Photon + heavy-quark jet production at Tevatron and LHC

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Lapth-Annecy

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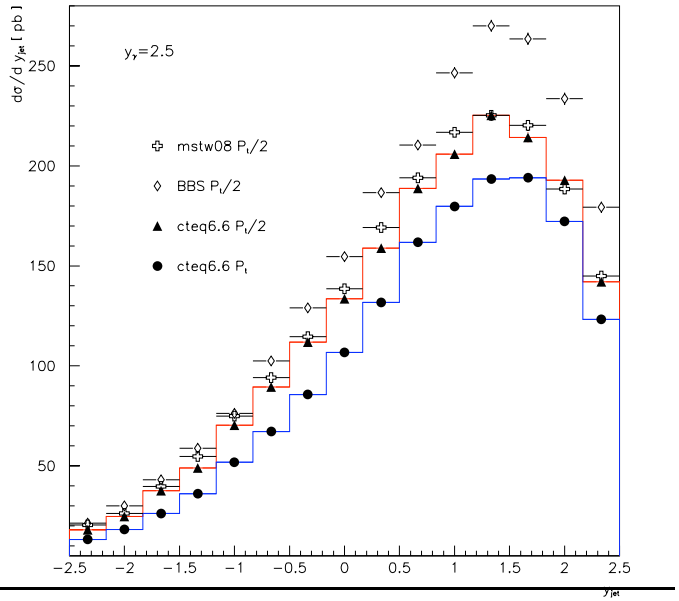
Overview

- $p\ p$ collisions at LHC at $\sqrt{s} = 7$ TeV opens a new era in research on particle physics, especially for QCD studies.
- Prompt photon at large-$p_\perp$ allows for probing perturbative QCD at NLO and putting constraints on PDFs and FFs.



γ-jet production[1]
at LHC
computed at NLO by JETPHOX

[1] Z. Belghobsi *et al.*, Phys. Rev. **D 79** (2009) 114024.

Overview

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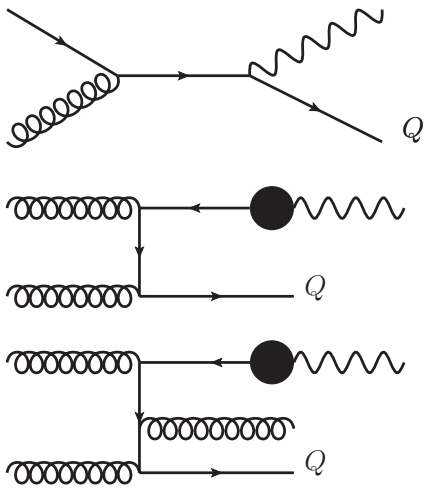
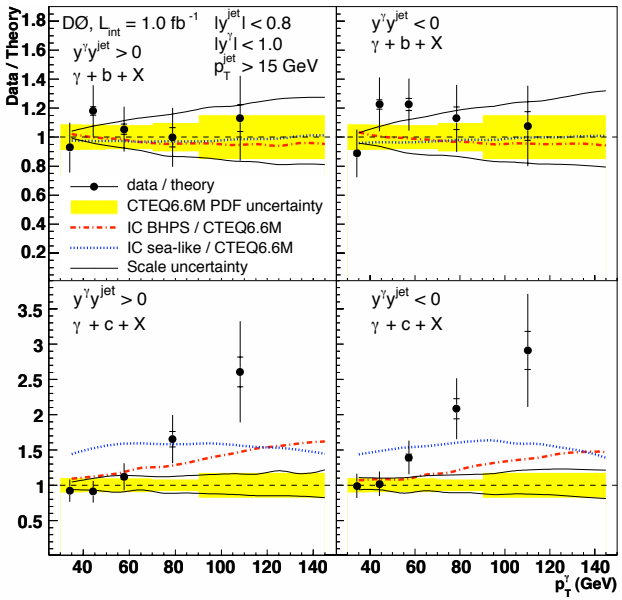
- Prompt photon at large-$p_\perp$ allows for probing perturbative QCD at NLO and putting constraints on PDFs and FFs.
- $\gamma + b/c$ production is the promissing processes to probe PDFs in heavy quark sector.

Motivation

- Interesting in comparison previous calculation[2] to Tevatron data[3]:

  Discrepancy between data and theory





[2] T.P. Stavreva, and J.F. Owens, Phys. Rev. **D 79** (2009) 054017.

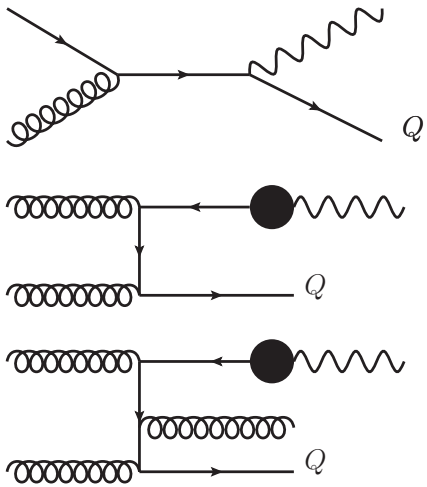
[3] V.M. Abazov et al. Phys. Rev. Lett. **102** (2009) 192002.

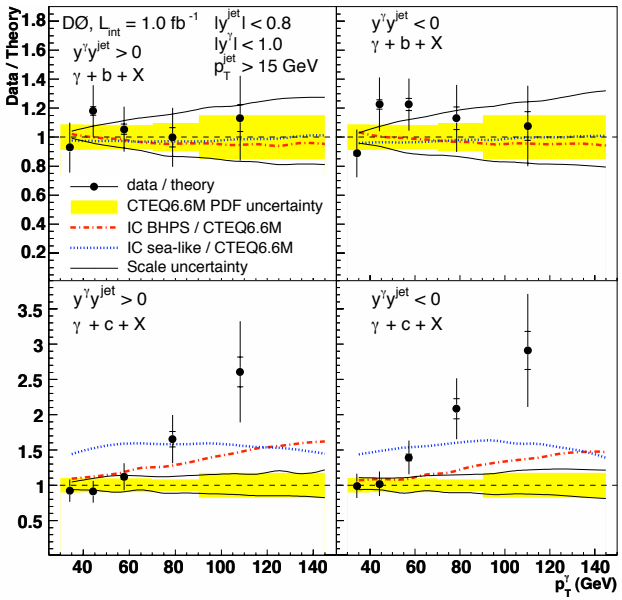
Motivation

- Interesting in comparison previous calculation[4] to Tevatron data[5]:

Discrepancy between data and theory

lacking of $g \to Q$ fragmentation ?





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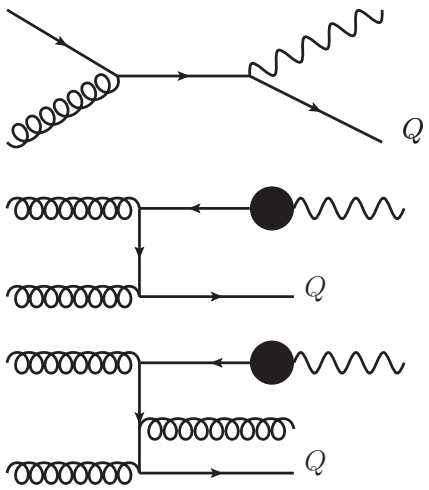
Goal

- Cross check with previous calculation, as well as understand Tevatron data.
- Including fragmentation of partons into heavy-quarks in the final state of the partonic process.



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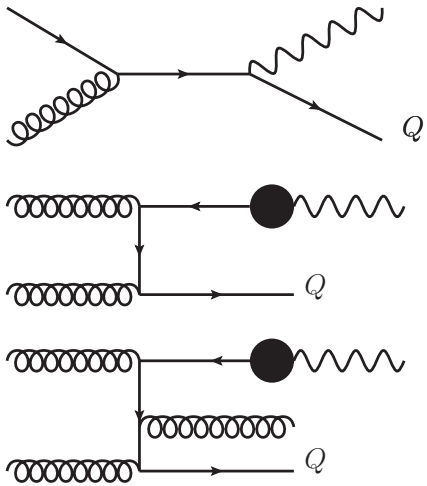
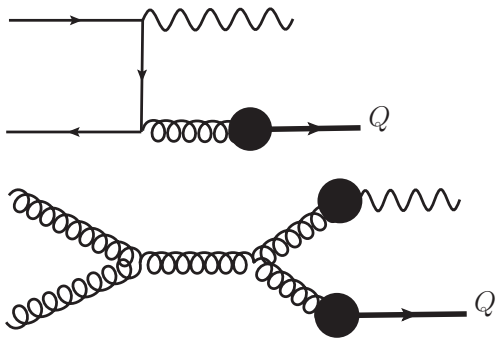
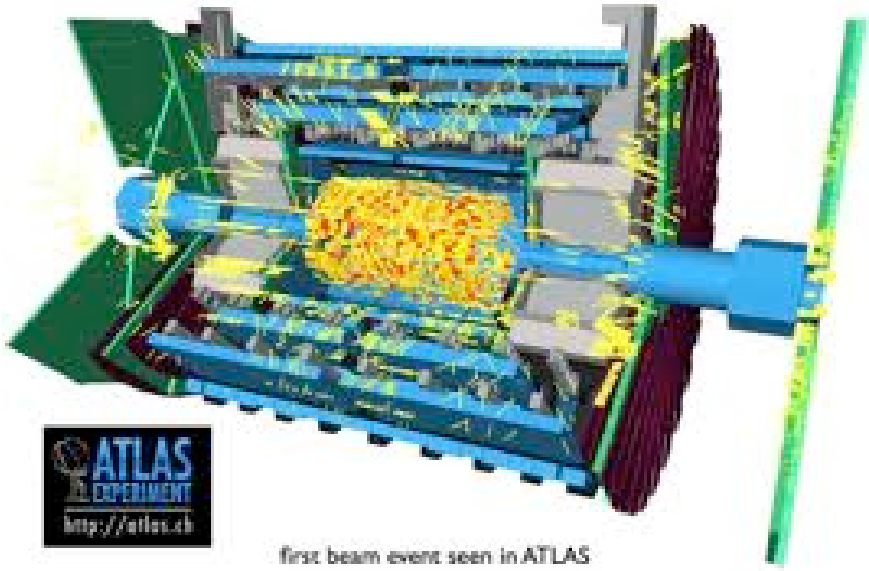




Goal

- Cross check with previous calculation, as well as understand Tevatron data.
- Including fragmentation of partons into heavy-quarks in the final state of the partonic process.
- Compare with first LHC data at 7TeV



first beam event seen in ATLAS

Goal (behide the scence)

Goal

1000 flags: survival

Goal (behide the scence)

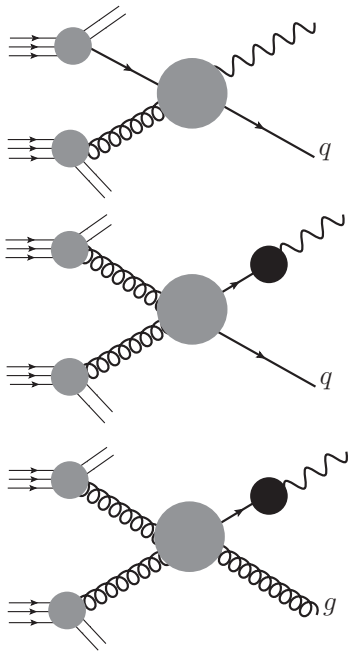
Goal

1000 flags:

jrjc2011

Method

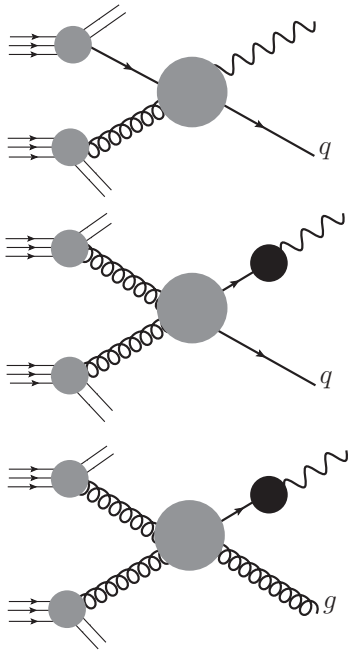
- Work based on the PHOX generators[6], especially JETPHOX

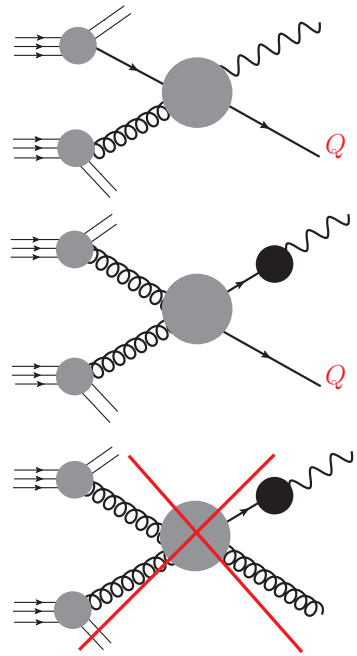


[6] http://lapth.in2p3.fr/PHOX_FAMILY/main.html

Method: based on the PHOX generators

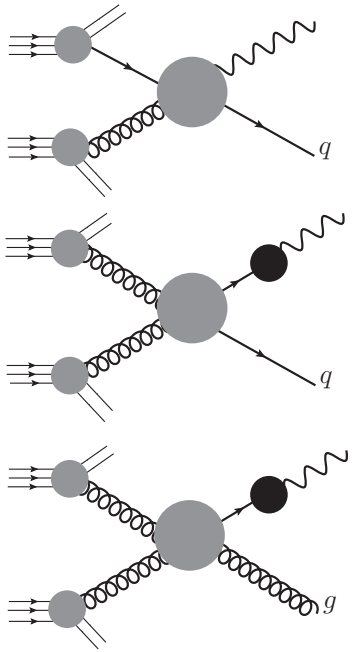
- Pick up the corresponding process to have a cross check
-

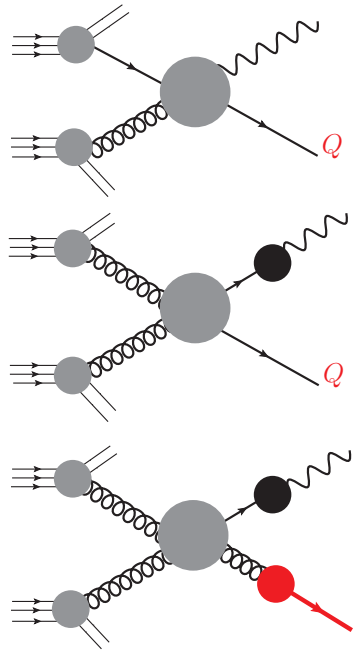




Method: based on the PHOX generators

- Pick up the corresponding process to have a cross check
- Including $g \to Q$ fragmentation: Improve current calculation

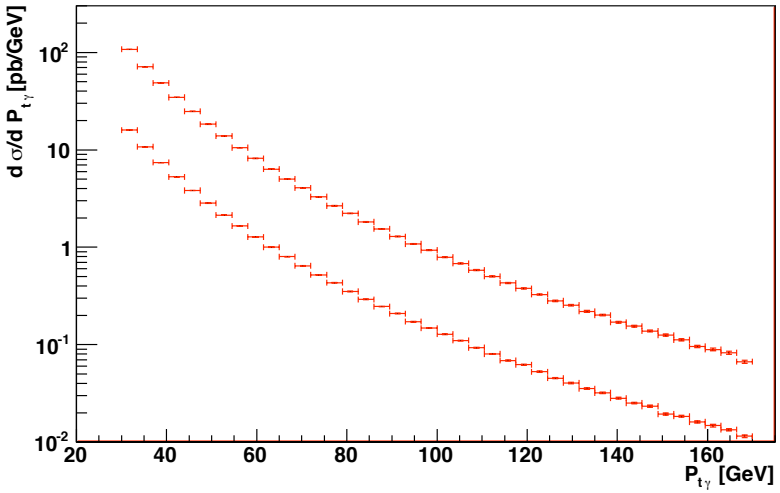


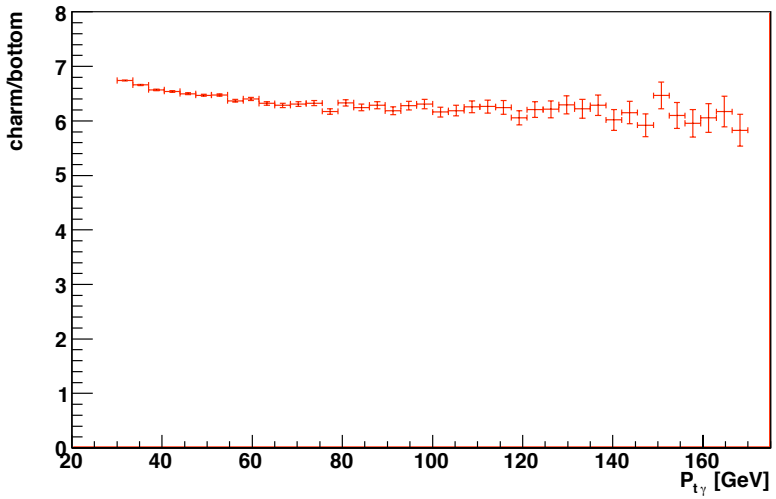


Born results

Left: γ+c and γ+b at LHC

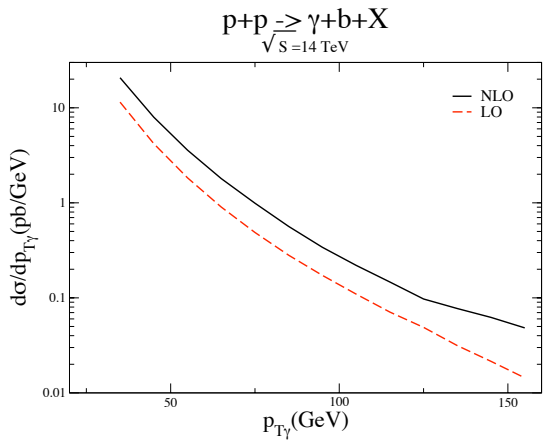
Right: (γ+c)/(γ+b) ratio at LHC

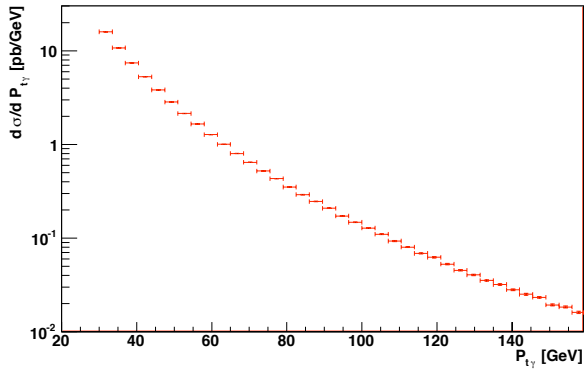


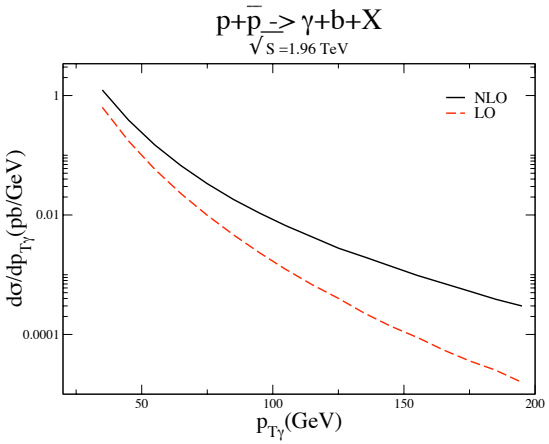


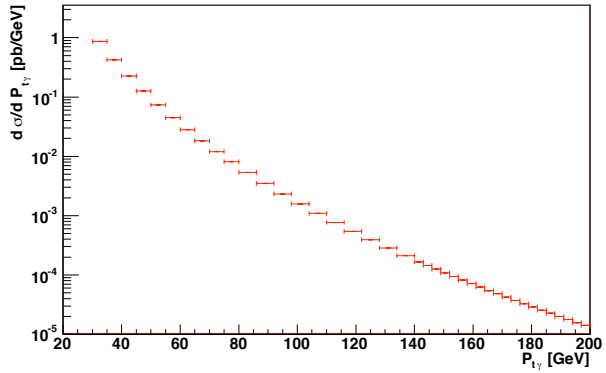
Cross check at Born

Good agreement with previous calculatior at Born level









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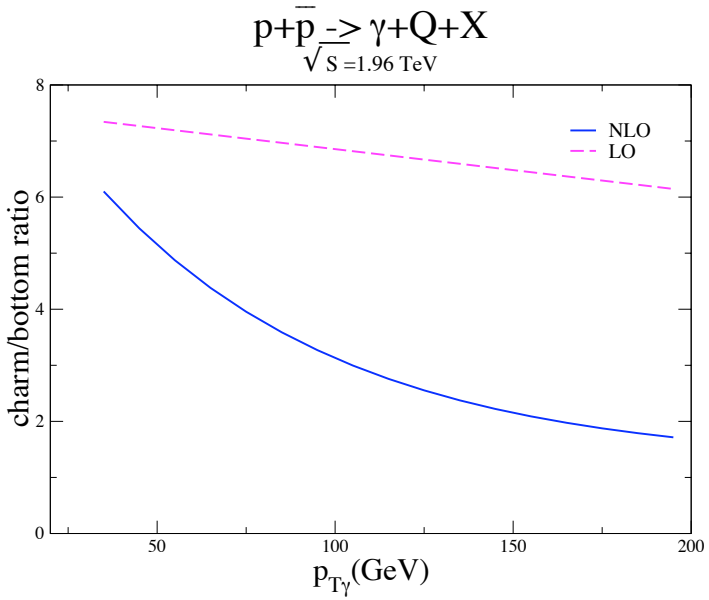
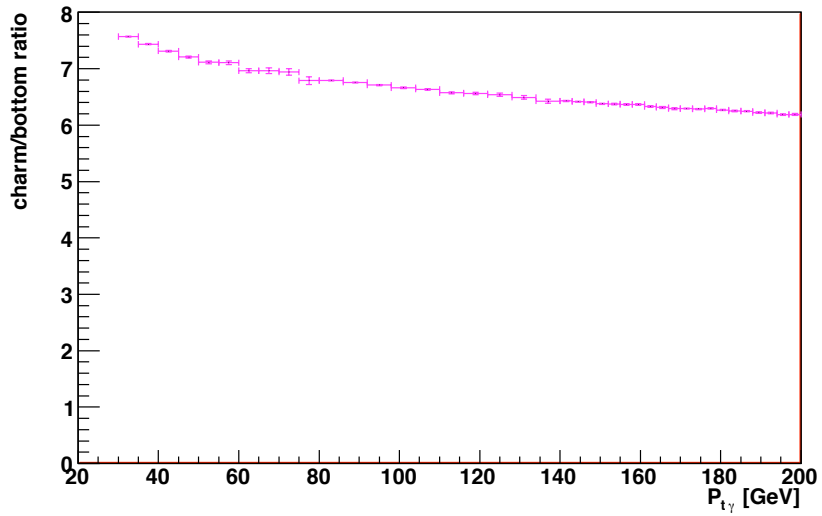




cross check (behind the scences)

previous'

1000 fl

status

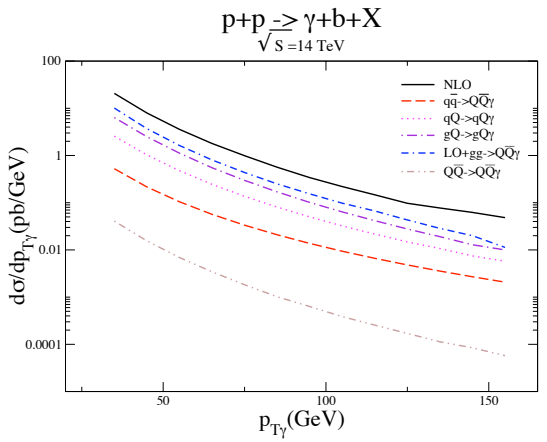
just 22 fl

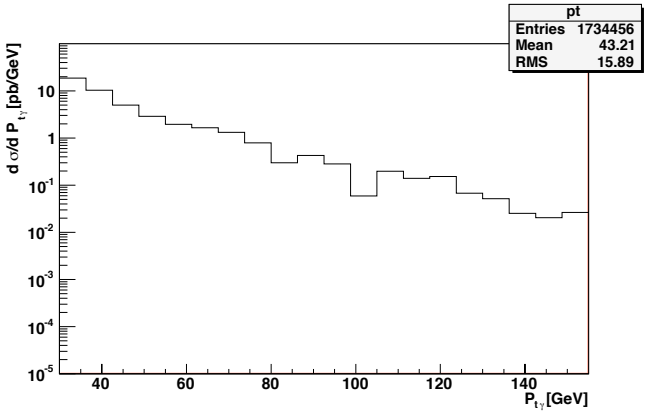
Noel break???

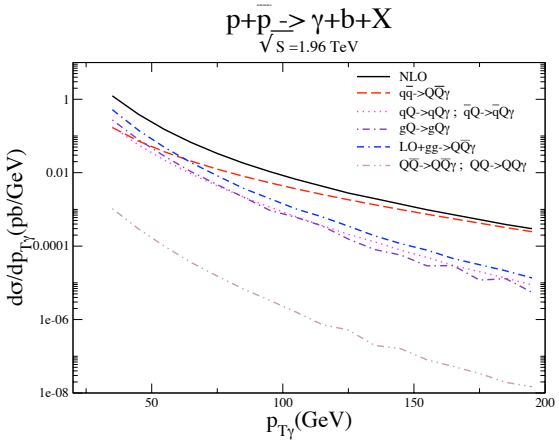
"direct" photon contribute

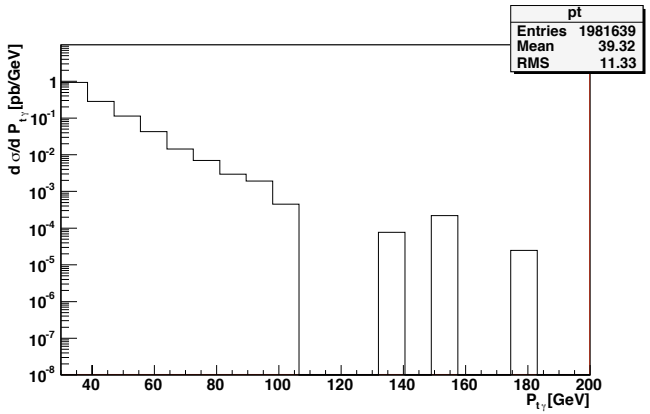
Left: direct + fragmentation (previous results)

Right: direct









Conclusion and outlook

- At Born level, good agreement results were obtained
- Direct contribution at NLO calculation is done.
- Contribution of partons fragmenting into heavy-quarks will be included
- Phenomenology at Tevatron and LHC.