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Photo-electron resolved data streams in multidimensional momentum microscopy at FLASH

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Multidimensional photoemission spectroscopy (MPES) experiments using delay-line detectors generate data streams which resolve individual photoelectrons. This enables the correlation of each detected electron to the full state of the experimental apparatus. Such a detection scheme is ideal for SASE FELs such as FLASH, where the inherent intensity fluctuation and timing jitters can not only be corrected for but can also be further exploited, thereby increasing the measured parameter space.

We developed a distributed workflow pipeline which takes advantage of single-event resolution to correct and calibrate MPES data and to generate an open-source data structure ready for analysis and storage with complete metadata description. Initially designed for the HEXTOF end-station, this workflow is easily generalized to any electron-resolved data stream, increasing portability and usability across a large community.

The modular structure of the workflow combines high resolution, artifact-free post processing methods for offline analysis with fast on-site data evaluation. This structure enables users to make data driven decisions, effectively increasing the output of significant data from each beamtime.

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