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and Prevention of Beta-Gamma Detector Noise

This study delves into the origins and mitigation strategies for detector noise in beta-gamma detectors used for radioxenon measurements, a crucial element in nuclear test-ban monitoring. Detector noise, arising from both electronic and environmental interferences, significantly affects the precision and accuracy of radioxenon isotopic analysis. A series of experiments was conducted at the Pacific Northwest National Laboratory, including the use of Photomultiplier Tube (PMT)-based beta cells versus Silicon Photomultiplier (SiPM) beta cells, alongside advanced shielding and noise isolation techniques. These tests were designed to replicate field conditions to ensure that findings are applicable to currently deployed systems. The study highlights the sources and solutions of noise present in beta-gamma systems and proposes key strategies to optimize detector performance, thereby enhancing the reliability and sensitivity of radioxenon measurements.

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