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# Charm quark and QGP interactions through the spectra and anisotropic flow of $D^0$ over the widest $p_T$ interval using Event-Shape Engineering at CMS

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The charm quark is formed almost exclusively during the initial stages of the collision, and a significant fraction of the charm quarks fragment into the  $D^0$  meson, the lightest open-charm hadron. We can gain insights into the interactions between the charm quark and the quark-gluon plasma (QGP) medium by studying the production and the flow of  $D^0$  meson in heavy-ion collisions. We study the effect of the initial shape of the collision system on the elliptic flow ( $v_2$ ) of promptly produced  $D^0$  using event-shape engineering (ESE) in PbPb collisions at 5.02 TeV, at CMS. A correlation between the initial shape anisotropy with the  $D^0$   $v_2$  would suggest that the flow gets driven by the interactions between the charm quark and the QGP and comparison with theoretical predictions allow us to unravel the mechanism behind the generation of  $v_2$ . We also study the anisotropic flow of nonprompt  $D^0$  produced due to the decay of the bottom quarks and the nuclear modification factor ( $R_{AA}$ ) for prompt and nonprompt  $D^0$ . These studies provide further insights into the QGP interactions of heavy quarks like charm and bottom in heavy-ion collisions in different  $p_T$  regions ranging from 1–40 GeV/c, the widest ever performed with ESE, and centralities between 0–50%.

## Category

Experiment

## Collaboration (if applicable)

CMS

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