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 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:** **Directional X-ray Dark-Field Imaging**	**Experiment number**: MI-1001
Beamline: ID19	**Date of experiment**: from: 27/1-2010 to: 1/2-2010	**Date of report**: 1/9-2010 28/2-2011
Shifts: 15	**Local contact(s)**: Timm Weitkamp, Irene Zanette	*Received at ESRF:*

Names and affiliations of applicants **(* indicates experimentalists):**

From Technichal University Munich, Germany

- Dr. Martin Bech(*)
- Prof. Franz Pfeiffer
- Mr. Arne Tapfer(*)
- Dr. Guillaume Potdevin (*)

From University of Copenhagen, Denmark

- Prof. Robert Feidenhans'l
- Mr Torben Jensen(*)
- Mr Arvid Böttiger(*)

From Max Planck Institute of Colloids and Interfaces, Potsdam, Germany

- Mr. Michael Kerschnitzki(*)

From EPFL, Lausanne, Switzerland

- Dr. Carole Poitry-Yamate

Report:

A grating based directional dark-field imaging experiment was conducted at ID19. The used grating interferometer was designed for the 11th Talbot distance (477 mm) at 17.6 keV. The detector used was a FReLoN CCD, with a 7.46 micron pixelsize, yielding a FOW of 15x15 mm2. Experiments were made with different grating alignment (horizontal and vertical). Experiments were also conducted at 33 keV for comparison.

A medical case study was conducted on a number of rat brain slices. The samples were very nicely prepared. But the signal from the samples were unfortunately too weak to be measured with the present experimental configuration.

A second line of study was conducted on directional dark-field imaging of strongly oriented samples. These studies explored non-sinusoidal variations in the visibility signal for strongly ordered systems. The results were published in Physical Review B:
Jensen et al. 'Directional x-ray dark-field imaging of strongly ordered systems' Physical Review B **82** 214103 (2010).

A third line of study was conducted on phase-contrast imaging of porcine fat and rind. These studies explored the possibility of using a grating interferometer to study different quality related properties of porcine fat and rind. The results are published in Meat Science.
Jensen et al. 'X-ray phase-contrast tomography of porcine fat and rind', Meat Science (2011) (no number yet available, doi:10.1016/j.meatsci.2011.01.013)

Figures relating to Jensen et al. Phys. Rev. B

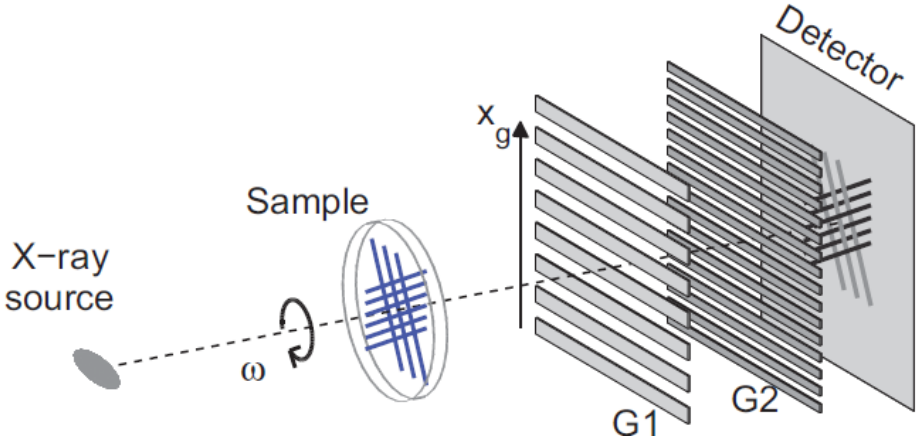

Figure 1: Outline of the experimental set-up. (Jensen et al. Phys. Rev. B **82,** 214103 (2010)).

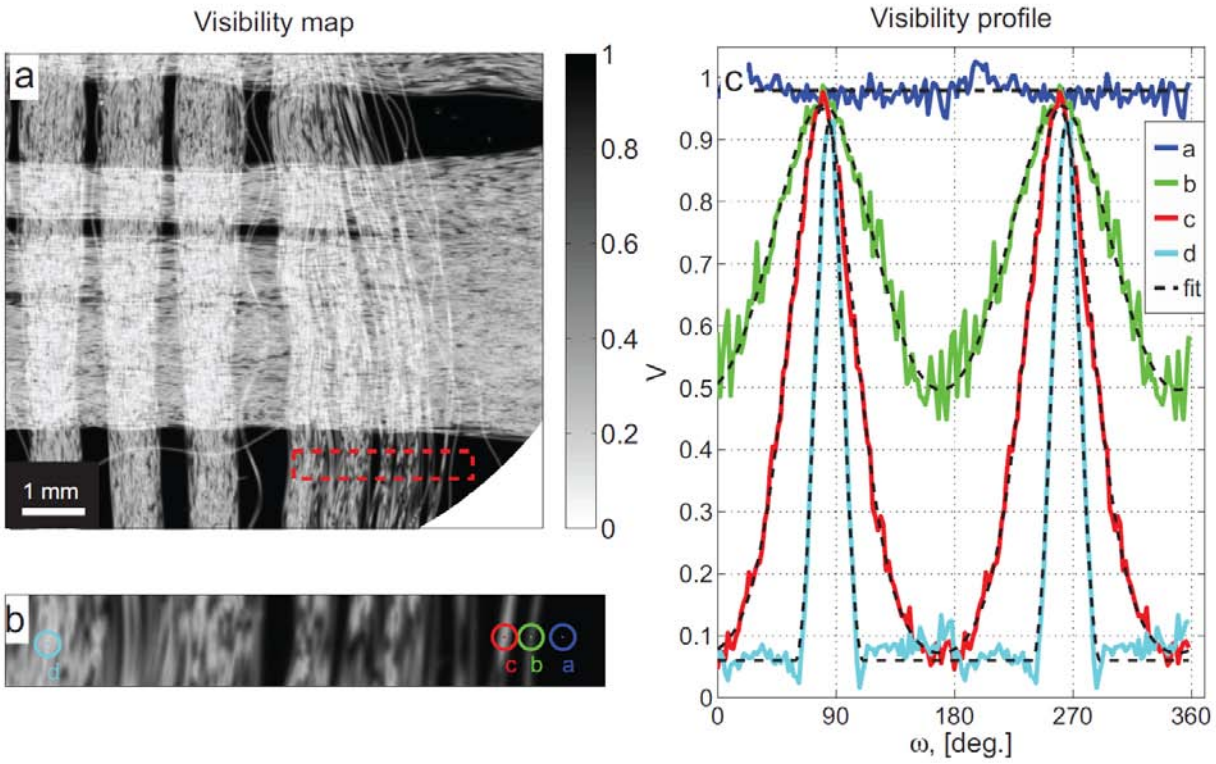

Figure 2: (a) Average visibility of a polypropylene (PP) fiber mesh. (b) Enlargement of part of (a), height 0.5 mm. (c) Visibility variation as a function of rotation angle for four different points marked in (b). Note the non-sinusoidal behavior of the red and cyan lines. The dashed black lines are model fits to the measured values. The model is presented in detail in the article. (Jensen et al. Phys. Rev. B **82**, 214103 (2010))

Figure relating to Jensen et al. Meat Science

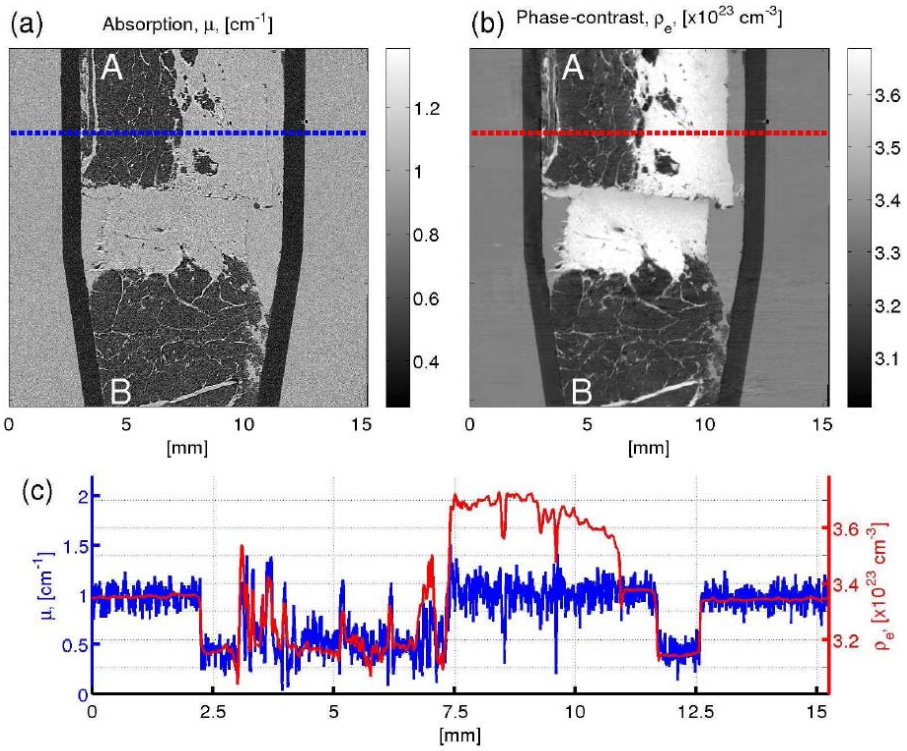

Figure 1: (a) Frontal slice through the tomographic reconstruction of the absorption-contrast. (b) Frontal slice through the tomographic reconstruction of the phase. (a) and (b) are scaled displayed on a linear gray scale corresponding to 2σ, where σ is the standard deviation of the pixel gray values in the image. (c) Plot of the absorption-contrast and phase-contrast through the lines marked in (a) and (b). (Jensen et al. Meat Science (2011)).