

# CFD Simulation of Helium-cooled Divertor Test Mock-up

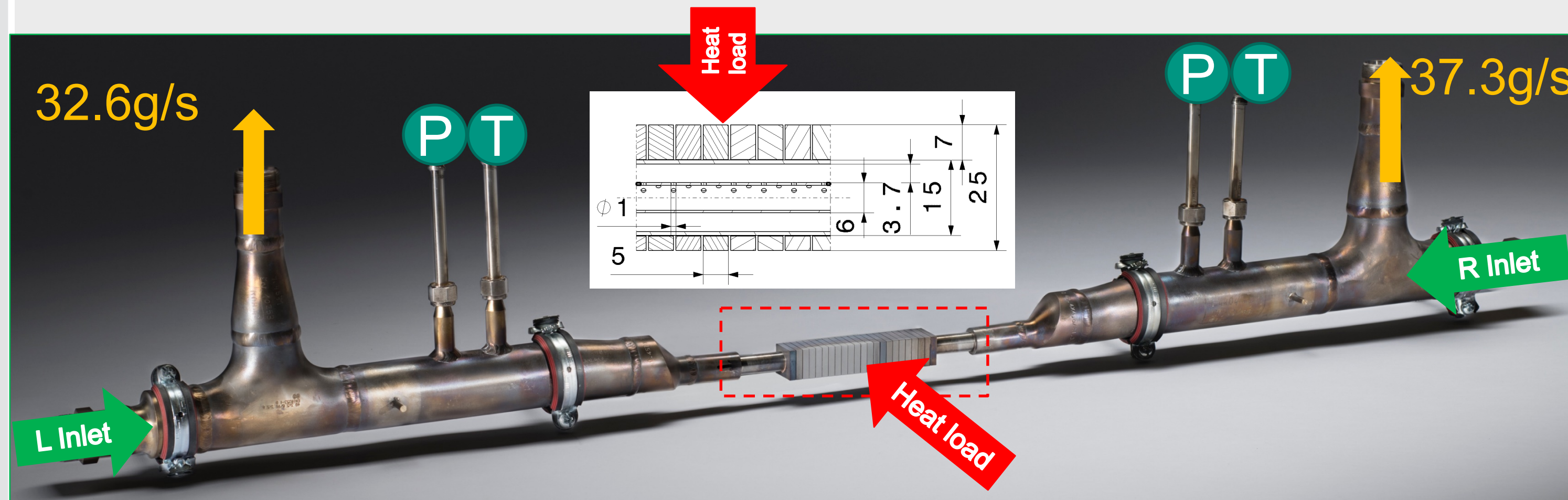
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## He-cooled divertor testing under HHF conditions

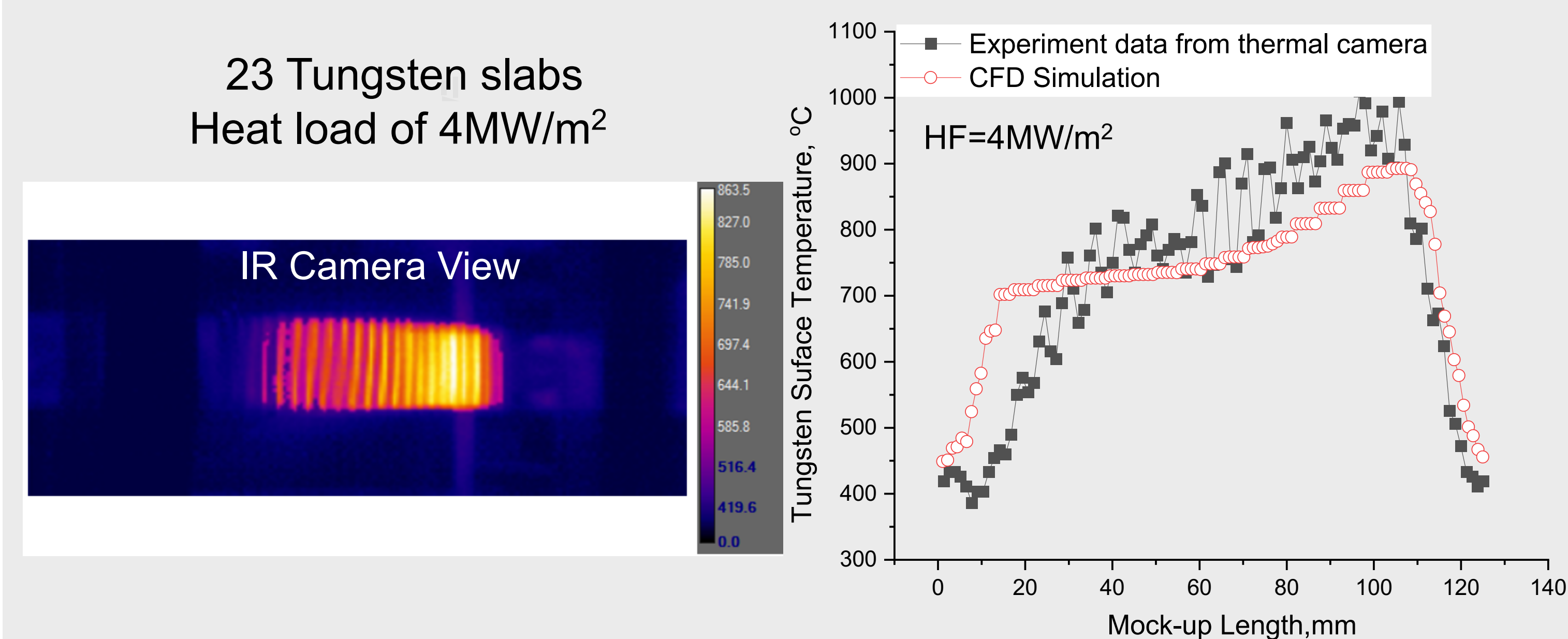
Helium Multi-Jet (HEMJ) Pipe concept was tested under high heat loads in HELOKA facility of KIT:

1000 pulses (300s long) @ 8MW/m<sup>2</sup> and  
25 pulses @ 10MW/m<sup>2</sup>

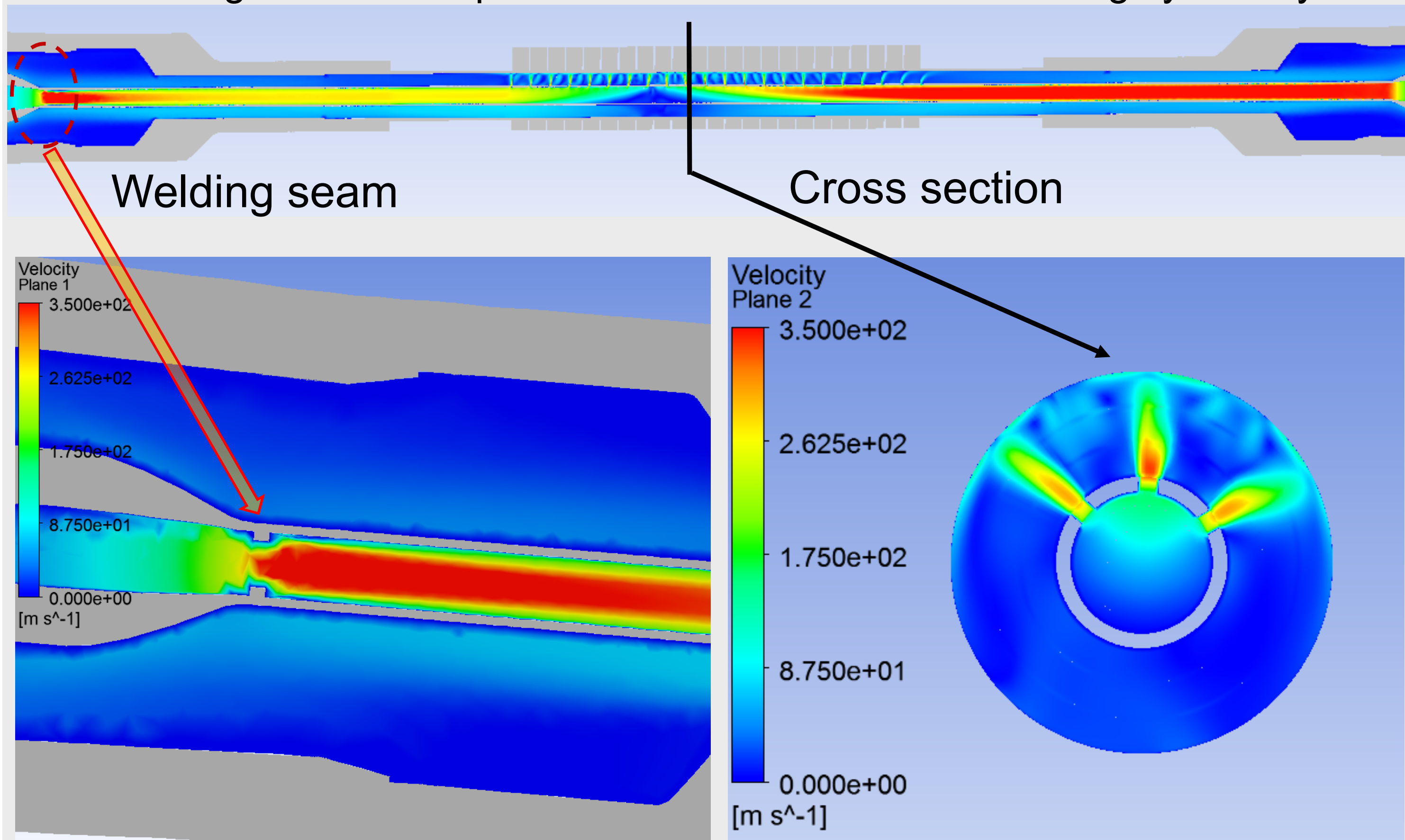
with Helium at 400°C and 8MPa.



Initial load screening showed an axially increasing surface temperature profile



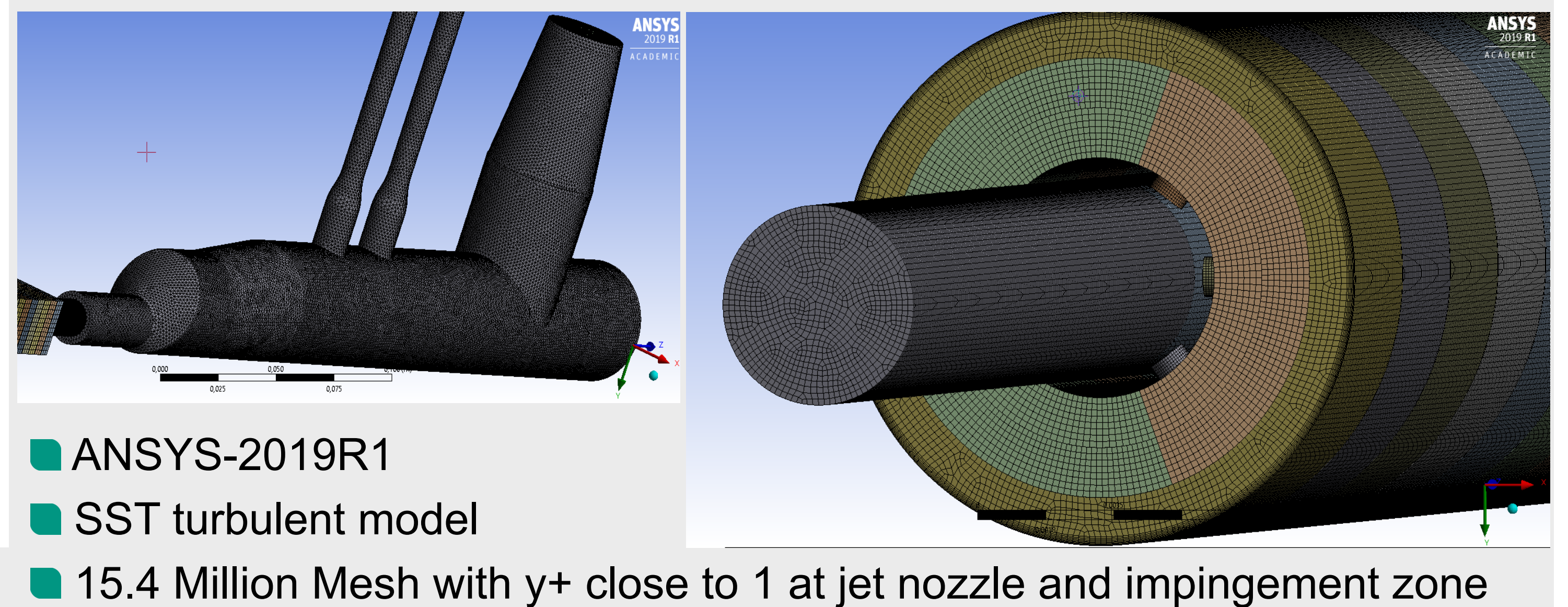
CFD Simulation: reduced flow cross section at the Left Inlet line due to the welding seam is the probable cause of the loss of cooling symmetry



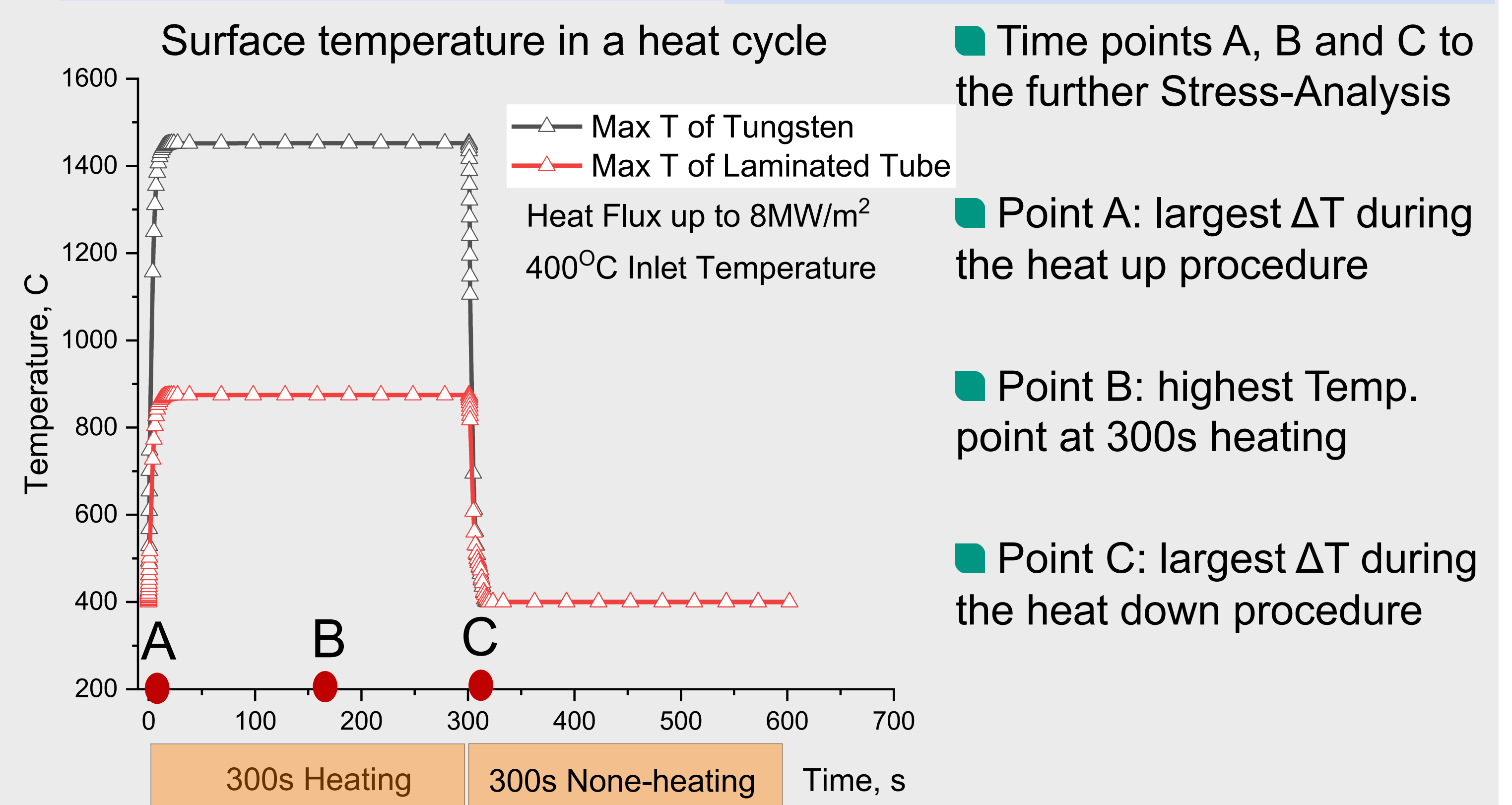
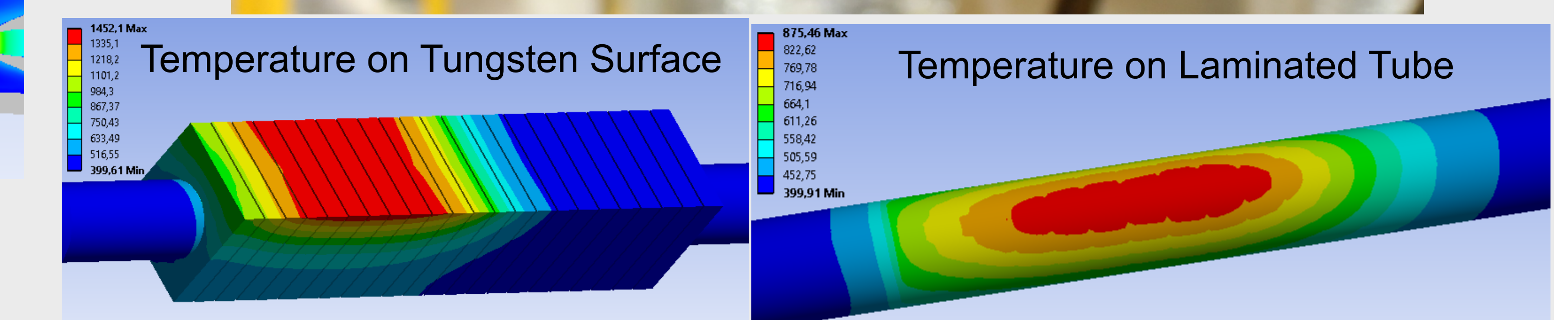
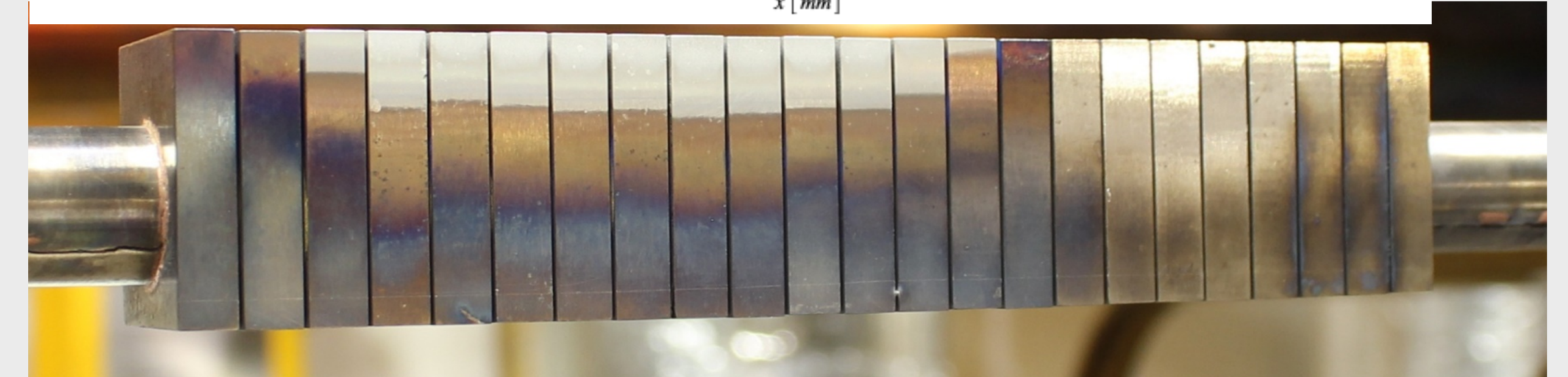
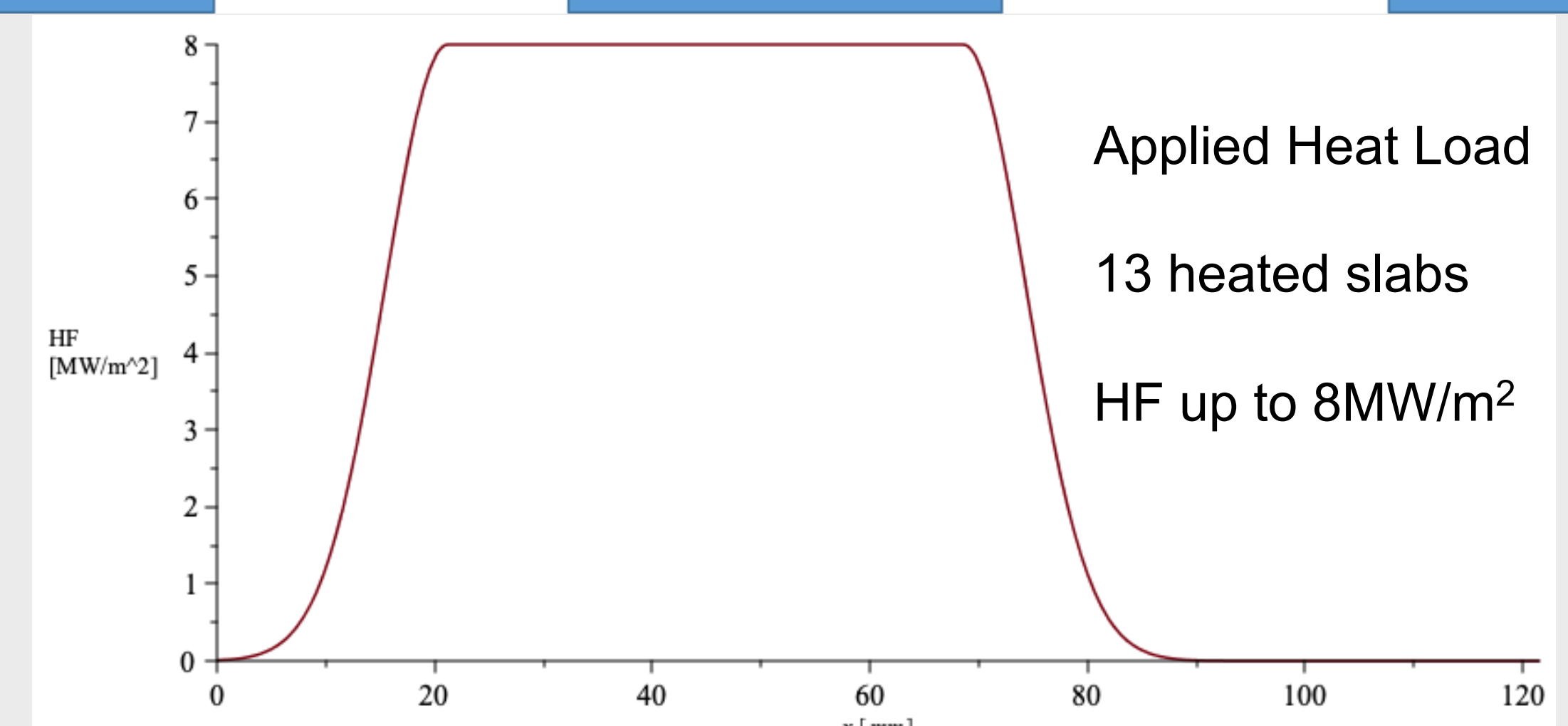
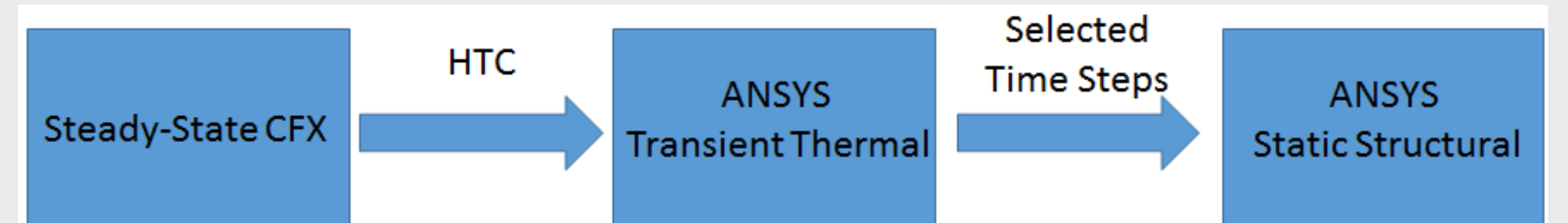
CFD analysis estimated that the W-Cu laminate pipe temperature reaches 800°C for an uniform heat load of 6MW/m<sup>2</sup>.

When applying the load to only 13 slabs (left side) from the total of 23 slabs the pipe temperature reaches 800°C at 8MW/m<sup>2</sup>.

## Simulation domain, mesh and turbulent models



## Simulation of 600s cycling loading with ANSYS



## Conclusions

- The CFD Model was compared with experiment data of 4MW/m<sup>2</sup>
- Simulation of 8 MW/m<sup>2</sup> heat flux predicts the maximum temperature of tungsten blocks and laminated tube
- Time steps of highest temperature and maximum temperature difference during the heat up and down were selected for stress analysis