DEFORMATION FIELD MAPPING OF THE X-RAY SILICON FRESNEL ZONE PLATE

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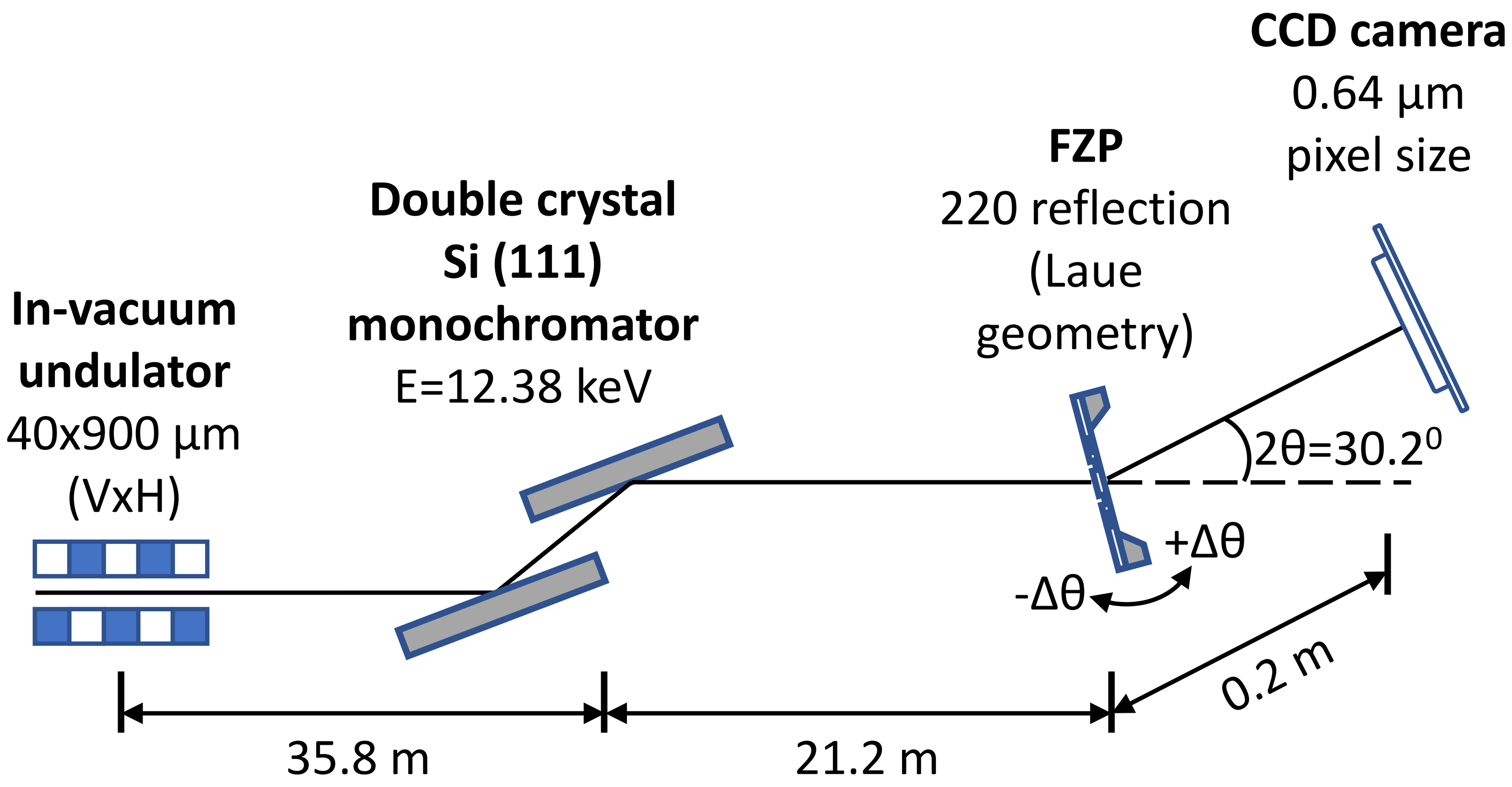
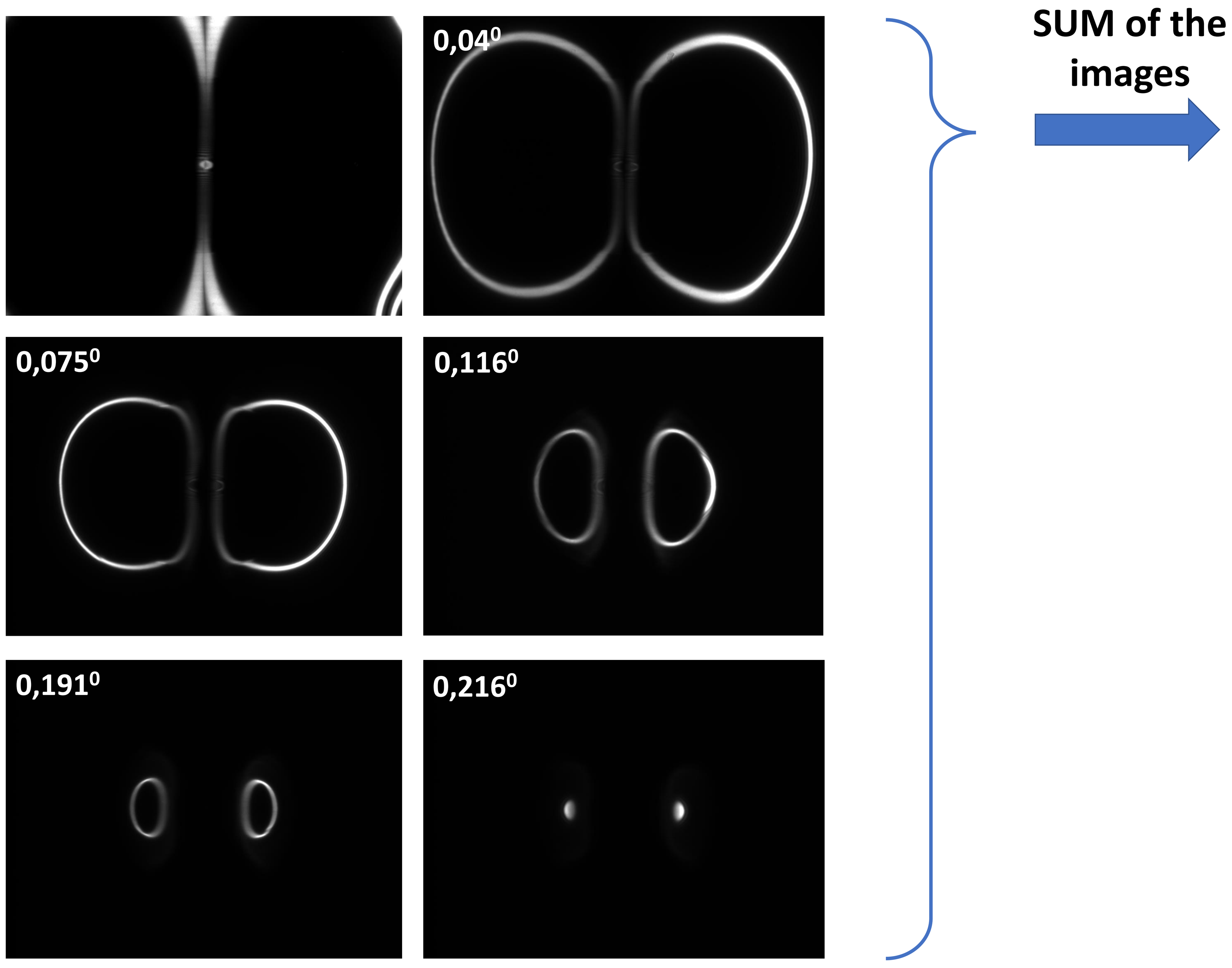
ABSTRACT

The X-ray topography technique is very sensitive to the crystal lattice misorientations in the monocrystals. It was implemented in studying of the deformations of the X-ray silicon Fresnel Zone Plate (FZP). The research was performed at the ID06 ESRF beamline using the 12.38 keV radiation energy. During the experiment, the contour map of the FZP deformation field was obtained. This map was used in the reconstruction of the surface curvature profile at three points: at the FZP center, 60 µm, and 120 µm below the FZP center. As result, the FZP with 242 zones has a concave profile in its center and a convex profile near the outermost zones. This technique can be used not only for the characterization of the conventional binary FZP but also for the Multilayer Laue Lenses and FZP with multilevel, and kinoform profiles.

ID06 BEAMLINE LAYOUT

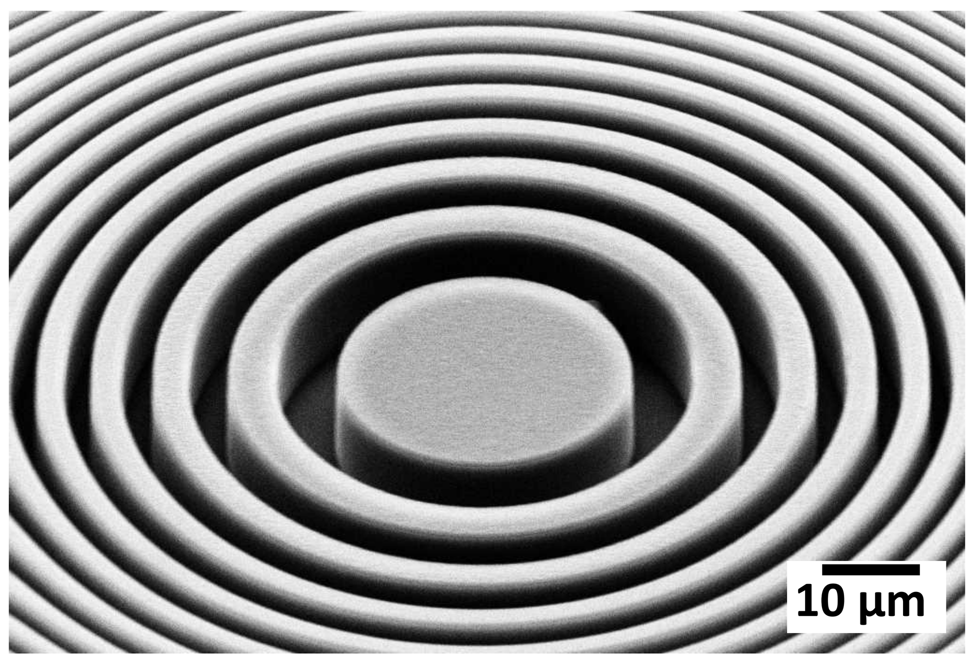


±Δθ SCAN



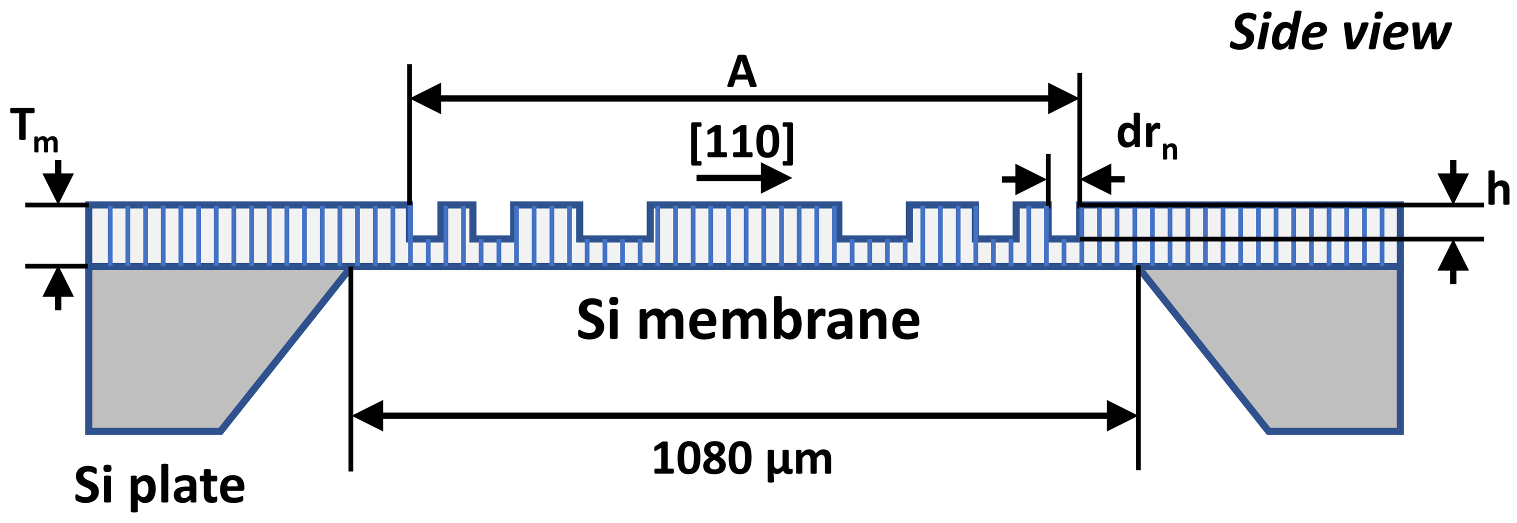
Stereo images with isolines recorded during the FZP rotation at the different angles ±Δθ.

SAMPLE DESCRIPTION



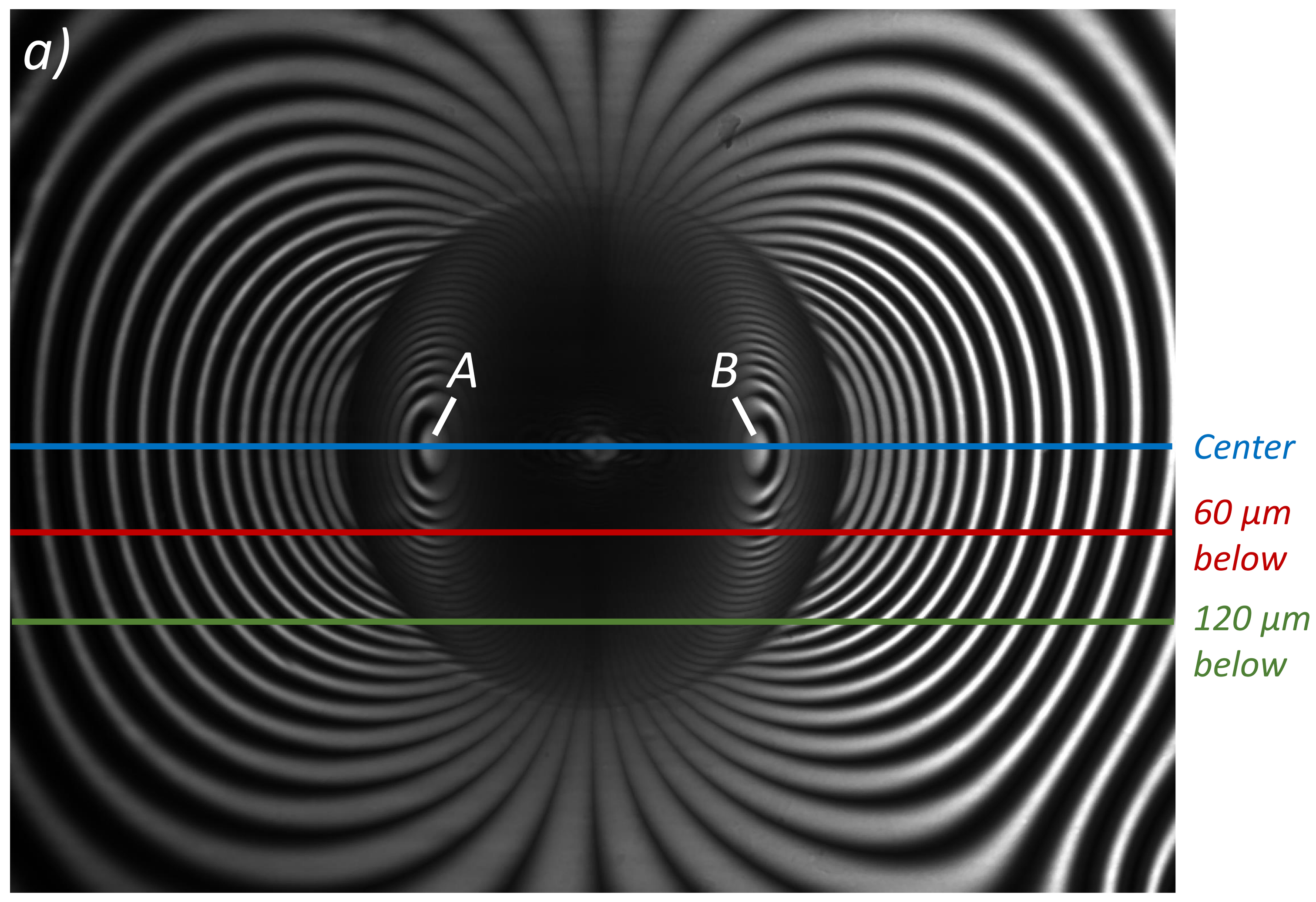
X-ray circular Fresnel Zone Plate from silicon manufactured by MEMS technology

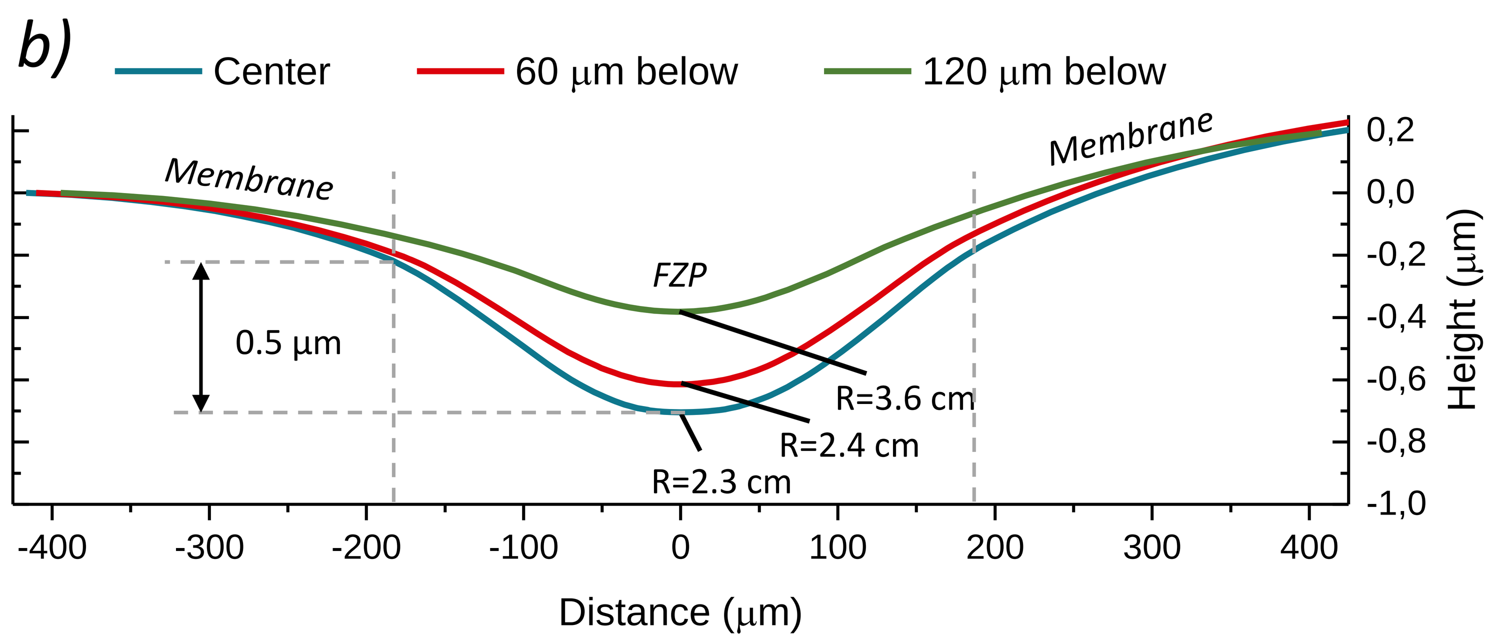
(I.Snigireva et al. Phys. Status. Solidi 204(8), 2007)



Aperture diameter A	Membrane thickness T_m	Outermost zone width dr_n	Zone height h	Number of zones	Focal distance at the 4 keV
387 µm	12 µm	0.4 µm	9 µm	242	0.5 m

DEFORMATION FIELD MAPPING





(a) Contour map obtained by the summation of the stereo images. (b) The horizontal deformation profiles of the FZP reconstructed at the different positions. The inflection points of the central profile are marked by A and B.

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