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aare –A Flexible Data Analysis Library for Hybrid Pixel Detectors

The data rates of hybrid pixel detectors are rapidly increasing, with next-generation systems moving from 10 Gbit/s to 100 Gbit/s readout. For Matterhorn, a new single-photon counting detector under development at PSI, a 16-megapixel configuration would generate data rates of up to 3.2 Tbit/s (or 400 GB/s). These high data rates are not only a challenge for beamline operation but also make laboratory testing more difficult, emphasizing the need for efficient data handling tools. Aare is a library designed to help scientists analyze terabyte-scale datasets from hybrid pixel detectors. It features for example cluster finding, interpolation and detector calibration. The core is implemented in C++ for performance, but we also offer low-overhead Python bindings for ease of use. The code is multi-threaded capitalizing on the parallelizable nature of pixel and frame processing. Development plans include support for heterogeneous hardware architectures (GPU/FPGA) to further enhance performance.

Workshop topics

Detector systems

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