JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN
JENNIFER
Belle II
Bundesministerium für Bildung und Forschung
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ONSEN / DAQ

Status for phase 2 and plans for phase 3

DAQ tests 2018

- **Achievements** while Thomas Geßler is at KEK atm.:
  - Without modules up to 30 kHz pulse/poisson (dead time: 29.5µs)
  - With modules (0.5% pattern) up to 12 kHz pulse/poisson (dead time: 70µs)
    - so far, no data recorded with PXD modules
- Combined tests with SVD, CDC, ECL, ARICH

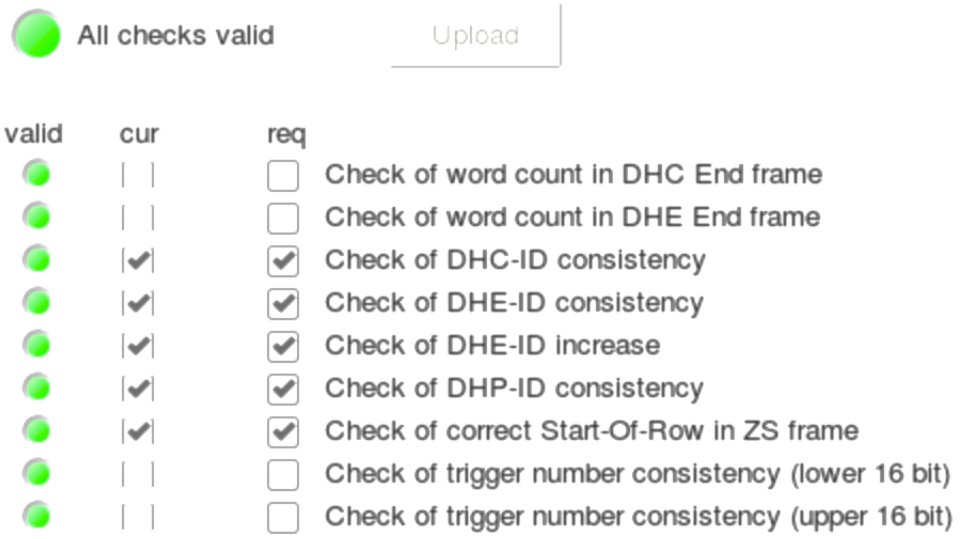
- HLT slow at beginning → full buffers → loss of triggers for whole Belle2

> **ryosuke.itoh** 9:59 AM
> I found that HLT output is almost real time. But the num. of event in the queue to event builder 2 becomes large at the beginning of the run. I'm not sure but the processing of evb2 or storage is the source of the delay. But anyway, you need to implement backpressure before ONSEN buffer becomes ready.

- DHC requires reset. Otherwise, trigger number is messed up
- New Phenomena: Trigger number is +1 in DHE frame

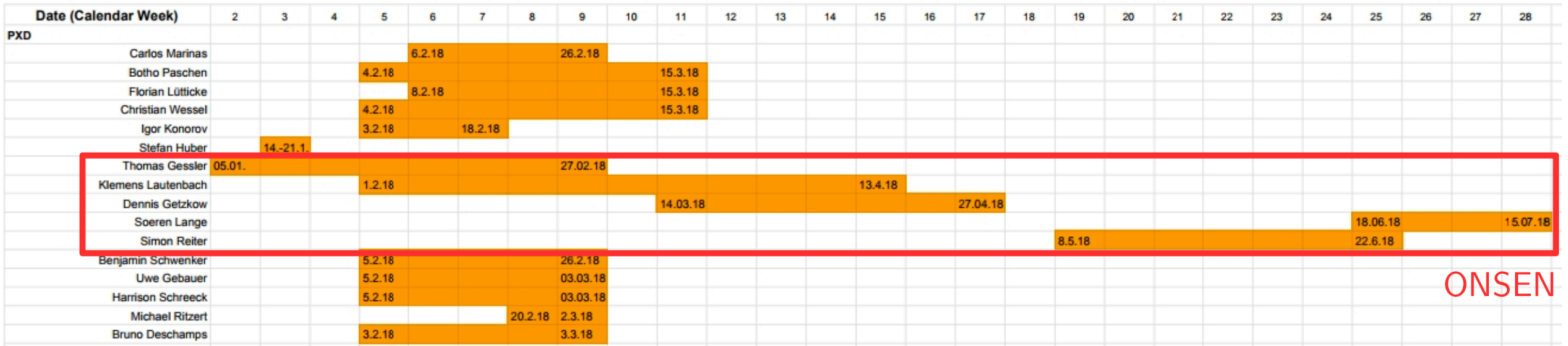
ONSEN improvements

- Selective error checks on all selector nodes
  - Trigger number consistency
  - DHE/DHP-ID consistency
  - Word count
  - Correct begin with Start-Of-Row
- Limit log messages to reduce load of PXD servers



DAQ phase 2

- PXD DAQ expert shift
  there will be at least 1 Giessen person at KEK for phase 2



- Priority tasks for February:
  1. achieve error free 30 kHz operation
  2. take data to check 2nd readout frame problem **before BPAC**
  (appears only w/ real data, so far only DHP test patterns recorded)
- long–term DAQ tests may not be possible anymore after start of cosmic run
  (no further DATCON test so far)

ONSEN plans pre-phase3

- ONSEN transition from half system to full system
- according to BPAC report, only available time slot for VXD cosmic test at KEK (B4) is ~4 weeks in September 2018, but attendance at KEK not planned yet
- 3 additional firmware features:
  - ROI distribution
  - Clear memory leaks
  - Cluster format? (needs to be decided by TB)

ROI distribution

- Currently under development by Dennis Getzkow
- Distribution of HLT data to different nodes

a	e	a	e	a	e	a	e
b	f	b	f	b	f	b	f
c	g	c	g	c	g	c	g
d	h	d	h	d	h	d	h

DHC-ID

- Required for load balancing
- Fully controllable by Slow Control (config-db)
  - EPICS integration will follow

Clear memory leaks

- Will be developed later this year by Dennis Getzkow
- Events with errors (corrupt data) are dismissed and stay in memory until next LOAD progress.
- Memory pointer are visible in log and help verifying the problematic event

- Phase 3: memory controller has to free these blocks in order to reuse them

Cluster Format

- not needed for "normal" operation
- only needed for cluster rescue (slow pions [?] large Bethe-Bloch)
- required firmware changes on **DHH**
  - remapping must be implemented on DHE (so far, still running on Onsen)
  - clustering algorithm
  - requires testing, needs to reach 30 kHz
  - Bethe-Bloch cluster rescue needs to be implemented on DHE (flagging a cluster, for bypassing ONSEN)
- required firmware changes on **ONSEN**
  - cluster buffering (keep all pixels of a cluster, although some pixels may be outside ROI) needs testing
  - new data format not completely defined yet problem with 10 bits re-mapped SOC address needs to be solved
- **software groups need to adopt to new data format! pedestal runs, alignment, …**

Cluster Format

- not needed for "normal" operation
- only needed for cluster rescue (slow pions [?] large Bethe-Bloch)
- required firmware changes on **DHH**
  - remapping must be implemented on DHE (so far, still running on Onsen)
  - **ONSEN point of view: we should not move to cluster-based format, unless stable, error free, 30 kHz operation has been achieved with pixel-based format**
  - (flagging a cluster, for bypassing ONSEN)
- required firmware changes on **ONSEN**
  - cluster buffering (keep all pixels of a cluster, although some pixels may be outside ROI) needs testing
  - new data format not completely defined yet
    problem with 10 bits re-mapped SOC address needs to be solved
- **software groups need to adopt to new data format!**
  pedestal runs, alignment, …

ATCA 10Gbps uplink

- Developed by Klemens Lautenbach as ALTERNATIVE
- Data transfer to EventBuilder2 bundled via ATCA backplane
- Instead of 32 optical link single 10G cable
- ATCA switch capable of >900MB throughput (constant rate) verified
  - How fluctuations are handled by switch requires more investigation

- EventBuilder 2 requires changes in software to receive data
  - already in contact with Yamagata-san

- This solution needs to be discussed on coming B2GM!