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Forward sliding-swing acceleration: electron acceleration by high-intensity lasers in strong plasma magnetic fields[1] ZHENG GONG, UT Austin, FELIX MACKENROTH, Max Planck Institute, TAO WANG, UCSD, XUEQING YAN, Peking University, TOMA TONCIAN, Institute for Radiation Physics, HZDR, ALEXEY AREFIEV, UCSD — A high-intensity laser beam propagating through a dense plasma drives a strong current that robustly sustains a strong quasi-static Mega Tesla-level azimuthal magnetic field. The transverse laser field efficiently accelerates electrons in such a field that confines the transverse motion and deflects the electrons in the forward direction, establishing the novel *forward-sliding swing acceleration* mechanism. Its advantage is a threshold rather than resonant behavior, accelerating electrons to high energies for sufficiently strong laser-driven currents. We study the electrons' dynamics by a simplified model analytically, specifically deriving simple relations between the current, the particles' initial transverse momenta and the laser's field strength classifying the energy gain. We confirm the model's predictions by numerical simulations, indicating Mega ampere-level threshold currents and energy gains two orders of magnitude higher than achievable without the magnetic field [arXiv:1811.00425 https://arxiv.org/pdf/1811.00425.pdf].

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