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# A Multi-Purpose Antenna: The Full-Wavelength Loop

Some radio enthusiasts feel that vertically-mounted, full-wavelength loops (fig. 1A) are one of the best kept secrets in the realm of excellent-performing but little-used antenna designs. Such loops have a bit more gain (about 2 dB) than a halfwave dipole, are reported to respond less to noise than most other antennas, and are good DX antennas for receiving or transmitting.

## But There's More

By changing the point at which the feedline is attached to the antenna, the signal polarization for the antenna can be shifted from vertical to horizontal. If that isn't enough, with a slight change in the way the feedline is attached to the receiver, a loop can serve as a random-length receiving antenna. Add an antenna tuner and this modification works well for transmitting, too.

## On The Other Hand

When a full-wavelength loop is turned and mounted parallel to the ground (fig. 1 B) it produces vertical radiation which supports short-haul, high-end MF and low-end HF communications out to perhaps 600 miles. This is particularly effective in hilly terrain where antennas with low-angle radiation often just won't support communications.

So with all these factors to recommend it, let's take a look at how we go about making these antennas.

## Let's Make One

For a full wavelength loop you will need a length of wire determined by the formula below. Use any size wire that is strong enough to last — size 12 to 14 is a good choice—braided or hard drawn copper will resist breaking well.

Length(in ft) = 1005/frequency(in MHz)
Length(in meters) = 306/frequency(in MHz)

For example, for a 10 MHz loop the length would be 100.5 feet or 30.6 meters.

See the feature article on a circular loop cut for television. A circular shaped loop gives the highest gain, a square more gain than a rectangle, but the loop can be any handy shape and still function OK. For HF square loops you will need four insulators (three if you shape the antenna as a triangle, etc.) for holding the wire in place, and one "center" insulator. For VHF loops you will need two plastic pipe or fiberglass tubing cross arms (fig. 1C).

You can use the top part of the mounting mast as one of the cross arms (fig. 1C); this will save having to attach the antenna to the mast. Add some support ropes for HF loops or a mast for VHF loops, and a length of coaxial cable with a plug to match your rig's antenna socket and you're ready to start building the antenna.

A. Cut the wire to length.

B. For HF loops slip the wire through one end of each insulator. For VHF loops cut the cross arms to length, make center notches in the arms, and put holes in the arm ends for the wire. Glue the arms into a cross and run the wire through the holes in the arm tips.

C. For HF loops wrap the wire ends to the remaining insulator as shown. Scrape the wire bright where the coax will attach, then solder the center conductor of the coax to one wire and the shield of the coax to the other. Seal the open end of the coax with coax sealer if the loop is used outside.

D. For HF loops add ropes to the unused ends of the insulators; for VHF loops mount the antenna frame on a non-metallic mast. Mount the antenna as high and in the clear as possible.

For vertical polarization, orient the antenna with the feedpoint at the middle of the bottom (fig. 1A) or top. For horizontal polarization, orient it with the feedpoint at the middle of one side.

E. Don't forget lightning protection. The minimum is to never operate during weather likely to produce lightning, and disconnect and ground the antenna when it is not in use.

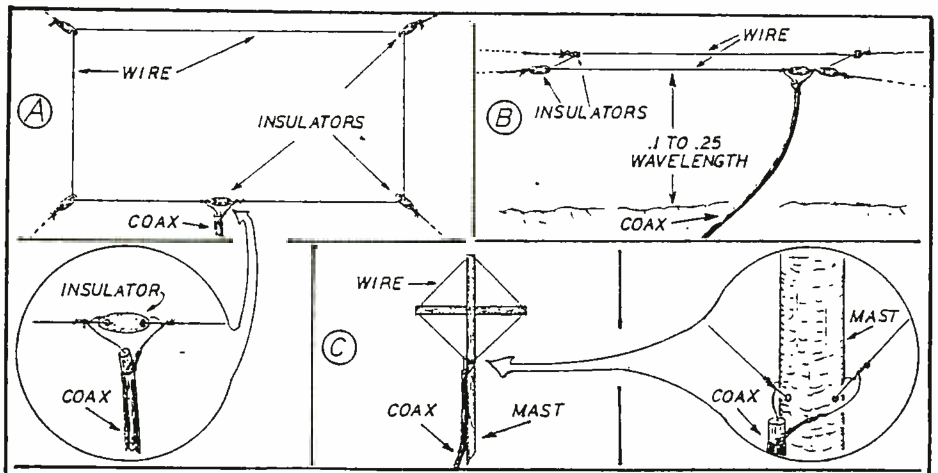


FIG. 1 FULL-WAVELENGTH LOOPS FOR HF (A,B) AND VHF-UHF (C).

## Using the Loop

This antenna's gain is greatest broadside to the plane containing the loop, but it is responsive to signals from all directions. If you connect the center conductor and shield of the coax together at the receiver end of the feedline, and then connect them to the center connection of the antenna input of your receiver, the antenna essentially becomes a random-length antenna. With an antenna tuner it can also be used in this fashion for transmitting.

## Radio Riddles

### Last Month

Last month we recalled how a beam antenna pointing toward the horizon is actually always pointing toward the antipodes: the spot on the exact opposite side of the world from the beam antenna's location. We also discussed how a signal transmitted from the beam can continue on that same path, continue on past the antipodes, and by the "round the world" path travel right back to the location where it was originally transmitted. As a matter of fact, if it is then still strong enough, it may go on around again, and even again.

Our riddle was then: "Is it possible to transmit signals to yourself in this fashion, and if it were possible, how long would you have to wait to hear yourself?"

Well, it takes only 1/7th of a second for a radio wave to travel around the world, and so your receiver would have to be switched back into operation that quickly after transmitting ceases in order to respond to the signal as it returns to the backside of your antenna. And, obviously, your antenna must be responsive to signals coming in from this "back door" direction which is opposite to the direction from that in which the signal was originally transmitted. Bidirectional beams and nondirectional antennas are then more likely to support this sort of reception than are unidirectional beams. Having the antenna mounted high and in the clear is important for success in this "self communication."

John Kraus, in his autobiography *The Big Ear*, tells about checking for 'round-the-world DX openings with his early W8JK beam by listening for his own signal to return in this fashion. The W8JK beam is bidirectional, and therefore would respond well to the signal coming back to the opposite side of the beam from which it was transmitted.

In the early days of wireless, the legendary "Imperial Beam," provided England with the first reliable world-wide radio communication the world had known. Transmitting with this antenna, Marconi's operators could sometimes hear not only one pass from their signals going on an around-the-world trip, but occasionally even several passes!

## This Month

We sometimes read that HF radio waves which leave the antenna at high angles, especially those waves heading straight upward, pass through the ionosphere and on into space. But is this necessarily true? And what if you did make a HF loop as described above and mounted it parallel to the ground (fig. 1B)? And what is "NVIS" anyhow, or "BLOS" for that matter?

## Here's A Riddle That I Can't Answer; Can You Help?

I have heard several reports of mysterious signals which have a number of people across the nation wondering what is going on. These signals seem to come and go, sometimes as if they were turned on and off with a switch. They are reported to have a frequency of 17-20 Hz, which would place them in the extremely low frequency band of the radio-frequency spectrum. As this is also the low end of the audio frequency band, only those persons with good hearing at the low end of the audio range can hear these signals.

For those that do hear the sound, it is described as anywhere from "unusual," "annoying," "distracting," "sounding like a truck idling," or "a humming sound," to causing ear aches and loss of sleep, or even disturbing a person's sense of balance! As of yet no one seems to have an explanation for the signals, although some are trying to blame them on aliens! These signals are so mysterious that various newspapers and even *People* magazine (9/21/92) have carried articles about them.

Do these signals propagate as a radio signal? Are audio signals produced by objects in the environment responding to some incoming radio wave of a higher frequency? Are they produced by some mechanical oscillations propagating from a distant source? Are they are generated locally at each site where they are heard? Are they caused in some other way? If you have any information on these signals I'd like to hear from you. Just drop me a line in care of *Monitoring Times*. If we can accumulate enough meaningful information, I'll report back to you on this intriguing mystery.

And so, 'til next time, Peace, DX, and 73.

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