for the momentum p_1 of the fast proton two kinematical solutions are possible for the recoil proton energy T_2, we define them as "high energy" (HES) and "low energy" (LES) solutions. The neutron spectator momenta, denoted as q in the deuteron rest frame, range from 30 to 440 MeV/c.

The measured tensor analysing powers A_{yy} and the calculation results with the Bonn deuteron wave function are shown in Figs.1. The main feature of the experimental data is the strong deviation from simple IA (dash–dotted line) for $q \geq 0.2$ GeV/c. The full theory including the delta exitation graphs (full line) gives the satisfactory explanation of this deviation, the multiple scattering graphs (dashed line) playing the decisive role.

The vector analysing power results A_y shown in Fig.2 exhibit a similar tendency: significative correction to the IA above 0.25 GeV/c arising from the above mentioned mechanisms. The good coincidence of the full calculations with the experimental points is achieved at all SPES-4 settings for both high and low energy solutions.

PARITY NONCONSERVING NEUTRON SPIN ROTATION IN THE VICINITY OF ^{139}La P–WAVE RESONANCE

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It is well known that weak interaction in nuclei results in arising neutron optical phenomena in the passage through a nuclear target. These PNC–effects are as follows:

$$\Delta\sigma_{PNC} = \frac{4\pi}{k} \cdot \mathrm{Im}(f(0)^+ - f(0)^-) \quad - \quad \text{neutron optical dichroism}$$

and

$$\Phi_{PNC} = \frac{4\pi}{k} \cdot n \cdot L \cdot \mathrm{Re}(f(0)^+ - f(0)^-) \quad - \quad \text{neutron spin rotation,}$$

where:
$f(0)^{\pm}$ – the forward scattering amplitudes,
$\Delta\sigma_{PNC}$ – cross section difference for the opposite neutron helicities,
Φ_{PNC} – spin rotation angle,
n – atomic number density,
L – nuclear target thickness.

Effect of neutron optical dichroism had been observed and investigated both in the thermal neutron energy region and in the resonance one [1,2]. In the vicinity of p-wave resonance the effect was observed to be enhanced, in particular, for 0.734 eV resonance of ^{139}La up to the value about 10% [2]. Unlike PNC–dichroism, the effect of neutron spin rotation around neutron linear momentum was studied in this nucleus with the cold polarized neutrons only. Investigations of this effect with resonance energy neutrons present a considerable challenges such as low polarized neutron beam intensity and necessity of the precise neutron polarization control. That is why only one attempt to observe this effect in the vicinity of 0.734 eV resonance in ^{139}La is known till now [3], however results were obtained with a very poor statistical accuracy.

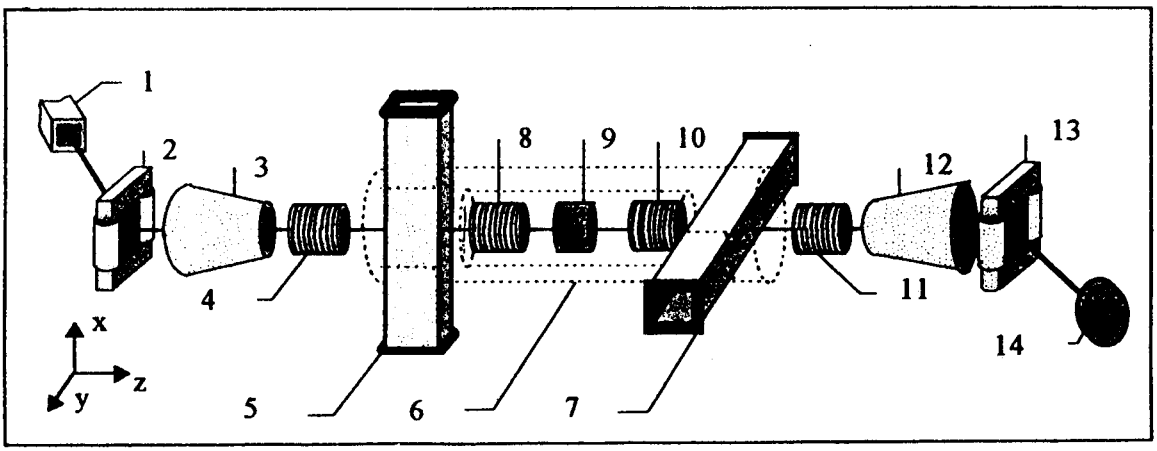

Fig.1. Sketch of experimental setup: *1* - Soller collimator; *2* - electromagnet with polarizing crystal; *3* - adiabatic "flipper"; *4* - "averaging" coil; *5* - "X-coil"; *6* - two-layer magnetic shield; *7* - "Y-coil"; *8,10* - "Z-coil"; *9* - ^{139}La target; *11* - "averaging" coil; *12* - adiabatic "flipper"; *13* - electromagnet with polarizing crystal; *14* - neutron counter

In 1994–1995 the new installation based on polarizing crystal-diffraction monochromator was developed at the WWR-M reactor to test different conditions of realization of future T-noninvariance experiments [4] - see Fig.1. With some modifications this setup was used for the first investigation of P-odd neutron spin rotation in the vicinity of ^{139}La p - resonance 0.734 eV and for the repetition of measurement of P-odd neutron optical dichroism [5]. Results of these two experiments are shown in Fig.2 along with theoretical curves calculated for the cases of ideal and real energy resolution of the instrument. One can see a good agreement of both P-odd effects with the theory [6,7]. The top P-odd dichroism effect was observed to be equal 7×10^{-3} with statistical accuracy of about 3% in a time as short as 20 minutes. The time of neutron spin rotation measurements was significantly longer (about 12 hours per experimental point) because of necessity to use an additional magnetized Hisler alloy crystal as an analyzer of neutron polarization. When using for this purpose a polarized ^{3}He target, the time of measurement would be cut by 20 times. An additional factor of about 100–300 can be achieved if we place our setup at a hot neutron source of a high flux reactor like ILL or PIK. These estimates give an apt illustration of possibilities and perspectives of our experimental setup and crystal-diffraction method at a steady reactor for a search for P- and T-noninvariant effects in neutron reactions.

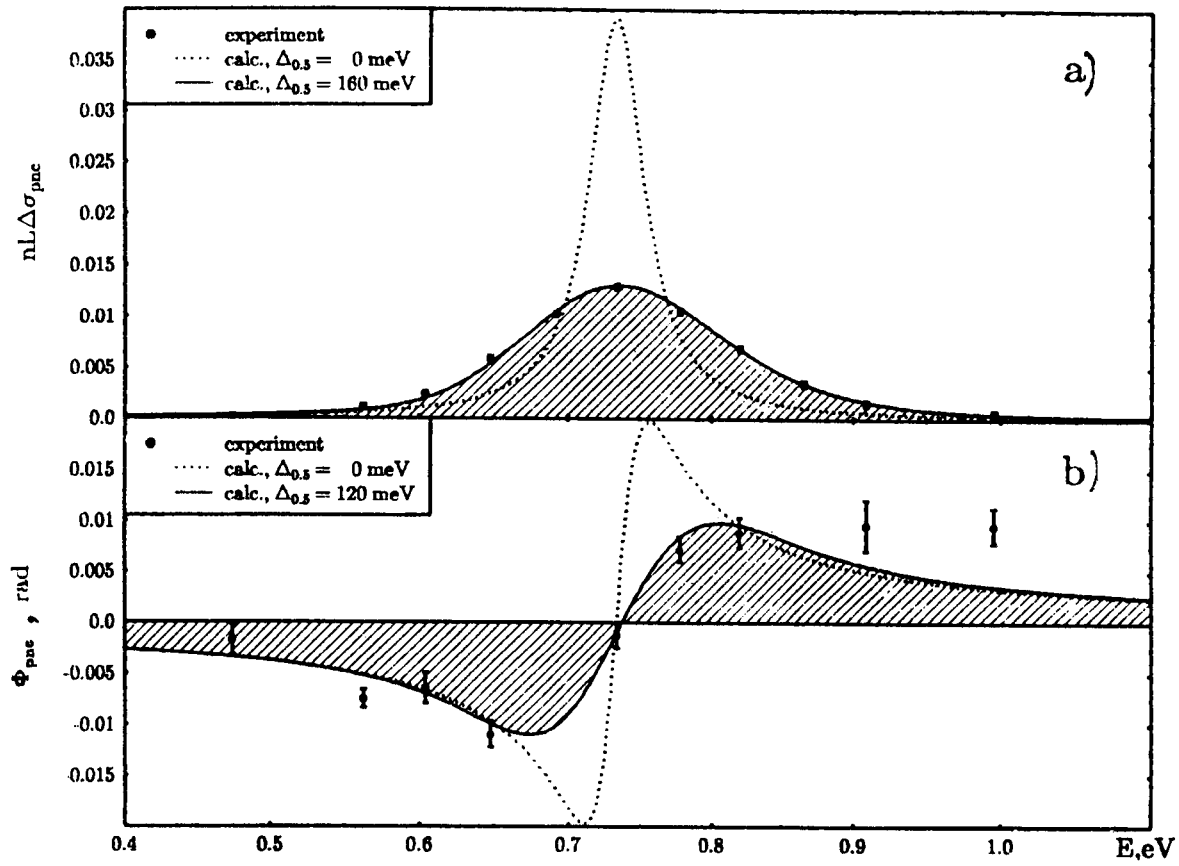

Fig.2. Experimental results (points) in comparison with theoretical calculations (curves): a) effect of P–odd dichroism, b) effect of P–odd spin rotation. Dotted curves show the effects for ideal neutron energy resolution, solid curves – the same effects for real resolution of the setup

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