

Experimental report

06/11/2023

Proposal: CRG-2977

Council: 10/2022

Title: Fluctuating loop currents in doped La_{2-x}Sr_xCuO₄

Research area: Physics

This proposal is a new proposal

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Samples: La_{2-x}Sr_xCuO₄

Instrument	Requested days	Allocated days	From	To
IN12	5	5	10/05/2023	16/05/2023

Abstract:

The abstract is in the scientific case pdf file.

Fluctuating loop currents in doped La_{2-x}Sr_xCuO₄

We wanted to investigate the fluctuation of the $q=0$ magnetic signal in La_{2-x}Sr_xCuO₄ ($x=0.08$) at low temperature, in the pseudo-gap phase of cuprates. It has been shown that the order is confined in 1d stripes in this compounds. This 1D confinement results in magnetic fluctuations of this universal magnetic order, in a large temperature range.

Unfortunately, we could not find the results already obtained on these very same samples at LLB-Orphée in 2010 (see scans Fig 1. We thus tested that the composition was not modified over time by measuring the magnetic excitation at 4meV, which position is related to the composition. We found that the incommensurate position corresponds to the expected value of 8% (see fig. 2).

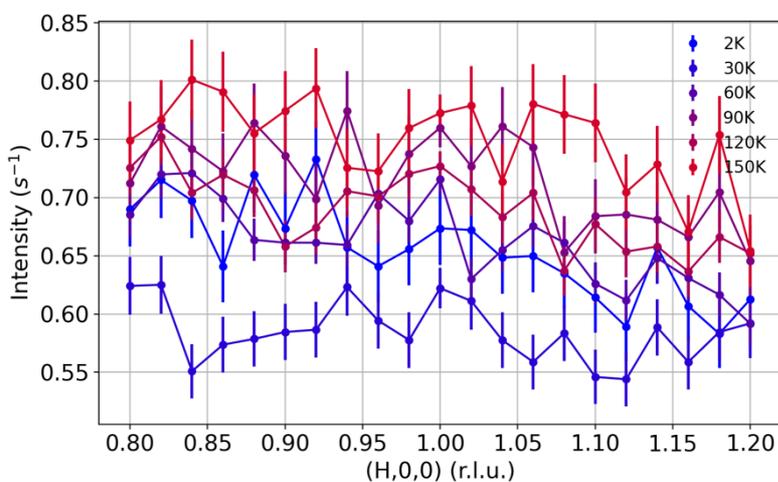


Fig. 1 : H scan on the (100) position at different temperatures (from 2 to 150K). No evidence for new peak at low temperature was found, contrary to the results obtained in 2010 on 4F1 spectrometer (LLB-Orphée).

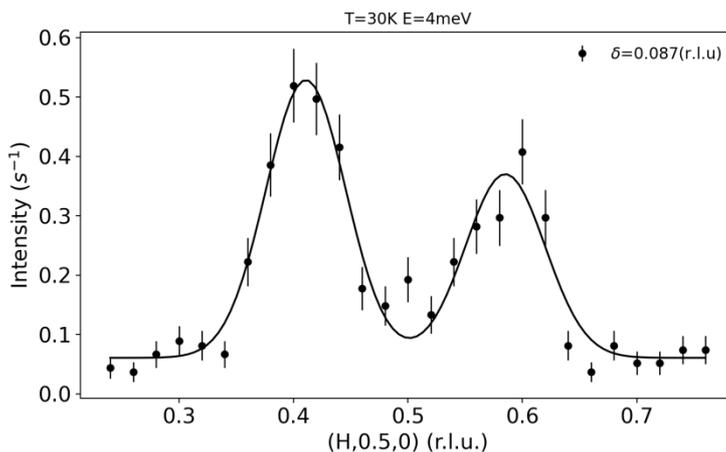


Fig. 2 : H scan around the (0.5,0.5,0) position at 4 meV. The position of the peaks are related to the Sr content in La_{2-x}Sr_xCuO₄. The position here indicate the expected composition $x=0.08$.

We explain the fact that the signal is no visible in this experiment by the fact that the background is too large to measure such small signal. We propose that polarized neutron may help improve the signal/noise ratio. The same experiment needs to be done with such setup in the future.