Electromagentically self-interacting fermions in time-dependent relativistic quantum mechanics ATHANASIOS PETRIDIS, SCOTT BARCUS, Drake University — The time-dependent electromagnetically self-coupled Dirac equation is solved numerically by means of the staggered-leap-frog algorithm. After the stability region of the method versus the interaction strength and the spatial-grid size over time-step ratio is established, the expectation values of several dynamic operators are evaluated as functions of time. These include the fermion and electromagnetic energies and the fermion dynamic mass, as the self-interacting spinors are no longer mass-eigenfunctions. There is a characteristic, non-exponential, oscillatory dependence leading to asymptotic constants of these expectation values. In the case of the fermion mass this amounts to renormalization. The dependence of the expectation values on the spatial-grid size is evaluated in detail.

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