AC-LGAD cooling simulations and latest geometry mock ups

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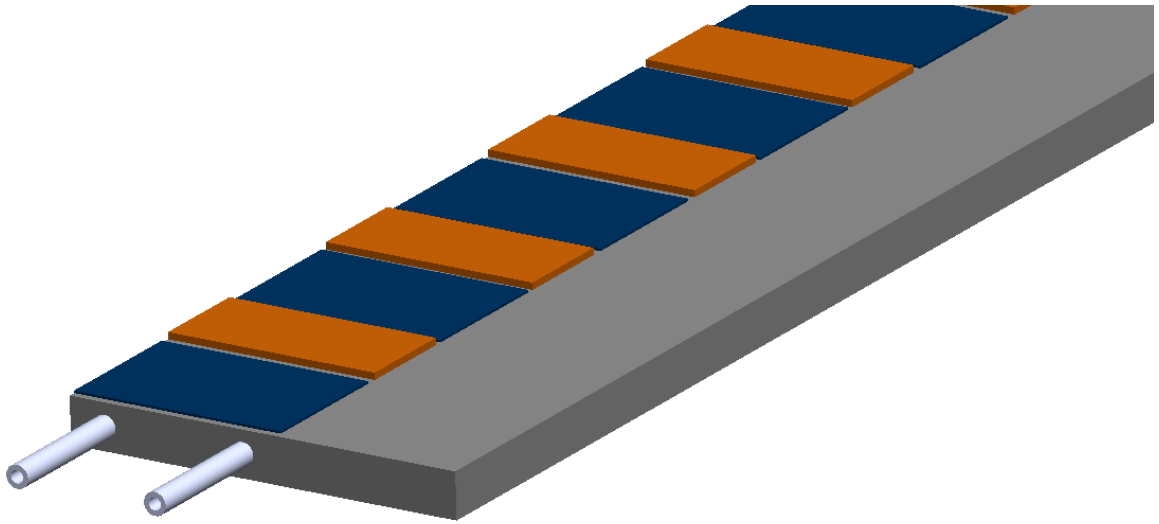
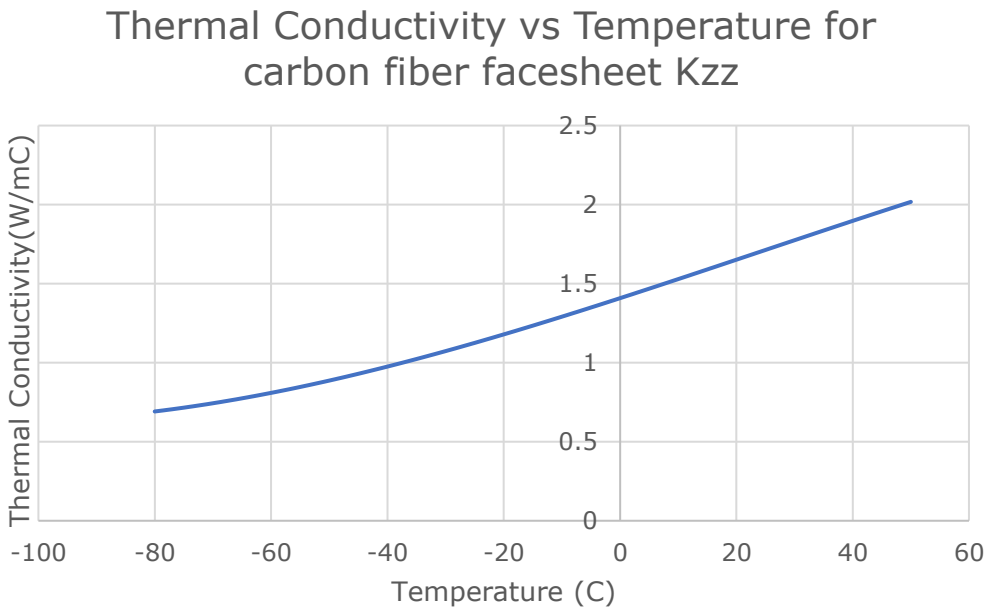
Updated CAD

- Blue – 3x2cm Silicon Modules
- Orange – 3x1.4cm ASIC/ROC Modules
- 10mm Cooling Pipe bend radius



Part Name	Thermal Conductivity (W/mK)	Thickness (µm)
ROC and ASIC (Kapton properties)	0.97	400 and 300
Silicon Module	148	200
Carbon Face Sheet	Kxx - 180 Kyy - 150 Kzz – 0.70-2.01(Shown in graph)	200
Carbon Foam	25	6420
Loctite Epoxy	1.28	120
Stainless Steel Pipe	16	716

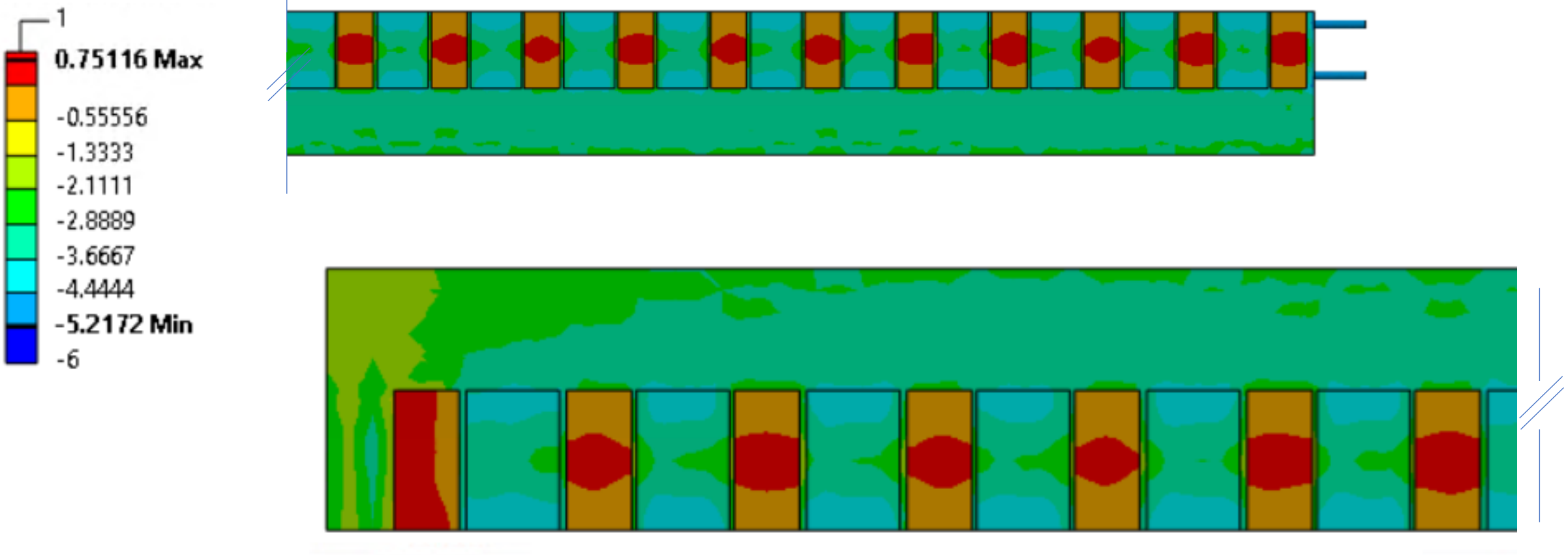


Boundary Condition Updates

- Heat Flux
  - 1.024 W/Module converted to heat flux on top surface
  - ROC Modules - 1.09 W
  - ASIC Modules- 3.14 W
- Pipe Cooling
  - 5 C 50% Glycol/Water -> h = 940 W/m^2
    - Nusselt Number = 4.36
    - Fully developed flow with constant heat flux (Heat transfer to or from a fluid flowing through a tube)
- Ambient Air Cooling
  - 22 C – h = 5 W/m^2

Results for new pipe layout and -5C glycol cooling

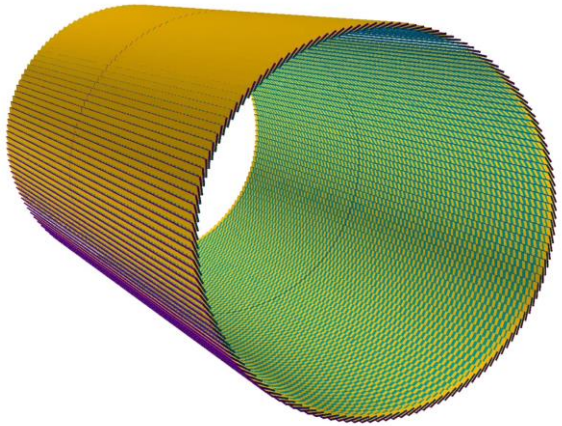
Unit - °C

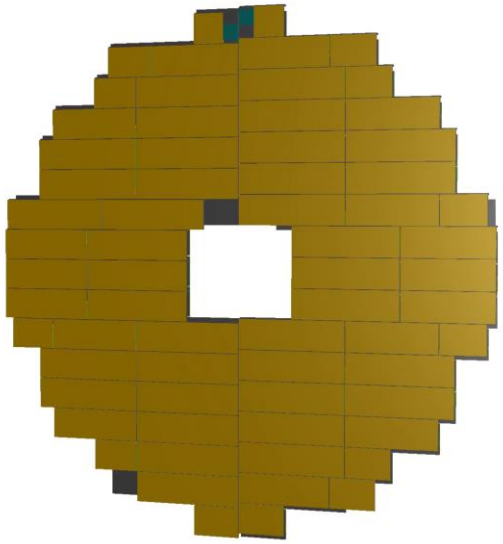


We are within simulated
$\Delta T = 7°C$

Started 3D printing and mocking up mounting mechanisms for staves and engagement rings

CAD from Tommy's emails





New geometries being implemented for both stave mechanics and cooling prototyping as well as FEA

Next steps at Purdue

1. Implement bTOF FEA simulations for cooling performance with latest layout
2. Stave clip mechanism for mounting iteration v2.
3. Stave thermal performance and layout for all the readout and patch panel CAD in the global mechanics assembly process