Welcome to AntennaSelect™ Volume 20 – June 2015

Welcome to Volume 20 of our newsletter, AntennaSelect™. Each month we will be giving you an "under the radome" look at antenna and RF technology. If there are subjects you would like to see covered, please let us know what you would like to see by emailing us at: info@micronetixx.com

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New FMM - mid power FM antennas

Our newest FM antenna family has arrived. The FMM model antenna is a mid power antenna with an input rating of 3 kW per bay. It is available in single bay configuration, or up to a 12 bay center fed model. The FMM antennas are constructed from stainless steel, ensuring a very long service life.

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The FMM antennas produce a right hand circular polarized signal, with an excellent H to V linearity. The antenna is available in half wave, 7/10 wave, 7/8 wave and full wave spacing. Beam tilt and null fill options are available on center fed versions of the antenna. The input to the antenna is a 3-1/8” EIA flange.

The inter bay feed system is constructed with an Aluminum outer and a copper inner. The Aluminum feeder lines are finished with a Class 1-A finish, ensuring a long service life. The feeder line may be painted if desired. Each bay has stainless steel mounting brackets to mount to a tower leg or outrigged pole.

With the 3-1/8” EIA input the input power rating of a 10 or 12 bay FMM antenna can produce an ERP of up to 100 kW (C/P). Every element of the FMM antenna is DC grounded for superior lightning protection.

The ring stub design of the FMM antennas are rugged but lightweight. The elements are built using high quality stainless steel. Each antenna bay is under 20 lbs and presents just a few square feet of wind load. The FMM is also an excellent choice for stations wanting to add an auxiliary. A two bay model needs about 25 feet of clear tower space, and has a 6 kW input rating.

The V.S.W.R. performance over a 200 kHz channel is at a 1.10:1 or better. Optional matching transformers are available to allow more precise field tuning of the antenna.

As an option the FMM antennas can be supplied with heaters. The heaters can be supplied to run on 110 or 220 volt power. A flexible conduit pigtail is furnished on each bay to attach to the power source.

FM antenna heater systems

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Heaters in FM antennas are often used when the station wants to prevent the buildup of ice on the antenna elements. The heaters provide enough warmth to the antenna elements to keep ice from building up. Depending on the design, a heating system will add only a few pounds to each antenna bay. A temperature controlling located in the transmitter building turns on the heaters when the outside temperature drops to 37 to 40 degrees Fahrenheit. When the temperature rises above about 40 degrees, the heaters are switched off.

Heaters are not designed to remove accumulated ice buildups. Turning on a heater after ice has formed will help the ice to thin and fall off, but the time needed may be several hours.

The heater system in the antenna bay is quite simple. Nichrome wire forms the heating element. Nichrome wire is available in a number of grades and sizes from 10 gauge down to 40 gauge. The design constraints of the heater are: 1) It must fit inside the antenna elements 2) provide the proper resistance to produce the right level of heat and 3) be mechanical stable from both an operational and installation standpoint.

A straight section of small Nichrome wire (26 gauge) has a resistance of about 2.5 Ohms per foot. The Nichrome wire is not insulated, so a common method to building is to wind it into a continuous coil. At Micronetixx we wind the heater wire into a coil using specially designed tooling.

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Pictured above is a completed, coiled heater wire. The wire is cut to the right length and then the ends are silver brazed to special high temperature lead wires. A braided fiberglass flexible sleeve is slipped over the heater wire for insulation from the antenna elements. The braided insulator is rated for 1400 degrees Fahrenheit. The heater assembly is then inserted into the antenna element. A small junction box on the antenna bay is used to connect the wiring from the individual heater elements. Depending the application, and antenna type design, the heaters will vary in power usage. 50 to 100 Watts is a common range.

Moving to high band VHF ?
TPV-SFN VHF Slot antennas

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In the last issue of AntennaSelect we looked at one case where a high band DTV was having serious reception issues in the core of the city. With the reduced ERP they received for digital, along with poorer receive antenna solutions, the blue screen of death came true for many viewers.

The Micronetixx TPV-SFN VHF slot antennas use our exclusive technologies to greatly improve difficult reception issues. First, the TPV-SFN antenna uses an innovative half wave spaced slot array. A six bay antenna will actually have a total of 12 slots.

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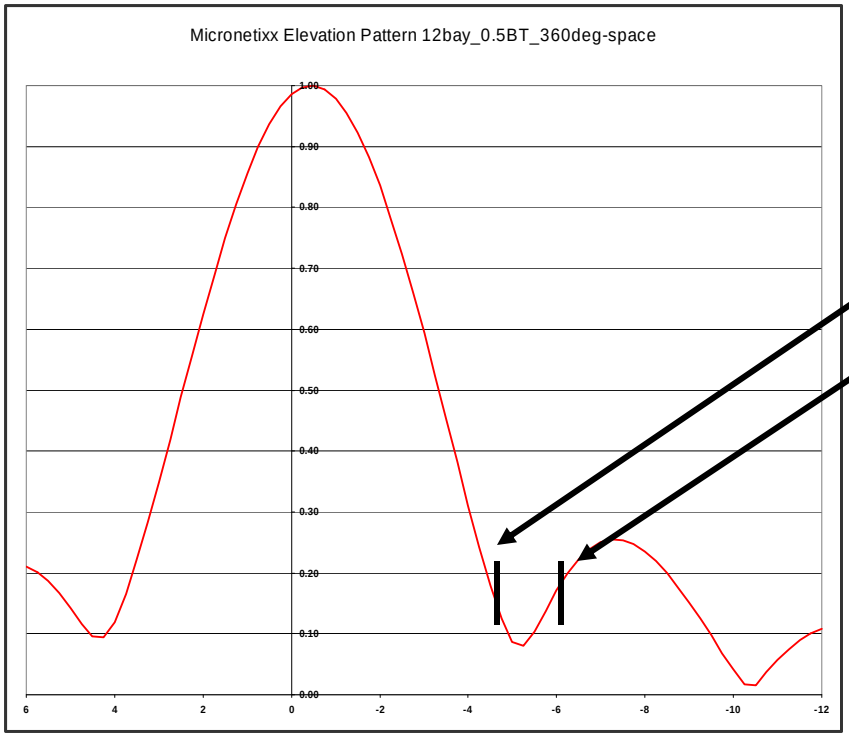
Having the higher slot counts allows us to control the elevation pattern more precisely. Another benefit is the unit elevation gain of these antennas is 12 to 15 percent higher than standard slot or batwing style antennas. The design also enables us to customized the TPV-SFN antennas with elliptical or circular polarization. With the TPV-SFN design all slots produce a true quadrature signal. Some competing designs use alternate slot polarization technology, however these are not true 90 degree launched quadrature signals.

Lets go back to the problem we outlined in the April newsletter. The station was using a 12 bay batwing antenna, and had 9 kW ERP. The serious reception issue they were having was in the city core. The first null of the antenna fell right in the city core producing an effective ERP of only 57 Watts.

Now let's fast forward a year after the spectrum auction. This station is staying on its VHF channel and will still have a 9 kW ERP. The reception problem is still there in the city core.

12 Bay Batwing antenna elevation pattern



City core between these two points

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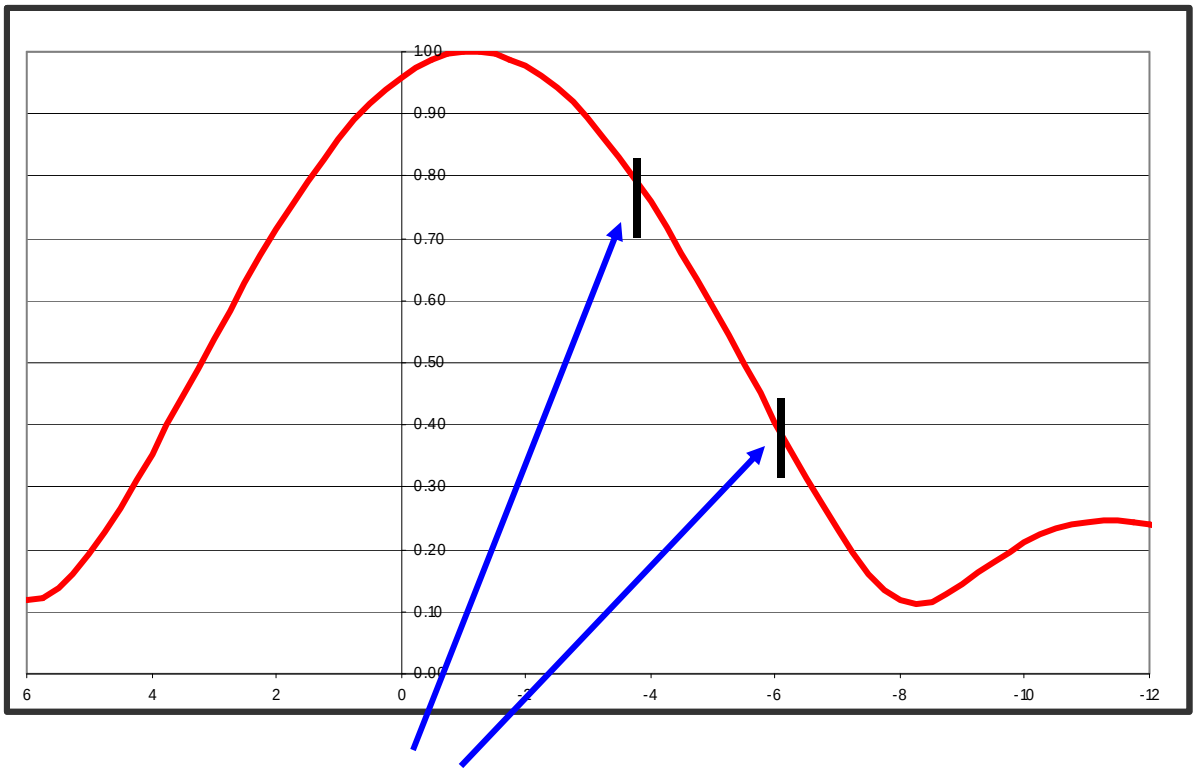
Since we are in the antenna business, we love selling new antennas. We also love to hear from customers about how well the station covers. So for this station here are a couple solutions we would offer.

The first is going to a new antenna. Since the station has 1.8 kW of TPO available and is only using 910 Watts now, lets see what we can fit in. Also we want to go to elliptical polarization with a 70/30 power split. That in it self will solve a lot of indoor reception problems.

Our first cut is a 8 bay TPV-SFN antenna with 1.25 degrees of electrical beam tilt. The elevation gain is 9.64. When configured with elliptical polarization, the elevation gain reduces to 6.75. This configuration takes a TPO of 1.62 kW, so the transmitter will be fine. Here is the elevation pattern of the 8 bay antenna below:

8 bay SFN elevation pattern with 1.25 degrees of beam tilt



City core is between these points

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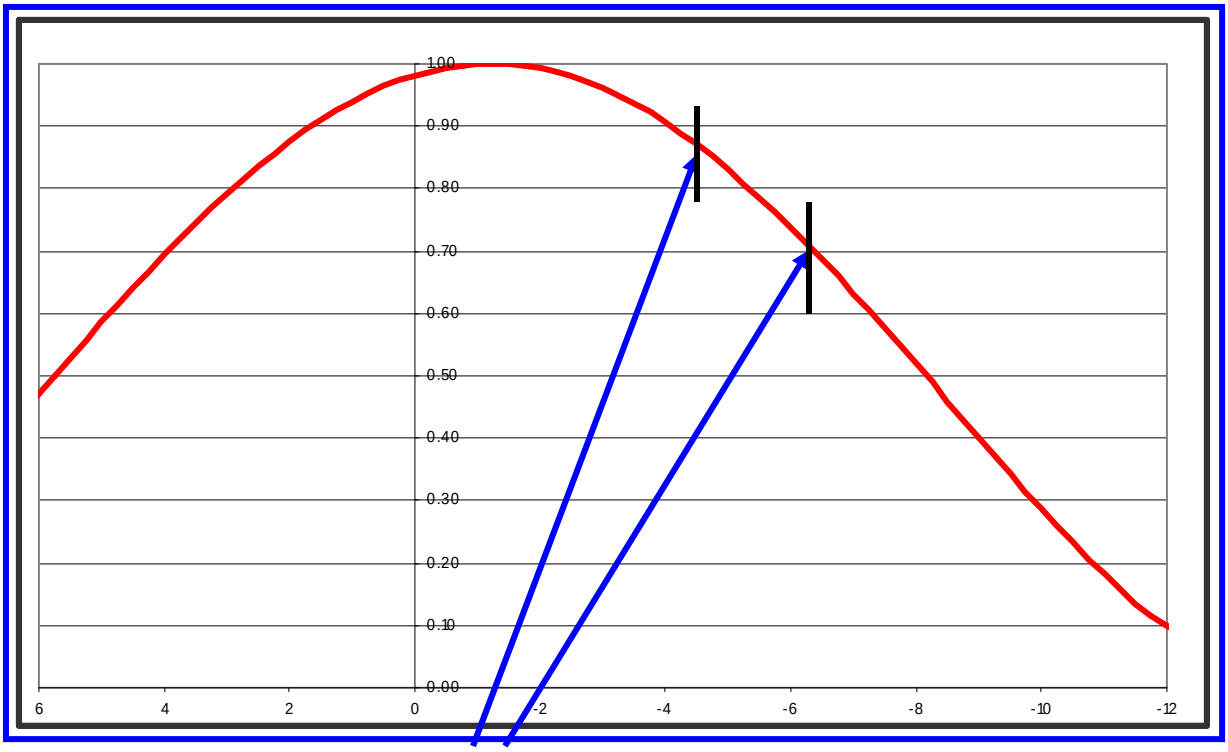
With the new antenna in place the fist null has been moved farther in to -8.25 degrees, a place that is a little more than 1-1/2 miles from the transmitter. The effective ERP at that point will be 110 Watts, but is outside the city core.

The old null point of the 12 by antenna was at -5.25 degrees, with a ERP of 57 Watts. With the new antenna, the ERP at that point is now 2.65 kW – a 16.6 dB improvement. At the close edge of the city core the old ERP at -4.25 degrees was only 291 Watts. It is now 4.64 kW – a 12 dB improvement. Also remember we now are running elliptical polarization, so in some locations the Improvement may well reach 20 dB.

Idea #2. The station has an extra slot in the transmitter for another PA tray – that would raise the TPO up to 2.7 kW. So in this case we will drop down to a 5 TPV-SFN bay antenna. At the former null point of the 12 bay antenna, the new antenna would have an ERP of 5.9 kW – just over a 20 dB improvement.

5 Bay SFN elevation pattern with -1.25 degrees of beam tilt



City core is between these two points

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At the close edge of the city core the ERP went from 291 Watts using the 12 bay antenna to 6.35 kW – a 13.4 dB improvement. Our TPO is now at 2.53 kW.

The former 74 foot high batwing antenna has been replaced by a 31 foot long pylon antenna with a radome. That has dropped about 4000 lbs of loading from the tower, possibly freeing up the tower for some space rentals below. Pylon antennas are mechanically very simple and have no wiring harness that may need to be replaced in the future.

The station now is saturating the core of the city with 13 to 20 dB more signal, and elliptically polarized at that. With ATSC 3.0 coming up, will we be watching mobile TV on our tablets ? TV everywhere ? Placing a fat signal over your market also lessens the chance of interference from tight packing of signals.

Now the bad news – we have just told you going to a smaller and less expensive antenna could help your coverage area. It looks like we will be selling more, yet less expensive antennas.

In the August issue of AntennaSelect, we will look at another trick to help VHF high-band stations shine. If you would like us to run some “what if” solutions for your station, please let us know. We love running them and hearing the success stories once they are installed.

Be on the lookout for the next volume of AntennaSelect™ coming out in August