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Ultra-high intensity laser scattering with quantum corrections
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— With the advances in plasma wakefield acceleration and in laser technology, electron beams with about 1 GeV of energy and ultra-high intensity lasers (up to 10^{21} W/cm^2) are now available. These provide a means to explore regimes with a small ratio between the electric field in the electron rest frame and the Schwinger field (χ parameter). In this work the radiation spectrum of electrons undergoing nonlinear Thomson/Compton scattering at small χ is explored through PIC simulations combined with the radiation post-processing diagnostic jRad. Quantum corrections are modeled with a quantum corrected emissivity formula that generalizes that of Lieu & Axford [ApJ vol 416, 700 (1993)] for arbitrary angles of observation. Scenarios with short ultra-intense linearly polarized laser pulses (a_0 up to 30) interacting with electrons with up to few 10s GeV are modeled. Spatially resolved multidimensional (and integrated) spectra are presented and the effects of radiation damping and laser amplitude variation during the interaction are explored. Comparisons of the results with equivalent OSIRIS-QED simulations are also presented and the transition from the quantum corrected emissivity to QED Compton scattering is explored.

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