

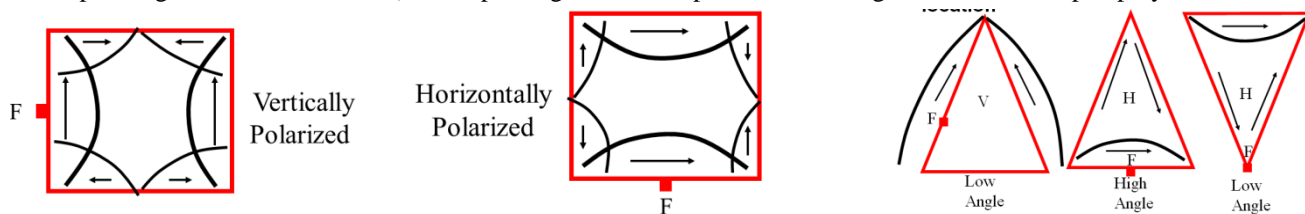
# The Radio Hotel - The Saga of the Full Wave loop

## A Multi-part Guide to Full Wave Loops – Part 1 (of 5)

Every once in a while, someone in BVARC gets a wild hair and starts to experiment and build a full wave loop HF antenna. The chatter on the 94 machine gets intense as the Ham describes what he is doing and how it works and what he has worked, etc. Pretty exciting stuff. Loops can provide a bit of an advantage over a dipole or a vertical and just what advantage depends on how it is deployed. Advantages can be one or two of many -- low angle of radiation in the main lobe, lower noise, horizontal polarization, vertical polarization, convenient feed point location, single hanging point, multi-band operation, etc. Whatever advantage/benefit you are trying to achieve with your antenna farm can be had easily with a full wave loop.

So, just what is a full wave loop? As we all know, a dipole is a standing wave antenna of, typically, a half-wave length long. A half-wavelength is the shortest length antenna that is self-resonant (wire only, without any phasing or loading) It has a sinusoidal current distribution that is maximum in the center of the dipole (Ref: TRH 2015 May). Polarization is horizontal when the dipole is parallel to the ground and vertical when it is perpendicular to ground. The main lobe radiation angle is dependent on polarization and the height it is placed above ground. The feed Z varies along with this height. All of these dipole facts are well documented in any antenna handbook. A full wave loop is also a standing wave antenna, 2 half-wave dipoles long, connected together so that they make a continuous, circuitous path. The current distribution is sinusoidal in each half of the loop. The physical perimeter created can be a square, a rectangle, a triangle (many different types) or even a circle. The shape and orientation will determine the advantage that you are going to get out of it once it is deployed.

The figures below show a few different configurations of loops. Quads (4 sided) and delta loops (3 sided) -- there are benefits to all of them. "F" notes the feed point. Also shown is the "in phase" properties of the loop's standing wave current directionality (black arrows pointing in the same direction). This phasing determines polarization and gain on certain loop deployments.



[If you would like to check out the origin of the full wave loop, grab a copy of Bill Orr's book *All About Cubical Quads* – first published 1959 (again in 1972 and 1982) and read about Clarence Moore, RF engineer at HCJB in Quito, Ecuador in 1939. It starts as a folded dipole and is turned into a quad loop with beneficial qualities for their particular high altitude location. Also Ref. Clarence Moore --US Patent # US 2537191]

A word of 'design caution' to keep in mind throughout this series. Most full wave loop systems have a 'designed for' fundamental frequency of resonance and they can also be resonant on harmonically related frequencies. However, just because the loop is resonant or shows a low SWR at those additional harmonic frequencies, that does not mean that the far field radiation pattern will be advantageous. Yes, it will load and might work, but a full wave loop designed and deployed in a particular shape, at a particular height and fed in a particular way is a single band antenna configured for a particular purpose. Stated succinctly: just by being resonant or able to be matched to and power dumped into it, does not necessarily make the loop a great radiator on these other bands. That said; as with all antenna designs, there are exceptions to the design rules, which we will see in the following parts.

During this 5 part series I will be building a bibliography, which I will get NU5K to place on the [BVARC.org/tech pages](http://BVARC.org/tech_pages). Both on-line and off-line references will be used, so you will have more information at your disposal than what I can provide in the articles. By following this series, I hope you'll see that full wave loops are quite fun to design, build and use. Enjoy your hobby. GL ES 73 DE W5RH

### Next time.... Full Wave Loops -- Part 2 (of 5) – Rectangular and Square Loops – The Quad loop

While writing this I have been listening to "Andy Mac"-- W5ACM on KTRU (KBLT-LP) Rice University on *Treasures of the 60's* show

The purpose of **The Radio Hotel** is to give you a practical kick start 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.



## Gun Net Forum

Just a brief note to remind all persons interested in shooting sports, reloading and other areas of firearms including some legal and safety measures. The gun net forum takes place every Tuesday Night @ 7:30 PM on the 94 Repeater. It is Hosted by J.L. KE7 NSB (No Silver Bullets. All are welcome to participate.