Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Coherent flow and Bose-Einstein Condensation of Long Lifetime Polaritons[1] GANGQIANG LIU, BRYAN NELSON, MARK STEGER, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, RYAN BALILI, Department of Physics, MSU-Iligan Insititute of Technology, Iligan, 9200, Philippines, DAVID SNOKE, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, KEN WEST, LOREN PFEIFFER, Department of Electrical Engineering, Princeton University, NJ 08544, USA — Exciton-polaritons with lifetimes of the order of 100ps are created in semiconductor microcavity of extremely high quality factor (? 106). Due to this long lifetime and very few defects in the sample, the polaritons can travel ballistically over macroscopic distances up to millimeter. The properties of the system changes dramatically with the particle density. At moderate density, the polaritons behave like a superfluid, maintaining phase coherence after propagating over hundreds of microns. This indicates the existence of long range spatial coherence in the system. As the density increases above a threshold value, the polaritons condense into the lowest-energy state of the effective trap produced by the repulsive interaction between the polaritons and excitons within the excitation region and the cavity gradient across the sample. The coherence time of this polariton BEC is measured to be at least 280ps. By creating a exciton barrier at the center of a stress trap, we are able to obtain a ring shape polariton BEC which provides the opportunity for studying the constant flow of a superfluid in the polariton system.

[1]This work is support by National Science Foundation under grant DMR-1104383, Gordon and Betty Moore Foundation as well as the National Science Foundation MRSEC Program through the Princeton Center for Complex Materials (DMR-0819860).

Gangqiang Liu
Department of Physics and Astronomy, University of Pittsburgh

Date submitted: 09 Nov 2012 Electronic form version 1.4