

# Electromagnetic ion-beam instabilities in a cold plasma

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We study the stability of the cold-plasma dispersion relation for circularly polarized waves in a plasma composed of an ion background and an ion beam. The presence of the beam introduces a resonant branch into the dispersion relation for right-hand-polarized waves propagating in the direction of the external magnetic field, which, for  $V > V?$ , has negative energy (here  $V$  is the beam velocity and  $V?$  is the wave phase velocity). Therefore this branch may give rise to explosive instabilities when the waves experience parametric decays. It is shown graphically that resonant right-hand-polarized and nonresonant left-hand-polarized waves, propagating parallel to the external magnetic field, can be unstable. It is also shown that the instability region can extend to large frequencies and wavenumbers, and that the instability regions have a band structure. The parametric dependence of instability thresholds and marginal modes is also studied.