



D_s^+ production at central rapidity in pp collisions at 7 TeV with the ALICE experiment

G.M. Innocenti for the ALICE Collaboration

University & INFN, Torino, Italy

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Physics Motivation for D_s^+ analysis

$$D_s^+ \rightarrow \phi \pi^+ \rightarrow K^+ K^- \pi^+ \quad m(D_s^+) = 1.968 \text{ GeV} \quad \tau = 147 \mu\text{s}$$

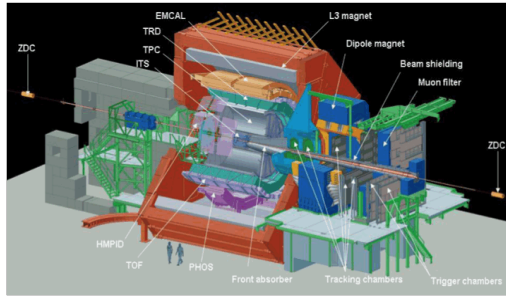
In pp collisions:

- D_s^+ meson p_T differential cross section is an important test for perturbative QCD calculations
- Measurement of the fraction of charm that goes in D_s^+
- Reference for heavy-ion collisions

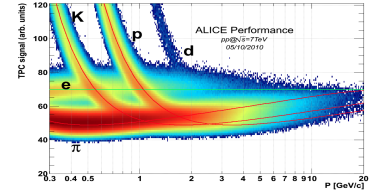
In A-A and p-A collisions:

- Study of hadronization mechanisms
- D_s^+ / D^+ ratio (fragmentation and recombination)
- Initial state effects such as modification of the PDF inside the nuclei, parton saturation and Cronin effect
- Final state effects such as parton energy loss and anisotropic flow

ALICE DETECTOR



PID identification



- TPC: Particle identified if its energy loss is compatible with a given specie Bethe Bloch within $N\sigma$
- TOF: Particle identified as Kaons if the measured time-of-flight is compatible (within $N\sigma$) with the values expected assuming kaon mass

Reconstruction Strategy

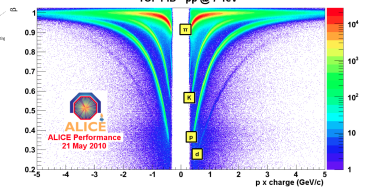
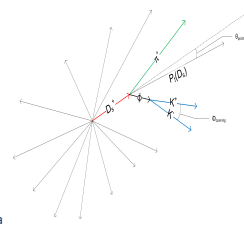
The analysis strategy is based on an invariant mass analysis of fully reconstructed decay topologies originating from displaced vertices:

- Single track transverse momentum and impact parameter selection
- Track combination with proper particle charges
- Secondary vertex reconstruction
- Selection of candidates with topological cuts based on primary and secondary vertex separation and pointing of D momentum to primary vertex
- Particle identification of the decay products

Candidate Selection

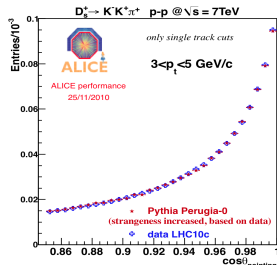
Several selection on cut variables are then applied to reduce the large combinatorial background:

- Distance between primary and secondary vertex d_{pt} (e.g. $d_{\text{pt}} > 300 \mu\text{m}$)
- Cosine of the angle between the reconstructed D meson and the D flight line $\cos\theta_D$ (e.g. $\cos\theta_D > 0.95$)
- Invariant mass of the ϕ reconstructed meson
- Dispersion of the secondary vertex
- Selections related to the angle between the momenta of the D_s^+ and its decay products



PID is crucial for D_s^+ analysis due to the presence of two Kaons in the final state

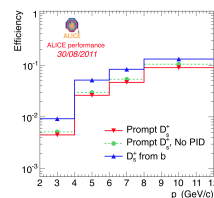
Cut variables, Data vs. MC



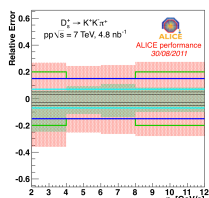
Data-MC comparison for the distribution of D_s^+ events as a function of $\cos\theta_D$ (left) and decay length (right) performed with loose analysis cuts

Good agreement between Data and MC

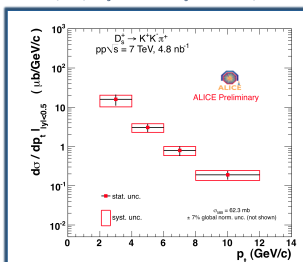
p_T differential cross section $D_s^+ \rightarrow K^+ K^- \pi^+$ in pp, $|\eta| < 0.5$



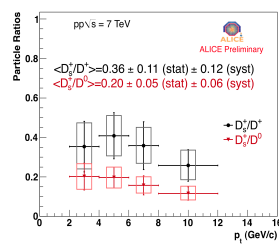
Reconstruction and selection efficiency for prompt D_s^+ meson and D_s^+ from B decays



D_s^+ systematic uncertainties as a function of p_T

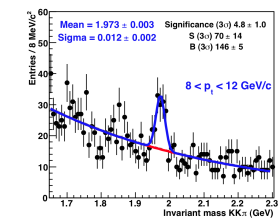
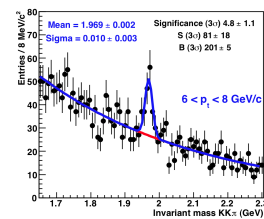
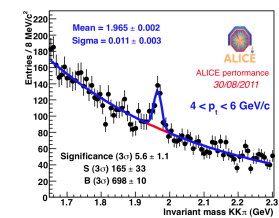
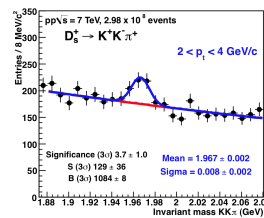


Preliminary p_T differential cross section. B-feed down corrections estimated using FONLL



Ratio between p_T differential cross sections: D_s^+ / D^+ and D_s^+ / D^0 . p_T integrated values are also shown

Invariant mass spectra



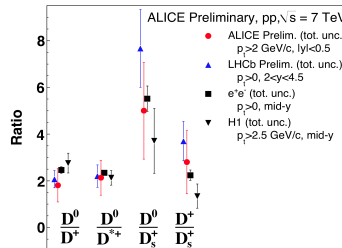
D_s^+ invariant mass spectra in four transverse momentum ranges from 2 to 12 GeV/c obtained with the full 2010 ALICE minimum bias statistics (≈ 298 millions of events)

Conclusions

ALICE detector showed to have good capabilities in the exclusive reconstruction of D_s^+ via hadronic decays:

- D_s^+ signal has been observed in four p_T bins with a good significance
- D_s^+ p_T differential cross section measured in the 2-12 GeV/c transverse momentum range

With the 2011 ALICE pp data sample, the signal significance is expected to improve and the cross section p_T range to be larger.



Ratio between p_T integrated D meson cross sections measured by ALICE compared with the results of other experiments