

## 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.



	<b>Experiment title: Understanding of sub-band gap absorption of tellurium hyperdoped silicon using extended x-ray absorption fine structure (EXAFS)</b>	<b>Experiment number:</b> 20-01-795
<b>Beamline:</b> BM20	<b>Date of experiment:</b> from: 05 July 2017 to: 07 July 2017	<b>Date of report:</b>
<b>Shifts:</b> 6	<b>Local contact(s):</b> Dr. Scheinost Andreas	<i>Received at ESRF:</i>
<b>Names and affiliations of applicants</b> (* indicates experimentalists): Mao Wang Helmholtz-Zentrum Dresden-Rossendorf (HZDR)		

### Report:

Unfortunately, Unfortunately, the EXAFS experiments for Te- hyperdoped Si is failed.

The experiment started from 05 July 2017 and ended on 06 July 2017. During the measurement, we met several problems. The first problem was getting the coordinate of samples. Although the Te concentration is up to 2.5%, it is still too low compared to the Si substrate since the beam go through the whole sample. To solve this problem, the detorors and the incident angles were adjusted so many times, finally the samples position was obtained. However, the second problem comes, the detected signal was too weak for EXAFS experiment, which is resulted by the low Te concentration. We tried the Te-2.5%-PLM and thick layer Te-2.0% that have more Te atoms and thicker layer sample may have strong signal. After 3 hours scanning, we got some results and Dr. Andreas tried to analyze them. Here we have the third problem, there are some undertrained peaks showing in the spectral, randomly appeared around the K edge of Te (31.8 keV), this makes difficulty to fitting and analysis the spectral. We thought they may come from the samples or the detector element affect by large Bragg reflections from substrate after we checked the incident and exit beam,

this is also mentioned in the paper about EXAFS experiment for Se doped Si. The solution reported was arranged samples at less than a 5 degree angle of incidence for the incoming beam, but this resulted in a small cross sectional area on the surface of samples, subsequently signal becomes weak again. So we spent a lot of time to adjust the angle that is suitable for avoiding background noise and showing strong enough signal to do the EXAFS measurement. Finally we chose sample Te-2.5%-PLM and set it to a suitable angle for overnight scanning to get more data points that may remove the Bragg reflection from average signal, unfortunately we still have the weird peaks after 12 hours scanning, this may be due to the incident beam energy is too high, almost three times of EXAFS experiment for Se K edge. On 06 July 2017, we did the calibration again and redo the experiment, but it did not make any sense. The experiment is stopped on 06 July 2017.