

Multi-Photomultiplier Detectors in the Water Cherenkov Test Experiment

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The Water Cherenkov Test Experiment (WCTE) at CERN is designed to test various technologies and techniques related to water Cherenkov detectors, which may later be implemented in the Hyper-Kamiokande experiment. WCTE consists of 97 multi-PMT photosensors placed in a water tank (~3.8 m in diameter, ~3.6 m in height, total water mass ~41 tonnes). Each multi-PMT contains nineteen 3" PMTs and associated front-end electronics, all enclosed in a watertight pressure vessel. The same mPMT design, with improvements, will be used in the IWCD (Intermediate Water Cherenkov Detector). A similar design—capable of withstanding higher pressure and featuring lower power consumption—will be deployed in the Far Detector of Hyper-Kamiokande.

In this talk, we will focus on the design and production of the mPMT detectors for WCTE, describing quality assurance measures, assembly procedures, and initial testing. We will also present the methods used to evaluate the electronics performance and the parameters of the 3-inch PMTs. Finally, we will describe the results of data analysis from the gain and timing calibrations for modules installed in the WCTE detector.

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