Effects of radiation damping in extreme ultra-intense laser-plasma interaction\textsuperscript{1} RISHI PANDIT, YASUHIKO SENTOKU, Department of Physics, University of Nevada, Reno — Effects of the radiation damping in the interaction of extremely intense laser ($> 10^{22}$ W/cm$^2$) with overdense plasma are studied via a relativistic collisional particle-in-cell simulation, PICLS1D. We had derived the Landau-Lifshitz equation, which is the first order term of the Lorentz-Dirac equation, and also derived the second order term as the first time and implemented in the code. The code had been tested in a single particle motion at the extreme intensity laser. It was found that the first order damping term is reasonable up to the intensity $10^{22}$ W/cm$^2$, but the second order term becomes not negligible and comparable to the first order term beyond $10^{23}$ W/cm$^2$. The radiation damping model was introduced to a one-dimensional particle-in-cell code (PIC), and tested in the laser - plasma interaction at extreme intensity. The strong damping of hot electrons in high energy tail was demonstrated in PIC simulations. Hot electrons generated by such extreme-intense laser lights on the plasma get the relativistic energy with gamma factor > 100, and lose energy strongly by emitting radiation. The second order term becomes comparable to the first order term when the laser intensity > $10^{23}$ W/cm$^2$.

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