

A THEORY OF CORRELATION EFFECTS
IN TWO-ELECTRON QUASI-ONE-DIMENSIONAL
NANOCLUSTERS WITH PARABOLIC
BOUNDARIES

S.Ya. Goroshchenko

M.M. Bogolyubov Institute for Theoretical Physics,
Nat. Acad. Sci. of Ukraine
(14b, Metrolohichna Str., Kyiv 03143, Ukraine)

S u m m a r y

We study the energy spectra and electron density distributions in model quasi-one-dimensional nanocluster systems with two electrons interacting via the Coulomb law (long-range interaction) or in a contact manner (short-range interaction) covering various regimes of the electronic correlation (by dealing with clusters of different lengths). It is shown that, in a strong correlation regime, the general structure of energy spectra turns out to be invariant relative to the nature of interaction. In this case, the system with the Coulomb interaction becomes a quasi-classical one in which the electron density is localized at the edge points of a cluster, whereas the system with a contact interaction remains in a quantum state where the density spreads over the whole cluster. The verification of a strongly correlated energy structure by using the methods of dipole and quadrupole spectroscopies is assumed.