



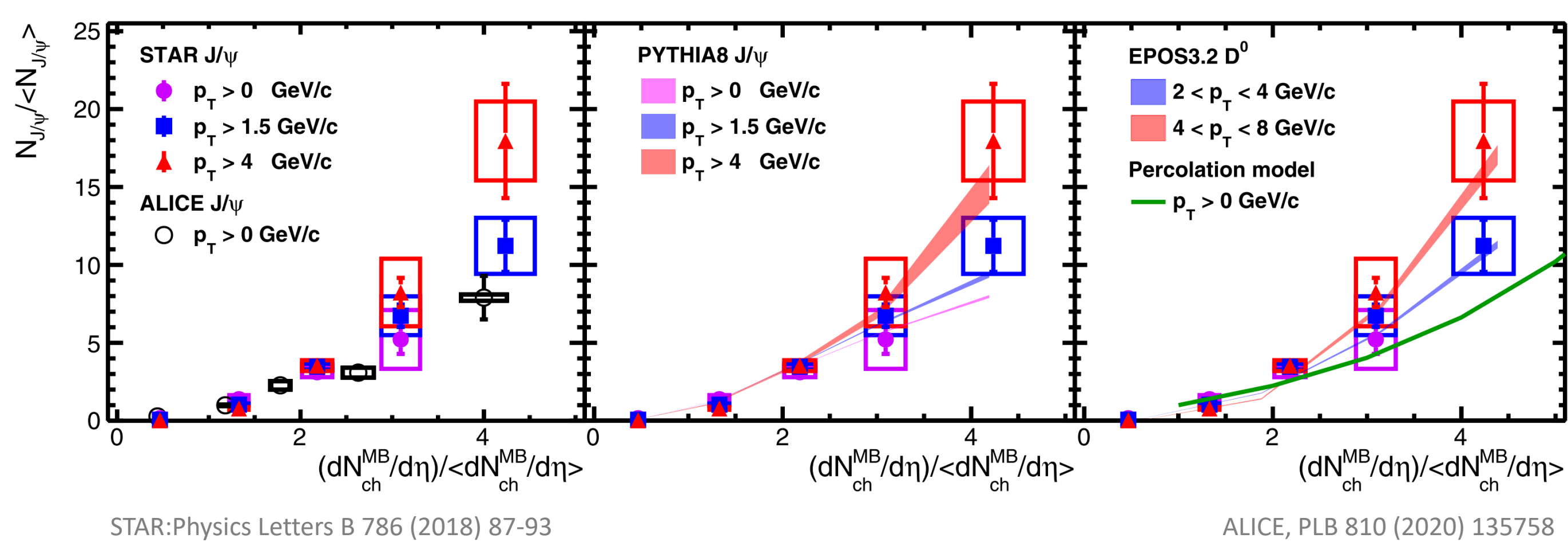
# Measurement of the event multiplicity dependence of $J/\psi$ production in p+p collisions at $\sqrt{s} = 510$ GeV with STAR at RHIC

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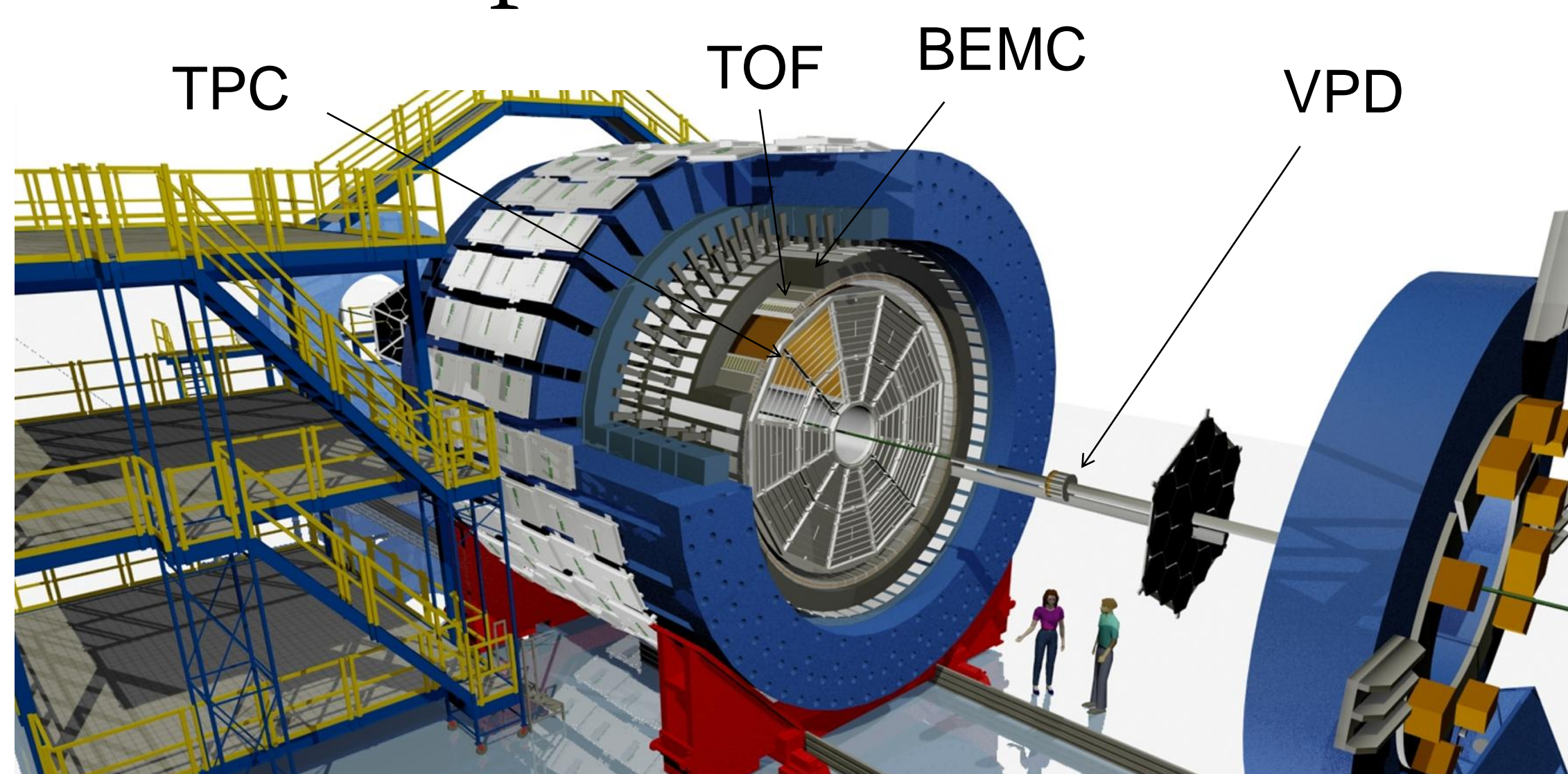
Existing measurements at both  $\sqrt{s} = 200$  GeV from STAR and  $\sqrt{s} = 7$  TeV from ALICE have shown a faster-than-linear rise for the self-normalized  $J/\psi$  yield at mid-rapidity as a function of charged particle multiplicity. In this poster we present work in progress toward a new high-statistics measurement of inclusive  $J/\psi$  production versus event multiplicity in p+p collisions at  $\sqrt{s} = 510$  GeV with the STAR experiment at RHIC. At mid-rapidity, calorimeter-triggered events are selected for candidate  $J/\psi$  detection through the dielectron decay channel.

## Motivation



- Study of  $J/\psi$  production vs. event activity explores correlation between hard and soft processes
- Existing measurements from STAR and ALICE show a faster-than-linear rise in mid-rapidity  $J/\psi$  production vs. charged particle multiplicity
- 2017 data features a 4x increase in luminosity ( $79.5 \text{ pb}^{-1}$ ) over earlier 200 GeV p+p data

## The STAR Experiment



### Time Projection Chamber:

- Momentum and  $dE/dx$

### Vertex Position Detector:

- Min-bias trigger
- Online vertex
- Pileup event rejection

### Barrel Electromagnetic Calorimeter:

- Trigger on, identify electrons

### Time Of Flight:

- Particle identification
- Pileup track rejection

## Event Selection

Trigger: BEMC High Tower

$$E_T \geq 4.2 \text{ GeV}$$

vzTPC -40 to 40 cm

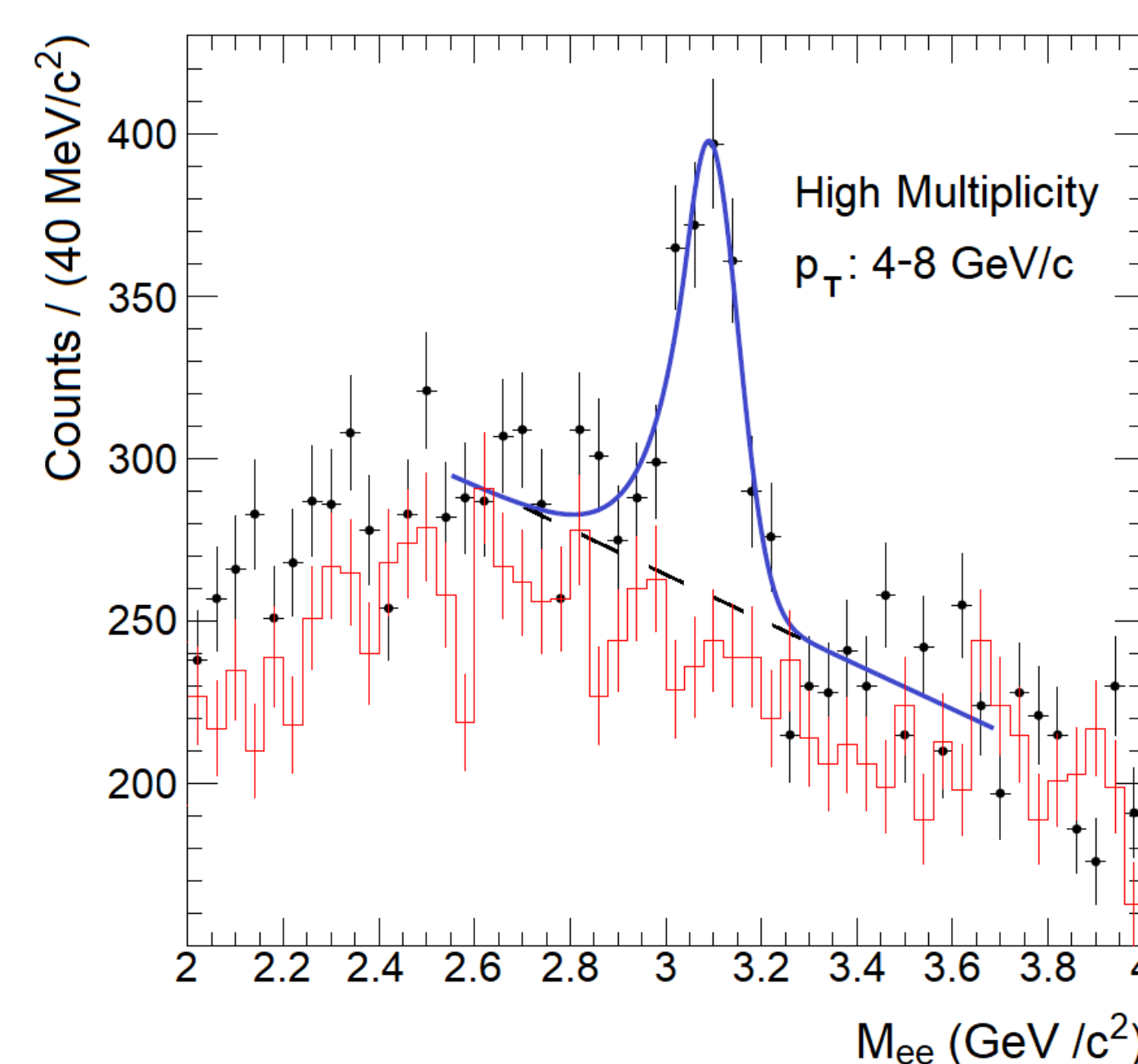
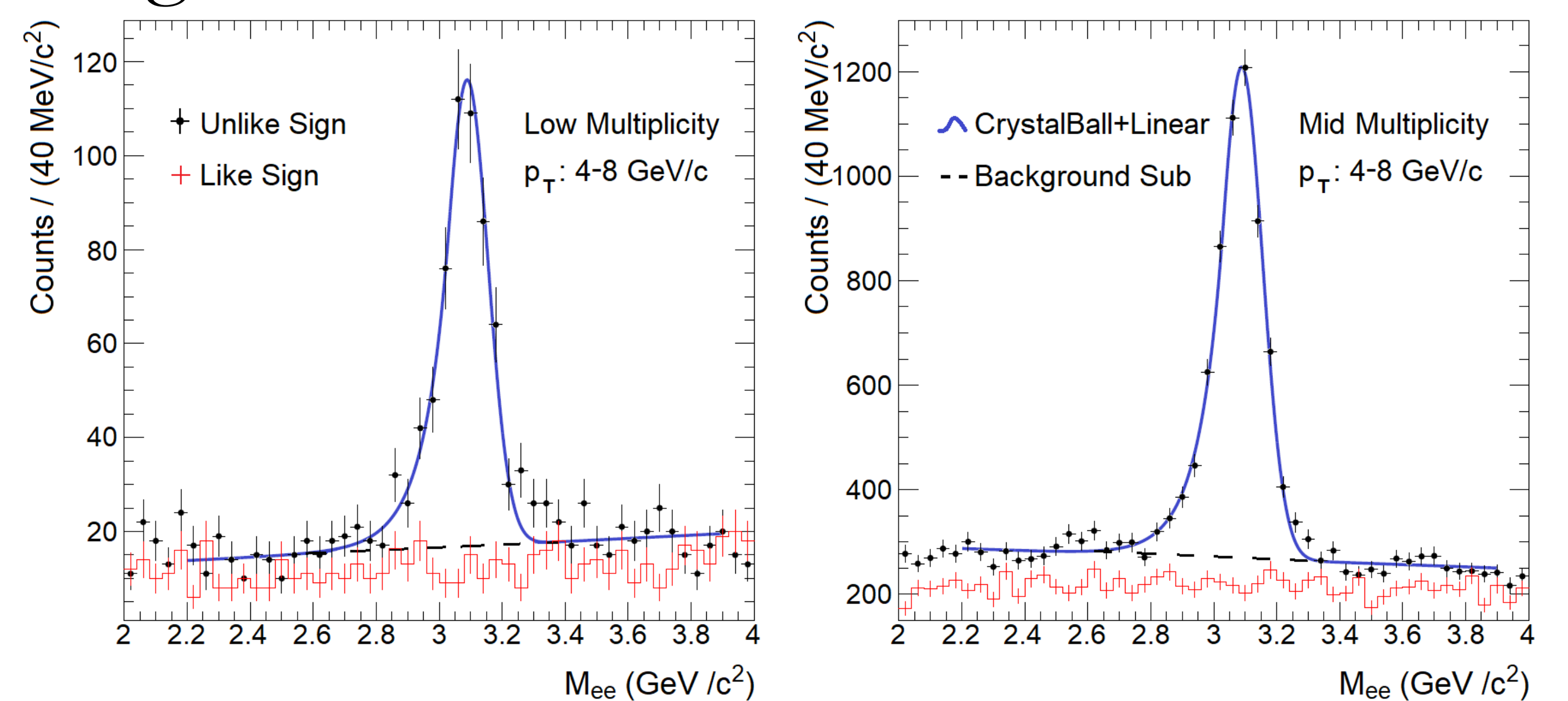
## Tracking Cuts

$\eta$  -1.0 to 1.0  
 $p_T$   $> 0.2 \text{ GeV}/c$   
 DCA  $< 1.0 \text{ cm}$   
 $E_{\text{TOW}}/E_{\text{CLU}} > 0.5$   
 TPC Quality Cuts

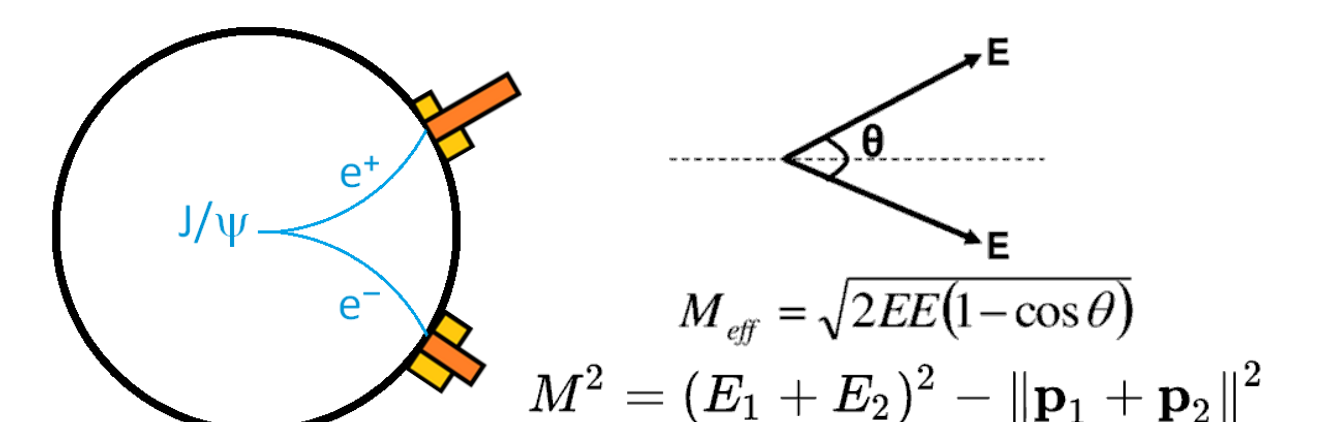
## Particle ID Cuts

TPC  $n\sigma_e$  -1.9 to -3.0  
 $E/p$  0.67 to 3.33  
 $\beta_{\text{TOF}}$  0.97 to 1.03

## Signal Extraction



- Method of invariant mass used in di-electron channel



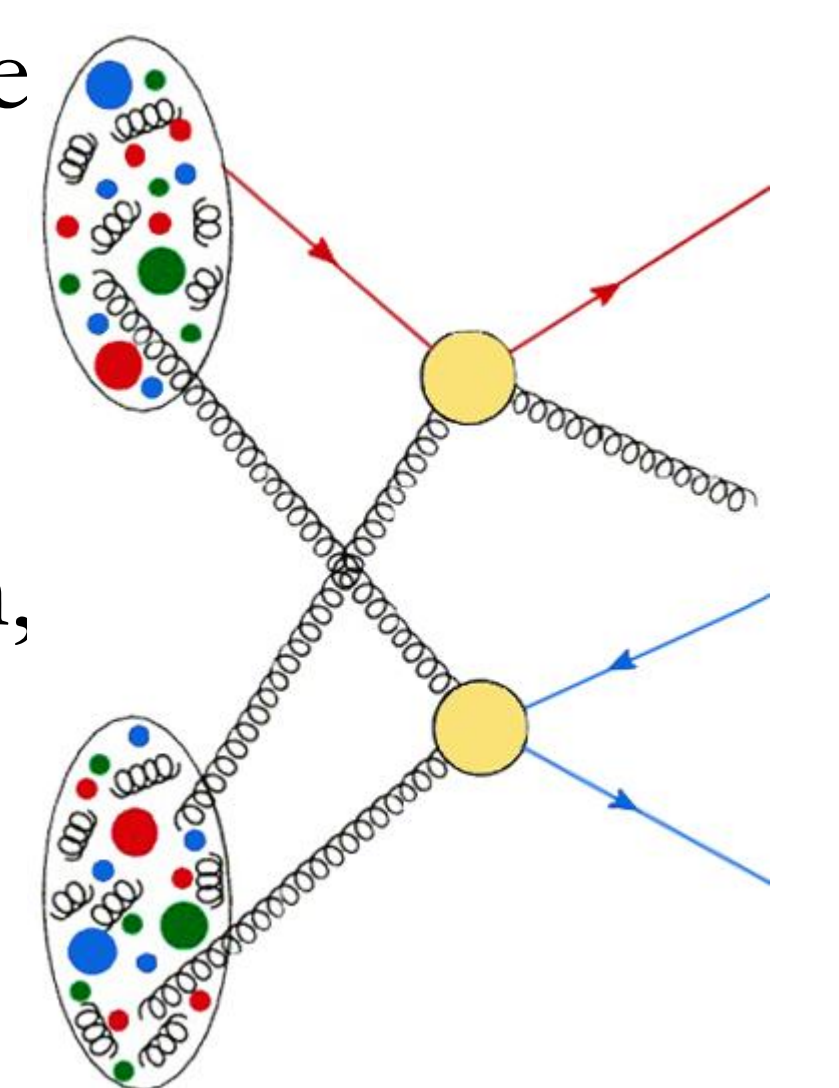
- Subtract like-sign  $e^+ e^-$  pairs from unlike-sign  $e^\pm e^\mp$  pairs
- CrystalBall + linear fit

## Corrections and Calibrations

- Event multiplicity characterization requires a luminosity-dependent correction
- Correct for multiplicity-dependent event triggering and vertex finding efficiencies for both MB and  $J/\psi$  events
- Correct for remaining pileup effects

## Outlook, Summary, and Conclusion

- A key goal of this work will be to extend the reach into higher event multiplicity where model calculations diverge, enabled by prolific dataset size
- Future extension to include di-muon channel to access  $J/\psi$  at low  $p_T$
- As a candidate explanatory mechanism, multi-parton interactions offer a rich subtext to investigate transverse structure, color reconnection, even collectivity in p+p



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