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Rare alpha and beta decays

Abstract

Current status of experimental searches for rare alpha and beta decays is reviewed. Several interesting observations of alpha and beta decays, previously unseen due to big half lives in the range of $10^{15} - 10^{20}$ yr, have been achieved during last years thanks to improvements in experimental techniques and underground location of experiments that allows to suppress backgrounds. In particular, the list includes first observations of alpha decays of ^{151}Eu , ^{180}W (both to the ground state of daughter nuclei), ^{190}Pt (to excited daughter state), ^{209}Bi (to the ground and excited daughter states). Isotope ^{209}Bi has the longest known half life of $T_{1/2} \sim 10^{19}$ yr. Beta decay of ^{115}In to the first excited state of ^{115}Sn ($E_{\text{exc}}=497.334$ keV), recently observed at the first time, has the Q value of only 155 ± 24 eV, which is the lowest Q value known to-date. Searches and investigations of other rare a and b decays (^{48}Ca , ^{50}V , ^{96}Zr , ^{113}Cd , ^{123}Te , $^{178\text{m}2}\text{Hf}$, $^{180\text{m}}\text{Ta}$) are also discussed.

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