Higgs Triggers for Startup

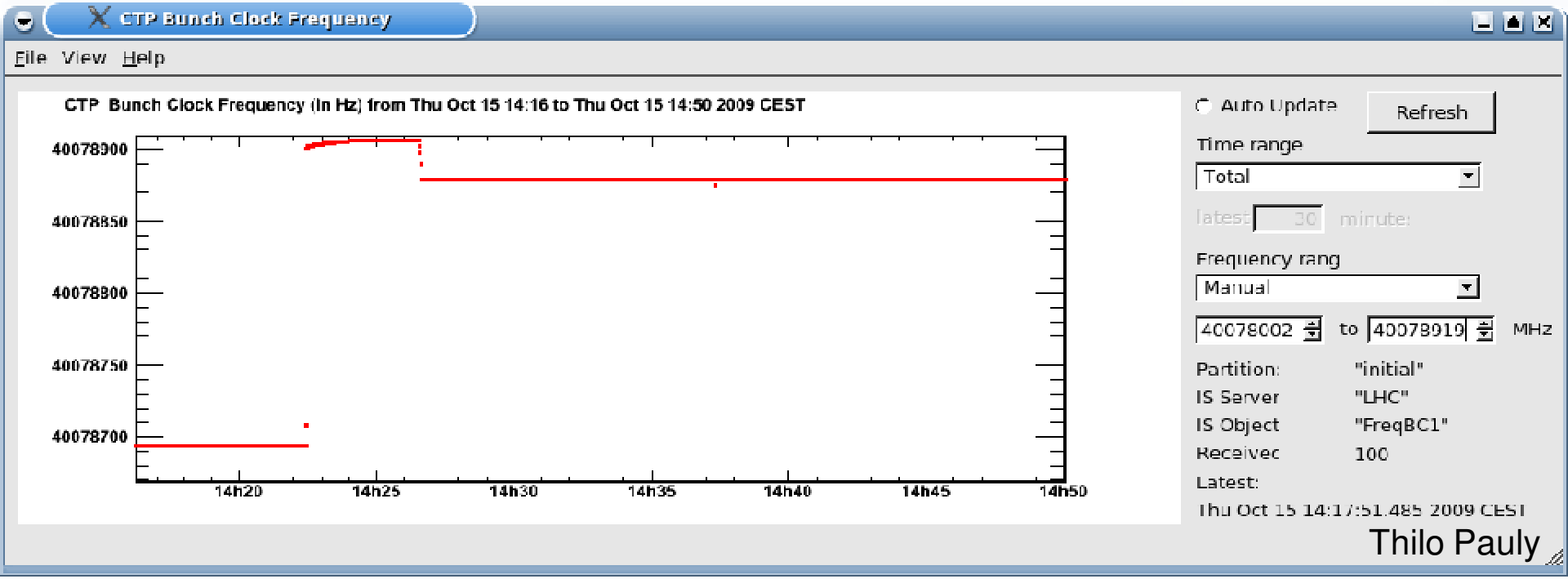
Higgs Working Group Meeting

6th November 2009

Ricardo Gonçalo - RHUL

Introduction

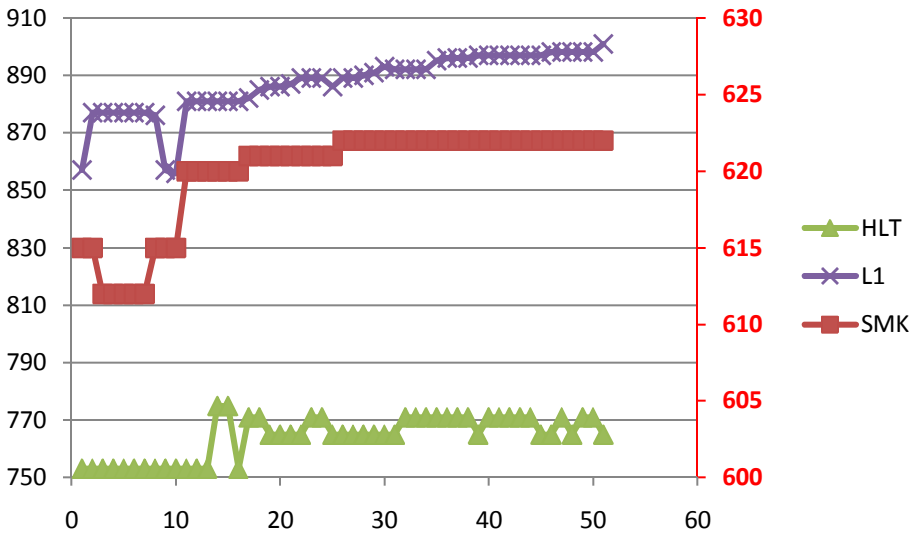
- In several cases, the latest Higgs WG trigger studies are still the Beatenberg ones – this was an important milestone
- In the meantime: beam energy and luminosity expectations have changed, L1 calo calibration changed, and trigger menu changed quite a lot
- ATLAS has been in combined run (24h coverage) for the last month – single beams can be expected in 3 weeks and first collisions in 1 month
- **This is a good time to refocus on the trigger**



Thilo Pauly

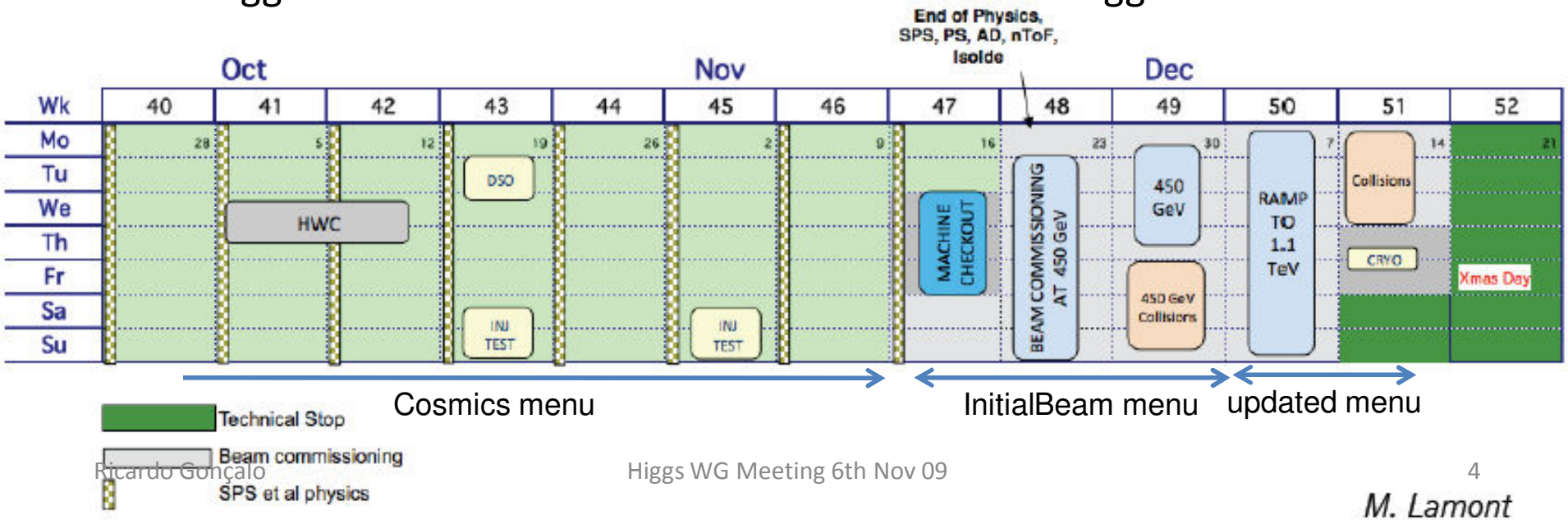
Trigger Status

- Lots of activity at P1:
  - Provide appropriate triggers for detector commissioning
  - Running High Level Trigger routinely with cosmics-adapted algorithms
  - Testing algorithms, configuration machinery, steering, monitoring (online & offline in CAF), streaming, debug streams, etc
- Last week:
  - Around 50 runs since 135926 (22nd Oct.09)
  - 5 Super Master Keys (SMK)
  - 14 High-Level Trigger prescale keys (HLT)
  - 21 L1 prescale keys (L1)
  - 32 different configurations



Plans for beam running

- Only very short run:
  - A few days of single beams
  - A few fills of 950 GeV collisions
  - Ramping to 1.1 TeV (stay within safety comfort zone)
- Trigger will run L1 only
  - HLT configured but inactive unless conditions look safe enough to activate – can't afford to loose any of this data
  - Event streaming based on L1 only
  - Activate HLT *calibration* triggers only – accept events into calibration streams to provide detectors with useful commissioning data
- Run trigger in CAF on L1-selected data – validate HLT triggers



M. Lamont

Initial menu

- Single-beam events to be selected with same menu as for 1st collisions - https://twiki.cern.ch/twiki/bin/view/Atlas/InitialBeam_v1
  - Dominated by minimum bias scintillators (MBTS) and random triggers ANDed with beam pickup (BPTX)
  - BPTX signals are on time with the beam – to be replaced with the "bunch group mechanism" when this one is commissioned

- With the beam time reference from the BPTX, these data will allow work on e.g. timing-in the muon spectrometer and LAr

- Significant amount of work on Level 1 calorimeter calibration also needs to be done with initial collisions

Beam Pickup: at ± 175m from ATLAS
Trigger on filled bunch
Provide the reference timing

Minbias Trigger Scintillator:
32 sectors on LAr cryostat
Main trigger for initial running
η coverage 2.1 to 3.8

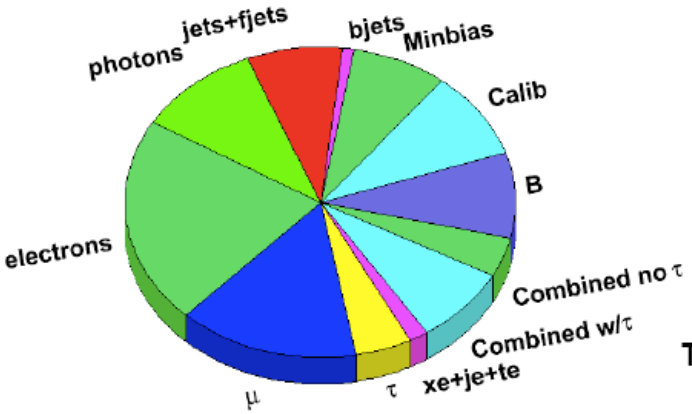
Trigger Rates

- At L≈$10^{28}cm^{-2}s^{-1}$ (12 bunches) inelastic rate ~800Hz => need to prescale some L1 items
- If we go to higher energy and luminosiy: at $10^{29}cm^{-2}s^{-1}$ either prescale L1 items or activate some of HLT – needs to be validated first
- Proposal to keep constant fraction of bandwidth per signature group as of today (10^{31} menu) – to be reviewed early next year

Initial beam conditions @ 900 GeV

No of bunches	1	4	12	43	43
Particles/bunch [x 10^{10}]	4	4	4	2	4
Beam Intensity	4 10^{10}	16 10^{10}	4.8 10^{11}	8.6 10^{11}	1.7 10^{12}
Luminosity [cm^{-2} s^{-1}]	1.7 10^{27}	6.6 10^{27}	2 10^{28}	1.8 10^{28}	7.2 10^{28}
Integrated Lumi 24 hours [nb^{-1}]	0.06	0.24	0.7	0.64	2.6
inelastic event rate [kHz]	0.07	0.27	0.8	0.7	2.9

Ref: http://lhccwg.web.cern.ch/lhccwg/Procedures/stageA/phaseA7/index.htm



EF triggers	Rate (Hz)
electron	27
mu	19
tau (single +combined)	16
photon	13

Total ~ 140 Hz (105 w overlap)

Srini Rajagopalan

Streaming

Reminder:

- Physics streams are inclusive
- Each trigger has a set of stream tags
- An event passing triggers A and B goes to streams indicated by these tags
- Need to be careful with double counting
- Current streams (L1 based) are close to sub-detector, rather than physics – will change in the future

Run	Links	#LB	#Events	debug_ L2ForcedAccept	debug_ efdProcTimeout	debug_ efdPtCrash	debug_ efdStopTransition	debug_ hiterror	cs_ M	express_ express
138065 (ongoing)	RS, AMI, DQ, DCS-B/E, ELOG	217 (61 s)	n.a. (n.a. Hz)	3 (0.0 Hz, 7.1%, 12.0 MB/run, 4.0 MB/evt)	n.a.	n.a.	n.a.	39 (0.0 Hz, 92.9%, 168.0 MB/run, 4.3 MB/evt)	,775 4.3%, B/run, IB/evt)	65,152 (5.1 Hz, 7.6%, 256 GB/run, 4.0 MB/evt)
138062	RS, AMI, DQ, DCS-B/E, ELOG	192 (59 s)	807,782 (70.5 Hz)	n.a.	n.a.	n.a.	1 (0.0 Hz, 5.9%, 3.0 MB/run, 3.8 MB/evt)	16 (0.0 Hz, 94.1%, 61.0 MB/run, 3.9 MB/evt)	,168 4.4%, B/run, IB/evt)	48,910 (4.3 Hz, 6.5%, 182 GB/run, 3.8 MB/evt)
138060	RS, AMI, DQ, DCS-B/E, ELOG	10 (56 s)	13,622 (23.9 Hz)	n.a.	n.a.	n.a.	n.a.	n.a.	,486 4.5%, B/run, IB/evt)	1,323 (2.3 Hz, 13.0%, 5 GB/run, 3.8 MB/evt)
138057	RS, AMI, DQ, DCS-B/E, ELOG	18 (58 s)	11,996,004 (11472.4 Hz)	n.a.	n.a.	n.a.	n.a.	n.a.	,594 1.0%, B/run, IB/evt)	1,631 (1.6 Hz, 11.2%, 6 GB/run, 3.8 MB/evt)
138055	RS, AMI, DQ, DCS-B/E, ELOG	6 (38 s)	0 (0.0 Hz)	n.a.	n.a.	n.a.	n.a.	n.a.		

runquery

Higgs Triggers

- 900GeV data will mostly contain background
  - No real electrons, muons, taus etc expected
    - Still allows functional checks of selection & reconstruction algorithms, comparison of trigger tracking algorithms etc
- After 2010 restart, hoping to ramp up to 7 or 10 TeV collisions quickly
  - Real signals should be accessible with O(1pb^{-1}) – e.g. a few thousand W$^{\pm}$s
  - This is where the 10^{31}cm^{-2}s^{-1} menu starts to be relevant (as a fixed point in the menu evolution)
- https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsWGTriggerPage
- Triggers in the menu are classified as:
  - Primary Trigger : a trigger used to acquire the data sample for a physics or performance study;
  - Supporting Trigger : a trigger used to measure some property of a primary trigger;
  - Calibration Trigger : a trigger that is used explicitly to collect data for detector calibrations
  - Backup Trigger : a trigger that may be used if the rate is higher or lower than we expect. It will be enabled only in case of rate problems;
  - Commissioning Trigger : a trigger that is enabled only in the commissioning menus
  - Test Trigger : a trigger that is used only in the MC_ menu for testing purposes.

HSG1: H->γγ (gg, VBF)

- No update
- Primary trigger 2g20_loose?
- Any supporting or backup triggers?

HSG2: H->ZZ$^{(*)}$

- Primary trigger EF_mu10 || EF_e10_medium

Trigger	primary/support/backup	expected efficiency for signal	can be prescaled?	other notes
mu10 or e10_medium	**primary**	**>99%**	**no prescale**	
mu15	backup		no prescale	if the rate for mu10 is too high
e12_medium	backup		no prescale	if the rate for e10_medium is too high
mu6	supporting		prescalable	for efficiency measurement of mu10
e10_medium_SiTrk	supporting		prescalable	for efficiency measurement of e10_medium

HSG3: H->WW (gg, VBF, WH, ttH, VBF invisible H)

- Primary trigger EF_mu10 || EF_e10_medium

Trigger	Primary/support/backup	Expected efficiency for signal	Can be prescaled?	Other notes
e10_medium	Primary		No prescale	
mu10	Primary		No prescale	

HSG4: H->ττ (SM, MSSM), H->μμ (MSSM)

- Main triggers for expected signal events
- Single electron channels = H->ττ->ee, eμ, eτ final state
  - primary trigger = e10_medium
  - support trigger = e10_medium_SiTrk
  - backup trigger = e12_medium
- Single muon channels = H->ττ->μμ, eμ, μτ final state and H->μμ
  - primary trigger = mu10
  - support trigger = mu4 or mu6
  - backup trigger = mu15
- Double tau channels = H->ττ (hh)
  - primary trigger = 2tau20i_loose
  - support trigger = e10_medium || mu10 || xe30
  - backup trigger = 2tau29i_loose
- Tau+MET channels = H->ττ (hh)
  - primary trigger = tau16_loose_xe25
  - support trigger = tau16i_loose_4j23
  - backup trigger = tau16_loose_xe20 and tau16i_loose_xe25(_EFxe* triggers will disappear soon from the menus.)

HSG5: Complex Final States (H+/-; ttH, H->bb)

- Minimal Triggers required:
- EF_mu15
- Also needed, but higher thresholds:mu20_xE30, EF_e15_medium also needed, but higher thresholds:e22i_XE30 e25ixE40_3j20_L1_TAU30 (?)
- H+->tauhad_nu: trying for lowest threshold unprescaled for
- tau+xe || single-xe || tau+3jets
- EF_tau16_loose_xe25
- Single-xe or tau+3jets
- xE80 possibly required by h+ ->taulep_nu (single lepton)
- Possibly add in a fully hadronic trigger

Analysis Tools

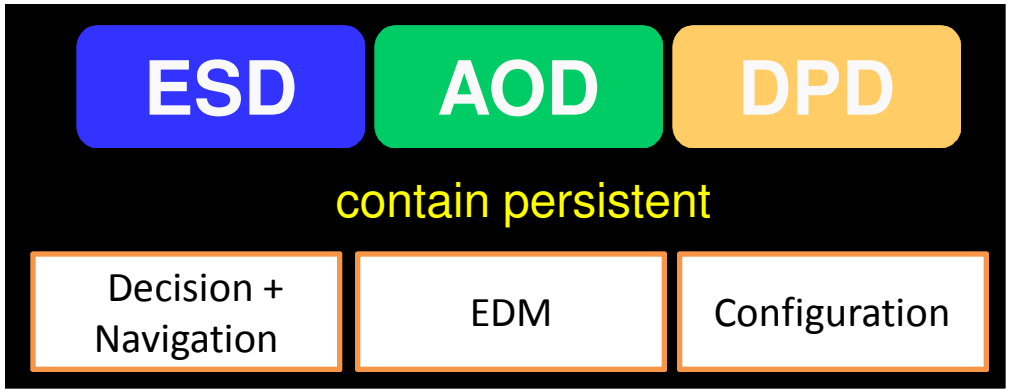
- There are several tools available to help using trigger information in a physics analysis
- They are covered in the ATLAS **Offline Software tutorials**
  - See e.g.: http://indico.cern.ch/conferenceDisplay.py?confId=66700
  - And https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerTutorialForAtlasOfflineSWTutorial

- The main interface for user trigger-aware analysis is the TrigDecisionTool
  - New re-written version in production since release **15.2.0**
  - More user-friendly, simpler, and more robust than the previous version

- The TriggerObjectMatching package provides a framework to allow matching of trigger and offline objects according to any metric (default is ΔR)
  - See: https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerObjectsMatching

- Other important tools give information on the trigger configuration, allow quick checks of AODs etc

TrigDecisionTool

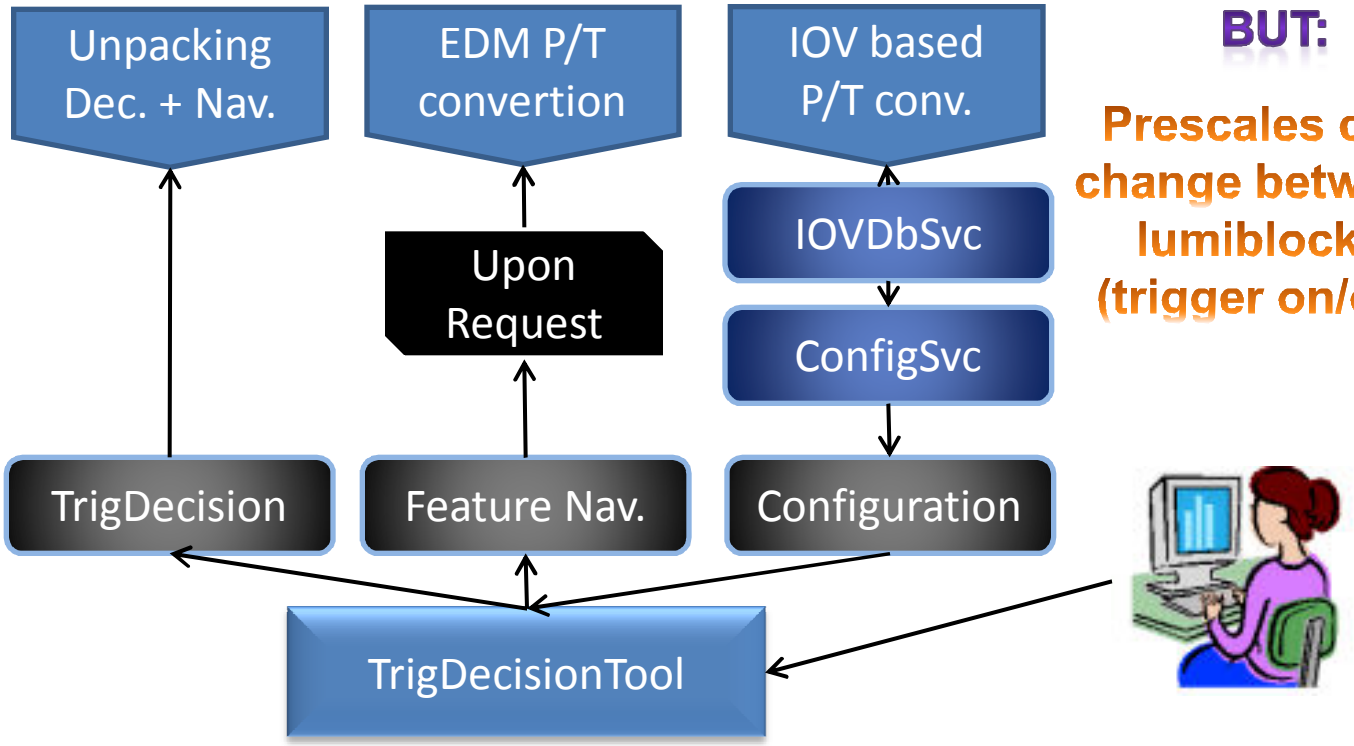


Configuration can change between runs

BUT:

Prescales can change between lumiblocks (trigger on/off)

Transient:



https://twiki.cern.ch/twiki/bin/view/Atlas/TrigDecisionTool15

Scripts to Check Pool File Content

- checkTrigger.py AOD.pool.root
  - Runs over ESD/AOD/DPD and presents detailed (chain-wise) counts of the trigger decision

```
File:AOD.pool.root
Size:    55955.492 kb
Nbr Events: 250

Trigger configuration summary:
SMK: 0, HLTpsk: 0, L1psk: 0
Config source: TriggerMenuXML/LVL1config_MC_lumi1E31_no_prescale_15.1.0.xml and
TriggerMenuXML/HLTconfig_MC_lumi1E31_no_prescale_15.1.0.xml
L1 Items   : 146
HLT Chains : 556

================================================================================
  ID level     Trigger name    Passed events:   raw, after PS, after PT/Veto
================================================================================
      LVL1   Global LVL1                  250
      LVL2   Global LVL2                  250
        EF   Global EF (LVL3)             250
--------------------------------------------------------------------------------
  13  LVL1   L1_2EM13                    71       71          71
  14  LVL1   L1_2EM13I                   34       34          34
 163  LVL1   L1_2EM13_MU6                 8        8           8
....
--------------------------------------------------------------------------------
...
  77  LVL2   L2_2g10                    118      118         118
 246  LVL2   L2_2g10_mu6                  12       12          12
....
--------------------------------------------------------------------------------
...
 477    EF   EF_2e6_medium                8        8           8
 478    EF   EF_2e6_medium1               7        7           7
  79    EF   EF_2g20                     39       39          39
 248    EF   EF_2j42_xe30                 3        3           3
....
================================================================================
```

- checkTriggerConfig.py -d AOD.pool.root
  - Runs on ESD/AOD/DPD and presents detailed trigger configuration(s)
  - Shows multiple configurations (merged DPD)

> checkTriggerConfig.py –d data09_cos.00121733.physics_L1Calo.recon.ESD.r733_tid073522/ESD.073522._000001.pool.root.1

…

EF: EF_mu0_tgc_halo_IDSCAN (1.00), L2: L2_mu0_tgc_halo_IDSCAN (1.00), L1: L1_MU0_TGC_HALO (1) [streams: TGCwBeam]

Trigger Content of Atlas-Runquery

ATLAS Run Queries

Run Summaries | Trigger Configuration Query | AMI Data Search | DDM Dashboard | Tier-0 Monitoring | DQ Monitoring | Data Preparation | Operations

Run Search – Insert Your Query:

f r 91890-92070 / sh r and allev and smk and rel and tr EF_e5*

Show Runs

[*default query condition*]

Examples (query format inspired by SPIRES):

Run and event ranges | Time ranges and duration | Detectors | Streams | Magnets | Data quality | Project tag | Trigger | Partition

f r 90270-90350 and ev 100k+ / sh r and allev

f r 91890-92070 and smk 368,373 / sh smk and rel

f r 91890-92070 / sh tr L2_E*,L2_Cosmic*

f r 91890-92070 and tr EF_e5*

Search Result

Selection rule: f r 91890-92070 / sh r and allev and smk and rel and tr EF_e5*

Query command: AtlRunQuery.py --run "91890-92070" --show run --show events --show allevents --show smk --show release --show "trigger EF_e5*" --verbose --projecttag "data08*,data09*" --partition "ATLAS"

Selection sequence:
Checking for runs in run range [[91890, 92070]] : 35 runs found
Checking if the filename tag matches "data08*,data09*" : 35 runs found
Checking if partition name matches "ATLAS" : 35 runs found

No. of runs selected: 70

Total no. of events: 16,842,326 (excluding 4 runs without available "#Events" information)

Execution time: 19.6 sec

- Search for runs by release, configuration key, trigger content
- Display and have links to run-summary, AMI, trigconf.ch, e-log

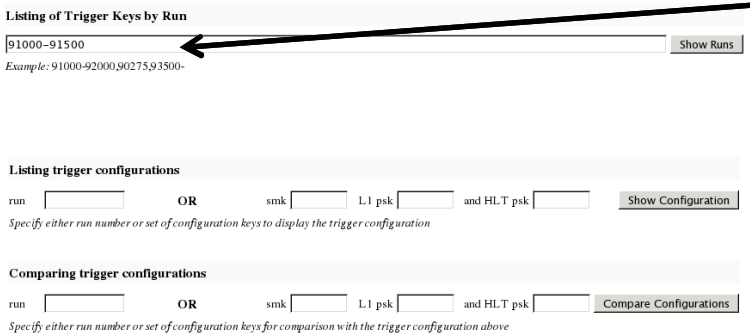
Run	Links	#LB	#Events	#Events (SFO)	#L2A	SMK	HLT PSK	L1 PSK	Release	Trigger Chains
91890	RS, AMI, Trigger, ELOG	35	2,022,080	2,297,668	5,787,181	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0), EF_e5_NoCut_FwdBackTrk (1|0)
91891	RS, AMI, Trigger, ELOG	24	n.a.	n.a.	n.a.	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0), EF_e5_NoCut_FwdBackTrk (1|0)
91892	RS, AMI, Trigger, ELOG	1	2,344,840	2,620,933	6,743,545	n.a.	n.a.	n.a.	n.a.	
91893	RS, AMI, Trigger, ELOG	1	23,316	26,452	75,012	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0), EF_e5_NoCut_FwdBackTrk (1|0)
91894	RS, AMI, Trigger, ELOG	1	0	0	0	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0), EF_e5_NoCut_FwdBackTrk (1|0)
91895	RS, AMI, Trigger, ELOG	3	20	22	20	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0), EF_e5_NoCut_FwdBackTrk (1|0)
91896	RS, AMI, Trigger, ELOG	2	40	46	40	368	388	n.a.	14.2.23.2	EF_e5_NoCut (1|0), EF_e5_NoCut_IdScan (1|0), EF_e5_NoCut_TRT (1|0), EF_e5_NoCut_SiTrk (1|0),

Example for the Configuration Portal

- Go to http://trigconf.cern.ch

1. Enter run-range

3. Browse the trigger configuration (definition, algorithms, selection cuts)

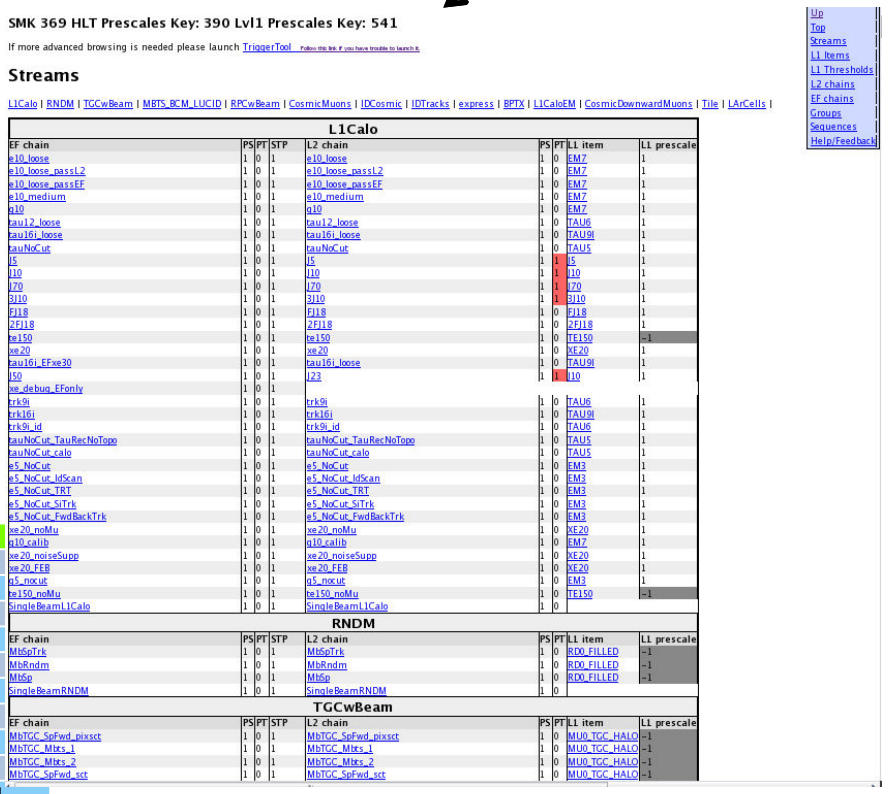


2. Click on link in resulting run list

Also with simple comparison functionality

Clic on L1 prescale to get to full trigger menu display. Mark two menus and click diff

run	Start Time	SMK	HLT PSK	L1 PSKs
91001	Wed Oct 8 15:28:35 2008	351	368	520 (1-) ☐
91003	Wed Oct 8 15:36:43 2008	351	368	520 (1-) ☐
91007	Wed Oct 8 15:54:39 2008	351	368	520 (1-) ☑
91043	Wed Oct 8 21:03:23 2008	355	373	520 (1-) ☑
91044	Wed Oct 8 21:27:12 2008	351	369	520 (1-) ☐
91045	Wed Oct 8 21:37:16 2008	351	369	520 (1-) ☐
91047	Wed Oct 8 22:04:03 2008	351	369	520 (1-) ☐
91056	Wed Oct 8 22:42:37 2008	351	369	520 (1-) ☐
91059	Wed Oct 8 23:57:22 2008	351	368	520 (1) ☐ 520 (2) ☐ 521 (3-) ☐
91060	Thu Oct 9 01:28:35 2008	351	368	520 (1) ☐ 522 (2-5) ☐ 520 (6-) ☐
91077	Thu Oct 9 12:25:35 2008	351	368	515 (1-) ☐
91086	Thu Oct 9 13:12:05 2008	351	368	515 (1-2) ☐ 9 (3-) ☐
91112	Thu Oct 9 14:13:32 2008	357	356	519 (1-) ☐



Luminosity

- Not strictly related to trigger, but in fact…
  - When calculating the luminosity, one needs to take the trigger prescale and deadtime into account

- ATLAS luminosity calculation returns $L = \Sigma_{LB}(l\, L^0/p)$ where:
  - l - trigger livetime fraction
  - p - trigger prescale factor ($p^{L1} * p^{L2} * p^{EF}$)
  - L^0 - 'uncorrected' luminosity
  - ε_{sel} - selection efficiency (includes trigger)

- This can be used in: $\sigma = (N_{sig} - N_{bkg})/(\varepsilon_{sel}\, l\, L^0/p)$
  - See a nice discussion on luminosity calculation and combining triggers in yesterday's Luminosity Group meeting: http://indico.cern.ch/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=73190

Conclusion

- With collisions approaching (at last!...) this is a good time to revisit the trigger side of each analysis

Backup….

Additional Information

Trigger user info:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerUserPages
Tutorials:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerSoftwareTutorialPage
TDT Twiki:	https://twiki.cern.ch/twiki/bin/view/Atlas/TrigDecisionTool
TDT Doxygen:	http://atlas-computing.web.cern.ch/atlas-computing/links/nightlyDevDirectory/AtlasOffline/latest_doxygen/InstallArea/doc//TrigDecisionTool/html/index.html
Trigger obj matching:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerObjectsMatching
TrigAnalysisExample:	http://atlas-computing.web.cern.ch/atlas-computing/links/nightlyDevDirectory/AtlasOffline/latest_doxygen/InstallArea/doc/TrigAnalysisExamples/html/index.html
UserAnalysis example:	https://twiki.cern.ch/twiki/bin/view/AtlasProtected/UserAnalysis
Trigger Configuration:	http://trigconf.cern.ch
TriggerTool:	http://www.cern.ch/triggertool
Run query:	http://atlas-runquery.cern.ch/
Trigger EDM:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerEDM, http://alxr.usatlas.bnl.gov/lxr/source/atlas/Trigger/TrigEvent/TrigEventARA/TrigEventARA/selection.xml
TriggerMenu group:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerPhysicsMenu
TriggerSW group:	https://twiki.cern.ch/twiki/bin/view/Atlas/TAPMCoreSW
TriggerConfig group:	https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerConfiguration
Help on e-groups:	hn-atlas-TriggerHelp at cern.ch

TrigDecisionTool Usage

1. Alg.h: define ToolHandle to a TrigDecisionTool

```
private:
    ToolHandle<Trig::TrigDecisionTool>  tdt;
```

2. Alg.cxx – Alg::Alg(): declare ToolHandle as public tool

```
MyAlgo::MyAlgo(const std::string &name, …)
tdt("Trig::TrigDecisionTool/TrigDecisionTool")
{…}
```

3. Alg.cxx – Alg::initialize(): retrieve tool
   - Has to be in initialize()!

```
StatusCode sc = tdt.retrieve();
```

4. Alg.cxx – Alg::execute(): use tool

```
if (tdt->isPassed ("L2_e15i"))  {
    log << MSG::INFO << "I'm happy!" << endreq;
}
```

TWIKI: https://twiki.cern.ch/twiki/bin/view/Atlas/TrigDecisionTool15
Doxygen: http://atlas-computing.web.cern.ch/.../TrigDecisionTool/html/

Working with ChainGroups

1. Alg.h: define ChainGroup pointer

```
const Trig::ChainGroup* mMyTrigger;
```

2. Alg.cxx – Alg::initialize(): declare ChainGroup
   - Note: the ChainGroup automatically updates with each run (chain content) and lumiblock (prescales)
   - Use regular expressions, e.g. "EF_e.*"

```
mMyTrigger =
    tdt.createChainGroup("EF_e10_loose");
```

3. Alg.cxx – Alg::execute():
   - Access to trigger configuration
   - Access to trigger decision
   - Access to trigger objects

```
bool useLB = ! mMyTrigger->getListOfTriggers().empty();
bool myEvent = mMyTrigger.isPassed();
const Trig::FeatureContainer fc = mMyTrigger.features();
const std::vector< Trig::Feature< TrigTau > > taus =
    fc.get();
```

Anonymous ChainGroups:

- Note that one can work without steps 1 and 2. In Alg::execute() define the triggers on the fly:
- Equally fast (TDT keeps ChainGroups)

```
string  tr ("EF_e10_loose");
bool useLB = ! tdt->getListOfTriggers().empty(tr);
bool myEvent = tdt->isPassed(tr);
const Trig::FeatureContainer fc = tdt.features(tr);
```

Example of using Features

FeatureContainer for 'EF_tau16i_loose_2j23'

Access the feature

You need to know the type of the Feature: 'JetCollection' in EF

Access the object (implicit conversion)

Access information of object

Find corresponding L2 jet using TDT::ancestor<T>

```
FeatureContainer f = tdt->features("EF_tau16i_loose_2j23");  // creating the feature container
std::vector< Feature<JetCollection> > jetColls = f.get<JetCollection>();
mLog << MSG::INFO << "Number of JetCollections: " << jetColls.size() << endreq;
if(jetColls.size()>0) {
    const Feature<JetCollection>& jcf = jetColls[0]; // get the first Feature
    mLog << MSG::INFO << "Label: " << jcf.label() << endreq;
    const JetCollection* jc = jcf;    // implicit Feature -> object conversion
    mLog << MSG::INFO << "Number of Jets: " << jc->size() << endreq;
    JetCollection::const_iterator jIt = jc->begin();
    for (; jIt != jc->end(); ++jIt ) {
        Jet* jet = *jIt;
        mLog << MSG::INFO << "Jet e : " << jet->e() << endreq;
    }
    // find the corresponding jets in LvI2 through the inheritance tree (navigation does that all)
    Feature<TrigT2Jet> l2jetF = tdt->ancestor<TrigT2Jet>(jcf);
    mLog << MSG::INFO<<"Found "<< (l2jetF.empty()?"no ":"")<< "corresponding L2 Jet."<<endreq;
    if ( !l2jetF.empty() ) {
        const TrigT2Jet* t2jet = l2jetF.cptr(); // explicit Feature -> object conversion
        mLog << MSG::INFO << " e : " << t2jet->e() << endreq;
    }
}
```

Output:

```
Number of JetCollections: 1
TE Label: TrigJetRec
Number of Jets: 1
Jet e : 82827.9
Found corresponding L2 Jet.
e : 83197.4
```

Streams planned for first beams

physics_BPTX	BPTX items go here. Not running for cosmics
physics_L1Calo	Events with active L1Calo items
physics_L1CaloEM	Events with active EM items (subset of L1Calo)
physics_MinBias	MBTS/BCM/LUCID/ZDC items
physics_RNDM	Random L1 items
physics_MuonswBeam	Muons in time with beam
physics_CosmicMuons	Muons out of time
calibration_IDTracks	Seeded by calibslice chains (TAU seeded)
calibration_LArCells	Seeded by LArCalib_V2 (unseeded)
calibration_Tile	Seeded by TileCalib_cis + TileCalib_laser (calibration requests)
calibration_pixelnoise	Seeded by Cosmic_pixelnoiseV2 (L1_RD0_EMPTY)
calibration_l2_cost_monitoring	Seeded by cost_monitor chain at L2 (unseeded)
calibration_ef_cost_monitoring	Seeded by cost_monitor chain at EF
express_express	A subset of events are written to the express stream for prompt reconstruction

Note:

- No IDCosmic stream
- Pixelnoise stream will at most be there in short breaks between fills. Should we remove it?

Bunch groups

- BG0 : Bunch counter reset (BCR) Veto (for detector ops)
- BG1 : Filled physics bunch group
- BG2 : Empty bunches reserved for calibration pulses
- BG3 : Empty bunches reserved for cosmics triggers
- BG4 : Unpaired bunches beam 1
- BG5 : Unpaired bunches beam 2
- BG6 : Empty bunches directly after a filled one