The Quad Loop

by Bill Smith
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The author's employer Bob Cooper, president of CADCO, Inc., encouraged the writing of this article after the results obtained in my apartment DX shack.

Nothing new is claimed about this design, called a Quad Loop, but it is apparent that the design has been neglected by TV DXers. The quad was developed in 1939 by W9LZX for shortwave broadcast application at station HCJB, near Quito, Equador. The Quad Loop may be the Es antenna answer for many who live in apartments, or similar, and do not have the benefit of outside antennas. The quad Loop is a single band, or channel, antenna because of its high "Q". It is a quarter-wave length on a side, figured by the formula: 248 divided by the center frequency of the desired television channel. (See Figure 1) For example, channel 2 is 54 to 60 MHz, so the center frequency is 57 MHz, making each side of the Quad Loop 4.35 feet. Similar calculation applies to whichever channel(s) you choose to DX.

The loop may be made from electrical zip cord, (typically 5¢ per foot) split apart, and soldered at one end to form a single wire 8.7 feet long. The wire may be nailed to a wail (using small wire brads) in the shape of a square. It should be fed where the ends meet, either on a vertical or on a horizontal side. The feed must be at the center of either side. If the loop is fed on the vertical side, the antenna will exhibit predominately vertical polarization, and if fed on a horizontal side will have horizontal polarization. Polarization shift o£ a signal propagated by Es may or may not allow it to arrive at your receiving site in the name plane as transmitted by the television station. It is therefore questionable whether a vertical or horizontal polarized receiving antenna is important. If, for instance, you have a local station adjacent to the channel you wish to DX, vertically polarized antenna will serve to reduce this interference by perhaps 30 dB, while having little or no effect on the desired Ee station. Most TV stations transmit a horizontally polarized signal, so in an adjacent local channel situation, there is a definite advantage to make your Quad Loop vertically polarized.

The Quad Loop's maximum gain is broadside to its faces. Ideally, two loops should be used on opposite walls of the shack, one facing north-south, the other east-west, but the choice is yours. I have my Quad Loops covered with a decorative fish net. The white zip cord is all but unnoticeable, which my wife appreciates.

The Quad Loop may be directly fed with 75 ohm coax, the center conductor soldered to one end, the shield to the other. For the perfectionist; yes, an unbalanced condition does exist which could cause a standing wave problem, but for our purposes, may be neglected. Another advantage of a shack wall mounted antenna is that the 75 ohm coax feedline length may be kept to a minimum. In fact, if you need adjacent channel protection and/or voltage gain, a trap or preamplifier may be placed right at the feedpoint.

About performance...from personal experience the quad loop far outperforms a standard dipole. Theory says the Quad Loop has a 9/10 gain over a standard dipole. In practice, the gain appears to be much better. Single channel tower-mounted antennas obviously are better, but the so called all-channel antennas are a compromise at any channel in terms of gain, feed point impedance and similar parameters, all of which are compounded by lengthy feedlines. A typical 100 foot feedline can cost you many dB and in fact, a simple indoor antenna such as the Quad Loop may well outperform an expensive outdoor array for Es reception.

I do know that my simple 45cent Quad Loop holds its own against larger expensive arrays, and is likely the best you can do with an indoor antenna, because I've tried them all. I needed a system that would allow me to meet Bob Cooper face-to-face every morning at the office when we compare Es results. In all fairness, the Quad Loop finishes second to a log or Yagi over tropo paths.

One last thought... 5 to 6 dB gain over a single Quad Loop may be had by mounting a second closed loop of the same size behind the driven element, by a distance of the center frequency divided into 118 (Figure 2). For channel 2, the distance is 2.07 feet. The antenna could be closet mounted with the loops attached to opposite walls, or on either side of the same wall, depending on the channel design. Maximum gain is off the face of the loop that is fed. Back signals are rejected by as much as 25 dB.

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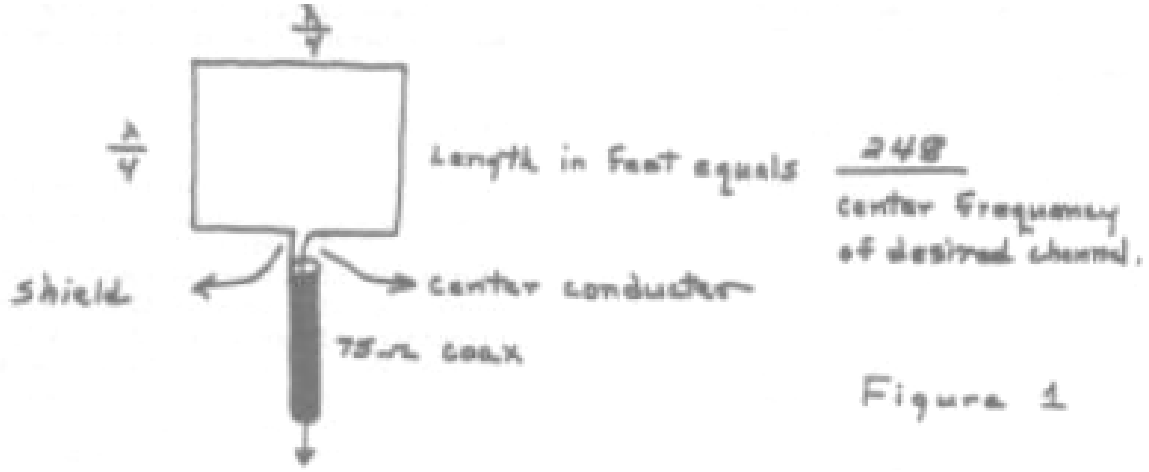

Figure 1

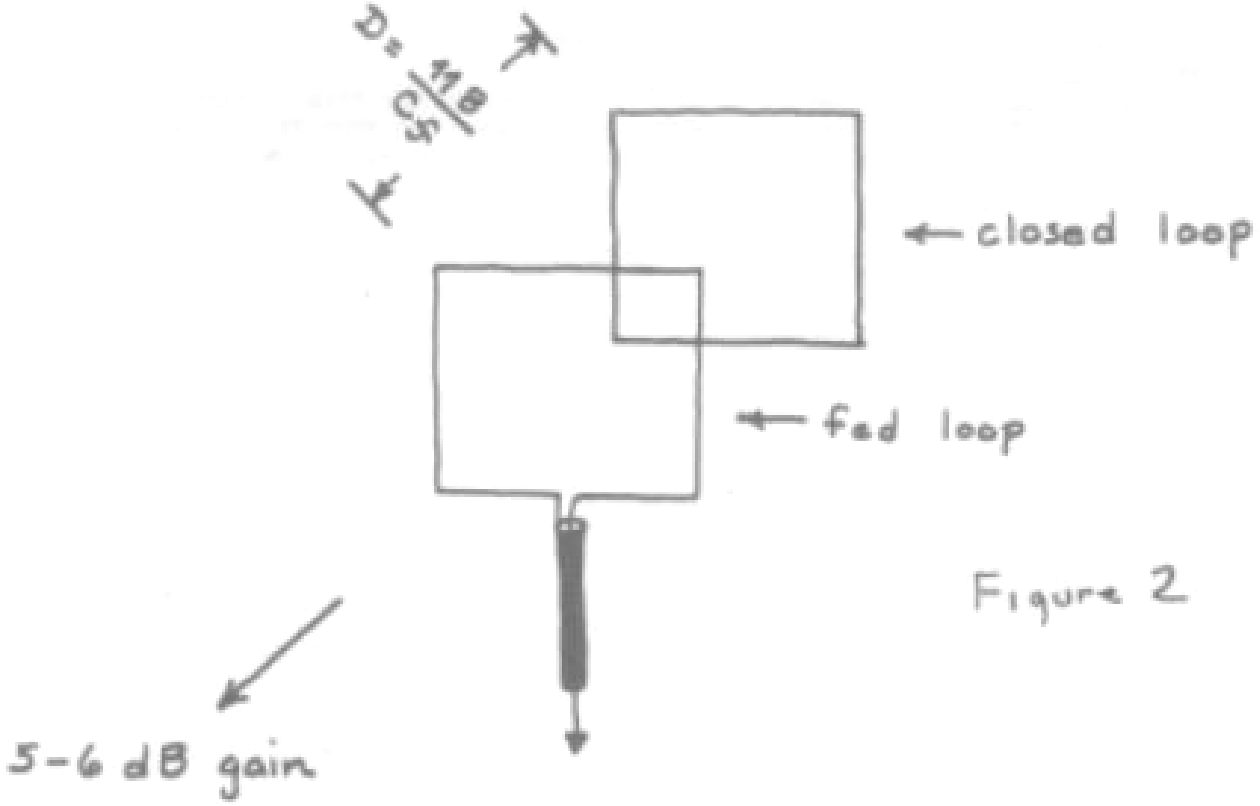

Figure 2

The length of each side of each loop is determined by formula $L = \frac{248}{C_f}$