



Contribution ID: 22

Type: **not specified**

Mind the (gas) gap: a single-phase liquid xenon TPC

Thursday, 16 September 2021 07:00 (15 minutes)

One of the most significant challenges for future dual-phase xenon TPCs is achieving the high, uniform electric field needed in the gas layer. One solution is to avoid using gaseous xenon and instead to create the secondary scintillation within the liquid itself, in a single-phase xenon TPC. Within micrometres of thin wires, the electric field is high enough to enable VUV scintillation. Avoiding the gas gap can provide a workaround to some of the technical challenges facing larger TPCs. At the same time, it opens up new detector design possibilities by relaxing the requirement that electrons are drifted upwards and facilitates analysis based on counting electrons. We discuss some of these advantages and present experimental results from a small single-phase demonstrator TPC with 10 μm anode wires.

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Session Classification: Detector Techniques (3A)

Track Classification: Light/charge response in noble elements