Reference on the APLOM2 project

Measurement of analyzing powers for the reaction

p(pol)+CH_2 up to 7.5 GeV/c and n(pol)+A up to 4.5 GeV/c at the Nuclotron

Elastic electromagnetic form factors of the nucleons at high transferred momenta Q^2 contain an unique information on the radial distribution of electric charge and magnetic moment inside the nucleon. At Jefferson Lab (JLab), four nucleon form factors (electric and magnetic, for protons and neutrons) have been measured up to Q^2=8 $(GeV/c)^2$ with polarized electron beam at energy up to 6 GeV and have demonstrated very interesting features widely discussed in current literature and many conferences. Knowledge of the all four nucleon form-factors allows one to separate contribution of quarks of different flavor. On the whole, this experimental data provide a test of non-perturbative QCD and also several phenomenological models motivated by JLab publications of the form factor ratio data.

The Jlab proposal for double-polarization measurements up to 12 GeV with transferred momentum Q^2 up to 12-15 $(GeV/c)^2$ is approved by the Jlab PAC. Since polarization of the recoil nucleon has to be measured in this experiment, one has to know analyzing powers of the suitable reactions with polarized initial proton and neutron at corresponding energies that is the aim of the APLOM2 project.

Within the APLOM2 project will be measured the analyzing power for the reaction {\vec p}+CH_2 at proton momentum 5.3, 6.5 and 7.5 GeV/c and for the reaction {\vec n}+CH at 5 GeV/c and 6 GeV/c at the JINR Nuclotron. These measurements will be the next step of the previous ones successfully performed at lover momenta (1.75 - 5.3) GeV/c and used as a basis for the polarimetry in the above mentioned measurement at JLab.

In new measurement planned in 2028-2030 will be used two new drift chambers that will provide a high accuracy of the scattered angle measurements , and modified hadron calorimeter will be used in order to reject low energy hadrons scattered off the target. All equipment required to make this experiment at VBLHEP/JINR does exist and have been tested with the beam. The funds required is only one half of the total amount, another part of which will be covered by JINR partners of this projects.

Realization of the project will allow one to obtain new data on analyzing powers for the reactions induced by protons and neutrons on C, CH_2, Cu necessary for the Jlab experiment on measurement of electromagnetic proton and neutron form factors up to 12-15 $(GeV/c)^2$. Furthermore, it will offer a possibility to perform at JINR nuclotron other polarization experiments at the corresponding energies.

I would recommend this project for realization with the first priority.



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