Magnetic Moment Fragmentation in Nd_2ScNbO_7

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The spin ice state in rare earth pyrochlores has been an object of study for decades due to the Pauling residual entropy observed at low temperatures. The mixture of two-in, two-out spins provides a way to observe a phenomenon known as moment fragmentation - the excitations act like magnetic monopoles.[1] There is another way to observe moment fragmentation by investigating pyrochlores that have dipole-octopolar crystal field states such as those containing Nd^{3+}. Unfortunately, cubic pyrochlores such as $Nd_2Ti_2O_7$ do not exist because of the mismatch between the Nd^{3+} and Ti^{4+} sites. However, cubic mixed B-site pyrochlores, such as Nd_2ScNbO_7 (which has Sc^{3+} and Nb^{5+} instead of Ti^{4+}), can be prepared and large single crystals can be grown via the floating zone image furnace method.[2] Our group has recently been successful in the synthesis of a series of A_2ScNbO_7 pyrochlores (A = Pr, Nd, Sm –Dy) under ambient pressure. In this presentation, the idea of moment fragmentation will be introduced, and how can be studied in Nd_2ScNbO_7.[3]

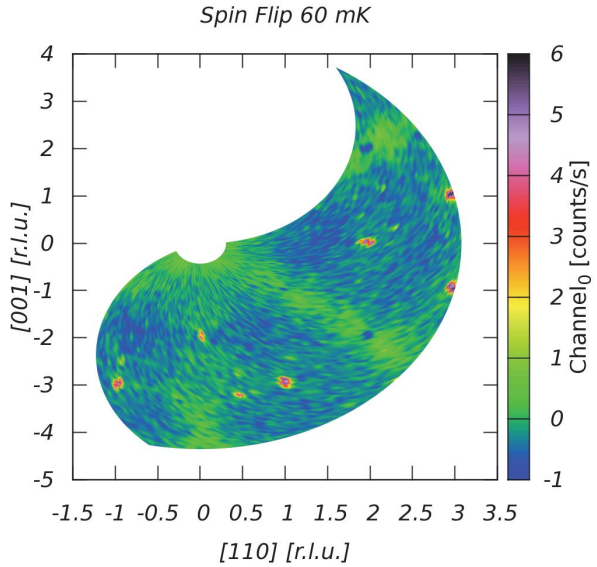

Figure. Slip flip polarized neutron scattering data on Nd_2ScNbO_7 at T = 60 mK (from the DNS). The coexistence of diffuse spin ice scattering and magnetic Bragg peaks points towards magnetic fragmentation at low temperatures.

References

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