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R2D2: a xenon TPC for neutrinoless double beta decay search

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The search for neutrinoless double beta decay could cast light on one critical piece missing in our knowledge i.e. the nature of the neutrino mass. Its observation is indeed the most sensitive experimental way to prove that neutrino is a Majorana particle. The observation of such a potentially rare process demands a detector with an excellent energy resolution, an extremely low radioactivity and a large mass of emitter isotope. Nowadays many techniques are pursued but none of them meets all the requirements at the same time. The goal of R2D2 is to prove that a spherical high pressure TPC filled with xenon gas could meet all the requirements and provide an ideal detector for the $0\nu\beta\beta$ decay search. The prototype has demonstrated an excellent resolution with argon at low pressure and test at higher pressure are ongoing. The xenon recuperation and recirculation system is under commissioning and results in xenon will be obtained soon. In addition the light readout has been recently tested. In the proposed talk the R2D2 results obtained with the first prototype will be discussed as well as the project roadmap and future developments.

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