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The Hyper-Kamiokande experiment: design, status of construction and physics goals

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Hyper-Kamiokande (HK) is the next generation water Cherenkov detector being constructed in Japan, following in the footsteps of the very successful Kamiokande, Super-Kamiokande and T2K experiments. The Hyper-Kamiokande far detector (260 kton) is planned to be instrumented with 20,000 50 cm diameter photomultiplier tubes (PMT) and about 2,000 multi-PMT optical sensors (each containing 19 7.6 cm PMTs) looking inwards at the detector and 7,200 7.6 cm diameter PMTs looking outwards to veto cosmic radiation and other backgrounds. The design and construction of the detector is at an advanced stage. Hyper-Kamiokande is expected to be commissioned in 2027. The experiment will also count with an Intermediate Water Cherenkov Detector (IWCD) at a site approximately 900 m from the target used to produce neutrino beams at the J-PARC accelerator facility, while the Hyper-Kamiokande far detector is located 295 km away. The main physics goals of the experiment are to significantly improve the precision of neutrino oscillation measurements using the upgraded J-PARC neutrino beam, including the potential discovery of CP violation in the neutrino sector of the Standard Model, measurements of neutrinos from astrophysical sources, such as cosmic rays, solar neutrinos and neutrinos originating from supernovae, and a world-leading search for proton decay.

In this talk, I will describe the design of the Hyper-Kamiokande far and intermediate water Cherenkov detectors, the status of their construction and the expected physics capabilities of the experiment.

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