

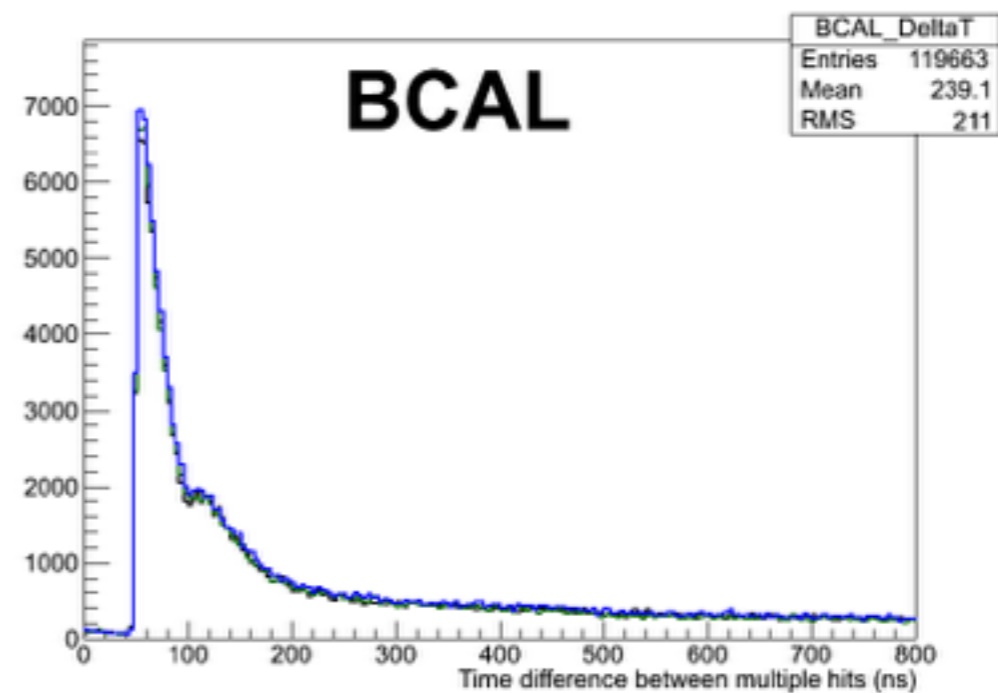
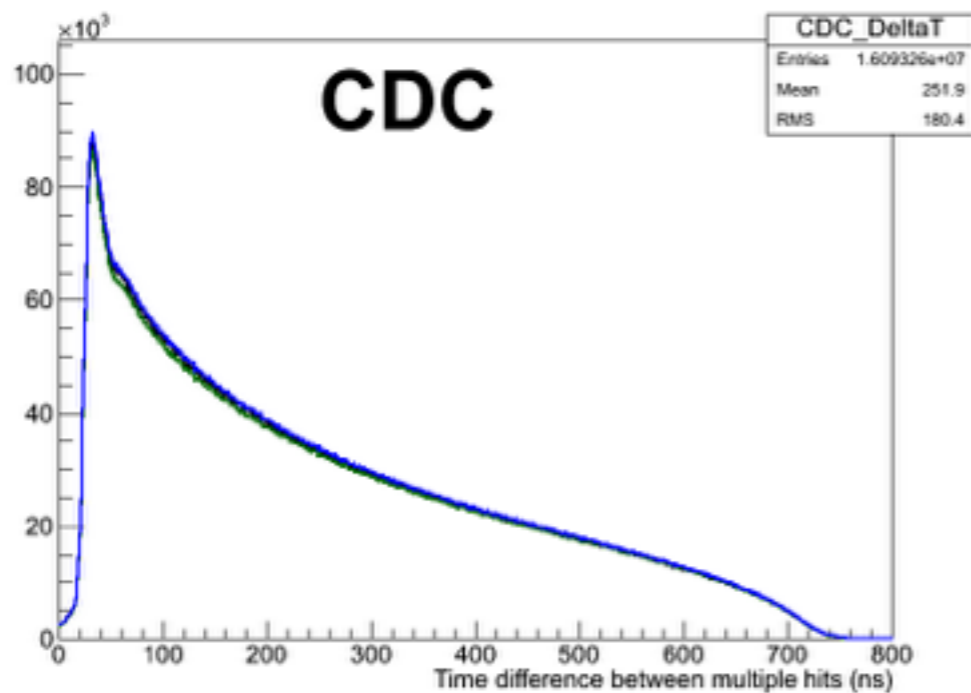
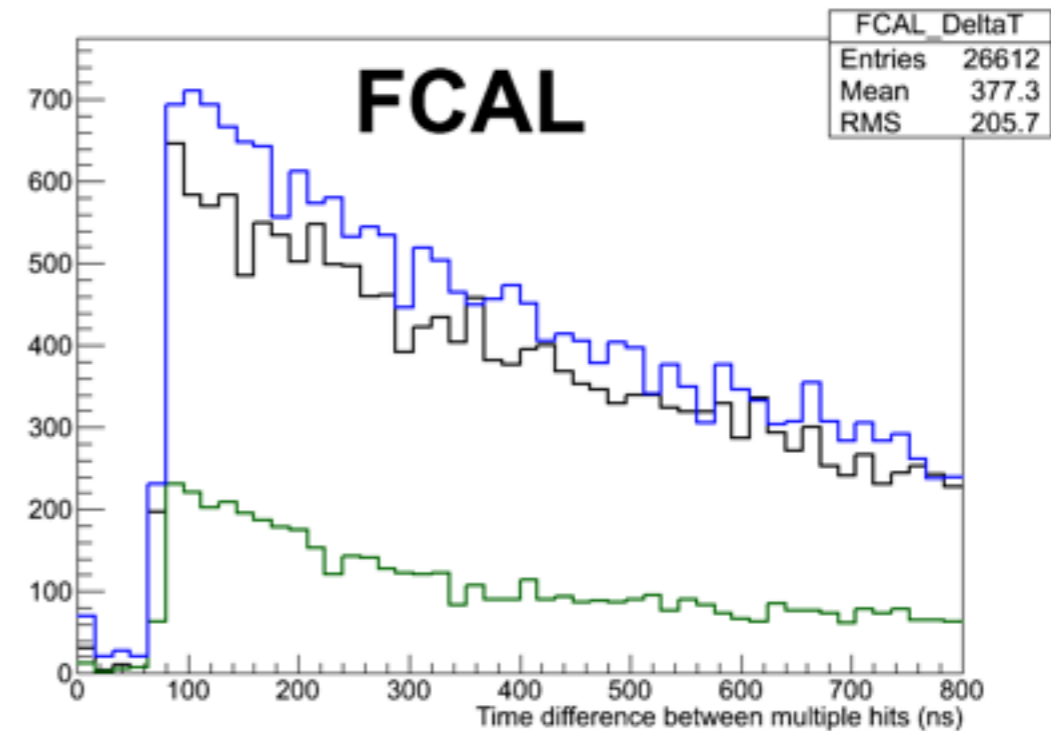
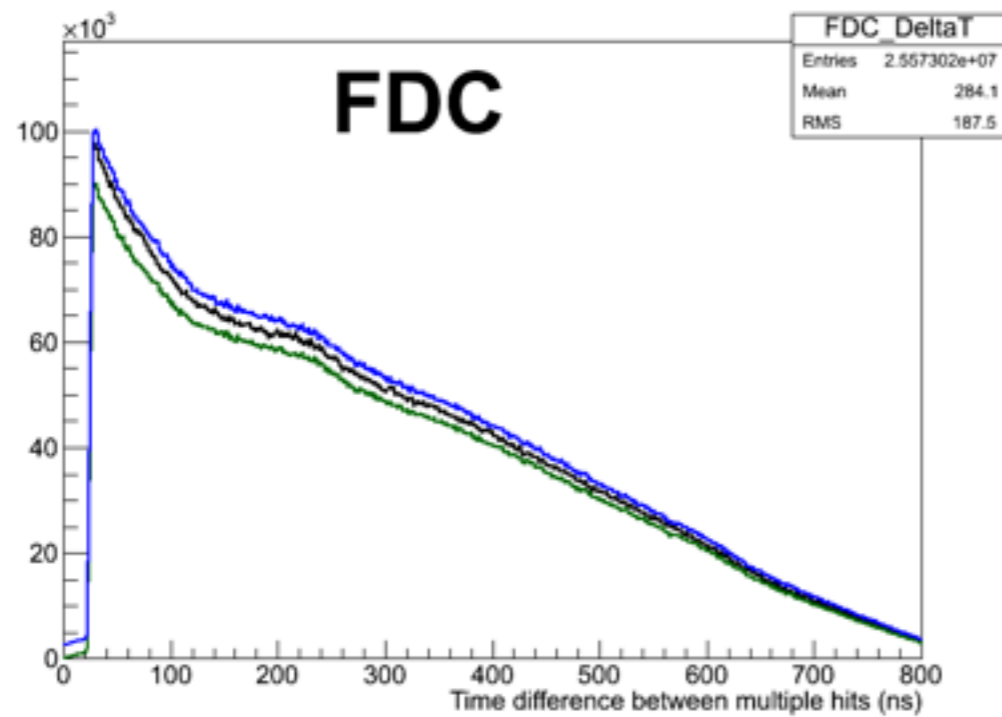
# EM Background From Event Mixing

- David L. wrote hddm\_merge\_events program, merges hits from multiple hddm files
  - Idea: Including EM background by mixing together bggen and background template events can dramatically reduce CPU time needed
  - N.B. Took awhile to realize this relied on HDDDM C API, currently limited to pre-mcsmear files.
- Generated equal amounts of bggen and EM bkg. events.
  - EM bkgd generated by shooting pions down the beam pipe using modified genpi program.
  - $E(\gamma) = 7 - 12$  GeV, coherent brem., BGRATE = 1.10  
Solenoid current = 1200A
- Compare results with bggen events generated with standard EM background simulation

# Rate for Multiple Hits per Channel

	No EM Bkgd.	Std. EM Bkgd.	Mixed EM Bkgd.
<b>BCAL</b>	1.8%	1.9%	1.9%
<b>CDC</b>	8.3%	8.4%	8.4%
<b>FCAL</b>	0.8%	1.4%	1.5%
<b>FDC</b>	8.9%	9.1%	9.2%
<b>SC</b>	0.6%	2.1%	2.3%
<b>TAGH</b>	—	14.9%	14.9%
<b>TAGM</b>	—	5.1%	5.1%
<b>TOF</b>	6.2%	20.4%	20.9%

# Times Between Hits in Same Channel

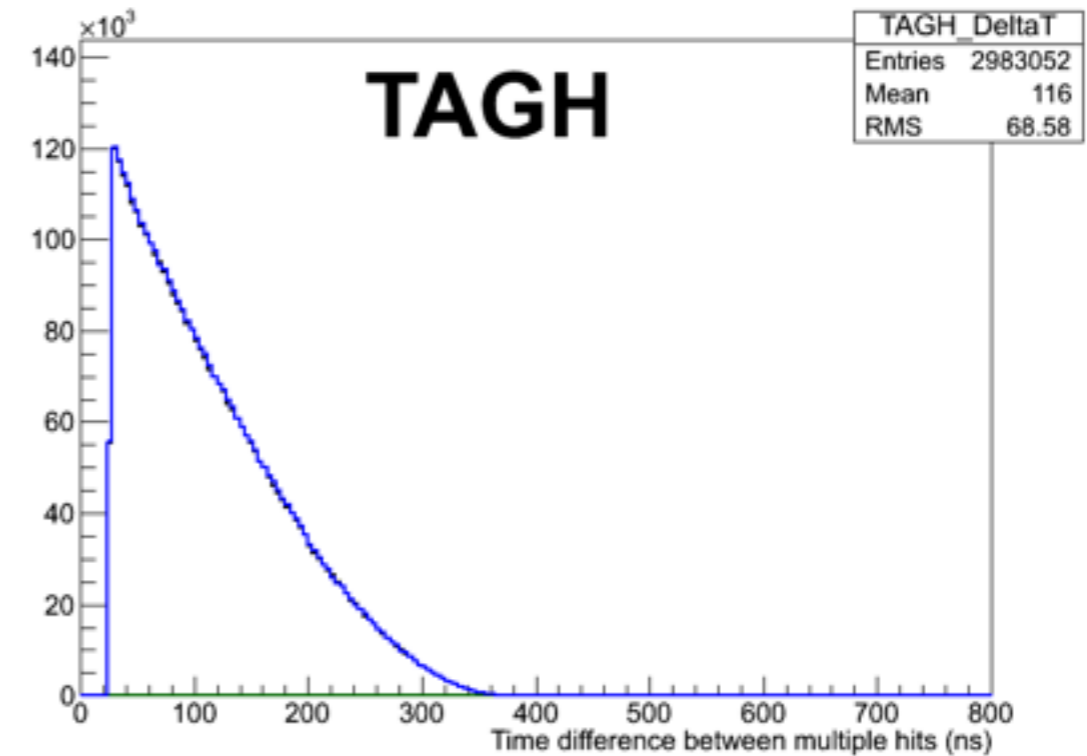
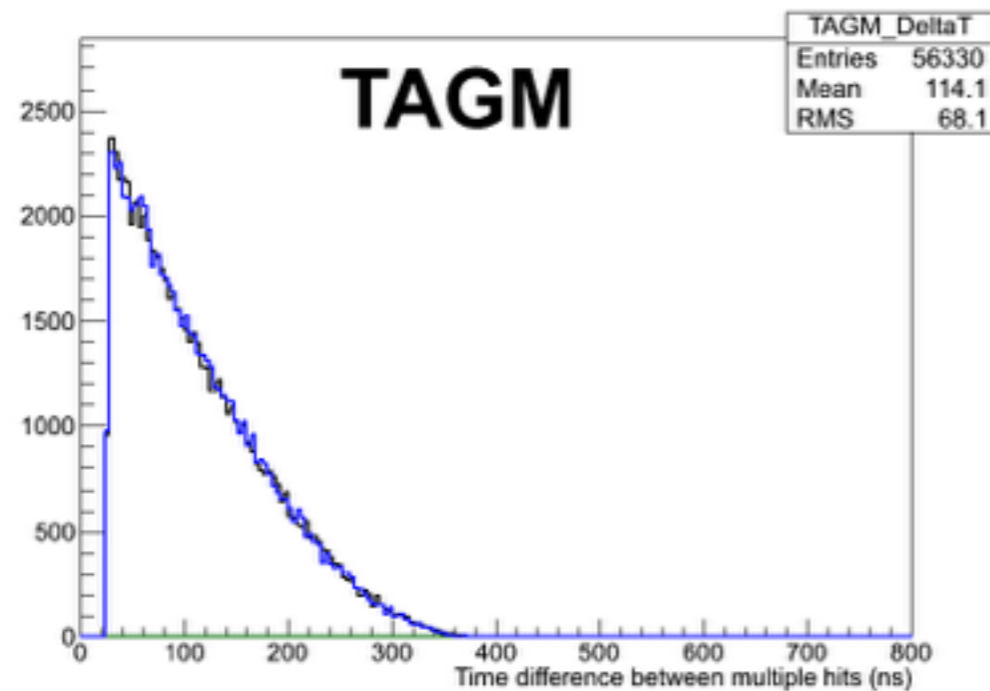
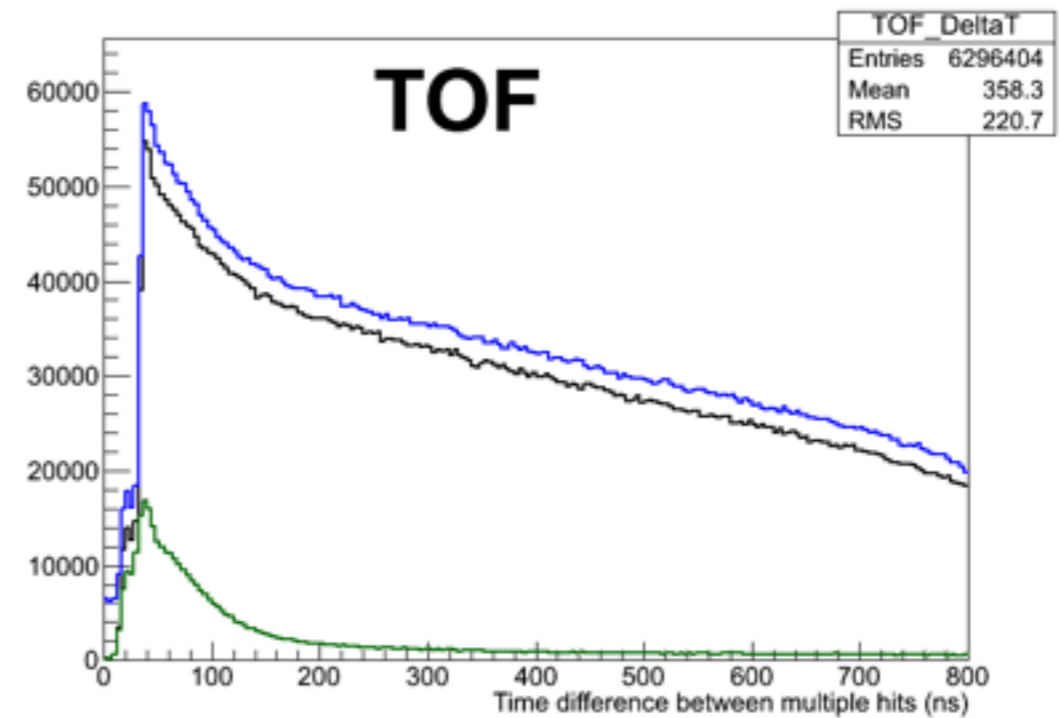
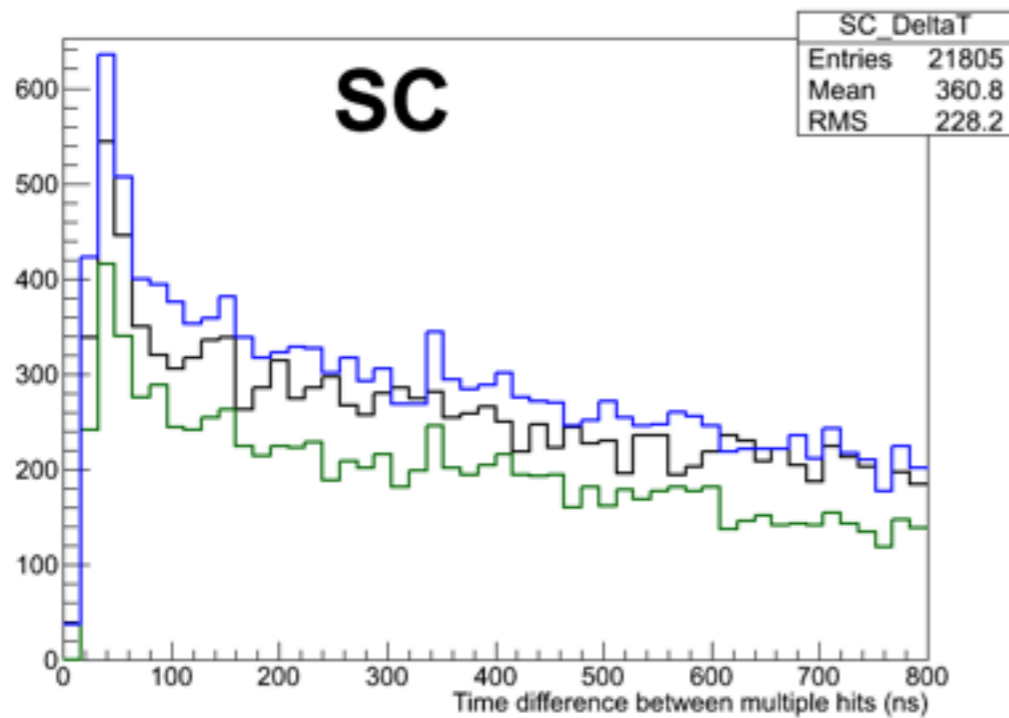


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Times Between Hits in Same Channel

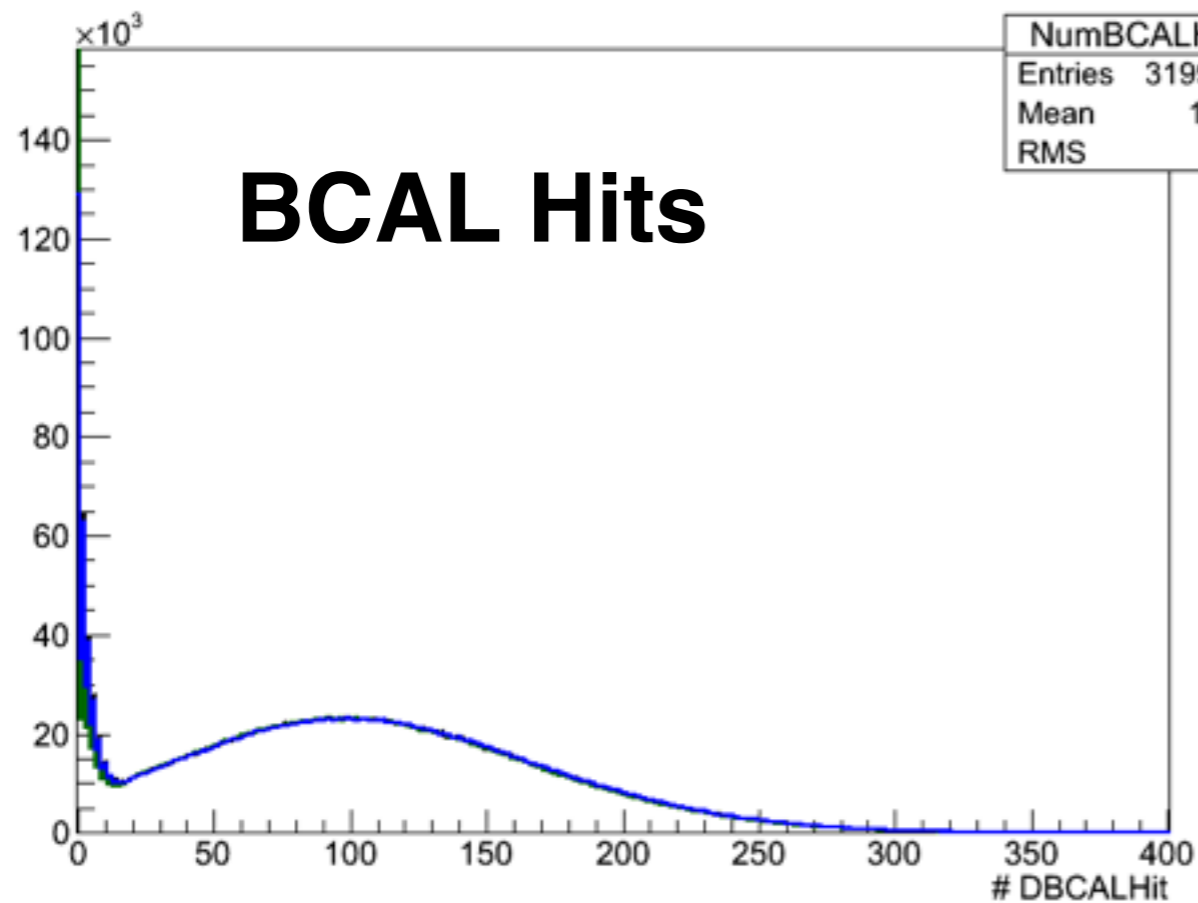


**Normal EM bkgd.**

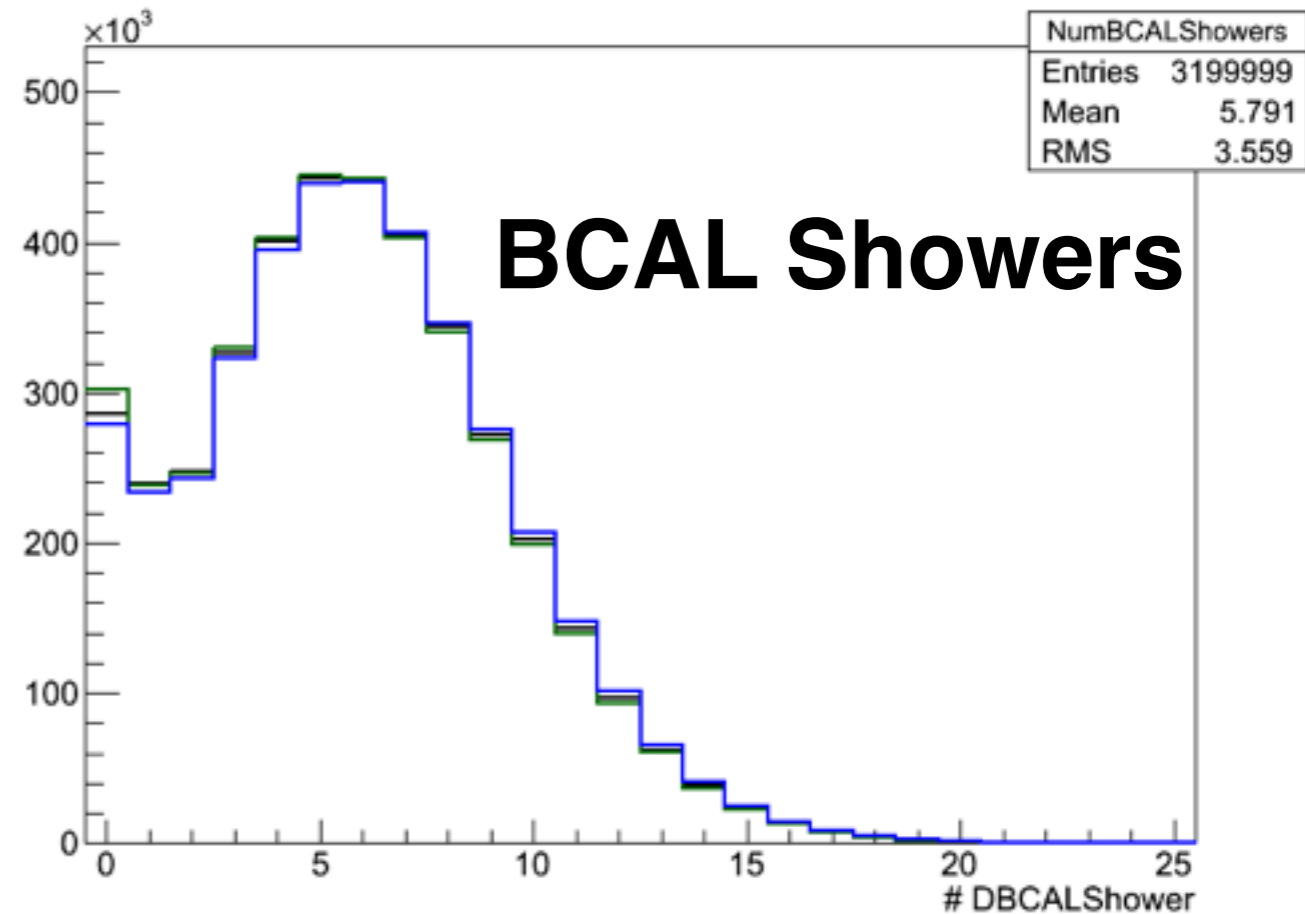
**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects



**BCAL Hits**



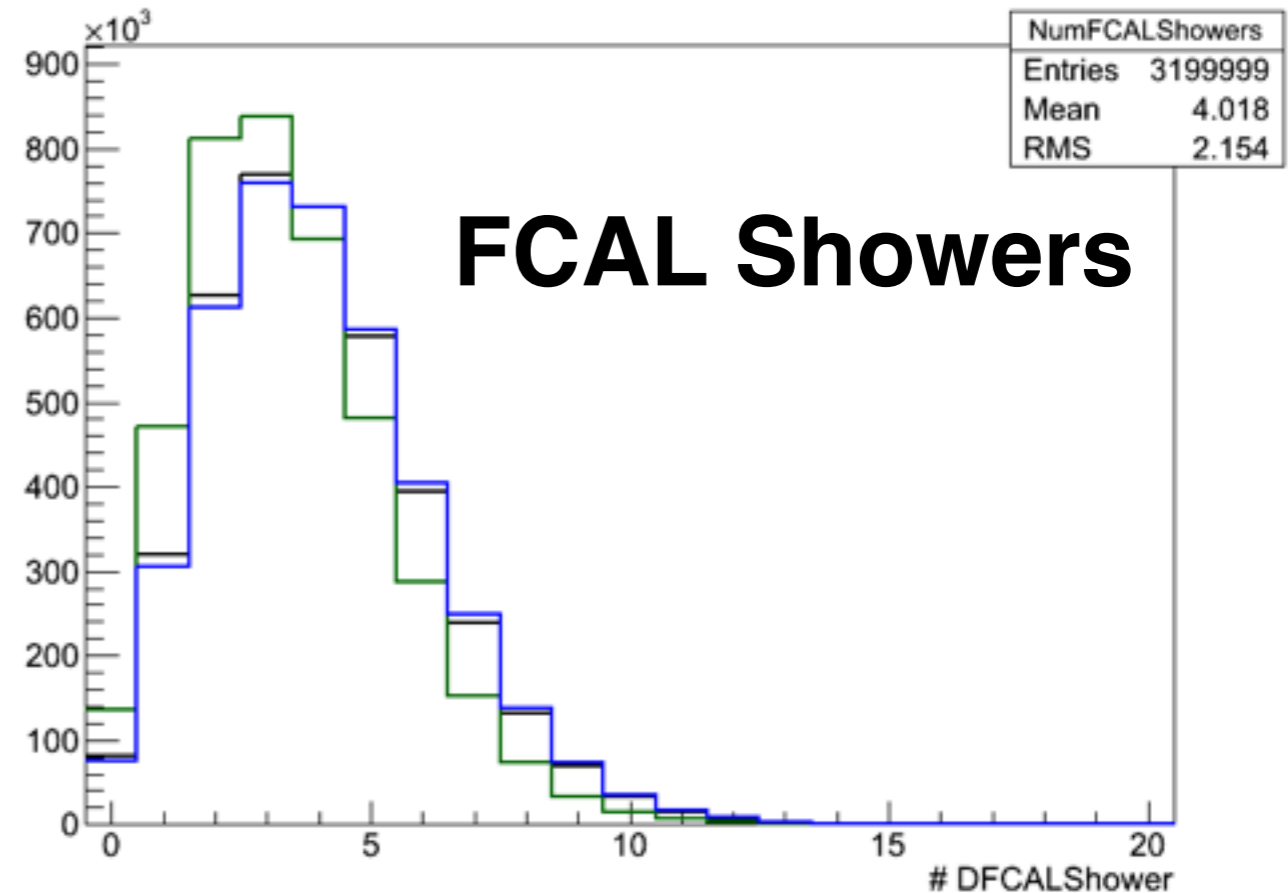
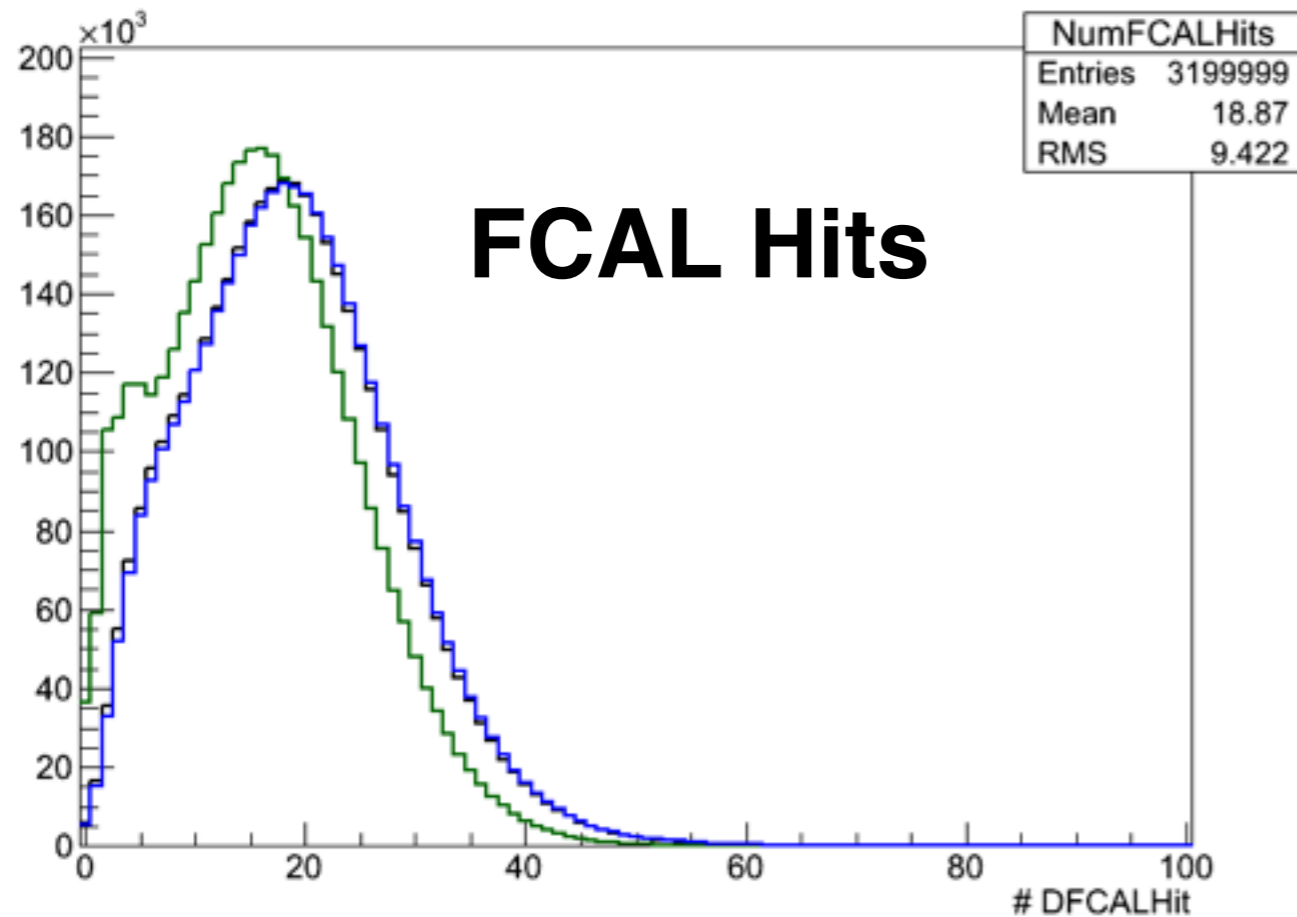
**BCAL Showers**

**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects

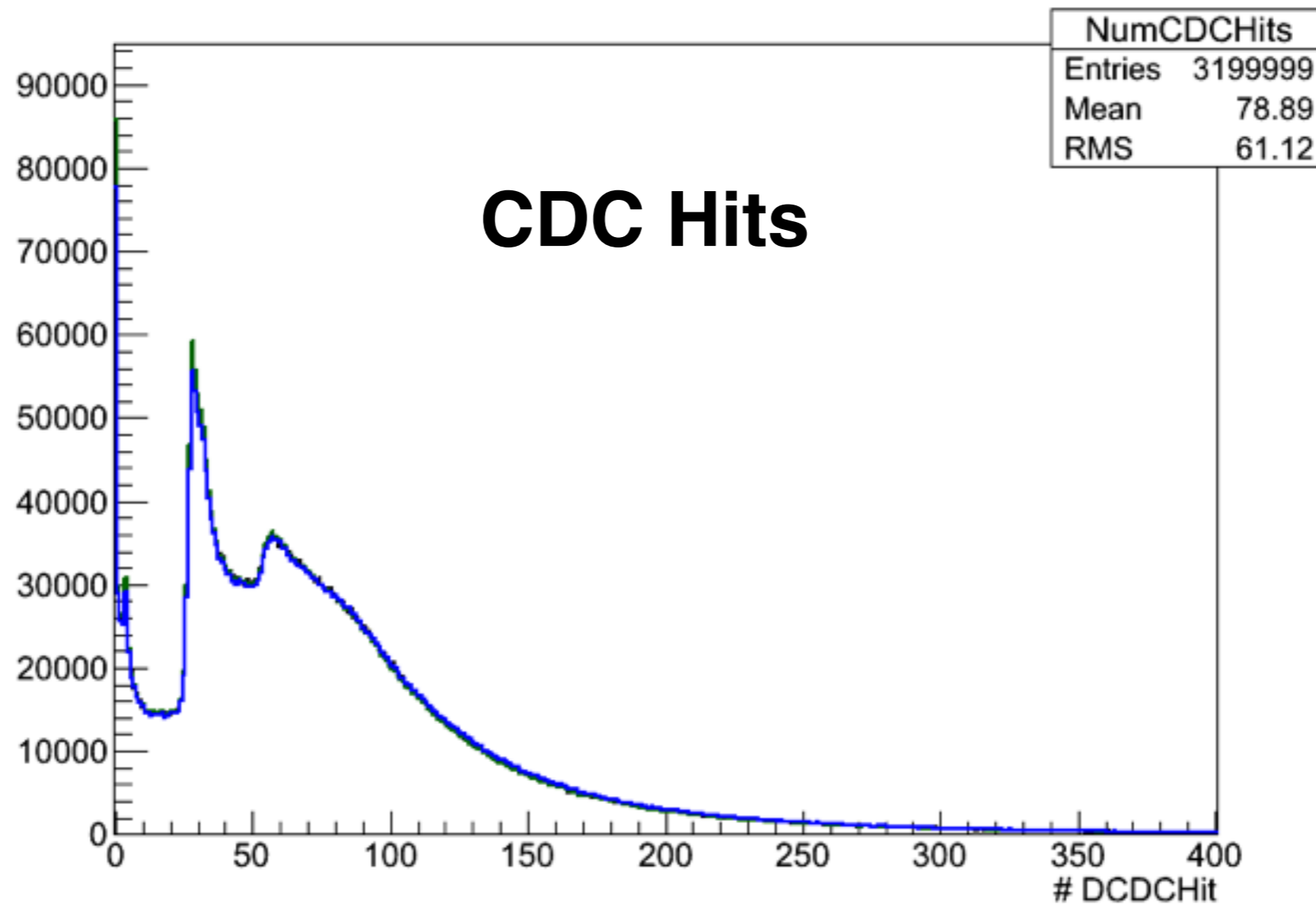


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects

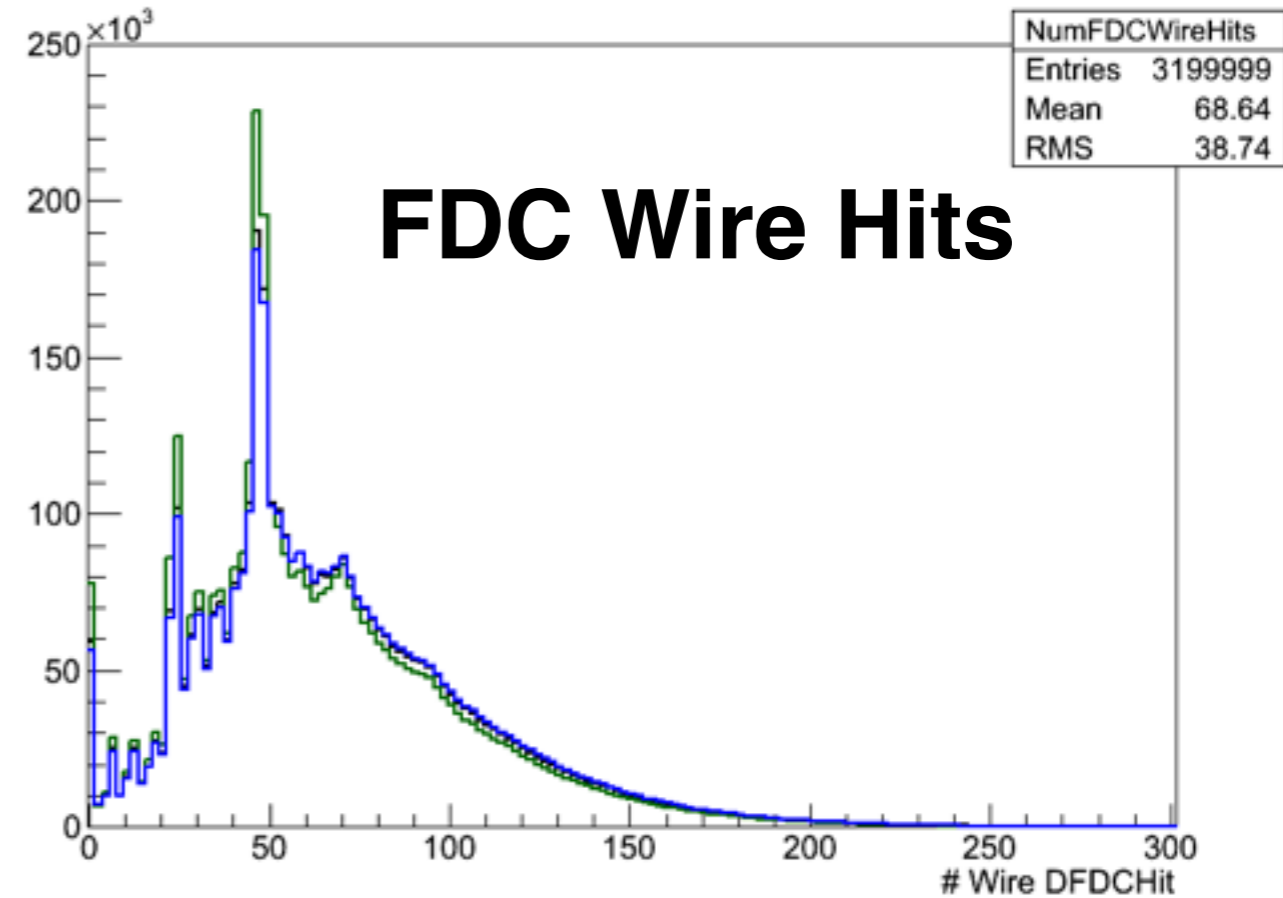
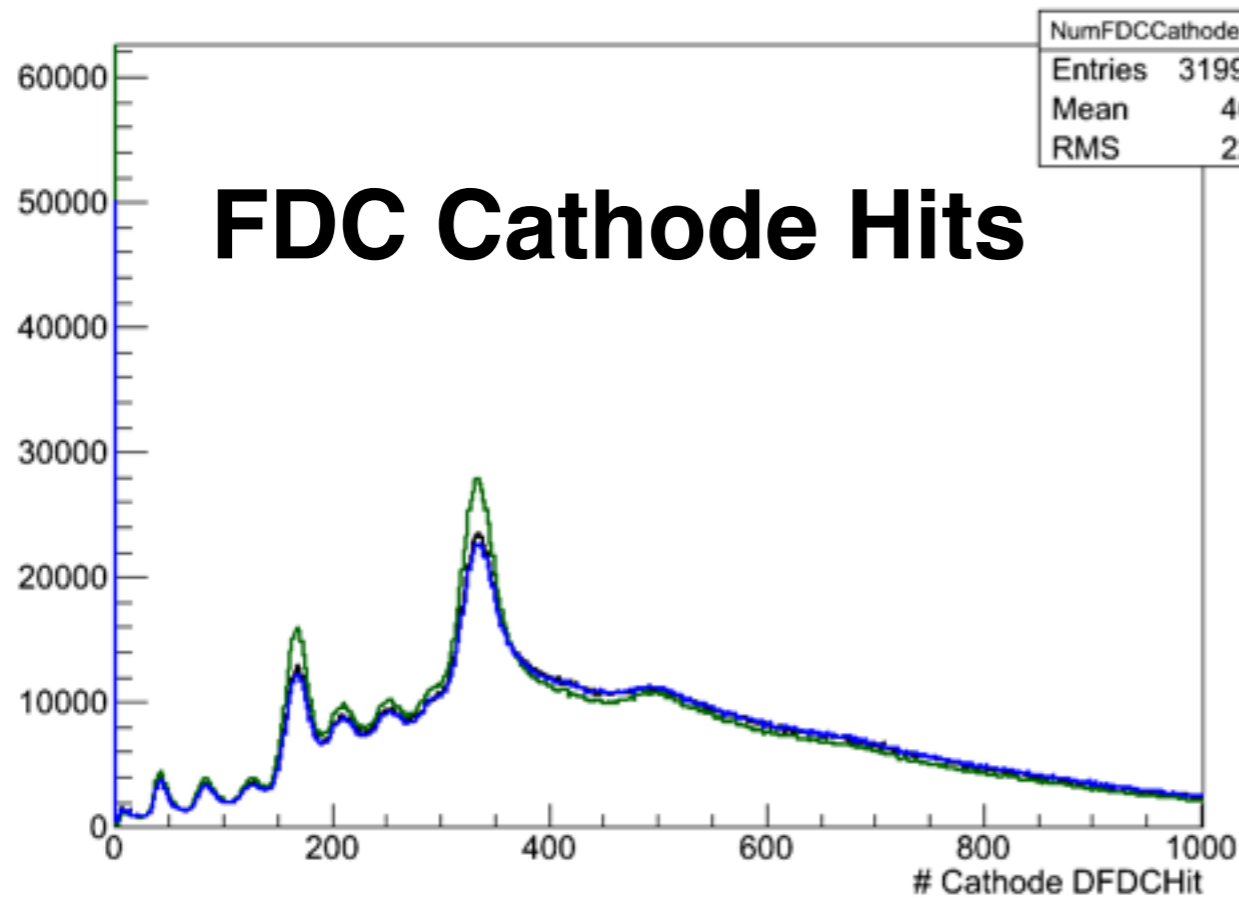


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects



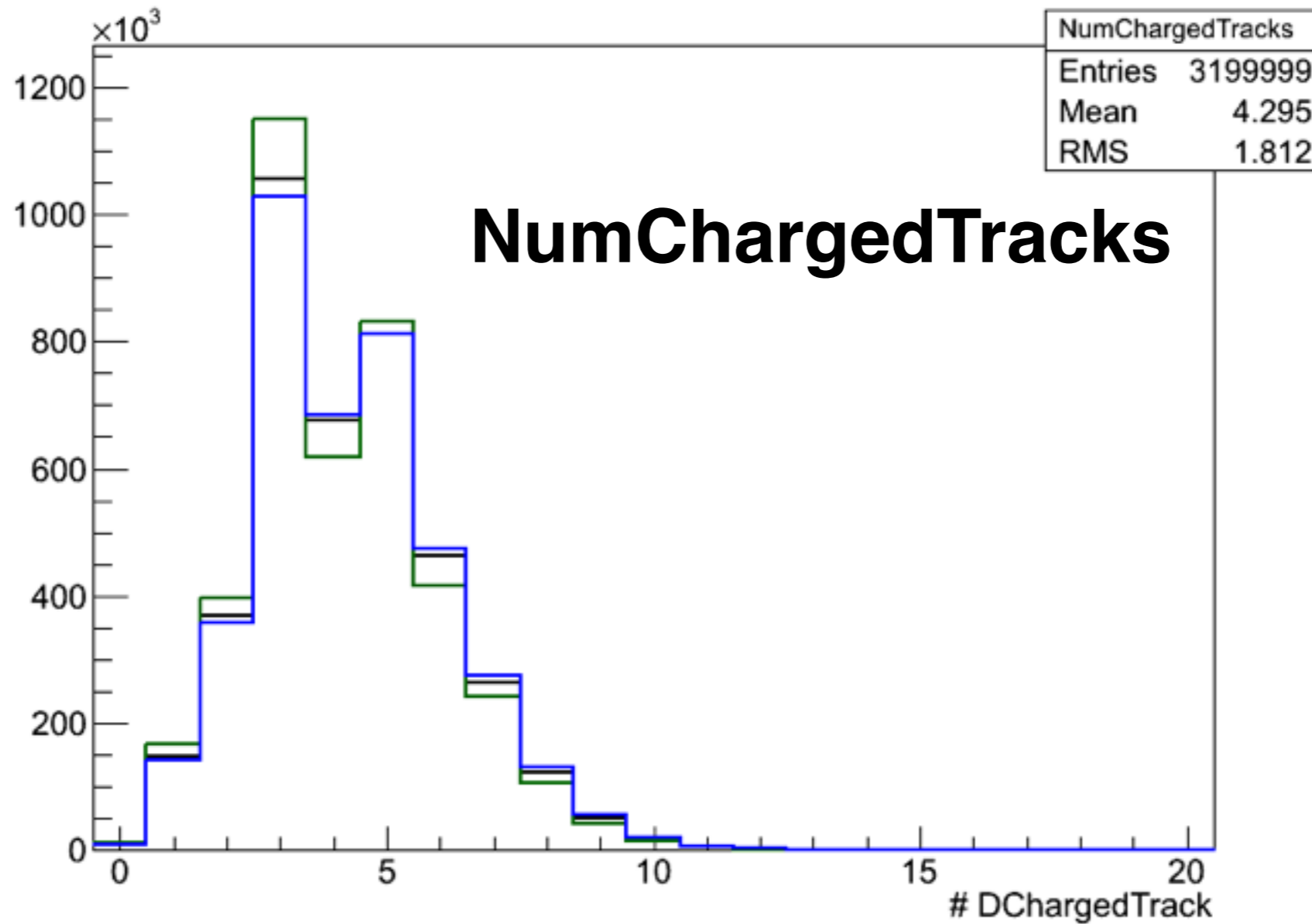
**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**



# Reconstructed Objects

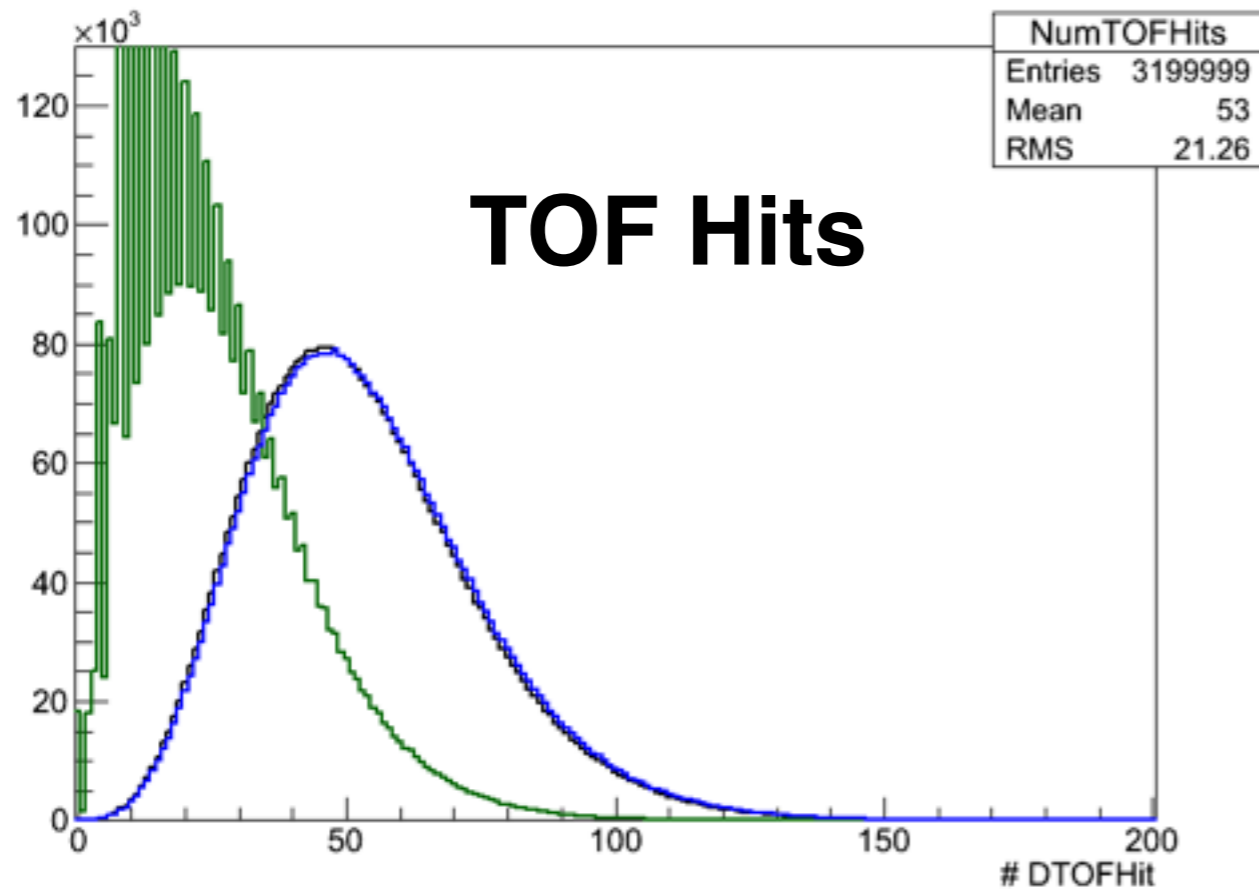


**Normal EM bkgd.**

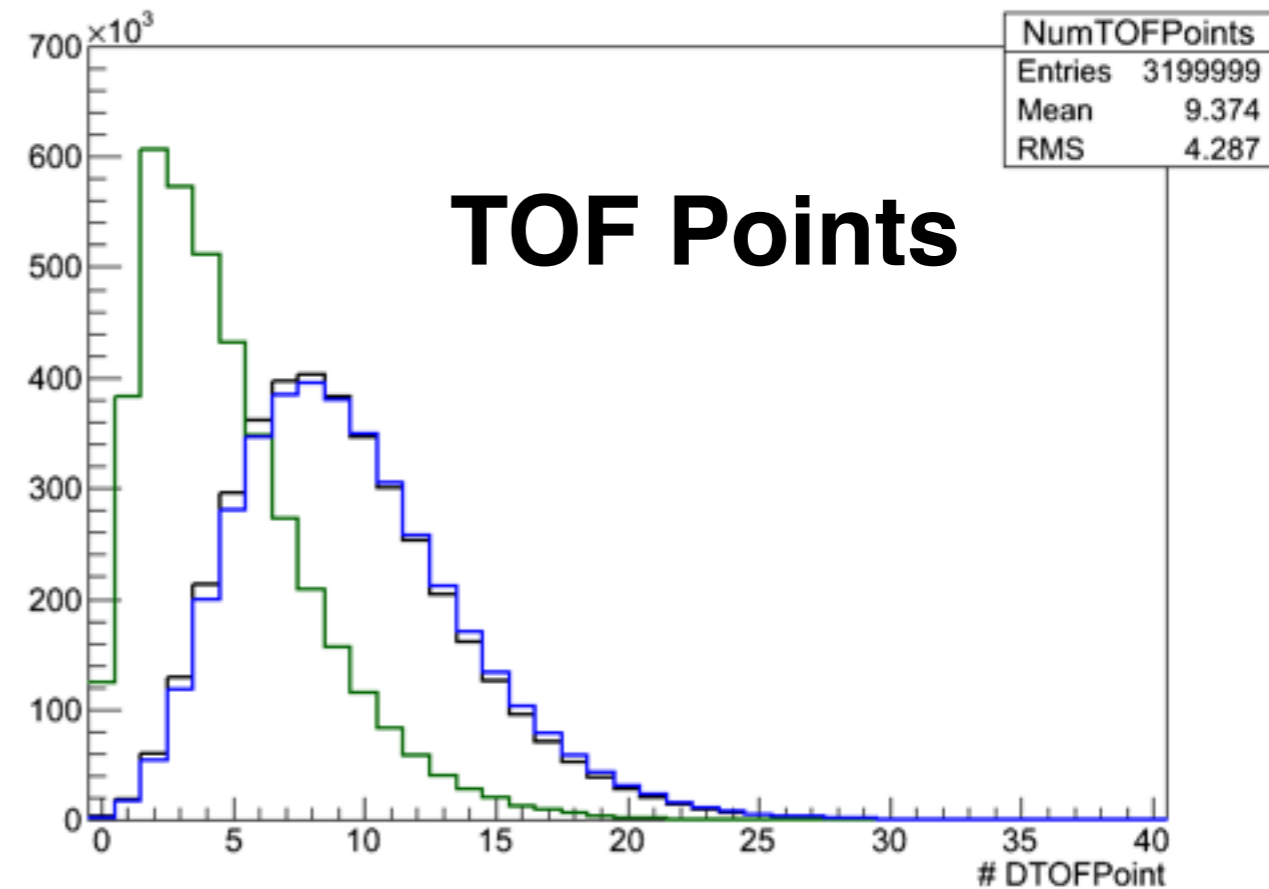
**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects



**TOF Hits**



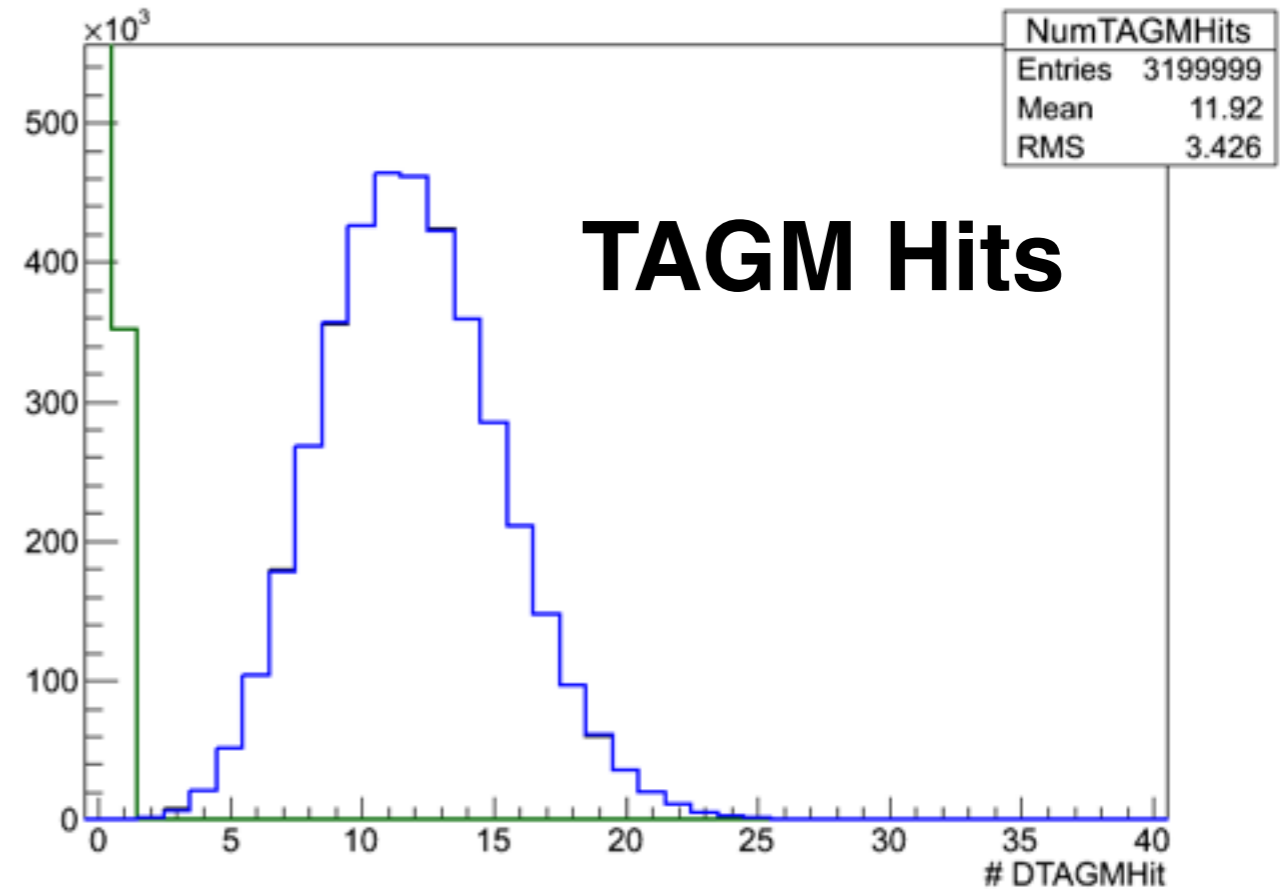
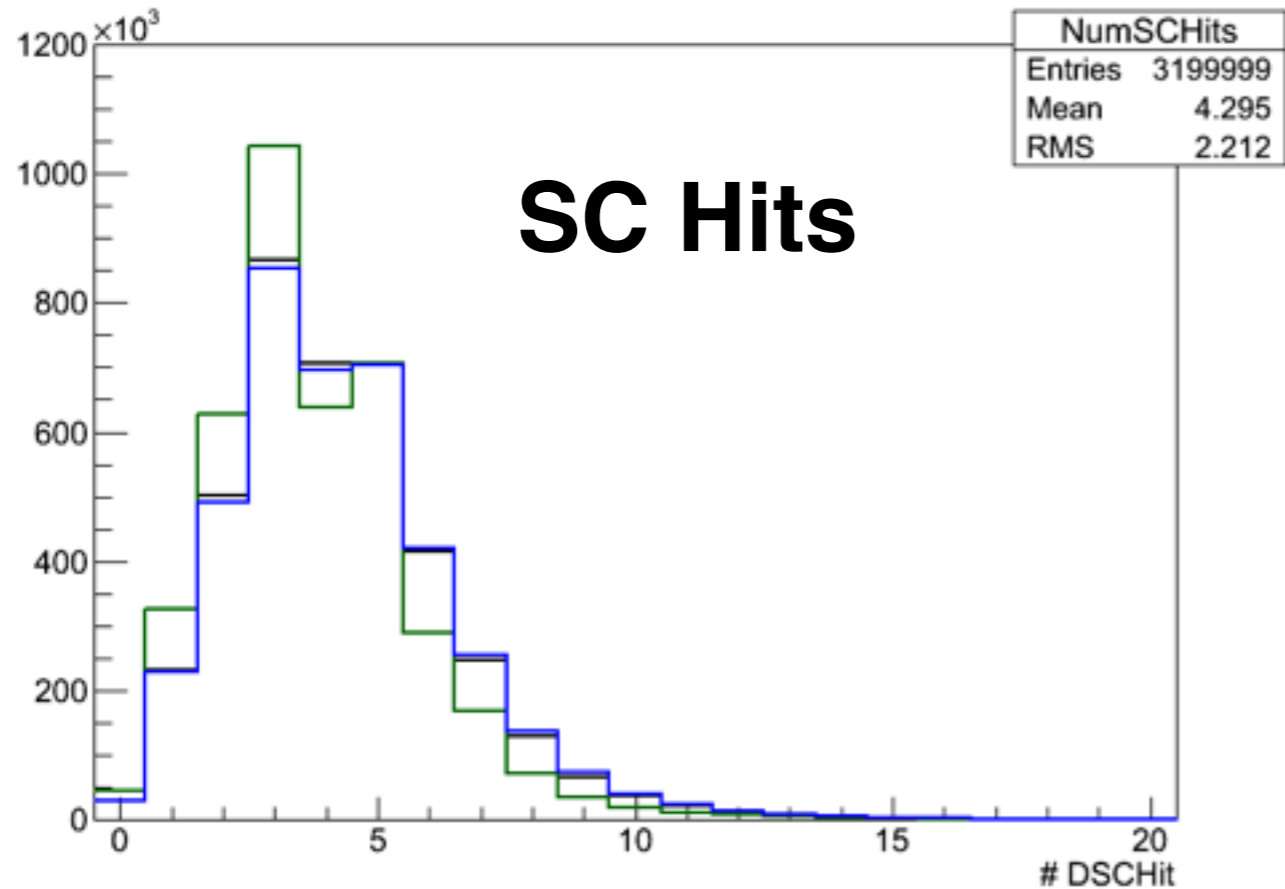
**TOF Points**

**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects

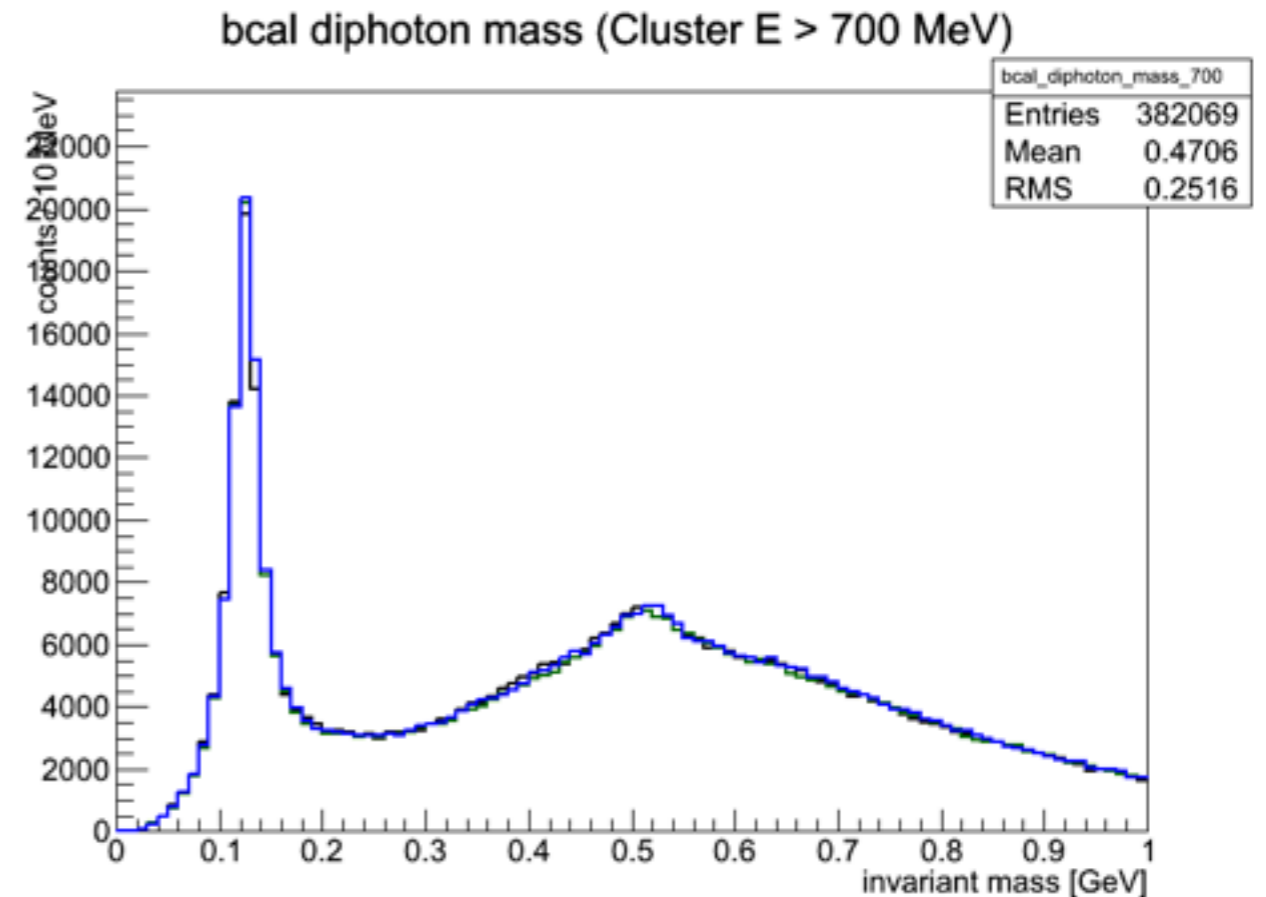
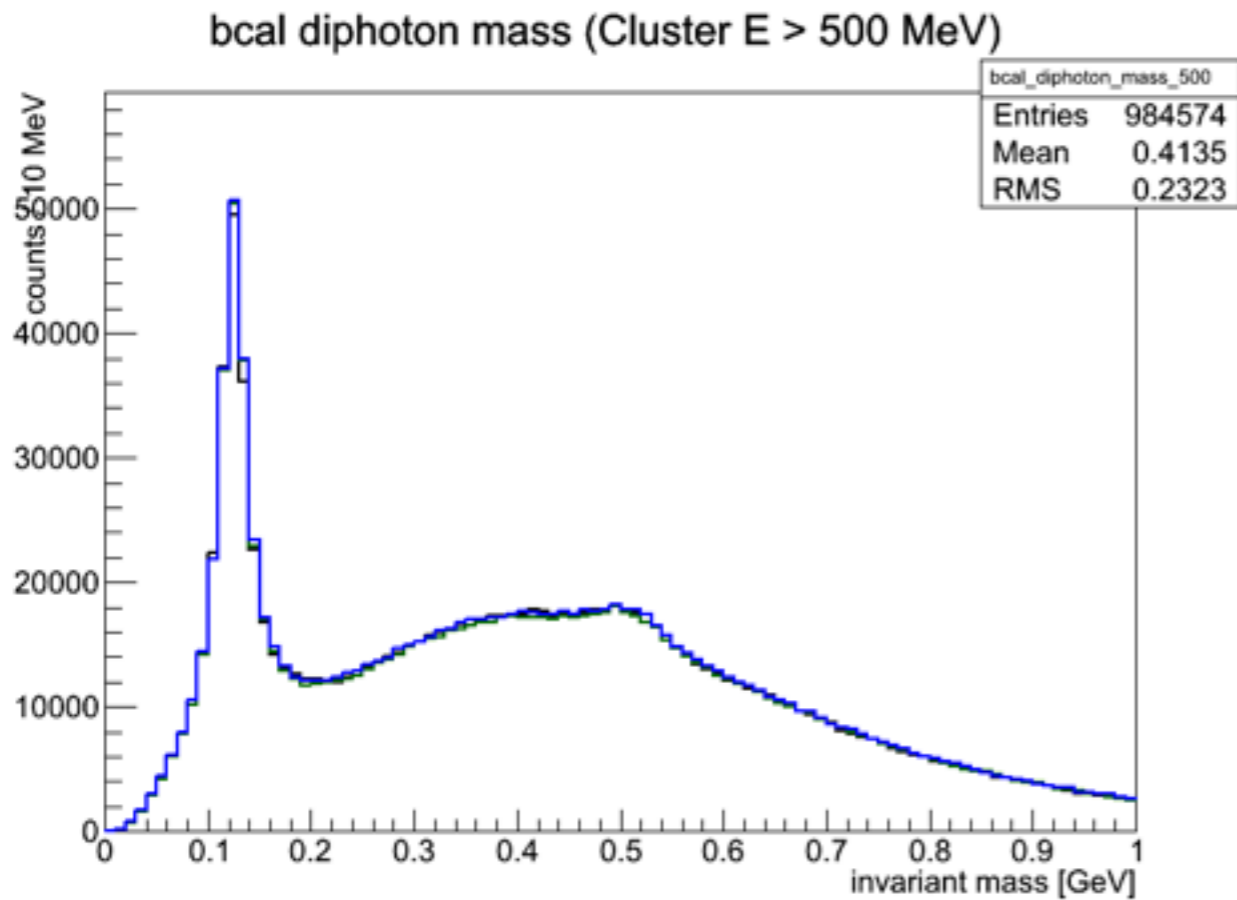


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects

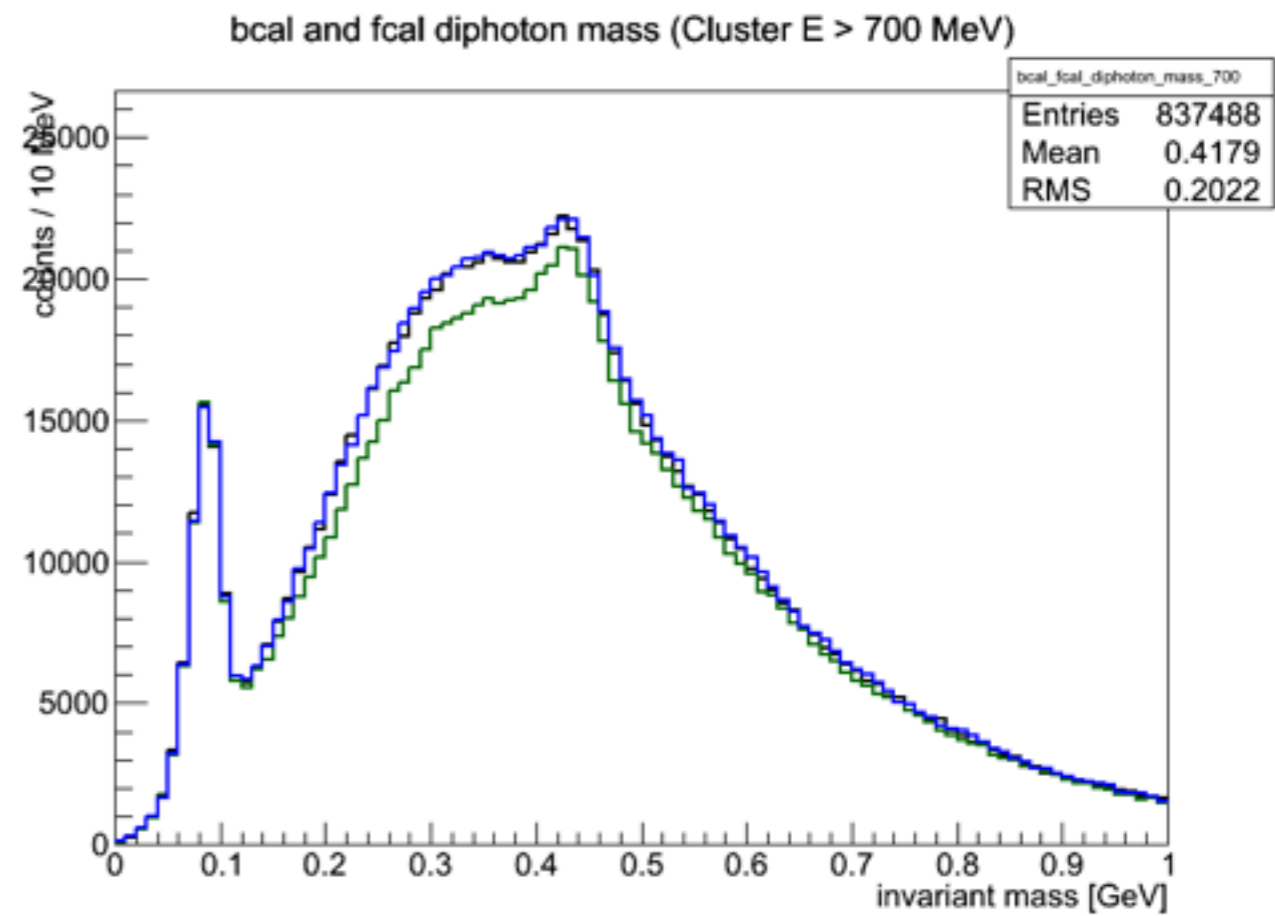
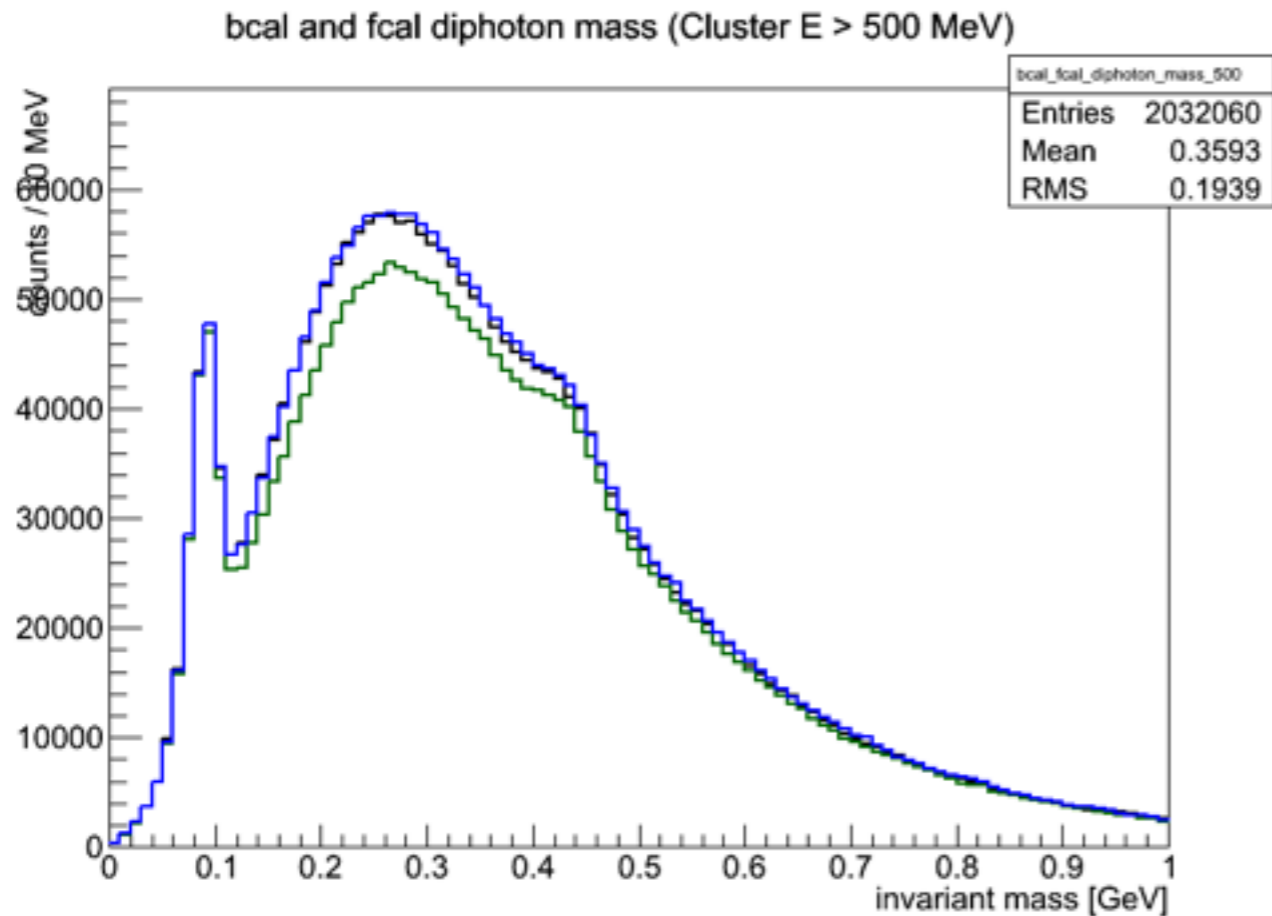


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Reconstructed Objects

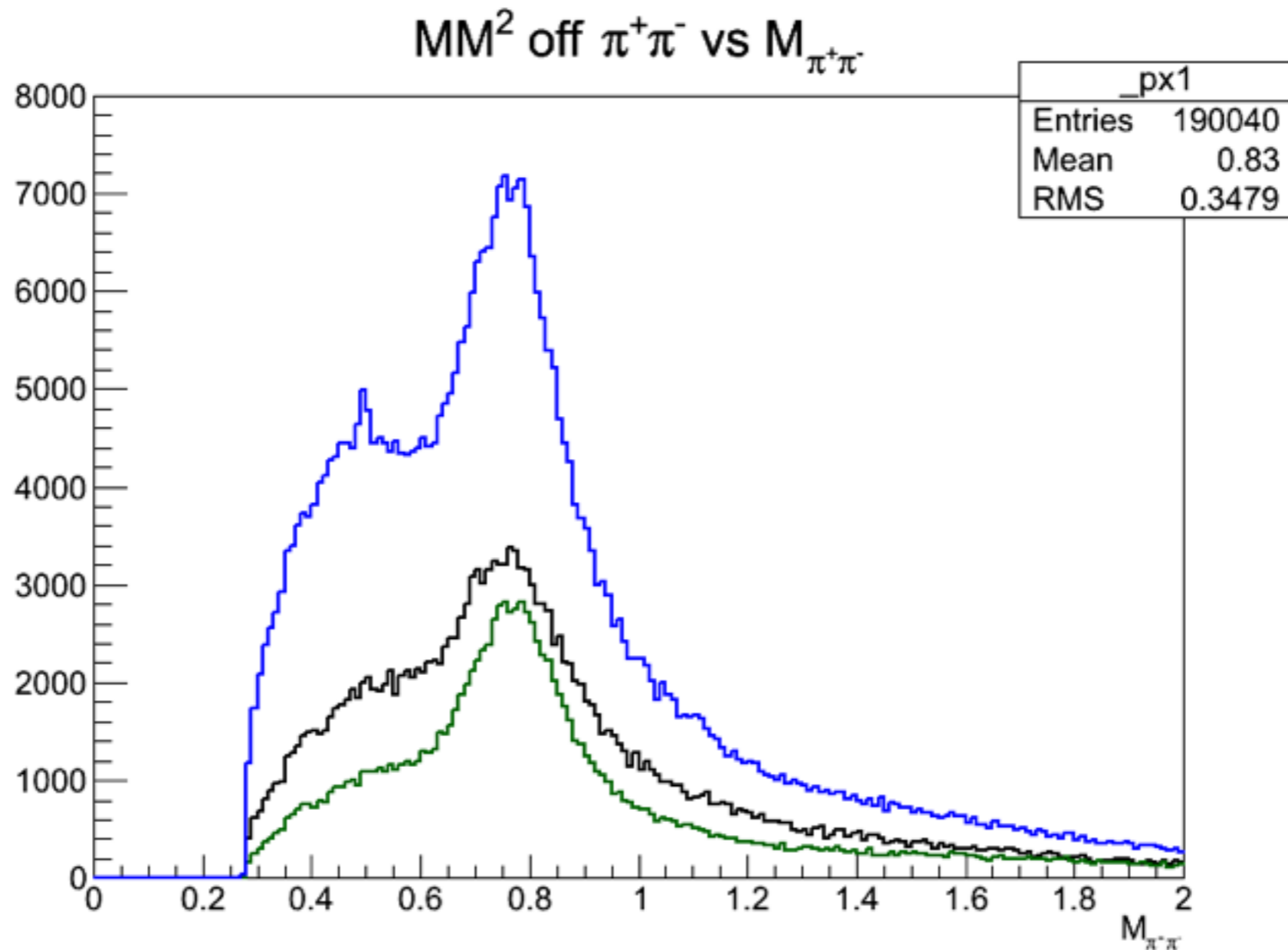


**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Analysis Objects



**Normal EM bkgd.**

**Mixed EM bkgd.**

**No EM bkgd.**

# Moving Forward

- Procedure of mixing background events using `hddm_merge_events` works, in principle
- Need to decide what types of events to use in this procedure
  - Simulated events are a good start
    - What is the best way to simulate them?
    - Does this accurately capture the noise?
  - Data events? What trigger? PS trigger is fine for main spectrometer. How does this scale with beam intensity?
- Other mixing details:
  - Mix full background events, or subsets of events?
  - Do we loop through the same set of background events or access them randomly?