ANTENNA BASICS FOR BEGINNERS

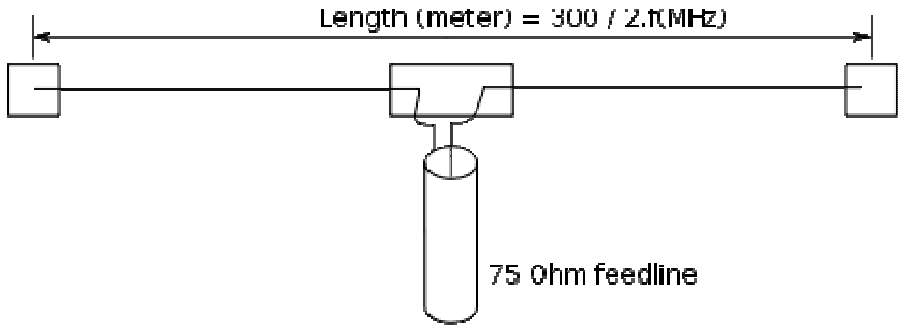
PART 2 -DIPOLES

DIPOLES -General

MULTIBAND DIPOLES

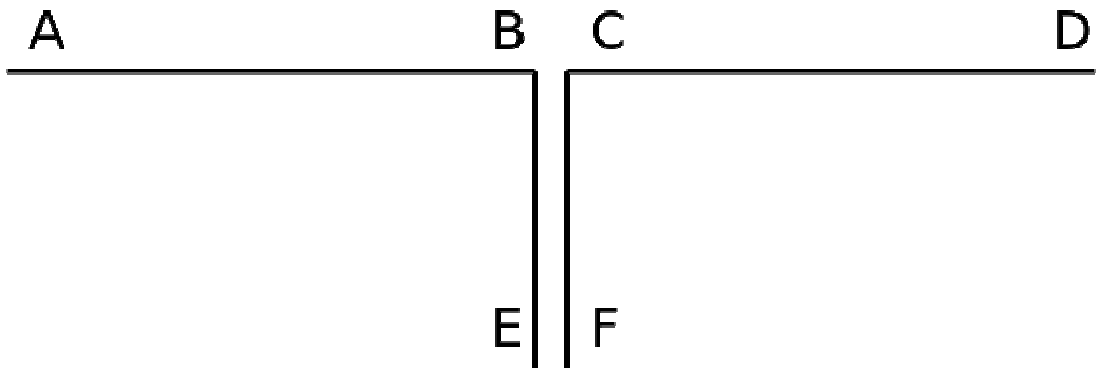
RF CHOKES

DIPOLES



Several different variations of the dipole are also used, such as the *folded dipole*, *short dipole*, *cage dipole*, *bow-tie*, and *inverted vees*

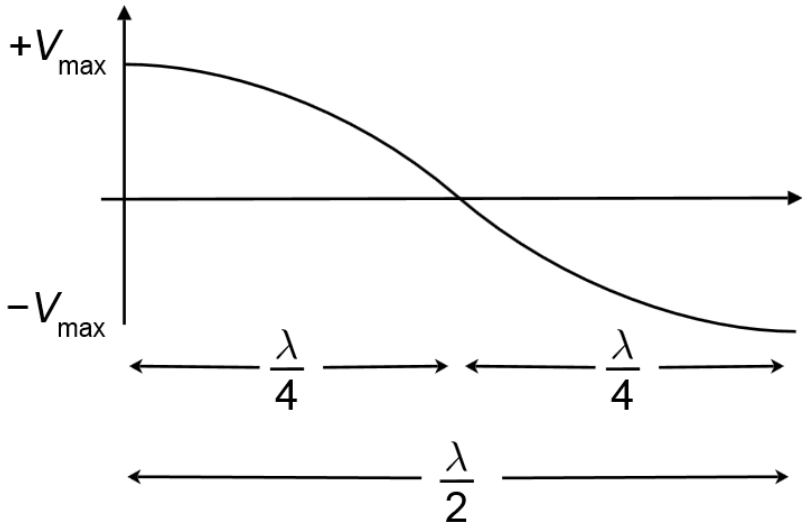
DOUBLET



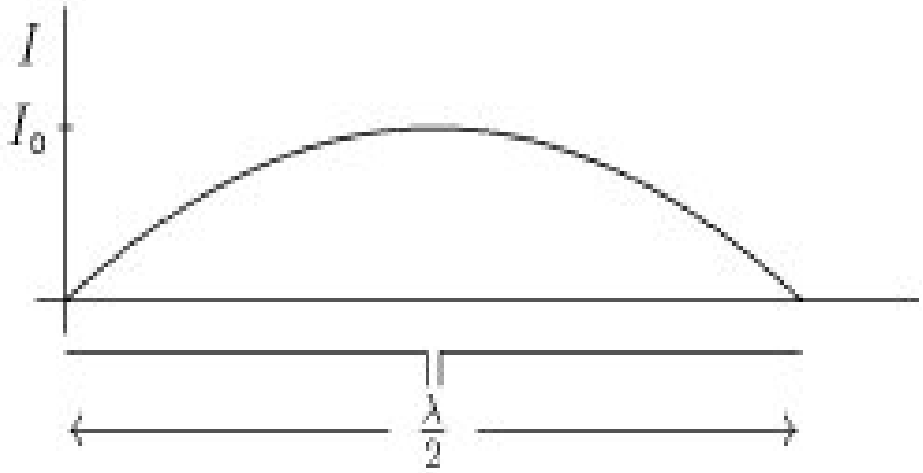
The doublet antenna is dipole antenna with a resonant symmetric feeder line. It can be connected to a symmetric antenna tuner

DIPOLES

The instantaneous voltage distribution across a dipole antenna of total length λ/2



The current distribution is approximately sinusoidal along the length of the dipole



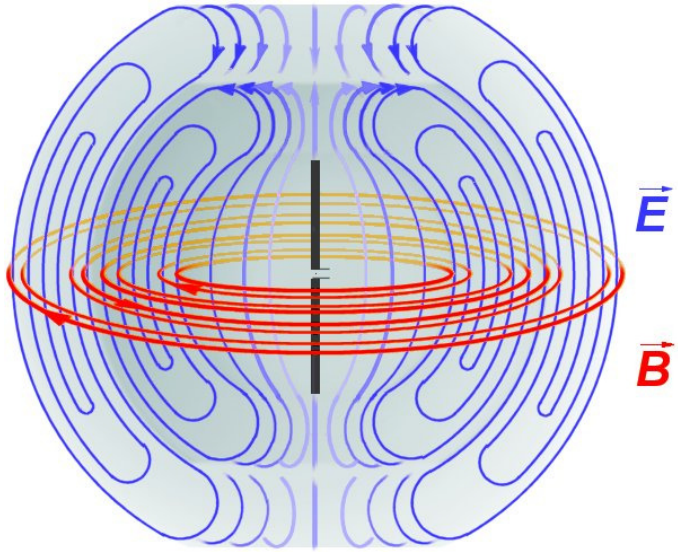
DIPOLES

For transmitting, you generate an electrical RF signal on a conductor.

As a result:

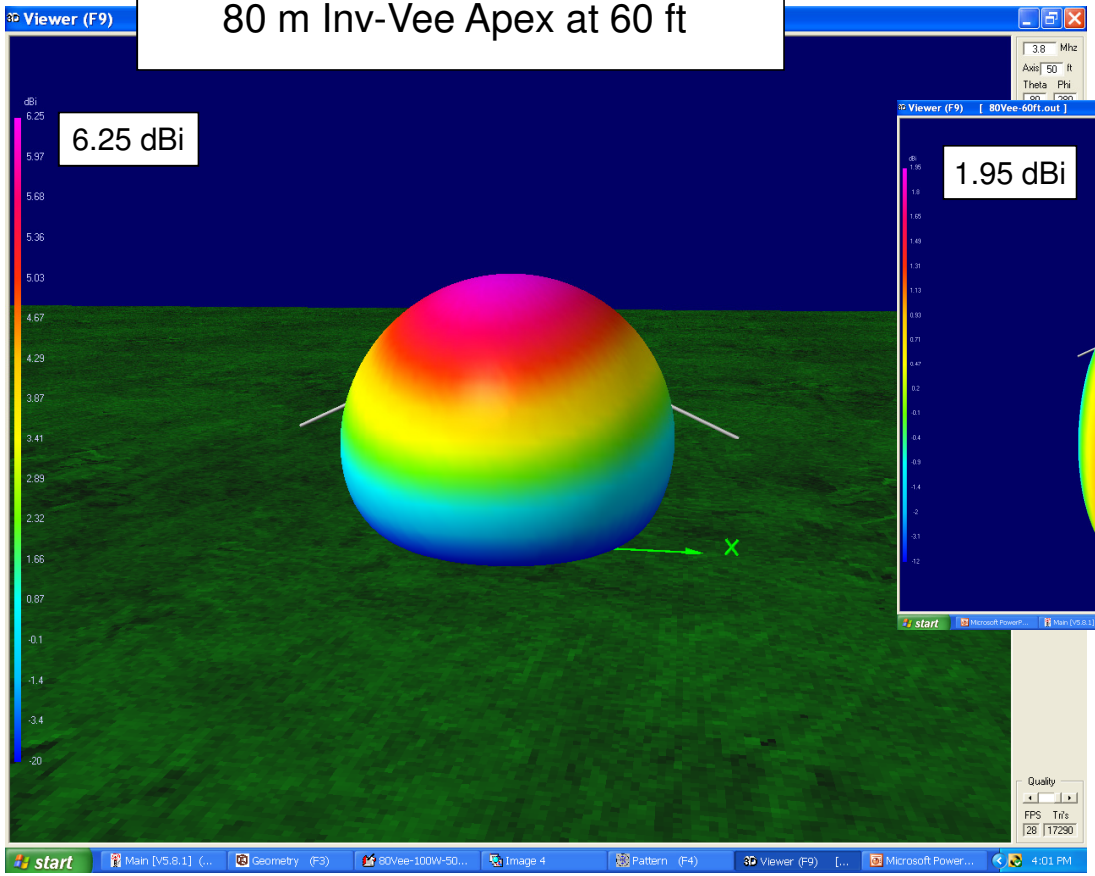
-**Electric (E)** fields arise from a voltage rapidly changing

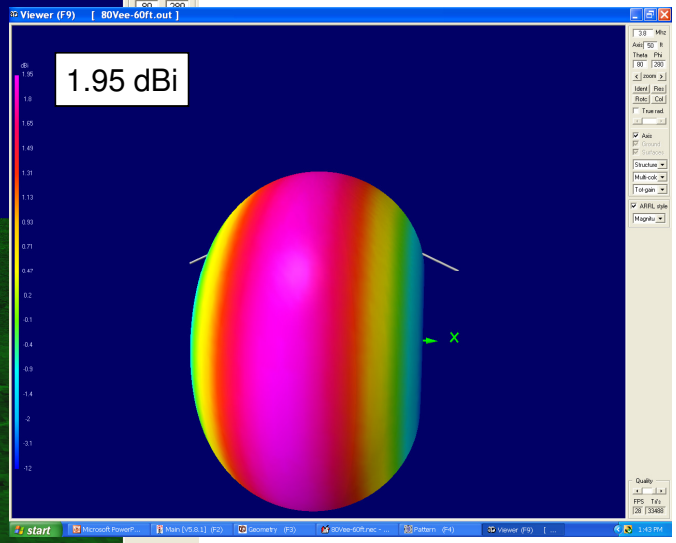
-**Magnetic (M)** fields arise from a current rapidly changing



DIPOLES

80 m Inv-Vee Apex at 60 ft

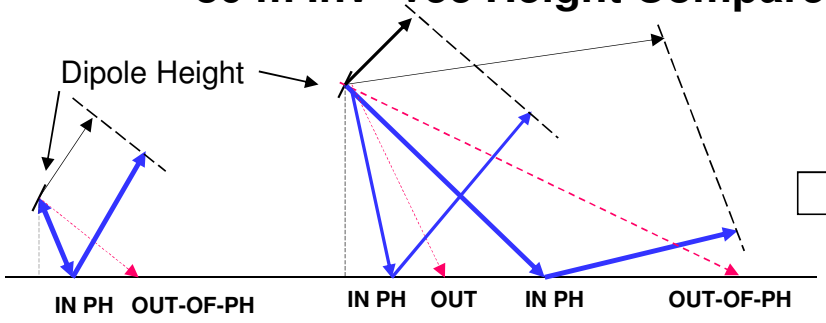




Free Space

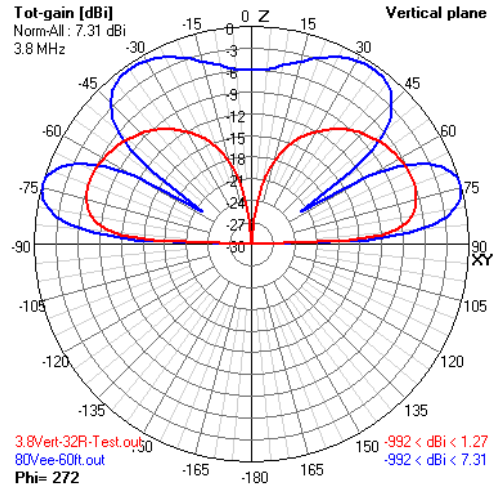
DIPOLE TAKE OFF ANGLE (Frensel Zone)

80 m Inv -Vee Height Compared to Full-Sized Vertical

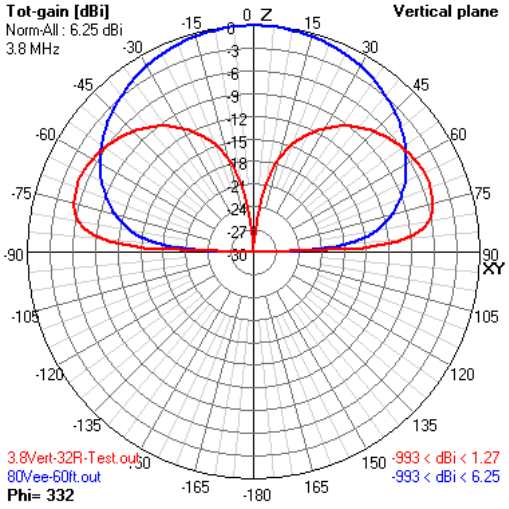


FRENSEL ZONE

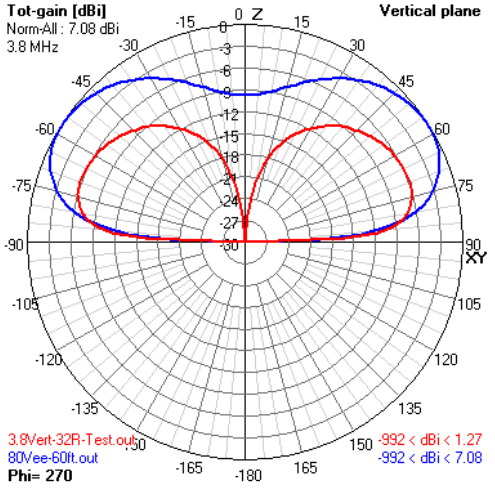
Note: For illustration purposes only



1 WL High
(240 ft Apex)



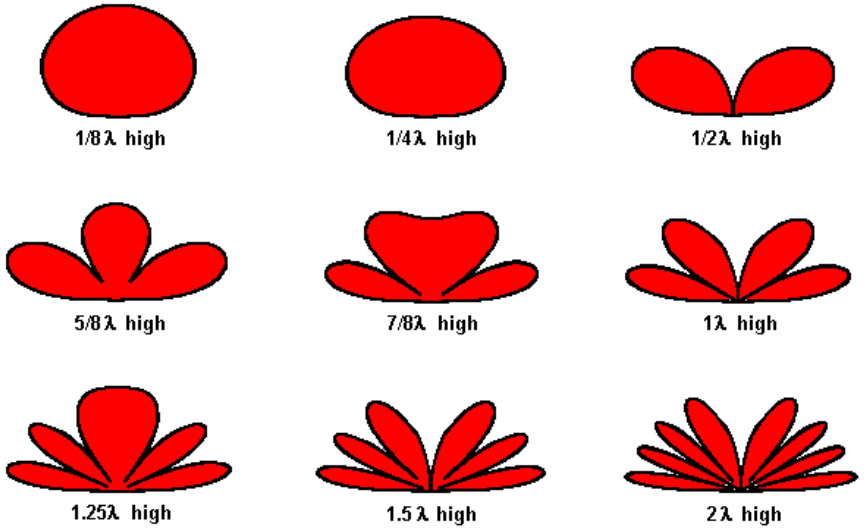
1/4 WL High
(60 ft Apex)



1/2 WL High
(120 ft Apex)

DIPOLES

Dipole Pattern Vs Height



Typical Dipole Efficiency Vs Height

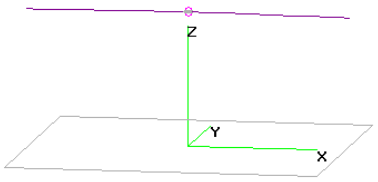
λ /0.015	λ /0.1	λ /0.15	λ /0.2	λ /0.25
18%	53%	72%	81%	87%

DIPOLES

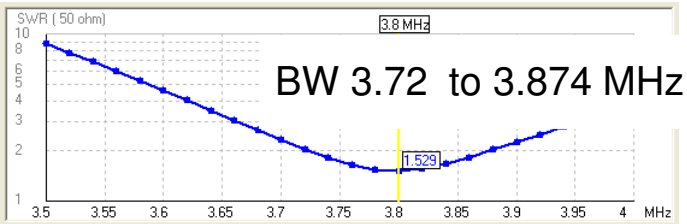
½-Wavelength Dipole Vs Inv-Vee

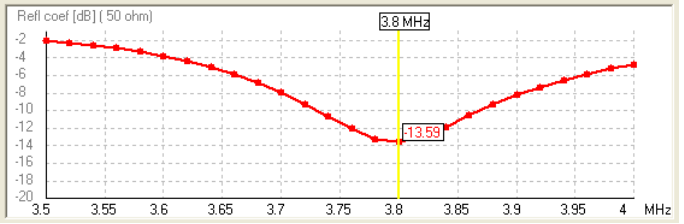
80dipole.out 3.8 MHz

80 m Dipole



Z = 76 -j2.5
Eff = 84.7%
Fr = 3.8 MHz

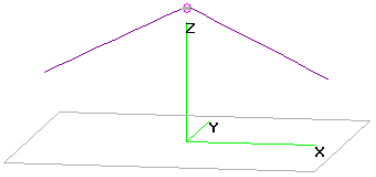




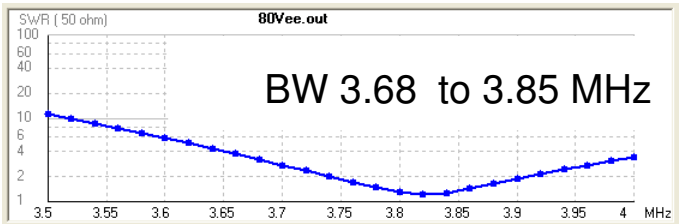
Theta : 80 Axis : 50 ft Phi : 280

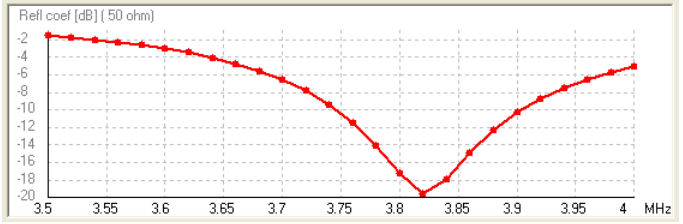
80Vee.out 3.8 MHz

80 m Inv-V



Z = 64 +j0.5
Eff = 76%
Fr = 3.77 MHz

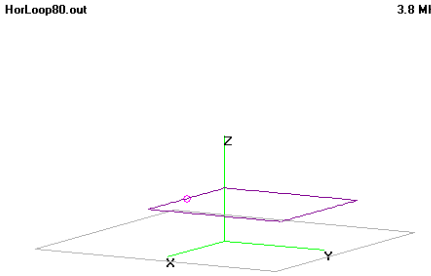




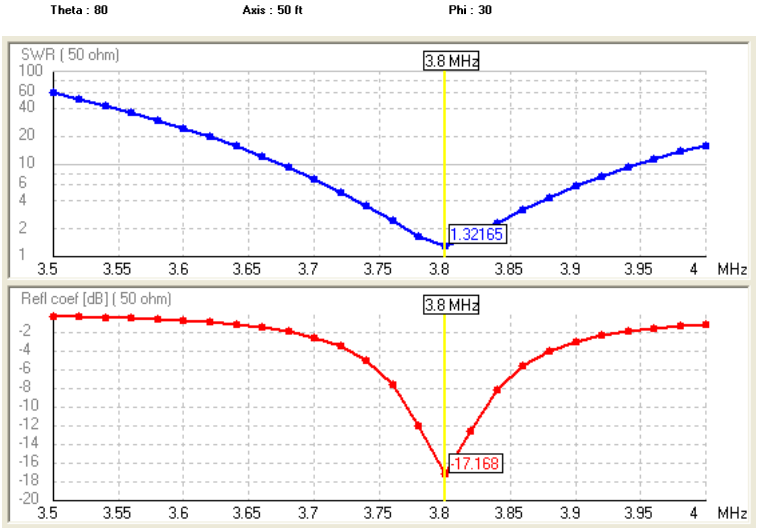
Theta : 80 Axis : 50 ft Phi : 280

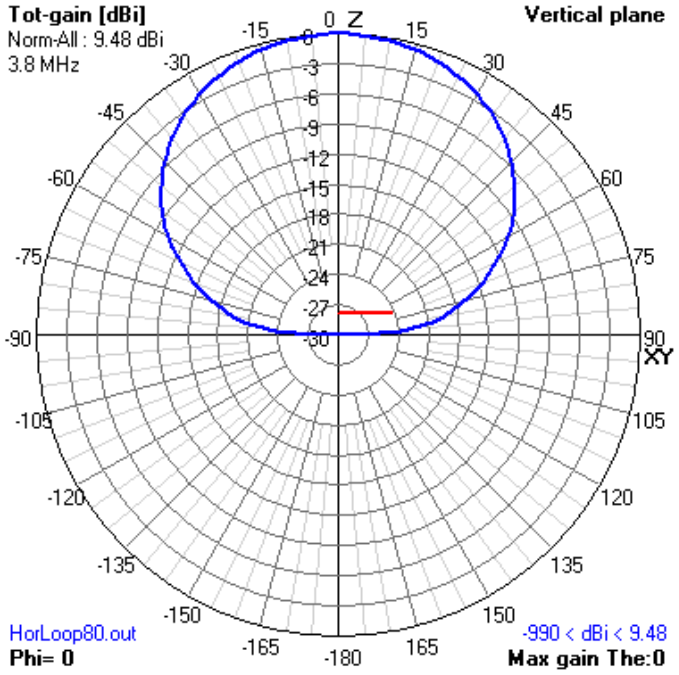
LOOPS

66 ft X 66 ft X 25 ft High 80 m Horizontal Loop Antenna



Z = 76 +j4
Eff = 54.9%
Fres = 3.8 MHz

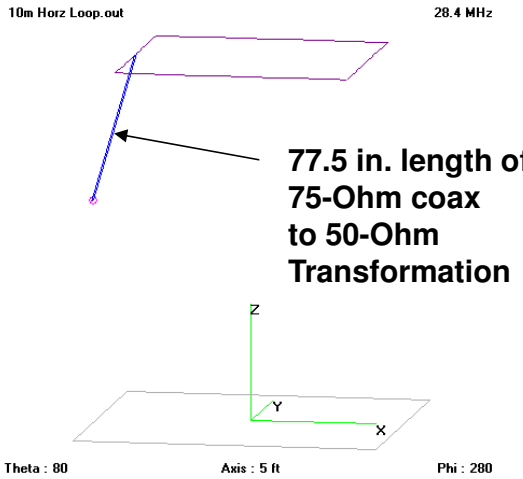




Near Vertical Incidence Skywave (NVIS)

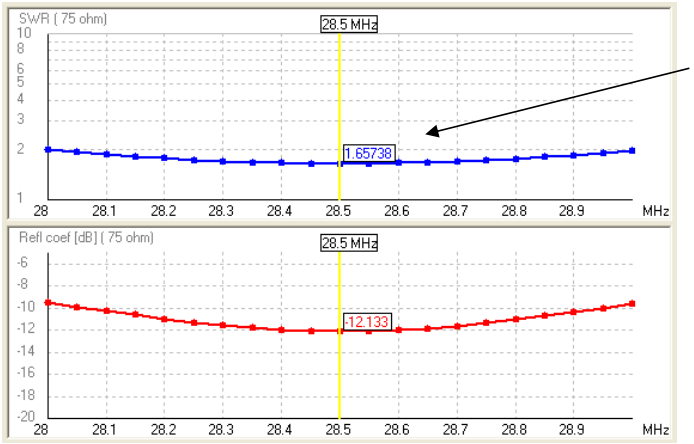
LOOPS

Roof Top 10 m Horizontal Loop Antenna

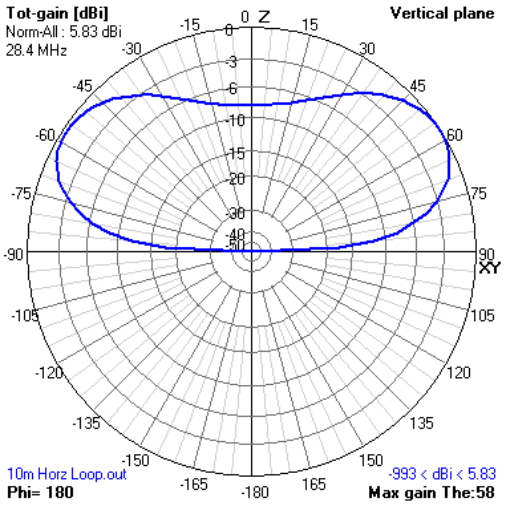


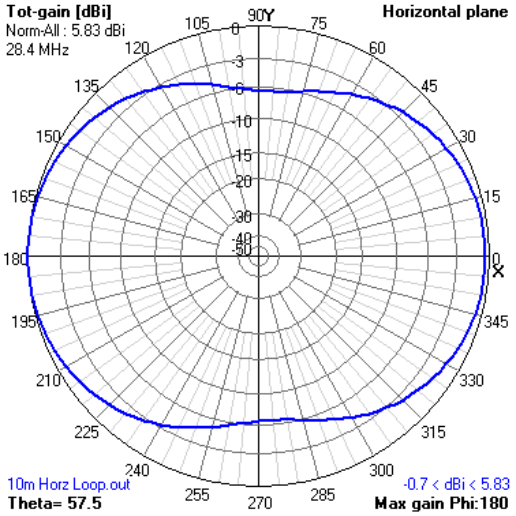
77.5 in. length of 75-Ohm coax to 50-Ohm Transformation

Z = 76 -j2.5
Eff = 84.7%
Fr = 28.5 MHz



Direct feed 75-Ohm coax SWR curve

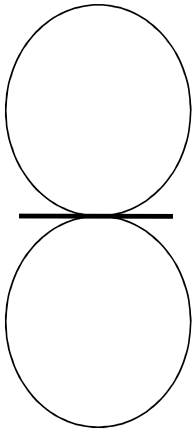




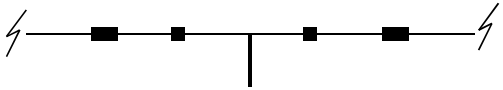
MULTIBAND

Comparison Between ½ WL Trapped and Open-Wire Center fed Antennas

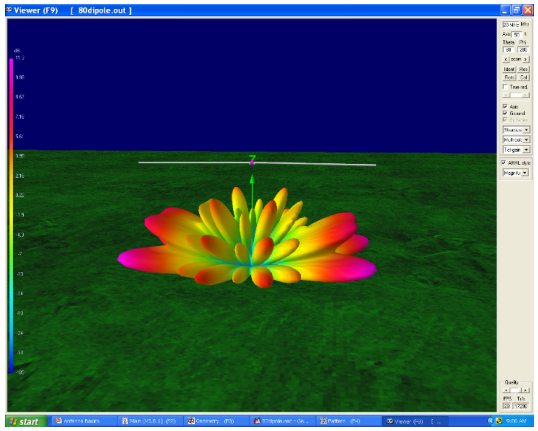
½ WAVE
DIPOLE



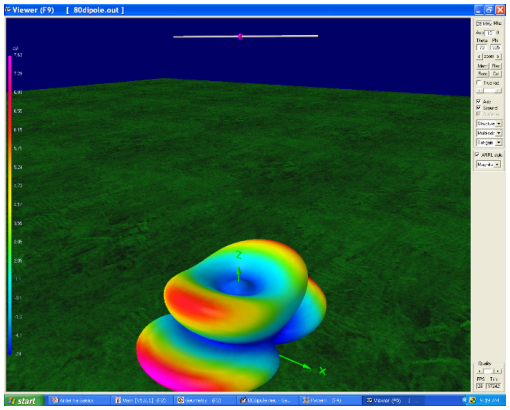
Trapped



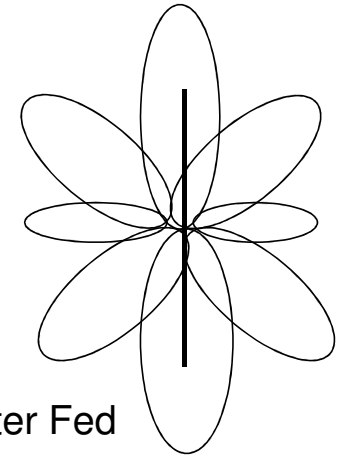
Coax feedline
(Narrower BW and
fewer bands)



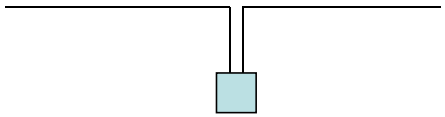
Each 10 m antenna at 35 ft



130 ft
DOUBLET



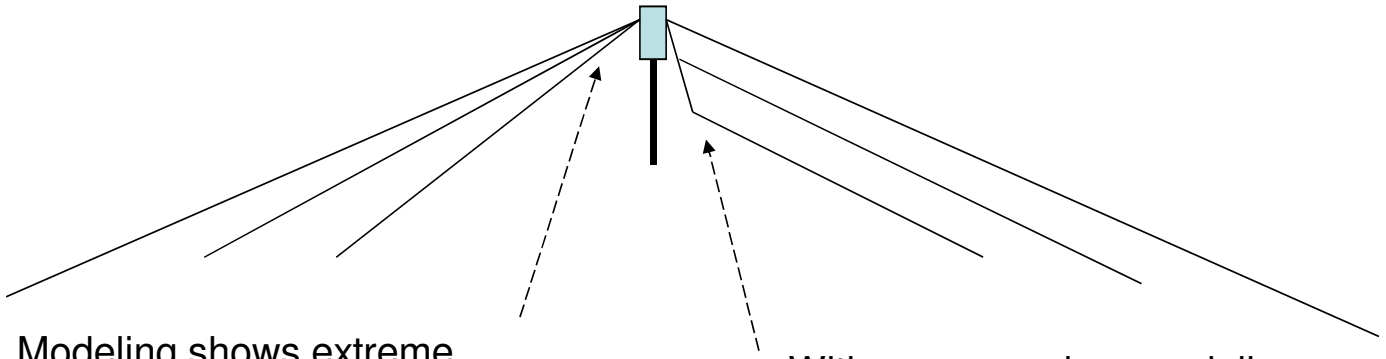
Center Fed



Open feedline
and Tuner

MULTIBAND

Parallel (Fan) Multiband Antenna



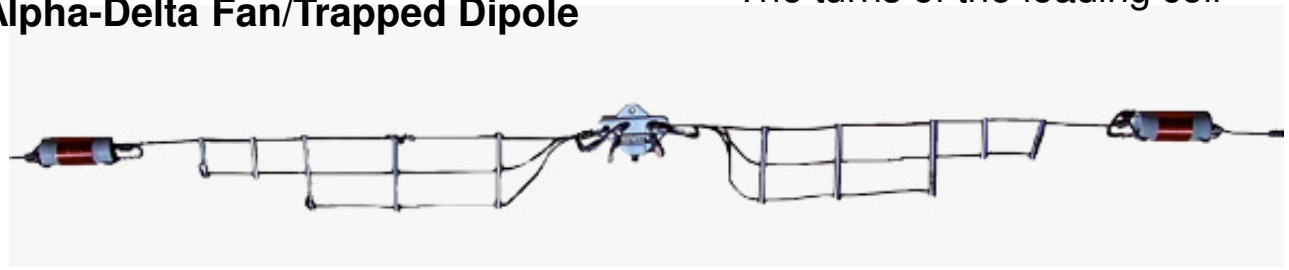
Modeling shows extreme difficulty tuning –especially on 15 m

-I've had good luck with two bands (80 and 40 m)

With more spacing, modeling shows easier tuning and better SWR when more bands are added

This trap appears to be resonate by using distributed capacitance between The turns of the loading coil

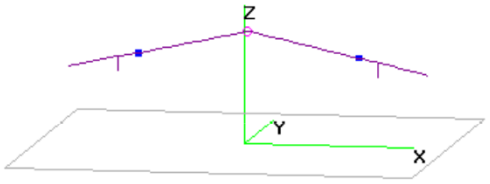
Alpha-Delta Fan/Trapped Dipole



MULTIBAND

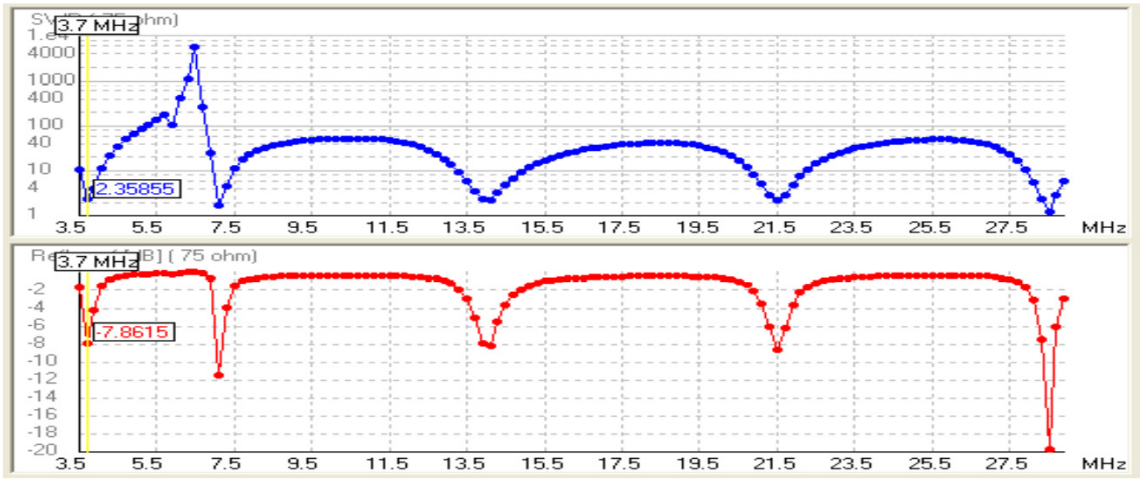
80 – 10 m W8NX 5-Band Dipole Antenna –My Choice

W8NX-V.out 28.4 MHz

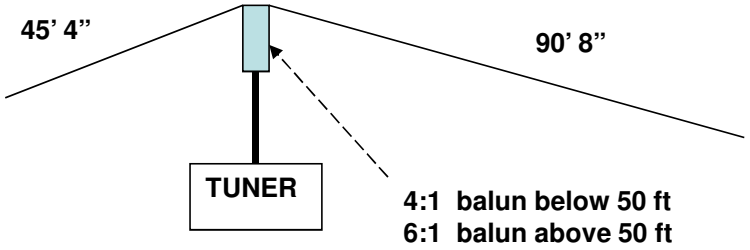


-Coax fed – SWR below 3:1 on all bands
-No external tuner required
-40 m trap and 20/15/10 m stubs
-Full-sized performance 80/40 m
-20, 15, and 10 m have multiple lobes

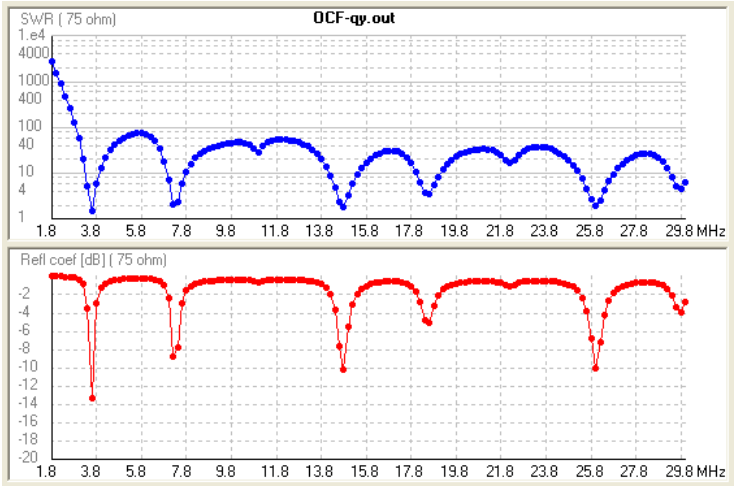
Theta : 80

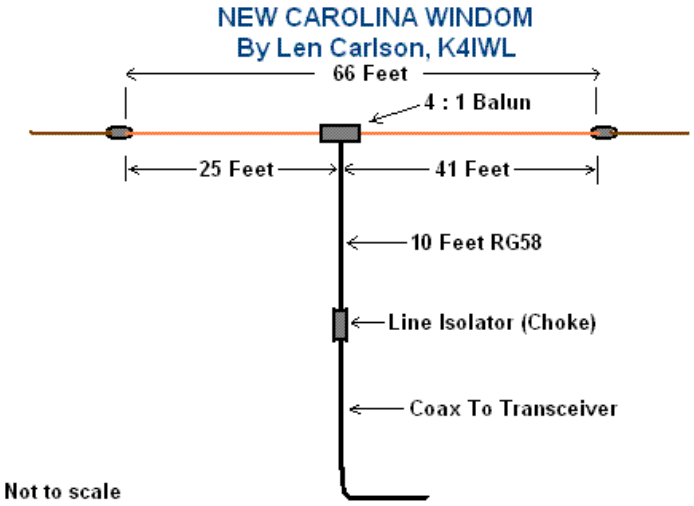


MULTIBAND
Off-Center-Feed and Windom Antennas



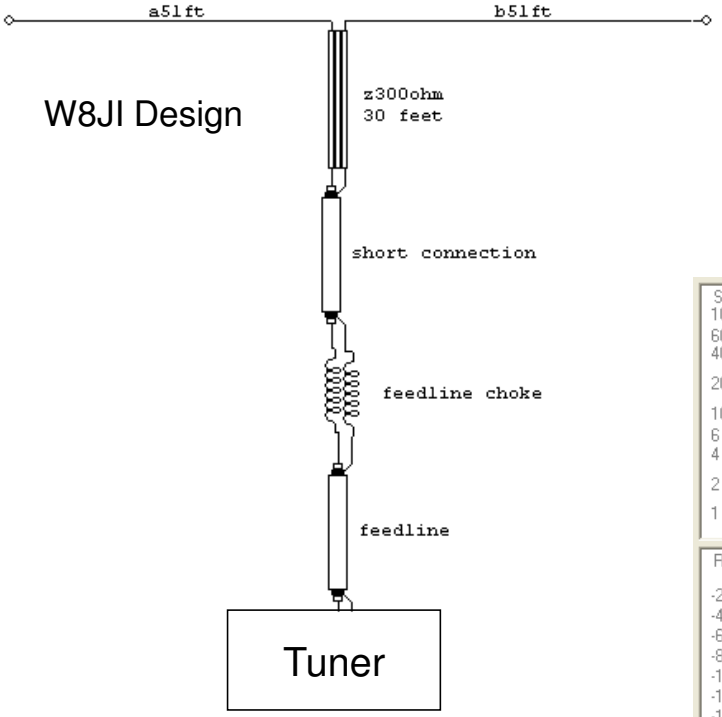
-Requires a Tuner
-High bands have multiple lobes



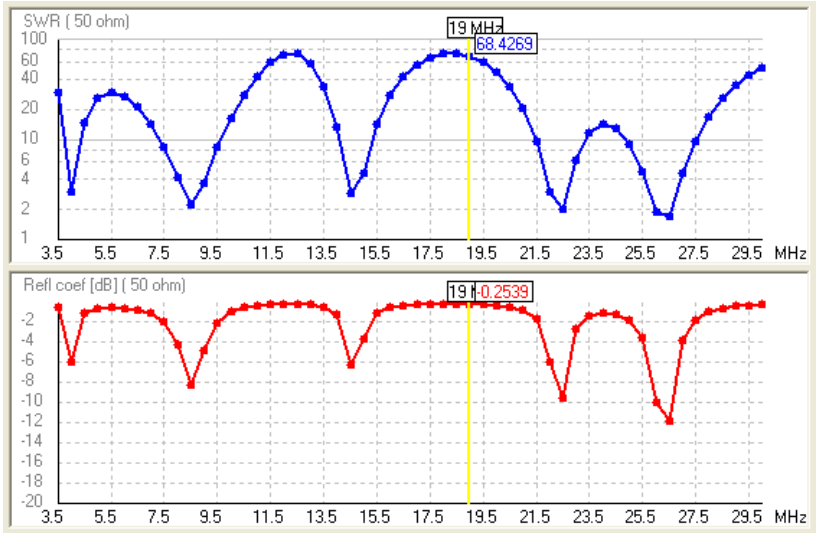


MULTIBAND

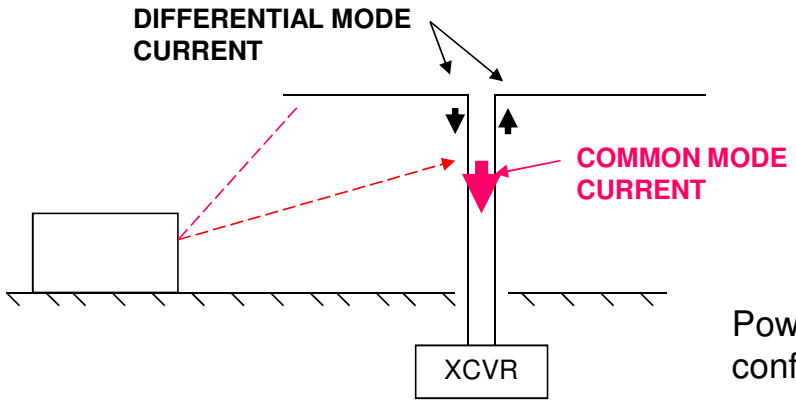
G5RV Antenna



	80	40	20	30	15	12	10
SWR	2.71	4.1	1.9	Hi	5.5	2.6	Hi



RF CHOKES

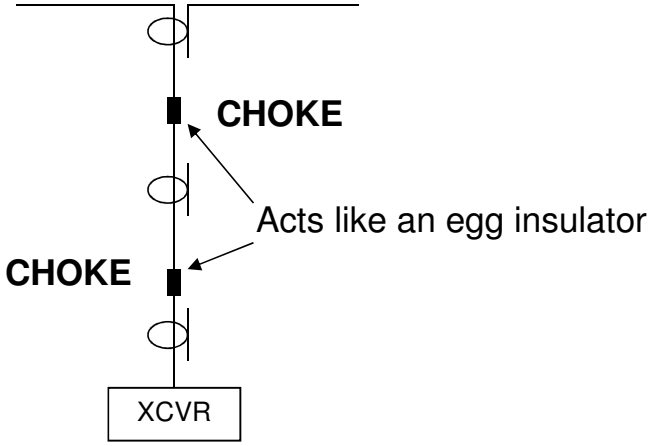


Why Use a Choke?

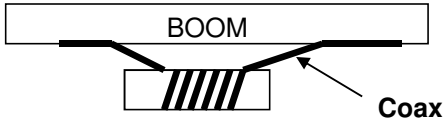
-Isolate antenna from feed line
-Reduce noise
-Keep RF out of the shack

Power (and field) is confined inside the coax

Common Mode power (and field) is outside coax

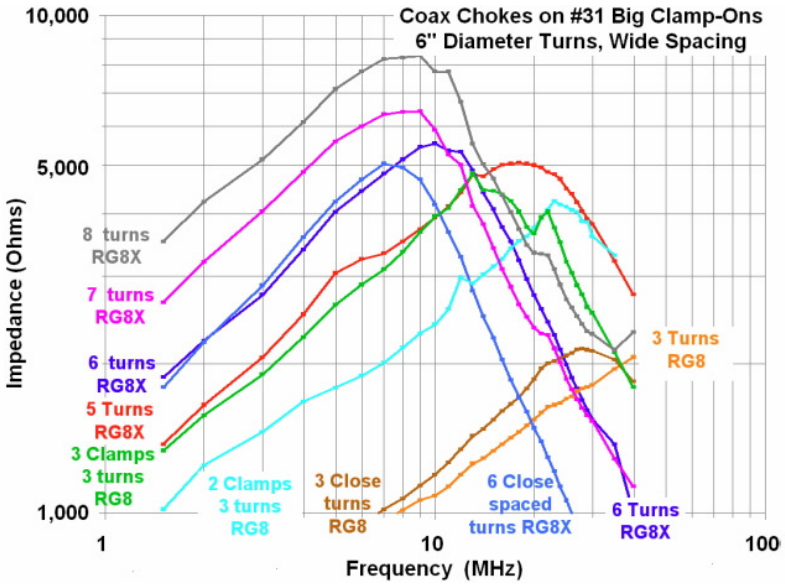


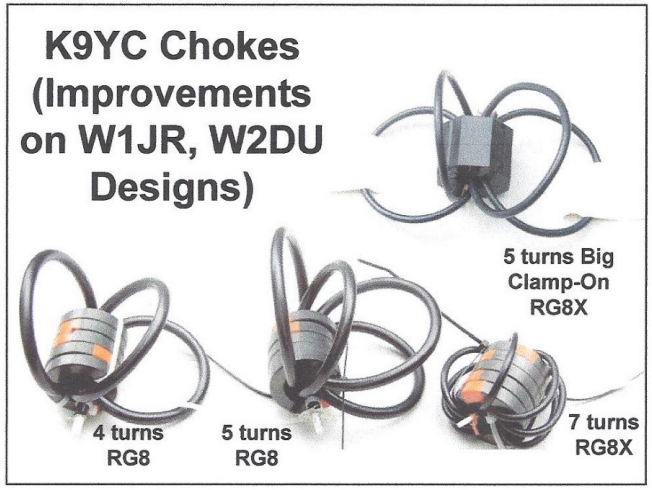
20 to 10 m Yagi Choke

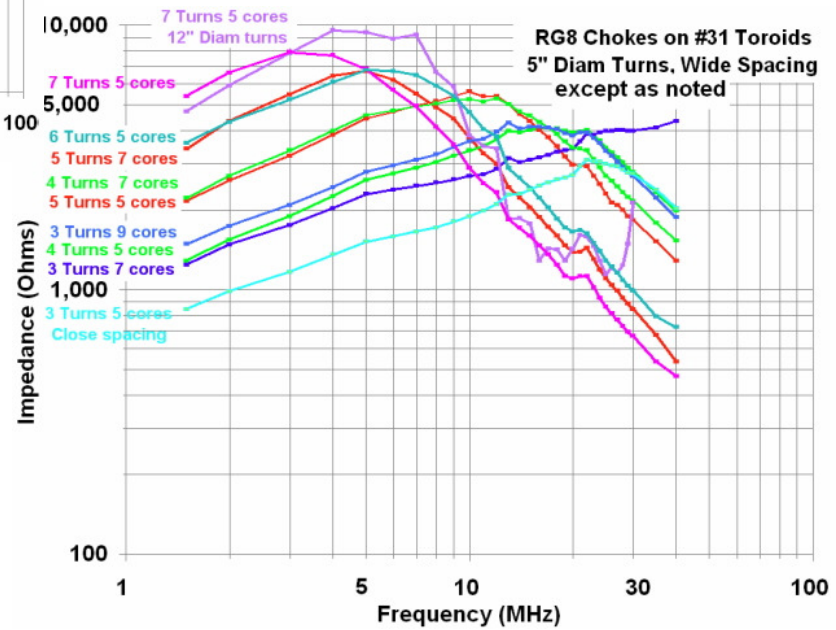


Six turns on 4" PVC sewer pipe attached away from the boom to prevent coupling via the boom (12 turns for 40 to 30 m)

RF CHOKES



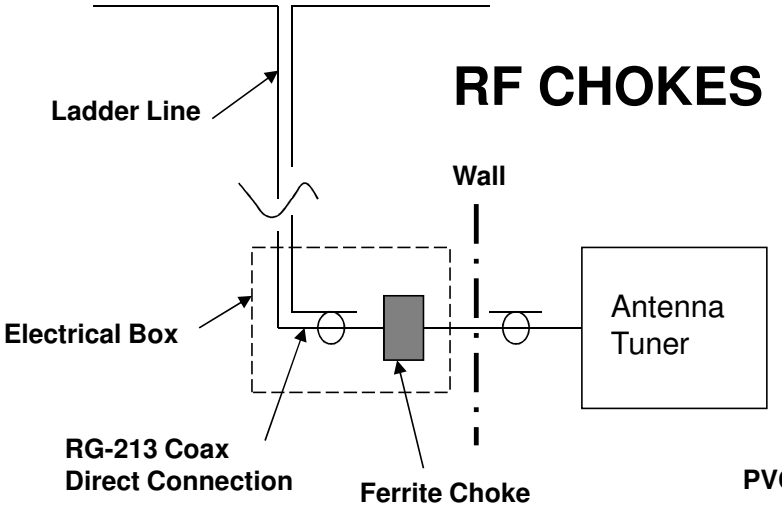




Data from K9YC's webpage:

http://audiosystemsgroup.com/NCDXACoaxChokesPPT.pdf

RF CHOKES



A resonant antenna will never have a feed impedance of 400+j0. It will be a low impedance near it's resonant, 3rd harmonic, etc. On the even harmonics, it will have a high impedance. Thus, the 400-Ohm ladder line never shows an impedance anywhere close to 400 Ohms at the transmitter. Thus, a specific impedance matching ratio is never correct. That's why there's an antenna tuner inside the shack - to match whatever impedance is seen to the 50 Ohms that the transmitter wants. -Courtesy of Tom McDermott –N5EG

Thus, making sure that there are no common mode currents present is the key objective, both to minimize noise pickup and to make sure that there are no currents that could couple into the house wall. The feed line choke does that very well.

DIPOLES

THE END

K5QY