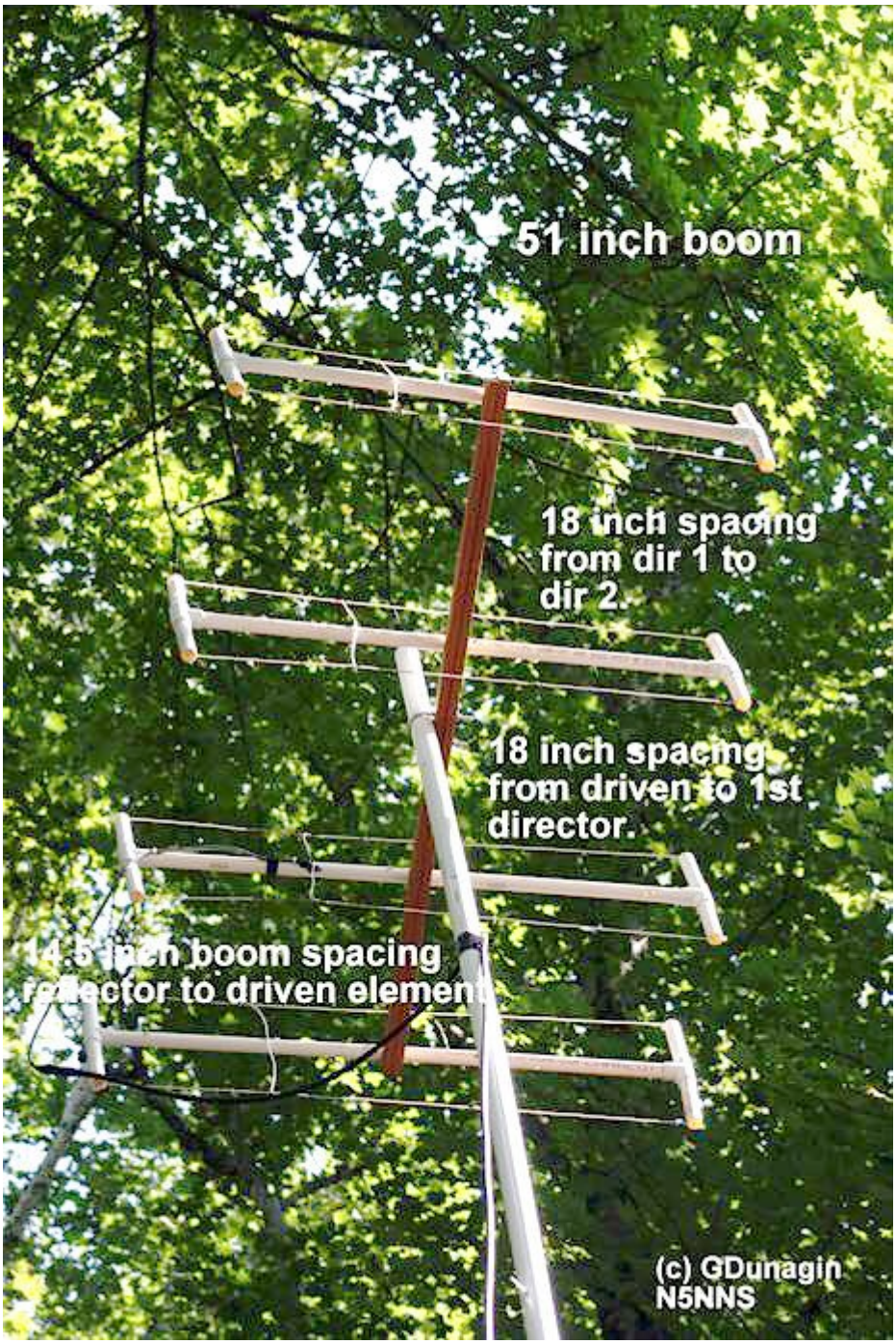
The 4 Element Hentenna Beam for 2 Meters

by N5NNS



Having been a ham for 27 years and knowing that the most important part of any station is the antenna, I have built, designed, and redesigned antennas for over two decades.

I always look for simplicity and, more than this, effectiveness. I want a wide band-width, reasonable gain and inexpensive construction. I have built yagis, dipoles, quads, verticals, loops, and pretty much anything you can imagine.

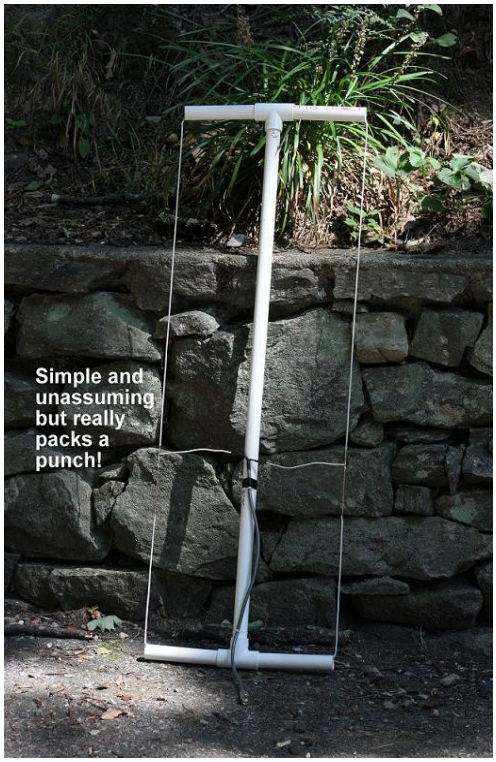
My XYL says "You should spend less time building and more talking." And she is right to a degree but the feeling I get when a project comes together and works as it should is something I know that only the builder can experience.

I was out of hamming for a few years and in the process we moved from central Mississippi to the beautiful mountains of Western North Carolina. Yes it is beautiful and the people here are just wonderful. Hams are into everything and it is exciting!

But that brings me to the QTH. We live on a mountain on 10 1/2 acres of forest, literally. Even though I am 2,700 feet up, unless I get 100 feet above the house, in the spring and summer, I am surrounded by leafy trees and yes they are beautiful when they change. HF is not really affected but VHF and UHF, well; you want as much gain as possible when the leaves are on the trees. Having tried several antennas with good results (I always want better, HI HI!) I tried the hentenna and I am so glad I did!

As you can see in the photos below, the basic hentenna appears to be a rectangle of some 40 X 14 inches. But it is more than that. As noted everywhere, the word "hen" in Japanese is said to mean "strange" but it also means "wonderful, magical, etc" and is used to describe something that is "great" but why it is great is not fully known. It can be built with wire and pvc (as I did, 14 awg THHN), aluminum or copper.

Now on to the construction:



Here is the prototype in the photos above with a "yardstick, 39 inches long" on the left and shown without the "yardstick" on the right.

It is in the horizontal polarity position as pictured above and is bi-directional with about 3.5 db gain in those directions for a single Hentenna. After I determined the feed placement as noted in the photo (it can be from 1/10 to 1/6 wavelength from the bottom) I sat it on my deck, on its' side like this I------I (for vertical polarity) and pointed it broadside to the 146.610 repeater across the county in South Carolina. S9+10! I was shocked!
My 2 meter 6 element yagi gave me S9+20 and it is considerably LARGER! Oh in researching this project I found that the band-width is huge (reported to be 10 mhz) and I did find that it covers the entire 2 meter band! SWR ran from 1.3:1 to 1.6:1, which I was totally happy with, 144-148 mhz.
Research modeling on a Japanese site shows 14.2 - 14.8 db gain. (assumed to be referenced to a dipole).

Having seen plans on the net for a 6 meter 3 element hentenna I thought,
"Why not make one for 2 meters?" So I did.

How I arrived at the lengths was this: I took the driven element 40 X 13.5 and:

For the reflector I multiplied the 13.5 inches by 1.05 and the 40 inches by 1.05 and I got 14 1/4 inches by 42 inches so I cut the wire to fit this and I also multiplied the 13.5 feed point by 1.05 and got 14 1/4 inches which I set as match point on the reflector. (So all of the lengths, etc for the reflector were increased by 5%.)

Director 1 was treated in the same manner except the driven element formula was 13.5 X .95 and 40 X.95 and of course the same for the match point then I had: 13 X 38 inches with a 13 inch match point. (So all of the lengths, etc were decreased by 5%.)

Director 2 was reduced in the same manner using the figures from Dir 1. All by .95 thus further reducing the size to: 12 3/8 X 36 1/8 and a 12 3/8 match point. (Dir 2 was reduced in overall size by 5% less than Dir

1.) These I mounted on a wooden boom using a quad antenna spacing formula I was familiar with:

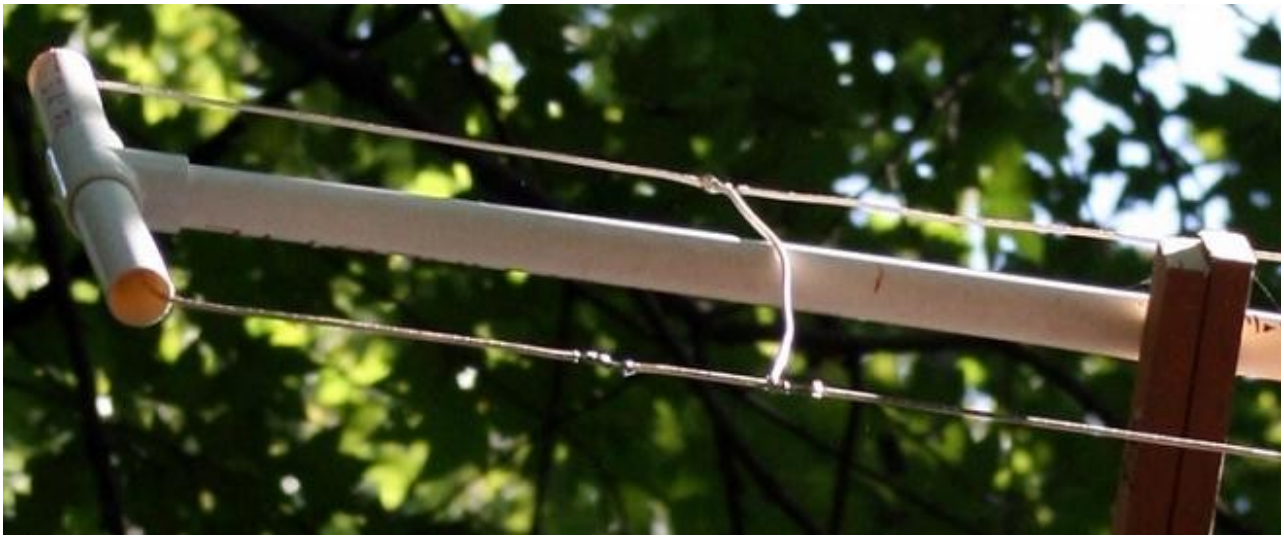
Spacing:

Reflector to driven element 14.5 inches
18 inches to Dir 1 from driven
18 inches to Dir 2 from Dir 1
This gives a 51 inch boom, total. The boom is a 2 X 3 painted board.

Element total lengths:

Reflector = 14 1/4 inches by 42 inches
Driven element =13.5 X 40 inches

Dir 1 =13 X 38 inches
Dir 2 =12 3/8 X 36 1/8 inches



Shown above is the typical matching method using shorted feed points on the director #2 as an example. The reflector, and director #1 were done the same way. The driven element is fed with coax at it's respective matching point.

Matching Points:

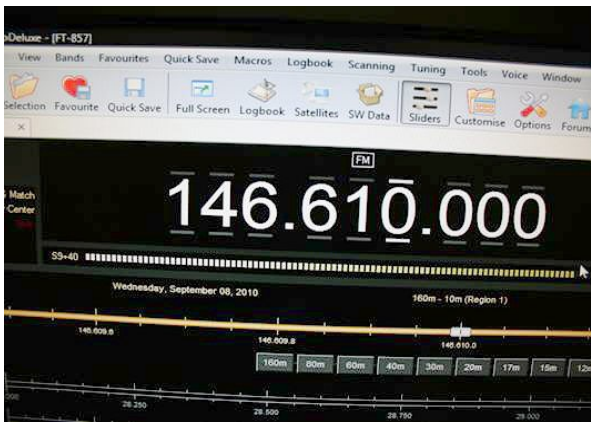
For finding the match points on the reflector, and the 2 directors, the standard formula 1.05 for the reflector and .95 for the 1st director and .95 of that for the second director.

I used 3/4 inch PVC in the construction of the antenna.

For clarity, It should be noted that the match points for the directors are progressively 5% less in overall length than the driven element starting with the Dir 1 and then Dir 2 is 5% less than Dir 1. The reflector match point is 5% longer than the driven element. The same goes for the overall "loops" of the antenna. The reflector element is 5% longer than the driven element. Dir 1 is 5% shorter than the driven and Dir 2 is 5% shorter than Dir 1.

Notice the wooden boom on the right and the wire going inside the PVC end sections that are used for support on the ends of the antenna to form the respective element "loops" of the antenna in the photo above.

Does it work? See the photo below.



S9 + 40!

S9 +40! As high as the meter will go, same repeater and the antenna is mounted on 20 feet of metal pipe with 5 more feet of PVC 1 1/2 inch to isolate it. I turned the right rear corner to the repeater to check F/B and it would come up but did not register on the meter so the front to back ratio is excellent!

Yes I am very pleased with the results! I have built 2 - 6 meter single elements to test and also a 20 meter for HF. Yes, it is about 34.5 feet high and 11 feet wide and I will post photos and results on all of that soon.

I am indebted to JE1DEU / JH1FCZ/ JH1YST for their efforts in coming up with such an amazing antenna and to Hamuniverse.com for hosting and promoting the use of ideas and construction so that everyone who wishes may enjoy fabricating and improving designs and experimentation. I also want to thank my XYL, Sandy for her patience and understanding as I pursue the service and hobby of HAM radio and my daughter and son-in-law for assisting in the installation! They are starting to study for their tickets too!

73's and God bless,

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