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Transportation and Manipulation of A Laser Plasma Acceleration Electron Beam

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The ERC Advanced Grant COXINEL aims at demonstrating free electron laser amplification, at a resonant wavelength of 200 nm, based on a laser plasma acceleration source. To achieve the amplification, a 8 m long dedicated transport line was designed to manipulate the beam qualities. It starts with a triplet of permanent magnet with tunable gradient quadrupoles (QUAPEVA) that handles the highly divergent electron beam, a demixing chicane with a slit to reduce the energy spread per slice, and a set of electromagnetic quadrupoles to provide a chromatic focusing in a 2 m long cryogenic undulator. Electrons of energy 176 MeV were successfully transported throughout the line, where the beam positioning and dispersion were controlled efficiently thanks to a specific beam based alignment method, as well as the energy range by varying the slit width. Observations of undulator radiation for different undulator gaps are reported.

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