

Heat transfer simulations for three TOF-MPD detector modules

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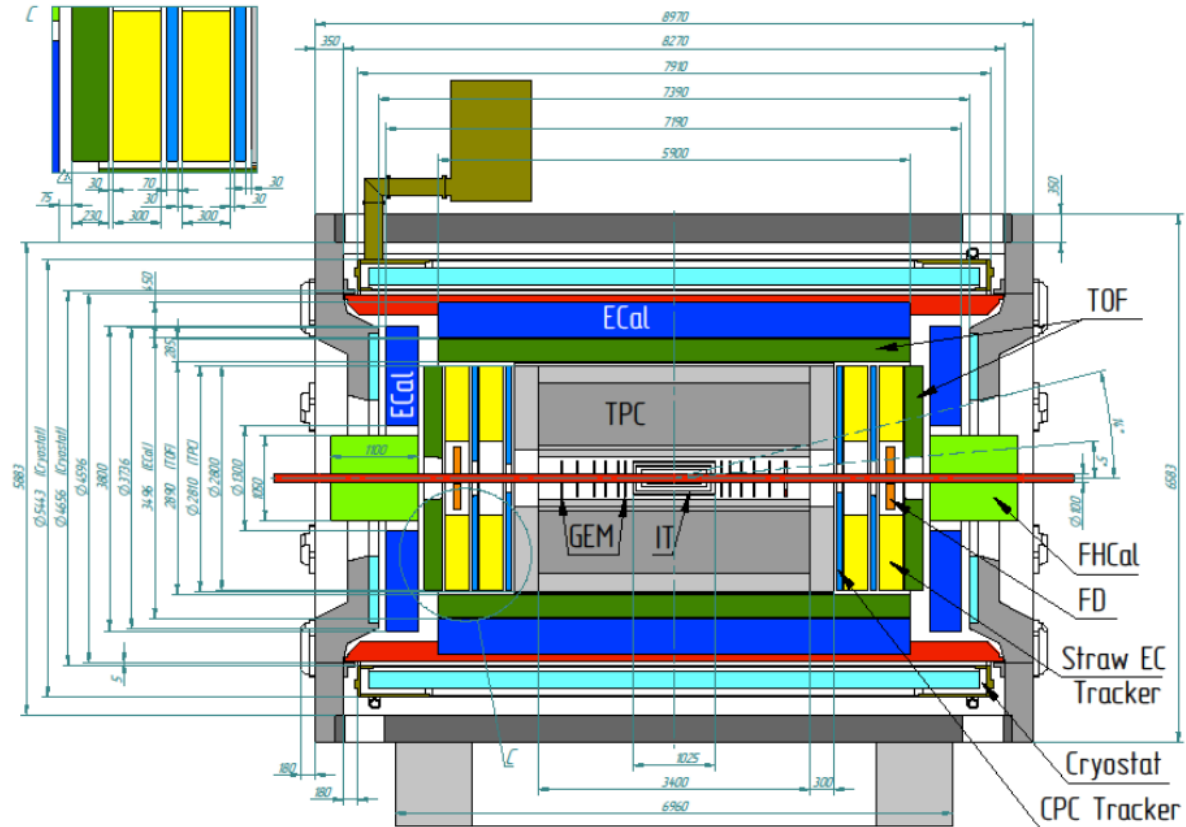
Outline

- ▶ Tasks
- ▶ Introduction
- ▶ Difficulties that came across
- ▶ The final simulation
- ▶ Results
- ▶ Conclusions
- ▶ What next?

Tasks

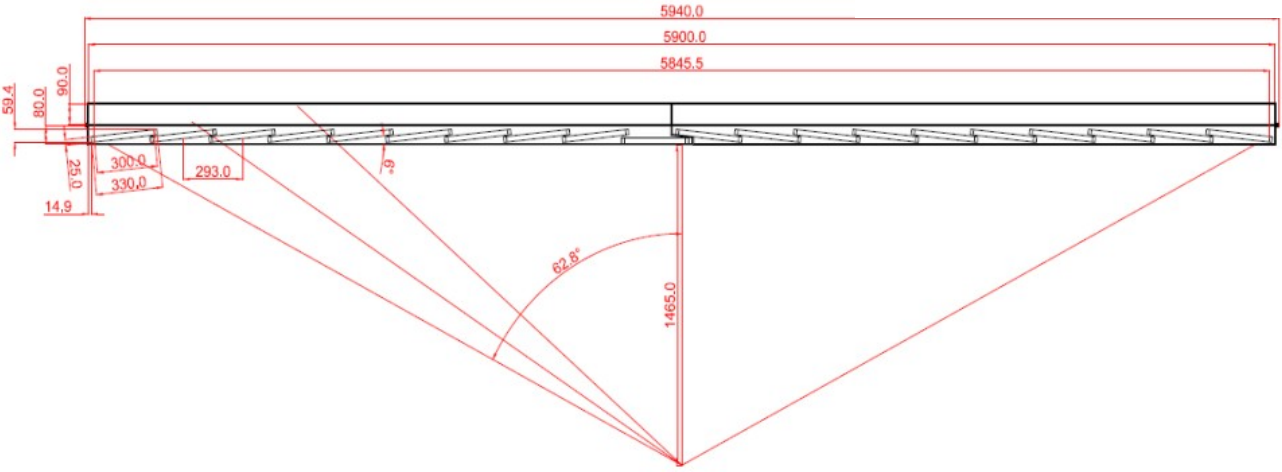
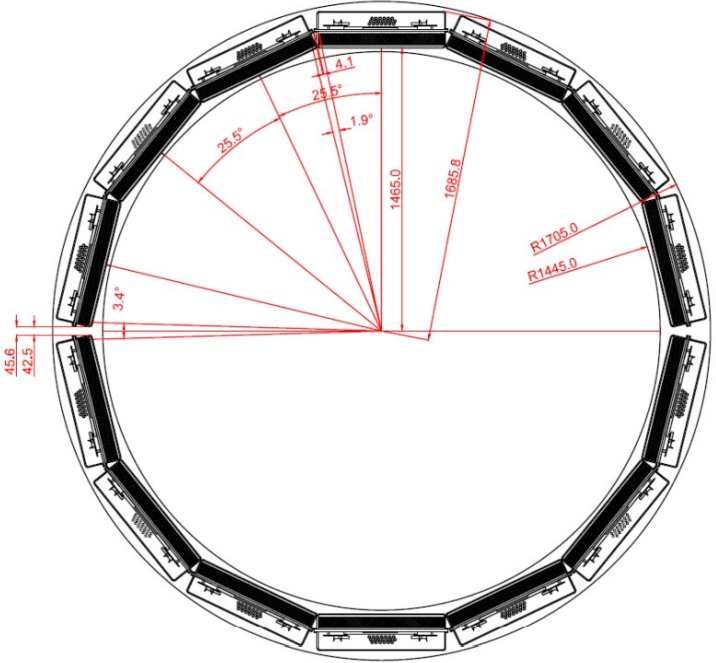
- ▶ Learn how to use Autodesk Inventor and Autodesk CFD
- ▶ Carry out simulations for electronic elements and simplified models of modules, and eventually, three adjacent modules of MPD-TOF
- ▶ Research on a method of heat transfer simulations using previous simulations results
- ▶

Introduction



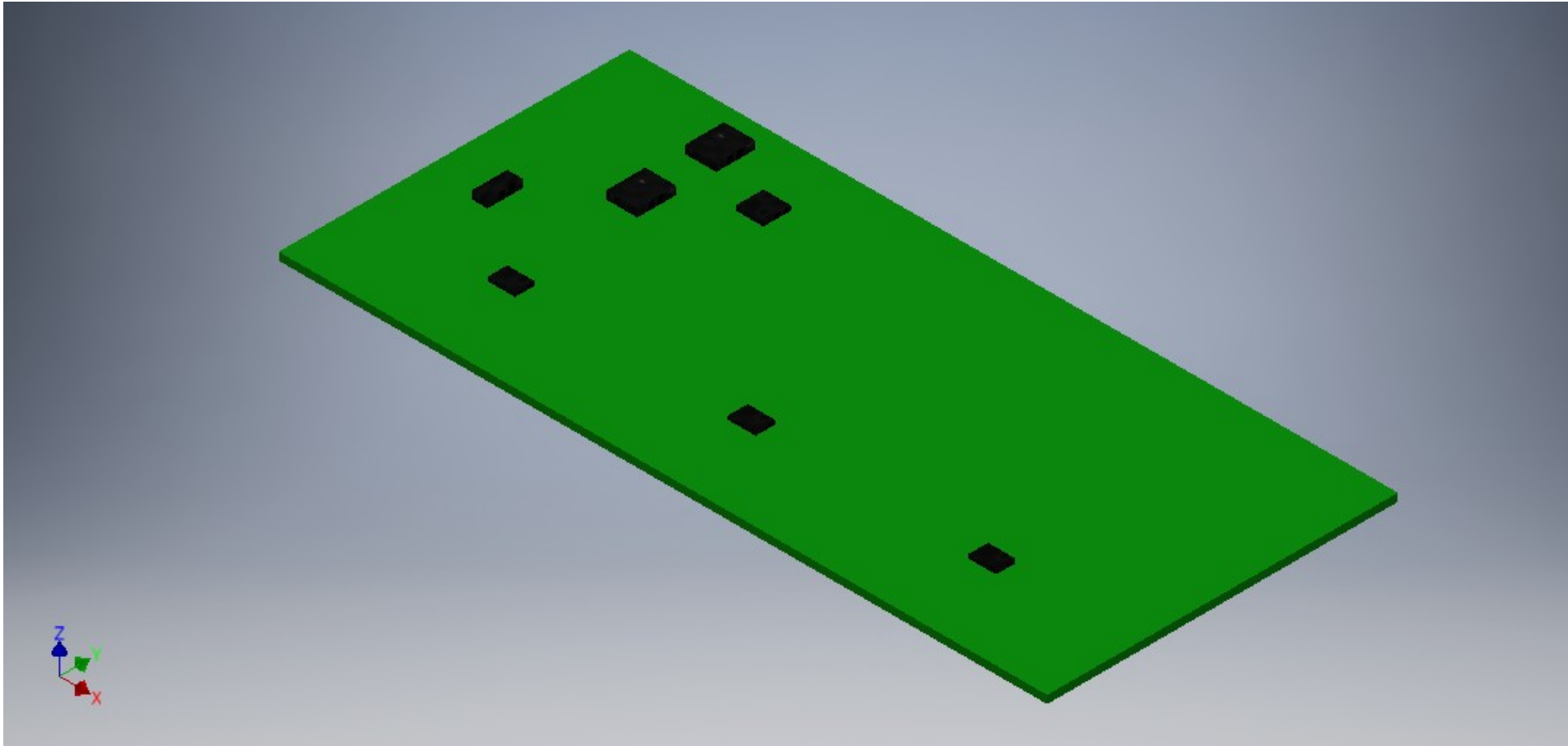
Source: MPD NICA technical design report of Time of Flight (TOF)

Introduction



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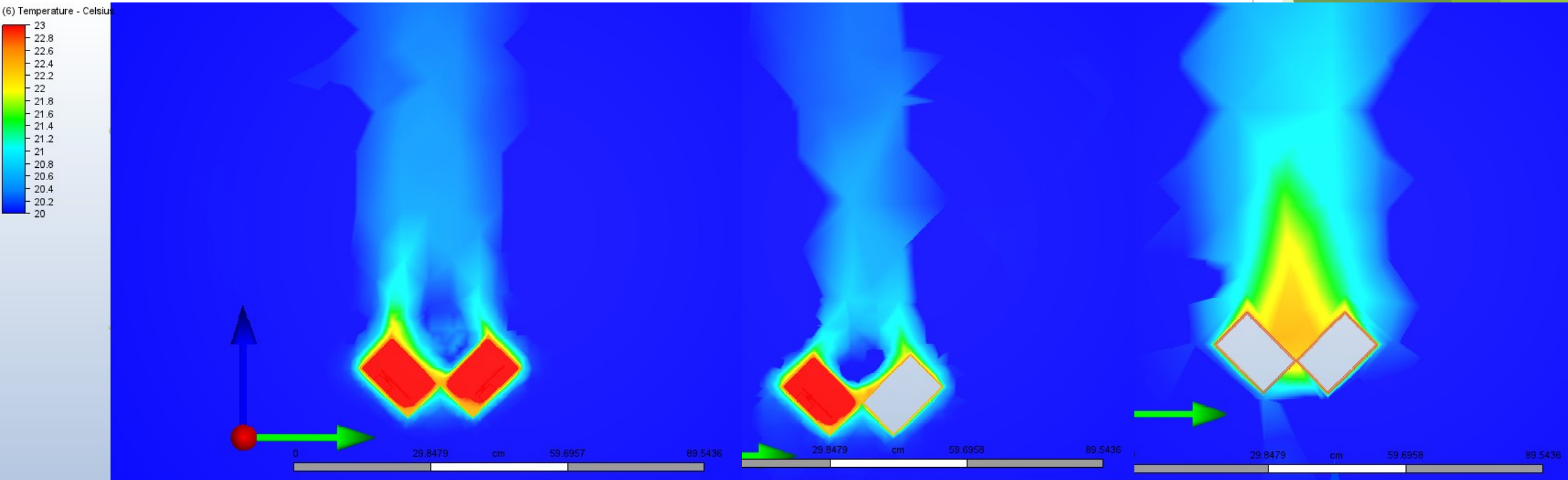
Introduction



Difficulties that came across

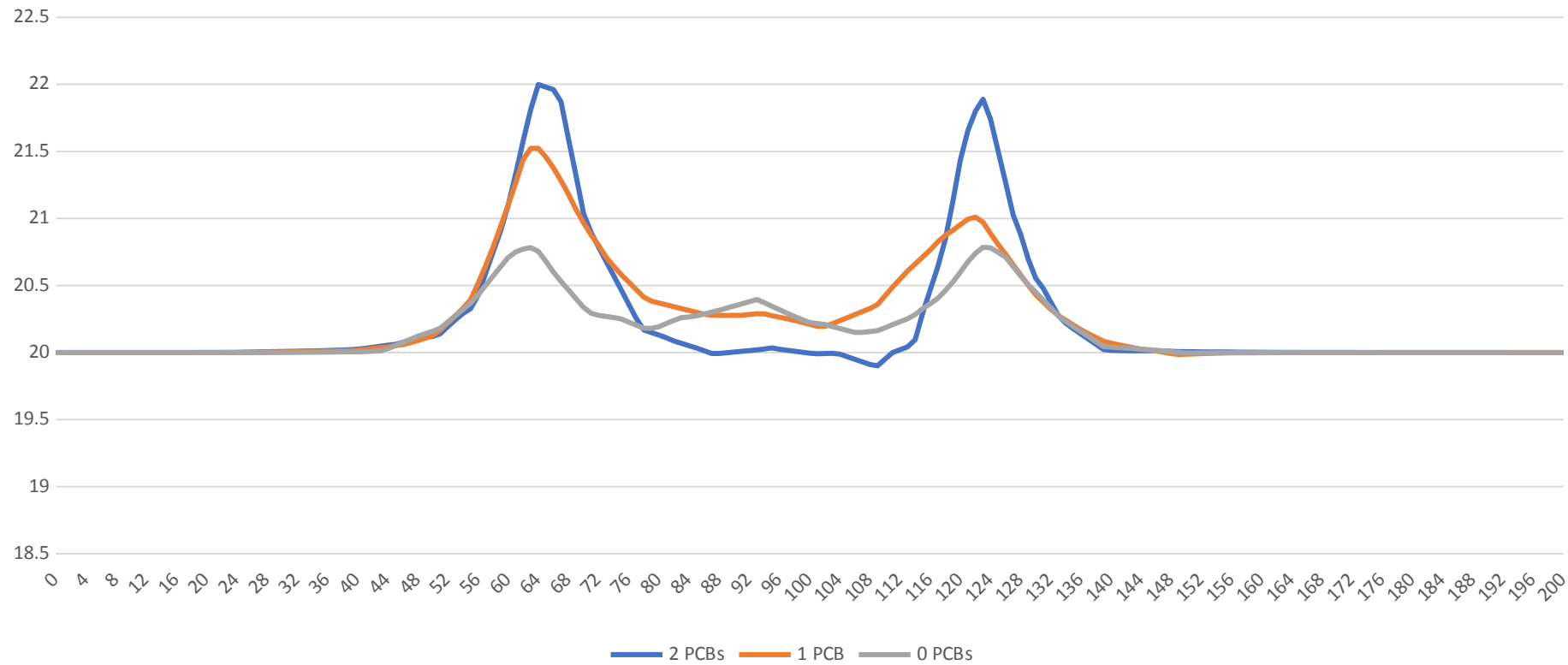
- ▶ Research on the method of performing heat transfer simulations using previous simulations results turned out not to be accurate enough

Difficulties that came across Method Research

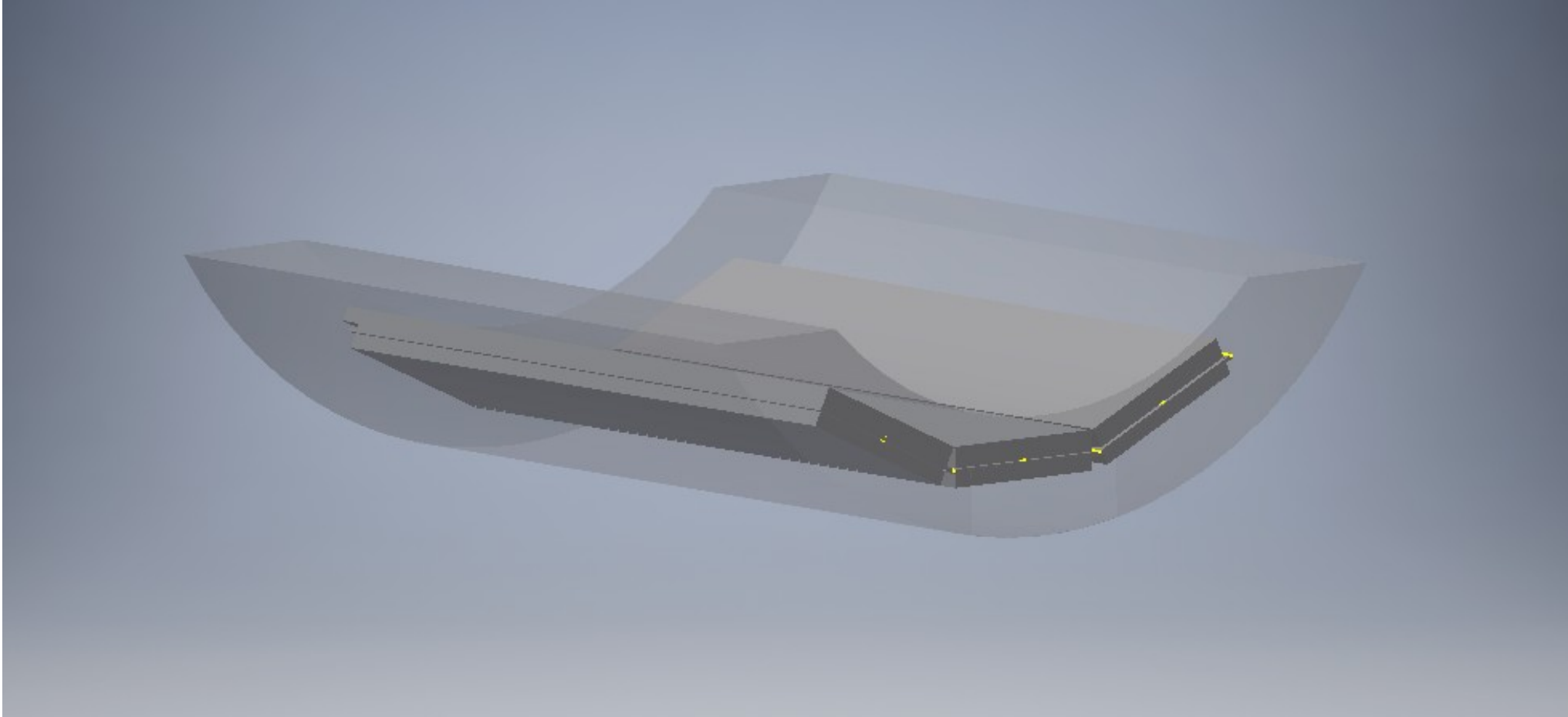


Difficulties that came across Method Research

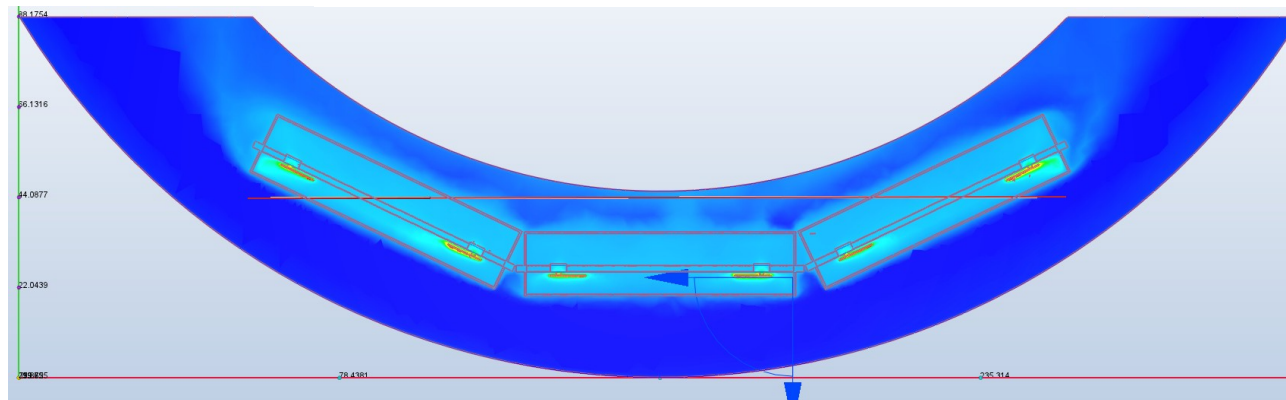
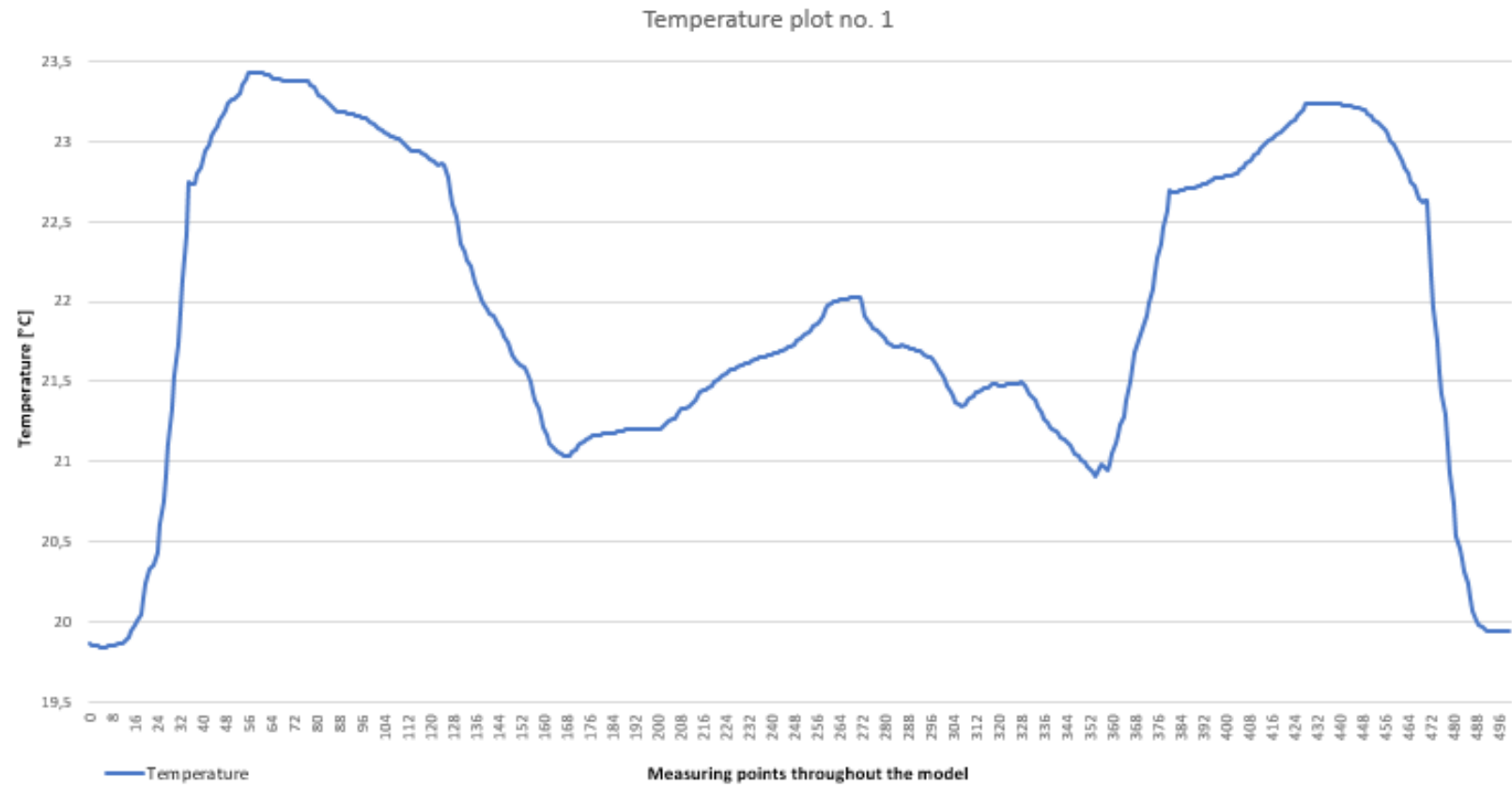
Temperatures above simplified models used during research



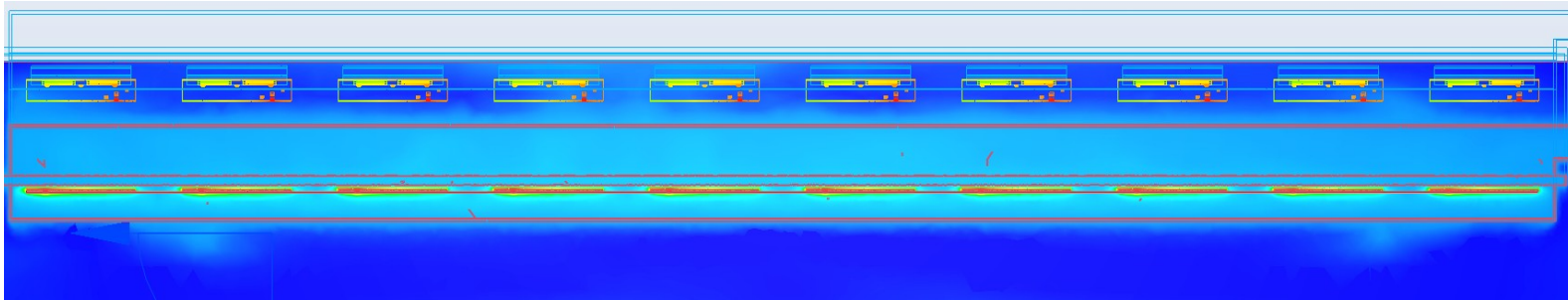
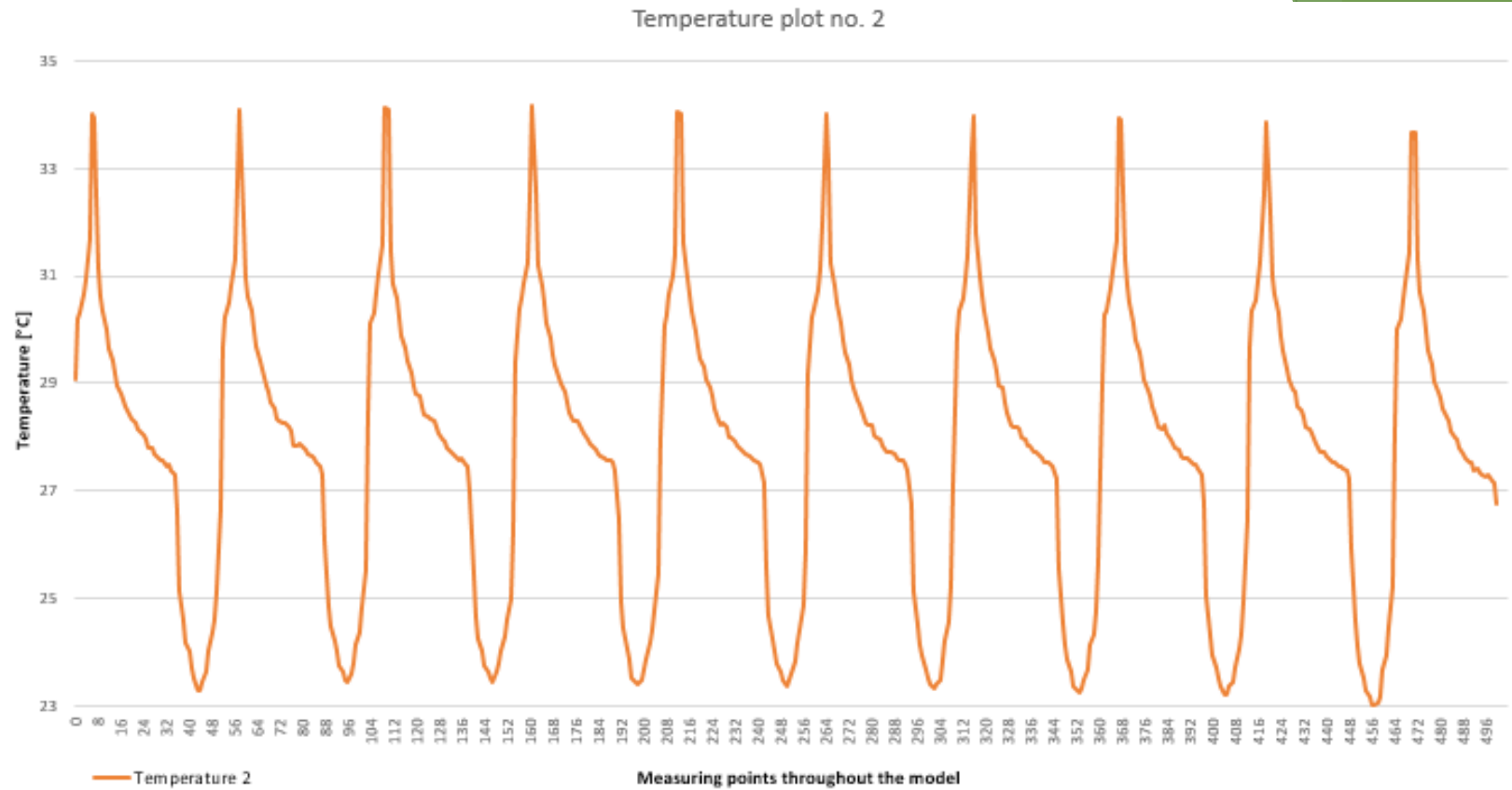
The final simulation



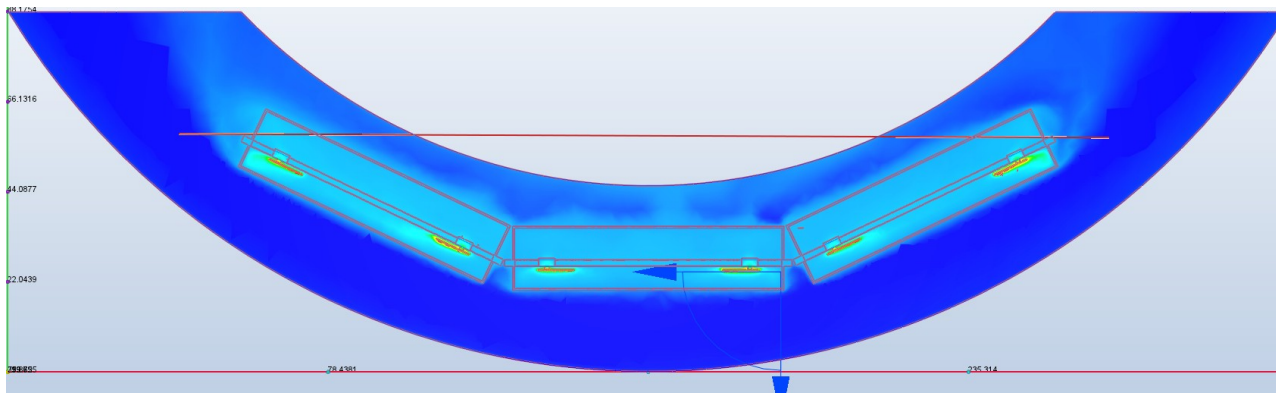
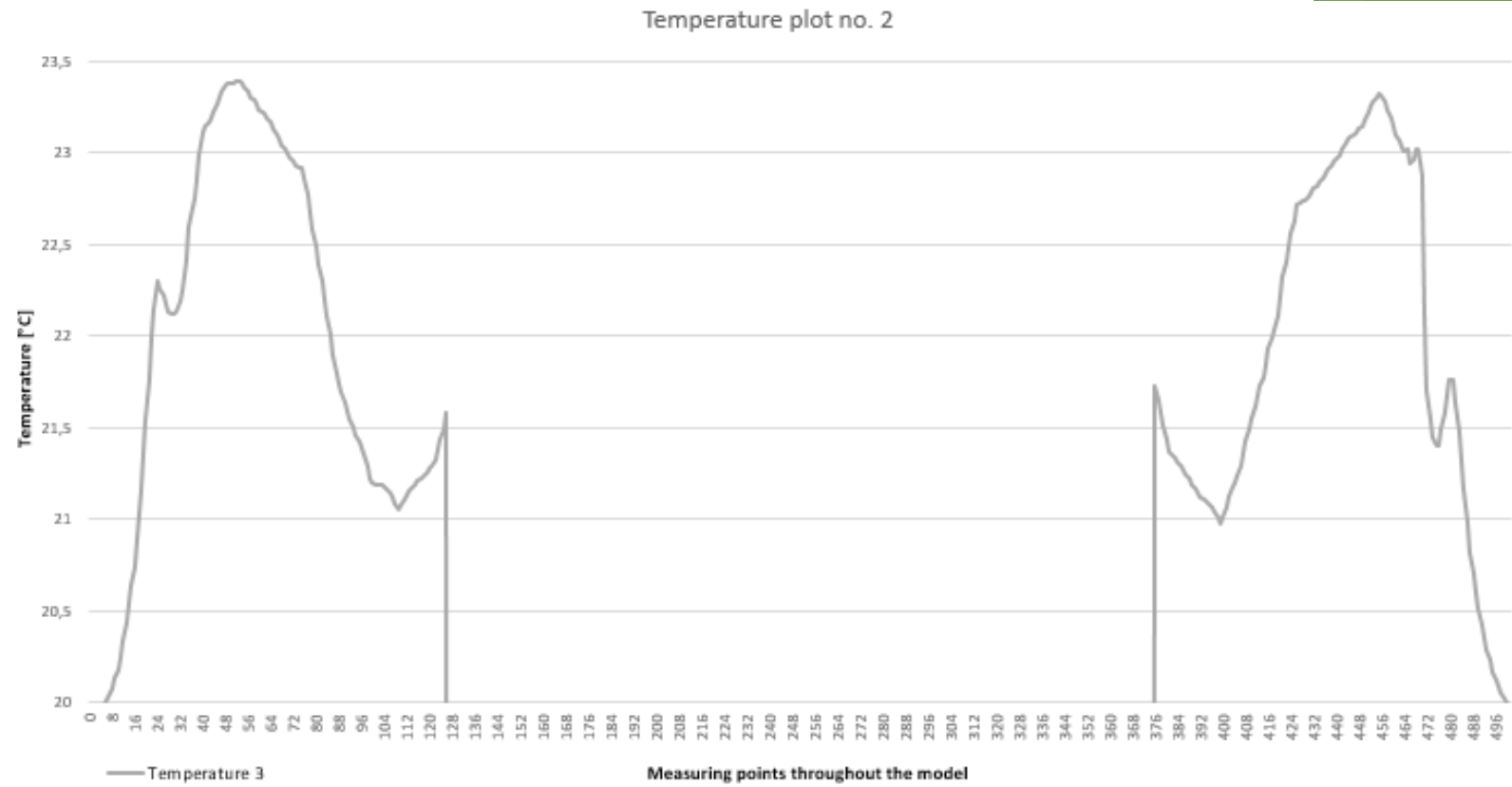
Results



Results

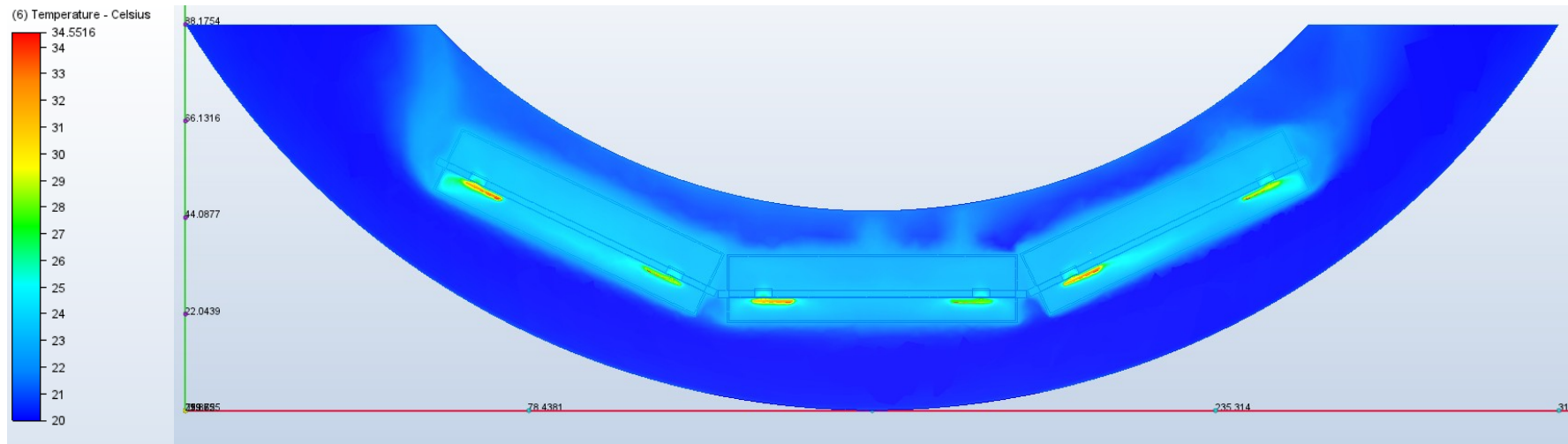
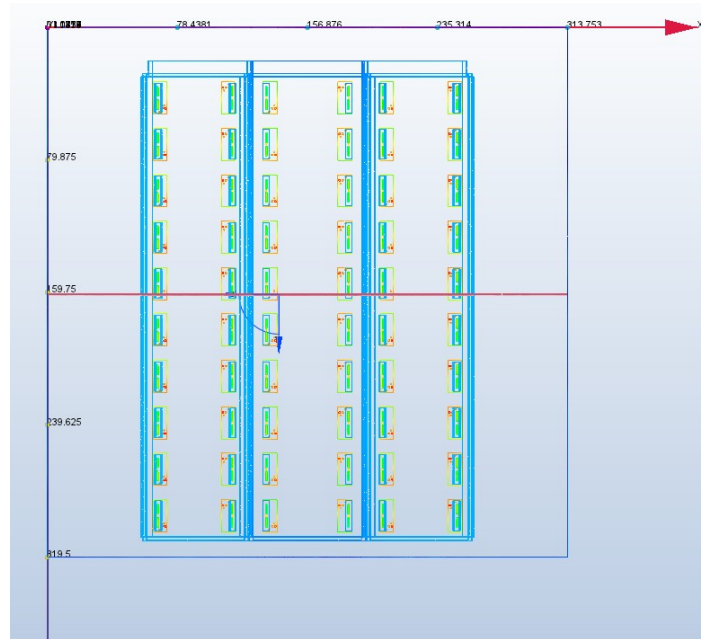


Results

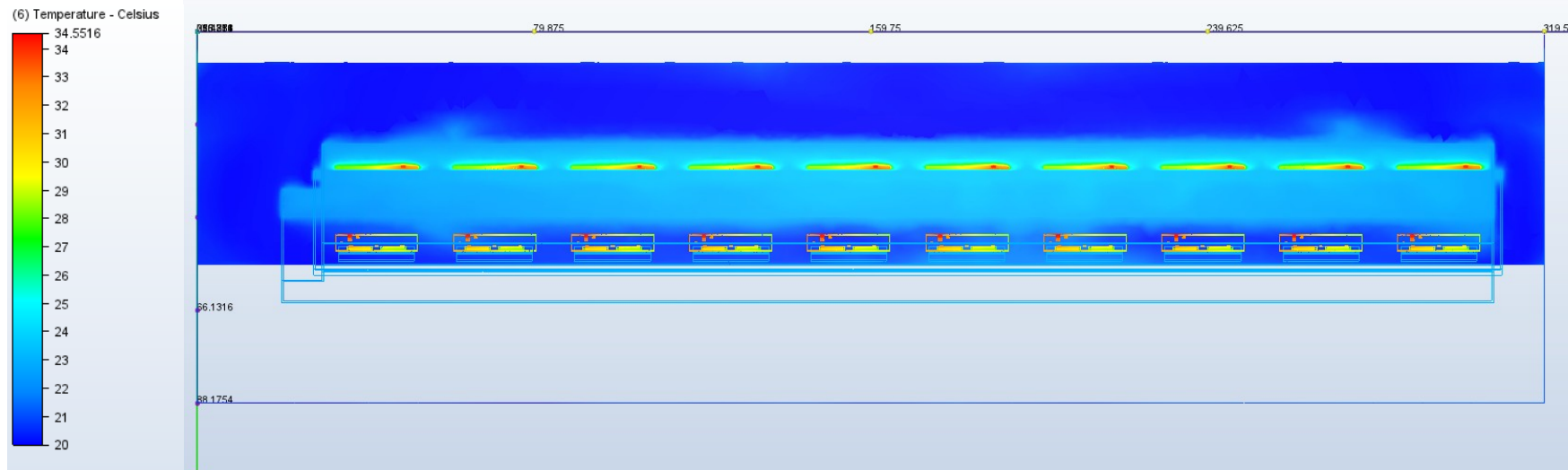
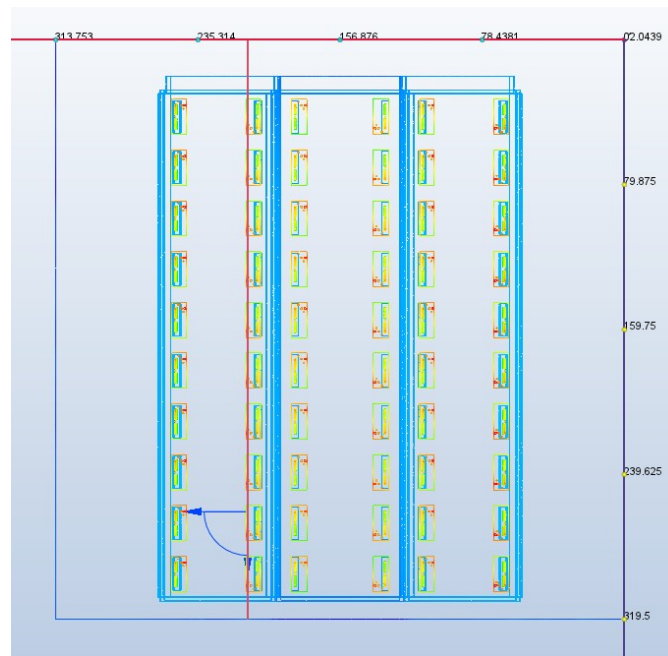


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Results



Results



Conclusions

- ▶ There is a noticeable heat transfer between the modules.
- ▶ There is a need of providing cooling system for TOF-MPD modules due to heat transfer between them.
- ▶ There is a significant difference in the level of heat transfer between lower and upper modules due to the shape of the detector.



What next?

- ▶ Carrying heat transfer simulations for all of 28 TOF-MPD detector modules using simplified models
- ▶ Carrying simulations for more detail models of detector modules using computing cluster instead of PCs
- ▶ Development of cooling system for TOF-MPD detector modules
- ▶ Further research on overheating problem inside of Multi Purpose Detector
- ▶ Carrying simulations for other detectors of MPD

Thank you for attention!

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Questions?