25e Congrès Général
de la Société Française
de Physique

Contribution ID: **225** Type: **Orale**

Well-controlled near-critical plasmas from supersonic gas jets for enhanced ion acceleration by ultra-intense laser interaction

Wednesday, 10 July 2019 15:15 (25 minutes)

Efficient electron heating and enhanced ion acceleration by ultra-intense laser interaction with well-controlled near-critical plasmas were predicted numerically but remained relatively unexplored owing to the difficulty of creating such type of targets. We studied this regime on the CLPU VEGA-2 200TW laser facility (6J, 30fs, at 10^21W/cm2) with state-of-the-art pressure-boosted supersonic gas jets from CELIA.
The interest in compact high-repetition rate ion sources with high energy-density at ultra-low emittance stems from many potential applications, including proton radiography, time-resolved probing of ultrafast laser-induced phenomena, fast ignition, nuclear physics and medical applications. Most of these applications require a particle flux which may greatly surpass those attained on standard radio-frequency accelerators.
Our gas jets issue from novel shock nozzles with carefully adapted spatial density profiles that have a high temporal ms-scale stability. Employing different gases, namely N2, He and mixtures of both, the resulting jets are characterized by a maximum free electron density of ≈10^21/cc after laser-induced ionization.
Such experimental conditions may be prone to driving collisionless electrostatic shocks with PW-level ultra-short laser pulses. We will show first preliminary results already obtained at the 200TW level, regarding the accelerated species detected on radiochromic films, CR-39 and a pair of PIN-diodes.

Choix de session parallèle

4.1 Plasmas et accélérateurs: état de l'art et machines du futur 1

Primary author: Mrs OSPINA, Valeria (1) Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France 2) CEA-DAM/DIF, CEA/DAM Île-de-France, Arpajon, France 3) C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain)

Co-authors: EHRET, Michael (IKP TU-Darmstadt // CELIA U-Bordeaux); Mr SALGADO, Carlos (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr PEREZ-HERNÁNDEZ, J.A. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mrs HUAULT, Marine (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr DE MARCO, Massimo (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr APIÑANIZ, Jon (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); HANNACHI, Fazia (CENBG, CNRS-IN2P3, Université de Bordeaux, Gradignan, France); DE LUIS, D. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr HERNÁNDEZ TORO, J. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mrs MÉNDEZ, C. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr PISONERO, J.D. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr VARELA, O. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr DEBAYLE, A. (CEA--DAM/DIF, CEA/DAM Île-de-France, Arpajon, France); Mr D'HUMIÈRES, Emmanuel (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr GREMILLET, L. (CEA-DAM/DIF, CEA/DAM Île-de-France, Arpajon, France); NGUYEN-BUI , T.-H. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr OLIVIER, E. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr

REVET, G. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr BRABETZ, Christian (Plasma Physik/PHELIX, GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany); CARON, J. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr CECCOTTI, T. (CEA/IRAMIS, SPAM, Gif-sur-Yvette, France); Mr NUTER, R. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr RAFFESTIN, Didier (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France); Mr ROTH, Markus (Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, Germany); Mr VAISSEAU, Xavier (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr GATTI, G. (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr VOLPE, Luca (C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain); Mr SANTOS, J.J. (Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France)

Presenter: Mrs OSPINA, Valeria (1) Université de Bordeaux, CNRS, CEA, CELIA (Centre Lasers Intenses et Applications), UMR 5107, Talence, France 2) CEA-DAM/DIF, CEA/DAM Île-de-France, Arpajon, France 3) C.L.P.U. (Centro de Láseres Pulsados), Salamanca, Spain)

Session Classification: Séance Parallèle