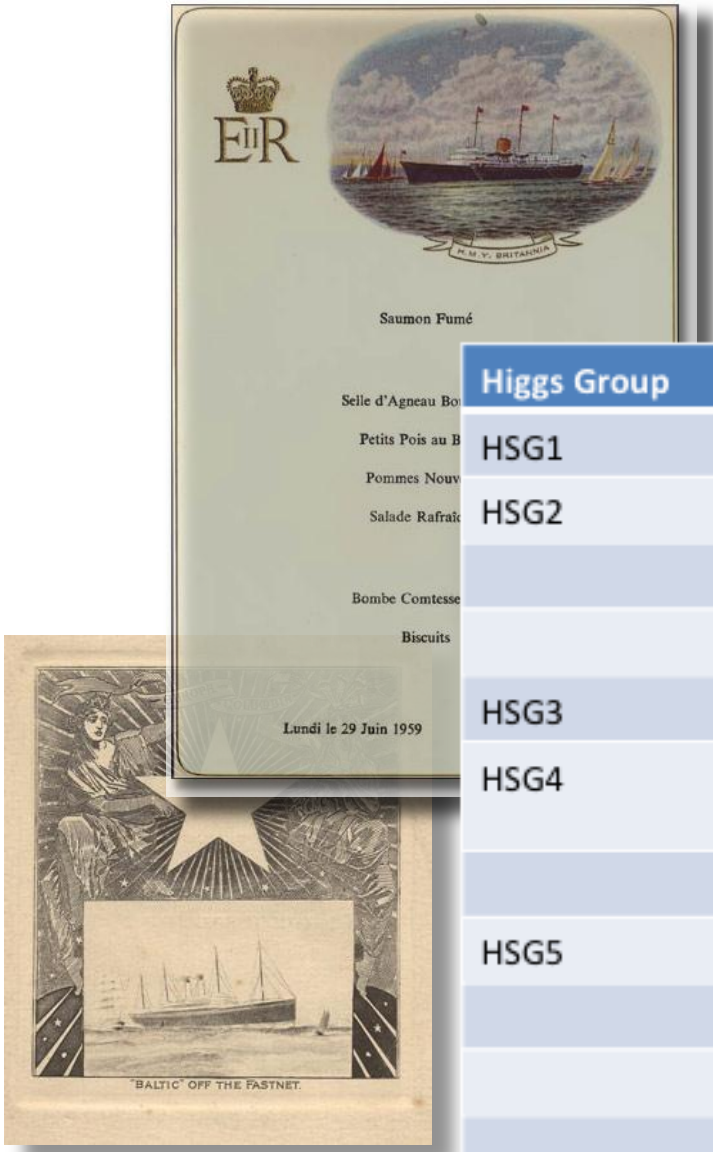
HIGGS TRIGGER MENU

ATLAS-UK Higgs Group Meeting – 19th July 2010

Ricardo Gonçalo – Royal Holoway University of London

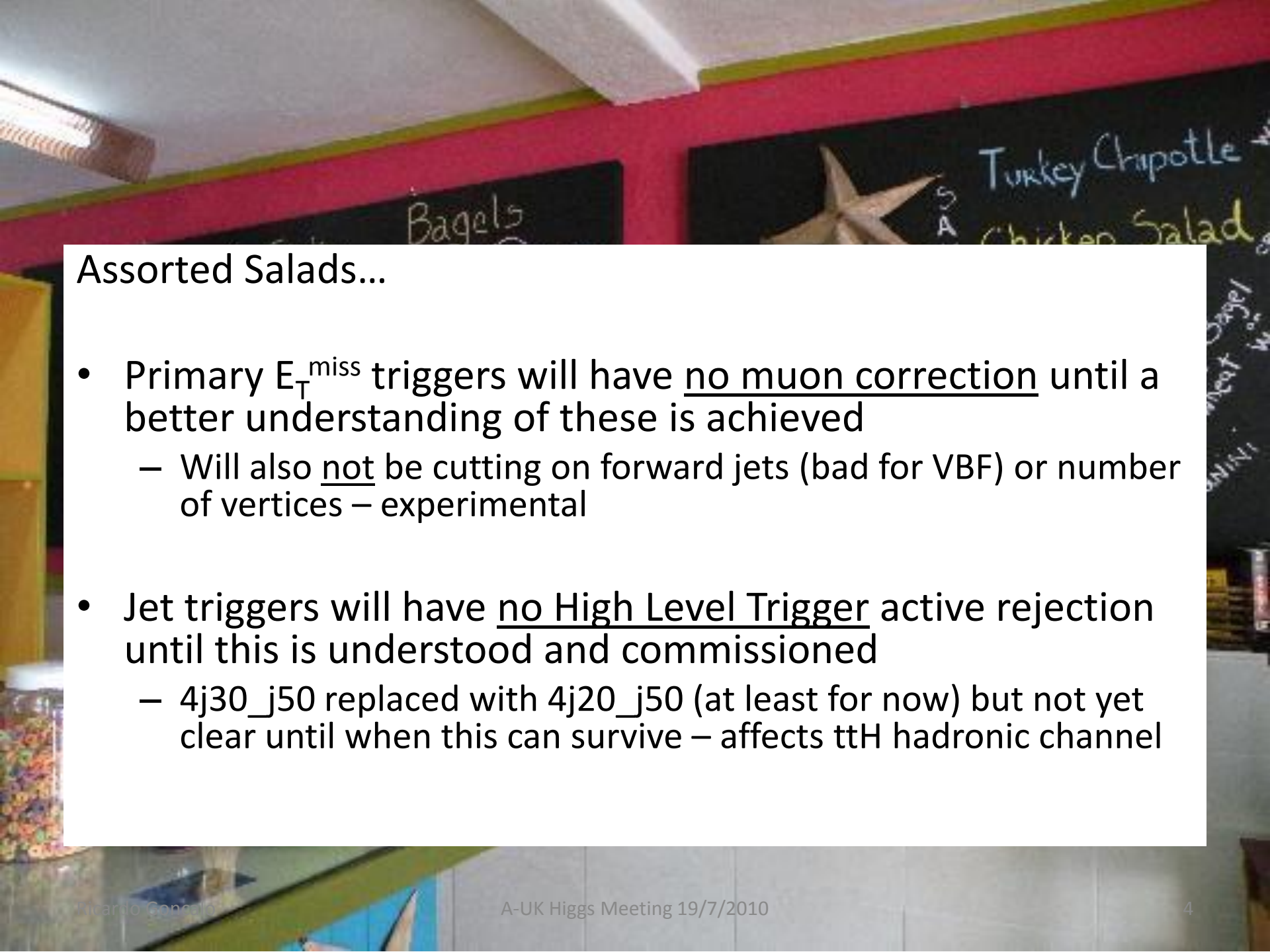


Higgs Trigger Crew

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

Starters

- Physics menu will be activated around July 19th technical stop
- Higgs Group requests made after last Higgs WG meeting (and many many emails):
  - Higgs WG talk:
  - http://indico.cern.ch/getFile.py/access?contribId=2&resId=1&materialId=slides&confId=86986
  - Menu request:
  - https://savannah.cern.ch/bugs/?68310
- Several changes since, as more data was taken and rate estimates became better
- Current status of menu design is almost the final one; some changes still coming in
  - Can be seen in CAFHLT nightly releases through atlas-trigconf:
    - http://atlas-trigconf.cern.ch/nightlies/display/release/15.6.X.Y.Z/project/CAFHLT/nightly/rel_4/name/Physics_pp_v1_15.6.9.11.1/
- Further changes will be possible as needed, but at a low rate for stability
- This talk gives a (very) short account of the menu



Assorted Salads…

- Primary E_T^{miss} triggers will have no muon correction until a better understanding of these is achieved
  - Will also not be cutting on forward jets (bad for VBF) or number of vertices – experimental
- Jet triggers will have no High Level Trigger active rejection until this is understood and commissioned
  - 4j30_j50 replaced with 4j20_j50 (at least for now) but not yet clear until when this can survive – affects ttH hadronic channel

$\mathcal{L} = 1x10^{30}\ cm^{-2}s^{-1}$

Trigger	Classification	Obs.
e/gamma:		
g10_loose	primary	for H->γγ event selection until rates too high: don't prescale while possible
2g10_loose	backup	for H->γγ: backup for event selection at higher lumi if needed
em105_passHLT	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v, H->2l2b, ttH (semileptonic), tbH+, H->γγ event selection: avoid efficiency drop at high pT common in other e/gamma chains
e10_loose	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+ : primary trigger for signal selection
e15_medium	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if e10_medium rate too high (since e15_loose seems to have same rate as e10_medium)
2e5_medium	primary	for H->ττ - leptonic, H->WW (gg, VBF, WH, ttH, inv.): primary to increase efficiency in 2-e final state; ZH->inv.
muon:		
mu10	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+, light H+->tau(lep)nu or csbar or a1W: primary trigger for signal selection
2mu6	primary	for H->ττ leptonic (primary to increase efficiency in 2-mu final state) and light H+->a1W->uuW, ZH->inv.
mu13	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if mu10 rate too high
mu6	support	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: support trigger for rate and bias studies
tau:		
tau20_loose	primary	for light H+ hadronic final state event selection
2tau12_loose	primary	for H->ττ hadronic final state event selection

Trigger	Classification	Obs.
ETmiss:		
xe30_noMu	primary	for light H+ hadronic channel
jet:		
4j35	primary	for ttH hadronic: primary trigger for event selection (90% eff. at 10TeV) - keep unprescaled whenever possible
4j30_j50	primary	for ttH hadronic: primary trigger for event selection at 10^30 if rates allow - otherwise go to 4j20_3j40_2j60
b-jet:		
3b10_4L1J5	primary	for ttH hadronic: primary trigger for event selection if rates allow, otherwise go to…
3b10_4L1J10	backup	for ttH hadronic: backup for 3b10_4L1J5
3b15_4L1J10	test	for ttH hadronic: test for higher lumi
EF_mu4_l1j5_matched	support	for ttH hadronic: to produce a b-enriched sample for b-tagging studies; go to lower
EF_mu4_l1j10_matched	support	... or higher thresholds depending on rate to get more stats
combined		
e10_loose_mu6	primary	for H->ττ - leptonic: primary to increase efficiency in e-mu final state
e5_medium_mu4	support	for H->ττ - leptonic: support trigger for e-mu final state for fake studies
tau12_loose_e10_loose	primary	for H->ττ - lep-had: primary for e-tau final state
tau12_loose_mu10	primary	for H->ττ - lep-had: primary for mu-tau final state
tau12_loose_2b15	primary	for tbH+ -> 2b W(had) tau(had) nu: primary trigger for event selection
tau12_loose_xe15_noMu	primary	for tbH+ -> 2b W(had) tau(had) nu, H->ττ hadronic final state event selection
j35_xe30_mu15	test	for heavy tbH+: test trigger to allow studies for higher lumi
j35_xe30_e15_medium	test	for heavy tbH+: test trigger to allow studies for higher lumi

$\mathcal{L} = 1x10^{31}\ cm^{-2}s^{-1}$

Trigger	Classification	Obs.
e/gamma:		
g20_loose	primary	for H->γγ event selection until rates too high: don't prescale while possible
2g10_loose	primary	for H->γγ: backup for event selection at higher lumi if needed
g10_loose	support	for H->γγ: support trigger for efficiency estimation
g30_tight	primary	for H->γγ: test trigger to be used for selection at higher lumi
em105_passHLT	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v, H->2l2b, ttH (semileptonic), tbH+, H->γγ event selection: avoid efficiency drop at high pT common in other e/gamma chains
e10_medium	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+ : primary trigger for signal selection
e15_medium	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if e10_medium rate too high (since e15_loose seems to have same rate as e10_medium)
2e5_medium	primary	for H->ττ - leptonic, H->WW (gg, VBF, WH, ttH, inv.): primary to increase efficiency in 2-e final state; ZH->inv.
muon:		
mu10	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+, light H+->tau(lep)nu or csbar or a1W: primary trigger for signal selection
2mu6	primary	for H->ττ leptonic (primary to increase efficiency in 2-mu final state) and light H+->a1W->uuW, ZH->inv.
mu13	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if mu10 rate too high
mu6	support	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: support trigger for rate and bias studies
tau:		
tau38_loose	primary	for light H+ hadronic final state event selection
2tau16_loose	primary	for H->ττ hadronic final state event selection

Trigger	Classification	Obs.
ETmiss:		
xe30_noMu	primary	for light H+ hadronic channel
jet:		
4j35	primary	for ttH hadronic: primary trigger for event selection (90% eff. at 10TeV) - keep unprescaled whenever possible
4j30_j50	primary	for ttH hadronic: primary trigger for event selection at 10^30 if rates allow - otherwise go to 4j20_3j40_2j60
b-jet:		
3b10_4L1J5	primary	for ttH hadronic: primary trigger for event selection if rates allow, otherwise go to…
3b10_4L1J10	primary	…this one
3b15_4L1J10	test	for ttH hadronic: test for higher lumi
EF_mu4_l1j5_matched	support	for ttH hadronic: to produce a b-enriched sample for b-tagging studies; go to lower
EF_mu4_l1j10_matched	support	... or higher thresholds depending on rate to get more stats
combined		
e10_loose_mu6	primary	for H->ττ - leptonic: primary to increase efficiency in e-mu final state
e5_medium_mu4	support	for H->ττ - leptonic: support trigger for e-mu final state for fake studies
tau12_loose_e10_loose	primary	for H->ττ - lep-had: primary for e-tau final state
tau12_loose_mu10	primary	for H->ττ - lep-had: primary for mu-tau final state
tau16_loose_2b15	primary	for tbH+ -> 2b W(had) tau(had) nu: primary trigger for event selection
tau12_loose_xe15_noMu	primary	for tbH+ -> 2b W(had) tau(had) nu, H->ττ hadronic final state event selection
j35_xe30_mu15	test	for heavy tbH+: test trigger to allow studies for higher lumi
j35_xe30_e15_medium	test	for heavy tbH+: test trigger to allow studies for higher lumi

$\mathcal{L} = 1x10^{32}\ cm^{-2}s^{-1}$

Trigger	Classification	
e/gamma:		
g30_tight	primary	for H->γγ event selection
2g15_loose	primary	for H->γγ event selection
g15_loose	support	for H->γγ: support trigger for efficiency estimation
em105_passHLT	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v, H->2l2b, ttH (semileptonic), tbH+, H->γγ event selection: avoid efficiency drop at high pT common in other e/gamma chains
e15_medium	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+ : primary trigger for signal selection
e20_medium	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if e10_medium rate too high (since e15_loose seems to have same rate as e10_medium)
2e5_medium	primary	for H->ττ - leptonic, H->WW (gg, VBF, WH, ttH, inv.): primary to increase efficiency in 2-e final state; ZH->inv.
2e10_medium	backup	for H->ττ - leptonic, H->WW (gg, VBF, WH, ttH, inv.): backup for 2e5_medium
muon:		
mu13	primary	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+, light H+->tau(lep)nu or csbar or a1W: primary trigger for signal selection
2mu6	primary	for H->ττ leptonic (primary to increase efficiency in 2-mu final state), light H+->a1W->uuW, ZH->inv.
mu15	backup	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: backup trigger if mu10 rate too high
2mu10	backup	for H->ττ - leptonic, H->WW (gg, VBF, WH, ttH, inv.): backup for 2mu6
mu6	support	for H->WW (gg, VBF, WH, ttH, inv.), H->4l, ZH->inv, H->2l2τ, H->2l2v and H->2l2b, H->ττ->lh and ll, ttH (semileptonic), tbH+: support trigger for rate and bias studies
tau:		
tau38_medium	primary	for light H+ hadronic final state event selection
2tau29_loose	primary	for H->ττ hadronic final state event selection
tau50_medium	backup	for light H+ hadronic final state: backup for tau38_medium (can't go any higher for this channel)

Trigger	Classification	
ETmiss:		
xe30_noMu	primary	for light H+ hadronic channel
xe35_noMu	backup	for light H+ hadronic channel: backup for xe30
jet:		
4j35	primary	for ttH hadronic: primary trigger for event selection (90% eff. at 10TeV) - keep unprescaled whenever possible
4j30_j50	primary	for ttH hadronic: primary trigger for event selection at 10^30 if rates allow - otherwise go to 4j20_3j40_2j60
b-jet:		
3b10_4L1J5	backup	for ttH hadronic: in case rate affordable
3b10_4L1J10	primary	for ttH hadronic: primary trigger for event selection if rates allow, otherwise go to…
3b15_4L1J10	test	test for higher lumi
EF_mu4_l1j5_matched	support	for ttH hadronic: to produce a b-enriched sample for b-tagging studies; go to lower
EF_mu4_l1j10_matched	support	... or higher thresholds depending on rate to get more stats
combined		
e10_loose_mu6	primary	for H->ττ - leptonic: primary to increase efficiency in e-mu final state
e10_loose_mu10	primary	for H->ττ - leptonic: backup to e10_loose_mu6
e5_medium_mu4	support	for H->ττ - leptonic: support trigger for e-mu final state for fake studies
tau12_loose_e10_loose	primary	for H->ττ - lep-had: primary for e-tau final state
tau12_loose_mu10	primary	for H->ττ - lep-had: primary for mu-tau final state
tau12_loose_2b15	primary	for tbH+ -> 2b W(had) tau(had) nu: primary trigger for event selection
tau16_loose_xe25_noMu	primary	for tbH+ -> 2b W(had) tau(had) nu, H->ττ hadronic final state event selection
j35_xe30_mu15	test	for heavy tbH+: test trigger to allow studies for higher lumi
j35_xe30_e15_medium	test	for heavy tbH+: test trigger to allow studies for higher lumi


Comments?

Backup Slides

(cc) CAROL ESTHER/FLICKR

HSG1: H -> ↖↖

Li Yuan

- $\mathcal{L} = 10^{30}$ to 10^{31} $cm^{-2}s^{-1}$:
  - g20_loose – primary trigger (7 $Hz^{(1)}$ 15 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - 2g20_loose – backup trigger: will become primary trigger when needed (>10^{32} $cm^{-2}s^{-1}$?)
  - g20i_loose – supporting trigger: study isolation at Level 1
  - g10_loose (11 $Hz^{(1)}$ 35 $Hz^{(2)}$ at 10^{30} $cm^{-2}s^{-1}$) or g5_loose – support triggers for efficiency determination (bootstrap); can be prescaled to a low rate

- $\mathcal{L} = 10^{32}$ $cm^{-2}s^{-1}$:
  - Primary trigger: g20_loose (70 $Hz^{(1)}$ – prescaled) or g20_medium (no prescale expected?)
  - 2g20_medium or g20_g30_loose – primary trigger for event collection
  - g20i_loose – supporting trigger: study isolation at Level 1
  - g10_loose or g5_loose – backup triggers for bootstrap methods; heavily prescaled

- Questions:
  - Any reason to not go to g20_medium or g20_tight at 10^{32} if g20_loose prescaled?
  - Why use both g20_loose and 2g20_loose as primary triggers?
  - Rates I saw are still uncertain (Li's rates larger then egamma trigger) – how are they calculated?
  - If we need to use new trigger (g30_g20) should justify – what's increase in efficiency?

(1) Extrapolated – see Rainer Stamen in http://indico.cern.ch/conferenceDisplay.py?confId=94961

(2) Estimated in MC https://twiki.cern.ch/twiki/bin/view/Atlas/AtlasTriggerRates

HSG2: H->ZZ*->llll

Diego Rodriguez

- $\mathcal{L} = 10^{30}$ to 10^{31} $cm^{-2}s^{-1}$:
  - e10_medium – primary trigger (34 Hz[(1)] or 48 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$)
  - e12_medium – backup for e10_medium if rate too high
  - e10_medium_SiTrk – supporting (alternative L2 tracking)
  - mu10 – primary trigger (15 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$)
  - mu6 – supporting (4.4 Hz[(2)] – prescale 200 – at 10^{31} $cm^{-2}s^{-1}$)
  - mu15 – backup for mu10 (3 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$)

- $\mathcal{L} = 10^{32}$ $cm^{-2}s^{-1}$:
  - e15_medium – primary trigger (10 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$)
  - e15_medium_SiTrk – suporting (still needed?)
  - e20_medium – (2 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$) backup for e15_medium if the rate too high
  - mu13 – primary trigger (no rates found)
  - mu15 – (3 Hz[(2)] at 10^{31} $cm^{-2}s^{-1}$) backup for mu13
  - mu10 – supporting

- Questions:
  - Could we have e10_tight (or e15_medium) as backup for e10_medium instead at 1e31?
  - Supporting trigger e15_medium_SiTrk still needed at 1e32?
  - For 1e32 would mu15 be ok if mu13 not in menu? (How much would we loose?)
  - Any reason to go to di-lepton triggers? (I.e. is there need to lower p_T thresholds? Or is there some margin?)

(1) Extrapolated – see Rainer Stamen in http://indico.cern.ch/conferenceDisplay.py?confId=94961

(2) Estimated in MC https://twiki.cern.ch/twiki/bin/view/Atlas/AtlasTriggerRates

ZH->inv, H->2l2τ, H->2l2ν and H->2l2b

Paul Thompson
Sylvie Brunet

- All four analyses rely on leptons for trigger
- In signal these come from Z decay
- Can use same triggers as H->4l channel in previous page

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

Gemma Wooden

- $\mathcal{L} = 10^{30}$ to 10^{32} $cm^{-2}s^{-1}$:
  - e10_medium and mu10 – primary single lepton triggers for H->WW->ll (l = e,mu)
  - 2e5_medium(2 Hz(2) at 10^{31} $cm^{-2}s^{-1}$) and 2mu6 – backup: di-lepton trigger in case offline lepton p_T may be lowered
  - e10_loose – support trigger to study fake rate
- VBF trigger: seems useful at ≈ 10^{32} $cm^{-2}s^{-1}$, when single-lepton triggers need to get tight
  - Di-jet trigger + rapidity gap + lepton
  - Lepton p_T threshold low (perhaps ~8 GeV)
  - Would give gain in phase space for VBF H->WW at the cost of little extra rate
  - In the tau channel, this trigger increases the number of events by 20-25%, but lower gain expected for WW channel

- Questions:
  - Rates too high for above single-lepton triggers at 10^{32} $cm^{-2}s^{-1}$. Would the ones below be ok? (I.e. how much do we loose?)
    - e15_medium – primary trigger (10 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
    - e20_medium – (2 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for e15_medium if the rate too high
    - mu13 – primary trigger (no rates found)
    - mu15 – (3 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for mu13
  - Would e10_loose_mu6 be useful? (with e10_medium_mu10 for higher lumi) – requested for H->ττ
  - Would be great to have lepton trigger efficiencies and p_T spectrum
  - VBF trigger:
    - Which di-jet+gap trigger? (EF_2j40_deta3_5, EF_2j20_deta3_5, EF_2j10_deta3_5, EF_2j10_deta5? Prescales not yet known)
    - Can we live with existing lepton pT cut ? E.g. electron 10GeV, muon 6GeV. What would we gain with pT >5GeV for electrons?
    - What is the efficiency for signal with each possibility?

HSG4: H->ττ leptonic and lep-had

- From: https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsττTrigger and input from Matthew
- $\mathcal{L} = 10^{30}$ to 10^{31} $cm^{-2}s^{-1}$:
  - e10_medium – primary trigger (34 $Hz^{(1)}$ or 48 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - e12_medium – backup for e10_medium if rate too high
  - e10_medium_SiTrk – supporting (alternative L2 tracking)
  - mu10 – primary trigger (15 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - mu6 – supporting (4.4 $Hz^{(2)}$ – prescale 200 at 10^{31} $cm^{-2}s^{-1}$)
  - mu15 – backup for mu10 (3 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - e10_loose_mu6 – (1Hz $^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$): 50% increase in signal efficiency wrt e10_medium || mu10 – requested into Physics menu)
  - e5_medium_mu4 – support trigger for e10_loose_mu6 (fake rate & bias studies)

Matthew Beckingham
Henrik Nilssen

- $\mathcal{L} = 10^{32}$ $cm^{-2}s^{-1}$:
  - e20i_loose – primary trigger (10 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) – e20i_medium not in the menu (shall we request it?)
  - e15_medium, e20_medium – supporting
  - e25_medium – (≈0 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for e15_medium if the rate too high – e25i_medium not in phys menu
  - mu20 – primary trigger (2 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - mu10 or mu15 – supporting trigger: mu15 – (3 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for mu13
  - e10_loose_mu6 or e10_loose_mu10 – It may be necessary to go to higher muon p_T cut, depending on luminosity

- Questions:
  - Is list of single-lepton triggers up to date?
  - How do we gain so much (50%) by going from e10_medium || mu10 to e10_loose_mu6? (decrease in offline p_T cut?)
  - Obs.: 2e5_medium has 2 Hz at EF (1E31) but 2mu6 has 10Hz – can't assume they will be un-prescaled
  - Some healthy resistance in menu group to adding triggers in particular not clear about e5_medium_mu4

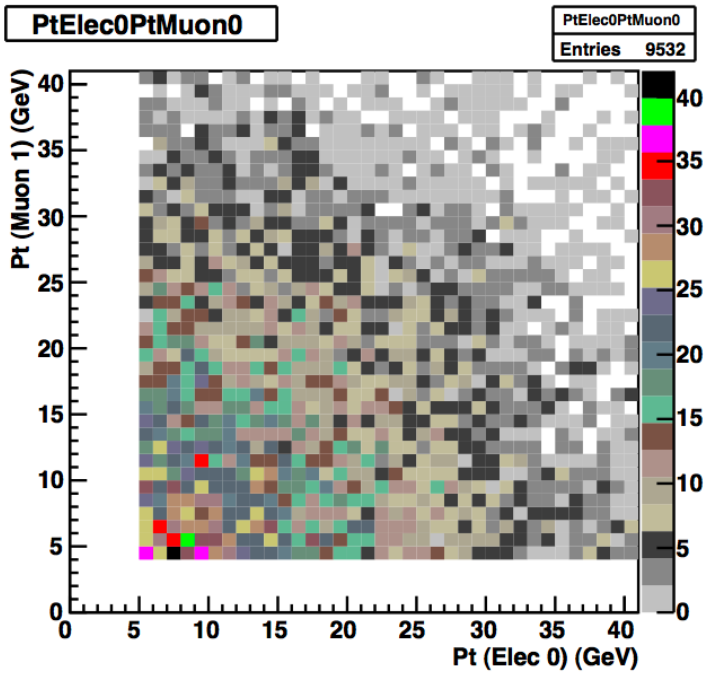
(1) Extrapolated – see Rainer Stamen in http://indico.cern.ch/conferenceDisplay.py?confId=94961
(2) Estimated in MC https://twiki.cern.ch/twiki/bin/view/Atlas/AtlasTriggerRates

H -> τ τ -> eν μν

Matthew Beckingham
Henrik Nilssen

- Could live with p_T thresholds for single-lepton triggers if the other remains low, but moving both to 20 costs ~35% of signal:
  - e10_medium|| mu10 → e10_medium mu20: keep ~99% of events
  - e10_medium || mu10 → e20_medium mu10: keep ~95% of events
  - e10_medium || mu10 → e15_medium mu15: keep ~88% of events
  - e10_medium || mu10 → e20_medium mu20: keep ~65-70% of events
- Solution: use di-electron, di-muon and e+mu trigger
  - Including e10_loose_mu6 we gain 50% more events wrt to e10_medium || mu10
  - Including e5_medium_mu4 we gain 56% more events wrt to e10_medium || mu10

  …and lowering electron and muon preselection cuts to p_T>5 GeV



Matthew Beckingham

HSG4: H->ττ Hadronic

Stefania Xella

- From: https://twiki.cern.ch/twiki/bin/view/AtlasProtected/Higgsττ#Trigger

- $\mathcal{L} = 10^{30}$ to 10^{31} $cm^{-2}s^{-1}$:
  - double tau:
  - primary trigger = 2tau20_loose – version with isolation (2tau20i_loose) not available in menu
  - support trigger = e10_medium || mu10 || xe30 – not clear which xeYY will be unprescaled for 1e31
  - backup trigger = 2tau29_loose – version with isolation (2tau29i_loose) not available in menu
  - tau+MET:
  - primary trigger = tau16_loose_xe25 – ok
  - support trigger = tau16i_loose_4j23 – not available in menu
  - backup trigger = tau16_loose_xe20 and tau16i_loose_xe25 - ok

- $\mathcal{L} = 10^{32}$ $cm^{-2}s^{-1}$:
  - double tau:
  - primary trigger = 2tau29i_loose – version with isolation (2tau29i_loose) not available in menu
  - support trigger = e20_medium || mu20 || xe40 – not clear which xeYY will be unprescaled for 1e32
  - backup trigger = 2tau38_loose - ok
  - tau+MET:
  - primary trigger = tau29i_loose_xe30 – not in physics menu
  - support trigger = ?
  - backup trigger = tau38_loose_xe40 – not in menu

- Questions:
  - List needs to be updated – some of the triggers not in Physics menu, but similar chains could be used (or request new if really needed)

HSG5: ttH (H->bb) semileptonic

Catrin Bernius

- Also including Fat-Jet analysis
- Basically need lowest un-prescaled single-lepton trigger; my proposal:
- $\mathcal{L} = 10^{30}$ to 10^{31} $cm^{-2}s^{-1}$:
  - e10_medium – primary trigger (34 $Hz^{(1)}$ or 48 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - e12_medium – backup for e10_medium if rate too high
  - mu10 – primary trigger (15 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - mu15 – backup for mu10 (3 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)

- $\mathcal{L} = 10^{32}$ $cm^{-2}s^{-1}$:
  - e15_medium – primary trigger (10 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$)
  - e20_medium – (2 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for e15_medium if the rate too high
  - mu13 – primary trigger (no rates found)
  - mu15 – (3 $Hz^{(2)}$ at 10^{31} $cm^{-2}s^{-1}$) backup for mu13

- Absolute efficiencies from CSC studies were 82% mu20 || e22i || e55, so we should be in safe ground for this year

- Obs.:
  - Jet triggers will be studied, but numbers are not available for now, so better hold off on requests

HSG5: ttH (H->bb) hadronic

Michael Nash

- Not clear what triggers are needed and possible at present
- Only jet triggers and E_T^{sum} could be useful
- Menu currently has some multi-jet triggers: EF_3j80, EF_4j40, EF_5j20
  - But not clear which will be prescaled and when
- Available numbers:
- For the MC@NLO fully hadronic ttbar dataset, the 'useful' chains I can see are:
  - EF_2j10 (100%) not in new menu
  - EF_2j20 (99%) not in new menu
  - EF_2j40 (96%) – looks very useful!
  - EF_3j20 (93%) percale 10 000 000!

HSG5: Heavy charged Higgs

Martin zur Nedden

- Looking at new menu:
  - The combinations of ”e + MET" and "tau + MET" currently in the menu are ok
  - A new combination ”e + MET + jet” exists but still to be checked
  - Missing combined triggers:
    - combination "mu + MET" is MISSING
    - combination "tau + MET + jet" is MISSING
    - combination "mu + MET + jet" is MISSING
  - And more details that I won’t mention