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**Analyses of High-Temperature Superconductivity in Doped Hubbard Model –High-Precision Variational Monte Carlo Study**– TAKAHIRO MISAWA, MASATOSHI IMADA, Dept. of Applied Physics, Univ. of Tokyo — Two-dimensional Hubbard model, which only includes the on-site Coulomb interaction $U$ and the nearest hopping $t$, is one of the simplest models proposed for describing the high-$T_c$ superconductivity. Although numerically unbiased methods such as auxiliary-field quantum Monte Carlo(QMC)[1] and Gaussian-basis QMC [2] do not find an indication for the superconductivity for intermediate coupling region($U/t < 8$), several approaches such as the variational Monte Carlo(VMC) method[3,4] suggest that the $d$-wave superconductivity appears in the doped Hubbard model. To quantitatively resolve the origin of the controversy and to reveal the superconducting mechanism, by using a high-precision VMC[5], we present results which successfully reproduces the results of previous unbiased calculations[1,2], while finds the superconductivity in a strong coupling region. We focus on the relation of the superconductivity to proximity of phase separation with charge fluctuations as its mechanism. [1]N.Furukawa and M.Imada, J. Phys. Soc. Jpn. 61, 3331 (1992). [2]T.Aimi and M.Imada, J. Phys. Soc. Jpn. 76, 113708 (2007). [3]H.Yokoyama *et al*. J. Phys. Soc. Jpn. 73, 1119(2004). [4]D.Baeriswyl *et al*. New J. Phys. 11 075010 (2009). [5]D.Tahara and M.Imada,J. Phys. Soc. Jpn. 77,114701(2008).

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