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The quantum density of states of the helium-3. Wigner approach in path integral Monte Carlo

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A new path integral representation of the quantum density of states (DOS) and distribution functions of strongly correlated fermions are derived in the Wigner formulation of quantum mechanics. A new path integral Monte Carlo approach to calculate DOS and thermodynamic functions is suggested. Using helium-3 as an interesting example, we calculate the DOS, internal energy distrubution (IED), momentum distribution functions (MDFs), spin--resolved radial distribution functions at different densities and temperatures. The physical meaning and parameters of exchange--correlation holes, the quantum oscillations of IEDs and DOS as well as the high--momentum asymptotic (`quantum tails'') of MDFs have been considered and explained.

Biography:

Engineer, Post-Graduate, Junior scientist, Scientist, Senior scientist, Leading scientist, Main scientist in Theoretical Department of the Institute for High Temperatures Russian Academy of Science, Moscow. SPECIALIZATION: Computational methods of quantum statistical mechanics and theory of wave propagation in random media; classical and magnetic fluids, quantum dense plasma and solid state, quantum molecular dynamics method for solving Wigner-Liouville equation, tomographic representation of quantum mechanics, strongly correlated dusty plasma, strongly correlated quantum electromagnetic and quark – gluon plasmas