Experimental report

15/09/2023

Proposal: 5-54-394 **Council:** 10/2022

Title: Magnetic structure of Mn3Ga thin film by unpolarised neutron with D10and spherical polarimetry with D3

Research area: Physics

This proposal is a new proposal

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Samples: Mn3Ga thin film

Instrument	Requested days	Allocated days	From	To
D10	7	7	04/09/2023	11/09/2023
D3 CPA	6	13	29/06/2023 22/08/2023	05/07/2023 28/08/2023

Abstract:

Hexagonal Mn3Ga thin film are promising for antiferromagnetic spintronics. The determination of its magnetic structure is important for the fundamental understanding as well as for device application. However, the study of Mn3Ga is hampered by the lack of single crystal and high-quality thin film. Recently we achieved high quality epitaxial growth of Mn3Ga on semiconductor substrate. We propose to study the crystal and magnetic structure by a combined unpolarised neutron diffraction and spherical neutron polarimetry. D10+ will be employed for verifying previous neutron powder diffraction. Spherical neutron polarimetry with D3 will be carried out for a unique magnetic structure determination, out of the four symmetry allowed candidate structures.

Magnetic structure of Mn_3Ga thin film by D10 and D3

Experiment at D10

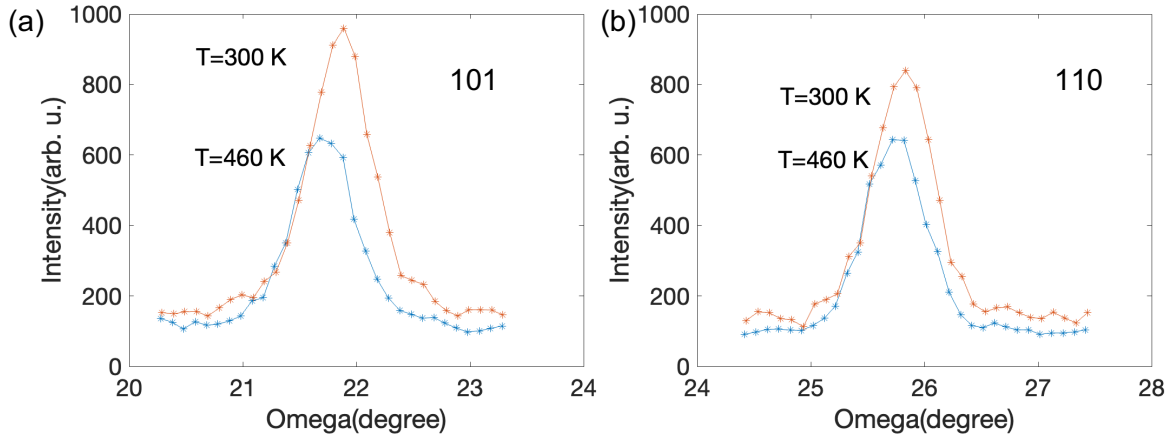

Figure1. neutron diffraction at room temperature and above magnetic ordering temperature for 101 and 110 reflection of Mn_3Ga thin film measured at D10+.

We studied the thin film sample at 300 K and 460 K. we covered a wide range of reflections in reciprocal space, in total 22 reflections at each temperatures. Figure 1 show two of the reflections below and above the phase transition temperature. Data analysis is under way.

Experiment at D3

We encountered a technical problem with the instrument, due to one of the guiding field. The malfunction has prevented us from properly analyse the data acquired at D3. The issue is solved now. We are applying for a continuation for the D3 part.