Interparticle Fields Amplified Radiation Reaction

M J Quin[1], A Di Piazza[1,2,3], C H Keitel[1], and M Tamburini[1]

[1] *Theoretical Quantum Dynamics and Quantum Electrodynamics, Max Planck Institute for Nuclear Physics (MPIK), Heidelberg, Germany*
[2] *Department of Physics & Astronomy, University of Rochester, Rochester NY, USA*
[3] *Laboratory for Laser Energetics, University of Rochester, Rochester NY, USA*
Contact Email: Matteo.Tamburini@mpi-hd.mpg.de

In classical electrodynamics, energy losses due to the emission of electromagnetic radiation can be accounted for by solving the Landau-Lifshitz equation of motion. Analytically, this equation is typically solved while treating each particle independently in an external field; numerically, one often includes a self-consistent mean field, as seen with particle-in-cell (PIC) codes. In both cases, interparticle fields from point-like particles are neglected. By considering the collision of a neutral relativistic electron-positron bunch with an intense laser pulse, we demonstrate that the inclusion of interparticle fields can coherently amplify a broad range of radiated frequencies, by orders of magnitude. This corresponds to an amplified energy loss by particles within the bunch, with coherent emission that can feed into incoherent radiation reaction.