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Calculating Relative Ionization Probabilities of Plutonium for Resonance Ionization Mass Spectrometry to Support Nuclear Forensic Investigations[1] CRAIG LENSEGRAV, CRAIG SMITH, Naval Postgraduate School, BRETT ISSELHARDT, Lawrence Livermore National Laboratory — Ongoing work seeks to apply the technology of Resonance Ionization Mass Spectrometry (RIMS) to problems related to nuclear forensics and, in particular, to the analysis and quantification of debris from nuclear detonations. As part of this effort, modeling and simulation methods are being applied to analyze and predict the potential for ionization by laser excitation of isotopes of both uranium and plutonium. Early work focused on the ionization potential of isotopes of uranium, and the present effort has expanded and extended the previous work by identifying and integrating new data for plutonium isotopes. In addition to extending the effort to this important new element, we have implemented more accurate descriptions of the spatial distribution of the laser beams to improve the accuracy of model predictions compared with experiment results as well as an ability to readily incorporate new experimental data as they become available. The model is used to estimate ionization cross sections and to compare relative excitation on two isotopes as a function of wavelength. This allows the study of sensitivity of these measurements to fluctuations in laser wavelength, irradiance, and bandwidth. We also report on initial efforts to include predictions of americium ionization probabilities into our modeling package.

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