P4.014 Search for heavy neutral leptons with the near detector complex ND280 of the T2K experiment

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Heavy Neutral Leptons (HNLs, heavy neutrinos) with masses below the electroweak scale are considered in some extensions of the Standard Model (e.g. υMSM) in order to address the open questions: neutrino oscillations, dark matter and baryon asymmetry. In the mass range of < 500 MeV/c^2 these heavy neutrinos can be produced in pion or kaon decays, and further decay themselves into charged particles, hence allowing their detection in detector media. Probing the kaon parents` decays allows the study of a wider mass range of heavy neutrinos. The T2K long-baseline neutrino oscillation experiment utilizes an intense beam of muon neutrinos, originating mainly from π/K parents, produced with the 30 GeV proton synchrotron at J-PARC. The near detector complex ND280 of various sub-detectors operated inside a magnetic field provides the necessary tracking capabilities to identify the products of HNL decays. By using the TPC volumes to search for heavy neutrino events it is possible to significantly reduce the backgrounds coming from interactions of active neutrinos. The detailed simulation of the HNL flux was performed for the T2K ND280 layout and the detector performance was studied with respect to the reconstruction of heavy neutrino vertices. It is shown that with the current ND280 dataset ($\sim 1 \times 10^{21}$ POT) one can obtain bounds on the HNL mixing parameters comparable to those of the CERN PS191 experiment, which, together with the BNL E949 data, put the most stringent constrains for 140 MeV/c^2 < m_{HNL} < 450 MeV/c^2. Furthermore the T2K ND280 data can be used to improve the current experimental limits in the mass region close to the kaon mass.