

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.



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| | Experiment title: <i>Low-temperature spin-lattice coupling of orthorhombic $Eu_{1-x}Y_xMnO_3$</i> | Experiment number: 01-02-748 |
| Beamline: BM01A | Date of experiment: From 04/10/2009 at 08:00 to 07/10/2009 at 08:00 | Date of report: August 2010 |
| Shifts: | Local contact(s): D. CHERNYSHOV | <i>Received at ESRF:</i> |

Names and affiliations of applicants (* indicates experimentalists):

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Magnetolectric compounds have in the recent past attracted a lot of interest in the scientific community due to the coupling between electric polarization and magnetic order. Particularly, multiferroic materials, which exhibit ferromagnetism and ferroelectricity coupled together in the same thermodynamic phase, are of considerable interest due to their potential applicability in novel technological devices, opening the possibility to control spin transport electrically.

In this study we have performed Synchrotron x-ray diffraction experiments at the beamline BM01A (Swiss-Norwegian BeamLines) of multiferroic $Eu_{1-x}Y_xMnO_3$ ceramics. Diffraction data were collected using a wavelength of $\lambda=0.70\text{\AA}$ from a Si(111) double crystal monochromator and a MAR345 image plate detector. Measurements were made at temperatures between 5 K and 290 K by using a flow He cryostat.

This work has allowed us to study very accurately the temperature dependence of the structural parameters in orthorhombic $Eu_{1-x}Y_xMnO_3$ system at low temperatures. A significant magneto-elastic coupling is revealed by anomalies observed in lattice parameters at the magnetic phase transitions, apparent also in both Mn-O bond lengths and Mn-O1-Mn bond angle. These anomalies are experimental manifestation of a significant spin-phonon coupling in these materials in the low-temperature multiferroic regime.

Published as:

J. A. Moreira, A. Almeida, W. S. Ferreira, A. M. Pereira, J. P. Arujo, M. R. Chaves, M. M. R. Costa, V. A. Khomchenko, J. Kreisel, D. Chernychoy, S. M. F. Vilela, and P. B. Tavares

Strong magneto-elastic coupling in orthorhombic $Eu_{1-x}Y_xMnO_3$ manganite

<http://arxiv.org/abs/1005.4841> - *Phys. Rev.B* (accepted August 2010)