

## Editorial

Intense heavy ion beams and lasers and pulsed power devices are the research tools, which are most commonly used to achieve high energy density states in matter. This report covers the progress of the field in 2003. Since over 20 years the international community of high energy density physics takes the opportunity to meet very early in the year in the Austrian alpine village of Hirschegg to discuss the results and the progress. The emphasis of this meeting has shifted from inertial fusion and inertial fusion driver issues to basic physics problems of high energy density matter. This transition is also reflected and documented in the annual issues of this report. Lasers now play a key role in the generation and diagnostic of warm dense matter and high energy density states. Laser plasmas from ultra intense laser radiation has also turned out to be a powerful source of intense particle beams from electrons to protons and even heavy ions. The new PHELIX laser system is also intended to be a tool to study the properties of intense laser plasma generated particle beams. The laser program at GSI has reached a couple of milestones last year, since all the components of the LLNL Nova laser which were shipped to GSI were integrated into the system, and the commissioning of the 2-pass main amplifier was started. Moreover a first experiment was successfully carried out. In this experiment a transient, collisionally excited x-ray laser in Ni-like zirconium was demonstrated at a wavelength of 22 nm.

For many years GSI was the only accelerator laboratory in Germany that was engaged in plasma physics and high energy density physics. Meanwhile DESY at Hamburg, with the VUV-FEL user facility also entered this field. The high intensity short wavelength radiation of this facility is able to generate small samples of matter and to achieve high matter temperature and extreme pressure on a very short time scale. Thus intense heavy ion beams and intense short wavelength photons are excellent tools for high energy density physics and they complement each other. The VUV-FEL facility is described in one contribution of this report. The community is ready to use heavy ion beams, laser beams and the VUV-FEL for their research projects and the whole field will certainly benefit from the diversity of intense radiation sources that are available.

The future accelerator facilities project at GSI, which is now called FAIR (**F**acility for **A**ntiproton and **I**on **R**esearch), also was a focus point for the activities in 2003. In October a workshop was held at GSI to discuss the future physics program at FAIR, and a large scientific community demonstrated their interest in high energy density physics with the intense heavy ion beams provided by the new accelerator facility. The plasma physics contribution to this workshop is summarized in a short chapter with three contributions.

GSI is charged to keep in touch with the development of inertial fusion activities worldwide. In the framework of these activities GSI scientists participated in the Inertial Fusion Science and Applications conference held 2003 in Monterey and they send a representative to participate in the IAEA coordinated research program on elements of power plant design for inertial fusion in Vienna.

I want to thank all colleagues for submitting their contributions, which gives us the opportunity to demonstrate the widespread interest in this research field.