

Z124c The Super-Kamiokande Pre-Supernova Alert System

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In 2020, the Super-Kamiokande (SK) experiment entered in a new phase, SK-Gd, with the addition of gadolinium (Gd) sulfate octahydrate to the water in the detector, improving the identification of neutrons emitted from inverse beta decay reactions and, therefore, enhancing SK's sensitivity to low energy electron anti-neutrinos. SK-Gd has the potential of detecting yet-unobserved neutrinos coming from different astronomical sources such as the diffuse supernova neutrino background and pre-supernova stars, which are massive stars at the last evolutionary stage before core-collapse supernova (CCSN). During this stage, pair annihilation and beta decay processes are the main cooling mechanisms of these stars, emitting high fluxes of electron anti-neutrinos. The detection of electron anti-neutrinos from pre-supernova stars could provide early warnings for CCSNs. From October 2021, a new alarm based on the detection of pre-supernova neutrinos has been running in Super-Kamiokande, sending alerts for potential nearby CCSN within 1 kpc. For SK with 0.01% Gd, in the case of Betelgeuse, the pre-supernova alarm would send alerts up to 9 hours before the CCSN, with optimistic parameters. We report the sensitivity of Super-Kamiokande to pre-supernova neutrinos and details about the new alert system based on their detection.