Relativistic Particle Motion of a Charge including the Radiation Reaction

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Abstract

The problem of the electromagnetic radiation of an accelerated charged particle is one of the most controversial issues in Physics since the beginning of the last century representing one of the most popular unsolved problems of the Modern Physics. Different equations of motion for a point charge including the electromagnetic radiation emitted have been proposed throughout history, but all these expressions show some limitations. An equation based on the principle of conservation of energy is proposed for the ultra-relativistic motion. Different examples are analyzed showing that the energy lost by the charge agrees with the relativistic generalization of the Larmor formula. This proposed equation has been compared with the Landau-Lifshitz equation obtaining a good agreement in the range of application of the Landau-Lifshitz formula. Finally, it is discussed a possible variation of the typical relativistic particle integrators (*e.g.* Boris, Vay or Higuera-Cary methods) in order to include the radiation reaction.

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