D^+-meson reconstruction in pp collisions $\sqrt{s} = 8$ TeV with the ALICE Detector

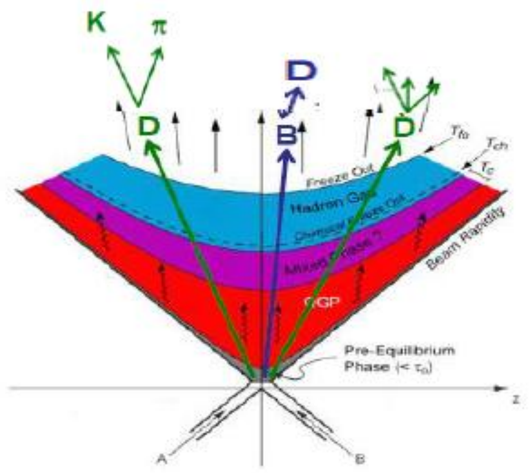
Ankita Sharma, for the ALICE Collaboration

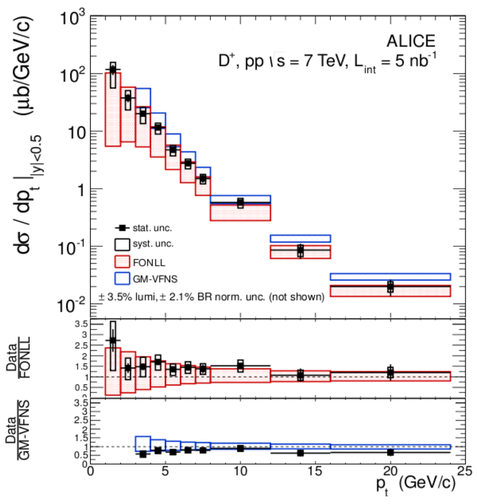
University of Jammu, India

XXIV QUARK MATTER DARMSTADT 2014

Physics Motivation

- Heavy quarks (charm and beauty) are powerful probes to investigate the properties of the hot and dense medium created in heavy-ion collisions.
- Due to their large mass heavy quarks are mainly produced in the hard partonic scattering processes occurring in the early stages of the collision.
- The produced heavy quarks travel through the medium, experiencing all the stages of its evolution and finally hadronize.
- Measurements of charm hadron production cross sections in pp collisions at LHC energies provide an important test of pQCD calculations and the necessary reference for the results from p-A and A-A collisions.
- The inclusive p_T differential production cross section of D^+ meson has been measured in pp collisions at $\sqrt{s}$ = 2.76 TeV within $2 < p_T < 12$ GeV/*c* and at 7 TeV within $1 < p_T < 24$ GeV/*c* .
- Precise p_T-differential measurements at high p_T are still missing.





(ALICE Coll., JHEP01 (2012) 128)

Experimental Set Up and Data sample

- A Large Ion Collider Experiment (ALICE) is one of the four main experiments at the Large Hadron Collider (LHC) at CERN.
- ALICE is optimized to study heavy-ion collisions.
- The detectors that are relevant for the D meson analysis are:
  - Inner Tracking System (ITS): tracking and vertexing
  - Time Projection Chamber (TPC): tracking and d*E*/d*x* for PID
  - Time of Flight (TOF): time-of-flight for PID

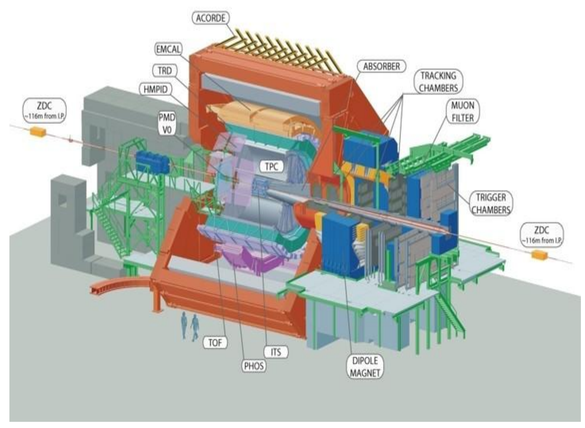
Data Sample used:
pp collisions at $\sqrt{s}$= 8 TeV

Triggers used to analyze the data are

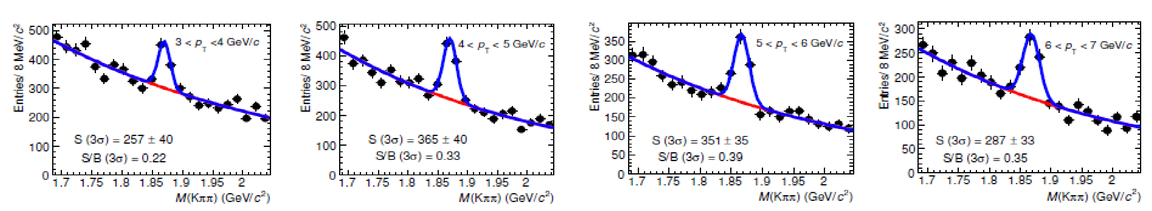
Minimum Bias Trigger: based on signal in the V0 scintillators in coincidence with a bunch crossing.

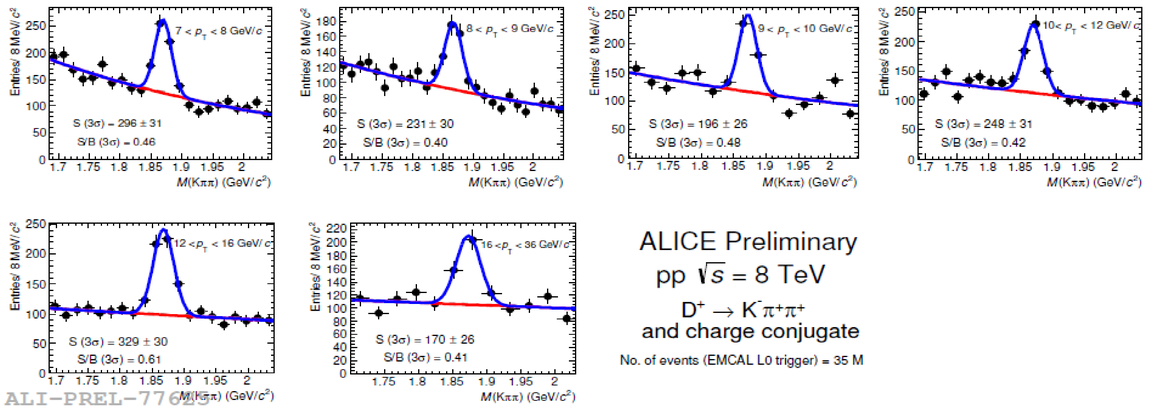
EMCAL L0 Trigger: based on the energy deposit in the EMCAL detector.

Number of events
MB = 113 M
EMCAL L0 = 35 M



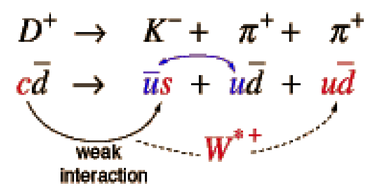
D^+ Signal in different p_T intervals at √s = 8 TeV with EMCAL L0 trigger





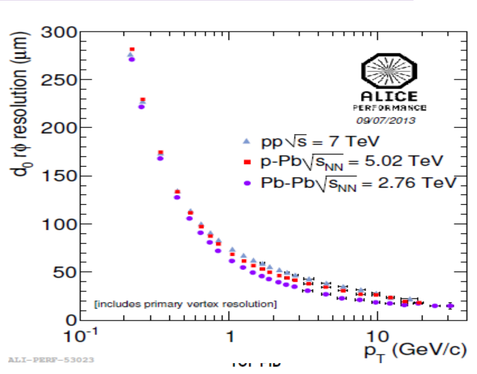
$D^+ \rightarrow K^- \pi^+ \pi^+$: Reconstruction Strategy

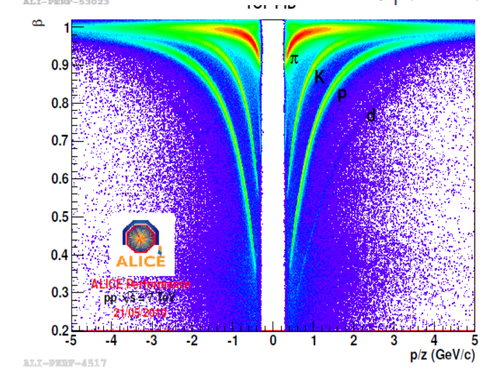
D^+ meson signal extraction is based on invariant mass analysis of fully reconstructed decay topologies displaced from the primary vertex.



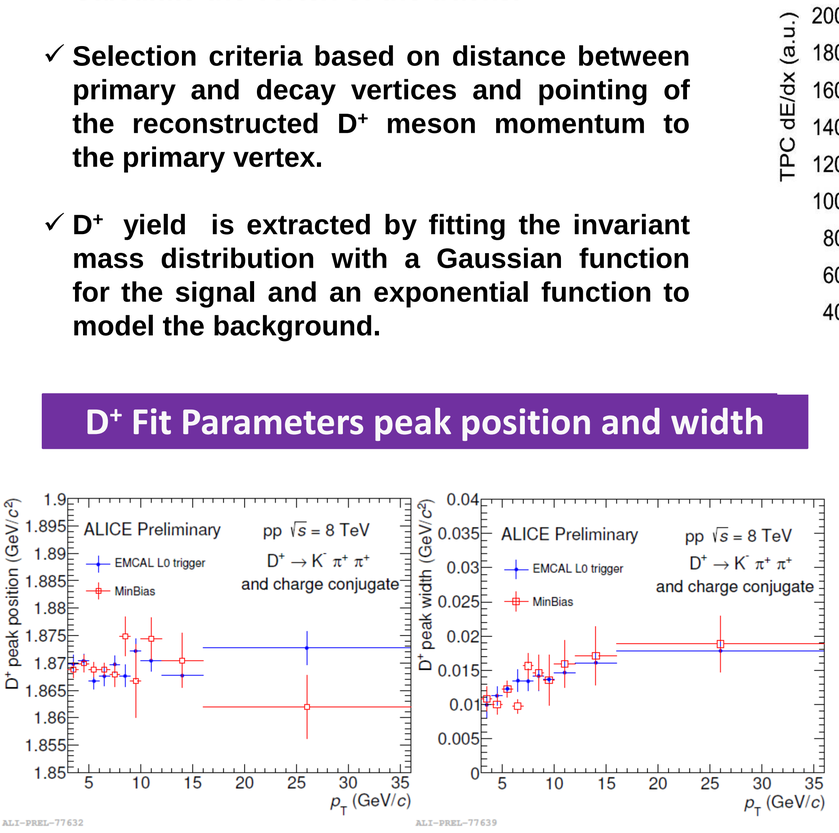
Branching Ratio = 9.13 ± 0.19%
ct ≈ 312 μm,

- ✓ Build triplets of tracks with correct combination of charge signs and large impact parameters.
- ✓ Particle identification with TPC and TOF to reduce background.
- ✓ Calculate the vertex of the tracks.
- ✓ Selection criteria based on distance between primary and decay vertices and pointing of the reconstructed D^+ meson momentum to the primary vertex.
- ✓ D^+ yield is extracted by fitting the invariant mass distribution with a Gaussian function for the signal and an exponential function to model the background.





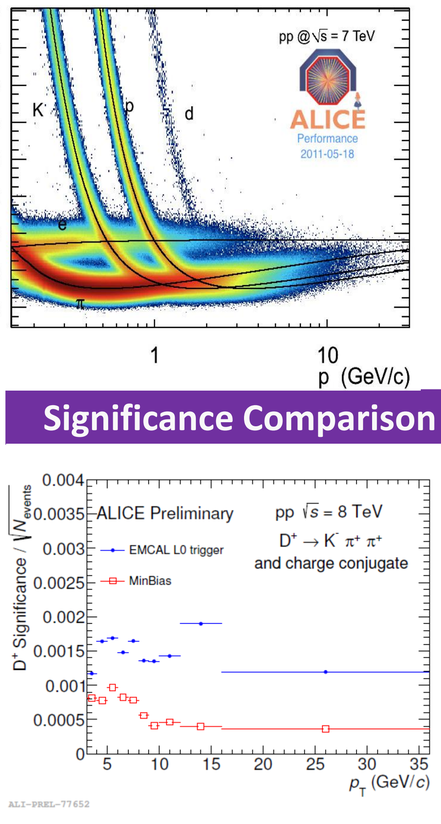
D^+ Fit Parameters peak position and width



D^+ meson peak position compatible with the D^+ mass for both triggered samples.

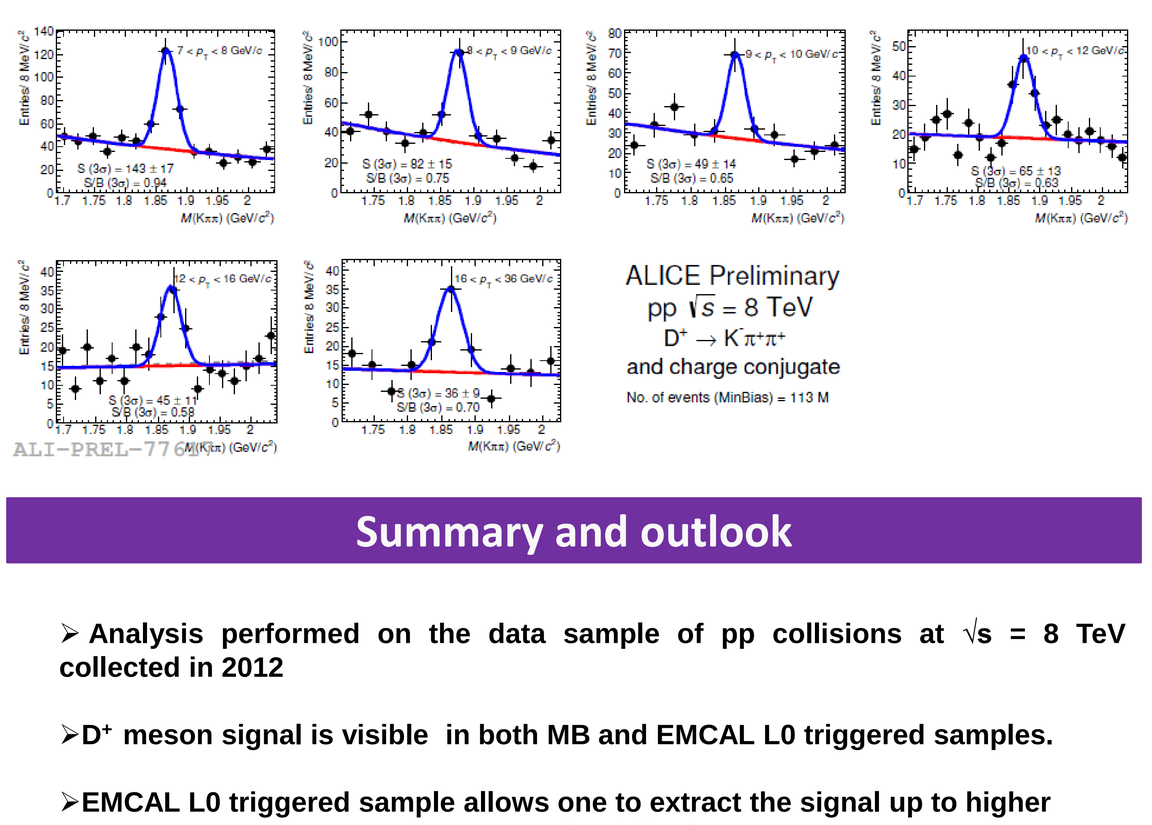
D^+ meson peak width is consistent for both trigger samples.

Significance Comparison



EMCAL L0 trigger data sample provides a large D^+ statistical significance with respect to the minimum bias trigger.

D^+ Signal in different p_T intervals at √s = 8 TeV with MB trigger



Summary and outlook

- Analysis performed on the data sample of pp collisions at √s = 8 TeV collected in 2012
- D^+ meson signal is visible in both MB and EMCAL L0 triggered samples.
- EMCAL L0 triggered sample allows one to extract the signal up to higher transverse momentum as compared to MB trigger.
- Ongoing efforts towards cross section calculation.