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Updates on atmospheric neutrino and proton decay results in Super-Kamiokande

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Super-Kamiokande (SK) is a 50 kilotonne water Cherenkov detector aiming for the detection of several physics such as solar, atmospheric, astrophysical neutrinos, proton decay, WIMP dark matter, etc. It has been running over 20 years since 1996, and achieved several remarkable outcomes in the field of the particle and astrophysics, one of which is the discovery of the neutrino oscillation, bringing the Nobel Prize in physics 2015.

SK still accumulates a large number of neutrino events, and simultaneously the physic target and its sensitivity are extended along with the improvement of the analysis method, such as event reconstruction and background rejection. For example, a new technique to detect the recoiled neutron has been developed and utilized for the atmospheric and proton decay analysis recently.

One of the strong motivations for the atmospheric neutrino oscillation measurement is to measure the mass ordering (hierarchy) between ν_2 and ν_3. The atmospheric neutrino is sensitive to the mass hierarchy with help of the matter effect which is given when passing through the Earth. We have performed a detailed analysis to discriminate small signature of the mass hierarchy due to the matter effect.

Proton decay is a direct signature anticipated by the grand unified theory (GUT) which is the physics beyond the standard model. Though the major decay modes and GUT models are excluded by the past searches, the efforts to search a glimpse of the proton decay signal are being continued with better event reconstruction and analysis method.

In this talk we will review the status and the results of the atmospheric neutrino measurement and proton decay search using the most updated dataset taken until 2017 spring.

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