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Using a passive dielectric structure to manipulate FEL beams

Plasma wakefield accelerators have the potential to reduce the size of particle accelerators because of the high accelerating gradients in plasma wakes. However, the finite length of bunches combined with the short wavelength of plasma wakes can give output beams with non-negligible energy spread that can negatively impact FEL performance. SwissFEL routinely operates a passive dielectric structure to perform beam manipulations that modify the FEL bandwidth and produce sub-femtosecond X-ray pulses. In this poster we present experimental observations and accompanying simulations that show the short-range wakefields in the SwissFEL passive dielectric structure can be used to modify the energy spread of the beam. We also show long-range wakefields produced in the passive structure can accelerate the SwissFEL beam.

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