

The Loop Skywire

Looking for an all-band HF antenna that is easy to construct, costs nearly nothing and works great DX? Try this one!

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There is one wire antenna that performs exceptionally well on the HF bands, but relatively few amateurs know about it or use it. The purpose of this article is to present what one user has described as the “best kept secret in the amateur circle.”

The Loop Skywire antenna is simple and easy to construct, costs nearly nothing, and eliminates the need for multiple antennas to cover the HF bands. It is made of only wire and coaxial cable, and often needs no Transmatch. An efficient antenna, it is effectively omnidirectional over most real earth, and exhibits a good signal-to-noise ratio. The antenna operates on all bands (harmonics) above the design or fundamental frequency and fits on almost every amateur’s lot. It also works DX better than any other antenna I have had in the past.

You’re suspicious? No antenna does all that? Since 1957, I have used this antenna in many locations with great success every time. There is, of course, no such thing as a “best” antenna. One operator’s dream can become another’s nightmare. Antennas are very sensitive to their environment. Yet, out of the numerous amateurs I have known who put up this Skywire, not one took it down because of poor performance. Invariably, other antennas, including beams, were dismantled when the Skywire became their main antenna.

It is curious that many references to this antenna are brief pronouncements that it operates best as a high-angle radiator and is good for only short-distance contacts. Such statements, in effect, dismiss this antenna as useless for most amateur work. This is not the case!

The Antenna

It is quite possible that the Loop Skywire

has not been fully studied, analyzed and researched. Those who are able and curious should investigate the polarization of this one. This article does not offer a technical explanation of its performance or operation. Rather, it is a description of the antenna accompanied by construction hints and actual user comments. Take some time to erect the Skywire and decide for yourself whether it works.

Novices and Extras take note: Here is a simple, single antenna that *really* works all bands without the need for special stubs or tuning and pruning procedures. A Transmatch in the shack is helpful, but is often unnecessary, especially with tubefinal rigs.

The Loop Skywire is a “magnetic” version of the old super SKYBUSTER—the open-wire, center-fed “electric” Zepp that has performed extraordinarily well for many decades. Yet, this one is less difficult to match and use. It can quickly displace that myriad of wires that many have erected in an attempt to work all HF bands. Besides the improvement in appearance, mutual coupling is greatly reduced. Antennas really do not like neighbors: The more antennas erected, the poorer they all generally work.

The Loop Skywire is shown in Fig. 1. It is simply a loop antenna erected horizontal to the earth. The horizontal position is its secret. Maximum enclosed area within the wire loop is the fundamental rule. The antenna has 1 wavelength of wire in its perimeter at the design or fundamental frequency. If you choose to calculate L_{total} in feet, the following equation should be used:

$$L_{total} = \frac{1005}{f} \quad (\text{Eq. 1})$$

where f is frequency in MHz

Given any length of wire, the maximum possible area the antenna can enclose will be with the wire in the shape of a circle. Since it takes an infinite number of skyhooks to hang a circular loop, the square loop (four skyhooks) is the most practical. Reducing the area enclosed by the wire loop further brings the antenna closer to the properties of the folded dipole and both harmonic impedance and feed-line voltage problems can result. Dipole (electric) antennas are only reasonably resonant at their odd harmonics. A little known fact in the amateur community is that loops are reasonably resonant at all harmonics of the design frequency. Loop geometries other than a square are thus possible, but remember the two fundamental requirements for the Loop Skywire: its horizontal position and maximum enclosed area.

Construction

Antenna construction is simple. Generally, a minimum of four skyhooks are required. Fig. 2 shows the placement of the insulators at the loop corners. There are two methods used to attach the insulators: Lock or tie the insulator in place with the loop wire tie shown, or leave the insulator “free” to float or slide along the wire. Most loop users float at least two insulators. This allows pulling the slack out of the loop once it is in the air and eliminates the need to have all the skyhooks exactly placed for proper tension in each leg. I recommend floating two opposite corners. The feed point can be positioned anywhere along the loop that you wish. However, most users corner-feed the skywire. Fig. 3 depicts a method of doing this. It is advantageous to keep the feed-point mechanicals away from the corner support. I usually feed a foot or so off one

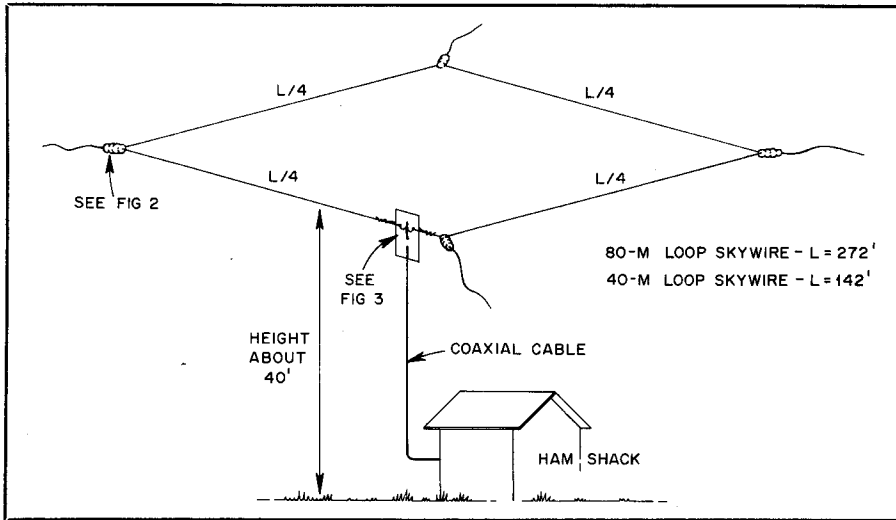


Fig. 1—A complete view of the Loop Skywire. The Loop is erected horizontal to the earth.

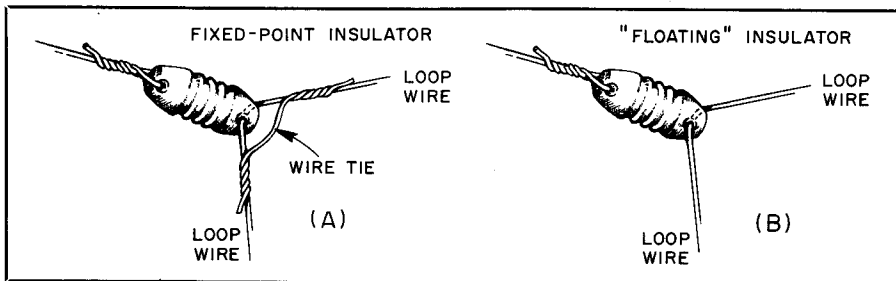


Fig. 2—Two methods of installing the insulators at the loop corners.

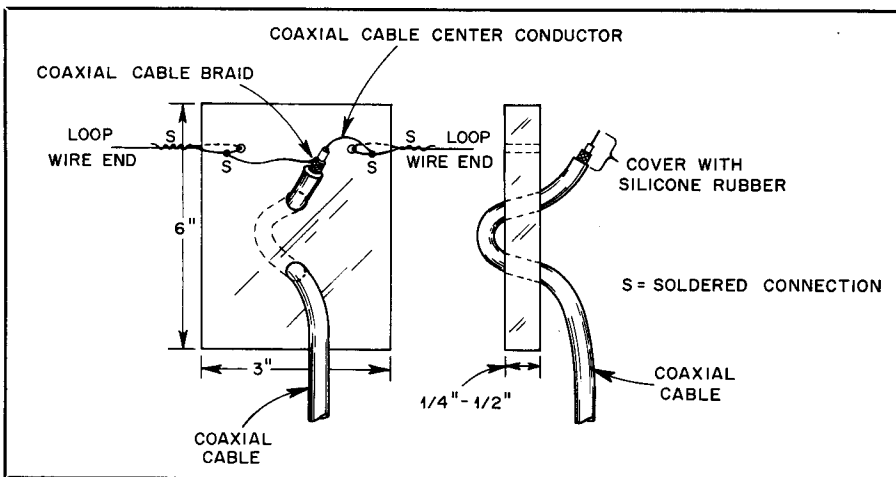


Fig. 3—Most users cornerfeed the Skywire. A high-impedance, weather-resistant insulant should be used for the feed-point insulator. Cover the end of the coaxial cable with silicone rubber for protection from the weather and added electrical insulation. Dimensions shown are approximate.

corner, allowing the feed line to exit more freely. This method keeps the feed line free from the loop support.

If the skyhooks (e.g., trees) move, then at least two of the ropes or guys used to support the insulators should be counterweighted and allowed to move freely. The

feed-line corner is almost always tied down, however. Very little tension is needed to support the loop (far less than that for a dipole). Thus, counterweights are light weights. Several loops have been constructed with the use of bungee cords tied to three insulators and the attached ropes

tied fast. This eliminates the need for counterweighting.

There is another great advantage to this antenna system. It can be operated as a vertical antenna with top-hat loading on all bands as well. This is accomplished by simply keeping the feed-line run from the antenna to the shack as vertical as possible and clear of objects. Both feed-line conductors are then tied together (via a shorted SO-239 jack, for example), and the antenna is fed against good ground. This method allows excellent performance of the 40-meter Loop Skywire on 80 meters, and the 80-meter Loop Skywire on 160 meters. When constructing the loop, connect (solder) the coaxial feed-line ends directly to the loop wire ends. Don't do anything else. Baluns or choke coils at the feed point are not to be used. They are unnecessary. The feed arrangement for operating the loop as a vertical antenna is shown in Fig. 4.

Some skeptics have commented that the Loop Skywire is actually a vertical antenna in disguise. Yet when the loops have been used in on-the-air tests with both local and DX stations, on those bands where loop operation is possible, the loop operating as a loop consistently "out-signals" the loop operating as a vertical.

Although the loop can be constructed for any band or frequency of operation, the following two Loop Skywires are the star performers. The 30-meter band can also be operated on both.

80-meter Loop Skywire (80-100 meter loop + 160-meter vertical)
Total Loop perimeter: 272 feet
Square Sidlength: 68 feet

40-meter Loop Skywire (40-10 meter loop + 80-meter vertical)
Total Loop perimeter: 142 feet
Square Sidlength: 35.5 feet

Actual total length can vary from these dimensions by a few feet. Do not worry about tuning and pruning the loop to resonance physically. No signal difference was detected on the other end when that method was used. Let the Transmatch do the necessary mop up.

Copper wire is usually used in the loop. Lamp or "zip" cord and Copperweld can also be used. Several loops have even been constructed successfully with steel wire, but soldering is difficult.

Recommended height for the antenna is 40 feet or more. The higher the better, especially if you wish to use the loop in the vertical mode. Successful local and DX operation has been reported, however, in several cases with the antenna at 20 feet.

If you are preoccupied with SWR, the reading will depend on your operating frequency and the type of feed line used. Coaxial cable is sufficient; open wire does not appear to make the loop perform any

User Responses to the Loop Skywire

W8BO (40-meter Loop Skywire at 20 feet): "This antenna has to be the best-kept secret in the hambook! I had been using the loop vertical for three years when, one day, I worked an HA4 in Europe. He said his loop was in the horizontal configuration, and I immediately took mine down and repositioned it horizontally. The height was 20 feet above ground. Here is what I found. The radiation results in a blanket coverage throughout the USA. What was surprising, though, was the effective coverage at low angles. This horizontal loop listens to the DX in an amazing fashion. What you have here is the complete backyard antenna that not only ragchews, but also DXs. Europe can be worked easily on all bands with 100 W. On 20, 15 and 10 meters, the sky is the limit. While the 'big boys' are bringing their beams around, you can work anybody within 360 degrees. You can almost see the tears running down their faces. If a station within the States does not come back to me, I immediately look out the window to see if the antenna has blown down. I hold 5BWAS and 5BDXCC. If I say an antenna works, you'd better believe it!"

K4SSW (40-meter Loop Skywire at 53 feet): "The 40-meter Loop Skywire is my only antenna now. I work 40, 20 and 15, and my enjoyment is ragchewing with DX ops. I work anyone I can hear, and I hear lots! My average QSO time working DX is 10 to 15 minutes per contact, so the signal has to be decent to withstand changing conditions, the "rat race" and the alarming increase in every frequency you work being used as the national tune-up spot! My rig is a TS-530S with an MFJ-941C antenna matching network and 90 W out, and I get a 1:1 SWR with ease. DX stations are very curious about the loop and request information about it.

"The following statistics are taken from my log over a time span of 16 months of operation (November 1983, when the loop went up, until March 1985). Total QSOs = 1350, with 739 as DX and 611 as local (USA and Canada). Using the RS/RST system, these are my received signal reports:

	R5	R4	R3	S9	S8	S7	S6	S5	S4
DX	685	39	15	96	44	118	98	232	151
Local	592	16	3	215	92	115	45	99	45
Total	1277	55	18	311	136	233	143	331	196
Percentages									
DX	93%	5%	2%	13%	6%	16%	13%	31%	21%
Local	97%	2%	1%	36%	15%	19%	7%	16%	7%
Total	95%	4%	1%	23%	10%	17%	11%	25%	14%

"These data show that the loop is a very good performer. Those who expect 599 + 40 dB are dreamers. Overall, the signal was perfectly readable (R5) 95% of the time. DX-wise, the signal was moderate or better in strength 79% of the time; and locally, 93% of the time. Of course, the RS/RST system is not scientifically based, but it is the system we use. Hams really do jump up and down at 599s, but then take the other guy as honest or a "lid" when it's 339! This antenna works great! Represented in these 739 DX QSOs are 90% DXCC and multiple WAC. Locally, the 611 QSOs are WAS several times. The first signal heard on this antenna when it was put up in November 1983 was a UK2 on 80 CW, and the sun was still shining. The loop was loaded as a vertical on 80 meters. I heartily claim the Loop Skywire a real winner!"

employed to eliminate the chance of induced or direct lightning hazard to the shack and operator. Some users simply employ a three-connector (PL-259/PL-258/PL-259) weather-protected junction in the feed line outside the shack and completely disconnect the antenna from the rig and shack during periods of possible lightning activity.

The antennas just described are in daily use, and I estimate at least several hundred are working well throughout the world at the present time. Comments offered by some users appear in the accompanying sidebar. They are representative of comments received from the numerous amateurs polled by the author who use the Loop Skywire. There were no dismal or negative results reported with this antenna, which the textbook-touters dismiss as a useless antenna for the HF ham bands. The Loop Skywire is truly a real Loop Skywalker! Try it; you'll like it! I welcome your comments on its use.

W0MHS has been active on the HF bands for nearly 40 years. Working CW exclusively, Dave participates in the NTS, chases DX, enjoys contesting and ragchewing, and is a member of the QCWA. He holds a degree in Applied and Pure Mathematics and Mathematical Logic from the University of Missouri at Rolla and the University of Kansas, respectively. He earned his PhD from the University of Nebraska. Dave has worked with electromagnetics, antennas and transmission lines while both an engineer and technical consultant at Hy-gain in Lincoln, Nebraska. He has also taught at the Universities of Nebraska and Kansas, founded a radio astronomy and radio science observatory at Earlham College, Kansas, and has authored numerous technical papers. His most recent work is in the area of fiber-optic cables for long-haul telecommunication services. Dave is presently director of engineering for Superior Cable Corporation.

Strays



I would like to get in touch . . .

anyone with a manual and schematic diagram for a Hallicrafters transmitter, Model HT-40. Merlin Koellen, KB6FQP, 5851 Snead Dr., Huntington Beach, CA 92649.

anyone with a circuit for automatic restart of the scanning mode for the Yaesu FT-207R 2-meter hand-held. Dan Council, WB9UKL, 5819 N. Rosemead, Peoria, IL 61614.

anyone with any information on a Western Electric regulator circuit identified by J87214A-1L1, J87211A-1L7, SD81541-01. Lynchburg ARC, P.O. Box 4242, Lynchburg, VA 24502.

anyone having a service manual or schematic for a General Radio pulse generator, Model 1340. Elwood Bloese, WA4AYC, 7245 Chilton La., Riverdale, GA 30296.

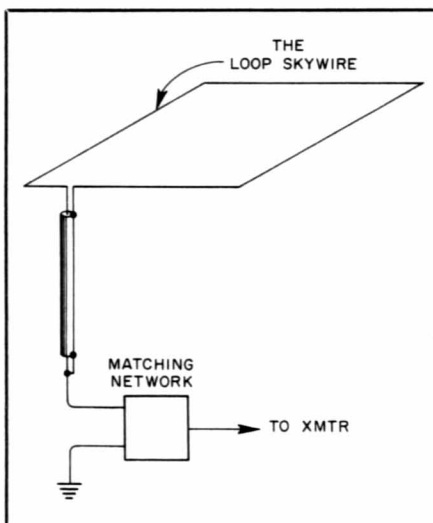


Fig. 4—The feed arrangement for operating the loop as a vertical antenna.

better or matching to it any easier. Most users feed with RG-58, RG-59 or RG-62. RG-8 and RG-11 are generally too cumbersome to use. With full power and coaxial cable feeding these loops, feed-line problems have not been reported to me. The SWR from either of these loops with approximately 100 feet of feed line is rarely over 3:1. For those who understand SWR, the use of a Transmatch will eliminate all concern for power transfer and maximum signal strength. The SWR in my shack is always 1:1. The highest line SWR usually occurs at the second harmonic of the design frequency and all other frequencies above that. The Loop Skywire is somewhat more broadband than corresponding dipoles, but the loop is efficient: The SWR curves are not "dummy load" flat!

Since the loop is high in the air and has considerable electrical exposure to the elements, proper methods should be