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CONVECTIVE PARAMETRIC DECAY INSTABILITY IN REALISTIC TWO-DIMENSIONAL PLASMA GEOMETRY *)

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In the early 70s, Prof. Piliya [1,2] and Prof. Rosenbluth [3,4] independently showed in the framework of a one-dimensional plasma model that plasma inhomogeneity strongly affects the efficiency of nonlinear three-wave interaction. The decay of one of the waves leading to the generation of two daughter waves is possible in the vicinity of the point where the resonance decay conditions for their wave numbers and frequencies are fulfilled. In this case, the daughter waves with their group velocity leave the nonlinear interaction region of finite size along the inhomogeneity direction and experience only spatial amplification, which means saturation of the instability. Mathematically, this saturation is a consequence of the fact that the gain matrix is pole-free as a function of the frequencies of the daughter waves. Nonlinear interaction in the decay layer leads to spatial amplification of a broad frequency spectrum of thermal noise, often referred to as convective parametric decay instability (CPDI). In this case, the nonlinear (parametric) process proceeds rather inertly, and the excited waves are by no means coherent.

This paper presents the results of analyzing the effect on the decay process of the finite size of the pump wave in the direction perpendicular to the direction of plasma inhomogeneity. The possibility of excitation of absolute PDI in this case is investigated.

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