Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Phase-locking transition of coupled low-dimensional superfluids LUDWIG MATHEY, Harvard University, ANATOLI POLKOVNIKOV, ANTONIO CASTRO NETO, Boston University — We study the phase-locking transition of two coupled low-dimensional superfluids, either two-dimensional superfluids at finite temperature, or one-dimensional superfluids at zero temperature. We find that these superfluids have a strong tendency to phase-lock. The phase-locking is accompanied by a sizeable increase of the transition temperature (T_{KT} in 2D) of the resulting double-layer superfluid, which suggests a plausible way of observing the Kibble-Zurek mechanism in two-dimensional cold atom systems by rapidly changing the ratio T/T_{KT} varying the tunneling rate between the superfluids. When the two superfluids interact with each other, which is the case for polar condensates or for radio frequency induced double well potentials, further phases can be realized. We also extend the discussion to more than two coupled superfluids.

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Date submitted: 18 Nov 2006 Electronic form version 1.4