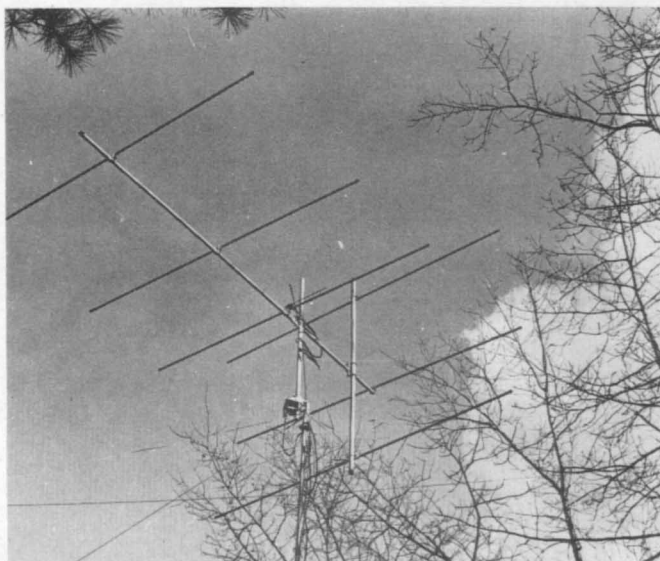


A Tri-Yagi for 50 MHz

For long-boom performance with short-boom safety, start from scratch or convert your old standard Yagi. It's cheap, easy to make and it works!

By Vincent A. Quaresima,* K2NE



One of the most important factors to keep in mind when designing any beam antenna is that there is usually an optimum design compromise between boom length, number of elements and wind loading. Referencing this to the question of 6-meter Yagi designs, an ideal boom length would seem to be 12 feet, particularly because of the ready availability of aluminum tubing stock in precut 12-foot lengths. Several manufacturers clearly have taken advantage of this fact, as evidenced by the number of 6-meter antennas on the market featuring boom lengths of 12 feet.

It would seem that the ideal number of elements for a 12-foot boom length at 50 MHz would be four. With optimized spacing along the boom, a Yagi configuration of this type should yield approximately 9-dBd gain. While this may be ade-

quate for most routine users, the serious vhf DXer or contest operator might want some improvement in performance over that provided by the traditional 4-element Yagi. Although many people immediately recommend one of the commercially available long-boom, wide-spaced Yagis as the best way of increasing forward gain, there is an often-overlooked possibility of accomplishing this without encountering the severe wind-loading problems attendant in the long-boom Yagi.

A Compromise for Stacking Yagis

Stacking Yagis at 50 MHz presents several physical problems, both from the construction aspect and from the standpoint of wind loading. However, the advantages of obtaining additional gain by H-plane pattern compression are too

great to be summarily dismissed. An ideal compromise would be to compress the H-plane pattern of the antenna system without having to worry about stacking frameworks, manifold-feed systems and whether or not the darn thing will stay up once installed on the tower!

*Department of Mathematics, John K. Ossi Vo-Tech High School, Medford, NJ 08055

Test Measurements

For the purpose of gain measurement, test transmissions were made over an 8-mile path from K2NE to KA2BOP. Observations of the signal level with the Yagi were made first and then compared with the signal-level observations made next with the dipole. The procedure was to increase the power level transmitted through the dipole until the monitored signal

had the same strength as obtained via the Yagi. The results given in the article were obtained by using the figures for the original power output (through the trigonal Yagi) and the figures for the adjusted power output (through the dipole). These were applied to the formula, $\text{gain (dB)} = 10 \log (p/p_T)$, where p = power to the dipole and p_T = power to the test antenna.

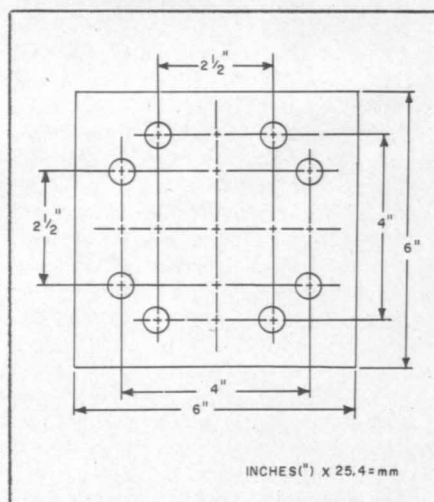


Fig. 1 — Template for the boom-to-boom bracket. The plate is constructed from 1/4-inch (6.4-mm) steel. All holes are 17/32-inch (13.5-mm) dia to accommodate 2-inch (51-mm) U clamps.

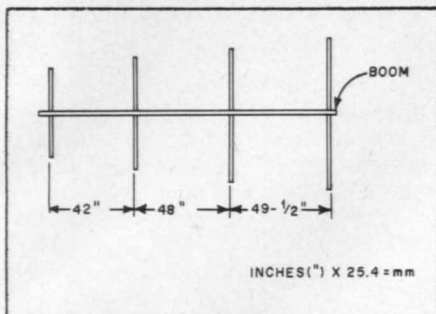


Fig. 2 — Planar element configuration of the K2NE 6-meter antenna. Element lengths are as supplied by manufacturer. Do not use the shortest director. Element lengths are not drawn to scale.

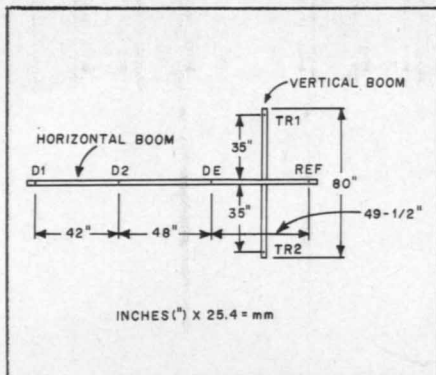


Fig. 3 — A side elevation of the beam with trigonal configuration.

Fortunately, there is such a compromise. On the average, replacing the standard Yagi reflector with a corner-type reflecting screen will improve the forward gain of the antenna by about 4 dB. At 50 MHz, however, a corner-reflector screen would dangerously increase the wind-loading of the antenna, particularly in icing conditions, as well as being impractically large for most users.

While not as efficient as a full screen-reflector, a trigonal reflector configuration still represents a way of improving gain of a Yagi over the "stock" Yagi configuration. In the case of the Cushcraft 5-element Yagi, this conversion is easy to do and inexpensive, and results in an antenna that will perform favorably when compared against the 6-element "standard" Yagis on booms of length varying between 21 and 26 feet. Note again that we are talking about 6-element, "wide-spaced" performance on *half* the boom-length and with significantly less wind loading.

The Conversion

To make the conversion, you will have to acquire aluminum tubing (two 12-foot or 3.66-m lengths) having 3/8-inch (10-mm) outer diameter, and an 8-foot (2.44-m) length of 2-inch (51-mm) OD tubing. You will also need six 2-inch (51-mm) U clamps. A diagram of one possible bracket for securing the trigonal support mast to the main boom is given in Fig. 1. Construct two elements, each identical to the reflector that is supplied by the manufacturer, being sure to drill holes in each element for the U clamp which is used to attach them to the reflector support mast.

Simply reposition the four remaining "planar" elements in accordance with the spacing information that is outlined in Fig. 2. Then mount the trigonal assembly as indicated in Fig. 3. Feeding and matching the antenna is done according to the manufacturer's instructions. It is not a bad idea to aim the antenna straight up while matching adjustments are made.


This will minimize the interference caused by immediate obstructions and make the job of matching the beam quicker, easier and more accurate.

Simplicity of Matching the Antenna

In practice, matching the antenna to the feed system is a simple matter accomplished by varying the position of the shorting bar along the gamma match until the point of the lowest SWR is located. An SWR of less than 1.2:1 is quite easily attained. The antenna is fed with RG-8/U coaxial cable, although any low-loss 50-ohm unbalanced feed line would work. The end result, shown in the accompanying photograph, is mounted with an Alliance U-100 rotator atop a 30-foot (9.1-m) collapsible mast. The wind-load factor for this antenna is significantly less than that of a wide-spaced 6-element antenna on a boom in excess of 20 feet (6.1 m). Forward gain is in the neighborhood of 11 dBd, according to tests run with another amateur located 8 miles away. The comparison antenna for the gain test was a half-wave center-fed dipole mounted on the same mast, prior to the actual mounting of the "Tri-Yagi." The 11-dBd gain is obtained by H-plane pattern compression. Thus the normally wide, half-power beamwidth of the 4-element Yagi is not compromised in the E plane at all. This is important to consider when using the antenna for weak-signal work. It won't help much in reducing interference off the front of the beam during a contest, but the improvement is impressive!

Scatter Experiment

An interesting experiment would be to try establishing ionospheric scatter circuits. Mounting this antenna at 35 to 40 feet above ground and tilting the boom axis upward on an angle from 35 to 40 degrees might produce significant improvement in scatter results.

I wish to thank James Esposito for the original drafting and James Cramer and Paul Clark for the photograph. 

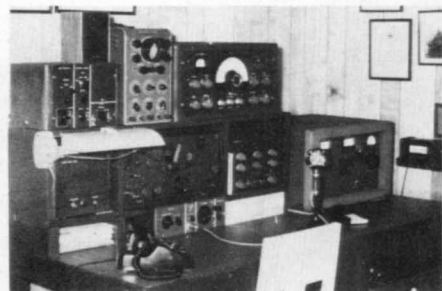
Strays

THE FRONT PANELS DON'T MATCH, BUT . . .

□ "You don't have to be continually buying and investing in ham gear to fully enjoy the hobby," says Tom Fielder, W4EPL, of Columbia, South Carolina. Tom has come to believe in homemade and surplus gear — and his station shows it.

The top shelf of his uncommon station setup includes af and rf test oscillators, modified scope for monitoring and the ssb exciter from June 1958 *QST*. The bottom shelf holds a modified BC-348 (with product detector from February 1966 *QST*), converters for 10, 15 and 20 meters (February 1956 *QST*) and a 1-kW linear amplifier that contains 4CX250Bs. The control panel includes a phone patch, sidetone monitor and the Monimatch SWR indicator from February 1957 *QST*.

Tom wrote the receiver modification article that appeared in February 1966 *QST*. He sums things up by saying, "While the station may be antiquated in today's environment, the net result is a clean signal, good audio and a receiving capability that is not often surpassed." If anyone thinks that older gear is ugly looking, it may be worth quoting noted *QST* author W7ZOI: "Ugly-looking gear does not denote inferior performance!" — Doug DeMaw, *W1FB*



W4EPL says that this station, featuring homemade and surplus gear, has been in operation for 18 years, essentially unchanged.

QST Congratulates . . .

□ Richard I. Vaughn, N5AA, who has been named FCC Regional Director, San Francisco.

ATTENTION AFFILIATED CLUBS

□ Have you mailed in *your* annual report forms yet? We would like to keep your club on our mailing list, but cannot if we don't hear from you. — Sally O'Dell, *AE8P, Club and Training Department*