

JULY 18, 1989

CIRCULAR POLARIZED DIRECTIONAL ANTENNA SYSTEM
FOR RADIO STATIONS KPLU, KLSY, KMPS AND KRPM
WITH TRANSMITTING AND ANTENNA FACILITIES
LOCATED AT WEST TIGER MOUNTAIN, WASHINGTON

Electronics Research, Inc. is providing a custom fabricated directional antenna system that is specially designed to meet the F.C.C. requirements and the general needs of radio stations KPLU, KLSY, KMPS and KRPM.

The antenna is the 1082-4CP-DA type configuration. The circular polarized system consists of four 10' vertically spaced bays using 2 individually excited iris cells per bay. The antenna was tested on a full scale model of a section of a self supporting Magnum tower that exists at the West Tiger Mountain site. This is the structure planned to support the array. This model contained all ladders, transmission lines and other devices that will be in the aperture of the proposed antenna system. All tests were performed on frequencies of 88.5 MHz, 92.5 MHz, 94.1 Mhz and 106.1 MHz which are the centers of the FM broadcast channels assigned to the above stations. In anticipation of possible expanded use of the antenna additional pattern measurements were made on other FM channels which are allotted to the general Seattle-Tacoma area.

Pattern measurements were made on a fifty-acre antenna pattern range which 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 both the Bachelor of Electrical Engineering and the Master of Electrical Engineering degrees from Cornell University, and is also a registered professional engineer in the states of Indiana, Maryland and Minnesota.

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of the complete four bay circular polarized system. The elements and brackets that were used in this test are the ones that will be installed at the West Tiger Mountain site.

The tower 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 azimuth indicating mechanism, resolution of this azimuth measuring system is one-tenth of a degree.

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(Continued)

The antenna under test was operated in the transmitting mode and fed from a Wavetek Model 3000 signal generator. The frequency of the signal source was set at each of the carrier frequencies of the involved stations.

A broad-band horizontal and vertical dipole system, located approximately 628 feet from the test antenna, and mounted at the same height above terrain as the center of the antenna under test, was used to receive the emitted test signals. The signals received by the dipole system were fed to the test building by way of two buried Heliac cables to an Anritsu Model ML521B measuring receiver. This data was interfaced to a Hewlett-Packard Model 9872C plotter by means of a Hewlett-Packard Model 86 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. Both horizontal and vertical components were recorded separately. The patterns furnished herewith are the averages of multiple separate measurements performed on each of the frequencies indicated.



Dan Dowdle, Test Site Director
Electronics Research, Inc.
108 Market Street
Newburgh, Indiana 47630

FIGURE # 1
1082-4CP-DA ANTENNA
TAPERED TOWER

HORIZONTAL PLANE RELATIVE FIELD PATTERN

JUNE 30, 1989
STATION KISW
SEATTLE WA
99.9MHZ

ELECTRONICS RESEARCH, INC.
108 MARKET STREET
NEWBURGH, IN 47630

TRUE NORTH

1.00

.75

.50

.25

ANTENNA ORIENTATION
NORTH 270 DEGREES EAST

HORIZONTAL _____
VERTICAL _____

THE KISW ANTENNA ELEMENTS ARE MOUNTED ON FACES ADJACENT TO THE
NORTH 270 DEGREE EAST TOWER LEG.

DIETZEN CORPORATION

NO. 341-P DIETZEN GRAPH PAPER
MILAR CO-ORDINATE

HORIZONTAL PLANE RELATIVE FIELD & DBK LIST
FOR RADIO STATION KISW 99.9MHz

AZIMUTH	H POL RELATIVE FIELD	H POL DBK	H POL POWER KW	V POL RELATIVE FIELD	V POL DBK	V POL POWER KW	AZIMUTH	H POL RELATIVE FIELD	H POL DBK	H POL POWER KW	V POL RELATIVE FIELD	V POL DBK	V POL POWER KW
0.0	.610	13.33	21.55	.706	14.61	23.92	180.0	.668	14.13	25.91	.714	14.71	29.59
5.0	.559	12.59	13.14	.655	13.96	24.91	185.0	.772	15.39	34.58	.765	15.31	33.98
10.0	.513	11.83	15.26	.601	13.21	20.95	190.0	.851	16.23	42.82	.801	15.71	37.26
15.0	.463	10.94	12.41	.564	12.66	18.46	195.0	.930	17.30	50.52	.844	16.16	41.32
20.0	.403	9.73	9.41	.512	11.91	15.18	200.0	.977	17.43	55.39	.889	16.41	43.77
25.0	.335	8.14	6.52	.469	11.06	12.77	205.0	.994	17.58	57.34	.869	16.41	43.77
30.0	.266	6.13	4.11	.425	10.21	10.58	210.0	.989	17.53	56.68	.889	16.41	43.77
35.0	.223	4.59	2.88	.381	9.26	8.44	215.0	.950	17.18	52.29	.844	16.16	41.32
40.0	.204	3.83	2.42	.330	8.01	6.83	220.0	.902	16.73	47.14	.820	15.91	39.81
45.0	.202	3.73	2.36	.291	6.92	4.92	225.0	.837	16.39	40.60	.788	15.56	35.99
50.0	.197	3.53	2.26	.242	5.31	3.40	230.0	.776	15.43	34.95	.774	15.41	34.77
55.0	.185	2.99	1.99	.186	3.83	2.81	235.0	.729	14.88	30.79	.765	15.31	33.98
60.0	.168	2.13	1.63	.138	.41	1.10	240.0	.708	14.63	29.87	.774	15.41	34.77
65.0	.145	.84	1.21	.088	-3.43	.45	245.0	.712	14.65	29.41	.806	15.76	37.69
70.0	.122	-.67	.86	.055	-7.49	.18	250.0	.750	15.13	32.62	.849	16.21	41.80
75.0	.089	-3.48	.46	.062	-6.56	.22	255.0	.794	15.63	36.60	.894	16.66	46.37
80.0	.054	-7.67	.17	.090	-3.29	.47	260.0	.841	16.13	41.86	.942	17.11	51.43
85.0	.012	-20.69	.01	.111	-1.43	.72	265.0	.866	16.38	43.50	.964	17.31	53.85
90.0	.032	-12.27	.06	.121	-.69	.85	270.0	.871	16.43	44.80	.975	17.41	55.18
95.0	.065	-3.77	.42	.114	-1.23	.75	275.0	.866	16.38	43.50	.947	17.15	52.82
100.0	.132	.03	1.81	.095	-2.79	.53	280.0	.832	16.83	40.13	.918	16.91	47.99
105.0	.183	2.89	1.95	.073	-5.87	.31	285.0	.794	15.63	36.60	.849	16.21	41.81
110.0	.229	4.83	3.84	.064	-6.19	.24	290.0	.759	15.23	33.38	.801	15.71	37.26
115.0	.257	5.84	3.93	.084	-3.93	.40	295.0	.750	15.13	32.62	.752	15.16	32.82
120.0	.260	5.93	3.92	.111	-1.49	.71	300.0	.759	15.23	33.38	.723	14.81	30.28
125.0	.271	6.28	4.25	.142	.67	1.17	305.0	.804	15.73	37.45	.727	14.86	30.63
130.0	.279	6.53	4.58	.173	2.41	1.74	310.0	.861	16.33	43.80	.757	15.21	33.20
135.0	.302	7.24	5.29	.202	3.76	2.38	315.0	.912	16.83	48.25	.802	15.71	37.26
140.0	.343	8.33	6.81	.245	5.41	3.48	320.0	.955	17.23	52.90	.849	16.21	41.80
145.0	.398	9.64	9.20	.296	7.07	5.09	325.0	.977	17.43	55.39	.894	16.66	46.37
150.0	.442	10.53	11.31	.354	8.61	7.26	330.0	.977	17.43	55.39	.928	16.91	49.11
155.0	.470	11.88	12.84	.421	10.11	10.27	335.0	.944	17.13	51.70	.915	16.86	48.55
160.0	.484	11.33	13.68	.483	11.31	13.53	340.0	.891	16.63	46.87	.899	16.71	46.98
165.0	.487	11.38	13.75	.545	12.37	17.24	345.0	.808	15.79	37.89	.854	16.26	42.38
170.0	.513	11.83	15.26	.601	13.21	20.95	350.0	.733	14.93	31.15	.801	15.71	37.26
175.0	.576	12.84	19.23	.659	14.81	25.28	355.0	.665	14.89	25.62	.752	15.16	32.32

CITY OF LICENSE: SEATTLE WA

MOUNTING STRUCTURE: MAGNUM TOWER-TIGER MT SITE

ANTENNA TYPE: 1082-4CP-DA NUMBER OF BAYS:4

HORIZONTAL MAXIMUM RELATIVE FIELD= 1 AZIMUTH 206

HORIZONTAL MINIMUM RELATIVE FIELD= 4.31519076827E-3 AZIMUTH 86

VERTICAL MAXIMUM RELATIVE FIELD= .974721426276 AZIMUTH 270

VERTICAL MINIMUM RELATIVE FIELD= 5.11541076175E-2 AZIMUTH 72

HORIZONTAL R.M.S.=.64519 VERTICAL R.M.S.=.64519

MAXIMUM HORIZONTAL E.R.P.= 58.0000KW MAXIMUM VERTICAL E.R.P.= 55.1047KW

ANTENNA ORIENTATION: NORTH 270 DEGREES EAST

ELECTRONICS RESEARCH, INC.
7777 GARDNER ROAD
CHANDLER, IN. 47618

FIGURE 2

----THEORETICAL-----
VERTICAL PLANE RELATIVE FIELD
4 LEVELS OF TYPE 1080 ELEMENTS
-1.15 DEGREE(S) BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL

OCTOBER 19, 1998
99.9 MHz
BAY SPACING
120.00 INCHES
(1.0157 WAVELENGTH)

