H->bb Note Plans for Summer

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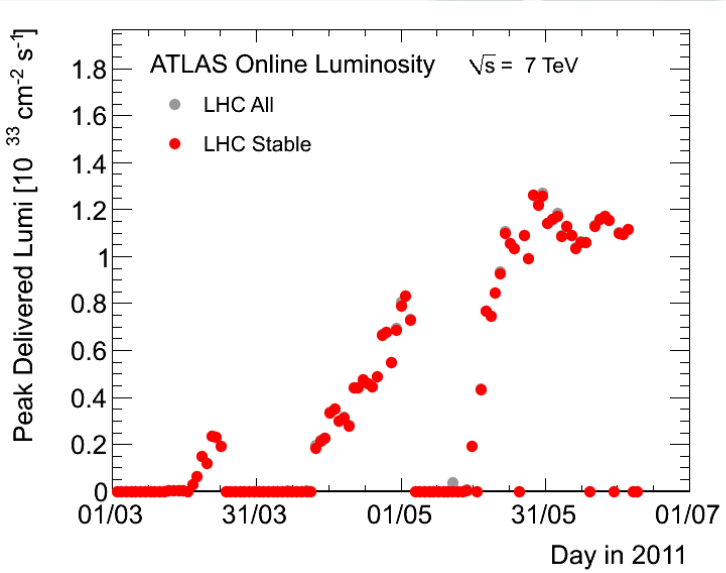
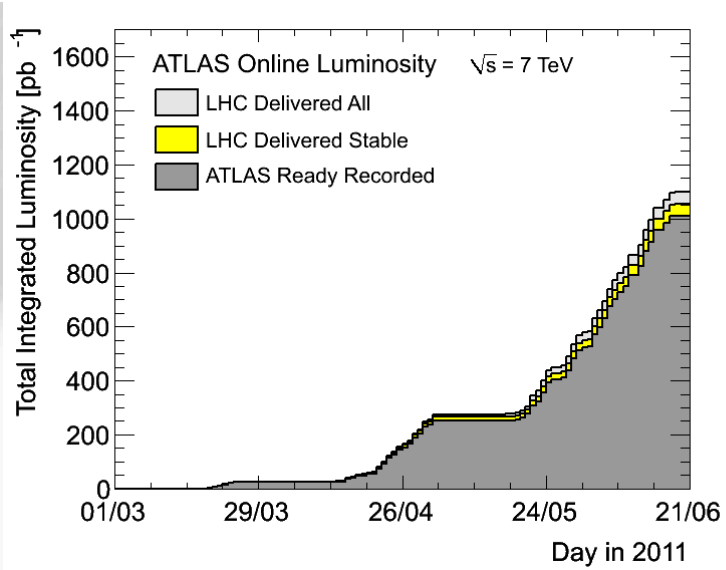
HSG5 H->bb weekly meeting, 21 June 2011

News! News! News!

- About 1.01 fb^{-1} collected with stable beams so far (1.06 fb^{-1} delivered)
- Peak lumi $1.26x10^{33}cm^{-2}s^{-1}$
- 30 – 50pb^{-1} per day





F.Zimmermann (ATLAS Week): https://indico.cern.ch/getFile.py/access?contribId=66&sessionId=8&resId=1&materialId=slides&confId=141246

luminosity potential of present LHC

how to go further? $L = \frac{f_{rev} n_b N_b^2}{4\pi\beta^* \varepsilon} \frac{1}{\sqrt{1+\phi_{piw}^2}}$ $\phi_{piw} \equiv \frac{\sigma_z \theta_c}{2\sigma^*_{x,y}}$

50 ns spacing:

n_b: 1092 → 1380, N_b: 1.2x10^{11}→1.7x10^{11} (double batch inj.)

β*: 1.5 →1.0 m

total gain ~ factor 4 → **5x10^{33} cm^{-2}s^{-1} at 3.5 TeV**

25 ns spacing (e- cloud in SPS & LHC!?):

n_b: 1092 → 2808, N_b: 1.2x10^{11}

β*: 1.5 →1.0 m, γε: 3 μm → 4 μm

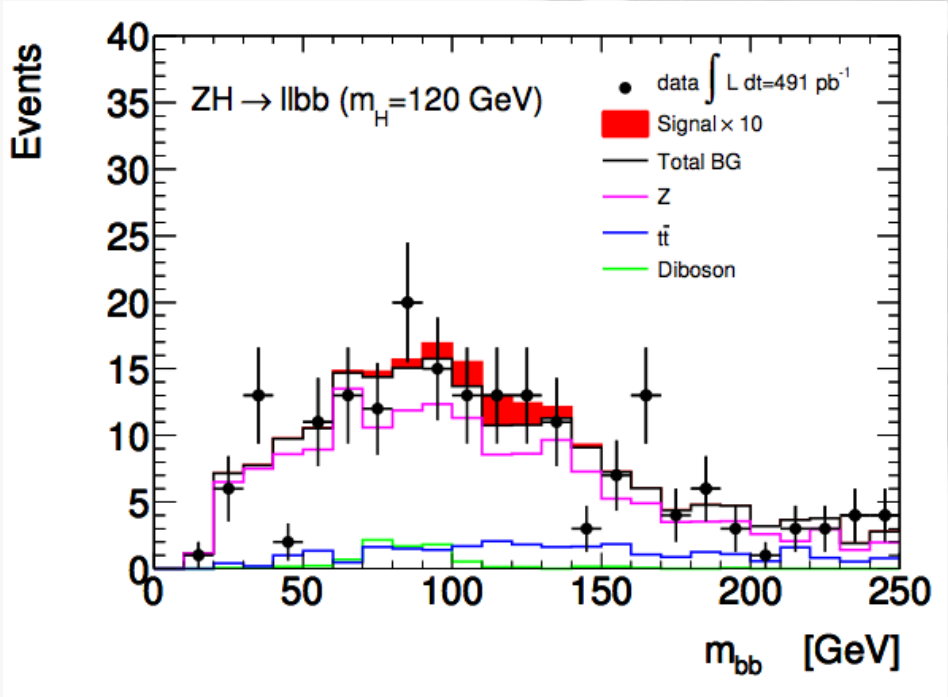
total gain ~ factor 3 → **4x10^{33} cm^{-2}s^{-1} at 3.5 TeV**

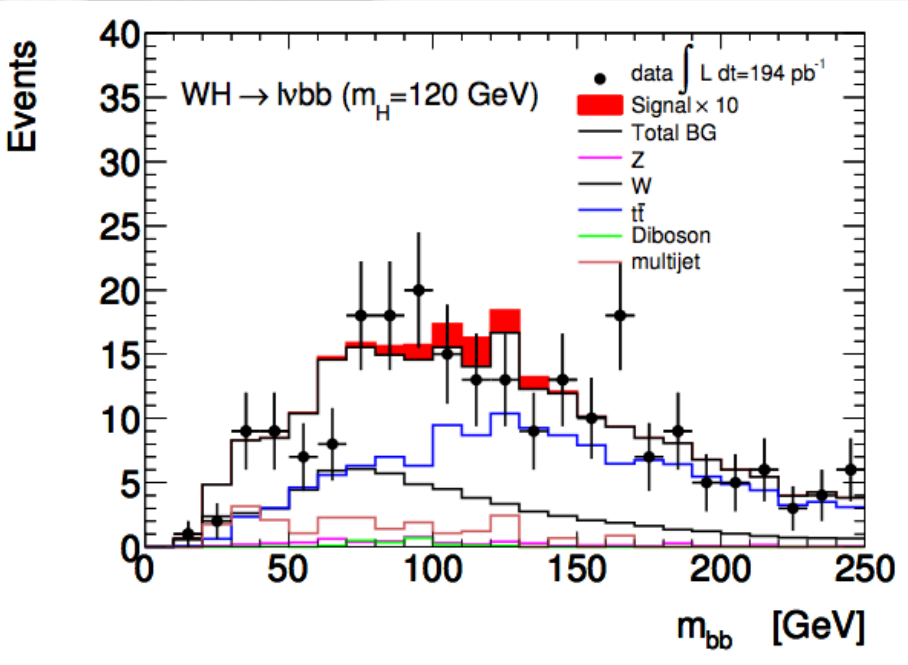
another factor 4 from going to ~7 TeV (&β*~0.5 m)

2x10^{34} cm^{-2}s^{-1} at ~7 TeV does not appear impossible

WH/ZH Note

- First meeting with the editorial board on Friday last week: https://indico.cern.ch/conferenceDisplay.py?confId=143697
  - Many thanks to everyone who connected to the meeting!
  - Initial feedback from Ed.board already in first version of INT note
- Note available in CDS (re-used old CDS record): http://cdsweb.cern.ch/record/1307560?ln=en
  - List of authors to be updated soon
- Next Ed.board meeting on Thursday (10:30-12 CET) – next steps described in: https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HSG5ConfNoteSteps2011#CONF_note





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

JVF-fixed D3PDs

- SMWZ D3PDs were produced by Wisconsin 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; please try it and let me know in case of problems (several datasets still being transferred)

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
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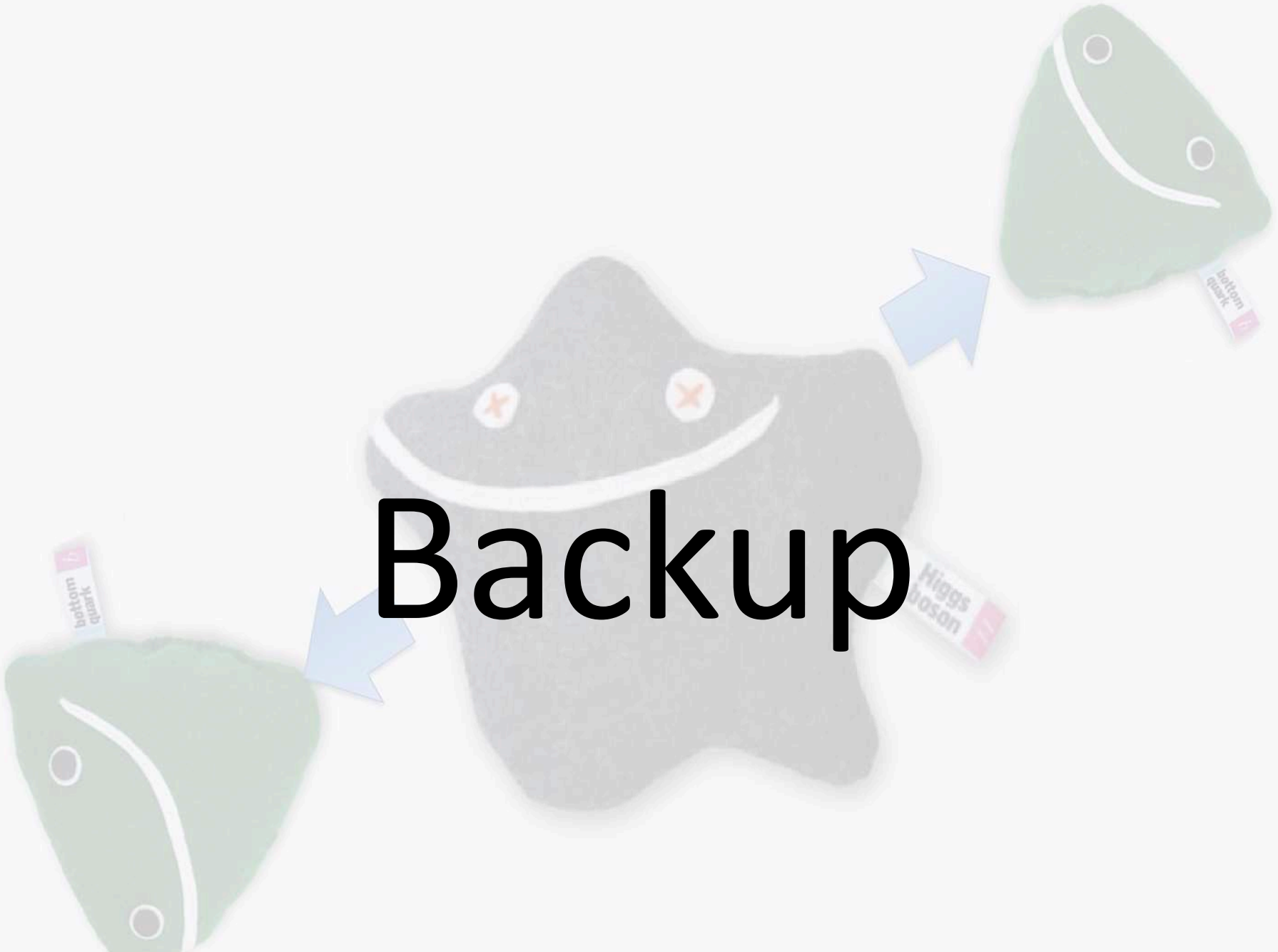
- Need someone to give summary talk at Higgs WG tomorrow – volunteers?



Backup

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

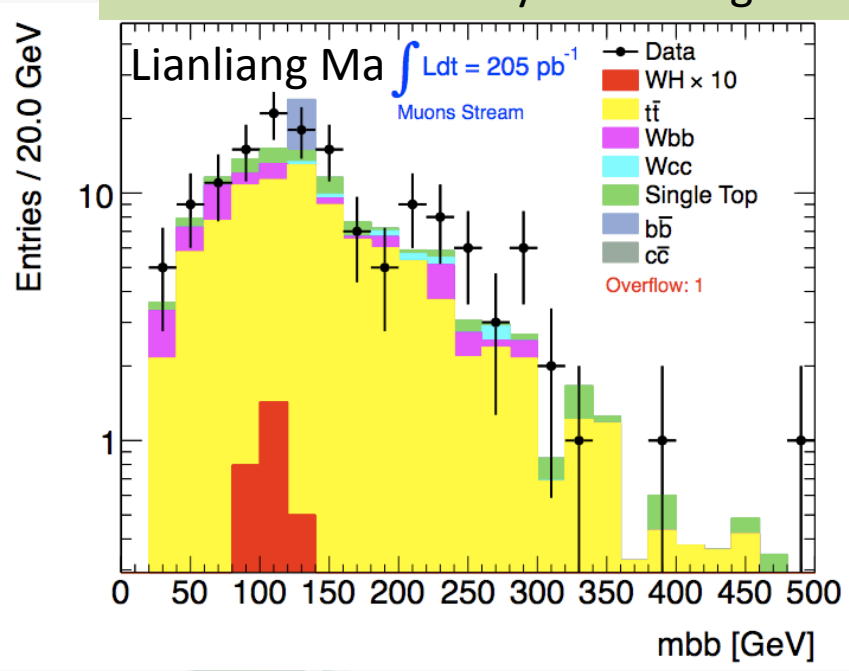
LHC actual versus design parameters

	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

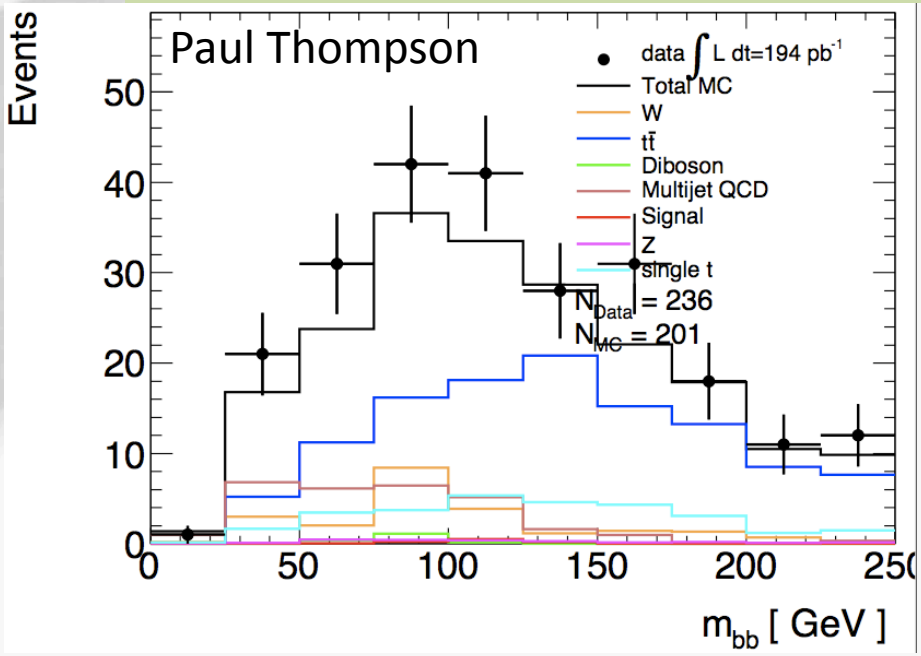
Do we need a JVF cut?

- 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)



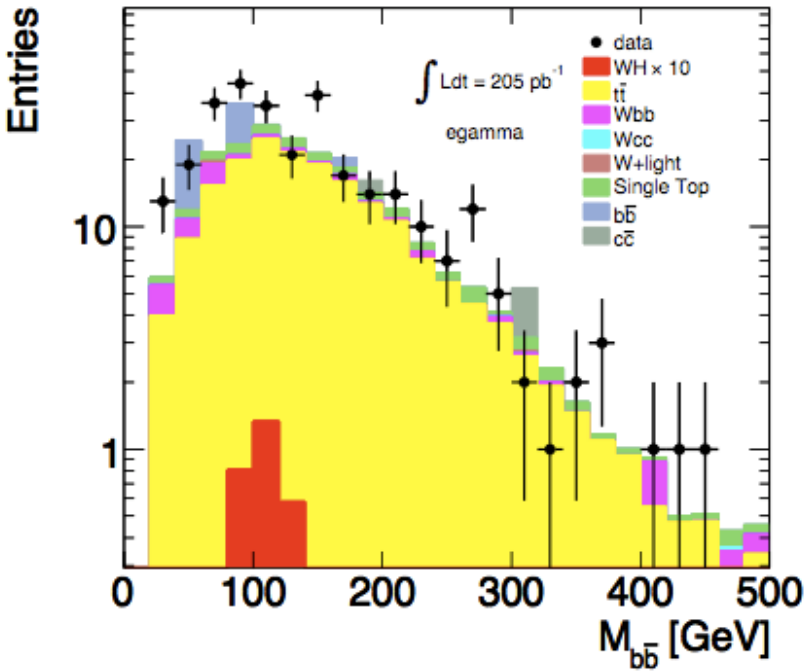
Do we need a JVF cut?

- 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

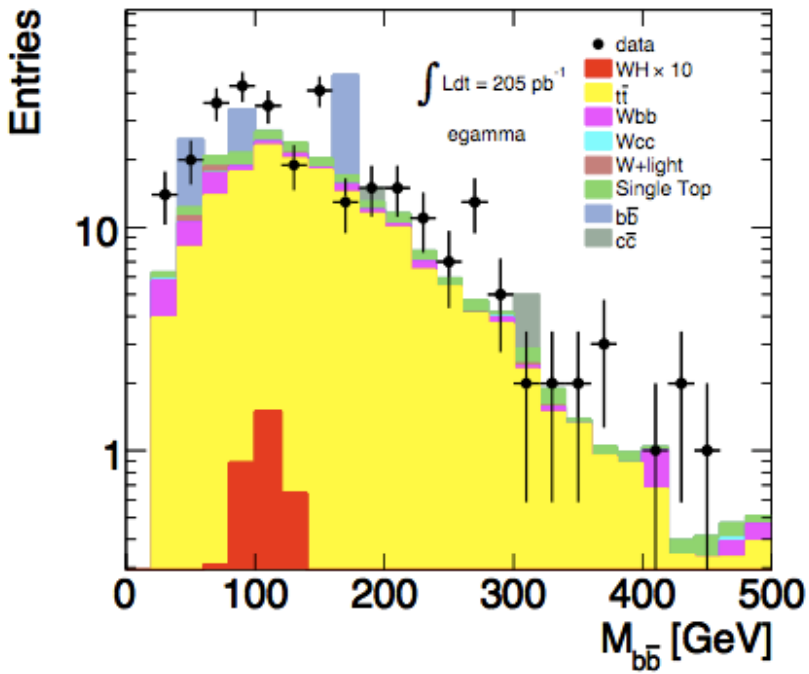
Haifeng Li

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