



Introduction to New Optimization Tool in Engineering Simulation

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Mechanical Engineering Group

European XFEL

June 19, 2025



12. DESY Engineering and Innovation Day 2025

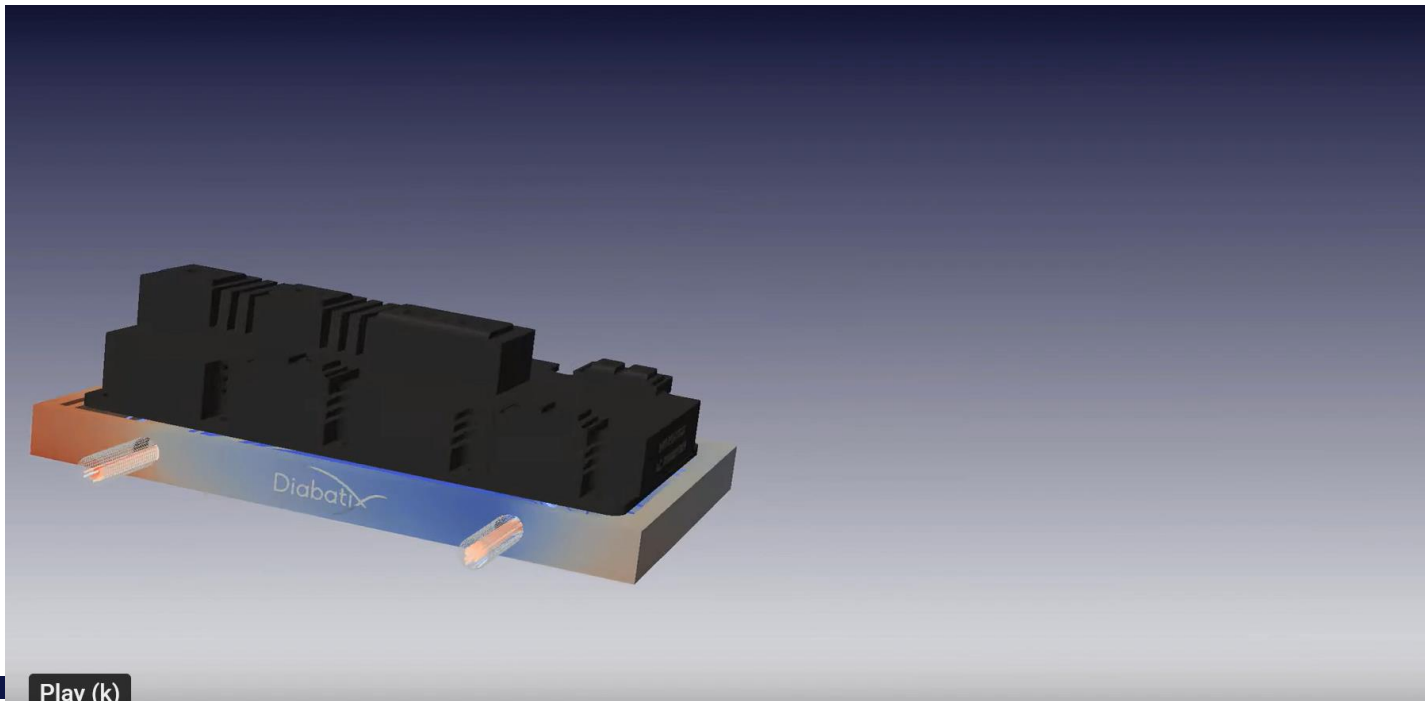
Outline

- Introduction of the generative design Platform ColdStream
 - Concept of algorithm and workflow
 - Vendor use case
 - Initial user experience
- Data Postprocessing Tools for DoE and Optimization
- Information for upcoming events

A Novel Generative Design Platform: Coldstream

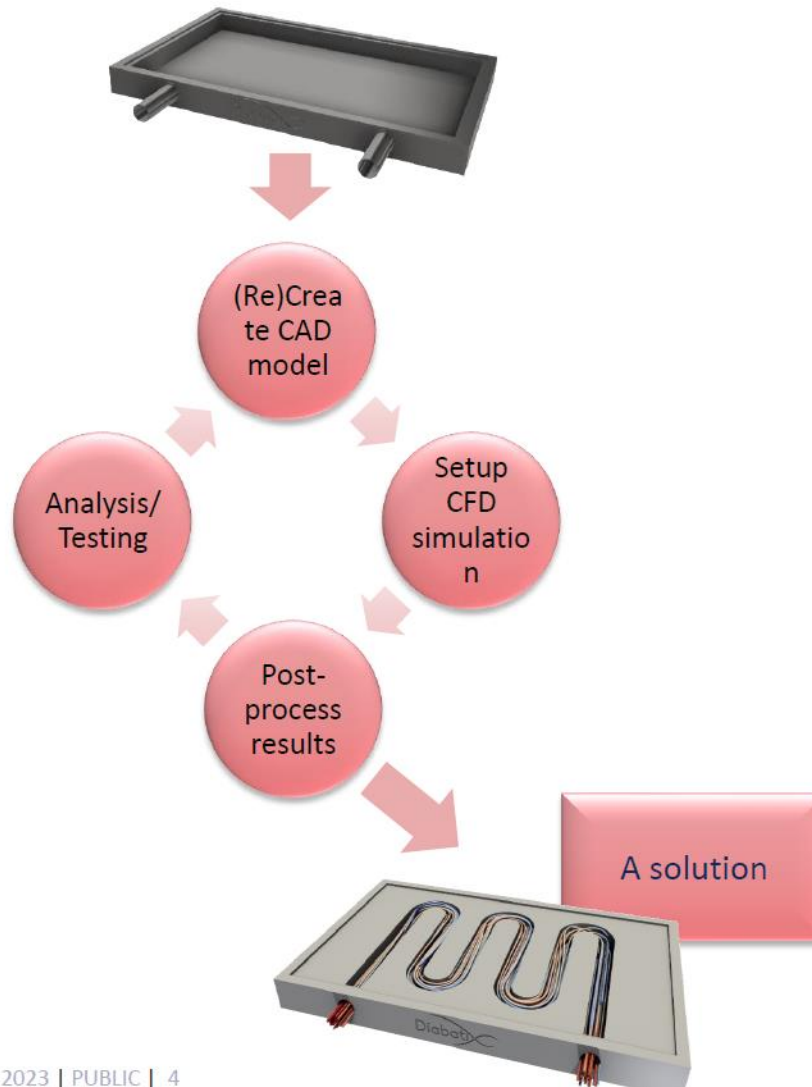


- Spin-off from KU Leuven, Belgium
- Specialized in generative thermal design for cooling solutions
- 2021: Cloud-based platform released
- 2023: Technology partner of ANSYS and Hexagon
- 2024. 11: Kick-off meeting for pilot project proposal
- 2025. 4: Trial phase with DESY for detector cooling design



ColdStream Optimization Workflow Overview

Conventional Design Cycle



Managing Number of Variables in Optimization Algorithm

Without a common parameter set



- Radius
- Height
- Spacing X
- Spacing Y



- Width
- Length
- Height
- Spacing X
- Spacing Y

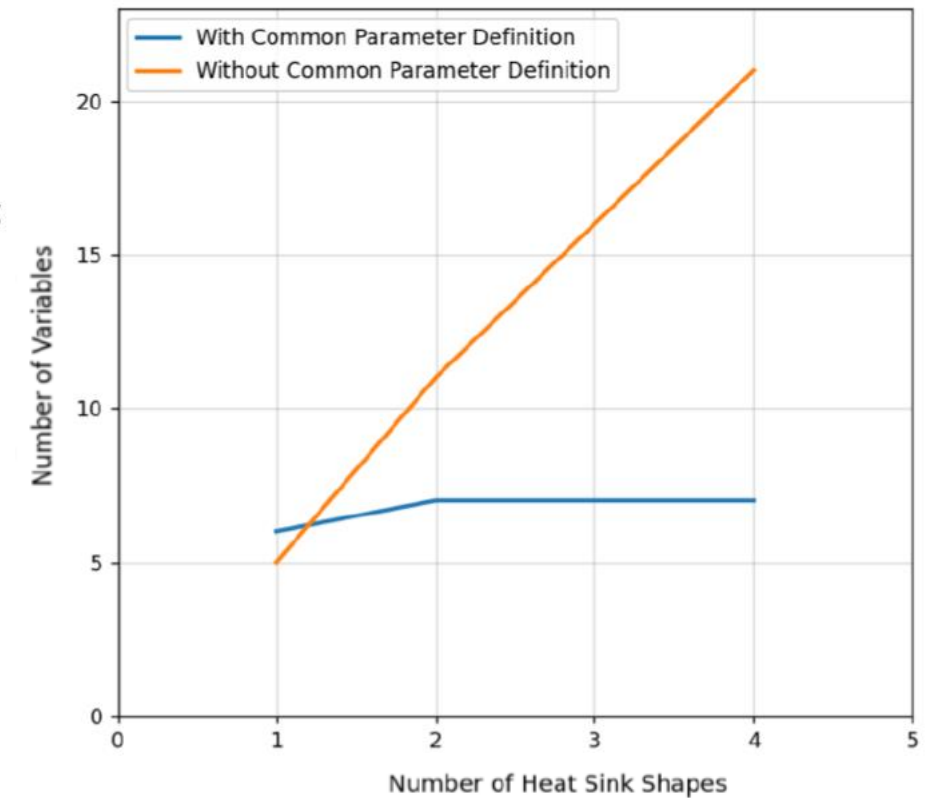
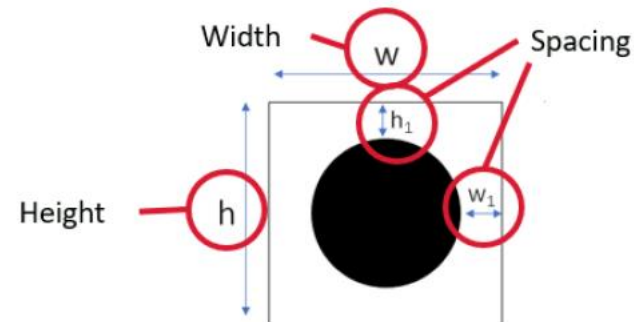


- Width
- Length
- Height
- Spacing X
- Spacing Y



14 variables

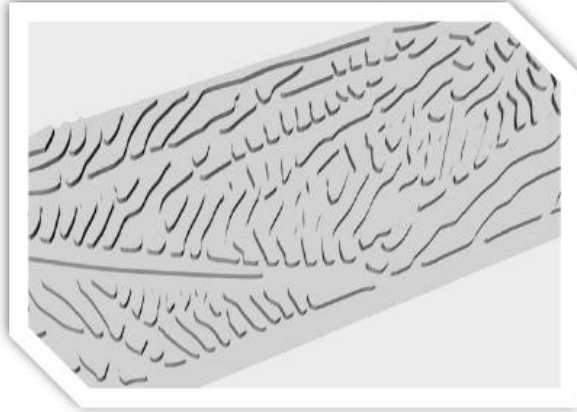
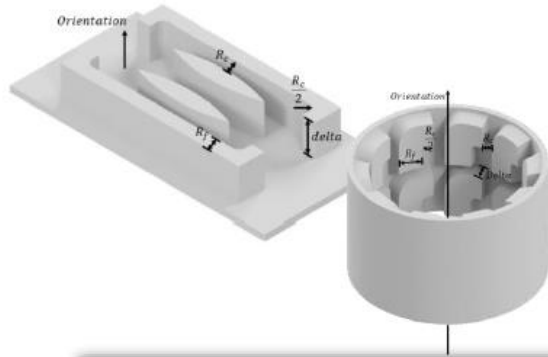
With unit-cell approach



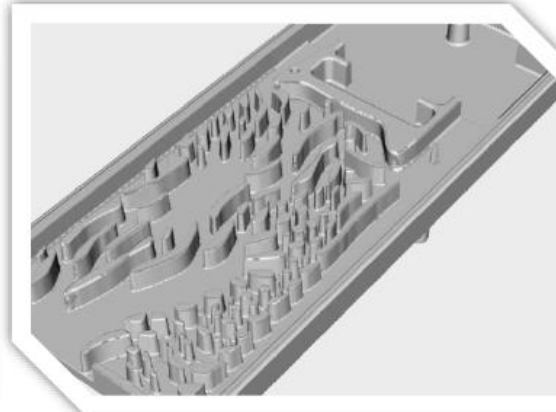
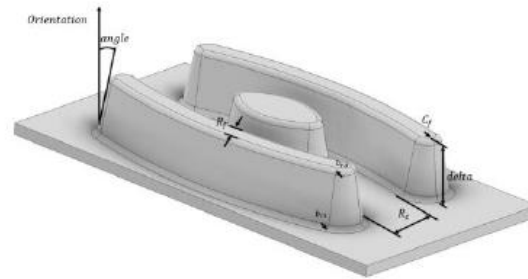
Presented at Therminic 2023

Limitless design freedom for optimal design

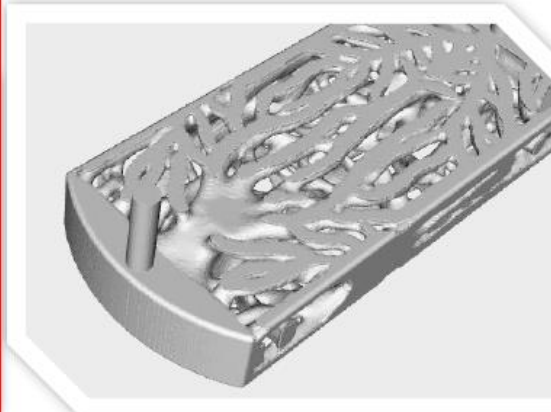
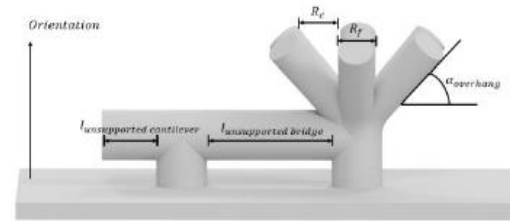
CNC Milling



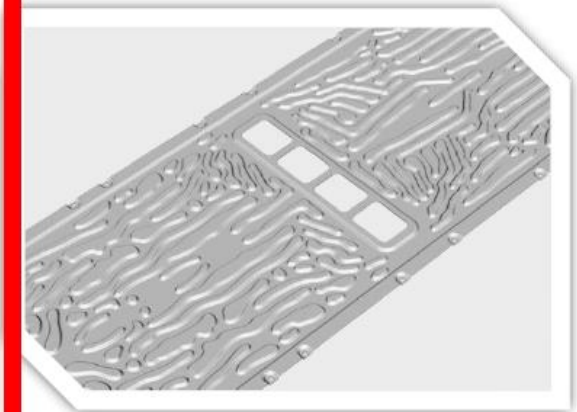
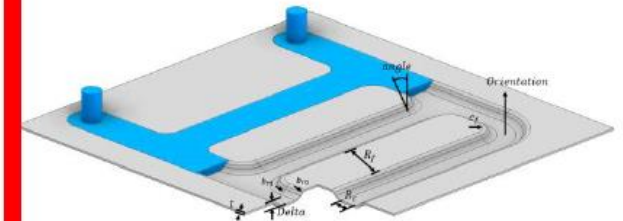
Die Casting



3D Printing

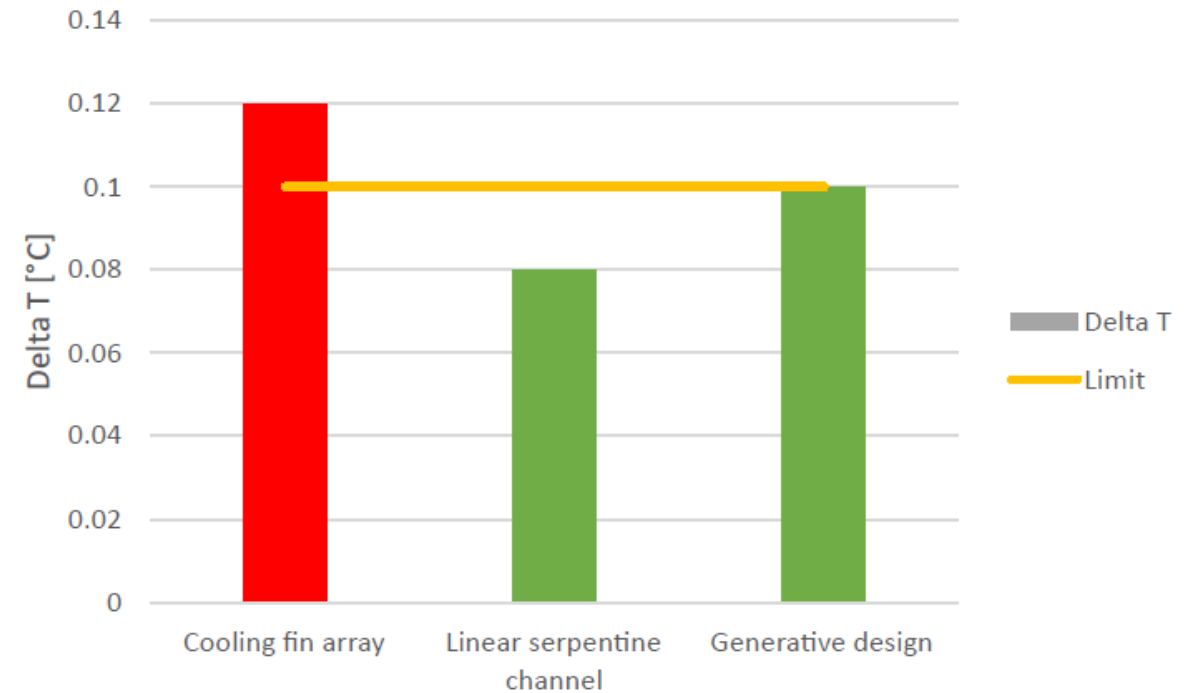
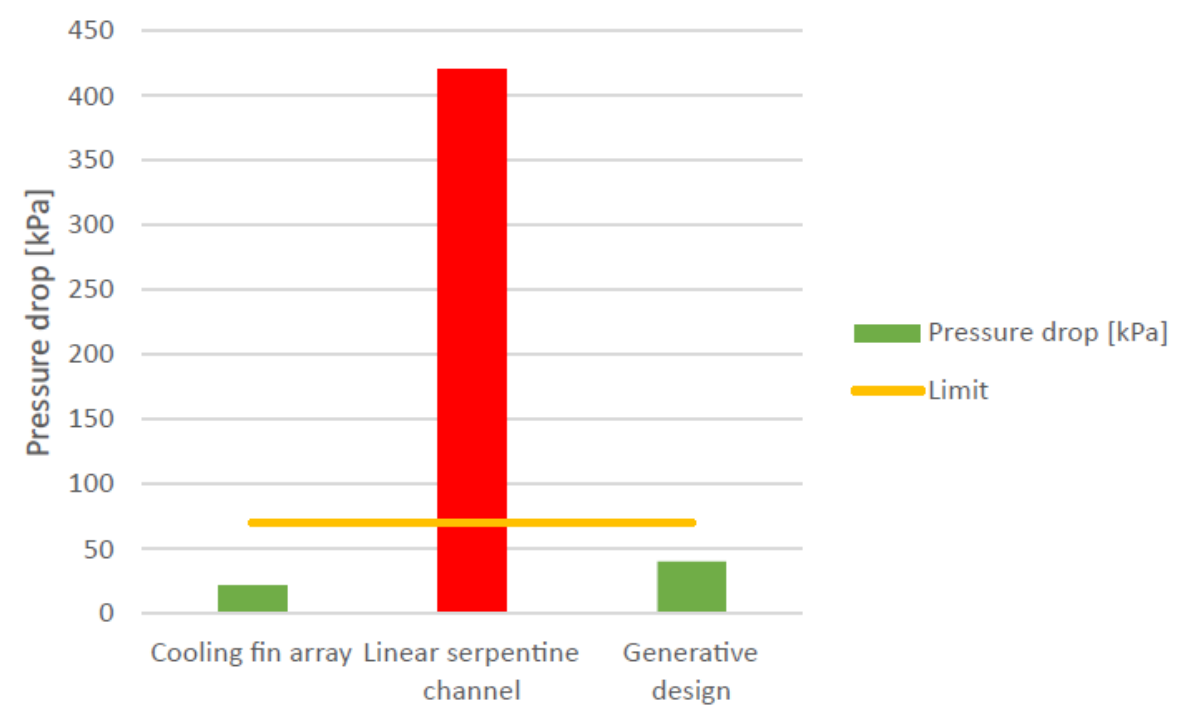
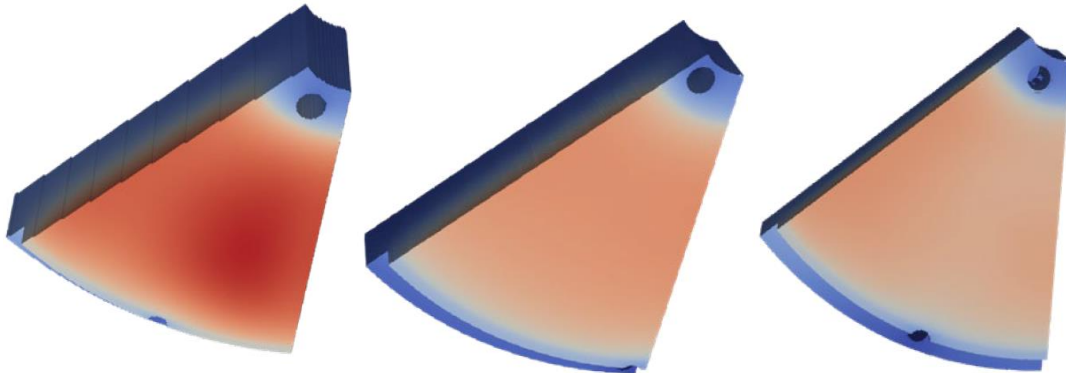


Sheet Metal Forming

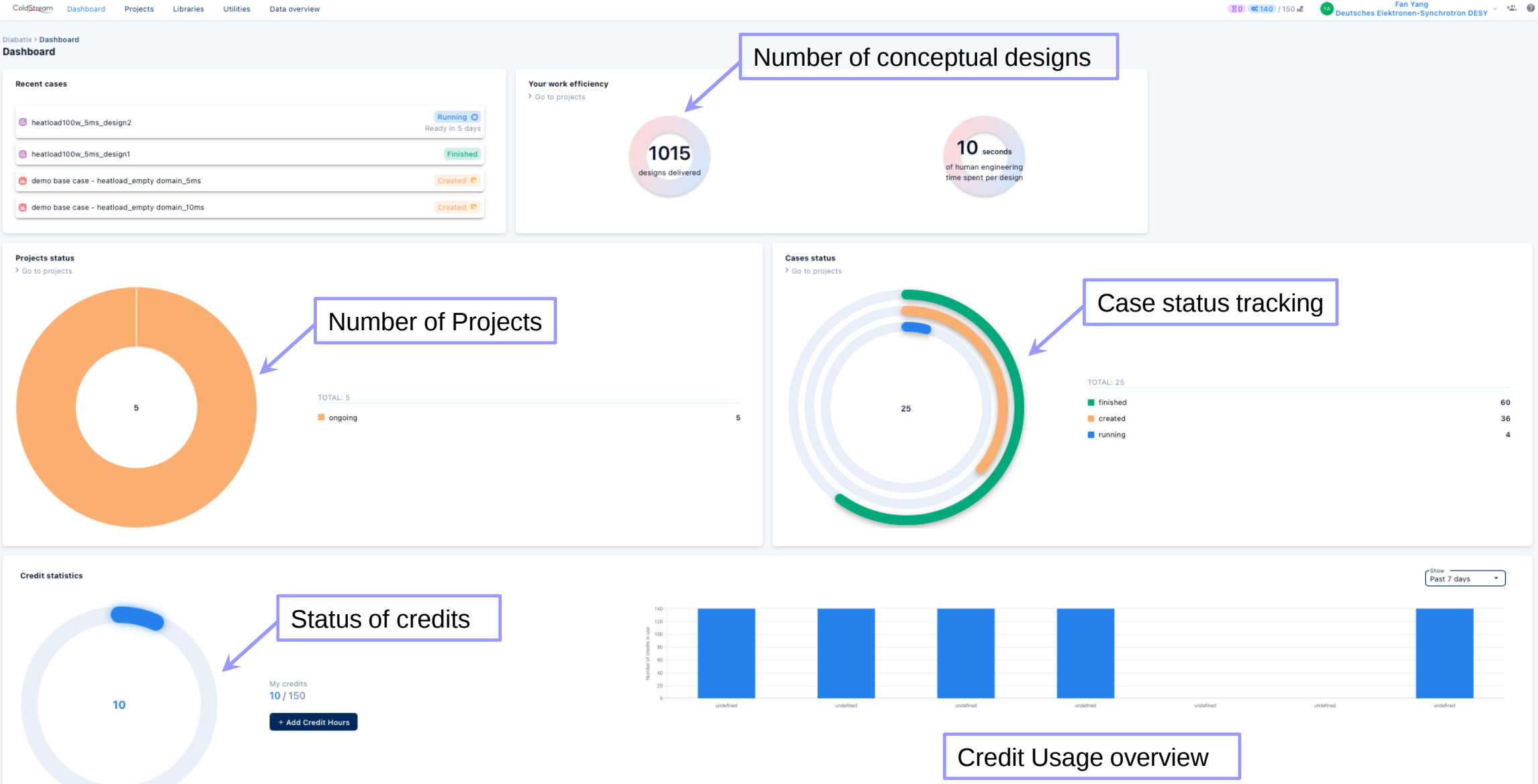


Vendor use case

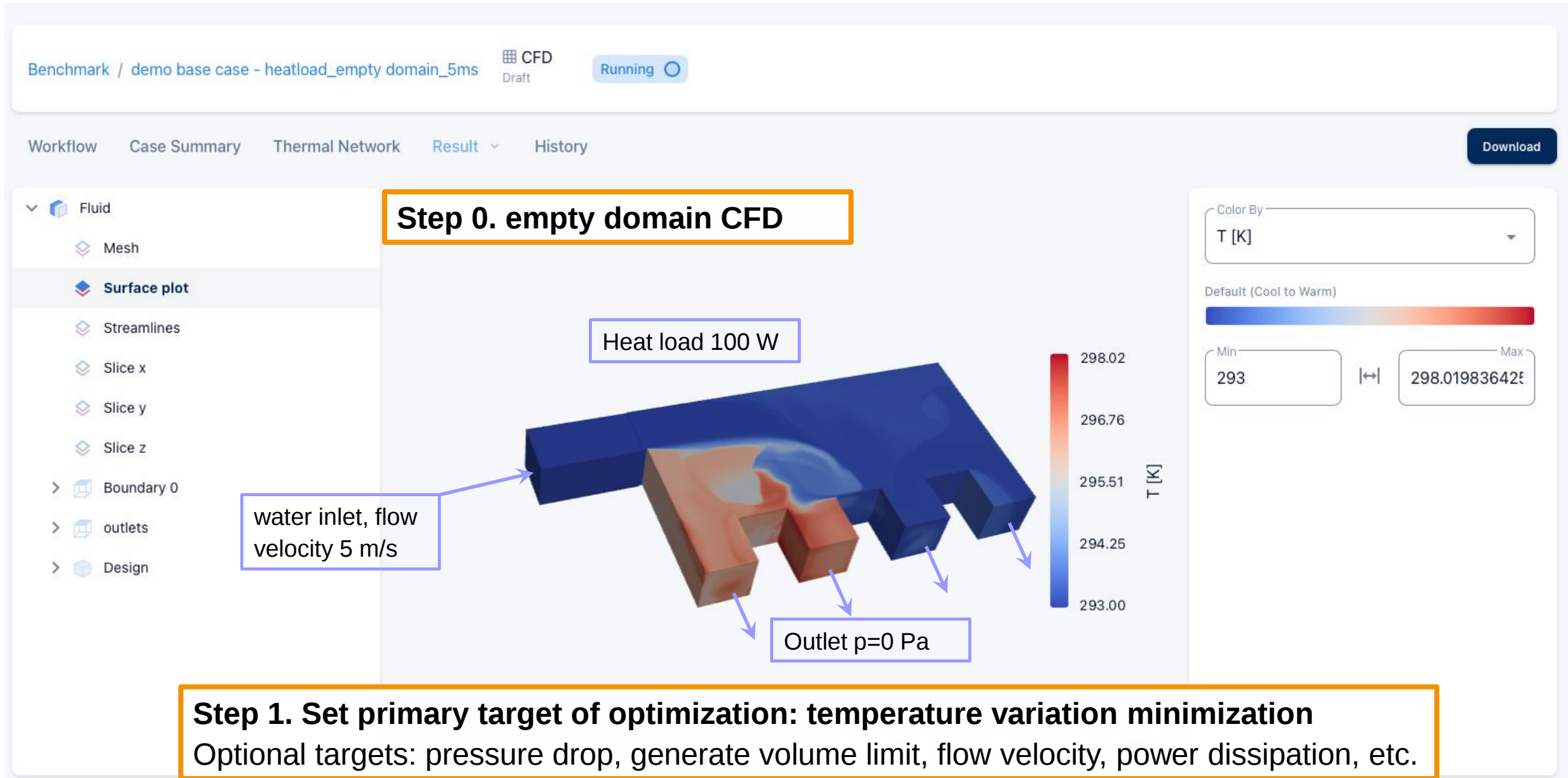
Optimised thermal management
in semiconductor fabrication using
AI-enabled generative design and
Additive Manufacturing



Initial User experience: Dashboard

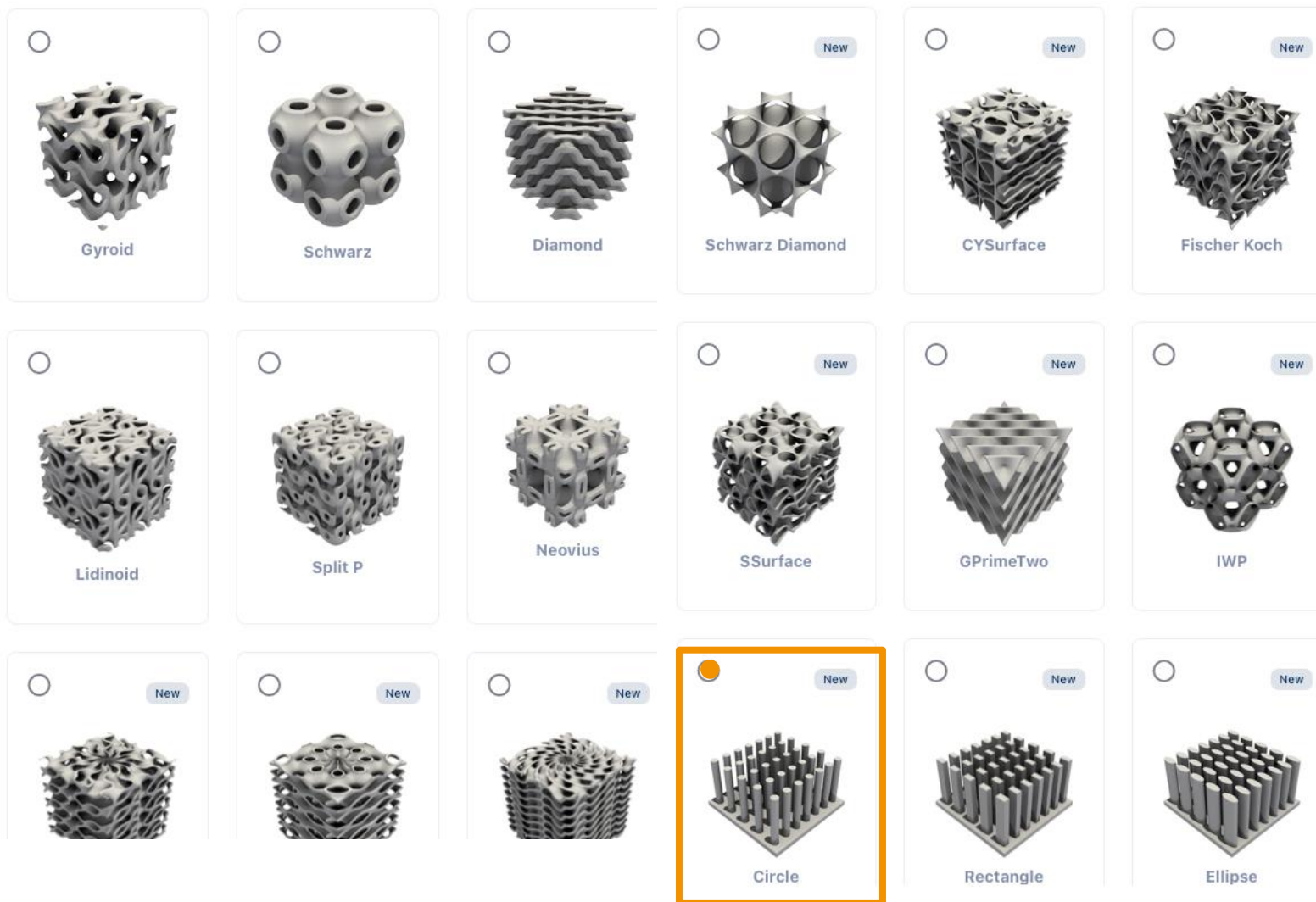


Test project: cooling design of a manifold



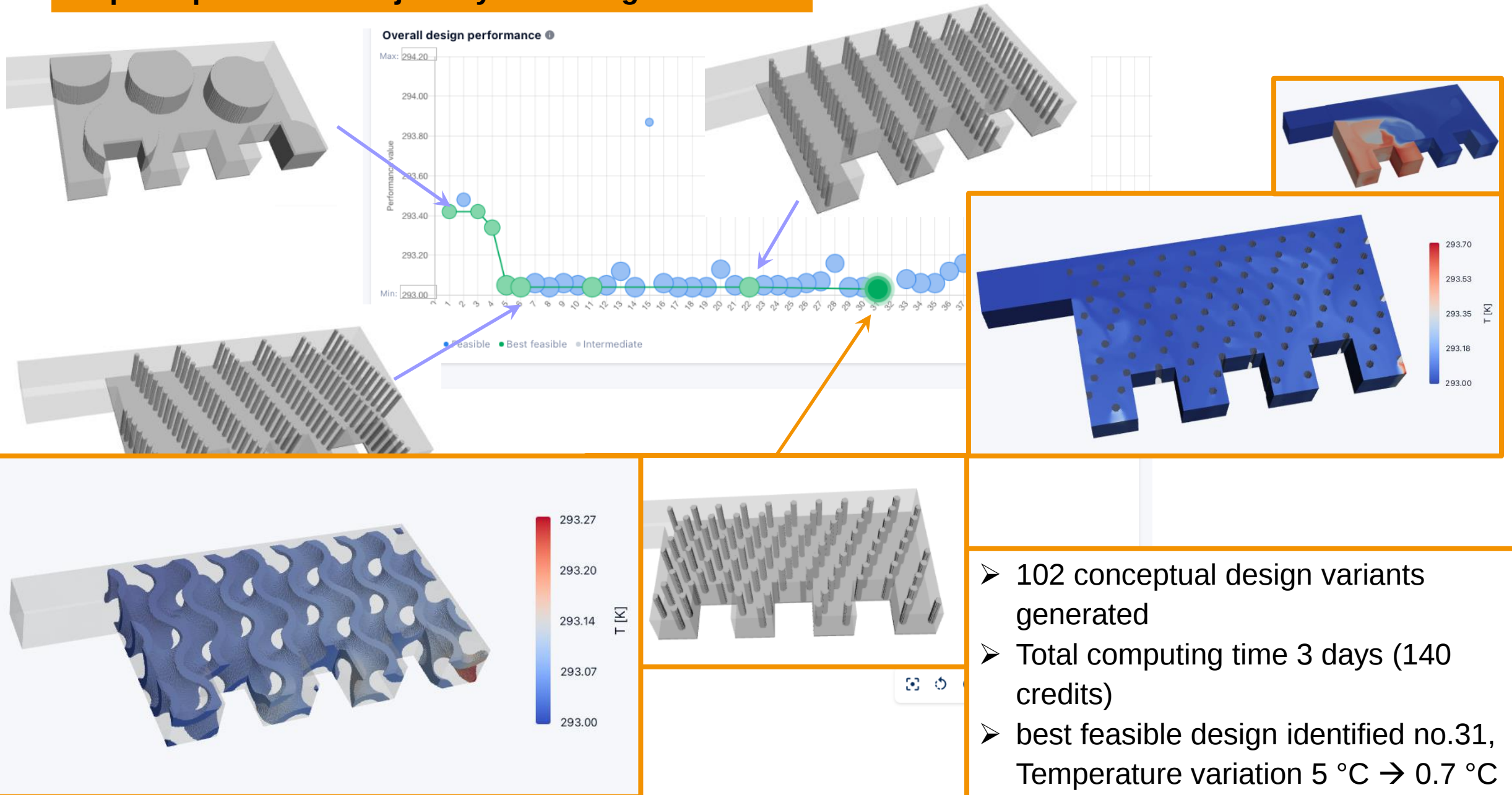
3D Printing

Step 2. select manufacturing method and shape

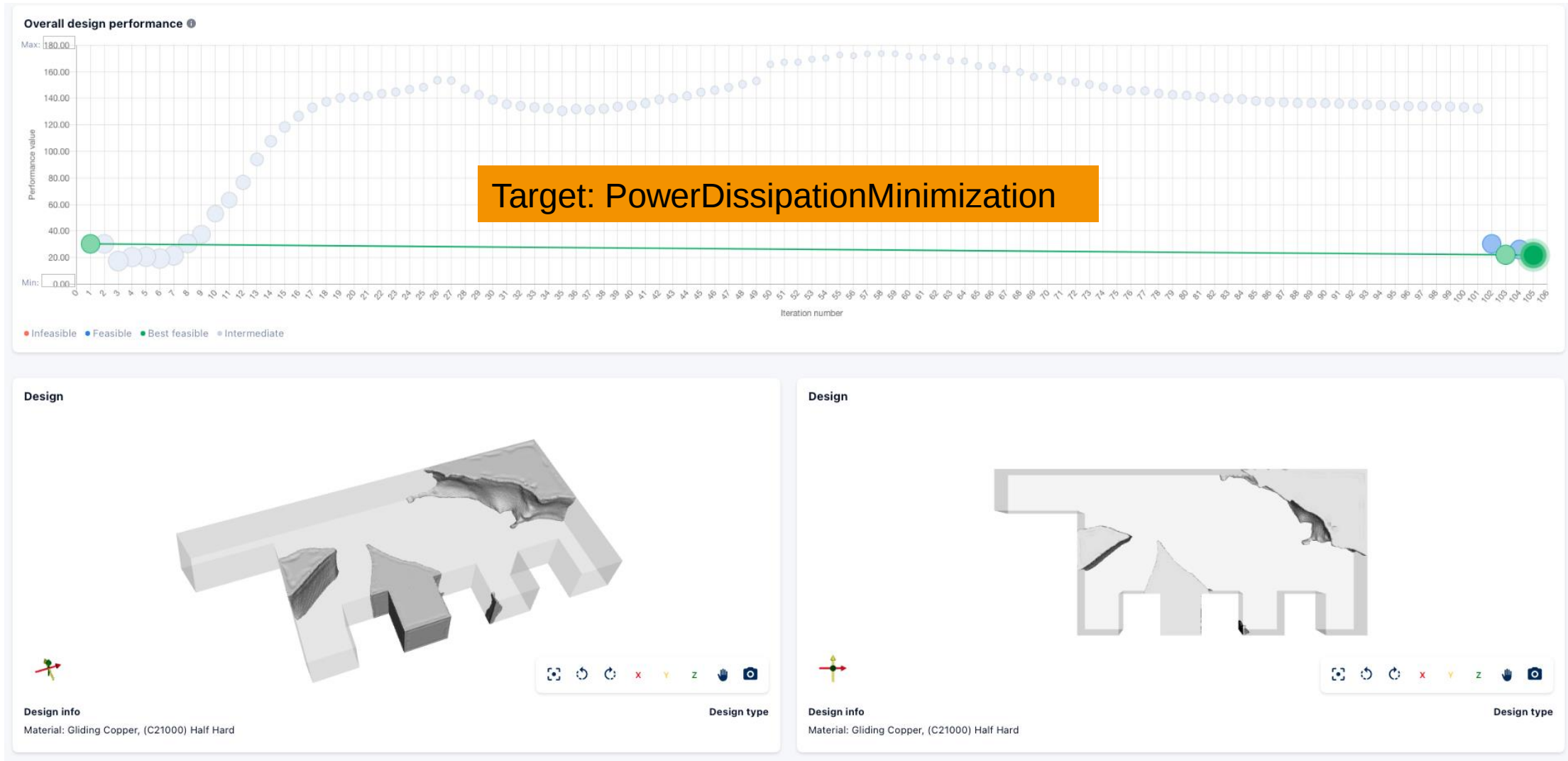


Step 3. Optimization trajectory and design evolution

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Unexpected results



Preliminary User Experience

■ Highlights:

- ✓ Innovative algorithm for design optimization
- ✓ Intuitive UI/UX:
 - direct CAD model integration with B.C. definition
 - real-time updated status message
 - transparent project management
- ✓ Clear documentation and responsive support

■ Observed Limitations:

- relatively long iteration time (with 150 credits)
- no restart possible after interruption
- no recovery !

■ Call for test cases and pilot project for assessment and benchmark

**ColdStream Notification** 2 hours ago
Meshing finished, mesh summary:

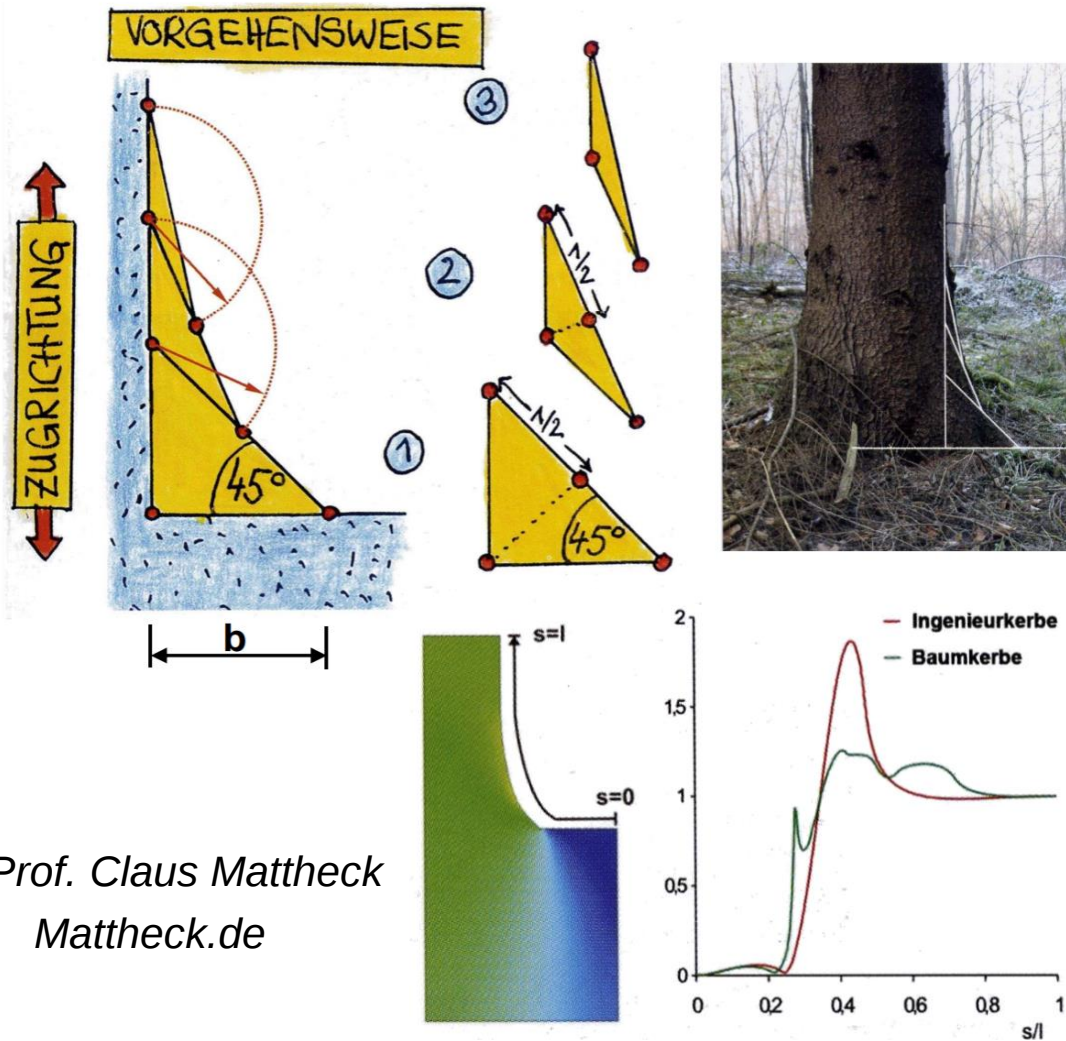
- region: Fluid: 962708 cells
- region: Design: 335313 cells

Total number of cells: 1298021

**ColdStream Notification** 2 hours ago
Meshing strategy 1/3 successful.

No-code, statistical and ML empowered tools

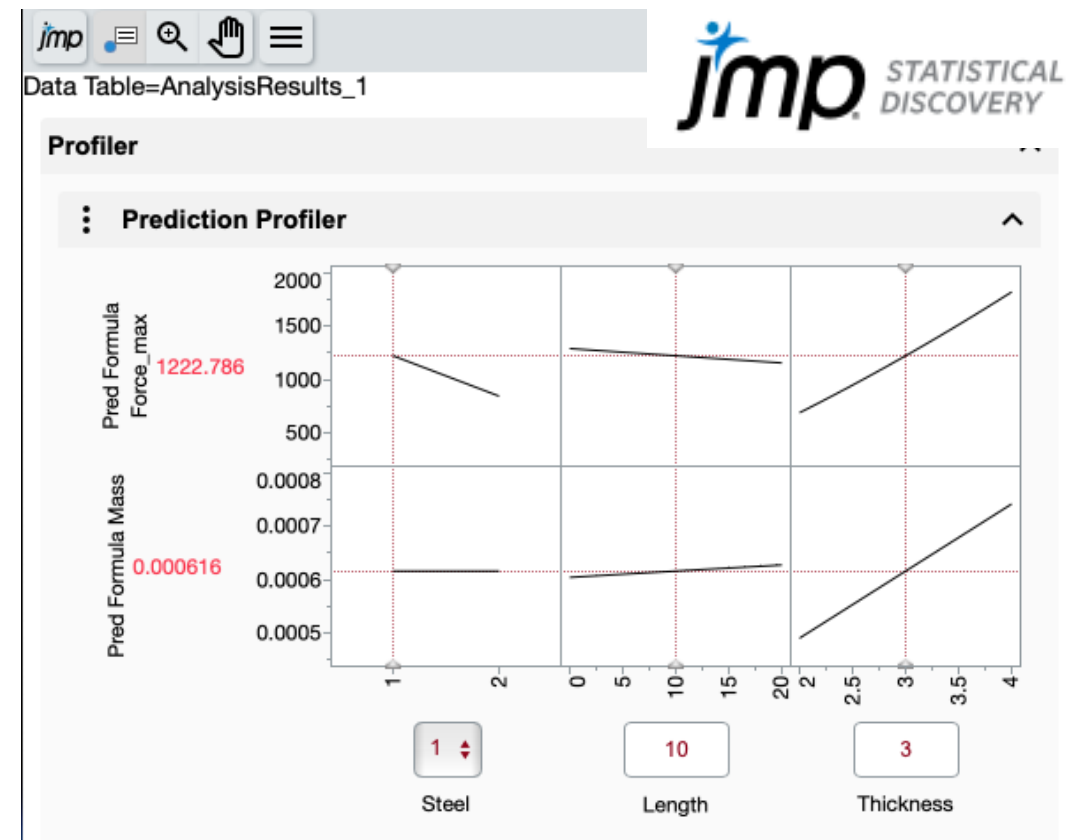
Method of Tensile Triangles



Prof. Claus Mattheck
Mattheck.de

JMP & dAlve

– Data processing for design optimization



Acknowledgment

■ Thanks to the collaboration and support from DESY ZM1 and EuXFEL ME group.

Up-coming Events

■ June 27, 10am: Meeting with ParaView users

■ October 13: 3rd Simulation Users Meeting at DESY/EuXFEL
(to be held in EuXFEL Lighthouse)

Call for Presentations and Posters

Call for Test Cases Using ColdStream

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