Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

One and two dimensional shock waves of light RICARDO FERRO, HASANUZZAMAN RAHMAN, GERMAN KOLMAKOV, MANAS KULKARNI, New York City College of Technology, City University of New York — By using numerical simulations for the dynamics of an exciton polariton condensate in an optical microcavity, we demonstrate that strongly nonlinear, spatially localized waves can be formed during the propagation of the condensate perturbations. We show that at the terminal stage of their evolution, the condensate density waves acquire the universal shape of a shock wave, which is similar to that known from a classical rarefied interacting gas dynamics. Since the exciton-polaritons in the condensate include photons as their integral part, such nonlinear waves can be treated as shock waves of light propagating in a microcavity. By numerically solving the chiral nonlinear wave equation for the condensate perturbation dynamics, we studied the shock front structure and then, investigate the propagation of light shock waves in a two-dimensional geometry in an unrestricted microcavity as well as in quasi-one dimensional polariton channels. We also discuss the effects of the scattering of the polariton shock waves on the structural defects in the cavity, and the effects of the phase coherence during mutual scattering of two and more shock waves.

Manas Kulkarni
New York City College of Technology, City University of New York

Date submitted: 14 Nov 2014 Electronic form version 1.4