DSG Ansys R&D Meeting Minutes

Date: October 12, 2023
Time: 2:00 PM – 3:00 PM

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

1. NPS thermal analysis with Ansys Mechanical

Aaron Brown and Pablo Campero

1. Ran simulation in transient mode
   - Incremented the step time to reach equilibrium of maximum temperature at the crystals
   - Allocation memory error received during the solving process; debugging in process
2. Created a model of
3. one crystal
   - Added thin slice volume attached to the rear face of the crystal to enable the setup of internal heat generation
4. Tested various thermal conditions
   - Heat generation of 7.5e5 W/m3
   - Heat flow of 0.3 W
5. Ran multiple simulations applying convection to different numbers of walls
   - Generated temperature plots
   - Noted a difference less than 0.7°C on the final maximum temperature of the crystal when model is set with internal heat generation and heat flow
   - Convection applied to different numbers of crystal external walls affects the maximum temperature of the crystal

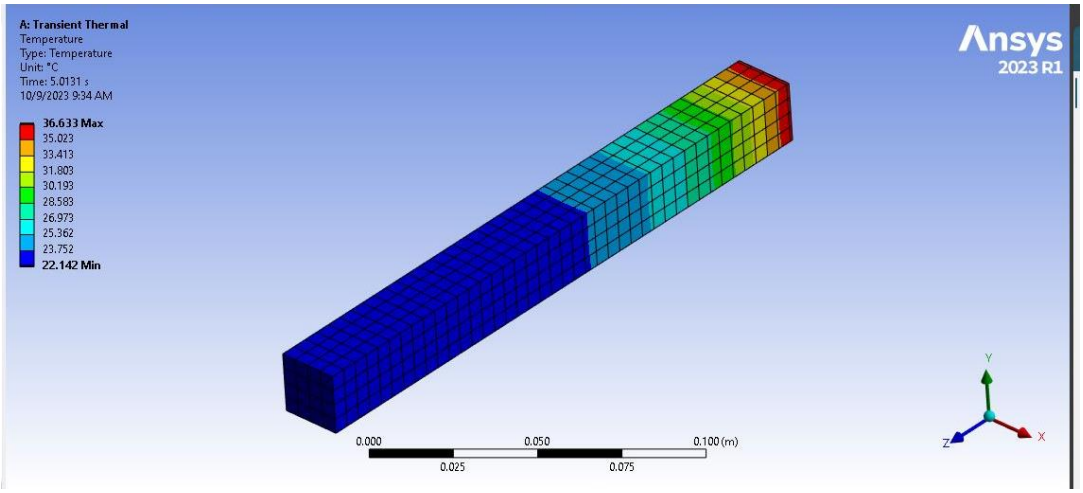

Fig. 1. Crystal with internal heat generation of 7.5e5 W/m3 and convection at 10 walls. Maximum temperature was 36.6°C

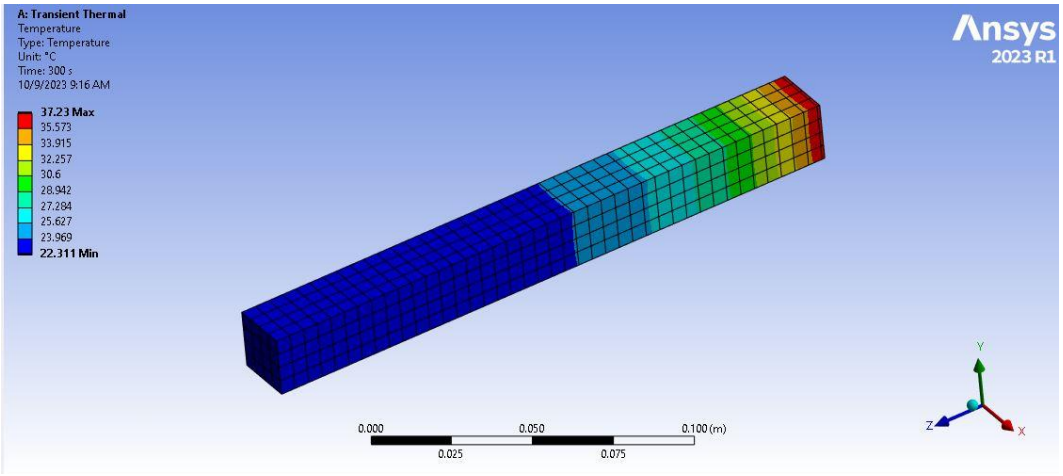

Fig. 2. Crystal with heat flow of 0.3 W and convection at 10 walls. Maximum temperature was 37.23°C

2. EIC beampipe Ansys Fluent thermal analysis

Pablo Campero

1. Added another layer of insulation for a total thickness of 0.78 mm
2. Ran thermal simulation; difference between model with 0.78-mm thickness and the model with thickness of 0.39 mm is < 0.2°C
   - Overall temperature is higher for the model with 0.78 mm
3. Plotted all measurements for eight airflow inlet velocities at fixed inlet flow temperature of 100°C

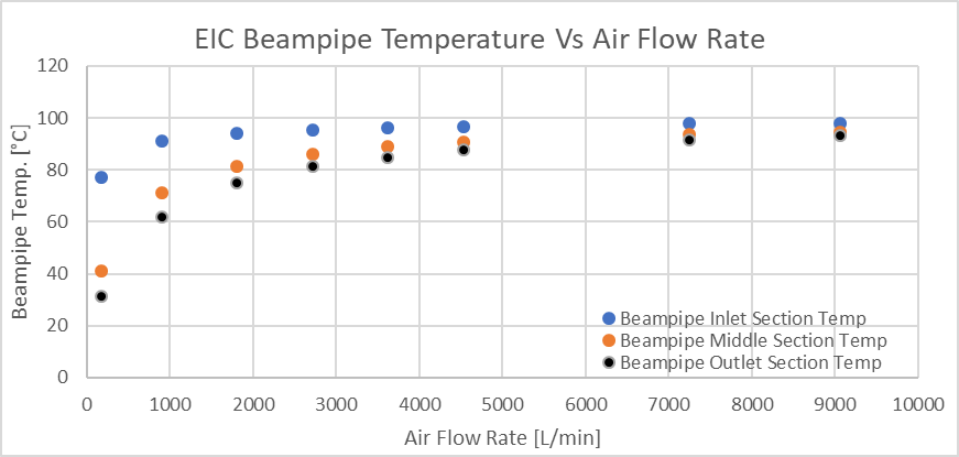

Fig.3. EIC beampipe temperature vs airflow rate