Abstract Submitted
for the APR15 Meeting of
The American Physical Society

Radiation-Reaction Force on a Small Charged Body to Second Order JORDAN MOXON, EANNA FLANAGAN, Cornell Univ — In classical electrodynamics, an accelerating charge emits radiation and experiences a corresponding radiation reaction force, or self force. We extend to greater precision (higher order in perturbation theory) a previous rigorous derivation of the electromagnetic self force in flat spacetime by Gralla, Harte, and Wald. The method introduced by Gralla, Harte, and Wald computes the self-force from the Maxwell field equations and conservation of stress-energy, and does not require regularization of a singular point charge, as has been necessary in prior computations. For our higher order compuation, it becomes necessary to adopt an adjusted definition of the mass of the body to avoid including self-energy from the electromagnetic field sourced during the history of the body. We derive the evolution equations for the mass, spin, and center of mass position of an extended body through second order using our adjusted formalism. The final equations give an acceleration dependent evolution of the spin (self-torque), as well as a mixing between the extended body effects and the acceleration dependent effects on the overall body motion.

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Date submitted: 09 Jan 2015 Electronic form version 1.4