Realistic detector requirements for high energy synchrotron X-ray nano-imaging

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Having used X-ray detectors for the last 35 years in both synchrotron and ion beam accelerator environments, I have witnessed, used and taught, the advent of these devices as they evolved to fulfil and sometimes precede the needs of the X-ray spectroscopy community. The X-ray applications I have been involved with, went from fundamental atomic physics such as in precision spectroscopy of relativistic high Z few electron ions, ion-surface interactions, plasma physics to photon-atom interactions, as in inelastic and Raman-Compton scattering, and finally to applied physics in the synchrotron environment. Gradually, X-ray spectroscopy became the ideal tool for Earth and Planetary Sciences, Environmental Sciences, Materials Sciences, Biology and Art & Archaeometry. Representing the needs of these communities, as a physicist trained in Solid State Physics and Electronics, helped focus our needs to a relatively well understood pool of requirements, which, unlike those of other communities, are rather realistic. Far from a "faster, better, smaller" utopic scheme, we entertain a more pragmatic, approach, prioritizing our requirements. We want to address, by order of priority, those requirements potentially limited nowadays and specifically those which would produce big steps forward in their fields, were these limitations removed or decreased. Therefore, I will present a brief list of potential improvements for both single element or position sensitive detectors which are standing to strongly benefit the applied X-ray communities involved in the fields outlined above. Examples of X-ray fluorescence (XRF) results featuring short term detector limitations will be shown and justified, as well as more long term ones, requiring a concerted common goal, for both device manufacturers and R&D actors alike.