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FemtoMAX beamline instrumentation and femtosecond pump-probe time-resolved experiments at the MAX IV Laboratory

Tuesday 16 September 2025 17:00 (1 hour)

FemtoMAX is a multi-purpose, short-pulse X-ray beamline at MAX IV, uniquely located at the short pulse facility downstream of the LINAC, rather than the 3 GeV storage ring. Operational since 2021, it enables time-resolved X-ray diffraction/scattering experiments in the femtosecond to picosecond range using <100 fs X-ray photon pulses* that make it possible to follow the ultrafast dynamics in solid materials and biological molecules by investigating the structure of transient states along the optical response. FemtoMAX combines the temporal resolution of an FEL with the operational stability of a storage ring. The beamline features versatile optics including monochromators and focusing systems, and multiple 2D detectors in air and vacuum endstations providing a flexible sample environment. It is equipped with an ultrafast laser system and terahertz pump capabilities for pump-probe experiments. Controlled via the Sardana framework, the beamline supports custom scans and real-time data analysis. We present the beamline instrumentation, recent applications highlighting FemtoMAX's value**,***, and opportunities of the experiments at the FemtoMAX beamline at the MAX IV Laboratory.

Footnotes

* FemtoMAX Beamline, <https://www.maxiv.lu.se/beamlines-accelerators/beamlines/femtomax/>

** Tatsuya Amano et al., Nature Physics, Vol. 20, No. 11, (2024).

*** Gonzalez A, et al., J. Synchrotron Rad. 32, (2025).

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