MEASUREMENT OF PARITY VIOLATION IN REACTION $^{6}Li(n,\alpha)\ ^{3}H$ WITH POLARIZED NEUTRONS

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The parity violating asymmetry $W \sim 1 + \alpha_{pN}(\vec{\sigma}_n \cdot \vec{K}_t)$ in the reaction $^{6}Li(n,\alpha)t$ is investigated in the geometry $\vec{\sigma}_n \| \vec{K}_n \| \vec{K}_t$ ($\vec{\sigma}_n$ — the neutron spin, $\vec{K}_t, \vec{K}_n$ — the tritium and neutron momenta. The value of the corresponding asymmetry coefficient is $\alpha_{pN}^{exp} = -(6.44 \pm 5.50) \cdot 10^{-8}$.

Lately great attention has been given to experiments and theoretical calculations /1,2/ of parity non-conserving effects in NN and few-body systems such as $nd \to t\gamma$, $pp \to p'p'$, $np \to d\gamma$, $^{18}F^{*} \to {}^{18}F + \gamma$ and others. The aim of these papers is to separate the neutral and charged weak currents and to estimate the weak coupling constants — f_π, $h_{\rho,\omega}^{0,1,2}$. The investigation of the parity-violating asymmetry with the help of thermal polarized neutrons in the reactions $^{6}Li(n,\alpha)^{3}H$, $^{10}B(n,\alpha)^{7}Li$ with a large claw cross-section and an evident cluster structure, may give a considerable contribution for solving this problem /3/.

The measurements were carried out at a polarized neutron beam of the vertical channel of WWR-M reactor at the LNPI with an integral flux $\sim 2\ 10^{10}$ n/s, polarization $\sim 80\%$, an average wave length of neutron $\lambda = 4.2$ Å. A multisectional proportional chamber was used in an ionization current regime (fig. 1). The average $\cos(\vec{\sigma}_n, \vec{K}_t) = 0.8$. The absorption of the neutron beam in the chamber is $\geqslant 90\%$.

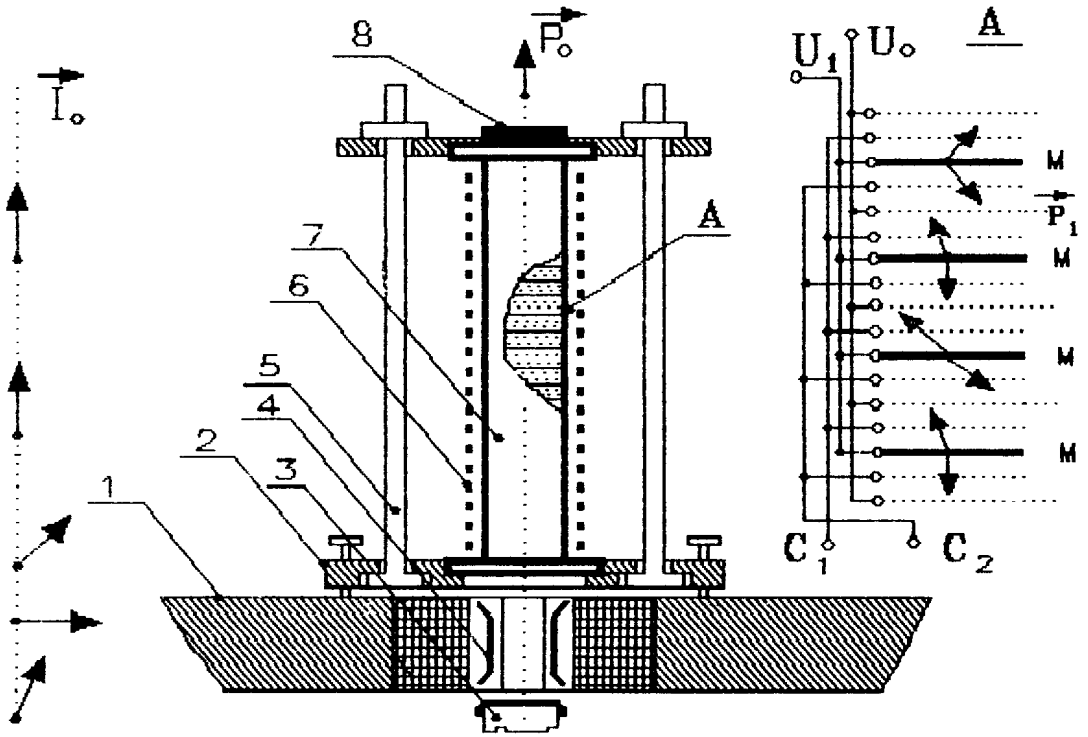

Fig. 1. Scheme of plant:

1 — cover of reactor, *2* — adjusting table of chamber, *3* — neutron quide, *4* — high-frequency flipper, *5* — fixation system of chamber, *7* — chamber, *6* — coils of driving magnetic field, *8* — stothering ^{6}LiF plate. $\vec{I}_0$ — neutron spin, $\vec{p}_0$ — momentum of neutron, $\vec{p}_1$ — momentum of tritium. The section A — scheme of chamber's module. U_0,U_1 —potentialls of blockadiny grid and target, C_1,C_2 — output from signal «forward-back» grids

The suppression factor for a left—right asymmetry $(\vec{\sigma}_n \cdot [\vec{K}_t \times \vec{K}_n])$ owing to the choice of the geometry was $\sim 10^{-4}$. The method of measurement is analogous to ref /4/. The experimental value for the asymmetry coefficient, where the zero-experiment is considered, is

$$\alpha_{pN}^{exp} = -(6.44 \pm 5.50) \cdot 10^{-8}$$

which essentially improves the precision of the previous measurements $\alpha_{pN} = (0.7 \pm 8.0) \cdot 10^{-7}$ /5/. The value $f_\pi = (-0.09 \pm 1.22) \cdot 10^{-7}$ was calculated from the comparison of the theoretical estimate of the effect (based on solving a three-body pickup reaction /3/)

$$\alpha_{pN}^{theor} = +0.06\, h_\varrho^0 - 0.45 f_\pi \,*$$

with the experimental value α_{pN}^{exp}, when $h_\varrho^{ob.v.} = -14.4 \cdot 10^{-7}$ — «best value» of DDH /1/. This is in a good argeement with the result of measurement of circular polarization in $^{18}F^*$ $f_\pi = (0.4^{+1.4}_{-0.4}) \cdot 10^{-7}$ /6/. It is essentially lower than the estimate for the «best value» of DDH /6/.

REFERENCES

1. *Dubovik V. M., Zenkin S. V.* Annals of Physics, 1986. V. 172. N 1. P. 100.
2. *Adelberger E. G.* Ann. Rev. Part. Sci., 1985. V. 35. P. 621.
3. *Nesterov M. M., Okunev I. S.* JETP Lett., 1988. V. 48. N 11. P. 621.
4. *Vesna V. A. et al.* Preprint LNPI-1560, Leningrad, 1989. 12 p.
5. *Vesna V. A. et al.* JETP Lett., 19. V. 35. N 5. P. 265.
6. *McDonald A. B. et al.* Phys. Rev., 1987. V. 35. N 3. P. 1119.

* The sign at α_{pN}^{theor} in the paper [3] should be replaced by an opposite one.