EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office using the **Electronic Report Submission Application:**

http://193.49.43.2:8080/smis/servlet/UserUtils?start

Reports supporting requests for additional beam time

Reports can now be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.

ESRF	**Experiment title:** RXS studies of low-carrier system CeP under high magnetic field	**Experiment number**: HE-2421
Beamline: ID 20	**Date of experiment**: from: 01/03/2007 to: 06/03/2007	**Date of report**: 30/08/2007
Shifts: 15	**Local contact(s)**: Valerio Scagnoli	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

PAOLASINI Luigi
European Synchrotron Radiation Facility, 6 Rue Jules Horowitz, BP220, 38043 Grenoble Cedex, France

KOHGI Masahumi
Tokyo University of Fisheries, Kounan, Minato, Tokyo 108, Japan

KUWAHARA Keitaro
Tokyo Metropolitan University, Minami-Ohsawa 1-1, Hachioji, Tokyo 192-03, Japan

IWASA Kazuaki
University of Tohoku, Katahira, 2-1-1 Aoba-ku, Sendai 980-77, Japan

The Ce monopnictide compounds CeX (X=P,As,Sb,Bi) with the NaCl-type structure exhibit unusual transport and magnetic properties, and have been extensively studied with neutron and synchrotron scattering techniques [1]. They have extremely low carrier densities, and the magnetic properties are determined by the single electron of the 4f orbital of Ce^{3+} ion.

The aim of the experimentwas to characterize the different propagation vectors at different magnetic field up to 10T by the energy dependence at Ce L-edges as a function of the photon polarization.

Measurements were taken at the Ce L3 edge which was expected to show the strongest signal.
During the experiment the energy dependence of the scattering intensity was measured as a function of the outgoing photon polarization (in and out of plane, $\sigma-\pi$ and $\sigma-\sigma$ respectively) at different temperature and in the different magnetic phases.
Fig.1 shows the energy dependence of the antiferromagnetic reflection (1 0 0). This phase is visible below 10K with a magnetic field up to 1T. In the $\pi-\pi$ channel the signal is cover by the fluorescence background. However, in the $\pi-\sigma$ channel, thanks to the polarization crystal that greatly supresses the background, an antiferromagnetic signal is clearly visible.
Increasing the field new reflections with several satellites appear. Fig.2 shows the spectra, in the two polarization channels, of the (2 0 4/11) reflection. A nice signal is visible in both channels.
The signal in the $\pi-\pi$ channel has a double origin. First, the lattice modulation produced by the different size between the Ce paramagnetic ions and the ones which are carring a magnetic moment. Second, at resonance, the weak signal produced by the different Ce electronic distribution, is also present.
The two signals might also interfere with the so-called Templeton-Templeton scattering which however is supposed to be small.
This could be the origin of the signal measured in the rotated polarization channel $\pi-\sigma$. This signal is weaker than the one measure in the $\pi-\pi$ channel but stronger than the (100) antiferromagnetic reflection.

An extended study of these satellites reflection, which will require more beamtime, will give the possibility to determine quantitatively the different electronic structures of the Ce ions.

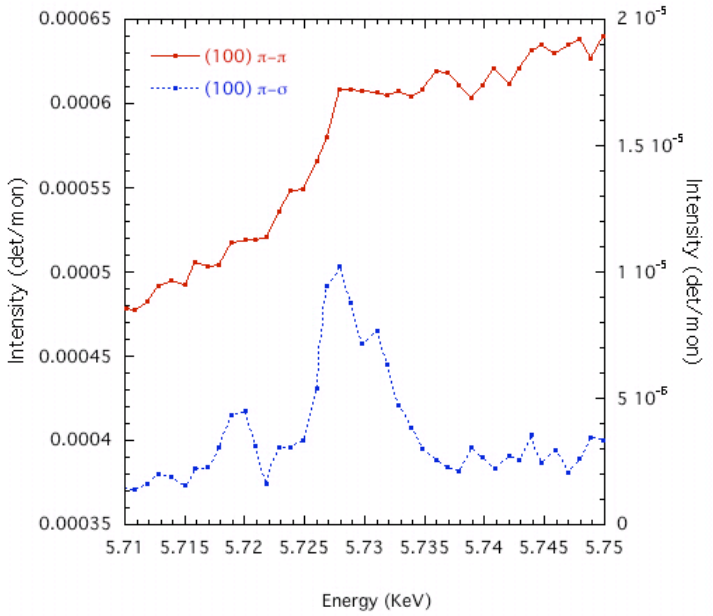

Fig.1 Energy dependence of the (1 0 0) antiferromagnetic reflection in the two polarization channels π–σ (dotted line) and π–π (continous line). Temperature is 2.7K and no magnetic field is applied.

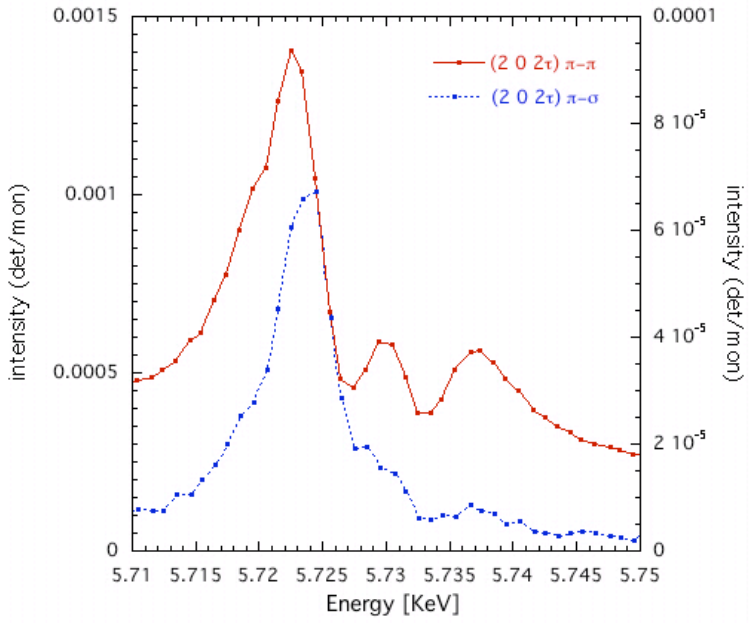

Fig.2 Energy dependence of the (2 0 2τ) reflection in the two polarization channels π–σ (dotted line) and π–π (continous line). Temperature is 2.7K and a magnetic field of 3T is applied.

[1] J. Rossat-Mignot *et al*, J. Magn. Magn. Mater., 52 (1985) 111