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Characterization of sub-femto-second pulse duration of low-charge electron bunches using a Bunch-Compressor-Monitor at SwissFEL

Thursday 11 September 2025 10:00 (20 minutes)

The absolute characterization of the electron pulse duration- bunch length - in the ultra-short and low- charge (3-10 pC) operation mode of SwissFEL is relevant to a deeper understanding of the spectral structure and broad-band distribution of the resultant Free-Electron-Laser (FEL) pulse. Under this operation mode of SwissFEL, the output signals of the Bunch-Compressor-Monitor (BCM) in operation after the final magnetic chicane (ECOL) of the hard x-ray undulator line of SwissFEL (Aramis) can be suitably processed to obtain an absolute characterization of the electron bunch-length [1]. This is possible in the ECOL-BCM thanks to the simultaneous detection of the Edge-Synchrotron radiation pulse in two different and partially overlapping spectral bands by means of a pyro-detector and an optical fiber spectrometer. Experimental results on the absolute characterization of the electron bunch-length at the ultra-short and low-charge operation mode of SwissFEL will be presented together with details on the formal method applied for processing the two output signals of the ECOL-BCM [1].

Footnotes

[1] Orlandi, G.L. Absolute and non-invasive determination of the electron bunch length in a free electron laser using a bunch compressor monitor. Sci Rep 14, 6319 (2024). https://doi.org/10.1038/s41598-024-56586-1

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