ESRF	**Experiment title:** Development of High Energy Focusing Optics for Materials Diffraction (longterm proposal)	**Experiment number**: MI-225
Beamline: ID15a/BM5	**Date of experiment**: from: 8-3-98/15-7-98 to: 10-3-98/17-7-98	**Date of report**: 22 August 98
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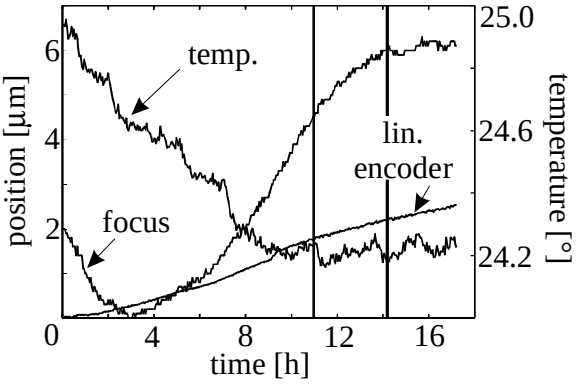
Report: **(1) ID15a: Stability test of Laue-microfocusing optics**

Aim: The stability of a prototype focusing Laue monochromator set-up was tested with regard to (i) heatload, (ii) mechanical components, (iii) standard optical table and (iv) hutch temperature.

Experiment: The bent Laue monochromator was mounted on X95 profiles on a standard (red) optical table. The focal spot size and position were analyzed by absorption knife-edge scans. This unit was mounted on the same table. Next to it another optical table (blue) was installed and the relative height movements of the tables were monitored by a linear encoder. 1 mm^2 of direct beam was accepted, with 4 mm Al and about 10 mm Si attenuators.

Results: No instability due to the heatload of the filtered, direct beam was observed. We conclude that no water cooling will be required for the Laue monochromator to be installed in the ID11 extension hutch. The focus position and relative height of the optics tables showed a slow long term drift of 6 μm and 2 μm, respectively. No clear correlation with the temperature variation (0.8 °C) was observed. Even in the present case, sub-micron stability



can be achieved by monitoring the long term drift by means of a reference point. The temperature variation in the air conditioned ID11 extension hutch should be < 0.1 °C. Critical points of the mechanical components were suggested but further work is needed.

2 BM5: (a) SiGe gradient crystal monochromator test

Aim: We investigated a monochromator scheme which should provide (i) a bandpath of $\Delta E/E = 0.1\%$ (ii) fixed exit geometry and (iii) not increase the apparent source size. This becomes feasible by recently developed gradient crystals. Such a pre-monochromator would solve major problems of the micro-focusing optics, i.e. heatload, background and too large bandwidth.

Result: The available gradient crystals (from the outer part of the ingot) were of insufficient perfection. Experiments performed at HASYLAB showed that samples from the central part of the ingot are of sufficiently perfect. The project will be continued when better crystal are available.

(b) Scattering from collimators

Aim: The limitations of high energy micro-beam preparation by collimators due to (i) total reflection (wave guide effect) and (ii) diffuse scattering were investigated.

Experiment: A 30 mm long WC collimator of about 13 µm opening was tiltet in a monochromatic beam (above the W K-edge). The transmitted beam was analyzed by perpendicular slit scans.

Results: No total reflection was observed but side beams were produced within the collimator when it was tilted to obstruct the direct beam. The integrated intensity of the side beams was down by 2.5 orders of magnitude compared to the direct beam and their direction followed the tilt angle of the collimator. The divergence was about the opening angle of the collimator. The side beams are attributed to diffuse scattering. Modelling suggests that the diffuse scattering might be substantially reduced by an optimized surface profile.