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Editorial from the Editor-in-Chief

Ion and Laser Beams as tools for High Energy Density Physics

Last year (2008) our journal, *Laser and Particle Beams*, experienced a significantly enhanced submission rate. Since at the moment, we reached the limit for the total number of printed pages per year, this means that the selection process for *Laser and Particle Beams* articles is quite severe. We published 65 articles in 2008. This amounts to an average article size of roughly 10 printed pages. However, for those articles accepted, we did not restrict the number of pages per article. It is still the policy of the editorial board to give authors sufficient space to describe their results in detail and put their own research work in perspective to the scientific environment that is covered by this journal. We have introduced a short notice section and a section for invited review papers. Authors are encouraged to make use of these new possibilities provided by the journal.

The majority of articles in our journal are devoted to interaction processes of intense laser beams with matter and the application resulting from it. This was also the case last year (Bagchi *et al.*, 2008; Chen *et al.*, 2008; Deutsch *et al.*, 2008; Flippo *et al.*, 2007; Ghoranneviss *et al.*, 2008; Gupta & Suk, 2007; Hora, 2007; Hora & Hoffmann, 2008; Kasperczuk *et al.*, 2008; Nakamura *et al.*, 2008; Nickles *et al.*, 2007; Ostermeyer *et al.*, 2008; Tartar *et al.*, 2008; Varro & Farkas, 2008). The development of sophisticated targets exactly tailored to the needs of experiments is a key issue for the success in the field. For many years, *Laser and Particle Beams* has followed this development and encouraged publication of new target developments (Aleksandrova *et al.*, 2008; Cook *et al.*, 2008; Kasperczuk *et al.*, 2007; Temporal *et al.*, 2003). However, intense particle beams of high energy electrons, protons and heavy ions from laser produced plasma as well as from accelerators and pulsed power machines tend to become an interesting tool in high energy density physics, as well as for inertial fusion applications (Malik *et al.*, 2008; Tahir, K. *et al.*, 2008; Tahir, W. *et al.*, 2008; Evans, 2008; Liu,Y. *et al.*, 2007; Liu, Z. *et al.*, 2007). Here I want to direct the attention of our readers and authors toward the possibilities available with intense heavy ion beams.

Heavy ion beams are characterized by an extremely high and efficient specific energy deposition in a well defined volume of matter. This property distinguishes heavy ion beams from all other kinds of radiation. Short and intense pulses are therefore well suited to isochorically heat matter at solid density. Thus dense, strongly correlated plasmas are induced, where interaction phenomena dominate thermal processes. Dense plasmas are interesting research objects for basic research, since most of the visible matter in the universe is ionized matter up to extreme densities. Properties of matter under extreme conditions, the hydrodynamic behavior, and transport phenomena are of interest to astrophysics, to model the development of stars and to describe stellar atmospheres. Within plasma physics and in some areas of material science, there is a growing interest to investigate properties of dense plasmas theoretically and experimentally as well. Most of the investigations address properties of matter under extreme conditions of energy density, and phase transitions in hot dense matter at very high pressure. Characteristic properties like critical temperature, critical pressure, and the detailed properties of the phase diagram in the regime of extreme pressure above some Mbar are known only for very few substances. Only since very recently, particle beams of heavy ions open a new path to address these questions in combination with high power lasers and novel diagnostic tools.

Interaction processes of radiation with matter constitute a classical research topic of nuclear physics. Heavy ion interaction experiments with ionized matter have added a completely new aspect to this field, addressing interaction processes with ionized matter.

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