The Radio Hotel– The CCD Antenna

Controlling Standing Wave Current

by W5RH Rick Hiller

We all know that by loading an antenna with xL-- inductive reactance (an inductor) the antenna becomes physically shorter. It maintains the electrical length by the bulk inductor cancelling the xC-- capacitive reactance of the physically shortened electrical length. So, an inductor can make an antenna shorter, but, how do you make an antenna longer? If we just add wire, then the physical length becomes electrical length, thus changing the radiation characteristics, sometimes to the detriment. The G5RV is a good example of this, as it adds length to make it 3 half wavelengths long on 20 meters and provides a beneficial patterns of multiple lobes….exactly why Louis, G5RV, put the darn thing up in his garden.

What happens to an antenna when we add xC-- capacitive reactance (a capacitor) to it? It shortens the electrical length of the antenna. A few hams many years ago took advantage of this fact and made antennas that were 1 wavelength long, but resonant at the ½ electrical wavelength frequency. By placing many capacitors spaced equally along the length of the antenna they could achieve this phenomena. By doing so, the normally (on a dipole) sinusoidal current standing wave would be changed and a fairly constant current value was formed across the whole length of the 1 wl wire. The big benefit comes from this constant current re-distribution across the wire length.

Remember my "not so often quoted and referenced" **83/63 Rule –** which reads "on a standing wave antenna 83% of the current amplitude happens in the middle 63% of the ½ wave element". So, if we could replicate a majority of this 63% section over and over along the length of the wire and eliminate the 23.5% of the reduced antenna radiation current at each end of the sinusoid curve, we could build a gain antenna that is much smaller than the usual gain antenna. Enter the CCD…Controlled Current Distribution Antenna. Unfortunately, the CCD has not taken off as a popular antenna, as it is not as straight forward as putting up a wire or aluminum element. A fair amount of calculations and intense building (measuring, soldering, stretching, etc) is required. It is an interesting implementation, so let's take a look at the benefits and where you can go to further your knowledge of the CCD. I did further research, and only research; I have not built one of these yet.

Some benefits of the 1 wl CCD are numerous and a few of them are listed here:

- Greater gain than a conventional dipole
- Reduction in the end effects and coupling to the local environment
- Higher antenna resistance than a normal dipole
- Very broadbanded
- Has an independence from ground so that height above ground has little influence versus a dipole.

To learn more you can visit my CCD Bibliography at **http://bvarc.org/home/tech-pages/.** The easiest accessible articles are in the ARRL Antenna Compendiums # 2 and #3: (others in Ham Radio and 73 Magazines)
The best, all encompassing "cookbook" article is:

The CCD Antenna – Improved, Ready to Use Construction Data found in the Antenna Compendium #3.

There is a lot to learn about the CCD antenna and it might just be worth it. The hams 20 years ago put forth a fair amount of effort to experiment and test this CCD antenna. But, since then it has fallen out of favor. Other antennas, which are easier to make and erect have taken its' place. If you are looking for esoteric, the CCD might just be what you are looking for. If the benefits can be proven it just might be that Holy Grail antenna which we have all been looking for.

Enjoy your hobby. 73…Rick – W5RH

Next time…. The Impedance of Space

The purpose of ***The Radio Hotel*** *is to give you a practical kickstart into exploring the workings of antenna systems 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.*