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Alpha particle imaging detectors to measure sample surface radioactive impurities

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In underground astrophysics experiments such as neutrino, dark matter, and double beta decay searches, it is important to use the ultra-low radioactive impurities in the material of the detectors. We have been developing the gaseous TPC with the μ -PIC (or micropattern gaseous detectors: MPGD) and optics to measure the emissivity of alpha particles from the material surface in a low radioactive background. By adding the detection of the gaseous scintillation light, the electron drift length from the μ -PIC plane can be determined. The event quality of alpha emission from the surface would be improved. As a result, the sensitivity (the upper limit of detection) is achieved to a few 10^{-4} alpha/cm²/hr. Further, by suppressing the radon gas in the chamber using the zeolite, we plan to improve the background level more. Until now, the TPC has been operated to measure samples for many other groups. In this presentation, we will detail the detector setup, the mechanism, the operation status, and the prospect.

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