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Ultrafast photo-induced hidden phases in strained manganite thin films[1] JINGDI ZHANG, A. S. MCLEOD, GU-FENG ZHANG, UC San Diego, VLADIMIR STOICA, Penn State Univ., FENG JIN, Univ. of Sci. and Tech. of China, MINGQIANG GU, Northwestern University, VENKATRAMAN GOPALAN, Penn State Univ., JOHN W. FREELAND, Argonne National Lab, WENBIN WU, Univ. of Sci. and Tech. of China, JAMES RONDINELLI, Northwestern University, HAIDAN WEN, Argonne National Lab, D. N. BASOV, R. D. AVERITT, UC San Diego — Correlated transition metal oxides (TMOs) are particularly sensitive to external control because of energy degeneracy in a complex energy landscape that promote a plethora of metastable states. However, it remains a grand challenge to actively control and fully explore the rich landscape of TMOs. Dynamic control with pulsed photons can overcome energetic barriers, enabling access to transient or metastable states that are not thermally accessible. In the past, we have demonstrated that mode-selective single-laser-pulse excitation of a strained manganite thin film La2/3Ca1/3MnO3 initiates a persistent phase transition from an emergent antiferromagnetic insulating ground state to a ferromagnetic metallic metastable state [1]. Beyond the photo-induced insulator to metal transition, we recently discovered a new peculiar photo-induced hidden phase, identified by an experimental approach that combines ultrafast pump-probe spectroscopy, THz spectroscopy, X-ray diffraction, cryogenic near-field spectroscopy and SHG probe. [1] J. Zhang and R.D. Averitt et al., Nat. Mater. 15, 956 (2016)

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Jingdi Zhang
Univ of California - San Diego

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