6M HALO VERSON II + OPTIONAL 2M GROUND PLANE

The halo is an omnidirectional, horizontally polarized antenna with about the same gain as a dipole but without the low elevation nulls off the ends (+5.5 to +3.5dBi variation for the Halo vs. +7.9 to –17.1dBi for the dipole). It consists of a single turn resonant horizontal loop a bit less than ½ wavelength in circumference. A capacitor is inserted in the loop for tuning. All conductors and connections in the loop and capacitor must be very low resistance for good efficiency. . This halo is a 28" diameter (center-to-center) piece of bare Al (Aluminum) ¾" CATV hardline with a 5/8" gap for the capacitor.

This halo is simple, cheap, easy to build and works well. It requires no critical parts or machining. It can be hoisted up in a tree, mounted on a mast, or side mounted on a tower. It is easily tuned and has low SWR (< 1.5:1 from 50.0 to 50.4). It might even survive going mobile with a little beefing up here and there.

This is my second 6M halo. It has been simplified in the process of eliminating some rain-induced tuning shift noticed in Version I. Version I used a loop of ½" CATV hardline with a ½" PVC "T" epoxied across the gap for physical rigidity and as one of the support points. Water across the PVC "T" [presumably] was the source of the tuning shift. Version II has nothing across the gap except air. It relies on the strength of ¾" hardline to keep its shape. There is some concern about temperature stability – we'll see come winter.

Besides hardline (which is usually available cheap/free in large quantity), the halo uses SS hose clamps and PVC pipe. Other tubing may be used instead of hardline with the following considerations:

- Thick-walled or larger diameter tubing is harder to bend although it will improve rigidity.
- Smaller or softer tubing may make the gap less stable and/or reduce efficiency. The width of the cap can be stabilized by using a tiny scrap of cable tie, Teflon, etc. across the gap and held under the clamps that hold the capacitor plates. Do not to put anything under the capacitor tabs.

You will need about 90" of hardline but it's easier to bend if you have a foot or two extra on each end for leverage that can be trimmed off later. A small capacitor across the gap consisting of two Al plates tunes the loop. Use fairly stiff Al that won't bend accidentally. Leave a ½" wide by ¾" long tab in the center of one long side of each plate. Bend the tabs 90^{o} for clamping under the SS hose clamps. I have tried the following sizes with no detectable change in operation. (Note: The round plates are centered on the hardline axis at the gap and have three 3/8" wide tabs bent to fit the hardline outside diameter.)

OPTIONAL CAPACITOR SHAPES			
HEIGHT	WIDTH	AREA	APPROX. SEPARATION
1½"	2¼"	3.375	¾"
!"	2"	2	3/8"
2" dia.	2"dia	3.14	est. 0.5"

A crossbar of ½" PVC (SCH40 or the thin-walled PVC1120) with a ½" "T" on each end supports the loop and the gap. The small air space where the hardline passes through the "T"s is filled with epoxy. Just turn the loop on its edge, drizzle a few drops of quick-set epoxy all around the upper ends of the "T"s and let harden a few minutes. Apply additional layers until the gap is filled. Flip over and repeat for the other end of the "T"s.

A PVC cross is placed in the middle of the crossbar if the antenna will be supported by a rope (great for hoisting way up in a tree) or mounted on a mast. Rigidity can be improved by going to ¾" SCH40 pipe and "T"s with two ½" reducers in each end "T" for the hardline. I use a couple drops of super glue to each PVC joint after everything is positioned properly instead of PVC pipe cement which only gives you one chance. Slow cure epoxy is also an option.

The halo can be fed through a gamma or delta match, a small coupling loop or a direct coax connection tapped part-way around the loop. This one uses coax directly connected through what looks like a gamma rod except there is no gamma capacitor. Since it looks like a gamma match it seems least confusing to call it that. The gamma match is approx. 16" of ½" bare Al CATV hardline bent to the radius of the main loop and mounted with about 7/8" clearance between the two. Mine measures 13½" from the coax end to the center of the ground clamp. The tube should have a hole drilled in ½" from the coax end for a #6 SS bolt for attaching the center conductor. This hole should be positioned

6M HALO VERSON II + OPTIONAL 2M GROUND PLANE

180° opposite the gap in the main loop and above the coax ground clamp. The coax end of the tube is supported by a sturdy insulated standoff or a spacer made from a 1¼" long piece of ½" PVC.

To make the spacer file a circular notch in one end of the PVC to fit the ¾" hardline and a notch in the other end to fit the ½" hardline. The bottoms of the notches should be 7/8" apart. Drill a small hole crosswise in the center of the spacer big enough for two black cable ties. Use sandpaper to rough up the inside of the spacer and a spot on the hardline about 2-3" from the coax ground clamp. Position the spacer, test fit the gamma tube and use a tie to attach the spacer to the main loop. Put about ½ teaspoon of epoxy inside the spacer to keep it from shifting on the hardline. Once the epoxy has hardened use the second cable tie to hold the gamma tube in the upper notch in the spacer. No glue needed here but I put a couple drops of super glue anyhow after final adjustment.

The other end of the gamma tube is supported and grounded by a 7/8" Al spacer or a scrap of ½" wide Al bent in a "U" or "Z" shape. The parallel legs are ¾" long to go under SS hose clamps. These parallel legs should be 7/8" at the outside which determines the gamma spacing. Avoid mixing metal types like copper and steel or Al. An exception is that SS is OK with anything and can be used as a "buffer" between two dissimilar metals. A dab of anti-oxidant or silicon grease on all Al contact surfaces isn't a bad idea.

The feedline connection is just 50 or 75Ohm coax with short ¾" leads. I soldered the leads into bare terminal lugs to help prevent the wires from breaking. The ground lead of the feed is clamped under a SS hose clamp. A choke balun can be wound in the feedline if desired but the EZNEC simulator runs show little difference (probably because the coax shield is connected at a zero RF potential point.. Be sure to waterproof all coax ends and connectors!

The halo is a little off balance when supported by a rope due to the weight of the gam (and glued!) into the center cross. If spinning is a problem it can be controlled by attaching a light line to the main loop at the ground feed point or to the end of a 12" piece of ½" PVC attached to the vertical support rod with a "T" or "L".

Tune the halo by varying the capacitor plate spacing. Bend the plate(s) slightly or loosen the clamp(s) and slide for more range. Closer together lowers frequency, further apart raises. Keep the clamps up close to the plates but fully on the hardline. The gamma match is adjusted by moving the grounded end support and determines the feedpoint impedance and bandwidth.

And now for the added bonus: an optional 2M groundplane almost for free and fed over the same feedline. Here goes: Take a SO-239 and make a standard 2M ground plane with 4 radials - one in each hole. I used lugs and #12 wire for the radials and #10 for the vertical. The end of the vertical element is filed down to fit the center conductor solder cup. It's not critical – 1/16" brass welding rod would work for all elements with less trouble and be a little stiffer. All my elements were cut to 19¼" and I ended up trimming 1/8" off the vertical. The radials are bent down at 45-60 degrees with two on each side of the crossbar. The SO-239 flange about 2-3/16" above the center of the crossbar. The main feedline comes up into the bottom of the SO-239 through a 2½" long piece of ½" PVC 1120 which is taped, glued, cable tied or whatever to the side of the center cross.

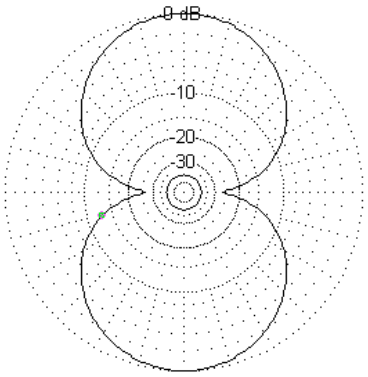
Next cut a 36" piece of foam coax or 30" solid dielectric (Vf=.8 or .66 respectively). Strip about ¾" to 1" of jacket off each end. Put lugs on the shield on both ends and the center conductor on just one end. Attach the end with 2 lugs to the halo gamma rod as described previously. Put one or two small loops in the free end of the coax to take up the slack and fasten the ground lug under one of the 4 screws on the SO-239. Carefully solder the center conductor to the SO239 center conductor and waterproof the whole mess.

There is very little interference between the two antennas See the Pix and graphs for details.

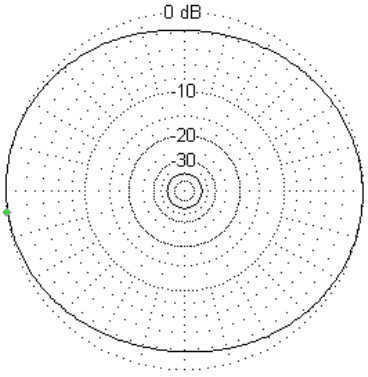
C. W. Gantt - W4CWG
www.w4cwg.com
w4cwg@w4cwg.com

6M HALO VERSON II + OPTIONAL 2M GROUND PLANE

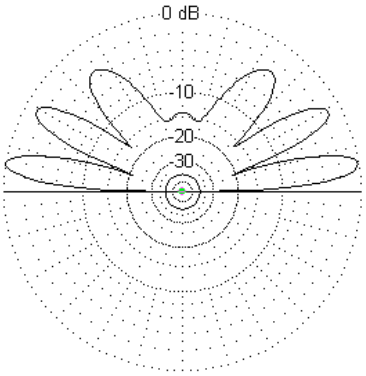
Graph / simulation data from EZNEC v4.0 w/ real, high accuracy ground.



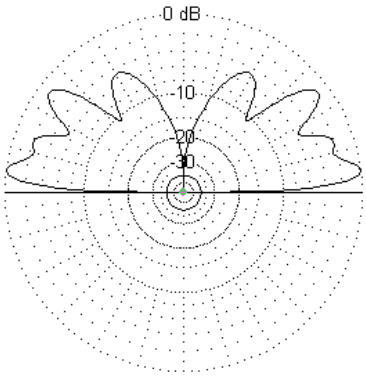
Dipole at 30', 9deg. elev. 50.2MHz
0dB = 7.9dBi



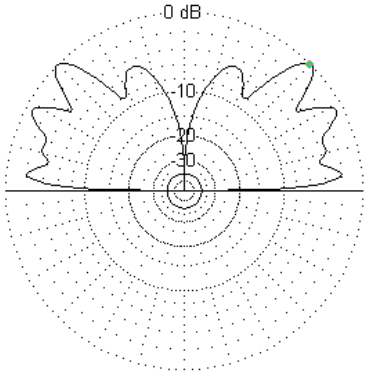
Halo at 30', 9deg. elev. 50.2MHz
0dB = 5.5dBi



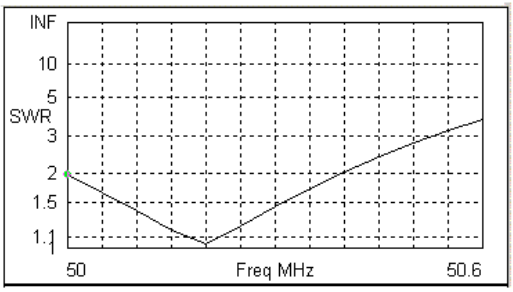
Typical dipole, halo, elevation pattern at 30' (6M)



Typ. Ground plane at 30', 0dB = 3.45dBi



5/8 wave vert. 0dB = 4.45dbi

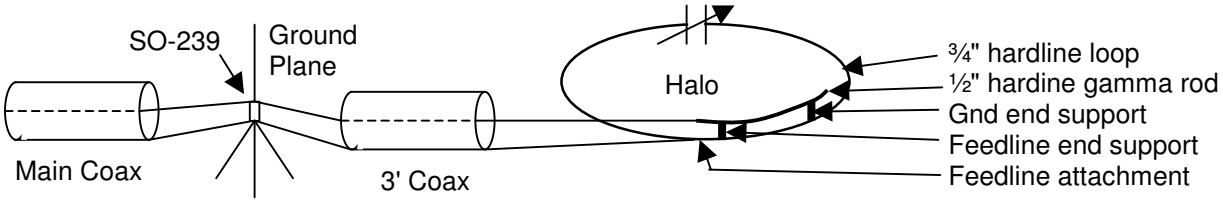


Halo typical SWR - 50-54MHz at 2:1

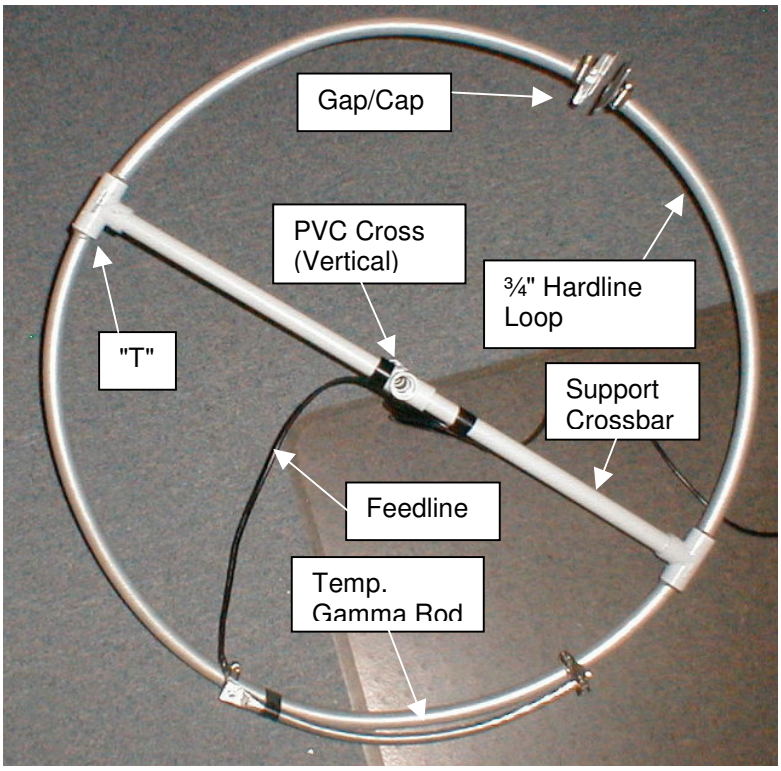
HALO 6M PATTERN COMPARISON TO OTHER ANTENNA TYPES

SWR MEASURED IN TEST STAND 6' OFF CONCRETE FLOOR

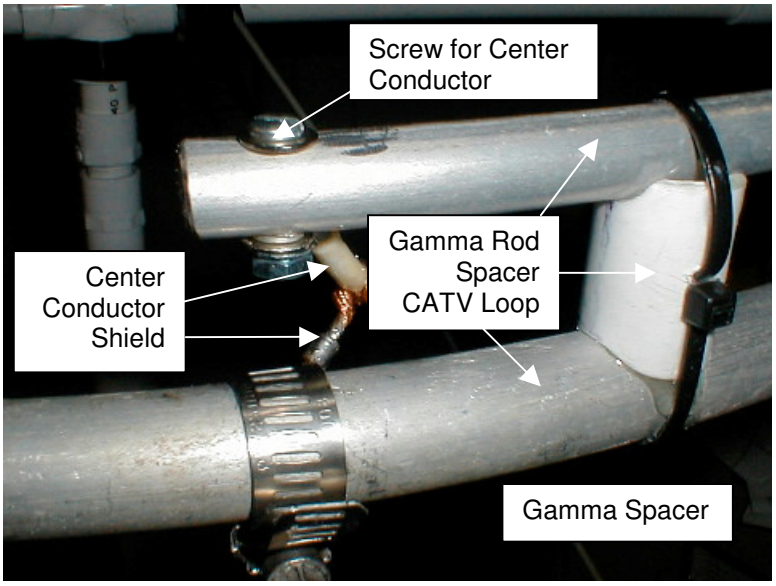
6M FREQ	50	50.1	50.1	50.3	50.4
SWR	1.4	1.2	1.2	1.4	1.7
2M FREQ	144	145	146	147	148
SWR	1.3	1.0	1.05	1.1	1.05



6M HALO VERSON II + OPTIONAL 2M GROUND PLANE

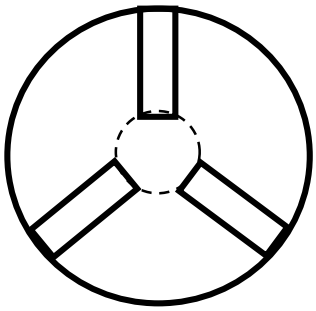


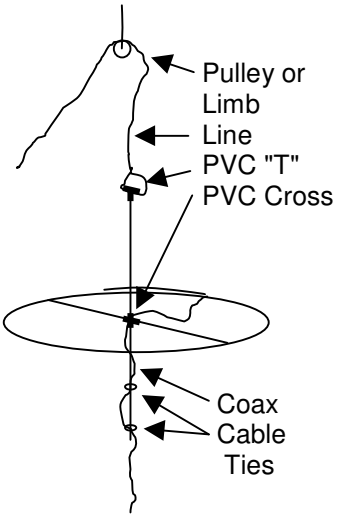
6M HALO VERSON II + OPTIONAL 2M GROUND PLANE



Example capacitor plate with mounting tab (not to scale)

Circular plates: Cut straight in to ¾" dia guide circle & bend mounting tabs up





HANGING HALO

6M HALO VERSON II + OPTIONAL 2M GROUND PLANE

Not shown: bottom 12-16" piece of ½" PVC glued in bottom of "cross". Feedline is tie-wrapped to PVC for strain relief on connector and passes weight through to top piece. The bottom piece of PVC can be shortened and stepped up to ¾" or larger for mounting on a mast