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Numerical and experimental investigations of fusion-relevant beam-plasma instabilities M. KING, S.L. MCCONVILLE, D.C. SPEIRS, R. BRYSON, K.M. GILLESPIE, A.D.R. PHELPS, A.W. CROSS, C.G. WHYTE, K. RONALD, University of Strathclyde, R.A. CAIRNS, I. VORGUL, University of St Andrews, R. BINGHAM, R.M.G.M. TRINES, STFC Rutherford Appleton Laboratory — The growth and evolution of beam-plasma instabilities is of interest in a variety of fields of plasma physics. In fast-ignition inertial confinement fusion this instability may provide an additional ion heating mechanism. In this form of inertial confinement fusion, a deuterium-tritium fuel pellet is compressed by uniformly distributed intense laser radiation forming a high density plasma. A secondary short, high power laser pulse then interacts with the high density plasma, possibly via a conical gold insert, producing a highly relativistic electron beam that propagates through the plasma. During this propagation, the two-stream instability can occur. This instability takes the form of Langmuir waves which may parametrically decay to ion acoustic waves. These ion acoustic waves can then be damped by ion-ion collision providing a heating mechanism in addition to electron-ion collisions. To investigate this behaviour, numerical simulations have been conducted in a lower density and lower temperature regime utilising a two-dimensional particle-in-cell (PiC) code. The parameters used represent a laboratory experiment that is being designed and constructed to provide an experimental benchmark for the numerical predictions.

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