# General random news

- **mc12** VBFH(125)—>bb and ggH(125)—>bb "filtered" samples are running (AODs are done, D3PDs official production asked for)

http://panda.cern.ch:25880/server/pandamon/query/?mode=taskquery&qTaskName=mc12_8TeV%25VBFH125_bb%25&qsubmit=QuerySubmit
http://panda.cern.ch:25880/server/pandamon/query/?mode=taskquery&qTaskName=mc12_8TeV%25181707%ggH%25&qsubmit=QuerySubmit

- **mc11 jobOptions**: almost done (more in this meeting); next: request
- **data12&11 slimming** (with on-line b-jets info) done

/mnt/project_mnt/atlas/atlas_gen_fs/atlas/data/Hbb/2011/Smilze/new/user.eguido.data11.period*NTUP_SMWZ.newProd_1311.VBF.*
/mnt/project_mnt/atlas/atlas_gen_fs/atlas/data/Hbb/2012/Smilze/new/user.eguido.data12.period*NTUP_SMWZ.newProd_1311.VBF.*

- **run2 trigger studies**: more in this meeting & update at the TGM today (?) Work in progress, and many issues (samples' content, understanding...)

- From what said at the last HSG5 weekly, the strategy/timescale for EdB for post-Moriond analyses is under discussion by PC
  - we have been asked to start writing at least the internal documentation, this should make easier to have an EdB assigned
  - end of January given as a rough timescale for a first version
  - start ~now!

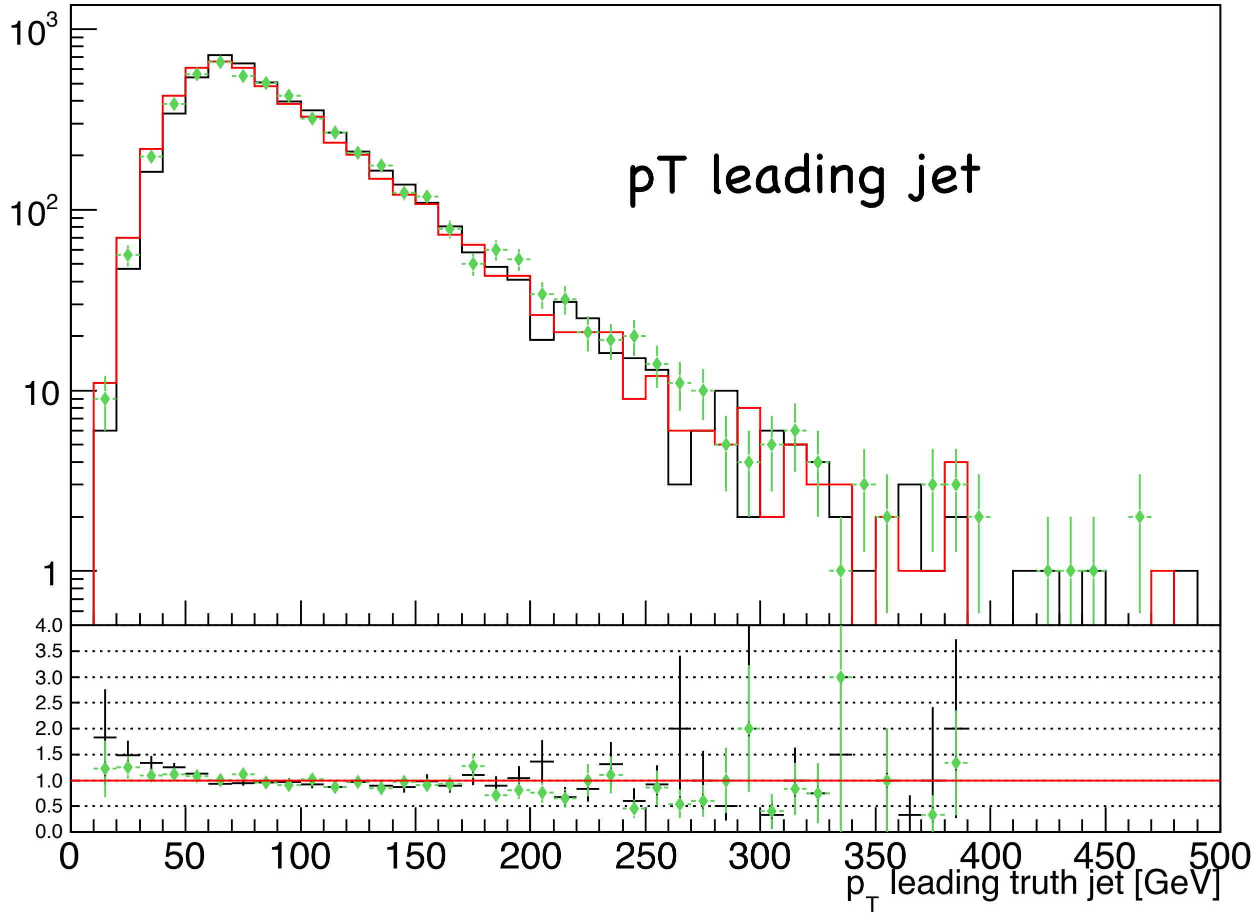
# 1. Summary of mc11 studies

- What we need: VBF and gg H samples, as for mc12
- What we have:
  - VBF samples generated with Herwig (Eric's samples)
  - NO gg sample
- What I am doing:
  - VBF and gg H sample generated with PowHeg+Pythia (for consistency purpose between 2012 and 2011), basically starting from scratch
  - filter for the gg sample (4 leading jets pT>20GeV)
  - generation of small (5k) samples, and comparison with existing mc11/12 similar ones
- Results:
  - VBF sample seems OK
  - gg ?

mc11 VBFH—>bb with PowHeg+Pythia (mine)

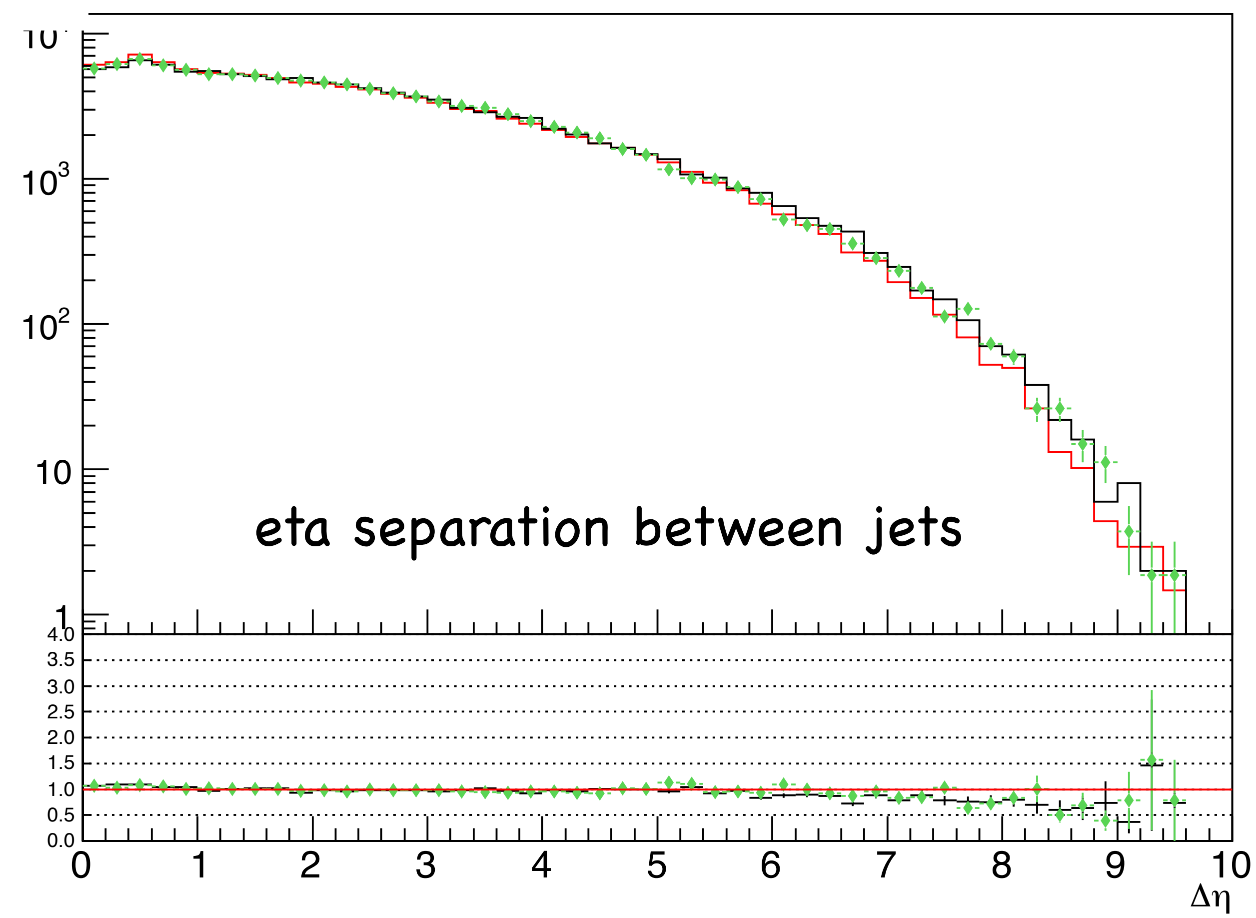
*compared with:*

- mc11 VBFH—>bb with Herwig (Eric's sample)
- mc12 VBFH—>bb with PowHeg+Pythia8 (official sample)

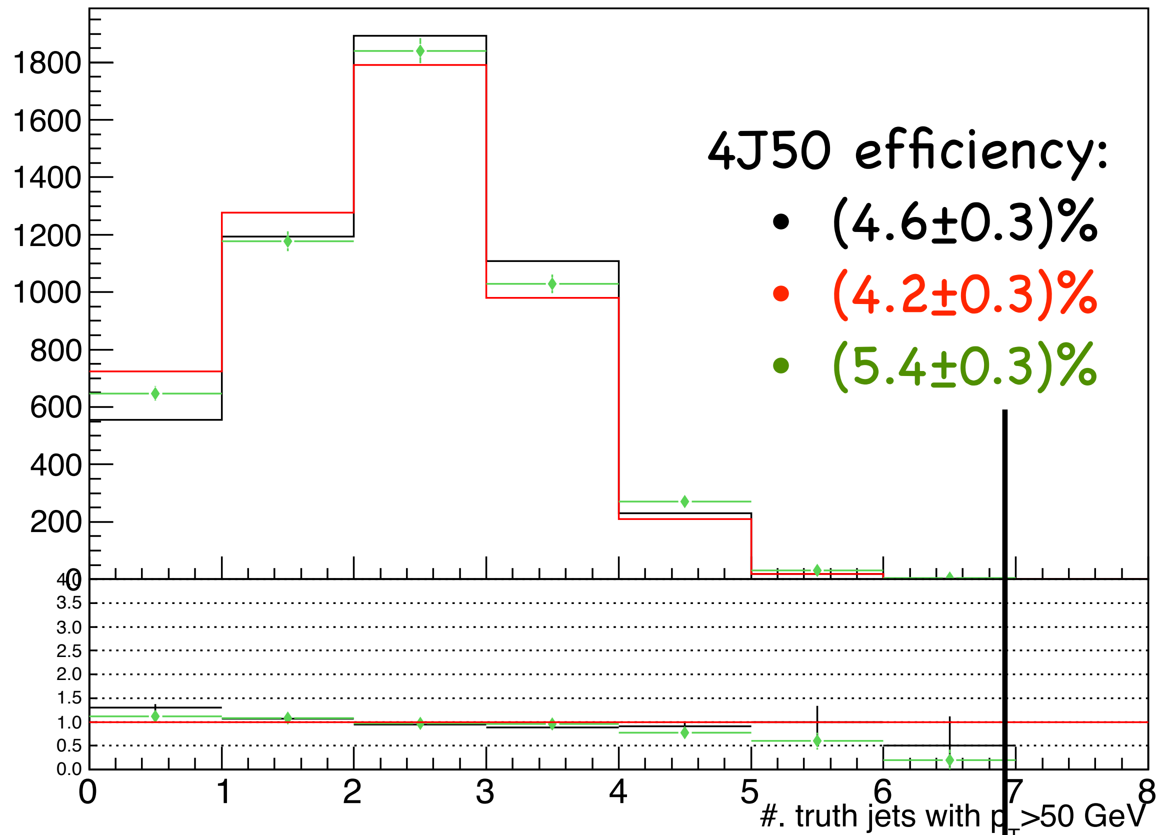



- mc11 Herwig (5k events)
- mc11 PowHeg+Pythia (5k events)
- mc12 PowHeg+Pythia8 (5k events)

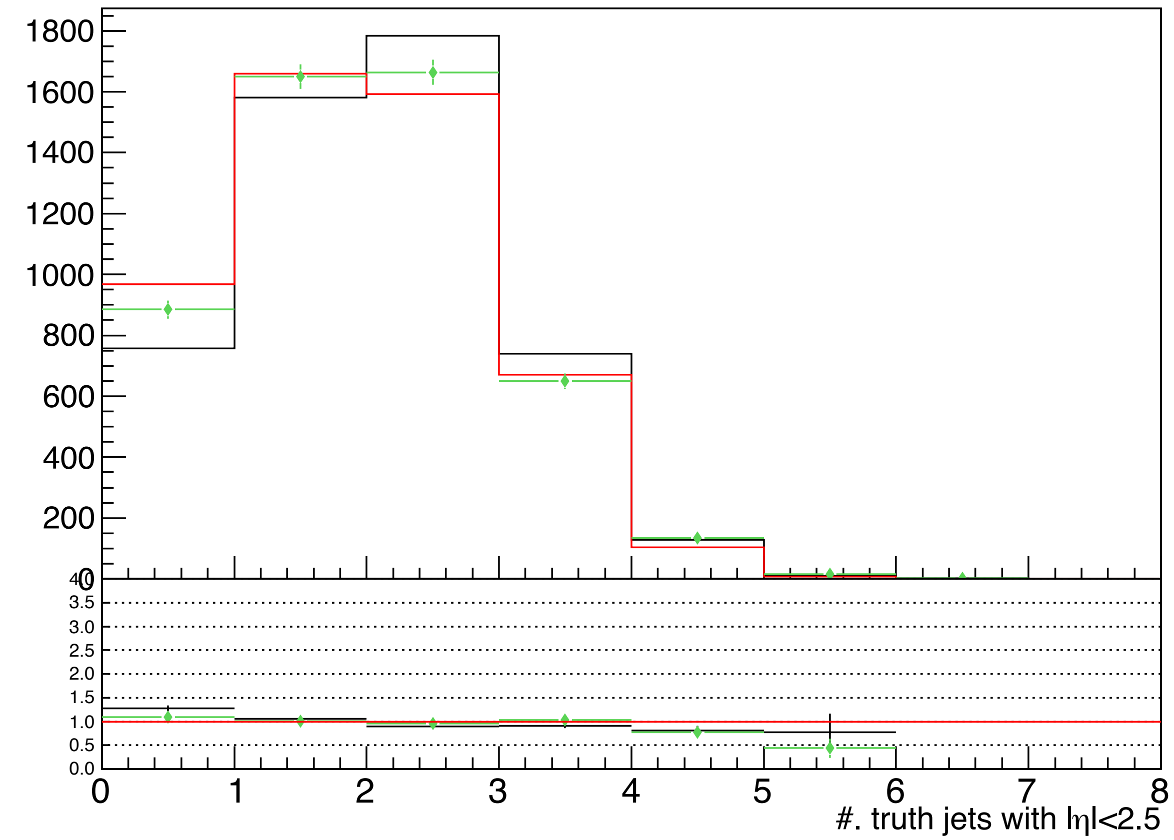
In the insets:
- mc11 PowHeg+Pythia / mc 11 Herwig
- mc11 PowHeg+Pythia / mc 12 PowHeg+Pythia8



#. jets with $p_T$>50 GeV per event



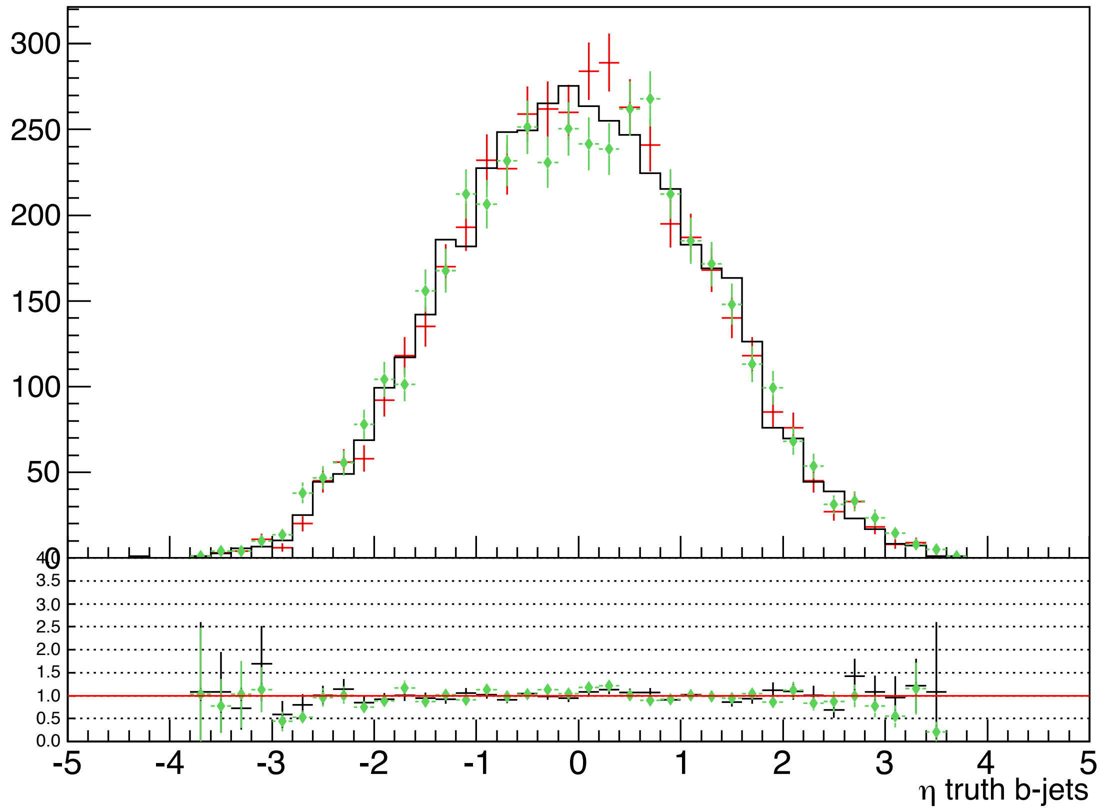

#. jets with $p_T$>50 GeV and |eta|<2.5 per event

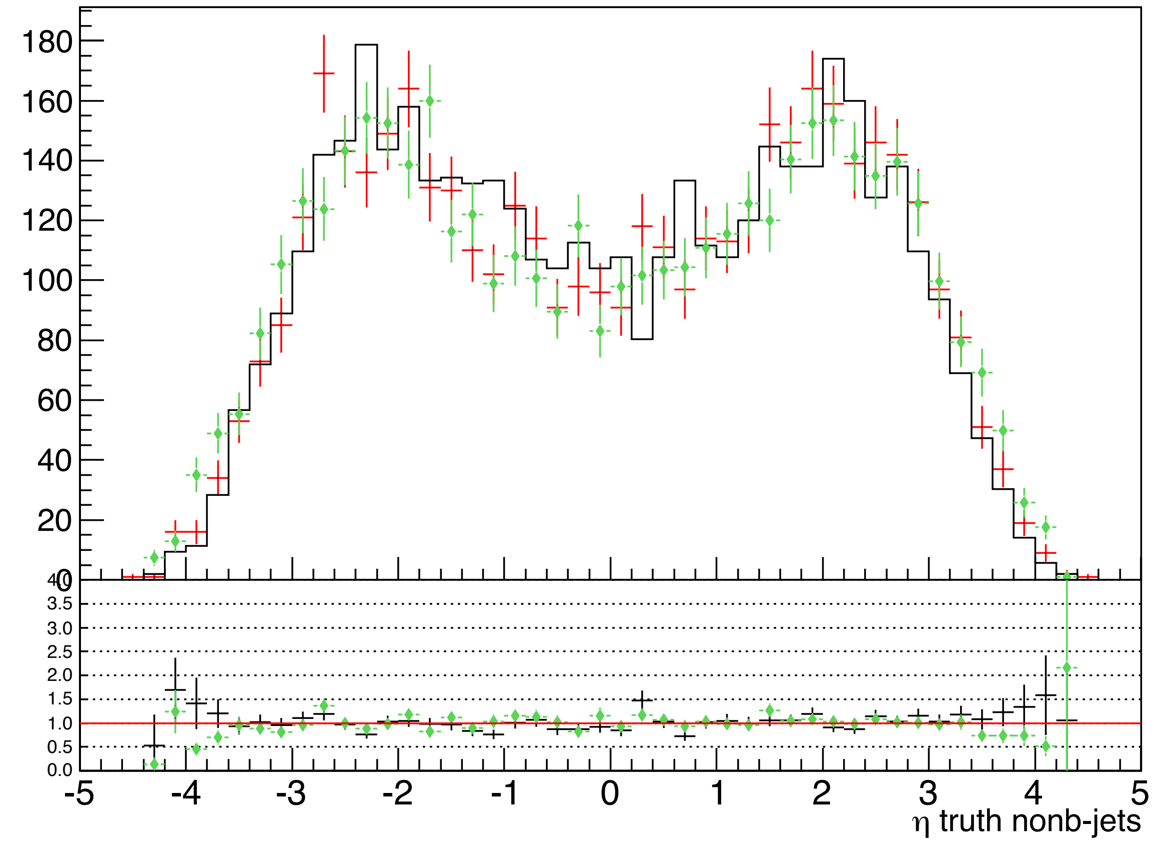



| | total | 0J50 | 1J50 | 2J50 | 3J50 | 4J50 | 5J50 |
|---|---|---|---|---|---|---|---|
| Herwig 11 | 5000 | 0,111 | 0,239 | 0,379 | 0,222 | **0,046** | 0,004 |
| | error | 0,004 | 0,006 | 0,007 | 0,006 | 0,003 | 0,001 |
| PowHeg+Pythia 12 | 5000 | 0,129 | 0,235 | 0,368 | 0,206 | **0,054** | 0,006 |
| | error | 0,005 | 0,006 | 0,007 | 0,006 | 0,003 | 0,001 |
| PowHeg+Pythia 11 | 5000 | 0,145 | 0,255 | 0,358 | 0,196 | **0,042** | 0,004 |
| | error | 0,005 | 0,006 | 0,007 | 0,006 | 0,003 | 0,001 |

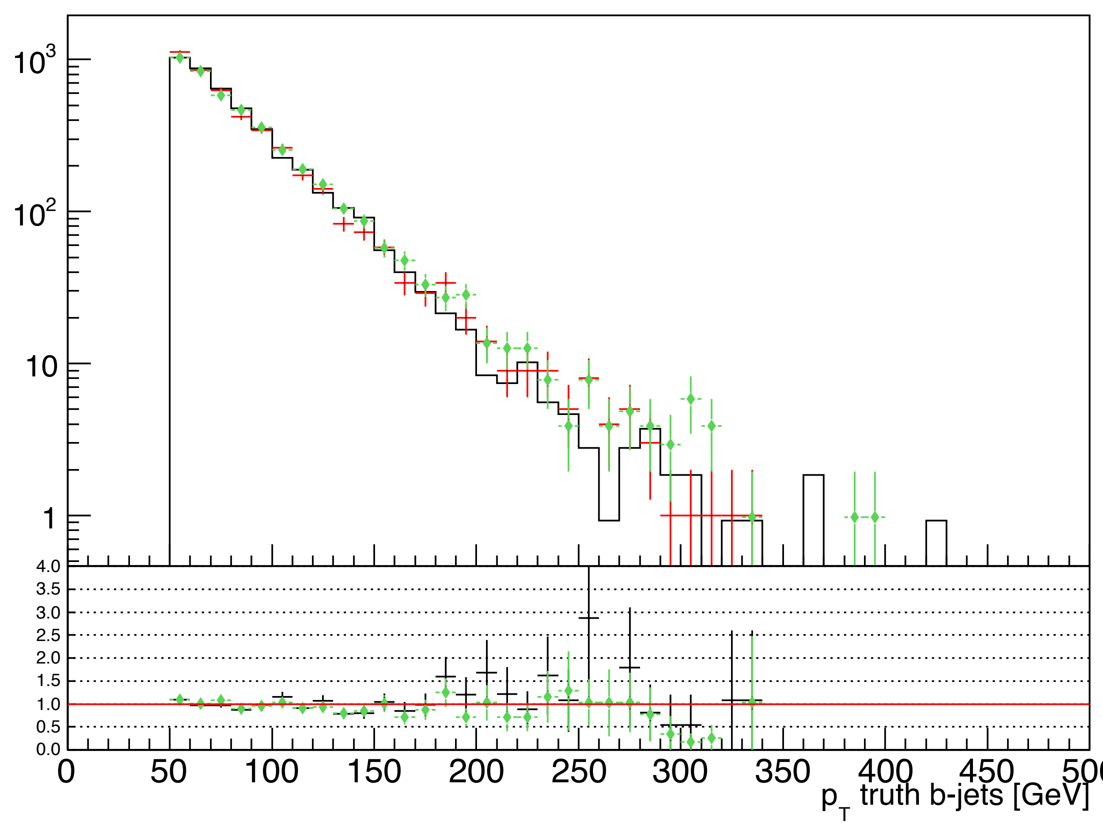
==fraction of events with XJ50, i.e. with X jets with $p_T$>50 GeV

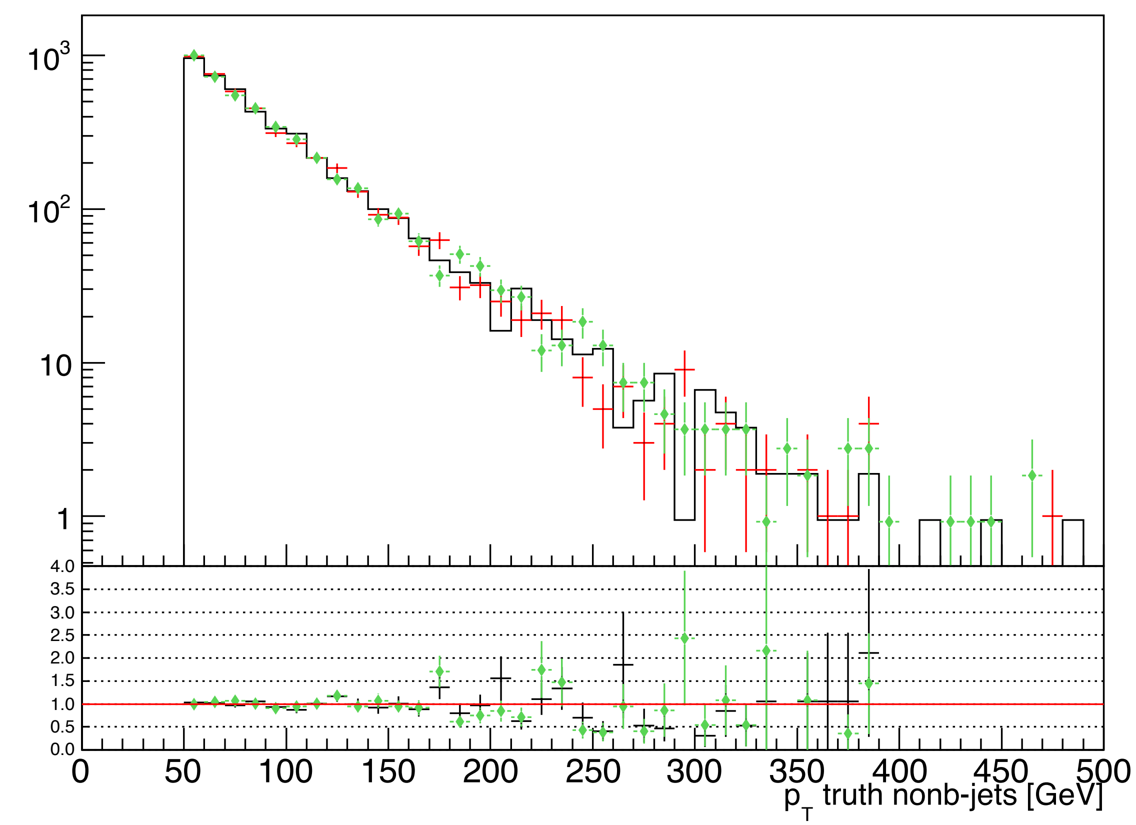
After requiring pT>50 and |eta|<4.5:




[b-jets == truth-matched with a b in a cone 0.4]



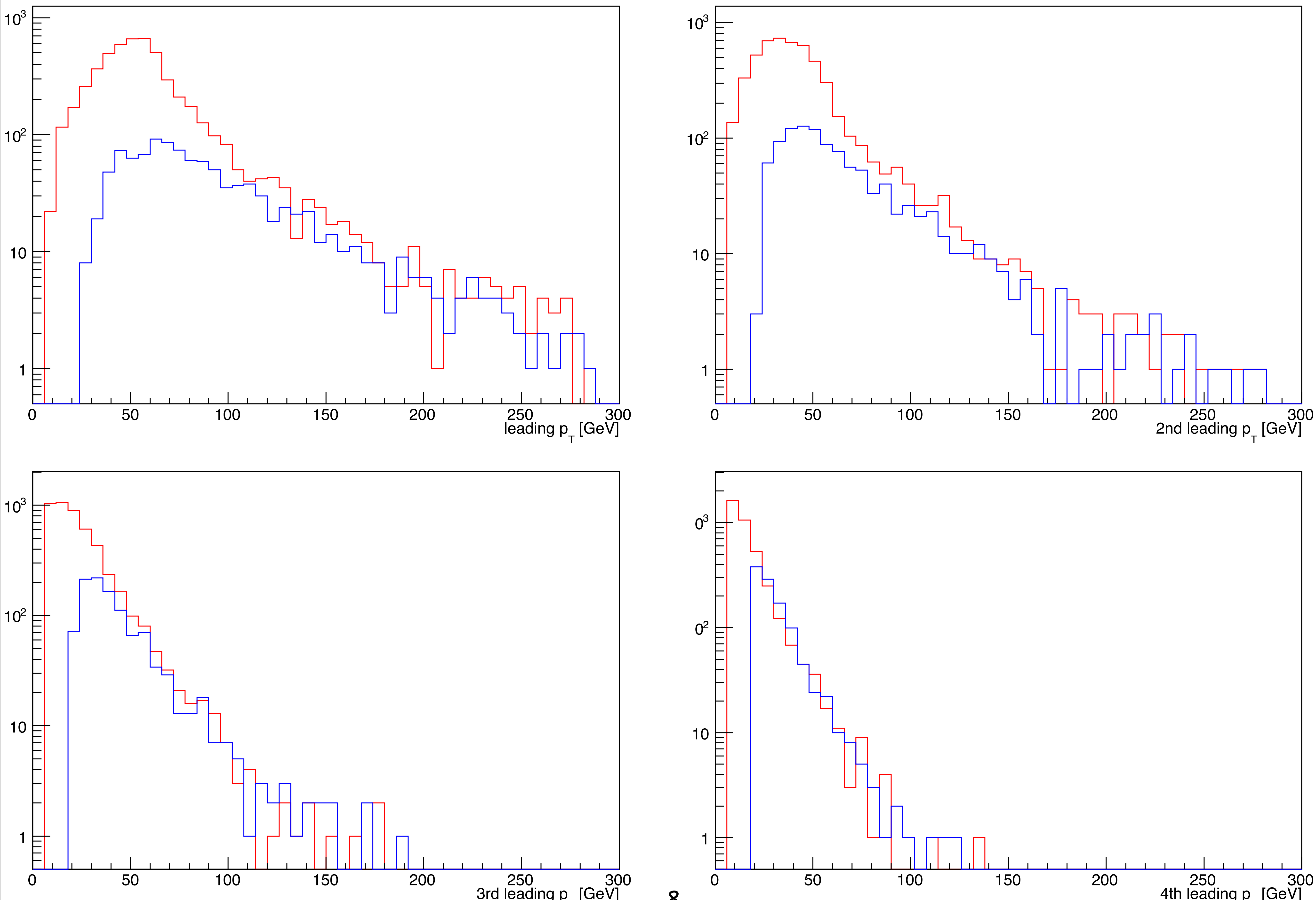
- mc11 ggH—>bb with PowHeg+Pythia (mine)
- mc11 ggH—>bb with PowHeg+Pythia FILTERED (4 leading $p_T$>20GeV) (mine again)

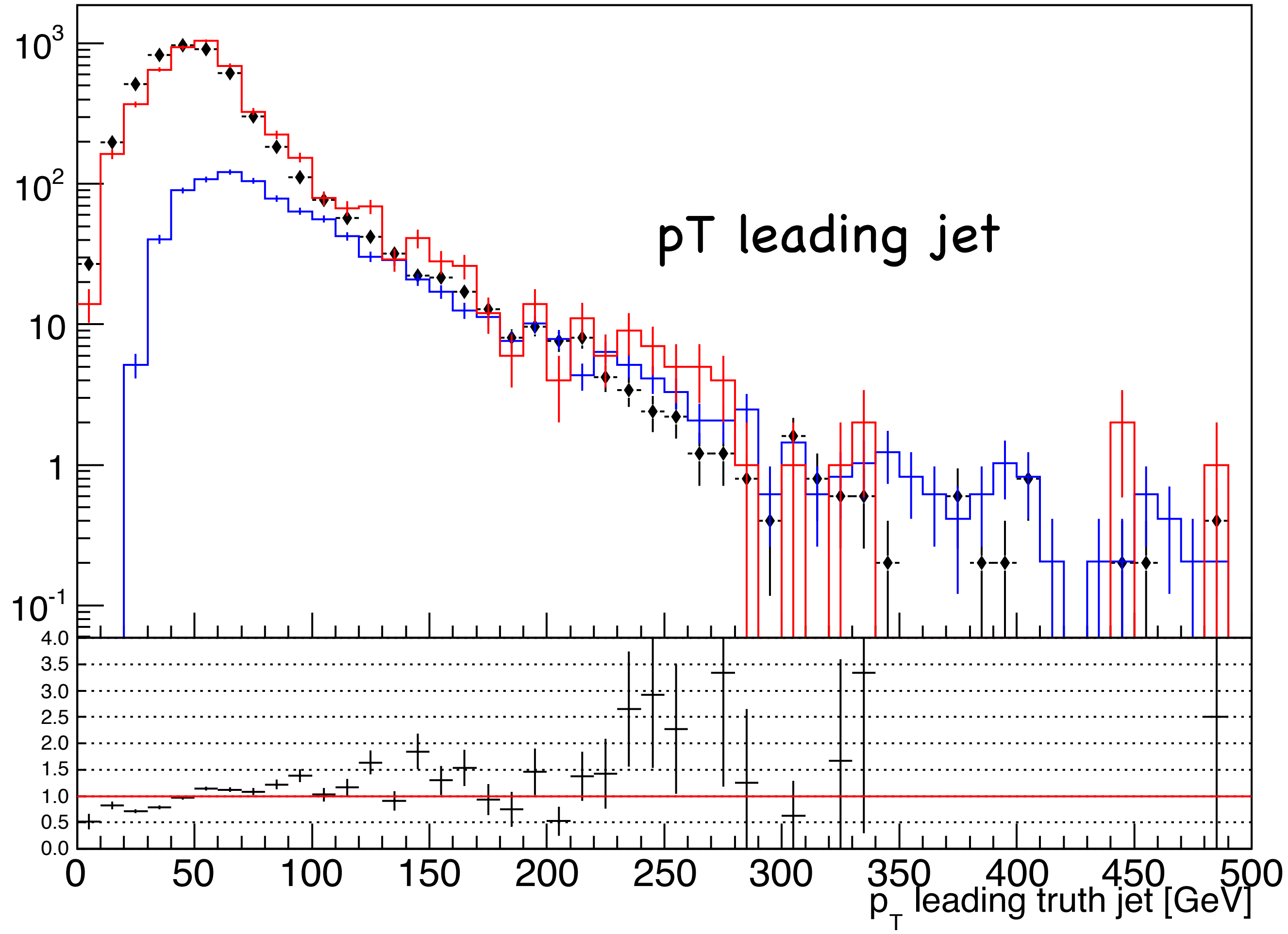
*compared with:*

mc12 ggH—>bb with PowHeg+Pythia8 (official sample)

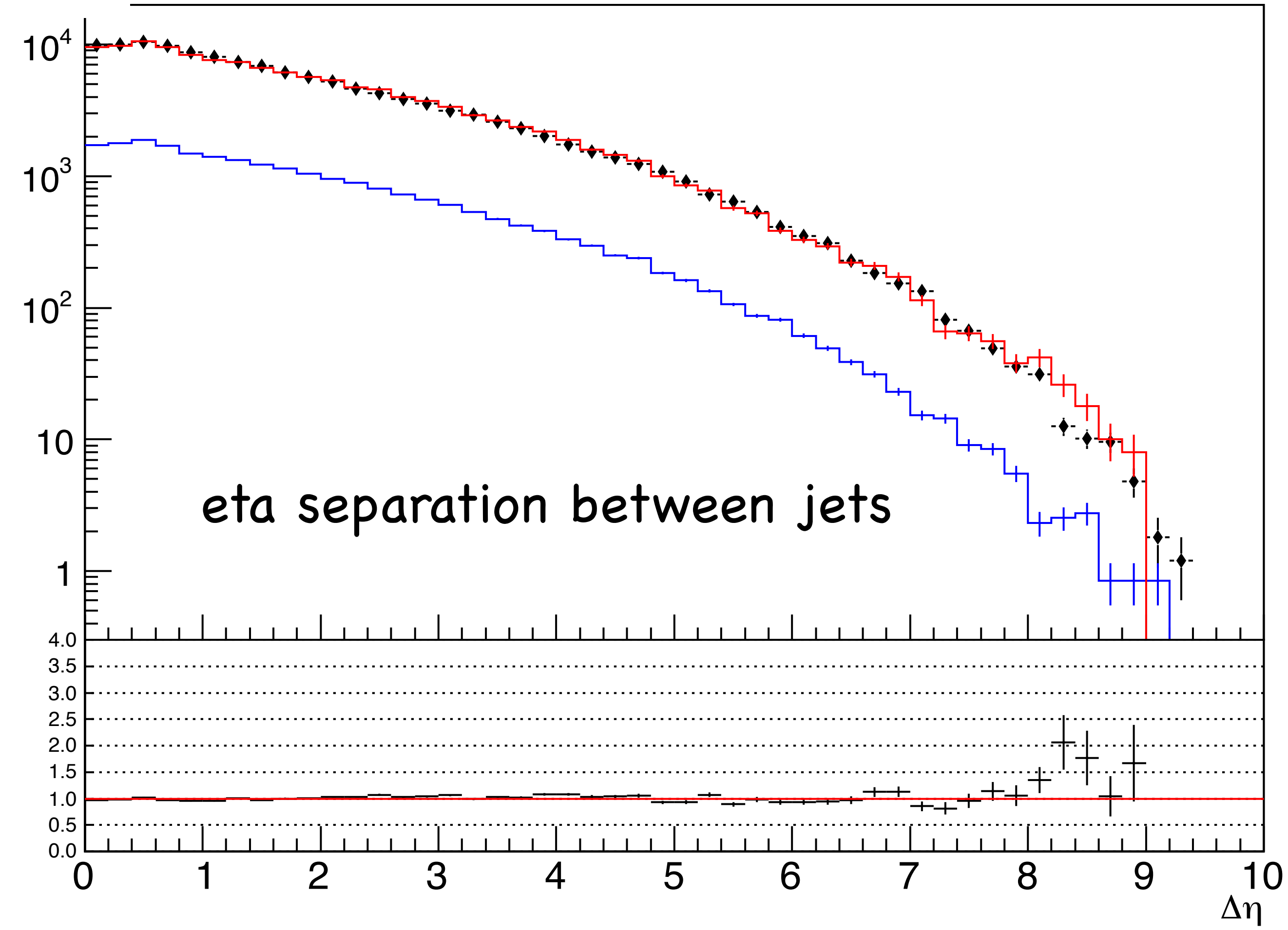
*[filter efficiency ~18%, in agreement with mc12]*

# 4 leading jets $p_T$ un-filtered (5k events) & filtered (5k*filter efficiency events)





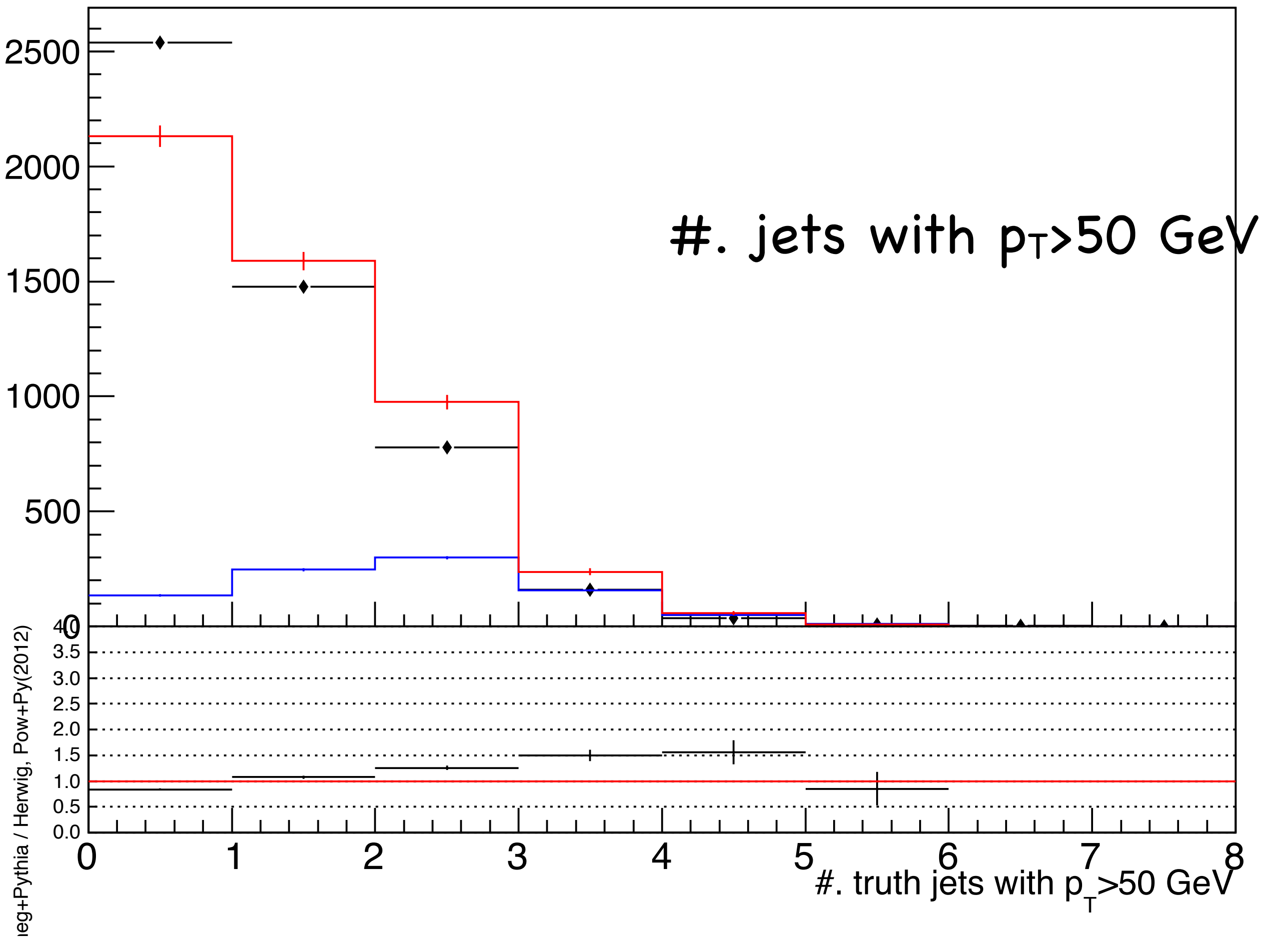

- mc 12 is normalized to mc 11 unfiltered
- mc 11 filtered is normalized to mc 11 unfiltered *filter efficiency



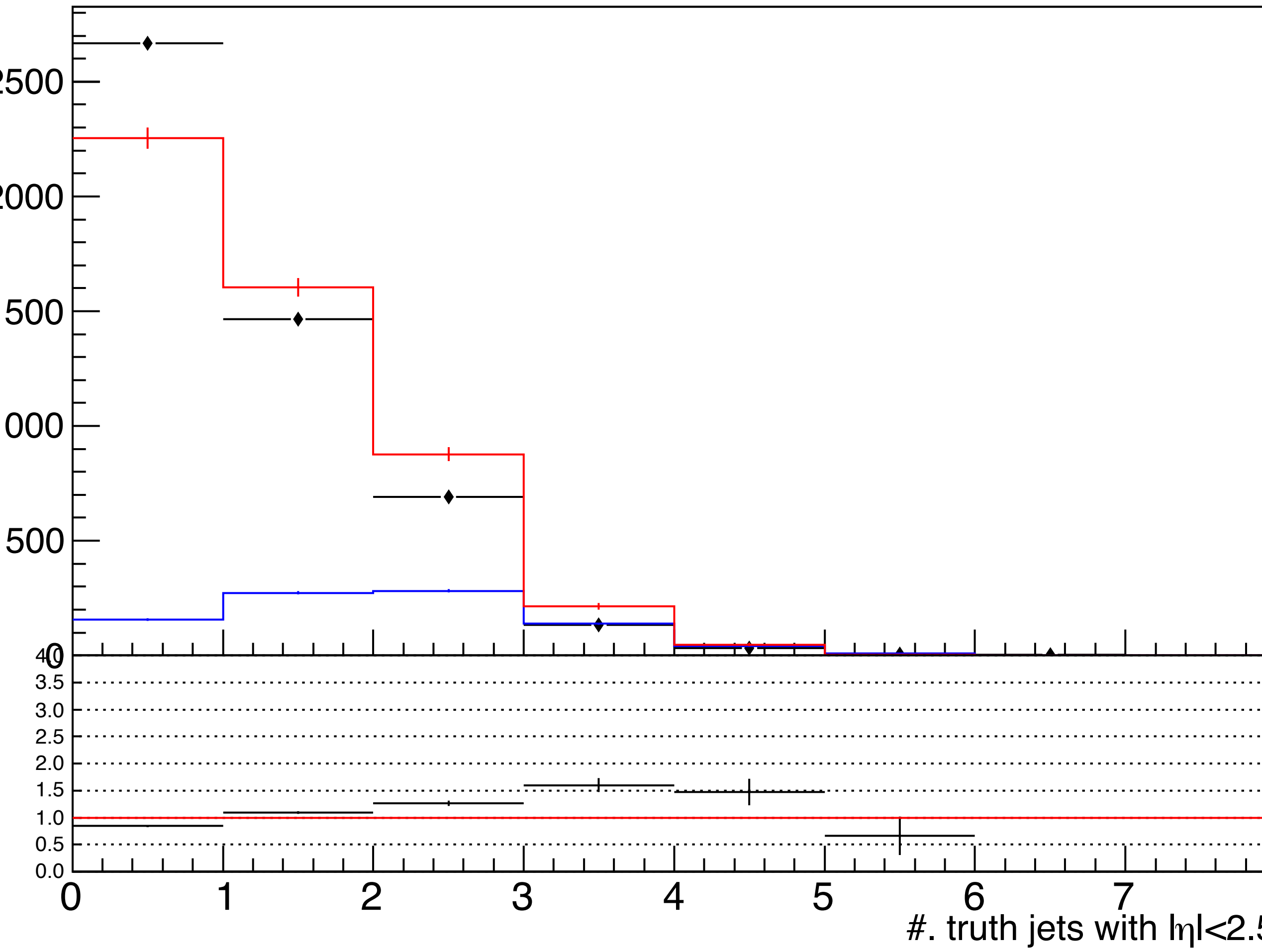

- mc12 PowHeg+Pythia8 (25k events)
- mc11 PowHeg+Pythia unfiltered (5k events)
- mc11 PowHeg+Pythia filtered (5k events)

In the insets:
- mc11 PowHeg+Pythia unfiltered / mc 12 PowHeg+Pythia8

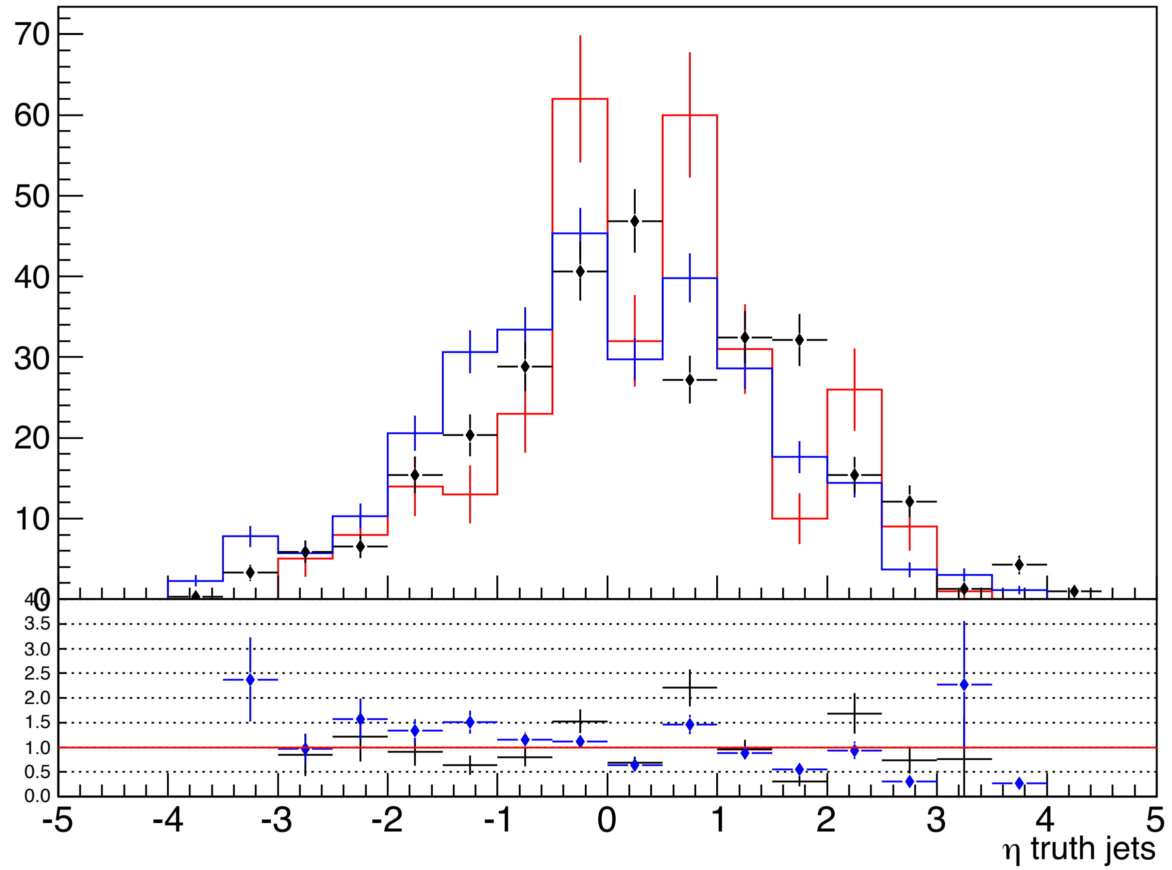
#. jets with $p_T$>50 GeV per event



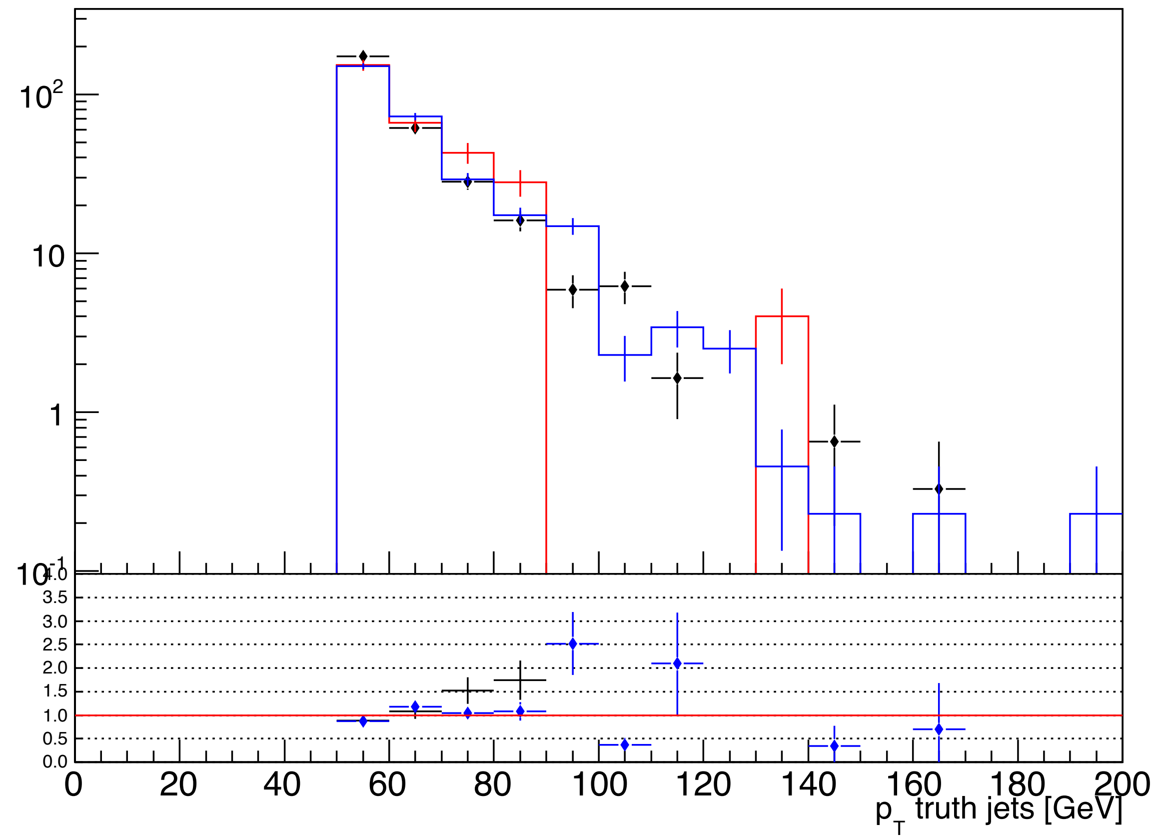

#. jets with $p_T$>50 GeV and |eta|<2.5 per event



Only events with 4J50 and at least 2 central jets (as in the analysis):




- both mc 12 and mc 11 filtered are normalized to mc 11 unfiltered (lower stat)




In the insets:

- mc11 PowHeg+Pythia unfiltered / mc 12 PowHeg+Pythia8
- mc11 PowHeg+Pythia filtered / mc 12 PowHeg+Pythia8

# 2. Summary of run2 trigger studies

- A few things understood (and sent for TGM update):

## L1 items efficiences

- Hbb VBF: the most promising L1 items are 2J_2FJ and 3J_FJ
  - need to evaluate with higher threshold
  - meaning of "higher": uniformly increase the thresholds of J and FJ, or only the FJ threshold (up to FJ75 the efficiency is good)

| | sampleT 14TeV 25ns | nominal 8TeV | improvement 14_25vs.8 |
|---|---|---|---|
| | 2000 | 5000 | |
| L1_4J10 | 46,9% | 23,06% | 2,03 |
| L1_4J15 | 26,8% | 12,50% | 2,14 |
| L1_4J20 | 16,75% | 6,74% | 2,49 |
| | | | |
| L1_FJ30 | 24,1% | 11,26% | 2,14 |
| L1_FJ50 | 11,3% | 3,66% | 3,09 |
| L1_FJ75 | 5,75% | 0,78% | 7,37 |

| | | | |
|---|---|---|---|
| L1_2FJ15 | 10,4% | 1,02% | 10,20 |
| L1_2FJ30 | 4,75% | 0,30% | 15,83 |
| L1_2FJ50 | 2,8% | 0,00% | — — — |
| | | | |
| L1_2J15_2FJ15 | 8,95% | 0,38% | 23,55 |
| L1_3J15_FJ15 | 21,65% | 5,18% | 4,18 |

[Andrea Fa.,Carlo]

# L1 items rate

| Trigger menu |
|---|
| MU20 |
| 2MU10 |
| EM24VHI |
| EM50 |
| 2EM15VH |
| J100 |
| 3J50 |
| 4J20 |
| HT200 |
| XE70 |
| J75_XE40 |
| FJ100 |

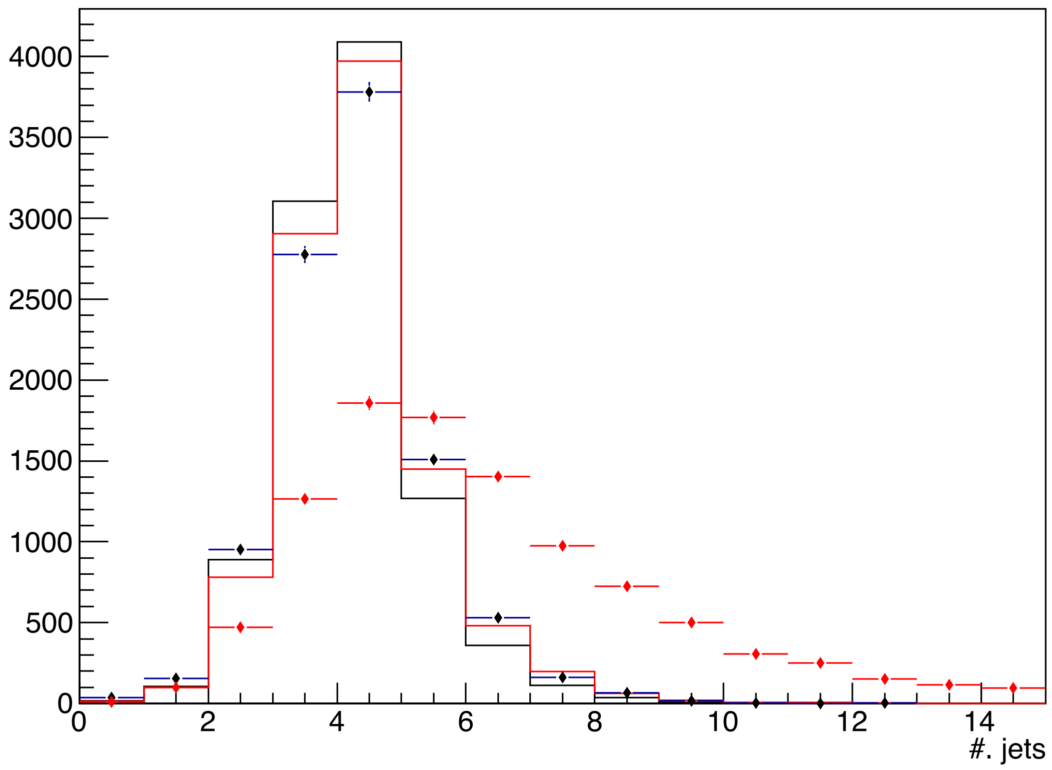
| Trigger | | 14 TeV MC (kHz) |
|---|---|---|
| 2J25_2FJ25 | rate | 0.9+- 0.2 |
| | unique rate | 0.6+- 0.1 |
| 3J25_FJ25 | rate | 1.2+- 0.2 |
| | unique rate | 0.6+- 0.1 |

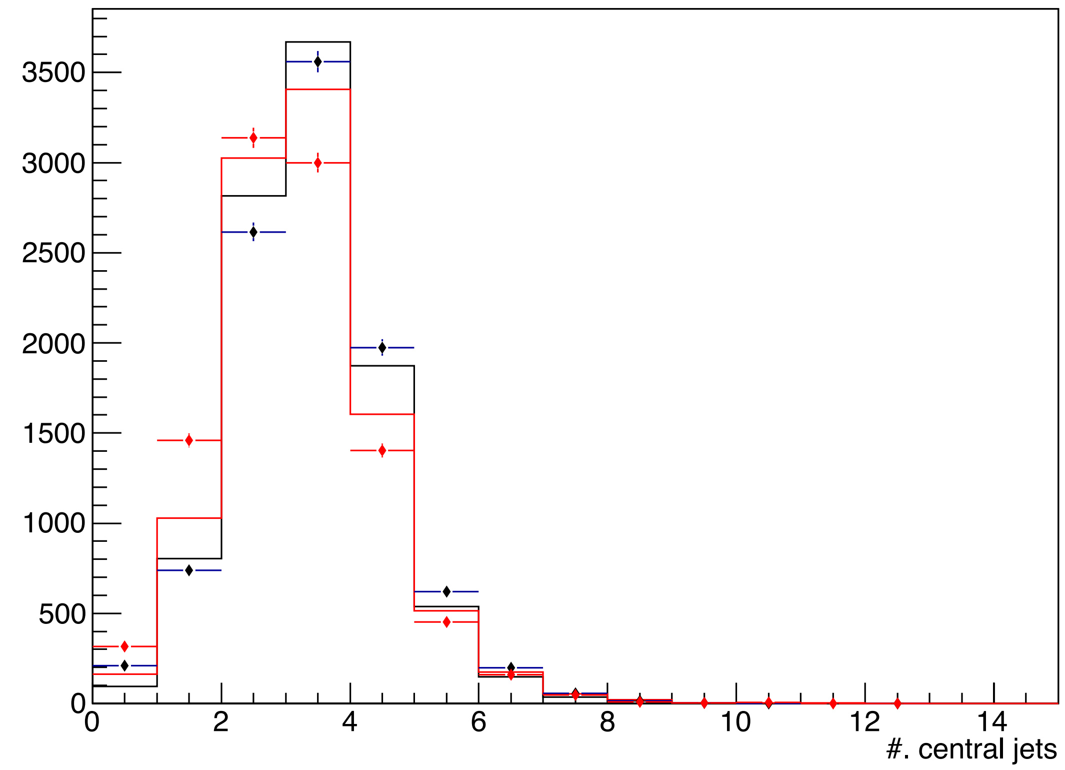
- not all items from strawman menu, but a sufficient sub-set
- L1 rate prediction tool by Brian Petersen: /afs/cern.ch/user/a/aagaard/public_atlas/L1Rates
  - the rates reported in the table are the ones for 14 TeV MC (25 ns; mu=54), and not the data scaled to 14 TeV because the scaling is not always reliable
  - unique rate of 2J25_2FJ25 and 3J25_FJ25 evaluated w.r.t. the L1 items listed here
  - the sum of the unique rates is almost the same of the unique rates sum (1 kHz vs 1.2 kHz): this means that the two items are almost uncorrelated
- we will study the efficiencies/rates as a function on threshold
  - 25 GeV already seems a reasonable threshold. Lower thresholds give too high rates
- we will study items with smaller multiplicity but with higher FJ threshold, and also the rates as a function of the “central jet” definition

2

- A lot of things not understood...

1. The following step - from the L1 eff. point of view - is to check at the L1 items eff. on selected events, where selected means with the 8-TeV analysis requirements applied. Not very straightforward.



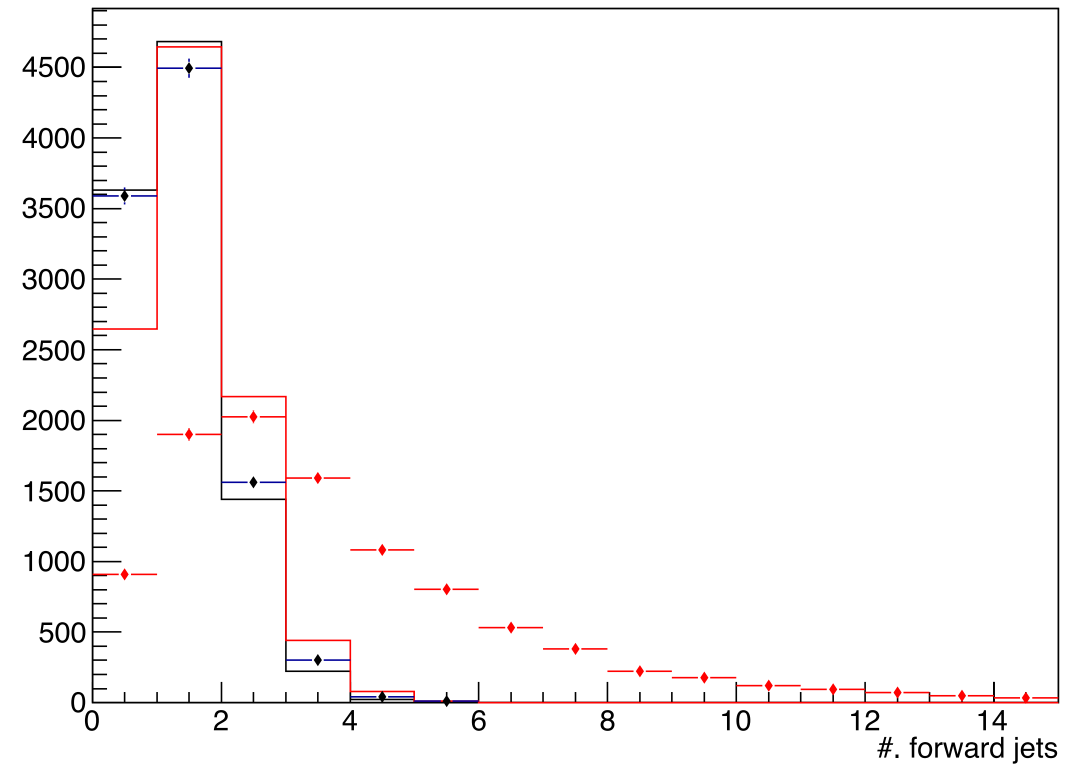



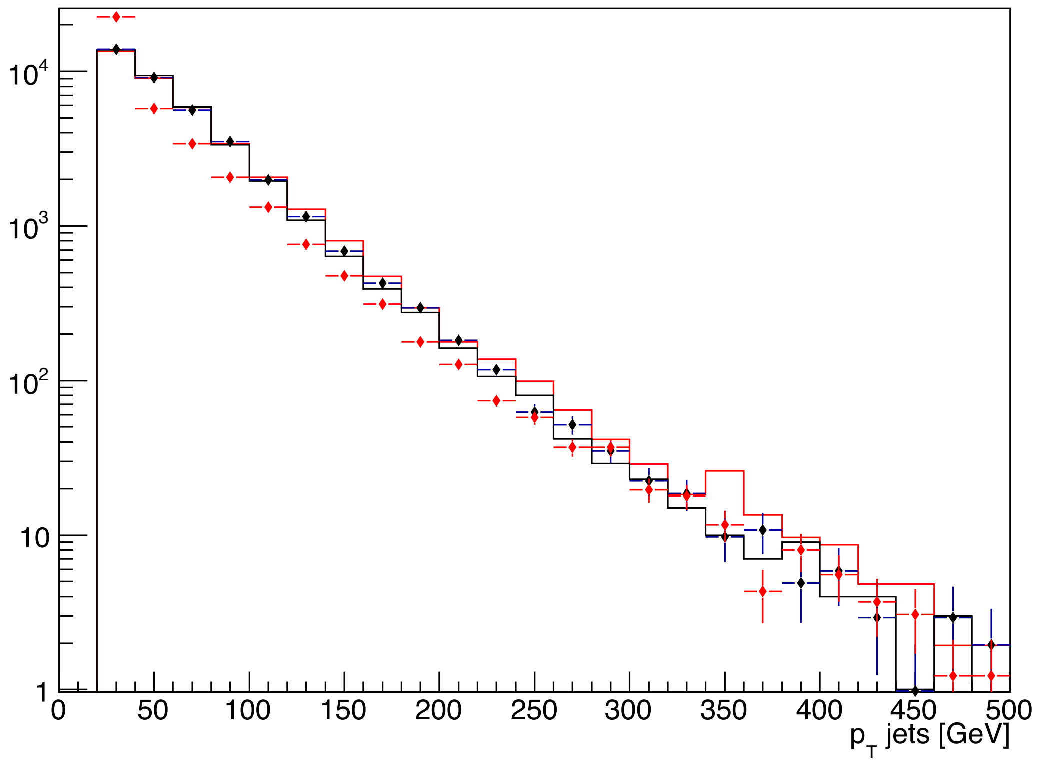

-mc8TeV (10K events)

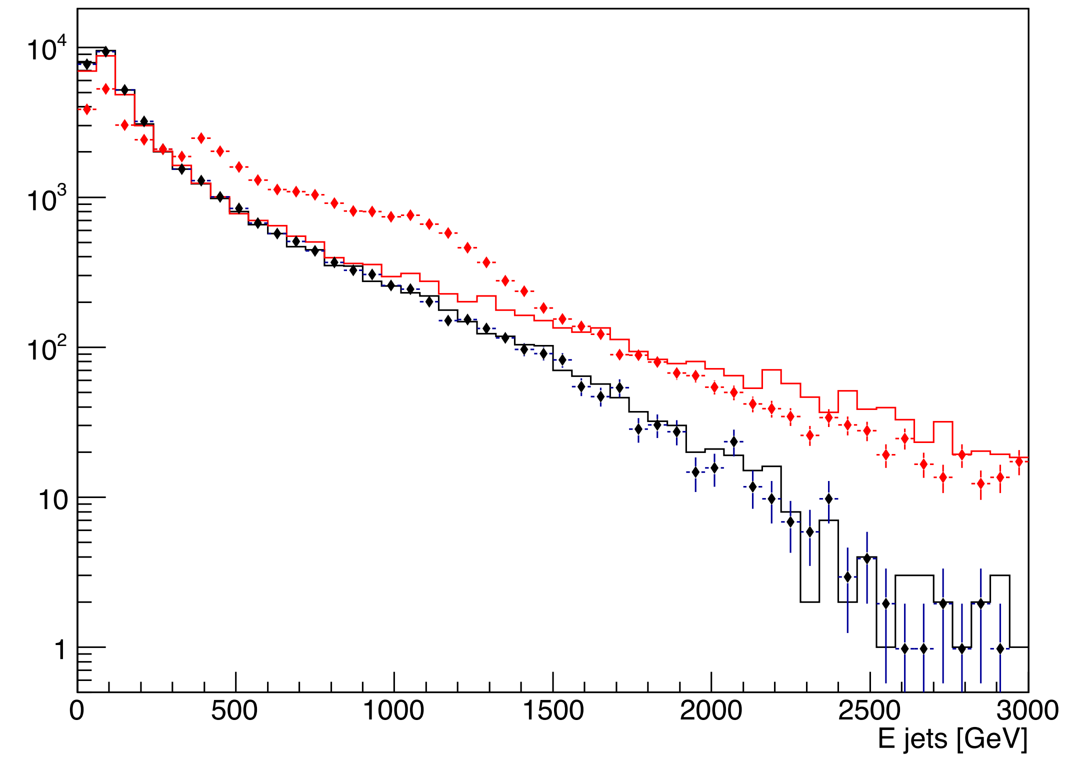
-mc14TeV (10k events)

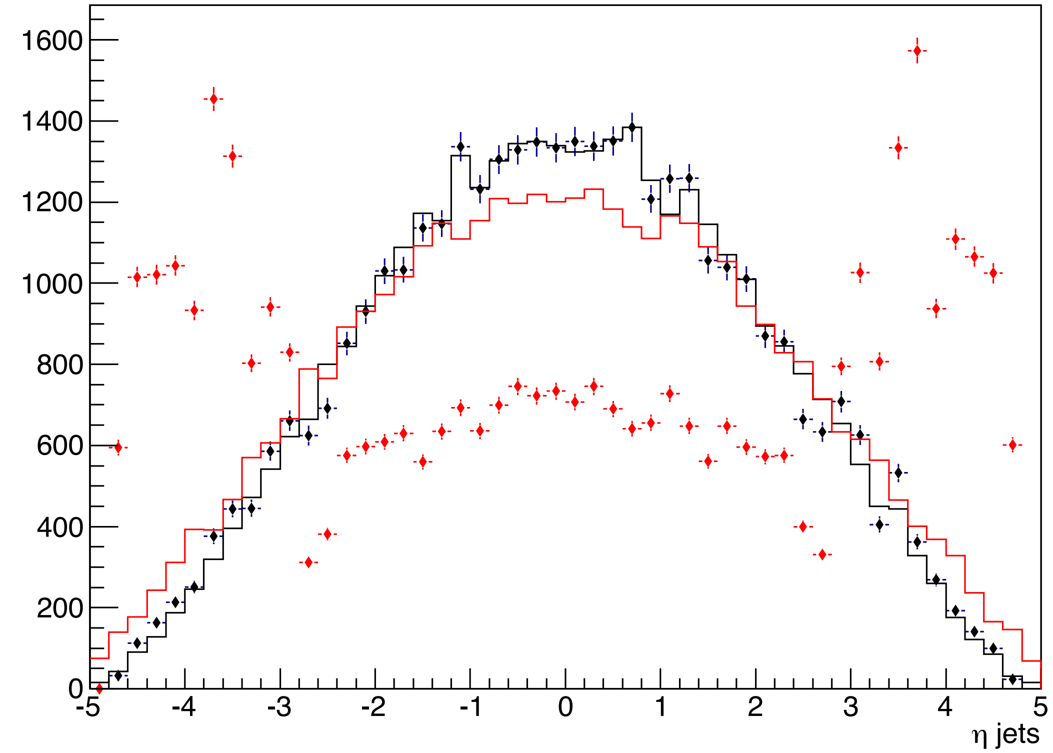
-histograms truth jets (AntiKt4Truth with $p_T$>20 GeV)

-points reco jets (AntiKt4TopoEM with **|jvtxf|>0.3** and $p_T$>20 GeV)





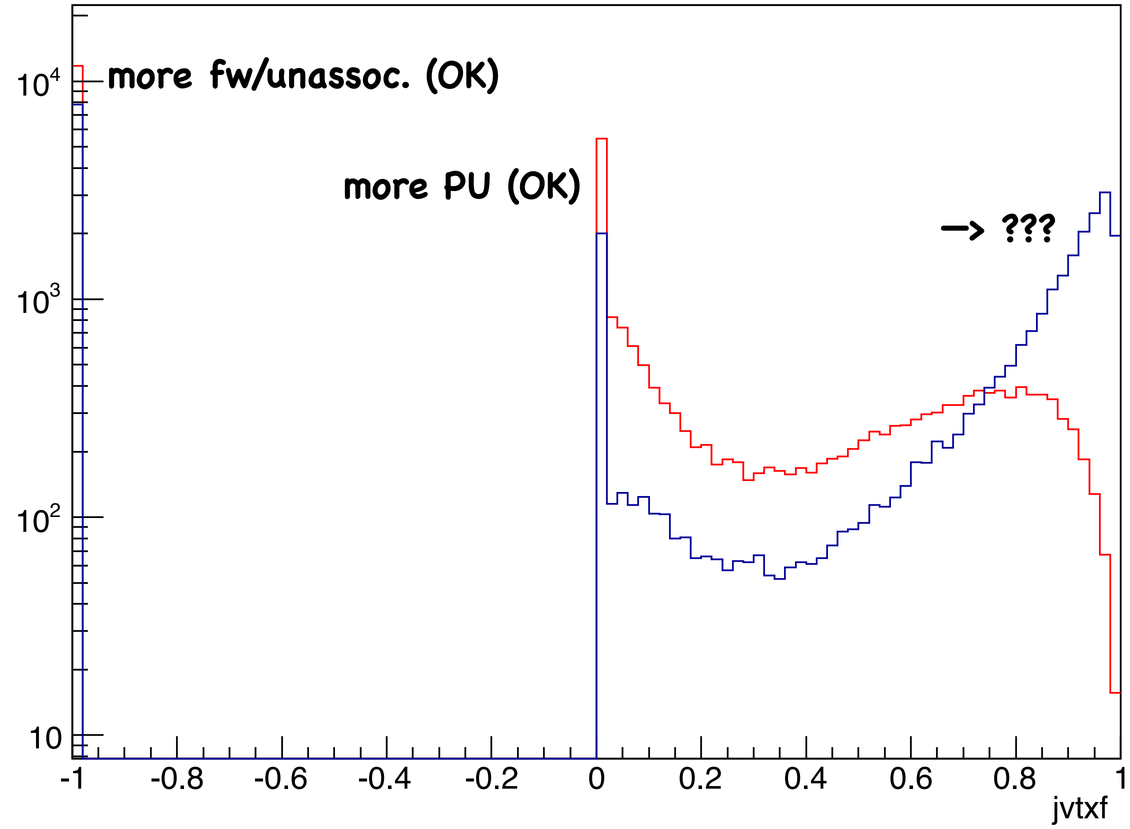

-mc8TeV (10K events)

-mc14TeV (10k events)

-histograms truth jets (AntiKt4Truth with $p_T$>20 GeV)

-points reco jets (AntiKt4TopoEM with **|jvtxf|>0.3** and $p_T$>20 GeV)

Why |jvtxf|>0.3:




-mc8TeV (10K events) reco jets

-mc14TeV (10k events) reco jets

Understand how to handle pile-up is mandatory in order to move forward.

2. The following step - in terms of L1 rate estimate - is to play with trigger objects and try to emulate different thresholds for the 2J+2FJ and 3J+FJ items. Not completely straightforward (missing info in the samples? more by A.&C.)