SMH Subgroups

• SM benchmarks and PDF's	Ferrag/Moretti/Soldner
• Monte Carlo	Richardson
• Higgs decay to WW	Nikitenko
• Higgs via weak-boson fusion	Unal
• Higgs with top quarks	Gascon-Shotkin
• Higgs with bottom quarks	Willenbrock

Higgs + Bottom Subgroup

Scott Willenbrock

U. of Illinois at Urbana-Champaign

Les Houches 2005

May 20, 2005

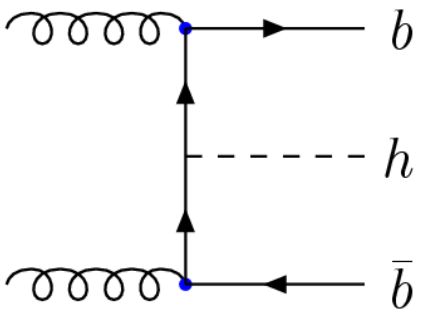
Presentations from

- Spira
- Collins
- Smith
- Nikitenko
- Kalinowski
- Lehti
- Perries
- Sopczak
- Hesselbach
- Olness
- Harlander
- Willenbrock

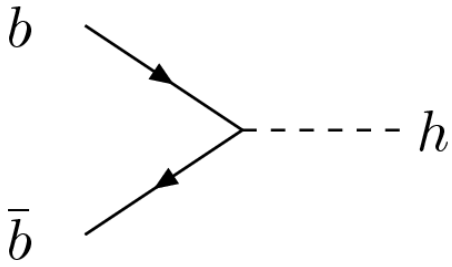
… and participation by many others

Higgs with bottom quarks

Inclusive cross section



Expansion in $\alpha_S \ln(m_h/m_b)$

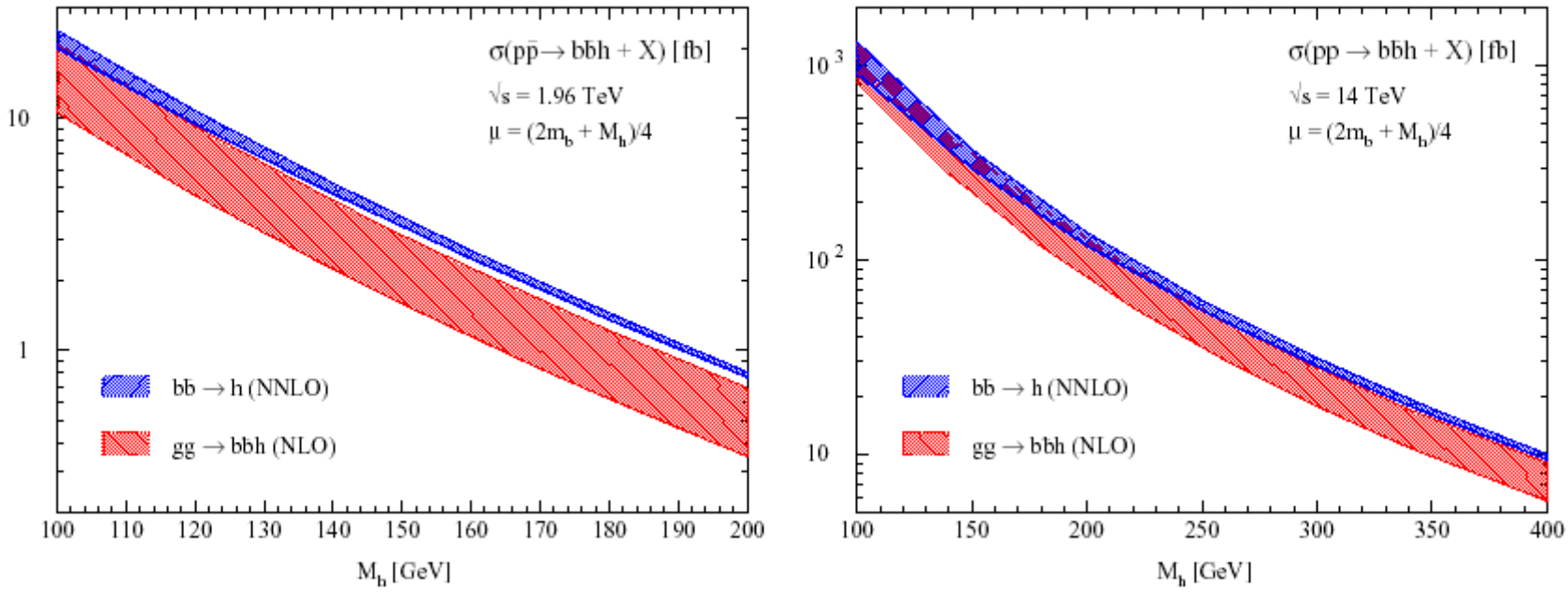


Expansion in α_S

and $1/\ln(m_h/m_b)$

Aivazis, Collins, Olness, Tung;
Chuvakin, Smith, van Neerven

Les Houches 2003

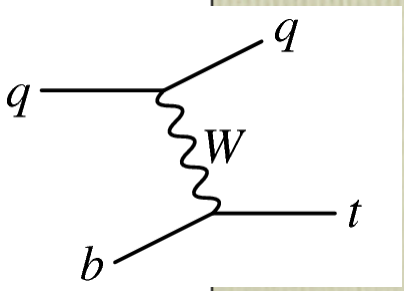


bb → h @ NNLO – Harlander and Kilgore

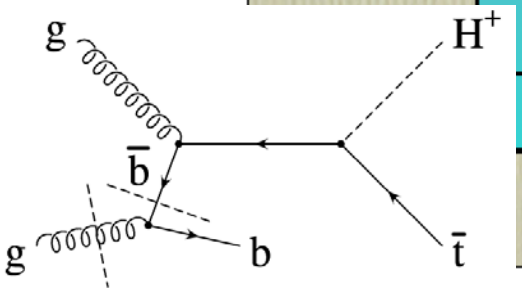
gg → bbh @ NLO – Dittmaier, Kramer, Spira; Campbell et al.

Dawson, Jackson, Reina, Wackeroth

Some examples of b-initiated processes



Process	Interest	Accuracy
single-top t-channel	SM, top EW couplings and polarization, V_{tb}. Anomalous couplings.	NLO
single-top + W		NLO
Wbj	SM, bkg to single top	(NLO)
gamma+b	SM, SUSY bkg, b-pdf	NLO
Z+b		NLO
inclusive h,A	SUSY discovery/ measurements at large tan(beta)	NNLO
(h,A)+b		NLO
H + t	SUSY discovery, couplings	NLO



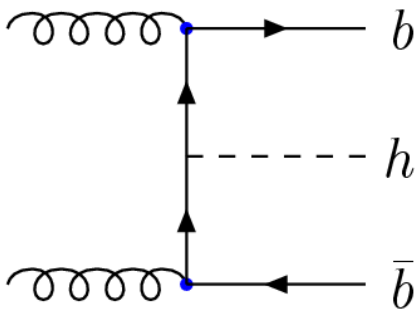
Higgs Working Group @ TEV4LHC, BNL, Febraury 2005

Maltoni

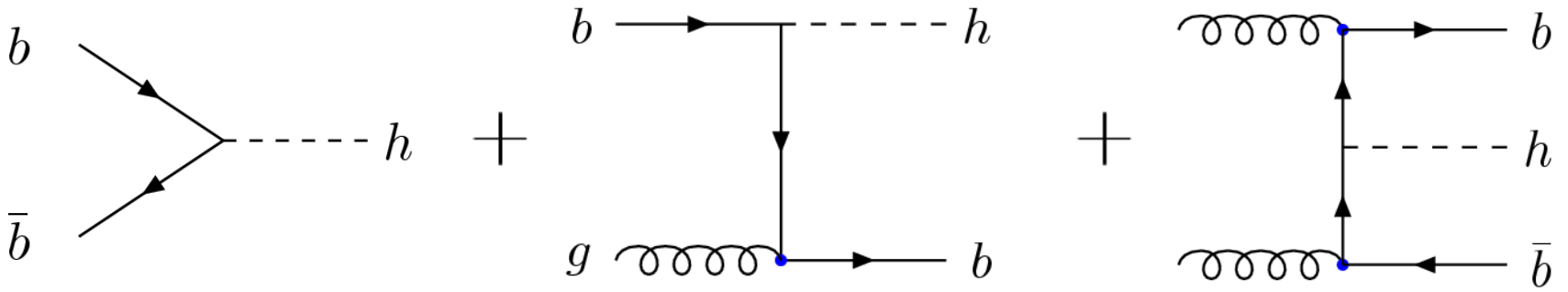
Refinements

- Effect of finite m_b in $bb \to h$
- Consistent treatment of virtual top quark
- Four/five-flavor PDF sets

Effect of finite m_b



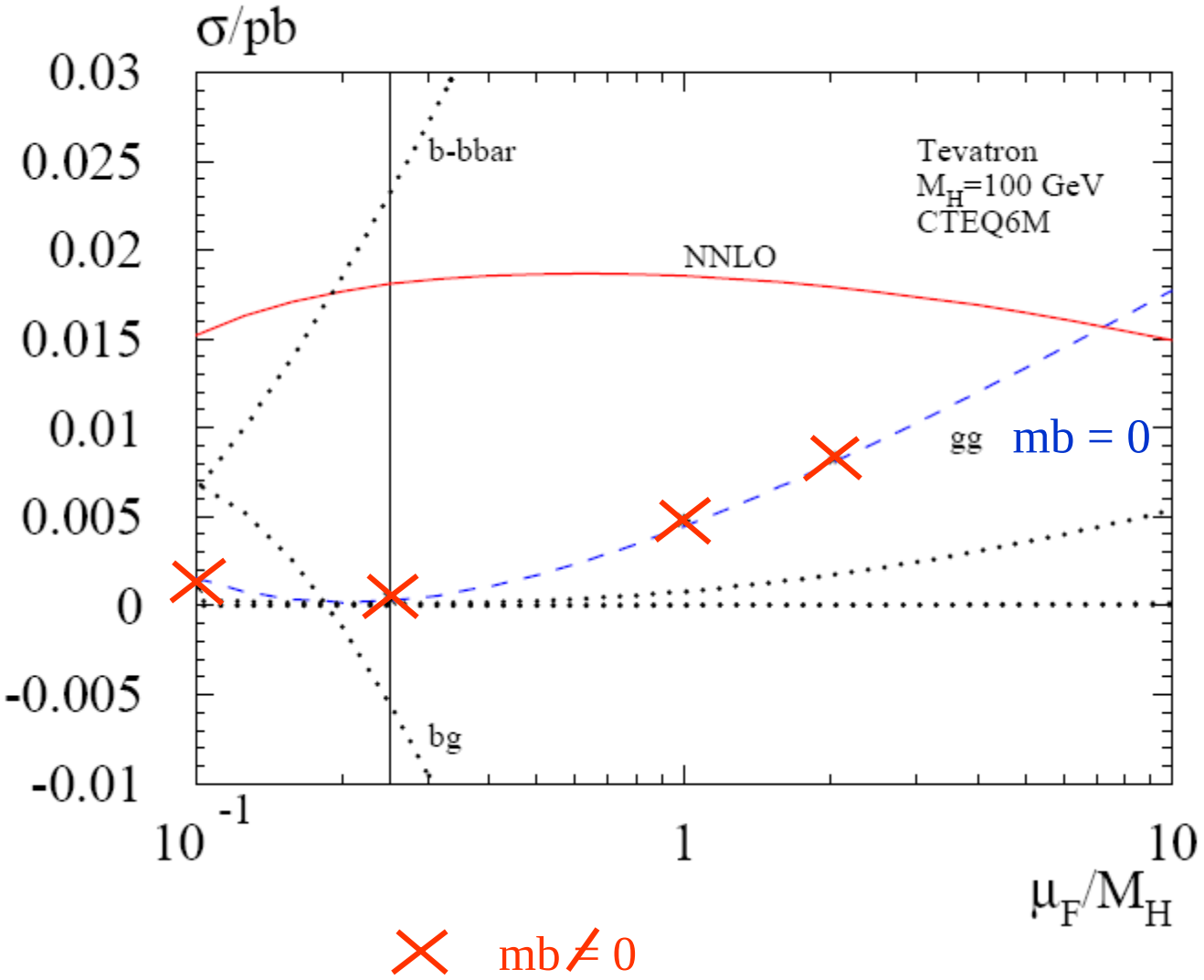
mb ≠ 0



mb ≠ 0

Harlander and Kilgore

Maltoni, Sullivan, SW



Refinements

- Effect of finite m_b in $bb \rightarrow h$
  - Negligible

Refinements

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  - Negligible
- Consistent treatment of virtual top quark
  - In progress

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  - Self-consistent NNLO sets Collins, Olness, Smith

Refinements

- Effect of finite m_b in $bb \to h$
  - Negligible
- Consistent treatment of virtual top quark
  - In progress
- Four/five-flavor PDF sets
  - Self-consistent NNLO sets Collins, Olness, Smith
- Quantify effect of resummation
  - More important at large x

Effect of resummation

x = 0.1 x = 0.01

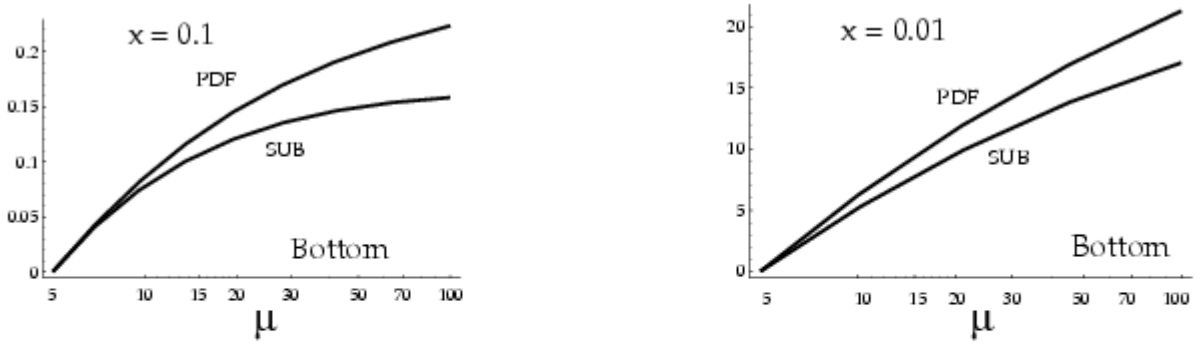
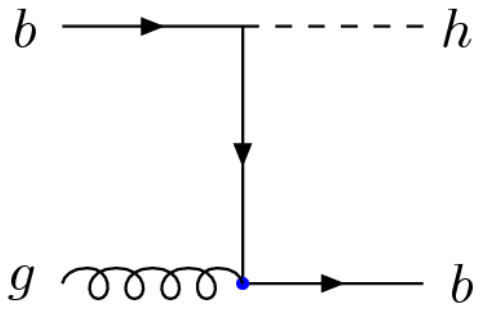


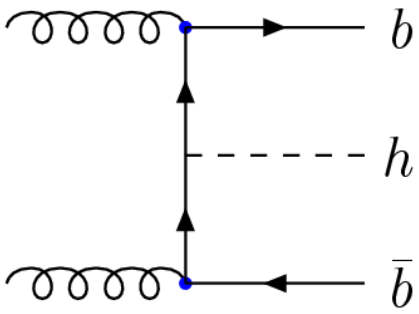
FIG. 5. Comparison of the evolved PDFs, $f^H(x,\mu)$ (labeled PDF), and perturbative PDFs, ${}^1f^H(x,\mu)$ (labeled SUB), as a function of the renormalization scale μ for charm at $x = 0.1$ (a) and $x = 0.01$ (b), and for bottom at $x = 0.1$ (c) and $x = 0.01$ (d). This shows the compensation between fully evolved heavy quark parton distribution and the first order perturbative contribution (which is the only part contained in the FFN scheme calculation).

Olness, Scalise, Tung

Simulations of H + 1 b jet

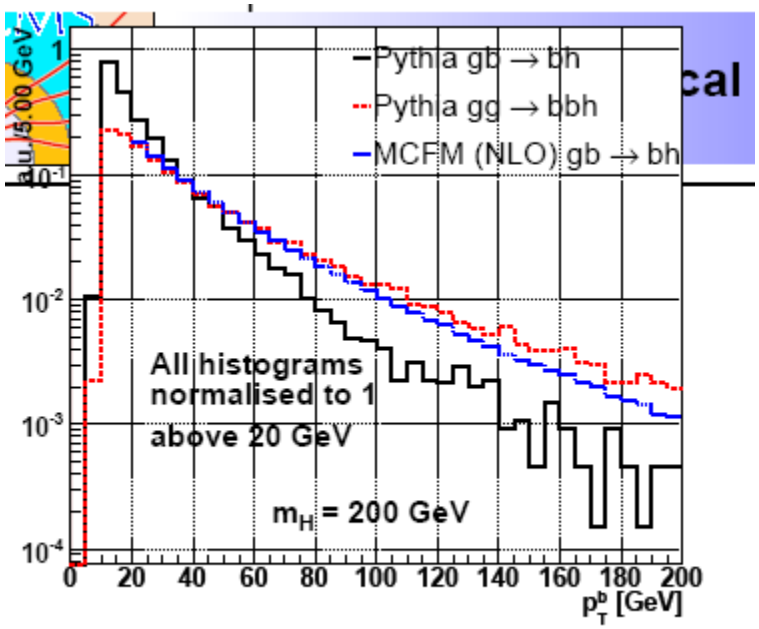


gb → hb



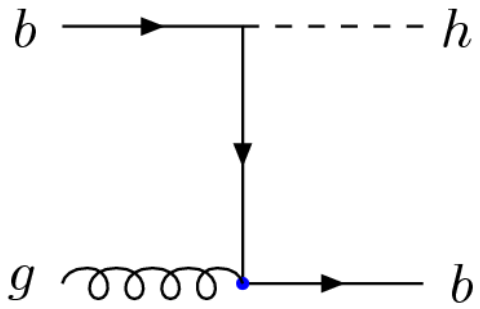
gg → bbh

Kalinowski and Nikitenko

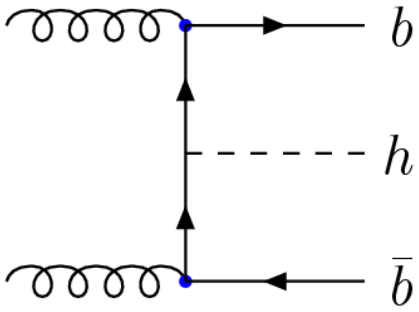


p_T of leading b jet.

Simulations of H + 1 b jet

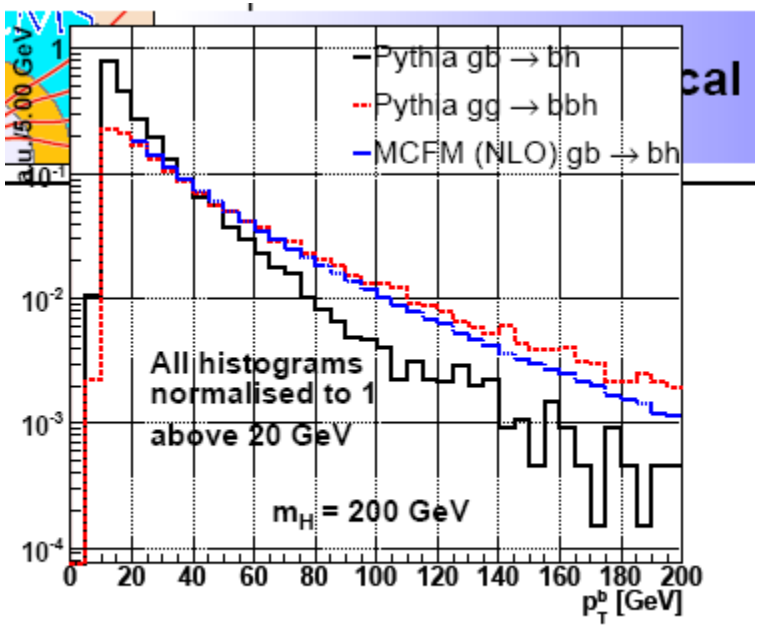


gb → hb Use only for high p_T^b !!!

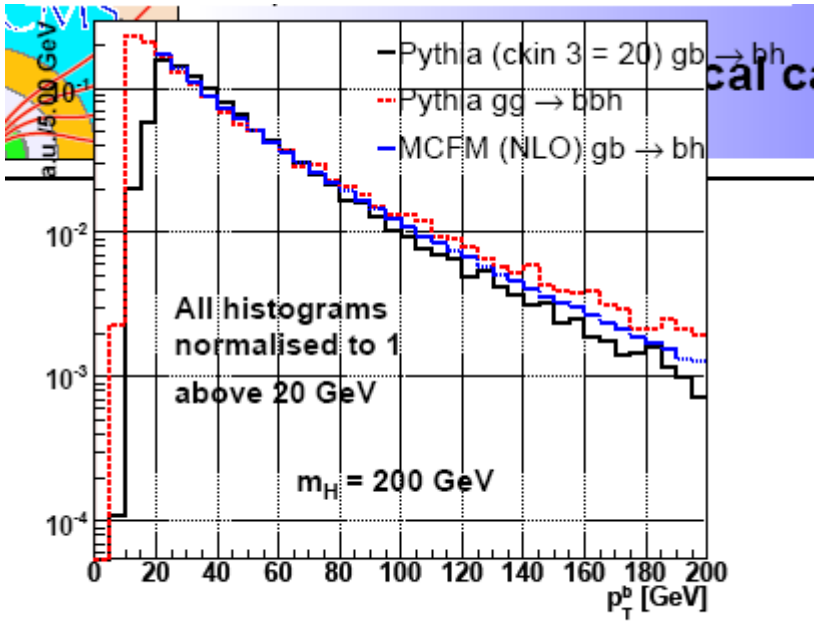


gg → bbh

Kalinowski and Nikitenko



p_T of leading b jet.

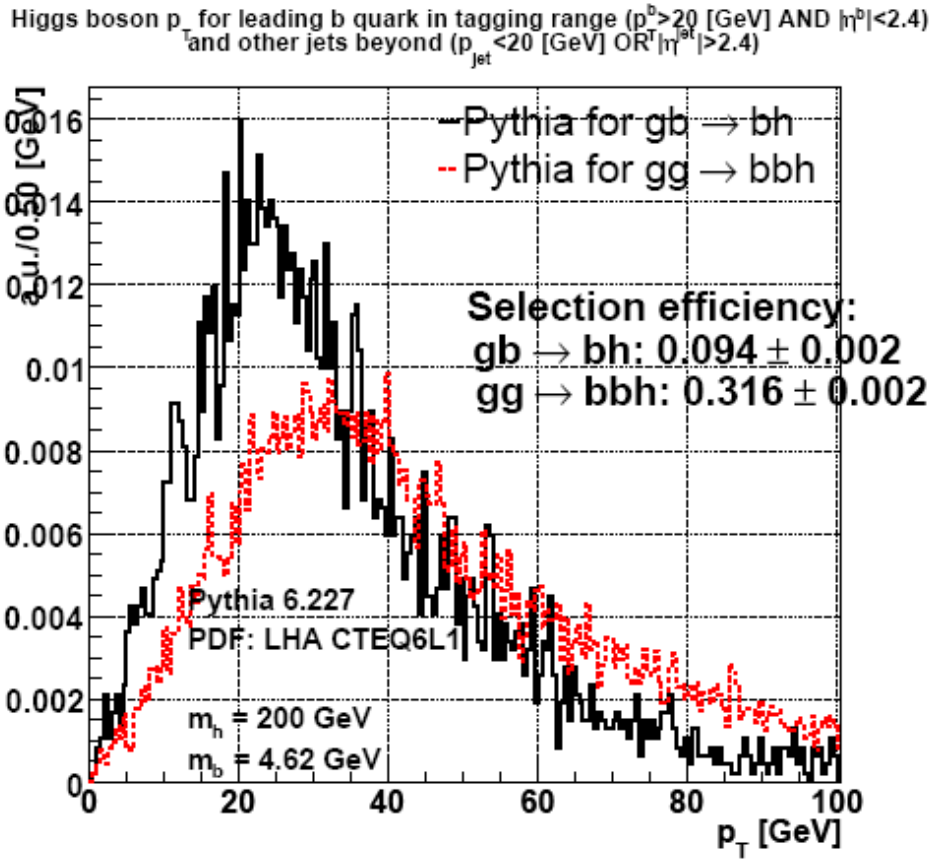


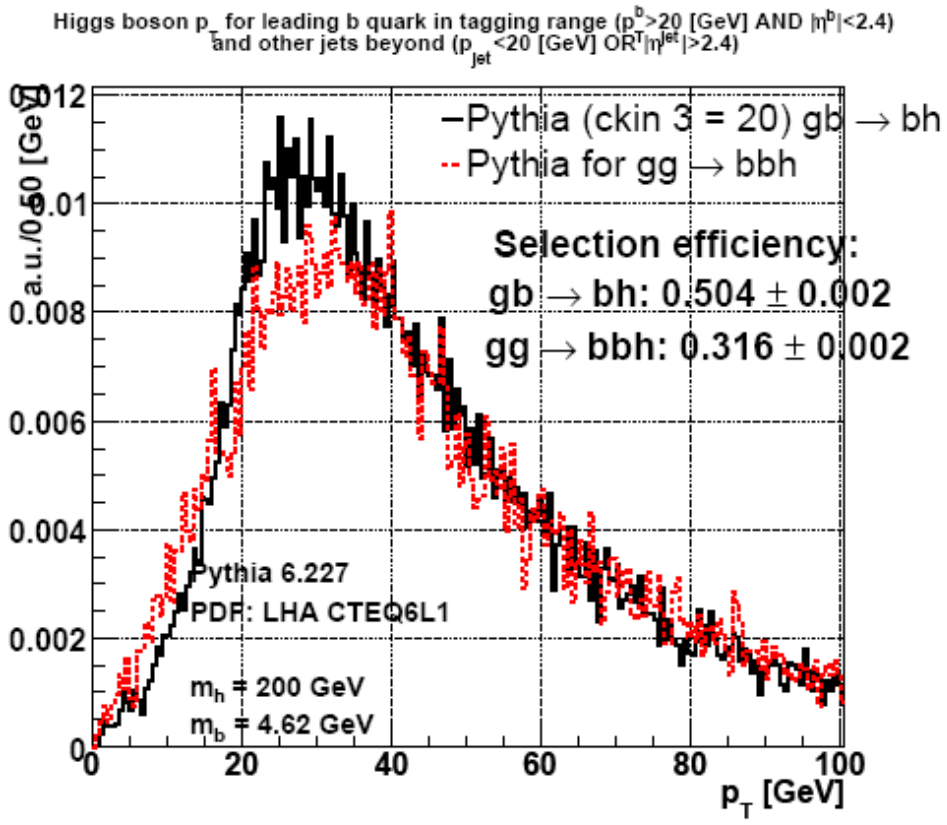
p_T of leading b jet.

No p_T^b cut

$p_T^b > 20$ GeV

Higgs p_T with first b jet in tagging range and jet veto



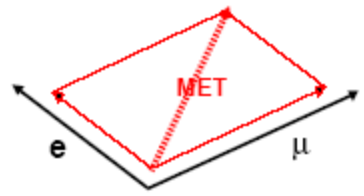


No p_T^b cut

$p_T^b > 20$ GeV

Zbb as a benchmark for Higgs (Hbb)

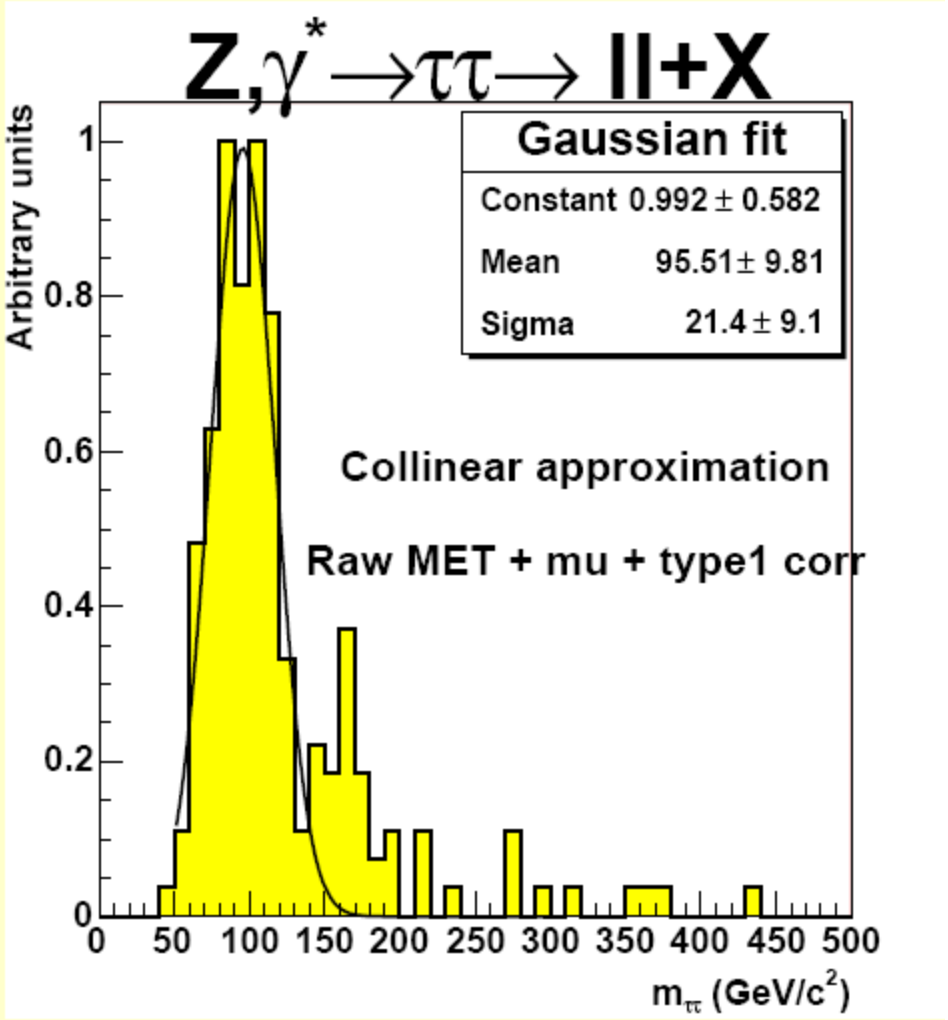
S. Lehti



Collinear approximation

Mass reconstruction using the collinear approximation. Neutrinos are assumed to be emitted along the leptons. The missing Et is divided into components. The lepton directions in 3D give possibility to estimate also the z component of the neutrino momentum.

Here the peak is at the right position within the error bars 95.5 ± 9.8 GeV.



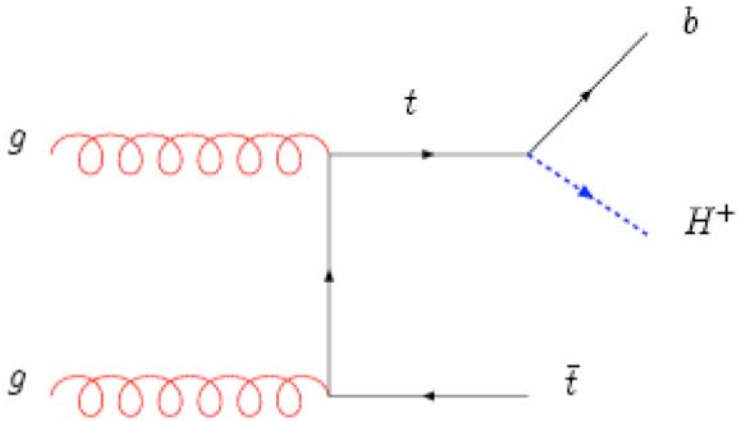
tbH^+ at the Tevatron and LHC

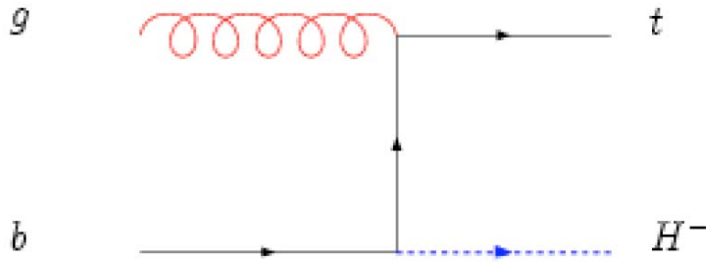
Lev Dudko, Stefan Hesselbach,
Stefano Moretti, Stéphane
Perries, André Sopczak

- Signal cross sections clarified
- Basic selection variables defined
  for Neural Network optimization
- Fast simulation setup for the Tevatron
- Effect of Tevatron results on LHC Analysis

Charged Higgs

- Same issues as Wt – see Nikitenko's talk

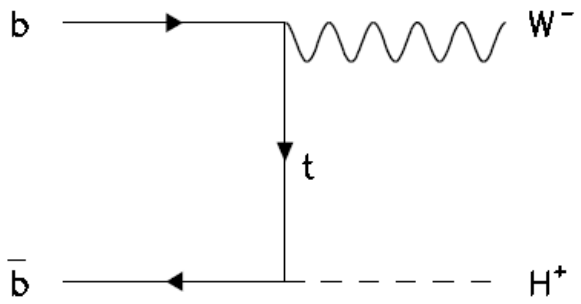




$m_H < m_t$ $m_H > m_t$

$W^{\pm}H^{\mp}$ Production at LHC with Subsequent $H^{\pm} \longrightarrow \tau^{\pm}\nu$ Decays

Stefan Hesselbach



SMH Working Group

Thanks to fellow convenors, subgroup leaders, and participants