Quick and Cheap Omni Antenna for 1296 MHz

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Recently, I was browsing through the latest *IEEE Antennas and Propagation Magazine*, where they publish papers without enough divergences, curls, or triple integrals for the regular *Transactions*. In one article on Crossed Dipole Antennas[1], I came across a sketch of an antenna simple enough that it could be easily built. Details were limited, since it was taken from another paper[2] in a journal to which I don't have access, but I could build one and try it. I left the magazine on my bench, open to that page, and it occasionally re-emerged as a reminder until I finally decided to build one.

The antenna, shown in the sketch in Figure 1, has two crossed dipoles of unequal length. The longer one, shown in blue, is specified as ~0.527λ long, while the shorter one, shown in red, is ~0.42λ long. They are fed by coax, with a ¼λ balun shown in green. The idea is that the longer dipole has an inductive reactance, while the shorter one has a capacitive reactance to compensate. The antenna is claimed to radiate circular polarization in the boresight direction.

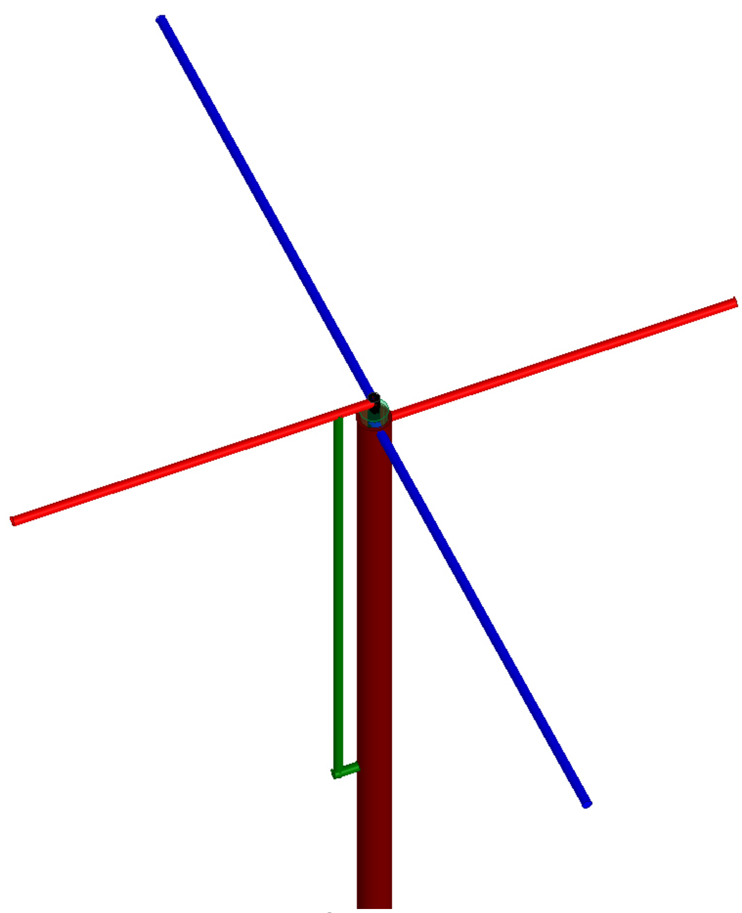

Figure 1 – Crossed Dipole Antenna

The sketch in the article has dimensions for 1.7 GHz and uses 0.086 inch semi-rigid coax. I scaled the dimensions to 1296 MHz and found a piece of 0.141 inch semi-rigid coax with an SMA connector on one end. The wire size was the first spool I found on the workbench, and the whole thing was soldered together in a few minutes, resulting in the precision assembly shown in Figure 2.

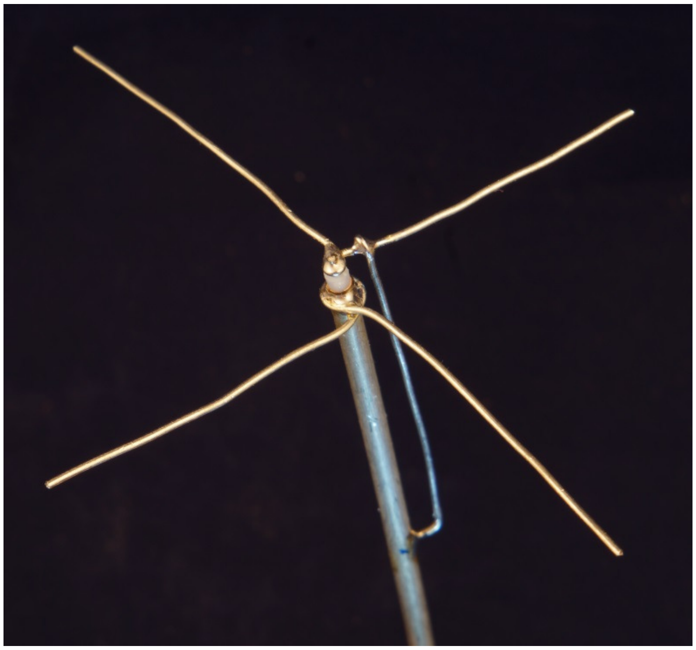

Figure 2 – 1296 MHz by W1GHZ

I then plugged the SMA connector into my *miniVNA Tiny* (miniradiosolutions.com) to sweep the Return Loss. With the initial dimensions, best return loss was at 1.14 GHz, so I pruned the dipoles proportionally to move it up to 1296 MHz. As can be seen in Figure 3, I trimmed a bit too much, so it ended up tuned to 1340, but the Return Loss is still a very good 22 dB at 1296 MHz. I couldn't find my tool for putting stuff back on, so I figured this is good enough. The dimensions for 1296 are 55mm for each side of the long dipole, 45mm for each side of the short dipole, and 57.5mm for the length of the balun – but leave a little extra on the dipoles for trimming.

So how does it work? A quick test with both dipoles horizontal shows that the radiation favors the longer dipole, and the polarization is mostly linear and horizontal. However, radiation in the boresight direction, along the coax axis, has less variation with polarization, and may be more circular. Better evaluation will require an antenna range better my shack.

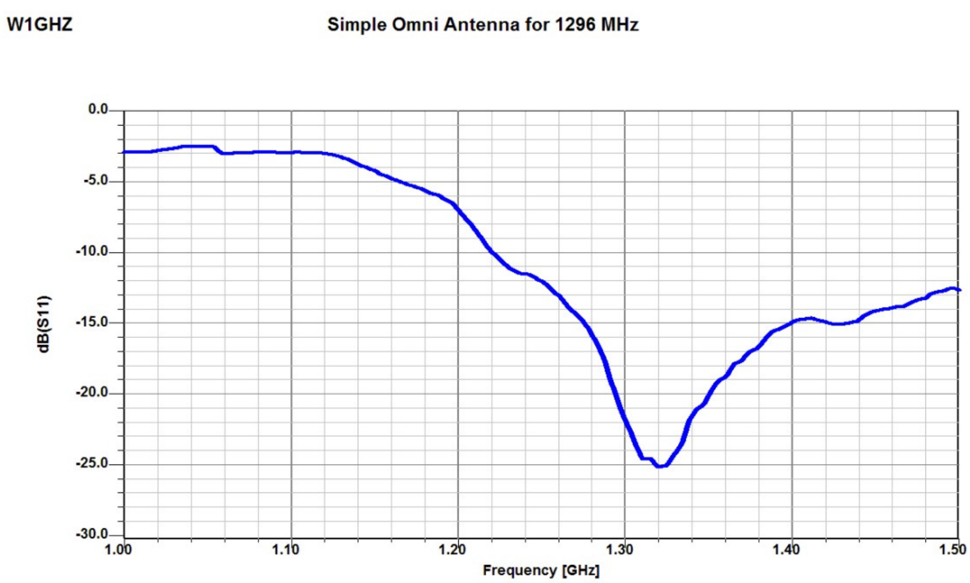

Figure 3 – Return Loss of 1296 MHz Antena

But whether this is a great antenna or not, it is really simple to build, costs nothing, and is handy for a test source or local beacon or whatever. And it can be scaled to whatever frequency you might need.

References

1. Son Xuat Ta, Imko Park, and Richard W. Ziolkowski, "Crossed Dipole Antennas, A review," IEEE Antennas & Propagation Magazine, October 2015, pp. 107-122 (Fig 9).
2. B. Y. Toh, R. Cahill, and V.F. Fusco, "Understanding and Measuring Circular Polarization," IEEE Trans. Educ., Aug. 2003, pp. 313-318.