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Mutual spin-charge entanglement and phase string effect: A case study by exact diagonalization of one hole doped t-J model in one dimension WAYNE ZHENG, ZHENG-YU WENG, Tsinghua Univ — A doped Mott insulator exhibits distinct properties associated with the peculiar Berry-phase structure known as the phase string. As a case study, we investigate the ground states of finite-size Heisenberg spin chains doped by one hole with numerical exact diagonalization. A series of quantum critical points with distinct crystal momenta are identified as a function of J/t in each given finite-size chain, which reduces to a single phase once the phase-string Berry phase is turned off. We introduce a new kind of mutual spin-charge entanglement to characterize such different phases and phase transitions as the result of quantum interference of the phase string effect. Important physical implications inferred from the study will be discussed.

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