Measurement of the spin rotation parameters A and R is a key experiment in the whole program of studying $\pi^{\pm}p$ elastic scattering since only such measurement permits to remove discrete ambiguities arising in the course of a phase shift analysis. This experiment is carried out at the pion channel of ITEP accelerator by PNPI scientists and engineers in collaboration with physicists of Institute for Theoretical and Experimental Physics (Moscow). The experiment has required a special type of polarized proton target with the polarization vector lying in the horizontal plane and a proton polarimeter for measuring the asymmetry of the secondary scattering of the recoil protons by nuclei of a substance (usually carbon) with the known analyzing power. The polarized proton target, placed between a pair of superconducting Helmholtz coils, was built at PNPI by physicists of the Meson Physics Laboratory and the Laboratory of Polarization Effects. As to the proton polarimeter, two types were used at different stages of the experiment. One was a multi-plate polarimeter made of optical spark chambers with graphite electrodes; a special television system was developed for filmless read-out in this case. Another type of polarimeter consists of one thick graphite block (36.5 g/cm^2) with two arrays of spark chambers (in front and behind of this block) to detect the recoil proton before and after the secondary scattering; the analyzing power of this polarimeter was determined experimentally using the beam of polarized protons available at ITEP.

The spin rotation parameters A, R for π^+p and π^-p elastic scattering were measured at ITEP at three energies of the incident pions: 1300 MeV (corresponding momenta p_π = 1430 MeV/c) , 1500 MeV (1620 MeV/c) , 875 MeV (1000 MeV/c). One of the most interesting results is the fact that experimentally measured values of the parameter A agree well with the predictions of the phase shift analysis VPI performed at Virginia Polytechnic Institute and contradict to the analyses KH and CMU–LBL. Since all the characteristics of πN resonances presented in Listings of the Review of particle Physics are obtained just on the base of the analyses KH and CMU–LBL, which seem to be not entirely correct in the light of our last experimental data, it is necessary to revise and specify these fundamental constants by means of performing a new phase shift analysis.

Now a new stage of experiments is underway at ITEP – measurement of the polarization parameter P for πp scattering to the backward hemisphere.