (W/m²) Canada			S_L (W/m²)=	5.351	31.636	W/m²
R_C = Minimum distance to the Radiating Element for Compliance (cm) FCC		$R_C=\sqrt{(P_A G_N/4\pi S_L)}$	R_C (cm) =	1.3	0.6	cm
R_C = Minimum distance to the Radiating Element for Compliance (cm) Canada		$R_C=\sqrt{(P_A G_N/4\pi S_L)}$	R_C (cm) =	2.3	0.9	cm
S_C = Power Density of the device at the Compliance Distance R_C (W/m²) FCC		$S_C=(P_A G_N)/(4\pi R_C)^2$	S_C (W/m²) =	16.01	80.07	W/m²
S_C = Power Density of the device at the Compliance Distance R_C (W/m²) Canada		$S_C=(P_A G_N)/(4\pi R_C)^2$	S_C (W/m²) =	5.35	31.64	W/m²
R_{20} = 20cm			R20=	20	20	cm

For Compliance with Canada General Population Limits, User Manual must indicate a minimum separation distance of 2.3 cm

Or in Meters for Compliance with Canada General Population Limits, a minimum separation distance of 0.02 Meters

Summary: Standalone MPE Calculations and Summary					Public Limit		Public	
	Tx Duty Cycle (%)	Tx Frequency (MHz)	Power Total (mW)	Antenna Gain (numeric)	S_L (W/m²)	S_{20} (W/m²)	R_C (cm)	S_C (W/m²)
FCC	100	2402	10	3.72	16.013	0.07	1.3	16.01
Canada	100	2402	10	3.72	5.351	0.07	2.3	5.35

	Limit		Overall Minimum (cm)	Overall Minimum (inches)
	Public	Occupational		
FCC (cm)	1.3	0.6		
FCC (inches)	1.0	1.0		
Canada (cm)	2.3	0.9		
Canada (inches)	1.0	1.0		

Overall Minimum Limit Public	Overall Minumu Limit Occuppational
3 cm	1 cm
2 inches	1 inches

	HVIN:	4277	Test Number: 230405D					
MPE Calculator	RF Exposure uses EIRP for calculation. EIRP is based on TX power added to the antenna gain in dBi.							
	dBi = dB gain compared to an isotropic radiator.							
	S = power density in mW/cm^2							
		Transmitter Output power (mW)	17.7					
		Transmitter Output power (W)	0.037					
Output Power for % duty Cycle operation (Watts)	100		0.037		Antenna Gain (dBi)	0.9		
	Output Power for 100% duty Cycle operation (Watts)		0.037		Antenna Gain (Numeric)	1.23		
Tx Frequency (MHz)	2412	Calculation power (Watts)	0.037	dBd + 2.17 = dBi	dBi to dBd	2.17		
					Antenna Gain (dBd)	-1.27		
Cable Loss (dB)	0.0	Adjusted Power (dBm)	15.67		Antenna minus cable (dBi)	0.90		
					Antenna Gain (Numeric)	1.23		
	Calculated ERP (mw)	27.542			EIRP = Po(dBm) + Gain (dB)			
	Calculated EIRP (mw)	45.394			Radiated (EIRP) dBm	16.570		
					ERP = EIRP - 2.17 dB			
					Radiated (ERP) dBm	14.400		

Power density (S) mW/cm² = EIRP / (4 p r^2)

r (cm)	EIRP (mW)

	Occupational Limit	FCC radio frequency radiation exposure limits per 1.1310		
8.04	mW/cm²	Frequency (MHz)	Occupational Limit (mW/cm²)	Public Limit (mW/cm²)
80.4	W/m²	30-300	1	0.2
	General Public Limit	300-1,500	f/300	f/1500
1.608	mW/cm²	1,500-10,000	5	1
16.1	W/m²			

	Occupational Limit			
$0.6455f^{0.5}$	W/m²	IC radio frequency radiation exposure limits per RSS-102		
31.7	W/m²	Frequency (MHz)	Occupational Limit (W/m²)	Public Limit (W/m²)
	General Public Limit	100-6,000	$0.6455f^{0.5}$	
$0.02619f^{0.6834}$	W/m²	6,000-15,000	50	
5.37	W/m²	48-300		1.291
		300-6,000		$0.02619f^{0.6834}$
		6,000-15,000	50	10

				General Public	Occupational	
f = Transmit Frequency (MHz)			f (MHz) =	2412	2412	MHz
P_T = Power Input to Antenna (mW)			P_T (mW) =	36.8978	36.8978	mW
Duty cycle (percentage of operation)			% =	100	100	%
P_A = Adjusted Power due to Duty cycle or Cable Loss (mW)			P_A (mW) =	36.90	36.90	mW
G_N = Numeric Gain of the Antenna			GN (numeric) =	1.23	1.23	numeric
S_{20} = Power Density of device at 20cm (mW/m²)		$S_{20}=(P_AG_N)/(4\pi R_{20})^2$	S_{20} (mW/m²) =	0.01	0.01	mW/m²
S_{20} = Power Density of device at 20cm (W/m²)		$S_{20}=(P_AG_N)/(4\pi R_{20})^2$	S_{20} (W/m²) =	0.09	0.09	W/m²
S_L = Power Density Limit (W/m²) FCC			S_L (W/m²)=	16.080	80.400	W/m²
S_L = Power Density Limit (W/m²) Canada			S_L (W/m²)=	5.366	31.702	W/m²
R_C = Minimum distance to the Radiating Element for Compliance (cm) FCC		$R_C=\sqrt{(P_AG_N/4\pi S_L)}$	R_C (cm) =	1.5	0.7	cm
R_C = Minimum distance to the Radiating Element for Compliance (cm) Canada		$R_C=\sqrt{(P_AG_N/4\pi S_L)}$	R_C (cm) =	2.6	1.1	cm
S_C = Power Density of the device at the Compliance Distance R_C (W/m²) FCC		$S_C=(P_AG_N)/(4\pi R_C)^2$	S_C (W/m²) =	16.08	80.40	W/m²
S_C = Power Density of the device at the Compliance Distance R_C (W/m²) Canada		$S_C=(P_AG_N)/(4\pi R_C)^2$	S_C (W/m²) =	5.37	31.70	W/m²
R_{20} = 20cm			R20=	20	20	cm

For Compliance with Canada General Population Limits, User Manual must indicate a minimum separation distance of 2.6 cm

Or in Meters for Compliance with Canada General Population Limits, a minimum separation distance of 0.03 Meters

Summary: Standalone MPE Calculations and Summary					Public Limit		Public	
	Tx Duty Cycle (%)	Tx Frequency (MHz)	Power Total (mW)	Antenna Gain (numeric)	S_L (W/m²)	S_{20} (W/m²)	R_C (cm)	S_C (W/m²)
FCC	100	2412	37	1.23	16.080	0.09	1.5	16.08
Canada	100	2412	37	1.23	5.366	0.09	2.6	5.37

	Limit		Overall Minimum (cm)	Overall Minimum (inches)
	Public	Occupational		
FCC (cm)	1.5	0.7		
FCC (inches)	1.0	1.0		
Canada (cm)	2.6	1.1		
Canada (inches)	2.0	1.0		

Overall Minimum Limit Public	Overall Minumu Limit Occuppational
3 cm	2 cm
2 inches	1 inches