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LOW-THRESHOLD TWO-PLASMON PARAMETRIC DECAY OF AN EXTRAORDINARY WAVE AT A MONOTONIC DENSITY PROFILE*)

Nagovitsyn A.A., Gusakov E.Z., Popov A.Yu.

Ioffe Institute of the Russian Academy of Sciences, St.-Petersburg, Russia,
nagovitsyn@mail.ioffe.ru

Electron cyclotron resonance heating (ECRH) is a well-known technique in toroidal devices for magnetic plasma confinement. Recently, however, a number of anomalous parasitic effects have been detected during ECRH experiments. Among them are the powerful microwave radiation of the plasma [1, 2], which can damage the measuring equipment [3], and the generation of groups of accelerated ions [4, 5]. These phenomena have been observed when a microwave beam passes through a plasma region with a non-monotonic density profile due to a magnetic island [6] or the "electron pumping" effect [7]. These phenomena were interpreted as consequences of low-threshold parametric decay instability (PDI) of the pump wave, resulting in the excitation of daughter waves localized near the local density maximum [8].

In the present work, it is shown analytically, based on the results of [9, 10], and numerically that a low-threshold PDI of an extraordinary pump wave accompanied by the excitation of nonlocalized daughter upper-hybrid (UH) waves can be observed at a monotonic density and magnetic field profile. The scenario is realized in the presence of two nearby decay points. In this case, the excitation of daughter waves with oppositely directed group velocities creates positive feedback, which can lead to the exponential growth of the amplitudes of UH waves with time [11]. The results obtained allow looking differently at the phenomenon of a significant broadening of the power deposition profile, recently discovered when analyzing data accumulated over decades at the T-10 tokamak [12, 13], and explaining this effect as a consequence of the excitation of low-threshold two-plasmon decay of a sub-MW X2-mode pump.

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