Coherent radiation of electrons interacting with intense laser pulses

Abstract: This project is focused on the theoretical and numerical investigation of the radiation emitted by a dense particle bunch colliding with an intense laser pulse. The analysis will be done within the full quantum regime, where not only recoil effects in the emission will be considered but also the collective quantum properties of the incoming multi-electron bunch. The emission energy spectra will be computed analytically and numerically accounting for the emission of several photons. Working in the full quantum realm will enable us to ascertain how to enhance coherence effects in the frequency domain beyond the x-ray regime by manipulating, for example, the incoming electron beam at the microscopic level, and ultimately ascertain the feasibility of realizing a gamma-ray free electron laser.

Type of thesis: dissertation thesis

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