My Longwire Antenna

Cheap, no-fuss and it's got gain!

by Dean Frazier NH6XK

There are instances when a ham wants propagation in several general directions, with gain, on more than two or three bands, to take advantage of different propagation conditions at different times of day. Living in Hawaii, almost all of my HF work is off-island DX, across water, for very long hauls. It is very enjoyable to be able to operate all bands through the day and into the night as each band "comes in" and subsequently "goes dead"—early morning 20 meters to Africa/Europe; 10 meters in the day to the U.S. mainland, VK-land, and Asia; 12, 15, and 17 to Oceania; 20 again to South America, as well as 15 meters, in the afternoon; 30 meter CW in the evening to almost anywhere; 40 meters in the evening to VK, ZL, and the U.S. mainland; and 80 meters also to the big "Big Island."

My longwire puts signals on all of these bands, just about centered in each of the directions I wish to propagate. It's a cheap, no-fuss antenna (it's a piece of wire!), and it's got gain.

The Longwire

My end-fed longwire runs 414 feet east-west, and averages 20 or so feet above the ground, a modest setup indeed. But, contrary to what all the books say, I don't experience RF in the shack, as would be expected from an unbalanced antenna, but this is probably because of the way I feed it.

The radio output, either direct or through my linear (after low-pass filtering), runs through a simple random wire tuner (L/C "Box"), and then out the window for about 100 feet on RG8 coax. The antenna, covered with #12 wire PVC, takes off from the center conductor of the coax, and terminates in an insulator which is tied off to a bush, with nylon line. The antenna starts at the rear peak of the house, crosses the backyard in the clear, and then disappears into a forest to the east. Fully three-quarters of the antenna is literally "buried" in the forest, which slopes down into a rather deep gulch. I consistently receive amazing signal reports from the U.S. mainland and South America.

The coax itself is air RF choked at both ends, just past the random wire tuner and just before the feed point, with six turns of the coax wrapped tightly to a diameter of six inches, taped together. I clamp quarter-wave counterpoise wires for all of the bands to the braid side of the coax at the feedpoint, and fan the wires out on the roof.

In the directions of the primary lobes of the antenna, it beats my dipoles, my R5, and horizontal-half-wave inductively-loaded "baby" loops. And it's inconspicuous—towers/beams etc. are not allowed in the planned community on Oahu where I live. On 10 meters, for example, when the background noise level is very high, as it is now as Cycle 22 takes a swan dive and few stations are heard, I have been told by hams on the mainland that my S9+ signal is a "real crusher."

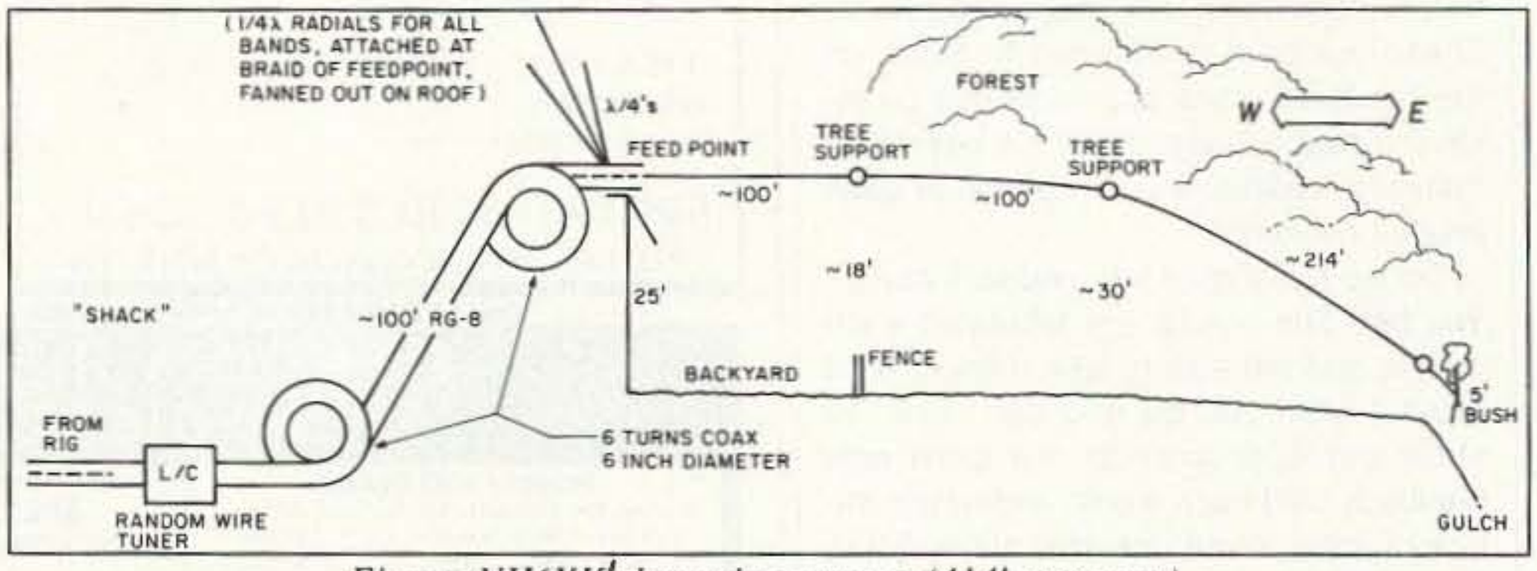

Figure. NH6XK's longwire antenna (414' east-west).

With a wire this long, the antenna impedance will be on the order of 500 to 600 ohms at average heights above ground. This presents a mismatch of about 10- or 12-to-one at the radio. But via the tuner in my TS-440S (balun about 3 or 4 to 1) and the L/C box itself (another 3 or 4 to 1), the mismatch is easily compensated for, e.g., 3:1 x 4:1 = 12:1.

Pertinent data concerning my antenna is given in the sidebar.

Recall that a gain of 3 dB is equivalent to doubling your power; 6 dB gain is a double-double, i.e., 100 watts becomes 400 watts; and a 9 dB gain is a double-triple, or 800 watts equivalent for 100 watts.

You don't need this much wire (414 feet) to realize gains; I just happen to be fortunate enough to be able to put out this much. Even a modest 68 feet will give you some gain over a dipole, and access to four bands.

Here are longwire lengths which I have tried, with their expected performance:

Length (Feet)	Bands Covered (Meters)	Gain (dBd) on 20 Meters
68	10, 15, 20, 40	1/2
137	10, 12, 15, 17, 20, 30, 40, 80	1-1/2
206	10, 12, 15, 17, 20, 30, 40, 80	2
275	10, 12, 15, 17, 20, 30, 40, 80, 160	3
372	10, 12, 15, 17, 20, 30, 40, 80, 160	4-1/2
414	10, 12, 15, 17, 20, 30, 40, 80, 160	5

NOTE: Gains will be in excess of these figures on higher frequency bands—as you have more waves on the wire, the shorter the wavelength. The converse is true of lower frequency bands.

The Figure shows how I have set up my longwire.

The bottom line is that if you are looking for a simple antenna which will cover all the bands, costs next to nothing to make, and has gain and directionability, a simple longwire may be hard to match, except by two of them (called a rhombic), of course. And there's no need to be put off by admonishments that you'll get "RF in the shack"—just choke off antenna currents as described.

If you've never tried a longwire, you have missed an opportunity to discover how simple and inexpensive an antenna can be, and still be very, very effective. 73

NH6XK's Longwire Antenna

Band Meters	Number of Full Waves on Wire	Horizontal Angle Of Major Lobes, From Wire Axis, Degrees	Radiation Angle, Degrees	Gain dBd
10	12	15	18	9
12	10-1/2	16	23	8
15	9	17	27	7
17	7-1/2	18	30	6
20	6	20	30	5
30	4-1/2	22	30	4
40	3	28	30	3
80	1-1/2	42	30	2
160	7/8	57	30	1