PHENIX

How to make RPC chamber

Thalassa Sodre – Muhlenberg College

What we need to assemble the RPC chamber

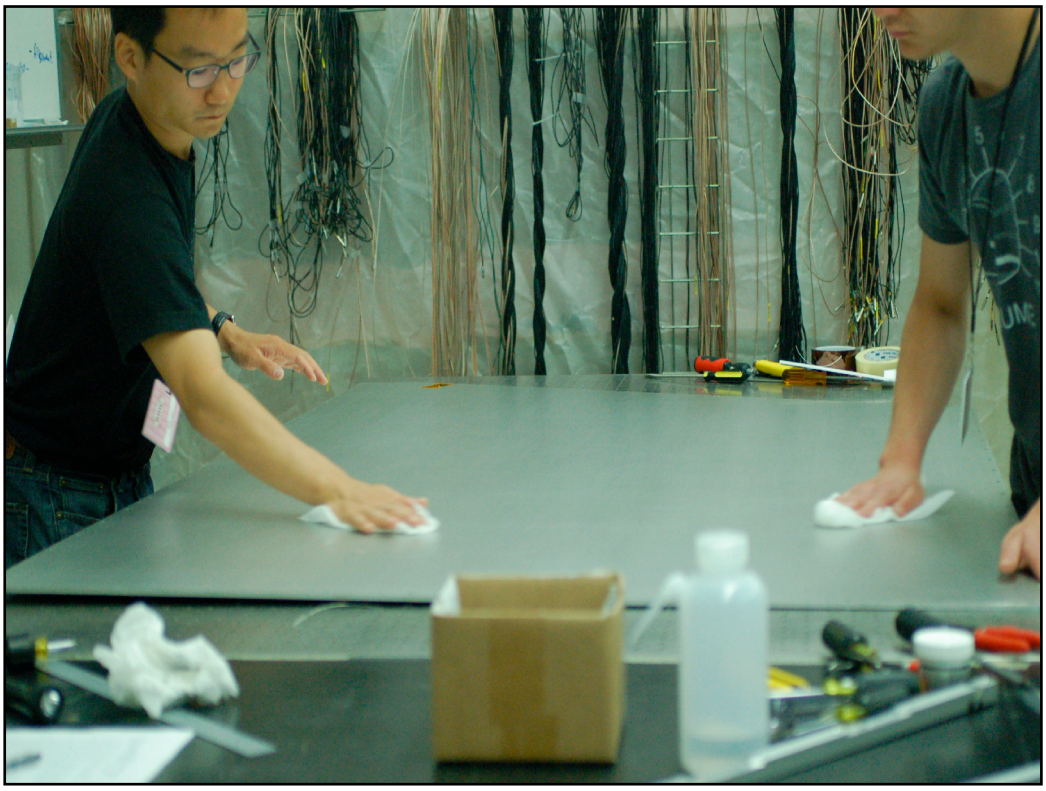
PHENIX

1. Copper foil♪
2. Mylar♪
3. HV and ground cables and connectors♪
4. Ground wire♪
5. Knife, Scissor, Wire stripper, crimper♪
6. Solder♪
7. Glove♪
8. Copper tape, Kapton tape♪
9. Screw driver♪
10. Bolts, nuts♪
11. Shrink wrap♪
12. Gas tubes♪

PHENIX

Cautions

The copper foil is thick and sharp so that ♪
it's not easy to treat.♪
Always be careful not to cut your finger.♪
(recommend the glove)♪



All materials including the bolts, side bars and plates should b e cleaned with alcohol.♪

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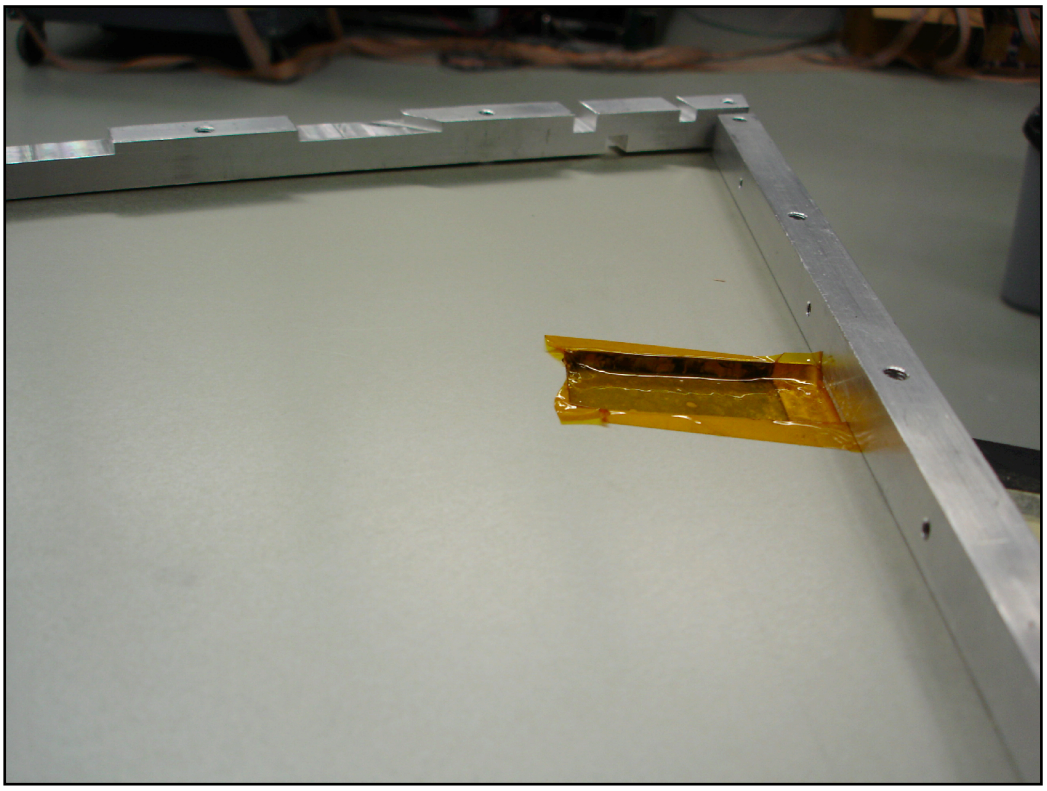
Photo © Thalassa Sodre♪



The slot for the high voltage (HV) connector on the RPC should be cover ed with kapton tape. This needs to be completed before the side bars a re reattached.♪

Screw back in the octant and half octant side bars. The other two shoul d only be screwed in at the ends since they will be shortly removed.♪

♪

Clean the appropriate mylar sheet. Use pressurized air to clean the casin g of all dust. The mylar sheet should fit snugly inside the casing. Cut tw o slits on the long side of the HV connector, and the short side furthest f rom the sidebar, so that the mylar can be pushed into the slot. ♪

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Photo © Thalassa Sodre♪

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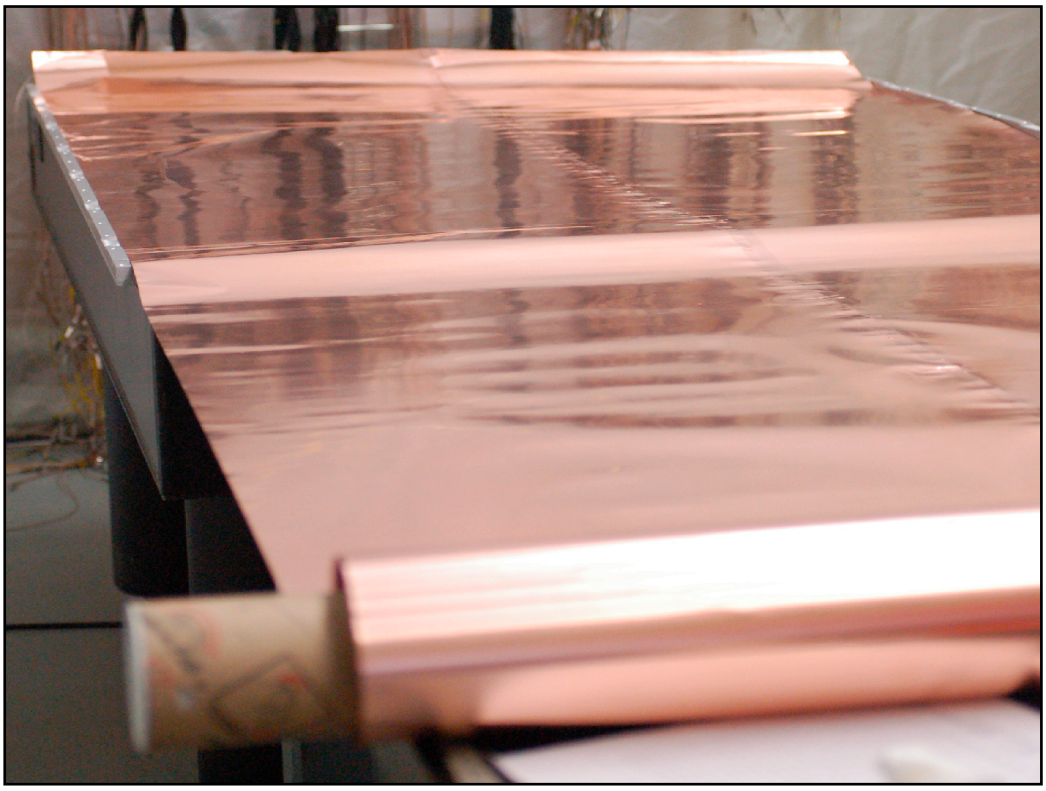

Over the mylar, place the precut/pretaped copper sheet. Line up the octa nt side of the casing with the copper foil (there should be about 3 inches of excess copper that overhangs the casing). There should be enough c opper so that it can be folded back on the gas gap completely sandwichi ng it. ♪

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Photo © Thalassa Sodre♪

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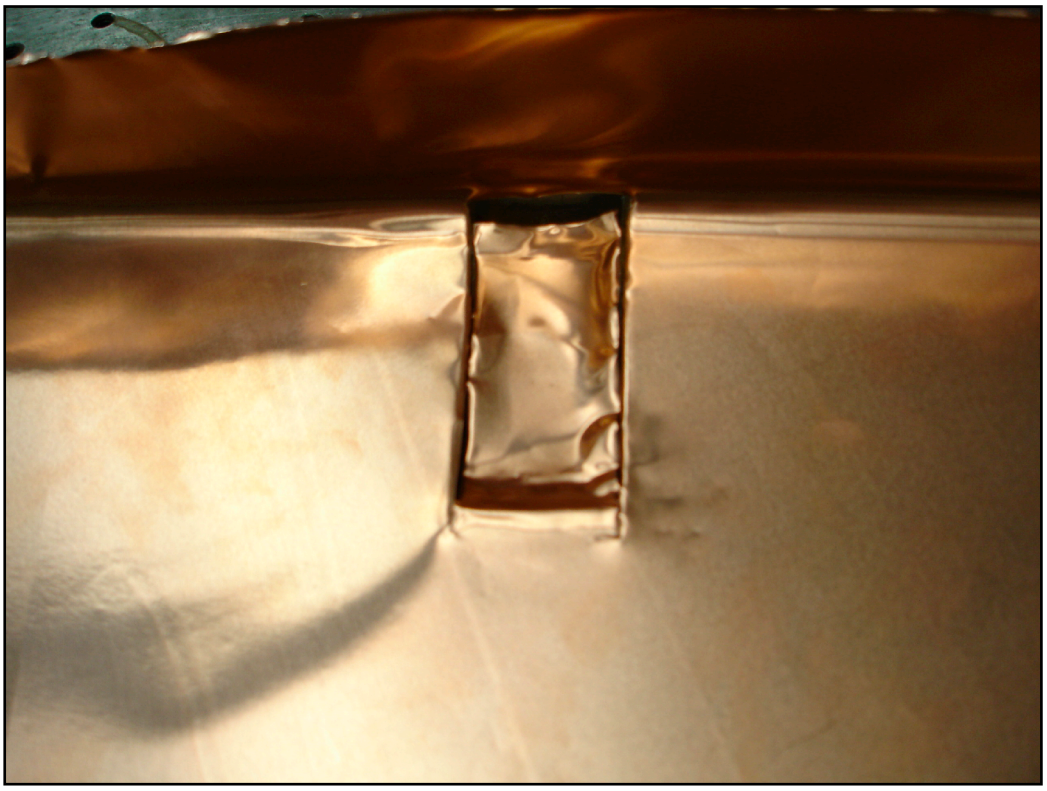

Mark where the HV slot is on the copper, and cut the foil. Cut the two lon g sides, then the side against the octant side bar. Push the cut copper f oil into the HV slot. Be careful not to cut your finger.♪

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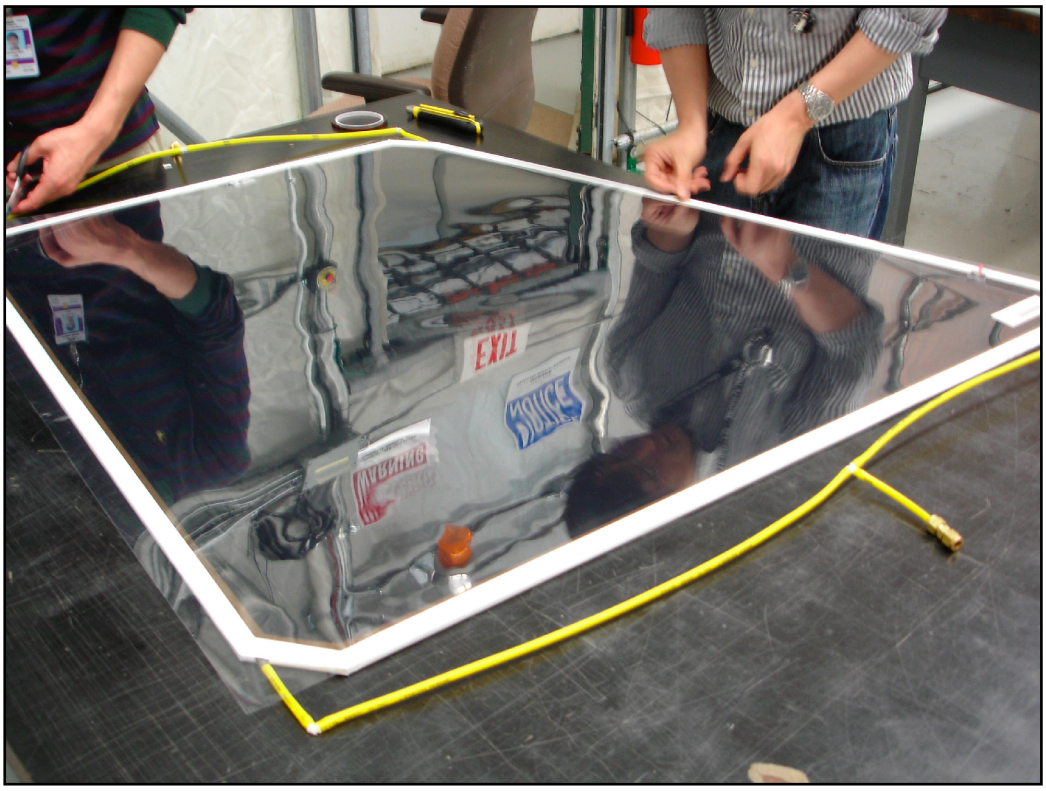

Remove plastic cover of lower gas gap – any barcodes or other stickers should be removed, recorded, and kept at another location. Fit the appr opriate mylar sheet on the gas gap and tape with kapton (ensure the pro per side of the gas gap has mylar). The mylar sheet should fit about half way on the white tape bordering the gas gap. Slits should be cut on the two long sides of the HV connector.♪

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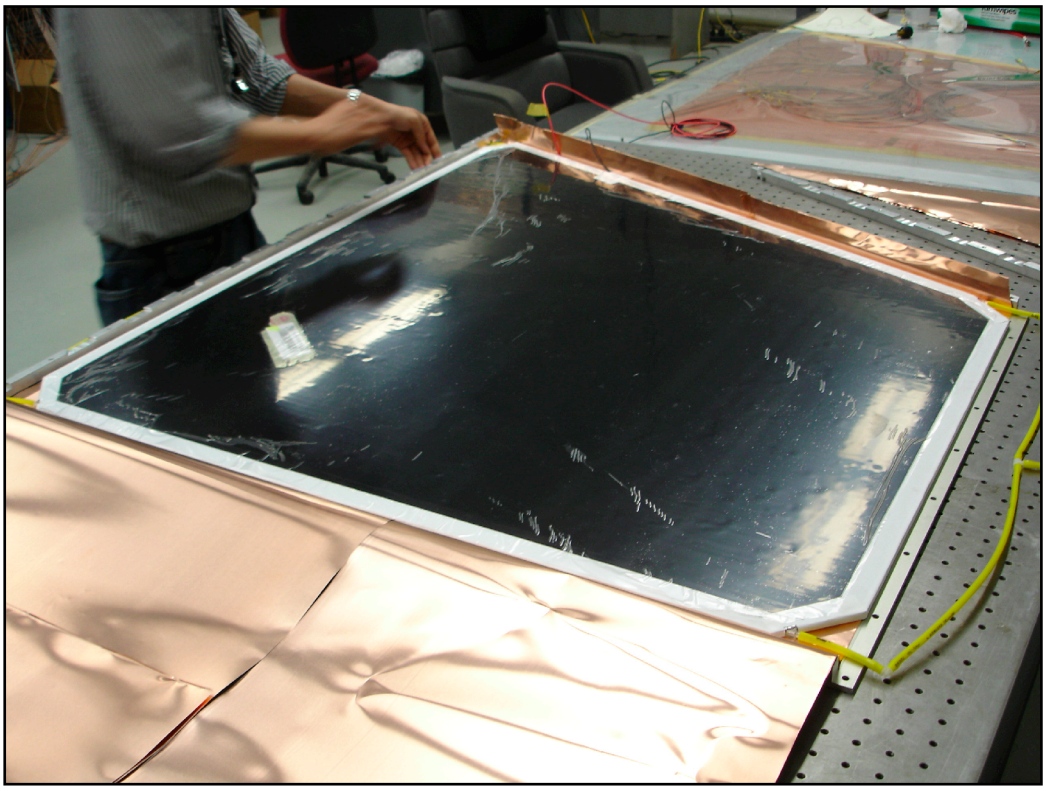

Flip the gas gap into place so that the mylar sits between the gas gap an d the copper foil. ♪

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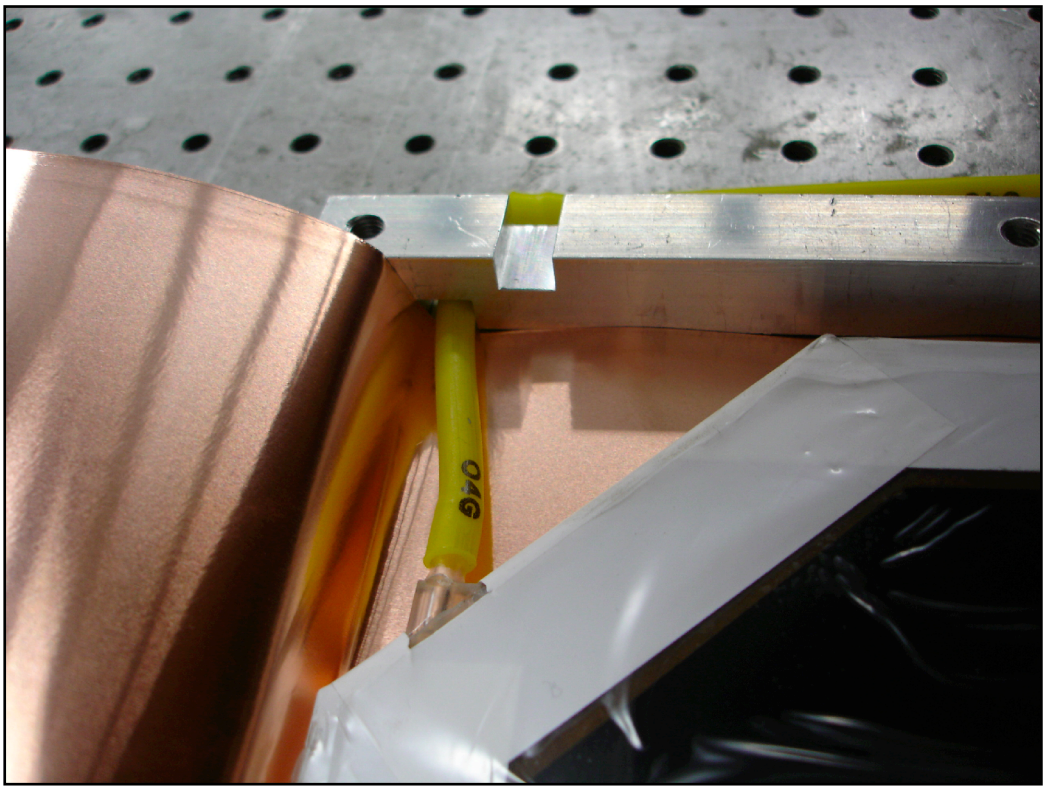

The gas piece is easy to break! Remove the inner and outer radial sides. Using a heat gun heat up one end of a 6 in. gas tube so that It will slide on easily. You need to slightly bend the gas tube to match with the hole of the frame bar. Bend the tube to the appropriate direction while placin g the sidebar into its position.♪

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Photo © Thalassa Sodre♪

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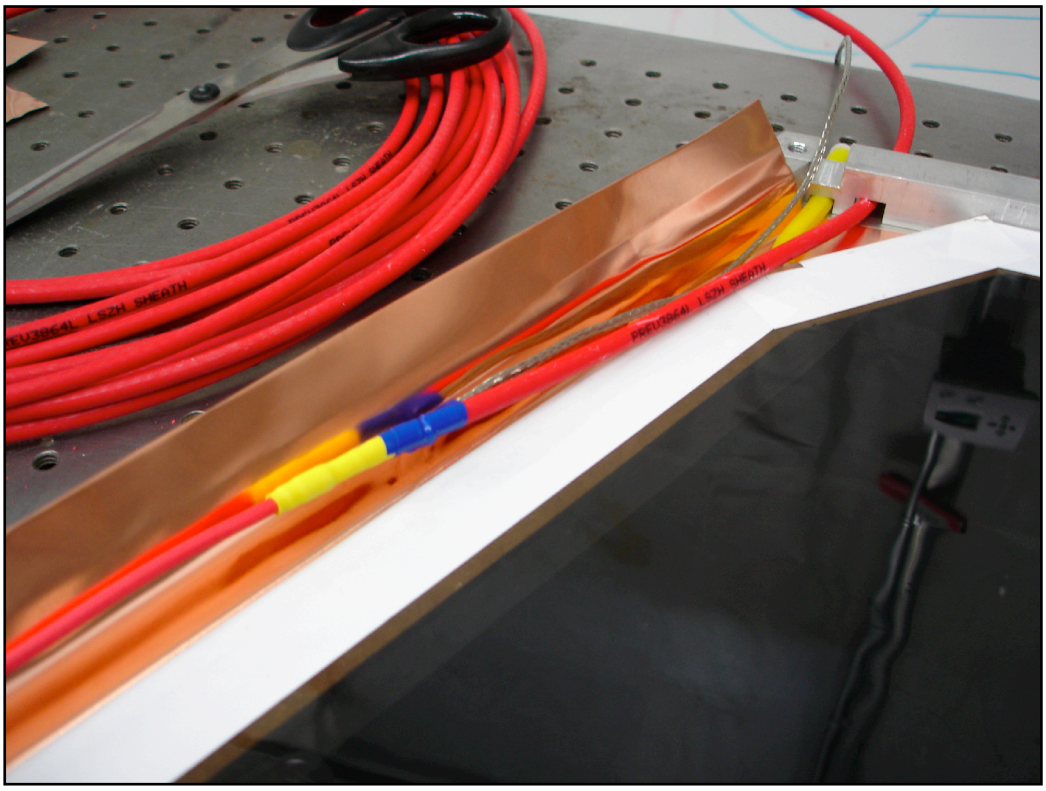

High voltage has a bulk head connector and must have sufficient length outside the chamber.♪

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TOTAL LENGTH of HV wire APPROX. (350 cm) ♪

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The black gas gap wire is directed towards the outer radial side and looped back behind the copper to the 2nd small hole. Run the red gas gap wire towards the inner radial side. If the red wire is too long, cut approximately where the yellow and blue shrink wrap meet (as seen above). Place the HV cable at the end of the red gas gap wire. Loop the HV cable around the copper to the third small hole on the octant sidebar. This is where the cable should be stripped to – exposing the braid. Pull the inside of the wire out from the braid and remove the shiny foil. Cut most of the exposed wire leaving 2 cm extra from where the braid begins. Strip about 1 cm of the last layer of insulation exposing the inner wire. Expose about 2 cm of the red gas gap wire.♪

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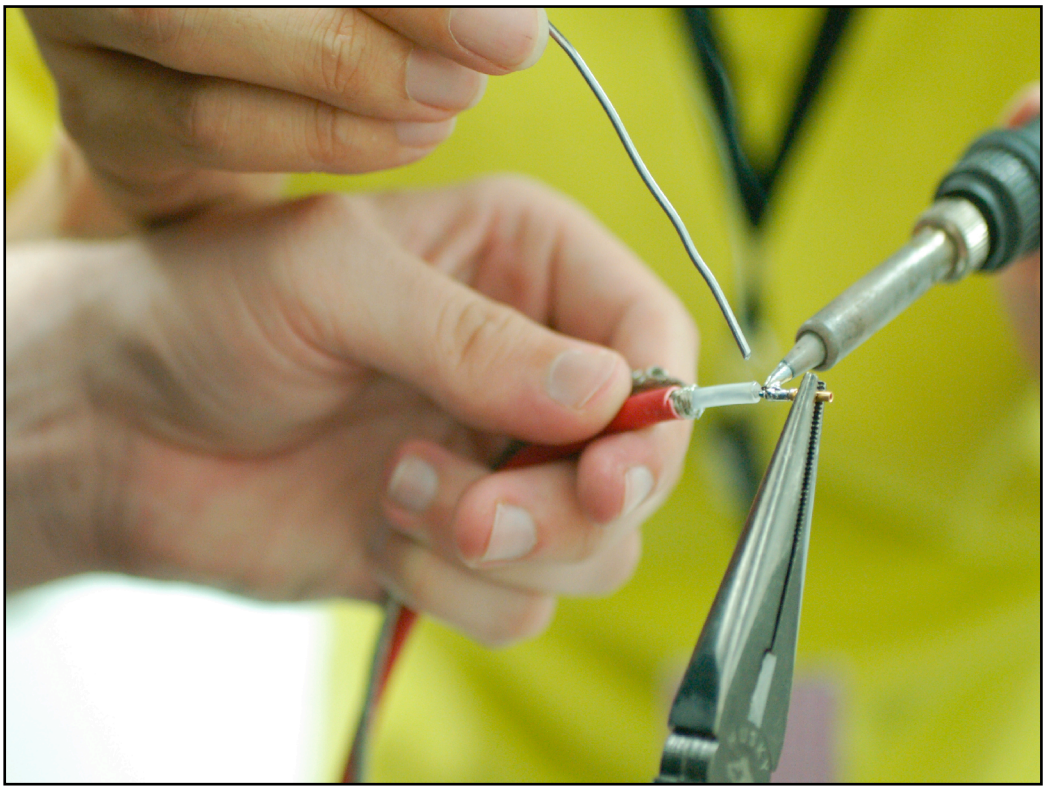

Slip on 3 separate sizes of shrink wrap. Solder one wire into a copper p in.♪

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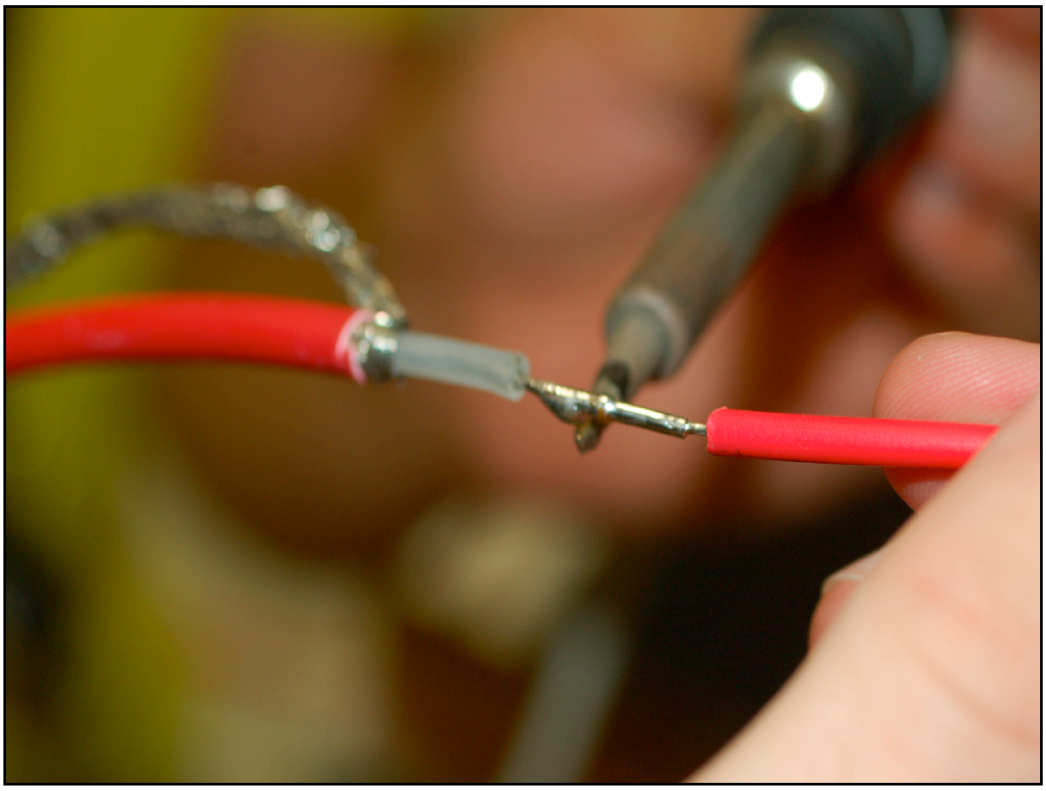
Photo © Thalassa Sodre♪



Solder the other wire.♪

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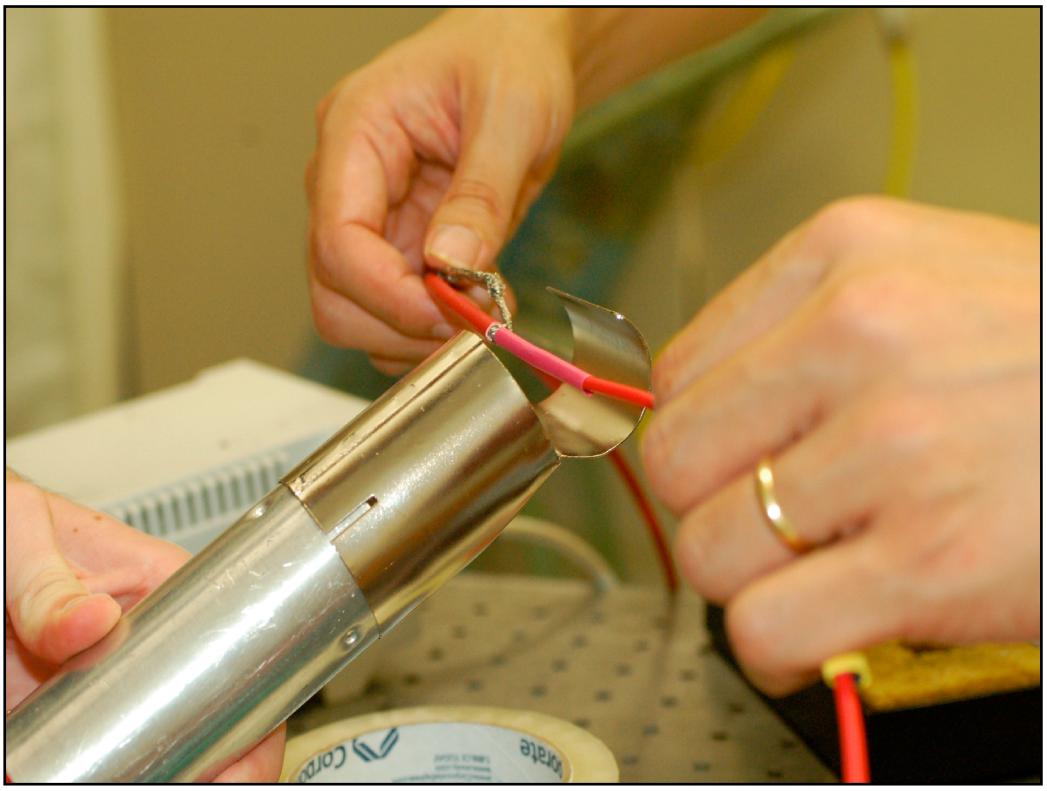

Use a heat gun to melt the shrink wrap in place. Use electrical tape if ne eded.♪

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Place the HV cable through the appropriate hole (smaller hole from botto m) and double back the braid behind the copper. The braid must be abl e to reach the third small hole. The cable should come about 210 cm ou tside of the chamber. Screw in sidebars.♪

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Photo © Thalassa Sodre♪

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Once all use of the soldering iron and heat gun are finished, remove any plastic or stickers on gas gap. Clean with alcohol. ♪

Place spacing tubes parallel on the outer and inner radial sides. Use as many as necessary to ensure all the components are snug inside the cas ing.♪

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Photo © Thalassa Sodre♪

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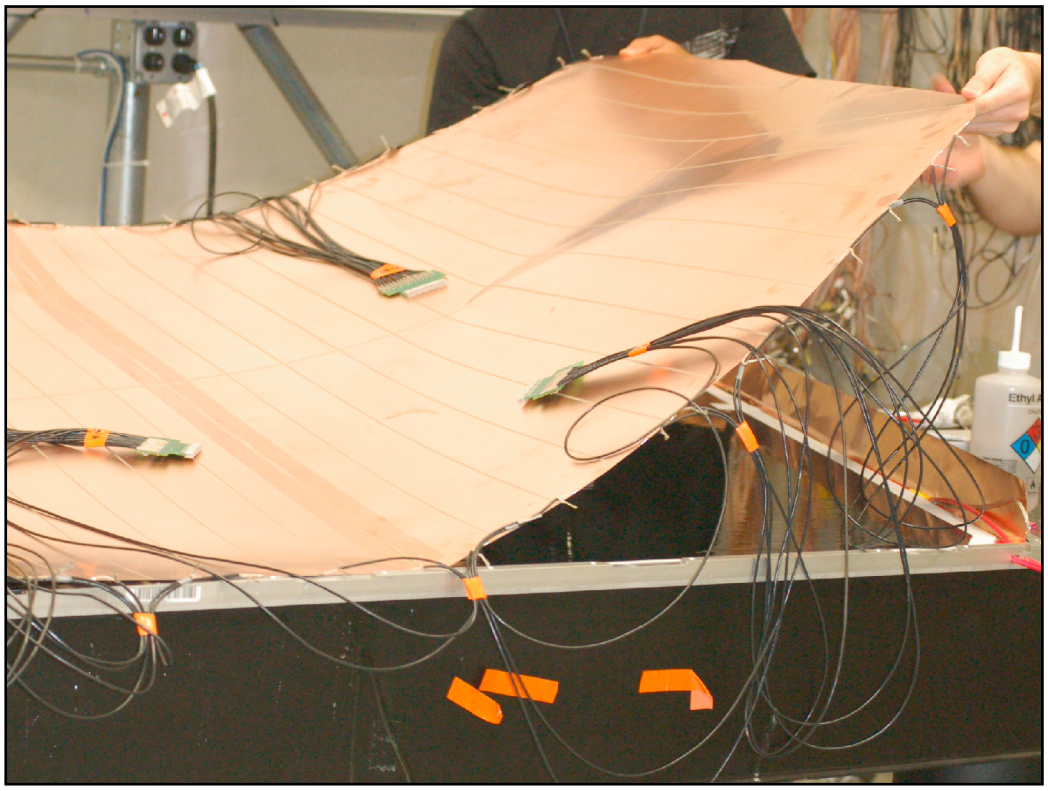

Place the signal strip on the RPC gap. Direct all the transition board wire s to the appropriate holes. Ensure there are three long strips on either si de of the plane. If they are not, strip the laminate and use mid-size cop per tape to connect the top/bottom of the appropriate strips to create a s trip that goes nearly the entire height's length. ♪

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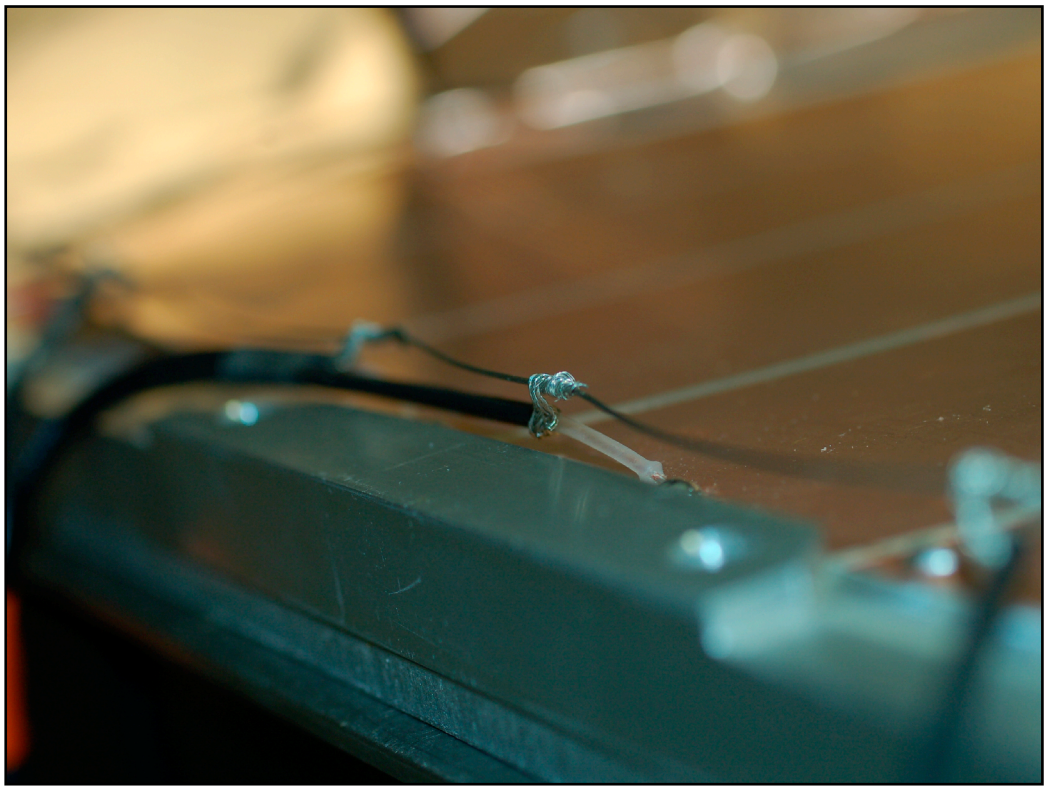

run steel wires from the second small hole on the octant sidebar from the outer and inner radial sides respectively. Run down both the outer and inner radial sides to the half octant sidebar. Wrap the braids of the signal wires around the steel wire (as seen above) and solder in place. Leave about 6 cm extra on the half octant side. Use kapton tape to ensure braids will not touch the signal plane when pushed down by the next gas gap.♪

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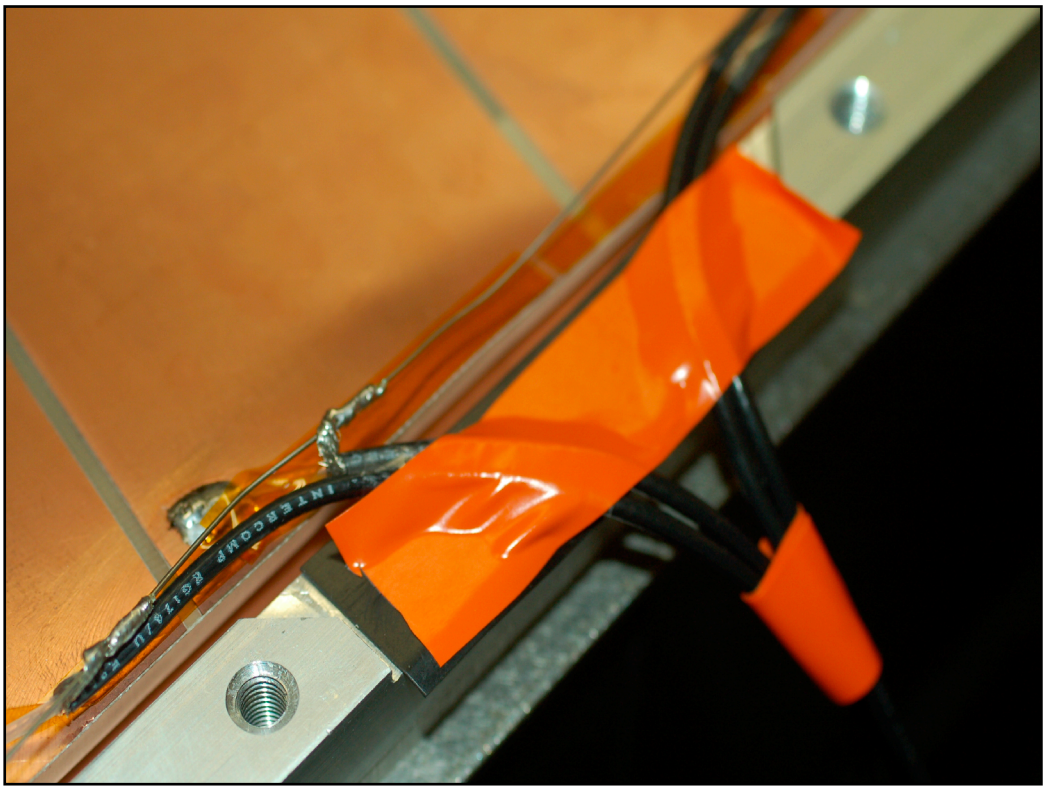

Use strain relief and electrical tape on the transition board wires – make sure all wires lay flat and inside grooves.♪

Clean the read out plane with alcohol and use pressurized air to expel all debris. ♪

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Photo © Thalassa Sodre♪

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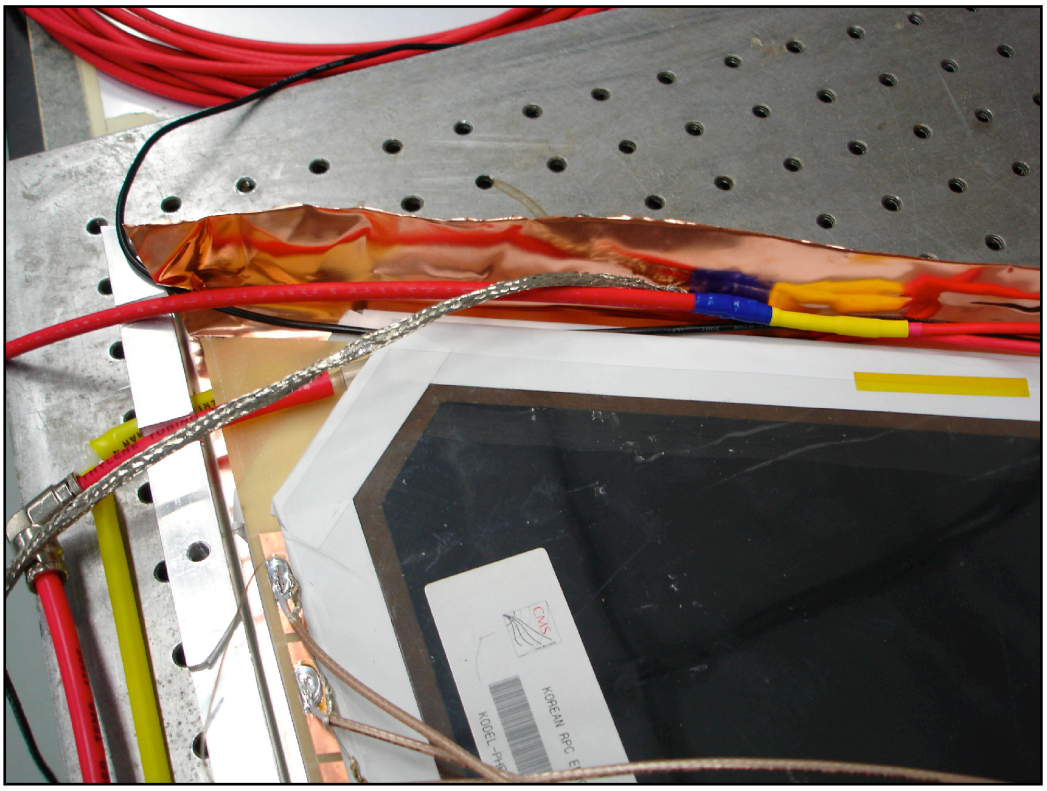

After removing the plastic from the appropriate side and cleaning, place t he upper gap on top of the readout plane. Slide on gas tubes with the sa me method as the lower gap (slide 11). Run this strip's red and black ga s gap wires toward the outer radial side. Ensure the braid can loop from t he end of the red gas gap wire to the fourth small hole from the outer rad ial side – this is the length of the braid. Also, ensure that from the exit p oint of the HV cable, there is enough length to double back across the o ctant side, plus approximately 100+ cm. Separate the inner HV cable fro m the braid. Leave only 2 cm of the inner cable from where the braid be gins and strip down 1 cm to the inner wire. Connect the red wire and HV wire with a copper pin, solder, and 3 sizes of shrink wrap (as seen abov e). Run the HV wire through the smaller hole from the top (as seen abov e). Ensure braid can double back behind the copper and reach the fourth small hole.♪

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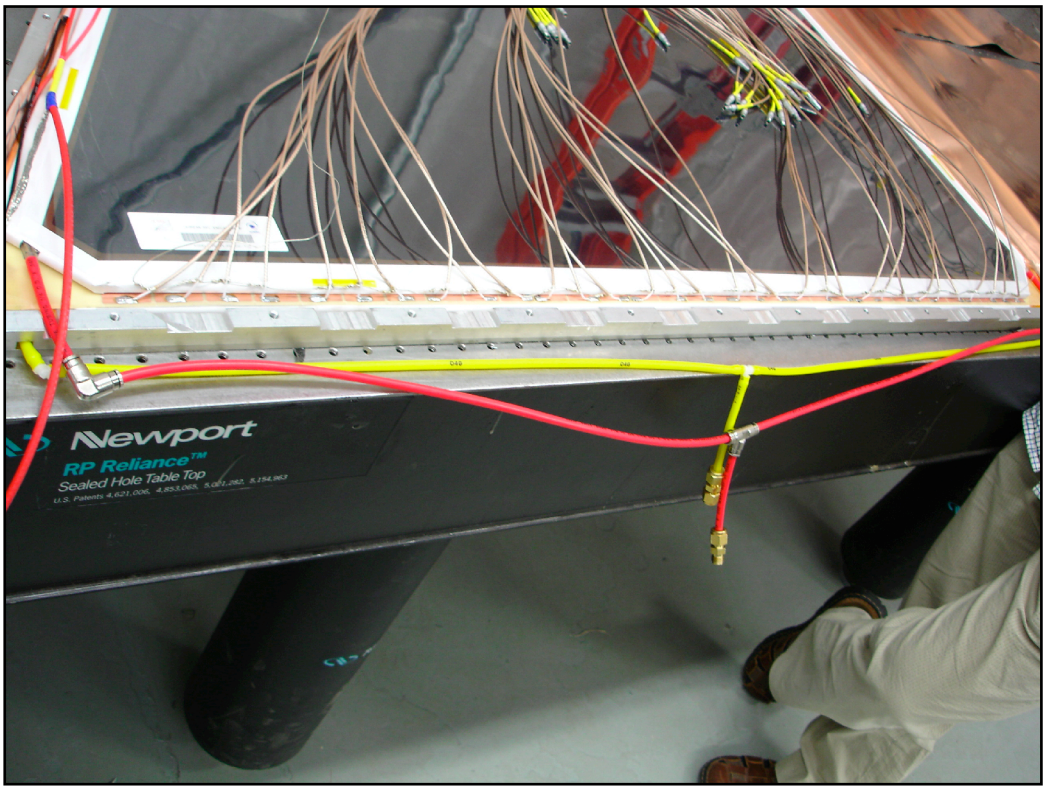

After all work to do with soldering and heat guns is done, remove any pla stic or stickers from the gas gap. Clean with alcohol. ♪

Also, clean the appropriate mylar sheet – tape the mylar to the gas gap a fter cutting corners and the two long sides of HV connector.♪

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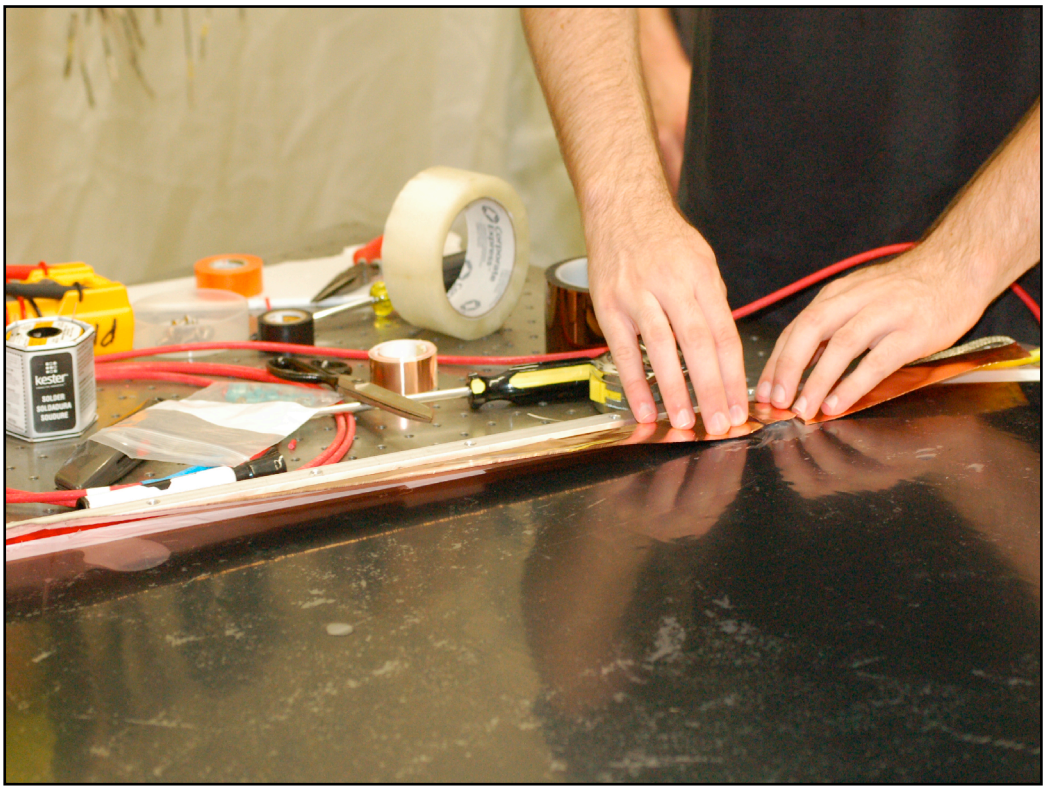

Squeeze foam between the upper gas gap and the sidebars to ensure a t ight fit – about a foot between every foam piece. ♪

Trim excess foil so that it can fold back down on the gas gap without int erfering with the casing.♪

Make sure the casing top's HV slot will fall directly on the HV connector. Cut two strips along side the red HV connector to the gas gap on the ex cess foil (octant side). ♪

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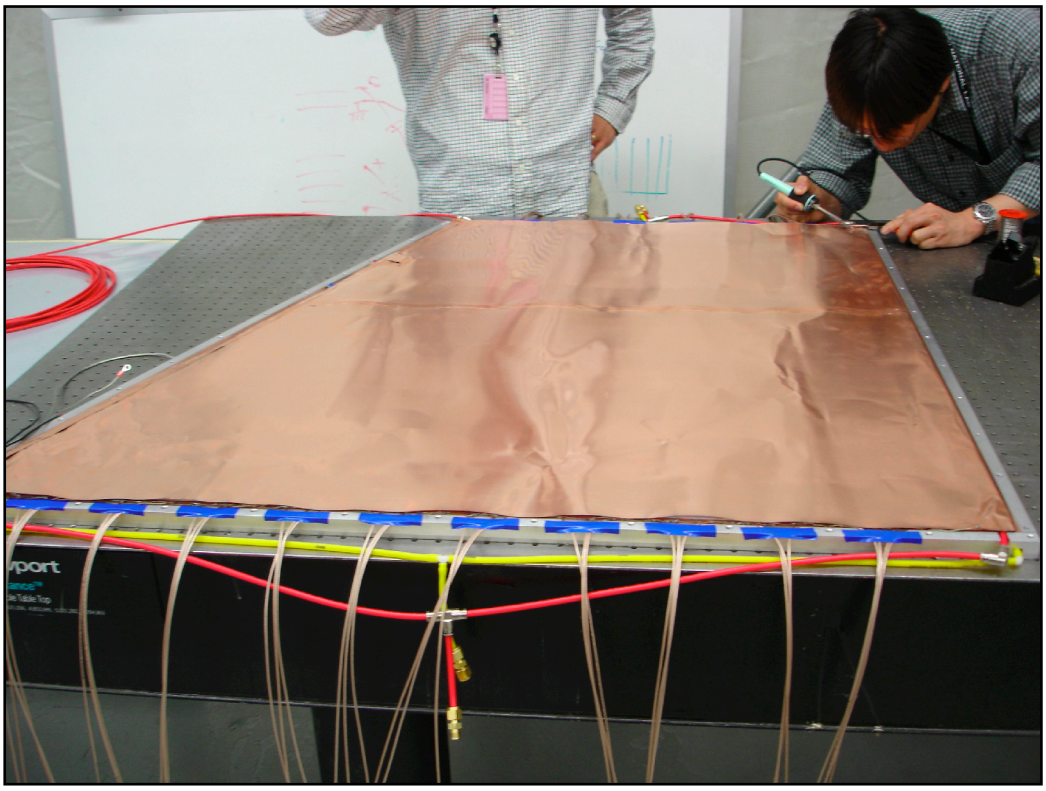
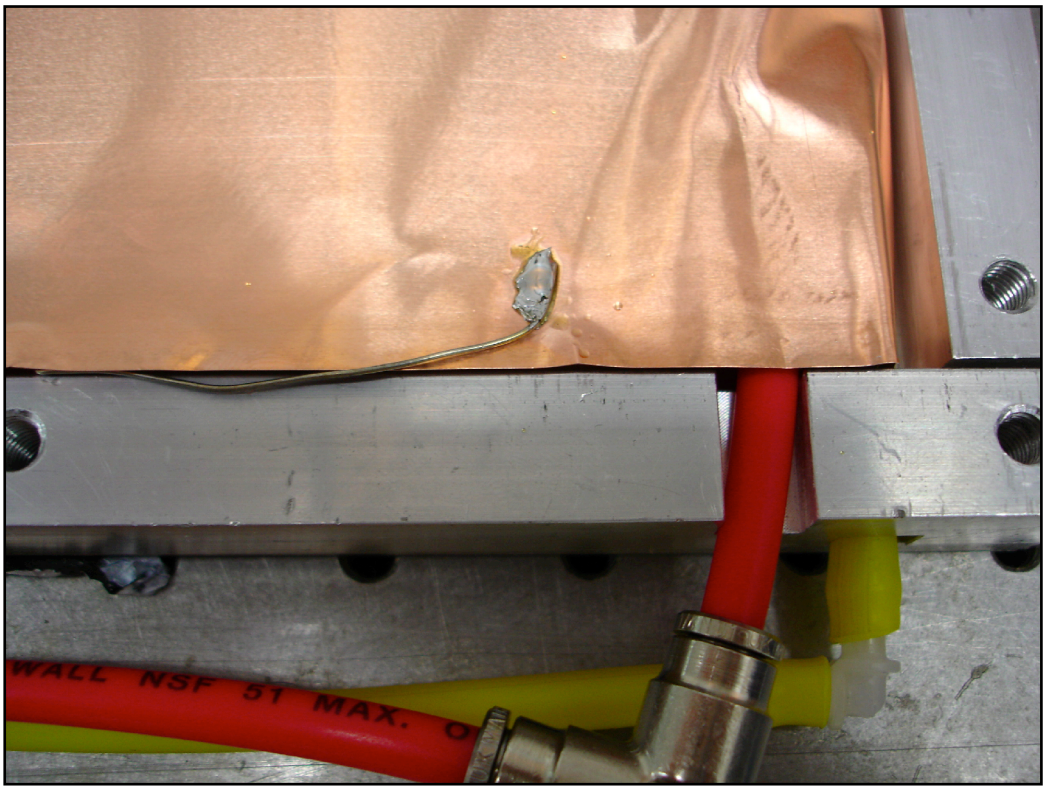


Fold copper back and trim excess so that copper fits inside casing.♪
Secure all folds with copper tape. ♪

Photo © Thalassa Sodre♪



Solder the ends of the steel wires (near the half octant side) to the copp
er.♪

Do not solder over gas tubes!♪

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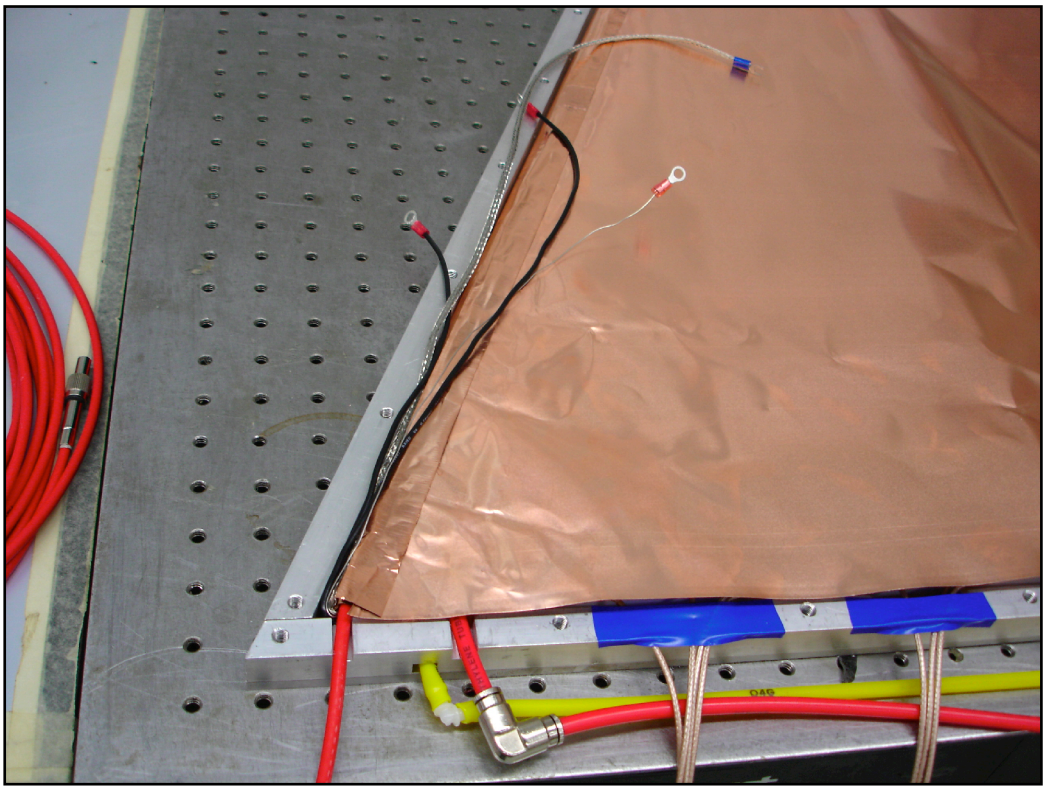
Photo © Thalassa Sodre♪



From the outer radial side:♪

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The steel ground cable should be cut at the second small hole on the oct ant side. Fold the end back on itself, then add the terminal ring and crim p. Bolt to second hole. ♪

The two black signal cables must be cut at the third and fourth small hole s on the octant side. Trim the insulation back less than a cm, add the ter minal ring and crimp. Bolt one to the third small hole, and the other the f ourth. ♪

The braid is cut at the fifth small hole. Add the terminal ring, and crimp. Bolt the braid to the fifth hole.♪

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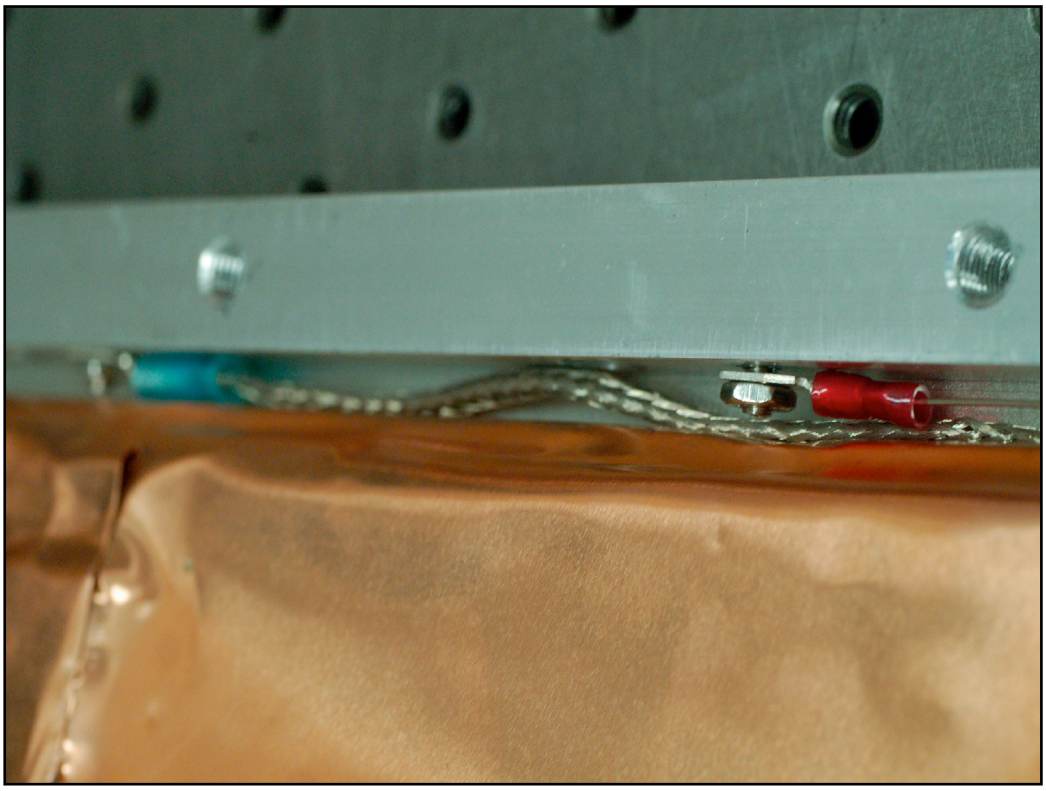

Example of bolting the terminal rings to the module♪
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Photo © Thalassa Sodre♪
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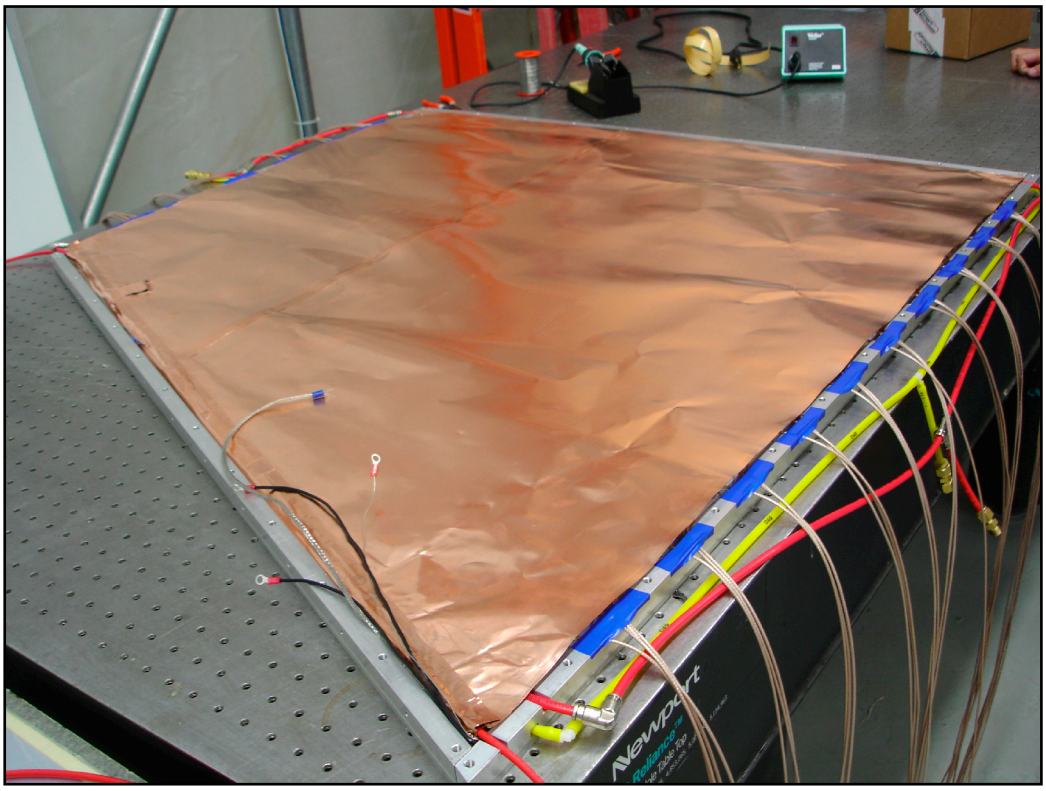

From the inner radial side:♪

♪

The steel wire is cut at the second small hole. The end is looped back a cm, and crimped to the terminal ring. Bolt the steel wire to the second s mall hole. ♪

The braid is bolted to the third small hole. ♪

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Photo © Byungil Kim - Korea University

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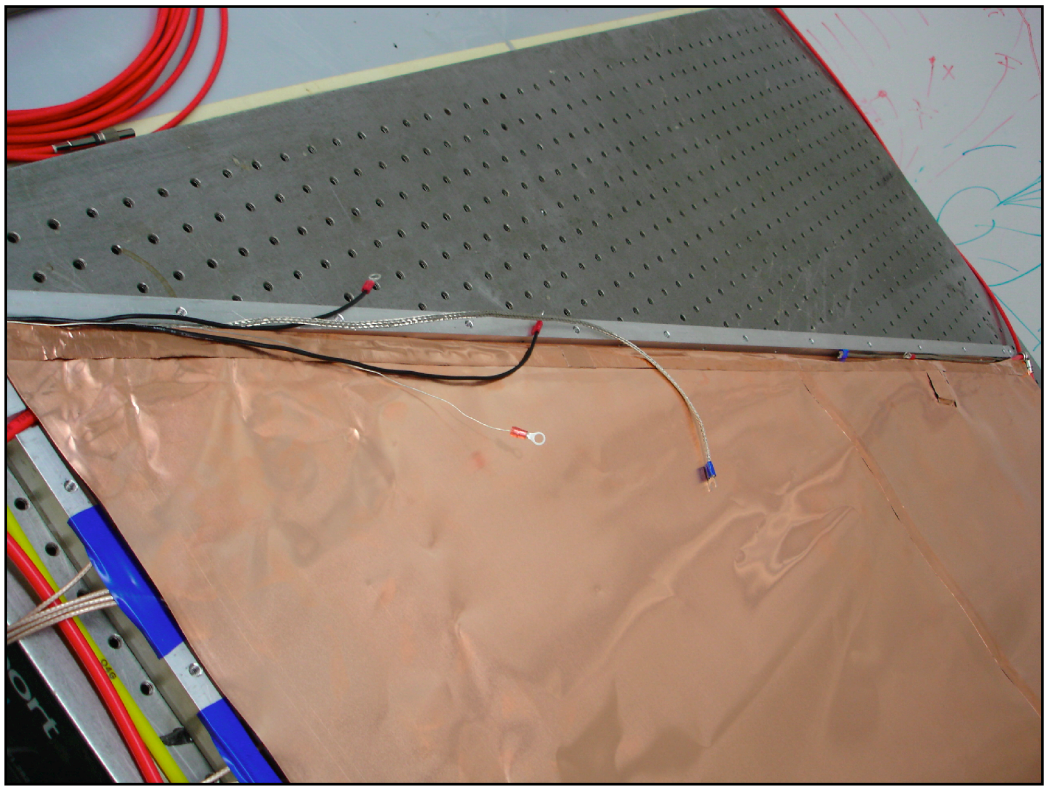

Ensure all debris is removed. Carefully close the casing after adding the last mylar sheet on top of the copper. Make sure high voltage connector sits comfortably or the case will not close.♪

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