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Nonlinear finite self-energy classical electron model BAXTER ARMSTRONG — A classical electron model is proposed having finite self-energy e^2/r_0, stability, and Lorentz invariance. The electrostatic field energy density provides a nonlinear spherically symmetric microscopic integrable charge and energy distribution of infinite extent in the rest frame. In motion a coupling equation required for Lorentz invariance is defined between the radius of a spherically symmetric core containing the charge e and rest mass m_0, and its linear velocity v. It separates the charge and rest mass from the exterior electromagnetic field kinetic energy, providing a proxy size, demonstrating point-particle behavior and displaying the Coulomb field. The core radius decreases with increasing v, approaching zero as v$\rightarrow$ c. Analogies to the uncertainty principle and Zitterbewegung appear. Results of current theory are unchanged. Although the classical self energy is finite, its Coulomb field will produce some of the divergences encountered in QED. This derivation shows that the theory expands the scope of special relativity beyond point particles to include this class of extended charged particles.

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