EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

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 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:** Effect of the electric depinning of an incommensurate CDW on the phonon spectrum probed by inelastic X-ray	**Experiment number**: HC-4045
Beamline:	**Date of experiment**: from: 21.11.2018 to: 27.11.2018	**Date of report**: 21.10.2020
Shifts:	**Local contact(s)**: Alexei BOSAK	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

The following measurements have been performed during the beamtime:

- Diffuse scattering (DS) in $TbTe_3$, $GdTe_3$ and $ErTe_3$ as a function of temperature
- Diffuse scattering in $GdTe_3$ as a function of applied current at differente temperatures.
- Inelastic scattering (IXS) in $TbTe_3$ as a function of applied current at room temperature

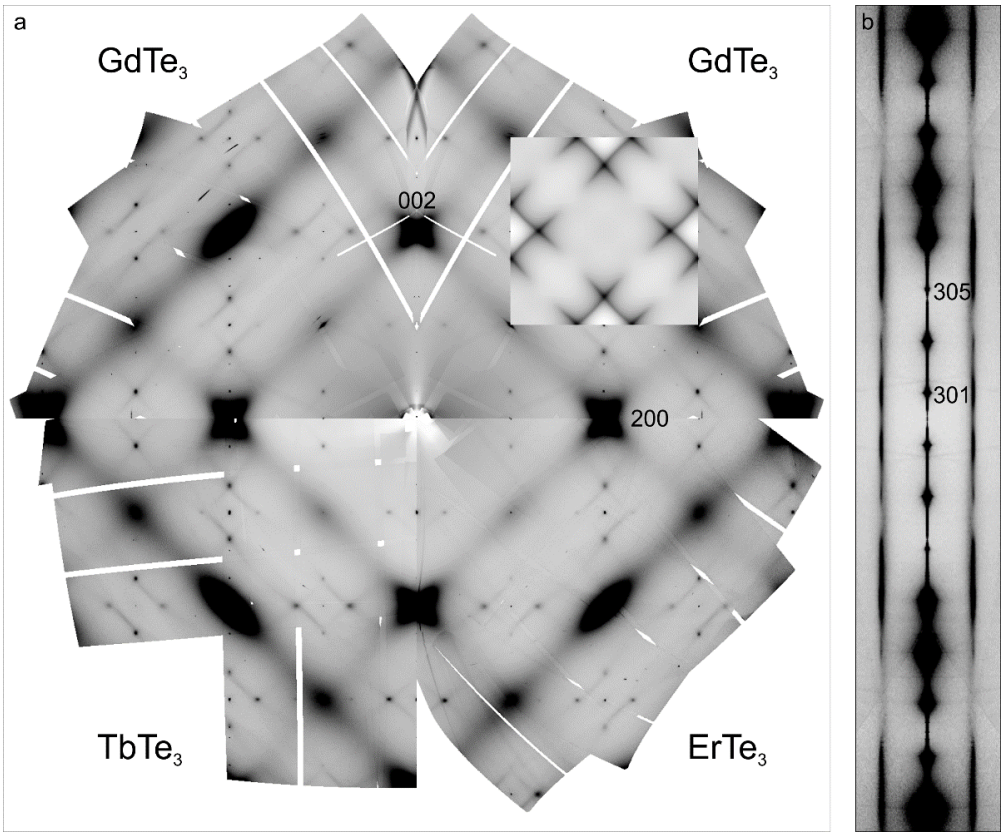

Figure 1(a) Reciprocal space layer *h*0*l* of RTe_3 (R = Er, Tb, Gd), reconstructed for ambient temperature, with the superposed interband nesting function in the upper right quadrant. (b) Reciprocal space layer 3*kl* of $ErTe_3$ at 270K. Laue symmetry of crystal was applied to the reconstructed layer.

Dependence of diffraction/diffuse scattering from current and temperature was recorded for $GdTe_3$ as for having transition temperature well above room temperature $T_{C1} \sim 377$ K. The principal problem is current heating, potentially masking the effects of CDW sliding. In order to discriminate the effects, following datasets were collected:

A) Ambient temperature, zero current
B) No external heating, 250 mA
C) External heating to 328 K, low current
D) External heating to 338 K, low current

Temperature of heat blower gas in case (C) was adjusted to fit the resistance of case (B).

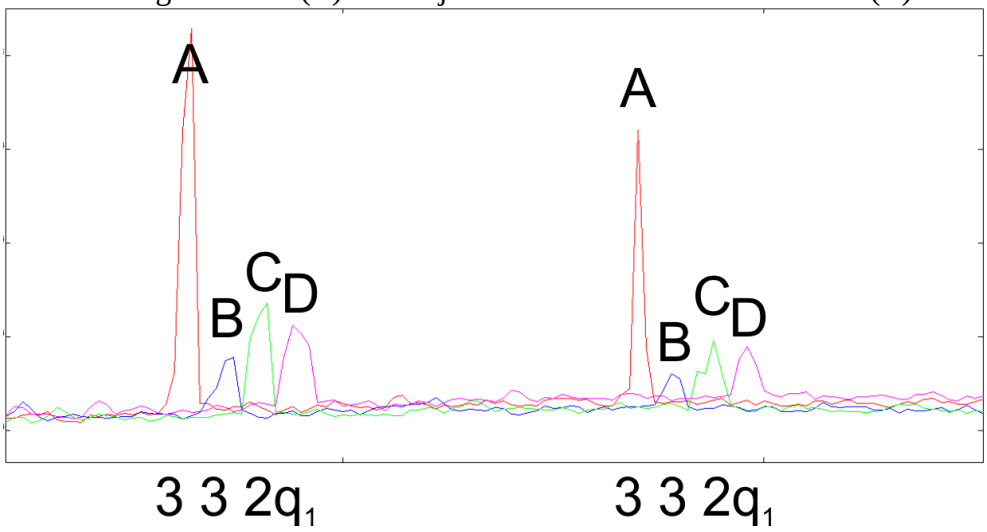

Figure 2. Diffuse scattering intensity distibution along b* crossing of $2\mathbf{q_1}$ in $GdTe_3$.

The effect on Bragg intensities is more robust than for the diffuse scattering. Effect on second-order satellites is illustrated by Fig. 2. The intensity drop in the sliding mode is superiour to the case C, supposed to be measured for the same temperature as B. It is also superiour to the case D, where measurement was performed at still higher temperature. It can be proposed thus that the effect of CDW sliding manifests in diffraction/diffuse scattering in the same way as sample heating. In the particular case of $GdTe_3$ above the sliding threshold its effect is seen as virtual heating by at least 10-15 K

Figs. 3 illustrate IXS data taken in this experiment on $TbTe_3$ as a function of the applied current and at room temperature. The spectra taken at Q=(3 -6 0.3) shows an effect that very likely due to sample moving (or heating) than related to an intrinsic effect. Spectra at 0 and 50 mA are basically the same, that at -50 mA is slightly more intense. The spectra at Q=(3 -5 0.3), close to the CDW modulation peak, remains unchanged.

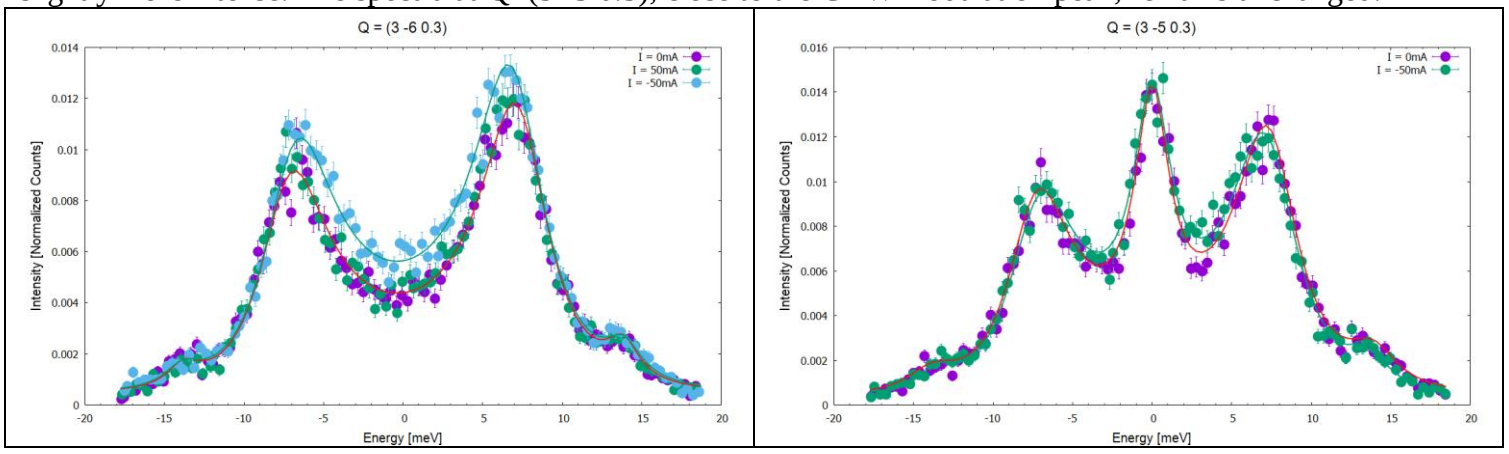

Figure 3. IXS data at two different Q-positions in $TbTe_3$ as function of the applied current. Solid lines are fits with a damped harmonic oscillator. A current of 50 mA was applied.