Poster session 3 – Wednesday 6 July

P3.080 **Improved SRN search in Super-Kamiokande**

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The Supernova Relic Neutrino (SRN) flux has not yet been observed due to its expected low event rate and high backgrounds. By dissolving a gadolinium (Gd) salt into water Cherenkov detectors, inverse beta decay, a process in which a positron and a neutron are produced and the dominant channel for the detection of supernova neutrinos in water, will have two signals. The prompt one is the Cherenkov signal from the positron and the delayed one is a ~8 MeV gamma cascade from neutron capture on gadolinium. Backgrounds for SRN can be greatly reduced by requiring the coincident detection of these prompt and delayed signals.

SK-Gd is the initiative to dissolve 0.2% gadolinium sulfate into Super-Kamiokande (Super-K, SK) in order to enable Super-K to efficiently detect thermal neutrons. It will not only be helpful in removing low energy spallation backgrounds caused by cosmic rays, but also make it possible to positively identify electron anti-neutrinos from their subsequent neutron events. The primary goal of the SK-Gd project is the world's first observation of SRN flux; it is expected to be achieved within a few years after introducing gadolinium to Super-K. Gadolinium loading will also benefit Super-K by providing better capabilities for supernova burst detection and higher sensitivities for solar neutrinos, long baseline neutrinos, proton decay, and other longstanding physics analyses.

As a part of SK-Gd project, the EGADS facility, consisting of a 200-ton water Cherenkov detector and additional Gd-related equipment, was built in the Kamioka mine. A solution of 0.2% gadolinium water has been successfully loaded into the EGADS tank and - along with other calibration techniques to characterize the gadolinium's effect on water transparency - an Am/Be neutron source has been used to explore the Gd-loaded water's response to neutrons.

The current status of the SK-Gd project and the physics work now being performed in EGADS, as well as information regarding detector calibration and data analysis, will be presented.


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