2nd Asia-Pacific Conference on Plasma Physics, 12-17,11.2018, Kanazawa, Japan

Stability of flat-top soliton in transverse direction

Deepa Verma, Ratan Kumar Bera, and Amita Das

Institute for Plasma Research, Gandhinagar-382428

e-mail :deepaverma@ipr.res.in

Interaction of high intensity electromagnetic radiation with plasma attracts significant amount of research attention due to its interesting nonlinear properties as well as its wide range of applications in areas as diverse as inertial confinement fusion, particle acceleration, photon acceleration, table top radiation sources. One of the interesting aspects of the nonlinear coupling between light radiation and plasma is the formation of coherent structures. The detailed characterization and dynamical behavior of these solutions have been studied extensively for 1-D in several earlier works[1,2]. The 2-D stability were first time studied by us for the case of single and multiple peak structures [3] (with electron dynamical response alone). It was shown that the transverse dimension introduces in addition to Raman Forward scattering instability an additional filamentation mode. The light field and the plasma tend to separate in the transverse direction for this particular mode. Here, we have carried out studies to understand the effect of transverse dimension in the context of flat top solitons which form when the background ions also participate in the dynamics. The study shows that the flat top solution first undergoes the regular 1-D backward Brillouin instability. Subsequently, they undergo a distinct second phase of destabilization through transverse modulational instability.

References

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