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Radiation damage in time-resolved X-ray solution scattering experiments

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Time-resolved pump-and-probe X-ray solution scattering experiments can probe kinetics and dynamics of biological macromolecules in real time and under nearnative conditions. A concern is radiation damage to the sample. One approach to reduce radiation damage is to use mechanical devices to probe only with short X-ray pulses. We used this approach to monitor intermediate states in calcium transport at beamline ID09 at the ESRF 1,2. However, such experimental designs are delicate and typically only available at dedicated time-resolved synchrotron beamlines, which limits availability. An alternative approach is to use detector readout to obtain the temporal resolution, which requires careful characterization of radiation damage. We developed such an approach at the CoSAXS beamline at MAX IV Laboratory and tracked kinetics and structural dynamics of the enzyme adenylate kinase 3.

References

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