Self-consistent Relativistic Brueckner-Hartree-Fock theory for finite nuclei.*

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Relativistic Brueckner-Hartree-Fock theory is applied for the first time in a fully self-consistent calculation for finite nuclear systems. Starting from a realistic bare nucleon-nucleon (NN) force adjusted to nuclear scattering data, the G-matrix is obtained as an effective interaction by solving the Bethe-Goldstone equation in an Harmonic oscillator basis. This G-matrix is inserted in a relativistic Hartree-Fock code for finite nuclei and in each step of the iteration a new G-matrix is calculated by solving the Bethe-Goldstone equation for the Pauli-operator derived from the corresponding Fermi surface in the finite system. The self-consistent solution of this iteration process allows to calculate the ground state properties of finite nuclei without any adjustable parameter. As an example the nucleus ^{16}O is investigated by this theory. Its ground state properties, such as binding energy, charge radius are largely improved as compared with the results from non-relativistic Brueckner-Hartree-Fock theory and more close to the experimental data. This theory provides a method to study in an *ab initio* calculation the ground state properties of heavy nuclei.

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