Strong x-ray induced resonant Auger decay from core-excited states

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We theoretically investigate the resonant Auger decay of Ne atoms exposed to a strong x-ray pulse of few femtoseconds duration. The x-ray pulse, of duration ~ 2 fs, generates a core-excited state wavepacket by simultaneously populating two core-excited states. The intensity of the x-ray pulse is sufficiently strong to induce Rabi oscillations between the ground and two core-excited states of Ne atom within the lifetime of the core-excited states (~2.4 fs). The total (energy-integrated) Auger electron yield and the energy-resolved Auger electron spectra obtained from the coherently excited superposition of core-excited states shows a strong dependence on the variation of the intensity of the x-ray pulse, and moreover, they are significantly different from those through the individually excited core-excited states.

In general, the strong x-ray pulse induced Rabi oscillations between the ground and a core-excited state is manifested in the form of asymmetric splitting in the Auger electron spectra. We investigate to what extent the Auger electron spectra is modified because of the x-ray induced Rabi oscillations between the ground and coherently superposed core-excited states. We also perform the numerical dressed state calculations to interpret the origin of such x-ray induced splitting in the Auger electron spectra.

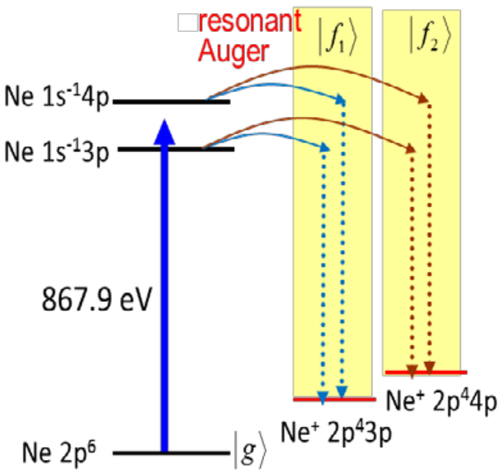

Fig. 1 Level scheme. Strong x-ray pulse simultaneously couples the ground state to 1s^{-1}3p and1s^{-1}4p core-excited states.

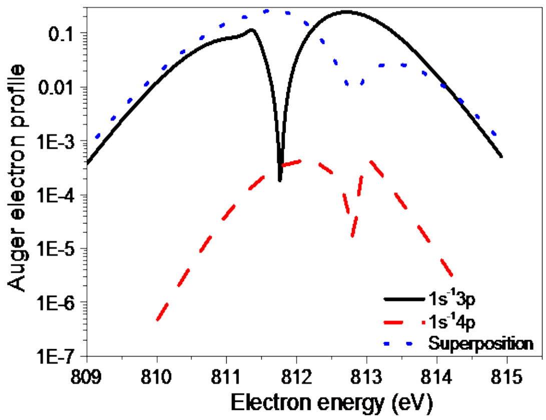

Fig. 2 RA spectra generated by strong x-ray laser (I^0= 5x10^{18} W/cm^2) for both individual as well as superposition of core-excited states

[1] Rohringer and Santra, PRA **77**, 053404 (2008).
[2] Demekhin and Cederbaum, PRA **86**, 063412 (2012).