MC@NLO for top production

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Why we care about MC@NLO?

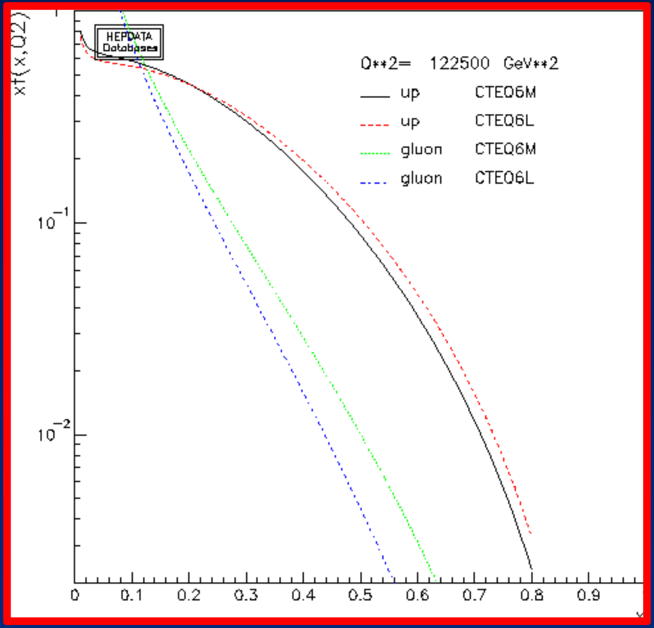
LO Pythia and Herwig MC have only 5% glue-glue contribution, wheras the NLO has 15%. (mainly due to LO vs NLO gluon pdfs, and diff. K factor for gg vs qq)

1. gg channel has different acceptance and different event topology (more ISR jets), compared to qq channel

3. This effect could be important toward precision measurements on top cross section and kinematic properties.

5. Important to investigate this problemin early state using NLO MC

(like MC@NLO)

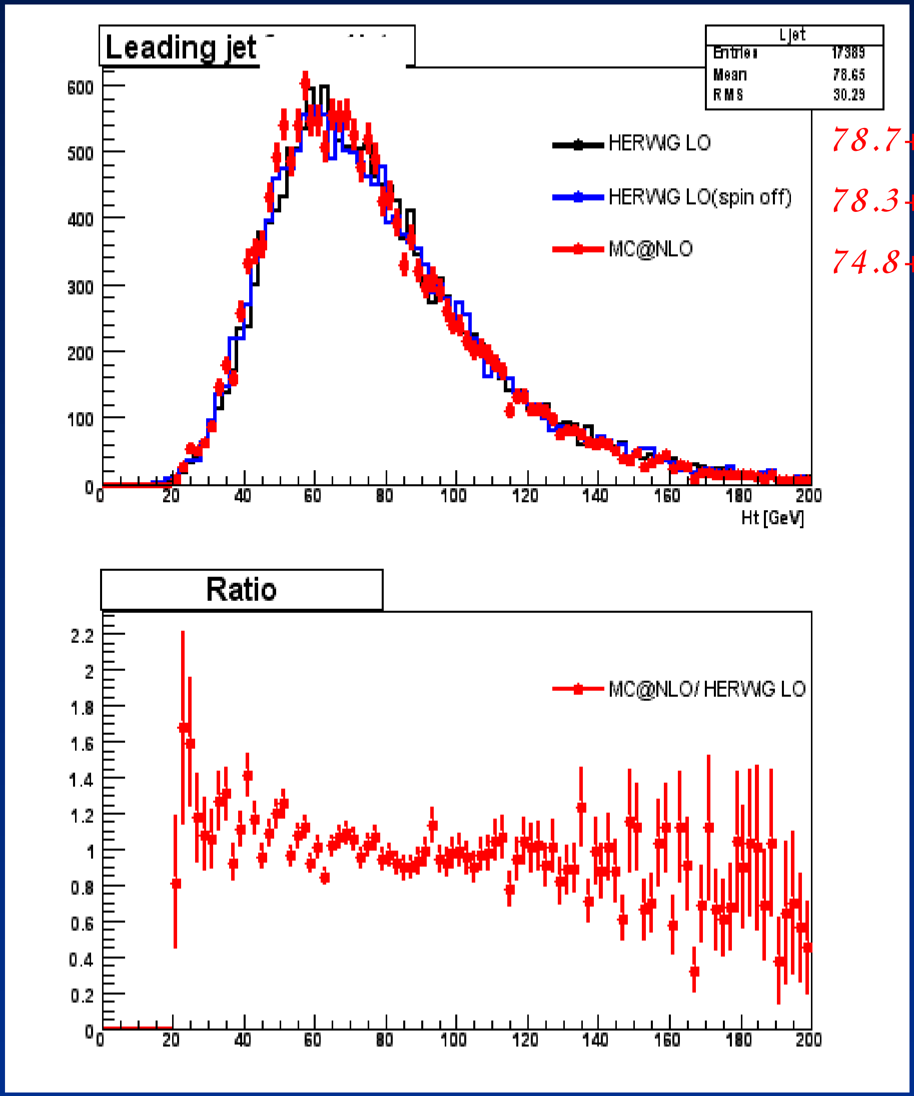


Comparison of acceptance
MC@NLO vs HERWIG?

Acceptance(%)	HERWIG (gg: 5.5%)	HERWIG (spin off) gg:5.5%	MC@NLO gg: 14.3%
Lepton(muon)	7.46	7.53	7.33
Lep-jet (>=3jet) (relative gg frac)	61.0 (5.7)	60.8 (5.7)	60.6 (14.5)
Lep-jet(3jet)	26.2 (4.6)	25.2 (4.3)	25.2 (11.4)
Lep-jet(4jet)	34.9 (6.5)	35.6 (6.7)	35.3 (16.7)

- gg channel has a higher acceptance in lepton+4jets.
- gg diagram produce more jets (larger acceptance)
- MC@NLO (no spin correlation)

Leading Jet Et for Njet>=3



78.7+-0.2

78.3+-0.2

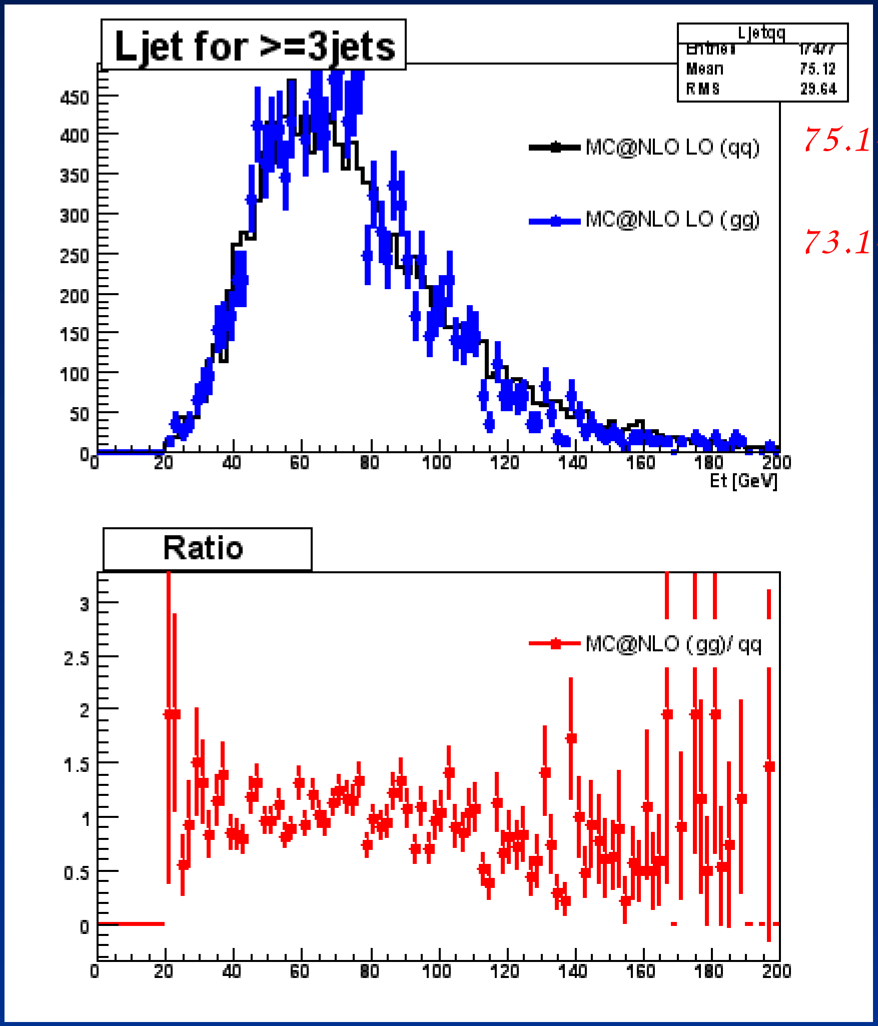
74.8+-0.2

MC@NLO has a softer leading jet Et than HERWIG (by 5%).

1. Softer top pt in MC@NLO, both W and bjet have lower energy.

Evt selection (lepton+jet): Pt(central lep)>20, MET>20, Jet Et>15&& |eta|<2

Leading Jet Et for Njet>=3
qq vs gg channels : MC@NLO

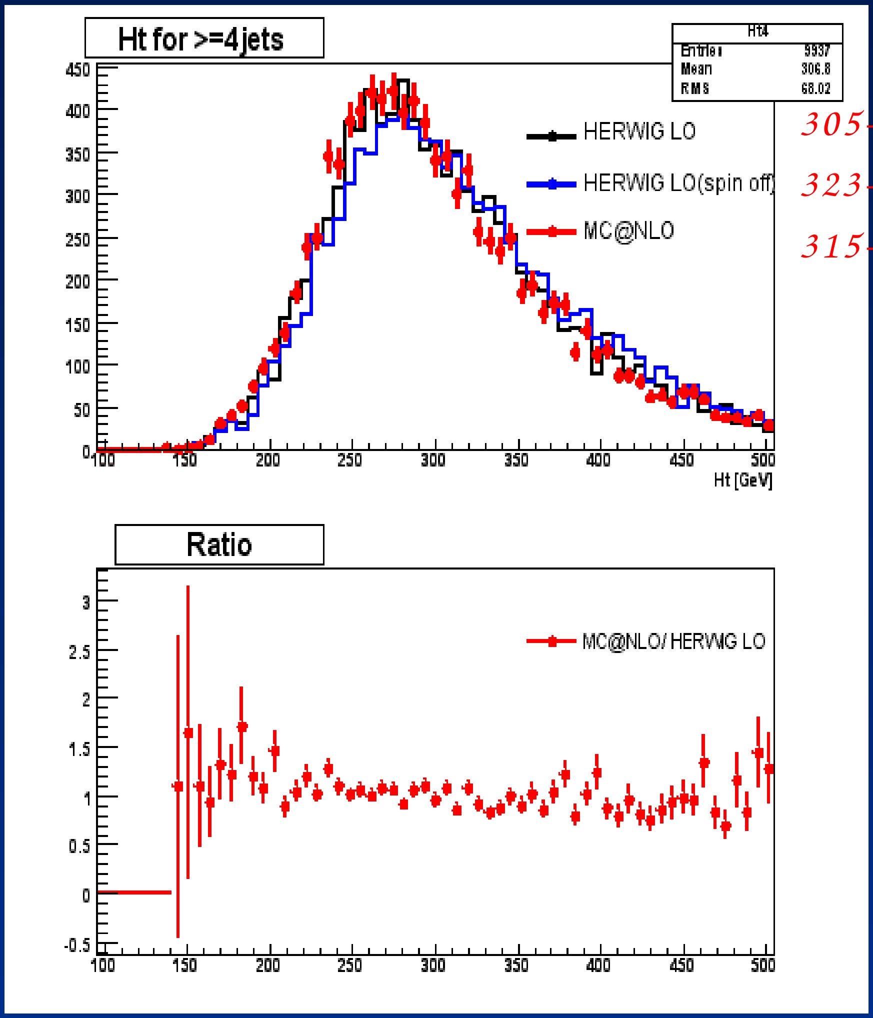


75.1+-0.3

73.1+-0.5

1. *gg channel has 2.7% higher leading jet Et value than qq channel..*

Ht for Njet>=4



305+-0.7

323+-0.7

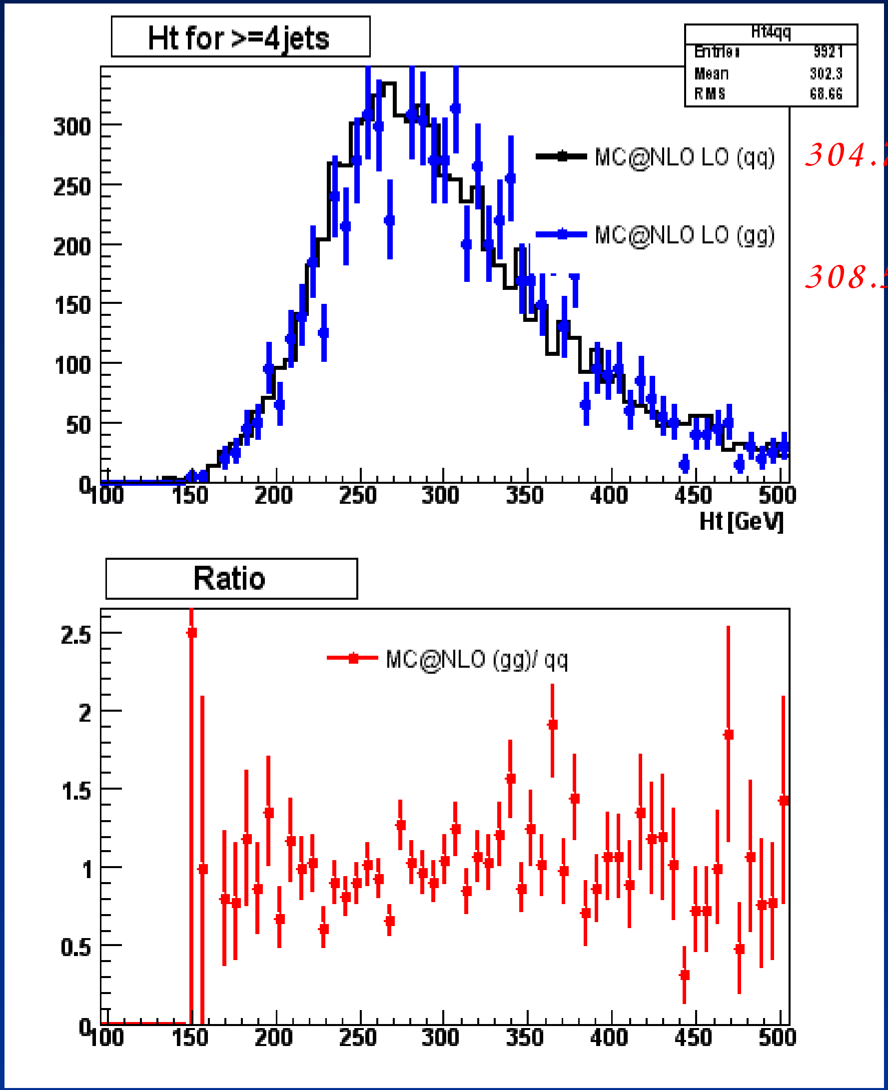
315+-0.7

MC@NLO has a softer leading jet Et than HERWIG (by 3%).

1. Softer top pt in MC@NLO, both W and bjet have lower energy.

Ht=Et sum of lepton(|eta|<1), MET, Jet(|eta|<2)

Ht for Njet>=4
qq vs gg channels : MC@NLO



304.7+-0.7

308.5+-1.7

1. gg channel has 1% higher Ht value than qq channel, even with lower leading Jet Et. (perhaps due to more jets).

Comparisons of MC@NLO and HERWIG at generator level

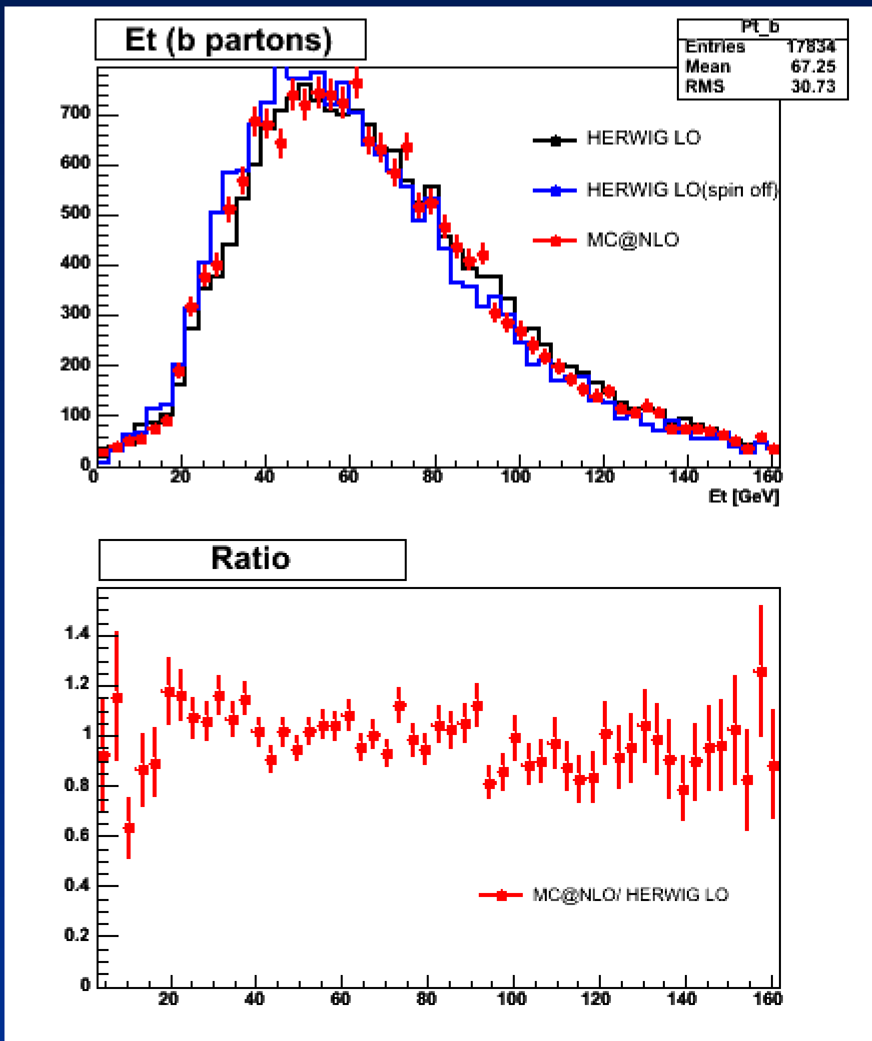
Evt selection (lep-jet channel): Pt(nu, 4jets)>20 GeV

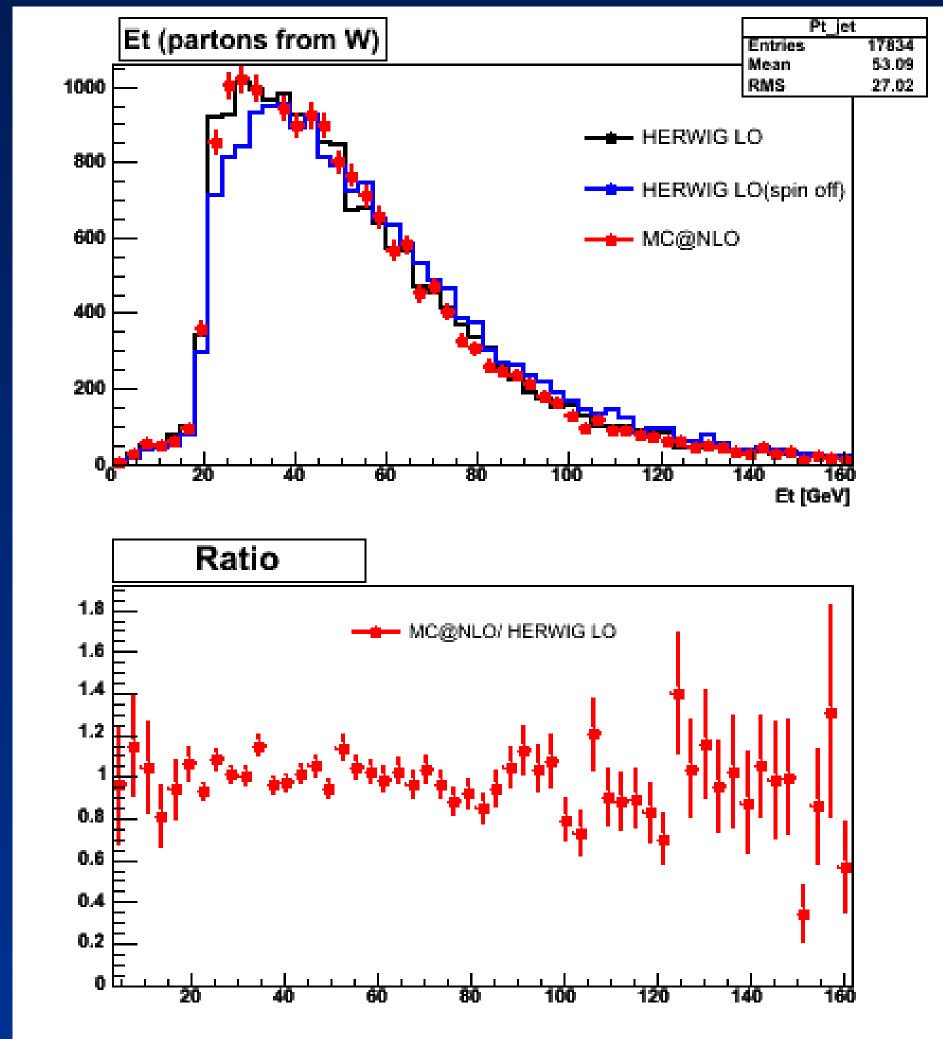
Average values	HERWIG	HERWIG (spin off)	MC@NLO
Et(lep)	44.5	54.2(problem?)	43.8
Et(b-parton)	69.7	65.9	67.5
Et(parton from W)	54.2	57.0	52.7
Pt(W)	81.8	89.3	78.5
Pt(top)	103.1	104.8	94.38(soft)

- HERWIG (spin off): problem in top decay? Higher Pt(W), lower Et(b)
- MC@NLO has a lower Pt(top): bring lower jet Et and Ht etc.

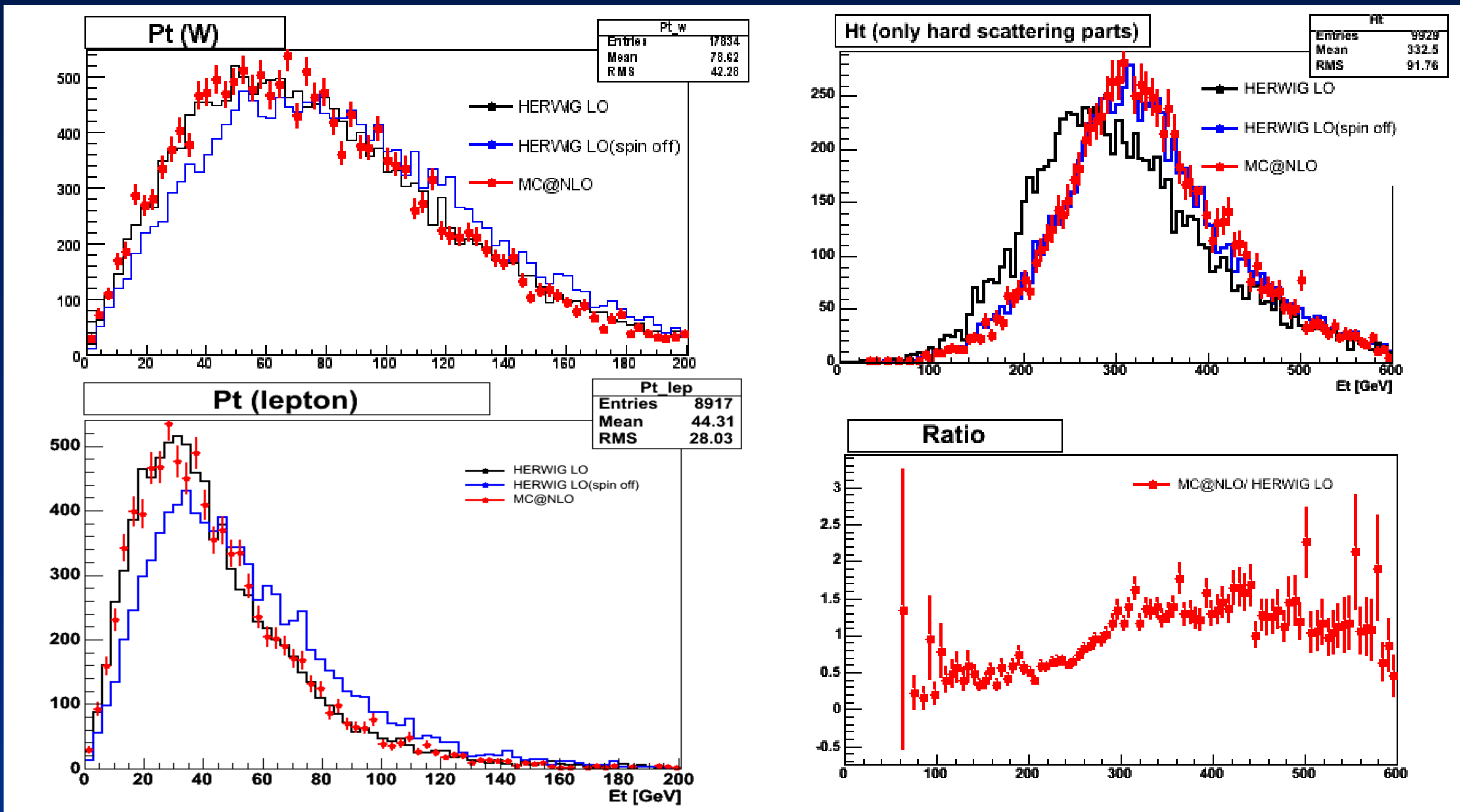
Comparisons of MC@NLO and HERWIG at generator level

for all hard partons from W





Evt selection (lep-jet): Pt(nu, 4jets)>20 GeV



Evt selection (lep-jet): Pt(lep,nu, 4jets)>20 GeV

Summary and Plans

- MC@NLO shows interesting features, lower leading Et and higher Ht value (due to lower top pt, and more jets?)
- More investigations on MC@NLO and HERWIG (spin off) are necessary.
- Plan to do detail study on acceptance and kinematic distributions (also with diff NLO pdfs)
- Once we have a good control on MC@NLO, this MC will be really powerful toward precision top measurements with no doubt.