Reference on the APLOM2 project

Measurement of analyzing powers for the reaction p(pol)+CH2 up to 7.5 GeV/c and n(pol)+A up to 6.0 GeV/c at the Nuclotron (ALPOM2 proposal)

Elastic electromagnetic form factors of the nucleon 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 have been measured up to Q^2=8 GeV^2 with polarized electron beam 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 to separate contribution of quarks of different flavor. On the whole, this experimental data provide a test of QCD, and several theoretical models based on non-perturbative approaches have been developed to explain the JLab data on the form factor ratio. The Jlab proposal for double-polarization measurements up to 12 GeV with transferred momentum Q^2 up to 12-15 GeV^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 higher energies that is the aim of the APLOM2 project.

Within the APLOM2 project, the analyzing powers for polarized proton and neutron beam at different targets (C, CH, CH2 and Cu) were measured at momenta 3.0, 3.75 and 4.2 GeV/c. These measurements show the valuable asymmetries when the charge-exchange np reaction is registered. In new measurements drift chambers were used that provides a high accuracy of the scattered angle measurements, and hadron calorimeter used in order to reject low energy hadrons scattered off the target. All equipment required to make this experiment is available at VBLHEP/JINR. The required funds, some part of which is provided by foreign partners, are necessary mainly for reconstruction of magnetic channel in order to increase the neutron momentum that in its turn will be important for new measurements of the analyzing power of the reaction {\vec p}+CH2-> p+X at proton momentum 7.5 GeV/c and for measurement of asymmetries in the charge-exchange p+A(CH2)-> n+X reactions.

Realization of this project will allow one to obtain new data on analyzing powers for the reactions induced by protons and neutrons on C, CH2, Cu that is required for the Jlab experiment aimed for measurement of electromagnetic proton and neutron form factors up to Q^2=12-15 GeV^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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