**B. G. Erozolimskiĭ.** *Beta decay of the neutron.* In the thirty years since the discovery of the beta decay of the neutron, some thirty experiments have been performed in which this elementary nuclear beta decay process was investigated, including five new investigations reported in the last three years, in which the measurement accuracy has been substantially improved.

In these studies they measured the following characteristics of the beta decay of a neutron:

1) the lifetime of the free neutron;

2) the angular correlation between the directions of the emission of the electron and antineutron—the constant $a$;

3) the angular correlations in the decay of polarized neutrons:

a) $\sigma$, $\mathbf{p}_e$—the constant $A$,

b) $\sigma$, $\mathbf{p}_\nu$—the constant $B$.

c) $\sigma$, $\mathbf{p}_e \times \mathbf{p}_\nu$—the constant $D$.

Since 1970, the following new measurement results have been obtained, besides those reported in the review[1]:

1. In Austria, Dobrozemsky *et al.*[2] obtained a new value of the constant $A$ by measuring the summary spectrum of the recoil protons. They obtained $a = -0.099 \pm 0.011$.

2. Two measurements of the electron–spin correlation (the constant $A$) were performed at Argonne[3] and at the Kurchatov Institute[4]:

$$A = -0.110 \pm 0.008^{[3]}, \quad A = -0.115 \pm 0.006^{[4]}.$$

3. Two additional attempts were made to observe the $T$-odd correlation (measurement of the constant $D$) at the Kurchatov Institute[5] and at the Laue-Langevin Institute in Grenoble (France)[6]:

$$D = -0.0027 \pm 0.0033^{[5]}, \quad D = -0.0011 \pm 0.0017^{[6]}.$$

The values of the phase angle between the constants $G_A$ and $G_V$, which were obtained from these measurements, are

$$\theta = (180.35 \pm 0.42)^\circ \text{ from the data of }^{[5]},$$

$$\theta = (180.14 \pm 0.22)^\circ \text{ from the data of}^{[6]}.$$

It is appropriate to note that in a recent paper by the Princeton group,[7] who measured an analogous $T$-odd correlation in the beta decay of $Ne^{19}$, a result of unprecedented accuracy was obtained:

$$\theta = (179.94 \pm 0.11)^\circ.$$

All this seems to indicate that there is no violation of $T$-parity in the weak interaction responsible for the beta decay of nuclei (at any rate on the scale observed in $K$-meson decay).

The mean-weighted angular-correlation constants $A$, $B$, and $a$, in all the performed measurements, are respectively[8]

$$A = -0.1139 \pm 0.0040, \quad B = 0.995 \pm 0.028, \quad a = -0.0985 \pm 0.0097$$

The averaged value $G_A/G_V$ obtained on the basis of these quantities is

$$\frac{G_A}{G_V} = -1.259 \pm 0.009^{[9]},$$

and agreed well with the value of $G_A/G_V$ obtained on the basis of data on the $(f\tau)$ of the neutron and $(f\tau)$ of the $0 \to 0$ transitions:

$$\frac{G_A}{G_V} = -1.245 \pm 0.011^{[10]}.$$

The averaged values of the constants $A$, $B$, and $a$ agree quite well with the requirements that follow from the $V-A$ variant of the theory, namely, that $1 + A = B + a$ and $A^2 + A = Ba$.[8] Nevertheless, the accuracy with which we presently know the constants, especially the neutrino angular correlations, is still insufficient to be able to exclude the rather appreciable constributions of $S$ and $T$ variants (at a level 25–30% of the $V$ and $A$ variants, respectively).

Further progress in the accuracy of the measurement of the electron–spin correlation constant will also make it possible to attempt to observe effects of weak magnetism and currents of the second kind of the beta decay of a neutron, which undoubtedly would be of considerable interest. This requires an investigation of the dependence of the constant $A$ on the energy of the decay electrons, i.e., a measurement of $dA/dE$ with accuracy not less than $10^{-3}$ Mev$^{-1}$.


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