Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Effect of radiation back-reaction on the interaction of super-strong laser fields with plasmas. IGOR V. SOKOLOV, Space Physics Research Laboratory, University of Michigan, Ann Arbor, MI 48109, JOHN A. NEES, VICTOR P. YANOVSKY, Center for Ultrafast Optical Science and FOCUS Center, University of Michigan, Ann Arbor, MI 48109, NATALIA M. NAUMOVA, GERARD A. MOUROU, Laboratoire d Optique Appliquee, UMR 7639 ENSTA, Ecole Polytechnique, CNRS, 91761 Palaiseau, France — We analyze the effect of self-force on a single electron and on plasma electrons giving attention to the electromagnetic energy generated by non-linear Thomson scattering. The effect is essential if the scattered energy is comparable with the rest-mass energy of the electron in the frame of reference where the electron was initially at rest. We develop a method for solving the Lorentz-Abraham-Dirac equation and accounting for radiation in a self-consistent manner. The solution is then applied to the interactions of super-strong laser fields with an electron and a plasma layer including the presence of strong charge separation fields. This scheme allows a simulation of resulting radiation with spatial and spectral distributions, and demonstrates the possibility of efficient conversion (up to several %) of incident radiation to γ-ray emission at intensities of $\sim 10^{22}\mathrm{W/cm}^2$, recently achieved in experiments.

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Date submitted: 23 Jul 2007 Electronic form version 1.4