Experimental report

04/05/2022

Proposal: 5-31-2830 **Council:** 10/2020

Title: Magnetic ground states in layered metamagnets - towards understandingbroadband electromagnetic radiation absorption

Research area: Physics

This proposal is a new proposal

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Samples: $Co(NO_3)_2 \cdot 2H_2O$
$Cu_3Nd(SeO_3)_2O_2X$ (X = Br and Cl)

Instrument	Requested days	Allocated days	From	To
D1B	2	1	12/06/2021	13/06/2021

Abstract:

An extremely broadband electromagnetic radiation absorption has been recently reported in layered metamagnets. This remarkable phenomenon takes place when the system undergoes a first-order transition from antiferromagnetic ground state into ferro/ferri-magnetic state, which is triggered by the magnetic field. The tremendous frequency width of the absorption appears to be driven by a combination of a number of intertwining mechanisms that complement each other, yet, the exact physical explanation is still unclear. Here we propose to study ground states of several new layered metamagnetic materials that will provide an important new information to answering this intriguing question.

Powder neutron diffraction measurements were performed on layered metamagnetic materials $Cu_3Nd(SeO_3)_2O_2X$, X =Br, Cl. Measurements were conducted at several temperatures above and below the magnetic transition $T_N \sim 35$ K. In the paramagnetic phase, i.e., at 40 K, the diffraction patterns for Br compound comply with the crystal-structure model, whereas for Cl compound we find some additional reflections, which might be due to non-magnetic impurity. At base temperature, i.e., at 1.7 K, additional reflections emerge for both compounds. These reflections are clearly magnetic, as they correspond to the (0 0 ½) magnetic wave vector, implying antiferromagnetic coupling between the magnetic layers. Detailed analysis of the magnetic structure is still in progress.