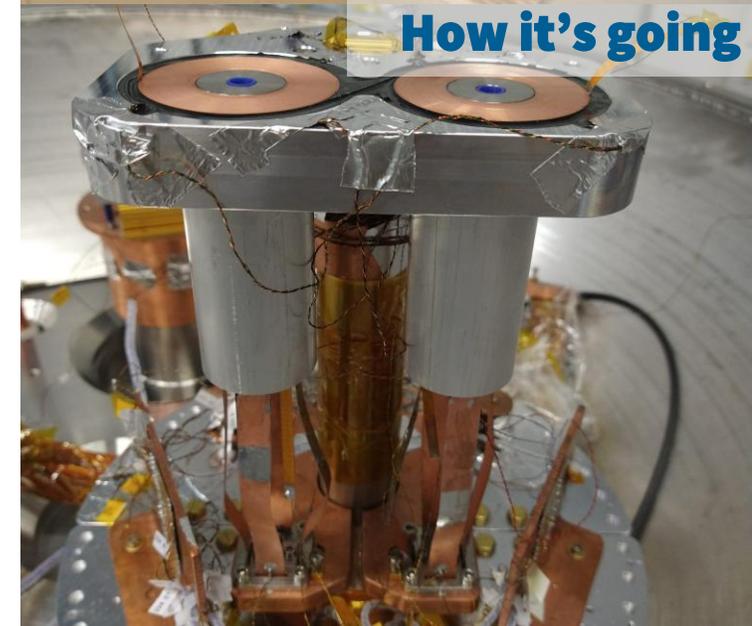
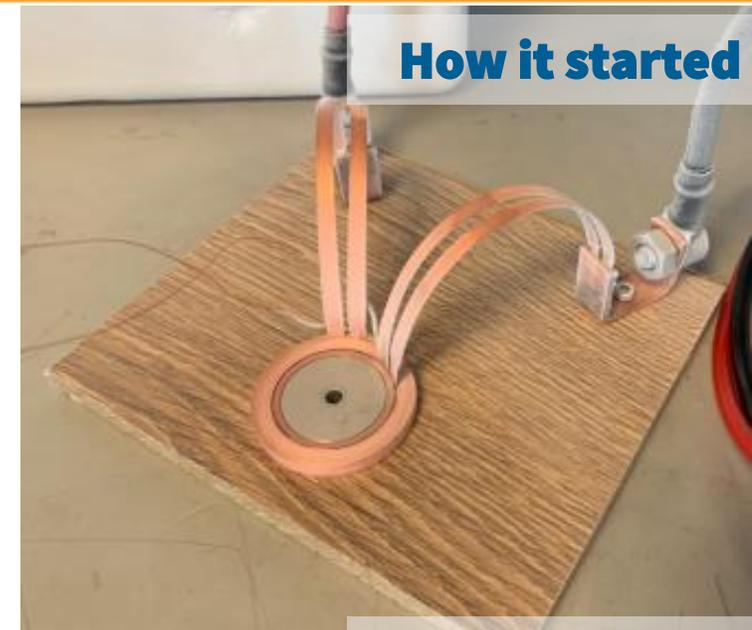


VDL Frozen: Superconductivity in the High Tech industry

Dr.Ir. Mathijs van Gorcum

Contents

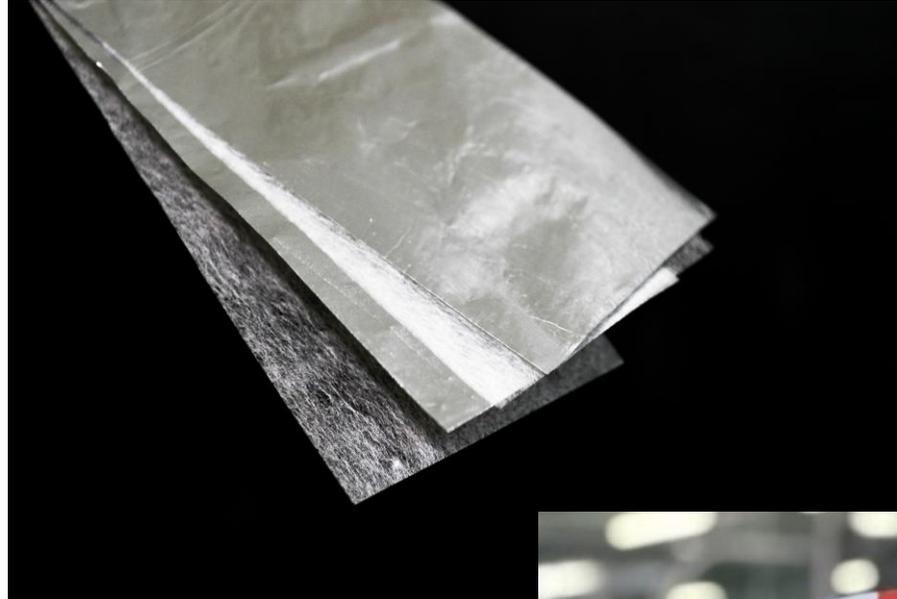
- Why superconductivity at VDL?
- Frozen competence program
 - Thermal interface test
- Bloemhof Duet
- Future work



Why superconductivity

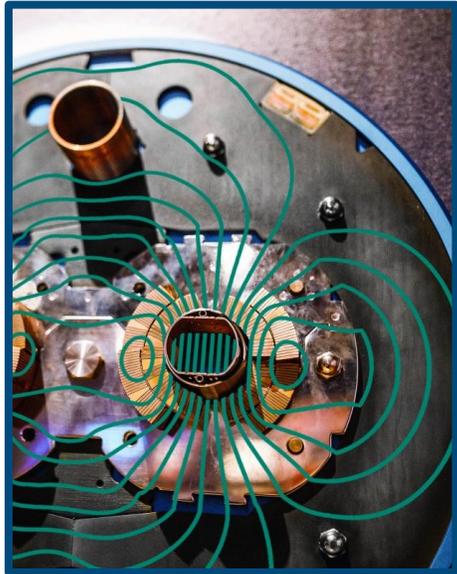
➤ Off the shelf components

- Cryocoolers
- HTS tapes
- Oxygen free copper
- MLI
- Vacuum pumps



Why superconductivity

➤ More power, higher magnetic fields



High Field Magnets



Actuators/Motors



Improved/New MRI's



Energy Grid



Transport

➤ **Frozen:**

- **Competence** development
- Gaining **knowledge**
- Gaining **experience**

➤ **Learning by doing**

➤ **Started in 2019**



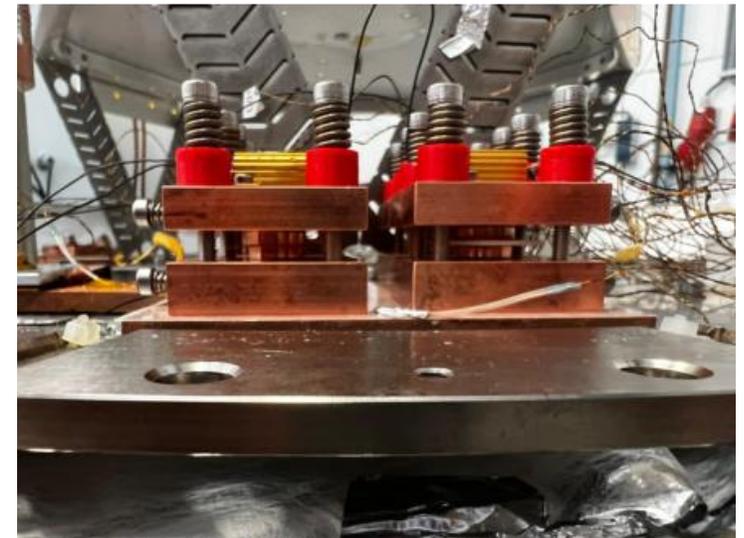
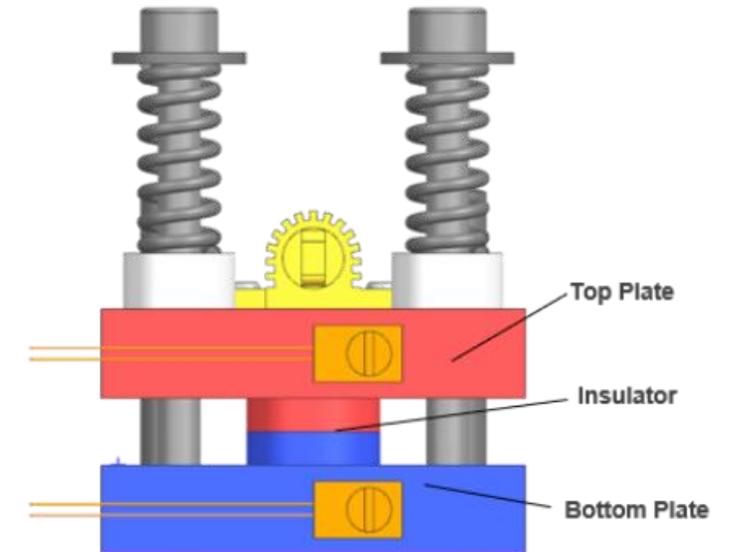
Breaking things

- Finding the limits of our system

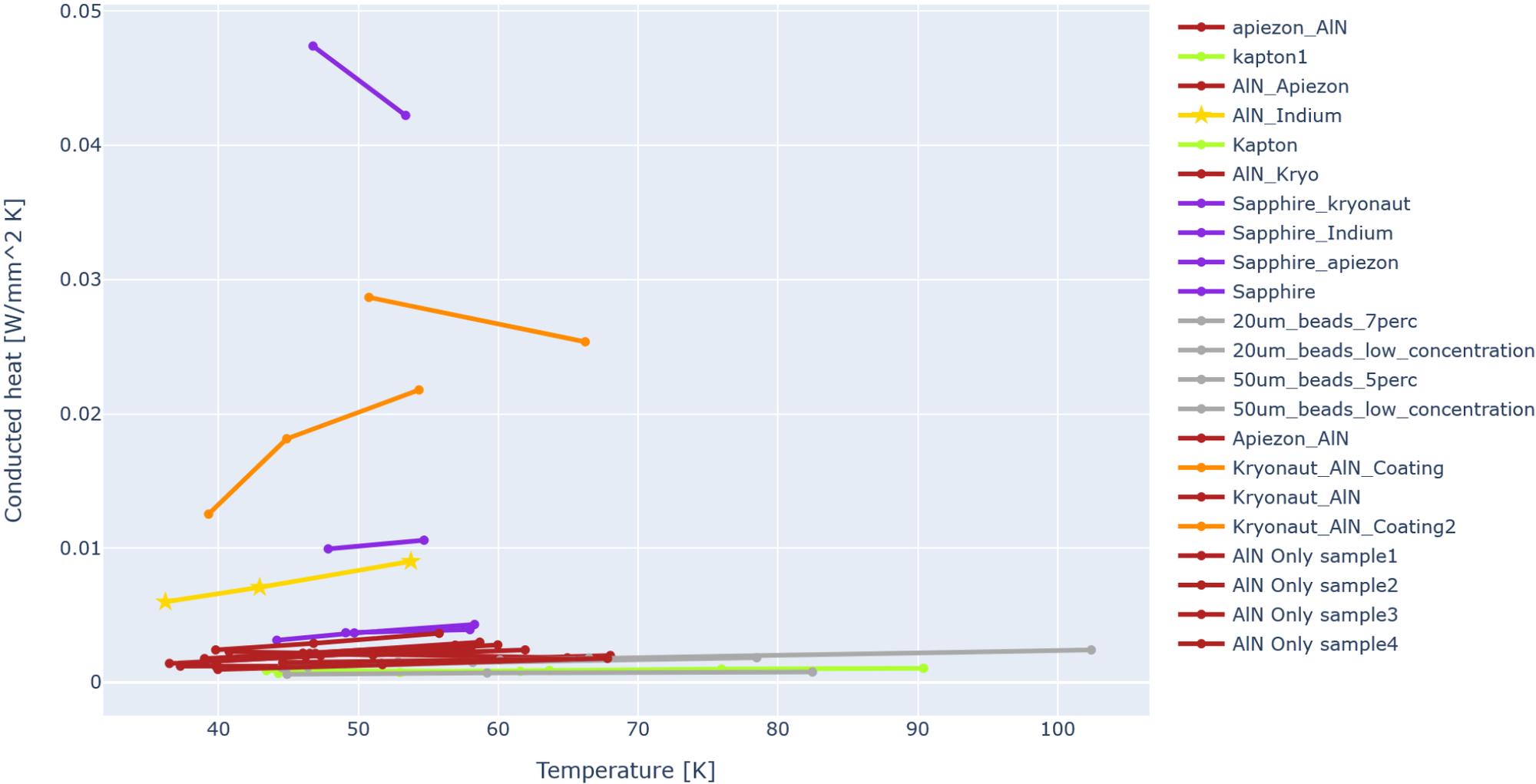


Thermal interface test

- Different insulators
- Resistor as heater
- Springs for controlled pressure
- pt1000 sensor on top and bottom
- known contact area

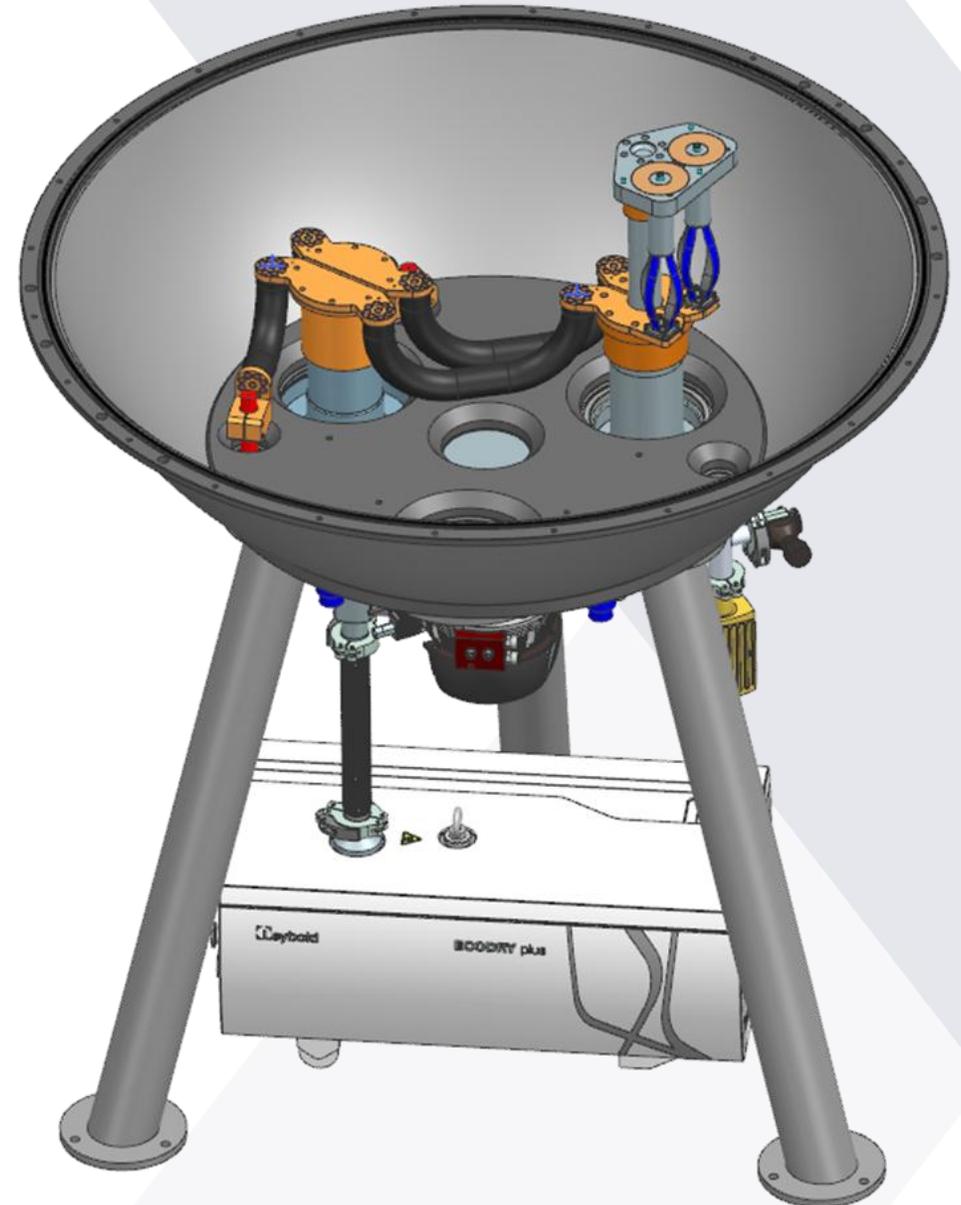


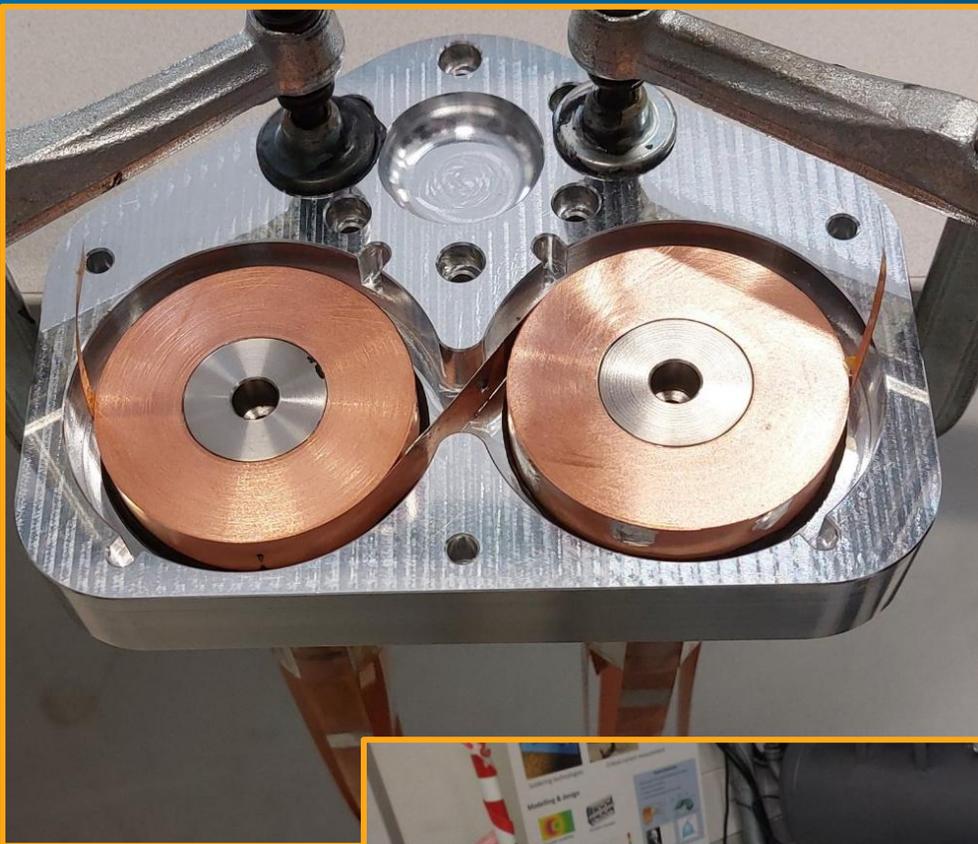
Thermal interface test



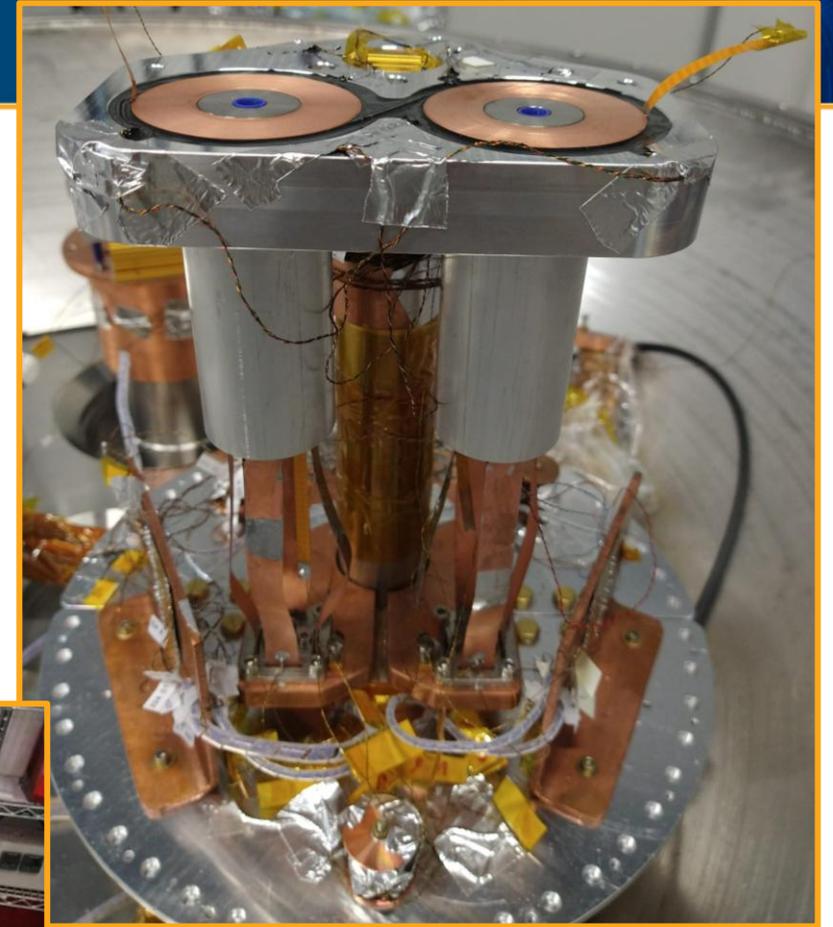
Conduction cooled in-house designed setup

- ELSA II Conduction-cooled
- Dual cryocoolers
- Capable of $<10\text{K}$
- Carry 2.7kA to 40K at transition to HTS



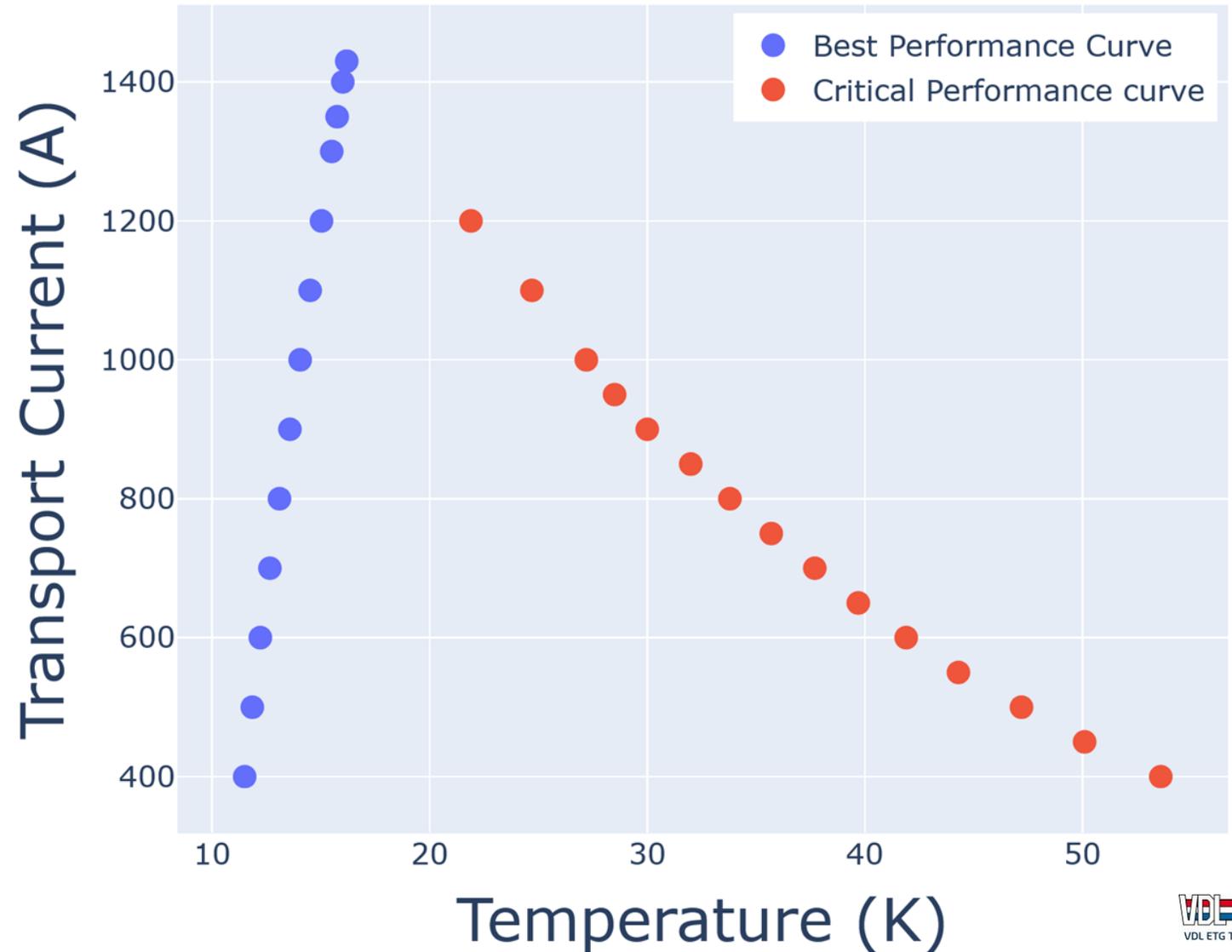
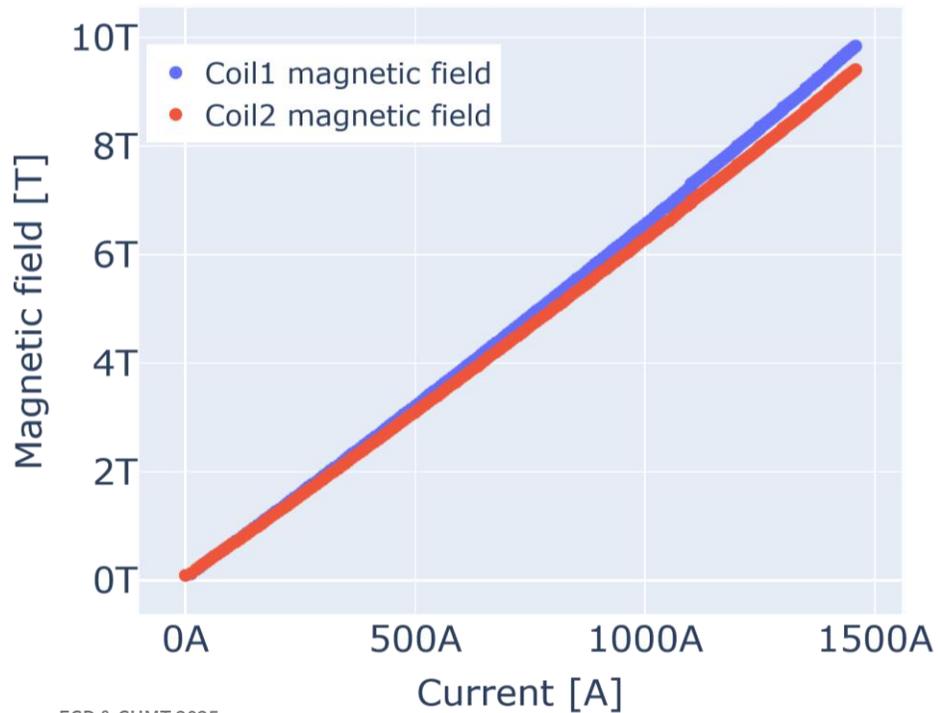


Bloemhof Duet



Magnetic fields

HTS coil Bloemhof Duet results



Frozen Team



Maikel



Peter



Ewald



Raymond



Bob



Aernout



Matthijs



Dave



Jeroen



Michel



Mathijs



Jorrit

Strong academic collaborations

- Strong connection with the EMS group at the university of Twente
- 4 PhD's working on the program
- 10+ Graduation Students in the past few years
- Frequent interactions

Fast Actuator using Superconducting Technology

- **Future work:**
- **3-phase linear motor**
- **100 G acceleration**
- **More details coming soon (EMS symposium)**





Coming soon