Contribution ID: **91** Type: **Posters**

Calibration of Image Plate response to energetic Carbon ions

Tuesday, 29 November 2011 14:32 (1 minute)

A wide range of detectors has been developed to reveal the different existing types of radiation. Among those detectors, scintillators are a broadly used option. The Image Plate (IP) is a type of scintillator and is made of phosphors with phosphorescent properties which can release the store energy in a long-lasting de-excitation (typically few hours). The energy stored in the IP can be retrieved by stimulating the excited metastable state. The stimulation can be done by photons, and then the energy is released as light and called photo-stimulated luminescence (PSL). The PSL signal emitted during the reading of the IP is proportional to the energy stored in the IP active medium. The IP has a high sensitivity to the stimulating radiation and the response to the signal is very well linear in all the dynamic range that is about five orders of magnitude.
The response of the IP detector type BAS-TR to protons has been reported in earlier works[1,2]. We present here results providing the calibration of the IP response to high energy Carbon ions. The experiment was performed at the Rutherford Appleton Laboratory (RAL), using the Vulcan laser that operates in the infrared range and can deliver onto the target an intensity of the order of 10^20 W/cm2. Such an intense laser pulse can generate, by the well-known TNSA mechanism[3], protons and ion beams from hydrocarbons and water vapour impurities usually present on the target surface. In particular, we were able to generate carbon ions in a broad energy range useful for calibration purposes (i.e. up to 40 MeV Carbon ion). In order to obtain the calibration of the IP for Carbon ions of different energies, a Thomson Parabola is used to disperse the ion beam onto the CR39 and IP. A system make of a slotted CR39 placed on the IP was used as detector so that carbon ions having reasonably close energies can be recorded at the same time around the edges of the slots, both on the CR39 and IP. The PSL signal from the IP and the pits number on the CR39 were compared at a given ion energy, giving a calibration curve as the ratio of those two values, PSL/Carbon. The IP showed the ability to detect even a single carbon ion in the range investigated, ranging from 0.5 to about 3.3 MeV/nucleon.

[1] A. Mančić et al., RSI 79, 073301 (2008)
[2] H. Chen et al., RSI 79, 033301 (2008)
[3] S. Wilks et al, Phys. Plasmas, 8, 542 (2001)

Primary author: Dr DORIA, Domenico (Queens University of Belfast, Belfast, UK)

Co-authors: RAMAKRISHNA, B (Queens University of Belfast, Belfast, UK); SARRI, G (Queens University of Belfast, Belfast, UK); OSTERHOLZ, J (Institute of Laser and Plasmaphysics, Heinrich-Heine-University Düsseldorf, Germany); KAKOLEE, K (Queens University of Belfast, Belfast, UK); BORGHESI, M (Queens University of Belfast, Belfast, UK); CERCHEZ, M (Institute of Laser and Plasmaphysics, Heinrich-Heine-University Düsseldorf, Germany); WILLI, O (Institute of Laser and Plasmaphysics, Heinrich-Heine-University Düsseldorf, Germany); MCKENNA, P (SUPA, Department of Physics, University of Strathclyde, Glasgow, UK); Dr KAR, S (Queens University of Belfast, Belfast, UK); YUAN, X (SUPA, Department of Physics, University of Strathclyde, Glasgow, UK)

Presenter: Dr DORIA, Domenico (Queens University of Belfast, Belfast, UK)

Session Classification: Poster Session: presentation of posters