

Remote Couplers and Broadband HF Antennas

Steve Hansen KB1TCE

Pen Bay ARC

Overview

- Multi-band resonant antennas are a very practical solution for the amateur radio bands. For other uses (governmental, private commercial services such as Sail Mail, etc.), the frequencies are more randomly scattered throughout the HF spectrum. Some “off band” frequencies may be hard or impossible to tune with typical ham antennas and external tuners.
- One solution, where there are only a few frequencies are involved is the multi-element fan dipole antenna.
- This presentation will cover non-resonant (traveling wave) antennas in two classes:
 - Those using a remote coupler at the antenna feedpoint;
 - Those not requiring a tuner for broadband HF coverage.
- These antennas use essentially random length radiators.

Remote Antenna Couplers

Couplers versus Tuners

- Antenna tuners are generally located at the transmitter output, at the radio end of the coaxial feed line. A tuner “fools” the radio into thinking it is working properly.
- Antenna couplers are placed at the antenna, and match the conditions of the antenna to the feed line.
- A coupler installed at the antenna feed point eliminates the most serious cause of feed line losses by providing a proper match of the antenna to the feed line.
- Most commonly seen around here on cruising boats and Coast Guard ships.

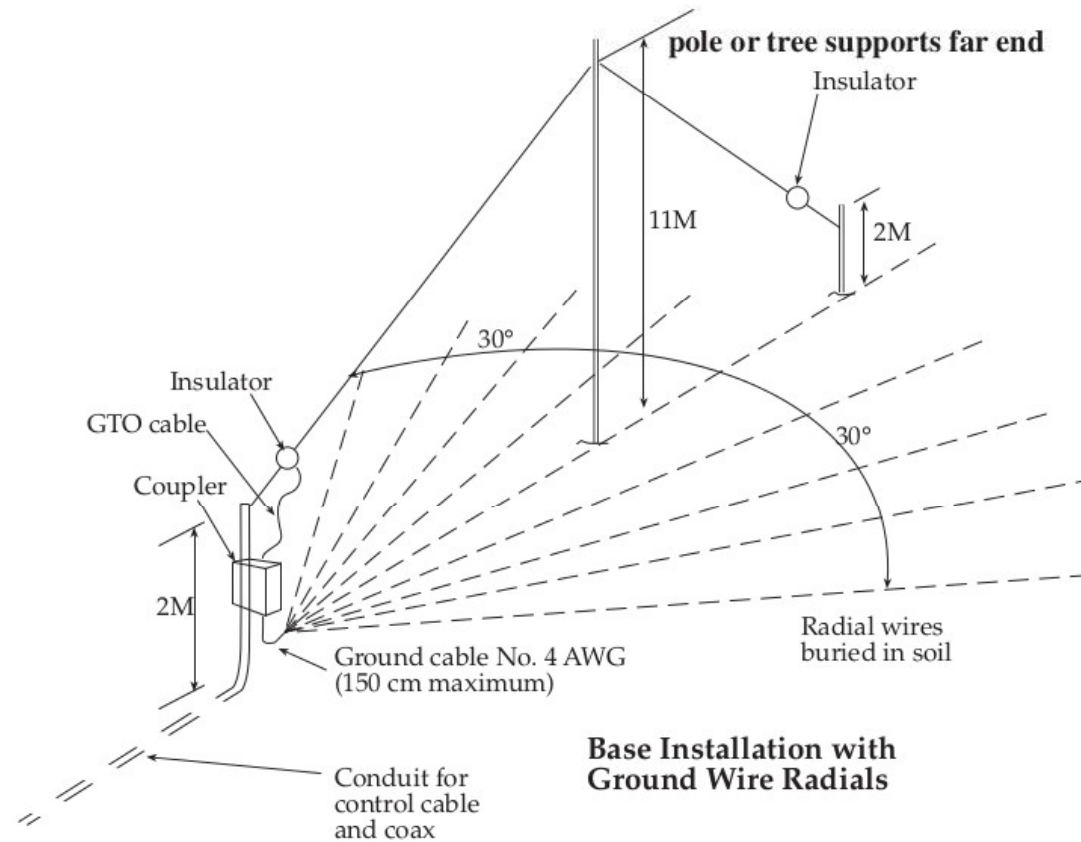
SGC “Smartuners”

- Most of the following is drawn from SGC’s documentation including the *HF Users Guide*, *Smartuners for Stealth Applications* and the *Stealth Kit Manual*.
- See <http://sgcworld.com/PubInfoPage.html>
- The SGC products have varying performance characteristics (tuning range, power handling, packaging and, of course, price).
- Stated tuning range is 0.1 Ω to 10,000 Ω .
- Other ham oriented manufacturers include LDG and MFJ.

SGC-239

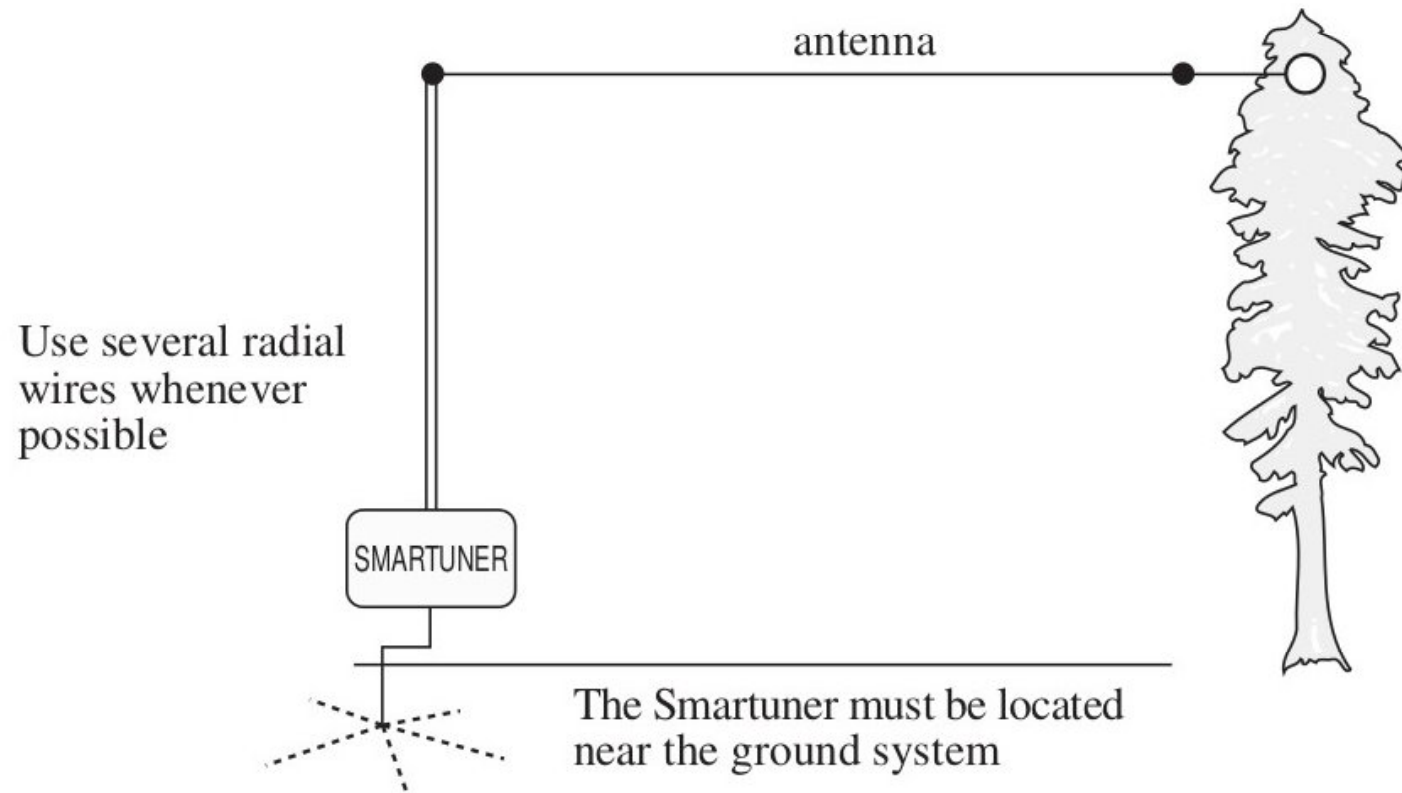
- Lower end of the line. I've had one since around 2012 used in sloper and dipole antenna configurations. Mostly 67 ft. radiators (non-resonant on ham bands).
- 1.5 to 200 watts PEP, 40% duty cycle cw/data at maximum power.
- Minimum radiator lengths:
 - 7 to 30 MHz: 9 ft.
 - 3 to 30 MHz: 40 ft.
 - 1.8 to 30 MHz: 100 ft.
- 12 volt power.
- Minimally protected circuit board, requires waterproof enclosure for outside use.

Inverted V End Fed

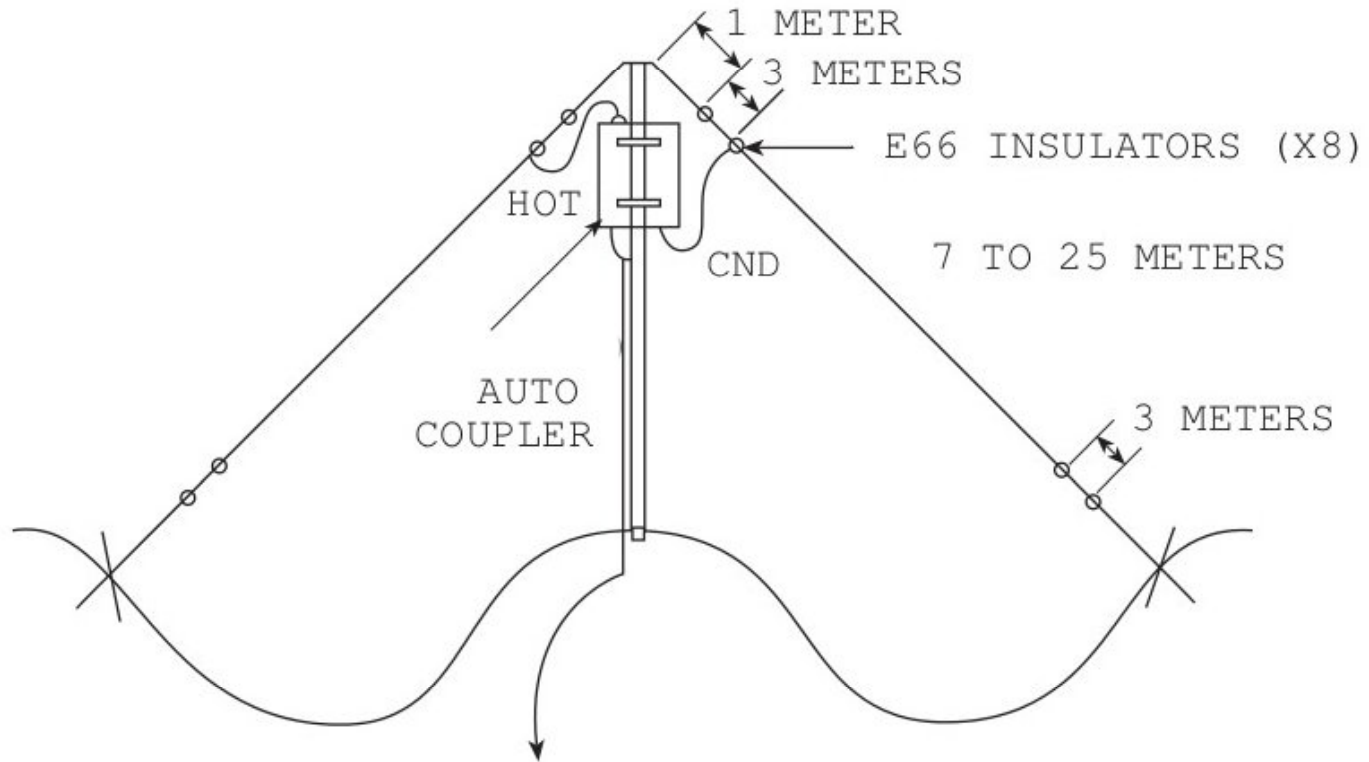


Radials are required for all configurations with the exception of dipoles and loops.

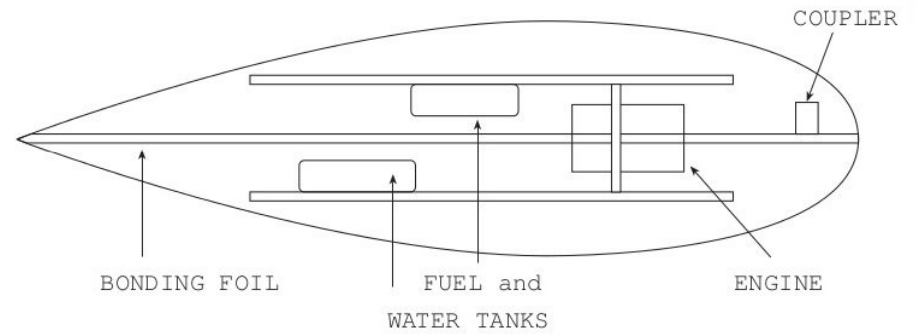
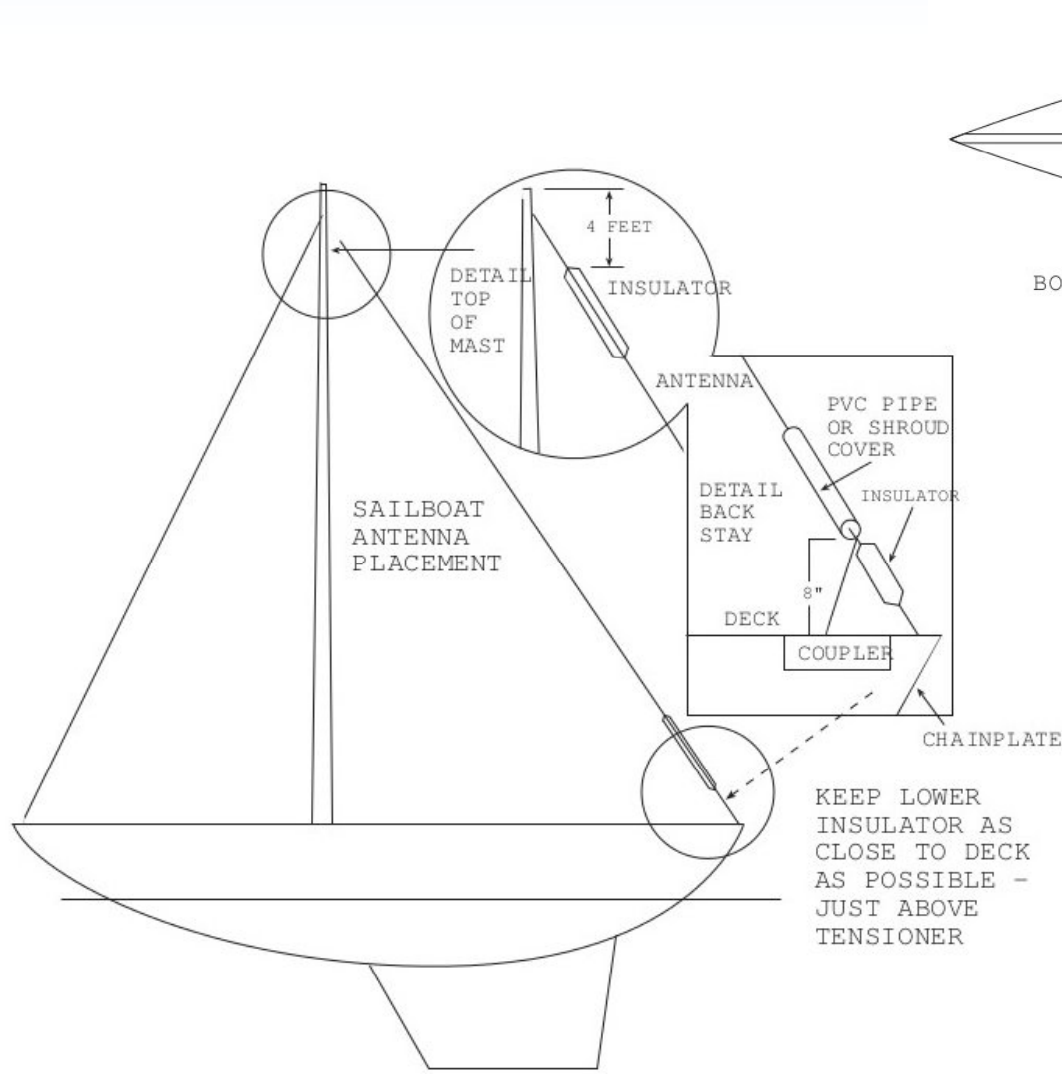
Inverted L



Dipole



Installation on a Sailboat



Installation is much simpler on steel hulled vessels

Mobile Applications



SGC "Quick Mount System."
Straps and suction cups hold the coupler in place.



Typical front-mounted coupler and whip. Would look great on Ray's Land Rover.

Loops

- About 80 feet of insulated wire, typically as a rectangle or triangle, with 1 to 4 turns.
- Horizontal better for NVIS.
- Vertical better for skywave.
- Have started to experiment with them. No useful data yet. Options:
 - Horizontal loop around the inside of the garden shed.
 - Take down PVC pipe frame for portable use (Field Day 2020 goal).

Improvised Indoor Loop

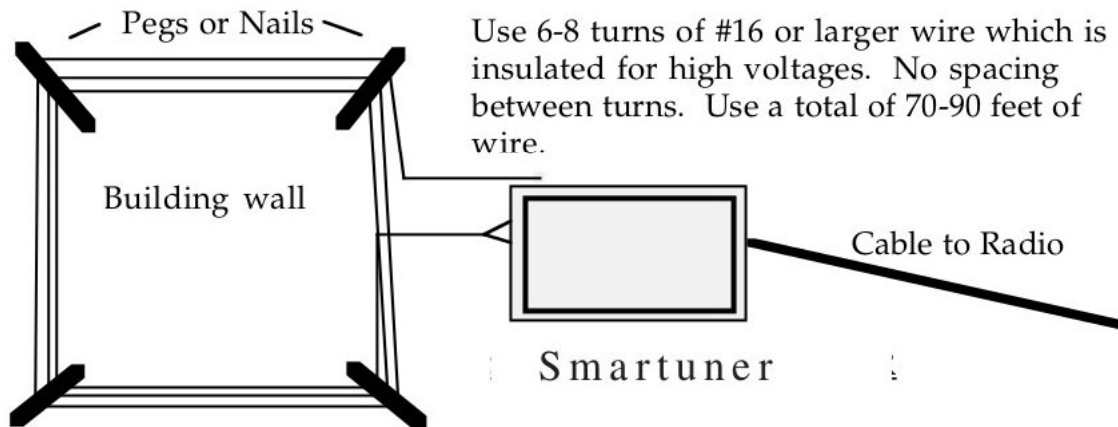


Photo shows a 2 turn loop. Perhaps the RF is powering the fluorescent lamps.



Loop on a Vehicle



Folds down when not in use

The Poynting Vector Antenna

- This is really a tuned resonant antenna but weird enough to include here.
- Developed by Ted Hart W5QJR and Paul Birke VE3PVB.
- US Patent 6486846, issued November 2002.
- A very compact antenna, it consists of two cylinders arranged end to end with a tuning coil that resonates with the capacitance between the cylinders. A high voltage is generated which creates the E-field. RF current flow on the cylinders creates the H-field.
- The practical implementation uses a cylinder shape that follows a cosine function. This gives rise to the common name flute antenna (as in a wine glass).
- The radiation pattern is isotropic with elliptical polarization. This virtually eliminates fading due to Faraday rotation.
- Typical length is 0.03λ ; Q is about 10.

Commercial Flute Antenna

Advanced HF Solutions: <https://advancedhfsolutions.com/>

Deployed Dimensions: 40" X 12" X 48"

Primary customer base: Federal



[Home](#)

[Contact Us](#)

[Get Updates](#)

[FLUTE Models](#)

[Cart](#)



FLUTE HF 150 Watt High Power Micro Antenna System With EMP Shield Protection

\$6,825.00

The FLUTE Omni Directional Ultra Long Distance Micro Antenna Comes With a Myriad of Features and Performs Better Than Most 80 FT Antennas.

⚡ This Model Operates Up To 150 Watts

∨ Frequency Range - 2-30 MHz Model: HF230-125R

See below for additional specifications

1

Add to cart

An internet search will find some DIY info on this type of antenna.

**Broadband Antennas:
No Tuner/Coupler Required**

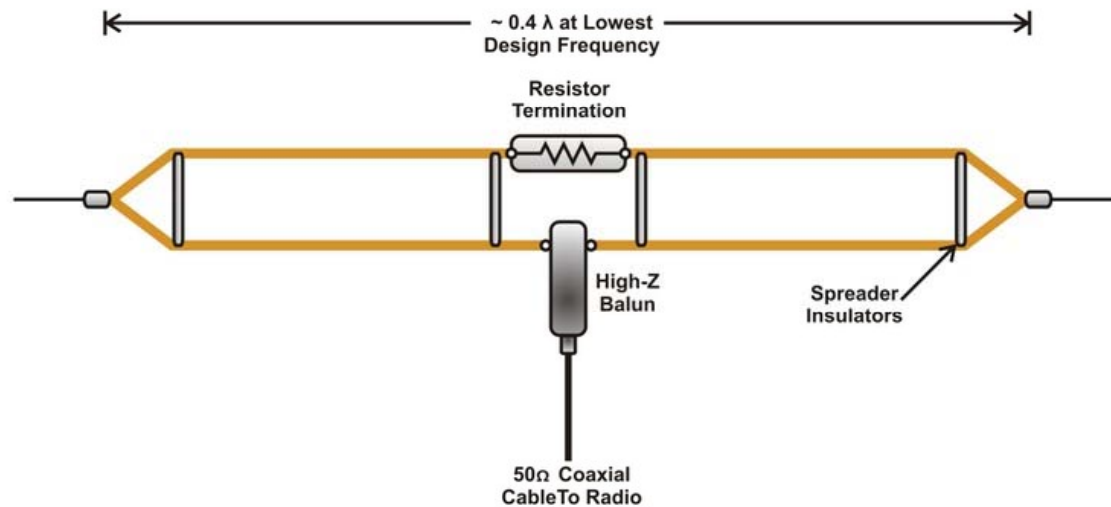
Broadband Antennas

- Broadband antennas dispense with the need for a tuner but at some cost in terms of efficiency as power is lost in one or more terminating resistors.
- While the efficiency vs a resonant antenna is lower, a benefit is a (sometimes substantial) lowering of the noise floor.
- Some hams refer to them as expensive loads. This is a misconception. However, probably not the best solution for weak signal QRP DX.

Tilted Terminated Folded Dipole (T2FD)

- Developed by the US Navy in the 1940s.
- Originally designed as a sloper (hence the “tilted”), they are now generally used as flat-top or inverted V antennas.
- The main elements are the balun and a loading resistor. The resistor creates a loss in efficiency (about 30%) but it broadbands the antenna.
- Most often used in military/government services, MARS and for automatic link establishment (ALE).
- The general term for the various configurations is simply “terminated dipole” or “broadband antenna.”

Terminated Folded Dipole



Terminated Folded Dipole Antenna (T2FD or TFD)

© 2014 HFLINK

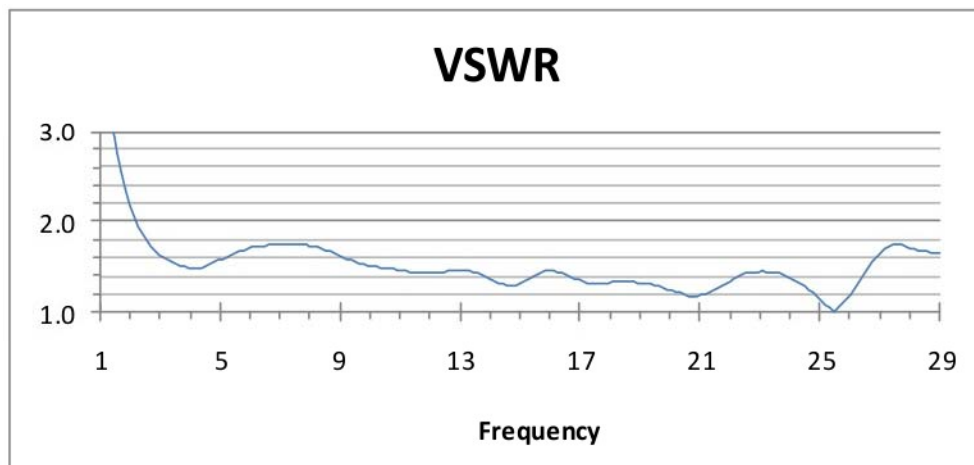
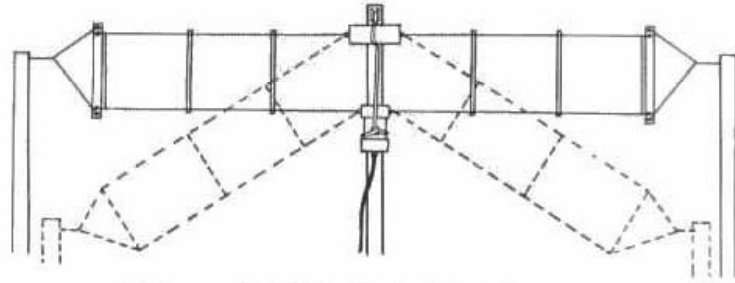


Illustration courtesy of
HFLink.com

The Club's Yaesu YA-30



- 1.6-30 MHz
- 150 watts PEP, 75 watts cw/data
- VSWR <2:1 from 1.6 to 18 MHz; <3:1 above 18 MHz
- 83 feet overall length
- Was used at the former Red Cross building in Rockland. Now gathering dust in my basement. Any takers???

Other Variations

Chameleon Tactical Dipole

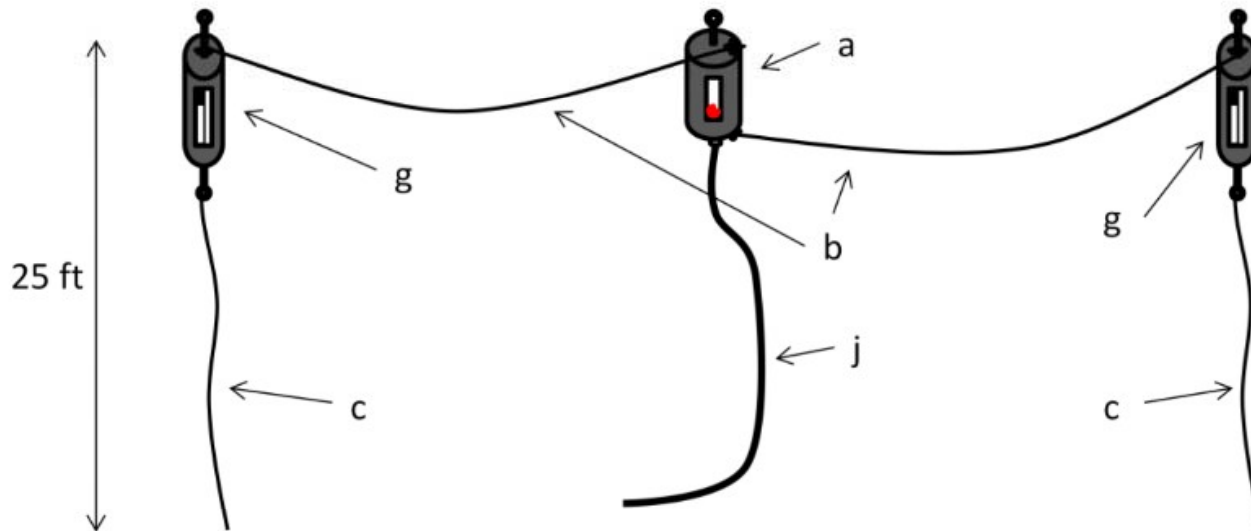


Figure 4. Horizontal Dipole Configuration.

- My SHARES antenna is this configuration as an inverted V.
- Balun (a) is 5:1 (Emcomm II)
- Resistors (g) are 300 Ohms.
- Stock radiators (b) are 60 ft. Dangly things (c) are 25 ft.

KB1TCE's Terminated Dipole

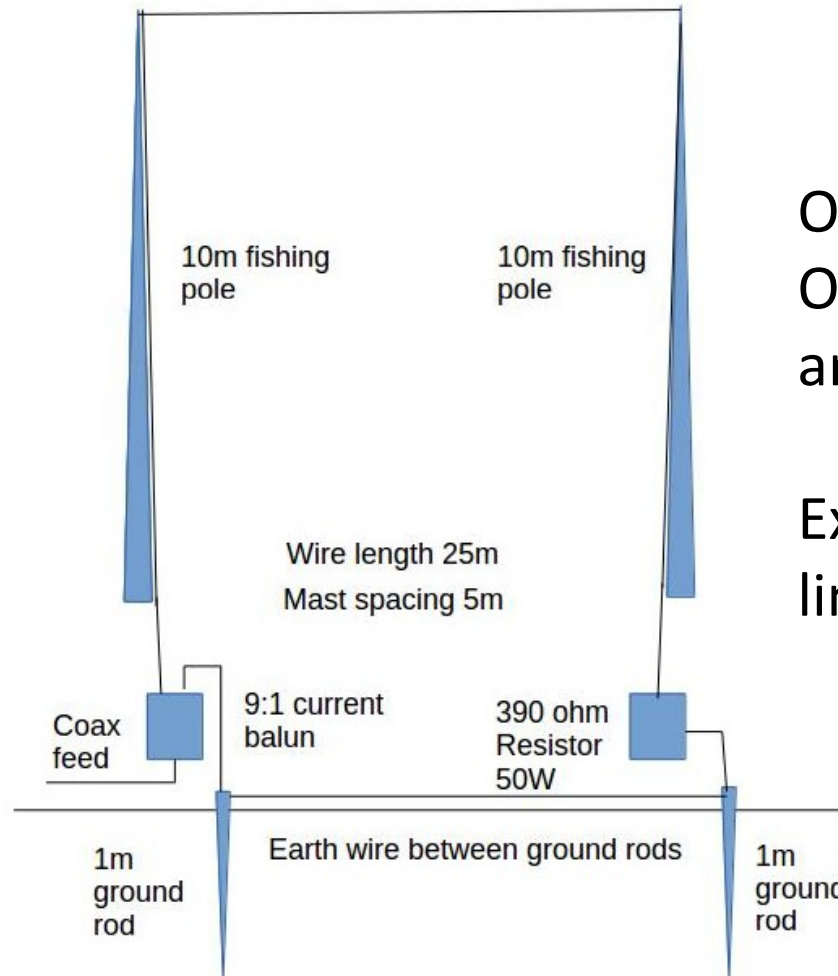


Left: Feedpoint with Emcomm II
and common mode choke

Right: 300 Ω terminating resistor
(lowered for picture)



Cross Country Wireless Terminated Inverted U



Other aspect ratios are OK. Balun and resistor are available from CCW.

Excellent write up at the link below.

http://www.crosscountrywireless.net/terminated_inverted_u.html

So What?

If you are not involved in non-ham HF communications, broadband antennas are generally not required. However, remote couplers can be very useful for ham applications.

On the other hand, for broadband antennas:

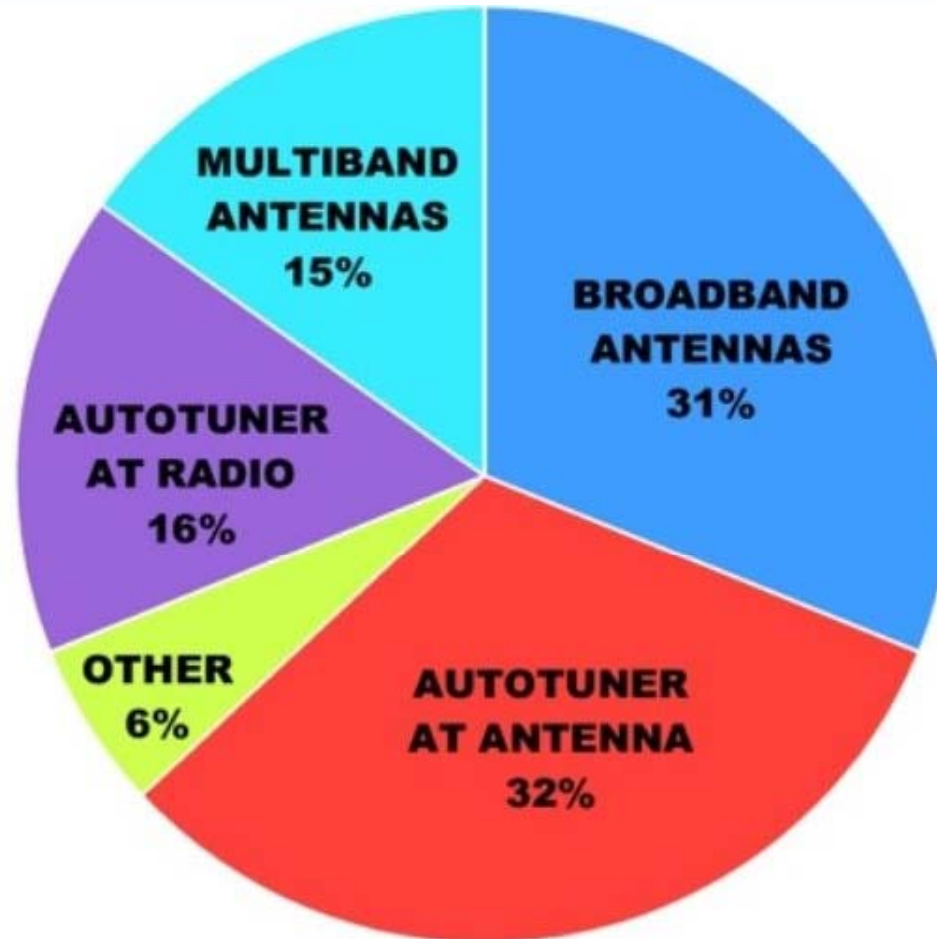
- They can be useful in high noise environments;
- In scanning applications (BBS, RMS);
- Hams like to tinker with antennas.

Some hams might enjoy exploring the ALE Ham Network using Steve Hadjucek N2CHK's PCALE software (ham version of his MARS ALE program). See <http://hflink.com/pcale/>

Video: PCALE with Chameleon Terminated Dipole

- OH8STN TV (YouTube)
- *Broadband Terminated Dipole Antenna for Automatic Link Establishment*
- PCALE (Ham ALE software) and Chameleon CHA TD kit
- <https://youtu.be/ZUFgLqEmCBY>
- OH8STN's home page: <http://oh8stn.org/> (lots of good information)

Antennas used for Ham ALE



2013 poll of 5000+ ham ALE network operators.