

## **Coherence requirements for various seeding schemes**

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The impact of external laser quality on the quality of the radiation produced by a seeded FEL is fairly well understood. Less appreciated is the impact of longitudinal variations in the electron beam on longitudinal coherence. The mechanisms for this dependence are explored, and tolerances on the electron beam to achieve fully coherent radiation are calculated for various seeding schemes. The most challenging requirement is for a very flat slice energy profile, which is made more challenging for small-gap undulators due to the effect of resistive wall wakefields. Strategies to minimize both beam energy variations and their impact on the output of the FEL are explored, and simulations of examples for soft x-ray FELs are presented.