EUROPEAN NETWORK FOR NOVEL ACCELERATORS

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GeV-scale low-emittance positron beams from a laser-wakefield accelerator

We report on the first direct and comprehensive characterisation of the spatial and spectral properties of near-GeV positron beams generated in a fully laser-driven configuration, using a 100 TW-class laser system.

More than 10^5 positrons are generated within 5% of energies exceeding 500 MeV, and isolated using an energy selection system. The beam exhibited a normalised emittance at 600 MeV of 18 micron, a source size of 5 micron, and a longitudinal length < 15 micron.

We propose that positron beams with these characteristics will enable the experimental study and optimisation of plasma-based positron accelerators.

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