APR18-2018-001243

Abstract for an Invited Paper
for the APR18 Meeting of
the American Physical Society

Neutrinoless double beta decay: present status and future prospects

J.F. WILKERSON, Univ of North Carolina, Chapel Hill

In 1937 Ettore Majorana realized that the symmetry properties of Diracs hole theory allowed the possibility for electrically neutral spin-1/2 fermions to be their own anti-particles. If so, a rare process known as neutrinoless double-beta decay ($0\nu\beta\beta$) could occur and consequently the total number of leptons in the universe would not be a conserved quantity. Eighty years later, $0\nu\beta\beta$ remains the only practical experimental technique to probe the Majorana nature of neutrinos. Its observation would profoundly impact our understanding of neutrinos while providing a possible explanation of the mystery of the matter-antimatter imbalance in the universe. With the discovery that neutrinos have non-zero masses, a necessary condition for $0\nu\beta\beta$, experiments are being pursued with vigor and ingenuity by international collaborations around the world. Significant progress has been made, with current sensitivities attaining half-lives of greater than 10^{26} y. Although searching for such a rare process requires reducing backgrounds to unprecedented levels, the prospects are bright for future ton scale experiments that will be capable of discovery measurements covering the entire inverted neutrino ordering region.