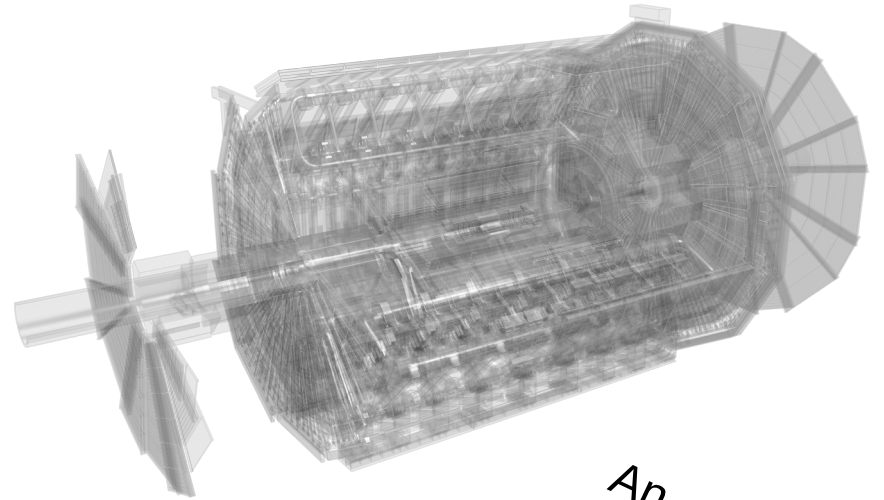


GrasPA 2026

Summer School Presentation

Matthias KRUGMANN

> Unfolding of ATLAS Run 2 Data



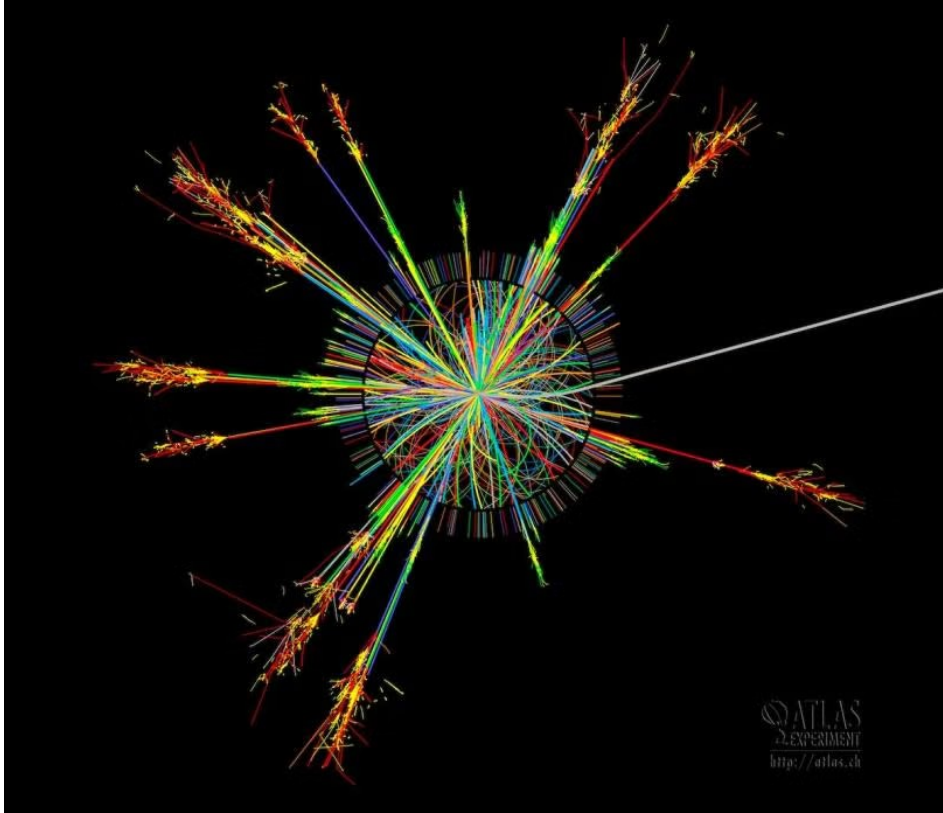
GRENOBLE
INP
UGA

Phelma

An engineer ????

LAPP
Laboratoire d'Annecy de Physique des Particules

Context



Run 2 :

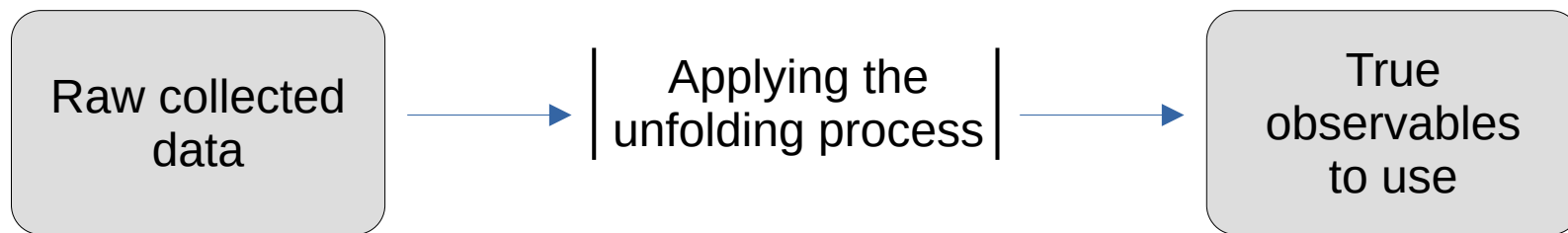
High luminosity and energy > more stats

Focus of the study :

Production of dilepton pairs in association with the number of b-jets

Concepts & Goals

- Unfolding of ATLAS Run 2 Data

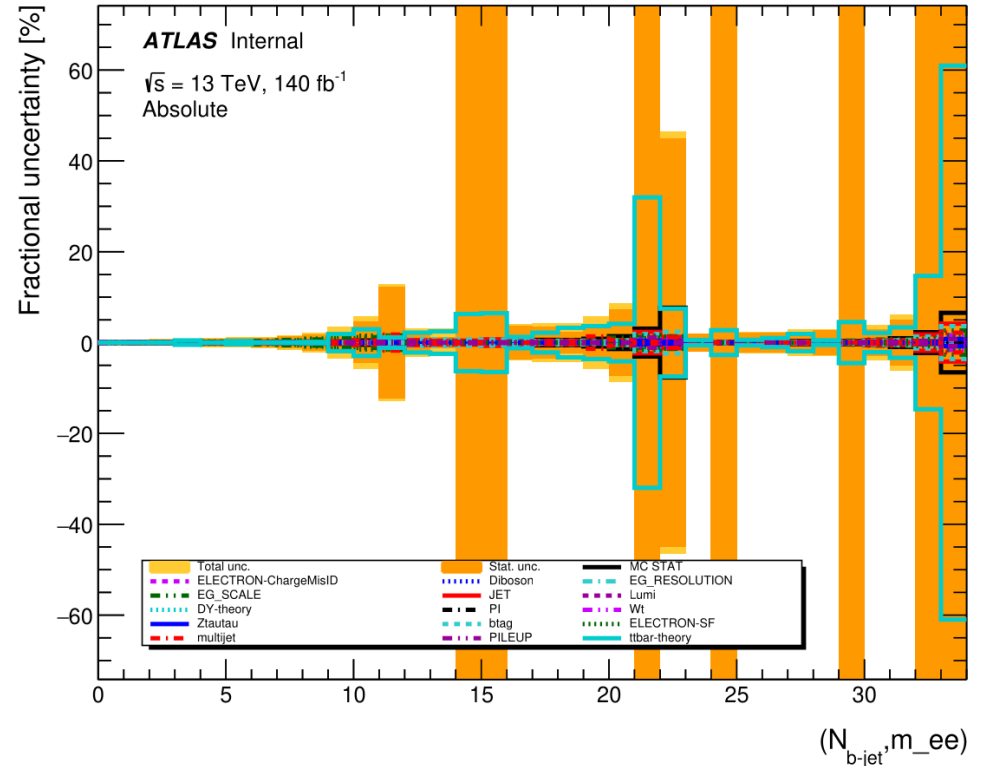


- Use of the likelihood function

$$\mathcal{L}(\mu, \vec{\theta}, \vec{\gamma}) = \underbrace{\prod_{i \in \text{bins}} \text{Pois}(N_i | \mu s_i(\vec{\theta}) + \gamma_i b_i(\vec{\theta}))}_{\text{Distribution for each bin}} \times \underbrace{\prod_{\theta \in \vec{\theta}} \frac{1}{\sqrt{2\pi}} e^{-\theta^2/2}}_{\text{Nuisance parameters auxiliary measurement}} \times \underbrace{\prod_{i \in \text{bins}} \text{Gauss}(\beta_i | \gamma_i \beta_i, \sqrt{\gamma_i \beta_i})}_{\text{Background}}$$

State of the project

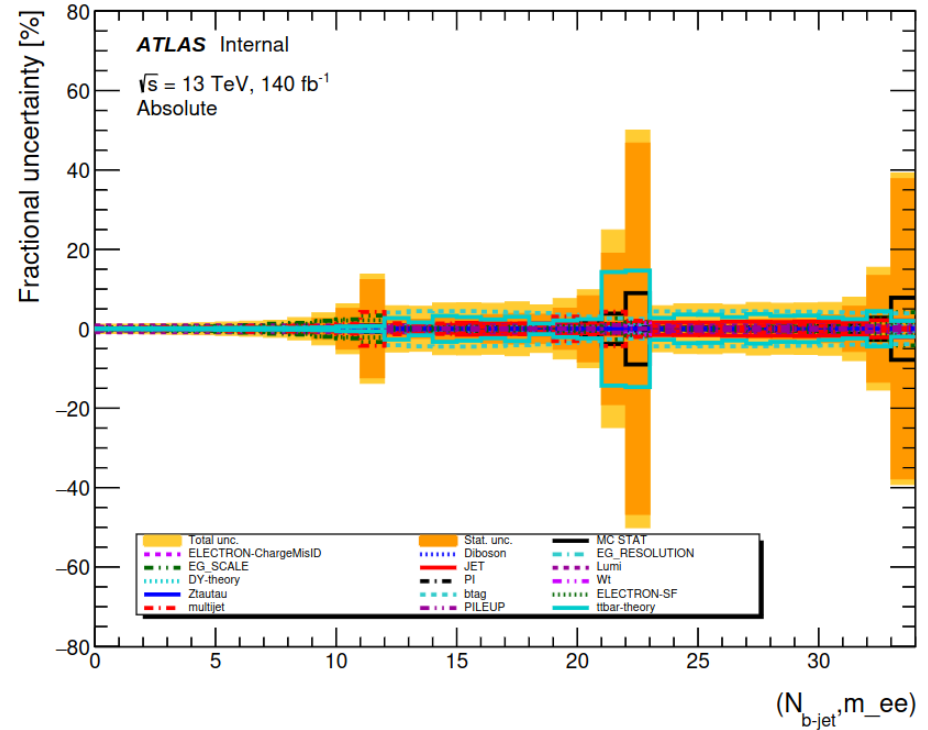
- Got new raw data
 - systematics, background, ...
- Unfolding showing divergence : why?
 - analysing logs and changing settings



Results

- Effect of systematics:
 - targetted a specific one and obtained convergence
- Effect of fitting criteria:
 - converging with the most complex strategy

=> Great use of maths and computer science



Thanks for listening 😊

QUESTIONS?

Appendix

Figure references...

- 1 : <https://phelma.grenoble-inp.fr/fr/l-ecole/le-nouveau-logo-est-arrive>
- 2 : <https://www.lapp.in2p3.fr/en/lapp>
- 3 : <http://atlas.ch>
- 4 : internal result from team DITTO
- 5 : internal result from team DITTO

Appendix



```
└─ Dilepton_ee_V14
  > Binnings
  > Fits
  > Histograms
  > Plots
  > Pulls
  > Rankings
  > RooStats
  > Systematics
  > UnfoldingHistograms
  > UnfoldingPlots
  ! CorrelationMatrix.yaml
  ⚡ CorrMatrix_V14_ASIMOV_shower_Drop_Norm.pdf
  ⚡ Gammas_V14_ASIMOV_shower_Drop_Norm.pdf
  ⚡ NormalisationPlot_V14_ASIMOV_shower_Drop_Norm.pdf
  ⚡ NormFactors_V14_ASIMOV_shower_Drop_Norm.pdf
  ≡ NPorder.txt
  ⚡ Pruning_V14_ASIMOV_shower_Drop_Norm.pdf
  🗑 Pruning.root
  ≡ PruningText.txt
  ⚡ Unfolding_ee_UnfoldedData.pdf
  ! Unfolding_ee_UnfoldingData.yaml
> Dilepton_mumu_V14
> DY_ee_V14_CorrectScaleVar
> DY_mumu_V14_CorrectScaleVar
> plots
```

Structure of the project

Appendix

b-jet production => b-jet + dilepton
 $q\bar{q} \rightarrow Z + b\bar{b} \quad || \quad Z \rightarrow \ell^+\ell^-$