Środowe seminarium w Instytucie Fizyki

April 07th – 12:00

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"Cyclic symmetry and self-organization of charged particles in circular geometry"

The basic principles of self-organization of one-component charged particles, confined in disk and circular parabolic potentials, are proposed. A system of equations is derived, that allows to determine equilibrium configurations for arbitrary, but finite, number of charged particles that are distributed over several rings. The main idea is based on the cyclic symmetry and periodicity of the Coulomb interaction between particles located on several rings. Our approach reduces significantly the computational effort in minimizing the energy of equilibrium configurations and demonstrates a remarkable agreement with the values provided by molecular dynamics calculations. With the increase of particle number $n \geq 180$ we find a steady formation of a centered hexagonal lattice that smoothly transforms to valence circular rings in the ground state configurations for both potentials.