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A 会場 ：11/4　PM1 （13:45-15:30）
14:55〜15:10

高強度レーザー駆動多種イオンプラズマ中の無衝突静電衝撃波によるイオン加速

#坂和　洋一 [1],Ishihara Hiroki[1],Kuramoto Otono[1],Matsumoto Yusiro[1],Egashira Syunsuke[1],Ota Masato[1],Pikuz Tatiana[1],Ninami Takumi[1],Sakai Kentaro[1],Kuramitsu Yasuhiro[1],Morace Alessio[1],Abe Yuki[1],Arikawa Yasunobu[1],Fujioka Shinsuke[1],Sano Takayoshi[1],Kumar Rajesh[1],Morita Taichi[2],Kanasaki Masato[3],Fukuda Yuji[4],Ohira Yutaka[5],Dohl Leonard[6],Woolsey Nigel[6],Ryazantsev Sergey[7]
([1] 大阪大学,([2] 九州大学,([3] 神戸大学,([4] 関西光科学研究所,([5] 東京大学,([6]York Univ UK,([7]Russian Academy of Sciences

High-intensity laser driven ion acceleration by collisionless electrostatic shock in a multicomponent ion plasma

#Youichi Sakawa[1], Hiroki Ishihara[1], Otono Kuramoto[1], Yusiro Matsumoto[1], Syunsuke Egashira[1], Masato Ota[1], Tatiana Pikuz[1], Takumi Ninami[1], Kentaro Sakai[1], Yasuhiro Kuramitsu[1], Alessio Morace[1], Yuki Abe[1], Yasunobu Arikawa[1], Shinsuke Fujioka[1], Takayoshi Sano[1], Rajesh Kumar[1], Taichi Morita[2], Masato Kanasaki[3], Yuji Fukuda[4], Yutaka Ohira[5], Leonard Dohl[6], Nigel Woolsey[6], Sergey Ryazantsev[7]
([1]Osaka Univ,([2]Kyushu Univ,([3]Kobe Univ,([4]Kansai Photon Science Institute,([5]Univ Tokyo,([6]York Univ UK,([7]Russian Academy of Sciences

Shock waves observed in astrophysical systems, for example, supernova remnant shock and the bow shock of the earth, are shocks in collisionless plasmas. Such collisionless shocks are the most promising candidate for the generation mechanism of cosmic-rays. The interaction between the electric and magnetic fields, generated by the collective phenomenon of plasma, and charged particles is important for the generation of collisionless shocks. By using a high-intensity laser, an acceleration mechanism called ion acceleration by a laser-driven collisionless electrostatic shock is drawing attention [1-4]. In the collisionless electrostatic shock ion-acceleration (CESA), upstream ions of the shock are reflected by the shock potential and accelerated.

The CESA experiments are performed with high-intensity LFEX laser beams (pulse width = 1.5 ps, energy〜300 J, laser intensity 〜(3-6)x10^{19} W/cm^2, and normalized laser intensity a_0〜2) at the Institute of Laser Engineering, Osaka University. In order to generate an initial plasma with a near-critical density and a long scale-length on the rear-side of the drive-laser irradiated target, which is suitable for CESA [2-4], the rear surface of the target is irradiated with an ionization laser at 2.5 ps before the drive laser. As the ionization laser, one of the Gekko XII laser beams (pulse width = 1.3 ps, energy〜3 J, laser intensity〜3x10^{11} W/cm^2) is focused on the back surface of the target (a thin foil of C_8H_7Cl with a thickness of 1 μm). Thomson parabola spectrometer (TPS) and electron spectrometer (ESM), located on the rear-side of the target, are used to measure ion and electron spectrum, respectively. We observed clear evidences for the proton acceleration by the collisionless electrostatic shock.

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