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Theory of laser-dressed resonant Auger decay for ultraintense and ultrashort x rays[1] ANTONIO PICON, GILLES DOUMY, STEPHEN SOUTHWORTH, LINDA YOUNG, CHRISTIAN BUTH, Argonne National Laboratory —
The emerging x-ray free electron lasers (FELs) such as the Linac Coherent Light Source (LCLS) at SLAC National Accelerator Laboratory can reach very high x-ray intensities and ultrashort pulse durations. We develop a theory for the strong coupling of x rays with an atom, which couples core electrons with Rydberg states. In addition, we consider a near-infrared (NIR) laser that couples the Rydberg states among each other. We can theoretically describe several atomic systems with this setup using three-level (Λ-type and cascade-type are considered) models, which allow us to use electromagnetically induced transparency for x rays induced by the NIR laser. The theoretical models also allow us to calculate the NIR-laser-controlled Auger electron spectrum. We apply these models to predict the Auger electron spectrum of Ne (Λ-type) and Ne^+ (cascade-type). This work opens up new prospects to study and analyze the interaction of ultraintense and ultrashort x rays with atoms.

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