Abstract Submitted
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Quantum Process Tomography for Energy Transfer Systems via Ultrafast Spectroscopy JOEL YUEN-ZHOU, Harvard University, Chemistry and Chemical Biology — The description of excited state dynamics in energy transfer systems constitutes a theoretical and experimental challenge in modern chemical physics. A spectroscopic protocol that systematically characterizes both coherent and dissipative processes of the probed chromophores is desired [1,2]. In this talk, I show that a set of two-color photon-echo experiments performs quantum state tomography (QST) of the one-exciton manifold of a dimer by reconstructing its density matrix in real time. This possibility in turn allows for a complete description of excited state dynamics via quantum process tomography (QPT). Simulations of a noisy QPT experiment for an inhomogeneously broadened ensemble of model excitonic dimers show that the protocol distills rich information about dissipative excitonic dynamics, which appears nontrivially hidden in the signal monitored in single realizations of four-wave mixing experiments Progress on the experimental side will be discussed, as well as new insights that QPT has offered on the understanding of 2D electronic and vibrational spectroscopy. [1] J. Yuen-Zhou, J. J. Krich, A. Aspuru-Guzik, Quantum state and process tomography of energy transfer systems via ultrafast spectroscopy Joel Yuen-Zhou, Jacob J. Krich, Masoud Mohseni and Alán Aspuru-Guzik Proc. Nat. Acad. Sci. USA, Early Edition (2011). [2] J. Yuen-Zhou, A. Aspuru-Guzik, Quantum process tomography of molecular dimers from two-dimensional electronic spectroscopy I: General theory and application to homodimers Joel Yuen-Zhou and Alán Aspuru-Guzik . Chem. Phys. 134, 134505 (2011).

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