ESRF	**Experiment title:** Dynamics of fluctuating membranes as seen by coherent x-rays	**Experiment number**: SC-812
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Report:

The project concerns XPCS measurements of the dynamics of the layer fluctuations associated with the low-dimensional ordering in smectic membranes. It had a flying start thanks to an earlier single period of beamtime in November 2000 that preceded this long-term proposal. The results from the first part of the present period have been published in PRL **88**, 115503 (2002), attached to this report, and in the ESRF Highlights 2001, p. 41. Later results (not published yet, a longer paper is in preparation) can be summarized as follows.

1. Technically the lower limit of XPCS has been brought down to the limit of 2.8 ns given by the bunch-to-bunch distance of the storage ring in the uniform filling mode. Neutron-spin-echo measurements, planned at ILL for October 2002, should bridge the gap between the two methods.
2. The results for the correlation function are expected to depend on the length of the projection on the sample of ξ_t, the transverse coherence length ($\xi_t \approx 10$ µm). Increasing the size of the pinhole from 10 µm to 100 µm (and thus decoupling this projection from the footprint of the beam) leave the correlation function unchanged, in agreement with this idea. Furthermore, measurements at different q_z-positions along the specular ridge show a variation of the correlation function in the expected direction of decreasing projected ξ_t with increasing q_z.
3. We rotated the sample and thus the scattering plane, leading in the new geometry to $\xi_t \approx 150$ µm. Now ξ_t can be changed in an independent way by reducing the pinhole size in steps from 100 µm down to 4 µm. No conclusive results were obtained regarding the dependence described under point 3. Several attempts made to remove this uncertainty (switching to higher energies, variation of the pre-detector slits) were not successful. It seems we have reached some limit of what can be done with the present experimental set-up (incoming speckles from the mirror causing unclear changes?)
4. Independently of the problems mentioned under 3 we reached for certain thickness films stability limits of the smectic membranes. Local heating by x-ray absorption probably causes uncontrolled internal flow, influencing the local mosaic structure and thus the correlation function.
5. A start was made to investigate other types of film (liquid crystalline polymers, associated polyelectrolytes).