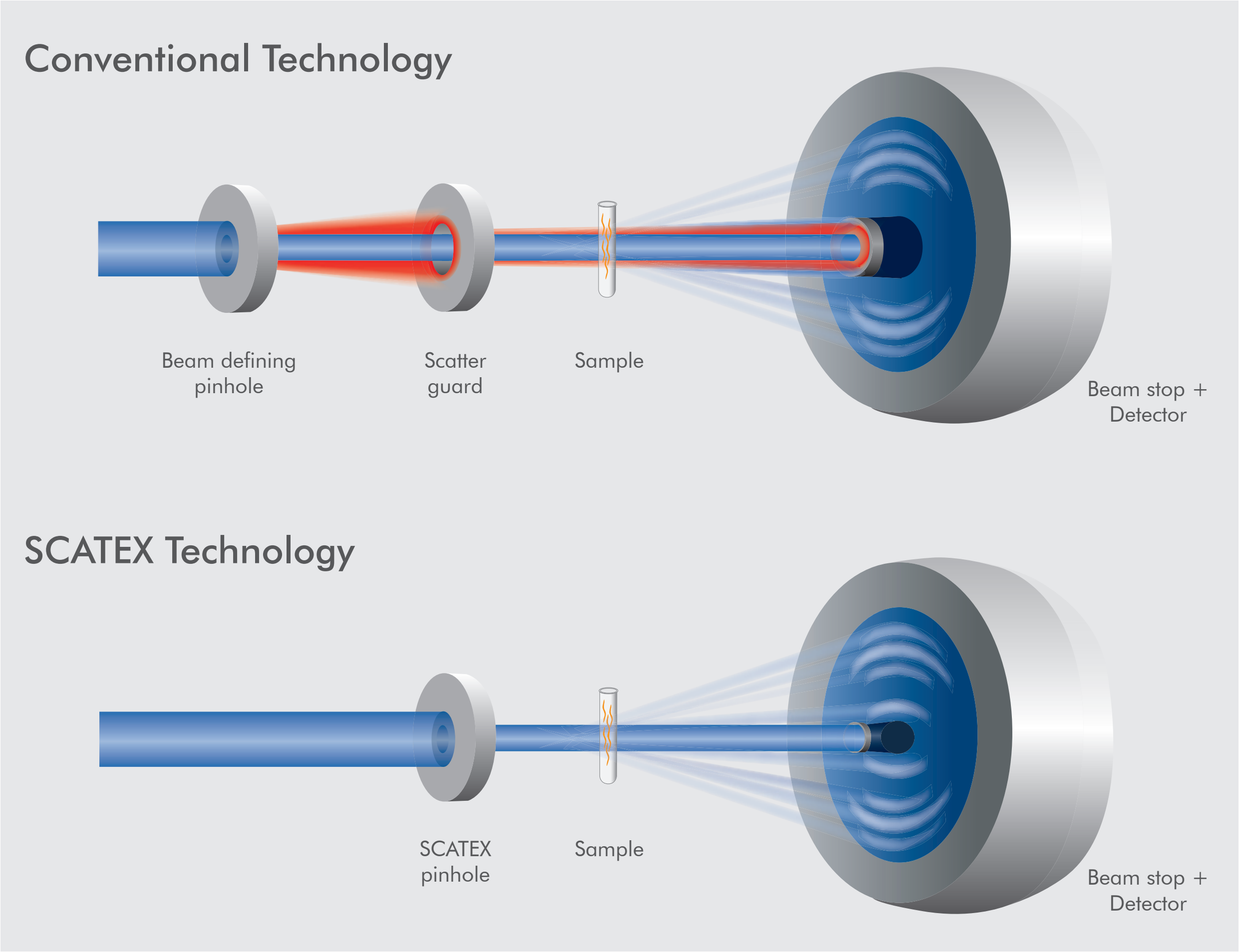
SCATEX

Scatterless pinholes for synchrotrons



Parasitic scattering caused by apertures is a well-known problem in X-ray analytics, which forces users and manufacturers to adapt their experimental setups to this unwanted phenomenon. Increased measurement times due to lower photon fluxes, a lower resolution caused by an enlarged beam stop, a larger beam defining pinhole-to-sample distance due to the integration of a scatter guard and generally a lower signal-to-noise ratio lead to a loss in data quality.

Main SCATEX features:

- Germanium pinholes for lower and Tantalum pinholes for higher photon energies
- available sizes: 20-2000 µm

Your benefits:

- strongly reduced parasitic aperture scattering
- resolution and photon flux enhancement
- easier and faster pinhole alignment
- no scatter guard needed
- system size shrinks
- data quality improves

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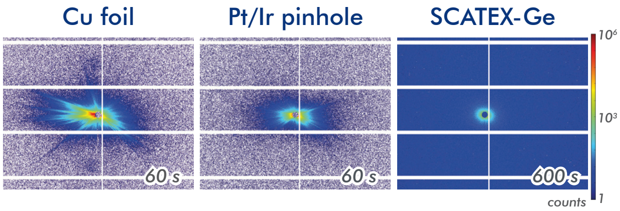
SCATEX

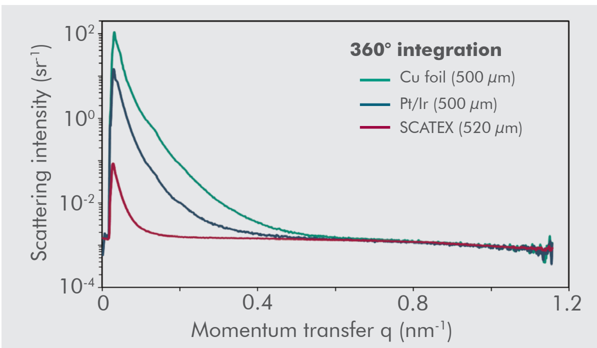
SCATEX-Ge Pinholes

The measurements were performed at 8 keV at the PTB four-crystal monochromator beamline at BESSY II by C. Gollwitzer with typical photon fluxes of $\sim 10^{10}$ ph/s. All tested apertures were aligned centrically into the primary beam and acted as the beam defining element. No scatter guards were used.

Comparison of different pinholes types

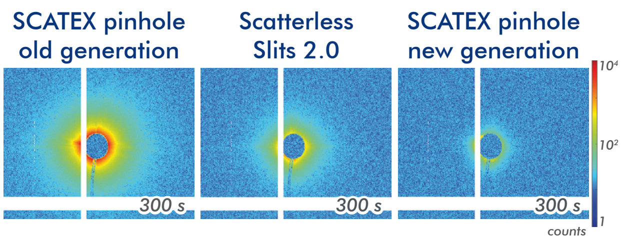
The following apertures were compared: a Cu foil with hole, a commercially available Pt/Ir pinhole and a SCATEX pinhole made of Germanium. The experiments show that even with a 10 times longer exposure time SCATEX pinholes cause 2-3 orders of magnitude less parasitic scattering. SCATEX apertures show reduced scattering at higher q-values and exhibit a circular scattering pattern due to its high overall structural quality.



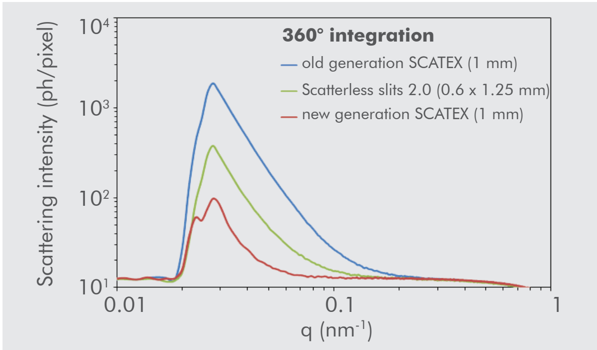


Scattering intensity vs. q-plot. Data are corrected for respective exposure times and normalized to the primary beam photon flux and to the solid angle.

Comparison of scatterless slits 2.0 and new generation SCATEX pinholes



The measurements show that new generation SCATEX pinholes cause up to 4 times less parasitic aperture scattering than Scatterless Slits 2.0 and up to 19 times less than old generation SCATEX pinholes. Additionally, SCATEX pinholes exhibit a faster aperture scattering decay below the background at considerably smaller q-values.

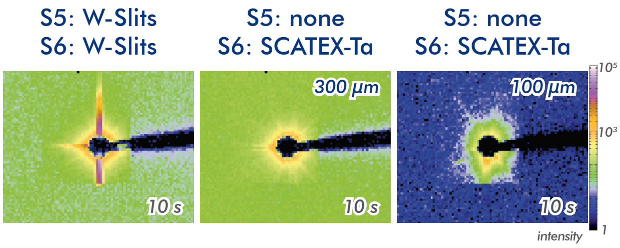


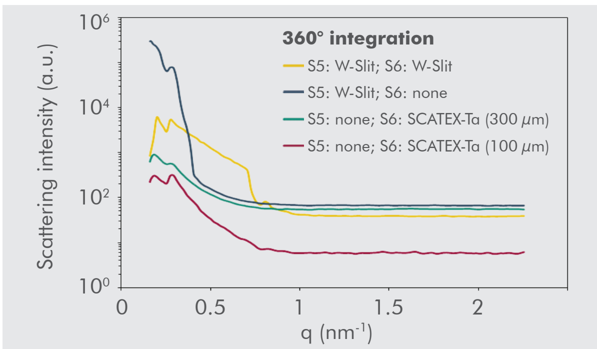
The detector images and the scattering intensity vs. q-plots show the parasitic aperture scattering at 8 keV. The downstream flux was the same (variation < 1%) for all compared test apertures.

SCATEX-Ta Pinholes

Comparison of W-Slits and SCATEX-Ta pinholes

The measurements were performed at 13 keV at the Nanofocus Endstation P03 beamline at PETRA III, DESY by C. Krywka with typical photon fluxes of 10^{11}-10^{12} ph/s.





The parasitic scattering of various apertures was tested at position S5 and S6. Standard beam setup: S5 - beam defining aperture position, S6 - scatter guard position. The data of the scattering intensity vs. q-plot is normalized to the number of summed up pixels.

The measurements show that a single SCATEX pinhole made of Tantalum can replace both beam defining slit S5 and antiscatter slit S6. Thus, the SCATEX pinhole can be positioned closer to the sample. The analysis exhibits that SCATEX-Ta pinholes cause one order of magnitude less parasitic aperture scattering than conventional Tungsten slit systems.