	Experiment title: Doping dependence of the precursor charge density wave correlations in $La_{2-x}Ba_xCuO_4$	**Experiment number**:
Beamline:	**Date of experiment**: from: 26 September 2018 to: 02 October 2018	**Date of report**: 14th January 2020
Shifts:	**Local contact(s)**: Flora Yakhou-Harris	*Received at ESRF:*

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Report:

We have published this work as:

Formation of Incommensurate Charge Density Waves in Cuprates
H. Miao, R. Fumagalli, M. Rossi, J. Lorenzana, G. Seibold, F. Yakhou-Harris, K. Kummer, N. B. Brookes, G. D. Gu, L. Braicovich, G. Ghiringhelli, and M. P. M. Dean
Phys. Rev. X 9, 031042 (2019)

Although charge density waves (CDWs) are omnipresent in cuprate high-temperature superconductors, they occur at significantly different wave vectors, confounding efforts to understand their formation mechanism. Here, we use resonant inelastic x-ray scattering to investigate the doping- and temperature dependent CDW evolution in $La_{2-x}Ba_xCuO_4$ ($x = 0.115–0.155$). We discover that the CDW develops in two stages with decreasing temperature. A precursor CDW with a quasi-commensurate wave vector emerges first at high temperature. This doping-independent precursor CDW correlation originates from the CDW phase mode coupled with a phonon and "seeds" the low-temperature CDW with a strongly doping dependent wave vector. Our observation reveals the precursor CDW and its phase mode as the building blocks of the highly intertwined electronic ground state in the cuprates.

Please refer to this publication for the required details.