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## Measurement of heavy flavor production and azimuthal anisotropy in small and large systems with ATLAS

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Measurements of heavy flavor hadron production and their correlations in A+A collisions provide insight into the energy loss mechanism and transport properties of heavy quarks in the QGP. From this perspective, the same measurements in p+A collisions thus serve as a necessary baseline for understanding the observations in A+A collisions. Additionally, detailed studies of the azimuthal anisotropy for heavy flavor hadrons in p+A may help address the question of whether the observed long-range "ridge" correlation arises from hard or semihard processes, or if it is the result of mechanisms unrelated to the initial hardness scale. This talk presents ATLAS measurements of heavy flavor production, via their semi-leptonic decay to muons in  $\sqrt{s_{\rm NN}} = 2.76$ TeV Pb+Pb and pp collisions, and via identified prompt D mesons in  $\sqrt{s_{\rm NN}} = 8.16$  TeV p+Pb collisions. Heavy flavor muon yields are observed to be strongly suppressed in Pb+Pb collisions compared to that in pp collisions. On the other hand, the prompt D meson production in p+Pb collisions shows no obvious modification compared to the theoretical predictions for pp collisions, indicating relatively small cold nuclear matter effects for D meson production. The  $p_{\rm T}$  and centrality dependence of flow harmonics  $v_2 - v_4$  associated with heavy-flavor muons in Pb+Pb are also presented. The measured  $v_2$  decreases over the  $p_T$  range of 4-14 GeV, and shows a systematic variation with centrality that was observed in other  $v_2$  measurements. The anisotropy measurements are extended to 8.16 TeV p+Pb collisions, where the azimuthal modulations of heavy-flavor muons, prompt D mesons and J/ $\psi$  are studied using two-particle correlations. The statistical significance of the presence or absence of long range correlations involving heavy flavor production in p+Pb events is quantified.

## **Content type**

Experiment

## Collaboration

ATLAS

## Centralised submission by Collaboration

Presenter name already specified

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