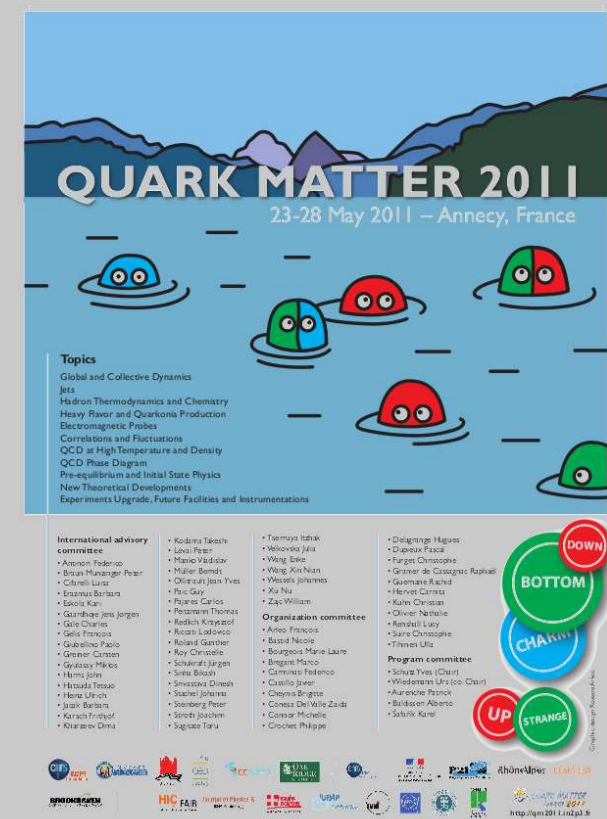




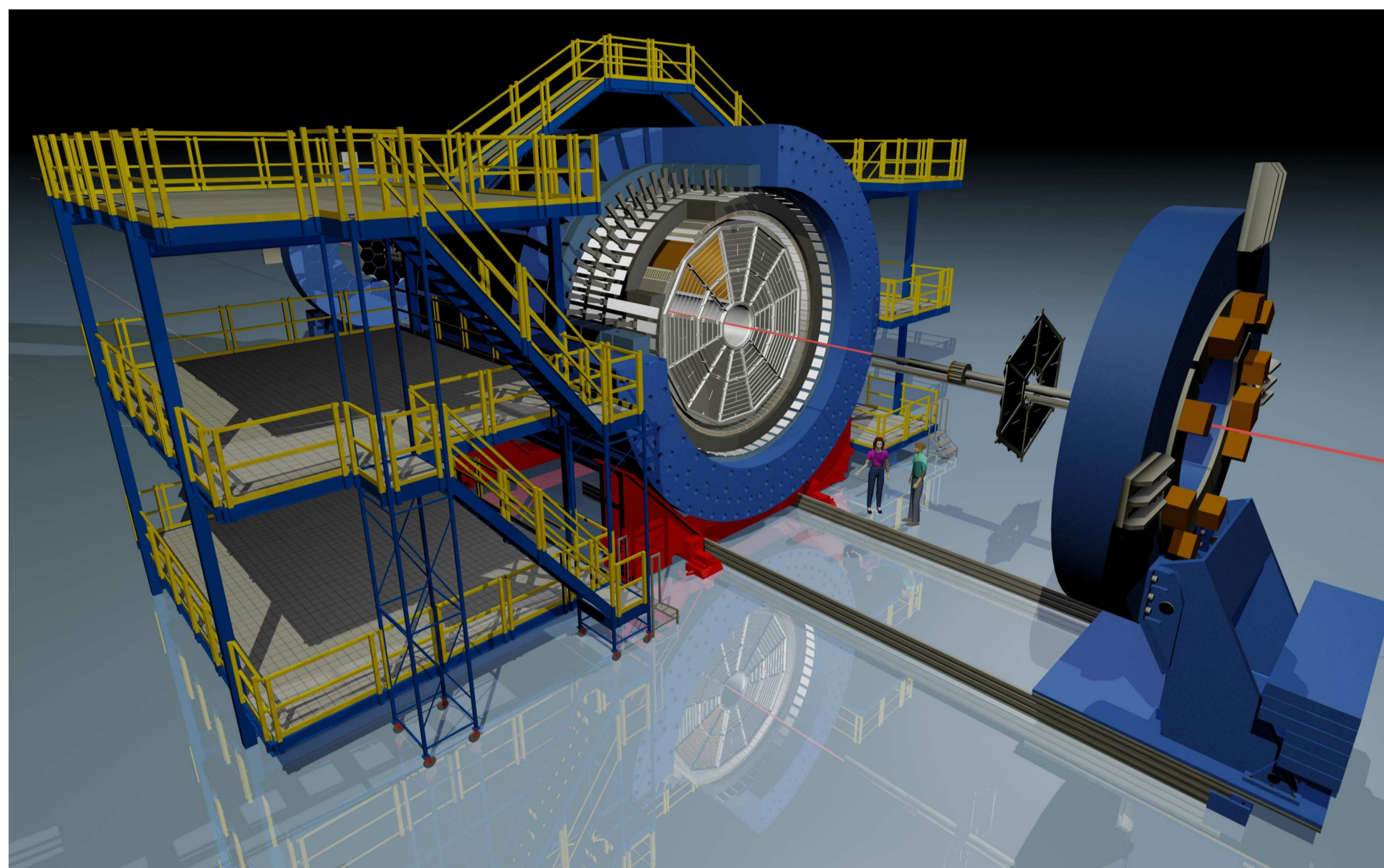
DIELECTRON PRODUCTION IN Au+Au-COLLISIONS AT $\sqrt{s_{NN}} = 39 \text{ GeV}$ AT STAR

Patrick Huck for the STAR collaboration
LBNL (Berkeley), IOPP (CCNU, Wuhan), IKF (Frankfurt)

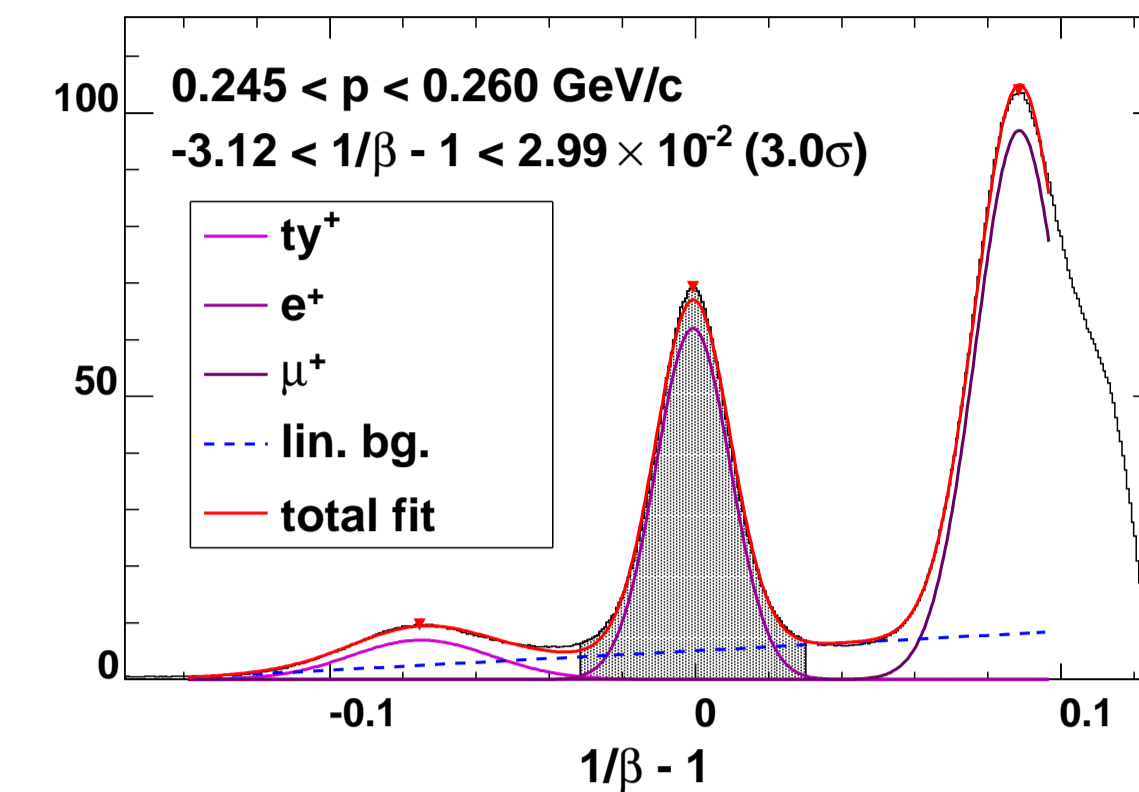


MOTIVATION FOR DIELECTRON MEASUREMENTS

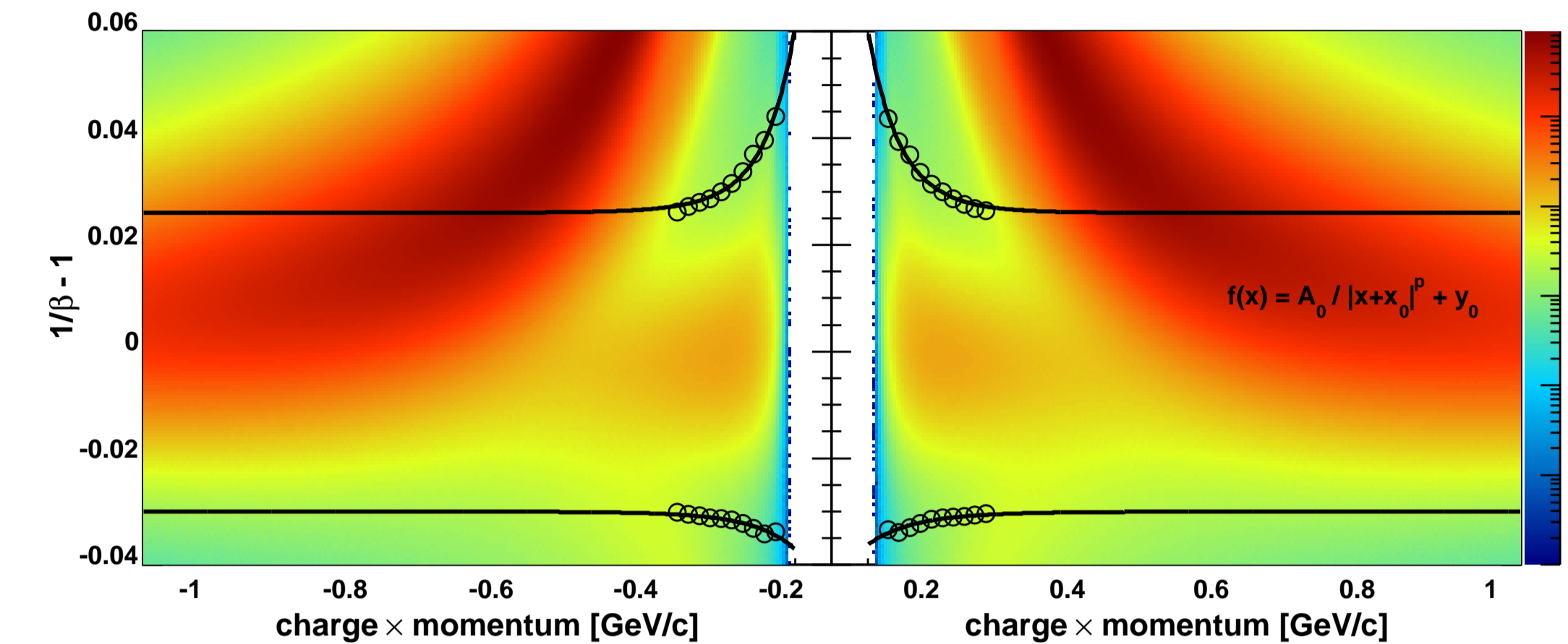
- As electromagnetic probes, e^+e^- pairs provide direct access to in-medium information and thus are sensitive to the early stage of a heavy ion collision
- Dielectron pairs serve as an additional tool to study QGP properties (R_{AA} , v_2 , fireball radiation) and possible signatures for the QCD phase boundary
- Centrality and energy dependent investigation of vector meson production (ρ/ω , ϕ , J/ψ)
- Study physical cause of reported enhancement in LMR region ($M_{inv}^{ee} = 1.2 \text{ GeV}/c^2$)
- Beam Energy Scan: systematic energy dependent study of QCD phase diagram
- 169M events recorded for $\sqrt{s_{NN}} = 39 \text{ GeV}$
- Fully assembled Time-Of-Flight (TOF) detector enables improved electron identification with large acceptance in addition to the particle's energy loss in STAR's Time Projection Chamber
- Minimum material budget in the tracking part of the detector significantly reduces conversion



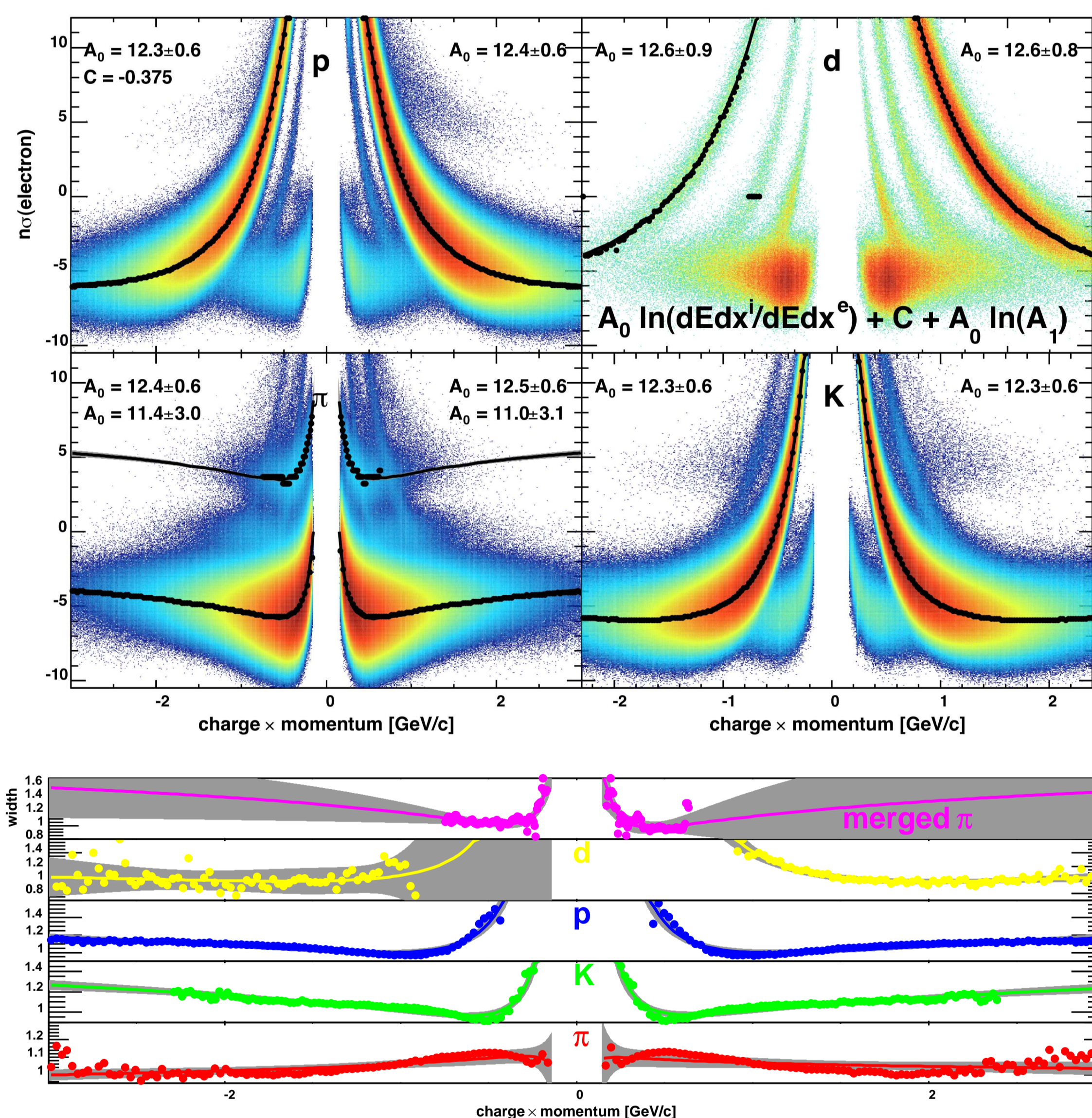
HADRON REJECTION VIA TOF MEASUREMENT



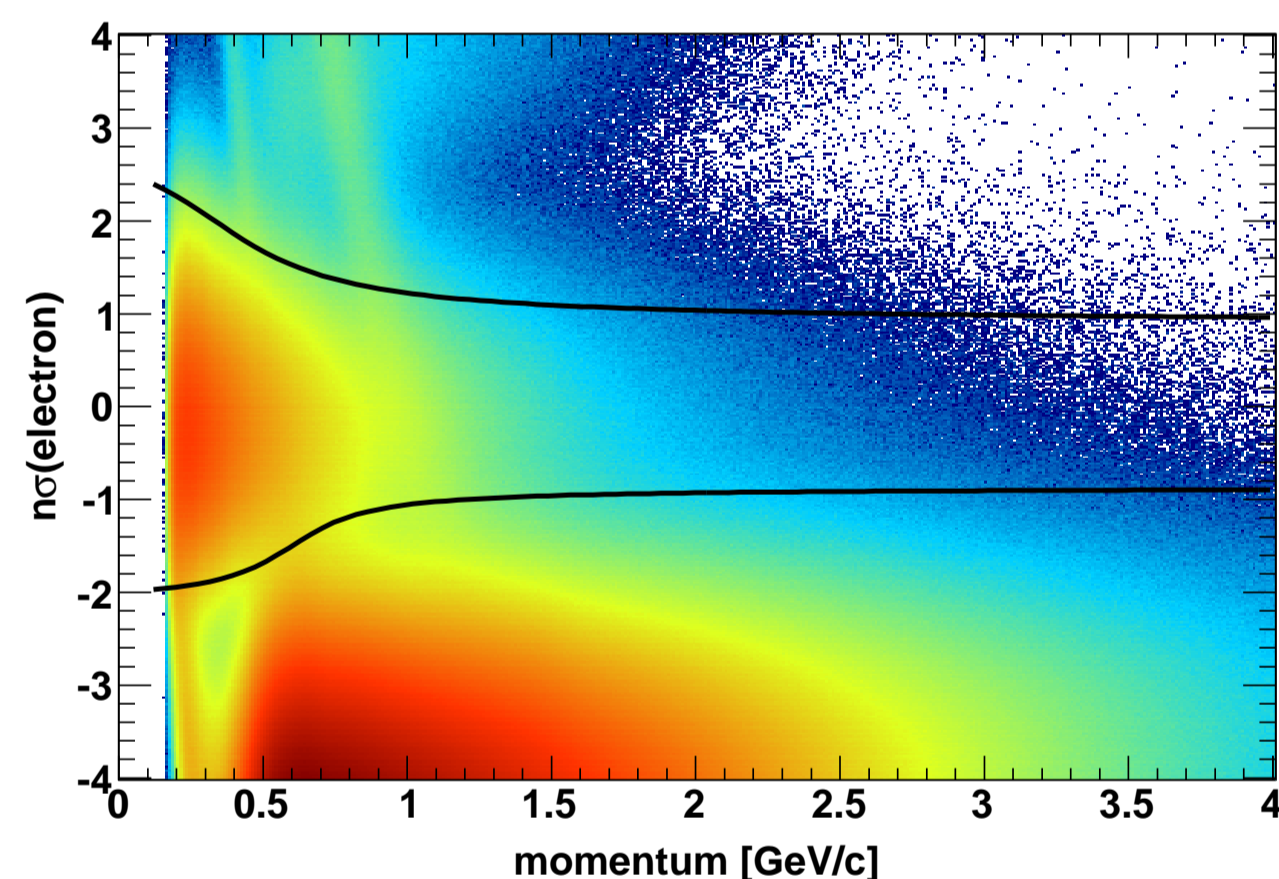
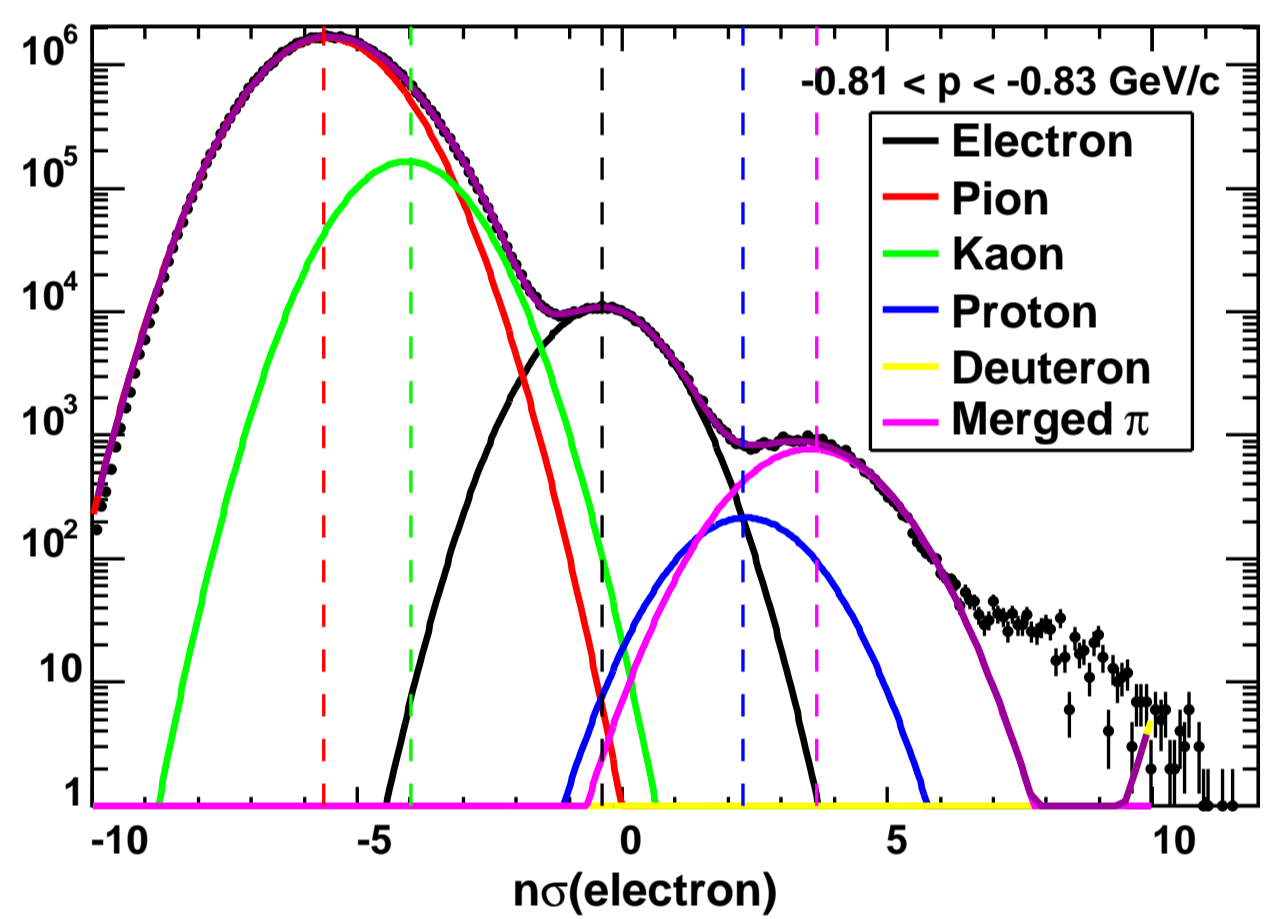
- charge-dependent 3σ cut on β .
- p-dependence at low momenta extrapolated to give a confident constraint on 3σ cut.
- 'tachyons' due to an electron (conversion close to TOF) and a hadron sharing a TOF hit



ELECTRON IDENTIFICATION USING TPC ENERGY LOSS

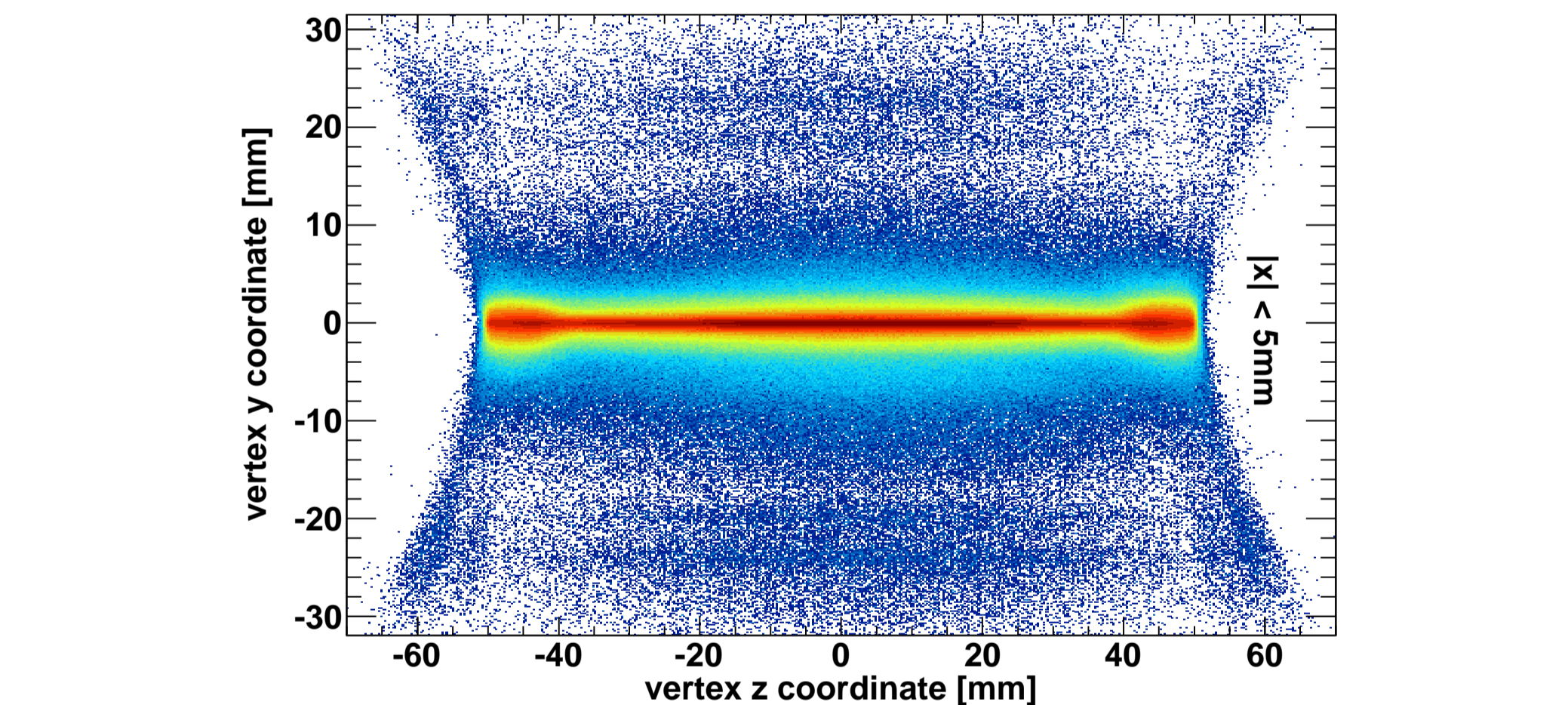
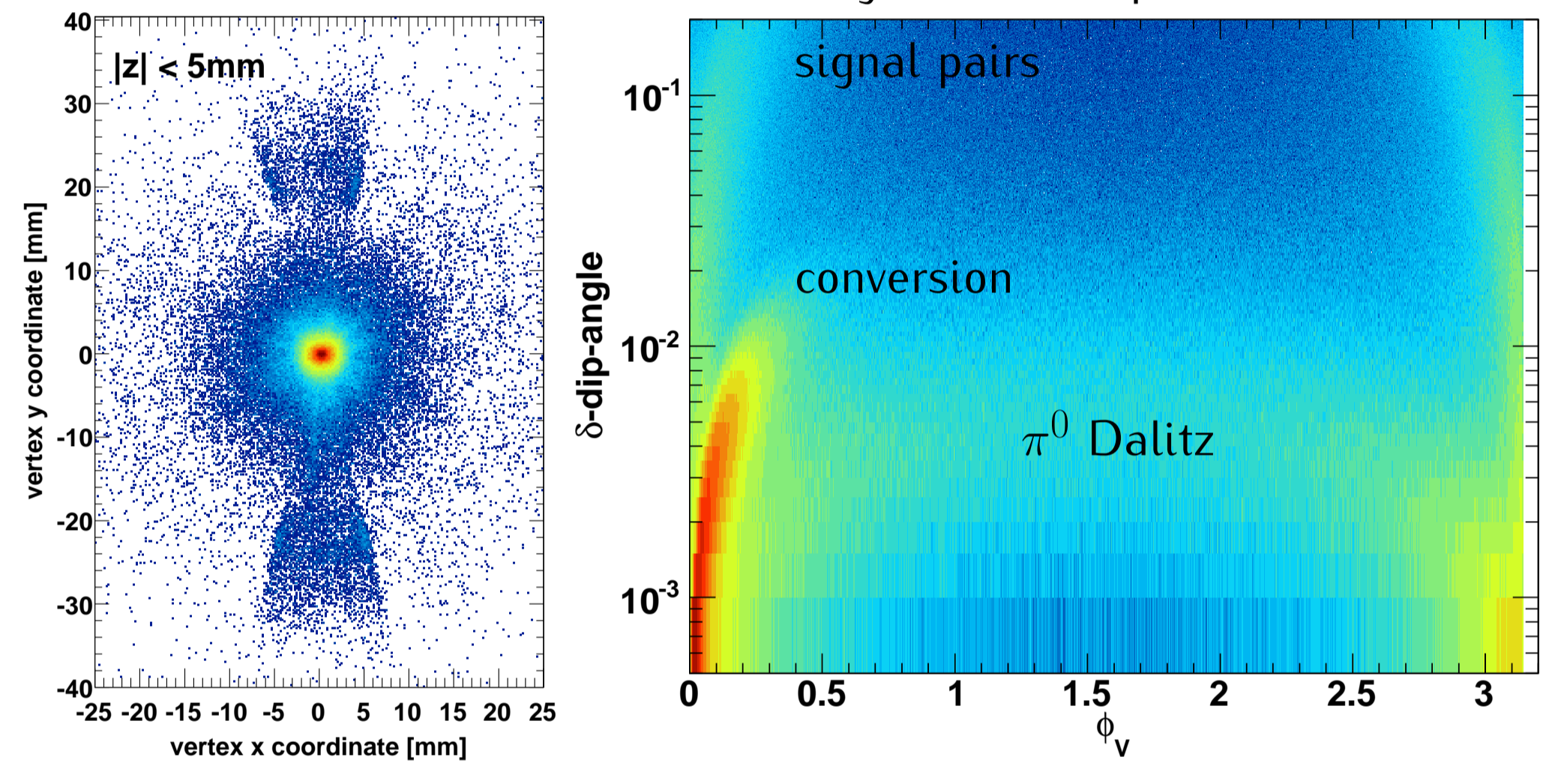


- deduce input parameter for $n\sigma$ contributions from pure particle samples obtained by narrow cuts on m^2 .
- tune purity and estimate cut efficiency.
- systematic check of widths and amplitudes.

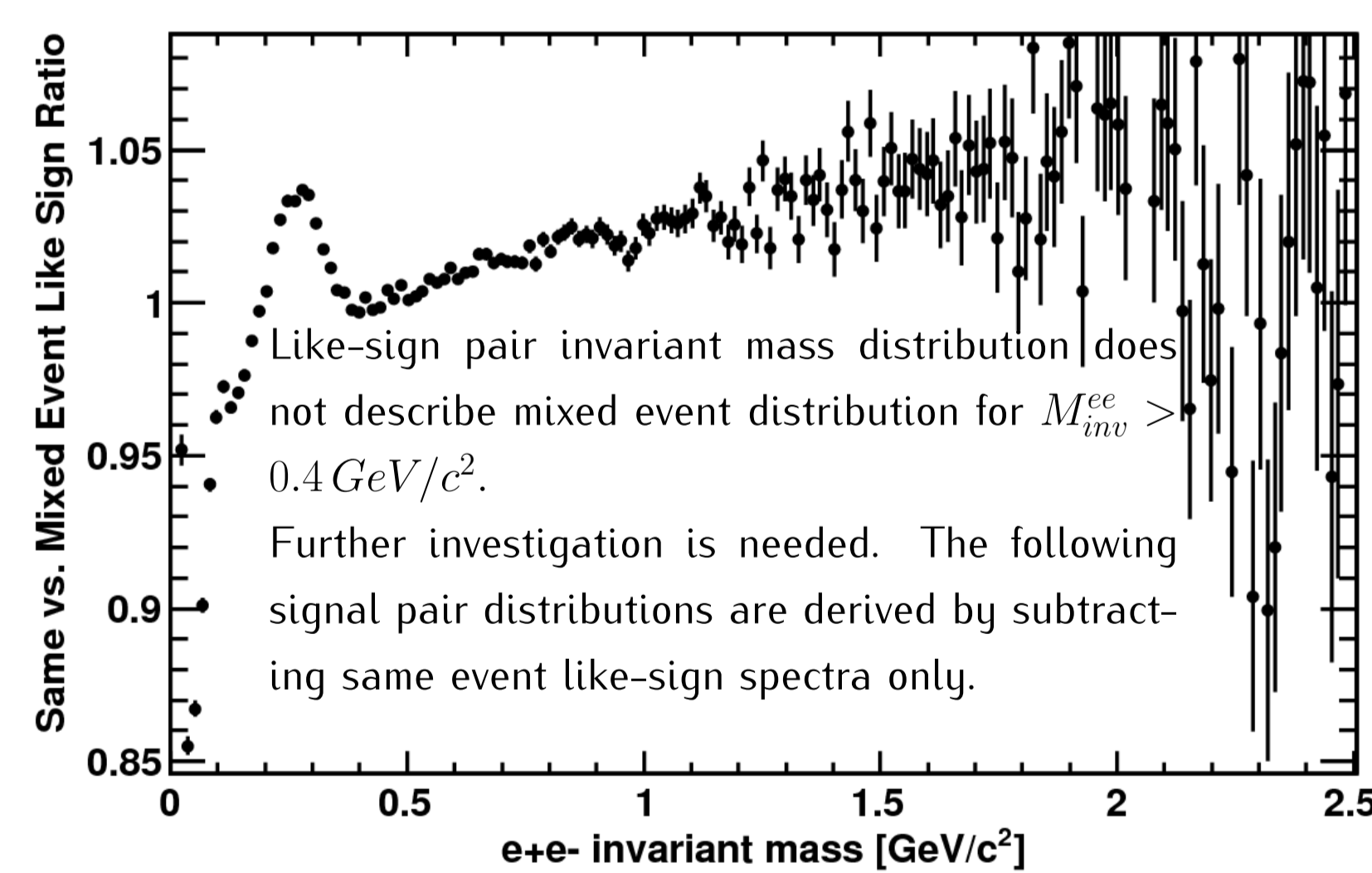
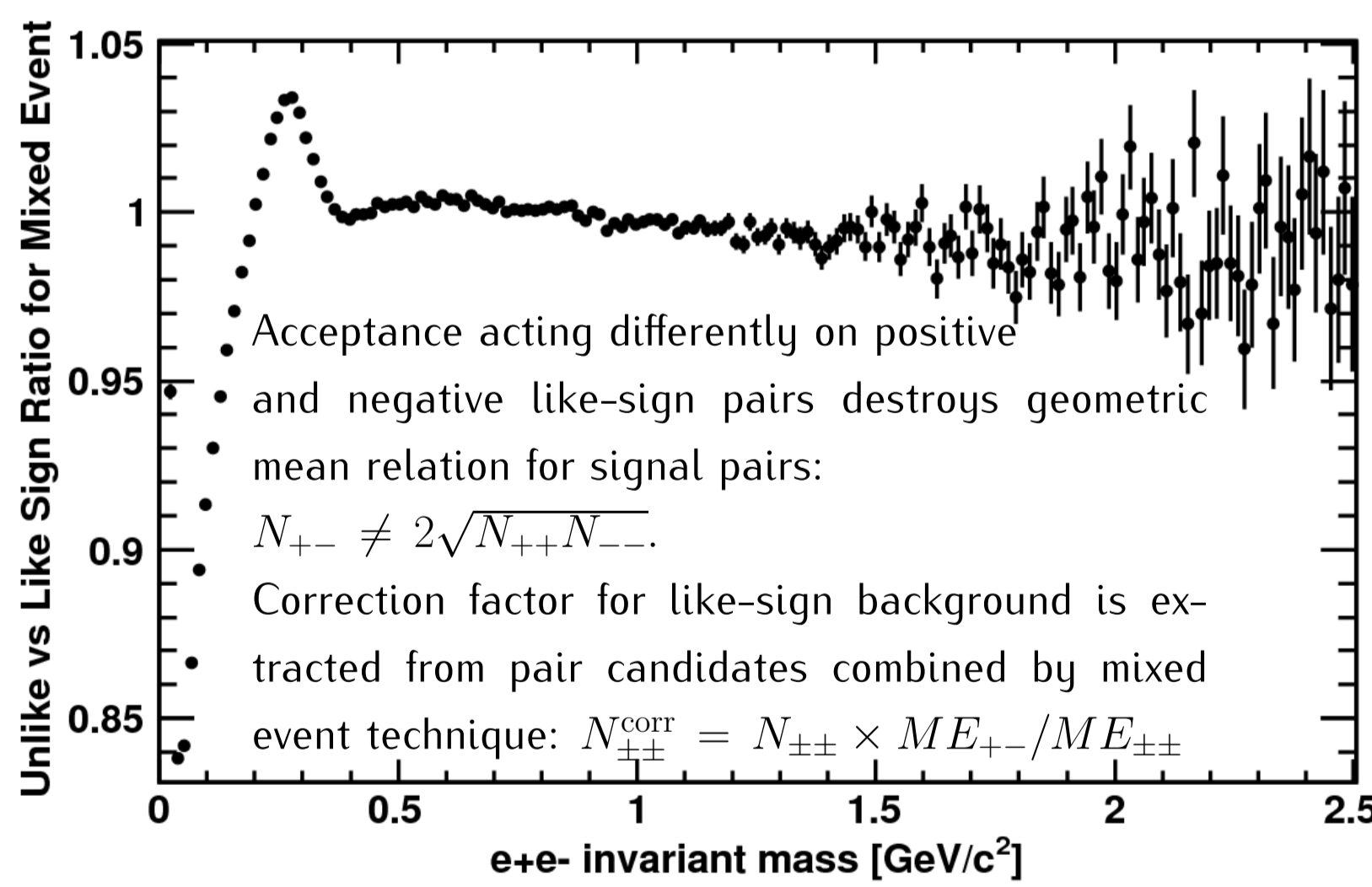


CONVERSION BACKGROUND

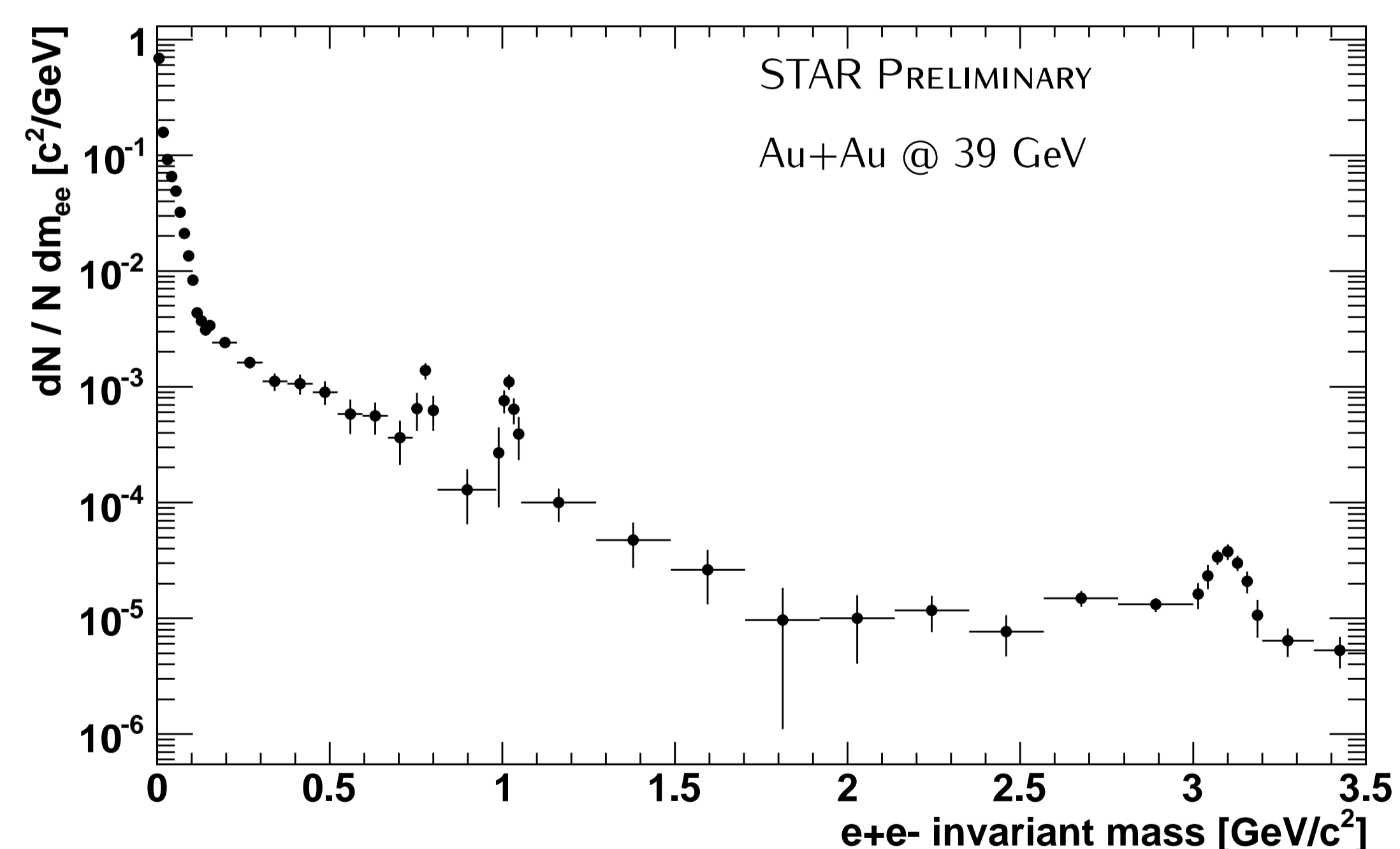
e^+e^- pair vertices are reconstructed to study their origin and reject conversion pairs. Correlations between δ -dip-angle (orientation of track helices) and ϕ_V (ordered opening angle wrt B-field) reveal physical e^+e^- sources and identify conversion pairs.



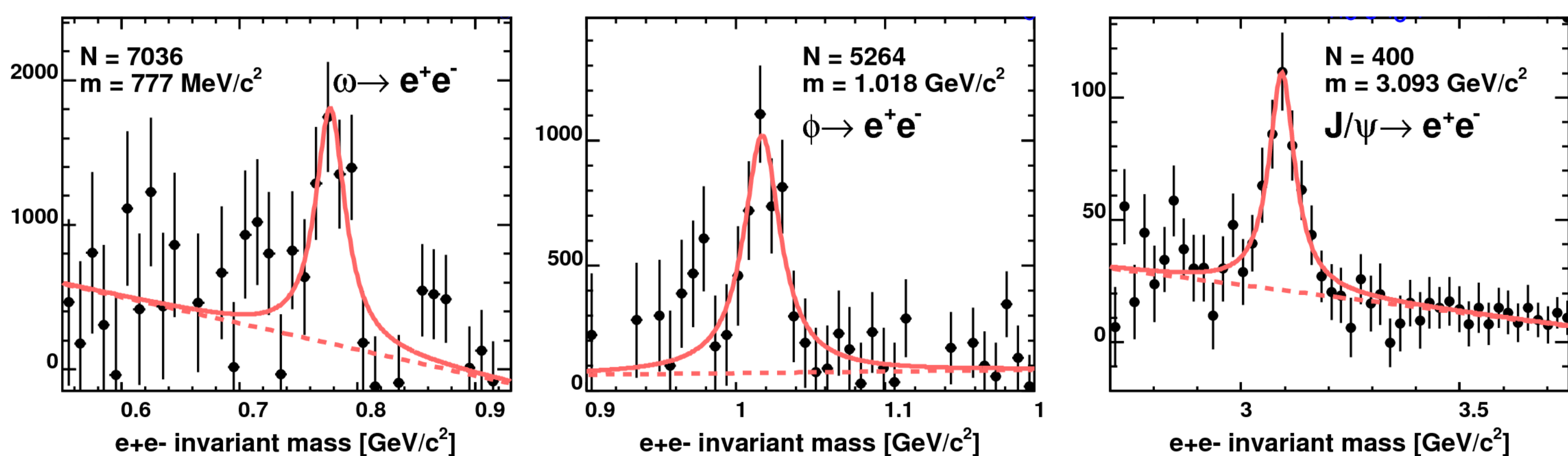
BACKGROUND RATIOS



RAW INVARIANT MASS SPECTRUM



VECTOR MESON SIGNALS



CONCLUSIONS

- Prominent e^+e^- decay signals of ω , ϕ and J/ψ mesons identified in Au+Au-collisions at $\sqrt{s_{NN}} = 39 \text{ GeV}$. For the first time at RHIC in this energy regime.
- Results point to promising physics able to be extracted from this data set. In the near future equivalent analysis is planned to be carried out for a comparably sized data set at $\sqrt{s_{NN}} = 62 \text{ GeV}$.

