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Pressure-induced antiferrodistortive phase transition in SrTiO3: common scaling of soft-mode with pressure and temperature SHIH-CHANG WENG, National Synchrotron Radiation Research Center, RUQING XU, Advanced Photon Source, Argonne National Laboratory, XINYUE FANG, Department of Physics, University of Illinois at Urbana-Champaign, AYMAN SAID, BOGDAN LEU, YANG DING, HAWOONG HONG, Advanced Photon Source, Argonne National Laboratory, PETER ABBAMONTE, Department of Physics, University of Illinois at Urbana-Champaign, S.-L. CHANG, National Synchrotron Radiation Research Center, T.-C. CHIANG, Department of Physics, University of Illinois at Urbana-Champaign — We report a study of the pressure-induced anitferrodistortive cubic-to-tetragonal phase transition in strontium titanate ($SrTiO_3$) at ambient temperature. High-resolution inelastic X-ray scattering measurements reveal the softening of a phonon mode (R_{25}) at the Brillouin zone boundary; a lattice distortion sets in at a critical pressure of 9.5 GPa, which corresponds to a critical volume reduction of 5.3%. Prior studies have shown that similar phonon softening and ensuing lattice distortion can be induced under ambient pressure by lowering the sample temperature through a critical temperature of 105 K. The relationship between the two phase transitions is clarified by comparing the power laws of the pressure and temperature dependences of the softening behavior and by first-principles calculations of the energetics of the system.

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