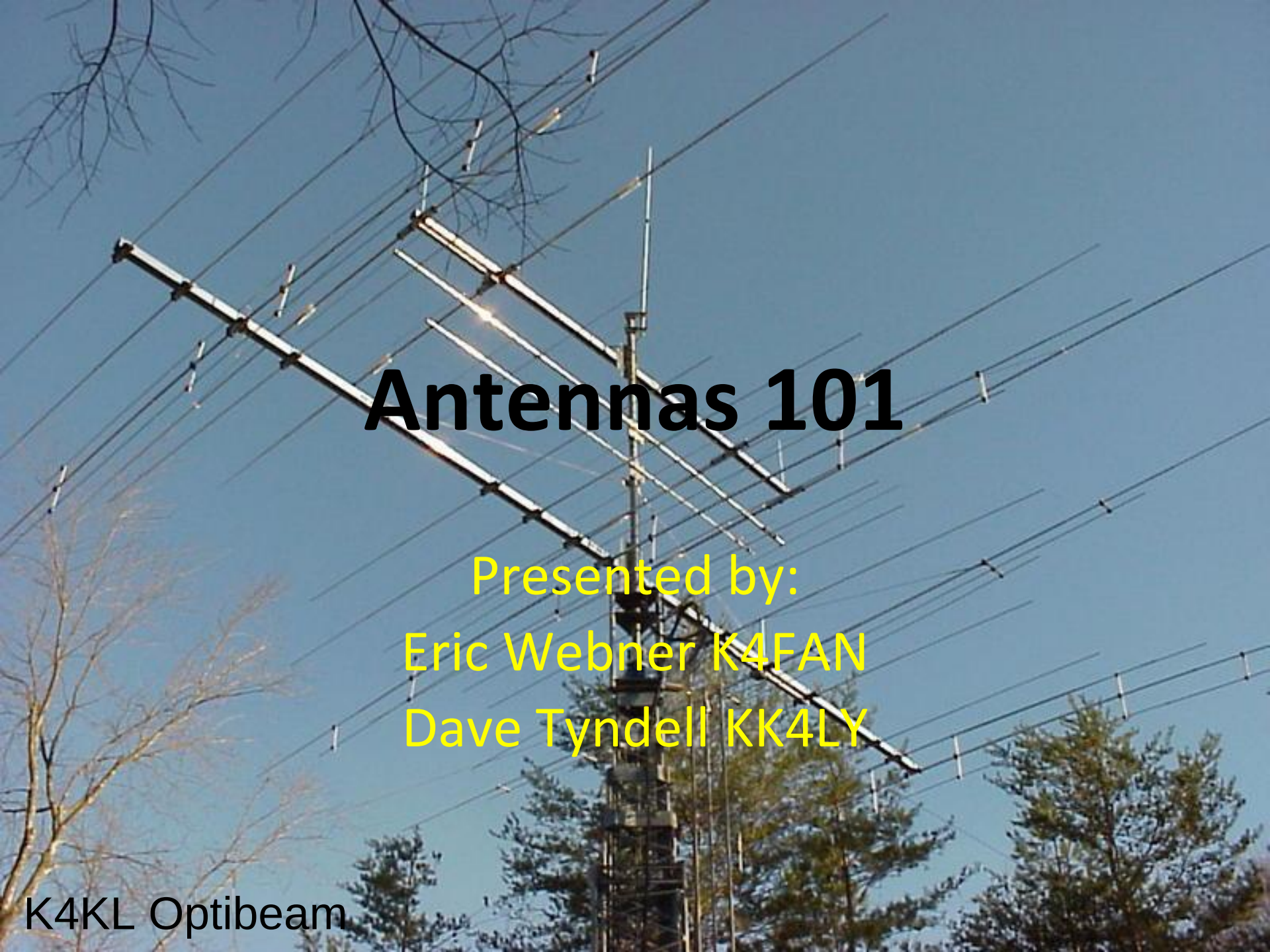

Antennas 101

Presented by:
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Dave Tyndell KK4LY

K4KL Optibeam

Introduction

- An overview of common ham antennas for portable, base and mobile use, geared towards the new ham.
- Answers the (BIG) question of, “Now that I’ve got my license and I bought this Super Whiz-Bang radio, how do I get this thing on the air?

Introduction

- Remember that frequency is inversely proportional to wavelength. Many antennas are measured in terms of the fraction of a wavelength at the frequency of operation.
- Engineering methodology and higher math will not be covered in this presentation (whew!).

Antennas for Portable (HT) use

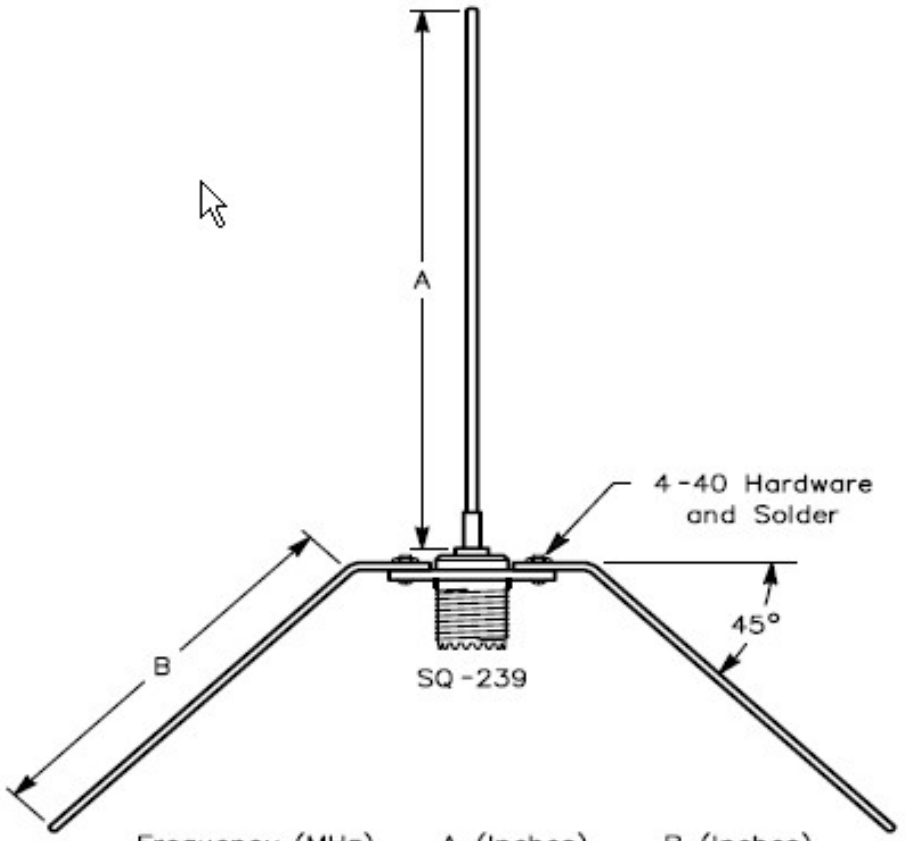
- Single or dual band (2m/440MHz)
- stock vs. aftermarket

- Connectors used include BNC, SMA and reverse SMA (Chinese radios)

- Extending coverage by using a mobile or base antenna

Antennas for mobile and base VHF/UHF

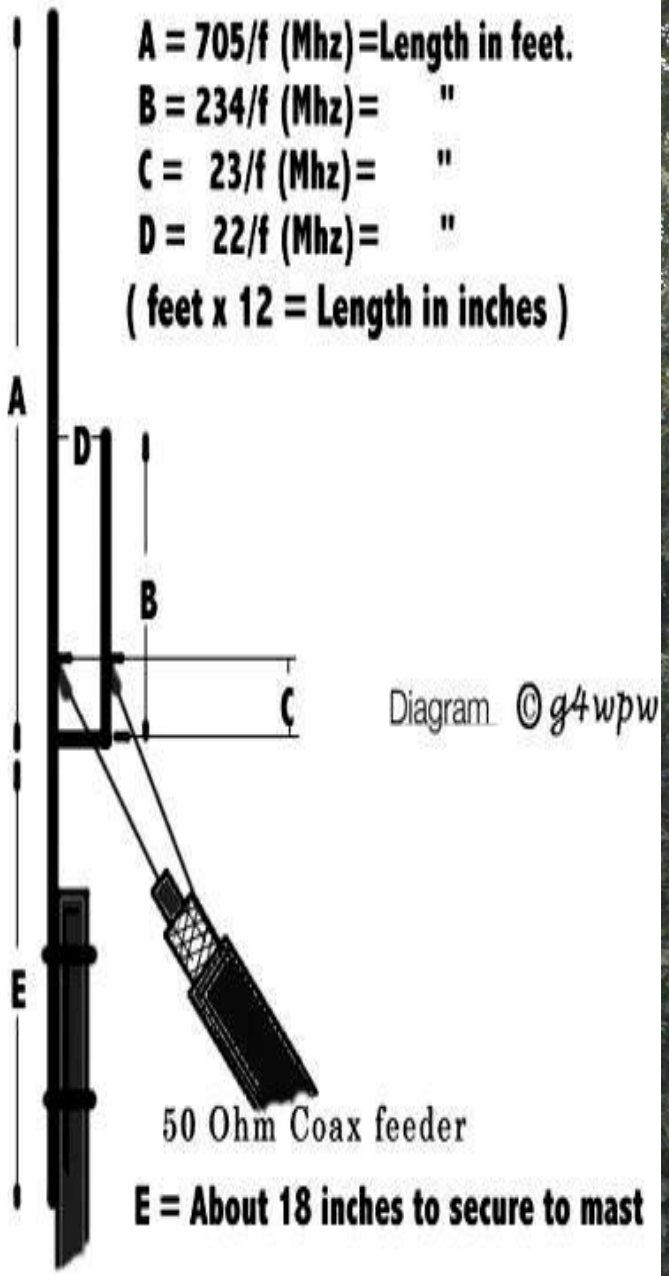
- ¼ wave ground-plane



Frequency (MHz)	A (Inches)	B (Inches)
146	19-5/16"	18-11/16"
225	12-5/8"	12"
445	6-3/8"	5-3/4"

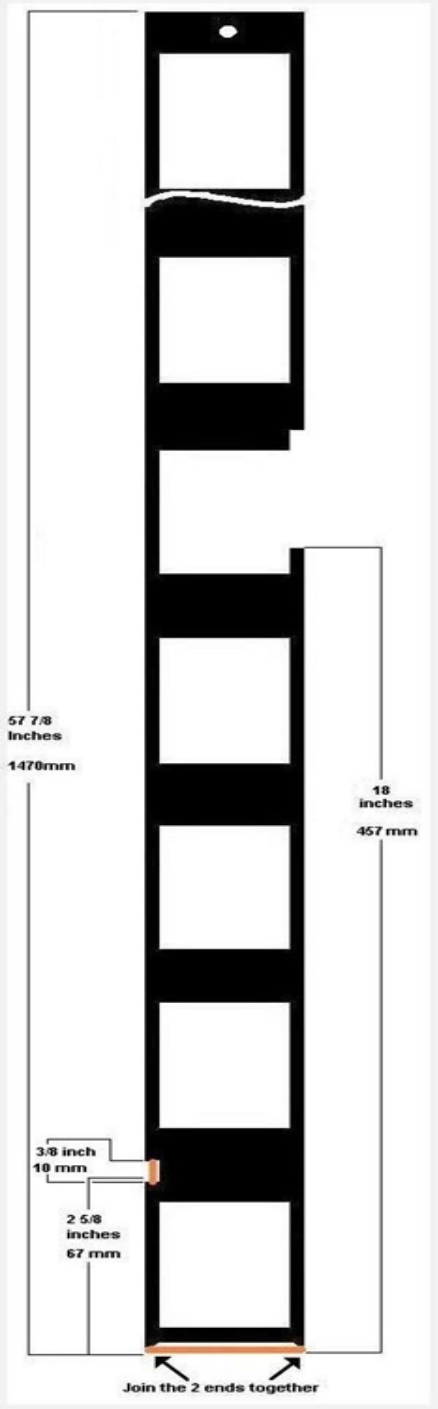

Hustler 5/8-wave full-size 2-m
Larsen dual-bander
Comet dual-bander

J Pole vertical antenna



- Bob K9TMU's Slim Jim

- Variation on J-pole
- dual band
- easily built from a piece of 450 ohm ladder line



Commercial collinear base antennas

- multiple ⅝ wave elements means more gain, lower takeoff angle
- watch out for overstated gain figures

Diamond X-50a

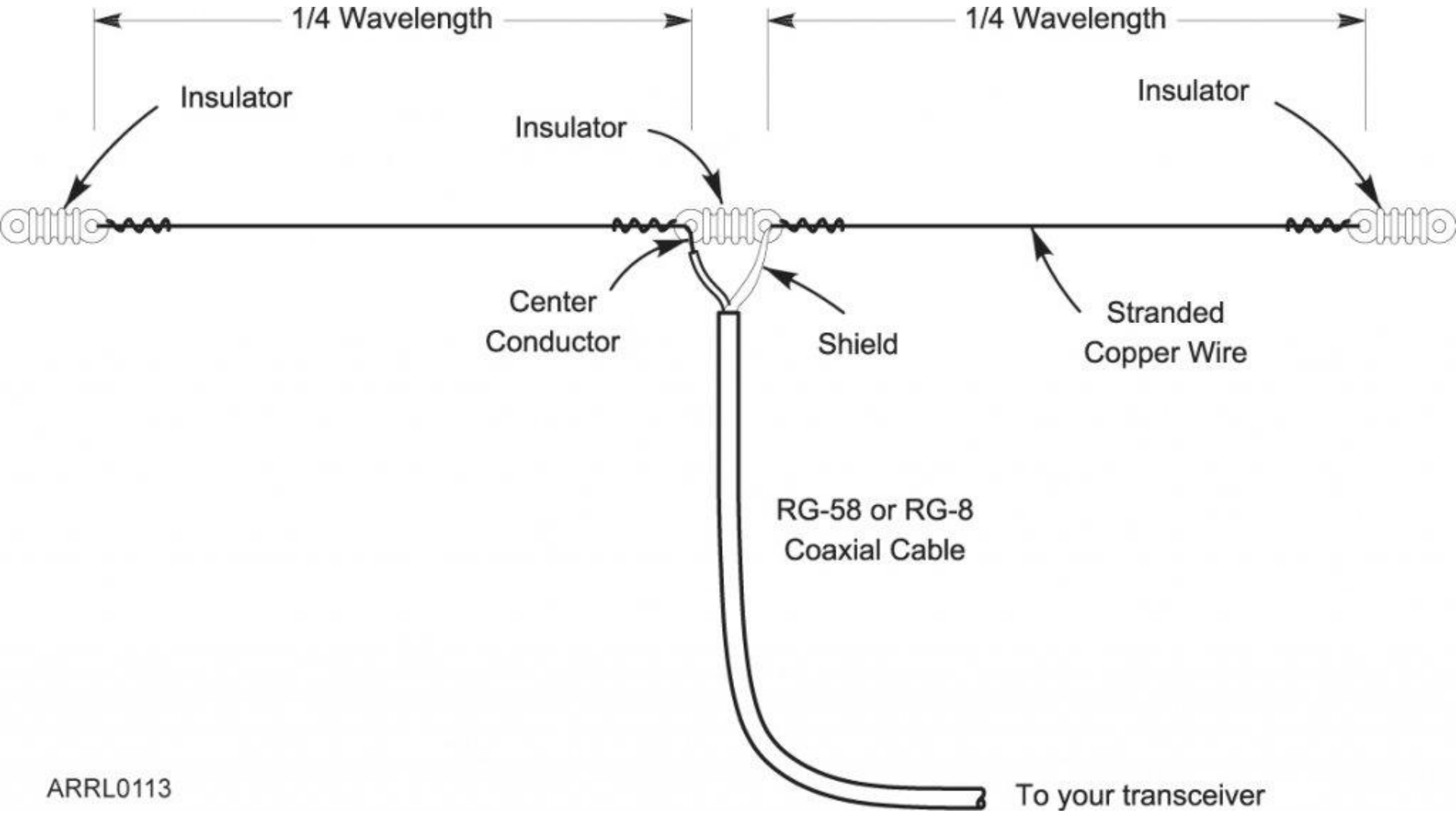
Ringo Ranger II

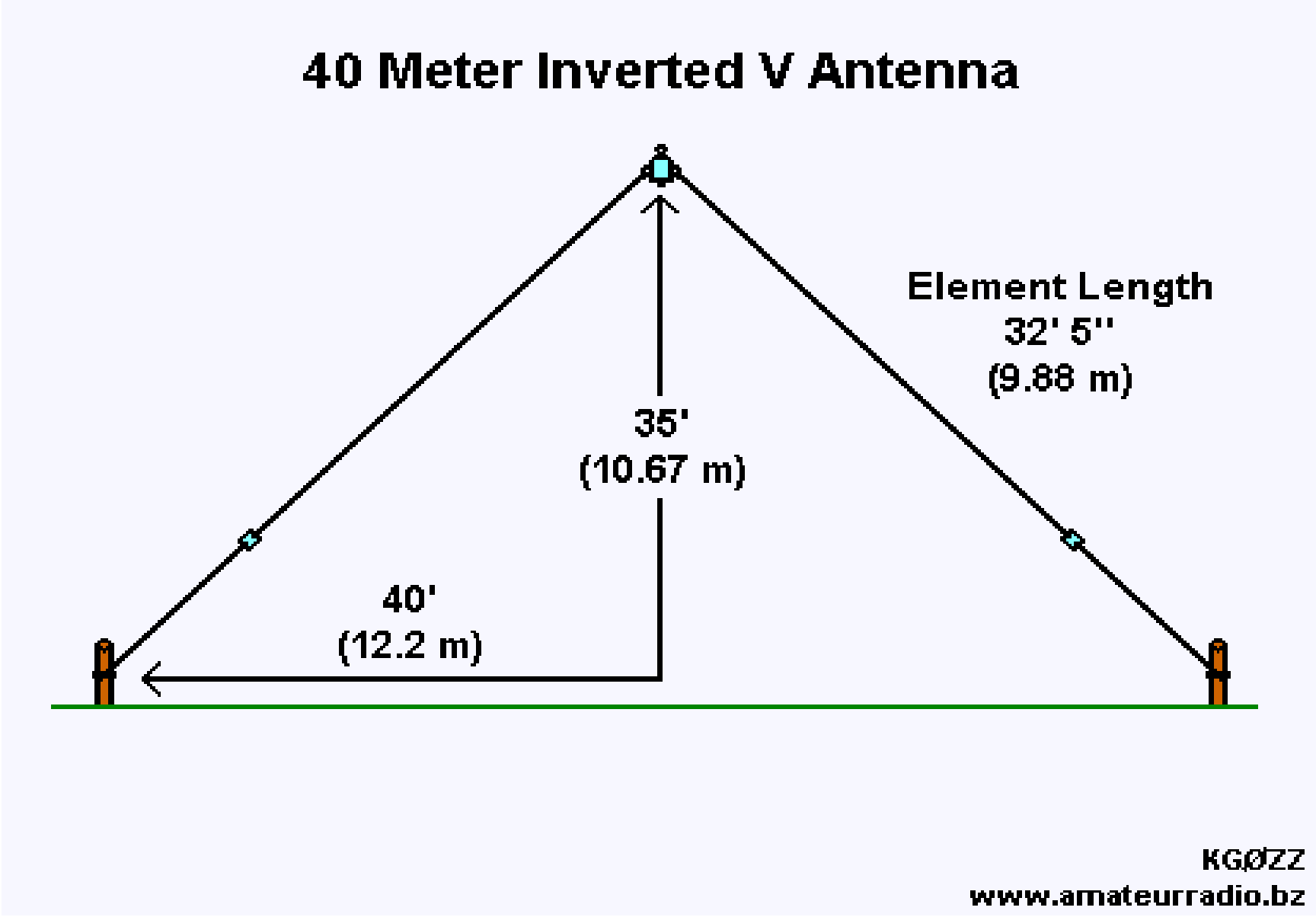
Antennas for HF base use

Simple wire antennas

- resonant dipole, either as flat-top or inverted V

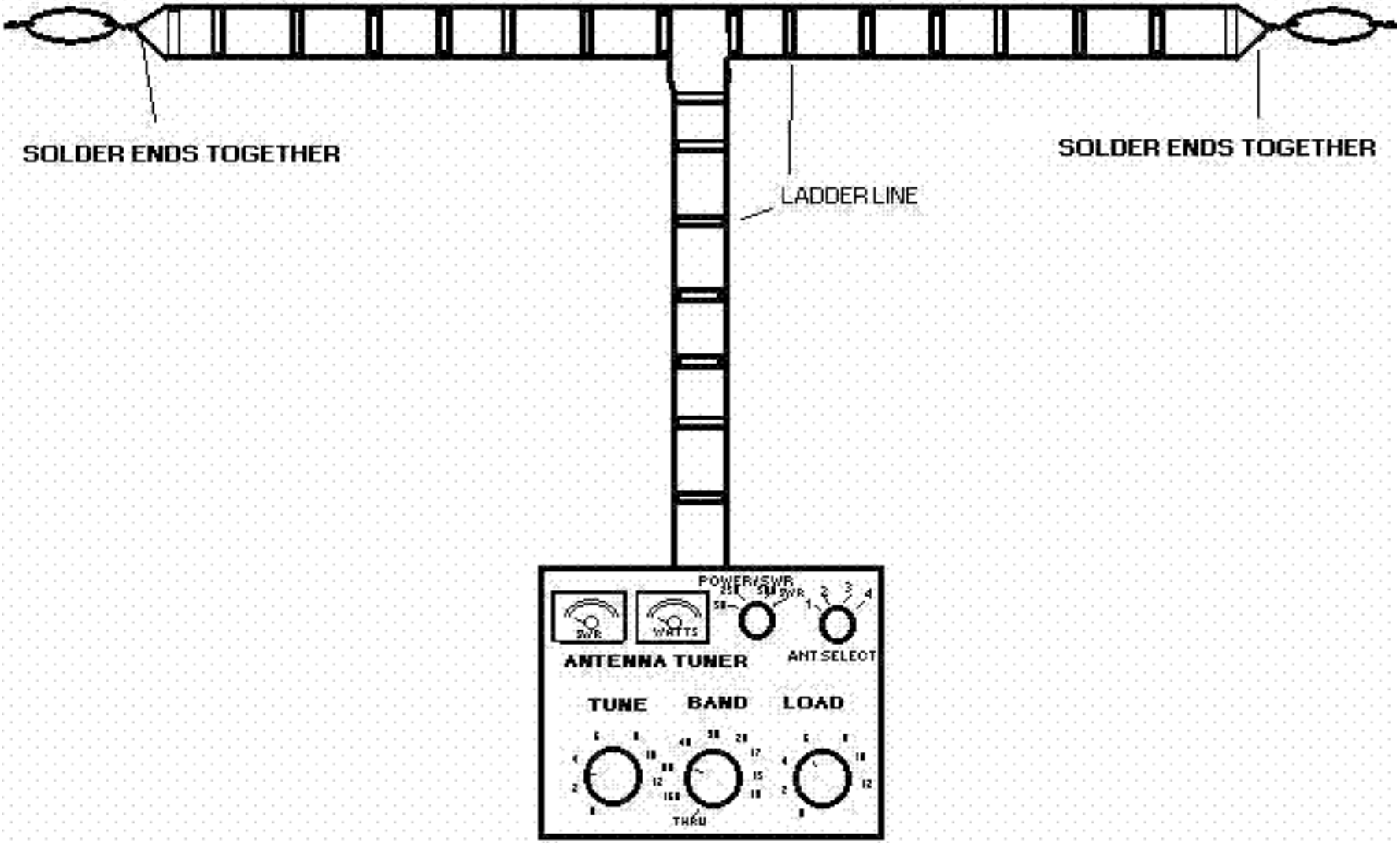
½ wavelength horizontal dipole





- Best angle between the elements is 90 - 120 degrees
- It does not have to stand completely vertical

½ wave folded dipole



Dipole and Inverted Vee Antenna Calculator

Sufficiently accurate for wire antennas up to 30 Mhz.

Enter primary operating frequency in Mhz 3.80

Inverted Vee, approximate angle from horizontal. 45 Degree - 5% shorter

Click to Calculate Length or Clear Values

Dipole's length

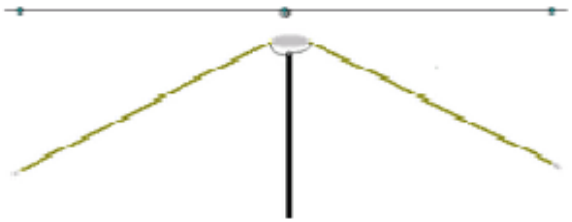
Each leg

Total Vee length

Each Vee leg

Min vert. height

Min horiz. spread



Assuming level ground, the minimum height of vee will be (length of leg * sin(angle from horizontal) plus the height of endpoints of vee above ground. The horizontal spread of Vee will be the distance from endpoint to endpoint, plus the tie off points

NOTE: Remember that location, height, obstructions, wire type, wire coating, etc will effect the calculated lengths. Always cut your wire a little longer and then trim for your installation.

The basic formula for determining the wire length of a center fed, 1/2 wave wire dipole or inverted Vee antenna (30 mhz or less) is 468/freq(mhz).

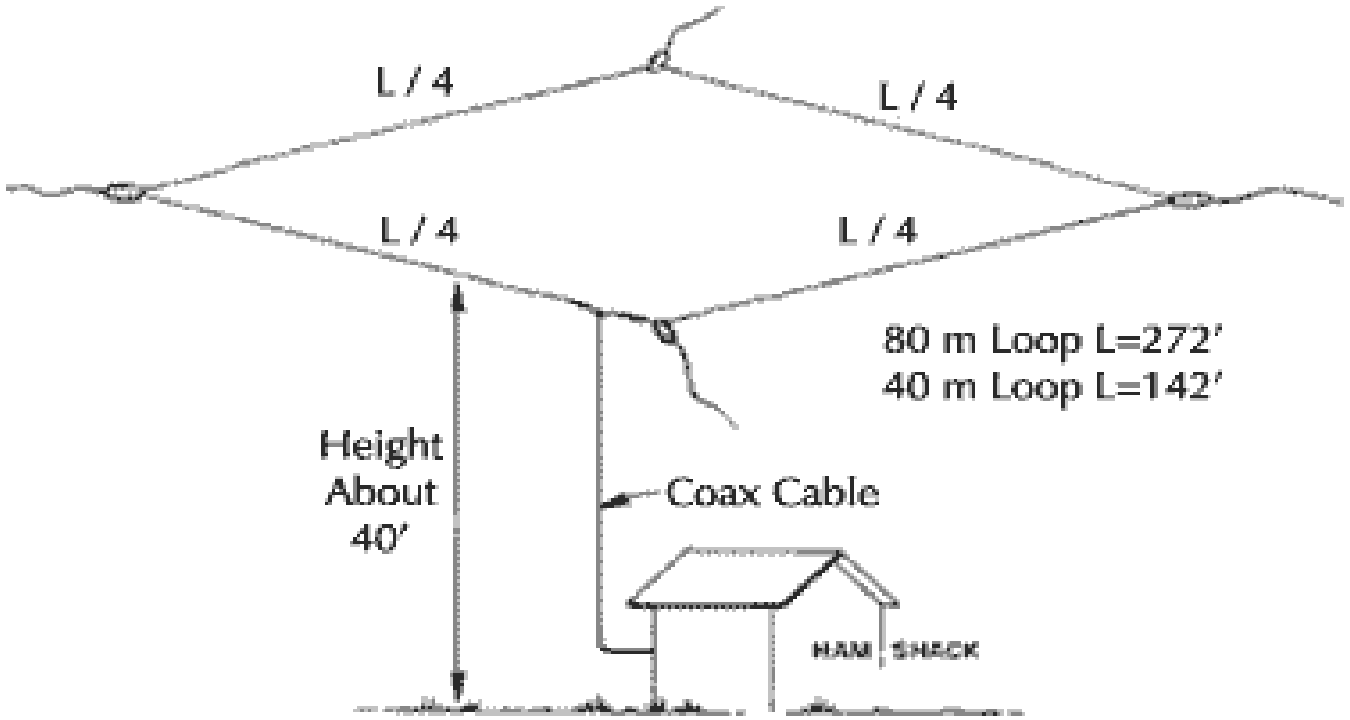
The inverted Vee antenna will be shorter by 2 - 5% depending on the angle from horizontal.

Dipoles and inverted vee antennas have a feed point of about 75 ohm's in free space, and can be fed with 52 to 72 ohm coax with or without a 1:1 balun

http://qsl.net/wb4bxw/antenna_cal_diople.html

Loop Antennas

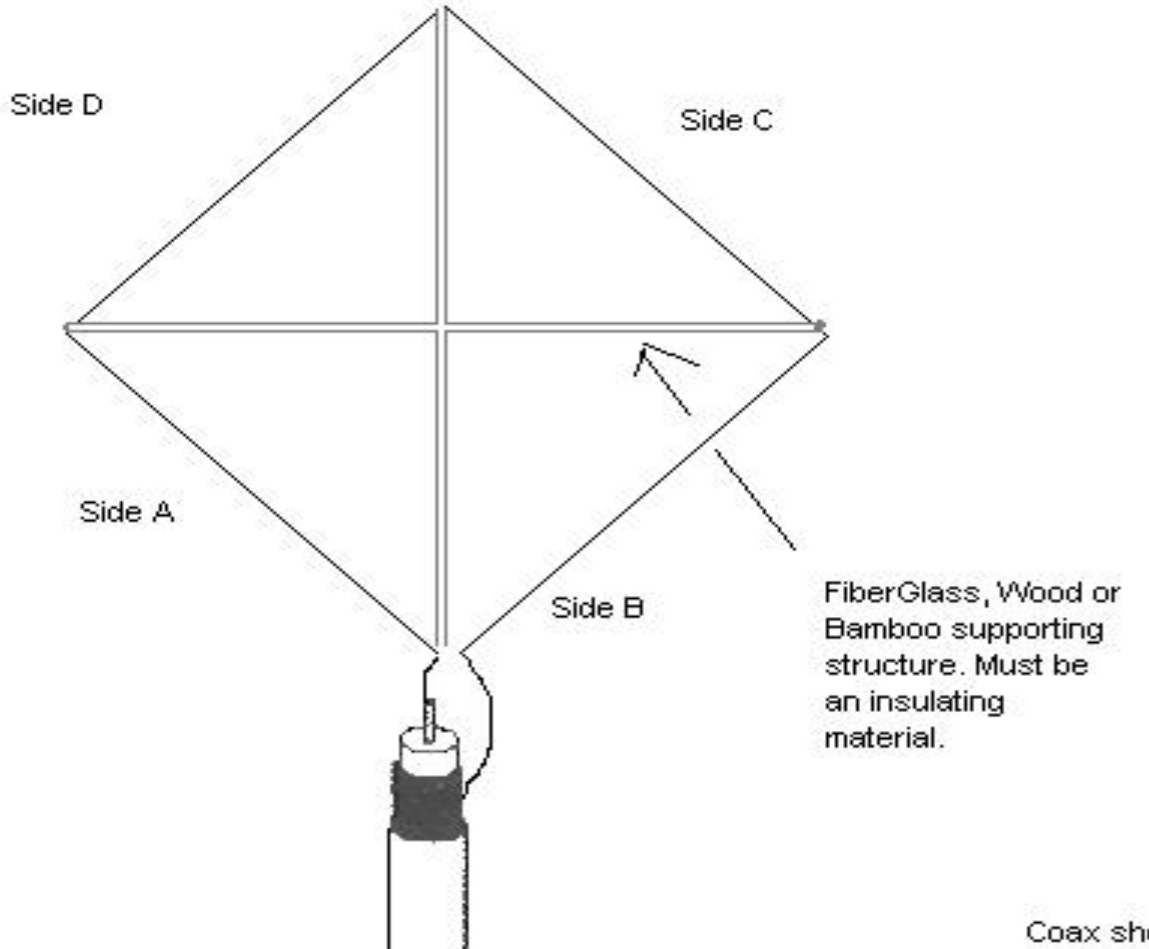
Full-wave horizontal loop: good for short-range communications, NVIS or “cloudwarmer” antenna

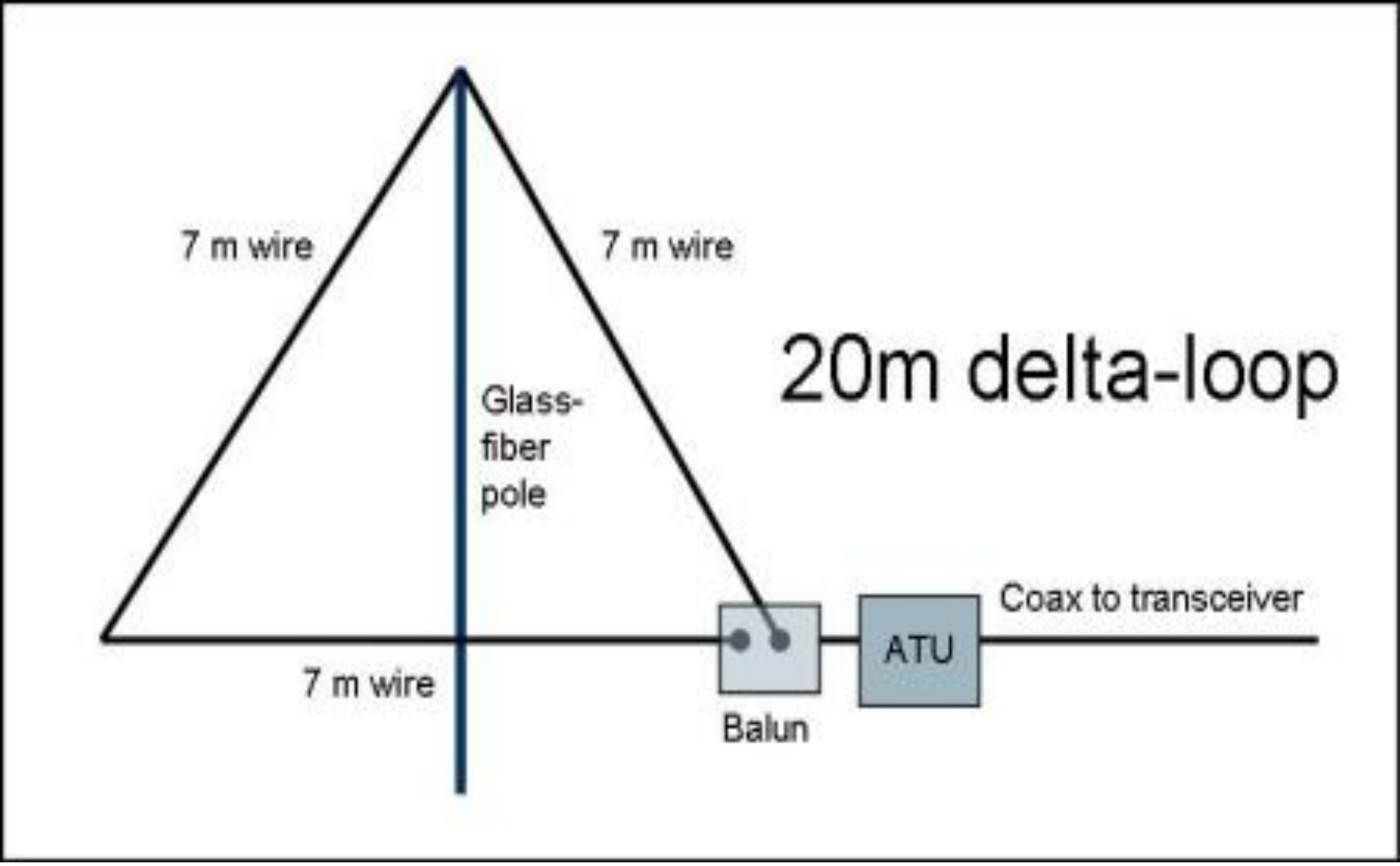


Vertical Square loop

- Feedpoint determines polarization
- Maximum radiation perpendicular to the plane of the loop

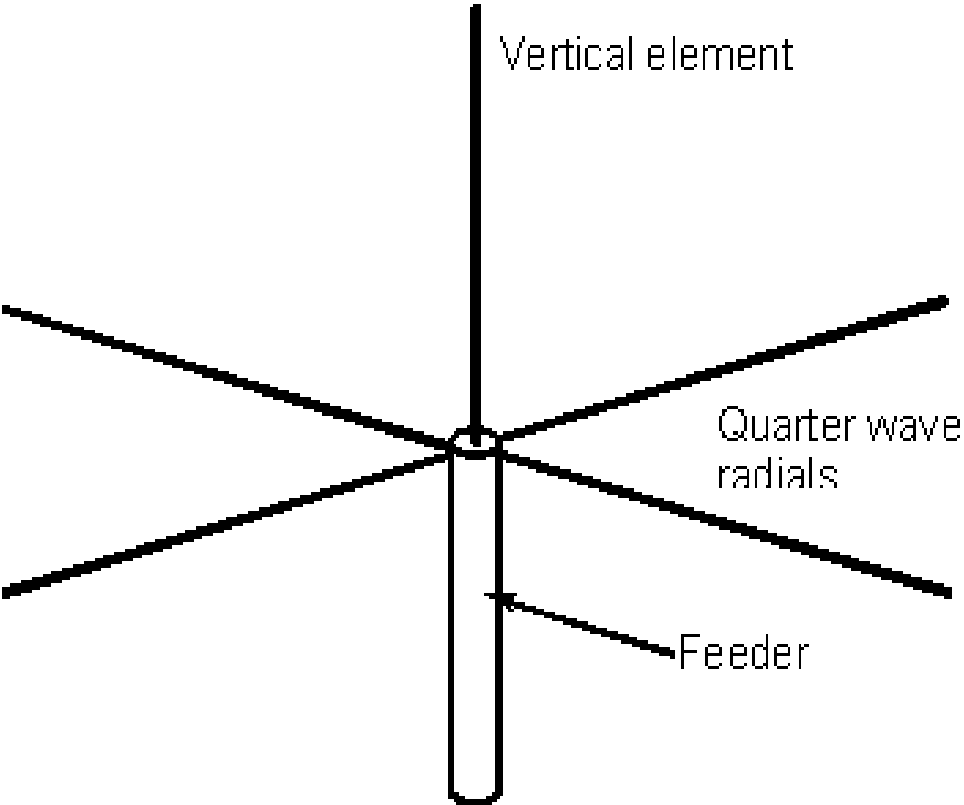
Quad Loop with Supporting structure shown



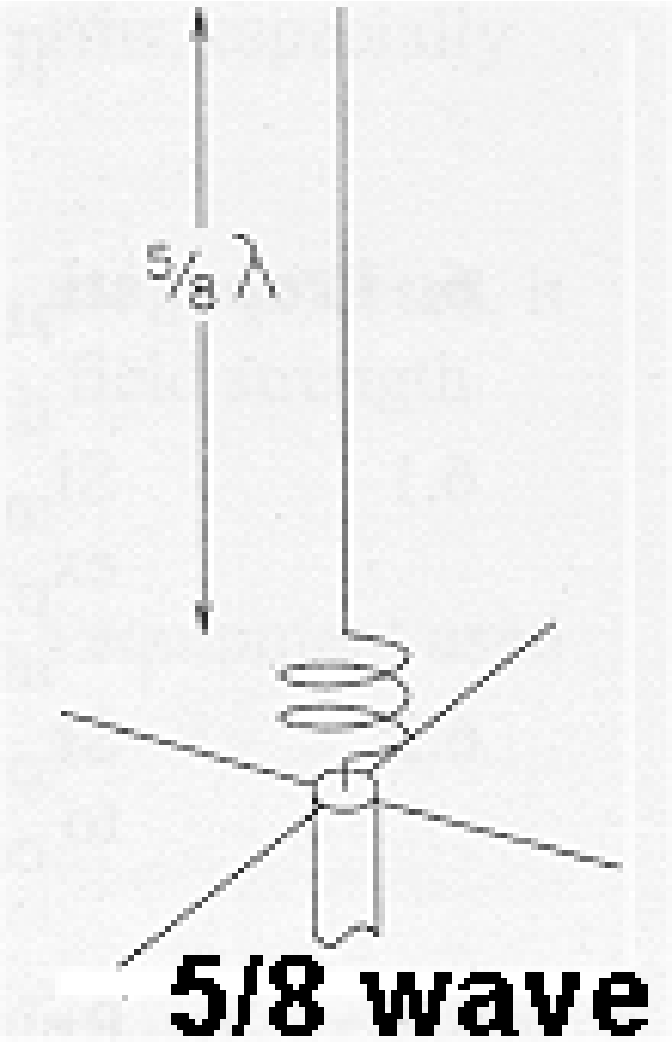

7 m wire
7 m wire
20m delta-loop
Glass-
fiber
pole
Coax to transceiver
ATU
7 m wire
Balun

Vertical and Inverted L Antennas

- ¼ wave Vertical monopole, which requires a ground plane (elevated) or a system of ground radials (ground-mounted).



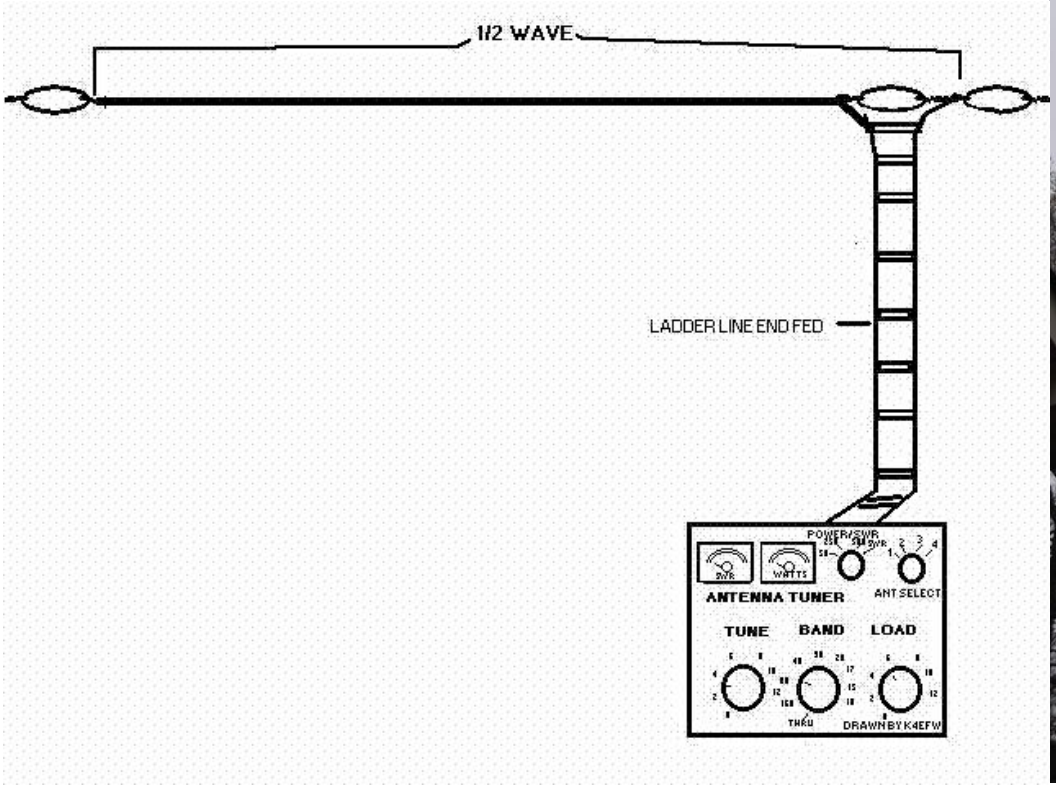
- Many verticals are a 5/8 wave element, which has higher gain, lower radiation angle. Requires GP or radials. Note the loading coil at the base of the antenna.



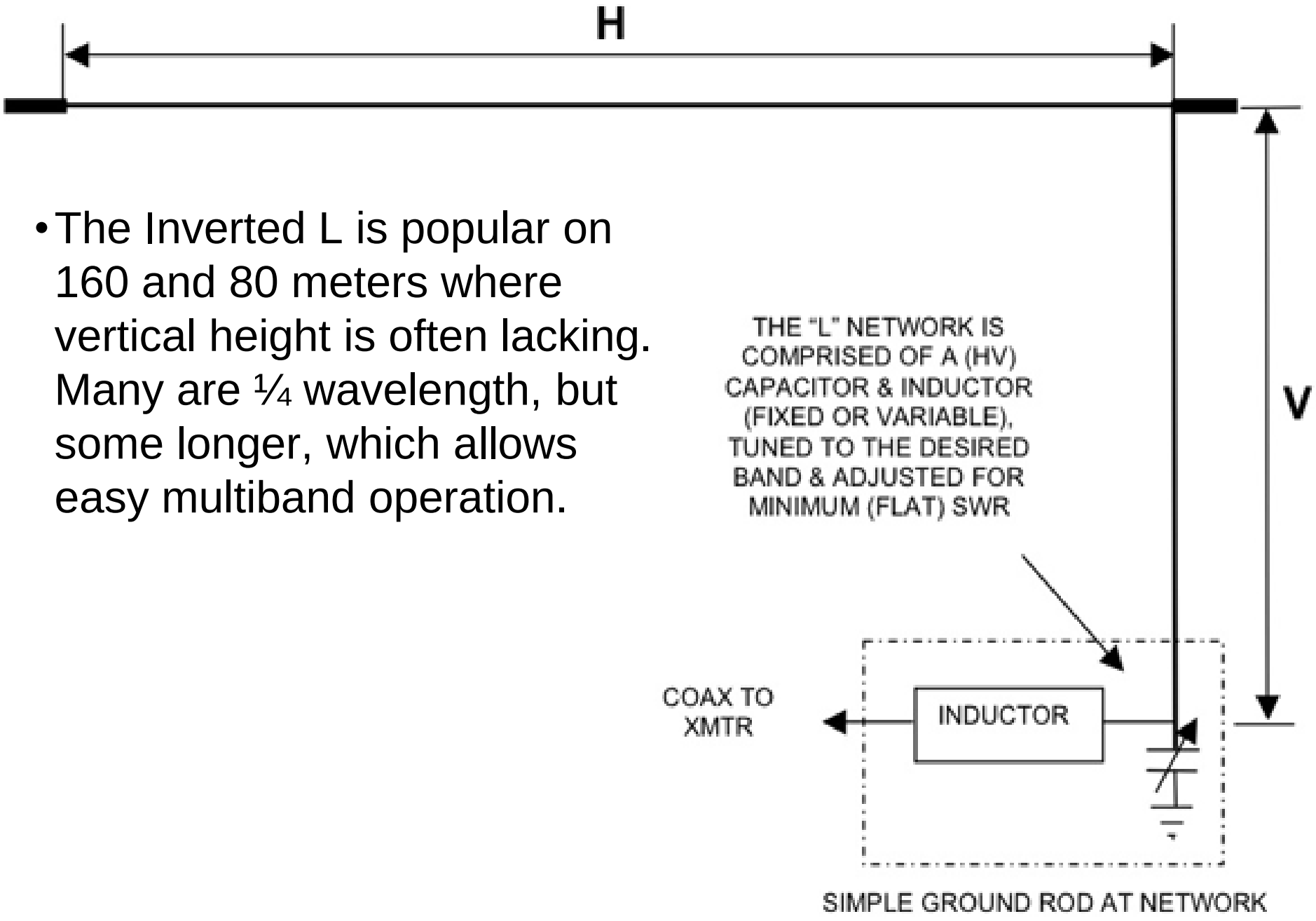
- Many commercial multiband verticals, which use a combination of traps, linear loading and/or capacity hats, use ½ wave elements which does not require radials.

Cushcraft R7 Vertical

½ wave antennas can be fed from the end (voltage feed)



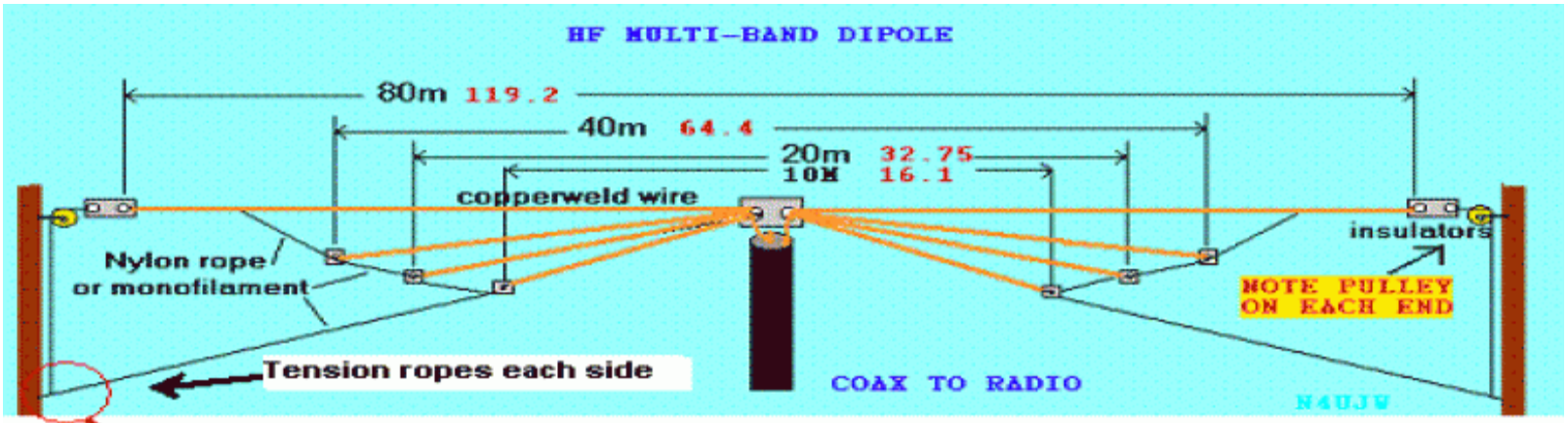
AD4IE end-fed as inverted L



- The Inverted L is popular on 160 and 80 meters where vertical height is often lacking. Many are ¼ wavelength, but some longer, which allows easy multiband operation.

Multiband Antennas

- Fan (or parallel) dipole

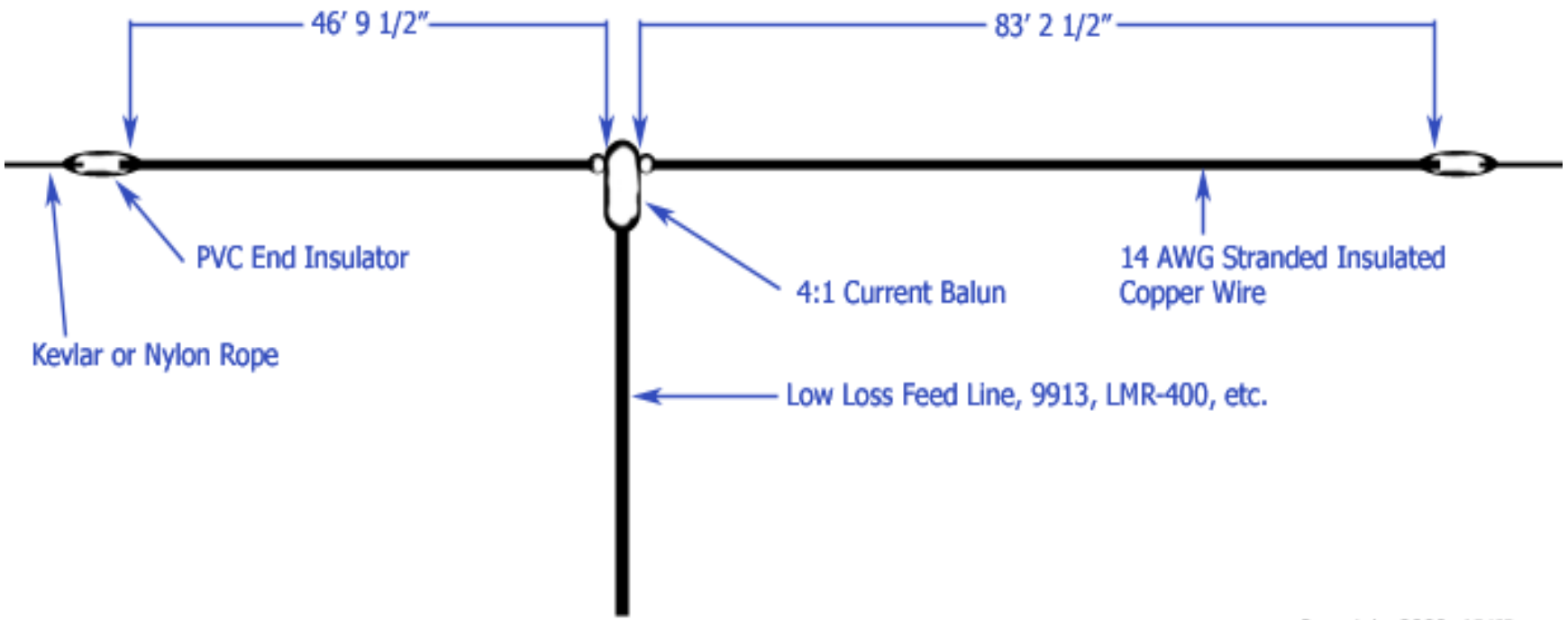


Tension rope is not tied to pully rope in picture. It is tied near location of pully rope down on supports within easy reach. It is tied last after final SWR adjustment and the antenna is in it's final position.

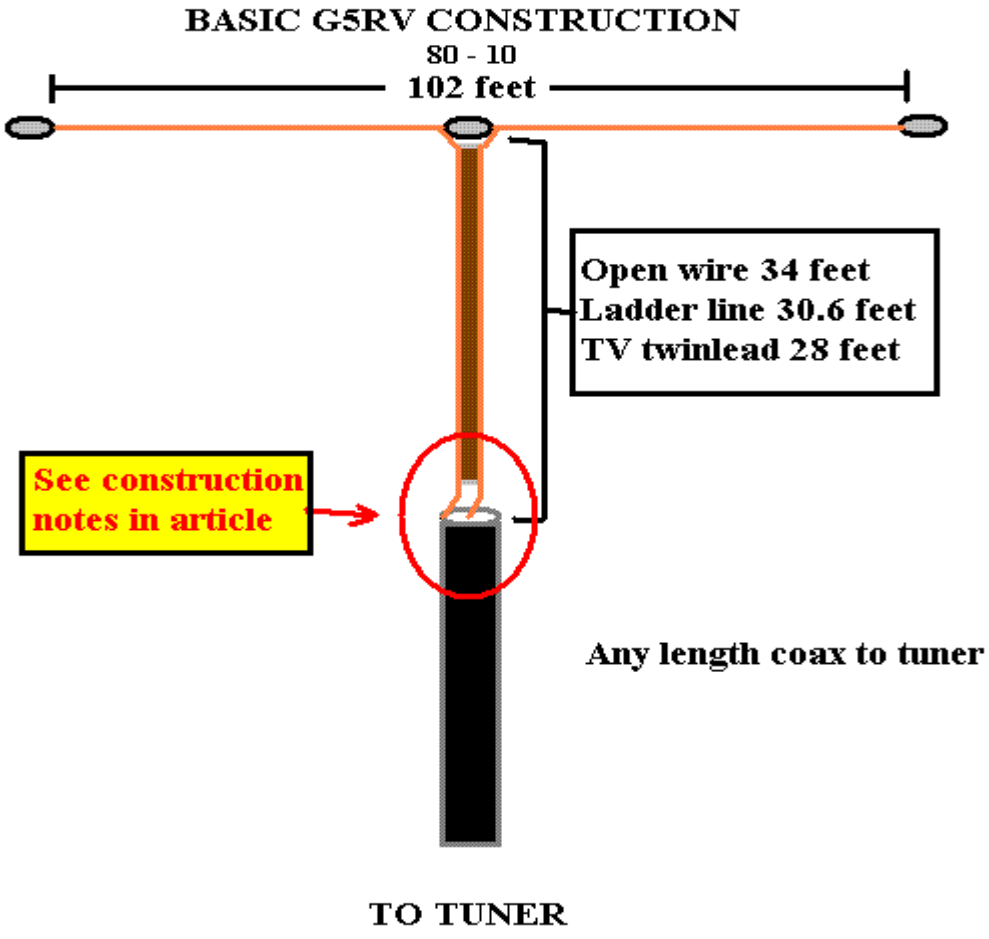
Suggested total lengths:
80 meters - 120 feet
40 meters - 65 to 66 feet
20 meters - 34 feet
10 meters - 17 feet
These lengths are not exact. Some tuning may be required. Use the standard formula 468 / freqmhz for total feet for each band (freq) of interest. Adjust each length longer or shorter as needed.

Off-Center Fed (OCF) Dipole

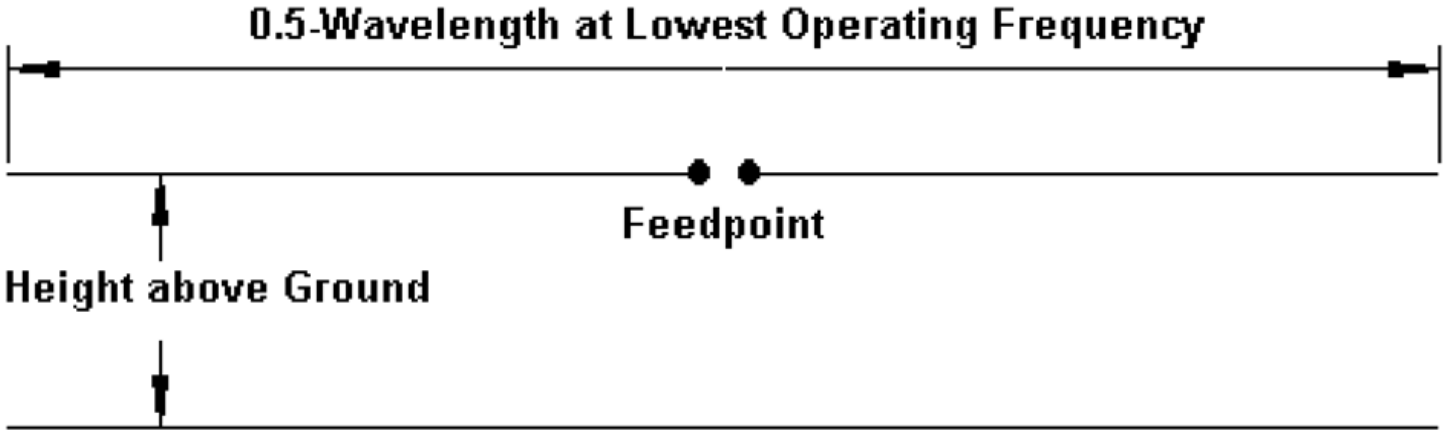
- Based on the Windom antenna



The G5RV


BASIC G5RV CONSTRUCTION
80 - 10
102 feet
Open wire 34 feet
Ladder line 30.6 feet
TV twinlead 28 feet
See construction notes in article
Any length coax to tuner
TO TUNER
N4UJW

Dipole Doublet – L.B. Cebik W4RNL (sk)



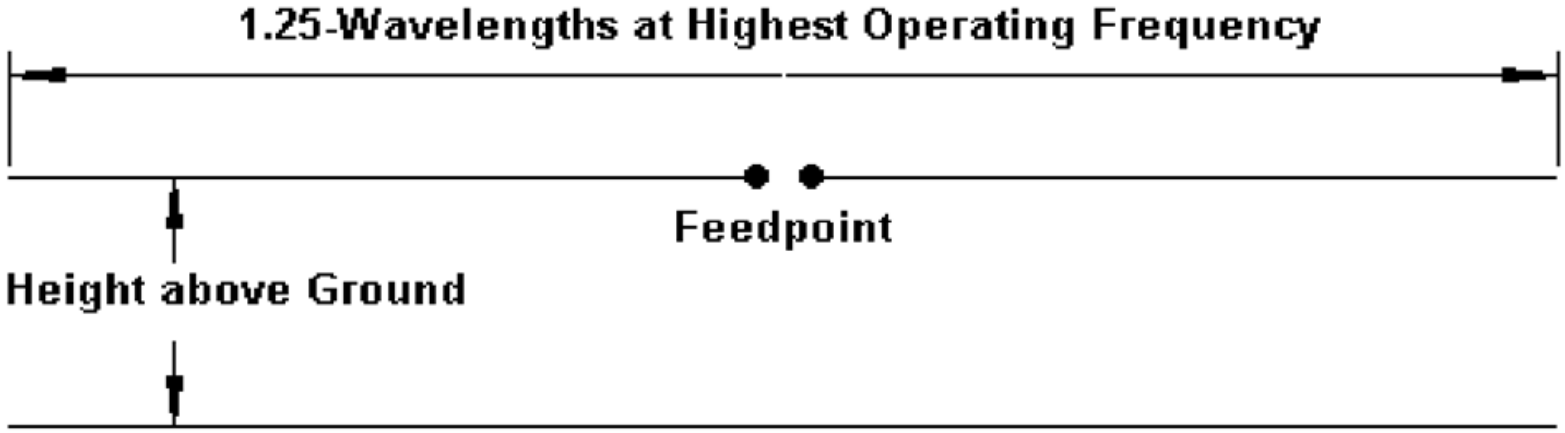
The Dipole-Doublet

Fig. 10

- Fed with ladderline and an antenna tuner, this will work all HF bands from its ½ wave frequency on up.
- Not concerned with radiation pattern.

The Broadside Doublet – L.B. Cebik W4RNL (sk)

Extended Double Zepp



The Broadside Doublet

Fig. 3

Broadside Doublet Lengths and Amateur Band Coverage

Length (feet) Bands covered

- 44' 10, 12, 15, 17, 20, 30, 40 meters
- 66' 15, 17, 20, 30, 40, 60 meters
- 88' 20, 30, 40, 60, 80 meters

Stealth Antennas

- K2AMV dual-bander

Directional Antennas

- Yagi-Uda antennas feature a driven element with a passive reflector and director(s)
- Monoband Yagis have the best performance
- Multi-band Yagis utilize traps and additional elements

K4KAY Yagi antennas

Many Yagis are triband (20/15/10m) such as W4BFB's Cushcraft A3 and A4 antennas

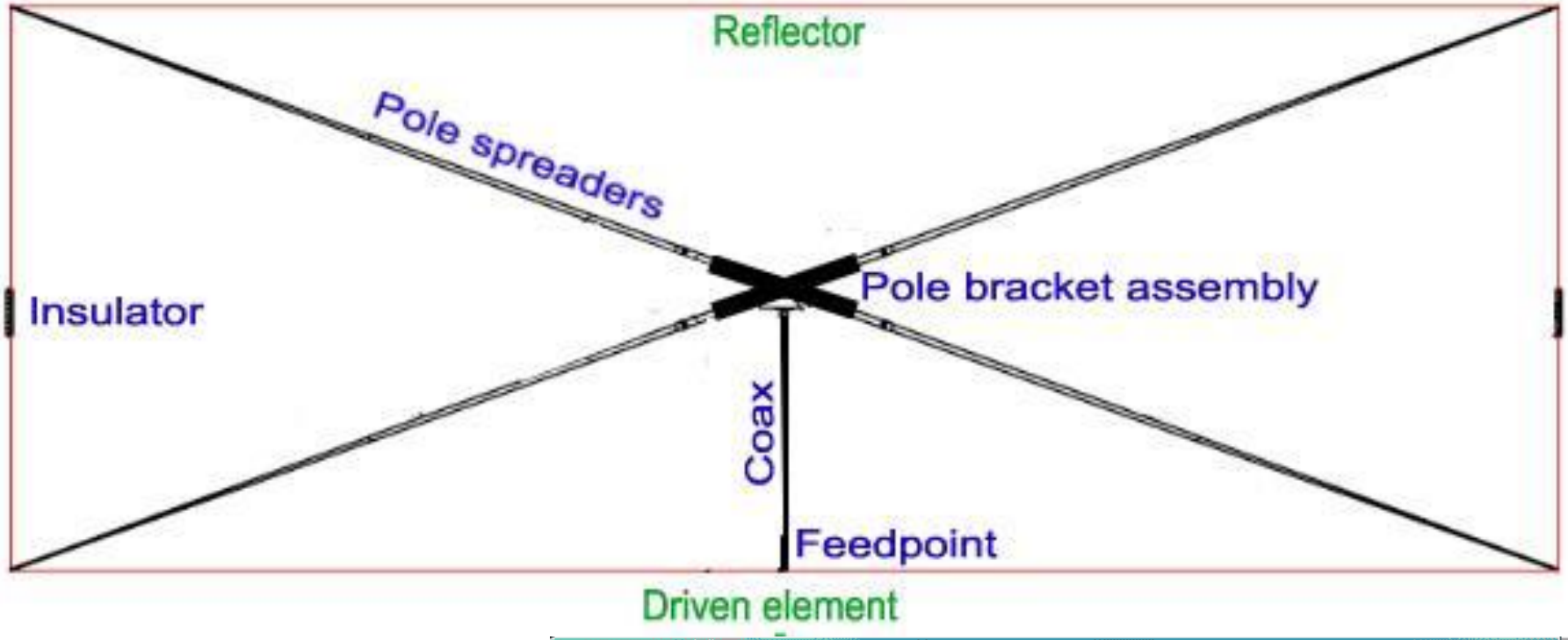
Add-on kits extend the number of frequency bands covered by the array

Gain is related to the number of elements and the length of the boom


K4MQG 80 and 40 m beams at 135 and 120 feet. How'd he get all the way up there?

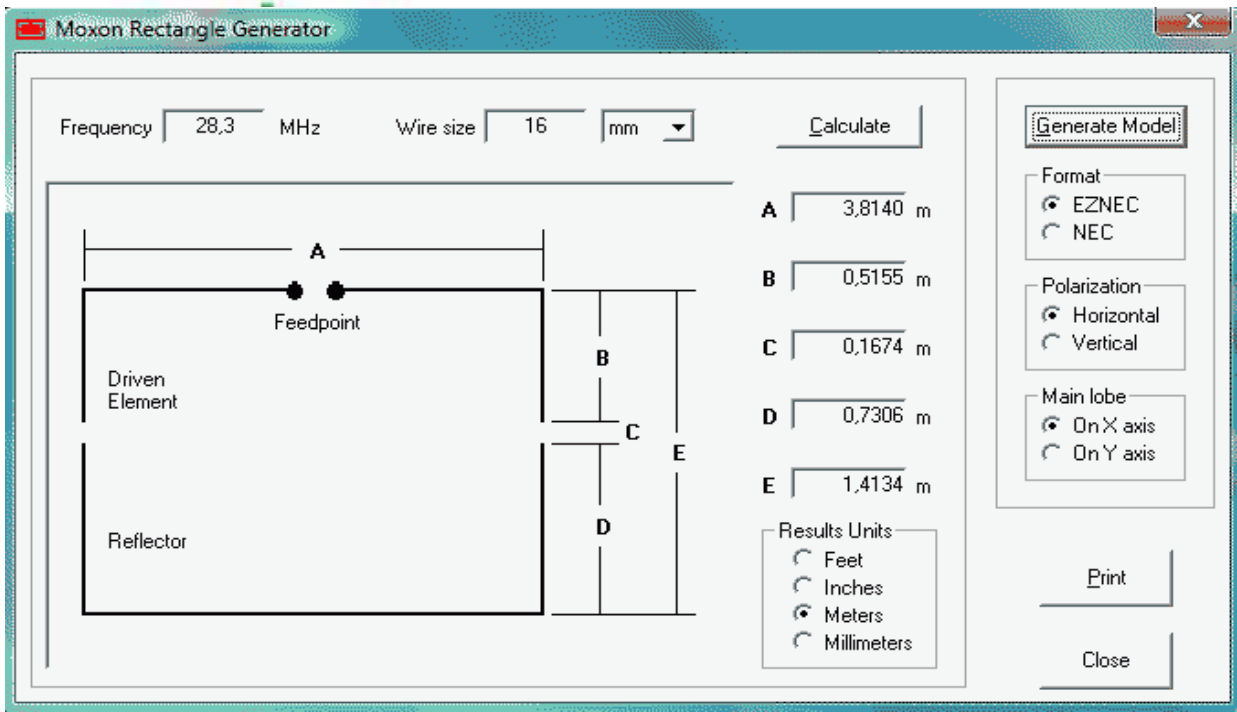
W3GQ SteppIR Yagi – motorized elements

AE8J Hexbeam



Moxon Rectangle

- Like a Yagi, but more compact

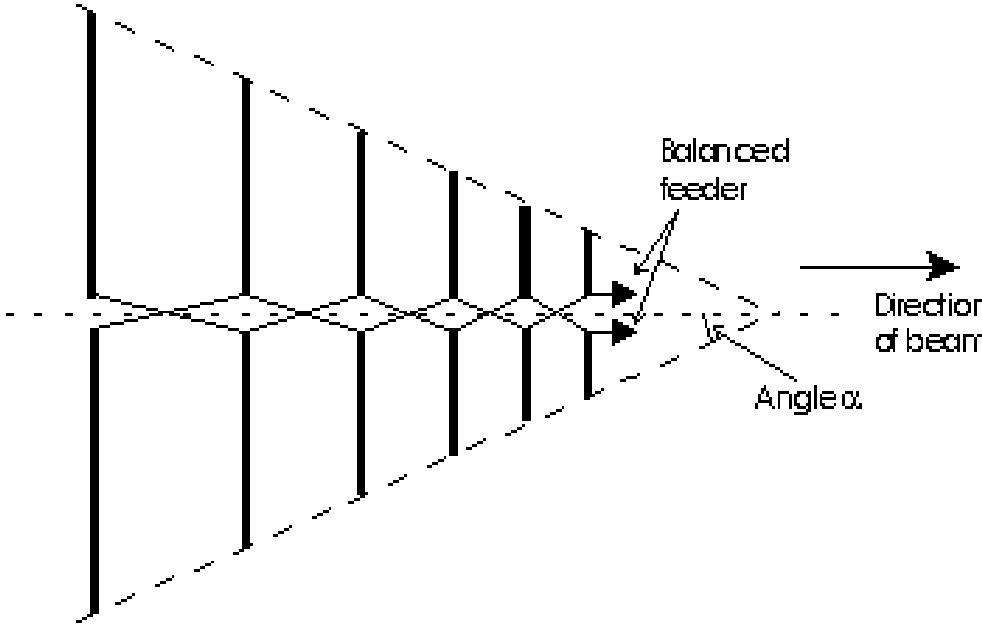


W3GQ (now K4FAN's) Lightning Bolt Quad 20-6m, 2m Quad at the top

- Better performance at lower heights, but fragile

Log-periodic Antenna

- Wide frequency coverage
- Less gain than yagi



N8WRL 80m Four-Square Antenna

HF Mobile Antennas

- These antennas are shortened versions of vertical antennas
- Use loading coils and capacity hats to match and increase efficiency
- Screwdriver antennas use a motor to adjust the tap on the coil
- Hamsticks are helically wound, single-band antennas

References

- www.arrl.org QST, The ARRL Antenna Handbook
- www.cebik.com W4RNL (sk) Antenna guru
- http://www.hamradiosecrets.com lotsa antenna stuff
- http://www.diamondantenna.net mobile/base antennas
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- www.cdxa.org Thanks for the fine pictures many of you sent me!
- www.k0bg.com “The Man” for all things mobile radio!
- http://qsl.net/wb4bxw/antenna_cal_diople.html