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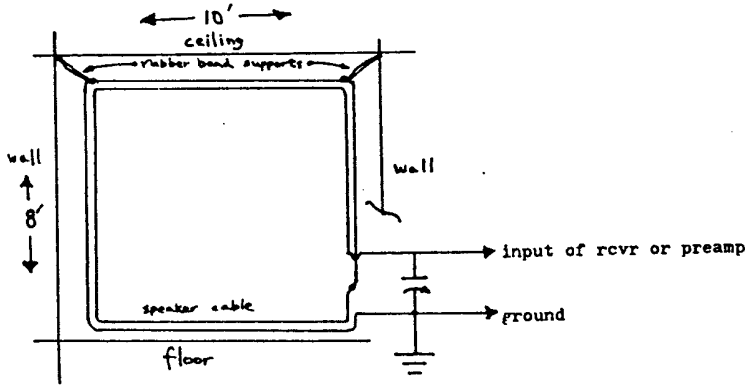
the irca technical column

A Large Area Loop

by Steve McGreevy

I know that the larger a loop's area, the greater the signal pickup it has. Even though the idea of a room-sized loop struck me as being a little ridiculous, I went ahead and made one. I took about 35 feet of speaker wire (Radio Shack #278-1385) and used it to make a two turn loop, 10'x 8'. The twin wires of the speaker cable are not separated; one wire forms the first turn of the loop, and the other wire forms the second turn. See diagram below:



To support the loop, I put two small brads near the ceiling on opposite walls of my DX room. I knotted a thick rubber band on each of the upper corners of the loop so that the bands could be hooked onto the brads. The rubber bands are secured onto the loop with electrical tape. The loop now hangs from these brads in a more-or-less rectangular shape, following the contours of the room; the bottom of the loop lies on the floor. A hook on the ceiling can support the center of the loop if it sags too much. Naturally, I oriented the loop in the direction of the desired DX.

The variable capacitor which I used to tune the loop had a total maximum capacity of about 720 pF. This tuned the loop from 650-1700 kHz. I can also convert my loop to a one turn model, with the second wire of the speaker cable acting as a pick-up turn for coupling the loop to the receiver. In this case however, my 720 pF variable tunes the loop from 1300-5000 kHz.

Here's a list of advantages and disadvantages of my loop:

Advantages--
- Large signal gain over my 3½' spiral loop (about 15-20 dB)
- Very portable--can be folded up and stored.
- Good for those who lack room for a longwire or short Beverage.
- Can null if oriented properly.
- More signal output than my 200' wire (using no antenna tuner)
- Good for those who want to TP DX, but live on a cliff over the water, hi!
- Very quick to put up and take down (for me, under 3 minutes)

Disadvantages--
- A bit less "Q" than some smaller loops.
- Nulls are hard to find. Placement is critical.
- Large wide lobes (i.e. not very directional--somewhat, but not great)
- Can pick up excessive noise if placed near house wiring.
- Receives high angle skip as opposed to a Beverage (may sometimes be an advantage though)
- Not rotatable.

My "floppy loop" has been a boon for weak signal DX, especially when used with my tuner/preamp, and I would highly recommend it for those whose only other alternative would be a ticky-tacky short wire, which it will greatly outperform; the extra tuned stage also helps reject receiver spurs. It is a super easy loop to construct for beginners and really does a commendable job. I'm very happy with mine.

* * *

Thanks Steve. Here's a bit more about large loops from the editorial "desk". I don't have room in my DX cubicle to duplicate the 10'x 8' loop, but I did make a 6'x 6' loop out of 3-conductor power cord, forming a 2-turn loop with 1-turn pickup, and found it only roughly comparable to my unamplified 3-foot square box loop in signal strength produced. However, the 3' loop had been optimized for signal pick-up; see article below for that... Then I constructed a 3 turn loop with a one-turn pick-up--it was about 18'x 6' and ran from my DX cubicle's window to a nearby tree; it was resonated by a "730 pF" variable capacitor--two 365 pF gangs in parallel. Oriented at 270°, it did give me from 12-15 dB more signal strength on DU's and JJ's, at least some of the time, when compared with my box loop. Distributed capacity in the turns of the loop limited it to below 1300 kHz, and its size really meant that it was approaching a random wire in its action, or so I would think. However, a 50' random wire was consistently outclassed by the big loop when it came to the strength of DU's and JJ's, especially in readability...less noise and splatter were heard on the big loop. On the other hand, stronger signals were heard from the western clears, semi-locals etc. when using the random wire, so it would appear that even that big a loop favors a lower angle signal than a short random wire.

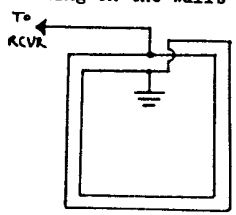
The loop had reasonably high Q, especially when it was matched to the receiver with a toroidal transformer. It was interesting that signal strengths of any individual DU or JJ station were not consistently better on the big loop compared with the 3' inside job. Certainly there were times when a substantial difference was noted, yet moments later signal strength would be about equal on both loops. So the large loop may make a difference on a weak signal in some circumstances. My large loop had to come down (the tree wasn't a very stable support in a wind) so the observations relate only to a few DX sessions.

For those interested in other kinds of large area loops, Glen Kippel wrote an article on his large loops in the tech column in the March 20, 1982 DX Monitor. This article will also appear in the upcoming second edition of the Technical Guide. Dave Dobson, a Medium Wave Circle member in Britain uses a 7' spiral loop phased against a 100' random wire. This arrangement allows nulls in almost all directions while keeping the loop stationary.

An Indoor Random Wire---or is it Loop?

by Ben Peters

I'm presently using a two turn loop of wire in a horizontal plane running on the walls of my room (4 x 5 meters) near the ceiling. The total wire length is about 40 meters. Exactly in the middle of this length of wire is a tap which gives a very clean signal to the receiver antenna input, when both the beginning and end of the wire are grounded and/or are fed to the receiver ground terminal. By itself it is OK, but it gives very good results with my phasing set-up (described in Jan 2, 1982 DX Monitor). Above this two turn loop I made a 7 turn loop using 140 meters of wire which gives a lot of flexibility, depending on which turn of the loop is tapped for ground or for signal. For example, the beginning of the 7 turn loop gives BBC-4 at midday on 720 kHz, yet the end gives the German as the dominant. This is untuned, and with no connections through a phasing unit.



(ed. note: a similar system to the above was tried here--10 turns in a spiral in a horizontal plane mounted on a 3 x 3 meter ceiling. With the center-tap feeding the receiver's antenna terminal, the ground connection was moved from turn to turn (the ends of the loop were left unconnected unless one or other was connected to the ground terminal). Using this system, one station or another could be chosen on a few channels. Certainly, signal strengths of dominant stations on various channels could be varied considerably. It would seem a good random antenna to use with a phasing system, as the dominant signal could be varied a fair bit even before the phasing unit was used, perhaps allowing better nulls. It must be noted however that this antenna doesn't produce high level signals, and amplification will probably be necessary when listening to weak signals or when phasing this against an outdoor antenna. I also noted that varying a 10 k potentiometer connected across the open ends of the loop could occasionally deepen a null on a signal.)

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Large-Area Loops for High-Noise Environments

by Glen Kippel

In urban areas, power-line hash can be strong enough to wipe out DX when a random-length wire antenna is used. There is a way to overcome this problem, however, and that is by using a loop antenna.

The loop antennas employed by DXers in the past have been reasonably effective in improving signal-to-noise ratio, but have been either expensive to buy or complex to build. Further, air-core loops are somewhat cumbersome and unaesthetic (unless made by an artist, hi--ed), and amplified loops may introduce circuit noise, thereby exchanging one form of noise for another.

The main drawback of the loops to be described is that they are normally non-rotatable, though directional in the plane of the loop, but then nobody seems to complain that their longwire or dipole isn't rotatable. Besides, it may be possible to build a rotatable version, described later in this article. However, they are inexpensive, simple to construct, easily transportable and can sometimes be hidden from view.

The simplest form of a large-area or "floppy loop" is just a length of co-ax cable, chosen to match the input impedance of the receiver. RG-58 or RG-59 should work fine, but even microphone cable will work if a matching device is used. The shield is used in this antenna as a Faraday screen to attenuate the electrostatic field. Thirty to fifty feet of cable will do for a decent sized loop. Prepare one end of the cable to interface with the receiver antenna input, a PL-259 connector, or whatever is applicable. Connect that end to the receiver.

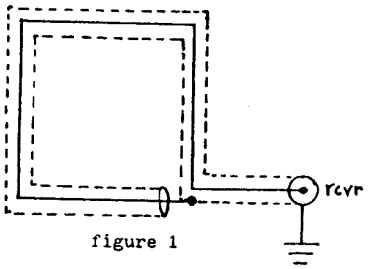

figure 1

At the other end of the cable, cut off the outer jacket and the shield an inch or two back from the end. A razor blade or sharp knife is appropriate for this. Next, strip off some of the dielectric to expose the center conductor. It would be prudent to wrap a little electrical tape over the exposed end of the shield to prevent the shield braid from touching ground or the center conductor at this point. This is important!

Next you will need to arrange some support for the antenna. You can drape the cable over a drapery rod, over one or more doors, shelves, pictures or whatever it takes to hold the cable in an upright loop. A few small nails driven in a wall near ceiling height would be sufficient to support the cable. Now bring the far end of the cable back to the receiver chassis. If it won't quite reach (and it's perfectly acceptable to lay the cable on the floor) then, with a sharp knife or razor blade, cut a hole in the cable's vinyl jacket (near the receiver) and attach the center conductor end to the shield with a blob of solder, or perhaps you can tape it in place. Remember, the larger you can make the loop the more signal pickup you will have. Once you have returned the far end of the center conductor to receiver ground, you will have completed an unbalanced, shielded, Floppy Loop (see figure 1).

The ambient noise level may or may not be reduced by connecting the receiver chassis to a water pipe or other earth ground. Experimentation is in order here. Also, moving the antenna slightly may result in improved noise cancellation. You will note that your Floppy Loop may be easily folded up and transported, hung up in a couple of tree branches at a DXpedition, in a motel room, or wherever you want to DX.

If the level of local electrical interference is severe, it may be necessary to use a balanced loop. This will require the interposition of a balun so that the loop itself is balanced and "floating" (see figure 2). To do this, wind a simple transformer on a toroid core. The Radio Shack ferrite assortment should have some toroids in it. Any of these will work. You will need to decide if you want a resonant or non-resonant loop. If you have problems with locals generating spurs all over the band, resonant is probably the best way to go. The resonance peak is very broad with this sort of loop, however.

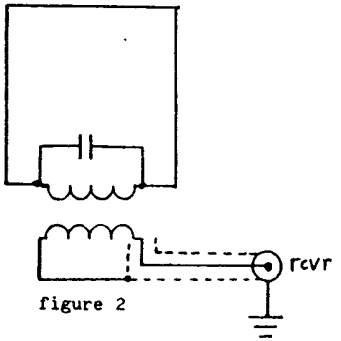

figure 2

Start by winding about 10 turns or so of #28 magnet wire or #30 wire-wrap wire on each side of the core (see figure 3A), and hook it up as in figure 2. For proper signal transfer, the loop must be tuned by paralleling an appropriate capacitance across it. I found that .025 uF would tune to the low end of the band, .005 the top, and wired up a rotary switch to change the capacitance in .005 steps. The capacitance values would be somewhat different if more or less turns are used on the transformer.

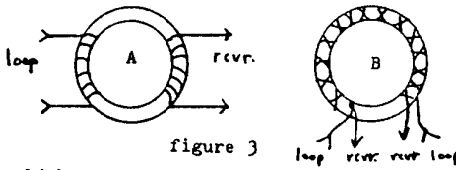

figure 3

An untuned transformer makes operation more convenient, especially if the antenna must be hidden for the sake of appearance--my N-S loop is hidden in a large closet. The coils use about 15 turns of bifilar-wound #28 wire on a ferrite core. Perhaps the number of turns may need to be changed; so far these transformers do an adequate job for me. See figure 3B for construction details. When using a broad-band transformer the shunt capacitor is not used.

For structural rigidity, the toroid can be held in place inside a small aluminum box. The antenna wires come out the ends through rubber grommets, and I thought it elegant to make the output connection by means of a BNC connector. Note that a balanced loop need not be shielded, so any type of wire may be used for the loop itself. The shape can be irregular, just as long as it is more or less upright. The lead from the transformer to the receiver must be shielded.

Because of the low cost of these antennas, it would be possible to put up several, oriented in different directions, and switch between them. Another possibility might be to connect two crosa-oriented loops to the receiver through a goniometer or a phasing unit. Or, if you have some space available in the backyard, support the antenna in a frame made of PVC pipe and turn it with a TV rotator. A ten-foot loop shouldn't be too heavy for the rotator to handle.

Because the Floppy Loop can be hidden behind a drape, behind a bookcase, or otherwise rendered invisible, it may be the answer for the apartment dwelling DXer who can't put up an outside antenna.

----------That cleans up nearly everything on hand at the moment. Thanks very much to all the contributors over the last few months. 73--NHP