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: Stress micro-mapping of mesas etched HgCdTe photodiodes**	**Experiment number**: 32-02-775
Beamline: BM32	**Date of experiment**: from: 13 May 2015 to: 19 May 2015	**Date of report**: 09/09/16 - 10/02/20
Shifts: 18	**Local contact(s)**: Jean-Sébastien Micha	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

The experiment was clearly successful with enough available beamtime, an intense Ø300nm white-beam X-ray beam with excellent stability. With our dedicated horizontal sample support, we achieved a 500 nm height resolution inside the sample, a mandatory requirement here. Using a rigid Ge wafer as an intermediate support, we avoid any possible source of external strain on our samples. Finally, combined to a local strain-free reference, image averaging and a CCD camera as far as possible, we achieved an unprecedented strain resolution of 5. 10^{-5}.

The main objective of this proposal was to determine the stress induced by the etching and passivation processes on a smaller scale than the trenches depth and spacing. We expect to measure the stress induced by these processes and map it along the trenches profile but also inside the HgCdTe diode to resolve its lateral propagation which is assumed to run over several microns.

The result of this proposal were of very good quality and could be successfully published as [1]. Please find below the summary of this publication:

We present an x-ray micro-diffraction investigation of localized strain and lattice disorientation in HgCdTe layers with a submicronic resolution using a synchrotron white beam in Laue configuration. Diffraction peak displacement mapping evidences bending of the crystal planes around mesa-etched photodiodes, with strong dependence upon the processing steps. The etching step by itself does not induce any deformation within the layer, while the passivation step leads to sufficient strain for plastic deformation to occur at the lateral edges of the etching. The annealing step is found to have a healing effect on the layer, which reduces the overall deformation and even re-crystallizes plastically deformed areas of the layer.

[1] A. Tuaz, P. Ballet, X. Biquard, and F. Rieutord, 'Micro-diffraction Investigation of Localized Strain in Mesa-etched HgCdTe Photodiodes', Journal of Elec Materi, vol. 46, no. 9, pp. 5442–5447, Sep. 2017, doi: 10.1007/s11664-017-5691-6.