

# Ultra-precise XUV-focusing mirrors beyond the 1nm rms figure error limit and their characterization by means of slope measuring deflectometry

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Beamlines at state of the art synchrotron sources like 3<sup>rd</sup>-Generation and Diffraction Limited Storage Rings (DLSR) require near-perfect x-ray focusing mirrors to deliver synchrotron light of defined energy and polarization to experiments without significant degradation of brightness and coherence. Elliptical cylinder like KB-mirrors for application in the hard-X-ray have shown sub-nm rms precision in the past [1, 2]. However mirrors designed to focus photons in the XUV-range have a much higher variation of the radius of curvature which is challenging to measure and manufacture. In the past their quality was limited to a residual figure error in the range of 3-5nm rms [3] which corresponds to a slope error of approx. 0.5 $\mu$ rad rms. We will report on KB-focusing mirrors of sub-nm rms precision designed and manufactured for applications in the XUV-range at beamline P04 at the PETRA III storage ring at DESY (Hamburg). These mirrors were finished by means of deterministic surface finishing (EEM-polishing, [4]) and feature 0.3nm rms figure error precision and a slope error of up to 120nrad rms. The topography of these mirrors was inspected using slope measuring deflectometry at the BESSY-Optics-Laboratory. We will show and discuss our results of the slope measurements and will give an outlook on upcoming requirements and challenges to provide and measure such type of optics.

## References

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