Software Needs and Plans for the Phase 1 Upgrades

Nov 12, 2015

HCAL Phase 1 Software Task Force

Timeline

HF upgrade (YETS 2015-16):

Replace QIE8 with QIE10, add TDC, support for dual readout

Plan to have readout software available by mid Jan…

PMT rework (EYETS 2016-17):

Enable dual readout

HE installation (EYETS 2016-17):

Replace QIE8 with QIE11, support for increased depth segmentation

HB installation (LS2 2019):

Replace QIE8 with QIE11, support for increased depth segmentation

Installation schedule may change (HF may be delayed)

Release Schedule

https://twiki.cern.ch/twiki/bin/viewauth/CMS/CMSSW_8_0_0

Schedule for pre-release deadlines

- CMSSW_8_0_0_pre1: 2 November 2015
- CMSSW_8_0_0_pre2: 16 November 2015
- CMSSW_8_0_0_pre3: Built 30 November 2015
- CMSSW_8_0_0_pre4: Built 14 December 2015
- CMSSW_8_0_0_pre5: Built 18 January 2016
- CMSSW_8_0_0_pre6: 1 February 2016 (Last open release)
- CMSSW_8_0_0_pre7: 15 February 2016
- CMSSW_8_0_0: Deadline 29 February 2015

Goal is to have the HF dual anode readout included in CMSSW_8_0_0_pre5

Goals

Hardware installation schedule sets the priority

→ *first focus on HF, then on HE and HB in 2016.*

Have software to support dual anode readout in HF needs to be available by mid Jan (CMSSW 8.0.0_pre8)

Able to operate in mix mode readout (single + dual anode…)

We will need to have the operational support software developed in parallel to development of the readout software

- *Monitoring (DQM and prompt feedback) and calibration tools will need to be ready*
- *Establish prompt feedback team to examine early data and react to any anomalous signals (self triggering, cosmics)…*

Plans

Currently reviewing the status of the software, some code has been written, will need to find out what state it was left in

Formulating a task list and assigning people to the tasks

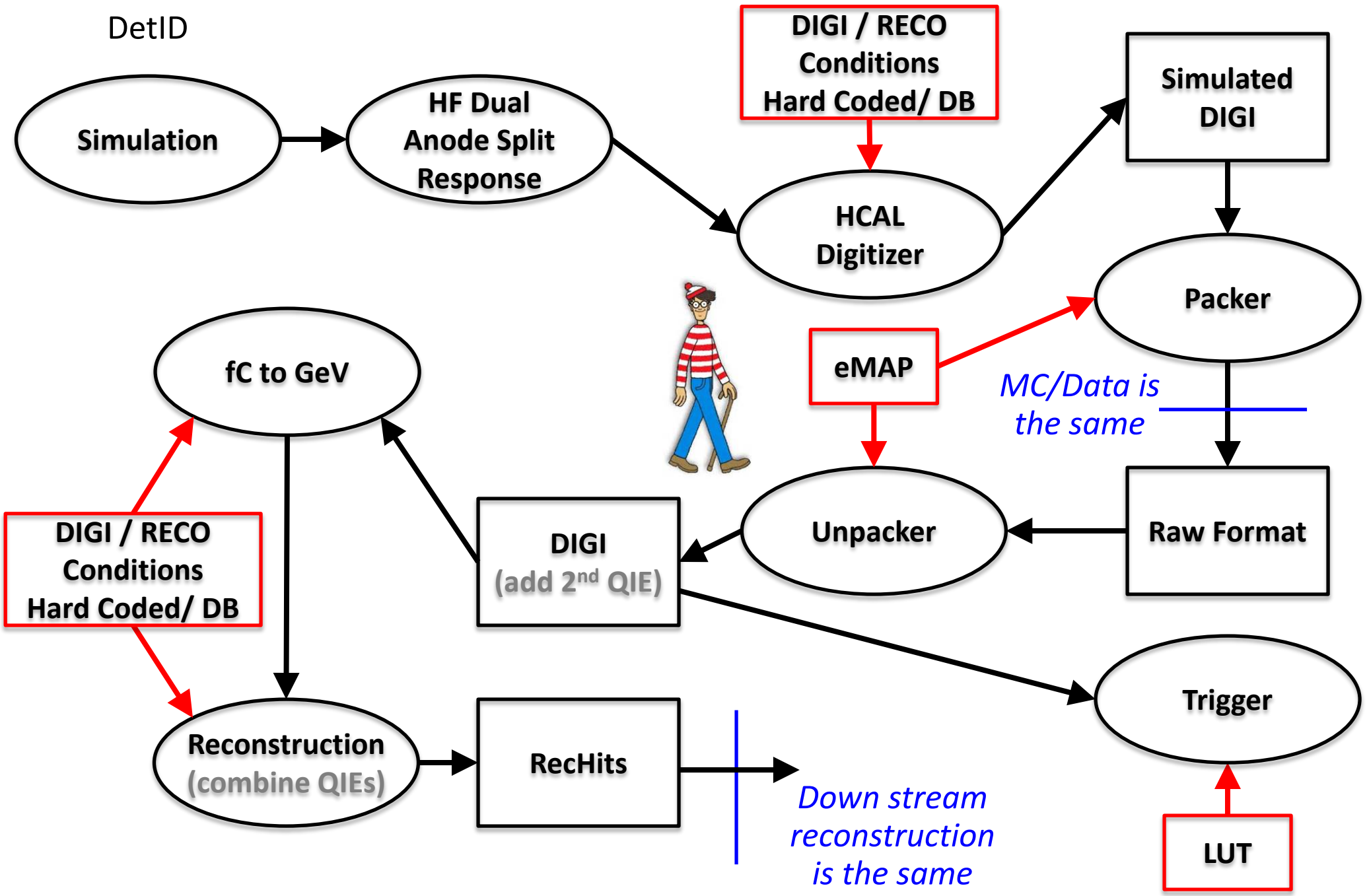
Plan to have weekly meetings to discuss the strategy and to monitor progress

Some new effort for the readout software is available

But… will need the existing groups to develop supporting software for the new hardware

- *DAQ control and monitoring*
- *DQM and prompt feedback*
- *Calibration and conditions updates*
- *Noise filters*

Simulation and Reconstruction Workflow



HF Dual Anode Energy Reconstruction

Will combine two QIE inputs to form the reconstructed energy

Add second QIE output to the DIGI

Allows easy association of two QIEs to a cell

Will need to check for known QIE10 problems

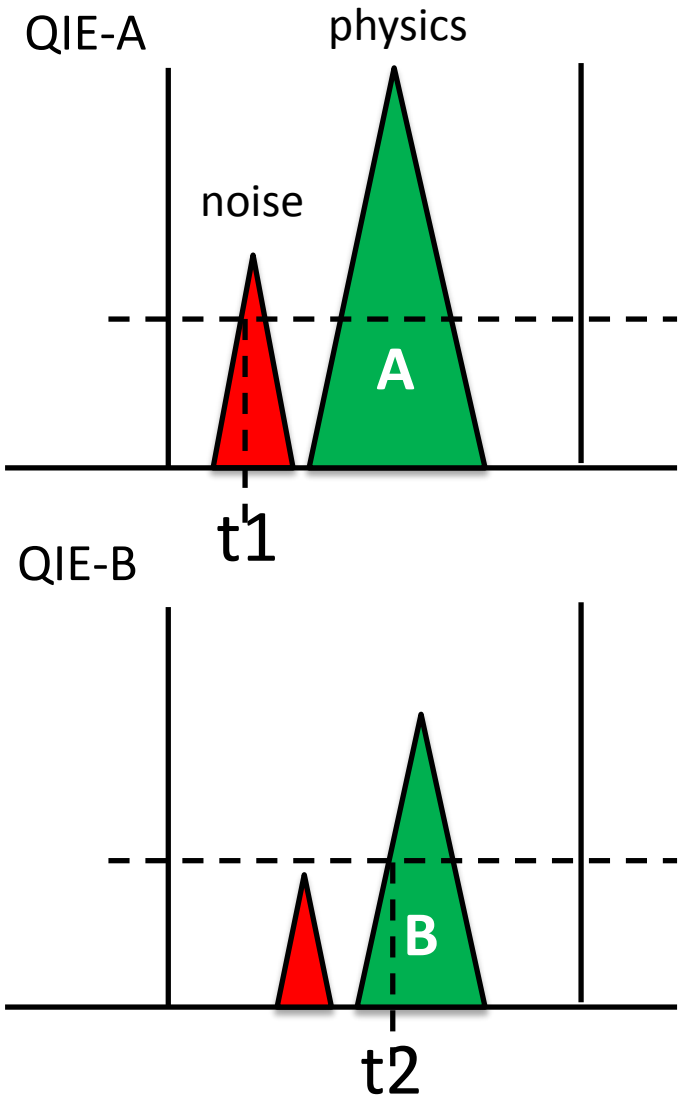
Range selection error, Rref voltage

Noise filtering will be done when constructing the RecHit

Make use of hit arrival time

Develop energy reconstruction from two QIE inputs

HF Dual Anode Energy Reconstruction



Combine two channels to get the reconstructed energy

1) Check for any QIE10 digitization problems *(range selection error)*
2) Arrival time of signals (t1, t2) should be consistent with physics
3) Charge asymmetry should be consistent with a good measurement of (A-B) / (A+B)
4) *Use one channel when other is problematic*

Store algorithm parameters in the database, allow possibility for adjustment for special channels…

Software Support for HF Dual Anode

HF Dual readout software

Support for simulation

Support for readout

Database objects

Down stream reco after rechit remains unchanged

Trigger support

Additional supporting software

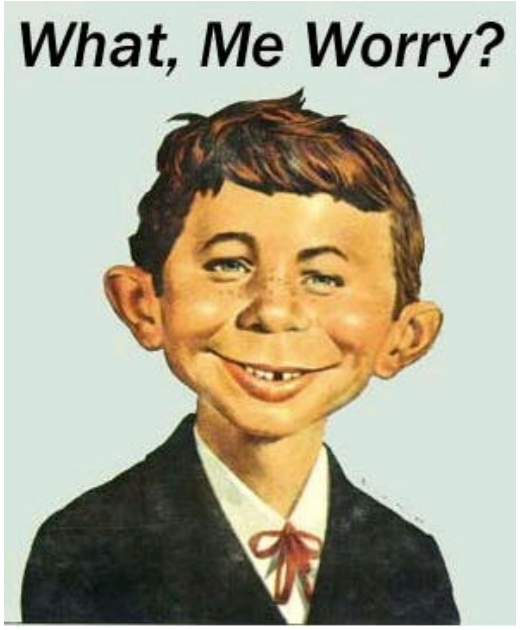
Release validation

Online control and configuration

Calibration and response monitoring

DQM and prompt feedback

Noise filters



HE and HB

Once we have the HF software in place we will start on support for HE

HE will be installed before HB, but we expect that HB to share much of the same software infrastructure as HE (see if this can be done together)

Expect that online supporting software for HBHE will be more complicated since we will to configure and monitor the SiPMs

Also will have increased depth segmentation which will impact:

- DQM and prompt feedback
- Calibration (including triggers)
- Clustering (and PFlow)

We will need to have in place data monitoring teams to be able to react to any new hardware related issued

- New noise filters

Summary

Forming a task list and assigning people to the tasks…

Will focus on HF now and on HE(HB) in 2016

→ *Support for HF readout should be available by mid-Jan*

Need to identify people within the existing groups to start planning the development of the *operational support software*

Propose that they outline a plan which includes

- Needed features and functionality
- Identify available resources
- Outline a schedule with milestones

We would benefit if the plans were presented at a appropriate meeting and be informally reviewed *(designate a reviewer for each plan and have a brief report)*