

Discussion on measurement definitions based on truth particles at SM@LHC

black: original text blue: ALICE comments red: new items
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Definition of stable particles entering the detector

ALICE Definition:

Particles produced in the collision including products of strong and electromagnetic decay and excluding feed-down from weak decays of strange particles.

Extrapolations or Fiducial Cuts:

Both are model dependent.

In case of fiducial cut because of resolution effects (de-convolution kinematic efficiency)

Definition of Leptons

Leptons from W/Z bosons

Treatment of radiated photons from leptons (born/bare/dressed)

Central Barrel electrons (statistics limited)

Bare muons in fwd muon spectrometer (no calorimetry)

Bare muon easier to define in high-occupancy HI environment. Use same cuts for pp (p-A) as reference.

Tau-leptons: treatment of electrons and muons from tau-lepton decays, definition of tau decay

Isolation requirements for leptons

No tau analysis

Definition of jets and b-tag for jets

input particles: definition of hadrons treatment of neutrinos, muons

ALICE, full and charged jet reconstruction. For full jet reconstruction: correct to all particles (including neutrinos)

Pile-up correction algorithms applied to truth and reconstructed jets treatment of particle from the underlying event

In heavy ion collisions

- large contribution from UE to energy fluctuations requires
 - jet-by-jet correction of the energy scale
 - deconvolution
 - fake-jet rejection (minimum jet energy, min. pT cut on leading particle)
- Possible model dependence
 - leading particle cut needs knowledge about fragmentation function
 - kinematic efficiency in de-convolution
 - how to include possible back-reaction of the medium in jet definition ?

Particle correlations

- **Purist view:** only correlation function can be measured and compared to theory.
- **Pragmatic approach:** decompose into background, jet-like correlations, flow

- algorithmic definition of signals (as for jets)
 - for example there is no "true" correlated particle yield
- Measured HBT radii depend on background assumptions
 - is there a true "radius" ?

Truth jet-ID: treatment of jets with only photon or lepton constituents

Lepto-jets ?

Not relevant

Definition of b-jets, matching B-hadrons (similar for charm)

MC definition: HF-hadron within $R < 0.4$ of jet axis.

How to treat gluon splitting ?

Relevant for jet quenching (gluon might be equally relevant for jet properties)

Definition of the missing transverse momentum object

Not relevant

Overlap jet/lepton treatment

Not relevant (so far)

Order/flow chart of truth particle building, e.g. start with photon dressing around prompt-leptons (order e, mu, tau ?), built jets etc.

Not relevant

Complex final states: top quarks, ZZ cross sections, Higgs boson production modes and decays etc.

Not relevant

Event characterization (centrality, event plane, ...)

Centrality parameters (number of binary collisions, number of participants, ...) are not directly measurable.

- Needs models to connect to measured centrality estimators
- For small systems (e.g. p-A): event sample bias can be different in data and models

Discuss common activity estimator for small systems between ALICE, ATLAS and CMS, which should not supersede the estimators developed and optimised by the individual experiments, but provide an additional tool, in particular to allow direct comparison of results.

Consider discussion on common definition for Ultra Peripheral Collisions.