

UPDATE FIVE

Well here is the next installment of the continuing saga of trying to resurrect a Passive Maser.

This Maser was one built under a Hughes Aircraft Company project the "Earthbased Compact Hydrogen Maser" circa 1985.

Around ten years ago a friend bought it and had me pick it up in Thousand Oaks CA.

It was just the "Physics package" with a bit of RF stuff but all the major electronics was missing.

I brought it home, figured out the oven connections and ran some preliminary tests on it.

Getting the cavity close to temp and tuning the varactor determined the Q and proper tuning.

It was indeed a Maser package and had a Q of 7000 indicating a Passive Maser or in this case a "Q enhanced active Maser" utilizing external gain to raise the Q to a point where it will oscillate.

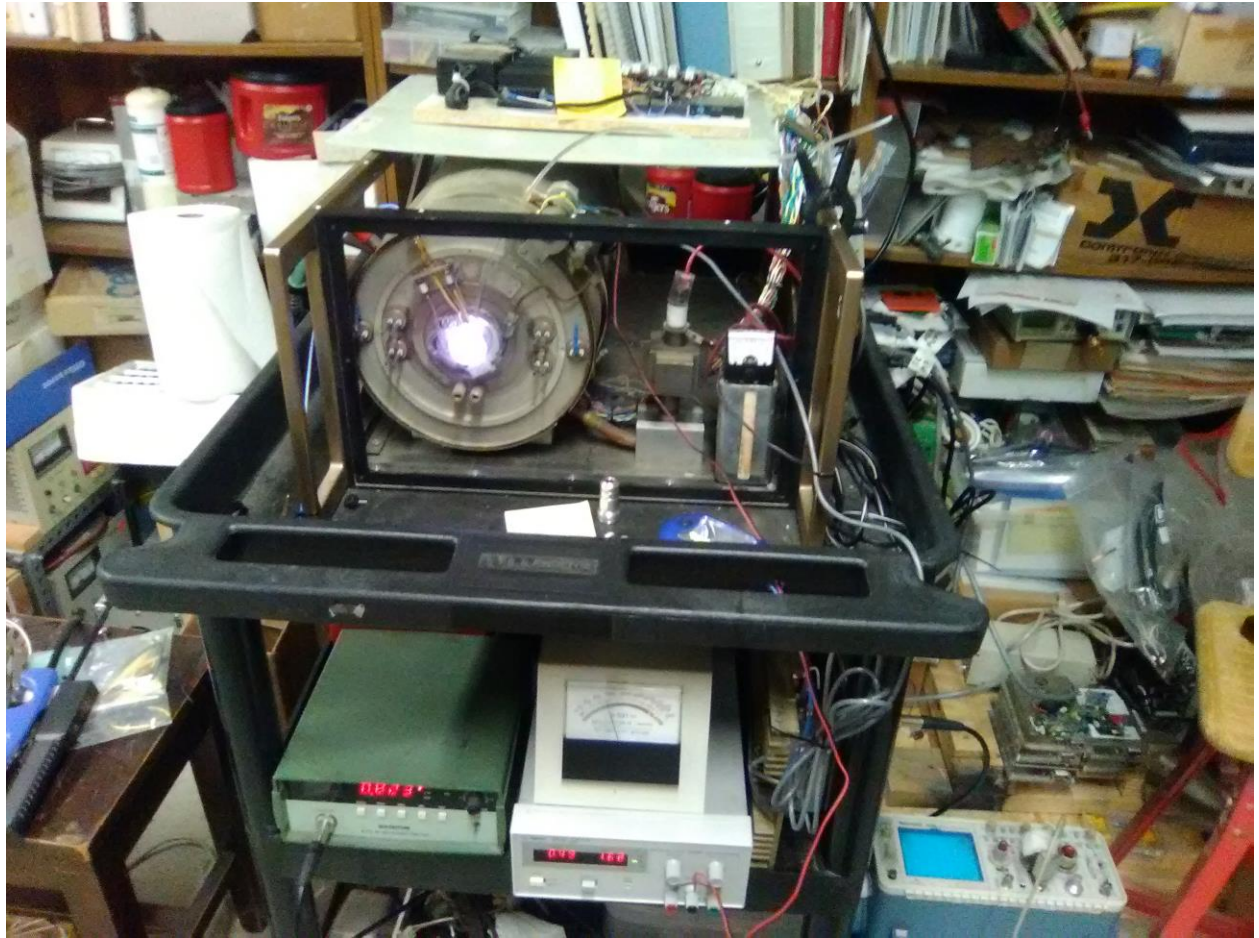
For quite a while I tried to get some Hydrogen out of its Hydride based Hydrogen supply with no success. I then slowly accumulated the supplies to provide a new source of Hydrogen.

Leery of letting air into the Maser I tried one last time to get Hydrogen from the Hydride source and I finally got some Hydrogen pressure!

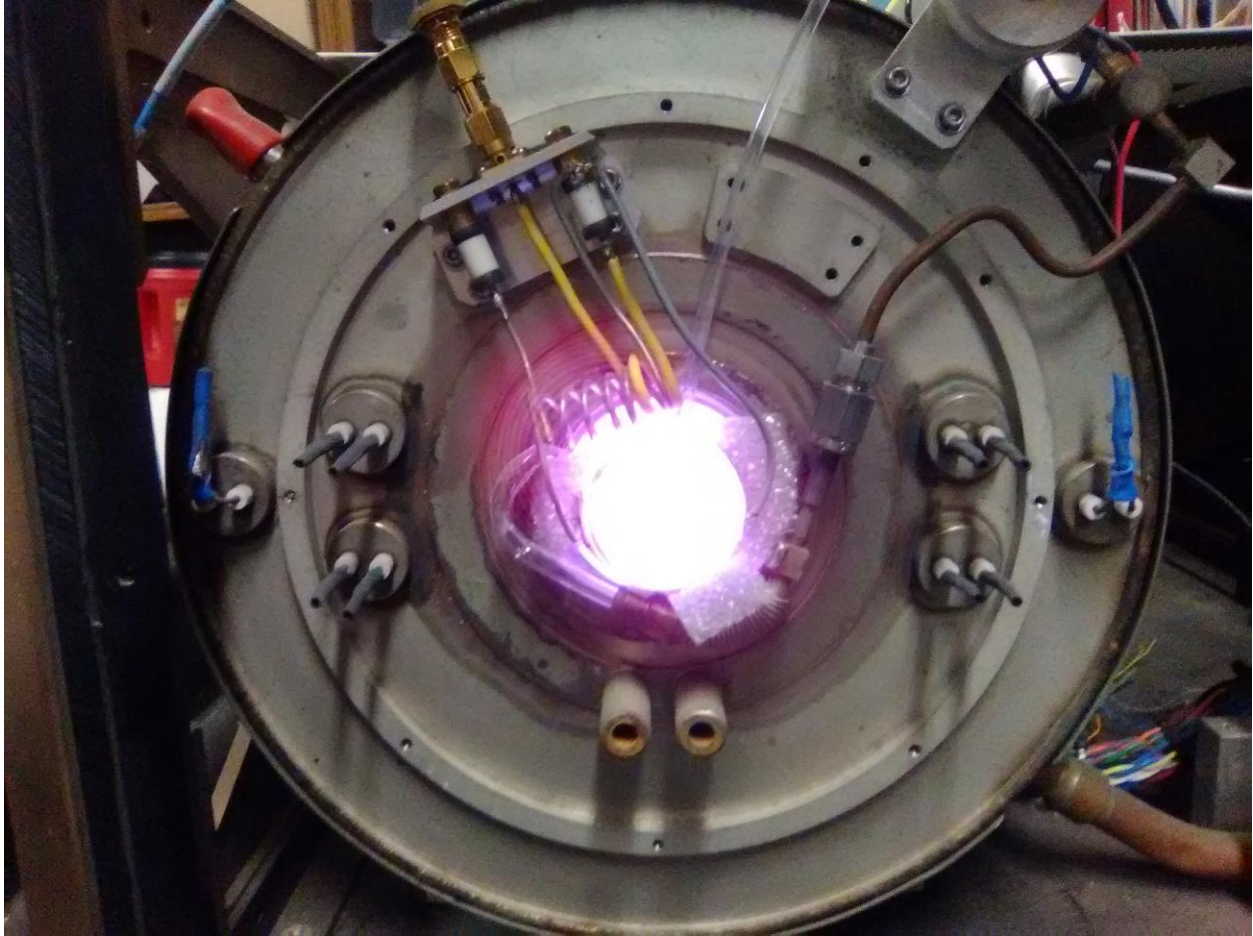
Built an RF generator to drive the dissociator and got some "glow", however the color was not quite right. A handheld spectrometer did show the 3 visible atomic Hydrogen Balmer lines but also showed the "continuum" of molecular Hydrogen.

After two weeks of running, the spectrum did not improve.





DISSOCIATOR LIT

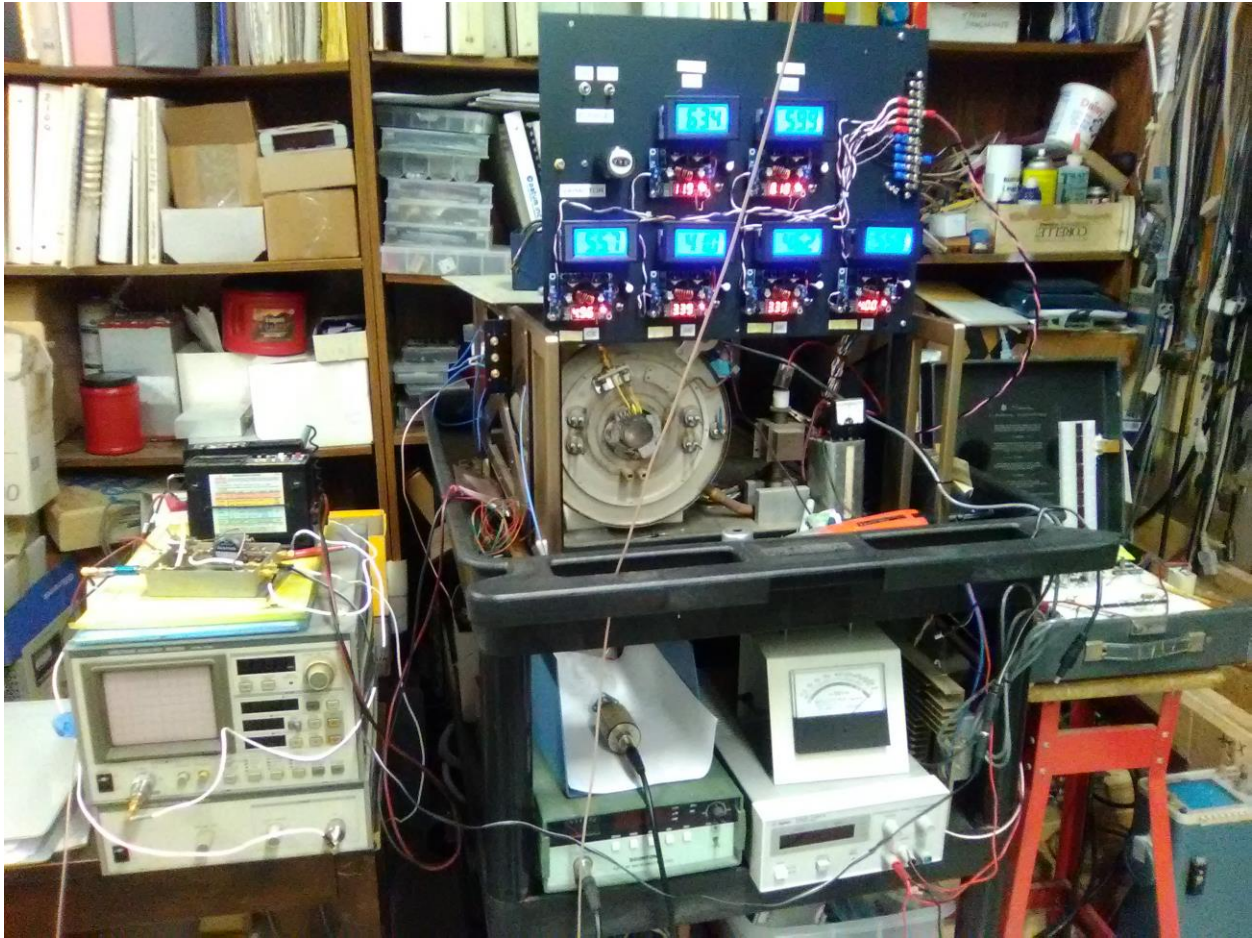


DISSOCIATOR GLOW

Decided to see if there was any Hydrogen line "gain" even with the not so clean glow.

Hooked up the 6 ovens, a spec-A with a tracking generator, and an RF generator at 1420.405751 Mhz.

Got the cavity up to temp but when I tried to adjust the temp and varactor for the line frequency I found that the cavity was over 1Mhz off! Subsequent troubleshooting revealed the Major show stopper of a shorted cavity varactor diode!



HEATER AND RF SWEEP

So the decision to start tearing the unit down made itself!

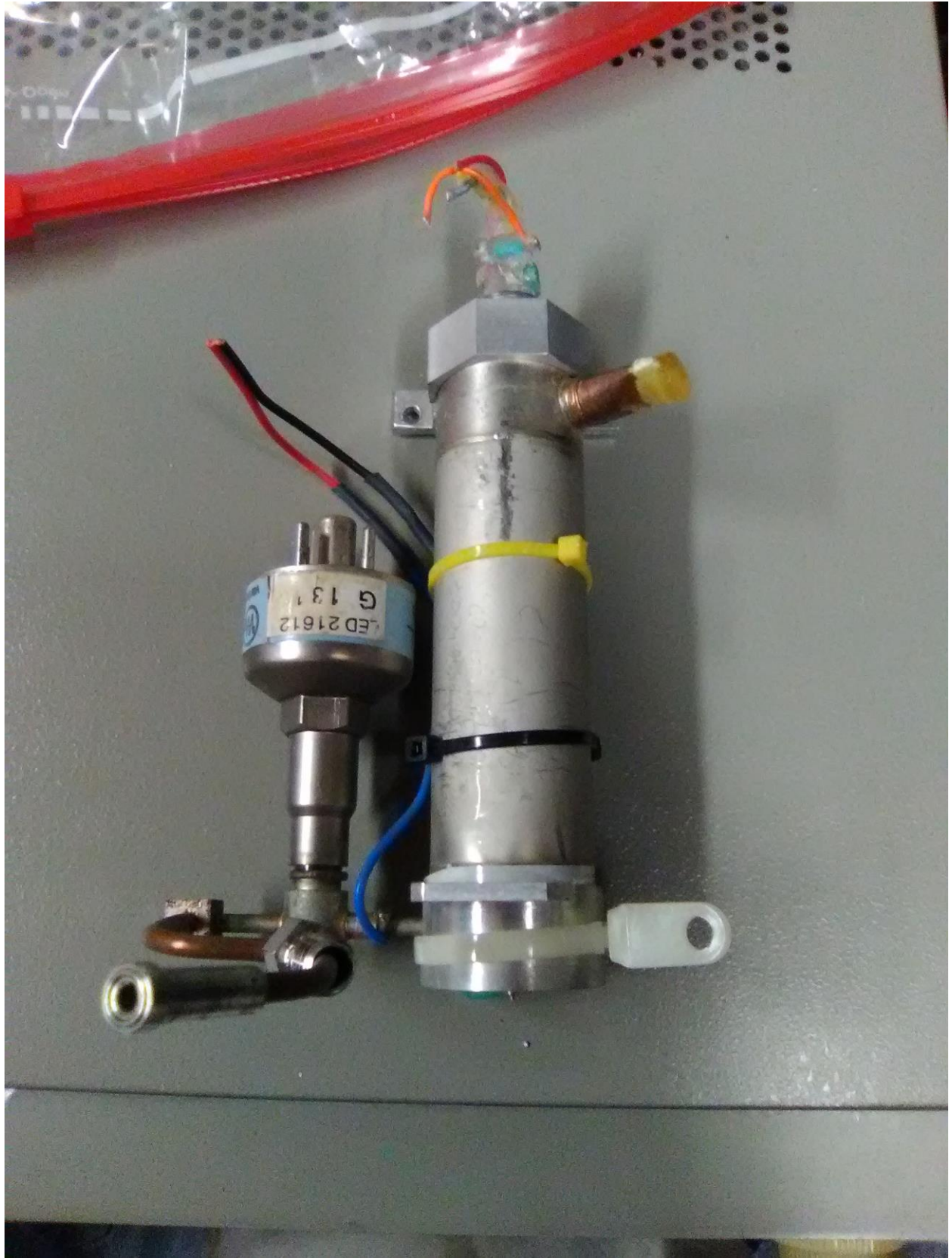
Unfortunately the "all welded titanium construction" of the vacuum envelope meant that getting it apart would require much cutting.

I knew that once it was opened "up to air" the getter pump assemblies would be ruined and also that the dissociator envelope appeared to be visibly contaminated.

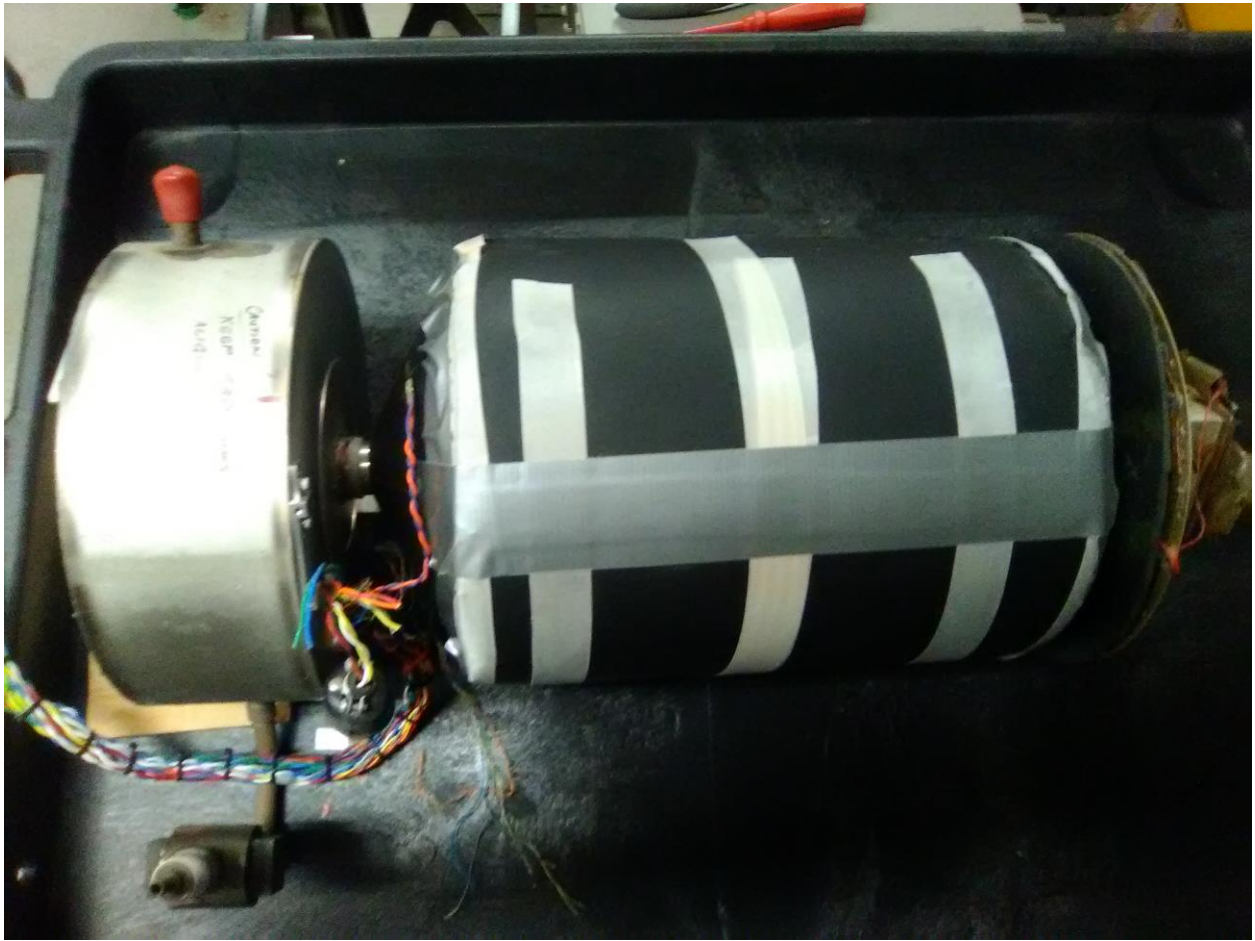
So since I did not have to worry about those items the decision was made to cut the whole assembly off.



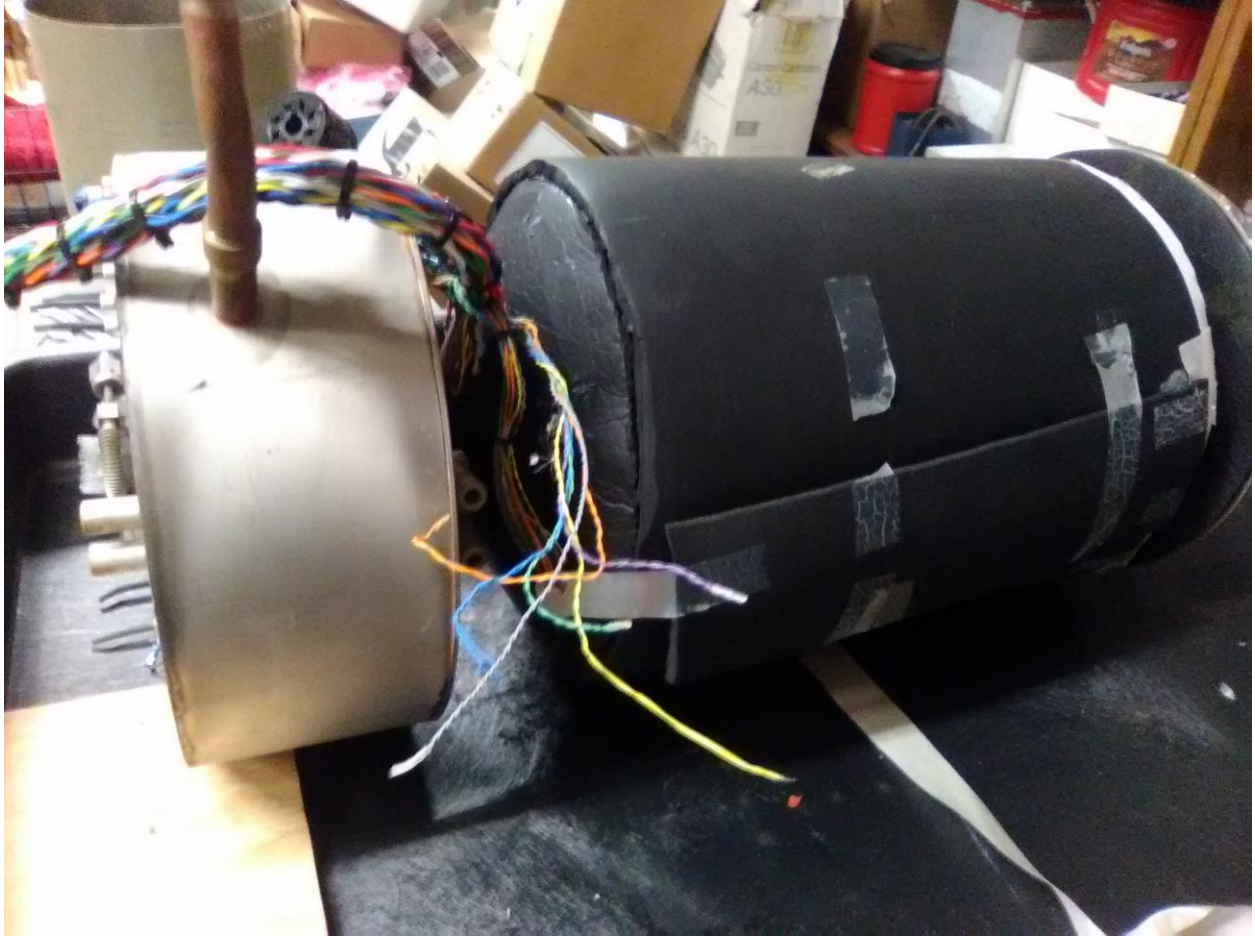
READY TO START TEAR DOWN



HYDRIDE CANISTER



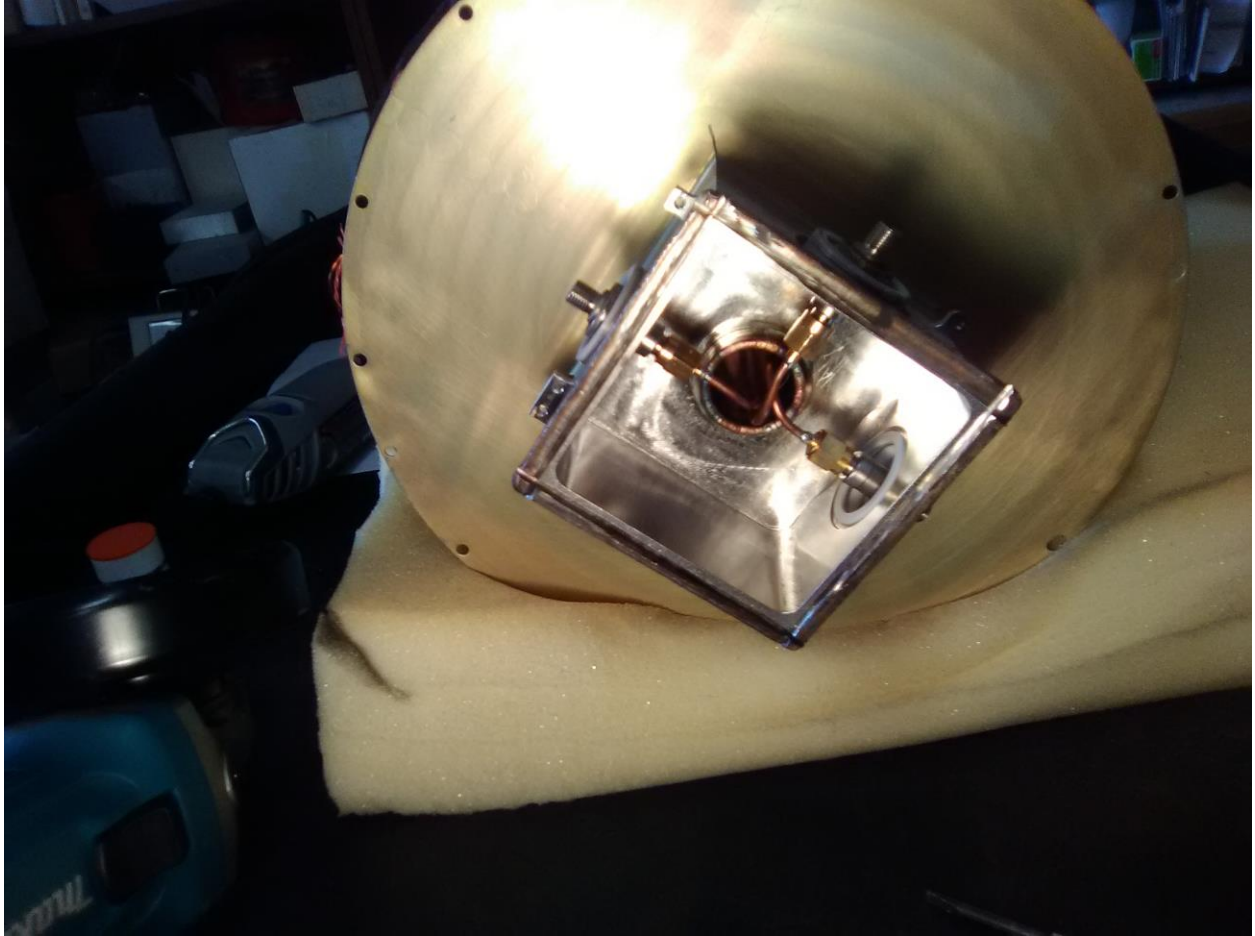
OUTER SHIELD REMOVED



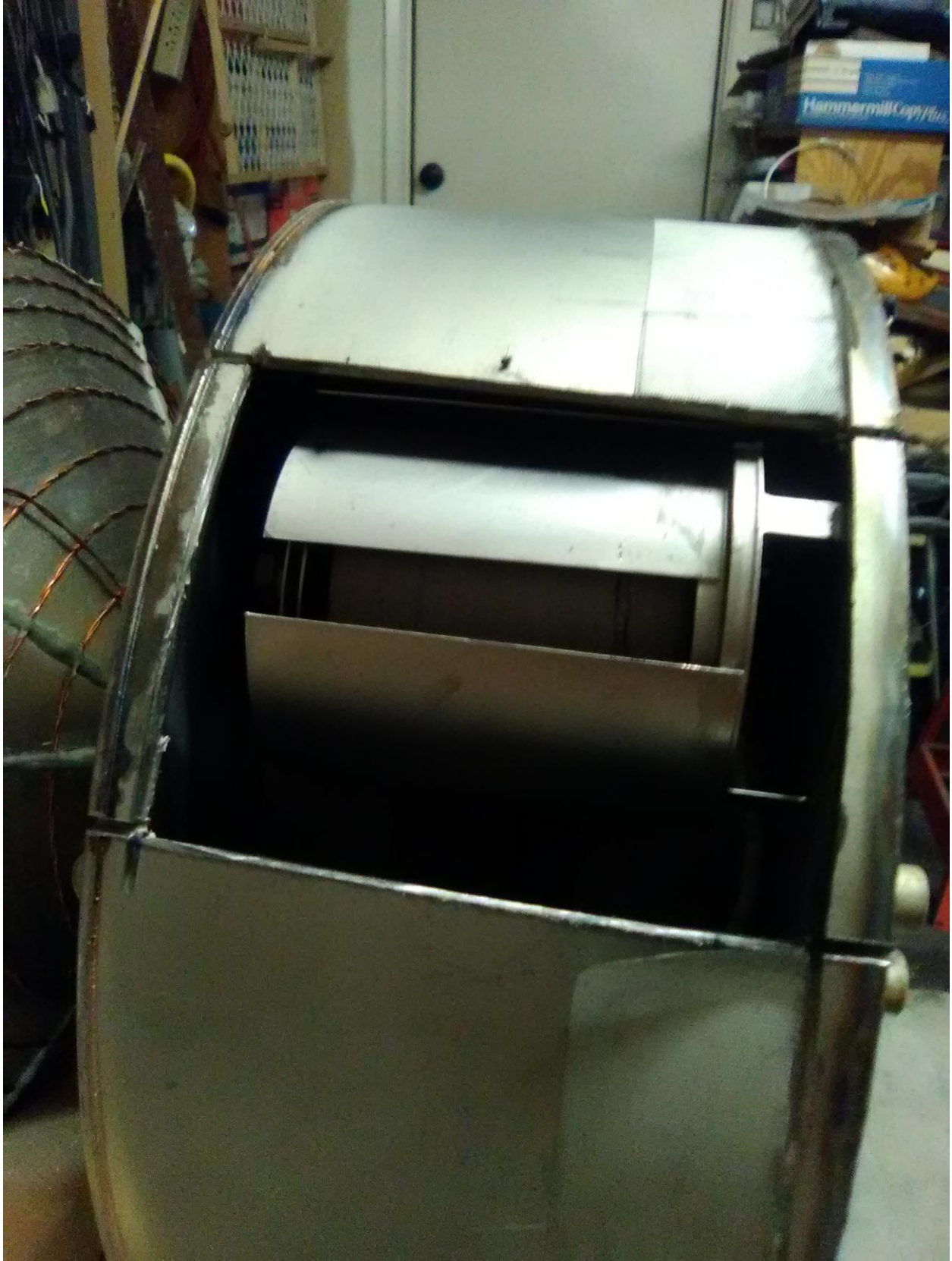
FIRST INSULATION LAYER



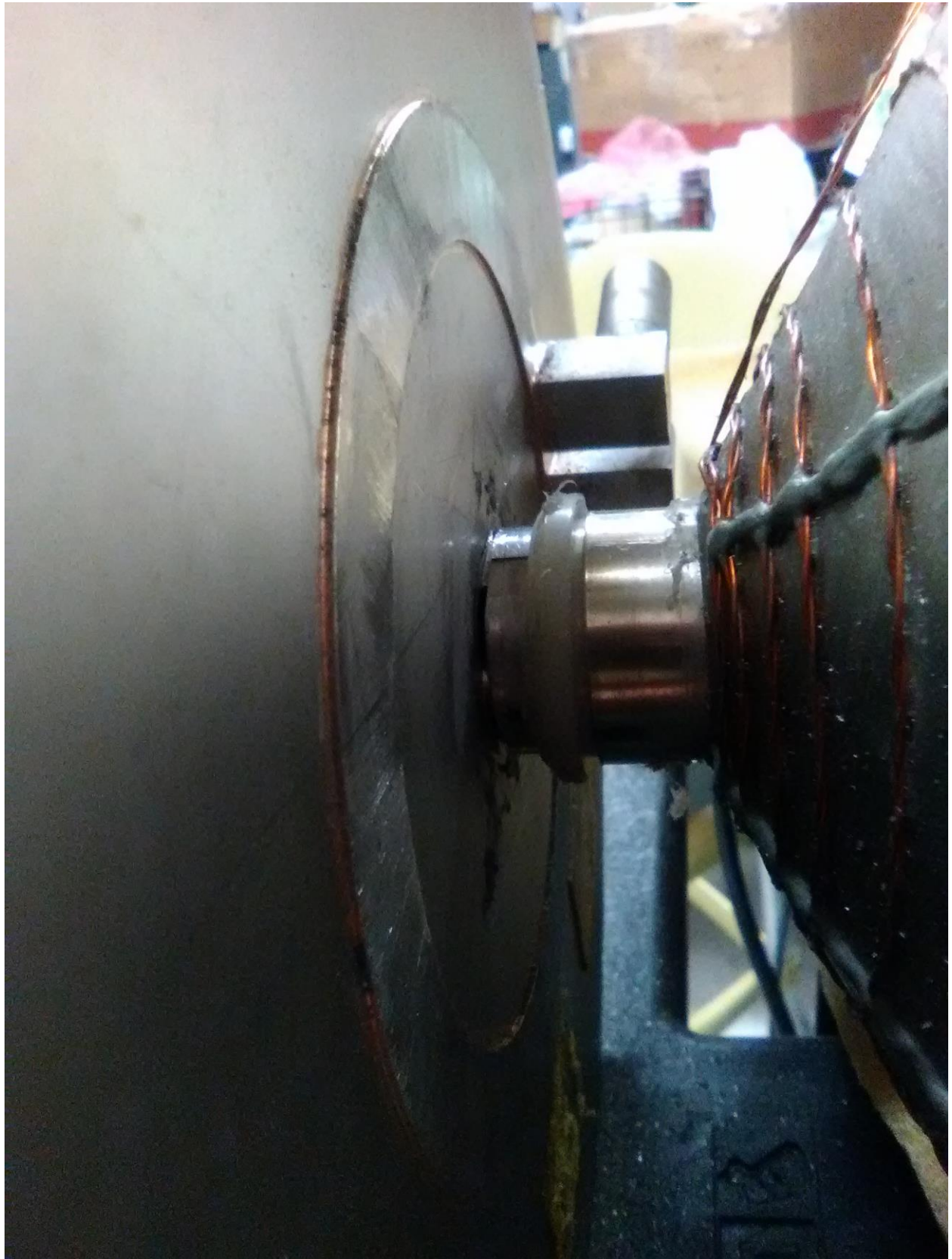
OUTER HEATER



RF BOX



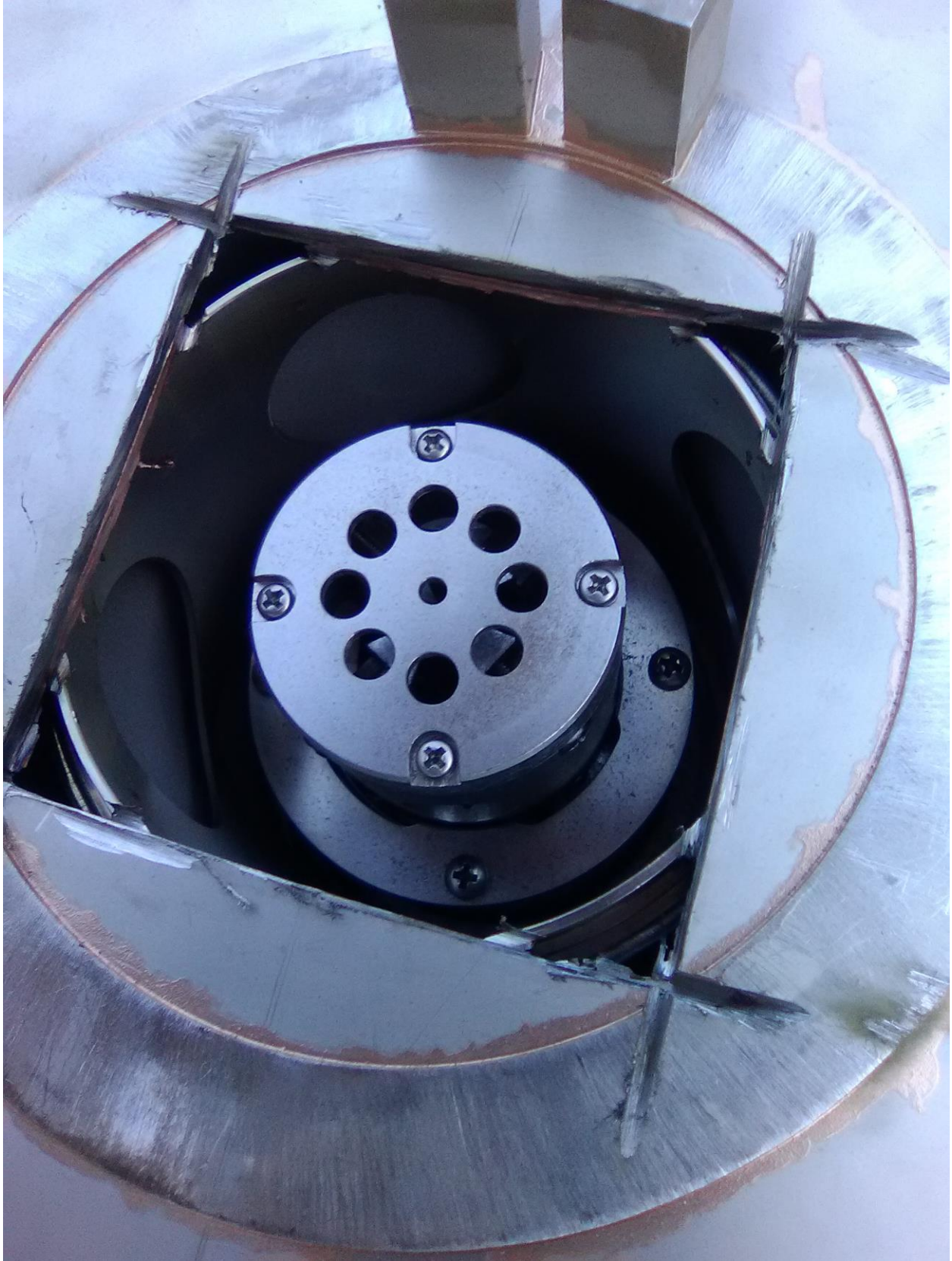
GETTER SLUG



NECK COIL REMOVED



STATE SELECTOR MAGNET VISIBLE



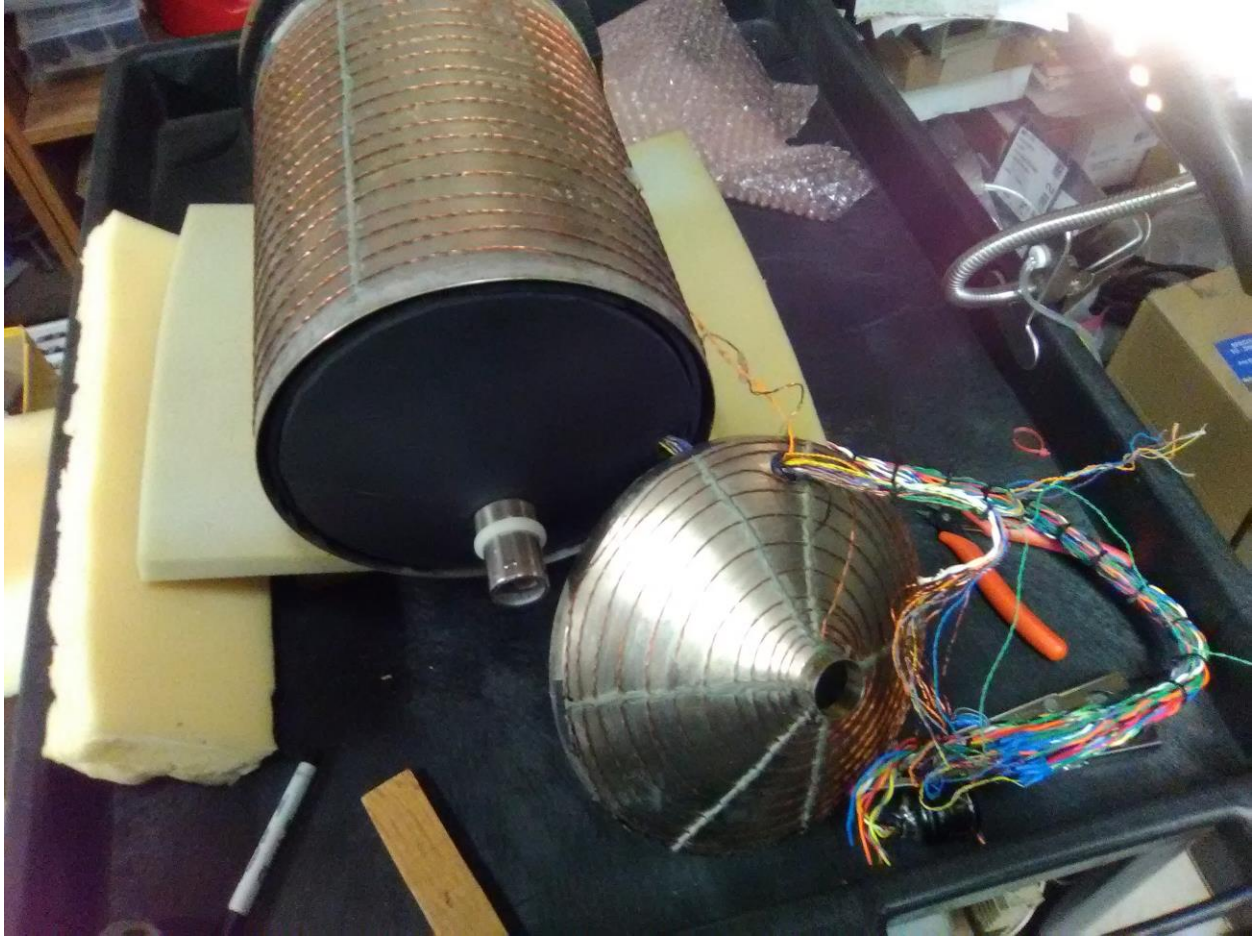
STATE SELECTOR MAGNET



DISSOCIATOR



DISSOCIATOR ORIFICE



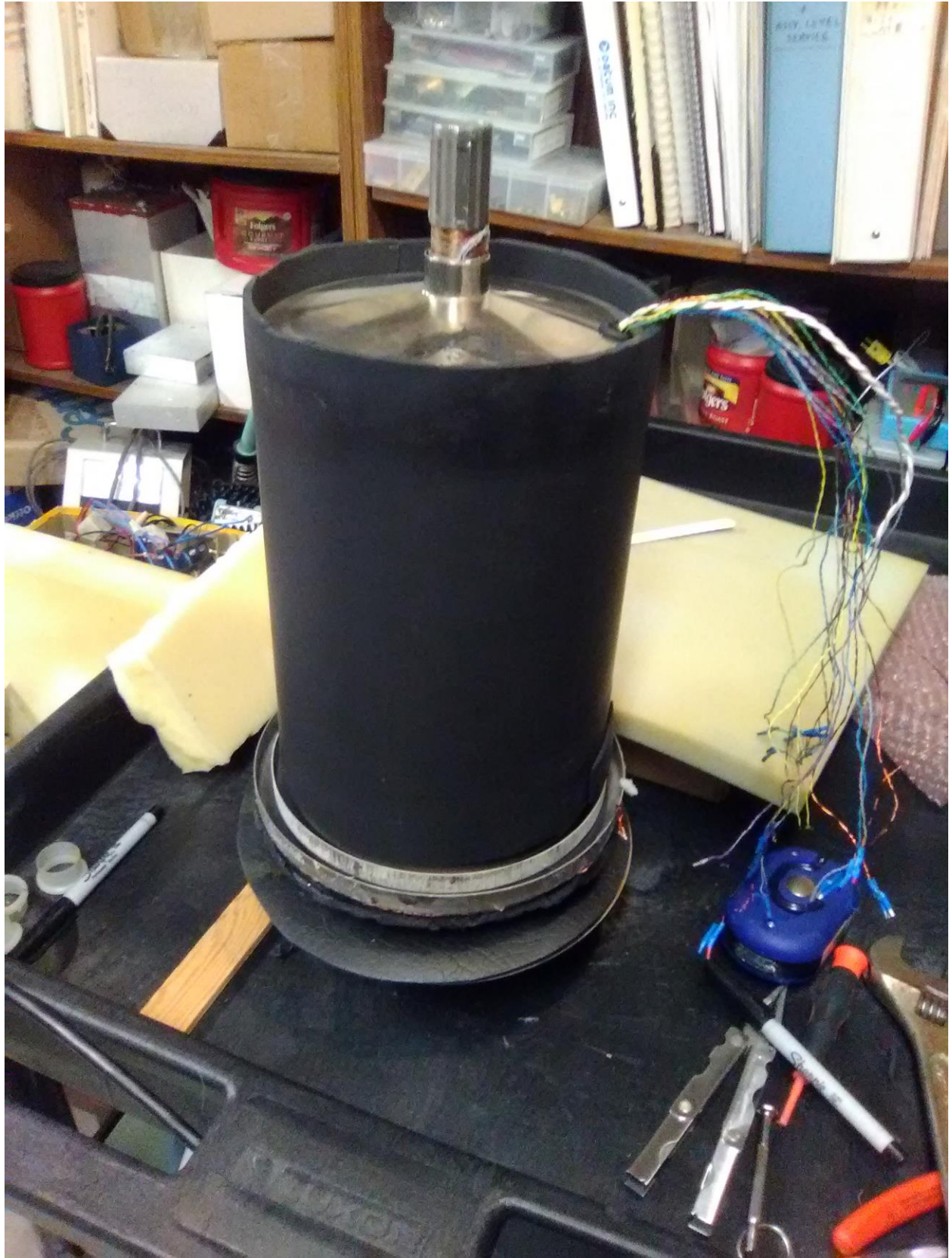
OUTER HEATER AND END CAP



OUTER HEATER AND END CAP



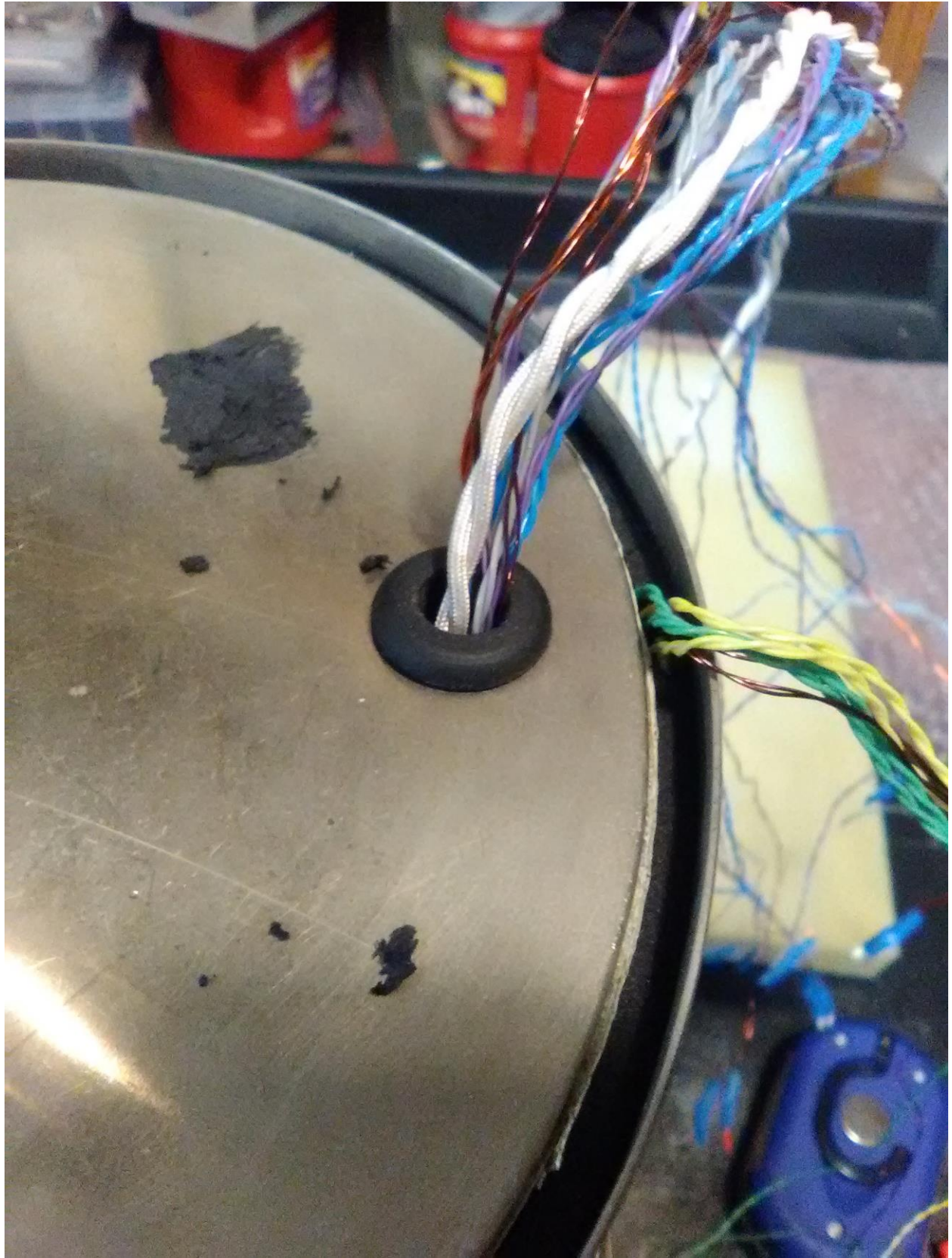
END HEATER



NEXT LAYER



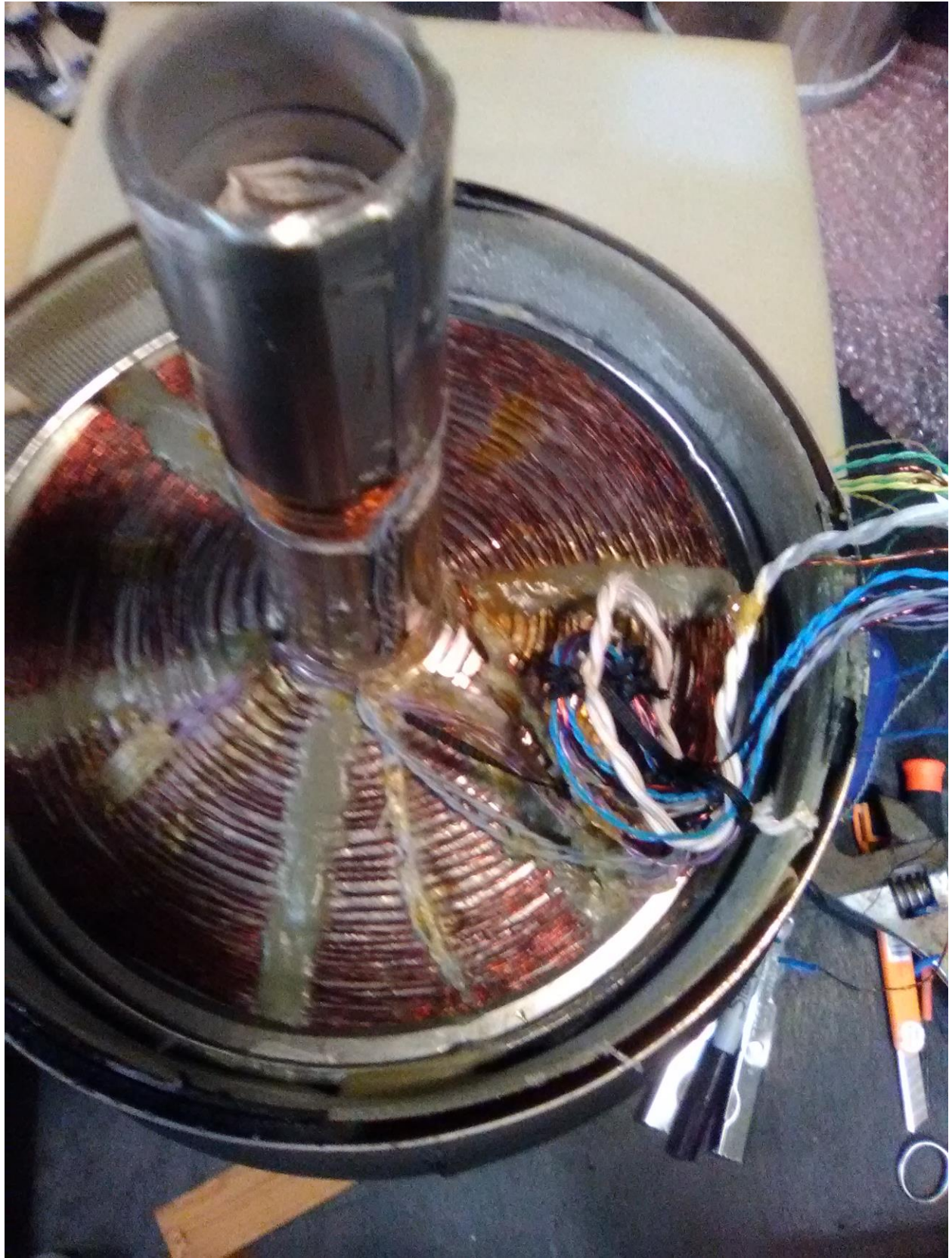
FINAL END CAP



WIRING DETAILS



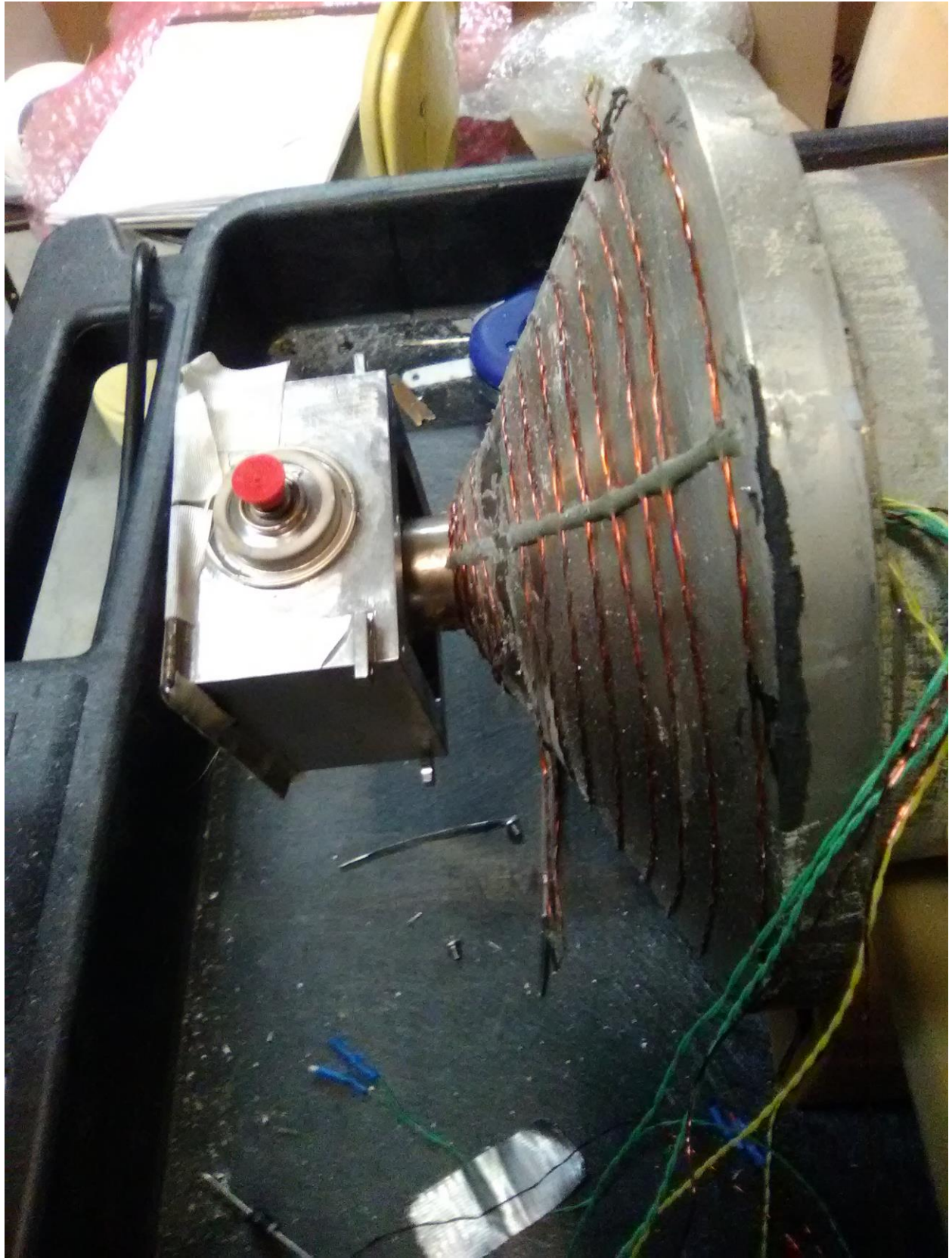
FINAL END CAP AND END HEATER



VACUUM ENVELOPE END HEATER



VACUUM ENVELOPE END HEATER AND LAST SHIELD



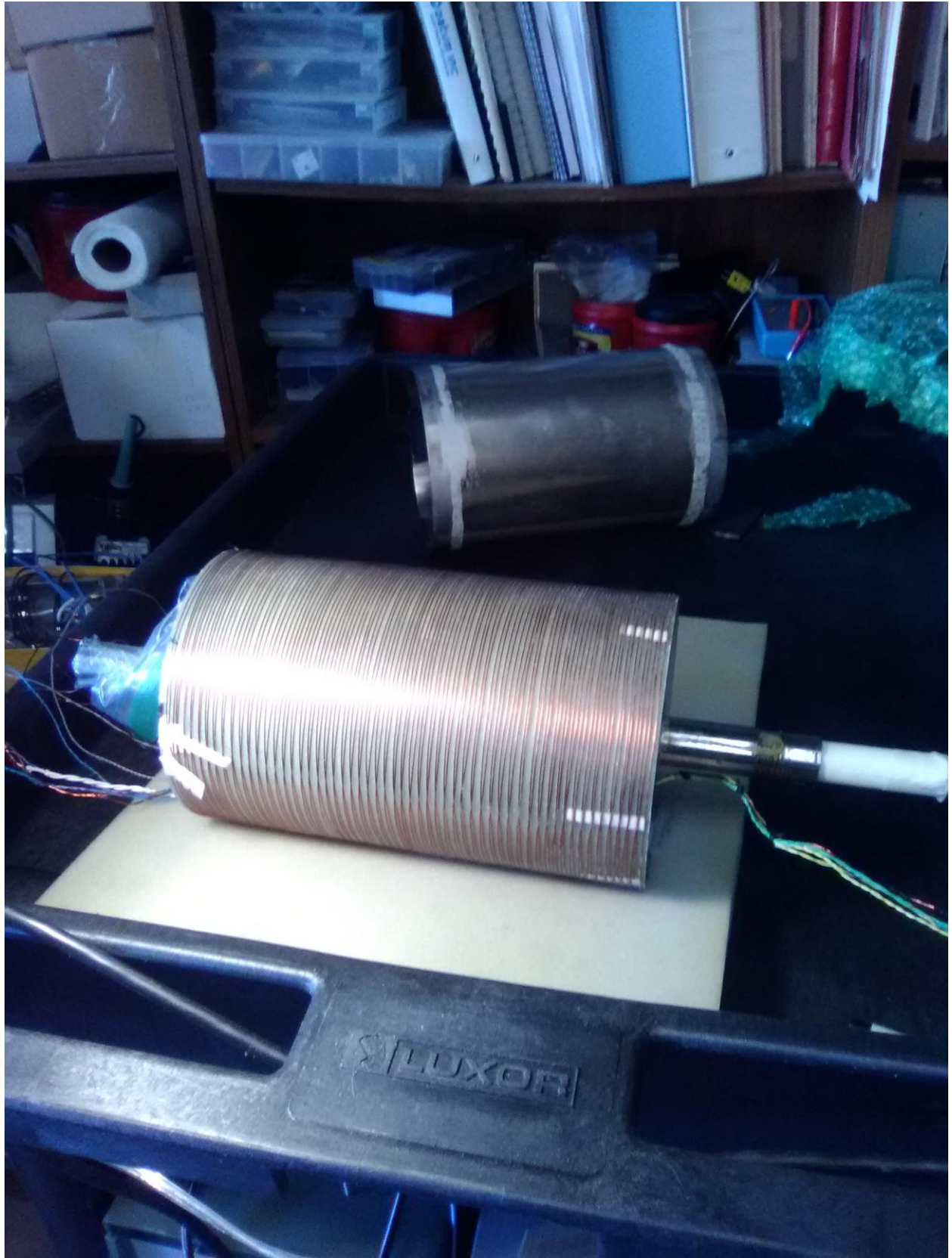
RF BOX END PRIOR TO CUT



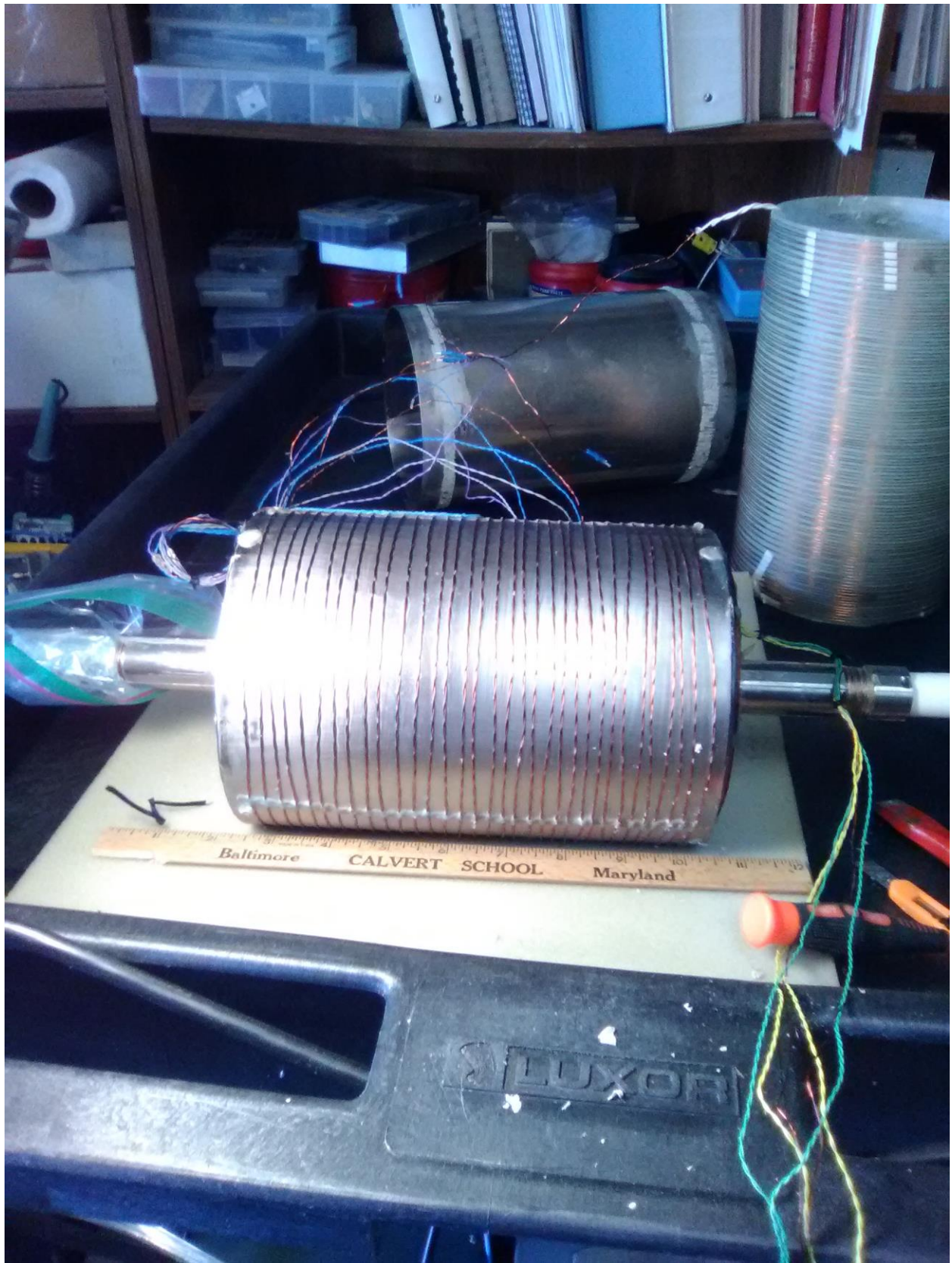
RF BOX SMA DISCONNECTED



VACUUM ENVELOPE END HEATER. SMA CABLES SHIELDED PRIOR TO CUT



RF BOX REMOVED. LAST SHIELD REMOVED. C-FIELD WINDING EXPOSED



C-FIELD WINDING REMOVED. VACUUM ENVELOPE AND ITS HEATER FULLY EXPOSED.



VACUUM ENVELOPE WELD

This went well and after a bit more cutting the state selector magnet assembly was removed intact.

The hope at this point is that if a new varactor can be installed the state selector and a new dissociator bulb can be mounted.

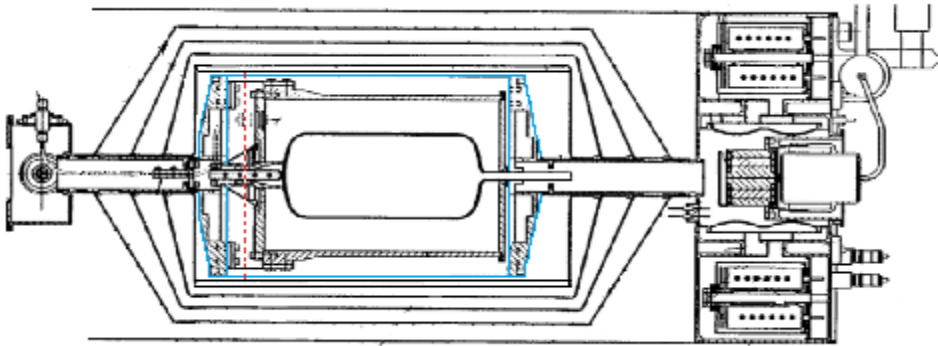
I also removed a "window" into the other end where the cavity input, output, and varactor SMA connectors mount.

Now came the "matrushka doll-like" disassembly to get to the actual cavity!

After cutting off the SMA mounting "box" I was able to remove the magnetic shield end caps and cylinders.

Now all that remains is to figure out the best way, and the best location to open up the vacuum envelope.

Update six will detail getting the vacuum envelope open to expose the cavity, and opening the cavity to see if the varactor can be replaced.



VACUUM ENVELOPE IN BLUE, PROPOSED CUT AT DOTTED RED LINE. SHOULD ALLOW CAVITY TO SLIDE OUT.

Details are not clear but it looks like (I HOPE) that the cavity is held onto the end plate of the vacuum enclosure with screws and also that the cavity end plate is also secured by screws. One reference says "cavity resonator is installed in the all Titanium vacuum chamber using Titanium leaf springs and Titanium screws."