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Pressure-induced antiferrodistortive phase transition and phonon softening in $SrTiO_3$ SHIH-CHANG WENG, Dept of Physics, U. of Illinois at Urbana-Champaign, RUQING XU, AYMAN SAID, Advanced Photon Source, Argonne National Lab, SHIH-LIN CHANG, National Synchrotron Radiation Research Center, TAI-CHANG CHIANG, Dept of Physics, U. of Illinois at Urbana-Champaign — $SrTiO_3$, at room temperature, undergoes an antiferrodistortive transition under pressure with a critical pressure of $P_c \sim 9.6$ GPa. This transition is accompanied by a cubic–to–tetragonal structural distortion, and the same distortion can be induced at ambient pressure by lowering the sample temperature to below $T_c \sim 105$ K. The temperature-induced transition is known to involve a soft phonon at the R point in the Brillouin zone based on neutron scattering, inelastic x-ray scattering, and thermal diffuse scattering studies. The same soft mode is expected for the pressure induced transition, and we report herein the first direct measurement using inelastic x-ray scattering and a diamond-anvil pressure cell. The phonon softening behavior follows a power law and is accompanied by a central peak. The results are analyzed theoretically and correlated with those for temperature-induced transition.

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