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Thermodynamic properties and thermometry of 1D Bose gases. KAREN KHERUNTSYAN, HUI HU, PETER DRUMMOND, University of Queensland — We investigate the thermodynamic properties of an array of independent 1D Bose gases formed by a two-dimensional optical lattice. In particular, we calculate the total entropy of the system and compare it with the respective result for the 3D Bose-Einstein condensate as a function of the temperature and the interaction strength. This allows us to analyze how the temperature of the system is altered upon an adiabatic transfer of the 3D gas into an array of 1D tubes. The calculation is based on the exact finite temperature solution for a uniform 1D Bose gas, combined with the local density approximation [1]. The results can be applied to the recent experimental measurements of the local pair correlations in 1D Bose gases [2], which potentially can include finite temperature effects and no fitting parameters. In addition, we point out that the pair correlation function can be used as a thermometer for 1D Bose gases, under conditions when the density profiles become insensitive to temperature changes. [1] K. V. Kheruntsyan, D. M. Gangardt, P. D. Drummond, G. V. Shlyapnikov, Phys. Rev. A 71, 053615 (2005). [2] T. Kinoshita, T. Wenger, D. S. Weiss, Phys. Rev. Lett. 95, 190406 (2005).

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