

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 via the User Portal:

<https://www.esrf.fr/misapps/SMISWebClient/protected/welcome.do>

Reports supporting requests for additional beam time

Reports can 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.



	Experiment title: Understanding spin-orbit-lattice coupling in Jahn-Teller distorted GeM ₂ O ₄ -type spinels	Experiment number: HC 931
Beamline: ID31	Date of experiment: from: 15 Nov 2013 to: 18 Nov 2013	Date of report: 22 Oct 2014
Shifts: 9	Local contact(s): Caroline Curfs	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): Matthew Suchomel* APS - Argonne National Laboratory, USA Phillip Barton, University California at Santa Barbara, USA Ram Seshadri, University California at Santa Barbara, USA Moureen Kemei, University California at Santa Barbara, USA		

Report:

This successful ID31 experiment used the beamline liquid Helium cryostat to examine structural distortions in a series of spinel oxide samples; including Mn₃O₄, and GeM₂O₄ (with M = Co, Ni, Fe).

As part of the complete structure-property understanding for these materials, the ESRF data were combined with powder diffraction measurements made at the APS beamline 11-BM, and also with physical property data (magnetic, dielectric permittivity, and thermoanalytical) measured at UCSB. These results were used in 2 separate publications in the journal Physical Review B. Please refer to the publications listed below for details (and figures) of the results.

We thank Andy Fitch and Caroline Curfs for providing assistance in using beamline ID31.

A few brief comments about experimental finding not included in the publications below. The "new" cryostat at ID31 perform brilliantly. However - beam heating of the powder samples at cryogenic temperatures (< 50 K) was a significant challenge, especially if the full flux of the ID31 (with all 3 gaps closed) at our experimental energy of ~ 29 keV (0.413731 A). Fortunately, we had a "standard" powder of CuFeO₂ which displays a well established clear structural transition at ~ 12 K. Using this sample (soon to be provided to ID31 staff as a reference material) we were able to determine the correct sample preparation methods and beam flux conditions (running with only one 1 closed gap!) that ensured a experimental real sample powder temperature approximating the display cryostat temperature reading. This can be an important consideration for many future low temperature cryostat experiments at ID31.

Publications incorporating ESRF, ID31 powder XRD data

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Kemei, M. C.; Harada, J. K.; Seshadri, R.; Suchomel, M. R. Structural change and phase coexistence upon magnetic ordering in the magnetodielectric spinel Mn₃O₄. Physical Review B 2014, 90, 064418.

Barton, P. T.; Kemei, M. C.; Gaultois, M. W.; Moffitt, S. L.; Darago, L. E.; Seshadri, R.; Suchomel, M. R.; Melot, B. C. Structural distortion below the Néel temperature in spinel GeCo₂O₄. Physical Review B 2014, 90, 064105.