THE KD5IVP Backpacker Yagi

By Paul Dryer, KD5IVP

I designed this antenna with a specific purpose in mind, that is, to provide the lightest, most collapsible Yagi antenna possible for backpacking. It needed to be dual purpose in that the mast may be used for tarp/shelter support. It needed the have the highest forward gain possible with the fewest parts and no matching network. Collapsed, it had to fit in a pack pocket like any tent pole. This design weighs in at 2.1 ozs., And is predicted to have better than 6 dBd gain! This antenna is for the 2-meter Amateur radio bands and will easily handle 5 watts of the average handy talkie.

Materials you will need:
1 Aluminum or Carbon Fiber Arrow shaft
1 SMA connector
3 feet of RG174U coaxial cable
1 "tube" of .025 music wire (tube usually has 5, 3ft rods. You'll need 4 rods)
3 inches of scrap vinyl insulation from some 20 ga. Speaker wire. Clear vinyl works best. This will act as an insulator for your elements as they pass through the arrow shafts.
1 1/2" x ¾ inch piece of thin Plexiglas. This will separate your feedline at the feed point.
2 of the smallest alligator clips you can find.
1 cap off the tube of music wire to be glued to the handle end of your new antenna.

Refer to the printed plots and layout of the antenna on page two.

Start by drawing a pencil line down your arrow shaft to provide a

centerline for drilling. Using the molding on a doorframe as a vee notch straight edge makes this easy.
Remove the 'nock' end from the arrow by griping with pliers and twisting. Measure ½ inch from this end and mark your first hole. This hole will be your reference for the rest of the elements leaving you about 6 inches for a handle. Driven element holes should be ½ inch apart.
The drill bit size will depend on the vinyl insulation you are using. Measure it's thickness and use the next size smaller bit. The .025 music wire needs to pass through this insulation with some resistance. A drill press is the best way to drill these holes.

Fig. 1 Vinyl insulation inserted in hole. Insulation will stay there unless it need to be replaced. Carry some spare. Do not glue. Interference fit only.
Drill the rest of the element holes and insert 1" of vinyl insulation per hole.
Cut your element to length per the drawing and smooth the burs off the ends for safety.

The reflector element is 41" which means you'll need to make a splice since most music wire is 36". Simply sand, flux with

plumber's paste, and solder an overlap joint. Cover with heat shrink tubing as shown. Cut to length.

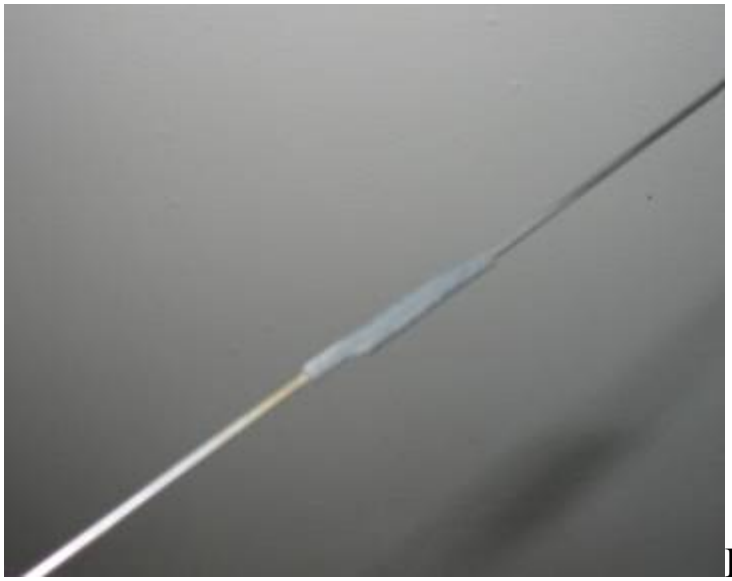


Fig 2. Reflector element overlap joint.

Once you have cut and smoothed the elements, you'll need to make a small crimp in the centers of the reflector and director elements and on the ends of the driven elements as shown. Crimp 'rule of thumb' is ½ the diameter of the arrow shaft.

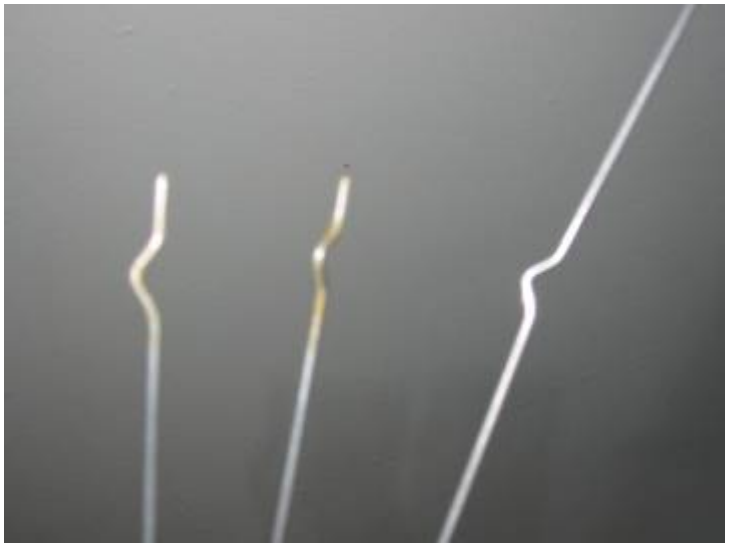


Fig. 3 Crimp needs to be ½ diameter of your arrow shaft. The

crimp holds the shaft centered and firm and allows for alignment with the other elements. A wipe down with some WD-40 helps with insertion and removal.

Build your wiring harness with 3 feet of RG174U and the SMA connector. On the feed end, very carefully strip 2 ½ inches of insulation off the coax. Gently form a "hole" in the coax braid and poke the center conductor insulation through the hole to separate the two conductors without un-braiding the shield. I heatshrink the braid.

Drill two 1/16th inch holes, 1 inch apart in the Plexiglas as shown in the picture below. Pass the center conductor and shield through each hole and solder on the alligator clips. Sometimes it helps to super glue the holes to keep the wires from sliding in the holes.

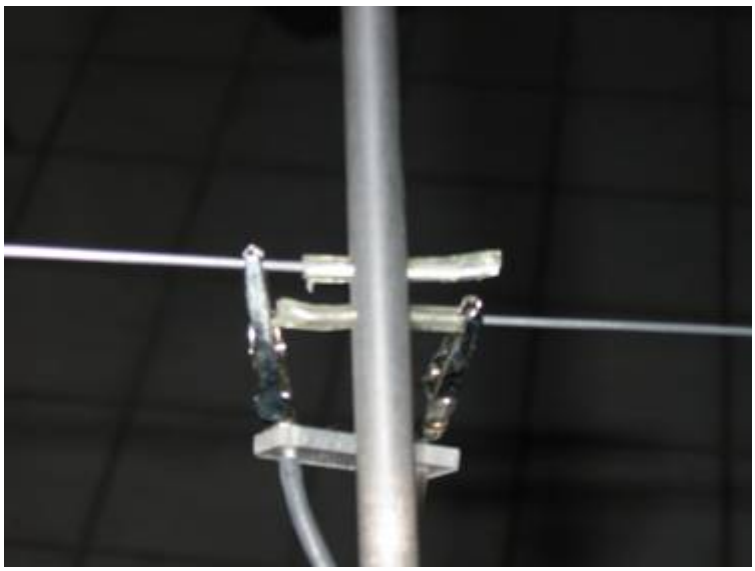


Fig. 4 Driven elements, alligator clip feed points, Plexiglas separator.

Using either heat shrink or electrical tape (cut your tape with scissors) tape the feedline to the arrow shaft in a couple of places, the first just behind the driven elements.

Super glue the cap on threaded end of your arrow shaft to keep stored elements from sliding through.

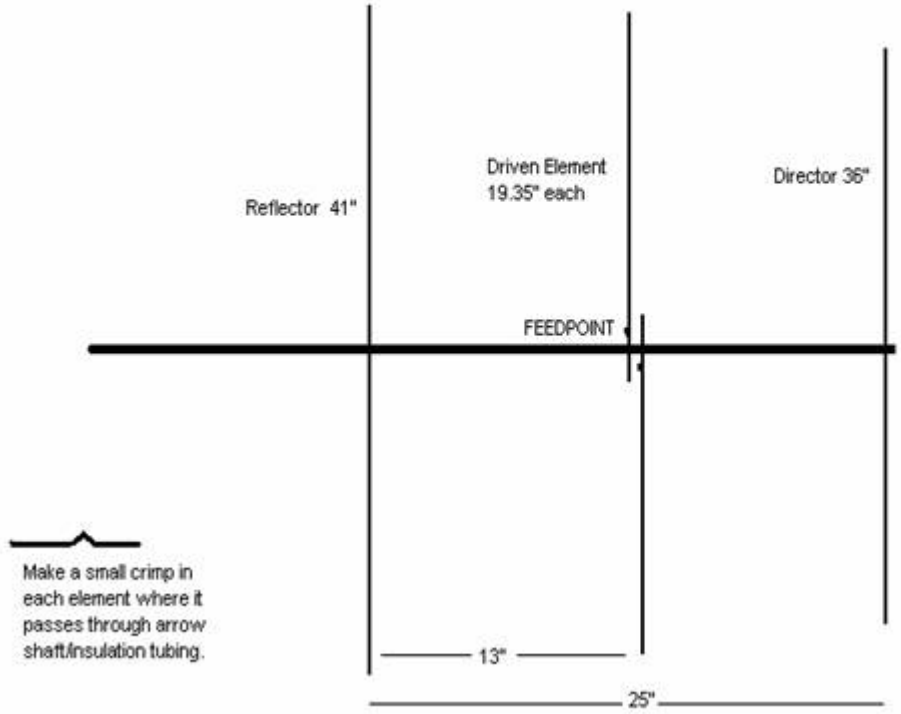
Wipe down the elements with WD-40 and assemble your new antenna. The VSWR should be about as predicted in the graph. Any tuning should be done very carefully, first by sliding your driven elements around in the sleeves and moving the feed points around slightly. 1.4 VSWR is plenty acceptable. I have not tested this antenna with more than 5 watts. Prune elements at your own risk but I have found my modeling predictions to be very close.

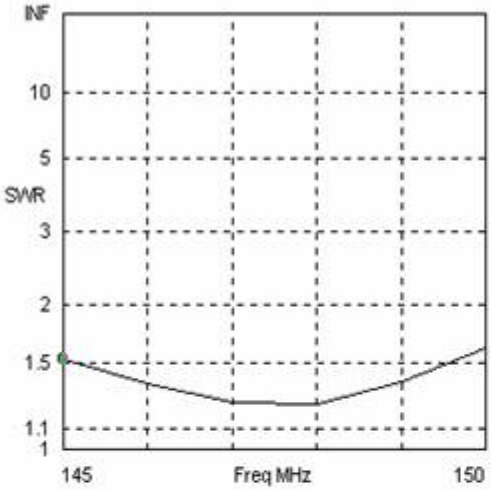
Fig. 5 Elements stored inside arrow shaft, coax wrapped around shaft. Vinyl sleeves remain in place always.

Have fun and enjoy! I have won transmitter hunts with this antenna on both 2 meters and 70cm (it also works on 70cm with a fair impedance match) It also works well with AMSATs.

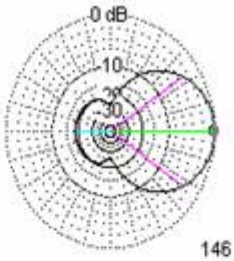
Paul Dryer
KD5IVP

KD5IVP ULTRALITE
BACKPACKER YAGI II





Freq	145 MHz	Source #	1
SWR	1.52	Z0	50 ohms
Z	42.4 - j 18.02 ohms		
Refl Coeff	0.2077 at -101.82 deg.		



146 MHz

Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	10.0 deg.	Gain	8.27 dBi
Outer Ring	8.27dBi		0.0 dBmax

Slice Max Gain	8.27 dBi @ Az Angle = 0.0 deg.
Front/Back	18.3 dB
Beamwidth	67.8 deg.; -3dB @ 326.1, 33.9 deg.
Sidelobe Gain	-10.03 dBi @ Az Angle = 180.0 deg.
Front/Sidelobe	18.3 dB