

Future proton decay search experiments

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Grand Unified Theories (GUTs) generically predict direct transition processes between quarks and leptons, making the search for proton decay a crucial method for directly testing these theories. The current limits on the proton (and neutron) decay lifetimes have primarily been established by the Super-Kamiokande (Super-K) experiment, which utilizes the world's largest underground water Cherenkov detector. In addition to the Super-K experiment, a few underground experiments are planned to start their data-taking in this decade, Hyper-K in Japan, DUNE in the U.S., and JUNO in China. This presentation will discuss the fundamental principles of proton decay searches, the current experimental status, and the anticipated future sensitivities of these experiments. Furthermore, it will introduce an ongoing study focused on designing a large-scale proton decay search detector in deep-water to significantly enhance the potential for discovery.

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