Comparison of SHERPA/MadGraph programs

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Configuration of SHERPA

- Lund fragmentation

PDF cteq6l1

~100k events

qcut (CKKW) = 30

qcut (partons) = 20

etamax (jet) = 5

Configuration of MadGraph

Fragmentation in PYTHIA

PDF cteq6l1

~300k events

Expect to have ~30% efficiency of PS matching

qcut (MLM) = 30

qcut (partons) = 20

etamax (jet) = 5

Grouping events

- Divide events into groups:
  - Events containing at least 1 muon from ttbar hard subprocess → Mu+(0/1)Mu/Elec+jets→ ‘semi events’ (so called, not correctly named)
  - Other events → (1/2)Elec+jets (‘nonsemi’)
  - Use simple scheme to select ‘semi’:
    - all genMu and genNu →W candidate;

mass window (70,90)GeV on W cand; N(W)>=1

    - W cand. + genBquark->top candidate;

mass window(170,180)GeV on top cand;N(top)>=1

    - Some failure of requirements → ‘nonsemi’
    - ‘Tag’ Efficiency =N(semi,’semi’)/(N(semi,’semi’) +N(semi,’nonsemi’)

’MisTag’ Efficiency = N(nonsemi,’semi’)/N(all,’ semi’)

Yield of SHERPA events

- Asked total number of events ~ 100k
- Only ~65k were processed
- First group ~13k
  - Mu+jets ~9.9K
  - Mu+Mu+jets ~1.5K
  - Mu+Elec+jets ~1.7K
- Second group ~52k
  - Mu+jets ~6K
  - Mu+Mu+jets ~0.2K
  - Mu+Elec+jets ~0.8K

- ‘Tag’ Efficiency ~ 0.62
- ’MisTag’ Efficiency ~0.24

Yield of MadGraph events

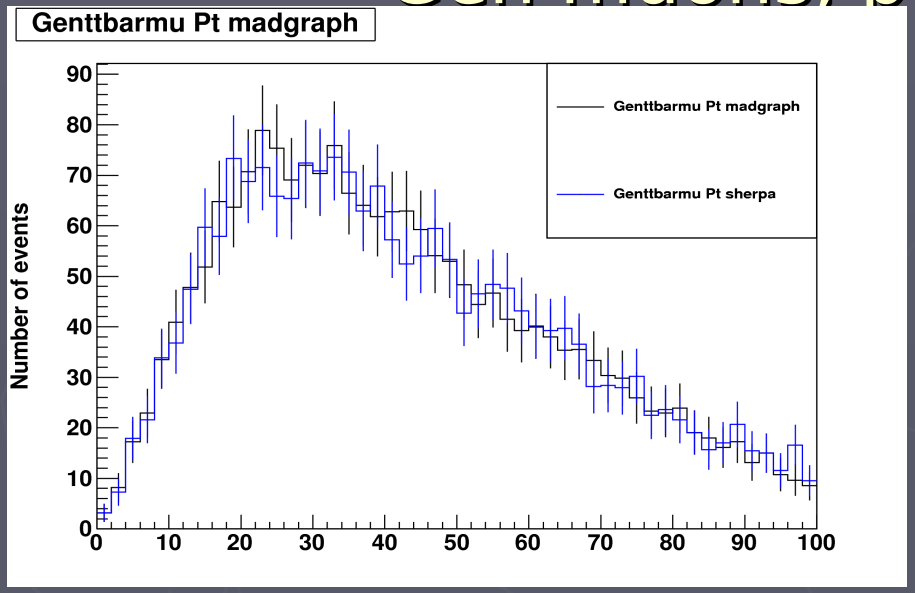
- Total number of events ~ 120K (300K asked)
- Only ~115K were processed
- First group ~15K
  - Mu+jets ~12K
  - Mu+Mu+jets ~1.3K
  - Mu+Elec+jets ~1.7K
- Second group ~100K
  - Mu+jets ~8.4K
  - Mu+Mu+jets ~
  - Mu+Elec+jets ~1.3K
- ‘Tag’ Efficiency ~ 0.58
- ’MisTag’ Efficiency ~0.20

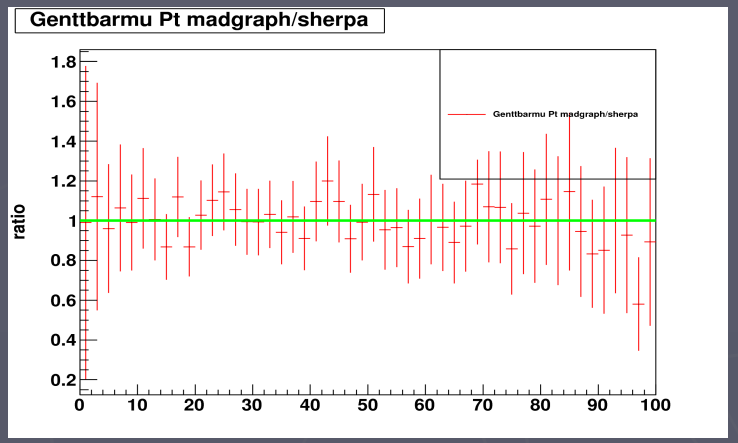
- all plots for 20^-1 pb,

assume xsect(SHERPA)=xsect(MadGraph)

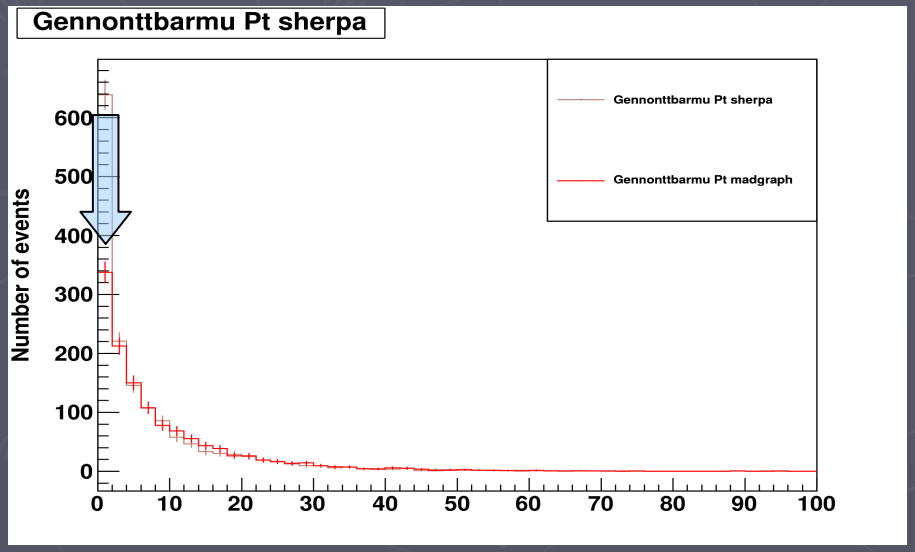
- Let's look at
  - Mu+jets events from so called 'semi' events (first group)
    - Muon Spectra:
      - Gen ttbar/nonttbar
      - Reco muons
    - Jets Spectra
      - Reco jets
      - Gen Jets
  - All events from 'nonsemi' events (second group)
    - Jets Spectra
      - Reco jets
      - Gen Jets

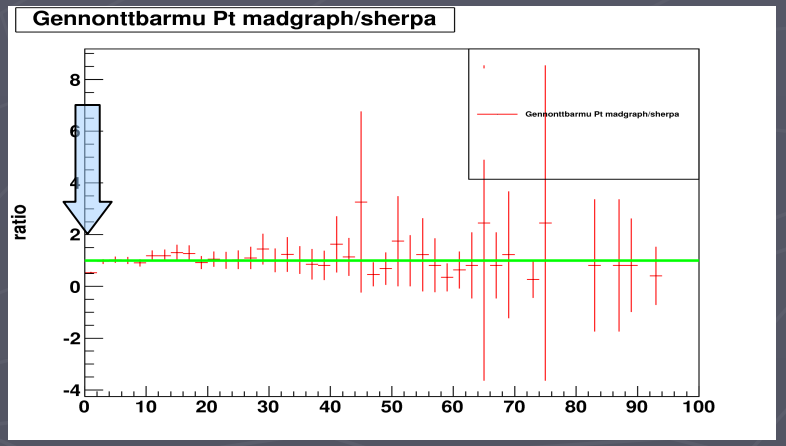
Kinematical distributions
Gen muons, pT, 'semi' events



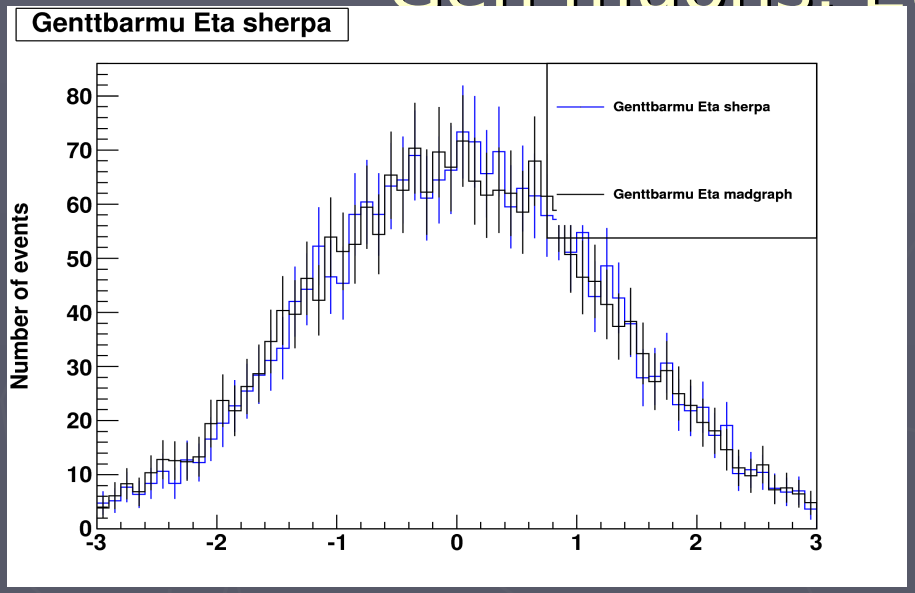


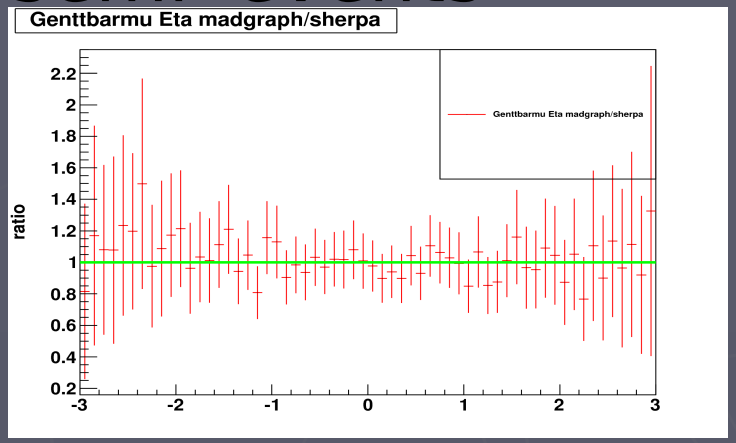
- The visible difference in pt spectra of nonTtbar muons
  Look at first bins



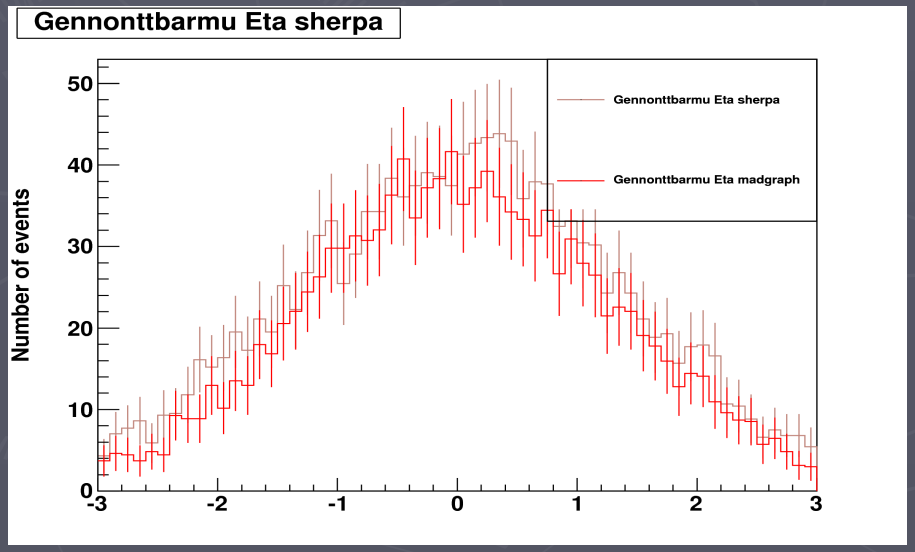


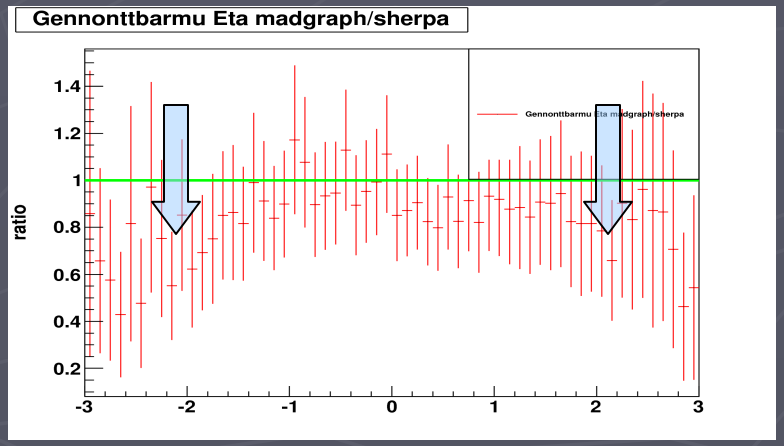
Kinematical distributions
Gen muons, Eta, 'semi' events





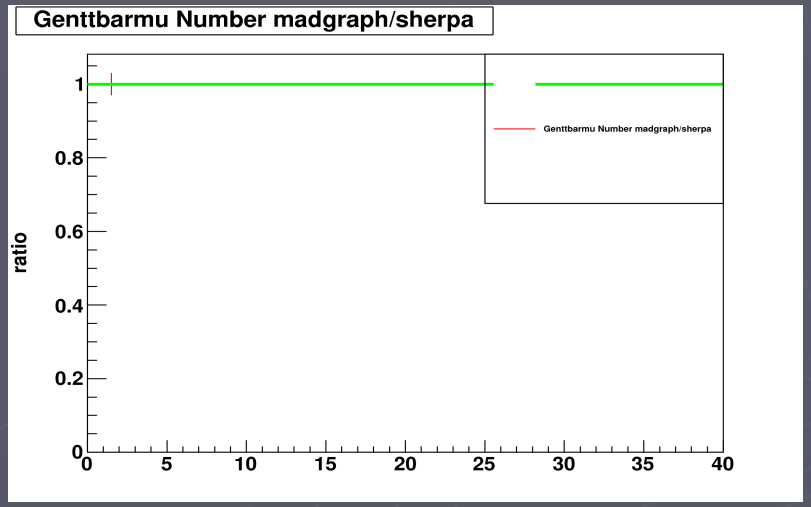
- The 'problematic' region of Eta : 1.5<Abs(eta)<3
- Mainly for nonTtbar muons

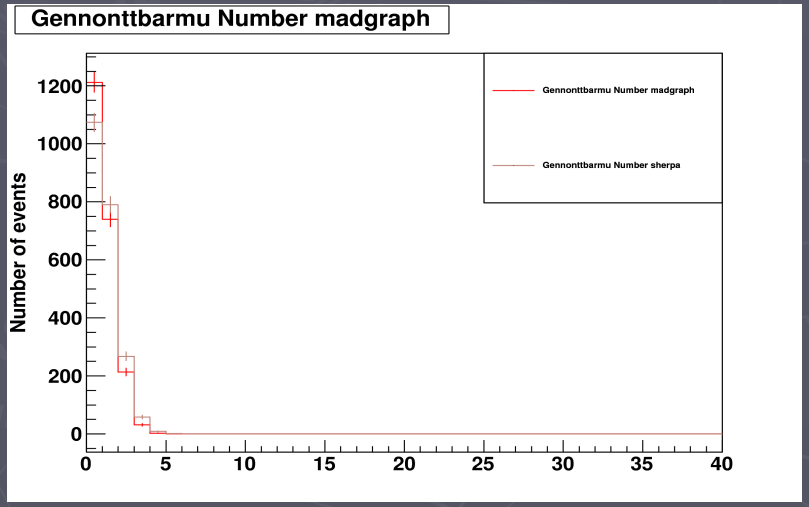


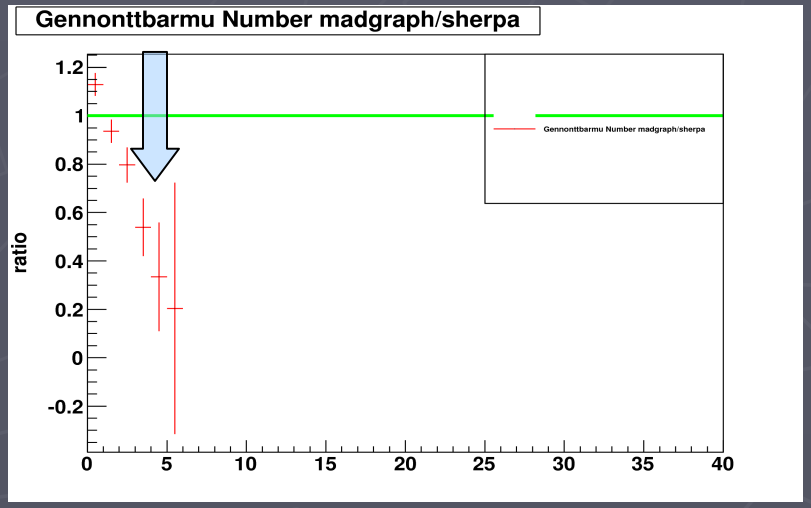


Kinematical distributions
Gen muons, Multiplicity, 'semi' events

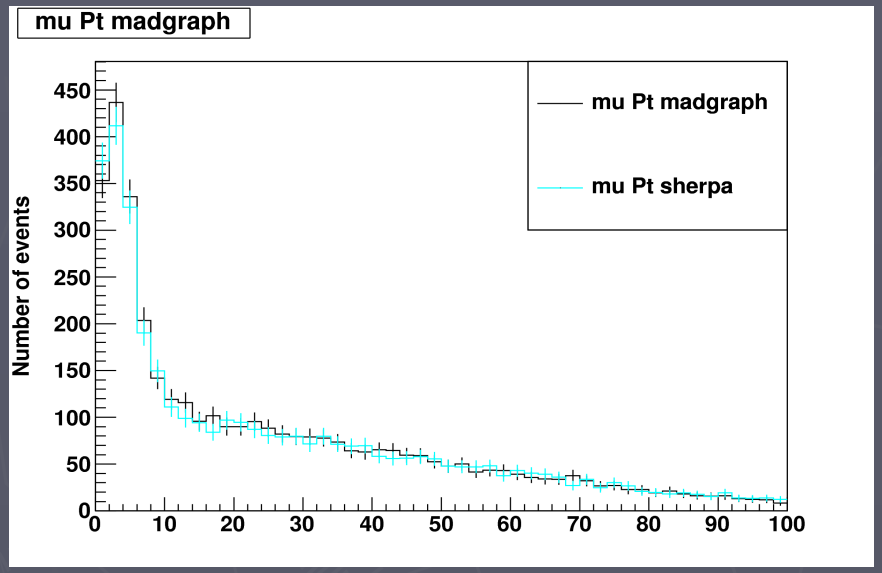
- SHERPA gives more nonTtbar muons than MadGraph,
- Events have 2/3/4/5 additional very soft pt muons from fragmentation

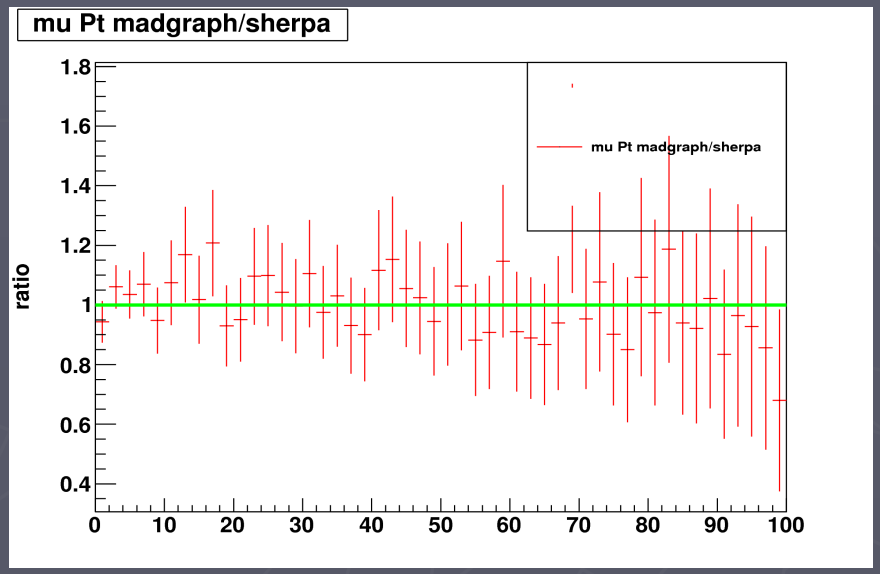


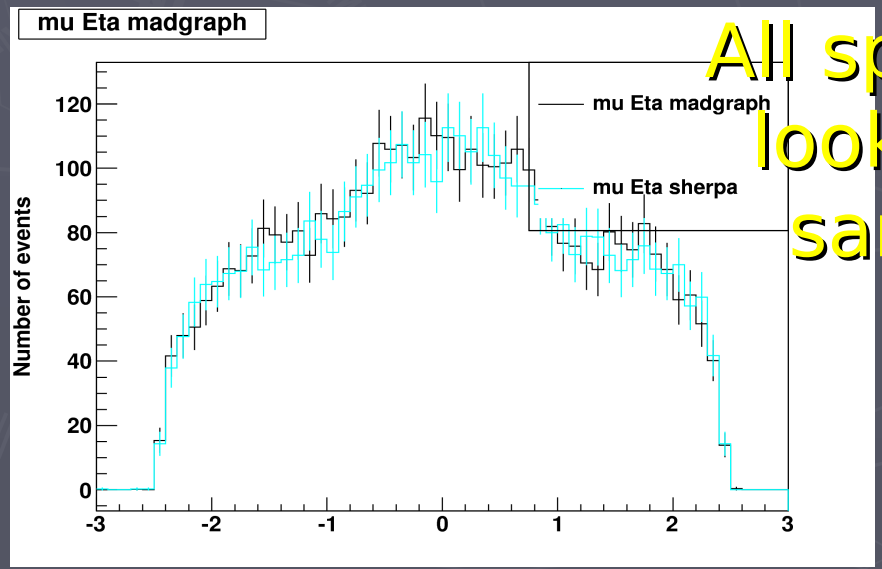




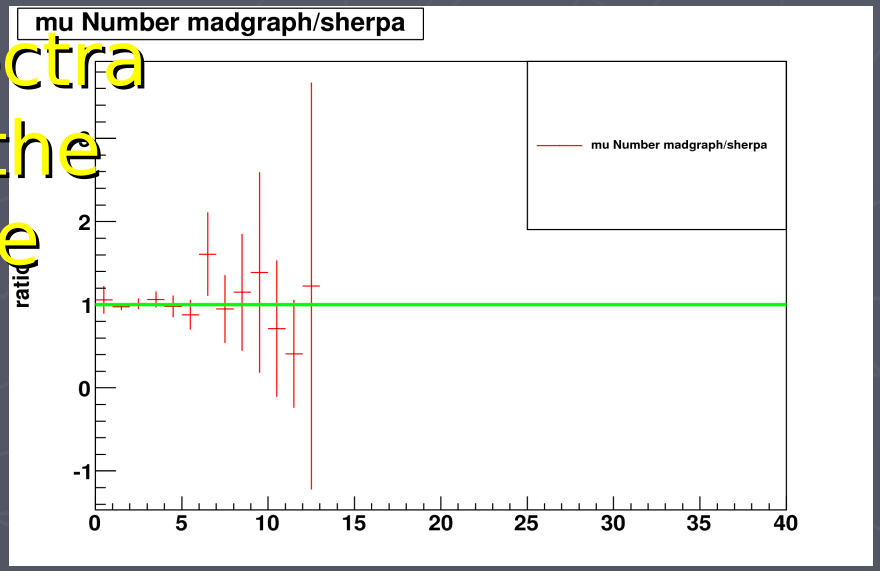
Kinematical distributions
Reco Muons,pT,Eta, 'semi' events



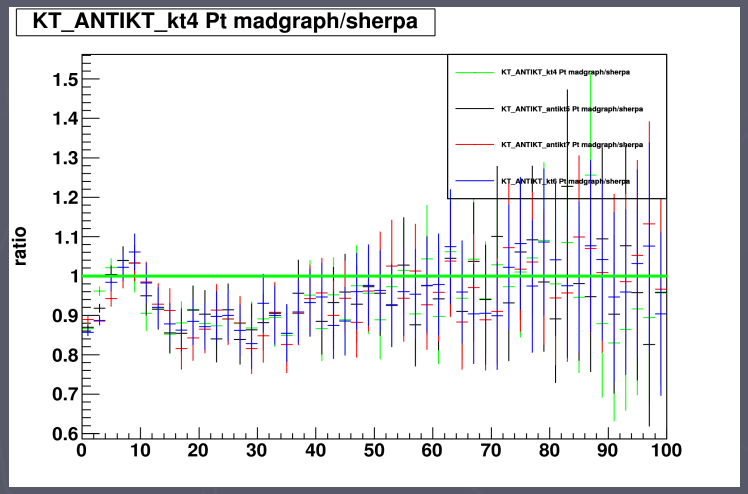


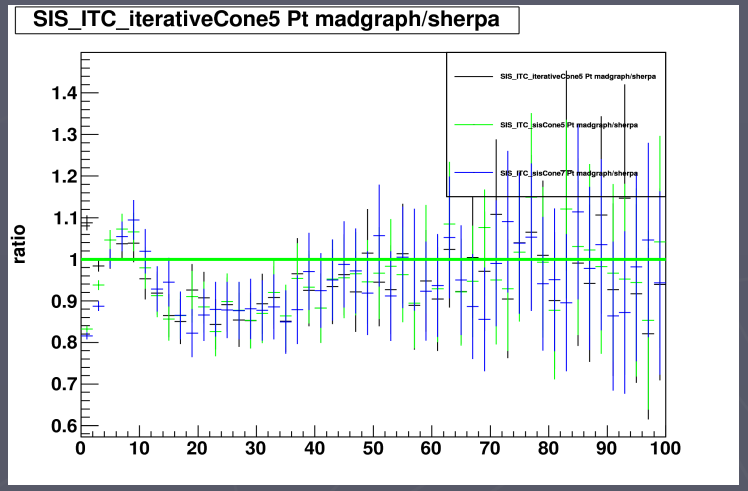


All spectra look the same



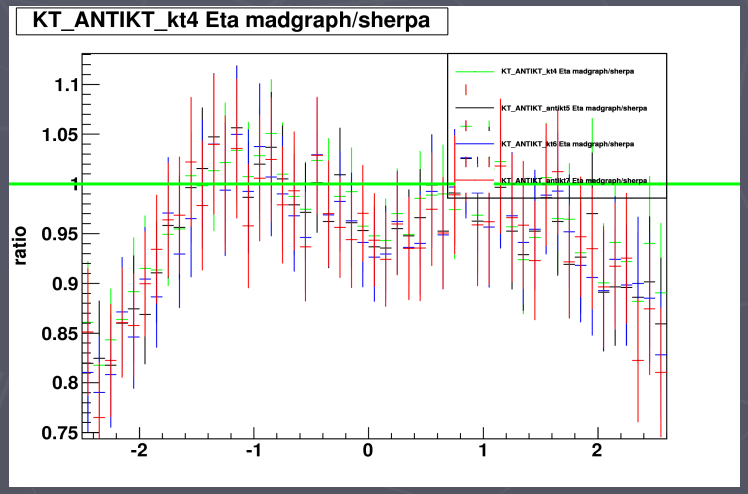
Kinematical distributions
Reco Jets,Pt,Eta, 'semi' events

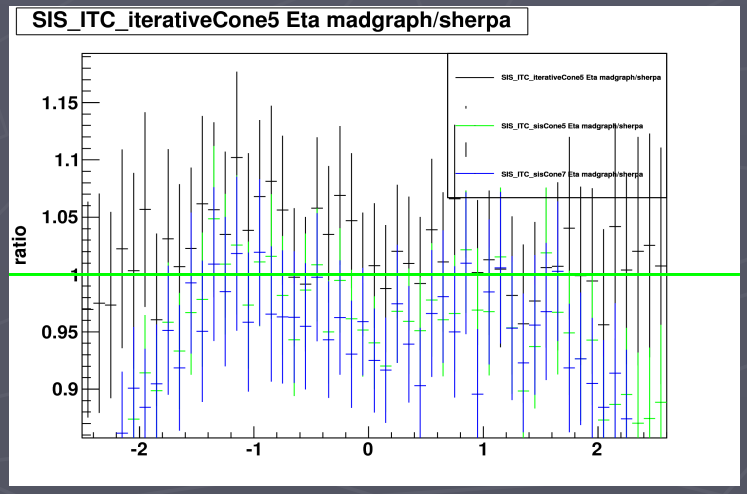




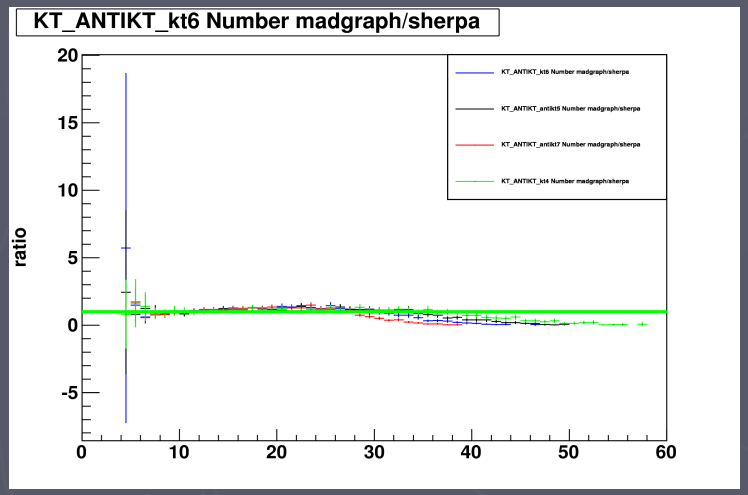
- kT-,antikT recoJets differ at Abs(eta)>1. everywhere

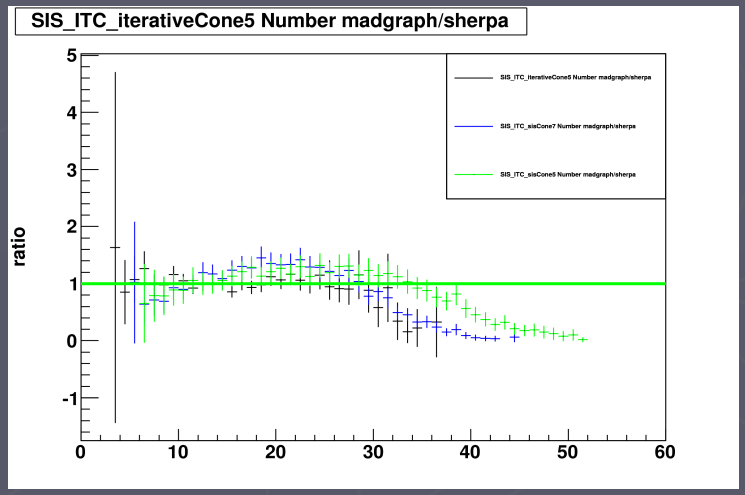
Cone based jets look comparable



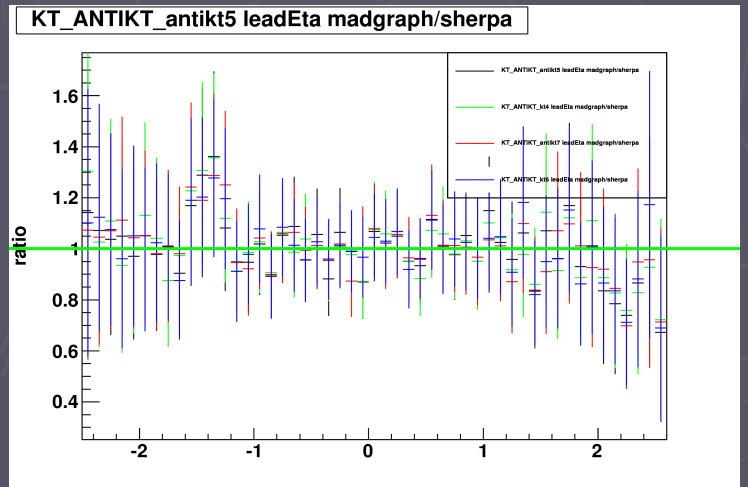


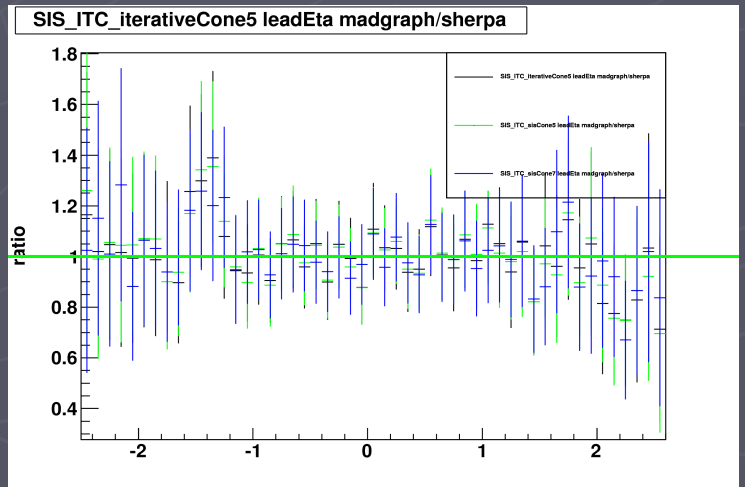
Kinematical distributions
RecoJets, leadEta,Number, 'semi' events



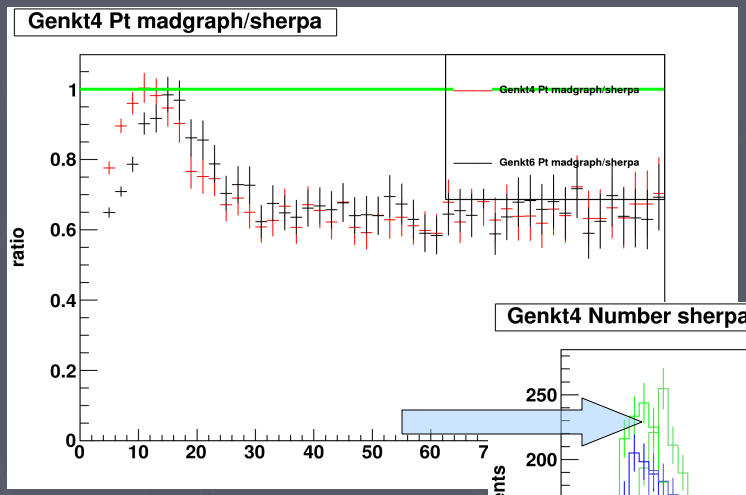


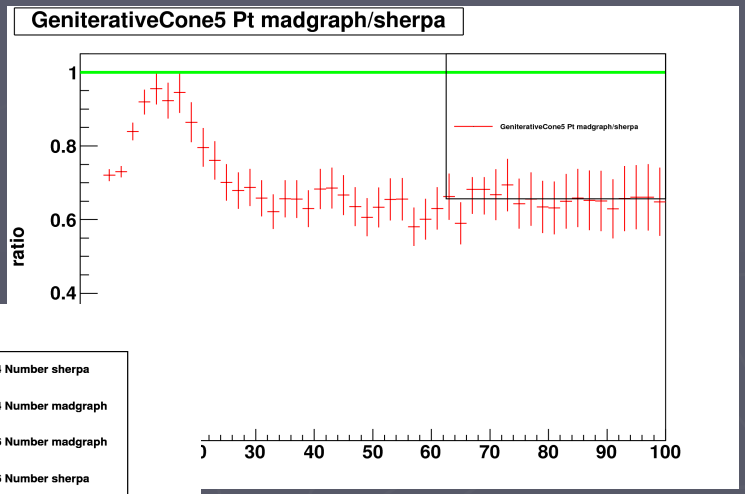
- For cone based algos difference, there is difference of high multiplicity

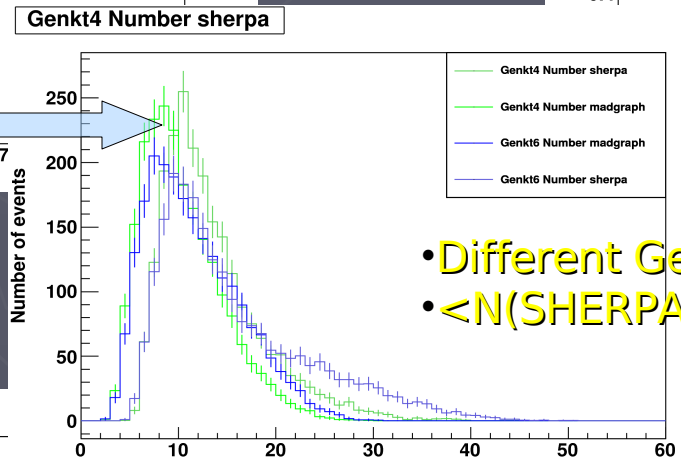




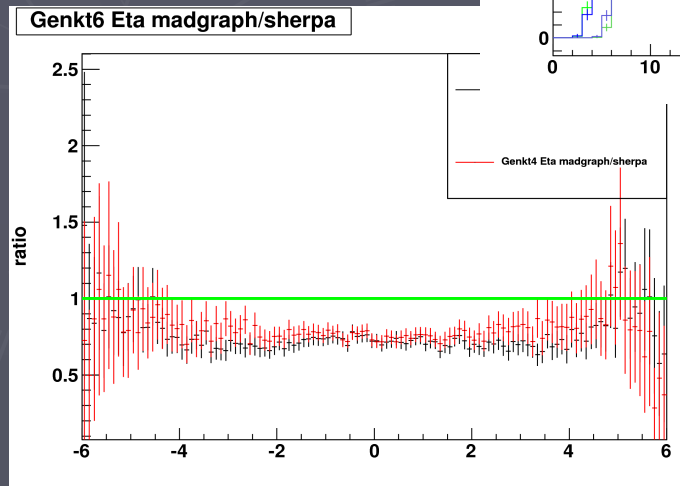
Kinematical distributions
Genjets, Pt,Eta, 'semi' events

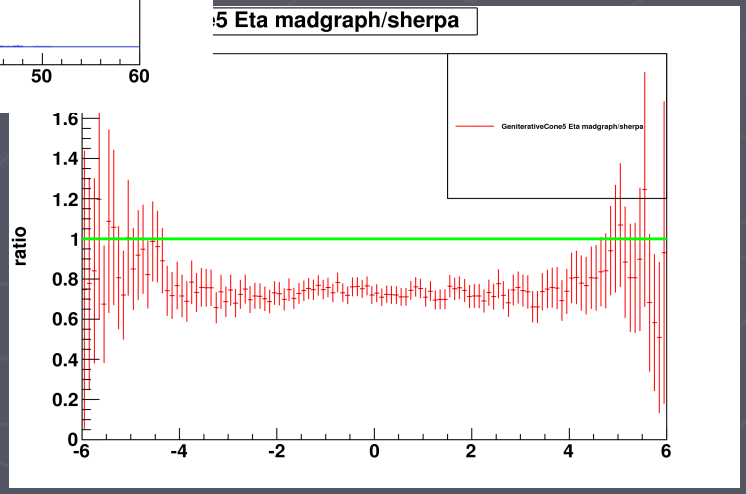




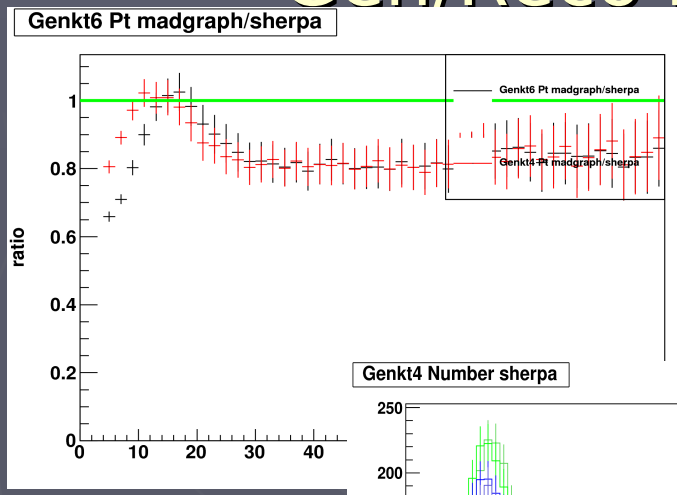


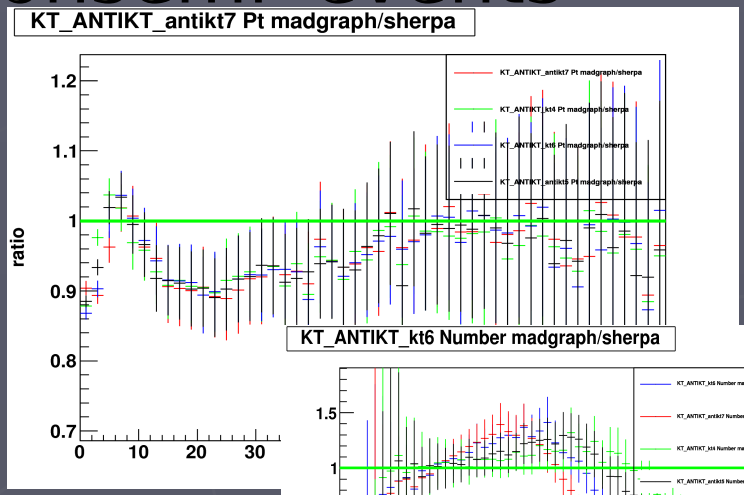
- Different GenJets multiplicity for all methods.
- <N(SHERPA)> =1.5 <N(MadGraph)>

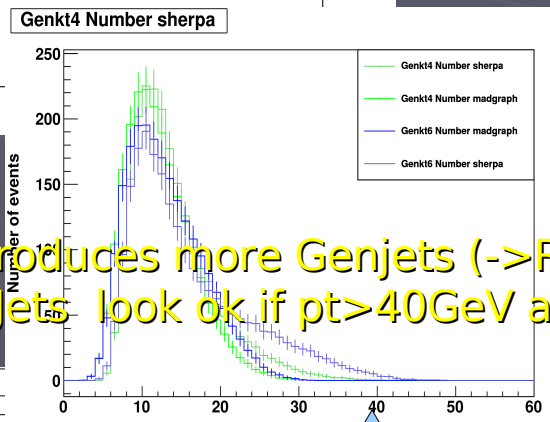


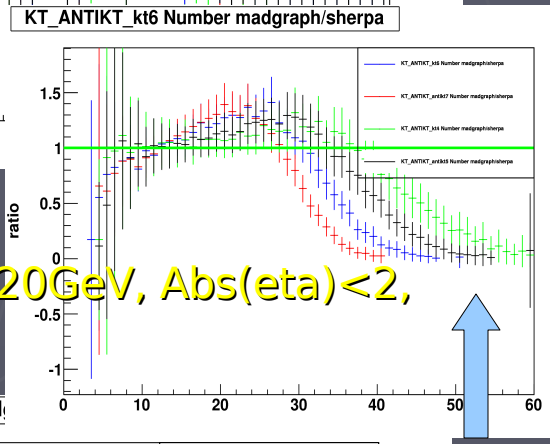


Kinematical distributions
Gen/Reco ktjets, 'nonsemi' events









- Sherpa produces more Genjets (->RecoJets), high pT>20GeV, Abs(eta)<2,
- But RecoJets look ok if pt>40GeV and Abs(eta)<1.5