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Time-dependent solutions to the Dirac equation for interacting systems ATHANASIOS PETRIDIS, ZACHARY KERTZMAN, KHINLAY WIN, Drake University — Time-dependent solutions to the minimally-coupled Dirac equation are obtained numerically using the staggered leap-frog method. The systems studied include: (1) Electromagnetically mutually interacting fermion-antifermion pairs propagating in free space and in medium representing mesons that undergo electromagnetic dissociation. The stability of the algorithm is challenged by the presence of time-retarded potentials generated by the 4-dimentional, fermionic currents. (2) Fermions interacting with fixed solenoidal magnetic vector potentials giving rise to a time-dependent Aharonov-Bohm effect especially inside quantum rings. The resulting interference patterns are evaluated to study the induced action. (3) Self-interacting fermions, emitting and re-absorbing photons. Their dynamic mass renormalization is studied and the ensuing problem of numerical stability and convergence is discussed.

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