SHORTENING YOUR DIPOLE

BY KD8OUT, Mike Kieffer

HOW WOULD YOU LIKE TO SHORTEN YOUR DIPOLE TO FIT YOUR YARD?

- There are six ways to shorten your ½ wave dipole
  - Tuned feeders
  - Matching at the dipole feed point
  - Loading coil to tune out the capacitive reactance
  - Linear Loading
  - Capacitive end loading
  - Combining some of the above

- We are going to use an 80 meter ½ wave dipole for this discussion.
- An 80 meter dipole (3.8mhz) is about 38.5 meters (126.3feet)total length.

- TUNED FEEDER
  - In a typical ¼ wave dipole center fed by ladder line is approx. 13Ω - j 1100 Ω used on 80 meters.
  - j1100Ω is right at the upper limit of a typical LDG transmatch (tuner), so you could step it down with a balun transformer before the transmatch.

- MATCHING AT THE DIPOLE FEED POINT
  - A matching network (transmatch) could be installed at the feed point, but this is impractical for a dipole.
  - This can be done with a base fed vertical antenna, but is not feasible for an elevated dipole.

- COIL LOADING
  - Loading coils can be installed anywhere along each leg of the shortened dipole.
  - The further out on the leg the coil goes, you a higher radiation resistance (good), but requires a larger coil and higher resistive loss (bad).
  - Therefore, as you move the coil toward the end, there is a balancing of competing efficiencies.
  - DJ4AX did a series of experiments moving the loading coil from center to end. He found that the position did not matter in practice. Use the highest Q loading coils is most important. Larger diameter, flat wire, silver plate.

- LINEAR LOADING

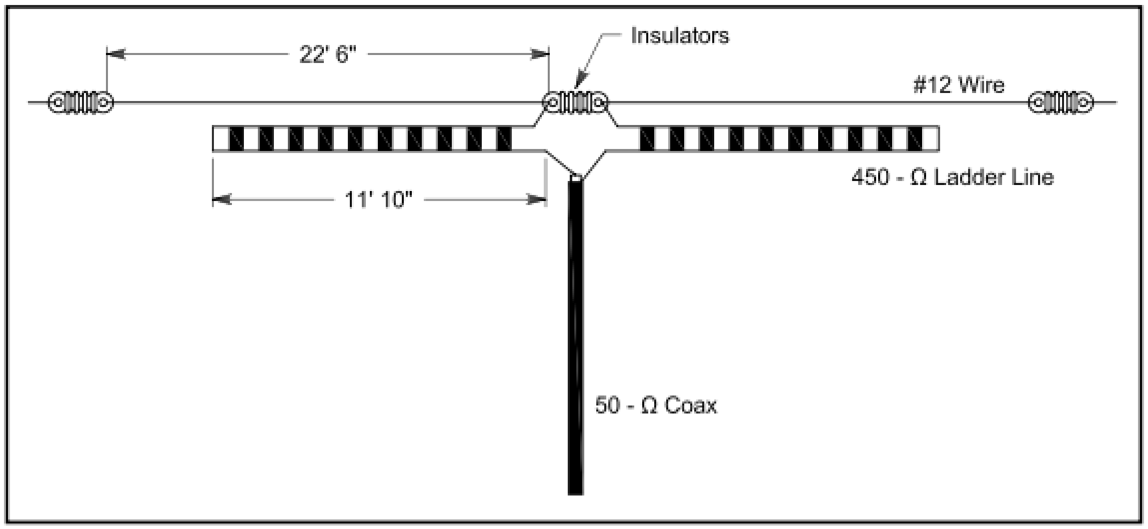

Figure 1—Layout of K4VX linear-loaded dipole. Although the #12 wire is threaded through the 450-Ω window line to support it, this is not shown in this drawing for clarity.

- 19.8meters(65 FEET) is the ½ wave length of a 40 meter dipole.
- http://www.af2cw.com/license/dipole.pd

- CAPACTIVE (end) LOADING
- It has the advantage of physically shortening the antenna, without introducing inductor losses!

THE MAGIC BULLET.

- Lets see:
- S=22.9meters (2286cm) full length is 37.54 meters
- D=0.2cm 12ga wire
- H=10 meters (1000cm)

$$Z_S = 276 \log \left[\frac{S}{d\sqrt{1+\frac{S}{4h}}} \right]$$

- Z (impedance) = 1093Ω
- A ½ wave dipole equals 180 degrees of a wave, so each leg equals 90 degrees. The S=22.9 meters is about a 45% shortening ratio of the ½ wave length (37.5m).
- Therefore 90^0 x (18.75/37.5) = 54.8 degrees
- X (inductive) = j x 1093 x tan(54.8) = 1550Ω
- You need –j 1550Ω to cancel the X above
- C = 1,000,000 / (2 x ∏ x 3.8 x 1550) = 27pf
- Diameter of hat = 2.85 x 27 = 77 cm or 30.3"

- Bingo Bango
- D=2.85 (see chart on next slide) x 27 pf = 77 cm (30.3") capacitive hat (disc) on each end of the dipole.
- The formula above is for a solid disc, an 8 spoke disc is a good approximation.
- So for 22.9m(75feet) dipole, 10m off ground, a 30" hat at each end will resonate the dipole at 3.8mhz!

- This graph represents capacitance hat diameter vs Capacitance in pf

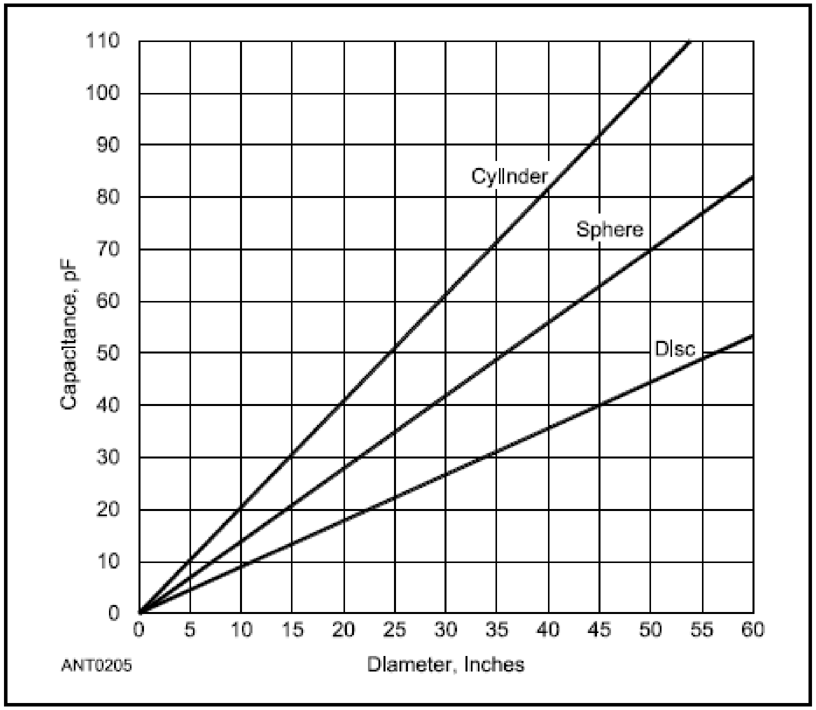

Figure 9.36 — Capacitance of sphere, disc and cylinder as a function of their diameters. The cylinder length is assumed equal to its diameter.