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Lower Energy Extension for Anti-Electron-Neutrino Search in the Super-Kamiokande Experiment

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The Super-Kamiokande (SK) is one of the largest water Cherenkov detectors and has a sensitivity for $\mathcal{O}(1\,\mathrm{MeV})$-$\mathcal{O}(100\,\mathrm{GeV})$ neutrinos. For the observation of anti-electron-neutrinos of diffuse supernova neutrino background (DSNB), we have upgraded the SK with Gd to improve the distinction performance between electron- or anti-electron-neutrinos. The latter are associated with a neutron. The typical energy of DSNB is $\mathcal{O}(10\,\mathrm{MeV})$. Recently, we opened the first data of the SK-Gd-phase and set an upper limit of the anti-electron-neutrino flux, which is now under preparation for publication.
In this presentation, I show the status and prospects of future analysis to lower the lower energy threshold in the $\bar{\nu}_e$ or DSNB search. It potentially brings us reactor neutrinos and further understanding of background events such as spallation and atmospheric neutrinos events. The conventional analysis has an energy threshold of 8 MeV relating to the ordinary trigger system. However, the higher energy yield of delayed neutron-captured signals of Gd opened the possibility to decrease the energy threshold by introducing a new trigger system whose energy threshold is a few MeV. This presentation includes details of the trigger system and analysis strategy, the feasibility study using an AmBe gamma and neutron source, and the prospects.

Submitted on behalf of a Collaboration?

Yes

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