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Fast Proton Diagnostic in Inerzial Fusion experiments

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A new era of plasma science started with the first experiments on the National Ignition Facility (NIF) in the US and will be soon followed by the Laser Mégajoule (LMJ) in France.
Such facilities, whose one of the objectives is to reach the ignition by imploding deuterium-tritium targets using high-energy laser beams, will provide a unique tool not only for ICF physics but also for basic science fields such as astrophysics, planetary & stellar science, nuclear & physics.
A petawatt short pulse laser will be added to the ns pulse beams of the LMJ. This is the PETAL system (PETawatt Aquitaine Laser), under construction on the LMJ site near Bordeaux (France), with the ultimate goal of reaching 7 PW (3.5 kJ with 0.5 ps pulses). In a first phase (beginning in 2015) PETAL will provide 1 kJ in 1 ps and will be coupled to the first four LMJ Quads. Once in operation, LMJ & PETAL will form a unique facility in Europe for High Energy Density Physics (HEDP).
PETAL is aiming at providing secondary sources of particles and radiation to diagnose high energy density plasmas generated by the LMJ beams..
The Petal+ project is a dedicated one to design and to provide diagnostics dedicated to experiments with PETAL laser beam.
Within this project, three types of diagnostics are planned: a proton spectrometer, an electron spectrometer & a large-range X-ray spectrometer. Because of the particular characteristics of the PETAL beam, large dynamical ranges have to be covered by these diagnostics. The goal of these diagnostics will be to assess the characteristics of the secondary sources produced with PETAL, as well as the performance of PETAL itself. Further diagnostics will be installed in the future on the LMJ/PETAL facility to allow HEDP experiments.
During the presentation to the conference, the PETAL & Petal+ projects will be presented in detail, in particular the first three diagnostics planned for 2015.

Signatories':

Serena Bastiani1), Dimitri Batani2), Nathalie Blanchot3), Erik Brambrink1), Alexis Casner3), Tiberio Ceccotti4), Sandrine Dobosz-Dufresnoy4), Jean-Eric Ducret5,2), Alain Duval3), Julien Fuchs1), Franck Gobet6), Sébastien Hulin2), Michel Koenig1), Isabelle Lantuejoul-Thfoin3), Jean-Raphaël Marquès1), Jean-Luc Miquel3), Charles Reverdin3), Laurent Sérani6), Mehdi Tarisien6), René Wrobel3).

1) LULI, É. Polytechnique, CNRS, CEA, UPMC, F-91128 Palaiseau Cedex, France
2) CELIA, CEA, CNRS,U. Bordeaux 1, 351, cours de la Libération, F-33405 Talence, France
3) CEA/DAM/DIF, F-91297 Arpajon, France
4) IRAMIS/SPAM, CEA-Saclay, F-91191 Gif sur Yvette, France
5) IRFU/SAp, CEA-Saclay, F-91191 Gif sur Yvette, France
6) CENBG, CNRS/IN2P3, ch. du Solarium, F-33175 Gradignan, France

Presenter: Dr DUCRET, Jean-Éric (IRFU/Service d'Astrophysique & CELIA)

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