The small kT region in Drell-Yan production with the PB Method

Different qs values

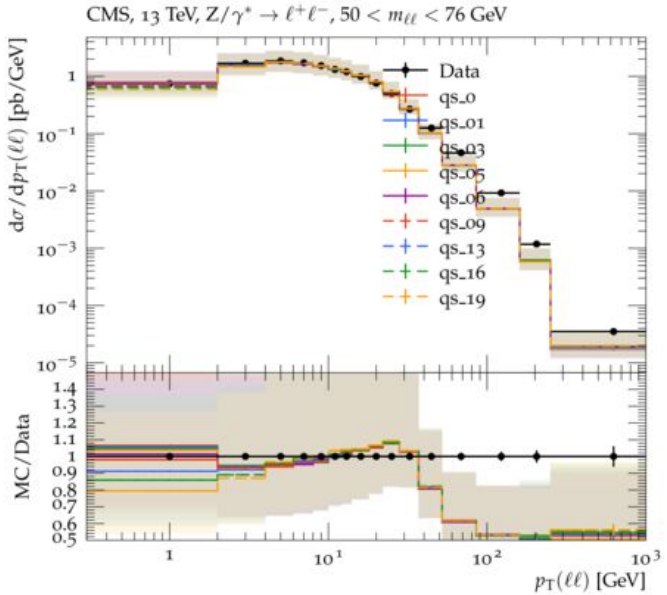
Itana Bubanja

Introduction

- Results obtained from the public arXiv:2205.04897 analysis:
  - 13 TeV
  - Five mass bins from **50 to 1000 GeV**
  - Variable: **pT(*ll*)**
- Effect of different qs values: [**0, 0.1, 0.3, 0.5, 0.6, 0.9, 1.3, 1.6, 1.9] GeV**
- Details:
  - No. of jobs: **1000**
  - Channel: **combined** (ee & mumu)
  - Files: **/eos/project/l/lhc-ewwg-eos/public/lhefiles/13TeV/mcatnlo/DYbias/**
  - Set: **2**
  - Cascade: **3.3.1**
  - Rivet: **v3.1.7**
  - kt_min: **0.02**
  - QED corr: **included**
- χ^2 calculation performed
- Several improvements

Effect of the intrinsic k_T distribution

➔ **pT of the lepton pair** - At centre-of-mass energy 13 TeV for 5 mass bins - **50-76 GeV, 76-106 GeV, 106-170 GeV, 170-350 GeV, 350-1000 GeV** for **q_s from 0 to 1.9 GeV**



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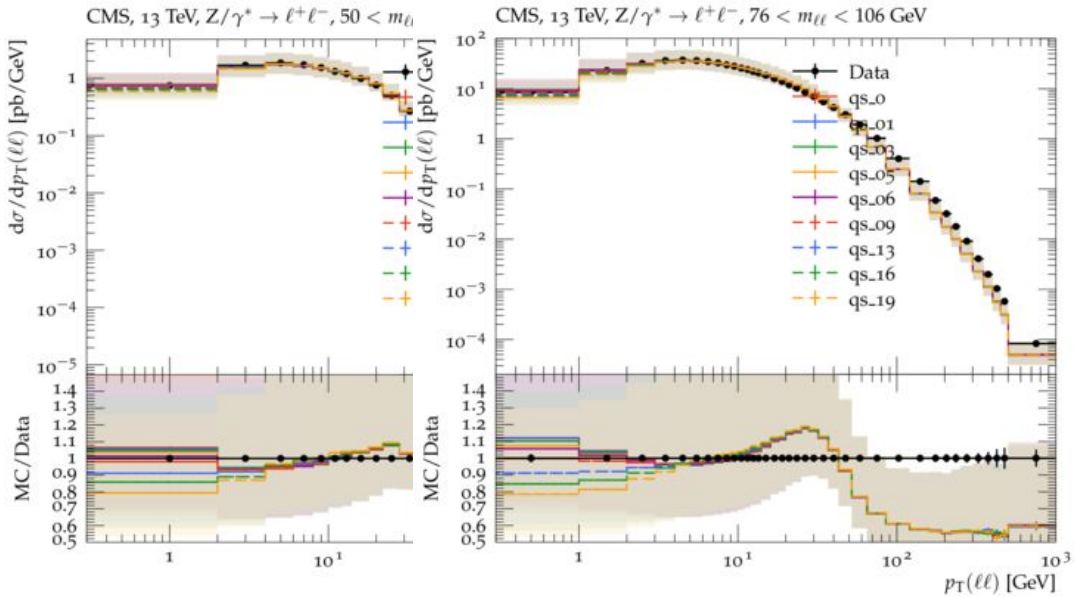

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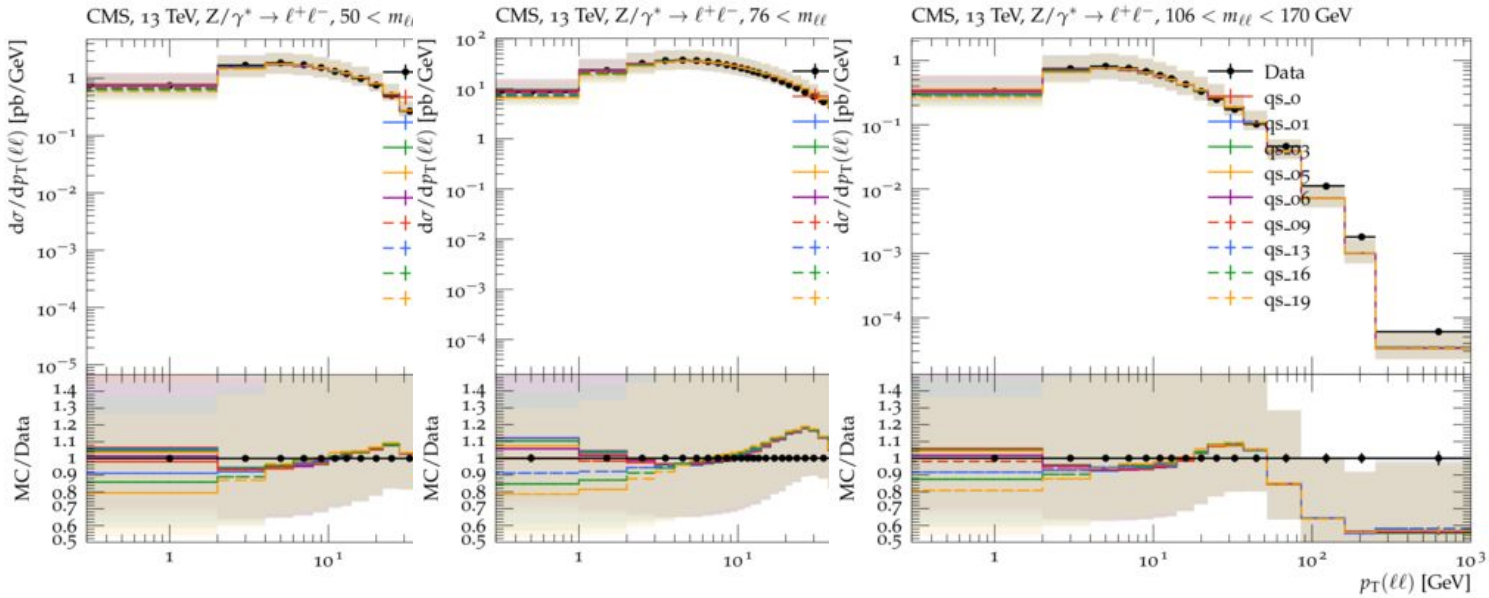

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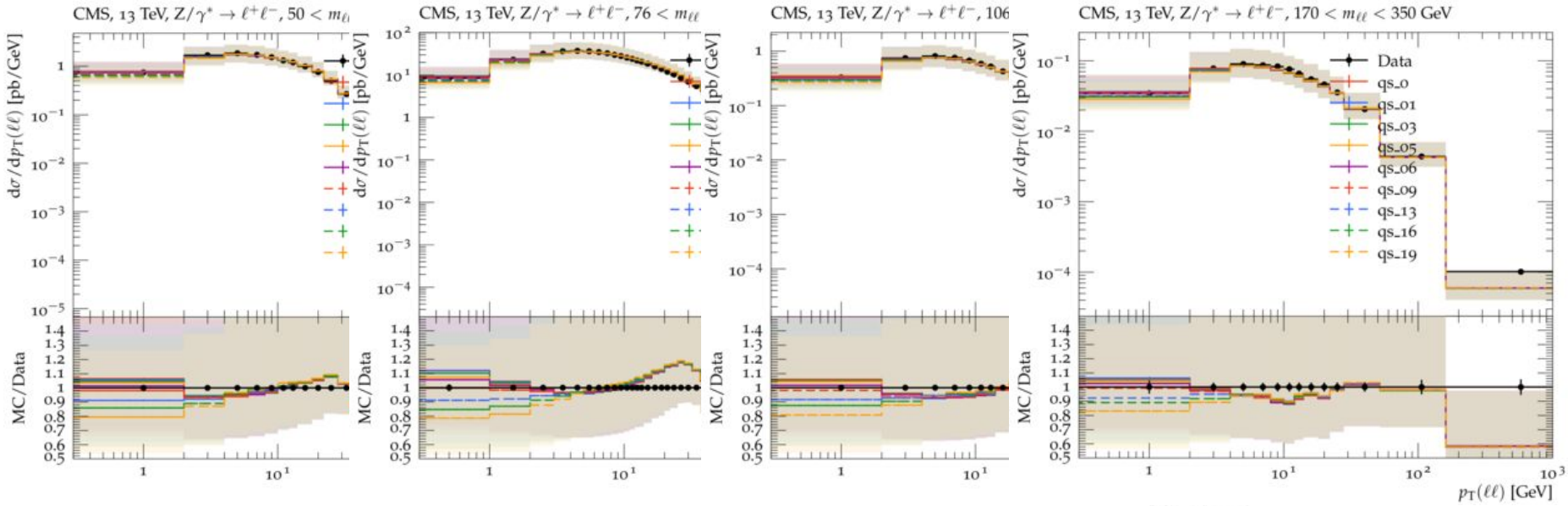

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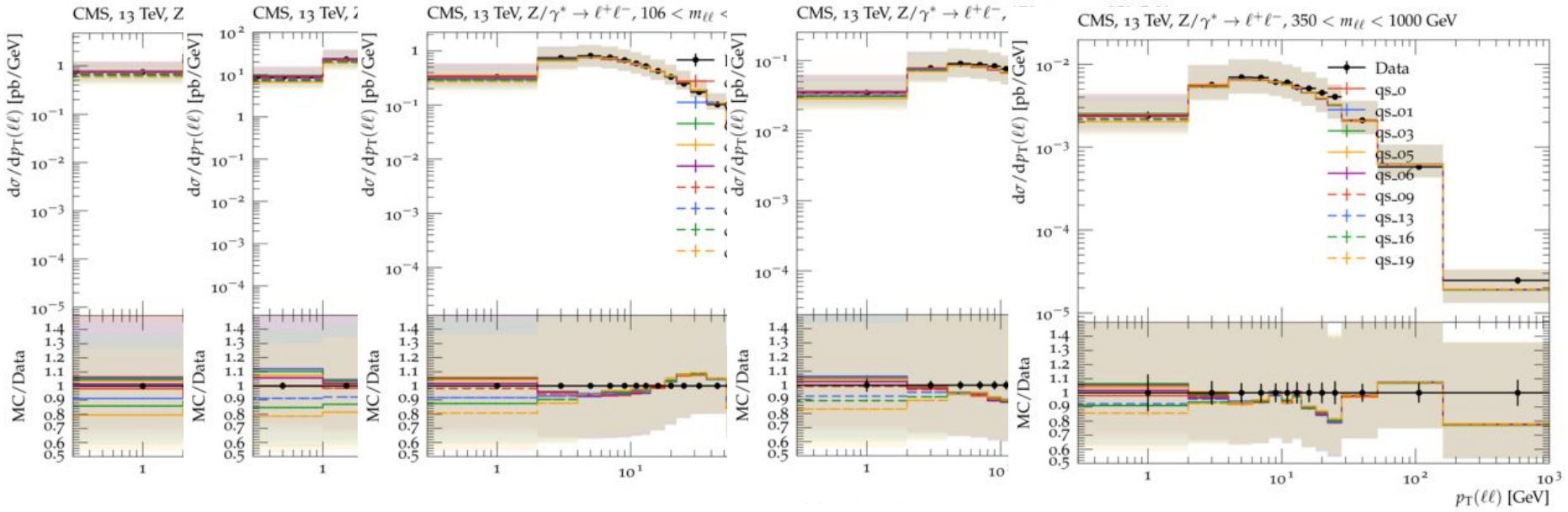
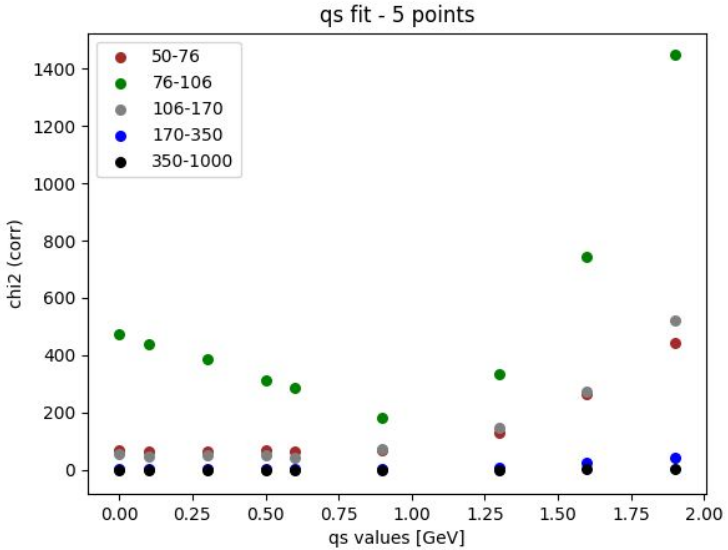
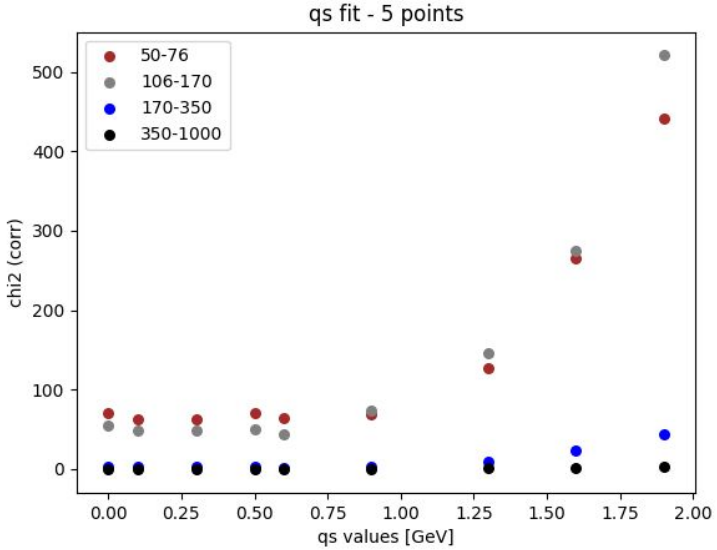


χ^2 vs. qs – 5 bins

- χ^2 calculated by using scripts from https://gitlab.cern.ch/lhcewkwg/lhcewkwg-vjets/correlations-library
- 5 mass bins - **50-76 GeV, 76-106 GeV, 106-170 GeV, 170-350 GeV, 350-1000 GeV**
- **q_s from 0 to 1.9 GeV**





χ^2 vs. qs – ~~5 bins~~ → cut on pT – 5 GeV

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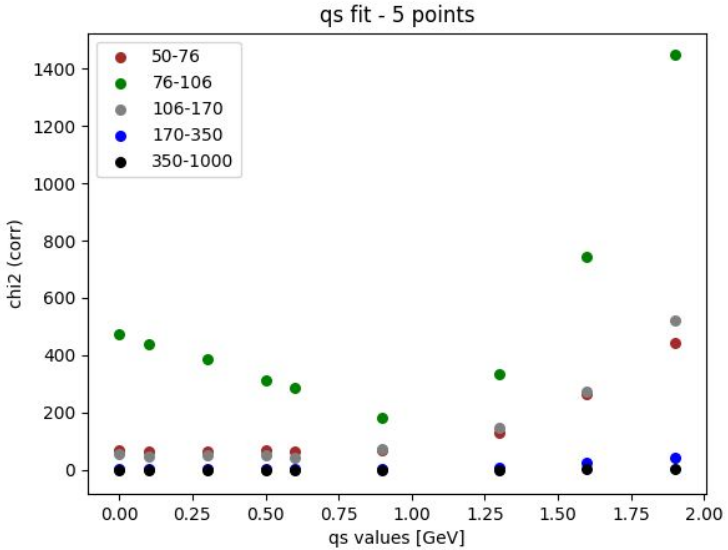

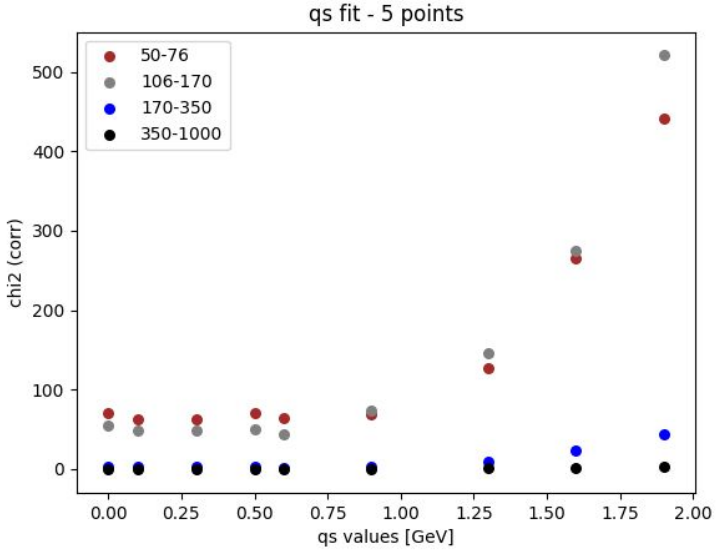

Improvements

- Bin based and pT based cuts implemented
- Significant improvement observed when renormalisation and factorisation scale variations (which is stored as histos in the yoda files) included - details of the script that is used: https://gitlab.com/hepcedar/mcnet-schools/beijing-2021/-/tree/master/rivet - makebands.py
- Covariance matrix changed - correction on the number of bin for the correlation matrix

- Some results that show improvement obtained by Hannes (Z peak region):

d03-x01-y01 (75 < m <106)

qs	chi2((stat)	chi2(stat+scale)
0	137.2,63.9	12.5,11.8
0.1	141.5,64.6	13.0,12.1
0.3	112.5,54,7	10.4,9.9
0.6	66.3,40.6	5.9,6.6
0.9	34.5,39.4	3.8,6.2
1.3	107.1,93.3	13.6,19.2
1.6	272.8,190.6	35.2,44.6
1.9	568.9,345.7	73.3,89.4