FEL2022



Contribution ID: 115 Contribution code: MOCI1

Type: Invited Orals

Population Inversion X-Ray Laser Oscillator at LCLS

Monday, 22 August 2022 14:10 (30 minutes)

Cavity-based XFEL systems will potentially offer much higher spectral quality of the hard x-ray beam compared to traditional XFEL SASE and self-seeded sources. A promising cavity-based concept is the population inversion x-ray laser oscillator, dubbed XLO, where the SASE beam is used as a pump, and a transition metal serves as a gain medium. We will report on the progress in design and construction of the XLO, using LCLS as an x-ray pump, being developed by a SLAC, CFEL, University of Hamburg, University of Wisconsin, and UCLA collaboration. Initially, XLO will be demonstrated at the Coherent X-ray Imaging (CXI) LCLS endstation, as a two pass Regenerative Amplifier operating at the Copper Kalpha1 photon energy of 8048 eV. In the later phase of the project, it will utilize LCLS multi-bunch mode, with up to 8 x-ray pulses. Finally, XLO will generate fully coherent transform limited pulses with about 50 meV FWHM bandwidth. We expect the XLO will pave the way for new user experiments, e.g. in inelastic X-ray scattering, parametric down conversion, quantum science, X-ray interferometry.

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Yes

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Session Classification: FEL Theory

Track Classification: FEL Theory