

DSG Ansys R&D Meeting

Date: July 13, 2023

Time: 2:00 PM – 2:30 PM

Attendees: Aaron Brown, Pablo Campero, Brian Eng, Tyler Lemon, and Marc McMullen

1. EIC test stand thermal analysis

Pablo Campero and Brian Eng

1. Ran simulation with no inlet velocities for the inner volume; applied thermal natural convection for fluid zones of the inner volume of the heater pipe and the beampipe
 - Temperature for the heater elements of 230°C
 - Used Boussinesq approach to vary the density of the mineral oil
 - Enabled gravity (y-axis direction, -9.81 m/s)
 - Results showed higher heat transfer between the heater element and the surrounding fluid than previous simulation, with ~10°C difference between the inlet and outlet, and silicon temperature increased to ~60°C
2. Discussed simulation results; agreed that temperature for the heater elements should be reduced and therefore the temperature of the heater pipe since the simulation model has a greater contact surface between the heater pipe and the beampipe compared to the actual test stand model
 - The goal is 100°C at the beampipe
 - Reduce temperature for the heater elements to 170°C
 - Replace Boussinesq model with polynomial coefficients (from mineral oil datasheet) to vary the density as function of the temperature
 - Simulation in progress

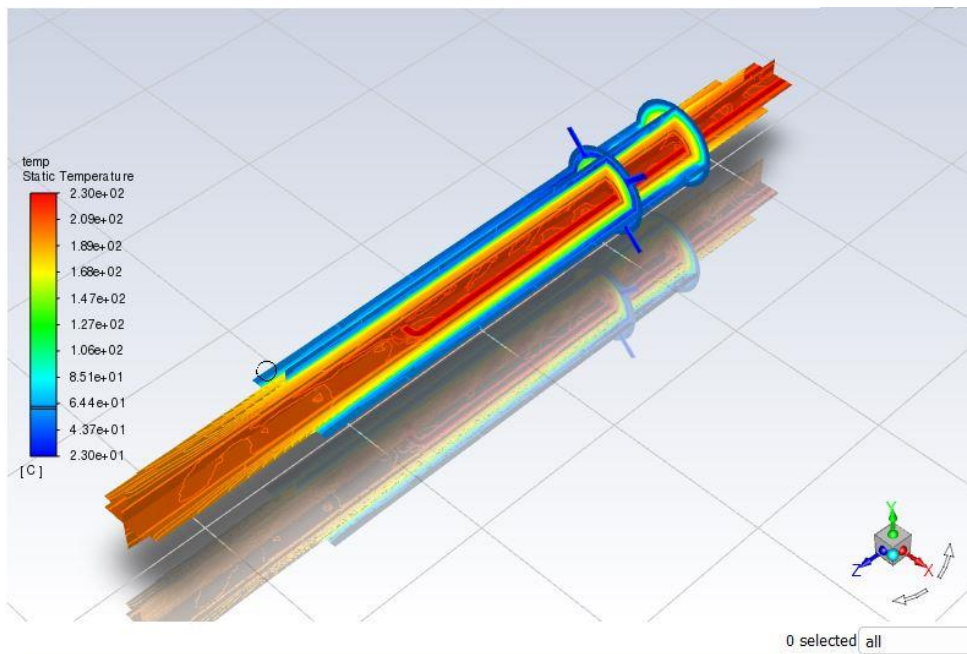


Fig. 1. Temperature contour plot – isometric view for various planes of the model when natural convection was simulated with no inlet velocity for heater pipe and beampipe inner volume fluids

2. NPS thermal analysis

Pablo Campero

1. Added individual crystal blocks with dividers to detector model
 - Subtracted crystal blocks, dividers, and cooling plate from inner volume of the detector
 - Completed sharing topology to ensure contact between surfaces
 - Completed geometry check to ensure that there is no interference
 - Researched Fluent options for models with thin geometry
 - Shell options can be used to simulate heat transfer from the dividers to the crystals, allowing removal of dividers from the model and use of a simple mesh

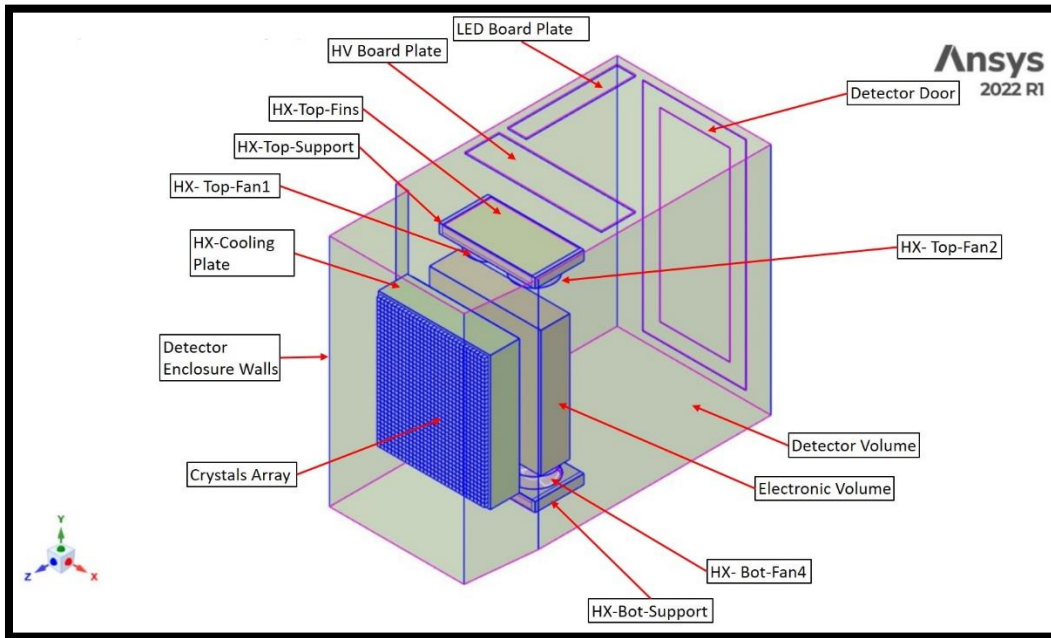


Fig. 2. Isometric view of the NPS detector enclosure with crystals and cooling components