Contribution ID: **109** Type: **talk**

Time resolved X-ray absorption measurements of high energy density matter using broadband X-rays from an electron beam

Tuesday, 26 September 2017 16:15 (15 minutes)

Measuring accurate and detailed information from energetic and dense plasmas, like those present in the core of large planets or inertial confinement fusion targets for example, presents a significant challenge. Within the laboratory frame, many of the key processes that govern these states occur over rapid time scales (femtoseconds or less), and due to the dense nature of such samples, many common diagnostics that rely on optical probing are inadequate. Here we present a new experimental technique that should provide a wealth of information about dense plasmas, on a truly ultrafast timescale. The X-rays generated by the betatron oscillations of a laser wakefield driven electron beam form a perfect probe beam. Not only does the pulse duration (10's of femtoseconds) provide a snapshot of the conditions present and that the brightness and photon energy (Ecritical = 25 keV) available can penetrate relatively large samples, but the smooth broadband spectral nature of these pulses make them ideal for performing single-shot X-ray absorption measurements near resonance edges, and ionisation states. This can provide direct information on the electron temperature and density, local structure, ionisation rate, and other more involved mechanisms such as ionisation potential depression.

Primary author: Dr KETTLE, Brendan (Imperial College London)

Co-authors: Mr WATT, Robbie (Imperial College London); Dr BAGGOTT, Rory (Imperial College London); Prof. ROSE, Steven (Imperial College London); Dr MANGLES, Stuart (Imperial College London)

Presenter: Dr KETTLE, Brendan (Imperial College London)

Session Classification: WG4_Parallel

Track Classification: WG4 - Applications of Compact and High-Gradient Accelerators