



Contribution ID : 180

Type : Oral talk

Designing a tagged neutrino beam at the U-70 accelerator complex

Friday, 2 December 2022 12:15 (15)

Specialized muon neutrino beams at high-energy proton accelerators are produced as tertiary particles from $\pi^\pm, K^\pm \rightarrow \mu^\pm + \nu_\mu (\bar{\nu}_\mu)$ decays. The neutrino channel itself generally consists of a focusing system that forms π, K mesons beams at the required momentum and angular intervals and a free decay section ending by hadronic and muon absorbers. To organize a neutrino channel at IHEP, it is proposed to use a proton beam with an 60 GeV energy, slowly extracted from the accelerator U-70, with an intensity of up to 10^{13} particles per cycle, about 9 seconds long. In the paper the basic optical scheme of the neutrino channel is considered and the main design characteristics of the generated beams are discussed. The parameters of neutrino beams in the near and far detectors located at distances of 100 m and 2595 km, respectively, after the end of the decay channel, as well as characteristics of the π -meson beam at the beginning of the decay region, are presented. The parameters of tagged neutrino beams in the near and far detectors are given. The calculation results are given for 10^{13} protons dropped onto the target per accelerator cycle. A simplified scheme is used in the calculations, in which the only sources of muon neutrinos are the decays of π mesons, and all pions entering the matter during transport through the channel are excluded from a consideration. Primary protons that do not interact in the target are also excluded from a consideration.

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Session Classification : Neutrino Physics

Track Classification : Neutrino physics