

# Collisional Strong-Field QED Kinetic Equations from Quantum Field Theory

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The long-time effect of strong electromagnetic fields on nonequilibrium dynamics is still poorly understood, and no general description that remains valid for late times is well-established. Aiming to improve this situation, I present our recent work on deriving collisional strong-field QED kinetic equations from nonequilibrium quantum field theory. Our leading order,  $O(e^2)$ , equations capture a plenitude of effects in one description ranging from early time vacuum (Schwinger) pair production to the onset of collisional equilibration in the presence of a strong field at later times that may also be inhomogeneous. The collision terms emerge with generalized strong-field scattering amplitudes that reduce to amplitudes commonly used in particle-in-cell descriptions in limiting cases.