Contribution ID: **166** Type: **Oral talk (15 min + 5 min questions)**

Role of Quarks in Nuclear Structure

Thursday, 14 July 2022 17:55 (20 minutes)

We propose semi-empirical quark model of nuclear structure that is based on the quark model of nucleon structure, Strongly Correlated Quark Model (SCQM). Nuclei are constructed due to junctions of SU(3) color fields of quarks of neighbor nucleons [1]. According to SCQM, arrangement of nucleons within nuclei reveals the emergence of the face-centered cubic (FCC) symmetry [2]. The model of nuclear structure becomes isomorphic to the shell model and, moreover, composes the features of cluster models. Binding of nucleons in stable nuclei are provided by quark loops which form three and four nucleon correlations. On the quark level the nuclear shell closures starting from s-shell correspond to the octahedral symmetry. The closure of a subsequent shells (p, d, f, ...) leads to rearrangement and disappearance of the previous ones, i.e. to no-core shells. Quark loops leading to four-nucleon correlations are responsible for the binding energy enhancement in even-even nuclei which are formed by virtual alpha-clusters. Two neighbor virtual alpha-clusters possess one common nucleon which couples them. The model describes the "magic" numbers without spin-orbital coupling of the shell model. According to the model "halo" nuclei emerge according to quark loops resulting in three nucleon correlations. The model allows to describe nuclear deformation, predict the boundary on nuclear stability and etc.

References

[1] G. Musulmanbekov in Frontiers of Fundamental Physics, New York, Kluwer Acad/Plenum Publ., 2001, p. 109 - 120.; PEPAN Lett., 2021, v.18, N5, p. 548-558.

[2] G. Musulmanbekov and N.D. Cook, Phys. Atom. Nucl. 71, 1226

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

Primary author: MUSULMANBEKOV, Genis (JINR)

Presenter: MUSULMANBEKOV, Genis (JINR)

Session Classification: Nuclear structure: theory and experiment