# Electromagnetic Radiation from an Accelerating Charged Particle

An accelerated, electrically charged, classical particle radiates electromagnetic waves. The energy that comes out with this radiation is known to be proportional, in the nonrelativistic limit, to the square of the acceleration. Naturally, one is lead to believe this lost energy must be accounted for by the kinetic energy loss of the particle itself, and this leads to a radiation damping force, known to be proportional to the time-derivative of the acceleration.

Review these two facts, which can be found in many graduate-level textbook on classical electrodynamics.

Then, consider the charge particle being accelerated uniformly, which means that the acceleration has no time-derivative. In this case, radiation energy remain constant and nontrivial, yet the damping force is zero. Try to compute and explain how this can be consistent with energy conservation, which must hold at any given time rather than as a time-integrated version. The question becomes most acute if you imagine that such a uniform acceleration continues forever.