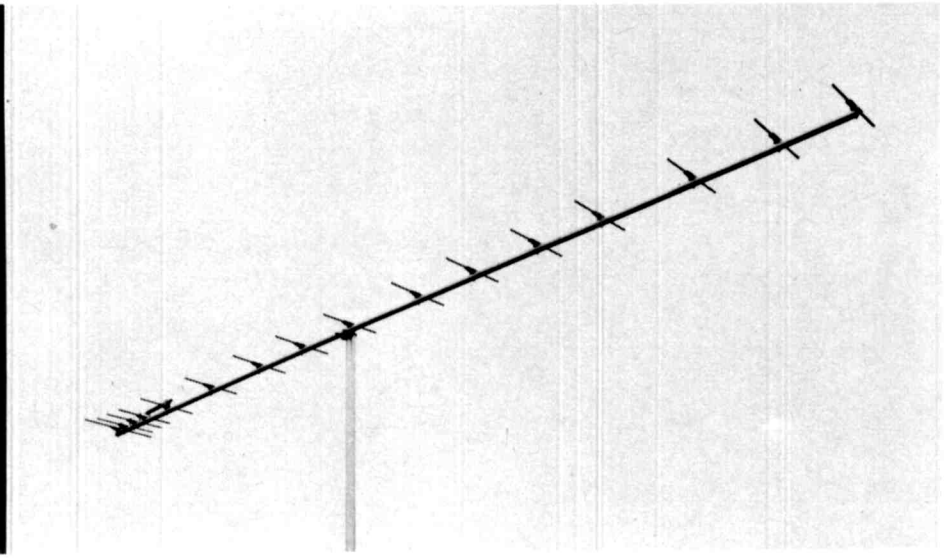

high gain yagi for 432 Mhz

A new long-boom 16-element Yagi design for 432 MHz that provides 15 dB gain over a dipole

For years the amateur uhf community has been trying to come up with a reproducible, high-gain Yagi beam for 432 MHz. At one time it was generally agreed among amateurs that the dimensions of a really long uhf Yagi antenna were so critical that it was impossible to build a practical, reproducible, high-gain, multi-element beam, and most uhf operators switched to the less critical co-linear array. Unlike the long-boom Yagi, the colinear is a low-Q antenna, so none of the dimensions are overly critical and it is easily reproduced for uhf operation.

However, as has been pointed out by Ed Tilton, W1HDQ,[1] it is possible to build Yagi antennas for 432 MHz (and other uhf frequencies) if *all* dimensions are properly scaled. Most experimenters scaled element length and spacing, but failed to scale either the element or boom diameter — this resulted in antennas that exhibited little more gain than a dipole, or worse. W1HDQ's 11-element, 432-MHz Yagi design was the first that proved to be reproducible, and although it uses a wooden boom, large numbers are being used by amateurs on the 432-MHz band. The gain of the Tilton Yagi has consistently measured about 13 dBd (gain over a dipole).

Other successful 432-MHz Yagi designs are those of WØEYE[2] and K2RIW.[3] WØEYE's 15-element design, which uses a 10-foot (2.9m) metal boom, attracted wide attention, but not everybody who tried to build it was successful. K2RIW's 13-element Yagi, which uses insulated elements (8-foot [2.4m] boom), has been quite popular in the East, and has consistently been shown to provide about 15 dBd gain.

Described here is another long-boom Yagi for 432 MHz which provides about 15 dBd gain. This has been confirmed at antenna measurement contests on both the East and West Coast. This Yagi, which was designed by Mike Staal, W6MYC, and Mel Farrer, K6KBE, of KLM Electronics, is based on successful design techniques

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proven on hf and vhf and uses a broadband driven structure which consists of three elements (**fig. 1**). This provides a reasonable operating bandwidth and ease in coupling to the 12 directors and one reflector. The broadband structure, in addition to providing optimum coupling to the directors, is the key to reproducibility. Small variations in dimensions can be tolerated without significantly changing the operating characteristics of the antenna.

construction

As is shown in **fig. 1**, the antenna is based on a 1-inch (25cm) diameter boom, 12-feet (3.7m) long. Each of the elements is 3/8-inch (9.5mm) diameter aluminum tubing, insulated from the boom except for the single mounting screw (this type of element mounting *must* be used for the dimensions given in **fig. 1**). The driven elements are cross connected using ¼-inch (6.5mm) wide aluminum strap. The feedpoint impedance is 50 ohms (balanced) and must be connected to a balun using low-inductance copper strap 5/16 inch (8mm) wide.* To prevent aluminum-to-aluminum and aluminum-to-copper corrosion, all joints should be coated with *Penetrox A* or equivalent weatherproofing. An acceptable balun can be made as described by K6HCP and WA6GYD in the ARRL *Radio Amateur's VHF Manual*.[4]

performance

At my station I have two of these antennas mounted side by side, and they have provided the expected results. Los Angeles is about 300 miles (483km) away, over mountainous terrain, and good solid contacts on 432 MHz are a nightly occurrence. Activity on 432 is starting to increase, and I feel confident that this new antenna, which is easy to build, will do a great deal to stimulate growth on this band.

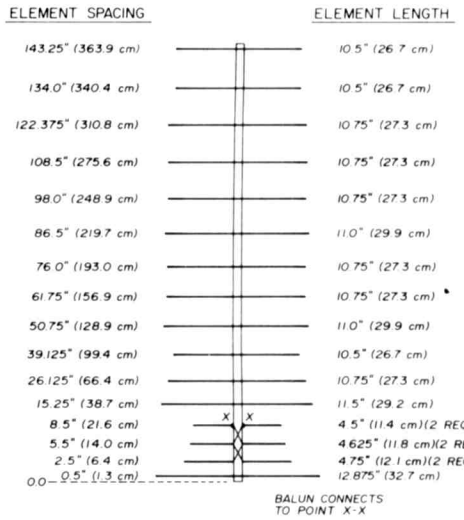

fig. 1. Layout of the 16-element Yagi for 432 MHz. Elements are 3/8" (9.5mm) diameter aluminum tubing, insulated from the boom except for the single mounting screw as shown in fig. 2.

*For those readers who do not have the time or material to build their own, this antenna is available from KLM Electronics, 17025 Laurel Road, Morgan Hill, California 95037.

references

1. Ed Tilton, W1HDQ, "Antennas for 220 and 420 MHz," *The Radio Amateur's VHF Manual*, ARRL, Newington, Connecticut, 1972, page 208.
2. Don Hilliard, WØEYE, "15-Element Yagi for 432 MHz," *QST*, January, 1972, page 96.
3. Dick Knadle, K2RIW, "13-Element Insulated Yagi for 432 MHz," *The ARRL Antenna Handbook*, 13th edition, 1974, page 243.
4. Ken Holladay, K6HCP, and Don Farwell, WA6GYD, "Making and Using Baluns," ARRL *Radio Amateur's VHF Manual*, page 170.

ham radio

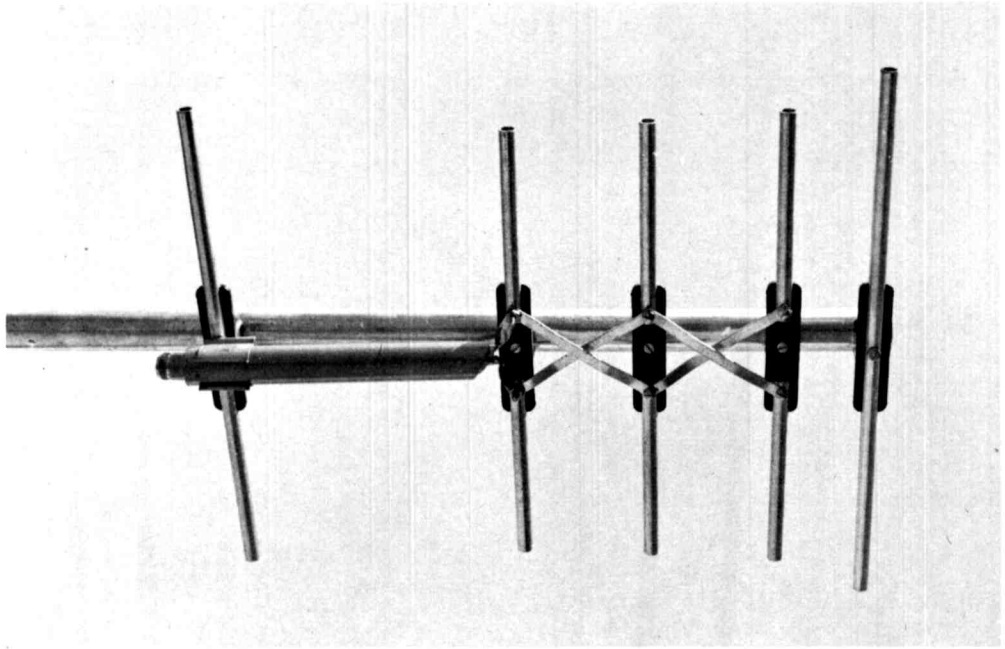

fig. 2. First five elements of the high-gain 432-MHz Yagi, showing element mounting and balun installation. The three-element, cross-connected driven structure is at the center.