HiggsTools Mid-Term Review - ESR 1

IPPP-Durham University

Supervisor: Frank Krauss

Davide Napoletano, ESR 1, IPPP-Durham University

ESR 1: Davide Napoletano

- Degree in Physics: University of Milan (2008 - 2012)
- Master Degree in Theoretical Particle Physics: University of Milan (2012 - 2014)
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- Part of the SHERPA collaboration

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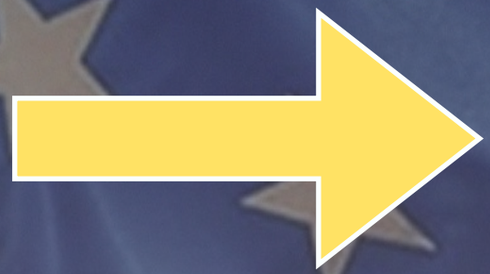

WP 3: Tools

- Automation of NLO Calculations
- Automated Matching with the Parton-Shower

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Improved heavy quark mass treatment in general purpose MC Event Generator

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Improved heavy quark mass treatment in general purpose MC Event Generator

Improved theoretical prediction for heavy quark initiated processes

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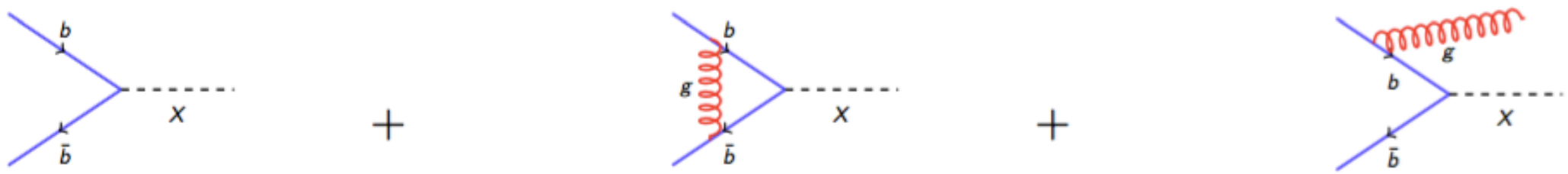
Massive Initial State Dipoles

To compute a NLO observable we need:

$$\mathrm{d}\sigma = \mathrm{d}\Phi_{\mathcal{B}} \left[\mathcal{B}(\Phi_{\mathcal{B}}) + \mathcal{V}(\Phi_{\mathcal{B}}) \right] + \mathrm{d}\Phi_{\mathcal{B}+1} \mathcal{R}(\Phi_{\mathcal{B}+1})$$



$\mathcal{V}(\Phi_{\mathcal{B}})$ and $\int \mathrm{d}\Phi_{\mathcal{B}+1}\, \mathcal{R}(\Phi_{\mathcal{B}+1})$ are separately soft (and collinear) divergent in $4d$

$\int \mathrm{d}\Phi_{\mathcal{B}}\, \mathcal{V}(\Phi_{\mathcal{B}}) + \int \mathrm{d}\Phi_{\mathcal{B}+1}\, \mathcal{R}(\Phi_{\mathcal{B}+1})$ is finite!

Need counter-terms to render integrand finite for massive Initial state partons

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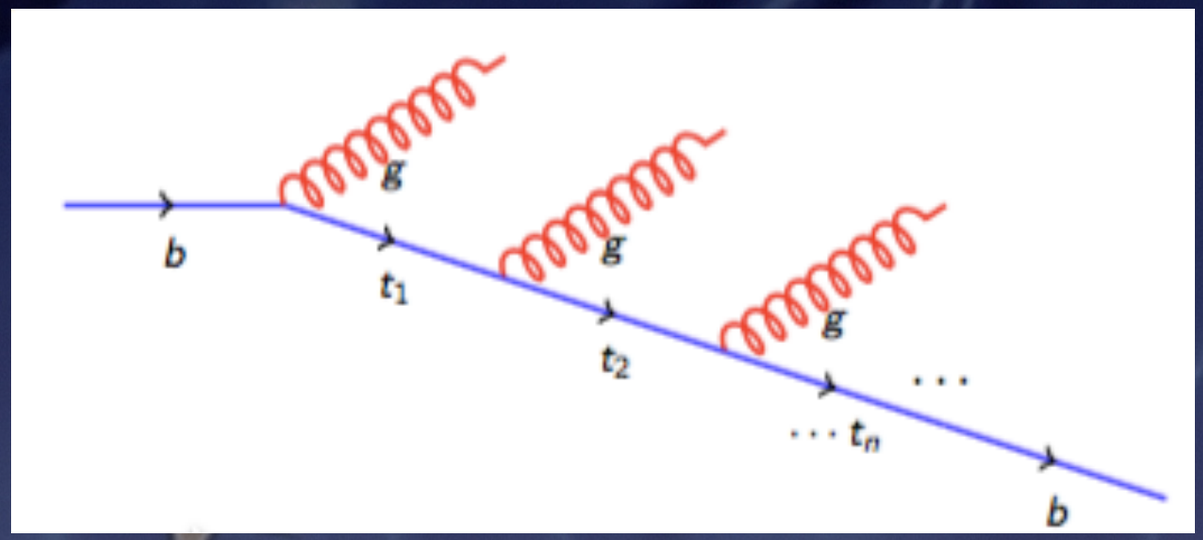
We can use these dipoles to model subsequent parton emissions, or Parton-Shower



This provides us with a more realistic emission pattern

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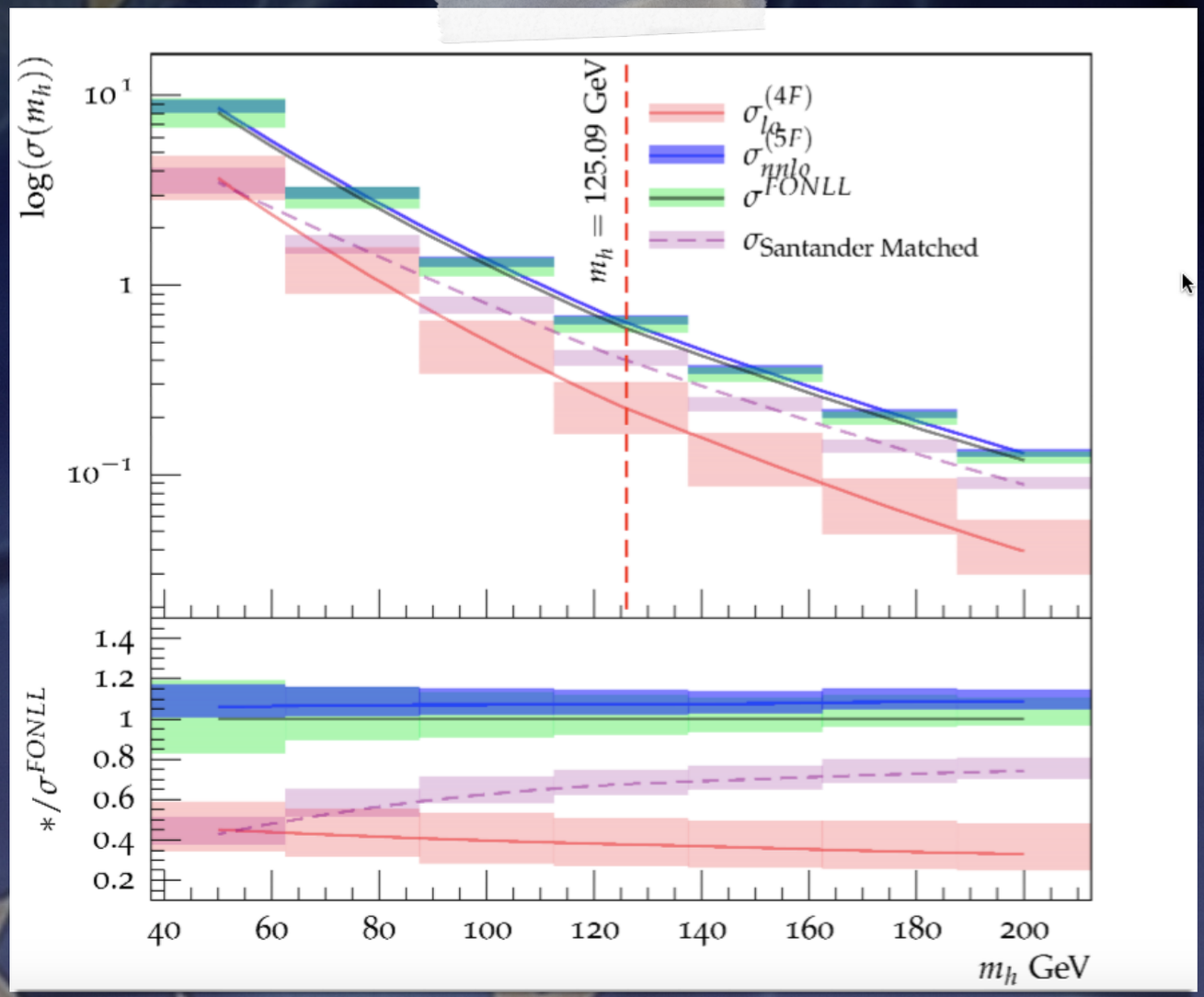
Mass Effects in bbh

(in collaboration with UniMi and Cambridge), arXiv:1508.01529

Inclusion of mass effects in Higgs production in bottom-quark fusion using a matched scheme



Mass corrections accidentally small due to scale choice.

Networks in HiggsTools and External Collaborations

Zurich Uni. (Jan.-Feb. 2015) - Marek Schönherr

Freiburg Uni. (Mar. 2015) - Stefan Dittmaier

Göttingen Uni. (Apr./Nov. 2015) - Steffen Schumann

Cambridge (Jan. 2015) - Maria Ubiali

Milan Uni. (Dec. 2015-Mar. 2016) - Stefano Forte (Accademic Secondment)

SLAC-Stanford (Mar. 2016-Jul. 2016) Stefan Höche

Together with Yacine Haddad, I've set up and organised both the previous and the current format of the HT JC, that provide ESRs with an opportunity of meet on a regular basis.

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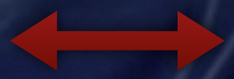

Publication in preparation

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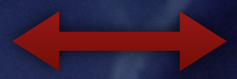

Publication in preparation.
Also collaboration with
LHCHXSWG and Les
Houche Proceedings

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Conferences and Schools

H+j 2015 @ IPPP, Durham University (Oct. 2014)
YTF & ATM @ Durham University (Dec. 2014)

SHERPA Meeting @ Zürich University (Jan. 2015)

First HT YRM @ Lumley Castle (Feb. 2015)

Seminar @ Freiburg University (Mar. 2015)

First HT Meeting @ Freiburg University (Apr. 2015)

Seminar @ Göttingen University (Apr. 2015)

Student Seminar @ Durham University (May. 2015)
Internal Seminar @ Durham University (May. 2015)

LHCHXSWG (May. 2015)

Physics at TeV Collider @ Les Houches (Jun. 2015)

First HT Summer School @ Aosta (Jun. 2015)

MC-Net Summer School @ Spa (Sep. 2015)

HiggsCoupling 2015 @ Lumley Castle (Oct. 2015, Local Organiser)

Career Outlook

Academia ?

Private Sector ?

Leave no door closed!

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