Trigger Menus

$t\bar{t}H$, $H \rightarrow b\bar{b}$ input to trigger menus for initial running

14/9/2007
ttH, H→bb CSC Note meeting
Ricardo Goncalo, RHUL

What we should answer until Monday

1. What is the ideal menu for ttH (at $L=10^{33}$ $cm^{-2}s^{-1}$ and higher) – i.e. triggers with high efficiency wrt the analysis baseline selection/preselection

2. How we plan to determine the trigger efficiency (or it's corresponding systematic error in the measurement) and what is needed from the trigger to do this

3. What initial triggers would be useful – i.e. what data samples would be useful to study background shapes and reconstruction performance

Ideal menu for $L=10^{33}$ $cm^{-2}s^{-1}$

- Semileptonic channel:
  - mu20i (& higher) and e25i:
    - The lower the threshold the better, but 20 I enough
    - High efficiency important, but matching between ID and MS maybe needed to avoid garbage
    - Same thing for muon isolation
  - e20_xeNN or e20_jeMM or e20_teKK: with the aim of lowering the lepton threshold; same for muons

- All-hadronic channel
  - Input from Fabrizio and Carlo; at first sight:
  - Multijet + b-tagging at HLT
  - teXX, jeYY, 2j42_XE30 (what will the real thresholds be)?
  - Non-isolated muon trigger
    - muon + N jets at L1: this can either be followed by a (non-isolated) muon + Njets at HLT or used to pass events to HLT where b-tagging would run after L2 jet reconstruction

- All-leptonic channel
  - 2e15i , 2mu15i – same comments apply as for the single-lepton triggers used in semileptonic channel (low thresholds, good purity, high efficiency)
  - Would be good to have triggers for 2e_xeYY, 2mu_xeUU and eXX_muYY

- No tau$\rightarrow$hadronic being looked at

Estimating trigger efficiency

- Lepton efficiency:
  - Should be reasonably ok:
  - Samples available ($Z \rightarrow ll$, $W \rightarrow l\nu$ both around the right scale and should be available) – this means keeping the necessary triggers active

- B-tagging:
  - Need multijet sample
  - Same trigger as B-tag group will need (what?)
  - Can select bbar-enriched dijet sample (jets with non-isolated muon)

- Some ways of estimating efficiency (and I'm sure we'll find more):
  - Tag-and-probe:
    - Gives single-lepton efficiency for an inclusive trigger
    - Maybe not so useful for people doing analysis
  - More useful from the analysis point of view:
    - Orthogonal triggers
      - If the orthogonal trigger efficiency is known and introduces no bias
    - Using samples selected with inclusive, lower thresholds, prescaled triggers, with a known prescale
      - Not totally unbiased either
  - Propose that trigger maintains a list of loose triggers and measurement of efficiencies (and average prescales) for each running period

Initial trigger

- ?
- I’ll go over the current list in detail until monday

Backup

Question A)

- There is a proposed Trigger menu for 10^{31} which can be found at

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

A) We ask that you review this menu's suitability for the physics and performance issues relevant to your group. What is missing? What is the motivation for the desired triggers? Are there triggers that may not be needed, or for which a larger prescaling could be applied if the overall rate is too large? Which triggers are critical for measuring trigger and reconstruction efficiencies and background rejections.

Question B)

B) What calibration/alignment triggers are needed [to be run concurrently with normal data taking runs]? How many events are needed and what kind of accuracy can you expect as a function of the assumed rate? Can you quantify the impact of a reduced rate on accuracy? [Note that: in some cases, a calibration trigger may be given special treatment in the TDAQ system so that only a subset of the detectors and/or only regions of interest are read out].

Question C)

C) What triggers are absolutely "unprescalable" and why?

Question D)

D) What triggers MUST go into the express stream? What will you do with the express stream data sets? What is the impact if it goes only into the regular stream? [Note: The events in the Express stream are complete events and contain a subset of the events sent to regular stream. Its purpose is to obtain rapid feedback, such as needed for Tier0 monitoring. Hence the question is what needs to be processed in a fast time-scale that can only be accomplished with your trigger in the express stream?]

Question E)

E) It can be difficult to estimate some rates, therefore what would you do if some trigger rates are higher than expected by a factors of 2, 5 or 10? Identify the triggers that are candidates for higher thresholds or prescales. Inversely, which triggers are candidates for lower thresholds or smaller prescales if the rates are half of the expected value?

Question F)

F) We are starting to consider the 10**32 menu. New unprescaled triggers will be added at higher thresholds, presecales on 10**31 triggers increased and perhaps some triggers dropped. We would like your preliminary thoughts on this.