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# DAQT-TDR Input, Subsystem Overview (EMC)

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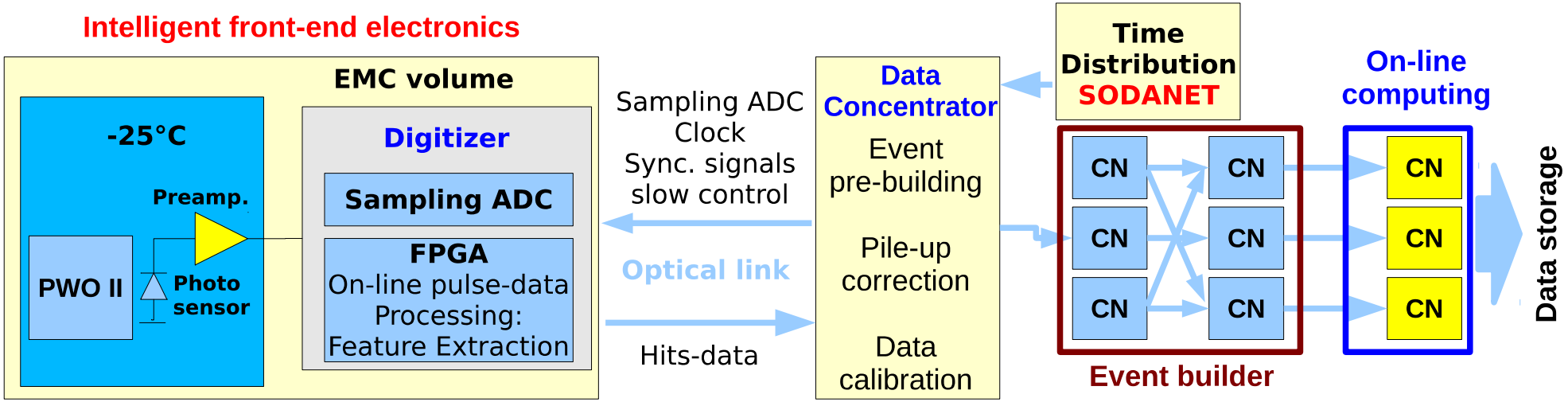
**for the PANDA collaboration**

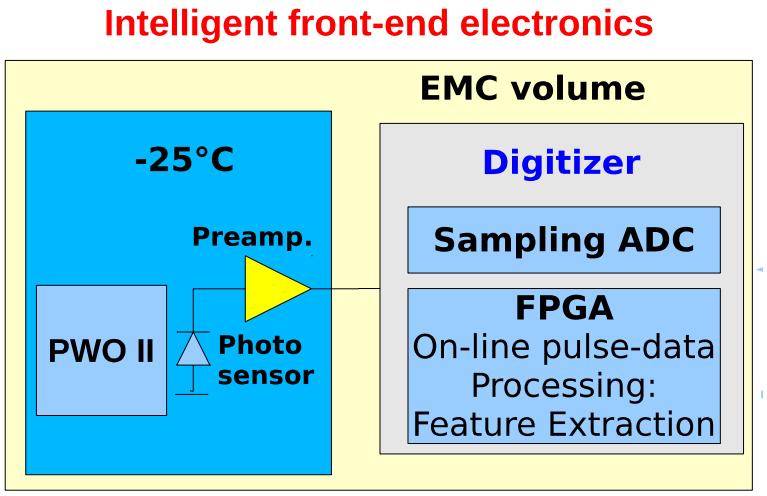
# EMC-Readout Scheme




## Components of the EMC readout:

- Intelligent front-end: **digitizer**
- Time-distribution system
- Data concentrators
- Burst-building network
- On-line computing

# EMC Front-End Electronics

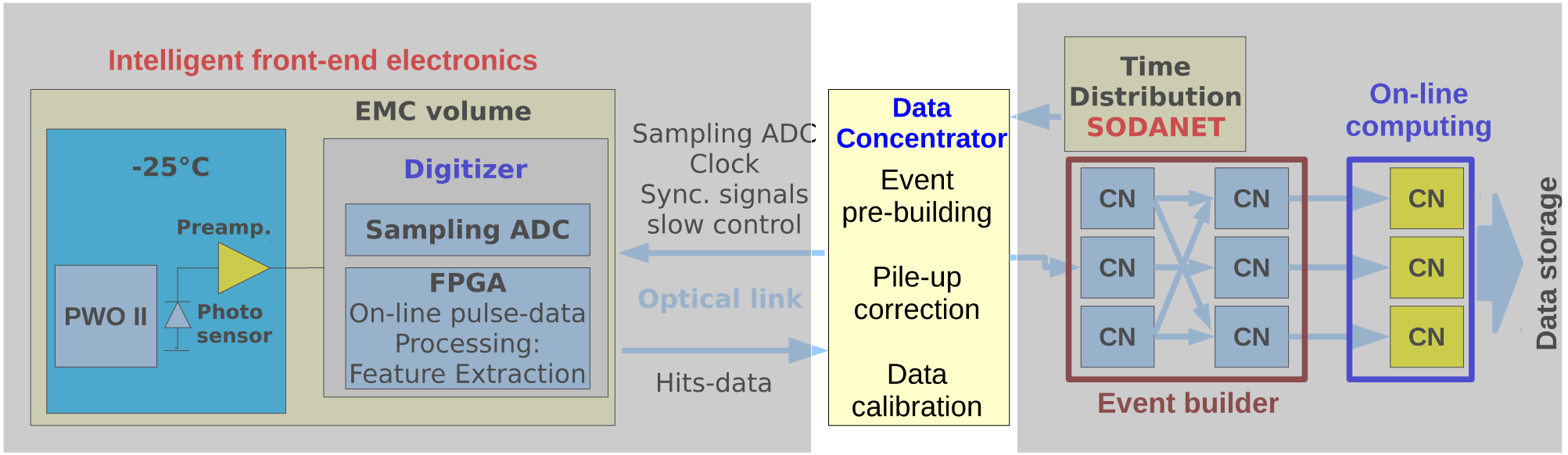



**Feature Extraction:**

- **MWD filtering** (programmable)
- Base-line follower
- Pulse detection
- Pile-up detection (output waveforms)
- Precise time
- Precise energy (amplitude, integral)
- Diagnostics: Possibility to readout raw ADC data (access to the noise-level measurement)
- **Controlled readout of waveforms (required for automatic determination of thresholds)**

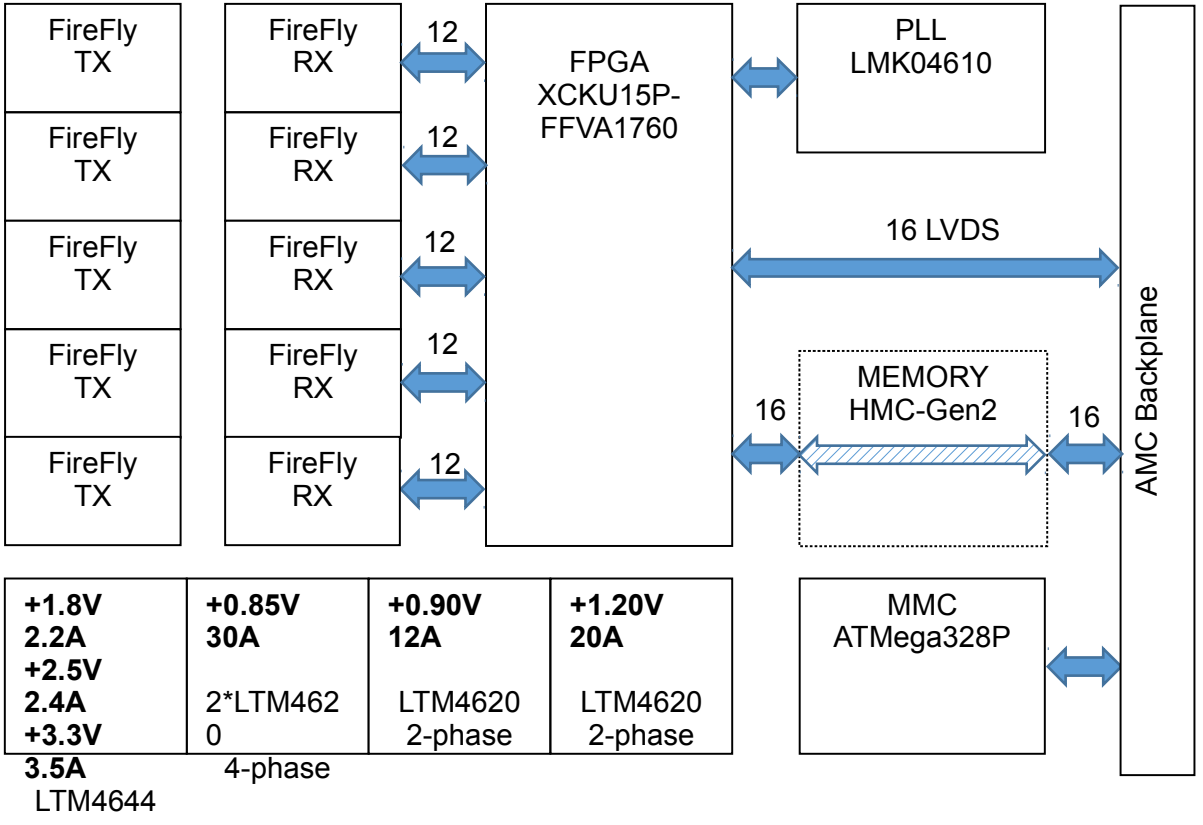
- Self-monitoring for configuration errors, fast recovery procedure

# Data Concentrator



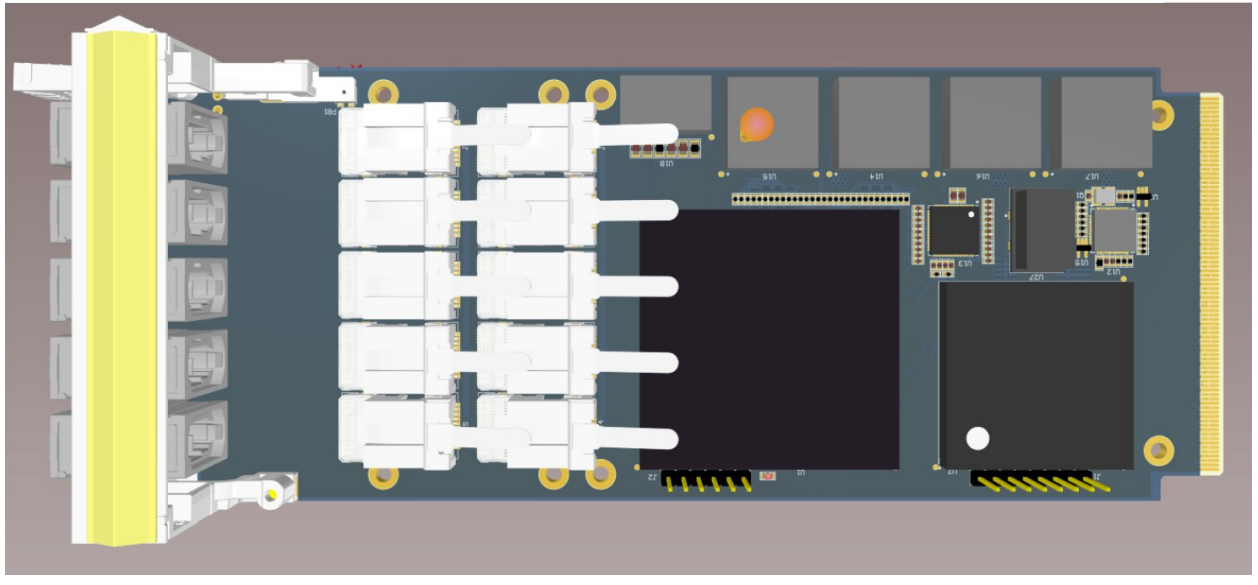

- **Data concentrator:**
  - Running on TRB3 and **Xilinx Kintex-7 development** boards
  - Receiving Waveforms and Hit-data over fiber from FEE
  - **Energy calibration for each ADC channel**
  - **Burst building**
  - Put each Waveform in one Panda data-packet (debugging mode)
  - Send Panda data-packets over fiber to CN UDP translator
  - **Slow Control with SODANET**
  - **Combine hits from two digitizers corresponding to the same crystal**
  - Additional features: on-line histogram, data monitoring (hits and waveforms), error detection and counting

# Data-Concentrator Unit




**Hardware specifications:**

- AMC board
- Kintex Ultrascale+ FPGA
- 60 optical links (12 Gbit/s)
- 16 high-speed serial links to backplane



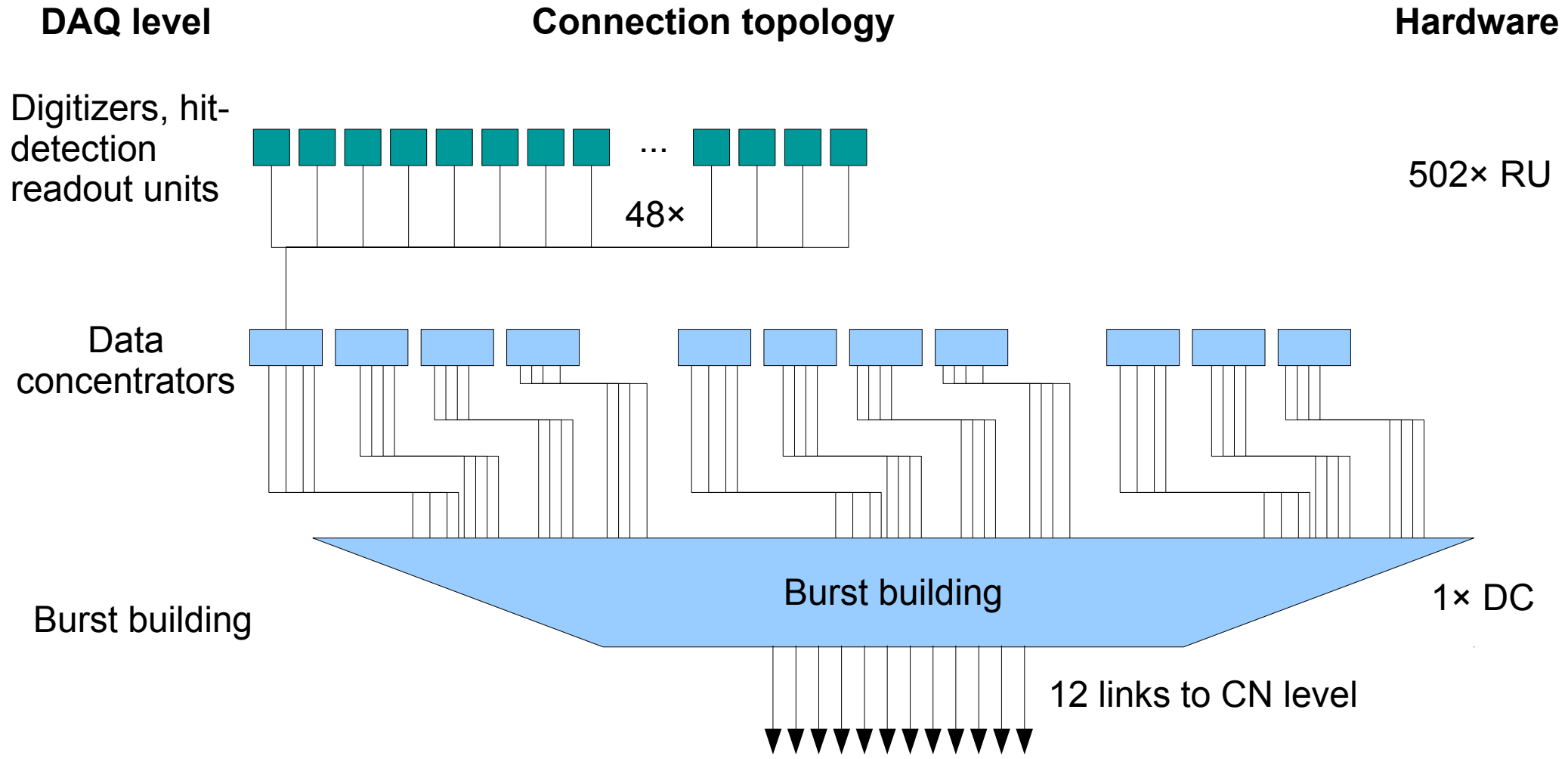
# EMC Data-Rates

**Summary of the EMC readout.**

| | photo sensors | # of RU | hit-rate/RU hits/sec. | max data rate/RU Gbps |
|---|---|---|---|---|
| Fw end-cap | 768 VPTTs | 24 | $1.6 \cdot 10^7$ | 1.9 |
| | 6176 LAAPDs | 193 | $3.2 \cdot 10^6$ | 0.4 |
| Barrel | $3040 \times 2$ LAAPDs | 117 | $5.2 \cdot 10^6$ | 0.62 |
| | $3840 \times 2$ LAAPDs | 73 | $5.3 \cdot 10^6$ | 0.63 |
| | $4480 \times 2$ LAAPDs | 85 | $1.1 \cdot 10^6$ | 0.13 |
| Bw end-cap | $524 \times 2$ LAAPDs | 10 | $1.1 \cdot 10^6$ | 0.13 |

About 502 Readout Units (RU) (ADC or readout modules for hit-detection ASIC) will readout the target EMC

# Readout Overview



# Summary

- **In order to complete DAQT TDR the readout topology for each subsystem should be known** (so far defined for: EMC, STT and Luminosity)

- **The DC hardware will be used as the SODANET source, hub and burst building network**