Abstract Submitted
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Scaling laws for positron production in laser-electron beam collisions[1] TOM BLACKBURN, Chalmers University of Technology, ANTON ILDERTON, University of Plymouth, CHRISTOPHER MURPHY, University of York, MATTIAS MARKLUND, Chalmers University of Technology — Showers of gamma rays and positrons are produced when a multi-GeV electron beam collides with a super-intense laser pulse. All-optical realisation of this geometry, where the electron beam is generated by laser-wakefield acceleration, is currently attracting much experimental interest as a probe of radiation reaction and QED effects. These interactions may be modelled theoretically in the framework of strong-field QED or numerically by large-scale PIC simulation. To complement these, we present analytical scaling laws for the electron beam energy loss, gamma ray spectrum, and the positron yield and energy that are valid in the radiation-reaction–dominated regime. These indicate that by employing the collision of a 2 GeV electron beam with a laser pulse of intensity $5 \times 10^{21}\,\mathrm{Wcm}^{-2}$, it is possible to produce 10,000 positrons in a single shot at currently available laser facilities.

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