

Expected number of prompt neutrino events

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Short report
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Outline

- Reminder
 - Neutrino flux calculation
- Target efficiency
- Average neutrino energy
- Number of expected events
- Neutrino energy spectrum
- Conclusions



Neutrino flux reminder

- D production cross section

- $\sigma_{D^+}=(12.8\pm 4.4)\mu\text{B/nucleon}$
- $\sigma_{D^0}=(27.8\pm 5.2)\mu\text{B/nucleon}$
- $\sigma_{D_s}=(6.6\pm 2.9)\mu\text{B/nucleon}$

- x_F and p_T dependence

- $\sigma \sim (1-|x_F|)^n \exp(-bp_T^2)$
- $n=(7.4\pm 0.6)$, $b=(0.94\pm 0.06)\text{GeV}^{-2}$

- neutrino rate

- $N(\nu_e)=(4.7\pm 1.3)\times 10^{-4} \nu_e/\text{POT}$ (46.3%)
- $N(\nu_\mu)=(4.5\pm 1.4)\times 10^{-4} \nu_\mu/\text{POT}$ (44.4%)
- $N(\nu_\tau)=(9.5\pm 4.2)\times 10^{-5} \nu_\tau/\text{POT}$ (9.3%)



Target efficiency

- Weighted efficiency
 - fraction of the neutrinos produced that pass through the emulsion target
 - include genbod weighting
 - don't include energy weighting
- efficiency:
 - ν_e and ν_μ : 6.8%
 - ν_τ : 13.4%



Average Neutrino energy

- Weighted efficiency
 - include genbod weighting
 - include energy weighting
 - ν_e and ν_μ : 87GeV
 - ν_τ : 111GeV

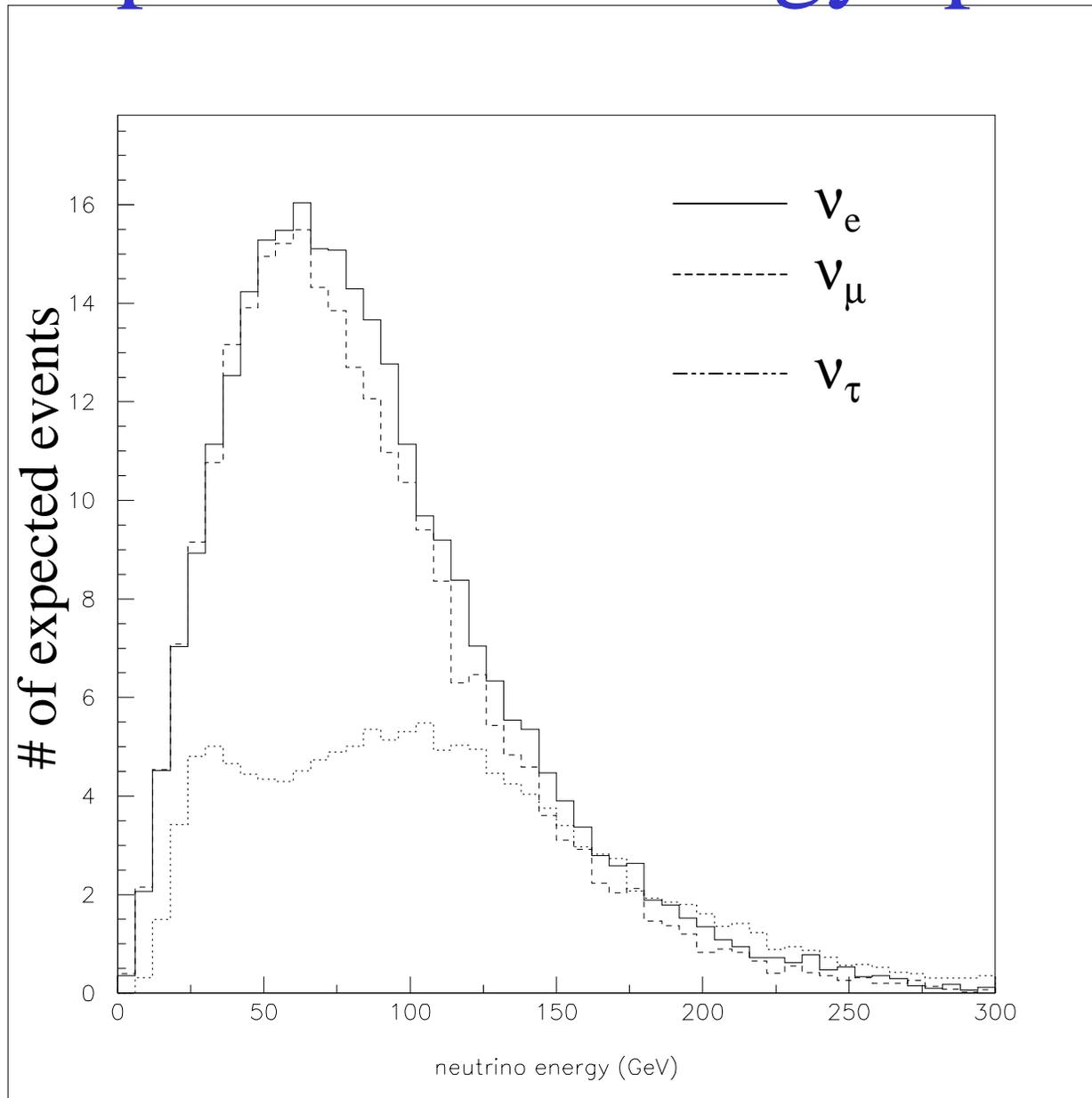


Expected # of interactions

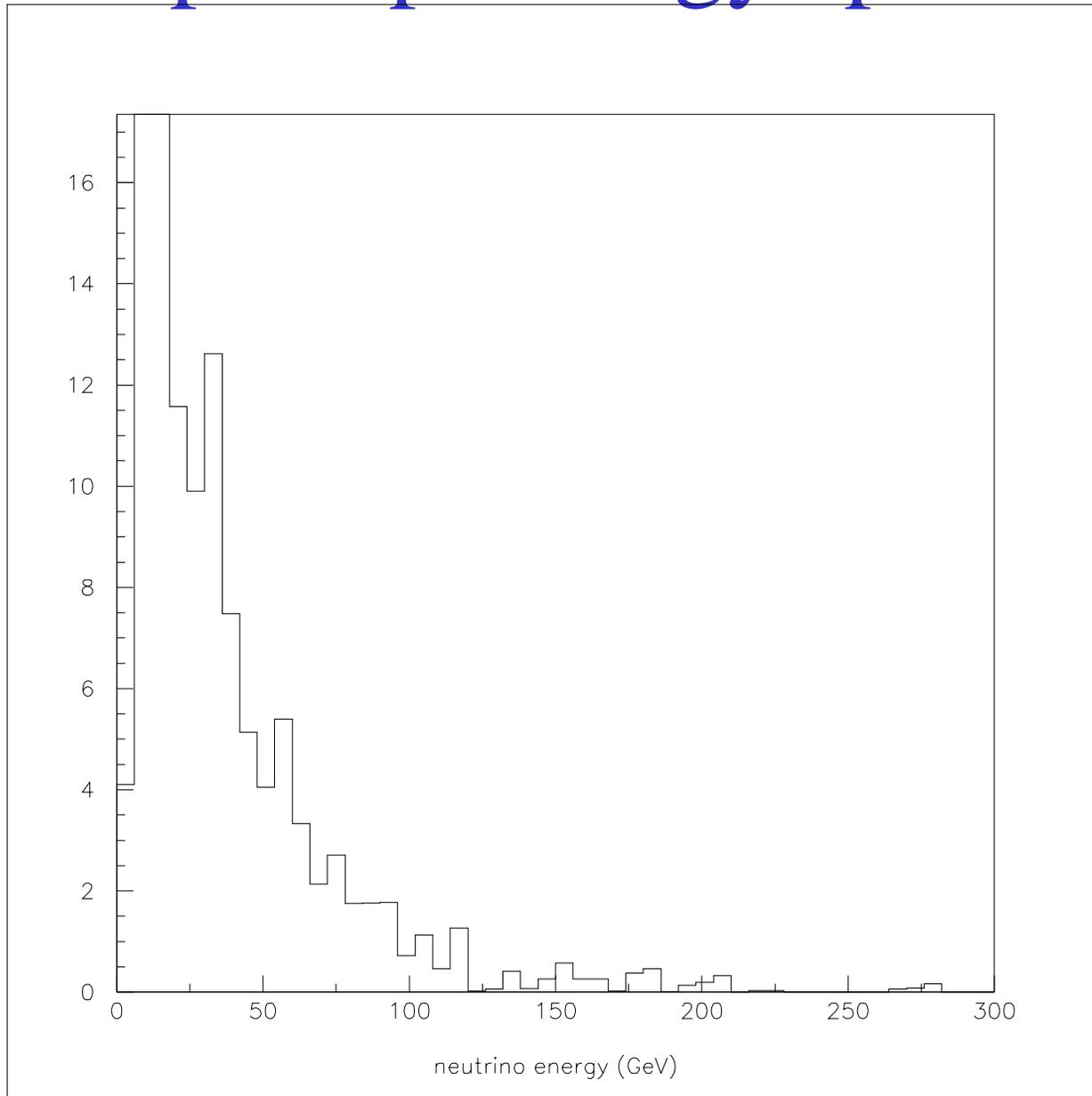
- Only prompt neutrinos
- no detector efficiency corrections
- assuming 1/3 is NC
- error=30%
- number of events
 - ν_e CC: 275 (28%)
 - ν_μ CC: 253 (25%)
 - ν_τ CC: 137 (14%)
 - ν NC: 332 (33%)
 - total: 997



Prompt neutrino energy spectrum



Nonprompt energy spectrum



Conclusions

- The expected number of prompt neutrinos has been calculated
 - $997(\pm 330)$ events
- The error is large due to uncertainty in D flux
- The result is consistent with the observed number, including inefficiencies
- The prompt-nonprompt normalization can be done now



Bonus slide: Muon momentum

