Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Pattern Formation and Strong Nonlinear Interactions in Exciton-Polariton Condensates[1] LI GE, Department of Engineering Science and Physics, College of Staten Island, City University of New York, ANI NERSISYAN, BARIS OZTOP, HAKAN TURECI, Department of Electrical Engineering, Princeton University — Exciton-polaritons generated by light-induced potentials can spontaneously condense into macroscopic quantum states that display nontrivial spatial and temporal density modulation. While these patterns and their dynamics can be reproduced through the solution of the generalized Gross-Pitaevskii equation, a predictive theory of their thresholds, oscillation frequencies, and multi-pattern interactions has so far been lacking. Here we represent such an approach based on current-carrying quasi-modes of the non-Hermitian potential induced by the pump. The presented theory allows us to capture the patterns formed in the steady-state directly and account for nonlinearities exactly. We find a simple but powerful expression for thresholds of condensation and the associated frequencies of oscillations, quantifying the contribution of particle formation, leakage, and interactions. We also show that the evolution of the condensate with increasing pump strength is strongly geometry dependent and can display contrasting features such as enhancement or reduction of the spatial localization of the condensate.

[1]We acknowledge support by DARPA under Grant No. N66001-11-1-4162 and NSF under CAREER Grant No. DMR-1151810.

Li Ge
Department of Engineering Science and Physics,
College of Staten Island, City University of New York

Date submitted: 15 Nov 2013 Electronic form version 1.4