GEM Online, Operations, and Commissioning Summary

Where we currently stand

- In terms of personpower, resources, and software, we are supporting 3 semi-competeing modes of operation

  - "stable" production testing – QC7/8, ULB, initial P5 commissioning
  - "stable" upgrade testing – GE2/1 teststand
  - "final system" development – 904 coffin teststand

- "stable" software was "nominally" "frozen" in May of this year to allow development to focus on the long-term P5 operation system for the complete GEM project, while still allowing QC8 to operate at the necessary throughput

- This is not a problem per se, just a challenge, but has at times (often) resulted in short-term prorities shifting focus and resources away from long-term objectives

QC7

☐ Added dedicated PC for QC7 (should swap resources, as this PC is much more powerful and should possibly be driving the data-taking)

☐ Currently using (inefficiently) three (2+1) CTP7s

  ☐ Inefficient because of I/O needs vs resource utilization

  ☐ Implemented in this way because resoureces never allowed for the GLIB to fully realize its potential and the ever-present short-term pressure

  ▪ Now Laurent (ULB) has laid the groundwork for a straightforward
  ▪ FIT are now helping pick up the task due to needs for their teststand
  ▪ Once minus endcap push is over, will have a break to update software and will be the right time to understand if replacing the CTP7s with GLIBs will sustain the remainder of the GE1/1 QC program

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- Able to reach a rate of 3 chambers per day in the case of no issues

  - issues related to poor connectivity
  - issues that can be solved by replacing components
  - completely rejected components are low

QC8

- Currently operating three full columns (since August)
- Rate of chambers that have to retest QC7 is low
- Low rate of problems with VTRx needing replacement
- Had an instance of overextension of disk resources
  - Attached "scratch" USB disk to data-taking PC to alleviate the issue in the short term
  - Migrated old data to EOS to free up space
  - Purchased new disks (took 2 weeks to arrive, now won't install until after minus endcap push is over)
- Have had several issue which have required in-depth investigations (some are outstanding)
- Currently, finally (barely) keeping up with the installation needs

GE1/1

- Coffin setup currently being used for

  - GE1/1 integration testing
  - GE1/1 development
  - GE1/1–CSC trigger testing (still no superchamber)

- Activities are scheduled to not overlap
- Utilization seems to be effectively used
- Reminder: this setup is our long-term GE1/1 debugging station, and will transition into this role as the GE1/1 commissioning transitions to regular CMS operations

GE2/1

- One PC currently being monopolized for GE2/1 operations (only occasionally results in conflict, which is quickly resolved)

  - Eventually (soon?) the monopoly will be broken up as the SW will be completely GE1/1 vs. GE2/1 agnostic

- GE2/1 activitise are using the resources effectively and making excellent progress on the project
- Eventually, this teststand will **also** be the long-term GE2/1 debugging station, with all that entails

Note

Dedicated talk tomorrow afternoon, tune in for details

DCS

☐ The first version of the local DCS for the full GE1/1 system was deployed at P5 on the 31th of July

☐ Connection can be tested only after panel is installed in the coming weeks (foreseen for Oct 14th)

☐ Must be able to quickly get to the point where unattended operation is allowed by CMS TC

☐ Preparations to define/validate action matrix

DAQ

☐ Three phase program planned

☐ Phase I: local connectivity testing, currently entering this phase

☐ Phase II: Expect full minus endcap operations to begin in full at the end of November (start of phase II)

☐ Phase III: Expect full system integration to start in spring 2020 (for minus endcap, summer 2020 for plus endcap)

☐ During Phases II and III we will need better estimates of the amount of muons (cosmic or pp) we will need to reach various commissioning milestones, and we should have some idea of the needs for 2020 this week (need to followup with the DPG)

S-curves

☐ At the end of August, a temporary chiller and bench-top LV were provided, and the team was able to do some initial testing on the July SCs

☐ Connectivity testing succeeded immediately, however problems were encountered while performing s-curve and s-bit rate scans to characterize the noise

☐ It was necessary to derive a new set of DAC calibrations for all the VFATs and s-curves were able to be taken (untrimmed)

☐ Cost was two long afternoons, and late evenings (thanks to all!!)
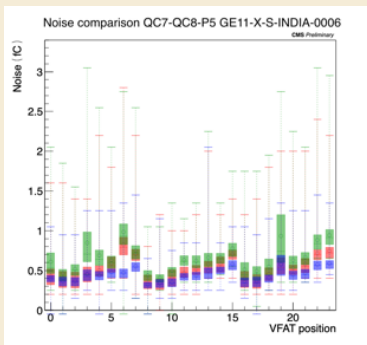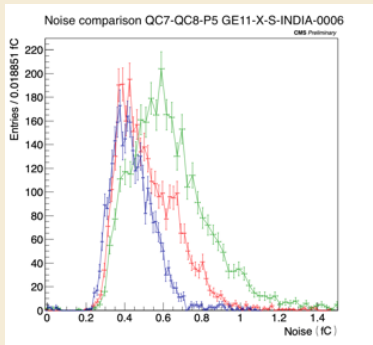
"Legacy" developments

- ☐ Support of QC7/QC8 bug reports (fortunately, now these are much more rare)
- ☐ Adapted VFAT trimming procedure, will be deployed soon
- ☐ Increase statistics in QC tools to understand better the tails, also to be deployed soon, improves resolution of the s-bit rate scan

Progress to final P5 system

- ☐ Major restructuring of the architecture undertaken by ULB superteam (Laurent+Louis) (mostly done)
- ☐ xdaqification of the calibration tools being undertaken by Camilla (ongoing)
- ☐ Adapting of current code base, in daily use at QC7/8, to the new architecture (starting)
- ☐ Update to xdaq15 and cc8 (passively ongoing, plan for early 2020 to complete)

Architecture redesign

☐ Done to facilitate long-term maintainability of codebase as well as expected compatibility with future upgrade infrastructure

☐ Details to be presented in Camilla's talk tomorrow afternoon

Developments

☐ Completely reworked the panels (massive effort, reward present)

☐ Need to connect the DCS with the DAQ to have monitoring of LV and electronics values (mostly work on the DAQ side, but datapoints will be needed in the DCS DBs and possible visualizations/alarms in the DCS itself)

Problem

- ☐ Initially planned to have a DB workshop in April of 2019 to hash out a few remaining items

Goals

- ☐ Give DB people more hands-on knowledge of the detector and online system (still needed)
- ☐ Define tables for QC and parts (mostly done)
- ☐ Define and begin implementation of dashboards and views in OMS (still needed)
- ☐ Define and implement the online configuration DB (slowly converging)

- ☐ Continually delayed, still has not happened, earliest it can happen now is next year, and now what we would have liked to accomplish, although not done, will not be worth the workshop

Summary

- QC7/QC8 have arrived to a mostly steady state
- Software for the QC needs has been stable since August, with only minor bugfixes, but it was a challenge to get to this point
- Development is actively ongoing for the final P5 system, but not expecting to use this before 2020
- Commissioning of 2 P5 SCs started in August for 2 days, regular commissioning ready to begin in earnest, only services and TC schedule need to be accomodated
- Final critical phase of the GE1/1 project is now starting (while two other critical phases are still ongoing)
- Need to sustain effort on SW development and DB aspects
- But overall, I am optimistic of our current status and timeline for the work