ESRF	**Experiment title:** The spatial distribution of the electronic phase in the KFeSe superconducting system studied by micro-XANES	**Experiment number**: HC-1135
Beamline: ID21	**Date of experiment**: from: 27-11-2013 to: 02-12-2013	**Date of report**:
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Report:

The aim of the experiment was to probe the spatial distribution of the electronic phase of the superconducting $K_{0.8}Fe_{1.6}Se_2$ single crystal using scanning x-ray absorption spectroscopy technique using the micro-beam XAS beamline ID21.

To begin with we collected a Fe K-edge XANES spectra on a well characterized $K_{0.8}Fe_{1.6}Se_2$ single crystals at room temperature. The x-ray beam was focused to 1×1 μm^2 by means of a Kirkpatrick-Baez (KB) mirror system and the fluorescence signal was collected with a large active surface (80 mm^2) energy-dispersive Silicon Drift Detector (SSD) from Bruker. The detector was in the back-scattering geometry respect the incoming beam (http://wikiserv.esrf.fr/id21/index.php/Silicon_Drift_Diode), in order to minimize the self-absorption effect on the XANES spectra. The distance between the detector and the sample was arrange to optimize the dead-time of the detector in each energy range. After several scan tests at different points of the sample, we have choosen three significant energy values, two on the quadupole peak and one after the edge (marked as A, B and C in Fig.1). where we have collected the maps in a sample area of 40x40 μm^2. For these maps, a single pixel corresponds to a spatial area 0.5x0.5 μm^2. The map with energy 7111.5 eV corresponding to the quadrupole-contribution (Fig. 2) shows interesting intensity distribution which seems to correlate well with the phase-separation scenario already established in this system. By acquiring some complete XANES spectra at different bright and dark points of the map, we have highlighted the difference in the local and electronic states in the system. This is the first such scanning micro- x-ray absoption study

which enables the mapping of the electronic states permitting to directly correlate the spatial distribution of the electronic states with that of the strucutral degrees of freedom.

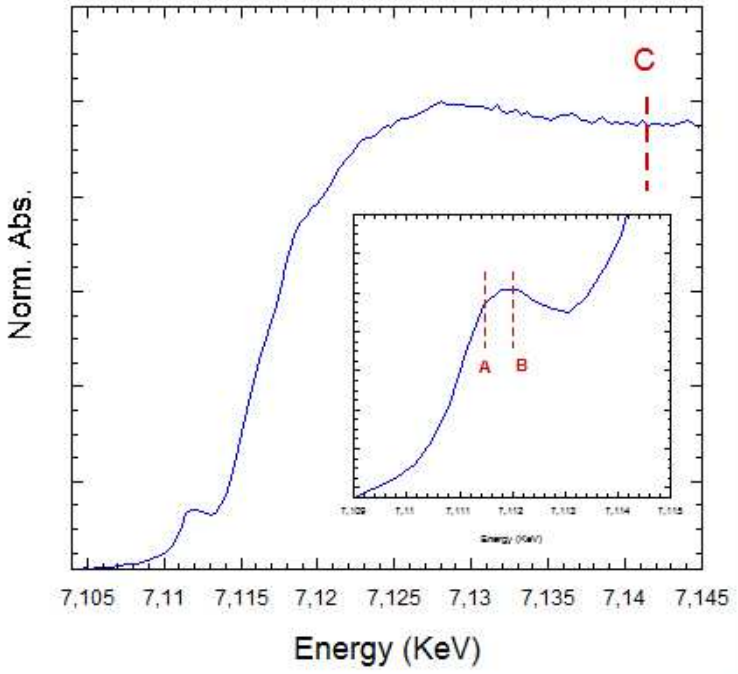

Figure 1 Fe K-edge XANES spectrum on $K_{0.8}Fe_{1.6}Se_2$ single crystal ,acquired in fluorescence mode at room temperature. The energy values choosen to map the samples are indicated as A, B and C,respectively at 7111.5, 7112.0 and 7.1413 eV.

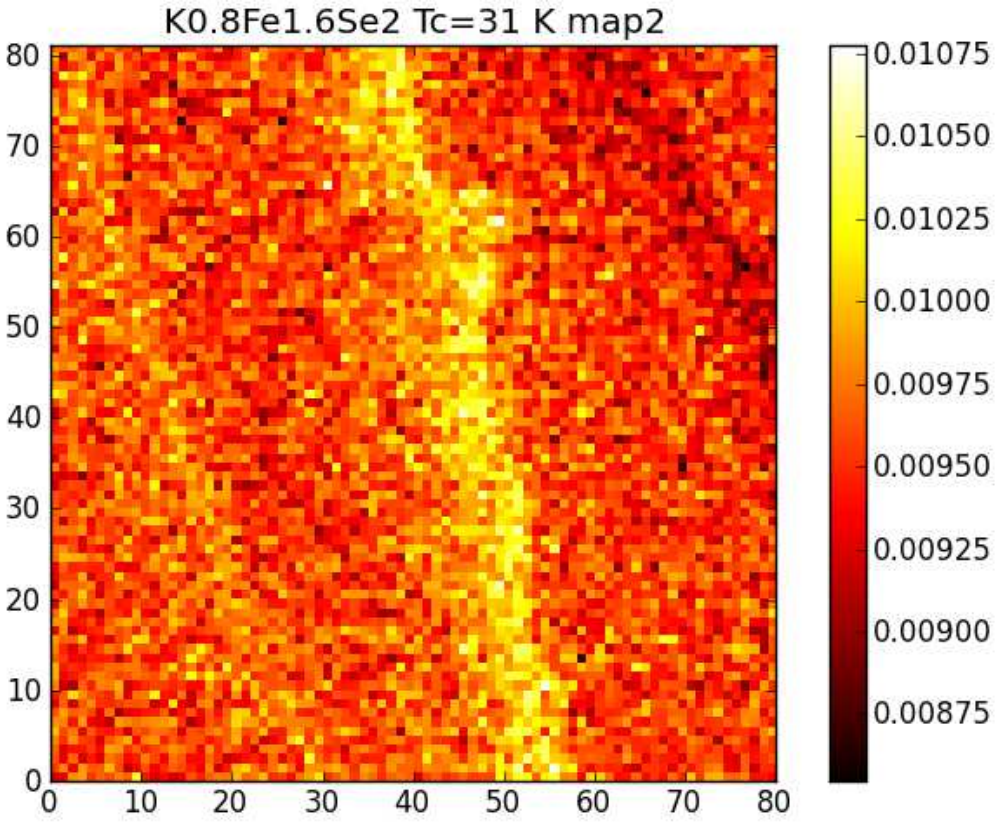

Figure 2 The Fe spatial distribution map on $K_{0.8}Fe_{1.6}Se_2$ single crystal at fixed energy value 7111.5 eV The scanned area is 40x40 μm^2, with a single pixel corresponding to 0.5x0.5 μm^2.