$\mu^- Al \rightarrow e^- Al$ with X10 Mu2e muon flux

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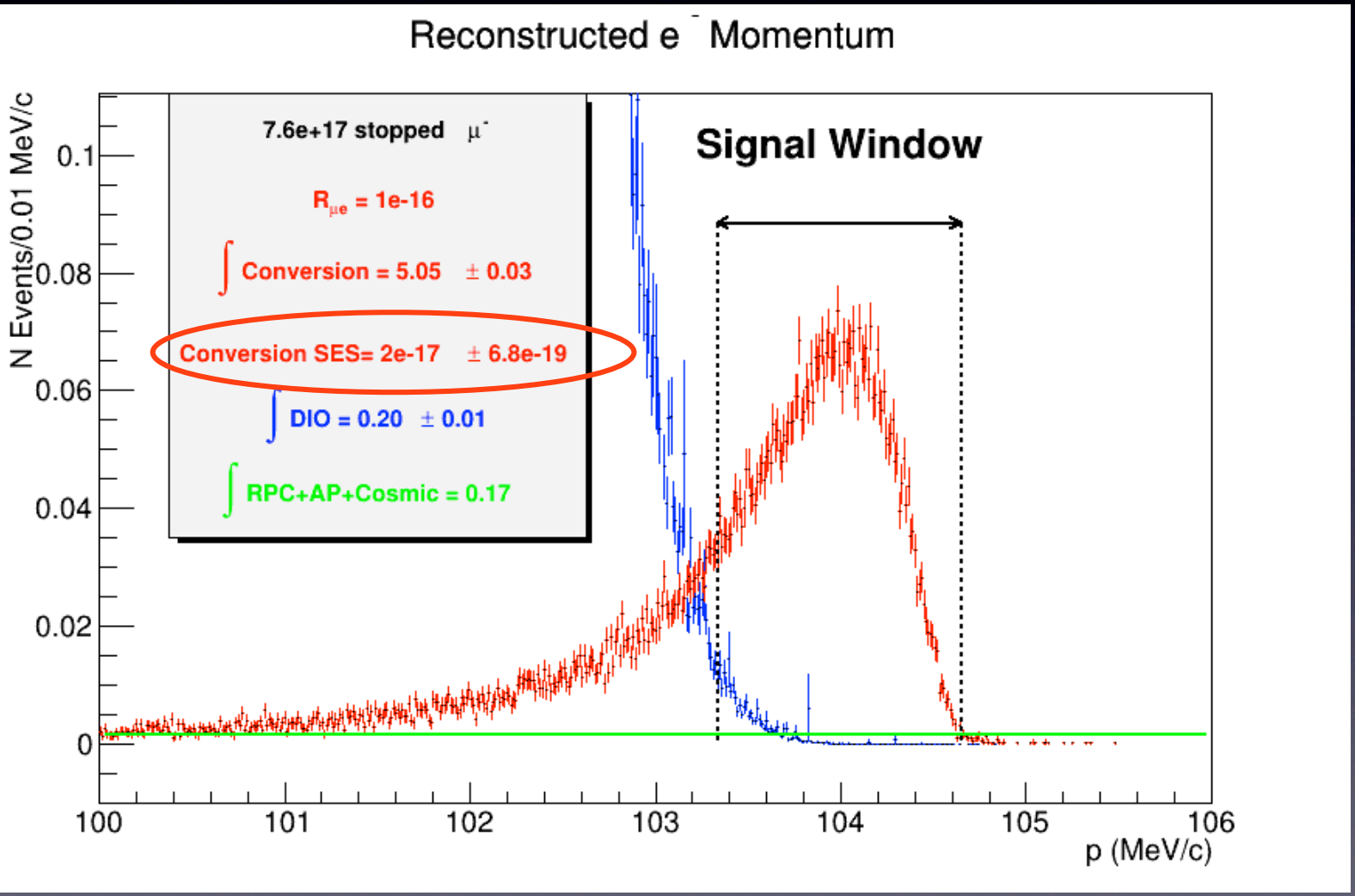
Mu2e Performance

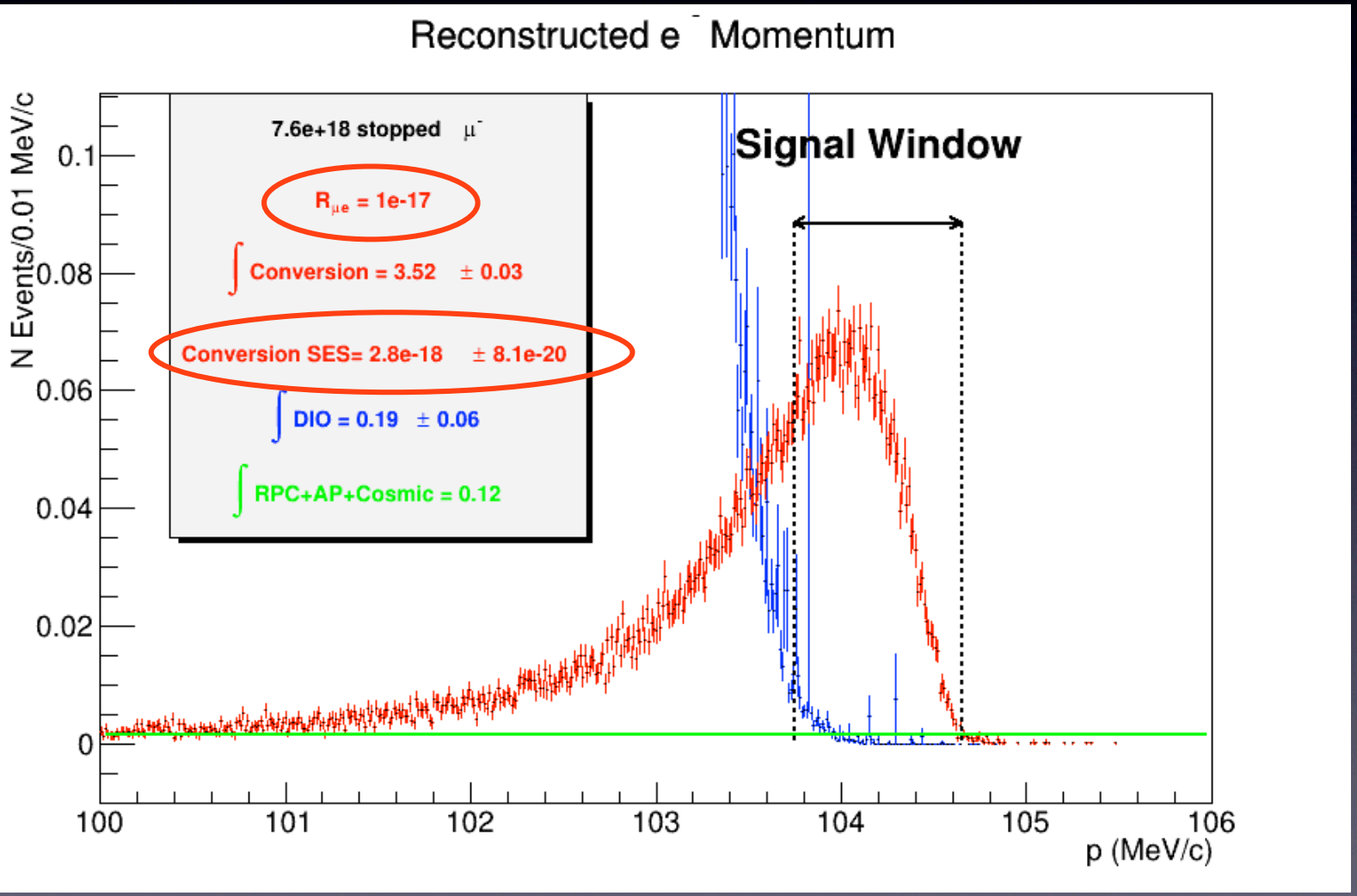
- Figure of merit: Conversion electron single-event sensitivity for a constant (0.2) contamination of Michele decay in orbit (DIO)



SES = 2×10^{-17}

Mu2e, 10× integrated μ flux

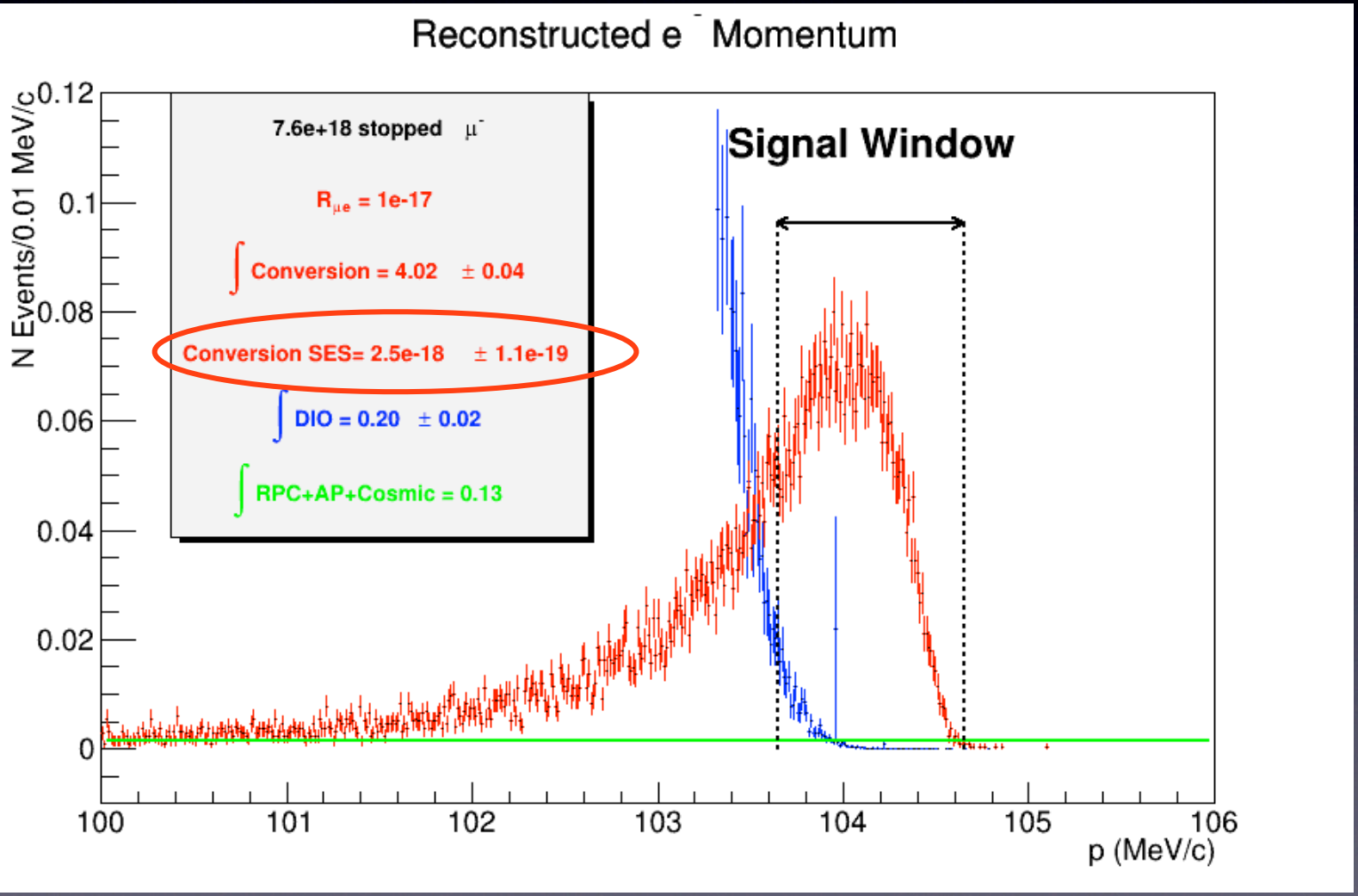
- Same apparatus
- 10× stopped muons, 3× background hit rate



SES = 2.8×10^{-18}

Mu2e, 10× integrated μ flux

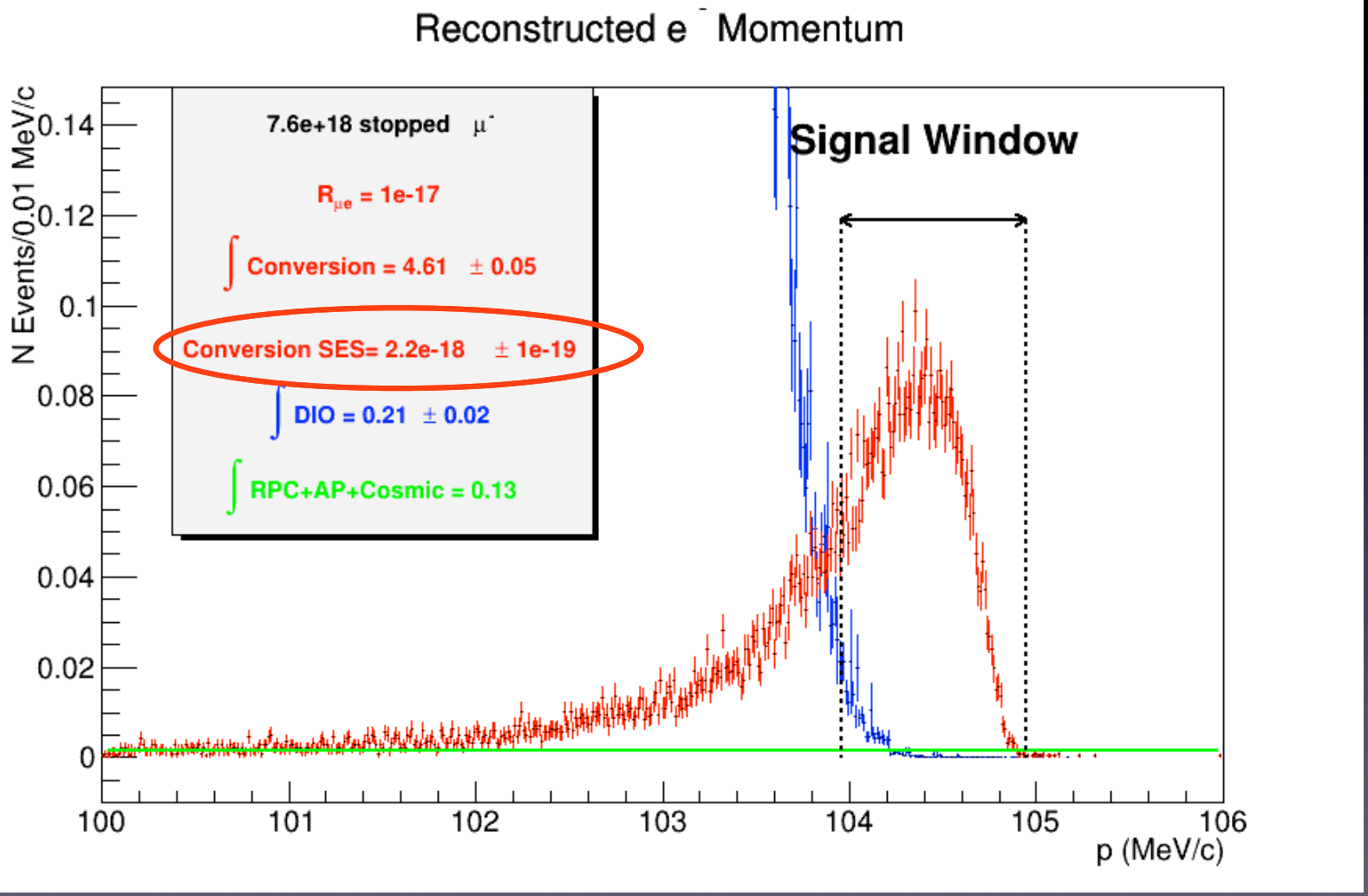
- Same target, 8 μm straw walls
- 10× stopped muons, 1.5× e^- bkg. hit rate, 3× proton bkg. rate



SES = 2.5×10^{-18}

Mu2e, 10× integrated μ flux

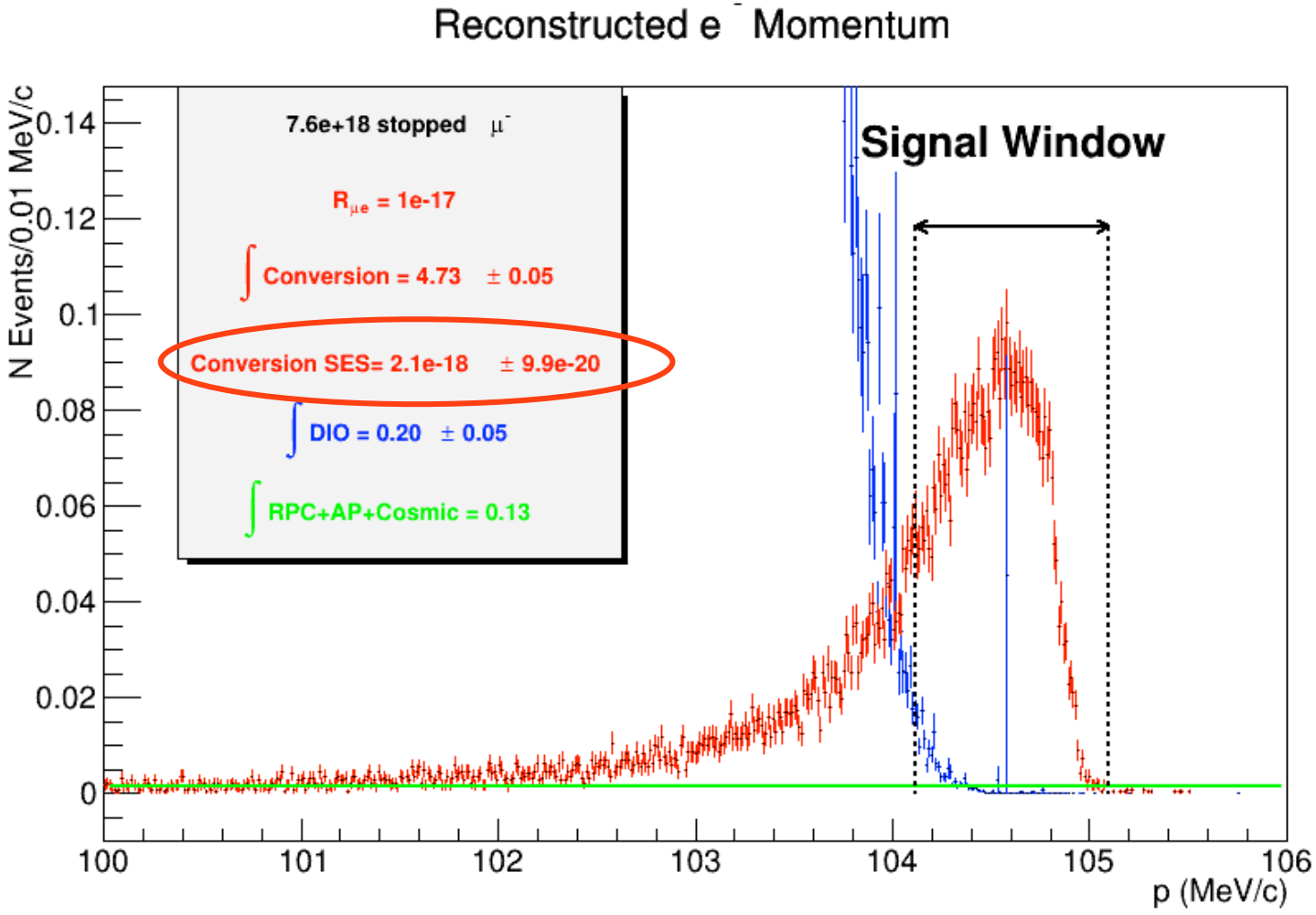
- Same target, 8 μm straw walls, 50% Proton Absorber (PA)
- 10× stopped muons, 1.5× e^- bkg. hit rate, 4× proton bkg. rate



SES = 2.2×10^{-18}

Mu2e, 10× integrated μ flux

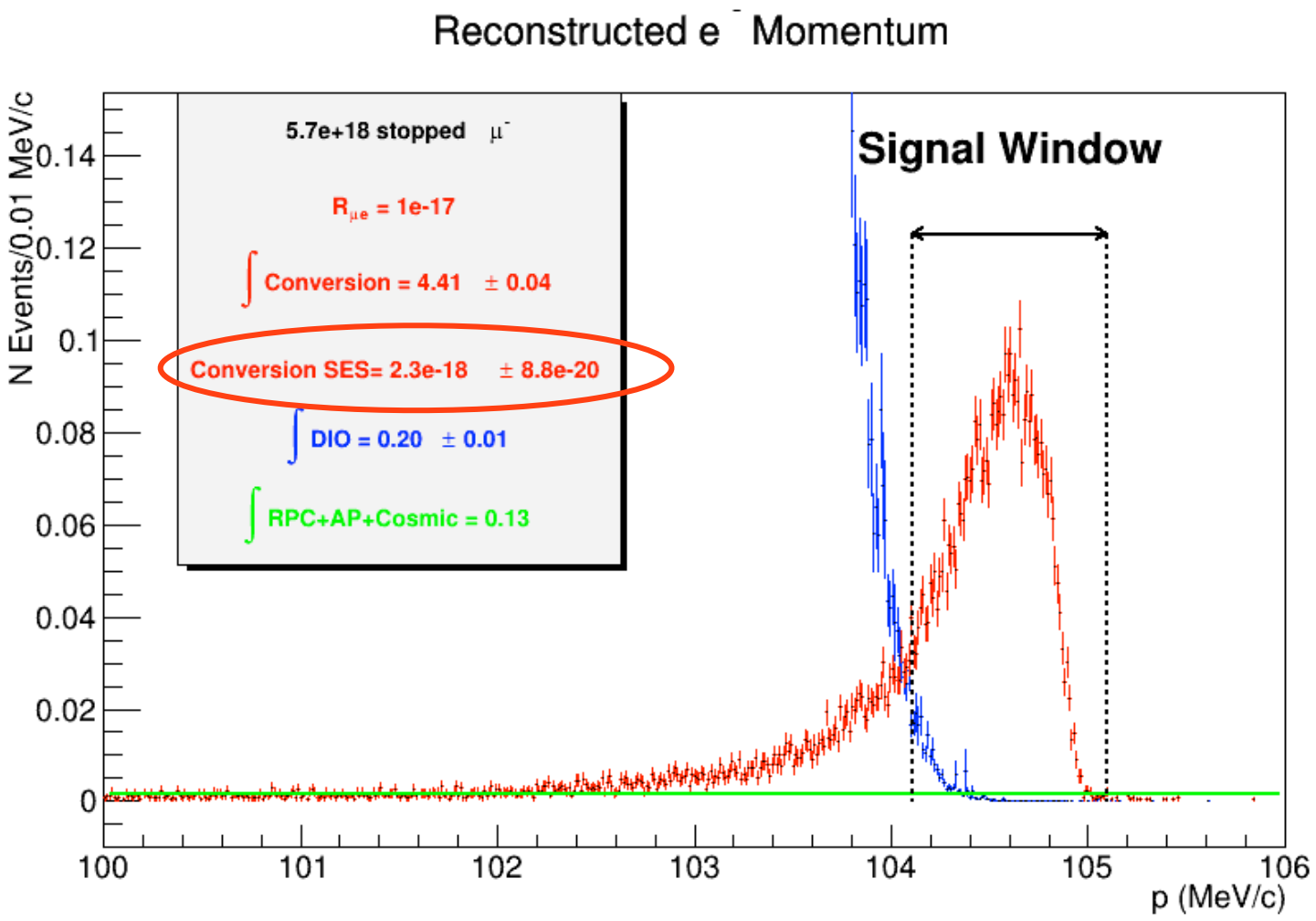
- Same target, 8 μm straw walls, 25% Proton Absorber (PA)
- 10× stopped muons, 1.5× e^- bkg. hit rate, 6× proton bkg. rate



SES = 2.1×10^{-18}

Mu2e, 10× integrated μ flux

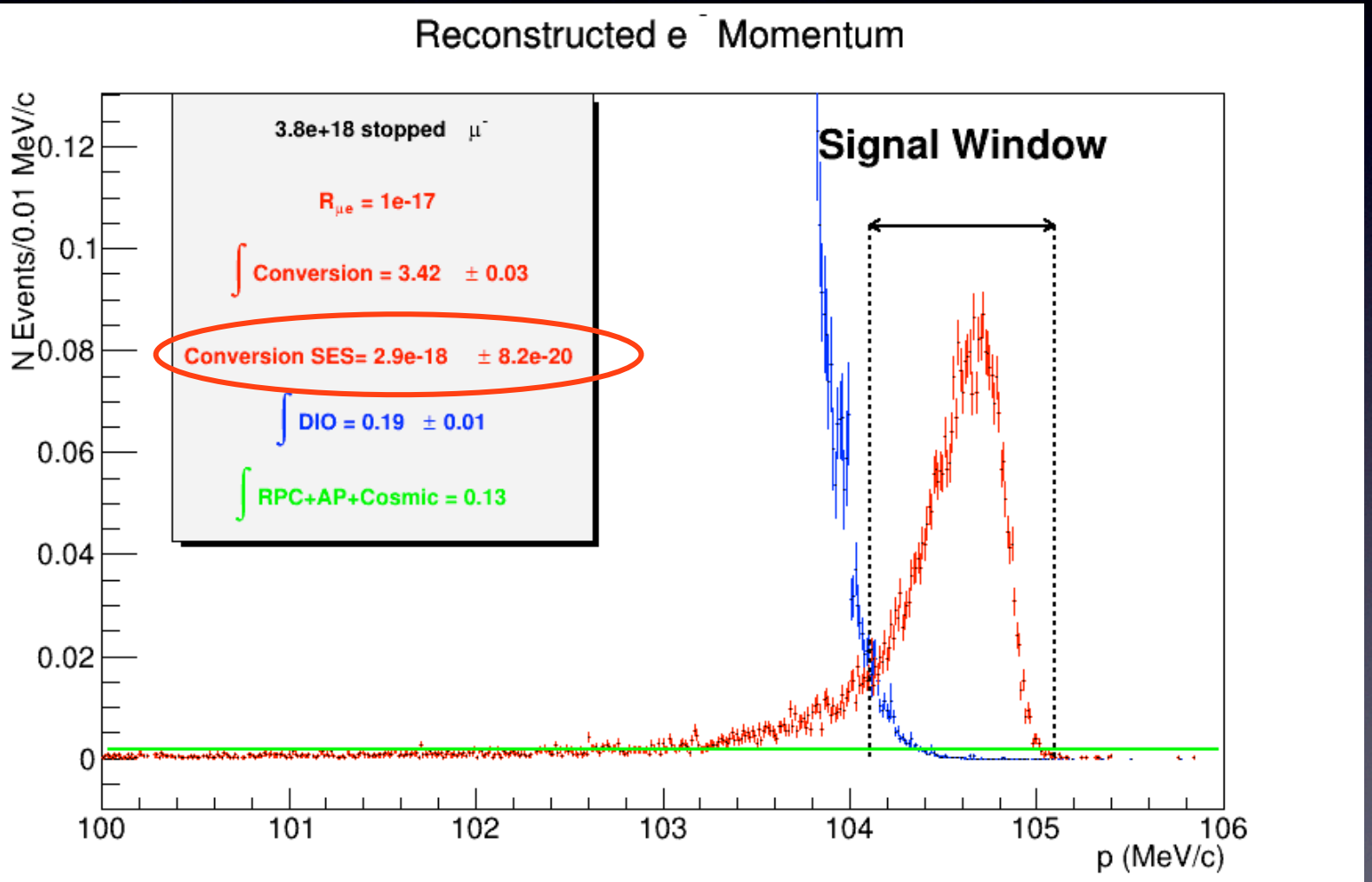
- Same target, 8 μm straw walls, 25% PA, 75% stopping target
- 7.5× stopped muons, 1.1× e^- bkg. hit rate, 5× proton bkg. rate



SES = 2.3×10^{-18}

Mu2e, 10× integrated μ flux

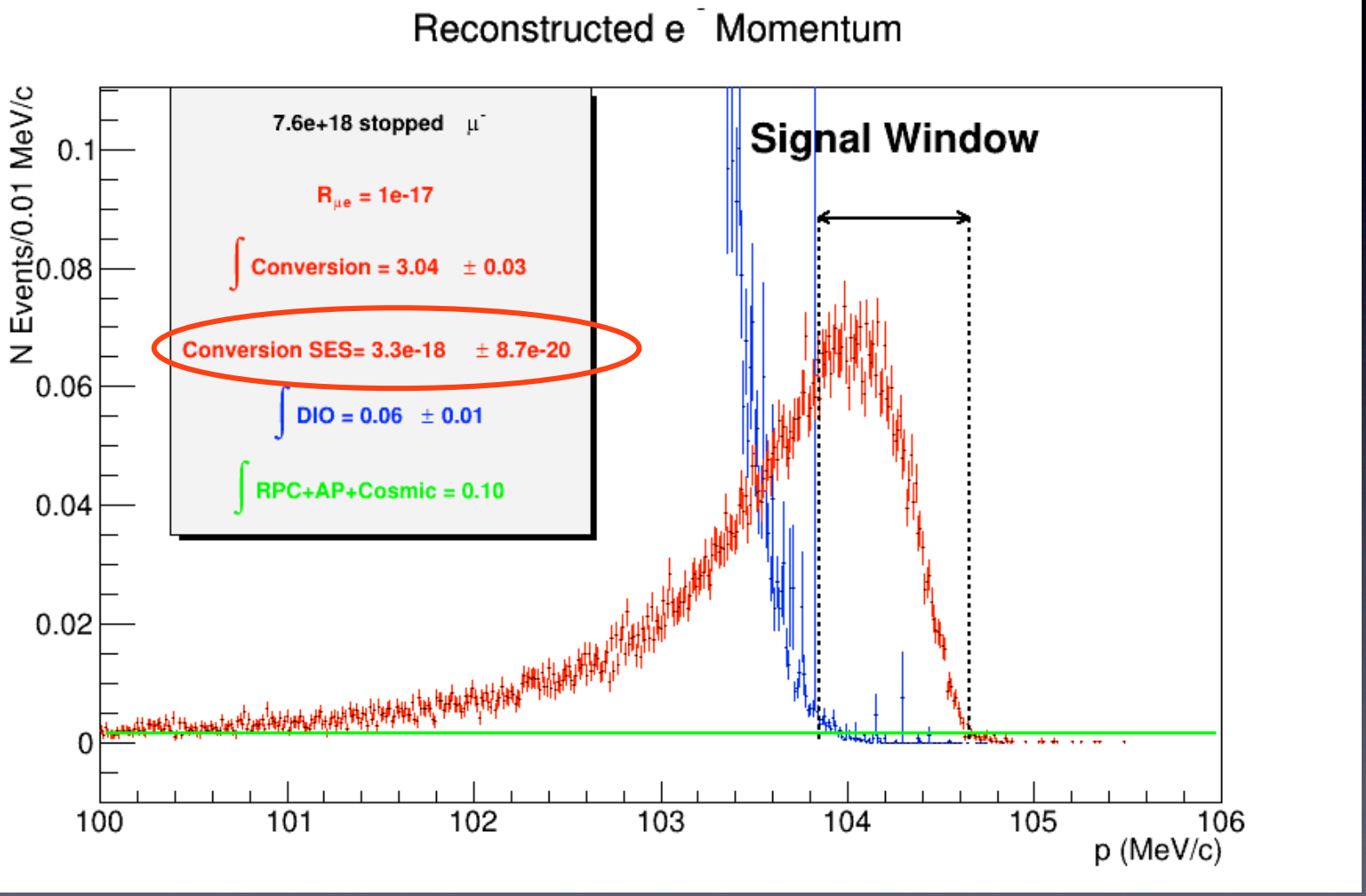
- Same target, 8 μm straw walls, 25% PA, 50% stopping target
- 5× stopped muons, 0.8× e^- bkg. hit rate, 3× proton bkg. rate



SES = 2.9×10^{-18}

Momentum Scale Error

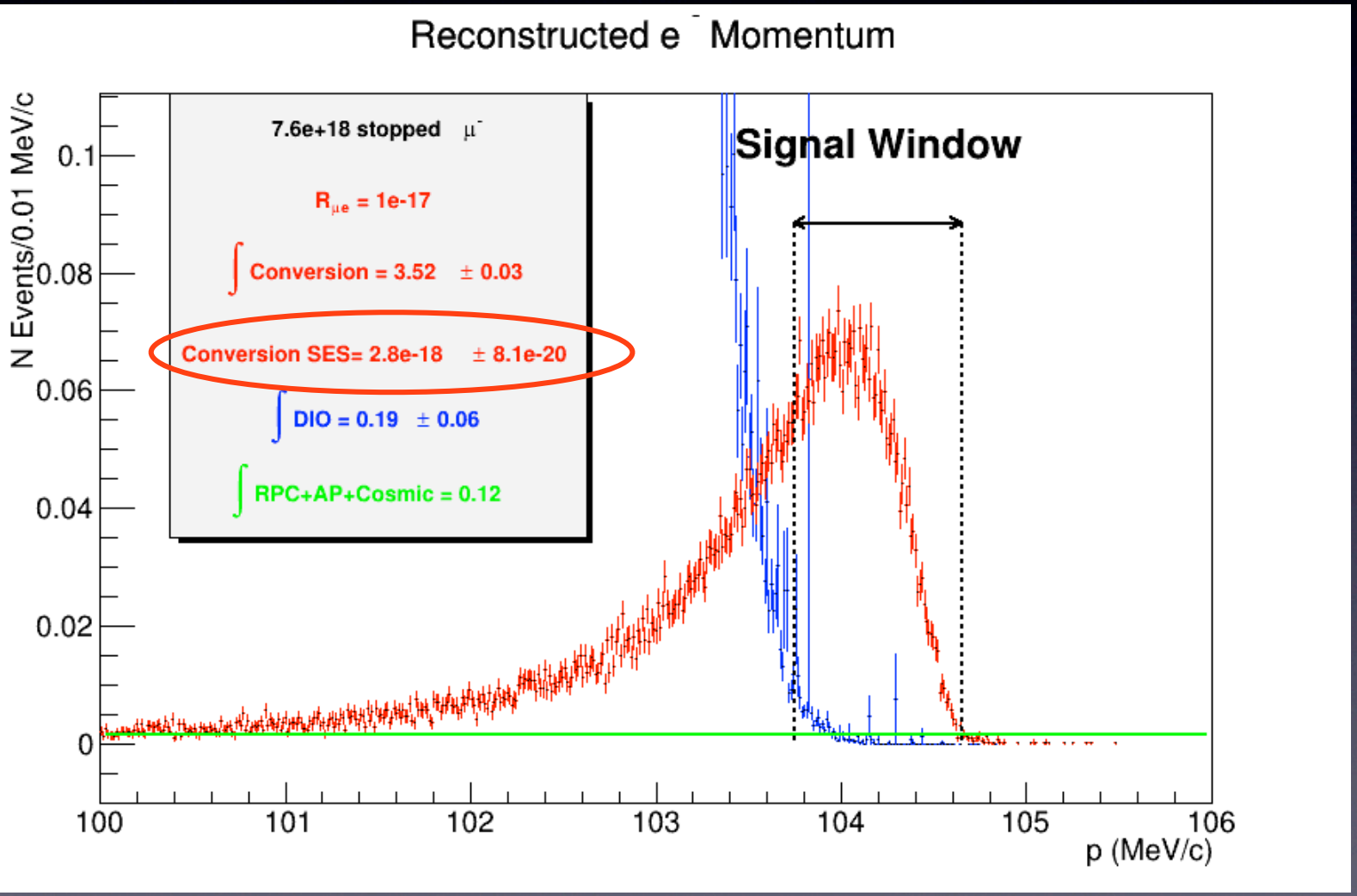
- Uncertainty in momentum scale can be ~50 KeV
- Conservative approach: cut 2σ (100 KeV) above 0.2 DIO



SES = 3.3×10^{-18}

Mu2e, 10× integrated μ flux

- Same apparatus
- 10× stopped muons, 3× background hit rate



SES = 2.8×10^{-18}

Momentum Scale Error

10× Mu2e muon flux

Configuration	SES, 0.2 DIO	SES, 0.2 DIO +100 KeV	Proton rate
Nominal Mu2e	2.8×10^{-18}	3.3×10^{-18}	×3
8μm Straws	2.5×10^{-18}	2.8×10^{-18}	×3
8μm Straws, 50% PA	2.2×10^{-18}	2.4×10^{-18}	×4
8μm Straws, 25% PA	2.1×10^{-18}	2.3×10^{-18}	×6
8μm Straws, 25% PA, 75% ST	2.3×10^{-18}	2.5×10^{-18}	×5
8μm Straws, 25% PA, 50% ST	2.9×10^{-18}	3.1×10^{-18}	×3

Conclusions

- Decreasing upstream and tracker material, the $R_{\mu e}$(Al) sensitivity of Mu2e can be increased by nearly 10× with 10× the muon flux
- Momentum scale error affects the optimum configuration
- Technical issue: can straws handle the charge and current of a reduced proton absorber?
  - Optimize target + proton absorber material
  - Reduce HV during beam flash period?