Welcome to AntennaSelect™ Volume 8 – March 2014

Welcome to Volume 8 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

In this issue:

LPFM: How many antenna bays are best ?

To answer the question we will show the elevation patterns of several bay counts of our **FML** series FM antennas. Unlike higher power FM stations that may have antennas 300 or more feet above ground, LPFM services are generally kept to maximum of 98 feet (30 meters) above ground. So what advantages or disadvantages are there with single versus multi-bay antennas ?

Let's look at the elevation pattern of a single antenna bay first.

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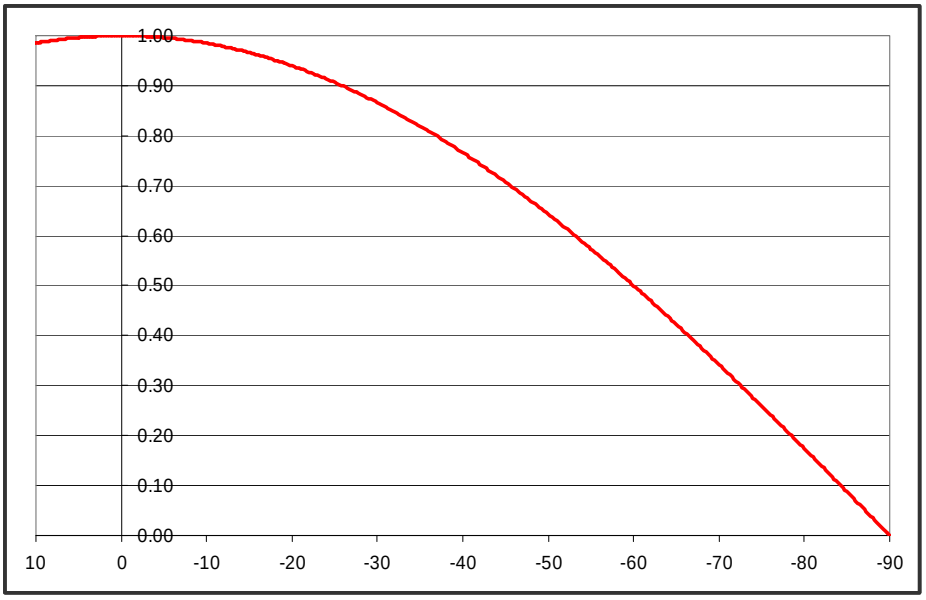
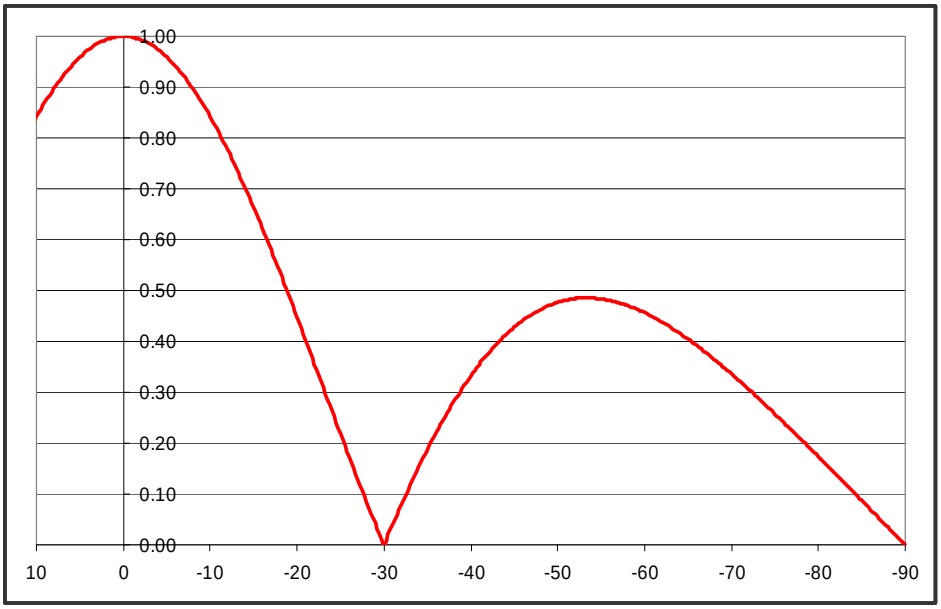


Here is the elevation pattern of a single **FML** series antenna bay. It has an elevation gain of -0.48, or -3.20 dB. When the antenna is mounted 98 feet from the ground, the signal level 98 feet from the tower will be at a depression angle of -45 degrees, At 3 miles from the tower the beam from this antenna will be at -0.36 degrees .



Here is the elevation pattern of a two bay **FML** series antenna. It has an elevation gain of 1.00 (0.00 dB). When mounted 98 feet above the ground the first null will fall 171 feet from the tower at a depression angle of -30 degrees.

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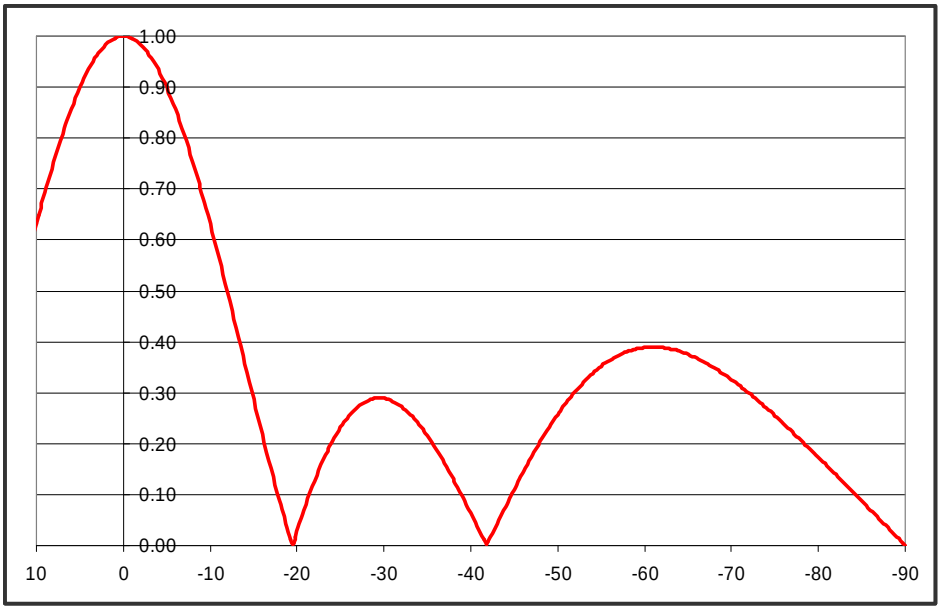

Here is the elevation pattern of a 3 bay **FML** series antenna. This antenna has an elevation gain of 1.52 (1.84 dB). When mounted 98 feet above the ground the first null is located at a depression angle of -19.50 degrees, which is 278 feet from the tower. The second null. located at -42.00 degrees is located 109 feet from the tower.

Which of the three patterns would work best for an LPFM ?

All three elevation patterns would work equally well for an LPFM station. The nulls found on the two and three bay patterns are not a problem since they are so close to the tower. There would be enough signal level at those locations to receive a great signal. The majority of the listeners are located between -0.50 degrees and -2.00 degrees. All three patterns cover this area very well.

So coverage being equal, what are the tradeoffs between the three elevation patterns we have looked at ?

There are two tradeoffs to look at when comparing the three elevation patterns. One is the amount of room or space you have to mount the antenna, and the second is the amount of transmitter power needed to make your 100 Watt ERP.

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Here is a comparison of the amount of space needed to mount a single bay antenna, a two bay model and a three bay model. We will assume that the station is on 98.1 MHz and needs a 120 foot long piece of transmission line. We will model LDF4-50A flex line, which has a loss of -0.784 dB (83.5% efficient). The ERP is 100 Watts, and we are running circular polarization.

Single Bay FML antenna

Minimum Vertical space needed: 120 inches
Optimal Vertical space needed: 150 inches
Transmitter power needed: 249.5 Watts

Two Bay FML antenna

Minimum Vertical space needed: 240 inches
Optimal Vertical space needed: 360 inches
Transmitter power needed: 120 Watts

Three Bay FML antenna

Minimum Vertical space needed: 360 inches
Optimal Vertical space needed: 480 inches
Transmitter power needed: 79 Watts

Each of the three antenna solutions we have looked at will produce the best possible coverage for your new station. The difference are the amount of space you have to mount the antenna and the size of transmitter you want to run. If there LPFM antenna questions, please call us at (207) 786-2000 or email us at: info@micronetixx.com. We will be glad to share our many decades of antenna engineering knowledge with you to make your new LPFM station shine.

Alternates to ERI DTV antennas

If you have been looking at an ERI DTV antenna, Micronetixx may well have a better solution for you. We are in full production of DTV and FM antennas along with our diverse industrial microwave products. We also have a full schedule of R&D projects and will be announcing several new antenna technologies later in the year.

For DTV applications, we build an impressive array of slotted VHF (Band III) and UHF (Band IV) antennas. Our antennas use standing wave pylon technology for wide bandwidth and have virtually no differential group delay over the channel.

For lower power antennas, we offer a much wider range of choices over the ERI AL or ALP series slot antennas. The antennas come in 4 to 12 bay end fed models with an input power rating of up to 5.5 kW. Plus we build these antennas in one bay increments – so a 7 or 10 bay model is standard to us. We can match the ERI azimuthal patterns or engineer a custom pattern to more closely meet your needs. Elliptical and Circular polarization are available on all models.

For higher power UHF models we offer the **CS** series of antennas for side mount applications, and our **DL** series for top mounted applications. These are true center fed antennas for the lowest differential group delay (under 7 nS) across the channel. We offer a large choice of azimuth patterns and customize beam tilt and null fill in each antenna to meet your exact needs. Elliptical and Circular Polarization are available on all models, including a choice of pressurized and unpressurized radome systems.

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Input power ratings from 7.5 to 65 kW are available. Our top mounted models can be stacked with other **DL** series UHF or **TPV** series VHF antennas.

Is RFR a problem at your site, or is potential RFR (NIR) not letting you build where you want ?. Our **SFN** series of UHF antennas have up o 25 dB less RFR at high depression angles as compared to similar sized standard UHF slot antennas. End fed models up to 10 bays are available and larger antennas are center fed. They are available in 8 to 24 bay counts in two bay increments. We are the only antenna company to produce this innovative technology.

Looking at VHF (Band III) ? We offer a line of slotted pylon antennas as well as batwing style antennas. Our slotted **TPV** series VHF pylon antennas use the same time tested standing wave pylon technology to deliver an excellent V.S.W.R. and low group delay profile across the channel. They are available in side and top mounted models, Elliptical and Circular polarization are available.

If RFR is an issue with your station we also offer a low RFR version our VHF slot antenna, called the **TPV-SFN**. The **TPV-SFN** produces 10 to 20 dB less RFR than the standard models. Elliptical and Circular polarization are available.

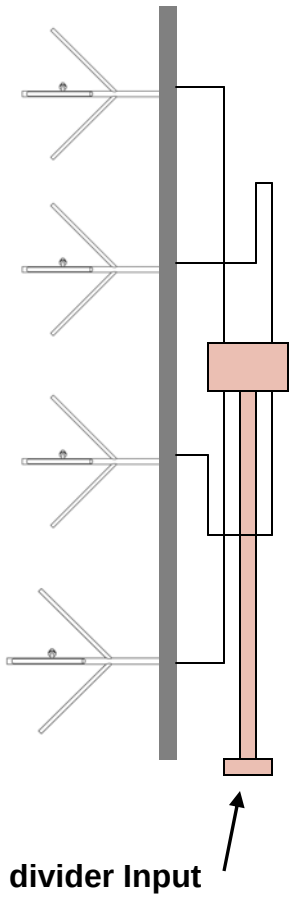
Our Batwing antennas are available for low and high band VHF. They can be built with standard bay or reduced bay spacing to reduce RFR. The antennas can also be scaled to the channel or channels of interest to improve the elevation pattern.

So if you have an application for a new DTV antenna come check us out. We love to engineer solutions that provide you the best coverage.

FM Antenna Engineering: Branch fed antennas

MICRONETIXX COMMUNICATIONS

This month we are going to talk about one style of transmitting antenna that is branch or parallel fed. Each bay of the antenna is fed from an input power divider by equally phased feed lines.



Power divider Input

Pictured to the left is a depiction of a 4 bay branch fed FM antenna. Each bay is receiving 1/4th of the power that is presented to the input power divider. If each antenna bay has a rating of 4 kW, a properly sized input power divider would give a 16 kW input power rating for the array.

A popular type of power divider uses a multi-stage Chebyshev design. For FM applications a two stage divider has enough bandwidth to cover the FM band. Going to a higher order divider will provide additional bandwidth.

Branch fed antenna bays are fed in phase. The in phase relationship is present at all depression angles. End fed antennas on the other hand do not maintain an in phase relationship as there is a transit time between the feed point and the last bay. The longer the end fed antenna, the larger phase delay will be in the antenna. The in phase relationship of the branch fed antenna is constant and does not change with different antenna bay counts.

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Branch fed antennas also have better bandwidth than their end fed cousins. The better bandwidth also translates to flatter gain over a given frequency band. That is an advantage for digital services that can be impaired as gain and phase of the antenna varies.

Pictured to the left is a pancake style power divider. This one is for FM and has a 3-1/8” EIA input. The divider is 10 feet long.

A simple branch fed FM antenna up to 10 bays can be built using a single power divider. Larger antennas will need three or more power dividers. Is there a difference in reliability of a branch fed versus end fed antenna ? Not really. An 8 bay branch fed antenna needs 8 interconnect cables, while a end fed model would need 7 cables connecting bay to bay. In either a branch fed or end fed antenna there are very small losses from the feeder cables. The power divider itself also has a very small loss. A lot of the loss is offset by the signal going to each bay only needing to pass though two connectors, rather than up to 14 connectors on an 8 bay antenna.

Next month in the April newsletter, we will look at end fed antennas.

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