Abstract Submitted for the MAR07 Meeting of The American Physical Society

Phase diagram for ultracold bosons in double-well optical lattices<sup>1</sup> IPPEI DANSHITA, JAMES E. WILLIAMS, NIST, Gaithersburg, MD 20899, CAR-LOS SA DE MELO, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, CHARLES W. CLARK, NIST, Gaithersburg, MD 20899 — We study the superfluid-Mott insulator transition of bosons in double-well optical lattices. Applying a mean-field approximation to the Bose-Hubbard Hamiltonian, we obtain the zero-temperature phase diagram and find that there exist the half-integer-filling and integer-filling Mott insulator domains in the phase diagram. We show that the half-integer-filling Mott insulator phase is stabilized as the intra-well hopping energy increases. We also calculate the phase diagram by employing the time evolving block decimation (TEBD) algorithm and compare the results obtained from the mean-field approximation with those from the TEBD.

<sup>1</sup>I.D. is supported by a Grant-in-Aid from JSPS.

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Date submitted: 19 Nov 2006

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