Hcal Pedestal Noise in CRAFT 09

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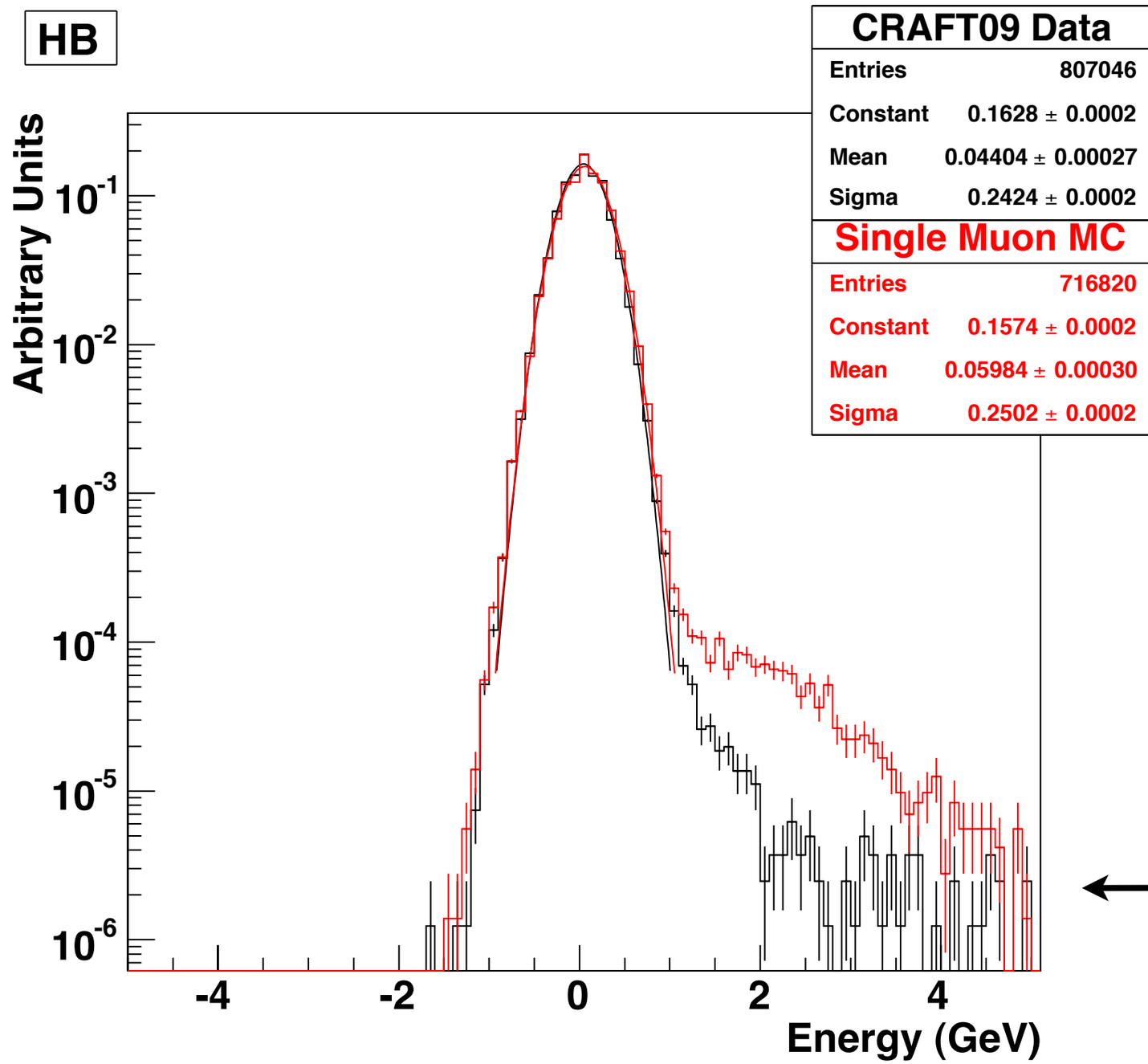
Introduction

- Investigate low energy (< 1 GeV) pedestal noise in CRAFT09.
- This information used to determine energy threshold in jet reconstruction.
- Compare Data and MC:
  - Run 109575.
  - Full Sim, RelValSingleMuPt100.
- Consider RecHit energy after pedestal subtraction and ADC ➔ GeV conversion.
- Summed timeslice(s):
  - 4 timeslices (4–7) in HB, HE, HO.
  - 1 timeslice (3) in HF.
- Data and MC are zero suppressed with standard thresholds: HB/HO/HE/HF = 8/9/8/10 ADC.

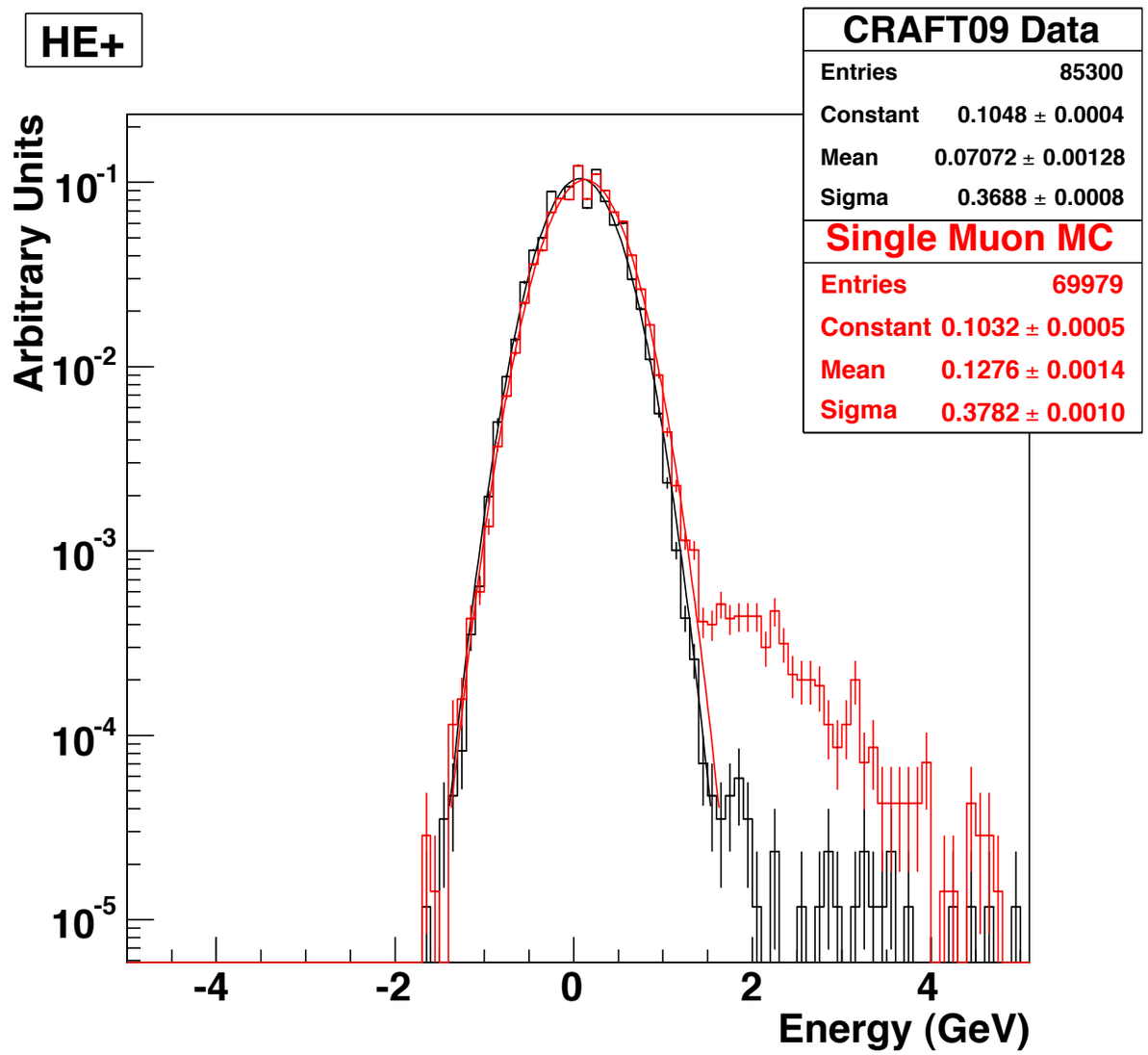
HB

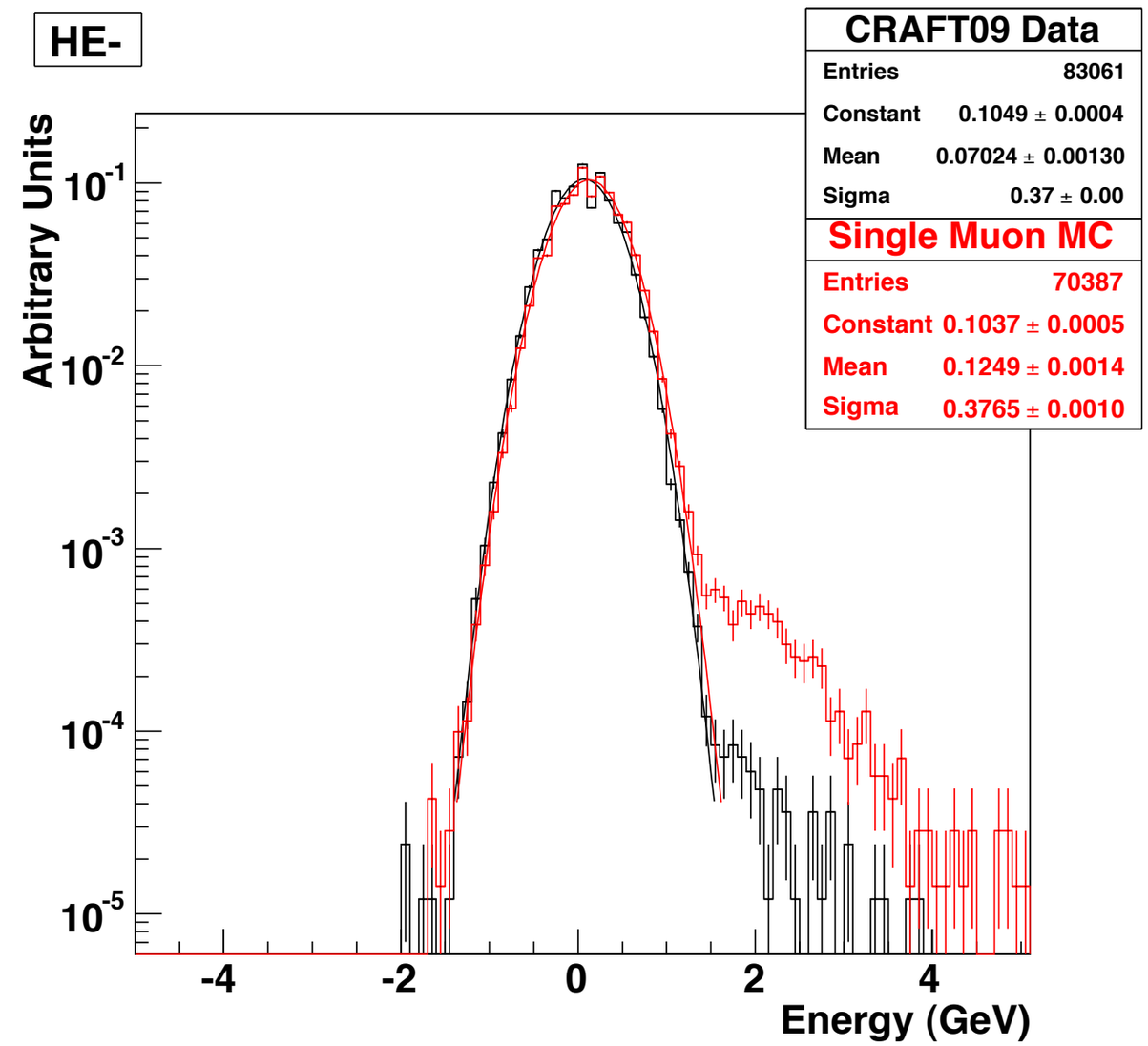


Muon tails; muon rates enhanced in MC.

- Pedestal width is ~240 MeV.

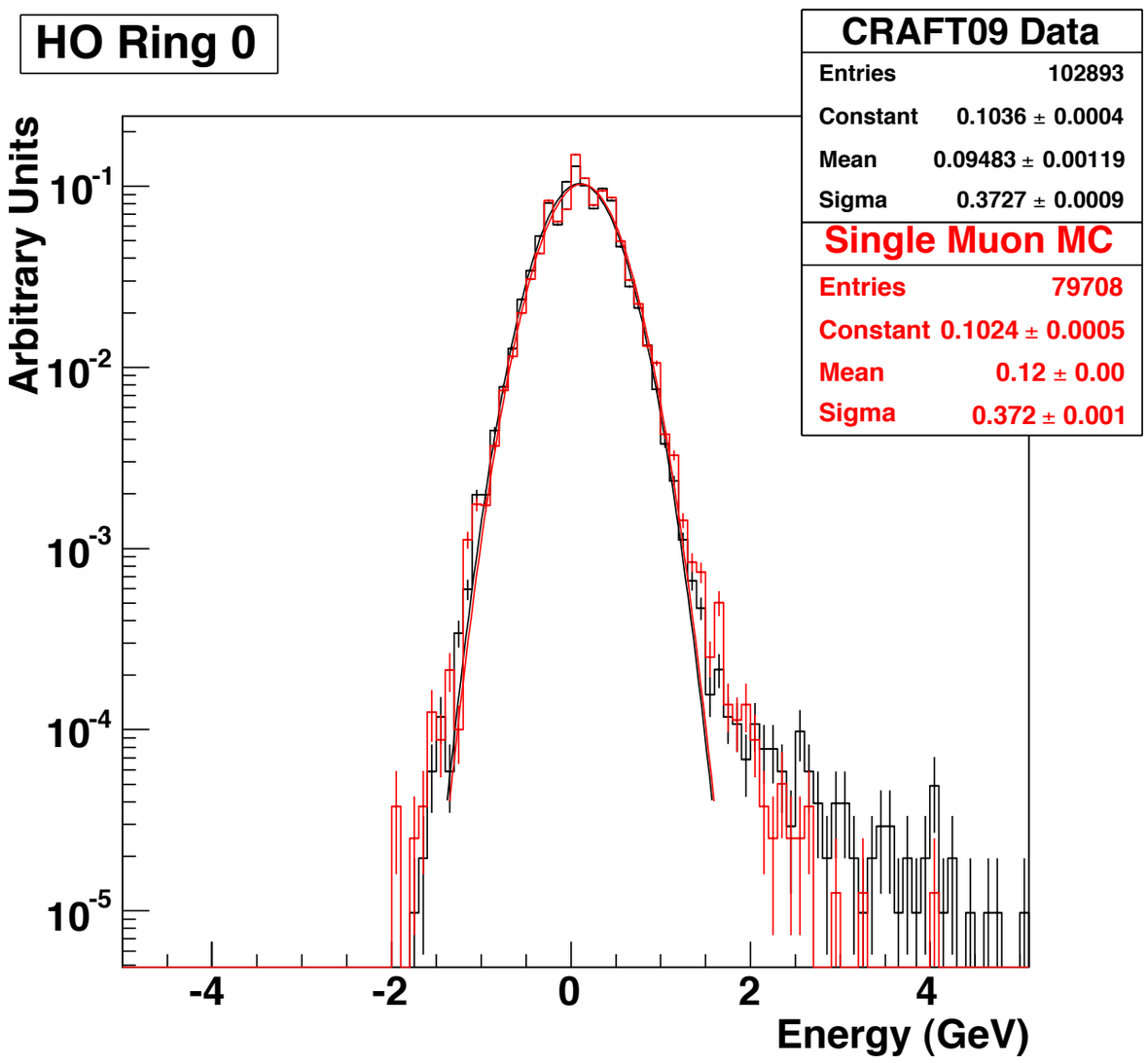
HE

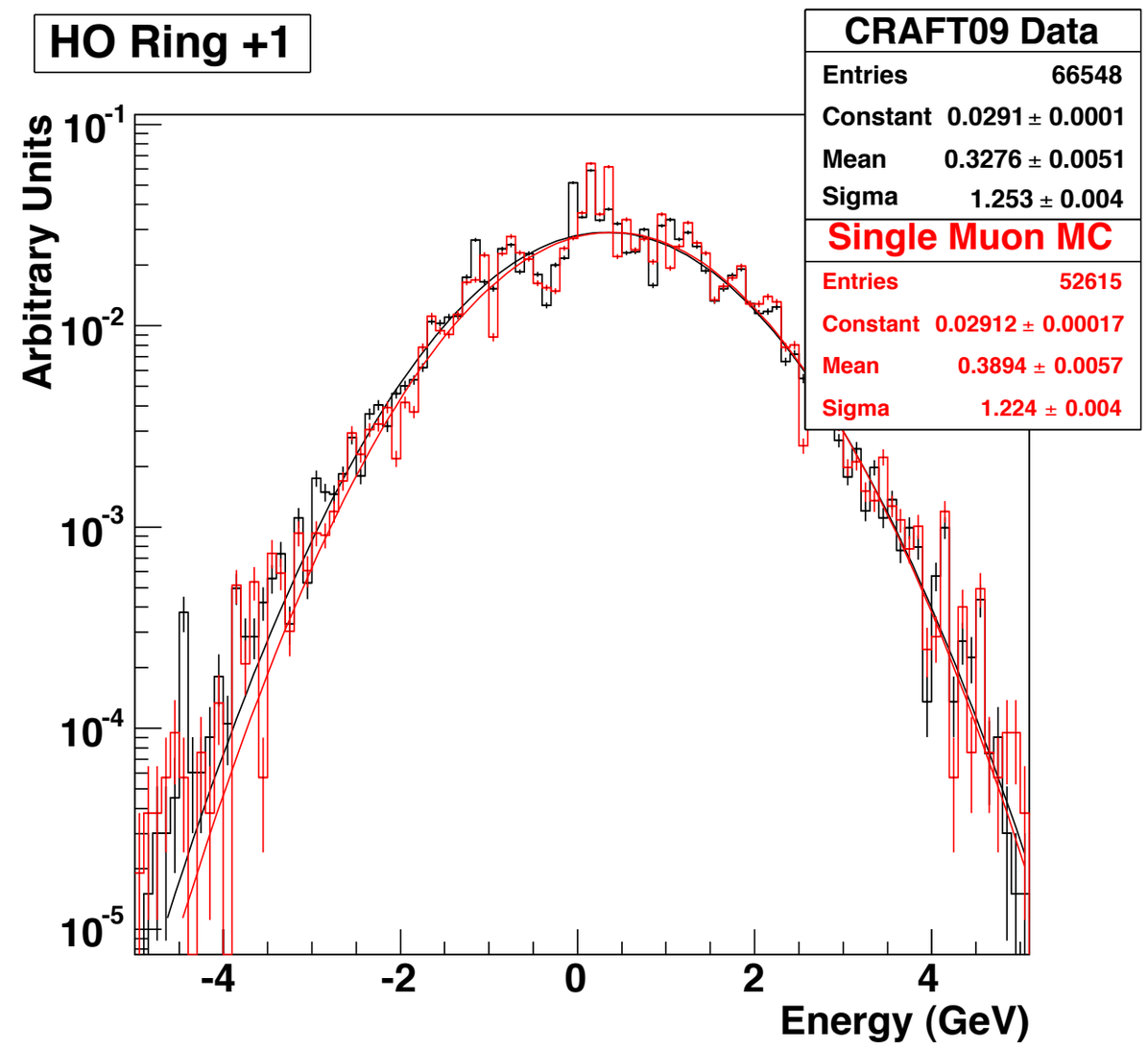




- HE pedestal width (in GeV) is 1.5 times that in HB.
    - Longer cables in RBX increase electronics noise (in ADC).
    - Lower fraction of active volume in HE increases width after ADC ➔ GeV conversion.

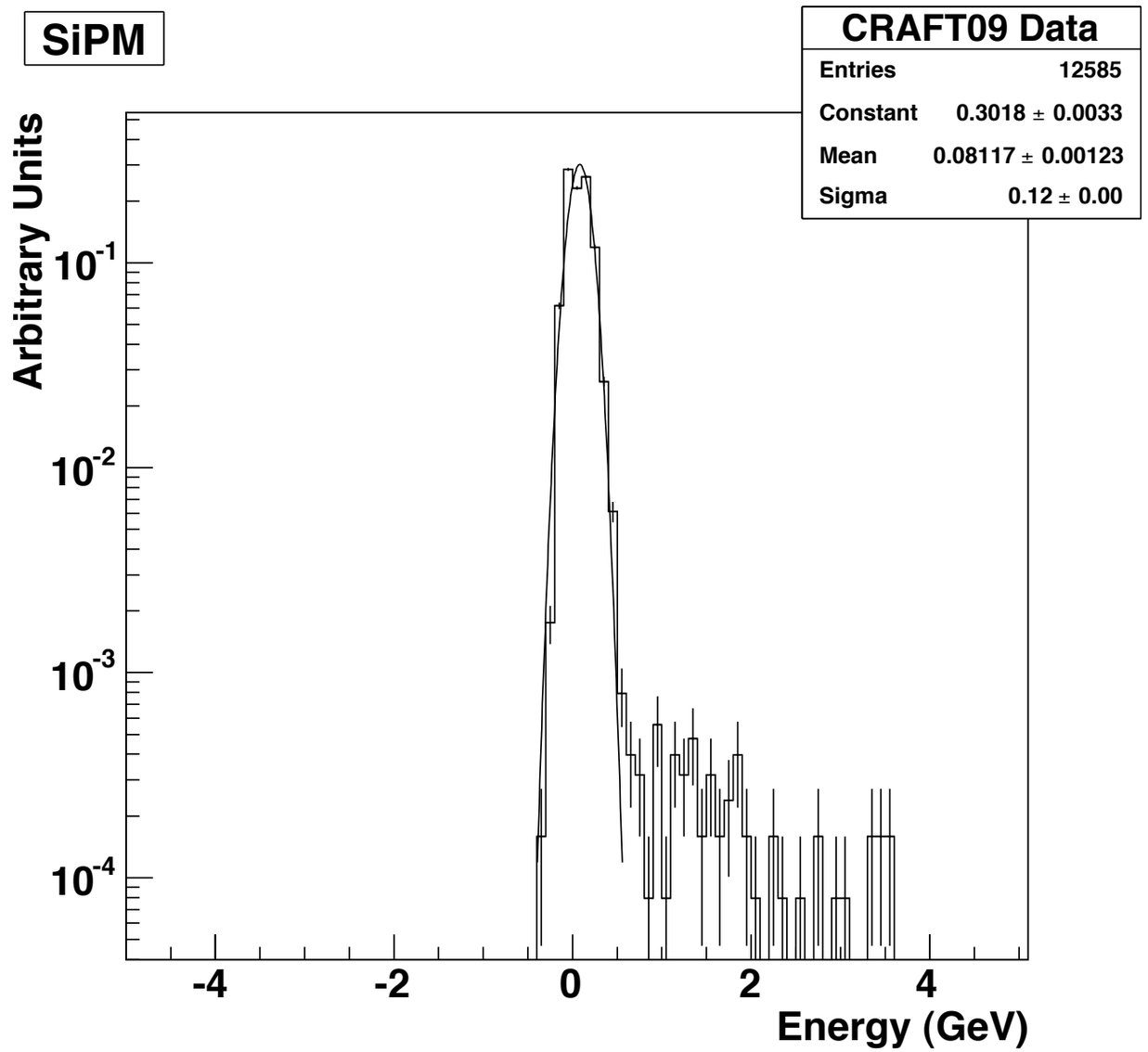
HO





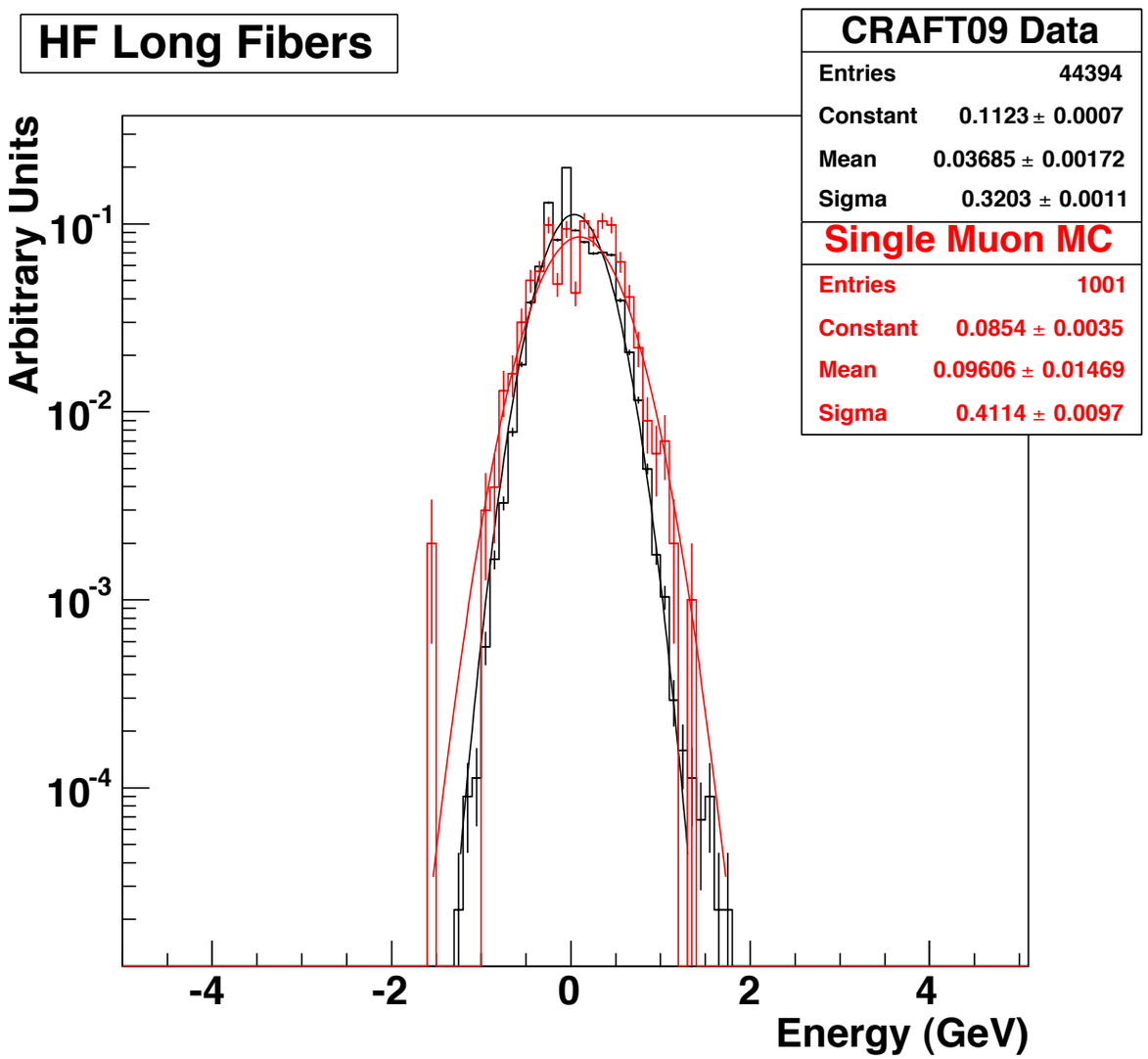
- Ring 0 is ~3 times narrower than other rings (in GeV).
  - HV is higher in ring 0 than other rings: 8.0 vs. 6.5 kV.
  - Active fraction of volume is greater in ring 0.

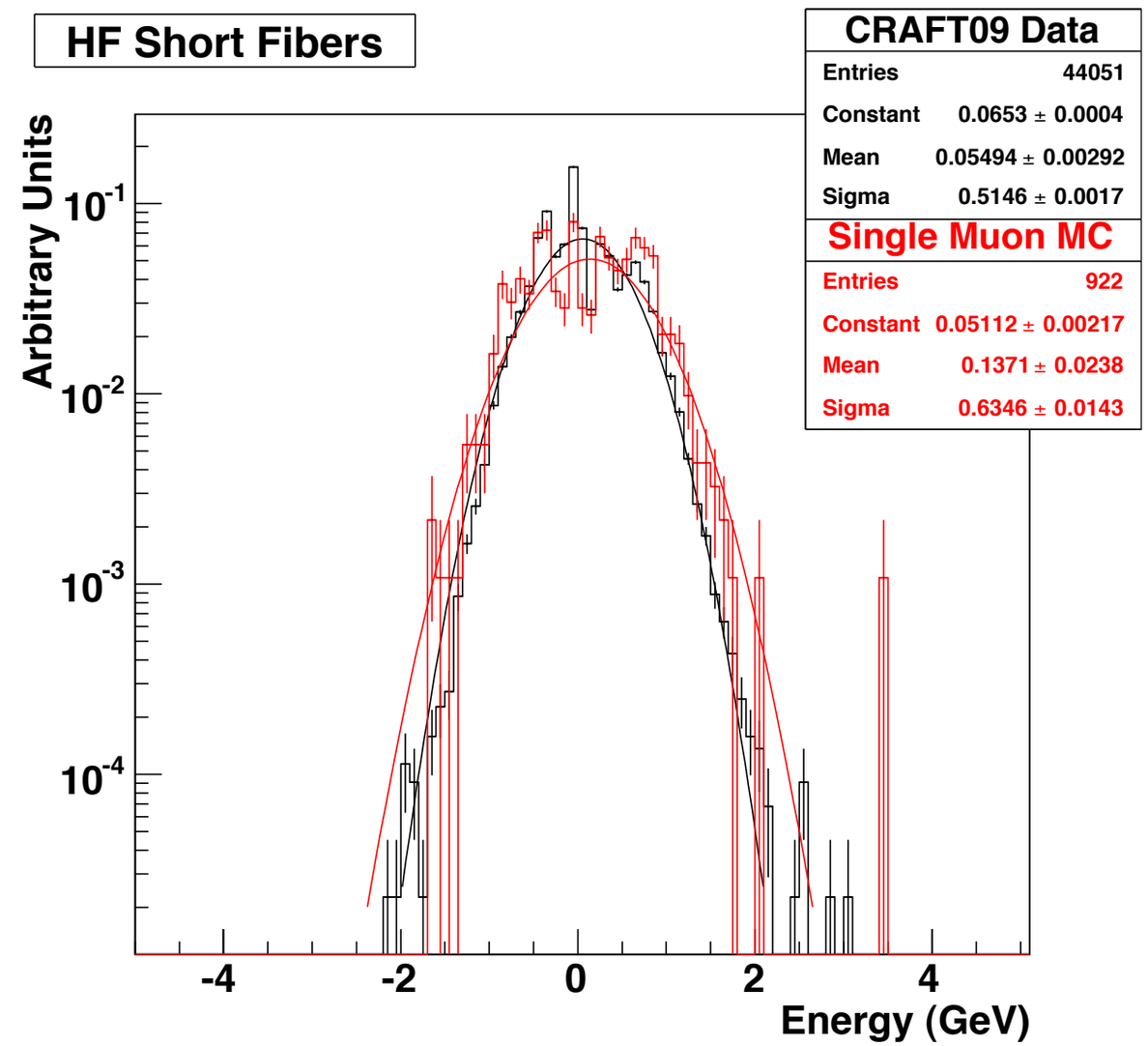
HO SiPMs



- SiPMs are not yet simulated.
- Pedestal width is ~3 times narrower than HPDs in HO ring 0.
  - SiPMs have high intrinsic gain yielding narrow pedestal width (in GeV).

HF

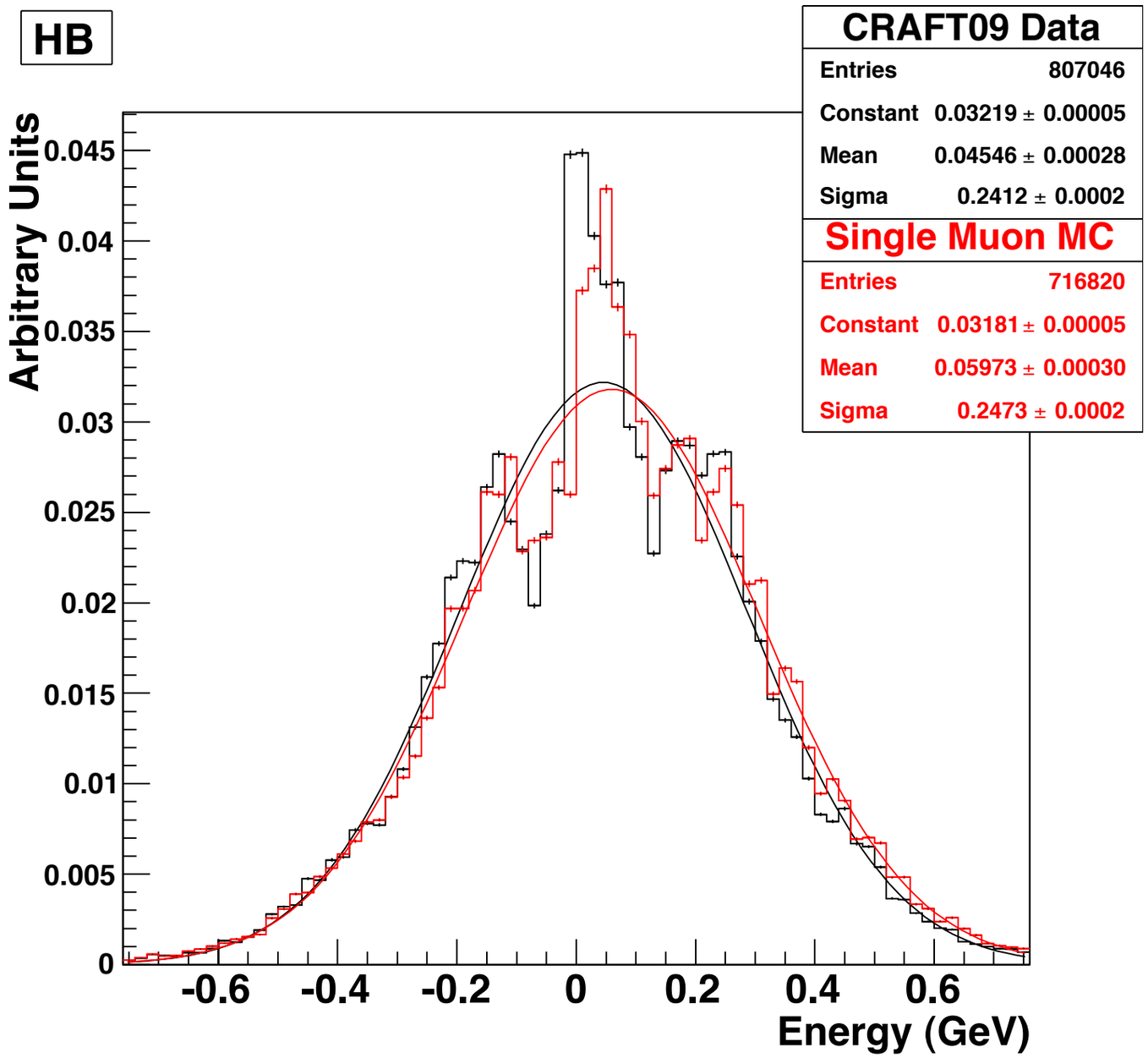




- PMT gain is lower in short fibers.
- Because of high ZS threshold in HF, we are comparing tails of full noise distribution – unsuppressed data/MC agree well.

Detector	Sigma of Fitted Distribution (MeV)		Notes
	Craft09 Data	MC	
HB	242.4 ± 0.2	250.2 ± 0.2	• HE has longer cables in RBX and lower fractional active volume.
HE	369.8 ± 0.6	377.6 ± 0.7	
HO ring 0	372.7 ± 0.9	372.0 ± 1.0	• HO ring 0 has higher HV and larger fractional active volume.
HO ring +1	1253 ± 4	1224 ± 4	
HO SiPMs	120.0 ± 0.1	not simulated	• SiPMs have high gain yielding narrow width (in GeV).
HF Long	320.3 ± 1.1	411.4 ± 9.7	• PMT gains are lower in short fibers. • High HF ZS thresholds → data/MC agreement in tails of full noise dist.
HF Short	514.6 ± 1.7	634.6 ± 14.3	

Quantization Effects



- Summing discrete ADC counts causes structure in noise shape.
- Negligible effect on energy resolution.