

Abstract Submitted
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Relativistic bi-stability and adiabatic excitation of a large plasma wake OLEG POLOMAROV, GENNADY SHVETS, Institute for Fusion Studies, The University of Texas at Austin, TX, 78712 — The Dynamical Bi-Stability (DBS) [1] is caused by the relativistic nonlinearity of a high-amplitude plasma wave. When the laser beam intensity exceeds a detuning-dependent threshold, a long adiabatic beatwave can leave behind a large relativistic wake due to DBS. The Dynamical Bi-Stability is explained in terms of a representative Hamiltonian particle, describing the plasma wave, which undergoes a complicated nonlinear dynamics in the proper phase space. This dynamics includes separatrix crossings and phase space bifurcations, and are governed by an adiabatic evolution of the Hamiltonian of the representative particle [2]. We generalize DBS to the most interesting regime of short pulses and strong relativistic beat-wave amplitudes. Examples of the large wake-field comparable or larger in amplitude to the cold wave-braking electric field are given. Comparisons with other methods of adiabatic generation of the plasma wake (e.g. auto-resonant excitation) are made. [1]. G. Shvets, “Beat-wave excitation of plasma waves based on Relativistic Bi-Stability,” Phys. Rev. Lett. 93 195004 (2004). [2]. S. Kalmykov, O. Polomarov, D. Korobkin, J. Otwinowski J. Powerand, G. Shvets, “Novel techniques of laser acceleration: from structures to plasmas” submitted to Proc. Roy. Soc.

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