Plasma Diagnostics

An Active Multi-Channel Ion Beam Profiler for Laser-Driven Ion Beams

An optical imaging system for an ion beam profiler was designed and successfully tested in an experiment at Vulcan Petawatt. Several different optical components were tested as well as different designs for the optical setup to maximise the resolution. The spatial resolution that can be achieved by the optical system itself was ~ 4 lp/mm. Several scintillator stack designs were used throughout the experiment for comparisons of brightness and resolution. It was found that, out of commonly used plastic scintillators, EJ 260 was the brightest, yet it was still an order of magnitude dimmer than Gadox-based phosphor screens, viz. the Lanex screen and P43 screens. The response of the P43 screen was calibrated against radiochromic film (RCF), giving a conversion factor of ~ 170 counts/Gy.

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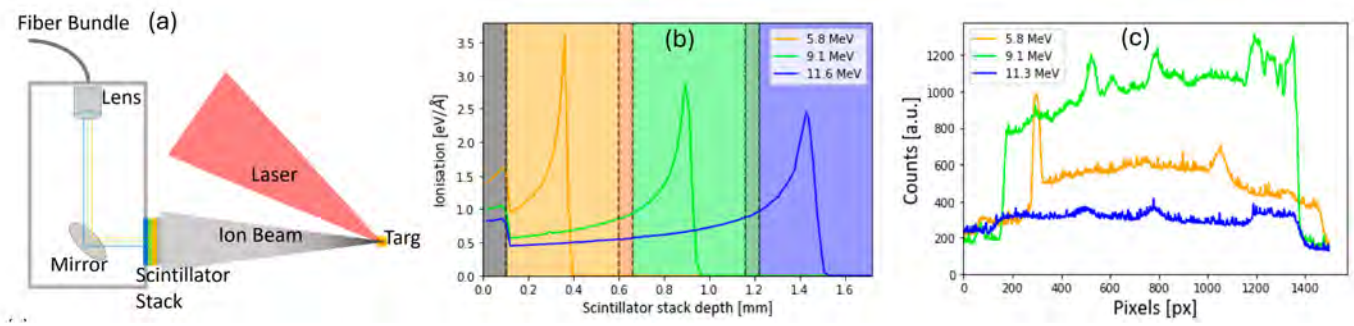

(a) The setup of the ion beam profiler inside the vacuum chamber; the image was transported away from the interaction region using a fibre bundle. (b) The Bragg peak in each layer of the scintillators stack deployed in the experiment. (c) A comparison of the brightness of light output from the scintillators.