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ESRF

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: Kinetics at the Ferroelectric/Paraelectric phase transition in Triglycine Sulphate**	**Experiment number**: HS3037
Beamline:	**Date of experiment**: from: June 21, 2006 to: June 27, 2006	**Date of report**:
Shifts:	**Local contact(s)**: Thierry D'Almeida	*Received at ESRF:*

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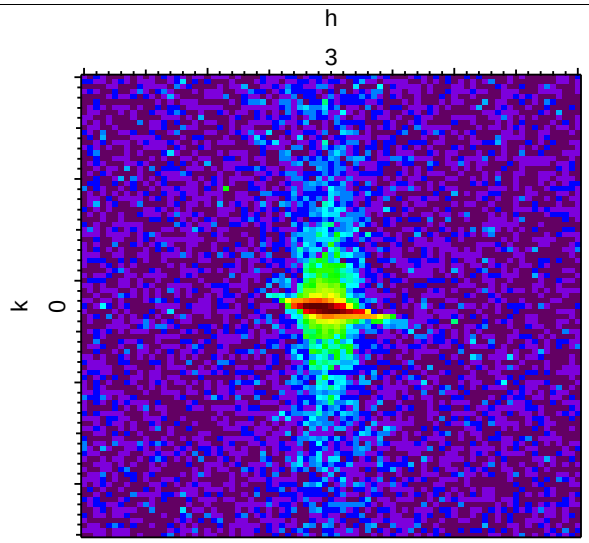
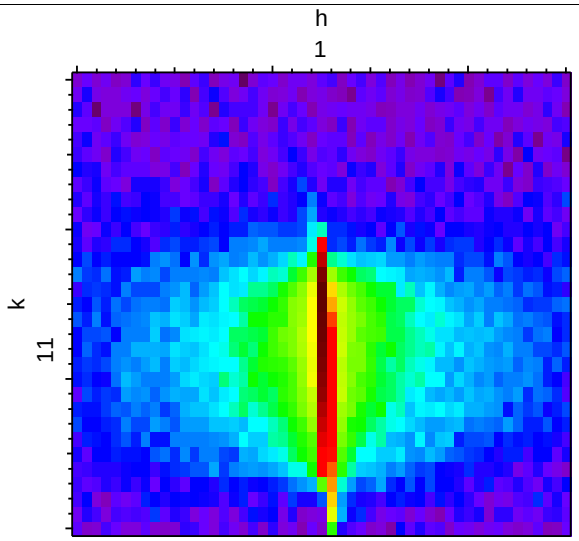
Report:

The aim of these experiments (HS-3037) was to study the real-time behaviour of the critical x-ray scattering in triglycine sulphate (TGS) during the application of dynamic electric fields at various temperatures close to the ferroelectric/paraelectric phase transition. Using the triple crystal diffraction instrument available at ID15A, several maps of reciprocal space were made as a function of temperature and static field. Regions of interest were then identified for further study.

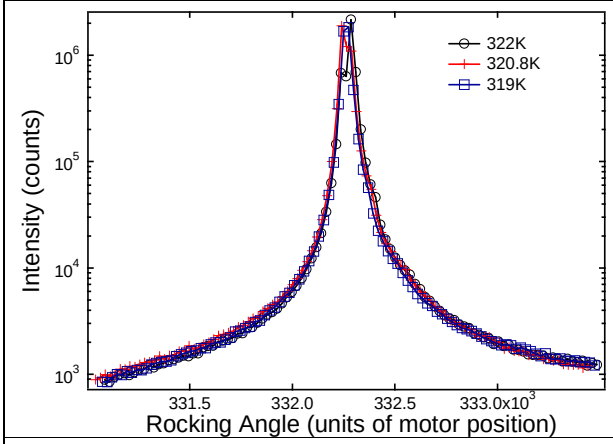


Mesh scan around the (300) Bragg peak, intensity on a log scale.

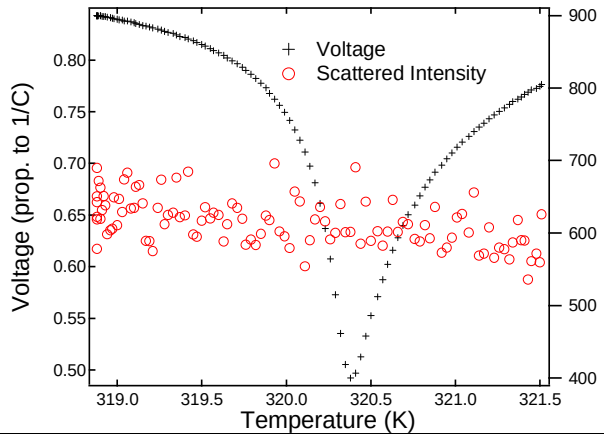


Mesh scan around the (1 11 0) Bragg peak, intensity on a log scale.

The above Figures show the diffuse scattering around two selected Bragg peaks at room temperature, the (060) and (004) peaks were also measured during this process. Selected transverse and longitudinal scans were then performed around these peaks as a function of temperature.



Omega scans through the (300) at various temperatures close to T_C.



Temperature ramp through the transition temperature while sitting at (0 6+Δk 0) in reciprocal space.

Initial analysis seems to suggest an absence of critical scattering, contridictory to previous measurements [1]. The above Figures clearly show no temperatrue dependence in the scattered intensity while the sample has passed through its second order phase transition. This is an odd result considering both theoretical studies and previous experimental measurements have predicted and observed critical scattering to occur within this material. Further analysis of the results is continuing.

Static electric fields were also applied to the sample in order to observe expected suppression of the critical scattering. These results also suggest a lack of critical scattering. Custom made electronics designed to be integrated onto the ID15A data acquisition system to allow for time-resolved stroboscopic data acquisitioin was tested succesfuly, this system is now available to us for future experiments using the triple crystal diffractometer.

Several difficulties were encountered with the operation of the instrument which compounded problems and wasted much time. The most dramatic of these problems was an apparent lack of alignment which wasted up to four shifts during sample orientation.

Unfortunately we did not achieve our initial goal of observing the time-resolved critical scattering during dynamic electric fields. The critical scattering expected in TGS was not visable using high-energy x-rays. This result however raises interesting questions as to the relationship between the corelation length of the critical fluctuations in TGS and the wavelength of the probing radiation. Critical scattering in TGS is clearly visable at lower x-ray energies as observed by Fuji and Yamada [1]. These results therefore raise the possibility of variable wavelength studies in the future. Much of the data obtained during these experiments will still be of great use to the primary proposer, John Daniels, as it provides complementary measurements to that already obtained for presentation within his PhD thesis.

1. Fujii, Y. and Y. Yamada, *X-ray critical scattering in ferroelectric tri-glycine sulphate.* Journal of the Physical Society of Japan, 1971. 30(6): p. 1676-85.