A Coaxial Trap Inverted Vee for 160/80 **3/1/2016 N6MW**

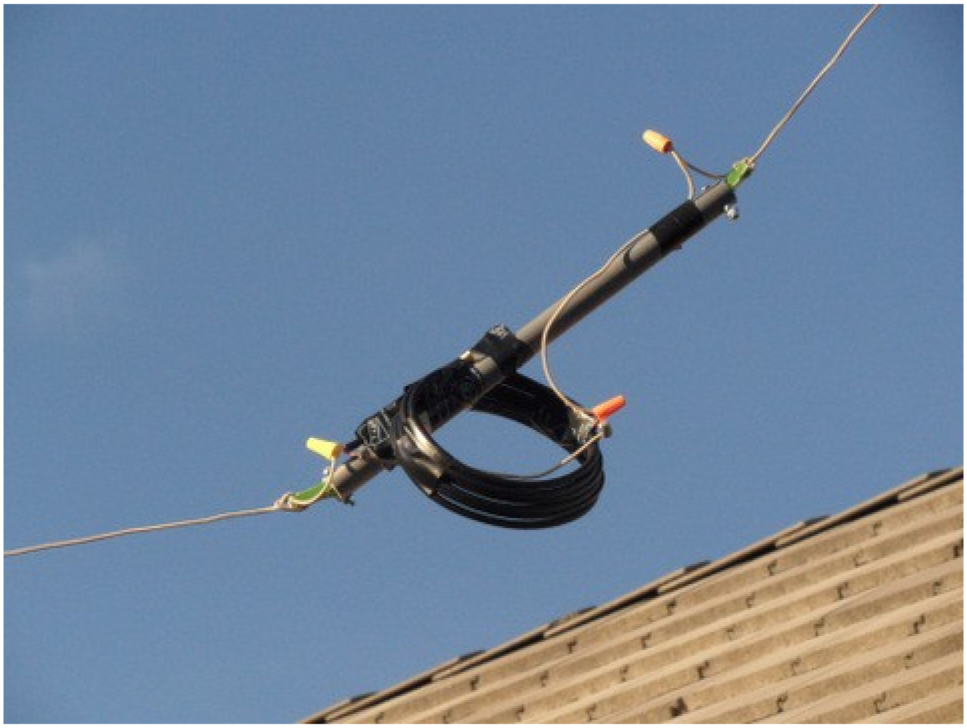
Since I grew weary of physically opening up my 160 m InvV wire about half way down the length on both sides to use on 80 m (not doable at night, the only time of interest), it was time to make a trapped InvV. And in view of prior experience with coaxial traps, this approach seemed evident.

As reported in a prior note (see http://n6mw.ehpes.com/CT5.pdf), coaxial traps have a checkered history of misunderstanding but there is no doubt as to their effectiveness. I happened to have an unused length of RG8X coax which was a candidate for this application although it is not quite as light and has a somewhat lower capacitance per length than some other coax types not on hand.

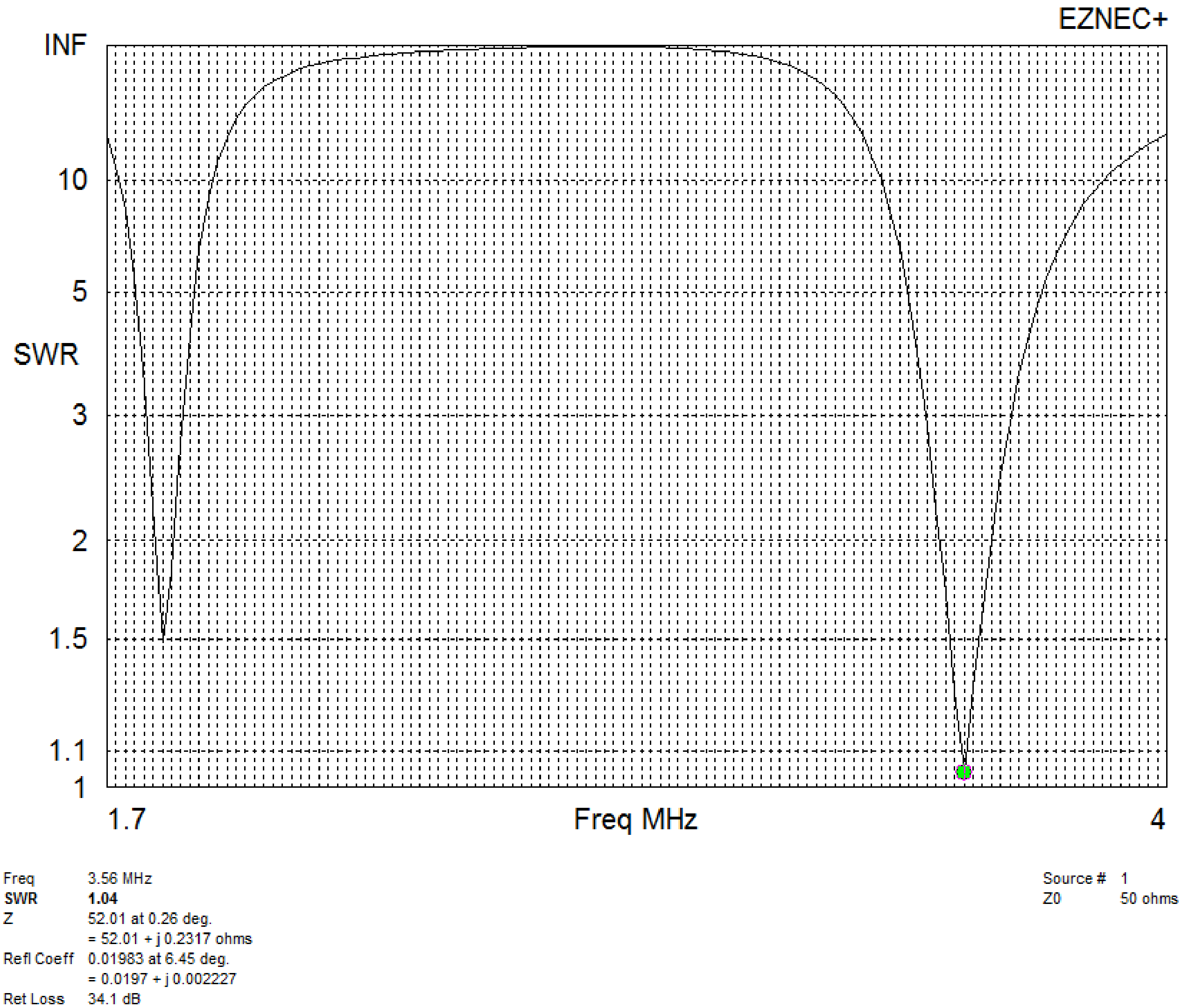
The required calculation for length of coax and diameter of coil was assisted using the free "Coaxial Trap Design" software of VE6YP which allows input of desired frequency (3.6 MHz target here) and coax properties (e.g., the claimed 24.8 pfd/ft) to get your length/diameter selection. The length result is a weak function of coil diameter and gives a length of ~ 117 inches on a 5.5" coil form for an inductance of 8.1 microH and capacitance of 241 pf. Note that these two values are for the LoZ connection of the trap and become 32.4/60pf if you use the HiZ connection (i.e., LX4 and C/4).

After double checking all, the coax was cut a bit long in preparation for the final tuning cut after a measurement. In a better world, a measurement of the resonant frequency of the (now coiled up) trap would be done with something like a dip meter with very light coupling. In my world the plan is to measure the impedance across the trap with my sometimes reliable MFJ antenna analyzer. Of course the impedance is too big to measure near the resonance this way but the impedance curve with frequency is nearly symmetrical and falls off fairly quickly on either side. So the frequencies at which the impedance is some particular large value, say 650 ohms (my MFJ limit), will average to (very nearly) the resonance frequency. Starting with the long coax, measurements were made and the coax length was reduced to get the desired resonance. It is possible to compensate a bit for coax length if it is a bit off the desired resonance by altering the diameter of the coil form (assuming you do not have a rigid form).

So the final coil (in one layer as if, but actually not, on a form) was 114.5" plus pigtails taking ~6.5 turns on a "form" diameter of ~ 5.5 inches. Keeping the leads short, this yielded a trap resonance estimate of 3.55 MHz when measured in the LoZ connection where |Z| was 650 ohms (maximum allowed by my MFJ) at 3.0 and 4.1 MHz for one case. A second coil was constructed and resonance verified. The coil is held together by some heavy duty black PVC tape often used for wrapping insulation on pipe. The construction of the coil support has a ~1' long piece of PVC pipe through the coil, held on by tape, in the current version. The antenna wires were then attached to drilled piece of an old plastic cutting board held to the pipe by a screw. This initial version just uses wire nuts to connect all the needed wires but weather-proofing is planned before the next use.



Now off to EZNEC to find the lengths of wires needed for the trapped Inverted Vee. For a center height at 45', drooping a bit to the traps and then at 10' at the ends, it is found that for desired minimum SWR frequencies of 1.82 and 3.55, the needed wire lengths are estimated as 63' plus 52.5' at the end for LoZ connection and 63' plus 34' at the end for HiZ. There are some differences in the bandwidths for Lo and Hi but since a tuner is used I opted for the shorter antenna using HiZ. In the HiZ mode, one side of the antenna is connected to the trap coax center while the other is connected to the other end of the trap at the braid. Then the braid of the first end is connected to the center conductor at the other end. Resonance frequencies for HiZ and LoZ are nominally the same.



Foolishly thinking it was cautious, the 80m wires were cut to 64' to start, the 160m ends were left quite long and the antenna elevated to the top of the lower 45' of my spiderbeam 18m fiberglass telescoping tubes. Two fiberglass Jackite supports of 25' were (from the old antenna configuration) about 80' from the center support. The first thing noticeable was the substantial droop of the relatively heavy traps.

The 80m frequency of the SWR minimum of the trapped antenna was measured and found to be 3.60 MHz with SWR of nearly 1.0. This is at a frequency a bit higher than expected but it should be fine. The SWR on 160m was too low in frequency to be seen, as expected. Next the 160 ends were trimmed to about 34.5' beyond the trap (EZNEZ said ~ 34'). The SWR with the now shortened antenna ends was found to be 3.6 at 80m (no change as expected) and on 160m we get a minimum SWR at 1.83 MHz of ~ 1.4.

So success was proclaimed once it was verified that the Elecraft tuner was happy to match the antenna over frequencies of interest at 500 watts. To finish it up a qso was made with a PJ2 on 160m late that afternoon at about sunset (early here). The next day on 80m FM, JD and others were worked. Modest effort in the ARRL DX CW contest got 11 countries on 160 and 25 on 80. The prime motivation for the project timing was to work A35T on 160. Easily done on 80 and then miraculously (after I'd given up and taken the antenna down) on 160 but with the antenna center at 25' using an “emergency” support for a last minute midnight antenna raising.

The modest downside of this trapped antenna is the trap is a lot heavier than the wire segment it replaced causing a rather ugly droop due to the placement of the two side supports. Furthermore the center fiberglass support, guyed only near the middle, sways noticeably with the wind causing the traps to wonder around in the air more that a person would prefer. The two side supports may need to be moved. If you had a rigid center support, it could be easier to nail it down by supporting the traps.

One personal side benefit has been that this configuration produces no RFI to my controlling computer on 80m which is in sharp contrast to the old antenna, also center fed with a W2UA balun, with the disconnected 160m “extenders.” It was discovered during the deconstruction/construction that the prior antenna disconnect points for the 80m disconnect were different by about 3' so it was Off Center Fed, though not by a lot. For the old 80m antenna, my usual computer was highly disturbed by 80m operation although a different controller computer had no issues. It is not assured this is an OCF issue since, obviously, other things were changed.