

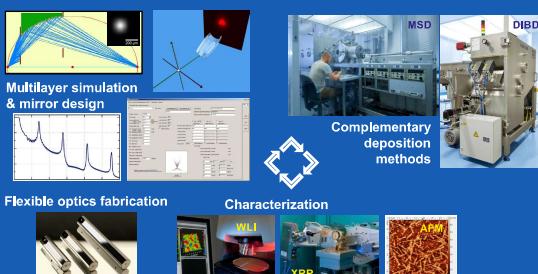
Tailored X-ray systems for new generation small X-ray sources

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Design, fabrication & measurement

For best customer-specific solutions, the most suitable X-ray source, optics and geometry are selected, simulated and optimized. X-ray optics are entirely fabricated in-house where numerous characterization instruments are available. Each final source-optics system is tested at-wavelength (if possible in the lab) before delivery.



Comparison of different source types performance

Brilliance ($\text{ph} / \text{s mrad}^2 \text{ mm}^2 0.1\% \text{ BW}$) is a fixed source parameter, only flux density (ph / mm^2) can be increased by optics. Depending on customers' applications the best source optics combination can be designed. Typical source performance parameters for Cu (MetalJet: Ga) anodes are shown in the table.

Source type	Energy [keV] Material	Anode spot [$\mu\text{m} \times \mu\text{m}$]	Power [W]	Power density [kW/mm^2]	Takeoff [°]	Beam size [$\mu\text{m} \times \mu\text{m}$]
fixed anode	8.0 (Cu K α) or Co, Mo, Rh, Ag, ...	12000x400	2200	0.5	6	12000x40
microfocus	8.0 (Cu K α) or Cr, Co, Mo, Rh, Ag, ...	50x500 50x250	50 30	2.0 2.4	6 12	50x50 50x50
rotating anode	8.0 (Cu K α) or Mo, Ag	70x700	1200	24.5	6	70x70
metaljet	9.2 (Ga K α) or In	20x80 10x40	250 125	156 312	16 16	20x20 10x10

Microfocus X-ray source system

X-ray source

- microfocus source
- typical anode materials for example Cr, Cu, Mo, Ag

X-ray optics

- focussing ASTIX-f (< 200 μm)
- collimating ASTIX-c (~ 900x900 μm^2)
- hybrid ASTIX-h (customized)

X-ray control unit

- HV generator
- controller with various I/O signals
- control software and Ethernet interface



MetalJet X-ray source – ASTIX X-ray optics system

Applications

- Powder diffraction
- SCD & protein crystallography
- SAXS
- X-ray microscopy



in collaboration with exillum

X-ray microscopy setup with ASTIX illumination optics and diffractive X-ray lenses (MLL) as objective

Parameters:

- Ga/In Metal Jet X-ray source
- anode spot size 5-20 μm (tunable), high brilliance
- high curvature accuracy (HCA) mirrors
- HR and HF optics for Ga-K and In-K radiation available



X-ray source-optics combinations



Micro focus
Metal Jet X-ray source
spot Ø: 5...20 μm
250 W
e.g. with ASTIX™-f-InKa
spot Ø: <100 μm

Micro focus
X-ray source
spot Ø: 50 μm
50 W
water cooling
with ASTIX™-f-CuKa
spot Ø: ~160-200 μm



Micro focus
X-ray source
spot Ø: 30...70 μm
30-70 W
water cooling
e.g. with ASTIX™-f-MoKa
spot Ø: ~110-130 μm



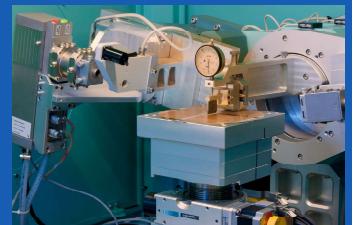
Fine focus X-ray source
12 mm x 0.4 mm
line focus
2.2 kW
water cooling
with 1D collimating mirror (PBO)
beam height ~1 mm



Versatile AXO multi-functional XRD/XRR system

in collaboration with HUBER

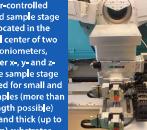
- microfocus X-ray tube
 - focus size: 30-50 μm
 - power: 30-50 W
 - anode materials: Cu, Mo, Ag, Cr, ...
 - water cooled, via chiller
 - safety shutter and fast shutter
- controller and generator for X-ray tube
 - 19" 2U rack-mount
 - input: 100-240 V (AC), 50/60 Hz
 - output: 70 W max.
 - high voltage: 10-65 kV
 - emission current: 1.4 mA max.
 - safety interlock circuit with control of safety shutter
 - X-ray tube temperature protection, chiller interlock
 - option for two X-ray sources
- water-to-air cooler
- multilayer X-ray optics (ASTIX-f/c/h)
 - focusing, collimating or hybrid
 - K β suppression > 10³
 - beam size: 300-1500 μm (ASTIX-f)
 - spot diameter: 30-600 μm (ASTIX-h)
- automatic filter changer
- 0/θ-goniometer with tube & detector arm
- motorized sample stage
- scintillation detector
- radiation protection housing
- controller for motors and detector
- water-to-air cooler
- Spec software and macro package



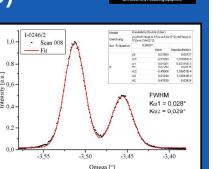
Scintillation detector with crossed slit screens (secondary optics optional).



Reflected XRD and diffraction (K α) patterns. These patterns can be carried out on very long samples. The toroidal test sample shown here is a ~62 cm long ZEISS synchrotron mirror.



Computer-controlled motorized sample stage. Located in the rotational center of two 1-circle goniometers, with Huber x-, y- and z-stage. The sample stage is designed for small and large samples (more than 50 cm length possible) and thin and thick (up to several cm) substrates.



Rocking scan after ASTIX optics showing Cu K α and K β peaks

Laboratory „beamline“ at BM28 (XMaS)

Laboratory „beamline“ at BM28 (XMaS) beamline at ESRF, Grenoble, France, for single crystal XRD

- Cu microfocus source (50 μm , 50 W)
- 2D collimating ASTIX-c optics for Cu K α radiation plus optional double-bounce Ge (022) channel-cut crystal (CC) for Cu K α , radiation
- divergence ≈ 0.03°
- divergence with CC around 5× smaller



Infos &
Contact:



AXO DRESDEN GmbH

Applied X-ray Optics

Röntgenoptik und

Präzisionsbeschichtung