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 $1800 \ \Omega$
- 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 $\frac{1}{4} \lambda$ 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

- \( \frac{468}{F(\text{MHz})} = \frac{\lambda}{2} \) in feet for antenna.

- \( \frac{246}{F(\text{MHz}) \times VF} = \frac{\lambda}{4} \) in feet for matching section.

- Remember to include velocity factor before cutting the wire to length.
A Balanced Output Tuner

ZM-2 ATU
**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 counterpoise can be as short as 0.05\(\lambda\).
A Lumped Constant Coupler
(as described by AA5TB)
### Graph Analysis

#### Frequency (MHz)
- **Freq**: 14.1 MHz
- **SWR**: 1.023
- **Z**: 1777 at -1.07 deg., $= 1777 - j33.25$ ohms
- **Refl Coeff**: 0.01134 at -124.45 deg., $= -0.006417 - j0.009355$
- **Ret Loss**: 38.9 dB

#### Table Data

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>SWR</th>
<th>Impedance (Z)</th>
<th>Reflection Coefficient (Refl Coeff)</th>
<th>Return Loss (Ret Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.1 MHz</td>
<td>1.023</td>
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<td>38.9 dB</td>
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Source #: 1
Z0: 1300 ohms
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\[
\Gamma = 10^{(-\text{Return Loss/20})}
\]

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

\[
\text{VSWR} = (1 + |\Gamma|) / (1 - |\Gamma|)
\]

\[
\text{Mismatch Loss (dB)} = 10 \log(1-\Gamma^2)
\]

\[
\text{Reflected Power (%) = 100 } \times \Gamma^2
\]

\[
\text{Return Loss (dB) = -20 log } |\Gamma|
\]

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

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

\[
\text{Through Power (%) = 100 } (1-\Gamma^2)
\]
Impedance versus "CounterPoise" Length

Ohms and jOhms vs. "Counterpoise" in Wave Lengths

- Blue line: R
- Pink line: jX
References

- http://w0vlz.blogspot.com/2012/06/another-portable-antenna.html