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P1.063 The potential of discrimination methods in a high pressure xenon TPC for the search of the neutrinoless double-beta decay of Xe-136

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In the search for the neutrinoless double beta decay of 136Xe, a high pressure xenon time projection chamber (HPXe-TPC) has two advantages over liquid xenon TPCs: a better energy resolution and the access to topological features, which may provide extra discrimination from background events, keeping good signal efficiency.

The PandaX-III experiment has recently proposed a 200 kg Xenon gaseous TPC based on Micromegas charge readouts, to be located at Jinping Underground Laboratory in China. Its detection concept is based on two results within the T-REX project: microbulk Micromegas readout planes can be built with extremely low levels of radioactivity (below 0.1 μBq/cm2); and the operation in xenon-trimethylamine (Xe-TMA) at 10 bar in realistic experimental conditions (30 cm diameter readout area, 1200 channels, 38 cm drift) has proven an energy resolution of 3% FWHM at the region of interest (still limited by practical and not fundamental reasons).

In this poster, two discrimination methods are applied to a 200 kg HPXe-TPC. They are based on two well-known algorithms of graph theory: the identification of connections (or tracks) and the search for the longest path. Results show that high background rejection factors (more than 100 both for 214Bi and 208Tl) can be obtained for small pixel sizes (2-5 mm) and the low diffusion of Xe+TMA (about 1 mm for 1 m. drift), keeping signal efficiency of 40%. Moreover, a new observable (the blob charge density) can be used to reject surface contaminations (a factor 10 extra), which make completely unnecessary the use of a trigger signal in this detection technique.