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LASER-COMPTON SCATTERING X-RAYS FROM INTERMEDIATE ENERGY ELECTRON BEAMS AS AN X-RAY SOURCE FOR NONPROLIFERATION AND X-RAY IMAGING

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Laser Compton scattering (LCS) experiments were carried out at the Idaho Accelerator Center (IAC) using the 5-44 MeV linear accelerator (LINAC). LCS X-rays were generated using a 50 ps electron beam colliding with a 4 GW, 250 ps, phase locked Nd:YAG laser. 60 Hz X-rays bursts resulting from an approximate head-on collision of relativistic electrons with the high peak power laser lines (1064, 532 and 266 nm) were generated with energies ranging from 20 to 122 keV. 122 keV LCS X-rays were used for X-ray fluorescence (XRF) experiments and X-ray transmission measurements in uranium samples of different concentrations.

One of the purposes of this work was to use LCS Xrays as a non-invasive means for actinide elements identification and quantification in liquid samples. Results from our experiments showed that because of its relatively low spectral bandwidth, energy tunability and low bremsstrahlung background (high signal to noise ratio), LCS is a useful x-ray source for hybrid k-edge densitometry (HKED). LCS X-rays with energies equal to 20 and 47 keV were generated using the laser fundamental wavelength and second harmonic respectively and were used for absorption based and phase contrast imaging experiments.

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