

Updated open heavy flavor studies with the ECCE detector performance

ECCE physics analysis note: [ecce-note-phys-2021-04](#)

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Outline

- Updated heavy flavor hadron reconstruction with the tracking performance from the 2nd ECCE simulation production.
- Projection of flavor dependent nuclear modification factor R_{eAu} in 10+100 GeV e+Au collisions.
- Conclusions and Outlook.

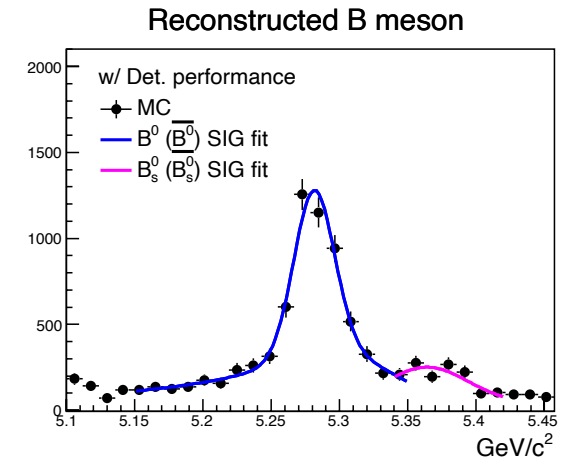
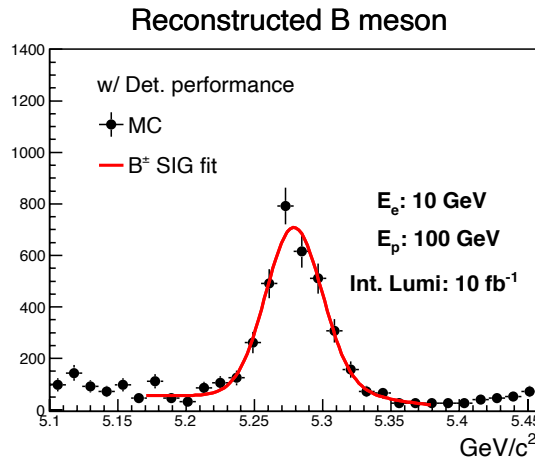
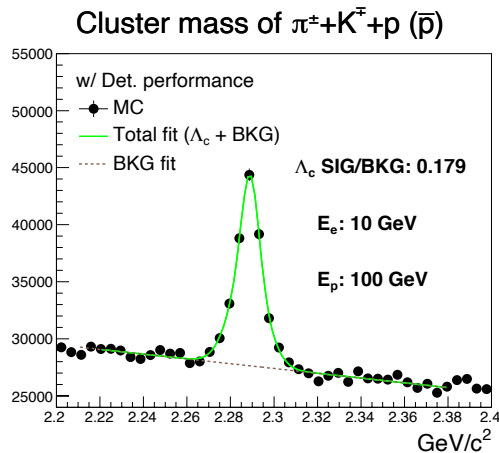
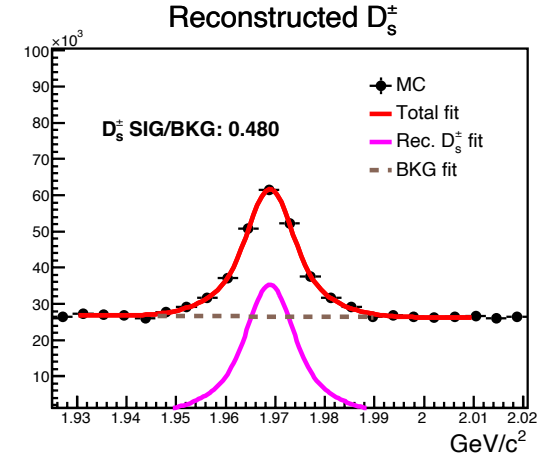
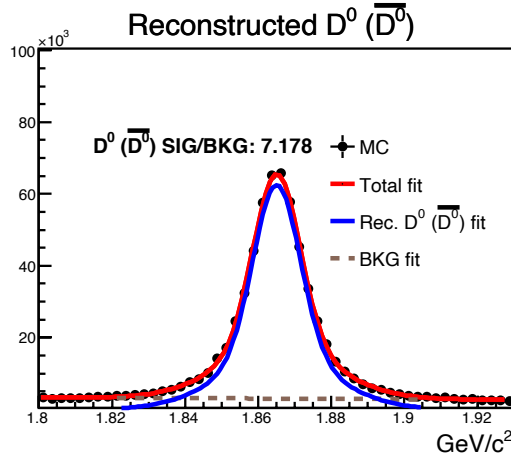
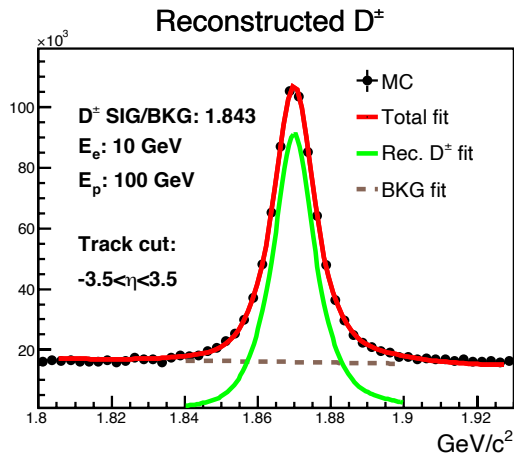
Simulation Configuration

- Event generation: PYTHIA8
 - With the 25 mrad beam crossing angle.
 - $Q^2_{\min} = 10 \text{ GeV}/c^2$
 - Scaled with the $Q^2_{\min} = 1 \text{ GeV}/c^2$ events.
 - Total number of events: 60M, scaled the projections with the 10 fb^{-1} e+p luminosity.
- Detector performance:
 - Using the evaluated tracking performance from the 2nd ECCE simulation campaign. See latest studies in https://indico.bnl.gov/event/12860/contributions/54893/attachments/37316/61492/ECCE_tracking_20210924_XuanLi.pdf
 - Other detector performance listed in the EIC yellow report.
- Particle momentum, space and energy response smeared by the detector performance.

Reconstructed HF hadrons in 10+100 GeV e+p collisions

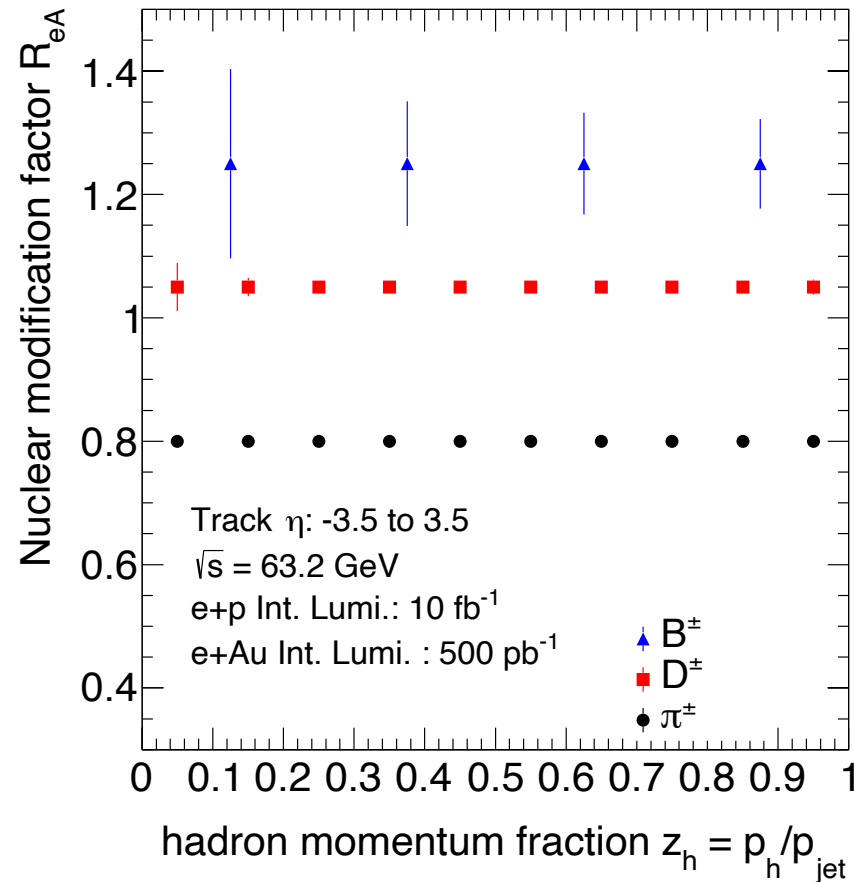
- Clear $D^\pm$, $D^0(\bar{D}^0)$, $D_s^\pm$, $\Lambda_c^\pm$, $B^\pm$, $B^0(\bar{B}^0)$ and $B_s^0(\bar{B}_s^0)$ signals found in 10 GeV electron and 100 GeV proton collisions.

PYTHIA with the ECCE detector performance evaluated in Fun4All.



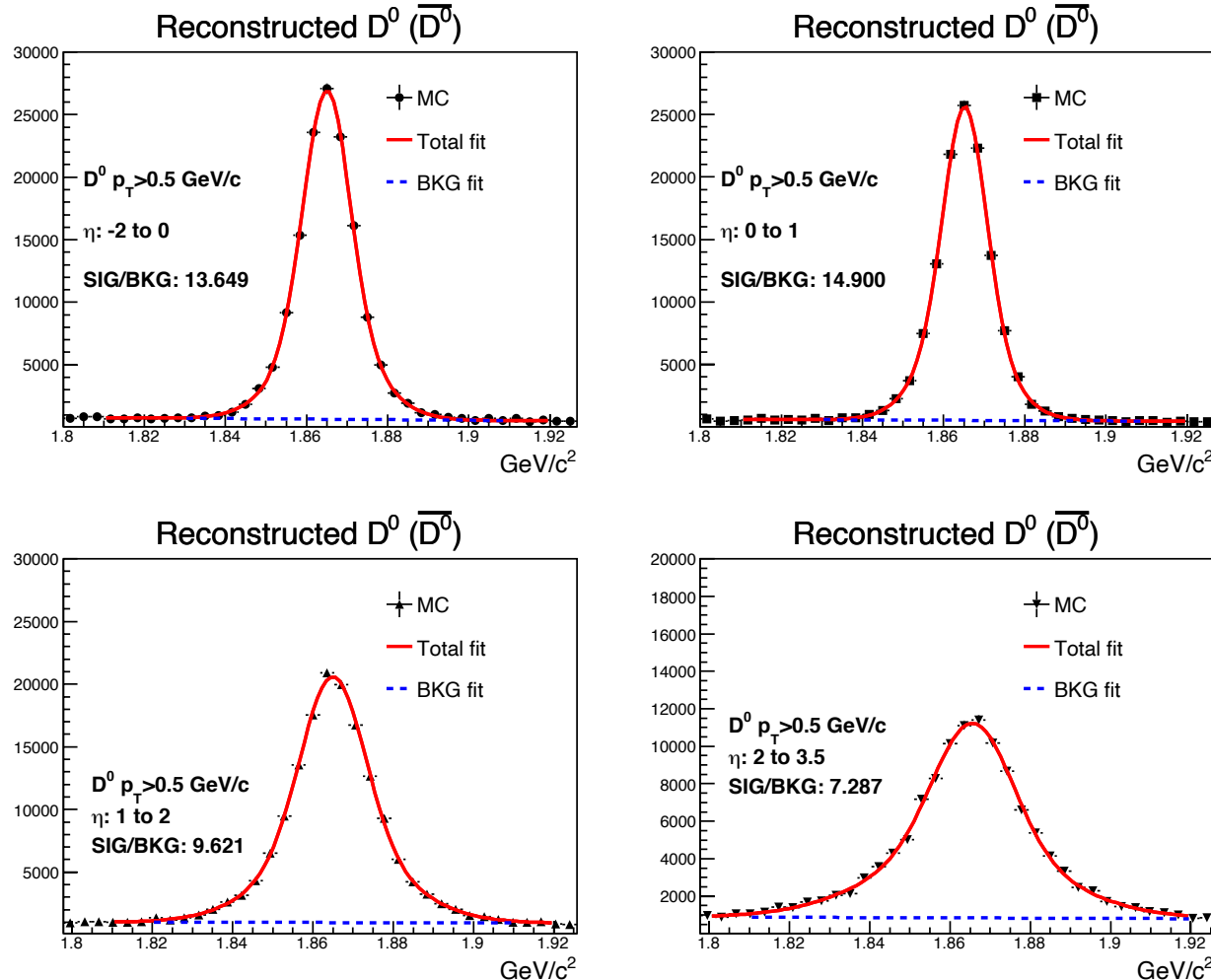
Projection of nuclear modification factor R_{eA} in 10+100 GeV e+p/Au collisions

- Flavor dependent R_{eA} statistical uncertainties versus hadron momentum fraction z_h in 10+100 e+p and e+Au collisions.



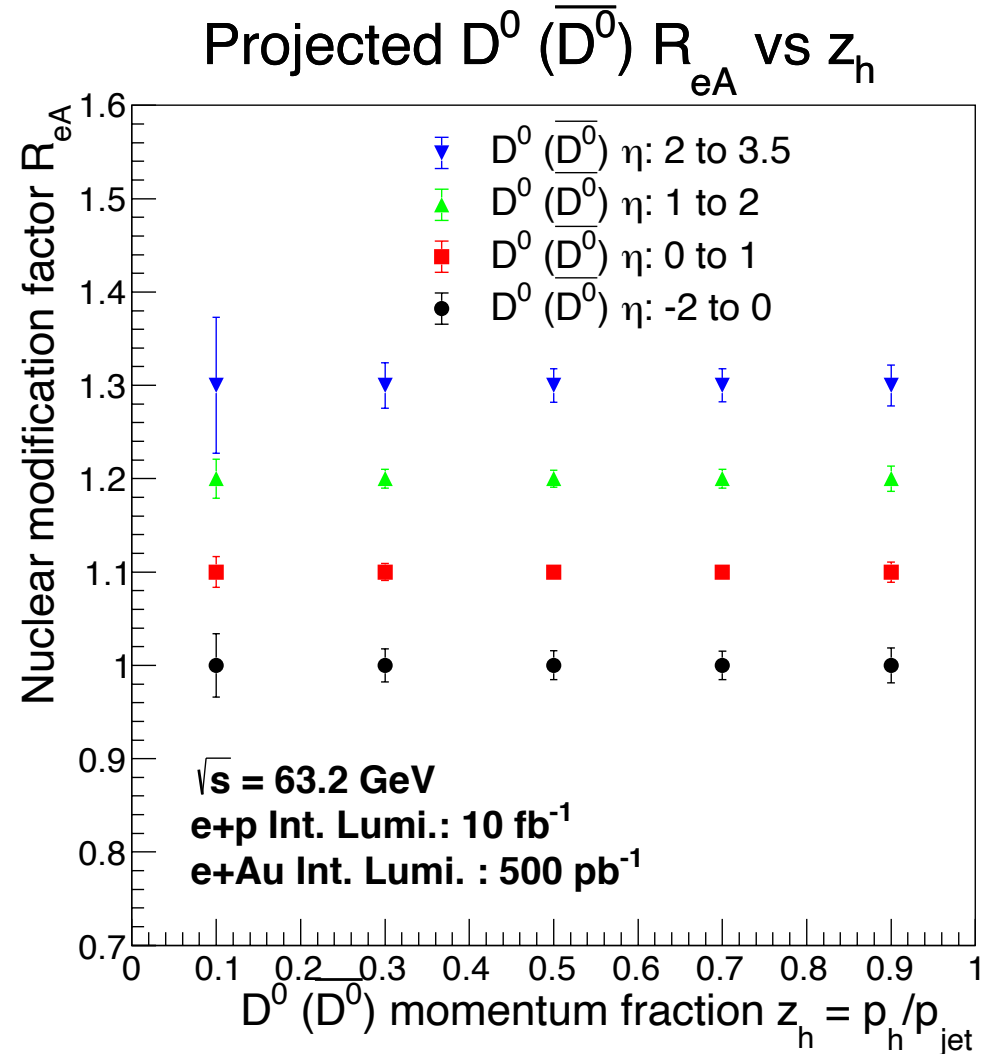
Reconstructed $D^0(\bar{D}^0)$ in 10+100 GeV e+p collisions

- Pseudorapidity dependent $D^0(\bar{D}^0)$ meson reconstruction with the tracking configuration from 2nd simulation production.



Projection of reconstructed $D^0(\bar{D}^0)$ nuclear modification factor R_{eA} in 10+100 GeV e+p/Au collisions

- Pseudorapidity dependent reconstructed R_{eA} statistical uncertainties versus hadron momentum fraction z_h in 10+100 e+p and e+Au collisions.



Conclusions and Outlook

- Clear reconstructed heavy flavor hadron signals have been obtained with the ECCE tracking performance from the 2nd simulation campaign.
- The projected nuclear modification factor with the ECCE tracking performance from the 2nd simulation campaign can explore the hadronization process in the nuclear medium with good precisions.
- Will update the physics projections and compare with theoretical predictions.
- More details will be documented in ecce-note-phys-2021-04.