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Studies of Wavelength Control at FERMI

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FEL basic theory indicates that the output wavelength of a seeded FEL operated in the HGHG configuration is determined by the wavelength of the seed laser and light is emitted when undulators are tuned to one of the harmonics of the seed laser. In a more realistic case, when taking into account the electron beam imperfections and the finite bandwidths of the seed and of the amplification process, the output wavelength is influenced by these factors and there is a small variation from this rule.

In this work, we consider the effects of the dispersive section, the curvature of the electron beam longitudinal phase-space and the frequency pulling as major contributors. We show how these quantities influence the effective final FEL wavelength. Furthermore, we show how one can reconstruct the electron beam longitudinal phase-space from the analysis of the FEL wavelength sensitivity to the seed laser delay with respect to the beam arrival time.

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Yes

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