An Off Center End Fed Dipole for Portable Operation on 40 to 6 Meters

This compact design rolls up and fits in a small DX go-bag for easy travel.

Kazimierz "Kai" Siwiak, KE4PT

Your success with low power HF operations increases when you can increase the flexibility of your station. By that, I mean increasing the choices of operating modes, and choices of operating bands. The more choices you have, the more fun you will have. Here I describe an *off center end fed* (OCEF) dipole of my own design that is *physically* end-fed, but *electrically* off-center fed. I needed a simple-to-deploy antenna for portable use that I could easily stow in a small DX go-bag along with a Yaesu FT-817 radio and a tiny Elecraft T1 automatic antenna tuning unit (ATU). This OCEF dipole and ATU combination allows me to operate on all ham bands from 40 to 6 meters. I've even used it on the 80 meter band, with limited success. You can hang the OCEF dipole by one distant end support, or you can drape it in ad-hoc fashion over a fiberglass tent pole (Figure 1) or other convenient support — the ATU adds further flexibility. This lightweight antenna can be rolled and stowed in a small plastic bag for travel. Here's how I built mine.

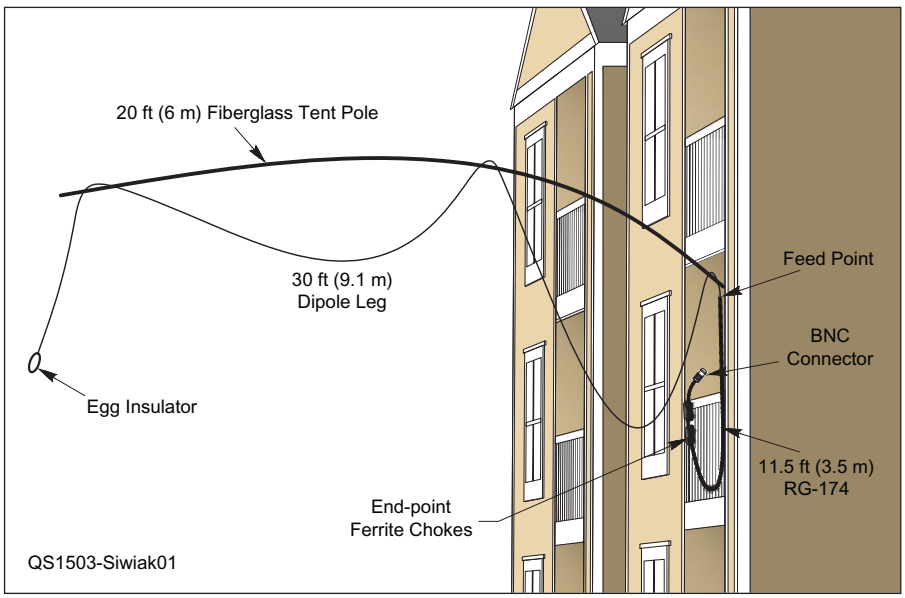

Figure 1 — The OCEF dipole can be drooped from a fiberglass tent pole, as shown here, or stretched out and hung by the end egg insulator.

OCEF Dipole Construction

The OCEF dipole consists of two dipole legs and an optional droop wire (Figure 2). For the far-end portion I used 30 feet (9.1 m) of Teflon® insulated #20 AWG stranded copper wire that starts at the ceramic egg insulator at A. You can also use PVC insulated wire. My wire was salvaged from a twisted pair with yellow and purple insulation, which I unraveled and joined together. Solder it to the center conductor of miniature RG-174 coaxial cable at the *electrical* feed point B. The second radiating portion is the outer shield of the 11.5 feet (3.5 m) long section of RG-174 coax that extends from the electrical feed point B to the ferrite chokes at the physical end of C.

Start with enough RG-174 coax (at least 13 feet; 4 m) so you can wind three turns of the RG-174 coax around each of two ferrite chokes, and terminate the coax in a BNC connector. I chose a BNC female connector so that I can easily add more feed line.

At point C, I added a 2-foot (60 cm) long Teflon covered #20 AWG stranded droop wire to help "tame" the typically high wave impedance at the end of a dipole. This optional wire C – D is the third radiating portion of the OCEF dipole. The electrical end of the antenna is C, or D (if the optional droop wire is used). The ferrite common mode chokes attenuate the radiating currents and keep them from flowing past the choke towards the transmitter.

Theory of Operation

The OCEF dipole is 41.5 feet (12.6 m) long measured from A to C, or 42.4 feet (12.9 m) long from A to D. I chose the two dipole leg lengths A – B and B – C (or B – D) so that they would not be a multiple of a half wavelength on any band of operation.

The radiator length between the egg insulator and the end of the optional droop wire acts like a dipole radiator. This is a non self-resonant design, so you need an antenna match box — I use the Elecraft T1 automatic Antenna Tuning Unit (ATU) — to present a 50 Ω load to the transmitter.

You can attach the optional 2-foot (60 cm) long droop wire to move the very high wave impedance present at the end of a dipole away from the choke, to the end of the droop wire, easing the job of the ferrite chokes. If needed, you can wind the droop wire back around the antenna part of the coax to change the impedance seen by the ATU. Note that changing feed line lengths also changes the impedances presented to the ATU — I normally use a 15-foot (4.6 m) long cable between the antenna and the transmitter — you might need to change this length depending on how your tuner performs.

I chose the two dipole sections of different lengths so that the actual complex impedances at the dipole electrical feed point

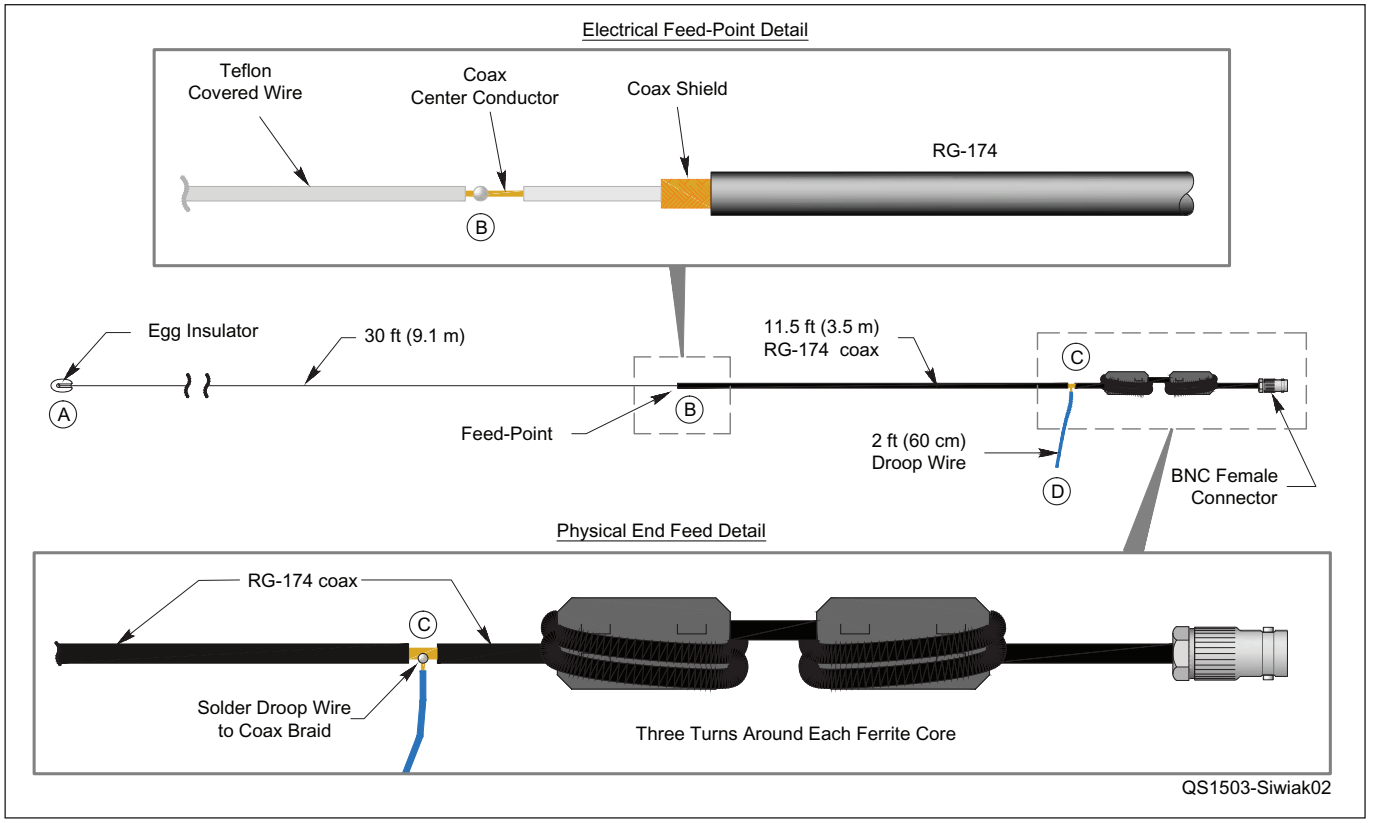

Figure 2 — This OCEF dipole detail shows the radiating portions A – D, details of the electrical feed point, and the common mode chokes at the physical feed end. You need 32 feet (9.7 m) of #20 AWG stranded copper wire, Teflon or PVC insulated (part #125840 **www.jameco.com**), 13 feet (4 m) of RG-174 coaxial cable, 2 snap-on ¼ inch mix-31 split ferrites (**www.Palomar-Engineers.com**), and a cable-end BNC female connector.

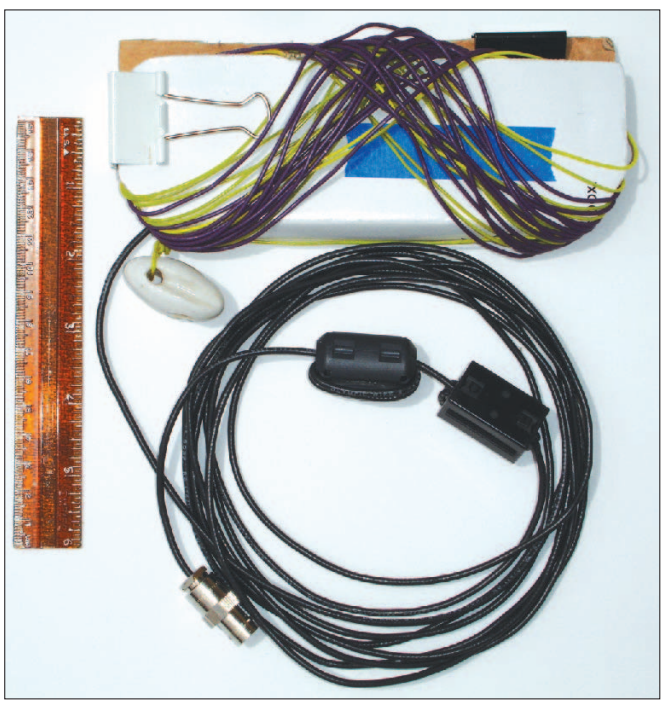

Figure 3 — The antenna rolls neatly into a compact package for easy stowing (droop wire not shown). The ruler is 6 inches (30 cm) in length. [Kai Siwiak, KE4PT, photo]

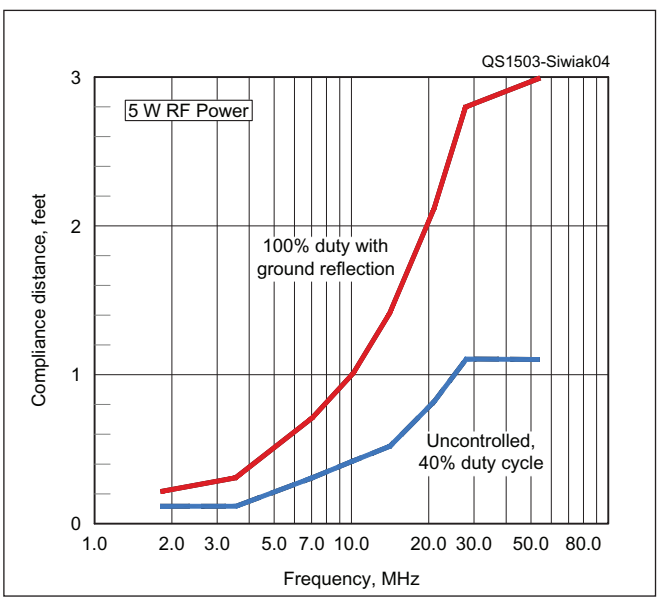

Figure 4 — RF exposure compliance distance for 5 W power. For 50 W multiply the distances by 3.2.

would be relatively easy for the ATU to match. Again, no magic here, just a judicious choice of lengths.

Deploying the OCEF Dipole

When stretched out and hung by the end insulator in an area clear of obstacles, the OCEF dipole is self-resonant near 11.8 MHz and its harmonics (slightly lower with the droop wire). We do not, however, use the antenna near any of the self-resonant frequencies. Antennas do not need to be self-resonant to radiate effectively. With this design, I can match the antenna using the ATU in any ham band from 40 to 6 meters — even and especially — if the antenna is deployed in a random fashion, such as drooped over a fiberglass tent pole, as in Figure 1. I've even had success on 80 meters when the antenna is fully stretched out.

Stowing the OCEF Dipole

Starting at the egg insulator, I wind the wire section of the dipole in figure-eight style around a corrugated cardboard form (6 × 7 inches; 15 × 18 cm). Winding this way prevents twisting in the wire. I then coil the coax portion in a loop (Figure 3), and stow inside the folded cardboard form. The antenna easily fits in a quart (liter) size plastic bag along with additional connectors and jumper cables for the ATU and HF radio.

Using the OCEF Dipole

With 5 W RF power the RF exposure compliance distance (Figure 4) from any part of the antenna rises steadily from 1 foot (30 cm) at 10 MHz to 3 feet (1 m) at 54 MHz. For 50 W RF multiply the distances by 3.2.

When packing constraints limit what I can bring along during travel, this antenna provides lots of freedom in choosing operating bands to let me get my share of DX. The antenna travels well and deploys easily from a hotel room balcony or from a tree at a camp site.

ARRL member Kazimierz "Kai" Siwiak, KE4PT, enjoys DXing and carries a low-power "DX go-bag" station while travelling. You can reach him by e-mail at **k.siwiak@ieee.org**.

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