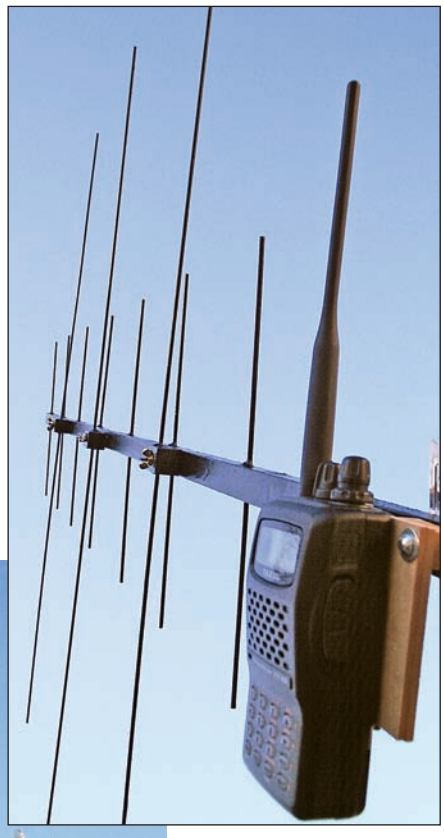
Dual Band Handy Yagi

Thomas M. Hart, AD1B

The popular handheld Handy Yagi can now work on both VHF and UHF.



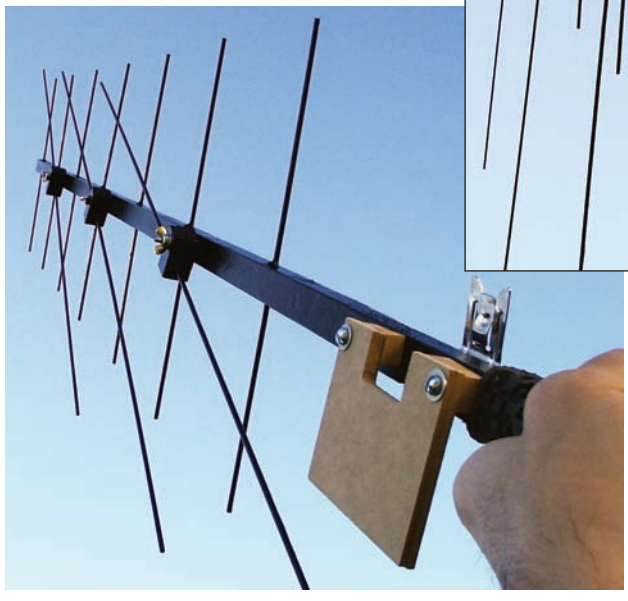


Figure 1 — Dual band Handy Yagi with 2 meter elements folded for storage.

Recently, I started operating through the SO-50 and AO-51 satellites with my dual band Yaesu FT-60 handheld transceiver. The standard flexible antenna worked, but I decided to investigate handheld Yagi antennas to improve conditions. My goal was to build a simple dual band 2 meter and 70 cm Yagi without driven elements, a matching network or a feed line. In short, my plan was to mount the FT-60 on the antenna as I had with the original 70 cm Handy Yagi.[1]

After testing several configurations on Roy Lewallen's *EZNEC* program (see **www.eznec.com**), I settled on a design with seven directors on 70 cm and three on 2 meters. My Yaesu FT-60 dual band handheld serves as the driven element. Figures 1 and 2 show the configuration.

Construction

The final design balances performance and size. The elements for both bands are interlaced and mounted in parallel. There is no driven element or reflector. Instead, the FT-60 and a bicycle handlebar grip occupy the usual reflector and driven element end of the boom. The 2 meter elements can be rotated parallel to the boom to simplify storage. A screw eye at one end can be used to hang the antenna when not in use.

Computer modeling indicated that λ/4 element spacing works reasonably well on both bands. This allows the use of a 55 inch boom. The handheld is attached firmly in place by its belt clip. A speaker microphone makes transmitting and receiving very simple. See the illustrations for additional details.

All elements were cut from ⅛ inch diameter steel rod. An article by Ron Hege, K3PF, provided the dimensions for the 2 meter elements shown in Table 1. The 70 cm element dimensions are found in *The ARRL Antenna*

[1]Notes appear on page 43.

Table 1

Length and Spacing of 2 Meter Elements

All dimensions are in inches.

Director:	*D1*	*D2*	*D3*
Length	37.5	36.375	36.0
Element Spacing	DE to D1	D1 to D2	D2 to D3
Spacing	12	12	12
Cumulative	12	24	36

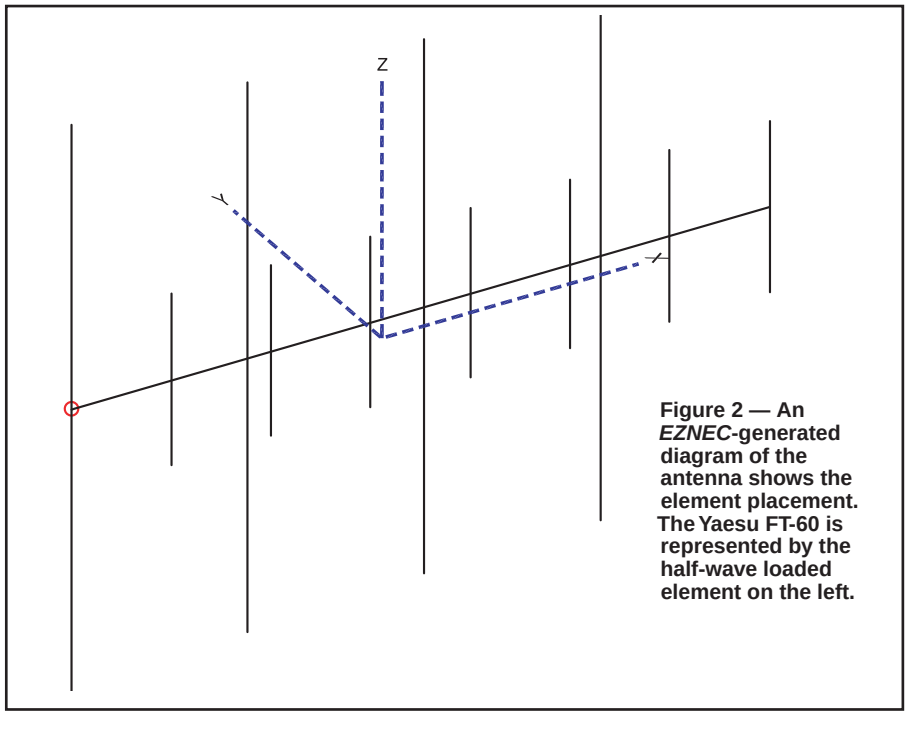


Figure 2 — An *EZNEC*-generated diagram of the antenna shows the element placement. The Yaesu FT-60 is represented by the half-wave loaded element on the left.

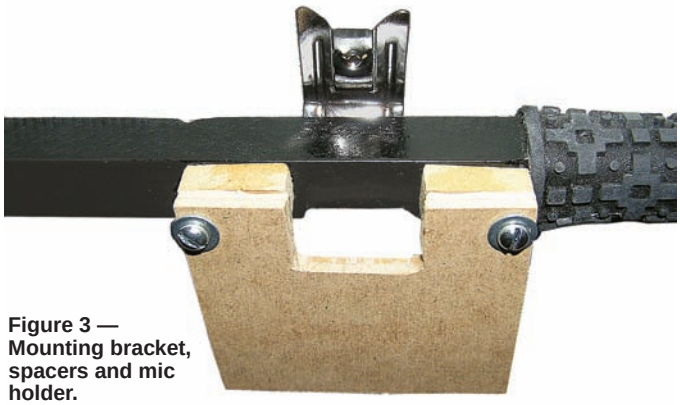


Figure 3 — Mounting bracket, spacers and mic holder.

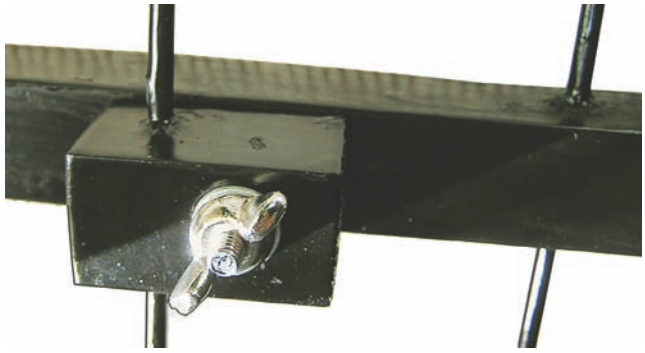


Figure 4 — The wing nut and bolt allow the 2 meter element to rotate.

Table 2

Length and Spacing of 70 cm Elements

All dimensions are in inches.

Director:	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*
Length	11.750	11.688	11.625	11.563	11.500	11.438	11.375
Elements	DE to D1	D1 to D2	D2 to D3	D3 to D4	D4 to D5	D5 to D6	D6 to D7
Spacing	6.78	6.78	6.78	6.78	6.78	6.78	6.78
Cumulative	6.78	13.56	20.34	27.12	33.9	40.67	47.45

Table 3

Dimensions of Other Antenna Assemblies

All dimensions are in inches.

Boom	0.75 × 0.75 × 55
Handle grip	5
Handheld bracket	3.5 × 3.0 × 0.25 (WHD)
Notch for handheld	1.125 W × 0.75 H
Bracket spacers	0.375
2M element mounts	0.75 × 0.75 × 1.5

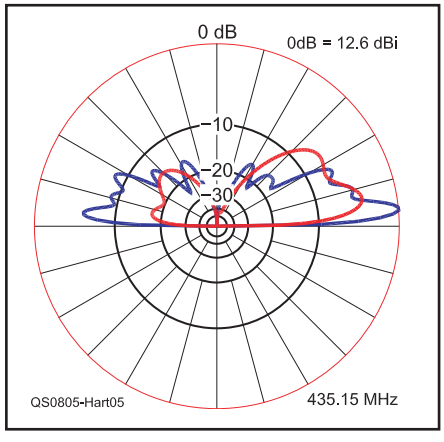


Figure 5 — Predicted elevation patterns of the 2 meter (red) and 70 cm (blue) Yagis.

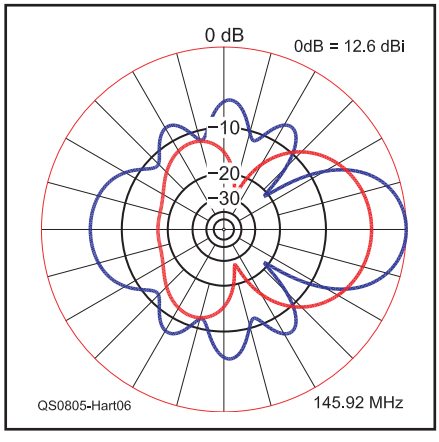


Figure 6 — Predicted azimuth patterns at the peak of the elevation response for the 2 meter (red) and 70 cm (blue) Yagis.

Book and reproduced as Table 2. Other dimensions are shown in Table 3.

Two glued together pieces of ⅛ inch pressed fiberboard form the handheld bracket shown in Figure 3. The elements are held in place with epoxy. After cutting all 10 to length, drill seven holes through the boom and three more through the 2 meter element mounts. Slide the elements into place and apply a bead of epoxy on both sides. Several light applications of epoxy will hold the rods in place.

All 2 meter element mounts require two holes. One secures the element while the second is used for the bolt and wing nut that allow the element to rotate during storage or transport as shown in Figure 4. Finally, two coats of black satin paint give the antenna a more professional appearance.

Testing

Faced with an absence of analytical instruments, the testing process involved *EZNEC* computations and operational observations. *EZNEC* computed the front-to-back ratios as 14 dB for 2 meters and 5.5 dB for 70 cm. *EZNEC* azimuth and elevations patterns are shown in Figures 5 and 6.

Field testing on 2 meters involved contacting the 146.97 MHz repeater in Paxton, Massachusetts. The repeater, according to my *Magellan Topo* 3D GPS software, is 38.0 miles away at a bearing of 251°. The FT-60 helical antenna cannot reach the repeater from my house. With the dual band Handy Yagi, I had no trouble reaching the repeater. Moving the antenna in an arc toward and away from the repeater produced corresponding signal strength changes on the meter corresponding to the predicted directivity.

On 70 centimeters, field tests involved reception of signals from the AO-51 and SO-50 satellites. Signal strength increased dramatically when the antenna approached and centered on the target. My conclusions are that operations on both bands are in agreement with *EZNEC* predictions.

The antenna that I built is designed for satellite contacts. However, the basic concept can be used for portable operations, fox hunting and emergency use as well.

Notes

[1]T. Hart, AD1B, "The Handy Yagi," *QST*, Nov 2007, pp 37-38.
[2]R. Hege, K3PF, "A Five-Element, 2-Meter Yagi for $20," *QST*, Jul 1990, pp 34-36.
[3]R. D. Straw, Editor, *The ARRL Antenna Book*, 21st Edition, p 18-45. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9876. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

All photos by the author.

Tom Hart, AD1B, began listening to short wave broadcasts in 1961. He received his Novice class license, WN1JGG, in 1968 and has been an active on CW, SSB, RTTY, FM and packet ever since. Tom has a BS from Tufts and an MS from Northeastern. He is an accountant who would rather be chasing or giving out counties on 20 meters. You can reach Tom at 54 Hermaine Ave, Dedham, MA 02026 or via **tom.hart@verizon.net**.