Introduction

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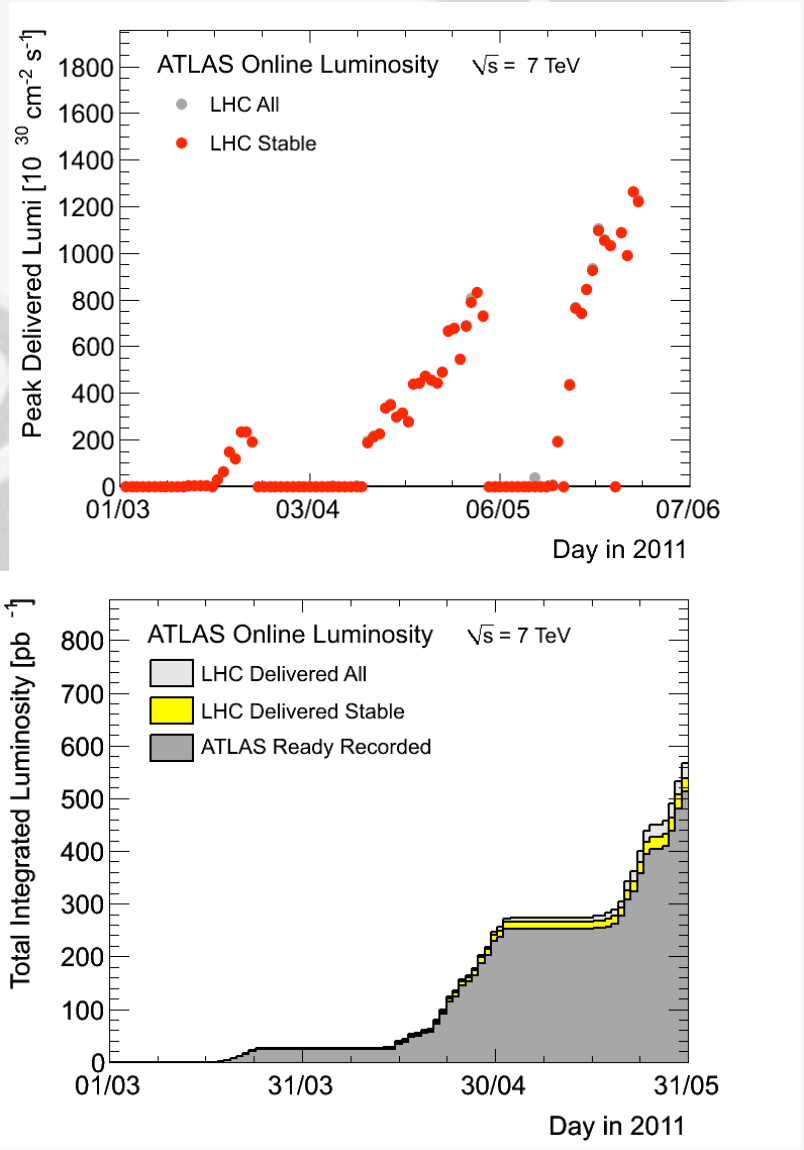
HSG5 H->bb weekly meeting, 31 May 2011

News! News! News!

- About 0.51 fb^{-1} collected with stable beams so far
- Peak pileup stays ≈ 10 collisions per bunch crossing
- Up to 1042 colliding bunches so far – will go up to 1380 in next few weeks
- Lumi up to $1.26x10^{33}cm^{-2}s^{-1}$
  - Should expect up to $5x10^{33}cm^{-2}s^{-1}$ in next few months
- Last few days collected almost as much data **per day** as in 2010!…



MC requests for H->bb

Current list in Junichi's page here:
https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsWGHSG5Dataset7TeV

People responsible for each requested MC sample:

- Un-boosted channels:
  - Haifeng – WH mH=110 GeV and 140GeV
  - Jike – ZH mH=110 GeV and 140GeV
  - (|Donny> + |Mike>) – ttH mH=110 GeV and 140GeV

- Boosted Higgs:
  - Wahid
    - WH, W->e/mu/tau+nu, H->bb, pt(H)>100GeV, Pt(W)>100GeV with 1e/mu filter, mH=110/120/130
    - ZH, Z->2e/2mu/2tau, H->bb, pt(H)>100GeV, Pt(W)>100GeV, mH=110/120/130
  - Song-Ming
    - ZH, Z->2nu, H->bb, pt(H)>100GeV, Pt(W)>100GeV, mH=110/120/130

Trigger News

- **Stefania Xella** replaced Gemma Wooden as Higgs trigger contact

- New **sample T** produced:
  - Allows quickly checking efficiency of new menus in signal samples
  - r2400 has conditions which do NOT include the noise suppression.
  - r2434 has conditions which DO include the noise suppression.
  - Find samples with e.f.: dq2-ls "valid*r2400*"
  - Samples with r2434 are being produced now

- **L1 calo** options (…or how can e/gamma and tau triggers survive?!)
  - Very interesting report form Stephen Hiller at TDAQ week: https://indico.cern.ch/getFile.py/access?contribId=41&sessionId=6&resId=1&materialId=slides&confId=112739
  - Introduce eta-dependent EM thresholds or L1 isolation
  - Can be studied on current MCs , to estimate efficiency losses

- **Important**: need study of analysis efficiency with several possible triggers, to **prepare for near term future**! (Discussion starting in tomorrow)
  - See details in Brian Petersen's talk: https://indico.cern.ch/getFile.py/access?resId=0&materialId=slides&confId=139948

Efficiencies for older release/menu (r2210) and new **sample T** (r2400)
WH inclusive sample: valid1.116127.HerwigH120W_bbinc.recon.AOD.e598_s933_s946_r2400
Should expect BR≈11% into each lepton flavour (13% including τ decays to e and μ)
See some clear **efficiency change** in new menu!! **How does this compare with our current signal MC??**
Note that we need to move to **e20_medium1** and **mu20*** already at $2x10^{33}$ (in principle after EPS)

	Efficiency for incl. WH (%)	
Single Electron Trigger	16.6.3.2.1/ r2210	16.6.4.2.1/ r2400
EF_e20_medium	10.9 ± 1	8.6 ± 0.7
EF_e20_medium1	11.7 ± 1	7.6 ± 0.6
EF_e20_medium2		7.8 ± 0.6
EF_e20_tight	9.2 ± 1	7.4 ± 0.6
EF_e22_medium	10.6 ± 1	8.3 ± 0.7
EF_e22_medium1		7.4 ± 0.6
EF_e22_medium2		7.6 ± 0.6
EF_e25_loose	11.1 ± 1	9.0 ± 0.7
EF_e25_medium	9.7 ± 1	7.8 ± 0.6
EF_e30_loose	9.7 ± 1	7.3 ± 0.6
EF_e30_medium		7.0 ± 0.6

	Efficiency for incl. WH (%)	
Single Muon Trigger	16.6.3.2.1/ r2210	16.6.4.2.1/ r2400
EF_mu18	9 ± 1	10.1 ± 0.7
EF_mu18_MG	8.8 ± 1	10.0 ± 0.7
EF_mu18_medium		9.8 ± 0.7
EF_mu20	8.3 ± 1	9.0 ± 0.7
EF_mu20_MG	8 ± 1	9.0 ± 0.7
EF_mu20_MG_medium		8.8 ± 0.7
EF_mu20i	5.8 ± 0.8	6.0 ± 0.6
EF_mu20i_medium		6.0 ± 0.6
EF_mu22	7.6 ± 1	8.6 ± 0.7
EF_mu22_MG	7.2 ± 1	8.6 ± 0.7
EF_mu100_MSonly	0.9 ± 0.3	1.0 ± 0.22

Trigger Timeline

- Current menu is stretched until end of July (if possible)
  - EF_e20_medium should be ok until then
  - Muon items seeded by L1MU10 may need to move to L1MU11
    - 3-station coincidence instead of 2; 10% loss in eta<1)

- Regarding L1 menu update for support triggers in case of too high rate until end of July:
  - There is one slot for possible update: June technical stop.
  - Please give feedback now if you think you need this

- By end of July the menu for 2-5E33 needs to be ready
  - This menu will look very different from the current one, with raised thresholds at L1 , not only at EF
  - So, it's important to find which trigger we'll use after EPS

Jet Vertex Fraction Bug

- Bug present in 16.6.X:
  - TRT tracks got accidentally included – no eta info, so set to point to (0,0,0)
  - Track-vertex association only done for one vertex – problems if with 2 nearby vertices
  - Savannah report: https://savannah.cern.ch/bugs/index.php?82544
  - Should be **fixed** in JetMomentTools-00-00-37-01

- Will be discussed in reconstruction meeting today: https://indico.cern.ch/conferenceDisplay.py?confId=141432

- Phys. Validation requests feedback from the physics groups:
  - Current data/MC agreement on JVF
  - Which information analyses would like to have in the future – e.g. flag to say if jet comes from PV? probability for that? JVF for different verteces, etc.

WH analysis

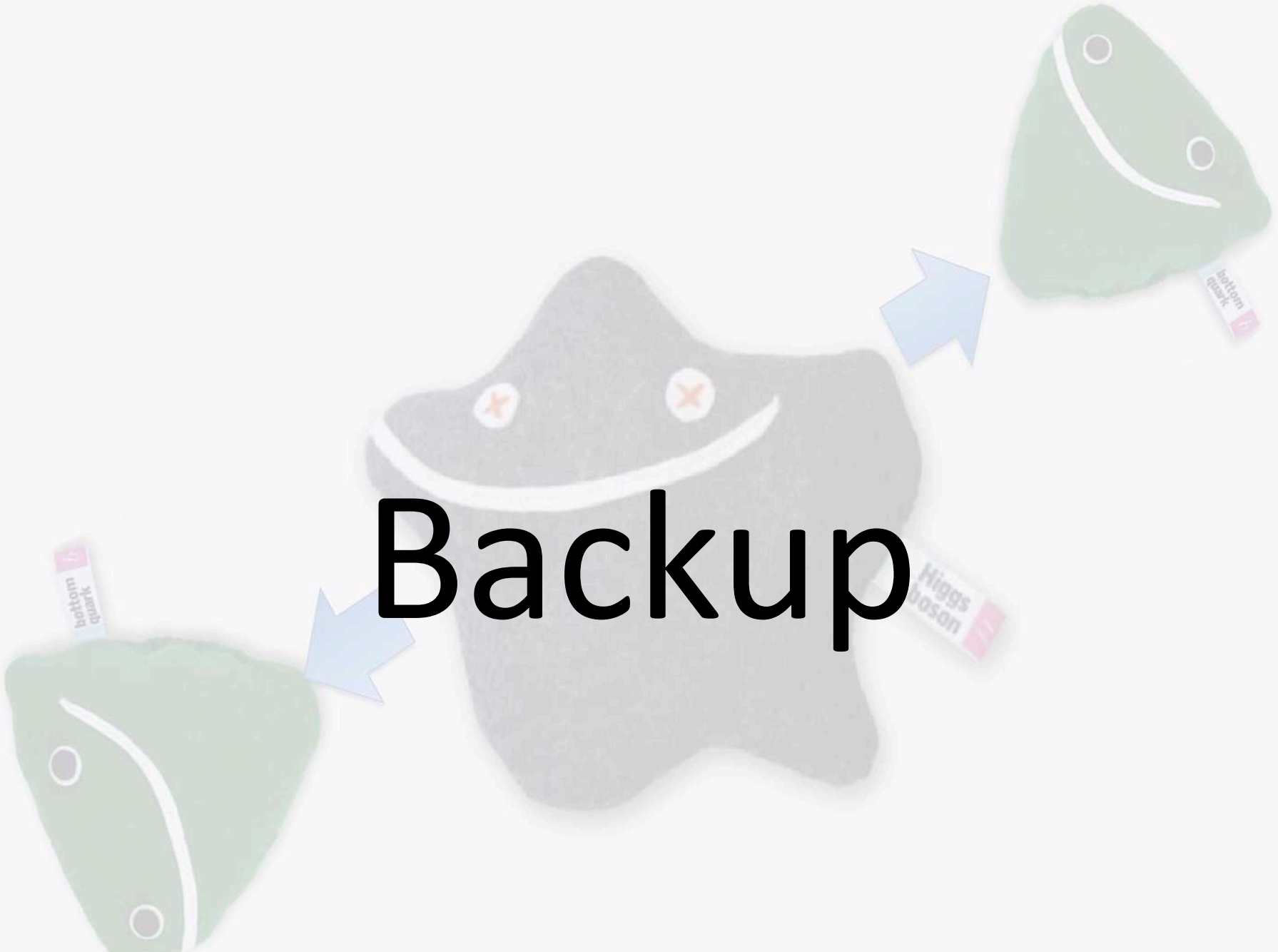
- Z0 and d0 cuts
- Jet Vertex Fraction
- To be agreed on today!

Preselection	
primary vertex	Nvtx>=1 & Ntrks>3
jet/MET cleaning	Loose
trigger	e20_medium || mu18_MG (if ok) or e20_medium1 || mu20_MG (backup)
Muon Selection	
finder	MUID incl. segment-tagged
pT	> 25 GeV
|eta|	< 2.4
MCP quality cuts	yes
|Z0 wrt PV|	TBD
|d0 wrt PV|	TBD
isolation	pTtrk20/pT<0.1
Electron selection	
author	1 or 3
PID	ElectronTight
pTcluster	> 25 GeV
|eta|	< 2.47 excl. crack
isolation	pTtrk20/pT<0.1
|z0 wrt PV|	TBD
|d0 wrt PV|	TBD
MET	
algorithm	MET_LocHadTopo + muon term
Jet selection	
finder	AntiKt4Topo
pT	> 25GeV
scale	EM+JES
|eta|	< 2.5
JVF	TBD
Overlap removal	
jet-e	remove jet for dR<0.4
mu-jet	remove muon for dR<0.4
Event selection	
b-tag (IP3D+SV1)	exactly 2 jets with w>4.5
lepton	exactly 1 lepton as defined above
MET	> 25GeV
b tag	exactly 2
MT	> 40 GeV

CONF note for EPS-HEP 2011

- Tight time scale – but feasible!
  - First **INT** note draft should be ready on 10 June
  - Finished finished by the end (20^{th} – 24^{th}) of June
  - Data frozen for EPS on 22 June – expect final calibrations etc soon after
  - **CONF** note circulated early July to be approved before conference
  - Conference starts 21 July

- Notes:
  - Re-using existing CDS number ATL-COM-PHYS-2010-929
  - Having a bit of difficulty finding willing and able editorial-board members
  - SVN area for note https://svn.cern.ch/reps/atlasgrp/Physics/Higgs/HSG5/data_7TeV/ATL_COM_PHYS_2010_929/trunk/



Backup

Poster abstract for EPS-HEP

H->bb searches with the ATLAS detector at the LHC

The H -> bb channel is extremely important for the observation of a Higgs boson signal at the LHC. In the Standard Model, this channel would provide a significant contribution to the Higgs boson search in the low mass region, where this decay mode constitutes the dominant Higgs decay channel. Due to the enormous jet production cross-section at the LHC, the search must target channels where the Higgs boson is produced in association with a weak boson, a pair of top quarks, or jets separated by a rapidity gap. It also requires complex techniques to reconstruct the signal and separate it from an overwhelmingly large background. We present the status of Higgs searches in the H->bb channel currently being performed within ATLAS.

- In case it's accepted we'll need a candidate to present it at EPS
- Please let me know by email before Friday if you would like to do this
- Will randomly choose a presenter from candidates

- Conferences:
  - for EPS-HEP, focus on papers instead of notes
  - Higgs approvals for EPS-HEP: 20th – 25th July

Summer 2011 Conferences

- PLHC, June 6th ⟹ Higgs approvals next week at latest
- LHCC, June 15th
- EPS, July 21st ⟹ Higgs approvals June 20th - 25th
- Lepton-Photon, August 21st
- SUSY11, August 28th

Remarks:

- Run the analysis during approval process to update the results with new data.
- PLHC results: based on conference notes.
  (write them as short as possible, since these are based on Moriond 2010 notes.)
- EPS and beyond: should be aiming for journal papers.
  - In some cases, circulation to ATLAS could be shortened,
    as some analyses will be already documented for PLHC.
  - Approval of paper plots during Open Discussion meetings:
    only if the paper can be sumbited to arXiv within the next 10 (to 14) days.

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https://indico.cern.ch/getFile.py/access?contribId=0&resId=0&materialId=slides&confId=136406

The 1e33 Menu

The main primary triggers

	Trigger	Rate (Hz)
Egamma Triggers	e20_medium	50
	2e12_medium	1.1
	e10_medium_mu6	4
	g40_tight	16
	g80_loose	2.7
	2g20_loose	1.7
	3e10_medium	0.1
	g40_loose_EFxe40	1.8
	g150_etcut	1.5

	Trigger	Rate (Hz)
Muons / BPhys Triggers	mu18	40
	2mu10	1.0
	2mu4_DiMu	18
	mu40_MSOnlyBarrel	4
	mu40_slow	0.2

	Trigger	Rate (Hz)
MET / TE	xe60_noMu	4
	te1000	0.1

	Trigger	Rate (Hz)
Jets / Hadronic Triggers	j180_a4tc_EFFS	6
	multijets	10
	fj100_a4tc_EFFS	0.3
	ht350_a4tc_EFFS	7
	j75_j30_anymct150	4
	b10_4L1J10*	15
	b10_L1JE140*	14

*Not in final configuration

	Trigger	Rate (Hz)
Taus / Combined	tau100_medium	8
	tau29_tau20_medium1	5
	tau29_xe35	6
	tau16_e15_medium	7
	tau16_mu15	6
	j75_xe45_loose	10
	HV triggers	4

	Trigger	Rate (Hz)
MinBias	rd0_filled	5

Prescaling Triggers

Priority Lists

Trigger (already disabled)	Baseline trigger
Priority 1	
e20_medium	e20_medium1
mu18	mu20
2mu4_DiMu	2mu4_Bmumu/Jpsimumu
2j30_j75_anmct150	2j30_j75_anymct175
3mu6_MSOnly	2mu6_MSOnly_g10_loose
tau20_medium1_tau29_medium1	2tau29_medium
e15_medium_xe30	e20_medium1
j75_a4tc_EFFS_xe45_loose	j75_a4tc_EFFS_xe55_loose
mu40_MSOnly_Tighter	mu40_MSOnly_Barrel
Priority 2	
2mu4_DY	2mu10
ht350	ht400
g40_tight	g80_loose
mu40_MSOnly_tight	mu40_MSOnly_Barrel
tau29_medium_xe35	tau29_medium_xs80
g100_etcut_g50_etcut	g150_etcut
2g15_loose	2g20_loose
High L1-Rate	
e15_tight	e20_medium
2e10_medium	2e12_medium

Prescaling depends not only on the EF rates, but also on the L1 and L2 hardware limits (detector readout, network, …)

No additional triggers expected to be prescaled till 1.5e33

WH Task List

https://twiki.cern.ch/twiki/bin/view/AtlasProtected/WHNoteSummer2011#Analysis_Tasks

Task	Obs	People
Trigger: study optimal trigger for the 2011 data. Bear in mind that single-lepton triggers will likely increase to pT thresholds of ≈20 GeV – i.e. analysis cuts will need to increase to ≈22 GeV; check also any sculpting, angular acceptance, etc	Does this need AODs? Enough info on WZ/top D3PDs? Sample A or sample T should have the foreseen menus Liaise with Gemma Wooden	
Muon reconstruction: investigate different options		Jinlong Zhang
Electron reconstruction: investigate alternatives	Inclusion/exclusion of cracks Inner detector cuts (B layer?)	
Pileup: what do we need to do with 2011 pileup	Reweighting method. Jet vertex fraction. Choice of vertex reconstruction	Jike Wang
Jet energy scale: investigate size of systematic uncertainty	Worry about b jets. Any way to improve di-jet mass resolution? Liaise with JetETmiss	Patricia Conde, Jose Maneira, Nuno Anjos
B tagging algorithms	Effect of each different choice on significance	Jinlong Zhang
Fast monitoring: implement WH baseline selection in online monitoring infrastructure	Example exists. Involves programming in Athena. Liaise with Fabien Tarrade.	Lianliang Ma
QCD background estimation from data		Michiel Sanders, Jonas Will

Reconstruction issues

- **Muon** CP group recommendations for release 16:
  - Reconstruction efficiency and isolation efficiency scale factors, momentum smearing functions
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/MCPAnalysisGuidelinesRel16
- Jet/Etmiss recommendations for **jet cleaning** in release 16:
  - Medium jet cleaning should give similar rejection to rel 15 cleaning but with better efficiency
  - Tight jet cleaning should not be used – still under discussion
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HowToCleanJets#Bad_jets_rel16_data
- New!: Final **b-tagging calibrations** for release 16 based on full 2010 data:
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/Analysis16
- e/gamma recommendations for **energy scale and resolution** in release 16:
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EnergyScaleResolutionRecommendations
  - And rescaler tool: https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EnergyRescaler
- Standard Model **W/Z** group **baseline selection** for release 16 (next 4 slides):
  - See discussion in W/Z group Sharepoint
  - Also, finer points (and perhaps the not so fine) still being discussed