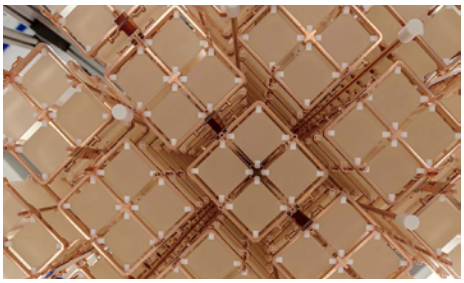

RESEARCH

CUORE: A RECORD EXPERIMENT

The international scientific collaboration that conducts the CUORE experiment (Cryogenic Underground Observatory for Rare Events) at the INFN Gran Sasso National Laboratories has released its latest experimental results, which represent more than two years of data acquisition (from April 2017 to July 2019). This new study provides an even more cogent limit to the existence of a very rare process, neutrinoless double beta decay, which would prove that the neutrino is a Majorana particle. In other words, it would prove that the neutrino is its own antiparticle: a property with important implications in the process of forming matter in the first moments of the universe.

Although the distinctive signal of neutrinoless double beta decay still has not been detected, new CUORE data provide a limit that is two times better compared to that previously published on the frequency of this process in the tellurium-130 nuclei contained in the CUORE crystals. These results, in turn, can be interpreted as a narrower margin on the value of the mass of the Majorana neutrino, which would be lower than a tenth of an electronvolt, or around 5 million times lighter than that of an electron. CUORE's latest results represent the biggest collection of data ever acquired from a particle physics experiment based on solid-state detectors, which use crystals instead of more common liquids for research into double beta decay. The results were obtained with the use of a new and sophisticated algorithm, which makes it possible to amplify the detectors' signals and, at the same time, to eliminate annoying background noise. In addition, the new algorithm makes it possible for CUORE, with its mass of almost one ton of detectors, to research dark matter particles never before observed, called WIMP, or Weakly Interacting Massive Particles, by exploiting the periodic nature of the expected signal. ■