

# RICH Exit Window Assembly

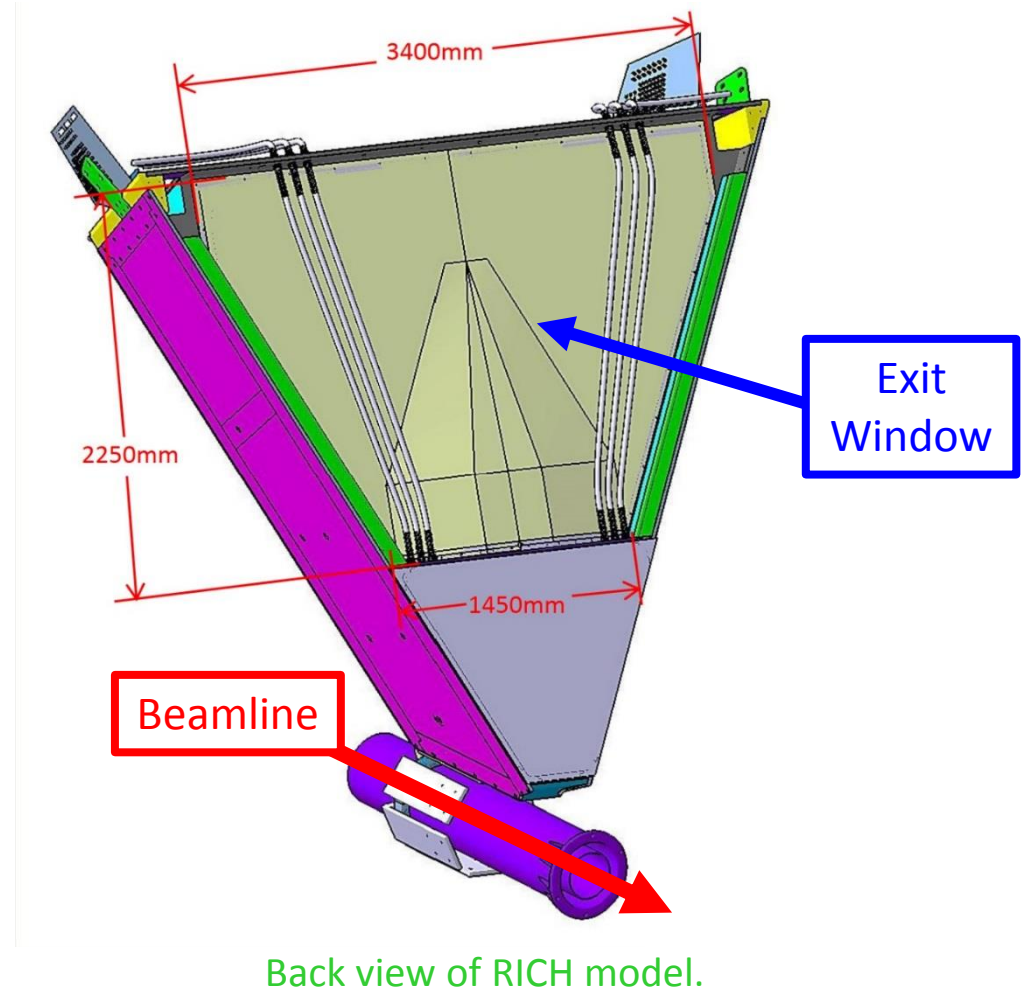
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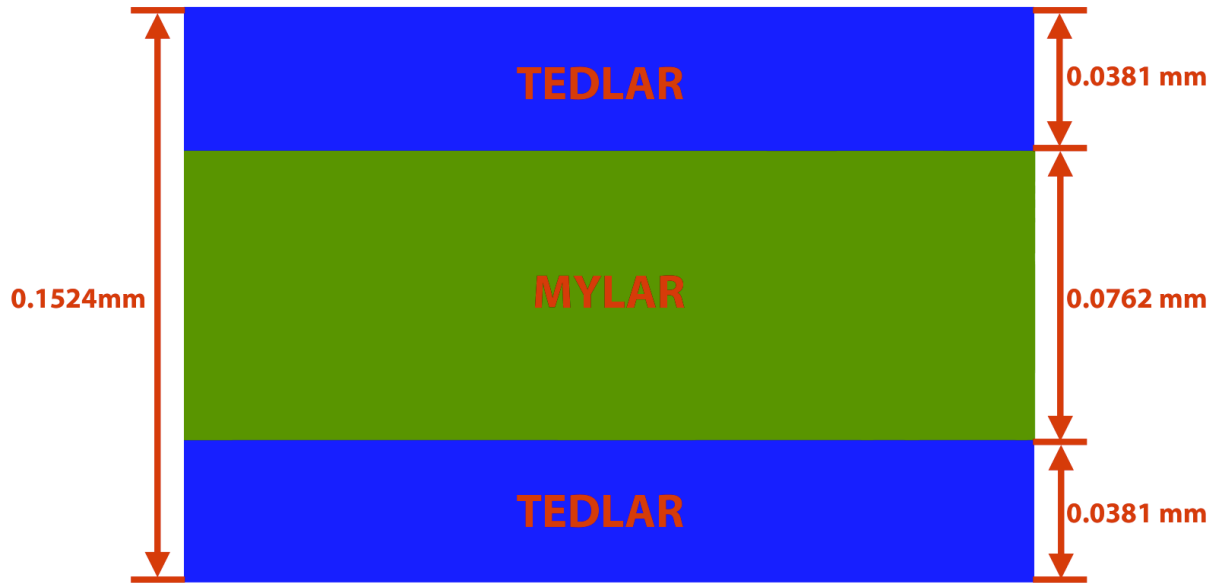
# Ring Imaging Cherenkov Exit Window

- Seals back of RICH shell.
- Mylar/Tedlar sheet glued to aluminum frame.



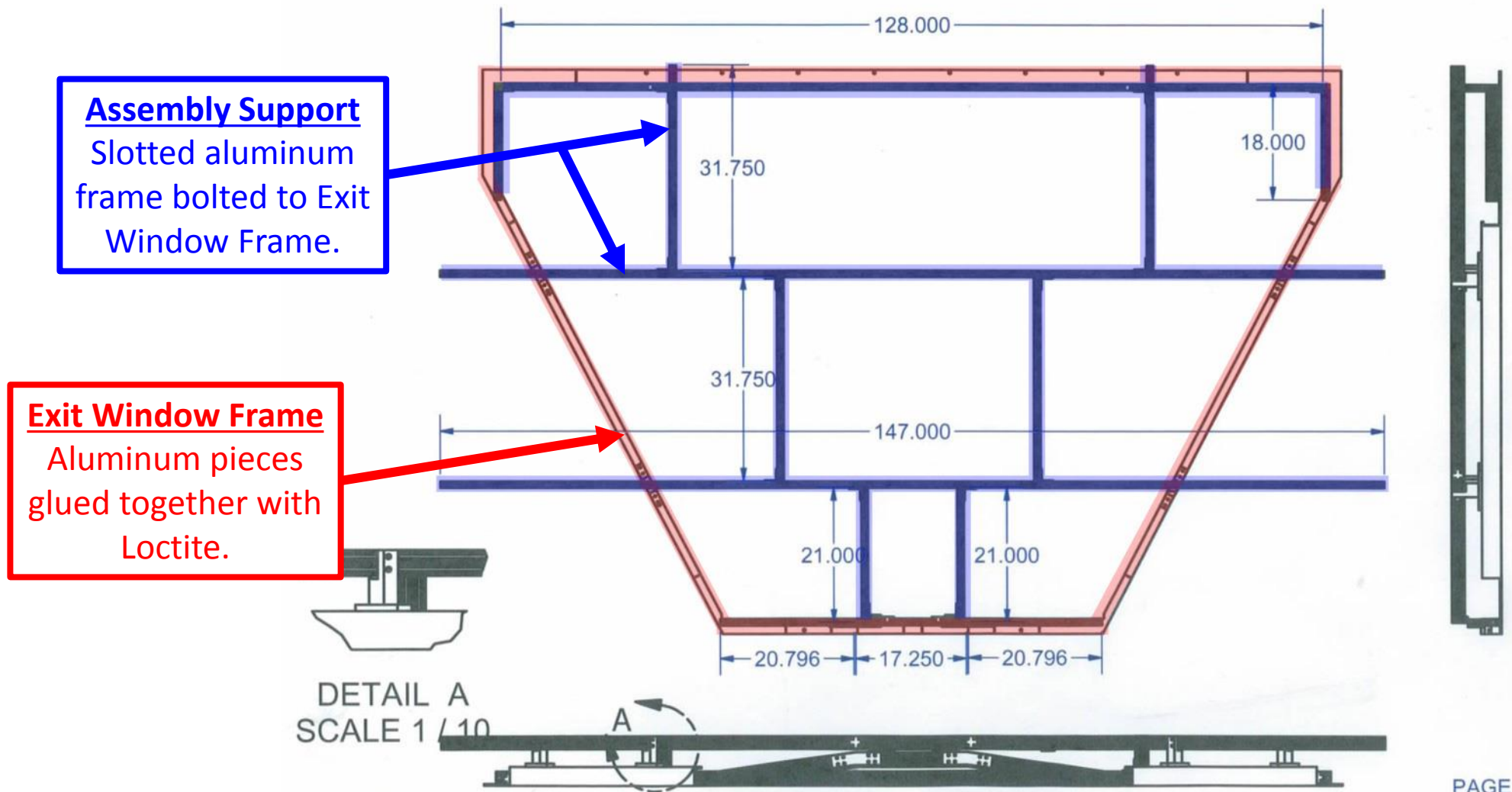
# Exit Window

- Mylar sandwiched between two Tedlar layers.
  - ~ 0.15 mm thick in total
    - 0.0762 mm of Mylar
    - Two 0.0381 mm layers of Tedlar
- Mylar
  - Biaxially-oriented polyethylene terephthalate
  - Helps create a gas-tight barrier
- Tedlar
  - Polyvinyl fluoride (PVF)
  - Remains tough and flexible over wide temperature range



Cross section model of Mylar/Tedlar sheet.

# Exit Window Frame and Assembly Support



# Safety Concerns

- Assembly required use of Loctite epoxy and G-Flex two-part epoxy.
  - Both are hazardous and flammable.
- Outgassing an issue with air-recirculation in cleanroom.
- Hazard mitigation used:
  - Personal protection equipment.
  - Ventilated EEL 124 by opening roll-up door to EEL 125 ~36 inches.
  - Limited working time to one hour before taking a break out of cleanroom.
  - Worked with adhesive in small batches.



Top: G-Flex epoxy in cans prior to mixing.  
Bottom: Loctite epoxy in applicator tube with automatic mixing nozzle.

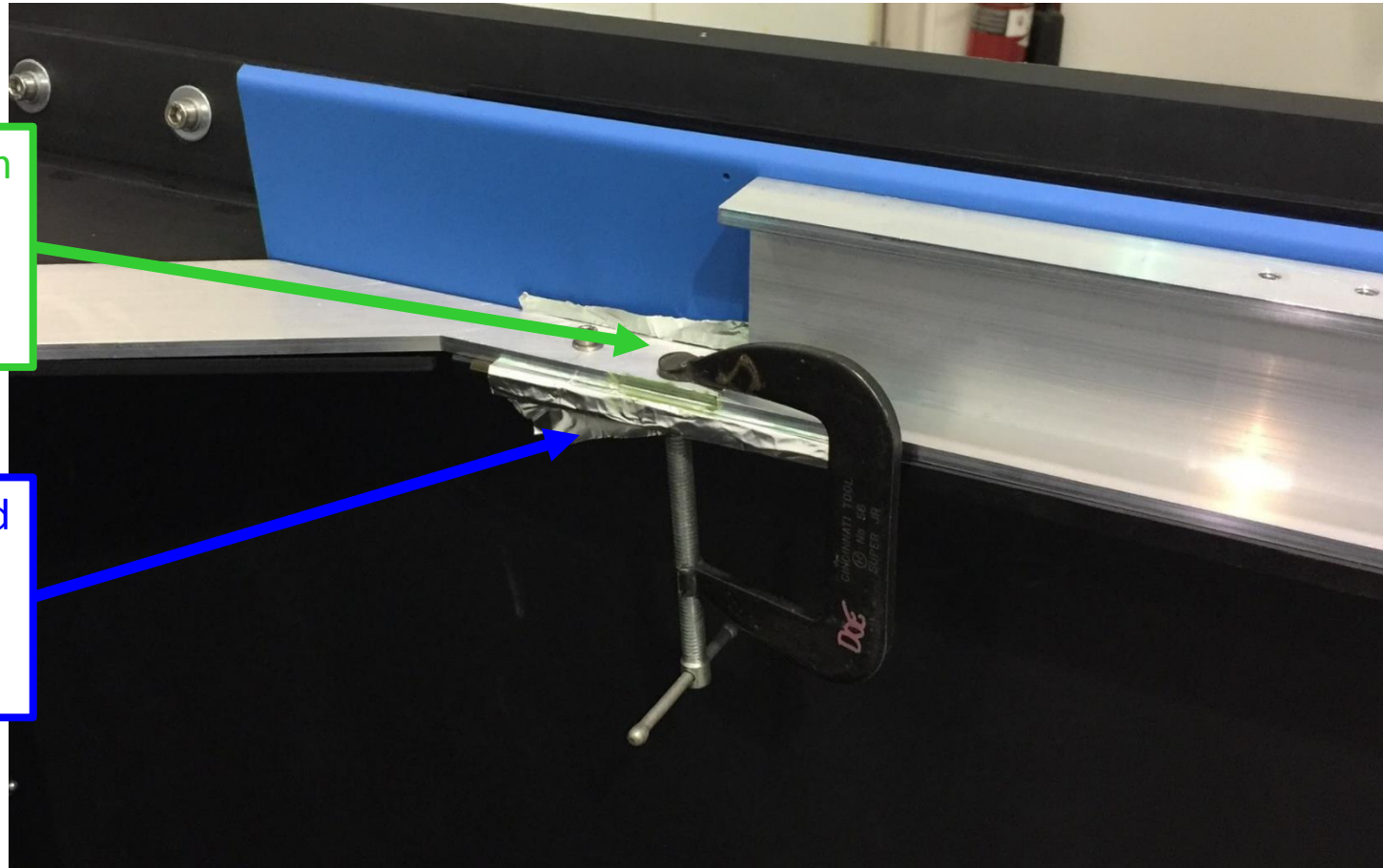
# Assembly Process

1. Lay out aluminum frame on detector shell.
2. Glue aluminum frame together with Loctite epoxy.
3. Remove frame from detector shell.
4. Layout and cut Mylar/Tedlar sheet to size.
5. Glue Mylar/Tedlar sheet to frame with G-Flex epoxy.
6. Clamp Mylar/Tedlar sheet for curing.
7. Trim excess Mylar/Tedlar and cured glue from frame.

# Exit Window Frame Assembly

Two aluminum pieces glued together with Loctite.

Foil and tape placed under joint before gluing to protect carbon fiber.



Joint of Exit Window frame clamped for curing after applying Loctite.



# Removing Frame from RICH Detector Shell



George Jacobs and Argonne Collaborators lifting assembled frame to place it on floor to glue Mylar/Tedlar sheet.



# Removing Gantry Straps from Frame



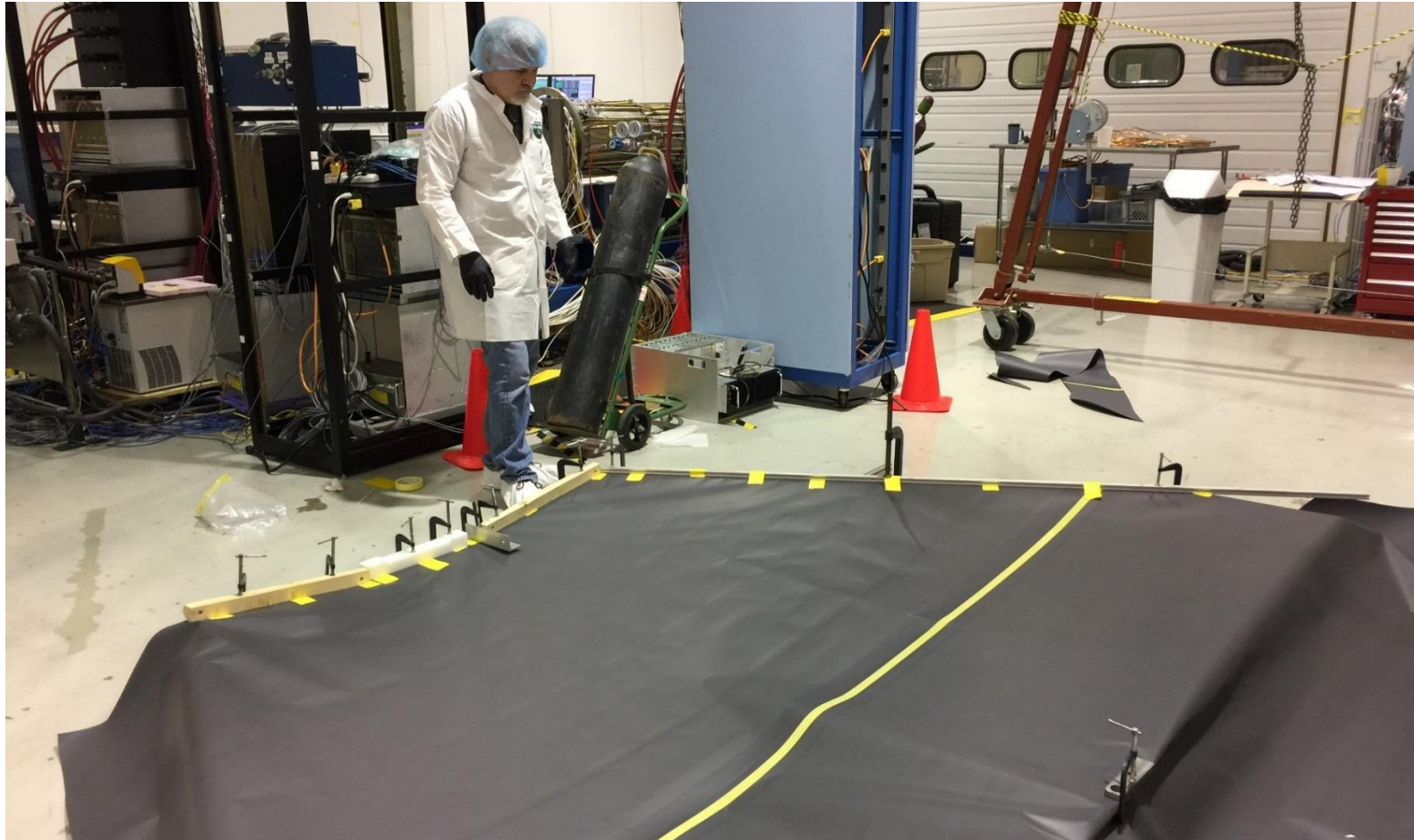
DSG removing assembled Exit Window frame from gantry.

# Rotating Frame to Rest on Assembly Support



DSG and Argonne Collaborators flipping Exit Window frame to allow Mylar/Tedlar sheet to be glued to it.

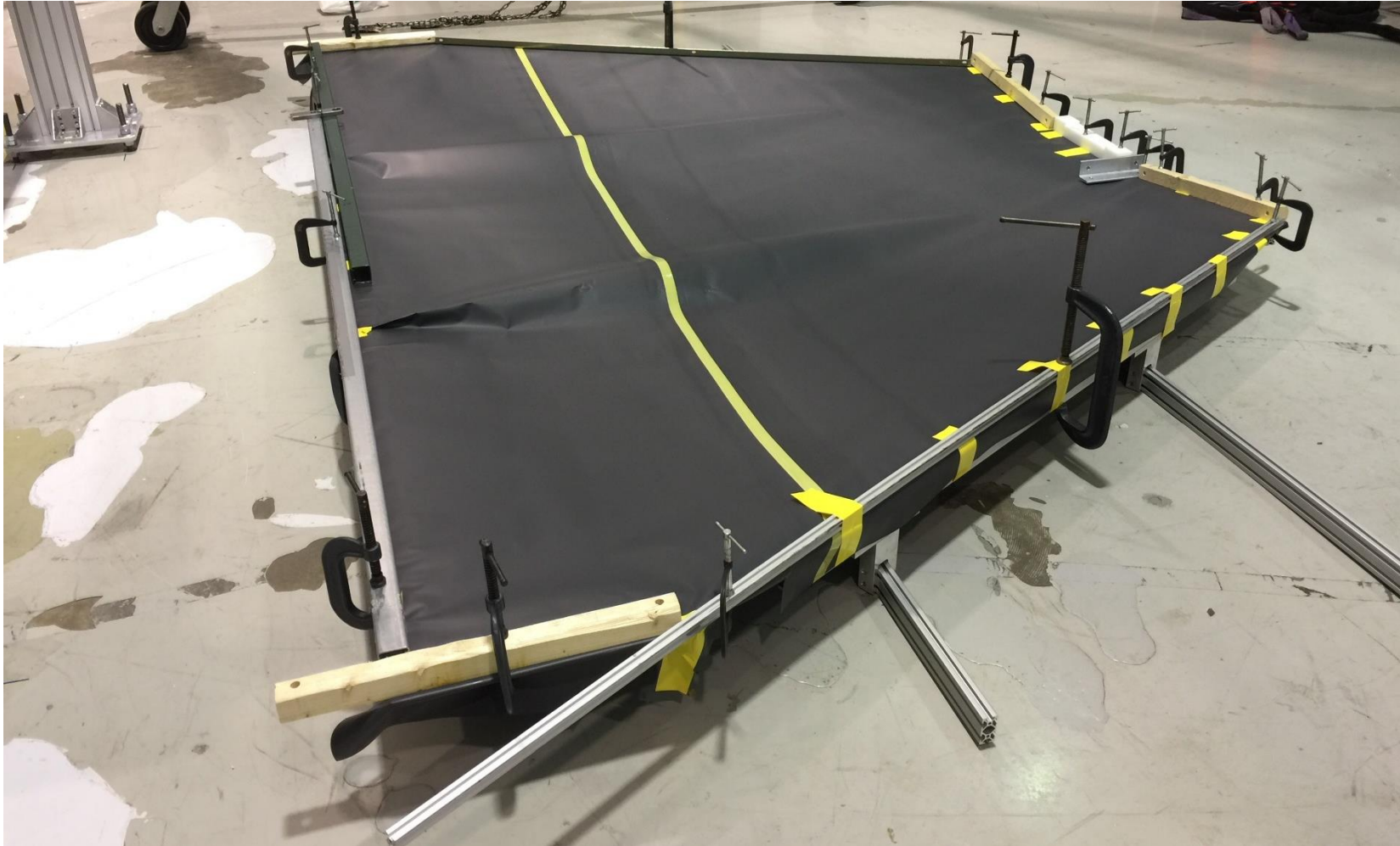
# Gluing Exit Window to Frame



Tom O'Connor, an Argonne Collaborator, clamping the freshly glued Mylar/Tedlar sheet to the Exit Window frame for curing.



# Exit Window Clamped to Frame for Curing After Gluing



# Complete Exit Window on RICH Detector Shell



# Remaining Tasks

- Add foam gasket to detector shell for between RICH and Exit Window.
- Add additional sealant to improve gas seal.
- Fasten Exit Window to RICH using screws.
  - Longer M5 screws at least ~20 mm in length must be procured due to thickness added by foam gasket, epoxy, and Mylar/Tedlar.



# Conclusion

- Contributions from DSG during all assembly steps.
- Appropriate steps taken to mitigate any safety hazards.
  - Ventilated EEL 124 by opening roll-up door to EEL 125 ~36 inches.
  - Limited exposure to fumes by limiting working time and limiting amount worked with at one time.
- Additional tasks required to improve gas seal.
- **Exit Window fully assembled.**

**Thank You**