EXPERIMENTAL STUDY OF ANTINEUTRINO SCATTERING BY ELECTRON AT NUCLEAR POWER PLANT REACTOR

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The experiment on νe-scattering is still in progress at Rovno Power Plant [1]. At present, that is of interest as a probe of the magnetic moment of the neutrino is as large as $10^{-11} - 10^{-10}\ \mu_B$.

The new set-up with 75 *kg* silicon detector for this experiment has been placed in the neutrino flux $2 \cdot 10^{13}\ \nu/cm^2 s$ in the new neutrino laboratory at the 1000 MW PP reactor. The detector consisting of 600 coaxial Si(Li) modules was inserted into first layer shielding container (1000 *kg*) held at a temperature 100 *K* under vacuum. The passive shield consists of mercury (80 mm), cooper (150 *mm*), graphite (500 *mm*) and iron (150 *mm*). The active shield cavity ($2.5 \times 2.5 \times 2.0\ m$) was built of 120 plastic scintillation detectors. Each Si(Li) detector has a preamplifier, an amplifier, a discriminator and a linear gate so that each detector has its own spectrum in the computer memory.

The first run of measurements was carried out 16.7 days with the reactor off-stream and 29.6 days with the reactor on-stream. As a result, the νe-scattering cross-section in the interval 0.6— 2.0 *MeV* is:

$$\sigma = (1.26 \pm 0.62) \cdot 10^{-44}\ cm^2/fission$$

or $\sigma = (1.28 \pm 0.63)\,\sigma_{W-S}$, where σ_{W-S} is a cross-section in the standard model for the known neutrino spectrum and $\sin^2 \Theta_W = 0.22$. The upper bound on the neutrino magnetic moment obtained from the constraint $\sigma_\mu \leq 0.91\sigma_{W-S}$, is:

$$\mu \leq 1.5 \cdot 10^{-10}\ \mu_B\ (68\%\ \text{c.l.}) \text{ or } \mu \leq 1.9 \cdot 10^{-10}\ \mu_B\ (95\%\ c.l.).$$

At present the new run of measurements with modified construction of the detector is prepared so that energy region above 100 *keV* could be explored where the magnetic cross-section is an order of magnitude higher than in the 0.6 *MeV* region.

Reference

Derbin A.V., Popeko L.A., Cherny A.V., Shishkina G.A. JETP Lett. V.43. 1986. P.164.