ESRF	**Experiment title:** BRAGG PEAK SHAPE OF AN ELECTROSTATIC SWOLLEN LIQUID CRYSTAL	**Experiment number:** SC257
Beamline: BL4/ID2	**Date of experiment:** from: 2 April 97 to: 4 Apr 97	**Date of report:** August 97
Shifts: 6	**Local** contact(s):Diat Olivier	*Received at ESRF:* 2 SEP. 1997

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Report:

This experiment requires the conjunction of four different experimental difficulties:

l- Achieve a resolution of the data points, typically ten times less than the full width half maximum of the very sharp Bragg peaks observed

2-reduce the background noise in order to observe with a peak/ noise ratio exceeding 1000, Bragg peaks at q less than 300 Å Bragg spacing. The absolute scaled intensity is of the order of the order of 1 cm- 1, about hundred times the incoherent scattering of pure water.

3-orient the sample: the aim is to measure Bragg peak decay along two directions: fluctuations of the smectic direction as well as fluctuations of the interlayer distances

4- measure the scattering along two different directions, in transmission geometry. The smectic layers align parallel to glass/quartz or mylar interfaces, so grazing incidence geometry has to be used.

Due to reduction of the beam time allocated, we could not use the Bonse-Hart crossed crystal arrangement: this experiment is typically 100 times slower for an increase of resolution of a factor of ten only. Experiments have been performed with the 1024 pixel detector at 5m, and the resolution partially restored by an image desmearing technique (Le Flanchec et al., J. Appl. Cryst., 1996, 29, p. 1).

During the six shifts allocated, we tried three different arrangements:

l-reflection mode on flattened thin (0.5 mm) glass capillaries: the signal is too low to be distinguished from reflection on the flat capillaries window.

2-grazing incidence, measurement of the Bragg peak after transmission of the sample (the so-called Cauchois geometry). Here the signal to noise ratio is acceptable, but the transmission varies quickly with angle, giving strong attenuation of the peak.

3- conventional arrangement, transmission geometry.

In the two first cases, the sample was oriented, but the signal to noise ratio after crossing several centimetres of sample in grazing incidence or the parasitic reflections made that we could not achieve the measurement of the peak shape along two directions.

In conventional transmission geometry on unoriented samples, the signal to noise ratio was enough to measure four Bragg peaks on swollen liquid crystals. Power-law decays varied surprisingly with the order of the peak. For illustration, a typical profile averaged on all directions (presence of spherulites) is shown on Figure 1, raw data as well as after one to three desmearing steps compared to resolution (dashed line). These data cannot be interpreted as long as the decay power law along two perpendicular directions cannot be isolated from each other: this is the aim of next proposal. Thes econd figure shows the FWHM after desmearing (together with resolution) of the first four Bragg peaks observed in this coupled system: the surprise is that the Bragg peak width DECREASES with order n, a fact that we have nether observed before.