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Exploring the thermodynamic limit of optomechanical systems STEPHEN RAGOLE, Joint Quantum Institute, HAITAN XU, Yale University, JOHN LAWALL, National Institute for Standards and Technology, JACOB TAYLOR, Joint Center for Quantum Information and Computer Science — Optomechanical systems enable exploration of novel nonlinear optical elements and even quantum domain experiments. Recently, symmetric membrane-in-the-middle systems have been driven into stable buckled configurations, where the membrane spontaneously breaks the Z_2 symmetry and buckles to a fixed position. We identify a parameter regime in which a natural thermodynamic limit arises for the optical spring even though the system is nominally out of equilibrium. In this regime, we describe the phase diagram for the experimental system, a many-mode membrane with two optical modes. We discuss potential realizations of a $U(1)$ symmetry breaking experiment.

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