DSG Ansys R&D Meeting Minutes

Date: October 5, 2023
Time: 2:00 PM – 3:30 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. Completed model mesh
   - Mesh became finer due to thin parts that needed to conform with the surrounding parts
2. Completed Ansys Mechanical thermal model setup
   - Set up materials for crystals, cooper plate, and dividers
   - Added boundary conditions; heat flow of 0.3 W for each crystal rear wall
3. Ran first simulation in transient mode
   - Maximum temperature was ~22ºC
   - Need to run more to reach equilibrium

2. NPS thermal analysis with Ansys Fluent

Pablo Campero

1. Resolved high spot temperature issue; maximum temperatures are within expected range
   - Turned on energy-numerical-noise filter
   - Modified crystal rear face wall conditions; used heat generation rate and wall thickness instead of Shell Conduction option
   - Numerous shell conduction walls slow down the user interface interaction greatly
   - Turned off energy secondary gradients at walls
2. Ran simulation with 300 iterations in ~48 hrs
   - Noted that high temperature spot was not present
   - Maximum temperature for the crystal did not reach steady state
   - Sent files to Ansys support

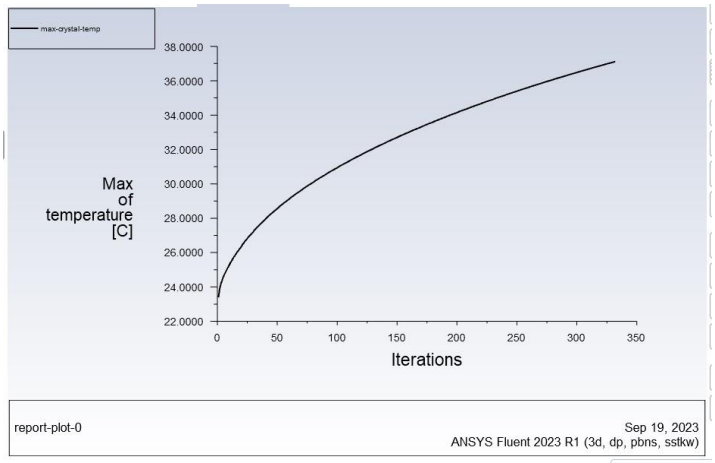

Fig. 1. Maximum crystal temperature report definition for simulation with 300 iterations

3. Evaluating contour plots and report definitions for simulations with 1000 iterations

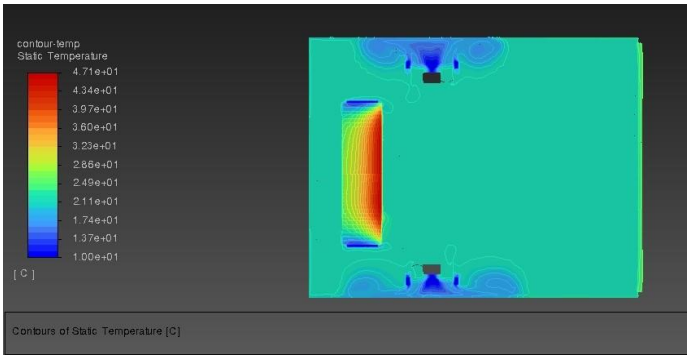

Fig. 2. Temperature contour plot for *YZ* plane, cross-section, right. High temperature of >47ºC is at the crystals' rear face

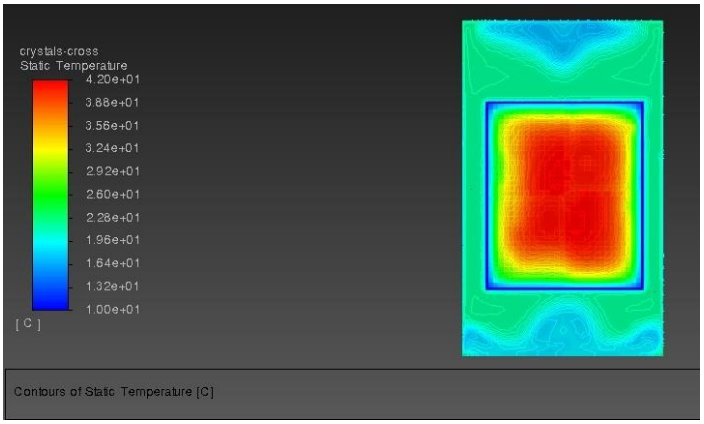

Fig. 3. Temperature contour plot for *XY* plane, cross-section, front

4. Ansys support stated that about 4000 iterations are needed by the crystal to reach steady state
   - Ansys informed that simulation was run on Ansys Cloud with 320 cores
   - Maximum temperature of the crystal reached steady state at ~58ºC
   - Running this simulation with the same number of iterations on EXPCAMPERO computer might take weeks; suggested to look into HPC resources (HPC_Pack licenses and cloud for multicores usage)

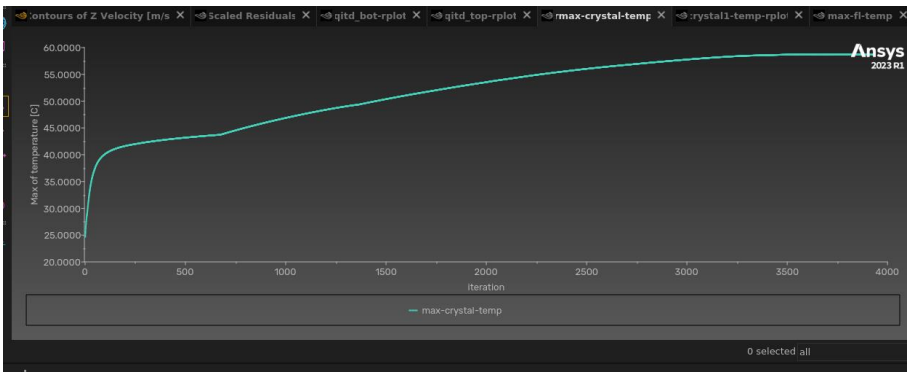

Fig. 4. Maximum crystal temperature plot for 4000 iterations

5. Discussed available resources for HPC in the Lab with Todd Coates

- Testing stage setup is almost completed to run Cloud Computing with Amazon Web Service (AWS)
- Ansys will provide testing HPC pack trial licenses to run the system while testing
- Will be open initially to selected users with complex models and eventually to all Ansys JLab users
- Test will determine the usage and performance of the system