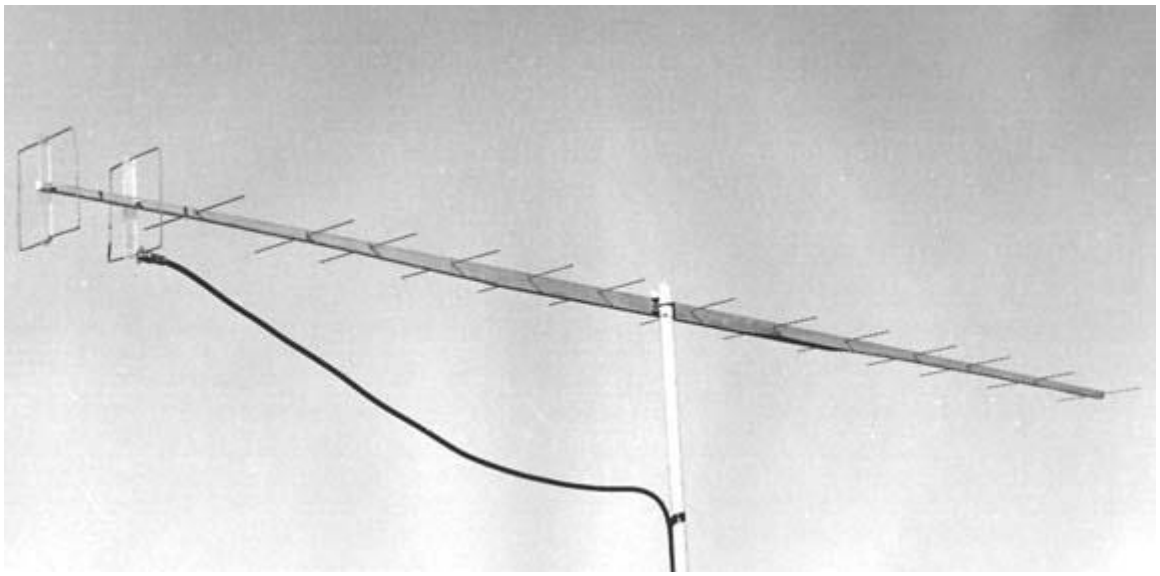
Quagi 13 Elem. 432MHz

By WE4FLY



Quagi construction notes for 144, 222 and 432 MHz

The original Quagi antennas used wooden booms (1x2 or 1x3 Douglas Fir, tapered at both ends to reduce the weight and wind load), but any other nonconductor (e.g., fiberglass, Plexiglas or even taped bamboo) can also be used. If an aluminum boom is used, the elements should be mounted on insulators above or below the boom (not passed through a metal boom). Many builders have used small pieces of hardwood moulding to mount the directors atop an aluminum boom.

The driven element and reflector are mounted on nonconductive spreaders such as dowel rods or strips of Plexiglas to avoid interaction. The driven element has a coaxial connector (an SO-239 or type-N connector, which is preferable at UHF) at the center of the bottom side of the element and is fed directly with 50-Ohm coaxial cable. In the original design, covered solid #12 TW house wire was used for the quad-style elements. The use of other types of wire, or even removing the insulation, may change the resonant frequency enough that the length has to be adjusted. Suggestion: build the antenna to the dimensions shown in the chart and run an SWR curve, noting the SWR above and below the desired operating frequency. If it is lowest below the desired frequency, the driven element should be made shorter--or longer if the SWR is lowest above the desired frequency. The reflector should then be adjusted in length a similar amount. Many builders have used THHN wire, which is more readily available than type TW now. They generally report that the resonant frequency is higher than expected, which means the loop elements have to be lengthened slightly for THHN wire. Tests in 2003 indicated that each wire loop should be about one percent longer than the original dimension if THHN wire is used.

Fine-tuning of the element length is usually not needed for the directors, provided they are made of 1/8-inch aluminum rods, brass welding rods or something similar--as long as the boom is a nonconductor or the elements are mounted on insulators above or below the boom. If the elements pass through a metal boom (even with insulating sleeves), the length will have to be adjusted experimentally (have fun!). The director lengths are tapered from longest (closest to the driven element) to shortest (at the front of the antenna).

Although the quad loops are square or circular, the antenna is linear in polarization, not circular. If it is fed at the bottom, the antenna will be horizontally polarized. Feed the antenna on either side for vertical polarization (and then mount the directors vertically, not horizontally.

Some builders have tried baluns to correct the imbalance in this quad-style feed arrangement. In many cases, a balun introduces losses so great that it's better to live with the unbalanced feed than to try to correct it. Feedline radiation can be reduced by placing toroids on the feedline at the antenna. Also, the feedline should run away from the feedpoint along the boom or below it--and then down the supporting mast perpendicularly to the elements to avoid interaction problems.

A phasing harness is needed if two or more Quagi antennas are stacked for additional gain. The simplest way to feed multiple bays is with a commercial power divider and equal-length 50-ohm feedlines from the power divider to each antenna. An alternative method is to feed each pair of antennas with odd quarter-wavelength multiples of 75-ohm coaxial cable going to a T connector and with 50-ohm cable from that point to the station. Most amateur radio reference books describe phasing harnesses more fully.

With a little practice, these antennas can be mass-produced in large quantities at low cost. I have built as many as 16 of them for e.m.e. work in less than a day.

Performance? Quagi antennas have been measured for gain at VHF conferences many times. If well built, the 8-element model usually comes in between 12 and 13 dBd. forward gain over a dipole, while the 15-element model is around 14-15 dBd. gain. These antennas have been used by a number of record-setting VHF-UHF contest stations, sometimes in portable applications like the one shown in the photo here.

This photo, taken in 1976 at Utah Pass, Utah shows an installation of six Quagi antennas (two each for 144, 222 and 432 MHz) plus a Yagi for 50 MHz. They are mounted on the original "Cabover Kilowatt" contest truck, which was featured on the cover of QST in August, 1971.

432-MHz, 15-Element, Long Boom Quagi Construction Data

Element Lengths, Inches	*Interelement Spacing, Inches*
R—28	R-DE—7
DE—26-5/8	DE-D1—5-1/4
D1—11-3/4	D1-D2—11
D2—11-11/16	D2-D3—5-7/8
D3—11-5/8	D3-D4—8-3/4
D4—11-9/16	D4-D5—8-3/4
D5—11-1/2	D5-D6—8-3/4
D6—11-7/16	D6-D7—12
D7—11-3/8	D7-D8—12
D8—11-5/16	D8-D9—11-1/4
D9—11-5/16	D9-D10—11-1/2
D10—11-1/4	D10-D11—9-3/16
D11—11-3/16	D11-D12—12-3/8
D12—11-1/8	D12-D13—13-3/4
D13—11-1/16	

Boom: 1 x 2-in. x 12-ft Douglas fir, tapered to 5/8 in. at both ends.
Driven element: No. 12 TW copper wire loop in square configuration, fed at bottom center with type N connector and 52-Ω coax.
Reflector: No. 12 TW copper wire loop, closed at bottom.
Directors: 1/8-in. rod passing through boom.