MEASUREMENT/TECHNICAL REPORT

Intermec
Technologies Corporation
EMC Test Laboratory
Cedar Rapids, IA

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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David L. Fry
EMC Engineer
Date: Sept. 8, 2004

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	dBi to dBd	2.17
TX Frequency (MHz)	2450	Watts	0.07244		Antenna Gain dBd	-1.17
Cable Losses dB	0.2	dBm	18.599784			

dBd 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

Ocupational Limit
5.0 mW/cm ^{2}

General Public Limit
1.0 mW/cm^2

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

d = cm EIRP=mW

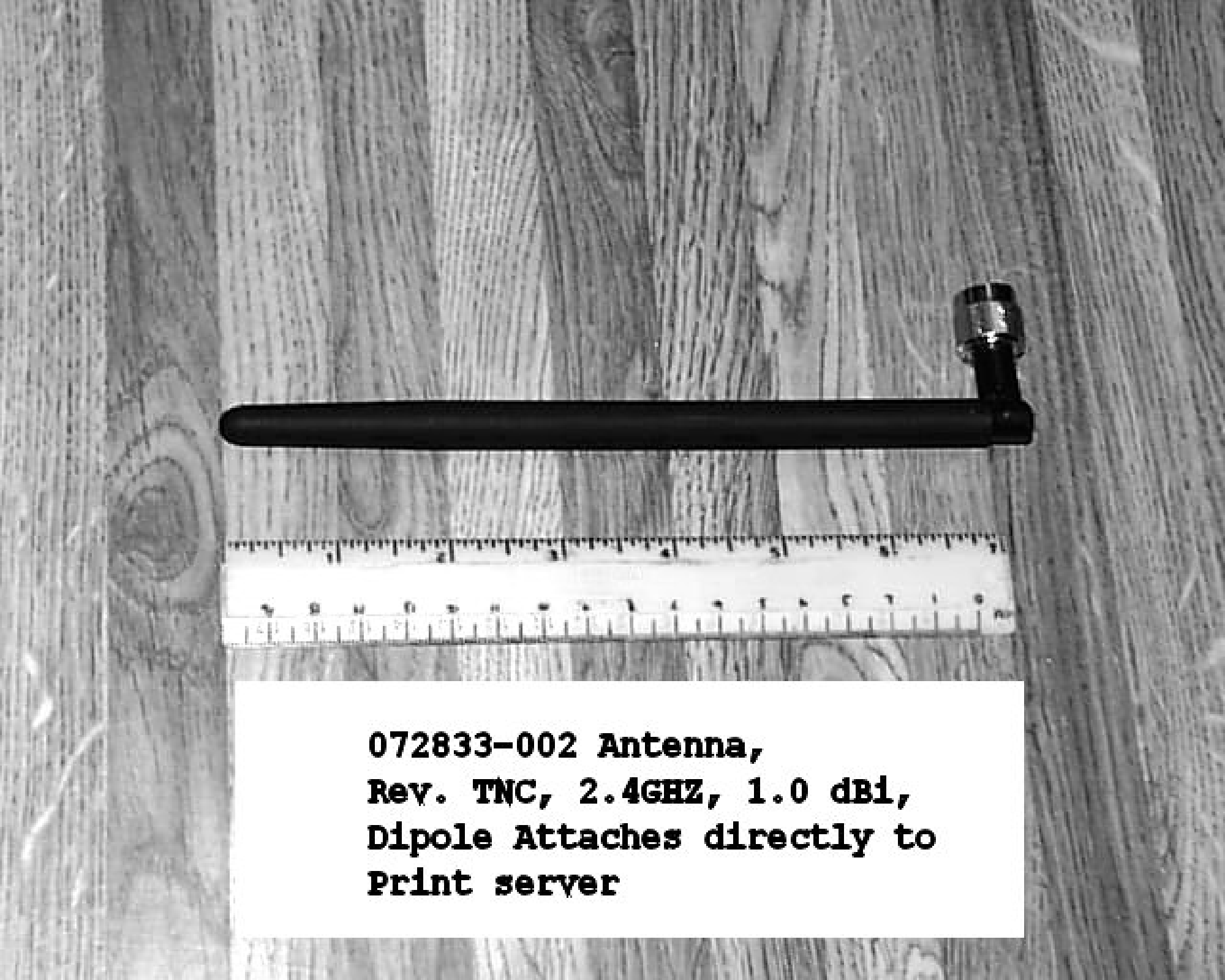
TX Frequency (MHz) wavelength	
meters	cm
0.12244898	12.245

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/cm^2 x 3770) ref: FCC Guide OET 65



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

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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	dBi to dBd	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

Ocupational Limit
5.0 mW/cm ^{2}

General Public Limit
1.0 mW/cm ^{2}

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

d = cm EIRP=mW

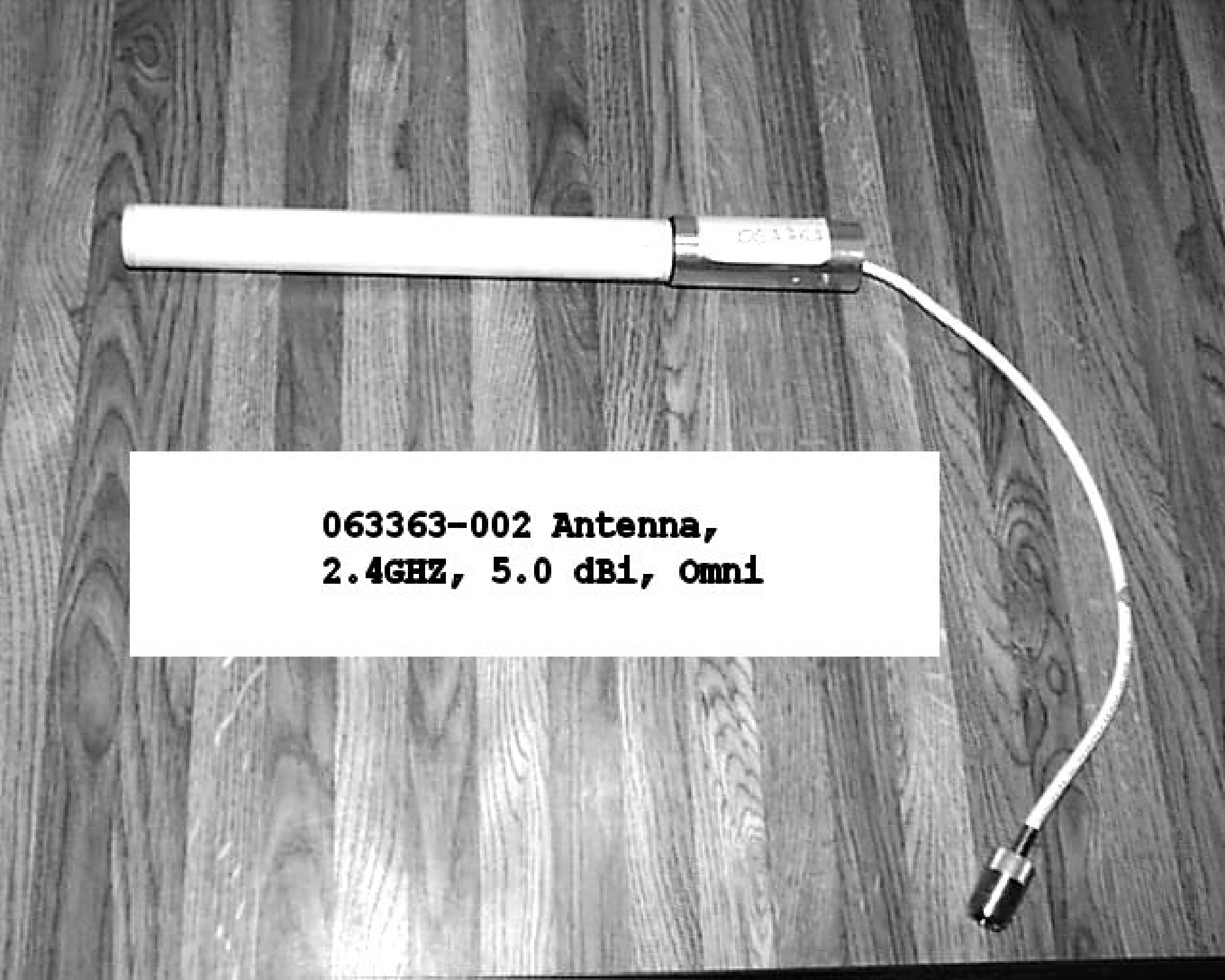
TX Frequency (MHz) wavelength	
meters	cm
0.12244898	12.245

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/cm^2 x 3770) ref: FCC Guide OET 65


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

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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	dBi to dBd	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

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General Public Limit
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$$\frac{EIRP}{4 \pi d^2} = mw/cm^2$$

d = cm EIRP=mW

TX Frequency (MHz) wavelength	
meters	cm
0.12244898	12.245

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

MPE uses EIRP for calculations. EIRP is based on TX power added to the antenna gain in dBi.
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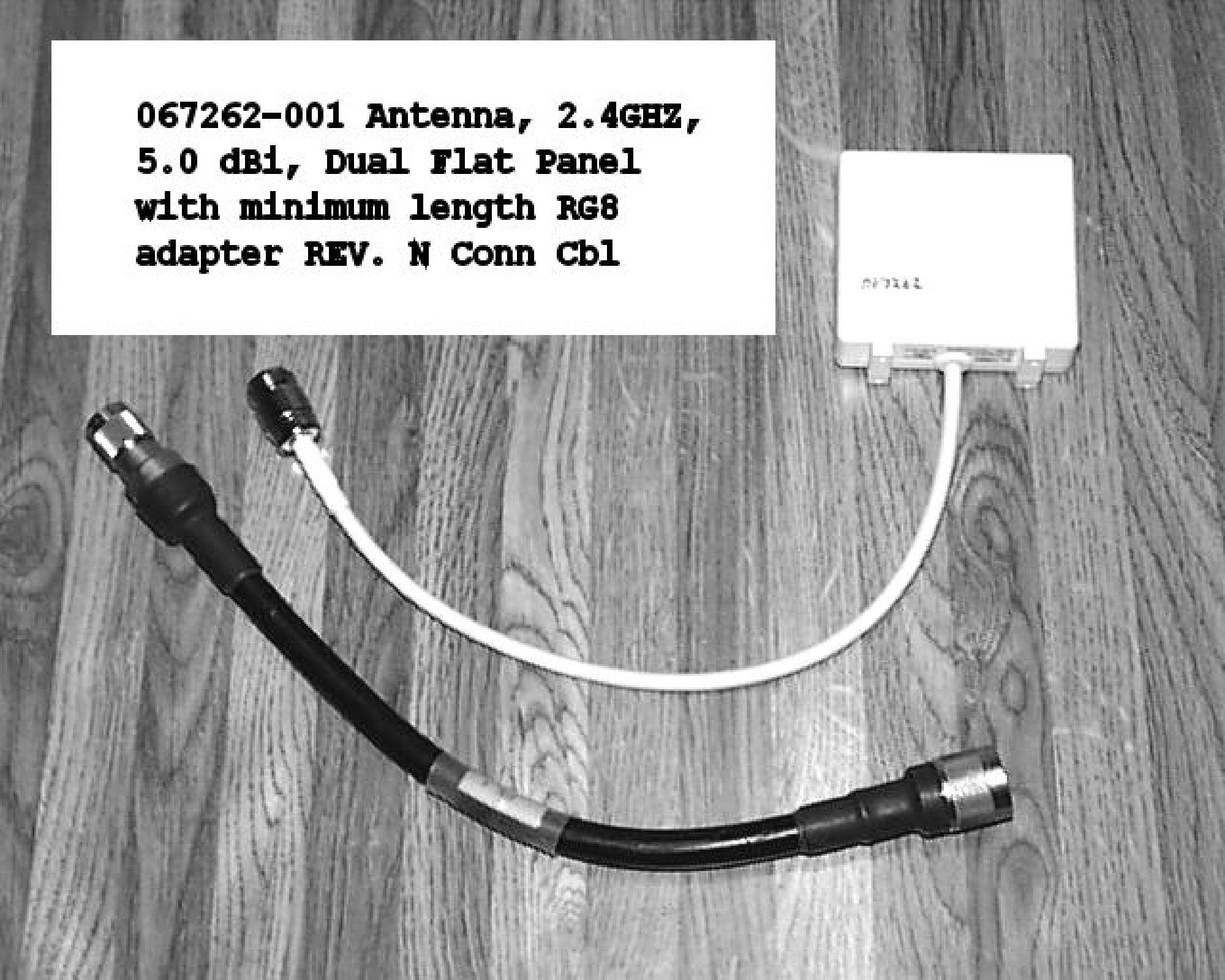
	218.7653	190.0	1.900	74.80		0.00048	1.348
	218.7653	180.0	1.800	70.87		0.00054	1.423
	218.7653	170.0	1.700	66.93		0.00060	1.507
	218.7653	160.0	1.600	62.99		0.00068	1.601
	218.7653	150.0	1.500	59.06		0.00077	1.708
	218.7653	140.0	1.400	55.12		0.00089	1.830
	218.7653	130.0	1.300	51.18		0.00103	1.971
	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/cm^2 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