

# Solution of the Landau Lifshitz and the Caldirola equations

## Abstract

The interaction of electrons with radiations, emitted by itself, has been a topic of great interest since a century. With the advent of high power laser, the case of radiation reaction has become a real world problem. The Landau Lifshitz and the Caldirola equations are considered as the most adequate equations to describe the motion of the electron with radiation reaction. Our main objective is to develop the numerical integrators for the Landau Lifshitz and the Caldirola equations. We are interested to study the motion of the electron focusing by a linearly polarized electromagnetic wave and to resolve the limit of validation of two equations. We have observed that there is no effect of radiation of electron on its dynamics when it moves with non-relativistic velocity. However, in the case of relativistic motion of the electron, the radiation reaction slows down the charged particle in the direction of the propagation of the electromagnetic wave and it accelerates the electron in the polarization direction of the wave. One important point is that the Landau Lifshitz equation represents the motion of a point particle whereas the Caldirola equation is for finite size charged sphere. When we apply the point particle limit in the Caldirola equation it shows quite unphysical behaviour which points out that it is not a valid equation for point particle. The two equations show the same results under their validity limits.