

Abstract Submitted  
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**Phase Identification and Thermometry of Condensates in 2D Optical Lattices**<sup>1</sup> ERIC DUCHON, The Ohio State University, YASUYUKI KATO, NAOKI KAWASHIMA, Institute for Solid State Physics, Tokyo, NANDINI TRIVEDI, The Ohio State University — Definitive identification of the phases in a periodic optical lattice and an overall confining potential continues to present difficulties. By direct comparison of density images from experiments<sup>2</sup> of bosons on 2D optical lattices to QMC density profile calculations,<sup>3</sup> we differentiate between Mott insulator, superfluid and normal phases. Kinks in the compressibility spatially locate the emergence of superfluid order.<sup>4</sup> The temperature is estimated by examining the deviations from integer density of the Mott plateaus as well as from the tails of the density profiles.

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<sup>2</sup>N. Gemelke, et al., *Nature* **460**, 995-998 (2009).

<sup>3</sup>Y. Kato, et al., *Nature Physics* **4**, 617 (2008).

<sup>4</sup>Q. Zhou, et al., *Phys. Rev. Lett.* **103**, 085701 (2009).

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