

Experimental facilities for High-Energy Density and Warm Dense Matter Experiments at FAIR

Monday, 27 January 2020 11:50 (30 minutes)

At the site of the Gesellschaft fuer Schwerionenforschung (GSI) in Darmstadt, the Facility for Antiproton and Ion Research (FAIR) is currently under construction. FAIR will offer unique high-intensity heavy ion beams and high-intensity proton beams for experiments covering many fields of research, including the study of high-energy density samples and the study of warm dense matter.

The research in this field is coordinated by the High Energy Density Science at FAIR (HED@FAIR) collaboration, which will focus on four main fields of study:

- 1) The study of the properties of materials driven to extreme conditions of pressure and temperature;
- 2) The study of shocked matter and of equations-of-state;
- 3) The study of basic properties of strongly-coupled plasma and warm dense matter; and
- 4) Nuclear photonics, including the excitation of nuclear processes in plasmas and laser-driven particle acceleration and neutron production.

The SIS-100 heavy ion synchrotron at FAIR will provide heavy ion beams with up to $5 \cdot 10^{11}$ U^{28+} ions with 2 AGeV in a 50 ns bunch for plasma physics experiments where they will be used either to isochorically heat macroscopic samples to eV temperatures or to indirectly compress them to megabar pressures. In addition, SIS-100 will also high-energy protons (up to 10 GeV with up to $2.5 \cdot 10^{13}$ protons per bunch) which will be used for a proton microscope.

Before the start of FAIR, experiments will use the upgraded UNILAC and SIS-18 accelerators at GSI ("Phase 0"). In my presentation I will give an overview of the experimental facilities that will be available for HED experiments at FAIR as well as at GSI in Phase 0, the current status and the timeline for the construction and commissioning of the experimental setup.

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Session Classification: HED and HED Facilities II