MEASUREMENT OF ELECTRON-NEUTRON SPIN ASYMMETRY IN NEUTRON BETA-DECAY

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The A-coefficient, which characterizes the angular correlation between the electron escape and the decaying neutron spin directions, was measured on the polarized neutron beam from vertical channel of the LNPI reactor (the whole flux $f = 3 \cdot 10^{10}$ n/s, the mean wavelength $\lambda = 4.2$ Å and polarization $P \approx 80\%$).

About $7 \cdot 10^{6}$ neutron decay events have been registered, and the final result is

$$A = -0.1131 \pm 0.0014.$$

After the correction on "weak magnetism" and other small terms this value is:

$$A_0 = -0.1116 \pm 0.0014.$$

The summary of errors is given in table 1. The total error is 1.2% The main part of this error is connected with polarization measurement (0.85%) and statistical accuracy (0.7%). The accuracy of A-coefficient measurement with this technique is limited by the polarization measurement accuracy.

Comparison of the result of this work with the previous results is given in table 2. One can see that all the data agree with each other in their error limits. The weighted mean value of A-coefficient from these four measurements is:

$$\overline{A} = -0.1141 \pm 0.0011 \quad (A_0 = -0.1126 \pm 0.0011),$$

Table 1

Type of error	Value
Statistical error	±0.7%
Poarization	±0.85%
Possible "drift" of polarization	±0.4%
Determination of $(\frac{V}{C})$	
a) calibration accuracy	±0.2%
b) calculation	±0.1%
Determination of geometry factor cos Θ	
a) geometry uncertainty	±0.1%
b) backscattering of the electrons	±0.4%
Total error	±1.2%

Table 2

Year	Laboratory	A	Ref.
1975	A N L	−0.113±0.006	[1]
1979	A E I	−0.114±0.005	[2]
1986	I L L	−0.1160±0.0019	[3]
1990	LNPI - AEI	−0.1131±0.0014	Present work

that gives the $\lambda = \frac{g_A}{g_V}$:

$$\lambda_A = -1.2571 \pm 0.0029.$$

The results of this paper are published [4].

References

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4. Erozolimskii B.G. et.al. //Yad.Fiz., 1990. V.52.P.1583.