Measurement of D-meson production and azimuthal anisotropy in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with ALICE

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Heavy flavours in the QGP
- Heavy flavours (i.e. c and b quarks) are mainly produced in hard-scattering processes on short time scales.
- They experience the full evolution of the Quark-Gluon Plasma (QGP) created in ultra-relativistic heavy ion collisions, interacting with its constituents.

D-meson reconstruction
- $D^+ \rightarrow K^+ + \pi^0$ (BR = 3.93%)  
- $D^+ \rightarrow K^+ + \pi^0$ (BR = 9.46%)  
- $D^{*+} \rightarrow D^+ + \pi^0$ (BR = 67.7% x 3.93%)  
- $D_s^+ \rightarrow \bar{c} q$ (BR = 2.27%)
- Reconstruction of decay vertices displaced few hundred microns from primary vertex combining pairs/triplets of tracks with proper charge sign
- Particle identification (PID) of decay tracks and geometrical selection of displaced decay-vertex topology
- Efficiency correction with Monte Carlo simulations using HIJING [1] events enriched with PYTHIA [2] $c\bar{c}$ and $b\bar{b}$ pairs

Nuclear modification factor
- $R_{AA} = \frac{1}{(T_{AA})} \frac{dN_{AA}}{dp_T}$
- $v_2$ is the average nuclear overlap function, proportional to the number of binary nucleon-nucleon collisions
- It provides information about the mechanism of energy loss in the QGP
- The suppression decreases from central (0-10%) to peripheral (60-80%) collisions [4]
- The comparison between $D_s^+$ and non-strange D mesons allows to study the modification of the hadronisation mechanism
- Hint of smaller $D_s^+$-meson suppression w.r.t. non-strange D mesons [4] expected in case of hadronisation via coalescence due to the enhanced production of $s$ quarks in the QGP

Time Projection Chamber
- Track reconstruction
- Particle identification via specific energy loss

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Azimuthal anisotropy
- The azimuthal distribution of particle momenta can be written in terms of Fourier expansion
- $v_2 = \langle \cos(2\phi - q_T) \rangle$
- Calculation of $v_2$ from the event plane distribution
- The comparison to model calculations can constrain medium parameters
- Models based on heavy-quark transport can fairly reproduce the data for $p_T >$ 10 GeV/c [6-12]
- Interplay of collisional energy loss, radial flow, hadronisation via recombination
- Models based on pQCD provide a good description of the data for $p_T >$ 10 GeV/c [13-15]
- Radiative energy loss dominant effect

(Time Projection Chamber)
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References