FILAMENTATION INSTABILITY OF ELECTROMAGNETIC RADIATION IN MAGNETIZED PLASMA

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Filamentation instability (FI) of electromagnetic waves traveling across an ambient magnetic field in a plasma has been investigated in the limit of low order coupling of the nonrelativistic electrons with the field of an incident, large amplitude pump wave. The incident electromagnetic *O*-mode wave decays into two forward scattered *X*-waves and an ion cyclotron wave in magnetized plasmas. Here the static magnetic field is perpendicular to both the direction of propagation of the electromagnetic waves and the direction of oscillation of the incident laser field.

The set of equations that describe FI in magnetized plasma is obtained, where a closed system of equations is derived and solved for homogeneous plasma, the general dispersion relation of FI growth rate in the presence of a perpendicular *dc*-magnetic field has been derived and solved numerically for typical plasma parameters that occur in inertial confinement fusion. Also, the dispersion relation is solved analytically for weakly magnetized plasma, where an analytical expression for the instability growth rate is obtained. Comparing the analytical solution with that obtained from the numerical solution of the dispersion relation shows a very good agreement especially in determining the peak values of the growth rate.

Result shows suppression of the instability growth rate by the magnetic field, where a *dc*-magnetic field plays a stabilizing role by reducing both the maximum value and the width of the instability range. Both the maximum value and the width of the instability range decrease to well bellow half the original value at a cyclotron frequency less than 20% of the incident laser frequency.