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UCRL-ABS-234011

Utilization of Accelerator Mass Spectrometry in a Real Time Occupational Internal Dosimetry Program

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(Abstract submission, Health Physics Society 41st Midyear Topical Meeting, Oakland, January 27-28, 2008)

September 2007

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

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In 2003 Lawrence Livermore National Laboratory (LLNL) began utilizing accelerator mass spectrometry (AMS) to analyze ^{240}Pu and ^{239}Pu as a supplemental technique to its routine DOELAP accredited alpha spectroscopy analytical method. The AMS analysis has been applied to over 250 samples, including both reprocessed alpha spectroscopy disc material and investigatory urine samples. The AMS technique reliably provides detection levels of less than 1 μBq, typically on the order of about 0.2 μBq. This detection capability is greater than 100 times more sensitive than the routine alpha spectroscopy technique. The sensitivity of the AMS technique has enabled the LLNL Internal Dosimetry Program to confirm the presence of low-level intakes not initially identified by workplace monitoring or alpha spectroscopy analysis, resolve excretion patterns for Pu-in-urine levels well below the alpha spectroscopy detection levels, investigate sporadic or barely detectable alpha spectroscopy results, estimate intake time frames and solubility information from retrospective analysis of historical routine samples, and determine source terms based on the ^{240}Pu to ^{239}Pu ratio. Use of AMS has the benefit of identifying previously unrecognized low-level Pu impurities/contaminants within the routine Pu-in-urine bioassay chemical processing methods. This presentation will review the AMS technique used at LLNL, review significant achievements, and provide a plan for continued use of AMS as part of LLNL's Internal Dosimetry Program.

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