# INVESTIGATION OF POLARIZED NUCLEON INTERACTION (JINR – FRANCE – UKRAINE INTERNATIONAL COLLABORATION)

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The polarized targets are developed by Russia, France and Ukraine cooperation. We were equipped existing facility with the new holding coils magnet field to rotate the vector polarization as required by MPT project. The new results on spin- dependent total cross section difference $\Delta\sigma_L$(np) were obtained by joint efforts.

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The application of the polarized target in experiments to study hadron-hadron interactions presents the enormous interest with standpoint of account of influence their spin dependency. With this purpose in JINR (Dubna) in frame of collaboration France-Russia-Ukraine the experiment was proposed to measure the asymmetry of the total cross on polarized protons.

In realization of this project for the first time in world the "Movable Polarized Target" (MPT) is created [1]. The particularity of this complex is that the polarized target is performed in mobile variant. It means one can be transported without stripping and installed on any accelerator. MPT was created of all participants of collaboration.

A contribution of NSC KIPT to the MPT was creation of the high frequency device to pump the proton polarization and the special magnet to change the spin orientation in different directions to the reaction plane.

At the NSC KIPT the superconductivity magnet system was designed, the coils were wound by superconducting cable and the critical parameters at transitions to the normal state were measured. An electrical support system and system to protect the superconductivity magnet at returning into the normal state was made and tested. To measure the level of liquid helium the superconductivity sensors were designed.

Superconductivity magnet system allows getting the magnetic induction from 0.5 T up to 2.5 T in "warm" volumes from 30 $cm^3$ to 6000 $cm^3$ at the field homogeneity $\pm 1 \times 10^{-2}$ and 20% accordingly.

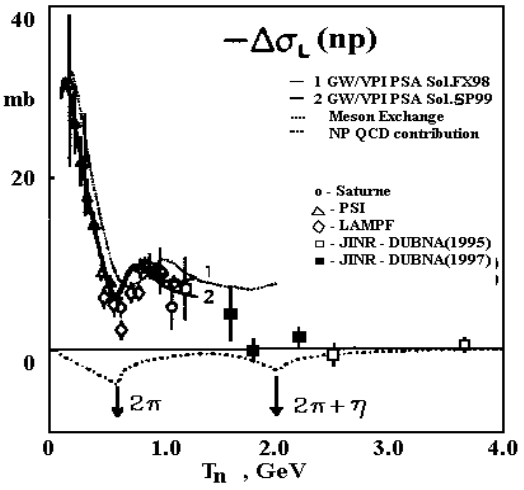
NSC KIPT takes part in the installation, supporting of the MPT and it's using in the experiments. At JINR synchrophasotron (Dubna) the joint investigations of the asymmetry differences of cross-sections in the interaction of quasi-monochromatic polarized neutrons with polarized protons carry out by Saclay (France), JINR (Dubna), SPINF, INF (Russia) and NSC KIPT (Ukraine).

New results for the *np* spin- dependent total cross section difference $\Delta\sigma_L$(np) at neutron beam with kinetic energies of 1.19, 1.59, 1.79, 2.20, 2.49 and 3.65 GeV are presented. Measurements of the $\Delta\sigma_L$(np) energy dependence were carried at the Synchrophasotron of the Laboratory of High Energies of the JINR. The values of $\Delta\sigma_L$ were measured as difference between the *np* total cross sections for parallel and antiparallel beam and target polarizations, both oriented along the beam momentum.

The obtained $-\Delta\sigma_L$(np) values are presented in the figure. The errors are quadratic sums of both the statistical and systematic uncertainties.

The result from refs. [2,3] together with the existing $\Delta\sigma_L$(np) data, obtained with free polarized neutrons at lower energies, are also shown in Fig.1. One can see, that the new results are smoothly connected with the lower energy data and confirm a fast decrease to zero within a 1.2-2.0 GeV energy region, observed previously [3].

A fast decrease of $\Delta\sigma_L$(np) with increasing energy above 1.1 GeV, as it was first seen from the previous data, was confirmed. The new results are also compared with model predictions and with the phase shift analysis fits. The $\Delta\sigma_L$ quantities for isosinglet state I=0, deduced from the measured values $\Delta\sigma_L$(np) and known $\Delta\sigma_L$(pp) data, are given.




*Energy dependence of the $-\Delta\sigma_L$(np) observable obtained with free neutron polarized beams.*

## REFERENCES

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