NEUTRINO LABORATORY AT ROVNO ELECTRIC POWER STATION

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The low energy electron-neutrino scattering experiment (besides the standard model test) is of interest as a probe of the nonstandard quality of the neutrino such as the magnetic moment, which can solve the solar neutrino puzzle [1]. The scattered electron spectrum has both a weak interaction and an electromagnetic one. Connected with magnetic moment cross-section is proportional to the square of the magnetic moment value. In the reactor neutrino experiment a 10% excess in the spectrum at the energy of 1.0 MeV (in comparison with that calculated in the standard model) would correspond to the neutrino magnetic moment of $5 \cdot 10^{-11}$ of the Bohr magneton.

The absolute measurements of the reactor neutrino cross-section are limited by a 6% uncertainty of the reactor neutrino spectrum. To increase the sensitivity of the neutrino magnetic moment deposit it is necessary to decrease the electron energy threshold measured because the electron energy spectrum has a 1/Ee contribution. In 1983-85 using a small silicon detector of 25 kg we made the first experiment in the neutrino laboratory of the Kurchatov Institute of Atomic Energy [2]. A new set-up with a 75 kg silicon detector for this experiment is prepared. Its background level has decreased by one order in comparison with the old one in the energy range of 1.0 MeV mainly because of the thick cooled mercury shield used [3].

In 1989 this arrangement (over 100 tons) has been placed in the new neutrino laboratory of LNPI at the third block of the Rovno Power Station. The reactor core of this block is practically a point-like neutrino source with the activity of 6.10^{20} s^{-1}. The main parts of the installation are shown in fig.

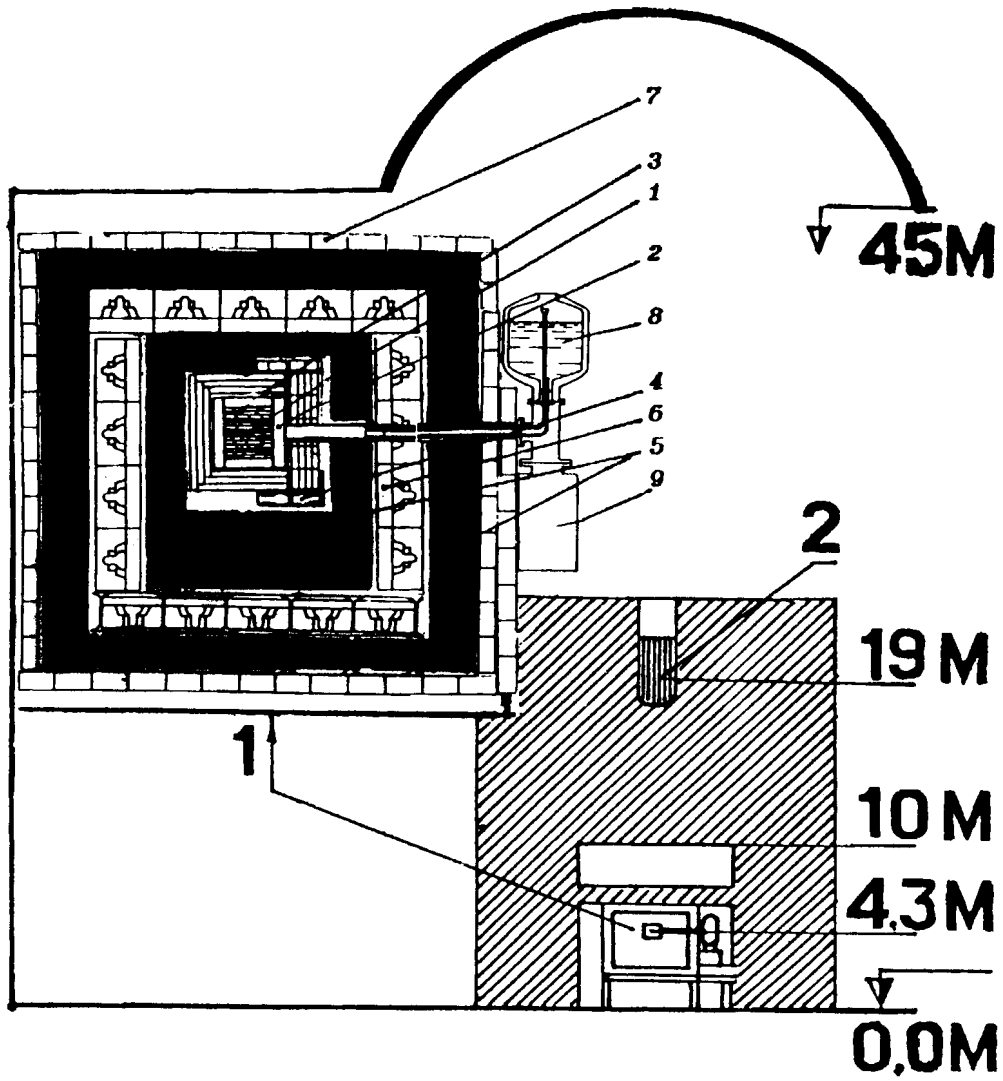

Fig. Experimental arrangement scheme: *1* — neutrino laboratory, *2* — Reactor WWER-1000. Insertion shows arrangement of neutrino chamber: *1* — 75-silicon detector; *2* — 80 mm mercure schield; *3* — 150 mm copper; *4* — 648 preamplifiers; *5* — 500 mm graphite of two layers; *6* — — scintillation active shield; *7* — Duwar cooling system; *9* — ion pump

This installation contains a graphite neutron moderator instead of a polyethylen one to defend it from the neutron background deposit of the neutrino reaction (ν, p)-(n, e^+), which is correlated with the reactor on and off. The scintillating active shield situated between the two graphite layers provides a cavity of 2.0 x 2.0 x 2.0 m. The 75-kg silicon detector is installed in the centre of the cavity which is in the neutrino flux of 2.2 10^{13} cm^{-2} s^{-1}. The massive concrete reactor building over the neutrino lobaratory and the core of the reactor inself, as we have found, creates a passive cosmic shield of 30 m. w. e. A preliminary result of the background test is 1000 background events per day in the energy interval of 1.0 — 3.0 MeV, while the effect from ν-e-scattering is expected to be 40. Therefore, the 20% accuracy for cross-section is supplied by 25 day reactor's stop schedule.

REFERENCES

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