HIGGS TRIGGER UPDATE

Higgs Working Group Meeting – 10th September 2010

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Higgs Trigger Crew

Higgs Group	Channel	Contact Person
HSG1	H->γγ	Li Yuan
HSG2	H->4l	Diego Rodriguez
	H->2l2tau, H->2l2nu and H->2l2b	Paul Thompson
	HZ (H->invisible)	Sylvie Brunet
HSG3	H->WW (gg, VBF, WH, ttH, inv.)	Gemma Wooden
HSG4	H->ττ leptonic and lep-had final states	Matthew Beckingham and Henrik Nilssen
	H->ττ hadronic final states	Stefania Xella
HSG5	ttH (H->bb) semileptonic	Catrin Bernius
	ttH (H->bb) hadronic	Michael Nash
	H+ (light, hadronic tau)	Martin Flechl
	H+ (light, leptonic tau)	Arnaud Ferrari
	H+ (heavy)	Martin zur Nedden

Online Issues and Menu Status

- Currently in Technical Stop – no stable beams before Tuesday
  - Data-taking period G will start after technical stop
- Luminosity reached 10^{31} $cm^{-2}s^{-1}$ in late August
  - 46/50 bunches filled so far
  - Bunch trains to come next week (150ns)

- Now approving menu for $3x10^{31}$ $cm^{-2}s^{-1}$:
  http://trigmenu.web.cern.ch/trigmenu/scratch0/15.6.9.22/newEB/testRatesNew_30/
  - Newly activated chains:
    - 2e10 loose, 2e10 medium, 2e15 loose, and g17_etcut_EFxe20

- STANDBY stream introduced for data from warm-up period

- Three UNPAIRED bunch groups introduced:
  - Useful for beam background estimation
  - UNPAIRED_ISO: bunches > 3 BCIDs from other beam filled bunches
  - UNPAIRED_NONISO: bunches < 3 BCIDs from other beam filled bunches
  - UNPAIRED: OR of above bunch groups

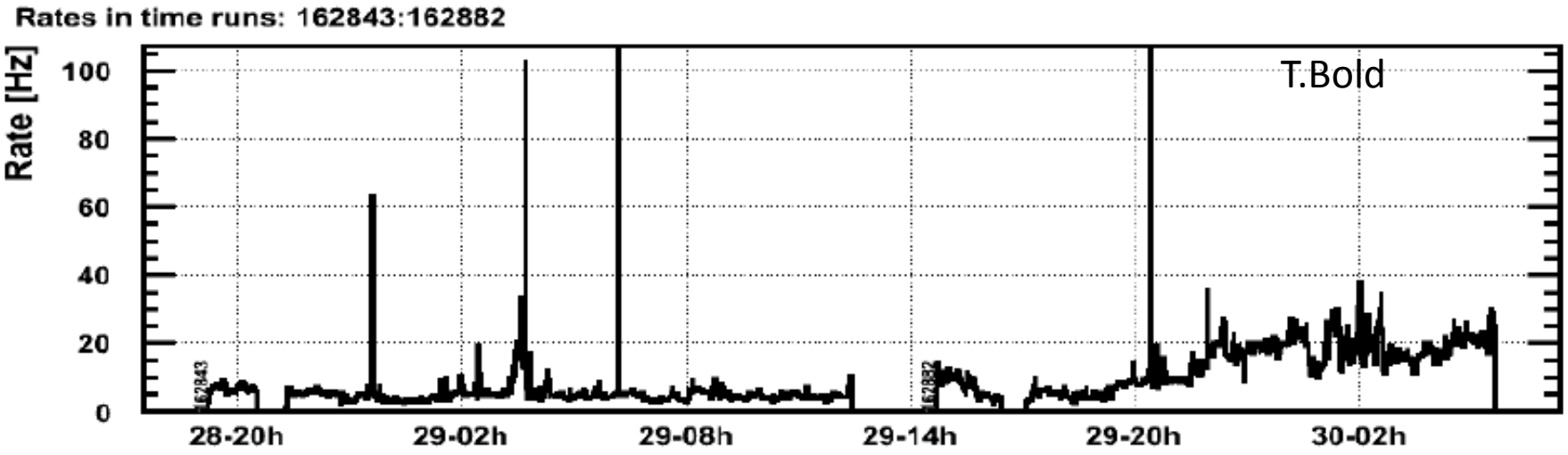
- See menu expert report in last Trigger General Meeting (yesterday):
  http://indico.cern.ch/getFile.py/access?contribId=10&sessionId=0&resId=0&materialId=slides&confId=74202

	$L = 1 \times 10^{31}$ cm^{-2}s^{-1}	$L = 2 \times 10^{31}$ cm^{-2}s^{-1}	$L = 3 \times 10^{31}$ cm^{-2}s^{-1}
Lowest unprescaled chains	e10_medium mu10_msonly_tight tau_tau38_loose met_xe30_noMu	e10_tight mu10_msonly_tight tau38_loose xe30_noMu	e10_tight mu10_MG tau50_loose xe30_noMu
Disabling or prescaling chains	L2_xe17_tight_noMu L2_mu10_Msonly L2_g15_loose	L1_2J30 L1_4J5_J15 e10_medium e15_loose mu4_L1J5_matched mu4_L1J10_matched	L1_3J15 J30_XE10 tau38_loose and tau38_medium L2_tau12_loose xe15_noMu L2_tau12_loose_IdScan xe15_noMu 2mu6_noAlg mu10_Msonly_tight 2mu4 g20_loose

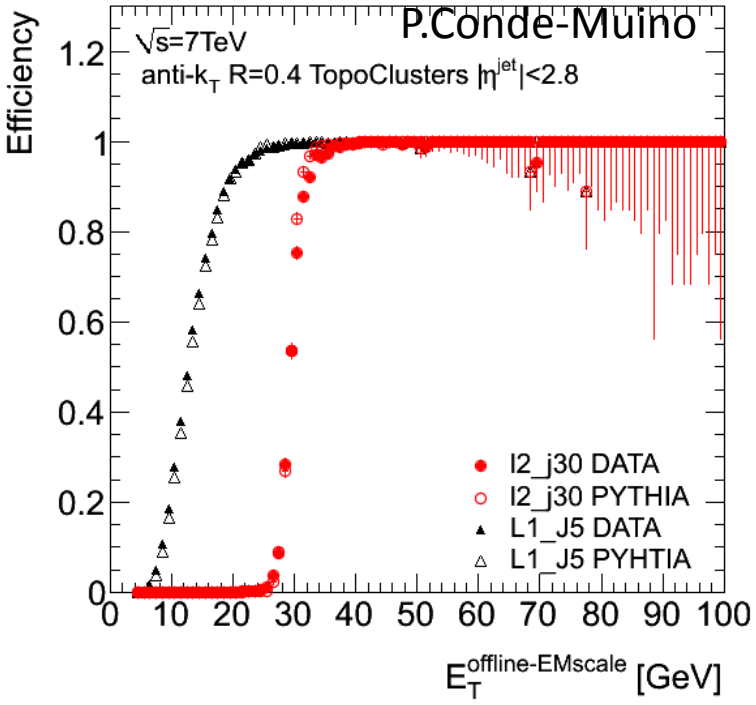
From E.Strauss

Other News

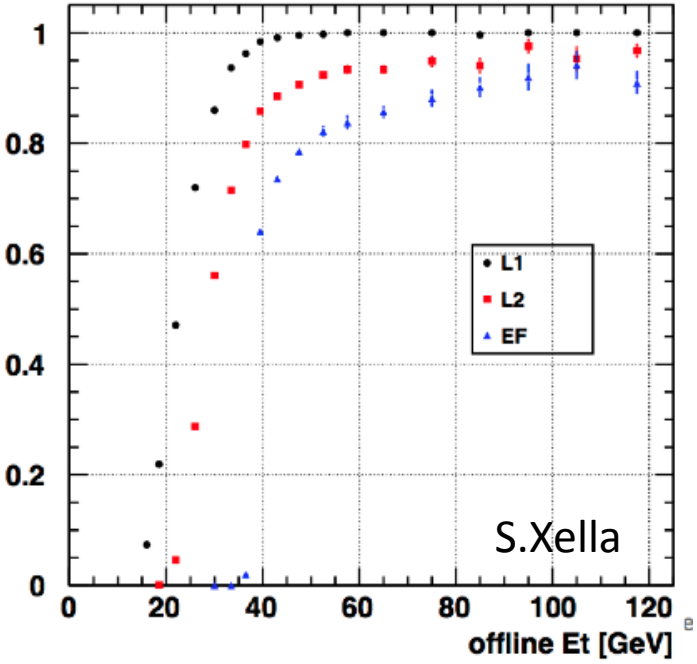
- **Level 1**
  - Presampler noise started in early August and has been affecting trigger rates – LAr experts investigating
  - L1_J10 is main Level 1 item affected
  - Possible way to deal with issue is to automatically prescale chain when rate goes above a threshold – under tests and discussion
  - Can only be done safely for "*_EMPTY" triggers – i.e. in empty bunch group, not for physics triggers



- **Jets**
  - Level 2 jet chains validated
  - See details in: **ATL-COM-DAQ-2010-136**
  - Expect all L2 jet chains to be activated when run re-starts next week, including multi-jet chains

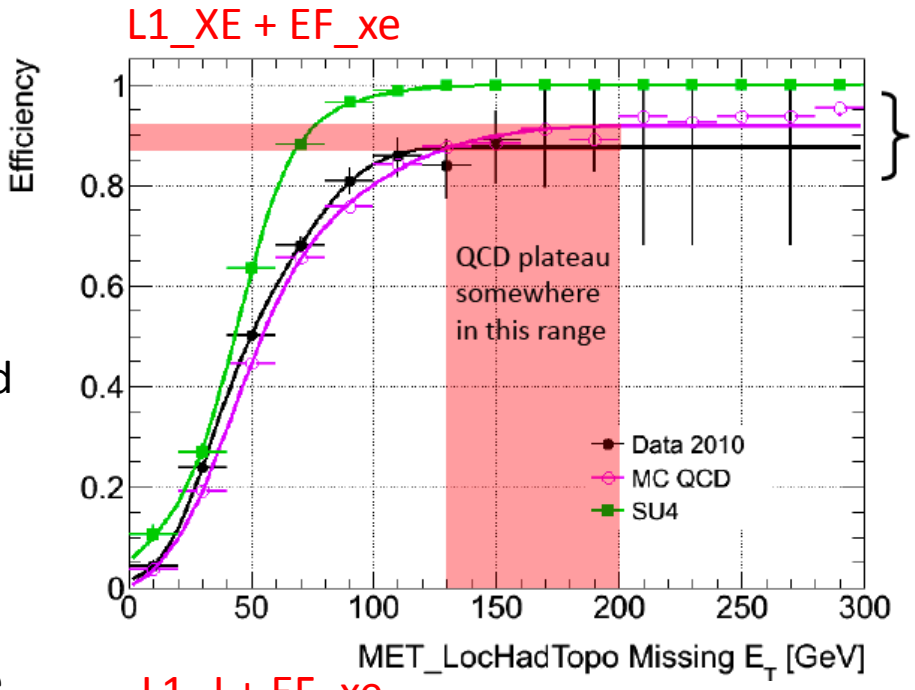


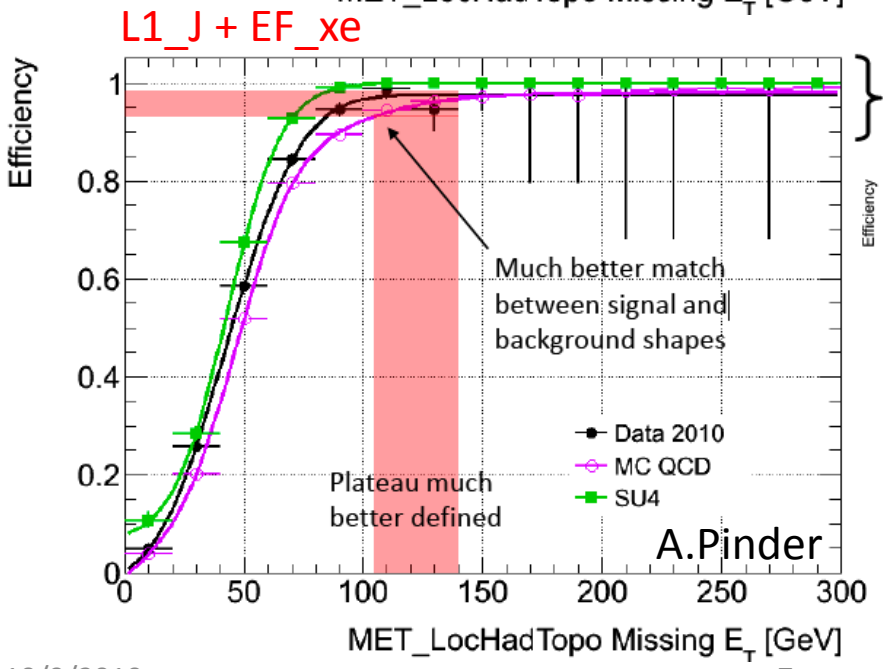
- **Taus**
  - Tau chain optimization softened cuts for:
  - tau38_loose
    - No rate change
  - tau50_loose
    - Increases from 4Hz to 9Hz at 3E31
  - tau84_loose
    - Increases from 0.5Hz to 1Hz at 3E31
  - Efficiency improvement, especially near threshold



Missing ET Trigger:

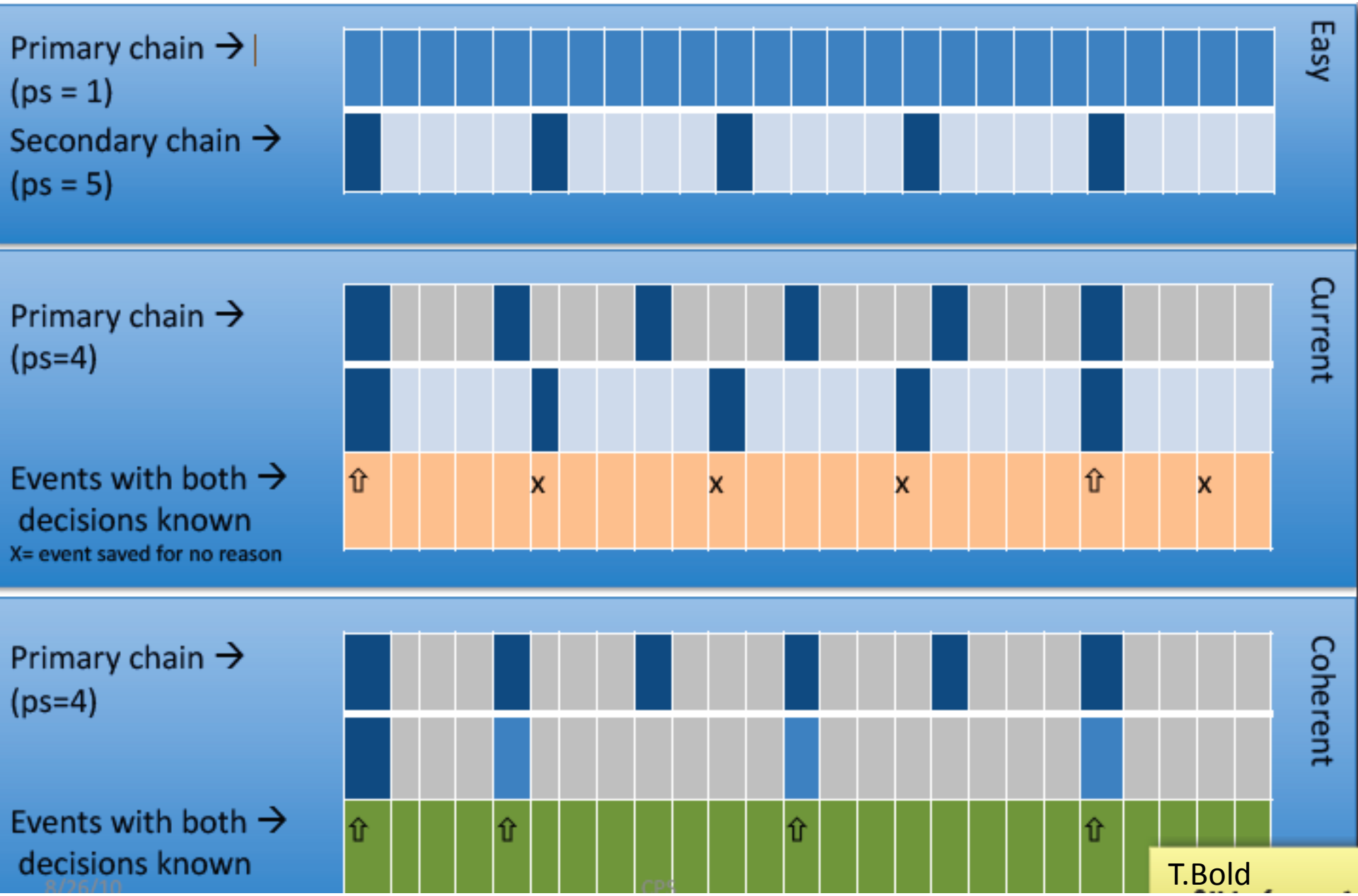
- MET+forward jet veto:
  - Spacing of 5GeV between MET trigger thresholds means factor 10x in rate
  - To allow smaller steps, MET slice proposed to introduce MET chains with Forward Jet Veto "_vfj":
    - xe30_vfj_noMu
    - xe30_vfj_medium_noMu
    - xe30_vfj_tight_noMu
  - Not good for VBF channels! BUT these are always in addition to plain MET triggers
  - Not added for the moment until use case more clear
- L1 jet + EF MET:
  - SUSY group proposed L1_Jet + EF_MET triggers
  - Improve reach in some channels and avoid difficulties in L1 MET:
  - j75_jetNoCut_EFxe20/25/30/35/40_noMu





Coherent Prescales (CPS)

- Possible to have groups of (prescaled) triggers with fully correlated prescale rejection
- I.e. if triggers A and B have prescales 2 and 5 respectively, then B would run only in 5/2 of the events where A also runs and in no other events
- Notes:
  - Only items with the same L1 input could be coherent
  - Correlated prescales are done before L2
  - No bearing on L2 decision
    - The correlated chains only run on the same events. They don't necessarily accept the same events
  - No coherent passthrough (CPT) so far


Primary chain →
(ps = 1)
Secondary chain →
(ps = 5)
Easy
Primary chain →
(ps=4)
Events with both →
decisions known
X= event saved for no reason
Current
Primary chain →
(ps=4)
Events with both →
decisions known
Coherent
T.Bold

- Several possible advantages for:
  - **Operation**: easier to know what resources will be used/saved by including/excluding correlation group
  - **Bandwidth:**
    - estimated rate savings of 25Hz in 200Hz – equivalent to e.g. all jet triggers
    - In practice, it would mean that some resource-hungry chains like beamspot and ID full-scan would continue to be feasible (due to caching of event data)
  - **Performance studies**: for bootstrap studies, run on less events to get same statistical uncertainty – by a factor of Prescale(chain A) x Prescale(chain B)

- Also potential dangers:
  - Overlook correlation between 2 chains in analysis:
    - Simple prescale de-correlates chains – allows to take events from e.g. mu4 (P=800) and mu6 (P=300) and consider them un-correlated to 1 event in 240000 – would not work with CPS
    - Depends of course on use case… infinite possibilities for errors if one is not careful
  - There are claims that the lumi calculation would be harder (I can't see why)

- More info:
  - http://indico.cern.ch/getFile.py/access?contribId=8&resId=0&materialId=slides&confId=74201
  - http://indico.cern.ch/getFile.py/access?contribId=5&sessionId=0&resId=0&materialId=slides&confId=74202

- The plan is to use CPS only for monitoring/supporting items
- Start from (use as case study):
  - L1_MU0 (separate mu4, mu6, mu10 groups)
  - L1_EM5, L1_EM10, L1_2EM2
  - L1_TAU5 (move all trk items to start from L1_TAU5)
- No primary/physics items will be included in CPS groups except 2e3_medium (J/psi triggers) and xe15/20_noMu (?)
- Physis groups feedback being requested to cross check CPS groups for physics items once created
- Comments? ☺