NC4FB - Amateur Radio

Optimizing the W3EDP Antenna

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The W3EDP multi-band HF wire antenna is popular among QRP enthusiasts because it is light weight and cheap. It is also used as a portable antenna for Field Days and other similar events. I decided to see if the W3EDP antenna could be optimized by adjusting the counterpoise lengths for each band.

Figure-1 is a diagram of the original W3EDP antenna. See the article entitled *An Unorthodox Antenna* published in the March 1936 issue of QST. A technical explanation of the antenna can be found on pp. 33-34 of *Practical Wire Antennas* by John D. Heys, G3BDQ.

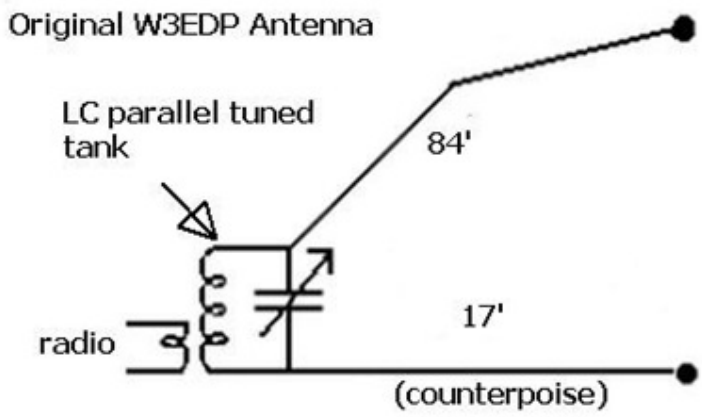


Figure-1. diagram of original W3EDP antenna

SAFETY NOTE: The W3EDP antenna counterpoise may radiate when you transmit. Take proper steps to ensure that no one goes near the counterpoise or the lower end of the 84' foot radiator while you are operating.

PHASE I

My experiment was divided into two phases. Phase I entailed construction of a close approximation of the original W3EDP antenna. After construction, the SWR measurements for

the (80 – 6 meter bands) were taken with my AIM-4170C and recorded for comparison purposes. A counterpoise length of 33′ was used for the (80 – 40) meter bands. A counterpoise length of 17′ was used for the (20 – 6 meter bands). I draped both lengths of counterpoise wires (#14 AWG copper stranded THHN insulated) over a pair of plastic fold-up sawhorses. the counterpoises were spaced roughly 2′ apart and ~3′ above ground. Figure-2 is a diagram of the Phase I antenna.

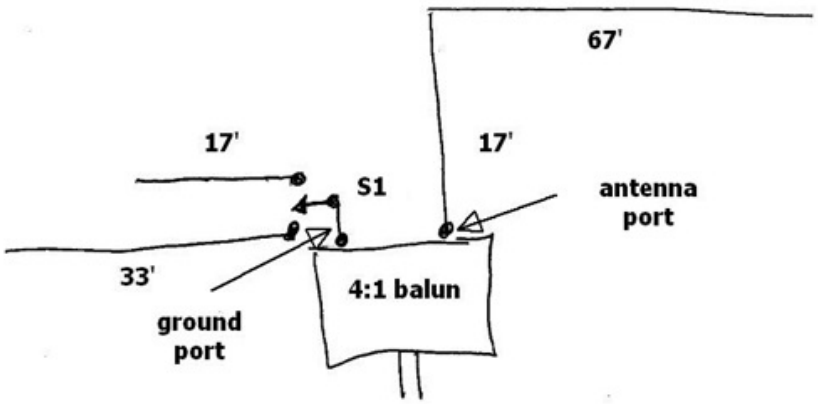


Figure-2. Diagram of Phase I antenna.

PHASE II

Phase II consisted of modifying the Phase I antenna to provide continuously variable counterpoise lengths, adjusting the counterpoise lengths for the (80 – 6 meter bands), and recording the SWR measurements taken with my AIM-4170C. A 33′ X 1″ coated steel tape measure was used as an adjustable counterpoise. I cut the tip off the tape measure and attached a spade lug to facilitate connection to the balun. Be sure to extend the tape about a foot and lock it securely before cutting the tip off and attaching the lug. Otherwise, the tape will retract inside the case. Attaching a pair of locking pliers or a hemostat to the tape near the enclosure entrance slot and the tip is also a good idea in case the lock fails to hold the tape in place. An LDG RBA-4 4:1 balun was used. When extended, the tape measure was draped over fold-up plastic sawhorses at a height of ~3 above ground. Figure-3 is a diagram of the Phase II antenna. The optimum counterpoise lengths (best SWR curve) for each band were recorded and entered into a table shown in Figure-4.

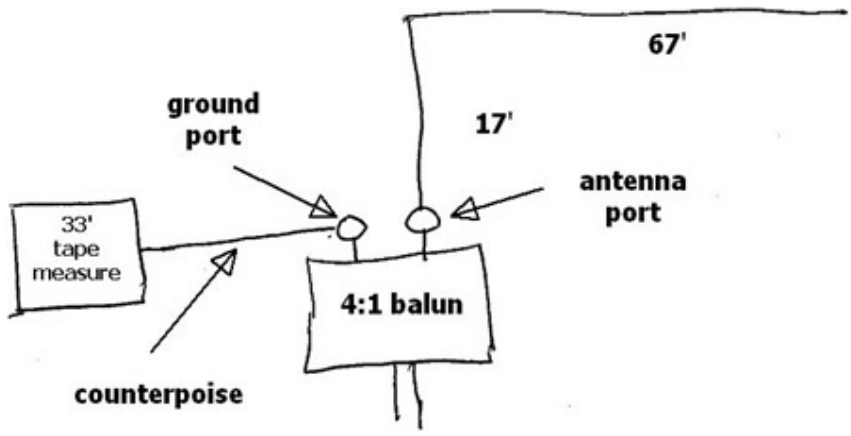


Figure-3. Diagram of the Phase II antenna

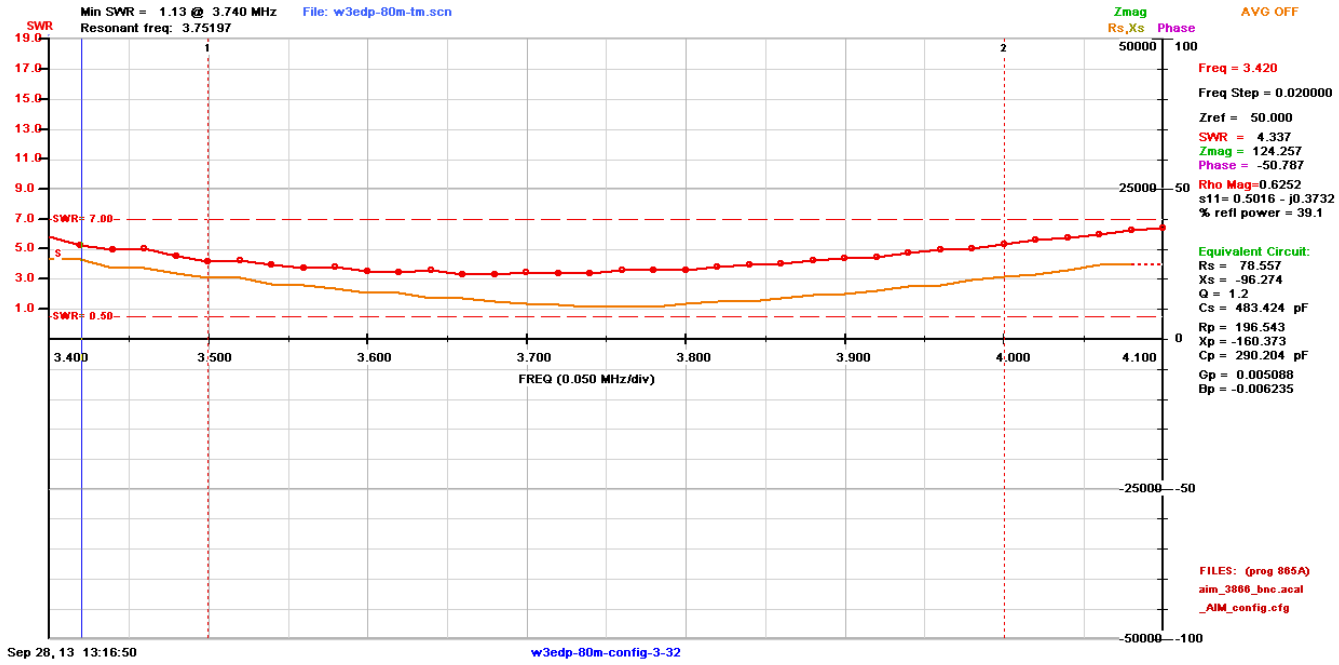
Band (meters)	Freq. Range (MHz)	Optimum (ft.)
80	3.500 – 4.000	13.0
40	7.000 – 7.300	33.0
20	14.000 – 14.350	19.5
17	18.068 – 18.168	12.0
15	21.000 – 21.450	9.0
12	24.890 – 24.990	6.5
10	28.000 – 29.700	5.0
6	50.000 – 54.000	13.0

Figure-4. Table of optimum tape measure counterpoise lengths by band

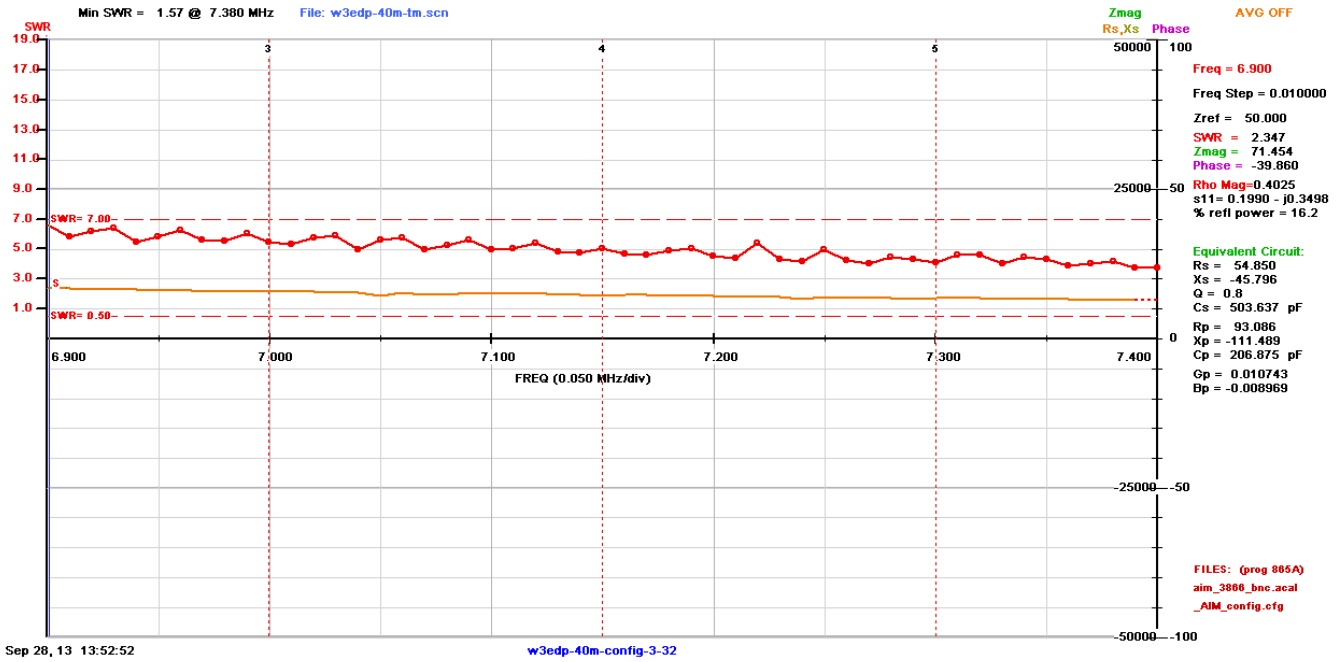
Analysis

The measured SWR curves from Phases I and II were overlaid on a graph for each band to facilitate comparison. The red lines with embedded circles represent Phase I SWR curves. The light orange lines represent the Phase II SWR curves. comparisons.

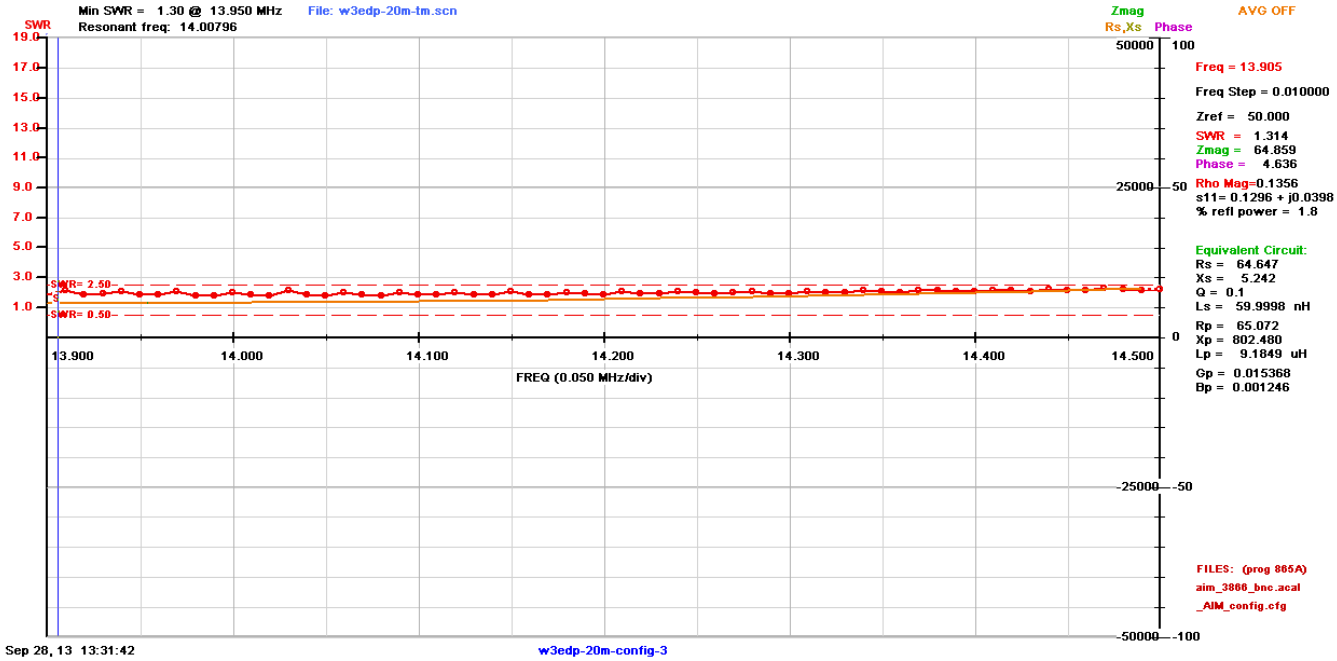
80 meters



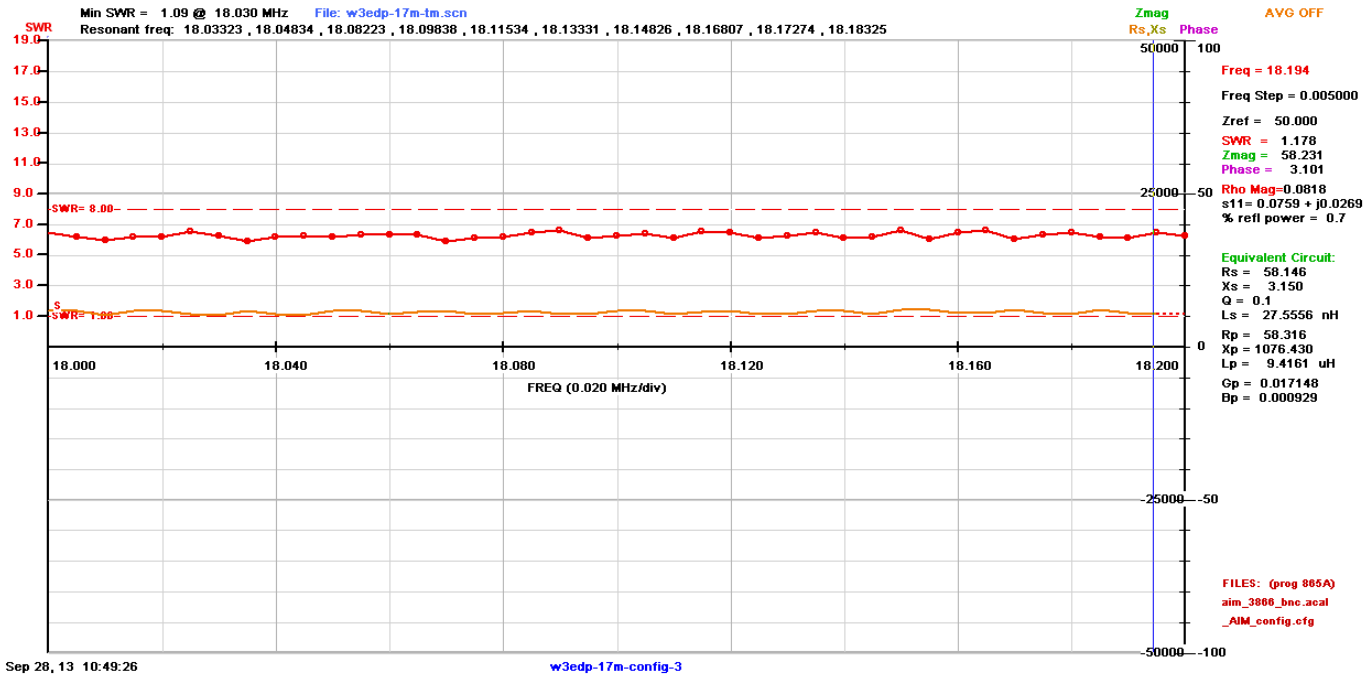
40 meters



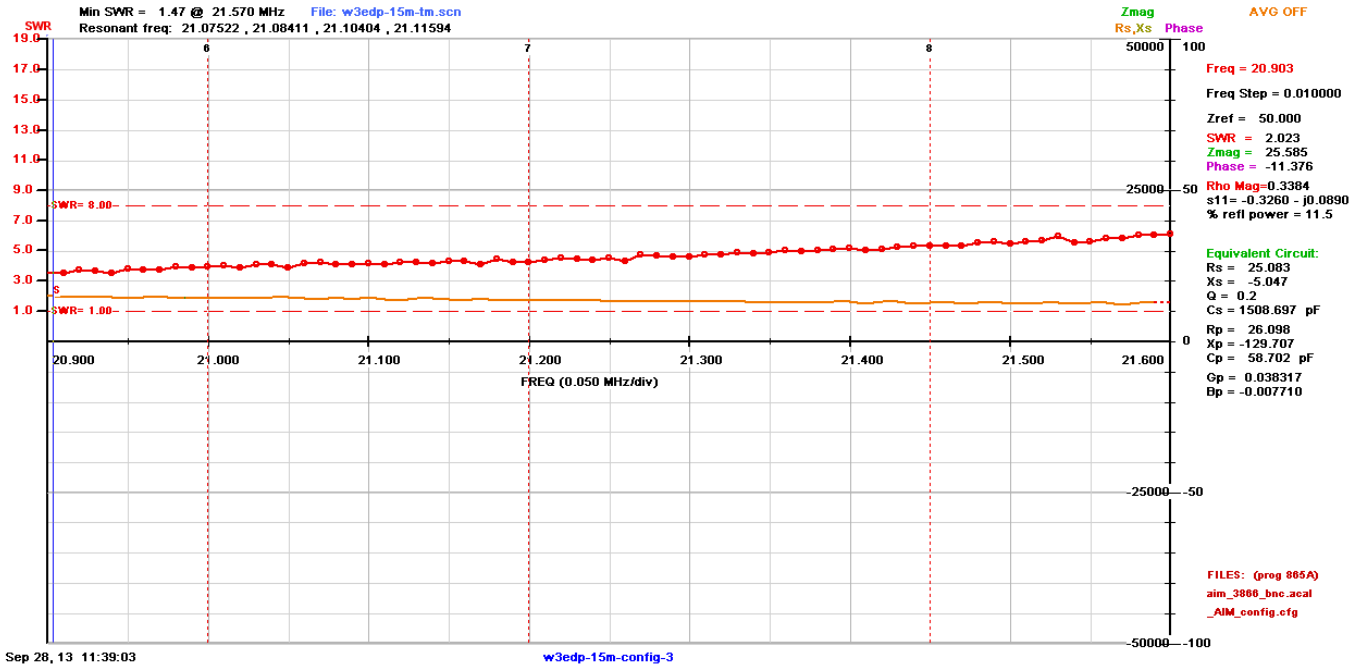
20 meters



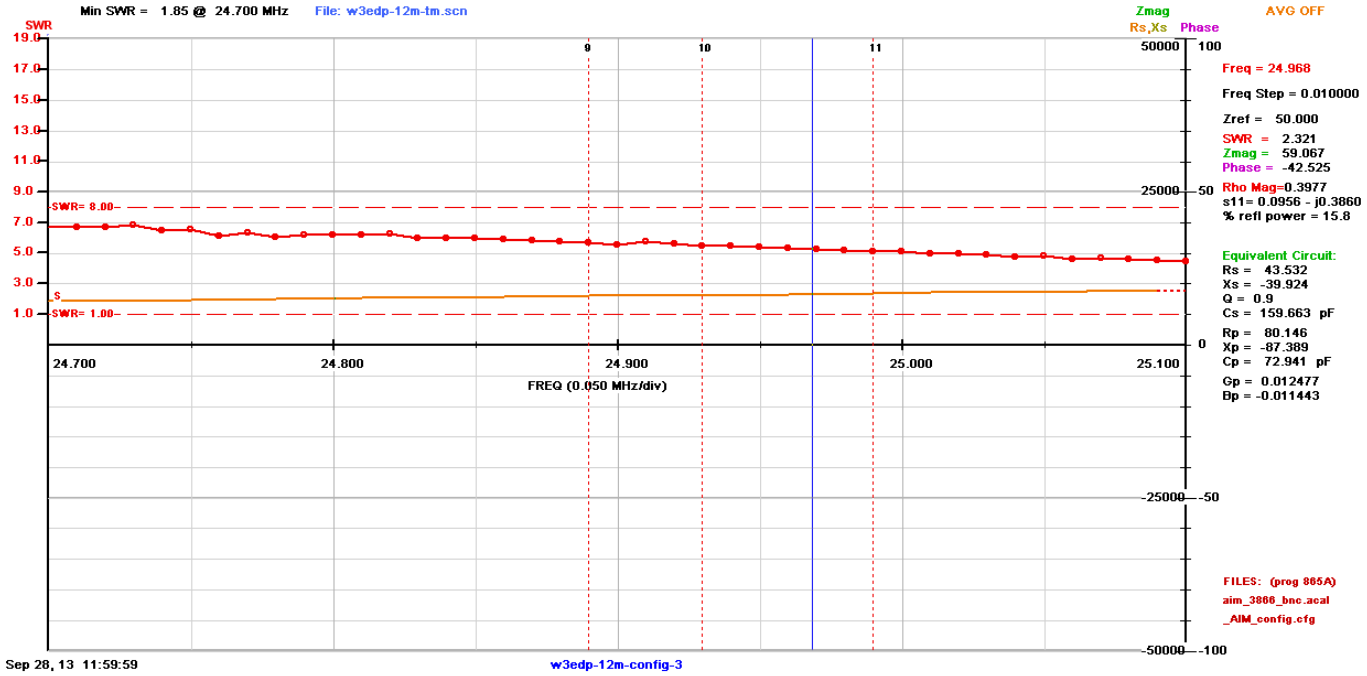
17 meters



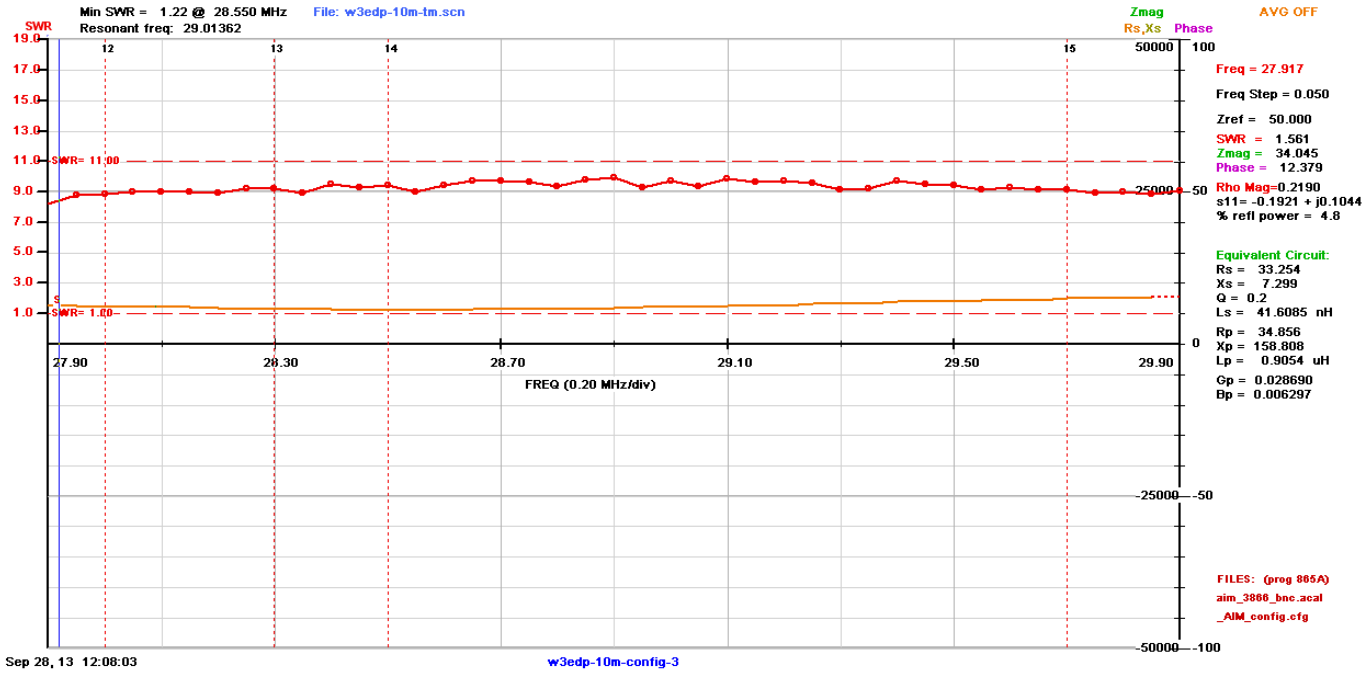
15 meters



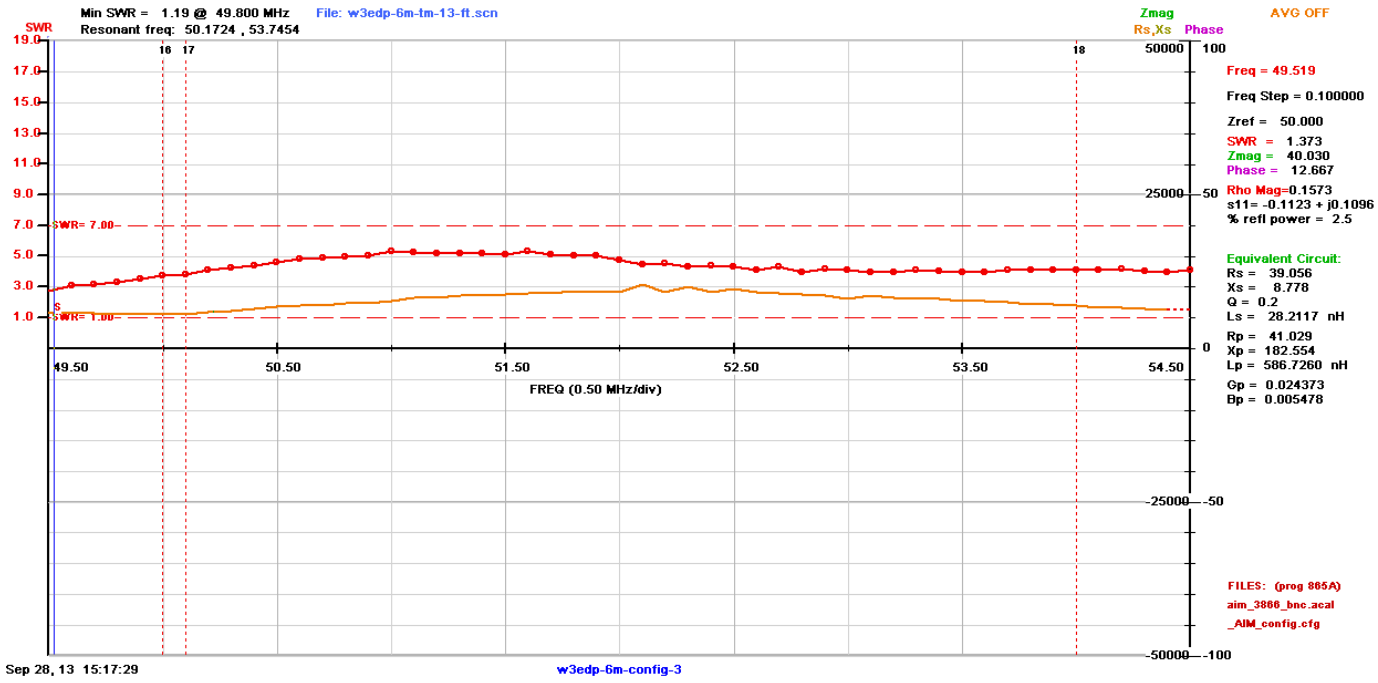
12 meters



10 meters



6 meters



Summary

The SWR curves for every band tested were improved by adjusting the counterpoise to an optimum length. I tested the antenna on 17 meters using my ICOM-706MKIIG at 100 watts (SSB) to see how well it would work with the tape measure counterpoise. I set the tape measure to a length of 12′, found an open frequency and tuned up using the default 17 meter settings (52/284) for my Palstar AT-500 manual tuner. I didn't have to make any adjustments to the tuner. I cruised around the band until I heard CQ from G0EPU (Maltby, England) on 18.120 MHz. Had a nice QSO with him. He reported receiving me at 5-5 to 5-9. The 17 meter band was fluctuating quite a bit at the time.

2 Responses to "Optimizing the W3EDP Antenna"

- Edd G0JOS

  December 5, 2015 at 9:04 am

  Thank you very very much for sharing your experiments and test results and spending the time to write such an interesting article on the W3EDP Antenna.
  I shall be trying this out for myself in my small garden very soon wx permitting
  73s Good DX G0JOS Edd

  Reply

- Travis K5HTB

February 8, 2015 at 10:14 am

Delighted to find your work on the 85ft antenna. I have used it several times in the field and have good results.
I am going to give the tape measure idea a try. Looks very good.

73
Travis
K5HTB

Reply