Ultra-High Rate Measurements of Spent Fuel Gamma-Ray Emissions DOUGLAS RODRIGUEZ, BRENT VANDEVENDER, LYNN WOOD, BRIAN GLASGOW, MATTHEW TAUBMAN, MICHAEL WRIGHT, MICHAEL DION, KARL PITTS, ROBERT RUNKLE, LUKE CAMPBELL, JAMES FAST, Pacific Northwest National Laboratory, ULTRA-HIGH RATE GERMANIUM TEAM — Presently there are over 200,000 irradiated spent nuclear fuel (SNF) assemblies in the world, each containing a concerning amount of weapons-usable material. Both facility operators and safeguards inspectors want to improve composition determination. Current measurements are expensive and difficult so new methods are developed through models. Passive measurements are limited since a few specific decay products and the associated down-scatter overwhelm the gamma rays of interest. Active interrogation methods produce gamma rays beyond 3 MeV, minimizing the impact of the passive emissions that drop off sharply above this energy. New devices like the Ultra-High Rate Germanium (UHRGe) detector are being developed to advance these novel measurement methods. Designed for reasonable resolution at $10^6\ s^{-1}$ output rates (compared to $\sim 1 - 10\text{e}3\ s^{-1}$ standards), SNF samples were directly measured using UHRGe and compared to models. Model verification further enables using Los Alamos National Laboratory SNF assembly models, developed under the Next Generation Safeguards Initiative, to determine emission and signal expectations. Measurement results and future application requirements for UHRGe will be discussed.

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