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Hyper-Kamiokande: A next generation neutrino observatory to search for CP violation in the lepton sector

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Hyper-Kamiokande (Hyper-K), a proposed one-megaton water cherenkov detector to be built in Japan, is the logical continuation of the highly successful program of neutrino (astro)physics and proton decay using the water Cherenkov technique. Hyper-K will search for CP violation in neutrino oscillations associated with the irreducible phase δ in the lepton mixing matrix using the neutrino beam produced at J-PARC. With an exposure of $7.5 \text{ MW} \times 10^7$ seconds, δ can be measured to better than 19 degrees at all values, and CP violation can be detected with more than 3 sigma significance for 76% of values of δ . In addition to the search for neutrino CP violation, Hyper-K will offer a broad program of neutrino astrophysics, including continued studies of atmospheric neutrinos and the detection of neutrinos produced in supernovae as far as the Andromeda Galaxy. It will also extend the sensitivity to proton decay, an incontrovertible sign of new physics and grand unification, by an order of magnitude.

Summary

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