

The Outer Detector (OD) system for Hyper-Kamiokande experiment

Friday 31 July 2020 11:45 (15 minutes)

Hyper-Kamiokande, scheduled to begin construction as soon as 2020, is a next generation underground water Cherenkov detector, based on the highly successful Super-Kamiokande experiment. It will serve as a far detector, 295 km away, of a long baseline neutrino experiment for the upgraded J-PARC beam in Japan. It will also be a detector capable of observing — far beyond the sensitivity of the Super-Kamiokande detector — proton decay, atmospheric neutrinos, and neutrinos from astronomical sources.

An Outer Detector (OD) consisting of PMTs mounted behind the inner detector PMTs and facing outwards to view the outer shell of the cylindrical tank, would provide topological information to identify interactions originating from particles outside the inner detector. Any optimization would lead to a significant improvement for the physics goals of the experiment, which are the measurement of the CP leptonic phase and the determination of the neutrino mass hierarchy.

An original setup using small 3" PMTs is being designed for the Hyper-Kamiokande OD. They would give better redundancy, spatial, and angular resolution, as they would be twice or three times more photosensors than the original 8" design proposal of the experiment, and for a reduce cost. Several 3" PMTs candidates considered for the Hyper-Kamiokande OD have been characterized for this study. They all show a very low dark counts and good collection efficiency, which makes them excellent choice to be used in the experiment.

In this talk/poster I will introduce the Hyper-K experiment with an emphasis on its sub-detector system. Then, I will show the expected performance of the system using a large array of 3" PMTs that performs better than the previous 8" design. The improvements on event selection with this new design will be discussed and how it affects the mass hierarchy sensitivity.

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Secondary track (number)

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Session Classification: Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques

Track Classification: 13. Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques