

# Luca Barzè

- I've just finished my PhD in Pavia;



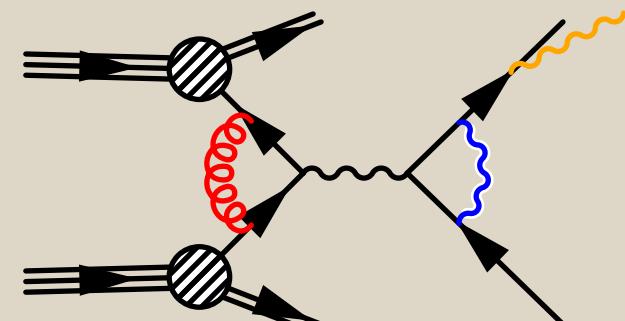
- my research activity is principally related to EW radiative corrections at hadron colliders:
  - NLO calculations interfaced to Parton Showers;
  - mixing of EW with QCD NLO;
- in collaboration with M. Chiesa, G. Montagna, P. Nason, O. Nicrosini, F. Piccinini & V. Prosperi.

# EW corrections for LHC? Precision physics

NC/CC Drell - Yan processes at LHC:

extraction of PDFs / luminosity monitoring / calibration of detectors /  
 $M_W$  ( $\Delta M_W^{LHC} \sim 15$  MeV),  $\Gamma_W$ ,  $\sin \vartheta_W$  / SM tests / background for BSM / ...

- clear experimental signature;
- integrated luminosity at the end of 2012  $\rightarrow \mathcal{L} \sim 20 \text{ fb}^{-1}$ 
  - $\sigma_W^{tot} \cdot \text{BR}(W \rightarrow l\nu) \sim 10 \text{ nb}$   
 $\Rightarrow \sim 2 \cdot 10^8 W$  in the data
  - $\sigma_Z^{tot} \cdot \text{BR}(Z \rightarrow l\bar{l}) \sim 1 \text{ nb}$   
 $\Rightarrow \sim 2 \cdot 10^7 Z$  in the data



Experimental accuracy aimed at the LHC for inclusive DY observables is  $\sim 1\%$  – exclusive observables important too

# Matching QCD w shower → (a)MC@NLO/POWHEG      EW NLO

Normalization at  $\alpha_s$

Shapes of high  $p_\perp$

Reduced dependence on  $\mu_R/F$

Shapes of low  $p_\perp$

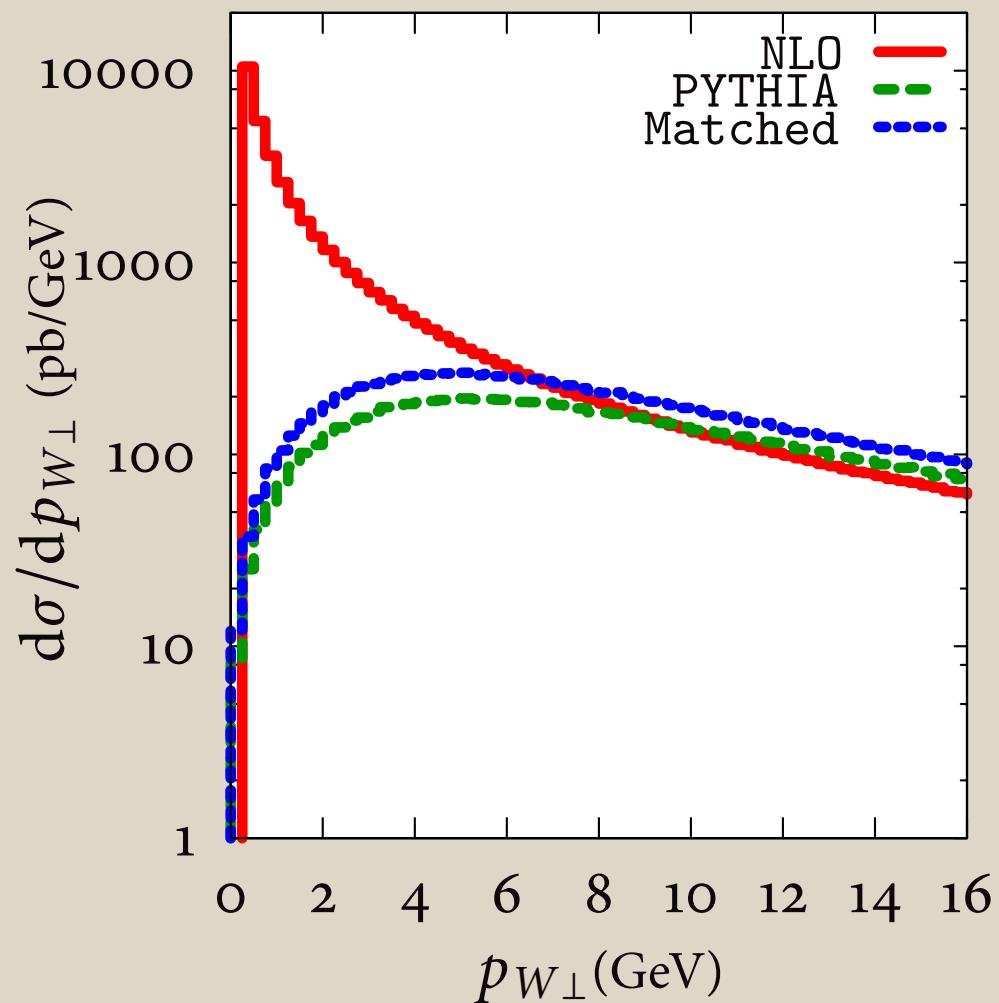
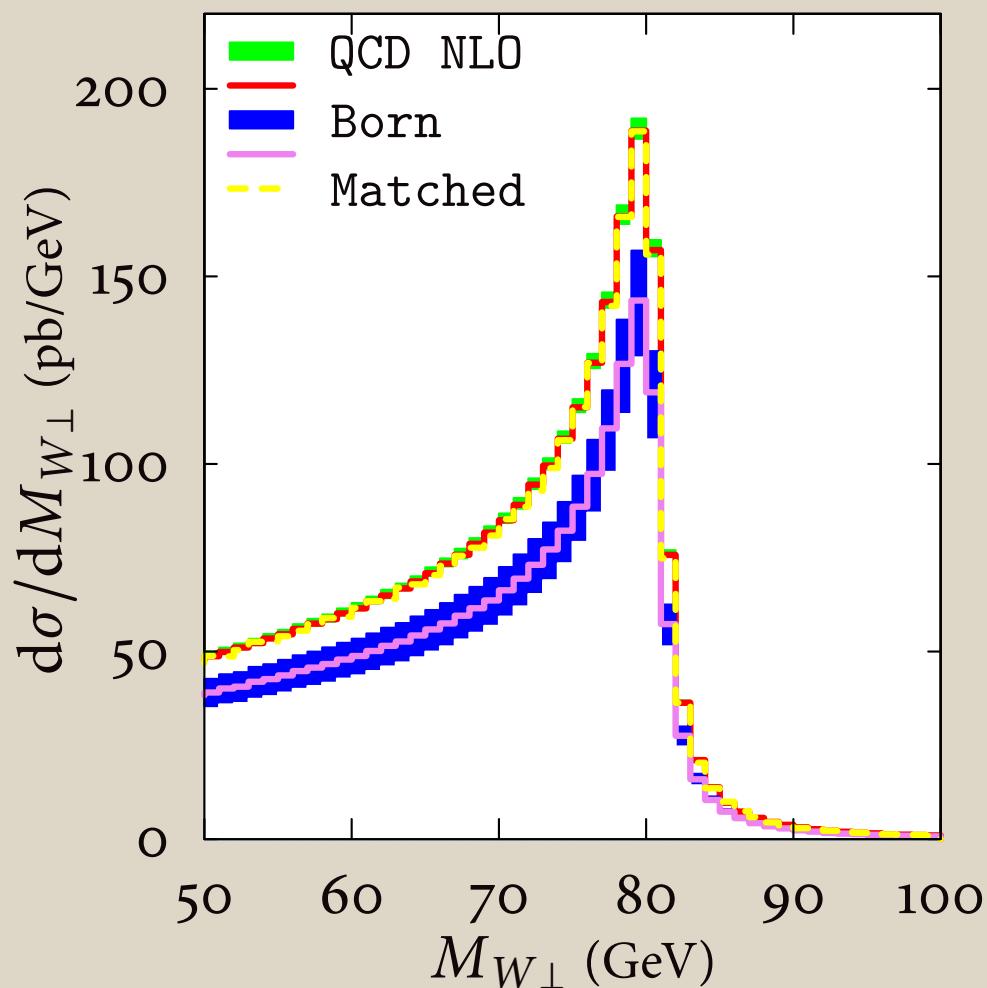
Realistic events

...

Normalization at  $\alpha_{EW}$

$\Delta M_W \sim 100$  MeV

EW Sudakov logs



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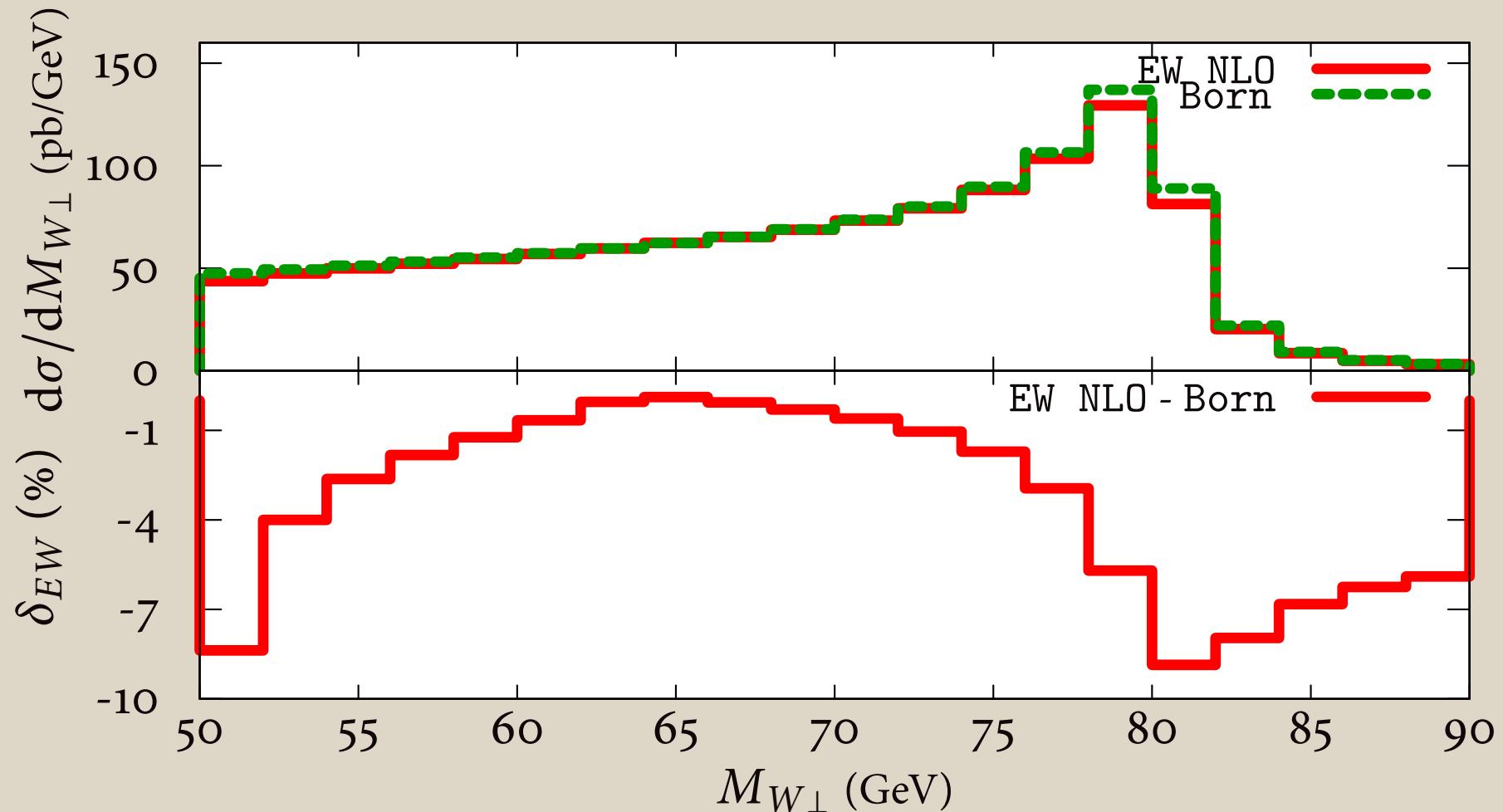
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# Matching QCD w shower → (a)MC@NLO/POWHEG & EW NLO

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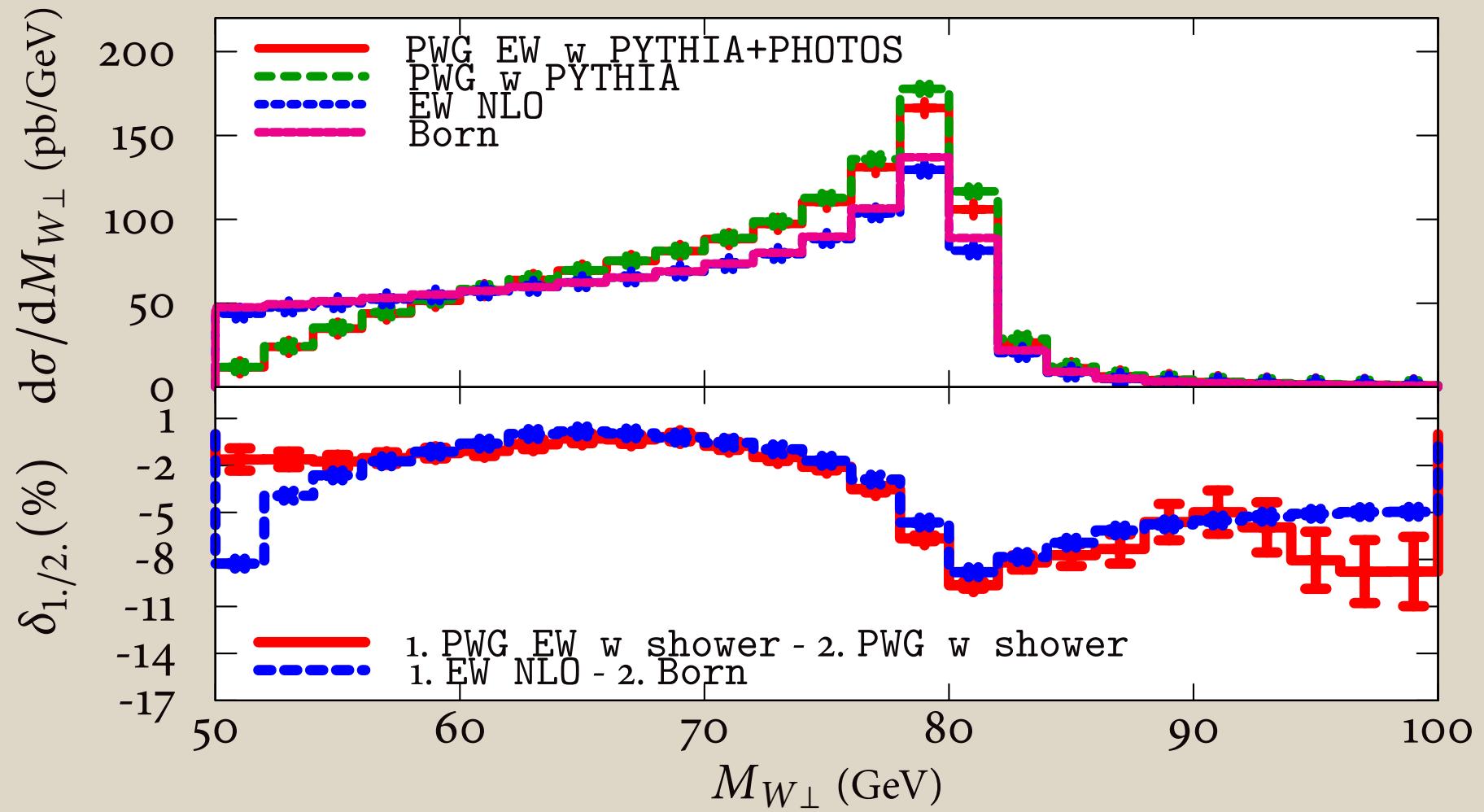
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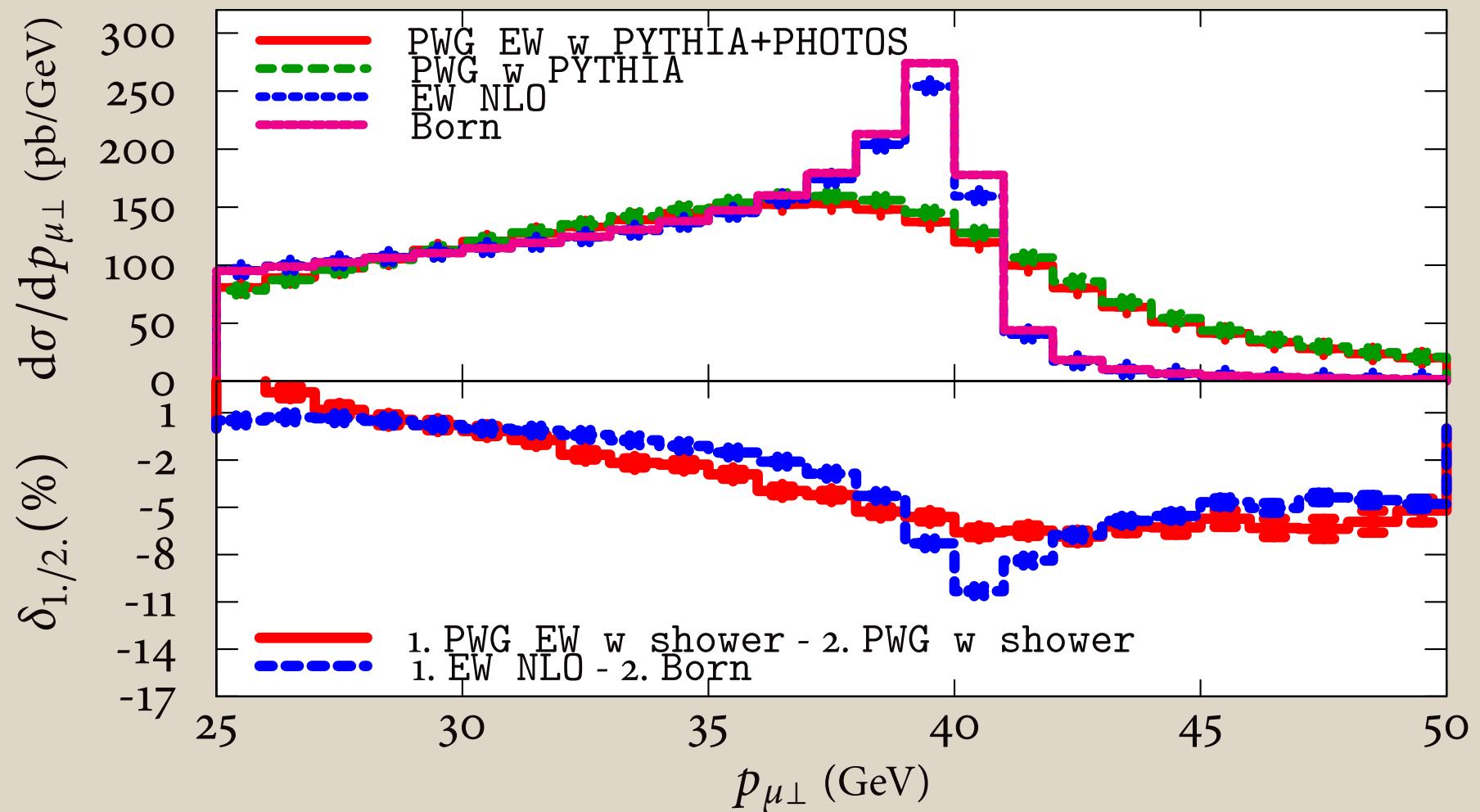
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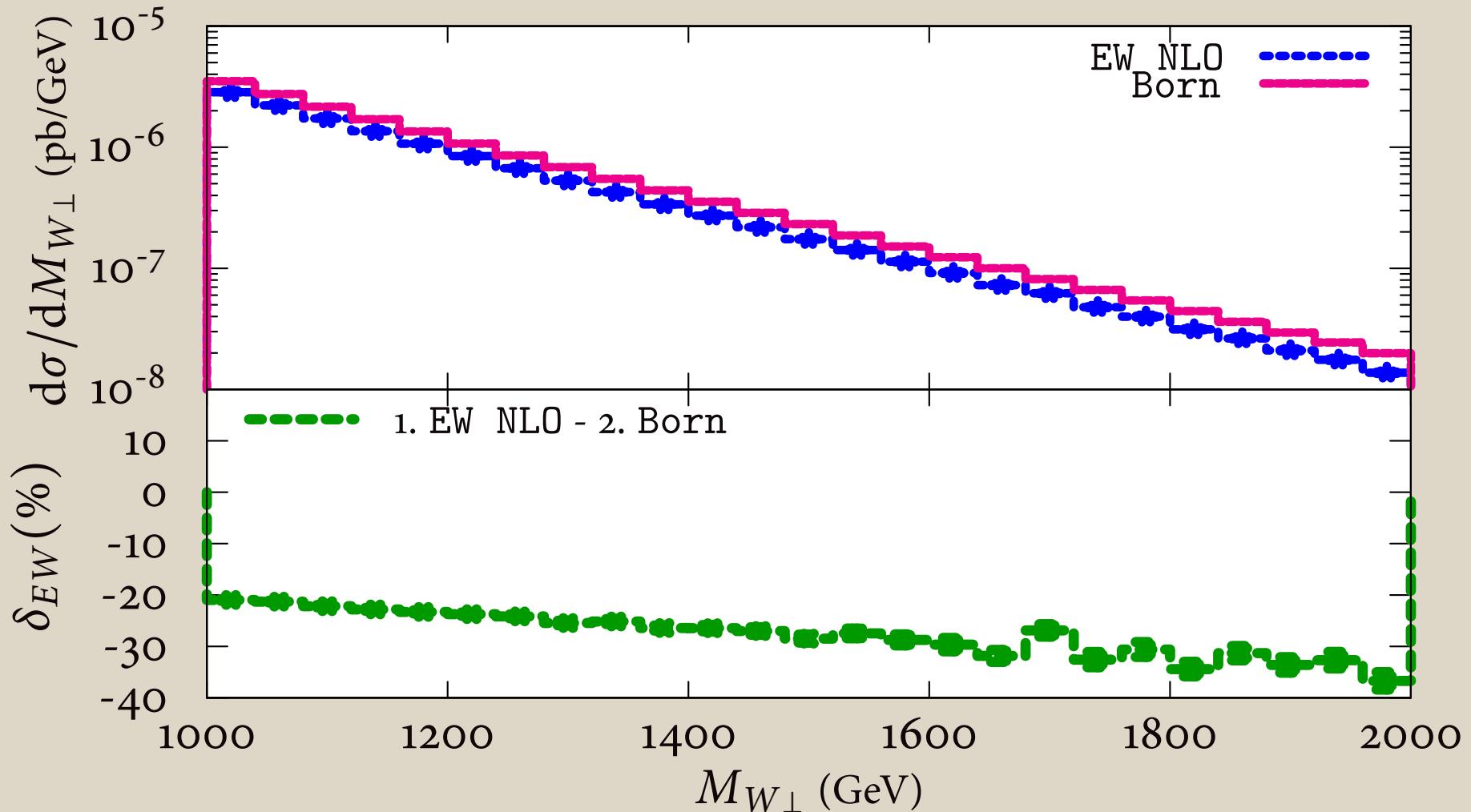
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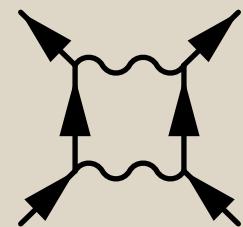
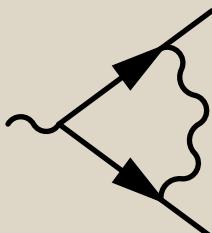
EW Sudakov logs



# EW corrections for LHC? EW Sudakov logs (not only DY)



Renormalization



$$\propto \log^{(2)} \left( \frac{s}{M_V^2} \right)$$

High energies  $\rightarrow Z/W \sim \gamma$   
define new observables?  
 $\sim 2$  TeV is "high energy"?

- EW radiative corrections are important:
  - normalization & shapes for precision physics;
  - high energies → better understand;
- $\text{EW} \otimes \text{QCD}$  radiative corrections sometimes needed;
- they are usually difficult to calculate, but can be automatized like the QCDs;
- phenomenological studies