



Contribution ID: 830

Type: Invited talk

Improving the Time-Resolution for Time Resolved Solution Phase Chemistry at XFELs

Wednesday 28 August 2024 11:20 (20 minutes)

The arrival of x-ray free electron lasers (XFELs) routinely made x-ray experiments with sub-500fs time-resolution possible, while additional diagnostics in combination with shot-to-shot analysis rapidly pushed this limit down to sub-100fs.

Following a decade of ultrafast time-resolved chemistry at XFELs there is a general interest to further push these temporal boundaries. ~100fs time-resolution is readily achievable by combining the nominal durations of XFEL pulses, laser pulses, timing diagnostics as well as the group velocity mismatch of a typical liquid sample jet. However, improving upon this limit has proven to be increasingly challenging and requiring developments in all aspects: compressed x-ray and laser pulses along with diagnostics and characterization, improved experimental timing diagnostics and procedures as well as thinner samples.

Here we will discuss the limitations and efforts to improve on them, including different laser compression schemes, sample delivery methods, time-tool targets and response as well as diagnostics for such experiments. With the goal of routinely achieving ~30fs time-resolution while maximizing the signal-to-noise necessary for hard x-ray solution phase experiments often utilizing a combination of solution scattering (XSS), x-ray emission spectroscopy (XES) and x-ray absorption spectroscopy (XAS) in a multimodal setup. The improvements in temporal resolution would allow for more detailed studies of coherent dynamics, molecular vibrations, and quantum phenomena in photochemistry.

I plan to submit also conference proceedings

Yes

Primary author: VAN DRIEL, Tim (SLAC National Accelerator Laboratory)**Co-authors:** Dr CHATTERJEE, Gourab (LCLS/SLAC); RAJ, Sumana (PULSE Institute)**Presenter:** VAN DRIEL, Tim (SLAC National Accelerator Laboratory)**Session Classification:** Mikrosymposium MS 12/1: Time Resolved Techniques**Track Classification:** 12. Time resolved techniques