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Utilizing a pair of orthogonally oriented corrugated structures for variable polarization self-locked streaking of electrons in time.

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Corrugated structures have recently been utilized for the time-resolved diagnostics of electron bunches in the several GeV energy range and free-electron-laser (FEL) pulses across several FEL facilities: SwissFEL at PSI and European XFEL at DESY. This approach is simple and cost-effective, based on the self-streaking of electrons with a transverse wakefield enhanced in such structures.

In this work, we introduce the simplified design of a corrugated streaker developed for electron bunches in the several hundred MeV range and the wide range of beam parameters of the CERN Linear Electron Accelerator for Research (CLEAR). We emphasize the potential benefits of using a pair of orthogonally oriented streakers. Firstly, variable polarization streaking can be achieved in such a configuration. Additionally, the undesired quadrupole wakefield of streaking in the vertical (or horizontal) direction with one structure can be compensated by the second streaker. This allows for a significant improvement in the resolution of the method and paves the way for cost-effective and robust temporal diagnostics for future compact FEL facilities.

Footnotes

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Author: MALYZHENKOV, Alexander (European Organization for Nuclear Research)

Co-authors: LATINA, Andrea (European Organization for Nuclear Research); GILARDI, Antonio (SLAC National Accelerator Laboratory); KORYSKO, Pierre (Oxford University); CORSINI, Roberto (European Organization for Nuclear Research); FARABOLINI, Wilfrid (European Organization for Nuclear Research)

Presenter: MALYZHENKOV, Alexander (European Organization for Nuclear Research)

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