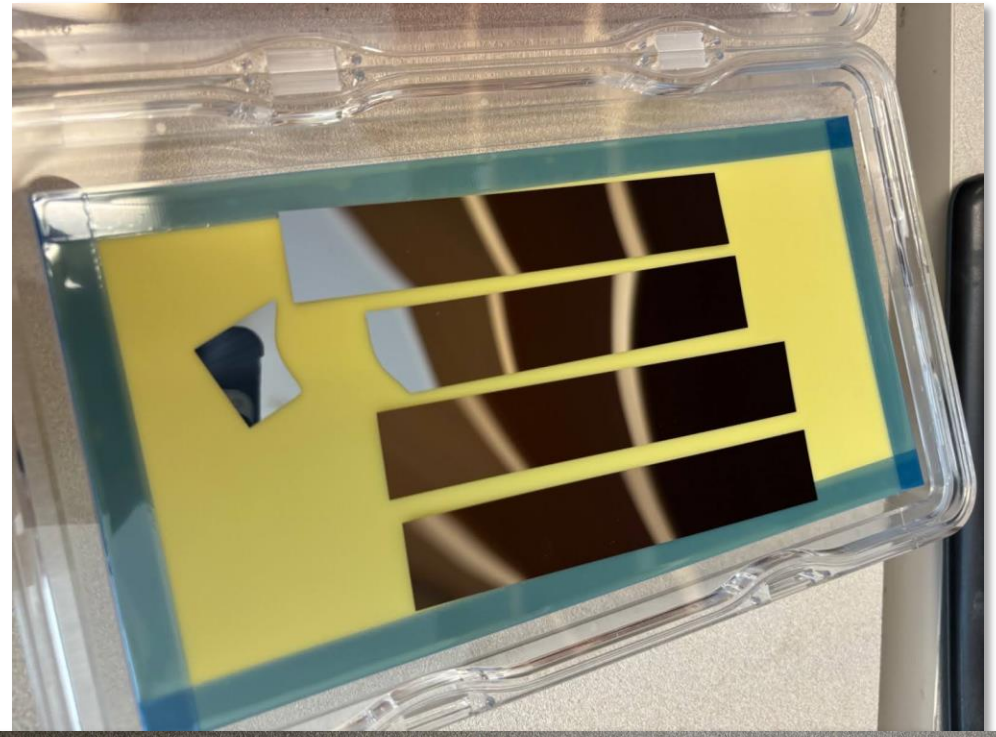
Disk update

Nikki Apadula, Eric Anderssen, Elaine Buron, Katie Gray, Skye Heiles, Ernst Sichtermann, Joe Silber

SVT Meeting 10/28/25

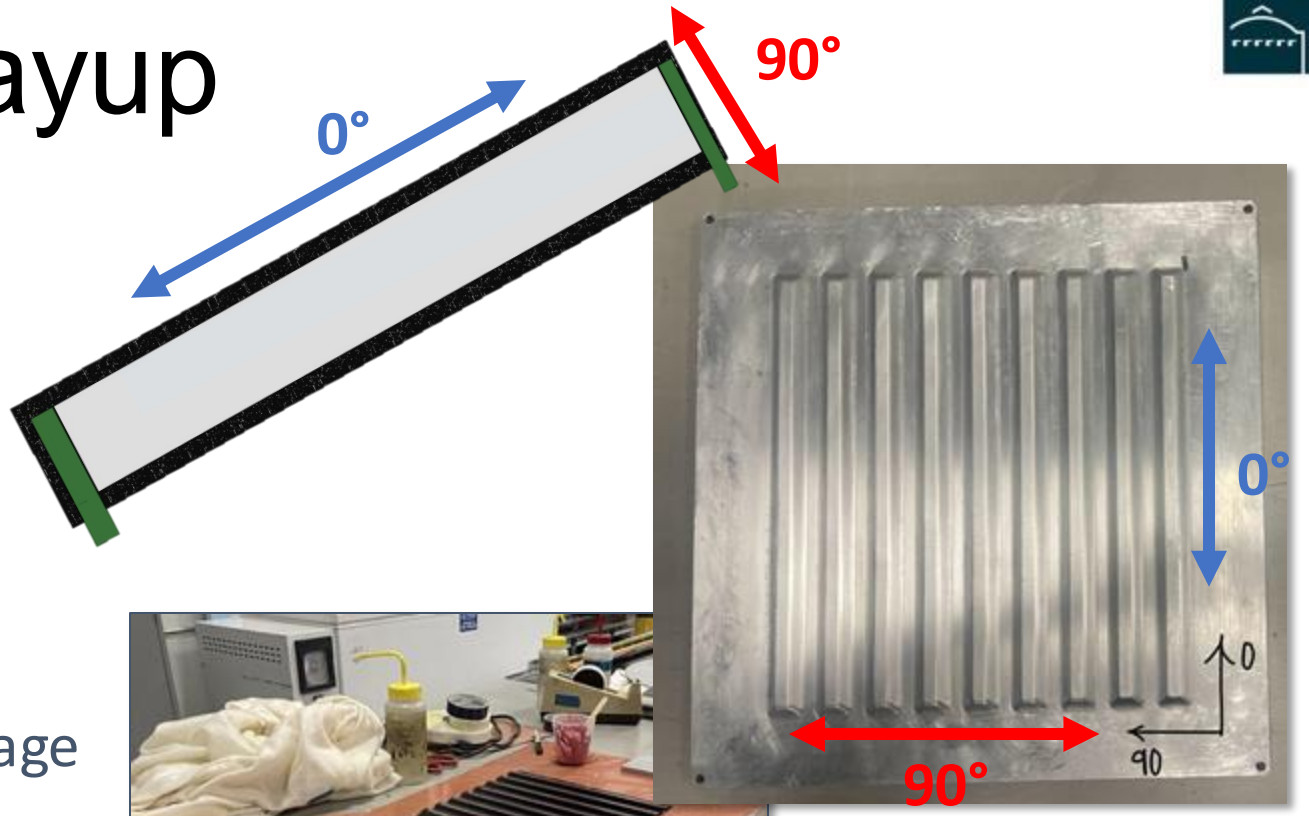
Dummy sensors

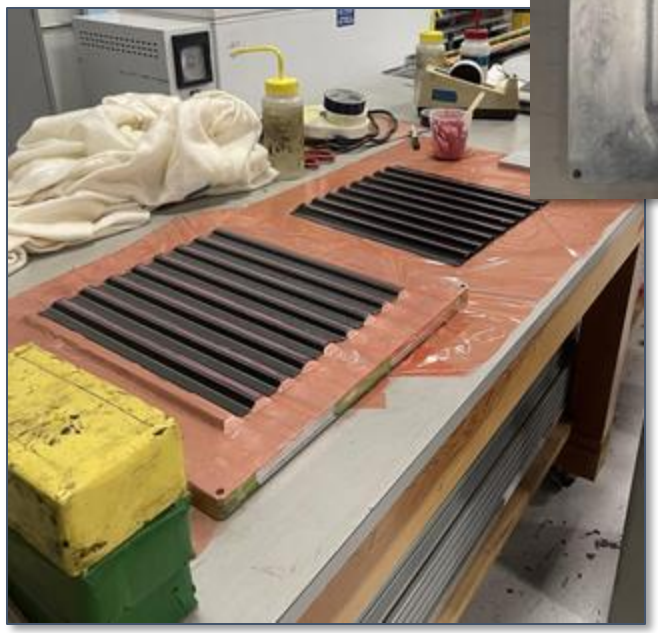
- Box used allowed sensors to move
  - 2 out of 26 arrived broken
- Previous order provided separation between dummy sensors & kept them tightly packed
- Sensors in Gelpak undamaged, but harder to remove



Carbon composite & layup

- **K13C2U** Carbon Fiber pre-preg
- **0°: along the corrugation**
- **90°: against the corrugation**
- Two different configurations
  - **Flat sheet: 0/90/0** → thermal advantage
  - **Corrugation: 90/0/90** → mechanical advantage for corrugation





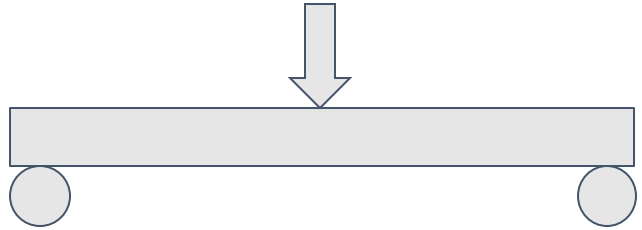
Credit: Skye Heiles

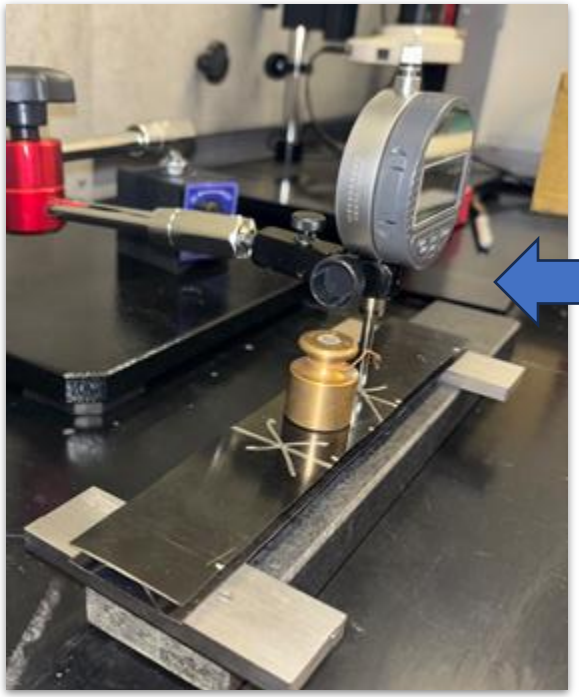
Corrugated Test Pieces

3 “rows”, bonded to two flat sheets
~70 mm x 300 mm
Corrugation: 90/0/90
Two flat sheet (FS) variations: 90/0/90, 0/90/0

Single row, bonded to two flat sheets
~ 40 mm x 200 mm
Corrugation: 90/0/90, FS: 0/90/0

3-point bend tests





Manual:

Using weights to apply force and a dial gauge to measure displacement

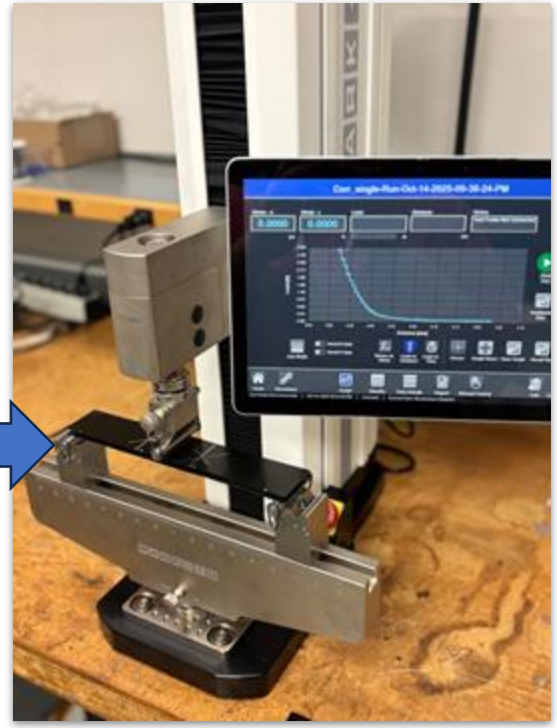
Subject to range and sensitivity of the dial gauge

Measuring displacement away from center due to the weight placement

Testing machine:

Mark-10 IntelliMESUR

3 point bend tests → moves downward & measures the force applied



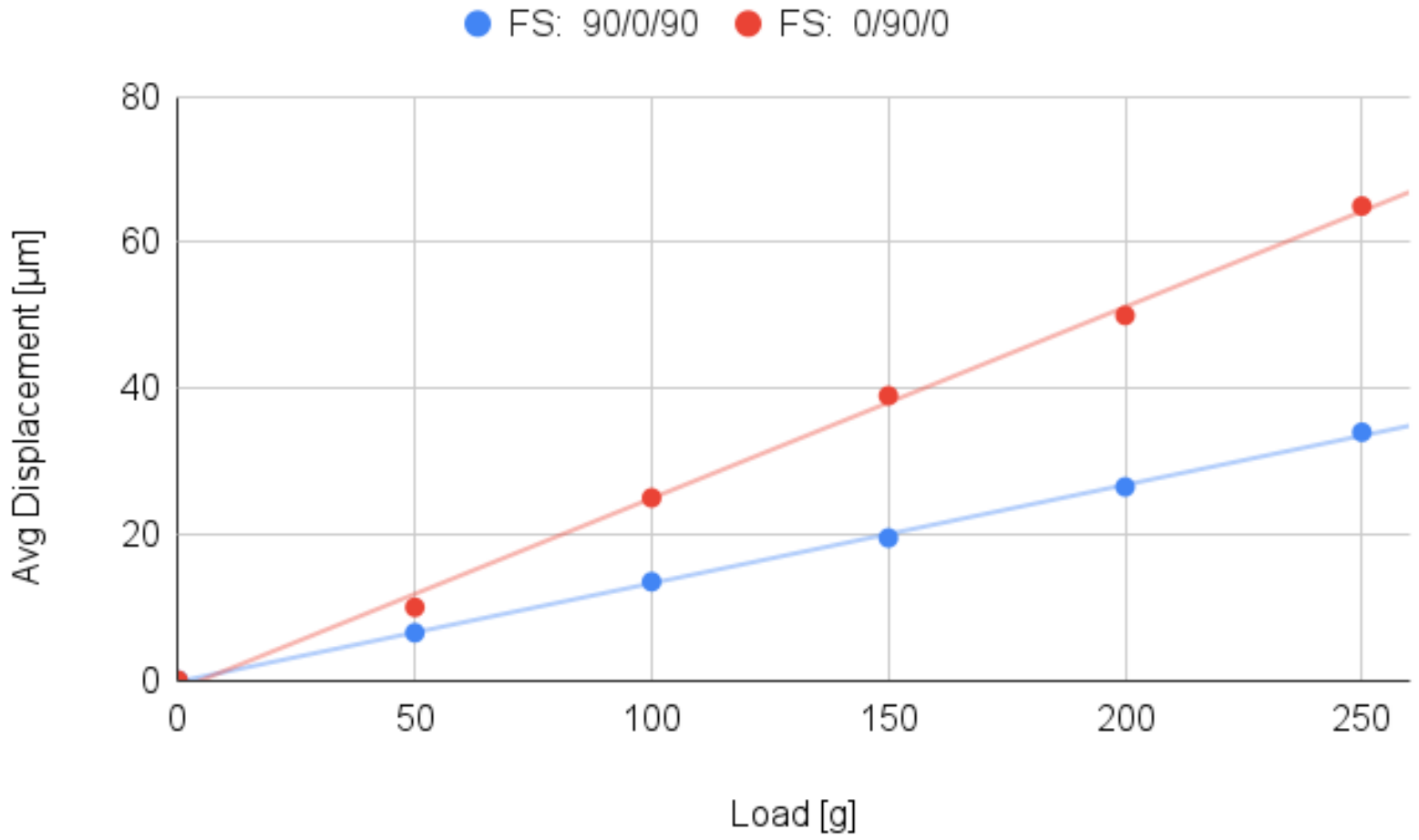
Layup comparison

3 corrugation pieces

Results shown for both FS

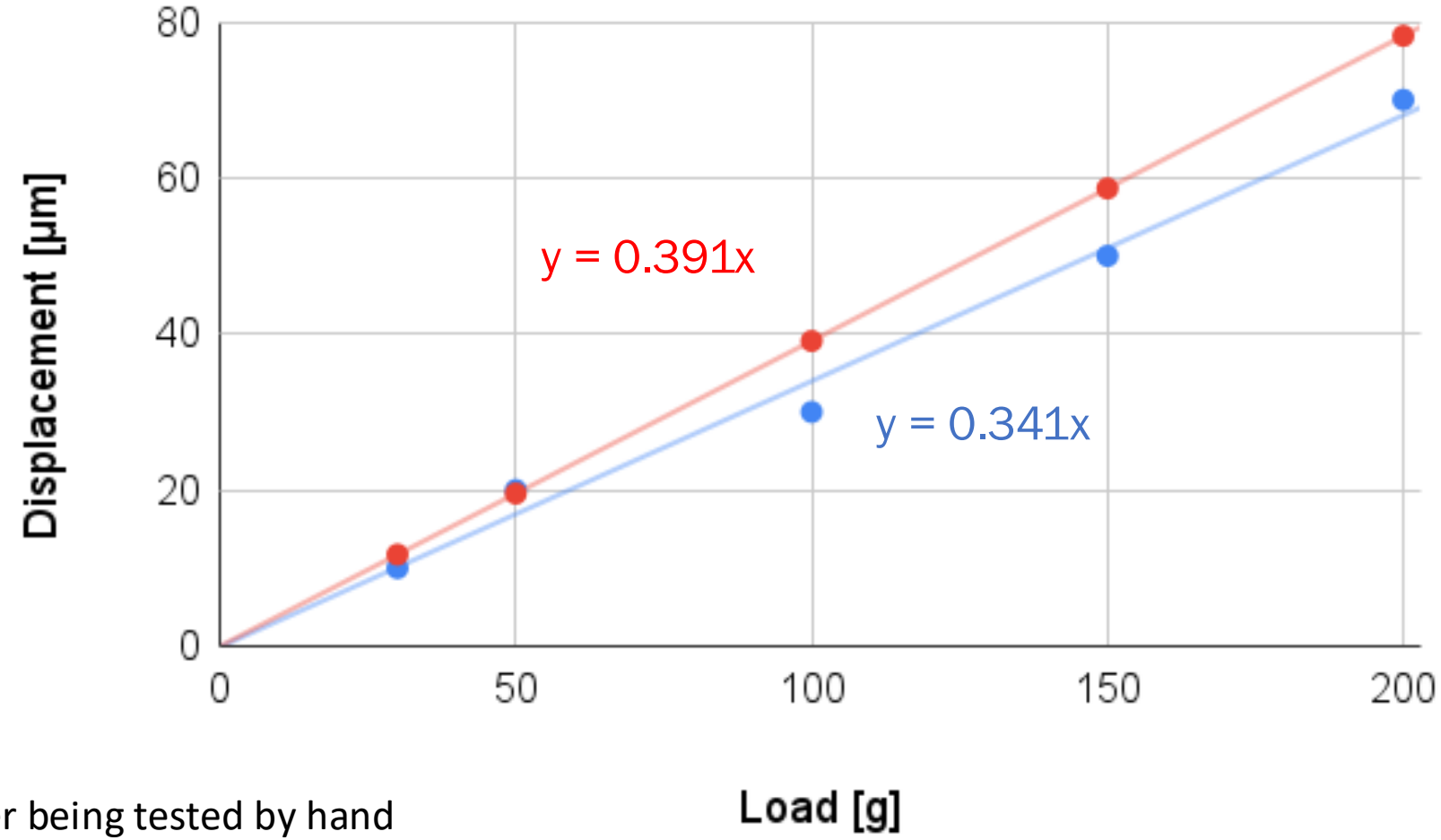
CF has a higher modulus for loads parallel to the fibers.

As expected, 0/90/0 has a larger displacement response to the weight.



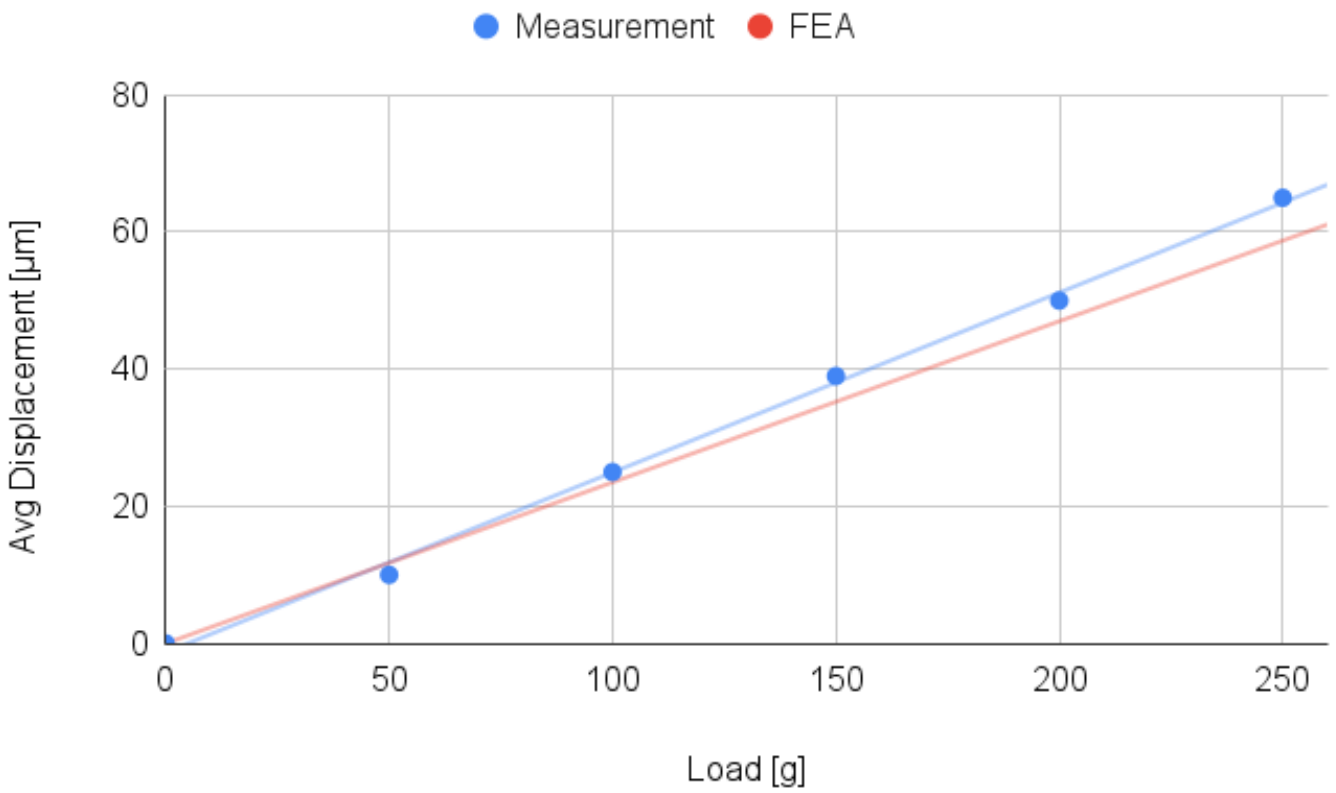
Single Corrugation Measurements

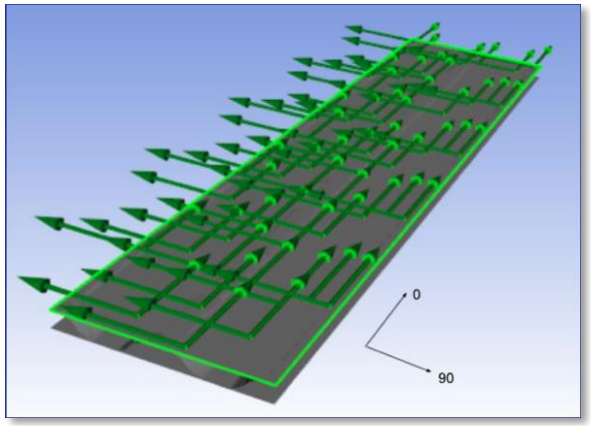
Red: Machine
Blue: By hand

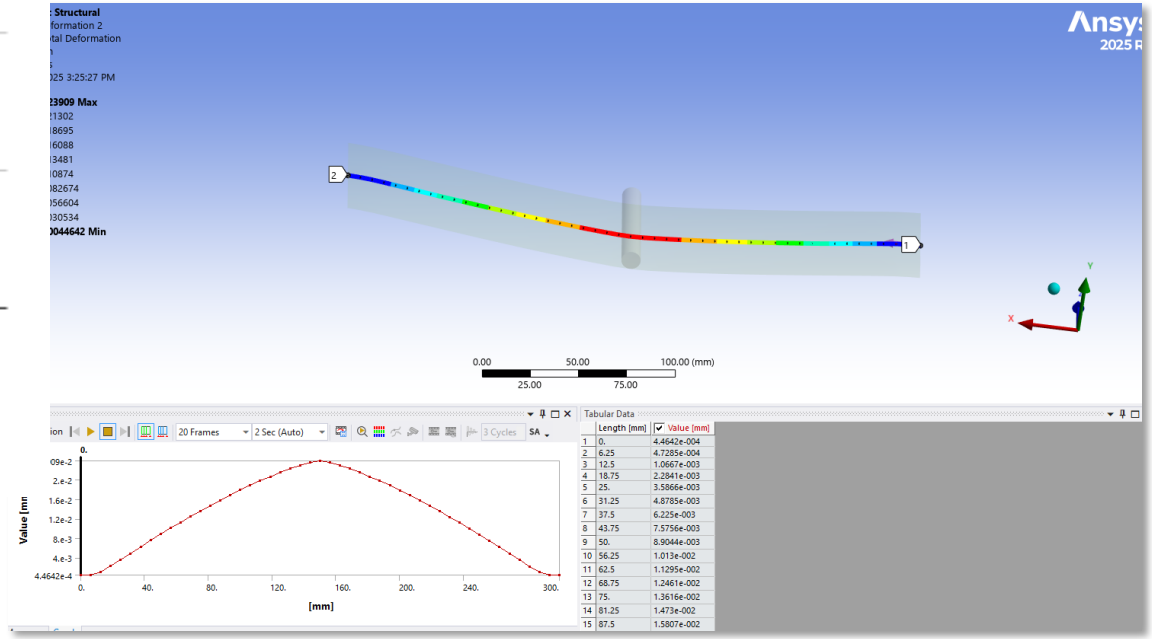


Tested on machine after being tested by hand
Can account for the larger displacement

FEA comparison



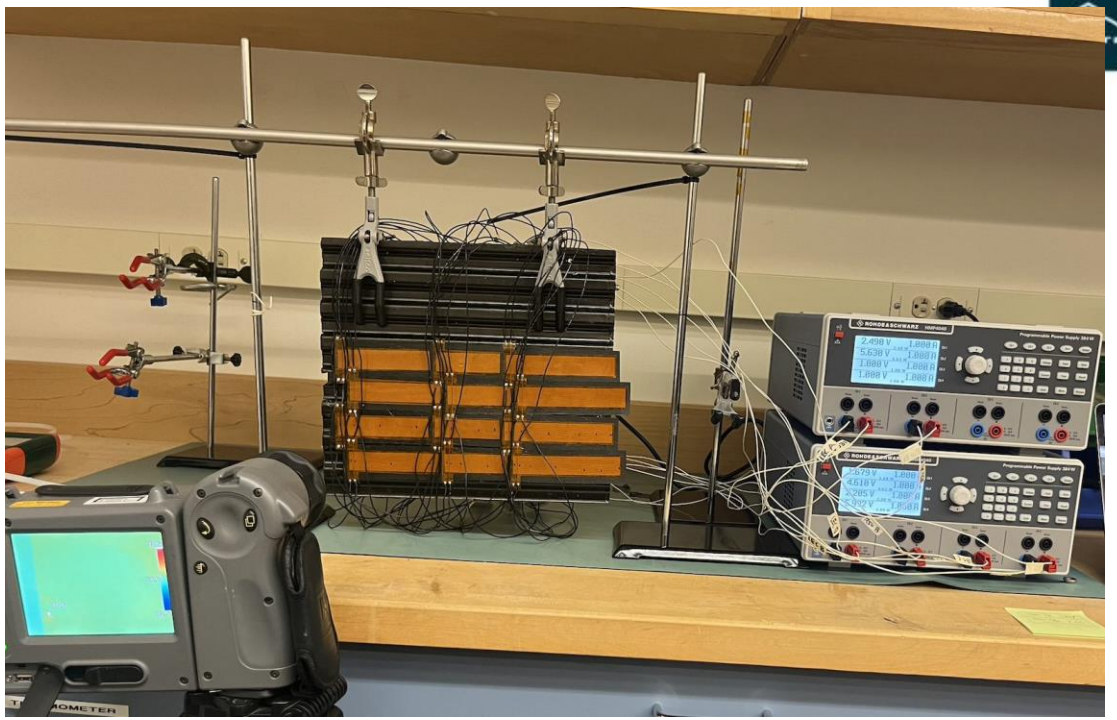




Work by Skye Heiles

Thermal neighbors setup

- Points of interest
  - Neighboring rows on same side
  - Neighboring rows on opposite sides
  - Power changes
  - Forced convection

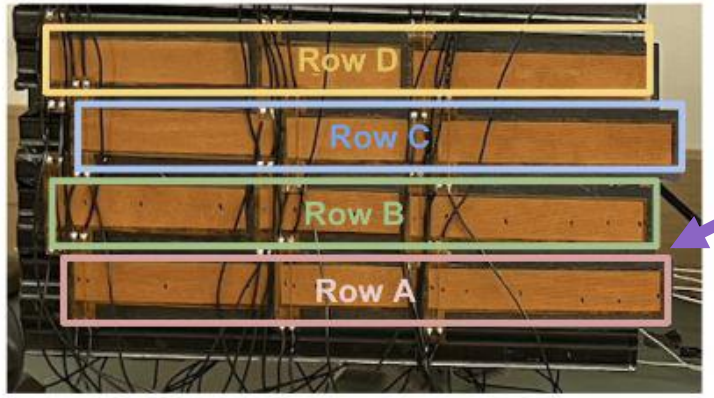


New Power Numbers

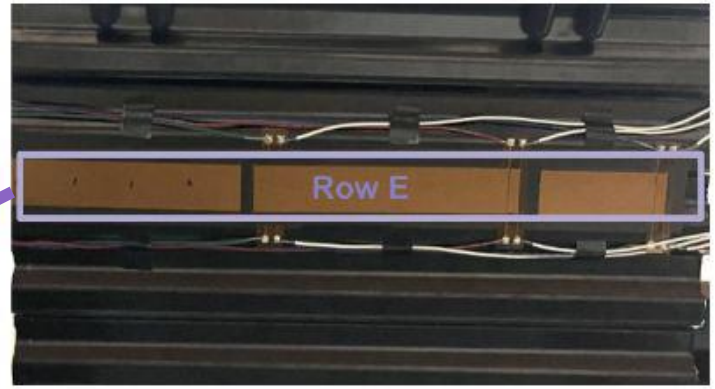
LEC: 0.24 W/cm^2

RSU: 0.05 W/cm^2

4 rows in front

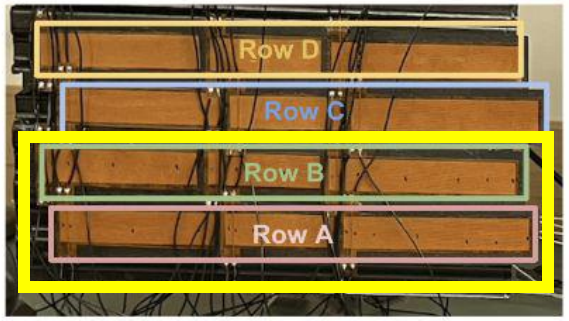


1 row in back



Work by Katie Gray

Thermal results



[”New” power numbers]

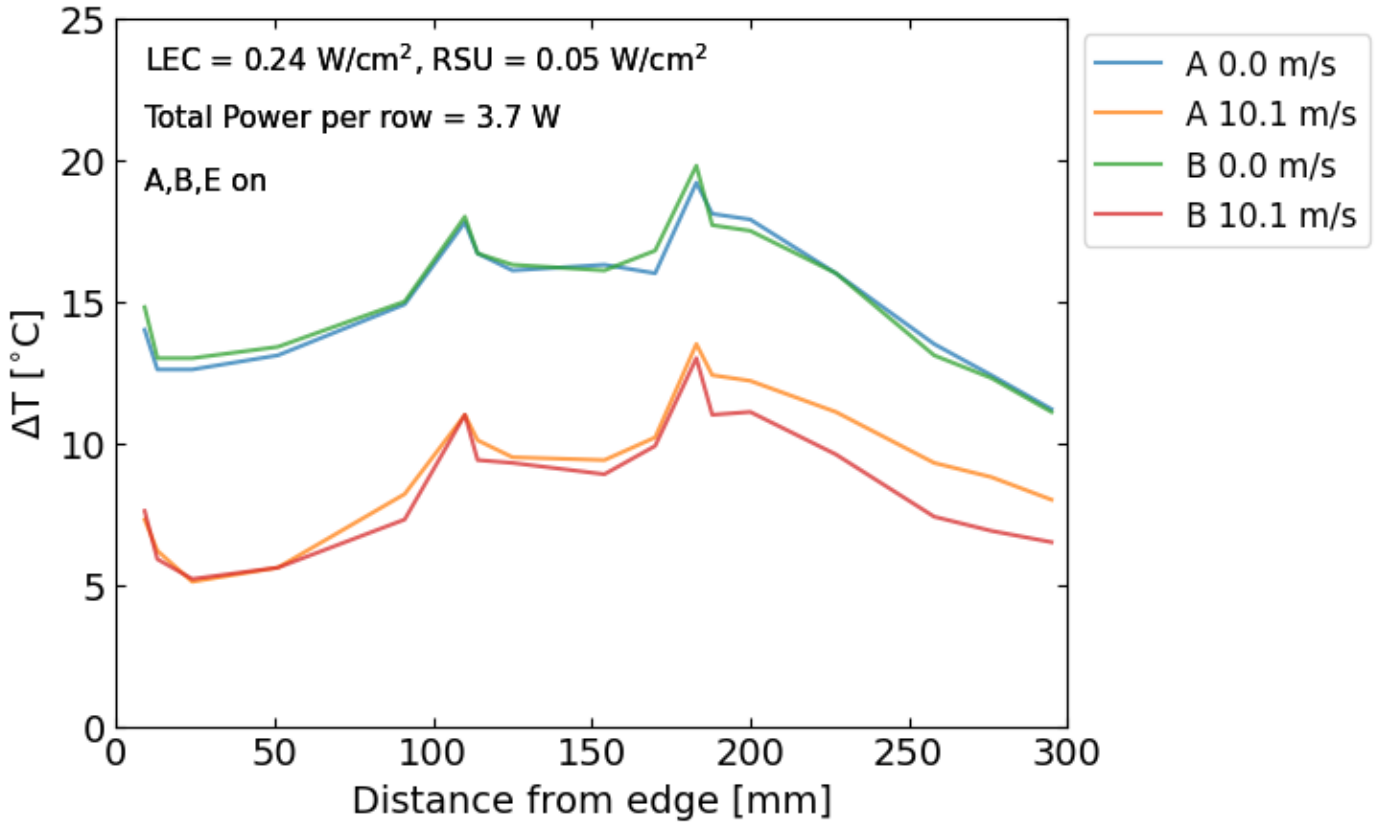
30% reduction in ΔT for LEC peaks

No major change in RSU temp

- power density stayed the same

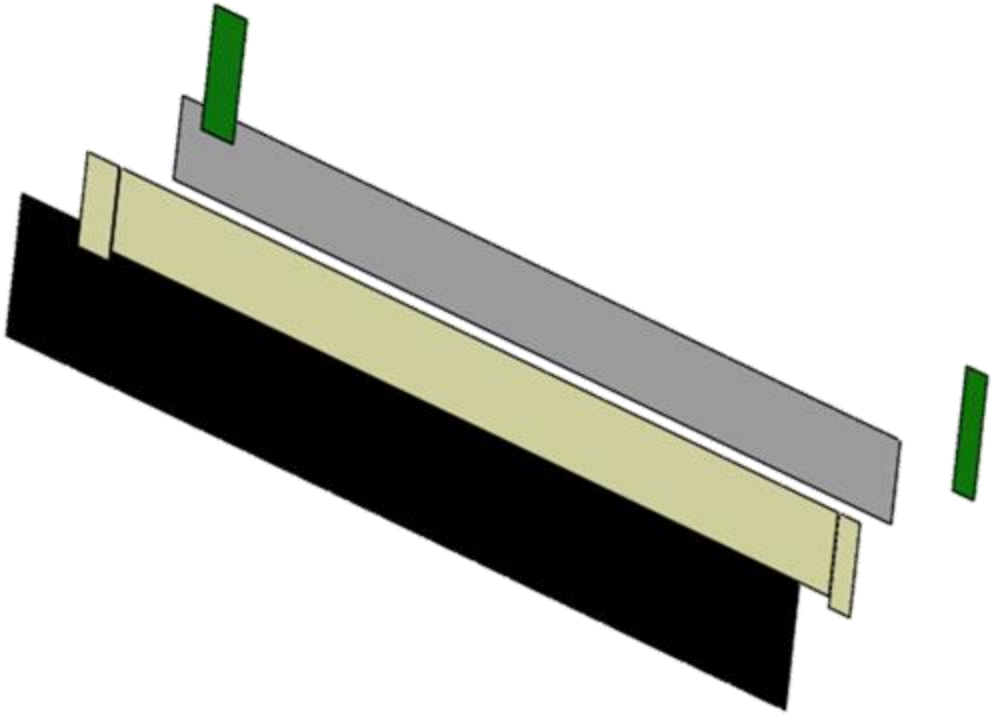
Caveat: No AncASIC

- test piece being constructed

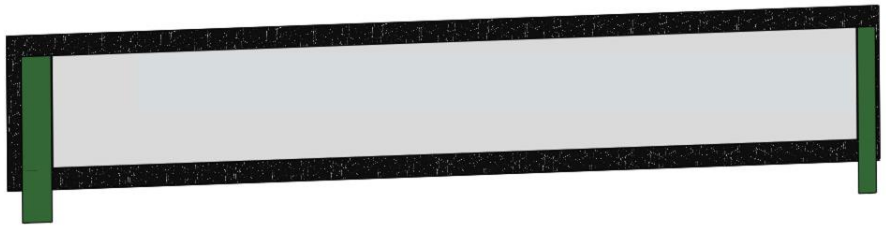


Disk modules

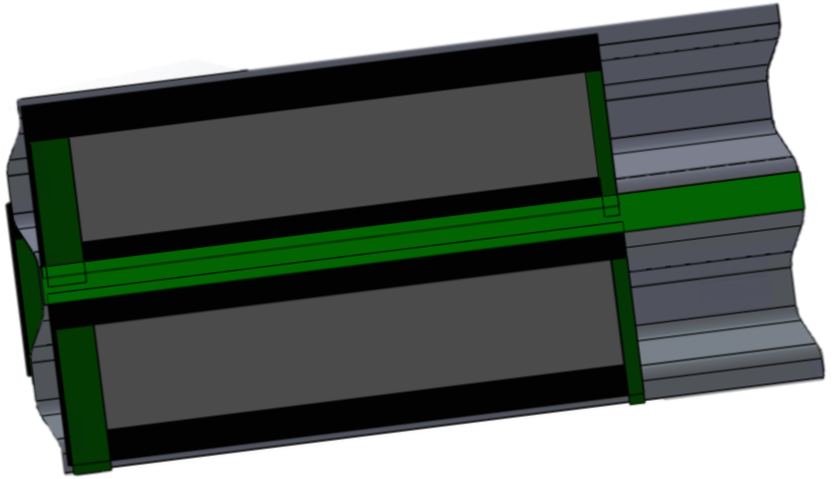
- Variations
  - 5 or 6 RSU
  - Inward or outward facing
  - Right or left handed
    - Direction of the bridge FPCs
- Considerations
  - Bridge FPC width
  - Size & placement of AncASIC
- Tooling
  - First iteration under re-design based on new information about FPCs



Summary/Next steps



- Module design being finalized
  - New information about bridge FPCs, power, & corrugation pitch all factor into the length & width of the carbon fiber flat sheet
  - Tooling design in parallel
- Other work in progress:
  - CFD with new power numbers
  - Thermal tests with AncASIC mockup
  - Connection points from disks to PST
  - Disk rim design with air manifold
  - Routing of air inlets & exhausts
  - Cable & fiber routing



Material measurements

Piece	Exp. Density [g/cm^2]	Meas. Density [g/cm^2]	% Difference (exp. to meas.)	Meas. % X/X_0
Corrugation	0.023	0.024	+4.3	0.06
Flat sheet	0.023	0.026	+13	0.06
Panel (fs + glue + corr + glue + fs)	0.072	0.078	+8	0.18

- Flat sheet not bleeding as much/enough resin? **Currently being checked**
- If we consider silicon at 0.09% X/X_0 (with overlaps), FPC at 0.03% X/X_0 (averaged over pitch) → total X/X_0 is **≥0.3% X/X_0**
  - Need to save ≥0.05%: Likely place is cut outs in the flat sheets → need to be tested for mechanical strength and effect on the thermal performance