



	Experiment title: Magnetic transitions under high pressures and enhancement of the multiferroic parameters in the iron-containing langasite crystals	Experiment number: MA-3726
Beamline: ID18	Date of experiment: from: 14.02.2018 to: 20.02.2018	Date of report: 28.02.2018
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Names and affiliations of applicants (* indicates experimentalists): Sergey Starchikov ^{1,2} , Igor Lyubutin ¹ , Ivan Troyan ^{1,2} , Kirill Frolov ¹ , Natalya Gervits ¹ , Sergey Axenov ^{1,2} ¹ Shubnikov Institute of Crystallography of FSRC “Crystallography and Photonics” RAS ² Institute for Nuclear Research, Russian Academy of Sciences		

Report:

During the experiment, we studied the high-pressure magnetic properties of powder samples of new multiferroics of the langasite family enriched with Fe-57 isotope $Ba_3M^{57}Fe_3Si_2O_{14}$ ($M = Ta, Nb, Sb$). The measurements were performed in diamond anvils (DAC) under high pressures up to 70 GPa and temperatures in the range of 3.9 - 273 K. Mössbauer spectra were measured using Synchrotron Mössbauer Source (SMS) at the Nuclear Resonance beamline ID18 at the ESRF. This method provides unique information about the structural, magnetic and electronic properties of the samples under high pressures and low temperatures. A set of magnetic and electronic transitions was revealed from the evolution of the Mossbauer spectra at different pressures and temperatures. The analysis of Mossbauer spectra will help us to clarify the details of transitions and to built the P-T magnetic phase diagram of the samples under extreme conditions of the high pressures and low temperatures. Especially we examined the region of the third structural transition at about 40 GPa, where we expect the spin- crossover effect, which changes essentially the magnetic properties of the samples. The analysis of Mossbauer spectra is in progress.

This experiment will allow us to fulfill the P-T magnetic phase diagram up to 70 GPa started in the previous proposal MA-2394. We expected that new results about correlations between magnetic and structural transitions will clarify the mechanism of coupling between the magnetic and ferroelectric order parameters and help to create new multiferroics for practical applications.