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Beam-plasma interaction in randomly inhomogeneous plasmas

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We consider linear instability of weak beam in randomly inhomogeneous plasma. Plasma density fluctuations result in several physical effects that we take into account:

k-vector of the wave propagating towards larger densities decreases and the resonant conditions for beam can not be satisfied that leads to the saturation of the wave energy flux while approaching reflection point, k-vector of the wave propagating towards smaller densities increases and the wave phase velocity decreases that leads to the damping of the wave energy due to the resonance with thermal particles, the presence of the small amplitude density fluctuations gives rise to the angular diffusion of the wave vector.

We developed theoretical model that includes these three effects to describe statistical properties of the wave amplitudes. Probability Distribution Functions that characterize statistical properties of such a system are compared with experimental observations onboard Cluster satellites.