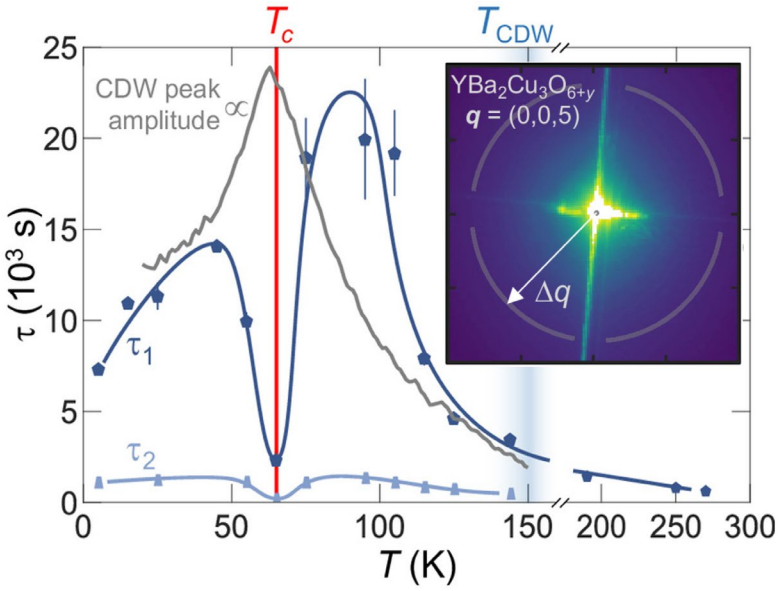
Understanding Superconductivity via Atomic Lattice Fluctuations

11-ID
CHX



XPCS data show temperature-dependent fluctuation measurements. The CDW peak (gray) is also shown. Inset: diffraction pattern for time-domain measurements collected at 60 K for 5,400 s at a frame rate of 1 Hz.

Z. Porter, L. Shen, R. Plumley, N.G. Burdet, A. N. Petsch, J. Wen, N.C. Drucker, C. Peng, X.M. Chen, A. Fluerasu, E. Blackburn, G. Coslovich, D.G. Hawthorn, J.J. Turner.
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Work was performed in part at NSLS-II

Scientific Achievement

Researchers use X-rays to measure slow, subtle fluctuations of the lattice of a high-temperature (T_c) superconductor.

Significance and Impact

Results help elucidate how and why coupling between electrons and the crystal lattice can yield exotic states, such as superconductivity and charge density waves (CDWs).

Research Details

- X-ray photon correlation spectroscopy (XPCS) at NSLS-II's CHX beamline was used to study atomic fluctuations in the high-T_c superconductor $YB_2Cu_3O_{6+y}$ over thousands of seconds.
- Results showed that the fluctuations slowed down in the CDW state and speed up at T_c and provide insights into the role of slow lattice dynamics in the material's electronic behavior.

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