Experimental report

15/09/2019

Proposal: **4-01-1617** **Council:** 4/2019

Title: Low-energy “clustered”magnetic excitations in Cu3Nb2O8?

Research area: Physics

This proposal is a new proposal

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Samples: Cu3Nb2O8

Instrument	Requested days	Allocated days	From	To
IN5	5	5	04/09/2019	09/09/2019

Abstract:

We have characterised the magnetic fluctuations in Cu3Nb2O8 using powders and single crystals. We have observed two disparate modes with one ~6-8 meV and the second ~27 meV. It is difficult to understand these two bands consistently within a model of Cu2+ spins, however they can be understood in terms of clusters of S=1/2 spins. In collaboration with our theoretical collaborators at University College London we have developed a model for this. However, to complete this we need a measurement of the low-energy spin fluctuations to establish anisotropy parameters in the spin wave Hamiltonian. Because of the low symmetry of the crystal structure, a spectrometer with position sensitive detectors is required for measurements along all three reciprocal lattice directions. This proposal requests 5 days on IN5 to complete this study and to investigate possible future work involving a magnetic field.

The goal of the experiment was to measure the low-energy magnons in Cu3Nb2O8. This is system is triclinic and incommensurate along all three crystallographic directions, therefore making triple-axis measurements difficult. To get a full magnon dispersion to compare with theory, position sensitive detectors on a chopper spectrometer are required.

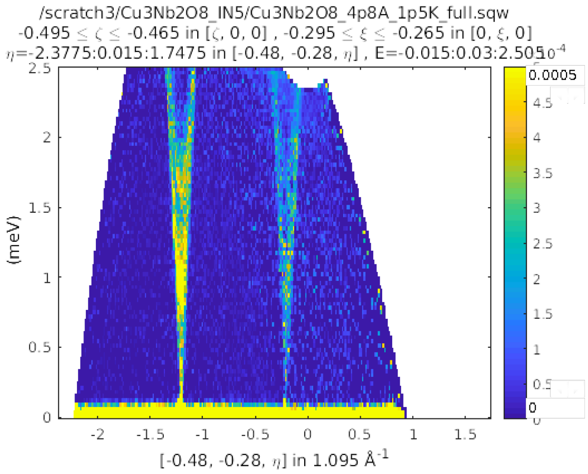

Figure 1: Our previous measurements on IN5 (taking ~36 hours). We propose to use this configuration in a field to search for directional anisotropic spin waves.

The experiment was successful in achieving this goal with two wavelengths of 2.8 and 4.8 Angstroms used. Example results are shown. We are now pursuing an RPA model apply bond operators to understand the spin waves and also to obtain exchange parameters.

This work will also be combined with our high energy MERLIN data to obtain a complete model of the excitations.