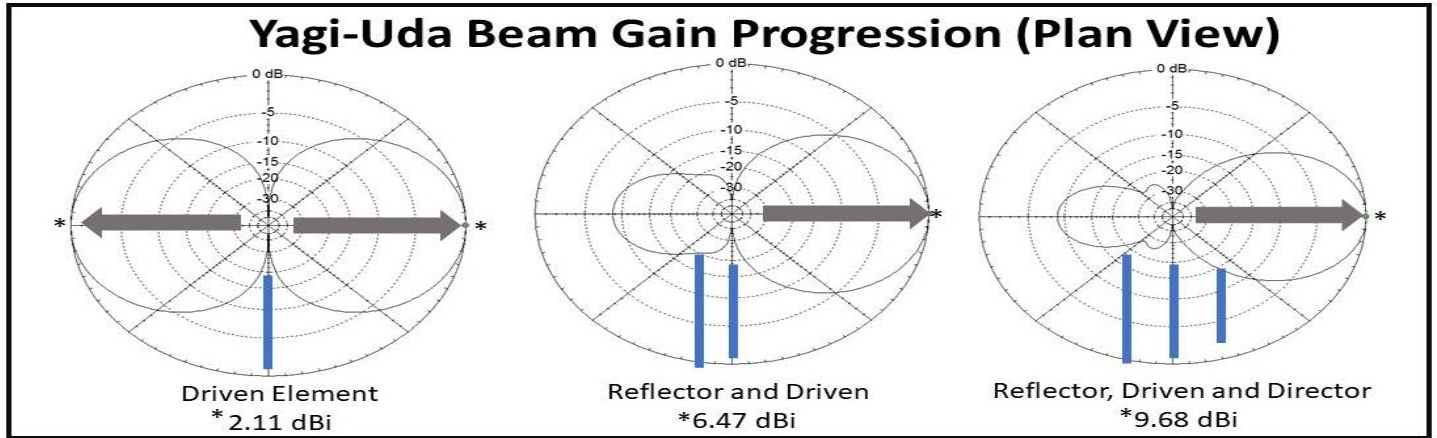


# The Radio Hotel Gain – The Final Frontier

by Rick Hiller – W5RH

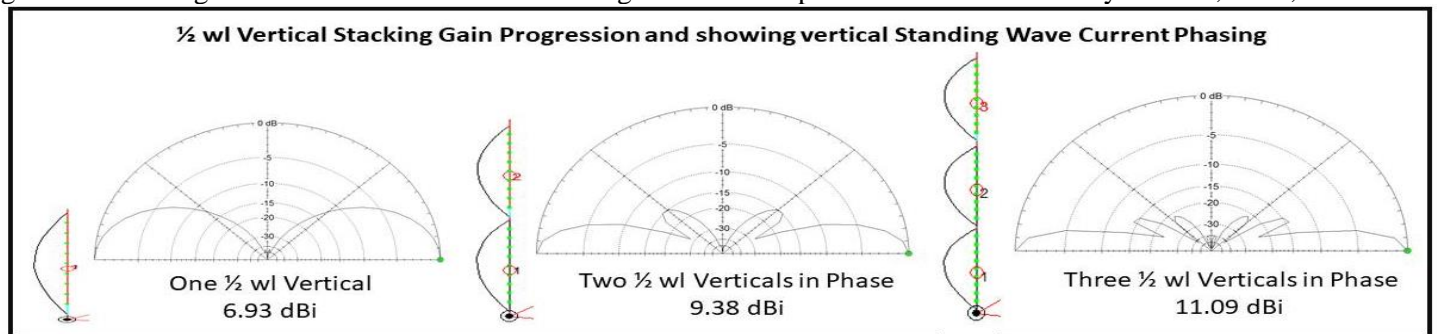
Ok, so gain is really not “the final frontier”, but it sounded good, thanks to Cap’n Kirk.. However, gain is what this Radio Hotel is about. Antenna gain – increasing the ERP – Effective Radiated Power -- and how you accomplish that.

First things first.....if your transmitter puts out 100 watts then, the antenna, if matched properly, will accept the 100 watts and radiate E and H waves of equivalent energy. You cannot get more power out of an antenna than what you put into it. You can, however, modify the radiation pattern in order to concentrate most of the radiated energy in a particular direction, or a particular launch angle, or even to NOT radiate in a particular direction. So with that restriction, let’s look at how you modify the radiation pattern to provide gain (forcing the radiation in a particular direction). The Yagi-Uda “beam” might be the easiest to look at, below, as the gain builds from a dipole (2.11 dBi) to a 3 element (9.68 dBi) Yagi.



A Yagi is all well and good if you can rotate the antenna to hear and work stations in various directions from your QTH. But....what if you can’t rotate the antenna?

Another way to achieve gain is by co-linearly stacking elements. Take a 2 meter vertical antenna. You can simply extend the vertical element to add another half wavelength section or add 3 or 4 more sections. However, you cannot simply extend the wire, you must also provide proper “phasing” of the individual  $\frac{1}{2}$  wavelength sections. You can see below in the 2D azimuth views that 2 or 3 sections with the same phase provide constructive wave mechanics to create an omni-directional lobe of concentrated radiation energy. The number of sections and the separation of the sections controls “the gain and lobe angle benefit” that we receive. Phasing can be accomplished in a number of ways – coils, stubs, etc.



So, from your home 2 meter station, instead of using a Yagi to get the gain you need, you can use a vertical, but one that is made up of stacked and phased sections of  $\frac{1}{2}$  wl dipoles. You’d be surprised with how much it improves your signals into repeaters far away. Even for the digital modes like DMR, a strong signal will help you get into those repeaters that are gateways to the talk groups you wish to communicate with. Of course, the choice of antenna system is yours alone. Choose a Yagi with a rotator or a vertical co-linear with equivalent gain. Both have benefits and detriments.

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