End-Feeding a Center-Fed Vertical Dipole

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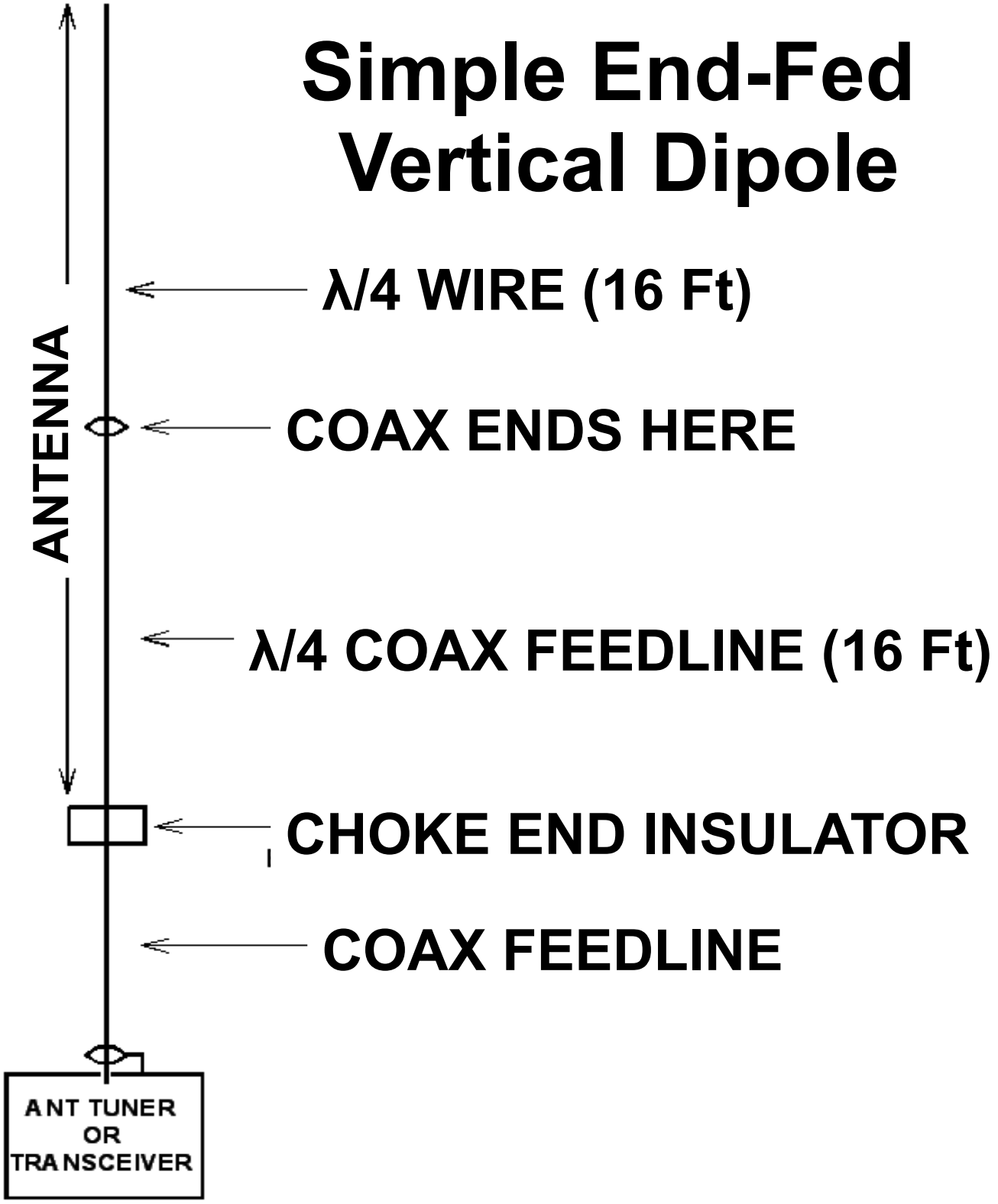
Simple End-Fed Vertical Dipole

Lengths shown are approximate for 20M



An End-Center-Fed Vertical Dipole

- Behaves like a center-fed vertical dipole
  - Z_O ~ 70 ohms, so 75 ohm coax is the best match
- Top half is λ/4 wire
- Outside of coax shield is the bottom λ/4
  - Use Vf ~ 0.97 for a PVC insulated 0.25-in conductor
- Ferrite common mode choke is end insulator
- Easy to rig with a single support
- Is a single-band antenna
  - But 40M dipole would work on 15M (3rd harmonic)

The Ferrite Choke

- **Use #31 core material**
- **Follow winding guidelines in Choke Cookbook to make resonant near the operating frequency**
  - ***k9yc.com/2018Cookbook.pdf***
- **Ends of a dipole are high voltage points**
  - **High voltage can overheat the choke**
  - **Higher choking Z reduces heating**
  - **It's the coax shield that gets hot**

The Ferrite Choke and Power

- Choke guidelines for 1.5kW CW/SSB
  - at least 30KΩ
  - 2 – 15KΩ chokes in series
  - Higher Z is better
- For lower power
  - at least 15KΩ for 500W
  - 7.5KΩ for 100W or less
- Higher Z for long transmit times

The Ferrite Choke and Power

- Higher choking Z reduces current through the choke, heat is I^2/R
- Two chokes divides power between them, and doubles choking Z
  - Power handling increases by 4:1
- Do not enclose the choke
  - Air flow helps cooling
  - Exposed choke helps heat radiation

Coax Guidelines

- For best power handling in choke, use
  - A robust copper braid shield above QRP – RG400
  - #12-2 Teflon, silver coated copper
  - #12-2 THHN
- 75Ω coax is best, but 50 ohm coax is OK
- 12-2 pairs are 90-100 ohms, also OK
- Any of these will work fine with a decent antenna tuner in the station

End-Feeding a Horizontal Dipole

- This feed method also works to center-feed a horizontal dipole from one end
- For example, a dipole suspended near the window of an upper floor shack in a house, apartment building, or hotel, with the other end suspended in a tree
- Resonant Z of this antenna would be the same as an ordinary horizontal dipole rigged between the same points
  - 50Ω coax best for low antennas (< λ/4), 75Ω for high ones (λ/2)

How Much Does Feedline Z_O Matter?

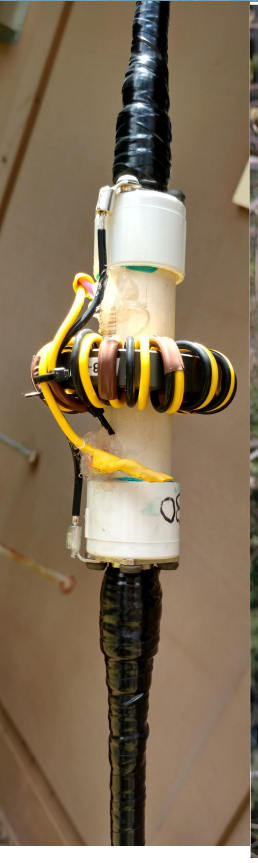
- **Feedline SWR and loss is set by the match of the line to the antenna, not to the transmitter**
- **There is very little additional due to mismatch for SWR < 2:1, but that loss increases significantly if SWR gets larger than about 5:1**
- **Such a mismatch happens with a dipole off resonance by 3-5% or more**
  - **Most significant on 80M (+/- 7% bandwidth)**
  - **The "right" coax matters off resonance with long runs**
  - **Does not matter for short runs**

20M Dipole Rigged For Testing

- **Antenna was rigged at W6GJB for testing over 5 mile path to K9YC**
- **Top antenna support rope goes through a pulley attached to another rope that supports one end of Glen's 80M dipole, which is strung between two tall redwood trees. Pulley was up about 80 ft**
- **Antenna was tested with end insulator at 0, 10, 20, 30, and 40 ft above ground**
- **Also tested with center at ground level coax laying on ground (acts as single λ/4 radial)**

More About This Test

- Path from W6GJB to K9YC is over irregular terrain, generally poor soil
  - Elevation ~ 800 ft ASL at W6GJB
  - Elevation 2,000 ft ASL at K9YC
- RX antenna at K9YC was λ/4 vertical with two radials, to a K3
- TX was a KX3 at 5W
- This test measures low angle radiation



Chokes λ/4 below feed-point

20M dipole rigged through pulley on support rope for 80M antenna

This simple choke was used for testing at 5W. A more robust choke should be chosen from k9yc.com/2018Cookbook.pdf

Field Test of 20M Vertical Dipole Over 5 Mile Path

Height of Choke	RX Signal
Center on ground	-4 dB
6 In	0 dB
10 Ft	+0.5 dB
20 Ft	+3.2 dB
30 Ft	+6.5 dB
40 Ft	+9.5 dB

This result confirms that the ground at W6GJB is quite poor!

Height of Vertical Antennas

- **This test was part of a large study of the effect of mounting height of vertical antennas, which shows why the antenna works better when it's higher.**
- **Slides for a presentation of that work can be downloaded at**

  k9yc.com/VerticalHeight.pdf

Chokes For This Antenna

- **This use is quite demanding for the choke that defines the bottom of the vertical radiator, because it is at a very high impedance point on the antenna.**
- **These are keydown values, computed for 33 ft (λ/2) of coax below the choke on the 20M dipole.**

Choke Z	Choke Power @ TX Power		
	100W	500W	1500W
30,000 Ω	5.6W	29W	87W
15,000 Ω	11W	53W	160W
7,500 Ω	18.5W	93W	280W

Chokes For This Antenna

- These are keydown values, computed for 16.7 ft (λ/4) of coax below the choke on the 20M dipole.
- To account for signal waveform, multiply these numbers by 0.3 for SSB and 0.4 for CW; multiply again by 0.5 to allow for short TX/RX cycles typical of contesting and DXing

Choke Z	Choke Power @ TX Power		
	100W	500W	1500W
30,000 Ω	4W	21W	62W
15,000 Ω	7W	34W	100W
7,500 Ω	10W	47W	141W

Power Handling For Chokes

- When two chokes are placed in series to achieve a greater choking impedance, the dissipation divides between them approximately in proportion to the resistive component of their choking impedance
- For the simple example of two identical chokes in series, their total Z sets the total dissipation, which would be equally divided between them
- Two 7,500 Ω chokes in series provide 15,000 Ω; with λ/2 coax below the chokes, at 1,500W, each would dissipate 80W keydown, 32W on CW, 24W on SSB; for contesting/Dxing, 16W CW, 12W SSB, 40W RTTY.

Credits

- **I got the idea for this feed method for a vertical dipole from Rudy Severns, N6LF, who used a coil of coax (without a ferrite) as the end insulator of a rather different antenna**
- **My contribution was to use a ferrite common mode choke with a lossy core material as the end insulator, which more effectively decouples the antenna from the feedline, and makes the antenna essentially independent of feedline length. To understand why, study**
  k9yc.com/RFI-Ham.pdf
- **I first published this on my website in 2008**
  k9yc.com/CoaxChokesPPT.pdf