



Contribution ID: 32

Type: talk

Ion accelerations via the interaction of intense laser pulses with cluster targets

Monday, September 14, 2015 4:00 PM (25 minutes)

In order to understand the synergetic interplay between the Coulomb explosion of clusters and the background gas dynamics, an energy spectrum of carbon/oxygen ions from the CO₂ clusters and that of protons from the background hydrogen gas are measured separately at 1×10^{19} W/cm² with a careful analysis of etch pit structures on CR-39. The maximum energies of carbon/oxygen ions and protons are determined as 1.1 MeV/u and 1.6 MeV, respectively. The structure of electric field and dynamics of contact surface due to the interaction between cluster and background gas are analyzed with help from 2D-PIC simulations. The phenomenon is suggested to have a similarity to a structure formation process in Supernova remnants.

Moreover, we present a development of submicron-size hydrogen cluster targets using a cryogenic conical nozzle and their characterization with the Mie scattering method. Above 10^{22} W/cm², achievable soon with the coming PW laser facilities, the anisotropic Coulomb explosion of submicron-size hydrogen clusters could produce directional proton beams with energies of several tens of MeV, quite advantageous to the future applications, since they are inherently impurity-free, high rep.rate, and robust.

Primary author: Dr FUKUDA, Yuji (Japan Atomic Energy Agency)

Co-authors: Mr ALONSO, Aaron (Queen's University Belfast); Dr PIROZHKOV, Alexander (Japan Atomic Energy Institute); Prof. FAENOV, Anatoly (Osaka University); Mr SMYTH, Ashley (Queen's University Belfast); Mrs SCULLION, Clare (Queen's University Belfast); Dr DORIA, Domenico (Queen's University of Belfast); Dr KIRIYAMA, Hiromitsu (Japan Atomic Energy Agency); Dr SAKAKI, Hironao (Japan Atomic Energy Agency); Prof. ODA, Keiji (Kobe University); Dr KONDO, Kiminori (Japan Atomic Energy Agency); Dr NISHIUCHI, Mamiko (Japan Atomic Energy Agency); Prof. BORGHESI, Marco (Queen's University Belfast); Dr KANDO, Masaki (Japan Atomic Energy Agency); Dr KANASAKI, Masato (Japan Atomic Energy Agency); Mr MATSUI, Ryutaro (Kyoto University); Dr JINNO, Satoshi (The University of Tokyo); Dr PIKUZ, Tatiana (Osaka University); Prof. YAMAUCHI, Tomoya (Kobe University); Prof. KISHIMOTO, Yasuaki (Kyoto University)

Presenter: Dr FUKUDA, Yuji (Japan Atomic Energy Agency)

Session Classification: WG2 - Ion beams from plasmas

Track Classification: WG2 - Ion beams from plasmas