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Plasma heating with crossing relativistic electron beams NAREN RATAN, University of Oxford , NATHAN SIRCOMBE, AWE Aldermaston, LUKE CEURVORST, MUHAMMAD KASIM, JAMES SADLER, University of Oxford, ROBERT BINGHAM, RAOUL TRINES, STFC Rutherford Appleton Laboratory, PETER NORREYS, University of Oxford — Plasma heating by relativistic electron beams is a powerful tool with applications including the heating of inertial confinement fusion targets and the study of matter in extreme conditions. We discuss the use of two relativistic electron beams to efficiently heat the plasma ions where the beams cross by using beam-plasma instabilities and non-linear wave coupling between Langmuir and ion-acoustic waves. Energy from the electron beams is coupled to the plasma ions as the beams become unstable and drive Langmuir waves which couple non-linearly to ion-acoustic waves which are then damped . Results of linear growth rate calculations are presented for the system of two crossing electron beams demonstrating a broad spectrum of unstable modes. Relativistic Vlasov-Maxwell simulations in two space and two momentum dimensions have been performed which demonstrate the non-linear coupling of the electron beam energy into ion-acoustic waves and the energy cascade to the background ions. Time-frequency analysis is applied to analyze the non-linear coupling between Langmuir and ion-acoustic waves in wave phase space. Structural properties of the strong turbulence produced at late times are analyzed.

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