
FM DIRECTIONAL BROADCAST ANTENNA
PROOF-OF-PERFORMANCE

MODEL JMPC-2 DA

SERIAL NUMBER 18067

KRUX

Las Cruces, NM



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DATE: September 10, 2015

ANTENNA GAIN	<u>H-pol</u>	<u>V-pol</u>
relative	1.83	1.83
(dBd)	(2.63)	(2.63)

RMS OF THE
AZIMUTH PATTERNS:

FM ANTENNA FOR:

STATION: **KRUX**

LOCATION: **Las Cruces, NM**

MODEL NUMBER: **JMPC-2 DA**

FREQUENCY & ERP: **91.5 MHz, 3.00 kW**

ANTENNA INPUT POWER: **1.638 kW**

ANTENNA BOOM HEADING: **235° T.**

Composite	H-pol	V-pol
0.830	0.735	0.743

CERTIFICATION

This certification, along with the accompanying antenna specification sheet, antenna mounting sketches, and azimuth and elevation patterns, certifies the construction and measurement of the *JAMPRO* FM CP antenna to the station's requirements, as measured at the *JAMPRO* antenna site in Sacramento, California. The following is an outline of construction methods, pattern measurements, installation requirements, recommended maintenance and equipment used.

CONSTRUCTION

A standard CP FM antenna model was used and parasitic reflectors were added to create the required directional patterns. From experience and by repeated measurements, these elements were adjusted as to position until the final configuration was determined and the pattern requirements were met. These additional elements are steel, hot dipped galvanized and either bolted or welded in place. Measurements to establish their exact location are shown on the antenna mounting sketches.

MEASUREMENT

The full scale antenna was mounted on an exact duplicate of its final support at the station. We were careful to duplicate conduits, cables and anything peculiar to this mounting. This was then placed on a turntable at the *JAMPRO* antenna range. This directional antenna was used for receiving the radiation from a transmitting antenna that is elevated 25 feet above ground and located at a distance of 4,500 feet. This transmitting antenna is capable of transmitting either horizontal or vertical polarization. The frequency of the signal generator was accurately set to station frequency by use of a frequency counter. A spectrum analyzer was used to continuously measure field strength as the antenna under test was rotated. Field strength at each azimuth was then plotted.



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Station: **KRUX** Model: **JMPC-2 DA**

INSTALLATION

The antenna must be installed in exactly the manner in which it was measured at the factory. This is shown in detail on the antenna mounting sketch, including the azimuth bearing of the elements. This boom must be verified by a surveyor at the site when installation is being completed. *Only non-metallic guy wires are permitted within the aperture of the directional antenna.* Good engineering practices should be followed in any details not covered by specific instructions.

MAINTENANCE

Annual or regular inspection should be made on the antenna system. At this time, tightness of U-bolts, or other fastenings, should be routinely checked. Any deterioration of the antenna due to lightning, or other causes should be promptly repaired.

EQUIPMENT

MODEL: -8656B Hewlett Packard Signal Generator, Serial #2612AO4046
-1580 Scientific Atlanta pattern Recorder, Serial # 471, Cal'd 11/01/07
-8591E H.P. Spectrum Analyzer, Serial #3308A01312, Cal'd 01/09/15
-TUNED CAVITY DIPOLE

CONCLUSION

In the development of this pattern, JAMPRO antennas, Inc. observed known requirements of the FCC, as stated on the station construction permit. Gain figures and required input power to achieve station ERP, as well as other details, are found on the first page.

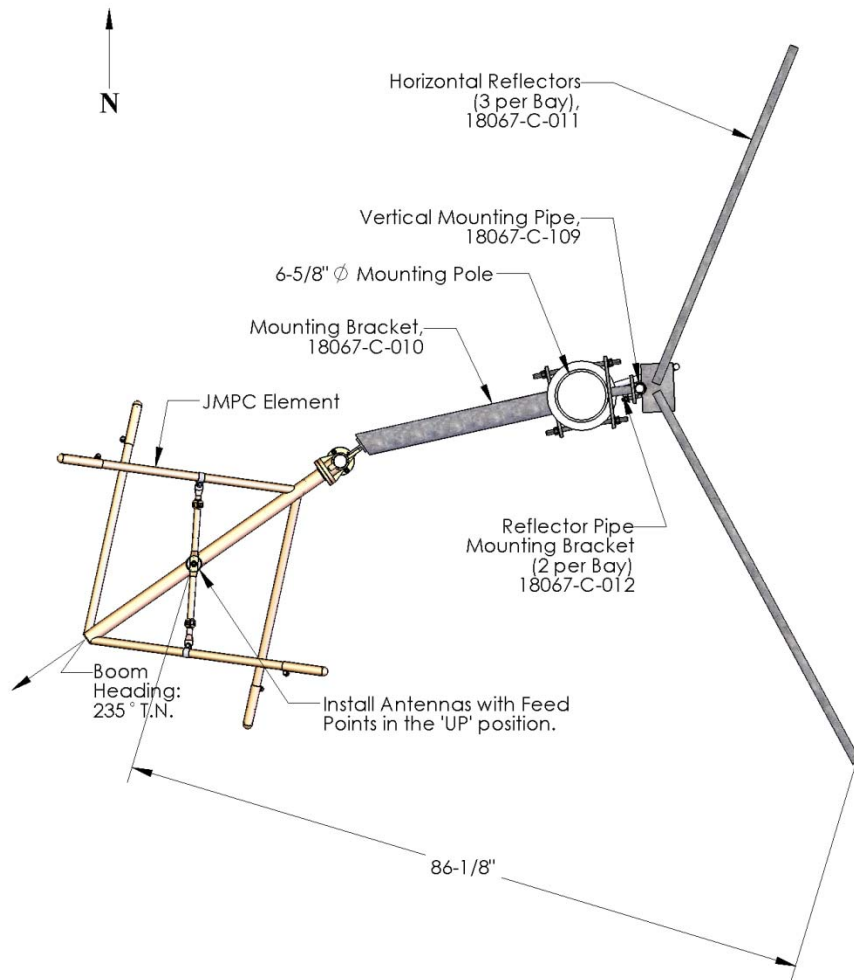
This certification, with its calculations were performed by J. Dane Jubera, B.S.E.E., Electrical Engineer, JAMPRO Antennas, Inc.

EXECUTED THIS 10th DAY OF September, 2015

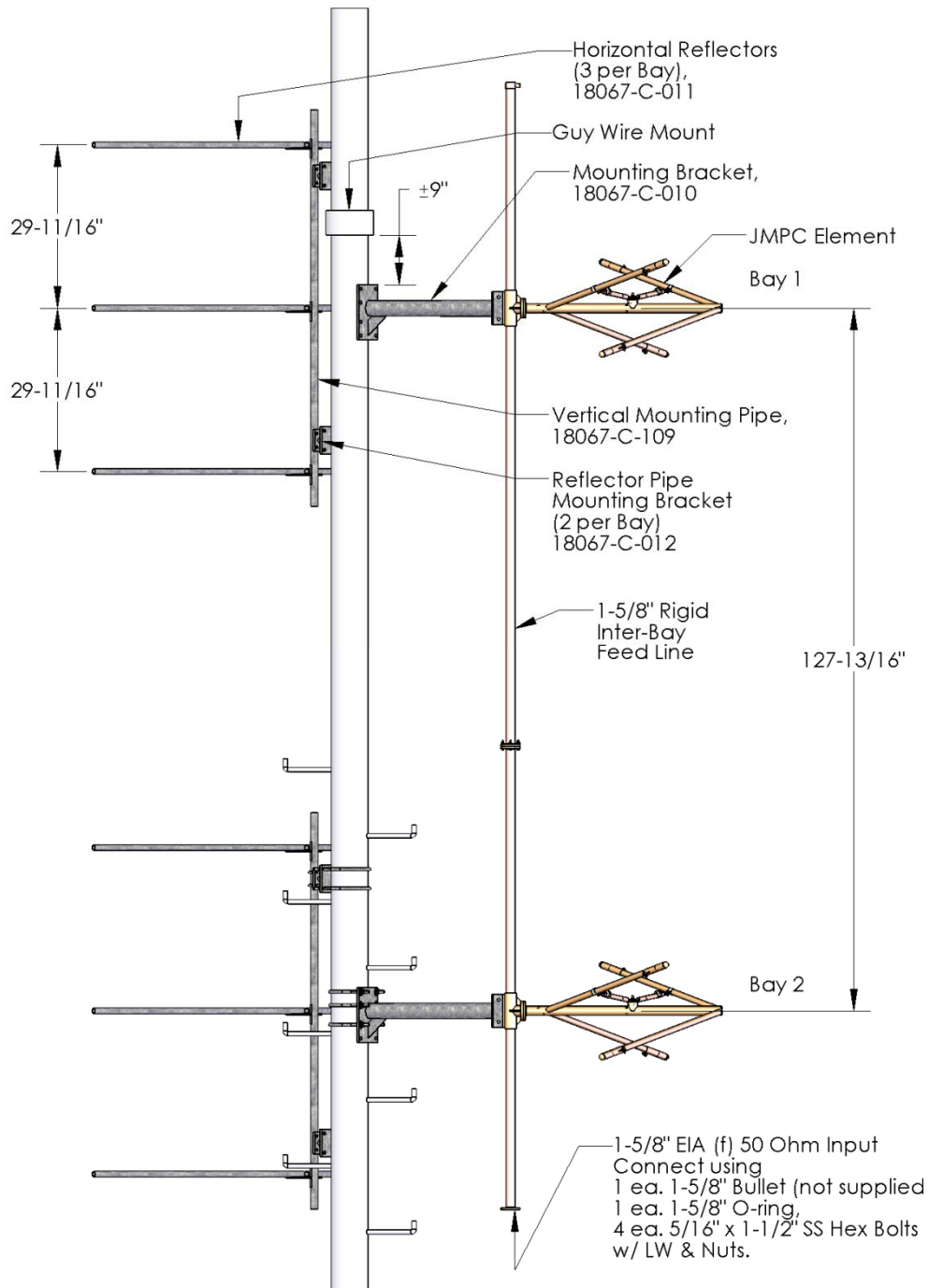
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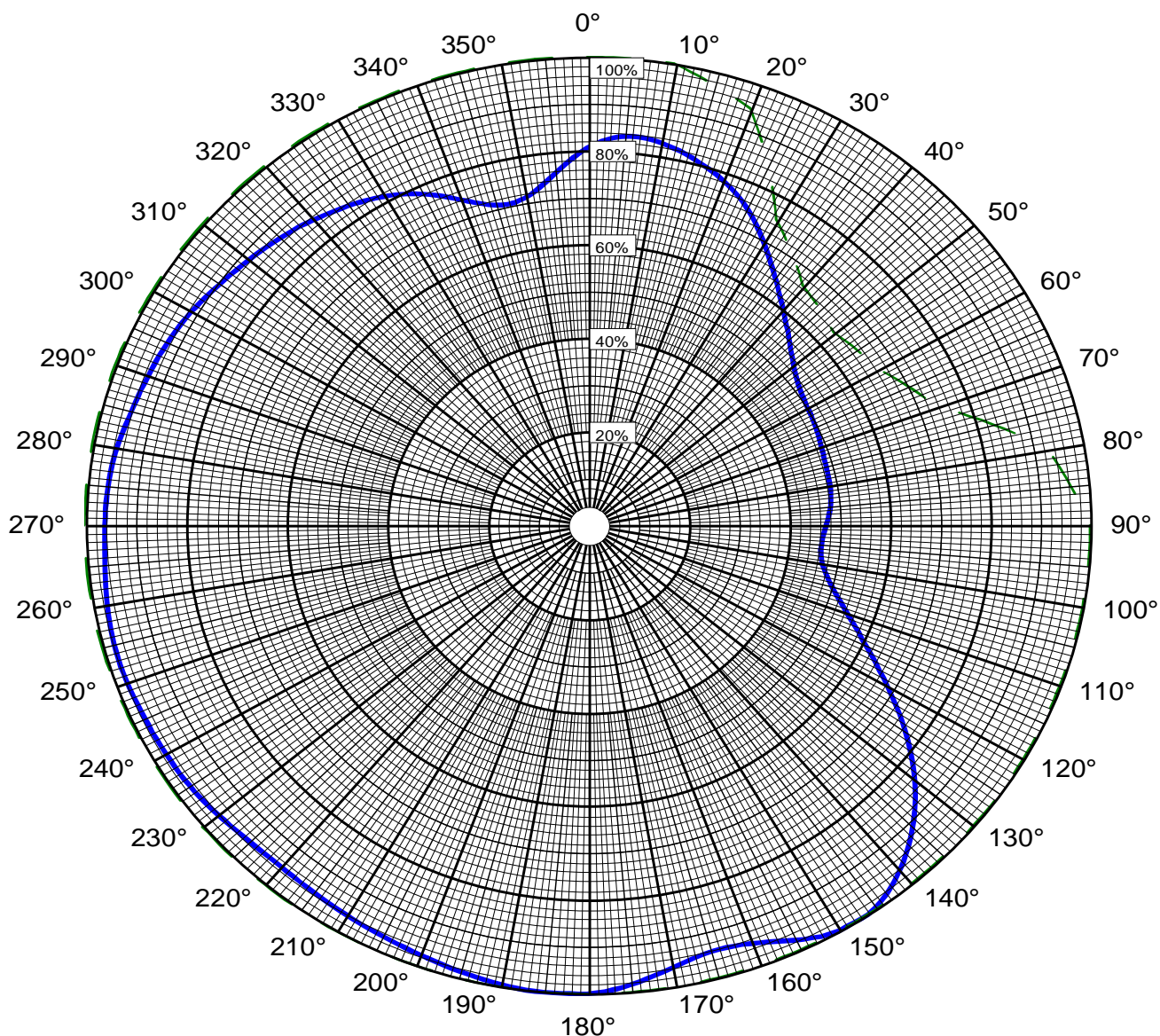
J. Dane Jubera, B.S.E.E. JAMPRO Antennas, Inc.

MECHANICAL DRAWINGS - TOP VIEW



MECHANICAL DRAWINGS - SIDE VIEW





Azimuth Pattern

Customer: KRUX

Date: August 12, 2015

Frequency: 91.5 MHz

Type Number: JMPC-2 DA

Notes:

COMPOSITE PATTERN ENVELOPE (H & V)



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KRUX

ERP = 3.00 kW

August 12, 2015

JMPC-2 DA

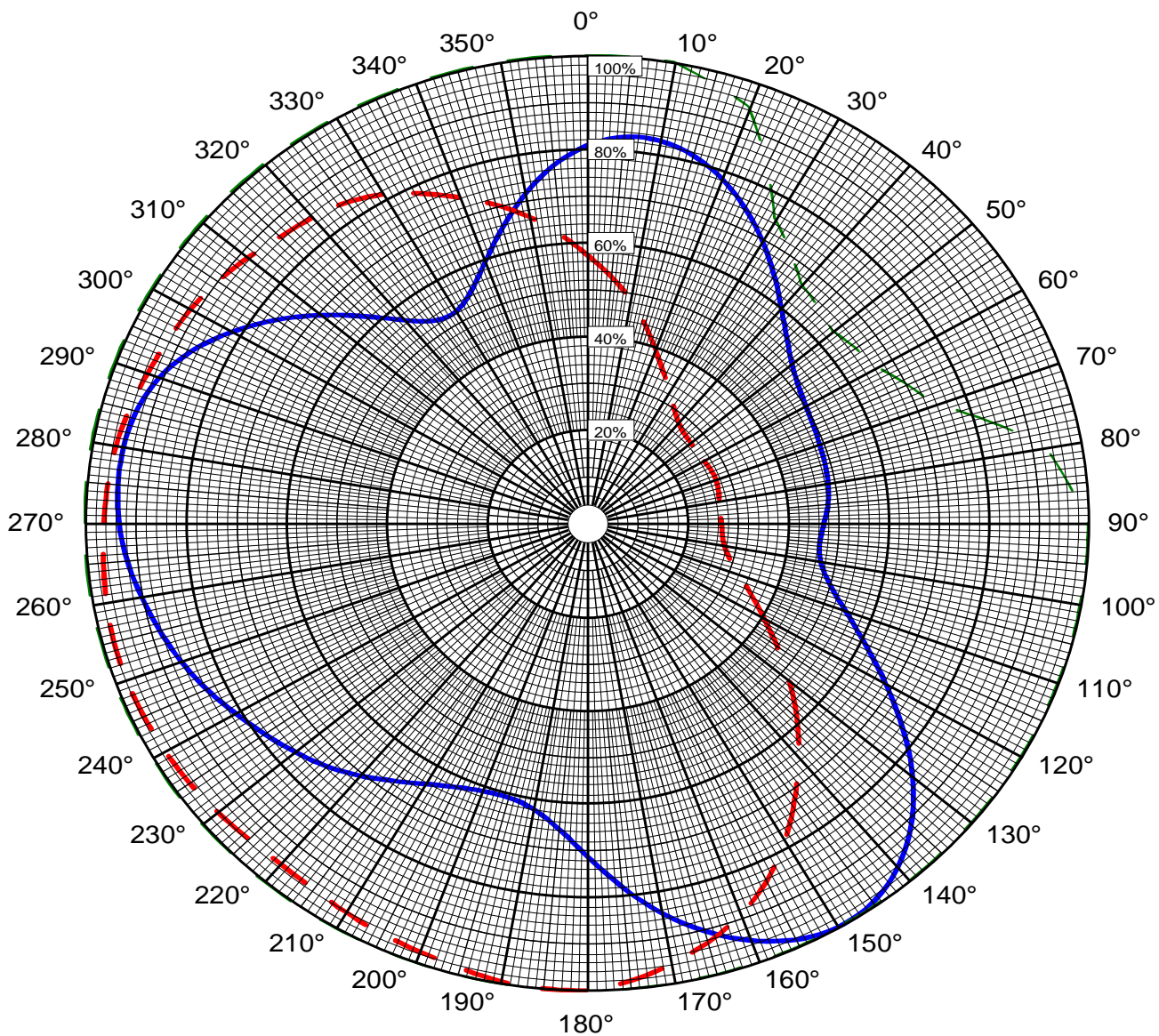
TABULATION OF RELATIVE FIELD

COMPOSITE MEASURED PATTERN (H & V)

<u>BEARING</u>	<u>FIELD</u>	<u>ERP</u> <u>(kW)</u>	<u>dBk</u>
0	0.805	1.94	2.89
10	0.830	2.07	3.15
20	0.785	1.85	2.67
30	0.700	1.47	1.67
40	0.605	1.10	0.41
50	0.535	0.86	-0.66
60	0.505	0.77	-1.16
70	0.495	0.74	-1.34
80	0.490	0.72	-1.42
90	0.475	0.68	-1.69
100	0.475	0.68	-1.69
110	0.550	0.91	-0.42
120	0.690	1.43	1.55
130	0.850	2.17	3.36
140	0.965	2.79	4.46
150	1.000	3.00	4.77
160	0.950	2.71	4.33
170	0.960	2.76	4.42
180	1.000	3.00	4.77
190	0.995	2.97	4.73
200	0.975	2.85	4.55
210	0.960	2.76	4.42
220	0.950	2.71	4.33
230	0.960	2.76	4.42
240	0.970	2.82	4.51
250	0.975	2.85	4.55
260	0.970	2.82	4.51
270	0.960	2.76	4.42
280	0.950	2.71	4.33
290	0.930	2.59	4.14
300	0.910	2.48	3.95
310	0.880	2.32	3.66
320	0.850	2.17	3.36
330	0.810	1.97	2.94
340	0.740	1.64	2.16
350	0.710	1.51	1.80

Relative fields at other azimuths:

45	0.567	225	0.952
135	0.914	315	0.866



Azimuth Pattern

Customer: KRUX		Date: August 12, 2015
Frequency: 91.5 MHz		Type Number: JMPC-2 DA
Notes: MEASURED PATTERN IN FULL SCALE		
<div style="display: flex; align-items: center; justify-content: center;"> <div style="width: 20px; border-bottom: 2px solid black; margin-right: 5px;"></div> HPOL <div style="width: 20px; border-bottom: 2px dashed black; margin-right: 5px; margin-left: 20px;"></div> VPOL <div style="width: 20px; border-bottom: 2px dotted black; margin-left: 20px;"></div> LIMITS </div>		



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KRUX ERP = 3.00 kW

August 12, 2015

JMPC-2 DA

TABULATION OF MEASURED FIELDS

BEARING	HORIZONTAL POLARIZATION		VERTICAL POLARIZATION	
	FIELD	ERP(kW)	FIELD	ERP(kW)
0	0.805	1.94	0.575	0.99
10	0.830	2.07	0.490	0.72
20	0.785	1.85	0.400	0.48
30	0.700	1.47	0.330	0.33
40	0.605	1.10	0.285	0.24
50	0.535	0.86	0.270	0.22
60	0.505	0.77	0.270	0.22
70	0.495	0.74	0.275	0.23
80	0.490	0.72	0.270	0.22
90	0.475	0.68	0.270	0.22
100	0.475	0.68	0.280	0.24
110	0.550	0.91	0.325	0.32
120	0.690	1.43	0.410	0.50
130	0.850	2.17	0.530	0.84
140	0.965	2.79	0.660	1.31
150	1.000	3.00	0.790	1.87
160	0.950	2.71	0.895	2.40
170	0.845	2.14	0.960	2.76
180	0.710	1.51	1.000	3.00
190	0.620	1.15	0.995	2.97
200	0.610	1.12	0.975	2.85
210	0.645	1.25	0.960	2.76
220	0.705	1.49	0.950	2.71
230	0.760	1.73	0.960	2.76
240	0.810	1.97	0.970	2.82
250	0.860	2.22	0.975	2.85
260	0.900	2.43	0.970	2.82
270	0.930	2.59	0.960	2.76
280	0.935	2.62	0.950	2.71
290	0.905	2.46	0.930	2.59
300	0.815	1.99	0.910	2.48
310	0.690	1.43	0.880	2.32
320	0.565	0.96	0.850	2.17
330	0.520	0.81	0.810	1.97
340	0.590	1.04	0.740	1.64
350	0.710	1.51	0.665	1.33
MAXIMUM FIELDS:				
150	1.000	3.00		
185			1.000	3.00
MINIMUM FIELDS:				
95	0.468	0.66		
85			0.269	0.22

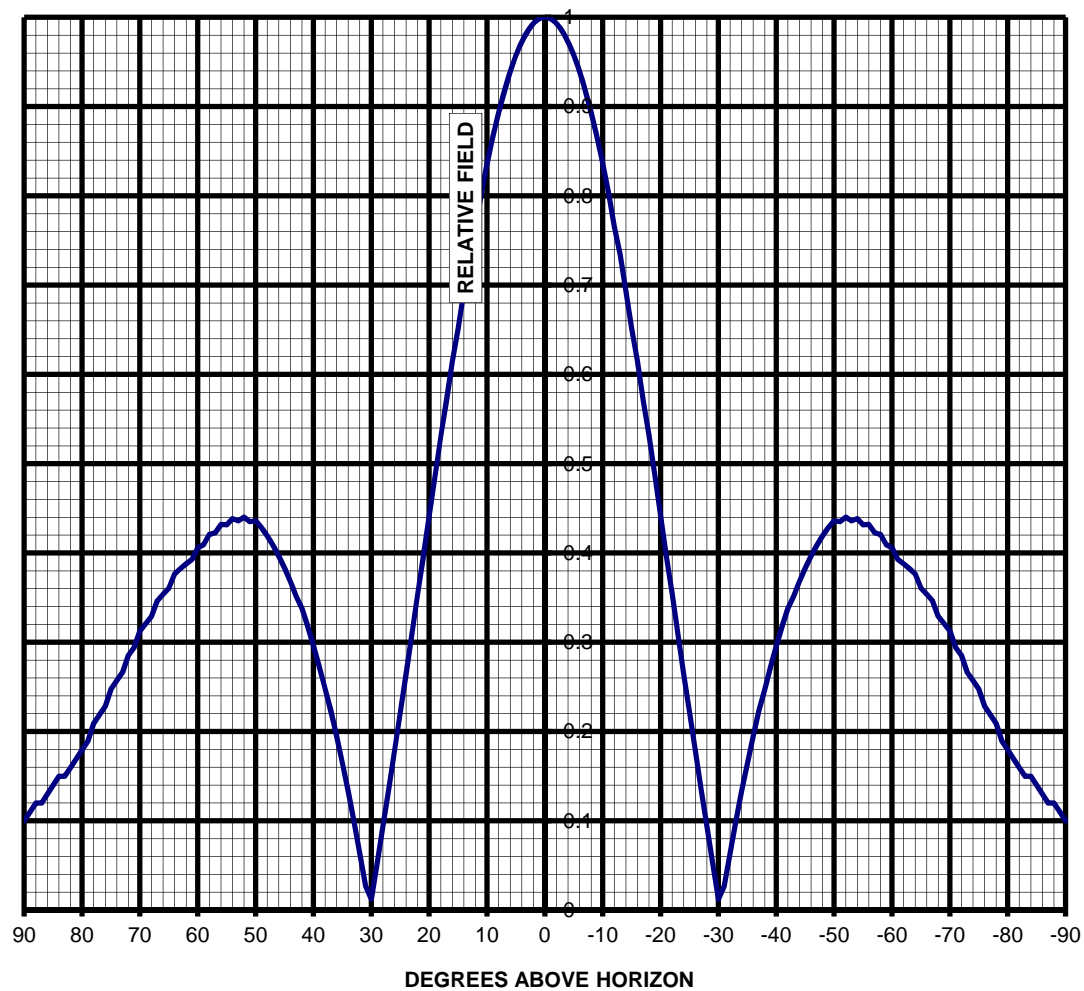


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PLOT OF ELEVATION PLANE PATTERN

STATION: KRUX 91.5 MHz JMPC-2 DA 1.00 lambda spacing





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TABULATION OF ELEVATION PLANE PATTERN

STATION: KRUX 91.5 MHz JMPC-2 DA 1.00 lambda spacing

<u>ELEVATION</u>	<u>RELATIVE</u>	<u>ELEVATION</u>	<u>RELATIVE</u>	<u>ELEVATION</u>	<u>RELATIVE</u>
<u>ANGLE</u>	<u>FIELD</u>	<u>ANGLE</u>	<u>FIELD</u>	<u>ANGLE</u>	<u>FIELD</u>
10	0.836	-25	0.222	-60	0.406
9	0.866	-26	0.178	-61	0.393
8	0.893	-27	0.135	-62	0.388
7	0.918	-28	0.094	-63	0.383
6	0.939	-29	0.052	-64	0.377
5	0.957	-30	0.012	-65	0.361
4	0.973	-31	0.027	-66	0.354
3	0.985	-32	0.064	-67	0.346
2	0.993	-33	0.099	-68	0.329
1	0.998	-34	0.134	-69	0.321
0	1.000	-35	0.164	-70	0.313
-1	0.998	-36	0.195	-71	0.294
-2	0.993	-37	0.223	-72	0.285
-3	0.985	-38	0.247	-73	0.266
-4	0.973	-39	0.273	-74	0.257
-5	0.957	-40	0.296	-75	0.248
-6	0.939	-41	0.318	-76	0.228
-7	0.918	-42	0.338	-77	0.219
-8	0.893	-43	0.351	-78	0.209
-9	0.866	-44	0.368	-79	0.189
-10	0.836	-45	0.383	-80	0.179
-11	0.804	-46	0.397	-81	0.170
-12	0.766	-47	0.409	-82	0.160
-13	0.734	-48	0.419	-83	0.150
-14	0.693	-49	0.428	-84	0.150
-15	0.651	-50	0.436	-85	0.140
-16	0.615	-51	0.435	-86	0.130
-17	0.571	-52	0.440	-87	0.120
-18	0.532	-53	0.436	-88	0.120
-19	0.487	-54	0.438	-89	0.110
-20	0.441	-55	0.432	-90	0.100
-21	0.396	-56	0.432		
-22	0.354	-57	0.423		
-23	0.309	-58	0.421		
-24	0.264	-59	0.409		