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Dynamic fluctuations and static speckle in critical X-ray scattering from $SrTiO_3$ MARTIN HOLT, Argonne National Laboratory, MARK SUTTON, McGill University, PAUL ZSCHACK, HAWOONG HONG, Argonne National Laboratory, T.-C. CHIANG, University of Illinois at Urbana-Champaign — We report a study of critical x-ray scattering from $SrTiO_3$ near the antiferrodistortive structural phase transition at $T_C \approx 105$K. A lineshape analysis of the thermal diffuse scattering results in the most precise experimental determination to date of the critical exponent $\gamma = 1.38 \pm 0.08$. The microscopic mechanism behind the anomalous "central peak" critical scattering component is clarified here by the first-ever observation of a static coherent diffraction pattern (speckle pattern) within the anomalous critical scattering of $SrTiO_3$. This observation allows us to directly attribute the origins of the central peak to Bragg diffraction from remnant static disorder above T_C.

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