

HIGH-BRILLIANCE MICRO-FOCUS SOURCES FOR X-RAY DIFFRACTOMETRY

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Modern micro-focus X-ray sources define the state-of-the-art for a broad gamut of applications in home laboratories such as protein crystallography and small-angle scattering. These sources have small anode focal spot sizes of 50 μm and below, which are usually combined with multilayer mirrors to image the source spot onto the sample position. Magnified to a suitable size, the beam-shaping optic provides a parallel or focused monochromatic X-ray beam.

Low power sealed micro-focus X-ray tube sources, such as the $\text{I}\mu\text{S}^{\text{High Brilliance}}$ represent an interesting reduced cost and maintenance alternative to rotating anode generators. Power loads of several kW/mm^2 in anode spot sizes below 50 μm deliver a compact and highly brilliant beam. The $\text{I}\mu\text{S}^{\text{High Brilliance}}$ delivers a flux up to 10^{10} photons/s/ mm^2 in a spot size in the range of 100 μm and is available for Cu, Ag and Mo anodes. Since its launch in 2006 more than two hundred $\text{I}\mu\text{S}$ sources are currently in operation world-wide for a large variety of diffractometric applications in biology, chemistry, physics and material science. We will demonstrate the usefulness of this laboratory source with some selected examples.

Emerging micro-focus X-ray sources based on liquid-metal-jet technologies promise to open up new possibilities for photon hungry applications which demand highly brilliant sources. In collaboration with our partners Bruker AXS and Excillum we are developing such a source with the potential to reach X-ray intensities of up to 10^{12} photons/s/ mm^2 . Due to the exceptional heat capacity of the liquid-metal-jet, the resulting power loading capability of the anode can be as much as $500 \text{ kW}/\text{mm}^2$, which is an order of magnitude higher than that of solid target sources. We will present details of this source where we have already achieved brilliances that outperform any other currently available X-ray analytical home laboratory system.