

# 3/30/2023 ePIC DAQ WG Agenda

1. Announcements & ongoing task status
2. Timing/RDO subgroup goals recap discussion
3. Scalers & DAQ Operation
4. Software Discussion recap
5. AOB

# Announcements & ongoing task status

1. Timing, and synchronization Dev Kits and FELIX board
  - Orders are out, thanks to Dave Abbot & Jo Schambach
  - Clock and timing modules to come in this week or next, 8 week timeline on the FPGA board delivery (Late May)
  - FELIX at BNL being tested and expected very soon, will follow up with Hao
  - Need well defined plans for where the boards go, and who does what work
    - Report next week from timing subgroup
2. WG reorganization
  - Still waiting for final details
  - Current plan has changed to 3 conveners to cover the full range of expertise in the electronics, readout and streaming concepts
  - Name: "Electronics, Readout and Data Acquisition WG"
3. DAQ software architecture organization (last weeks DAQ meeting)
  - Had been discussing informal WG organized scheme: (DAQ subgroup + Software subgroup/task force alternating local/joint meetings)
  - Will need DAQ local subgroup in any case, but current plan is "something else" with more formal status
4. Justin Frantz contacted conveners/CAMs regarding Electron Endcap EM cal regarding input for NSF proposal. We will be meeting with this group later today (2pm)
5. Cables and parameters:
  - We have failed to fill in DAQ portion of sheet so far:  
[https://docs.google.com/spreadsheets/d/1s8oXj36Sqlh7TJeHFH89gQ\\_ayU1\\_SVEpWQNkx6sETKs/edit#gid=0](https://docs.google.com/spreadsheets/d/1s8oXj36Sqlh7TJeHFH89gQ_ayU1_SVEpWQNkx6sETKs/edit#gid=0)
  - Uncertainty regarding three things holding us back:
    - Fiber architecture planning: (a) ~2500 fiber pairs (~50 x 1cm thick bundles of 48? Only some going inside detector), or else (b) 1/2 that + inside detector splitting, or else (c) (a + b) with splitting near detector, not inside
    - Power architecture planning: Power cables for 2500 RDOs, but unclear number of cables per detector because we don't know the extent of chaining of RDO power cables.
    - Potential overlap with detector specified requirements needs to be checked.

## RDO / Subgroup goals and questions

- Main goal: determine whether reconstructed clock is valid for all detectors (<5ps resolution). We assume that  $\sim < 100$ ps reconstructed clock is good out of the box for non-timing sensitive detectors, but verifying this comes free.
- Second goal: define timing protocol
- Related but not explicit goal of the subgroup: What is the procedure to synchronize systems and what phase controls do we need? Can we write down exactly what we mean by synchronization, and how do we monitor the synchronization?

It is important:

- $\sim 1$ ns synchronization:
  - critical to make sure we correctly identify bunch crossings & monitor this identification
  - Requires  $\sim 1$ ns synchronization to apply time window cuts (dRICH!)
  - May require good synchronization early on to evaluate backgrounds
- $\sim 5$ ps synchronization
  - Any early processing (cluster-finding, etc...) requires  $\sim 5$ ps synchronization at the hardware level at least for “nearby” channels for fast detectors (not enough to have good jitter)
  - will require synchronization at the software level to do appropriate monitoring
  - At this level, the geometry of the detector will matter – how do we define synchronized?

# Scalers / DAQ operation

No hardware trigger → all DAQ / (event selection/tagging) tasks are handled in software

Tasks we need to think about:

- When can we turn on our detectors? Do we know which detectors are insensitive to beam and/or cheap and easy to fix? Do we need hardware scalers, and if so what kind of system are we talking about? **It's not in the baseline!**
- Does a run based / run control work or do we need an “always taking data” scheme where starting and stopping is at the component level?
  - If at the component level how do we control detector modes:
    - Configuration
    - Beam development / Vernier Scans
    - Pedestals
    - Voltage Scans
    - Timing Scans
    - Detectors with HV off due to backgrounds
    - Detectors out of run due to debugging

Comments / Discussion?

# Software Discussion

Last week, Markus proposed unification of the DAQ / offline software into a single WG.

His main goal is to push the analysis of data closer to the taking of data, which involves early planning and automated systems for:

- Calibration (my word: “online calibration”): ie. Setting HV, gain tables, slewing corrections, thresholds, clustering
  - Calibration (my word: “offline calibration”): ie. Alignment, beam effects, saturations, space charge, acceptance, field distortions etc..
  - Reconstruction in quasi-real time (minutes rather than months)
  
  - Need a lot of prior planning, preparation, coding, and DAQ support
- I agree with these goals, though I think they are very difficult. Note that even partially successful activities will offer many benefits, so these should be pursued!
- I think of the strategy for the needed support in terms of “hooks”, whereas Markus thinks in terms of “integration”

He does understand the separation of many core DAQ tasks

- Transfer, aggregation, organization, monitoring, and tracking of data
- Parallel streams of different types of data
- There are some language differences that we should be careful about (“Raw data” to me is the ASIC/ADC data coming from front ends. “Raw data” to software group is the output of DAQ)
- The time-frame vs trigger-frame issue is I think resolved. (time-frame has no implication of triggering, it has only the implication of packetization and organization of data, and grouping in times of ~millisecond do not impact the goals listed above)

Still need to create an overlapping group discussing the software interfaces to DAQ. The extent to which we can provide the “software stack” for analysis-like plug-ins to the DAQ is an issue.

Comments / Discussion?

AOB?