
MC muons
Sept 2nd, 2010

Particle Gun (J.Yarba & S.Mrenna)

1. **Double peak in M plot, in a specific kinematic condition** – no answer so far

2. **Upsilon and Jpsi, generated with fixed mass:** effect of 2 things

A) in order to smear mass, the width should be greater than 0.1MeV,
The check on `pmas(ks,2)>1.D-4` is hardcoded in `pymass.f`.

B) the width in `pydata.f` (the particle data table that `pythia` uses, and from which the value is read in `pymass.f`) is 0 for `jpsi` and `ups`

J/psi	443	0	100	Meson	0	3.09688e+00	0.00000e+00	-100	-1	-100	-1	-1	3
Upsilon	553	0	100	B-Meson	0	9.46030e+00	0.00000e+00	-100	-1	-100	-1	-1	9
Z0	23	0	100	GaugeBoson	0	9.11870e+01	2.48009e+00	-100	-1	-100	-1	-1	16

** real width: Jpsi(0.09MeV), Upsilon(.22MeV)

3. **Id '94' only in the PG with FSR=ON**

“id=94 : CMshower Four-momentum of time-like showering system

The particle entry 94 should *ONLY* occur when FSR is turned on, and only when using the particle gun.

“

→ I understand that it's OK, but not WHY/the mechanism; postponed follow-up questions for after the double-peak problem is addressed

HYDJET vs HYDJET

Hydjet, Nov. (4 TeV)	150 Gen / kevts
Hydjet, Today (2.8 TeV)	0.4 Gen / kevts

} ?

pt_mu > 10 GeV/c

→ influence of the settings that were different between the 2 samples: collisionalEnergyLoss, Quarkonia+Bosons in, and different pt_hat_cut

En(GeV) 2760	#ev with pt_hat>6GeV/ c	#mu/ev	#mu/ev 1e-3 pt>10 GeV/c	#mu/ev 1e-3 pt>10GeV/c, eta <2.4
collEnLossFalse_mbJPhQBin	86000	.955 (82140)	0.26*(22)	0.24(21)
collEnLossTrue_mbJPhQBin	13000	.939 (12202)	(2)	0.15(2)
collEnLossFalse_mbJPhin	10000	.925 (9251)	0.2(2)	0.1(1)
collEnLossTrue_mbJPhin	15000	.951 (14258)	0.33(5)	0.33(5)

J=jets(QCD hard processes, Ph=photon jets, Q=quarqonia, B=Z/W

		mu%	Mu% pt>10GeV/c eta <2.4
CollEnLoss (on-off)/on	JPhQB JPh	0.4 2.7	-1.2 0.7
QB (in-out)/in	CollEnLoss False CollEnLoss True	1.9 -1.3	0.7 -1.2

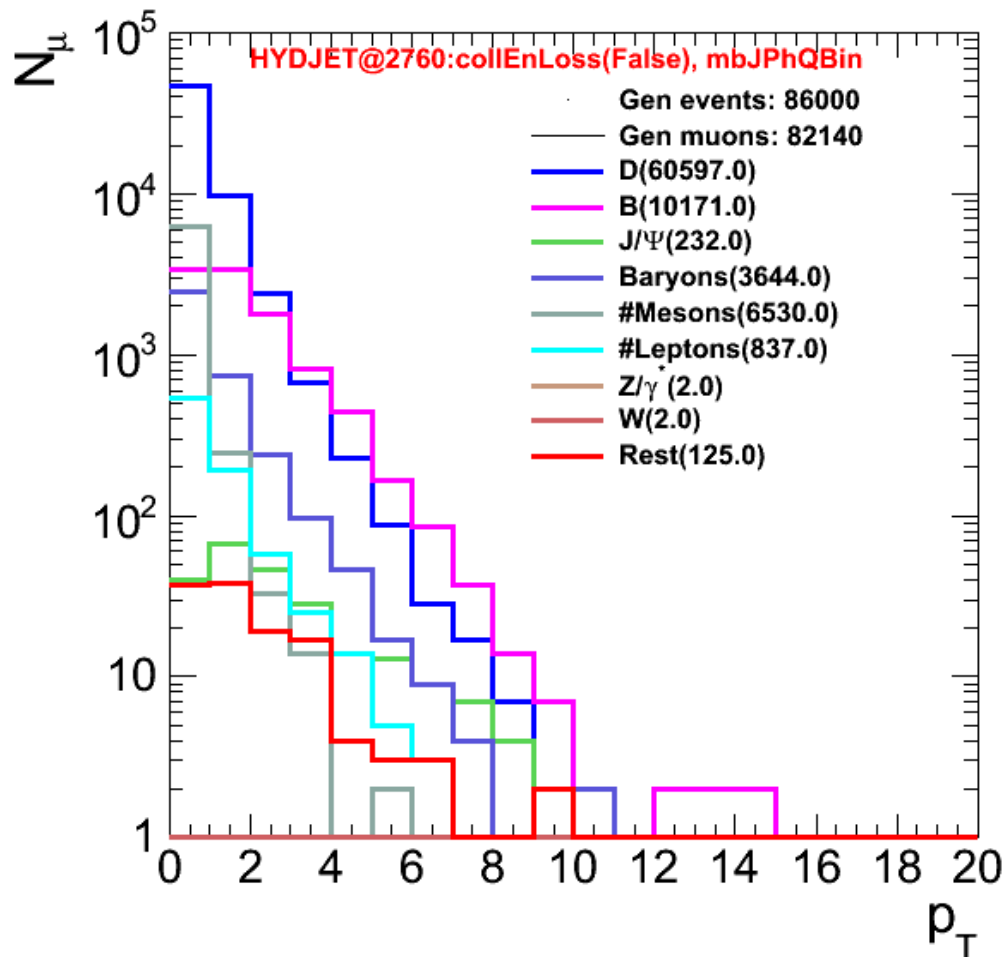
~few % effects

→ low pT (Qin) – smaller en loss via coll → smaller effect
 → high pT(Qout) – bigger en loss via coll → bigger effect
 (? pt dependence coll en loss)

→ no coll en loss at all – get more muons if have QB in (ok)
 → have coll en loss – get more muons if NOT have QB in (?)

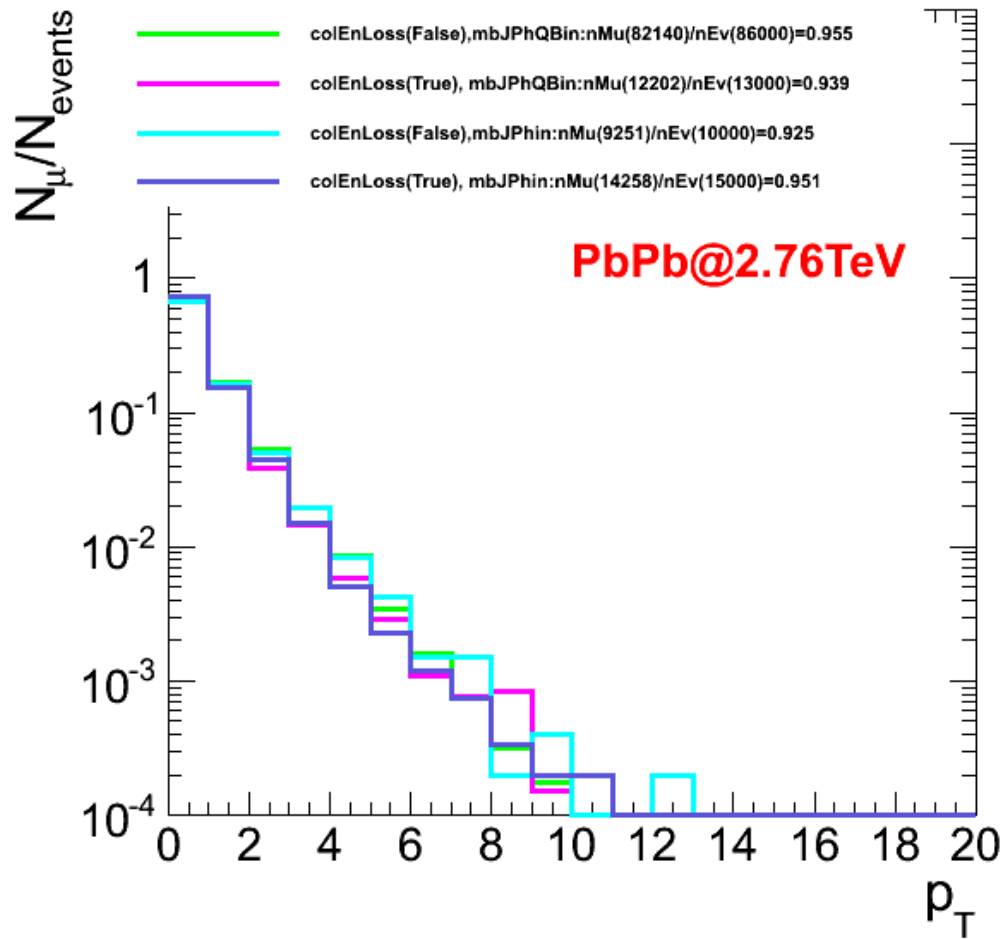
HYDJET vs HYDJET

J=jets(QCD hard processes), Ph=photon jets, Q=quarqonia, B=Z/W



HYDJET vs HYDJET

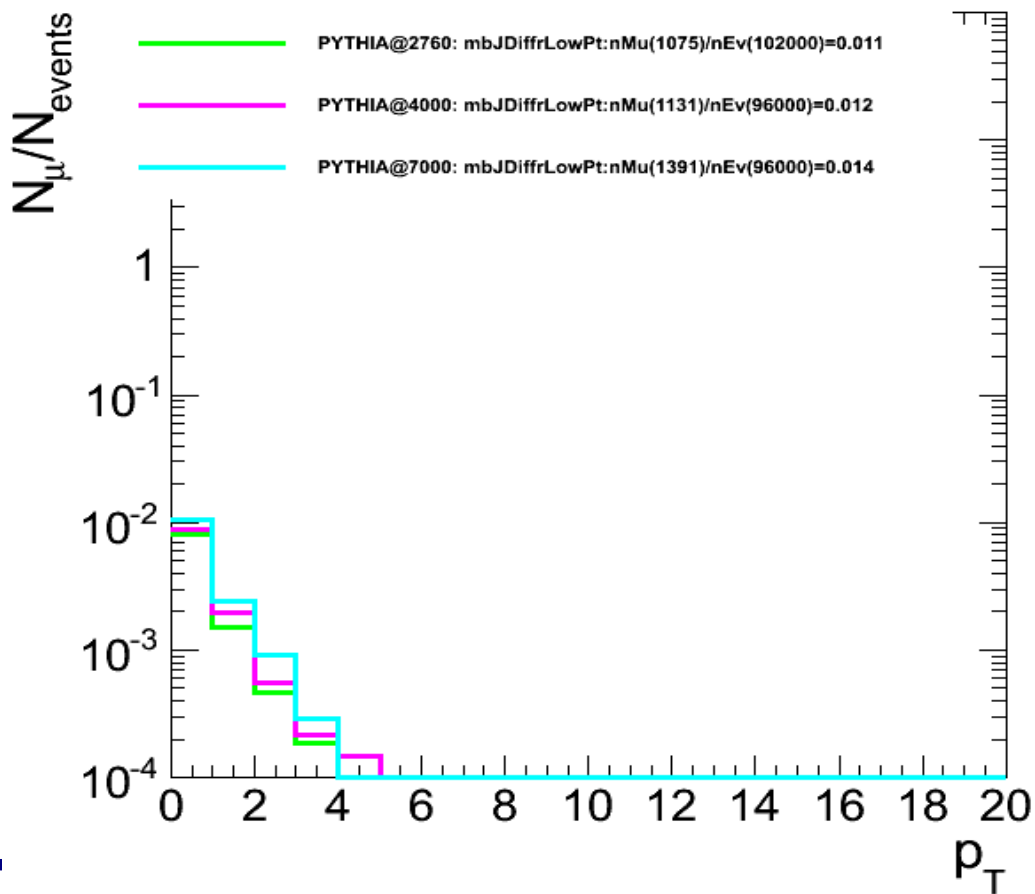
J=jets(QCD hard processes,, Ph=photon jets, Q=quarqonia, B=Z/W



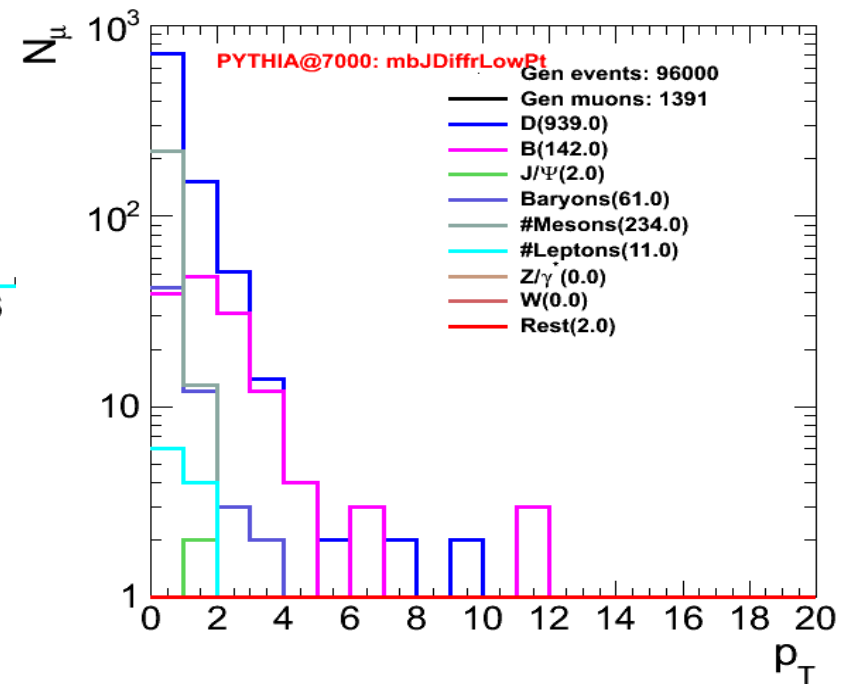
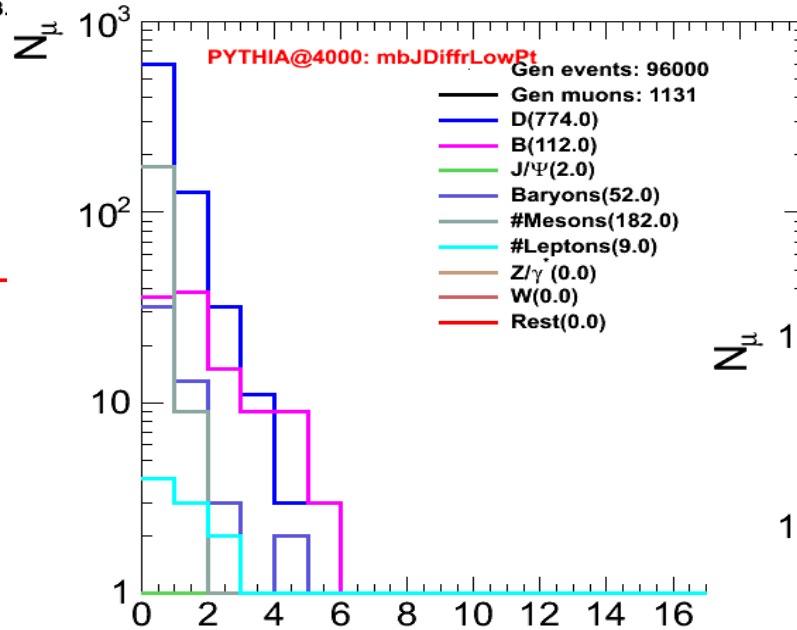
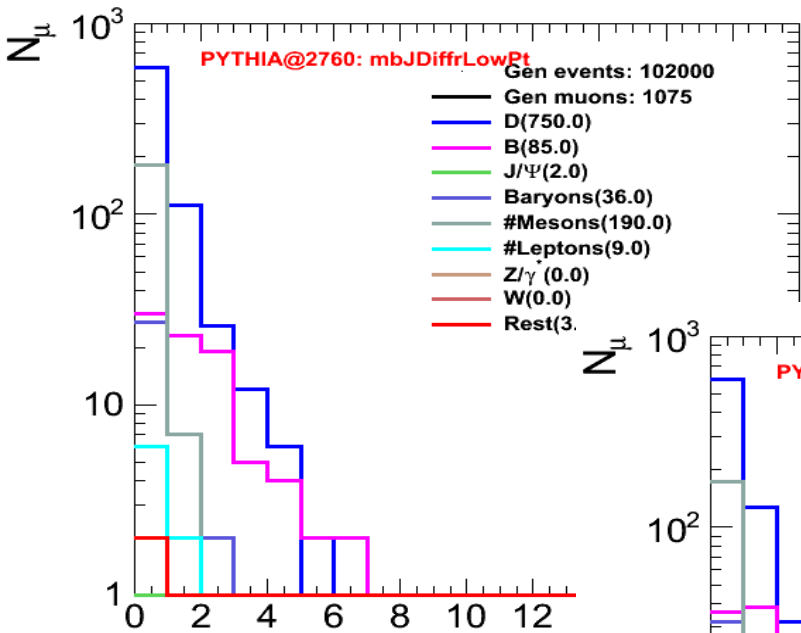
PYTHIA vs PYTHIA

AN2009-126 (10 TeV sim) 14 Rec / N_{coll} keVts
 pt_mu > 10 GeV/c
 MUO-10-002 (7 TeV data) 6 Glb / N_{coll} keVts

En(GeV)	#ev with pt_hat > 6 GeV/c	#mu/ev	#mu/ev pt > 10 GeV/c, eta < 2.4 1e-3
2760	102 000	0.0105(1075)	0.0196(2)
4000	96 000	0.0118(1131)	(0)
7000	96 000	0.0145(1391)	0.0417(4)



PYTHIA vs PYTHIA (pt_hat_gen_cut:6GeV/c)



HYDJET vs PYTHIA

MUO-10-002 (7 TeV data)	6 Glb / N_{coll} kevts
Hydjet, Nov. (4 TeV)	150 Gen / kevts
Hydjet, Today (2.8 TeV)	0.4 Gen / kevts

$p_T, \mu > 10 \text{ GeV}/c$

$N_{\text{coll}}=11$ (?)

En(GeV)	#mu/ev pt>10GeV/c, eta <2.4 1e-3
HYDJET@2760	0.24
PYTHIA@2760*Ncoll	0.2156
HYDJET@4000	
PYTHIA@4000*Ncoll	(0) --- need more stats

Conclusions

1. ParticleGun: waiting

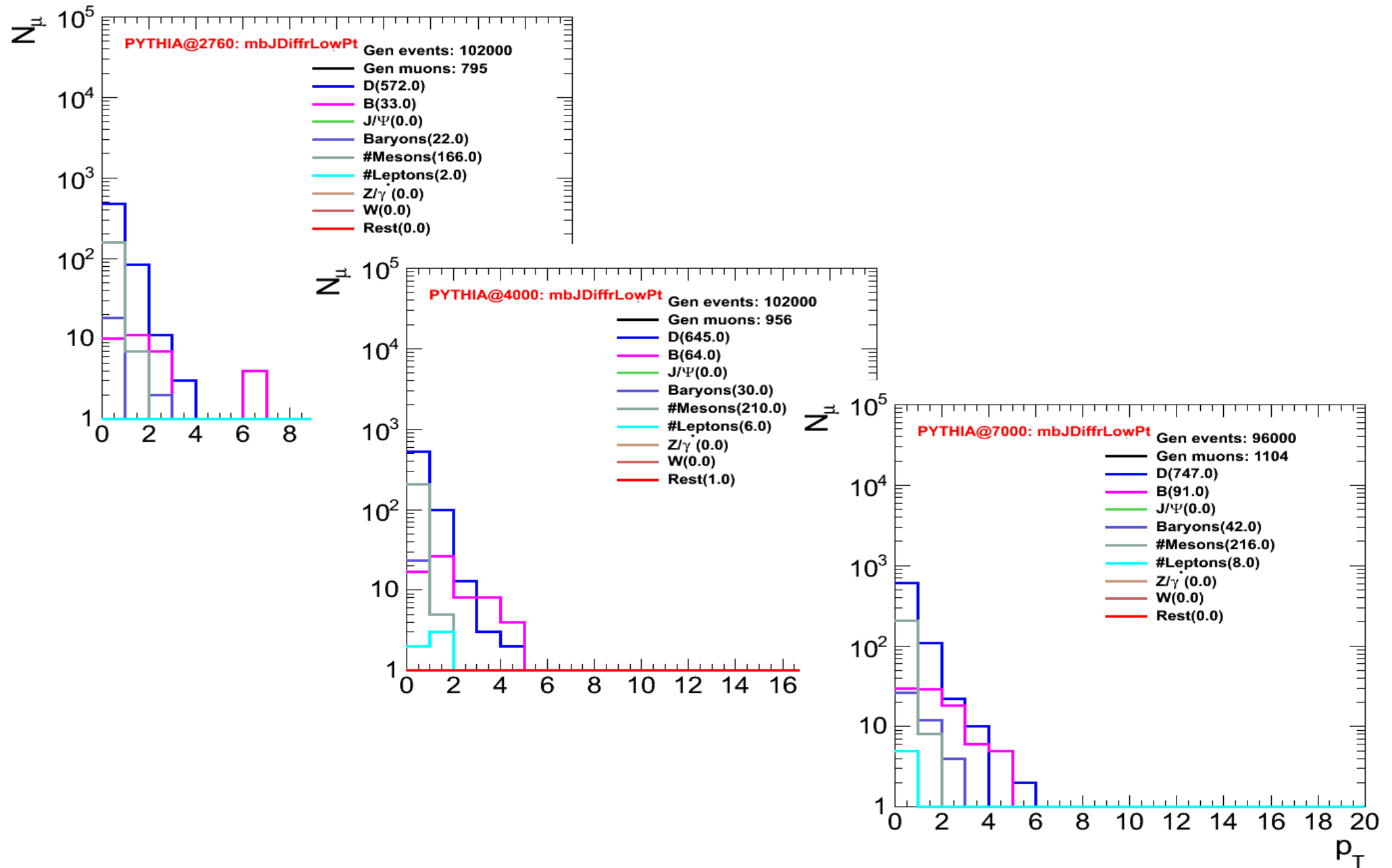
2. Ev. Generators:

– so far so good; need to update numbers

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

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PYTHIA vs PYTHIA (no pt_hard_cut at gen level)



PYTHIA base config file

```
import FWCore.ParameterSet.Config as cms
from Configuration.Generator.PythiaUESettings_cfi import *

generator = cms.EDFilter("Pythia6GeneratorFilter",
    pythiaHepMCVerbosity = cms.untracked.bool(False),
    maxEventsToPrint = cms.untracked.int32(0),
    pythiaPylistVerbosity = cms.untracked.int32(1),
    filterEfficiency = cms.untracked.double(1.0),
    crossSection = cms.untracked.double(71260000000.),
    comEnergy = cms.double(7000.0),
    PythiaParameters = cms.PSet(
        pythiaUESettingsBlock,
        processParameters = cms.vstring('MSEL=0      ! User defined processes',
            'MSUB(11)=1    ! Min bias process',
            'MSUB(12)=1    ! Min bias process',
            'MSUB(13)=1    ! Min bias process',
            'MSUB(28)=1    ! Min bias process',
            'MSUB(53)=1    ! Min bias process',
            'MSUB(68)=1    ! Min bias process',
            'MSUB(92)=1    ! Min bias process, single diffractive',
            'MSUB(93)=1    ! Min bias process, single diffractive',
            'MSUB(94)=1    ! Min bias process, double diffractive',
            'MSUB(95)=1    ! Min bias process'),
        # This is a vector of ParameterSet names to be read, in this order
        parameterSets = cms.vstring('pythiaUESettings',
            'processParameters')
    )
)
```

HYDJET base config file

```
import FWCore.ParameterSet.Config as cms
from Configuration.Generator.PythiaUESettings_cfi import *
collisionParameters7GeV = cms.PSet(
  aBeamTarget = cms.double(208.0), # beam/target atomic number
  comEnergy = cms.double(7000.0) # collision en
)
collisionParameters2760GeV = cms.PSet(
  aBeamTarget = cms.double(208.0), # beam/target atomic number
  comEnergy = cms.double(2760.0) # collision en
)
collisionParameters = collisionParameters2760GeV.clone()
qgpParameters = cms.PSet(qgpInitialTemperature = cms.double(1.0), ## initial temperature of QGP; allowed range [0.2,2.0]GeV;
  qgpProperTimeFormation = cms.double(0.1), ## proper time of QGP formation; allowed range [0.01,10.0]fm/c;
  hadronFreezoutTemperature = cms.double(0.14),
  doRadiativeEnLoss = cms.bool(True), ## if true, perform partonic radiative en loss
  doCollisionalEnLoss = cms.bool(False),
  qgpNumQuarkFlavor = cms.int32(0), ## num. active quark flavors in qgp; allowed values: 0,1,2,3
  numQuarkFlavor = cms.int32(0) ## to be removed
)
pyquenParameters = cms.PSet(dolsospin = cms.bool(True),
  angularSpectrumSelector = cms.int32(0), ## angular emitted gluon spectrum :
  embeddingMode = cms.bool(False),
  backgroundLabel = cms.InputTag("generator") ## ineffective in no mixing
)
hydjetParameters = cms.PSet(sigmaInelNN = cms.double(58),
  shadowingSwitch = cms.int32(0),
  nMultiplicity = cms.int32(21500),
  fracSoftMultiplicity = cms.double(1.),
  maxLongitudinalRapidity = cms.double(4.5),
  maxTransverseRapidity = cms.double(1.),
  rotateEventPlane = cms.bool(True),
  allowEmptyEvents = cms.bool(False),
  embeddingMode = cms.bool(False)
)
pyquenPythiaDefaultBlock = cms.PSet(
  pythiaUESettingsBlock,
  hydjetPythiaDefault = cms.vstring('MSEL=0 ! user processes',
    'CKIN(3)=6. ! ptMin',
    'MSTP(81)=0 ! multiple interaction OFF'
  ),
  pythiaJets = cms.vstring('MSUB(11)=1', # q+q->q+q
    'MSUB(12)=1', # q+qbar->q+qbar
    'MSUB(13)=1', # q+qbar->g+g
    'MSUB(28)=1', # q+g->q+g
    'MSUB(53)=1', # g+g->q+qbar
    'MSUB(68)=1' # g+g->g+g
  ),
  pythiaPromptPhotons = cms.vstring('MSUB(14)=1', # q+qbar->g+gamma
    'MSUB(18)=1', # q+qbar->gamma+gamma
    'MSUB(29)=1', # q+g->q+gamma
    'MSUB(114)=1', # g+g->gamma+gamma
    'MSUB(115)=1' # g+g->g+gamma
  )
)
impactParameters = cms.PSet(cFlag = cms.int32(1),
  bFixed = cms.double(0),
  bMin = cms.double(0),
  bMax = cms.double(30)
)
generator = cms.EDFilter("HydjetGeneratorFilter",
  collisionParameters,
  qgpParameters,
  hydjetParameters,
  impactParameters,
  hydjetMode = cms.string('kHydroQJets'),
  PythiaParameters = cms.PSet(pyquenPythiaDefaultBlock,
    # Quarkonia and Weak Bosons added back upon dilepton group's request.
    parameterSets = cms.vstring('pythiaUESettings',
      'hydjetPythiaDefault',
      'pythiaJets',
      'pythiaPromptPhotons'
    )
  )
)
```