The Time-dependent Aharonov-Casher Effect JARYD ULBRICHT,
University of California Santa Cruz, DOUGLAS SINGLETON, California State University Fresno — We approximate the Lagrangian for a particle of neutral charge with a non-zero magnetic moment by introducing a Pauli spin coupling to the free particle Dirac Lagrangian. Through the use of spinor projection operators we separate the Lagrangian into two non-interacting components that effectively couple to the electromagnetic fields minimally. In the absence of classical forces the coupling results in the neutral particle wavefunction acquiring an additional phase that, in the low velocity limit, reproduces the Aharonov-Casher phase, which is measurable in interference experiments. We use this covariant expression for the Aharonov-Casher phase to investigate the case where the particle is moving in *time dependent* electric and magnetic fields of a plane electromagnetic wave background. We focus on the case where the magnetic moment of the particle is oriented so that both the electric and magnetic fields lead to non-zero phases. We find that time dependent corrections to the phase appear at second order, due to a cancellation of first order corrections.

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