

# GENERATING HIGH BRILLIANCE X-RAY BEAMS FOR X-RAY DIFFRACTION AND SCATTERING APPLICATIONS



Reflecting Future Technology

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## XENOCS supplies :

- innovative x-ray multilayer optics
- X-ray beam delivery solutions

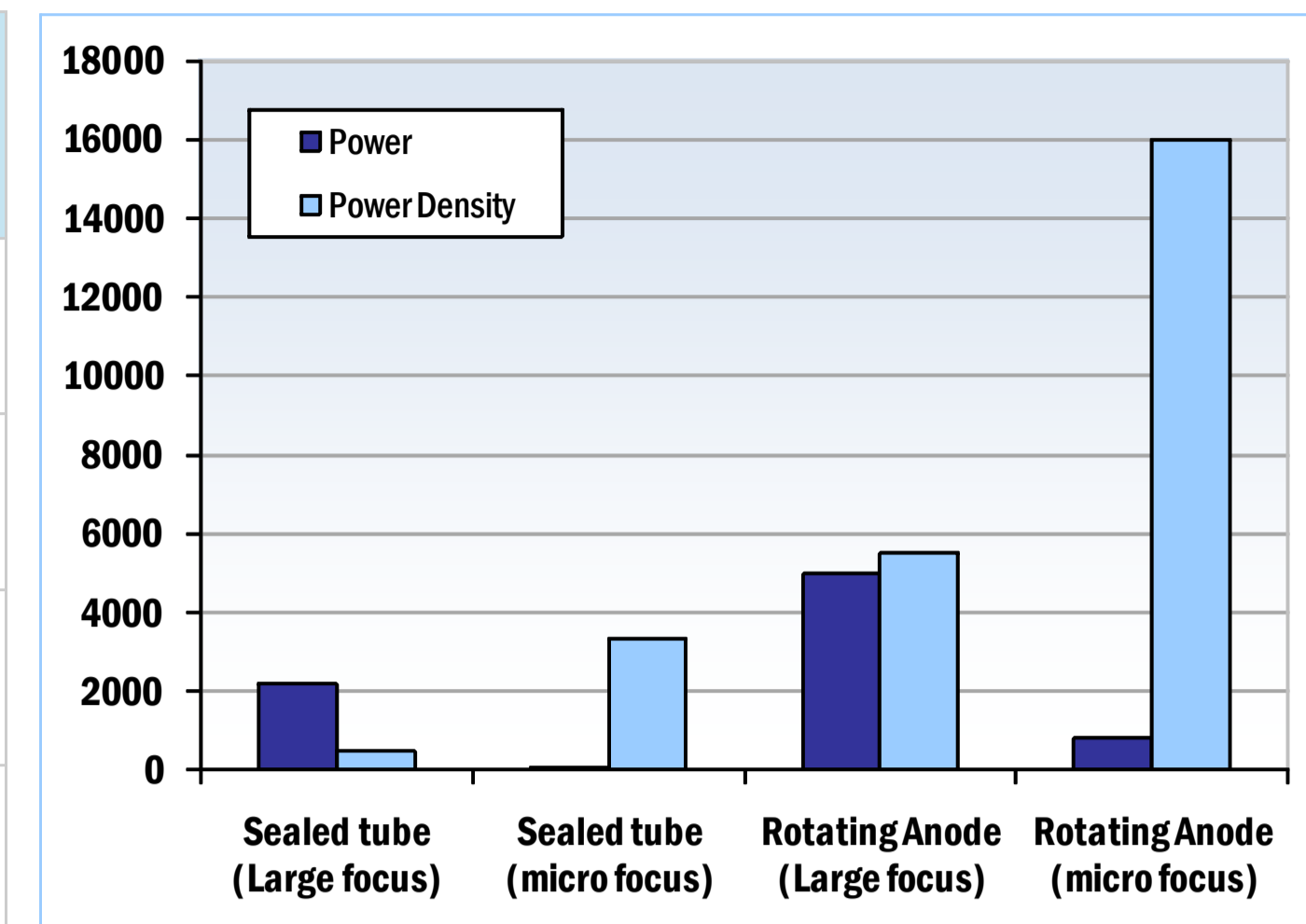


## Applications presently covered :

- Protein Crystallography
- Small Molecule
- SAXS
- High Resolution
- High pressure diffraction
- Powder diffraction
- And many others ...

## Performance ~ Brilliance (power versus power density)

X-ray Generator Type	Power (W)	e-beam spot (mm <sup>2</sup> )	Power Density (W/mm <sup>2</sup> )
Sealed tube (large focus)	2200	12 x 0.4	460
Sealed tube (micro focus)	50	0.3 x 0.05	3330
Rotating anode (large focus)	5000	3 x 0.3	5500
Rotating anode (micro focus)	800	0.7 x 0.07	16000



◆ Microfocus sources provide very high brilliance at low power

### Measurement:

- Small areas
- Mapping capability
- High resolution
- Short time

### Beam distribution in:

- Real space
- Angular space
- Wave-length or energy
- Time

### Beam generation:

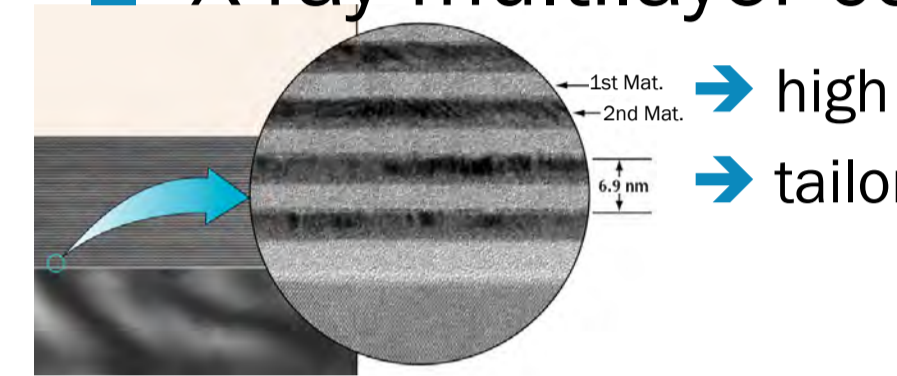
- Source brilliance
- Optics efficiency
- Beam path

**Brilliance:** Ph/mm<sup>2</sup>/mrad<sup>2</sup>/s in relevant part of spectrum

- Brilliance starts with the [source](#).
- At best, [optics](#), beam path preserves brilliance while transforming beam to a useful (optimum) distribution in phase-space.

## Aspheric Multilayer Coated Optics (AMCO)

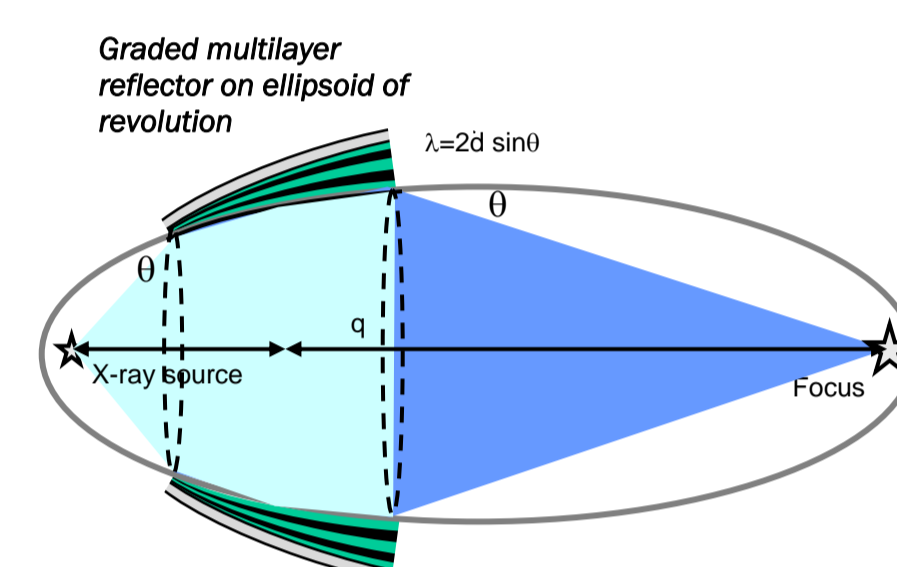
- X-ray multilayer coatings
- highly curved aspheric substrates



- high reflectivity
- tailored spectral purity

- large collection angles
- spot size

### Advanced X-ray optics



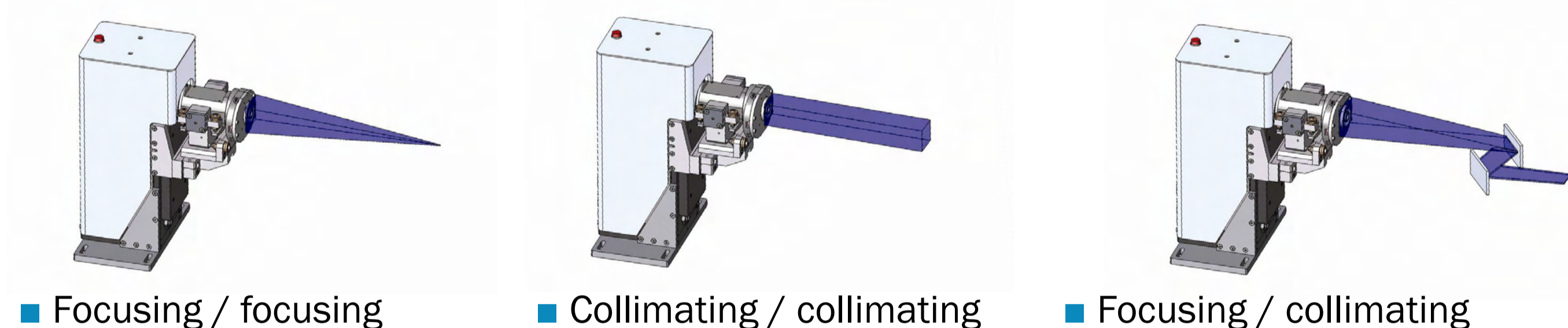
### AMCO preserve source brilliance

- high efficiency/reflectivity
- high stability
- easy to align
- larger collection angle
- no time degradation



## GeniX configurations

	Applications	Typical Flux <sub>vac</sub> (Mph/s)	Spot <sub>focus</sub> (FWHM/μm <sup>2</sup> )
GeniX CU High Flux	Small Molecule, Proteomics, Thin Film, Metrology	280	230 x 200
GeniX CU Low Divergence	SAXS, High Resolution	180	
GeniX CU Small Spot	Thin Film Metrology	55	90 x 110
GeniX CU High Convergence		300	110 x 110
GeniX MO High Flux	Small Molecule	16	200 x 200
GeniX MO Small Spot	High Pressure	3	40 x 80



- Focusing / focusing
- Collimating / collimating
- Focusing / collimating

## Features

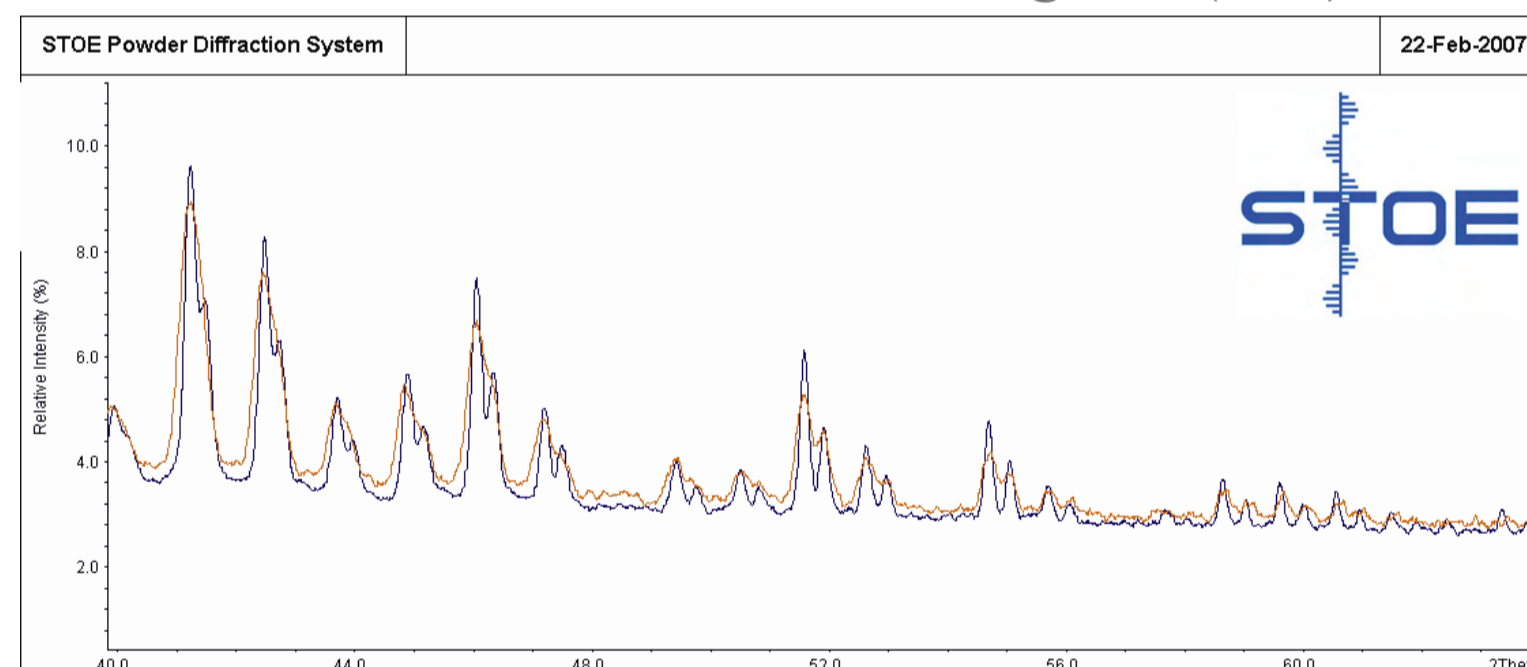
- Micro-focus Source (50W)
- High performance optics
- Compact system
- Collimation system
- Control & Command unit
- Safety & Fast Shutters
- Remote Operation (Ethernet)
- Water cooling (closed loop)
- Rack mounted chiller

## Benefits

- High brilliance
- Extreme beam stability
- Easy to integrate
- Ease of Alignment
- Ease of Use
- Space clearance from sample
- Low power consumption
- Low maintenance
- Limited Floor Space requirements

## LaB<sub>6</sub> Powder Diffraction

2kW Sealed tube versus GeniX MO High Flux (50W)



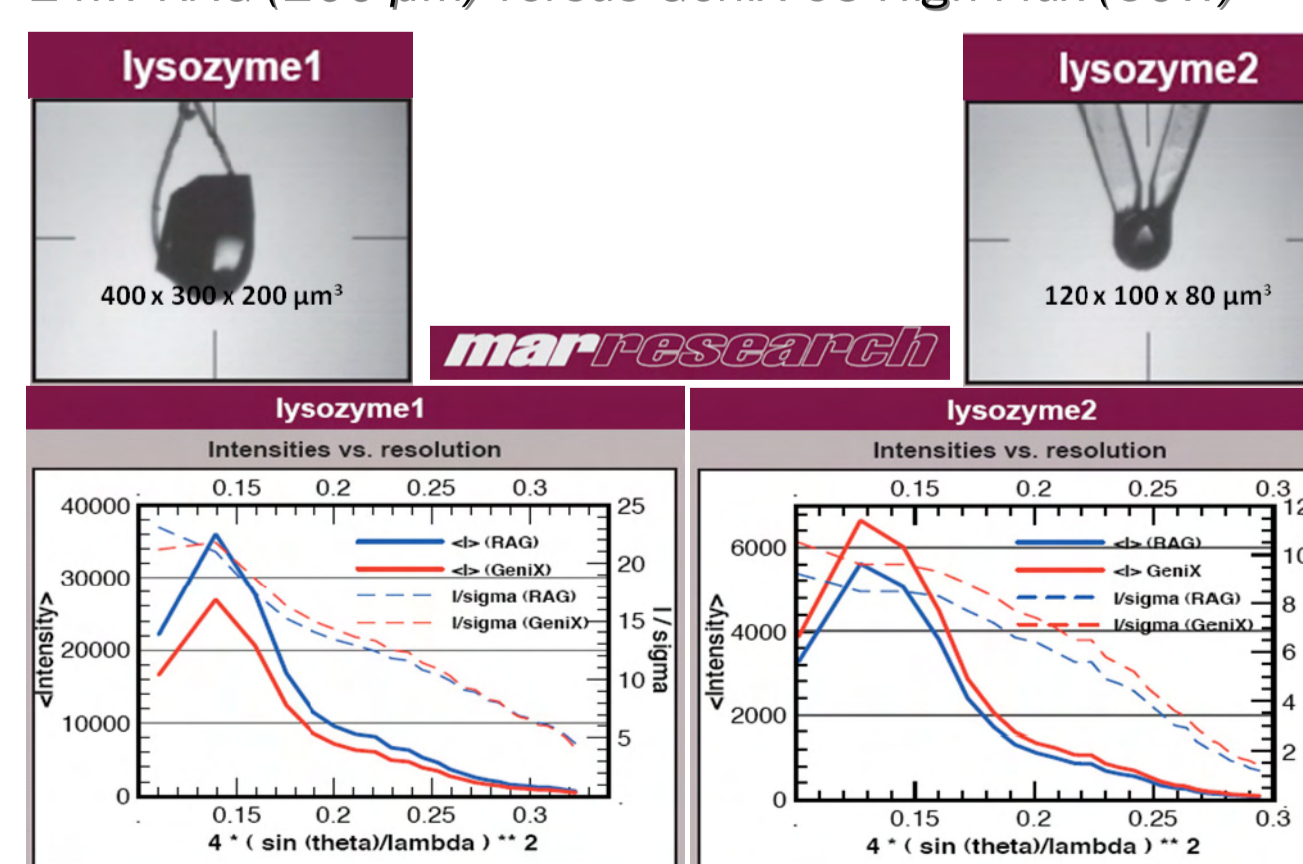
LaB<sub>6</sub> Powder Diagram - zoomed high angle data (blue = GeniX ; orange = sealed tube)  
Exposure time : 2 minutes

## GeniX CU High Flux

X-ray Beam Properties	
Wavelength	1.54 Å / 8 keV (Cu K <sub>α</sub> )
Flux (source 50W)	280 Mph/s
Divergence (FWHM)	< 4.8 mrad (both planes)

## Protein crystallography

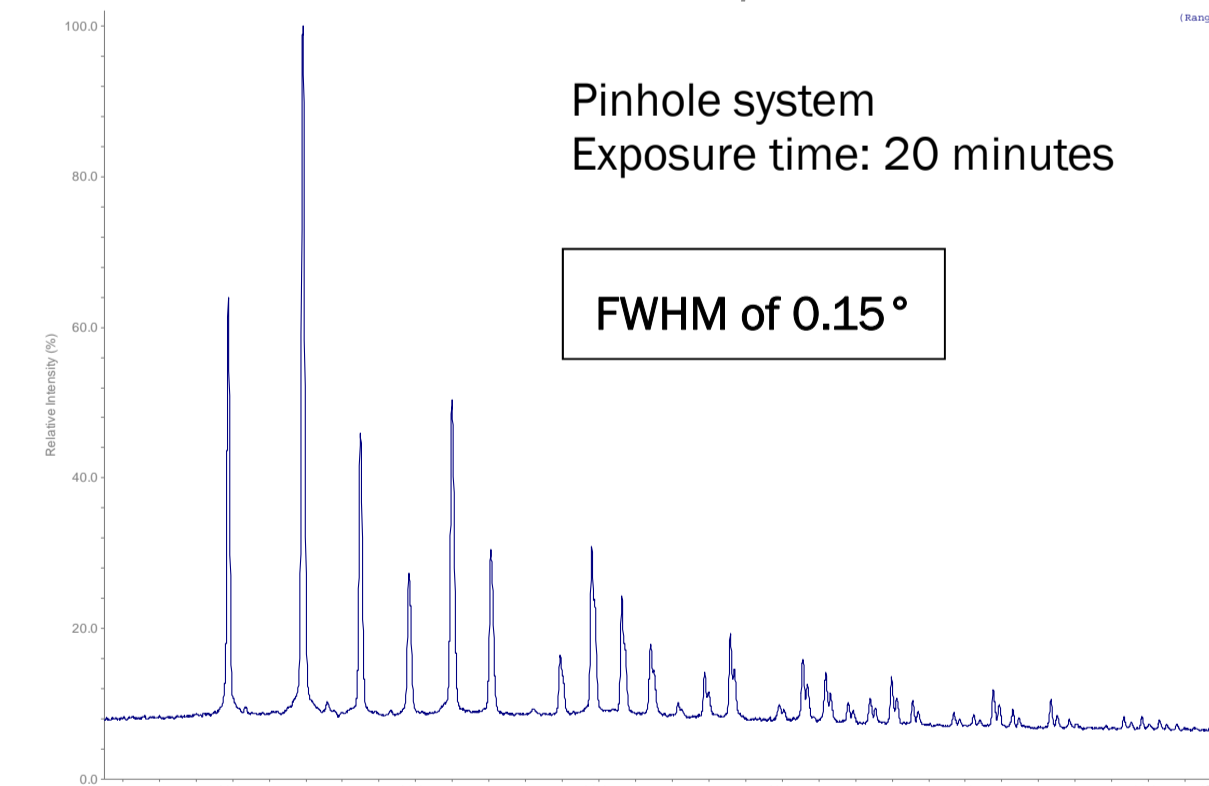
2 kW RAG (200 μm) versus GeniX CU High Flux (50W)



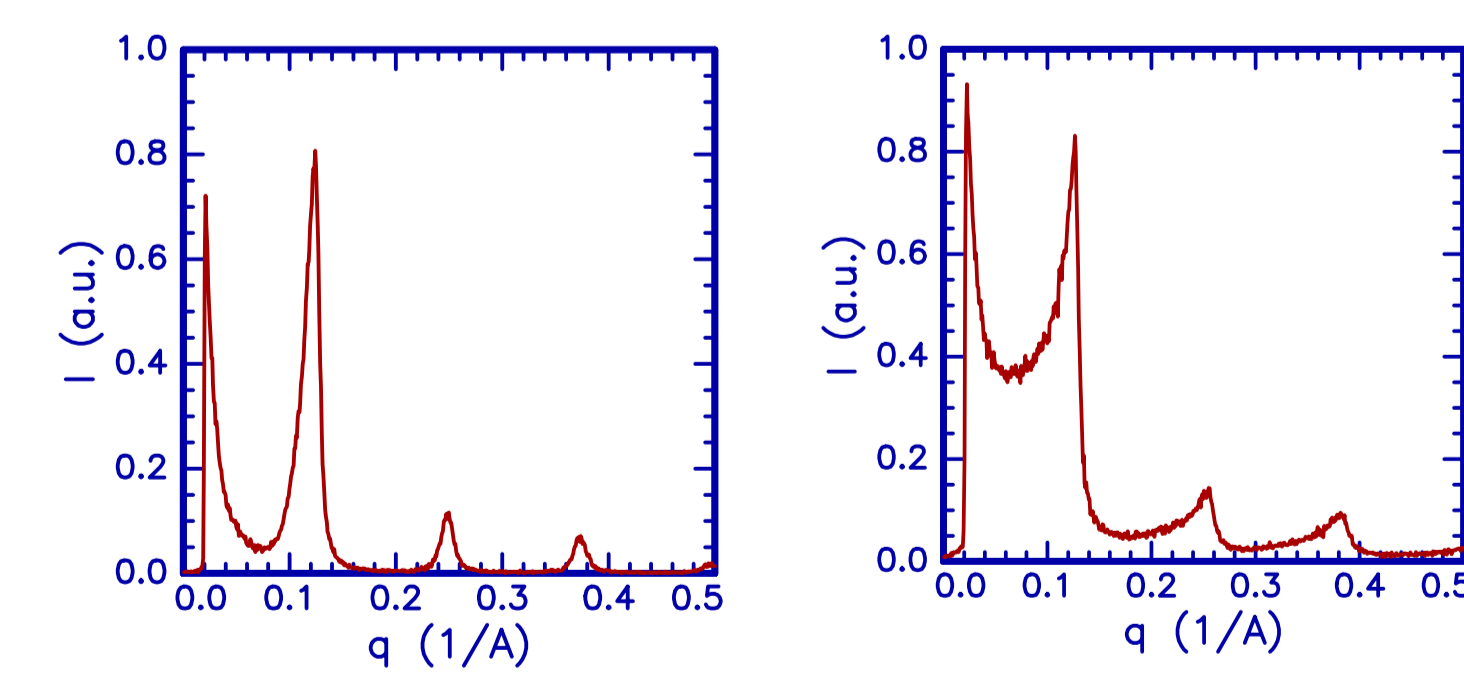
## GeniX MO High Flux

X-ray Beam Properties	
Wavelength	0.71 Å / 17.4 keV (Mo K <sub>α</sub> )
Flux (source 50W)	16 Mph/s
Divergence (FWHM)	< 3 mrad (both planes)

## LaB<sub>6</sub> measurement with optimized resolution



## SAXS Silver-stearate d = 48.68Å



- GeniX/Hecus point optics
- line-focus slit-collimation



\* Data courtesy of Stoe & Cie GmbH, MAR Research GmbH and Hecus X-ray Systems GmbH.



- is a stable, high brilliance, low power microfocus beam delivery system.
- is proven to outperform standard sealed tubes and to provide performance equivalent to traditional rotating anode generator in a number of applications.
- is an affordable solution metrology with reduced maintenance, facilities requirements and running cost.
- is validated by a number of equipment makers and academics

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