RESEARCH

NEUTRINOS: THE PURITY OF GERDA OPENS THE WAY TO THE EXPERIMENT LEGEND AT THE INFN GRAN SASSO NATIONAL LABORATORIES

The GERDA (GERmanium Detector Array) experiment at the INFN Gran Sasso National Laboratories (LNGS) is investigating the extremely rare process called neutrinoless double beta decay, using a technology based on germanium crystals enriched with ^{76}Ge isotope. This process, if observed, would allow to affirm that the neutrino is a Majorana particle, i.e. coinciding with its antiparticle, thus allowing the determination of the neutrino mass, which has never been measured by any other experiment. The detection of the phenomenon would also constitute an important contribution to the explanation of the abundance of matter in the universe, compared with antimatter. The experiment published in Physical Review Letters, on December the 17th, the tighter *limit* on the half-life of this rare decay, setting it at $1{,}8 \cdot 10^{26}$ years, more than a million billion times the life of the universe. This exceptional result was achieved thanks to the very limited number of background events in the signal region, $5{,}2 \cdot 10^{-4}$ counts / (keV · kg · year): the lowest level ever achieved in the world in similar experiments. GERDA thus confirms the achievement of all its objectives, also demonstrating the opportunity for a new generation of experiments with even higher sensitivity. The future LEGEND experiment has precisely the purpose of increasing the sensitivity on the half-life of the double decay neutrino-free beta decay up to 10^{28} years (one hundred times more than the result of GERDA). ■