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Development of the pre-Supernova Alert System for Super-Kamiokande

The current phase of the Super-Kamiokande experiment, SK-Gd, is characterized by the addition of gadolinium sulfate to the water Cherenkov detector, which improves the detection capability of thermal neutrons. For low energy events, the main detection channel for electron anti-neutrinos is the Inverse Beta Decay interaction, which has, in its final state, a positron and a neutron. The neutron thermal capture by gadolinium emits gamma-ray cascades with energies about 8 MeV, improving the identification of the products of this process, which reduces the background for low energy events and allows the analysis of neutrinos with energies below the usual Super-Kamiokande thresholds. One possible detection by SK-Gd is the neutrinos coming from massive stars at the last evolutionary stage before core-collapse Supernova, known as pre-Supernova stars. During this stage, pair annihilation and beta decay processes are the main cooling mechanisms of the stars, emitting high fluxes of electron anti-neutrinos. Their detection could provide an early warning for core-collapse Supernovae. In this poster it is presented the techniques for the development of a Supernova alert system for Super-Kamiokande based on the detection of pre-Supernova neutrinos and the expected sensitivity.

Working group

WG6

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