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Optimisation of a Ge pixel detector –how low can we go?

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The Australian Synchrotron has one hard X-ray XAS beamline. This was constructed to service the majority of the local scientific community needs, which notably consists of a significant component of Bio-XAS and materials studies where the elements of interest are often very dilute (< 0.5 ppm). This is balanced with users with more typical experimental needs (eg several 0.1%'s concentration fluorescence or transmission measurements). As such, a high flux (up to 10^13 photons/sec) beamline, matched to a 100 element Germanium pixel array detector (PAD) was seen as the best experimental match for the community for routine operation. On occasion, the sensitivity limit for XANES is around 100-200 ppb. At such low concentrations, many aspects of the PAD are critical. Areas we are constantly exploring include: using Z-1 filters and soller slits / collimators, masking adjoining pixel interstitial region, optimized electronic filter parameters, per element deadtime corrections, maximum countrate and linearity tradeoffs, peaking time vs resolution tradeoff and fitting the full fluorescence signal/background to provide better normalization. Results from selected investigations will be presented focusing on the resulting quality and reliability of the normalized XAS signals, influenced bythe question –"How low in concentration can we reliably go?"

Keywords

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