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PARAMETRIC DECAY INSTABILITY CONTROL BY NON-MONOCHROMATIC PUMPS

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Abstract. The results of comprehensive experimental and theoretical investigations of the last decade are reviewed, revealing a complicated and interesting behavior of nonlinear inhomogeneous wave system. It is shown that the wide variety of physical effects is accompanying the parametric decay instability (PDI) driven by the frequency modulated pump.

The experiment is carried out in the linear plasma device "Granit", where the PDI $l \rightarrow l' + s$ is excited at the microwave power less than 20 mW. It is shown that pump frequency modulation does not influence the PDI when the modulation frequency is much faster than the decay wave transient time in the interaction region. In the case of slower modulation, the PDI resonant enhancement and suppression may take place instead. The physical reason for the observed PDI resonant enhancement is provided by suppression of convective losses of the daughter wave from the decay region, drifting due to the slow pump frequency modulation at the ion acoustic velosity. The strong resonant suppression of the most dangerous absolute PDI is observed at a minimal frequency deviation (less than 1%) when the modulation frequency is equal to frequency separation of the stable lines observed in the backscattering spectrum which correspond to ion acoustic wave eigen modes excited in plasma by the absolute PDI. Based on this effect a scheme of active PDI feed-back control is proposed.

A possibility of deep PDI suppression by launching of an additional (small power) pump wave possessing a frequency shifted by the value equal to the frequency separation of ion acoustic eigen modes is demonstrated as well.

The recovery of microwave power absorption at the PDI suppression is shown using measurements of the plasma luminosity and fluxes of accelerated electrons.

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