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Magnetic quantization in monolayer bismuthene SZU-CHAO CHEN, Center for Micro/Nano Science and Technology, National Cheng Kung University, CHIH-WEI CHIU, Department of Physics National Kaohsiung Normal University, HUI-CHI LIN, Department of Electro-Optical Engineering, National Formosa University, MING-FA LIN, Department of Physics, National Cheng Kung University — The magnetic quantization in monolayer bismuthene is investigated by the generalized tight-binding model. The quite large Hamiltonian matrix is built from the tight-binding functions of the various sublattices, atomic orbitals and spin states. Due to the strong spin orbital coupling and sp^3 bonding, monolayer bismuthene has the diverse low-lying energy bands such as the parabolic, linear and oscillating energy bands. The main features of band structures are further reflected in the rich magnetic quantization. Under a uniform perpendicular magnetic field (B_z), three groups of Landau levels (LLs) with distinct features are revealed near the Fermi level. Their B_z-dependent energy spectra display the linear, square-root and non-monotonous dependences, respectively. These LLs are dominated by the combinations of the $6p_z$ orbital and ($6p_x$,$6p_y$) orbitals as a result of strong sp^3 bonding. Specifically, the LL anti-crossings only occur between LLs originating from the oscillating energy band.

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