ESRF	**Experiment title:** Connection between the nematic fluctuations and local structure in iron pnictide superconductors	**Experiment number:** HC-1177
Beamline: ID11	**Date of experiment:** from: 02-07-2014 to: 05-07-2014	**Date of report:**
Shifts: 9	**Local contact(s):** Andrea Bernasconi	*Received at ESRF:*

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Report:

The above beamtime enabled a comparative local structure study of pnictide superconductors $Ca_{0.82}La_{0.18}FeAs_2$ (112-type, T_c ~40 K) and $Ba_{0.64}K_{0.36}Fe_2As_2$ (122-type, T_c ~37 K), using room temperature x-ray total scattering measurements. See Fig. 1 left panel.

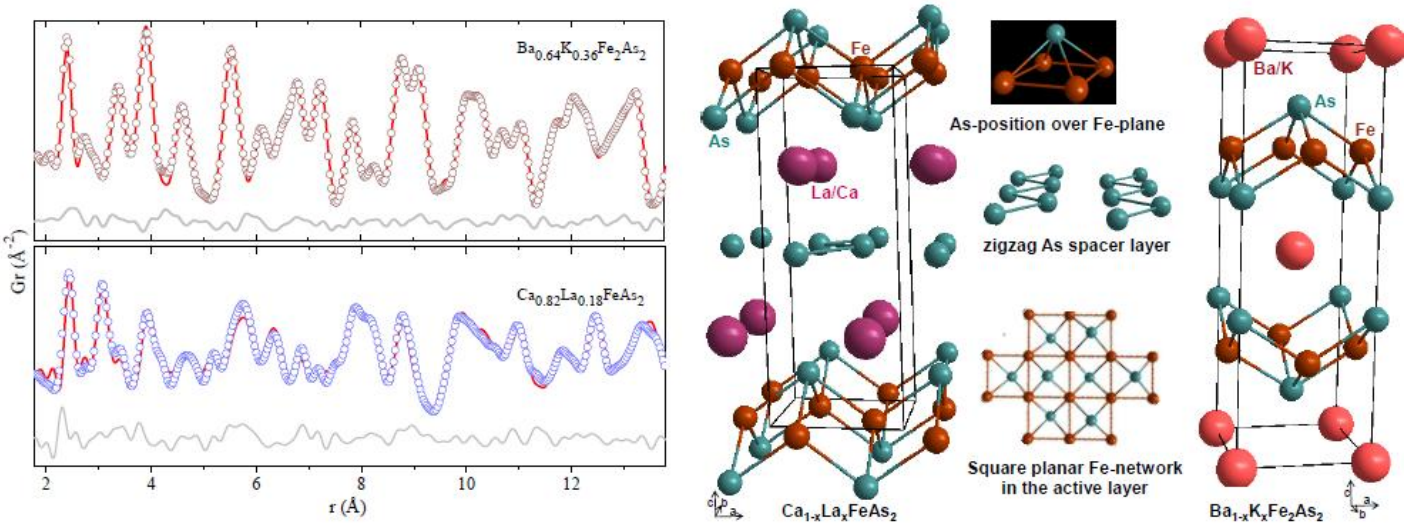

Figure 1. Left panel : Refinement results of atomic pair distribution function data at room temperature for the $Ba_{0.64}K_{0.36}Fe_2As_2$ and $Ca_{0.82}La_{0.18}FeAs_2$ [1]. Open circles are experimental data, red-solid lines are fit and gray-solid lines are the difference between data and fit. **Right panel**: Structural models of $Ca_{1-x}La_xFeAs_2$ and $Ba_{1-x}K_xFe_2As_2$. The *a-b* plane projection of the Fe-As active layer highlighting iron-square network, view of the pnictogen position above the Fe-plane (common to both structures) and the peculiar As-As spacer layer in $Ca_{1-x}La_xFeAs_2$ are also shown.

Analysis of the atomic pair distribution function data revealed that the Fe–As superconducting active layer is globally similar in both the systems (for details see Ref. [1]) consisting of edge-sharing $FeAs_{4/4}$ tetrahedra as in the general case of the iron-pnictide superconductors (see Fig. 1 - right panel). Although optimally superconducting, the active layer in these compounds is found to sustain a large local inhomogeneity. These results thus imply that a nanoscopic manipulation of the Fe–As active layer, rather than its isotropic structural tuning, is the key parameter to control the superconducting properties of the iron-based systems.

[1] B. Joseph, A. Iadecola, A. Bernasconi, P. Rispoli, N. Demitri, X. Xing, W. Zhou, Z. Shi,
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