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# NEMO-3 Analysis of the double-$\beta$ decay of 96Zr

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The NEMO-3 detector was operated from 2003 to 2010 in the underground laboratory of Modane.
Its main goal was the search for neutrinoless double-$\beta$ decay.
Its discovery would prove that neutrinos are Majorana particles, meaning that the neutrino is its own antiparticle.
This could help explaining the origin of the neutrino mass.
The current best lower limits on the half-lives of this process are set around $10^{24}$ - $10^{25}$ years as obtained by the NEMO-3 experiment (for the $2\beta$ isotope $^{100}$Mo) and other experiments.
Several analyses are still ongoing, studying the different isotopes installed in NEMO-3: $^{100}$Mo, $^{82}$Se, $^{96}$Zr, $^{150}$Nd, $^{48}$Ca, $^{116}$Cd.

A dedicated study on the double-$\beta$ decay processes of $^{96}$Zr to $^{96}$Mo has been performed using the entire detector live time of 5.25 yr for an exposure of 0.049 kg$\times$yr$^{-1}$.
Even if only a small mass was placed in the detector, the transition energy in the double-$\beta$ decay is one of the highest among the double-$\beta$ isotopes.
This is of first importance given the backgrounds coming from natural radioactivity.
Therefore, $^{96}$Zr is a very promising isotope for the neutrinoless double-$\beta$ decay searches.

During this conference, the measurement of the half-life of the two-neutrino process of $^{96}$Zr performed with the full statistics of NEMO-3 will be presented along with the current highest limit on the half-life of the neutrinoless double-$\beta$ decay process.
Given that $^{96}$Zr is one of the isotopes able to undergo a double-$\beta$ decay to excited states, this process has also been investigated and the results of its search will be exposed.

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