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Bistable Mott insulator to superfluid phase transition in cavity optomechanics W. CHEN, K. ZHANG, M. BHATTACHARYA, D.S. GOLDBAUM, P. MEYSTRE, B2 Institute, Dept. of Physics, and College of Optical Sciences, The University of Arizona — The central element of most cavity optomechanical systems is a Fabry-Pérot type cavity with one end-mirror allowed to vibrate about its equilibrium position under the effect of radiation pressure. It has recently been demonstrated that one or more modes of vibration of that mirror can be laser-cooled, and it is expected that cooling to the ground state of vibrational motion will be achieved in the near future. It is also known that these resonators can exhibit radiation-pressure induced optical multistability, whereby a given input intensity can result in two or more values of the output intensity, depending upon the history of the system. In this contribution we show that these combined effects can lead to the realization of opto-mechanically-induced multistable quantum phase transitions between superfluid and Mott insulator states of an ultracold bosonic sample trapped inside the resonator. We discuss experimental conditions under which this effect can be observed.

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