ESRF	**Experiment title:** Studies of magneto elastic effects in the $Sm_mM_nIn_{(3m+2n)}$ (M=Rh, Ir;m=1,2 and n=0,1) intermetallic compounds using resonant and non-resonant x-ray scattering	**Experiment number**: HE-2048
Beamline: ID20	**Date of experiment**: from: 02/11/2005 to: 08/11/2005	**Date of report**: 01/09/2006
Shifts: 18	**Local contact(s)**: Claudio Mazzoli	*Received at ESRF:*

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Report:

Applied magnetic fields of up to 10T have small effects on the antiferromagnetic order of Sm_2IrIn_8 revealed by X-ray magnetic scattering below T_N = 14.3K. Whilst the magnetic wave vector τ = (1/2, 0, 0) and the transition temperature remain unchanged the direction of Sm moments lying in the tetragonal *ab* plane change slightly after field cooling of the sample.

In a recent work we investigated the magnetic structure of Sm_2IrIn_8 by magnetic X-ray non-resonant and resonant diffraction with polarization analysis. The experiments were performed at the ID-20 beamline at the European Synchrotron Radiation Facility (ESRF), using the π incident polarization beam. Above 14.5 K, we observed Bragg peaks consistent with a tetragonal crystal structure and any magnetic peak was detected. Below T_N = 14.2 K, additional ((2n+1)/2, k, l) reflections were observed (with n, k, l integers). Such peaks were dramatically enhanced at the Sm L_{II} and L_{III} edges, at E= 7313 and 6716 eV respectively, due to resonant effects. All these properties of the superstructure reflections are consistent with an antiferromagnetic (AFM) structure with a wave vector τ = (1/2 0 0). The direction of the magnetic moment was determined as lying in the *ab* plane and rotated by about 18 degrees by performing an azimuthal dependence at the dipolar resonant peak. In this work we present the results of an applied magnetic field along the *b*-crystallographic axis of this tetragonal compound. The sample was installed in the cryomagnet of the ID20 beamline at the ESRF allowing the simultaneous study of its magnetic structure through resonant X-ray magnetic scattering at the L_{II} edge. Applied magnetic fields up to 10 T were not able to create any new feature in its phase diagram indicating the strong stability of the anisotropy of the Sm atoms in this compound below the ordering temperature. A field cooling of the sample with an applied magnetic field of 10 T had as effect the creation of a mono-domain distribution of the previously observed twined domains. After the field cooling it was also determined that the Sm moment direction was rotated from an observed value of 18 degrees to around 40 degrees from the *a*-crystallographic axis. Further studies are planned to pursue a detailed study of the magnetic properties of this compound.

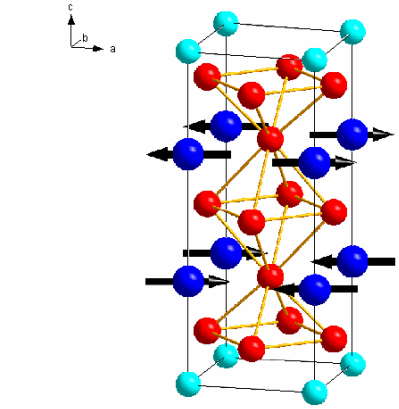

Fig. 1. Magnetic structure of Sm_2IrIn_8. The Sm magnetic moment lyes in the *ab*-plane at an angle of around 18 degrees from the *a*-axis.

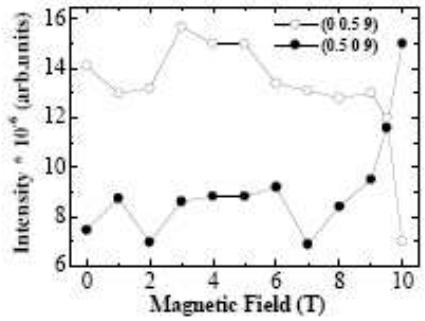

Fig. 2. Evolution of magnetic domains as a function of the applied magnetic field along the *b*-axis.

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[2] P. G. Pagliuso, J. D. Thompson, M. F. Hundley, J. L. Sarrao, and Z. Fisk, , Phys. Rev. B **63**, 054426 (2001).
[3] C. Giles, R. Lora-Serrano, C. Adriano, P.G. Pagliuso, J. C. Lang, G. Srajer, F. de Bergevin, C. Mazzoli, and L. Paolasini, in preparation (2006).