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Observation of distant reactor neutrino in Super-Kamiokande with gadolinium-loaded water

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Super-Kamiokande is a large underground water Cherenkov detector for neutrino physics and nucleon decay search in Kamioka, Japan. We upgraded its detector with gadolinium (Gd) in 2020 (SK-Gd) to improve electron antineutrino ($\bar{\nu}_e$) identification. The higher energy yield from neutron capture of Gd enables the SK trigger system to apply to a lower energy region in $\bar{\nu}_e$ search than that in the pure water phase where the previous search had a 9 MeV energy threshold.
Many scintillator experiments have measured reactor antineutrinos well, especially in the KamLAND detector in the long baseline over 100 km. No large-scale water Cherenkov detector succeeded in the long-baseline measurements except for the evidence in the SNO+ experiment.
We conducted electron antineutrino analysis from 4 MeV $\bar{\nu}_e$ energy threshold via inverse beta decay in the first Gd phase (0.01% concentration), 536×22.5 days · kt exposure from 2020 summer to 2022 summer, and observed reactor neutrino. In this poster, we will show the result of reactor neutrino analysis in the first Gd phase (0.01%) and its status in the second Gd phase (0.03%). In addition, we will discuss the application of reactor neutrino measurement in SK-Gd.

Poster prize

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