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T3.2-P07. Benefits Gained from the Use of a Silicon Beta Detector and Potential Cell Designs

Accurate detection of radioxenon sources is an important aspect of the International Monitoring System (IMS). Lowering the minimum detectable concentrations (MDCs) and increasing the power to discriminate between anthropogenic sources and nuclear explosions can each aid in the identification of radioxenon events. Current radioxenon detectors use beta-gamma coincidence detection to limit backgrounds and achieve the current MDCs. Sodium iodide (NaI) is used for detecting the gamma rays and plastic scintillator for detecting the beta particles. The use of silicon instead of plastic scintillator for detecting beta particles has the potential to both decrease the MDCs and increase the ability to identify the source of the radioxenon detected through the use of the ratios of the radioxenon isotopes. Xe-131m and Xe-133m both emit conversion electrons with energies that reside within the beta continuum of Xe-133, which is always present with Xe-133m and Xe-131m. The increased resolution of silicon results in narrower conversion electron peaks, and reduced backgrounds observed from Xe-133. We present the benefits of the different silicon detector types and cell designs currently of interest for improving beta-gamma coincidence detection.

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