

The Radio Hotel - The Saga of the Full Wave Loops

Part 2 -- Rectangular and Square Loops – The Quad

The most popular configuration of the full wave loop is the Quad Loop. Although most of the recent improvement in antenna designs has been applied to Yagi-Uda's, full wave loops are still quite popular.

A rectangular or square shape "Quad" having 4 sides is usually used as a fundamental element of a parasitic gain/directional array. With the full wave loop oriented in the vertical plane, a single element has the classic "dipole over a dipole" stacking; therefore, providing a bit of gain over a single dipole. Polarization is based on the current distribution. If the feed point is in the middle of the bottom leg, then the current max is in the bottom leg center and also in the opposing top leg, hence, horizontal polarization. If fed in the middle of the side, the current max's are on the two side legs, hence, vertical polarization. There are benefits to both polarizations, just like the dipole and vertical comparison; ground gain and low angle of radiation, respectively.

Clarence Moore, W9LZX, discovered /invented the quad loop in Ecuador at HCJB 1939, documented in Bill Orr's **All About Cubical Quad Antennas** book. Moore patented the quad in 1944, but his loop was two concentric loops -- see US Patent # 2,537,191. This is different than how we think of loops today -- as a single loop of wire. His double wire loop does not add anything gain or pattern wise. All the extra loop does is make the feed impedance higher and easier for the open wire, higher Z feedlines used back then to make a closer match. This is similar to a folded dipole making the dipole feed Z about 300 ohms vs. a single wire dipole at nominally 70 ohms Z.

The first instance of a "Quad" loop in QST is November 1948 in the Technical Topics on page 40, a monthly column written by George Grammer, W1DF, then Editor of QST. Quads were widely used on 10 meters then, as their large form factor played havoc with the Hams of the day devising unique structures from which to hang the loop. Innovation after innovation followed. For example, Sam Kennedy, KT4QW (a friend of BVARC's W5TOM) had a novel idea of stretching the loop vertically into a rectangle and from there had a nice 50 ohm match. This thinking is similar to the new Yagi-Uda design thinking where matching directly to 50 ohms is more important than the max gain or F/B. Sam's loop also hangs quite nicely. It reminds me a bit of Nizar's, K0NM, Bent Vertical dipoles (which are not loops, btw). Find the full info on Sam's unique loop in QST, October 2004.

During the 70's and 80's there was a huge "war" going on between the Yagi users and the Quad Users. Many articles in QST, 73, Ham Radio and CQ magazines were written on the comparison between them. The quad users built massive structures with 4, 5 or more elements and each element had multiple, concentric loops for the different bands i.e. 20, 15 and 10. Some later builds even covered the 12 and 17 meter WARC bands, so 5 loops within loops hanging on the same element structure. Commercial companies brought to market kit versions of these multi-element monstrosities. One nice thing about Quads is that they are fairly light weight, as the support structure arms were either bamboo or fiberglass and the elements were #14 antenna wire. This compared favorably to the heavier Yagi with aluminum, and sometimes 'doubled up' aluminum tubing to support the element and keep it horizontal. Although the huge, multi-element parasitic quad always brought to mind the old school antenna adage that, "if it didn't fall down last Winter, it wasn't big enough".

A couple of solid references to read are Orr and Cowan's -- **All About Cubical Quad Antennas** book, referenced above, and W4MB, R.P. Haviland's -- **The Quad Antenna: A Comprehensive Guide to the Construction, Design, and Performance of Quad Antennas**. Many other Quad and Full Wave Loop references are found by searching back in QST on the **ARRL.org** web page. Also, E.G. Ross's **High Performance Quads** is an extensive expose of Quad experimentation. A bit of Internet sleuthing is required to find it. (If you don't find it, I can help). Enjoy your hobby. GL ES 73 DE W5RH

Next time.... Full Wave Loops -- Part 3 – Triangular Loops

*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.*