

Vertical Odyssey

The Inverted L / Flagpole

A Low- Observable Antenna

© Excerpt from the presentation by

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Introduction

Our TVARC January presentation was a time log of antenna construction and performance at my QTH.

These slides review the Vari-L method to combine 'flagpole' and 'flat-top' to form an Inverted L in a motorized configuration so that the antenna can be tuned to any ham band; 75 – 10 meters.

Vari-L Benefits:

Low- Observable Antenna

Low Vswr, Legal Limit, No Tuner needed

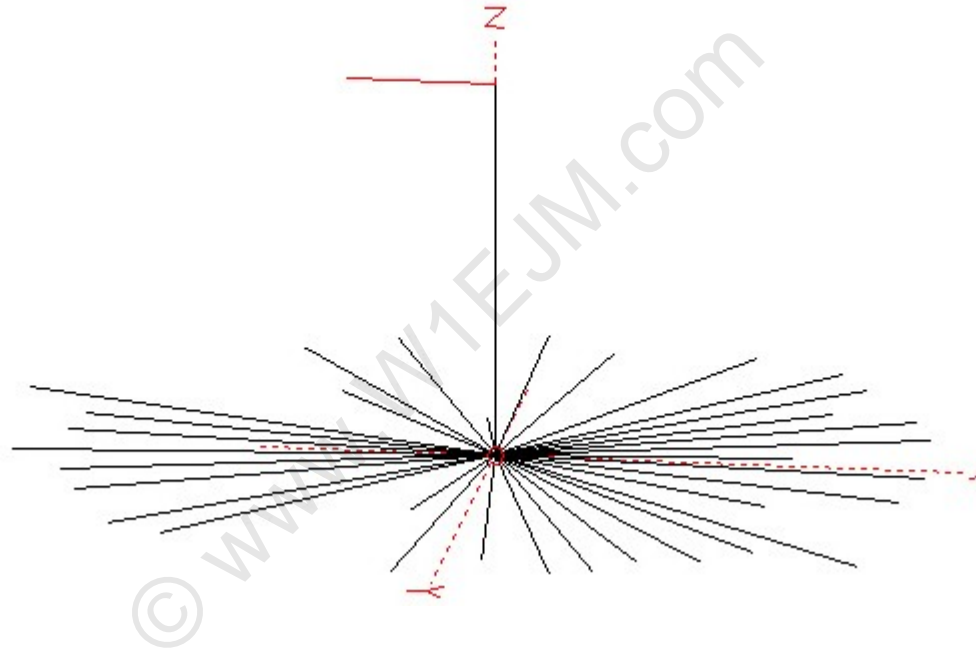
Inexpensive, readily available component parts

Tools; Dremel Rotary Tool, a Soldering Iron and household tools

Inverted-L's?

- Horizontal *and Vertical* Polarization
- A favorite of renowned Analyst L. B. Cebik W4RNL (SK)
- Performance similar to a 'low' Dipole
- Configuration:
- Use a Flagpole as the vertical support
- 32 Radials are recommended
- Flat Top wire back to house / tree

Inverted L Antenna



Flagpole Pole and Flattop Wire
Radials buried at grass-root level (32 recommended)
 $Z_{typ} \sim 40$ ohms for a 1.4:1 VSWR

2 Configurations of Flat Top Lengths

- 75-10 Meters, Variable Length of 0 to ~ 48' max.
- 160-10 Meters, Variable Length of ~ 45 to 85' max.

Lets see what happens in each case.....

Charting the Bands vs Lengths

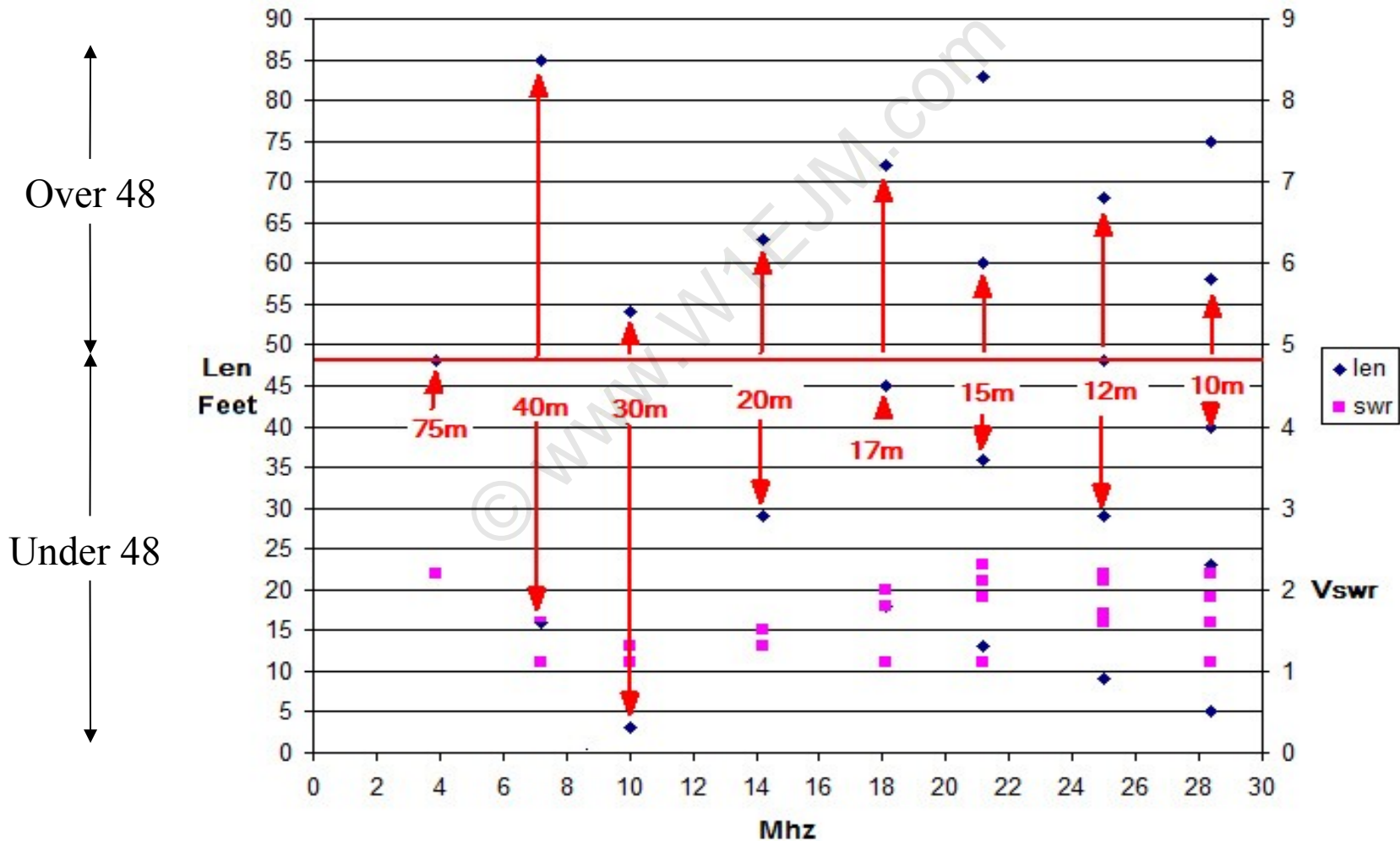
In the next slide, the results of NEC-2 modeling show
2 Variable Length regimens are reviewed.

- Below the **Red line**, 48' or less, show lengths for bands 75 – 10 meters with 1 to 3 reasonable Vswr values for each band, none higher than 2.4:1
- Above the **Red line**, 48' to 85' lengths allows operation on 160 meters with a fixed, relay controlled L/C at the Flagpole base in addition to the same number of low Vswr spots for the 75 – 10 meter operations.

Band vs. Flat Top Wire Length, NEC-2 Prediction

One wire *of proper length* could work all HF bands (Except 160)

Model Prediction Flat Top Length vs Frequency



The following slide shows 17 Meters

The X axis is length, 0 to 89 feet.

At 18' length

Vswr is 1:1

Gain is 6db

Pattern: North / South

At 73' length

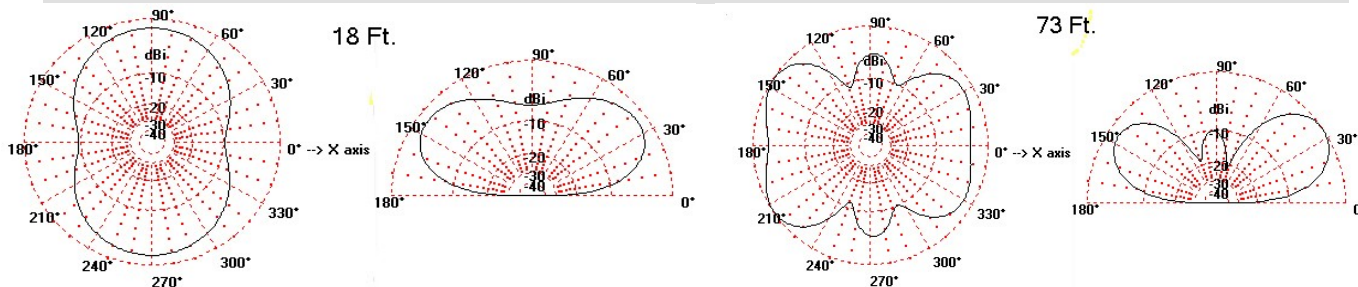
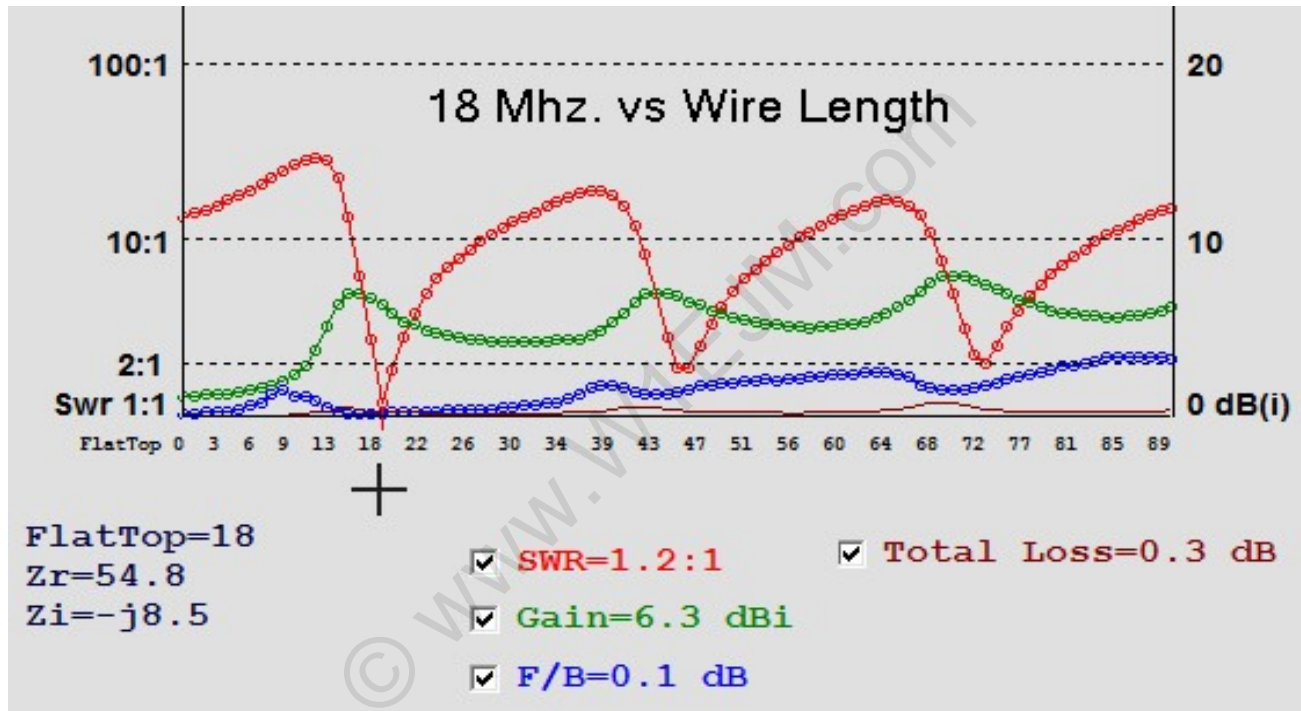
Vswr is 1:1

Gain is 7db

Pattern: East / West

17 Meter Band Modeling Example

One Flattop Wire of Variable Length



Proposed Mechanism

Slide Follows:

A Motor Driven Flattop Wire

Clothesline Format, 0-48' or 48-85' Flattop Length

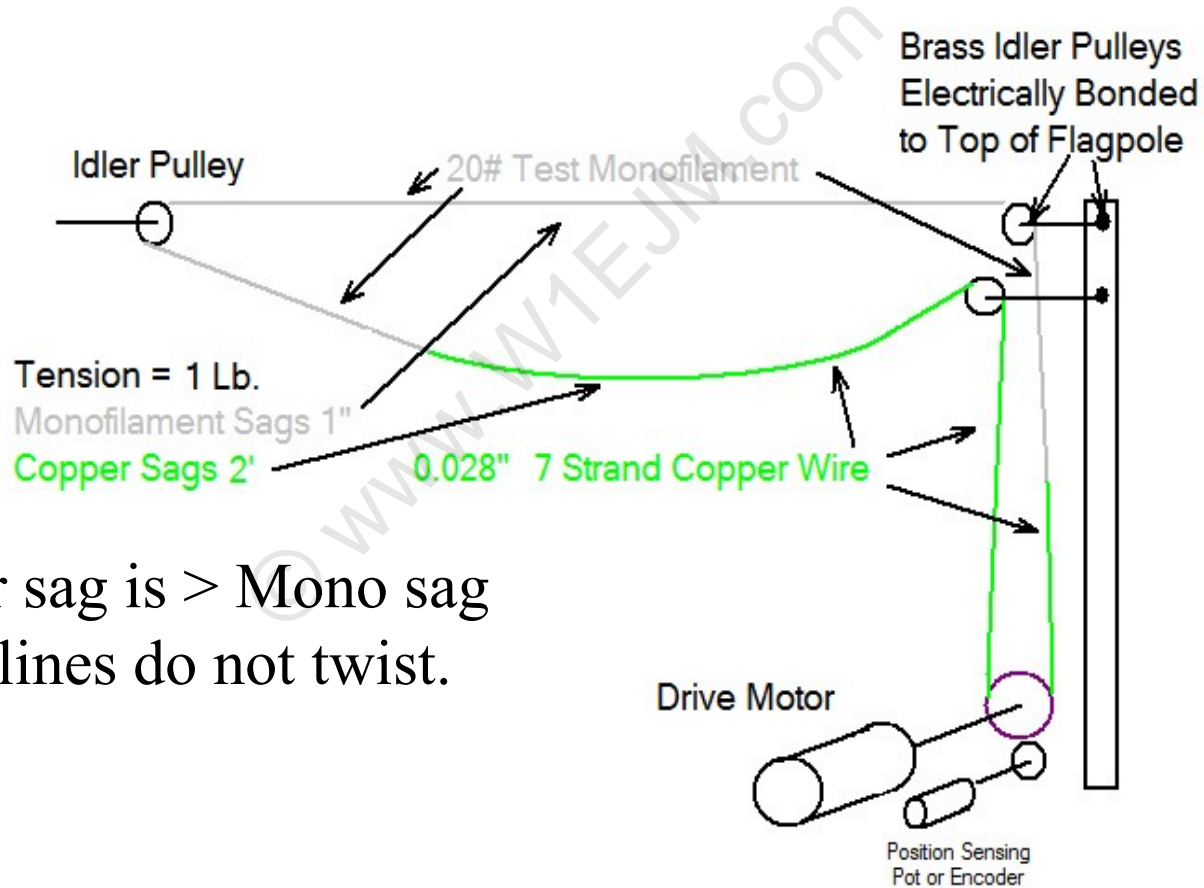
0-48', Wire minimum length 2', so retracting the wire would store 44' by the Flagpole (22 down, 22 back up), leaving 2-2' sections as Flattop.

48'-85', 41' stored by the Flagpole, leaving 44 Flattop minimum to 85' maximum.

Think about it, sketch it, get comfortable with the idea.

Vari-L All Band Inverted L Antenna

Clothesline Format Sketch



Copper sag is $>$ Mono sag
So the lines do not twist.

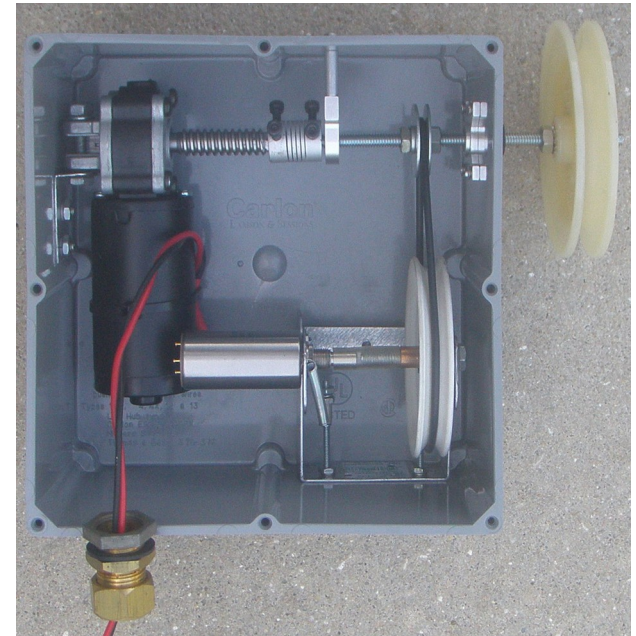
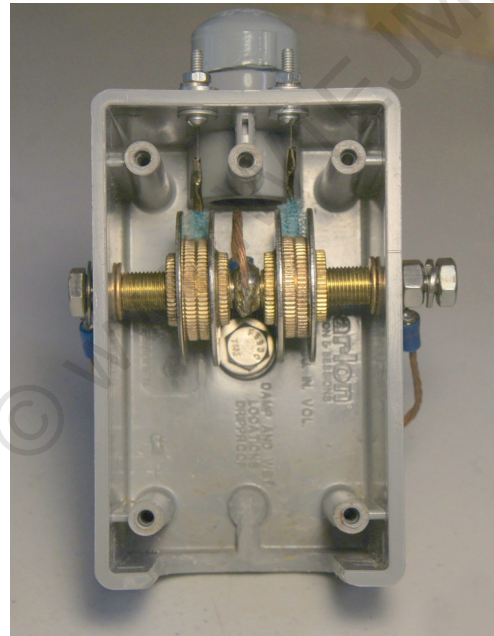


Vari-L All Band Inverted L Antenna

No-Tuner, Legal Limit Power, Low Visibility

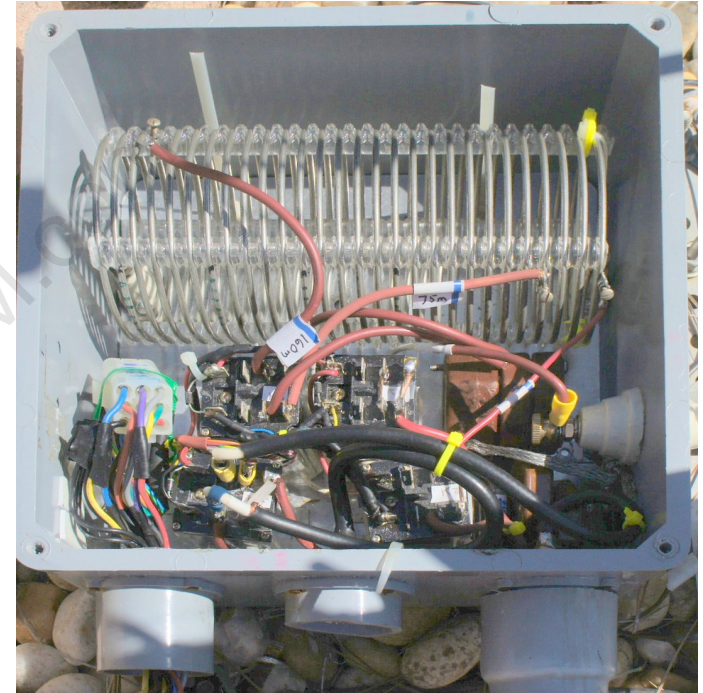
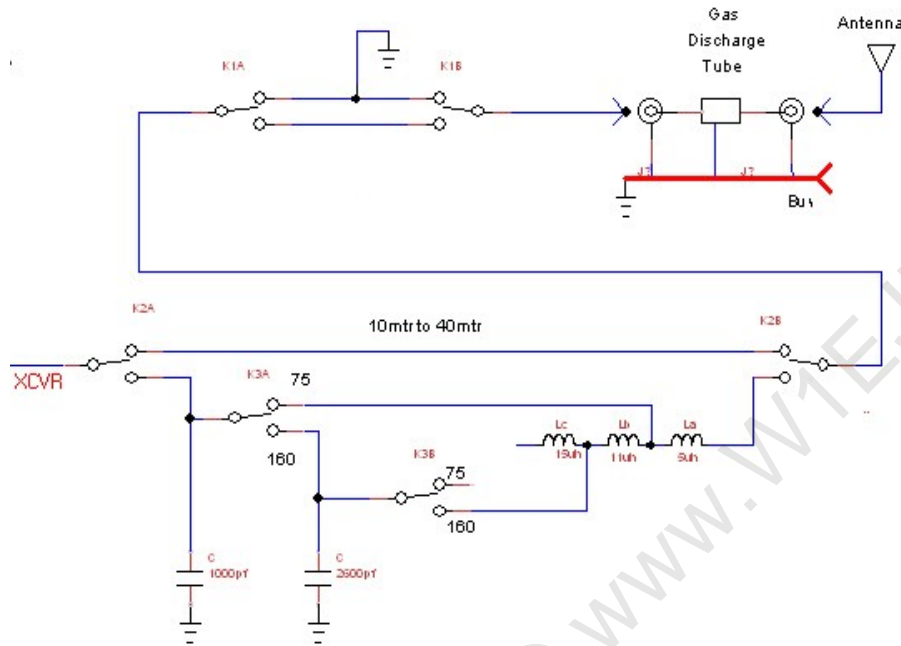
40 – 10 Meter $<1.7:1$ VSWR

75 Meters VSWR = **2.4:1**



So what about 75 & 160 Meters?

75 and 160 Meter Band Network



40-10 Bands are Straight Through connection

75 and 160 Meters have only 2 Tap Inductor and 2 Caps

L/C tuned to 3.5mhz and 1.8mhz for ~1:1 VSWR

Simply shorten wire to get to ~1:1 to operate higher in the band.

Actual Performance

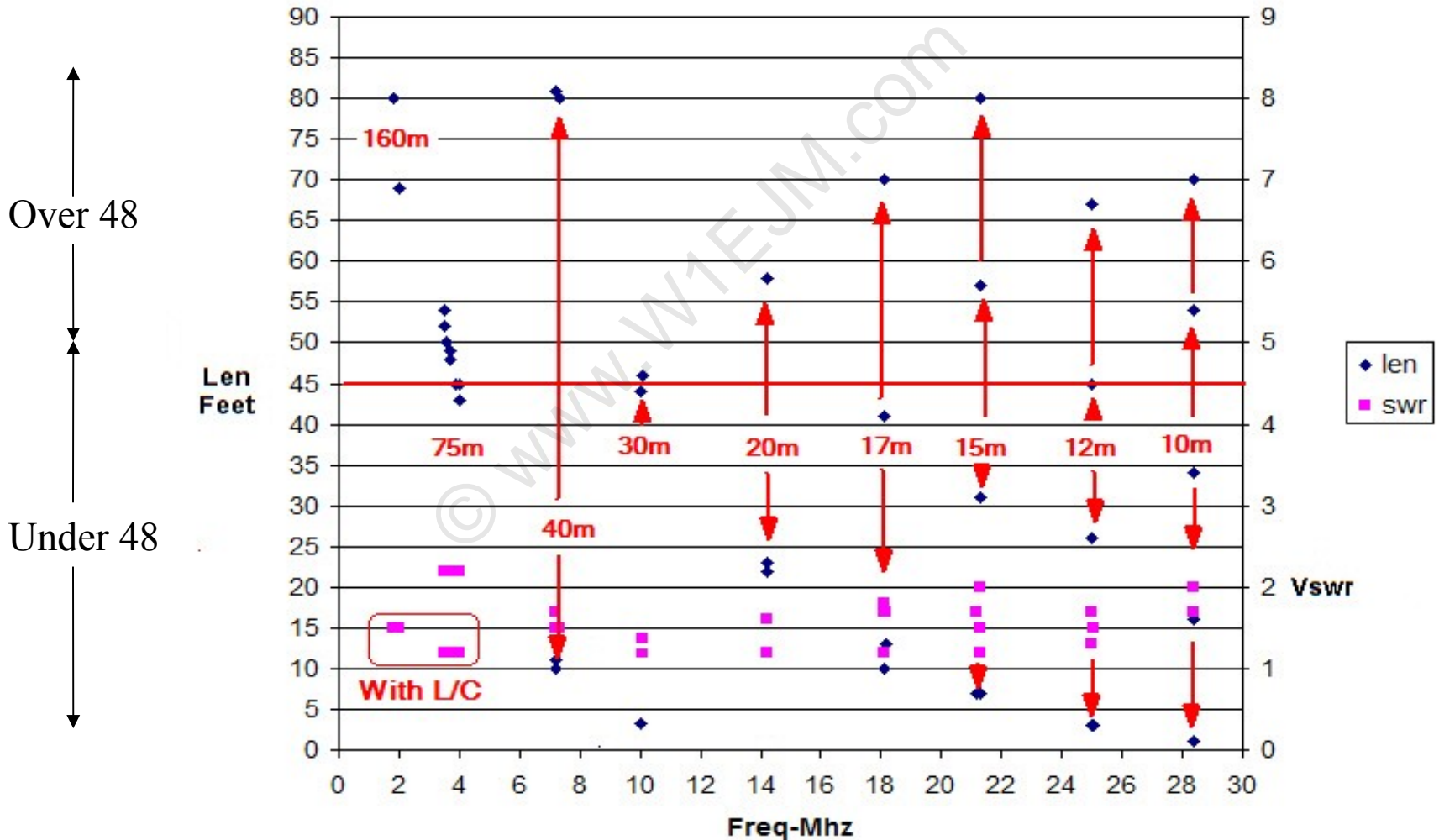
The graph in the following slide shows the actual low Vswr points vs. wire length for the antenna.

It's impressive to compare this graph with the Predicted performance shown in slide 8

Vari - L Flat Top – Actual Performance Data

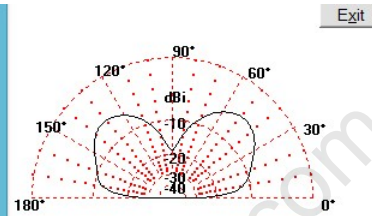
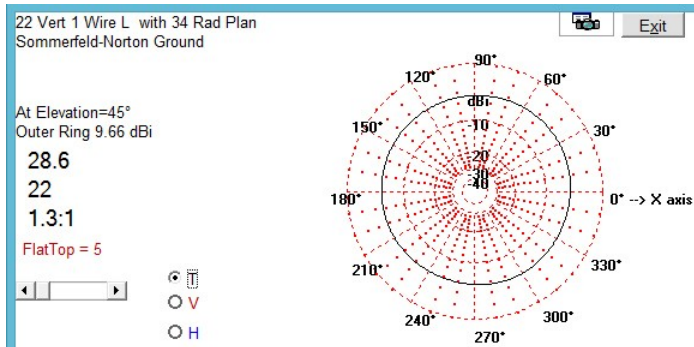
1-8-16

Flat Top Length and Vswr vs Frequency

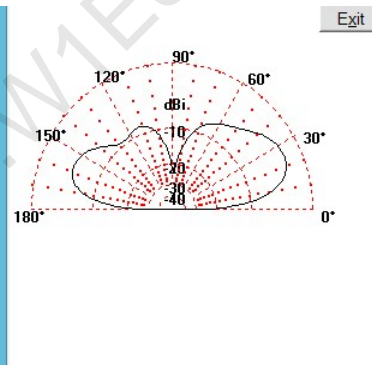
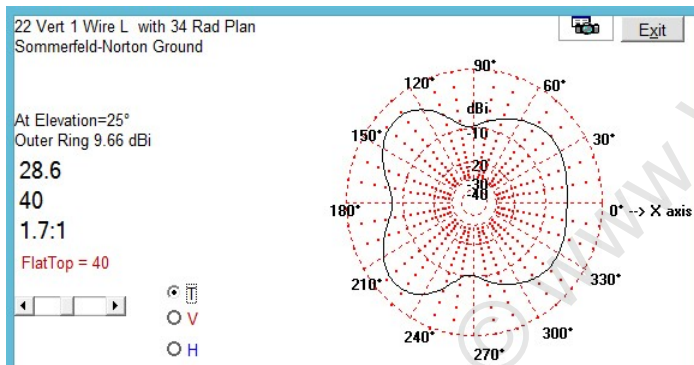


Directionality

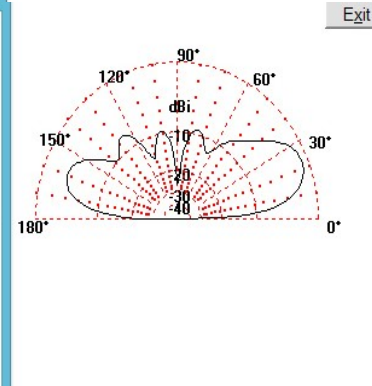
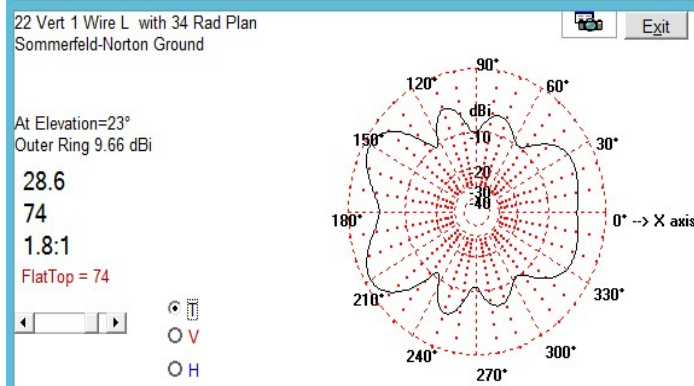
Antenna Model on 10 Meters Az / EL Pattern vs. Length



5ft



40ft



75ft