Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Ponderomotive acceleration and the supra-bubble regime for electrons in tenuous plasmas[1] V.I. GEYKO, I.Y. DODIN, N.J. FISCH, Princeton University, G.M. FRAIMAN, IAP — In the present work, we study electron acceleration via interaction with ultraintense laser pulses in tenuous plasma. For electrons injected inside a pulse with arbitrary momenta, we demonstrate different regimes of ponderomotive acceleration and show that plasma dispersion affects this process at densities $n/n_c > a_0^{-4}$, where n_c is the critical plasma density, and $a_0 = eA/mc^2$ is the normalized laser amplitude, which we assume much larger than one. For a cold electron beam, the so-called *supra-bubble* acceleration is studied, when electrons are pushed by a moving ponderomotive potential *ahead* of the wakefield potential. In this case, the maximum energy gain, $\gamma \propto a_0\gamma_g$, is attained when the particle Lorentz factor γ is initially about γ_g/a_0, where γ_g is the pulse group speed Lorentz factor. The supra-bubble acceleration scheme operates at $\gamma_g \geq a_0$ and yields energies comparable to those attained through conventional wakefield acceleration for the same plasma and laser parameters.

[1]This work was supported by the NNSA under the SSAA Program through DOE Research Grant Nos. DE-FG52-04NA00139 and DE-FG52-08NA28553.

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Date submitted: 15 Jul 2010 Electronic form version 1.4