Beitrag ID: **45** Typ: **Invited Talk**

PRIOR-II –The first proton and heavy-ion particle radiography facility for probing ultra-fast ns-scale HED physics and beyond

Freitag, 30. Januar 2026 10:30 (30 Minuten)

Magnetic lens-based proton radiography is a unique and powerful diagnostics technique capable of resolving ultra-fast processes on the ns-scale in dense matter with unprecedented micrometer spatial resolution. Recently, the PRIOR-II proton radiography facility has been designed, constructed and commissioned at the GSI Helmholtz Centre for Heavy Ion Research, pushing the technical boundaries of charged particle radiography with normal conducting magnets to the limits [1]. It is specifically designed for imaging ultra-fast processes in dense matter with up to 4.5 GeV protons from the SIS-18 synchrotron, its primary use case is the diagnostics of ultra-fast shock-wave experiments for HED fundamental physics applications or materials science.
PRIOR-II has the unique capability of imaging using heavier ions (tested with up to 975MeV/u 12C6+ and up to 1.5GeV/u 14N7+) which led to improvements of the underlying scattering theory used for radiographic density reconstruction. Furthermore, experiments can benefit from heavy ions due to an increased areal density contrast compared to proton imaging.
The PRIOR-II facility is currently undergoing a transition to enable HE driven HED physics and material science experiments on shock compressed matter at extreme densities above 100 GPa and to serve as a new user facility to the HED community. With the certification of key components completed, efforts are focusing on developing HE-driven planar shockwave generators to enable the first set of experiments in early 2027. These experiments will study shock compaction as an approach to large-scale,
high-pressure material synthesis, as well as planetary defense applications. The facility is also suited for characterizing new functional materials for use as first contact barriers in magnetic confinement fusion reactors, as well as for EOS measurements of
inhomogeneous and porous matter under extreme conditions.

[1] M. Schanz, D. Varentsov, et. al.; Design and commissioning of the PRIOR-II "proton microscope for FAIR". Rev. Sci. Instrum. 1 December 2024; 95 (12): 123704. https://doi.org/10.1063/5.0220086

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Sitzung Einordnung: Session 12 - Warm Dense Matter