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Two-stream instability for a longitudinally-compressing charged particle beam[1] EDWARD STARTSEV, RONALD DAVIDSON, Princeton Plasma Physics Laboratory — The electrostatic two-stream instability for a cold, longitudinally-compressing charged particle beam propagating through a background plasma has been investigated both analytically and numerically. Small-signal coupled equations describing the evolution of the amplitudes of the perturbation are derived and the asymptotic solutions are obtained. The results are confirmed by direct numerical solution of the linearized fluid equations. In addition, the particle-in-cell delta-f code BEST has been used to carry out detailed numerical studies of the instability, and the results are in reasonably good agreement with the theory. It is found that the longitudinal beam compression strongly modifies the space-time development of the instability. In particular, the dynamic compression leads to a significant reduction in the growth rate of the two-stream instability compared to the case without an initial velocity tilt.

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