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A photon beam line for the water window FEL at EuPRAXIA@SPARC_LAB

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A proposal for building a Free Electron Laser, EuPRAXIA@SPARC_LAB, at the Laboratori Nazionali di Frascati, is at present under consideration [1]. This FEL facility will exploit plasma acceleration to produce ultra-bright photon pulses with durations of few femtoseconds down to a wavelength between 2 and 4 nm, in the so called “water window”.

The photon beamline we designed will deliver the photon beam from the undulators to the experimental area, optimizing the beam for the running experiment to allow a fine tune of the beam characteristics. The FEL radiation will be in SASE regime, at least for the first phase of the project, so it will present shot-to-shot fluctuations in intensity, spectrum and position. The radiation diagnostics are therefore chosen to be single-shot and not-intercepting whenever possible. The beam will be characterized by measuring its dimensions, coherence and positions both in transverse and longitudinal directions, its spectrum and its intensity. The main class of experiments that will be performed at the EuPRAXIA@SPARC_LAB FEL will include coherent diffraction imaging, soft X-ray absorption spectroscopy, Raman and photofragmentation measurements [2].

[1] M. Ferrario et al., Nucl. Instr. Met. Phys. A, 2018, 909, 134.

[2] A. Balerna et al., Cond. Matt., 2019, 4, 30.

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