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HYDJET muons

Sept 16th, 2010

<https://twiki.cern.ch/twiki/bin/view/Main/HIMuons>

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# HYDJET vs PYTHIA

Ncoll=313(high pT, Npart = 106 (low pT))

En(GeV)  eta <2.4, pt_hat>6GeV/c	#mu/ev 1e-3 pt>10 GeV/c,	PHYTHIA/ HYDJET	#mu/ev 1e-3 pt>5 GeV/c	PYTHIA/ HYDJET
HYDJET@2760	0.31	6.4	4.8	4.9
PYTHIA@2760*Ncoll	1.98		23.4	
HYDJET@4000	0.63	2.	7.9	2.7
PYTHIA@4000*Ncoll	1.3		21.2	

--> Too few high-pT mus

En(GeV), pt_hat>6GeV/c	#mu/ev	PYTHIA/HY DJET	#mu/ev 1e-3 pt>3.5 GeV/c	PYTHIA/ HYDJET
HYDJET@2760	0.95	1.1	14	1.64
PYTHIA@2760*Npart	1.06		23	
HYDJET@4000	1.64	0.64	24.5	0.87
PYTHIA@4000*Npart	1.06		21.3	

--> better at low-pT

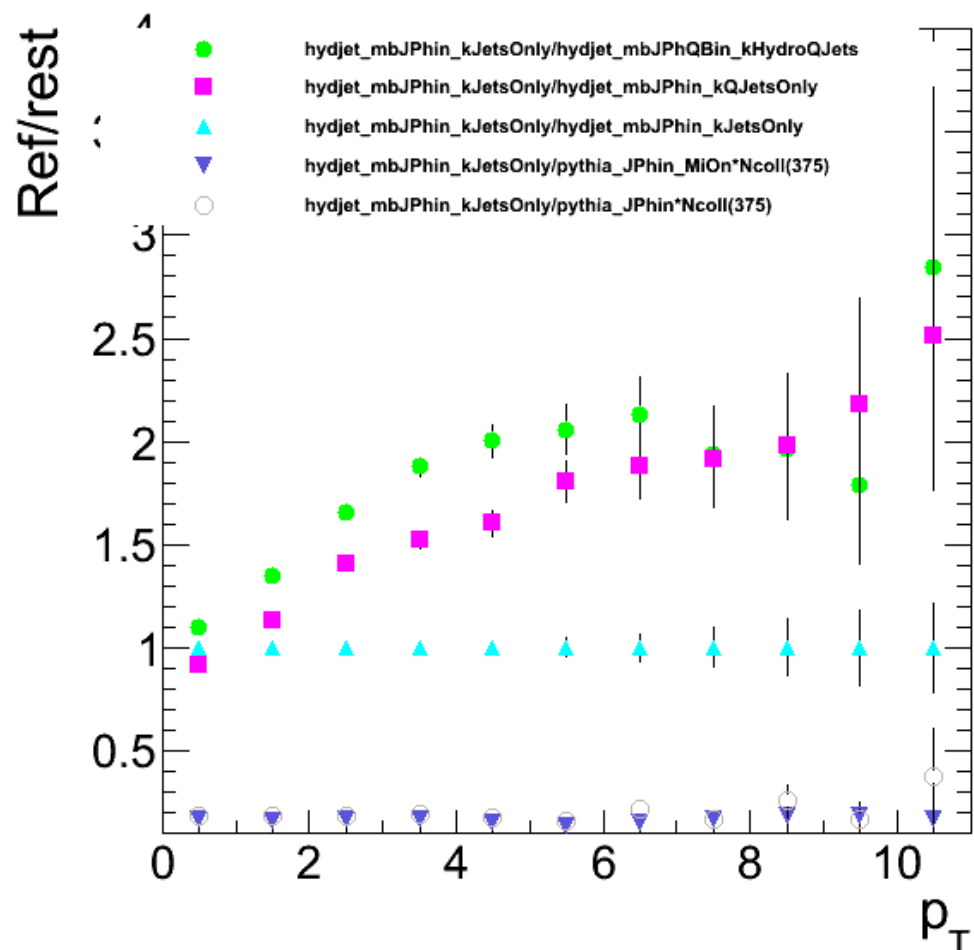
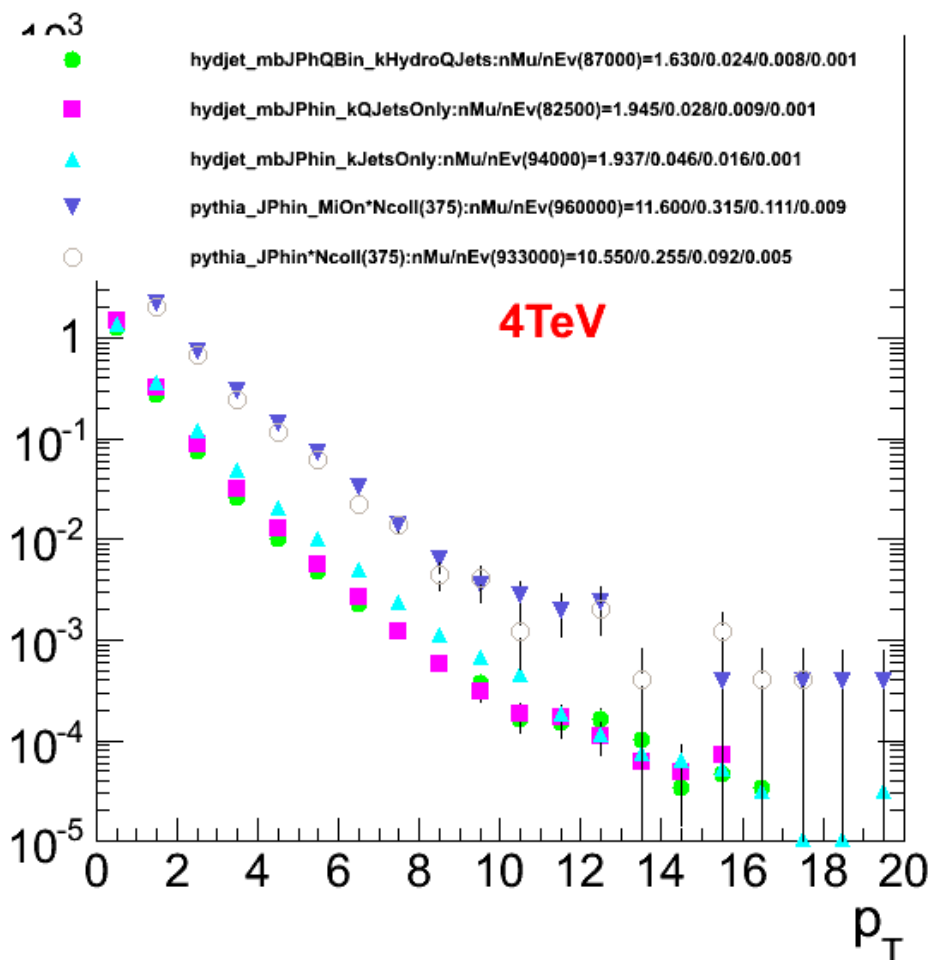
# HYDJET vs PYTHIA

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- Channels influence (look only in PYTHIA)
  - ++ official pp\_mb (jets, diffractive,low\_pT) vs hydjet\_setting (jets, photons, MSTP(81)=0) --> more muons when no multiple interactions (initial,final) OFF
  - ++ official (jets, diffractive,low\_pT) vs hydjet\_setting (jets, photons but MSTP(81)=1) --> slightly more than previous case (0.031 vs 0.028); so main difference from the channels

# HYDJET vs PYTHIA\*Ncoll

- HYDJET vs PYTHIA scaled (only with jets and photons in)
  - ++ hydro off, quenching on (nhsel = 4 aka kQJetsOnly)
  - ++ hydro off, quenching off (nhsel = 3 aka kJetsOnly)



# HYDJET vs PYTHIA\*Ncoll

#### HYDJET and PYTHIA deal differently with the hard event generation when a `pt_hat` is applied

\*\* HYDJET recalculates the number of hard scattering

\*\* PYTHIA does NOT recalculate the number of hard scattering

\* What does this mean?

\* If NO `pt_hat` cut, (0 to infinity), there will be generated:

→ in HYDJET `n_hydjet` hard scatterings

→ in pythia, `n_pythia` hard scatterings

\* if YES `pt_hat` cut, there will be generated

I → `n` HYDJET, [`n_hydjet` - `n_hydjet_(found in the  $pt < pt\_hat$  interval)`] (so only what is above the cut in the (1), a subset)

→ in PYTHIA, still all `n_pythia` hard scatterings

\* What is the effect?

\* You get more `hard_scattering_probes` in PYTHIA case than in HYDJET (just because you have more hard scatterings)

\* How to do comparison properly?

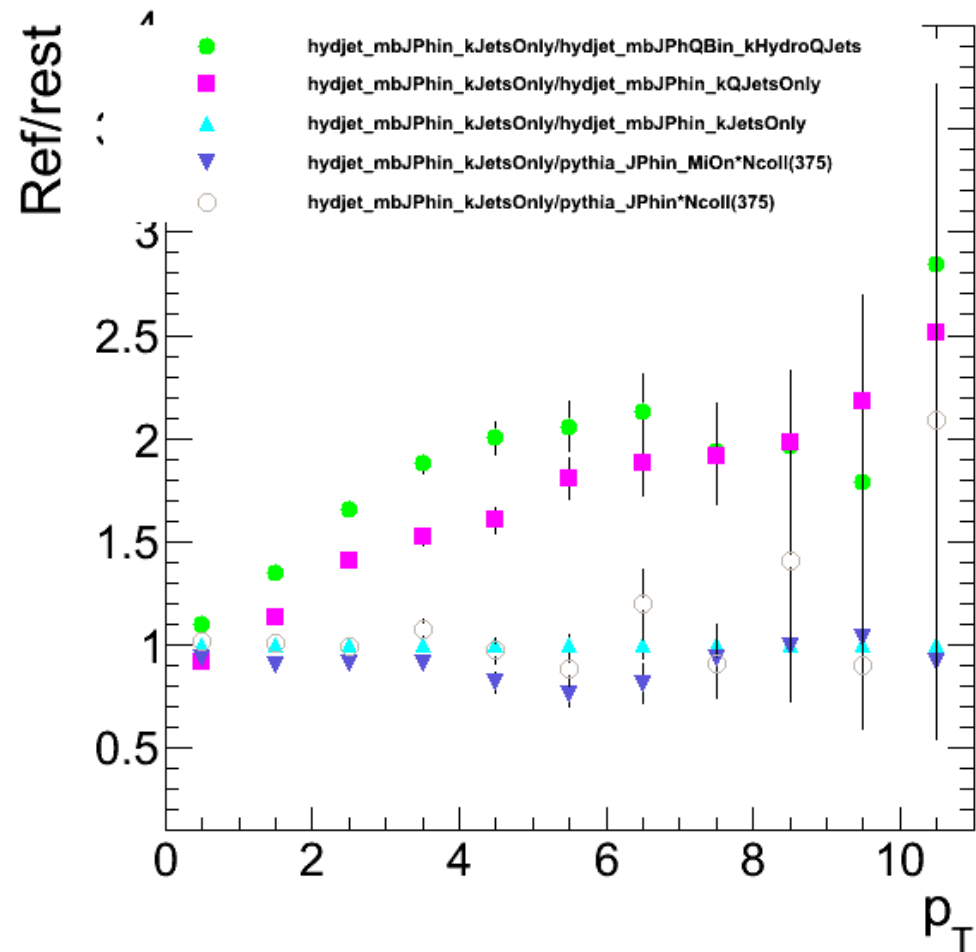
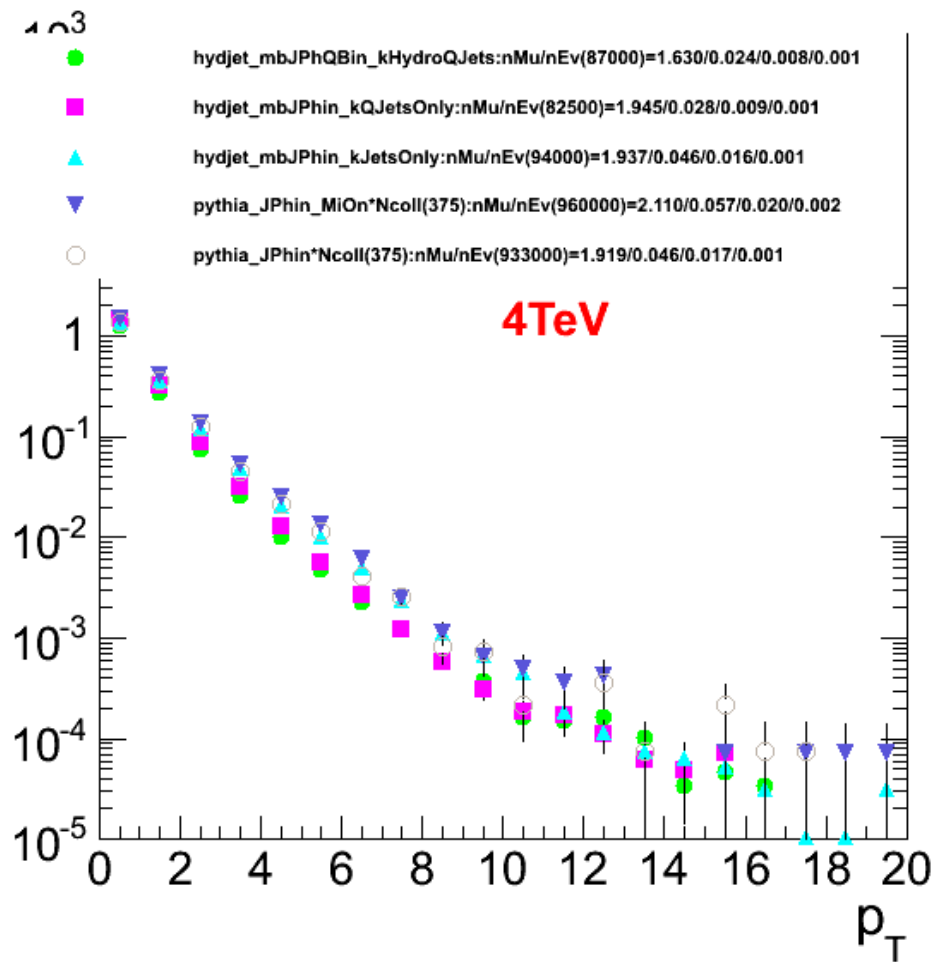
\* make a x-section correction:  $N_{coll} * N_{PYTHIA}(pt > pt_{cut}) * [sigjet/sigin]$

\* **sigin** is the total inelastic NN cross section at given cms energy (=58mb, it is actually input to HYDJET in the `hydjet` configuration file)

\* **sigjet** is the hard scattering NN cross section at given `pt` min and energy (=10.5474mb for `pT_hat > 6GeV` and 4TeV c.m.s, as taken from printout from `hyjpar`)

These 2 are stored as output from HYDJET in `COMMON /hyjpar/ ptmin,sign,sigjet,nhsel,ishad,njet`

# HYDJET vs PYTHIA \* Ncoll \* Sigma\_corr



# HYDJET vs PYTHIA \* Ncoll \* Sigma\_corr

Ncoll=313(high pT, Npart = 106 (low pT), Sigma\_corr = 0.115(2.76TeV), 0.182(4TeV)

En(GeV)  eta <2.4, pt_hat>6GeV/c	#mu/kev pt>10 GeV/c,	HYDJET/PYTHIA	#mu/kev pt>5 GeV/c	HYDJET/PYTHIA
HYDJET@2760	0.31	1.35	4.8	1.78
PYTHIA@2760*Ncoll*Sigma_corr	0.23		2.69	
HYDJET@4000	0.63	2.63	7.9	2.05
PYTHIA@4000*Ncoll*Sigma_corr	0.24		3.86	

En(GeV), pt_hat>6GeV/c	#mu/ev	HYDJET/PYTHIA	#mu/kev pt>3.5 GeV/c	HYDJET/PYTHIA
HYDJET@2760	0.95	7.92	14	5.28
PYTHIA@2760*Npart*Sigma_corr	0.12		2.65	
HYDJET@4000	1.64	8.64	24.5	6.31
PYTHIA@4000*Npart*Sigma_corr	0.19		3.88	

So ...

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→ HYDJET and PYTHIA\_properlyCorrected for the way in which generates events when have a  $p_{t\_hat\_min}$ , are consistent;

→ with the dijet+photonJet in, get at all times more muons in HYDJET than in PYTHIA scaled (→ the answer to 'enough muons in HI MC' question, from these results is 'yes'; the rest we shall see in 2 month.)

I'm DONE.