ESRF	**Experiment title:** *Do electronic correlations up to the micrometer scale exist in the sliding regime of $NbSe_3$?*	**Experiment number**: HS3717
Beamline:	**Date of experiment**: from: 11/02/2009 to: 16/02/2009	**Date of report**: 03/10
Shifts:	**Local contact(s)**: Zontone	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Le Bollocôh, LPS bât 510, 91405 Orsay
Pinsolle, LPS bât 510, 91405 Orsay
Jacques, LPS bât 510, 91405 Orsay
Monceau, I. Néel Grenoble
Sinchenko, I. Néel Grenoble

Report:

Upon an electric current larger than a threshold, an incommensurate Charge Density Wave (CDW) may slides as a whole, hence transporting a non-ohmic current. The aim of this proposal was to study the deformation of the CDW in the sliding state of $NbSe_3$ by using coherent x-ray diffraction**.**

$NbSe_3$ develops an incommensurate CDW under a temperature of 145K with a wave vector $\mathbf{Q}=2\mathbf{k}_F$**.** The lattice modulation gives rise to pairs of satellite reflections around the Bragg peaks at $\pm 2k_F$ in the x-ray spectra.

Good coherence conditions were obtained with 150X150µm^2 (HXV) secondary slits and 10 µm pinholes placed at 20 cm before the sample.

The 15µm*0.5µm*1mm sample lied on a sapphire substrate to avoid vibration (see figure 1). The sample has been mounted inside a He cryostat (provided by the sample environment group), with the (H0L) plane in the horizontal diffraction plane, and (0 q_c+1.241 0) satellite reflection has been probed at 120K. 2D speckle patterns has been measured within a direct-illumination CCD camera with 22 µm pixel size, located at 1.5m from the sample (δq=4.5 10 ï 5 Å^{-1} at 8keV).

The speckle pattern has been measured as respect to electric currents, larger than the threshold current.

a) b)

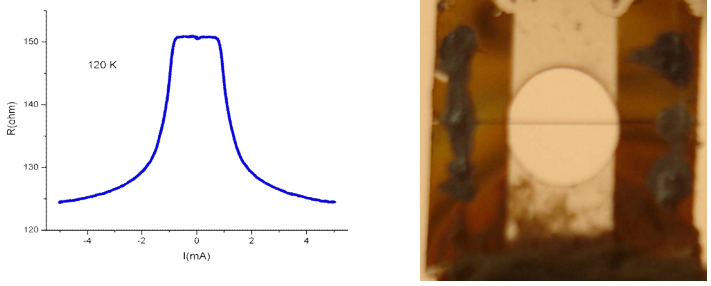

Figure1 : a) Derivative resistance as respect the external current in NbSe3 displaying the threshold current at Is=1.2 mA. b) Image of the sample liying on the sapphire substrate.

As soon as we put electric current, the $2k_F$ satellite reflection displays speckles along the transverse direction only. For electric current larger than the threshold, the number of speckles decreases and the $2k_F$ satellite tends to recover his original unstrained shape. For larger currents (i.e. for larger sliding velocity), the CDW recovers its phase coherence.

By lack of time, we have studied the CDW dynamics until small electric currents only (between 0.2mA to 1.8mA with a 1.2mA threshold current). For the next experience, we have to choose a larger cristal to be able to increase the external current far above the threshold.

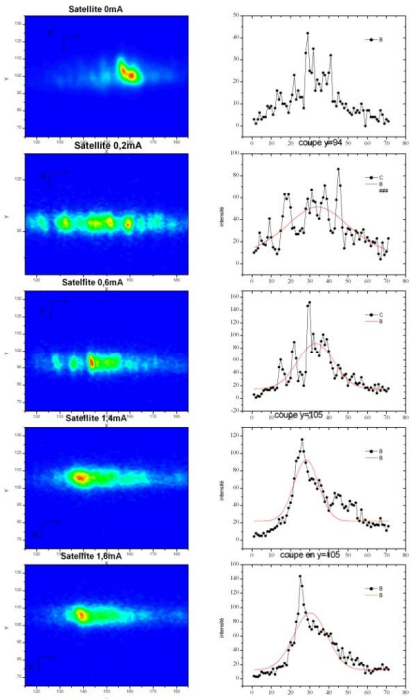

Figure 2: *$2k_F$ satellite reflection (0 1.241 0) in $NbSe_3$ under electric currents for I=0, 0.5, 1.4 and 1.8mA at T=120K. As soon as some electric current is applied, the reflection becomes larger along the transverse direction and speckles appear. When the current is increased above the threshold, the number of speckles decreases and the $2k_F$ satellite tends to recover his original unstrained shape*