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Dynamics of subcycle linearly polarized relativistic solitary waves in plasmas

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The properties of the linearly polarized solitary waves, often excited in the wake of an intense laser pulse propagating in a plasma, are investigated. The two coupled nonlinear equations that describe the wave dynamics are derived from the warm plasma fluid model and solved numerically with a finite difference scheme. The computed amplitude-frequency relationship is in agreement with the solitary waves observed in past particle-in-cell (PIC) simulations. The fluid solutions have been used to initialize a PIC code in order to study the stability of the waves on the electron timescale, their mutual collision, the emission of electromagnetic burts when a wave reaches a plasma-vacuum interface and their expansions on the ion timescale. This last process produces a peak in the ion spectra at an energy value controlled by the amplitude of the initial wave.

Fig. 1: *Logo SFP Bordeaux-2011*

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