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Transforming Targets

Transforming a Cluster-jet target into a Droplet/Pellet-target

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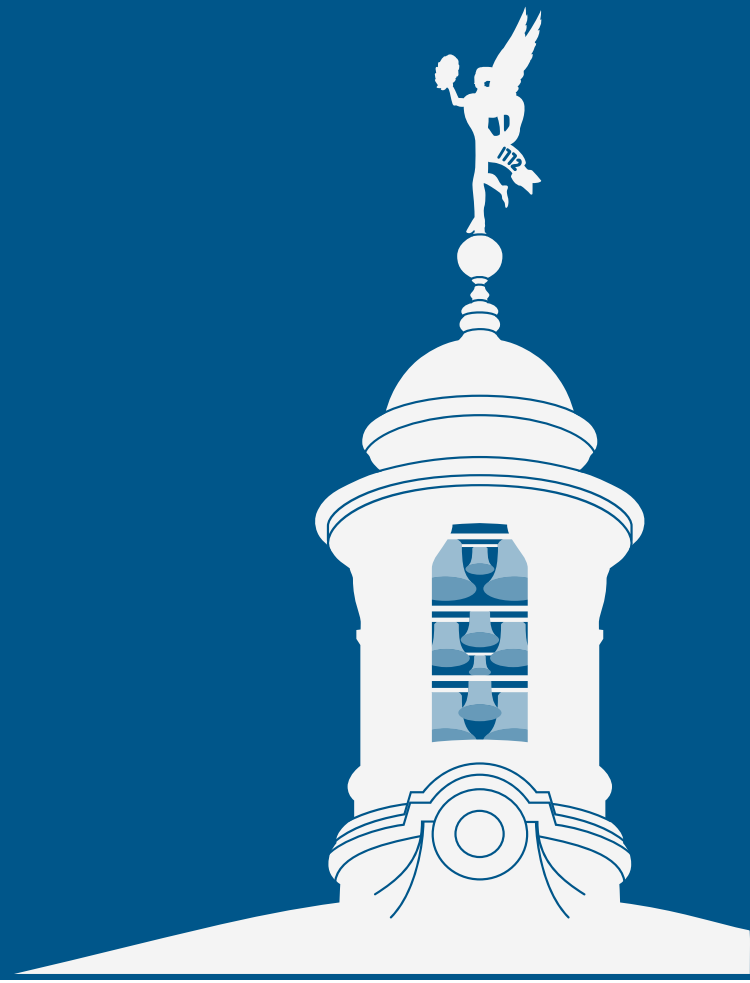

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Motivation

- The future of the pellet target remains uncertain
- It would be prudent to explore alternatives
- Cluster-jet targets and pellet targets are closely related

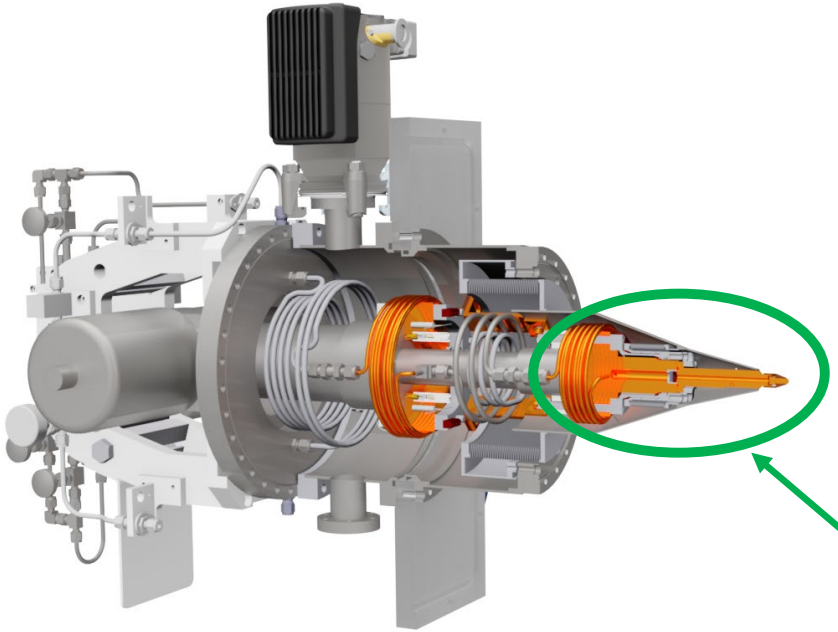
Similarities and differences

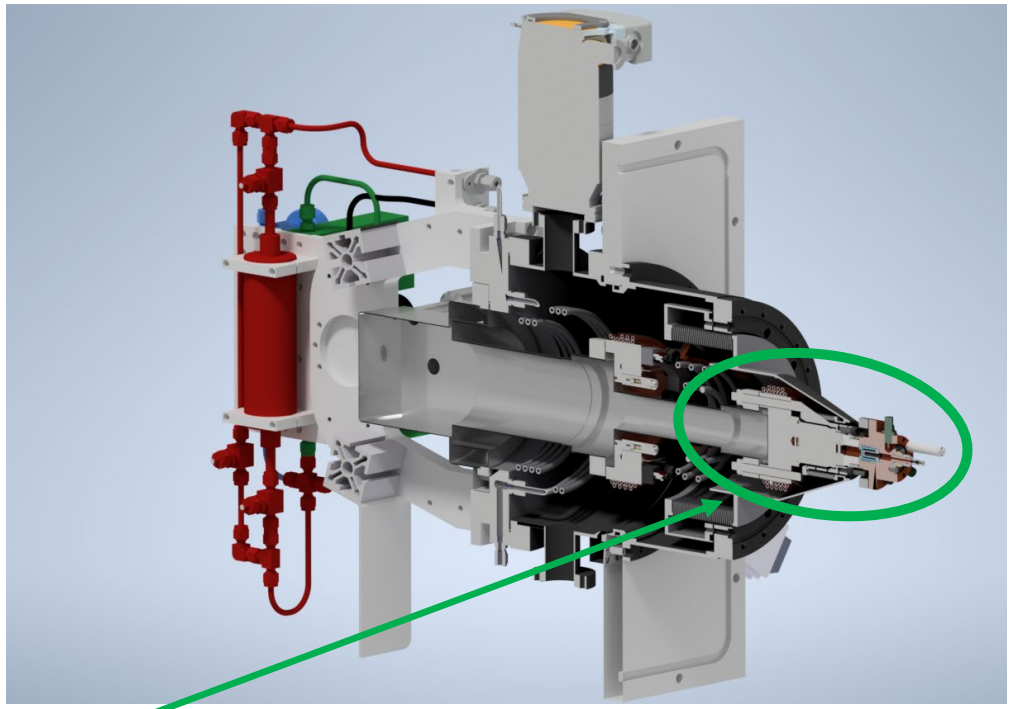
	Cluster-jet target	Droplet/Pellet target
Temperature	20-50 K	15-20 K
Gas pressure	5-18 bar	0.5-1.5 bar
Nozzle design	Laval nozzle	Aperture
Further requirements		Piezo vibrator

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

Requires adaptation of our cluster-jet target system

Transforming a Cluster-jet target (MCT-D) into a Pellettarget

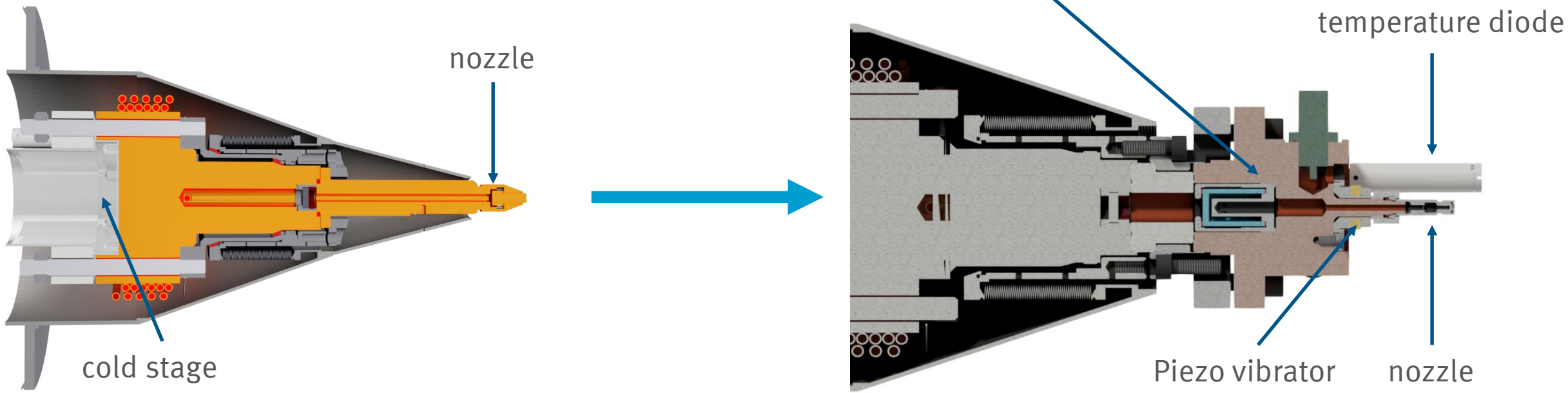




Only major change is performed at the nozzle system

Transforming a Cluster-jet target (MCT-D) into a Pellettarget

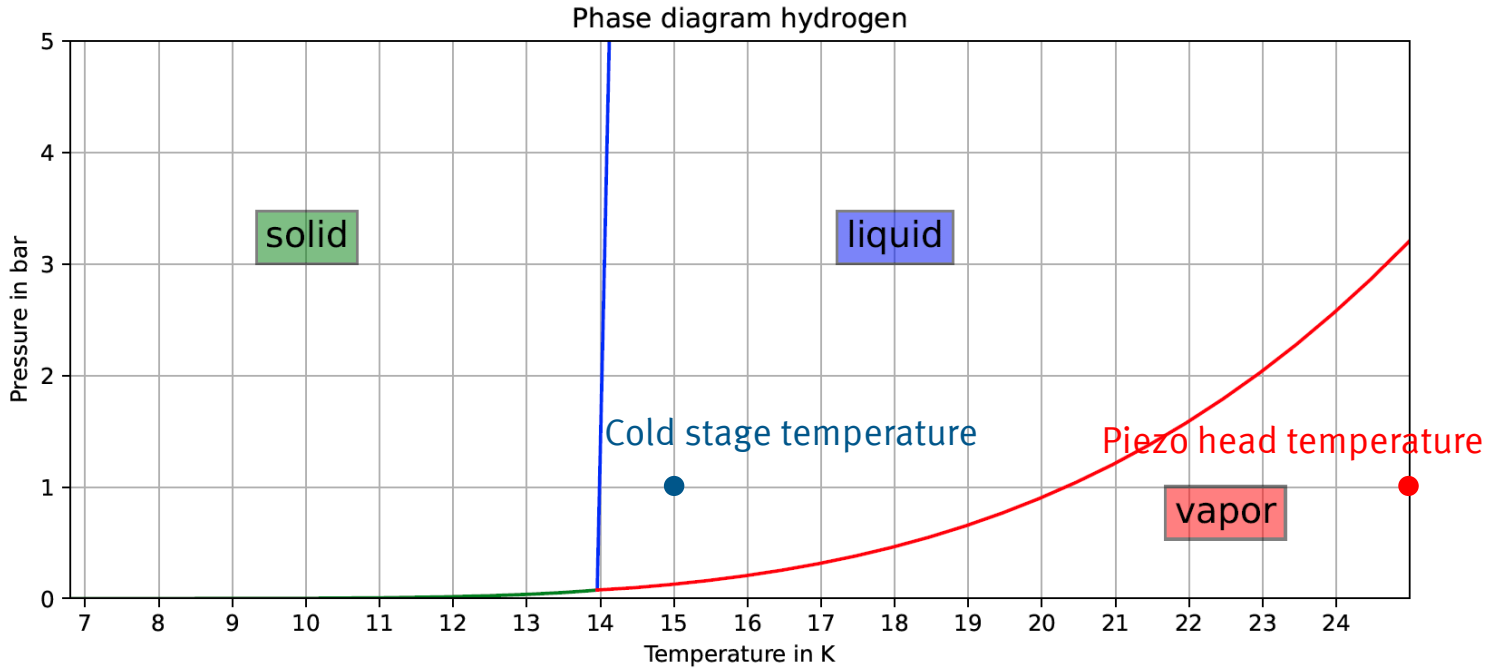
A closer look at the cutout:



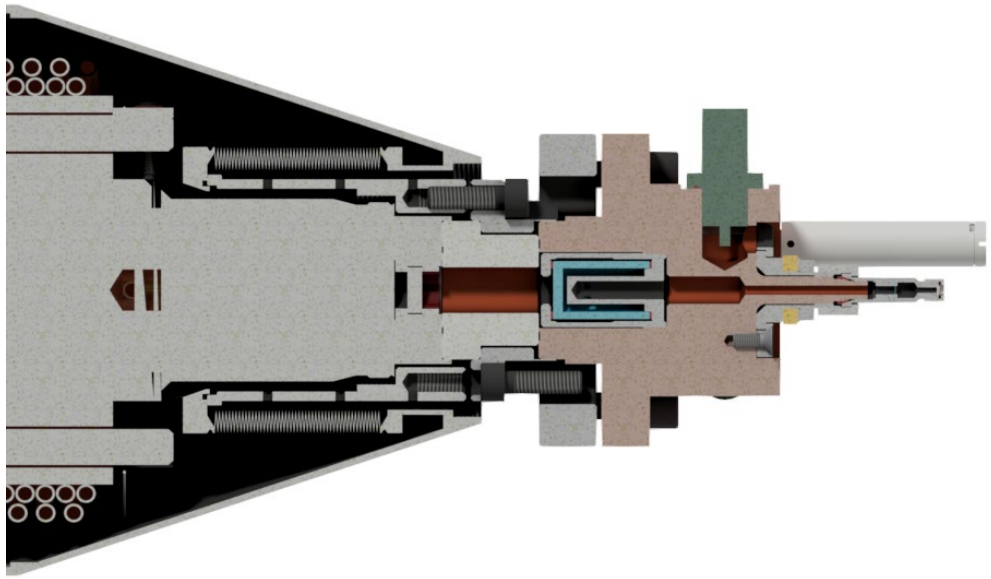
Challenge: Providing sufficient cooling

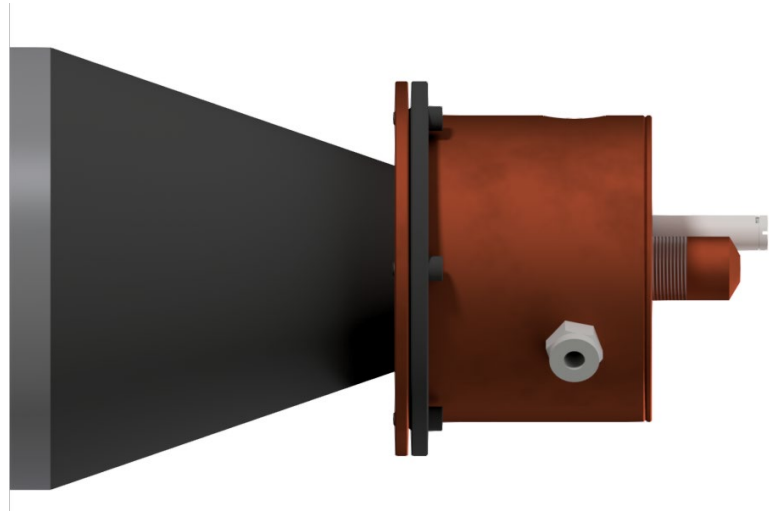
- In this configuration the piezo head is more than 10 K warmer than the cold stage.
- This makes reaching fluid hydrogen at droplet conditions impossible:

→ Inserting only a piezo head is not sufficient



Idea: Install a heat shield



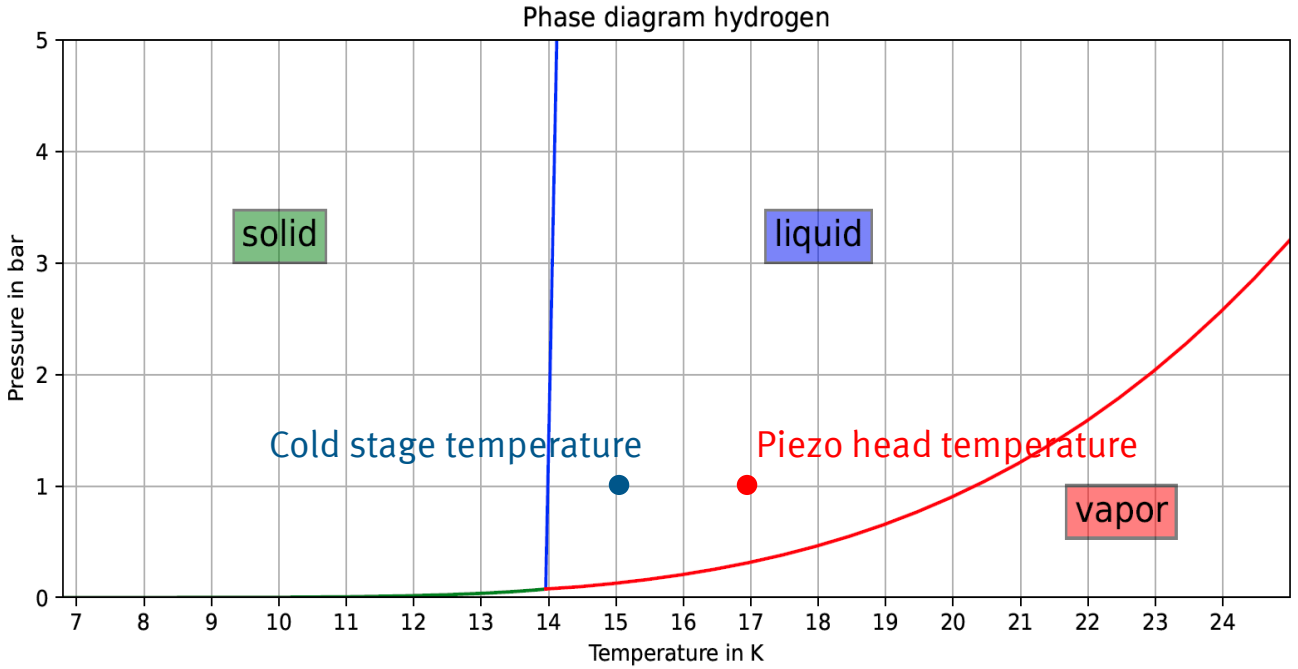


Idea: Install a heat shield

- Piezo head only ~2 K warmer than cold stage
- Reaching fluid hydrogen at droplet conditions now seems possible
- No fluid hydrogen has been observed

→ Nozzle itself is significantly warmer

→ Further heat shielding & exchange of nozzle material necessary



Summary and outlook

- Aim: interchangeabillity between cluster and droplet/pellet operation

  → **Only need to exchange the nozzle system**

- First tests showed general possibility of reaching desired conditions
- As always: devil is in the details

- Next: change the nozzle material from stainless steel to copper (due to thermal conductance)
- With stable fluid hydrogen jet: enable piezo for pellet beam operation

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Thank you for your attention
Are there any questions?