A HF Antenna for Hiking

What's wrong with my antenna? (Maybe nothing!)

- **Hiking Means Carrying Everything**
- **Less weight to carry is better!**
- **Needed: a Lightweight Antenna that Works**
- **Should be easy to put up and take down**

Typical Antenna Types

- **Common center-fed types include**

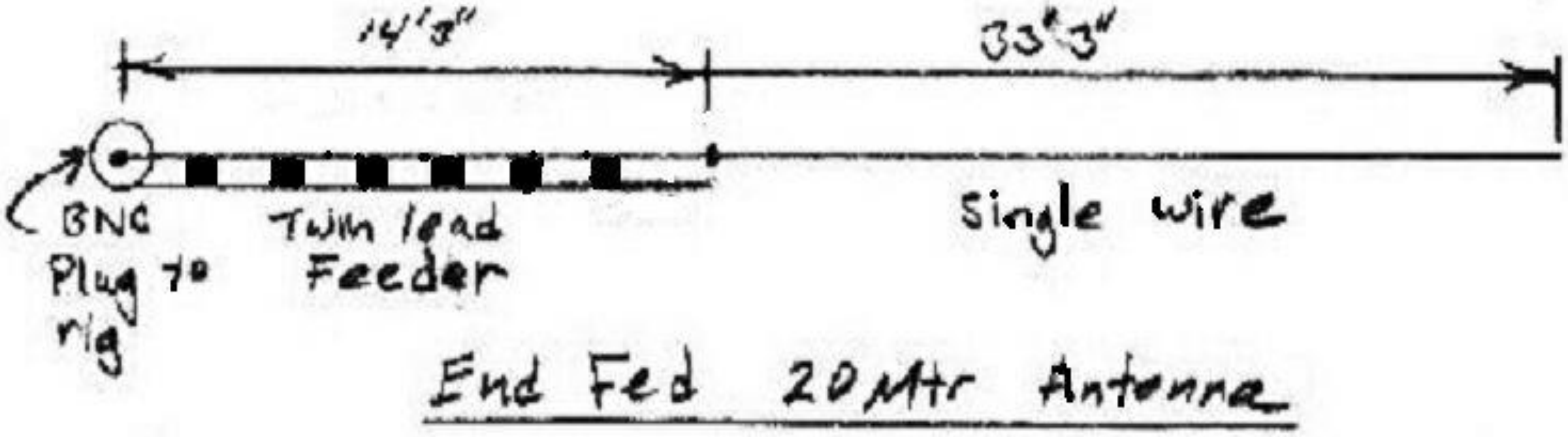
  Dipole   Inverted V

- **Both type are center fed, and require three tie-off points or three supports.**

- **End-fed antennas with one end up in a tree should be easy to manage, but aren't easily matched to a transmitter.**

End-Fed Halfwave

- **Feedpoint is at the end.**
- **For a vertical, Z at feedpoint is around 1800 Ω**
- **No ground radials needed**



Impedance Matching

- **The window line converts the 1800 Ω at the end of the antenna to 50 Ω at the radio.**
- **To do this, the section must be ¼ λ long, and chosen to have a characteristic impedance of $\sqrt{(1800 \times 50)} = 300\ \Omega$.**
- **The window line presents a balanced load to the transmitter.**

Advantages

- **Light weight**
- **Inexpensive to build**
- **Rolls up into a sandwich bag**
- **No radials needed**
- **Easily repaired**
- **Performs well**
- **Can be put up by one person as a vertical, inverted Vee, Inverted L and other configurations.**

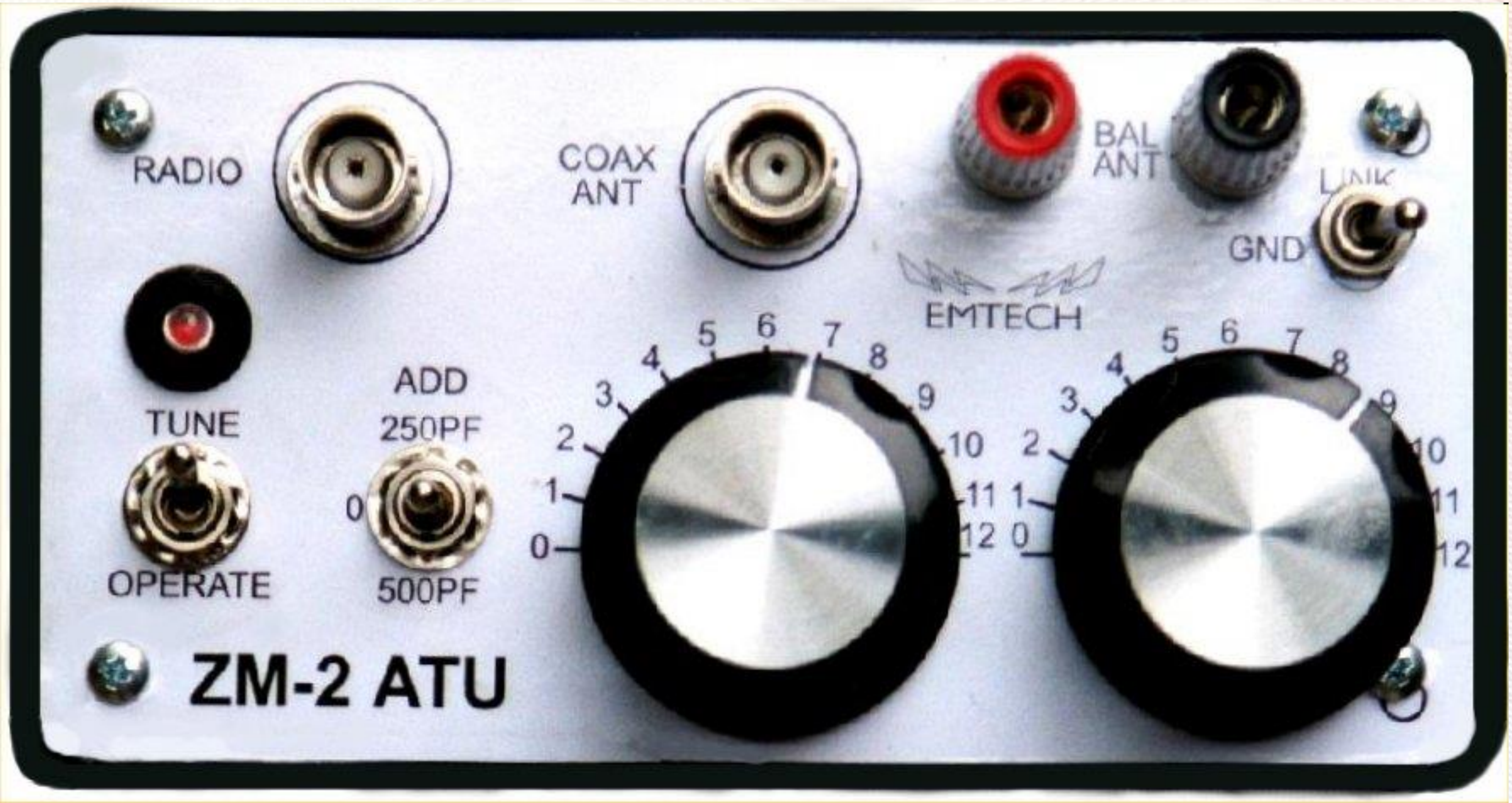
Disadvantages

- **Is a single-band antenna**
- **Requires a tuner with a balanced output**
- **Designed for low power. Maximum power limit has not been determined.**
- **Small gauge wire may stretch and sag – may need to re-tune.**
- **May take some effort to get antenna up in a tree. Swinging a weighted line may be the easiest.**

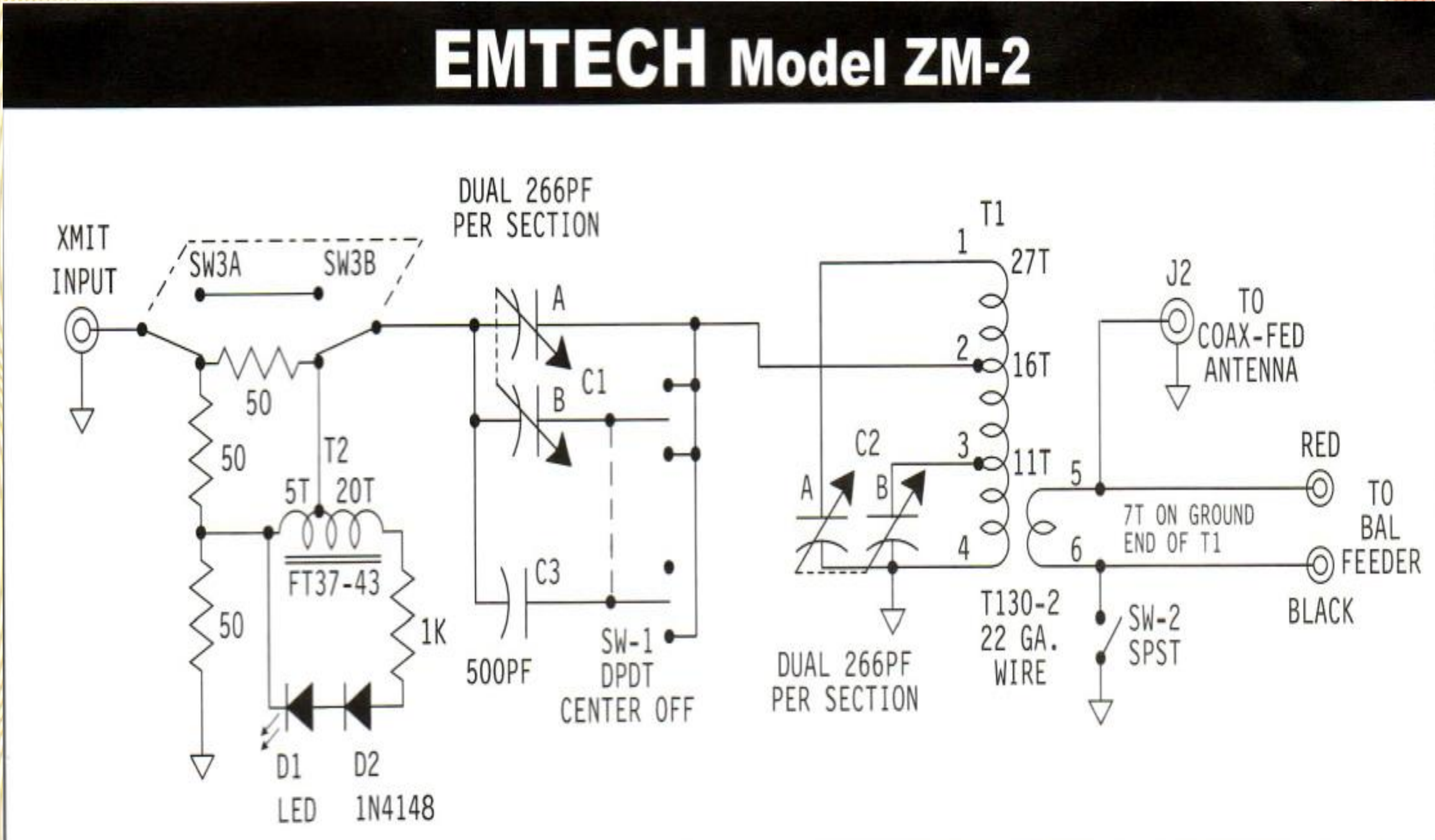
Determining Length of Antenna

- **468 / F(MHz) = λ / 2 in feet for antenna.**
- **246 / F(MHz) x VF = λ/4 in feet for matching section.**
- **Remember to include velocity factor before cutting the wire to length**.

A Balanced Output Tuner



Schematic


EMTECH Model ZM-2
XMIT INPUT
SW3A
SW3B
50
50
50
T2
5T
20T
FT37-43
1K
D1 LED
D2 1N4148
DUAL 266PF PER SECTION
A
B
C1
C3
500PF
SW-1 DPDT CENTER OFF
T1
1
27T
2
16T
3
11T
4
C2
A
B
DUAL 266PF PER SECTION
T130-2 22 GA. WIRE
J2
TO COAX-FED ANTENNA
5
6
7T ON GROUND END OF T1
RED
TO BAL FEEDER
BLACK
SW-2 SPST

Possible Alternatives

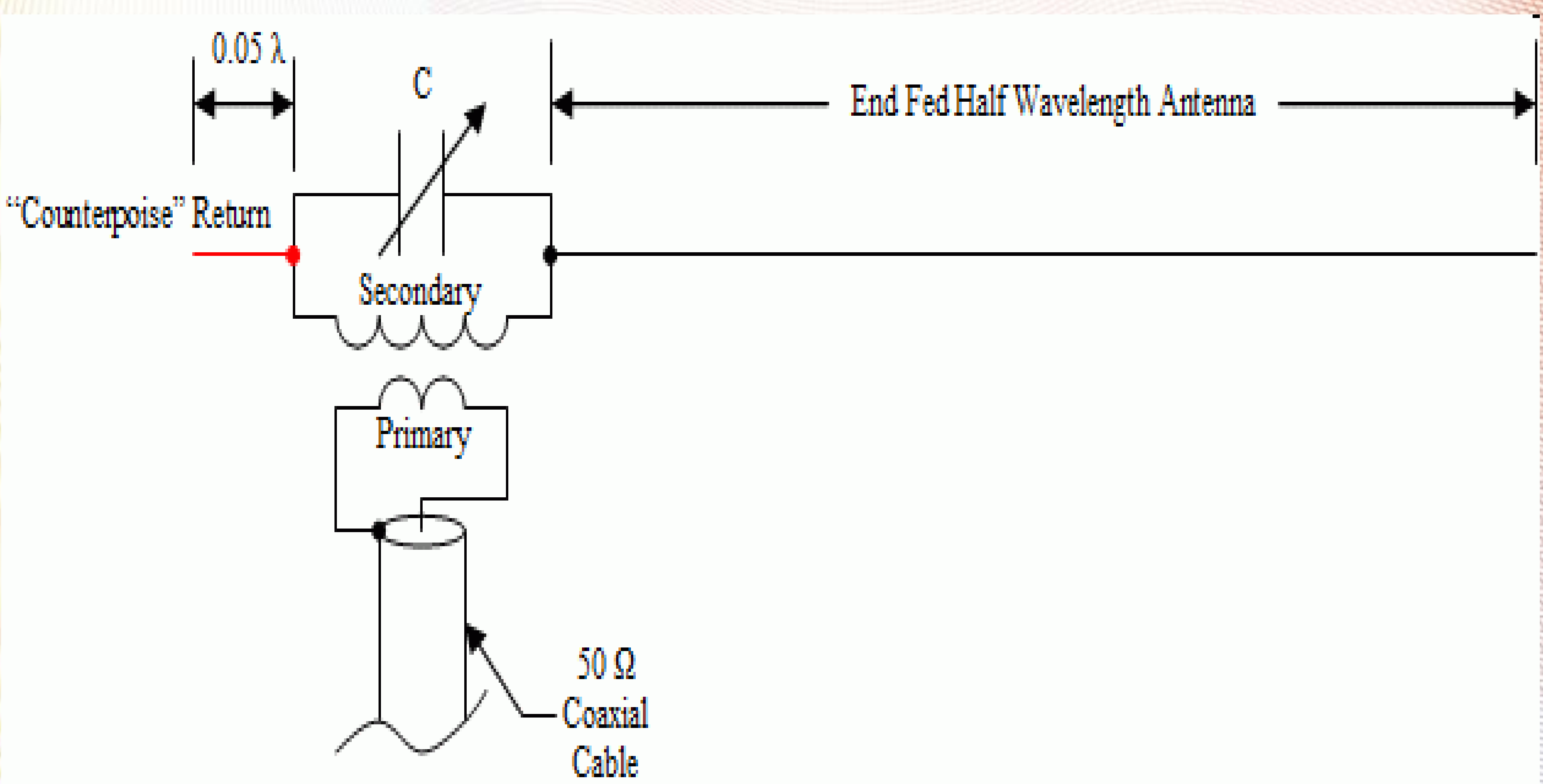
- **Maybe rewind 4-to-1 balun in older tuner to 1-to-1 for better impedance matching.**

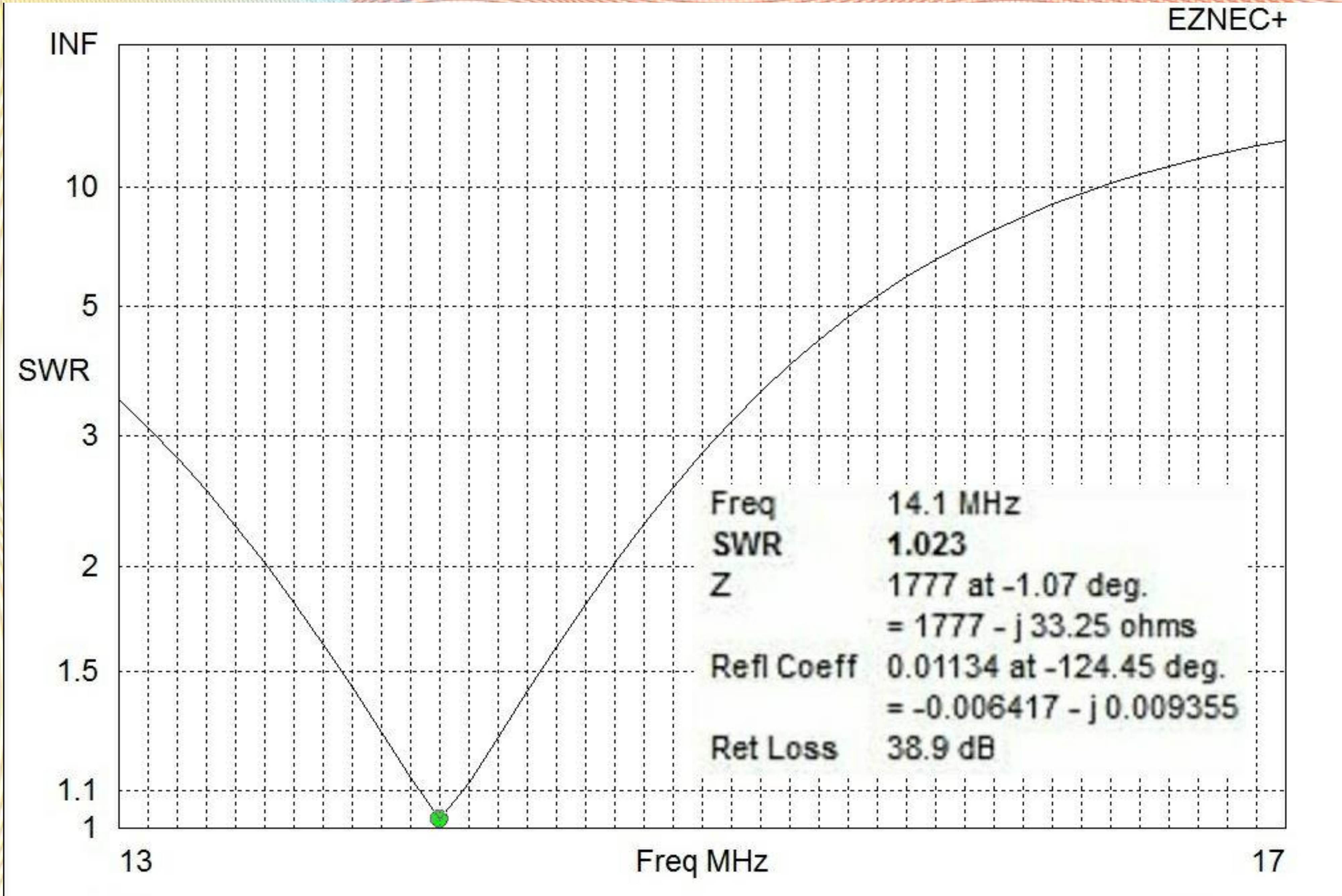
- **Several LED tuning indicators are on the market.**

- **Old TV twin lead antenna wire will work for matching section. May have different velocity factor compared to window line.**

- **A lumped-constant design requires a counterpoise, but the counter poise can be as short as 0.05λ.**

A Lumped Constant Coupler (as described by AA5TB)





Freq	14.1 MHz
SWR	**1.023**
Z	1777 at -1.07 deg.
	= 1777 - j 33.25 ohms
Refl Coeff	0.01134 at -124.45 deg.
	= -0.006417 - j 0.009355
Ret Loss	38.9 dB

Source #	1
Z0	1800 ohms

25	1.12	0.056	0.014	0.32	99.68
26	1.11	0.050	0.011	0.25	99.75
27	1.09	0.045	0.009	0.20	99.80
28	1.08	0.040	0.007	0.16	99.84
29	1.07	0.035	0.005	0.13	99.87
30	1.07	0.032	0.004	0.10	99.90
31	1.06	0.028	0.003	0.08	99.92
32	1.05	0.025	0.003	0.06	99.94
33	1.05	0.022	0.002	0.05	99.95
34	1.04	0.020	0.002	0.04	99.96
35	1.04	0.018	0.001	0.03	99.97
36	1.03	0.016	0.001	0.03	99.97
37	1.03	0.014	0.001	0.02	99.98
38	1.03	0.013	0.001	0.02	99.98
39	1.02	0.011	0.001	0.01	99.99
40	1.02	0.010	0.000	0.01	99.99

$\Gamma = 10^{(\text{-Return Loss}/20)}$

VSWR = $[1+10^{(\text{-Return loss}/20)}]/[1-10^{(\text{-Return loss}/20)}]$

VSWR = $(1+|\Gamma|)/(1-|\Gamma|)$

Mismatch Loss (dB) = $10 \log(1-\Gamma^2)$

Reflected Power (%) = $100 * \Gamma^2$

Return Loss (dB) = $-20 \log |\Gamma|$

Return Loss (dB) = $-20 \log [(\text{VSWR}-1)/(\text{VSWR}+1)]$

$\Gamma = (\text{VSWR}-1)/(\text{VSWR}+1)$

Through Power (%) = $100 (1-\Gamma^2)$

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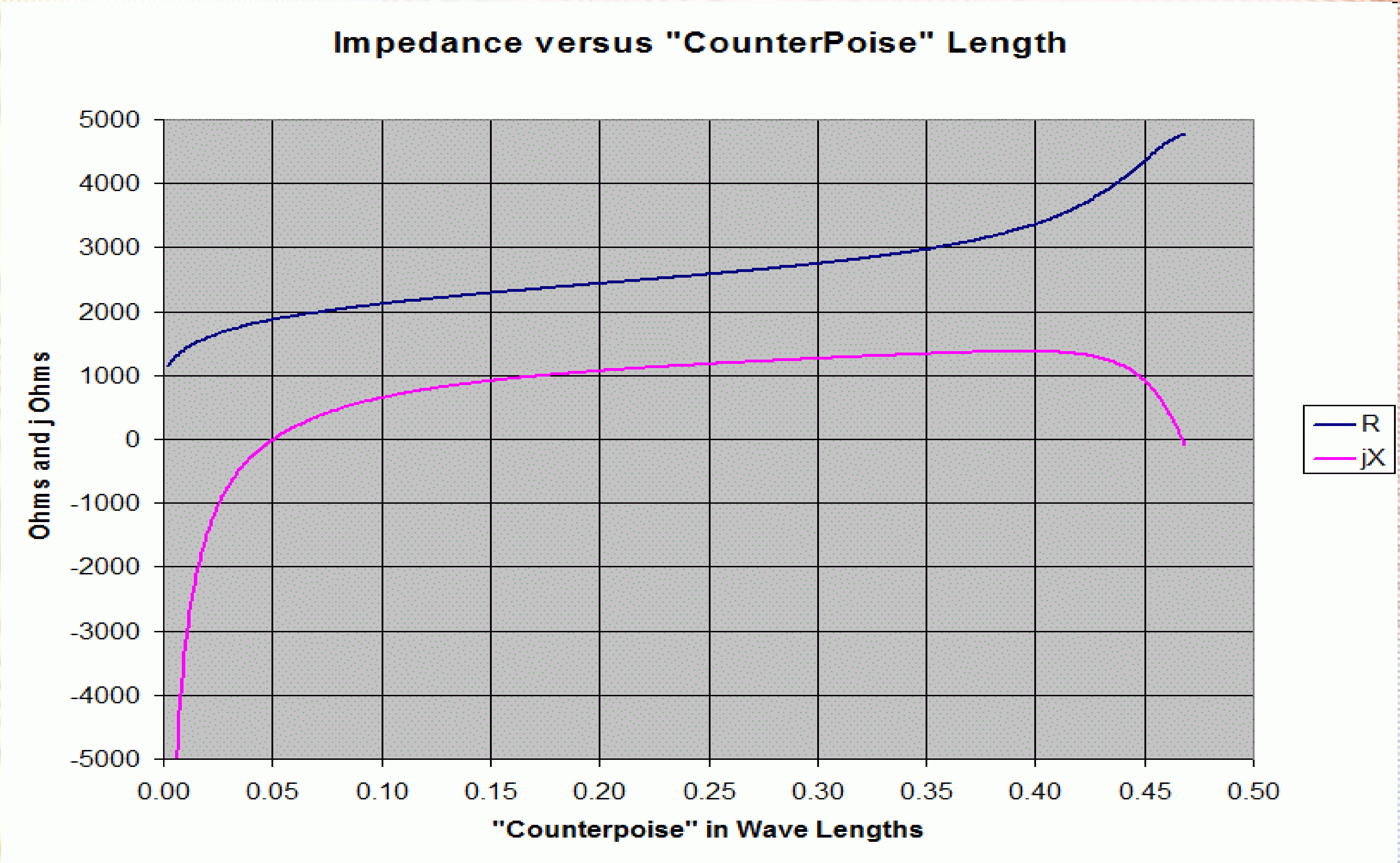

Impedance versus "CounterPoise" Length
Ohms and j Ohms
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
-5000
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
"Counterpoise" in Wave Lengths
R
jX

References

- http://www.aa5tb.com/efha.html
- http://w0vlz.blogspot.com/2012/06/another-portable-antenna.html
- The Radio Amateur's Handbook, 44th ed., pp. 369-372.
- https://www.markimicrowave.com/Assets/data/return%20loss%20to%20vswr.pdf