Contribution ID: **99** Type: **talk**

Propagation of trains of laser pulses in pre-formed plasma channels

Tuesday, September 26, 2017 6:40 PM (20 minutes)

It has now been shown experimentally that electrons can be accelerated to 4-GeV energies in a plasma wakefield driven by a single high-intensity laser pulse. However, such laser systems have limited repetition rates and low wall-plug efficiency. An alternative method is to resonantly excite plasma oscillations using a train of laser pulses of lower intensity spaced by the plasma period to drive multi-pulse laser wakefield accelerators (MP-LWFAs). Fibre and thin-disc laser technologies offer the possibility to drive MP-LWFAs efficiently and at high repetition rate (tens of kHz), opening a new domain for applications including compact X-ray sources with high mean brightness.
MP-LWFA based accelerators would require propagation of trains of laser pulses over tens of centimetres in plasma channels. An attractive possibility is a plasma channel based on hydrodynamic expansion of plasma column formed by optical field ionization. Transverse plasma density gradients as well as a combination of pump photon deceleration and group velocity dispersion need to be taken into account designing MP-LWFA accelerators. We will present outcomes of our studies using the two-dimensional EPOCH PIC code.

Primary author: Prof. WALCZAK, Roman (University of Oxford)

Co-authors: Mr ARRAN, Christopher (University of Oxford); Mr CHAPPELL, James (University of Oxforfd); Dr HOLLOWAY, James (The University of Oxford); Dr CORNER, Laura (JAI, Oxford University); Mr SHALLOO, Robert (JAI, University of Oxford); Prof. HOOKER, Simon (University of Oxford)

Presenter: Prof. WALCZAK, Roman (University of Oxford)

Session Classification: WG5_Parallel

Track Classification: WG5 - High-Gradient Plasma Structures/Advanced Beam Diagnostics