ID: 1888 - WEPSO34 Proposal for a Scheme to Generate a 10 tw Power Level, Femtosecond X-ray Pulses for Bio-imaging of Single Protein Molecules at the European XFEL

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Abstract Crucial parameters for bio-imaging experiments are photon energy range, peak power and pulse duration. For a fixed resolution, the largest diffraction signals are achieved at the longest wavelength supporting that resolution. In order to perform these experiments at the European XFEL, we propose to use a novel configuration combining self-seeding and undulator tapering techniques with the emittance-spoiler method. Experiments at the LCLS confirmed the feasibility of these three techniques. Their combination allows obtaining a dramatic increase the XFEL output peak power and a shortening of the photon pulse duration to levels sufficient for performing bio-imaging of single protein molecules at the optimal photon-energy range between 3 keV and 5 keV. We show here that it is possible to achieve up to a 100-fold increase in peak-power of the X-ray pulses at the European XFEL: the X-ray beam would be delivered in 10 fs-long pulses with 50 mJ energy each at a photon energy around 4 keV. We confirm by simulations that one can achieve diffraction before destruction with a resolution of 0.25 nm resolution.

Type of Presentation Poster

Main Classification Seeding FELs