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Detection of Electroluminescence in Liquid Xenon with a Radial Time Projection Chamber

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The dual-phase xenon Time Projection Chamber (TPC) is one of the most successful techniques for rare event searches. It detects both primary scintillation and ionization signals from particle interactions in liquid xenon (LXe). The ionization electrons are converted into electroluminescence in the gas xenon, subsequently detected by the same photo-sensors for the primary scintillation. However, it gradually becomes more and more challenging to build the TPCs with very large diameter while requiring sub-mm flatness of the gas gap. Here we developed a Radial TPC (RTPC) which can create and detect the electroluminescence directly in liquid xenon. It can simplify the design of the TPC by replacing the large diameter electrodes with a single wire in the axial center. The design of a liquid xenon RTPC and its first performance will be presented.

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