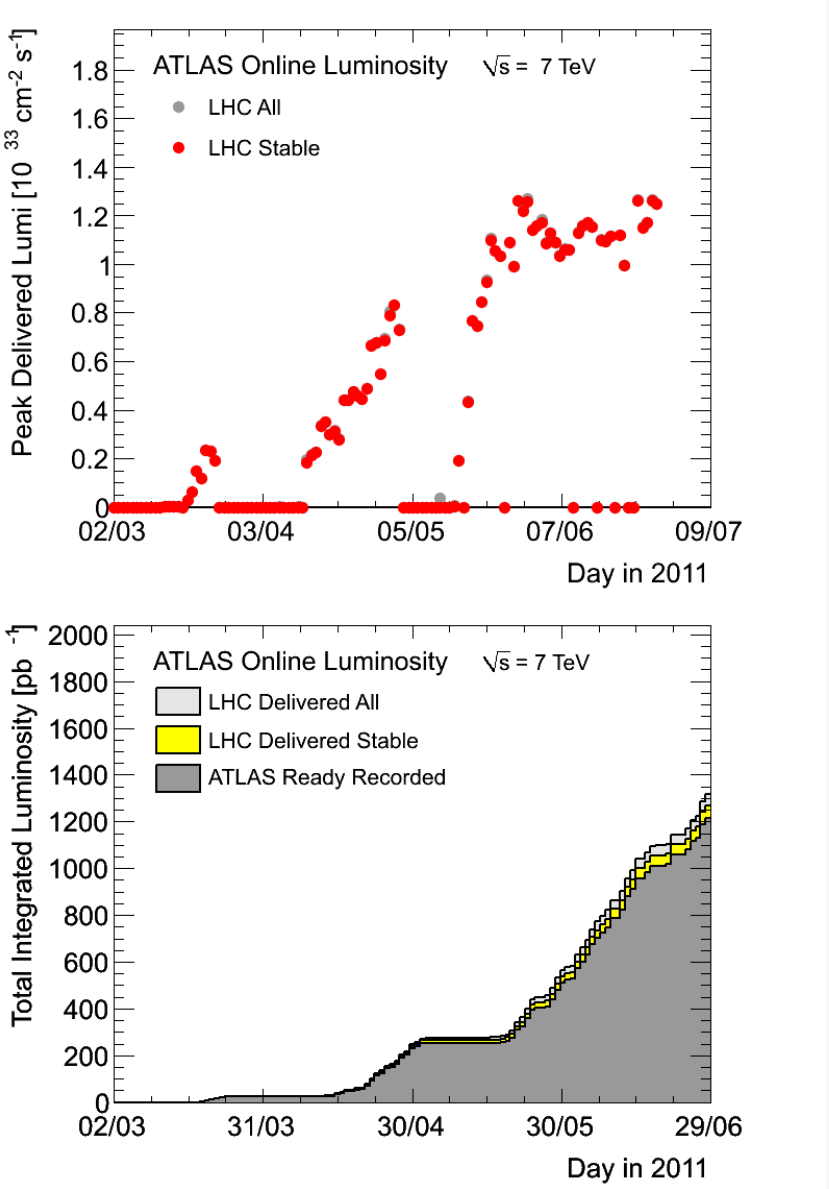
H->bb Note Plans for Summer

Ricardo Gonçalo (RHUL)

HSG5 H->bb weekly meeting, 28 June 2011

News! News! News!

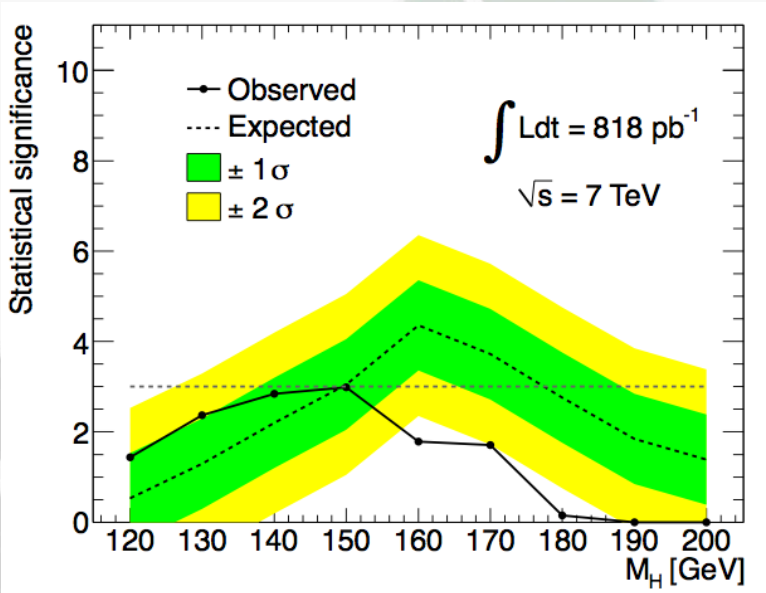
- About 1.2 fb^{-1} collected with stable beams so far (1.27 fb^{-1} delivered)
- Peak lumi stable at around $1.26x10^{33}cm^{-2}s^{-1}$
- 30 – 50pb^{-1} per day (peak so far was 60pb^{-1})
- 1318 colliding bunches

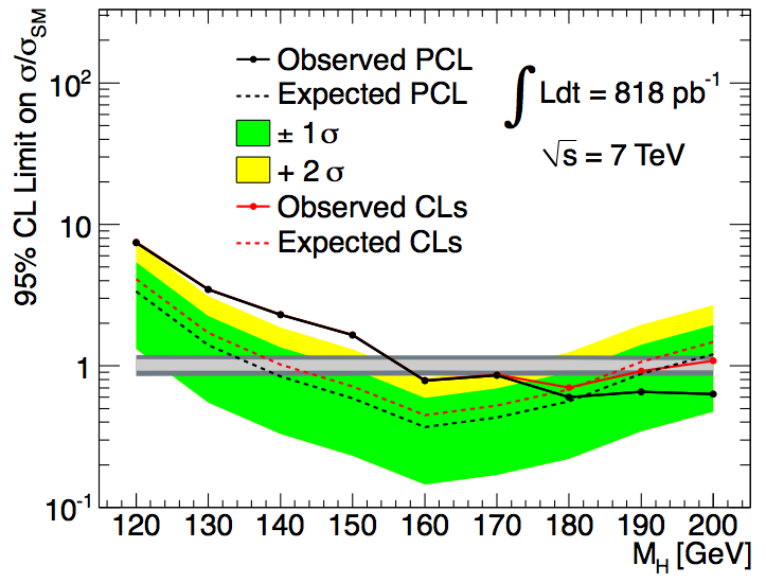


News! News! News!

H -> WW -> lvlv excess

- Excess in data in all channels being investigated
  - See Magda Cheltowska's talk last week: https://indico.cern.ch/getFile.py/access?contribId=7&resId=0&materialId=slides&confId=143469
- Cross checks between several analyses, event scans, the works
- Open issues:
  - Problem with the top background
  - Wrong tau polarization in MC
  - Mismodeling of the low pT electrons

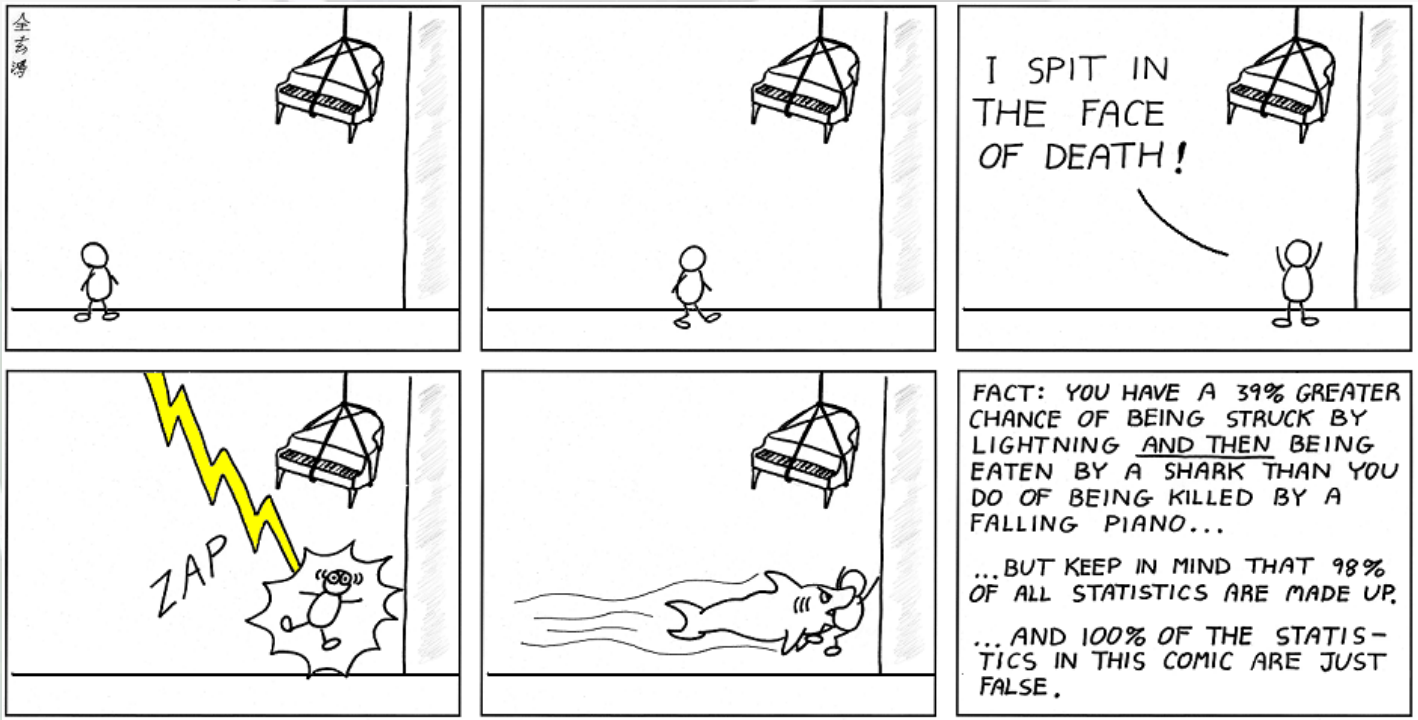




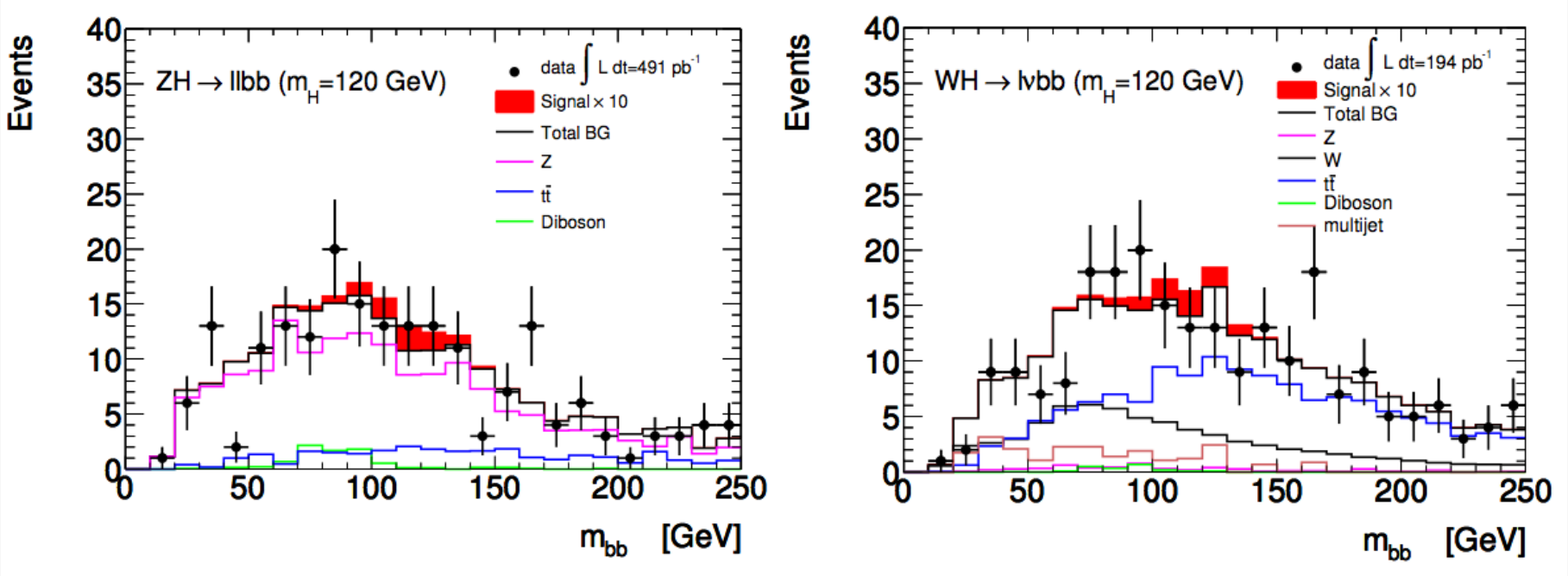
News! News! News!

Statistics Forum

- All ATLAS results for summer conferences should be made using CLs
- (All except analyses with a Bayesian history and Bayesian usage in CMS)



WH/ZH Note



- Second meeting with the editorial board last week
  - Next meeting right after weekly meeting today
- Note available in CDS: http://cdsweb.cern.ch/record/1307560?ln=en
  - List of authors to be updated soon (sorry, mea culpa)
- Our deadlines next…

Last call for EPS

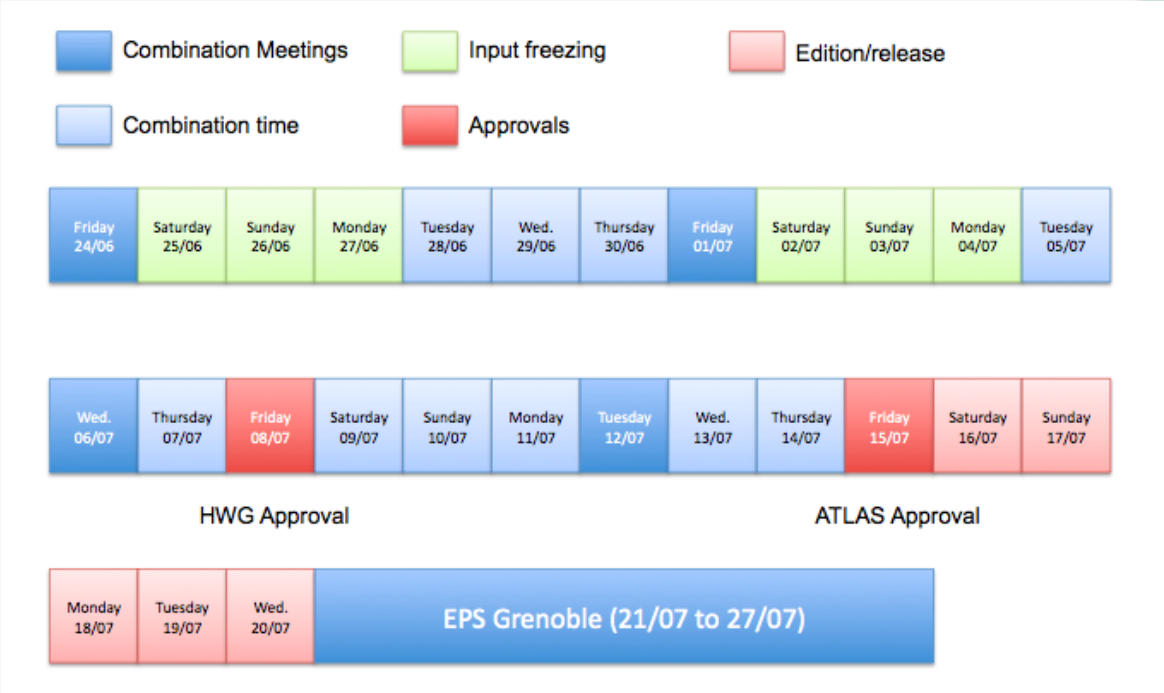
Leandro (ATLAS Week)

- **June 23rd**: final "analysis update"
  - Assumes ~ 7-10 days to run full analysis
  - **Data taken up to June 18th available with GRL (recorded L=1 fb^{-1});**
- **Jul 5th**: Drafts submitted to EdBoard
  - Early drafts should be circulated to the EdBoard earlier; very similar to PLHC
  - Final drafts on Jul 8th to PC;
- **Jul 9th:** last circulation of **Papers/Notes**
  - **Run again the full analysis to include the data after June 26th , at least for benchmark analyses? (technical stop on June 29thth, for ~10 days)**
- **Jul 15th**: last approval meetings
  - Present the circulated results and the ones obtained updating the analysis
- **Jul 18th**: conclude sign-offs of **Papers/CONF Notes**
  - Assumes 1 week for EdBoard and two sign-offs from PC/PubComm/Mngt
  - 18→20: 3 days contingency
- **Jul 21st**: EPS Conference

• This particular schedule can be adopted only for a few Papers and/or Notes (searches or more in general luminosity sensitive)

• Expect a "hot period" during next two weeks fully dominated by CONF/Paper approval meetings

Schedule for Setting Limits



- Combination meeting: https://indico.cern.ch/conferenceDisplay.py?confId=144353
- Inputs need to be:
  - Available today (28th June) – to have **limits** for INT note approval by Ed.board and Higgs WG on 30th
  - On 30th June – approval and **final decision** on whether to include in SM Higgs combination
  - **Frozen** by 4th July for Higgs approval on the 8th July
  - **Interpolated** inputs ready right after Higgs WH approval for input to ATLAS SM Higgs combination
  - ATLAS approval on 15th July

JVF-fixed D3PDs

- **Still need analysis cross check!** – cut-flow comparison between different analyses
- SMWZ D3PDs were produced by Haifeng with the bugfix for the Jet Vertex Fraction bug
  - Contain data from run 178044 (22 March 2011) to run 183021 (2 June)
  - Total (data+MC) is 2.7 TB
- Listed in https://twiki.cern.ch/twiki/bin/view/Main/PrivateD3PDWithJVFFix
- Transferred to UKI-LT2-RHUL_LOCALGROUPDISK
  - Should be accessible to everyone; let me know in case of problems
- More samples were produced and now being transferred to grid
- Thanks to Jonas for helping with remaining samples!

ReqID	DataPattern	DestinationSite	Status	NumDatasets All/Subscribed	SummarySize (GB)
34217	user.haifeng.mc10_7TeV.107*.AlpgenJimmyWenuNp*_pt2...	UKI-LT2-RHUL_LOCALGROUPDISK	subscribed	10 / 10	223.3026
34216	user.haifeng.mc10_7TeV.10*.PythiaB_cc*X.merge.NTUP...	UKI-LT2-RHUL_LOCALGROUPDISK	transfer	2 / 2	72.9053
34215	user.haifeng.mc10_7TeV.10*.PythiaB_bb*X.merge.NTUP...	UKI-LT2-RHUL_LOCALGROUPDISK	subscribed	3 / 3	214.9836
34212	user.haifeng.mc10_7TeV.105200.T1_McAtNlo_Jimmy.mer...	UKI-LT2-RHUL_LOCALGROUPDISK	transfer	3 / 3	57.4581
34211	user.haifeng.mc10_7TeV.116590.WH115lnubb_pythia.me...	UKI-LT2-RHUL_LOCALGROUPDISK	subscribed	1 / 1	2.7188
34210	user.haifeng.data11_7TeV.001*.physics_Muons.merge....	UKI-LT2-RHUL_LOCALGROUPDISK	transfer	67 / 67	946.4857
34152	user.haifeng.data11_7TeV.001*.physics_Egamma.merge...	UKI-LT2-RHUL_LOCALGROUPDISK	transfer	61 / 61	1125.8446
34151	user.haifeng.data11_7TeV.001*.physics_Egamma.merge...	UKI-LT2-RHUL_LOCALGROUPDISK	transfer	4 / 4	51.8227
34150	user.haifeng.data11_7TeV.00178109.physics_Egamma.m...	UKI-LT2-RHUL_LOCALGROUPDISK	subscribed	1 / 1	18.7077
34148	user.haifeng.data11_7TeV.00178047.physics_Egamma.m...	UKI-LT2-RHUL_LOCALGROUPDISK	done	1 / 1	0.4138
34147	user.haifeng.data11_7TeV.00178044.physics_Egamma.m...	UKI-LT2-RHUL_LOCALGROUPDISK	done	1 / 1	15.2501

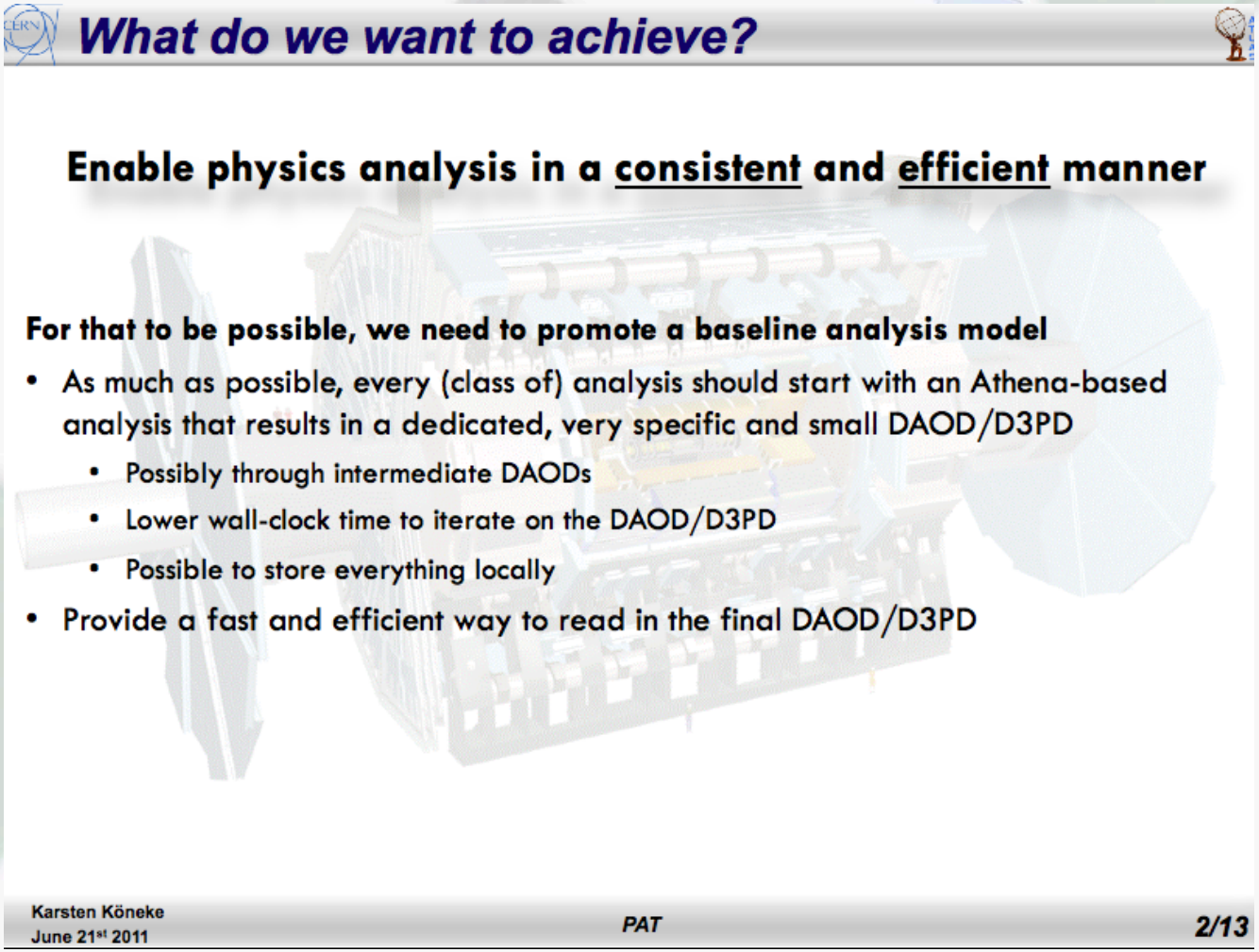
- Submitted abstract to Lepton Photon 2011 in Mumbai, starting August 22nd
  - ATLAS abstracts: https://indico.cern.ch/conferenceDisplay.py?confId=143052
- If accepted, will be presented by Koloina Randrianarivony who volunteered for this

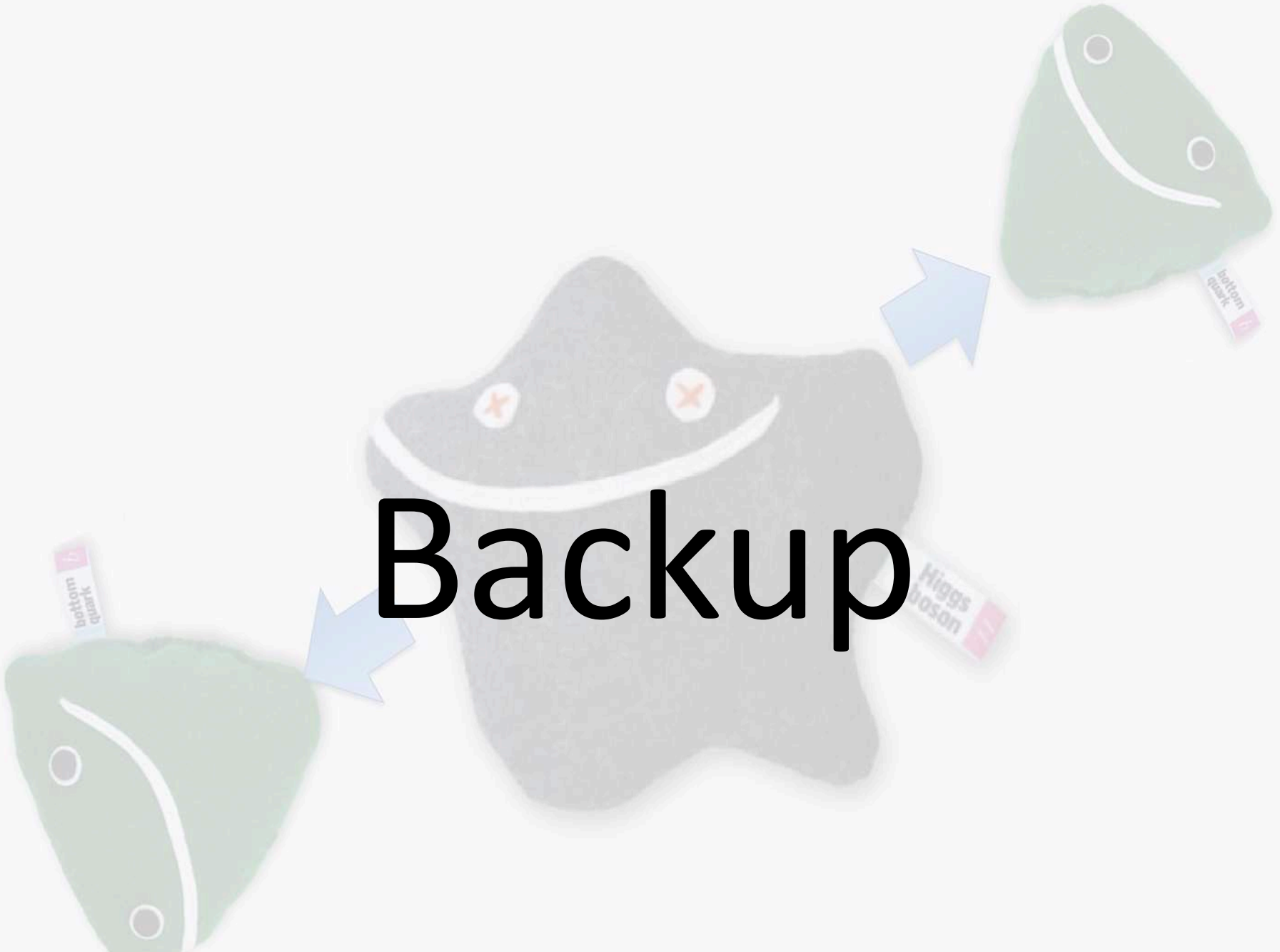
H->bb searches with the ATLAS detector at the LHC

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.

Other issues…

- PAT group has a vision…
  - See Karsten Koeneke's talk in ATLAS Week





Backup

WH/ZH Note: Missing Ingredients

- Moving to MC10b: done
- b tagging:
  - Need advanced tagger for increased background rejection
  - Efficiency scale factors almost done
  - Calibration & fake rate: preliminary on week of 20th June - will re-do analysis with final numbers
  - IP3D+SV1, 60% efficiency working point
- Jet Vertex Fraction:
  - Fix exists but applicable only to AOD-based analyses – i.e. only one analysis in our group
  - D3PDs including the bug fix exist for part of the 2011 run – being transferred to Grid site
  - **Validation**?
- Editorial board:
  - Richard Bateley (chair)
  - Alex Read
  - Emmanuel Lemonier
  - Niels van Eldik
  - Good 1st meeting with Ed.Board
- QCD background (incl. bb, cc):
  - Almost there
  - One **feature to be understood** in anti-track isolation QCD background in electron channel
  - Watch this space!
- Systematics:
  - First estimates done – dominated by b-tagging uncertainty (around 30%)
- SM Higgs combination:
  - Need to produce inputs for SM Higgs combination

https://indico.cern.ch/getFile.py/access?contribId=66&sessionId=8&resId=1&materialId=slides&confId=141246

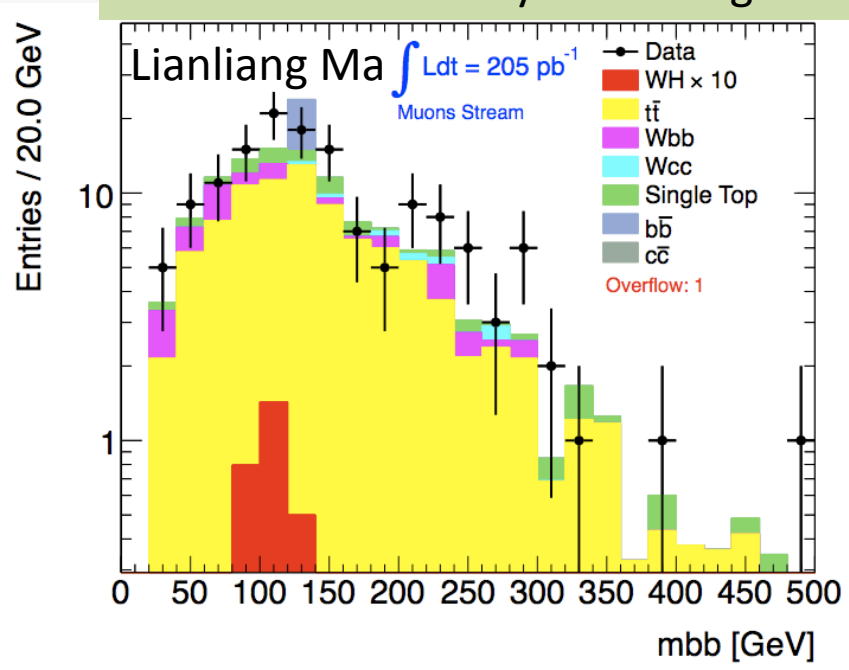
LHC actual versus design parameters

	design	present	comment
Beam energy	7 TeV	**3.5 TeV**	½ design
transv. norm. emittance	3.75 μm	**2.9 μm**	¾ design!
beta*	0.55 m	1.5 m	3x design
IP beam size	16.7 μm	34 μm	2x design
bunch intensity	1.15×10^{11}	**1.25×10^{11}**	higher than design
luminosity / bunch	3.6×10^{30} cm^{-2}s^{-1}	1.1×10^{30} cm^{-2}s^{-1}	only factor 3 away (x4 from energy!)
# bunches	2808	1092	approaching ½ design
bunch spacing	25 ns	**50 ns**	
beam current	0.582 A	0.236 A	close to ½ design
rms bunch length	7.55 cm	≥8.7 cm	
crossing angle	285 μrad	240 μrad	
"Piwinski angle"	0.64	≥0.31	
luminosity	10^{34} cm^{-2}s^{-1}	1.2×10^{33} cm^{-2}s^{-1}	>10% design

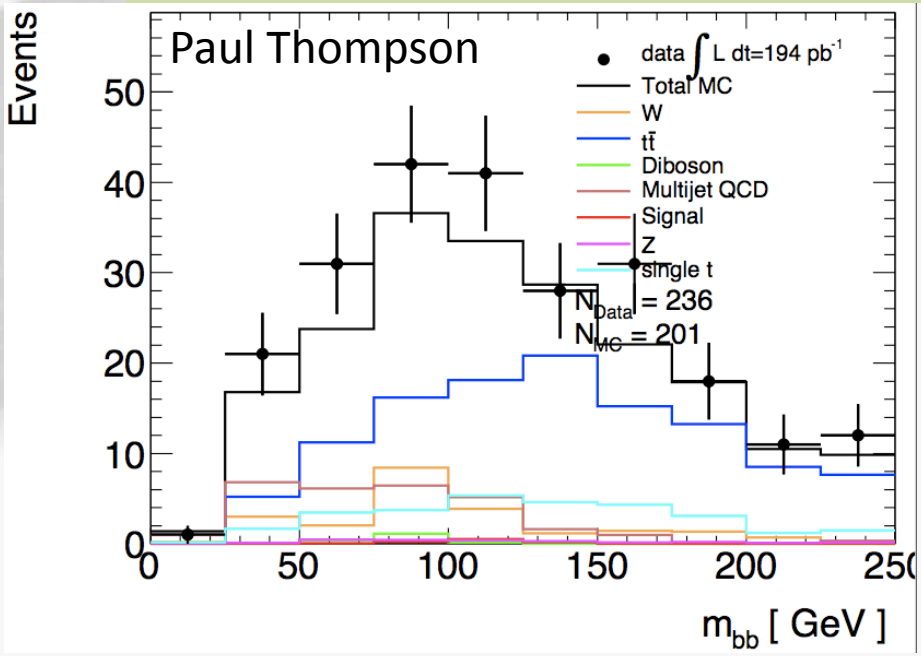
Do we need a JVF cut?

- In principle yes!…
- Need to use cut $N_{jets} = 2$ to suppress tt background; use $N_{jets} = 3$ as tt control region
- So must suppress spurious jets from pileup…

Njets < 4
All backgrounds from Monte Carlo
bb and cc MC clearly not enough



Njets = 2
QCD background from data
Before last scale factor (1-b sideband)



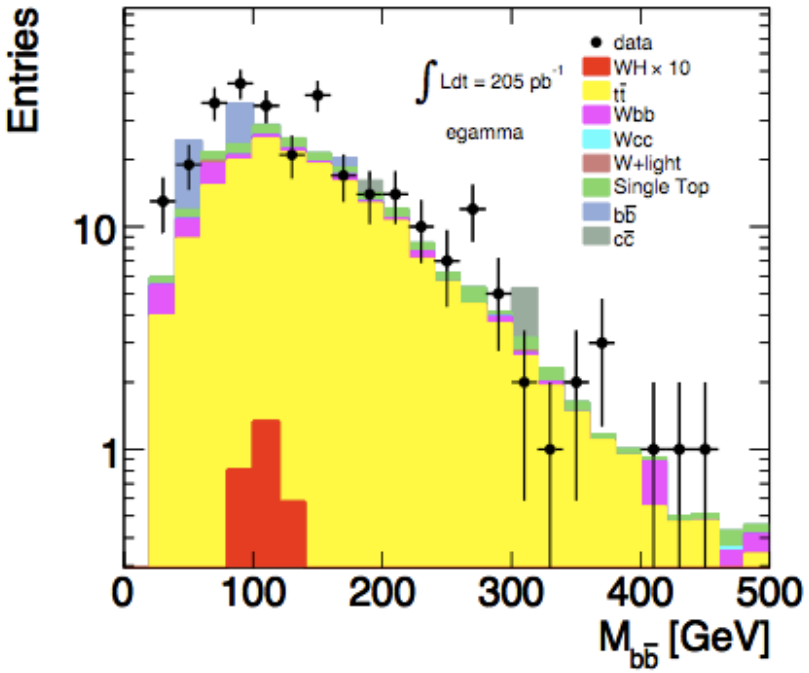
Do we need a JVF cut?

- In fact, not using the Jet Vertex Fraction seems to have a significant effect on Njets
- But a small effect after all cuts…

	data	tt MC
No JVF cut	303	200
JVF > 0.75	300	185

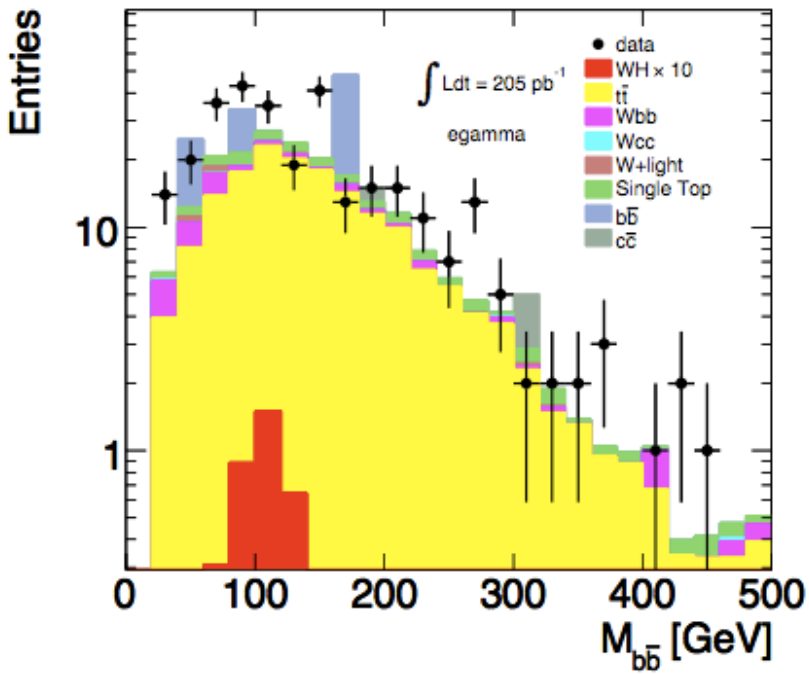
Haifeng Li

With JVF



Haifeng Li

No JVF



WH/ZH Note: Outlook

- Skeleton draft of INT note should be available now…
- Then a couple of weeks to finish details of QCD BG determination and interact with Editorial Board
  - Expect some changes to cuts etc during this
- Dataset frozen on 22 June (I think)
- Preliminary b-tagging calibrations around same time
- Aim for Higgs approval at end of June
- Last iteration with final b-tagging calibrations on…
- Circulate note to ATLAS for CONF approval in early July for approval in time for EPS