

The intermediate water Cherenkov detector for the Hyper-Kamiokande experiment

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The Hyper-Kamiokande (HK) experiment will perform a broad physics program including the study of long-baseline neutrino oscillations. This will be achieved by detecting neutrinos produced at an upgraded 1.3 MW beam at the J-PARC with a far water Cherenkov detector which will have about 8 times larger detector volume than that of the Super-Kamiokande detector, following the successful T2K experiment. To make full use of the high statistics data, an accurate prediction of neutrino interaction rates at the HK detector is essential. For this purpose, an intermediate water Cherenkov detector (IWCD) is planned as one of the HK's near detectors, which will use a kiloton scale water Cherenkov detector to be located at around 1 km from the neutrino source at J-PARC. The unique feature of IWCD enables it to move vertically relative to the beam direction, changing the energies of neutrinos impinging the detector. By collecting data at various vertical positions, IWCD will study the relation between neutrino energy and products of neutrino interactions directly. The detector is also planned to be operated with $\text{Gd}_2(\text{SO}_4)_3$ loading, allowing IWCD to measure neutrons accompanying neutrino interactions. The measurement will provide direct inputs to analyses at the HK detector that utilize information about these neutrons to reduce systematic uncertainties on neutron production. This talk will describe the IWCD design and its physics program, including key technology, new photosensor module, and challenges for the IWCD measurements.

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