Welcome to AntennaSelect™ Volume 25 – April 2016

Welcome to Volume 25 of our Newsletter, AntennaSelect™. Every two months 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:

SFN ~ Low RFR Antennas – Some Questions Answered:

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In the last issue of AntennaSelect we discussed our **SFN** series of low RFR antennas. A few questions were raised about the improved gain of these antennas as compared to standard slot antennas. The Micronetixx **SFN** series of antennas uses double the number of radiating centers compared to other designs.

The **SFN** design has on average 10 to 15% higher elevation gain per bay than a similar sized standard antenna. We are going to take a look at a elevation pattern of a Micronetixx **TPV** series high band TV antenna, versus a **TPV-SFN** antenna. We will use a 6 bay **TPV** and a 5 bay **TPV-SFN** in a comparison.

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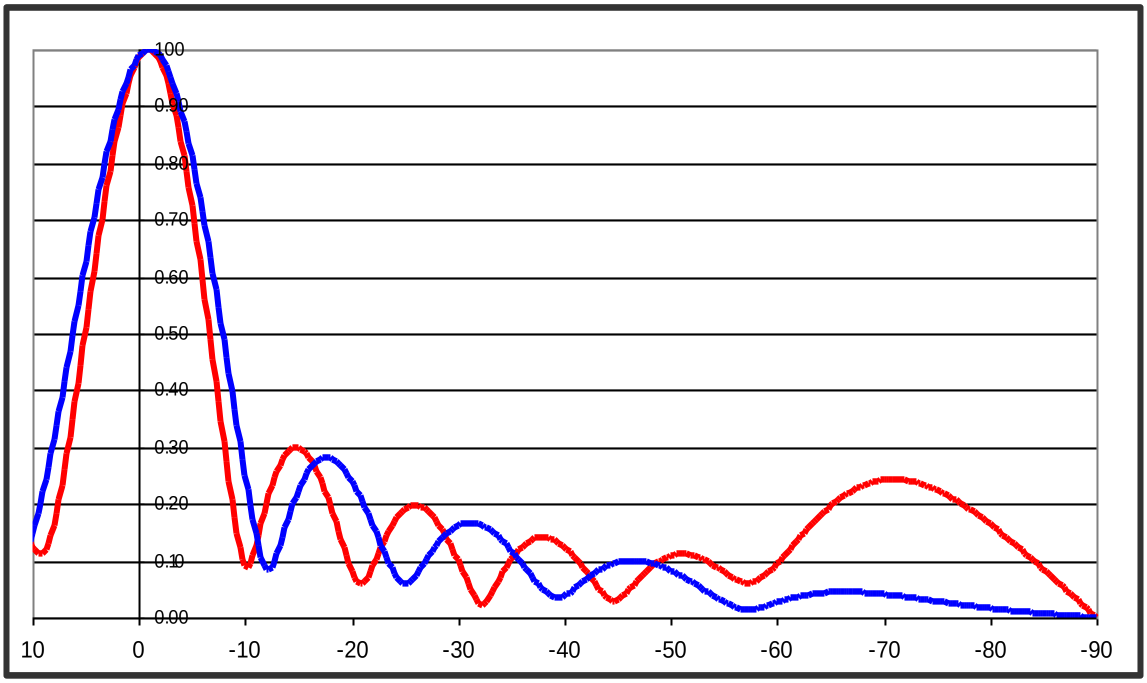
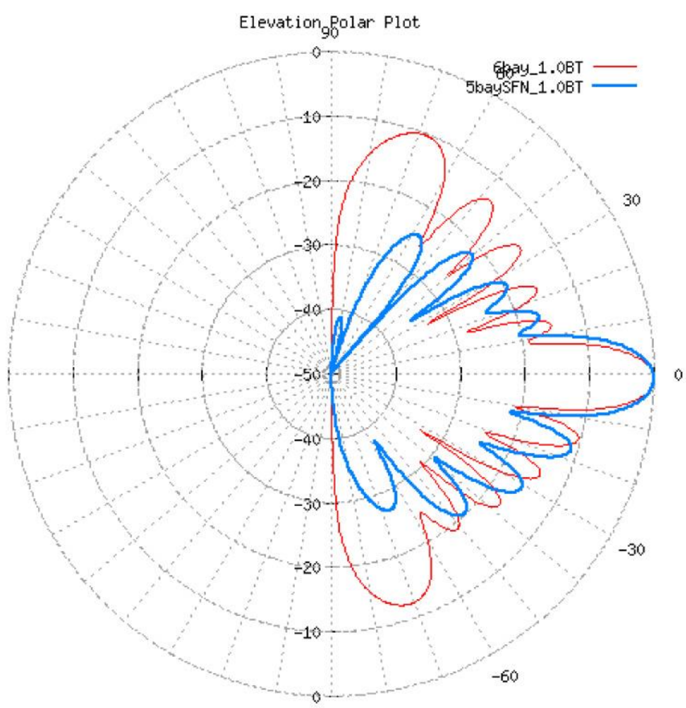
The first plot is a 6 bay **TPV** antenna with one degree of beam tilt, versus a 5 bay **TPV-SFN** antenna with one degree of beam tilt. The 6 bay plot is in RED, the 5 bay plot is in BLUE.



The elevation gain of the **TPV** antenna is 6.00, (7.78 dB), while the 5 bay **TPV-SFN** antenna has a gain of 5.95, (7.74 dB). Since the **TPV-SFN** has greatly reduced high angle grazing lobes (in this case, around +/- 70 degrees), the aperture efficiency of the array increases substantially.



To the left is the same set of elevation patterns shown in polar form. The **TPV-SFN** antenna, (Blue), produces much higher radiation at lower depression angles – hence the higher elevation gain and up to a 25 dB reduction in RFR hitting the ground.

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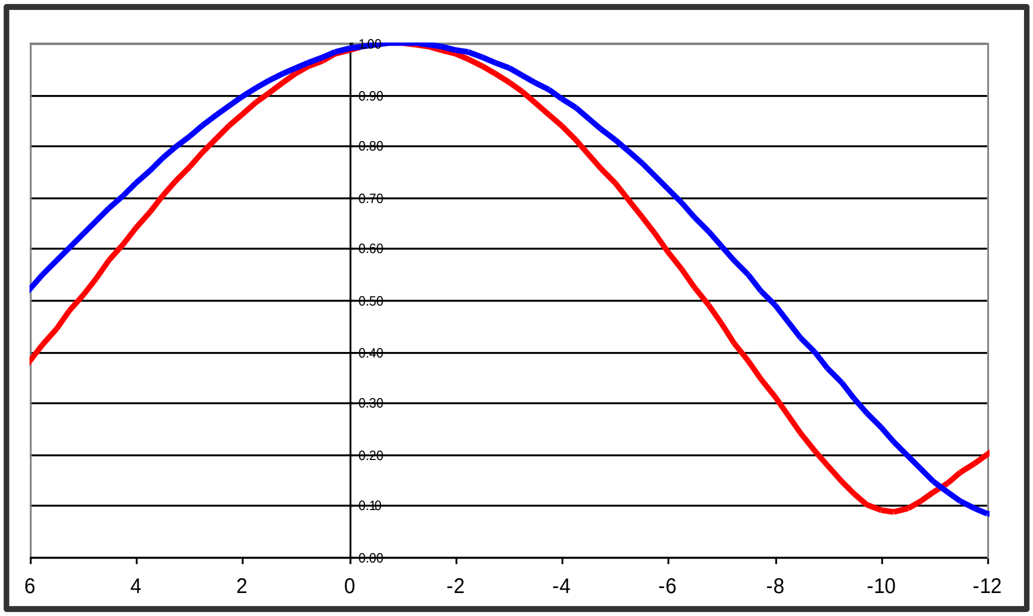
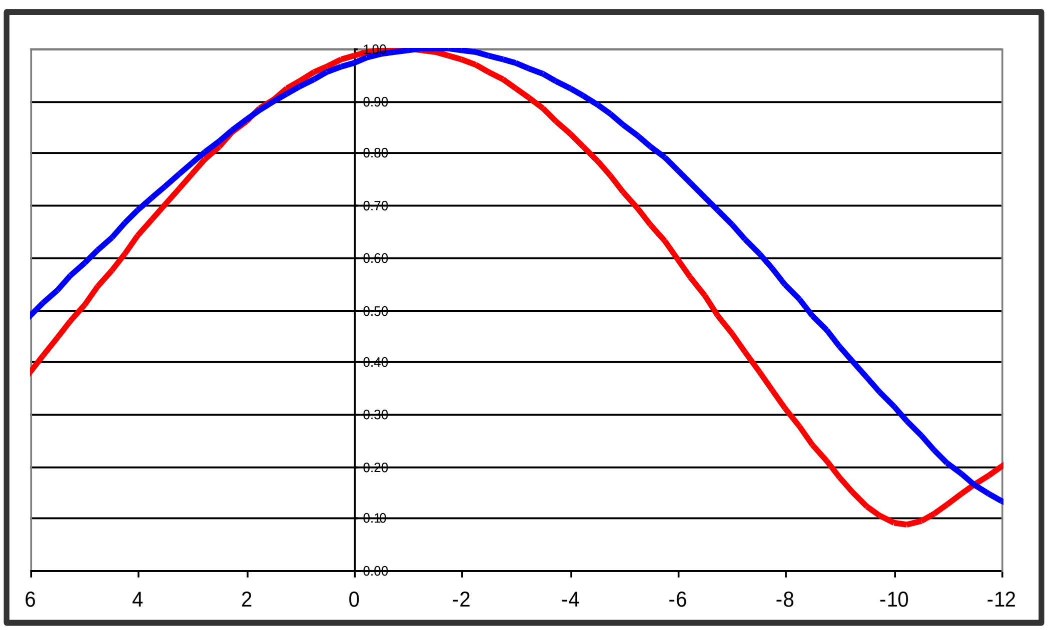
Let’s zoom in on the two elevation patterns for a closer look:



The beam tilt of both antennas on the upper plot is 1.0 degree. In the lower plot we have changed the beam tilt of the **TPV-SFN** 5 bay antenna to 1.5 degrees. The gain of the antenna did drop slightly to 5.80, (or 7.63 dB). Note the field values are up to 30% higher at some depression angles, compared to the standard 6 bay antenna.



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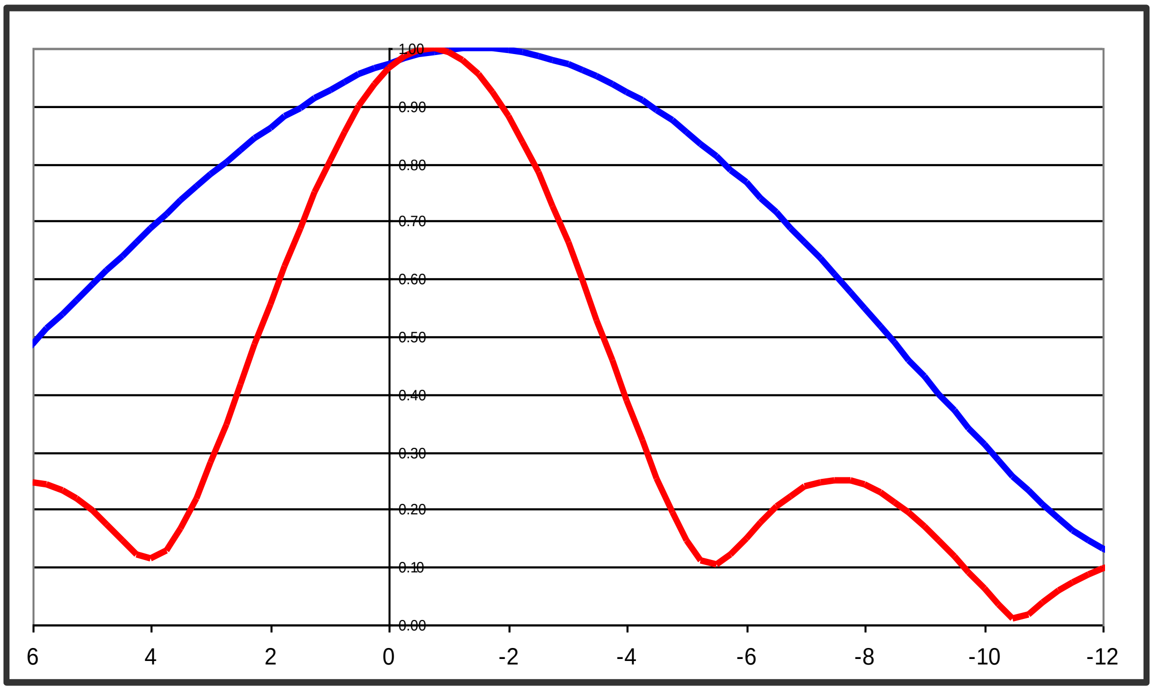
In going from a 6 bay standard antenna to a 5 bay **TPV-SFN** antenna with a higher beam tilt angle, the gain has dropped slightly, (approximately 0.15 dB). The half power point of the pattern has dropped from -5.25 degrees to -6.75 degrees.

Just for fun let's compare a 12 bay batwing antenna to the new 5 bay **TPV-SFN**. We will set the beam tilt of the batwing at 0.75 degree. The **TPV-SFN** is set at 1.5 degrees



If you are currently using a 12 bay batwing, going with a lower gain **TPV-SFN** antenna will greatly enhance reception in urban and hilly areas. The lower gain **TPV-SFN** will provide up to 70% more field at low depression angles. This will greatly help with building penetration. As we have said before, adding elliptical polarization is just icing on the cake in helping to get your signal to viewers.

And with ATSC 3.0 coming, there will be more mobile reception possibilities. Hand held devices work much better receiving elliptically-polarized signals.

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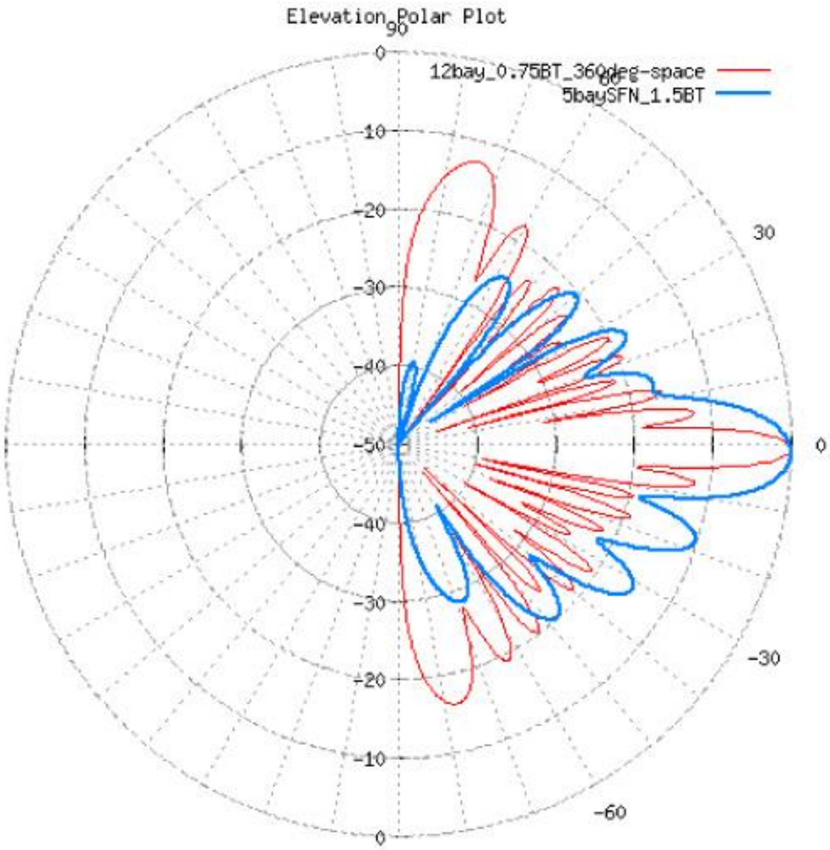

Here is a polar plot of the 12 bay batwing (RED) and the 5 bay **TPV-SFN** antenna with 1.5 degrees of beam tilt. Even with the 12 bay antenna there is a lot of signal wasted in the two high angle grazing lobes. These lobes do nothing more than fire more RF into the ground near the tower, and also wastefully up into space.

The SFN antennas can also reduce loads on towers. In the case of a high band top-mounted antenna, the weight may be reduced by up to 1000 pounds and the height reduced by 5 feet, versus a higher bay-count standard slot antenna. Side mounted models will also be about 5 feet shorter, and up to 100 pounds lighter, (using an antenna that is shorter by one bay).

We build the **TPV-SFN** antennas starting at 2 bays, in 1 bay increments up to 6 bays, and in 2 bay increments up to 12 bays. If you do have RFR problems at a multi user site, the **TPV-SFN** will help to mitigate the problem, reducing RFR exposure by up to 25 dB.

If you would like some scenarios run with your current antenna and a new Micronetixx **TPV-SFN** antenna, please let us know. We will be glad to run some innovative solutions for you. Getting your signal to as many viewers as possible is job one, and we know how to do it.

Elliptical Polarization: – Weight & Windload Differences…You May Be Quite Surprised!

On slotted antennas in some cases the increase in weight and wind load area are very small. The additional load that an Elliptically- or Circularly-Polarized Antenna adds is identical for both Polarization Profiles. The "polarizers" themselves are precision-tuned stainless steel elements that are DC-grounded and are slot-balun driven, **NOT PARASITIC**, (Micronetixx-Patented), at each radiating center in the array. Regarding Tower-Loading; on an 8 bay side-mounted UHF slot antenna, rotational-polarization, (either E/P or C/P), would add only about 10 pounds to the overall weight. That same weight increase would also apply to a top-mounted antenna. In addition, **everything** in the entire Antenna is DC-Grounded for superb lightning protection.

All of our UHF slot antennas have a partial to complete radome system covering the slots and polarizer elements. Depending on where the antenna is being installed, the radome design may be extended to provide more clearance between the radome and the radiating centers in the array. This is done in areas where there is more chance of ice forming. With the 8 bay UHF slot antenna, a larger radome may add 10 pounds to the antenna weight, and approximately 1 to 2 sq. feet of additional surface area.

With top-mounted antennas, depending on the azimuth pattern, we can offset the pylon in the radome when we use a full coverage design. This results in no change of radome weight or surface area.

Since we do not have a standard one-size-fits-all radome system, we can optimize the design to ensure that the antenna produces a pure in phase-quadrature signal under all weather conditions. Let us design a solution for you. Call us today !

Changing Channels? …How Large is The New Antenna?

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With the spectrum repack not too far down the road, a question often comes up; How big will the new antenna be ? Still, with the unknowns of a band clearing plan, and new channel assignments, the answers are still not there. So lets look at a few cases or “what ifs”, and show you how to do some basic length calculations.

Lets look at a station that is on channel 41, using a side mounted 24 bay UHF slot antenna. We will use our mechanical data to start with. Other manufacturers’ data may vary by a foot or two, depending on the feed system and antenna technology they use.

Our channel 41 antenna comes in at 41.8 feet in length and the array is center-fed. Looking ahead, channel 27 looks like a possibility. With slot antennas the bay to bay spacing is approximately one wavelength. At channel 41 the spacing is 18.76 inches (11803/641 MHz). So for 23 bay to bay spacings, times 18.76 inches, that works out to be just under 36 feet. Being center-fed, and with a some extra aperture to symmetricise the radiation pattern past the end slots, the answer is very close to the 41.8 feet.

So we now calculate the length of the channel 27 antenna. The wavelength of channel 27 is 21.42 inches (11803/551 MHz). Multiply that by 23, and the answer is 41 feet. Add in the additional length as above for pattern symmetry and center-feed, and the total length of the antenna is 47.7 feet.

So looking at the tower drawing, there is not 47 feet of free space where the old antenna is. Murphy’s law is alive and well. So if we went to a smaller antenna – lets say a 22 bay, how long would the antenna be? Since we are dropping two bays we would take 2 times 21.42 inches (the wavelength at channel 27).

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So the answer is 42.84 inches. Subtract that from the 47.7 feet and the new antenna is just over 44 feet long. It fits the free space perfectly.

Now what did we lose in gain? The elevation gain of slot antennas range from about 1.05x per bay to about 1.0x per bay, depending on beam tilt and null fill selections. So using 1.03x per bay as a reference, the 24 bay antenna had an elevation gain of 24.72 (13.93 dB), while the 22 bay antenna will have a gain of 22.66 (or 13.55 dB).

Let's look at one of our small end-fed antennas. At channel 27, an 8-bay antenna is about 16-1/2 feet long (7 bay to bay spacings, plus 48 inches). We build these antennas in 1 bay increments. To figure the length, add or subtract one wavelength, (at channel 27; 21.42 inches) for each bay added or subtracted. An 11-bay antenna would be 21.8 feet long, while a 7-bay antenna would be 14.8 feet long. The same average gain applies to these antennas. If you are coming up short on space and a little low in gain, our SFN antennas in the previous article may be your answer. They have an elevation gain per bay of 1.1x to 1.5x. A 7 bay standard antenna would have an elevation gain of about 7.21 (8.58 dB), while an SFN antenna would have a gain of 7.84 (or 8.94 dB).

If you do not want to run the math yourself, we will be glad to run some "what ifs" to help you plan for the changes ahead. Give us a call and we will come up with innovative ideas for the times ahead.

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

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