QUICK FIX TROJAN ANTENNA
FOR 10 GHz

What's the purpose of this antenna? While there are antennas with higher gain, this antenna is sufficiently small and light weight to fit inside a backpack or carry-on luggage for air travel. It is also has a low cost figure of merit (gain per $) of ~4 (100/$25) using readily available parts from a local home supply store.

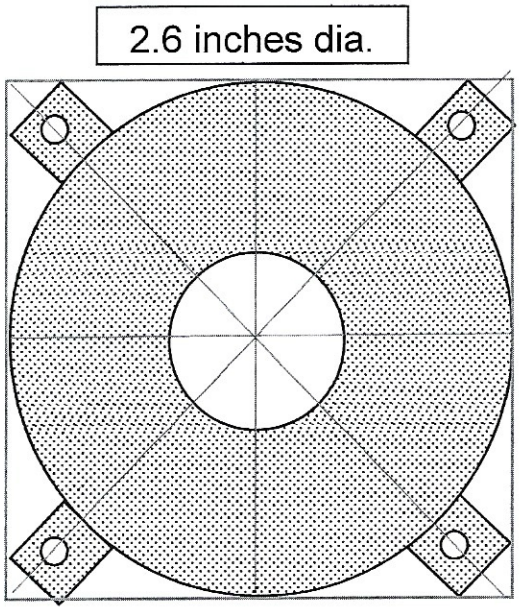
1. Preparing the reflector

- Using an 8.5 inch diameter Clamp Lamp (Part # SKU 277384) from Home Depot ($14.45), remove all components from the lamp leaving only the reflector.
- Proceed to Step 2 to make the reflector to transition interface.

2. Constructing the reflector to waveguide interface

- Prepare the reflector to transition interface using the templet below. This interface is made from a piece of 4 inch x 10 inch, 0.016 inch thick brass sheet available from Hobby Lobby for about $5.
- Cut a 2.6 inch square of the brass. Tape a paper copy of the templet on the following page to the brass and center punch the four mounting holes and the center hole of the templet.
- Mount the brass plate with wood screws to a block of wood and drill the 4 mounting holes for clearance of 6-32 screws. Also, drill a hole in the center of the brass center to allow passage of the head of a nibbling tool. After removing the brass from the block of wood, use a nibbling tool to "nibble" a 0.9 inch diameter hole to allow passage of a piece of ¾ inch copper water pipe.

- Use the nibbling tool to remove the brass from the area of the templet pattern that does not have a pattern background.



BRASS INTERFACE BETWEEN THE REFLECTOR

AND THE COAX TO WAVEGUIDE TRANSITION

3. Prepare the coax to waveguide transition

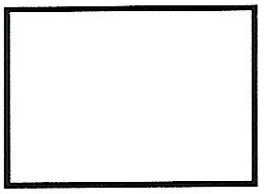
- Using a pipe cutter, cut a 3.6 inch length of ¾ inch copper water pipe. With a flat file, remove any sharp edges from each end of this pipe.
- Prepare a ¾ inch copper water pipe cap for use as the back wall for the coax to waveguide transition. Using a SMA chassis mount connector with a two hole flange, adjust the center connector to be 0.252 inches. Some SMA connectors have a center pin longer than this, so it can simply be cut to length and filed off smoothly. If the center pin is shorter, add a short length of bare buss wire to extend the length of the center pin to 0.252 inches.

- The probe will be 0.375 inches from the back wall of the copper pipe cap. The inside distance of the pipe cap to the front rim of the pipe cap to the back wall is 0.78 inches, so the distance from the front rim of the pipe cap to the probe is 0.78" – 0.375" = 0.405 inches.
- Place the pipe cap snuggly on the ¾ inch water pipe and, using a fine point Sharpie, draw a ring around the ¾ inch pipe using the pipe cap rim as a guide.
- Using the fine point Sharpie, mark a spot on the pipe cap that is 0.405" from the front rim of the pipe cap that will be used for a 4-40 screw used to tune the probe. Then determine a spot on the pipe cap that is directly opposite of the first spot; i.e. 180 deg. around the pipe cap. These two spots will be used for the placement of the SMA connector center pin and a 4-40 screw used to tune the transition for minimum SWR or maximum Return Loss.
- The 180 deg. point on the pipe cap can be determined by cutting a 0.5 inch wide strip of paper that is ~3.5 inches long. Using a line across the paper can be the point on the circumference line for the 4-40 screw. Wrapping the paper strip around the pipe cap will come back to this line to be taped such that the paper goes completely around the pipe cap like a cigar band. Once the paper is taped in place, then compress the paper to determine where the half way mark around the pipe cap is located and make a line there on the paper. Using the band, mark the location for the center of the SMA connector that is 180 deg. around the pipe cap from the tuning screw. Slide this paper band back on the pipe cap and mark the location for the SMA connector center pin.

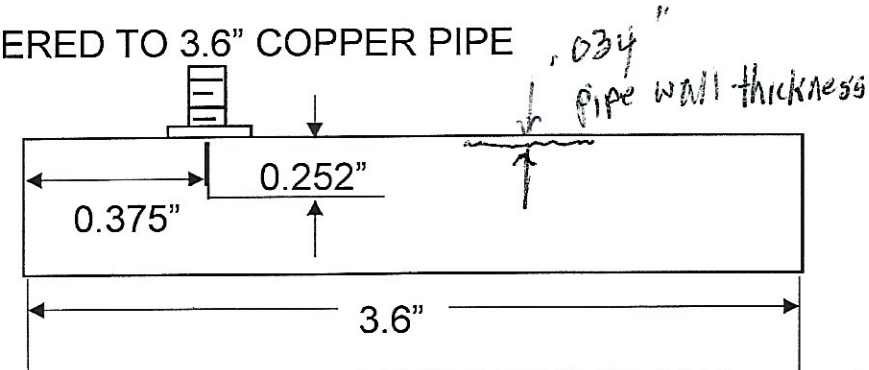
- These two marks will be 0.405" from the front rim of the pipe cap and 0.375 inches from the back wall of the pipe cap. Drill two small guide holes through the pipe cap that are 180 deg. around the pipe cap from each other.
- Slide the pipe cap on the 3.6 inch length of copper pipe and drill a hole appropriate for a 4-40 screw tap through the pipe cap and on through the pipe itself. Insert a 4-40 screw to hold this in place. Using the thin point Sharpie, insert it through the other hole on the opposite side for the screw. Remove the pipe cap and drill a 5/32 inch hole in the pipe which be the location for the center pin of the SMA connector when it is soldered to the 3.6 inch pipe.
- On the other side of the pipe cap, use a nibbling tool to cut a slot in the sidewall of the pipe cap from the front rim all the way to the back wall of the pipe cap. This slot will be used to clear the flange of the SMA connector which is soldered to the ¾ inch pipe with the center pin of the connector extending into the pipe.

SMA CONNECTOR WITH 2 HOLE FLANGE

SOLDERED TO 3.6" COPPER PIPE



¾" PIPE CAP WITH SLOTS FOR SMA CONNECTOR AND HOLE FOR 4-40 TUNING SCREW

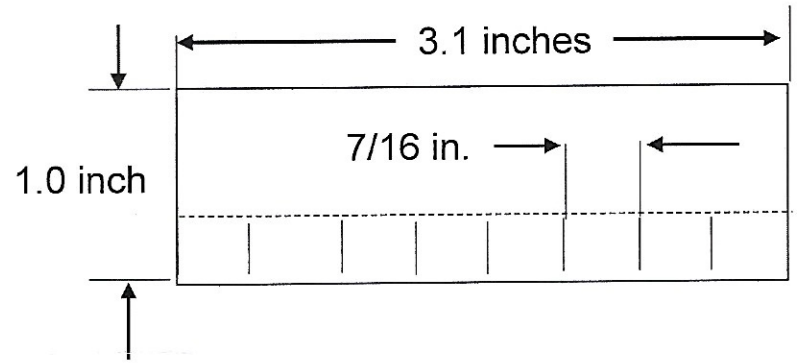


COAX TO WAVEGUIDE TRANSITION

.034
.252
.286

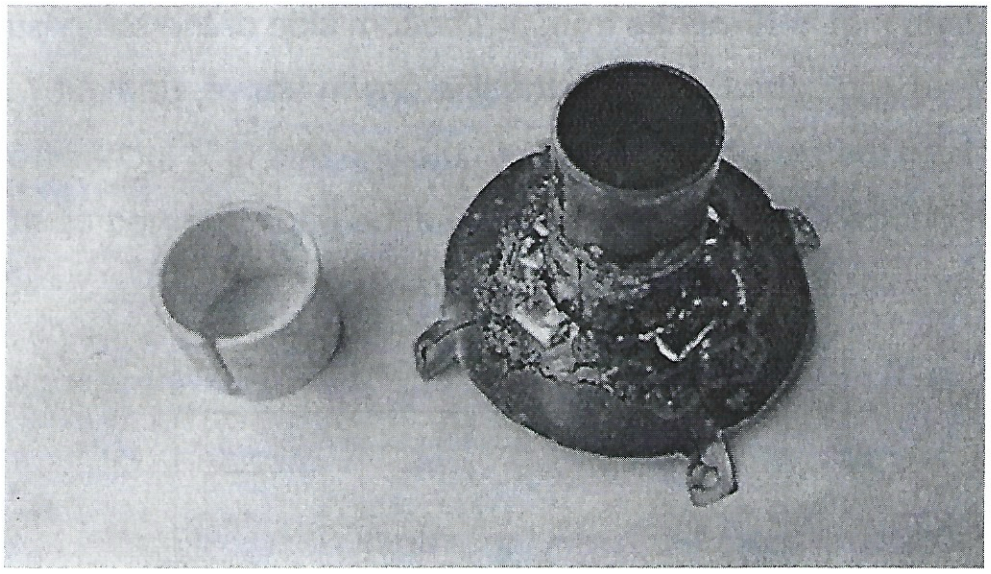
4. Connecting the ¾ inch pipe to the reflector

- Cut a strip of brass 0.016 brass sheet that is 1 inch high and 3.1 inches in length. Using the Sharpie, draw a line on the length of this strip that is ¼ inches from the bottom side of the brass strip. Make 7 perpendicular lines from the line drawn above, and cut 7 slits that go from the bottom of the strip to the line that is ¼ inches from the bottom. Cut these slits and bend the 8 tabs formed up at 90 deg.. A templet is shown below for this brass strip.



- Wrap the brass strip around the ¾ inch water pipe to be used for the coax to waveguide transition and hold in place while sliding a hose clamp around the top part to the circular strip to maintain its circular shape. Then, loosen the hose clamp and place a ¾ inch pipe coupling inside of the brass strip with the 8 tabs extending outward from the coupling. Once the coupling is in place, slide the brass strip down until the 8 tabs are at the bottom of the coupling. Tighten the hose clamp to hold the brass strip firmly around the ¾ inch pipe coupling and solder the brass strip to the coupling. These tabs will

then be used to solder the coupling to the backside of the reflector to coax transition. See the image below.

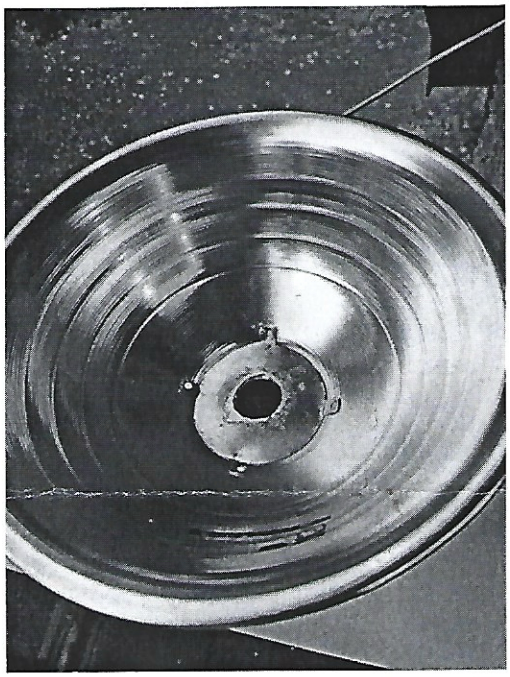


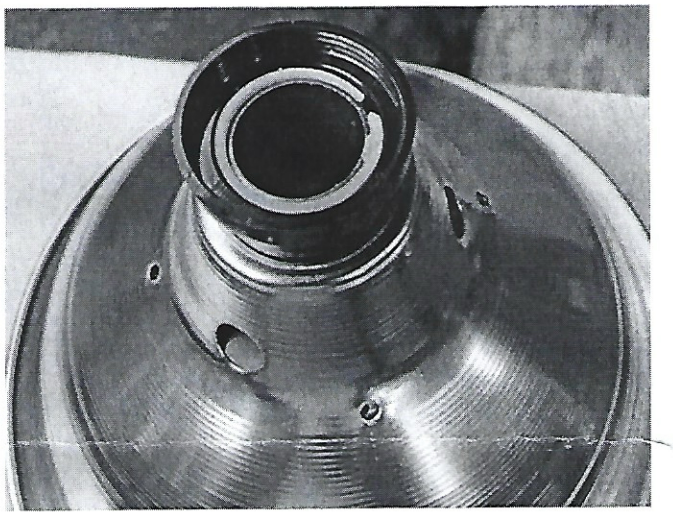
COAX TO WAVEGUIDE TRANSITION TO

ATTACH TO THE REFLECTOR

- Make sure the ¾ " waterpipe passes through the coupling and allow it to extend approximately an inch beyond the end of the coupling. Place this coupling with the water pipe through the hole in the brass interface to waveguide transition and solder the 8 tabs to the surface of the interface. After a couple of tabs are soldered to interface, the ¾ inch water pipe can be removed and the remaining tabs can be soldered.
- Cut a slit in a 0.9 inch length of PVC pipe that is parallel to the direction of flow of water in the PVC pipe. Slide the PCV pipe over the ¾ inch coupling. This piece of pipe is used as a shim to hold the coupling in the center of the insulator that comes with the reflector.

- Slide the 3.6 inch long coax to waveguide transition through the coupling and extending ~ 1/8 of an inch beyond the front side of the interface. A spot of solder to the outside surface of the ¾ inch copper pipe transition will hold it in place.
- Use four 6-32 bolts to attach the transition/interface to the Clamp Lamp reflector. This completes the QF Trojan antenna.





FRONT AND BACK SIDE OF THE TROJAN ANTENNA