

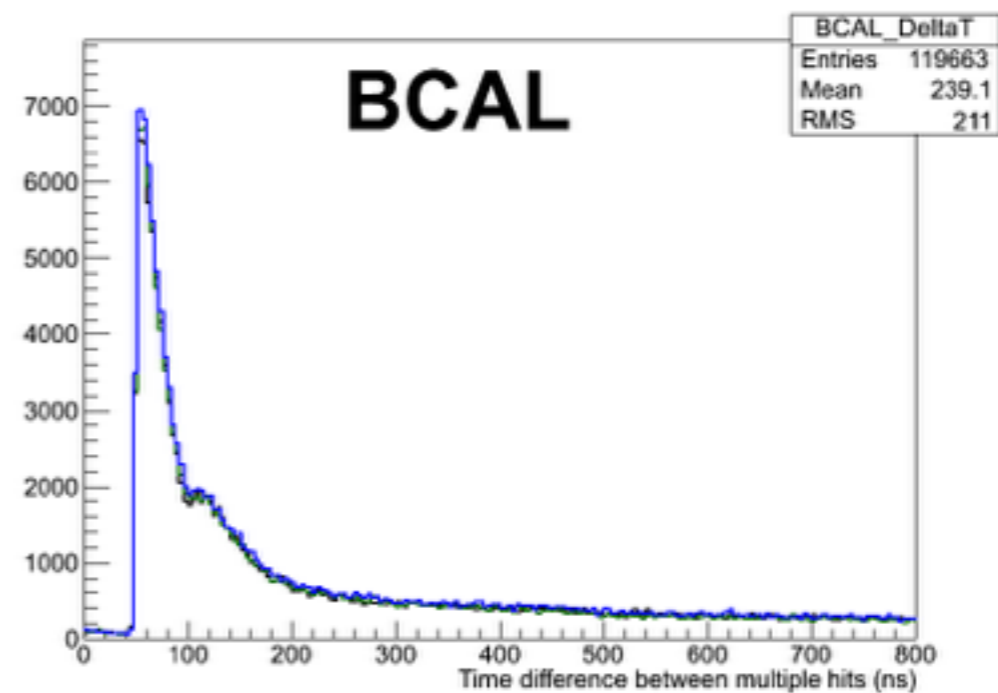
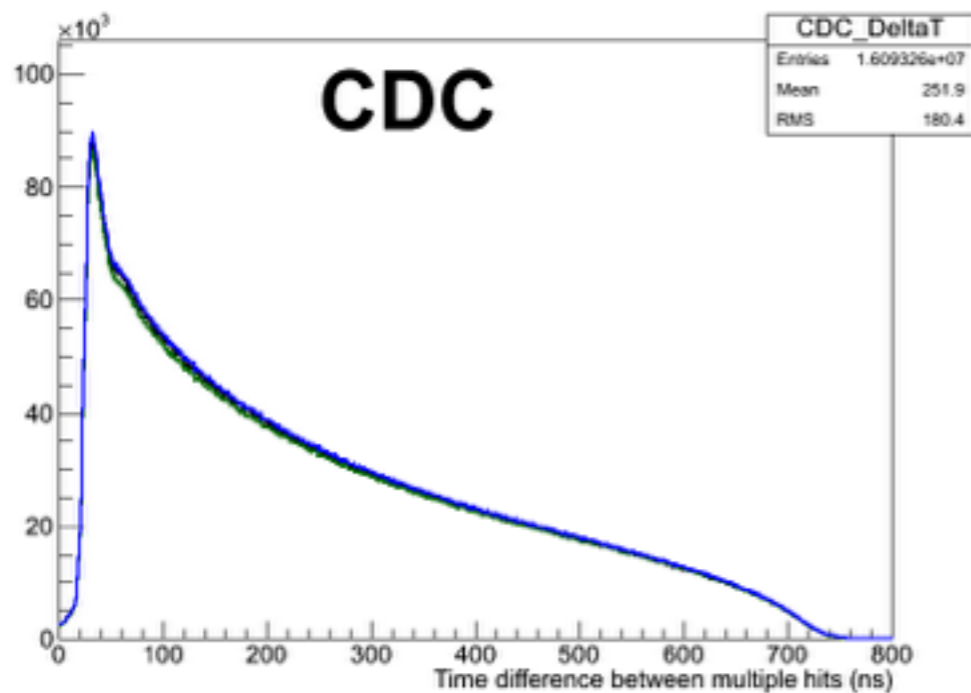
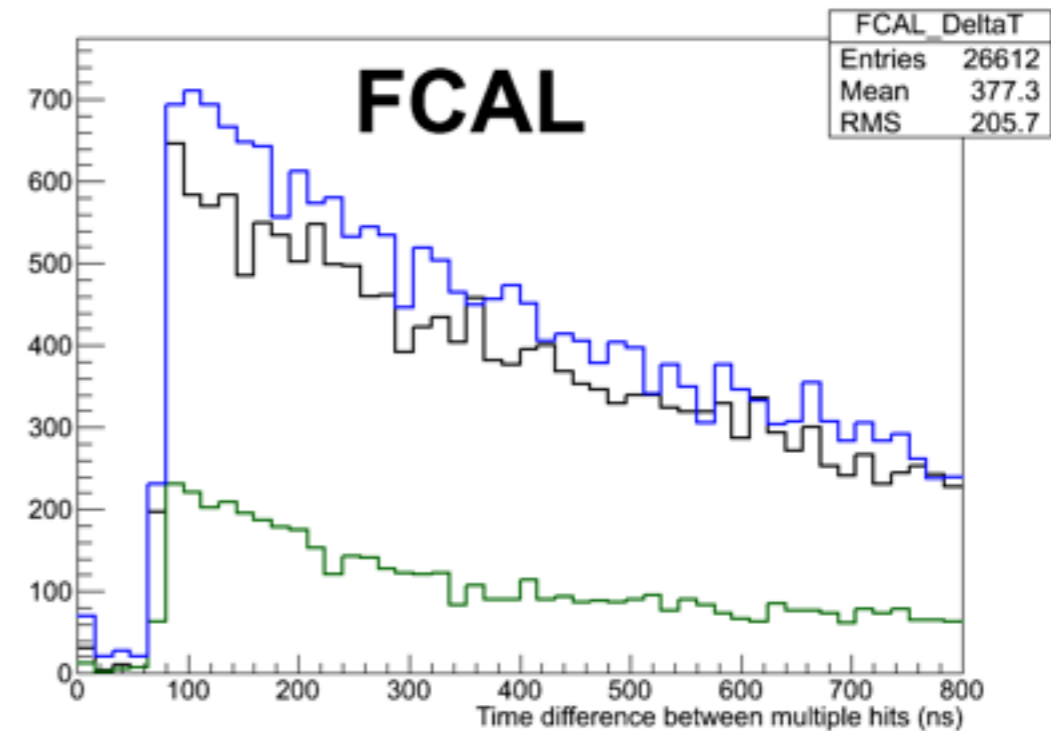
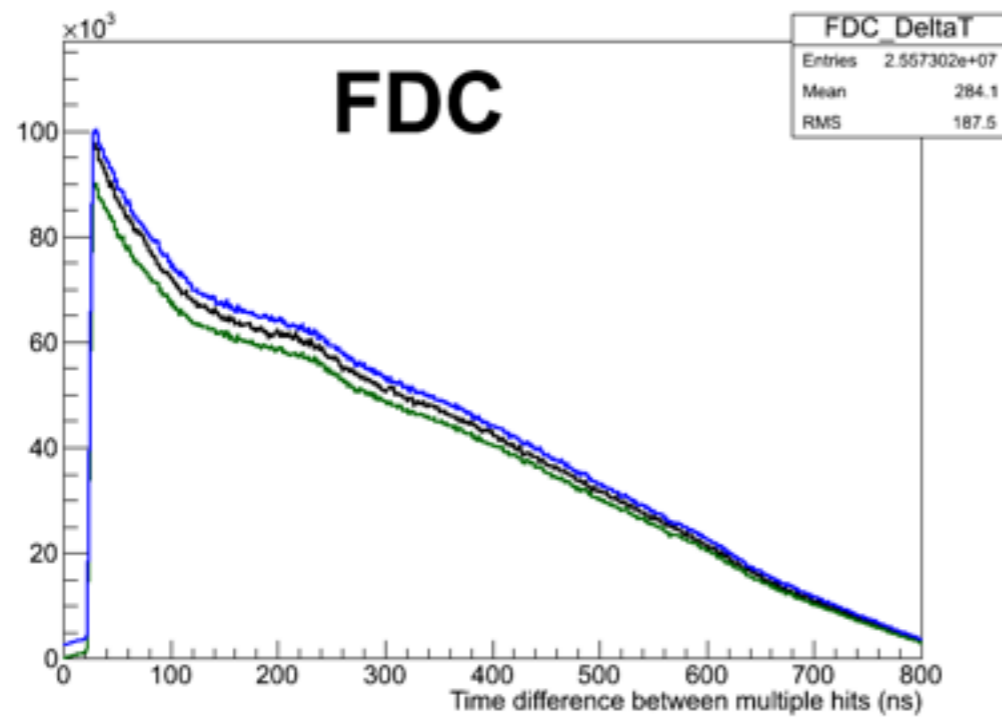
EM Background From Event Mixing

- 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.
BCAL	1.8%	1.9%	1.9%
CDC	8.3%	8.4%	8.4%
FCAL	0.8%	1.4%	1.5%
FDC	8.9%	9.1%	9.2%
SC	0.6%	2.1%	2.3%
TAGH	—	14.9%	14.9%
TAGM	—	5.1%	5.1%
TOF	6.2%	20.4%	20.9%

Times Between Hits in Same Channel

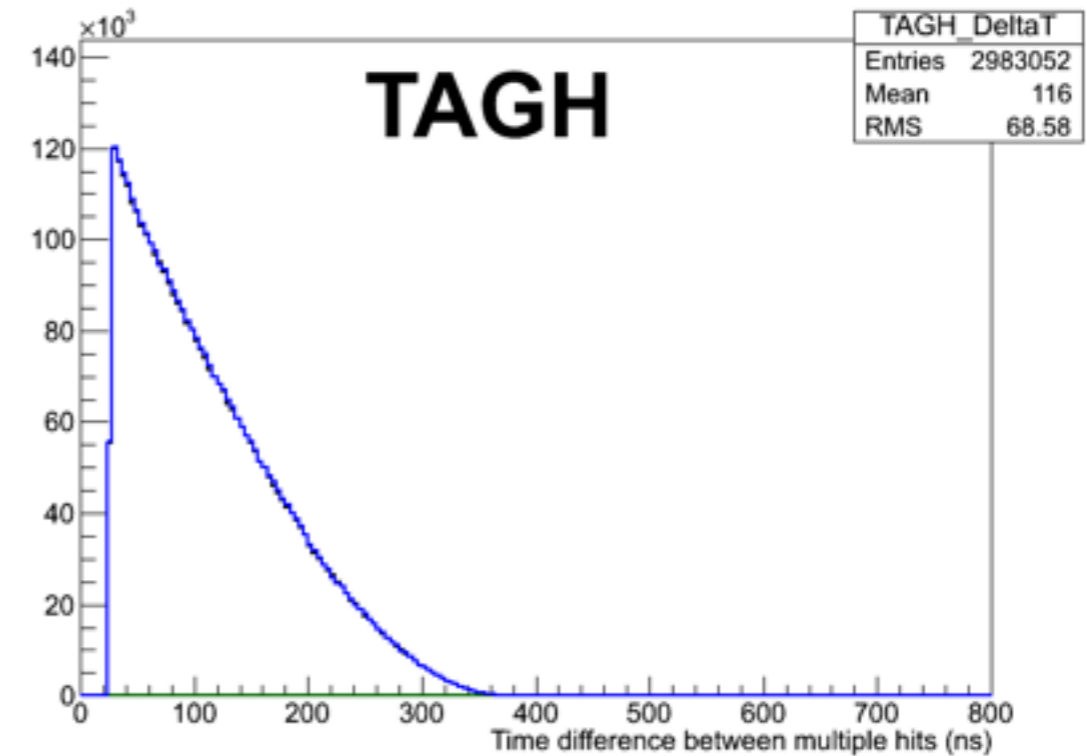
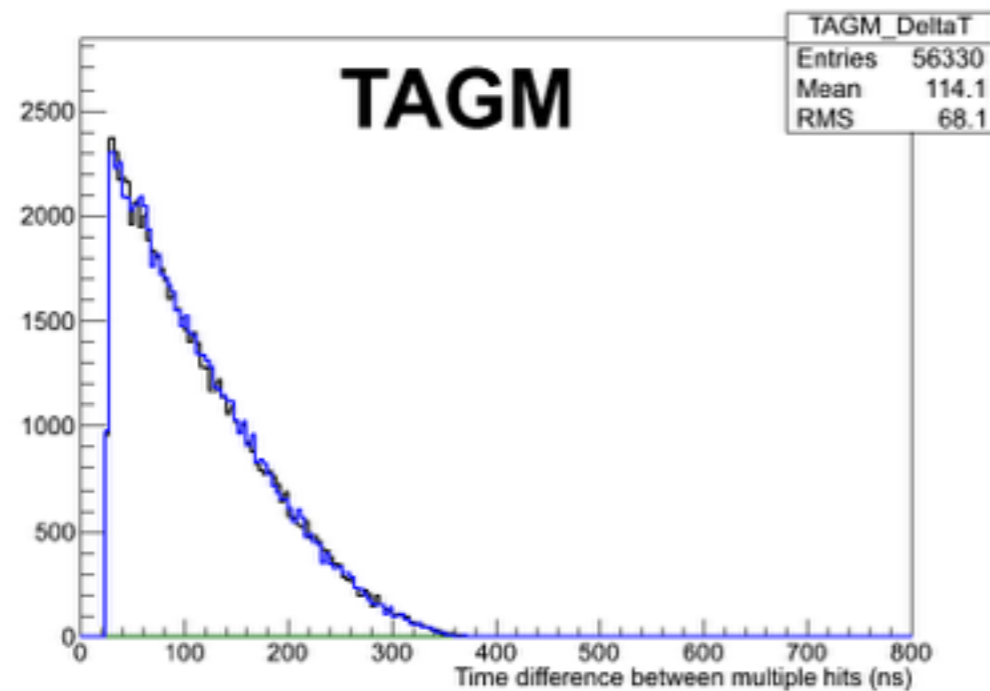
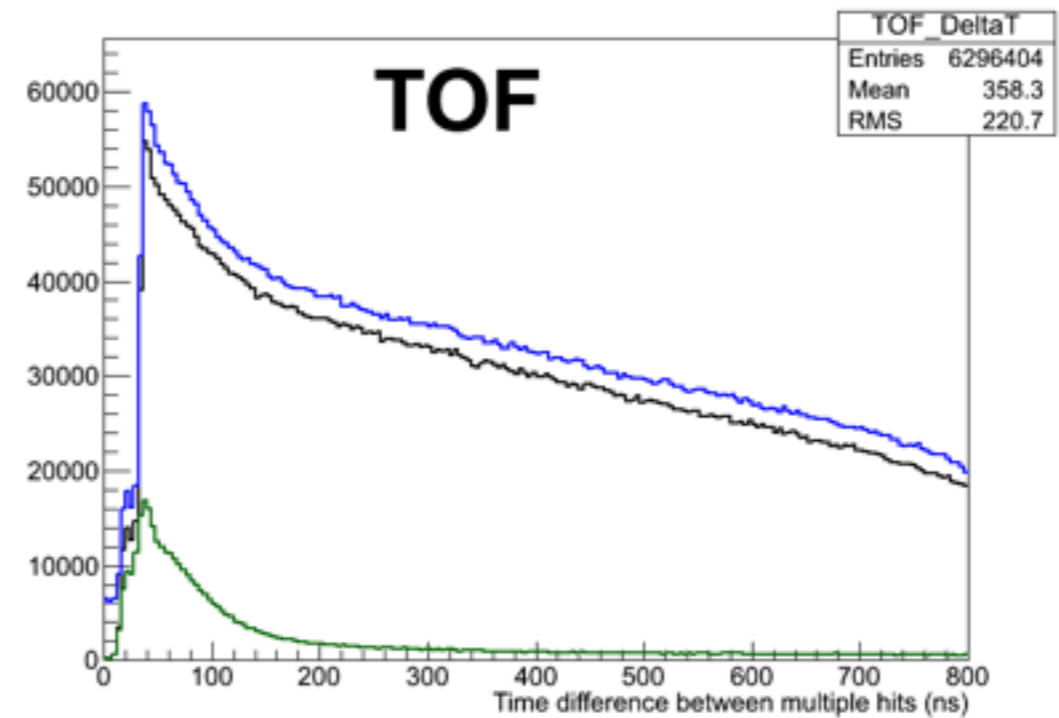
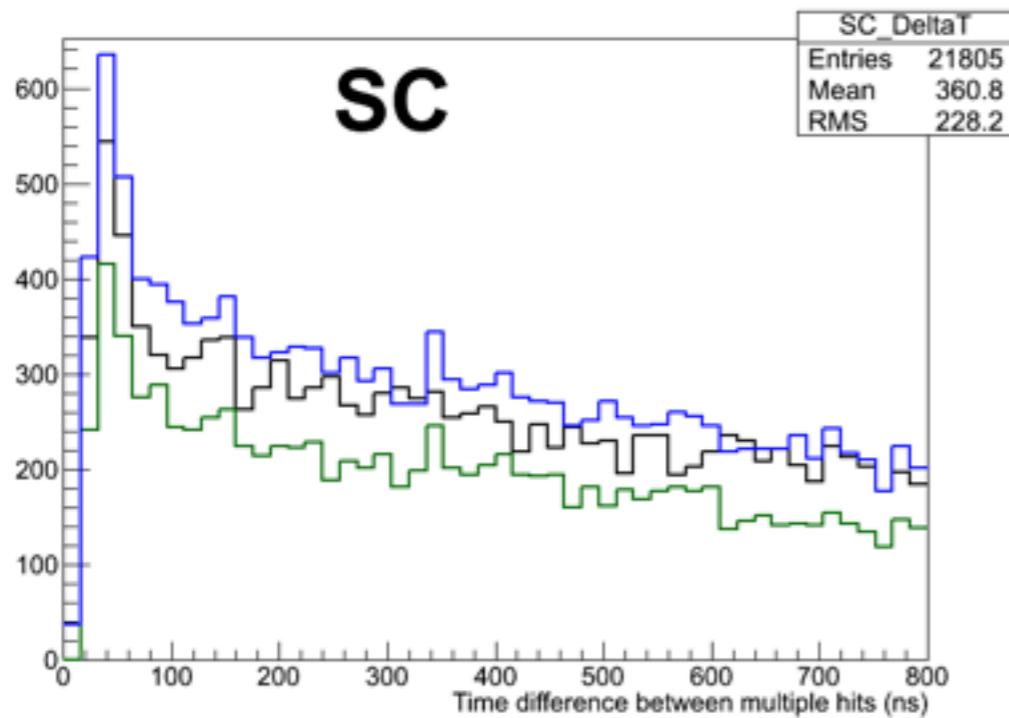


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Times Between Hits in Same Channel

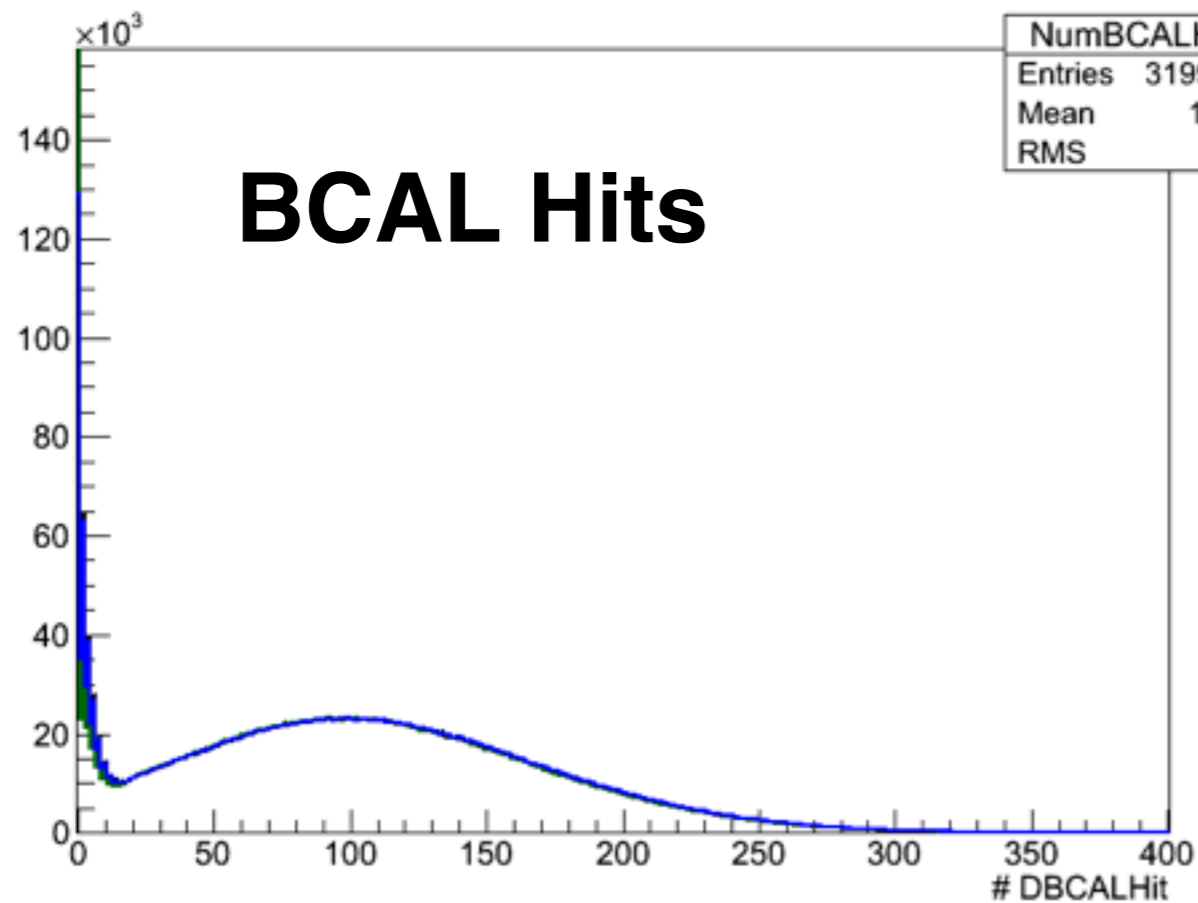


Normal EM bkgd.

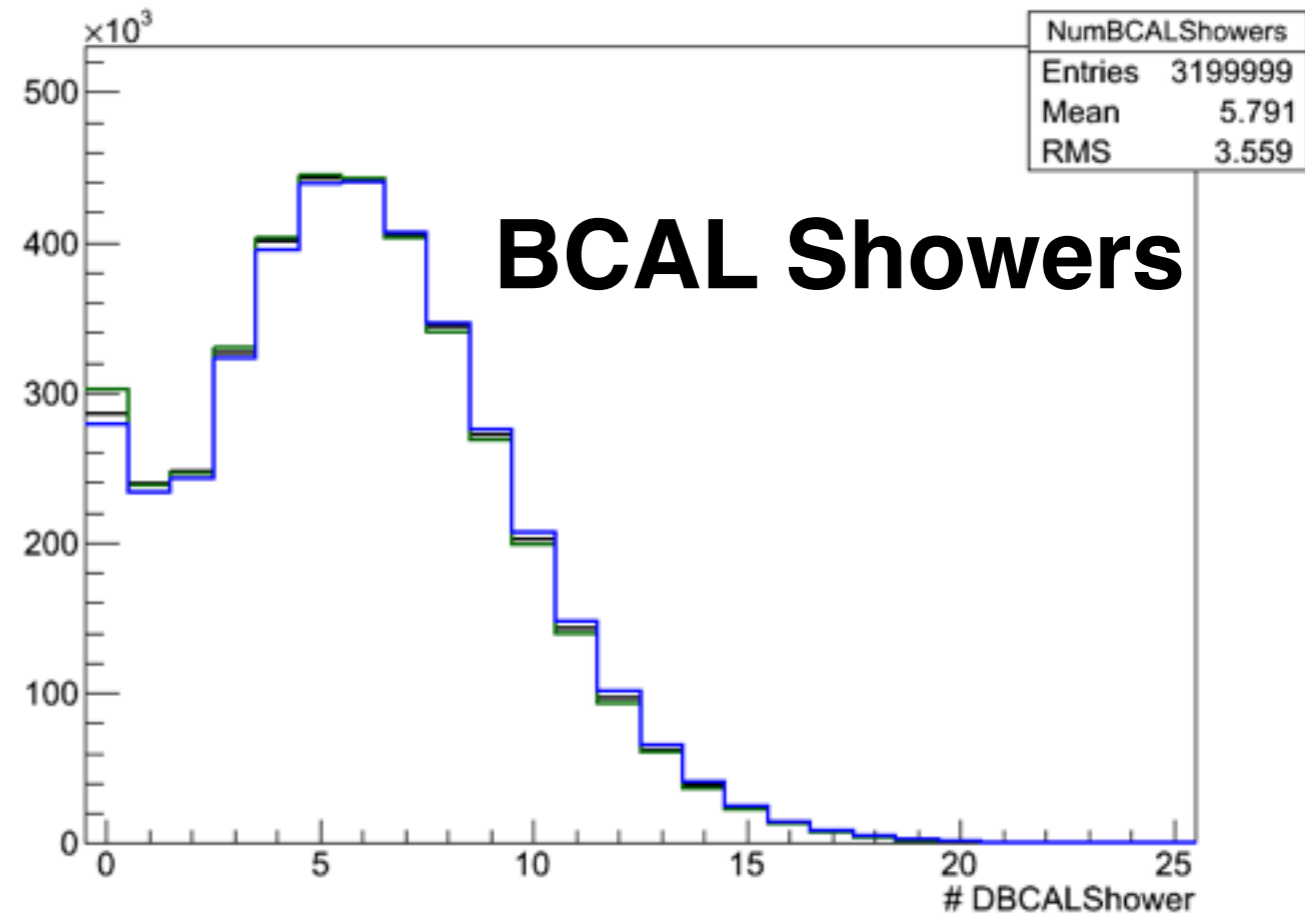
Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects



BCAL Hits



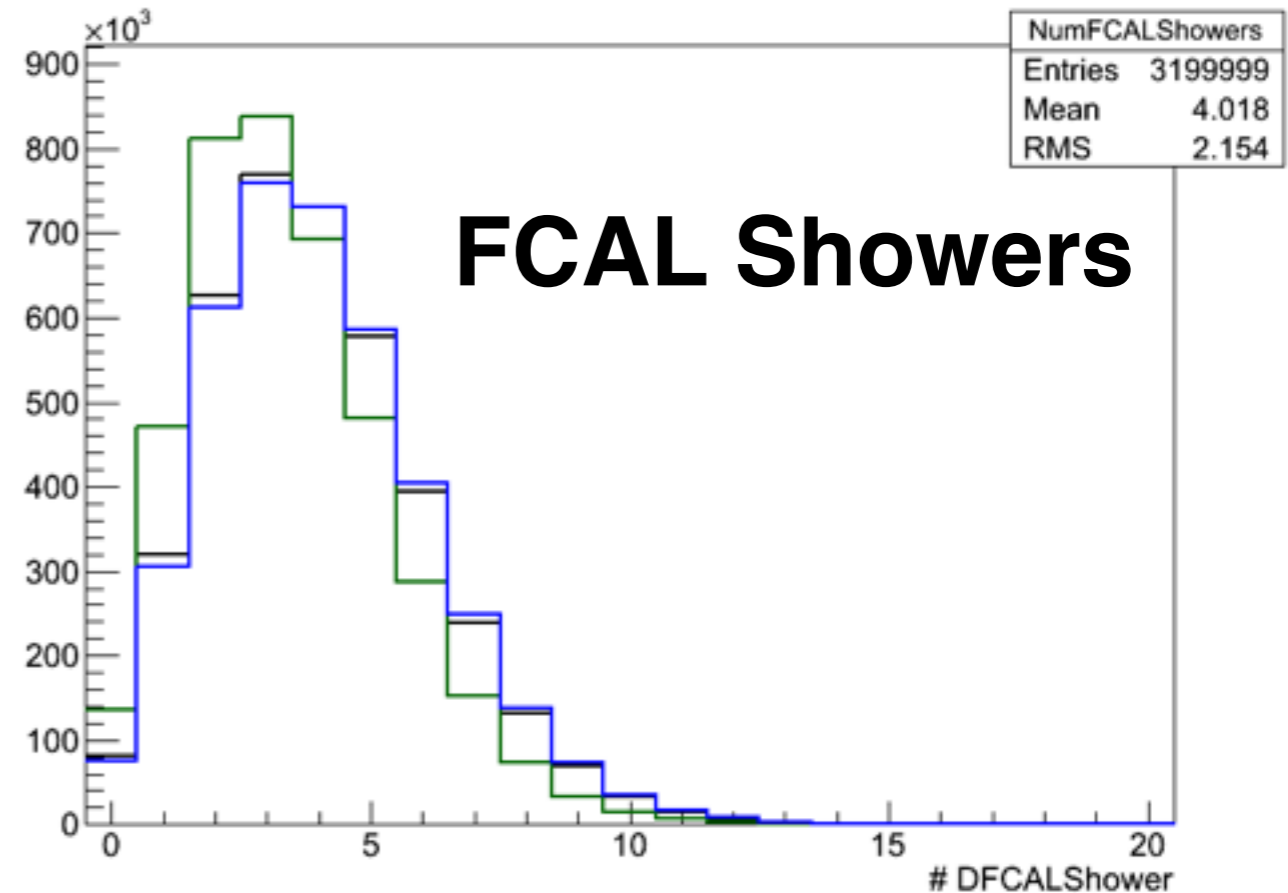
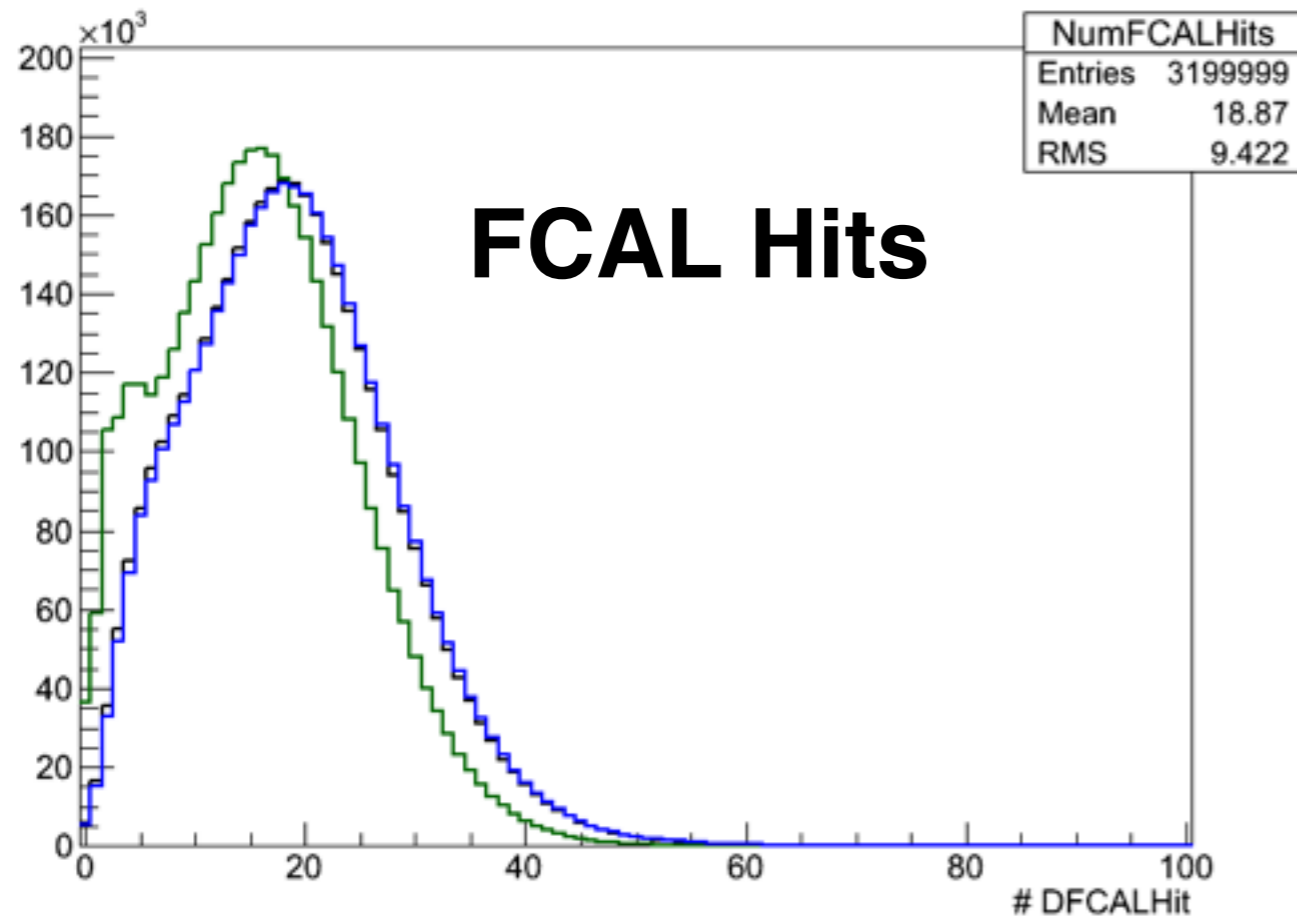
BCAL Showers

Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

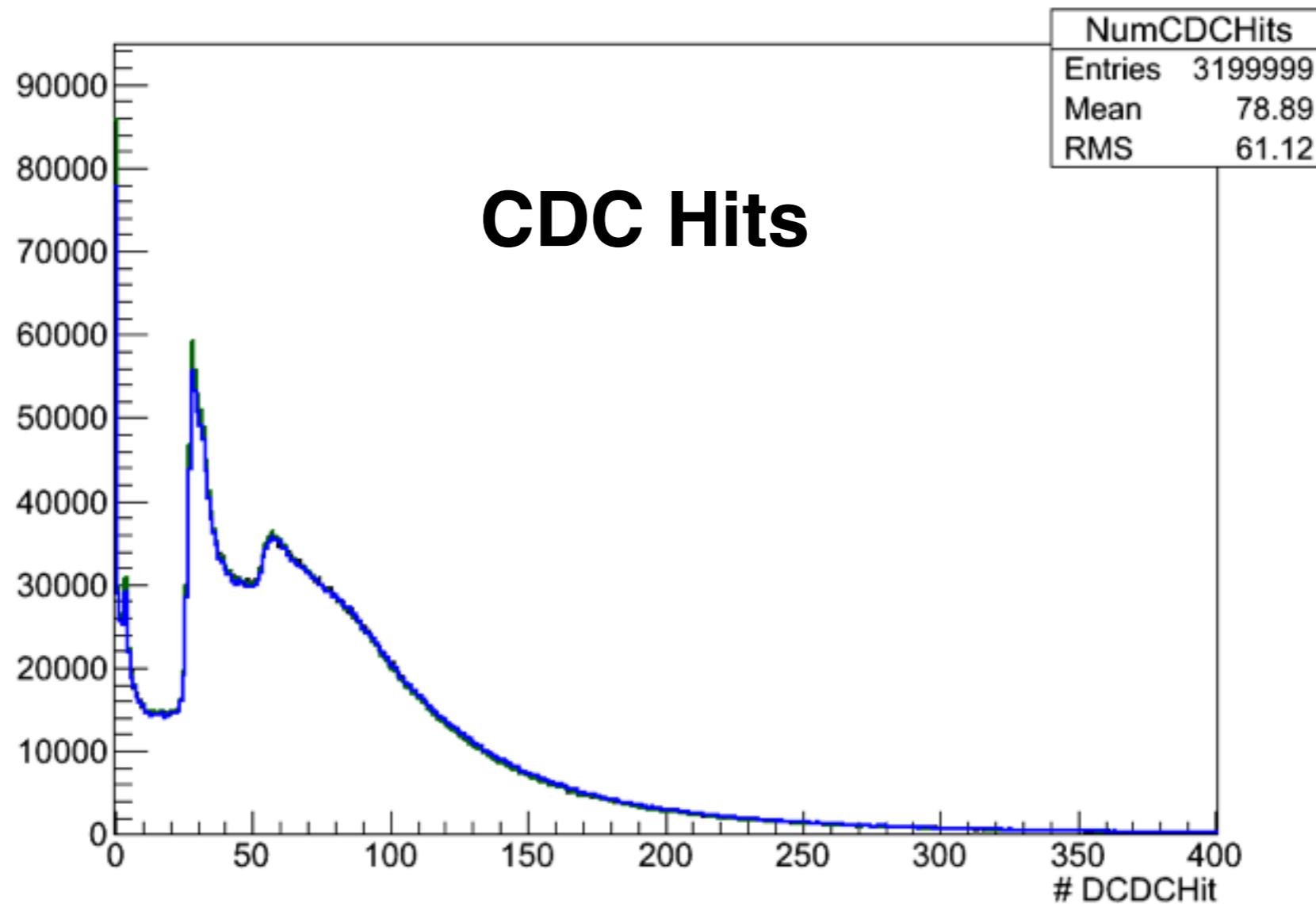


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

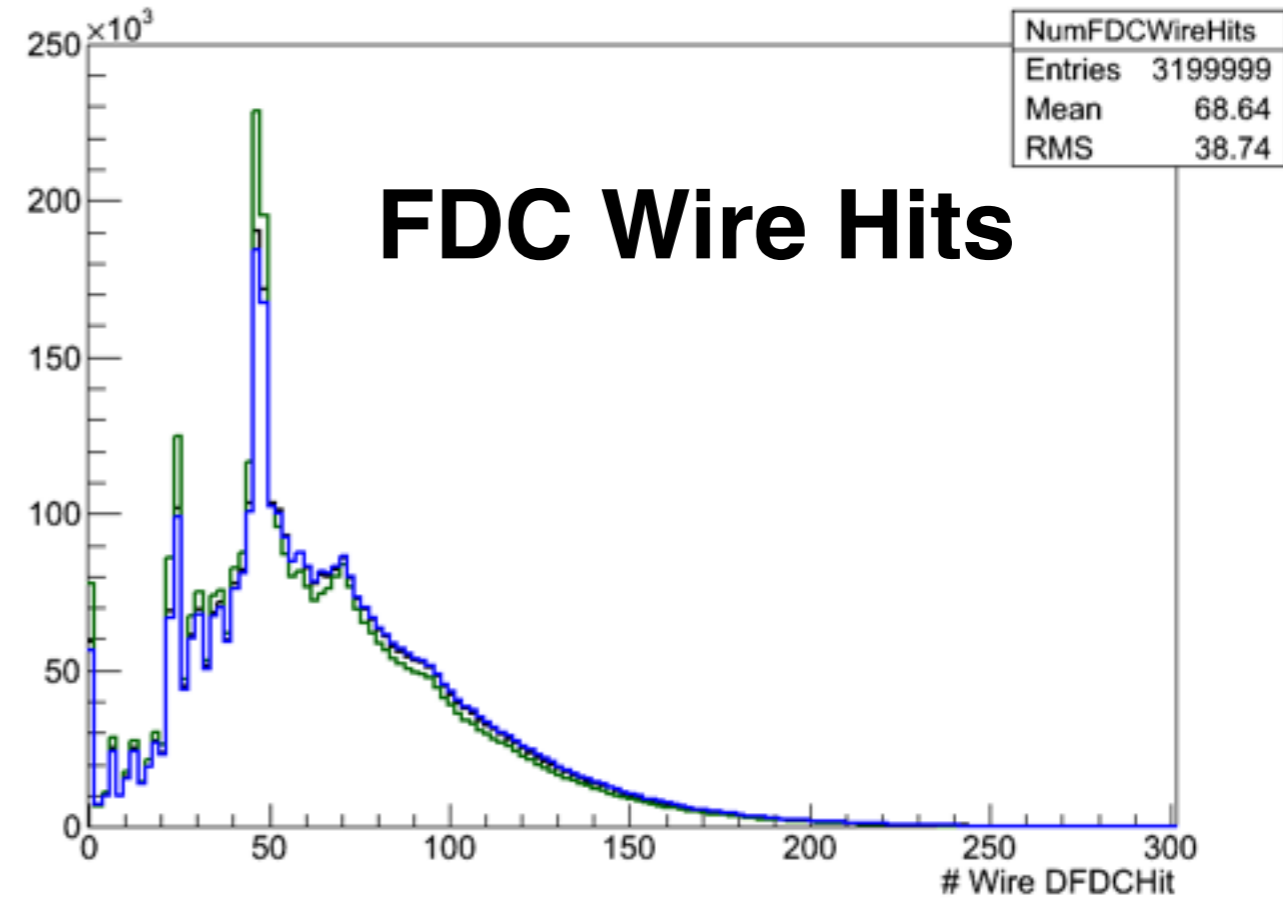
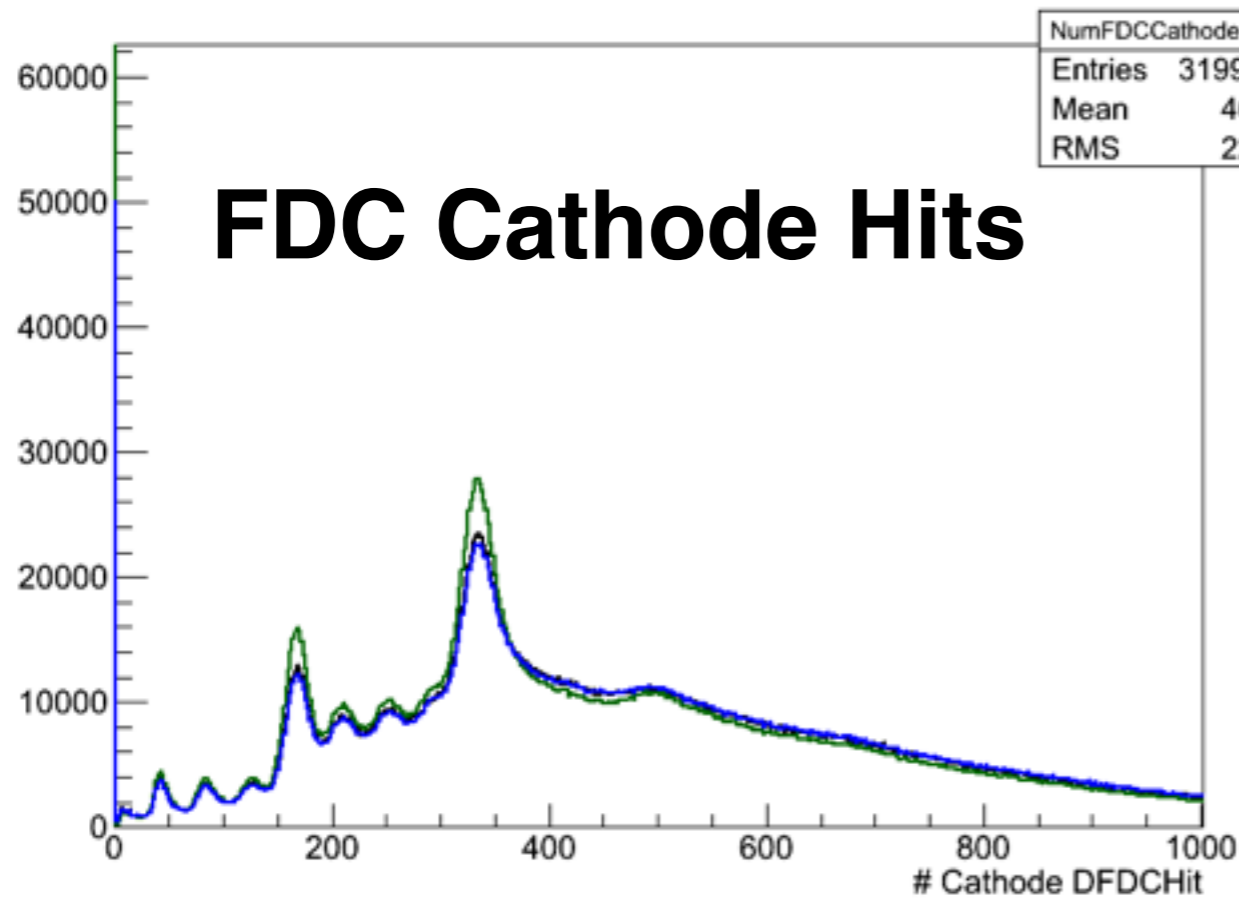


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

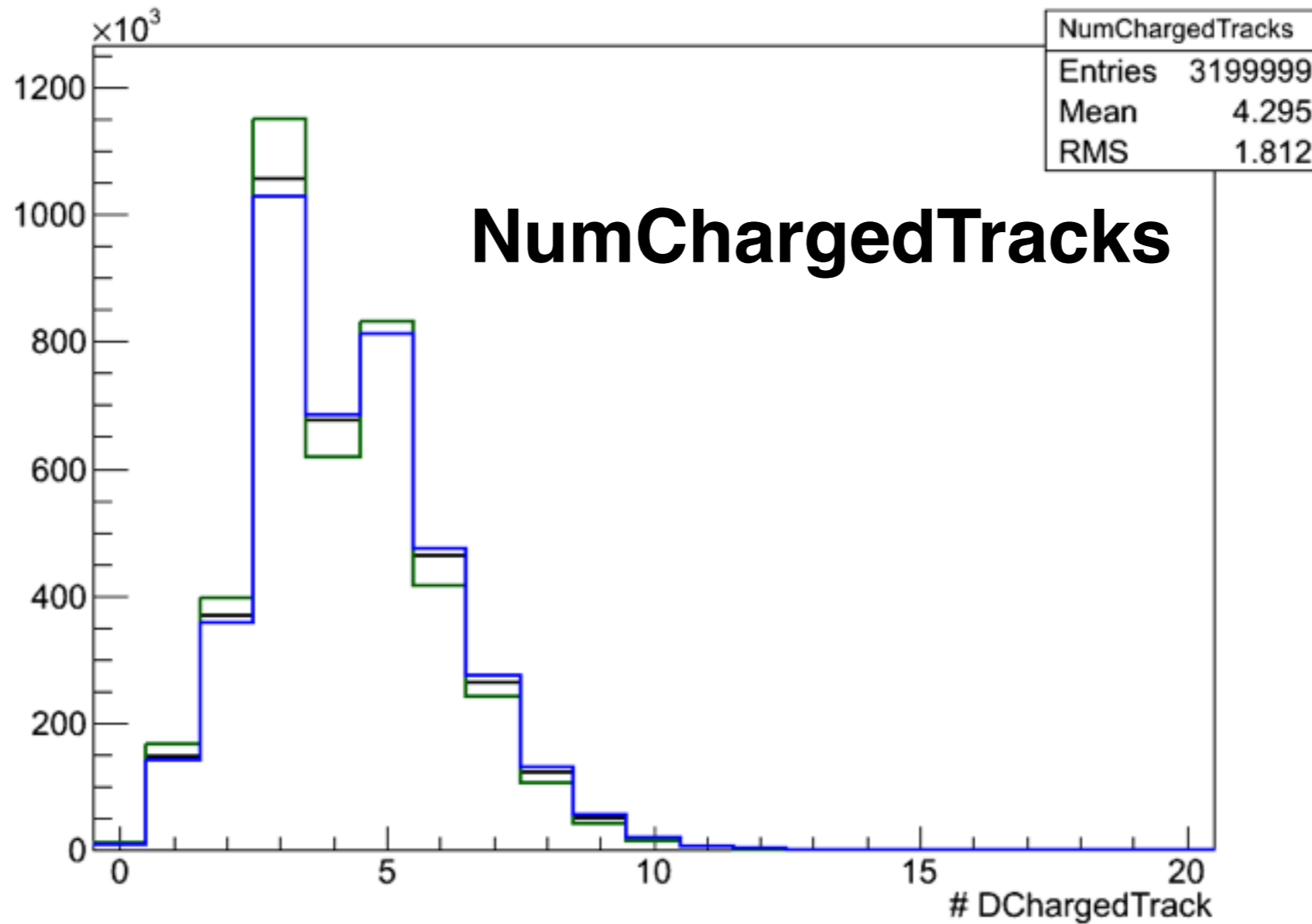


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

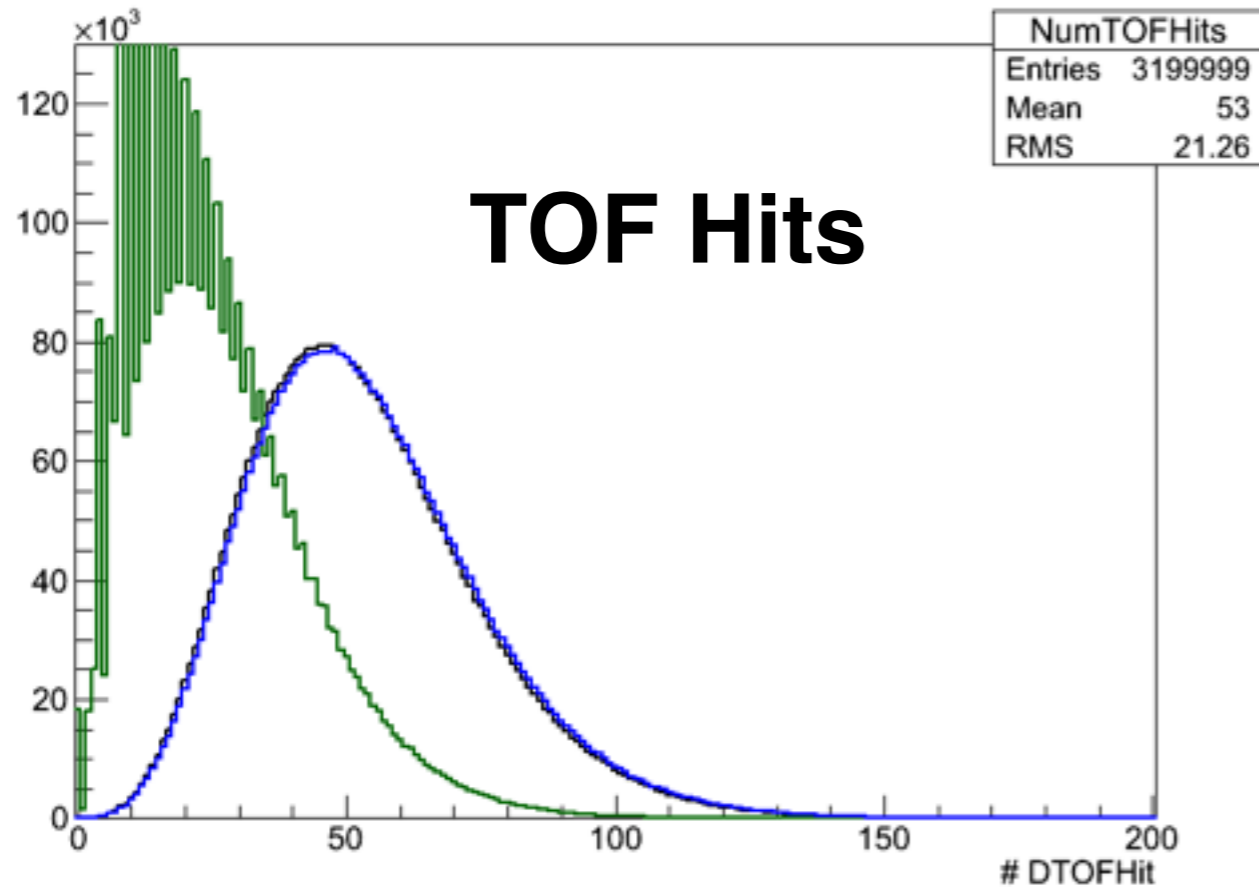


Normal EM bkgd.

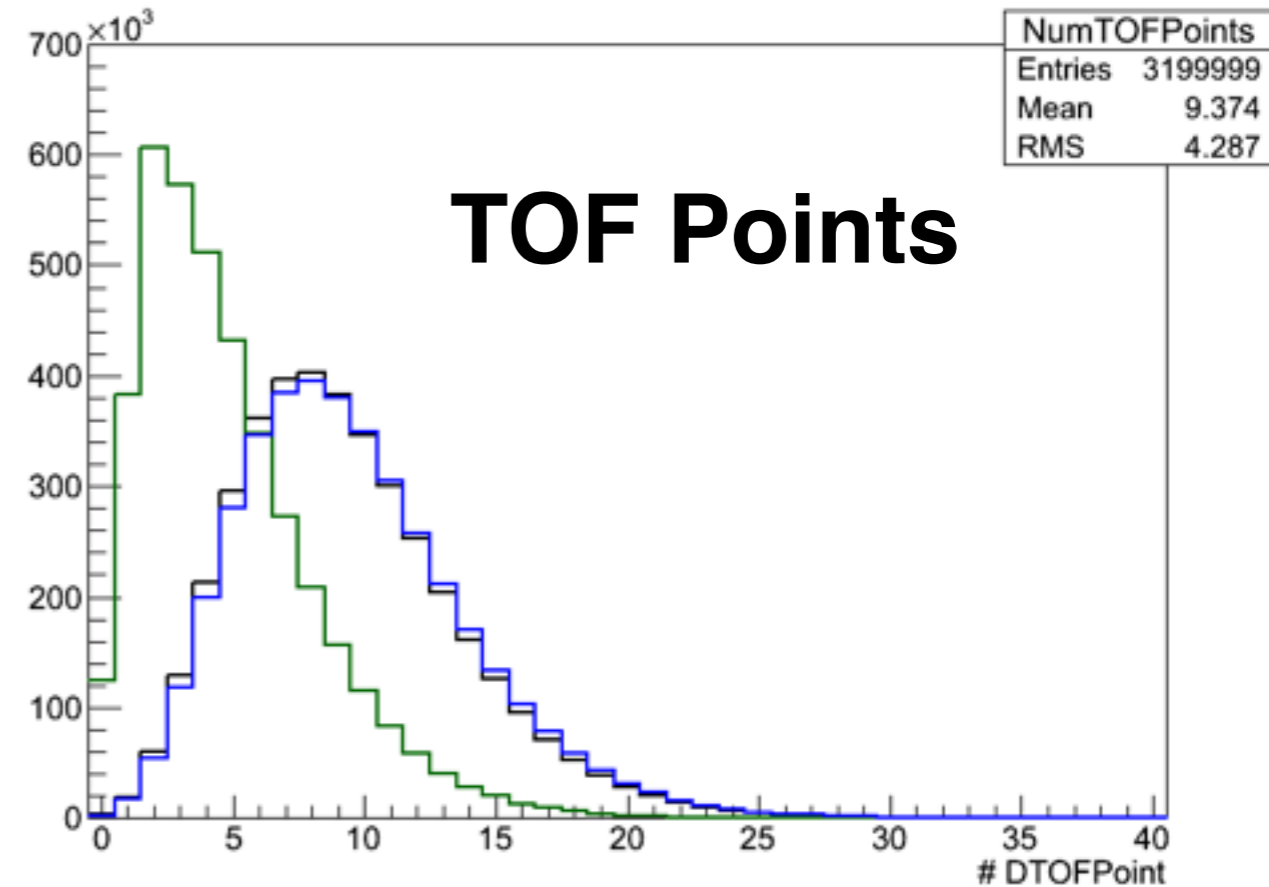
Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects



TOF Hits



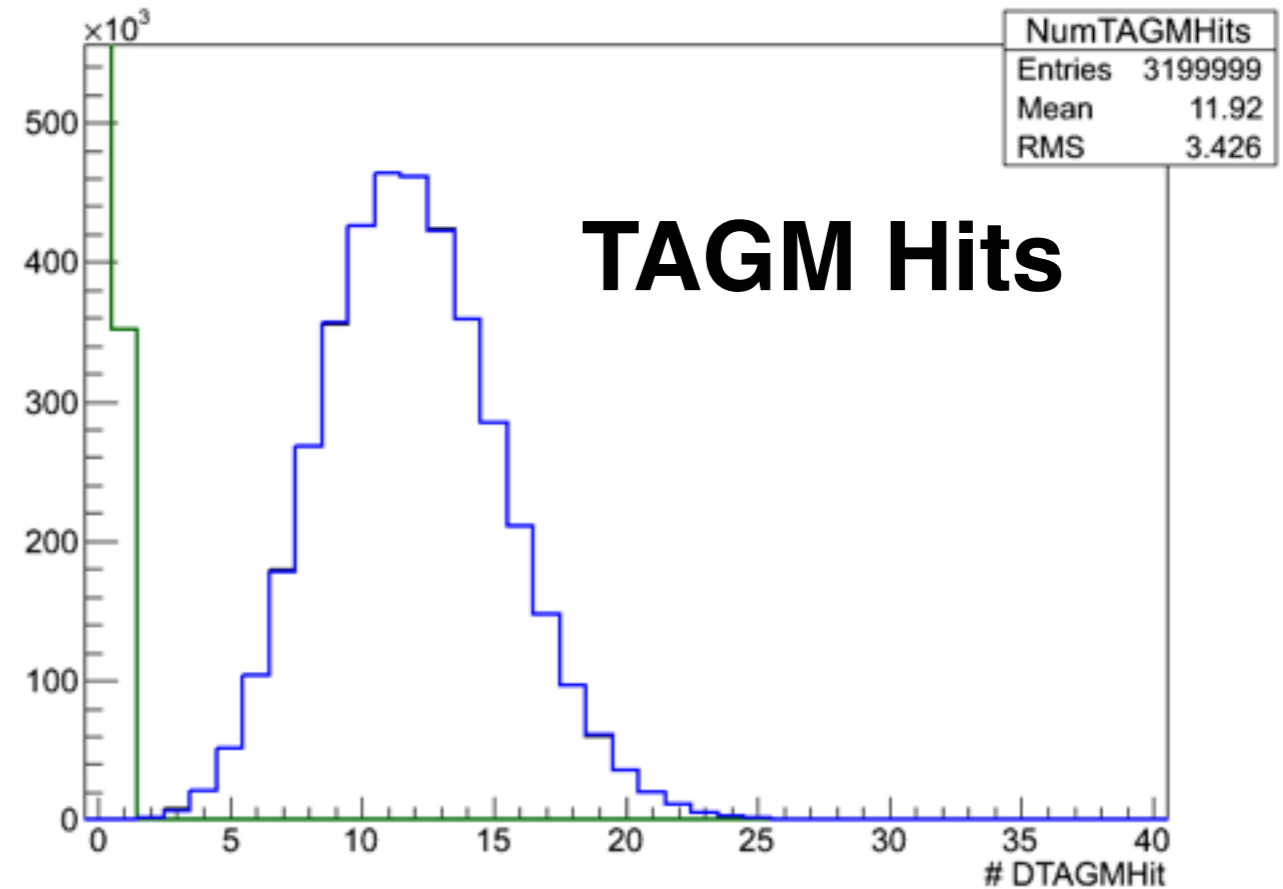
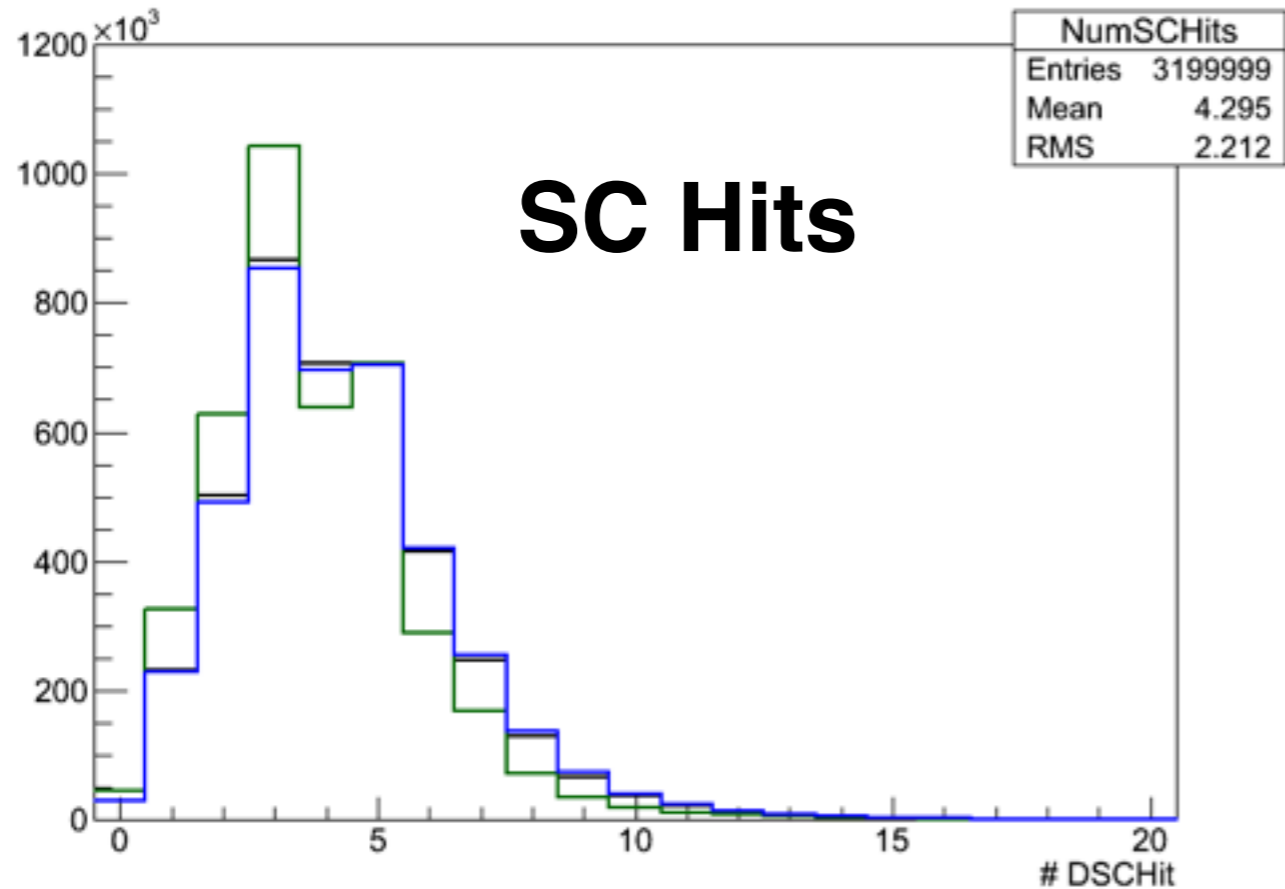
TOF Points

Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

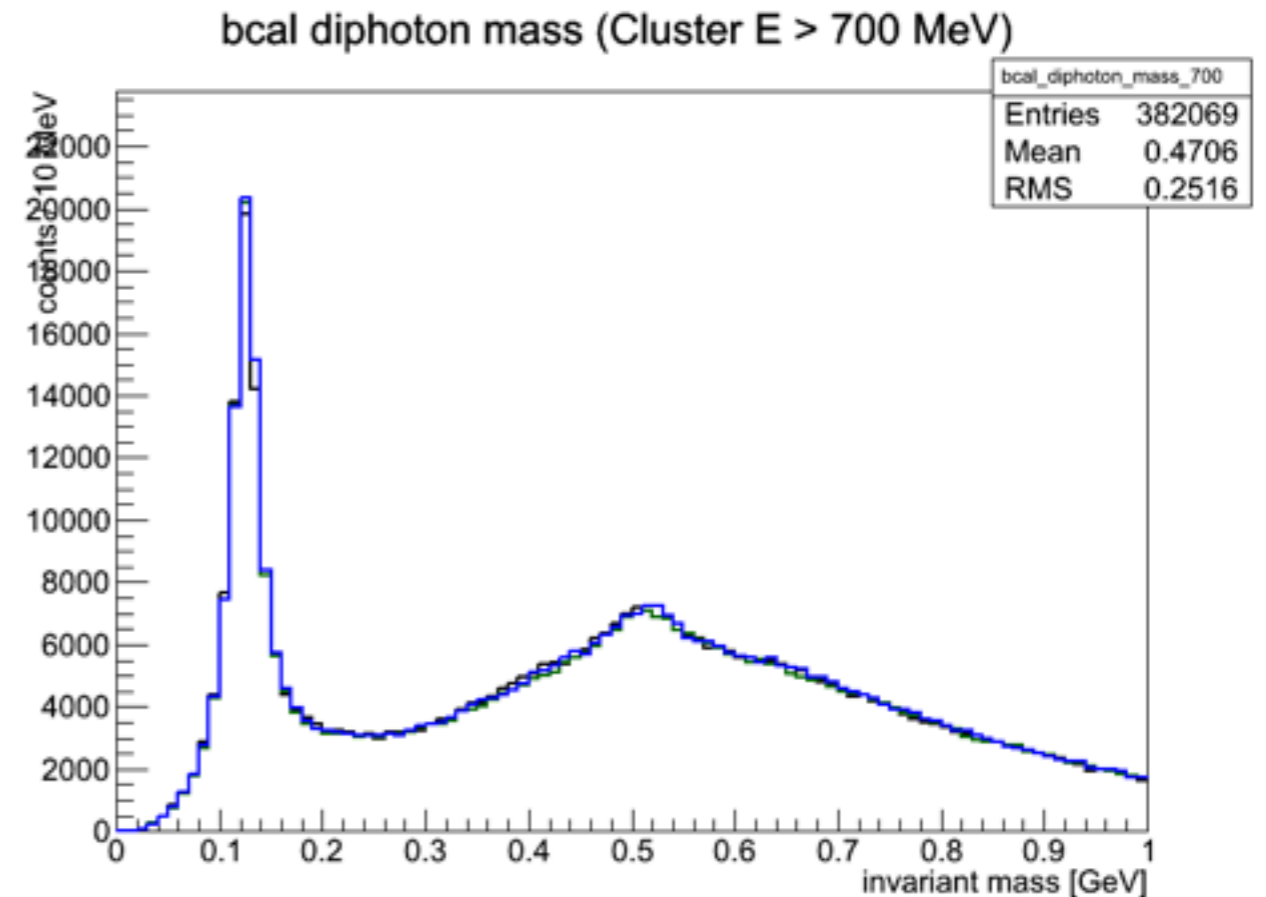
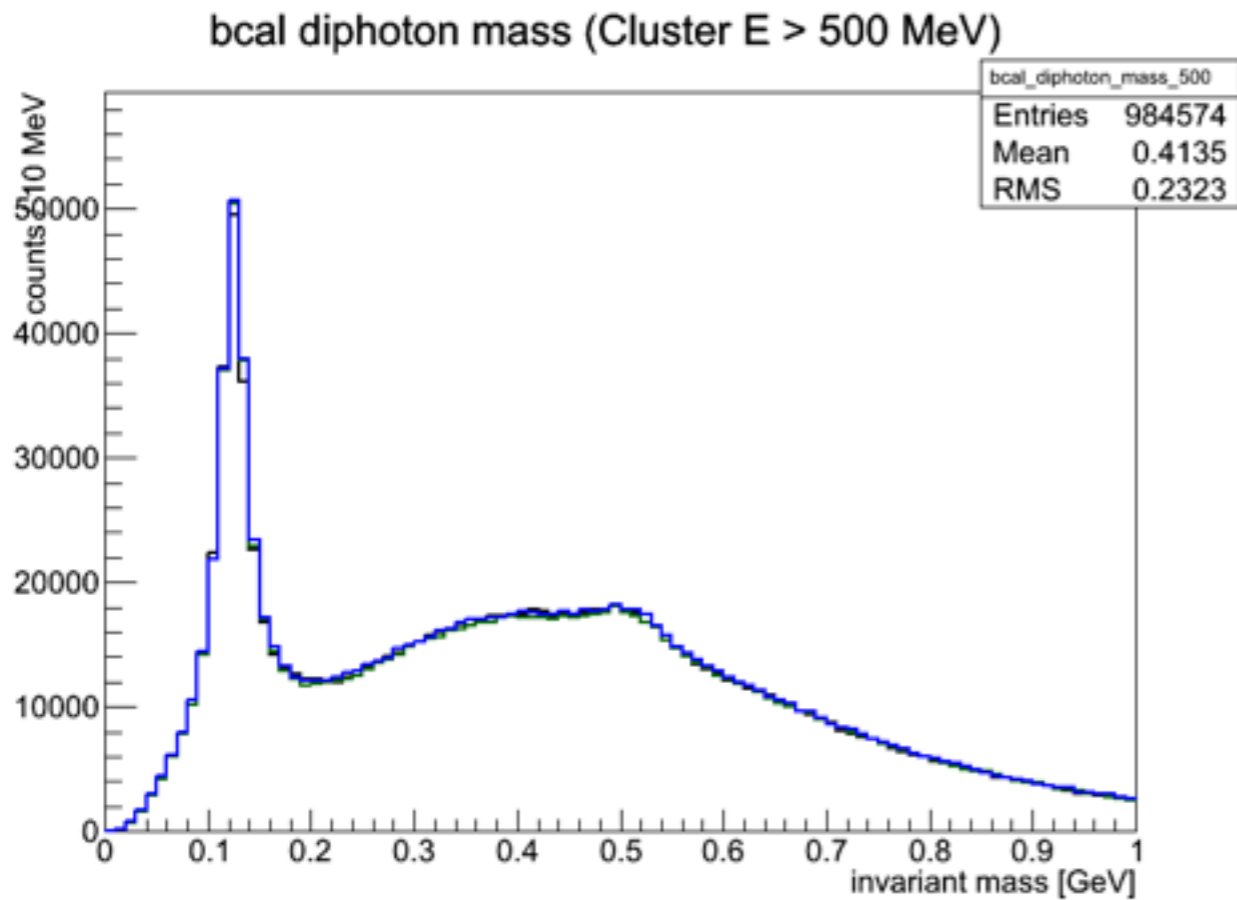


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

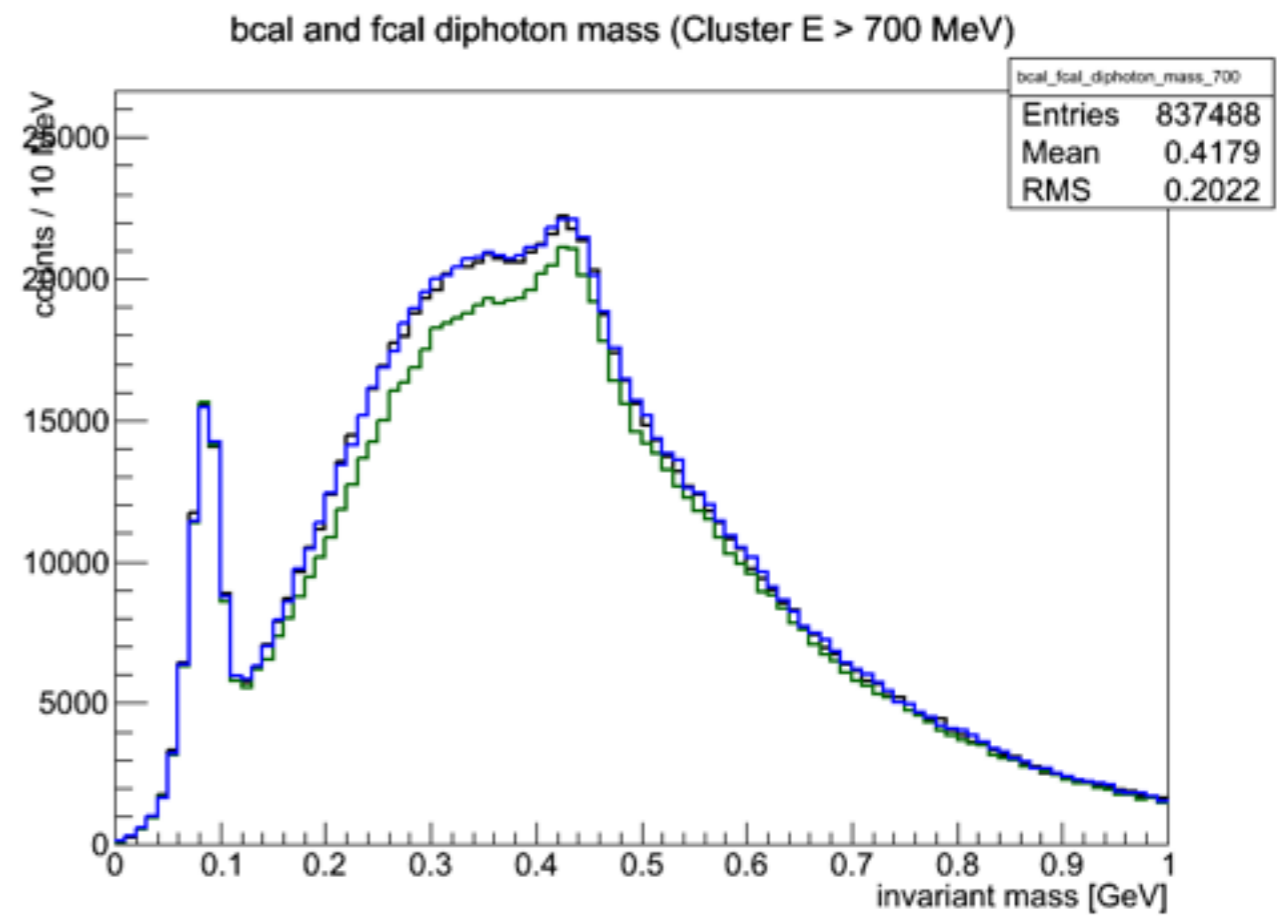
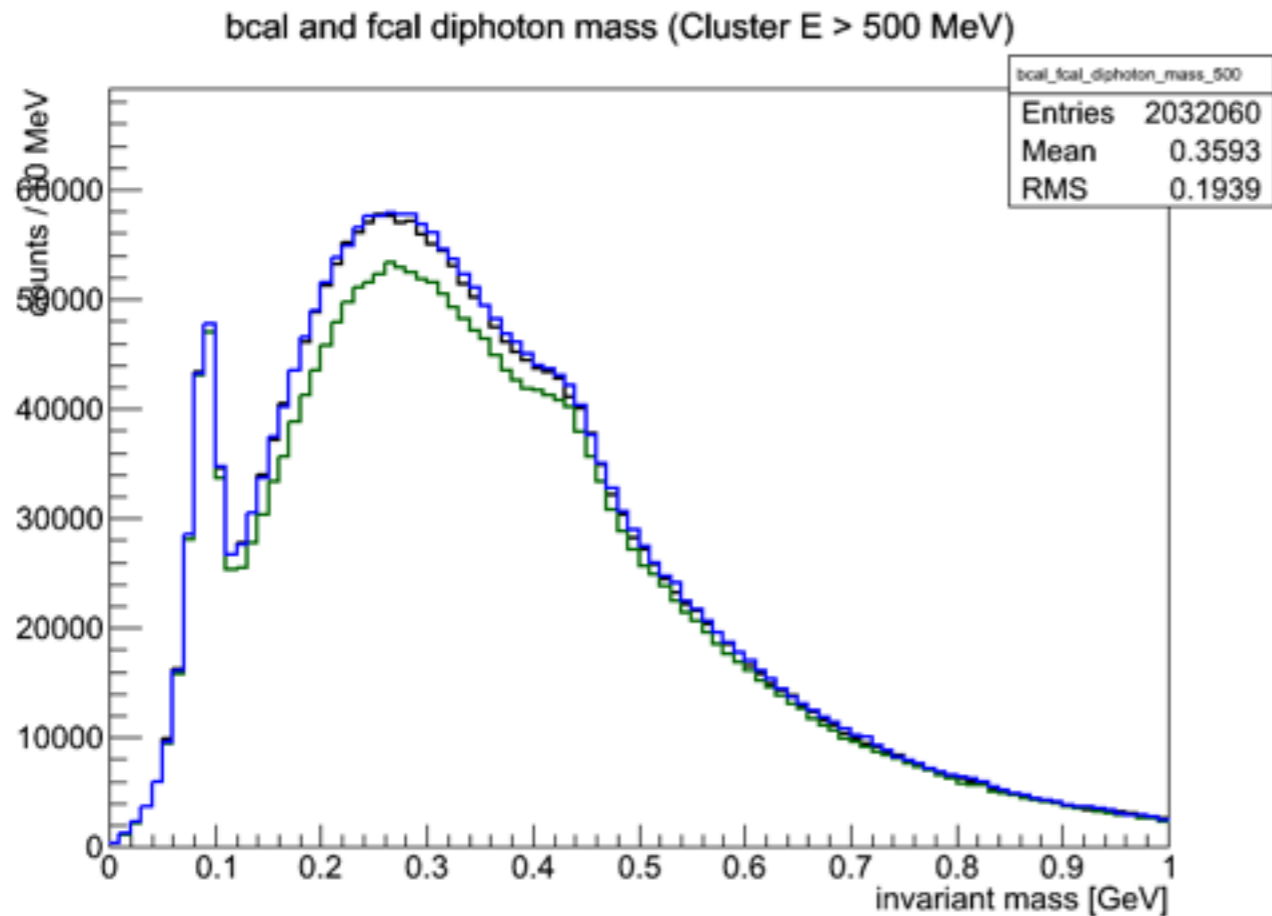


Normal EM bkgd.

Mixed EM bkgd.

No EM bkgd.

Reconstructed Objects

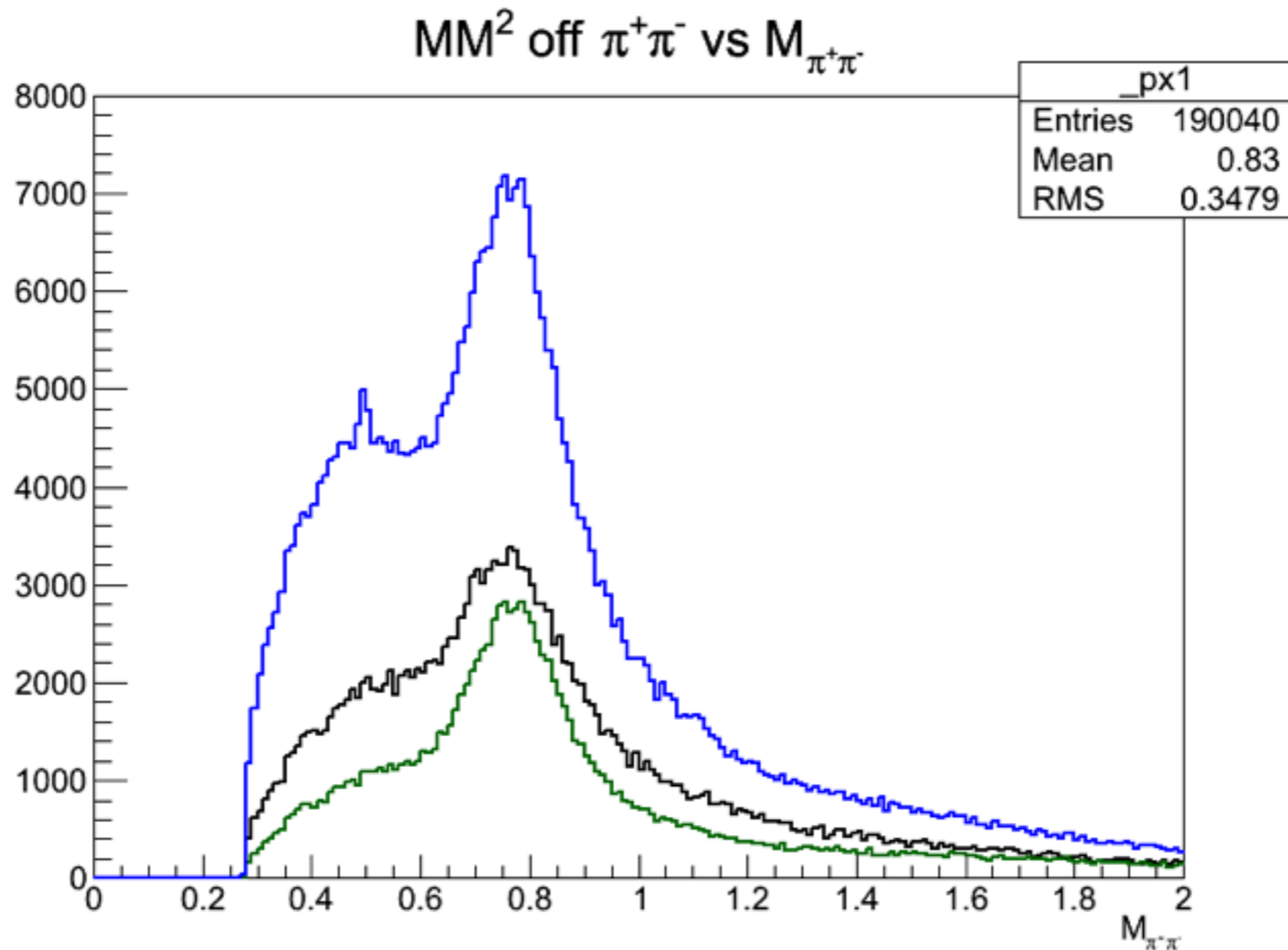


Normal EM bkgd.

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?