

### **Referee report on the project**

"Probing the Deuteron short-range Spin Structure in the (d,p) reactions using polarized deuteron beam at Nuclotron-M"

The hadronic deuteron induced reactions at Nuclotron energies are sensitive to the structure of light nuclei at short distances between the nucleons, in particular, to the relativistic effects and to manifestation of the non-nucleon degrees of freedom. The serious advantage of the DSS project is the systematic measurements of the polarization effects in deuteron-proton elastic scattering, deuteron-proton exclusive breakup and other binary reactions with polarized deuteron beam at Nuclotron, because this can allow to study the contribution of different mechanisms as a function of the energy.

During the previous period the authors performed the systematic measurements of the differential cross section and analyzing powers  $A_y$ ,  $A_{yy}$  and  $A_{xx}$  in deuteron-proton elastic scattering. They measured also dp- nonmesonic breakup at the energies 300-500 MeV in different kinematic configurations of the final protons. These data are very important for the development of the few-body systems theory at relativistic energies.

Authors made also significant progress in the development of the efficient tensor-vector deuteron polarimetry, what is very important for future spin studies at Nuclotron and NICA.

In the next period authors plan to continue the measurements of the analyzing powers in deuteron-proton elastic scattering at intermediate energies where the contributions of the three-nucleon forces and relativistic effects are significant. If the proton beam of high intensity will be available, the first measurements of the nucleon analyzing power in proton-deuteron elastic scattering will be performed. For this task the efficient proton polarimeter will be developed. This is very important for the realization not only DSS project, but also for SPD at NICA. The systematic measurements of the analyzing powers in deuteron-proton non-mesonic breakup in coplanar geometry at 400 MeV is also planned. The realization of these measurements will allow to obtain new experimental data which will shed a light on the short-range spin structure of the deuteron.

The estimation of the project realization cost and requested beam time are reasonable. The active participation and contribution of the physicists from Japan and countries -participants of JINR is important. Active role of young physicists in this project is also very essential.

I propose to approve the project for 2019-2021 years with the first priority.

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