Tuning Insulated Wire Dipole Antenna by Folding Back Ends – The Experiment
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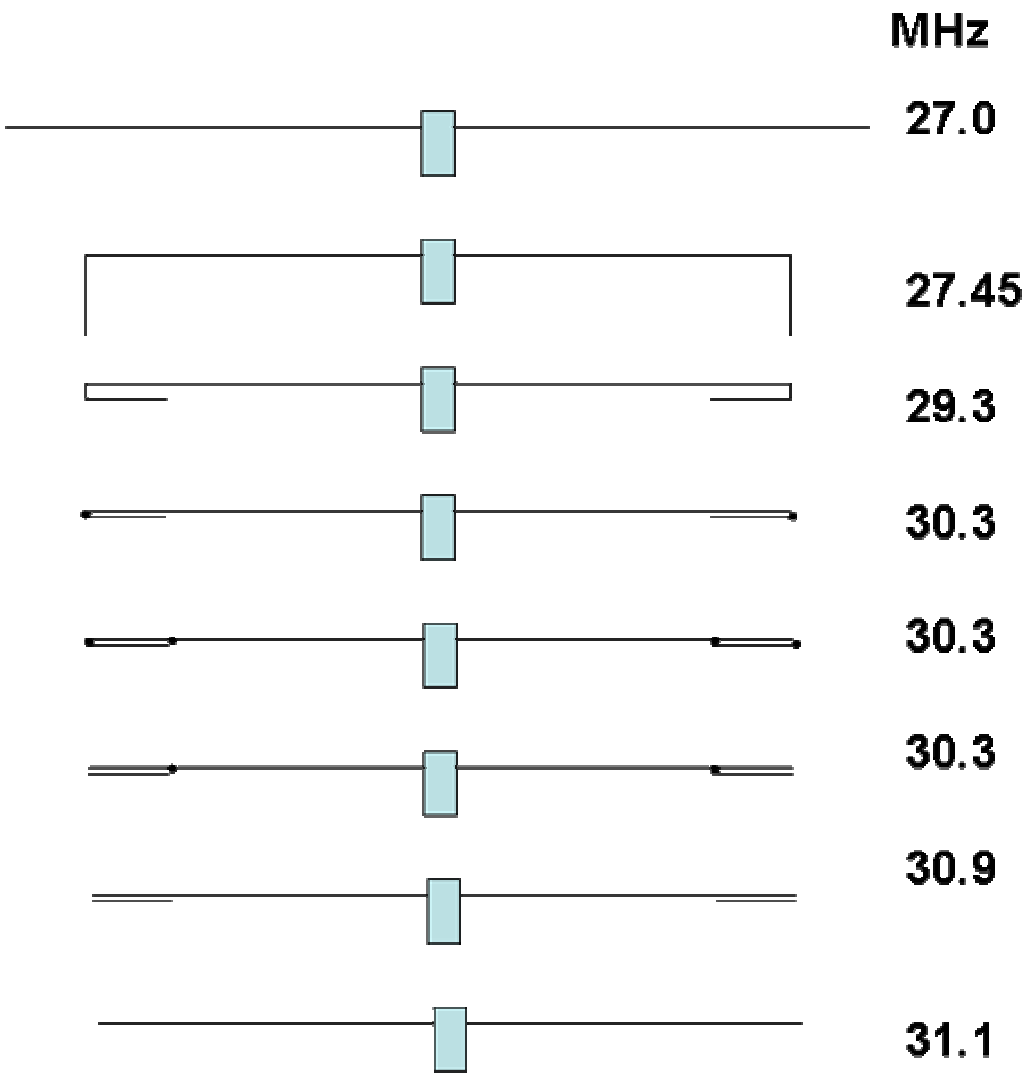
Working with insulated wires has some advantages but folding back the ends for tuning to resonance is less clear than for bare wire since the effective length of the folded back insulated wire is a bit murky.

To get some feel for this (using materials immediately at hand), a 195.8" dipole, fed by a W2AU balun at 8' height, was formed with standard insulated #16 stranded split zip wire. Each half consisted of a 97.6" (center-to-end) portion with the outer 12.3" portions at the two ends designated as the "tips" to be used for folding back

The dipole was put in several configurations and tested by looking for the minimum SWR with a standard MFJ analyzer connected with a couple of feet of coax. The typical minimum SWR was about 1.7 with R ~ 30 ohms. (This is, of course, not the resistance of a pure dipole but the environment here is well less than pure. Still, the relative variation with frequency is probably similar to the pure case.)

The resonance frequencies (where the impedance is purely real, X=0) were also noted and results were quite similar to those seen with minimum SWR.

The minimum SWR frequencies and configurations were as follows:



And in words:

Freq(MHz) Configuration

27.0 Full dipole (no folds) 2X 97.9”

27.45 Tips bent 90 degrees and pointed down

29.3 Tips loosely folded back with ~ 1” separation from main wire

30.3 Tips folded back tightly against main wire

30.3 Tip folded back tightly against main wire & tip inner ends shorted to main wire by removing some insulation on the main wire (at about 73.3” from the center)

30.3 Loops at outer ends clipped (made open), but still connected at inner tip ends

30.9 Tips inner ends short above now opened so tips are floating & not connected at all but held tightly against the end of the remaining main wire (so separation is ~2 insulation thicknesses)

31.1 Clipped tips removed altogether leaving a pure 2X 85.6" dipole

Conclusions/Thoughts

Full dipole and final smaller pure dipole results are roughly in accord with model expectations

The tips bend down results are roughly in accord with model expectations

The tips loosely folded back results are detectably higher in frequency (has shorter effective length) than the model

The tips tightly folded back case is not expected to model correctly due to small loop and was not attempted to be modeled

The frequency increase for the tightly folded back cases is about ¾ of that for the tips completely removed case. Put another way, if you were to clip the folded back tip about a quarter of the way from the end fold, the straightened wire would have about the some minimum SWR frequency as the fully folded one. This is certainly dependent on the parameters of the case (lengths and insulation thickness plus ??) so: DO NOT fold back to desired resonance and then cut away the folded portion because the resulting wire will then be too short!

Even leaving the electrically disconnected tip tightly against the end of the main wire does mildly but detectably reduce the frequency (effective length is increased).

And here is a <u>remarkable</u> part:

There was no significant difference among:
A) tight folding back
B) tight folding back with the inner end (not whole tip wire) of the fold shorted to the main wire or
C) tight folding back with the inner end (not whole tip wire) of the fold shorted to the main wire and with the end of the fold loop clipped open.

And all these are significantly different (effective length longer) from simply sniping off the folded wire as indicated above.

Unfortunately, this turns out to be more a cautionary tale than guidance for folding back insulated wires. YMMV