The Radio Hotel – The Path to Radial-less Verticals

By Rick W5RH

Classic Verticals

Vertical antennas are referred to as such due to 1) their physical orientation and 2) their radiation polarization. The foundation ¼ wavelength vertical antennas are, typically, mounted on the ground with a radial field of various sizes. This radial field has a major influence on the omni-directional performance of the radiating element. Seeking better performance with fewer radials, some hams elevate the radials above ground or, on much higher frequencies, they use a ground plane. Many hams think that a vertical is a space-saving antenna, but with the necessary radial field, no matter how many radials, it causes the footprint to be upwards of ½ wl in diameter.

OCF ½ WL Commercial Trickery

Crafty antenna designers came up with the vertical configuration of a ½ wl Off Center Fed (OCF) dipole making the short end of the dipole being an array of multiple, horizontal, 4 foot long metal rods – [Google-- Cushcraft R7 or R-8000 and Hy-Gain AV-640 or 680]. The base on these antennas is mounted about 10 feet off the ground in order to generate a low, 17 degree main lobe of radiation. In truth, although these antennas are independent of ground, they still require this type of radial "ground plane structure".

Doing away with radials completely

A further iteration has a ½ wl dipole turned vertically, fed in the middle, as a dipole. The antenna can be hung from a tree or mounted on the ground, insulated from ground using a PVC sleeve. Center feeding with coax is a bit of an implementation issue to minimize common mode antenna currents on the coax. Even though it is ground mounted, it is a resonant ½ wl, so there is no radial requirement. One recent entry into ham radio commercial manufacturing has solved the center feed problem. [Google -- Greyline Antennas]. Their antennas are HOA friendly, OCF halfwave flagpoles, mounted and insulated at ground level then Off Center Fed with 450 ohm twin lead in a special way. (See QST Aug 2018 pg 41). Used with a tuner at the base, you can get multi-band coverage with a low angle of radiation.

Verticals that aren't – a final improvement (?)

Recently there have been articles about "ground independent" wire loops, deployed as a vertically oriented loop, but offering horizontal radiation. The purported development interation comes from the discovery of "Slot" antennas for ham radio use. Slots have a polarization that is opposite to the physical orientation of the wire or metal elements. A shut fed, horizontal slot dipole radiates vertical polarization. Turn it vertically and the main radiation is horizontally polarized. One recent reference is John-- W6NBC, QST July 2019 "Unique HF Vertical" article.

His main thrust is developed from Slot antenna theory above; however, others arrived at the same implementation years ago using large, linear loop, quad-type antennas. You see, one cardinal rule of full wave loops is that there is always a current maximum opposite the feed point (on a full 1 wl loop it is 180 degrees away from the feed point). Feed a vertical 1wl square loop at the bottom and a current maximum is at the middle of the top wire creating horizontal polarized radiation. The vertical wires are out of phase and provide minimum radiation. This characteristic is exactly what John is promoting, so performance of his "slot" and the legacy linear loop is identical. If you go back a few years in ham antenna history you will find examples of this linear loop implementation: hung vertically, but with horizontal polarization occurring from the top (and baseline portion of the loop), as those wires are horizontally oriented. W6TC (in Ham Radio Oct 1979 and QST Feb 2008 and HB9ADQ RadCom Oct 2008) provide examples of this type of fullwave loop antenna deployment. Remember that horizontal polarization gives you 3 beneficial things: directionality, ground gain and lower receive noise.

W6NBC has recently given a few Zoom talks about the next iteration of this "slot" antenna, using 2 of elements oriented 90 degrees to each other. Looks like this double loop system might bear some fruit. Build one.

Enjoy your hobby. 73, Rick