Experimental report

11/02/2025

Proposal: CRG-3017 **Council:** 4/2023

Title: Low-energy spin-dynamics in the layered honeycomb spin = 1 nickelate materials BaNi2(XO4)2 (X = As, P)

Research area: Physics

This proposal is a new proposal

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Samples: BaNi2P2O8
BaNi2As2O8

Instrument	Requested days	Allocated days	From	To
ORIENTEXPRESS	1	1	23/06/2023	24/06/2023
IN12	5	5	23/08/2023	28/08/2023

Abstract:

The abstract is in the scientific case pdf file.

Experimental report

Proposal **CRG-3017**

Instrument : IN12 + Orientexpress

Dates : 23/08/2023 to 28/08/2023

Low-energy spin-dynamics in the layered honeycomb spin = 1 nickelate materials $BaNi_2(XO_4)_2$ (X = As, P)

In this experiment, we have reinvestigated the spin-dynamics in the layered honeycomb spin = 1 nickelate system $BaNi_2P_2O_8$ by means of inelastic neutron scattering on the triple-axis spectrometer IN12. After having aligned the crystal on Orientexpress within the *(a, b)* horizontal plane, we have performed Q-constant energy scans within the (H, K, 0) plane (Fig. 1) to map out the spin-dynamics in this compound.

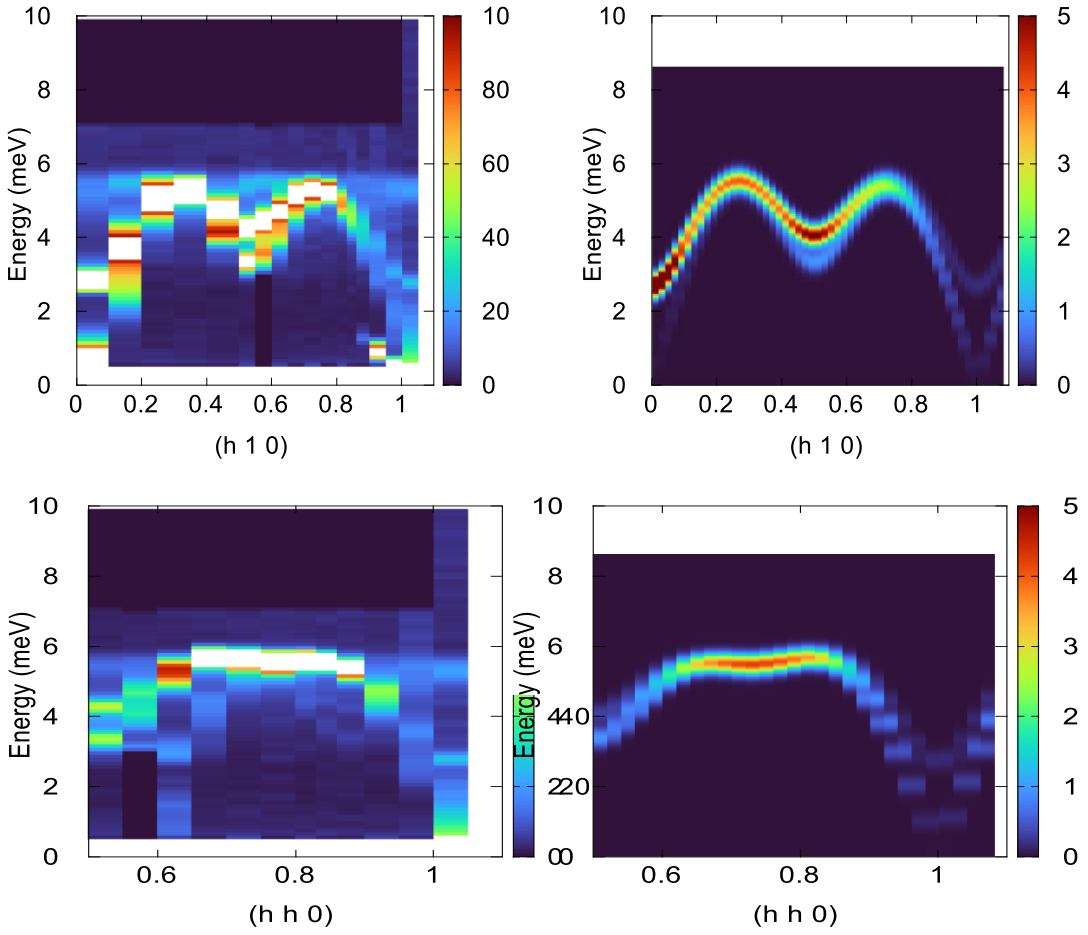
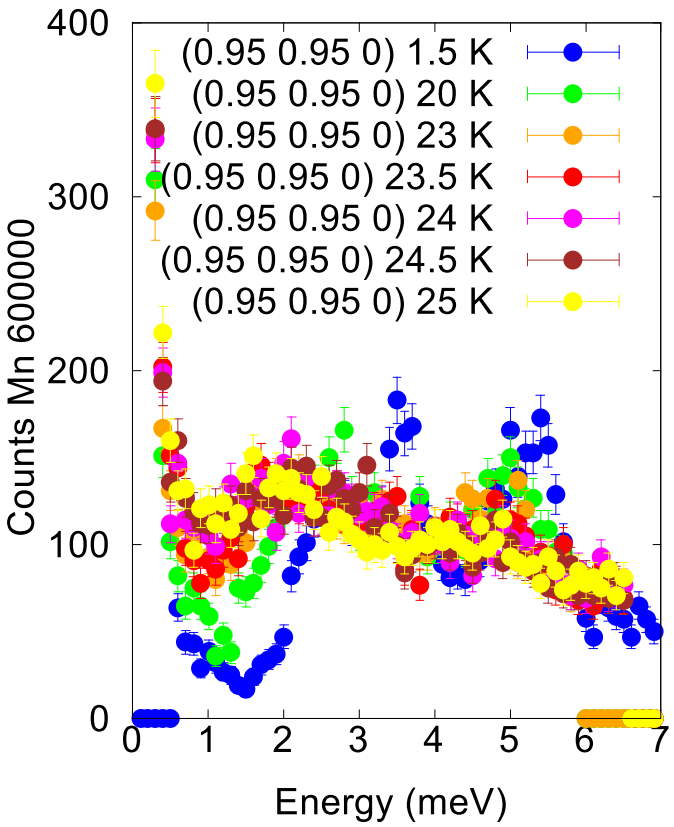


Fig 1: Experimental spin-dynamics (left) of $BaNi_2P_2O_8$ within the (h 1 0) and (h h 0) directions. LSTW calculations (right) using a J1-J2-J3 model.

Experimental dispersion maps are well explained using linear spin-wave theory (LSTW) by considering a J1 – J2 – J3 model with single ion anisotropy.

We have also investigated the temperature evolution of the optical gap present in this system in view of better understanding previous theoretical predictions of a possible Berezinski-Kosterlitz-Thouless (BKT) transition in this compound.



Understanding and interpretation of these results are still ongoing and would possibly require additional beamtime on IN12.