The Radio Hotel Small Antennas – Mag Loops Part 2

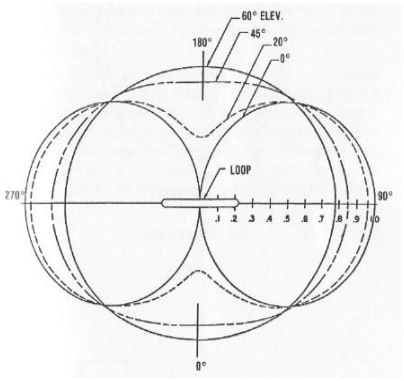
by Rick Hiller–W5RH

First off, I apologize for the delay in getting Part 2 into print. A few important family issues had to be handled, but now I am back in the Radio Hotel writing saddle again.

Managing the feed Z of such a small antenna. So how does an antenna that is 1/10th of a wavelength long, at the operating frequency, actually work? As you know, an antenna is (most times) a resonant circuit. That means it has no reactive component in its' radiation resistance. We Hams know that resonance is a short lived characteristic especially on the low bands, so we will typically use a ATU (antenna tuner) to provide opposite reactance to the reactance presented at the feed point of our too short or too long antenna. The small Mag Loops do the same thing. They are short and have a massive reactive component. A lumped reactance (xC) is used to bring the loop into resonance. At that point it can be matched to and fed power.

Radiation from such a small antenna. Take a ½ wl dipole operation as a reference. The charge (EMF – sinusoidal voltage) is fed into the feed point and this varying voltage wave spreads out over the length of the dipole element and generates a "standing wave" of voltage and a resultant current. Now, that dipole is .5 of a wavelength – 180 degrees. Take a 1/10th wl portion of that dipole, 36 degrees, and isolate it and look at the varying voltage of the fed charge voltage. The charge around the loop is varying but varying as an entity – close to having equal charge potential around the loop. It's almost pulsating, if you can visualize a slow motion version of the changing charge. This pulsating charge generates an associated pulsation current and this current causes the transfer of the radiation of our signal into the atmosphere. The strength of the radiation field varies with the voltage charge fed to the antenna loop. Remember, this is taking place at 3.75 x 10^{6} times a second, so, in reality, that radiation is a constant field strength when sampled over time.

Radiation patterns from such a small antenna. Ted Hart's 1982 "Loop Antenna" graphic, shown right, outlined the radiation patterns of the loop at various elevation angles. Max radiation is in-line with the loop plane and at a 0 degrees angle of radiation. The caveat is that the radiation strength is 6 or more dB down from a normal standard ½ wl antenna. On receive this lower field strength can be corrected by using a pre-amp. But on transmit, applying a high power amplifier is asking for trouble, as even with a barefoot (100w) rig, the circulating currents generated in the loop conductor can be in the range of 30+ amps.



So why use such a small antenna? It is slightly difficult to build, but once done, it makes for a backyard, neighbor/wife friendly antenna system. You might have to build 2 in order to cover the 80 thru 10 meter bands. It can be placed near the ground, as it has no height above ground requirement in order to lower the radiation angle for DX, as a dipole does. A rotor can be used to get all degrees of the compass if you are working different areas of the world. Again, the rotor can be placed near the ground for easy access on the install.

Where can I find more information on these small antennas? The web has a plethora of information about Mag Loops. Also, QST and QEX in the past 5 months or so has a number of articles about mag loops that will help you build one or help you understand more in-depth theory, if the theory side of antennas floats your boat. Part one of this article, in February, has a few references. And, JP gave an excellent hands-on one for Rich, K8NDS, **www.hfmagneticloopantennas.com.**

If you do build a Mag Loop, let the members of BVARC know so we can work you and enjoy the fruits of your efforts. Questions to rickhiller73@gmail.com Enjoy. 73….Rick – W5RH