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Sensitivity study for proton decay via $p \rightarrow e^{+00}$ and $p \rightarrow \pi^{+00}$ in the Super-Kamiokande Detector

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Super-Kamiokande is a 50 ktons water Cherenkov Detector in Japan and has been operating from April 1996 thus accumulated 0.37 megaton-years exposure of data. One of the main physics topics of Super-Kamiokande experiment is searching for proton decay to test Grand Unified Theory. One of the three-body proton decay modes, charged lepton and two pion decay mode can be considered in a model-independent manner and its expected decay rate is 25% ~ 140% in comparison with $p \rightarrow e^{+0}$. Super-Kamiokande detector can detect all final particles above Cherenkov threshold therefore proton mass and momentum could be reconstructed and most of atmospheric neutrino backgrounds could be rejected in fiducial volume as 2m inside the wall of inner detector. This analysis is first to search for nucleons decaying directly to a lepton and multiple neutral pions in Super-Kamiokande. In this poster, sensitivity studies of the three-body proton decay using Monte Carlo, especially via $p \rightarrow e^{+00}$ and $p \rightarrow \pi^{+00}$ decay modes will be presented.

In-person participation

No

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