N4PC comes up with another winning wire antenna. All you need besides a few components are a couple of tall trees.

The H Double-Bay Antenna

BY PAUL CARR*, N4PC

"What in the world is that?" my neighbor asked. I smiled. "It's my new 17 meter antenna," I replied. "I've never seen anything like that before. Will it work?" he questioned. "Well, the computer program says that it will, and that program has never lied to me before. I'll let you know by sundown." He left shaking his head. Did it work? You bet it did, and here is how you can build one.

Design Philosophy

This antenna design is in response to calls I have received over the years. A common request is for a short antenna that will produce gain. I have been a fan of closed-loop antennas for many years, and I also know that two wavelengths of wire will produce gain if they are placed in the right configuration. I also wanted a horizontally polarized and 50 ohm feedpoint impedance. Could all these requirements be designed into a single antenna? Well, it was time for a computer study.

If we look at a folded dipole and examine the impedances at various points, we will find that the impedance varies from almost zero ohms at the narrow end to about 300 ohms if it is fed as a conventional folded dipole. If the folded dipole is reconfigured into a square, the impedance is about 125 ohms. (The single quad loop is an example of this.) Somewhere between these two extremes is a 50 ohm impedance.

I tried a rectangular configuration with the short side on the bottom. I found when the rectangle was twice as tall as it was wide, the feedpoint impedance was about 50 ohms. The computer program also showed about 1.8 dBd of free-space gain in this configuration. The next thing to do was to increase the gain and maintain the 50 ohm feedpoint impedance.

The solution was simple. I placed a second full-wave loop on top of the existing loop. It was necessary for the loops to share a common horizontal side in the center of the rectangle to maintain a proper phase relationship for the current. It was also necessary to decrease the length of the horizontal wires and increase the length of the vertical wires. When the final configuration was determined, the feedpoint impedance was about 50 ohms and the predicted free-space gain was about 4 dBd.

Predicted Results

I modeled the antenna with the top wire at 60 feet. The predicted pattern was the familiar figure 8 that we expect from a bi-directional

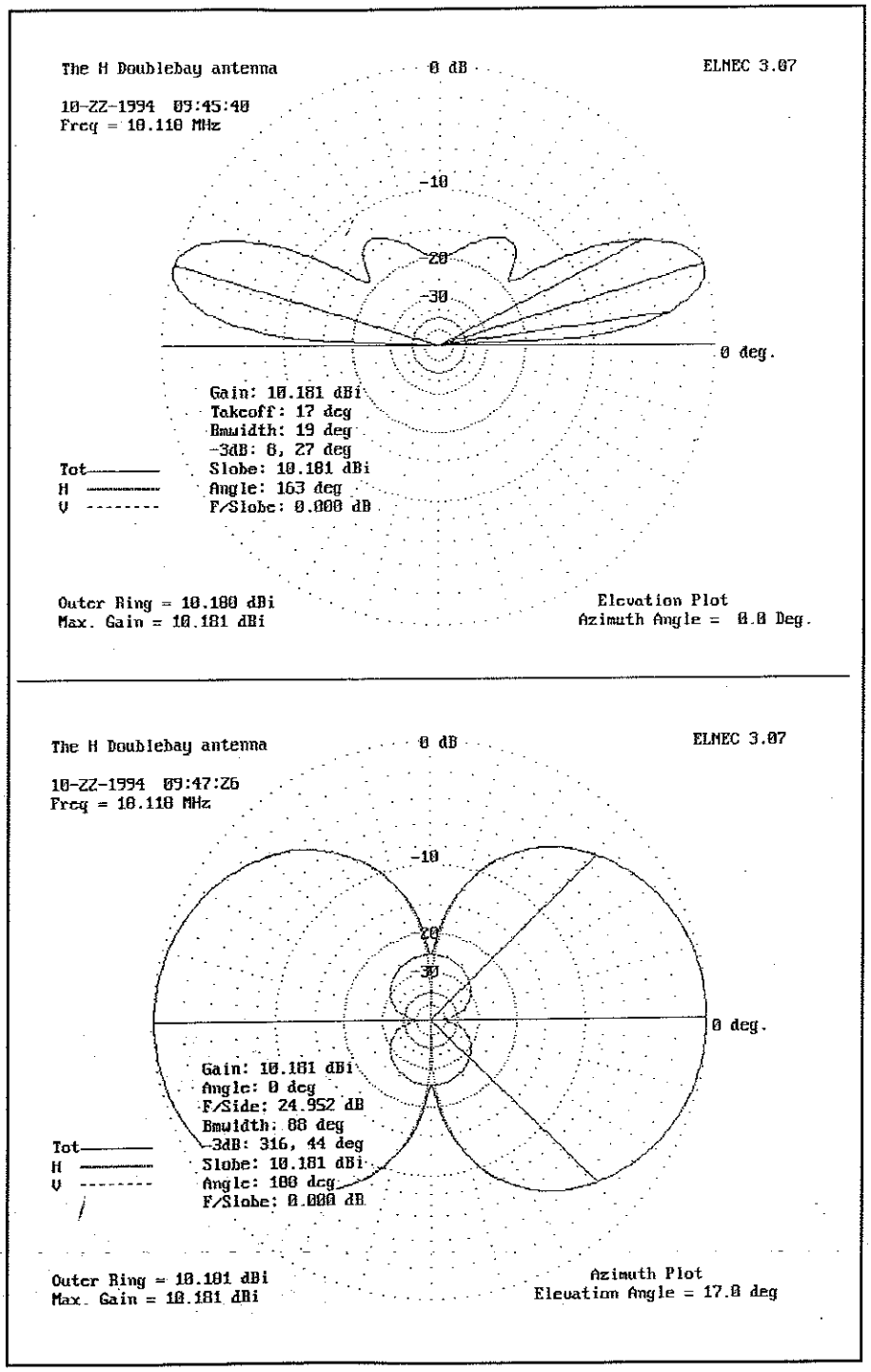

Fig. 1– (A) The vertical pattern for the H Double-Bay antenna. Notice that most of the energy stays low. (B) The horizontal pattern resembles the familiar figure-8.

*97 West Point Rd., Jacksonville, FL 36265

antenna (see fig. 1). At this height the vertical take-off angle is 17 degrees. It is also interesting to note that there is very little energy in the overhead component. The signal is pushed toward the horizon where it will do the most good.

Construction

Following are the details of construction should you decide to build your own.

Begin construction by cutting three pieces of pressure-treated wood into strips 3/4" × 1-1/2" × 6'6" (see fig. 2). These pieces of wood provide the necessary support for the horizontal wires (l). Next drill holes 2 inches from each end of the strips. This determines the final length of the horizontal wires, which is 6 ft. 2 in. The length of the horizontal wires ensures the feedpoint impedance is 50 ohms (fig. 2).

Now cut a single piece of wire to a length of 94 ft. This provides enough wire for the perimeter of the rectangle plus sufficient surplus length for final SWR adjustment. Fold the wire in half to locate the center of the wire. This allows you to locate the center of the wire in the center of the top horizontal spreader. Route the free ends of the wire through the pre-drilled holes in the horizontal spreaders. Align the center of the wire on the center of the top horizontal spreader and secure the wire to the spreader with tape or nylon cable ties so that it will stay in place during the remainder of the construction process.

Place the antenna on the ground and secure the top spreader by placing a couple of screwdrivers in the ground to act as stops so you can stretch the wire taut. Move the bottom spreader along the wire until the top wire and the bottom wire of the rectangle are spaced 40 ft. 4 in. apart. This measurement is for 12-gauge bare wire, and if you are using something different, your final measurements will vary slightly. Again, I have included enough surplus wire for any necessary final adjustments. Secure the wire to the bottom spreader as you did to the top spreader. Check to see that the horizontal wires and the vertical wires are perpendicular by measuring the diagonals of the rectangle. If the diagonals are not equal, make the necessary adjustments.

Next measure down 20 ft. 2 in. on each vertical wire. This locates the attachment point for the center horizontal wire. Cut a length of wire 6 ft. 4 in. Position the middle wooden spreader so that it will be above the middle horizontal wire when the antenna is in final position. Solder the wire to the center of each vertical wire. The final horizontal length should be 6 ft. 2 in. Move the wooden spreader so that it will rest on top of the wire when the antenna is in its final position. Route the bottom horizontal wires toward the center of the bottom spreader and tape them in position for subsequent feedline attachment.

In my case I supported my antenna with a rope bridle attached to the top spreader. I used a single loop in the bridle so the antenna could pivot about that point. This allows me to rotate the antenna (more about this later). I attached the bridle to the center of a rope and routed the ends of the rope over two convenient tree branches. I raised the antenna until it was a convenient height to reach from a step-ladder. I made the final adjustments by using an MFJ 259 SWR Analyzer. If you do not have such a piece of test equipment, attach a feedline and use your station equipment for final adjust-

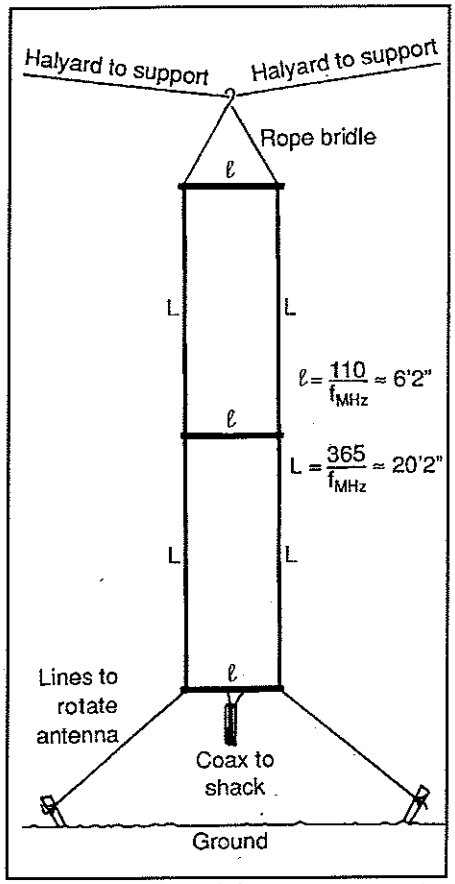

Fig. 2– Construction details for the H Double-Bay antenna.

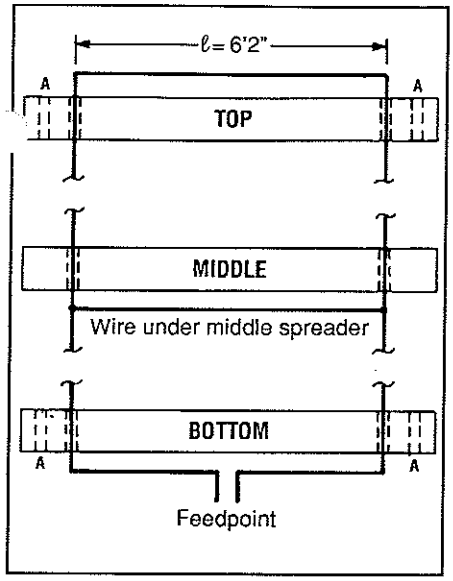

Fig. 3– Wire-stringing details.

ments. Final SWR should be very close to 1:1.

After you are satisfied with your SWR results, lower the antenna and be sure everything is secure. Now attach a line of string to each end of the bottom horizontal spreader. This line should be long enough to reach the ground at an angle when the antenna is in its final position. By properly positioning the line and attaching it to a convenient point, you can rotate the antenna to give full compass coverage. (No extra charge for this rotor.) Believe me, the antenna is much easier to build and tune than it is to write about.

Alternate Materials

I used wooden spreaders because they were available. I see no reason why you could not use 1 inch schedule-40 PVC plastic water pipe. A single 20 foot length would provide the necessary material for the spreaders.

Just a word about the wire type. The amount of wire required will depend on gauge, and it will also depend on whether the wire is insulated. If the wire is insulated, less wire will be required due to the capacity effect of the material. You can adjust the loop to resonance by changing the amount of wire in the bottom section of the loop. I don't think the performance will be adversely affected.

Preliminary Results

I could tell that my rig was happy because it was looking into a 50 ohm load. But so what? It would happy looking into a 50 ohm resistor. How does it work? I must say that I have been pleasantly surprised. The antenna gives a good account of itself. I must admit, I was surprised when I broke a pileup and worked Zimbabwe on the second call. By the way, my report was 57 and I was running 100 watts output. Yes, it works!

Afterthoughts

Perhaps the antenna is a bit of a novelty, but I don't think so. Maybe you can think of another way to use it. For example, there is no reason why the antenna could not be fed from the top if you happen to be a person who lives in a high-rise apartment and needs a stealth antenna. Just try to keep the antenna as far away from the metal structures as possible. Don't be afraid to dream up new applications for the antenna.

If you are thinking about using this design on other bands, the bandwidth between the 2:1 SWR points seems to be about 1.3%. This probably is due to the long rectangular configuration. This should present no problems on 17 and 12 meters, but if you intend to use it on 15 and 10 meters, you should keep these limitations in mind.

Acknowledgments

I would like to thank my friend Lew McCoy, W1ICP, for naming the antenna for me. He is always ready with sound advice and plenty of encouragement.

If there are questions I have not answered, feel free to call me in the evenings at 205-435-3642. Try this little antenna. I think you will be pleasantly surprised. ■