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Latest Achievements in Femtosecond Synchronization of Large Scale Facilities

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The laser-based synchronisation systems for the European XFEL and FLASH provide femtosecond-stable timing references for tens of clients along the accelerator and the experiment halls over many kilometres of optical fibre. Recently, benchmarking experiments revealed a point-to-point timing stability with sub-femtosecond rms timing jitter. At the same time geophysical effects like ocean waves and earthquakes do not only affect the performance of the system, but their impact can clearly be identified. To improve the temporal resolution in X-ray/optical pump-probe experiments, additional arrival time monitors for both the electrons and the optical laser pulses are currently being installed, allowing for a posteriori data sorting and eventually active feedbacks. Further, the optical reference oscillators and advanced synchronisation schemes are being developed, resulting in timing jitter on the sub-hundred attoseconds level.

Footnotes

Funding Agency

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