Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Semiclassical Ponderomotive Lagrangian for the Dirac Electron[1]

D.E. RUIZ, I.Y. DODIN, Princeton University — The ponderomotive effect caused by a high-frequency electromagnetic field on a classical particle can be calculated conveniently, within a first-principle variational approach, as the Kerr effect experienced by the particle's quantum wave function in the semiclassical approximation. The previous calculations have been restricted to nonrelativistic scalar particles in weak fields [1]. Here we extend those results to relativistic vector particles in arbitrarily strong fields. In particular, we derive the ponderomotive Lagrangian for the Dirac electron in a relativistically-intense laser wave propagating in vacuum. Classical waves in plasma can be described in a similar manner; hence our calculation also generalizes the recent "ponderomotive" theory of wave-wave adiabatic coupling [1] to fully electromagnetic interactions.

[4pt] [1] I. Y. Dodin and N. J. Fisch, *Ponderomotive forces on waves in modulated media*, Phys. Rev. Lett. **112**, 205002 (2014).

[1]This work was supported by the DOE NNSA through contract number DE274-FG52-08NA28553.

Daniel Ruiz
Princeton University

Date submitted: 11 Jul 2014 Electronic form version 1.4