

ETC Communications

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Report of Test FM-6V-DA For Michigan Community Radio, WSFP 88.1 MHz Harrisville, MI

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a FM-6V-DA to meet the needs of WSFP and to comply with the requirements of the FCC construction permit, file number BPED-20071114AGT.

RESULTS:

The measured azimuth pattern for the FM-6V-DA is shown in Figure 2. The horizontal component of this antenna was developed by constructing the dipole 0.005° off of vertical. The horizontal azimuth pattern of this antenna is omni-directional and therefore is not shown. 60" of clearance, minimum, is required above and below antenna. Figure 1 shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPED-20071114AGT indicates that the Vertical radiation component shall not exceed 18 kW at any azimuth.

From Figure 1, the maximum radiation of the Vertical component occurs at 90 Degrees T. At the restricted azimuth of 270 Degrees T the Vertical component is 10.149 dB down from the maximum of 18 kW, or 1.74 kW (mimima is 1.80 kW).

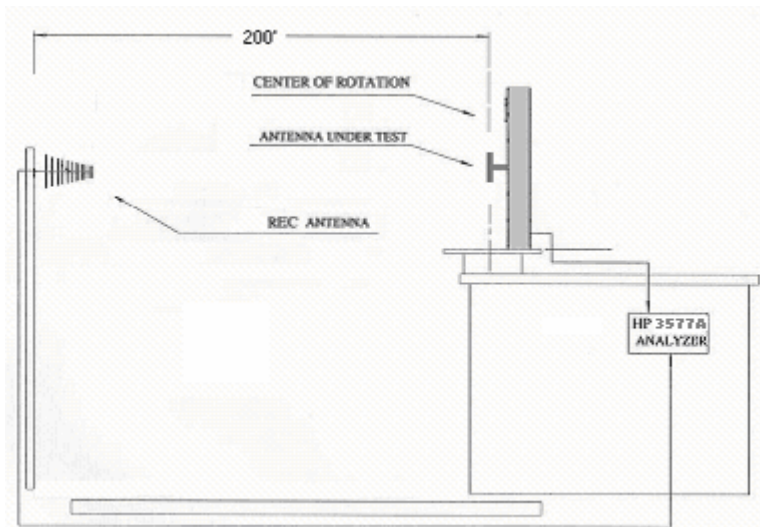
The R.M.S. of the Vertical component is 0.629163. The total Vertical power gain is 16.6731. See Figure 4 for calculations. The R.M.S. of the modified FCC theoretical pattern is 0.741524. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the FM-6V-DA dipole-type antenna was mounted on a tower of exact scale to the tower present at site. The effects of the side-mounting of the dipoles were simply studied. The azimuth pattern is shown in Figure 2. See Figure 5 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BPED-20071114AGT, a single level of the FM-6V-DA was set up on a rural "quiet zone" 80-acre antenna pattern measuring range, a scale of 1:1 was used.



EQUIPMENT:

The full-scale model pattern range consists of a rotating device equipped with an electronic position indicator. The full-scale tower section is placed on the top of rotating device and is used in the transmission mode at approximately 20 feet above ground level. A small diameter wooden support structure holds a broadband FM receiving yagi antenna that is spaced 200 feet away from the rotating device at the same level above ground as the transmitting antenna. The transmitting and receiving signals are carried to a control area by means of RG-8 type and RG-6 type double-shielded coax cables, respectively. The control area is equipped with: Hewlett Packard Model 3577A Network Analyzer. The test equipment is calibrated to ANSI/NCSL Z540-1-1994.

TEST PROCEDURES:

The network analyzer was set to the frequency of 88.1 MHz. Calibrated physical markers are used to check the linearity of the measuring system. From the recorded patterns, the R.M.S. values are calculated and recorded as shown in Figure 4.

Respectfully submitted by:

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Figure 1
TABULATION OF VERTICAL POLARIZATION
WSFP HARRISVILLE, MI
MODEL FM-6V-DA

Degrees	Vertical Field	FCC Field
0	0.542	1
10	0.594	1
20	0.649	1
30	0.713	1
40	0.781	1
50	0.849	*0.849
60	0.909	*0.909
70	0.957	*0.957
80	0.988	*0.988
90	1	1
100	0.994	*0.994
110	0.969	*0.969
120	0.927	*0.927
130	0.869	*0.869
140	0.796	*0.796
150	0.713	*0.713
160	0.626	*0.626
170	0.543	*0.543
180	0.473	*0.473
190	0.419	*0.419
200	0.379	*0.379
210	0.346	*0.346
220	0.318	*0.318
230	0.297	*0.297
240	0.289	*0.289
250	0.294	*0.294
260	0.304	*0.304
270	0.311	0.316
280	0.31	0.36
290	0.302	0.403
300	0.294	0.447
310	0.3	0.501
320	0.33	0.631
330	0.378	0.794
340	0.434	1
350	0.49	1

* Fields amended to meet 85% RMS requirement.

Figure 2
POLAR PLOT OF VERTICAL POLARIZATION
WSFP HARRISVILLE, MI
MODEL FM-6V-DA

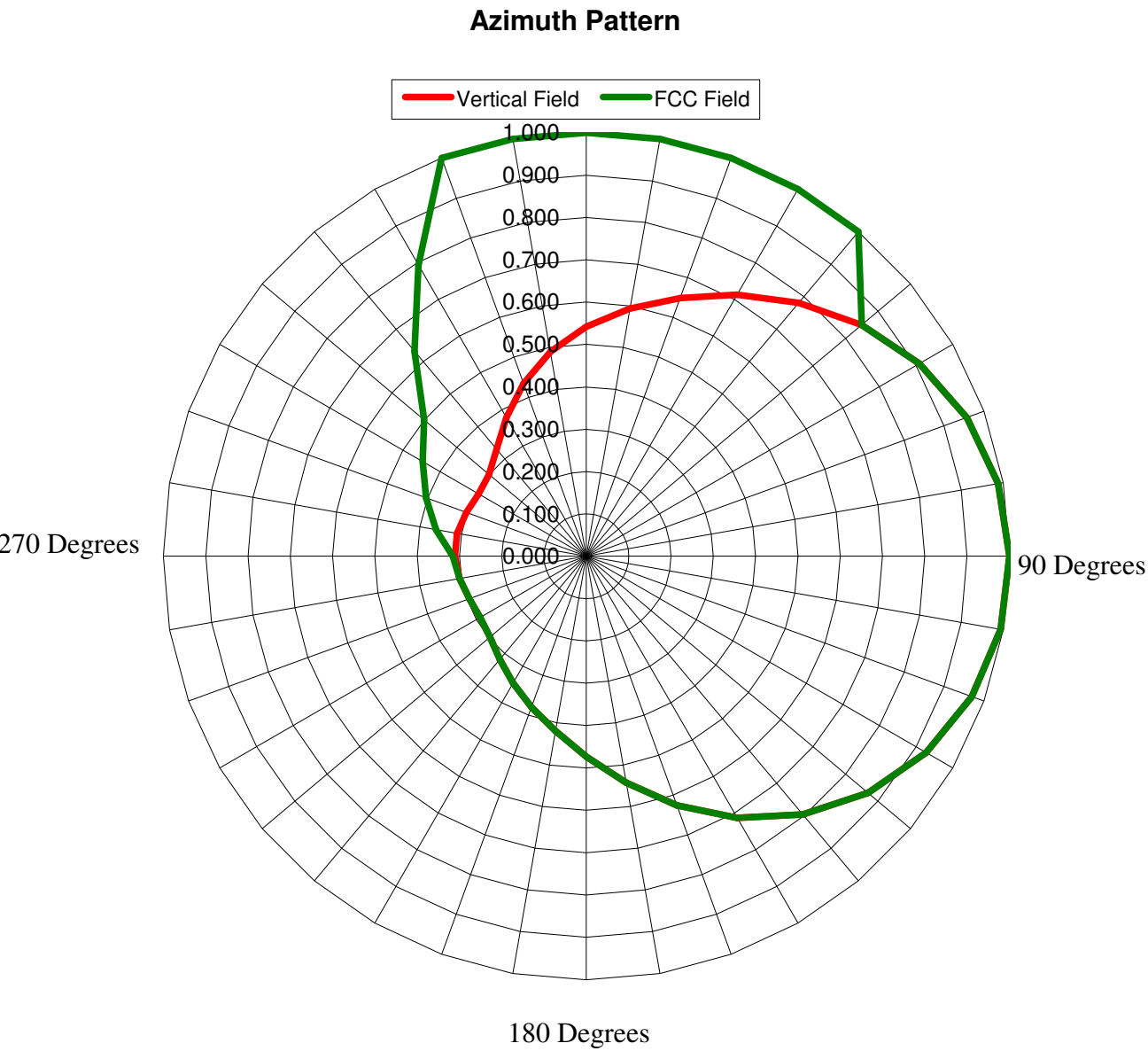


FIGURE 3
Vertical Pattern
WSFP HARRISVILLE, MI
MODEL FM-6V-DA

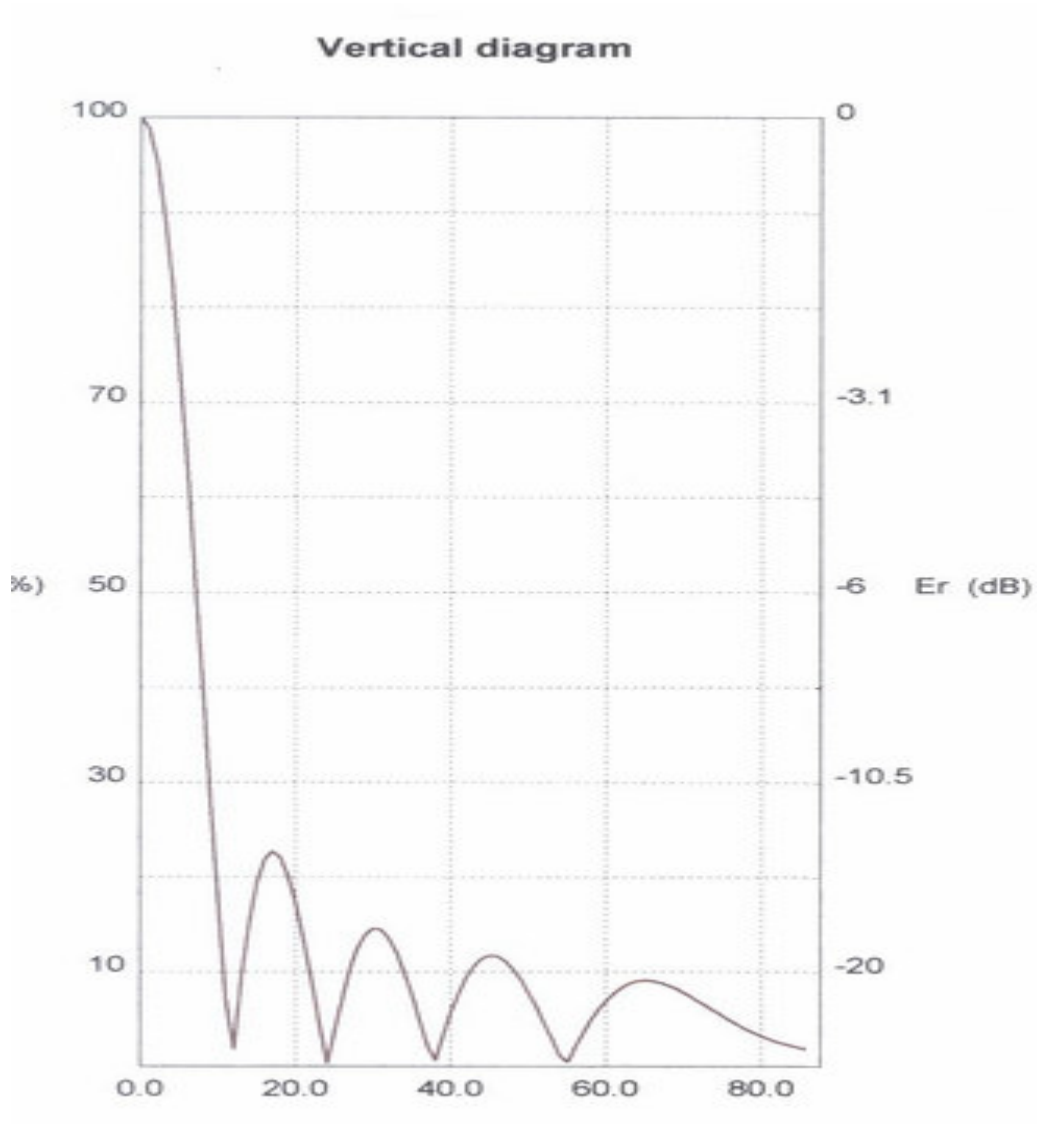


FIGURE 4
VALIDATION OF GAIN CALCULATION
WSFP HARRISVILLE, MI
MODEL FM-6V-DA

Elevation Gain of FM-6V-DA equals
Vertical 6.6

Vertical Azimuth Gain equals $1/(\text{RMS})^2$
 $1/(0.629163)^2 = 2.52623$

* Total Vertical Gain is Elevation Gain times Azimuth Gain
 $6.6 \times 2.52623 = 16.6731$

ERP divided by Vertical Gain equals Antenna Input Power
 $18 \text{ kW} \div 16.6731 = 1.07958 \text{ kW}$

FIGURE 5
 Antenna Mounting and Orientation
 WSFP HARRISVILLE, MI
 MODEL FM-6V-DA

