Contribution ID: **230** Type: **talk**

High Flux X-ray Emission from a Large Radius Electron Bunch that was Injected after Significant Pulse Compression in a Laser Wakefield Accelerator

Thursday, September 19, 2019 6:00 PM (20 minutes)

A Laser Wakefield Accelerator producing two distinct electron populations: a 2 GeV component that was self-injected early in the interaction, and a sub-GeV component injected close to the laser depletion length, was shown to be an intense source of betatron x-rays. The x-rays were predominantly generated by the sub-GeV bunch.
Simultaneous measurements of the electron and x-ray spectra demonstrated that the larger oscillation radius of the sub-GeV beam was the main driver of the increased flux of emitted radiation, while the lower energy gain ensured moderate photon energies of 10-20 keV.
As many as 5×10^{10} x-ray photons with energies > 1 keV were recorded per laser shot, which has led to a significant improvement in the signal to noise ratio of betatron radiography images.
3D particle-in-cell simulations demonstrate that the first bunch was injected after the initially oversized laser spot underwent rapid self-focussing to the matched spot size. Continuous temporal compression and power amplification of the drive pulse in the wakefield increased the width and length of the wakefield bubble through increased a_0, leading to the injection of a second electron bunch with higher transverse momentum.

Primary authors: WOOD, Jonathan (Imperial College London); PODER, Kristjan (DESY); Dr LOPES, Nelson (Instituto Superior Técnico); COLE, Jason (Imperial College London); Dr ALATABI, Saleh (Imperial College London); Dr FOSTER, Peta (STFC Rutherford Appleton Laboratory); KAMPERIDIS, CHRISTOS (ELI-ALPS, HU); KONONENKO, Lena (Ecole Polytechnique); MANGLES, Stuart (Imperial College London); PALMER, Charlotte (Lancaster University/Cockcroft Institute); Dr RUSBY, Dean (STFC Rutherford Appleton Laboratory); SARRI, Gianluca (Queen's University Belfast); Dr STREETER, Matthew (Imperial College London); SYMES, Daniel (Rutherford Appleton Laboratory); WARWICK, J (Queen's University Belfast); NAJMUDIN, Zulfikar (Imperial College London)

Presenter: WOOD, Jonathan (Imperial College London)

Session Classification: WG4-WG6

Track Classification: WG4-WG6 Joint Session