Some Thoughts On Possible Metrics For Calibration Comparisons

Chiara Roda & Peter Loch

THE UNIVERSITY OF ARIZONA.
Arizona's First University.

Comparisons (1)

P. Loch
U of Arizona

So far ... comparison based on MC or based on data

- Linearity, resolution, uniformity
  - Obvious requirements – but do we determine them correctly?
  - pT or energy matches?
    - Energy – it's a calorimeter after all!
    - But it needs to be studied as function of meaningful experimental observables (pT, y, eta…)
  - Gaussian, truncated Gaussian, RMS,…
    - Sensitivity to pile-up?
    - See later – but let's not forget tails and other non-Gaussian distribution features!
- Efficiency, fakes is this relevant to decide for calibration ?
  - Likely not simple per-jet quantifiers
    - Rather we should try to address in the context of topology, e.g., how efficiently do we find a jet at a certain direction, with certain pT, if it there is another jet/electron/gamma/muon/significant amount of calorimeter energy/track bundle is near by?
  - Not clear we are doing the correct thing – matching strategies, topologies?
    - What is actually efficiency? Jet not connected to final state is fake?
    - More data driven approaches – not trivial with precision?

Comparisons (2)

P. Loch
U of Arizona
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...and more stability against pileup and noise are very important

- More observables supporting refined physics analysis
  - In-jet pile-up boost/suppression?
    - Stability of JES and constituent signal scales against noise & pile-up
  - Jet shapes for calibration and physics
    - How useful and stable is this for the various strategies?
  - Sub-jet structure resolution for physics
    - It is useful at least for high pT jets – and there are requests from physics! Can also include single jet mass
  - Physics observables
    - Di-jet mass resolution
    - W (top?) mass spectroscopy
  - Not all available with sufficient statistics on day 1
    - But need to be considered if we really go for one jet calibration (see later)
- Systematic error propagation evaluation ?
  - How well is this supported by the various schemes?
    - Topology dependence

Statistical Analysis

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U of Arizona
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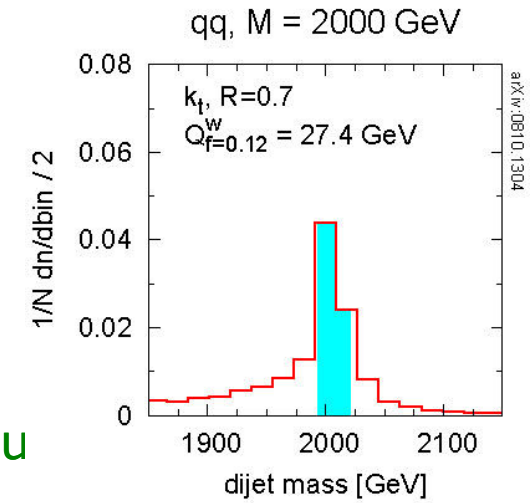
Need to understand differences to expected (Gaussian) behavior of response function



- Use all statistical estimators
  - Mean, median, mode, skewness, kurtosis, quantiles, other tail and asymmetry measu
- No reason not to do this day 1
  - "Classic" stuff – no excuses
  - Some are useful for trends only, of course
- LHC physics analysis is discovery driven
  - Understanding of tails in response is extremely important
    - Calibrations have to decrease the tails in response function!

Common software

- JetPerformance good basis
  - New design with better scalability

Concerns

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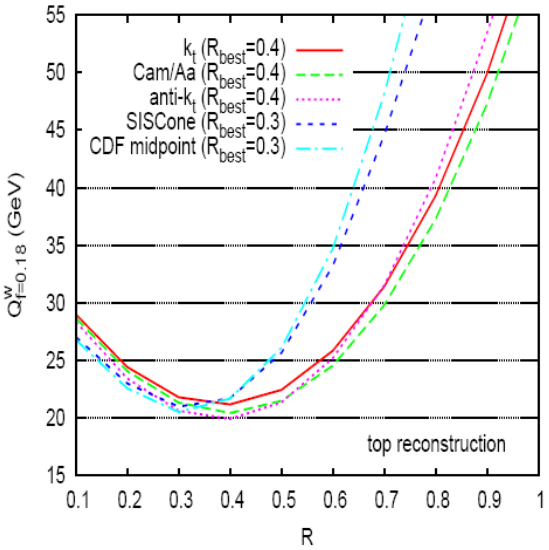

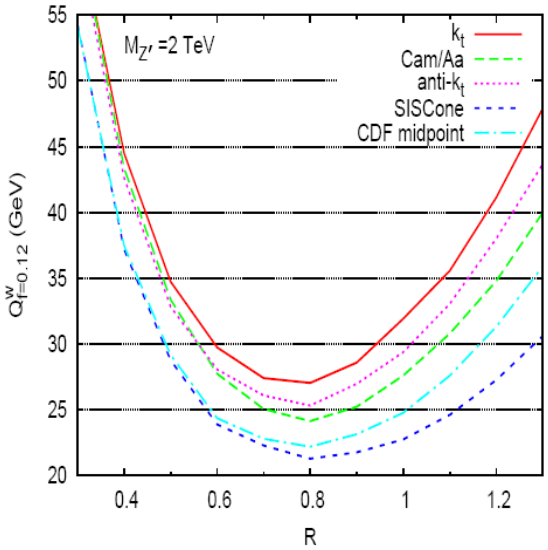

Stay open minded

- It is by no ways clear that one jet algorithm and one calibration is sufficient
  - Physics analysis may require different approaches for different final states
- Early (< 1 year of good real data) rejecting of suggested approaches can limit us forever
  - Hard to revive once discarded a signal choice or calibration scheme, we may never get it back!
    - Lack of interest/man power during physics running
  - Means we may not use our detector as we should forever!

But it would be nice to have only one calorimeter signal choice

- You guess my preference!

Combined Test beam data

P. Loch
U of Arizona

One very important sample to understand the behaviour of our calibration is CTB data. This is a tool that can be exploited much more and that should be kept as a reference.

It is the only clean (nearly clean) data sample of hadrons with known truth …

It can give important help in understading the systematics