Welcome to AntennaSelect™ Volume 2 – September 2013

Welcome to Volume 2 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:

- **How beam tilt in a slot antenna is created**
- **Treating Aluminum to stand up to the elements**
- **Introducing two new low power FM antennas**

How beam tilt in a slot antenna is created

There are two types of beam tilt used in slot antennas. One is electrical beam tilt were elements are short spaced or a feed line length is offset. The other is mechanical beam tilt, where the antenna array is tilted slightly from a true vertical position. In today's article we will use electrical beam tilt to design an antenna. Let's look at one method.

We will start out with modeling a 10 bay slot antenna, and applying electrical beam tilt in steps until our finished antenna has 0.70 degree of beam tilt.

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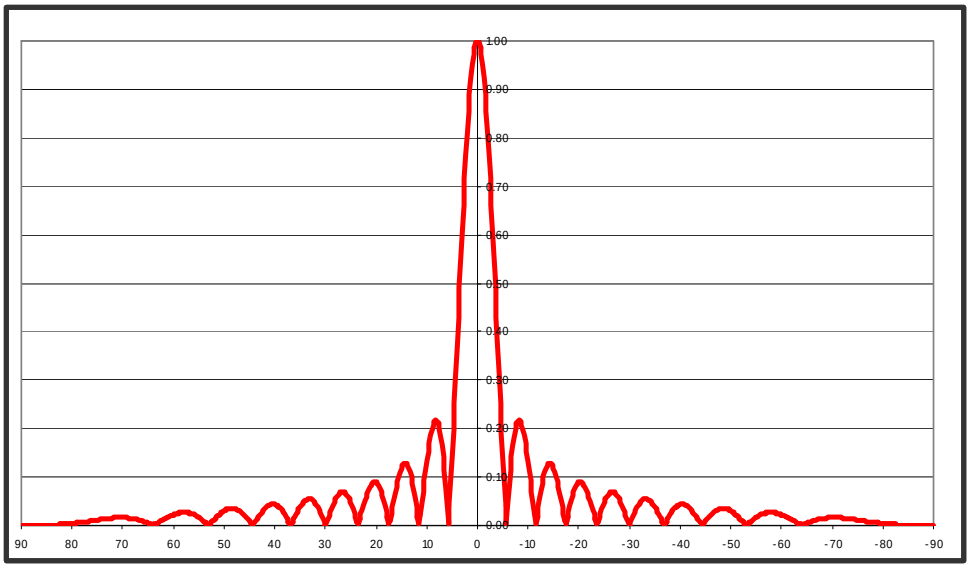
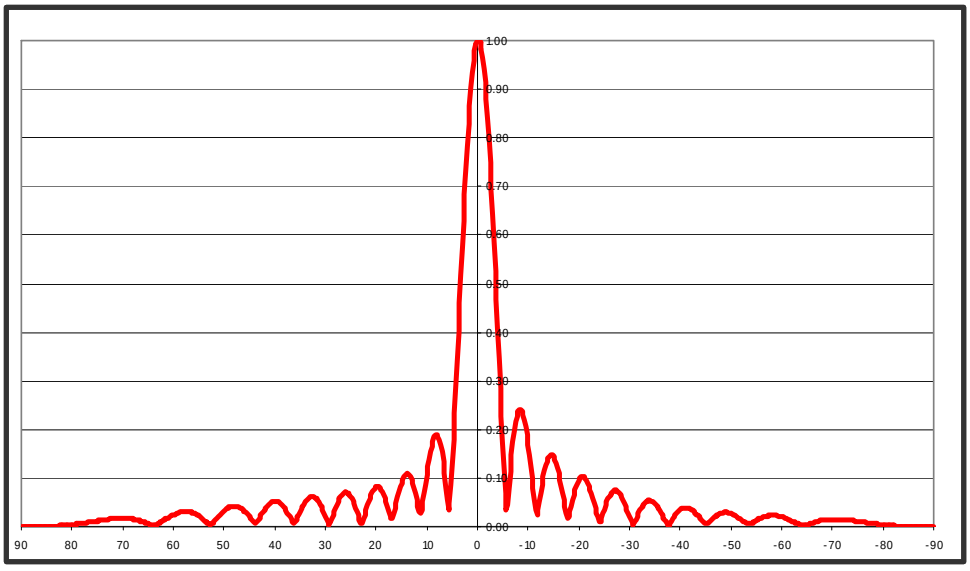


Example 1

10 Bays
No Beam Tilt
No Null Fill
Gain = 12.36 (10.92 dB)
Array Electrical Length Is 3420 degrees

The 10 bay elevation pattern above has no beam tilt and first null fill. In example 2 below we will start to add beam tilt. .



Example 2

10 Bays
0.25 Degree Beam Tilt
3.3% First Null Fill
Gain = 12.27 (10.89 dB)
Array Electrical Length Is 3380 degrees

The upper two slots have had their spacing reduced by 20 degrees. The array now has 0.25 degrees of electrical beam tilt and the first null has been raised from 0.0% of peak field to 3.3%. The second, and third nulls have been increased slightly from 0.0%. The elevation gain has dropped slightly to 12.27 and the electrical length of the array has dropped by 40 degrees to 3380 degrees.

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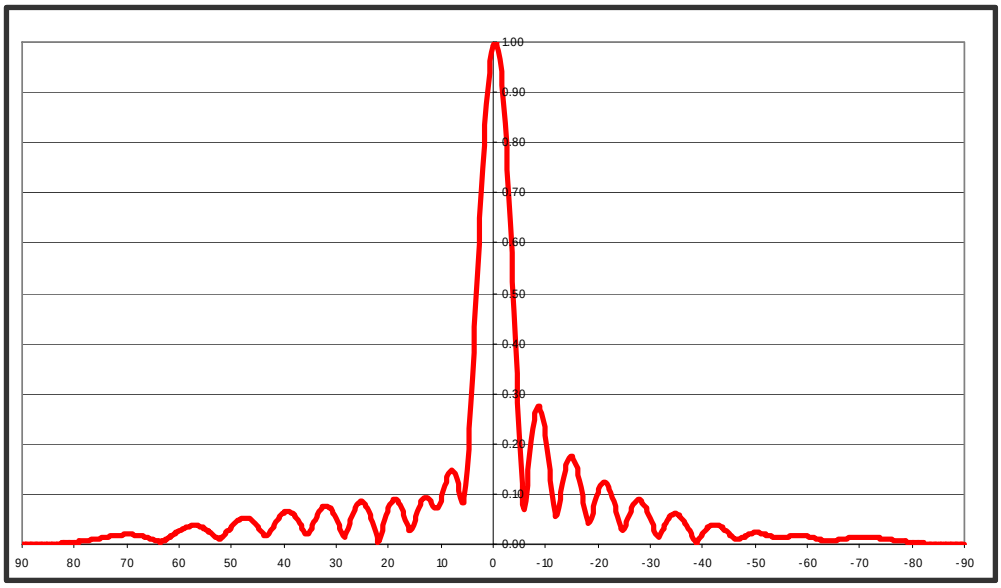
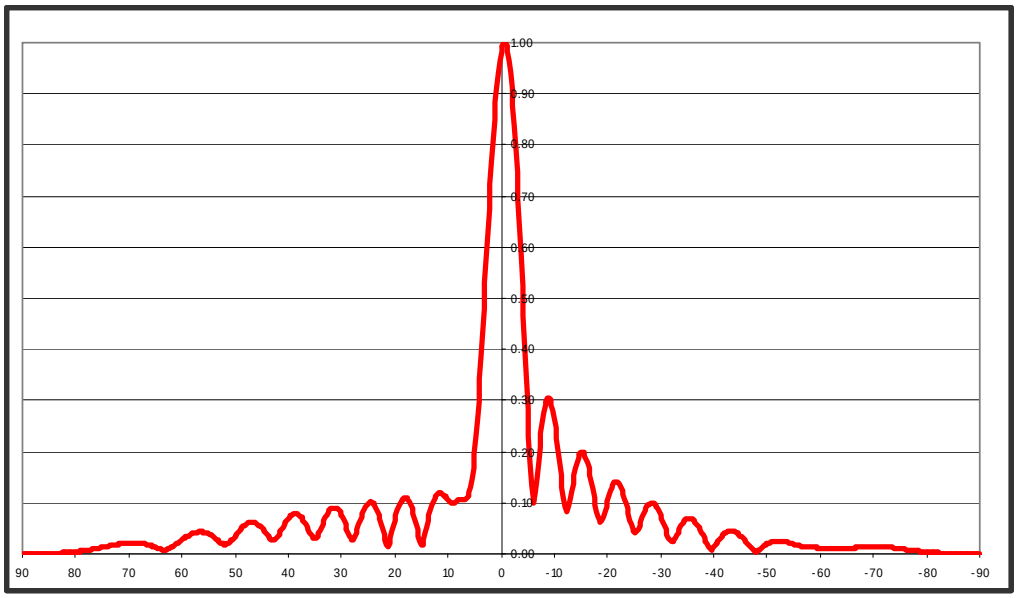


Example 3

10 Bays
0.50 Degree Beam Tilt
6.7% First Null Fill
Gain = 11.85 (10.74dB)
Array Electrical Length is 3324 degrees

The upper two slots have had their spacing reduced by 48 degrees. The array now has 0.50 degrees of electrical beam tilt and the first null has been raised from 0.0% of peak field to 6.7%. The second through fifth nulls have been increased slightly from 0.0%. The elevation gain has dropped slightly to 11.85 and the electrical length of the array has dropped by 96 degrees to 3324 degrees.



Example 4

10 Bays
0.70 Degree Beam Tilt
10% First Null Fill
Gain = 11.18 (10.48 dB)
Array Electrical Length is 3268 degrees

We increased the short spacing of the top two slots to 76 degrees. Our finished design now has a beam tilt of 0.70 degree and 10% first null fill. It is a very nice pattern for a variety of applications.

Treating Aluminum to Stand up to the elements

The majority of side mount slotted antennas are made from extruded Aluminum tubing. Aluminum tubing is a strong stable material. However just like steel, Aluminum can corrode. To help protect against corrosion, Aluminum can be treated by a process to put a protective finish on it. The picture below is a piece of untreated 6061-T6 Aluminum left outside for a year.

To protect Aluminum, a chemical treatment system called a chromate conversion can be used. Of the various processes, the MIL-C-5541-CLASS 1A treatment system provides the best corrosion resistance.

At Micronetixx, we have a multi-step process to finish and protect the Aluminum surfaces of the products we make. Once we have fabricated the product, step one is to buff the surfaces with an orbital sander. The buffing operation does two things:

It removes the hard layer of aluminum on extruded components and cleans surfaces of impurities deposited by handling the

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material, and processing it. The burnished surface will permit a much more uniform treatment in the conversion process. If the piece is to be painted, the extra step we take ensures superior adhesion of paint. The photo below shows the burnished finish.

After the burnishing process is complete, the Aluminum product is given an alkaline bath in a long trough like tank. This allows emersion of the entire assembly in one pass. After the alkaline bath the product is given a rinse in a second long tank. The product is then dipped in a warm solution of a chromate conversion chemical to finish it. The solution in the tank is kept at a constant temperature via a series of pumps and heaters. Chemical tests are done on a regular basis to ensure proper strength of the alkaline wash and chromate.

The pictures on the following page show a chromate finished slot antenna, and a slot antenna that has been painted over the treated finish. In addition to paint finishes, these antennas may also be powder coated. The added finish ensures long life in places with high marine humidity.

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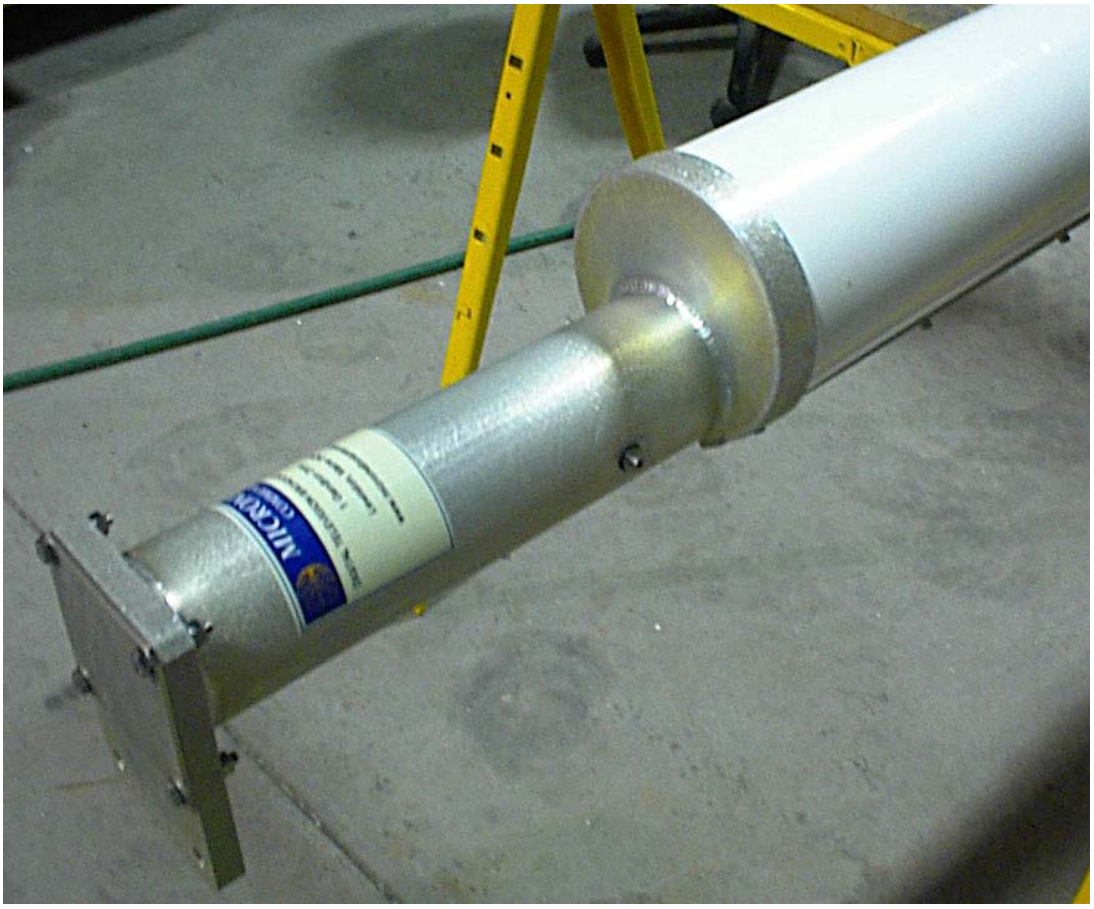
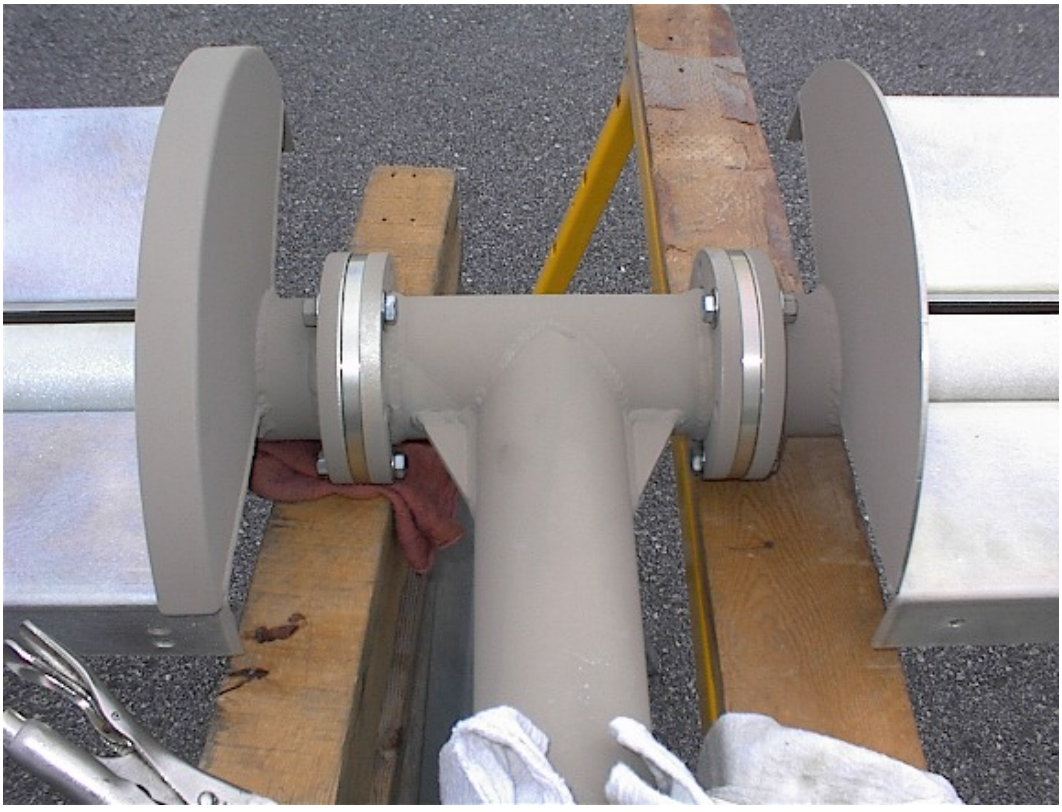


Antenna with class 1A surface treatment



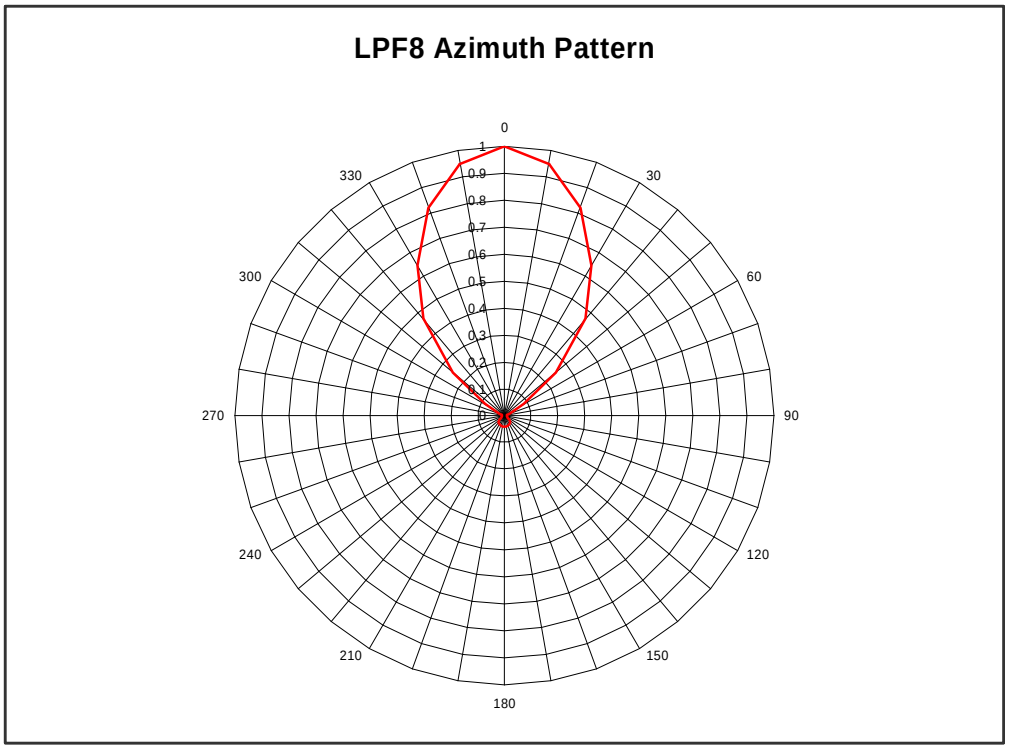
Treated antenna with painted finish

Two new low power FM antennas

We are introducing two new low power FM antenna models this month. The first antenna is an 8 element log periodic antenna, with an input power rating of 500 Watts. The second antenna is a compact C/P narrow band, omni-directional antenna.

LPF8 The LPF8 antenna is a broadband FM log periodic antenna with an input power of 500 Watts (50 Ohm model). The antenna has a power gain of 5.0 (7.0 dB) and a 78 degree beam width. Average front to back ratio is 20 dB.

The antenna is built to withstand harsh conditions, and is rated at a basic wind speed of 150 M.P.H. (240 K.P.H.). The boom and elements are made of thick wall aluminum tubing and are given a class 1-A chromate treatment to ensure a long service life.



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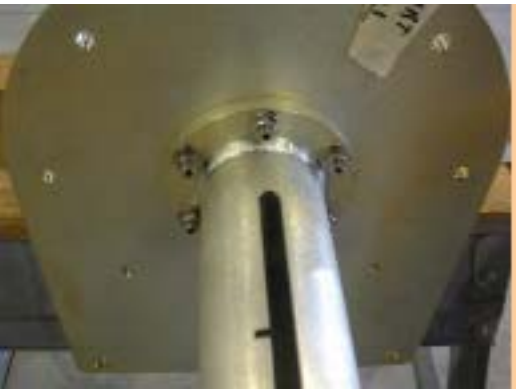
Additional azimuth patterns may be formed by the use of additional LPF8 antennas. The antenna may also be mounted vertically. A 75 Ohm version is for receive and CATV applications is also available.

FML The FML series are compact narrow band C/P FM antennas, with an input power rating of 500 Watts. The lightweight, but rugged design makes this antenna perfect for translator and low power applications. The antennas are built with stainless steel and mount to a nominal 2 to 3 inch pole.

The gain of a single bay is -0.48 (-3.20 dB). A two bay model – FML-2 has unity gain, The input is via an “N” connector. The antenna has excellent horizontal to vertical Omni-directional azimuth circularity and produces right hand circular polarization.

The compact weight and wind load of this antenna allow it to be mounted on building roof tops. Installed weight per bay is under 5 lbs (2.3 kg.). Wind load is less than 0.5 square feet (EIA-222F). The survival rating is 150 M.P.H (240 K.P.H.). For best operation the antenna should have a minimum clearance of 5 feet (1.5 meters) above and 5 feet (1.5 meters) below the ends of the antenna.

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



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