# Application and characteristics of Ag $K\alpha$ multilayer X-ray optics

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### Motivation for Ag Kα parallel beam mirror setup

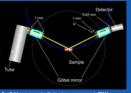
Covering of a large q-range up to 20 Å<sup>-1</sup> in the reciprocal space (  $0.1^{\circ} < 2\Theta < 160^{\circ}$  )

nfluence of sample fluorescence, displacement errors le transparency in **parallel beam geometry with secondary monochromator** 

## Experimental setup - Twin Mirror Arrangement (TMA)



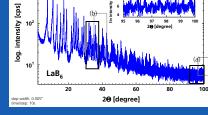


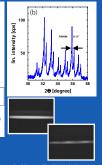


TMA - the parallel beam concept with

Characteristics of Ag Ka TMA

XRD measurement of LaB<sub>6</sub> powder sample Generator: 50 kV, 25 mA





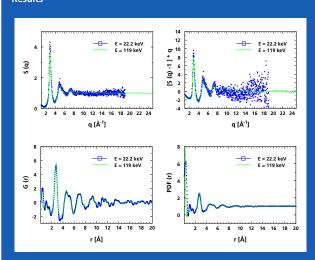
XRD measurement of single crystal Si111 reflection

Si 111 **FWHM** intensity [cps]  $\Delta(2\Theta) = 0.029^{\circ}$ 10<sup>3</sup>

- intensity ≈ 10<sup>8</sup> cps
- I(Ag Kα): I(Ag Kβ) > 10.000
- beam divergence of ΔΘ = 0.015° (<60 arcsec)</li>
   improved P/B ratio due to suppression of other characteristic emission lines (Ag Kβ)
   low background intensity level (<5 cps)</li>
   reflections up to 2Θ = 100° detected for LaB<sub>6</sub>

2**⊕** [degree]

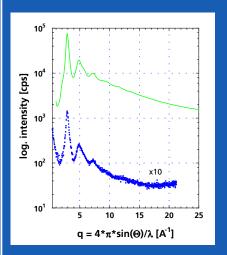
### Results



MA allows to cover the reciprocal space up to  $20\,\text{\AA}^1$ . The dynamic range of measured intensities is about rders of magnitude. The low brillance of laboratory X-ray sources limits the correlation determination to st shells with distances up to  $10\,\text{\AA}$  coincidence between synchrotron and TMA measurements with Ag K $\alpha$  radiation is clearly visible. A ction between individual correlation lengths in the PdCuNiP alloy is not possible and was not the aim of warringent

Measurements with Ag K $\alpha$  (E = 22.2 keV) and Synchrotron (E = 119 keV) sample: Pd<sub>40</sub>Cu<sub>30</sub>Ni<sub>10</sub>P<sub>20</sub>

locked coupled 2:1 scan:  $2^{\circ} < 2\Theta < 160^{\circ}$ ;  $\Delta(2\Theta) = 0.1^{\circ}$ ; t = 45 s



### Acknowledgements:

authors are indepted to N. Huber for providing the LaB $_6$  capillary sample and to H. Borrmann (MPI-Dresden) and Dr. M. Schuster (SIEMENS AG Munich) for helpful discussions and suggestion for starting the work on Ag K $\alpha$  multilayer parallel beam optics.

- Using the TMA, diffraction measurements can be done up to  $2\Theta=160^\circ$  to cover a large q-range in reciprocal space he intensity on laboratory X-ray sources is limited, but resolution is comparable up to  $10~\text{Å}^\circ$ . He second multilayer mirror on the diffracted beam side increases the P/B ratio. ample fluorescence can be suppressed. The suppressed when the suppressed in the suppressed in



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