# Development and application of coherent and incoherent laser based X-ray sources in spectroscopy and imaging

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## Summary

Coherent and incoherent laser based X-ray sources are important tools for ultrafast X-ray science. Due to its special properties such as short pulse duration and/or high degree of coherence these sources are applied in time-resolved X-ray spectroscopy, diffraction and coherent imaging. Recent developments in pump laser design as well as X-ray optics allow relatively small nearly table top setups for these investigations complementary to experiments at large scale facilities such as synchrotrons or free electron lasers.

In this talk we report on recent developments of laser based X-ray sources and applications at Max-Born Institute and at the Berlin Laboratory for innovative X-ray technologies. Special emphasis is placed on the description of high repetition rate pump lasers in thin disk technology (TDL). We describe a high repetition rate plasma based X-ray laser (XRL) pumped by a chirped pulse amplification (CPA) TDL system as well as a compact TDL based laser plasma source for soft X-ray spectroscopy and microscopy.

In the second part of this talk we discuss the application of these sources for X-ray microscopy, Fourier transform holography and time-resolved X-ray Absorption Fine Structure Spectroscopy (XAFS).