EUROPEAN **S**YNCHROTRON **R**ADIATION **F**ACILITY

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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:** XAS study of ferromagnetic nanoparticles	**Experiment number**: 25 01 632
Beamline: BM25A	**Date of experiment**: from: 09 March 2007 to: 13 March 2007	**Date of report**: 30-9-07
Shifts: 12	**Local contact(s)**: **Dra. Ana CORDON RODRIGUEZ**	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Dr. Carlos PRIETO
Ms. Eva CESPEDES
Dr. Felix JIMENEZ-VILLACORTA
Dr. Mercedes VILA

Report:

Granular magnetic systems formed by magnetic particles embedded in a non-magnetic insulator matrix, as well as metallic / insulator multilayers are now the subject of an increased interest for their applications in several fields of nanotechnology. These nanosystems present striking features associated with phenomena at the nanoscale, such as enhanced coercivity, magnetoresistance by means of tunnel junction effects, etc…

This experiment is one of the main parts of the study of granular multilayered systems formed by sequential deposition of Fe / Si_3N_4 bilayers.

X-ray absorption techniques provide a very useful tool to help in the effort of a complete understanding of the peculiar features of such systems. The local coordination of Fe atoms, especially those placed at the interface regions, will impinge directly in the magnetic and magnetotransport properties of these multilayered systems.

The experiment, performed at the BM25A beamline in the Fe K-edge energies using the fluoerescence yield detection mode, was succesful and have brought very interesting results that will be submitted soon to an international journal.

After the adequate data treatment, and accumulation of spectra in order to improve statistics, it has been observed (see Fourier transforms and filtered EXAFS signal in the figures below)

that another phase, different from the metallic one, appears. This new phase, ascribed to a Fe-N local environment, increases as the Fe layer thickness decreases (and as the number of layers increases). For this reason, we can aseverate that the new phase belongs to the regions near the Fe / Si_3N_4 interfaces.

To support this idea, XANES measurements (not shown here for brevity) reveal a progressive evolution from the typical metallic Fe reference to a different one with a more complex structure that will be analyzed in detail further on.