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New limits on the low-energy astrophysical electron antineutrinos at SK-Gd experiment

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The Super-Kamiokande (SK) experiment has the world's leading sensitivity to the astrophysical electron anti-neutrinos up to a few tens MeV, such like supernova originating neutrinos. In 2020, SK was upgraded to enhance its neutron capture signal by loading gadolinium, termed as the SK-Gd phase. Since 2022, more Gd has been loaded to achieve about 75% of neutron captures on Gd. Thanks to this, we continue reducing muon spallation backgrounds while increasing signal efficiency. One of the remaining dominant backgrounds are also atmospheric neutral-current quasi-elastic (NCQE) neutrino interactions. In this poster, we present a new method to reduce these NCQE events by up to a further factor of 10 as well as a dedicated neutron detection neural network to reduce 10^4 of muon spallation events. Finally, we show the results for the upper limits on the electron anti-neutrino flux that we can set with these improvements in the SK-Gd era

Poster prize

Yes

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