APR05-2004-000041

Abstract for an Invited Paper
for the APR05 Meeting of
the American Physical Society

Double-beta decay and the neutrino

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We now know that neutrinos have mass. The oscillation experiments have shown that at least one neutrino has a mass greater than about 45 meV. However, these experiments do not measure the absolute mass scale of the neutrino. Beta decay experiments, large-scale structure measurements, and double-beta decay experiments are the most promising techniques to determine this scale. In addition, double-beta decay experiments provide the only feasible technique to determine whether the neutrino is its own anti-particle. The current situation is enticing as the oscillation results give hope that upcoming double-beta decay experiments will see a signal. This, and because the neutrino plays an important role in nuclear physics, particle physics, astrophysics, and cosmology, the science of double-beta decay has stimulated great interest recently. This presentation will summarize the science and the experimental prospects.