A FIELD-THEORETICAL TREATMENT OF TWO-NUCLEON SYSTEMS: NUCLEON-NUCLEON SCATTERING AND DEUTERON PROPERTIES

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The "clothing" procedure in quantum field theory is applied for the description of nucleon-nucleon ($N-N$) scattering and deuteron properties. We consider the system of interacting fermion and meson fields with the Yukawa-type couplings to introduce trial interactions between "bare" particles. Special unitary transformations are used to express the primary total Hamiltonian through new creation/annihilation operators for the so-called clothed particles (these quasiparticles of our approach). We are focused upon the Hermitian and energy-independent interactions (quasipotentials) between the clothed nucleons, being built up in the second order in the coupling constants. The interactions are the kernels of integral equations for the T-matrix of $N-N$ scattering and the deuteron wave function in momentum space. We discuss distinctions between our quasipotentials and the Bonn potential. Numerical solutions of these equations are compared with those by the Bonn group.

Keywords: quantum field theory, nucleon-nucleon scattering, deuteron, Bonn potential.