Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

The role of collisions in the laser filamentation and Weibel instabilities R. BINGHAM, STFC Rutherford Appleton Laboratory, UK and U. Strathclyde, Glasgow, UK, R. TRINES, STFC Rutherford Appleton Laboratory, UK, P. NORREYS, STFC Rutherford Appleton Laboratory, UK and U. Oxford, UK, R.A. CAIRNS, U. St-Andrews, Fife, UK, L.O. SILVA, GoLP/IPFN, Instituto Superior Tecnico, Lisbon, Portugal — We report on two instabilities that are associated with inertial fusion, namely the laser filamentation instability and the Weibel instability that can filament the relativistic electron beam in fast ignition. We look at the role collisions have in these instabilities. First we consider the filamentation instability of lasers in high Z plasmas typical of hohlraum targets. The wavelength dependence of the two principal laser filamentation mechanisms, namely the ponderomotive force and Joule heating, are examined and deductions are made of their relative importance for current holhraum experiments. The Joule heating mechanism is important for short wavelengths and high Z materials while the ponderomotive force becomes more important for longer wavelengths and low Z materials. The high Z targets are susceptible to thermal filamentation, creating non-uniform plasmas. The effect of plasma density and laser bandwidth is also examined and reported on. In fast ignition, we show that the Weibel instability growth rate, which drives the filamentation of a relativistic electron beam, is reduced when collisions are considered.

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Date submitted: 15 Jul 2016 Electronic form version 1.4