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Seeded FEL lasing of the COXINEL beamline driven by the HZDR plasma accelerator

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Laser Plasma Accelerator (LPA) capabilities of producing high peak current, low emittance and GeV electron beams within a cm scale of accelerating distance paved the way for the realization of future compact light sources. With the continuous developments on LPA stability and electron beam properties, free electron laser (FEL) amplification had been recently demonstrated.
We report here on the commissioning of the COXINEL experiment at HZDR, combining the DRACO 150 TW ultra-short pulse laser and the COXINEL manipulation beamline, with the aim of achieving FEL amplification in the seeded configuration at 270 nm.
LPA-based FEL amplification requires a refined characterization of the electron beam phase space along the beamline before reaching the undulator.
The 10 meter long COXINEL beamline transport is designed to mitigate the chromatic emittance, reduce the slice energy spread and implement the supermatching optics, in addition to beam pointing alignment compensation allowing for position and dispersion control.
As for diagnostics, five imaging systems are installed along the line for electron beam optimization, a streak camera for temporal alignment and a UV spectrometer to measure the FEL signal. Furthermore, measurements are cross-checked with simulations, ELEGANT for beam optics and GENESIS for FEL.

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