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addenda and errata

# Scherrer grain-size analysis adapted to grazing-incidence scattering with area detectors. Erratum

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A poor divergence value in the paper by Smilgies [*J. Appl. Cryst.* (2009), **42**, 1030–1034] is corrected.

It was brought to my attention that the vertical beam divergence as determined by energy analysis using an Si(111) Bragg crystal [see the paragraph immediately above equation (9) of Smilgies (2009)] appeared to be too high, as the experimental vertical spot widths were clearly much smaller than predicted. The problem seems to be related to the standard energy analysis program not taking the high mismatch of multilayer and analyser Bragg angles properly into account (see Kazimirov *et al.*, 2006), and thus overestimating the beam divergence.

I devised a simple independent scheme to measure beam size and divergence using the sample holder and the beam stop for knife-edge scans. If the beam widths at the sample $\sigma_S$ and at the beamstop $\sigma_B$ are measured, then the beam divergence $\sigma'$ can be determined by

$$\sigma' = \left(\sigma_B^2 - \sigma_S^2\right)^{1/2} / L_{SB}, \qquad (1)$$

assuming Gaussian line shapes, where $L_{SB}$ is the sample-to-beamstop distance. Measurements can be made this way for both the horizontal and the vertical beamwidths and divergences. Fig. 1 shows the beam profiles for the GISAXS-I geometry with $L_{SB} = 1800$ mm.

The vertical beam divergence determined this way is 0.14 mrad, which is significantly lower than the originally reported value of 1.6 mrad obtained from analysing the beamwidths of the Si(111) and Si(333) reflections using existing software. The measured divergence value is yet significantly larger than the intrinsic source divergence of 0.08 mrad, as given by source size and distance (Smilgies, 2009). The horizontal beam divergence based on the knife-edge scan is 0.18 mrad, which compares quite well to the reported value of 0.16 mrad, as estimated from source size and source-to-sample distance in the original paper. On the basis of the new vertical divergence value, Fig. 2 [to be compared with the right panel of Fig. 3(*a*) of Smilgies (2009)] shows the revised resolution estimates for the GISAXS-I geometry, which were most affected by the original poor vertical divergence value.

I thank Christine Papadakis and Zhenyu Di at the Technical University of Munich, Germany, for pointing out the problem.

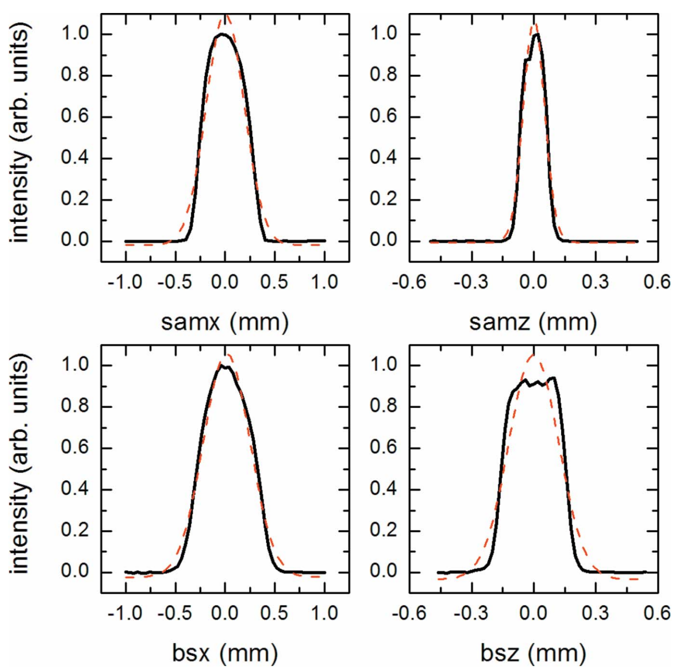


**Figure 1**
Horizontal and vertical beam profiles at the sample (samx, samz) and the beamstop (bsx, bsz) positions, as obtained by knife-edge scans. Solid lines show the measured profiles and dashed lines the corresponding Gaussian fits.

## References

Kazimirov, A., Smilgies, D.-M., Shen, Q., Xiao, X., Hao, Q., Fontes, E., Bilderback, D. H., Gruner, S. M., Platonov, Y. & Martynov, V. V. (2006). *J. Synchrotron Rad.* **13**, 204–210.
Smilgies, D.-M. (2009). *J. Appl. Cryst.* **42**, 1030–1034.

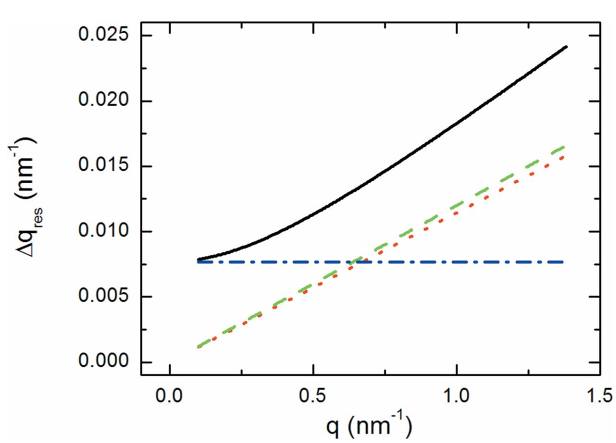


**Figure 2**
Revised instrumental resolution $\Delta q_{res}$ for the GISAXS-I geometry (solid line) using the vertical beam divergence as determined by knife-edge scans. Also shown are the partial contributions due to geometric (dashed line), band width (dotted line) and divergence smearing (dash–dotted line).

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