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Quantum radiation reaction in laser-electron beam collisions

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The intensity of short pulse lasers is now sufficiently high that the dynamics of energetic electrons in these fields is dominated by quantum radiation reaction. We present simulations of an experiment that uses a laser wakefield to drive GeV electrons into a counterpropagating laser pulse of intensity 10^{22} Wcm^{-2} . The stochastic nature of photon emission leads to broadening of the electron beam's energy spectrum and to a yield of high energy gamma rays much greater than that predicted by classical radiation theory. These signatures of strong-field QED processes should be detectable with current high intensity laser facilities.

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