



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008324 (ChETEC-INFRA).

**HZDR**  
HELMHOLTZ ZENTRUM  
DRESDEN ROSSENDORF

ChETEC-INFRA

TNA Event, 26.07.2021



**TA Facility**  
**HZDR – Felsenkeller**  
Access for astronuclear experiments

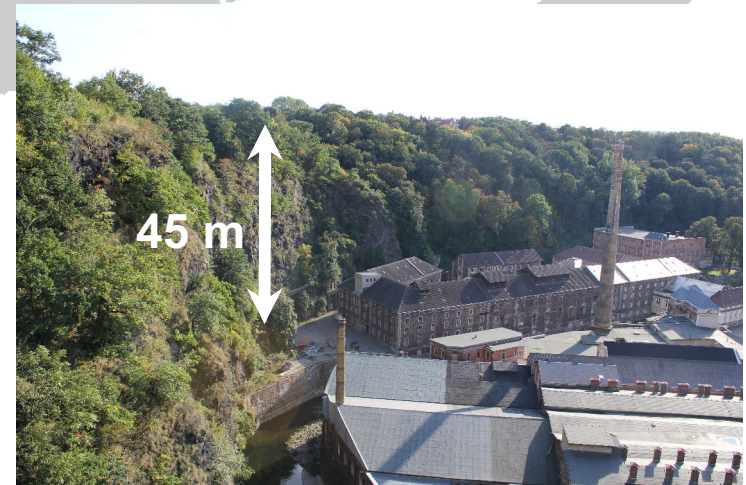
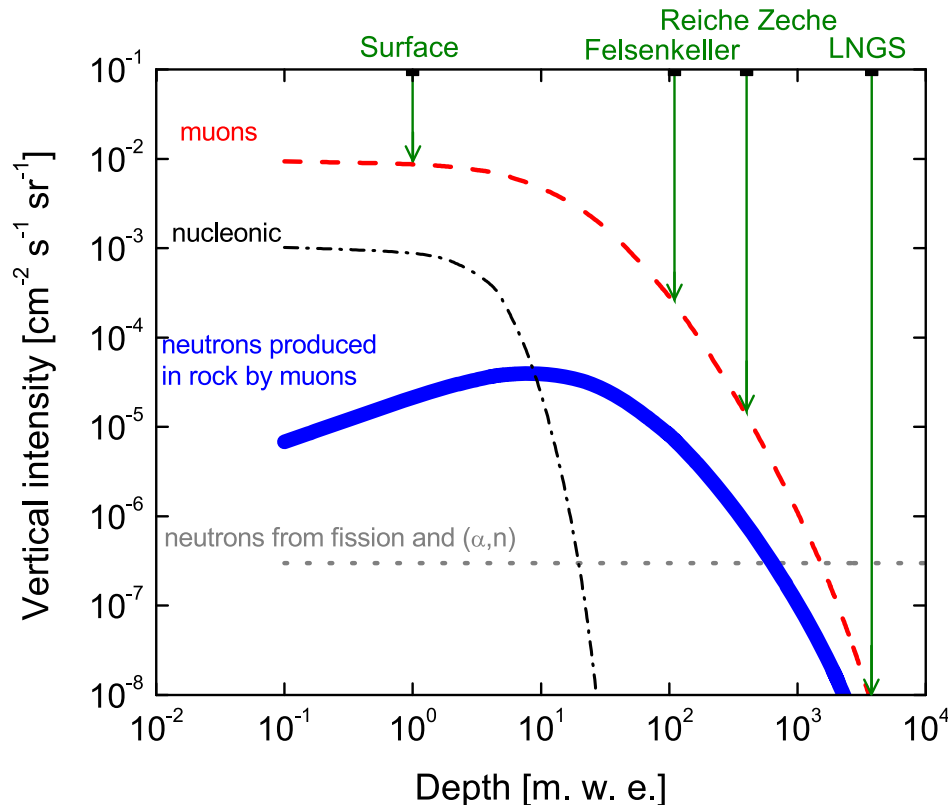
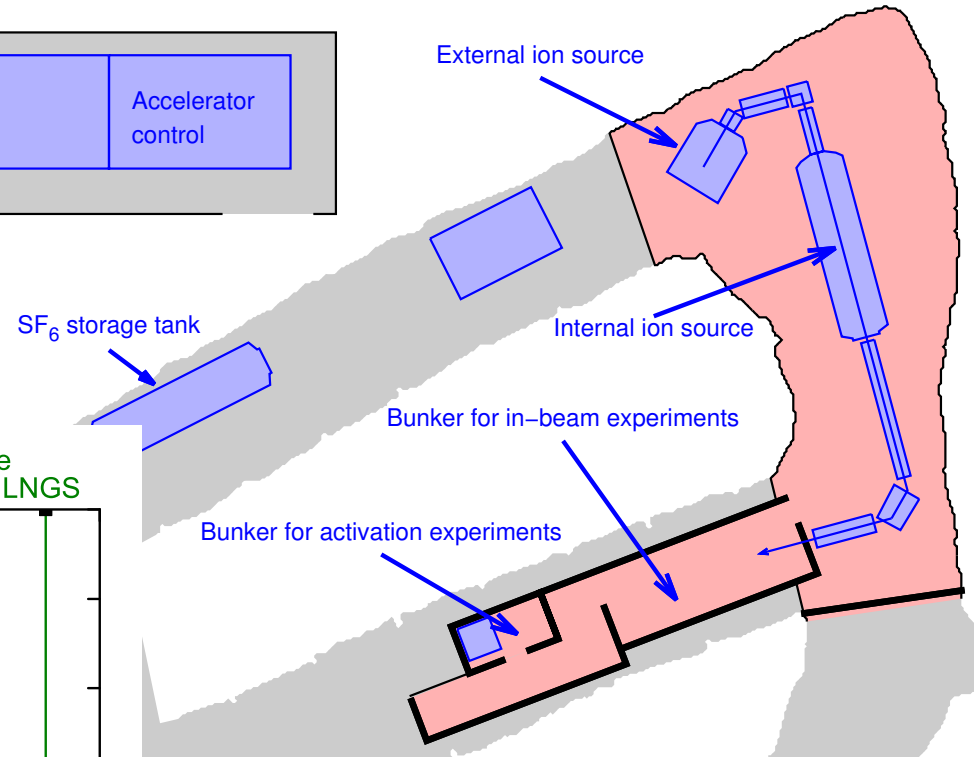
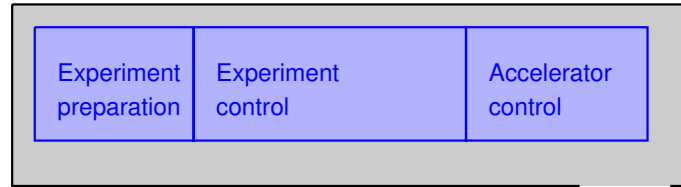
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# Felsenkeller TA facility

- 5 MV Pelletron accelerator
- combined with active muon vetos, the background rate is typically reduced by three orders of magnitudes



# Two ion sources for high intensity beams

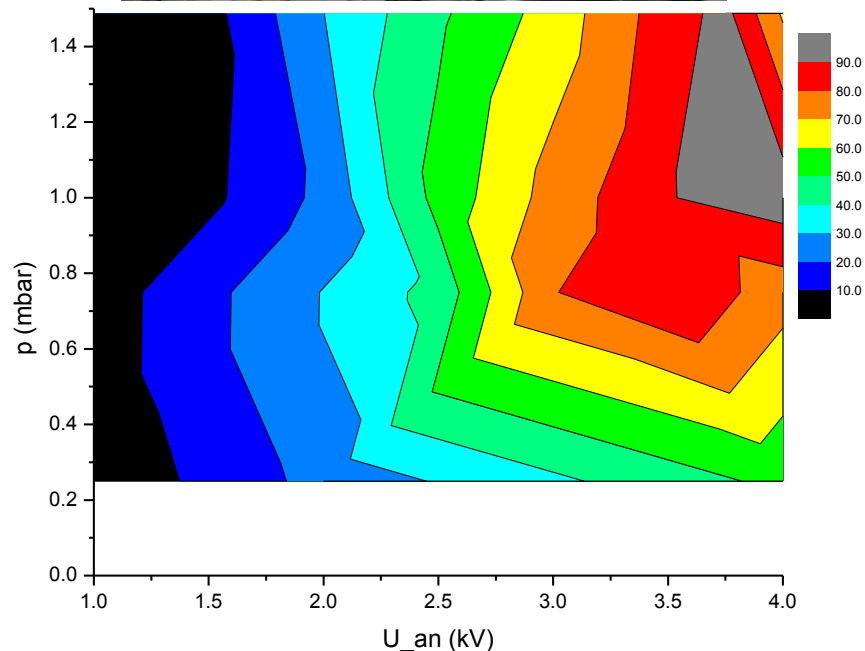
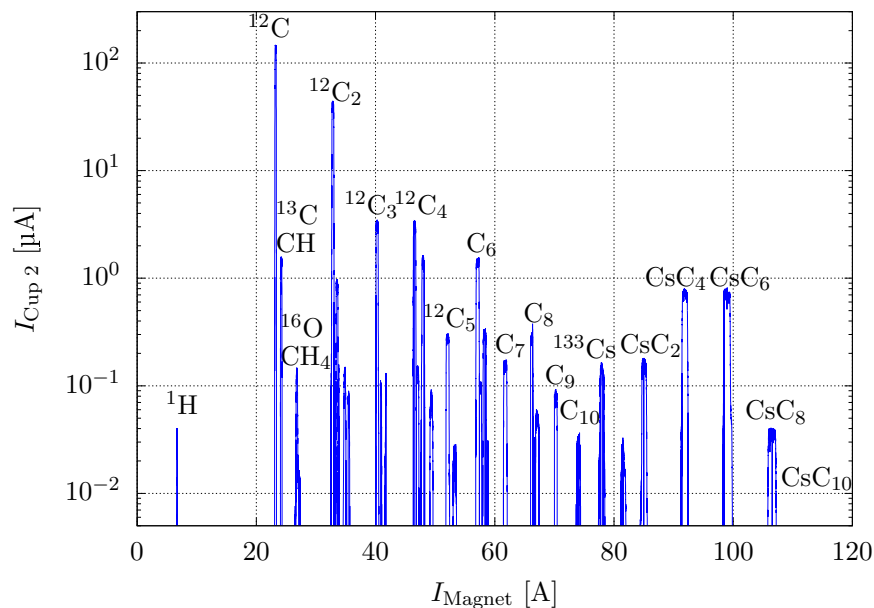
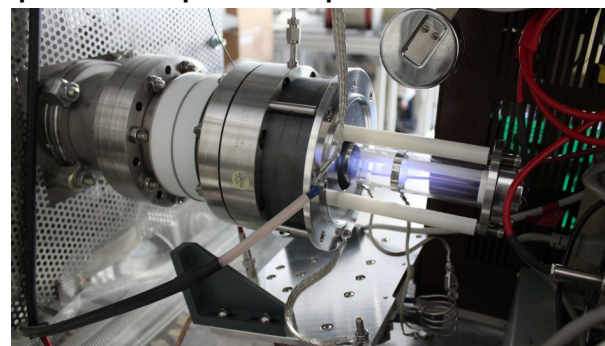
## External Cesium sputter ion source

- produces intensive  $^{12}\text{C}$ - beam
- measured up to  $140\ \mu\text{A}$  after the source
- other species of negatively charged ions available



## Internal radio frequency ion source

- produces intensive  $^1\text{H}$  and  $^4\text{He}$  beams
- expected up to  $30\ \mu\text{A}$



# Irradiation station: solid or gas target system

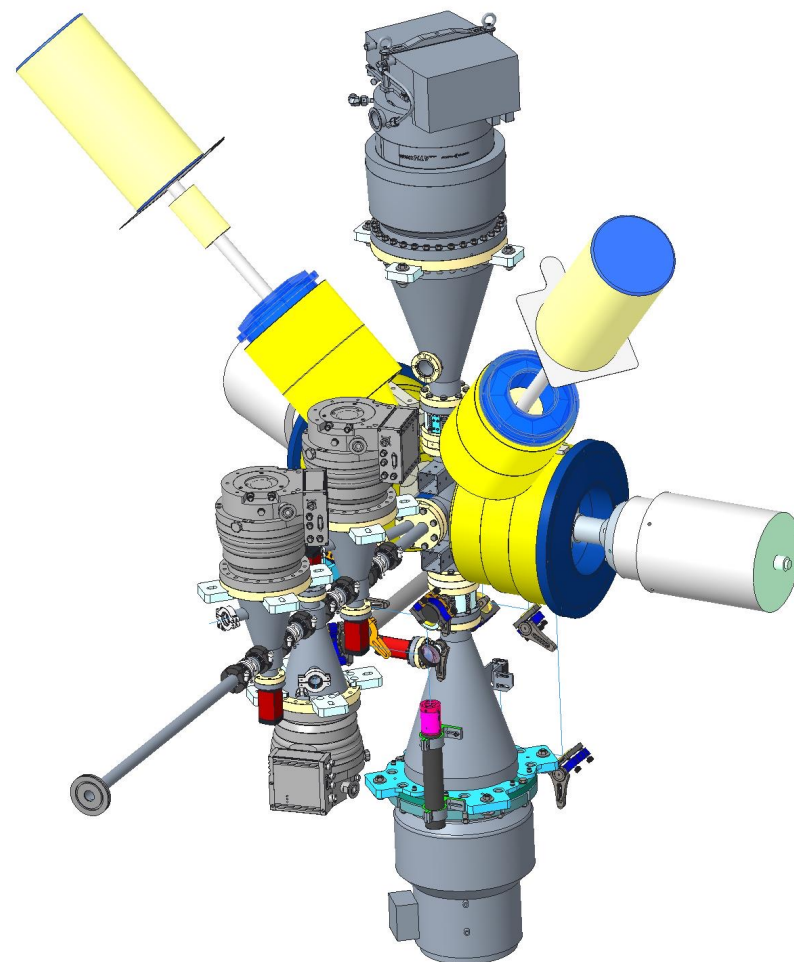
## Solid target system

- cooled by water or liquid nitrogen



## Gas target system

- wall jet and/or windowless extended gas target system (under construction)



# Currently available detectors for gamma-rays produced in the astronuclear reaction

Multiple high purity germanium detectors (grey) with active (BGO, blue) and passive (lead, yellow) shielding and collimators:

**1 x 90% HPGe**

**1 x 60% HPGe**

**4 x Euroball/Miniball**  
(2 x 7-cluster, 2 x 3-cluster)

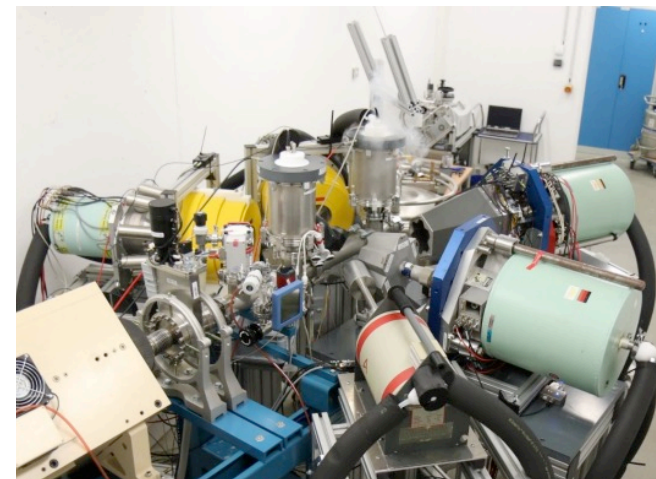
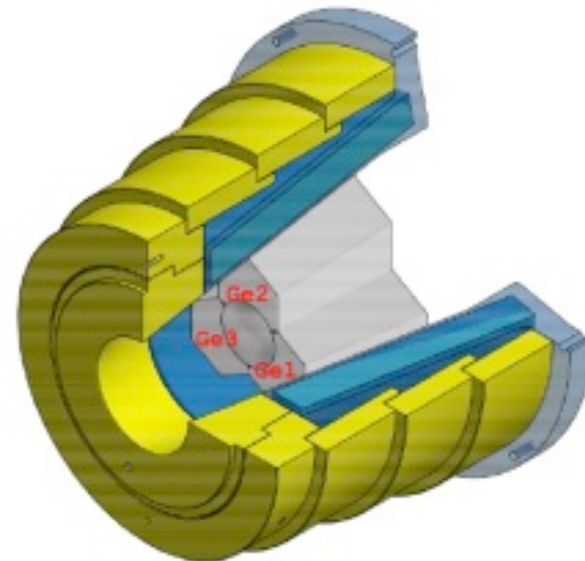
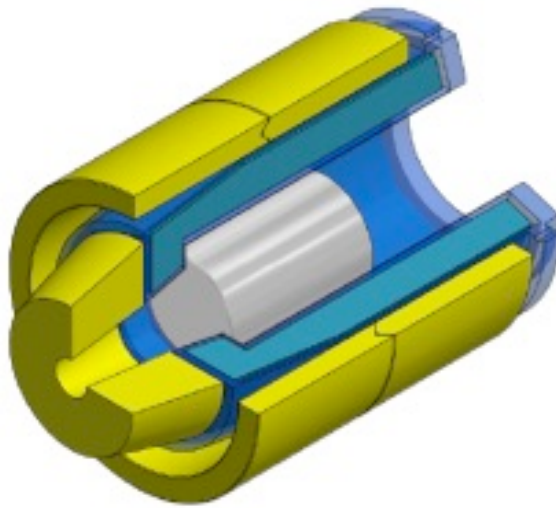
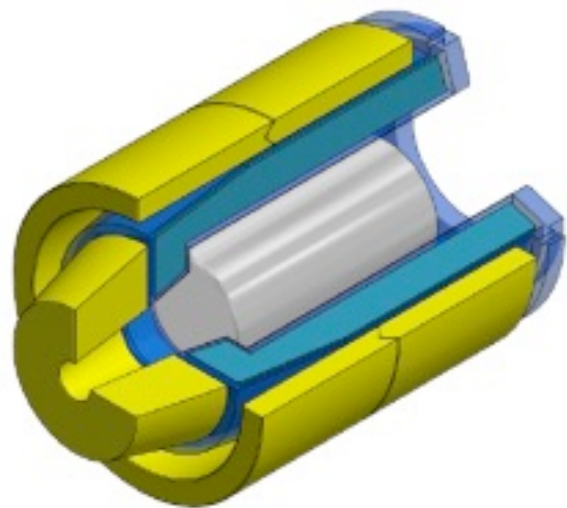


Figure taken from T. Szücs et al., Eur. Phys. J. A **55**, 174, 2019.

# Details of TA at HZDR – Felsenkeller

- Minimum total quantity of access provided under ChETEC-INFRA TA: 975 beam time hours
  - 200 to 400 beam time hours each in year
  - 100 to 300 beam time hours as typical amount per user project
- Access is provided in hands-on mode
  - user group must attend the experiment and work on the control of the detectors
  - ion beam will be provided and controlled exclusively by the trained operators of the facility, not by the users
- Users can
  - either use irradiation stations and detectors free of charge
  - or bring part of or even the whole setup themselves
- Accommodation
  - Suitable hotel room near Felsenkeller will be booked with good public transport connection to Felsenkeller
- Review Procedure: Access granted and reimbursed only for positive outcome by both,
  - ChETEC-INFRA User Selection Panel (USP)
  - Felsenkeller Scientific Advisory Board

# HZDR – Felsenkeller

Facility for experimental nuclear astrophysics

## Summary

- 5 MV Pelletron ion accelerator
- underground, shielded from cosmic rays by 45 m of rock overburden
- combined with active muon vetos, the background rate is typically reduced by three orders of magnitudes
- external cesium sputter ion source for
  - intensive carbon beams
  - many other species of negatively charged ions
- internal radio frequency ion source placed on the terminal for intensive
  - hydrogen beams
  - helium beams

## References

- M. Grieger et al., Phys. Rev. D **101**, 123027, 2020
- F. Ludwig et al., Astropart. Phys. **112**, 24, 2019
- T. Szücs et al., Eur. Phys. J. A **55**, 174, 2019

