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Ultrafast Probing of Antiferromagnetism and Dynamic Critical Behaviors in Iron Pnictide TIANQI LI, AARON PATZ, SHENG RAN, SERGEY BUD'KO, PAUL CANFIELD, JIGANG WANG, Department of Physics and Astronomy and Ames Laboratory-USDOE, Iowa State University, DEPARTMENT OF PHYSICS AND ASTRONOMY AND AMES LABORATORY-USDOE, IOWA STATE UNIVERSITY COLLABORATION — Iron pnictide superconductors and their parent compounds exhibit superconductivity, antiferromagnetism, poor conductivity in undoped phase, structural instabilities, and additional peculiarities. Much of the complexity originates from strong interactions among the spin, charge, lattice degrees of freedom, where correlated excitations and self-organization among them occur and cause exotic cooperative behaviors. Time-resolved magneto-optical spectroscopy has been developed as a power tool to dynamically disentangle various degrees of freedoms by exploring their responses to fs photoexcitation. Using femtosecond optical and magneto-optical technique, we were able to measure and decoupling dynamics of AFM, structure and electronic excitations in parent $BaFe_2As_2$ and also underdoped sample (Co=4.7%). The technique demonstrated provides an extremely powerful tool to reveal fs dynamics and critical behaviors of various order parameters in the iron pnictide system.

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