Data/MC comparison of NearDet Beam Event Time Structure
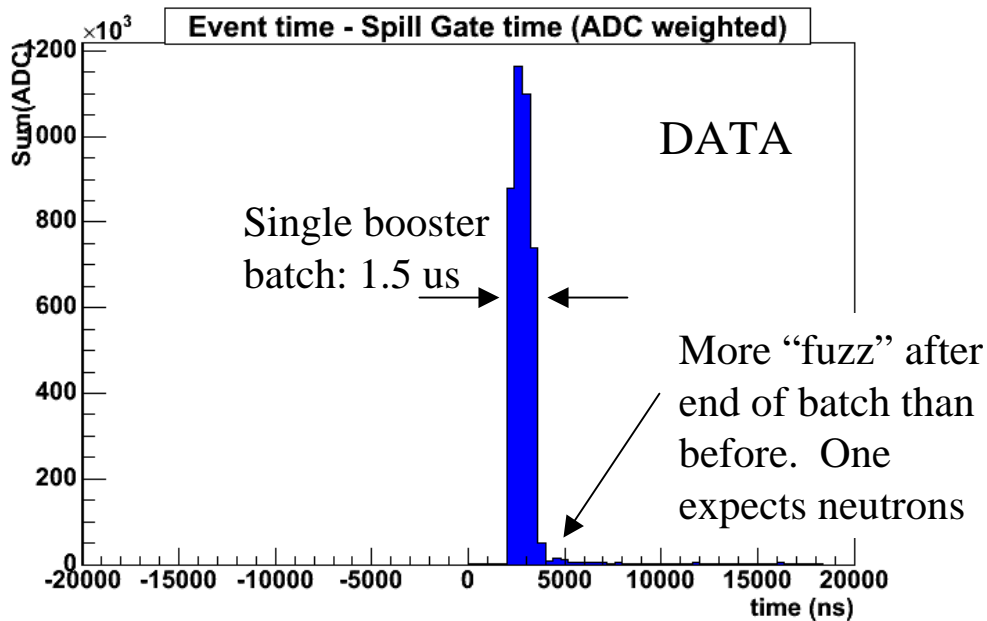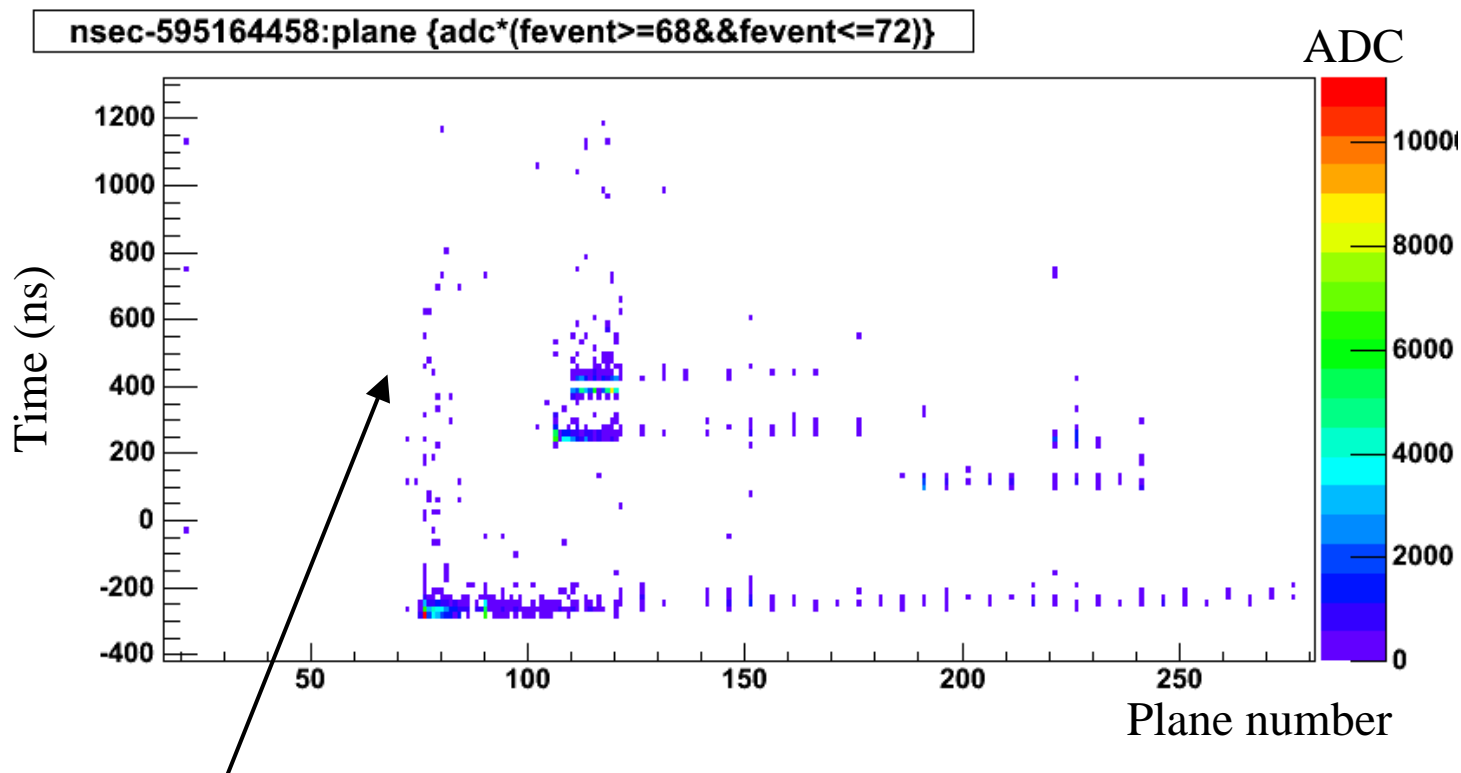
- Beam data taking at ND:
  - SGATE – up to ~19us of untriggered data
  - 1 digit per RF bucket per channel (19ns)
  - ~1/6 P.E. readout threshold

Event time - Spill Gate time (ADC weighted)

DATA

Single booster batch: 1.5 us

More "fuzz" after end of batch than before. One expects neutrons

ADC weighted time of all digits, relative to SGATE start

- Typical late afterglow:

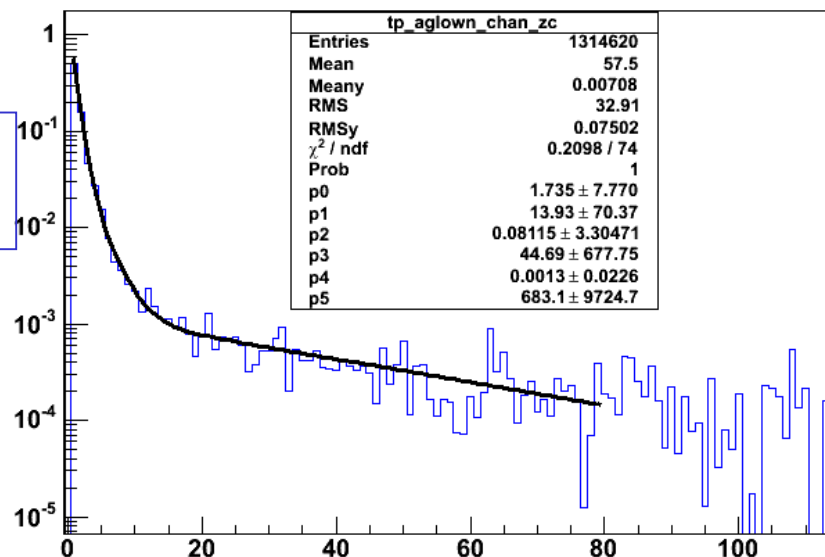nsec-595164458:plane {adc*(fevent>=68&&fevent<=72)}

Late afterglow: up to 1us

- Characterize the afterglow in DATA:
  - Easiest approach: look at ratio of ADC in a digit, relative to 1st digit in the same channel above 1000 counts
    - As a function of time from that 1st digit

Same Channel Afterglow (normalized, includes 0s)

tp_aglown_chan_zc	
Entries	1314620
Mean	57.5
Meany	0.00708
RMS	32.91
RMSy	0.07502
χ^2 / ndf	0.2098 / 74
Prob	1
p0	1.735 ± 7.770
p1	13.93 ± 70.37
p2	0.08115 ± 3.30471
p3	44.69 ± 677.75
p4	0.0013 ± 0.0226
p5	683.1 ± 9724.7

3 exponential fit:
~14ns, ~45ns, ~700ns

Note: parameter errors shown are meaningless
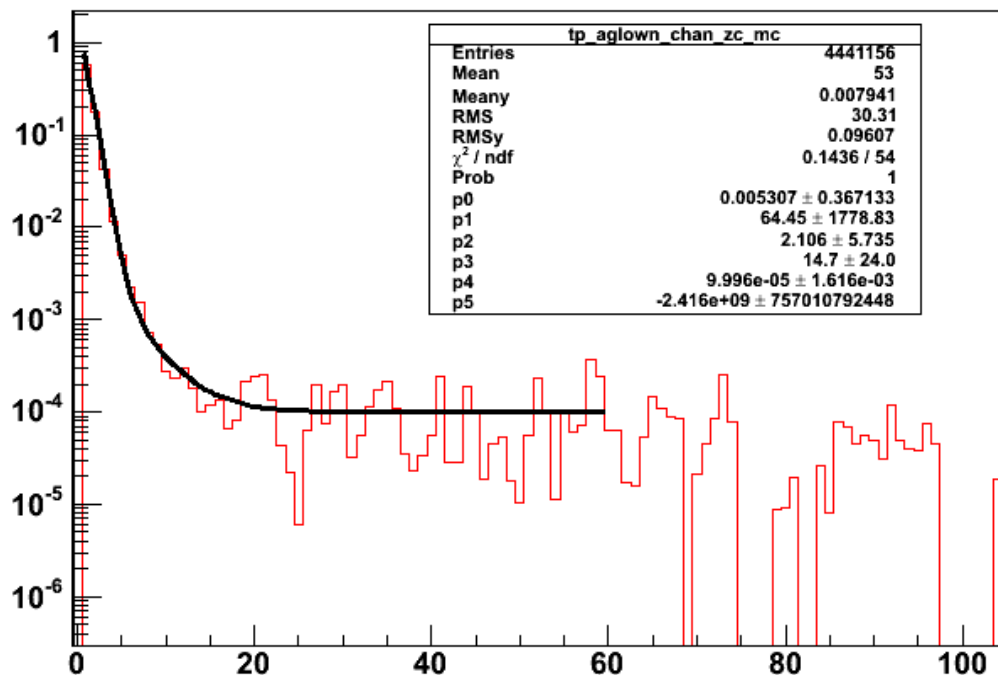
Time since 1st digit: RF bucket

- ## MC:

  - ### Alysia's 1.12 pseudo-ME

3 exponential fit:
~15ns, ~65ns, and flat

MC hits accidental floor
before a 3rd component is seen

*Note: parameter
errors shown are
meaningless*

Same Channel Afterglow (normalized, includes 0s)

tp_aglown_chan_zc_mc	
Entries	4441156
Mean	53
Meany	0.007941
RMS	30.31
RMSy	0.09607
χ^2 / ndf	0.1436 / 54
Prob	1
p0	0.005307 ± 0.367133
p1	64.45 ± 1778.83
p2	2.106 ± 5.735
p3	14.7 ± 24.0
p4	9.996e-05 ± 1.616e-03
p5	-2.416e+09 ± 757010792448

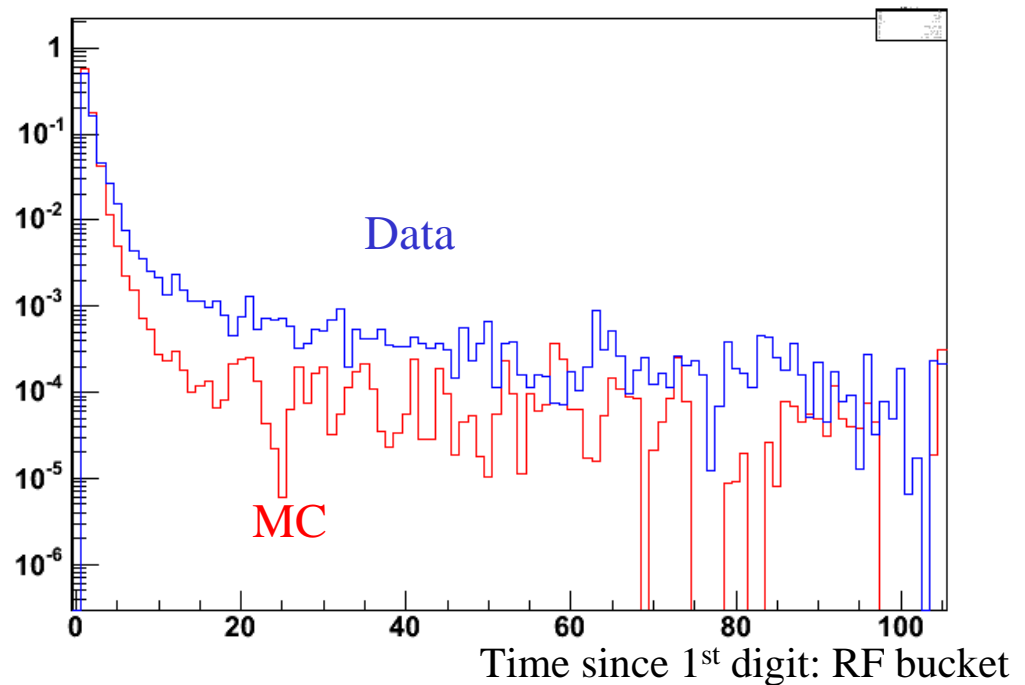Time since 1st digit: RF bucket

Do We Care?

People with more reco experience than me can judge the importance of the effect

Suggestions:

- It may be worth investigation into MC neutron generation, regardless

- More thorough "interaction-based" study – including all channels as function of distance from vertex

- Anyone interested?

Same Channel Afterglow (normalized, includes 0s)

Data

MC

Time since 1st digit: RF bucket

P.S. 6 Batches