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Advancing Soft X-ray Instrumentation for High-Resolution Microscopy and Imaging at SoftiMAX

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The SoftiMAX beamline at MAX IV, commissioned in 2020, provides a versatile platform for soft X-ray spectromicroscopy and imaging in the 275–2500 eV range. The Scanning Transmission X-ray Microscopy (STXM) end-station, initially based on the ALS conceptual design with interferometric sample positioning, has since undergone extensive mechanical redesign and software optimisation to improve stability, flexibility, and user operation. Today, SoftiMAX routinely delivers spatial resolution of 20–30 nm with STXM, and sub-10 nm resolution with ptychography. These capabilities enable detailed chemical and structural imaging across a broad range of scientific fields, including materials science, catalysis, and energy research.

Detector development is central to further enhancing SoftiMAX's imaging performance. Current capabilities rely on a suite of systems tailored to different energy ranges and acquisition needs: the Tuscen Dhyana 95 (275–900 eV, back-illuminated sCMOS), the Andor Zyla 5.5 (500–2500 eV, scintillator-coupled sCMOS), and, most notably, a prototype EIGER LGAD detector for soft X-Ray range (500–2500 eV, 512×512 pixels). The latter was successfully operated at SoftiMAX in combination with the SOPHIE end-station, hosted during a dark period at the Swiss Light Source. Building on this experience, the EIGER is now being commissioned in our new CHIARA end-station, designed to extend high-resolution imaging and ptychography capabilities.

This poster will highlight recent progress and outline how collaborative instrumentation development - particularly next-generation detector integration - strengthen and expand the microscopy and imaging capabilities of SoftiMAX.

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