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Reducing Background for the Hyper-Kamiokande's Intermediate Water Cherenkov Detector

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Hyper-K will be a next-generation long-baseline neutrino experiment with the goal of measuring neutrino flavour-mixing parameters and discovering CP-phase violation in the neutrino sector. To measure the unoscillated neutrino beam, Hyper-K will make use of the upcoming Intermediate Water-Cherenkov Detector, for which a new multi-photomultiplier photosensor module (mPMT) is being developed. Each mPMT will contain nineteen 3-inch photomultiplier tubes at the top, to detect the neutrino interactions, and a secondary scintillator-based detector at the bottom, to detect background particles. This scintillator plate will generate an electric pulse, or a “hit”, when traversed by a charged particle or photon, such as produced by the interaction of neutrinos with the soil. This hit will be used in a time-coincidence circuit with other detectors at the outer region of IWCD to veto these particles' effect and reduce IWCD's background. The scintillator plate's basic mechanism is quite simple: When traversed by a background particle, the scintillator generates photons, which are guided by a wavelength-shifting fibre to a photo-sensor. In this presentation, I will describe the technical considerations behind the design of this scintillator plate, from its dimensions to the fibre configuration, and the characterization of the photo-sensor device. I will also describe the experimental measurements performed so far, to determine the light yield of the plate when hit by cosmic rays and electrons, and towards a definitive design for the plate.

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Please select: Experiment or Theory

Experiment

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