Experimental report

18/02/2022

Proposal: 5-41-1155 **Council:** 4/2021

Title: Anti-ferromagnetic topological insulator candidate MnSb4Te7.

Research area: Physics

This proposal is a new proposal

Main proposer: Jian Rui SOH

Experimental team: Bachir OULADDIAF
Jian Rui SOH
Siobhan TOBIN

Local contacts: Bachir OULADDIAF

Samples: MnSb4Te7

Instrument	Requested days	Allocated days	From	To
D10	8	7	24/08/2021	31/08/2021

Abstract:

This proposal relates to the rapidly-expanding field of topological materials, specifically the search for materials where the topological fermions can be controlled by the magnetic order. Very recently, the layered antiferromagnet (AFM) MnSb4Te7 was proposed as such a system, where the magnetic order can determine if the material is a topological insulator or a Weyl semimetal. We wish perform careful single crystal diffraction measurements of the magnetic structure of MnSb4Te7 as a function of temperature and field. The results will establish whether or not the topological fermions in MnSb4Te7 are coupled to the Mn spin configuration.

Proposal number 5-41-1155

Anti-ferromagnetic topological insulator candidate MnSb4Te7.

Jian-Rui SOH, Siobhan TOBIN, Bachir OULADDIAF and Andrew Timothy BOOTHROYD

Abstract

This proposal relates to the rapidly-expanding field of topological materials, specifically the search for materials where the topological fermions can be controlled by the magnetic order. Very recently, the layered antiferromagnet (AFM) MnSb4Te7 was proposed as such a system, where the magnetic order can determine if the material is a topological insulator or a Weyl semimetal. We wish perform careful single crystal diffraction measurements of the magnetic structure of MnSb4Te7 as a function of temperature and field. The results will establish whether or not the topological fermions in MnSb4Te7 are coupled to the Mn spin configuration.

Experiment

We performed measurements of the integrated intensities of several Bragg peaks at T = 2 K to identify the ground state magnetic structure of the Mn sublattice. We also performed temperature sweeps from 2 K to 30 K of a series of magnetic reflections.

Results

We find that the anomalies in the magnetization of MnSb4Te7 at T = 6 K can be attributed to magnetic field induced spin flip transitions. At T = 2 K, we find that the hysteresis loops open up. The ground state magnetic order of the Mn sublattice is an *A*-type AFM with Mn moments along the crystal *c* axis.

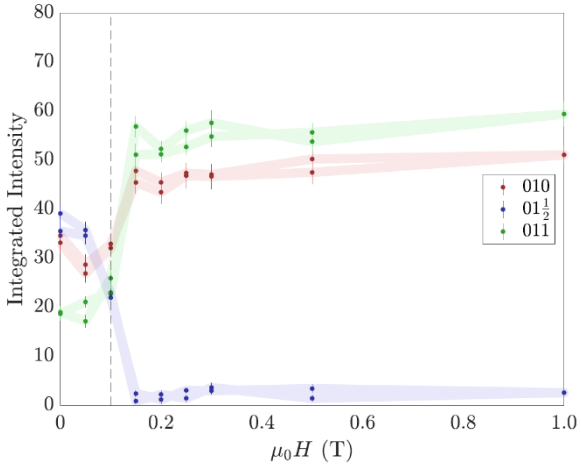

Figure 1. Field dependence of the several Bragg reflections as a function of field at T = 6 K.