

Top and bottom mass effects in hadronic Higgs production

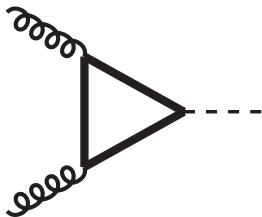
Marius Wieseemann

Bergische Universität Wuppertal

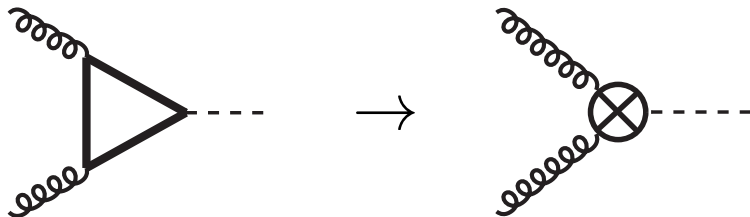
6th Annual Helmholtz Alliance Workshop
on "Physics at the Terascale"

December 3-5, 2012 (DESY, Hamburg)

Hadronic Higgs production



Hadronic Higgs production



Mass effects on distributions in gluon fusion

- top mass effects considered to be small
- TRUE: $<1\%$ for NNLO corrections
[Harlander, Mantler, Marzani, Ozeren '10], [Pak, Rogal, Steinhauser '10]
- BUT: only inclusive!
- HERE: validation of heavy-top limit for Higgs distributions
 1. p_T distribution at LO+NLL with full mass dependence
 2. subleading $1/m_{\text{top}}^2$ terms for Higgs+jet production at NLO

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Transverse momentum resummation

- NLO+NNLL in heavy-top limit (htl), HqT [Bozzi, Catani, de Florian, Grazzini '05]
- mass effects? \rightarrow reweighted with Born: $d\sigma_{\text{approx}} = d\sigma_{\text{htl}} \cdot \sigma_{\text{t+b}}^{(0)} / \sigma_{\text{htl}}^{(0)}$

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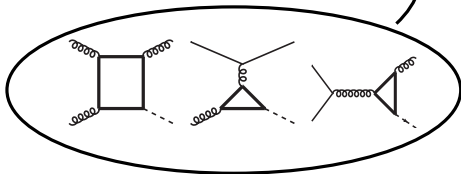
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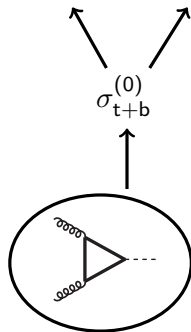
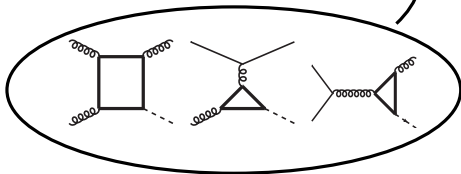


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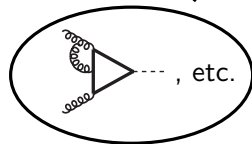
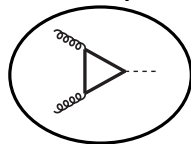
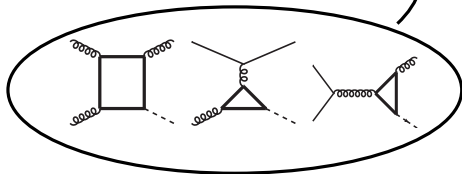


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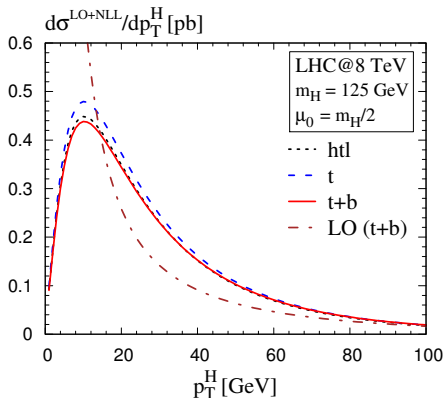
\mathcal{H}

Resummed cross section

p_T distribution at LO+NLL:

[Mantler, MW '12]

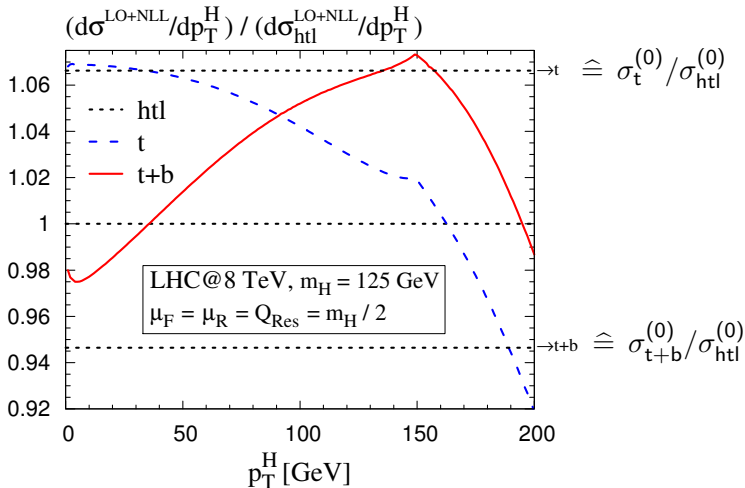
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Resummed cross section

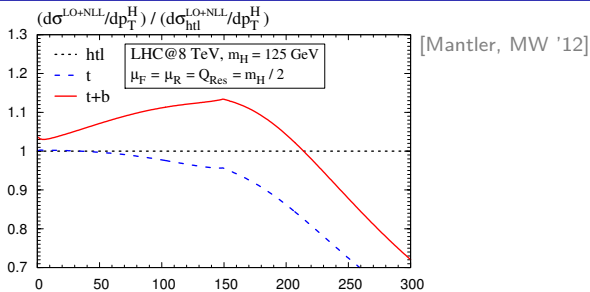
Mass effects at LO+NLL:

[Mantler, MW '12]

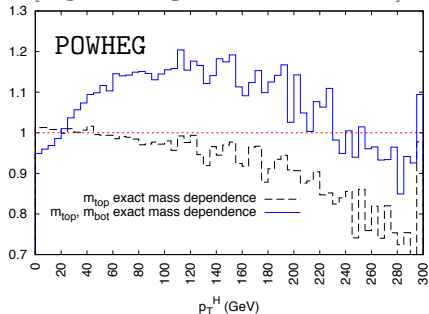


Analytic resummation vs. POWHEG vs. MC@NLO

Mass effects:

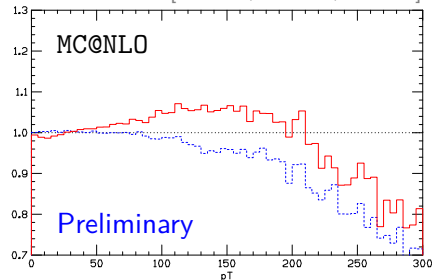


[Bagnaschi, Degrossi, Slavich, Vicini '12]



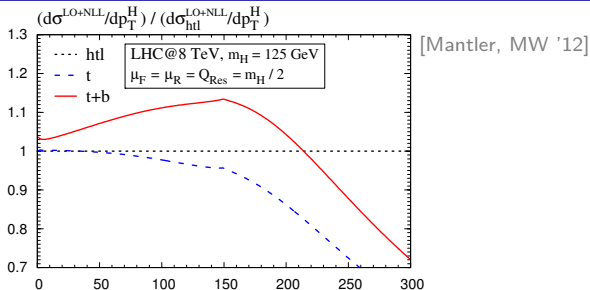
p_T^H [GeV]

[Frederix, Frixione, Maltoni]

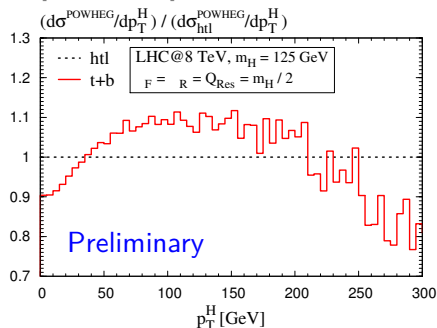


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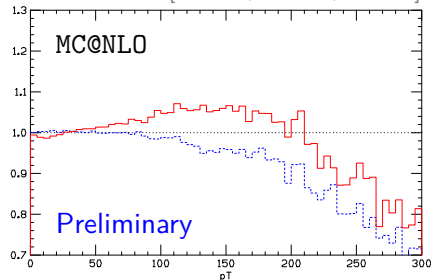
Mass effects:



[Mantler, MW]



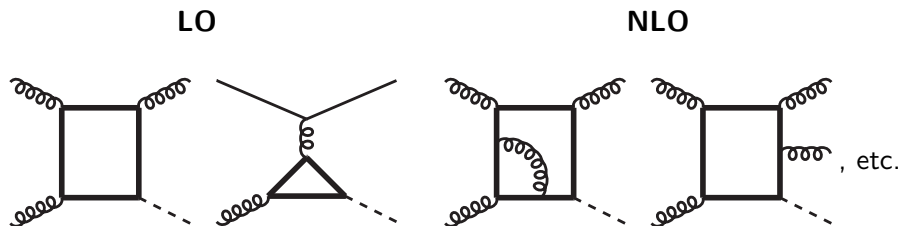
p_T^H [GeV] [Frederix, Frixione, Maltoni]



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Top mass effects in Higgs+jet production

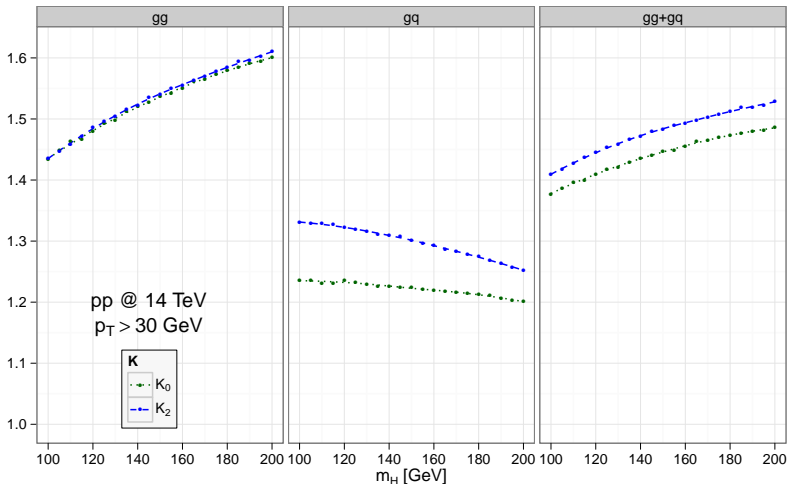


- subleading $1/m_{\text{top}}^2$ terms in asymptotic expansion
[Harlander, Mantler, Ozeren '10]
- fully differential up to NLO
[Harlander, Neumann, Ozeren, MW '12]
- dipole subtraction
[Catani, Seymour '97]
- Checks: Nagy α -parameter, fixed order p_T distribution of HqT

Top mass effects in Higgs+jet production at NLO

Higgs mass dependence:

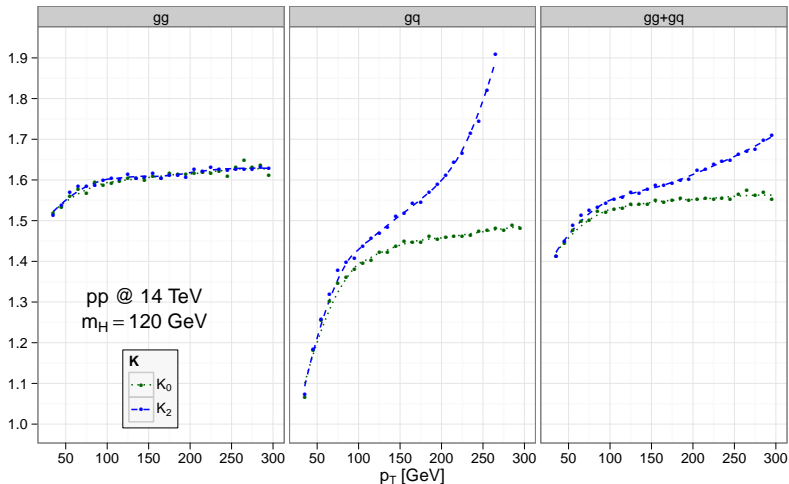
[Harlander, Neumann, Ozeren, MW '12]



Top mass effects in Higgs+jet production at NLO

Transverse momentum distribution:

[Harlander, Neumann, Ozeren, MW '12]



Conclusions:

- step forward from validation of htl in the fully inclusive case
- resummation at LO+NLL with full mass dependence
- small top mass effects of H +jet at NLO (fully differential)

Outlook:

- LO+NLL in the MSSM with full mass dependence
- comparison: analytic resummation vs. POWHEG vs. MC@NLO

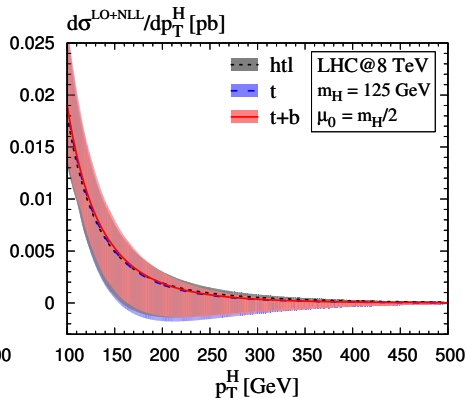
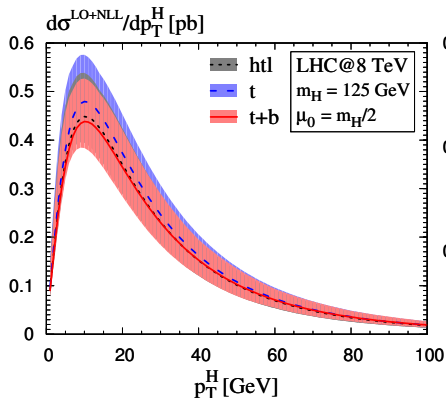
BackUp

Resummed cross section

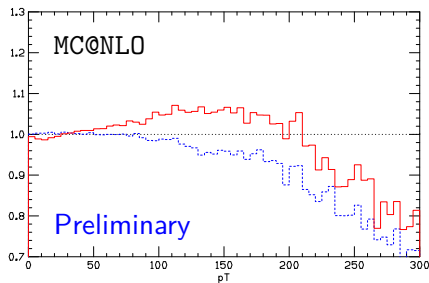
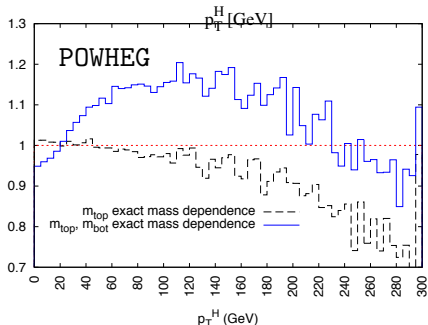
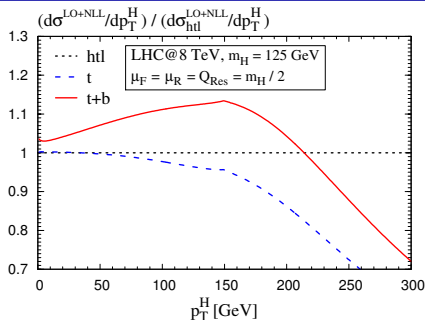
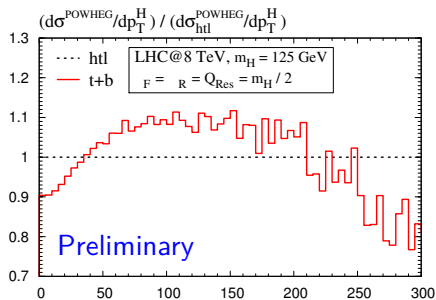
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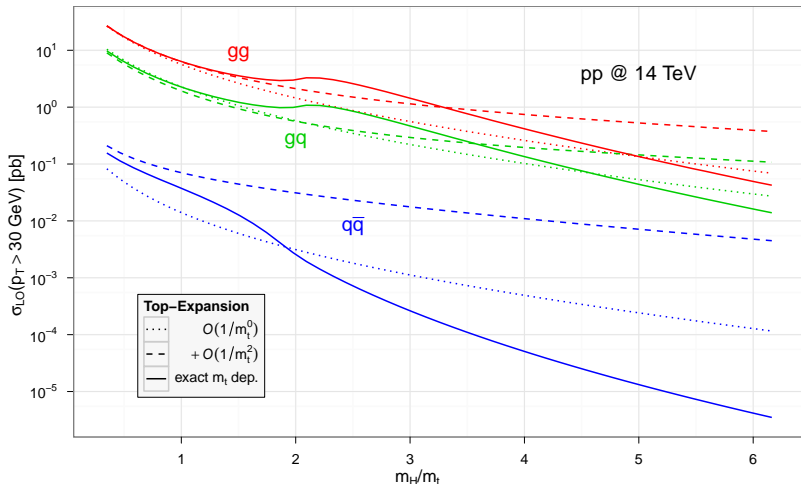
Analytic resummation vs. POWHEG vs. MC@NLO



Top mass effects in Higgs+jet production at LO

Higgs mass dependence:

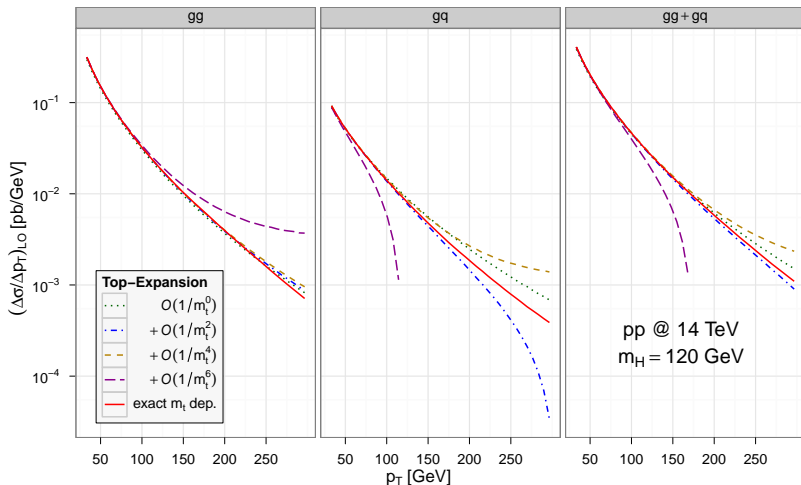
[Harlander, Neumann, Ozeren, MW '12]



Top mass effects in Higgs+jet production at LO

Transverse momentum distribution:

[Harlander, Neumann, Ozeren, MW '12]



Top mass effects in Higgs+jet production at NLO

Rapidity distribution:

[Harlander, Neumann, Ozeren, MW '12]

