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Engineering Portfolio

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Wisconsin Racing FSAE: Monocoque Modal Tap Test

(Spring 2024)

- Conducted modal tap test for correlation of CFRP monocoque test modes to FEM modes

- Developed Python code for LabJack DAQ to record time domain data at 10 kHz, resolving frequencies up to 1 kHz

- Developed WR-TapTest, a Python package designed to post-process tap testing data
  - Trial run averaging
  - Take time domain forcing and response data to FRFs, storing in 3D tensor
  - Compare test modes to FEM modes with modal assurance criterion (MAC)

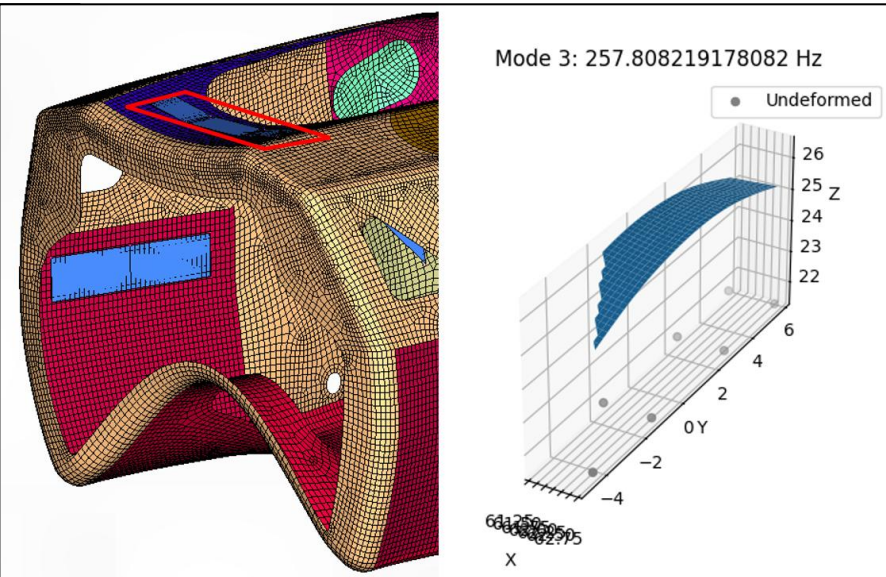- Correlation of modes in 200 – 600 Hz range

Free-free Boundary Condition Test Set-up
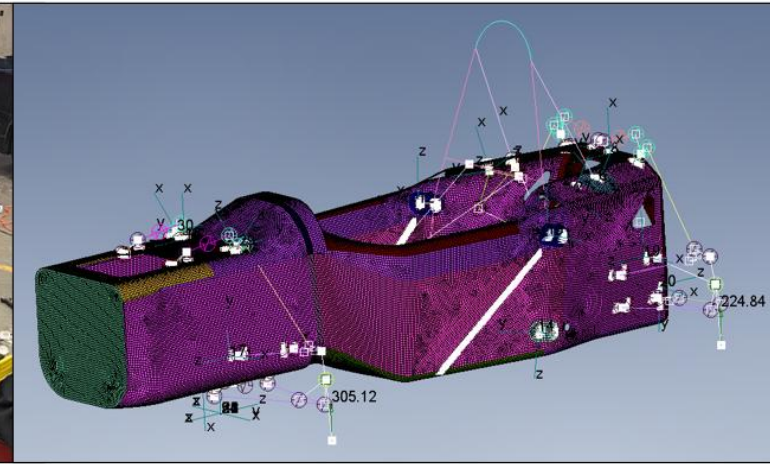
Monocoque Finite Element Model

Recording Forcing and Response Time Histories

Comparing FEM Modes (left) to Test Modes (right)

Wisconsin Racing FSAE: Accumulator Cooling
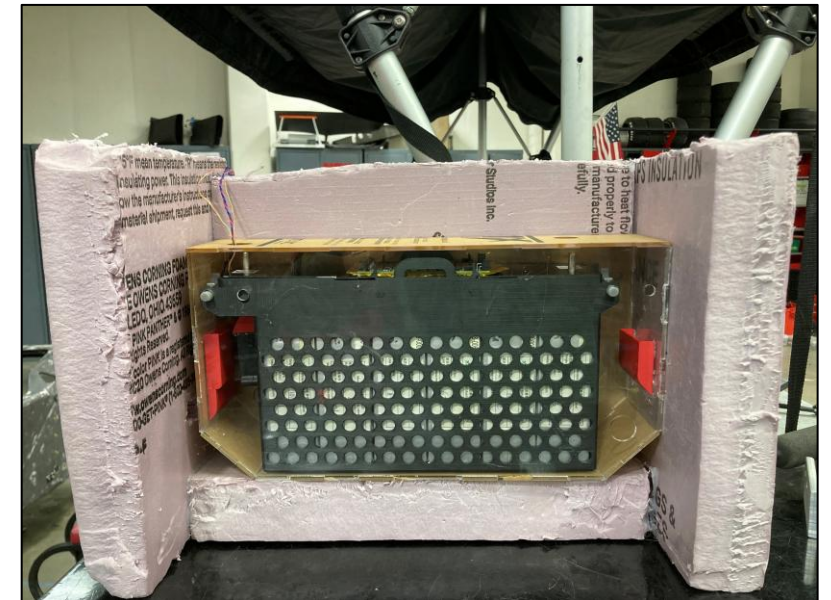
(Fall 2024 - Current)

- Introduced active air-cooled package into the HV Accumulator to keep cells under 45°C charging temperature limit due to the introduction of regenerative braking

- Identified chosen blower fan based on 1D thermal analysis and simulated heat transfer coefficient

- Design and tested inertial separator component to prevent water ingress into accumulator

- Led module thermal testing for characterization of air-cooled (11s3p) module temperatures vs SOC
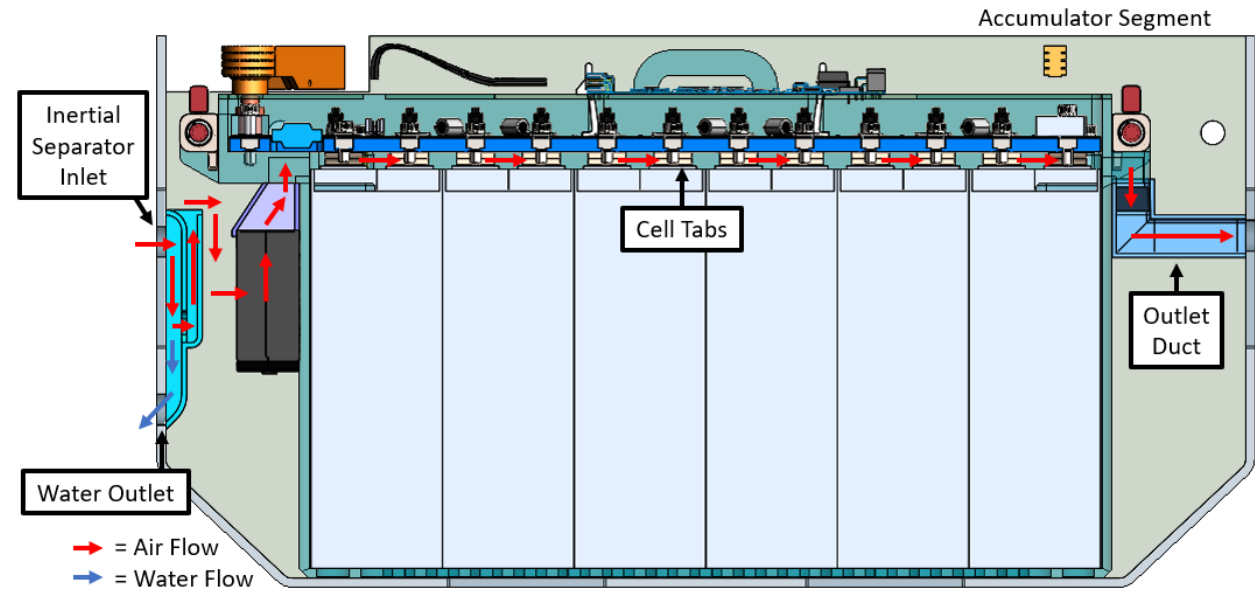
Accumulator Cooling Design and Module Air Flow Path
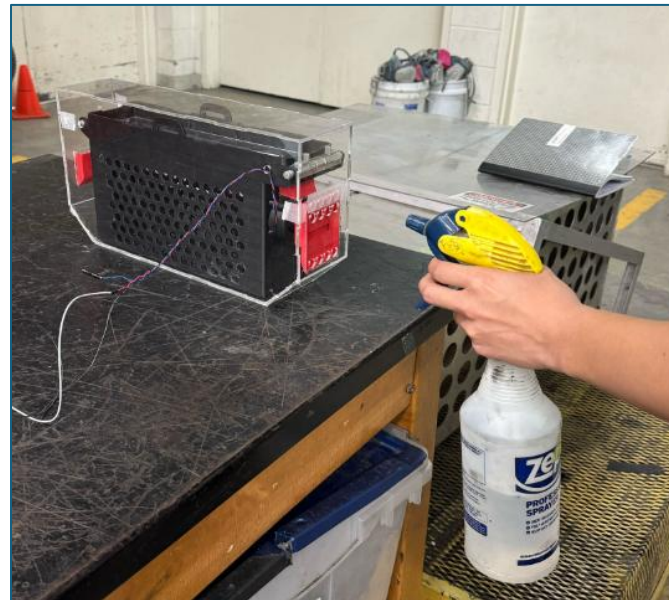

Inertial Separator Testing


Module Thermal Testing

Wisconsin Racing FSAE:
Cooling Loop Thermal Analysis
(Fall 2023 - Current)

- Introduced Conjugate Heat Transfer (CHT) CFD simulations to Wisconsin Racing to analyze heat transfer within the cooling loop

  - Updated cooling jacket pressure drop for 1D Simulink cooling loop model

  - Worked with cooling design team to present optimized flow rate for the pump

- Utilized high performance computing (HPC) clusters to run simulations

- Developed StarCCM+ Java macros, batch scripts, and Python scripts to improve parallel computing for sweeps and to decrease post-processing time
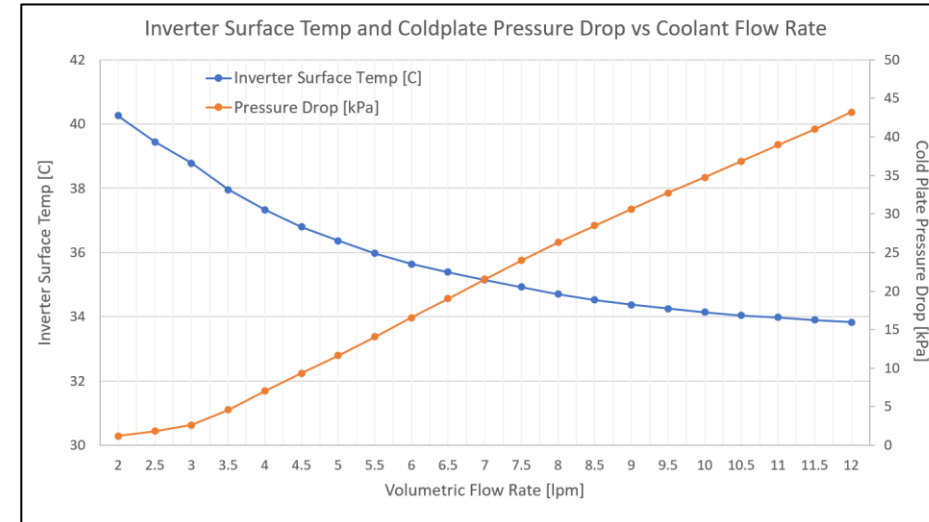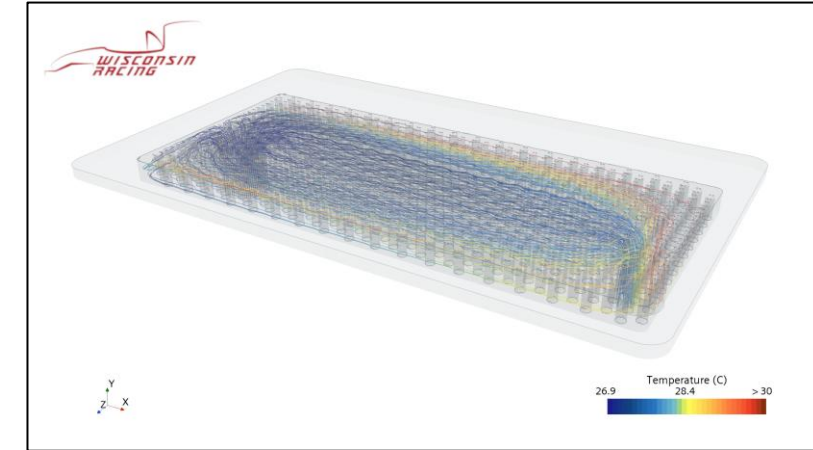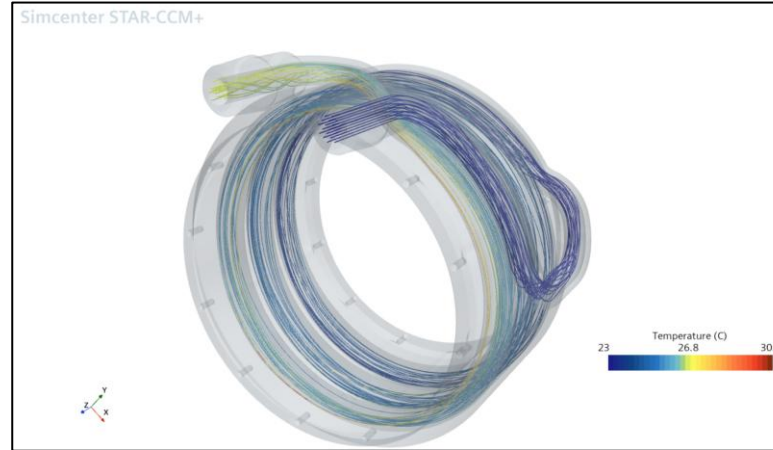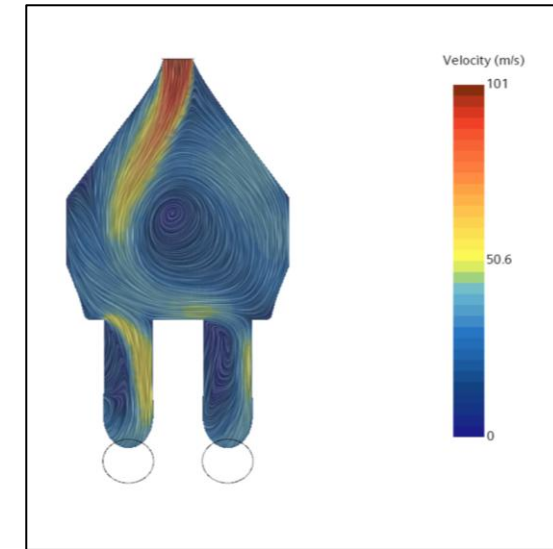
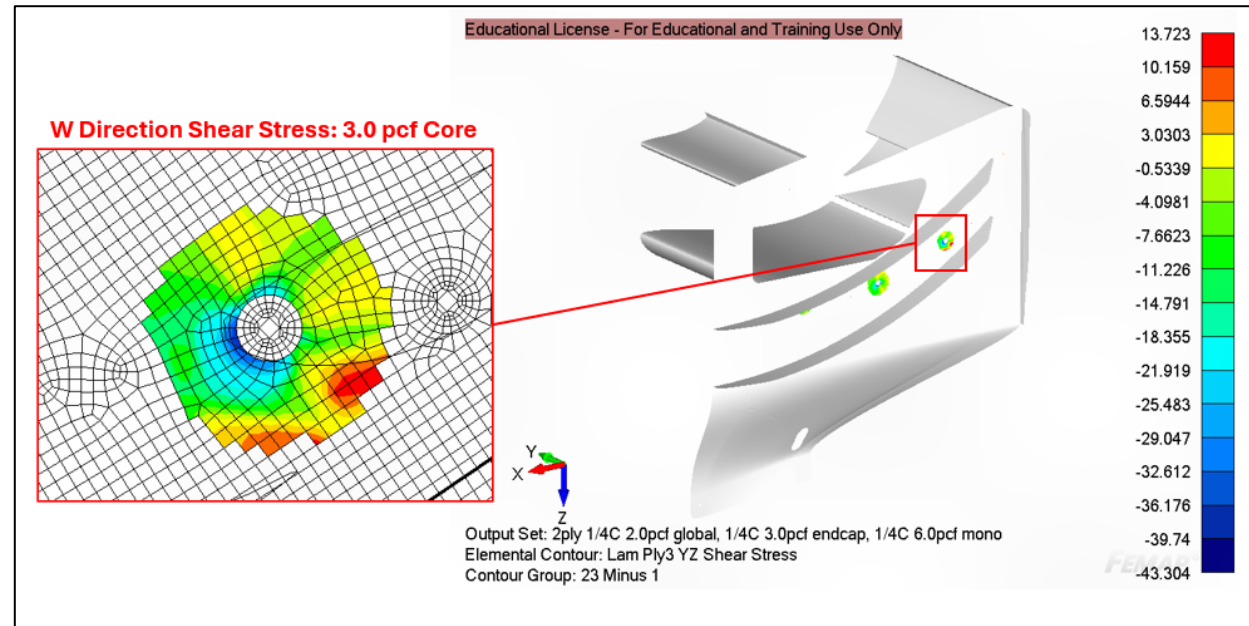# Wisconsin Racing FSAE: Other Analysis Projects
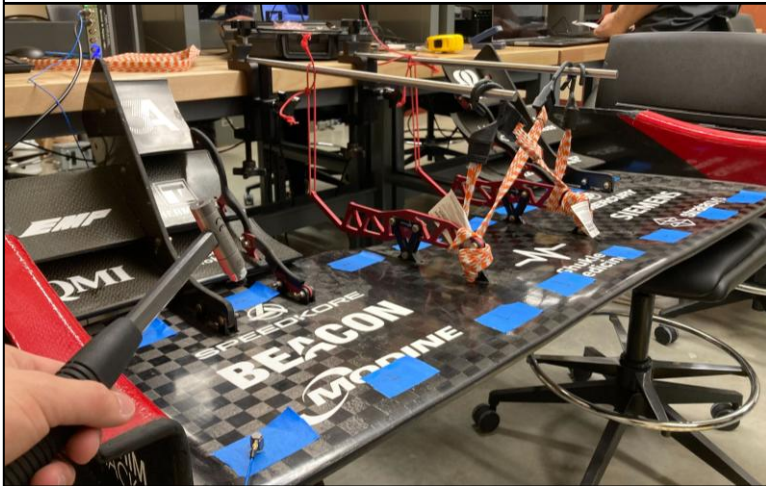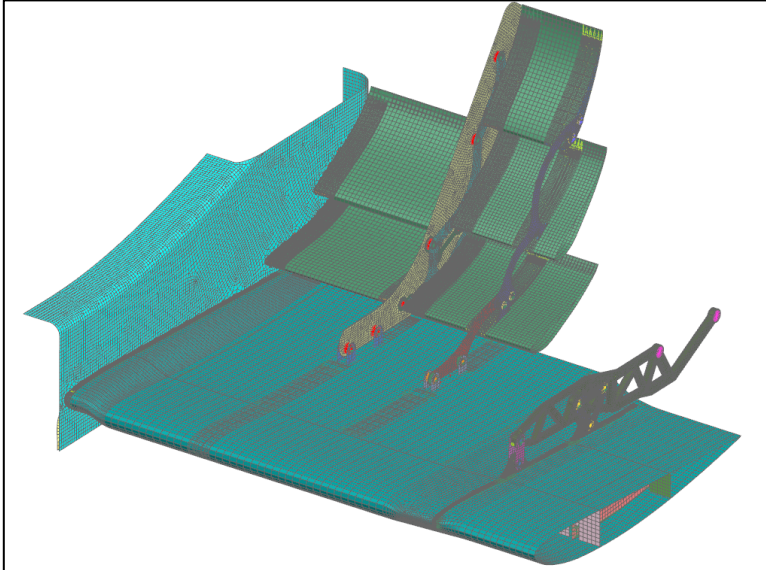
Front Wing Modal Tap Test Initial Correlation
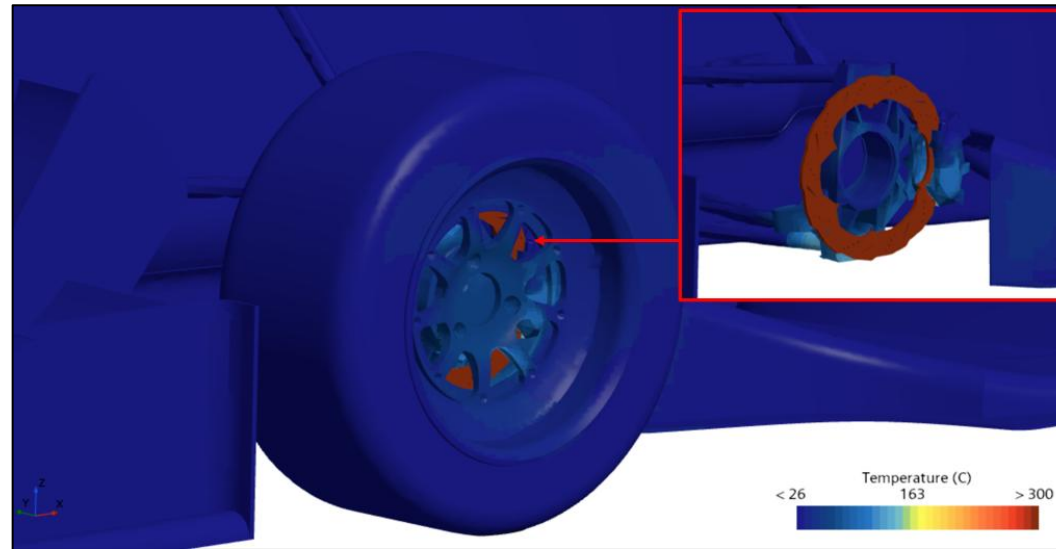
Brake Rotor Heat Transfer Coefficient Study

Custom Intake CFD Support

Rear Wing End Plate Mass Optimization Study