

Schrödinger cat states prepared by Bloch oscillation in a spin-dependent optical lattice

B. J. Wu and J. M. Zhang*

*Beijing National Laboratory for Condensed Matter Physics,
Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China*

We propose to use Bloch oscillation of ultra-cold atoms in a spin-dependent optical lattice to prepare Schrödinger cat states. Depending on its internal state, an atom feels different periodic potentials and thus has different energy band structures for its center-of-mass motion. Consequently, under the same gravity force, the wave packets associated with different internal states perform Bloch oscillation of different amplitudes in space and in particular they can be macroscopically displaced with respect to each other. In this way, a cat state can be prepared.

PACS numbers: 03.75.Lm, 03.65.Ud, 03.65.Sq

*Electronic address: jmzhang@iphy.ac.cn