

# Detector Activities at the European XFEL



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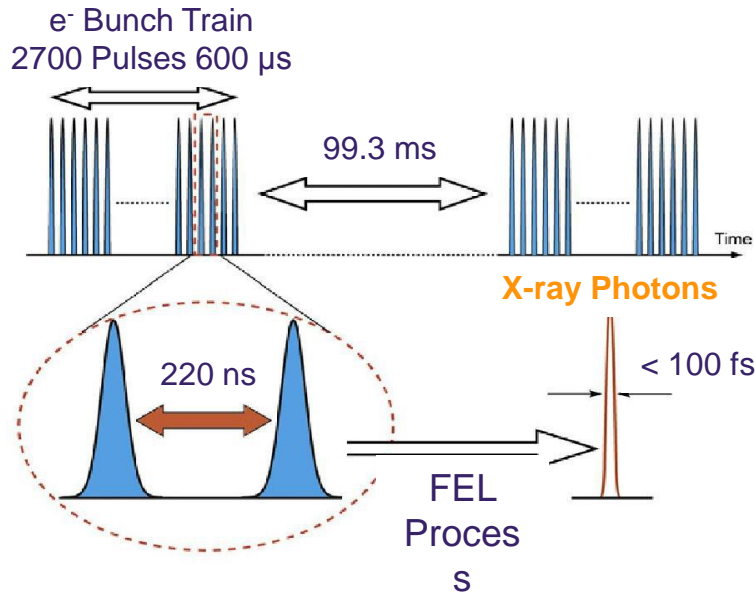
for the European XFEL Detector Group

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# Detector Requirements at the European XFEL

## XFEL e<sup>-</sup> Bunch and X-ray Pulse Structure



### ■ Data processing and storage

- ▶ Real time data processing and calibration at data rates beyond 13 GB/s
- ▶ Analysis and storage environment 100 PB and more

### ■ Energy range

- ▶ 0.25 keV to 25 keV in the future applications beyond 25 keV are envisaged

### ■ Angular resolution

- ▶ Angular resolution equivalent to 2 μm to 10 μm spatial resolution

### ■ Dynamic range

- ▶ 10<sup>5</sup> photons/pulse/pixel and more

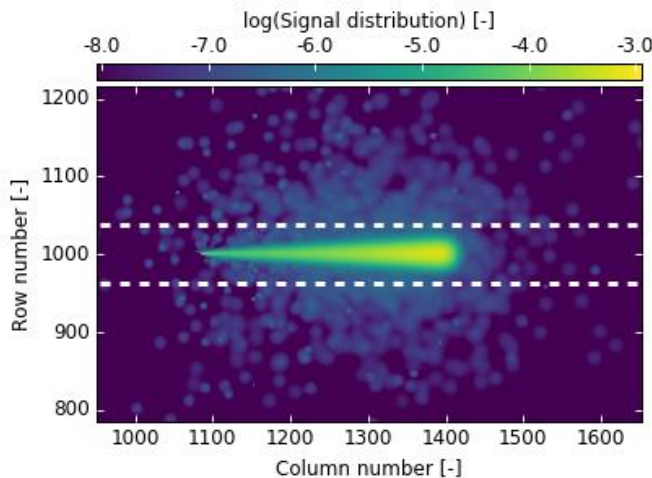
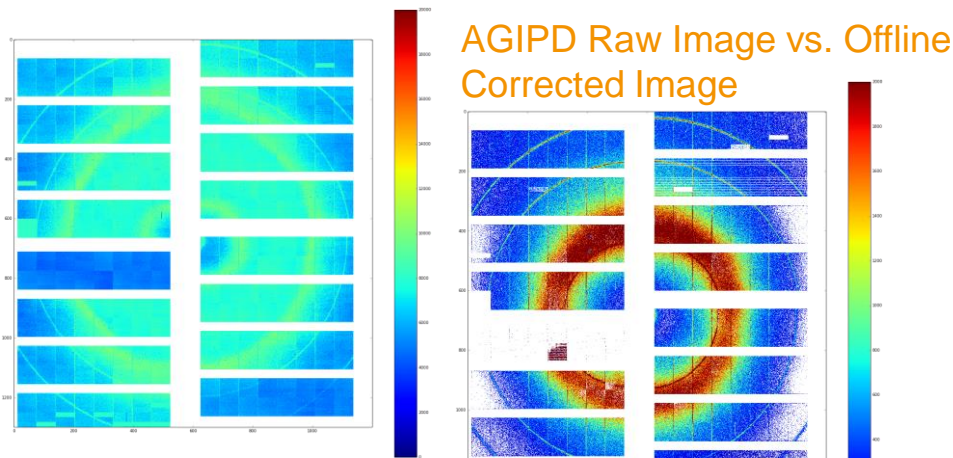
### ■ Flexible detector geometries, large angular coverage and maintainability

- ▶ Modular, segmented and curved detection planes

### ■ Experiment environment compatibility

- ▶ Ambient and UHV compatibility for applications at  $p \leq 10^{-10}$  mbar

# European XFEL Detector Activities



Signal distribution of mono-energetic 10 keV X-rays at 30° AOI.

## Data processing and calibration

- Standardized and transparent offline data processing, calibration and analysis software
- High throughput parallelized and GPU based data processing
- Rapid near real-time feedback to users ...

## Device performance simulation and optimization

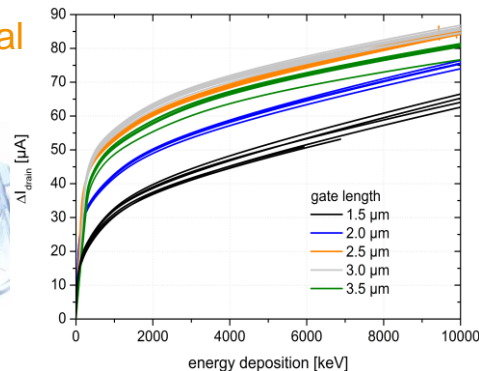
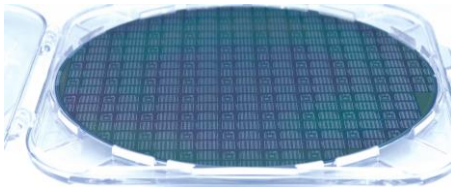
- Beam time preparation and feasibility
- Improve spatial resolution
- Data correction and calibration

## Infrastructure for detector testing and characterization

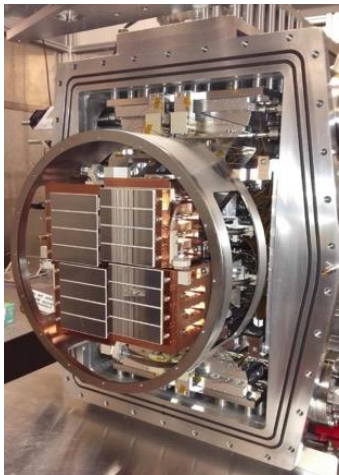
- Multi-energy pulsed and continuous X-ray sources
- DAQ and test infrastructure

# European XFEL Detector Activities

## DEPFET Wafer and Signal Response



## AGIPD, LPD and DSSC Detectors



- Low/high energy high speed imaging detectors
- Low noise and high dynamic range sensors
- High spatial resolution
- Modularization of large area detectors
  - Enable more flexible detection geometries
  - Maintenance and handling concepts for large area detectors
- Detector integration, commissioning, testing and maintenance
- UHV compatible detector front-ends and cooling concepts
  - e.g. UHV compatible in-vacuum PCB boards



