UNIVERSITY OF BIRMINGHAM | SCHOOL OF PHYSICS AND ASTRONOMY

Kinematic Resolutions for the Deathvalley configuration

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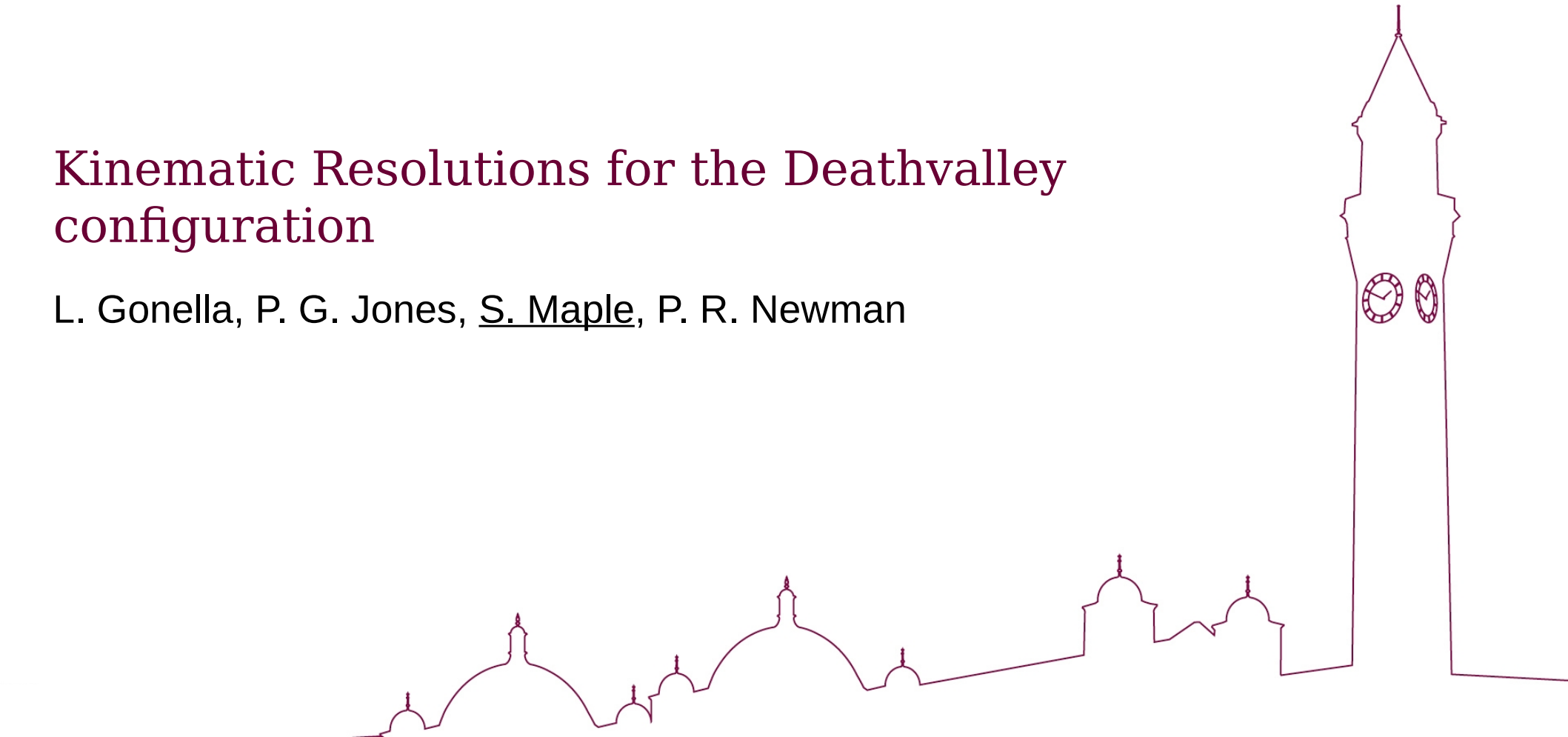
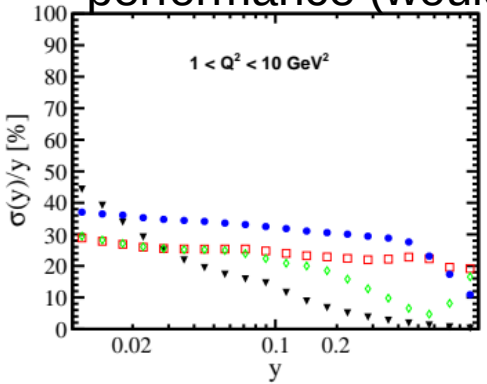


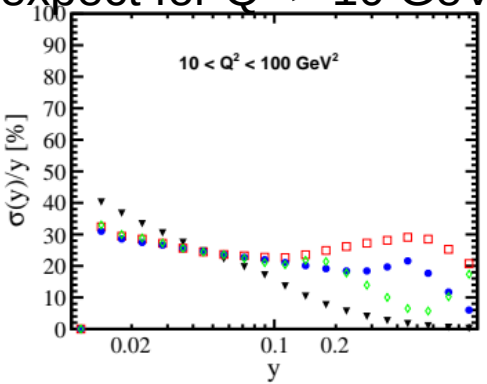
Overview

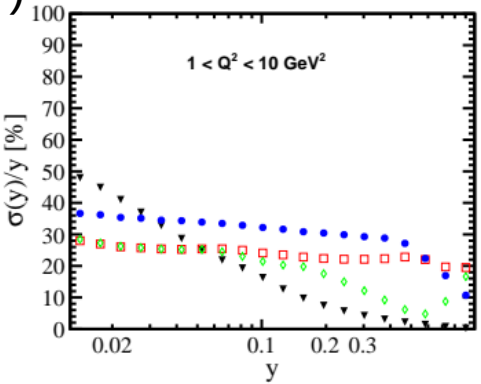
- Reconstructed detector simulation files on S3 at ATHENA/RECO/Deathvalley-v1.0/DIS/NC for 5x41 GeV^2 and 18x275 GeV^2
- Files containing events with minimum Q^2 = 1, 10, 100 GeV^2
- Inclusive kinematic quantities x, y, Q^2 obtained from reconstruction files for: Truth, Electron method, JB Method, DA method
- Quantities calculated from ReconstructedParticles separately for Sigma and e-Sigma methods
  - Compare resolutions for Canyonlands 2.1 and Deathvalley 1.0
  - Purity and Stability plots for Deathvalley

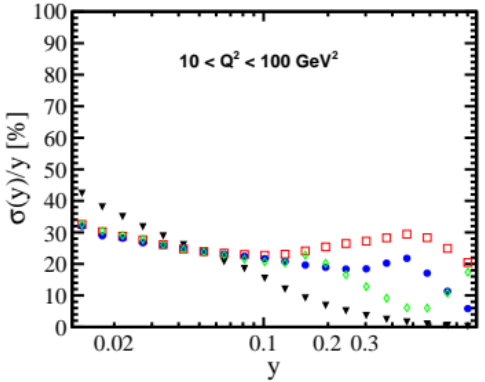
Y resolution vs Y, 5x41 GeV^2

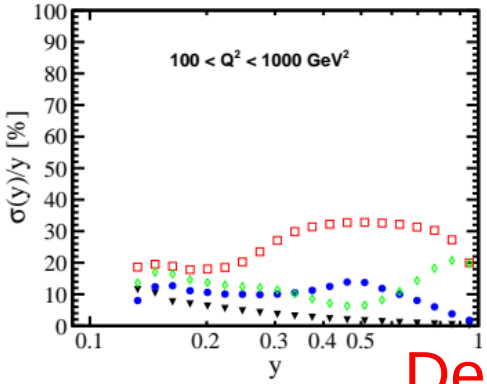
Results for both configurations similar → High momentum tracking improved in barrel for Deathvalley due to ToF layer, however no significant changes seen in e-method performance (would expect for $Q^2 > 10$ GeV^2)

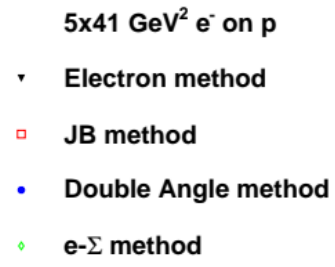


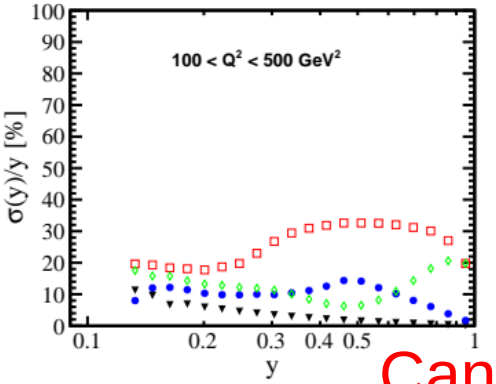


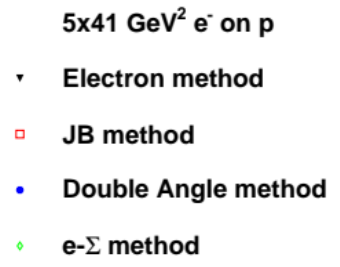










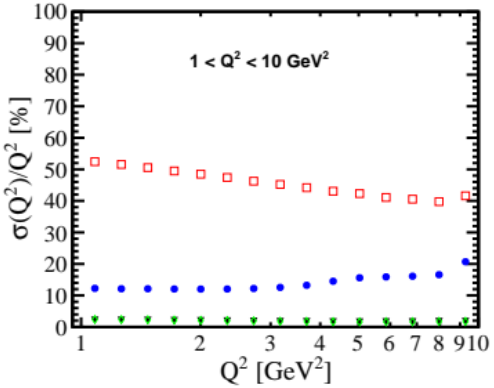


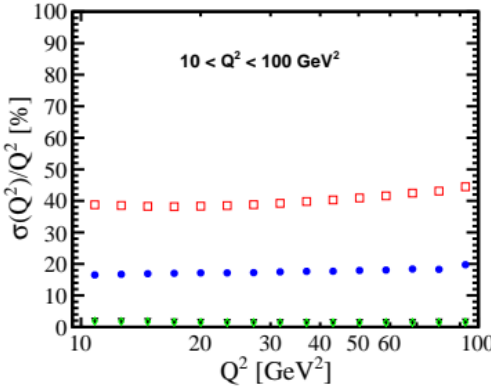
Deathvalley

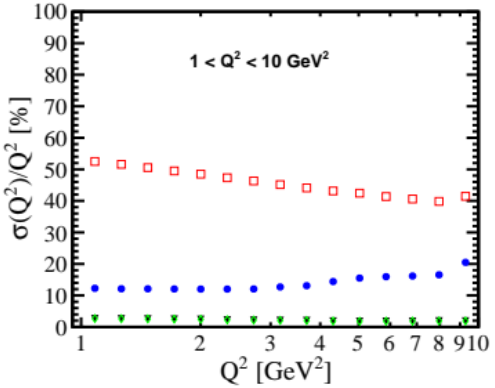
Canyonlands

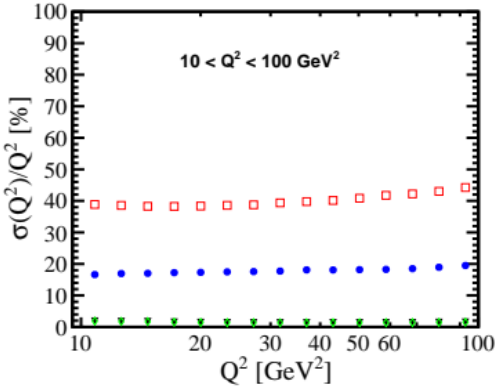
Q^2 resolution vs Q^2, 5x41 GeV^2

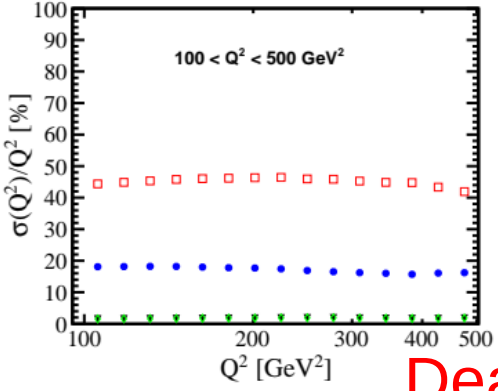
No significant differences for Q^2 resolution at 5x41 GeV^2 for the two configurations

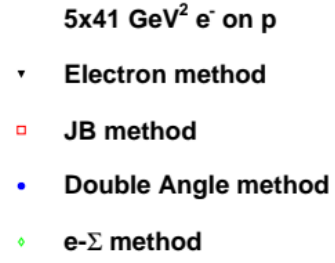


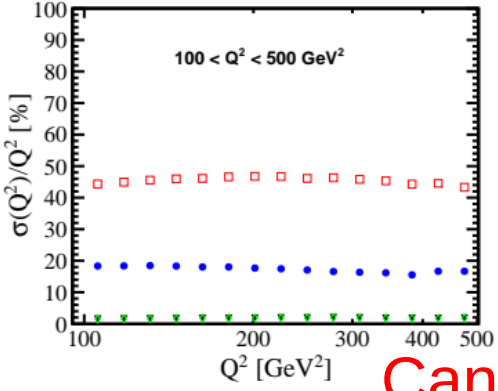


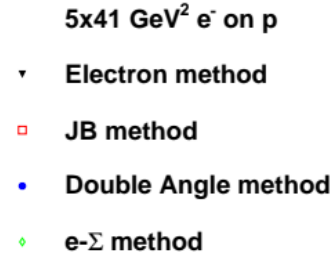










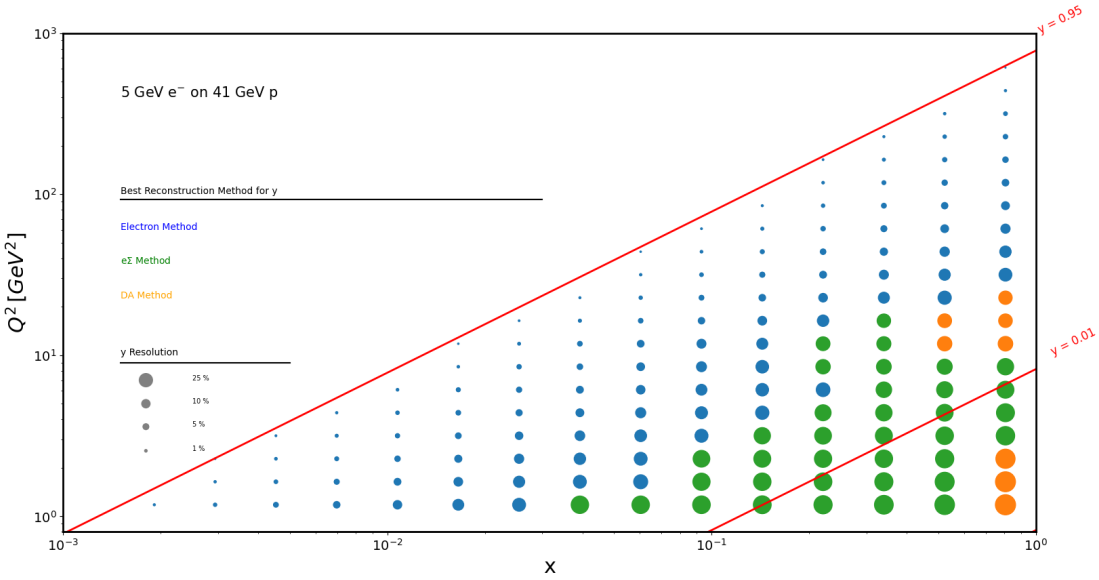


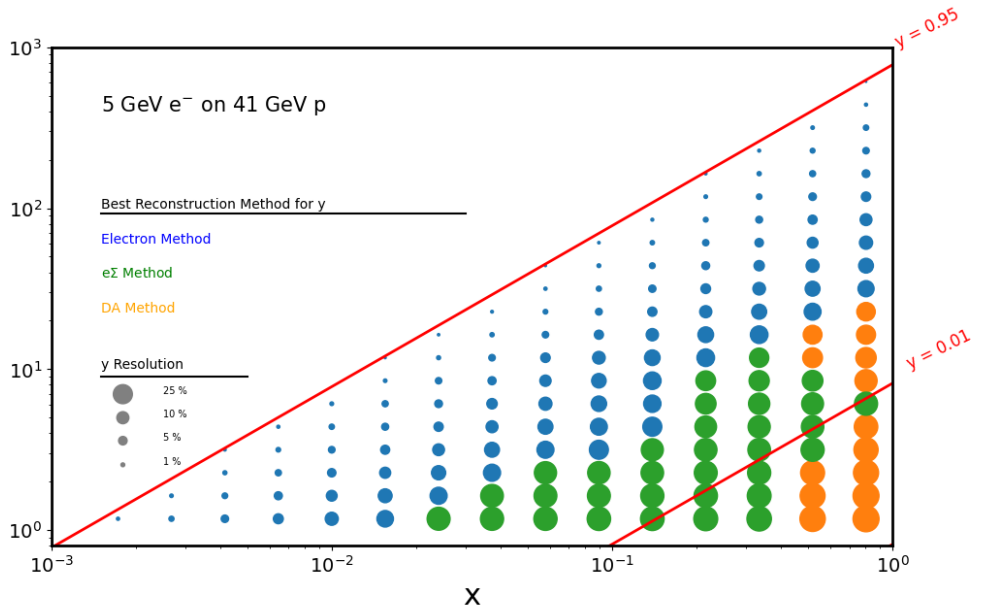
Deathvalley

Canyonlands

X-Q^2, 5x41 GeV^2

Generally similar trends → high x low Q^2 bins disappear when a $W>2GeV^2$ cut is applied



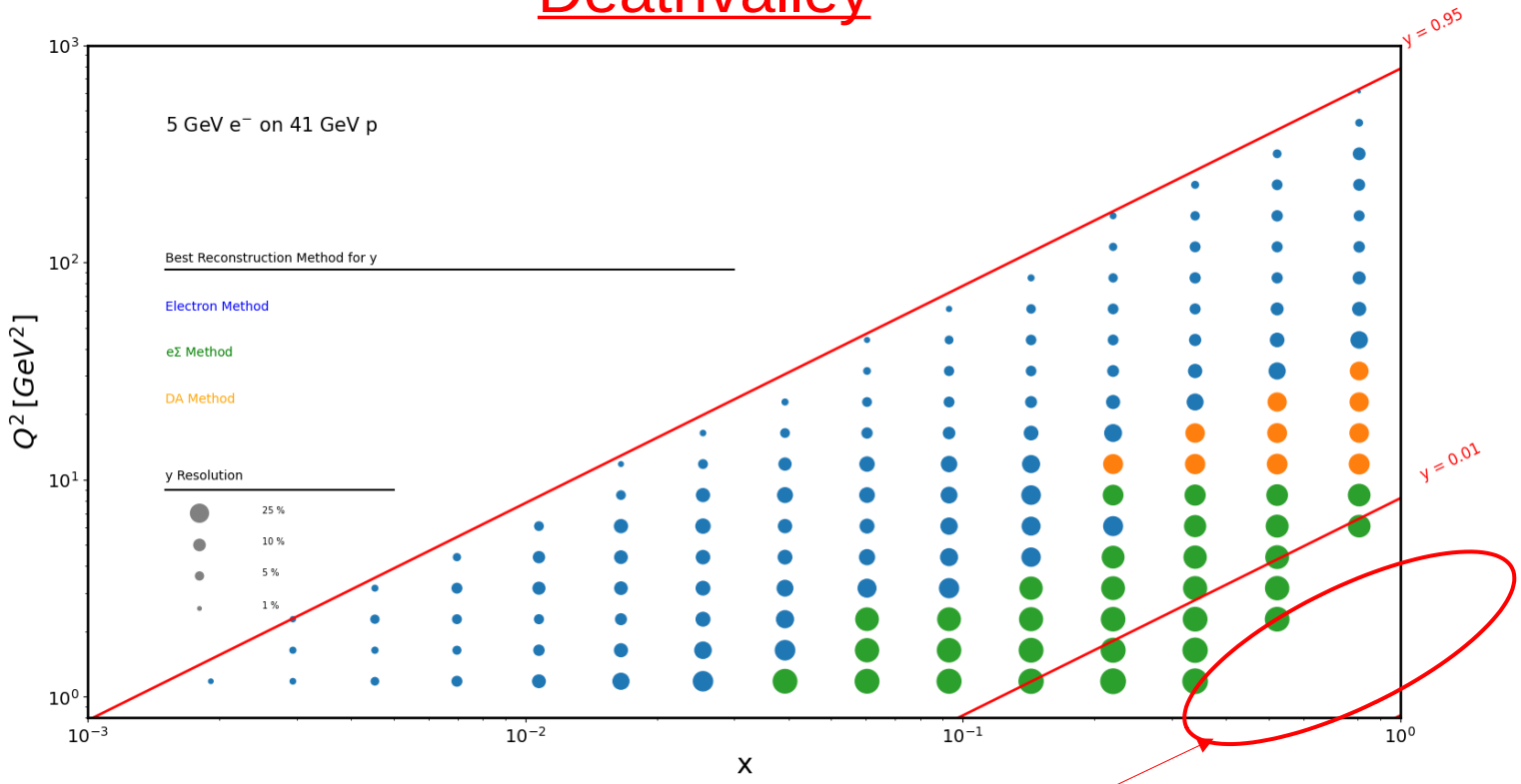


Deathvalley

Canyonlands

X-Q^2, 5x41 GeV^2 with $W>2GeV^2$ cut

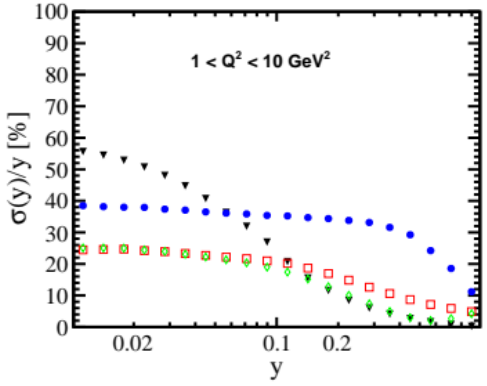
Deathvalley

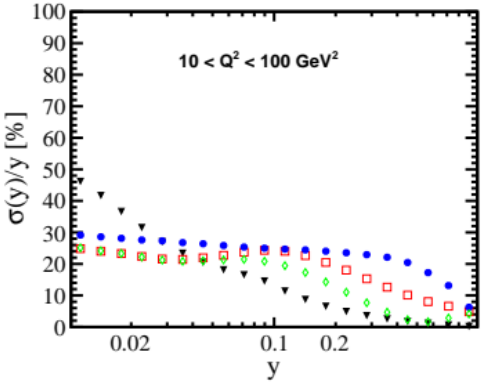


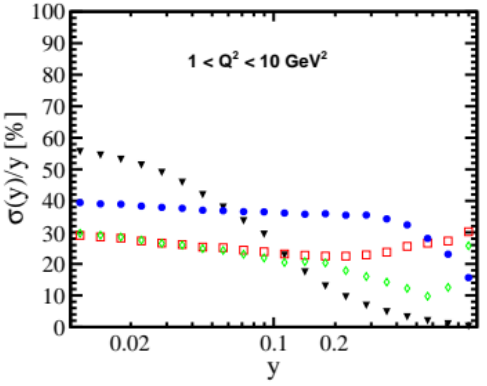
Bins disappear

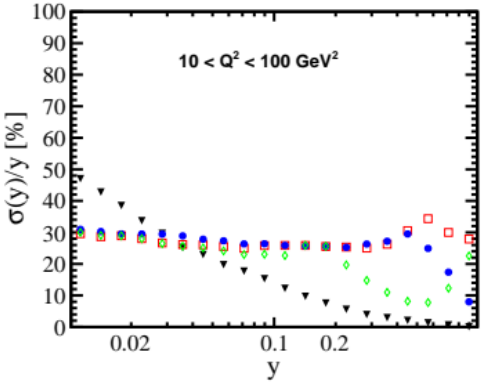
Y resolution vs Y, 18x275 GeV^2

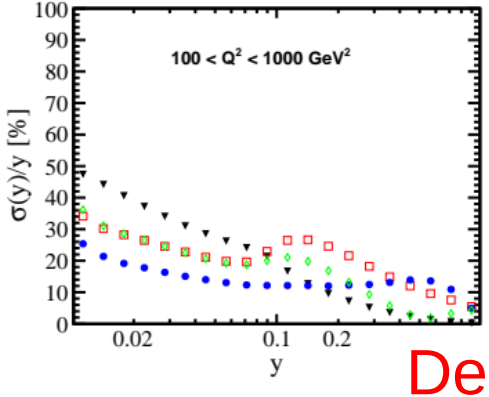
Significant differences at high y for hadron+mixed methods → double check that Canyonlands reconstruction was performed the same way

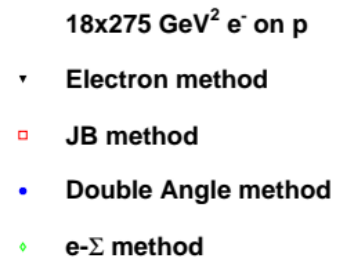


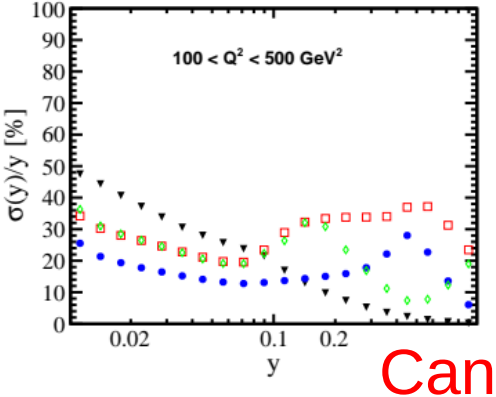


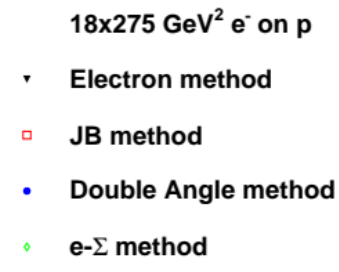










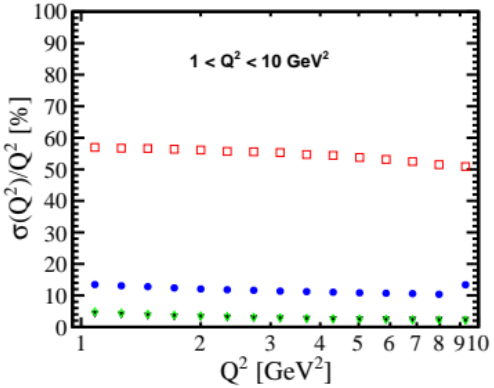


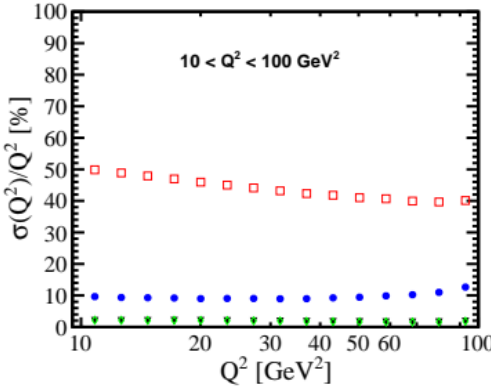
Deathvalley

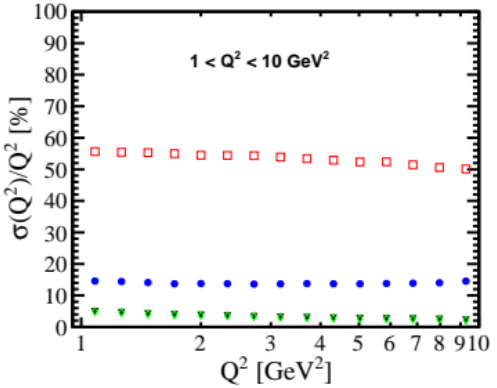
Canyonlands

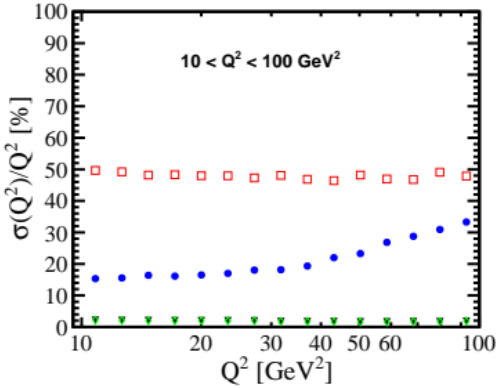
Q^2 resolution vs Q^2, 18x275 GeV^2

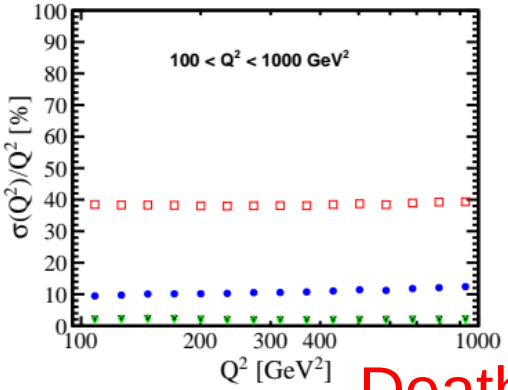
Most noticeable improvement seen in DA method, though also see an improvement for high Q^2 in JB method

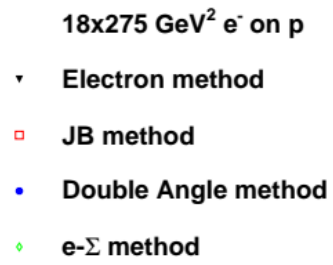


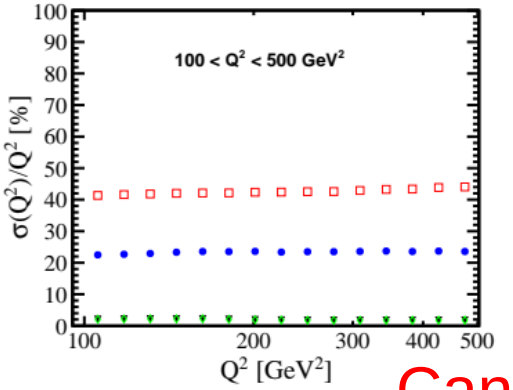


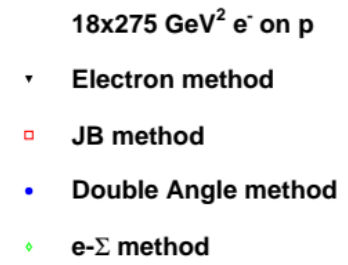










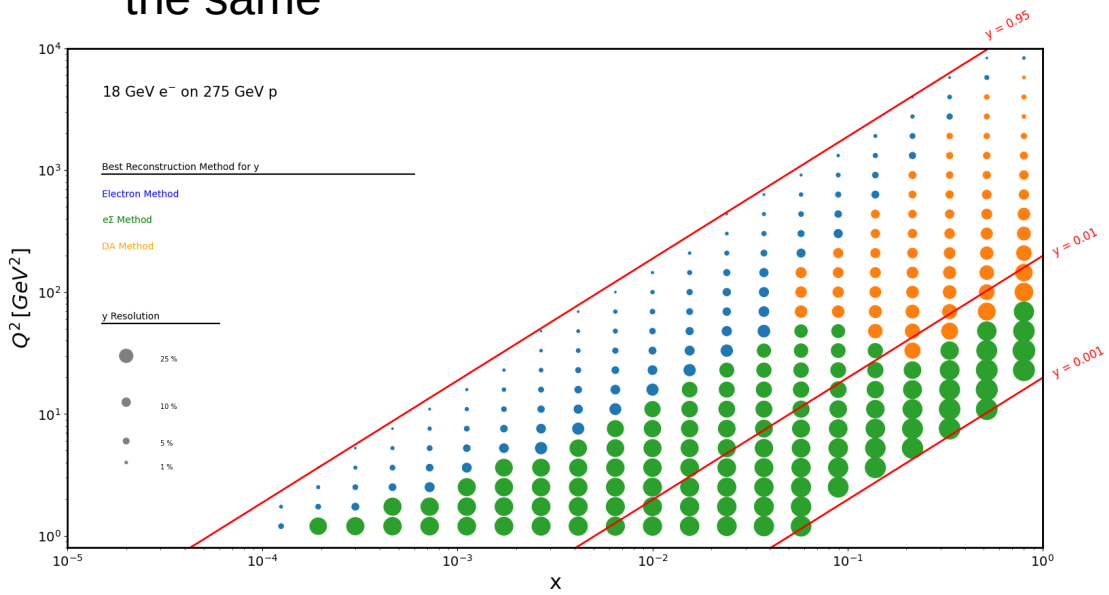


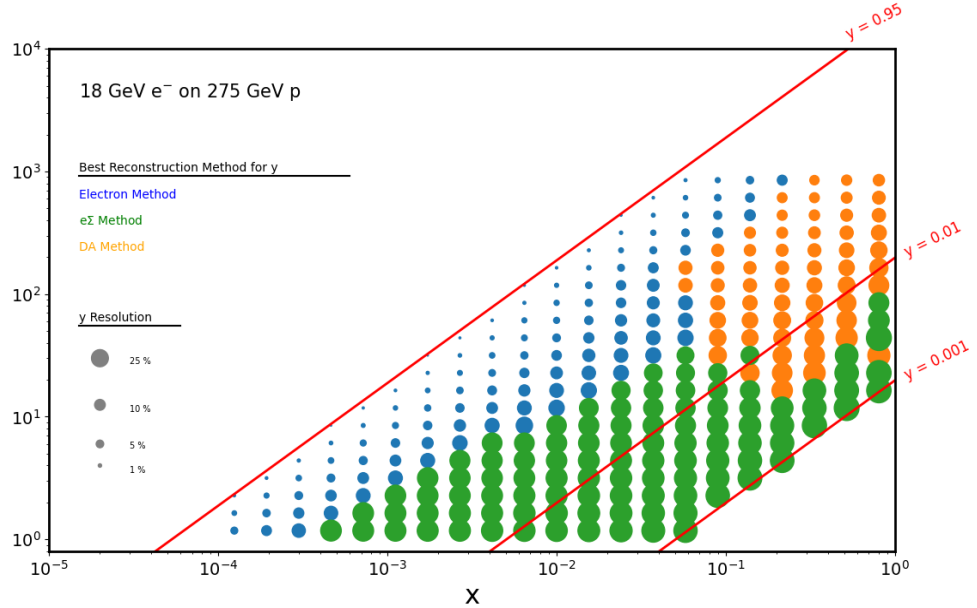
Deathvalley

Canyonlands

X-Q^2, 18x275 GeV^2

More statistics for Deathvalley cleans up bin fluctuations, overall trends remain the same

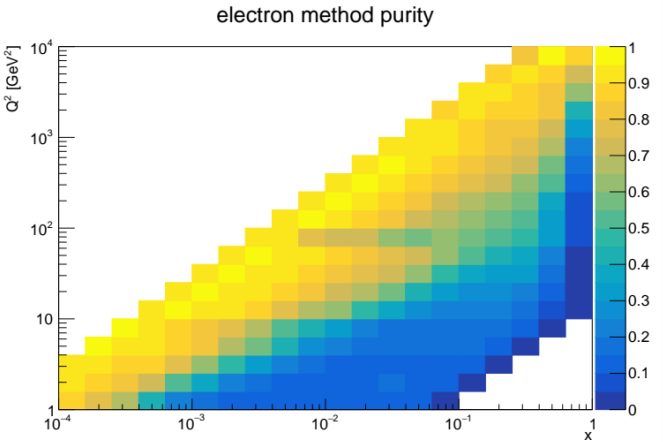


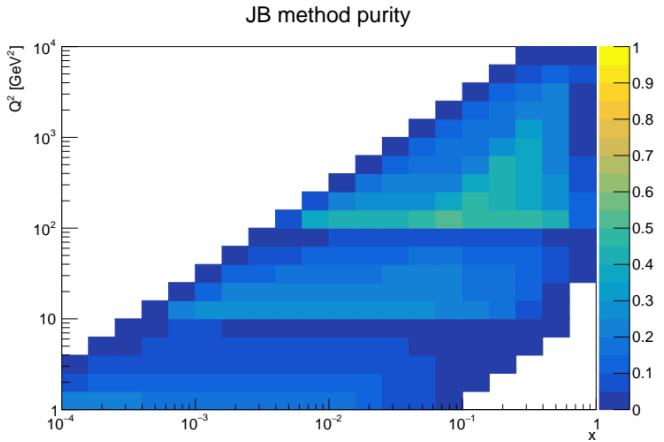


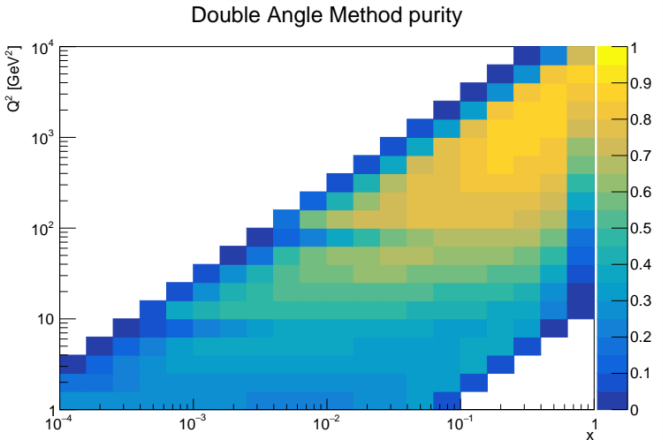
Deathvalley

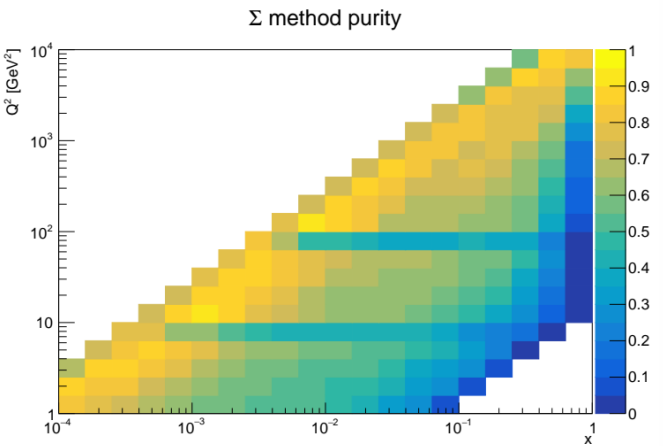
Canyonlands

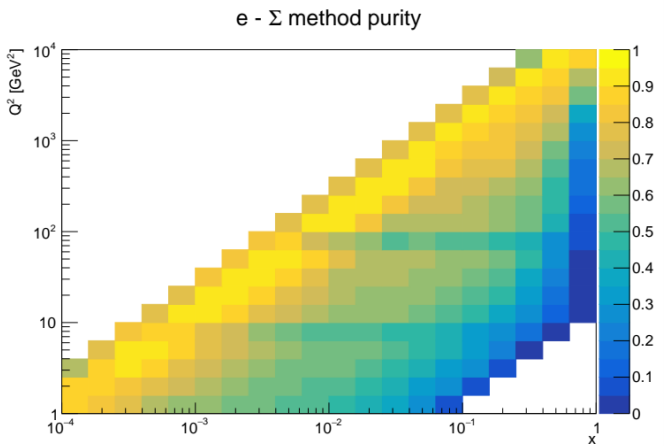
Purity, Deathvalley 18x275 GeV^2







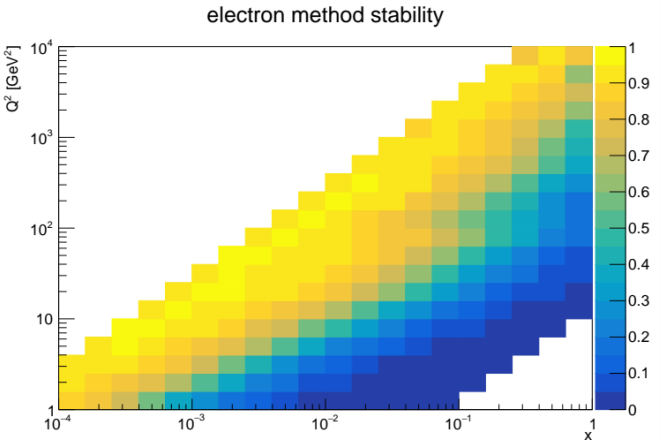


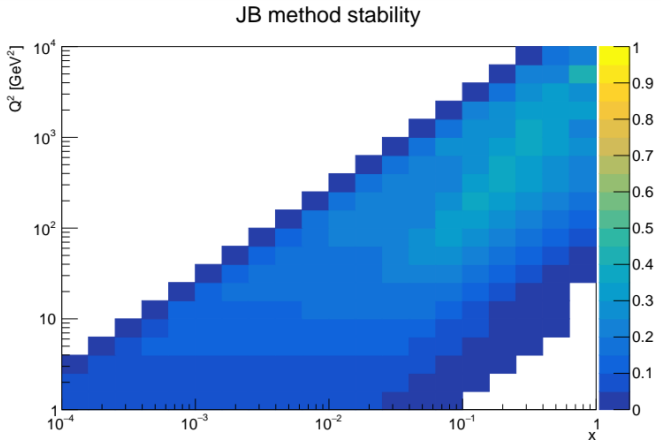


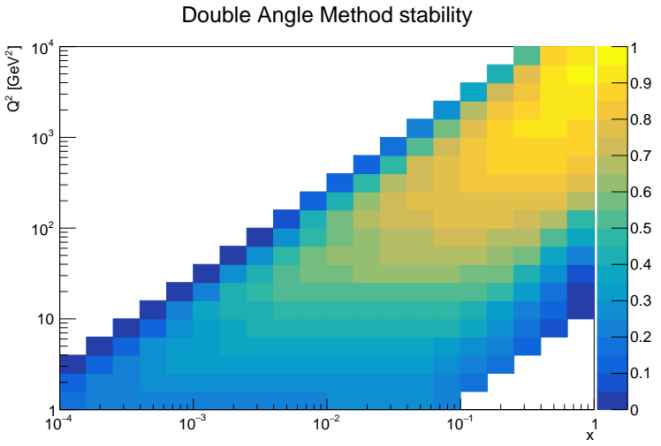
$$\text{Purity}^i = \frac{N^i_{\text{rec\&gen}}}{N^i_{\text{rec}}},$$

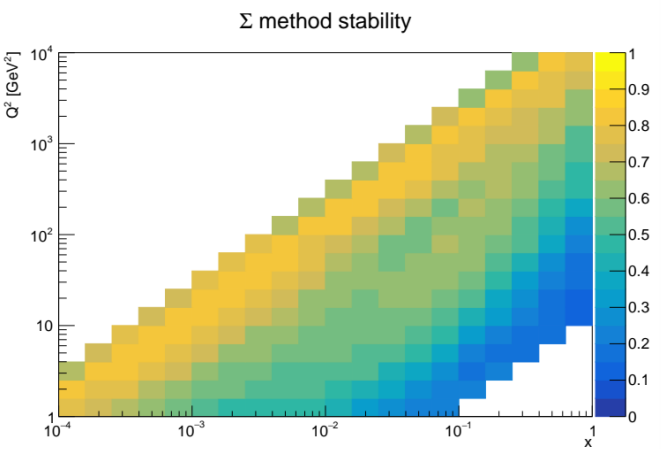
$$\text{Stability}^i = \frac{N^i_{\text{rec\&gen}}}{N^i_{\text{gen}}},$$

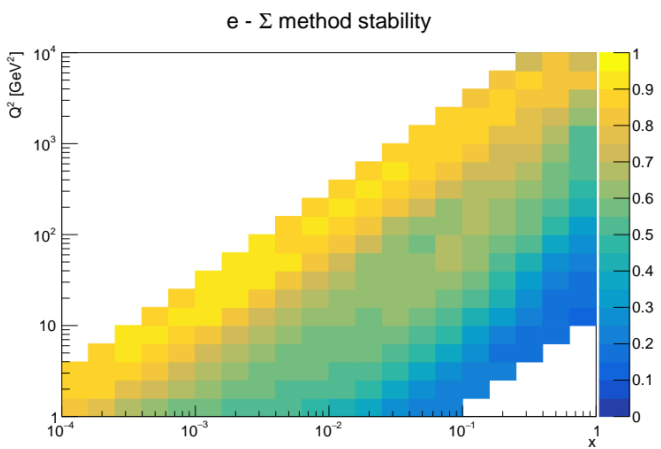
Stability, Deathvalley 18x275 GeV^2











$$\text{Purity}^i = \frac{N^i_{\text{rec\&gen}}}{N^i_{\text{rec}}},$$

$$\text{Stability}^i = \frac{N^i_{\text{rec\&gen}}}{N^i_{\text{gen}}},$$

Summary

- Kinematic reconstruction benchmark plots produced for Canyonlands and Deathvalley
- Deathvalley and Canyonlands show similar performance → Canyonlands benchmarks for 18x275GeV^2 beams to be investigated to understand y resolution features
- Purity and stability plots produced → drops in purity for Q^2 = 10 and 100 GeV^2