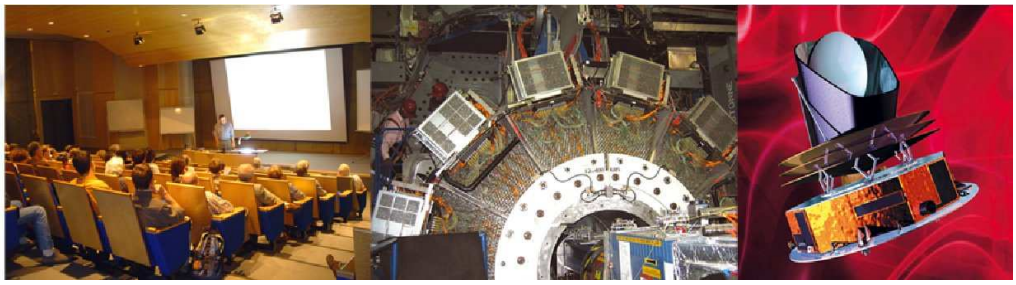
LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE



Séminaire du Laboratoire de l'Accélérateur Linéaire

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Mardi 23 Juin 2015 à 11 :00

Some problems of wakefield excitation and electron acceleration in plasma and dielectric cavities by drivers and by train of drivers

The results of numerical simulations and analytical investigations of wakefield excitation in plasma and in dielectric cavity by resonant or non-resonant or shaped train of relativistic electron bunches with large transformation ratio will be presented. The numerical simulations of self-consistent dynamics of train of 1, 32, 239, 318, 500, 1300 short or long electron bunches in plasma have been performed. Mechanism of wakefield saturation at its excitation by resonant train of relativistic electron bunches has been investigated. It has been shown that the maximal amplitude is realized, when bunch repetition frequency is a little smaller than electron plasma frequency $\omega_m < \omega_p e$. The mechanism of resonant wakefield excitation by non-resonant train of relativistic electron bunches has been simulated. The cases $\omega_m < \omega_p e$ and $\omega_m < \omega_p e$ are compared, resonance support is discussed, mechanisms of synchronization are investigated. The optimal short non-resonant train of dense bunches for chain of plasma bubbles excitation has been derived. Instability of cylindrical relativistic electron beam in plasma, beam-plasma instability for long shaped electron bunch, beam-plasma instability in case of large beam density have been 2d3v numerically simulated. The conditions of homogeneous and identical focusing of train of relativistic electron bunches in plasma or ideal plasma lens have been derived for long and for short bunches. The large transformation ratio in the case of wakefield excitation in plasma has been obtained for the cases :
- shaped train of electron bunches with linear growth of charge ;
-nonlinear wakefield excitation ;
-by train of bunches with shaped charge according to linear law with precursor ;
- by infinite train of shaped bunches-drivers and bunches-witness acceleration ;
- ramping of train charge according cosine ;
- by ion beam ;
-by laser pulse with ramping of its intensity according to cosine ;
-at wakefield excitation in dielectric cavity by shaped train of electron bunches with linear growth of current ; at charge shaping of stepped train of electron bunches according to a linear dependence ; by infinite periodical train of short trains of shaped drivers, interchanged by witnesses. The numerical simulation of plasma wakefield excitation by train of laser pulses, change with time laser plasma wakefield acceleration scheme into combined Laser plasma wakefield acceleration scheme and beam plasma wakefield acceleration scheme have been investigated.

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Thé et café seront servis 5 mn avant le séminaire