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Quantum Femtosecond Magnetism in Strongly Correlated Electrons induced by Femtosecond Far-Infrared Pulses TIANQI LI, AARON PATZ, Iowa State University and AmesLab USDOE, Ames, IA, JIAQIANG YAN, University of Tennessee, Knoxville, and ORNL, Oak Ridge, TN, ILIAS PERAKIS, University of Crete and Foundation for Research and Technology-Hellas, Crete, Greece, JIGANG WANG, Iowa State University and AmesLab USDOE, Ames, IA — There is growing evidence that femtosecond laser-induced transient polarization can be used to manipulate magnetic and electronic orders during a laser pulse. Recently we reveal a new paradigm called *quantum femtosecond magnetism*—photoinduced femtosecond magnetic phase transitions driven by quantum spin flip fluctuations correlated with laser-excited inter-atomic bonding coherence. It provides the opportunity to study the non-equilibrium quantum dynamics of phase competitions in strongly correlated materials. In addition, the scheme of photo modulation of the magnetic/electronic properties of materials also provides potential candidates for industrial application. In this talk, we show our results of using femtosecond far-infrared to tune the ground state of a strongly correlated manganese oxide. A transient photo-induced coherence is introduced far below the band gap without electronic heating and inter-band transition. Such photo-induced coherence affects the spin correlations and the resonant phonon vibrational modes, which thus leads to femtosecond spin and charge dynamics. Such non-equilibrium quantum control of the magnetic/electronic order goes beyond the scope of the conventional thermal dynamics and provides new insights into correlation mechanisms in the materials.

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