Programme Matter and Technologies

GPU-accelerated algorithms for data analysis

Detector Technology and Systems / Parallel Processing

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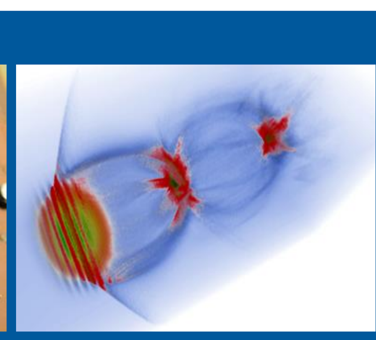
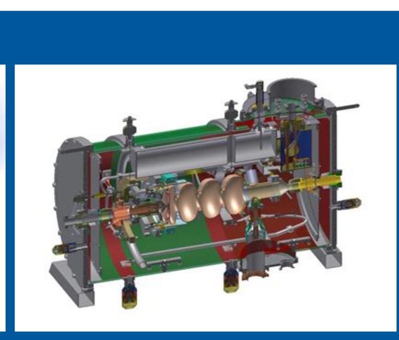
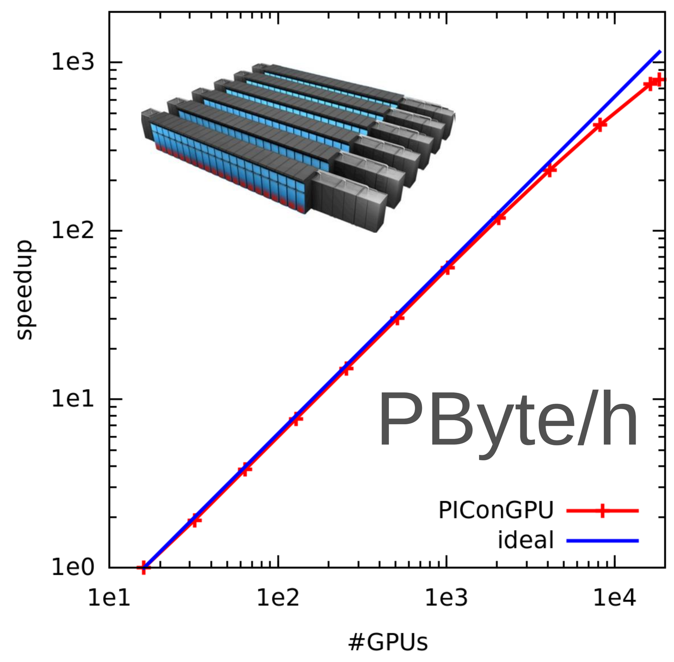



Motivation

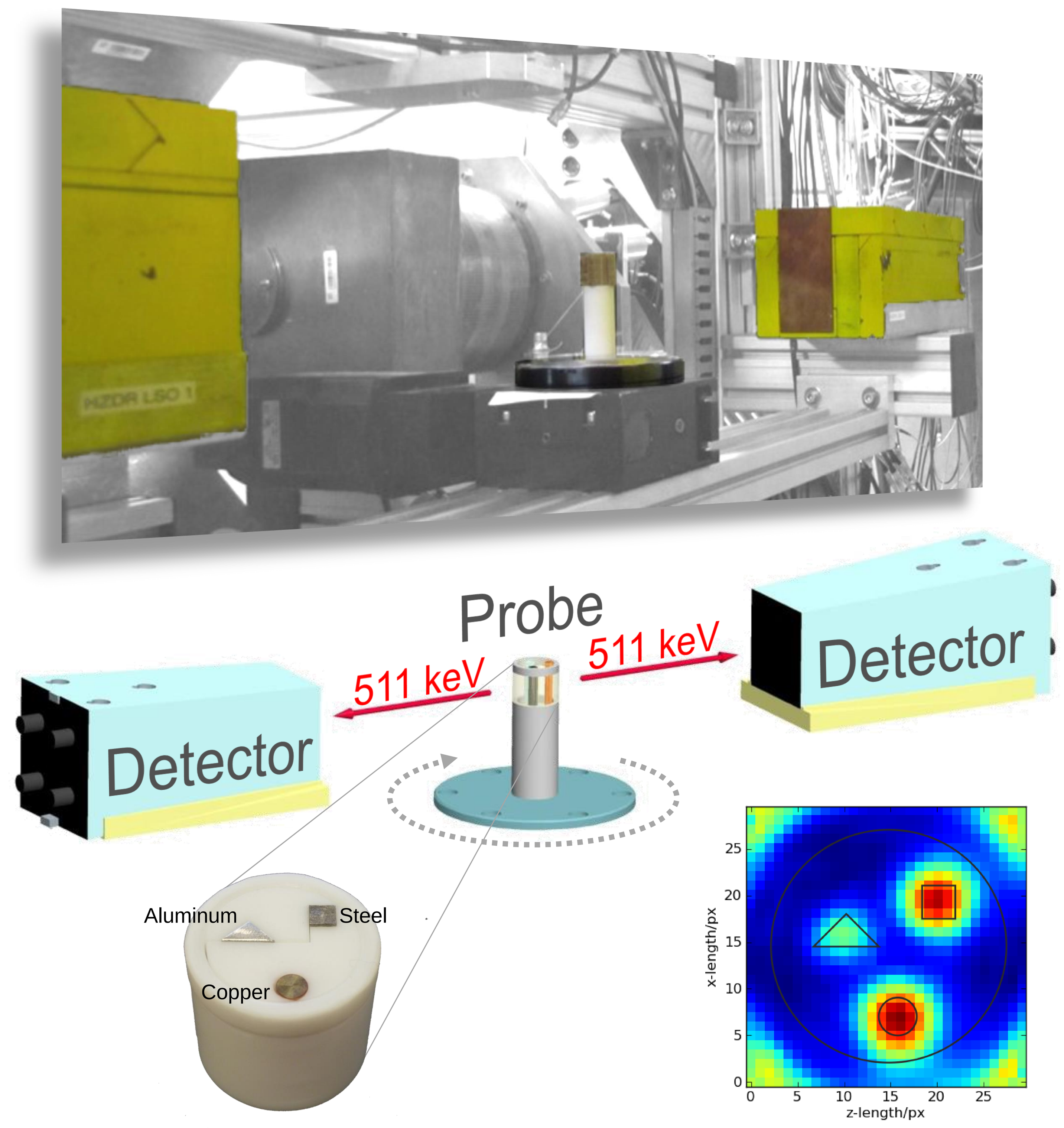
Parallel algorithms allow for **in-situ data analysis** and thus **great reduction** of data rates. Speeding up data analysis enables **real-time feedback**.

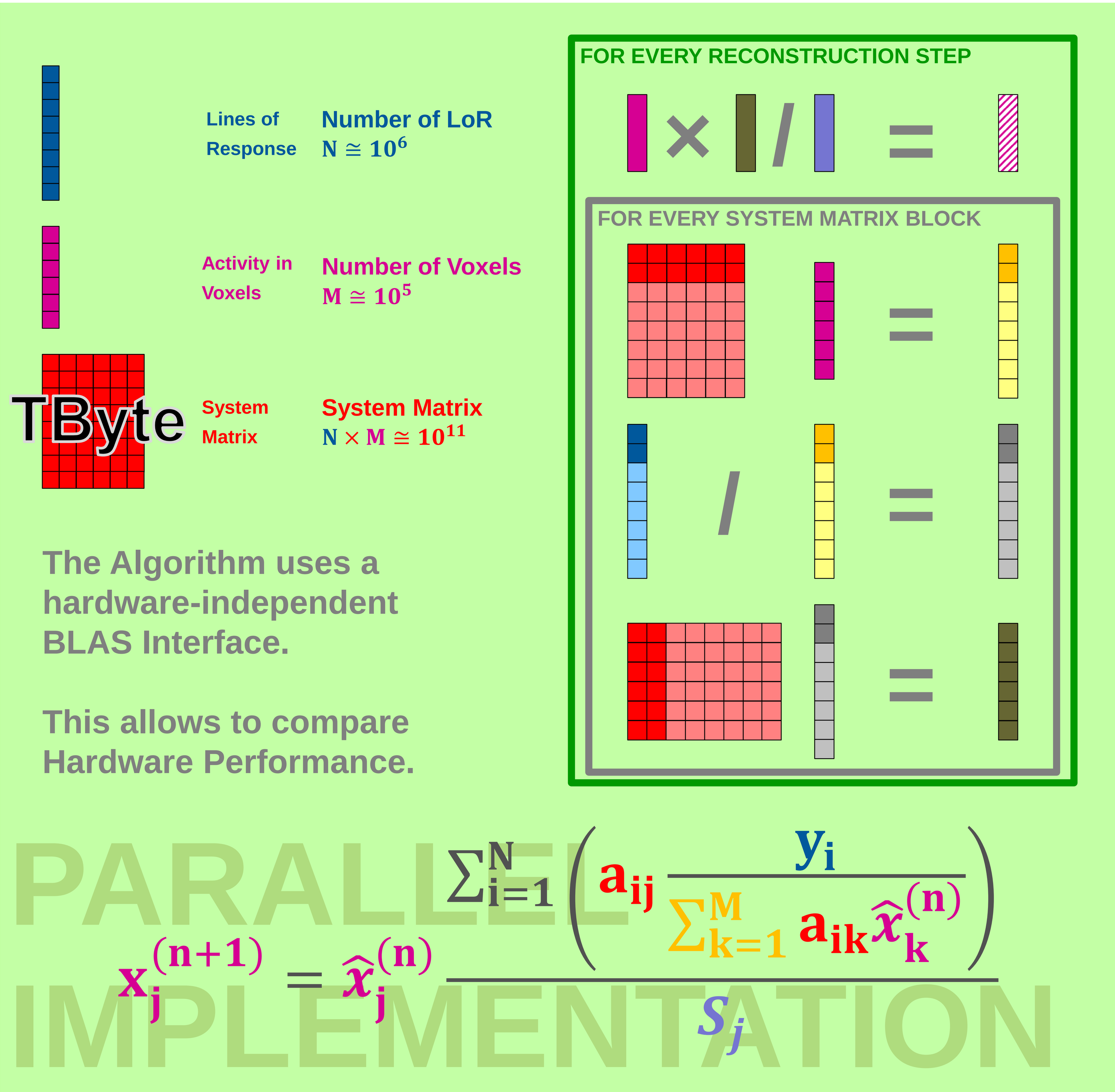
Here we show two examples of real-time data analysis that highlight the key requirements on parallel algorithms and data transport.

- **Moderate Rate, Complex Signals**: Real-time Image Reconstruction of PET Data
- **High Rate, Independent Signals**: Positron Annihilation Spectroscopy Event Analysis

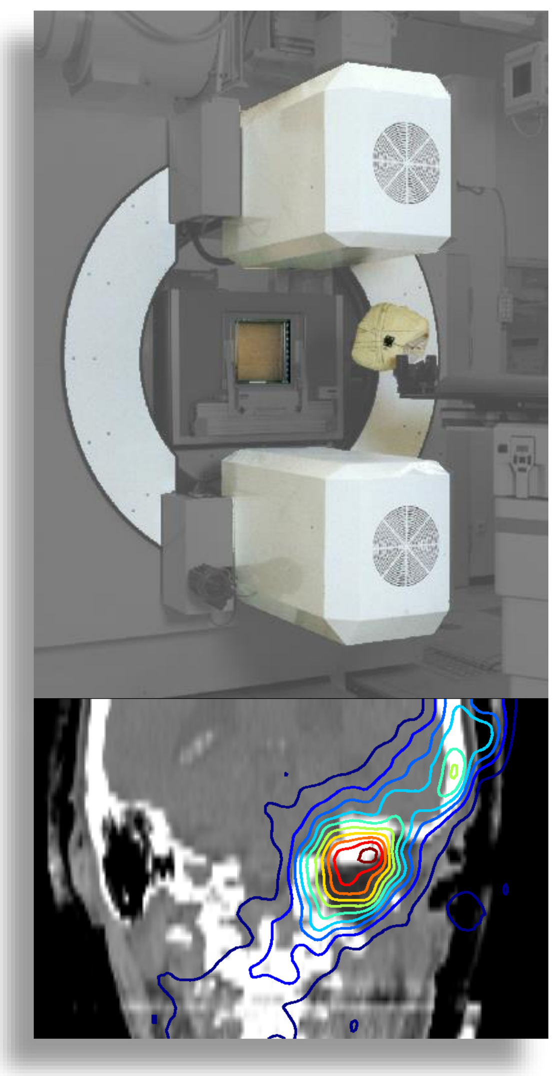


Real-time Image Reconstruction of PET Data

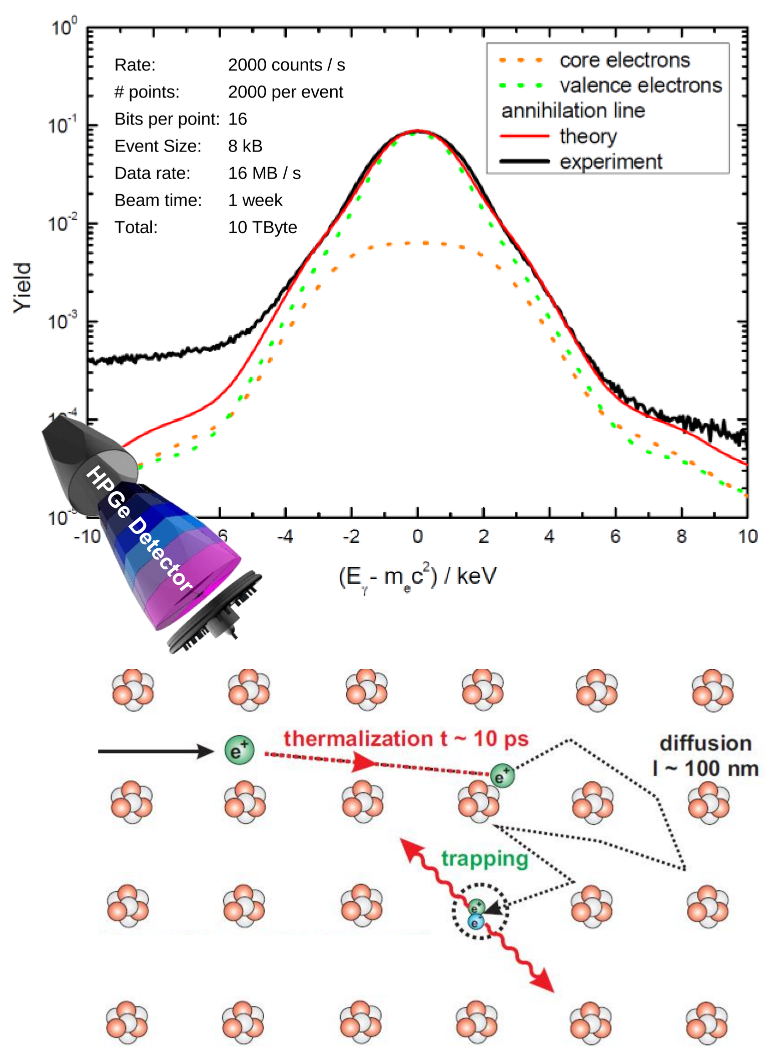


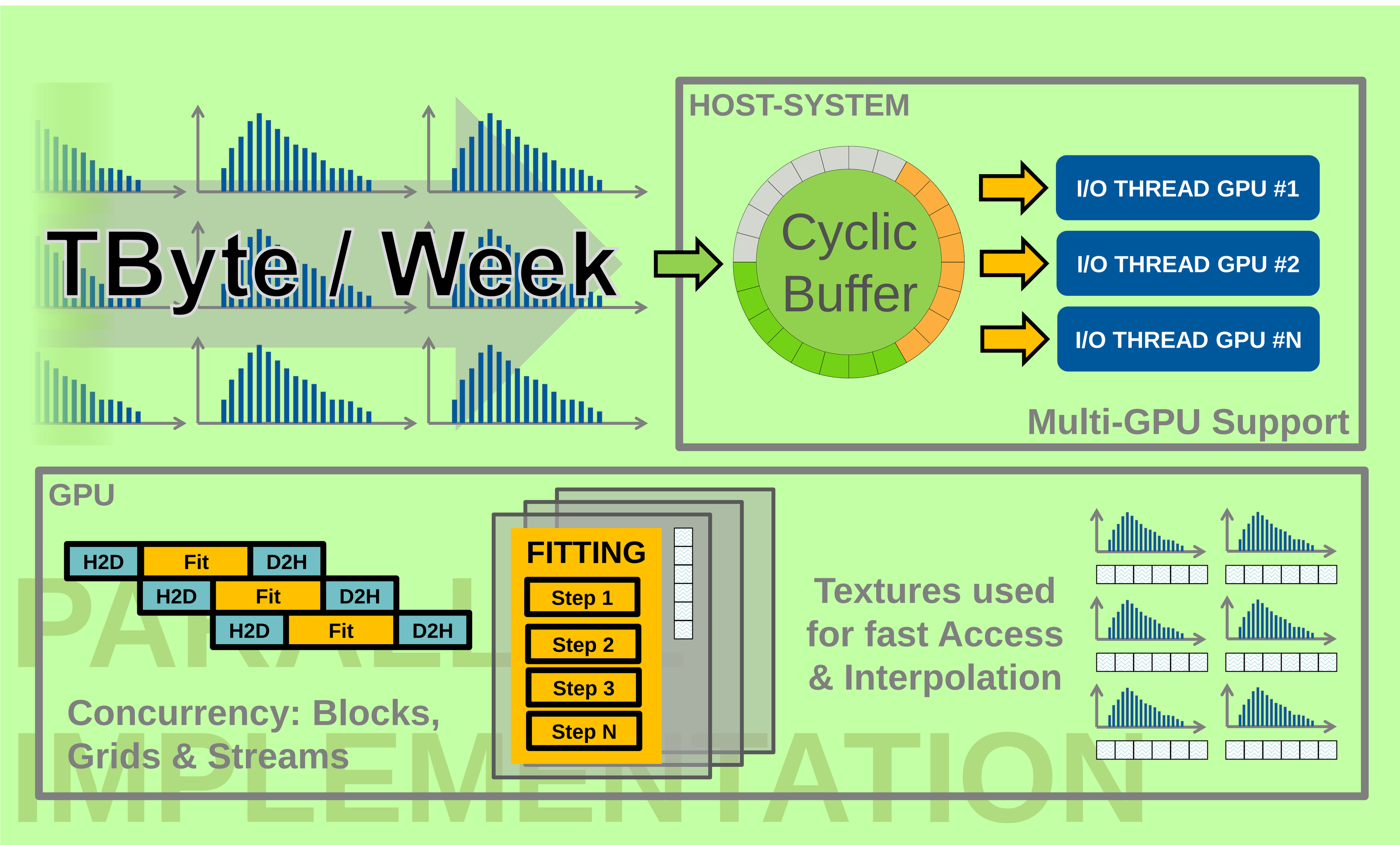


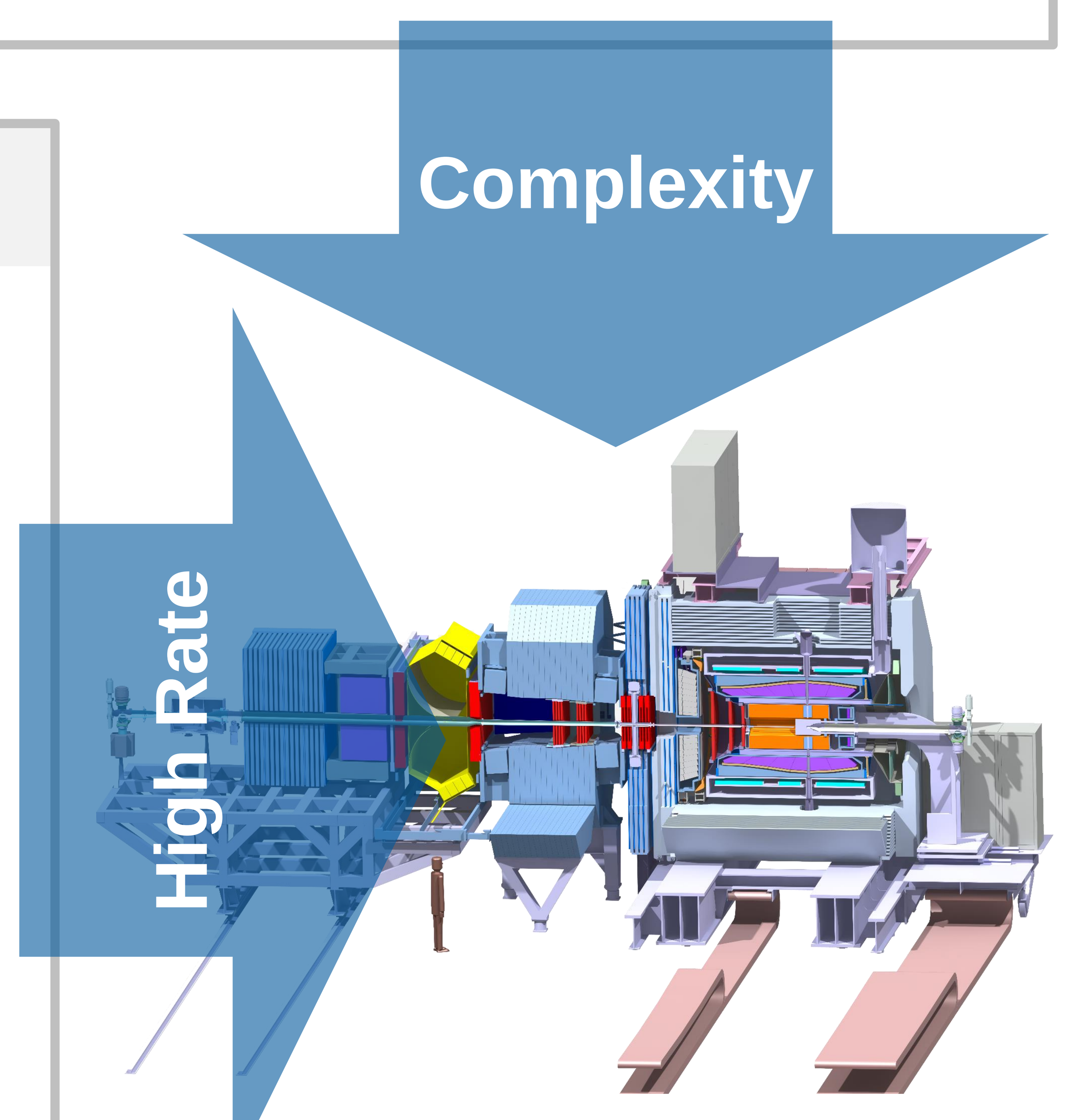
$$x_j^{(n+1)} = \frac{\hat{x}_j^{(n)}}{S_j} \sum_{i=1}^{N} \left(a_{ij} \frac{y_i}{\sum_{k=1}^{M} a_{ik} \hat{x}_k^{(n)}} \right)$$



Positron Annihilation Spectroscopy Event Analysis







Challenge

Scale to Demonstrator

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