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Investigating New Detection Mediums for Atmospheric Radioxenon Measurements

Several radioxenon isotopes (Xe-131m, Xe-133, Xe-133m, Xe-135) are characteristic byproducts of nuclear explosions, and the presence of these isotopes in specific ratios in the atmosphere acts as a clear tracer which allows the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) to verify the nuclear nature of a clandestine explosion. These isotopes can be discriminated from background and detected at extremely low concentrations (< 1 mBq/m3 air) via exploitation of their distinct beta-gamma coincidence decay signatures. At Oregon State University, we have recently developed three compact and relatively low-cost radioxenon detectors to improve reliability and maintainability of current radioxenon detection systems employed at the International Monitoring System. Our detectors utilize new detection mediums (Stilbene+SiPM, SrI2+SiPM, co-planar CZT, and PIPS detectors) to measure xenon radioisotopes via beta-gamma coincidence technique. In this presentation, we will present the design of detectors and also discuss our preliminary experimental results using (1) Stilbene-CZT, (2) PIPS-CZT, and (3) PIPS-SrI2 radioxenon detectors.

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