TOP QUARK @ BO

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OUTLINE OF THE TALK

- Powheg validation against MC@NLO
- Muon Tag & Probe with di-leptonic *tT* events
- *tT* commissioning analysis 10/pb @ 10TeV
- Plans for first data

POWHEG TTBAR

POWHEG

- NLO Generator ~ MC@NLO. Positive weights only, hard emission first
- Interfaced to any Shower Monte Carlo, such as Herwig/Jimmy, Pythia and Herwig++ (MC@NLO only with Herwig/Jimmy)
- Efforts coordinated w/ U. Husemann and C. Wasicki (DESY)

- Twiki pages:
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/PowhegForATLAS
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/POWHEGttbarValidation

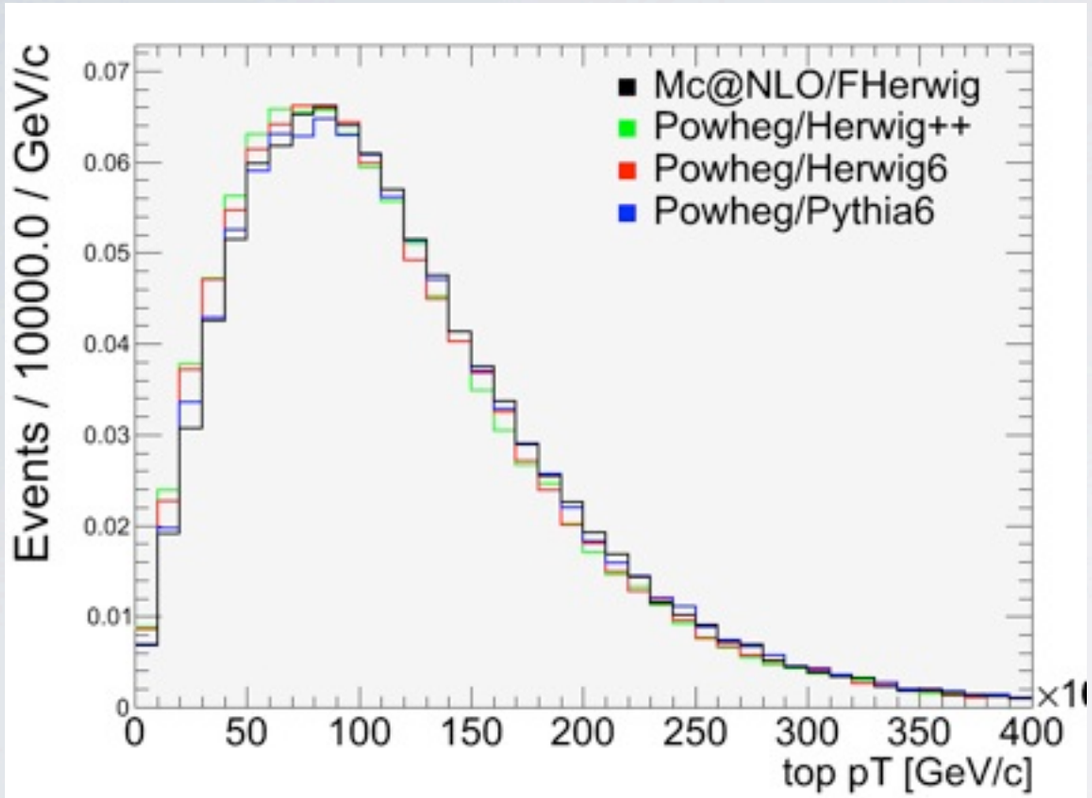
EVENT GENERATION

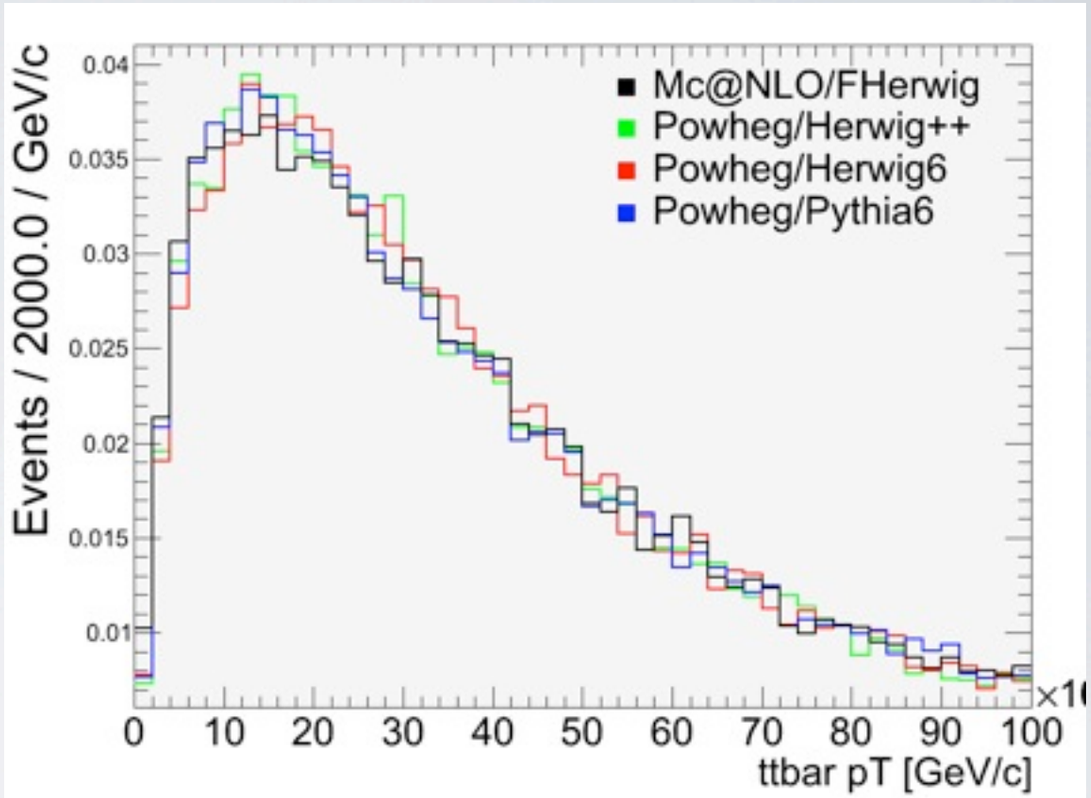
- Large .LHEF file is created for each sample (semilept, full-lept, full-had)
- A python script splits it in smaller chunks
- Athena jobOptions read chunks and perform P.S. in parallel
- Atlfast I is then run on EVGEN files
  - About to run job transforms on them, too!

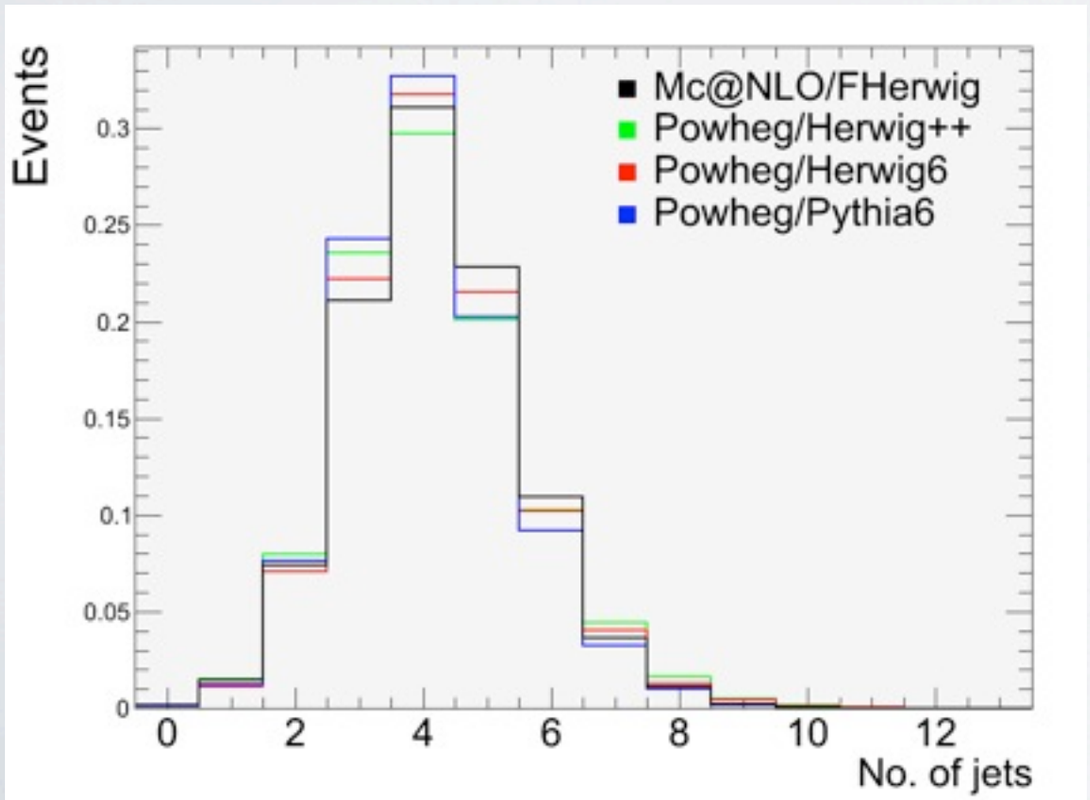
mt	mW	PDF
172.5GeV	80.4GeV	CTEQ6m

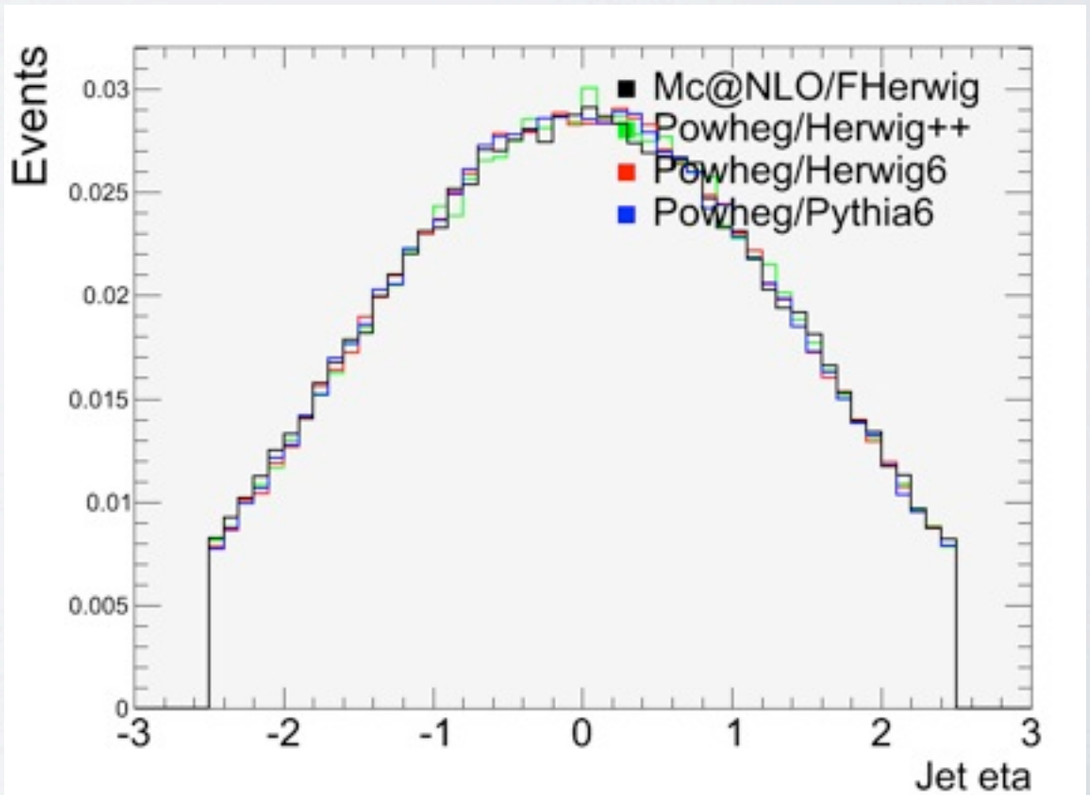
Sample	#gen	BR
semi lept	100k	4/9
full lept	100k	1/9
full had	300k	4/9

GENERATOR LEVEL

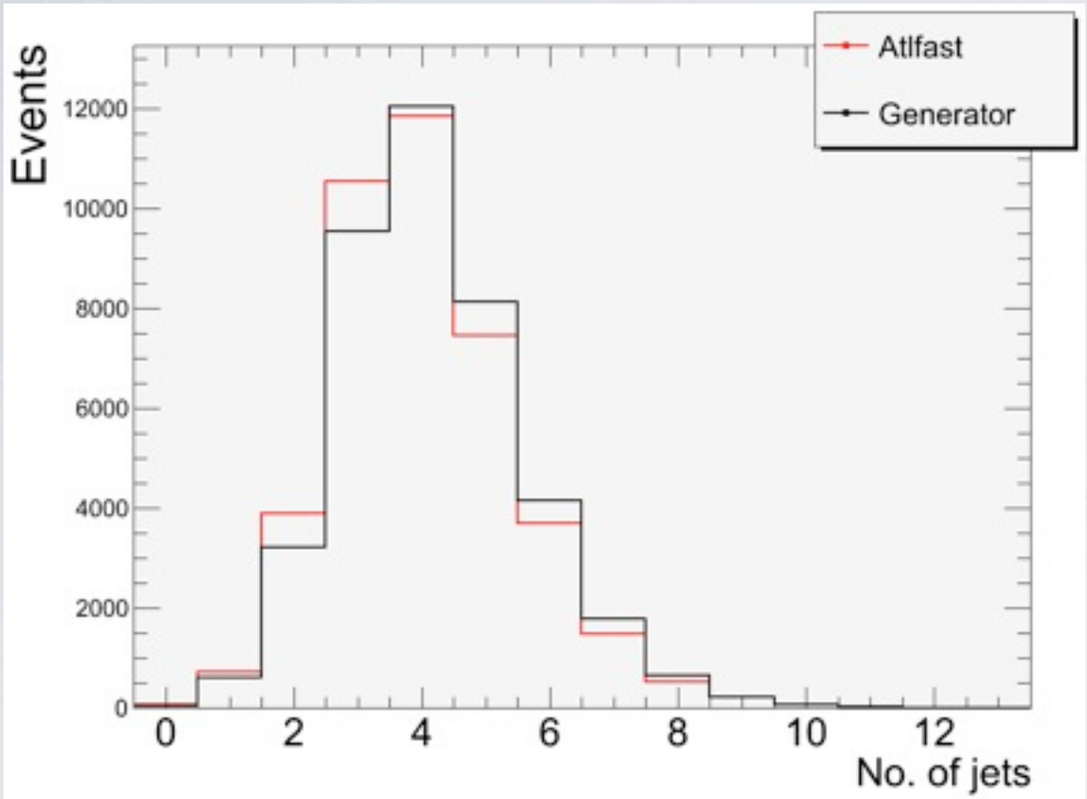


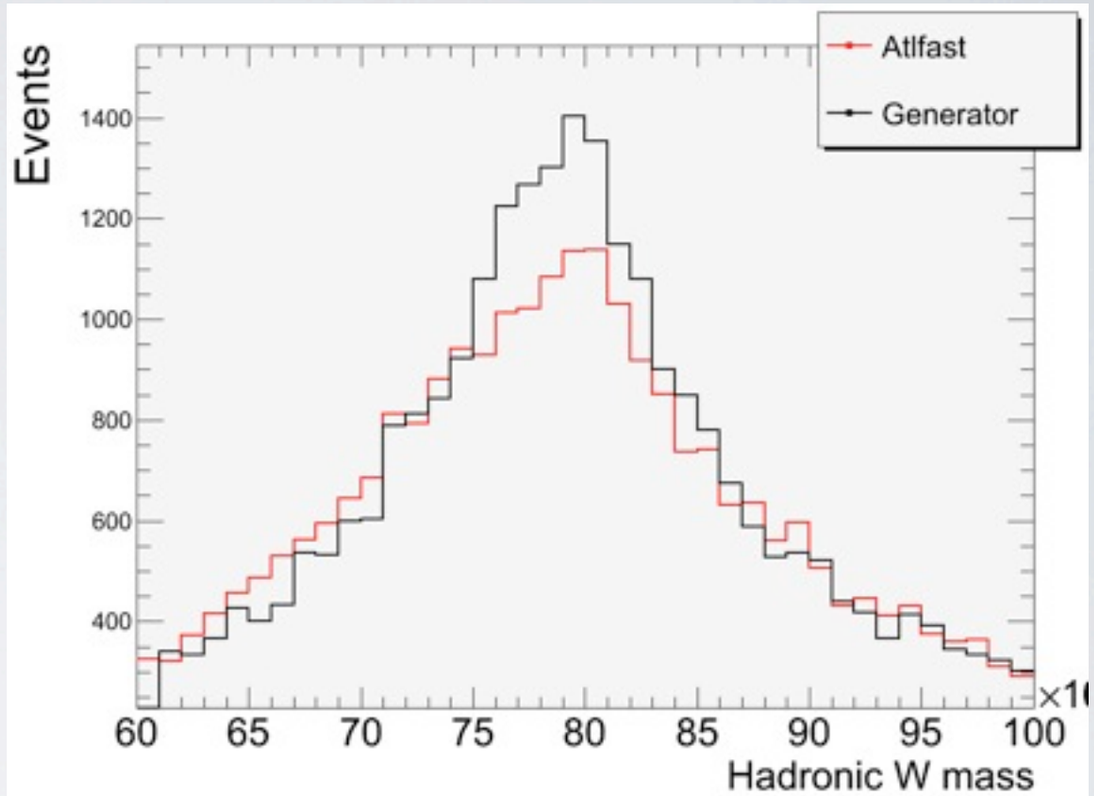


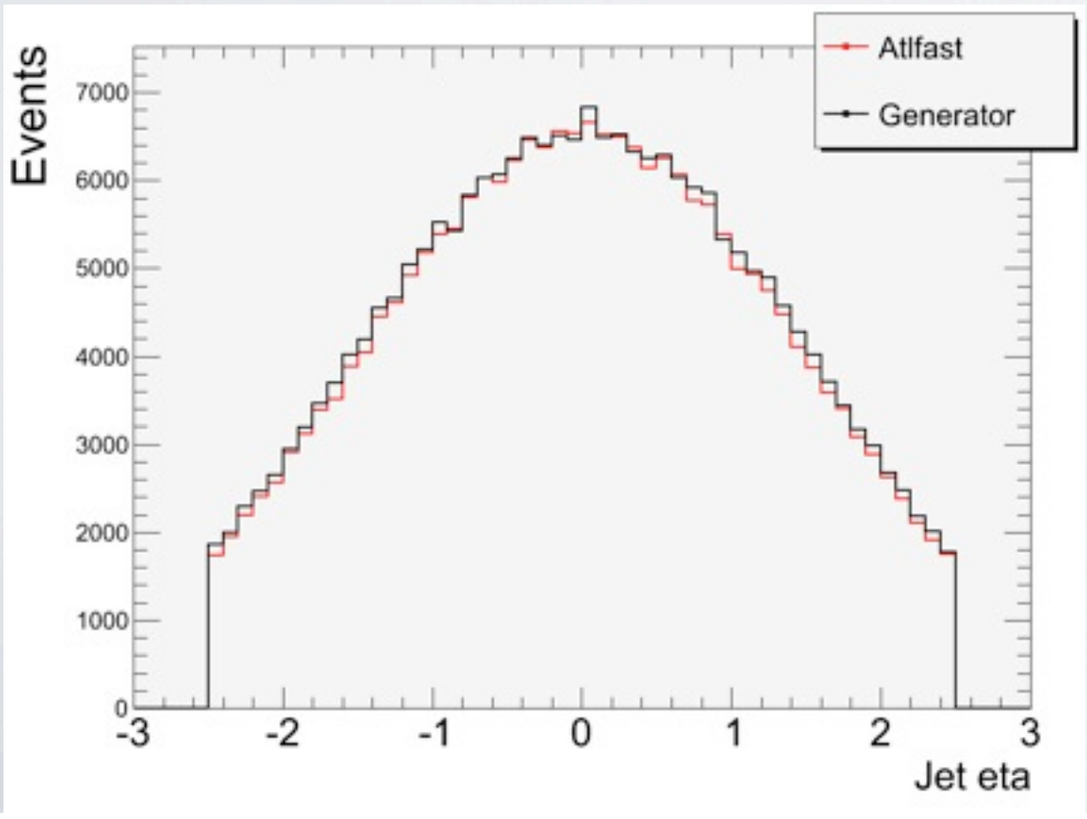


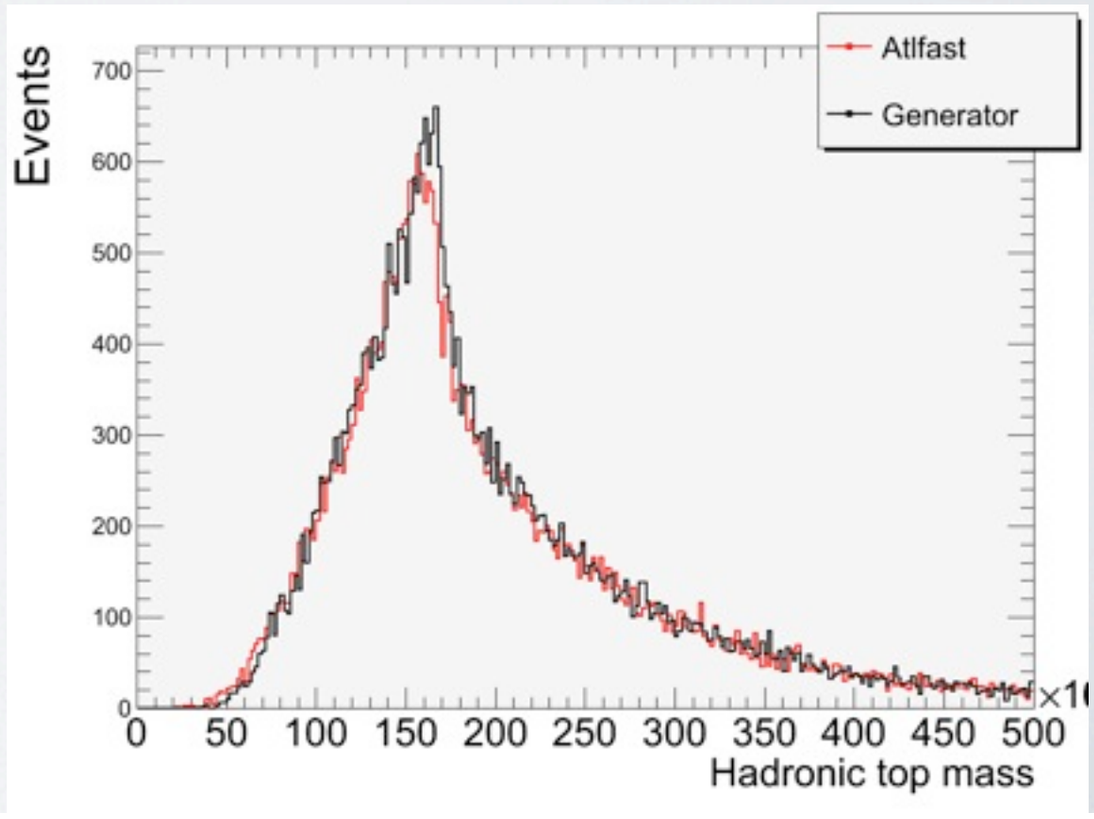


ATLFAST VS GENERATOR









MUON TAG AND PROBE

OVERVIEW

- Study muon trigger eff in the low-pT region
- *tT* leptonic events have a rich topology
  - Event selection more complicated
    - Challenging *in-situ* tag-and-probe in a complex environment
- Are efficiencies *w.r.t.* reco muons different from $Z \rightarrow \mu\mu$?

STRATEGY DEFINITION

- Selection of loose muons
- Event selection (cuts)
- Plot distributions
- Classification of kind of muons

selected (loose) muon:

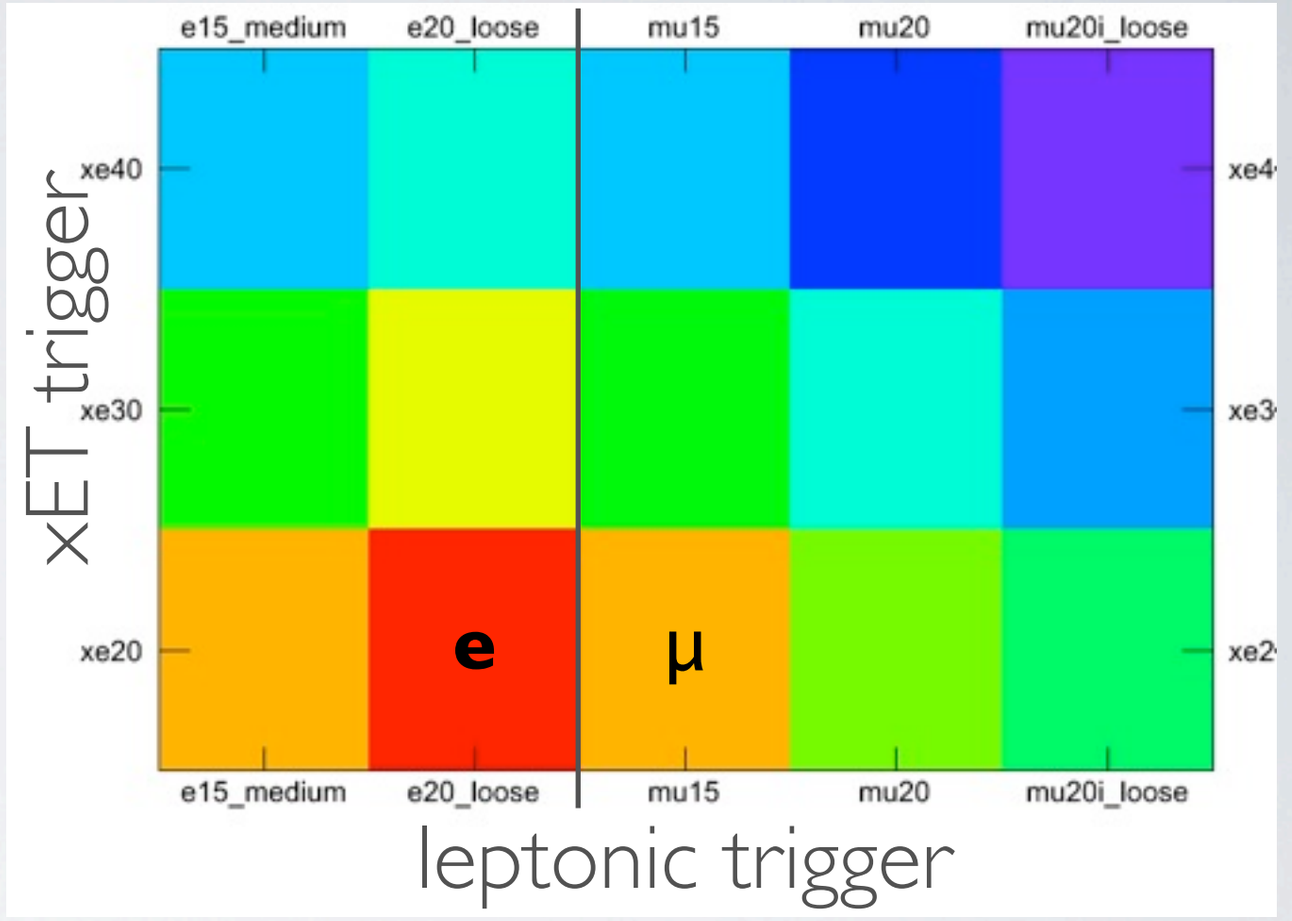
STACO container
pT>10GeV/c
$|\eta|<2.5$
Et cone 30 < 3GeV
(match $\chi^2<100$)

Tag muon:

loose muon
is combined
passed L1+L2+EF

EVENT SELECTION

- Single muon trigger
- mu15 candidate for *tT*
- Combined mu15_xe20 ?



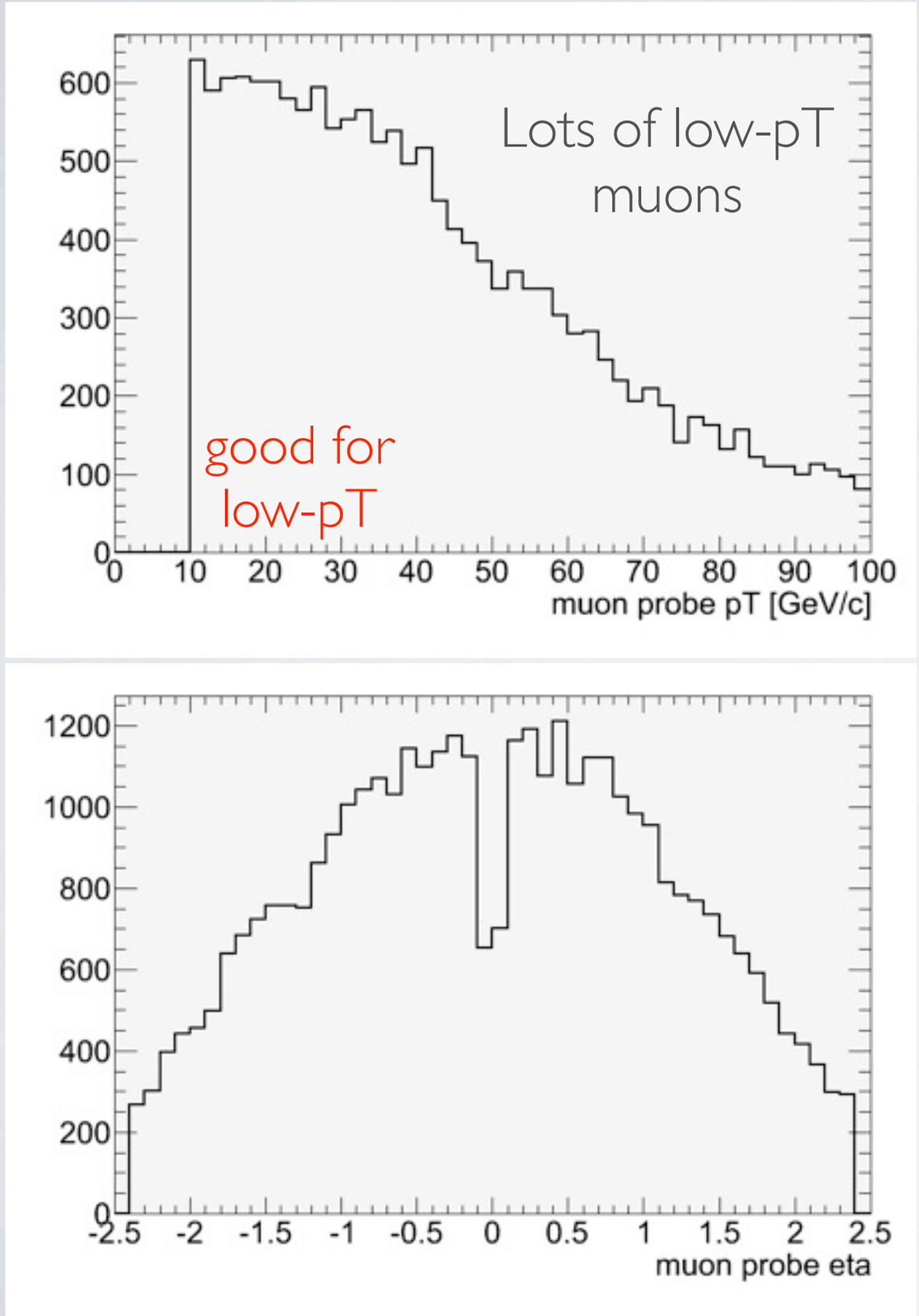
- *Zmm* events selected as usual
- *tT* events selected according to di-leptonic event selection

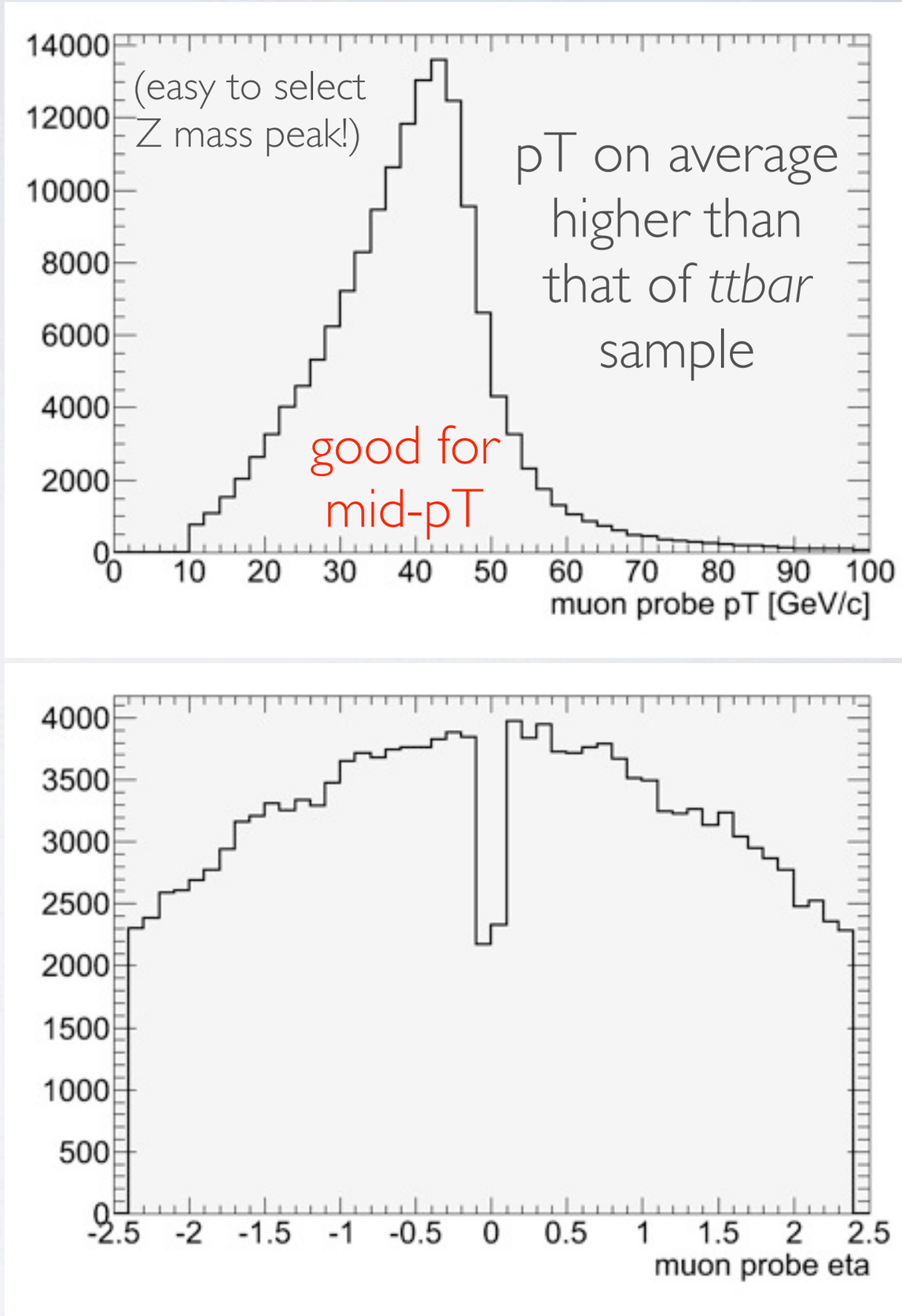
$Z^0 \rightarrow \mu\mu$	*tT*
2 selected muons	2 selected muons
$86 < m_{\mu\mu} < 96$	MET > 35. GeV
	No. of jets >= 2
	$m_{\mu\mu} < 86 \,\|\|\, m_{\mu\mu} > 96$

ttbar

Selected muons

$Z \rightarrow \mu\mu$

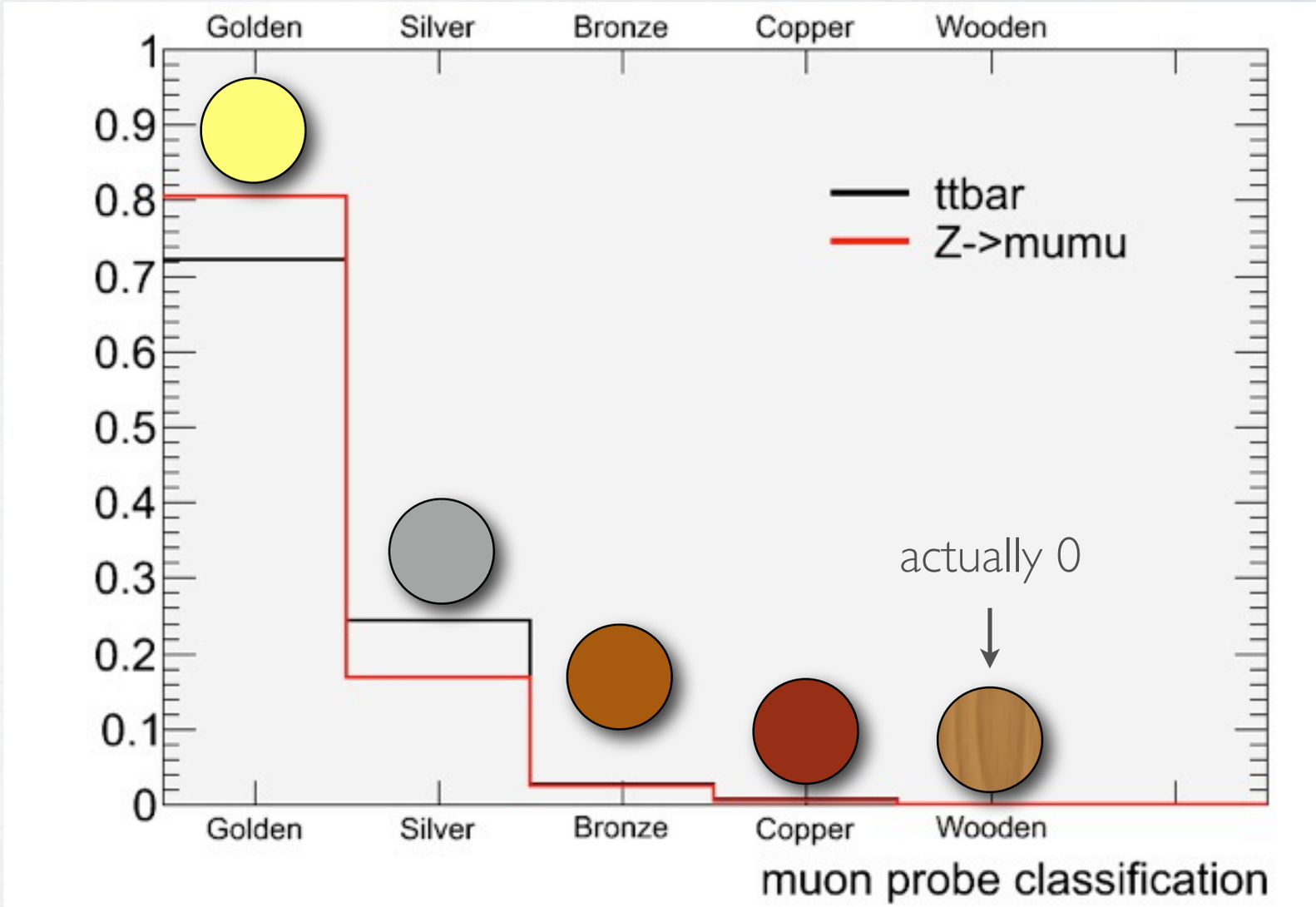




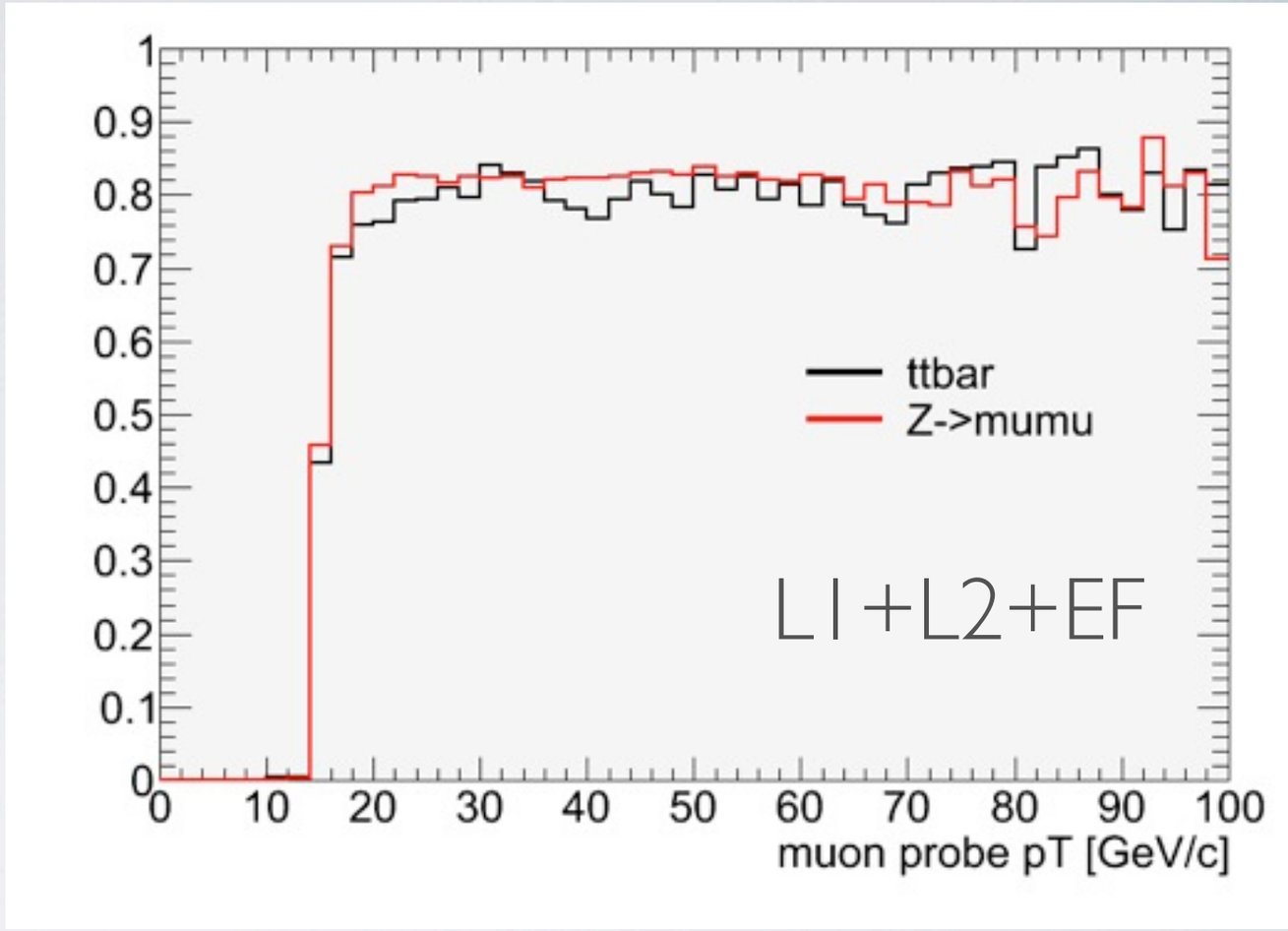
PROBE MUON CLASSIFICATION

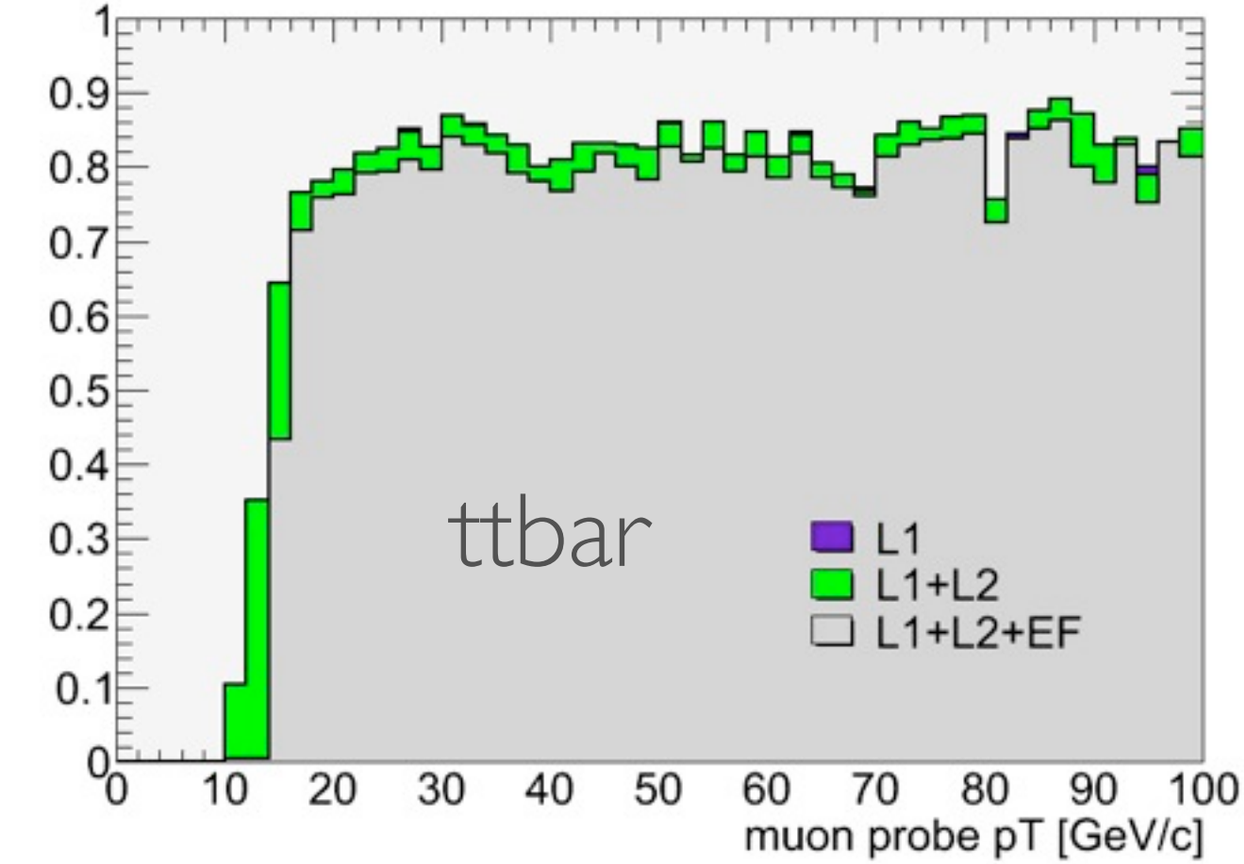
- Golden: is combined + L1 + L2 + EF = tag selection
- Silver: is combined, not triggered
- Bronze: not standalone but has indet trk
- Copper: is standalone but no indet trk
- Wooden: is standalone and has an indet trk in dR<0.3

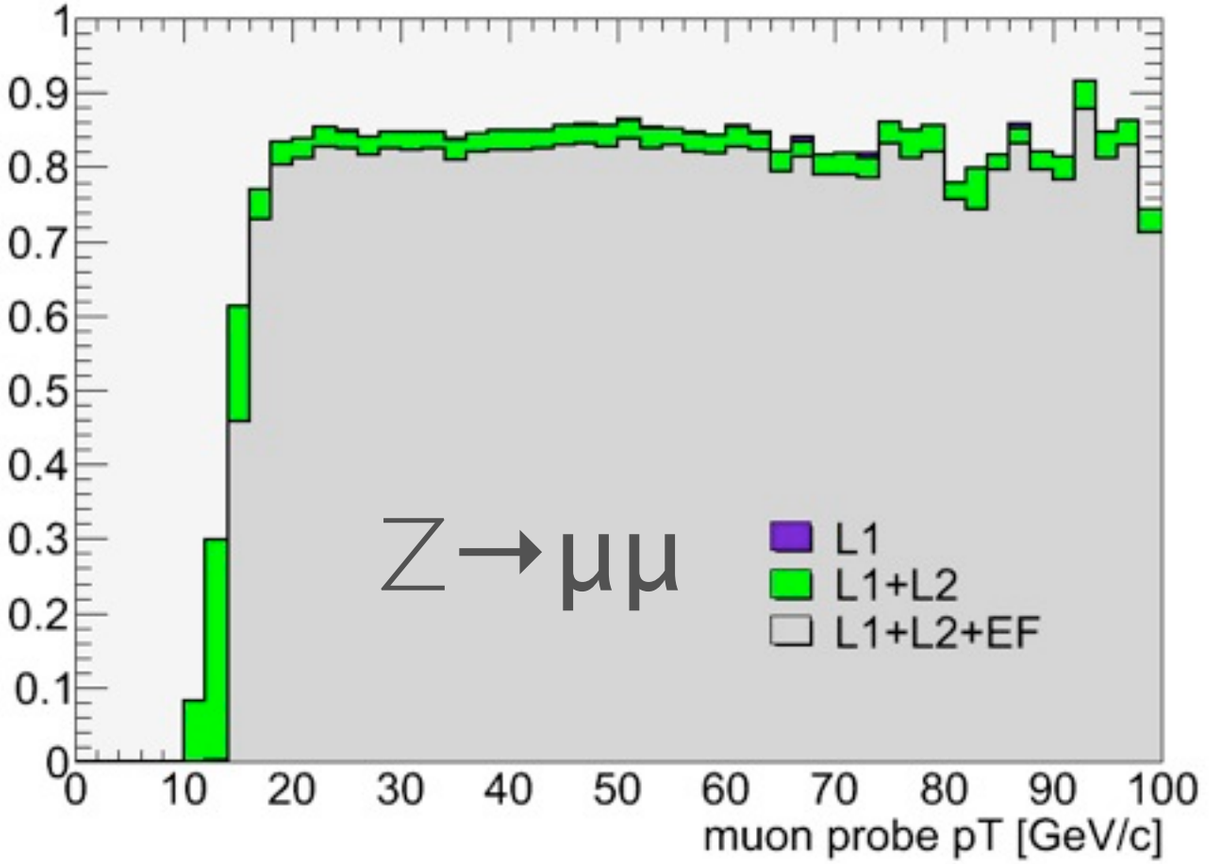
Which efficiency can be reached for each class?



- pT eff is quite similar, but the plateau is reached later at ~30GeV/c
- η eff evaluation ongoing...
- ...all reweighted to 7TeV







COMMISSIONING ANALYSIS

OVERVIEW

- Inspired by Single Lepton note. Estimate *tT* production XS in the semileptonic decay channel

- Same analysis should work on real data

- Objects: trigger chains, transverse sphericity, leptons, jets (& b-tag weight), xET, SumET, reconstructed hadronic W and top

DETAILS

- Format: only official FullSim AODs generated @10TeV
- Selection: UserAnalysisUtils, standard cut parameters
- Analysis: on the Grid:
  - Ganga ok, but some sites are not...
    - Submission on CA, DE, FR, IT & UK clouds
      - IT cloud: empty TIDs!
      - On some nodes jobs fail with no evident reason
- MC truth used only for event weight

DATASETS

- Signal *tT*: mc08.105200.T1_McAtNlo_Jimmy.merge.AOD.e357_s462_r635_t53/
- Bkgs: used s462_r635_t53/ series

- Reprocessed samples: e376_s462_s520_r808_r838/
- Used for new (reweighted) 7TeV plots
  - Powheg *tT* sample now available

CUT FLOW & OBJETCS

1. Trigger e20i OR mu15

2. ele XOR mu

3. xET > 20GeV

4. 3j40

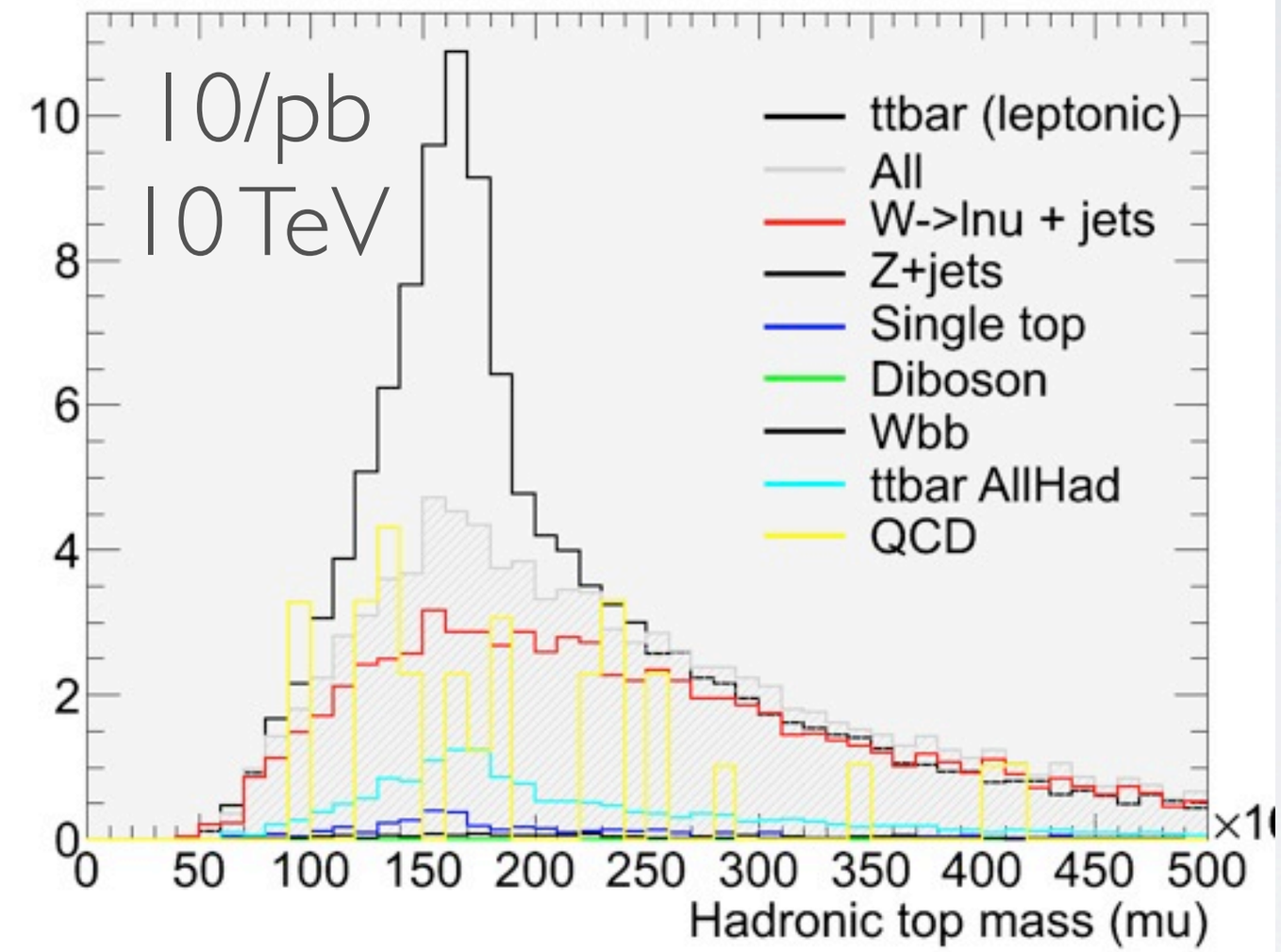
5. 4j20

Electron
pT>20GeV
$\|\eta\|$<1.37 OR 1.52< $\|\eta\|$<2.5
etcone20<6GeV
IsEM = Medium

Muon
StacoMuon
pT>20GeV
$\|\eta\|$<2.5
etcone30<6GeV
χ^2 < 100
dR(j,μ) > 0.3

Jet
Cone4H1TowerJet
pT>20GeV
$\|\eta\|$<2.5
dR(e,j) > 0.2

RESULTS @10TEV



iLumi	S	B	S/B	S/√B
10/pb	128	137	0.94	11
5/pb	64	68	0.94	5.6
1/pb	13	14	0.94	3

- All bkgs negligible except $W \rightarrow l\nu$ and *ttbar* all-had
- QCD MJB (from MC) has large errors
- With 10/pb top signal can be seen with:

S/√B	syst
11σ	no syst
10σ	+100% QCD +20% $W \rightarrow l\nu$
8σ	2*bkg
5σ	5*bkg

PLANS FOR EARLY DATA

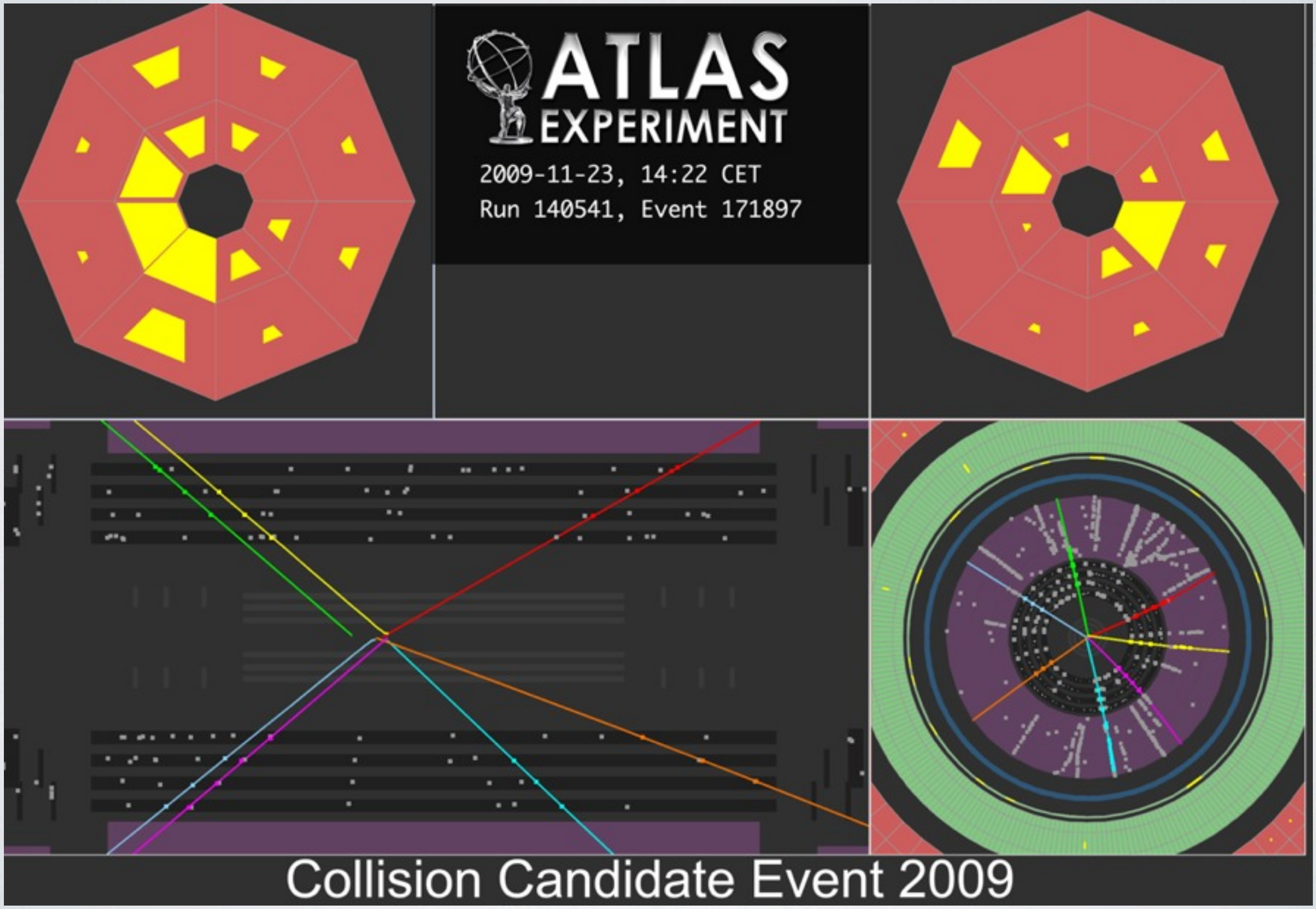
TRIGGER

- Detailed study of RPC roads for barrel muons ongoing
  - Several problems spotted, devising strategy to fix them online and offline
- Tag&Probe with J/ψ, Υ, Z^0
  - Tools now hand-made ⇒ InsituMuonPerformance
- Forseen use of ID, CAL, MDT, RPC

ANALYSIS

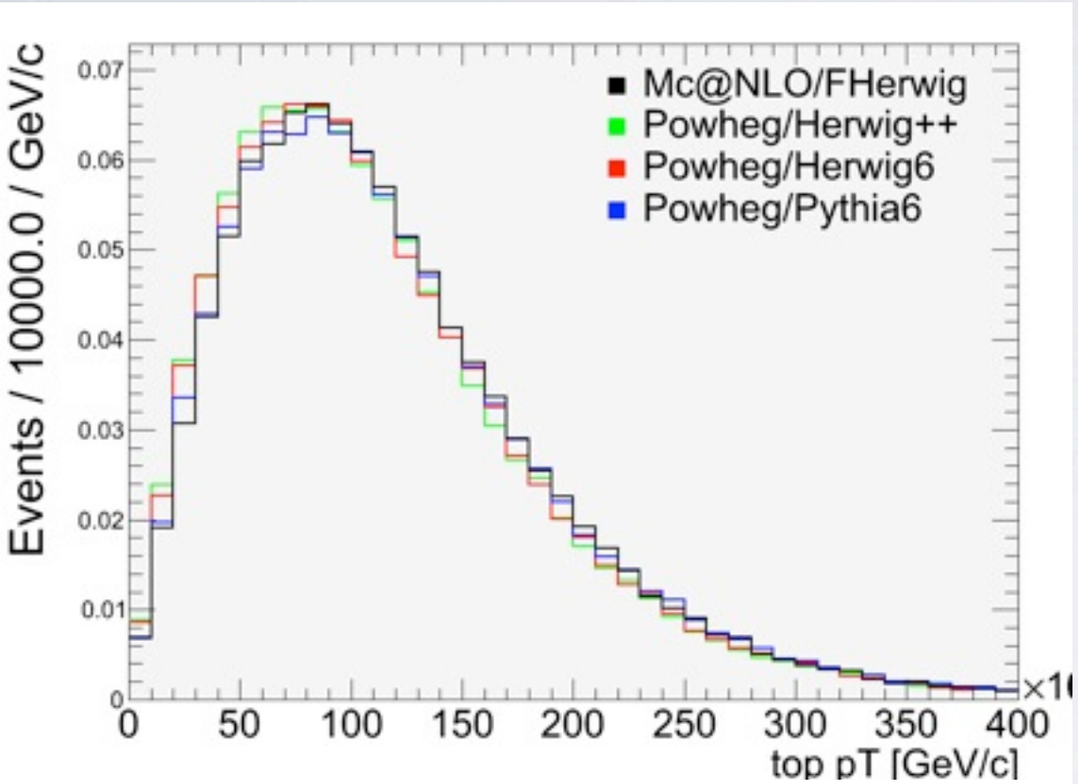
- AOD ⇒ private rootuple. Group DPDs would help...and ESD?
- Are there "common ntuples" already?
- First runs: object selection, plot distributions. Invariant masses?
- MC: Reweighting at hand. 10TeV→7TeV
- Troubles with Ganga. Several jobs fail, reasons unexplained

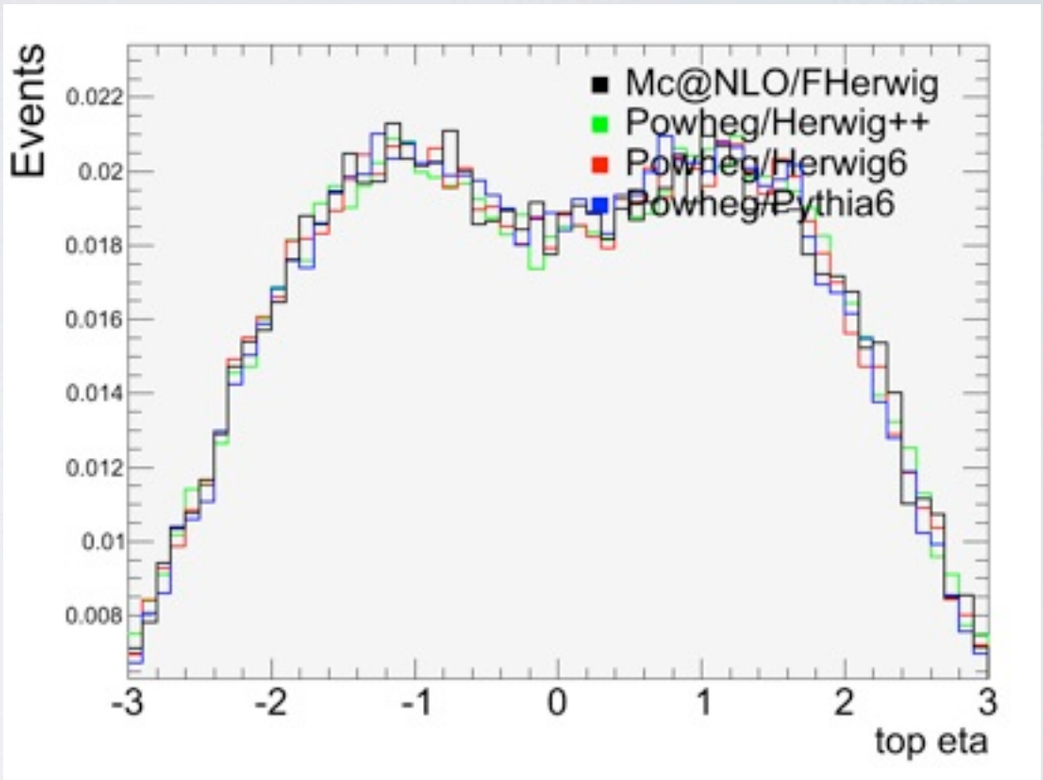
HERE WE GO!!!

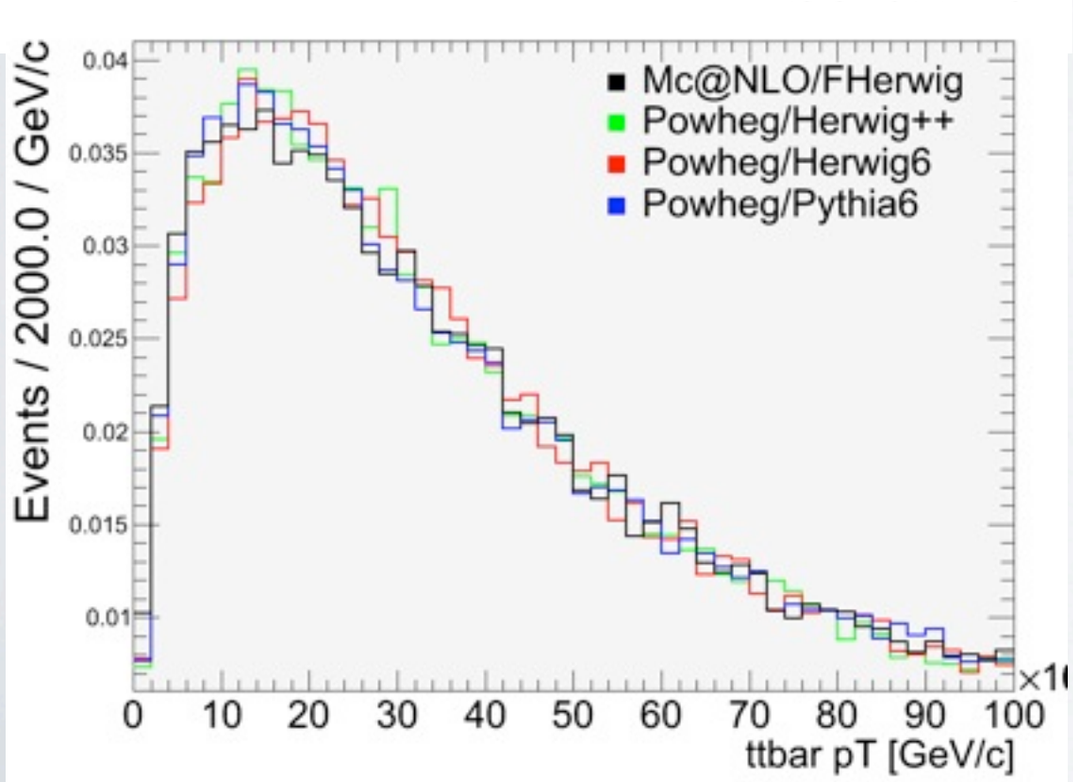

ATLAS
EXPERIMENT
2009-11-23, 14:22 CET
Run 140541, Event 171897
Collision Candidate Event 2009

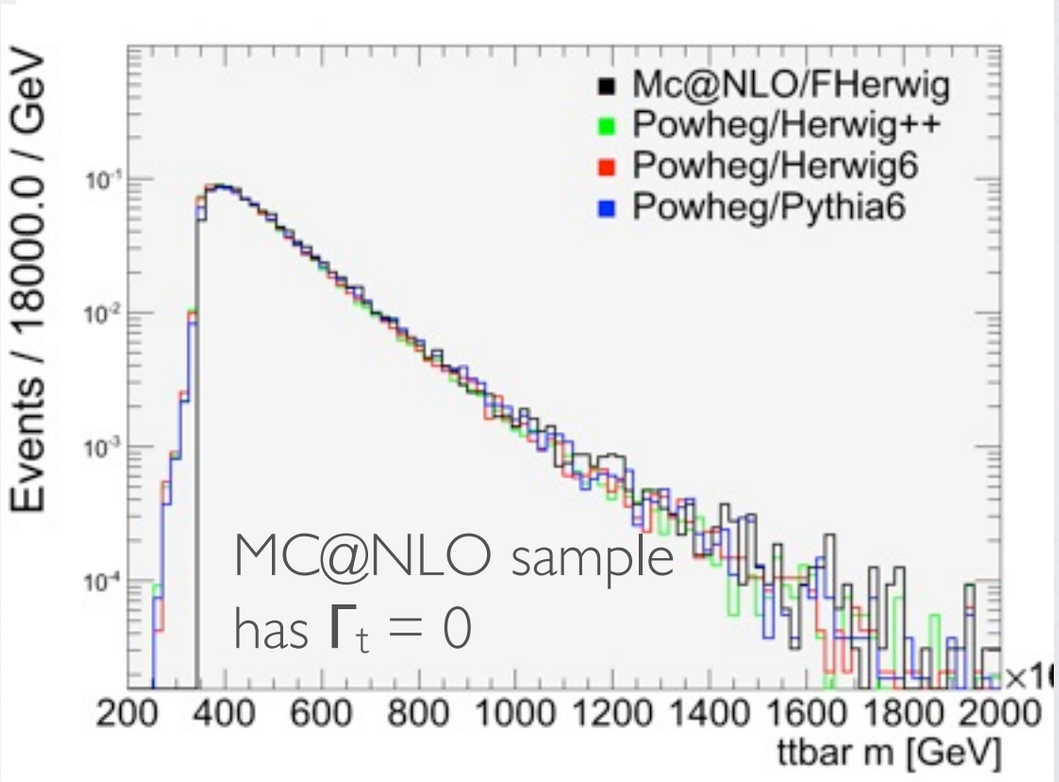
BAKCUP SLIDES

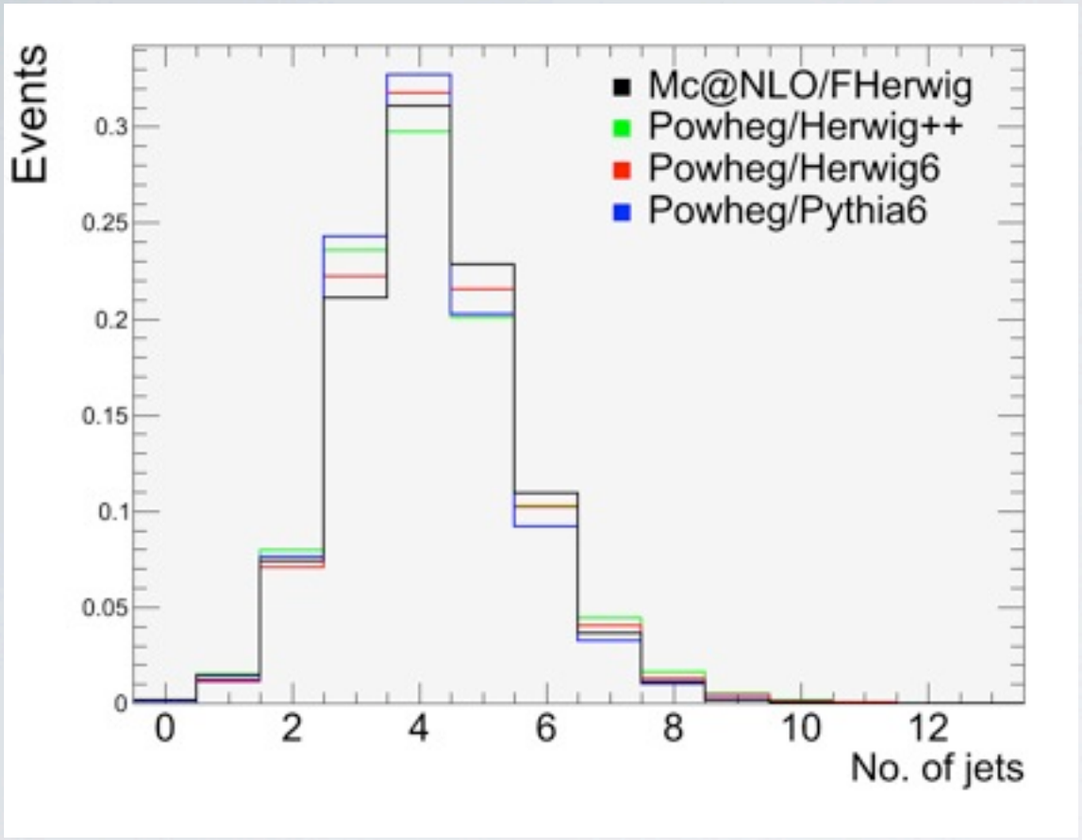
GENERATOR LEVEL PLOTS

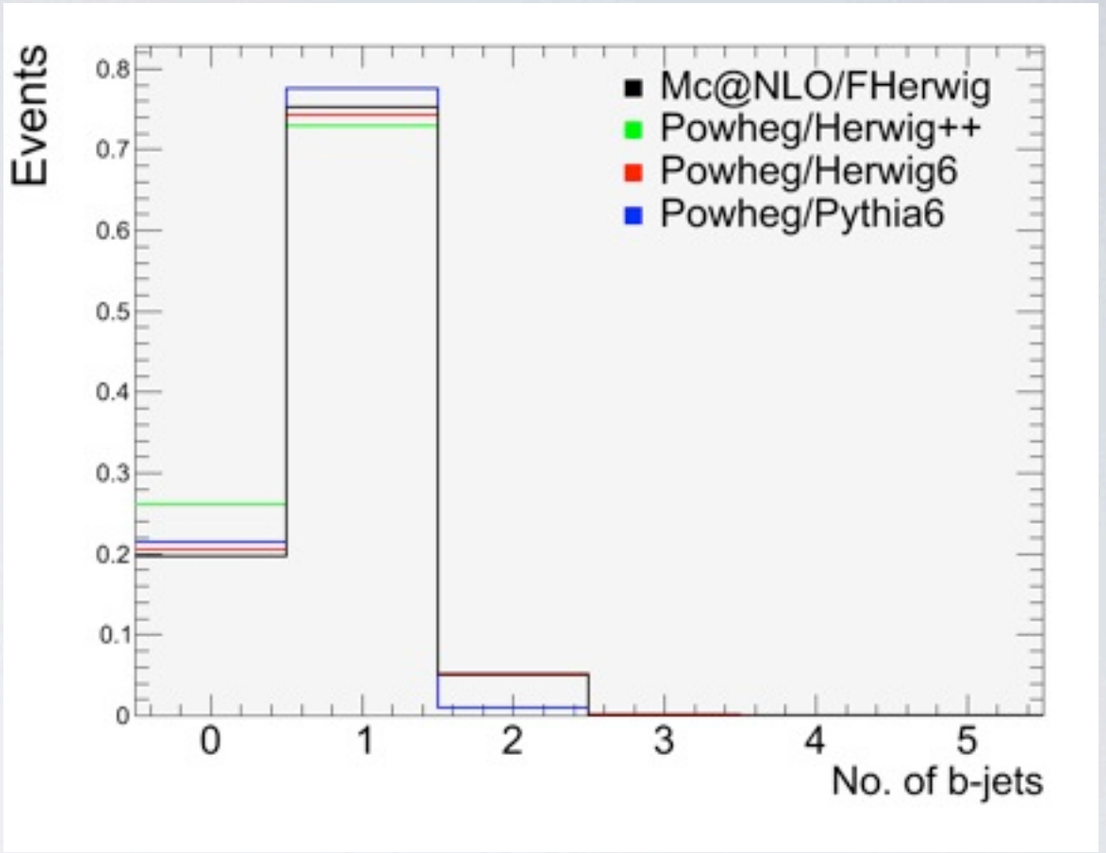


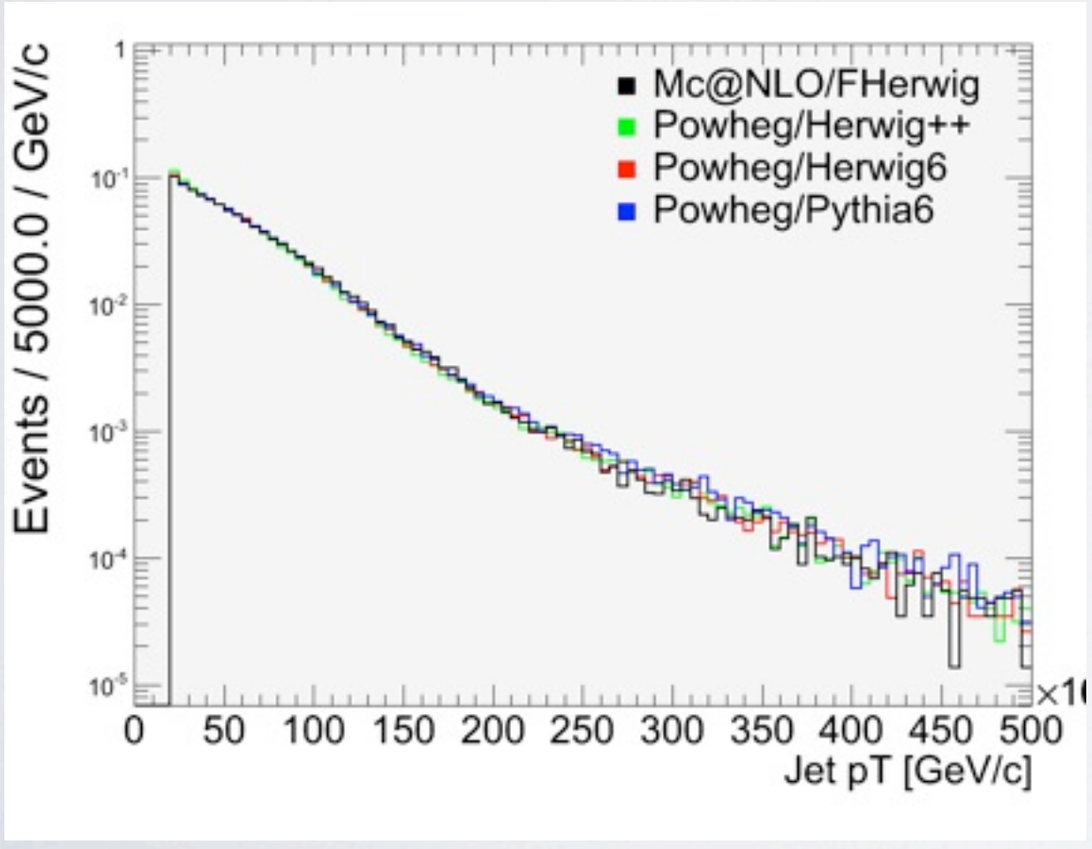


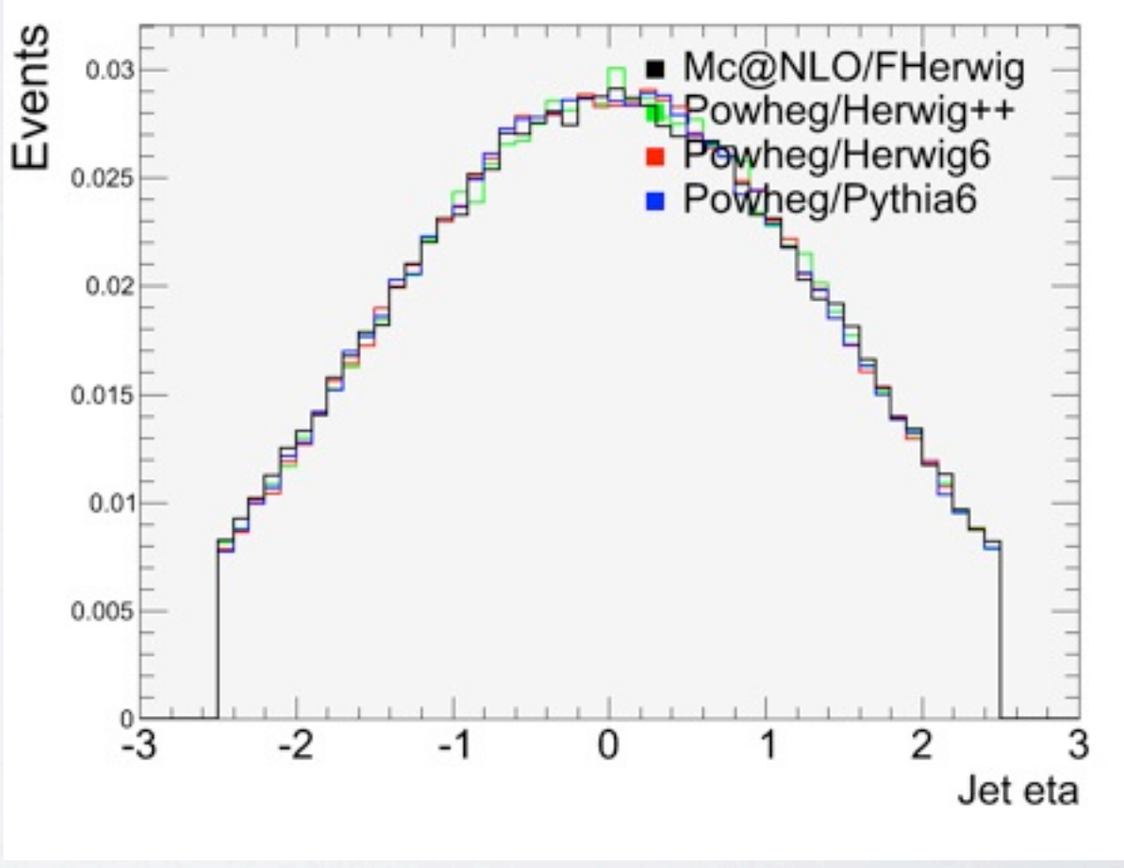


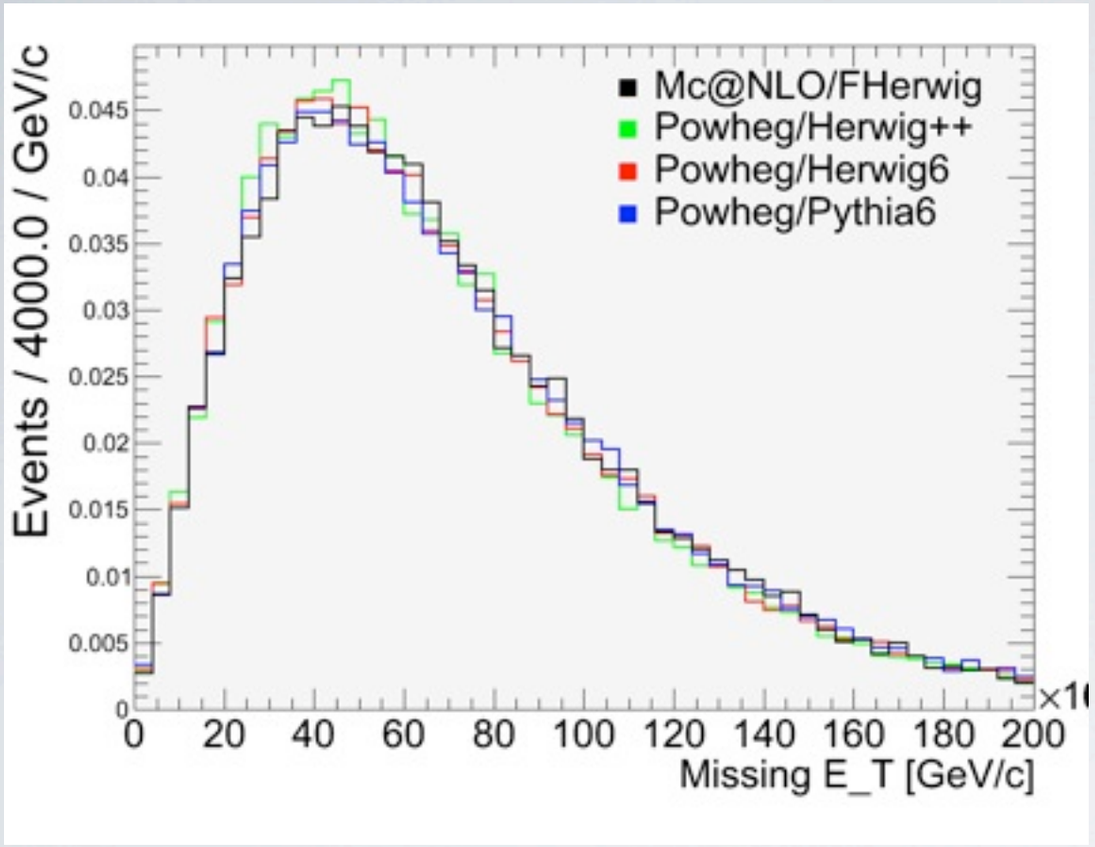


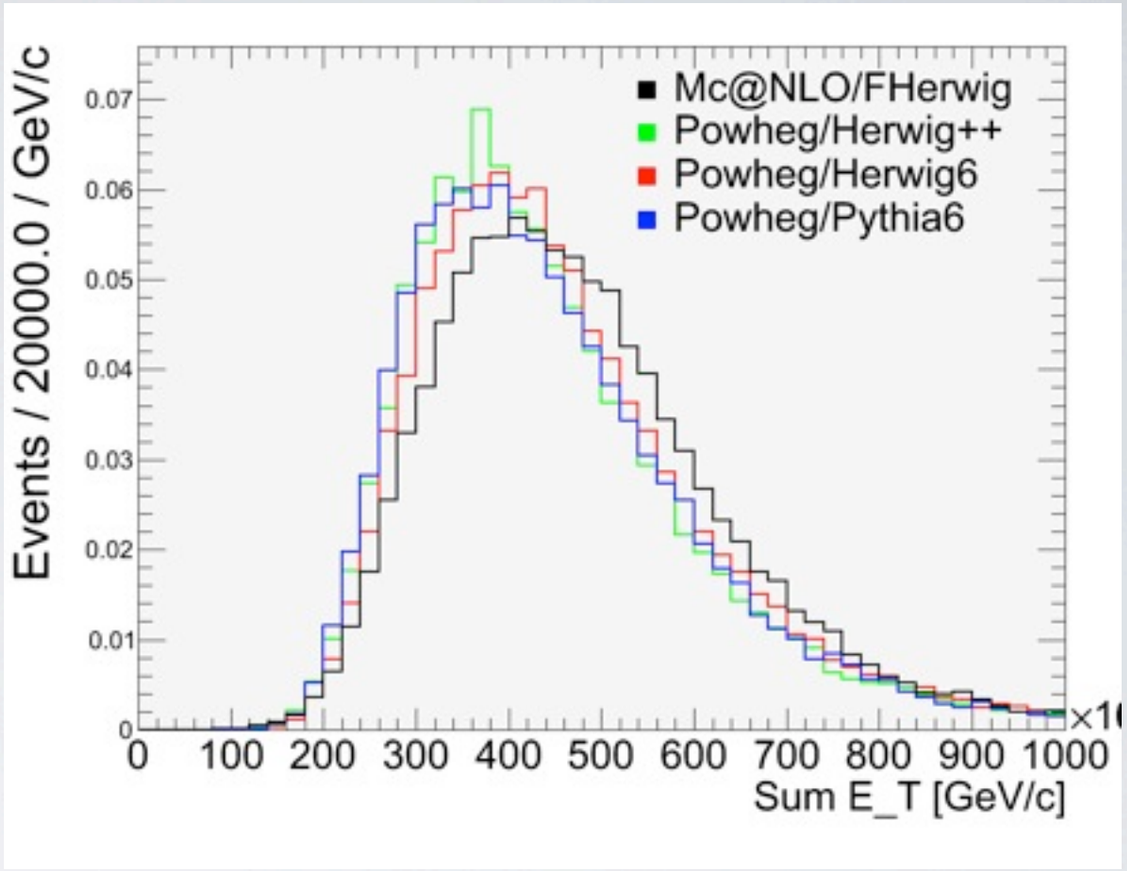

Events
Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
No. of jets


Events
Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
No. of b-jets


Events / 5000.0 / GeV/c
Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Jet pT [GeV/c]


Events
Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Jet eta


Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Events / 4000.0 / GeV/c
Missing E_T [GeV/c]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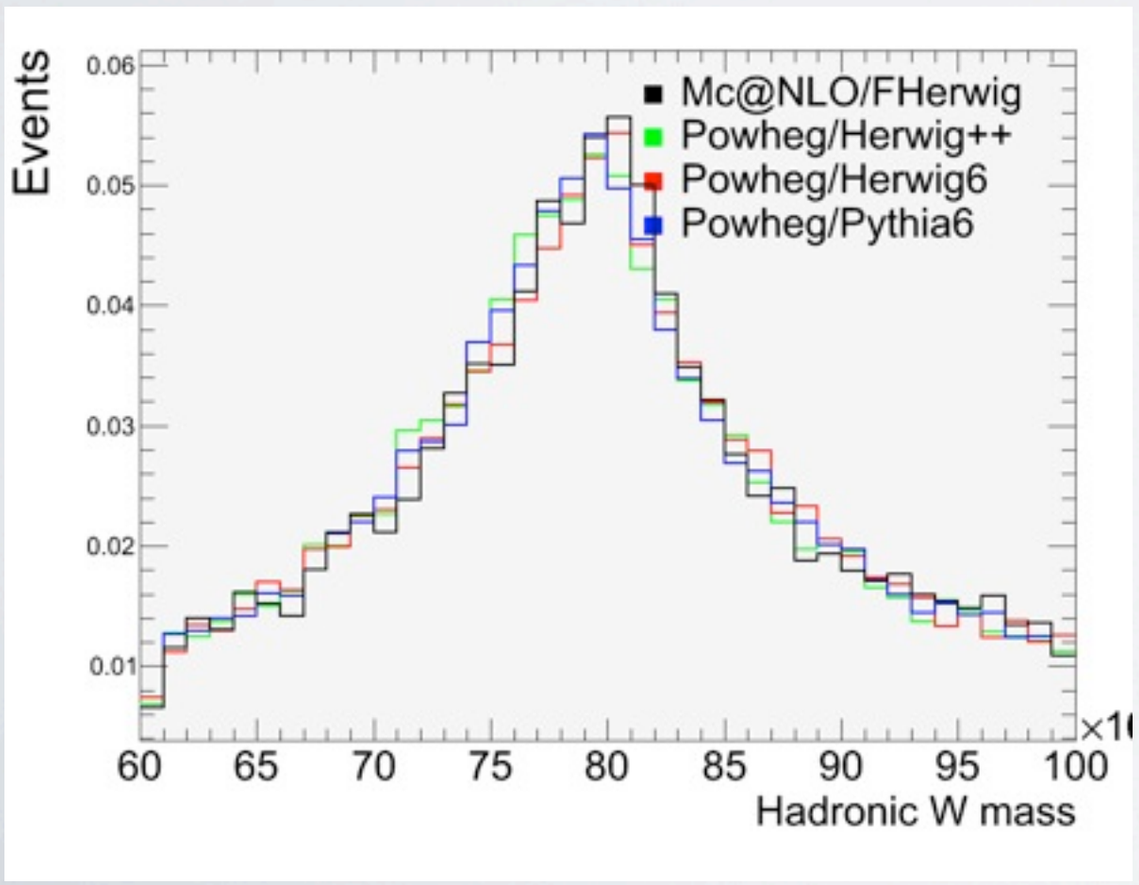
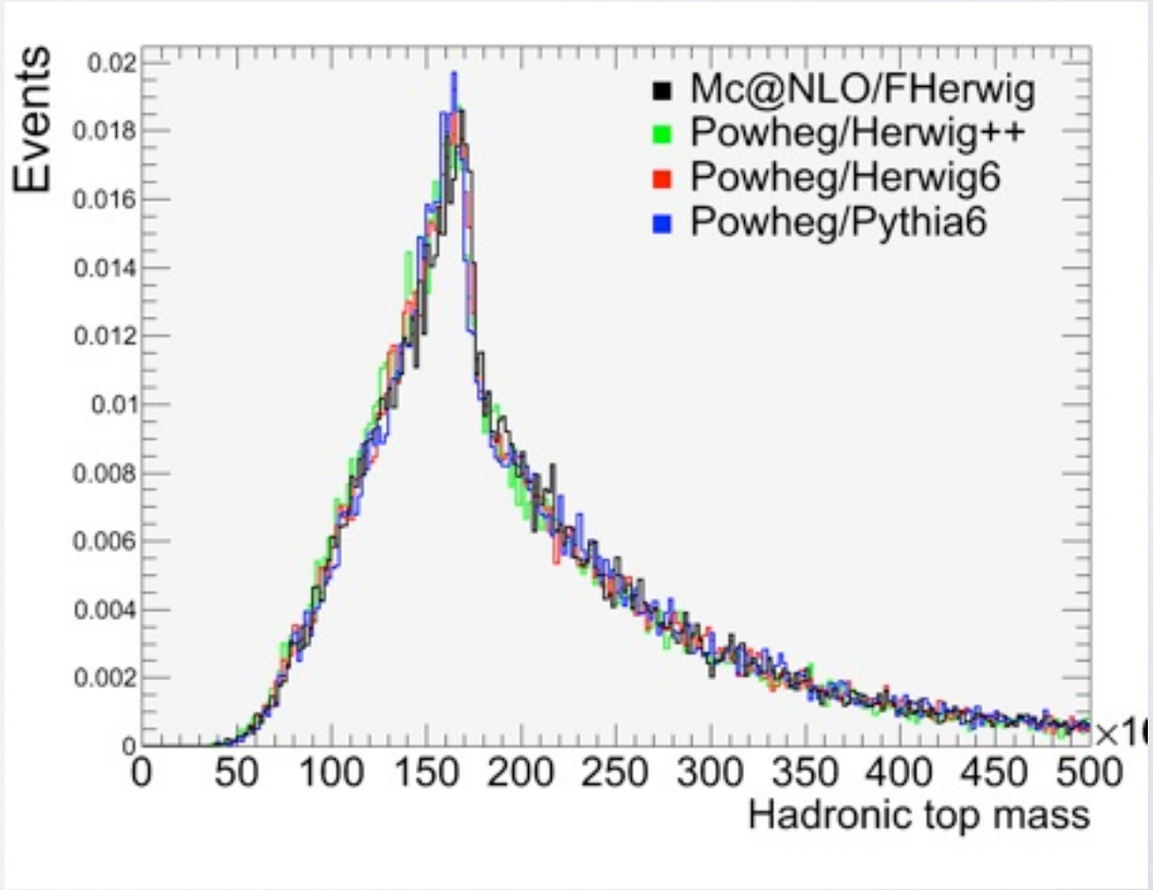
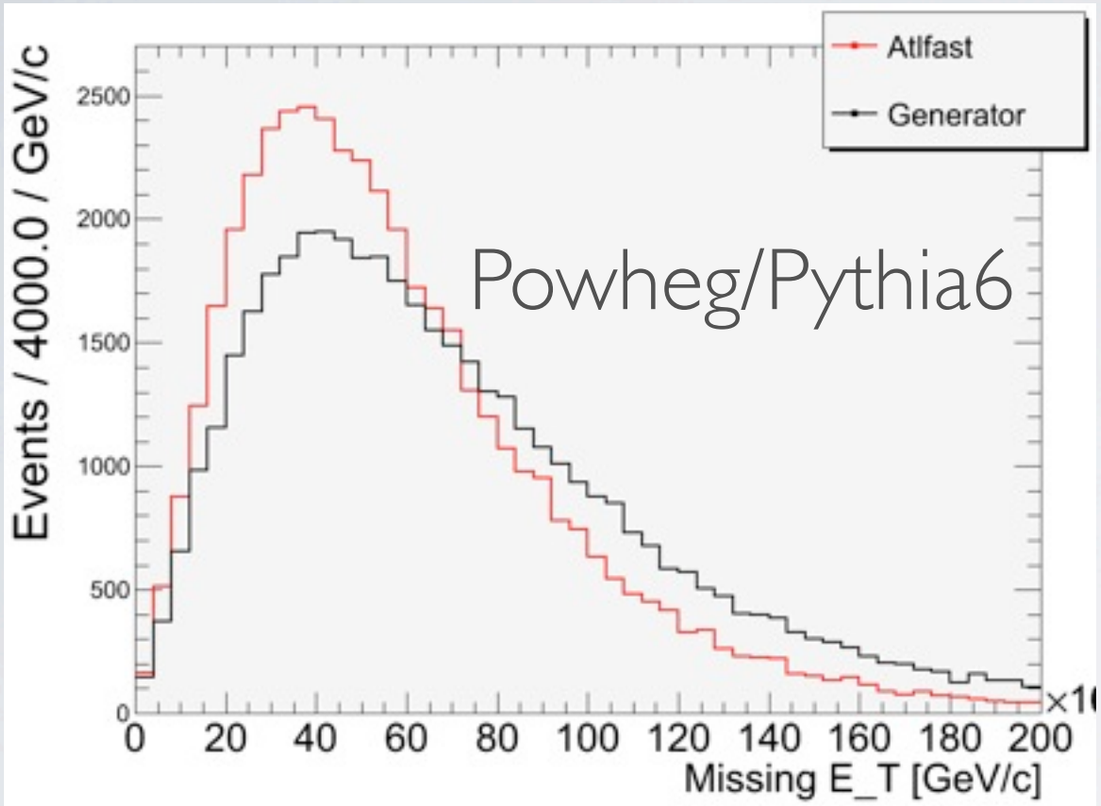
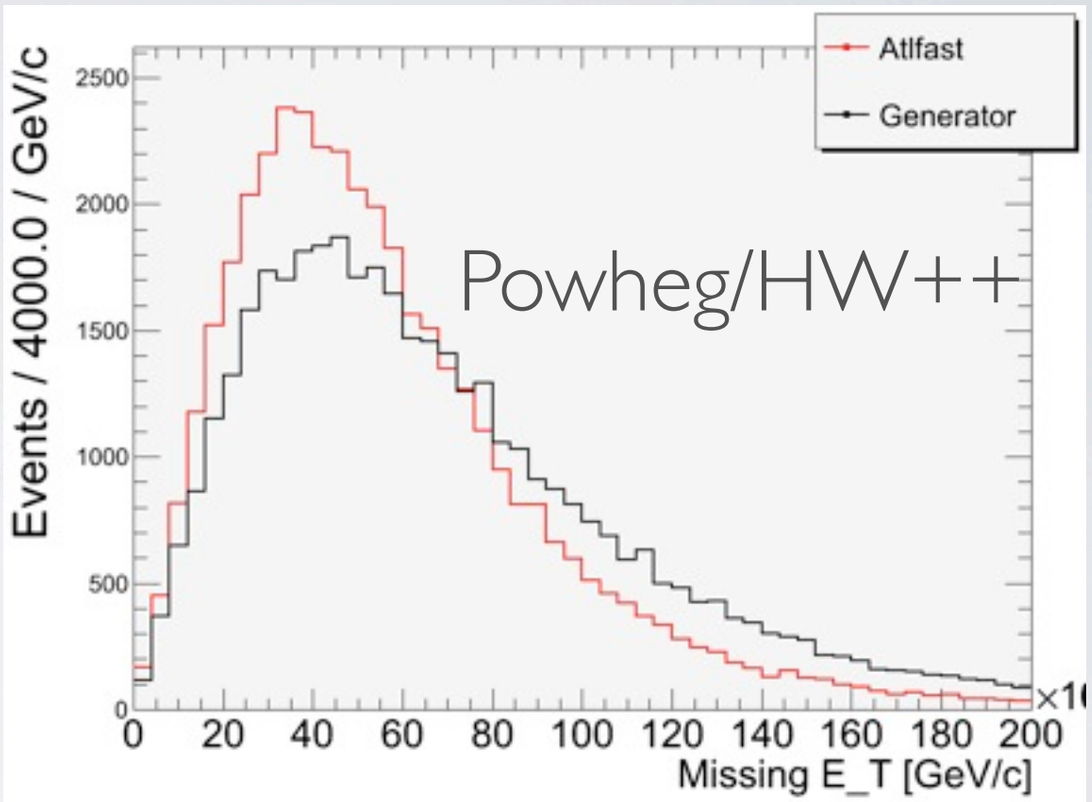
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Events / 20000.0 / GeV/c
Sum E_T [GeV/c]

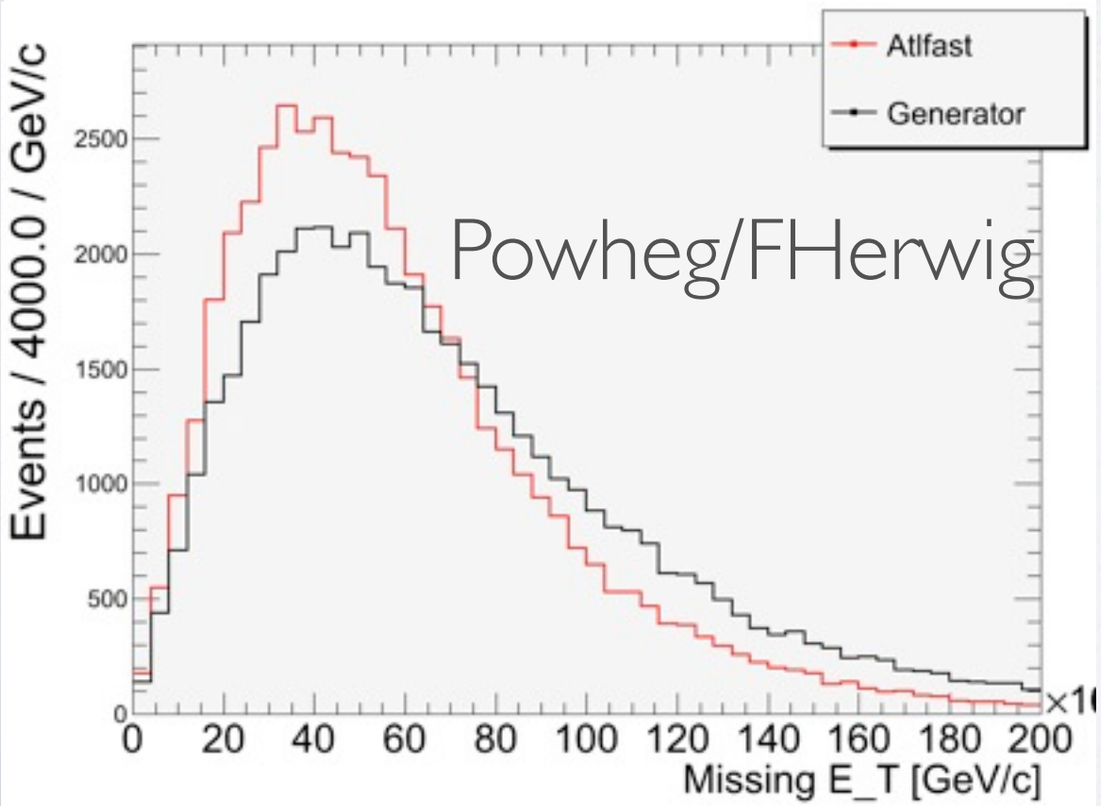

Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Events
Hadronic W mass


Mc@NLO/FHerwig
Powheg/Herwig++
Powheg/Herwig6
Powheg/Pythia6
Events
Hadronic top mass

MISSING ET "PROBLEM"







The effect is always present

Atlfast MET is lower

No muons in MET