Virtual subpixel approach for single-mask phase-contrast imaging using Timepix3

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X-ray phase contrast imaging provides a method to distinguish materials with similar density and effective atomic number, which otherwise would be difficult using conventional X-ray absorption contrast. In recent years, multiple methods have been developed to acquire X-ray phase contrast images using incoherent laboratory sources. The single mask edge illumination setup has been demonstrated as a possible candidate for large scale applications due to its relaxed restrictions on longitudinal coherence and mask alignment, and for its ability to do bi-directional phase contrast images in a single sample exposure. Unfortunately, the single mask edge illumination setup’s refraction sensitivity, and thereby signal to noise, is limited by detector artifacts. Furthermore, it requires multiple exposures to perform dark-field imaging, a method that enables imaging of micro-structures smaller than the image resolution.

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