ELECTRONICS RESEARCH, INC. ERI®

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com

Directional Antenna System for KAIA, Bloomfield, Missouri

April 30, 2009

Electronics Research Inc. is providing a custom fabricated antenna system that is specially designed to meet the FCC requirements and the general needs of radio station KAIA.

The antenna is the ERI model P300-3BE-DA configuration. The vertically polarized system consists of 3 full-wavelength spaced bays using one driven vertical dipole per bay. The antenna was mounted on the North 126 degrees East tower leg with bracketry to provide an antenna orientation of North 135 degrees East. The antenna was tested on a 36" face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 91.5 megahertz, which is the center of the FM broadcast channel assigned to KAIA.

Pattern measurements were made on a sixty-acre antenna pattern range that is owned and operated by Electronics Research, Inc. The tests were performed under the direction of Thomas B. Silliman, president of Electronics Research, Inc. Mr. Silliman has the Bachelor of Electrical Engineering and the Master of Electrical Engineering degrees from Cornell University and is a registered professional engineer in the states of Indiana, Maryland and Minnesota.

Directional Antenna System
Proposed For
KAIA, Bloomfield, Missouri

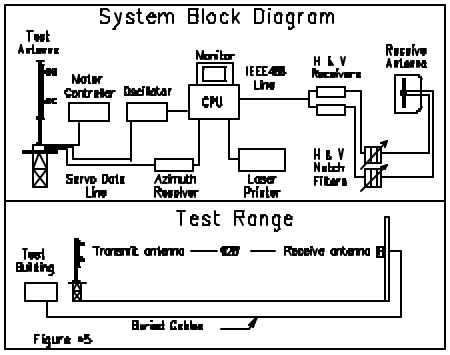
(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of a two bays of the vertically polarized system with the associated vertical parasitic elements. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna. A section of 3 1/8 inch o.d. rigid coaxial line was used to feed the test antenna, and a section of 3 1/8 inch o.d. rigid outer conductor only was attached above the test antenna. The lines were properly grounded during all tests.

The power distribution and phase relationship to the antenna elements was adjusted in order to achieve the directional radiation patterns for both horizontal and vertical polarization components.

The proof-of-performance was accomplished using a 36" face tower with identical dimension and configuration including all braces, ladders, conduits, coaxial lines and other appurtenances that are included in the actual aperture at which the antenna will be installed. The structure was erected vertically on a turntable mounted on a non-metallic building with the antenna centered vertically on the structure, making the center of radiation of the test approximately 30 feet above ground. The turntable is equipped with a motor drive and a US Digital angle position indicator. The resolution of this angle position indicator is one-hundredth of a degree.



The antenna under test was operated in the transmitting mode and fed from a HP8657D signal generator. The frequency of the signal source was set at 91.5 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

A broadband vertical dipole system, located approximately 628 from the test antenna, was used to receive the emitted test signals. The dipole system was mounted at the same height above terrain as the center of the antenna under test.

(Continued)

The signals received by the dipole system were fed to the test building by way of a buried Heliax cable to a Rohde & Schwarz measuring receiver. This data was interfaced to a laser jet printer by means of a computer system. Relative field strength was plotted as a function of azimuth.

The measurements were performed by rotating the test antenna in a counter-clockwise direction and plotting the received signal on polar co-ordinated graph paper in a clockwise direction.

CONCLUSIONS

The vertically polarized system consists of 3 full-wavelength spaced bays using one driven vertical dipole per bay. The power distribution and phase relationship will be fixed when antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The P300-3BE-DA array is to be mounted on the North 126 degrees East tower leg of the 36" face tower at a bearing of North 135 degrees East. Blue prints provided with the antenna will show the proper antenna orientation alignment. The antenna alignment procedure should be directed by a licensed surveyor as prescribed by the FCC.

Figure #1 represents the measured relative field value of the vertical component relative to azimuth. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 49 kilowatts (16.902 dBk).

The power at North 140 degrees East does not exceed 42.929 kilowatts (16.328 dBk).

The power at North 150 degrees East does not exceed 43.573 kilowatts (16.392 dBk).

The power at North 280 degrees East does not exceed 7.958 kilowatts (9.008 dBk).

The power at North 290 degrees East does not exceed 7.339 kilowatts (8.656 dBk).

The power at North 300 degrees East does not exceed 6.927 kilowatts (8.405 dBk).

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The power at North 310 degrees East does not exceed 8.480 kilowatts (9.284 dBk).

The maximum relative field pattern obtained from the measured data as shown on Figure #1 has an RMS that is greater that 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 36 feet 5 inches if the antenna is to be top mounted.

The directional antenna should not be mounted on the top of an antenna tower that includes a top-mounted platform larger than the cross-sectional area of the tower in the horizontal plane. No obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted within 75 ft. horizontally of the system. The vertical distance to the nearest obstruction should be a minimum of 10 ft. from the directional antenna. Metallic guy wires should be a minimum distance of forty feet horizontally from the antenna.

ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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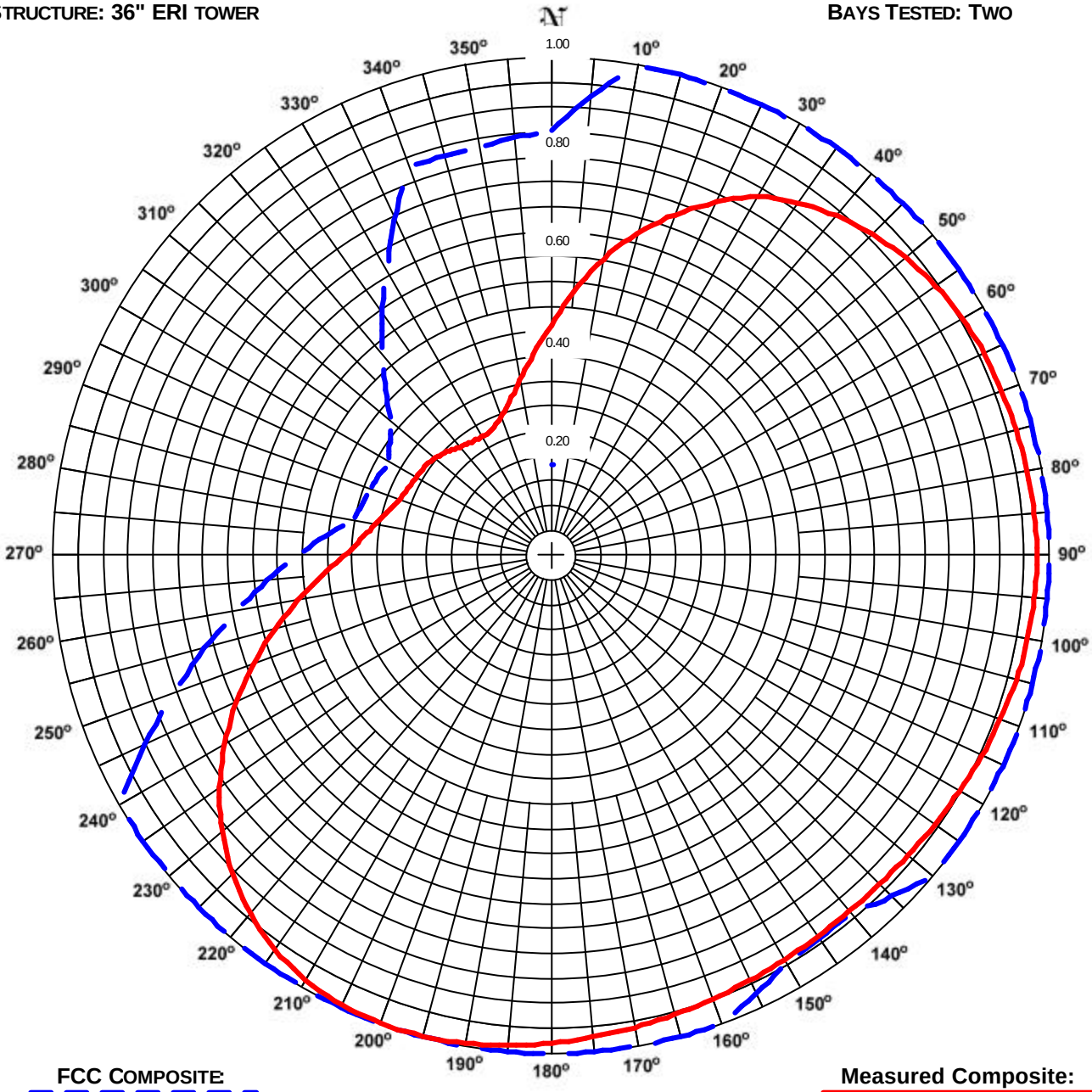
FIGURE NO: 1
STATION: KAIA
LOCATION: BLOOMFIELD, MO.
ANTENNA: P300-3E-DA
STRUCTURE: 36" ERI TOWER

DATE: 4/30/2009
FREQUENCY: 91.5 MHZ
ORIENTATION: 135° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



FCC COMPOSITE:

RMS: 0.890
MAXIMUM: 1.000 @ 10° TRUE
MINIMUM: 0.376 @ 300° TRUE

Measured Composite:

RMS: 0.785
Maximum: 1.000 @ 198° True
Minimum: 0.276 @ 330° True

COMMENTS: THIS PATTERN SHOWS THE MAXIMUM OF THE VERTICAL AZIMUTH VALUES. THIS PATTERN IS GREATER THAT 85% OF THE FCC FILED COMPOSITE PATTERN BPED-20070730ACS.

ERI® Horizontal Plane Relative Field List

Electronics Research, Inc. 7777 Gardner Rd. Chandler, In 47610 Phone (812) 925-6000 Fax (812) 925-4030 http://www.eriinc.com/

Station: KAIA
Location: Bloomfield, MO.
Frequency: 91.5 MHz

Antenna: P300-3E-DA
Orientation: 135° True
Tower: 36" ERI tower

Figure: 1
Date: 4/30/2009
Reference: kaia2m.fig

Angle	Pattern Data			Polarization	Angle	Pattern Data			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.462	10.47	10.20	Vertical	180°	0.979	47.01	16.72	Vertical
5°	0.533	13.93	11.44	Vertical	185°	0.987	47.77	16.79	Vertical
10°	0.606	18.01	12.56	Vertical	190°	0.994	48.44	16.85	Vertical
15°	0.669	21.96	13.42	Vertical	195°	0.999	48.90	16.89	Vertical
20°	0.730	26.08	14.16	Vertical	200°	1.000	48.98	16.90	Vertical
25°	0.784	30.09	14.78	Vertical	205°	0.995	48.55	16.86	Vertical
30°	0.832	33.96	15.31	Vertical	210°	0.985	47.50	16.77	Vertical
35°	0.866	36.72	15.65	Vertical	215°	0.966	45.74	16.60	Vertical
40°	0.891	38.93	15.90	Vertical	220°	0.939	43.25	16.36	Vertical
45°	0.913	40.82	16.11	Vertical	225°	0.905	40.10	16.03	Vertical
50°	0.930	42.40	16.27	Vertical	230°	0.862	36.42	15.61	Vertical
55°	0.944	43.66	16.40	Vertical	235°	0.813	32.36	15.10	Vertical
60°	0.954	44.58	16.49	Vertical	240°	0.757	28.11	14.49	Vertical
65°	0.960	45.15	16.55	Vertical	245°	0.698	23.87	13.78	Vertical
70°	0.964	45.50	16.58	Vertical	250°	0.637	19.85	12.98	Vertical
75°	0.968	45.94	16.62	Vertical	255°	0.575	16.22	12.10	Vertical
80°	0.972	46.29	16.66	Vertical	260°	0.517	13.08	11.17	Vertical
85°	0.974	46.52	16.68	Vertical	265°	0.462	10.48	10.20	Vertical
90°	0.975	46.61	16.69	Vertical	270°	0.417	8.52	9.30	Vertical
95°	0.975	46.54	16.68	Vertical	275°	0.384	7.24	8.60	Vertical
100°	0.972	46.26	16.65	Vertical	280°	0.359	6.33	8.01	Vertical
105°	0.967	45.80	16.61	Vertical	285°	0.340	5.66	7.53	Vertical
110°	0.961	45.21	16.55	Vertical	290°	0.326	5.21	7.16	Vertical
115°	0.954	44.56	16.49	Vertical	295°	0.317	4.93	6.93	Vertical
120°	0.947	43.91	16.43	Vertical	300°	0.314	4.82	6.83	Vertical
125°	0.941	43.35	16.37	Vertical	305°	0.311	4.72	6.74	Vertical
130°	0.936	42.91	16.33	Vertical	310°	0.304	4.54	6.57	Vertical
135°	0.933	42.64	16.30	Vertical	315°	0.295	4.27	6.30	Vertical
140°	0.932	42.56	16.29	Vertical	320°	0.286	3.99	6.01	Vertical
145°	0.933	42.68	16.30	Vertical	325°	0.279	3.81	5.81	Vertical
150°	0.937	42.99	16.33	Vertical	330°	0.276	3.74	5.73	Vertical
155°	0.941	43.43	16.38	Vertical	335°	0.281	3.87	5.88	Vertical
160°	0.948	44.00	16.43	Vertical	340°	0.296	4.30	6.33	Vertical
165°	0.955	44.66	16.50	Vertical	345°	0.322	5.07	7.05	Vertical
170°	0.963	45.40	16.57	Vertical	350°	0.359	6.31	8.00	Vertical
175°	0.971	46.20	16.65	Vertical	355°	0.407	8.12	9.10	Vertical

Polarization: **Envelope**
Maximum Field: **1.000 @ 198° True**
Minimum Field: **0.276 @ 330° True**
RMS: **0.785**
Maximum ERP: **49.000 kW**
Maximum Power Gain: **5.051 (7.034 dB)**

Total Input Power: 9.701 kW

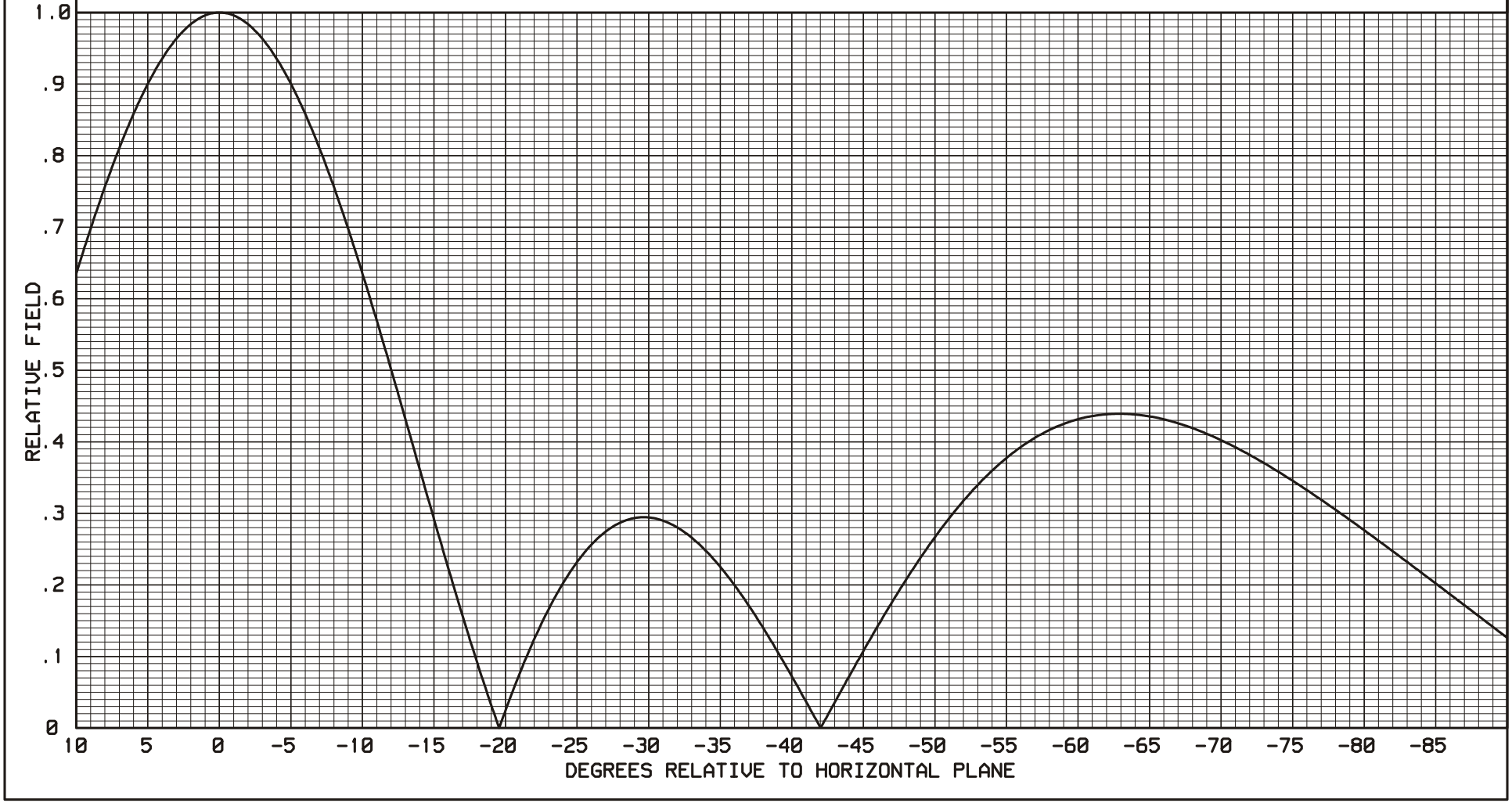
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI TYPE P300-3B-DA
VERTICALLY POLARIZED ANTENNA
0 DEGREE ELECTRICAL BEAM TILT
0 PERCENT NULL FILL

ELEMENT SPACING:
1.0 WAVELENGTH



Directional Antenna System
for
KAIA, Bloomfield, Missouri

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	P300-3BE-DA
Frequency:	91.5 MHz
Number of Bays:	Three

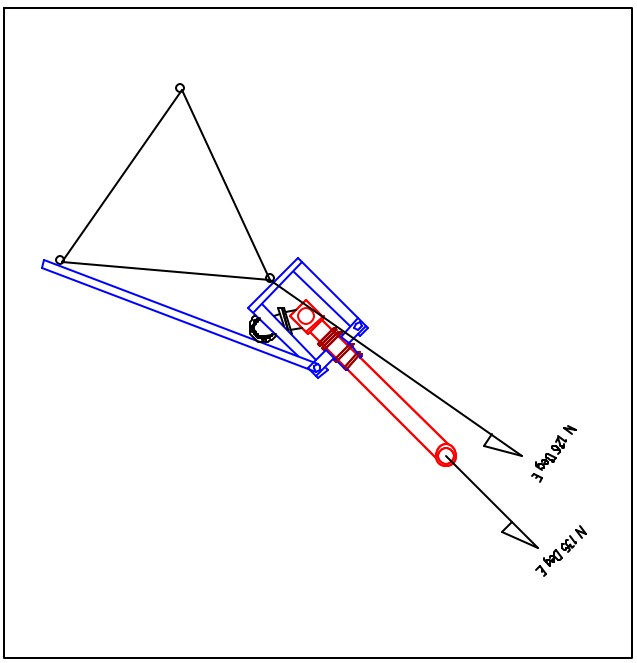
MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	31 ft 4 in
Aperture length required:	36 ft 5 in
Orientation:	135° true

Input flange to the antenna 3 1/8“ female.

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum vertical ERP:	49.000 kW (16.902 dBk)
Vertical maximum power gain:	5.051 (7.034 dB)
Total input power:	9.701 kW (9.868 dBk)



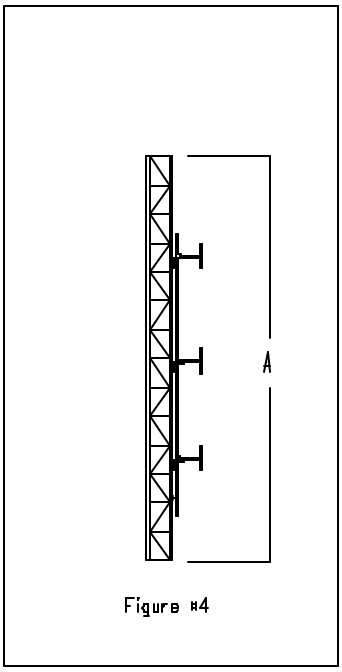


Figure #4