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Toward the Trigger-Less DAQ: EMS and STT joint readout

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for the PANDA collaboration

EMC Readout

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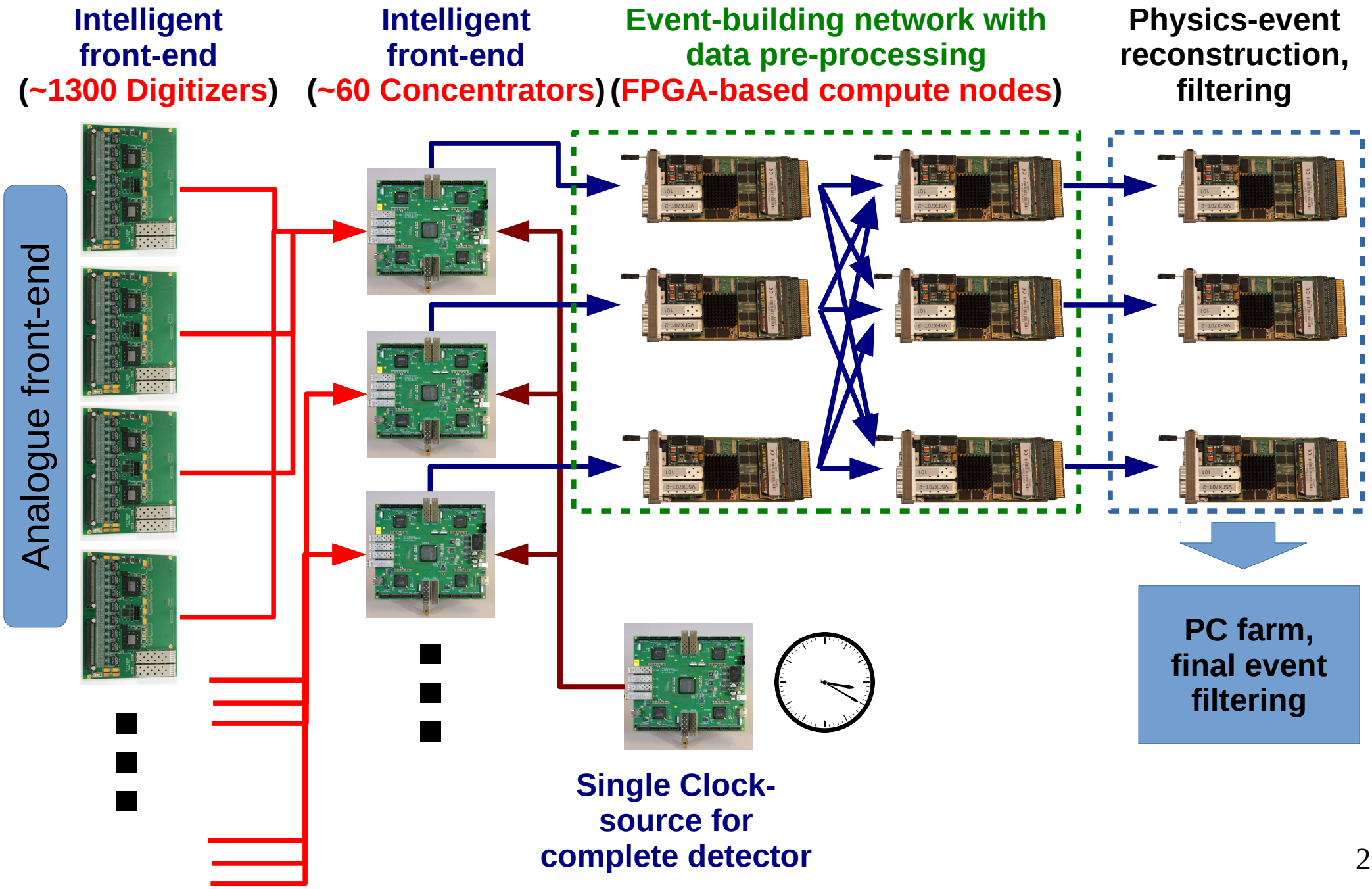

EMC Readout

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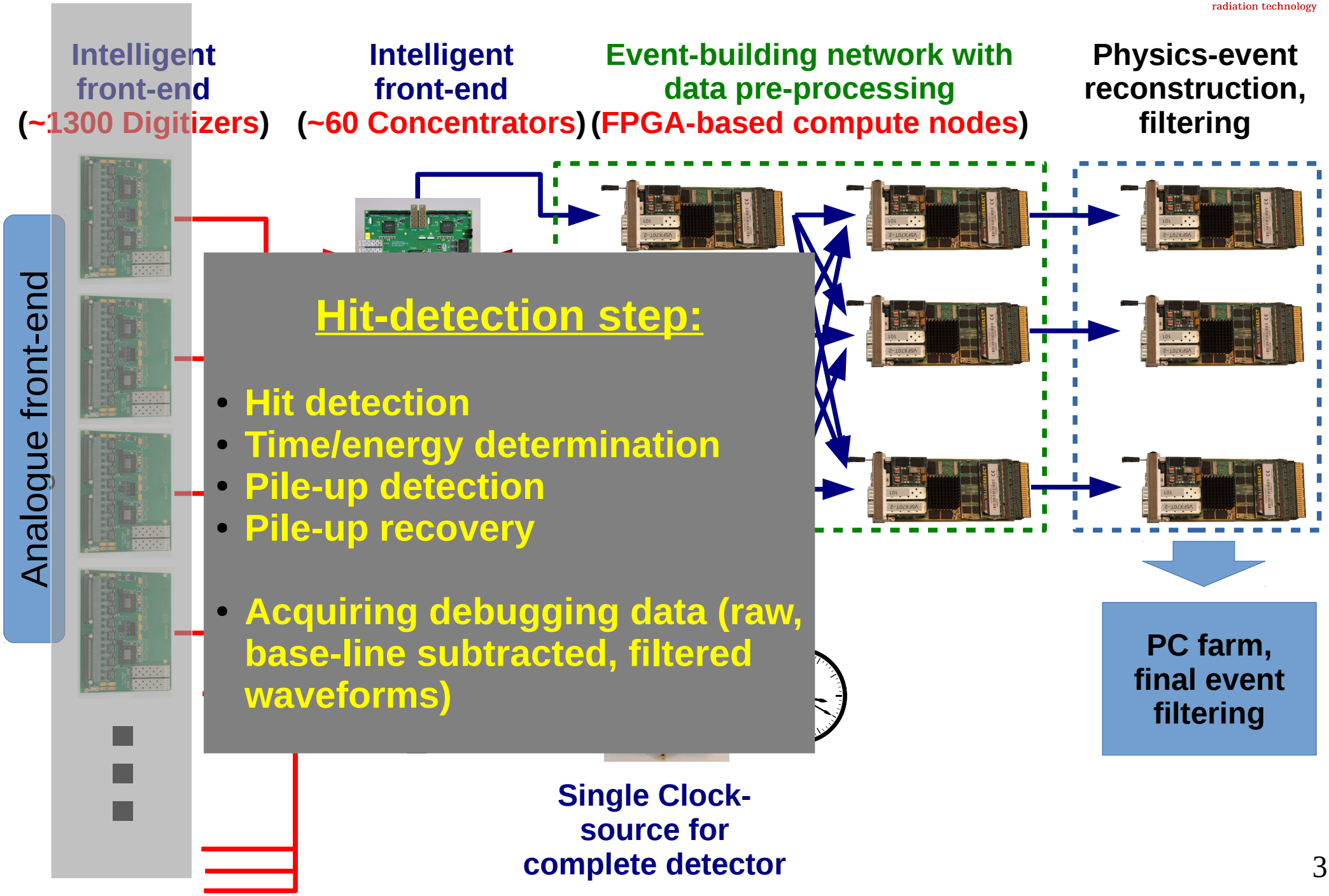

EMC Readout

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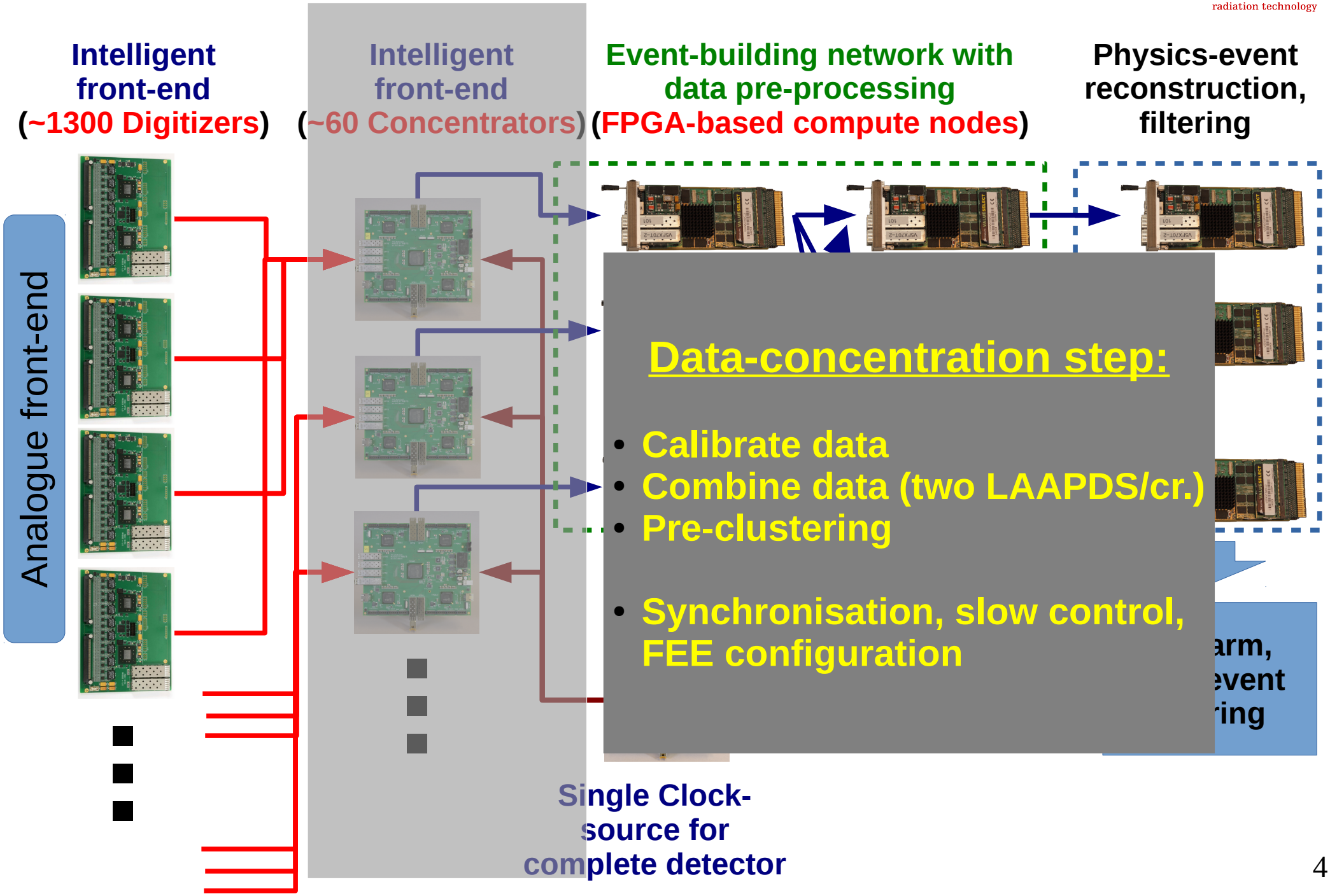

EMC Readout

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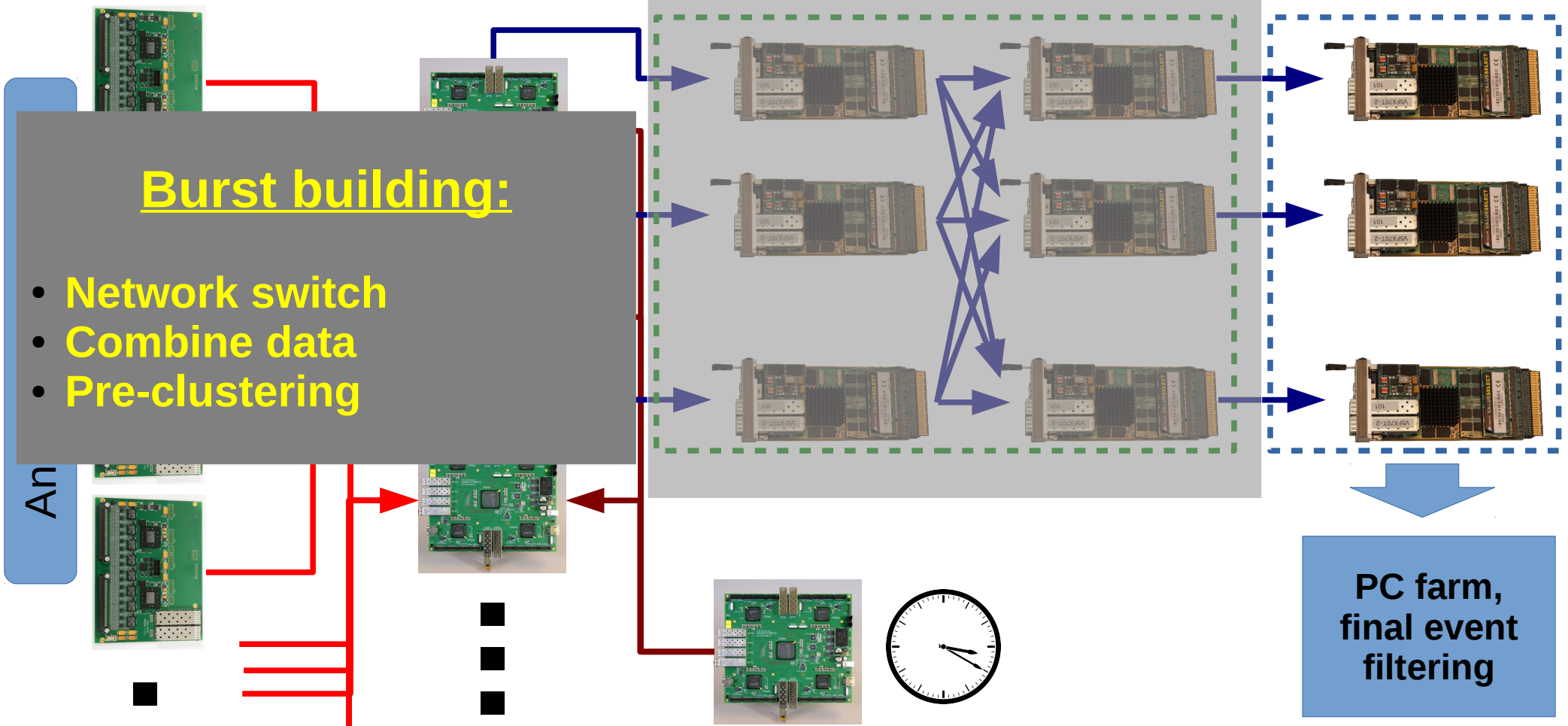
Intelligent front-end (~1300 Digitizers)

Intelligent front-end (~60 Concentrators)

Event-building network with data pre-processing (FPGA-based compute nodes)

Physics-event reconstruction, filtering



Burst building:

- Network switch
- Combine data
- Pre-clustering

PC farm, final event filtering

Single Clock-source for complete detector

EMC Readout

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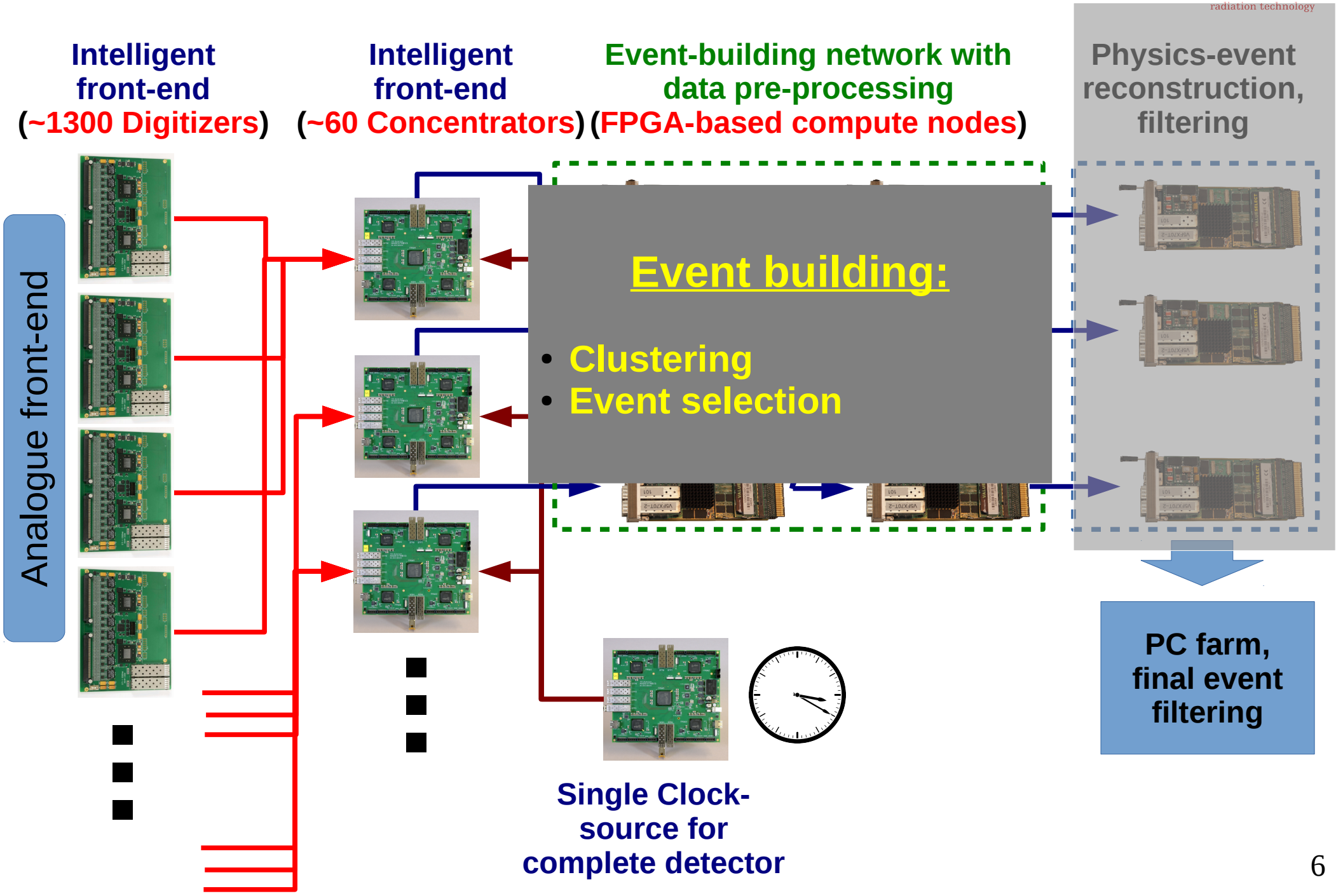

Readout Demonstrator

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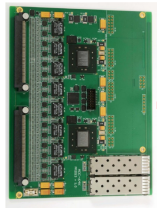
Intelligent front-end (2 Digitizers)

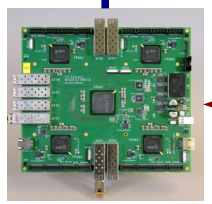
Intelligent front-end (1 Concentrator)

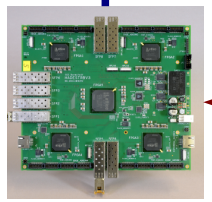
Event-building network with data pre-processing (FPGA-based compute nodes)

Physics-event reconstruction, filtering

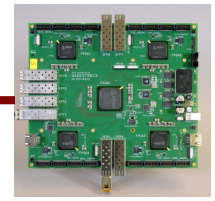
Analogue front-end



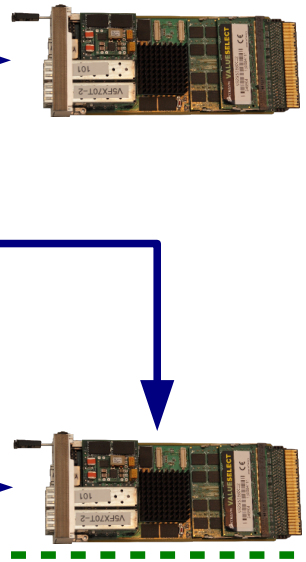


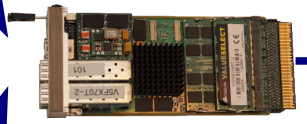


TRB-based STT readout



Single Clock-source for complete detector





PC, event filtering

The Setup

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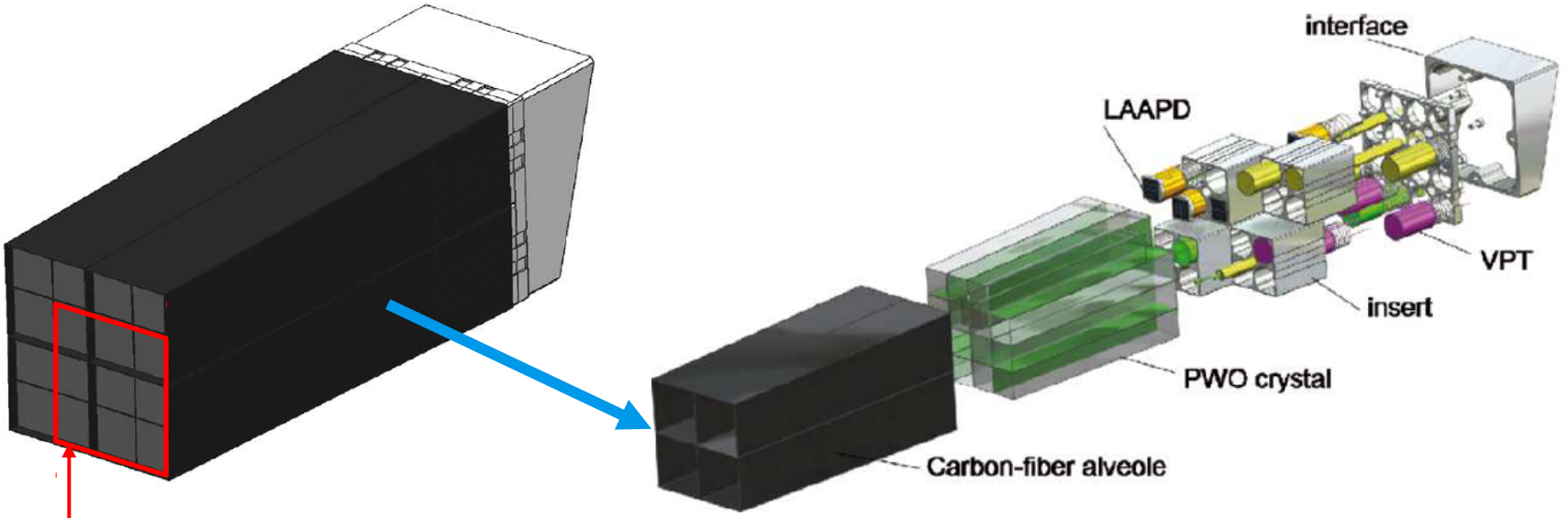

FW endcap subunit of
9 crystals + dummies

Each crystal read out by 2 LAAPDs

DAQ Demonstrator

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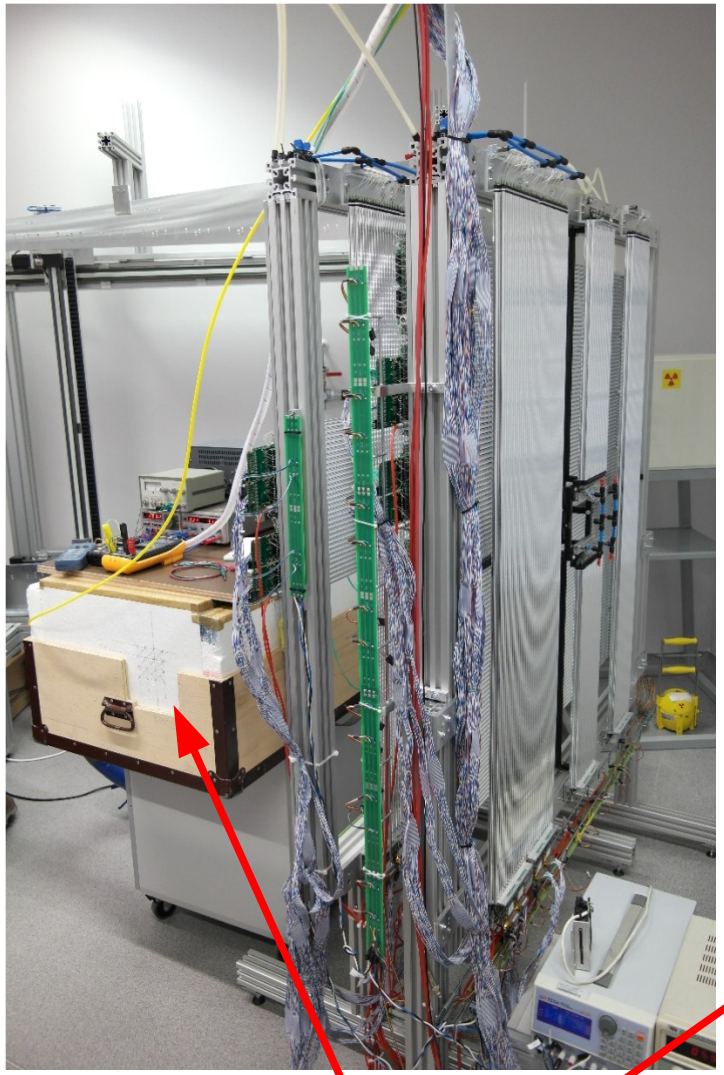

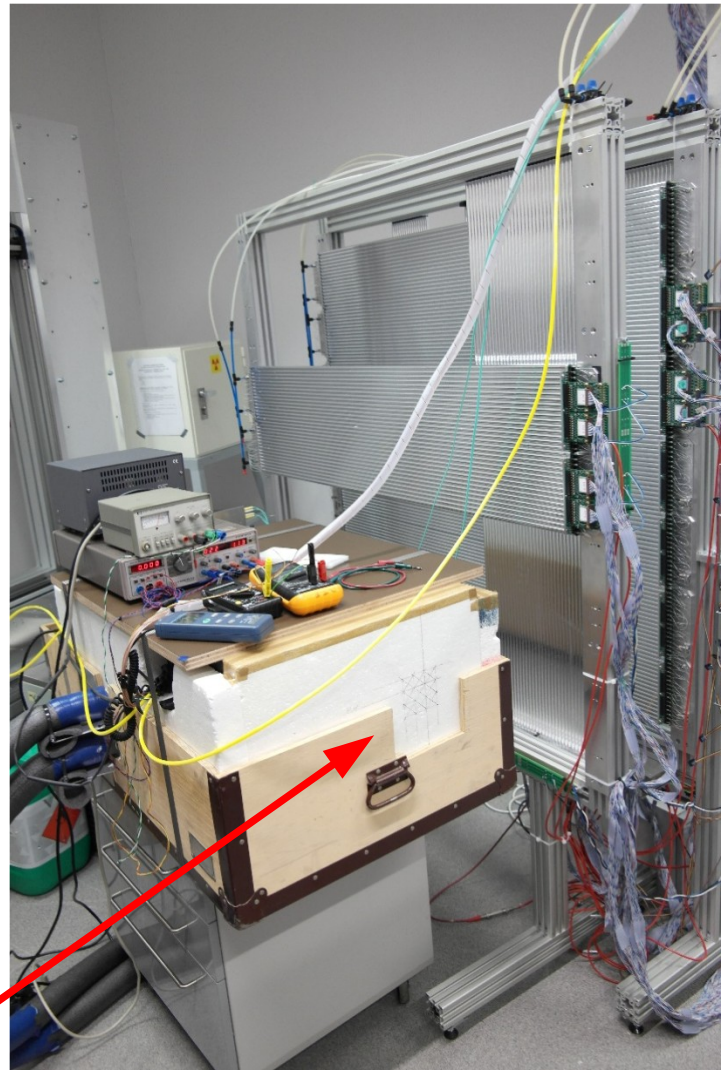

EMC

Looking for coincidences in EMC and STT:

- cosmics,
- light pulser.

Aim for the EMC readout

- Reliability test for:
  - Hit detection
  - Feature extraction
  - Calibration
  - Combining hits
  - Pre-clustering
  - Clustering
  - Buffer depth

EMC Data-Sample

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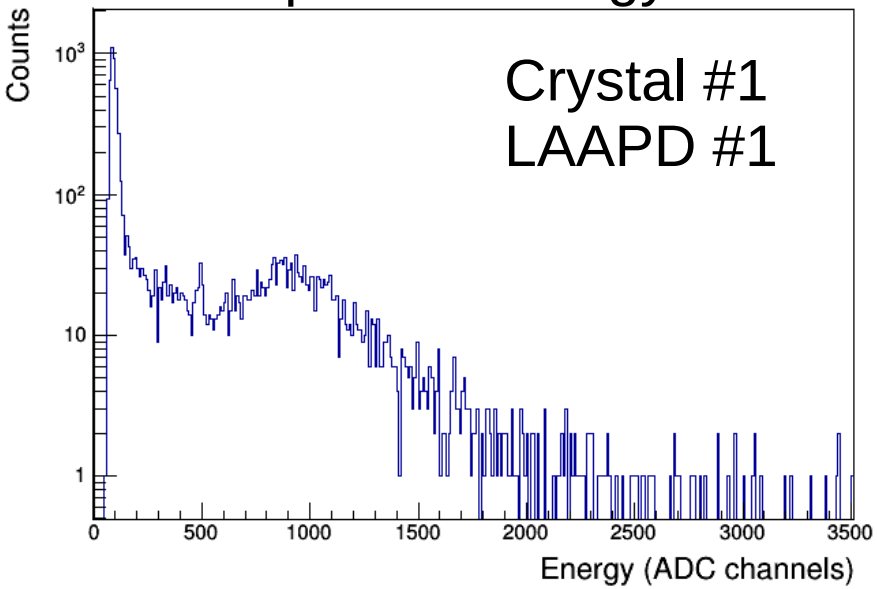
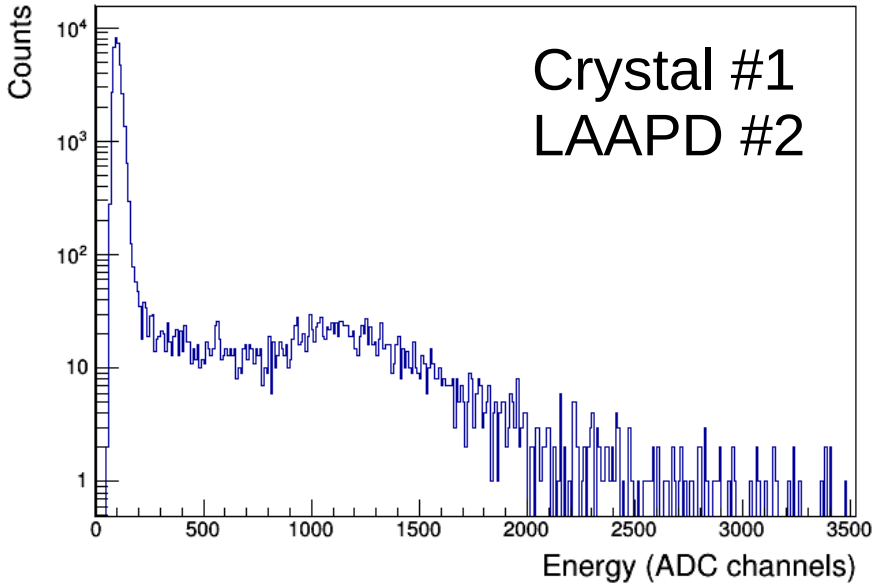
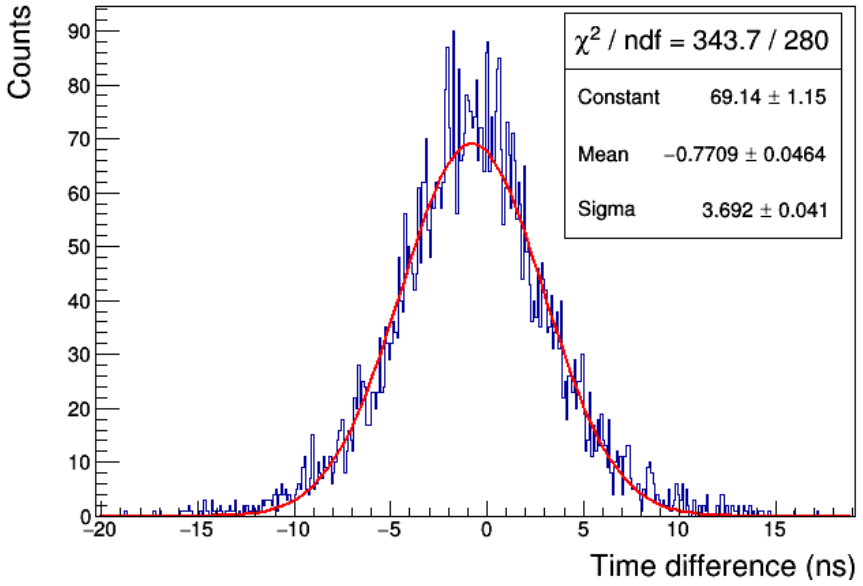
Deposited energy



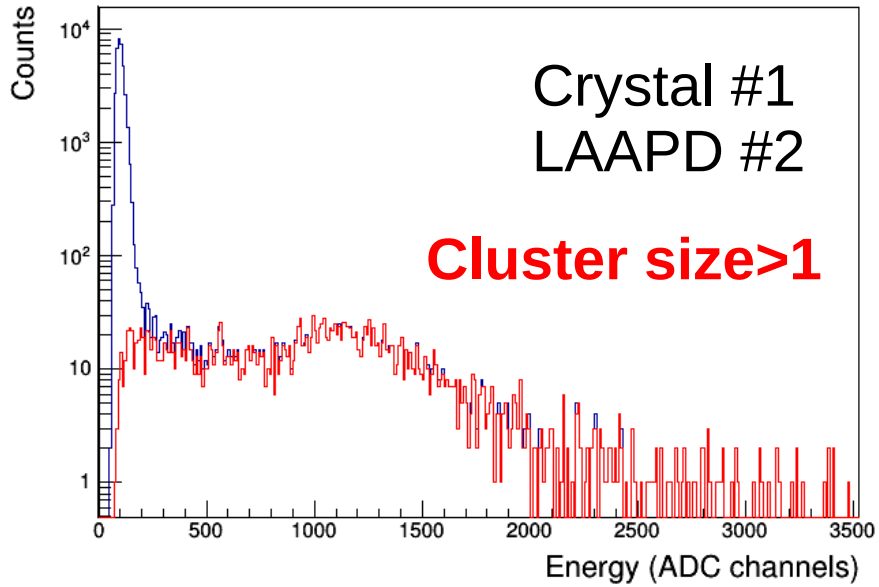
Deposited energy



Time difference between crystals



Deposited energy



Summary

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First multi-system readout is set up and perform up to expectations (in terms of synchronization). Buffer depth and throughput are being optimized.

EMC readout performs up to expectation. Looking for rare bugs,
e.g. wrong cluster size reported once per few GB of data.

To be done:

- **Extend complexity of the readout (more ADC and DC modules): requires more hardware.**
- **Optimize parameters for the feature extraction: requires “final” version of the EMC subunit.**
- **Decent slow control software**
- **Official PANDA readout interface (CN ↔ PC farm)**

Tests with proton beams are scheduled for September 2018.