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Trapping Long-Lifetime Superfluid Polaritons Using a Laser-Generated Barrier[1] B. NELSEN, M. STEGER, G. LIU, D. SNOKE, University of Pittsburgh, K. WEST, L. PFEIFFER, Princeton University — We present results with new microcavity structures that have polaritons that live as long as 100 ps, about two orders of magnitude longer than in previous structures. We show that an exciton reservoir can be used to create a potential barrier for a superfluid polariton gas. In these experiments, we use a non-resonant laser to create a superfluid polariton gas at the same location as a population of excitons. The excitonic component of the polariton can coherently scatter with the excitons. Since the excitons have mass four orders of magnitude larger than the polaritons, they form essentially a static barrier for the polaritons. By resolving the polaritons both in real space and momentum space, we determine that the polaritons roll down the potential barrier created by the excitons. These results are consistent with numerical solutions of the Gross-Pitaevskii equation for the measured parameters of this system. The potential to use the exciton reservoir as a barrier/trap will allow exciting new ways to study macroscopic coherence phenomena such as Josephson oscillations and superfluid vortices.

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