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:** Decoupling absorption and decoherence in single-bunch X-ray phase contrast images of laser-shock-induced compression waves	**Experiment number**: MA3755
Beamline: ID19	**Date of experiment**: from: 9 Sep 2017 to: 10 Sep 2017	**Date of report**:
Shifts: 6	**Local contact(s)**: Margie Olbinado	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Margie P. Olbinado, Pierre Pradel, Thibaut De Resseguier

Report:

Tomography

Figure 1 shows the tomographic slices obtained at varying static compression pressures. Pore collapse can be clearly observed.

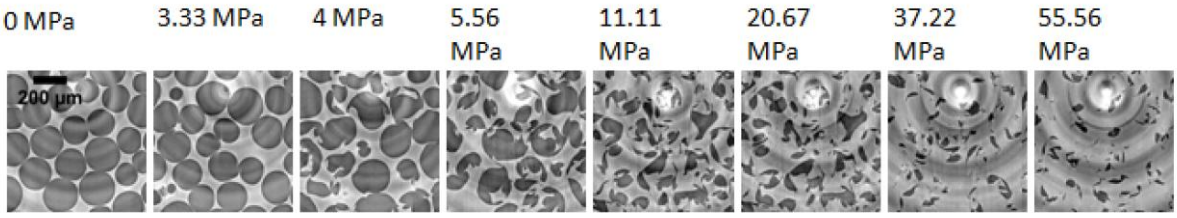

Figure 1. Tomography of the polyurethane foams under static compression from 0 to 55.56 MPa.

Radiography

Figure 2 shows the radiographs obtained at varying sample-to-detector distances and varying pressure. As the foam was compressed, the average transmission through the foam decreased by 16%, which is the same between the contact images (d = 0.05 m) and the phase-contrast images (d = 7.2 m). This indicate that the dark band in dynamic shock experiment [1] is mainly due to changes in transmission due to pore collapse, and the contribution from decoherence effect (if any) is negligible. We need to find news strategies to quantify the pore sizes as they collapse. We note that at d = 7.2 m (the same propagation distance used in the dynamic experiments), the image is dominated by speckles. A shorter propagation distance d=1.2 m is necessary if phase retrieval is desired for future data analysis. We also note that the measured change in transmission in static compression, was 23% is less than the measured in dynamic compression.

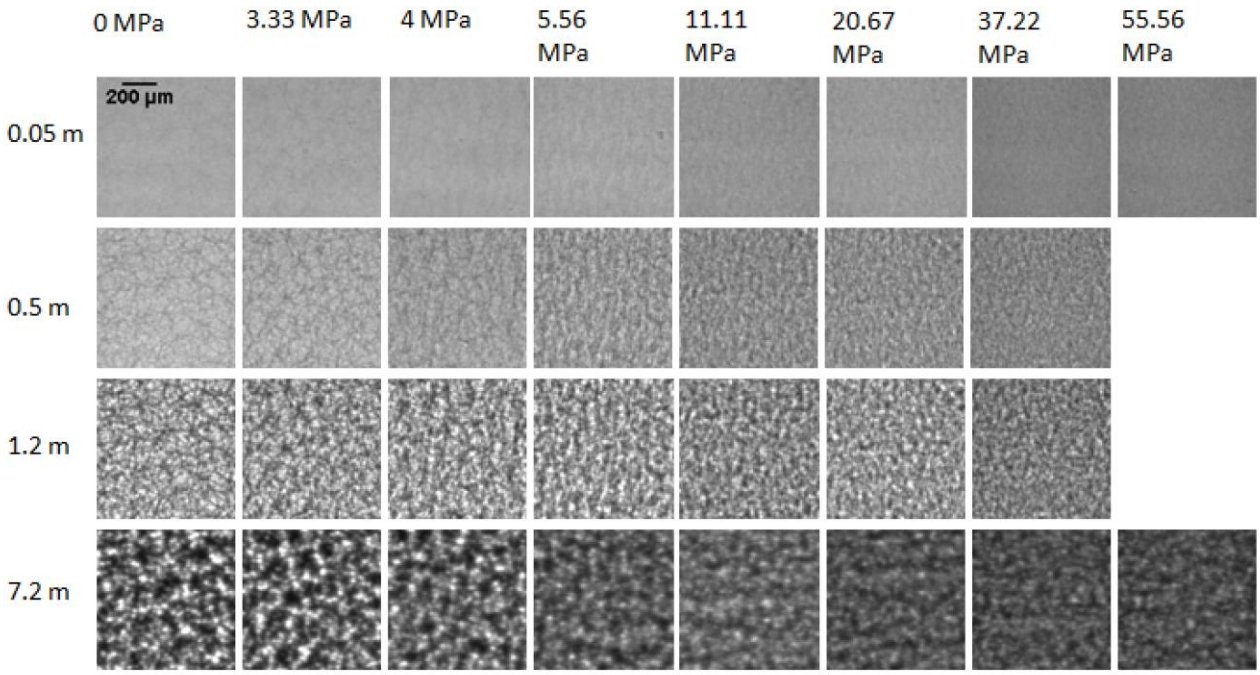

Figure 2. X-ray phase-contrast images of the polyurethane foams under static compression from 0 to 55.56 MPa measured at varying sample-to-detector distances (0.05 m, 0.5 m, 1.2 m and 7.2 m).

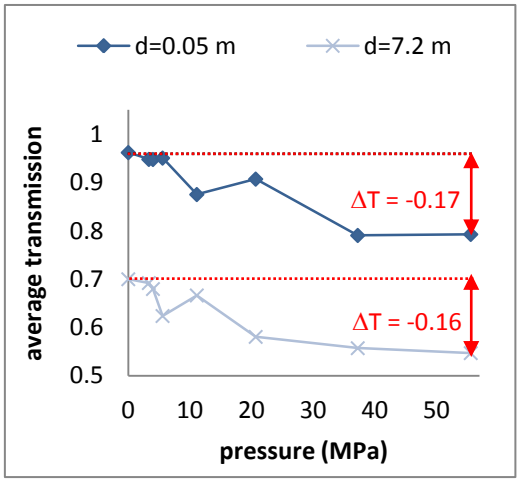

Figure 3. (a) Average transmission 3of XPCI images of the polyurethane foam under static compression from 0 to 55.56 MPa measured at varying sample-to-detector distances. Each point represents the calculation over the 100 (horizontal) x 200 (vertical) pixels images in Figure 2.

Discussion

From theoretical considerations, it is expected that the maximum pressure achieved during static compression is well beyond the onset of compaction in dynamic compression. Consequently we have seen that the measured transmission of the XPCI images during static compression is comparable to the values obtained during dynamic compression. We can therefore say that the pore collapse we observed from tomography during static compression can give the real picture of pore collapse in dynamic compression. We can therefore say that the observed dark band attributed to a compaction wave in dynamic compression experiment is indeed related to pore collapse.