Experimental report

09/02/2016

Proposal: 5-41-828 **Council:** 4/2015

Title: Magnetic structure of CePtIn4

Research area: Materials

This proposal is a new proposal

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Samples: CePtIn4

Instrument	Requested days	Allocated days	From	To
D9	8	8	09/11/2015	17/11/2015

Abstract:

We propose a study of magnetic structures in novel CePtIn4 which extends the family of indium rich cerium ternary compounds. CePtIn4 is one of the RTIn4 compounds (R=Ce, Eu, T= Co, Ni, Pt, Pd) adopting the orthorhombic YNiAl4-type structure (Cmcm) with rather prolongated b-axis. Compounds from this group are in focus due to its potential use in thermoelectric refrigeration [1] or posibly cylindrical Fermi surface (resulting from the prolongated b-axis).
Recently, we succeed in preparation of single crystal novel compound CePtIn4 and characterized it by x-ray diffraction and measurement of bulk properties. The compound orders antiferromagnetically below 2.3K, having an order-to-order transition at 1K. Application of magnetic field below the ordering transition leads to appearance of the field induced transition in low fields, most notably for the field applied along the b-axis.
The goal of the proposed experiment is to clarify the magnetic structure at the miscroscopical level, potentially sheding light on the ordering within the whole (Ce, Eu)TIn4 group of compounds (showing similar bulk properties at low temperatures).

Preliminary report on

Magnetic structure of $CePtIn_4$

Recently, we succeed in preparation of a $CePtIn_4$ single crystal and characterized it by x-ray diffraction and measurement of bulk properties.The compound orders antiferromagnetically at ~2.3K, having an order-to-order transition at 1K. Application of magnetic field below the ordering transition leads to appearance of the field induced transition in low fields, most notably for the field applied along the b-axis.

Our goal at ILL was to to clarify the magnetic structure at the miscroscopic level, potentially shedding light on the ordering within the whole (Ce, Eu)$T$$In_4$ group of compounds.

The initial investigation confirms the good crystallinity of the investigated sample as well as the structure obtained by x-ray single crystal diffraction. The crystallographic information was significantly improved by acquiring 390 reflections (191 independent) in paramagnetic range which allows improvement of structural model (after absorption).

The identification of the magnetic symmetry (propagation vector) in the intermediate region 1.0 K<T<2.3 K was rather unsuccessful – the reciprocal space was carefully examined yet no intensity of purely magnetic origin was found. We attribute this to rather elevated temperatures on the sample (T~1.9K, while the ordering temperature is 2.3K).

With the upgrade of pump on CYCPLOS a test experiment was done with T_{min}=1.5K, clearly showing additional magnetic reflections with presumably general propagation vector, see Fig 1. The evaluation of the propagation vector is undergoing.

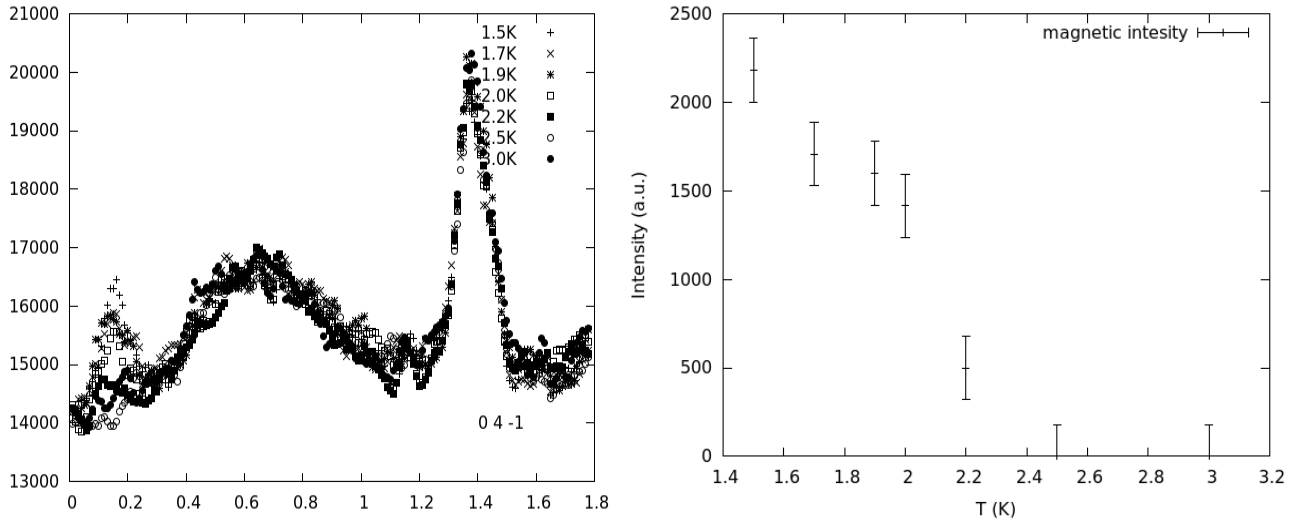

Fig 1: (left) Selected cut from the Laue pattern at different temperatures showing a magnetic satellite and nuclear 0 4 -1 reflection.

(right) Temperature dependence of the magnetic satellite intensity.