

WMAQ-TV Application for Modification of Post-Repack Construction Permit October 31, 2017

Engineering Exhibit

The purpose of this application is to request modification of the post-repack construction permit (LMS file number 0000027946) for operation on channel 33 for WMAQ-TV, Chicago, IL, Facility ID 47905, licensed to NBC Telemundo License LLC.

This application specifies use of WMAQ-TV's current antenna location on the lower section of a stacked antenna system at Willis Tower at a radiation center of 688.4 meters AMSL and height above average terrain (HAAT) of 509 meters. The directional antenna specified in this application includes the effect from the transmission line run to the antenna above the WMAQ-TV antenna. The proposed maximum effective radiated power (ERP) is increased from 377 kW to 398 kW.

A TVStudy 2.2.3 analysis of the proposed ERP increase to 398 kW and modified antenna pattern using the default 2 km cell size and 1 km terrain profile point spacing showed the maximum amount of new interference created to any post-auction baseline facility, any application filed in the replication and first priority window, and any granted post-auction construction permits in the LMS database dated October 26, 2017 was under 0.5%.

Antenna System

The proposed facility will use a directional antenna with elliptical polarization. The maximum proposed vertically polarized ERP is 173.5 kW. The vertically polarized ERP will not exceed the maximum horizontally polarized ERP (398 kW) in any direction although due to pattern distortion caused by the stack configuration the horizontal and vertical ERP is equal at the 266 degree azimuth, as shown in the attached plots. Plots and tabulation of antenna data required by FCC Rules Section 73.625(c) are attached.

Environmental Statement

The requested facility will be installed on an existing structure shared with other broadcasters in the same location currently occupied by the WMAQ-TV channel 29 antenna.

RF power density from the facility using combined maximum horizontal and vertically polarized ERP was calculated following the procedures described in FCC Office of Engineering and Technology Bulletin 65. The maximum RF power density anywhere on the ground including 2 meter added height for a person is calculated to be 0.000512 mw/cm² or 0.13% of the maximum permissible exposure (MPE) level of 0.391 mw/cm² at 587 MHz for an uncontrolled environment. Willis Tower is in an urban area surrounded by other buildings. Maximum power density at any location up to 420 meters (1377 feet) in height is calculated to remain below 5% of the maximum public exposure limit. Other than Willis Tower, there are currently no publicly accessible areas of buildings above this height in Chicago. The upper portion of the antenna masts on the John Hancock Center extend above 420 meters. However, in the main beam of the proposed WMAQ-TV antenna, the power density is calculated to drop below 5% of the public exposure limit at distances greater than 989 meters from the antenna. The John Hancock Center masts are not a concern as they are over 2,400 meters from Willis Tower. The Willis Tower roof-top area is shared with other broadcasters and communication facilities. WMAQ-TV, in cooperation with other users of the tower, will conduct RF exposure measurements after construction and will reduce power or shut off as required to protect workers working on the Willis Tower masts or rooftop from RF exposure above the limits specified in FCC rule §1.1310.

Broadcast Facility

Compliance with 73.616:

A study using TVStudy 2.2.3 and the FCC LMS database dated 10/26/2017 showed the proposed facility complies with the interference requirements of Section 73.616 with regards to any post-auction baseline facility, any application filed in the replication and first priority window, and any granted post-auction construction permits when studied with the default 2 km cell size and 1 km terrain profile point spacing.

WMAQ-TV Application for Modification of Post-Repack Construction Permit (continued)

Broadcast Facility

Compliance with 73.622(i):

The proposed facility will operate on the channel assigned to WMAQ-TV for operation post-repack. The proposed WMAQ-TV ERP of 398 kW and HAAT of 509 meters complies with the maximum allowable ERP and antenna height limits in Section 73.622(f)(8)(i).

Compliance with 73.623(e):

Not applicable. No channel change is proposed. This channel is not assigned to land mobile in any market.

Compliance with 73.625:

The proposed facility will place a 48 dB μ v/m principle community contour over Chicago, Illinois, the community of license. See attached map "WMAQ-TV Proposed Coverage."

Compliance with 73.1030:

A TVStudy analysis did not identify any requirement for coordination with the facilities listed in 73.1030.

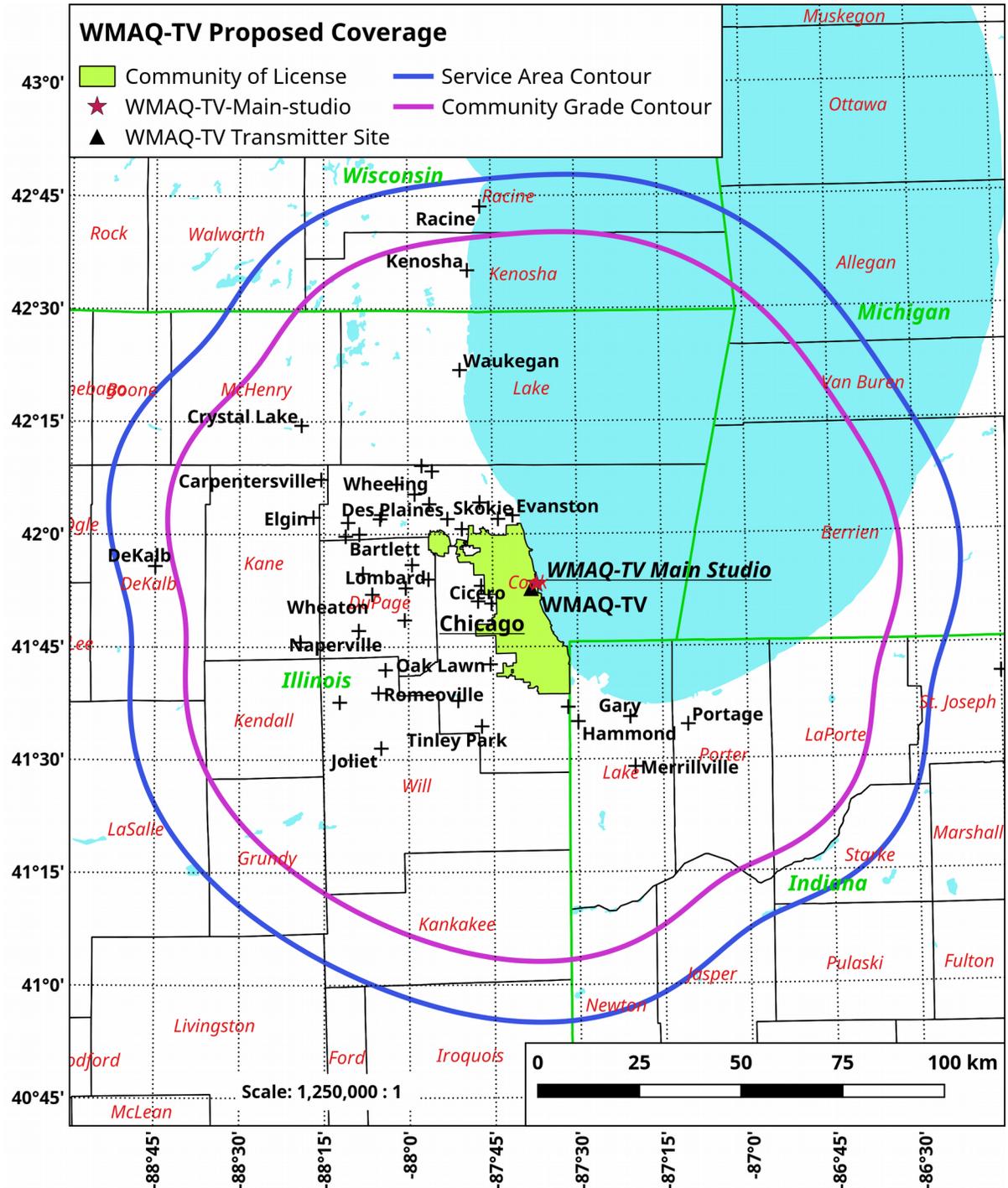
Compliance with 73.1125:

The proposed facility will place a 48 dB μ v/m principle community contour over the main studio located at 454 N. Columbus Drive, Chicago, IL 60611.

Compliance with 73.1650 :

The proposed facility is 371.2 km from the Canadian border and 1,825.6 km from the Mexican border. Coordination with Canada or Mexico is not required.

WMAQ-TV Application for Modification of Post-Repack Construction Permit (continued)



AZIMUTH PATTERN (H-Pol): Dielectric TFU-12GBH/VP-R O6SP

Main beam axis of symmetry: 206° true

Electrical Beam Tilt: 1.00°

Main Beam Calculated Max. H-pol Azimuth Pattern Gain (peak) 1.39 (1.42 dBd)

Maximum Main Beam H-Pol. Effective Radiated Power (ERP) 398.0 kW 26.00 dBk

Maximum Main Beam V-Pol. Effective Radiated Power (ERP): 173.5 kW 22.39 dBk

Tabulation of Azimuth Pattern (Horizontal polarization)

Angle	RF	dBk	ERP kW
0	0.733	23.30	213.8
10	0.787	23.92	246.5
20	0.833	24.41	276.2
30	0.837	24.45	278.8
40	0.798	24.04	253.4
50	0.741	23.40	218.5
60	0.731	23.28	212.7
70	0.813	24.20	263.1
80	0.902	25.10	323.8
90	0.860	24.69	294.4
100	0.716	23.10	204.0
110	0.783	23.87	244.0
120	0.973	25.76	376.8
130	0.945	25.51	355.4
140	0.726	23.22	209.8
150	0.657	22.35	171.8
160	0.836	24.44	278.2
170	0.976	25.79	379.1
180	0.996	25.96	394.8
190	0.954	25.59	362.2
200	0.916	25.24	333.9
210	0.912	25.20	331.0
220	0.944	25.50	354.7
230	0.990	25.91	390.1
240	0.989	25.90	389.3
250	0.873	24.82	303.3
260	0.682	22.67	185.1
270	0.688	22.75	188.4
280	0.909	25.17	328.9
290	0.990	25.91	390.1
300	0.826	24.34	271.5
310	0.703	22.94	196.7
320	0.832	24.40	275.5
330	0.908	25.16	328.1
340	0.836	24.44	278.2
350	0.741	23.40	218.5

Maximum

Angle	RF	dBk	ERP kW
26	0.841	24.49	281.5
83	0.908	25.16	328.1
124	0.995	25.96	394.0
177	1.000	26.00	398.0
235	1.000	26.00	398.0
288	0.995	25.96	394.0
329	0.908	25.16	328.1

Minimum

Angle	RF	dBk	ERP kW
56	0.725	23.21	209.2
103	0.702	22.93	196.1
147	0.642	22.15	164.0
206	0.909	25.17	328.9
265	0.642	22.15	164.0
309	0.702	22.93	196.1
356	0.725	23.21	209.2

AZIMUTH PATTERN (H-Pol): Dielectric TFU-12GBH/VP-R O6SP

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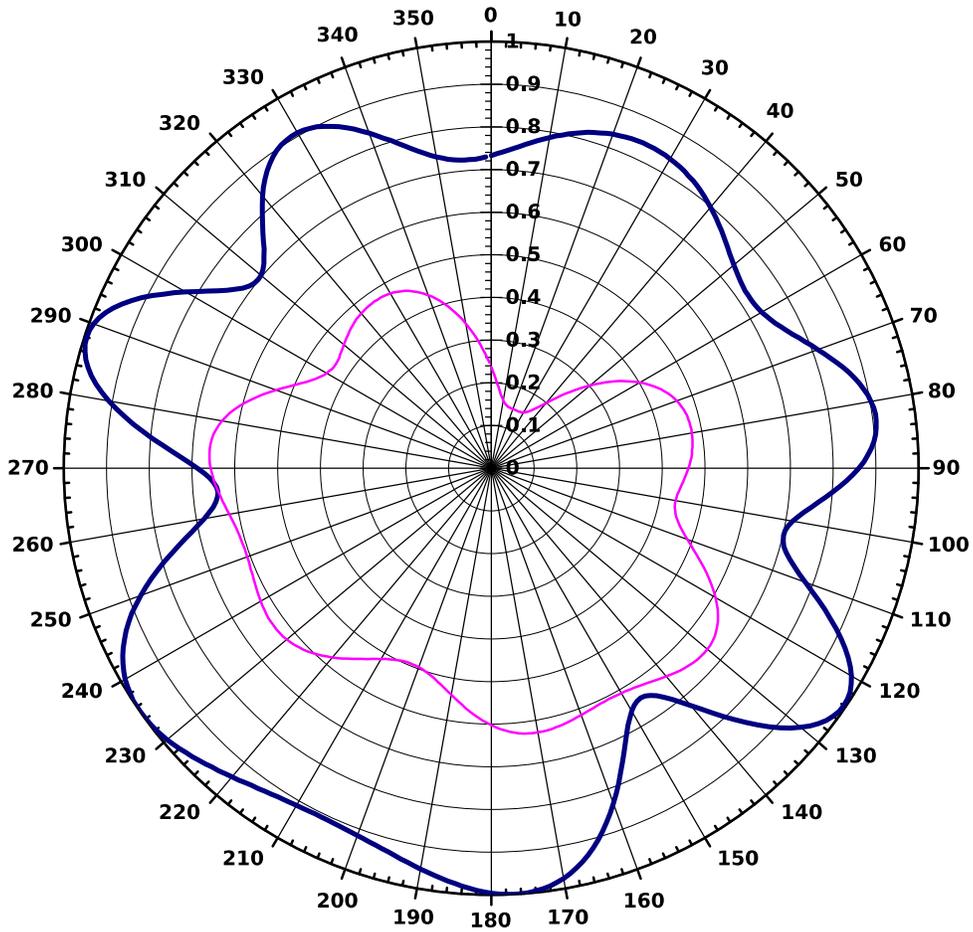
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AZIMUTH PATTERN RELATIVE FIELD



Blue plot shows azimuth pattern relative field for horizontal polarization
Red plot shows azimuth pattern relative field for vertical polarization

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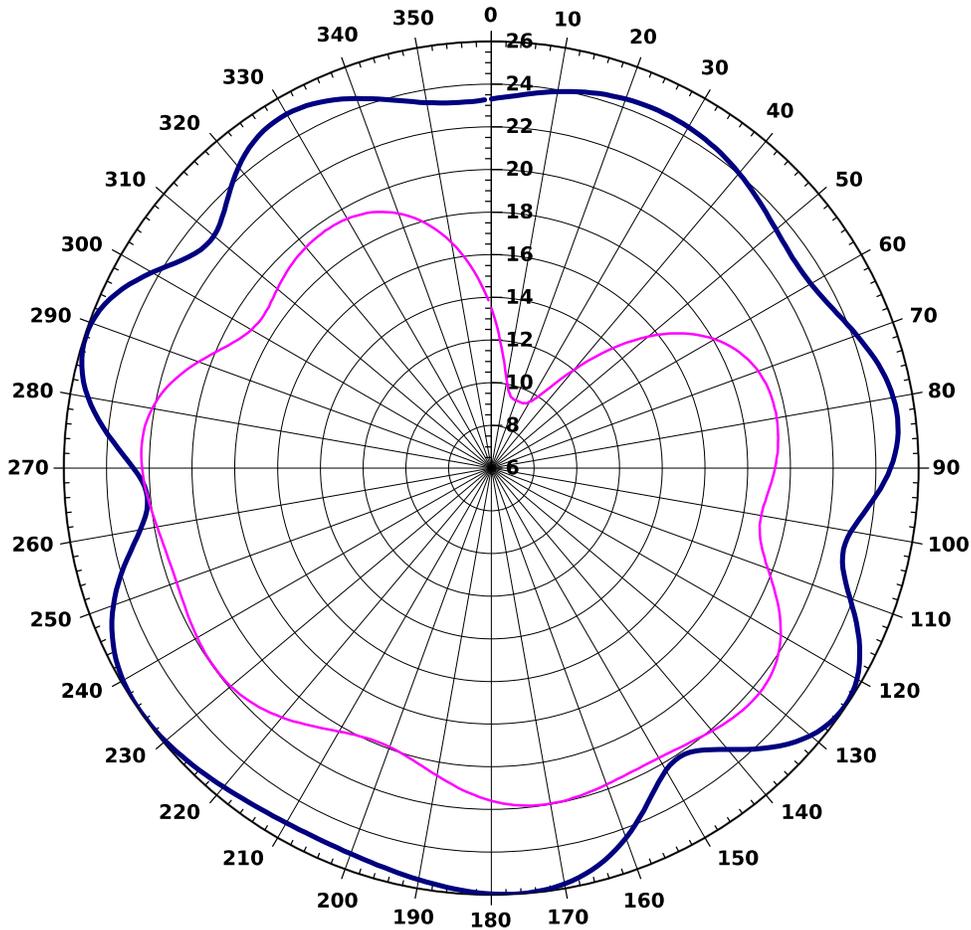
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AZIMUTH PATTERN ERP (dBk)



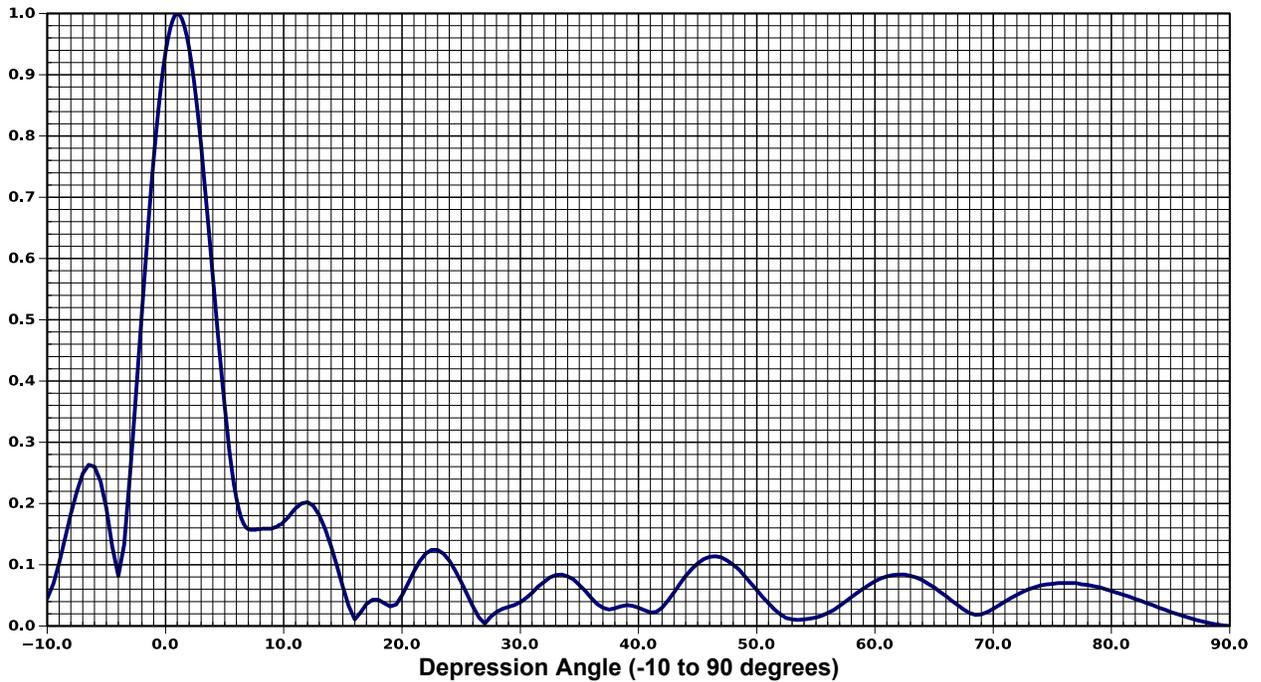
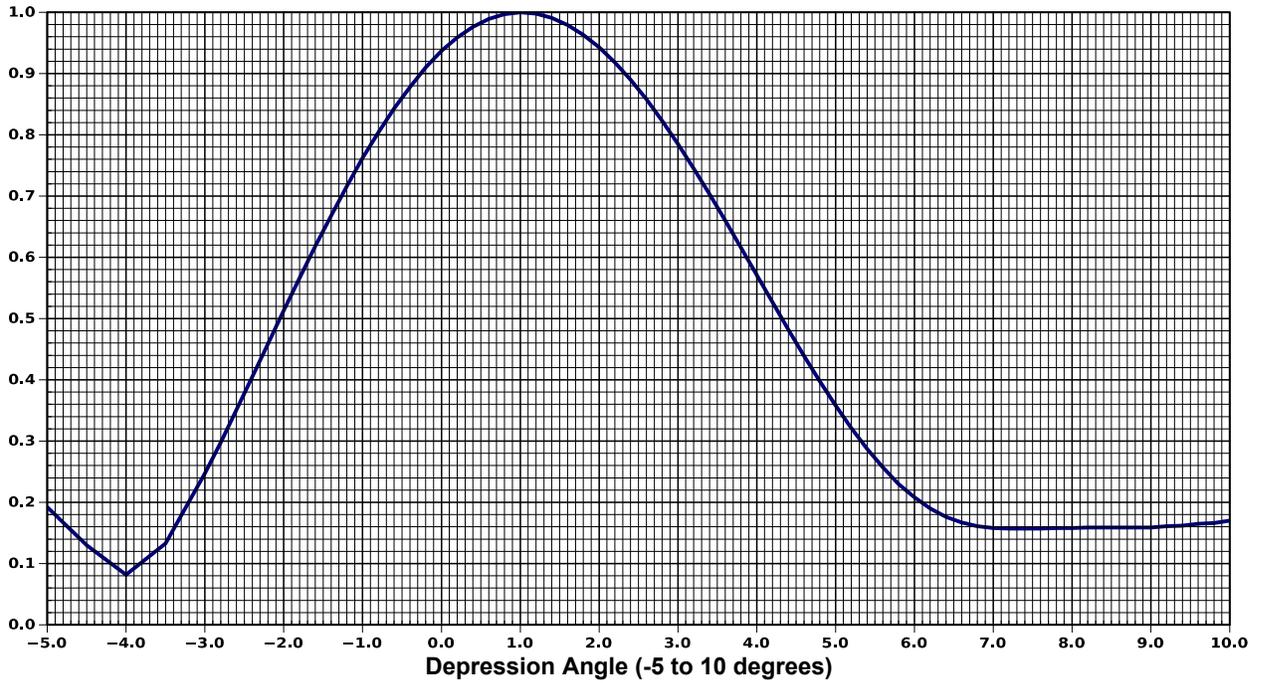
Blue plot shows effective radiated power (dBk) for horizontal polarization
Red plot shows effective radiated power (dBk) for vertical polarization

ELEVATION PATTERN Dielectric TFU-12GBH/VP-R O6SP

Electrical Beam Tilt: 1.00°

Calculated Maximum Elevation Gain (H + V polarization):	11.50	10.61 dBd
RMS Gain at Horizontal (H + V polarization):	10.10	10.04 dBd
Maximum Main Beam H-Pol. Effective Radiated Power (ERP)	398.0 kW	26.00 dBk
Maximum Main Beam V-Pol. Effective Radiated Power (ERP):	173.5 kW	22.39 dBk

Relative Field

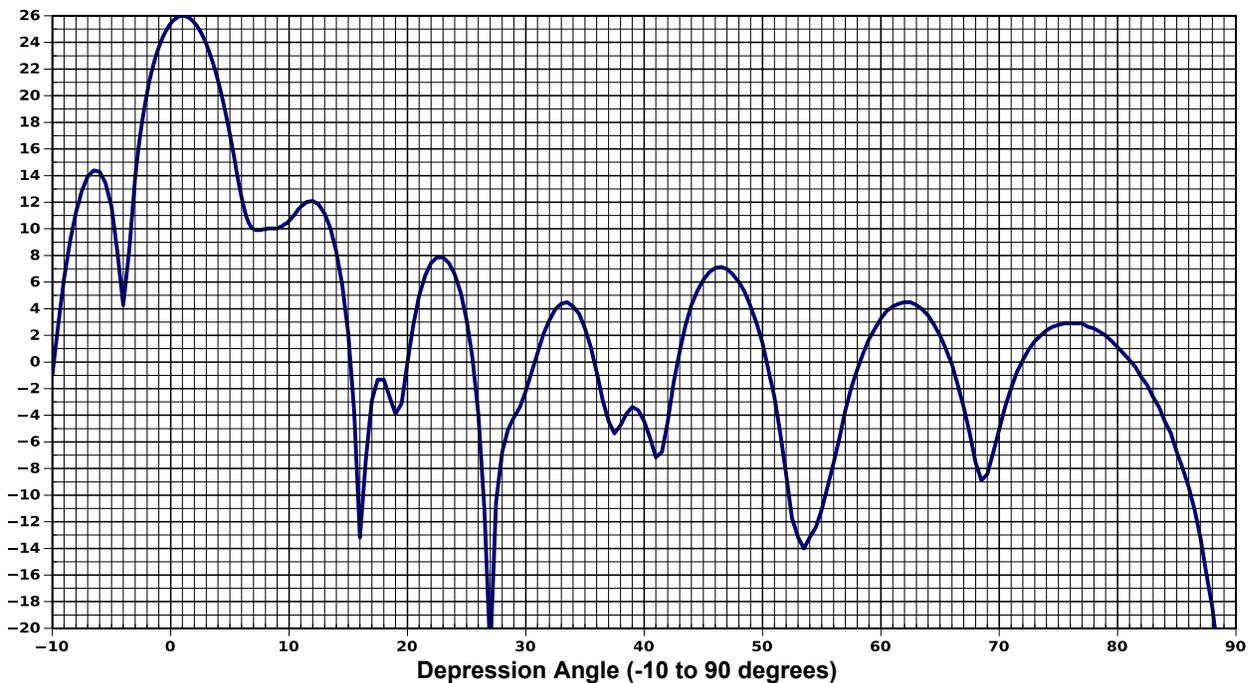
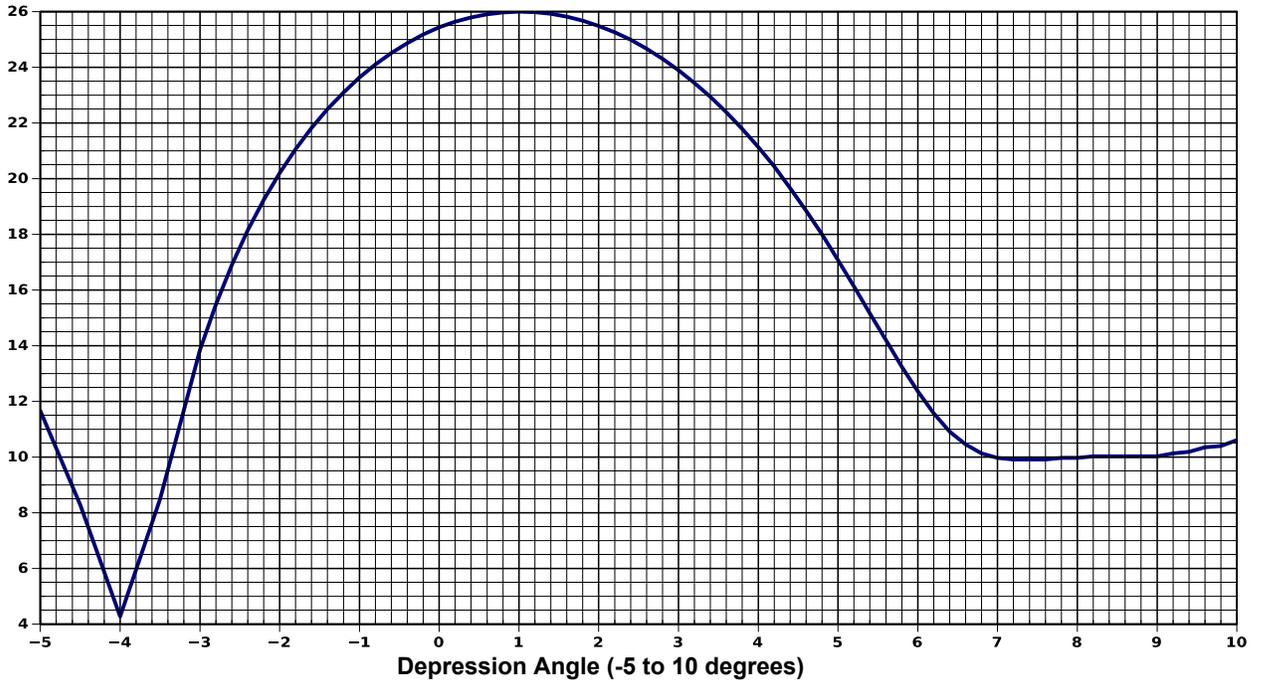


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ERP (dBK)



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Relative Field

Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field	Angle	Field
-10.0	0.045	1.2	0.998	8.2	0.159	21.5	0.106	39.0	0.034	56.5	0.026	74.0	0.066
-9.5	0.069	1.4	0.991	8.4	0.159	22.0	0.118	39.5	0.033	57.0	0.033	74.5	0.068
-9.0	0.103	1.6	0.979	8.6	0.159	22.5	0.124	40.0	0.030	57.5	0.040	75.0	0.069
-8.5	0.143	1.8	0.963	8.8	0.159	23.0	0.124	40.5	0.026	58.0	0.047	75.5	0.070
-8.0	0.183	2.0	0.943	9.0	0.159	23.5	0.118	41.0	0.022	58.5	0.054	76.0	0.070
-7.5	0.220	2.2	0.918	9.2	0.161	24.0	0.107	41.5	0.023	59.0	0.061	76.5	0.070
-7.0	0.249	2.4	0.890	9.4	0.162	24.5	0.091	42.0	0.030	59.5	0.067	77.0	0.070
-6.5	0.263	2.6	0.858	9.6	0.165	25.0	0.072	42.5	0.042	60.0	0.073	77.5	0.068
-6.0	0.260	2.8	0.823	9.8	0.166	25.5	0.052	43.0	0.055	60.5	0.078	78.0	0.067
-5.5	0.236	3.0	0.785	10.0	0.170	26.0	0.032	43.5	0.069	61.0	0.081	78.5	0.065
-5.0	0.192	3.2	0.745	10.2	0.174	26.5	0.014	44.0	0.082	61.5	0.083	79.0	0.063
-4.5	0.130	3.4	0.703	10.4	0.178	27.0	0.004	44.5	0.093	62.0	0.084	79.5	0.060
-4.0	0.082	3.6	0.660	10.6	0.183	27.5	0.015	45.0	0.102	62.5	0.084	80.0	0.057
-3.5	0.133	3.8	0.616	10.8	0.188	28.0	0.023	45.5	0.109	63.0	0.082	80.5	0.054
-3.0	0.247	4.0	0.571	11.0	0.192	28.5	0.028	46.0	0.113	63.5	0.079	81.0	0.051
-2.8	0.298	4.2	0.527	11.5	0.200	29.0	0.031	46.5	0.114	64.0	0.075	81.5	0.048
-2.6	0.351	4.4	0.482	12.0	0.202	29.5	0.034	47.0	0.112	64.5	0.069	82.0	0.044
-2.4	0.405	4.6	0.439	12.5	0.196	30.0	0.039	47.5	0.107	65.0	0.063	82.5	0.041
-2.2	0.459	4.8	0.398	13.0	0.181	30.5	0.046	48.0	0.100	65.5	0.056	83.0	0.037
-2.0	0.513	5.0	0.358	13.5	0.159	31.0	0.054	48.5	0.092	66.0	0.049	83.5	0.034
-1.8	0.566	5.2	0.321	14.0	0.130	31.5	0.064	49.0	0.081	66.5	0.041	84.0	0.030
-1.6	0.618	5.4	0.287	14.5	0.098	32.0	0.072	49.5	0.070	67.0	0.034	84.5	0.027
-1.4	0.668	5.6	0.257	15.0	0.064	32.5	0.079	50.0	0.059	67.5	0.027	85.0	0.023
-1.2	0.716	5.8	0.230	15.5	0.033	33.0	0.083	50.5	0.047	68.0	0.021	85.5	0.020
-1.0	0.762	6.0	0.208	16.0	0.011	33.5	0.084	51.0	0.037	68.5	0.018	86.0	0.017
-0.8	0.804	6.2	0.190	16.5	0.022	34.0	0.081	51.5	0.027	69.0	0.019	86.5	0.014
-0.6	0.843	6.4	0.176	17.0	0.036	34.5	0.076	52.0	0.019	69.5	0.023	87.0	0.011
-0.4	0.878	6.6	0.167	17.5	0.043	35.0	0.067	52.5	0.013	70.0	0.028	87.5	0.008
-0.2	0.910	6.8	0.161	18.0	0.043	35.5	0.057	53.0	0.011	70.5	0.034	88.0	0.006
0.0	0.937	7.0	0.158	18.5	0.037	36.0	0.046	53.5	0.010	71.0	0.040	88.5	0.004
0.2	0.959	7.2	0.157	19.0	0.032	36.5	0.036	54.0	0.011	71.5	0.046	89.0	0.002
0.4	0.976	7.4	0.157	19.5	0.035	37.0	0.030	54.5	0.012	72.0	0.051	89.5	0.001
0.6	0.989	7.6	0.157	20.0	0.050	37.5	0.027	55.0	0.014	72.5	0.056	90.0	0.000
0.8	0.997	7.8	0.158	20.5	0.069	38.0	0.029	55.5	0.017	73.0	0.060		
1.0	1.000	8.0	0.158	21.0	0.089	38.5	0.032	56.0	0.021	73.5	0.063		