

**Experiment title:**

Spin polarons in EuO films epitaxially integrated with silicon and YSZ

**Experiment number:**

MA-3167

**Beamline:**

ID12

**Date of experiment:**

from: 21/09/2016 at 08:00 to: 27/09/2016 at 08:00

**Session cancelled due to technical problems on the beamline.****Date of report:**

21 October 2016

**Received at ESRF:**

25 October 2016

**Shifts: 18****Local contact(s):** Dr. Andrei Rogalev**Names and affiliations of applicants (experimentalists):**Vyacheslav Storchak<sup>1</sup>, Dmitry Averyanov<sup>1</sup>, Mikhail Platunov<sup>2</sup><sup>1</sup>National Research Center "Kurchatov Institute", Kurchatov Sq. 1, 123182 Moscow, Russia<sup>2</sup>Kirensky Institute of Physics, Akademgorodok 50, bld. 38, 660036 Krasnoyarsk, Russia**Report:**

We note that the experimental session has been cancelled due to regular technical problems on the beamline with the PSS system. Therefore, we were able to carry out only a very little part of the experimental program. In particular, we managed to measure XANES spectra and partially an XMCD signal from the Eu  $L_3$ -edge in only one sample at only one temperature; neither XANES nor XMCD spectra of the Eu  $L_2$ -edge and Gd  $L_{3,2}$ -edges have been measured. However, the results are very encouraging and we hope to carry out the full experimental program next year.

Element-specific measurements have been carried out using XANES and XMCD techniques (in a magnetic field up to 17 T) at the Eu- $L_3$  absorption edge. The APPLE-II undulator and a Si(111) double crystal monochromator were used to collect the spectra at the respective energies. The XANES spectra at the Eu- $L_3$  absorption edge were recorded using the total fluorescence yield mode in a backscattering geometry. XANES scans were recorded with opposite helicities of the incoming circularly polarized X-ray beam (at 15 degrees grazing incidence with respect to the film surface) with a magnetic field set parallel to the x-ray wavevector. This direct difference gives an XMCD spectrum.

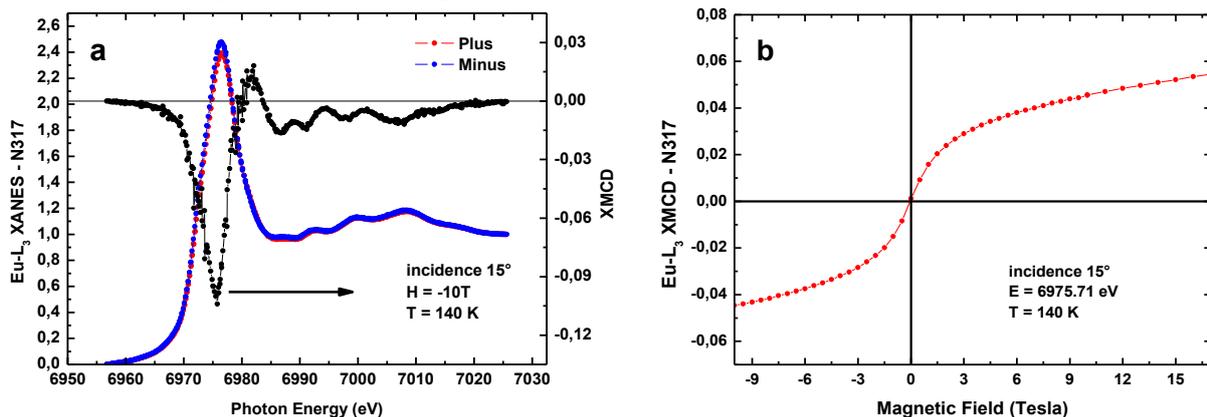


Figure 1. (a) Normalized XANES and XMCD spectra in 3% Gd-doped EuO/YSZ recorded at the Eu  $L_3$ -edge at 140 K and  $H = -10$  T and (b) the element-specific magnetization curve measured at 6.975 keV.

Figures 1(a) and 1(b) show the XANES/XMCD spectra and the field dependence of the XMCD signal at the Eu  $L_3$ -edge at 140 K, respectively. The magnetization curve demonstrates the superposition of the ferromagnetic and the paramagnetic signals in the paramagnetic state (SQUID-measured  $T_c = 125.5$  K). The ferromagnetic signal indicates the formation of magnetic polarons localized at the Gd atom.