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Neutrino Measurements and Neutrinoless Double-Beta Decay Search with KamLAND

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KamLAND is a kiloton-scale liquid-scintillator detector located in the Kamioka underground laboratory in Japan, originally designed to study reactor antineutrino oscillations. Over more than two decades of operation, KamLAND has evolved into a versatile facility for neutrino and rare-event physics. In this talk, I will give an overview of recent and ongoing results on astrophysical and geophysical neutrinos, as well as searches for neutrinoless double-beta decay.

On the astrophysical side, KamLAND has performed searches for electron antineutrinos from core-collapse supernovae and the diffuse supernova neutrino background, providing competitive constraints in the MeV energy range and complementary coverage to water-Cherenkov detectors. For geoneutrinos, KamLAND's long-term data set has enabled precision measurements of the radiogenic heat contribution from U- and Th-decay chains in the Earth's interior. I will also present the status and prospects of the KamLAND-Zen neutrinoless double-beta decay program, which has set world-leading limits on the 136Xe half-life and the corresponding effective Majorana neutrino mass. I will conclude with a brief outlook on future opportunities for neutrino and rare-event physics with KamLAND.

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