Pseudorapidity density measurement for pp collisions at $\sqrt{s} = 2.76\,\text{TeV}$ with the ALICE detector

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Outline

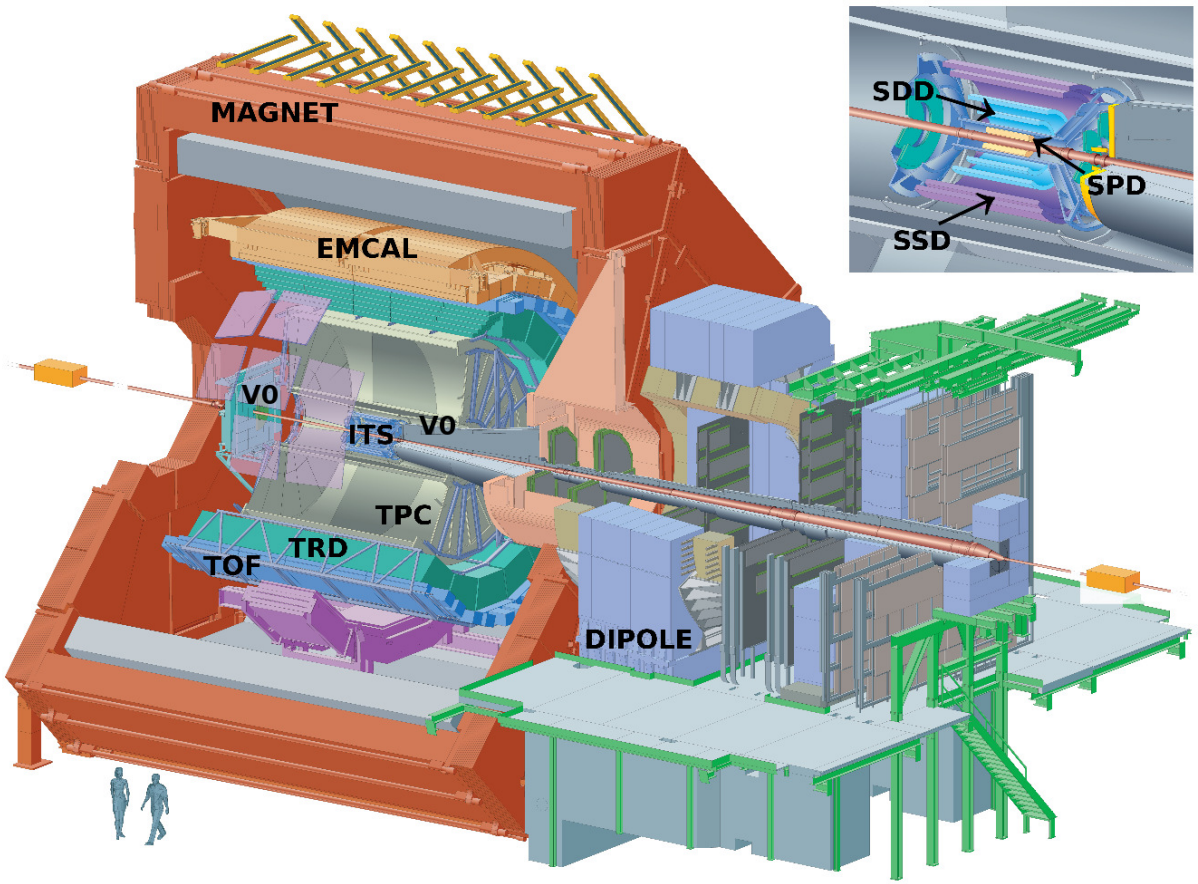
Introduction

- ALICE: Study properties of the quark-gluon plasma (QGP)
- At high temperature T and high baryochemical density
  $\longrightarrow$ phase transition to QGP (quarks and gluons not confined)
- Hard processes well understood (QCD calculations)
- Soft processes: perturbative QCD not applicable
  $\longrightarrow$ phenomenological models

- Study pseudorapidity density $\frac{1}{N_{events}} \frac{dN_{ch}}{d\eta}$
  with pseudorapidity $\eta = -\ln \tan(\frac{\vartheta}{2})$
- Compare measurement with prediction of models
  $\longrightarrow$ model which describes soft processes best
  $\longrightarrow$ if necessary MC tuning

ALICE - A Large Ion Collider Experiment

- Inner Tracking System
  - Silicon Pixel Detector
  - Silicon Drift Detector
  - Silicon Strip Detector
- V0
- Time Projection Chamber
- Transition Radiation Detector
- Time of Flight
- Electromagnetic Calorimeter



Data sets, event and track selection

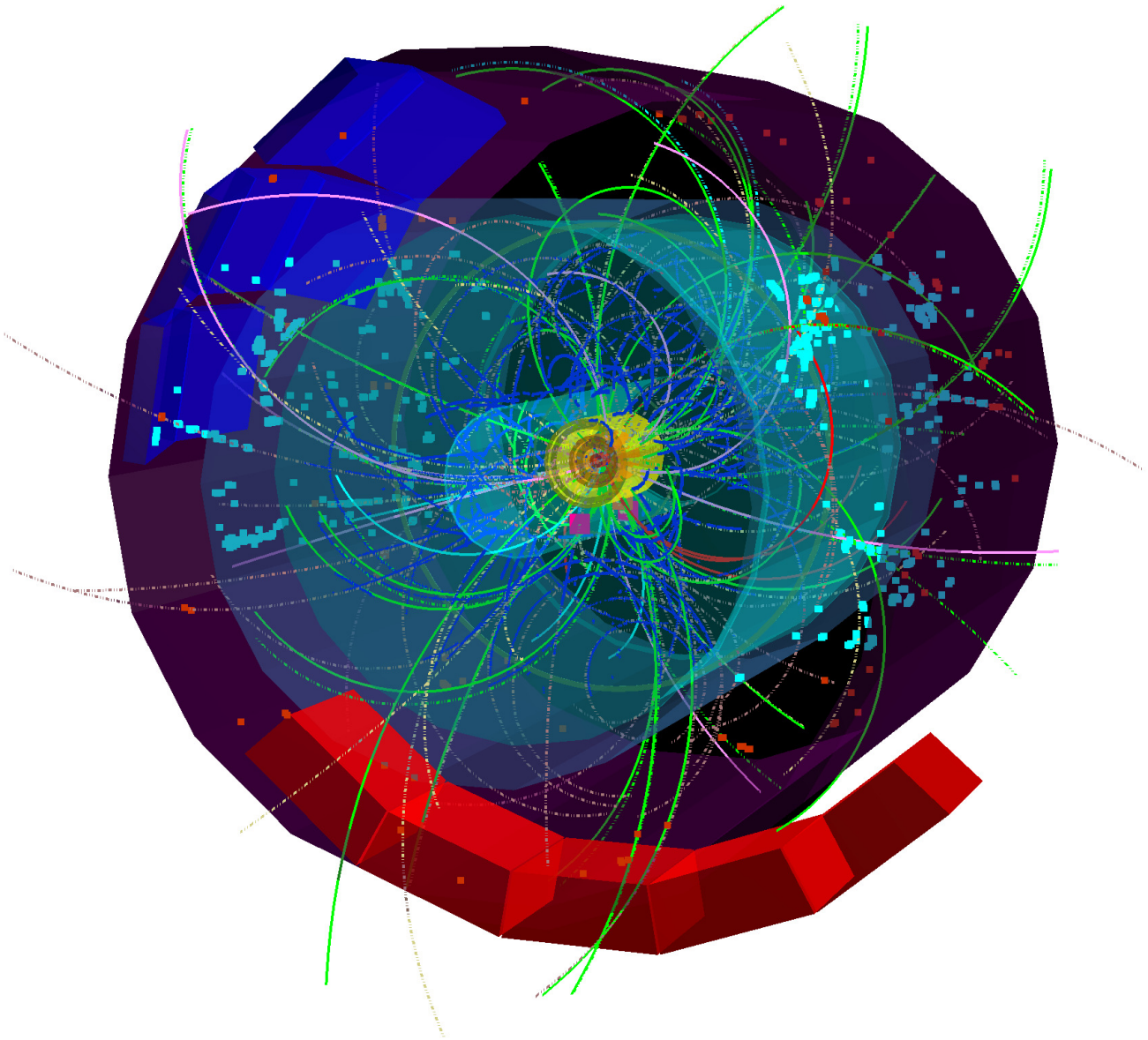
Data sets

- Monte Carlo (MC) to determine correction factors and validate correction (1.092.400 events)
  MC Truth and reconstructed MC after detector simulation
  (ESD = event summary data) for pp collisions at $\sqrt{s} = 2.76\,\text{TeV}$
- Data for pp collisions at $\sqrt{s} = 2.76\,\text{TeV}$ (8.644.514 events)

Event and track selection

- Require minimum bias trigger and reconstructed vertex
- Vertex position along z-axis: $-10.0\,\text{cm} \leq \text{vtx-z} \leq +10.0\,\text{cm}$
- MC Truth: Physical primary charged tracks
- MC ESD: Tracks reconstructed from 2 clusters in SPD and originating from primary vertex

$\frac{1}{N_{events}} \frac{dN_{ch}}{d\eta}$ $\rightarrow$ counting both events and tracks $\rightarrow$ correcting both



Correction procedure

Track correction (applied on track level)

- Tracking efficiency, tracks caused by secondary particles or decay of primary particles
  $\longrightarrow C_{track}(\eta, \text{vtx-z}) = \frac{\#\text{ tracks in MC Truth}}{\#\text{ tracks in MC ESD}}$ for events with trigger & vertex

Correct each track with C_{track}

Vertex reconstruction correction (applied on event level)

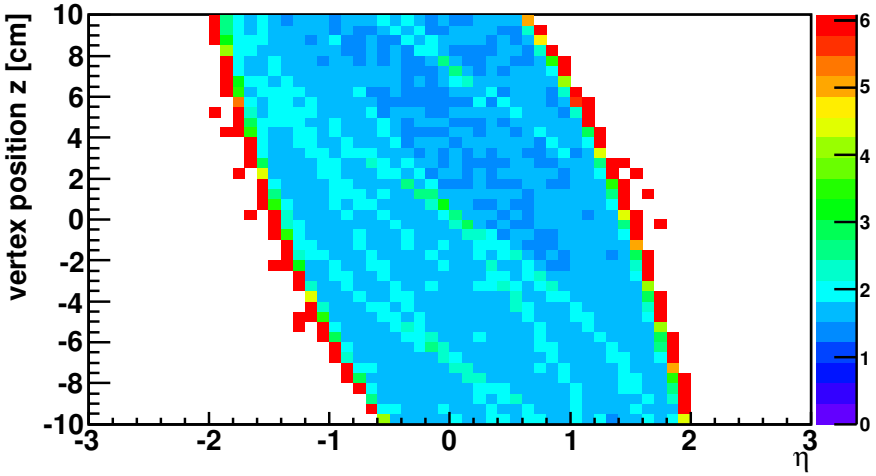
- Not reconstructed vertex position
  $\longrightarrow C_{vertex}(N, \text{vtx-z}) = \frac{\#\text{ events with trigger}}{\#\text{ events with trigger \& vertex}}$

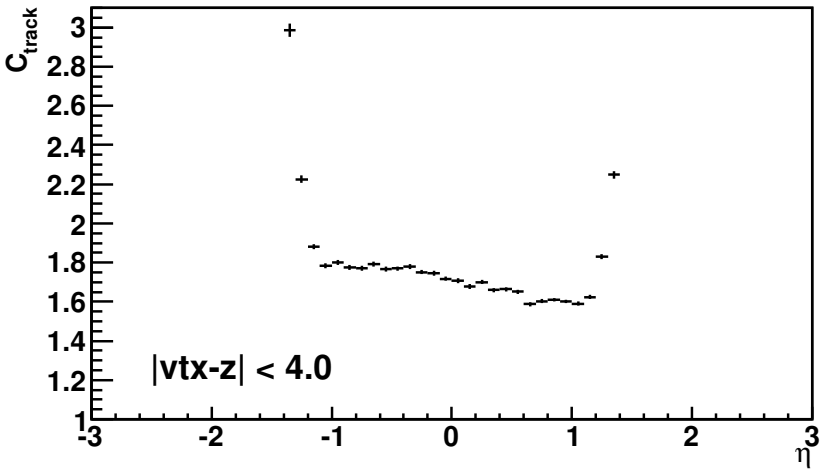
Trigger correction (applied on event level)

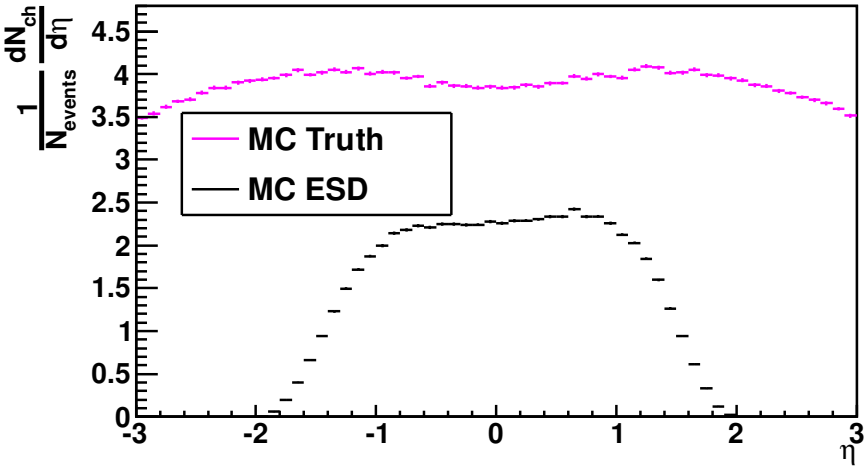
- Not triggered events
  $\longrightarrow C_{trigger}(N, \text{vtx-z}) = \frac{\#\text{ events in total}}{\#\text{ events with trigger}}$

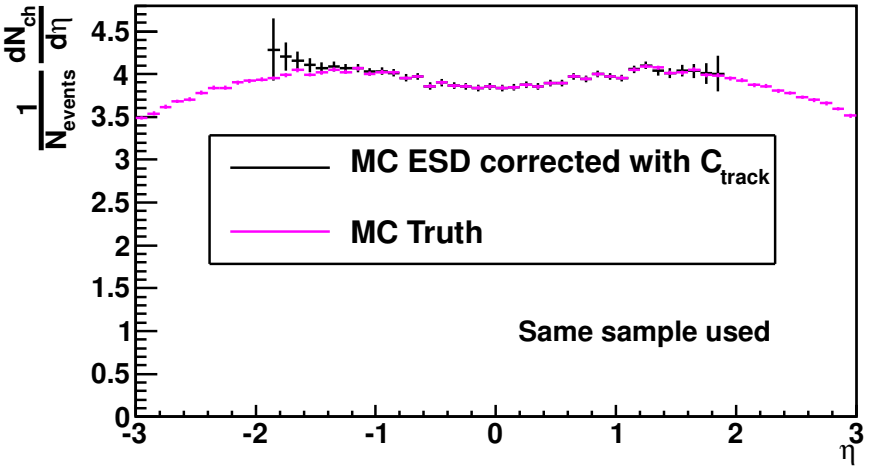
Obtain real number of events by reweighting with w where $w = C_{vertex} \cdot C_{trigger}$

Track correction

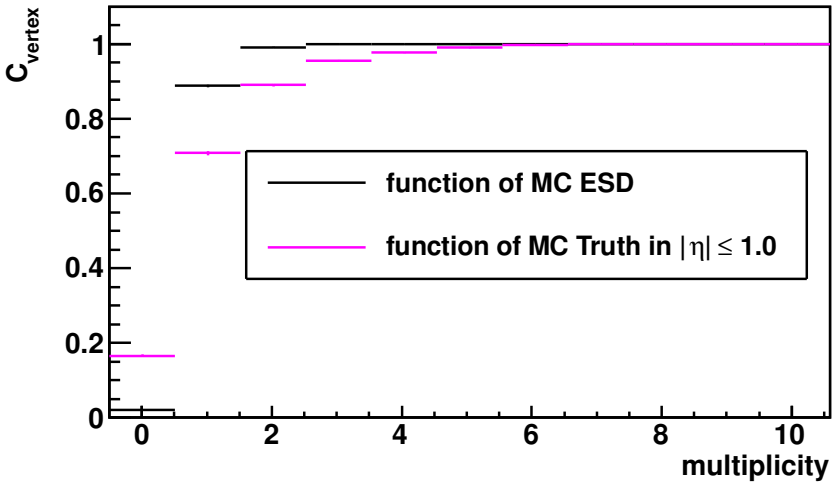


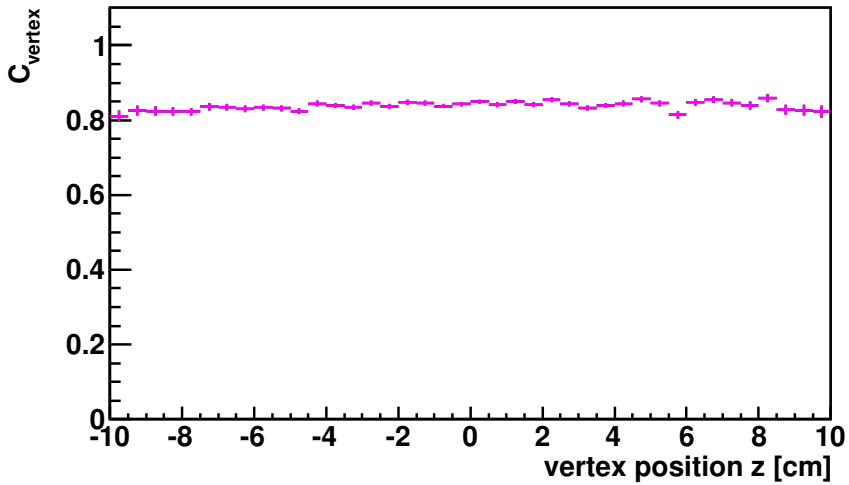


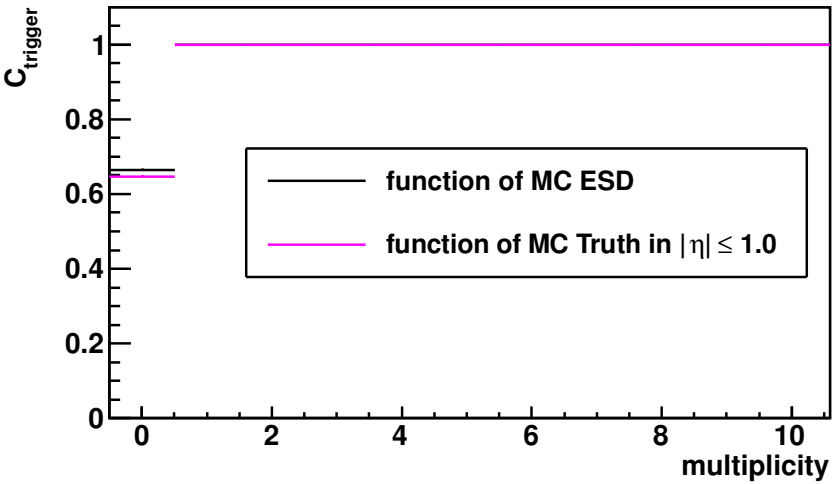


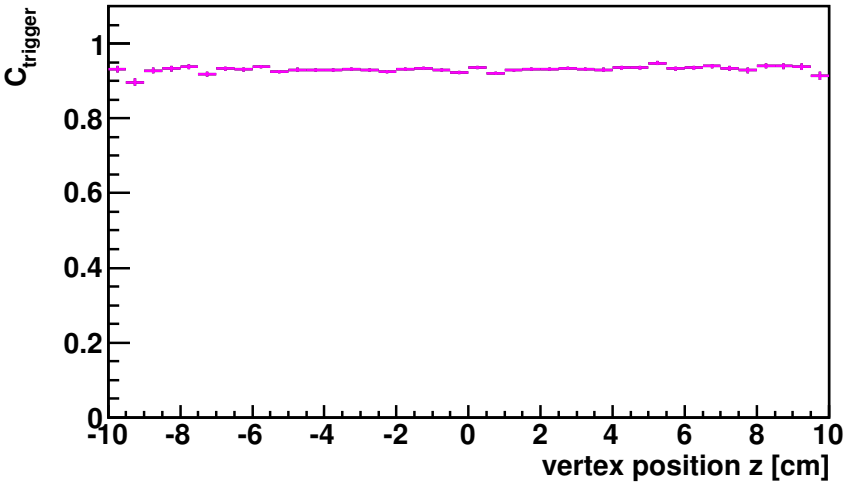


Vertex and trigger correction









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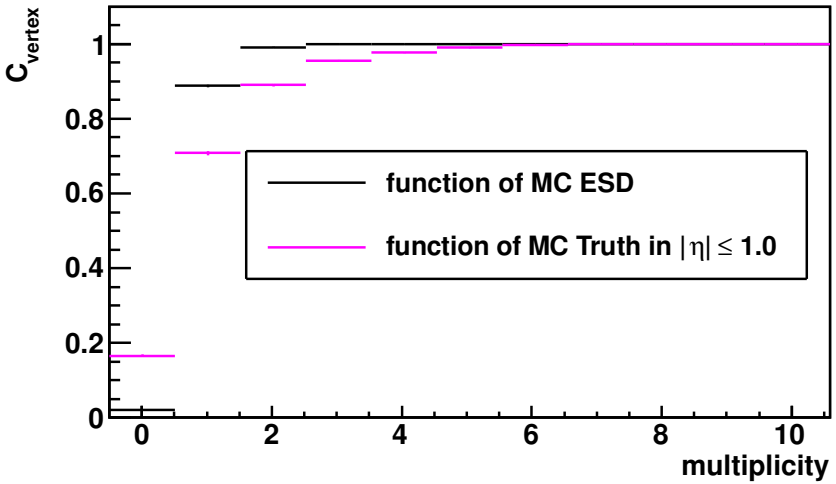

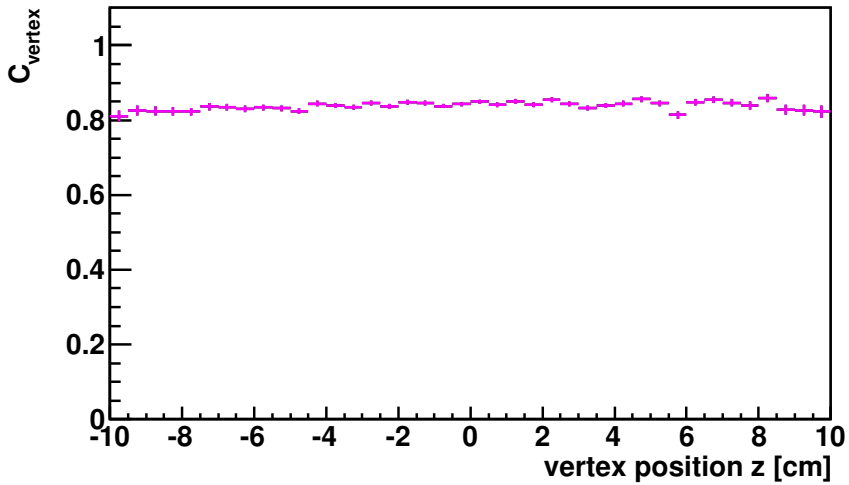

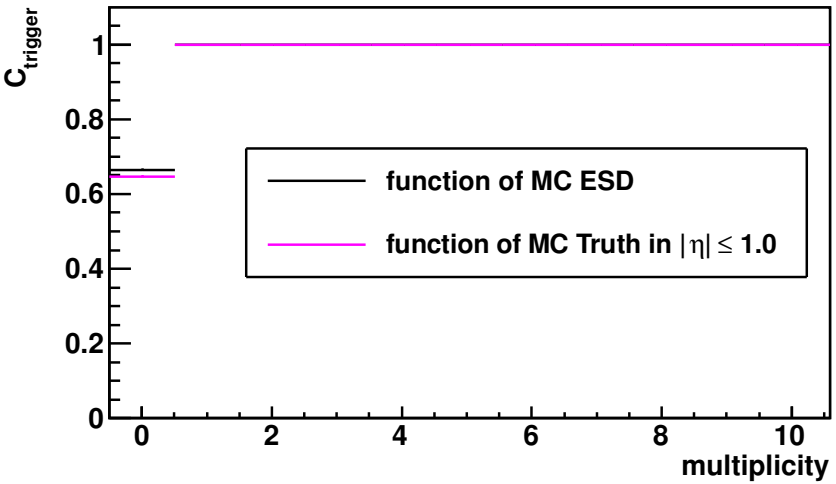

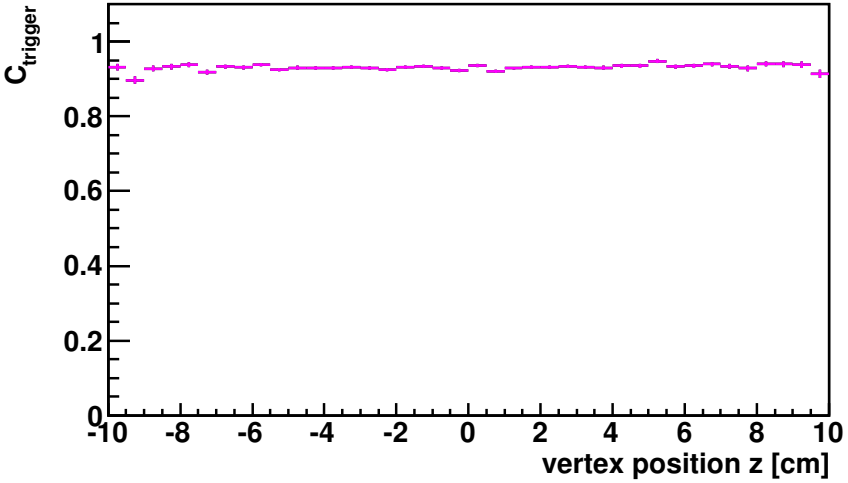

Next step: apply corrections

Summary and outlook

Summary

- Measurement of pseudorapidity density at $\sqrt{s} = 2.76\,\text{TeV}$ for pp collisions
- Correction procedure already developed
- Application of track correction factor on MC ESD reproduces MC Truth
  $\longrightarrow$ track correction procedure works correctly

Outlook

- Apply vertex reconstruction and trigger correction factors on MC ESD
- Apply correction procedure on data
- Repeat analysis with tracks from TPC (independent measurement)

Thank you for your attention.

References

- Image of the ALICE detector: `http://aliceinfo.cern.ch/Public/en/Chapter2/Chap2Experiment-en.html`
- Event Display: `http://aliceinfo.cern.ch/Public/ev_41_3D.png`