It's me…
Simon !

Presented by
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CERN
19th MCnet meeting

Contents

1. Master Thesis studies
2. Main Ph.D. studies topic
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Past: Master thesis studies

Dissertation:

Comparison Between Two Different Approaches To Resum Large Threshold Logarithms in Drell-Yan Rapidity Distribution

Main supervisor: Prof. Roberto Soldati

Co-supervisors: Prof. Giovanni Ridolfi, Dr. Simone Marzani

Soft gluon resummation of Drell-Yan rapidity distributions: Theory and phenomenology

Marco Bonvini, Stefano Forte, and Giovanni Ridolfi

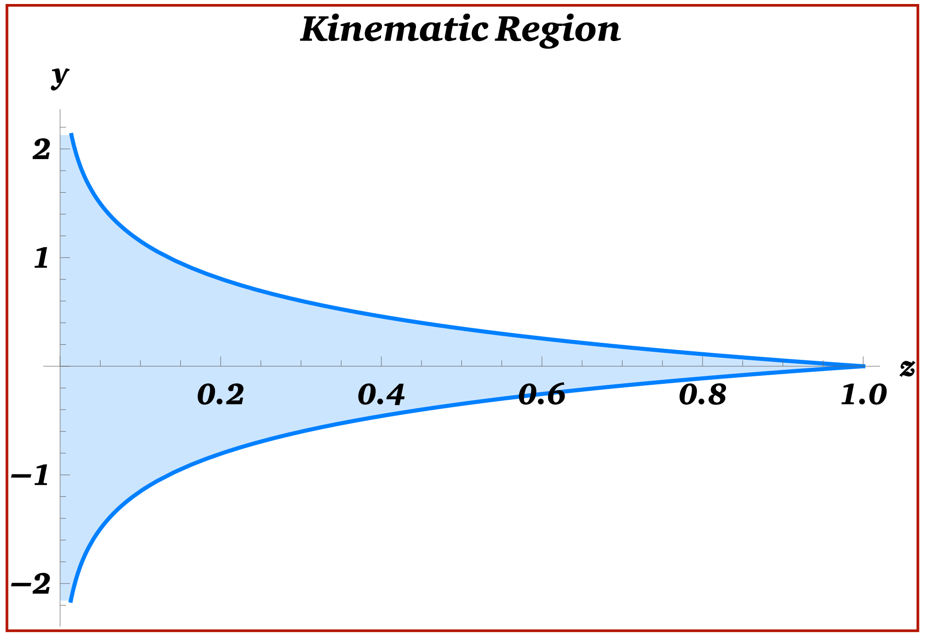
Mellin-Fourier approach

Threshold resummation of the rapidity distribution for Drell-Yan production at NNLO+NNLL

Pulak Banerjee et al.

Mellin-Mellin approach

Past: Master thesis studies



Mellin-Fourier

$$\tilde{\sigma}(N, b) = g_0(\alpha_s) e^{\Phi(\lambda_{MF}, \alpha_s)}$$

$$\lambda_{MF} = \alpha_s \beta_0 \log N^2$$

Mellin-Mellin

$$\tilde{\sigma}(N_1, N_2) = g_0(\alpha_s) e^{\Phi(\lambda_{MM}, \alpha_s)}$$

$$\lambda_{MM} = \alpha_s \beta_0 \log(e^{2\gamma_E} N_1 N_2)$$

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Past: Master thesis studies

<u>**Mellin-Fourier**</u>

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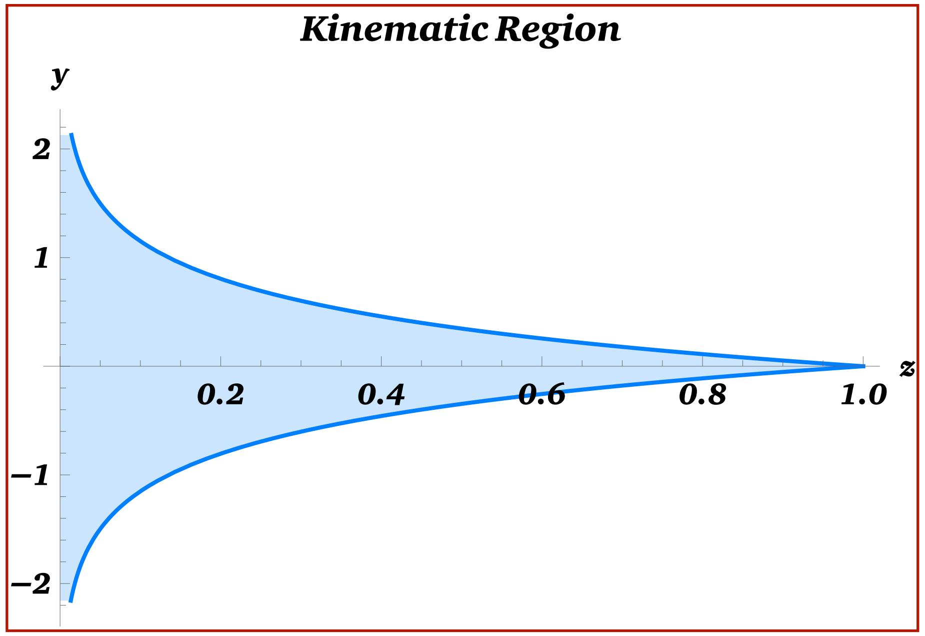

<u>**Mellin-Mellin**</u>

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$$\lambda_{MM} = \alpha_s \beta_0 \log(e^{2\gamma_E} N_1 N_2)$$

<u>M.M. = M.F. + sub-sub-power</u>

↓

$$(1-z)\log^m(1-z)$$

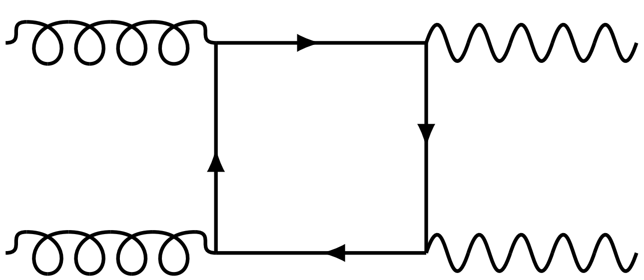
Present: Loop Induced Processes

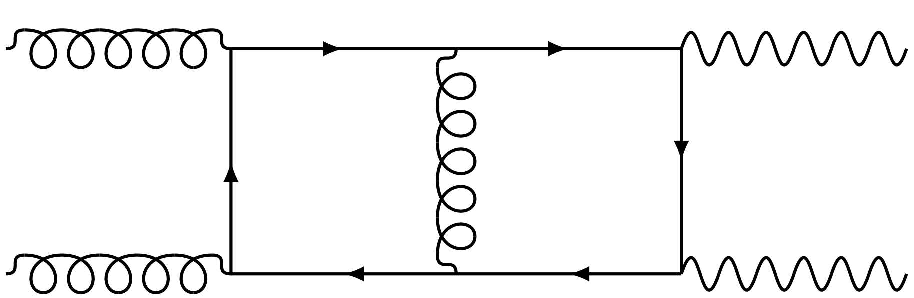
It is formally a NNLO contribution strongly enhanced by the large initial state gluon flux

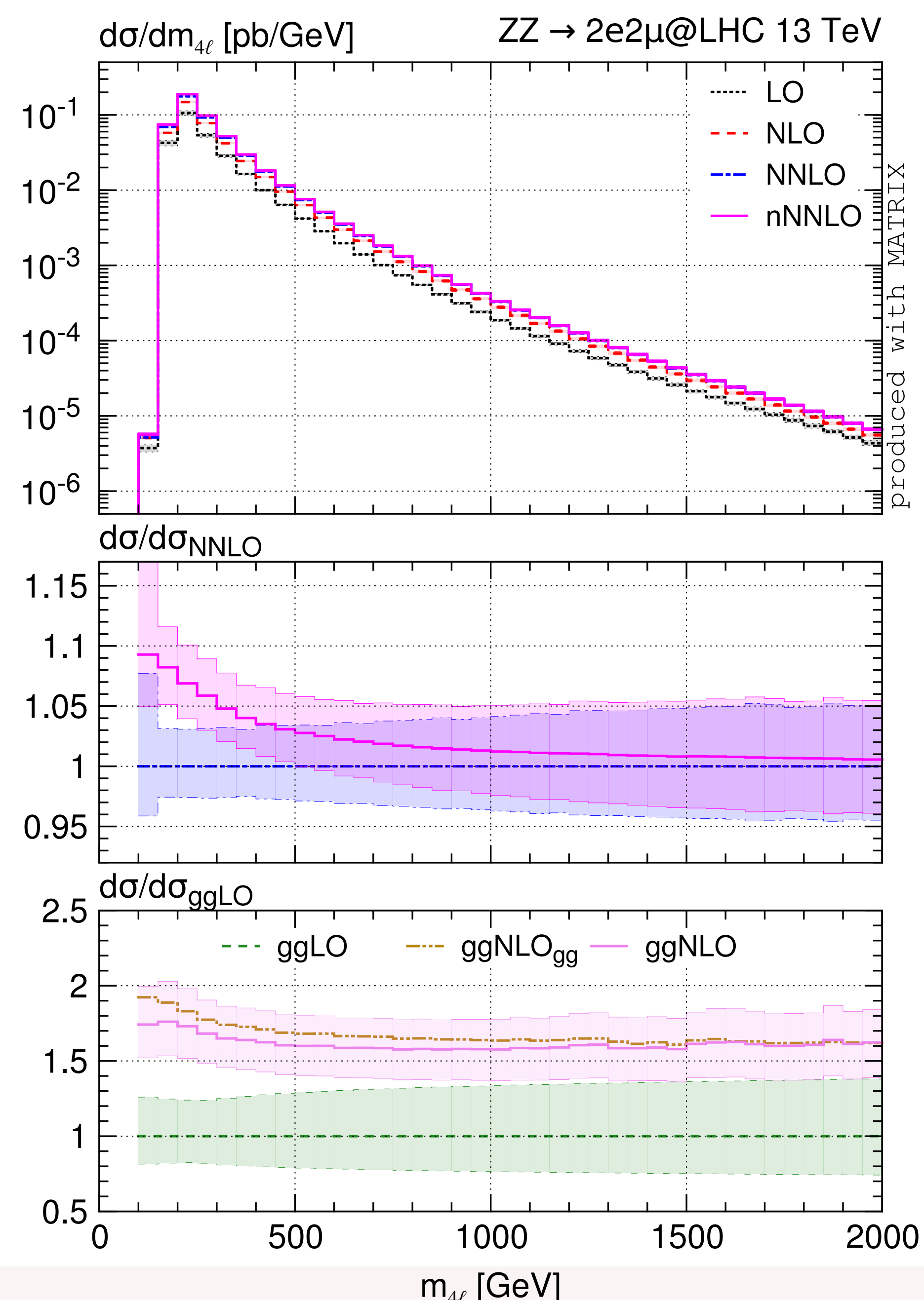
Invariant mass distribution

ZZ production at 13 TeV: *(Grazzini et al, '19)*

- **~62%** of NNLO corrections
- **~9%** of the total NNLO cross section







nNNLO/NNLO

ggNLO/ggLO

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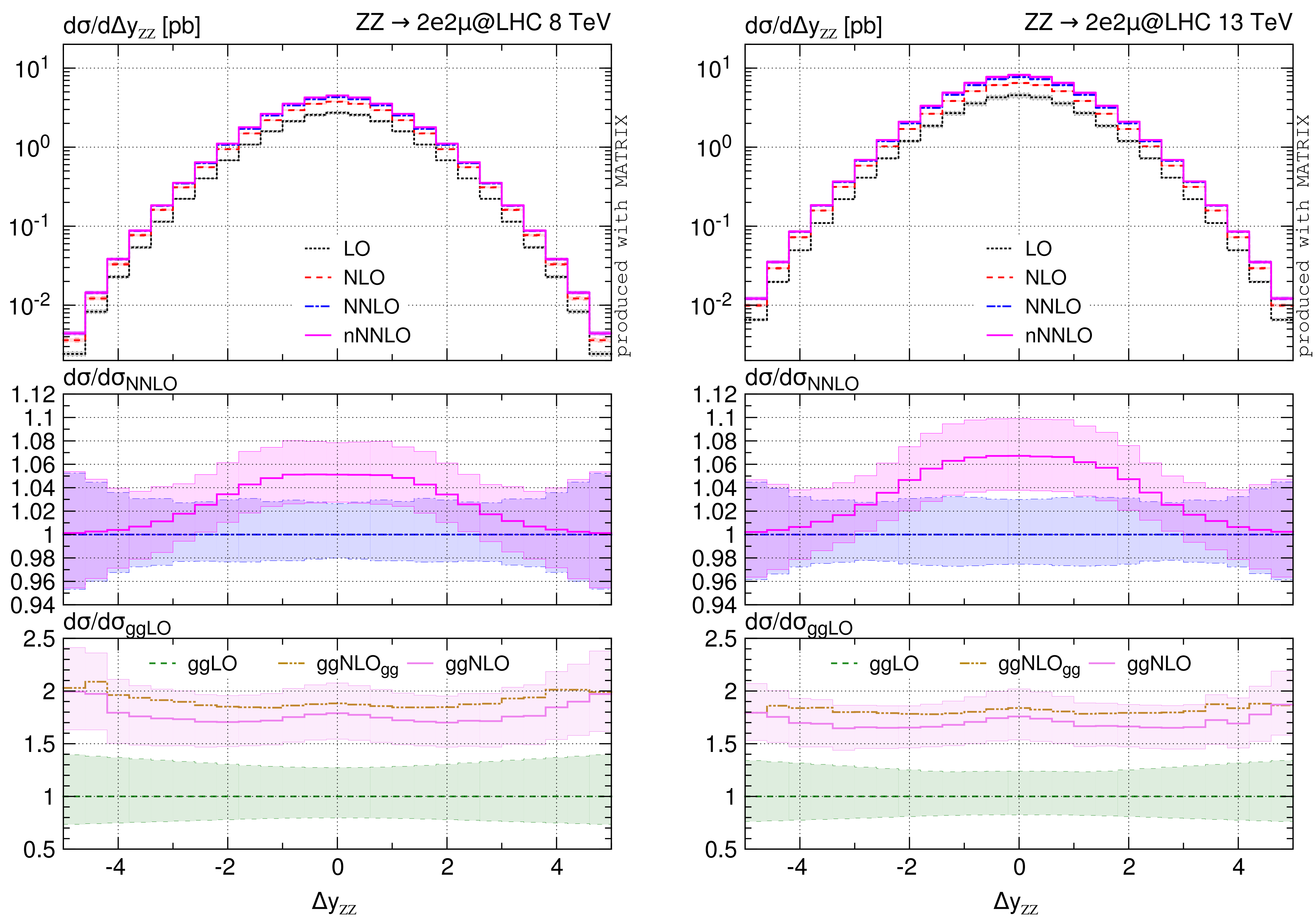
Present: Loop Induced Processes

Rapidity difference distribution



nNNLO/NNLO

ggNLO/ggLO

Present: External Amplitude Interface

Interface for external matrix elements generator (EXTAMP) in SHERPA used for the first time in:

Parton Shower and NLO-Matching Uncertainties in Higgs Boson Pair Production

S. Jones, S. Kuttimalai

RS term: *OpenLoops*

B term: *OpenLoops*

V poles: *Hard coded*

V finite term: *Grid interpolation*

↓

$$\beta(\hat{s}) = \sqrt{1 - \frac{4M_H^2}{\hat{s}}}$$

$$|\cos\theta| = \left| \frac{\hat{s} + 2\hat{t} - 2M_H^2}{\hat{s}\beta(\hat{s})} \right|$$

Grid cons:
Top Mass cannot be varied

Grid pros:
Fast computational time

↓

~ as long as the Born contribution

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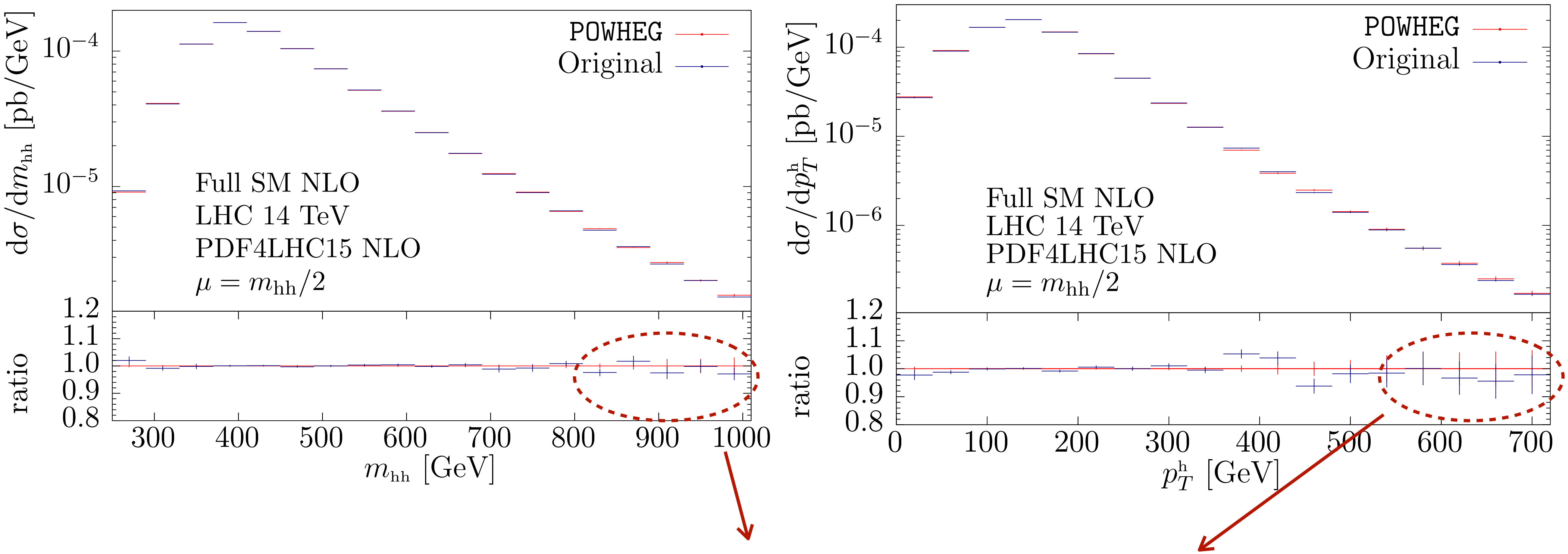
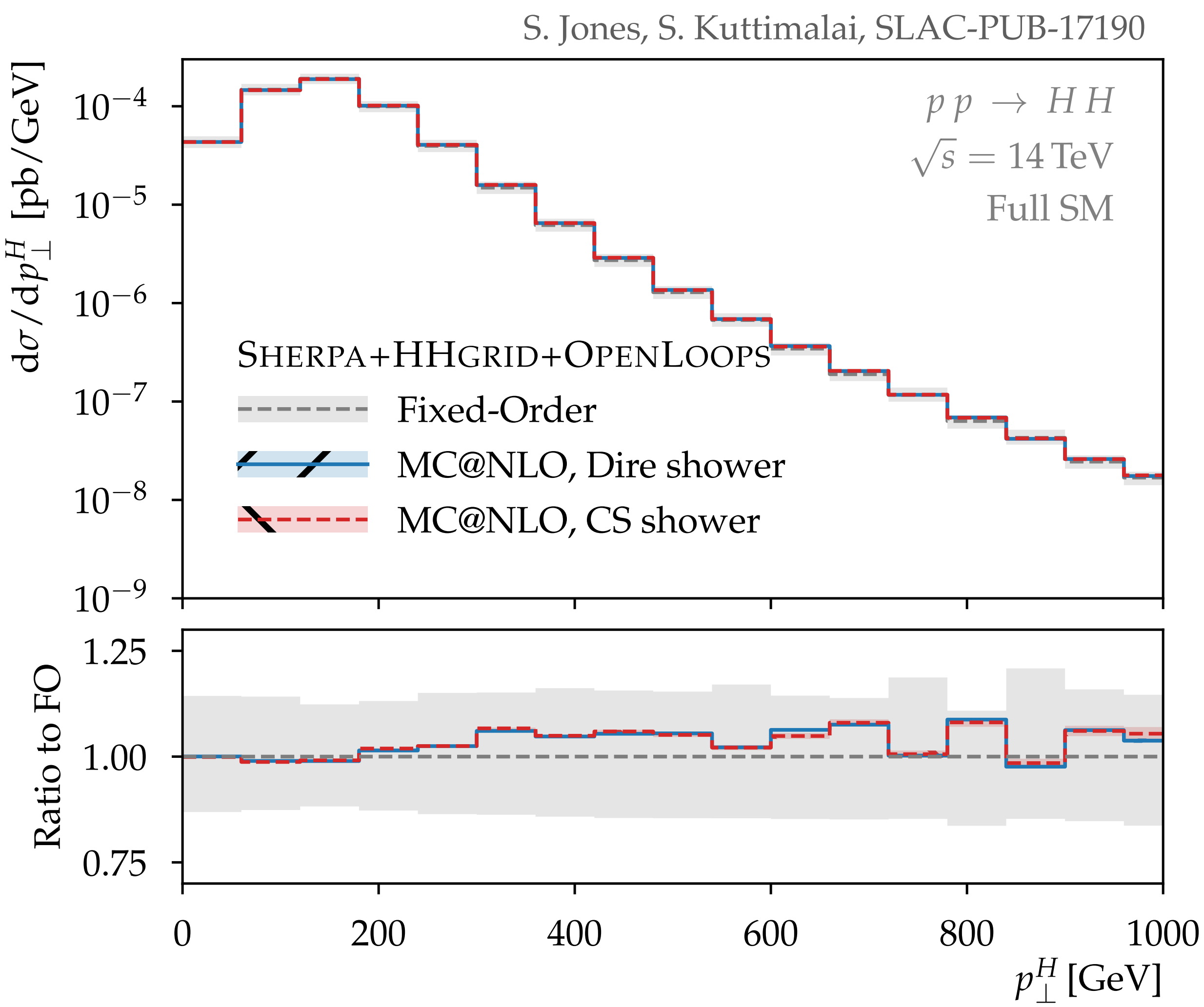
Present: External Amplitude Interface

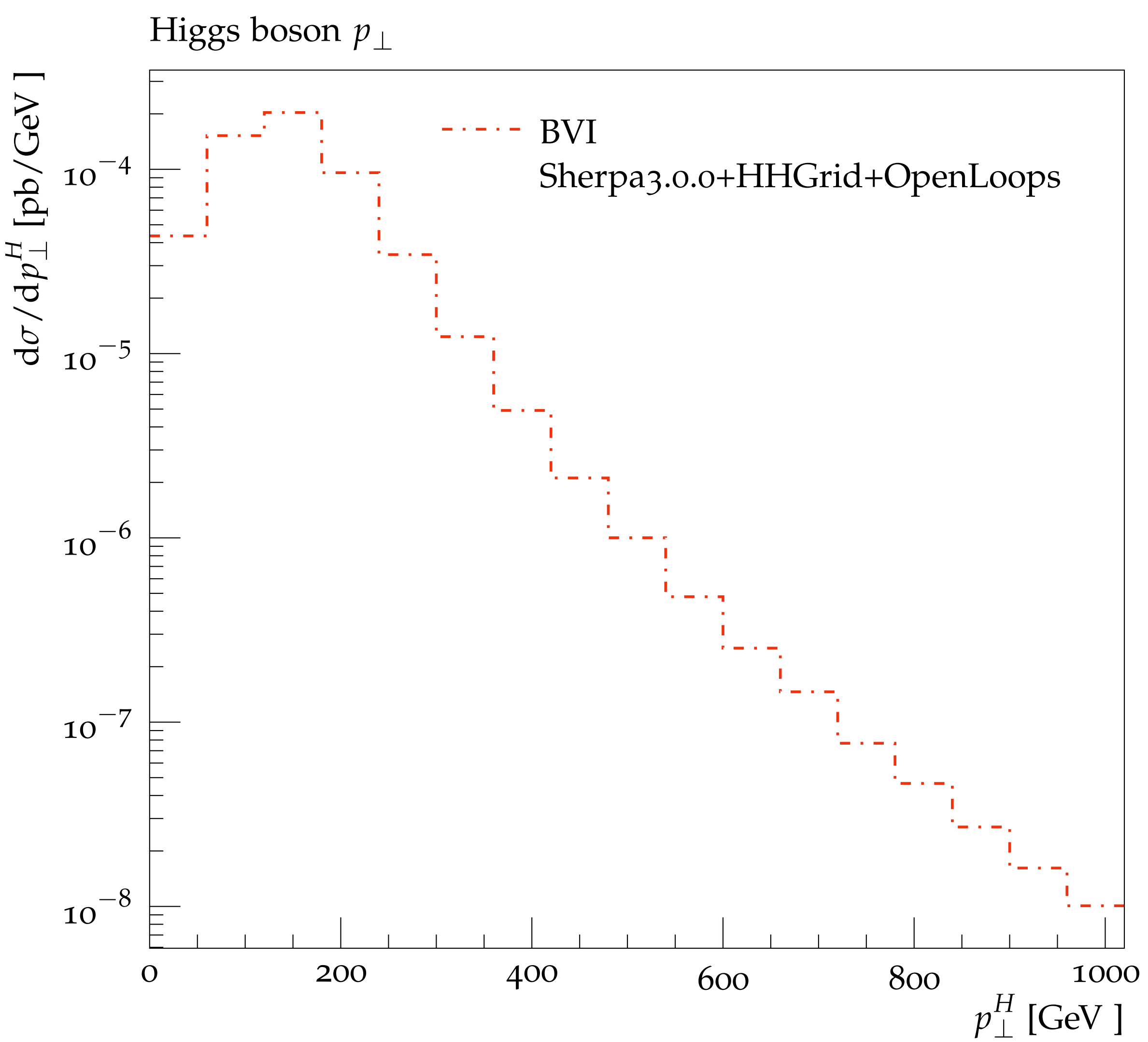
Heinrich et al, CERN-TH-2017-069



Systematic uncertainties due to grid spacing are inside the statistical uncertainty

Present: Validation LI@NLO within Sherpa





Future: ???

1. **Complete the validation checking PS matching**
2. **Phenomenology of LI processes**
3. **Toward the LHC-HL: precision measurements**
4. **Testing other available ME generator with EXTAMP**

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e.g. ggvvamp

Thanks for the attention