NEUTRINO FACTORY ON THE BASE OF INTENSE NEUTRON SOURCES

Lyashuk V.I.[1,2], Lutostansky Yu.S.[2]
[1]*Institute for Nuclear Research of Russian Academy of Sciences, Moscow, Russia;*
[2]*National Research Center "Kurchatov Institute", Moscow, Russia*
E-mail: lyashuk@itep.ru

The proposed neutrino factory is based on the lithium converter irradiated by an intensive neutron source. The powerful neutrino source (factory) is created under (n,γ)-activation of high purified ^{7}Li and subsequent β^{-}-decay ($T_{1/2}$ = 0.84 s) of ^{8}Li with emission of high-energy $\tilde{\nu}_e$ with E_ν up to 13 MeV [1]. Such a $\tilde{\nu}_e$-spectrum gives a significant advantages (especially compare to $\tilde{\nu}_e$-spectrum from nuclear reactor) as the cross section of neutrino depends at the considered energy as $\sigma \sim E_\nu^2$ and rate of the neutrino interactions will increase strongly.

Different neutron sources can be utilized for lithium activation [1-3]. It can be the high-flux nuclear reactors (in a stationary mode) enclosed by lithium converter (i.e., the neutrino factory in a static regime of operation). But the advantages of ^{8}Li antineutrino spectrum will be more fully utilized in the scheme with pulse reactors, when $\tilde{\nu}_e$-flux from β^{-}-decay of fission isotopes will be separated in time from neutrino of ^{8}Li decay. Another perspective regime is dynamical one, when an activated ^{7}Li is pumped in the close cycle through the active zone of the reactor and further is delivered close to the neutrino detector. Today the most perspective neutrino factory can be based on the tandem of lithium converter plus an accelerator and neutron generating target [3].

It was calculated the efficiency (number of ^{8}Li isotopes per neutron of the neutron source) of such an installations. It was considered the geometries of lithium converters. The functionals of the neutron field in the converter were simulated and parameters of the installation were proposed. Different types of converter matter were considered: the pure lithium in the metallic state and lithium chemical compounds. The most preferable is the D_2O-solution of LiOD, which allows to decrease the requirements in mass of high purified ^{7}Li isotope from tens to about three hundreds times. It was considered the neutron yield from targets (W, Pb) of the neutrino factory in the "tandem" scheme of proton accelerator (with energy of several hundreds MeV's) and the expected efficiency of the lithium converter were obtained. The conception of the proposed lithium converter [1-3] in the "tandem" scheme is included today to the project of the powerful source and proposed for neutrino investigations [4].

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