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Lattice entanglement of ultracold atoms via lattice shaking LUSHUAI CAO, XING DENG, XUE-TING FANG, QIAN-RU ZHU, ZHONG-KUN HU, MOE Key Laboratory of Fundamental Physical Quantities Measurement, School of physics, Huazhong university of Science and technology — Quantum entanglement of ultracold atoms is a key ingredient for quantum implementations, such as quantum computation. Ultracold atoms in optical lattices process various degrees of freedom (DOF) for generating entanglements, such as the site occupation, the orbital and the internal DOF, and the entanglement has been experimentally realized between the orbital and the internal DOF [Nature 527, 208], as well as between the site-occupation and internal DOF [Nature Physics 12, 783]. We propose a scheme to obtain entanglement between the orbital and the site-occupation DOF by lattice shaking. By carefully designing the shaking symmetry and taking advantage of the interaction blockade, this scheme can obtain entangled states on demand with controllable speed.

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