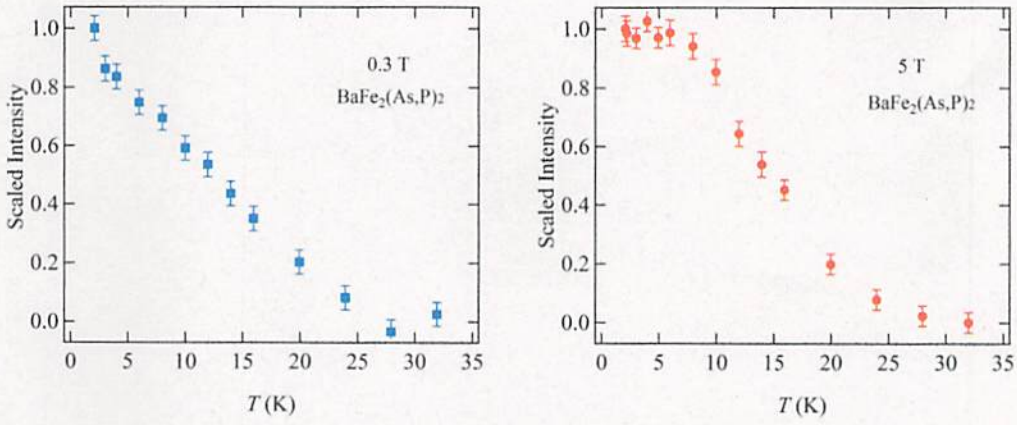
Vortex Lattice measurements on $BaFe_2(As/P)_2$ and Sr_2RuO_4

Ochanomizu Univeristy
Hazuki Kawano-Furukawa

$BaFe_2(As/P)_2$ is one of the iron-based superconductors with optimum T_c of ~30 K. These compounds are of much interest due to the relatively high maximum T_c even with magnetic Fe atoms. The current challenge in the system is to determine the symmetry of the superconducting gap to identifying the pairing mechanism. On the other hand, Sr_2RuO_4 is a 2-1-4 type oxides superconductor without Cu. The system has been believed to have p-wave symmetry and there are still many uncertainties. Vortex lattice (VL) measurements by small angle neutron scattering (SANS) technique can make prominent contributions to these debates. During December 2012, we visited ILL and HZB and performed VL measurements on $BaFe_2(As/P)_2$ and Sr_2RuO_4 at D33 (ILL) and V4 (HZB).

Figures show temperature dependence of VL scattering intensity of $BaFe_2(As,P)_2$ under magnetic fields of 0.3T (left) and 5T (right) parallel to the *c*-axis. At 0.3T the intensity shows monotonic increase down to very low temperature, < 0.1Tc, but at 5T it shows saturation behaviour. The former indicates that the system has nodes in its gap structure but the latter has a full gap state. From these data, we can interpret how the system changes its gap structure depending on the magnetic field.



We would like to extend this to the field angle dependence measurement as we can study anisotropy in the superconducting features. We expect to perform this when the JRR-3 reactor would be restarted. On the other hand, the experiment at V4 (HZB) was not so successful since we had some unexpected background problem from the other spectrometer and then we plan to redo those measurements again soon after resolving this problem. This travel was done with a financial support of by ISSP. We appreciate it pretty much since it could not be done without it.