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HZDR
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ChETEC-INFRA Kick-off Meeting
Session 2: Transnational Access
Facility Presentations
May 4, 2021



TA Facility
HZDR – Felsenkeller
Access for astronuclear experiments

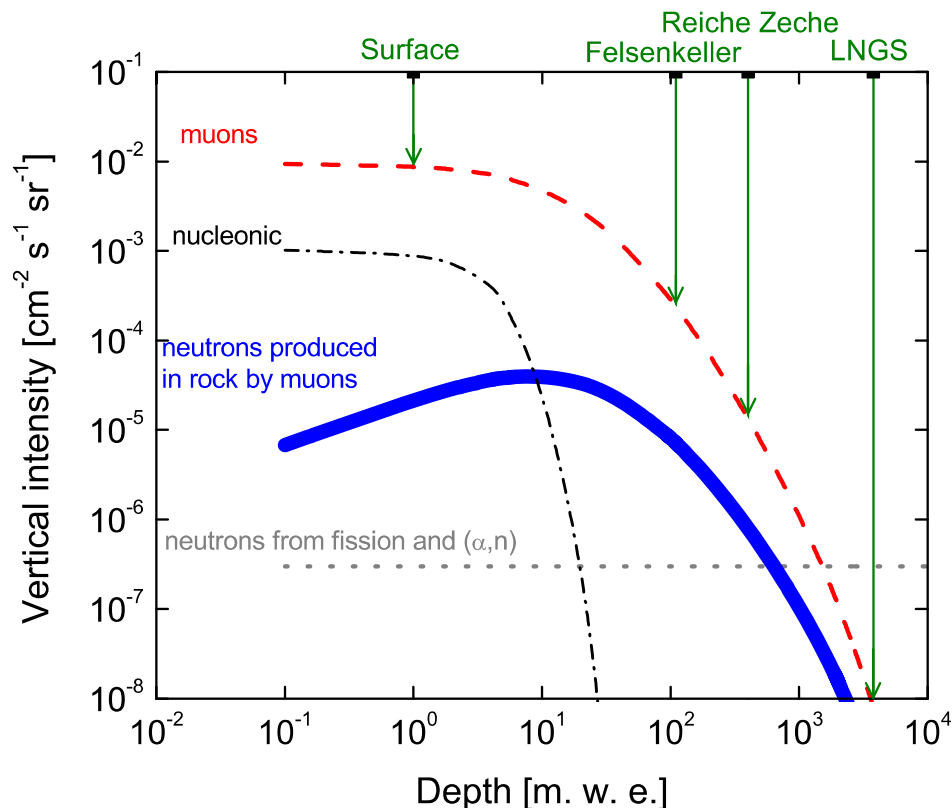
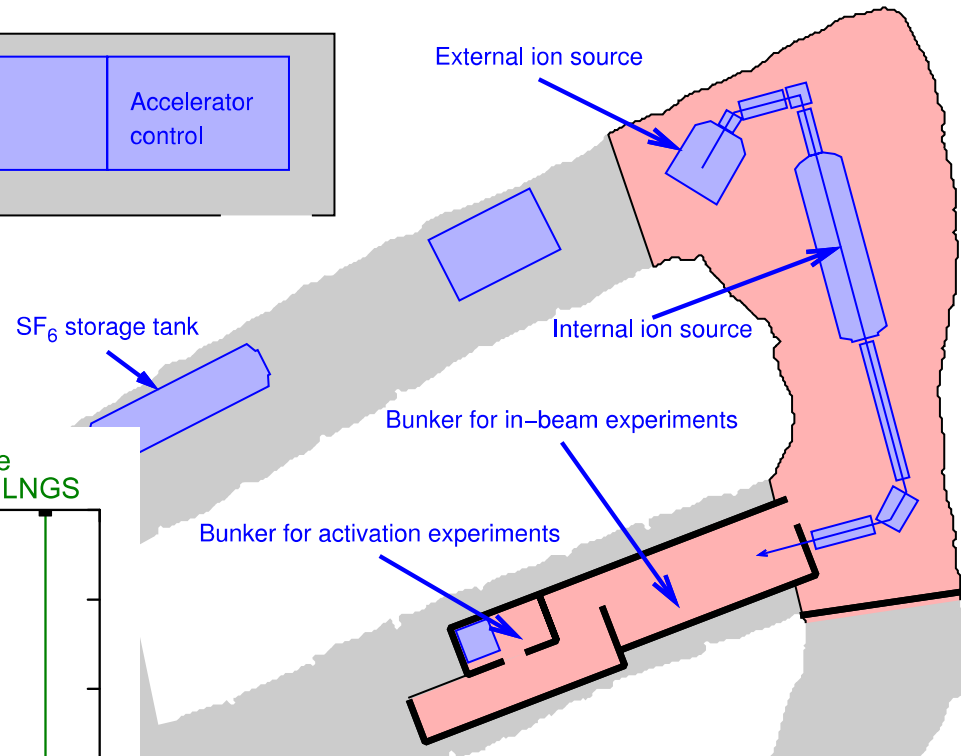
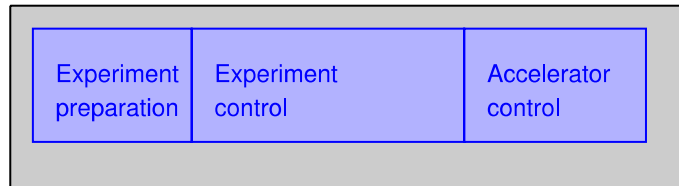
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Felsenkeller TA facility

- 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

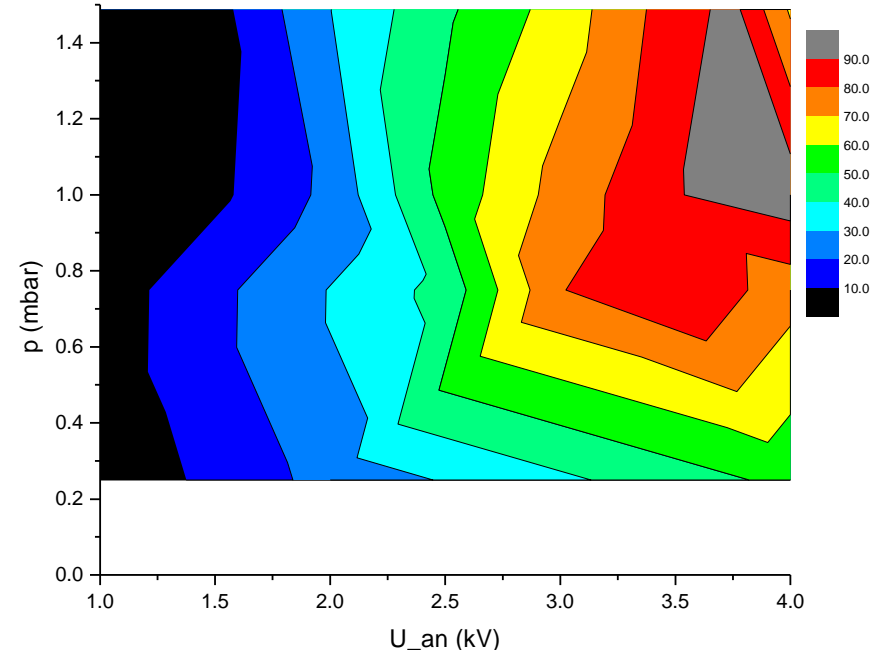
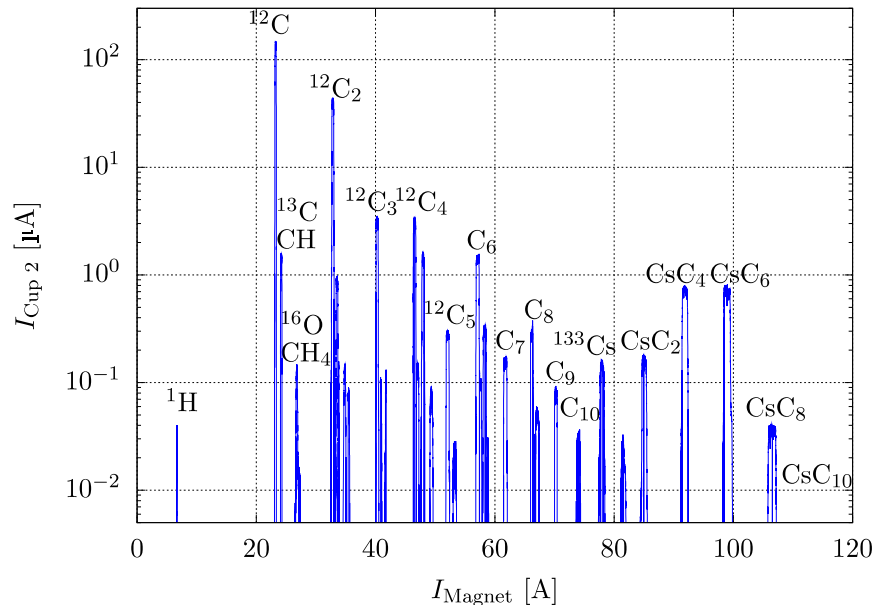
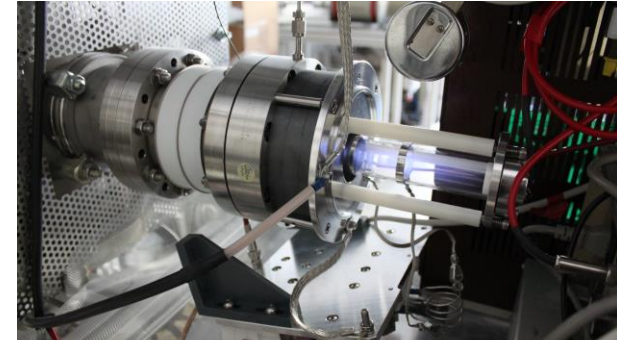
External Cesium sputter ion source

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



Irradiation station: solid or gas target system

Solid target system

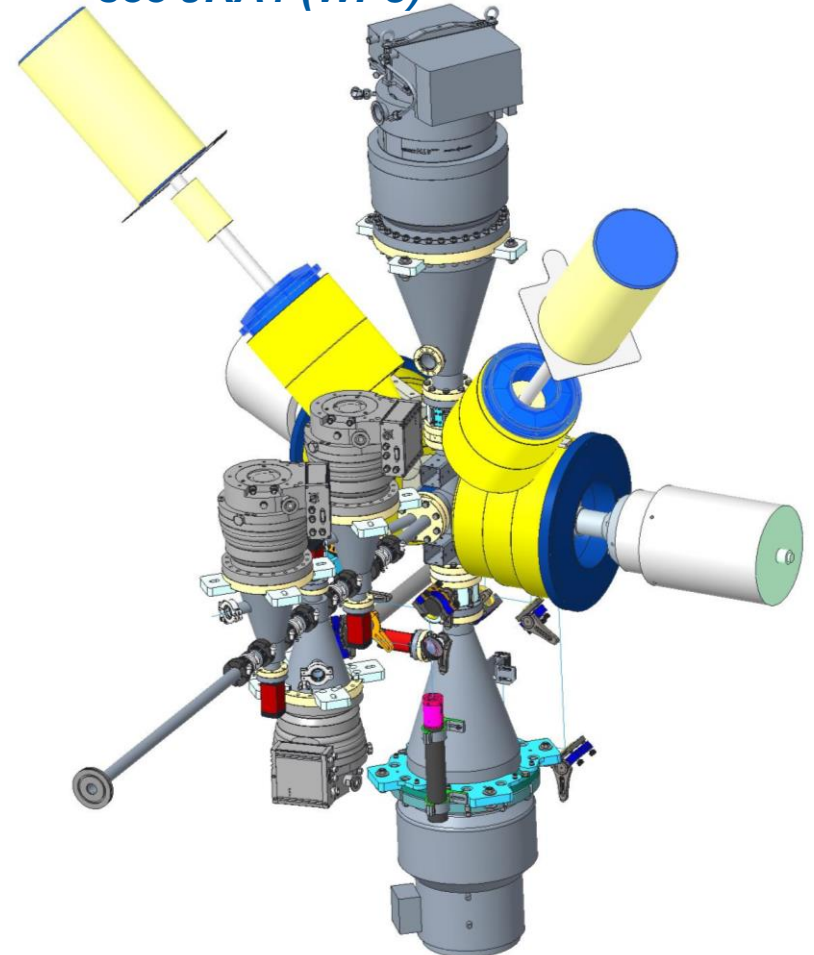
- cooled by water or liquid nitrogen



Gas target system

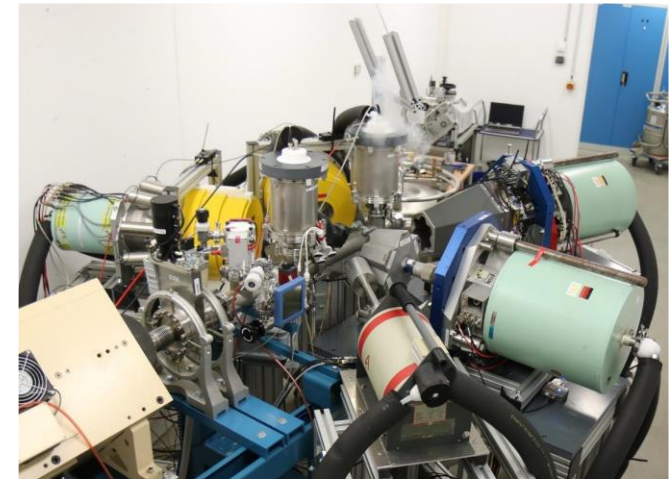
- wall jet and/or windowless extended gas target system (under construction)

→ see *JRA1 (WP3)*



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)

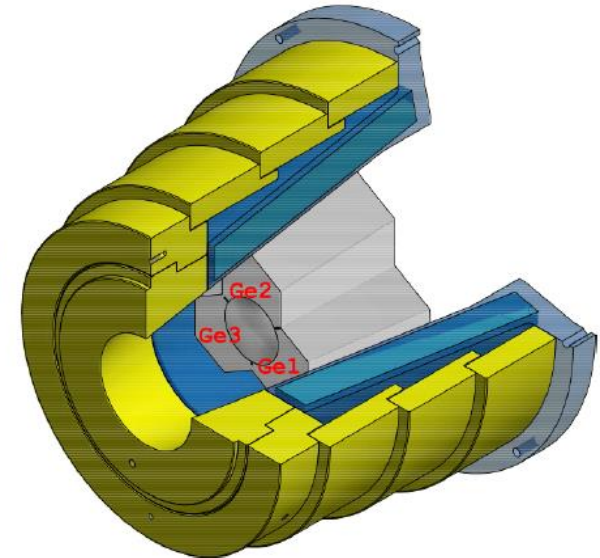
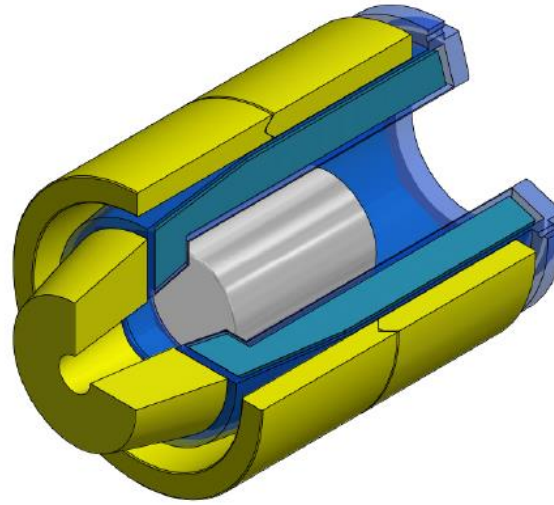
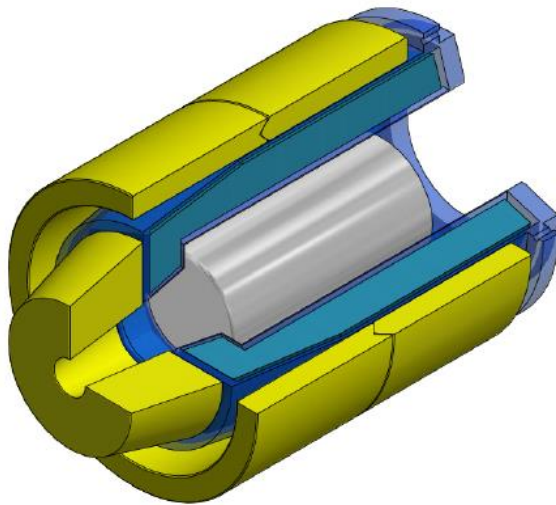


Figure taken from T. Szücs et al., Eur. Phys. J. A **55**, 174, 2019.

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

