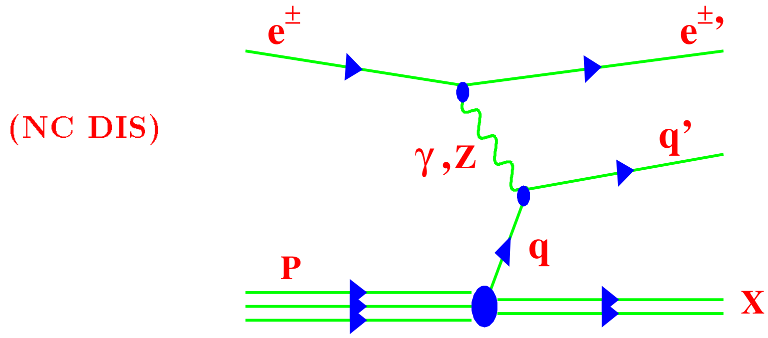
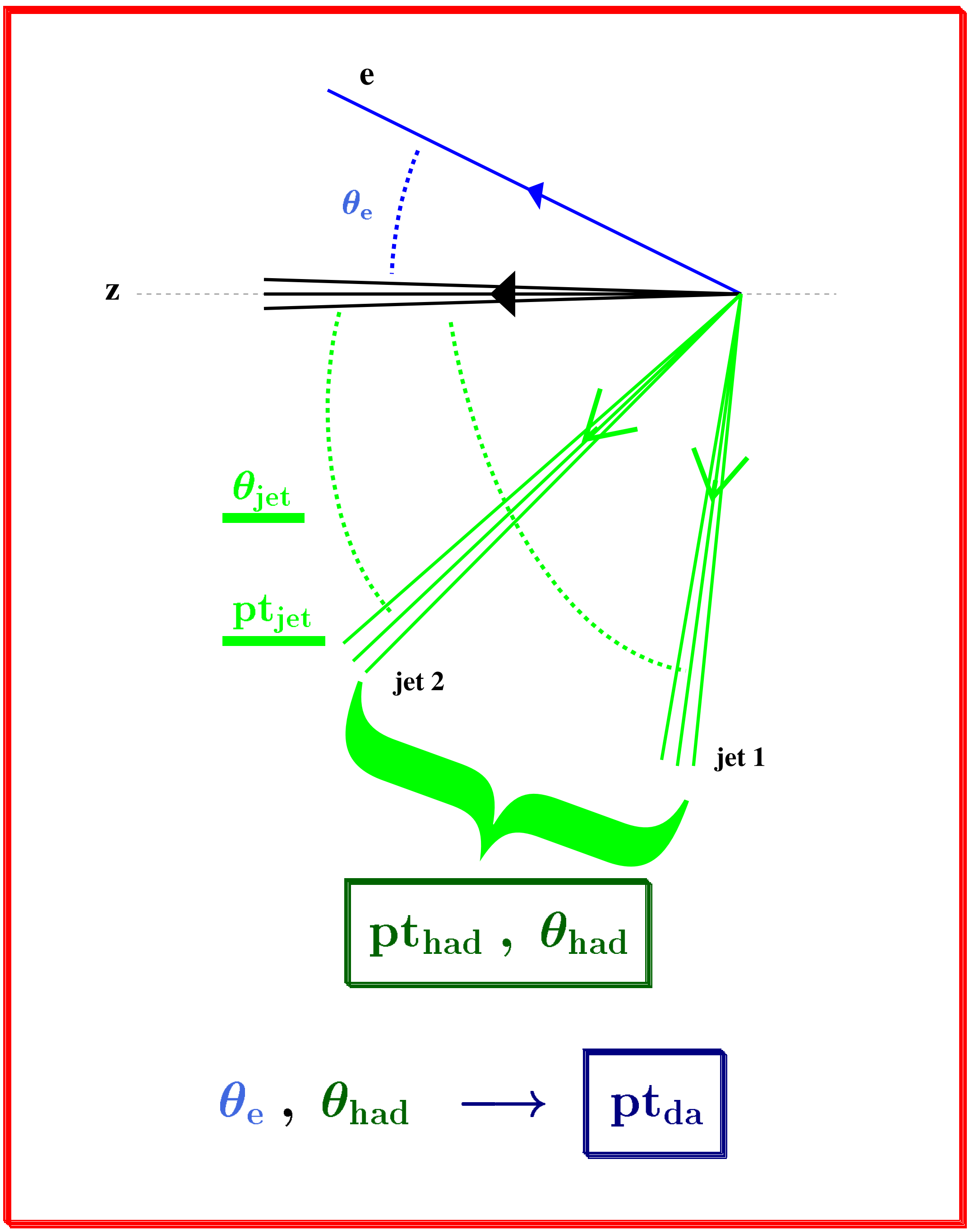
Measurement of Absolute Jet Energies in the H1 Liquid Argon Calorimeter

- **Kinematics**
- **Tracks + clusters combination**
- **Absolute calibration**
- **Benefits to physics measurements**





$$pt_{bal} = pt_{had} \,/\, pt_{da}$$

Tracks and clusters combination for hadronic energy measurement

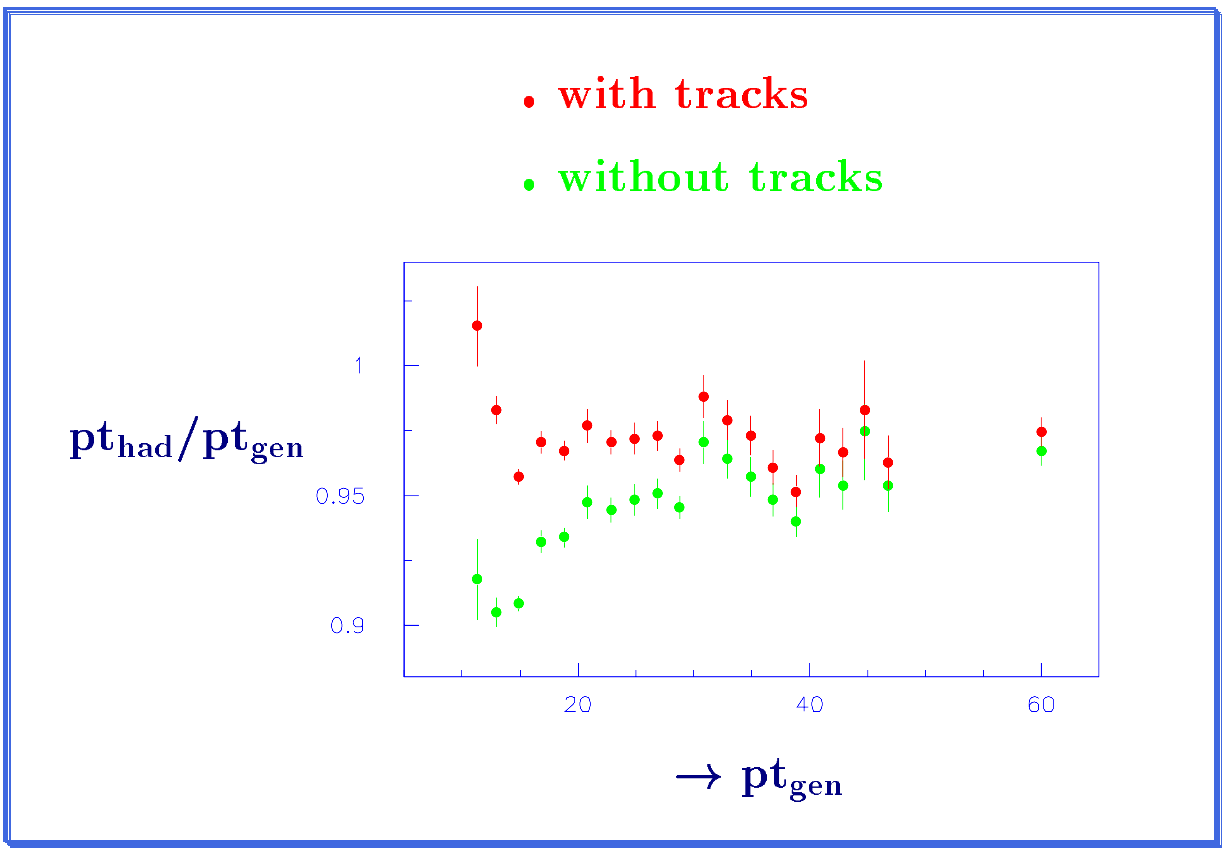
$$E = E_{LAr} + E_{tracks}$$

Measurement of tracking system better than the LAr measurement for low momentum.

- A track with $pt < 2$ GeV is extrapolated in the LAr
- Energy in a cylinder with $r = 25(50)$ cm in the EM (HAD) section around the track is assigned.

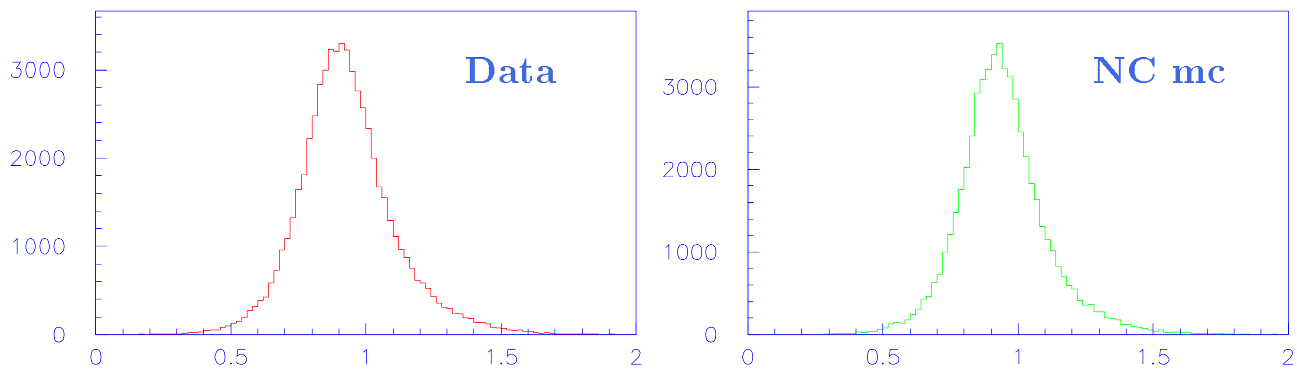
$\longrightarrow$ IF $E_{LAr} > E_{track}$: keep E_{LAr}

$\longrightarrow$ IF $E_{LAr} < E_{track}$: keep E_{track} (E_{LAr} neglected)



• Before calibration

pt_{had}/pt_{da}



mean = 0.929   mean = 0.943

→ With a Data/MC calibration

- ⋆ Data/MC within 2%
- ⋆ ... but : $pt_{bal}^{mean} \sim 0.943$ ...

→ Absolute calibration :

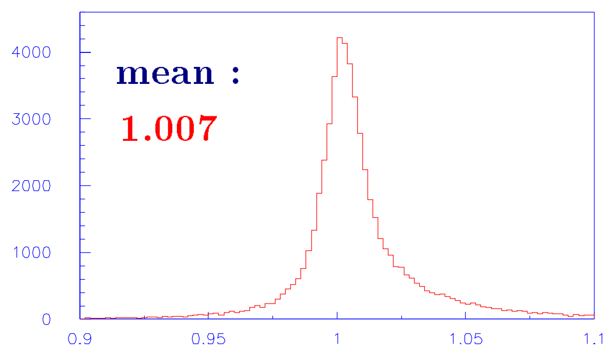
$\Longrightarrow$ Aims to bring $pt_{bal}^{mean} \rightarrow 1.$

for exclusive states analyses

(New physics , W analyses ...)

Procedure to obtain corrections

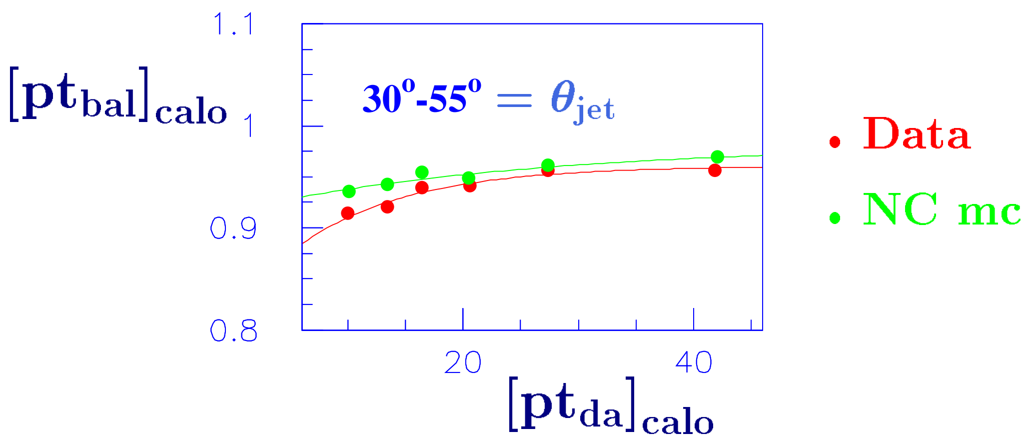
- Data and MC calibrated separatly
- Sample : high q^2 $(1+1)$ jets events
- pt_{da} as reference :



pt_{da}/pt_{gen}

(NC MC)

- In 8 θ_{jet} bins, the pt balance is computed in several pt_{da} bins.



⟶ Fits with exponential functions:

$$F(\theta_{jet}, pt_{da}) = A_\theta \, [\, 1 - \exp(-B_\theta - pt_{da}/C_\theta) \,]$$

Procedure to apply corrections

For a given quantity $\mathbf{q^{in}_{jet}}$:

Iterative procedure :

⋆ The initial $\mathbf{pt^{in}_{jet}}$ is first corrected

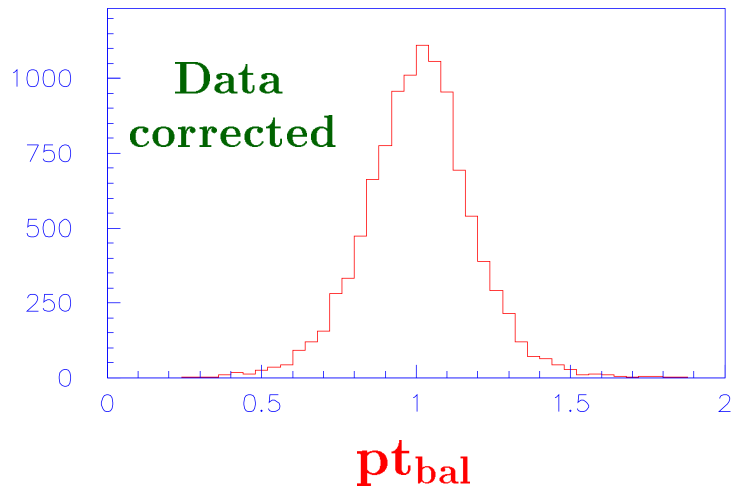
$$\mathbf{pt'_{jet}} = \mathbf{pt^{in}_{jet}} \; / \; \mathbf{F}(\theta_{jet}, \mathbf{pt^{in}_{jet}})$$

⋆ The final corrections are calculated at this corrected $\mathbf{pt'_{jet}}$

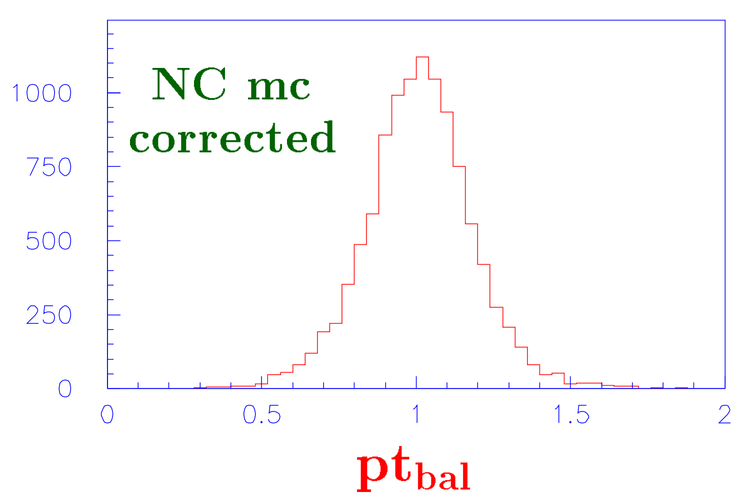
$$\mathbf{q^{corr}_{jet}} = \mathbf{q^{in}_{jet}} \; / \; \mathbf{F}(\theta_{jet}, \mathbf{pt'_{jet}})$$

(1+2) jets events

Data : mean of pt_{bal} : 0.949 → 1.008

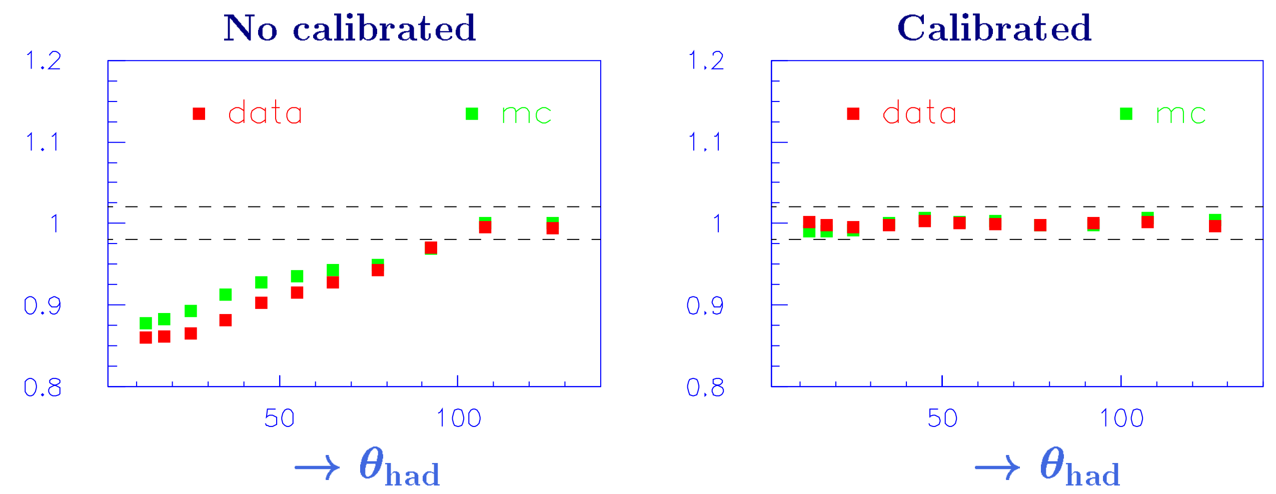


NC mc : mean of pt_{bal} : 0.960 → 1.010



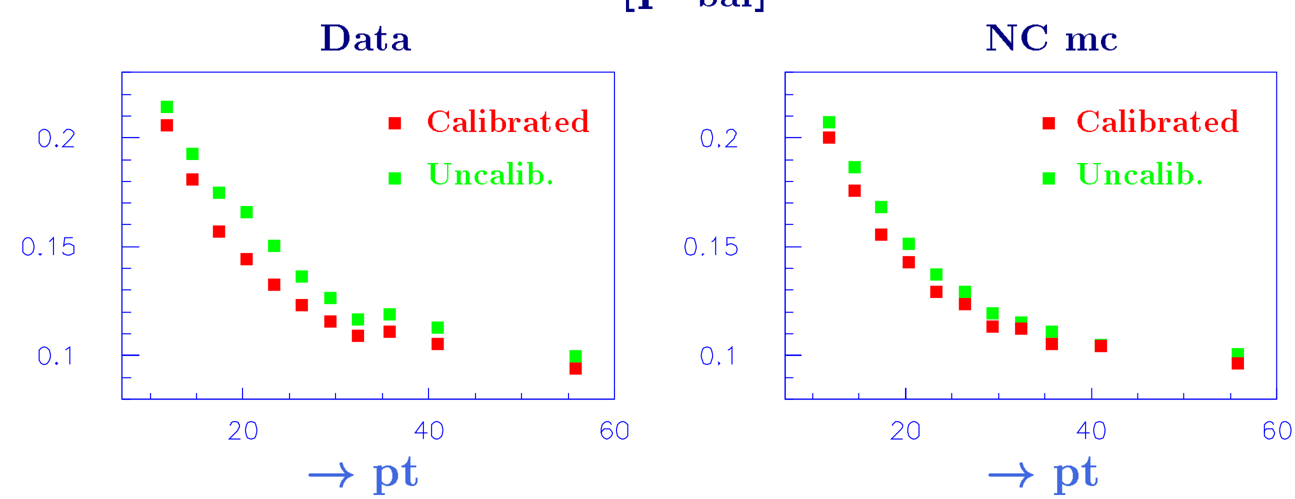
Exclusive calibration checks :

pt_{bal}



⟶ pt_{bal} inside 2% in the whole θ range

σ [pt_{bal}]

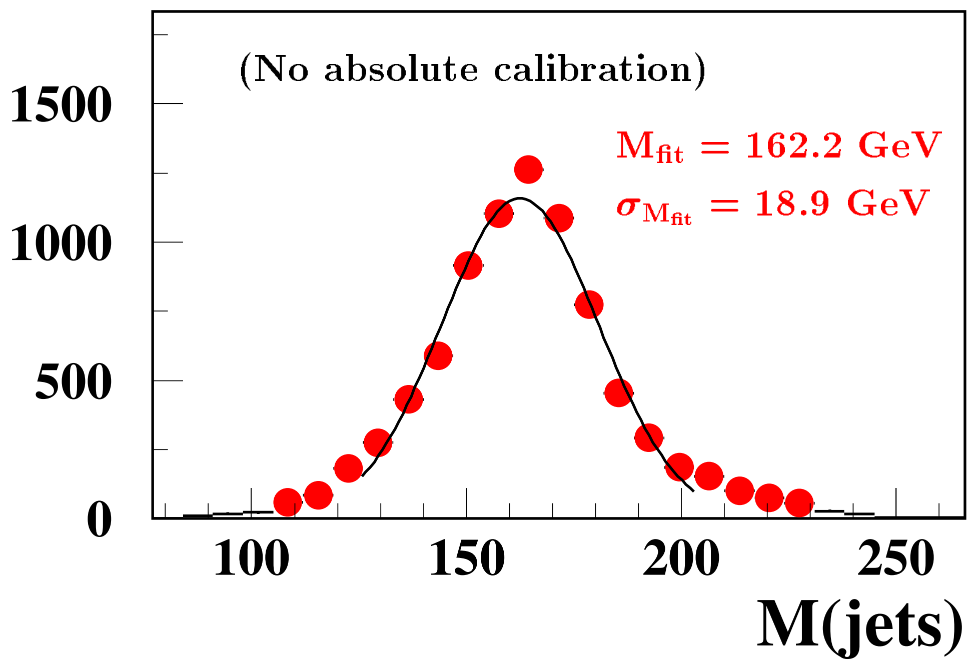


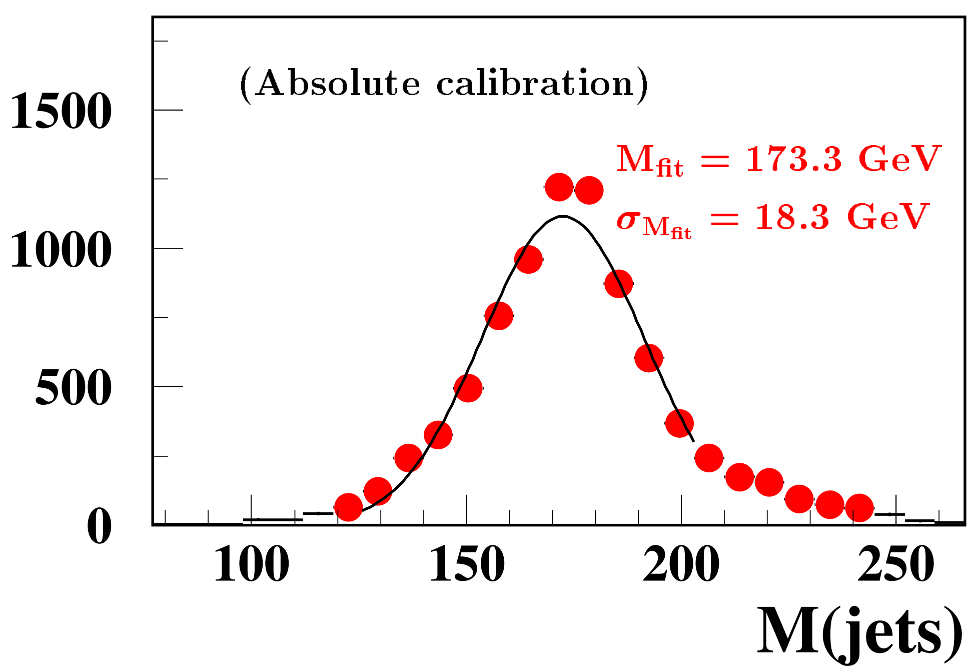
⟶ improvement of σ in the whole pt range

Benefit in 3 jets measurement

($pt_{jet}^{1,2,3} > 25, 15, 10$ GeV)

Single Top Monte Carlo ANOTOP (hadronic channel)

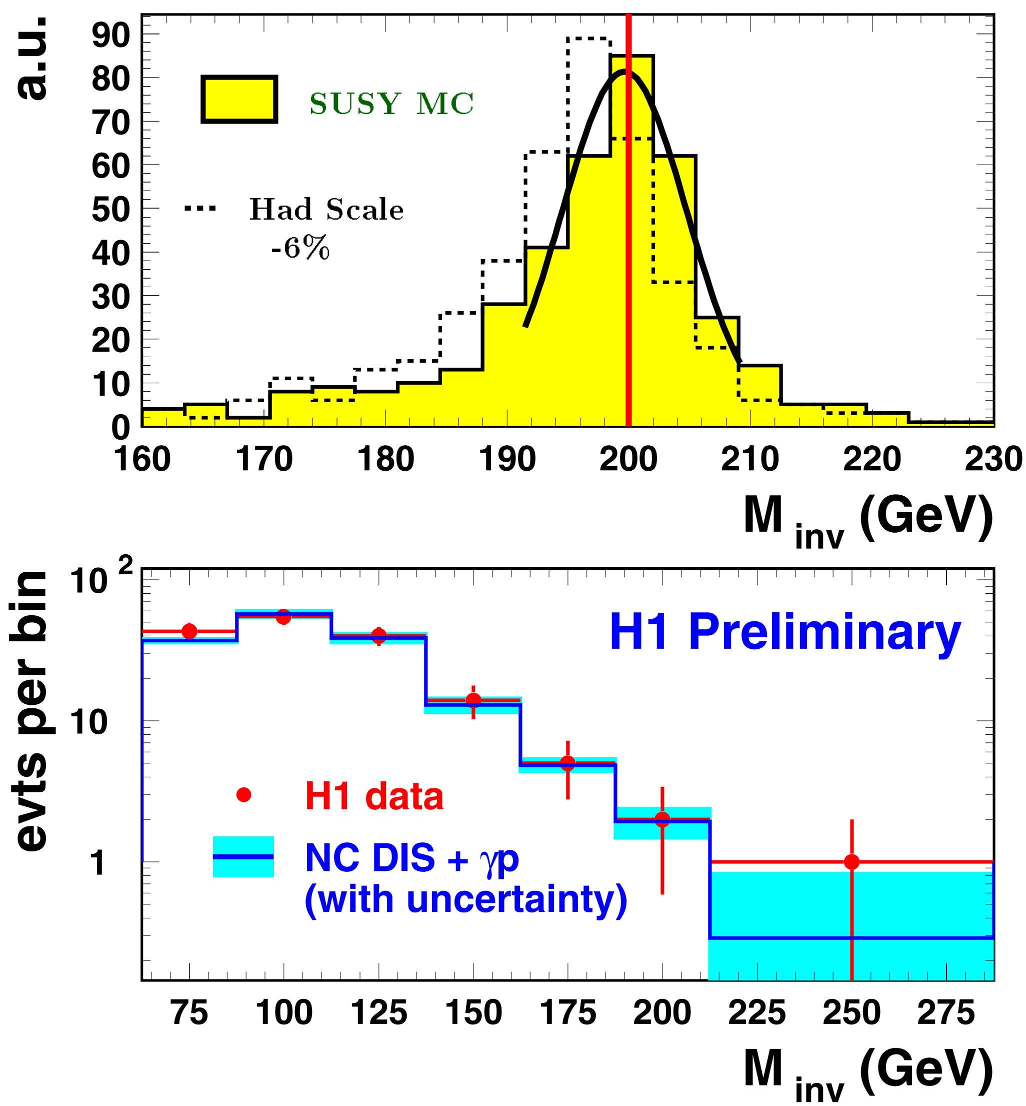




Squarks decaying to e + multijets

$$e + q \longrightarrow \tilde{q} \longrightarrow e + jets$$

$$M_{\tilde{q}}^{gen} = 200\ GeV \longrightarrow \boxed{M_{\tilde{q}}^{rec} = 199.6\ GeV}$$



Conclusion

- Corrections given as a function of pt_{jet} and θ_{jet}
- Calibration applicable for any high Q^2 event samples
- Corrections are within 2% independant of :
  - the selection of event samples
  - the number of jets in the events
  - the jet algorithm used
- Method initially devoted to the absolute calibration of high pt jets (new physics or exclusive states)

  $\longrightarrow$ works for inclusive studies as well