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Dissecting the diffuse supernova neutrino background flux over wide energy range in upcoming era

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The diffuse supernova neutrino background (DSNB), formed by neutrinos released from stellar core collapse over the cosmic history and floating in the Universe, is believed a key probe for stellar astrophysics as well as cosmic chemical evolution picture. Its experimental confirmation is still awaited, yet a recent search at the Super-Kamiokande water Cherenkov detector reports an exclusion of zero DSNB at a significance over 2σ, possibly implying the first hint. In the upcoming decade, larger underground detectors will operate, among which Hyper-Kamiokande, the successor of Super-Kamiokande with a $\sim$8 times larger volume, and JUNO, a $\sim$20 kton liquid scintillation detector in China, are quite promising for DSNB studies. Combining the data from these next-generation detectors will surely contribute to dissecting the DSNB flux shape over the wide energy range which is reflection of many astrophysical factors. Toward this purpose, we are developing the DSNB analysis framework, CARNE (Code for Analyzing Relic NEutrinos), with considering realistic background estimate and its systematic uncertainties at different types of neutrino detectors. In this presentation, we will report the basic idea and development status of this framework and show the expected sensitivity to models at future detectors.

Collaboration you are representing

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