John Adams Institute for Accelerator Science Lecture Series

Thursday 21st June 2012 at 2:30pm

Fisher Room, Denys Wilkinson Building

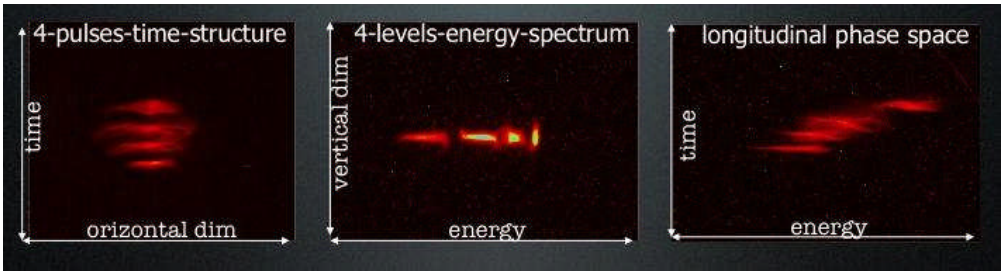
Advanced Accelerator Activities at SPARC_LAB

The lecture will be delivered by

Dr. Massimo Ferrario (INFN-LNF)

Abstract: A new facility named SPARC_LAB (Sources for Plasma Accelerators and Radiation Compton with Lasers and Beams) has been recently launched at the INFN National Labs in Frascati, merging the potentialities of the old projects SPARC and PLASMONX. The successful operation of the SPARC injector in the Velocity Bunching (VB) mode has opened in fact new perspectives to conduct advanced beam dynamics experiments with ultra-short electron pulses able to extend the THz spectrum or to drive the FEL in the SASE Single Spike mode. Moreover a new technique called Laser Comb, able to generate a train of short pulses with high repetition rate, has been recently tested in the VB configuration. Up to four electron beam pulses shorter than 300 fs and separated by less than 1 ps have been characterized. In addition the possibility to drive resonantly a plasma wake field accelerator using the comb structure has been also recently considered. Theoretical and numerical studies are under way in order to demonstrate the capability to produce a high brightness beam with this technique. Moreover the SPARC_LAB configuration allow to inject the plasma accelerated electron beam in a long undulator in order to test for the first time a high gain FEL driven by a plasma accelerator.

In this lecture we introduce from basic principles the main concepts of high brightness beam generation and manipulation using the beam envelope equation as a convenient mathematical tool. Matching conditions suitable to preserve the beam quality are derived from the model for significant beam dynamics regimes. An extension of the model to the plasma accelerator case is also introduced. The future perspectives at SPARC_LAB and at the recently proposed XFEL@SuperB project will be also discussed.



This lecture will be broadcast on webex. Details at:
http://www.adams-institute.ac.uk/lectures/?all=true&id=74
For further details contact Glenn Christian at g.christian1@physics.ox.ac.uk