Diphoton Event Selection

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11 April 2022

Detector Background/Pileup

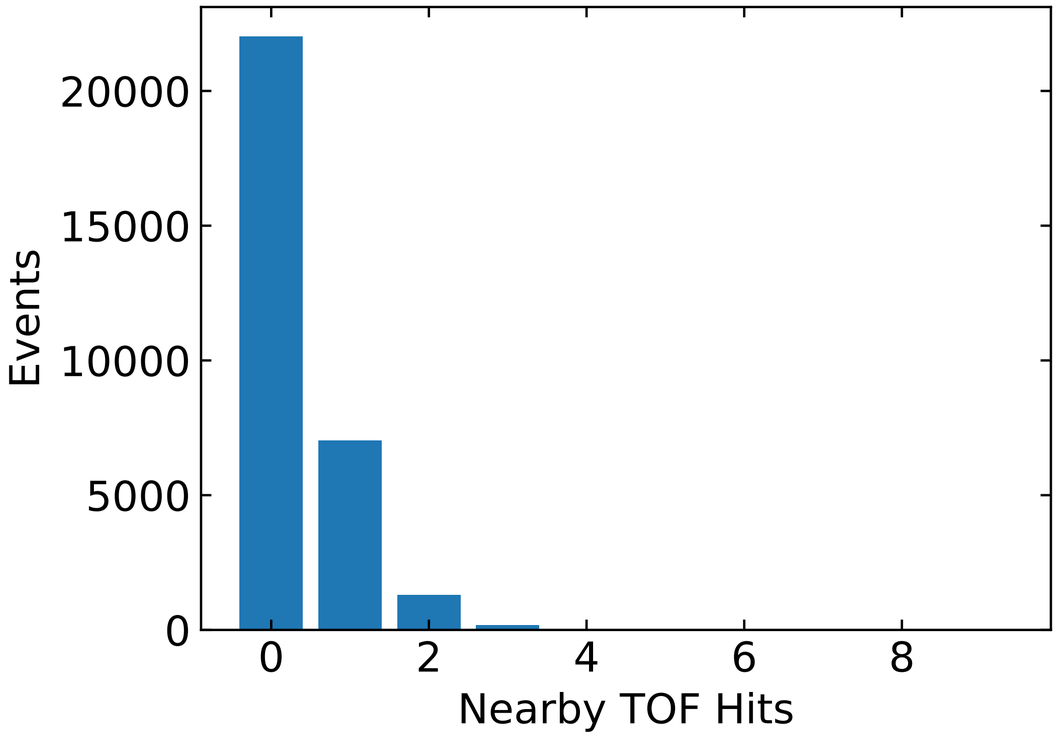
- Random coincidence events from other interactions can impact detector information collected for an event
- Random trigger of 100 Hz runs included in all runs to measure the rate of events that can impact signal event measurements
- These random events can be mixed into simulated signal to help determine event selection criteria
- Data from Run 90271 compared with simulation using run conditions + accidentals from Run 90271

Plugin Event Selection

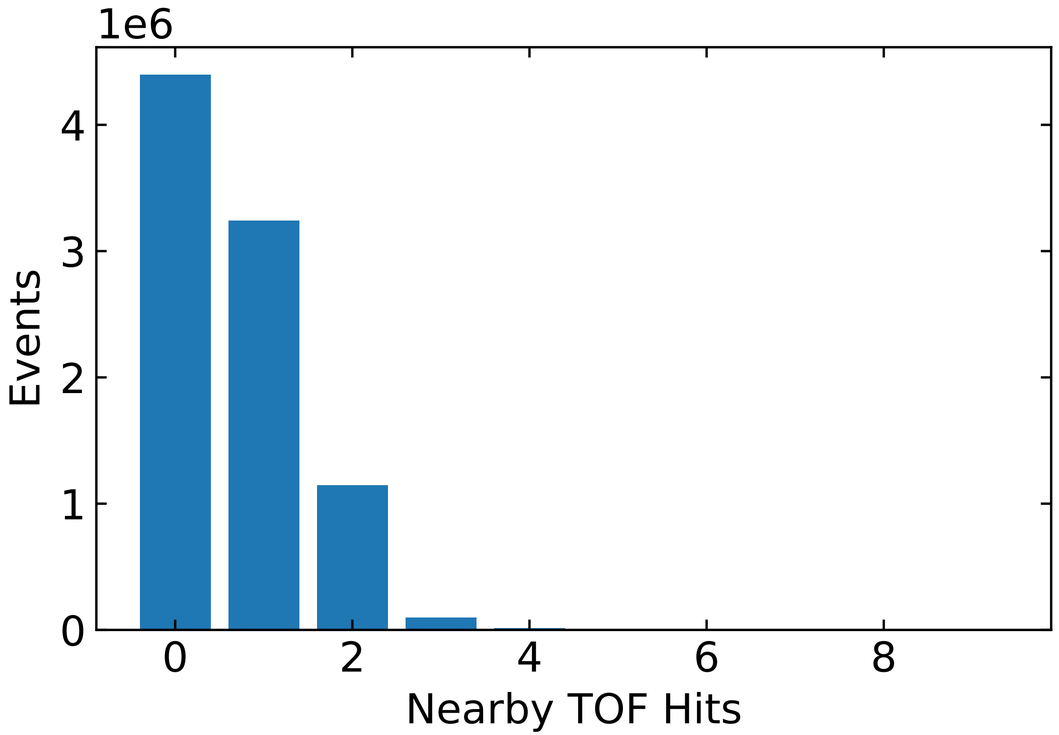
- Exactly 2 showers satisfying:
  - Propagated time within 3 ns of RF time
  - > 0.5 GeV energy
  - Not in layer 1 of the FCAL
- Beam photons included if within 22 ns of RF Time
- All other detector timing information included

TOF Hits within 6×6 cm^2 of showers

Event-Mixed Simulation

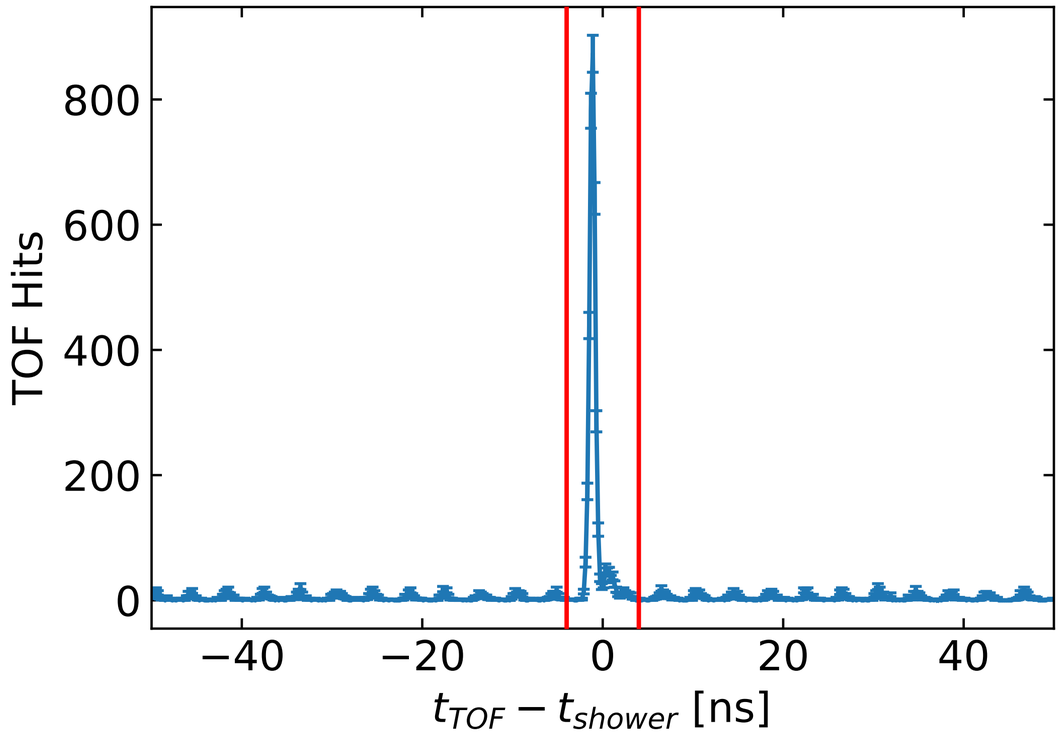


Data

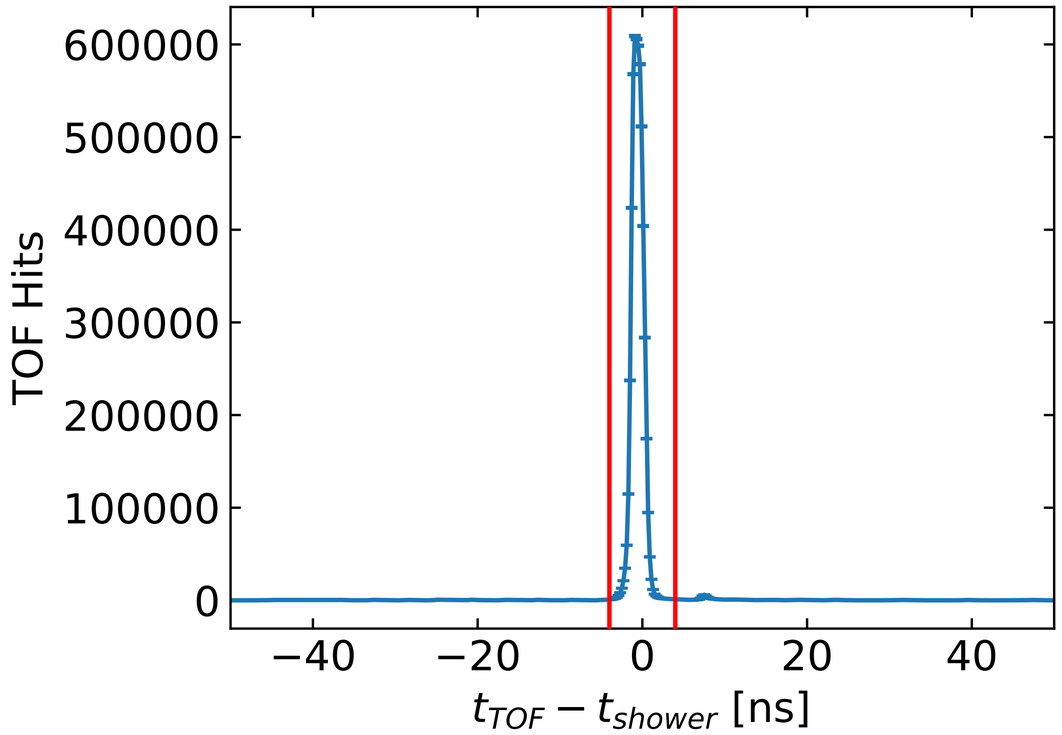


TOF veto on nearby hits with $-4 < \Delta t < 4$ ns

Event-Mixed Simulation

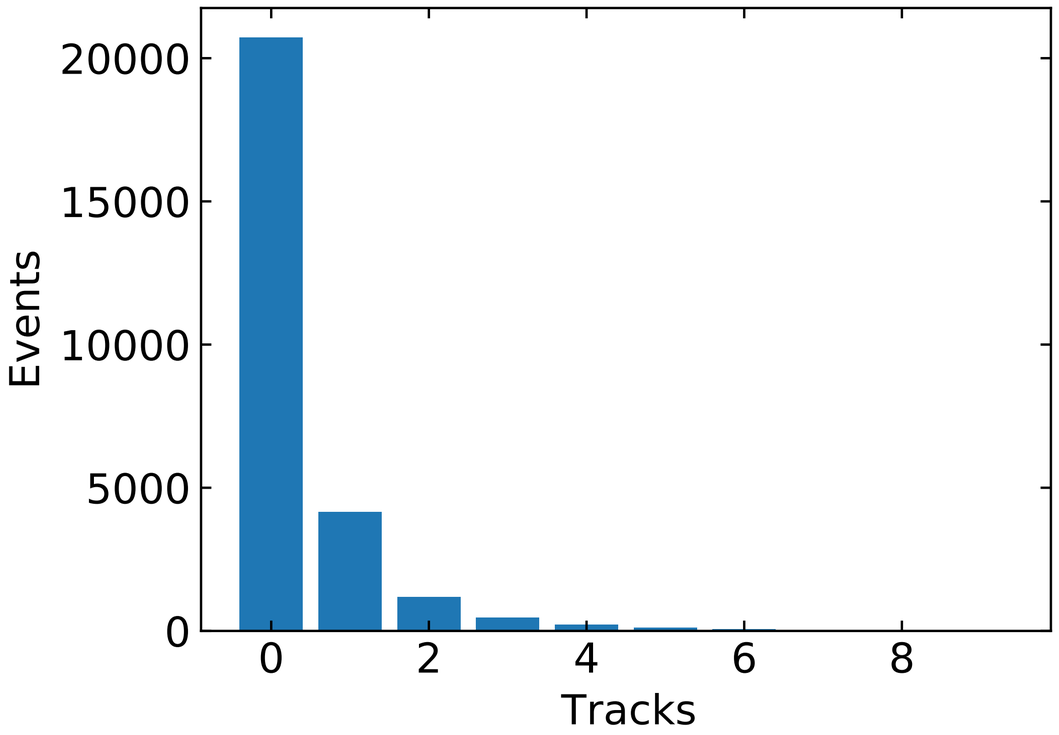


Data

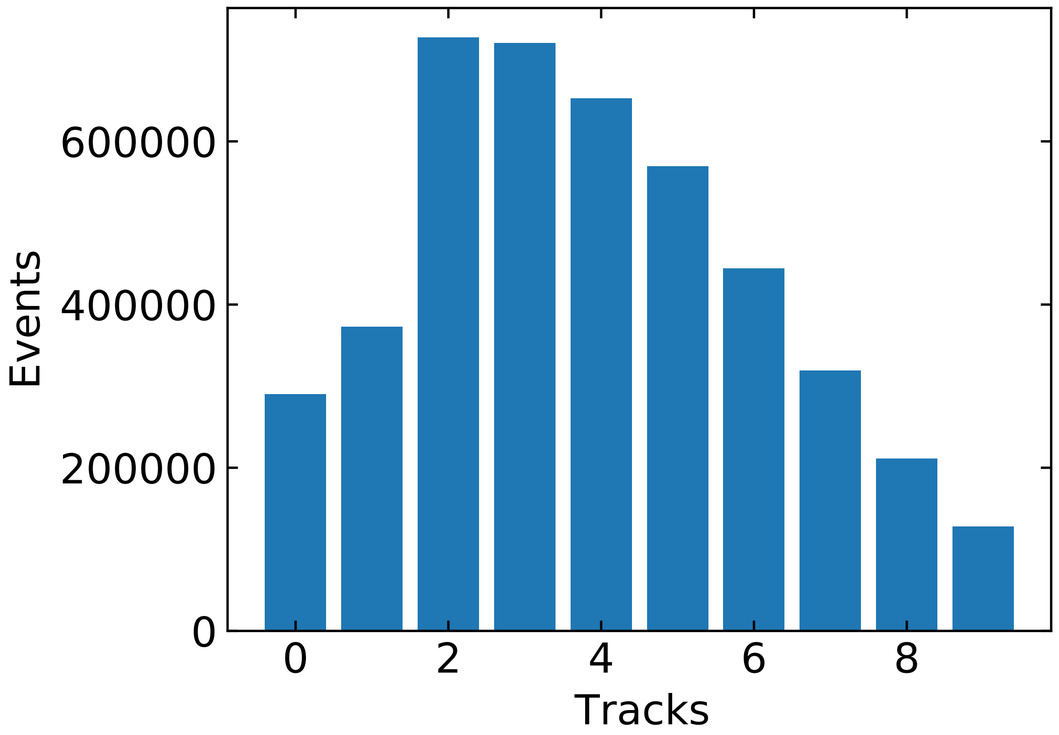


Tracks per event (after TOF veto)

Event-Mixed Simulation

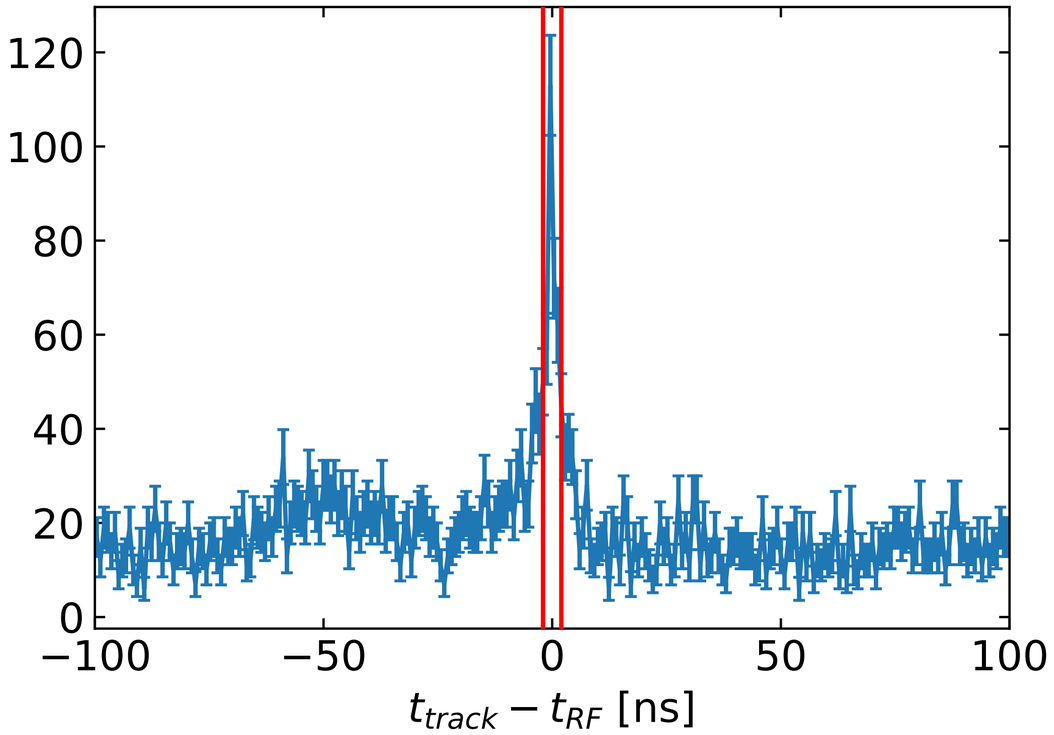


Data

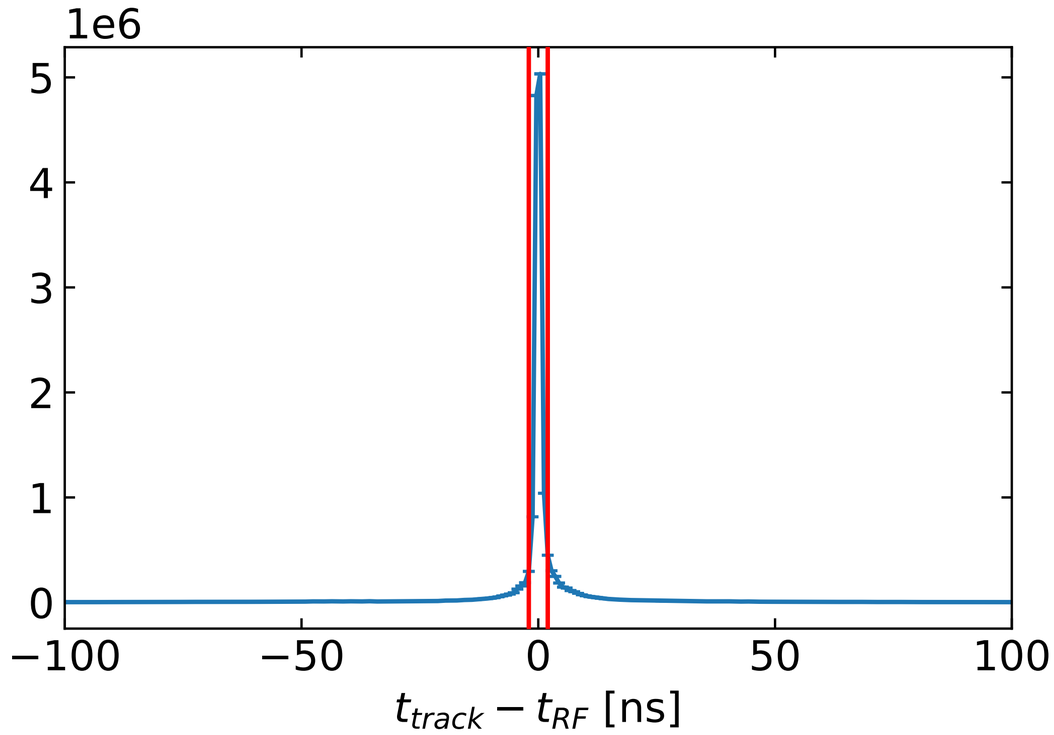


Track veto on $-2 < \Delta t < 2$ ns

Event-Mixed Simulation

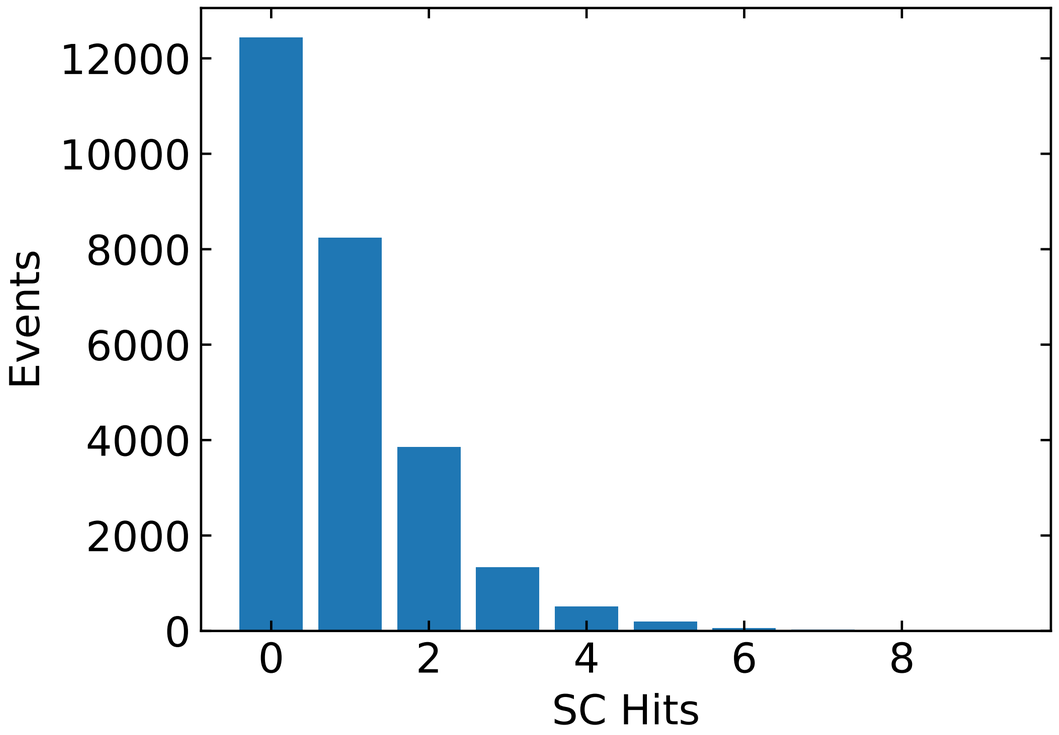


Data

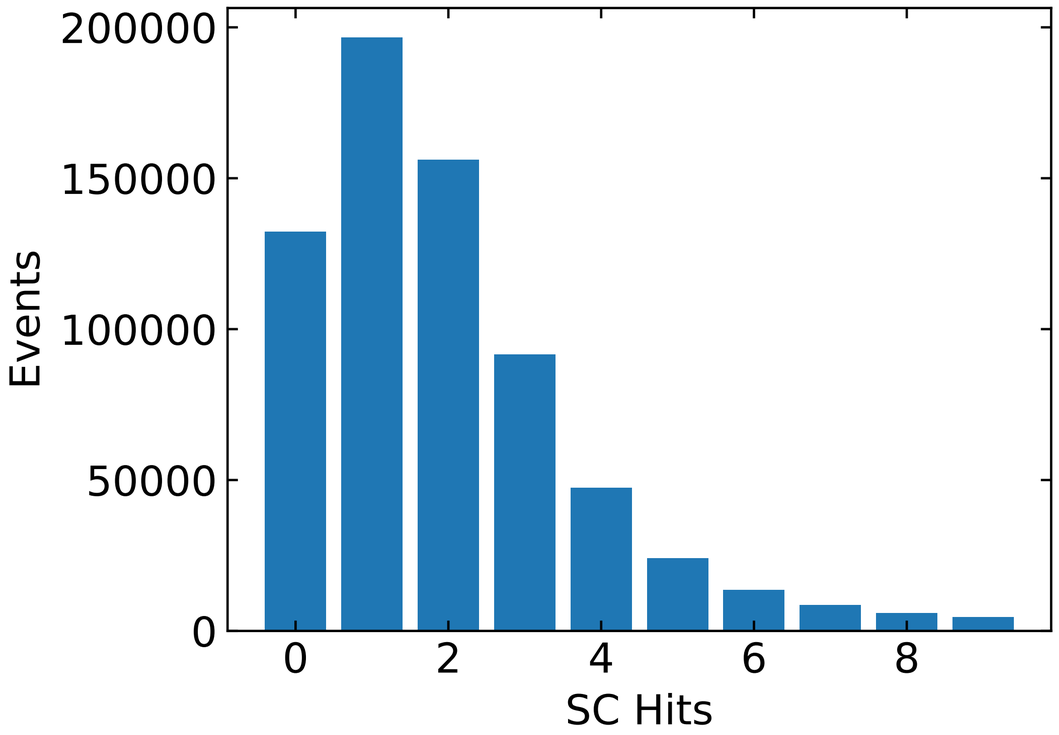


SC hits per event (after track veto)

Event-Mixed Simulation

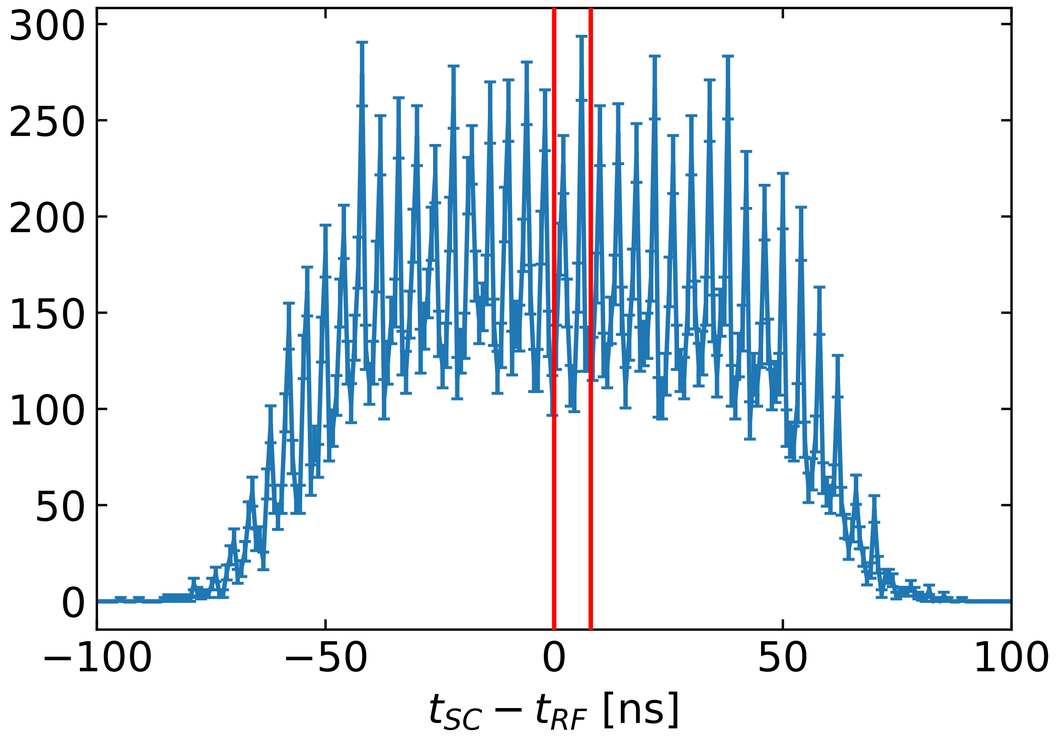


Data

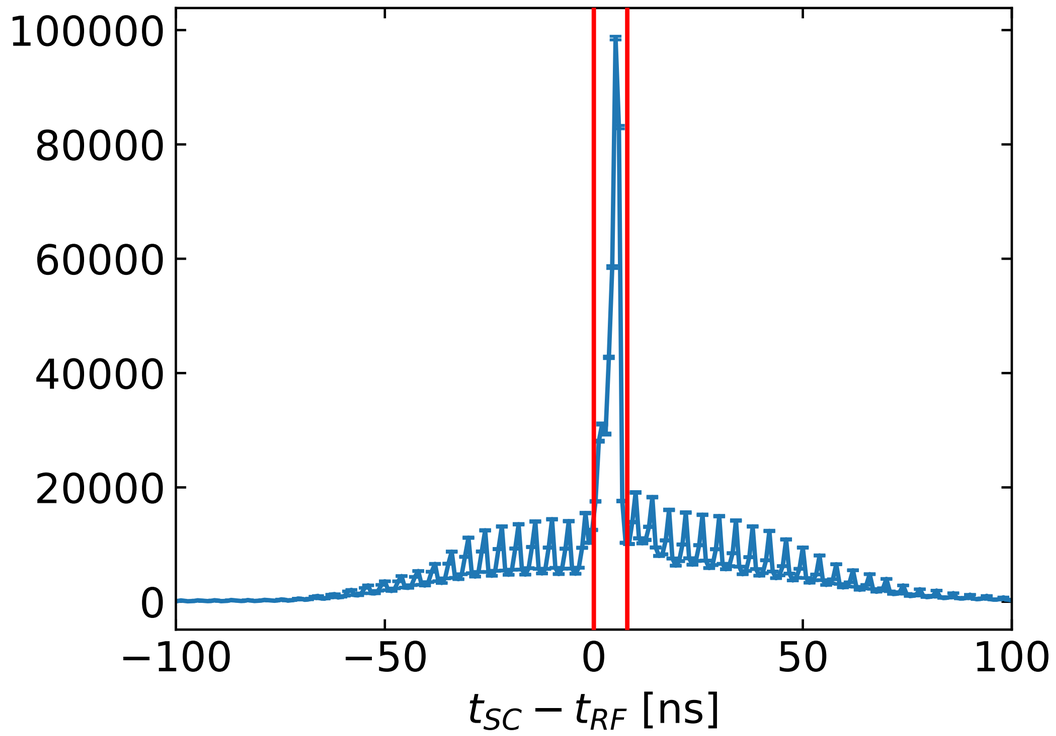


SC veto on $0 < \Delta t < 8$ ns

Event-Mixed Simulation

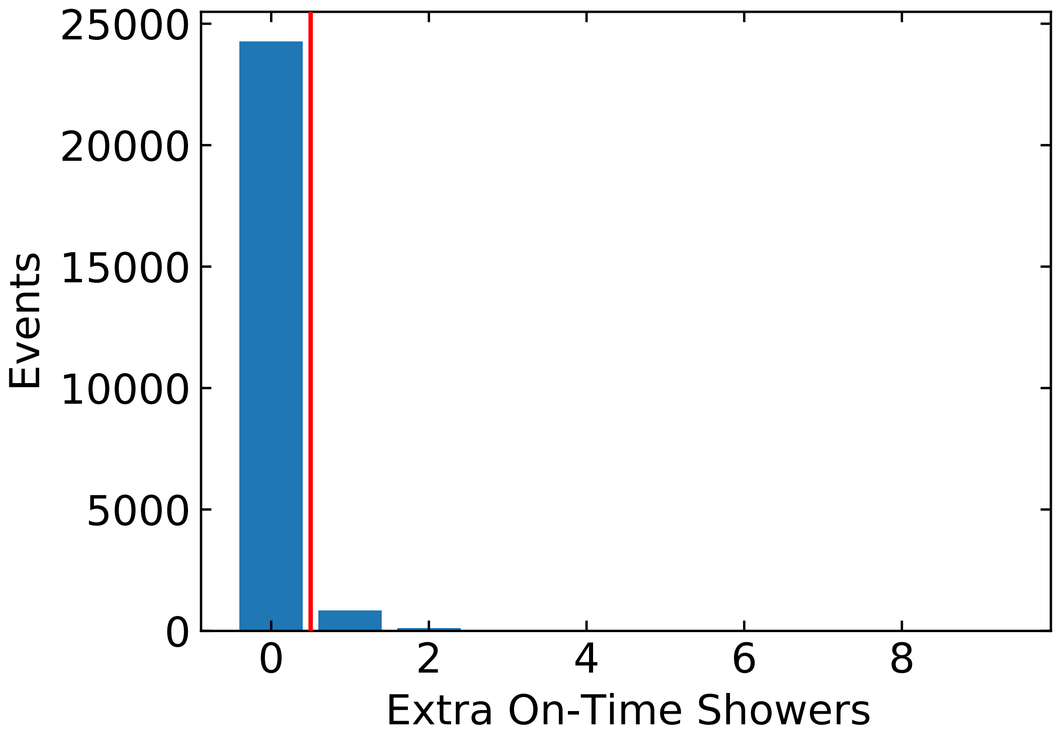


Data

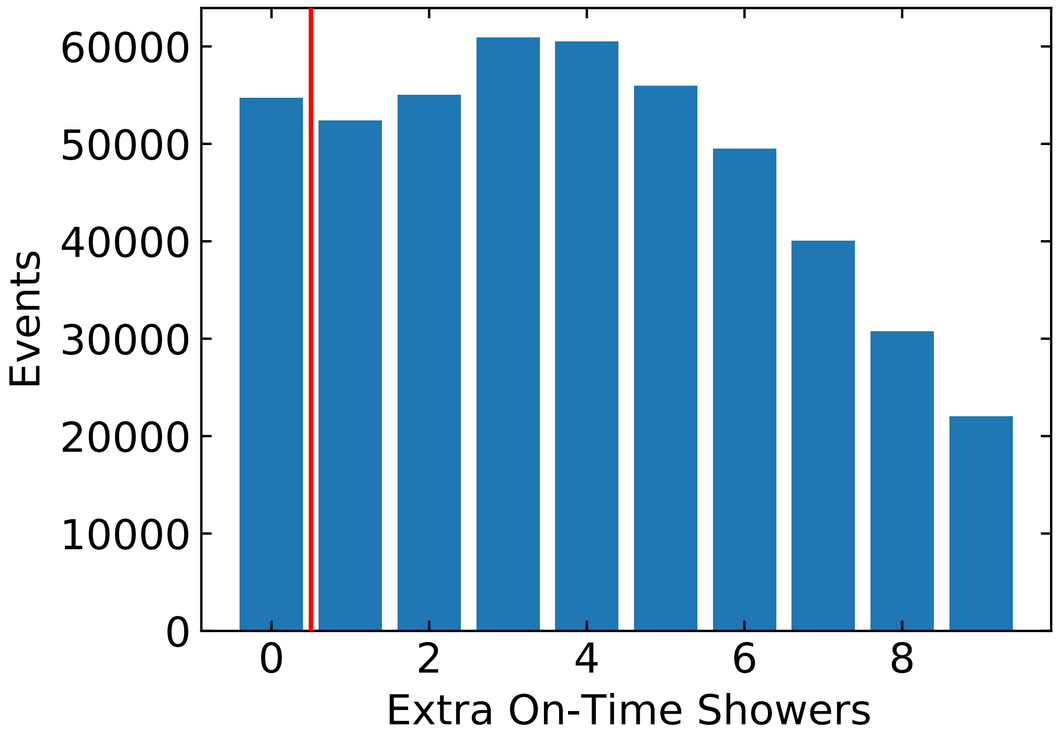


No additional showers allowed within 3 ns of t_{RF}

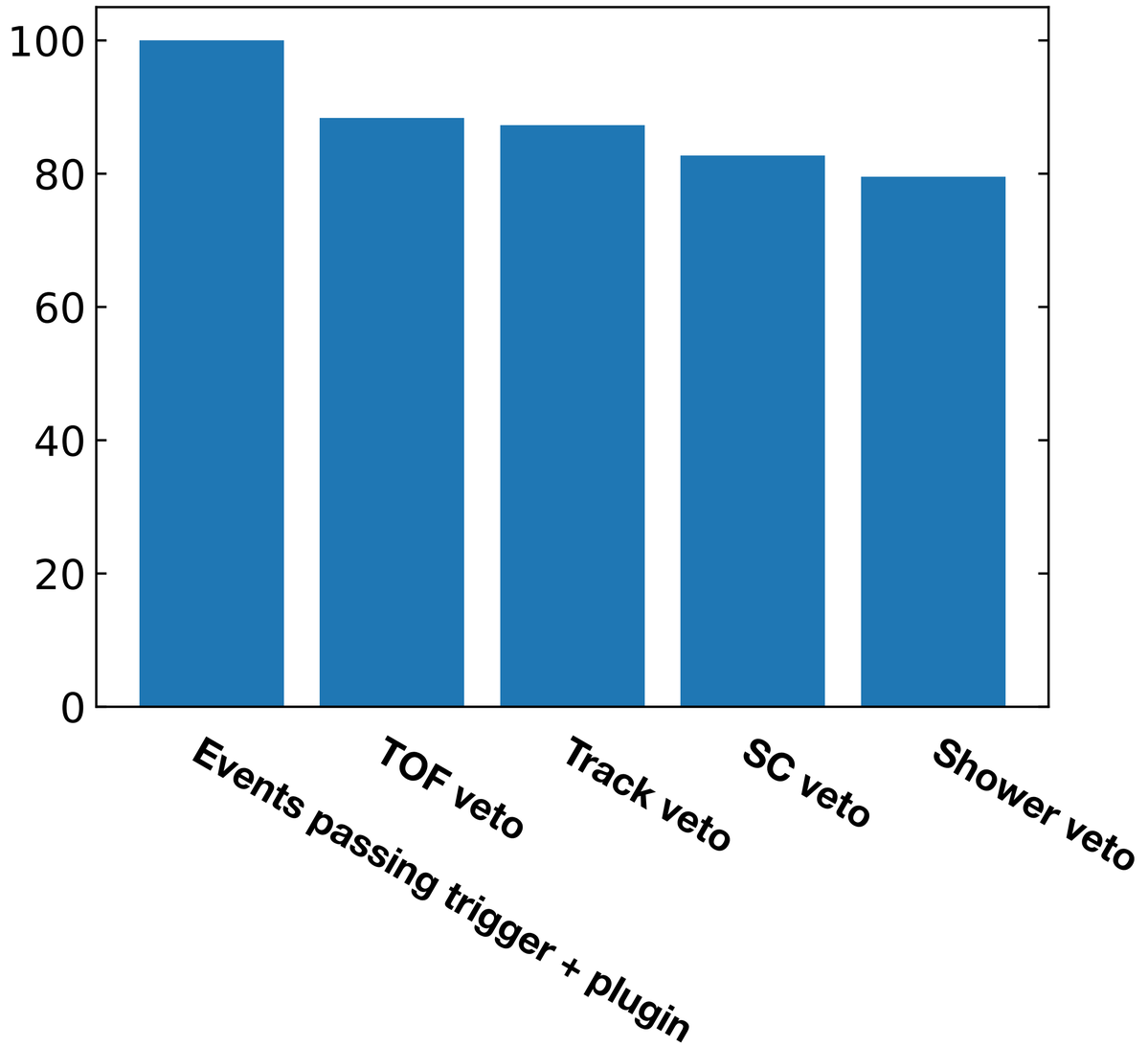
Event-Mixed Simulation



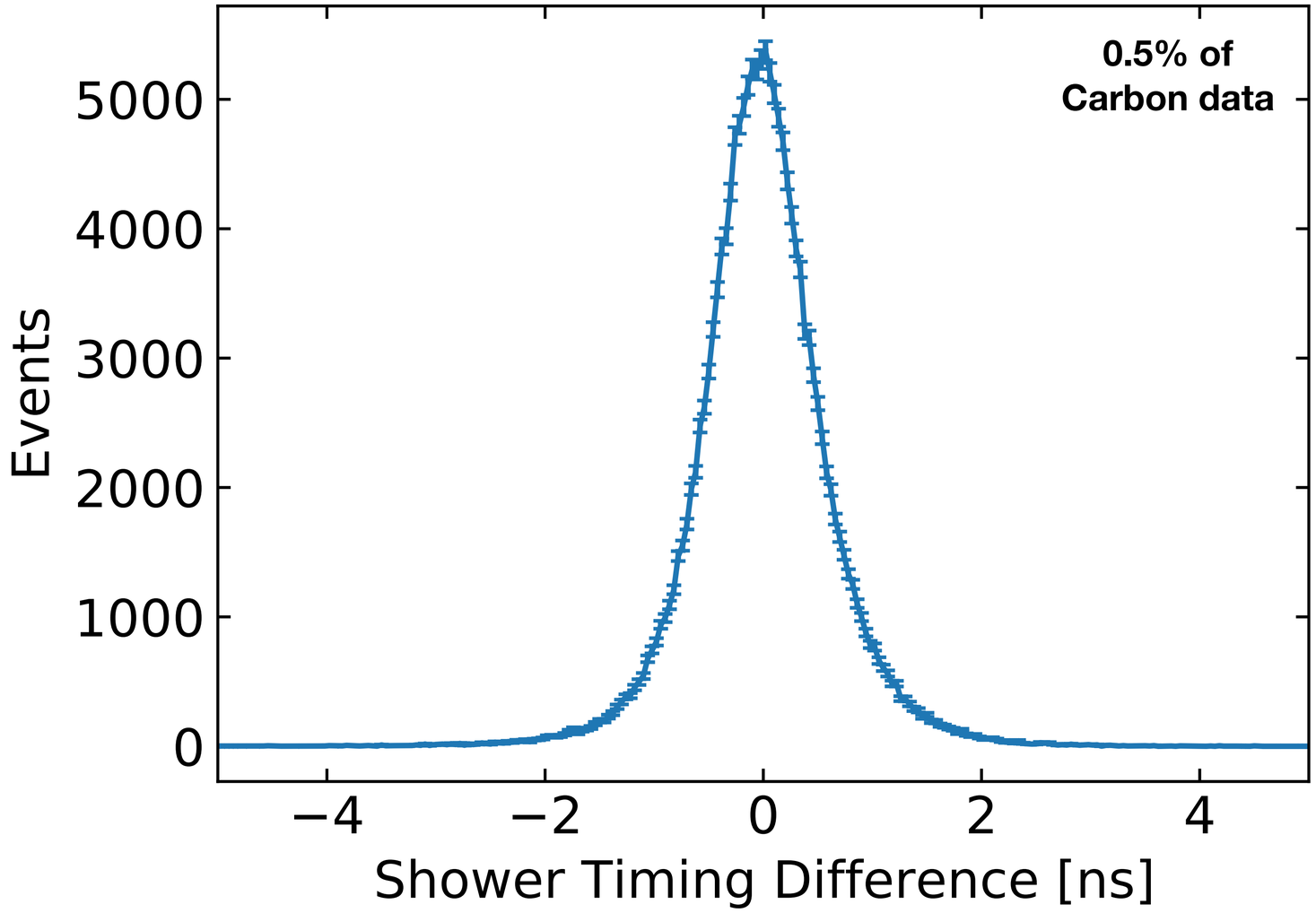
Data



Simulated cut efficiency

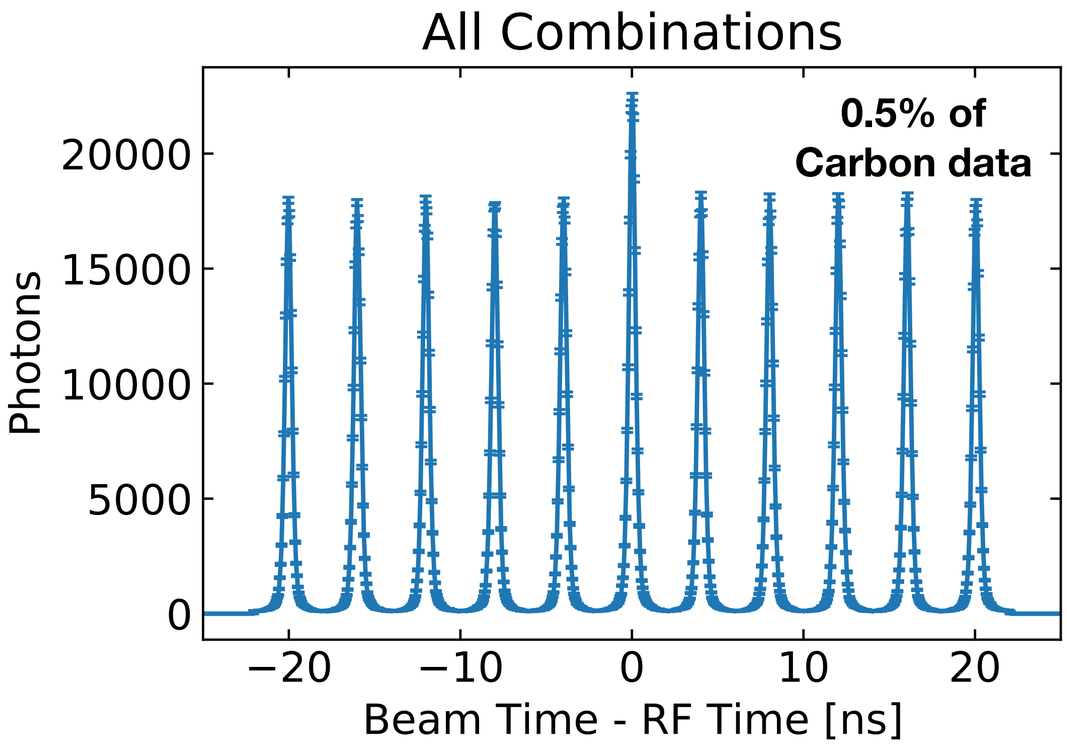


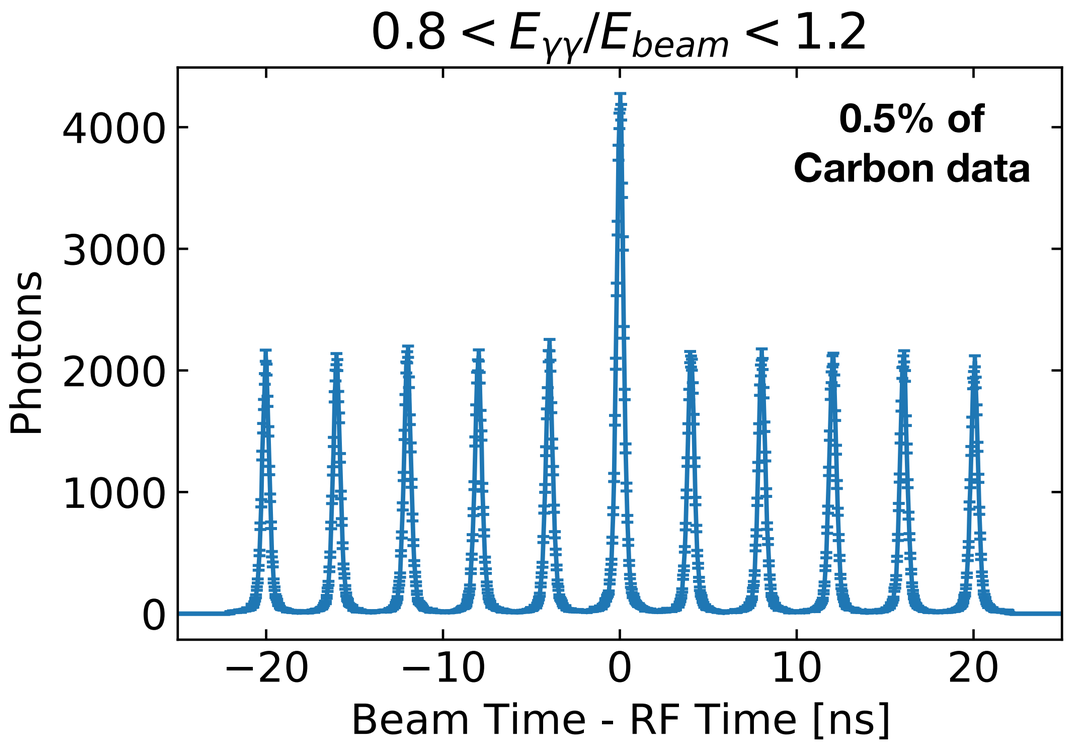
Shower Timing Difference



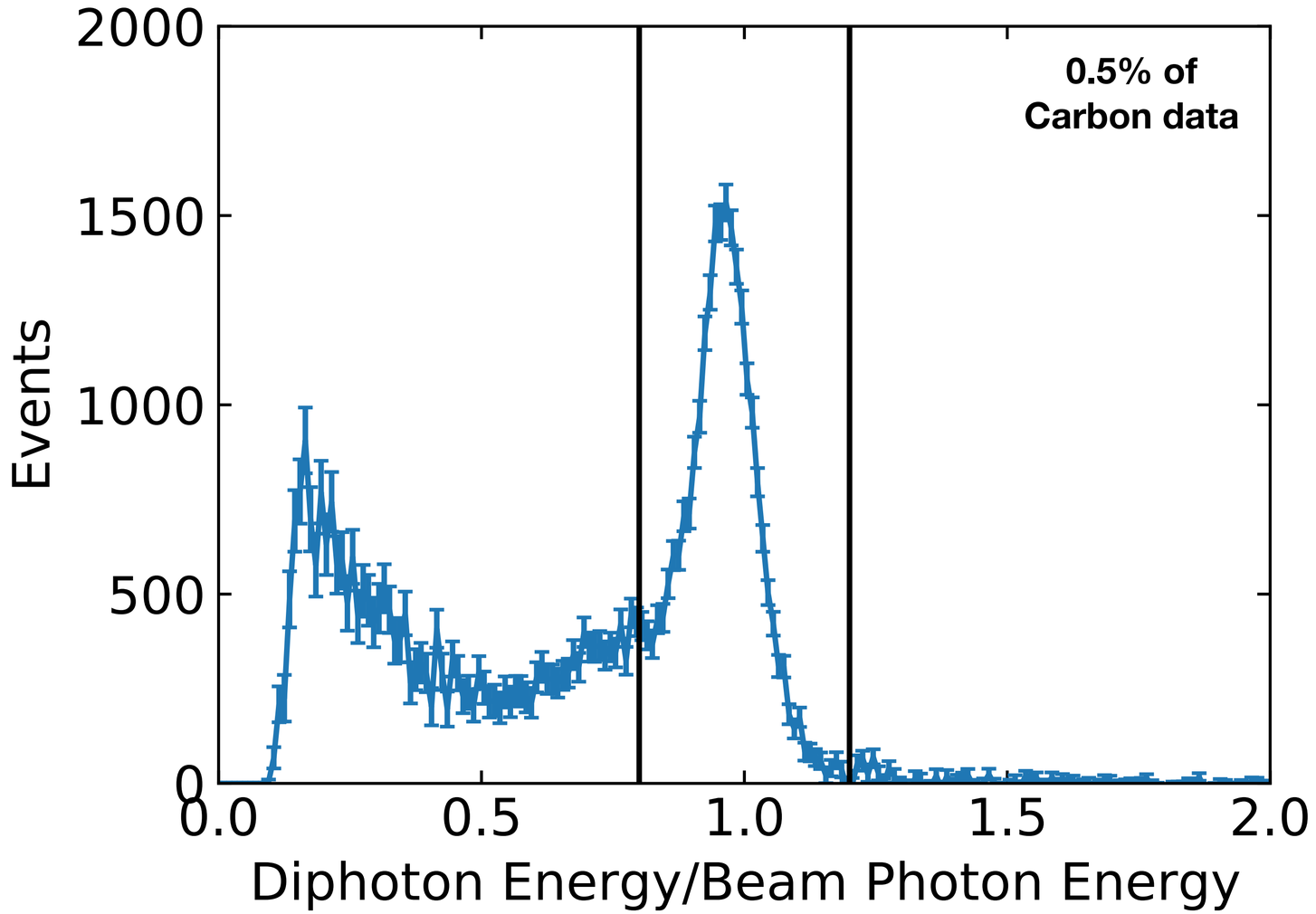
(Slight asymmetry between showers expected)

Beam photons subtracted using 8 side-bands





Elasticity


0.5% of
Carbon data
Events
2000
1500
1000
500
0
0.0
0.5
1.0
1.5
2.0
Diphoton Energy/Beam Photon Energy

Diphoton Mass Spectrum