
**FM DIRECTIONAL BROADCAST ANTENNA
PROOF-OF-PERFORMANCE**

MODEL JCPD-1-1(1)

SERIAL NUMBER 13266

WHKC

Columbus, OH



6340 Sky Creek Drive • Sacramento, California USA 95828
(916) 383-1177 phone • (916) 383-1182 fax



6340 Sky Creek Drive, Sacramento, California 95828
P.O. Box 292880, Sacramento, California 95829-2880

(916) 383-1177 FAX (916) 383-1182

TABLE OF CONTENTS

A.	Engineer's Statement	1,2
B.	Mechanical Drawings	3,4
C.	Composite Azimuth Pattern, Plot	5
D.	Composite Azimuth Pattern, Tabulation	6
E.	Azimuth Pattern, Horizontal & Vertical Polarizations, Plot	7
F.	Azimuth Pattern, Horizontal & Vertical Polarizations, Tabulation	8
G.	Elevation Plane Pattern, Plot	9
H.	Elevation Plane Pattern, Tabulation	10



DATE: November 22, 2006

ANTENNA GAIN	<u>H-pol</u>	<u>V-pol</u>
relative	2.87	2.87
(dBd)	(4.58)	(4.58)

FM ANTENNA FOR:

STATION: **WHKC**

LOCATION: **Columbus, OH**

MODEL NUMBER: **JCPD-1-1(1)**

FREQUENCY & ERP: **91.5 MHz, 15.00 kW**

ANTENNA INPUT POWER: **5.22 kW**

ANTENNA BOOM HEADING: **7° T.**

RMS OF THE
AZIMUTH PATTERNS:

Composite	H-pol	V-pol
0.455	0.426	0.449

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 CP FM panel antenna model was used to create the required directional patterns. From experience and by repeated measurements, the dipole elements were adjusted as to position until the final configuration was determined and the pattern requirements were met. 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.



6340 Sky Creek Drive, Sacramento, California 95828
P.O. Box 292880, Sacramento, California 95829-2880

(916) 383-1177 FAX (916) 383-1182

Station: **WHKC** Model: **JCPD-1-1(1)**

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. 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: -3000 WAVETEK SIGNAL GENERATOR, SERIAL #66479
-8591E H.P. SPECTRUM ANALYZER, SERIAL #3308A01312, CAL'd 1/16/03
-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.

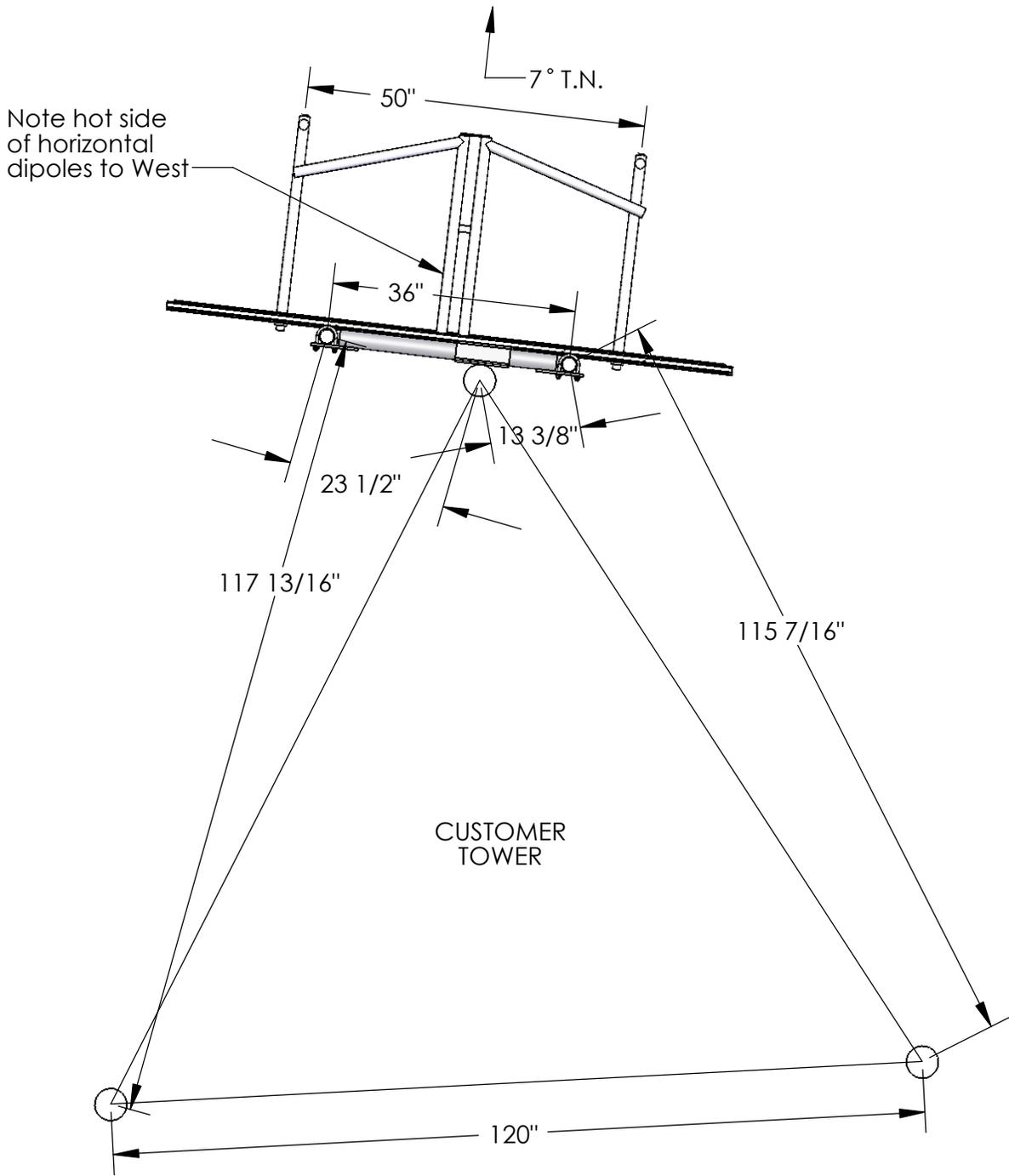
Gain figures and required input power to achieve station ERP, as well as other details, are found on the first page.

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

EXECUTED THIS 22nd DAY OF November, 2006

BY:

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



CUSTOMER TOWER

TOP VIEW

PROPRIETARY AND CONFIDENTIAL
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF JAMPRO ANTENNAS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF JAMPRO ANTENNAS IS PROHIBITED.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED
 TOLERANCES:
 FRACTIONAL $\pm 1/32"$
 ANGULAR: MACH $\pm .5^\circ$ BEND $\pm 1^\circ$
 TWO PLACE DECIMAL $\pm .01"$
 THREE PLACE DECIMAL $\pm .005"$

COMMENTS:

	NAME	DATE
DRAWN	SM	21Nov2006
CHECKED		
ENG APPR.		
MFG APPR.		

Jampro Antennas
 13266 WHKC

WEIGHT 419.006 lbs.

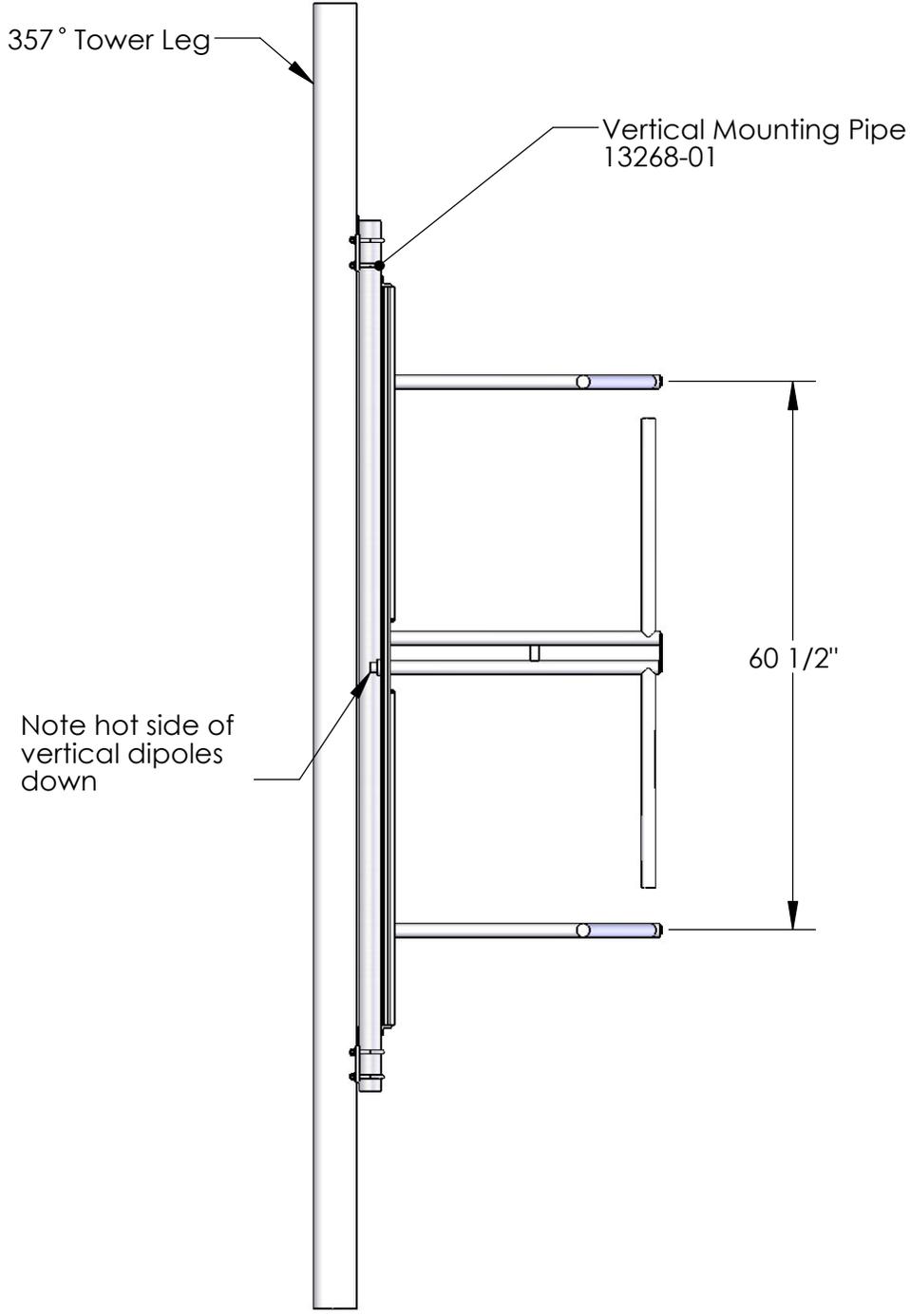
FINISH

MATERIAL

DESCRIPTION

DO NOT SCALE DRAWING

SIZE DWG. NO. **A** 13266, IB Assy SHEET 1 OF 4 REV.



PROPRIETARY AND CONFIDENTIAL
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF JAMPRO ANTENNAS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF JAMPRO ANTENNAS IS PROHIBITED.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED
 TOLERANCES:
 FRACTIONAL $\pm 1/32"$
 ANGULAR: MACH $\pm .5^\circ$ BEND $\pm 1^\circ$
 TWO PLACE DECIMAL $\pm .01"$
 THREE PLACE DECIMAL $\pm .005"$

COMMENTS:

	NAME	DATE
DRAWN	SM	21Nov2006
CHECKED		
ENG APPR.		
MFG APPR.		

Jampro Antennas
 13266 WHKC

WEIGHT 419.006 lbs.

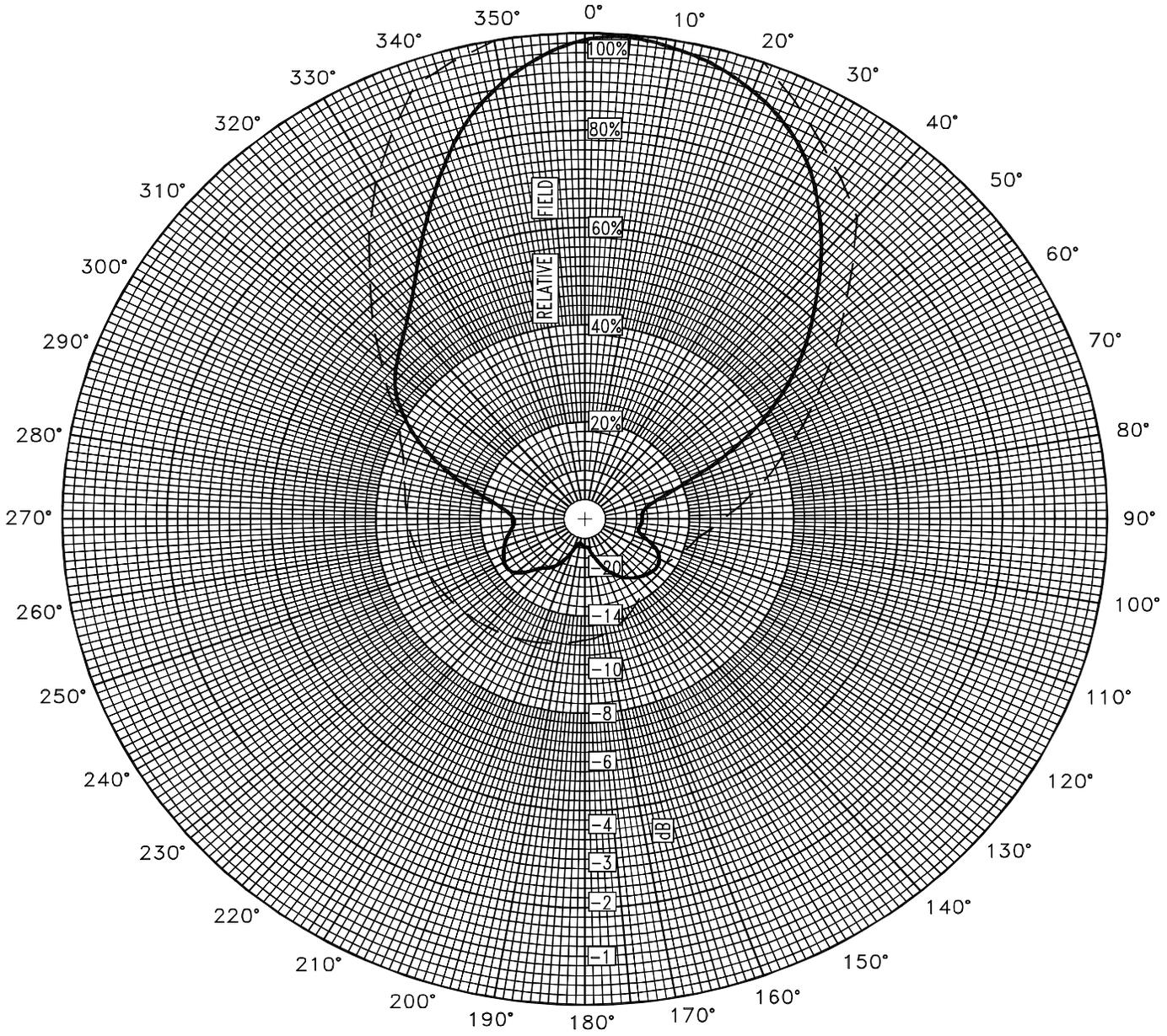
FINISH

MATERIAL

DESCRIPTION

DO NOT SCALE DRAWING

SIZE DWG. NO. **A** 13266, IB Assy SHEET 2 OF 4 REV.



Azimuth Pattern

Customer: WHKC

Date: November 2, 2006

Frequency: 91.5 MHz

Type Number: JCPD-1-1(1)

Notes:

COMPOSITE PATTERN ENVELOPE (H & V)



(916) 383-1177 Fax: (916) 383-1182

6340 Sky Creek Drive, Sacramento, CA 95828
 P.O. Box 292880, Sacramento, CA 95829-2880



WHKC

ERP = 15.00 kW

November 2, 2006

JCPD-1-1(1)

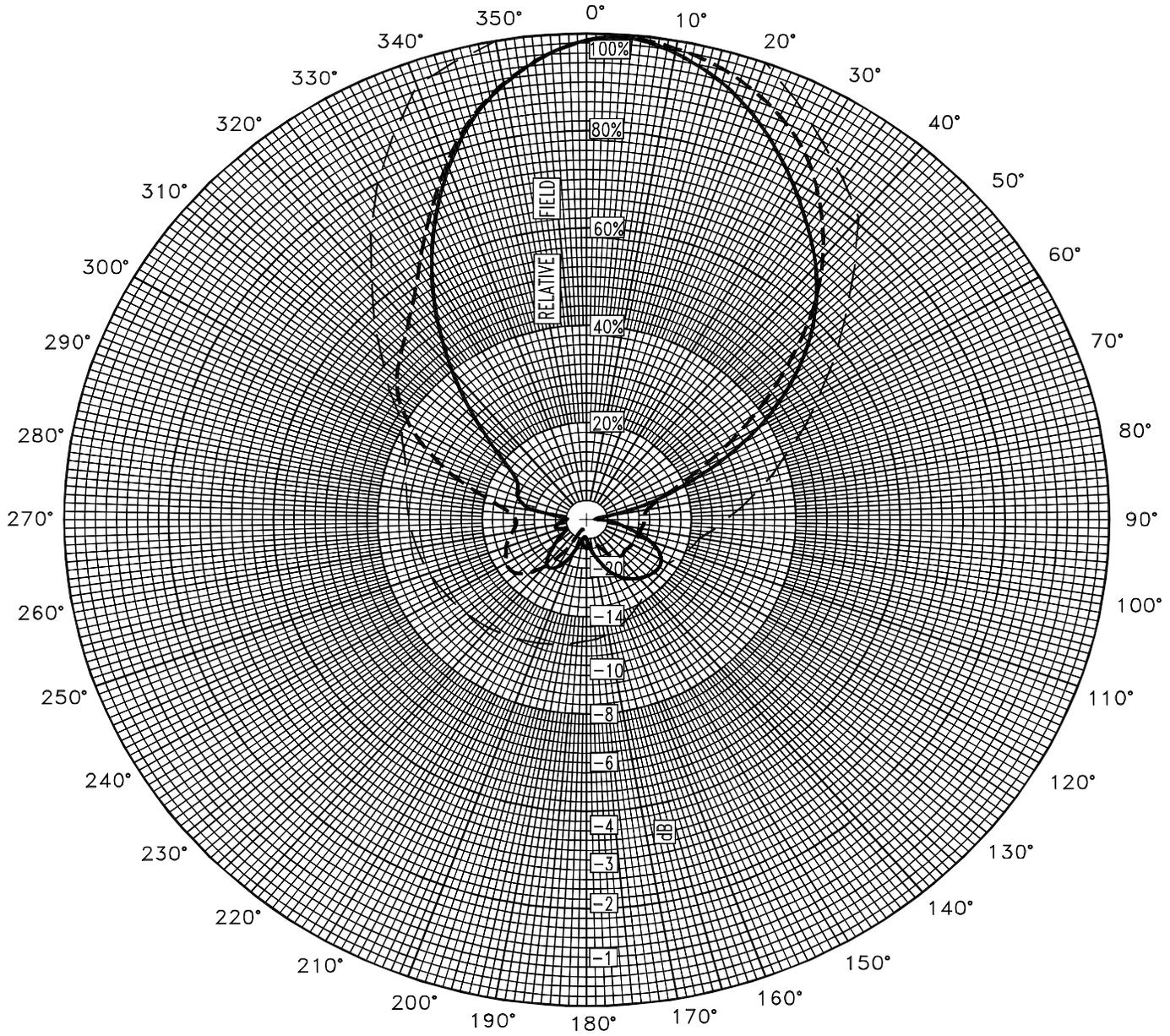
TABULATION OF RELATIVE FIELD

COMPOSITE MEASURED PATTERN (H & V)

<u>BEARING</u>	<u>FIELD</u>	<u>ERP</u> <u>(kW)</u>	<u>dBk</u>
0	0.991	14.74	11.68
10	0.985	14.55	11.63
20	0.940	13.25	11.22
30	0.855	10.97	10.40
40	0.710	7.56	8.79
50	0.554	4.61	6.63
60	0.389	2.26	3.55
70	0.193	0.56	-2.53
80	0.115	0.20	-7.03
90	0.110	0.18	-7.41
100	0.105	0.17	-7.82
110	0.131	0.26	-5.87
120	0.166	0.41	-3.86
130	0.169	0.43	-3.67
140	0.157	0.37	-4.30
150	0.140	0.29	-5.32
160	0.109	0.18	-7.47
170	0.071	0.08	-11.18
180	0.060	0.05	-12.68
190	0.050	0.04	-14.26
200	0.072	0.08	-11.11
210	0.113	0.19	-7.15
220	0.130	0.25	-5.96
230	0.175	0.46	-3.38
240	0.180	0.49	-3.13
250	0.165	0.41	-3.89
260	0.145	0.32	-5.01
270	0.135	0.27	-5.63
280	0.170	0.43	-3.63
290	0.280	1.18	0.70
300	0.395	2.34	3.69
310	0.475	3.38	5.29
320	0.530	4.21	6.25
330	0.635	6.05	7.82
340	0.785	9.24	9.66
350	0.915	12.56	10.99

Relative fields at other azimuths:

45	0.625	225	0.155
135	0.164	315	0.500



Azimuth Pattern

Customer: WHKC Date: November 2, 2006

Frequency: 91.5 MHz Type Number: JCPD-1-1(1)

Notes: MEASURED PATTERN IN FULL SCALE
 ——— HPOL VPOL - - - - LIMITS



(916) 383-1177 Fax: (916) 383-1182
 6340 Sky Creek Drive, Sacramento, CA 95828
 P.O. Box 292880, Sacramento, CA 95829-2880



WHKC ERP = 15.00 kW November 2, 2006

JCPD-1-1(1)

TABULATION OF MEASURED FIELDS

<u>BEARING</u>	<u>HORIZONTAL POLARIZATION</u>		<u>VERTICAL POLARIZATION</u>	
	<u>FIELD</u>	<u>ERP(kW)</u>	<u>FIELD</u>	<u>ERP(kW)</u>
0	0.991	14.74	0.990	14.70
10	0.977	14.32	0.985	14.55
20	0.905	12.27	0.940	13.25
30	0.796	9.50	0.855	10.97
40	0.686	7.05	0.710	7.56
50	0.554	4.61	0.515	3.98
60	0.389	2.26	0.320	1.54
70	0.193	0.56	0.170	0.43
80	0.054	0.04	0.115	0.20
90	0.033	0.02	0.110	0.18
100	0.070	0.07	0.105	0.17
110	0.131	0.26	0.105	0.17
120	0.166	0.41	0.100	0.15
130	0.169	0.43	0.095	0.14
140	0.157	0.37	0.100	0.15
150	0.140	0.29	0.085	0.11
160	0.109	0.18	0.055	0.05
170	0.071	0.08	0.045	0.03
180	0.040	0.02	0.060	0.05
190	0.039	0.02	0.050	0.04
200	0.072	0.08	0.020	0.01
210	0.113	0.19	0.060	0.05
220	0.121	0.22	0.130	0.25
230	0.081	0.10	0.175	0.46
240	0.048	0.03	0.180	0.49
250	0.059	0.05	0.165	0.41
260	0.059	0.05	0.145	0.32
270	0.040	0.02	0.135	0.27
280	0.109	0.18	0.170	0.43
290	0.143	0.31	0.280	1.18
300	0.151	0.34	0.395	2.34
310	0.236	0.84	0.475	3.38
320	0.407	2.48	0.530	4.21
330	0.599	5.38	0.635	6.05
340	0.776	9.03	0.785	9.24
350	0.913	12.49	0.915	12.56
MAXIMUM FIELDS:				
5	1.000	15.00		
5			1	15.00
MINIMUM FIELDS:				
85	0.004	0.00		
205			0.02	0.01

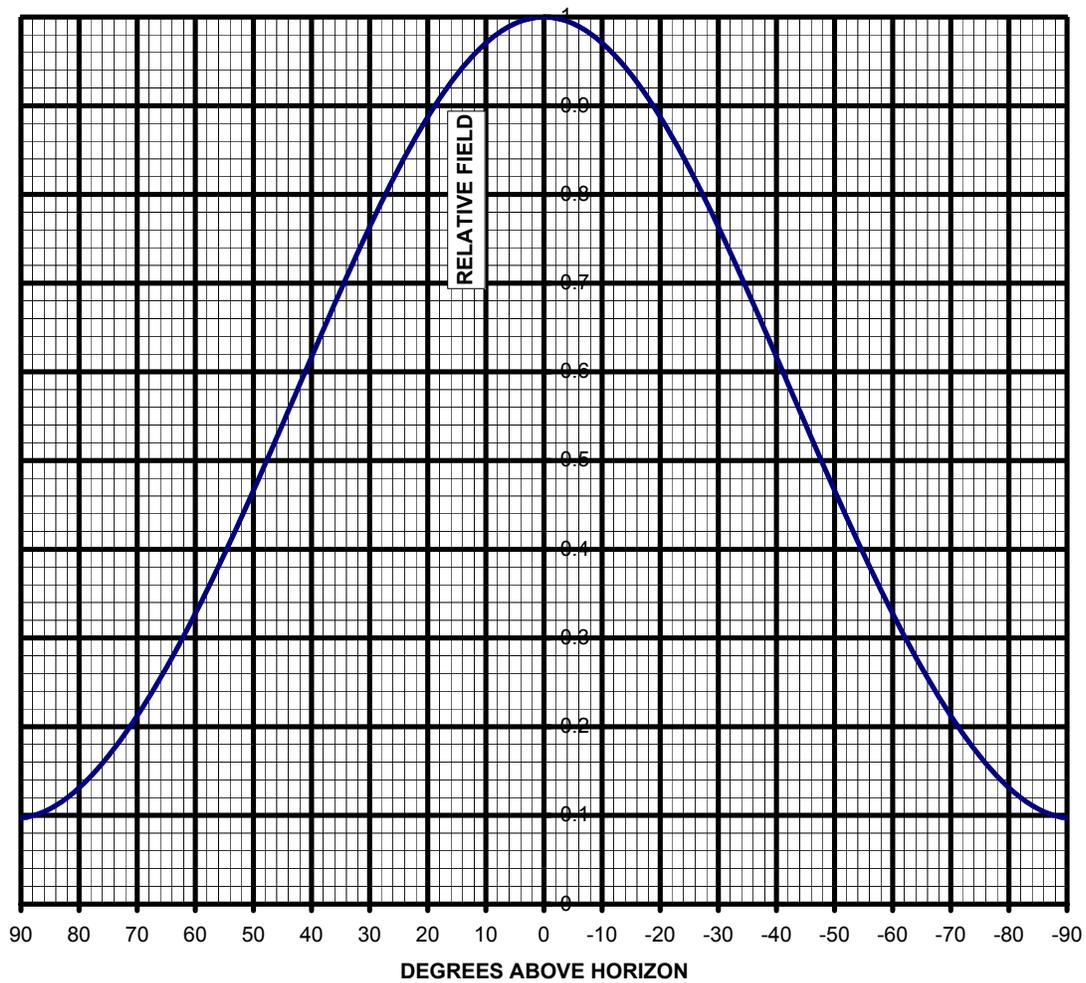


6340 Sky Creek Drive, Sacramento, California 95828
P.O. Box 292880, Sacramento, California 95829-2880

(916) 383-1177 FAX (916) 383-1182

PLOT OF ELEVATION PLANE PATTERN

STATION: WHKC 91.5 MHz JCPD-1-1(1)





6340 Sky Creek Drive, Sacramento, California 95828
P.O. Box 292880, Sacramento, California 95829-2880

(916) 383-1177 FAX (916) 383-1182

TABULATION OF ELEVATION PLANE PATTERN

STATION: WHKC 91.5 MHz JCPD-1-1(1)

<u>ELEVATION</u> <u>ANGLE</u>	<u>RELATIVE</u> <u>FIELD</u>	<u>ELEVATION</u> <u>ANGLE</u>	<u>RELATIVE</u> <u>FIELD</u>	<u>ELEVATION</u> <u>ANGLE</u>	<u>RELATIVE</u> <u>FIELD</u>
10	0.971	-25	0.829	-60	0.327
9	0.976	-26	0.817	-61	0.315
8	0.981	-27	0.804	-62	0.302
7	0.986	-28	0.791	-63	0.290
6	0.989	-29	0.777	-64	0.278
5	0.993	-30	0.763	-65	0.266
4	0.995	-31	0.750	-66	0.255
3	0.997	-32	0.735	-67	0.244
2	0.999	-33	0.721	-68	0.233
1	1.000	-34	0.706	-69	0.223
0	1.000	-35	0.692	-70	0.212
-1	1.000	-36	0.677	-71	0.203
-2	0.999	-37	0.662	-72	0.193
-3	0.997	-38	0.647	-73	0.184
-4	0.995	-39	0.632	-74	0.175
-5	0.993	-40	0.617	-75	0.167
-6	0.989	-41	0.602	-76	0.159
-7	0.986	-42	0.586	-77	0.151
-8	0.981	-43	0.571	-78	0.144
-9	0.976	-44	0.556	-79	0.137
-10	0.971	-45	0.541	-80	0.131
-11	0.965	-46	0.526	-81	0.125
-12	0.958	-47	0.511	-82	0.120
-13	0.951	-48	0.496	-83	0.115
-14	0.943	-49	0.481	-84	0.111
-15	0.935	-50	0.466	-85	0.107
-16	0.926	-51	0.452	-86	0.104
-17	0.917	-52	0.437	-87	0.102
-18	0.908	-53	0.423	-88	0.100
-19	0.898	-54	0.409	-89	0.098
-20	0.887	-55	0.395	-90	0.097
-21	0.877	-56	0.381		
-22	0.865	-57	0.367		
-23	0.854	-58	0.354		
-24	0.842	-59	0.340		