
## Welcome to AntennaSelect™

**Volume 6 – January 2014**

Welcome to Volume 6 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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- **What is beam sway in an antenna ?**

## LPFM antenna mounting tips (part II)

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We are getting a number of questions about optimal mounting of LPFM antennas. Many of the new LPFM broadcasters have limited options on where to put their antenna. With only a maximum power of 100 Watts, there is no power that can go to waste. So let’s look at a few cases and see what can be done to ensure the best possible coverage. In a number of cases, just moving the antenna by a few feet or a meter can make a big difference..

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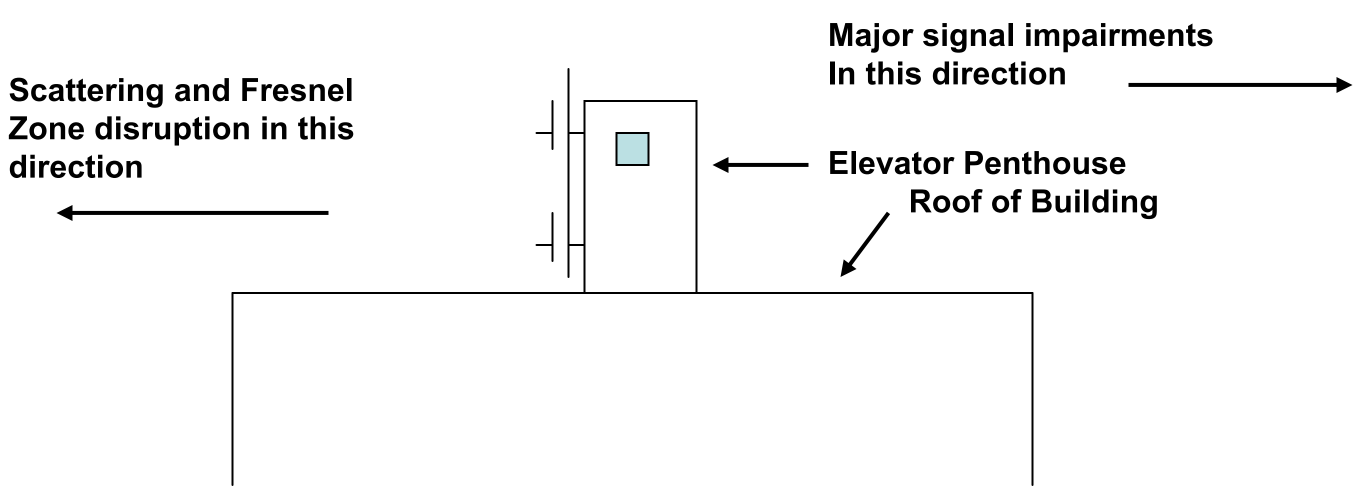
The first example is a two bay C/P antenna mounted on an office building. The building has an elevator penthouse that is 17 feet higher than the roofline. Could the antenna be mounted on one side of the penthouse ? There are two problems with this approach.

First the two bay antenna (using 98 MHz as an example) needs 240 inches (20 feet or 6.1 meters) of free vertical space. That would put the end of the bottom bay just a foot or so off the roof. The antenna would most likely be de-tuned. Also being that close to the roof the antenna would not be able to launch a good C/P signal, and the Fresnel zone disruption might reflect the signal above the radio horizon, the one place where the listeners are not.

The second problem is the Omni-directional characteristics of the antenna now resemble a very scattered cardioid antenna. Attenuation of 20 dB or more to the rear of the antenna would be likely. Scattering in the forward direction can easily be as much as 10 dB. This translates into having an ERP of only a few Watts in some azimuths and maybe not even below the radio horizon.

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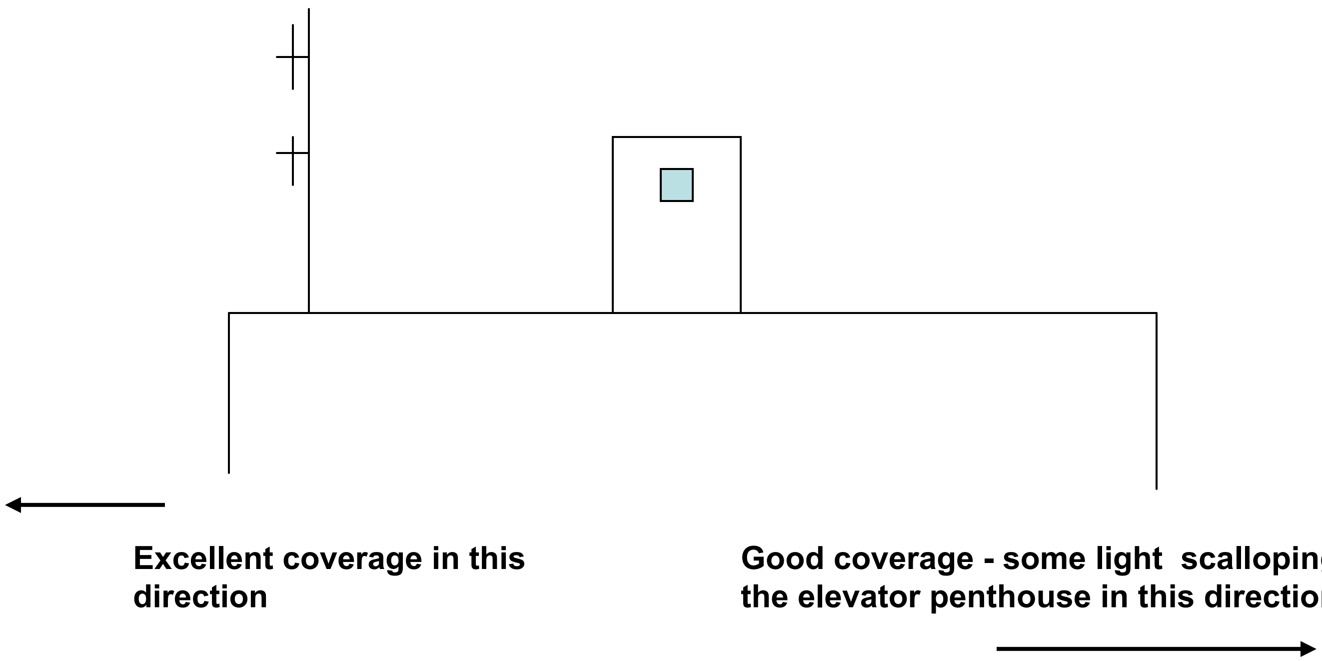
A second option would be to mount the antenna on a monopole away from the elevator penthouse. The monopole should be as faraway from the penthouse as possible. The bottom tip of the bottom bay of the antenna should be 1-1/2 wavelengths - 180 inches (15 feet or 4.6 meters) above the roofline if at all possible. If the majority of the population is in one direction from the building, try to mount the antenna on that side of the roof.




If the antenna needs to be mounted to the elevator penthouse, ensure that the bottom bay of the antenna is at least 10 feet (3 meters) above the roof of the penthouse. Most important in rooftop installations is to have the support mast and cable well grounded to the buildings lightning protection system. Contact a licensed electrical contractor or tower installer for more details. Proper bonding and grounding of your antenna is money well spent.

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Another question that has been asked is, can the antenna be mounted on the church steeple ? One reader pointed out they already had several cell service antennas in place above the roofline and below the steeple.

Mounting the antenna to the steeple is very much like the issues we looked at on the previous two pages, where the antenna was going to the be mounted on a roof of the building with an elevator penthouse.

Cell phone antennas are directional and only emit 3 to 10% of peak energy off the back side of the antenna. They can be mounted to a number of types of structures will minimal azimuth pattern disruption.

LPFM antennas are Omni-directional and emit the same amount of energy in all directions. Hence mounting them on the steeple will cause the same sort of pattern distortion as the elevator penthouse did in the previous example.

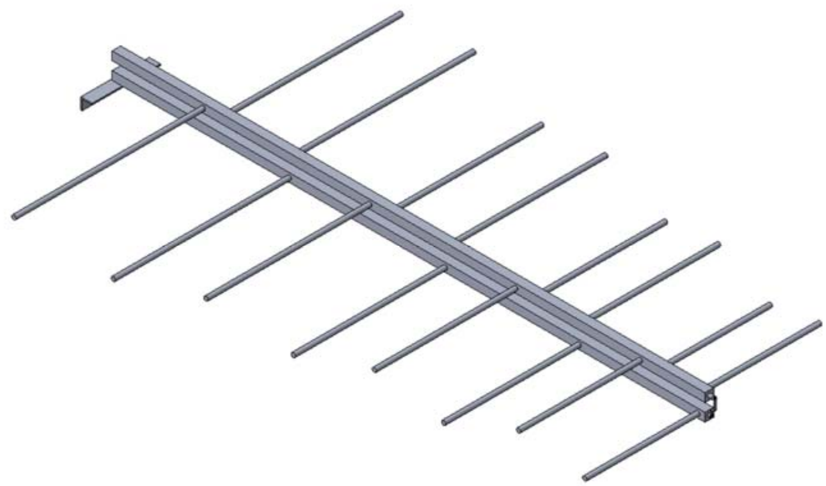
A much better way to mount the antenna, is to use a monopole or small face width tower. A two bay C/P antenna such as our **FML** series weighs about the same as a consumer TV antenna. We looked at one application where the church had a ridged roof that was 40 feet above street. The antenna needed to be mounted 30 more feet above that to get the licensed 30 meter average height above terrain.

Solution ? A 70 foot small face tower will be installed at the rear of the church and attached to the building. This will ensure excellent coverage, much better than if the steeple had been used. Have questions about mounting our FM antennas ? We love to help our new LPFM customers get the best reception possible.

# LPF8 FM Broadband Log Periodic Antenna

We have had requests for a very rugged FM broadband (88 to 108 MHz) log periodic antenna from a number of domestic and international customers. Our new **LPF8** FM broadband antenna meets those requests. The **LPF8** is the most rugged antenna in it's class. It features a heavy wall dual boom and solid elements. The LPF8 has a gain of 5.1 (7.0 dB), with a half power beamwidth of 52 degrees. We build the antenna in two versions, rear mount and center mount. The rear mount version may be mounted vertically.

A rear mount version of the **LPF8** is shown on the right. The 50 Ohm version has an "N" input connector and has a input power rating of 500 Watts. The 75 Ohm version has an "F" input connector and has a rating of 250 Watts.



The mounting brackets are stainless steel and fit a 2 to 3 inch nominal pipe. For horizontal rear mount applications, a metallic strut is furnished. For vertically mounted applications, a non metallic strut is furnished. The finish of the **LPF8** is a rugged Class 1-A chromate treatment to ensure the long service. This finish also makes it easy to paint the **LPF8** to meet architectural requirements. We can supply the antenna pre painted as an option.

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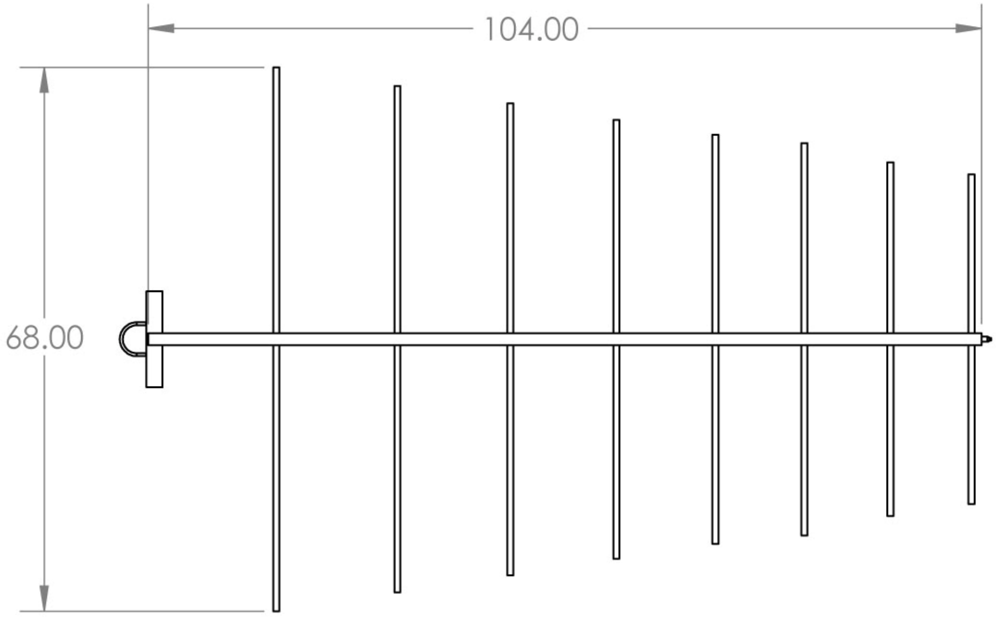



**LPF8 rear mounted dimensions (inches)**

The azimuth pattern is a tight cardioid. Multiple **LPF8** antennas can be used to create wide cardioid and peanut patterns. We can create other custom patterns as needed. Multiple H and V polarized **LPF8's** can be combined to provide dual polarization.

With an average front to back ratio of 25 dB, it makes a great receive antenna for translators and CATV systems.

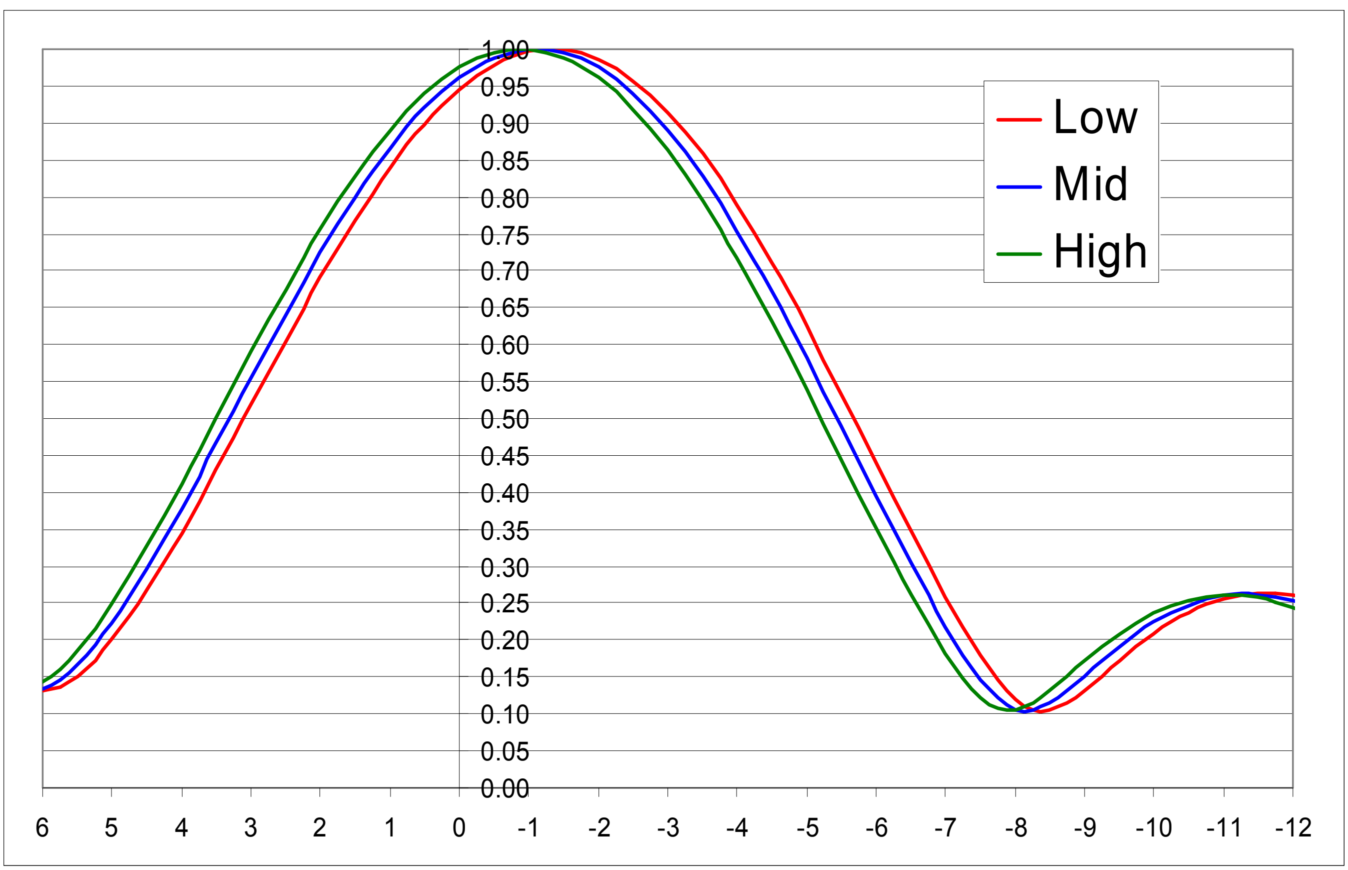
The **LPF8** is shipped partly assembled. The elements bolt to the main boom. The double boom structure and feeder cable are pre-assembled. There is no field tuning needed. The **LPF8** ships in a slim line carton to reduce shipping cost.

If one of the elements does fail from falling ice, a replacement can be ordered from the factory and the new element can quickly be installed. With rugged solid elements and a basic wind zone rating of 150 M.P.H. (240 K.P.H.), we are not expecting to sell very many replacement elements.

# Beam Sway in slotted pylon antennas

Beam sway is the difference in the antenna elevation pattern over its designed operational bandwidth. Slot antennas are designed to have slots spaced at 1λ (360 electrical degrees) or 1/2λ (180 electrical degrees). Usually this spacing is set for the middle of the intended operational band. As the frequency is decreased or increased from that point, the elevation pattern changes slightly.

We are going to look at two antenna examples, an 8 bay half wave spaced antenna, and a 10 bay half wave spaced antenna. Both of these were modeled at channel 35. The plot below is the 8 bay antenna, with a beam tilt of -1.25 degrees.

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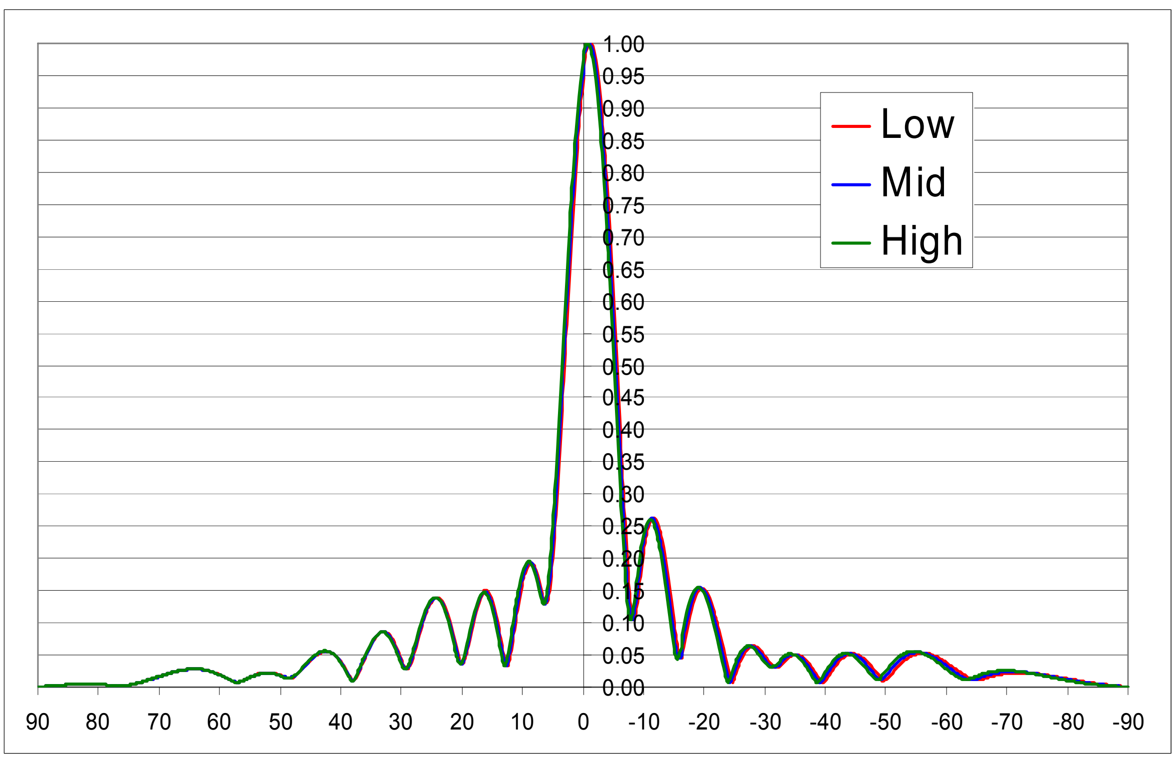
The **BLUE** trace is at the center of the channel, the **RED** trace is at the lower channel edge, and the **GREEN** trace is at the upper channel edge. Why the small differences in the elevation pattern ? At the center of the channel, the slot spacing is 1/2λ or 180 degrees. When we run the spacing for the bottom edge of the band 3 MHz down, the 180 degree spacing between slots is not maintained. The spacing slot to slot at the lower band edge is 179.1 degrees. At the upper edge of the channel, the spacing has increased to 180.9 degrees.

The elevation gain also changes over the channel slightly. As we go up in frequency so does the gain. At the lower edge of the channel the elevation gain is 9.49, at mid channel it is 9.52 and at the upper channel edge it is 9.56. Since 95% of the viewers are between -0.5 and -2.5 degrees below the radio horizon there is only a few percent difference in received signal level. When we expand the plot to cover the full +/- 90 degree range, there is very little difference in the elevation patterns.




**8 Bay 1/2λ elevation pattern +90 to -90 degree plot**

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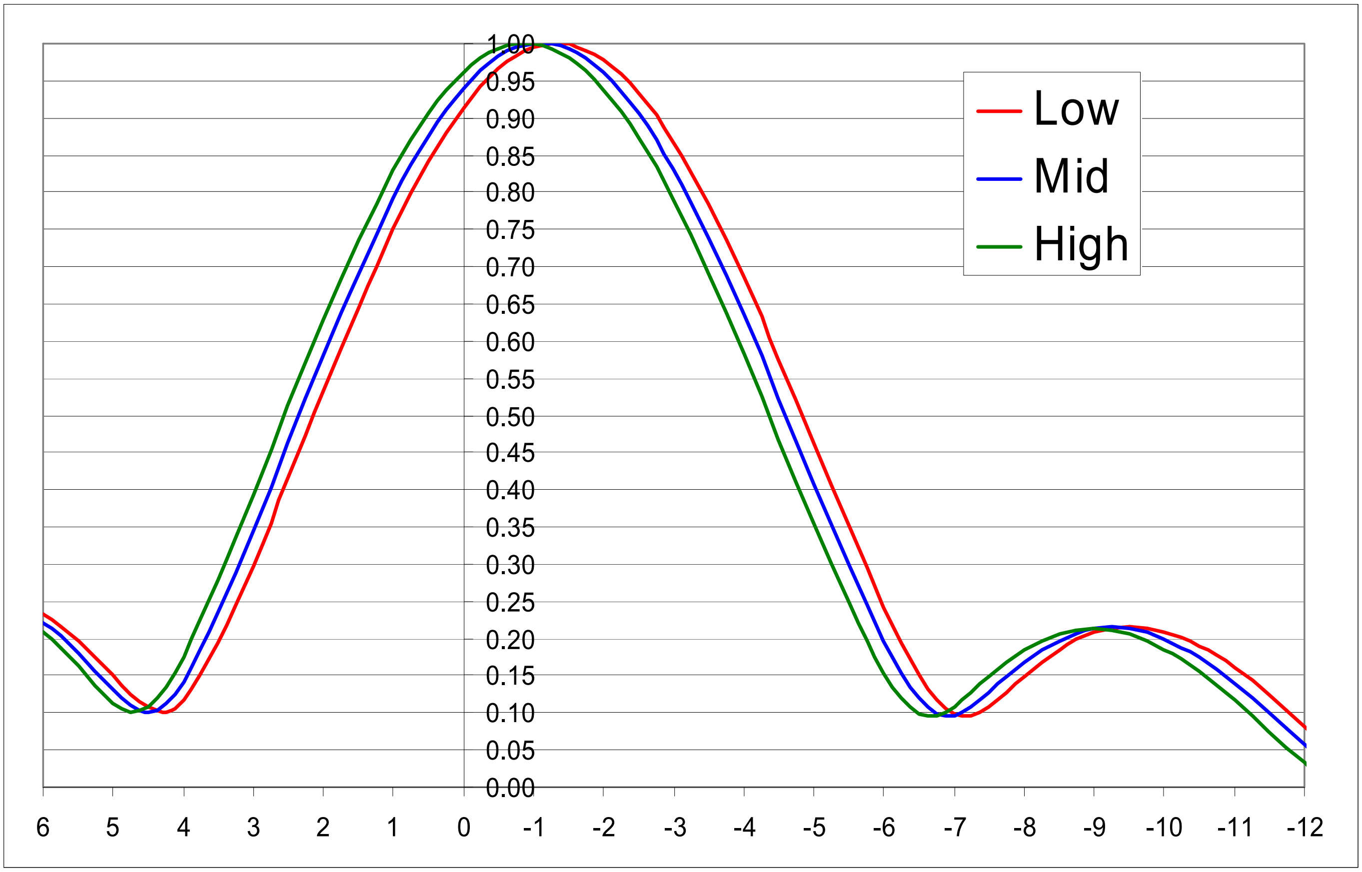
Let's look at a 10 bay 1/2λ spaced antenna with -1.0 degree of beam tilt. The elevation gain varies from 11.97 at the low edge of the channel to 12.05 at the high edge of the channel. Center channel gain is 12.01. Over the range of -0.5 to -2.5 degrees below the horizon there is again just a few percent difference in received signal level over the channel. We hope this explains the term beam sway and why it occurs.




**10 Bay 1/2λ spaced antenna with -1.0 degree of beam tilt**

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

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