Abstract Submitted
for the FWS20 Meeting of
The American Physical Society

Calibration of Optically-Stimulated Luminescence Dose Measurements for X-Ray Fluorescence Bone Lead Measurements[1] SARAH KROEKER, California State University, Fresno, MIHAI GHERASE, Physics — An experimental phantom-based method was established in our lab for lead (Pb) concentration measurements in the human tibia bone using a microbeam-based L-shell x-ray fluorescence (LXRF). *In vivo* LXRF bone lead measurements, however, require knowledge of the radiation dose delivered by the microbeam to the soft tissue overlying the bone. Optically-stimulated luminescence dosimeters (OSLDs) were selected for such dose measurements due to their reduced size similar to the small irradiated tissue volumes. Available calibrations of commercial OSLDs mostly target clinical applications such as x-ray imaging modalities and radiation therapy and could not be used for LXRF bone Pb measurements due to large differences in the x-ray photon energy. OSLD calibration was performed using an ion chamber calibrated by an x-ray beam with similar quality factor to the microbeam. Calculations and exposure rate measurements were performed at six positions along the microbeam. Calculated values were larger than the measured ones by a factor in the 1.2 to 1.7 range. Differences were explained by calculations not accounting the backscattered x-rays and the varying x-ray beam size.

[1]Research was supported by the National Institute of General Medical Sciences of the National Institutes of Health under award SC2GM121187.

Mihai Gherase
California State University, Fresno

Date submitted: 24 Sep 2020 Electronic form version 1.4