Optical Anechoic Chamber

ASSEMBLY PROCEDURE

Daniel Bluedorn – Lead Neural Network Capstone Engineer

Kyle Brown – Electrical Engineer

Joshua Johnson – Electrical Engineer

DeVontae Yazzie – Mechanical Engineer

Department of Engineering

NM STATE

BE BOLD. Shape the Future.®
New Mexico State University

Imager Placement

Optimal Dimensions for Field of View:

For a DVXplorer Micro Event-Imager:

Pixel Pitch: 9 μm, Pixel Grid: 640 x 480, W = 5.76 mm, H = 4.32 mm, $f = 12\ mm$
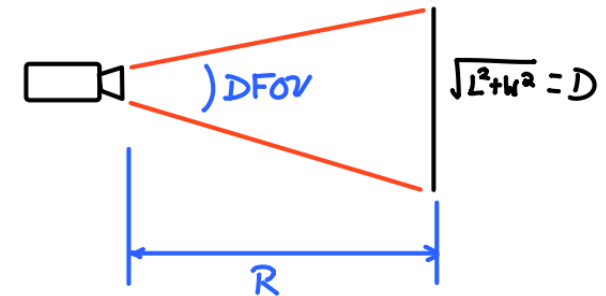
For an Alienware 500 Hz Gaming Monitor:

D = 24.5" = 622.3 mm

$$R = \frac{D\left(\sqrt{(pW)^2 + (pH)^2}\right)}{4f}$$

Pixel Ratios:

Horizontal: $r_x = \frac{1920}{640} = 3\frac{px}{px}$

Vertical: $r_y = \frac{1080}{480} = 2.25\frac{px}{px}$

- 840.3mm or 2.8 feet is the optimal placement from Alienware monitor to event imager for a 12mm focal length lens
- Horizontal and vertical pixel ratios can be used to convert between sizes in simulation and event image.

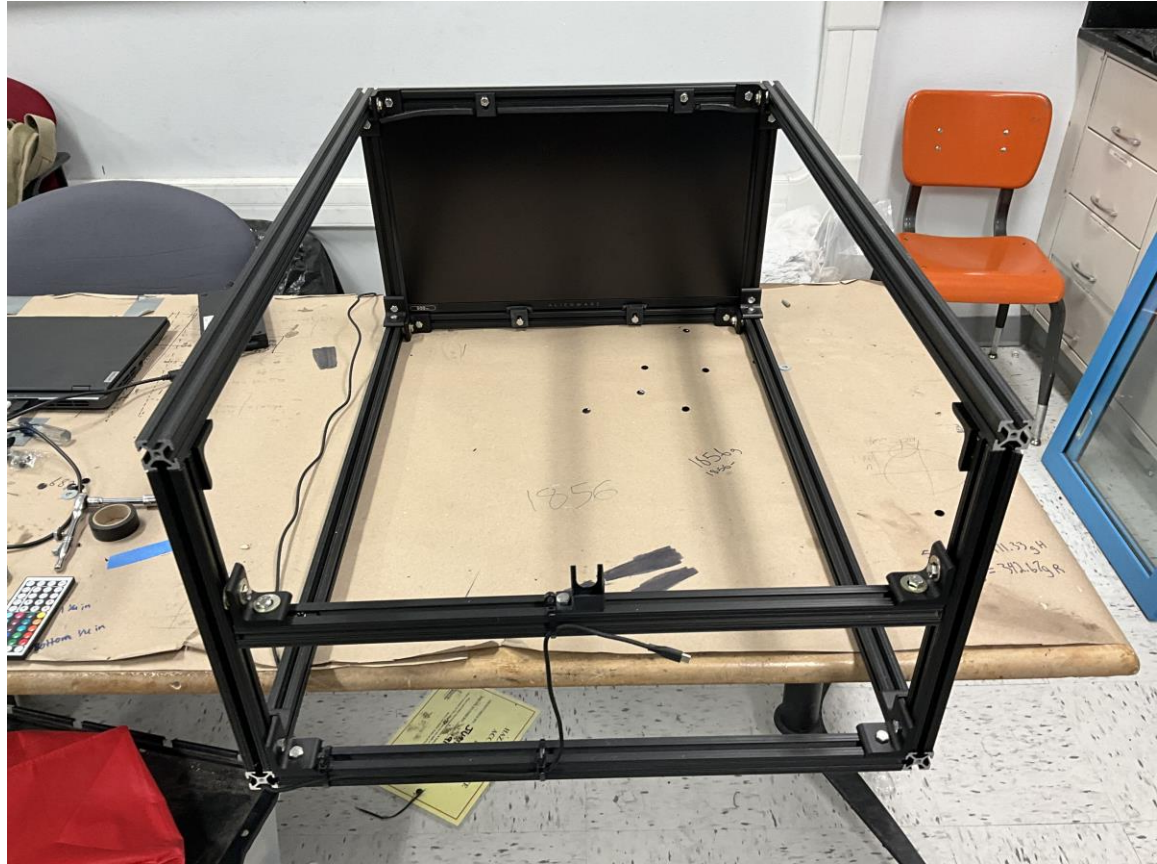# Section 1

Frame Design and 8020 Cutting

Bill of Materials

| Item #	Description	Quantity	Dimensions	Procurement Link	Estimated Cost ($)	Vendor
			Bill of Materials - Optical Anechoic Chamber			
1	1" 80-20 Aluminum Extrusion (Black)	6	15"	Items 1-4 (80-20 Aluminum)	$ 62.64	80/20
2	1" 80-20 Aluminum Extrusion (Black)	4	24"	Items 1-4 (80-20 Aluminum)	$ 60.12	80/20
3	1" 80-20 Aluminum Extrusion (Black)	4	34"	Items 1-4 (80-20 Aluminum)	$ 80.52	80/20
4	1" 80-20 Aluminum Extrusion (Black)	2	6"	Items 1-4 (80-20 Aluminum)	$ 11.70	80/20
5	10-Series ¼-20 Slide-In T-Nuts	40	¼-20	Item 5	$ 57.60	80/20
6	1/4-20 Flanged Hex Bolt McMaster Carr ID: 92865A171	50	¼-20 by 1/2"	Item 6	$ 38.28	McMaster Carr
7	1/4-20 Flanged Hex Bolt McMaster Carr ID: 92865A171	28	¼-20 by 3/4"	Item 7	$ 9.41	McMaster Carr
8	1" 10-Series L-Brackets	50	1"x1"	Item 8	$ 248.50	Amazon
9	Musou Black Fabric 43" Width	3 yards	43" by 3 yards	Item 9	$ 330.00	Amazon
10	Alienware 24.5" Monitor	1	24.5", 1920x1080 pixels FHD	Item 10	$ 450.00	Amazon
11	DVXplorer Event-Based Camera	1	640x480 pixel	Item 11	$ 2,843.29	Inivation
12	XOOL Grommet Tool Kit	1		Item 12	$ 36.00	Amazon
13	1/4-20 Slide-in Economy T-Nut	10	1/4 20	Item 13	$ 4.20	80/20
14	12mm Standard Zoom Board Lens Security CCTV Camera Lens 12 MM Focal Length	1	1"-32	Item 14	$ 9.99	Amazon
15	1/4" AAA Flat Washers	100	1/4"	Item 15	$ 16.34	Home Depot
Item Count:					Total Cost:	
15					$ 4,258.59	

Cut Configuration

- Leave the 36" sections uncut. This allows the DVX mount to slide closer to or away from the screen to allow different pixel ratios and lenses.
- Cut the 15" sections to be the vertical supports to 12"
- Cut the horizontal bars from the 24" stock to 22 ¼ "

Monitor Mount

- Slide two T-Nuts on each side of the horizontal bars (these will be for the mounting brackets)
- Use an L bracket to affix a 22.25" section to a 36" section with the 36" section butted out.
- At 90°, affix a 12" bar to the 36" bar. For this, use three washers to space out the bracket, one on the head side of the bracket, three on the opposite end.
- Do the same for each of the four sides of the monitor mount.
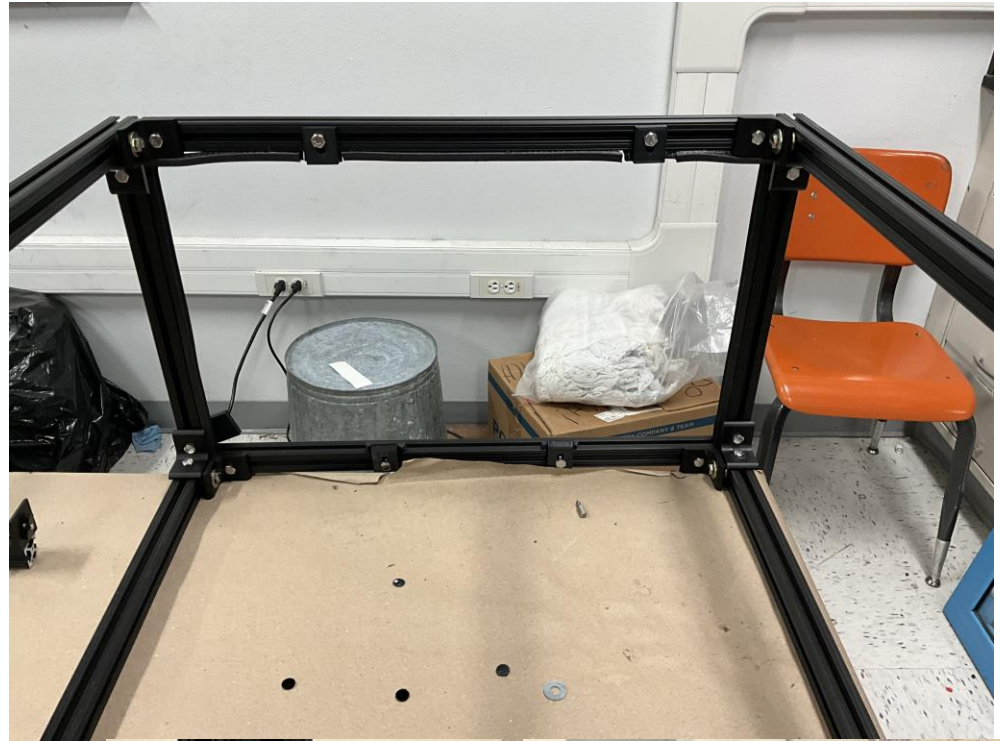
Support Brackets

- 3D print the provided STL files. These make the inner and outer brackets for mounting the monitor to the frame. Use carbon fiber PLA or another black plastic.

- Slotted holes are added on the inner brackets and upper outer brackets to allow better adjustments for a tight fit.

- Bolt the inner bracket on the top and bottom of the monitor frame, and place strips of rubber insulation (Item 16) over them.

- Place the monitor face down into the frame, ensuring the brackets support the bezel

- Bolt the outer top and bottom brackets to the outside and torque down until the monitor is securely fastened.
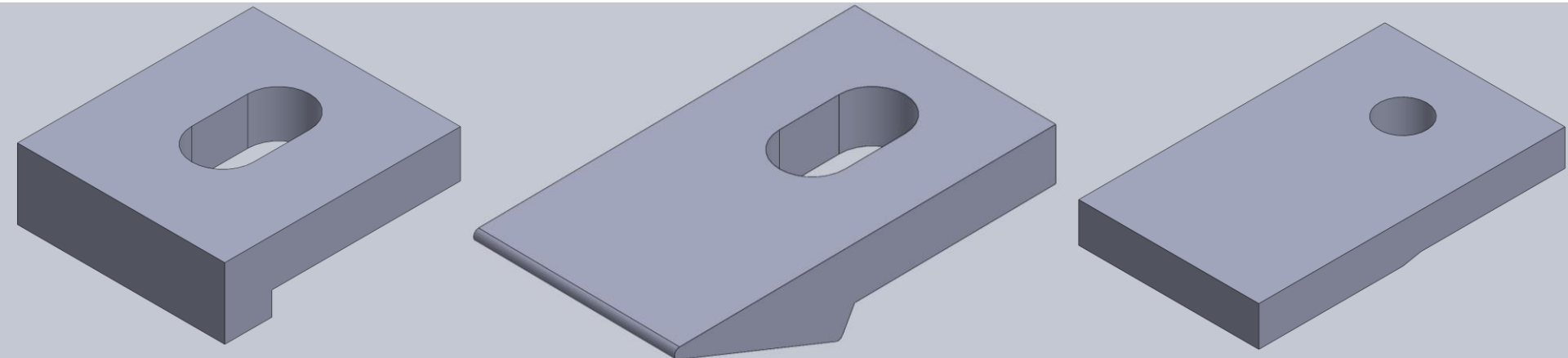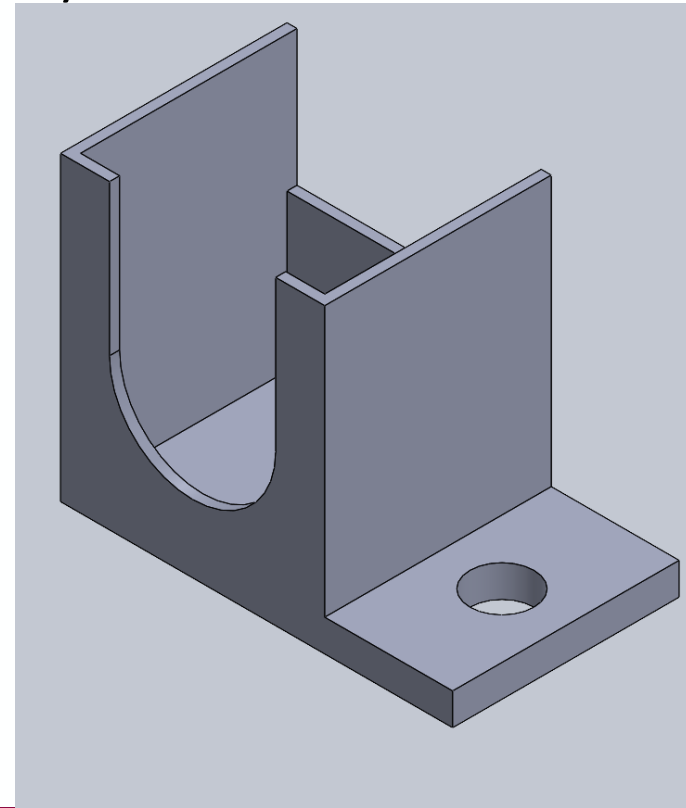
Section 2

Imager Mount

Imager Frame

- Affix a 22.25" horizontal bar to two vertical supports to form an I shape.
- Attach for washer-spaced brackets to each corner of the I, facing forward.
- Affix another horizontal bar to the bottom of the I shape, leave the corners of this shape open to receive the 36" bars.
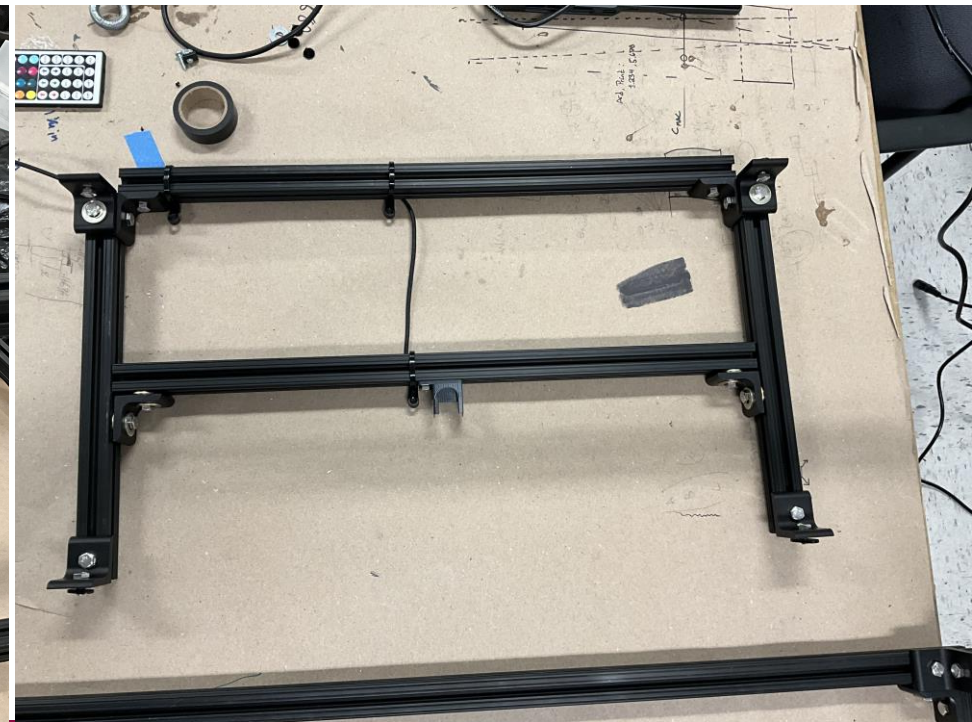
Imager Bracket

- 3D print the Imager Retainer STL provided in CF black or similar PLA.

- For a fully-sized DVXplorer, a retrofit of this design will be unnecessary, simply use the ¼-20 mount already installed on the camera to affix it to the frame.
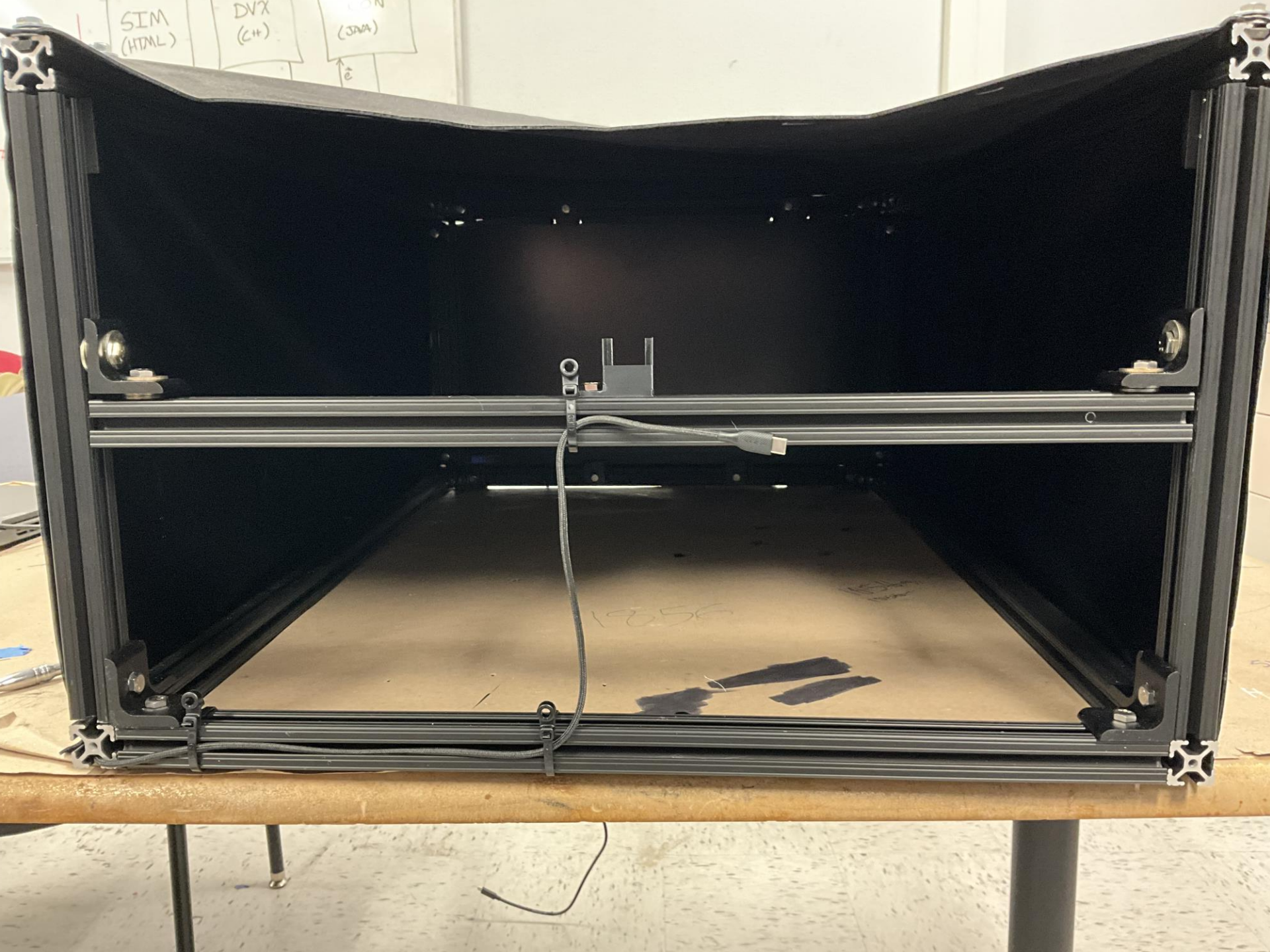
DVX Wire

- Route and zip-tie a USB-C to USB-A cable along the imager frame and through the 36" stock to the monitor frame.

Section 3

Fabric Shrouding

Fabric Cuts

- Cut 1 section of Mousou black fabric (Item 9) to 36" by 24"

- Cut 1 section to 36" by 30", and then cut it in half for the side panels. (cut 30" along the roll for this to save fabric)

- Cut a section to 16" by 24" for the imager panel.

- If desired, cut a second 36" by 24" section for the bottom of the frame.

Grommets

- To aid in affixing the shroud, dry fit the fabric sections on the frame. Use the XOOL Grommet Tool (Item 12) to stamp the grommets.

- It is generally best to cut the fabric sections slightly too large, then place a grommet on a corner of the fabric about a quarter of an inch from each edge, then bolt it to the frame. Take the opposite corner, and place the grommet such that the fabric is as taut as possible. Once the diagonals are secure, grommet the other corners.

- Repeat process for other panels

- Tip: For best tightness, you'll need to put large strains on the grommet holes, so it is suggested to sandwich them with washers when bolting to the frame for support.

Handles

- Optionally, handles can be affixed to the frame for easy transport. Identify the center of gravity of the frame with the monitor installed, and bolt the handles through the top shroud to the frame.

- Use plenty of washers to distribute the load to avoid damaging the fabric.

- Do not 3D print the handles, as their Z loading is too great for the specifications of most PLA.

ALIENWARE

25
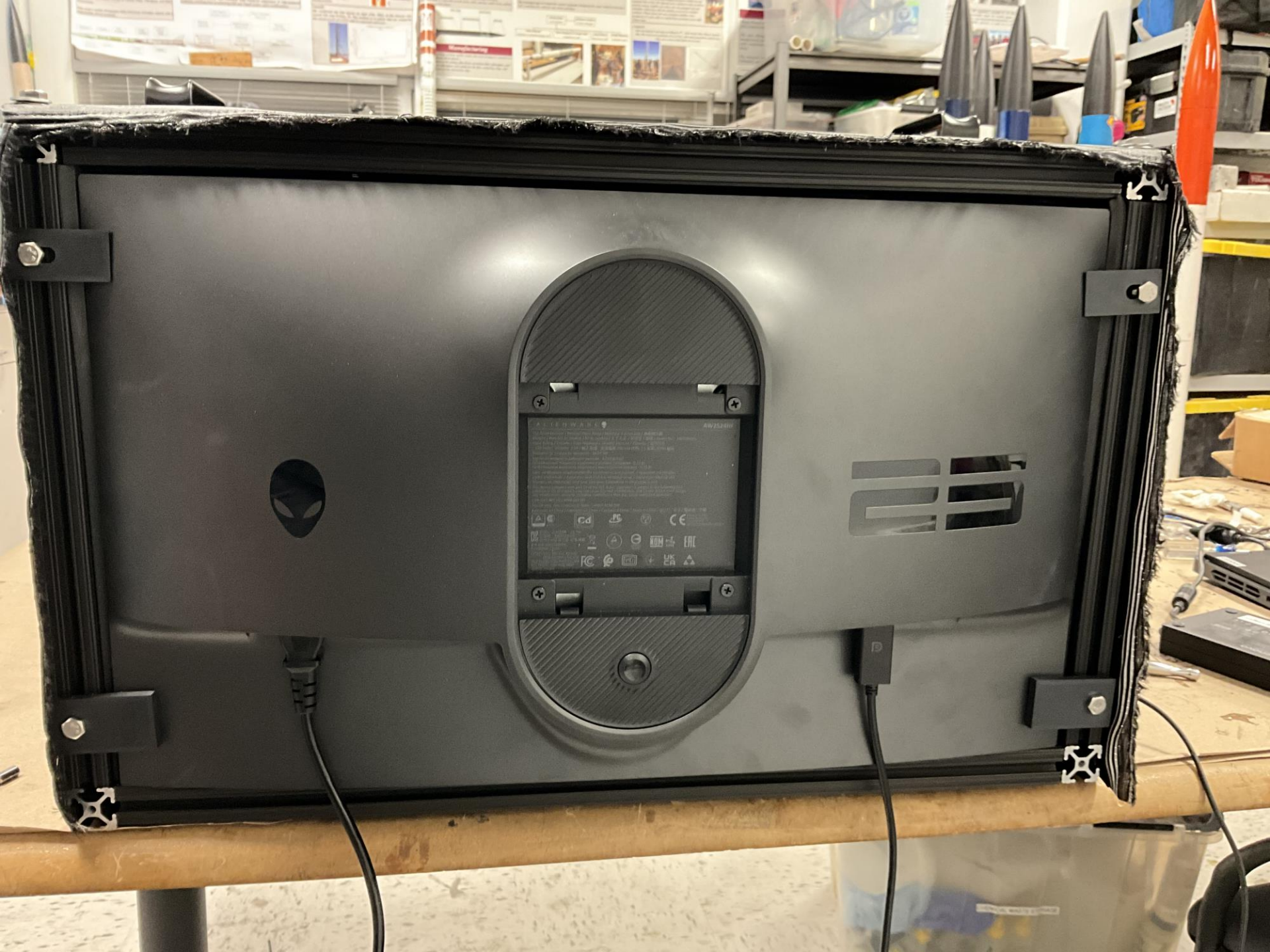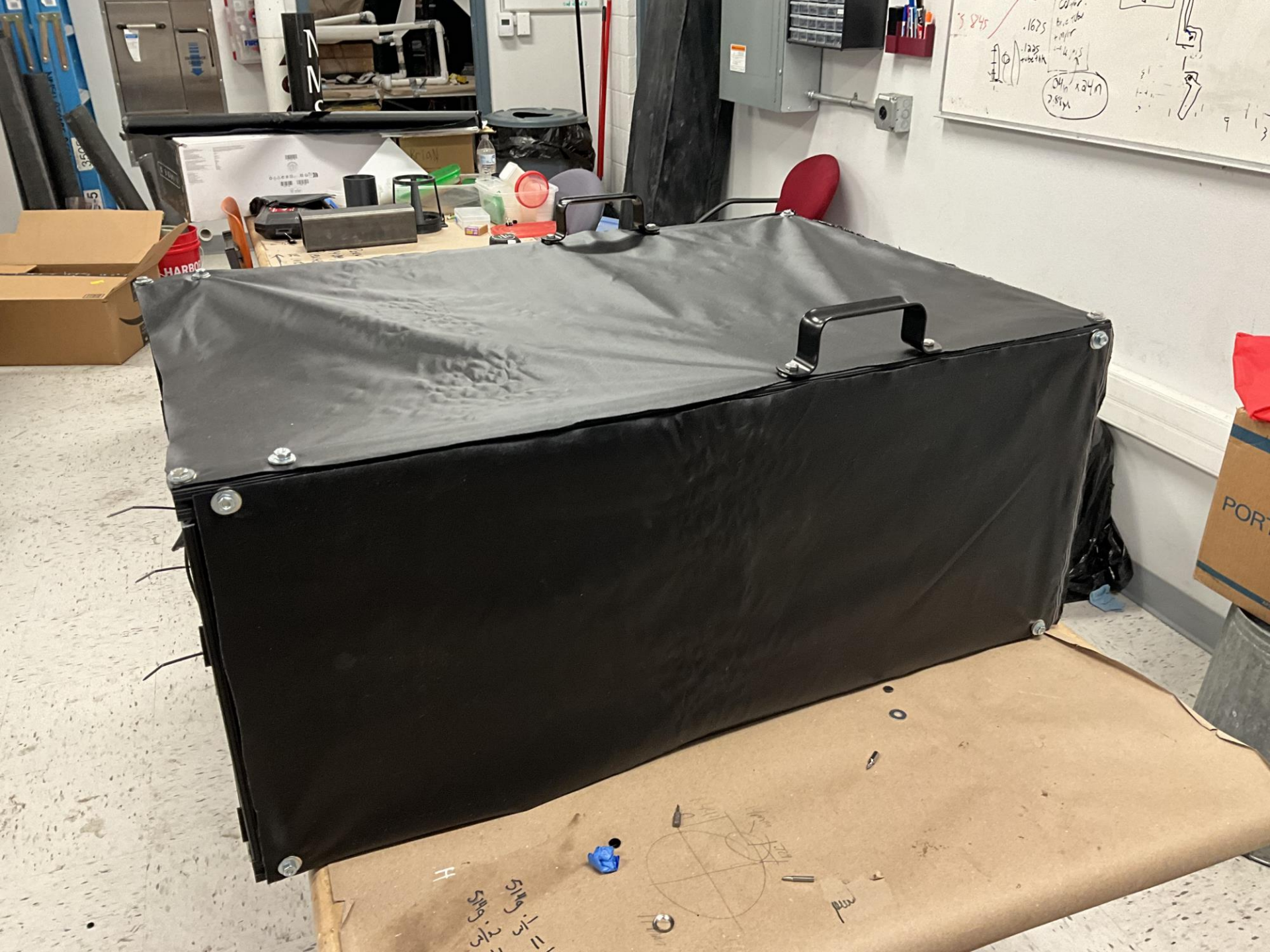
Design Notes

- The imager mount is designed to be movable. Loosen four bolts on the imager mount brackets facing forward and slide the mount forward.

- Depending on the precision of available cutting tools for the fabric, there may be small gaps where light can infiltrate. Use a flashlight to identify these areas. Use Black duct tape, electrical tape, or clay to patch gaps.

- The rear fabric near the imager should be an open flap, you will regularly need access to calibrate and test the imager.