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NON-NUCLEONIC DEGREES OF FREEDOM IN TERMS OF THE QUARK CLUSTER APPROACH

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Nuclear states, beginning with the six-quark Fock component of the deuteron, cannot be described solely in terms of conventional nucleon, meson, and isobar degrees of freedom in view of the presence of hidden-color states in any color-singlet multi-quark system. The momentum distribution of quarks in a nucleus is not a simple superposition of their distributions within nucleons. The EMC experiment at CERN was the first to establish this fact and many efforts were further made or planned (e.g. the NICA and EIC projects) to study the properties of quarks and gluons in the nuclear environment. In this work we develop the theoretical framework for study of hidden-color components of nuclei (including the nucleon-nucleon scattering states) on a basis of the QCD-motivated interaction [1] using methods of the nuclear cluster physics. We, citing the deuteron, show that a realistic description of the hidden-color component of the nucleus can be realized on a basis of the quark cluster model with taking into account 3 basic things: duality (a complementarity between the hadron and quark bases in studies of hadron data), the Pauli exclusion principle, and the requirement of the observed states be colorless. As a consequence it allows to evaluate weights of hidden color components of the deuteron including a possible dibaryon-like component of the NN wave function at the region of short distances [2]. These make possible to assess the behaviour of the deuteron form factors at large momentum transfer [3] and might be further used for interpretation of the A(e,e′NN), A(e, e′NΔ) and A(e, e′ΔΔ) data dependent on the short-range NN correlations.

Author: Dr OBUKHOVSKY, Igor (Institute of Nuclear Physics, Moscow State University)

Presenter: Dr OBUKHOVSKY, Igor (Institute of Nuclear Physics, Moscow State University)

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