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## Conceptual design of the laser-plasma based soft X-ray Free Electron laser

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The conceptual design of the laser-plasma-based soft X-ray Free Electron Laser at ELI-Beamlines involves the integration of a novel high-power, high-repetition-rate laser, plasma source, compact LPA-based electron beam accelerator, dedicated electron beam line with relevant diagnostics, undulator beam line, photon beam line with required diagnostics, as well as a photon beam distribution system. The proposed concept of the whole setup is optimized to produce high-quality, coherent X-ray pulses with femtosecond duration in the 'water-window' wavelength of the photon radiation, which will be used by the photon user community for expiring research in the field of biology to study biological structures and processes at the cellular and molecular level at high resolution. In addition, the laser-plasma-based soft X-ray FEL will extend the abilities of users in material science to study nanostructures and thin films. In the frame of this report, we present the conceptual design for the full setup, which will be incorporated into the existing infrastructure of ELI-Beamlines. Furthermore, we discuss the key obstacles and the role of this project in the EuPRAXIA joint activity.

### Footnotes

### Funding Agency

### Paper preparation format

### Region represented

Europe

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