ESRF	**Experiment title:** Dynamics of critical fluctuations of two liquids	**Experiment number:** SC685
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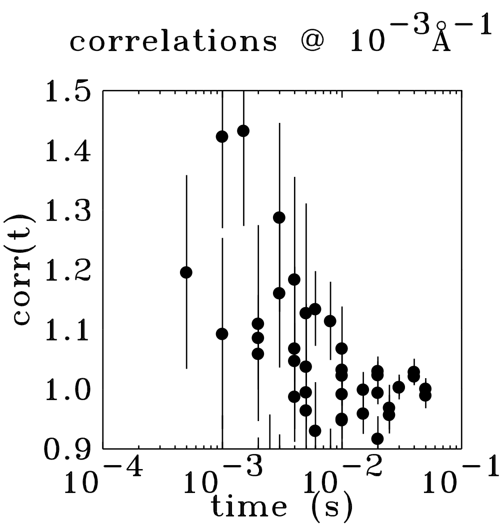
Report:

In this experiment, a mixture of two liquids (nitrobenzene and hexane) was observed close to the critical point corresponding to the unmixing of the two liquid at $20.29C$. In coherent scattering condition, the observation of the dynamics of the speckles of the small angle intensity provide direct measurement of the critical-slowing-down observed close to T_c.
The conditions necessary for carrying out this experiment can be shortly enumerated:
-High stability of temperature control in order to maintain the sample in the near vicinity of T_c.
-Measurements at very low q vectors, ranging from .5 to 3. 10^{-3}Å^{-1}.
-Measurements at a high repetition rate in order to be able to observe correlation times from 10. ms to .1 ms.

With our setup, the temperature of the liquid sample was stable within $2.mK$, and, in practice, measurements were performed at $T_c+.02K$ to T_c+8K. Maximum fluctuation length ξ was about 1000.Å.
Parasitic scattering from pinhole in the small angle range was difficult to eliminate, and no reliable measurements were obtained under 10^{-3}Å^{-1}.
Measurements were performed with a beam of high monochromaticity, (Si_{111} monochromator) and the intensity was relatively low (close to 5.10^8 x-rays/s. The use of "pink beam" in the case of these "very small angle experiments" could improve intensity a factor of one hundred, and this will be soon available at ID10C.

In order to improve statistics, a direct-illumination CCD camera was used, in a photon counting mode ("droplet algorithm"). This provides a very efficient noise suppression in the case of low intensity and large number of images. In order to overcome the (relatively) slow readout rate of our $1MHz$ converter, the kinetic mode was used. Using slits, only a small region ($24 * 100$ pixels) was illuminated, and the time correlations were observed on the same frame between regions illuminated at different times during shifting. Tests performed in this mode have shown that a time resolution of $0.1ms$ was easily obtained. In practice, the shutter was opening with a $3.7ms$ delay. For this reason, and also because the intensity was small, measurements were carried out only with a $0.5ms$ minimum time resolution.
The stability of the method was tested, and a statistical data treatment was further carried out, which takes account of: -all experimental rates of measurements, -all expositions on the same frame obtained in the kinetic mode, -all frames measured, -and all the data obtained in the same $|q|$ domain.



The figure summarizes, for $|q| = 10^{-3}\text{Å}^{-1}$, the normalized time correlations observed after statistical treatments. Time is on a log scale. The function has a long time value of 1, and a short time value close to 1.3. Crossover between these two values should occur at about $1ms$. Error bars on the figure show that statistics must be improved. All measurements of this figure were carried out over only 2000 frames, and a number of repetitions can be done (each series takes about 5minutes). But major improvement will be obtained from the larger intensities in the "pink beam" setup of ID10C.