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Approaching an optimum time resolution for synchroscan streak-camera measurements with visible synchrotron light

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The optical beam diagnostics at the BESSY II light source in Berlin have been improved significantly over the last few years. In particular, the streak-camera system has been extended in precision and sensitivity to allow two-dimensional imaging in time and space for equilibrated and non-equilibrated bunch patterns. In this paper, we prove experimentally and theoretically that we have reached a sub-ps RMS total time resolution using filtered synchrotron light. Detailed simulations, including the different physical time-dispersion mechanisms, show the influence of various band-pass and edge wavelength filters on the resolution. The limits for unfiltered near-visible synchrotron radiation (white-light) and the band-pass filter to achieve optimal time resolution are derived as well, providing a basis for more advanced beam-dynamics studies in the near future. (NIMA, 1062, May 2024, 169196)

Footnotes

Funding Agency

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Primary author: MARONGIU, Marco (Helmholtz-Zentrum Berlin fuer Materialien und Energie GmbH)

Presenter: MARONGIU, Marco (Helmholtz-Zentrum Berlin fuer Materialien und Energie GmbH)

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