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## Impact of Energy Calibration in X-Ray Region on Xenon Activity Concentration Calculation under Least-Squares-Based Net Area Calculation Method

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High resolution gamma spectrometry allows least-squares-based net area calculation in radioactive xenon detections. The least-squares-based calculation accounts for X-ray deconvolution and gamma peak area quantification. The International Data Centre (IDC) has been seeking a new approach to enhance the capability of gamma area quantification by taking advantage of X-ray counts. In a previous study, over 50% of discrepancies were observed when there were energy calibration shifts in the X-ray region by 2 channels, about 0.35 keV. This study investigates the sensitivity of activity concentration calculations to energy calibration. The study used six years of spike and sample spectra received at the IDC. Spikes were analyzed as the first exercise. In each spectrum, an energy calibration was performed as a reference point. Subsequently, activity concentrations were calculated while varying calibration offsets. Deviations to the reference value were examined. Depending on detected isotopes, the impact was assessed in three separate groups. Daily sample spectra with Xe-133 activity concentrations above 1 mBq/m<sup>3</sup> were retrieved and analyzed in the same manner as in the second phase. The results strongly suggested that the activity concentration calculation is especially susceptible to the calibration shift in the X-ray region.

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