KU LEUVEN

Update muX meeting 28/06

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Minimizing losses in anticoincidence

- Calibration lines continuous in time
- Total muon rate λ_μ
- Anticoincidence window ΔT

- For any given time:
  - Rate of muons in window $\lambda = \lambda_\mu \Delta T$
  - Poisson distributed in time

- Probability of having k muons in the anticoincidence window

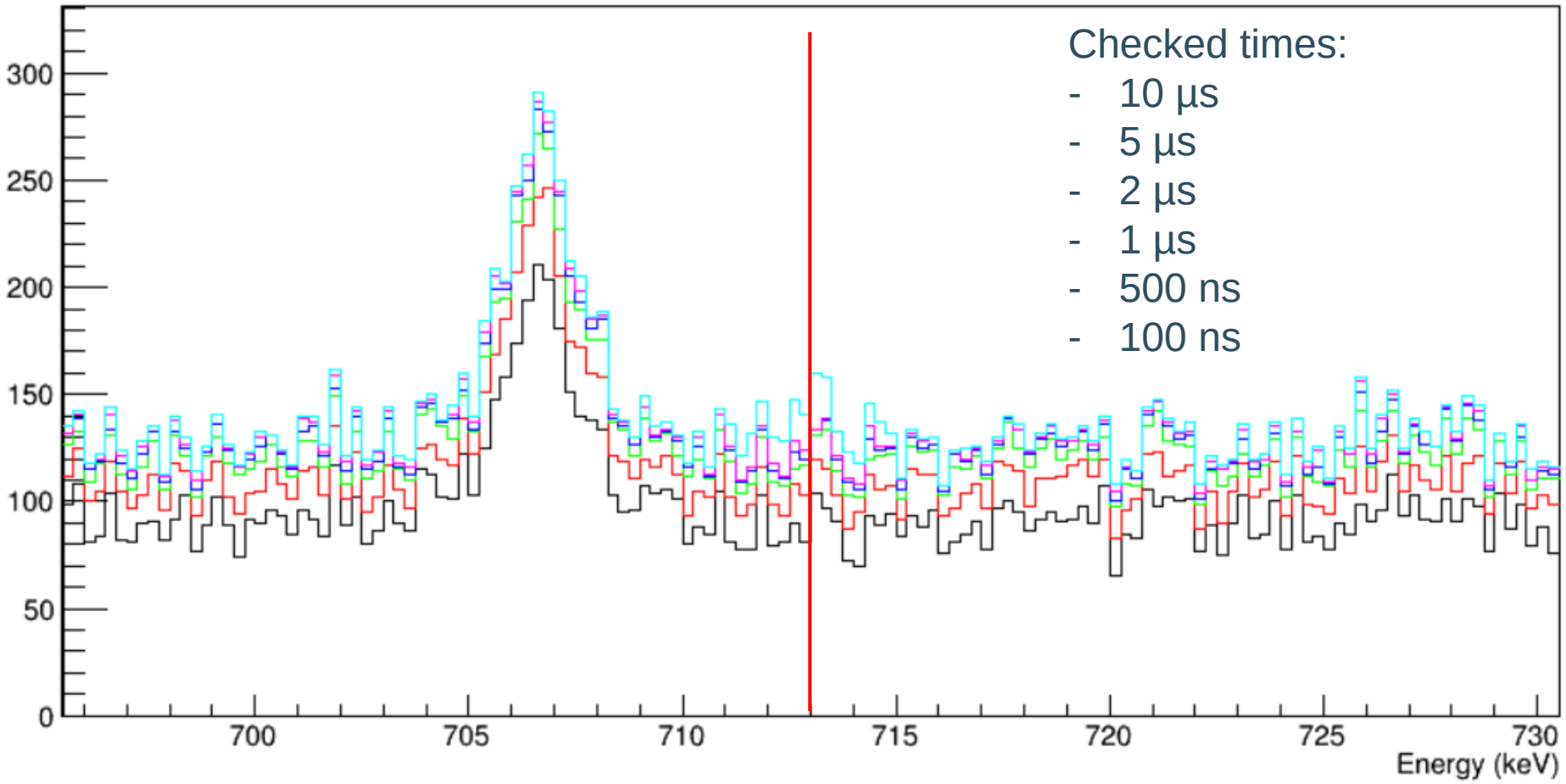
$$P(k) = \frac{\lambda^k \, e^{-\lambda}}{k!}$$

- Probability for a given time to be in anticoincidence with a muon = fraction of time remaining in anticoincidence

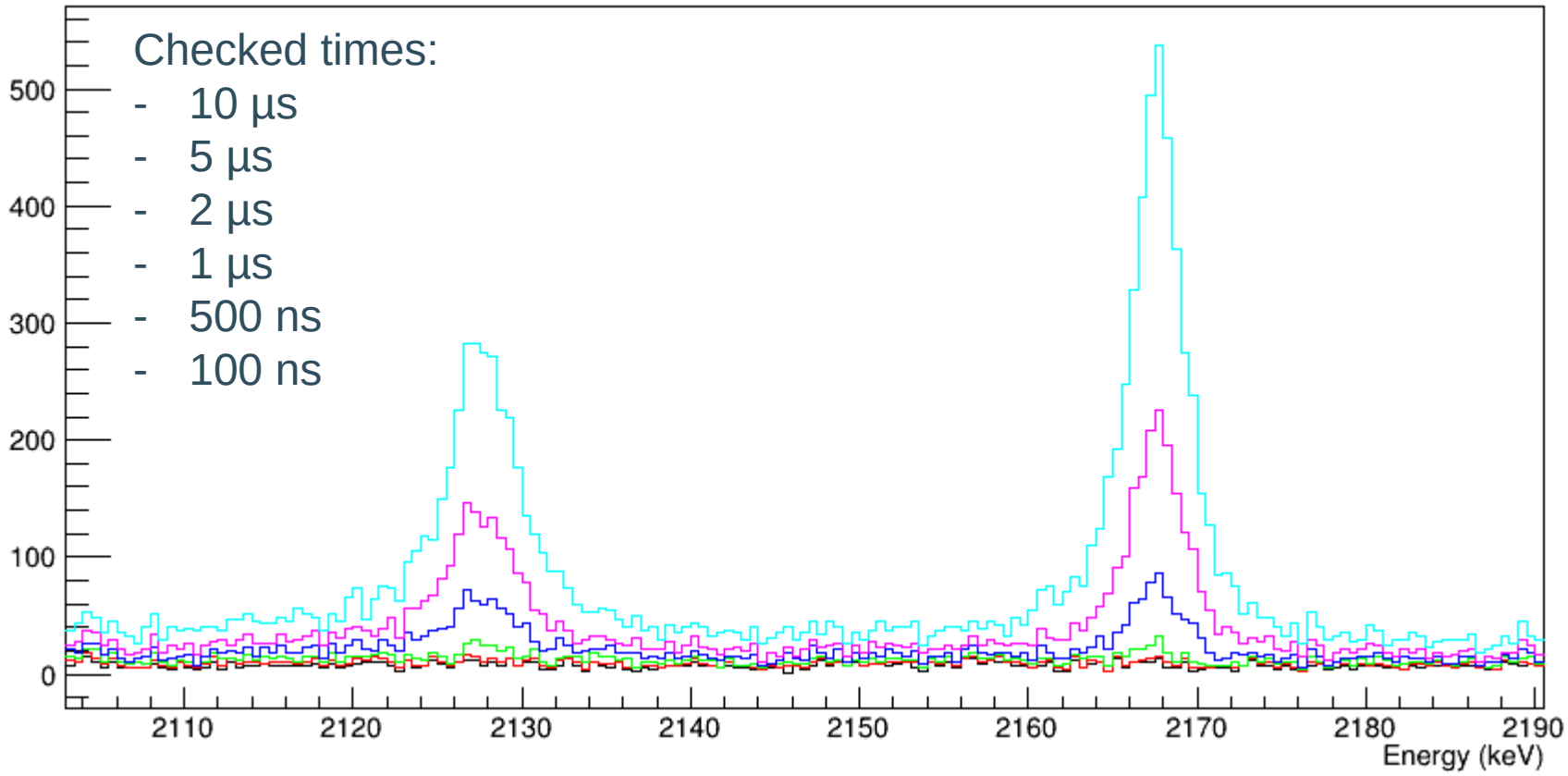
$$P(0) = e^{-\lambda}$$

Assumes muon veto and entrance are uncorrelated in time (for most, but not all muons)

Before muon arrival

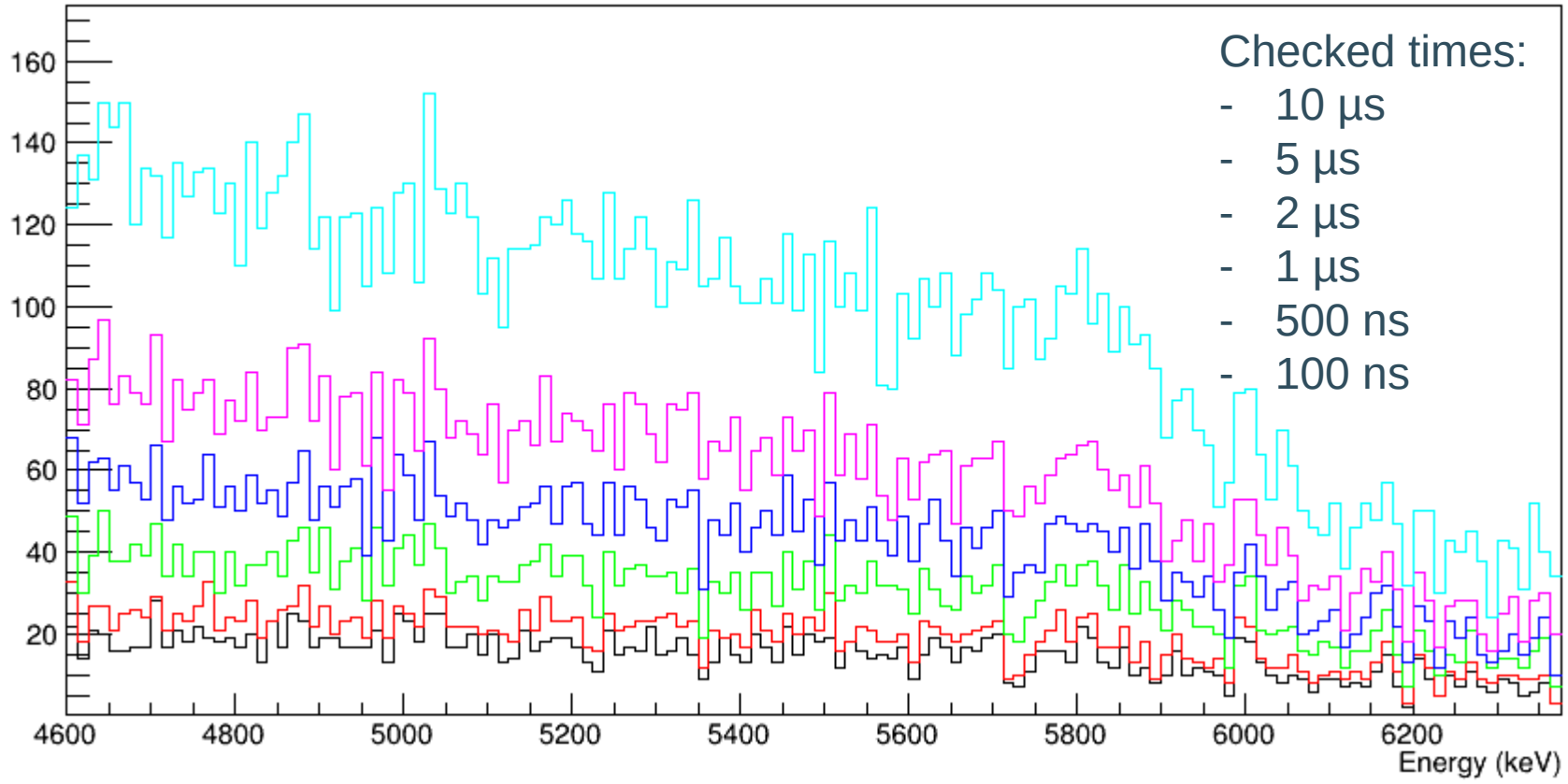


After muon arrival



After muon arrival

1 μs before and 5 μs after the muon seem to be good windows
→ No significant muon induced background



Back of the envelope calculation

Time is based on germanium reference → Negative time = after muon

Stable isotope runs: $\lambda_\mu \sim 65\ kHz$

- Old window $[-10\ \mu s;\ +10\ \mu s]$:
  Keep $e^{-1.3} \approx 27\%$ of events
- New window $[-5\ \mu s;\ +1\ \mu s]$:
  Keep $e^{-0.39} \approx 68\%$ of events
- Increase in statistics: 2.48
  In actual data: 1.8-1.9

^{40}K runs: $\lambda_\mu \sim 25\ kHz$

- Old window $[-10\ \mu s;\ +10\ \mu s]$:
  Keep $e^{-0.5} \approx 60\%$ of events
- New window $[-5\ \mu s;\ +1\ \mu s]$:
  Keep $e^{-0.15} \approx 86\%$ of events
- Increase in statistics: 1.42
  In actual data: 1.3-1.4

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