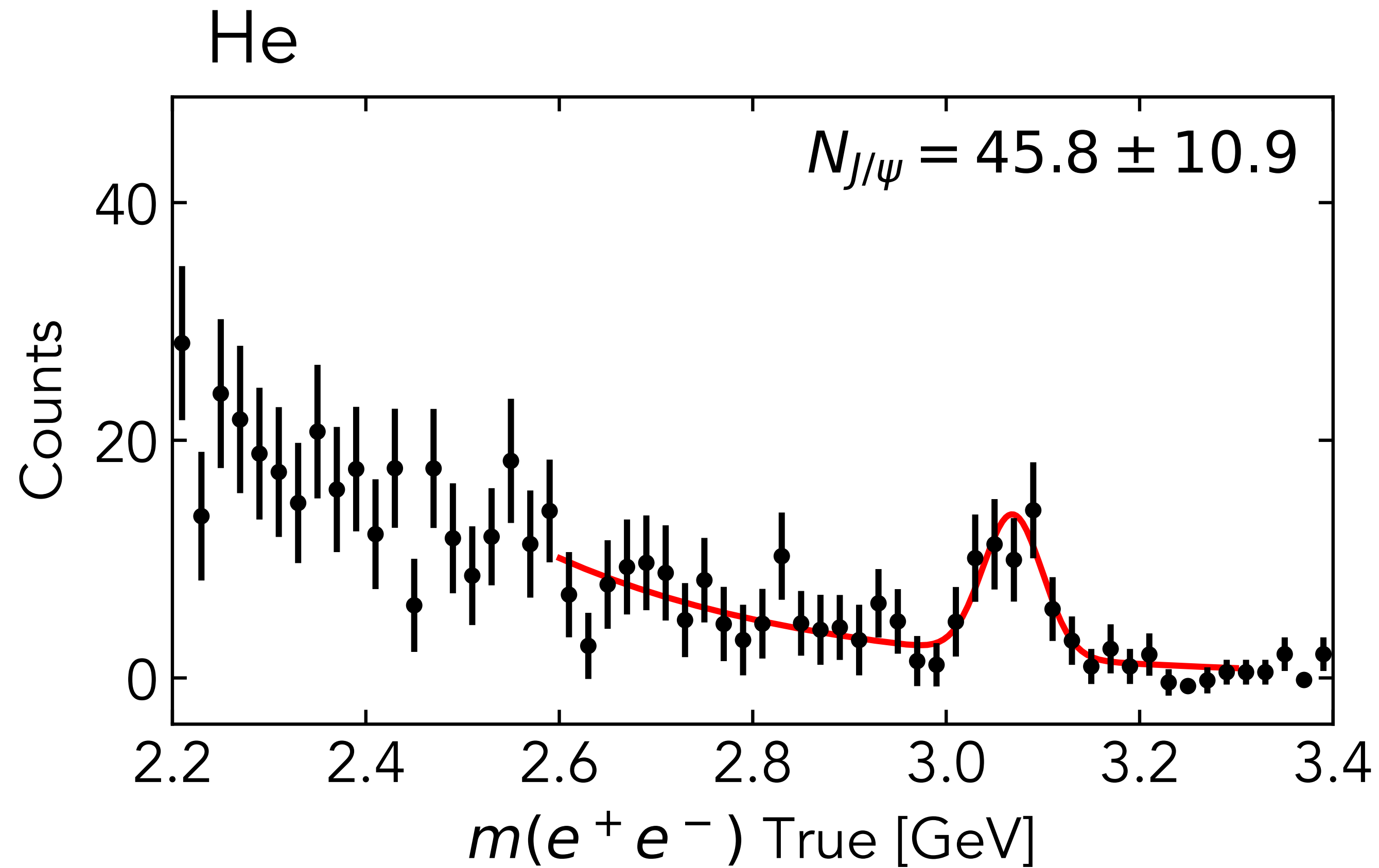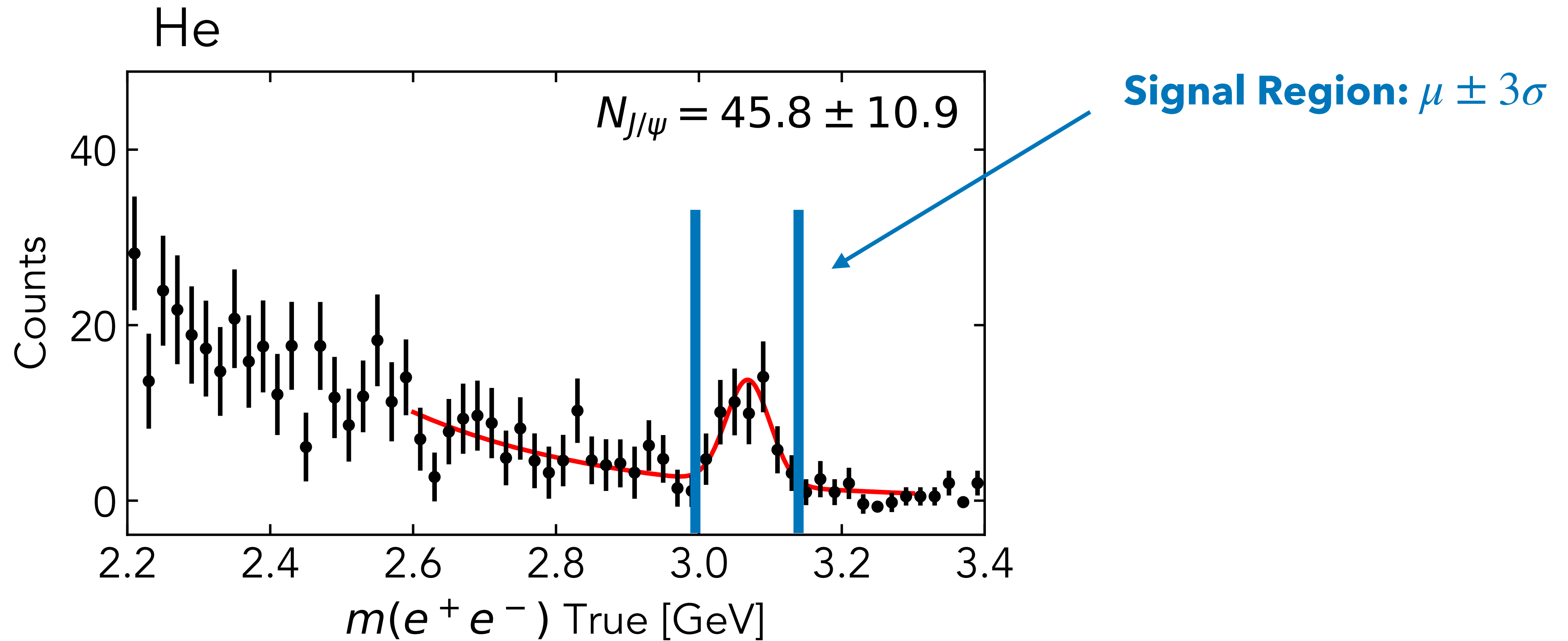# Differential Cross Section Extraction

Jackson Pybus
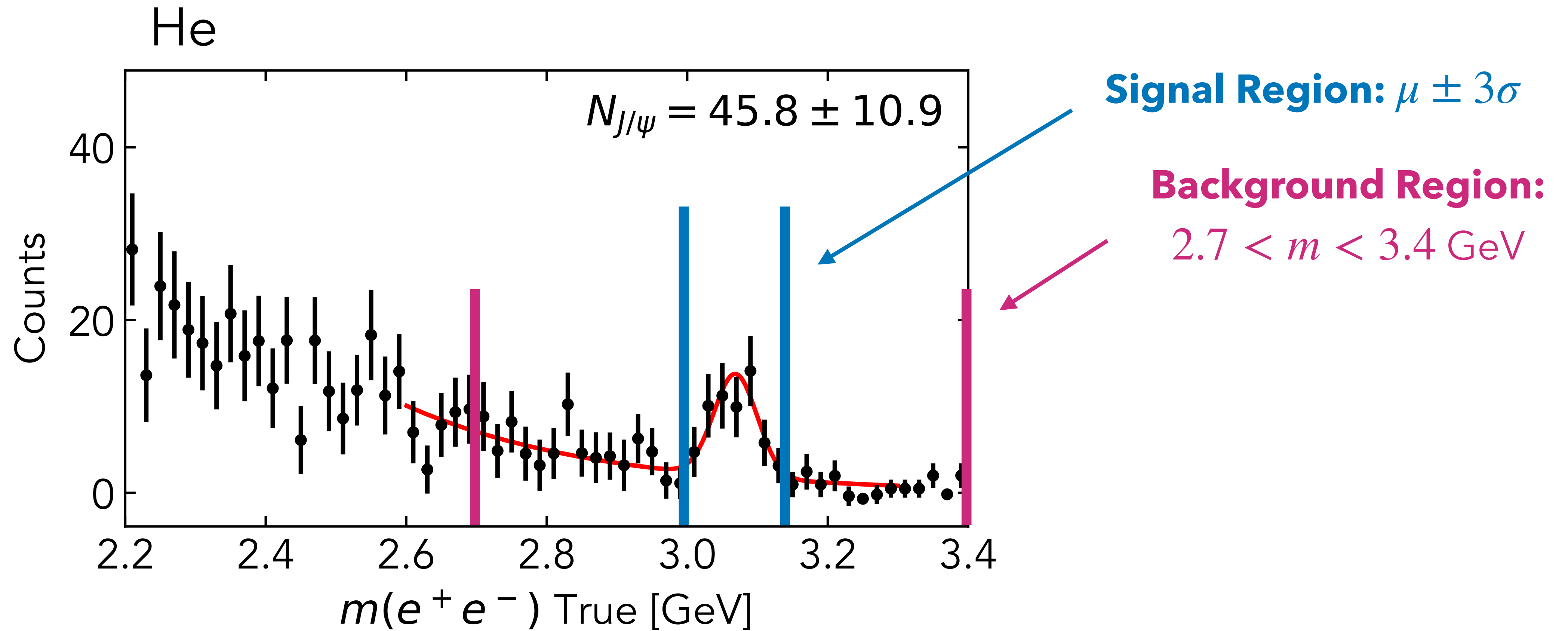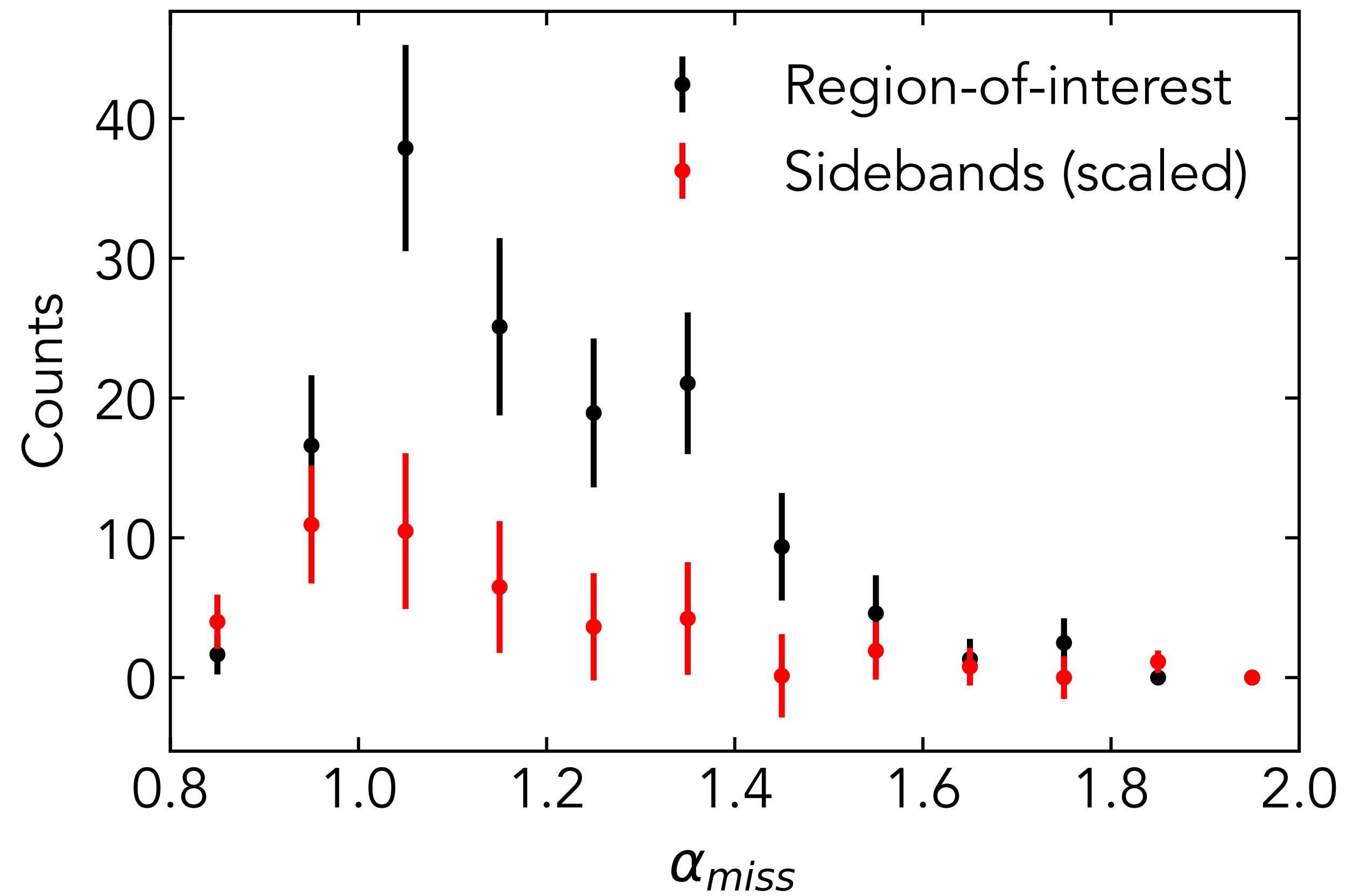
Using side-band subtraction to determine differential distributions

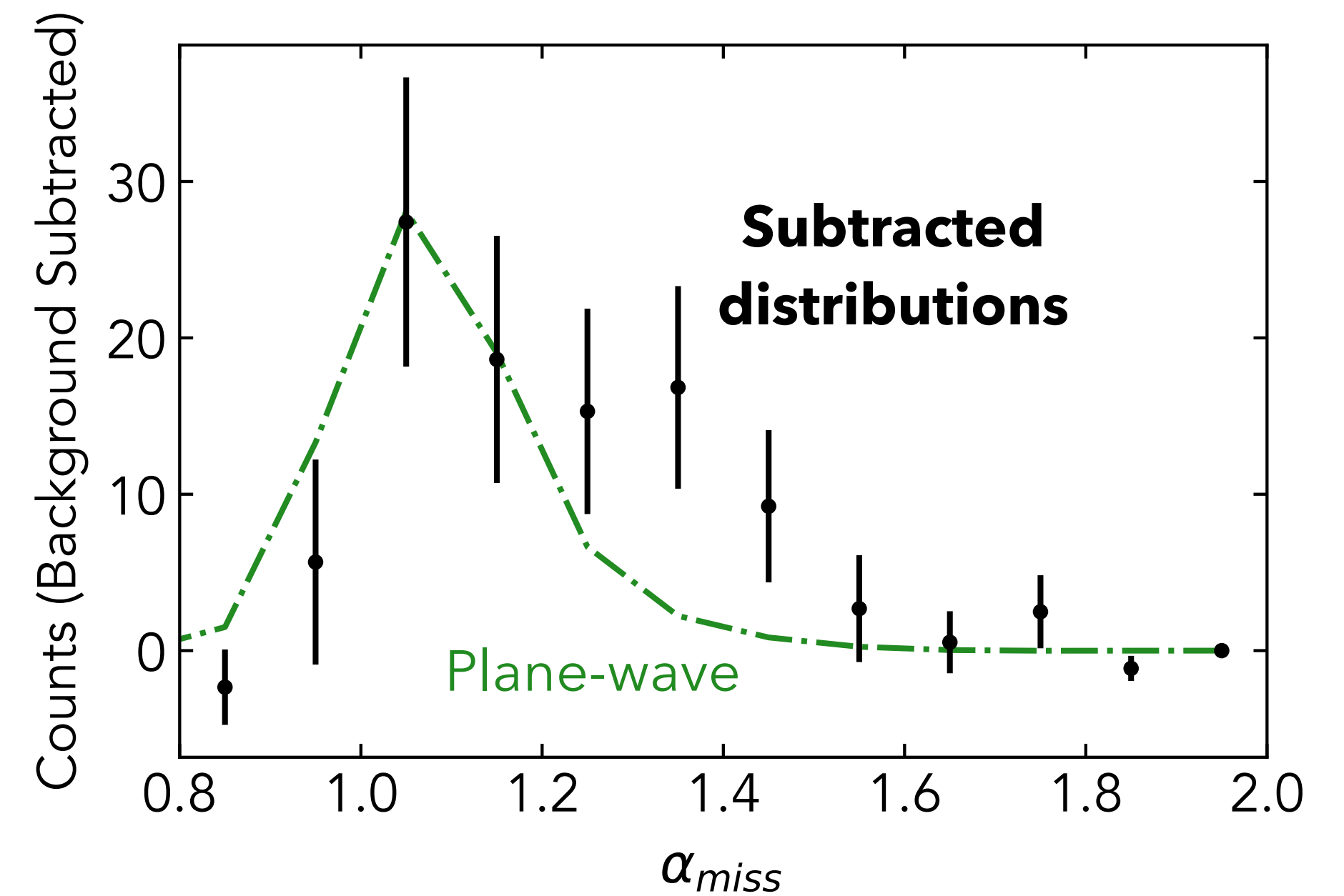# Using side-band subtraction to determine differential distributions

He

$N_{J/\psi} = 45.8 \pm 10.9$

Signal Region: $\mu \pm 3\sigma$

Counts

$m(e^+e^-)$ True [GeV]

Using side-band subtraction to determine differential distributions

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Signal Region: $\mu \pm 3\sigma$

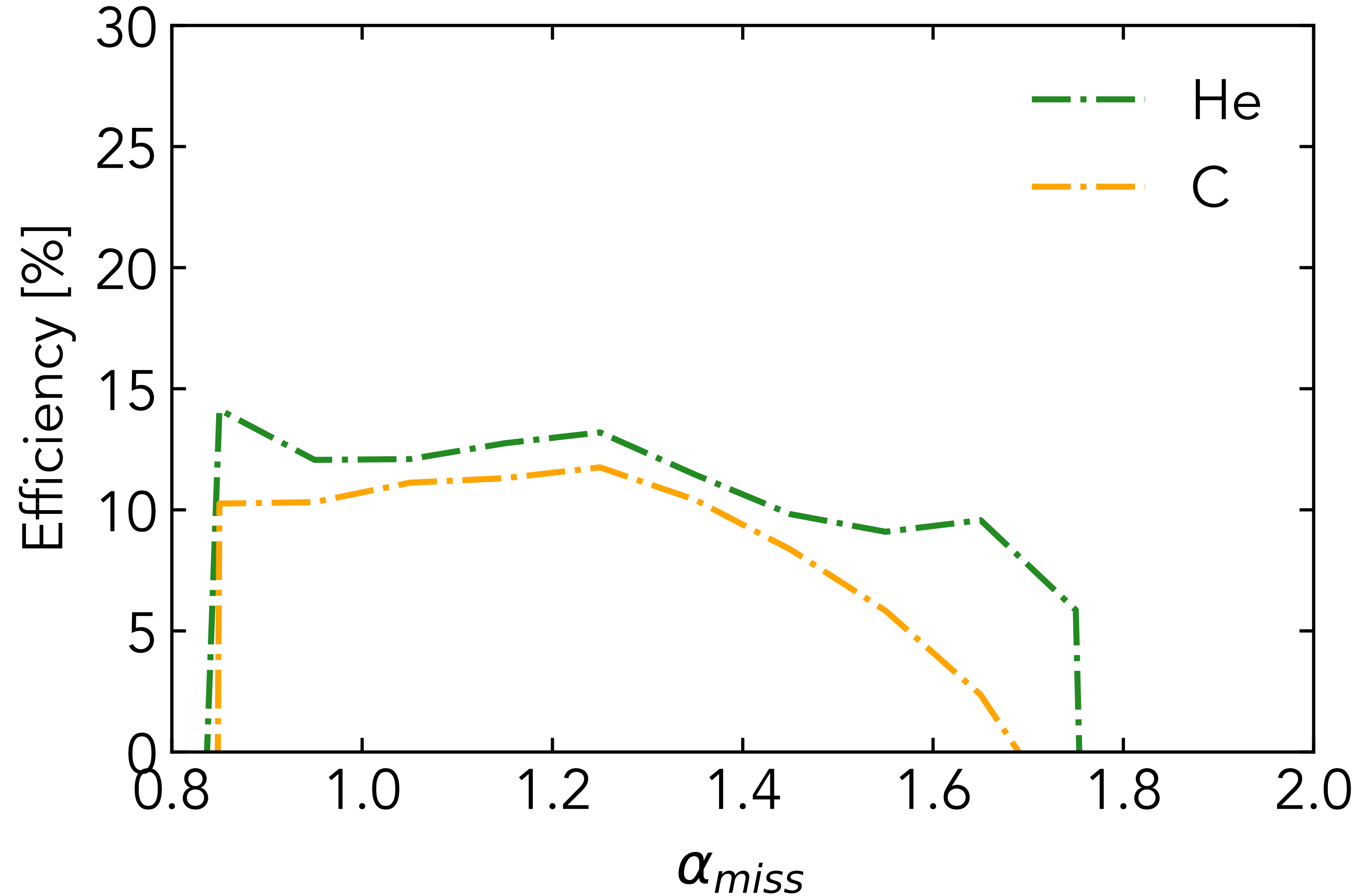**Background Region:** $2.7 < m < 3.4$ GeV

Examine distribution in ROI and side-bands

Examine distribution in ROI and side-bands
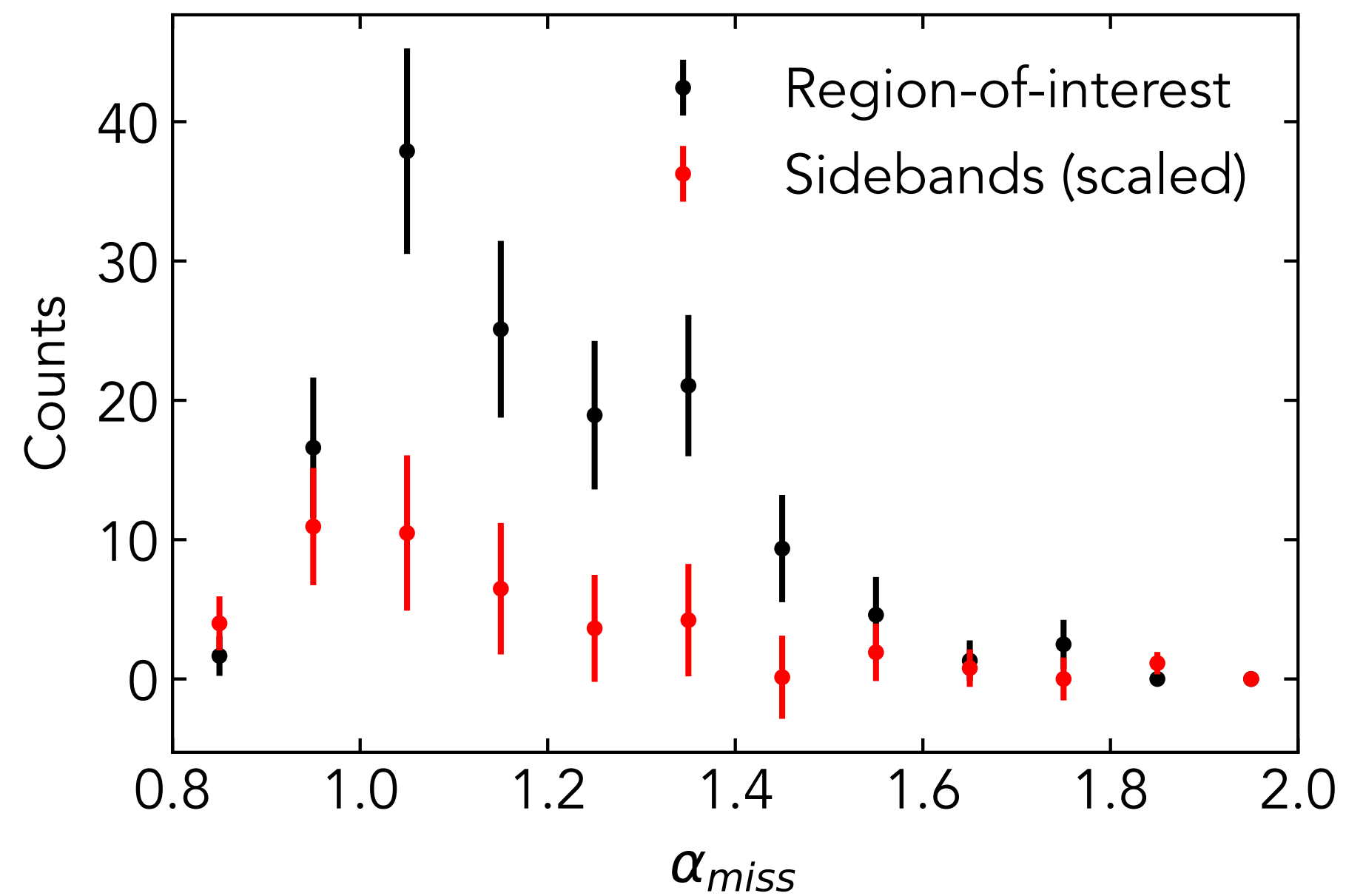
Monte-carlo calculations of kinematic-dependent efficiency

Differential cross section calculated with given quantities

Differential Cross Section

Event yields

$$\frac{d\sigma}{dX} = \frac{Y(X)}{\mathscr{L} \times \epsilon(X) \times T \times B(J/\psi \to e^+e^-) \times \Delta X}$$
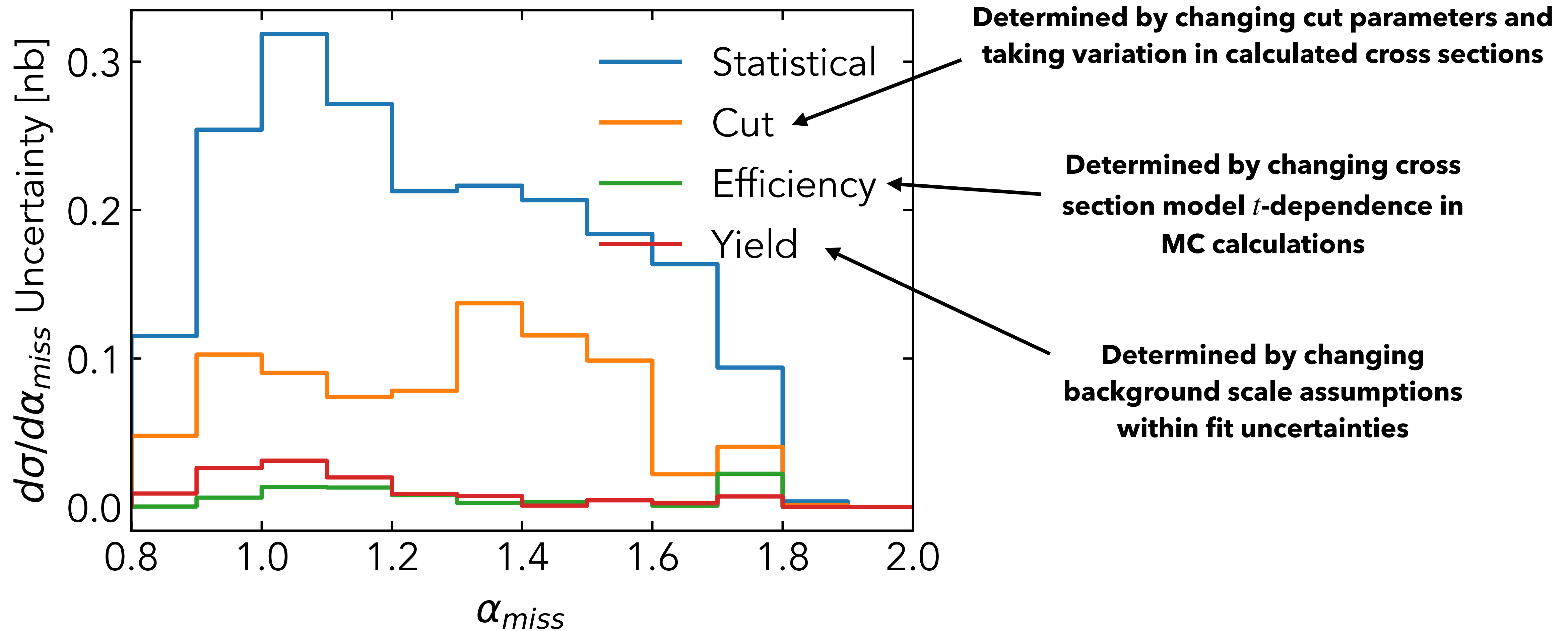
Luminosity

Efficiency
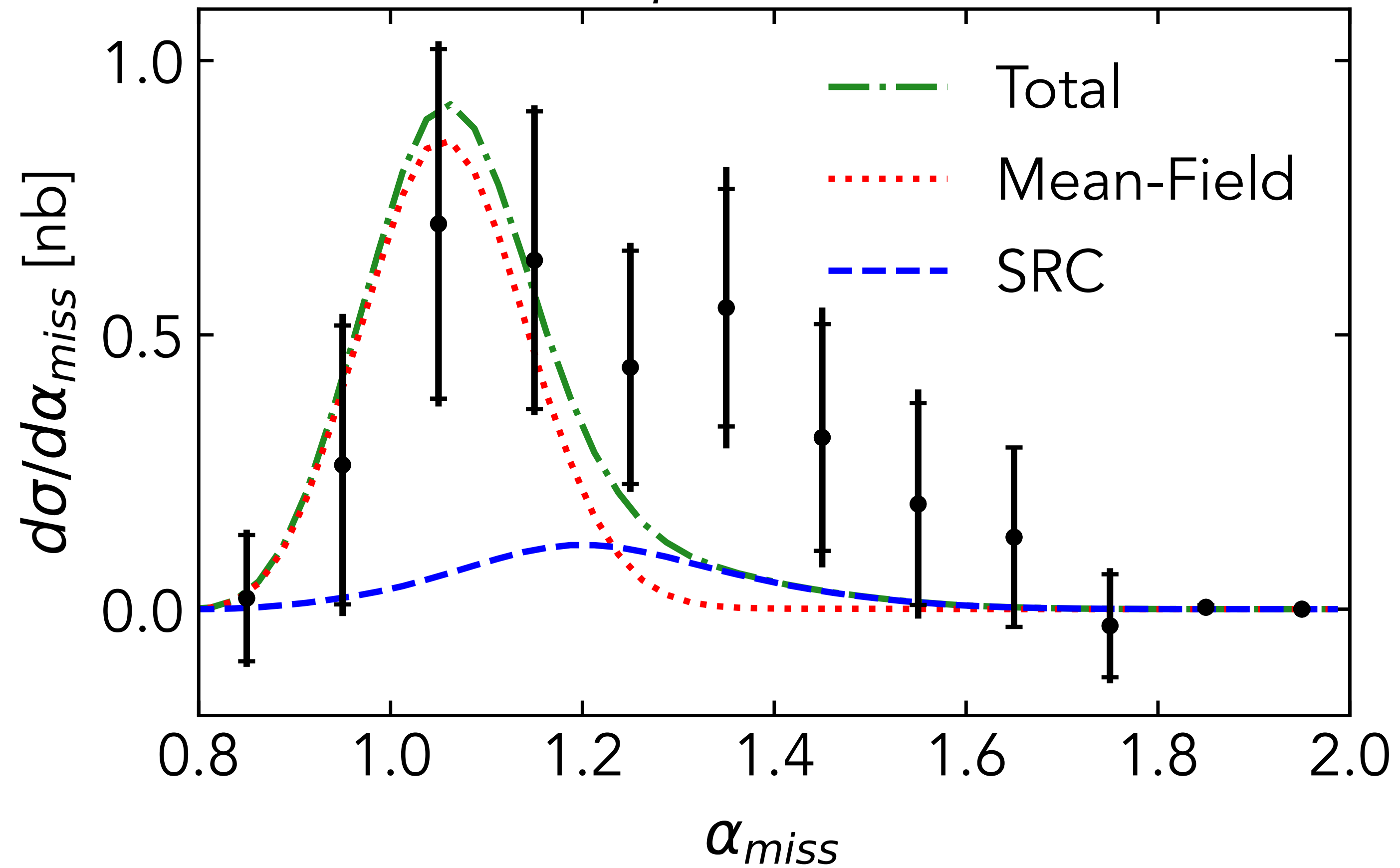
Proton Transparency

Branching Fraction

Bin width

Quantify sources of uncertainty

Determined by changing cut parameters and taking variation in calculated cross sections

Determined by changing cross section model t-dependence in MC calculations

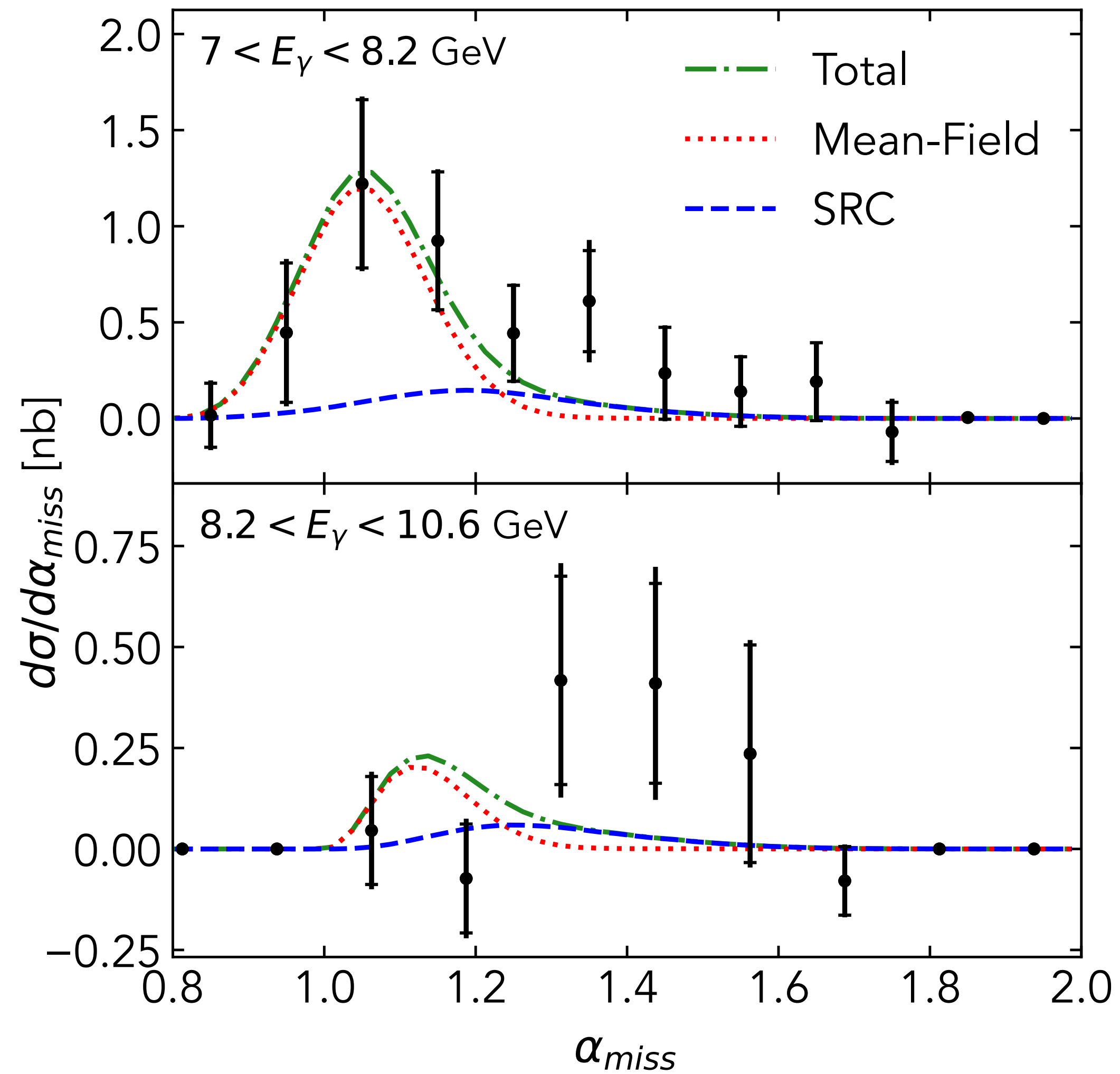Determined by changing background scale assumptions within fit uncertainties

Differential cross section extracted and compared with plane-wave

$7 < E_\gamma < 10.6$ GeV

Separately extracted for different energy bins

Can compare with different proton modification models