



The new intensity frontier: exploring quantum electrodynamic plasmas

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Just beyond the limit of intensity currently reached by high-power laser systems the creation of new plasma state in the laboratory is predicted - a 'quantum electrodynamic (QED)-plasma' - similar to that inferred to exist in extreme astrophysical environments such as pulsar magnetospheres. In this new plasma state the large-scale electromagnetic fields from the laser are so strong that strong-field QED processes play an important role in the plasma dynamics. These strong field QED processes should dominate the interaction of next generation multi-PW lasers with matter, yet they are far less well understood than standard QED. The interplay of these strong-field QED and ultra-relativistic plasma processes will give rise to a rich array of new phenomena in multi-PW laser-plasma interactions. Several of these new phenomena, the route to creating QED-plasmas in the laboratory as well as experiments with current PW lasers which constrain our models of the underlying strong-field QED processes will be discussed.