

# Vacuum-compatible hybrid photon counting pixel detector for WAXS, XRD and XRR in the tender X-ray range

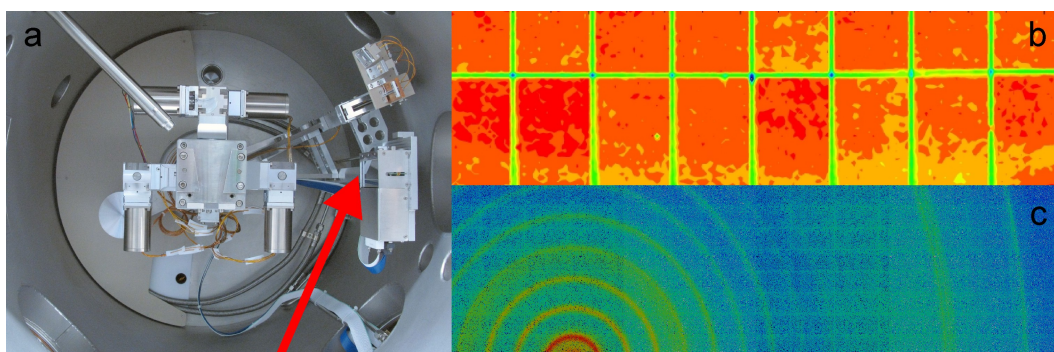
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The tender X-ray range is of growing importance for many applications because it enables the access to the K absorption edges of technologically or biologically important elements like Si, P, S, Cl, K, Ca etc.. PTB's four-crystal monochromator beamline covers the photon energy range from 1.75 keV to 10 keV already since 1998 [1]. In cooperation with Dectris, a vacuum-compatible version of the PILATUS 1M detector was developed [2] for small-angle X-ray scattering (SAXS) and grazing incidence SAXS (GISAXS) to access scattering angles up to about 5° for photon energies even below the Si K edge [3]. To cover larger scattering angles which are required for wide-angle X-ray scattering (WAXS) including X-ray diffraction (XRD), an additional vacuum-compatible PILATUS3 100K module has been installed on the detector arm which carried already different semiconductor photodiodes for X-ray reflectometry (XRR) [4]. The water-cooled detector module can be positioned from -45° to +90° with respect to the incoming beam at a distance of about 200 mm. The quantum efficiency of the new detector as well as its homogeneity and linearity have been investigated. First examples of the performance in WAXS, XRD and XRR at photon energies down to 1.75 keV will be presented.



a) Hybrid photon counting PILATUS3 100K detector module and additional detectors for XRR and XRF in the UHV reflectometer, b) quantum efficiency map of the detector module from a pencil beam scan at 3.2 keV, c) stitched WAXS pattern of AgBehenate at 3.2 keV

## References

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