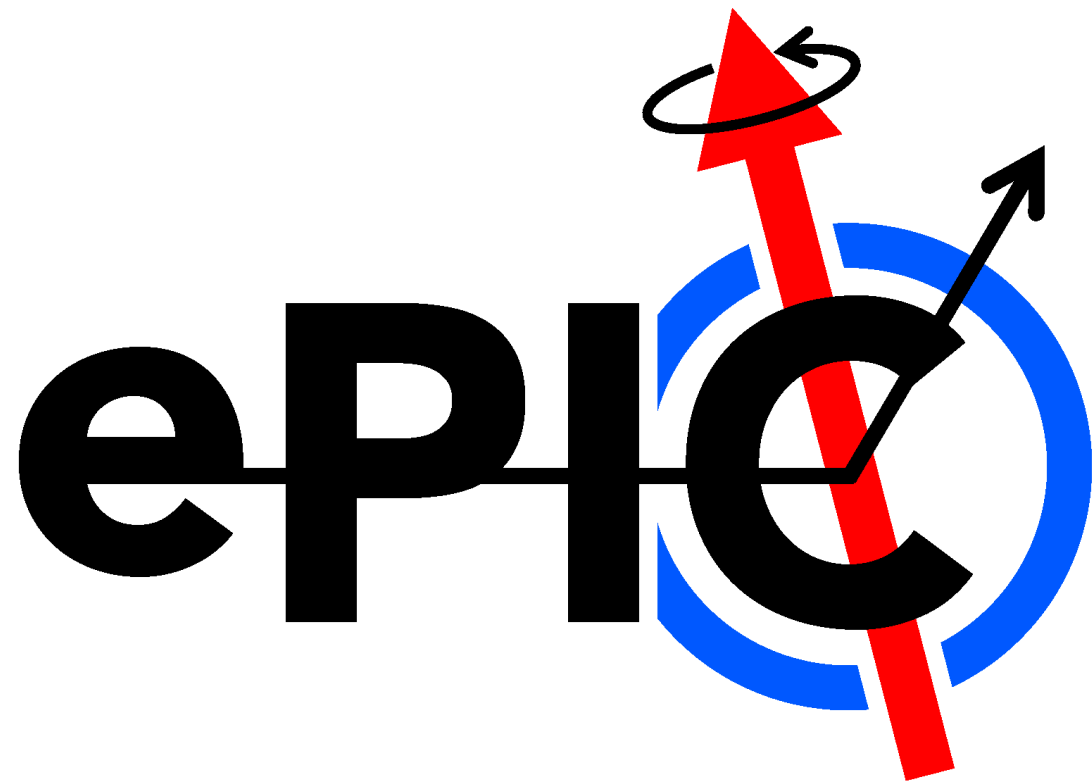


# Electron ID benchmarks

Tyler Kutz

ePID analysis meeting

October 26, 2023



# Benchmarks for ePID algorithm

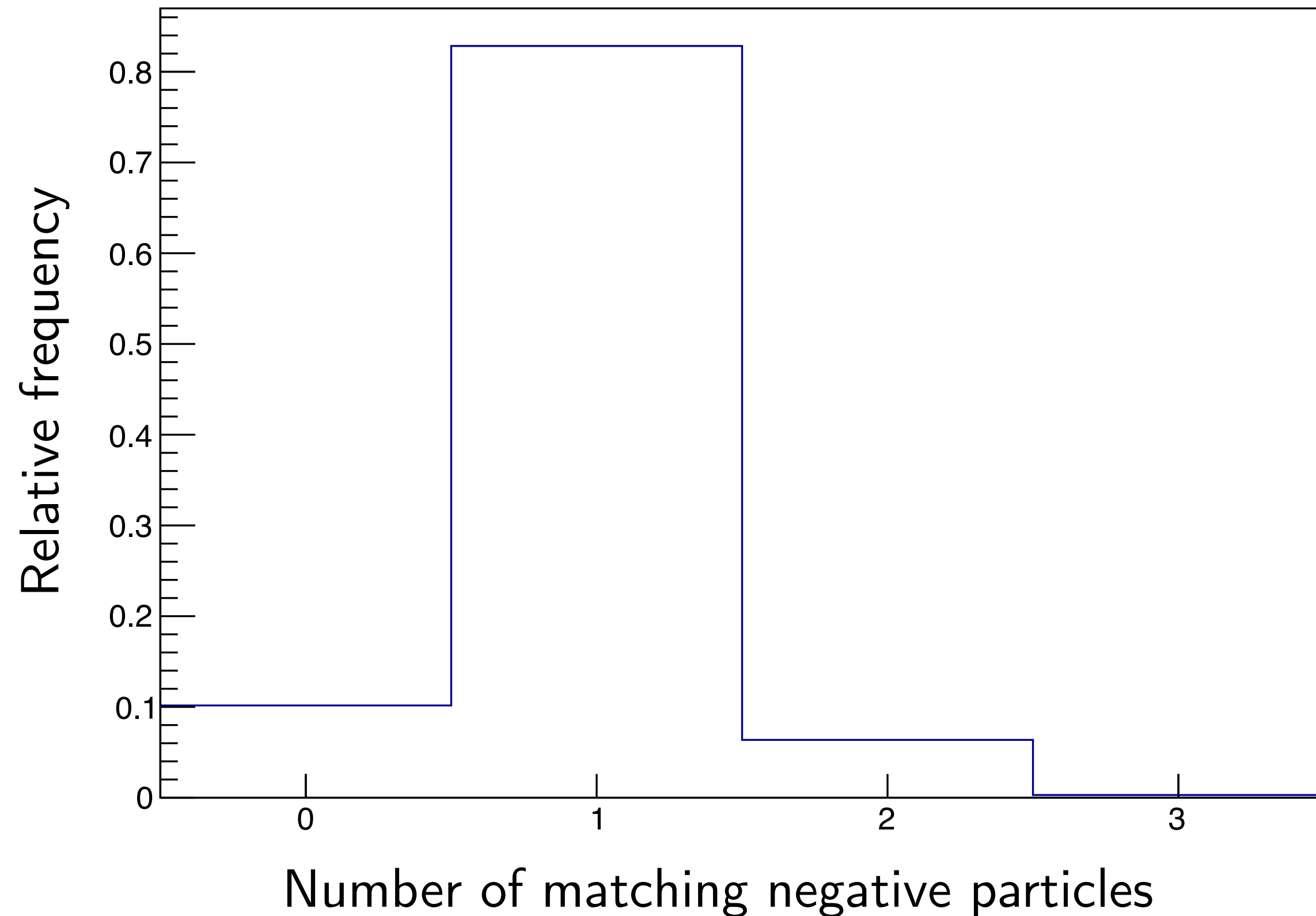
- How often is DIS electron correctly identified (i.e. efficiency)?
- How often are particles mis-identified as the DIS electron (i.e. contamination)?
  - What are the species of mis-identified particles?
  - What is the kinematic dependence of contamination?
    - Kinematic dependence of background *and* of detector performance
    - Impact of contamination also depends on physics observable (kinematic-dependent)

# Preliminary electron ID (DIS events only)

- Simple  $E/p$  electron finder implemented over the summer
  - Reconstructed  $E$  and  $p$ , but truth-level association
- Initial requirement of  $0.9 < E/p < 1.2$  (needs to be optimized)

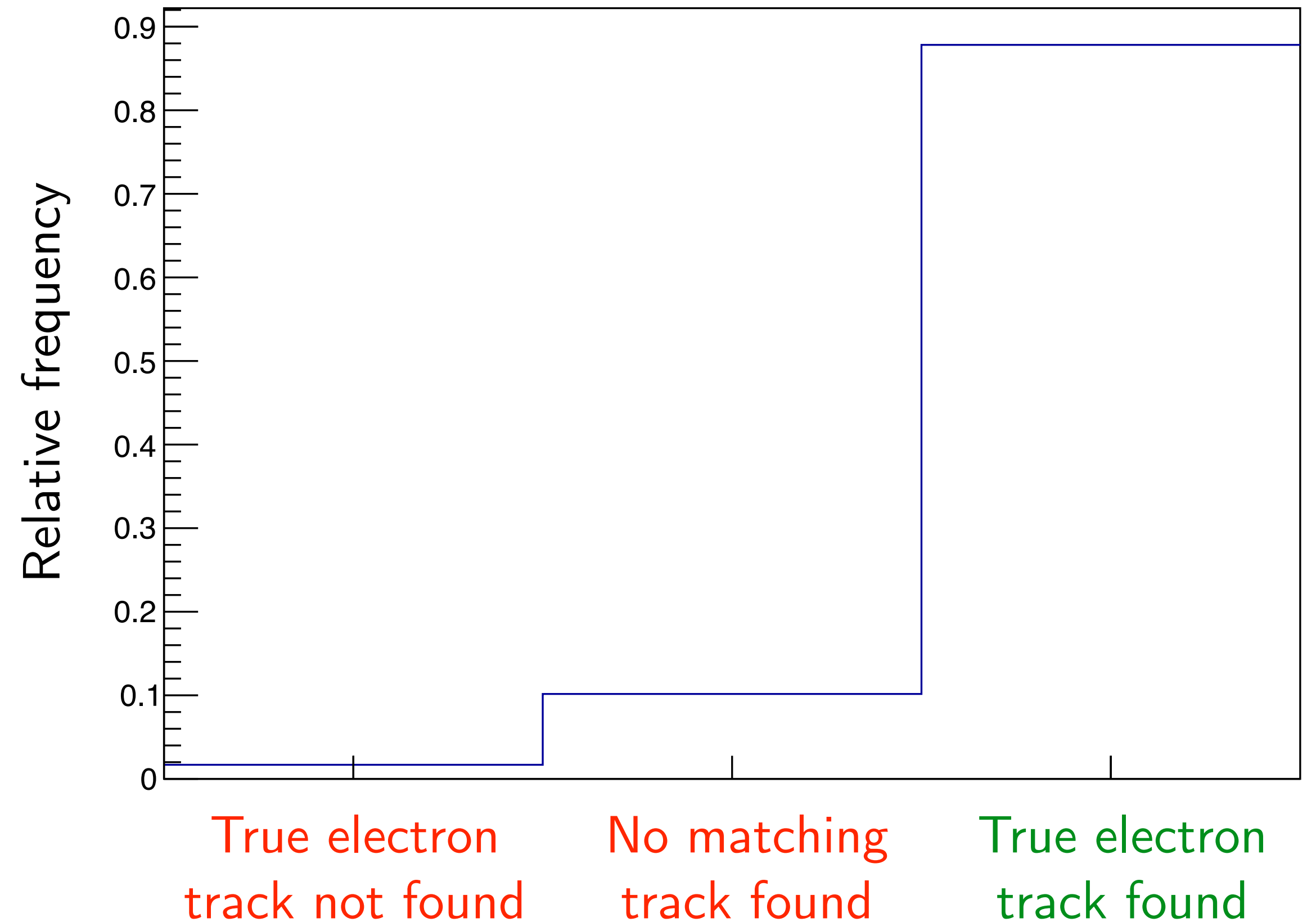
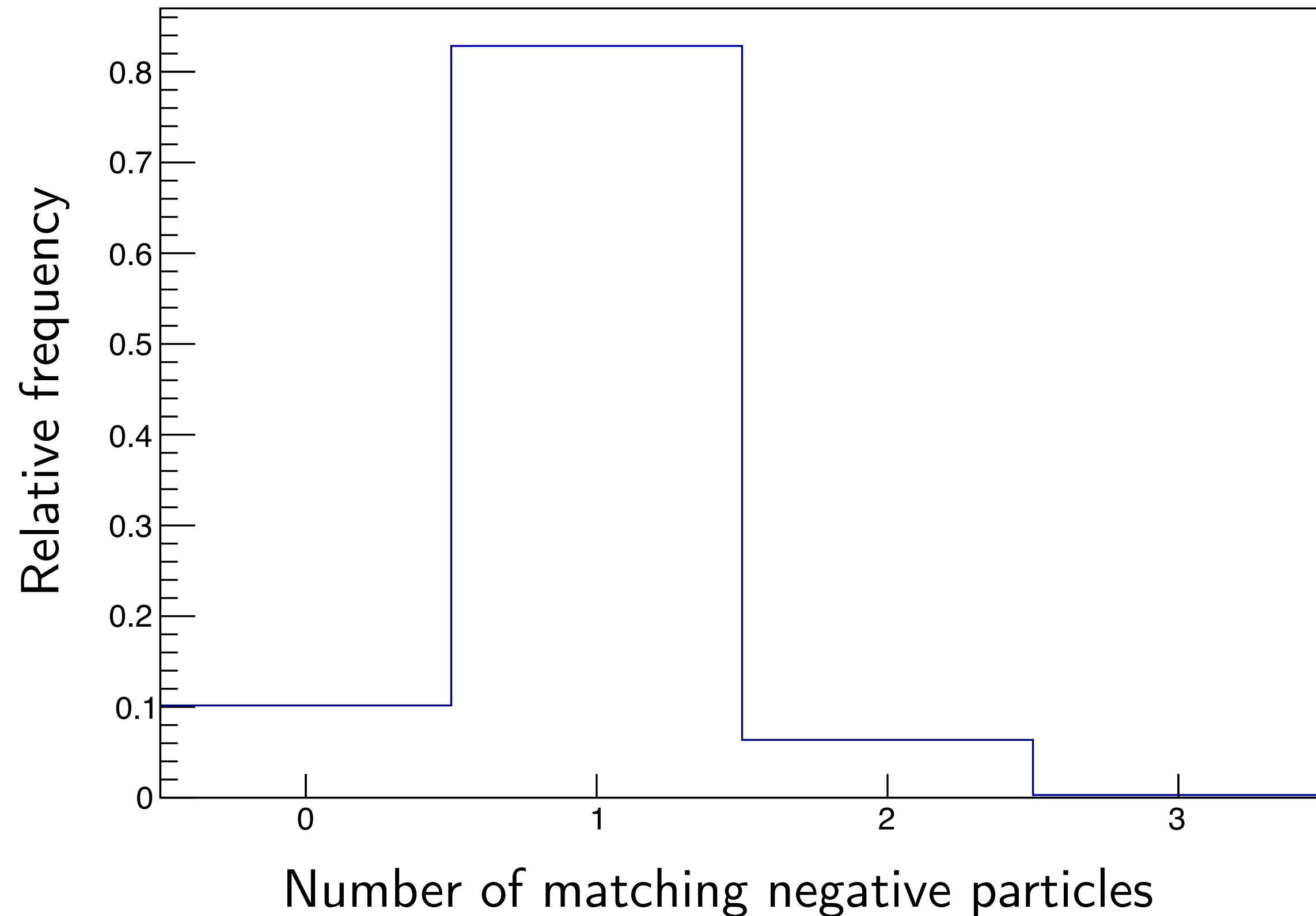
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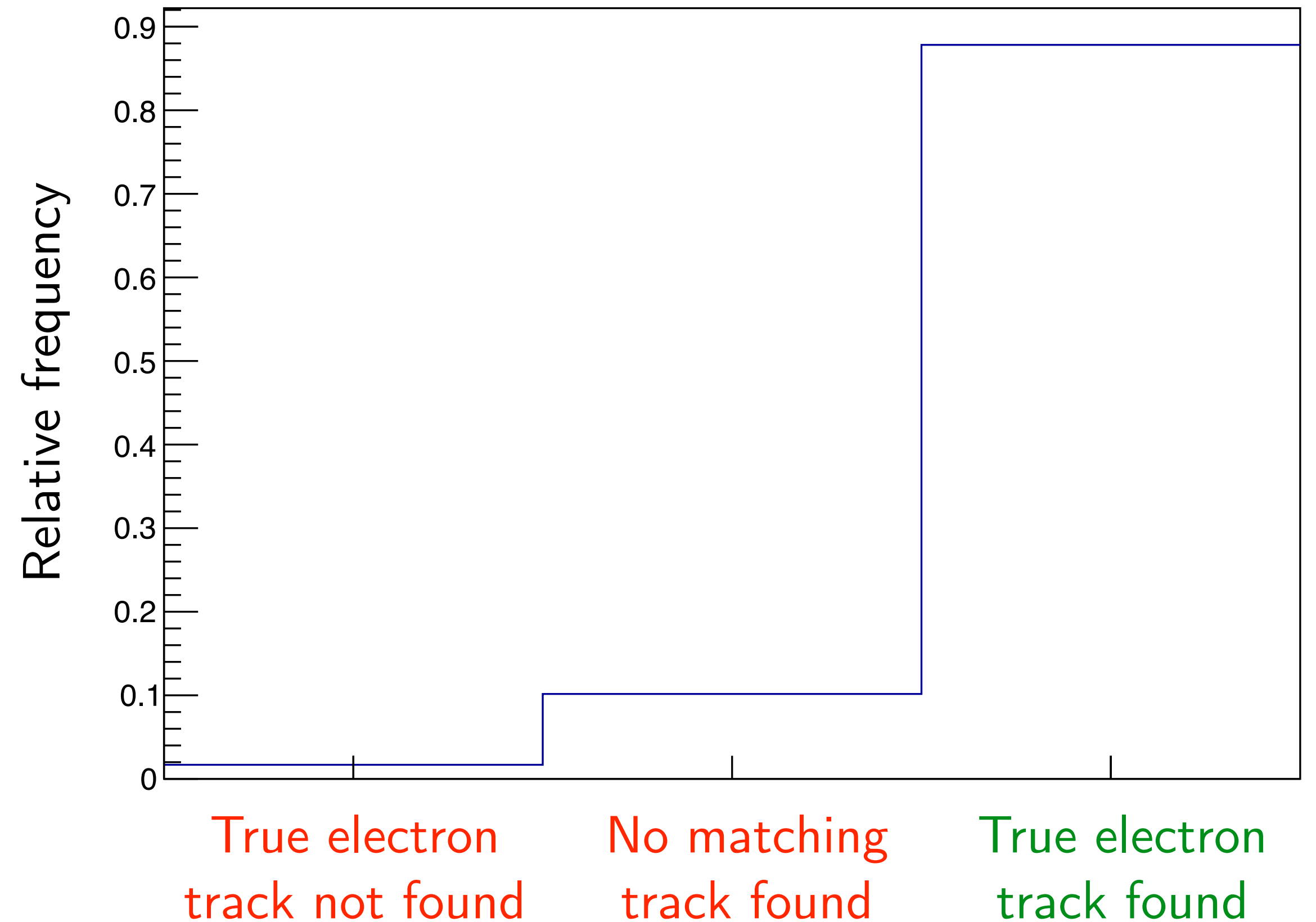
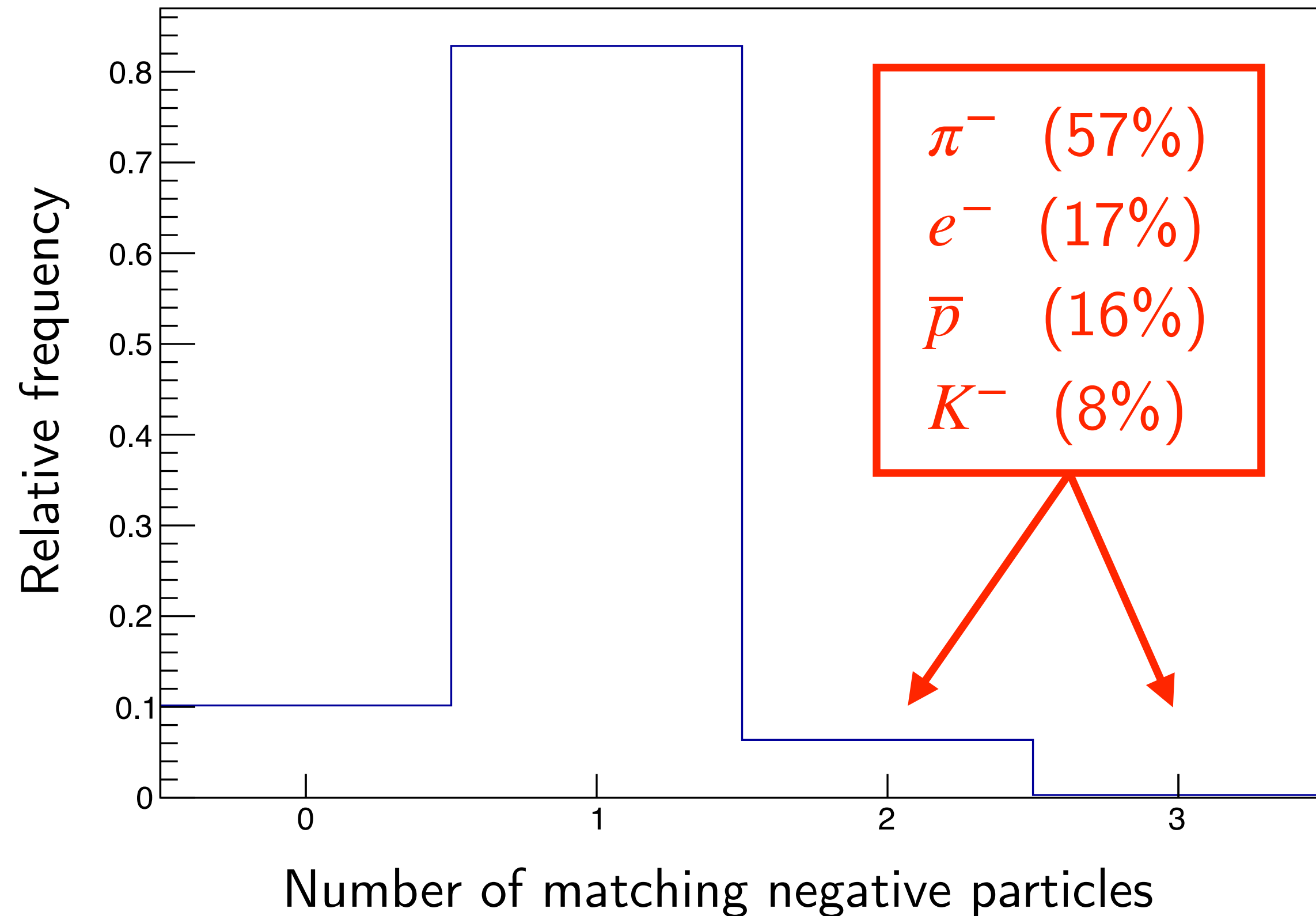
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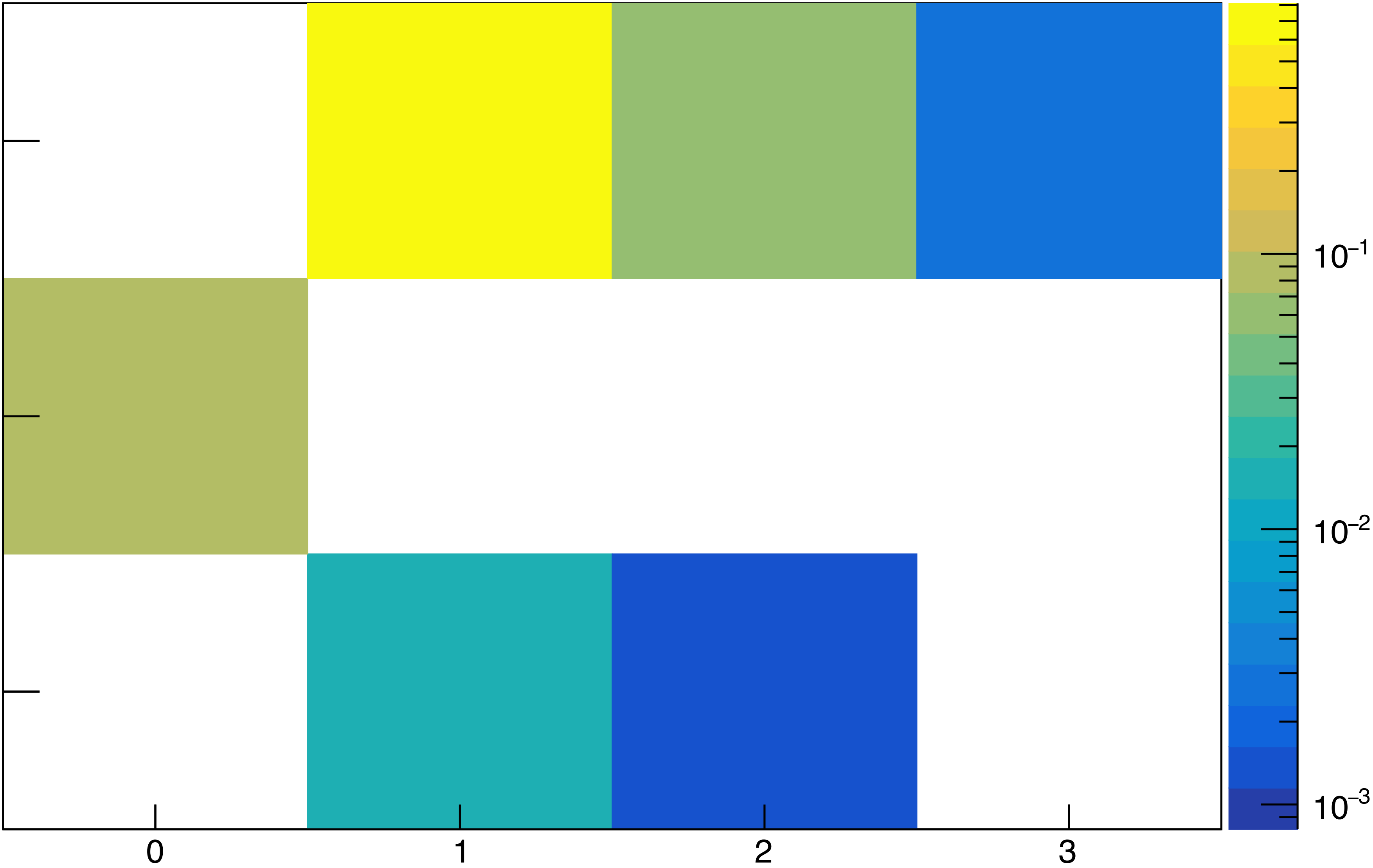


# Preliminary electron ID (DIS events only)

True electron  
track found

No matching  
track found

True electron  
track not  
found



Number of matching negative particles

# Impact of pion contamination $f_{\pi/e}$ on inclusive observables (B. Schmookler)

Unpolarized cross sections

$$\left( \frac{\Delta(\sigma^{r,NC})}{\sigma^{r,NC}} \right)_{\pi^-} = \Delta f_{\pi/e}$$

$$\approx 0.1 \times f_{\pi/e}$$



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Asymmetries

$$\left( \frac{\sigma_{A^e}}{A^e} \right)_{\pi^-} = \sqrt{(\Delta f_{\pi/e})^2 + \left( f_{\pi/e} \frac{|A^\pi| + \Delta A^\pi}{A^e} \right)^2}$$

$$\approx 0.1 \times f_{\pi/e} - 1 \times f_{\pi/e}$$

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Better observable for assessing ePID

- Develop efficiency and contamination benchmark macros for ePID
- Use single-spin asymmetries as benchmark physics observable to assess ePID performance