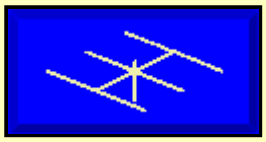

A Collection of 220-MHz Yagi Designs

L. B. Cebik, W4RNL (SK)

I have received numerous requests over the years for VHF Yagi designs, with the 220-MHz band (222-225 MHz) receiving the most requests. The reason for the emphasis upon 220 MHz owes perhaps to the fact that fewer designs are published for this band than for the more popular 144-MHz and 432-MHz bands.

I do not have many designs of my own for 220. However, I have collected a good number of Yagi designs for 144 MHz and for 432 MHz. Since scaling a design is routine work for most modeling programs, I freely adapted the designs in my collection for the new frequency. In the collection that follows, we shall see adaptations of designs by DL6WU, SM5BSZ, DJ9BV, and WB4WEN. In addition, we shall see some adaptations of the OWA principle, most noted in the NW3Z designs for HF. Most of the OWAs are from my own work, as are a few others.

In the collection, there will be 20 sample designs, ranging from 3 elements to 33 elements and in boom lengths from 20" to 596". All but the last few designs are standard Yagis. But we shall look at a quagi design, a Yagi with uniform-length directors, and a Yagi with multiple reflectors. These are certainly not all of the design possibilities, but they may be enough to provide a foundation for many a construction project.

Throughout, every design will presume that elements are well insulated and isolated from the supporting boom. There are too many options in boom diameters to try to provide correction factors for each design. As well, each design is composed of aluminum elements of the assigned diameter. Do not try to build a design using elements with a different diameter without first redesigning the element lengths and spacing to optimize performance.

Every design has been set up for a direct 50-Ohm feed. With insulated elements, a direct coaxial feed (with a means of suppressing common mode currents before they travel down the coax) seems most natural--not to mention simple. As well, all designs aimed for a minimum worst-case front-to-back ratio of 20 dB everywhere in the band. This goal was met in all but 4 designs, which dropped no lower than 18 dB at one or the other end the band.

A special note on materials: it has become customary for many Yagi builders to use only 0.1875" or 0.25" diameter rods for elements on 220. The usual excuse is that larger tubing weighs too much. Unfortunately, the justification is simply false. 0.1875" 6061 rod weights 0.032 pounds per foot, while 0.25" 6061 rod weighs 0.058 pounds per foot. However, 0.375" 6063 tubing weights 0.044 pounds per foot--less than quarter-inch rod. So we shall throw out the custom and use for each design the diameter tubing that best seems to optimize scaled performance.

Narrative will be minimal, except to provide a general characterization of a design and to acknowledge the design's origin. Emphasis will be placed on a. the beam dimensions, b. a chart of key performance characteristics, and c. free-space azimuth plots across the band. Here is the way in which I shall subdivide the beam collection.

- **Part 1: Boom Lengths under 100" and from 3 to 8 Elements**
- **Part 2: Boom Lengths from 140" to 220" and from 12 to 14 Elements**
- **Part 3: Boom Lengths from 235" to 596" and from 16 to 33 Elements**
- **Part 4: Special Designs: Equal-Length Directors, Quagis, and Multiple Reflectors**

For each sample design, there may well be better choices of element diameters and boom lengths. This collection is simply a starter for design efforts, not a finished product. Run them through your modeling and optimizing programs to change element diameter, element spacing, and overall boom length. Combine ideas to see whether you can squeeze more out of a given boom length and set of elements.


Go to Amateur Radio Page