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Effects of High Count Rates and Pulse Pileup in Sodium Iodide Scintillation Detectors E. FLUMERFELT, M. SALVITTI, J. BORGARDT, Juniata College, S. ROBINSON, Pacific NW Natl Labs, JUNIATA COLLEGE COLLABORATION, PACIFIC NW NATL LABS COLLABORATION — Radiation Portal Monitors (RPMs) are a key component for interdicting illicit radioactive material at US border crossings. PVT detectors have been central to this effort, however they lack the capability to identify specific radioisotopes, resulting in the development of NaI detectors that produce a higher resolution spectrum. An experiment was performed using 57Co, 60Co and 137Cs sources to determine the effects of high-count situations and pulse pileup on the spectral profile created by ASPs. Attention was focused on the common spectroscopic problems of peak shifting, count-rate saturation and distortion of spectral features. In these situations, isotope identification algorithms may experience problems such as additional or different sources being detected, or failure to recognize present isotopes. Experimental results were compared to MCNP simulations of the data. One of the ASPs tested has some compensation for high-count effects, and does not show these effects. The other ASP displayed signs of peak shifting but very little evidence of spectral marring. The NaI logs however, exhibited spectral distortion and peak shifting under conditions of pulse pile-up. These results provide foundational information in assessing how these detectors respond to potential saturation scenarios.

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