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Simulation of longitudinal phase space measurements for the RUEDI ultrafast electron diffraction beamline

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The RUEDI (Relativistic Ultrafast Electron Diffraction & Imaging) ultrafast electron diffraction (UED) beamline aims to provide electron bunches to diffraction samples with an at-sample temporal resolution of sub-10 fs. Electron bunches of such short duration prove non-trivial to measure at electron beam kinetic energies of 4 MeV. A diagnostic beamline design is presented to enable simultaneous longitudinal phase space measurements (bunch duration, momentum and momentum spread) with a streaker and spectrometer. Several methods of measuring sub-10 fs bunch durations using both RF transverse deflecting cavities and THz streakers are outlined here with their limitations. Measurements are replicated in simulation to demonstrate the diagnostic beamline is capable of the high-resolution required for the longitudinal phase space measurements within the RUEDI UED beamline.

Footnotes

Funding Agency

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LaTeX

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Europe

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