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## Guest Editor's Preface: Workshop on Fast High Density Plasma Blocks Driven By Picosecond Terawatt Lasers

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This issue of *Laser and Particle Beams* includes papers presented at the Workshop on “Fast High Density Plasma Blocks Driven by Picosecond Terawatt Lasers” held at the University of Western Sydney, Campbelltown Campus, Australia from 1–4 December 2004.

The main motivation for this international workshop was to bring together scientists and engineers in the fields of inertial fusion sciences, high-energy-density physics, inertial fusion energy (IFE), and other related research and applications.

The joint specialists from the USA, China, Poland, Germany, and Australia was to focus within a comparably small group on a very narrow defined topic (to distinguish from other meetings, e.g., Schilling, 2003; Desai, 2003; Honrubia & Tikhonchuk, 2004; Batani & Wooton, 2004; Giulietti, 2004), in order to provide an intensive exchange of information about very unusual results on intense picosecond laser-plasma interaction differing drastically from the usual main stream of observations.

It was a special advantage that the specific results of the main stream were presented by high caliber experts as E. Mike Campbell (Senior Vice President of General Atomics, San Diego, CA, USA), Scott Wilks (Lawrence Livermore National Laboratory, Livermore CA, USA), Dieter H.H. Hoffmann (Head of the Plasma Division of the GSI and Chair of Nuclear Physics, Technical University Darmstadt, Germany), and others, showing their rich information about the general achievements and to exchange the views with experts involved with the unusual observations. These were pioneered by the measurements of Jan Badziak (Institute of Plasma Physics and Laser Microfusion, Warsaw, Poland) in combination with unique measurements at the Institute of Physics of the Chinese Academy of Science in Beijing, and the leadership of Jie Zhang who only could send representatives to explain the work there.

These unusual phenomena were first understood theoretically on the basis of the many years of work in Australia (Heinrich Hora, University of New South Wales, Sydney) and associates including the team working numerically in the group of plasma physics at the University of Western Sydney, School of Quantitative methods and Mathematical

Science. The high laser intensity interaction process avoids the usually happening relativistic self-focusing and is understood as a skin layer acceleration of plasma blocks by the nonlinear (ponderomotive) force. The favor of a most fruitful cooperation between the Australian group together with connected teams in Warsaw, Prague, and Beijing, Mianyang and associated centers led to a clarification of several experimental, numerical, and theoretical facts about the block generation. It was then most important that leading experts about the usual relativistic interaction processes and generation of intense proton beams discussed the details of the mechanisms and their differences.

It was an opportunity also to receive overviews of large-scale facilities for this research in the USA, Europe, and China, and about the latest results on laser fusion energy generation. The different acceleration processes induced the study of related applications and general aspects how the processes in double layers and Debye sheaths can be generalized to metal physics and even to a new model of nuclear forces and quark-gluon plasmas.

The international workshop provided some excellent outcomes and results, which can be used for further collaboration in IFE research and applications. Participative and encouraging discussion sessions were very fruitful. A series of meetings on the subjects are expected to follow to help spark Fusion research in Australia and be a support group mechanism for some large IFE research laboratories around the world.

I would like to thank the workshop co-organizers and all my specialized colleagues and friends from all the parts of world for making the time to come to Australia. I would like to thank the University of Western Sydney and the Australian Institute of Physics in supporting this workshop. I would also like to thank the friendly catering staff that provided excellent hospitality for the duration of the workshop.

I would also like to thank Prof. Dieter Hoffmann, the Editor-in-Chief of the *Laser and Particle Beams*, for giving us the opportunity to publish the contributions to the Workshop in this Special Issue. Finally, we appreciate the contributions of all authors and referees to this Issue.

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