Contribution ID: **78** Type: **Poster report**

Particle sets in $NN\bar{K}$ quasi-bound state

Wednesday, 14 October 2020 18:50 (20 minutes)

The theoretical consideration of the $NN\bar{K}$ quasi-bound system is based on the isotopic-spin formalism in which mesons $\bar{K}^0$ and K^- are two isospin states of the $\bar{K}$ particle with the isospin of $\frac{1}{2}$. Nucleon is also considered as isospin $\frac{1}{2}$ particle having two states (proton and neutron) with the different projections of the isospin. According to the isospin formalism, the isospins in the $NN\bar{K}$ system are summed as isospins of three identical particles. And along with this, in the $NN\bar{K}(s_{NN}=0)$ system, the particle channels ppK^- and $pn\bar{K}^0$ are defined in literature due to the possible particle transition $n\bar{K}^0 \to pK^-$. Taking into account this assumption, the system can be found as ppK^- or $pn\bar{K}^0$ at the same time. The question is how these particle channels can be described within the isospin formalism.
In the presented work, the kaonic system $NN\bar{K}(s_{NN}=0)$ is studied based on the configuration space Faddeev equations. We considered two models associated with isospin "natural" basis and isospin "charge" basis. We show that the "particle representation" [1-3] for $NN\bar{K}(s_{NN}=0)$ system motivated by the "charge" basis does not describe the system in terms of coupled particle channels $ppK^-/pn\bar{K}^0$ [4]. The particle configurations of the $NN\bar{K}(s_{NN}=0)$ system may be classified by the masses and pair potentials (in particular, presence or absence of the Coulomb interaction). The $NN\bar{K}(s_{NN}=0)$ system is represented by four configurations: $ppK^-, npK^-, np\bar{K}^0, nn\bar{K}^0$. The results of the calculations including the kaon mass difference, the charge dependence of nucleon-nucleon interaction [5] and the Coulomb force for these particle configurations will be presented.

This work is supported by the National Science Foundation grant HRD-1345219 and NASA grant NNX09AV07A.

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Session Classification: Poster session 4 (part 2)

Track Classification: Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics.