

Neutrinoless Double-Beta Decay

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In the early universe, matter and anti-matter, produced equally in high-temperature density, are assumed to annihilate one another. However, the current universe is dominated by only matter. The “mystery of matter-dominated universe” is one of the big problems in particle physics and cosmology, and neutrinos are expected to be a key to the solution. More than 80 years ago, the physicist Ettore Majorana hypothesized that neutrino could be its own antiparticle, however, there has been no experimental evidence so far. The only practical experiments to test the Majorana nature of neutrinos is the search for neutrinoless double-beta decay, which has been a major challenge for nuclear and particle physicists. In this talk, the current status of the neutrinoless double-beta decay searches will be summarized, reviewing the progress of KamLAND-Zen, which recorded the world best sensitivity in the effective Majorana neutrino mass limit.

Primary author: SHIMIZU, Itaru (Tohoku University)

Presenter: SHIMIZU, Itaru (Tohoku University)

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