Poster Presentation

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MetalJet source for In-situ SAXS studies in the home laboratory

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High-end x-ray scattering techniques such as SAXS, BIO-SAXS, non-ambient SAXS and GISAXS rely heavily on the x-ray source brightness for resolution and exposure time. Traditional solid or rotating anode x-ray tubes are typically limited in brightness by when the e-beam power density melts the anode. The liquid-metal-jet technology has overcome this limitation by using an anode that is already in the molten state.

We have previously demonstrated prototype performance of a metal-jet anode x-ray source concept [1] with unprecedented brightness in the range of one order of magnitude above current state-of-the art sources. Over the last years, the liquid-metal-jet technology has developed from prototypes into fully operational and stable X-ray tubes running in many labs over the world. Small angle scattering has been identified as a key application for this x-ray tube technology, since this application benefits greatly from high-brightness and small spot-sizes, to achieve a high flux x-ray beam with low divergence. Multiple users and system manufacturers have since installed the metal-jet anode x-ray source into their SAXS set-ups with successful results [2]. With the high brightness from the liquid-metal-jet x-ray source, in-situ SAXS studies can be performed – even in the home laboratory [3].

The influence of the size of the x-ray source and its distance to the x-ray optics on the divergence will be discussed, and how to minimize the divergence and maximize the flux in SAXS experiments targeted to specific applications.

This presentation will review the current status of the metal-jet technology specifically in terms of stability, lifetime, flux and brightness. It will also discuss details of the liquid-metal-jet technology with a focus on the fundamental limitations of the technology. It will furthermore refer to some recent SAXS and GISAXS data from users of metal-jet x-ray tubes.

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[2] A. Schwamberger et al, Nuclear Instruments and Methods in Physics Research B 343 (2015) 116–122
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