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The Effect of Quantum Radiation Emission in High-Energy Wakefield Stages QIAN QIAN, DANIEL SEIPT, YONG MA, ALEXANDER THOMAS, Center of Ultrafast Optical Science, University of Michigan, Ann Arbor, Michigan 48109, USA — An electron beam passing through an undulator will experience radiation emission such that the high energy part of the beam will radiate more energy than the low energy part, decreasing its energy spread. In plasma accelerator stages with an injected electron beam at above one hundred GeV, stochastic radiation emission can cause a broadening of the energy spread as well. We use Particle-in-Cell simulations to study how quantum radiation emission would influence the energy spread and emittance of external injected beams inside laser wakefields. The effect of nonlinear focusing forces, beam energy spread and laser beam mismatch, however, can distort the phase space distribution and cause significant emittance growth. Theoretical analysis and numerical simulation were performed to find optimal conditions to minimize phase space distortions.

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