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**Instabilities in counter-propagating ion beams and plasmas** SOPHIE JEQUIER, VLADIMIR TIKHONCHUCK, EMMANUEL D'HUMIERES, REMI CAPDESSUS, STANLEY DAVIS, CELIA Universite Bordeaux 1 — Collisionless shocks are frequent events in the interstellar medium, they can also take place in inertial fusion targets where high energy ion beams interact with target plume plasma. The understanding of the processes is consequently important from a theoretical point of view and for laboratory laser–plasma interaction experiments. In this paper, we consider interaction of two counter-propagating homogeneous plasma beams with sub-relativistic velocities and no external magnetic field applied. In numerical simulations performed with a particle-in-cell code three stages of evolution can be identified. The shock formation is initiated with development of the electron-ion Weibel-like micro-instabilities, followed by fast electron heating and ion de-acceleration and heating. We present a theoretical analysis of the instabilities development and nonlinear saturation to explore the origins of the heating and the magnetic field generation. The analysis is done in the center of mass frame, considering the Lorentz transformation for each beam from its own reference frame. From the dispersion relation, instability is characterized and dependence on the electron temperature and ion velocity is studied.The growth rate and characteristic scales of instability are compared to simulations.

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