

Jets & Bosons Subgroup report

LHC EW WG General Meeting, 17.11.2022



Eram Rizvi

Javier Llorente



Deniz Sunar Cerci

Armando Bermudez Martinez



Stephen Farry

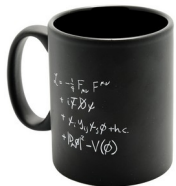
Will Barter



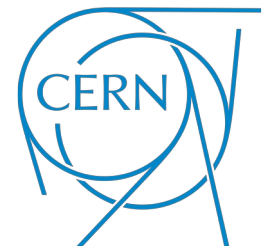
ALICE

James Mulligan

Nima Zardoshti



Marek Schoenherr



Our group

- Twiki: <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/EWWG2>
- [indico](#)
- Mailing list: [lhc-ewwg-vjets](#)
- E-mail: [lhc-ewwg-vjets-admin](#)

Group activities

- Benchmark comparisons
- Collection of RIVET routines
- Mini-workshops and invited talks on timely topics
- Intrinsic kt tune and comE dependence
- Correlation libraries and comparison of experiments

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- Collection of RIVET routines
- **Mini-workshops and invited talks on timely topics**
- **Intrinsic kt tune and comE dependence**
- **Correlation libraries and comparison of experiments**

Mini-workshops

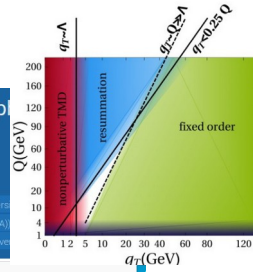
<https://indico.cern.ch/event/1194333/>

LHE-EWWG mini-workshop: low pT DY, measurement and prospects

Wednesday 7 Sept 2022, 13:00 → 19:00 Europe/Zurich

Armando Bermudez Martinez (CMS-DESY), Daniel Froidevaux (CERN), Deniz Sunar Cerci (Adiyaman University (TR) - Istanbul University (TR)), Eram Syed Rizvi (Queen Mary University of London), James Mulligan (University of California, Berkeley (US)), Javier Llorente Merino (Simon Fraser University (CA)), Marek Schoenherr (University of Durham (GB)), Nima Zardoshti (CERN), Stephen Farry (University of Liverpool)

Videokonferenz LHE-EWWG Jets and bosons mini-workshop

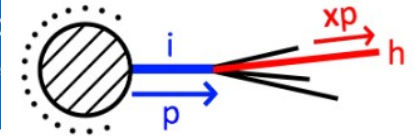


- 13:00** → 13:05 **Introduction** 🔊
Speaker: Armando Bermudez Martinez (CMS-DESY)
- 13:05** → 13:40 **Overview of resummation benchmarking in LHC SM precision EW WG (with focus on low pT)** 🔊
Speaker: Johannes Michel (MIT CTP)
- 13:40** → 14:15 **low pT DY in CMS** 🔊
Speaker: Guillermo Gomez Ceballos Retuerto (Massachusetts Inst. of Technology (US))
- 14:15** → 14:50 **low pT DY in LHCB** 🔊
Speaker: Hang Yin (Central China Normal University CCNU (CN))
- 14:50** → 15:25 **primordial kt and ISR starting scale in Pythia8** 🔊
Speaker: Leif Gellersen
- 15:25** → 16:00 **Primordial kt in a wide range of DY masses, non-perturbative Sudakov from CS and PB** 🔊
Speaker: Mikel Mendizabal
- 16:00** → 16:20 **Break**
- 16:20** → 16:55 **CS kernel measurement at the LHC** 🔊
Speaker: Alexey Vladimirov
- 16:55** → 17:30 **Overview of fits to NP contributions using NangaParbat** 🔊
Speaker: Giuseppe Bozzi (Unknown)
- 17:30** → 18:05 **Overview of fits to NP contributions using Artemide** 🔊
Speaker: Ignazio Scimemi (I)

<https://indico.cern.ch/event/1204311/>

LHC-EW WG: Jets and EW bosons

Monday 17 Oct 2022, 16:30 → 18:20 Europe/Zurich



Description We will use ZOOM for the meeting:

<https://cern.zoom.us/j/98001221614?pwd=VGxhSExlZEMrMUYtMUhRZ3JX>

Meeting ID: 980 0122 1614 (passcode 959106)

Meeting Recording:

https://cern.zoom.us/rec/share/2F1nxpo4mudSgqgs3qnZ37lnlEch_vSRR8t

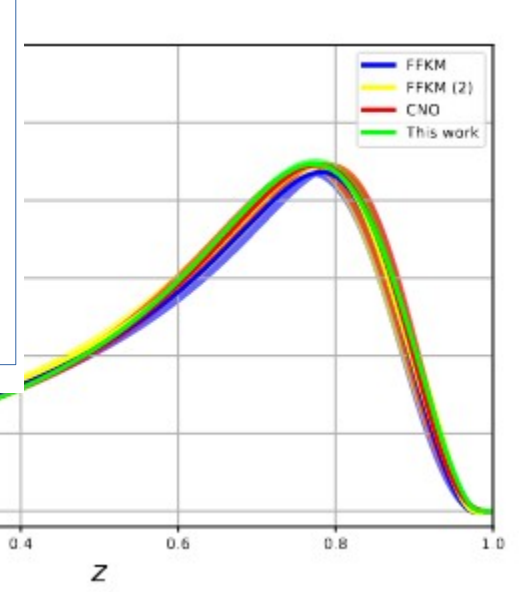
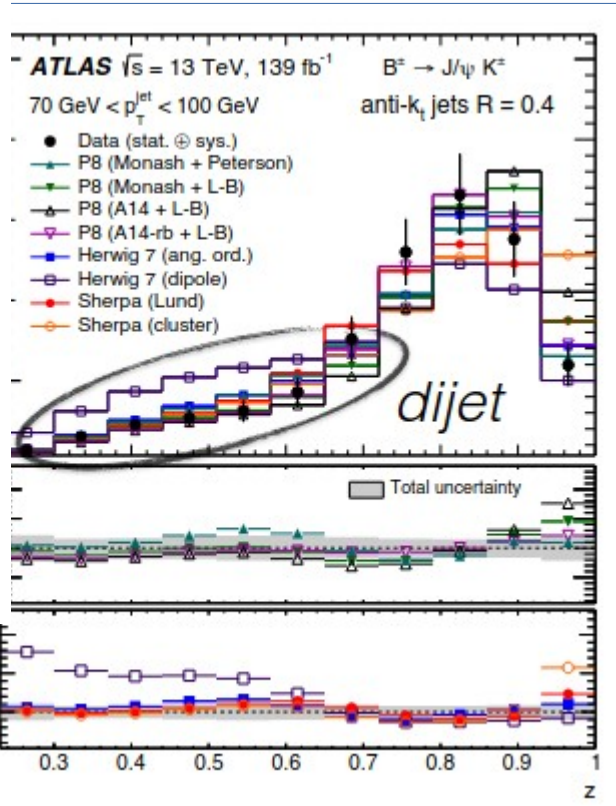
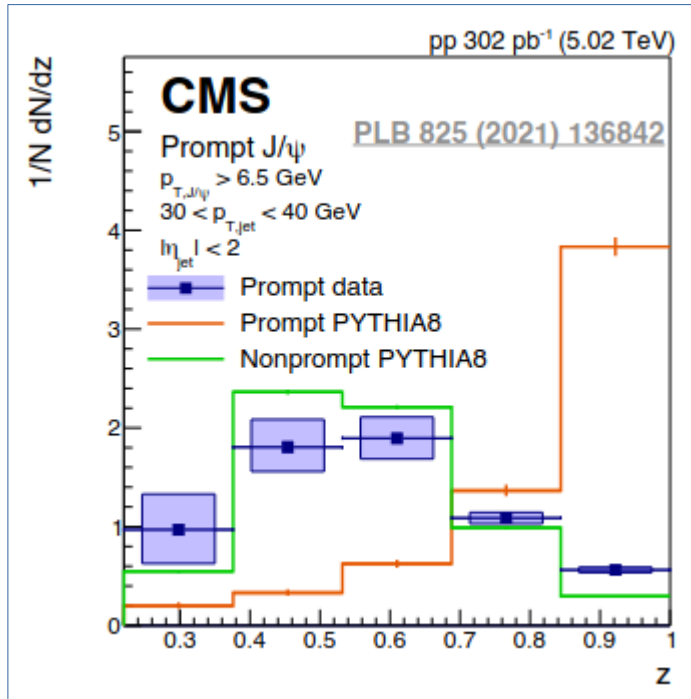
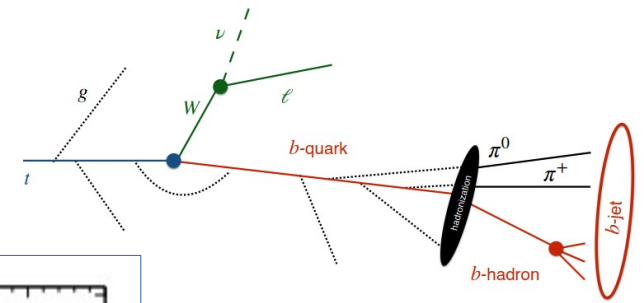
Access Passcode: 0nr9@p1k

NB: recording will automatically expire in 15 days. There are three separate

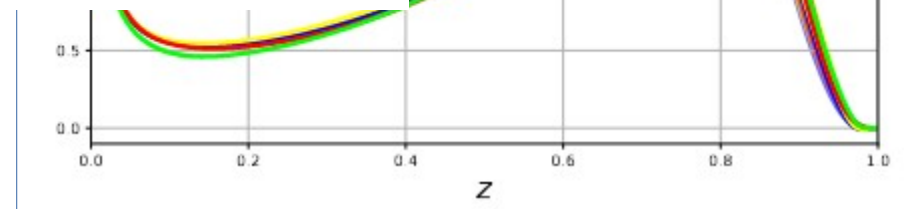
- 16:30** → 16:50 **Introduction**
Speakers: Eram Syed Rizvi (Queen Mary, University of London), Javier Llorente Merino (S)
- 16:50** → 17:10 **Theoretical predictions on the fragmentation of heavy flavour jets**
Speaker: Terry Generet (RWTH Aachen University)
- 17:10** → 17:30 **ATLAS measurements on b-jet fragmentation**
Speaker: Chris Pollard (University of Warwick (GB))
- 17:30** → 17:50 **Fragmentation of jets containing J/psi mesons in LHCB**
Speaker: Naomi Cooke (University of Birmingham (GB))
- 17:50** → 18:10 **Fragmentation of jets containing J/psi mesons in CMS**
Speaker: Batoul Diab (Université Paris-Saclay (FR))



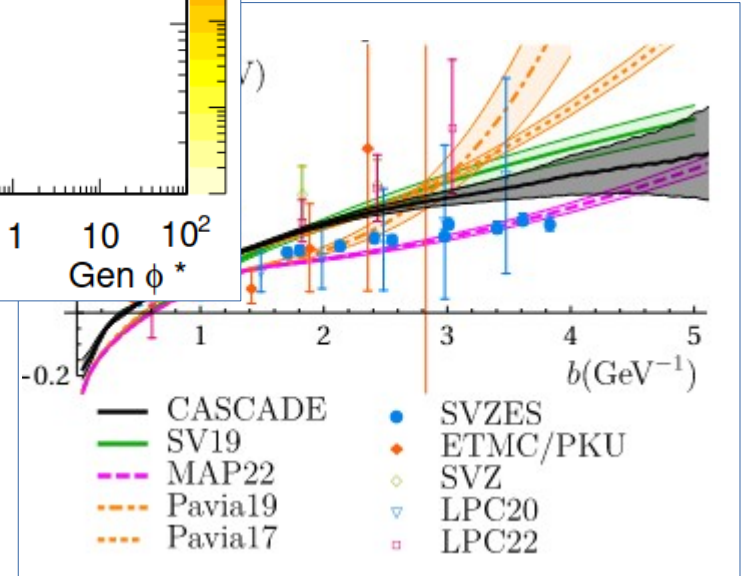
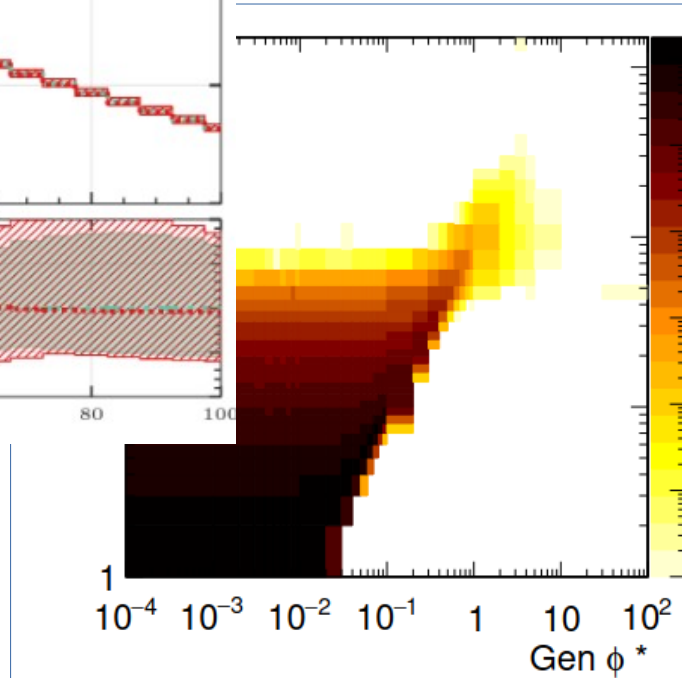
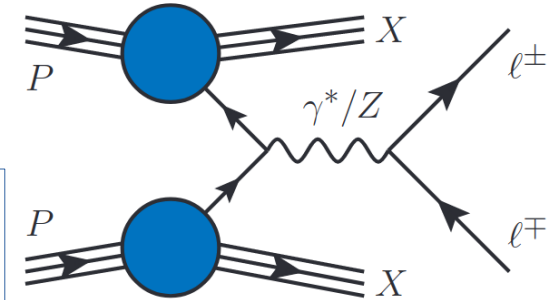
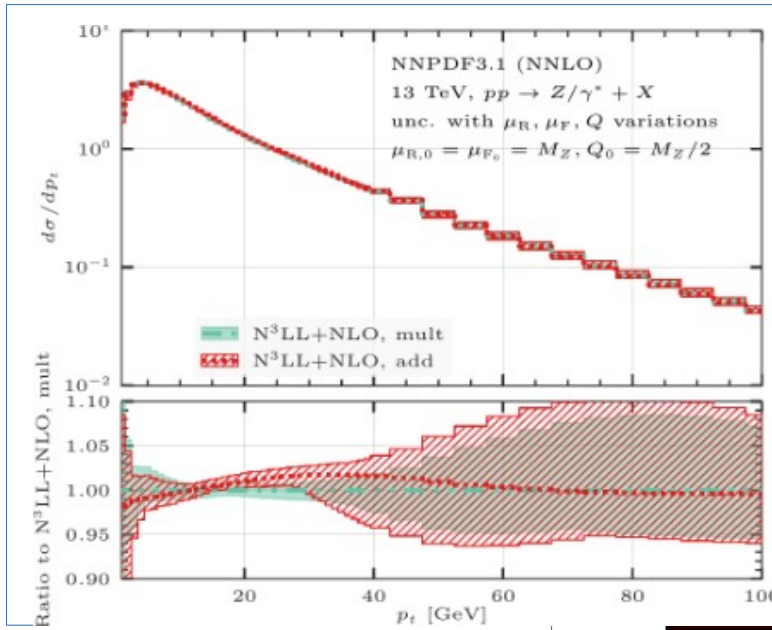
Highlights: HF FF



- Important for precision physics
- Precise probe of QCD
- Improved FF fits



Highlights: DY transverse momentum



- Do we understand all systematic sources?
- Improving NP models in MC generators?
- PB method vs TMD factorization
- Can we constrain NP contributions experimentally?
- ϕ^* vs p_T ?
- Can we test TMD factorization?



Highlights: Benchmark

<https://gitlab.cern.ch/lhcewkwg/lhcewkwg-vjets/yellowreport>

CERN Yellow Reports: Monographs
Volume X/2019

CERN-2019-XXX-M

Jets and EW Bosons

Report of the EW Working Group

Editors: ALICE: James Mulligan
ATLAS: Eram Rizvi, Ben Nachman, Loui Corpe
CMS: Armando Bermudez Martinez, Vieri Candelise,
Mikko Voutilainen, Hannes Jung
LHCb: Stephen Farry, Will Barter
Theory: Marek Schoenherr



Technical report, VERSION: 1.03, OCTOBER 19, 2022

Effect of uncertainty correlations to the estimated χ^2 value

Andrius Juodagalvis^a and Marijus Ambrozas^a

^a*Institute of Theoretical Physics and Astronomy, Faculty of Physics, Vilnius University, Naugarduko 3, LT-10257, Vilnius, Lithuania*

E-mail: andrius.juodagalvis@tfai.vu.lt, marijus.ambrozas@tfai.vu.lt

ABSTRACT: It is customary to evaluate the accuracy of a theoretical prediction by calculating the χ^2 value. The uncertainty of each value is important to estimate theoretical values. Correlation of uncertainties gives an accuracy that allows to mitigate systematic effects, like overall affecting the accuracy of the measurement. This is a jet measurement at $\sqrt{s} = 13$ TeV. **This is a theoretical study.**

Available on the CMS information server

CMS AN-21-101

CMS Draft Analysis Note

The content of this note is intended for CMS internal use and distribution only

2022/08/15
Archive Hash: c3b98d3-D
Archive Date: 2022/07/26

Tuning of the partonic intrinsic transverse momentum in Pythia8 using Drell-Yan data at 13 TeV

A. Bermudez Martinez, W. Jin, M. Dessen, E. Coelho, W. Ali Khan, M. Monteno, M. Sales, R. Covarelli, A. Marques Moraes, M. Mendizabal, Kyle Cormier
CERN

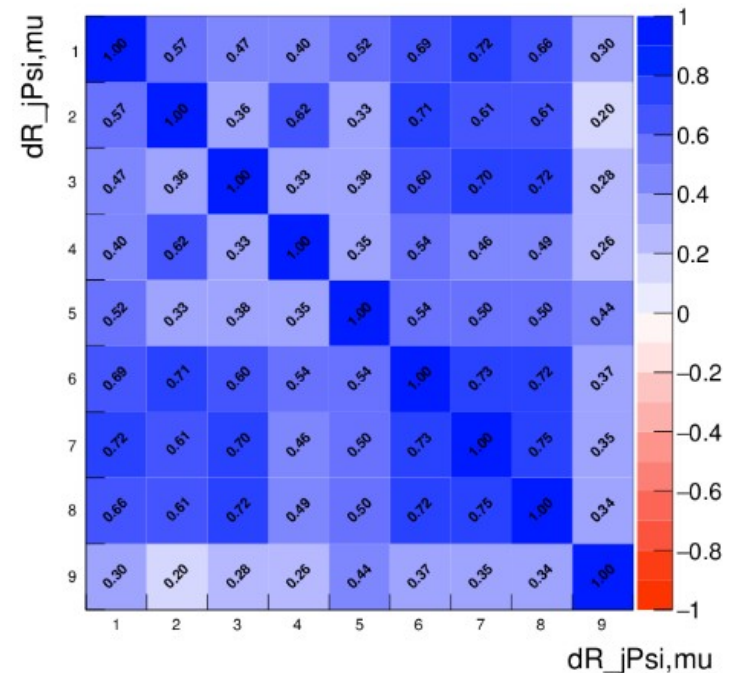
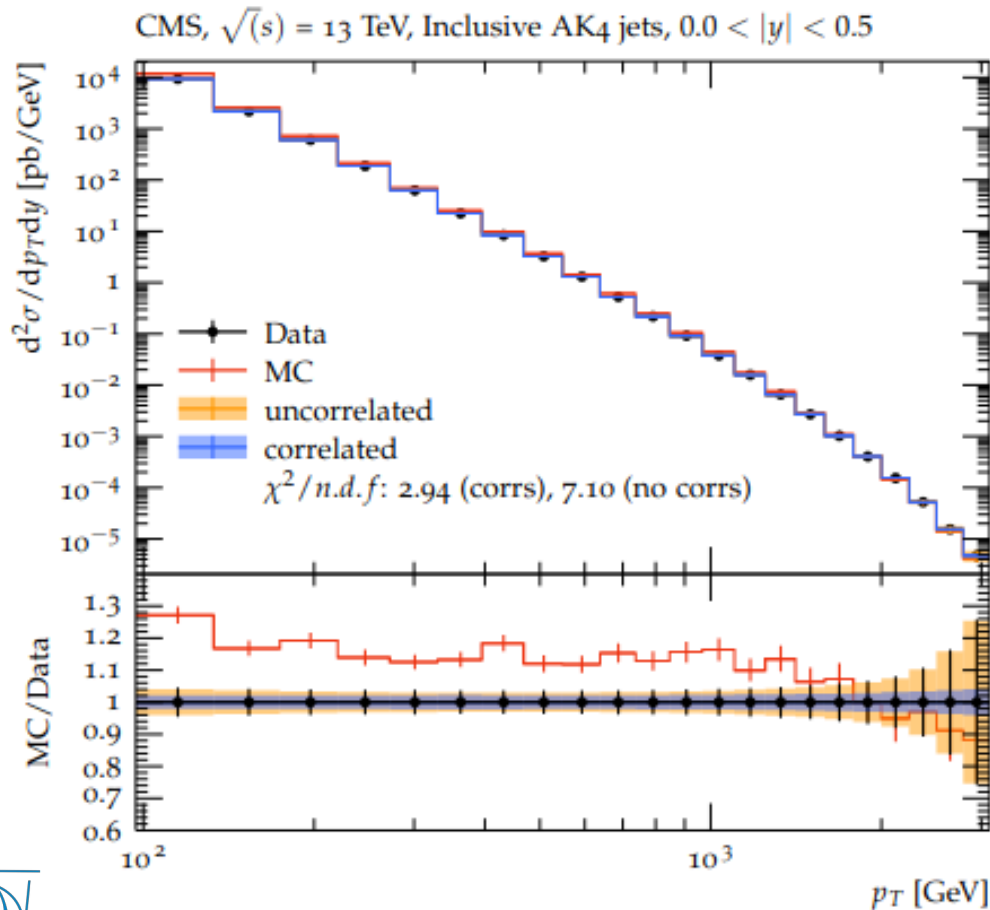
Abstract

A new tune of the primordial k_T parameter in the Pythia8 generator is presented. The tuning procedure is shown to be factorizable, leading to negligible changes in the performance of the baseline tune (CP5) on underlying-event observables. Measurements of the Drell-Yan transverse momentum spectrum and ϕ^* at 13 TeV in different rapidity ranges are used to determine the parameters of the tune. In addition, comparisons are made for observables measured in various specific processes, such as multijet, Drell-Yan, and top quark-antiquark pair production. Two approaches are used to obtain the tune, the traditional fitting procedure using the Professor 2 program, and a fit based on supervised machine learning algorithms using MCNN-TUNES.

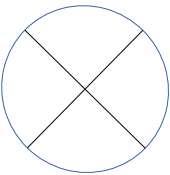
Highlights: Correlation libraries

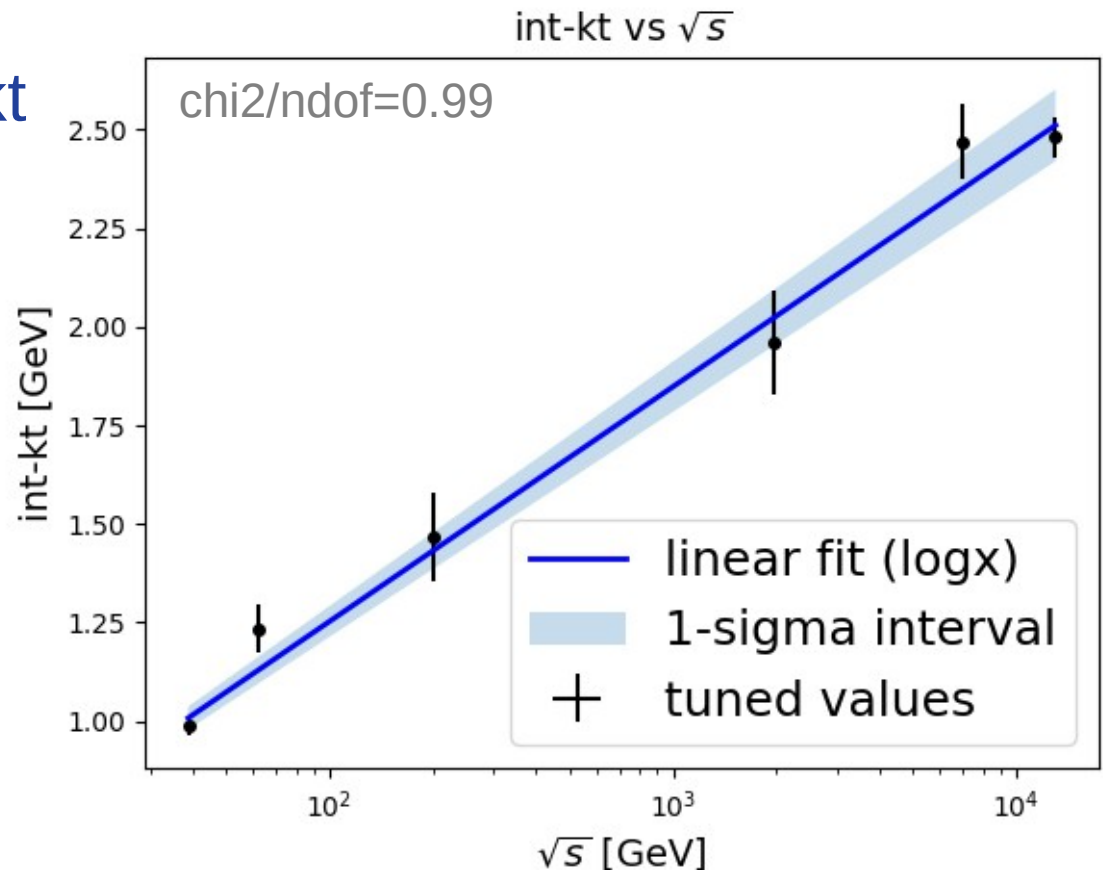
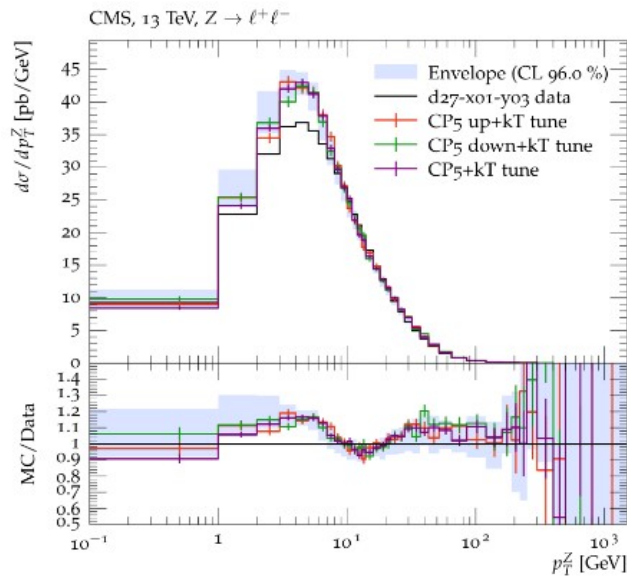
Andrius Juodagalvis
Marijus Ambrozus
Louie Corpe

- Storing and propagating covariance information
- Scenarios for analysis preservation
- Comparisons across experiments



Highlights: Primordial kt tuning

UE  Intrinsic kt

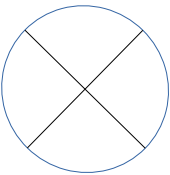


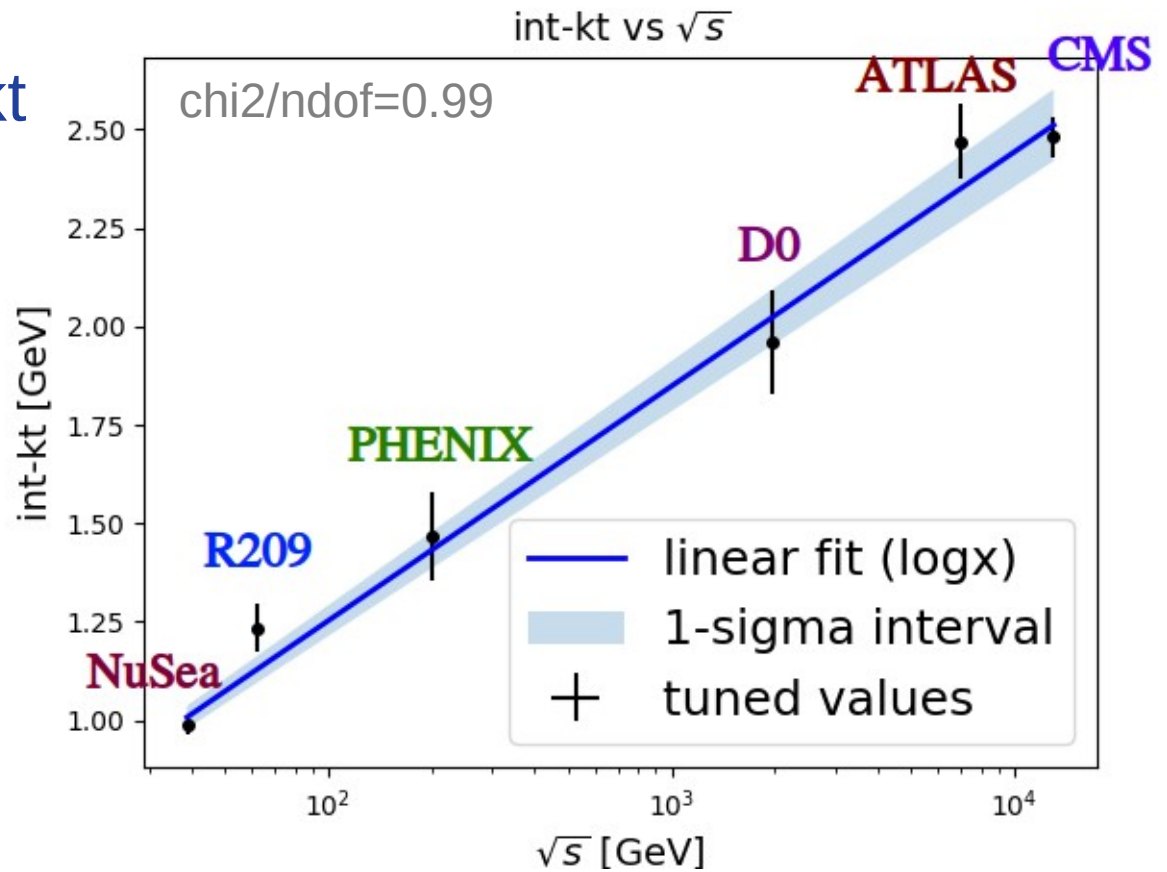
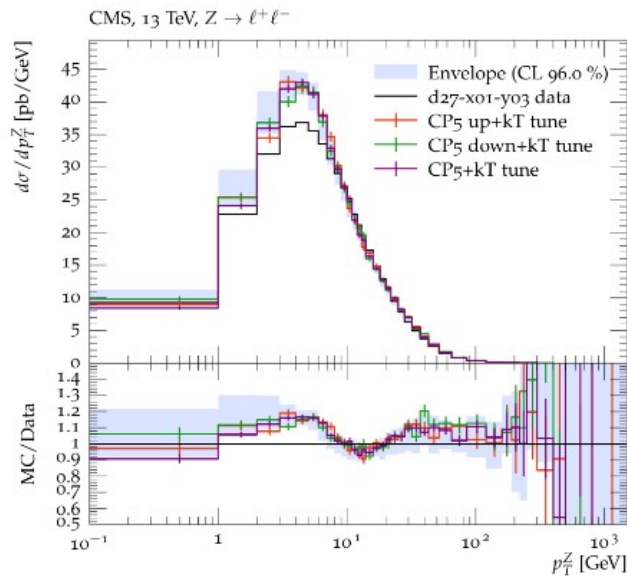
- Decouple from UE
- Avoid overparametrization
- Model dependent-ish

- comE dependent
- Very simple functional form (general?, e.g. PH)
- Extending the Pythia8 model



Highlights: Primordial kt tuning

UE  Intrinsic kt

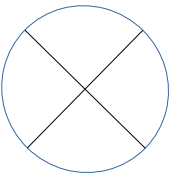


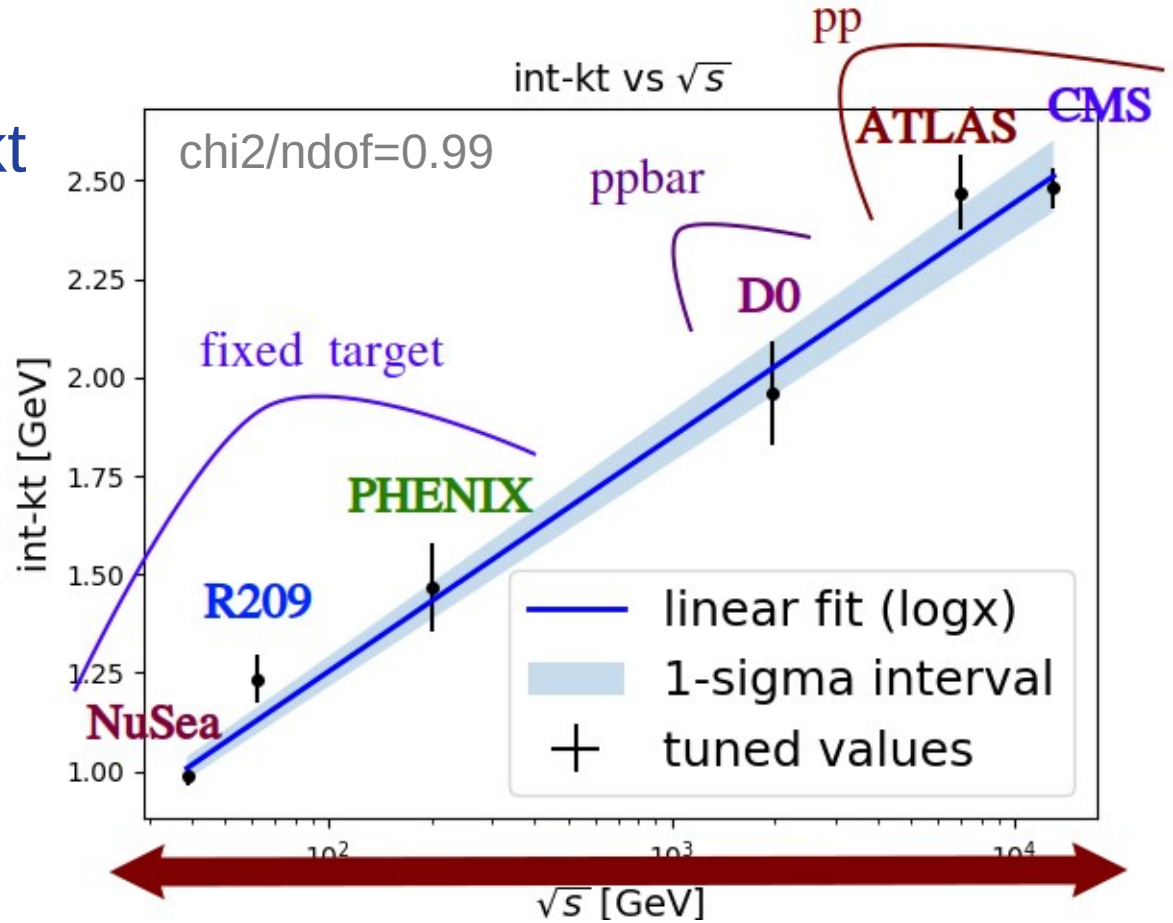
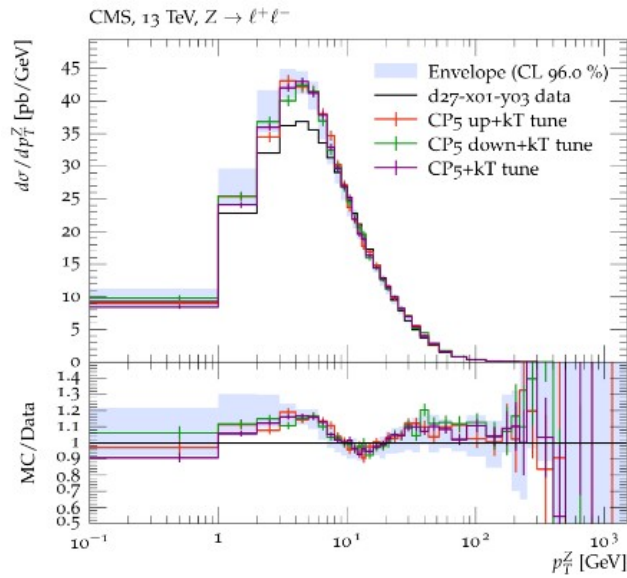
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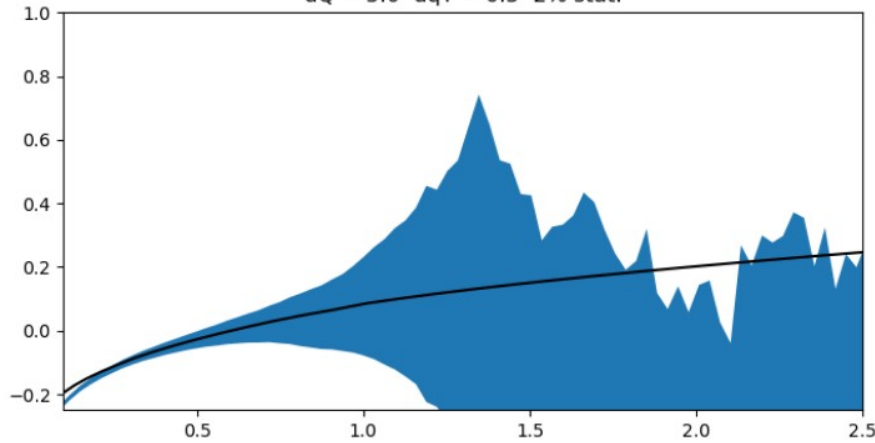
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Highlights: Direct determination of the CS kernel

Conservative estimate for CMS

dQ = 5.0 dqT = 0.5 2% stat.

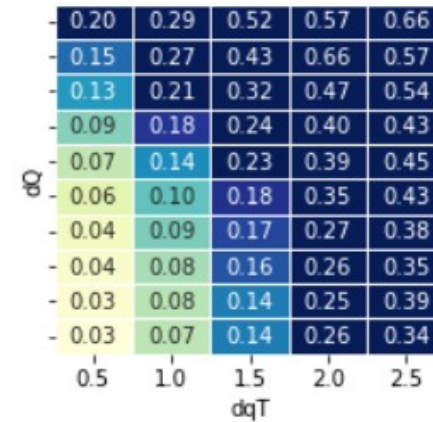


ABM et al. [2206.01105, accepted in PRD]

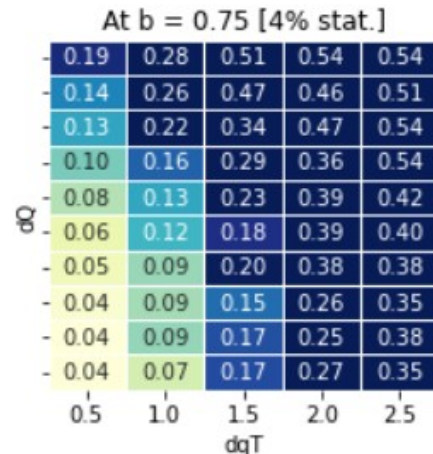
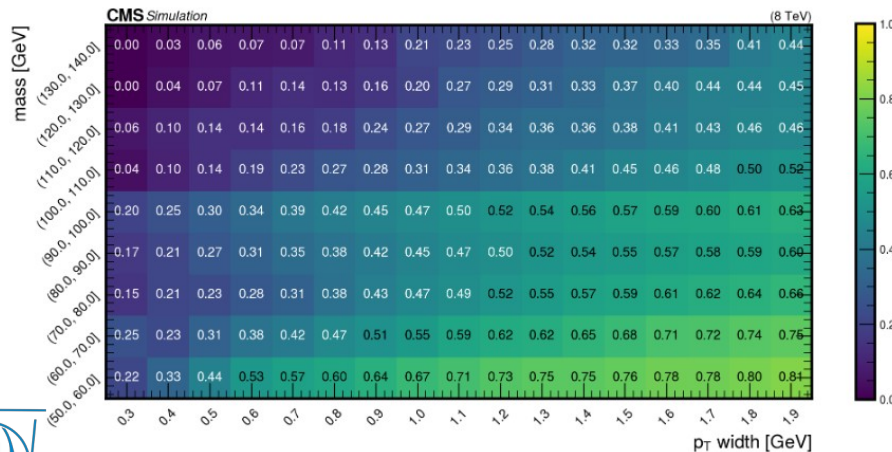
$$\mathcal{D}(b, \mu_0) = \frac{\ln\left(\frac{\Sigma_1}{\Sigma_2}\right) - \ln\frac{\sigma_0(Q_1)}{\sigma_0(Q_2)} - 2\Delta_R(Q_1, Q_2, \mu_0)}{4 \ln(Q_1/Q_2)} - 1$$

Sensitivity

At b = 0.75 [2% stat.]



Purity using 8TeV open data



Summary

- Documentation is progressing
- Correlation libraries used for inclusive jets
- Intrinsic kt tune well understood
- Simple functional form, improvement of the Pythia8 model
- Feasibility studies of CS kernel determination

Thank you

