

MPE Calculation page

12 Kw with 6-foot antenna array

Garmin	M4AONR00	Test Number:	014819			
MPE Calculator	MPE 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					
				Antenna Gain (dBi)	29	
		Output Power		dBd + 2.17 = dBi	dBd to dBd	2.2
Tx Frequency (MHz)	9400	Maximum (Watts)	11.059200		Antenna Gain (dBd)	26.83
Cable Loss (dB)	0.0	(dBm)	40.44		Antenna minus cable (dBi)	29.00
	Calculated ERP (mw)	5329957.083		EIRP = Po(dBm) + Gain (dB)		
	Calculated EIRP (mw)	8784634.813			Radiated (EIRP) dBm	69.437
				ERP = EIRP - 2.17 dB		
	Occupational Limit				Radiated (ERP) dBm	67.267
	5.00000 mW/cm ²	<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² 4 p r² r (cm) EIRP (mW) </div>				
	50.00000 W/m ²					
	General Public Limit					
	1.00000 mW/cm ²					
	10.00000 W/m ²					
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	f/300	f/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm ²)	31.33333333	6.266666667			
	300-1,500 (W/m ²)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm ²)	5	1			
	1,500-10,000 (W/m ²)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
8784634.813	0.69906	6.99059	1000.00	10.00	393.70	32.81
8784634.813	0.86304	8.63036	900.00	9.00	354.33	29.53
8784634.813	0.96756	9.67556	850.00	8.50	334.65	27.89
8784634.813	1.09228	10.92280	800.00	8.00	314.96	26.25
8784634.813	1.24277	12.42772	750.00	7.50	295.28	24.61
8784634.813	1.42665	14.26651	700.00	7.00	275.59	22.97
8784634.813	1.65458	16.54578	650.00	6.50	255.91	21.33
8784634.813	1.94183	19.41831	600.00	6.00	236.22	19.69
8784634.813	2.31094	23.10939	550.00	5.50	216.54	18.04
8784634.813	2.79624	27.96236	500.00	5.00	196.85	16.40
8784634.813	3.45214	34.52143	450.00	4.500	177.17	14.76
8784634.813	4.36912	43.69119	400.00	4.000	157.48	13.12
8784634.813	4.97109	49.71086	375.00	3.750	147.64	12.30
8784634.813	5.70660	57.06604	350.00	3.500	137.80	11.48
8784634.813	7.76732	77.67323	300.00	3.000	118.11	9.84
8784634.813	9.95456	99.54561	265.00	2.650	104.33	8.69
8784634.813	17.47648	174.76476	200.00	2.000	78.74	6.56
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	3.75	375 / 148	8.50	850 / 335

12 Kw with 4-foot antenna array

Garmin	M4AONR00	Test Number:	014819			
MPE Calculator	MPE 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					
		Output Power		Antenna Gain (dBi)	27	
			dBd + 2.17 = dBi	dBi to dBd	2.2	
Tx Frequency (MHz)	9400	Maximum (Watts)	11.059200	Antenna Gain (dBd)	24.83	
Cable Loss (dB)	0.0	(dBm)	40.44	Antenna minus cable (dBi)	27.00	
Calculated ERP (mw)	3362975.568			EIRP = Po(dBm) + Gain (dB)		
Calculated EIRP (mw)	5542729.854			Radiated (EIRP) dBm	67.437	
				ERP = EIRP - 2.17 dB		
Occupational Limit		<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² 4 π r² r (cm) EIRP (mW) </div>		Radiated (ERP) dBm	65.267	
5.00000 mW/cm ²						
50.00000 W/m ²						
General Public Limit						
1.00000 mW/cm ²						
10.00000 W/m ²						
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	ƒ/300	ƒ/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm2)	31.33333333	6.266666667			
	300-1,500 (W/m2)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm2)	5	1			
	1,500-10,000 (W/m2)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
5542729.854	0.44108	4.41076	1000.00	10.00	393.70	32.81
5542729.854	0.54454	5.44539	900.00	9.00	354.33	29.53
5542729.854	0.68918	6.89182	800.00	8.00	314.96	26.25
5542729.854	0.90016	9.00156	700.00	7.00	275.59	22.97
5542729.854	0.99740	9.97403	665.00	6.65	261.81	21.82
5542729.854	1.22521	12.25212	600.00	6.00	236.22	19.69
5542729.854	1.76431	17.64306	500.00	5.00	196.85	16.40
5542729.854	2.75673	27.56728	400.00	4.00	157.48	13.12
5542729.854	4.90085	49.00849	300.00	3.00	118.11	9.84
5542729.854	5.83242	58.32416	275.00	2.75	108.27	9.02
5542729.854	7.05722	70.57223	250.00	2.500	98.43	8.20
5542729.854	8.71262	87.12621	225.00	2.250	88.58	7.38
5542729.854	9.11315	91.13149	220.00	2.200	86.61	7.22
5542729.854	9.54195	95.41945	215.00	2.150	84.65	7.05
5542729.854	10.00173	100.01733	210.00	2.100	82.68	6.89
5542729.854	10.49557	104.95572	205.00	2.050	80.71	6.73
5542729.854	11.02691	110.26911	200.00	2.000	78.74	6.56
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	3.00	300 / 118	6.65	665 / 262

Rogers Labs, Inc.
 4405 West 259th Terrace
 Louisburg, KS 66053
 Phone/Fax: (913) 837-3214
 Revision 1

Garmin International, Inc.
 Model: M4AONR00
 Test #: 140819
 Test to: CFR47 Parts 2, 80, RSS-238
 File: RFExp M4AONR00

FCC ID: IPH-02552
 IC: 1792A-02552
 SN: FCC #3
 Date: October 23, 2014
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6 Kw with 6-foot antenna array

Garmin	M4AONR00	Test Number:	014819			
MPE Calculator	MPE 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					
		Output Power		Antenna Gain (dBi)	29	
			dBd + 2.17 = dBi	dBi to dBd	2.2	
Tx Frequency (MHz)	9400	Maximum (Watts)	5.529600	Antenna Gain (dBd)	26.83	
Cable Loss (dB)	0.0	(dBm)	37.43	Antenna minus cable (dBi)	29.00	
Calculated ERP (mw)	2664978.542			EIRP = Po(dBm) + Gain (dB)		
Calculated EIRP (mw)	4392317.407			Radiated (EIRP) dBm	66.427	
				ERP = EIRP - 2.17 dB		
Occupational Limit		<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² 4 p r² r (cm) EIRP (mW) </div>		Radiated (ERP) dBm	64.257	
5.00000 mW/cm ²						
50.00000 W/m ²						
General Public Limit						
1.00000 mW/cm ²						
10.00000 W/m ²						
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	f/300	f/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm2)	31.33333333	6.266666667			
	300-1,500 (W/m2)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm2)	5	1			
	1,500-10,000 (W/m2)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
4392317.407	0.34953	3.49530	1000.00	10.00	393.70	32.81
4392317.407	0.43152	4.31518	900.00	9.00	354.33	29.53
4392317.407	0.54614	5.46140	800.00	8.00	314.96	26.25
4392317.407	0.71333	7.13326	700.00	7.00	275.59	22.97
4392317.407	0.82729	8.27289	650.00	6.50	255.91	21.33
4392317.407	0.97092	9.70915	600.00	6.00	236.22	19.69
4392317.407	1.00411	10.04107	590.00	5.90	232.28	19.36
4392317.407	1.15547	11.55469	550.00	5.50	216.54	18.04
4392317.407	1.39812	13.98118	500.00	5.00	196.85	16.40
4392317.407	1.72607	17.26072	450.00	4.50	177.17	14.76
4392317.407	2.18456	21.84559	400.00	4.000	157.48	13.12
4392317.407	2.85330	28.53302	350.00	3.500	137.80	11.48
4392317.407	3.88366	38.83661	300.00	3.000	118.11	9.84
4392317.407	4.62188	46.21878	275.00	2.750	108.27	9.02
4392317.407	4.97728	49.77280	265.00	2.650	104.33	8.69
4392317.407	8.73824	87.38238	200.00	2.000	78.74	6.56
4392317.407	9.68226	96.82258	190.00	1.900	74.80	6.23
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	2.65	265 / 104	5.90	590 / 232

Rogers Labs, Inc.
 4405 West 259th Terrace
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 Revision 1

Garmin International, Inc.
 Model: M4AONR00
 Test #: 140819
 Test to: CFR47 Parts 2, 80, RSS-238
 File: RFExp M4AONR00

FCC ID: IPH-02552
 IC: 1792A-02552
 SN: FCC #3
 Date: October 23, 2014
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6Kw with 4-foot antenna array

Garmin	M4AONR00	Test Number:	014819			
MPE Calculator	MPE 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					
		Output Power		Antenna Gain (dBi)	27	
			dBd + 2.17 = dBi	dBi to dBd	2.2	
Tx Frequency (MHz)	9400	Maximum (Watts)	5.529600	Antenna Gain (dBd)	24.83	
Cable Loss (dB)	0.0	(dBm)	37.43	Antenna minus cable (dBi)	27.00	
	Calculated ERP (mw)	1681487.784		EIRP = Po(dBm) + Gain (dB)		
	Calculated EIRP (mw)	2771364.927		Radiated (EIRP) dBm	64.427	
				ERP = EIRP - 2.17 dB		
	Occupational Limit	<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² 4 π r² r (cm) EIRP (mW) </div>			Radiated (ERP) dBm	62.257
	5.00000 mW/cm ²					
	50.00000 W/m ²					
	General Public Limit					
	1.00000 mW/cm ²					
	10.00000 W/m ²					
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	f/300	f/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm2)	31.33333333	6.266666667			
	300-1,500 (W/m2)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm2)	5	1			
	1,500-10,000 (W/m2)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
2771364.927	0.22054	2.20538	1000.00	10.00	393.70	32.81
2771364.927	0.27227	2.72269	900.00	9.00	354.33	29.53
2771364.927	0.34459	3.44591	800.00	8.00	314.96	26.25
2771364.927	0.45008	4.50078	700.00	7.00	275.59	22.97
2771364.927	0.61261	6.12606	600.00	6.00	236.22	19.69
2771364.927	0.88215	8.82153	500.00	5.00	196.85	16.40
2771364.927	0.99836	9.98362	470.00	4.70	185.04	15.42
2771364.927	1.08908	10.89078	450.00	4.50	177.17	14.76
2771364.927	1.37836	13.78364	400.00	4.00	157.48	13.12
2771364.927	1.80031	18.00312	350.00	3.50	137.80	11.48
2771364.927	2.45042	24.50425	300.00	3.000	118.11	9.84
2771364.927	3.52861	35.28611	250.00	2.500	98.43	8.20
2771364.927	3.82879	38.28788	240.00	2.400	94.49	7.87
2771364.927	4.16896	41.68964	230.00	2.300	90.55	7.55
2771364.927	4.55657	45.56575	220.00	2.200	86.61	7.22
2771364.927	5.00087	50.00867	210.00	2.100	82.68	6.89
2771364.927	9.80170	98.01698	150.00	1.500	59.06	4.92
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	2.10	210 / 83	4.70	470 / 185

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 Revision 1

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 Test #: 140819
 Test to: CFR47 Parts 2, 80, RSS-238
 File: RFExp M4AONR00

FCC ID: IPH-02552
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4 Kw with 6-foot antenna array

MPE Calculator	MPE 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					
				Antenna Gain (dBi)	29	
		Output Power		dBd + 2.17 = dBi	dBi to dBd 2.2	
Tx Frequency (MHz)	9400	Maximum (Watts)	3.686400	Antenna Gain (dBd)	26.83	
Cable Loss (dB)	0.0	(dBm)	35.67	Antenna minus cable (dBi)	29.00	
	Calculated ERP (mw)	1776652.361		EIRP = Po(dBm) + Gain (dB)		
	Calculated EIRP (mw)	2928211.604		Radiated (EIRP) dBm	64.666	
				ERP = EIRP - 2.17 dB		
	Occupational Limit			Radiated (ERP) dBm	62.496	
	5.00000 mW/cm ²	<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² $4 \pi r^2$ r (cm) EIRP (mW) </div>				
	50.00000 W/m ²					
	General Public Limit					
	1.00000 mW/cm ²					
	10.00000 W/m ²					
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	f/300	f/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm2)	31.33333333	6.266666667			
	300-1,500 (W/m2)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm2)	5	1			
	1,500-10,000 (W/m2)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
2928211.604	0.23302	2.33020	1000.00	10.00	393.70	32.81
2928211.604	0.41426	4.14257	750.00	7.50	295.28	24.61
2928211.604	0.93208	9.32079	500.00	5.00	196.85	16.40
2928211.604	0.99062	9.90625	485.00	4.85	190.94	15.91
2928211.604	1.01137	10.11370	480.00	4.80	188.98	15.75
2928211.604	1.15071	11.50714	450.00	4.50	177.17	14.76
2928211.604	1.45637	14.56373	400.00	4.00	157.48	13.12
2928211.604	1.65703	16.57029	375.00	3.75	147.64	12.30
2928211.604	1.90220	19.02201	350.00	3.50	137.80	11.48
2928211.604	2.20610	22.06103	325.00	3.25	127.95	10.66
2928211.604	2.58911	25.89108	300.00	3.000	118.11	9.84
2928211.604	3.08125	30.81252	275.00	2.750	108.27	9.02
2928211.604	3.72831	37.28315	250.00	2.500	98.43	8.20
2928211.604	4.60286	46.02858	225.00	2.250	88.58	7.38
2928211.604	4.81446	48.14456	220.00	2.200	86.61	7.22
2928211.604	9.82542	98.25421	154.00	1.540	60.63	5.05
2928211.604	5.28389	52.83893	210.00	2.100	82.68	6.89
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	2.20	220 / 87	4.85	485 / 191

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 4405 West 259th Terrace
 Louisburg, KS 66053
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 Revision 1

Garmin International, Inc.
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 Test #: 140819
 Test to: CFR47 Parts 2, 80, RSS-238
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FCC ID: IPH-02552
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4Kw with 4-foot antenna array

MPE Calculator	MPE 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					
				Antenna Gain (dBi)	27	
		Output Power		dBd + 2.17 = dBi	dBi to dBd 2.2	
Tx Frequency (MHz)	9400	Maximum (Watts)	3.686400	Antenna Gain (dBd)	24.83	
Cable Loss (dB)	0.0	(dBm)	35.67	Antenna minus cable (dBi)	27.00	
	Calculated ERP (mw)	1120991.856		EIRP = Po(dBm) + Gain (dB)		
	Calculated EIRP (mw)	1847576.618		Radiated (EIRP) dBm	62.666	
				ERP = EIRP - 2.17 dB		
	Occupational Limit			Radiated (ERP) dBm	60.496	
	5.00000 mW/cm ²	<div style="border: 1px solid black; padding: 5px;"> Power density (S) EIRP ----- = mW/cm² $4 \pi r^2$ r (cm) EIRP (mW) </div>				
	50.00000 W/m ²					
	General Public Limit					
	1.00000 mW/cm ²					
	10.00000 W/m ²					
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit	Public Limit			
	300-1,500	f/300	f/1500			
	1,500-10,000	5	1			
FCC radio frequency radiation exposure limits per 1.1310						
	Frequency (MHz)	Occupational Limit @ Tx Freq	Public Limit @ Tx Freq (mW/cm ²)			
	300-1,500 (mW/cm2)	31.33333333	6.266666667			
	300-1,500 (W/m2)	313.3333333	62.66666667			
	1,500-10,000 (mW/cm2)	5	1			
	1,500-10,000 (W/m2)	50	10			
EIRP	S	S	Distance	Distance	Distance	Distance
milliwatts	mW/cm ²	W/m ²	cm	meter	inches	Feet
1847576.618	0.14703	1.47025	1000.00	10.00	393.70	32.81
1847576.618	0.26138	2.61379	750.00	7.50	295.28	24.61
1847576.618	0.58810	5.88102	500.00	5.00	196.85	16.40
1847576.618	0.91891	9.18909	400.00	4.00	157.48	13.12
1847576.618	0.96664	9.66637	390.00	3.90	153.54	12.80
1847576.618	1.20021	12.00208	350.00	3.50	137.80	11.48
1847576.618	1.63362	16.33616	300.00	3.00	118.11	9.84
1847576.618	1.94414	19.44139	275.00	2.75	108.27	9.02
1847576.618	2.35241	23.52408	250.00	2.50	98.43	8.20
1847576.618	2.90421	29.04207	225.00	2.25	88.58	7.38
1847576.618	3.67564	36.75637	200.00	2.000	78.74	6.56
1847576.618	4.07273	40.72728	190.00	1.900	74.80	6.23
1847576.618	4.53782	45.37823	180.00	1.800	70.87	5.91
1847576.618	4.80083	48.00832	175.00	1.750	68.90	5.74
1847576.618	6.53447	65.34466	150.00	1.500	59.06	4.92
1847576.618	9.87809	98.78089	122.00	1.220	48.03	4.00
1847576.618	10.21010	102.10102	120.00	1.200	47.24	3.94
			Occupational Limit minimum Distance (meters)	Occupational Limit minimum Distance (cm / inches)	Public Limit minimum distance (meters)	Public Limit minimum distance (cm / inches)
		Frequency (MHz)				
		300-1,500	N/A	N/A	N/A	N/A
		1,500-10,000	1.75	175 / 69	3.90	390 / 154

Rogers Labs, Inc.
 4405 West 259th Terrace
 Louisburg, KS 66053
 Phone/Fax: (913) 837-3214
 Revision 1

Garmin International, Inc.
 Model: M4AONR00
 Test #: 140819
 Test to: CFR47 Parts 2, 80, RSS-238
 File: RFExp M4AONR00

FCC ID: IPH-02552
 IC: 1792A-02552
 SN: FCC #3
 Date: October 23, 2014
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