Correcting Parallax Effects in X-ray Area Detectors: A Novel Integral Method for Enhanced Peak Position in pyFAI

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The parallax effect remains a critical challenge in X-ray diffraction with area detectors. When X-rays from a point source traverse thick detection layer at significant incident angles, they produce a systematic shift in the apparent position of detected events, degrading peak positions and broadening peak widths. These effects are particularly detrimental to pair distribution function (PDF) analysis and powder diffraction measurements.
In thick detectors, high incidence angles (>30°) cause X-ray photons to traverse multiple pixels, creating significant discrepancies between observed and expected scattering angles (2θ).
In this contribution, we present: (1) comprehensive simulations of the parallax effect on synthetic data; (2) several correction strategies; and (3) a novel integral method capable of correcting pixel positions for parallax effects regardless of detector position or orientation.
Our method is validated against experimental data from reference samples (Silicon, Ceria) acquired at the D2AM synchrotron beamline (ESRF-BM02) using Eiger-2 detectors with varying sensitive layers (Si, CdTe), which exhibit different absorption characteristics. Results demonstrate substantial improvements in peak position accuracy. This new integral method is available in **pyFAI v2025.12**.

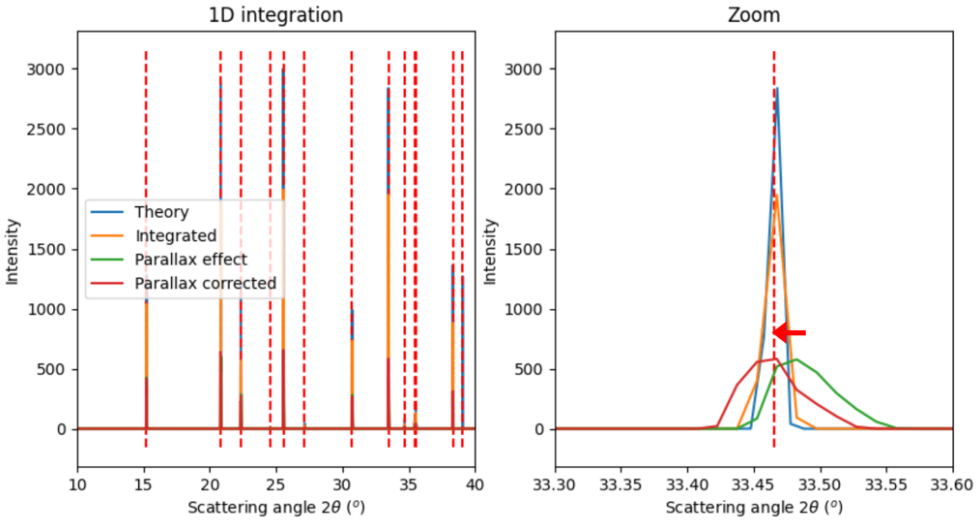


Figure 1. Diffractogram of a standard sample, showing the peak shift at high scattering angle, with and without parallax correction.

Abstract for poster presentation

EPDIC19 – CransMontana 2026