



	Experiment title: The nature of complex phase transition in $\text{Ni}_3(\text{BO}_3)_2$ and mixed $\text{Co}_2\text{Ni}(\text{BO}_3)_2$ antiferromagnetic borates	Experiment number: 01-02-1112
Beamline: BM01	Date of experiment: from: September 29, 2016 to: October 3, 2016	Date of report: October 24, 2016
Shifts: 12	Local contact(s): Dmitry Chernyshov	<i>Received at ESRF:</i>
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Report:

Part of the monocrystalline samples were prepared before experiment, but other and powders were prepared in the sample preparation room of BM01 beamline. Beam with energy of 17 keV was used. We successfully achieve temperatures below phase transitions ($T_N \approx 46$ K for $\text{Ni}_3(\text{BO}_3)_2$ and $T_N < 46$ K $\text{Co}_2\text{Ni}(\text{BO}_3)_2$) for our samples with the use of helium blower cryostat. It should be noted, that temperature was independently measured by the luminescence ($\approx 14440 \text{ cm}^{-1}$ lines) of the ruby crystals. Very weak superstructure reflexes were observed and currently analyzing.

High quality and stability of the beam and assistance of the beamline staff and our local contact allowed us to measure additional samples: single crystals and powders of fluorides, namely KCoF_3 , RbCoF_3 and KNiF_3 . These crystals have perovskite cubic structure at room temperature and some of them undergoes coupled magnetic-structural phase transitions. Nevertheless there are no complete understanding of mechanisms of this complex transitions as well as high resolution single-crystal diffraction data for this fluorides.

As it was expected we found very weak splitting of the reflexes of the single-crystal samples (Fig.1). Preliminary hypothesis is the second-order phase transition (independently confirmed by heat capacity measurements) to tetragonal phase.

In the last days a few orthorhombic Pb containing borates were studied too, namely PbFeBO_4 and PbMnBO_4 . The structure of these crystals contain lone-pair Pb ions, rigid BO_3 groups and edge-shared chains of the magnetic ions. Early results shows that PbFeBO_4 have anomalous anisotropic thermal expansion due to the presence of the mentioned structural peculiarities, so, we can expect similar effect in PbMnBO_4 .

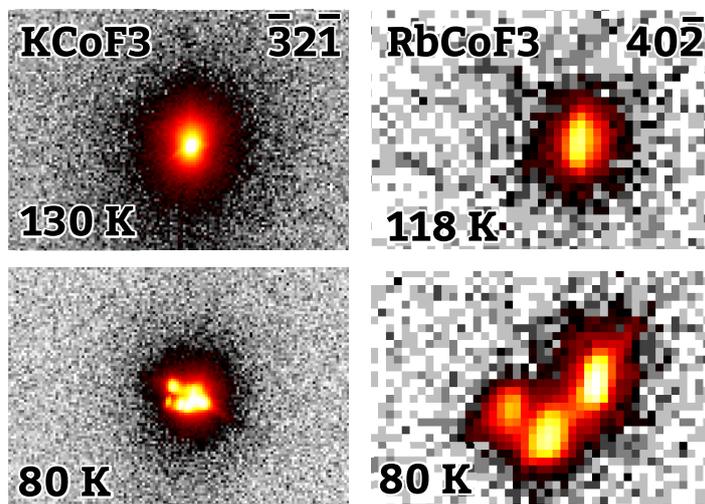


Figure 1: Splitting of the reflexes below Neel temperatures for KCoF_3 ($T_N = 114$ K) and RbCoF_3 ($T_N = 101$ K)

Obtained data is currently being processed. Results of the measurements will be used for the preparation of manuscripts.