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TPC without charge multiplication : a CMOS direct readout towards neutrinoless double-beta decay and other applications.[1] YUAN MEI, Lawrence Berkeley Natl Lab — High-pressure gaseous TPCs provide a unique combination of excellent energy resolution, event tracking for background discrimination, and scalability, which are ideal for neutrinoless double-beta decay searches. We are developing a pixelated charge readout plane filled with an array of CMOS sensors to harness the power of such a TPC. Each CMOS sensor has an exposed metal patch for direct charge collection and integrates charge sensitive amplifiers as well as signal processing and digitization/data transmission circuitry. The electronic noise is suppressed to a level that the required signal-to-noise ratio is achieved without the need of charge multiplication. It provides competitive energy resolution while improves on tracking capability, stability, and scalability compared to alternative readout schemes. Moreover, ions drifting in the gas can be read directly since the otherwise prohibitive ion avalanche is unnecessary. It enables the use of alternative gases and double-beta decay candidate isotopes such as $^{82}SeF_6$ gas, in which only ion drifting is possible. With modest modifications, the readout plane could be used in liquid noble gas and organic liquid TPCs for a broad range of applications. The design and the progress of the first prototype will be presented.

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