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Characterization/Selection of a Continuous Wave Laser for RIMS Analysis in Nuclear Forensics SUNNY LAU, F. ALVES, G. KARUNASIRI, C. SMITH, Naval Postgraduate School, B. ISSELHARDT, Lawrence Livermore Laboratory — The effort to implement the technology of resonance ionization mass spectroscopy (RIMS) to problems of nuclear forensics involves the use of multiple lasers to selectively ionize the elements of concern. While current systems incorporate pulsed lasers, we present the results of a feasibility study to determine alternative (Continuous Wave) laser technologies to be employed for analysis of the actinides and fission products of debris from a nuclear detonation. RIMS has the potential to provide rapid isotope ratio quantification of the actinides and important fission products for post detonation nuclear forensics. The current approach to ionize uranium and plutonium uses three Ti-Sapphire pulsed lasers capable of a fundamental wavelength range of 700-1000 nm. In this work, we describe the use of a COTS CW laser to replace one of the pulsed lasers used for the second resonance excitation step of plutonium near 847.282 nm. We characterize the critical laser parameters necessary to achieve high precision isotope ratio measurements including the stability over time of the mean wavelength, bandwidth and spectral mode purity. This far narrower bandwidth laser provides a simpler setup, more robust hardware (greater mobility), and more efficient use of laser irradiance.

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