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Development of wavelength-shifting plate light collector for Outer Detector of Hyper-Kamiokande

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Hyper-Kamiokande (HK) is a next generation underground water Cherenkov detector to be built in Japan for neutrino oscillation studies, proton decay searches, and neutrino astrophysics. An Outer Detector (OD) will provide information to identify interactions originating from particles outside the inner detector of HK and to veto background events. The baseline configuration of OD includes a few thousand photosensitive units. Each unit consists of a 3-inch PMT with a wavelength shifting (WLS) plate mounted around it to collect Cherenkov light, reemit it and concentrate on the PMT. The plates doped with different fluors were tested in air and water using a set of UV LED light sources with different wavelengths. The photon detection efficiency of wavelength shifting fluors, side reflectors, optical coupling between a PMT and a plate were studied. Presented results include comparative performance of WLS plates, absolute photodetection efficiencies, parameters of attenuation and light collection efficiency, optimization of chemical composition of WLS dopants.

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