

KTNW Minor Modification

Attachment 2, Antenna Technical Data

Washington State University

This attachment describes the proposed antenna for replacement coverage of KTNW (DTV, Richland, WA, facility ID 71023) from the current channel 38 assignment to the required channel 22 assignment. Washington State University ("WSU") is the licensee of KTNW.

This application proposes to locate the replacement antenna 6 meters higher than the existing channel 38 antenna to facilitate the transition to channel 22. Adjustments to ERP have been made in this application to closely replicate existing KTNW coverage.

WSU proposes the use of a Micronetixx SFN-3030 2 bay circularly polarized UHF slotted directional antenna attached to a top-mounted pole. This antenna provides an excellent pattern match to the existing Dielectric TLP-8L antenna. In accordance with the requirements of 47 CFR § 73.625(c), the following information is presented in this attachment:

1. Description: Micronetixx SFN-3030-G-2 top mounted, 2 bay end fed circularly polarized UHF slotted directional antenna, using a "G" pattern reduced rear cardioid. Azimuthal gain of the antenna is 3.60 (5.56 dB). Elevation gain is 1.30 (1.14 dB). Total gain is 4.68 (6.70 dB).
2. Horizontal and vertical plane pattern plots: The manufacturer's relative field horizontal pattern plot is below in *Figure 1* with field strength values below 10 percent also in *Figure 2*. *Figure 3* contains the vertical pattern, while *Figure 4* shows vertical field strength values below 10 percent. A vertical plane pattern plot showing detail around the main lobe is in *Figure 5*, clearly demonstrating the 1-degree beam tilt specification.
3. Horizontal and vertical plane pattern plots in dBk are contained in *Figure 6* and *Figure 7*, respectively. Note that the vertical or elevation pattern is identical for all azimuths, so the vertical pattern is shown for the main lobe (relative field of 1.0).
4. Horizontal and vertical plane pattern tabulations: The manufacturer's tabulation of relative field values for the horizontal and vertical planes is contained in *Table 1* (horizontal) and *Table 2* (vertical).
5. Depression angle tabulation: The calculations of HAAT, depression angle and ERP at depression angle, considering electrical beam tilt and the azimuthal radiation pattern for 36 azimuths plus the main lobe (at 25 degrees) are shown in *Table 3*. HAAT was determined using the Commission's HAAT Calculator¹.

¹ Antenna Height Above Average Terrain (HAAT) Calculator, Media Bureau, fcc.gov

Micronetixx Azimuth Pattern G Rotated 25 Degrees

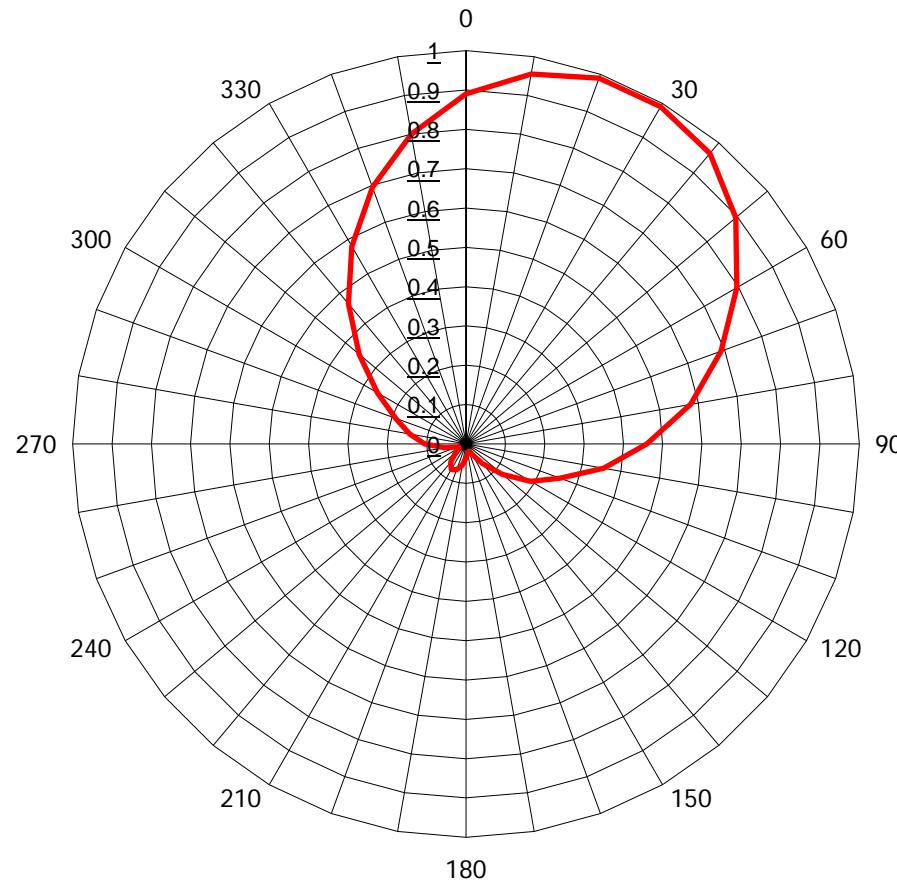


Figure 1. Antenna Horizontal Plane Azimuthal Plot

Micronetixx Azimuth Pattern G Rotated 25 Degrees: Enlarged Scale

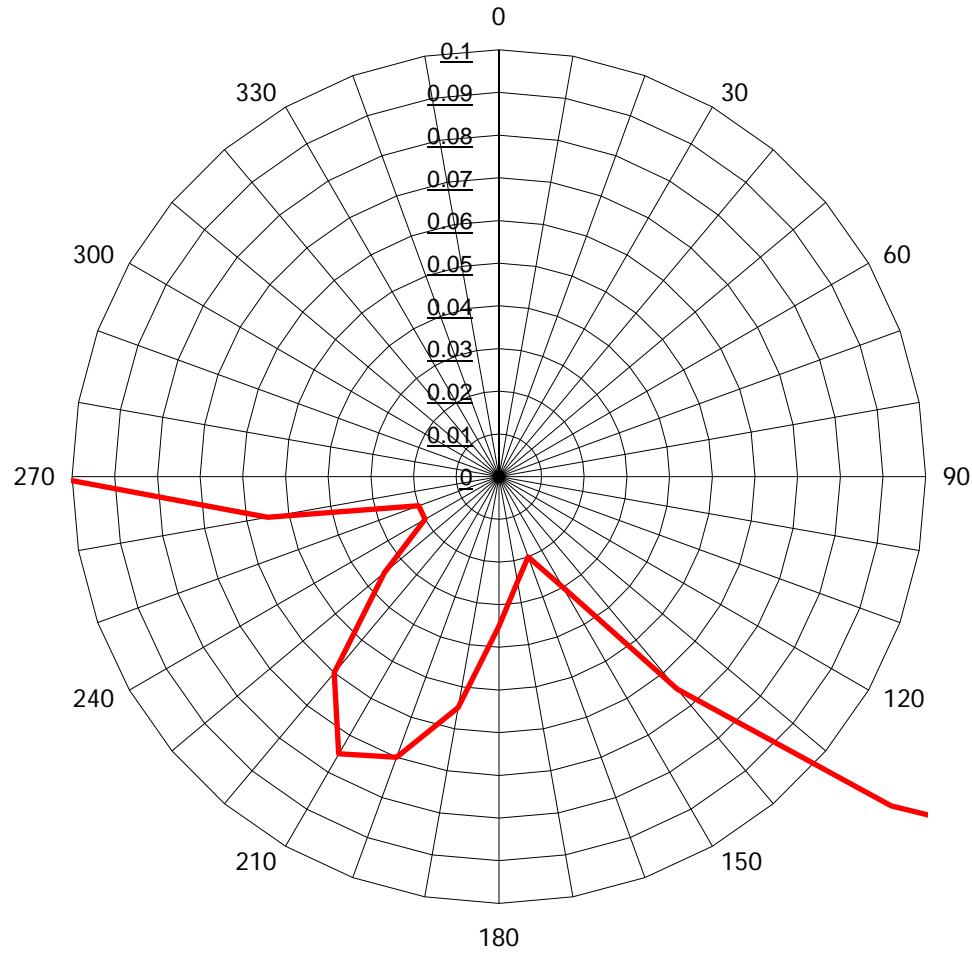


Figure 2. Antenna Horizontal Plane Azimuthal Plot, Enlarged Scale

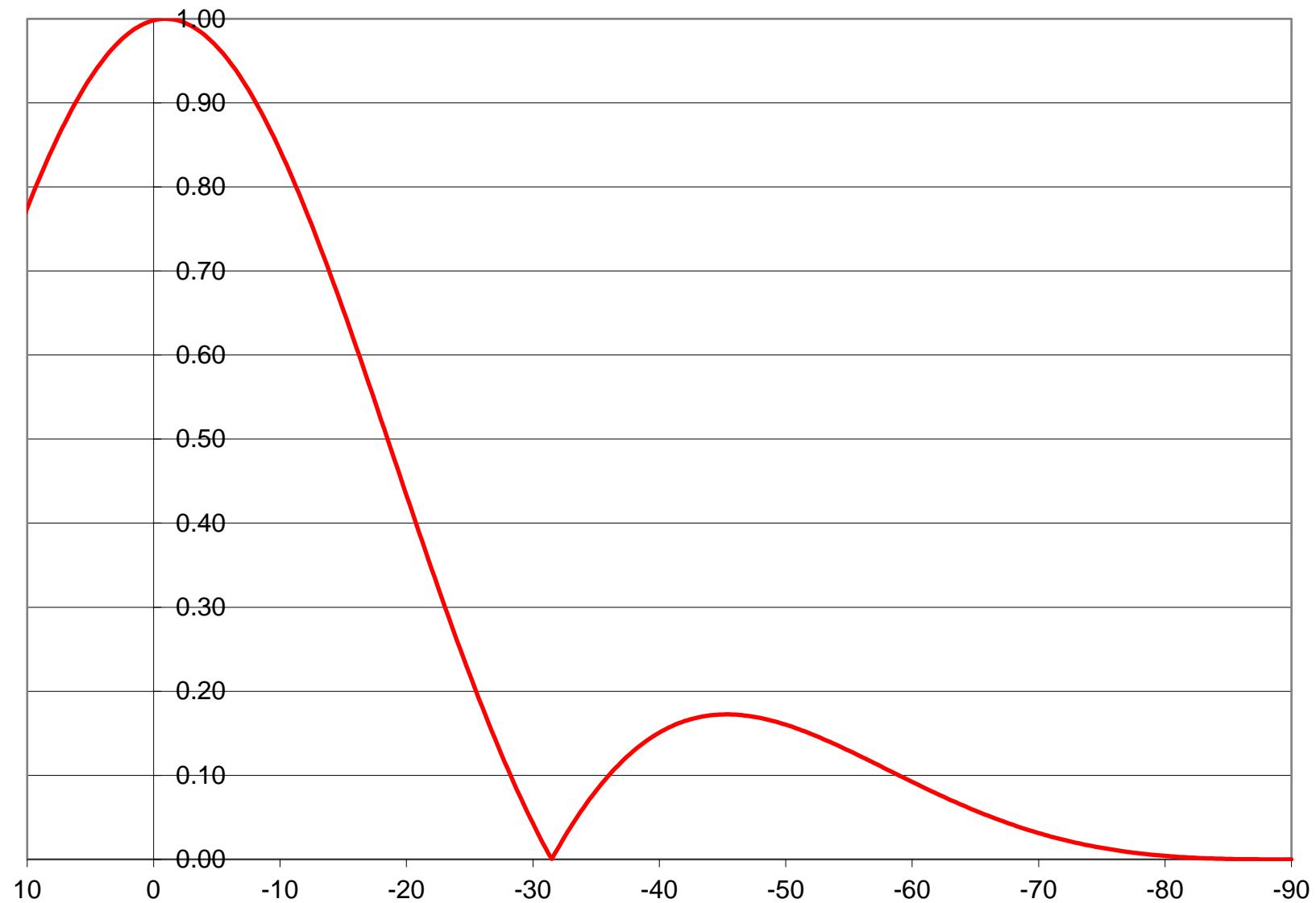


Figure 3. Antenna Vertical Plane Plot

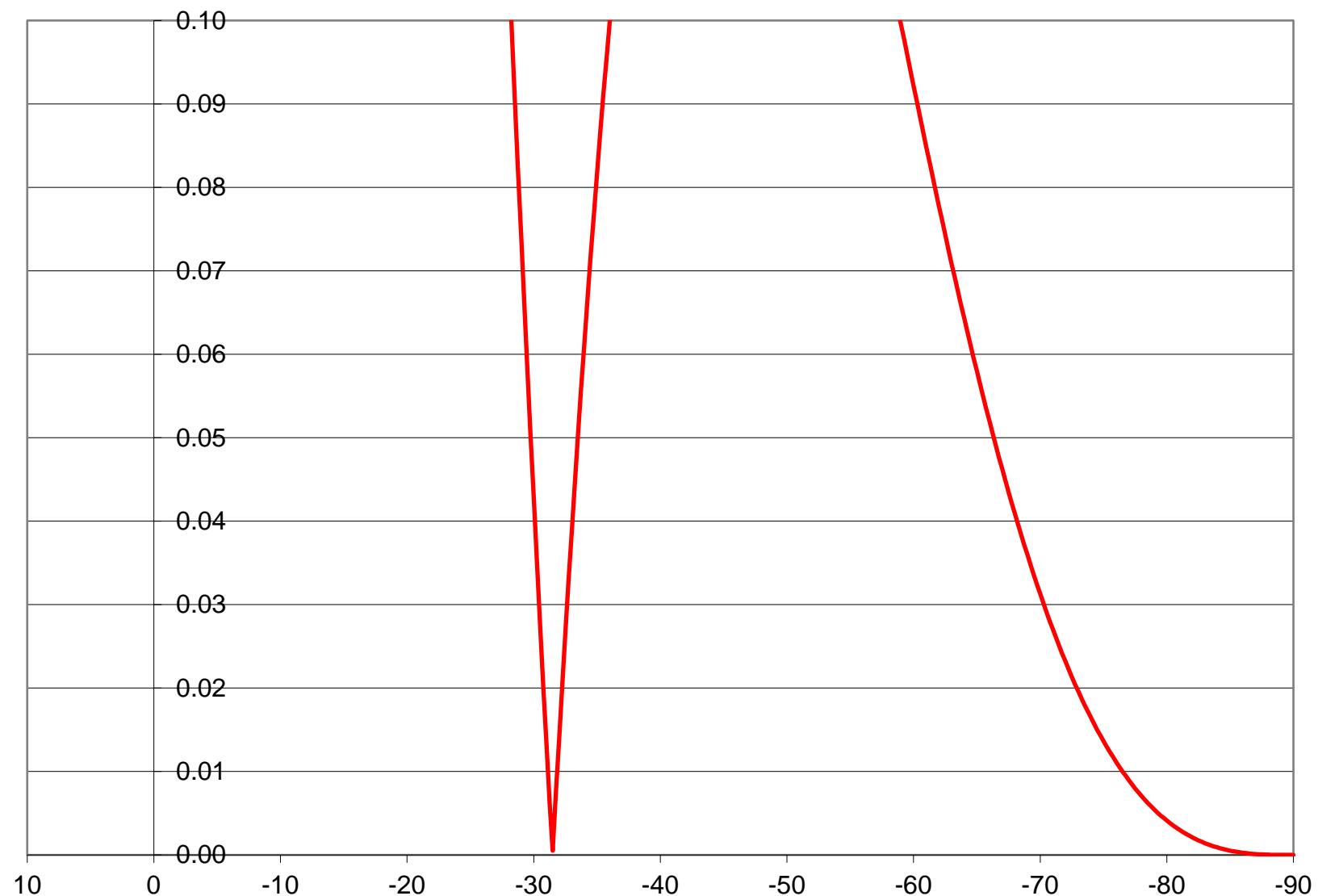


Figure 4. Antenna Vertical Plane Plot, Enlarged Scale

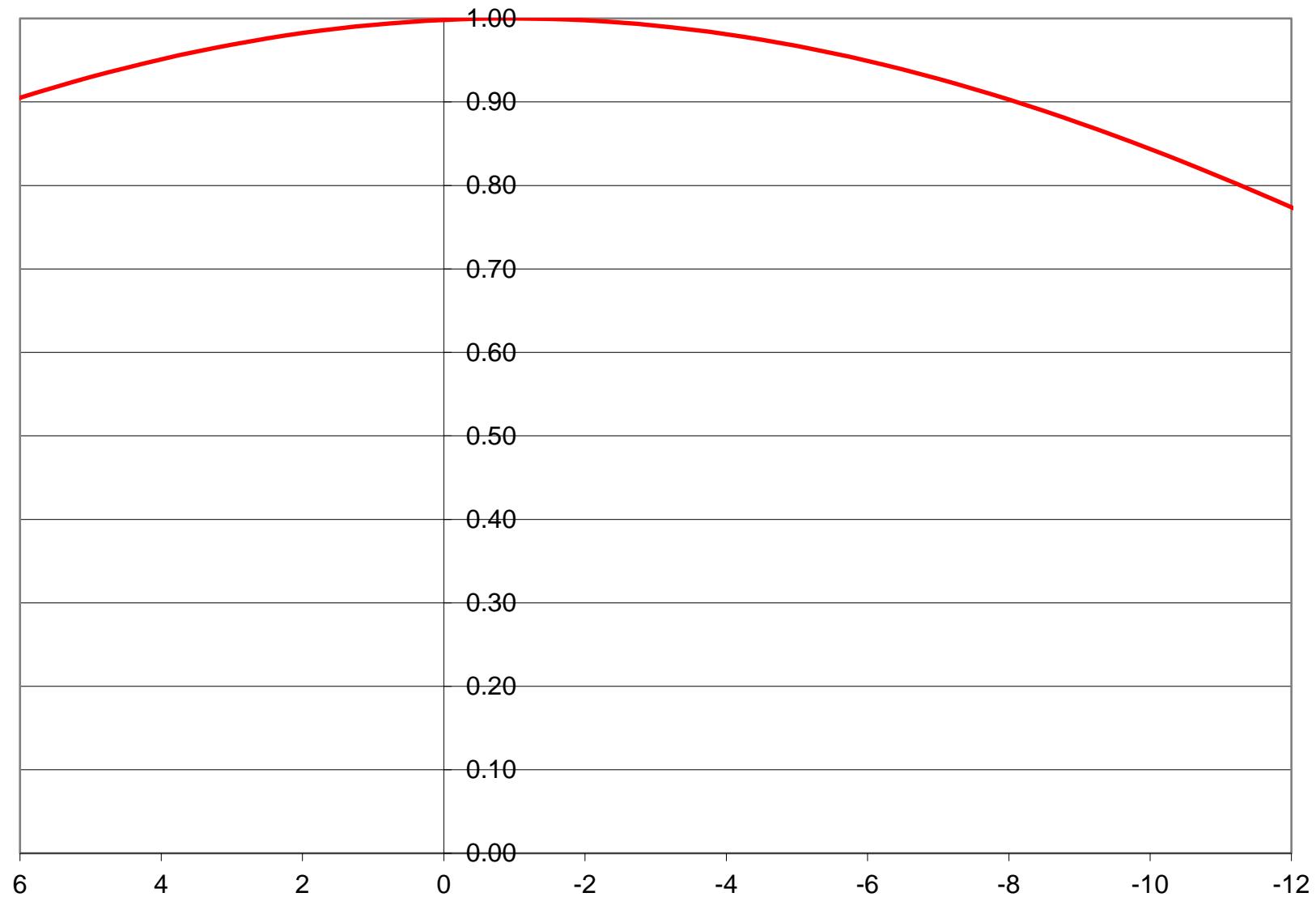


Figure 5. Antenna Vertical Plane Plot, near main lobe

KTNW Horizontal Plane Pattern, in dBk

Maximum Radiation: 14.7dBk at 25 degrees

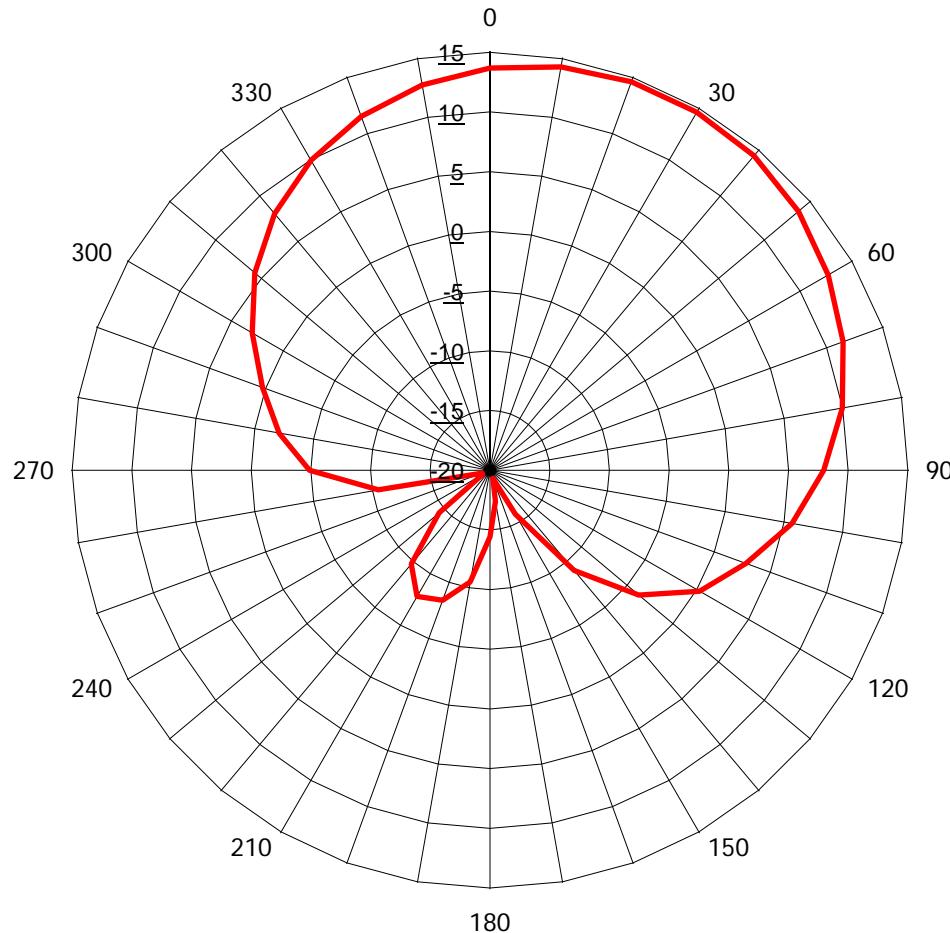


Figure 6. Antenna Horizontal Plane Plot, in dBk

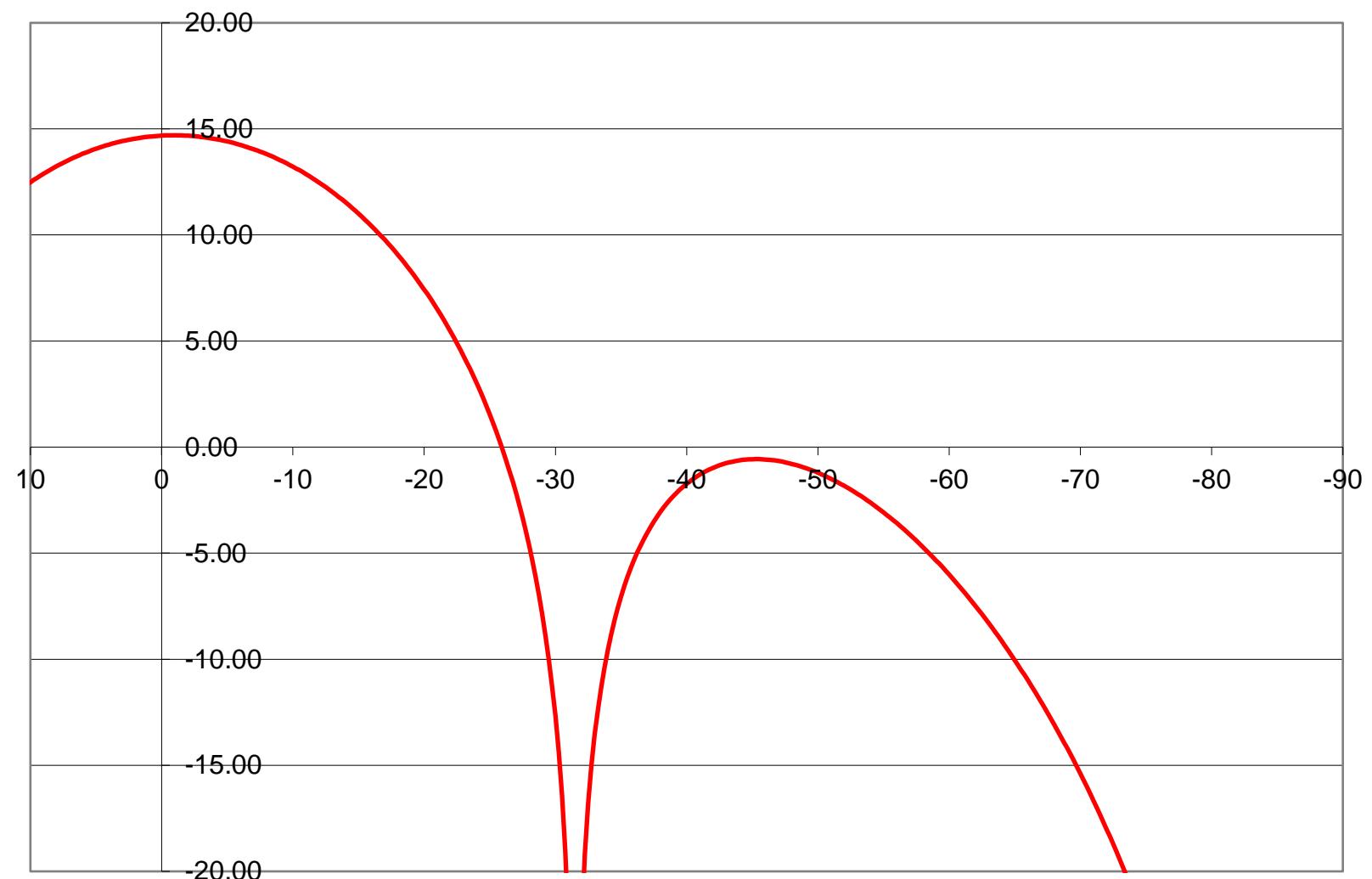


Figure 7. Antenna Vertical Plane Plot in dBk, Main Lobe

Micronettix "G" Pattern	
Rotated 25 degrees	
<i>Direction</i>	<i>Relative Field</i>
0	0.890
10	0.955
20	0.990
30	0.990
40	0.965
50	0.895
60	0.795
70	0.690
80	0.580
90	0.460
100	0.355
110	0.255
120	0.190
130	0.120
140	0.065
150	0.030
160	0.020
170	0.025
180	0.035
190	0.055
200	0.070
210	0.075
220	0.060
230	0.035
240	0.020
250	0.020
260	0.055
270	0.105
280	0.145
290	0.190
300	0.260
310	0.355
320	0.465
330	0.580
340	0.695
350	0.800
25	1.000

Table 1. Horizontal Plane Field Relative Field Strength Tabulation

Angle	Field								
90	0.000	80	0.004	70	0.032	60	0.098	50	0.182
89.75	0.000	79.75	0.004	69.75	0.033	59.75	0.100	49.75	0.184
89.5	0.000	79.5	0.005	69.5	0.035	59.5	0.102	49.5	0.185
89.25	0.000	79.25	0.005	69.25	0.036	59.25	0.104	49.25	0.187
89	0.000	79	0.006	69	0.037	59	0.107	49	0.189
88.75	0.000	78.75	0.006	68.75	0.038	58.75	0.109	48.75	0.190
88.5	0.000	78.5	0.006	68.5	0.040	58.5	0.111	48.5	0.192
88.25	0.000	78.25	0.007	68.25	0.041	58.25	0.113	48.25	0.193
88	0.000	78	0.007	68	0.042	58	0.115	48	0.195
87.75	0.000	77.75	0.008	67.75	0.044	57.75	0.117	47.75	0.196
87.5	0.000	77.5	0.008	67.5	0.045	57.5	0.119	47.5	0.197
87.25	0.000	77.25	0.009	67.25	0.046	57.25	0.122	47.25	0.199
87	0.000	77	0.009	67	0.048	57	0.124	47	0.200
86.75	0.000	76.75	0.010	66.75	0.049	56.75	0.126	46.75	0.201
86.5	0.000	76.5	0.010	66.5	0.051	56.5	0.128	46.5	0.202
86.25	0.000	76.25	0.011	66.25	0.052	56.25	0.130	46.25	0.203
86	0.000	76	0.011	66	0.054	56	0.133	46	0.204
85.75	0.000	75.75	0.012	65.75	0.056	55.75	0.135	45.75	0.205
85.5	0.000	75.5	0.013	65.5	0.057	55.5	0.137	45.5	0.206
85.25	0.000	75.25	0.013	65.25	0.059	55.25	0.139	45.25	0.207
85	0.001	75	0.014	65	0.060	55	0.141	45	0.207
84.75	0.001	74.75	0.015	64.75	0.062	54.75	0.143	44.75	0.208
84.5	0.001	74.5	0.015	64.5	0.064	54.5	0.146	44.5	0.208
84.25	0.001	74.25	0.016	64.25	0.066	54.25	0.148	44.25	0.209
84	0.001	74	0.017	64	0.067	54	0.150	44	0.209
83.75	0.001	73.75	0.018	63.75	0.069	53.75	0.152	43.75	0.209
83.5	0.001	73.5	0.018	63.5	0.071	53.5	0.154	43.5	0.210
83.25	0.001	73.25	0.019	63.25	0.073	53.25	0.156	43.25	0.210
83	0.001	73	0.020	63	0.075	53	0.158	43	0.210
82.75	0.002	72.75	0.021	62.75	0.076	52.75	0.161	42.75	0.210
82.5	0.002	72.5	0.022	62.5	0.078	52.5	0.163	42.5	0.210
82.25	0.002	72.25	0.023	62.25	0.080	52.25	0.165	42.25	0.209
82	0.002	72	0.024	62	0.082	52	0.167	42	0.209
81.75	0.002	71.75	0.025	61.75	0.084	51.75	0.169	41.75	0.208
81.5	0.003	71.5	0.026	61.5	0.086	51.5	0.171	41.5	0.208
81.25	0.003	71.25	0.027	61.25	0.088	51.25	0.173	41.25	0.207
81	0.003	71	0.028	61	0.090	51	0.174	41	0.206
80.75	0.003	70.75	0.029	60.75	0.092	50.75	0.176	40.75	0.205
80.5	0.004	70.5	0.030	60.5	0.094	50.5	0.178	40.5	0.204
80.25	0.004	70.25	0.031	60.25	0.096	50.25	0.180	40.25	0.203

Table 2. Vertical Plane Field Relative Field Strength Tabulation

Note that positive angles are above the radio horizon

Angle	Field								
40	0.202	30	0.043	20	0.334	10	0.775	0	0.998
39.75	0.201	29.75	0.036	19.75	0.345	9.75	0.784	-0.25	0.999
39.5	0.199	29.5	0.029	19.5	0.357	9.5	0.794	-0.5	1.000
39.25	0.198	29.25	0.021	19.25	0.368	9.25	0.803	-0.75	1.000
39	0.196	29	0.014	19	0.380	9	0.812	-1	1.000
38.75	0.194	28.75	0.006	18.75	0.391	8.75	0.820	-1.25	1.000
38.5	0.192	28.5	0.001	18.5	0.403	8.5	0.829	-1.5	0.999
38.25	0.190	28.25	0.009	18.25	0.414	8.25	0.837	-1.75	0.999
38	0.188	28	0.017	18	0.426	8	0.846	-2	0.998
37.75	0.186	27.75	0.025	17.75	0.437	7.75	0.854	-2.25	0.997
37.5	0.183	27.5	0.033	17.5	0.449	7.5	0.862	-2.5	0.995
37.25	0.180	27.25	0.042	17.25	0.460	7.25	0.869	-2.75	0.993
37	0.178	27	0.050	17	0.472	7	0.877	-3	0.991
36.75	0.175	26.75	0.059	16.75	0.483	6.75	0.884	-3.25	0.989
36.5	0.172	26.5	0.068	16.5	0.495	6.5	0.891	-3.5	0.987
36.25	0.169	26.25	0.077	16.25	0.506	6.25	0.898	-3.75	0.984
36	0.165	26	0.086	16	0.518	6	0.905	-4	0.981
35.75	0.162	25.75	0.095	15.75	0.529	5.75	0.911	-4.25	0.978
35.5	0.158	25.5	0.104	15.5	0.541	5.5	0.918	-4.5	0.975
35.25	0.155	25.25	0.114	15.25	0.552	5.25	0.924	-4.75	0.971
35	0.151	25	0.123	15	0.564	5	0.930	-5	0.967
34.75	0.147	24.75	0.133	14.75	0.575	4.75	0.935	-5.25	0.963
34.5	0.143	24.5	0.143	14.5	0.586	4.5	0.941	-5.5	0.959
34.25	0.138	24.25	0.152	14.25	0.597	4.25	0.946	-5.75	0.954
34	0.134	24	0.162	14	0.609	4	0.951	-6	0.949
33.75	0.129	23.75	0.173	13.75	0.620	3.75	0.956	-6.25	0.944
33.5	0.125	23.5	0.183	13.5	0.631	3.5	0.960	-6.5	0.939
33.25	0.120	23.25	0.193	13.25	0.642	3.25	0.965	-6.75	0.933
33	0.115	23	0.203	13	0.653	3	0.969	-7	0.928
32.75	0.110	22.75	0.214	12.75	0.663	2.75	0.973	-7.25	0.922
32.5	0.104	22.5	0.224	12.5	0.674	2.5	0.976	-7.5	0.916
32.25	0.099	22.25	0.235	12.25	0.685	2.25	0.979	-7.75	0.909
32	0.093	22	0.246	12	0.695	2	0.982	-8	0.903
31.75	0.087	21.75	0.257	11.75	0.706	1.75	0.985	-8.25	0.896
31.5	0.081	21.5	0.267	11.5	0.716	1.5	0.988	-8.5	0.889
31.25	0.075	21.25	0.278	11.25	0.726	1.25	0.990	-8.75	0.882
31	0.069	21	0.289	11	0.736	1	0.992	-9	0.875
30.75	0.063	20.75	0.301	10.75	0.746	0.75	0.994	-9.25	0.867
30.5	0.056	20.5	0.312	10.5	0.756	0.5	0.996	-9.5	0.860
30.25	0.050	20.25	0.323	10.25	0.765	0.25	0.997	-9.75	0.852

Table 2 (continued).

Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10	0.844	-20	0.433	-30	0.043	-40	0.151
-10.25	0.835	-20.25	0.422	-30.25	0.035	-40.25	0.153
-10.5	0.827	-20.5	0.411	-30.5	0.028	-40.5	0.155
-10.75	0.819	-20.75	0.400	-30.75	0.021	-40.75	0.157
-11	0.810	-21	0.389	-31	0.013	-41	0.159
-11.25	0.801	-21.25	0.378	-31.25	0.006	-41.25	0.160
-11.5	0.792	-21.5	0.367	-31.5	0.001	-41.5	0.162
-11.75	0.783	-21.75	0.356	-31.75	0.007	-41.75	0.163
-12	0.774	-22	0.345	-32	0.014	-42	0.164
-12.25	0.764	-22.25	0.334	-32.25	0.020	-42.25	0.166
-12.5	0.755	-22.5	0.324	-32.5	0.027	-42.5	0.167
-12.75	0.745	-22.75	0.313	-32.75	0.033	-42.75	0.168
-13	0.735	-23	0.302	-33	0.039	-43	0.169
-13.25	0.726	-23.25	0.292	-33.25	0.045	-43.25	0.169
-13.5	0.716	-23.5	0.281	-33.5	0.050	-43.5	0.170
-13.75	0.705	-23.75	0.271	-33.75	0.056	-43.75	0.171
-14	0.695	-24	0.260	-34	0.061	-44	0.171
-14.25	0.685	-24.25	0.250	-34.25	0.067	-44.25	0.172
-14.5	0.675	-24.5	0.240	-34.5	0.072	-44.5	0.172
-14.75	0.664	-24.75	0.230	-34.75	0.077	-44.75	0.172
-15	0.654	-25	0.220	-35	0.082	-45	0.172
-15.25	0.643	-25.25	0.210	-35.25	0.086	-45.25	0.172
-15.5	0.632	-25.5	0.200	-35.5	0.091	-45.5	0.172
-15.75	0.622	-25.75	0.190	-35.75	0.096	-45.75	0.172
-16	0.611	-26	0.181	-36	0.100	-46	0.172
-16.25	0.600	-26.25	0.171	-36.25	0.104	-46.25	0.172
-16.5	0.589	-26.5	0.162	-36.5	0.108	-46.5	0.172
-16.75	0.578	-26.75	0.153	-36.75	0.112	-46.75	0.171
-17	0.567	-27	0.143	-37	0.116	-47	0.171
-17.25	0.556	-27.25	0.134	-37.25	0.119	-47.25	0.170
-17.5	0.545	-27.5	0.125	-37.5	0.123	-47.5	0.170
-17.75	0.534	-27.75	0.117	-37.75	0.126	-47.75	0.169
-18	0.523	-28	0.108	-38	0.130	-48	0.168
-18.25	0.511	-28.25	0.099	-38.25	0.133	-48.25	0.167
-18.5	0.500	-28.5	0.091	-38.5	0.136	-48.5	0.166
-18.75	0.489	-28.75	0.082	-38.75	0.138	-48.75	0.166
-19	0.478	-29	0.074	-39	0.141	-49	0.165
-19.25	0.467	-29.25	0.066	-39.25	0.144	-49.25	0.164
-19.5	0.456	-29.5	0.058	-39.5	0.146	-49.5	0.163
-19.75	0.444	-29.75	0.050	-39.75	0.149	-49.75	0.161

Table 2 (continued).

Angle	Field	Angle	Field	Angle	Field	Angle	Field
-50	0.160	-60	0.092	-70	0.031	-80	0.004
-50.25	0.159	-60.25	0.090	-70.25	0.030	-80.25	0.004
-50.5	0.158	-60.5	0.089	-70.5	0.029	-80.5	0.004
-50.75	0.156	-60.75	0.087	-70.75	0.028	-80.75	0.003
-51	0.155	-61	0.085	-71	0.027	-81	0.003
-51.25	0.154	-61.25	0.083	-71.25	0.026	-81.25	0.003
-51.5	0.152	-61.5	0.081	-71.5	0.025	-81.5	0.003
-51.75	0.151	-61.75	0.080	-71.75	0.024	-81.75	0.002
-52	0.149	-62	0.078	-72	0.023	-82	0.002
-52.25	0.148	-62.25	0.076	-72.25	0.022	-82.25	0.002
-52.5	0.146	-62.5	0.074	-72.5	0.021	-82.5	0.002
-52.75	0.145	-62.75	0.073	-72.75	0.020	-82.75	0.002
-53	0.143	-63	0.071	-73	0.020	-83	0.001
-53.25	0.141	-63.25	0.069	-73.25	0.019	-83.25	0.001
-53.5	0.140	-63.5	0.068	-73.5	0.018	-83.5	0.001
-53.75	0.138	-63.75	0.066	-73.75	0.017	-83.75	0.001
-54	0.136	-64	0.064	-74	0.016	-84	0.001
-54.25	0.135	-64.25	0.063	-74.25	0.016	-84.25	0.001
-54.5	0.133	-64.5	0.061	-74.5	0.015	-84.5	0.001
-54.75	0.131	-64.75	0.060	-74.75	0.014	-84.75	0.001
-55	0.129	-65	0.058	-75	0.014	-85	0.001
-55.25	0.127	-65.25	0.056	-75.25	0.013	-85.25	0.000
-55.5	0.126	-65.5	0.055	-75.5	0.012	-85.5	0.000
-55.75	0.124	-65.75	0.053	-75.75	0.012	-85.75	0.000
-56	0.122	-66	0.052	-76	0.011	-86	0.000
-56.25	0.120	-66.25	0.050	-76.25	0.011	-86.25	0.000
-56.5	0.118	-66.5	0.049	-76.5	0.010	-86.5	0.000
-56.75	0.116	-66.75	0.048	-76.75	0.009	-86.75	0.000
-57	0.115	-67	0.046	-77	0.009	-87	0.000
-57.25	0.113	-67.25	0.045	-77.25	0.008	-87.25	0.000
-57.5	0.111	-67.5	0.044	-77.5	0.008	-87.5	0.000
-57.75	0.109	-67.75	0.042	-77.75	0.008	-87.75	0.000
-58	0.107	-68	0.041	-78	0.007	-88	0.000
-58.25	0.105	-68.25	0.040	-78.25	0.007	-88.25	0.000
-58.5	0.103	-68.5	0.038	-78.5	0.006	-88.5	0.000
-58.75	0.101	-68.75	0.037	-78.75	0.006	-88.75	0.000
-59	0.100	-69	0.036	-79	0.005	-89	0.000
-59.25	0.098	-69.25	0.035	-79.25	0.005	-89.25	0.000
-59.5	0.096	-69.5	0.034	-79.5	0.005	-89.5	0.000
-59.75	0.094	-69.75	0.032	-79.75	0.004	-89.75	0.000
						-90	0.000

Table 2 (continued).

Direction, Degrees	HAAT	Depression Angle	Horizontal Plane Field	Vertical Plane Field*	Composite Field	ERP, kW	ERP, dBk
0	515.1	0.63	0.890	1.000	0.890	23.37	13.7
10	529.6	0.64	0.955	1.000	0.955	26.90	14.3
20	532	0.64	0.990	1.000	0.990	28.91	14.6
30	539.9	0.64	0.990	1.000	0.990	28.91	14.6
40	541.5	0.64	0.965	1.000	0.965	27.47	14.4
50	532.1	0.64	0.895	1.000	0.895	23.63	13.7
60	523.7	0.63	0.795	1.000	0.795	18.64	12.7
70	519	0.63	0.690	1.000	0.690	14.04	11.5
80	488.1	0.61	0.580	1.000	0.580	9.92	10.0
90	457.3	0.59	0.460	1.000	0.460	6.24	8.0
100	411.2	0.56	0.355	1.000	0.355	3.72	5.7
110	374.7	0.54	0.255	1.000	0.255	1.92	2.8
120	309.5	0.49	0.190	1.000	0.190	1.06	0.3
130	294.7	0.48	0.120	1.000	0.120	0.42	-3.7
140	279.3	0.46	0.065	1.000	0.065	0.12	-9.0
150	278.4	0.46	0.030	1.000	0.030	0.03	-15.8
160	297.4	0.48	0.020	1.000	0.020	0.01	-19.3
170	292.5	0.47	0.025	1.000	0.025	0.02	-17.3
180	291.7	0.47	0.035	1.000	0.035	0.04	-14.4
190	299.8	0.48	0.055	1.000	0.055	0.09	-10.5
200	309.5	0.49	0.070	1.000	0.070	0.14	-8.4
210	309.3	0.49	0.075	1.000	0.075	0.17	-7.8
220	313	0.49	0.060	1.000	0.060	0.11	-9.7
230	284.9	0.47	0.035	1.000	0.035	0.04	-14.4
240	244.5	0.43	0.020	1.000	0.020	0.01	-19.3
250	203.6	0.40	0.020	1.000	0.020	0.01	-19.3
260	157.9	0.35	0.055	1.000	0.055	0.09	-10.5
270	153.7	0.34	0.105	1.000	0.105	0.33	-4.9
280	198.8	0.39	0.145	1.000	0.145	0.62	-2.1
290	256.2	0.44	0.190	1.000	0.190	1.06	0.3
300	346	0.52	0.260	1.000	0.260	1.99	3.0
310	384.7	0.54	0.355	1.000	0.355	3.72	5.7
320	416.7	0.57	0.465	1.000	0.465	6.38	8.0
330	442.6	0.58	0.580	1.000	0.580	9.92	10.0
340	465	0.60	0.695	1.000	0.695	14.25	11.5
350	488.9	0.61	0.800	1.000	0.800	18.88	12.8
25	535.8	0.64	1.000	1.000	1.000	29.50	14.7

*Since the depression angle for all azimuthal directions is less than 1 degree, the minimum relative field strength in the vertical plane is 0.998. Referring to 47 CFR § 73.625(c), this must be rounded to maximum radiation, or 1.000

Table 2. Depression Angle Calculation