STATUS OF HIGH ENERGY DENSITY PHYSICS AT GSI

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Knowledge of basic physical properties of matter under extreme conditions of high energy density such as equation-of-state, static and dynamic electrical conductivity, stopping power and opacity is of fundamental importance for various branches of basic and applied physics. Intense beams of energetic heavy ions provide a unique capability for the HEDP research compared to traditional drivers. Using intense ion beams, one can heat macroscopic volumes of matter fairly uniformly and generate this way high-density and high-entropy states. This new approach permits to explore fascinating areas of the phase diagram that are difficult to access by other means.

In this report we discuss various physics and technical issues of the high-energy-density physics (HEDP) research with intense heavy ion and laser beams that is being performed at GSI, as well as that is to be carried out at the future Facility for Antiproton and Ion Research (FAIR) in Darmstadt. The main highlights of plasma physics and HEDP research at GSI in 2008 as well as scientific plans for 2009 are addressed.