Experimental report

06/09/2022

Proposal: CRG-2807 **Council:** 10/2020

Title: Single domain stripe order in a high-temperature superconductor

Research area: Physics

This proposal is a new proposal

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Samples: La1.88Sr0.12CuO4

Instrument	Requested days	Allocated days	From	To
THALES	7	0		
IN3	1	1	01/07/2021	02/07/2021
IN22	7	7	02/07/2021	12/07/2021

Abstract:

Research on cuprate superconductors has converged to three major questions: (1) What is the nature of the pseudogap phase? (2) What is the mechanism behind the unconventional Cooper pairing? And (3) what is the symmetry of the competing density-wave states? The use of uniaxial pressure as an auxiliary tuning parameter can provide insight into some of these questions. Using x-ray diffraction, we have demonstrated very recently that uniaxial pressure induces unidirectional stripe order in La1.88Sr0.12CuO4 by lifting the in-plane rotational degeneracy. This raises the question whether the application of uniaxial pressure also leads to the selection of a single spin-density wave domain, providing direct evidence for a coupling between spin- and charge-density wave order. We aim to address this problem using neutron diffraction under compressive uniaxial pressure along one of the copper-oxygen bond directions. If the experiment is successful, we propose to study the low-energy spin excitations that couple to superconductivity in a followup study, which will provide novel insight into the competition between magnetism and unconventional superconductivity in the cuprates.

Experimental report Easy 966,976 and CRG-2807

We oriented 4 La1.88Sr0.12CuO4 single crystals for the experiments CRG-2807, DIR-240 and 5-41-1154.
The results of these experiments are found found in the online repository arXiv:2204.02304 (https://arxiv.org/pdf/2204.02304.pdf) and currently under review.