

A High-Throughput Data Pipeline for MHz-XPCS: Offline Analysis

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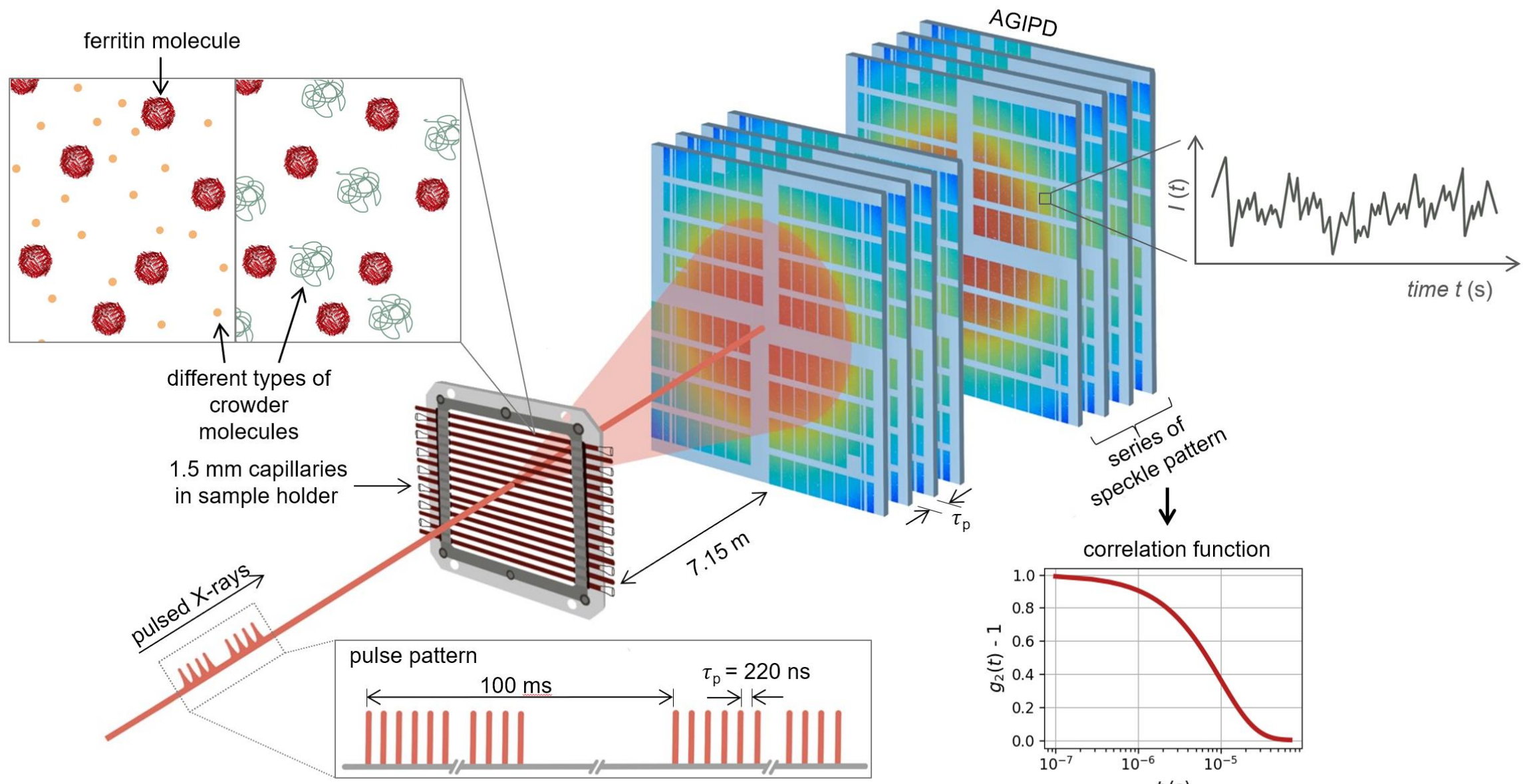
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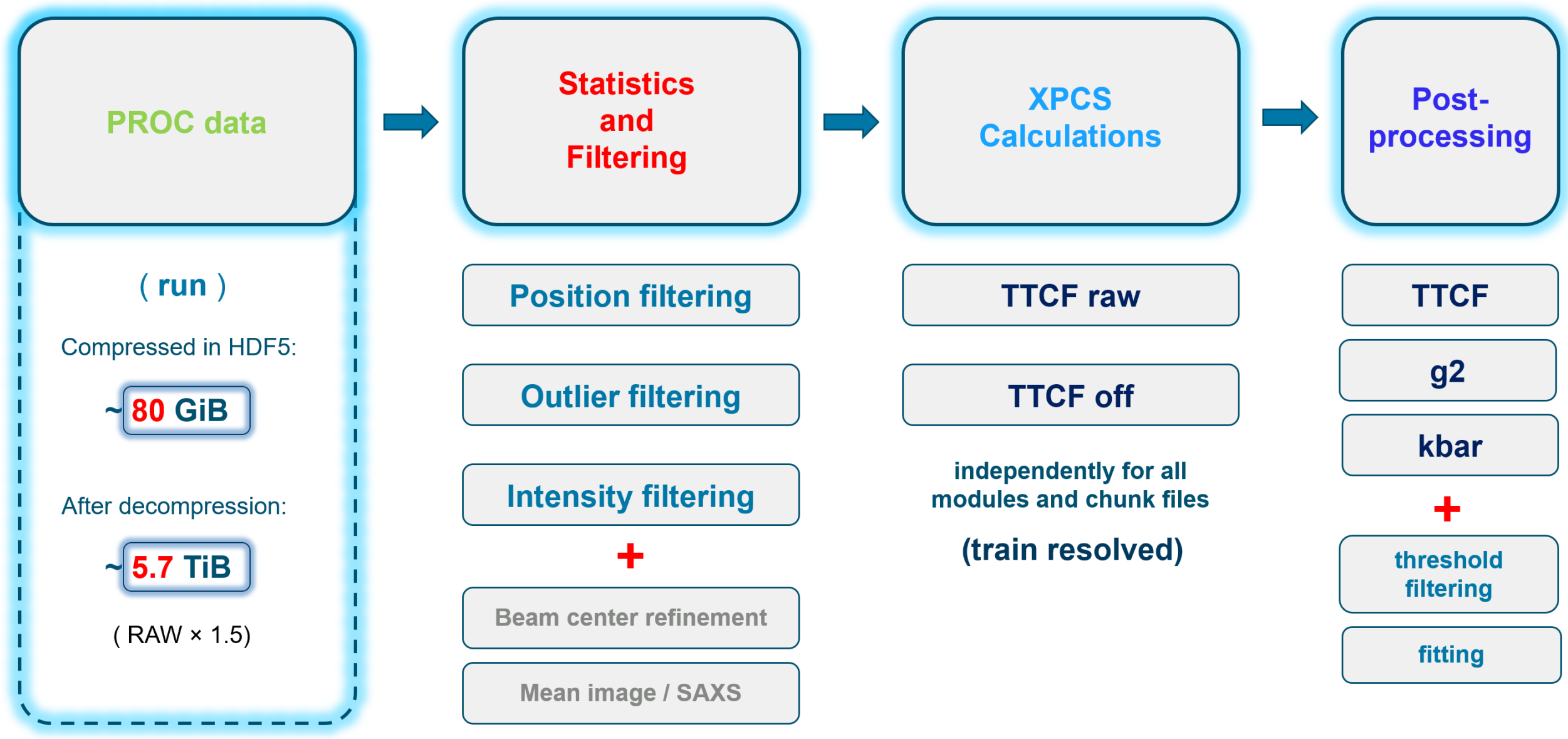
Introduction

The EuXFEL is the first free electron laser to produce ultra-short hard X-ray pulses at a megahertz repetition rate. This high repetition rate, combined with the exceptional transverse coherence, enables Megahertz X-ray Photon Correlation Spectroscopy (MHz-XPCS) to probe diffusive dynamics with (sub-) microsecond temporal resolution matching typical diffusion processes in dense cellular environments, therefore allowing to study the complex many-body interactions between proteins and their solvent at molecular length scales [1, 2]. In this poster, we present details on the experimental protocol and data processing for MHz-XPCS experiments on protein samples, implemented at the MID instrument of EuXFEL [3].

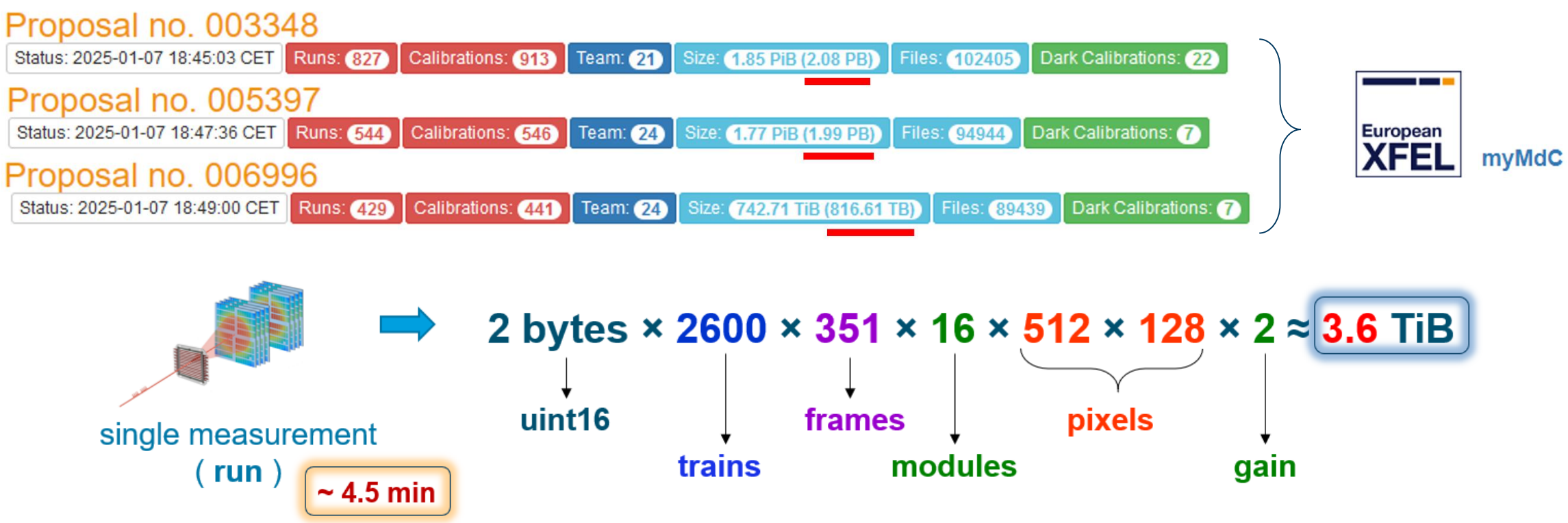
Experimental Protocol



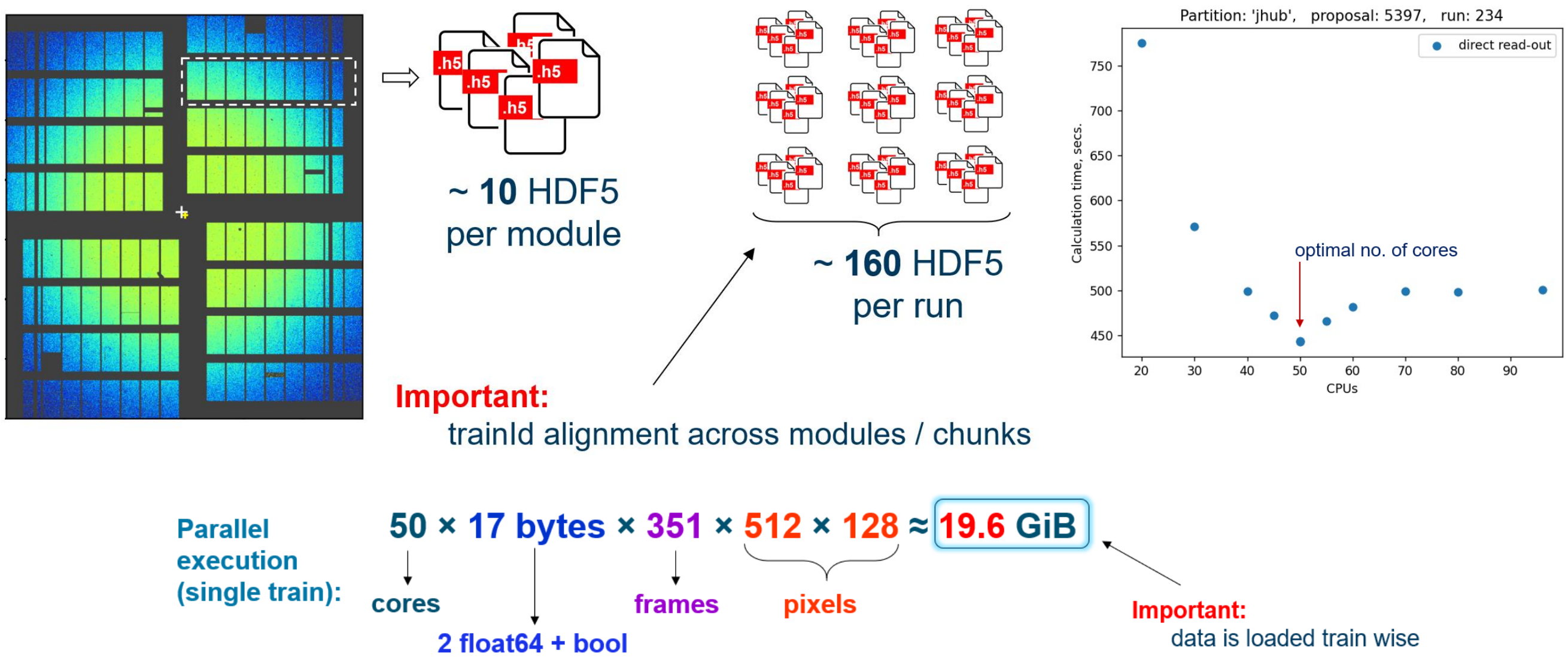
MHz-XPCS Data Pipeline: Overview



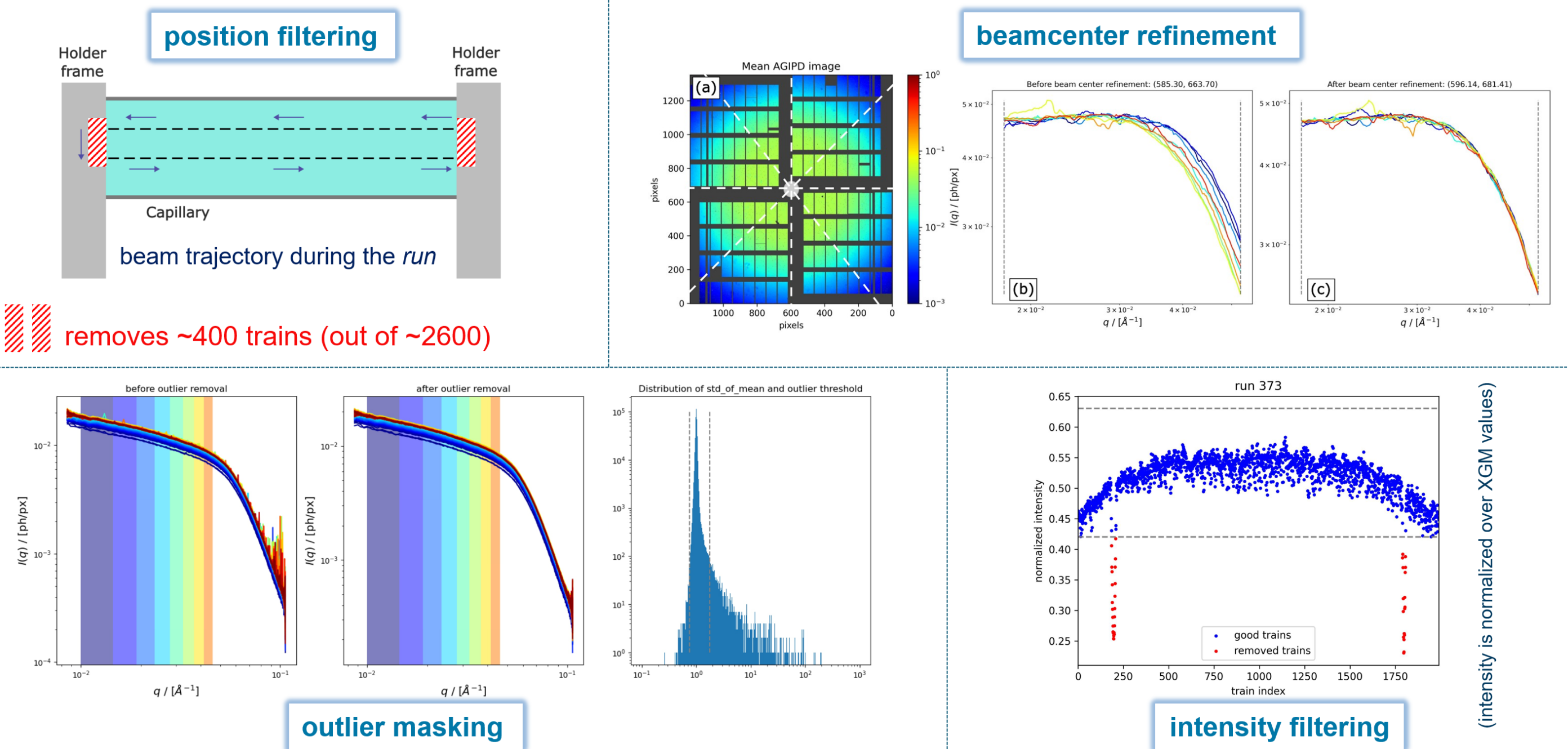
Data Volumes with MHz-XPCS



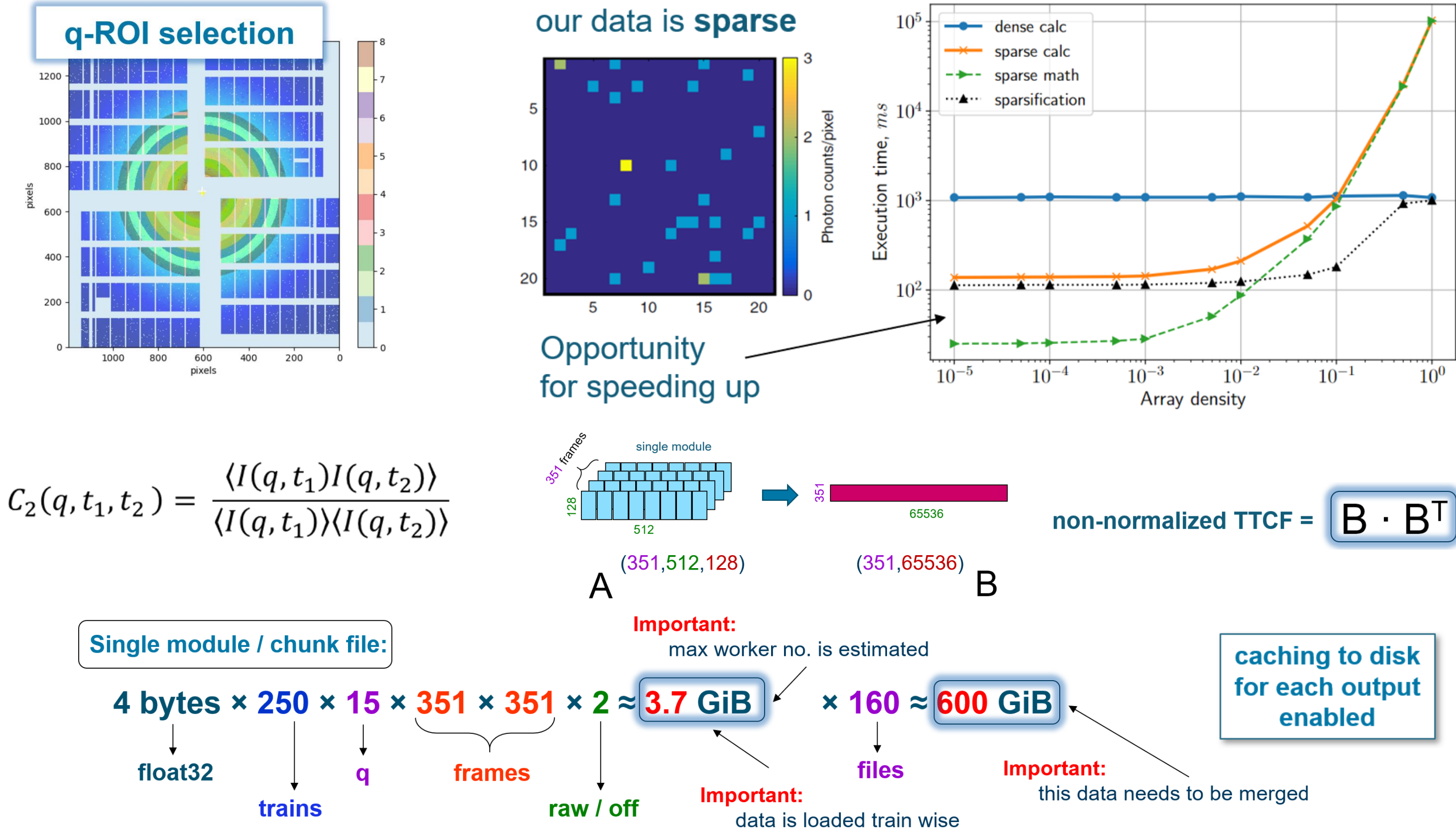
Mean Pixel-Cell Calculation



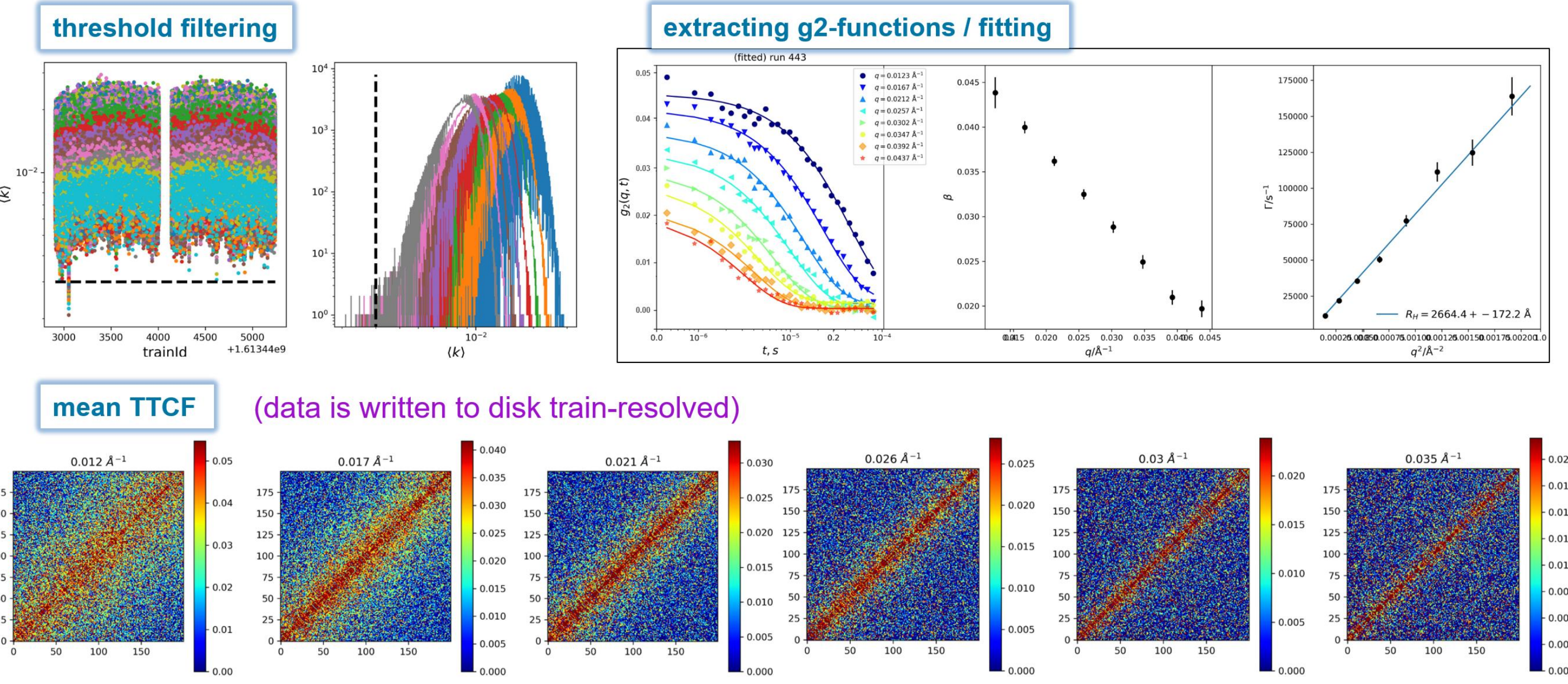
Filtering



TTCF Calculation



Post-Processing of Data



Acknowledgements

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[1] M. Reiser, et al. *Nat Commun* **13**, 5528 (2022)
[2] A. Girelli, et al., submitted to *Nat Commun* [<https://arxiv.org/abs/2410.08873>]
[3] A. Madsen, et al., *J. Synchrotron Rad.* **28**, 637-649 (2021)