

# Front End Processing Working Group

- ❖ **Digitisation**
- ❖ **Pre-processing**
- ❖ **GTS**
- ❖ **PSA**

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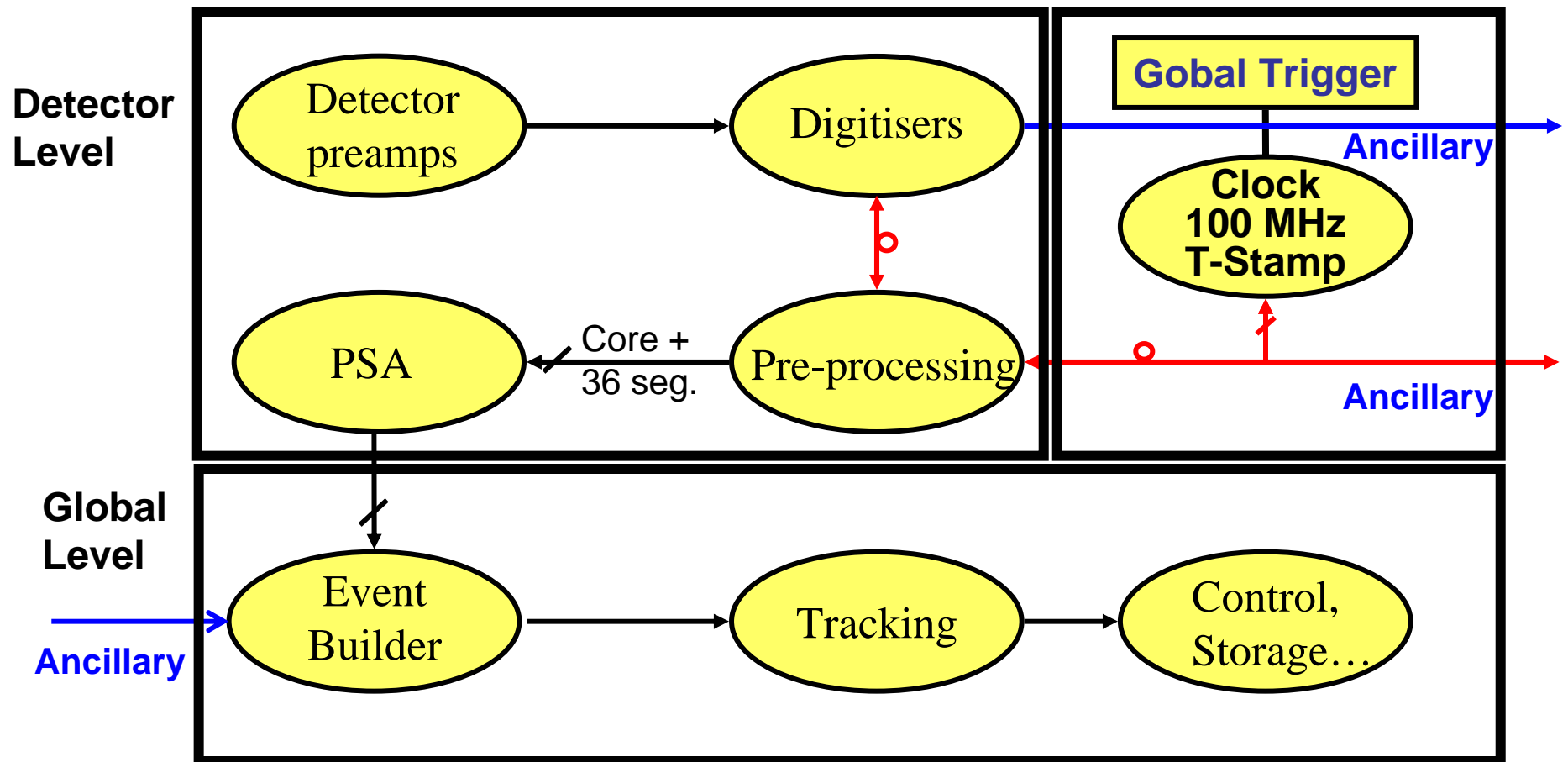
**R. Gernhäuser**

8<sup>th</sup> AGATA Week, Köln, March 30 - April 1, 2009

# AGATA EDAQ Specs

- 180 segmented germanium detectors
  - 6660 channels (6840 in fact, as the core is taken with two ranges)
- Up to 50 kHz singles rate
- Trigger rate
  - Up to 300 kevents/s at high multiplicity
  - Up to 3 Mevents/s at low multiplicity
- Real time operation of PSA and tracking
- Operation with other detectors

# Structure of EDAQ

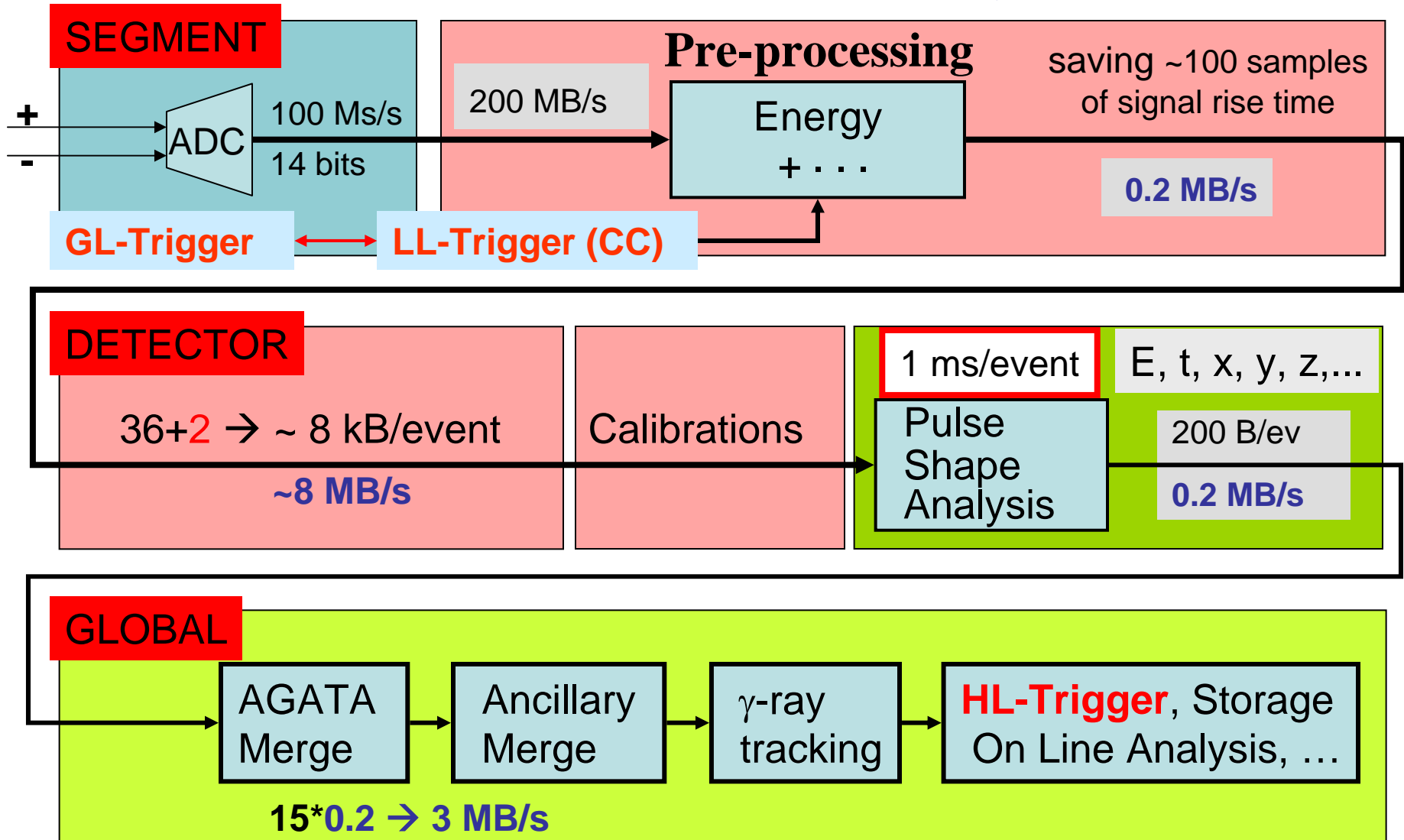


Ancillary detectors

- interface to GTS via mezzanine
- merge time-stamped data into event builder
- prompt local trigger available from digitisers

# Initial Data rates for Demonstrator

15 detectors, 10 kHz singles, GL-trigger, Ancillary → 1 kHz into PSA

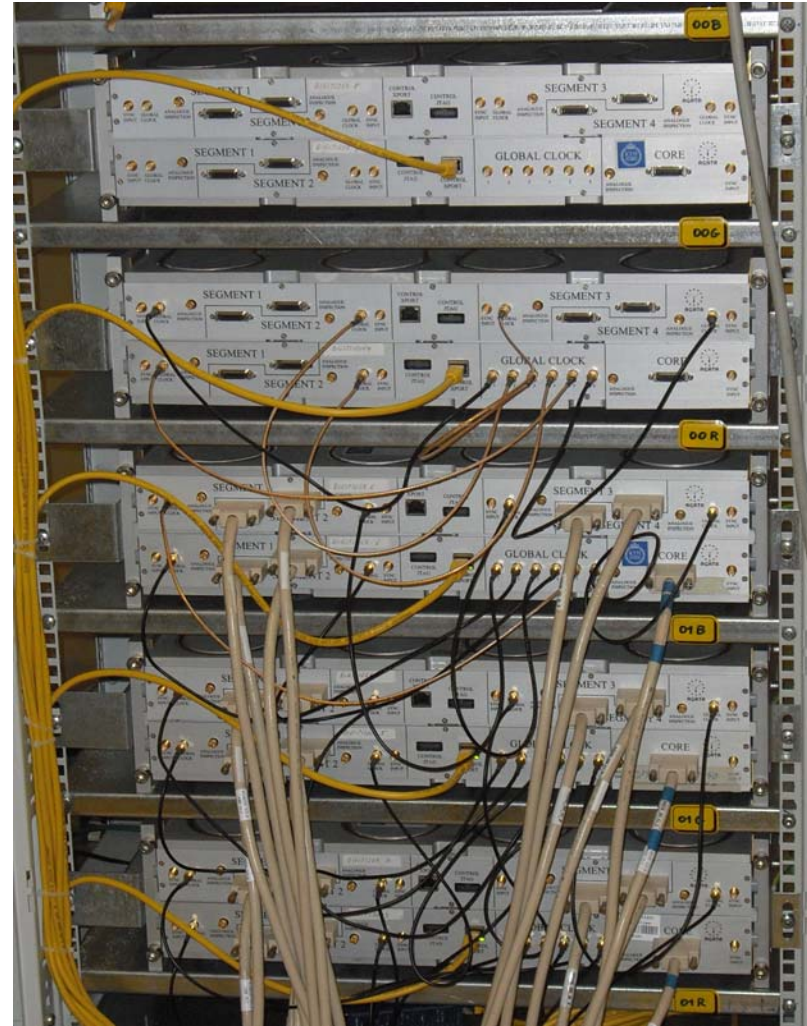
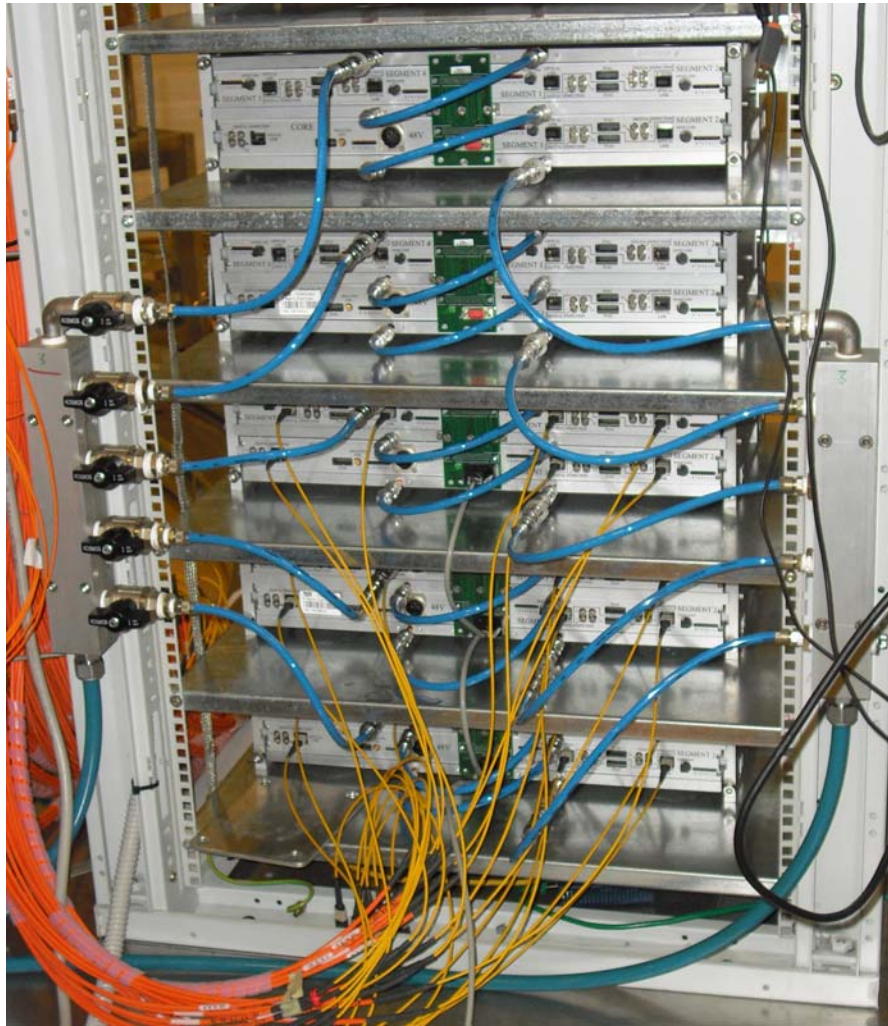


Initially, traces are written to disk for off-line validation

# Status

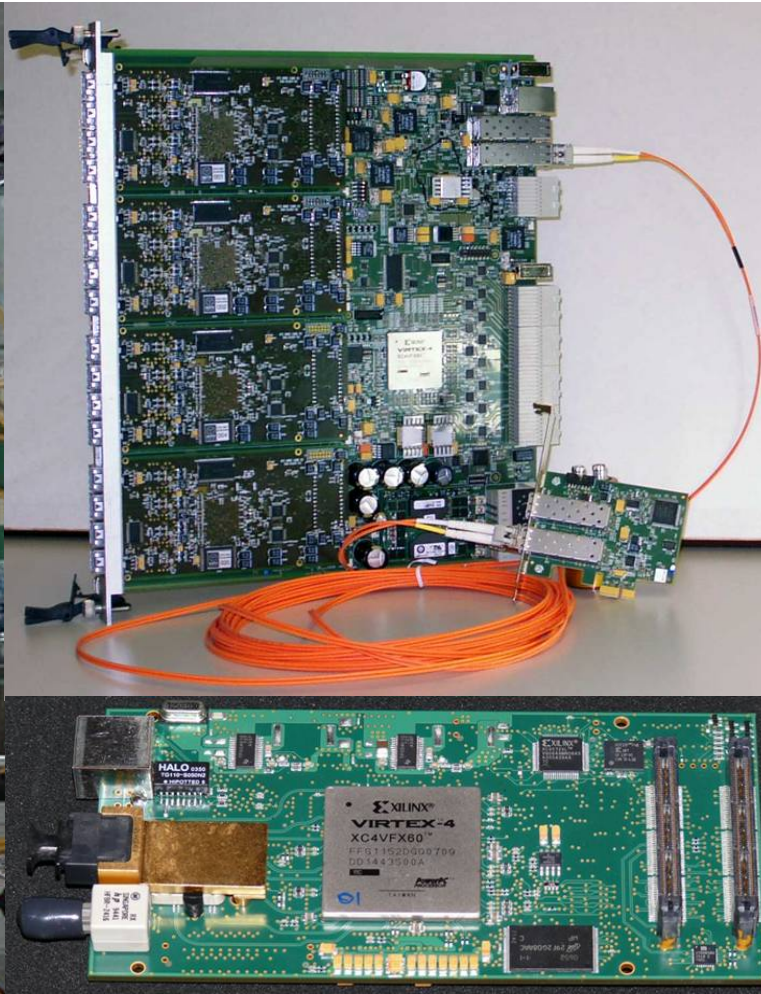
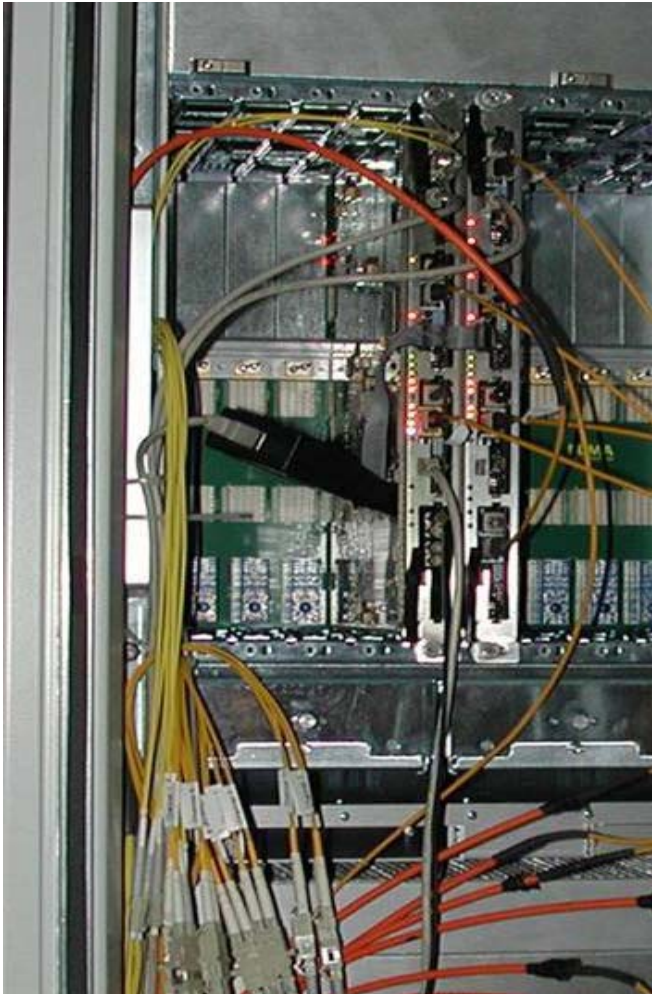
- At the last AGATA week we reported on the first operation of (a fraction of) one detector
- Now we can operate one triple cluster
  - 3 digitizers
  - 6 ATCA carriers
  - 21 processing mezzanines
  - 3 + 2 GTS mezzanines
  - Readout to DAQ via PCI Express

# Analogue electronics, located in the detector area



**Digitizers for 2 triple-clusters**

# Remote Digital Electronics



GTS mezzanine  
(clock and trigger)

Segment mezzanine  
(6 channels)

**ATCA carriers and processing mezzanines  
1 crate can instrument 2 full clusters (228 channels)**

# Status - hardware

- Digitizers
  - produced for 18 detectors;
  - 6 available on site; 3 of them in use since Q4-2008
- ATCA carrier board
  - 6 prototypes in use (+1)
  - 2 series production prototypes in test
  - 32 more units ready to be produced
- Segment mezzanines
  - 21 in use (18 for the segments; 3 for cores)
  - 20 prototypes delivered at the end of March
- Core mezzanines
  - development stopped; have to decide how to proceed
- GTS mezzanines
  - 5 in use
  - 2 final prototypes under test
  - 33 to be produced



# Status - firmware/software

- Digitizers
  - Mainly done
  - Implementation of ToT processing to be scheduled
- ATCA carrier board
  - Well advanced, including PCIe readout
- Processing mezzanines
  - Basic implementation done
  - Various developments needed to comply with specs
- GTS
  - First mini-tree in use; to be debugged
- Global trigger
  - Tests of timestamp-based implementation started last week

# General schedule for 2009

- Series production and tests of
  - ATCA carriers
  - Segment mezzanines
  - GTS mezzanines
- Development of the global trigger and connection to the ancillaries
- Start checking the timing performance
- Learn managing the complexity of the setup
- Continue improving firmware and software

# Todo's for firmware and software

- Remove know bugs
- Reduction of event dead time from 25  $\mu\text{s}$  to  $\sim 1 \mu\text{s}$
- Implementation of per-channel setup parameters
- Testing the exponential-average self-triggered blr
- Reduce number of readout samples from 160 to 80
- Verify if possible to use CFD keeping low thresholds
- Improve diagnostics
  - Counters of local triggers, validations, rejections, ...
- Readout of long traces
  - 100 ks if one channel;
  - 10-20 ks if 6 channels in parallel

# Program of the session

- Digitizers  
→ Patrick Coleman-Smith
- Pre-processing electronics  
→ Ian Lazarus
- GTS and global trigger  
→ Marco Bellato
- The processing mezzanine  
→ Nabil Karkour
- Controlling the carrier and the mezzanines  
→ Damiano Bortolato