THE PHASE SPACE PATH INTEGRAL REPRESENTATION OF THE QUANTUM DENSITY OF STATES. MONTE CARLO SIMULATION OF STRONGLY CORRELATED FERMIONS

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The Wigner formulation of quantum mechanics has been used to derive the new path integral representation of the quantum density of state (DOS) of the strongly correlated fermions for canonical ensemble. The new path integral Monte Carlo approach for simulation of the DOS and other thermodynamic functions has been suggested. The derived Wigner function in the phase space resembles the Maxwell – Boltzmann distribution but allows for the quantum effects.

The 3D quantum system of the strongly correlated soft–sphere fermions for the hardness of the potential of order of unity have been considered. Presented results for different densities and temperatures include the DOS, momentum distribution functions, spin – resolved radial distribution functions, potentials of mean force and related energy levels obtained by the making use of the Bohr–Sommerfeld condition. The physical meaning of the sharp peaks in the DOSs and momentum distributions have been analyzed and explained by arising the bound states.