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Quantum tricriticality at the superfluid-insulator transition of binary Bose mixtures: A quantum Monte-Carlo study YASUYUKI KATO, RIKEN Center for Emergent Matter Science (CEMS), DAISUKE YAMAMOTO, Condensed Matter Theory Laboratory, RIKEN, IPPEI DANSHITA, Yukawa Institute for Theoretical Physics, Kyoto University — Criticality emerging near a tricritical point (TCP) is referred to as tricriticality. We study quantum tricriticality in the two-component Bose-Hubbard model on square lattices that describes Bose-Bose mixtures confined in optical lattices. We confirm the existence of quantum TCPs on a boundary of superfluid-insulator transition by means of the unbiased quantum Monte-Carlo method. Moreover, we analyze an effective field theory to derive the quantum tricritical behaviors analytically. We show that the quantum tricritical behaviors are pronounced in the chemical potential dependence of the superfluid transition temperature and the density fluctuation. We suggest that the quantum tricriticality may be observed in existing experimental setups of Bose-Bose mixtures in optical lattice.

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