

GADZOOKS; Research and Development For The Next Generation of Water Cherenkov Detectors

The proposed introduction of a soluble gadolinium [Gd] compound into water Cherenkov detectors with 0.2% loading will result in greater than 90% of the neutrons capturing on the Gd. The delayed 8 MeV gamma cascades produced by these captures in coincidence with a prompt positron signal serve to uniquely identify electron anti-neutrinos interacting via inverse beta decay. Such coincidence detection greatly reduces backgrounds, allowing a large Gd-enhanced water Cherenkov detector to make the first observation of the diffuse supernova neutrino background and high precision measurements of Japan's reactor anti-neutrino flux. Now a dedicated Gd test facility is under construction in the Kamioka Mine, home of the Super-Kamiokande [SK] detector. This new facility will house a stainless steel tank filled with 200 tons of water and lined with 240 50-cm photomultiplier tubes, a specially designed water system for filtration and gadolinium recovery, and multiple devices for evaluating the quality of the water in the tank. Successful running of this new facility will demonstrate that adding Gd salt to SK is both safe for the detector and is capable of delivering the expected physics benefits.

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