Abstract Submitted
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High-quality multi-GeV electron beams from auto-resonance laser-acceleration YOUSEF SALAMIN[1], Department of Physics, American University of Sharjah, BENJAMIN GALOW, JIANXING LI, ZOLTAN HARMAN, CHRISTOPH KEITEL, Max-Planck Institute for Nuclear Physics in Heidelberg, Germany — Results from many-particle simulations will be presented that demonstrate feasibility of generating an electron bunch of over 10-GeV energy and ultra-high quality (relative energy spread $\sim 10^{-4}$) by cyclotron auto-resonance. The scheme employs a static magnetic field oriented along the direction of propagation of a laser beam. Tremendous energy gain by the electron from the laser field occurs if the injection conditions and laser and magnetic field parameters conspire to achieve auto-resonance: when the cyclotron frequency of the electron around the lines of the magnetic field match the Doppler-shifted frequency of the laser as seen by the electron. Accelerated electron bunches of the above-mentioned characteristics are suitable for fundamental high-energy particle physics research. In our calculations, the laser peak intensities and axial magnetic field strengths required are up to about 10^{18} W/cm^2 and 60 T, respectively. Gains exceeding 100 GeV are shown to be possible when weakly focused pulses from a 200-PW future laser facility are used.

Reference: *High-quality multi-GeV electron bunches via cyclotron autoresonance*, B. J. Galow, J.-X. Li, Y. I. Salamin, Z. Harman, and C. H. Keitel (submitted).

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