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Search for heavy neutral leptons in T2K experiment

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This work aims at study of heavy neutral leptons, or heavy neutrinos (N), in the mass range $m_N < 493\,\mathrm{MeV}/c^2$ [1]. Heavy neutrinos can be produced in $K^\pm$ and $\pi^\pm$ decays $M^\pm \to l^\pm_\alpha N$ ($M = \pi, K$; $\alpha = e, \mu$) in the T2K's standard neutrino beam. Then, these particles decay in the near detector ND280. Considered decays of heavy neutral leptons in the work are the following: $N \to l^\pm_\alpha \pi^\mp$, $N \to l^+_\alpha l^-_\beta \nu(\bar{\nu})$, where ($\alpha, \beta = e, \mu$).

In order to reduce background events from standard neutrino interactions, the search for heavy neutrinos is performed in gaseous-argon Time Projection Chambers (TPCs) of the near detector ND280. In current work we study heavy neutrinos produced from kaons and pions. Therefore, we are able to examine the next mass ranges: $140 < m_N < 493\,\mathrm{MeV}/c^2$ (as presented in [2,3]) and $m_N < 140\,\mathrm{MeV}/c^2$. Additional statistics is included compared to [2]. In addition, usage of new tracking method in TPCs and updated Monte-Carlo model will allow to improve experiment sensitivity towards mixing elements between active and heavy neutrinos.

In this work we present preliminary signal selection efficiencies, statistical and systematic uncertainties, expected number of background events, and expected experiment sensitivity for each considered heavy neutrinos'decay mode.

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