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Application of noble gases in searches for neutrino-less double beta decay

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Noble gases, like Xe or Ar in their liquid or gaseous phase, are becoming increasingly common in experimental programs searching for physics beyond the standard model. This includes the searches for the neutrino-less double beta decay. Noble gases may be used either as targets or can also serve as passive and/or active shields. In the first case one can use as an example the Xe-based detectors (like EXO or NEXT) applying gas enriched in the Xe-136 isotope. In the second case the LEGEND experiment can be presented, where LAr is used as the passive and the active shield, having strong impact on the background reduction.

Clear advantages of the detectors using noble gases are their high radio-purity, which can be relatively easy achieved by gas-phase purification, high scalability and good energy resolution. All this makes it possible to build ultra-sensitive detectors with active targets with masses of several tonnes and almost zero background level.

In the talk various experiments searching for the neutrinoless double beta decay and utilizing noble gases will be presented. Their construction, detection principle, background reduction techniques, expected/achieved sensitivities and prospects will be discussed.

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