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Electron and x-ray steering using pulse front tilts in laser plasma accelerators

Controlling the pointing of laser wakefield accelerated electrons is essential for applying them both directly, e.g. in stereotactic radiotherapy, and indirectly such as when coupling them to subsequent acceleration stages or beam transporting magnets. However, the electron beam can substantially deviate by tens of milliradians from the laser's optical axis when the laser exhibits a pulse front tilt. Here we present a method for controlling the pulse front tilt to reliably steer the electron beam to a desired angle. The control is shown to also extend to the generated x-ray radiation. The scheme could be used to stabilize the electron pointing over time, or for agile scanning of the electron beam without changing the optical axis.

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