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Weak Lasing of Exciton-Polaritons

Yuriy G. RUBO

Instituto de Energías Renovables
Universidad Nacional Autónoma de México

Abstract:

I will discuss the theory of weak lasing phenomenon occurring due to condensation of interacting bosons (exciton-polaritons in semiconductor microcavities) in the case when different single-particle states possess distinct life times. In the case of two condensation centers [1] the weak lasing is manifested by spontaneous symmetry breaking and formation of specific many-body condensation state characterized by different occupation of the centers (broken parity). Apart from single-line lasing this system can exhibit self-induced oscillations and emit an equidistant frequency comb light spectrum [2]. For many condensation centers and/or in superlattices of exciton-polaritons, weak lasing can lead to period doubling, reduced symmetry of the condensate state with respect to the underlying superlattice, and to appearance of spontaneous currents. I will also discuss the recent experimental observations of weak lasing in one-dimensional superlattices of exciton-polaritons [3] and in polarization degree of freedom for trapped exciton-polariton condensates [4].

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