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FL28: A new diagnostic beamline for ultra-short XUV FEL pulses at FLASH

Tuesday 16 September 2025 17:00 (1 hour)

The FLASH2020+ project∗, a major upgrade program for the high-repetition-rate XUV and soft X-ray free-electron laser FLASH at DESY, aims at significantly improving the FEL photon-beam properties for users. Besides external seeding at the full repetition rate of FLASH, a second focus is put on extremely short photon pulses in the lower fs range. Here, we will present the new diagnostic beamline concept for the FLASH2 branch to address the temporal characterization of the FEL photon pulses. The new FL28 beamline will be set up as a dedicated online diagnostic beamline. This is accomplished by an almost parasitic extraction of a small fraction of the FEL beam, while the main part of the beam is steered almost unaffected to the user experiments. The extraction and transport of the FEL radiation into the interaction chamber is realized by two Ni-coated mirrors under 16°, which cover a wavelength range from 2 nm to 90 nm, followed by a differential pumping stage and an ellipsoidal focusing mirror. Finally, the pulse length is derived from electron time-of-flight spectroscopy on noble gases in combination with an external infrared circularly-polarized streaking laser field∗∗.

Footnotes

∗ Martin Beye, et al., FLASH and the FLASH2020+ project—current status and upgrades for the free-electron laser in Hamburg at DESY, Eur. Phys. J. Plus 138, 193 (2023);
https://doi.org/10.1140/epjp/s13360-023-03814-8
∗∗ N. Hartmann, et al., Attosecond time–energy structure of X-ray free-electron laser pulses, Nature Photonics 12, 215 (2018);
https://doi.org/10.1038/s41566-018-0107-6

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