

Pulse- and field-resolved THz diagnostics at TELBE

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In this work we demonstrate an approach of double arrival time monitors (ATM), which is employed to increase synchronization level between external femtosecond laser systems and 4th generation light sources. With comparison to the single arrival time monitor technique, which was routinely used for time-resolved experiments at accelerator-based light sources, here we demonstrate more than twice increase in the temporal resolution and elimination of temporal drifts. The proposed technique opens a way for sub-femtosecond synchronization within large-scale facilities and laser systems.

Summary

We demonstrate the potential of pulse- and field-resolved diagnostics for superradiant THz sources utilizing a sequence of arrival time monitors for each involved accelerator-based source. Our pulse- and field-resolved diagnostics can be directly transferred to the soft-X-ray FEL FLASH where a THz undulator source is followed by an edge radiation source. Our findings are also of high relevance for current proposals to implement superradiant undulators into the European XFEL and the LCLS-II FEL as well as the many existing or discussed compact accelerator-based superradiant THz undulator facilities.

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