

MEASUREMENT/TECHNICAL REPORT



**Intermec Technologies Corporation
EasyLAN® Wireless CF Radio
2.4 GHz Spread Spectrum Transmitter**

REPORT NO: 040804-1

DATE: Aug. 8, 2004

Appendix D

RF EXPOSURE, MPE CALCULATION

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072833-002 Antenna, Rev. TNC, 2.4GHZ, 1.0 dBi

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067262-001 Antenna, 2.4GHZ, 5.0 dBi, Dual Flat Panel

MAXIMUM PERMISSIVE EXPOSURE, MPE CALCULATOR

2450MHz - 802.11b Radio with 1.0 dBi antenna

072833-002 Antenna, Rev. TNC, 2.4GHZ, 1.0 dBi, Dipole

MPE Calculator			dBi	1.00
			dBd + 2.17 = dBi	2.17
TX Frequency (MHz)	2450	Watts	0.07244	Antenna Gain dBd
				-1.17
Cable Losses dB	0.2	dBm	18.599784	
			dBi Watts x 1.64 = dBi Watts	
Calculated ERP (mW)		52.841902	radiated (ERP) dBm	17.230
Calculated EIRP (mW)		87.092036	radiated (EIRP) dBm	19.400

Occupational Limit
5.0 mW/cm²

General Public Limit
1.0 mW/cm²

EIRP

= mW/cm²

$\frac{4 \pi d^2}{\text{EIRP}}$

TX Frequency (MHz)

wavelength

meters	cm
0.12244898	12.245

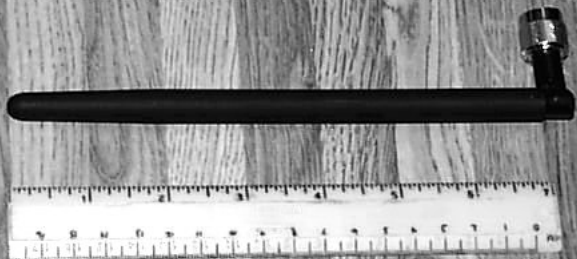
d = cm EIRP=mW

FCC radiofrequency radiation exposure limits 1.1310			
Freq. MHz	occ.limit		public limit
300-1,500	f/300		f/1500
1,500-10,000	5		1

MPE uses EIRP for calculations. EIRP is based on TX power added to the antenna gain in dBi.
dBi = dB gain compared to an isotropic radiator

EIRP (mW)	Distance (cm)	Distance (Meters)	Distance (inches)		mW/cm ²	V/M
87.09204	200.0	2.000	78.74		0.00017	0.808
87.09204	190.0	1.900	74.80		0.00019	0.851
87.09204	180.0	1.800	70.87		0.00021	0.898
87.09204	170.0	1.700	66.93		0.00024	0.951
87.09204	160.0	1.600	62.99		0.00027	1.010
87.09204	150.0	1.500	59.06		0.00031	1.078
87.09204	140.0	1.400	55.12		0.00035	1.155
87.09204	130.0	1.300	51.18		0.00041	1.243
87.09204	120.0	1.200	47.24		0.00048	1.347
87.09204	110.0	1.100	43.31		0.00057	1.469
87.09204	100.0	1.000	39.37		0.00069	1.616
87.09204	90.0	0.900	35.43		0.00086	1.796
87.09204	80.0	0.800	31.50		0.00108	2.021
87.09204	70.0	0.700	27.56		0.00141	2.309
87.09204	60.0	0.600	23.62		0.00193	2.694
87.09204	50.0	0.500	19.69		0.00277	3.233
87.09204	40.0	0.400	15.75		0.00433	4.041
87.09204	30.0	0.300	11.81		0.00770	5.388
*						
87.09204	20.0	0.200	7.87		0.01733	8.082
87.09204	10.0	0.100	3.94		0.06931	16.164
87.09204	5.0	0.050	1.97		0.27722	32.328

V/M= SQRT (mW/cm² x 3770) ref: FCC Guide OET 65



**072833-002 Antenna,
Rev. TNC, 2.4GHZ, 1.0 dBi,
Dipole Attaches directly to
Print server**

MAXIMUM PERMISSIVE EXPOSURE, MPE CALCULATOR

2450MHz - 802.11b Radio with 5.0 dBi antenna

063363-002 Antenna, 2.4GHZ, 5.0 dBi, Omni Dipole

MPE Calculator			dBi	5.00
			dBd + 2.17 = dBi	2.17
TX Frequency (MHz)	2450	Watts	Antenna Gain dBd	2.83
		0.07244		
Cable Losses dB	0.2	dBm	18.599784	
Calculated ERP (mW)		132.732857	dBi Watts x 1.64 = dBi Watts	
Calculated EIRP (mW)		218.765303	radiated (ERP) dBm 21.230	
			radiated (EIRP) dBm 23.400	

Occupational Limit
5.0 mW/cm²

General Public Limit
1.0 mW/cm²

EIRP

= mW/cm²

$\frac{4 \pi d^2}{\text{EIRP}}$

TX Frequency (MHz)

wavelength

meters	cm
0.12244898	12.245

d = cm EIRP=mW

FCC radiofrequency radiation exposure limits 1.1310			
Freq. MHz	occ.limit		public limit
300-1,500	f/300		f/1500
1,500-10,000	5		1

MPE uses EIRP for calculations. EIRP is based on TX power added to the antenna gain in dBi.
dBi = dB gain compared to an isotropic radiator

EIRP (mW)	Distance (cm)	Distance (Meters)	Distance (inches)		mW/cm ²	V/M
218.7653	200.0	2.000	78.74		0.00044	1.281
218.7653	190.0	1.900	74.80		0.00048	1.348
218.7653	180.0	1.800	70.87		0.00054	1.423
218.7653	170.0	1.700	66.93		0.00060	1.507
218.7653	160.0	1.600	62.99		0.00068	1.601
218.7653	150.0	1.500	59.06		0.00077	1.708
218.7653	140.0	1.400	55.12		0.00089	1.830
218.7653	130.0	1.300	51.18		0.00103	1.971
218.7653	120.0	1.200	47.24		0.00121	2.135
218.7653	110.0	1.100	43.31		0.00144	2.329
218.7653	100.0	1.000	39.37		0.00174	2.562
218.7653	90.0	0.900	35.43		0.00215	2.847
218.7653	80.0	0.800	31.50		0.00272	3.202
218.7653	70.0	0.700	27.56		0.00355	3.660
218.7653	60.0	0.600	23.62		0.00484	4.270
218.7653	50.0	0.500	19.69		0.00696	5.124
218.7653	40.0	0.400	15.75		0.01088	6.405
218.7653	30.0	0.300	11.81		0.01934	8.540
*	218.7653	20.0	0.200	7.87	0.04352	12.809
	218.7653	10.0	0.100	3.94	0.17409	25.619
	218.7653	5.0	0.050	1.97	0.69635	51.237

V/M= SQRT (mW/cm² x 3770) ref: FCC Guide OET 65



**063363-002 Antenna,
2.4GHZ, 5.0 dBi, Omni**

MAXIMUM PERMISSIVE EXPOSURE, MPE CALCULATOR

2450MHz - 802.11b Radio with 5.0 dBi antenna

067262-001 Antenna, 2.4GHZ, 5.0 dBi, Dual Flat Panel

MPE Calculator			dBi	5.00
			dBd + 2.17 = dBi	2.17
TX Frequency (MHz)	2450	Watts	0.07244	Antenna Gain dBd
				2.83
Cable Losses dB	0.2	dBm	18.599784	
			dBd Watts x 1.64 = dBi Watts	
Calculated ERP (mW)		132.732857	radiated (ERP) dBm	21.230
Calculated EIRP (mW)		218.765303	radiated (EIRP) dBm	23.400

Occupational Limit
5.0 mW/cm²

General Public Limit
1.0 mW/cm²

$$\frac{\text{EIRP}}{4 \pi d^2} = \text{mw/cm}^2$$

TX Frequency (MHz)	
wavelength	
meters	cm
0.12244898	12.245

d = cm EIRP=mW

FCC radiofrequency radiation exposure limits 1.1310			
Freq. MHz	occ.limit		public limit
300-1,500	f/300		f/1500
1,500-10,000	5		1

MPE uses EIRP for calculations. EIRP is based on TX power added to the antenna gain in dBi.
dBi = dB gain compared to an isotropic radiator

EIRP (mW)	Distance (cm)	Distance (Meters)	Distance (inches)		mW/cm ²	V/M
218.7653	200.0	2.000	78.74		0.00044	1.281
218.7653	190.0	1.900	74.80		0.00048	1.348
218.7653	180.0	1.800	70.87		0.00054	1.423
218.7653	170.0	1.700	66.93		0.00060	1.507
218.7653	160.0	1.600	62.99		0.00068	1.601
218.7653	150.0	1.500	59.06		0.00077	1.708
218.7653	140.0	1.400	55.12		0.00089	1.830
218.7653	130.0	1.300	51.18		0.00103	1.971
218.7653	120.0	1.200	47.24		0.00121	2.135
218.7653	110.0	1.100	43.31		0.00144	2.329
218.7653	100.0	1.000	39.37		0.00174	2.562
218.7653	90.0	0.900	35.43		0.00215	2.847
218.7653	80.0	0.800	31.50		0.00272	3.202
218.7653	70.0	0.700	27.56		0.00355	3.660
218.7653	60.0	0.600	23.62		0.00484	4.270
218.7653	50.0	0.500	19.69		0.00696	5.124
218.7653	40.0	0.400	15.75		0.01088	6.405
218.7653	30.0	0.300	11.81		0.01934	8.540
*	218.7653	20.0	0.200	7.87	0.04352	12.809
	218.7653	10.0	0.100	3.94	0.17409	25.619
	218.7653	5.0	0.050	1.97	0.69635	51.237

V/M= SQRT (mW/cm² x 3770) ref: FCC Guide OET 65

**067262-001 Antenna, 2.4GHZ,
5.0 dBi, Dual Flat Panel
with minimum length RG8
adapter REV. N Conn Cbl**

