Oxford ALP Seminar on
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Radiation-dominated electron acceleration in plasma channels using extremely intense light

With the availability of intense pulse lasers, it is now possible to construct accelerators in plasmas, that harness the energy of the laser and transfer it to energetic particles. Here we consider direct laser acceleration in plasma channels, analytically and with particle-in-cell simulations. Our study of electron acceleration provides compact scaling laws applicable to the regime of extreme laser intensities when particle motion is affected by radiation reaction. Counter-intuitively, the radiation emission can be beneficial for particle energy gain through radiative trapping and by increasing a fraction of particles that can achieve the betatron resonance. We have shown that electrons can be accelerated to energies > 10 GeV, in a single-stage experimental setup using near-future laser technology. The presented scaling laws can be used to optimize the acceleration strategy, and predict the output radiation content. A similar technique, with several modifications, can be used to accelerate positrons. I propose a viable configuration for experimental generation and acceleration of lepton beams using the near-future laser technology.