Abstract Submitted
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Time-resolved KLL-Auger decay via transient x-ray bleaching in O_2[1] RYAN COFFEE, SEBASTIAN SCHORB, CHRISTOPH BOSTEDT, MARC MESSERSCHMIDT, LCLS-SLAC, JAMES CRYAN, JAMES GLOWNIA, LCLS-SLAC/PULSE-Stanford, HYOTCHERL IHEE, KAIST-Chemistry, L. N. DENNIS NORDLUND, SSRL-SLAC — Time domain measurements are directly sensitive to the dynamic correlations responsible for Auger decay. The Auger process in molecules is more complicated than in atoms since the nuclear degrees of freedom strongly influence the valence corellations responsible for the various Auger. For instance, the Auger decay of strongly dissociative states like the π^* antibonding excitations of oxygen complicates the interpretation of broad Auger features; is the feature broad due to rapid decay or due to very steep molecular potentials? To demonstrate time-domain spectroscopy in the x-ray regime, we measured transient x-ray beaching of core-excited O_2 with two x-ray pulses of ~ 5 fs duration and 5–20fs relative delay. Both pulses were tuned to the $1s \rightarrow 2p\pi^*$ resonance in O_2 such that upon pump excitation, the transition became dark to the probe pulse. The molecule remains dark until it refills the core-vacancy primarily via KLL-Auger decay. The duration of the bleaching reflects O_2 Auger decay directly in the time-domain, pushing time-domain molecular spectroscopy into the KLL regime.

[1]This research was carried out at the Linac Coherent Light Source (LCLS).

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