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 via the User Portal:

https://wwws.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.

ESRF	**Experiment title:** Diffuse scattering in PMN relaxor as a function of external electric field	**Experiment number**: HC-1631
Beamline: BM01A	**Date of experiment**: from: 27.11.2014 to: 28.11.2014	**Date of report**:
Shifts: 3	**Local contact(s)**: Dmitry Chernyshov	*20.12.2014*

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Report:

Diffuse scattering data on $Pb(Mg_{1/3}Nb_{2/3})O_3$ (PMN) (100) and PMN (110) under applied electric field have been succsesfully collected during alocated beamtime (3 shifts). Crystals of PMN were prepared according to the following procedure:

- determination of a crystal orientation with a test diffraction experiment;
- sawing of a thin wafer along desired direction (in our case [100] and [110]);
- grinding of the wafer until it will have acquired a “pen-like” shape;
- polishing of prepared crystal down to 100μm size in thickness and several millimeters in length;
- etching of the crystal with HCl acid.

Diffraction experiments were carried out with using special in-situ cell (fig.1) modified for temperature range 300-500K. Mapping of reciprocal space has been done with pixel Pilatus-2M detector with 0.1^0 step.

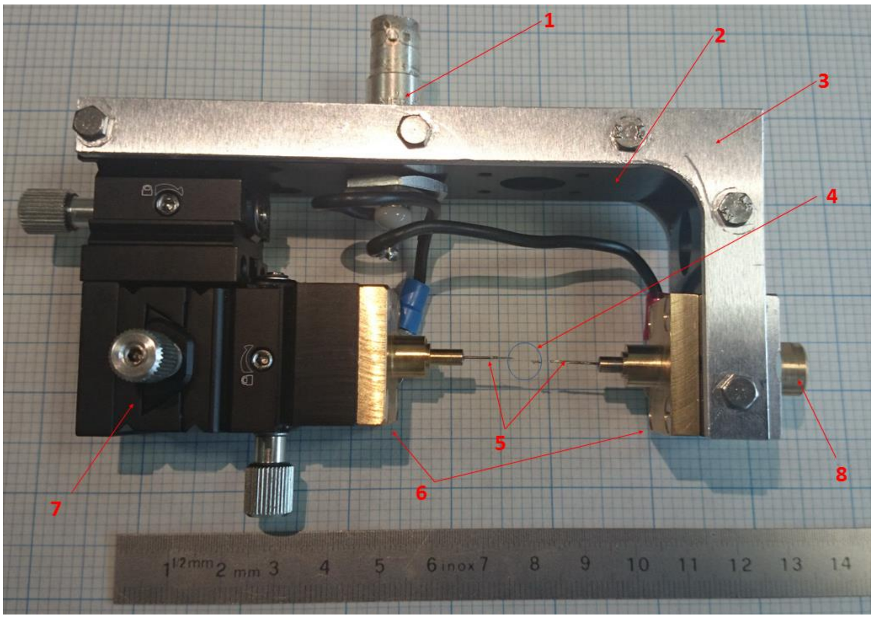

Figure 1. In-situ electric cell for diffraction experiments (SNBL BM01A).

First, the electric field was applied along [100] direction. Diffuse scattering intensity along directions parallel to <001> and <100> shows an isotropic suppression of intensity about 10% at 15kV/cm (fig.2) accompanied with an increase of Bragg intensity of (00-1) node (fig.3).

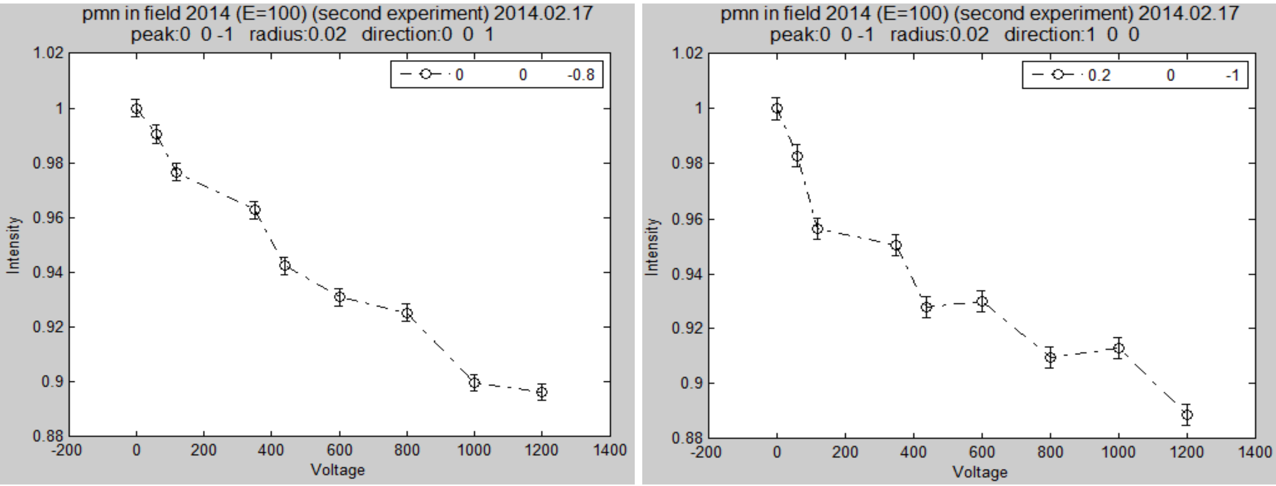

Figure 2. Relative intensity of integral intensity along <001> and <100> cubic directions. Electric field is applied along [100] cubic direction.

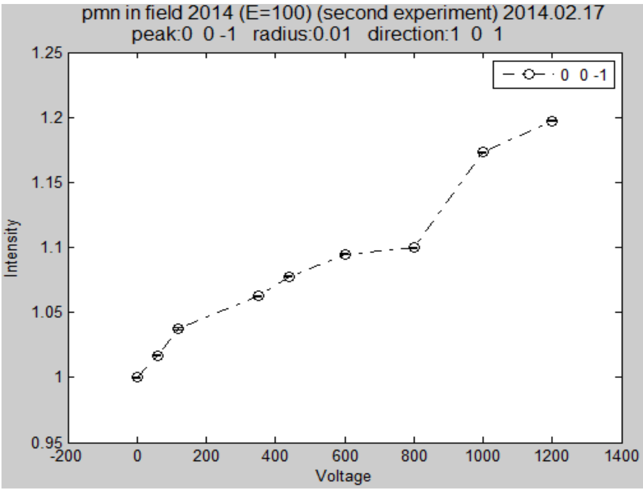

Figure 3. Integral intensity of Bragg (00-1). Electric field is applied along [100] cubic direction.

When the field was applied along [110] direction. Diffuse scattering intensity along directions parallel to <101> and <10-1> shows also nearly isotropic but much less expressed suppression of intensity only about 2% at 15kV/cm (fig.4).

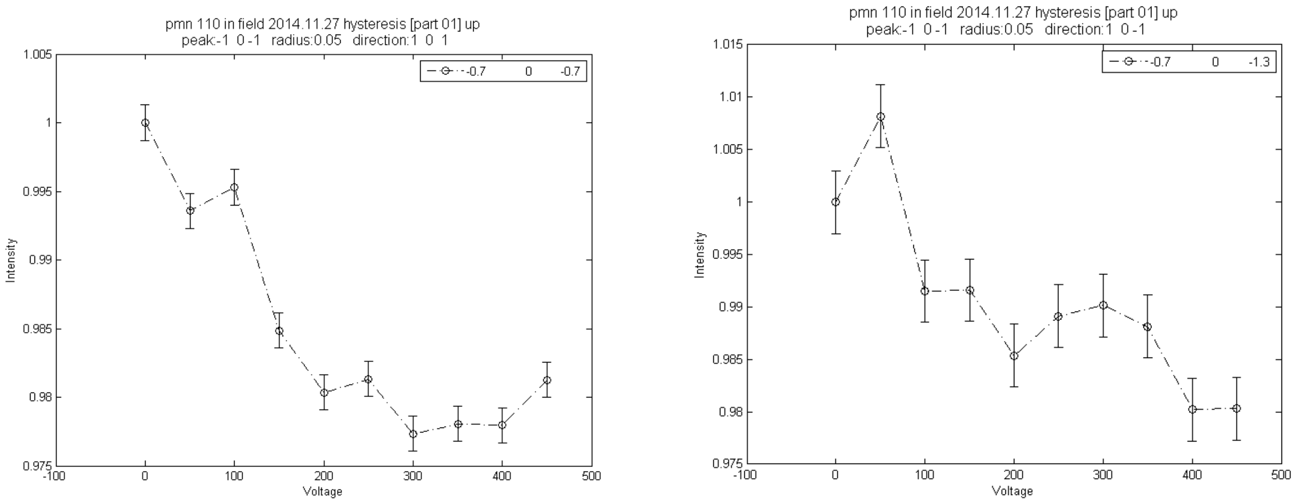

Figure 4. Relative intensity of integral intensity along <101> and <10-1> cubic directions. Electric field is applied along [110] cubic direction.

At variance with $Pb(Zn_{1/3}Nb_{2/3})O_3$ (PZN) relaxor where strong and highly anisotropic behaviour of diffuse scattering under field is reported [1], our data for PMN relaxor show much less change under field. We have recently done at dielectric measurements under field, the data will be analysed together with diffraction results to get more inside of the microscopic nature of relaxor behaviour.

[1] Guangyong Xu, Z. Zhong, Y.Bing, Z.-G. Ye and G.Shirane // Nature Materials, Vol.5, (2006)