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Taper-enhanced high-brightness SASE for stable temporally coherent HXR FEL pulses

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High-Brightness SASE (HB-SASE) is a proposed method for greatly improving the temporal coherence of SASE FEL pulses using magnetic delay chicanes along the undulator beamline. Isochronous chicanes, which include high-strength quadrupoles, promise to deliver the greatest improvement in temporal coherence but it is more convenient if the delay chicanes are composed only of dipoles. In this paper we present a simulation study of a FEL operating at 25keV, driven by a low charge electron bunch, in which HB-SASE is implemented with dipole-only chicanes to generate fully temporally coherent FEL pulses. Post-saturation tapering is then employed to further amplify the FEL pulse while maintaining its temporal coherence. The scheme is predicted to produce fully coherent, mJ pulse energy FEL pulses with few-femtosecond duration and excellent shot-to-shot stability of wavelength, pulse energy and pulse profile –as such it is a candidate for implementation on a future UK-XFEL.

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Footnotes

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Yes

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