

Thermal Analysis of NPS Crystal Array with Ansys

I am working on an IronPython script to extract temperature probe values from the Ansys static thermal analysis of the NPS crystal array model, Fig. 1, to determine the temperature profile of the crystal array and to verify that the cooling methods used in the detector frame are adequate to keep the temperature of the crystals at $18^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$ (proposed operating temperature). IronPython is an open-source implementation of the Python programming language which can be used in Ansys for simulation, control, and automation.

Initially, I tried to export the temperature profile directly from the simulation solution to a text file, but was only able to export the overall max, min, and average temperature of the model. There was no information on the individual crystal faces.

I was also able to export the temperature values at the model's mesh nodes to a text file, but these values did not provide any information regarding the temperature of the crystal faces as the mesh nodes are located at the corners of the crystal faces.

By placing temperature probes on the front face of each crystal (task completed by Mary Ann Antonioli), it was possible to use an IronPython script, `get-results4.py`, to export the temperature values to a text file, `36x30-temps17.txt`.

The plan going forward is to export the temperature values for the rear faces of each crystal using the same method. Eventually, these values, along with the front face temperature values, will be used to complete a gradient analysis of the crystal array temperatures.

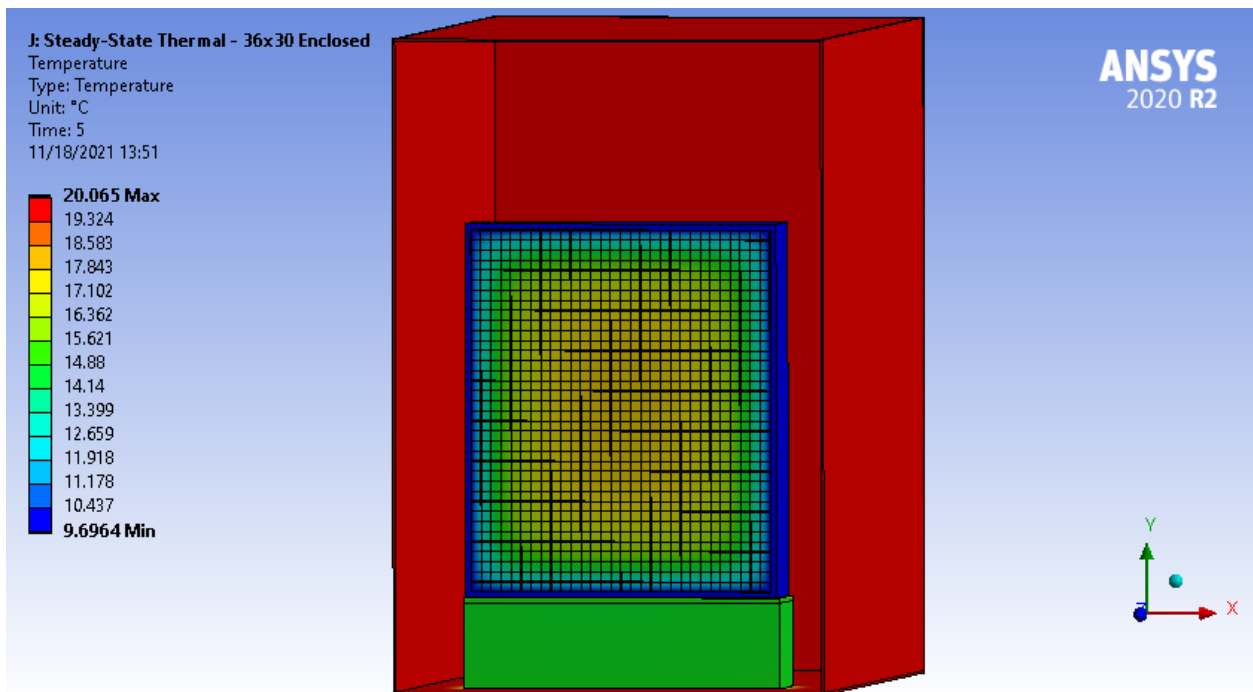


FIG 1. Screenshot of Ansys model of crystal array and enclosure.