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Ultrafast molecular processes at the short-wavelength regime[1]
A. PICON, C.S. LEHMANN, C. BOSTEDT, Argonne National Laboratory, A. RUDENKO, D. ROLLES, Kansas State University, A. MARINELLI, SLAC National Laboratory, L. YOUNG, S.T. PRATT, S.H. SOUTHWORTH, Argonne National Laboratory — Fundamental molecular processes that underlie chemical reactivity and biological processes typically involve intramolecular dynamics consisting of nuclear motion and the flow of charge and energy across atomic sites. Examples include photosynthesis, electron transfer in biomolecules, and molecular fragmentation. Molecular phenomena initiated by the absorption of an XUV/x-ray photon is one of the most challenging questions for the new generation of XUV/x-ray sources. New capabilities at accelerator-based are continuously being developed, being possible to nowadays generate two-color XUV/x-ray pulses with controlled time delay. The site-specificity of those photons allow the excitation of inner-shell electrons in a particular site of the molecule and, with a controlled time delay, the probing of the induced intramolecular dynamics in another site of the same molecule, opening the door to the unexplored field of intramolecular processes initiated by short-wavelength photons. Also, novel XUV/x-ray sources allow the generation of two-color pulses with a high spatio-temporal degree of coherence, suitable for quantum control schemes involving inner-shell electrons. In this talk, we present new theoretical and experimental results towards this direction.

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