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An Atmospheric Xenon TPC for Neutrinoless Double Beta Decay

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In modern searches for neutrinoless double beta decay ($0\nu\beta\beta$) using ^{136}Xe, one possible avenue being explored by collaborations such as NEXT is the use of a high-pressure gaseous Time Projection Chamber (TPC). The principal reasons for using gas TPCs are to exploit the low intrinsic recombination of the gas and the ability to use electroluminescence as a method of stable gain amplification, resulting in competitive energy resolution performance. One of the primary behaviors of gaseous TPCs, typically seen as a disadvantage, is electron diffusion, which causes blurred track topology. Remedying this typically requires gas additives to mechanically reduce ionization electron energy or computational deconvolution algorithms to recover the original topology. Instead of eliminating diffusion, here I will discuss the possibility of utilizing this effect as a means of improving energy resolution via individual electron counting in an atmospheric-pressure gaseous TPC.

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