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Laser Pump - X-ray Probe studies on liquid interfaces at LISA P08 Petra III

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Understanding and controlling structure and function of liquid interfaces is a constant challenge in biology, nanoscience and nanotechnology, with applications ranging from molecular electronics to controlled drug release. X-ray reflectivity and grazing incidence diffraction provide invaluable probes for studying the atomic scale structure at liquid–vapour interfaces. The new time resolved laser system at the LISA liquid diffractometer [1] situated at beamline P08 [2] at the PETRA III synchrotron radiation source in Hamburg, Germany provides a laser pump - X-ray probe setup to study dynamics at the liquid interface. The femtosecond laser combined with the LISA diffractometer allows unique opportunities to investigate photo-induced structural changes at liquid interfaces on the pico- and nanosecond time scales with pump-probe techniques. The synchronisation of X-ray and laser pulses (see Figure 1) enables to achieve a time resolution of 80 ps, which was verified with Bismuth. First experiments include laser induced effects at salt solution and liquid mercury surfaces with static and measurements on varied timescales showing the proof of concept for investigations at liquid surfaces. [3]

References

[1] B. M. Murphy et al., Journal of synchrotron radiation 21, 45-56 (2024).
[2] O. Seeck et al., Journal of synchrotron radiation 19, 30-38 (2012).
[3] J. E. Warias et al., Journal of synchrotron radiation 31, 779-790 (2024).
[4] F. Reise et al., Chemistry – A European Journal 24, 17497-17505 (2018).

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Instrumentation and methods

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