WP1 toward the running time

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- Collect ideas on what would be useful to do while data taking is approaching
- give a global picture for the work described in the next presentation

What we could expect in the next months

- In the coming run we can expect a few pb^{-1} of data @10 TeV
- The inclusive jet cross section measurement is an example of interesting measurement also useful to test the whole reconstruction/calibration analysis chain for jets

• rescaling the statistical error from the 1 fb^{-1} plot to 10pb^{-1} (14 TeV)

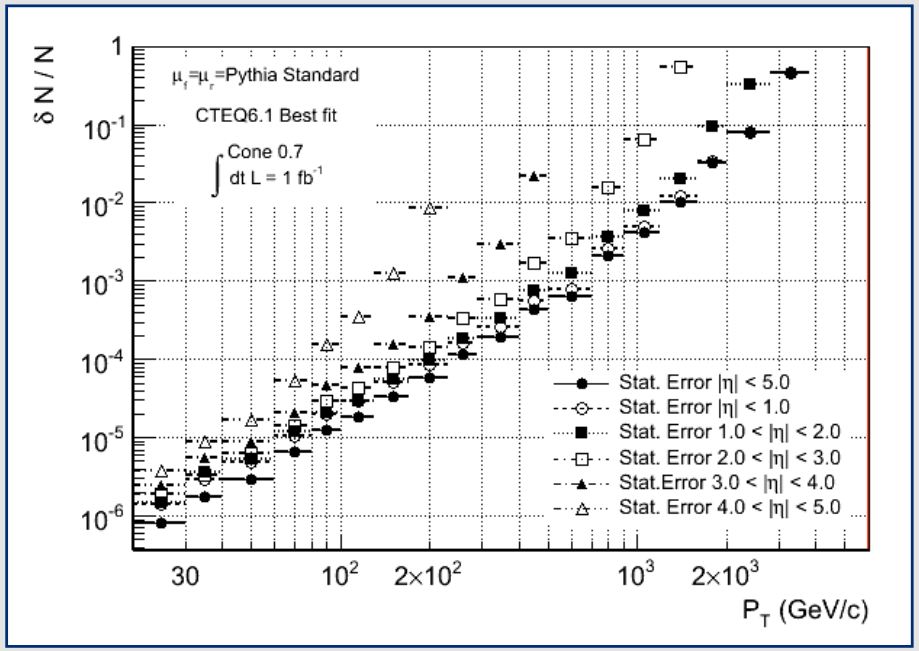
• we can expect to measure jets with:

p_T up to 600 GeV $|\eta|<1$

p_T up to 100 GeV $3<|\eta|<4$

with a statistical error <1%

• much smaller than theoretical error



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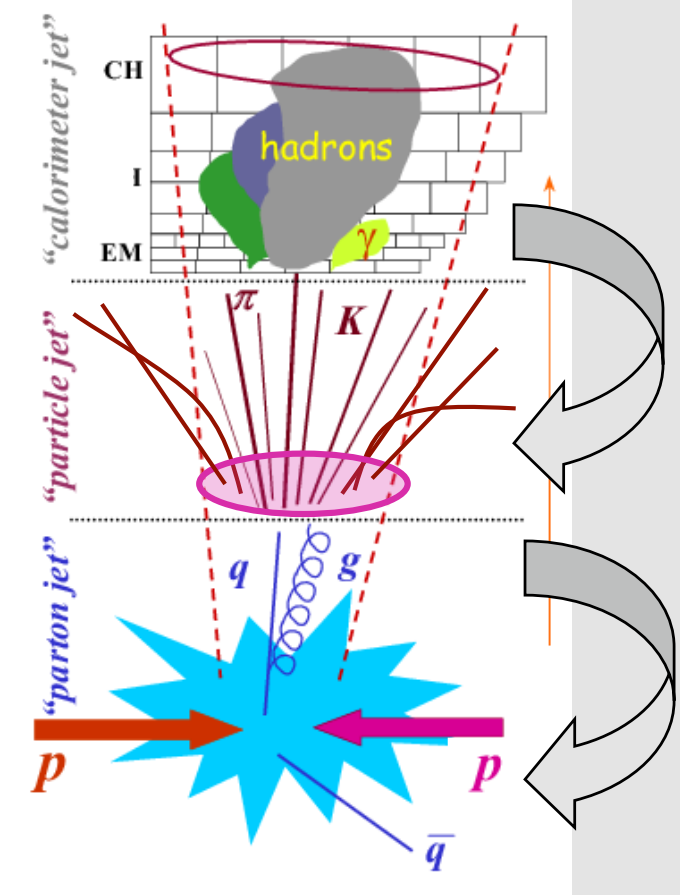
In order to estimate the systematic for this measurement we need have tools for asses the jet performance (for example linearity and resolution)

Jets: from production to analysis. Which effects we need to understand

Assuming jet algo cone 0.7



Dead channels

Electronic noise subtraction

Pile-up subtraction - 3 interaction * 3GeV = 9 GeV

uncompensation of calorimeters (e/h), cracks, dead material, material in front of the calorimeters, longitudinal leakage, magnetic field effect.

Global effect 70% -> 85% effect w.r. particle jet truth.

UE event subtraction – 3 GeV

Fragmentation effects – <1% percent pt jet

What Jets will we get at startup time ?

Understanding jet performance at LHC startup:

- Preliminary step: done at Tier-0 on express stream (T0 monitoring)
- First step will be done using a small fraction of ESD (DQ plots) + AOD
- Second (and very long) step is required to understand:
  1. jet reconstruction and calibration performance
  2. assess the systematic on the energy scale
  3. try a strategy to improve energy scale systematic and performance and go back to point 1

The information we will have in the AOD is the following:

Cone 0.4/0.7 – H1 Calibrated jets from topoclusters + Locally calibrated topoclusters

How much data will we have?

Assuming 1 day (2x8hrs fills) @ 100 Hz of data taking for jets we will have:

80 GB of DPD / day

800 GB of AOD /day

1.6 TB of ESD /day

We must be ready to run quickly on a huge amount of data. Get feedback, record the feedback to keep track of it and than re-run.

Jet performance need to be tested on large data set

It is important to be ready with all the tools to do this.

Jet performance package for data

At startup time all algorithms to evaluate Jet performances will be crucial. What instruments do we have:

Jet performance package from MC data (using truth)

➢Fundamental tool to have a first assessment of performance for any given calibration scheme

➢We need to keep it update and add the missing parts (....)

We need to develop a jet performance package for Data (clearly also applicable to MC for comparison). This package will contain:

•Tools to asses:

- efficiency/purity of jet reconstruction;
- Jet calibration uniformity, linearity and resolution
- Jet direction precision
- Jet shapes ...

Jet performance package for data

Examples of tools to include in the Jet performance package on data:

- Dijet balance vs eta/phi
- Dijet balance vs tracks (more on this later)
- Assessment of energy resolution from dijet balance
- Absolute scale uniformity using gamma+jet
- Energy scale and resolution from W → jj

Also some pre-jet studies should be included:

- Fragmentation studies
- E/p from isolate hadrons
- ....

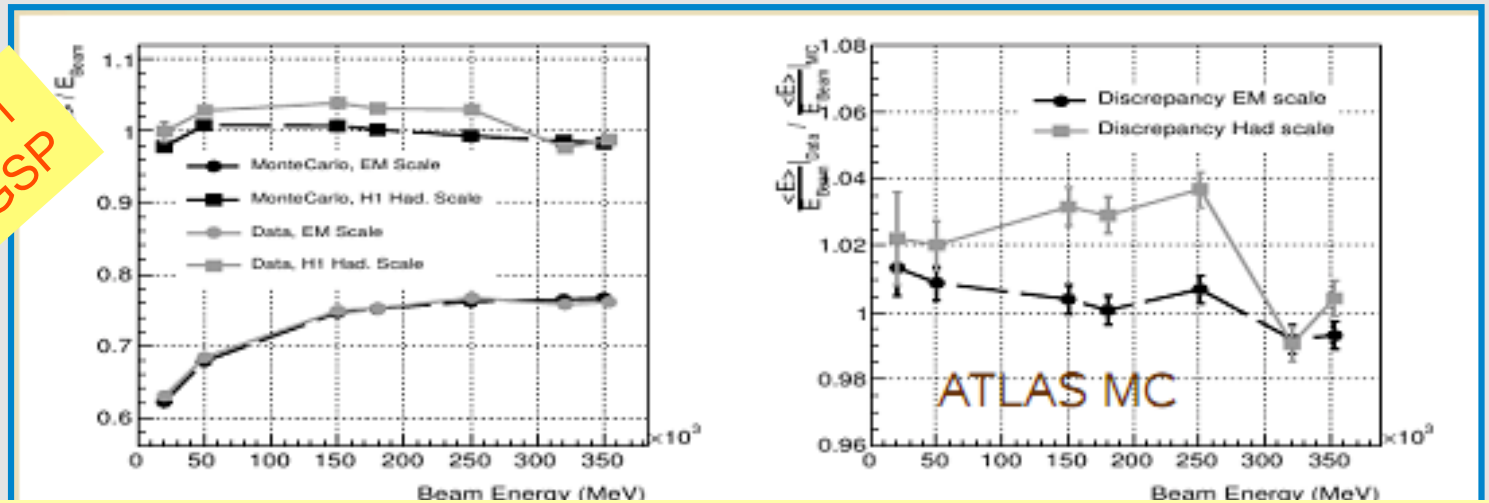
A lot of this studies are at very good stage but they need to be organized in a single package where they are easily usable.

Also the feedback from these studies needs to be made accessible to the calibration experts to be used in the calibration package.

Digression on the pre-jet studies

Any hadron calibration scheme may be assessed in the simple scenario of the CTB comparing the MC/data agreement before and after applying the calibration scheme.

Example H1 calib - QGSP



P.Francavilla's Laurea Thesis

MC/Data maximum disagreement: 2% @ EM scale - 4% @ HAD scale

It is important to carry out this study, for all hadron calibration scheme we want to use in ATLAS, with the most recent G4-model (QGSP_Bertini) since this will be the reference point of "best agreement" for single hadron is ATLAS.

WP2 works going on ...

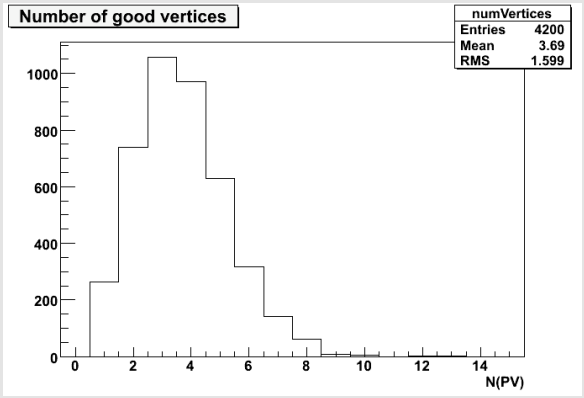
Works that are going on and that should be organized in the Jet Performance / data package:

- P.Francavilla – Boostrap method for high p_T jets
- P. Giovannini – Local hadron calibration and full hadronic ttbar
- V.Giangiobbe – Assessing the uniformity of the jet scale

Example: towards Pile-up subtraction

- A preliminary study to subtract PU contribution is under development
- Base idea (CDF): measure luminosity from the number of reconstructed primary vertices in the event and apply PU correction depending on this quantity
- Initial investigation performed in ATLAS with di-jet events with low luminosity PU (on avarage 2.3 additional MB events)

Example: ATLAS jets with pileup



Counting number of vertices from data
Applying quality cuts on vertex fitting
<N>=3.7, expected: 1 di-jet + 2.3 MB events

Effect of PU is a pedestal offset to data.
Leading jet in J6 sample is shifted of about 8 GeV towards higher energies.
Results obtained on MC jets.