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Ground-state properties of quantum rings with a few electrons YASUHIRO SAIGA, DAI HIRASHIMA, Nagoya University, JUNKO USUKURA, Tokyo University of Science — Quantum dots occupy an important position not only in the field of basic science, but also in the field of nanotechnology. Among various shapes of dots, a ring structure is a particularly interesting nanostructure, because the diameter and the ring width can be separately changed. In this talk, we discuss the ground-state properties of one-dimensional quantum rings with a few electrons, which interact with each other in the form of 1/r-Coulomb repulsion. By using exact diagonalization, we find that for three electrons, the fully spin-polarized ground state is uniquely realized when the diameter of the ring is sufficiently large. In contrast, for four and five electrons, the fully polarized state never becomes the unique ground state, however large the diameter is. These results can be understood in terms of multiple-spin exchanges. We also show that a magnetic field applied perpendicularly to the ring induces not only the persistent current but also the spin chirality.

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