ESRF	**Experiment title:** Long range density fluctuations in glass forming liquids studied by SAXS	**Experiment number:** SC-340
Beamline: ID02	**Date of experiment:** from: 31.10.970: 3.11.97	**Date of report:** 18.4.98
Shifts: 9	**Local contact(s):** N. Theyencheri	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Th. Thurn-Albrecht*, W. Steffen*, A. Patkowski*, E. Sadlik*, E.W. Fischer,
Max-Planck-Institut fur Polymerforschung, Mainz, Germany

P. Bosecke*
Hasylab, Hamburg

Report:

Light scattering experiments show the existence of long range density fluctuations in many polymeric as well as low molecular weight glass forming liquids. These unexpected fluctuations lead to a strong scattering signal in the q-range of light scattering experiments ($0.005\ nm^{-1} < 0.04 nm^{-1}$), whereas in a conventional small angle x-ray experiment ($qmin \approx 0.1 nm^{-1}$) the scattering intensity observed coincides with the value theoretically expected which is proportional to the isothermal compressibility. The aim of the experiment here was to extend the q-range of the existing measurements by performing a high resolution small angle x-ray scattering experiment.

In order to perform such an experiment the background scattering due to slits and windows has to be reduced to a minimal amount. This was achieved by avoiding any air path in the setup. In this way only two windows holding the liquid sample are necessary. Thin mica sheets were used for this purpose. Since the relevant scattering signal is isotropic whereas the background signal is usually anisotropic, the use of a 2D gas filled detector allowed us to identify remaining background contributions.

Fig. 1 shows the scattering caused by the long range density fluctuations in comparison to the background scattering and demonstrates that the background has been reduced sufficiently. The q-range covered in the experiment closes the gap between light scattering and conventional SAXS. A strong excess scattering signal is observed. A logarithmic presentation as shown in Fig. 2 reveals that the structure factor follows a power law in the q-range accessible by the experiment. At the high q limit of the present experiment the scattering intensity approaches a constant, which is the behaviour observed in a conventional SAXS experiment.