In vivo L XRF feasibility studies of uranium using \(^{125}\text{I}\) radioisotope

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In this study, the feasibility of L-XRF for \textit{in vivo} measurements of uranium in kidney and bone was explored. Uranium doped kidney and bone calibration phantoms were modelled for different concentrations ranging from 0-100 μg/g, using uranium doped plaster of Paris. \(^{125}\text{I}\) interstitial brachytherapy seeds were used as the excitation source. This source emits a gamma photon of energy 35.49 keV apart from Te and Ag X-rays; all of which have sufficient energy to excite L shell electrons in uranium. The L X rays thus produced were collected using a Si(Li) detector arranged in near back scatter geometry. The data were analyzed and the minimum detection limits of uranium in bare kidney and bone phantoms were determined. The effective MDL in kidney was calculated as 1.06 μg/g of Ca, whereas the same for bare bone was as 3.05 μg/g of Ca. The MDLs were further corrected for overlying soft tissue thicknesses for both kidney and bone and will be reported.