

# **Collective Radiation Reaction in an Electron-Positron Bunch and Laser Collision**

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In Classical Electrodynamics, the emission of radiation can be accounted for by solving the Landau-Lifshitz (LL) equation of motion. Typically when applied to many particles, each is treated independently in the presence of an external field, while interparticle fields are assumed to be negligible. By considering the collision of a small, relativistic electron-positron bunch with an intense laser-pulse, we demonstrate how the inclusion of interparticle fields when solving the LL equation can cause coherently amplified and inhomogeneous energy loss, which can alter the spectrum of emitted radiation by orders of magnitude. In nature, electron-positron plasmas are created by extremely strong electromagnetic fields near pulsars, black holes and quasars, where they are associated with the emission of coherent radiation. This implies a microscopic understanding of how particles radiate coherently is of fundamental importance.