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Femtosecond structural dynamics of trans/cis isomerization in photoactive yellow protein

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Time-resolved structural information of biological molecules is key to understanding the mechanism of biological functions, such as enzymatic catalysis and photo-induced signalling. Pump-probe studies on light activated molecules, like photoactive yellow protein (PYP), have been successfully performed up to 100 ps time resolution at 3rd generation synchrotrons. With the availability of hard X-ray pulses on the femtosecond (fs) time scale emitted by free-electron laser (FEL) sources, the ultrafast fs to ps timescale has become experimentally accessible. In a previous experiment on PYP we demonstrated that time- resolved serial femtosecond crystallography (TR-SFX) could be successfully carried out at x-ray FELs on the nanosecond to microsecond time scales. In this talk I will discuss the results of TR-SFX experiments on PYP covering the time range from 100 fs to 3 ps, and identify the structural changes associated with the earliest steps in the trans-to-cis isomerization of the chromophore.

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