A 30m Through 80m Loop

Great indoor antenna for QRP.

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The reasons for designing a relatively small antenna for 80 meters are usually to get around antenna restrictions or to solve the problem of lack of space. There is another good reason, however, and that is convenience.

Consider an antenna that fits easily into a room of a house, is easy to build and repair even during the worst weather, and is simple to tune. Isn't that convenience? The difficult thing is coming up with one that's small but capable, even at QRP levels of power (5 watts or less).

The design

Having had good QRP results on 40 meters with a small, single-turn loop based on standard designs, I decided to try to scale it up to 80 meters. Using proportions, I estimated the size needed and laid it out on the dining room floor using ordinary zipcord and a 250 pF variable. I was lucky and was able to tune up on 80 meters the first try. By pruning it, I was able to use the full extent of the capacitor. I found that I could tune the 30 and 40 meter bands, as well as the 80. I also found that the loop, though technically a small loop, was not exactly tiny. It was approximately 64 inches square.

Since the antenna was to stand upright to save space, I made it 66.5 inches high and 62.5 inches wide. This favors the vertical wires, which do most of the radiating. Two advantages of having the loop upright are that it is less sensitive to being near ground level than a horizontal loop, and it has some gain along the plane of the loop. Also, interference can be reduced because of the sharp tuning characteristics of a small loop and by means of the null associated with this type of antenna.

"This antenna fits easily inside a house, is easy to build and repair even during the worst weather, and is simple to tune."

Since my house is constructed of wood, the antenna works well in almost any location; some homes or buildings have a lot of metal in their construction that could shield the antenna and cause it to work poorly. Even so, there may be a spot that will work, such as a porch or an attic space above the metal.

One drawback of an antenna in the home is the danger of an RF burn. Insulation of the exposed parts of the antenna can help prevent this, but an indoor antenna must be treated with respect when it is being used to transmit.

Construction

Insulated house wire (#12 stranded) was used to form the loop. However, a wire loop requires a frame to hold it. I built a simple frame of furring strips designed to put as little wood between the radiating wires as possible. The frame holds the loop, the variable capacitor (240 pF), and the coupling loop firmly in place, yet it is lightweight and easy to reposition. See **Fig. 1.**

The sides of the loop are separate pieces of wire, supported and connected with plastic terminal blocks (Radio Shack™ #274-678). Since bolts and screws hold the frame together and the wire sides are held by the terminal block screws, it is easy to disassemble the whole antenna to move it. The capacitor is mounted on a Plexiglas™ plate screwed to the central support. (A plastic enclosure would be safer, but the plate was quicker.) The actual construction took about two hours.

Looking at the circuit design in **Fig. 2**, you can see the small loop that couples the coax to the main loop. The coupling loop is made of solid insulated #12 wire. This makes it more rigid for easy shaping and positioning. The top of this loop is held by part of a

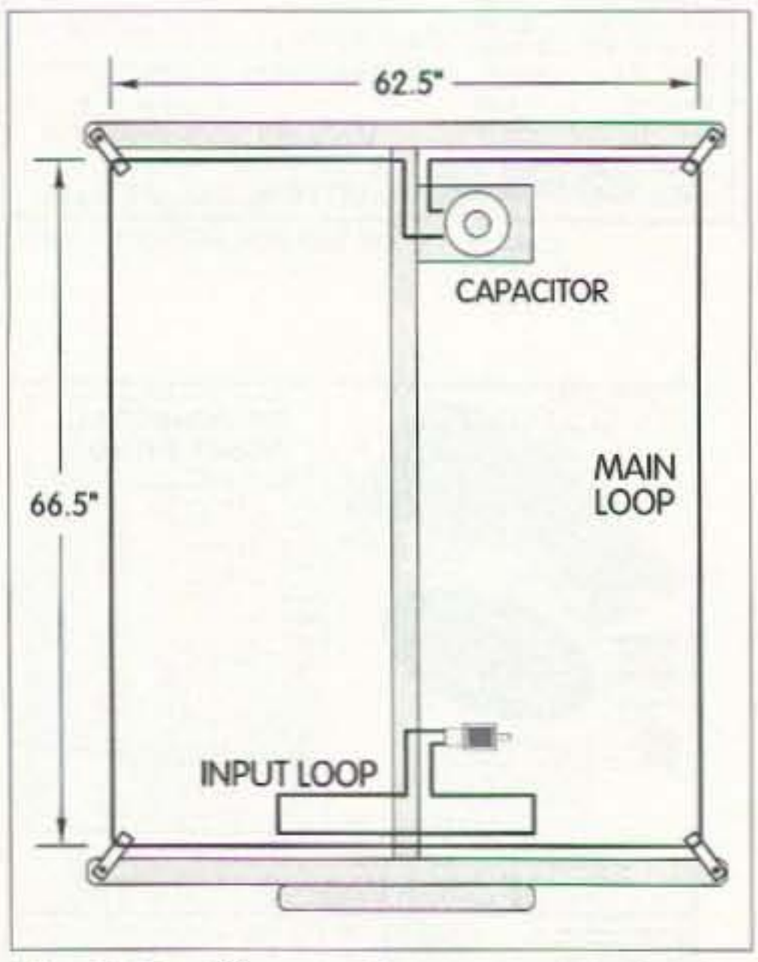

Fig. 1. The 80 meter loop antenna, showing the construction details.

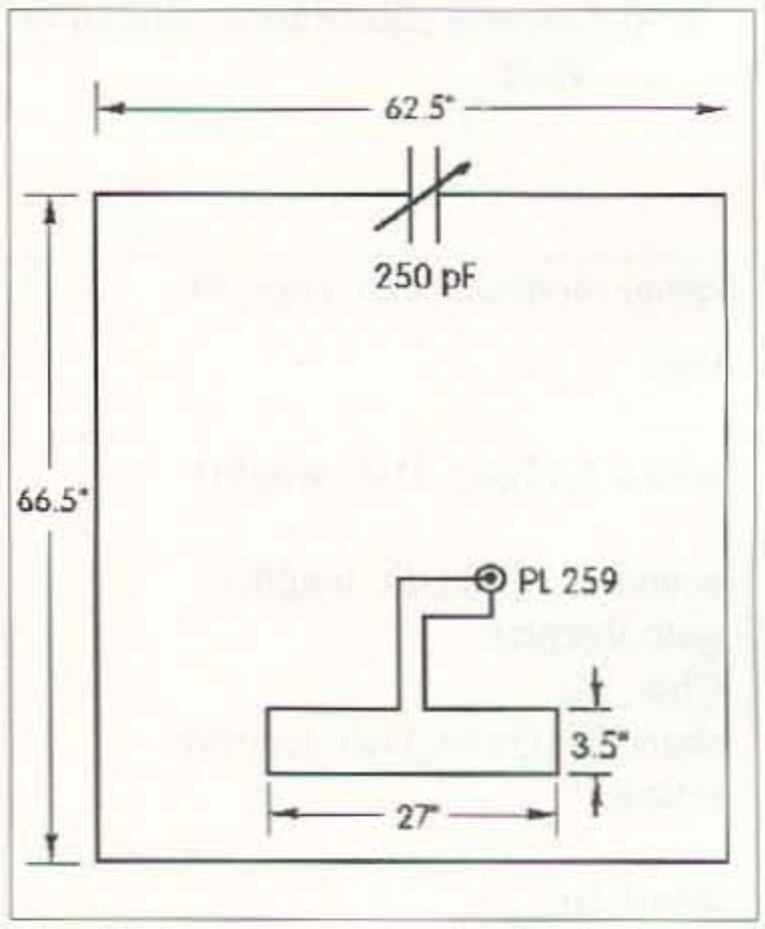

Fig. 2. Loop antenna circuit design and dimensions.

terminal block. The bottom is taped to the main loop itself. The small loop is 27 inches by 3.5 inches.

Operation

The antenna must be tuned to the frequency to be used, by connecting the antenna to a transceiver set for the desired frequency. Turn the knob on the capacitor until resonance is reached. At this point the background noise or signals will be heard, and they will be at a maximum. If the frequency is clear of traffic you can transmit briefly at low power to peak the output, using a field-strength meter. Marking resonance points on the plate that holds the capacitor makes retuning very quick and simple.

By inserting a tuner and an SWR meter in the circuit, the impedance seen by the transmitter can be improved and a wider range of frequencies can be used without retuning the antenna. Only the tuner needs to be touched up if the changes in frequency are not drastic. Recording tuner settings for future use will allow you to leave the tuner in the circuit, set it, and then resonate the loop.

Using an antenna analyzer, the resonance can be found more quickly and accurately without having to transmit.

The antenna sends out maximum signals along the plane of the loop. At the same time there is a pronounced null perpendicular to the plane at its center. These properties can be employed to enhance received and transmitted signals. Also, aiming the null at a noise source can cut down or eliminate that noise. I keep the antenna flat against a wall in an upstairs bedroom. By moving the left side or the right side out, I can easily change direction.

Since this antenna was intended for QRP use, or as much as 10 or 15 watts, the capacitor from an old 300-watt tuner served the purpose. At greater power levels a capacitor with a higher breakdown voltage should be used. Also, much more care should be given to safety considerations.

Comments

It's a pleasure to operate CW or SSB QRP on 80 meters using a relatively small antenna while still getting very good results (not getting TVI complaints is also pleasant, even when the TV is in the next room). The antenna works as well on 30 and 40 meters as it does on 80. Give it a try. 73