53.880 Mhz
103.5 hz PL
The KF6YB Repeater

Second Generation 6 Meter Duplexer

Introduction

Here is some pictures from other groups who have built one

I have begun to construct the second generation 6 Meter Duplexer based upon the lessons that I have learned by experience and advice. This duplexer will have a more solid construction and should be easier to tune. I will be posting pictures and descriptions as I progress.

Here is a list of materials that will be needed

- You will need 6 pieces of 1-5/8" Andrews Heliax to form the "stubs".
- You will need 6 quarter wavelength pieces of RG-58 coax to form the interconnecting cables.
- 2 BNC (or any type connector you like) connectors per stub to serve as the input and output.
- A long piece of hobby brass tubing the size to fit your coax dielectric
- 3 Shunt inductors and 3 capacitors. These serve to recover from the deep notch attenuation at the reject frequency as one approaches the 'pass' frequency.

Now to build one

For the recieve leg, you want to notch the transmit frequency and for the transmit leg, you want to notch the recieve frequency. Lets begin by building the stubs. First, we need to cut the Heliax to the proper length for the given frequency. For the recieve leg, you want to notch the transmit frequency.

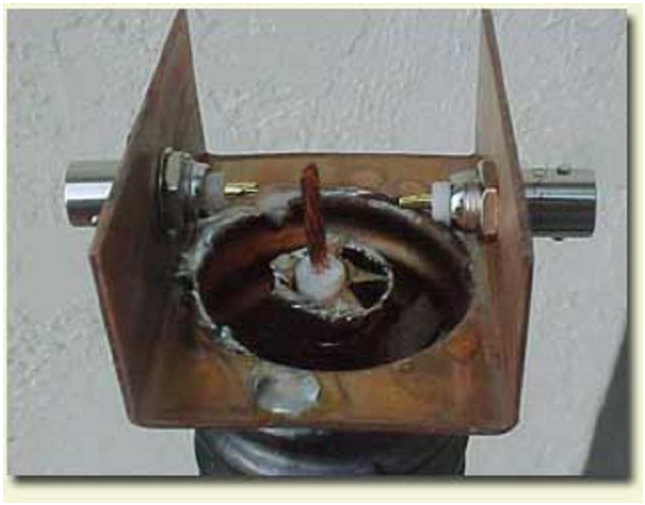
Here is a calculator to figure the end to end length of the stub.

- If you have Air Dielectric heliax use this one.
- If you have Foam Dielectric heliax use this one.

Here is a calculator to figure the end to end length of the interconnecting cables.

- If you have Foam Dielectric RG-58 use this one.
- If you have Teflon Dielectric RG-142 use this one.

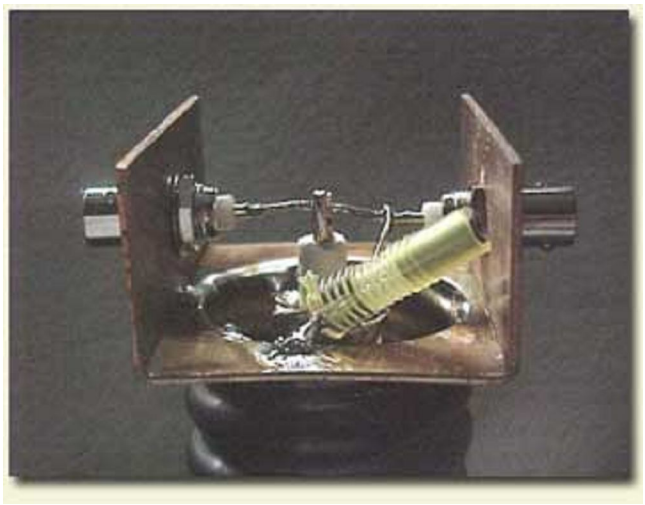
Here is a description of how I built the stub



The new design has a box made of medium wall copper bent into a U shaped channel. The BNC connectors are mounted to the walls of the box to add strength. The box is soldered to the top of the Heliax stub. The other major change you will notice is that the coax gimick cap is now a piece of brass hobby tubing soldered into the center of the heliax, this takes the place of the braid that was around the coax in the old design. The center conductor and dielectric is removed from the RG8

and inserted into the brass tubing giving a more sturdy and predictable capacitor. This design was invented by the WA7X group in Utah so I have dubbed it the "UTAH CAP".

This is how the completed stub looks with the Utah cap and the thru-line conductor. Notice the blob of solder on the plate, this is where the reactance inductor will go.

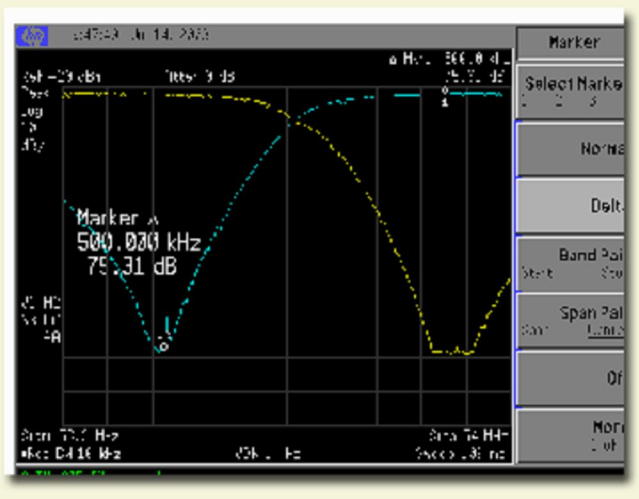


Here is a completed stub with the reactance inductor that has been tuned and ready for service. Very simple and easy to tune.

Here is a stub with the cover installed and ready for service.

Here is the completed set in service. The whole project took under 10 hours to build and tune however I built one 6 months ago so it was kind of easy. The new design is quieter as I noticed that the old coax braid gimick cap had a tendency to be microphonic, the Utah Cap is much quieter and predictable when it comes to tuning.

The final measurements show a 1.75db insertion loss through the 3 stubs and approximately 73db of notch depth. These figures are the same for the TX and RX sides of the duplexer.



This is a trace of the receive and transmit legs of the duplexer. The analyzer noise floor doesn't show the bottom of the notch very well. I am thinking that the transmit leg might need another stub!

Summary of references from this page

- WB5WPA website
- The WA7X group
- The NHRC Controllers
- The NHRC GE info pages

STUB Calculations

- If you have Air Dielectric heliax use this one.
- If you have Foam Dielectric heliax use this one.

Interconnecting Cable Calculations

- If you have Foam Dielectric RG-58 use this one.
- If you have Teflon Dielectric RG-142 use this one.

- Here is a description of how I built the stub.
- Here is a description of how I tuned the duplexer and array.
- Here is a schematic diagram of the duplexer.

A few words about the radio. I am using a GE Master 2 Mobile that was duplexed that has a 100 Watt PA. I have tuned the PA to make aprox 40Watts, this keeps the PA cool and reduces the transmitter noise commonly seen with under driving the PA. The controller is an NHRC/4 controller that plugs directly into the radio with little or no modification. I am willing to give advice and encouragement to anyone who may be trying to build one. Please send me an E-Mail and I will gladly help however I can. I am hoping that this web page will inspire other Hams to build one, innovate and improve on the original design as well as put more open repeaters on the 6-meter band.

73s
Oscar Quintanilla
KF6YB 8/15/03