Abstract Submitted
for the APR13 Meeting of
The American Physical Society

New Computational method for solving the time-based Dirac Equation ROBERT VASELAAR, HYUN LIM, JUNG-HAN KIMN, South Dakota State University, DONGMING MEI, University of South Dakota — Current computational methods for the Dirac equation are prone to negative behavior such as fermion doubling, instability, and poor performance for low-mass particles. These issues are usually addressed by artificial stabilizers and careful after-simulation tuning but this may cast doubt on the physical accuracy of computational results. We show that our space-time finite element method for the time-based Dirac equation converges to analytic solutions without artificial stabilization or after-simulation tuning even in the low-mass regime. This method may be an important tool for simulating partially understood particles such as neutrinos where low-mass performance is essential and after-simulation tuning is inappropriate.

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Date submitted: 08 Jan 2013 Electronic form version 1.4