

Charged-Current Single Charged Pion Production on Argon with MicroBooNE



Measurements in Muon and Electron Neutrino Channels

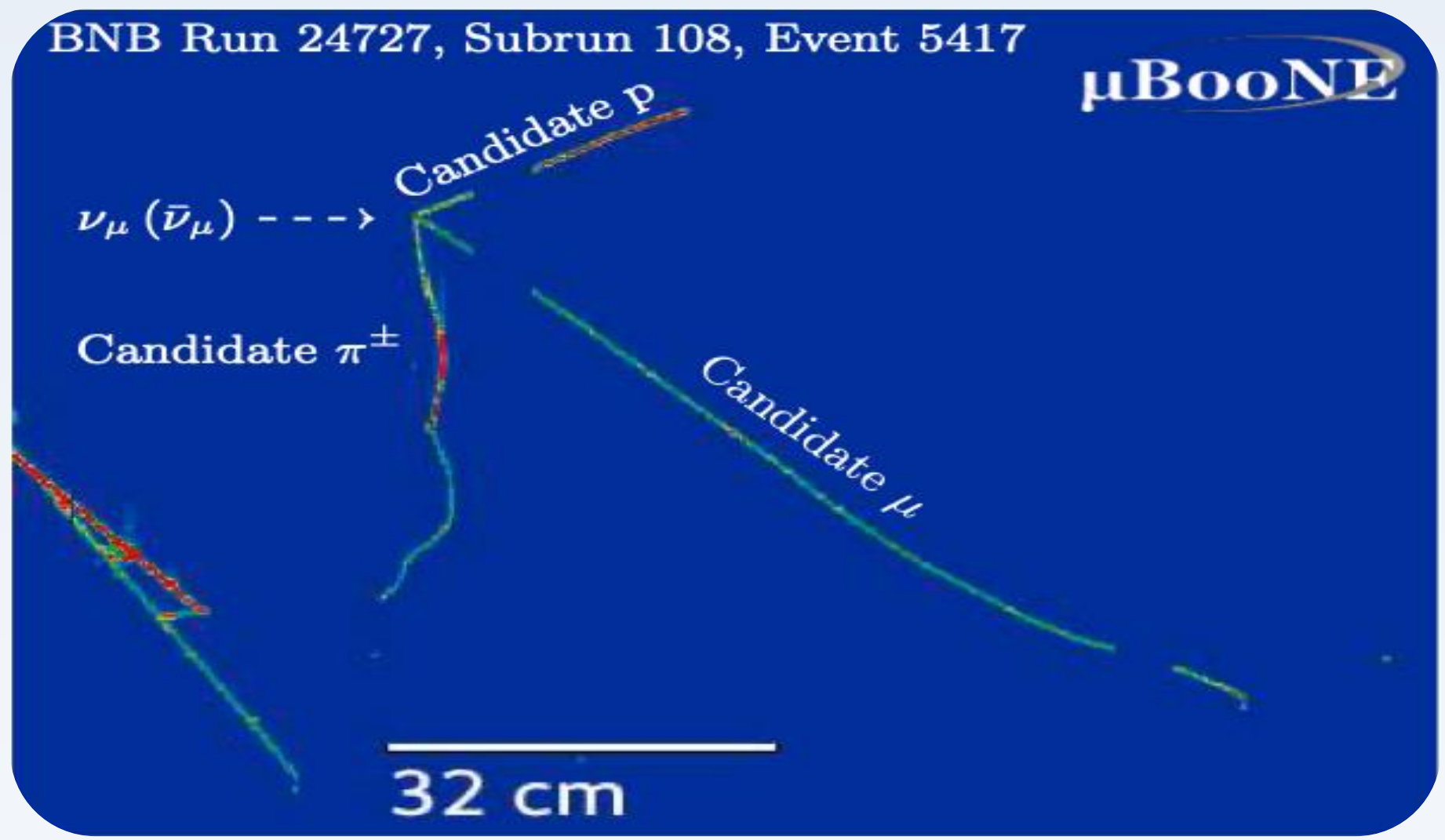
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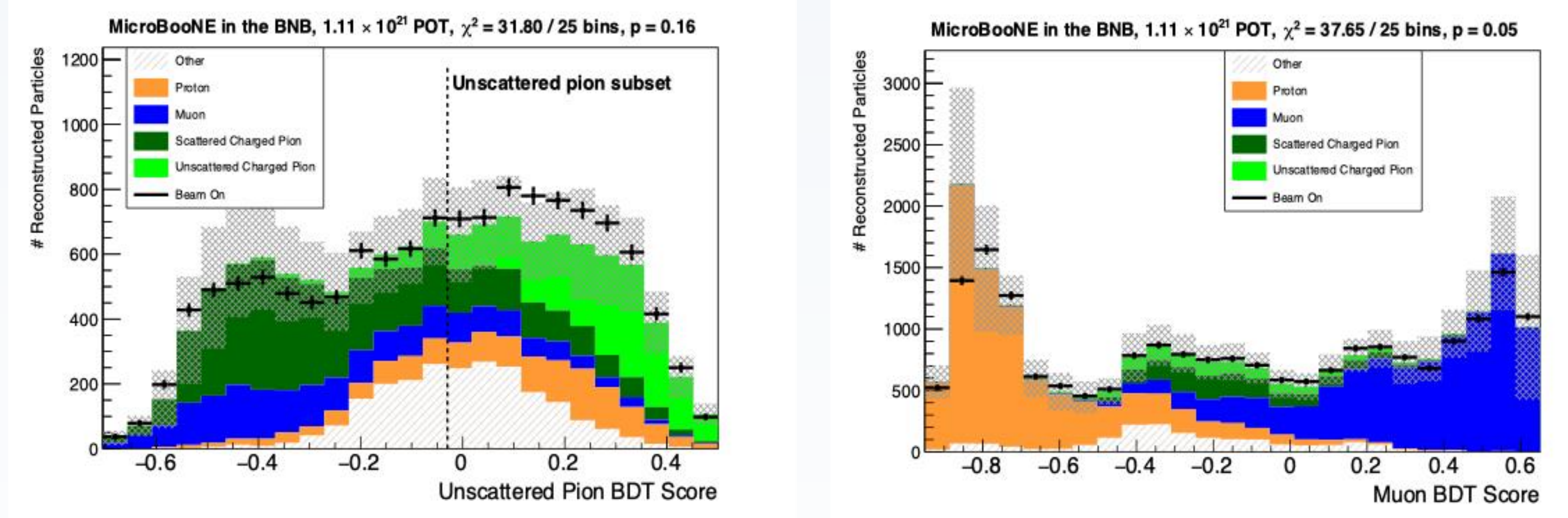
3. BNB: $\nu_\mu(\bar{\nu}_\mu)$ CC1 π^\pm

3.1. Event display

$$1\mu^\pm + 1\pi^\pm + 0\pi^0 + Xp, \text{ where } X \geq 0$$



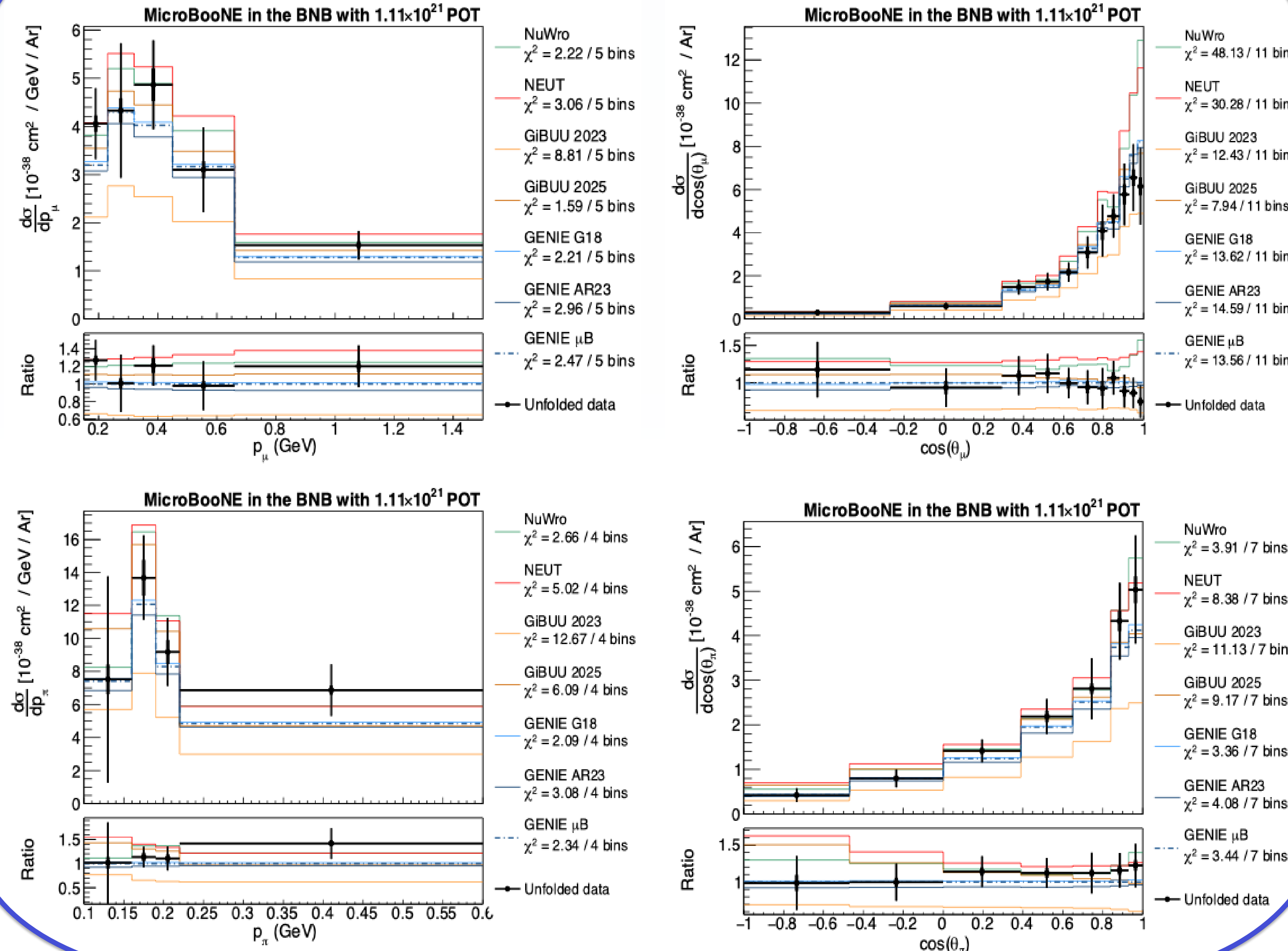
3.2 Key selection variable distributions



Candidate data events: 12566

Efficiency : ~20%
Purity : ~52%

3.3 Generator comparisons



1. Motivation

CC1 π^\pm resonant & coherent pion production is a major channel at ~1 GeV

- Both ν_μ & ν_e helps to:
 - Improve modeling
 - Reduce systematics
 - Refine signal/background predictions

2. MicroBooNE Detector

- 85 tones active mass LArTPC
- Beam data:
 - BNB: On axis, 8 GeV protons K.E
 - NuMI: 8° off axis, 120 GeV protons K.E

5. Key Takeaways

- BNB: $\nu_\mu(\bar{\nu}_\mu)$ CC1 π^\pm
 - 25-fold increase in data on argon
 - Tension with generators at low Q^2
 - Indications of pion kinematics shape mismodeling
- NuMI: $\nu_e(\bar{\nu}_e)$ CC1 π^\pm
 - First ever measurement on argon
 - Limited stats with good generator agreement

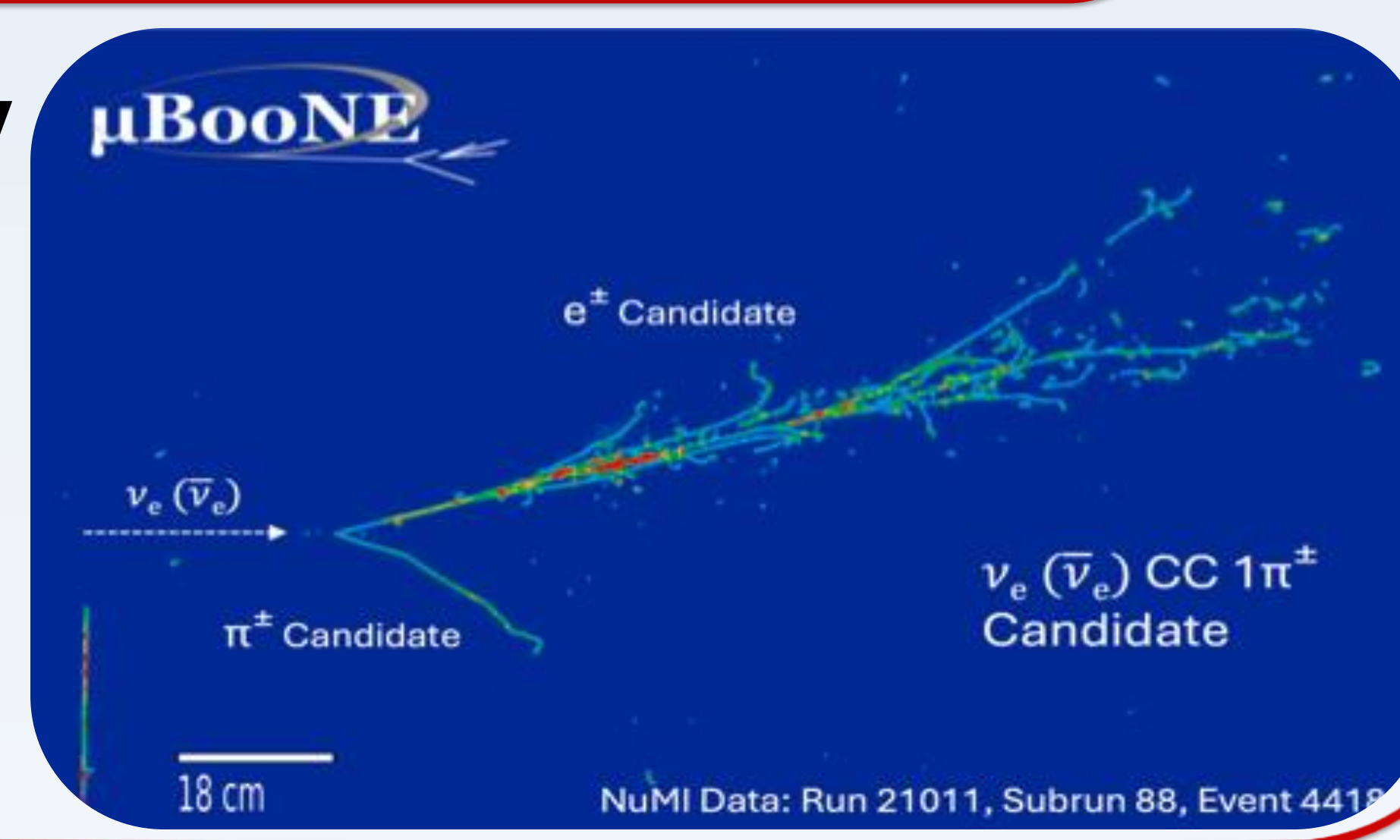
6. References

PHYS. REV. D 113, 032007 (2026)
PHYS. REV. L 135, 061802 (2025)

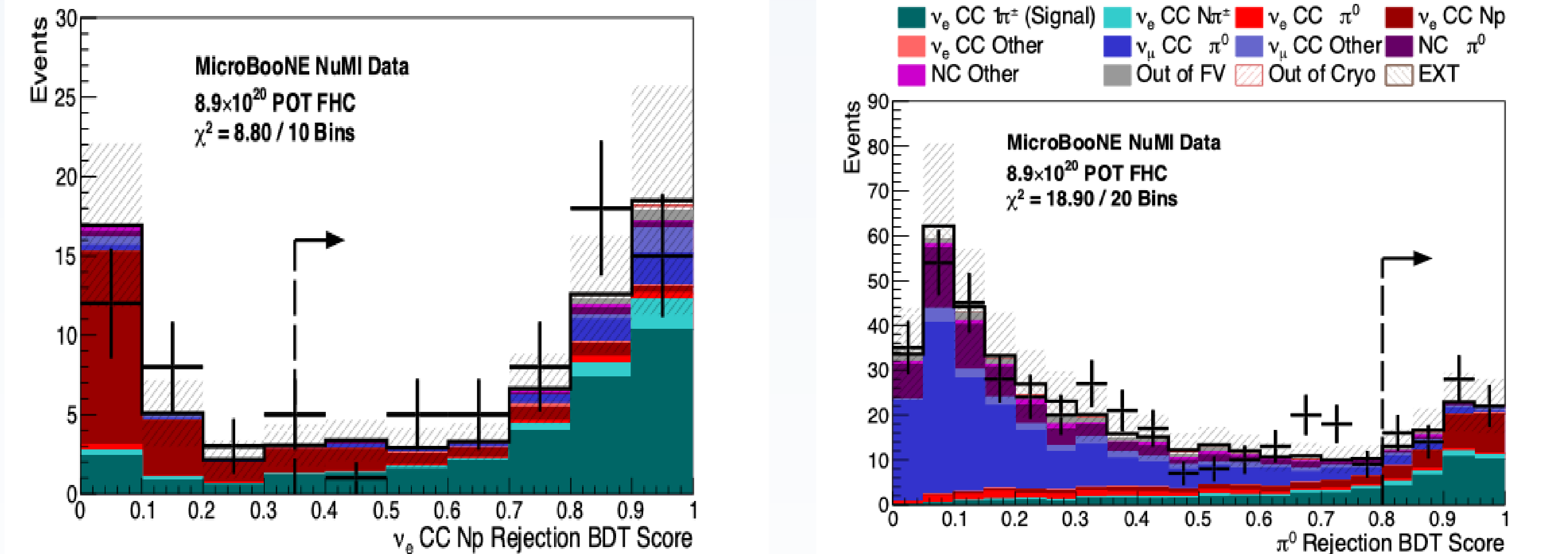
4. NuMI: $\nu_e(\bar{\nu}_e)$ CC1 π^\pm

4.1. Event display

$$1e^\pm + 1\pi^\pm + 0\pi^0 + Xp, \text{ where } X \geq 0$$



4.2 Key selection variable distributions



Candidate data events: 116

Efficiency : ~6%
Purity ~60%

4.3 Generator comparisons

