



The Radio Hotel – The Antenna - Part 5 by W5RH

Gain, Angles and Patterns – it's so EZ

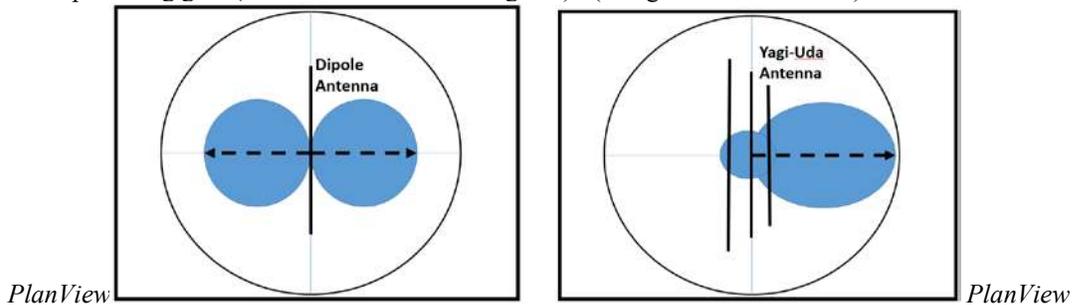
One of the great things about coupling Amateur Radio with computers is the availability of exquisite calculating programs that will provide you with a boat load of information about just about anything. Antennas and transmission lines are particularly lucky, as both of these disciplines have had tremendous development done in providing calculations and modeling of electromagnetic radiation. EZNEC is one of the many antenna system modeling programs available. A free version of W7EL's app can be had at:

<http://www.eznec.com/demoinfo.htm>

More on how to use EZNEC later in the Radio Hotel series. Briefly, it can provide you with modeling and the diagrams shown below, since we have been talking about antenna radiation characteristics.

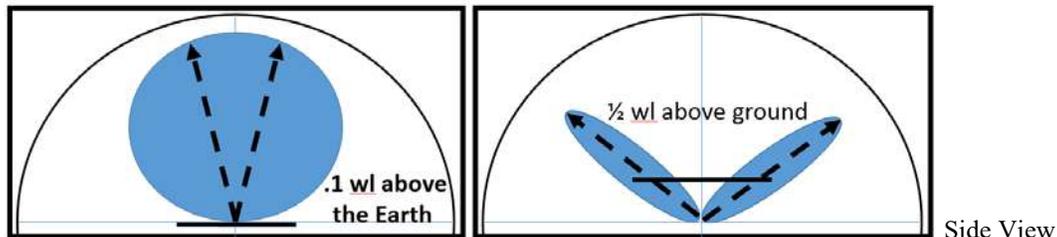
The antenna pattern is a three dimensional bulb of both the Gain and the Angle of Radiation. The gain changes the shape of the bulb looking from the top (plan view) and the Angle of radiation is determined by the view from the side.

“Gain” -- Gain is a bit of a misnomer. Gain does not cause the antenna to put out more total radiation, only more power to the antenna feedpoint can do that. Gain is simply a redirecting of the total energy into one direction. Instead of radiating equally in all directions, as a vertical will do, by configuring the right elements in the right place we can focus that energy into one direction, such as with a Yagi-Uda (Google it) antenna. Look at the following plan view diagrams....the one on the left is a dipole radiating in 2 directions off the side of the dipole. The diagram on the right is a simple 3 element parasitic array Yagi focusing the radiation in a single direction – providing gain (the radiation lobe is elongated). (Google – Antenna Gain)



Note: adding 4,5,6 or more elements to the Yagi-Uda makes the radiation pattern narrower and narrower and the gain (the elongation) stretches out more and more.

“Angle of Radiation” -- Looking at the radiation from the side allows us to see what the launch angle is of the main radiation lobe. For DX we desire a low launch angle (closer to the ground). That way the signal travels further before bouncing off of the ionosphere and back down to Earth. This angle is determined by the height above ground. Close to Earth a horizontal antenna radiates signals straight up. Put the antenna a half wavelength above Earth and the radiation angle drops to about 30 degrees. More height means lower angle in this case, to a point. Much higher and you get multiple lobes – some lower angle and some high angle. (Google -- Angle of Radiation)



One more in this part on patterns -- next time....Vertical Antennas

*The purpose of **The Radio Hotel** is to give you a practical kickstart into exploring the workings of antenna systems. It is a series, so go back and read the previous columns to get the whole picture, as one month relies on the previous month's information. Google the buzz words and find out what they mean. Read up on antenna system theory to see how it all works together. You will be glad you did.*

