Incommensurate magnetic structure of $EuPtIn_4$

P. J. Bereciartua[1], J. R. L. Mardegan[1], S. Francoual[1], P. Rosa[2], J. Rodríguez-Carvajal[3], F.-E. Picca[4], L. S. I. Veiga[1], M. Saleta[2], J. Strempfer[1], P. Pagliuso[2], E. Granado[2]

[1]*Deutsches Elektronen-Synchrotron (DESY), 22607 Hamburg, Germany*

[2]*Instituto de Física "Gleb Wataghin", Universidade Estadual de Campinas,*

13083-859 Campinas, São Paulo, Brazil

[3]*Institut Laue-Langevin (ILL), 38042 Grenoble, France*

[4]*SOLEIL synchrotron, Saint-Aubin, BP 48, 91192 Gif-sur-Yvette, France*

pablo.bereciartua@desy.de

Zintl phases are ionic intermetallic compounds exhibiting a polyanionic network with covalent bonds. These compounds may present very different structures and they are also studied because of their physical and electronic properties [1, 2]. An interesting case is the compound EuPtIn4, which presents a phase transition from a paramagnetic to an antiferromagnetic structure below a Néel temperature of 13 K. In this compound, a spin-flop transition was also observed with the application of a high magnetic field along the *ac*-plane at low temperature. Due to the significant neutron absorption of Eu, the resonant X-ray magnetic scattering (RXMS) technique was employed to characterize the magnetic structure in $EuPtIn_4$, taking advantage of the strong enhancement of the magnetic signal obtained at the L_2 edge of Eu. The RXMS experiments were performed at beamline P09 of PETRA III, employing a double phase retarder for a full polarization analysis and a vertical 14 T cryomagnet [3]. The measurements confirm the phase transition previously observed and reveal an incommensurate antiferromagnetic structure with a propagation vector $\mathbf{k} = (½, ½, \gamma)$, with $\gamma = 0.4258$. The intensities of a set of reflections with indices $(½, n + ½, \gamma)$, being n an integer between 6 and 14, have been measured in the $\sigma\pi$' channel to characterize the magnetic structure in the ground state while full linear polarization analysis was used to infer the changes in high magnetic fields. Hereby, we will report on the magnetic structure of EuPtIn4 as solved using the equations for RXMS and the density matrix formalism. Although the magnetic structure was determined using the representation analysis, the superspace formalism was employed for the assignment of the magnetic superspace group, and the combination of both approaches leads to a complete characterization of the magnetic structure.

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