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Status of the Combined target project and Cryopump developments

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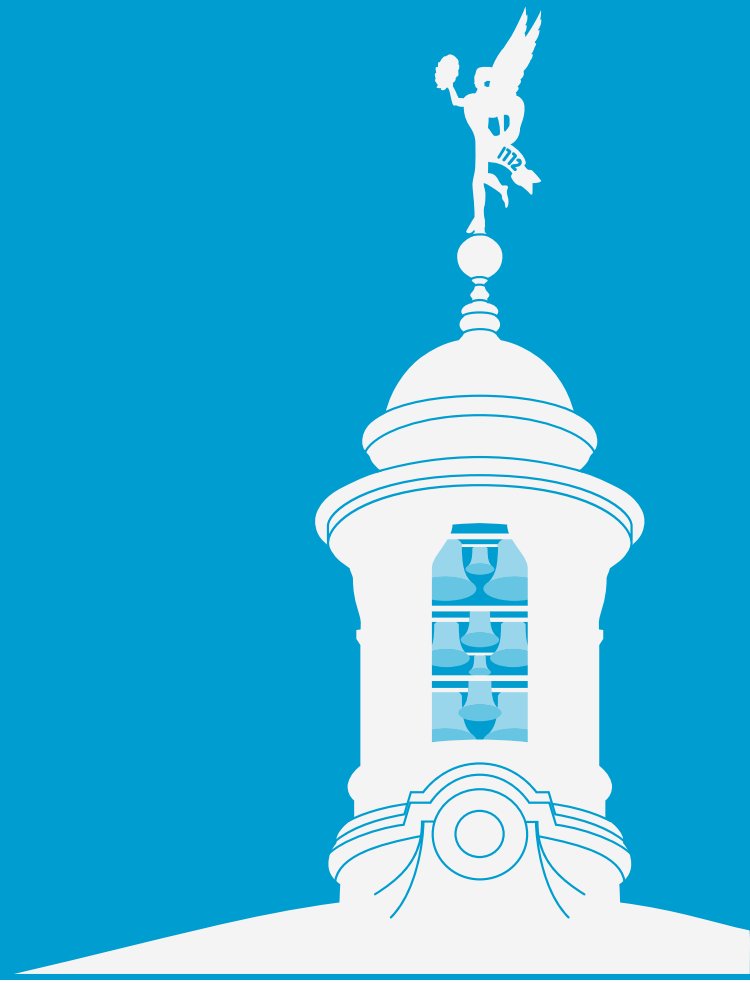
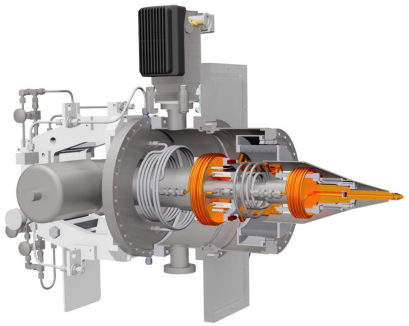
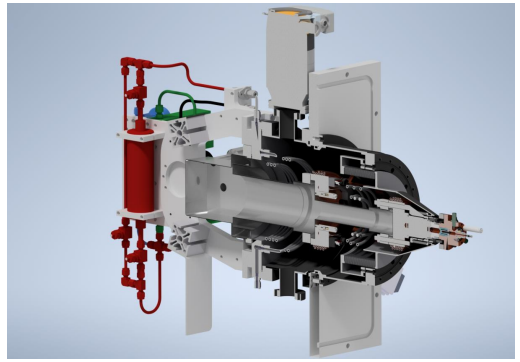


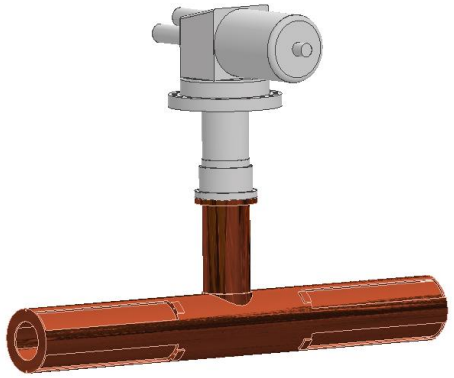
Two topics

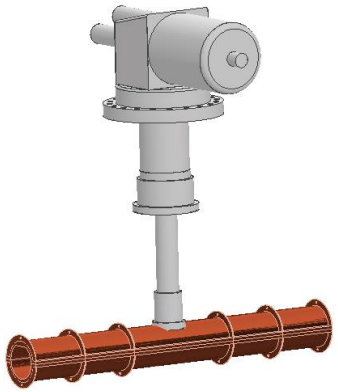
- The Combined target





- The Cryopump





Previously…

- We are working on transforming a Cluster-jet target into a pellet target:

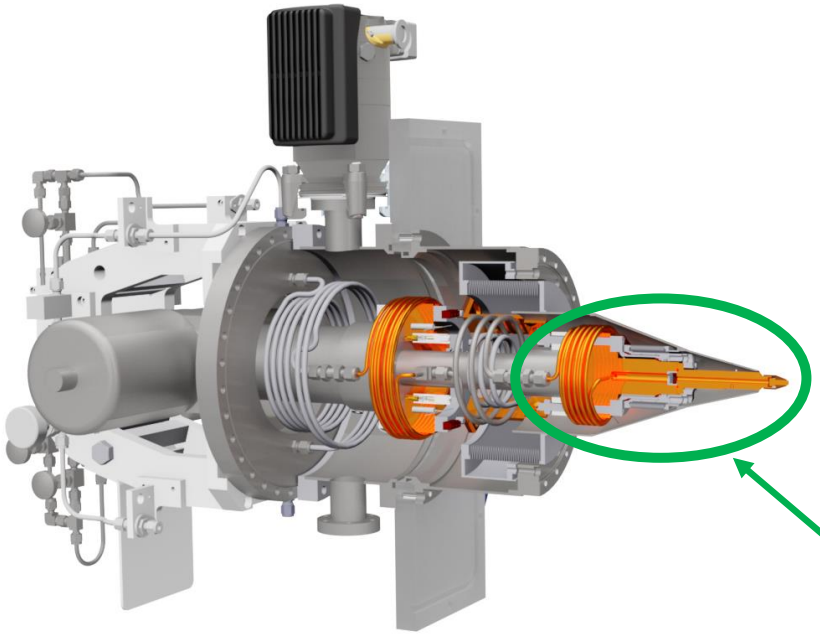
	Cluster-jet target	Droplet/Pellet target
Temperature	20-50 K	15-20 K
Gas pressure	5-18 bar	0.5-1.5 bar
Nozzle design	Laval nozzle	Aperture
Further requirements		Piezo vibrator

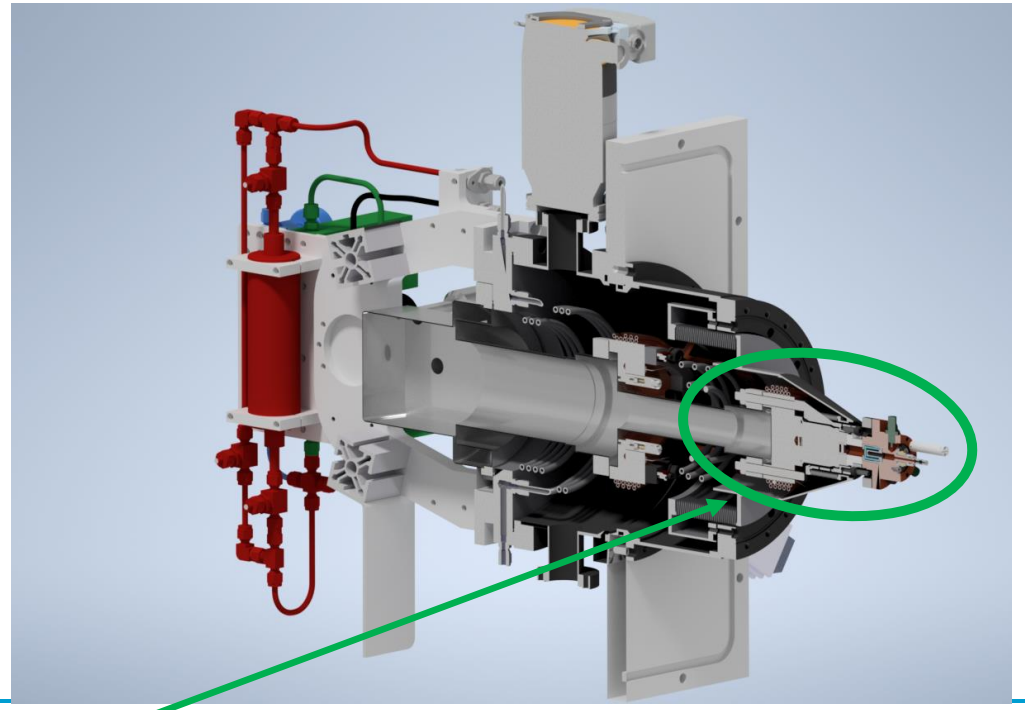
Can easily be fulfilled by our pre-existing Cluster-jet target systems

Requires adaptation of our Cluster-jet target system

Previously…

- Simple process:

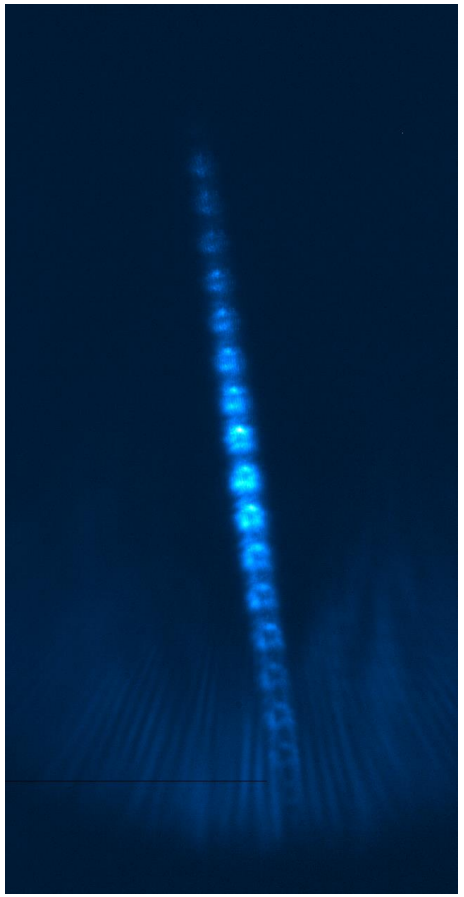




Only major change is performed at the nozzle system

Hydrogen pellet generation was achieved

- First stable operation (>3h) of the pellet target achieved!
- Operational parameters:
  - Nozzle diameter: 10µm
  - Gas pressure: 0.8 bar
  - Nozzle temperature: 16 K
  - Piezo frequency: 485,5 kHz
  - Pellet diameter: 12 µm (calculated)



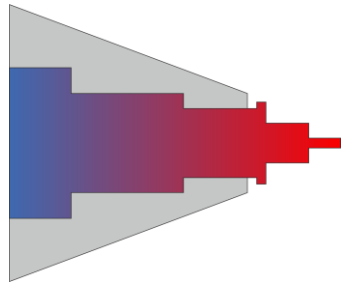
However, this success has proven to not be reliably reproducible. There are still several challenges to be overcome

The Combined target status

- There are two major challenges:

  - Nozzle clogging

  - Transfer of sufficient cooling power to the nozzle

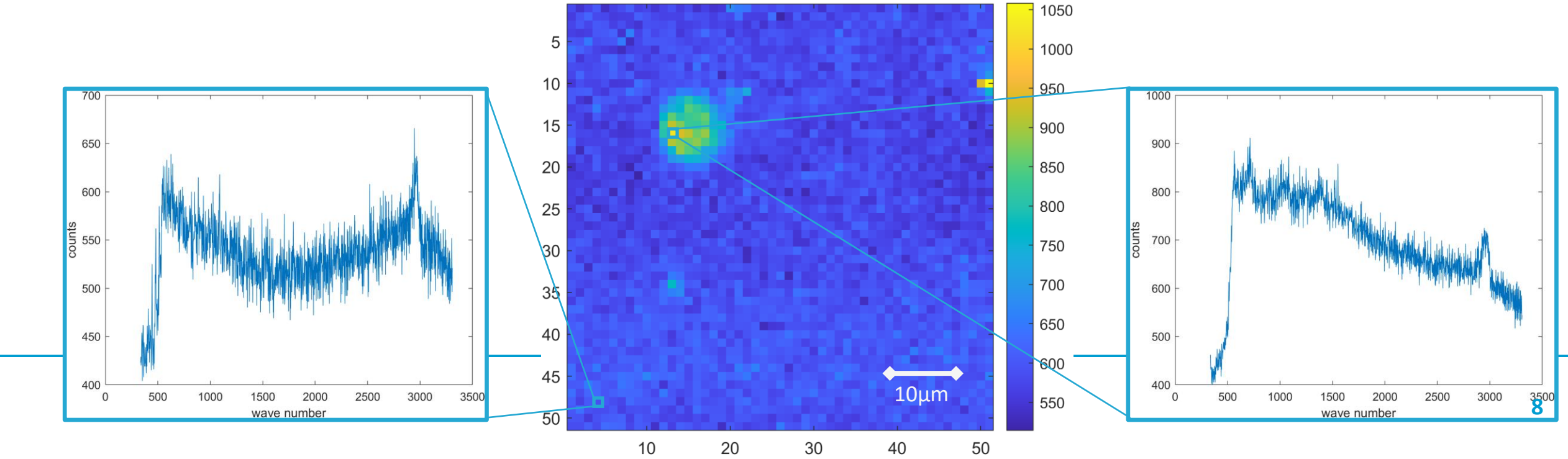


Nozzle clogging

- Issues created by nozzle clogging:
  - Frequent disruption of operation, lengthy downtime
    - Stable operation periods of months highly desirable for PANDA
  - Unstable operating conditions (gas flow, vacuum chamber pressures etc.) greatly increases the difficulty of interpreting operational parameters

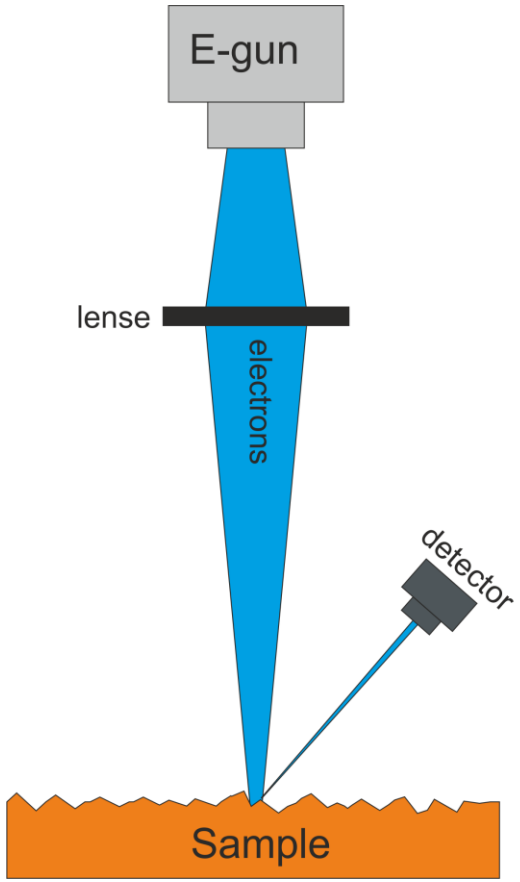
Combatting nozzle clogging

- Analysis of the impurities:
  - Raman-microspectroscopy (with the kind support of AG Fallnich from the WWU)



Nozzle clogging analysis

- Raman spectrum is typical for metals but does not allow for more specific identification
- Next step: Energy dispersive X-ray spectroscopy
  - The nozzle is imaged using electron microscopy
  - The characteristic X-ray spectrum is excited by the incident electrons
  - Elemental make-up can be determined with high precision



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A first step forward

- Before the target is operated it is “cryo flushed“ for several days
- Promising increase in stability of the operating conditions
- Allows for a better analysis of target parameters

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  - Nozzle clogging

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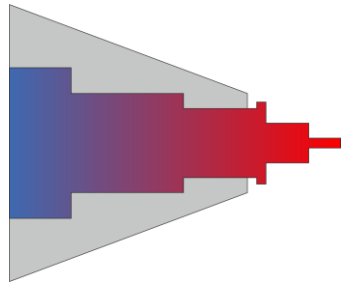
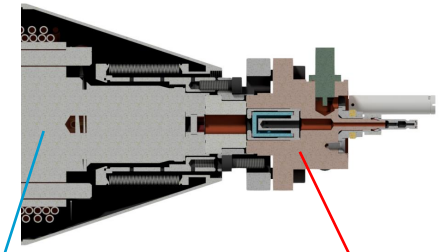
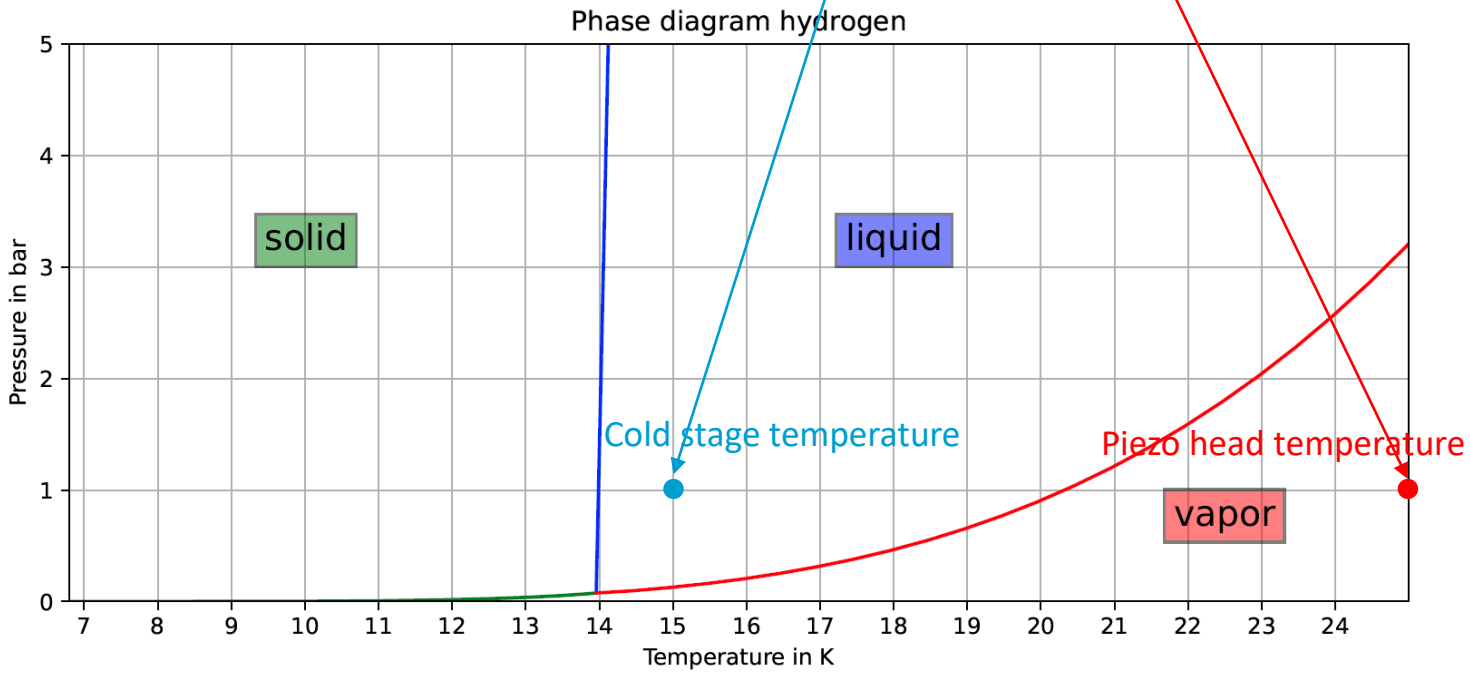


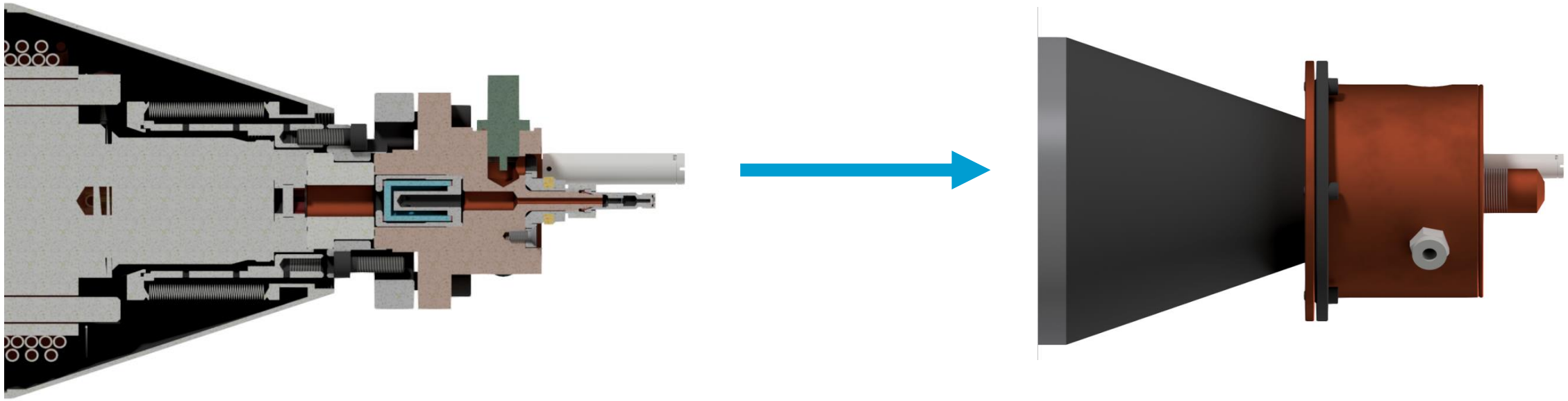
The cooling issue





As a response, heat shielding was installed around the nozzle

Installation of heat shielding

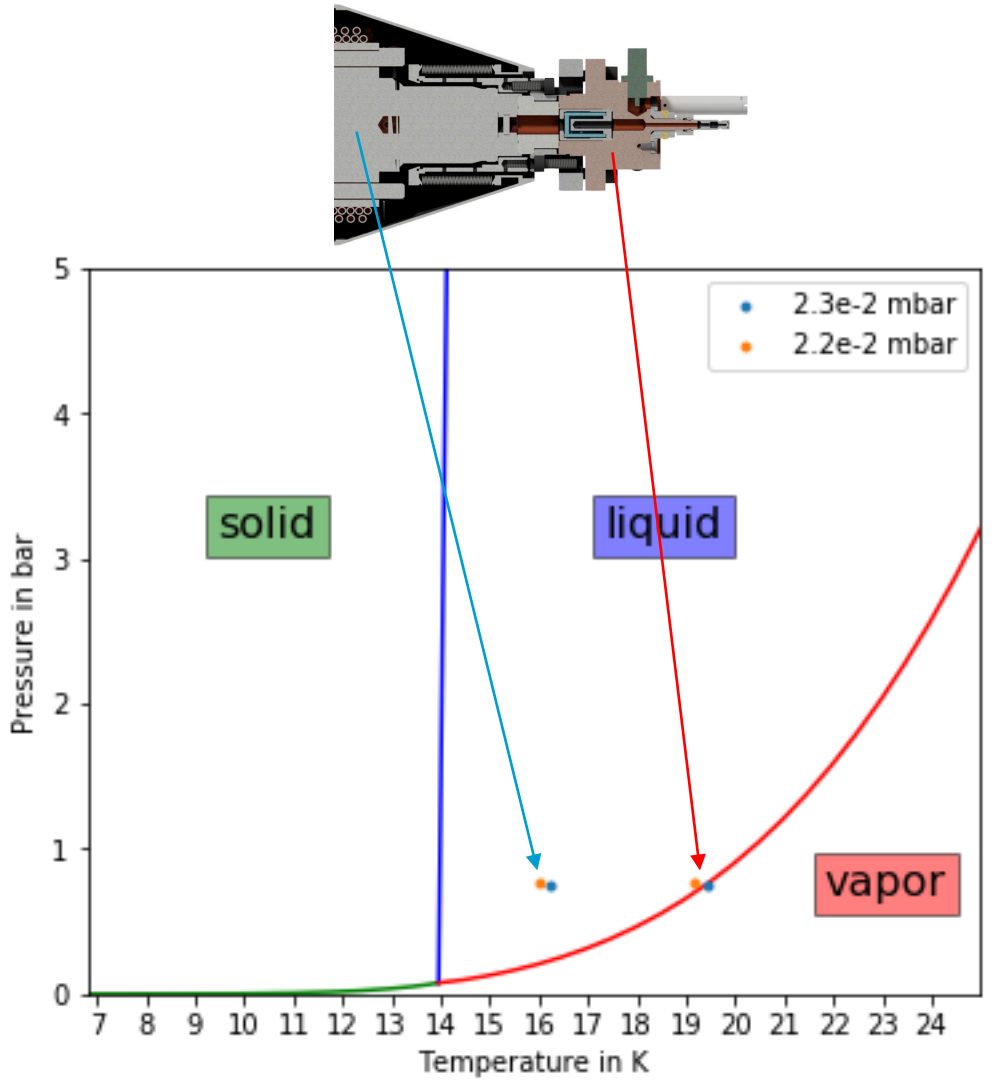


- Recent measurements have shown that this is not enough to cool down a completely free nozzle

The cooling issue

- The target has issues crossing the vapour curve

- Even a slight improvement in the chamber pressure can help.

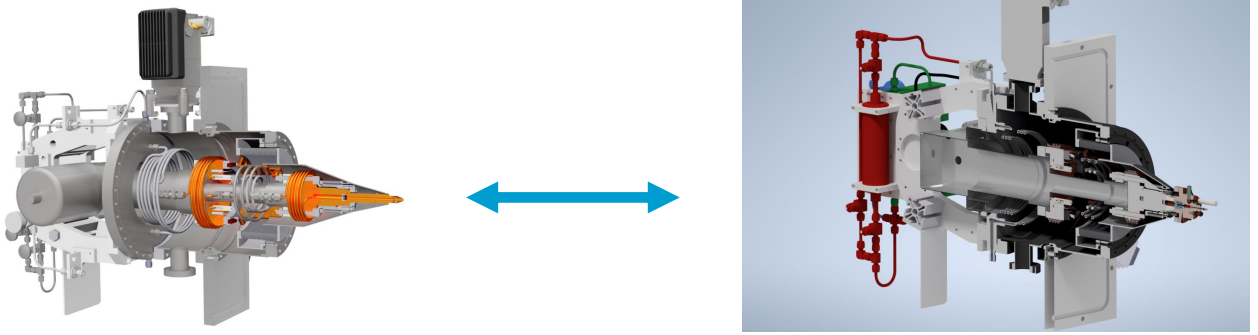


The next steps

- The experimental setup is currently being reworked
  - Installation of additional pumping power (~factor 10 better vacuum)
  - Test of the pumping station for the new beam dump
- Further tests with cold flushing
- Redesign of the piezo head

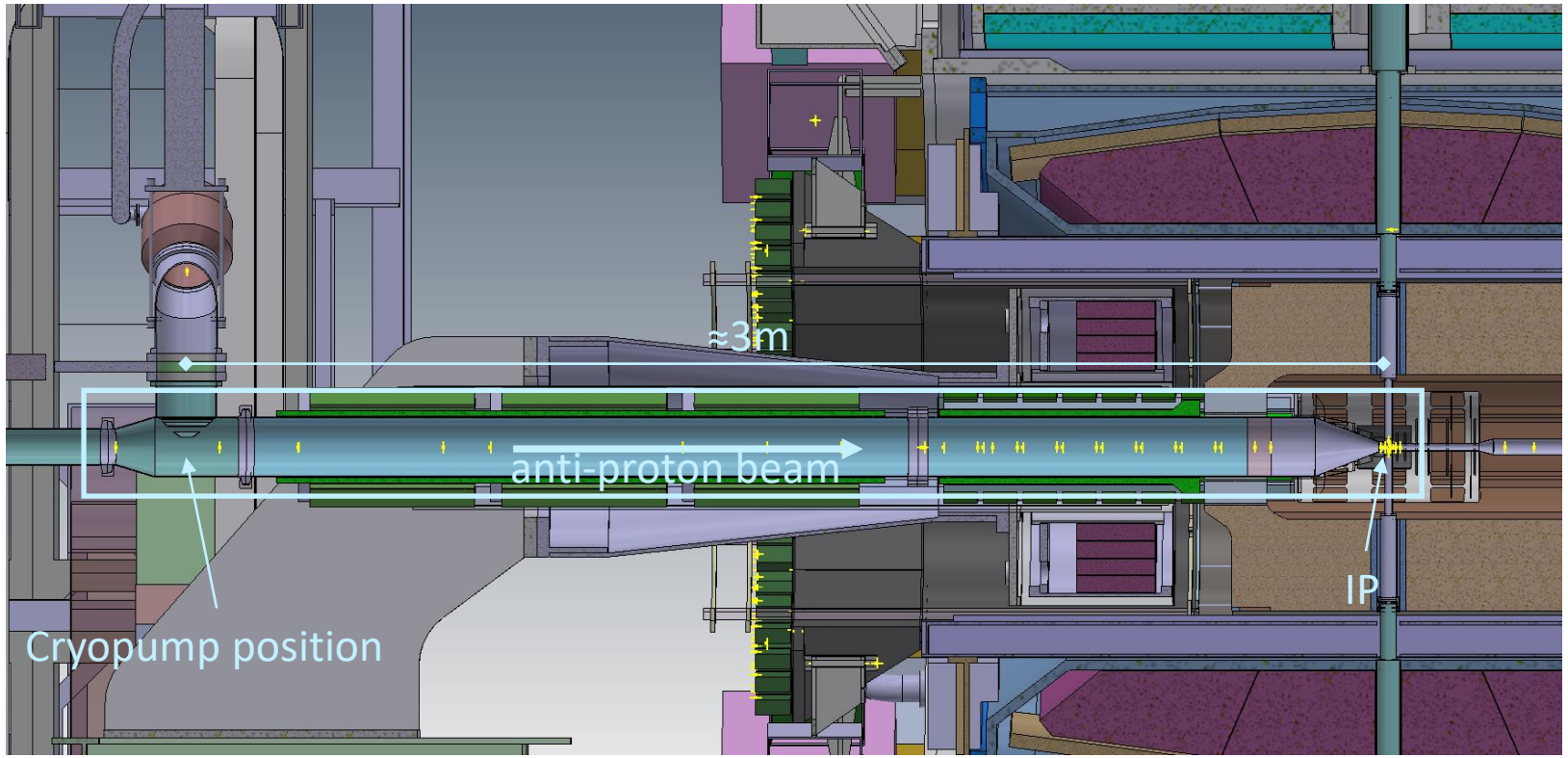
Two topics

- The Combined target



- The Cryopump

Location of the Cryopump



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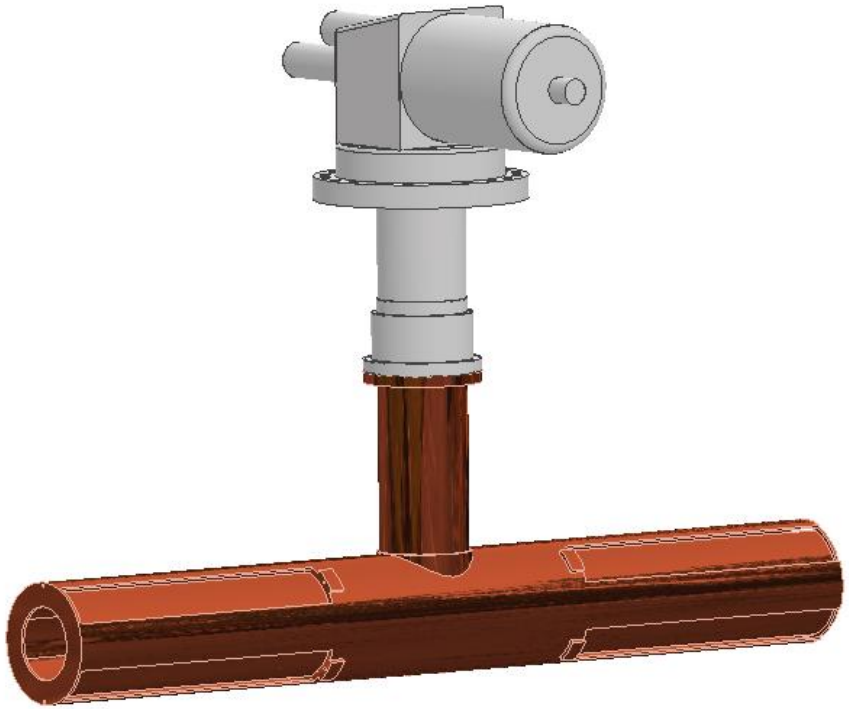
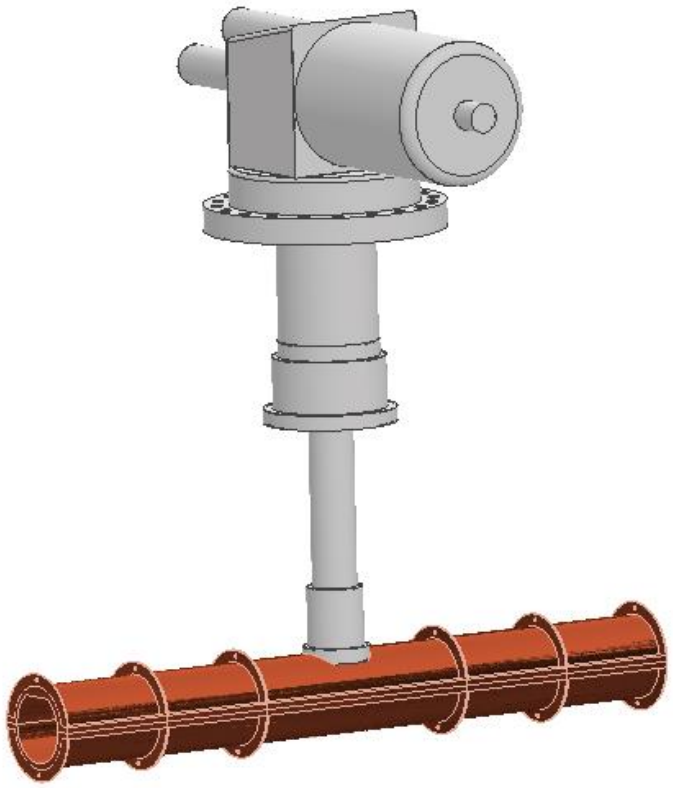


- Basic design is completed

Status of the cryopump



- Basic design is completed
- Pump is designed to be modular
- Technical drawings are currently in progress

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Thank you for your attention

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