A Compound Refractive Lens for 175-keV for Magnetic Compton Profile Measurements at SPring-8

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Despite the high intensity of circularly polarized radiation of energy 175 keV at SPring-8 beamline BL08W, for samples with small volume (for example thin layers or material in high pressure cells) the intensity of radiation scattered to the detector in Magnetic Compton experiments is low. Moreover, the sample holder generates a relatively high background. By focusing the radiation it is possible to increase signal from the sample while simultaneously decreasing the background from the holder.

Because, in our case, the focusing is need in the vertical plane only, the planar Compound Refractive Lens (CRL) [1], [2] and Multi Prism Lens (MPL) [3] are considered as the focusing element. They are able to give a focal spot of micrometer size and they are easy to add to an existing setup.

A Monte Carlo program has been written for simulations of plane geometrical optics for X-rays. With this software the performance for different lens parameters was tested. Fig.1 shows example comparison of performance of prism and parabolic lens for 1 micrometer source.

For first tests the 250 steel single parabolic lenses with radius of curvature at vertex of 100 microns will be stacked to form a lens 15 cm long with a focusing length of 4m. Test measurements with a prototype lens are scheduled for this year.

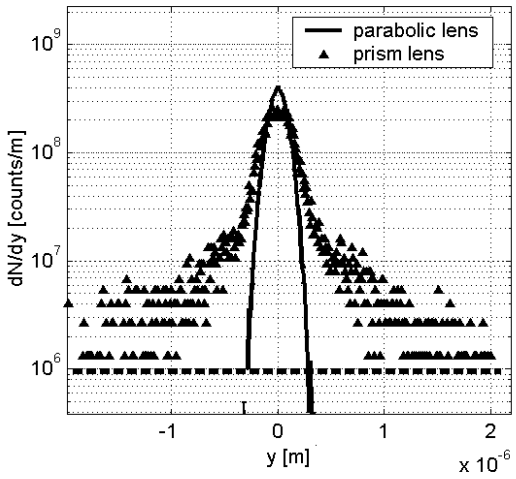

Fig. 1 *The simulated intensity distribution in vertical direction at focus position The focal length of both lenses is 4m The 1 micrometer source is situated 47m far from the lenses. The solid line and triangles represent data for parabolic and prism lenses respectively. The horizontal dashed line shows the intensity at sample without lenses.*

[1] Snigirev A.; Kohn, V.; Snigireva, I.; Lengeler, B., *Nature*, 1996, **384**, 49.
[2] Lengeler, B.; Schroer, C.G.; Benner, B.; Gerhardus, A.; Günzler, T.F.; Kuhlmann, M.; Meyer, J.; Zimprich, C., *J. Synchrotron Rad.,* 2002*,* **9**, 119.
[3] Cederstrom, B.; Lundqvist, M.; Ribbing, C., *Appl. Phys. Lett.,* 2002*,* **81**, 1399.