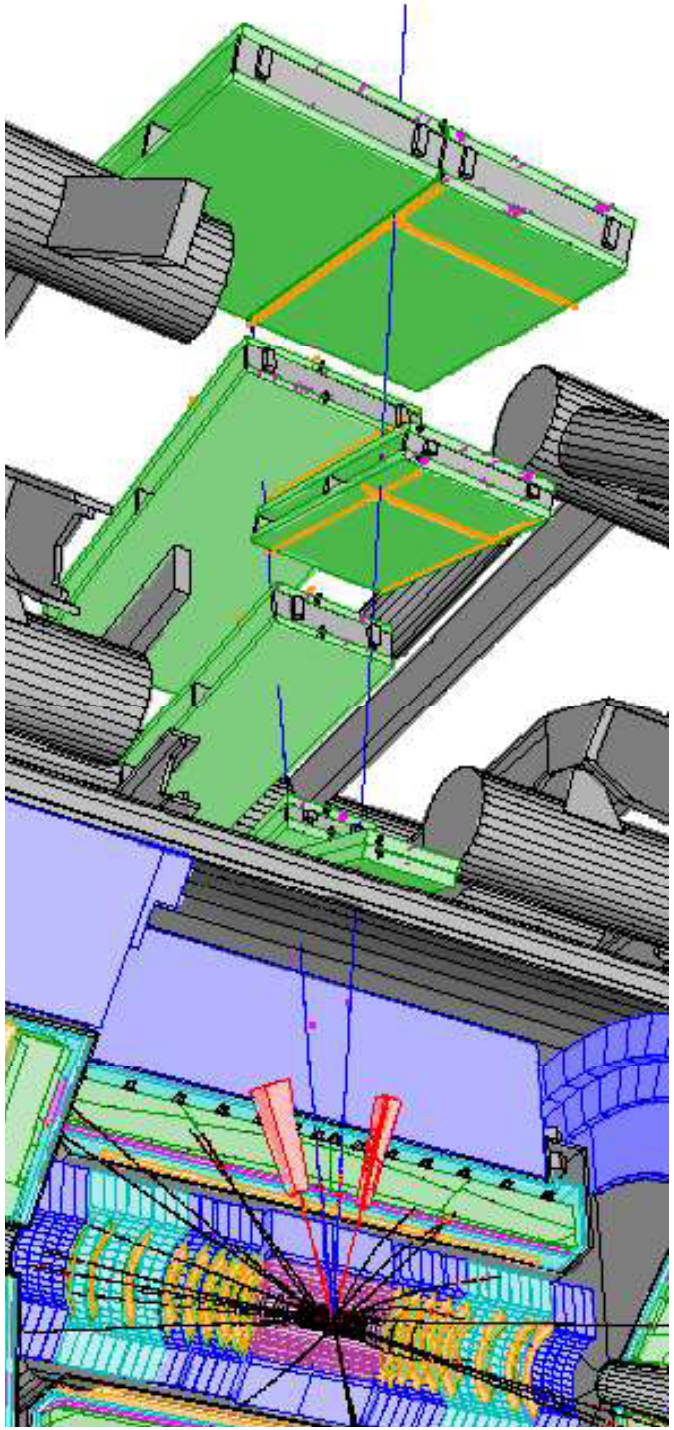


Trigger Issues

- Higgs menus meeting
- Initial trigger menus
- Other issues
- Conclusions

Ricardo Gonçalo, RHUL

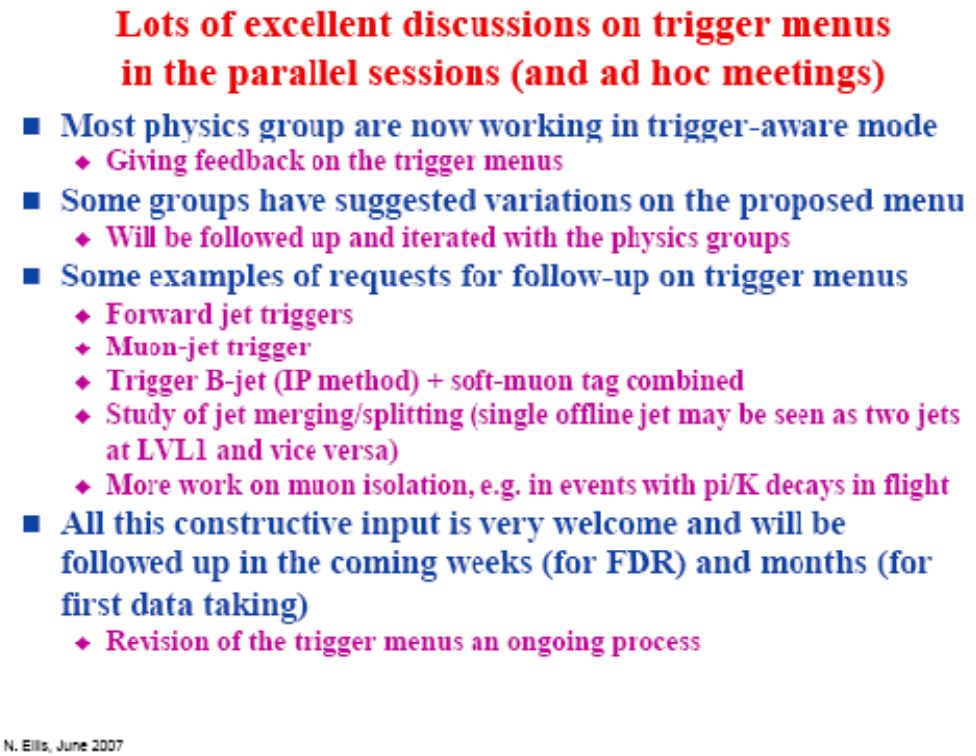
Higgs Working Group – June 12, 2007

Meeting on Higgs WG trigger menu

- Meeting two weeks ago to help provide feedback for initial trigger menus
  - Tried to answer:
  - What triggers do we need for Higgs analyses?
  - What are we likely to get for the first year?
  - What do we have now?
- Many thanks for contributions!
- Mostly, reassuring results were shown (H→γγ, H→leptons,…)
- Two areas of some concern:
  - b-tag triggers for e.g. H→bb
  - Forward jet triggers for VBF (especially invisible Higgs)

Trigger issues

- Still trying to get my bearings again after a week off…
- From last (T&P) week's talks:
  - A lot of progress has been made towards the initial trigger menus
  - Most physics groups in "trigger-aware" mode
  - BUT remember ALL real-life analyses need to be "trigger-aware"!



Lots of excellent discussions on trigger menus in the parallel sessions (and ad hoc meetings)

- Most physics group are now working in trigger-aware mode
  - Giving feedback on the trigger menus
- Some groups have suggested variations on the proposed menu
  - Will be followed up and iterated with the physics groups
- Some examples of requests for follow-up on trigger menus
  - Forward jet triggers
  - Muon-jet trigger
  - Trigger B-jet (IP method) + soft-muon tag combined
  - Study of jet merging/splitting (single offline jet may be seen as two jets at LVL1 and vice versa)
  - More work on muon isolation, e.g. in events with pi/K decays in flight
- All this constructive input is very welcome and will be followed up in the coming weeks (for FDR) and months (for first data taking)
  - Revision of the trigger menus an ongoing process

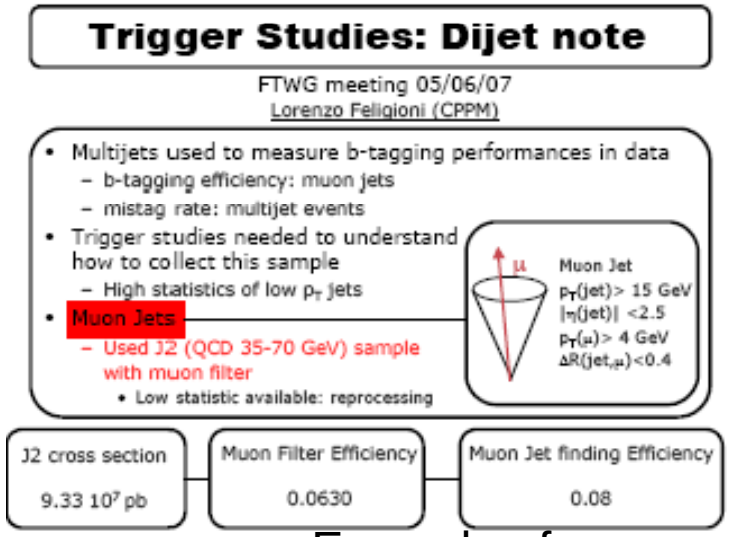
N. Ellis, June 2007 10

Early trigger menus

- Focusing on 10^{31} $cm^{-2}s^{-1}$
  - Beyond that is really just guesswork at the moment
- Not very interesting for Higgs signal in most channels
  - BUT this is where we'll really learn about our detector and trigger
- Draft menu now exists and becoming more detailed
  - See http://indico.cern.ch/conferenceDisplay.py?confId=16155#1
- This will be used in the Final Dress Rehersal (FDR) and made increasingly realistic

Early trigger menus II

- But much is still to be done:
  - Is this menu good for physics groups?
  - How to measure the efficiency from data? How to estimate systematic uncertainties from data? (must assume the simulation will NOT describe the data in many aspects)
  - Will this menu produce the samples needed to study performance of reconstruction algorithms? Background shapes? Alignment? Calibration?
- To anticipate some of the problems and needs, use the trigger and iterate with trigger community (or through me)



Example of calibration sample

S.Xella-HG3

double tau menus at 10^{33} h-h channel

(wot yet provided as default menus in 12.0.6,
Working on the trigger objects in AOD)

	L1(HZ)	L2(HZ)	EF(HZ)	H(120) (p_t^{Vis}>12)
tau25itau25i	2.4K	115	38	15%
tau35itau35i	634	19		
tau15itau35i	4.1K	147		
tau20itau35i	3.0K	100		
tau25itau35i	1.6K	68		

Developing double-tau menu

First checks of trigger health look fine

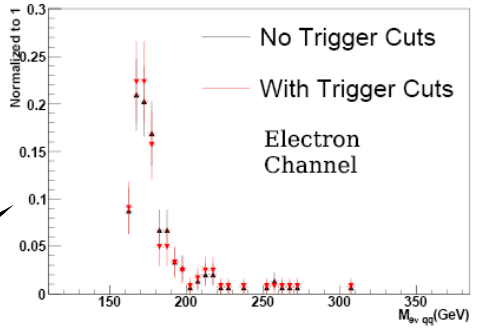
Studied effect of pileup and fragmentation

Again large effect from fragmentation model

Large uncertainty coming from the generator too!

G.Hanninger-HG9

Mass Distribution



'rigger efficiency does not seem to have a
ıtistically significant impact on the shape of the
$_{\ell\nu qq}$ distribution

ayle Page 9

W.Quayle-HG4

Jet Trigger

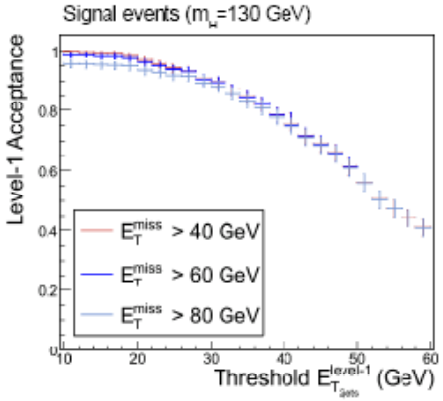
S.Tsuno

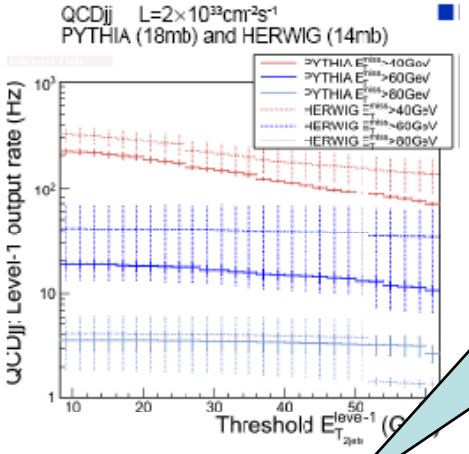
Level 1 jets :

- Increases ~10% for multi-jet trig.
- ~3times increases in L1_FJ30

ence in high pT jet trig.

ence by the different
(fragmentation).
t this is known feature in
cess.
One should expect large systematic
when we estimate the rate.





- Some good advice

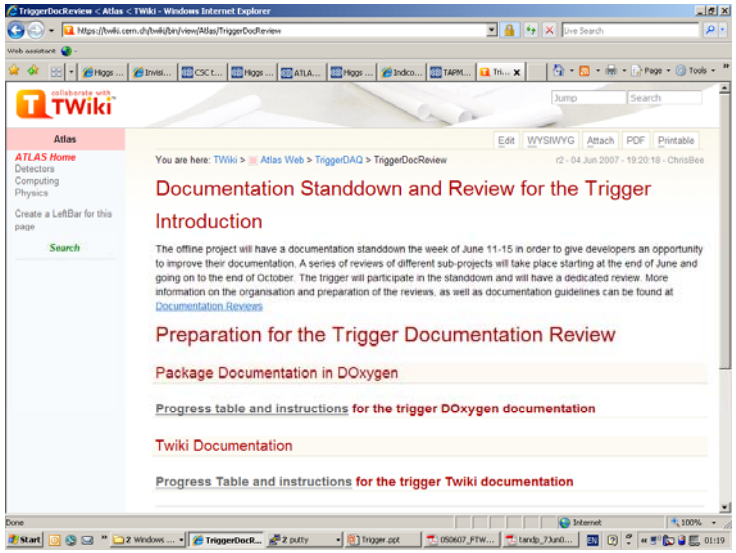
C.Potter, HG10

- Use single object triggers whenever possible. This simplifies measuring trigger efficiencies from data and applying them to MC simulation.
- Try to avoid the *b*-tag and missing ET triggers for initial running, as these will probably be more problematic than other triggers.
- Try to avoid prescaled triggers since the signal efficiency for these will be too low. The 1j and 2j signatures will probably be prescaled, but the 3j and 4j might not be.
- Watch the performance of the trigger algorithms in the signal MC with respect to offline reconstruction. Observe any anomalous behavior characteristic of signal and correct it immediately.
- Push for the most reaslitic rate estimates possible. As the trigger menus become less flexible to accommodate realistic rate estimates:
  - Use multiple-object signatures (single signatures ANDed together)
  - Use higher thresholds in the signatures as far as signal efficiency allows.
- Evaluate the impact of pileup and cavern background on signal trigger efficiencies as soon as possible.

Documentation standdown

- This week being reserved for code documentation:
  - HLT documentation will benefit from this
  - https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerDocReview

Feedback on user documentation welcome!



Main access point is the trigger user pages:
https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerUserPages
Best way to get expert attention if you have problems with trigger software:
https://hypernews.cern.ch/HyperNews/Atlas/get/TriggerHelp.html

Other issues

- Release 13 (for CSC notes that need it)
  - Many changes wrt 12.0.x
    - Some changes in trigger EDM
    - TrigDecisionTool
    - Mixed triggers
    - More/better topological triggers
    - New naming convention
  - My advice would be to avoid migrating until code is more stable
    - but if you migrate please report any problems you find!

- Express stream:
  - Will use a subset of the triggers to select high-threshold events (initially 5-15% of rate)
    - These events will be used for rapid feedback before main reconstruction starts
  - Aim to find problems early
  - May also be valuable to find interesting (high-pT) events!

Conclusions

- Much progress was done towards an initial trigger menu
  - We should iterate with trigger community until we're happy with the menu
- This week is dedicated to software documentation:
  - Feedback from trigger users would be most welcome
- Release 13.0.10 was built:
  - Expect many new features and some initial instability

More information

- Main access point is the trigger user pages:
  - https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerUserPages
- To use the trigger in your analysis:
  - https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerSoftwareTutorialPage
- Check especially the tutorial of the last T&P week:
  - https://twiki.cern.ch/twiki/bin/view/Atlas/TPTriggerTutorial1206
- Caveats (some very useful explanations and notes):
  https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerUserCaveats
- Best way to get expert attention if you have problems with trigger software:
  https://hypernews.cern.ch/HyperNews/Atlas/get/TriggerHelp.html
- For the status of trigger code in 12.0.6 see talk by Olga Igonkina in last T&P week (and other talks during week)
  - http://indico.cern.ch/conferenceDisplay.py?confId=12404#13
- TAPM open meetings: http://indico.cern.ch/categoryDisplay.py?categId=551