

Beam related background at the  
Near Detector.

**Estimation of the event rate.**

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# Some numbers from IDR

- **Proton driver:**

$3.125 \times 10^{15}$  protons/s

Repetition rate 50 Hz

⇒  $6.25 \times 10^{13}$  protons/burst

Total time for bunches 240  $\mu$ s ???

- **Muon front-end:**

Number of good muons per proton

≈ 0.1 muon/proton

≈ 0.1 antimuon/proton

⇒  $6.25 \times 10^{12}$  muons/burst

or  $3.7 \times 10^{21}$  good muon decays / year

# Event rate in the Near Detector

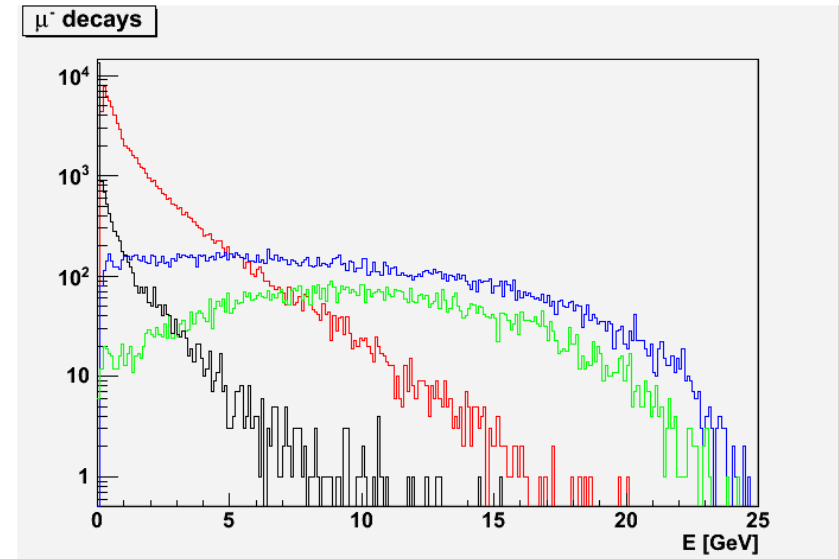
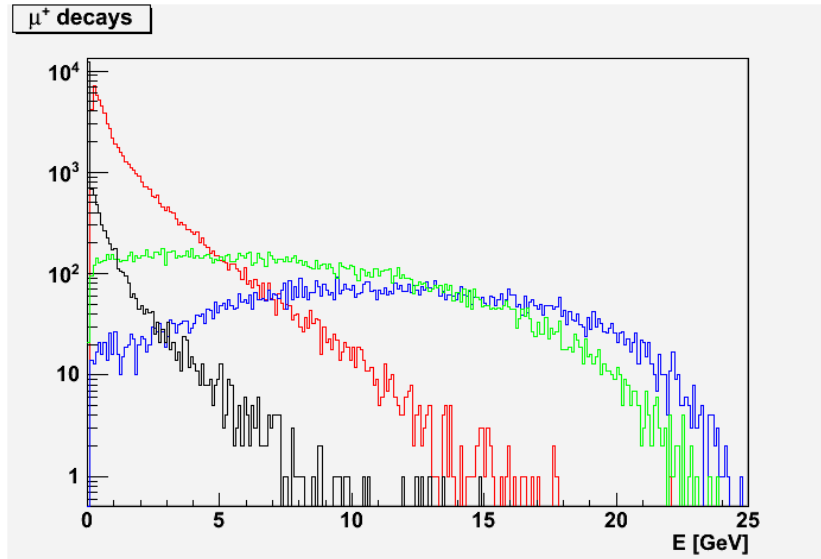
I will assume  **$6.25 \times 10^{12}$  muons/burst**

Muon live time at 25 GeV :  $\tau = 520 \mu\text{s}$ .

But 25% of the muons ( $1.56 \times 10^{12}$ ) will decay  
in  $150 \mu\text{s}$ .

What is the total number of events in the near  
detector for the first  $150 \mu\text{s}$  of the burst ?

# Event rate in the Near Detector



- Energy spectra of the secondary particles in concrete (GENIE): muons, electrons, charged pions, and gammas.
- The range of 25 GeV muon in concrete is  $\approx 60$  m (CSDA range Geant4)

# Event rate in the Near Detector

Muon decays in the storage ring	Background muons in 150 $\mu$ s	Background pions in 150 $\mu$ s	Background electrons in 150 $\mu$ s	Events in the detector In 150 $\mu$ s
50 m (10m concrete)	3.89	11.92	1.63	0.59
100 m	5.63	5.21	0.36	0.45
200 m	4.32	4.27	0.13	0.25s

Antimuon decays in the storage ring	Background muons in 150 $\mu$ s	Background pions in 150 $\mu$ s	Background electrons in 150 $\mu$ s	Events in the detector in 150 $\mu$ s
50 m (10m concrete)	2.30	2.50	2.89	0.54
100 m	4.46	4.52	0.53	0.38
200 m	2.97	3.34	0.41	0.28

# Conclusion

- Event rate is not an issue for a plastic scintillator near detector.