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Surface Waves at the Mott Insulator-Superfluid interface for confined BEC EROS MARIANI, ADY STERN, Department of Condensed Matter Physics, The Weizmann Institute of Science, 76100 Rehovot (Israel) — Bose Einstein Condensates in optical lattices under an external confinement are expected to form Superfluid and Mott-Insulating domains [1] reminiscent of the quantum phase transitions for the infinite system [2]. The experimentally observed transition [3] is presently ascribed to relative shrinking/widening of the different domains. The interfaces between the two phases and their excitations therefore play a crucial role in the time evolution of the system under an external perturbation as well as in its thermodynamic properties. In this work we derive the dispersion relation of the surface waves at the interfaces between Mott-Insulating and Superfluid phases. We then calculate their contribution to the heat capacity of the system and show how its low temperature scaling allows a direct experimental test of the existence and properties of Mott-Superfluid domains [4]. [1] D. Jaksch et al. , Phys. Rev. Lett. **81**, 3108 (1998) [2] M. P. A. Fisher et al. , Phys. Rev. B **40**, 546 (1989) [3] M. Greiner et al. , Nature **415**, 39 (2002) [4] E. Mariani and A. Stern, to be submitted to Phys. Rev. Lett. (2004)

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