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Time Resolved X-ray Pump/X-ray Photoelectron Spectroscopy Probe[1] ANDRE AL HADDAD, 1,2, A PICON, 3, G DOUMY, 1, T GORKHOVER, 4, S PRATT, 1, A LUTTMAN, A MARINELLI, S MOELLER, D RATNER, P WALTER, 4, L YOUNG, S SOUTHWORTH, 1, C BOSTEDT, 1,2,5, ARGONNE NATIONAL LABORATORY TEAM, PAUL SCHERRER INSTITUT TEAM, AUTONOMOUS UNIVERSITY OF MADRID TEAM, SLAC NATIONAL LAB TEAM, ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE TEAM — Recently, X-ray Free Electron Lasers proved the ability to produce two intense femtosecond x-ray pulses with controlled time delay and color. Combining these unique capabilities with X-ray photoelectron spectroscopy (XPS) probing, we can probe electronic and nuclear dynamics at a specific atomic site with femtosecond resolution. In our initial study we used carbon monoxide, i.e., a small heteronuclear molecule that can be well described with theoretical models. The pump pulse excites a core-electron resonantly at the oxygen K-edge and then we probe the molecular response with photoemission from the carbon core levels. The data gives a glimpse of the electronic and nuclear relaxation pathways proceeding on time scales <40 fs upon x-ray excitation on the oxygen site. Such experiments lay the ground for future time resolved core level spectroscopy at FELs that can be combined with more complex pulse modes and non-linear x-ray excitation modes.

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