Reactor Modeling of each Mark-18A Target in SRS’s K-Reactor during Californium Production Campaign

Mark-18A target assemblies contain the world’s remaining supply of unseparated 244Pu. This rare isotope was generated by irradiating eighty-five high assay 242Pu oxide target assemblies under extremely high neutron flux in K-Reactor at the Savannah River Site from 1968 to 1978 to produce milligram quantities of californium and other transuranic isotopes. During the Cf-I campaign, K-reactor was operated at 6E15 n/(cm2 s) for 18 months. Twenty one targets were removed to recover252Cf, 246-248Cm, andthe existing world supply of 244Pu.  After completion of the Cf-I campaign; the majority of the Mk-18A were shuffled around K-reactor for the next eight and a half years. During this time, shuffling had some targets relocate into blanket regions, buckle regions and control regions. Sixty-five targets are currently being stored in the Savannah River Site’s L-Basin, and will be transferred to SRNL shielded cell facility in 2020 with the objective to separate plutonium from the target using chemical processing techniques. Using the provided reactor performance summary and target shuffling history, the isotopes within each of the remaining 65 targets can be determined to predict unique quantities of heavy isotopes that will be recovered on a per target basis.

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