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Post-undulator time-resolved diagnostics of electron and photon beams at SwissFEL with a passive structure.

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SwissFEL is a hard X-ray free-electron laser (FEL) facility operating at the Paul Scherrer Institute in Switzerland. We recently installed a passive corrugated structure after the undulator beamline of SwissFEL. The transverse wakefields generated by the electron beam traveling through such a device can be employed to measure the time properties of the electrons. Compared to the standard transverse RF deflector approach, the method is more cost-effective, less sensitive to arrival-time jitter, but the reconstruction of the beam profiles becomes more complicated. A comparison of the longitudinal phase-space of the electron beam with and without lasing conditions also allows reconstructing the time-resolved properties of the produced hard X-ray radiation. We present simulations studies and first experimental results of this new method at SwissFEL.

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